Deepwater Horizon Oil Spill Natural Resource Damage Assessment

Texas Trustee Implementation Group
Final Restoration Plan/Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats

July 2025



NEPA UIN EAXX-006-48-1HC-1729121448

Suggested citation: Texas Trustee Implementation Group (Texas TIG). 2025. *Deepwater Horizon* Oil Spill Texas Trustee Implementation Group. *Final Restoration Plan/Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats*.

This National Environmental Policy Act (NEPA) document has been assigned the NEPA Unique Identification Number (UIN) EAXX-006-48-1HC-1729121448.

Photo caption: A completed marsh restoration project that beneficially used dredged material in Pierce Marsh. Photo courtesy of Philip Smith, Galveston Bay Foundation.

Executive Summary

On April 20, 2010, the *Deepwater Horizon* (DWH) mobile drilling unit exploded, caught fire, and eventually sank in the Gulf of America (formerly the Gulf of Mexico),[1] resulting in a massive release of oil and other substances from BP Exploration and Production's (BP's) Macondo well and causing loss of life and extensive natural resources injuries. Initial efforts to cap the well following the explosion were unsuccessful, and for 87 days after the explosion, the well continuously and uncontrollably discharged oil and natural gas into the northern Gulf of America. Approximately 3.19 million barrels (134 million gallons) of oil were released into the ocean (U.S. Department of Justice 2016). Oil spread from the deep ocean to the ocean surface and nearshore environment from Texas to Florida. Extensive response actions, including cleanup activities and actions to prevent the oil from reaching sensitive resources, were undertaken to reduce harm to people and the environment. However, many of the response actions had collateral impacts on the environment and on natural resource services.

As part of a 2016 settlement, BP agreed to pay a total of $8.1 billion in natural resource damages (inclusive of Early Restoration funding) over a 15-year period and up to an additional $700 million for adaptive management and to address natural resources injuries that are presently unknown but may become apparent in the future. The settlement allocated a specific sum for restoration within specific Restoration Areas and across Restoration Types (described in more detail below).

The Texas Trustee Implementation Group (Texas TIG) is responsible for restoring natural resources and their services that were injured by the DWH oil spill within the Texas Restoration Area. The purpose of restoration, as discussed in the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Final PDARP/PEIS; DWH NRDA Trustees 2016), is to make the environment and the public whole for injuries resulting from the spill. This will be achieved by implementing restoration actions that return injured natural resources and services to baseline conditions and compensate for interim losses in accordance with the Oil Pollution Act of 1990 and associated Natural Resources Damage Assessment (NRDA) regulations. The Final PDARP/PEIS and Record of Decision are available at www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan/.

The Texas TIG has prepared this *Final Restoration Plan/Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats* (RP/EA #3) to address injury to a subset of natural resources and natural resource services in the Texas Restoration Area resulting from the DWH oil spill, focusing on the beneficial use of dredged material (BUDM) to restore and conserve wetlands, coastal, and nearshore habitats. This RP/EA #3 includes a description and evaluation of eight restoration projects, also called restoration alternatives,[2] which compensate for the natural resource injury described in the Final PDARP/PEIS. Table ES-1 lists the reasonable range of alternatives evaluated by the Texas TIG.

[1] The waterbody was renamed per Executive Order 14172 "Restoring Names That Honor American Greatness" (January 20, 2025).

[2] The terms "project" and "alternative" are used interchangeably throughout this RP/EA #3.

Table ES-1 Reasonable Range of Restoration Alternatives Proposed in RP/EA #3

Alternative	Potential Acres	Preferred or Not Preferred
Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration	550	Preferred
Goose Island Wetland Restoration	40	Preferred
Guadalupe River Old Delta Wetland Restoration	1,140	Not preferred
Lower Neches Wildlife Management Area Old River Unit Wetland Restoration	224	Preferred
McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration	218	Preferred
San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration	200	Preferred
Schicke Point Wetland Restoration	72	Not preferred
Texas Point National Wildlife Refuge Wetland Restoration	623	Preferred

Many maintenance projects along the Texas coast involve dredging and disposing of sediment, which could be repurposed to ecologically benefit coastal habitats. The projects would restore and conserve wetlands and coastal habitats by using suitable material dredged from nearby maintenance projects to create vegetated wetland habitat. The placement of dredged material, construction of containment levees, and associated plantings for the preferred alternatives would restore up to 1,855 acres of intertidal marsh as indicated in Table ES-1.

The Draft RP/EA #3 was released for public review and comment on January 16, 2025, and public comments were accepted through February 18, 2025. The Texas TIG held a public meeting on January 28, 2025, to provide information about the Draft RP/EA #3 and to answer questions and receive public comment. The Texas TIG considered the comments received, which informed the analysis of alternatives in this Final RP/EA #3. A summary of public comments received and the Texas TIG's responses to those comments are included in Appendix F of this document. Edits made between the Draft and Final RP/EA #3 were primarily editorial changes; minor technical revisions to improve clarity; edits made in compliance with Executive Orders 14154, 14172, 14229; and edits made in compliance with other environmental laws and regulations. In addition to these minor revisions, the Texas TIG made two substantive changes. The *Schicke Point Wetland Restoration* project was preferred in the Draft RP/EA #3 but was removed by the Texas TIG from the list of preferred projects in this Final RP/EA #3. The Texas TIG reviewed new aerial photography following publication of the Draft RP/EA #3 and concluded the project would not provide as many natural resource benefits as initially anticipated, given the accretion of marsh and presence of submerged aquatic vegetation at the site. Sections 1.6.1.2 and 3.5.7 provide additional information regarding this change. The TIG also reduced the total amount of Wetlands, Coastal and Nearshore Habitats Restoration Type funding allocated to the projects from $40 million in the Draft RP/EA #3 to $36 million proposed in this Final RP/EA #3.

The Texas TIG is selecting the six project alternatives listed as "preferred" in Table ES-1 for funding and implementation. As opposed to identifying the cost of each alternative, the Texas TIG would use up to $36 million to implement the selected alternatives. This funding would be divided among the selected projects to provide the incremental cost for the U.S. Army Corps of Engineers or to fund other viable

sources to beneficially use dredged sediments to construct the preferred restoration alternatives, as well as for Trustee implementation costs, planning, and monitoring. Table ES-2 provides a summary of the anticipated environmental consequences of the eight projects (six preferred; two non-preferred) and the no action alternative evaluated in this RP/EA #3.

Table ES-2 Summary of the Reasonably Foreseeable Impacts of the Reasonable Range of Restoration Alternatives

Project	Geology and Substrates	Hydrology and Water Quality	Air Quality	Noise	Habitats	Wildlife Species	Marine and Estuarine Fauna	Protected Species	Socioeconomics	Cultural Resources	Infrastructure	Land and Marine Management	Tourism and Recreational Use	Fisheries and Aquaculture	Marine Transportation	Aesthetics and Visual Resources	Public Health and Safety
No Action	L	L	NE	NE	L	L	L	L	NE	NE	l	l	l	l	NE	l	l
Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Goose Island Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Guadalupe River Old Delta Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Lower Neches Wildlife Management Area Old River Unit Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Schicke Point Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Texas Point National Wildlife Refuge Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE

Notes:
+: beneficial effect
l: long-term, minor adverse effect
L: long-term, moderate-to-major adverse effect
NE: no adverse effect
s: short-term, minor adverse effect

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List of Abbreviations

BGEPA	Bald and Golden Eagle Protection Act
BP	BP Exploration and Production, Inc.
BUDM	Beneficial use of dredged material
BUDM Project Fund	$36 million allocation to implement the preferred alternatives selected in the *Final Restoration Plan/Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats*
CBRA	Coastal Barrier Resources Act
CEQ	Council on Environmental Quality
C.F.R.	*Code of Federal Regulations*
CWA	Clean Water Act
Cy	Cubic yards
CZMA	Coastal Zone Management Act
DIVER	Data Integration Visualization Exploration and Reporting
DOI	U.S. Department of the Interior
DWH	*Deepwater Horizon*
E&D	Engineering and design
EFH	Essential Fish Habitat
EO	Executive Order
ESA	Endangered Species Act
Final PDARP/PEIS	*Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement*
FRA	Fiscal Responsibility Act of 2023
GIWW	Gulf Intracoastal Waterway
GLO	Texas General Land Office
Gulf	Gulf of America, formerly Gulf of Mexico
MAM	Monitoring and Adaptive Management
MBTA	Migratory Bird Treaty Act
MMPA	Marine Mammal Protection Act
MPRSA	Marine Protection, Research, and Sanctuaries Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act of 1966, as amended
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRDA	Natural Resources Damage Assessment
NWR	National Wildlife Refuge
OPA	Oil Pollution Act
RHA	Rivers and Harbors Act
ROD	Record of Decision

RP/EA #1	*Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters*
RP/EA #2	*Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final Restoration Plan/Environmental Assessment #2: Restoration of Wetlands, Coastal, and Nearshore Habitats; Nutrient Reduction; Oysters; Sea Turtles; and Birds*
RP/EA #3	*Draft Restoration Plan/Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats*
RW RP/EA #1	*Deepwater Horizon Oil Spill Regionwide Trustee Implementation Group Final Restoration Plan/ Environmental Assessment 1: Birds, Marine Mammals, Oysters, and Sea Turtles*
SNWW	Sabine-Neches Waterway
SOP	Standard operating procedure
TIG	Trustee Implementation Group
TNRC	Texas Natural Resources Code
TPWD	Texas Parks and Wildlife Department
Texas TIG	Texas Trustee Implementation Group
USACE	U.S. Army Corps of Engineers
U.S.C.	*United States Code*
USFWS	U.S. Fish and Wildlife Service
WMA	Wildlife Management Area

1 Introduction, Purpose and Need, and Public Participation

This *Final Restoration Plan/Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats* (RP/EA #3) has been prepared by the Texas Trustee Implementation Group (Texas TIG). The Texas TIG includes three Texas State Trustee agencies: the Texas Commission on Environmental Quality; Texas Parks and Wildlife Department (TPWD); Texas General Land Office (GLO); and four federal Trustee agencies: National Oceanic and Atmospheric Administration (NOAA), on behalf of the U.S. Department of Commerce, U.S. Department of the Interior (DOI), U.S. Department of Agriculture, and U.S. Environmental Protection Agency. The Texas TIG is responsible for restoring natural resources and their services that were injured or lost as a result of the *Deepwater Horizon* (DWH) oil spill within the Texas Restoration Area.

The Texas TIG prepared this RP/EA #3 to continue restoration of natural resources and their services that were injured or lost as a result of the DWH oil spill and to inform the public about the DWH Natural Resources Damage Assessment (NRDA) restoration planning efforts for wetlands, coastal, and nearshore habitats. This RP/EA #3 was prepared in accordance with the Consent Decree[3] (E.D. La. 2016), *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Final PDARP/PEIS; DWH NRDA Trustees 2016) and the Record of Decision (ROD),[4] Trustee Council's standard operating procedures (SOPs; DWH NRDA Trustees 2021), Oil Pollution Act of 1990 (OPA), and National Environmental Policy Act of 1969 (NEPA) as amended by the Fiscal Responsibility Act of 2023 (FRA; Pub. L. No. 118-5, 2023). In this RP/EA #3, the Texas TIG identifies a reasonable range of project alternatives and selects those projects identified as "preferred" for funding and implementation to compensate the public for part of the injuries caused to wetlands, coastal, and nearshore habitats in the Texas Restoration Area.

1.1 Background and Summary of the Settlement

On April 20, 2010, the DWH mobile drilling unit exploded, caught fire, and eventually sank in the Gulf of America (formerly the Gulf of Mexico, herein referred to as "the Gulf"),[5] resulting in a massive release of oil and other substances from BP Exploration and Production, Inc.'s (BP's) Macondo well and causing pervasive natural resource injuries across the northern Gulf. Approximately 3.19 million barrels (134 million gallons) of oil were released (U.S. Department of Justice 2016) and spread from the deep ocean to the ocean surface and nearshore environment from Texas to Florida. Extensive response actions, including cleanup activities and actions to prevent the oil from reaching sensitive resources, were undertaken to reduce harm to people and the environment. However, many of these response actions had collateral impacts on the environment and natural resource services. The breadth of injuries incurred from the incident are described in Chapter 4 of the Final PDARP/PEIS.

Under the authority of OPA, a council of federal and state trustees (DWH Trustees[6]) was established to assess natural resource injuries resulting from the incident and to work towards making the

[3] Consent Decree, United States v. BPXP et al., Civ. No. 10-4536, (E.D. La. Apr. 4, 2016), centralized in MDL 2179, In re Oil Spill by the Oil Rig "Deepwater Horizon" in the Gulf of Mexico, on April 20, 2010 (E.D. La.).

[4] The Consent Decree, PDARP/PEIS, and ROD can be found on the DWH Trustee website www.gulfspillrestoration.noaa.gov/.

[5] The waterbody was renamed per Executive Order 14172 "Restoring Names That Honor American Greatness" (January 20, 2025).

[6] The Trustees are the entities authorized under OPA to act on behalf of the public to assess the natural resource injuries resulting from the DWH oil spill and to develop and implement project-specific restoration plans to compensate for those injuries. Together with the members of the Texas TIG, state Trustees authorized by the governors of Alabama, Florida, Mississippi, and Louisiana collectively compose the Trustee Council.

environment and public whole for those injuries. In accordance with OPA and the OPA NRDA regulations (15 Code of Federal Regulations [C.F.R.] § 990), in February 2016, the DWH Trustees issued a Final PDARP/PEIS and subsequent ROD detailing a specific, proposed plan to fund and implement restoration projects across the Gulf with available restoration funds. The Final PDARP/PEIS sets forth the process for selecting specific projects for implementation by outlining programmatic Restoration Goals and Restoration Types (see Figure 5.4-1 of the Final PDARP/PEIS). The Final PDARP/PEIS also establishes a distributed governance structure that assigns a TIG for each of the eight Restoration Areas.[7] The Texas TIG makes all restoration decisions for the use of funds allocated to the Texas Restoration Area. Chapter 7 of the Final PDARP/PEIS provides detailed information on the Trustees and the TIG governance structure. In April 2016, the U.S. District Court for the Eastern District of Louisiana entered a Consent Decree resolving civil claims by the Trustees against BP arising from the DWH oil spill.

1.2 Restoration Planning

Restoration planning from the DWH oil spill began in Texas in 2011 as part of the *Framework for Early Restoration Addressing Injuries Resulting from the Deepwater Horizon Oil Spill* (DWH NRDA Trustees 2011). Restoration planning continued in Texas with the release of two post-settlement restoration plans: 1) *Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters*[8] (RP/EA #1; Texas TIG 2017); and 2) *Deepwater Horizon Oil Spill Natural Resource Damage Assessment*, *Texas Trustee Implementation Group, Final Restoration Plan/Environmental Assessment #2: Restoration of Wetlands, Coastal, and Nearshore Habitats; Nutrient Reduction; Oysters; Sea Turtles; and Birds*[9] (RP/EA #2; Texas TIG 2022a).

In RP/EA #1, the Texas TIG selected, in addition to others, the *Dredged Material Planning for Wetland Restoration* project to address injury to wetlands, coastal, and nearshore habitats.[10] The project, further described in Section 2.2, involved the identification of priority locations, development of 60% design, and preparation of permit application packages for the beneficial use of dredged material (BUDM) for marsh restoration at eight sites along the Texas coast. The Texas TIG noted that "implementation of the BUDM to construct intertidal wetlands would take place in subsequent phases of the project" (Texas TIG 2017). The *Texas Dredged Material for Wetland Restoration – Final Report* was completed in 2022 (Texas TIG 2022b). This RP/EA #3 evaluates the sites identified in that report under OPA and NEPA for the next phase of planning and implementation.

Table 1-1 shows the total Texas TIG settlement funds allocated within the *Deepwater Horizon Oil Spill: Programmatic and Phase III Early Restoration Plan and Early Restoration Programmatic Environmental Impact Statement,*[11] the *Deepwater Horizon Oil Spill Final Phase IV Early Restoration Plan and Environmental Assessments*,[12] RP/EA #1, RP/EA #2, and funds proposed for allocation in this RP/EA #3.

[7] The restoration areas are Alabama, Florida, Louisiana, Mississippi, Texas, Regionwide, Open Ocean, and Adaptive Management and Unknown Conditions.

[8] RP/EA #1 is available at https://www.gulfspillrestoration.noaa.gov/media/document/dwh-arz000631pdf.

[9] RP/EA #2 is available at https://www.gulfspillrestoration.noaa.gov/media/document/2022-07-txrpeafinalcombined508pdf.

[10] The OPA evaluation of the project is in RP/EA #1, pages 61 through 63.

[11] Phase III Early Restoration Plan is available at https://www.gulfspillrestoration.noaa.gov/restoration/early-restoration/phase-iii.

[12] Phase IV Early Restoration Plan is available at https://www.gulfspillrestoration.noaa.gov/media/document/final-phase-iv-erp-eapdf.

For current information on the projects, see the NOAA's Gulf Spill Restoration website about the Texas Restoration Area.[13]

1.3 OPA and NEPA Compliance

As an oil pollution incident, the DWH oil spill is subject to the provisions of OPA (33 United States Code [U.S.C.] §§ 2701 *et seq*.). A primary goal of OPA is to make the environment and public whole for injuries to natural resources and services resulting from an incident involving an oil discharge or substantial threat of an oil discharge. OPA identifies factors the Texas TIG must consider in evaluating restoration projects. Under 15 C.F.R. §§ 990.54-55, the Texas TIG must consider a reasonable number of restoration alternatives when selecting a restoration project for implementation.

In addition, the federal trustees must comply with NEPA (42 U.S.C. §§ 4321 *et seq.*) and agency-specific NEPA implementing procedures and regulations when proposing restoration projects. The NEPA analysis in this integrated OPA/NEPA document is being prepared in accordance with NEPA and its amendments by the FRA. The Final PDARP/PEIS was intended to be used to tier the NEPA analysis in subsequent restoration plans prepared by the TIGs (42 U.S.C. § 4336b; see Chapter 6 of the Final PDARP/PEIS). A tiered environmental analysis focuses on project-specific issues and summarizes or references the broader issues discussed in a programmatic NEPA analysis—in this case, the Final PDARP/PEIS. The NEPA analysis in this RP/EA #3 tiers from the Final PDARP/PEIS, where applicable. Additionally, the Texas TIG incorporates by reference existing NEPA analyses, management plans, studies, or other relevant material and adopts existing NEPA analyses, where applicable, in the analysis of impacts in this RP/EA #3 (Chapter 4; Appendix A).

The FRA amended NEPA to require that when a federal agency relies on a programmatic environmental document more than five years old, the federal agency must re-evaluate the analysis and any underlying assumptions in the programmatic environmental document to ensure the analysis remains valid. The DWH Federal Trustees reviewed the framework of the Final PDARP/PEIS for continued relevance, and in a memorandum dated June 28, 2024, affirmed the continued validity of the Final PDARP/PEIS to the overall program. The Federal Trustees will evaluate whether new information or changed circumstances may affect the continued validity of relevant portions of the Final PDARP/PEIS at the project level during the preparation of each tiered RP/EA. Consistent with the FRA amendment to NEPA (42 U.S.C. § 4336b), the DWH Federal Trustees of the Texas TIG determined that the analysis and the underlying assumptions in the Final PDARP/PEIS (DWH NRDA Trustees 2016) remain valid in the context of the projects proposed in this RP/EA #3 and continue to be applicable as a programmatic evaluation for DWH restoration planning.

NOAA is the lead federal Trustee for preparing this RP/EA #3 pursuant to NEPA (42 U.S.C. § 4336a(a)(1)(A)). The other Texas TIG federal and state Trustees are acting as cooperating agencies for the purposes of NEPA compliance in the development of this RP/EA #3 (42 U.S.C. § 4336a(a)(3)). Each federal cooperating agency on the Texas TIG will review the analysis for adequacy in meeting the standards set forth in its own NEPA implementing procedures and subsequently adopt the NEPA analysis if appropriate (42 U.S.C. § 4336a(b)). Adoption of the environmental assessment would be completed via signature on the relevant NEPA decision document.

[13] The Texas Restoration Area portion of the Gulf Spill Restoration website is available at https://www.gulfspillrestoration.noaa.gov/restoration-areas/texas.

Table 1-1 Texas TIG Funds by Restoration Goal and Restoration Type

Final PDARP/PEIS Programmatic Restoration Goal	Restoration Type	Total Texas TIG Settlement Funds	Funds Allocated[14]	Funds Proposed in this RP/EA #3	Funds Remaining
Restore and Conserve Habitat	Wetlands, Coastal, and Nearshore Habitats	$100,000,000	$60,714,425	$36,000,000	$3,285,575
Restore Water Quality	Nutrient Reduction	$22,500,000	$5,106,163	-	$17,393,837
Replenish and Protect Living Coastal and Marine Resources	Sea Turtles	$27,465,000	$24,791,362	-	$2,673,638
	Birds	$40,603,770	$30,381,432	-	$10,222,338
	Oysters	$22,500,000	$9,915,607	-	$12,584,393
Provide and Enhance Recreational Opportunities	Provide and Enhance Recreational Opportunities	$18,582,688	$17,155,272	-	$1,427,272
Monitoring & Adaptive Management	N/A	$2,500,000	-	-	$2,500,000
Administrative Oversight and Comprehensive Planning	N/A	$4,000,000	$1,517,295	-	$2,482,705
	Total	**$238,151,458**	**$149,581,556**	**$36,000,000**	**$52,569,902**

1.4 Purpose and Need

The Texas TIG has undertaken this restoration planning effort to meet the purpose of contributing to the compensation for and restoration of natural resources and their services injured in the Texas Restoration Area resulting from the DWH spill. This RP/EA #3 is consistent with the Final PDARP/PEIS, which identified extensive and complex injuries to natural resources and their services across the Gulf and a need to plan for comprehensive restoration consistent with OPA. This RP/EA #3 falls within the scope of the purpose and need identified in the Final PDARP/PEIS. As described in Section 5.3 of the Final PDARP/PEIS, the programmatic Restoration Goals work independently and together to benefit injured resources and services. The reasonable range of restoration alternatives in this RP/EA #3 address one of the programmatic Restoration Goals: Restore and Conserve Habitat. Additional information about the purpose and need for DWH NRDA restoration can be found in Section 5.3.2 of the Final PDARP/PEIS.

[14] This includes funds allocated to restoration planning (e.g., plan development), Early Restoration projects, and Texas TIG Restoration Plan projects, as reported through the NOAA DIVER website. Data is current as of May 2025.

1.5 Proposed Action and Alternatives

1.5.1 Proposed Action

The Texas TIG proposes to implement the restoration alternatives identified as preferred in this RP/EA #3 to provide compensatory restoration toward meeting the Restore and Conserve Habitats Restoration Goal identified in the Final PDARP/PEIS (Section 1.5.3) and underlying Wetlands, Coastal, and Nearshore Habitats Restoration Type.

1.5.2 Proposed Alternatives

Table 1-2 identifies the reasonable range of restoration alternatives evaluated in this RP/EA #3. After preparing the Draft RP/EA #3 and reviewing public comments, the Texas TIG is selecting the proposed action of implementing the six alternatives identified as preferred, using funds made available through the DWH Consent Decree. The selected alternatives would be implemented over approximately the next five to ten years. Figure 1-1 provides the approximate location of each restoration alternative.

The Texas TIG is selecting projects that would use up to $36 million of Texas TIG settlement funds from the Wetlands, Coastal, and Nearshore Habitats Restoration Type. This would leave a balance of approximately $52.6 million across Restoration Types for the Texas TIG to allocate for future restoration. Funding allocated through this RP/EA #3 would be divided among the selected projects to provide the incremental cost to the U.S. Army Corps of Engineers (USACE) or to fund other viable sources to beneficially use dredged sediments to construct preferred restoration alternatives, as well as for Trustee implementation costs, planning, and monitoring. Detailed information on all alternatives can be found in Section 2.3.

Table 1-2 Reasonable Range of Restoration Alternatives Proposed in this RP/EA #3 (Listed Alphabetically)

Alternative	Potential Acres	Preferred or Not Preferred
Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration	550	Preferred
Goose Island Wetland Restoration	40	Preferred
Guadalupe River Old Delta Wetland Restoration	1,140	Not preferred
Lower Neches Wildlife Management Area Old River Unit Wetland Restoration	224	Preferred
McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration	218	Preferred
San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration	200	Preferred
Schicke Point Wetland Restoration	72	Not preferred
Texas Point National Wildlife Refuge Wetland Restoration	623	Preferred

1.5.3 Natural Recovery/No Action Alternative

Under the Natural Recovery/No Action Alternative, the Texas TIG would not select and implement any of the restoration alternatives proposed in this RP/EA #3 (Section 3.5). In the Final PDARP/PEIS, the

Trustees analyzed the Natural Recovery/No Action Alternative programmatically and found that it would not meet the purpose and need for restoring lost natural resources and their services. A No Action Alternative is included in this RP/EA #3 analysis pursuant to NEPA to analyze "any negative environmental impacts of not implementing the proposed agency action" (42 U.S.C. § 4332 (C)(iii). The No Action Alternative is analyzed in Appendix A.

1.5.4 Severability of Projects

Restoration alternatives identified in this RP/EA #3 are independent of each other and may be selected independently by the Texas TIG. A decision not to select one or more of the alternatives does not affect the Texas TIG's selection of any remaining alternatives in future restoration planning.

1.6 Public Involvement

On August 5, 2024, the Texas TIG posted a public notice on the DWH Trustee website indicating that the TIG was initiating restoration planning for this RP/EA #3.[15] The Draft RP/EA #3 was released for public review and comment on January 16, 2025, and comments were accepted through February 18, 2025. The Texas TIG held a public meeting in Galveston, Texas on January 28, 2025, to provide information on the Draft RP/EA #3 and to provide an opportunity for questions and public comment. The presentation and public comments provided during the meeting are available on the DWH Trustee website. In addition to the public meeting, public comments could be submitted during the comment period online or through U.S. mail.

The Texas TIG received six comments on the Draft RP/EA #3, which are available in the DWH Administrative Record.[16] The Texas TIG considered the comments received, which informed the analysis of alternatives in this Final RP/EA #3. A summary of public comments received is provided below, and Appendix F of this document provides specific comment summaries and the Texas TIG's responses to those comments. This Final RP/EA #3 reflects revisions to the Draft RP/EA #3 arising from public comments, progress on compliance with other laws and regulations, and continuing project development and consideration of potentially relevant information.

1.6.1 Summary of Public Comments on the Draft RP/EA #3

During the comment period, the Texas TIG received submissions from federal and local governments, private citizens, and other individuals and organizations. The public comments received included general comments on the Draft RP/EA #3 and comments on specific projects. A summary of the comments received and the changes made from the Draft to Final RP/EA #3 is provided below. Specific comment summaries and the Texas TIG's responses to those comments are provided in Appendix F.

General public comments included support for the Draft RP/EA #3 and proposed restoration projects; support for implementing BUDM techniques to restore the Texas coast; recommendations for alternative restoration activities; questions regarding project design considerations such as water quality standards and changing environmental and habitat conditions; and comments about cross-agency coordination.

[15] The Notice of Intent to begin restoration planning can be found at https://www.gulfspillrestoration.noaa.gov/2024/08/texas-trustees-initiate-third-restoration-plan.

[16] The DWH Administrative Record can be found at www.doi.gov/deepwaterhorizon/adminrecord/.

1.6.1.1 Comments on Specific Projects

Comments received on specific projects included support for the preferred and non-preferred alternatives and other feedback, as described below:

- *Guadalupe River Old Delta Wetland Restoration:* a comment in support of the project.
- *McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration:* a comment commending the Texas TIG in their continued work at the National Wildlife Refuge (NWR); a comment in support of the project due to the marsh's die off and expansion of open water habitat.
- *Texas Point National Wildlife Refuge Wetland Restoration:* a comment in support of the project due to the marsh's deteriorating conditions from storms and saltwater intrusion.

1.6.1.2 Changes Made from the Draft RP/EA #3

After considering the public comments received, the Texas TIG revised the Draft RP/EA #3 to prepare this Final RP/EA #3. Edits were primarily editorial or minor technical revisions to improve clarity or updates based on information obtained after the release of the Draft RP/EA #3, as summarized below. None of these minor revisions affected the conclusions of the RP/EA #3.

- Changes were made to the *Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration* project title, previously *Anahuac National Wildlife Refuge Roberts Mueller Tract Wetland Restoration*, and project location description to ensure consistency with Executive Order (EO) 14229 "Honoring Jocelyn Nungaray" (March 5, 2025).
- References to the "Gulf of Mexico" were updated to the "Gulf of America", in accordance with EO 14172 "Restoring Names that Honor American Greatness" (January 20, 2025).
- In accordance with EO 14154 "Unleashing American Energy" (January 20, 2025), analyses specific to EOs 12898 (February 11, 1994) and 14096 (April 21, 2023) were removed.[17]
- References to the Council on Environmental Quality's (CEQ's) NEPA regulations were removed, consistent with the rule issued by CEQ, Removal of National Environmental Policy Act Implementing Regulations, 90 *Federal Register* 10610 (February 25, 2025) (rescinding 40 C.F.R. Parts 1500-1508, effective April 11, 2025) and EO 14154.
- Chapter 5 was updated with the current compliance status for each of the preferred projects (Table 5-1).
- Appendix F was added to summarize public comments received on the Draft RP/EA #3 and the Texas TIG's responses to those comments.

In addition to the above minor revisions, the Texas TIG made two substantive changes. The Final RP/EA #3 removes the *Schicke Point Wetland Restoration* project as a preferred alternative, based on a review of new aerial photography following publication of the Draft RP/EA #3 that indicates the project would not provide as many natural resource benefits as initially anticipated, given the accretion of marsh and presence of submerged aquatic vegetation at the site. Text changes were made throughout this RP/EA #3 to remove the preferred indication, and the project monitoring and adaptive management (MAM) plan was removed from Appendix E. The Texas TIG has also reduced the total amount of Wetlands, Coastal and Nearshore Habitats Restoration Type funding allocated to the projects from $40 million in

[17] EO 14154, "Unleashing American Energy" (January 20, 2025) and the Presidential Memorandum, "Ending Illegal Discrimination and Restoring Merit-Based Opportunity" (January 21, 2025) require federal agencies to strictly adhere to the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321 et seq. These actions repeal EOs 12898 (February 11, 1994) and 14096 (April 21, 2023). Because EOs 12898 and 14096 have been repealed, complying with such EOs is a legal impossibility.

the Draft RP/EA #3 to $36 million proposed in this Final RP/EA #3. Consequently, the Texas TIG also updated the amount of funds remaining in the Texas TIG settlement allocation amounts in Table 1-1.

1.7 Administrative Record

The DWH Trustees opened a publicly available Administrative Record for the DWH NRDA concurrently with publication of the 2010 Notice of Intent (pursuant to 15 C.F.R. § 990.45). DOI is the lead federal Trustee for maintaining the Administrative Record. Information about restoration project implementation is provided to the public through the Administrative Record and other outreach efforts including the Texas Restoration Area portion of the DWH Trustee website.[18]

1.8 Coordination with Other DWH Restoration Programs

As discussed in Section 1.5.6 of the Final PDARP/PEIS, coordination with other DWH restoration planning efforts promotes successful implementation of restoration projects and optimizes ecosystem recovery. The Texas TIG has committed to coordinating with other DWH restoration programs (e.g., the Resources and Ecosystem Sustainability, Tourist Opportunity, and Revived Economies of the Gulf Coast States Act and the National Fish and Wildlife Foundation's Gulf Environmental Benefit Fund) to maximize the overall ecosystem impact of restoration efforts and ensure effective use of funds by identifying synergies and reducing potential redundancies in project selection. This coordination ensures that all funds are allocated for critical restoration projects in Texas.

1.9 Next Steps

This RP/EA #3 is intended to provide the public and decision makers with information and analysis documenting the Texas TIG's selection of preferred restoration alternatives to restore wetlands, coastal, and nearshore habitats. Based on the findings of the OPA and NEPA analyses documented in this RP/EA #3, the Trustees prepared a Finding of No Significant Impact (FONSI), provided in Appendix G, for the preferred alternatives selected herein.

All necessary permits will be obtained, and all environmental compliance requirements will be completed, prior to any implementation of regulated project activities (including those conducted under the Endangered Species Act [ESA] and National Historic Preservation Act [NHPA], among others). If the outcome of environmental compliance reviews would necessitate a change in project scope, or if substantial changes or significant new circumstances arise over the course of project implementation, the Texas TIG would review and affirm consistency with the analyses described in this RP/EA #3. If the actions fall outside of the analysis described herein, the Texas TIG would consider the need to supplement the relevant analyses consistent with Section 9.5.2 of the Trustee Council's SOPs (DWH NRDA Trustees 2021). Project records will be established through the Data Integration Visualization Exploration and Reporting (DIVER) website and available on the DWH Trustee website; progress will be reported annually.

[18] The Texas Restoration Area portion of the DWH Trustee website is available at https://www.gulfspillrestoration.noaa.gov/restoration-areas/texas.

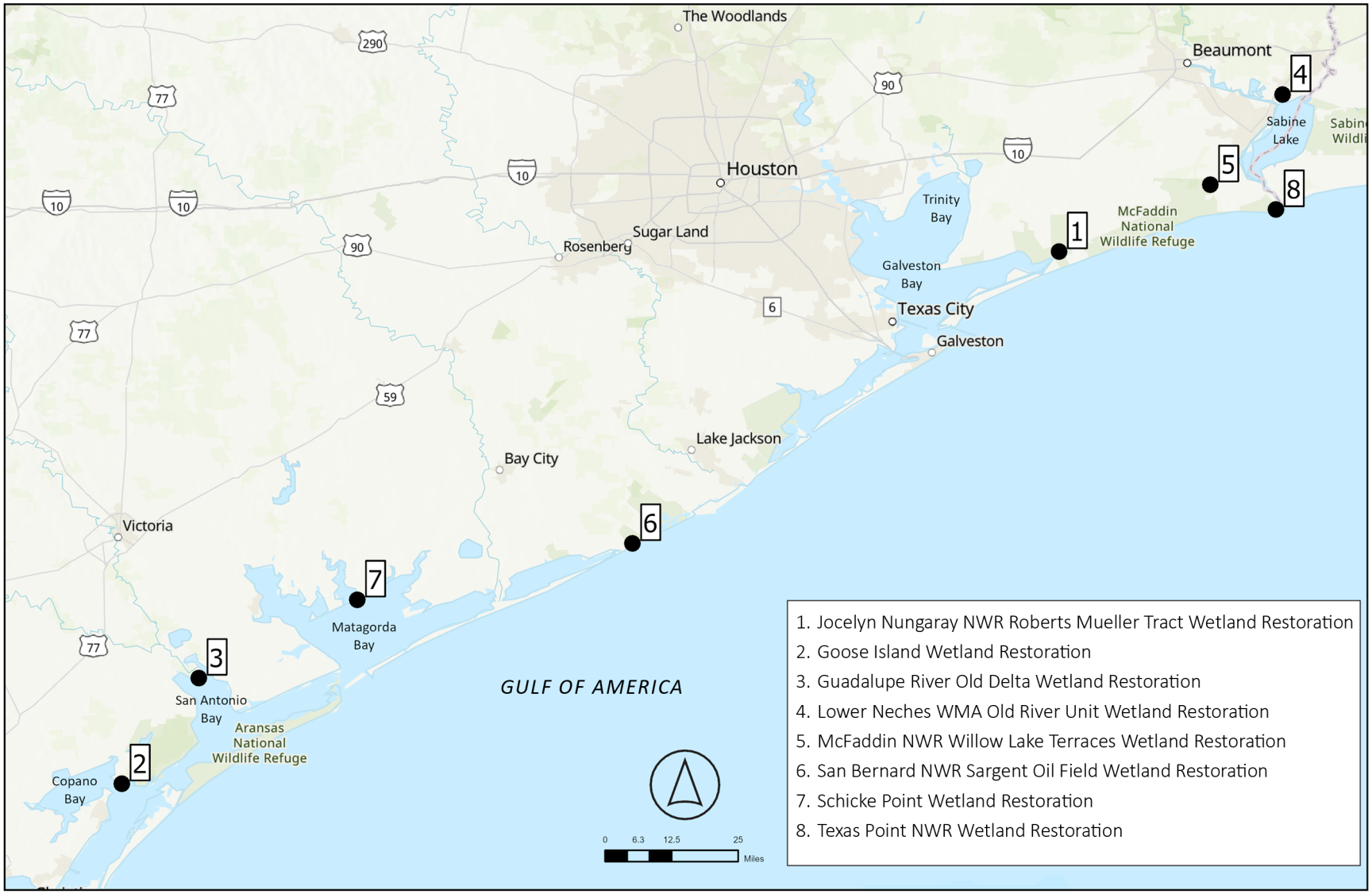


Figure 1-1 Approximate Locations of the Reasonable Range of Alternatives Proposed

2 Restoration Planning Process

NRDA restoration under OPA is a process that includes evaluating injuries to natural resources and the services they provide to determine the types and extent of restoration needed to address the injuries. Restoration activities need to produce benefits that are related to or have a connection to natural resource injuries and service losses resulting from a spill. As part of the NRDA process, the Trustees must consider a reasonable range of restoration alternatives[19] before selecting their preferred alternative(s) (15 C.F.R. § 990.53(a)(2)). The OPA NRDA regulations (15 C.F.R. § 990.54) provide evaluation standards to be used by Trustees to evaluate projects designed to compensate the public for injuries caused by oil spills.

The Texas TIG developed a screening process, described in this chapter, based on the OPA NRDA regulations to help identify the reasonable range of alternatives evaluated in this RP/EA #3. The reasonable range of alternatives is consistent with the DWH Trustees' selected programmatic alternative and the goals identified in the Final PDARP/PEIS. This chapter summarizes the injuries addressed by this RP/EA #3 and the projects considered in the reasonable range of alternatives.

2.1 Summary of Wetlands, Coastal, and Nearshore Injuries Addressed in the RP/EA #3

Chapter 4 of the Final PDARP/PEIS summarizes the injury assessment, which documents the nature, degree, and extent of injuries from the DWH oil spill to both natural resources and the services they provide. Restoration projects identified in this RP/EA #3 are designed to address injuries to resources resulting from the spill. This RP/EA #3 proposes alternatives for the Wetlands, Coastal, and Nearshore Habitats Restoration Type described in the Final PDARP/PEIS. This section summarizes the most relevant information from Chapter 4 of the Final PDARP/PEIS injury assessment and establishes the basis for restoration planning for this Restoration Type.

Injury to the coastal wetlands was observed across wide swaths of the northern Gulf. Injury occurred in all oiling exposure categories, with more severe and varied injuries documented along more heavily oiled shorelines. Multiple model species were affected, including mainland salt marsh plants (reduced plant cover and aboveground biomass), periwinkles (reduced abundance), shrimp (reduced growth and biomass), amphipods (reduced survival and biomass), *Fundulus* spp. (reduced hatch success and biomass), juvenile southern flounder (*Paralichthys lethostigma*; reduced growth and biomass), red drum (*Sciaenops ocellatus*; reduced growth and biomass), fiddler crab (reduced burrow density), insects (reduced abundance), and nearshore oysters (reduced cover and biomass). Marsh edge habitat also suffered increased erosion.

Animals using the edge of the marsh for refuge and forage were exposed to oil through contact with oiled plants, soil, sediment, and detritus on the marsh surface as it flooded with the tide, as well as through ingestion or contact with oil entrained in submerged sediments near the edge. Toxicity testing conducted using marsh soil containing oil from the spill demonstrates that polycyclic aromatic hydrocarbon concentrations found in oiled marsh areas are toxic to many marsh species (Morris et al. 2015). Cleanup and oil removal activities at the edge of marshes smothered, crushed, or removed animals and vegetation in oiled areas (Nixon and Michel 2015). The release of river water as part of spill

[19] For the purposes of this RP/EA #3, each project evaluated in the reasonable range is considered a separate alternative; therefore, the terms "project" and "alternative" are used interchangeably.

response actions also reduced growth of juvenile brown shrimp (*Farfantepenaeus aztecus*; Powers and Scyphers 2016).

As discussed in the Final PDARP/PEIS, oiling has been documented to adversely affect coastal wetland vegetation and associated fauna. Oil can wash up at the marsh edge, oiling soil and coating vegetation. It can also penetrate the marsh through tidal creeks and wash-over events and become stranded in the marsh interior, where it can coat plant stems and soil (Final PDARP/PEIS, Section 4.6.4.1). Furthermore, marsh plants help stabilize shorelines by holding, retaining, and accumulating marsh sediments. They also contribute to coastal flood protection by reducing storm surge and waves and provide critical structural habitat (as refuge and forage) for a wide variety of organisms (Final PDARP/PEIS Section 4.11.4).

2.2 Identification and Consideration of Reasonable Range of Alternatives

In developing a reasonable range of alternatives suitable for addressing the injuries caused by the DWH oil spill, the Texas TIG considered the programmatic Restoration Goals and Restoration Types specified in the Final PDARP/PEIS, the screening factors in the OPA NRDA regulations (15 C.F.R. § 990.54), the availability of funds under the DWH NRDA settlement, and projects previously funded by the Texas TIG or proposed to be funded by other sources.

The *Dredged Material Planning for Wetland Restoration* project was selected for implementation in RP/EA #1 (Texas TIG 2017). To implement the project, the Texas TIG engaged in a process of site identification and evaluation that included input from coastal stakeholders, experts, members of the public, and other organizations. With assistance from its project team, led by Ducks Unlimited, the Texas TIG engaged in an iterative process to create a list of potentially suitable sites and refine a shortlist for consideration and preliminary planning and development.

The initial survey of the Texas coastal restoration community identified 163 potential sites. Utilizing initial screening criteria (e.g., suitability for estuarine marsh habitat, protection from erosive forces, and proximity to a sediment borrow source), these were narrowed to 40 viable sites. The project team applied a second set of criteria to further reduce the list of sites to 15. These criteria included sites identified in the *Texas Coastal Resiliency Master Plan* (GLO 2019), that were within a technically viable distance to a sediment source, had long-term sustainability, and presented minimum regulatory restraints. From this group of sites, the Texas TIG identified eight sites that would provide the highest restoration benefit for surveying, development of 60% restoration design, and development of permit application packages. The *Texas Dredged Material for Wetland Restoration – Final Report* (Texas TIG 2022b) contains the biological, engineering, and site-specific details on the identification and evaluation of the eight project sites and restoration cell footprints.

These eight project ideas were submitted to the Texas TIG for consideration in the development of RP/EA #2 (2022). As these projects were still in development, the Texas TIG decided not to consider these projects in RP/EA #2, but to consider BUDM in a later restoration plan.

2.3 Reasonable Range of Restoration Alternatives Considered

Using the process described in Section 2.2, the Texas TIG identified a reasonable range of alternatives for further consideration and evaluation in this RP/EA #3 (Table 2-1). Summaries of each of these alternatives are provided in the subsequent subsections of this chapter. OPA NRDA and NEPA evaluations of these alternatives are provided in Chapters 3 and 4 of this RP/EA #3, respectively. The

total estimated cost to implement all preferred alternatives is discussed in Section 3.3. A No Action Alternative is also included in this RP/EA #3 pursuant to NEPA.

Table 2-1 Reasonable Range of Alternatives Considered in RP/EA #3

Alternative
Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration
Goose Island Wetland Restoration
Guadalupe River Old Delta Wetland Restoration
Lower Neches Wildlife Management Area Old River Unit Wetland Restoration
McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration
San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration
Schicke Point Wetland Restoration
Texas Point National Wildlife Refuge Wetland Restoration

2.3.1 Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration

Restoration Approach

Create, restore, and enhance coastal wetlands (Final PDARP/PEIS, Section 5.5.2.2).

Restoration Technique

Create or enhance coastal wetlands through placement of dredged material (Final PDARP/PEIS, Chapter 5, Appendix D.1.1).

Project Goal

This project would restore up to 550 acres of coastal intertidal wetlands through BUDM, which is consistent with the Restore and Conserve Habitat programmatic Restoration Goal and the Wetlands, Coastal, and Nearshore Habitats Restoration Type goals in the Final PDARP/PEIS (DWH NRDA Trustees 2016). The project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands; and 2) establish estuarine marsh vegetation.

Project Location

The project is located in the Roberts Mueller Tract of the Jocelyn Nungaray NWR in Chambers County, Texas, on the north side of the Gulf Intracoastal Waterway (GIWW), northwest of High Island, Texas (Figure 2-1).

Project Summary

The project site is within the Jocelyn Nungaray NWR, which is managed by the U.S. Fish and Wildlife Service (USFWS). Dredged material would provide fill for four dredge placement cells, using containment levees built from material collected on site, to restore up to 550 acres of intertidal marsh.

The predominant wetland habitats in the project area are characterized as salt and brackish marsh and estuarine open water. The combination of rising sea levels, subsidence, and reduced sediment supplies has resulted in significant loss of wetlands and other coastal habitats in the project area. Subsidence and sea level rise are rapidly converting emergent marsh to open water. This project is consistent with

regional efforts to counteract land and habitat loss through dune restoration, hydrology enhancements, and estuarine marsh restoration.

The overarching project goal is to restore and conserve wetlands and coastal habitats in the Jocelyn Nungaray NWR by beneficially using dredged material to create a viable, vegetated wetland habitat for fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage. The primary objective of this project is to return current submerged shallow open water habitat in the Jocelyn Nungaray NWR to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass (*Sporobolus alterniflorus*) and saltmeadow cordgrass (*Sporobolus pumilus*). This project would place up to 650,000 cubic yards (cy) of suitable hydraulically dredged material within levees constructed from on-site sediment. Dredged material would be placed in the levees to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 550 acres of marsh habitat, including the conversion of approximately 380 acres of existing open water to intertidal marsh habitat.

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the GIWW, private dredging sources, and material mined from dredged material placement areas. The specific sources of dredged material would be determined during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source.

General Project Activities and Implementation Timing

Project activities would include completion of engineering and design (E&D), permit acquisition, coordination with dredge material sources, construction, and monitoring.

The total amount of time to complete the project would depend on the timing of sediment availability and quantity of sediment available. Generally, the Texas TIG Trustees would coordinate with USACE or other project partners regarding dredging schedules and would complete engineering, design, and permitting in years 1 and 2. Sediment placement may require more than one dredge cycle to fill the restoration cells to their target elevations. Once construction is complete, post-construction monitoring would be conducted to assess project outcomes and determine if any corrective actions or adaptive management are needed.

Maintenance

Emergent wetlands promoted by the BUDM project should be self-sustaining and would not require maintenance unless conditions change. The project may need to be modified during construction or adaptively managed post-construction as described in the MAM Plan in Appendix E.

Monitoring

Project monitoring details are provided in the project MAM Plan in Appendix E.

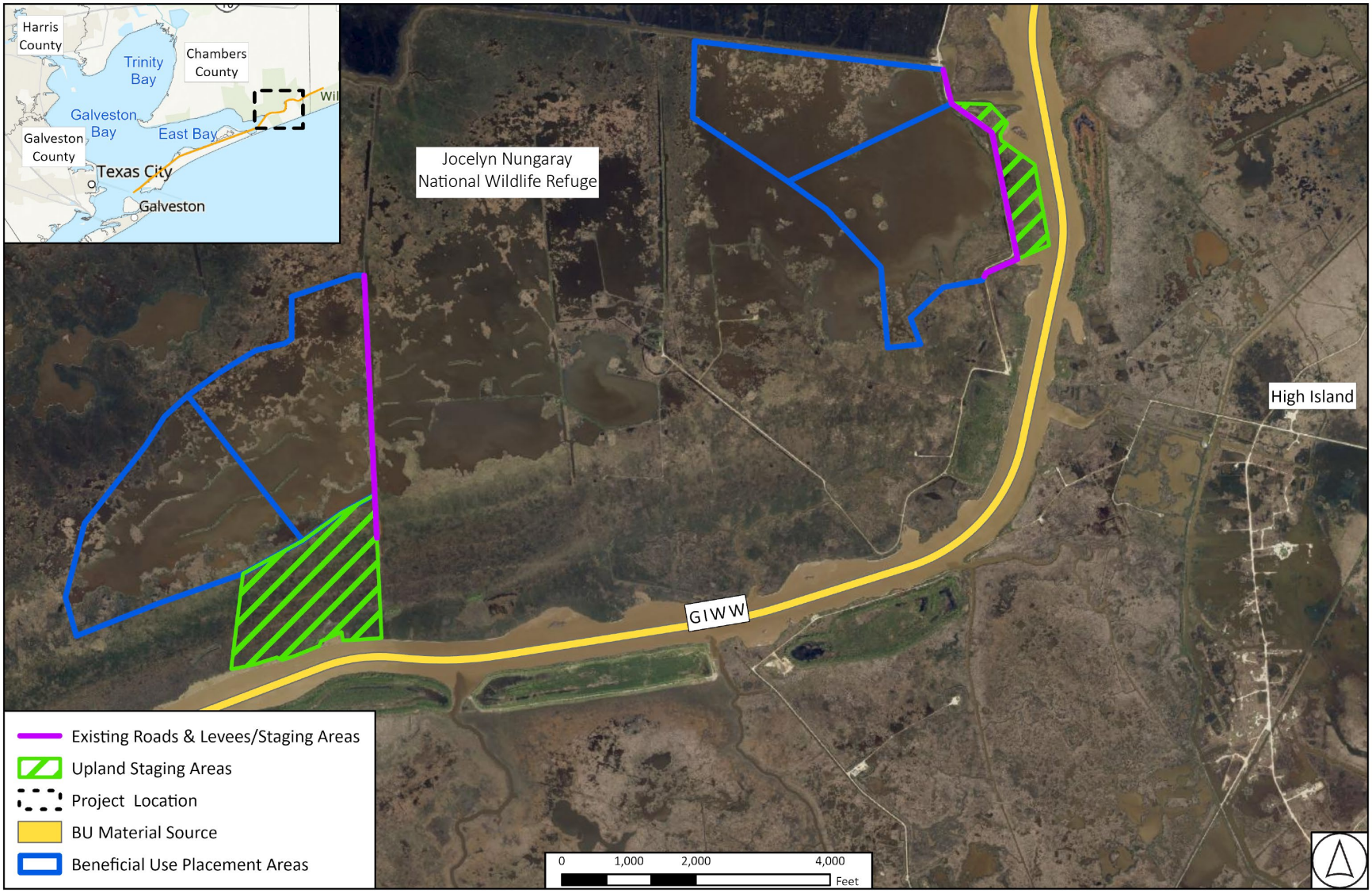


Figure 2-1 Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration: General Location Map

2.3.2 Goose Island Wetland Restoration

Restoration Approach

Create, restore, and enhance coastal wetlands (Final PDARP/PEIS Section 5.5.2.2).

Restoration Technique

Create or enhance coastal wetlands through placement of dredged material (Final PDARP/PEIS, Chapter 5, Appendix D.1.1)

Project Goal

This project would restore up to 40 acres of coastal intertidal wetlands through the placement of BUDM, which is consistent with the Restore and Conserve Habitat programmatic Restoration Goal and the Wetlands, Coastal, and Nearshore Habitats Restoration Type goals in the Final PDARP/PEIS (DWH NRDA Trustees 2016). The project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands; and 2) establish estuarine marsh vegetation.

Project Location

The project is located in Aransas County, Texas, at the end of Lamar Peninsula north of Rockport, Texas, between St. Charles and Aransas bays (Figure 2-2).

Project Summary

The project area is within Aransas Bay on or adjacent to Goose Island State Park. Dredged material would provide fill for two containment cells constructed at the site of an earlier marsh restoration project on Goose Island, as well as two new cells on the northern side of the existing cells. The containment levees would be constructed and rehabilitated using on-site sediments.

The predominant wetland habitats near the project site are characterized as salt marsh, seagrasses, and estuarine open water. The combination of rising sea levels, erosion, subsidence, and reduced sediment supplies has resulted in loss of wetlands and other coastal habitats on Goose Island. This project is consistent with regional efforts to counteract land and habitat loss through estuarine marsh restoration.

The overarching goal of the Texas TIG for this project is to restore and conserve wetlands and coastal habitats by beneficially using dredged material to create a viable, vegetated wetland habitat for fish and wildlife. In addition, rebuilding the wetlands contributes to coastal resiliency by creating buffers that protect adjacent natural areas from storm surge damage.

The primary objective of this project is to return current shallow open water habitat within the project site to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 195,000 cy of suitable hydraulically dredged material within containment levees. As part of the project, existing levees would be rehabilitated and additional levees constructed. Sediment would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 40 acres of marsh habitat, including the conversion of approximately 34 acres of existing open water to intertidal and high marsh habitat.

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the GIWW, private dredging sources, and material mined from dredged

material placement areas. The specific sources of dredged material would be determined during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source.

General Project Activities and Implementation Timing

Project activities would include completion of E&D, permit acquisition, coordination with dredge material sources, construction, and monitoring.

The total amount of time to complete the project would depend on the timing of sediment availability and quantity of sediment available in each dredging cycle. Generally, the Texas TIG Trustees would coordinate with USACE or other project partners regarding dredging schedules and would complete engineering, design, and permitting in years 1 and 2. Sediment placement may require more than one dredge cycle to fill the restoration cells to target elevation. Once construction is complete, post-construction monitoring would be conducted to assess project outcomes and determine if any corrective actions or adaptive management are needed.

Maintenance

Emergent wetlands promoted by the BUDM project should be self-sustaining and would not require maintenance unless conditions change. The project may need to be modified during construction or adaptively managed post-construction as described in the MAM Plan in Appendix E.

Monitoring

Project monitoring details are provided in the project MAM Plan in Appendix E.



Figure 2-2 Goose Island Wetland Restoration: General Location Map

2.3.3 Guadalupe River Old Delta Wetland Restoration

Restoration Approach

Create, restore, and enhance coastal wetlands (Final PDARP/PEIS Section 5.5.2.2).

Restoration Technique

Create, restore, and enhance coastal wetlands through placement of dredged material (Final PDARP/PEIS Chapter 5, Appendix D.1.1).

Project Goal

This project would restore up to 1,140 acres of coastal intertidal wetlands through BUDM, which is consistent with the Restore and Conserve Habitat programmatic Restoration Goal and the Wetlands, Coastal, and Nearshore Habitats Restoration Type goals in the Final PDARP/PEIS (DWH NRDA Trustees 2016). The project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands; and 2) establish estuarine marsh vegetation.

Project Location

The Guadalupe River Old Delta Wetland Restoration project area is located in Refugio County, Texas, at the northern portion of San Antonio Bay and forms a peninsula between Hynes Bay to the west and Guadalupe Bay to the east (Figure 2-3).

Project Summary

The project site is at the northern portion of San Antonio Bay on a peninsula separating Hynes Bay to the west and Guadalupe Bay to the east. Dredged material would provide fill for four dredge placement cells, using containment levees built from material collected on site to restore up to 1,140 acres of intertidal marsh in degraded portions of the delta.

Over the past several decades, the vegetated marsh of the site has deteriorated from erosion of portions of the marshes encompassing the site, as well as the expansion of interior open water areas. This change is particularly noticeable along the southern boundary of the delta where it is exposed to San Antonio Bay.

The predominant wetland habitat in the Guadalupe River Old Delta site is characterized as a mosaic of brackish marsh and estuarine open water. The combination of rising sea levels, erosion, storm impacts, and reduced sediment supplies has resulted in significant loss of wetlands and other coastal habitats in the project area. This project is consistent with regional efforts to counteract land and habitat loss through hydrology enhancements and estuarine marsh restoration.

The overarching goal of the project is to restore and conserve wetlands and coastal habitats in the Guadalupe River Old Delta by beneficially using dredged material to create a viable, vegetated wetland habitat for fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage. The primary objective of this project is to return current submerged open water in the project site to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 1.91 million cy of suitable hydraulically dredged material within levees constructed from on-site sediments. Dredge material would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would

restore up to 1,140 acres of marsh habitat, including the conversion of up to 480 acres of existing open water to intertidal marsh.

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the Victoria Barge Canal, private dredging sources, and material mined from dredged material placement areas. The specific sources of dredged material would be determined during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source.

General Project Activities and Implementation Timing

Project activities would include completion of E&D, permit acquisition, coordination with dredge material sources, construction, and monitoring.

The total amount of time to complete the project would depend on the timing of sediment availability and quantity of sediment available in each dredging cycle. Generally, the Texas TIG Trustees would coordinate with USACE or other project partners regarding dredging schedules and would complete engineering, design, and permitting in years 1 and 2. Sediment placement may require more than one dredge cycle to fill the restoration cells to target elevation. Once construction is complete, post-construction monitoring would be conducted to assess project outcomes and determine if any corrective actions or adaptive management are needed.

Maintenance

Emergent wetlands promoted by the BUDM project should be self-sustaining and would not require maintenance unless conditions change. The project may need to be modified during construction or adaptively managed post-construction.

Monitoring

The project has not been identified as a preferred alternative by the Texas TIG in this RP/EA #3. Therefore, a project MAM plan is not included.



Figure 2-3 Guadalupe River Old Delta Wetland Restoration: General Location Map

2.3.4 Lower Neches Wildlife Management Area Old River Unit Wetland Restoration

Restoration Approach

Create, restore, and enhance coastal wetlands (Final PDARP/PEIS, Section 5.5.2.2).

Restoration Technique

Create, restore, and enhance coastal wetlands through placement of dredged material (Final PDARP/PEIS, Chapter 5, Appendix D.1.1).

Project Goal

This project would restore up to 224 acres of coastal intertidal wetlands through the placement of BUDM, which is consistent with the Restore and Conserve Habitat programmatic Restoration Goal and the Wetlands, Coastal, and Nearshore Habitats Restoration Type goals in the Final PDARP/PEIS (DWH NRDA Trustees 2016). The project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands; and 2) establish estuarine marsh vegetation.

Project Location

The Lower Neches Wildlife Management Area (WMA) Old River Unit Wetland Restoration project is located in Orange County, Texas, south of Bridge City and north of Sabine Lake (Figure 2-4).

Project Summary

The project area is within the Old River Unit of the Lower Neches WMA, which is managed by TPWD. The Old River Unit of the WMA consists of 4,386 acres on the north shore of Old River Cove of Sabine Lake, near the GIWW. Dredged material would provide fill for six marsh restoration placement cells, using containment levees built from material collected on site to restore up to 224 acres of intertidal marsh.

The site is composed primarily of intertidal marsh and shallow open water. Over the past several decades, the vegetated marsh at the site has deteriorated, resulting in the expansion of shallow open water. The combination of rising sea levels, subsidence, and reduced sediment supplies has resulted in significant, rapid loss of wetlands and other coastal habitats in the region. This project is consistent with regional efforts to combat land and habitat loss through dune restoration, hydrology enhancements, and estuarine marsh restoration.

The overarching goal of the project is to restore and conserve wetlands at the project site by beneficially using dredged material to create a viable, vegetated, wetland habitat for fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage. The primary objective of this project is to restore shallow open water habitat in Lower Neches WMA Old River Unit to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 400,000 cy of suitable hydraulically dredged material within levees constructed from on-site sediment. Dredged material would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 224 acres of intertidal marsh, including the conversion of 96 acres of existing open water to intertidal marsh.

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the Sabine Neches Waterway (SNWW), private dredging sources, and

material mined from dredged material placement areas. The specific sources of dredged material would be determined during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source.

General Project Activities and Implementation Timing

Project activities would include completion of E&D, permit acquisition, coordination with dredge material sources, construction, and monitoring.

The total amount of time to complete the project would depend on the timing of sediment availability and quantity of sediment available in each dredging cycle. Generally, the Texas TIG Trustees would coordinate with USACE or other project partners regarding dredging schedules and would complete engineering, design, and permitting in years 1 and 2. Sediment placement may require more than one dredge cycle to fill the restoration cells to target elevation. Once construction is complete, post-construction monitoring would be conducted to assess project outcomes and determine if any corrective actions or adaptive management are needed.

Maintenance

The emergent wetlands promoted by the BUDM project should be self-sustaining and would not require maintenance unless conditions change. The project may need to be modified during construction or adaptively managed post-construction as described in the MAM Plan in Appendix E.

Monitoring

Project monitoring details are provided in the project MAM Plan in Appendix E.



Figure 2-4 Lower Neches Wildlife Management Area Old River Unit Wetland Restoration: General Location Map

2.3.5 McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration

Restoration Approach

Create, restore, and enhance coastal wetlands (Final PDARP/PEIS, Section 5.5.2.2).

Restoration Technique

Create, restore, and enhance coastal wetlands through placement of dredged material (Final PDARP/PEIS, Chapter 5, Appendix D.1.1.)

Project Goal

This project would restore up to 218 acres of coastal intertidal wetlands through the placement of BUDM, which is consistent with the Restore and Conserve Habitat programmatic Restoration Goal and the Wetlands, Coastal, and Nearshore Habitats Restoration Type goals in the Final PDARP/PEIS (DWH NRDA Trustees 2016). The project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands; and 2) establish estuarine marsh vegetation.

Project Location

The McFaddin NWR Willow Lake Marsh Restoration project is in Jefferson County, Texas, south of the GIWW, about 7 miles southwest of Port Arthur, Texas (Figure 2-5).

Project Summary

The project site is located at McFaddin NWR, which is managed by the USFWS. The restoration site boundaries were based on a previous effort to regenerate marsh using terraces within subtidal open water areas surrounding Willow Lake. The addition of dredge material to the terraced area would restore up to 218 acres of intertidal marsh habitat.

The predominant wetland habitats near the McFaddin NWR are characterized as salt and brackish marsh and estuarine open water. The combination of rising sea levels, subsidence, and reduced sediment supplies has resulted in significant loss of wetlands by rapidly converting emergent marsh to open water. This project is consistent with regional efforts to combat land and habitat loss through dune restoration, hydrology enhancements, and estuarine marsh restoration.

The overarching goal of the project is to restore and conserve wetlands and coastal habitats in Willow Lake by beneficially using dredged material to create a viable, vegetated, wetland habitat for fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage. The primary objective of this project is to restore shallow open water habitat in Willow Lake to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 475,000 cy of suitable hydraulically dredged material within levees constructed from on-site material. Sediment would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 218 acres of marsh habitat, including the conversion of up to 140 acres of existing open water to low marsh.

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the GIWW and SNWW, private dredging sources, and material mined from dredged material placement areas. The specific sources of dredged material would be determined

during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source.

General Project Activities and Implementation Timing

Project activities would include completion of E&D, permit acquisition, coordination with dredge material sources, construction, and monitoring.

The total amount of time to complete the project would depend on the timing of sediment availability and quantity of sediment available in each dredging cycle. Generally, the Texas TIG Trustees would coordinate with USACE or other project partners regarding dredging schedules and would complete engineering, design, and permitting in years 1 and 2. Sediment placement may require more than one dredge cycle to fill the restoration cells to target elevation. Once construction is complete, post-construction monitoring would be conducted to assess project outcomes and determine if any corrective actions or adaptive management are needed.

Maintenance

The emergent wetlands promoted by the BUDM project should be self-sustaining and would not require maintenance unless conditions change. The project may need to be modified during construction or adaptively managed post-construction as described in the MAM Plan in Appendix E.

Monitoring

Project monitoring details are provided in the project MAM Plan in Appendix E.



Figure 2-5 McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration: General Location Map

2.3.6 San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration

Restoration Approach

Create, restore, and enhance coastal wetlands (Final PDARP/PEIS, Section 5.5.2.2).

Restoration Technique

Create, restore, and enhance coastal wetlands through placement of dredged material (Final PDARP/PEIS, Chapter 5, Appendix D.1.1).

Project Goal

This project would restore up to 200 acres of coastal intertidal wetlands through the placement of BUDM, which is consistent with the Restore and Conserve Habitat programmatic Restoration Goal and the Wetlands, Coastal, and Nearshore Habitats Restoration Type goals in the Final PDARP/PEIS (DWH NRDA Trustees 2016). The project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands; and 2) establish estuarine marsh vegetation.

Project Location

The San Bernard NWR Wetland Restoration project is located in Matagorda County, Texas, on the north side of the GIWW, southeast of Sargent, Texas (Figure 2-6).

Project Summary

The project site is located at San Bernard NWR, which is managed by USFWS. Dredged material would provide fill for a contained placement area within the abandoned oil field adjacent to the GIWW to restore up to 200 acres of intertidal marsh.

The predominant wetland habitats in the San Bernard NWR Sargent Oil Field project area are characterized as salt and brackish marsh and estuarine open water. Over the past several decades, the vegetated marsh at the site has deteriorated, resulting in the expansion of shallow open water. The combination of rising sea levels, subsidence, and reduced sediment supplies has resulted in significant loss of wetlands and other coastal habitats in the region. This project is consistent with regional efforts to combat land and habitat loss through beach renourishment, dune restoration, hydrology enhancements, and estuarine marsh restoration.

The overarching goal of the project is to restore and conserve wetlands and coastal habitats in the San Bernard NWR Sargent Oil Field area by beneficially using dredged material to create a viable, vegetated, wetland habitat for fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage. The primary objective of this project is to restore shallow open water habitat in the San Bernard NWR Sargent Oil Field site to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 120,000 cy of suitable hydraulically dredged material within levees constructed from on-site sediment. Dredged material would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 200 acres of marsh habitat, including the conversion of up to 119 acres of existing open water to low marsh.

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the GIWW, private dredging sources, and material mined from dredged

material placement areas. The specific sources of dredged material would be determined during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source.

General Project Activities and Implementation Timing

Project activities would include completion of E&D, permit acquisition, coordination with dredge material sources, construction, and monitoring.

The total amount of time to complete the project would depend on the timing of sediment availability and quantity of sediment available in each dredging cycle. Generally, the Texas TIG Trustees would coordinate with USACE or other project partners regarding dredging schedules and would complete engineering, design, and permitting in years 1 and 2. Sediment placement may require more than one dredge cycle to fill the restoration cells to target elevation. Once construction is complete, post-construction monitoring would be conducted to assess project outcomes and determine if any corrective actions or adaptive management are needed.

Maintenance

The emergent wetlands promoted by the BUDM project should be self-sustaining and would not require maintenance unless conditions change. The project may need to be modified during construction or adaptively managed post-construction as described in the MAM Plan in Appendix E.

Monitoring

Project monitoring details are provided in the project MAM Plan in Appendix E.



Figure 2-6 San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration: General Location Map

2.3.7 Schicke Point Wetland Restoration

Restoration Approach

Create, restore, and enhance coastal wetlands (Final PDARP/PEIS, Section 5.5.2.2).

Restoration Technique

Create, restore, and enhance coastal wetlands through placement of dredged material (Final PDARP/PEIS, Chapter 5, Appendix D.1.1).

Project Goal

This project would restore up to 72 acres of coastal intertidal wetlands through the placement of BUDM, which is consistent with the Restore and Conserve Habitat programmatic Restoration Goal and the Wetlands, Coastal, and Nearshore Habitats Restoration Type goals in the Final PDARP/PEIS (DWH NRDA Trustees 2016). The project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands; and 2) establish estuarine marsh vegetation.

Project Location

The Schicke Point Wetland Restoration project is in Calhoun County, Texas, along the northern rim of Matagorda Bay at the mouth of Carancahua Bay (Figure 2-7).

Project Summary

The project site is located adjacent to the peninsula separating Matagorda Bay and Carancahua Bay. A segmented, rubble-mound breakwater was constructed along the shoreline facing Matagorda Bay in 2017. Dredged material would provide sediment to restore up to 72 acres of intertidal marsh behind the existing breakwater.

Over the past several decades, the marsh portion of the site has deteriorated through erosion of its bay-ward boundary, as well as the expansion of interior open water areas. The predominant wetland habitats at Schicke Point are characterized as salt and brackish marsh and estuarine open water. The combination of rising sea levels, erosion, reduced sediment supplies, wind-wave erosion, and storm impacts has resulted in significant loss of wetlands and other coastal habitats in the region. This project is consistent with regional efforts to combat land and habitat loss through hydrology enhancements, oyster reef restoration, and estuarine marsh restoration.

The overarching goal of the project is to restore and conserve wetlands and coastal habitats in Schicke Point by beneficially using dredged material to create a viable, vegetated, wetland habitat for fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage. The primary objective of this project is to restore shallow open water habitat in Schicke Point to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 182,000 cy of suitable hydraulically dredged material within levees constructed from on-site sediment. Dredged material would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 72 acres of marsh habitat.

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the Matagorda Ship Channel, private dredging sources, and material mined from dredged material placement areas. As part of the completion of E&D for the BUDM site, the

specific sources of dredged material would be determined during project implementation. Any dredged material used would pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source.

General Project Activities and Implementation Timing

Project activities would include completion of E&D, permit acquisition, coordination with dredge material sources, construction, and monitoring.

The total amount of time to complete the project would depend on the timing of sediment availability and quantity of sediment available in each project cycle. Generally, the Trustees would coordinate with USACE or other project partners regarding dredging schedules and would complete engineering, design, and permitting in years 1 and 2. Sediment placement may require more than one dredge cycle to fill the restoration cells to target elevation. Once construction is complete, post-construction monitoring would be conducted to assess project outcomes and determine if any corrective actions or adaptive management are needed.

Maintenance

Emergent wetlands promoted by the BUDM project should be self-sustaining and would not require maintenance unless conditions change. The project may need to be modified during construction or adaptively managed post-construction.

Monitoring

The project has not been identified as a preferred alternative by the Texas TIG in this Final RP/EA #3. Therefore, a project MAM plan is not included.



Figure 2-7 Schicke Point Wetland Restoration: General Location Map

2.3.8 Texas Point National Wildlife Refuge Wetland Restoration

Restoration Approach

Create, restore, and enhance coastal wetlands (Final PDARP/PEIS Section 5.5.2.2).

Restoration Technique

Create, restore, and enhance coastal wetlands through placement of dredged material (Final PDARP/PEIS Chapter 5, Appendix D.1.1).

Project Goal

This project would restore up to 623 acres of coastal intertidal wetlands through the placement of BUDM, which is consistent with the Restore and Conserve Habitat programmatic Restoration Goal and the Wetlands, Coastal, and Nearshore Habitats Restoration Type goals in the Final PDARP/PEIS (DWH NRDA Trustees 2016). The project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands; and 2) establish estuarine marsh vegetation.

Project Location

The Texas Point NWR project area is located within Jefferson County, Texas, at the extreme southeastern portion of Texas along the Gulf Coast and the west bank of Sabine Pass, which forms the boundary between Texas and Louisiana (Figure 2-8).

Project Summary

The project site is within the Texas Point NWR, which is managed by the USFWS. Dredged material would provide fill for three marsh restoration cells, using containment levees built from sediments collected on site to restore up to 623 acres of intertidal marsh.

The predominant wetland habitats near the Texas Point NWR are characterized as salt and brackish marsh and estuarine open water. Over the past several decades, the vegetated marsh at the site has deteriorated, resulting in the expansion of shallow open water. The combination of rising sea levels, erosion, and reduced sediment supplies has resulted in significant loss of wetlands and other coastal habitats in the region and project site. This project is consistent with regional efforts to combat land and habitat loss through dune restoration, hydrology enhancements, and estuarine marsh restoration.

The overarching goal of the project is to restore and conserve wetlands and coastal habitats by beneficially using dredged material to create viable, vegetated, wetland habitat for a variety fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage.

The primary objective of this project is to restore shallow submerged open water habitat in the Texas Point NWR to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 1.6 million cy of suitable hydraulically dredged material within levees constructed from on-site sediment. Dredged material would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 623 acres of marsh habitat, including the conversion of up to 239 acres of existing open water to intertidal marsh.

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the SNWW, private dredging sources, or material mined from dredged material placement areas. The specific sources of dredged material would be determined during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source.

General Project Activities and Implementation Timing

Project activities would include completion of E&D, permit acquisition, coordination with dredge material sources, construction, and monitoring.

The total amount of time to complete the project would depend on the timing of sediment availability and quantity of sediment available in each dredging cycle. Generally, the Trustees would coordinate with USACE or other project partners regarding dredging schedules and would complete engineering, design, and permitting in years 1 and 2. Sediment placement may require more than one dredge cycle to fill the restoration cells to target elevation. Once construction is complete, post-construction monitoring would be conducted to assess project outcomes and determine if any corrective actions or adaptive management are needed.

Maintenance

The emergent wetlands promoted by the BUDM project should be self-sustaining and would not require maintenance unless conditions change. The project may need to be modified during construction or adaptively managed post-construction as described in the MAM Plan in Appendix E.

Monitoring

Project monitoring details are provided in the project MAM Plan in Appendix E.



Figure 2-8 Texas Point National Wildlife Refuge Wetland Restoration: General Location Map

3 OPA NRDA Evaluation of Alternatives

The Texas TIG developed a reasonable range of restoration alternatives for consideration and evaluation in this RP/EA #3. The screening process to identify the alternatives and project descriptions are provided in Chapter 2. This chapter includes an OPA NRDA analysis of alternatives considered in this RP/EA #3. Section 3.1 summarizes the evaluation standards of OPA NRDA; Section 3.2 describes performance monitoring requirements; Section 3.3 describes the approach for estimating project costs; Section 3.4 discusses the use of best practices; Section 3.5 provides the evaluation of each project against the OPA NRDA standards and identifies those alternatives that the Texas TIG selects for implementation; Section 3.6 discusses a Natural Recovery/No Action alternative; and lastly, Section 3.7 summarizes the OPA NRDA evaluation.

3.1 Summary of OPA NRDA Evaluation Criteria

Trustees are required, pursuant to the OPA NRDA regulations, to determine a reasonable range of alternatives (15 C.F.R. § 990.53(a)(2)) that can be evaluated in accordance with the OPA NRDA evaluation standards (15 C.F.R. § 990.54(a)). Once a reasonable range of alternatives has been developed, the OPA NRDA regulations require trustees to evaluate the reasonable range of alternatives and identify preferred restoration alternatives based on, at minimum, the following standards:

- Cost-Effectiveness: the cost to carry out the alternative.
- Goals and Objectives: the extent to which each alternative is expected to meet the Trustees' goals and objectives in returning the injured natural resources and services to baseline and/or compensating for interim losses.
- Feasibility: the likelihood of success of each alternative.
- Avoid Collateral Injury: the extent to which each alternative would prevent future injury from the DWH oil spill and avoid collateral injury from implementing the alternative.
- Benefits: the extent to which each alternative benefits more than one natural resource and/or service.
- Health and Safety: the effect of each alternative on public health and safety.

If the Trustees conclude that two or more alternatives are equally preferable, the OPA NRDA regulations provide that the most cost-effective alternative must be chosen (15 C.F.R. § 990.54(b)).

3.2 Monitoring Requirements

When developing a restoration plan under the OPA NRDA regulations, Trustees establish restoration objectives that are specific to the natural resources that were injured (15 C.F.R. § 990.55(b)(2)). The desired project outcome is to be clearly specified in these objectives, as well as the performance criteria by which successful restoration under OPA would be determined, including criteria that would necessitate corrective actions (15 C.F.R. § 990.55(b)(2)). Should a corrective action become necessary from unanticipated conditions, the Implementing Trustee would evaluate the necessary corrective action for consistency with the OPA NRDA and NEPA analyses conducted in this RP/EA #3 in accordance with Section 9.5.2 of the Trustee Council's SOPs (DWH NRDA Trustees 2021). Requirements for the monitoring component of a restoration plan can be found in 15 C.F.R. § 990.55(b)(3).

One of the programmatic Restoration Goals identified in the Final PDARP/PEIS is Monitoring, Adaptive Management, and Administrative Oversight. Chapter 5, Appendix E of the Final PDARP/PEIS details how the Trustees committed to a MAM framework that integrates the best available science into planning

and design of each alternative, identifies and reduces key uncertainties, tracks and evaluates progress toward restoration goals, determines the need for corrective actions, and supports compliance monitoring. The DWH NRDA MAM framework provides a flexible, science-based approach to effectively and efficiently implement and monitor restoration to provide long-term benefits to the natural resources and services injured by the DWH oil spill.

The Texas TIG developed a draft MAM plan for each of the preferred alternatives identified in this RP/EA #3, which can be found in Appendix E. The MAM plans include descriptive information regarding monitoring goals, objectives, parameter details, potential corrective actions, and monitoring schedules. The plans are consistent with the OPA, the Final PDARP/PEIS (DWH NRDA Trustees 2016), the Trustee Council's SOPs (DWH NRDA Trustees 2021), and the Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.1 (DWH NRDA Trustees 2024). The MAM plans are intended to be updated as needed to reflect any changing conditions and/or to incorporate new information. For example, MAM plans may need to be revised if the project design changes, initial data analysis indicates that the sampling design is inadequate, if uncertainties are resolved, or new uncertainties are identified during project implementation and monitoring. Updates to MAM plans and any additional details concerning the status of monitoring activities will be made publicly available through DIVER.

3.3 Estimated Costs

The approach to identifying a total allocation for this RP/EA #3 is uniquely structured compared to other DWH restoration plans. Rather than including individual total project budgets, this RP/EA #3 identifies the total allocation the Texas TIG would use to fund the implementation of the suite of preferred alternatives. As beneficial dredged material becomes available through channel maintenance and other similar projects that are carried out by other project sponsors or agencies, the alternatives selected in this RP/EA #3 would be implemented. These projects would be implemented during multiple dredge cycles that may occur over a decade or more. This approach intends to apply more fiscal flexibility to accommodate real-time costs and opportunities as each project becomes ripe for implementation.

As opposed to identifying the cost of each alternative, the Texas TIG would use up to $36 million to implement the six preferred alternatives selected in this RP/EA #3. In RP/EA #1, the Texas TIG funded the initial site identification, project design, and USACE permit application packages for the eight restoration alternatives further evaluated in this RP/EA #3. As part of the initial project design effort, "upper end" fully funded cost estimates were developed for each alternative using information available at the time. These estimates reflected all costs for each project, including the full costs to dredge and transport material (i.e., costs beyond the Texas TIG's responsibility for the projects proposed in this RP/EA #3). The initial fully funded cost estimates ranged from approximately $2 million to more than $19 million across the eight projects considered in the reasonable range of alternatives. The Texas TIG considered these initial individual cost estimates when formulating the proposed allocation of funds for the six preferred alternatives identified in this RP/EA #3 and determined up to $36 million would be reasonable and appropriate, given the information available.

Project implementation would include final design, remaining permitting needs, incremental construction costs, site planting, project monitoring, and oversight. Incremental costs are defined as the difference in the cost between sediment disposal methods employed by USACE and other viable sources (e.g., open water or upland) and the cost to beneficially use sediments to restore intertidal marsh habitats. These incremental costs often include levee construction, increased sediment pumping distance, additional pipeline, project management, and equipment mobilization. Due to the Texas TIG's intention to fund the incremental costs associated with the construction of the selected alternatives

over an extended time frame—potentially spanning up to 10 years or more—accurately forecasting the incremental costs for each project poses challenges. Nevertheless, the Texas TIG anticipates that leveraging BUDM would ultimately result in a reduction of the overall costs required to implement these marsh projects. The potential incremental cost for each project would vary over time and would depend on the number of dredging events needed to complete site restoration and on external factors beyond the Texas TIG's control, such as USACE-funding levels and sedimentation rates in federally maintained channels. In addition, some sources of dredge material may become available before USACE dredging activities or can be used if USACE dredge activities are neither available nor cost effective. Estimating the cost of those other types of dredging activity is difficult given the unknown possible future availability of those dredge sources, the location of those sources, and the resulting costs of using those sources in the future. Therefore, the Texas TIG does not include cost estimates for each project site in this RP/EA #3. Instead, the OPA evaluation in Section 3.5 considers the level of restoration benefits that would be provided using the restoration technique "create or enhance coastal wetlands through placement of dredge material" at each of the sites identified in the *Texas Dredged Material for Wetland Restoration – Final Report* (Texas TIG 2022b). Additionally, the Texas TIG evaluates which sites included in that report would provide the highest restoration benefit. When the Texas TIG authorizes implementation of a selected project or portion of a selected project via a Trustee Resolution, the Texas TIG would ensure the project continues to provide restoration benefits within current site conditions and is cost-effective and will document the project budget. The Texas TIG will also inform the public via a web story that will document the project budget and the remaining balance in the BUDM Project Fund.

BUDM has become an increasingly important tool and a cost-effective approach in coastal restoration and resiliency. The impact of sea level rise, erosion, and subsidence is resulting in significant and unprecedented land loss, particularly in ecologically important habitats. The demand for sediment to mitigate this loss is high, as is the cost of transporting and placing fill material for habitat restoration. Navigational dredging on the Texas coast produces millions of cy of material annually. These dredged sediments are often placed in closed placement areas or inshore open waters or deposited offshore and removed from natural sediment budgets, rather than being beneficially used to restore coastal habitats. USACE has acknowledged the potential benefits to BUDM and, in a January 2023 *Beneficial Use of Dredged Material Command Philosophy Notice* (USACE 2023), outlined the USACE's goal to beneficially use at least 70% of dredged sediments by 2030, and identified the need for partnerships to meet this goal. For typical USACE dredging projects using BUDM, project partner expenses are limited to the incremental costs to beneficially use the sediments, while USACE incurs dredging and traditional, planned sediment placement costs. This partnership arrangement typically results in highly cost-efficient marsh restoration projects because project partners do not bear the full cost of sediment procurement, characterization, and equipment mobilization.

The Texas TIG would work with USACE to increase further cost-effectiveness by leveraging programs, such as the USACE Continuing Authorities Programs and Section 204—Aquatic Ecosystem Restoration. The Texas TIG would also seek additional opportunities to leverage project costs, including other NRDA case funds and state and federal funding sources. Before entering into an agreement with USACE or other viable sources, the Texas TIG would evaluate each incremental cost analysis USACE or other viable sources provides to ensure restoration costs are reasonable.

Due to the cost efficiency of BUDM as described above and past and ongoing leveraging efforts, the Texas TIG concludes that for the eight evaluated alternatives, BUDM is a cost-effective approach for restoring injured resources through the Wetlands, Coastal and Nearshore Habitats Restoration Type funds.

Implementation of the selected alternatives would result in a balance of approximately $3.3 million for the Texas TIG's Wetlands, Coastal and Nearshore Habitats Restoration Type allocation. The Texas TIG intends to hold these funds in reserve, and to use any other unexpended Wetlands, Coastal and Nearshore Habitats Restoration Type funds, for potential cost overruns in projects authorized in all three Texas TIG post-settlement restoration plans. Therefore, this plan is likely to be the last Texas TIG plan for the Wetlands, Coastal, and Nearshore Habitats Restoration Type.

3.4 Best Practices

The federal regulatory agencies provide guidance on best practices as part of the environmental compliance process. Best practices generally include design criteria, lessons learned, and expert advice. Trustees incorporate appropriate best practices to avoid or minimize impacts to natural resources, including protected and listed species and their habitats. Best practices are identified in required permits, consultations, or environmental reviews, including those described in Appendix 6.A of the Final PDARP/PEIS (DWH NRDA Trustees 2016). Best practices that each project would implement are described within the environmental analyses in Chapter 4 and Appendix A. Through technical assistance reviews, additional best practices may be identified for implementation, and these would be noted in project environmental compliance documentation.

3.5 OPA NRDA Evaluation of Reasonable Range of Alternatives

Each project in the reasonable range of alternatives is evaluated against the OPA NRDA standards. Project summaries are provided in Section 2.3.

3.5.1 Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration

OPA NRDA Evaluation Standard	Evaluation
Cost-effectiveness	The BUDM Project Fund would be used for project implementation, including final design, remaining permitting needs, site planting, incremental costs, project monitoring, and oversight. Due to the cost efficiency of BUDM described in Section 3.3, the Texas TIG concludes that for the eight evaluated alternatives, BUDM is cost-effective to restore injured resources through the Wetlands, Coastal, and Nearshore Restoration Type funds.
Goals and objectives	This project is consistent with the Texas TIG goals and objectives and meets the Trustee programmatic Restoration Goals and Restoration Type-specific goals as described in the Final PDARP/PEIS. This project would include restoring intertidal wetland elevations; restoring native coastal wetland vegetation; and providing habitat for fish, invertebrates, and resident and migratory birds. This project would restore up to 550 acres of wetland complex, a habitat type that was injured as a result of the DWH oil spill.
Likelihood of success	This project would build on strategic planning and design of past marsh restoration actions in nearby locations. Based on documented experience and successful completion of previous projects, the Texas TIG anticipates this project has a high likelihood of success. The project is technically feasible and uses proven techniques with established methods and documented results.
Avoid collateral injury	Best practices, conservation measures, and design modifications to avoid and minimize impacts identified during the permitting process or during consultations and reviews with regulatory agencies would be implemented. Also, best practices described in Appendix

OPA NRDA Evaluation Standard	Evaluation
	6.A of the Final PDARP/PEIS would be followed, as appropriate, to minimize environmental impacts.
Benefits	Beyond restoring wetlands and coastal habitat, this restoration project would increase ecological functionality for a range of resources injured by the DWH oil spill. The project would provide habitat for various ecologically and economically important species, including birds, fish, and crabs.
Health and safety	The Texas TIG does not anticipate impacts to public health and safety. The creation of marshes can benefit the public's safety by improving water quality and buffering storm surges.
Summary: Based on the OPA evaluation of the cost-effectiveness, goals/objectives, likelihood of success, benefits, and health and safety standards, this project was identified as a preferred restoration alternative.	

3.5.2 Goose Island Wetland Restoration

OPA NRDA Evaluation Standard	Evaluation
Cost-effectiveness	The BUDM Project Fund would be used for project implementation, including final design, remaining permitting needs, incremental costs, site planting, project monitoring, and oversight. Due to the cost efficiency of BUDM described in Section 3.3, the Texas TIG concludes that for the eight evaluated alternatives, BUDM is cost-effective to restore injured resources through the Wetlands, Coastal, and Nearshore Restoration Type funds.
Goals and objectives	This project is consistent with the Texas TIG goals and objectives and meets the Trustee programmatic Restoration Goals and Restoration Type-specific goals as described in the Final PDARP/PEIS. This project would combat land and habitat loss through estuarine marsh restorations that would include returning the area to reference marsh elevations to support habitat restoration and revegetation. This project would restore up to 40 acres of wetlands complex, a habitat injured as a result of the DWH oil spill.
Likelihood of success	This project would be modeled on past marsh restoration projects from nearby locations. Based on documented experience and successful completion of previous projects, the Texas TIG anticipates this project would have a high likelihood of success.
Avoid collateral injury	Best practices, conservation measures, and design modifications to avoid and minimize impacts identified during the permitting process or during consultations and reviews with regulatory agencies would be implemented. Also, best practices described in Appendix 6.A of the Final PDARP/PEIS would be followed, as appropriate, to minimize environmental impacts.
Benefits	This project would restore and conserve wetlands, coastal, and nearshore habitat while also maximizing ecological functions for a range of resources injured by the DWH oil spill. The project would provide habitat for various ecologically and economically important species, including birds, fish, and crabs.
Health and safety	The Texas TIG does not anticipate impacts to public health and safety. The wetland restoration in this project creates buffers to storm surge and damage to adjacent natural areas and improves water quality in the area.

OPA NRDA Evaluation Standard	Evaluation
Summary: Based on the OPA evaluation of the cost-effectiveness, goals/objectives, likelihood of success, benefits, and health and safety standards, this project was identified as a preferred restoration alternative.	

3.5.3 Guadalupe River Old Delta Wetland Restoration

OPA NRDA Evaluation Standard	Evaluation
Cost-effectiveness	The BUDM Project Fund would be used for project implementation, including final design, remaining permitting needs, site planting, incremental costs, project monitoring, and oversight. Due to the cost efficiency of BUDM described in Section 3.3, the Texas TIG concludes that, BUDM is cost-effective to restore injured resources through the Wetlands, Coastal, and Nearshore Restoration Type funds. However, there is a prior dispute over ownership of portions of the site. It is unclear what the costs would be to determine ownership, gain access to the site, and obtain approval to perform the project.
Goals and objectives	This project is consistent with the Texas TIG goals and objectives and meets the Trustee programmatic Restoration Goals and Restoration Type-specific goals as described in the Final PDARP/PEIS. This project would restore and conserve wetlands and coastal habitats and restore current low elevation, open-water habitat to reference marsh elevations. This project would restore up to 1,140 acres of wetland complex, including intertidal wetland elevations, a habitat injured by the DWH oil spill.
Likelihood of success	Texas Trustee agencies have successfully implemented marsh restoration projects in nearby locations using BUDM as a marsh restoration technique. However, as there is a prior dispute over the ownership of portions of this site, it is uncertain whether the Trustees would be able to implement this project as described, in a timely fashion.
Avoid collateral injury	Best practices, conservation measures, and design modifications to avoid and minimize impacts identified during the permitting process or during consultations and reviews with regulatory agencies would be implemented. Also, best practices described in Appendix 6.A of the Final PDARP/PEIS would be followed, as appropriate, to minimize environmental impacts.
Benefits	The project would restore and conserve wetland habitat and maximize ecological functions for a range of resources injured by the DWH oil spill. The wetland habitat would be beneficial to important fauna such as birds, fish, crabs, and many other benthic species.
Health and safety	The Texas TIG does not anticipate adverse impacts because measures would be taken to avoid impacting public health and safety. The creation of marsh can benefit public safety by promoting water quality and buffering storm surges.
Summary: Based on the OPA evaluation, this project was identified as a non-preferred restoration alternative due to a prior dispute over the ownership of portions of the property. As a result, the cost-effectiveness and likelihood of success are uncertain.	

3.5.4 Lower Neches Wildlife Management Area Old River Unit Wetland Restoration

OPA NRDA Evaluation Standard	Evaluation
Cost-effectiveness	The BUDM Project Fund would be used for project implementation, including final design, remaining permitting needs, site planting, incremental costs, project monitoring, and oversight. Due to the cost efficiency of BUDM described in Section 3.3, the Texas TIG concludes that for the eight evaluated alternatives, BUDM is cost-effective to restore injured resources through the Wetlands, Coastal, and Nearshore Restoration Type funds.
Goals and objectives	This project is consistent with the Texas TIG goals and objectives and meets the Trustee programmatic Restoration Goals and Restoration Type-specific goals as described in the Final PDARP/PEIS. This project would create vegetated wetland habitat. This project would restore up to 224 acres of intertidal marsh, a habitat that was injured as a result of the DWH oil spill.
Likelihood of success	The Texas TIG anticipates this project would have a high likelihood of success because the Texas TIG agencies have successfully implemented marsh restoration projects in nearby locations using similar techniques.
Avoid collateral injury	Best practices, conservation measures, and design modifications to avoid and minimize impacts identified during the permitting process or during consultations and reviews with regulatory agencies would be implemented. Also, best practices described in Appendix 6.A of the Final PDARP/PEIS would be followed, as appropriate, to minimize environmental impacts.
Benefits	The intertidal wetland elevations would be restored, increasing wetland vegetation and habitat for fish, invertebrates, and birds. The project's benefits would be provided for many resources injured by the DWH oil spill.
Health and safety	The Texas TIG does not anticipate adverse impacts because measures would be taken to avoid impacts to public health and safety. The creation of marsh can benefit public safety by promoting water quality and buffering storm surges.
Summary: Based on the OPA evaluation of the cost-effectiveness, goals/objectives, likelihood of success, benefits, and health and safety standards, this project was identified as a preferred restoration alternative.	

3.5.5 McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration

OPA NRDA Evaluation Standard	Evaluation
Cost-effectiveness	The BUDM Project Fund would be used for project implementation, including final design, remaining permitting needs, site planting, incremental costs, project monitoring, and oversight. Due to the cost efficiency of BUDM described in Section 3.3, the Texas TIG concludes that for the eight evaluated alternatives, BUDM is cost-effective to restore injured resources through the Wetlands, Coastal, and Nearshore Restoration Type funds.
Goals and objectives	This project is consistent with the Texas TIG goals and objectives and meets the Trustee programmatic Restoration Goals and Restoration Type-specific goals as described in the Final PDARP/PEIS. This project would restore and conserve wetlands and coastal habitats. This project would restore up to 218 acres of intertidal marsh, a resource that was injured in the DWH oil spill.

OPA NRDA Evaluation Standard	Evaluation
Likelihood of success	The Texas TIG anticipates this project would have a high likelihood of success because the Texas TIG agencies have successfully implemented similar marsh restoration projects in nearby locations.
Avoid collateral injury	Best practices, conservation measures, and design modifications to avoid and minimize impacts identified during the permitting process or during consultations and reviews with regulatory agencies would be implemented. Also, best practices described in Appendix 6.A of the Final PDARP/PEIS would be followed, as appropriate, to minimize environmental impacts.
Benefits	Benefits for multiple resources, such as wetlands habitat that provides for birds, fish, and crabs, would be increased through this project. This restoration project would maximize ecological functions for a range of resources injured by the DWH oil spill.
Health and Safety	Measures in the final design would be taken to avoid adversely impacting public health and safety, and the Texas TIG does not anticipate adverse impacts. The creation of marsh can benefit public safety by promoting water quality and buffering storm surges.
Summary: Based on the OPA evaluation of the cost-effectiveness, goals/objectives, likelihood of success, benefits, and health and safety standards, this project was identified as a preferred restoration alternative.	

3.5.6 San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration

OPA NRDA Evaluation Standard	Evaluation
Cost-effectiveness	The BUDM Project Fund would be used for project implementation, including final design, remaining permitting needs, site planting, incremental costs, project monitoring, and oversight. Due to the cost efficiency of BUDM described in Section 3.3, the Texas TIG concludes that for the eight evaluated alternatives, BUDM is cost-effective to restore injured resources through the Wetlands, Coastal, and Nearshore Restoration Type funds.
Goals and objectives	This project is consistent with the Texas TIG goals and objectives and meets the Trustee programmatic Restoration Goals and Restoration Type-specific goals as described in the Final PDARP/PEIS. This project would allow the marshes to return to a sustainable and productive estuarine wetland. This project would restore up to 200 acres of intertidal marsh, a resource that was injured in the DWH oil spill.
Likelihood of success	The Texas TIG anticipates this project would have a high likelihood of success due to the successful implementation of marsh restoration projects using similar techniques.
Avoid collateral injury	Best practices, conservation measures, and design modifications to avoid and minimize impacts identified during the permitting process or during consultations and reviews with regulatory agencies would be implemented. Also, best practices described in Appendix 6.A of the Final PDARP/PEIS would be followed, as appropriate, to minimize environmental impacts.
Benefits	Beyond restoring and conserving wetlands, coastal, and nearshore habitat, this restoration project would maximize ecological functions for a range of resources injured by the DWH oil spill. The project would provide habitat for various ecologically and economically important birds, fish, and crabs.

OPA NRDA Evaluation Standard	Evaluation
Health and safety	The Texas TIG does not anticipate impacts on public health and safety because the final design plan of this project would include specifications to avoid negative impacts. The creation of marsh can benefit public safety by promoting water quality and buffering storm surges.
Summary: Based on the OPA evaluation of the cost-effectiveness, goals/objectives, likelihood of success, benefits, and health and safety standards, this project was identified as a preferred restoration alternative.	

3.5.7 Schicke Point Wetland Restoration

OPA NRDA Evaluation Standard	Evaluation
Cost-effectiveness	The BUDM Project Fund would be used for project implementation, including final design, remaining permitting needs, site planting, incremental costs, project monitoring, and oversight. Due to the cost efficiency of BUDM described in Section 3.3, the Texas TIG concludes that for the eight evaluated alternatives, BUDM is cost-effective to restore injured resources through the Wetlands, Coastal, and Nearshore Restoration Type funds.
Goals and objectives	This project is consistent with the Texas TIG goals and objectives and meets the Trustee programmatic Restoration Goals and Restoration Type-specific goals as described in the Final PDARP/PEIS. This project would restore intertidal wetland elevations; increase native coastal wetland vegetation; and provide habitat for fish, invertebrates, and resident and migratory birds. This project would restore up to 72 acres of intertidal marsh, a resource that was injured from the DWH oil spill.
Likelihood of success	The Texas TIG anticipates this project would have a high likelihood of success. This project would be modeled on the efforts used in past restoration projects in nearby locations.
Avoid collateral injury	Best practices, conservation measures, and design modifications to avoid and minimize impacts identified during the permitting process or during consultations and reviews with regulatory agencies would be implemented. Also, best practices described in Appendix 6.A of the Final PDARP/PEIS would be followed, as appropriate, to minimize environmental impacts. As described in Section 2.3.7, a breakwater was constructed in 2017 to reduce wave action that contributed to shoreline erosion. Since publication of the Draft RP/EA #3, the Texas TIG has learned that submerged aquatic vegetation and marsh habitat have naturally developed behind the breakwater, in the area intended for placement of BUDM. As such, the Texas TIG has determined that placing dredged material in the originally proposed location would now result in collateral injury.
Benefits	The project would restore and conserve wetland habitat and maximize ecological functions for a range of resources injured by the DWH oil spill. The wetland habitat would be beneficial to important fauna such as birds, fish, crabs, and many other benthic species. As noted above, since publication of the Draft RP/EA #3, the Texas TIG has learned that subtidal and intertidal wetlands habitats have naturally restored behind a constructed breakwater at the project site. Placement of BUDM would, therefore, not achieve as many ecosystem benefits as originally anticipated.

OPA NRDA Evaluation Standard	Evaluation
Health and safety	The Texas TIG does not anticipate impacts to public health and safety. The creation of marsh can benefit public safety by promoting water quality and buffering storm surges.
Summary: Based on the OPA evaluation, this project was identified as a non-preferred restoration alternative in this Final RP/EA #3. The Texas TIG reviewed new available aerial photography after release of the Draft RP/EA #3 and determined that, due to the presence of submerged aquatic vegetation and marsh accretion at the site, project implementation could result in collateral injury and would not have as many natural resource benefits when compared to the other alternatives evaluated in this RP/EA #3.	

3.5.8 Texas Point National Wildlife Refuge Wetland Restoration

OPA NRDA Evaluation Standard	Evaluation
Cost-effectiveness	The BUDM Project Fund would be used for project implementation, including final design, remaining permitting needs, site planting, incremental costs, project monitoring, and oversight. Due to the cost efficiency of BUDM described in Section 3.3, the Texas TIG concludes that for the eight evaluated alternatives, BUDM is cost-effective to restore injured resources through the Wetlands, Coastal, and Nearshore Restoration Type funds.
Goals and objectives	This project is consistent with the Texas TIG goals and objectives and meets the Trustee programmatic Restoration Goals and Restoration Type-specific goals as described in the Final PDARP/PEIS. This project aims to restore intertidal wetland elevations; increase native coastal wetland vegetation; and provide habitat for fish, invertebrates, and resident and migratory birds. This project would restore up to 623 acres of intertidal marsh, a resource that was injured from the DWH oil spill.
Likelihood of success	The Texas TIG anticipates this project would have a high likelihood of success due to the successful implementation of marsh restoration projects using similar techniques.
Avoid collateral injury	Best practices, conservation measures, and design modifications to avoid and minimize impacts identified during the permitting process or during consultations and reviews with regulatory agencies would be implemented. Also, best practices described in Appendix 6.A of the Final PDARP/PEIS would be followed, as appropriate, to minimize environmental impacts.
Benefits	Beyond restoring and conserving wetlands, coastal, and nearshore habitat, this restoration project would maximize ecological functions for a range of resources injured by the DWH oil spill. The project would provide habitat for various ecologically and economically important birds, fish, and crabs.
Health and safety	The Texas TIG does not anticipate impacts to public health and safety. The creation of marsh can benefit public safety by promoting water quality and buffering storm surges.
Summary: Based on the OPA evaluation of the cost-effectiveness, goals/objectives, likelihood of success, benefits, and health and safety standards, this project was identified as a preferred restoration alternative.	

3.6 Natural Recovery/No Action

Pursuant to the OPA NRDA regulations, the Final PDARP/PEIS considered "a natural recovery alternative in which no human intervention would be taken to directly restore injured natural resources and services to baseline" (15 C.F.R. § 990.53(b)(2)). Under a Natural Recovery alternative, no additional restoration would be implemented by the Texas TIG to accelerate the recovery of wetlands, coastal, or nearshore habitats in the Texas Restoration Area using DWH NRDA funding.

Given that technically feasible restoration approaches are available to compensate for natural resource and service losses, the DWH Trustees rejected the Natural Recovery alternative under the OPA evaluation within the Final PDARP/PEIS. Based on this determination, tiering this RP/EA #3 from the Final PDARP/PEIS and incorporating that analysis by reference, the Texas TIG did not further evaluate Natural Recovery as a viable alternative under OPA, and it is not considered a reasonable alternative. Natural Recovery is not considered further in this RP/EA #3.

A No Action Alternative is evaluated in Appendix A of this document as a basis for comparison of potential environmental consequences in the NEPA context.

3.7 OPA NRDA Evaluation Conclusions

As described in Section 3.4, the Texas TIG conducted an OPA NRDA evaluation for each project included in the reasonable range of alternatives for this RP/EA #3. All of the projects evaluated in this RP/EA #3 would use proven techniques that have a high likelihood of success, and their cost effectiveness would be optimized by reliance on BUDM. The proposed restoration approach is consistent with the goals and objectives for the Wetlands, Coastal, and Nearshore Habitats Restoration Type as described in the Final PDARP/PEIS. These projects would provide benefits to multiple species by creating or restoring habitat, and collateral injury would be reduced through adherence to relevant best practices, conservation measures, and design modifications. The Texas TIG does not anticipate that any of these projects would have adverse impacts to public health and safety; rather, the projects would provide benefits through improving water quality and buffering storm surges. However, one project, *Guadalupe River Old Delta Wetland Restoration*, has less certainty of success and cost-effectiveness owing to the prior dispute over the ownership of portions of the property necessary to implement the project. Additionally, based on a review of new aerial photography after publication of the Draft RP/EA #3, the Texas TIG determined that a second project, *Schicke Point Wetland Restoration*, may result in collateral injuries to natural resources and a lower level of benefits compared to other alternatives analyzed in this Final RP/EA #3. For these reasons, these two projects are not preferred for implementation at this time. The Texas TIG's identification of preferred alternatives is based on this evaluation and informed by the NEPA analysis presented in Appendix A and summarized in Chapter 4.

4 Environmental Assessment

4.1 Overview of NEPA Approach

The NEPA statute requires federal agencies to consider the reasonably foreseeable effects that a proposed action may have on the physical and biological environment and related social and economic effects before funding, authorizing, or implementing an action. This integrated OPA/NEPA document was prepared in accordance with NEPA and its amendments under the FRA and agency-specific NEPA implementing procedures and regulations. NEPA conclusions presented herein are informed by the NEPA Supporting Documentation Report in Appendix A.

The NEPA analysis describes the affected environment and associated environmental consequences for each project in the reasonable range of alternatives. A No Action Alternative is also analyzed as a benchmark. The NEPA Supporting Documentation Report (Appendix A) is consistent with the Final PDARP/PEIS, which is incorporated by reference, and tiers where applicable. Resources analyzed and impact definitions (minor, moderate, and major) in Appendix D align with those described in the Final PDARP/PEIS (DWH NRDA Trustees 2016).

To determine whether an action has the potential to result in significant impacts, the context and intensity of the proposed action are considered. Context refers to the area of impacts (i.e., local or statewide) and duration (i.e., whether they are short or long term). Intensity refers to the severity of impact and could include the timing of the action (e.g., more intense impacts would occur during critical periods like high visitation or wildlife breeding/rearing). Intensity is also described in terms of whether the impact would be beneficial or adverse. “Adverse” is used in Appendix A and this chapter only to describe the Texas TIG’s evaluation under NEPA. This term is defined and applied differently in consultations pursuant to ESA and other protected resource statutes. The analysis in this RP/EA #3 characterizes adverse impacts as short- or long-term and minor, moderate, or major. The analysis of beneficial impacts focuses on the duration (short- or long-term) and does not attempt to specify the intensity of the benefit (Appendix D).

The NEPA Supporting Documentation Report provided in Appendix A and the conclusions provided in this chapter address the reasonably foreseeable impacts for each alternative. The analysis in this RP/EA #3 incorporates by reference relevant evaluations of the environmental consequences from Section 6.4.1.1 (Create, Restore, and Enhance Coastal Wetlands) of the Final PDARP/PEIS. Section 2.3 provides project descriptions for each alternative. Further, brief project descriptions focusing on activities that would result in environmental impacts are provided in Appendix A.

To streamline the NEPA evaluation process and present a concise document that provides sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a FONSI, and to aid the Texas TIG’s compliance with NEPA, relevant information from previous environmental analyses, existing plans and studies, and the Final PDARP/PEIS have been incorporated by reference. All documents used to conduct the NEPA analyses are incorporated by reference and available in the administrative record, and links are provided in the environmental consequences discussion, where applicable.

4.2 Consistency with the Final PDARP/PEIS

The NEPA analysis in this RP/EA #3 tiers from the Final PDARP/PEIS, where applicable. To ensure compliance with the FRA in the preparation of this RP/EA #3, the DWH Federal Trustees of the Texas TIG

re-evaluated the Final PDARP/PEIS analysis and its underlying assumptions and confirmed its continued validity. Specifically, the Federal Trustees of the Texas TIG compared their assessment of each project's anticipated impacts on each resource analyzed with the impact intensity definitions (short- or long-term, and minor, moderate, or major) found in Table 6.3-2 of the Final PDARP/PEIS (and in this RP/EA #3 as Appendix D), the impacts that the Final PDARP/PEIS forecasted for preliminary phases of restoration planning (Section 6.4.14), and the restoration approaches and techniques to create, enhance, or restore coastal wetlands (Section 6.4.1.1) proposed in this RP/EA #3.

The Final PDARP/PEIS found that the types of activities proposed in this RP/EA #3, which utilizes approaches and techniques to create, enhance, or restore coastal wetlands, would be likely to cause environmental consequences, as discussed in the sections below. The DWH Federal Trustees of the Texas TIG found that the resource impacts as forecasted in the Final PDARP/PEIS are consistent with the impacts anticipated from the projects analyzed in this RP/EA #3, and thus, the Texas TIG affirms the applicability of the Final PDARP/PEIS's NEPA analysis to this RP/EA #3. Additional analysis regarding the specific activities proposed in this RP/EA #3 is found in Appendix A.

4.2.1 Physical Resources

Short-term, minor adverse impacts on geology and substrates, hydrology and water quality, air quality, and noise could occur during the construction phase. For example, short-term impacts could result from the use of staging areas (e.g., causing water turbidity from sediment disturbance) and construction equipment (e.g., releasing emissions causing adverse air quality and noise impacts from the operation of machinery). Short-term adverse impacts would be minimized by implementing best practices. Long-term, minor adverse impacts on the physical environment could occur from the construction of sediment containment levees and the placement of dredged material in shallow water areas, which may affect local sediment dynamics. Placement of materials (e.g., dredged material or riprap) would result in long-term, but localized, adverse impacts to the existing substrate. Hydrology also may be affected where tidal connectivity is modified per project design. However, projects would typically require implementation of best practices to minimize or avoid adverse impacts. Best practices, such as silt curtains, buffer zones, and water quality monitoring, would be used to minimize such effects. This approach would benefit wetlands and other shoreline habitats by raising substrate elevations affected by subsidence and sea level rise and re-establishing natural hydrology needed to restore the function of coastal wetland communities. Reconnecting coastal wetlands to freshwater sources and/or tidal flooding would restore the natural hydrology of these habitats. This would re-establish natural estuarine salinity gradients and could maintain and improve coastal water quality, benefiting other coastal habitats and resources. This approach also helps stabilize substrates, which increases the resilience of coastal wetlands to sea level rise and reduces coastal erosion. This approach supports linkages within the broader coastal and nearshore ecosystem by restoring the natural movement of water, sediments, energy, and nutrients among habitats. Long-term benefits to hydrology and coastal resilience are anticipated as a result of increasing upland areas and providing buffer for storm surges.

4.2.2 Biological Resources

Depending on the techniques implemented, short-term, minor-to-moderate adverse impacts to biological resources could occur during construction activities related to 1) disturbance to wetland vegetation during construction and 2) displacement of land-based or aquatic faunal species resulting from staging equipment and materials, as well as entrapment of marine mammals. Long-term, minor-to-moderate impacts could include conversion of one wetland vegetation type to another (e.g., saline vegetation to more freshwater vegetation), resulting in changes to the distribution of faunal

communities. Some applications of this approach could also result in localized, permanent, adverse impacts to shallow intertidal or subtidal habitat—such as that for submerged aquatic vegetation or oysters, for instance, if fill is placed in areas to create marsh. These impacts are expected to be confined to the immediate vicinity of the project, and best practices would be implemented to minimize adverse impacts. This approach would provide long-term benefits for many ecologically and economically important animals, including fish, shrimp, shellfish, birds, sea turtles, marine mammals, and terrestrial mammals in the form of food, shelter, breeding, and nursery habitat. Many of the species that directly use coastal marshes and mangroves as juveniles later migrate offshore, where they serve as prey for ecologically and economically important open ocean species. Thus, these highly productive habitats support ecological connectivity both within the coastal ecosystem and between the coastal, nearshore, and open ocean ecosystems through the movement of animals that use wetlands during their life cycle to grow and reproduce. Projects implementing these techniques would be designed to maximize ecological benefits to animals that depend on coastal wetland habitats.

4.2.3 Socioeconomic Resources

Adverse impacts to socioeconomic resources in the immediate area could occur during construction through 1) limits on recreational activities near the construction area to protect public safety; 2) temporary increases in road traffic due to movement of construction vehicles; and 3) adverse effects on aesthetics due to the presence of construction equipment, sediment containment levees, or other changes to the surrounding environment. Implementation of this approach at national, state, and local parks; NWRs; and WMAs could result in short-term, minor adverse impacts to land and marine management due to temporary partial or full closure of areas, public access restrictions, and/or interruption of interpretive programs. Long-term benefits for the public are anticipated as a result of the restoration approach. This approach may provide long-term benefits to recreationists through increased opportunities for wildlife viewing, kayaking, canoeing, hunting, fishing, and other recreational activities. Additional benefits could include increased fishing opportunities (both commercial and recreational) from restoring coastal habitats that benefit fish. To the extent that these increased recreational opportunities result in increased visitation, local businesses may benefit from visitors' increased expenditures. This approach may increase property values adjacent to a project site if aesthetics are improved. Improvements in water quality resulting from increased water filtration from these activities could also contribute to long-term benefits to public health. Wetland restoration and enhancement activities could provide benefits to coastal populations and infrastructure through improved flood and shoreline protection. This benefit is particularly effective for low-energy storm events. Creating, enhancing, or restoring coastal wetlands could result in minor (i.e., temporary disturbance) to moderate (i.e., disturbance without loss of cultural information) impacts on cultural and historic resources due to construction activities such as dredging, addition of sediments or borrow materials, and/or removal of sediments, depending on the scale of the action and site-specific characteristics. Adverse impacts could include physical destruction or alteration of resources and may alter, damage, or destroy resources such as historic shipwrecks, engineering structures or landscapes, or connectivity with related sites. The NOAA Office of Coast Survey's Automated Wreck and Obstruction Information System database and other relevant studies are available for identification of submersed resources for individual projects. Discovery or recovery of cultural or historic resources would allow their future protection.

4.3 Overview of Affected Texas Coastal Environments

As displayed in Figure 1-1, this RP/EA #3 analyzes eight alternatives, spanning from Jefferson County (east of Houston) to Aransas County (just north of Corpus Christi), and in coastal waters. These alternatives are part of the Gulf Prairies and Marshes Ecoregion, which is characterized by barrier

islands, salt grass marshes surrounding bays and estuaries, remnant tallgrass prairies, oak parklands and oak mottes scattered along the coast, and tall woodlands in the river bottomlands (TPWD 2024a). Marshes in the affected area provide habitat for a variety of wildlife (e.g., migratory birds and fish), serve as buffers against storm surge, and filter pollutants from freshwater runoff (TPWD 2024b). Additionally, these ecosystems support local economies through tourism and benefit commercial fisheries and commerce. The impacts of sea level rise, erosion, subsidence, and reduced sediment supplies have resulted in significant and unprecedented land loss in these ecologically important habitats. Further details on resources specific to each particular project are described in the Affected Environment sections of Appendix A.

Additionally, the Texas TIG previously described areas included in the affected environment for the eight alternatives in this restoration plan and incorporates by reference the affected environment information from the Final PDARP/PEIS (DWH NRDA Trustees 2016), *Deepwater Horizon Oil Spill Regionwide Trustee Implementation Group Final Restoration Plan/ Environmental Assessment 1: Birds, Marine Mammals, Oysters, and Sea Turtles* (RW RP/EA #1; Regionwide TIG 2021), and RP/EA #2, as well as the *Coastal Texas Protection and Ecosystem Restoration Feasibility Study: Final Environmental Impact Statement* (USACE and GLO 2021). The Texas TIG reviewed and determined that this information remains relevant to the current NEPA analysis.

4.4 Summary of Environmental Consequences

Analysis of environmental consequences for each alternative in this RP/EA #3 is included in Appendix A. Table 4-1 summarizes reasonably foreseeable impacts of each alternative and the No Action Alternative. The environmental analysis demonstrated that there would primarily be minor, but some moderate, short- and long-term adverse impacts and short- and long-term benefits from implementation of the RP/EA #3 alternatives.

In general, implementation of the RP/EA #3 alternatives would result in short-term, minor adverse impacts to physical resources, including geology and substrates and hydrology and water quality associated with increased turbidity during sediment removal and placement of dredged material. There would also be short-term, minor adverse impact to air quality and noise from the operation of construction machinery and activities.

There would be minor, long-term adverse effects to geology and substrates and hydrology and water quality associated with the placement of dredged sediment for implementation. All the alternatives in this RP/EA #3 would benefit wetlands and coastal habitats by beneficially using dredged material to create viable, vegetated wetland habitat for a variety of local wildlife and would contribute to coastal resiliency by rebuilding wetlands to create buffers against storm surge damage to adjacent natural areas.

Biological resources would primarily experience short-term, minor-to-moderate adverse impacts from human- and construction-related disturbance (e.g., foot traffic or human presence). Overall, biological resources would also experience long-term benefits from wetland restoration and creation.

The Texas TIG has initiated technical assistance reviews with relevant regulatory agencies regarding potential adverse impacts to protected species and habitats for each preferred alternative. Table 5-1 contains the environmental compliance status for each alternative. Implementing Trustees would conduct due diligence to ensure that no unanticipated effects to listed species and habitats would occur. Adverse impacts would be minimized by following mitigation measures and other guidance developed during environmental reviews, consultation and permitting processes, and other relevant regulatory

requirements. The Texas TIG would also consider best practices referenced in Section 3.3 of this RP/EA #3 and Appendix 6.A of the Final PDARP/PEIS (DWH NRDA Trustees 2016).

For socioeconomic resources, the RP/EA #3 alternatives would result in short-term, minor adverse impacts to tourism and recreation, fisheries and aquaculture, and public health and safety. Short-term, minor-to-moderate adverse impacts to aesthetics and visual resources could occur. Short-term, minor adverse impacts to tourism and recreation may be attributed to temporary inaccessibility during construction for activities such as birding, hiking, and fishing. Temporary turbidity during dredged material placement may have short-term, minor adverse impacts to fisheries and, therefore, displace fishers, and short-term, minor-to-moderate adverse impacts during construction to visual scenery and aesthetics. Machinery present during construction, as well as active construction sites, may cause short-term, minor adverse impacts to public health and safety. No long-term adverse impacts are anticipated. Furthermore, most projects in this RP/EA #3 would result in short- and long-term benefits to socioeconomic resources (in particular, socioeconomics, tourism and recreational use, fisheries and aquaculture, aesthetics and visual resources, and public health and safety) as a result of restoration of coastal and wetland habitats. Enhancing wetlands increases appeal to tourists and creates a more desirable destination for activities such as birding, hiking, and wildlife viewing. RP/EA #3 alternatives are not expected to result in undue burdens for local communities.

Initial review of Texas Historical Commission cultural and historical resources database (Texas Historical Commission 2024) indicates that no known historic sites or significant cultural, scientific, or historic resources exist within the boundaries of the project areas. No adverse impacts to cultural resources are anticipated as a result of the projects. For each selected project, a comprehensive review under Section 106 of the NHPA would be completed before any project activities began, to develop practices that avoid, minimize, or mitigate adverse effects on historic properties within the project area. The projects would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

The No Action Alternative is anticipated to result in long-term, moderate-to-major adverse impacts to physical and biological resources from continued erosion and coastal flooding, continued wetland habitat degradation and fragmentation, and conversion of wetlands to open water. Continued wetland degradation, erosion, and land loss would also result in long-term, minor impacts to socioeconomic resources including infrastructure, land and marine management, tourism and recreational use, fisheries and aquaculture, aesthetics and visual resources, and public health and safety.

Table 4-1 Summary of the Reasonably Foreseeable Impacts of the Reasonable Range of Restoration Alternatives

Project	Geology and Substrates	Hydrology and Water Quality	Air Quality	Noise	Habitats	Wildlife Species	Marine and Estuarine Resources	Protected Species	Socioeconomics	Cultural Resources	Infrastructure	Land and Marine Management	Tourism and Recreational Use	Fisheries and Aquaculture	Land and Marine Transportation	Aesthetics and Visual Resources	Public Health and Safety
No Action	L	L	NE	NE	L	L	L	L	NE	NE	l	l	l	l	NE	l	l
Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Goose Island Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Guadalupe River Old Delta Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Lower Neches Wildlife Management Area Old River Unit Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Schicke Point Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Texas Point National Wildlife Refuge Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE

Notes:
+: beneficial effect
l: long-term, minor adverse effect
L: long-term, moderate-to-major adverse effect
NE: no adverse effect
s: short-term, minor adverse effect
s*: short-term, minor-to-moderate effect
S: short-term, moderate-to-major adverse effect

5 Compliance with Other Environmental Laws and Regulations

In addition to the requirements of the OPA and NEPA, other federal laws may apply to the preferred alternatives considered in this RP/EA #3. Legal authorities applicable to restoration alternative development were fully described in the context of the DWH restoration planning in the Final PDARP/PEIS, Section 6.9 Compliance with Other Applicable Authorities and Appendix 6.D Other Laws and Executive Orders. That material is incorporated by reference herein.

The Texas TIG will ensure compliance with all applicable federal, state, and local laws and regulations relevant to the proposed restoration alternatives. Technical assistance reviews are in progress with relevant agencies for protected species and their habitats under the ESA, Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; which defines Essential Fish Habitat), and the Marine Mammal Protection Act, and other federal statutes, where appropriate. In addition, compliance with Section 404 of the Clean Water Act (CWA), Section 10 of the Rivers and Harbors Act (RHA), and Section 103 of the Marine Protection, Research, and Sanctuaries Act (MPRSA), where applicable, as well as technical assistance reviews for cultural resources under the NHPA will also be completed prior to project implementation for the preferred alternatives. Finally, NOAA, as the federal NEPA lead, submitted a consistency determination in accordance with the Coastal Zone Management Act (CZMA) to the State of Texas coincident with the Draft RP/EA #3 and received a concurrence response.

The current compliance status for each preferred alternative at the time of this RP/EA #3 is provided in Table 5-1. The status of each statute by project is sorted into the following categories:

- Complete (C): indicates that the requirements have been met and a response was received from the appropriate agency(ies).
- In Progress (IP): indicates that the compliance reviews have been requested or are in the process of being requested, but an answer has not yet been received from the regulatory agency(ies).
- Not Applicable (N/A): indicates that the statute is not applicable to a preferred alternative, often due to the scope and/or location of the activities to be carried out under the alternative.

Projects involving in-water work may require authorization pursuant to Section 404 of the CWA, Section 10 of the RHA, and Section 103 of the MPRSA, where applicable. Any work in waters of the United States, including wetlands, associated with the preferred alternatives will be coordinated with USACE, and final authorization pursuant to Section 404 of the CWA, Section 10 of the RHA, and Section 103 of the MPRSA, where applicable, will be completed prior to construction.

Wherever existing consultations or permits are present, they will be reviewed to determine if the consultations/permits are still valid or if re-initiation of any consultations or permits are necessary. Implementing Trustees will implement alternative-specific implementation measures (i.e., best practices) identified in this RP/EA #3, biological evaluation form requirements, and completed consultations/permits. Oversight, provided by the Implementing Trustees, would include due diligence to ensure that no unanticipated effects to listed species and habitat occur, including ensuring that best practices are implemented and continue to function as intended.

Federal environmental compliance responsibilities and procedures will follow the Trustee Council's SOPs, specifically Section 9.4.6 (DWH NRDA Trustees 2021). The Implementing Trustee for each

preferred alternative will ensure the status of environmental compliance is tracked through DIVER. The Implementing Trustee will keep a record of compliance documents and ensure the documents are submitted for inclusion in the Administrative Record. Additional information specific to each preferred alternative regarding environmental compliance requirements and their status is provided in Table 5-1.

5.1 Additional Federal Laws and Executive Orders

Additional laws or federal EOs that may be applicable include, but are not limited to, the following:

- Endangered Species Act (16 U.S.C. §§ 1531 *et seq.*)
- Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 U.S.C. §§ 1801 *et seq.*)
- Marine Mammal Protection Act (16 U.S.C. §§ 1361 *et seq.*)
- Coastal Zone Management Act (16 U.S.C. §§ 1451 *et seq.*)
- National Historic Preservation Act (16 U.S.C. §§ 470 *et seq.*)
- Coastal Barrier Resources Act (16 U.S.C. §§ 3501 *et seq.*)
- Migratory Bird Treaty Act (16 U.S.C. §§ 703 *et seq.*)
- Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668 *et seq.*)
- Clean Air Act (42 U.S.C. §§ 7401 *et seq.*)
- Federal Water Pollution Control Act (33 U.S.C. §§ 1251 *et seq.*)
- Rivers and Harbors Act (33 U.S.C. §§ 401 *et seq.*)
- Marine Protection, Research, and Sanctuaries Act (16 U.S.C. §§ 1431 *et seq.,* 33 U.S.C. §§ 1401 *et seq.*)
- Estuary Protection Act (16 U.S.C. §§ 1221–26)
- Archaeological Resource Protection Act (16 U.S.C. §§ 470aa–470mm)
- National Marine Sanctuaries Act (16 U.S.C. §§ 1431 *et seq.*)
- Farmland Protection Policy Act (7 U.S.C. §§ 4201–09)
- EO 11988: Floodplain Management (as augmented by EO 13690), (May 24, 1977) as amended
- EO 11990: Protection of Wetlands, (May 24, 1977) as amended
- EO 12962: Recreational Fisheries, (June 7, 1995) as amended
- EO 13112: Safeguarding the Nation from the Impacts of Invasive Species, (Feb. 3, 1999) as amended
- EO 13175: Consultation and Coordination with Indian Tribal Governments (Nov. 6, 2000)
- EO 13186: Responsibilities of Federal Agencies to Protect Migratory Birds (Jan. 10, 2001)
- EO 14154: Unleashing American Energy (Jan. 20, 2025)
- EO 14172: Restoring Names That Honor American Greatness (Jan. 20, 2025)
- EO 14229: Honoring Jocelyn Nungaray (Mar. 5, 2025)

5.2 State Laws

State laws may apply to the proposed preferred alternatives considered in this RP/EA #3. The Texas TIG will ensure compliance with all applicable state laws and regulations relevant to the proposed restoration alternatives. Potentially applicable state laws may include, but are not limited to, the following:

- Texas Natural Resources Code (TNRC)
- Coastal Public Lands Management Act (TNRC §§ 33.001 *et seq.*)
- Dune Protection Act (TNRC §§ 63.001 *et seq.*)
- Open Beaches Act (TNRC §§ 61.001 *et seq.*)
- Texas Parks and Wildlife Code
- Texas Water Code
- Texas Health and Safety Code

Table 5-1 Current Status of Federal Regulatory Compliance Reviews and Approvals of Preferred Alternatives at Release of This RP/EA #3

Preferred Alternative	CZMA	ESA (NMFS)	ESA (USFWS)	EFH (NMFS)	MMPA (NMFS)	MMPA (USFWS)	NHPA	RHA/CWA	BGEPA (USWFS)	MBTA (USFWS)	CBRA (USFWS)
Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration	C	C	IP	C	N/A	IP	IP	IP	IP	IP	IP
Goose Island Wetland Restoration	C	C	C-EC	C-EC	EC	IP	IP	IP	C-EC	C-EC	N/A
Lower Neches Wildlife Management Area Old River Unit Wetland Restoration	C	C	IP	C	N/A	IP	IP	IP	IP	IP	IP
McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration	C	C	IP	C	N/A	IP	IP	IP	IP	IP	IP
San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration	C	C	IP	C	N/A	IP	IP	IP	IP	IP	IP
Texas Point National Wildlife Refuge Wetland Restoration	C	C	IP	C	N/A	IP	IP	IP	IP	IP	IP

Notes:
C: complete
IP: in progress
N/A: not applicable
EC: existing compliance documentation available
CZMA: Coastal Zone Management Act
ESA: Endangered Species Act – Section 7
EFH: Essential Fish Habitat under the Magnuson-Stevens Act
MMPA: Marine Mammal Protection Act
NHPA: National Historic Preservation Act
RHA/CWA: River and Harbors Act/Clean Water Act
BGEPA: Bald and Golden Eagle Protection Act
MBTA: Migratory Bird Treaty Act
CBRA: Coastal Barrier Resources Act

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Appendix A National Environmental Policy Act Supporting Documentation

This appendix contains the National Environmental Policy Act (NEPA) supporting documentation for the reasonable range of alternatives and informs the NEPA summary presented in Chapter 4. This environmental analysis includes evaluation of a No Action alternative for comparative purposes. The following analysis provides the site-specific affected environment for each project (alternative) evaluated, including the No Action alternative, and a discussion of environmental consequences. The appendix is organized as follows.

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List of Acronyms

BGEPA	Bald and Golden Eagle Protection Act of 1940
BUDM	Beneficial use of dredged material
C.F.R.	Code of Federal Regulations
CIP	Channel Improvement Project
DIVER	Data Integration Visualization Exploration and Reporting
DMMP	Dredged material management plan
DWH	*Deepwater Horizon*
E&D	Engineering and design
EFH	Essential fish habitat
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
Final PDARP/PEIS	Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement
GIS	Geographic information system
GIWW	Gulf Intracoastal Waterway
GLO	Texas General Land Office
HSC	Houston Ship Channel
MBTA	Migratory Bird Treaty Act
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act of 1972
MSA	Magnuson-Stevens Fishery Conservation and Management Act of 1976
MSC	Matagorda Ship Channel
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
NRDA	Natural resource damage assessment
NWR	National Wildlife Refuge
O&M	Operations and maintenance
OSHA	Occupational Safety and Health Administration
PDC	Project design criteria
RP/EA	Final Restoration Plan/Environmental Assessment
RRC	Railroad Commission of Texas
SNWW	Sabine-Neches Waterway
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
THC	Texas Historical Commission
TIG	Trustee Implementation Group
TMDL	Total Maximum Daily Load
TPWD	Texas Parks and Wildlife Department
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VBC	Victoria Barge Canal
WMA	Wildlife Management Area

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A.1 Incorporation by Reference of Previous NEPA Analyses

This section summarizes existing environmental analyses that relate to the proposed actions in this *Final Restoration Plan/Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats* (RP/EA #3). These summaries provide supplemental information on resources of the affected environments and environmental consequences associated with actions related to the activities proposed in this RP/EA #3, such as beneficial use of dredged material (BUDM) in coastal restoration projects.

The projects in this plan rely on BUDM, and the analyses of material placement in Section A.3 focus solely on the sites where material would be placed. The U.S. Army Corps of Engineers (USACE) has prepared environmental analyses of the anticipated impacts of the dredging of the material proposed for placement at the sites considered in this plan. This section summarizes the pertinent environmental analyses of those dredging activities connected to the BUDM projects proposed in this plan.

USACE is responsible for maintaining the Gulf Intracoastal Waterway (GIWW) from Sabine Pass (Texas-Louisiana border) south to the Brownsville Ship Channel (Texas-Mexico border). In addition, there are multiple deep-draft and shallow-draft navigation channels maintained by USACE within the study area, including the Sabine-Neches Waterway (SNWW), the Houston Ship Channel (HSC), the Galveston Ship Channel, and the Matagorda Ship Channel (MSC). Shallow-draft channels in the study area include the GIWW from Port Arthur to High Island, GIWW from High Island to Matagorda Bay, GIWW from Corpus Christi to Matagorda Bay, Palacios Channel, tributaries to the HSC, and the San Bernard River Channel. The following are summaries of existing NEPA Analyses for USACE navigation dredge projects related to the eight alternatives included within this RP/EA #3.

A.1.1 Final Environmental Impact Statement for SNWW Channel Improvement Project Southeast Texas and Southern Louisiana

The SNWW is an approximately 64-mile federally authorized and maintained waterway located in Jefferson and Orange counties in southeast Texas and Cameron Parish, Louisiana. The deep-draft portion of the authorized federal project generally provides for a channel 42 feet deep and 800 feet wide at the entrance to the Gulf of America (formerly the Gulf of Mexico, herein referred to as "the Gulf"),[1] a channel 40 feet deep and 500 feet wide to Port Arthur, and a channel depth of 40 feet Mean Lower Low Water (MLLW) and 400 feet wide to Beaumont by way of the Neches River. Authorization for deepening the SNWW to 48 feet MLLW was included in the Water Resources and Reform Development Act of 2014.

The *Final Environmental Impact Statement (EIS) for SNWW Channel Improvement Project (CIP) Southeast Texas and Southwest Louisiana* (USACE 2011) was prepared as required by NEPA to present an evaluation of potential impacts of the proposed SNWW Channel Improvement Project (CIP). The proposed SNWW CIP is intended to improve the efficiency of the deep-draft navigation system to a depth of 48 feet MLLW while protecting the area's environmental resources. The Final EIS addressed the potential impacts of the proposed project on the human environment, as identified during the public interest review, including placement of dredged material. All factors that may be relevant to the proposed project were considered, including plans for construction and operations; dredged material management and opportunities for beneficial uses; hydrology, salinity, and storm surges; terrestrial and

[1] The waterbody was renamed per Executive Order 14172 "Restoring Names That Honor American Greatness" (January 20, 2025).

aquatic habitats; endangered species; essential fish habitat (EFH); hazardous materials; air quality; shoreline erosion; cultural resources; socioeconomic considerations; safety; and economic effects.

A.1.2 MSC Improvement Project Feasibility Report and Final EIS

The 26-mile existing Federal MSC is located 125 miles southwest of Galveston, Texas, and 80 miles northeast of Corpus Christi, Texas. The channel extends from offshore in the Gulf through Matagorda Bay and Lavaca Bay to the Port. The MSC CIP would deepen the main channel to -47 feet MLLW, deepen the entrance channel to -49 feet MLLW, widen the main channel bottom width to 300 feet, and widen the entrance channel bottom width to 550 feet.

The purpose of the *MSC Improvement Project Feasibility Report and Final EIS* (USACE 2019) was to evaluate federal interest in alternative plans (including the No Action Plan) for reducing transportation costs while providing for safe, reliable navigation of the MSC. The study also assessed the effects of the alternatives on the natural system and human environment, including the economic development effects of existing inefficiencies. The MSC dredged material management plan (DMMP) addressed the dredging needs, disposal capabilities, capacities of placement areas, environmental compliance requirements, potential for BUDM, and indicators of continued economic justification. The MSC DMMP will be updated periodically to identify any potentially changed conditions. The MSC DMMP identifies specific measures necessary to manage the volume of material likely to be dredged over a 50-year period from both construction and maintenance dredging.

A.1.3 Final EIS Coastal Texas Protection and Restoration Feasibility Study

The *Coastal Texas Protection and Ecosystem Restoration Feasibility Study* was completed to determine the feasibility of constructing coastal storm risk management and ecosystem restoration features using a multiple lines of defense strategy along the Texas coast. The project feature selection process resulted in six coastal storm risk management options and nine large-scale ecosystem restoration features that were evaluated for engineering, economic, and environmental viability and reviewed under NEPA to determine feasibility for Congressional consideration. The *Final EIS Coastal Texas Protection and Restoration Feasibility Study* (USACE and GLO 2021) employs a tiered-NEPA approach in which full environmental compliance with NEPA and environmental laws has been demonstrated for "actionable measures," which primarily consist of ecosystem restoration actions where the impacts and designs are well understood and minimal changes are anticipated during the preconstruction engineering and design phase.

A.1.4 GIWW Coastal Resiliency Study-Draft Integrated Feasibility Report and Environmental Assessment

The project area encompassed 85 miles of the Texas portion of the GIWW in Brazoria and Matagorda counties, which was divided into 20 zones for detailed analysis according to geography and ecology. The *Gulf Intracoastal Waterway Coastal Resiliency Study – Draft Integrated Feasibility Report and Environmental Assessment* (USACE 2022) addressed three main issues within the navigation channel: 1) the chronic and episodic coastal storm erosion of the shorelines and barrier islands that have historically protected vessels on the GIWW; 2) sea level rise and continued hurricanes and tropical storms that would likely exacerbate the loss of barriers around the channel; and 3) sediment carried by coastal storms from eroded shorelines and shoals in the channel leading to light-loading and unintentional groundings of vessels resulting in navigation safety risks.

The purpose of the study was to investigate and determine modifications that would: increase system resilience, improve navigability and navigation safety, reduce overall dredging and structure maintenance, reduce commercial transit delays and accidents, and enhance regional sediment management practices along the GIWW. The study evaluated alternatives that would benefit the GIWW navigation system by reducing ongoing shoreline erosion and shoaling in the channel and mitigating impacts of periodic coastal storms. Considerations of ecosystem restoration or damage reduction benefits are incidental to the primary navigation purpose of the GIWW. Analyses focused on identifying causes of transportation service interruptions or capacity reductions; reaches most vulnerable to effects of erosion, shoaling, storm damages; changes due to relative sea level rise; local sediment resources that have the potential for BUDM (e.g., used to restore degraded sandbars, islands, and wetlands); methods to reduce impacts of currents and wind fetch on navigation through restoration of coastal features; and high shoaling areas that require significant expenditures for operations and maintenance (O&M), such as dredging.

A.1.5 GIWW BUDM – Aquatic Ecosystem Restoration for Gulf Intracoastal Waterway – Beneficial Use of Dredged Material, Aransas County, Texas, Detailed Project Report and Environmental Assessment Continuing Authorities Program Section 204A

The tentatively selected plan (project) in the *Aquatic Ecosystem Restoration for Gulf Intracoastal Waterway – Beneficial Use of Dredged Material, Aransas County, Texas, Detailed Project Report and Environmental Assessment Continuing Authorities Program Section 204* (USACE 2024a) aligns with the objectives and scope of the *Goose Island Wetland Restoration* project described in this RP/EA #3. The UESACE project seeks to beneficially use material dredged from the nearby GIWW to restore habitat and capture ecological output through beneficially placing operations and maintenance (O&M) material in areas degraded from coastal and navigational forces over time. The focus of the study is to investigate the options around placing O&M material at Goose Island to build up marsh and create future capacity for the surrounding O&M placement areas for the GIWW and other federally maintained channels surrounding Goose Island. A tentatively selected plan for implementation of this project has been evaluated in the A*quatic Ecosystem Restoration for Gulf Intracoastal Waterway – Beneficial Use of Dredged Material, Aransas County, Texas, Detailed Project Report and Environmental Assessment Continuing Authorities Program Section 204* (USACE 2024a). The document focused on the expected impacts of restoration activities on the environment and related social and economic activities and analyzed the transportation and placement of material to the Federal Standard location (No Action) or to Goose Island State Park.

The USACE tentatively selected plan builds the existing cells 1 and 2 to a target elevation between 0.6- and 0.8-foot NAVD88 but may reach up to 1-foot NAVD88. Two new parcels (cells 3 and 4) are built to the north of the existing cells to add 9.5 and 6.5 acres, respectively. Within cells 3 and 4, along the southern area, fill material would be constructed to target between 1.5- and 2.0-feet NAVD88 to create a 3.7- and 2.5-acre higher elevation marsh, respectively. The remaining area in cells 3 and 4 (9.5 and 6.5 acres, respectively) would be filled to target elevations of 0.6- and 0.8-foot NAVD88.

A.1.6 Final Environmental Statement Maintenance Dredging GIWW Texas Section—Main Channel and Tributary Channels—Volume 3 Supplements

The Maintenance Dredging GIWW Texas section includes the maintenance dredging for the GIWW, including the following main channels and tributaries: Colorado River Channel, Tributary Channel to Port Mansfield, Galveston Bay to Matagorda Bay, Port Isabel to Mud Flats, Tributary Channel to Harlingen, High Island to Galveston Bay, Corpus Christi Bay to Mud Flats, San Bernard River Channel, Port Arthur to

High Island, Channel to Palacios, Channel to Victoria, Matagorda Bay to San Antonio Bay, San Antonio Bay to Corpus Christi Bay, and Tributary Channel to Aransas Pass. The federal action continued periodic maintenance dredging of the channels and tributaries required to prevent shoaling from halting or restricting navigation on the GIWW.

A.2 Project-level Evaluation Tiered from the Final PDARP/PEIS

The *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Final PDARP/PEIS; Deepwater Horizon (DWH) Natural Resource Damage Assessment (NRDA) Trustees 2016) established a framework for restoration of resources injured by the DWH oil spill and programmatically evaluated environmental consequences on the physical, biological, and socioeconomic resources of the Gulf associated with implementing a range of restoration approaches. The proposed alternatives in this RP/EA #3 use the Final PDARP/PEIS restoration approach "create, restore, and enhance coastal wetlands." The relevant portions of the Final PDARP/PEIS that evaluated that approach programmatically are incorporated by reference and summarized in Section 4.2 of this RP/EA #3.

Consistent with the criteria described and applied in the Final PDARP/PEIS, criteria for addressing environmental consequences were applied to each project evaluated. Applicable definitions for context and intensity per each resource category are provided in Appendix D, Guidelines for NEPA Impact Determination in the Final PDARP/PEIS.

The projects proposed in this RP/EA #3 are located across the Texas coast from Copano Bay to Sabine Lake (Figure A-1). The environments associated in each of the project areas are generally similar; however, each project setting also includes location-specific environments. Descriptions of each affected environment and analysis of the environmental consequences are presented for each project considered within the reasonable range of alternatives. Each project is evaluated for impacts to those resource categories addressed in the Final PDARP/PEIS:

Physical Resources

Geology and Substrates, Hydrology and Water Quality, Air Quality, Noise

Biological Resources

Habitats, Wildlife Species (including Birds), Marine and Estuarine Resources (Fish, Shellfish, Benthic Organisms), Protected Species

Socioeconomic Resources

Socioeconomics, Cultural Resources, Infrastructure, Land and Marine Management, Tourism and Recreational Use, Fisheries and Aquaculture, Land and Marine Transportation, Aesthetics and Visual Resources, Public Health and Safety

The descriptions and analyses of the projects are based on the 60% basis of design concepts developed under the *Texas Dredged Material for Wetland Restoration – Final Report* (Texas TIG 2022b) authorized in the *Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Texas Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters* (RP/EA #1; Texas TIG 2017), except for the *Goose Island Wetland Restoration* analysis. The *Goose Island Wetland Restoration* analysis is based upon the tentatively selected plan in *Aquatic Ecosystem Restoration for Gulf Intracoastal Waterway – Beneficial Use of Dredged Material, Aransas County, Texas, Detailed Project Report and Environmental Assessment Continuing Authorities Program Section 204* (USACE 2024a). The descriptions for each of the

construction elements are preliminary and based on current planning efforts and resource agency experience with similar marsh restoration projects.

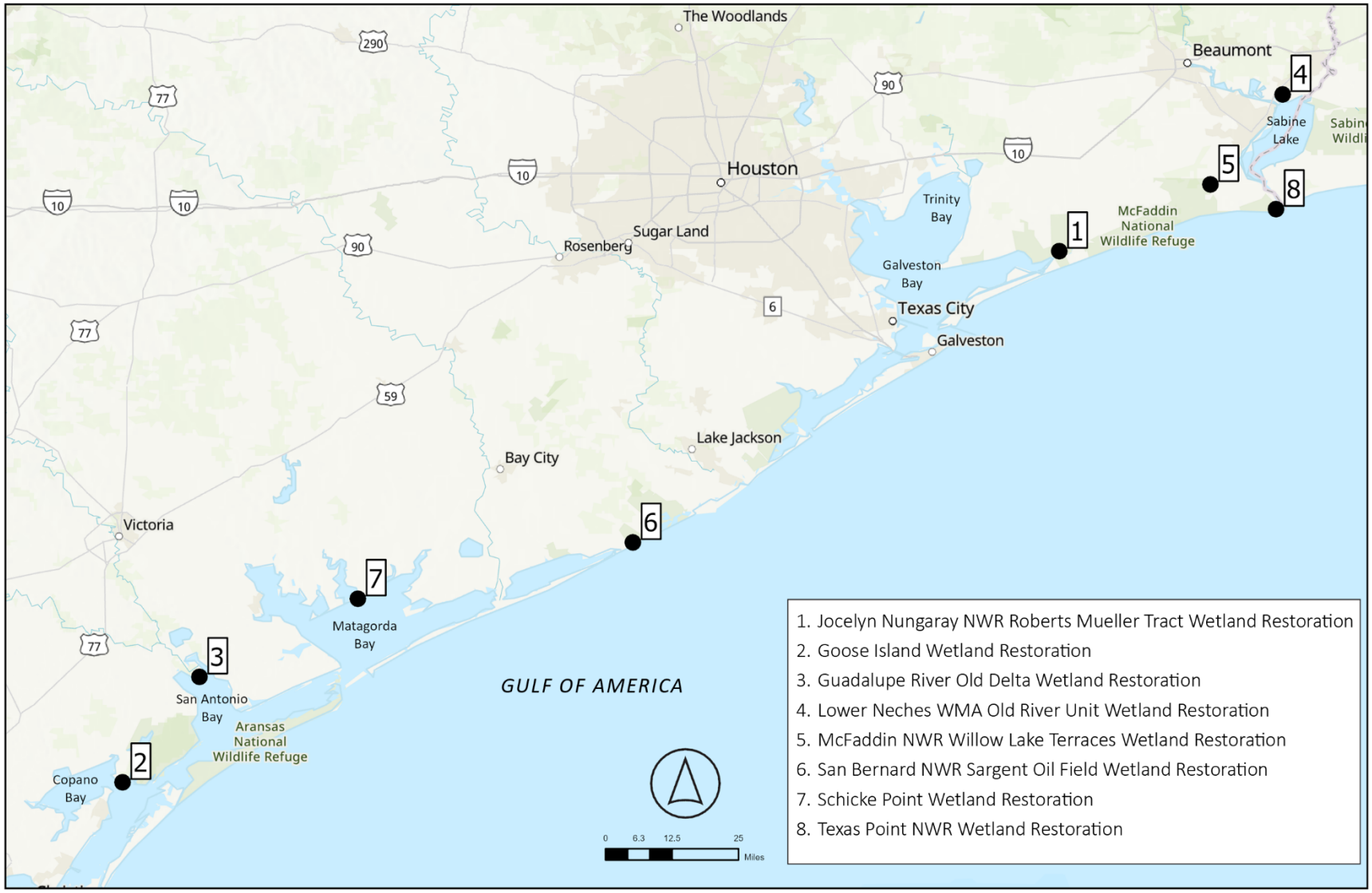


Figure A-1 Approximate Project Alternative Locations Along the Texas Coast

Throughout the completion of the 100% designs, which is an activity incorporated into all the proposed action alternatives, every practical attempt would be made to avoid or minimize potentially adverse environmental and cultural resource impacts. Although the Texas Trustee Implementation Group (Texas TIG) does not consider it likely, it is possible that the 100% Engineering and Design (E&D) process could generate planned implementation actions that may result in adverse environmental impacts different in type or magnitude from those discussed in this document. Should differences in level of impacts occur, the Texas TIG would, consistent with each project monitoring and adaptive management plan (Appendix E), determine whether further environmental impacts analysis would be necessary and prepare supplemental analysis if needed. Any additional environmental analysis would be included in the Administrative Record and Data Integration Visualization Exploration and Reporting (DIVER) once completed.

The Texas TIG has completed environmental compliance reviews with relevant regulatory agencies regarding potential adverse impacts to protected species and habitats for each preferred alternative for which implementation is proposed. The Texas TIG would coordinate and complete consultation with relevant regulatory agencies, if necessary, regarding potential adverse impacts to protected species and habitats before project implementation. Implementing Trustees would conduct due diligence to ensure that no unanticipated effects to listed species and habitats would occur. Adverse impacts would be minimized by following mitigation measures, best practices, and other guidance developed during the permitting processes, environmental reviews, consultation processes, and other relevant regulatory requirements. The Texas TIG would also consider best practices referenced in Section 3.3 of this RP/EA #3 and Appendix 6.A of the Final PDARP/PEIS (DWH NRDA Trustees 2016).

The sections below provide additional information concerning those resource categories common to all projects and associated regulatory responsibilities for the analysis of environmental consequences.

A.2.1 Physical Resources

A.2.1.1 Hydrology and Water Quality

In accordance with 40 Code of Federal Regulations (C.F.R) § 130.8 and 33 United States Code (U.S.C.) §§ 305(b) and 303(d) of the Clean Water Act, the Texas Commission on Environmental Quality (TCEQ) is responsible for developing and enforcing the Texas Surface Water Quality Standards (TCEQ 2022) to ensure that both freshwater and marine surface waters in the state support their designated uses (i.e., aquatic life, contact and noncontact recreation, drinking water, and oyster waters). Impairment criteria include dissolved oxygen, temperature, pH, dissolved minerals, toxic substances, and bacteria. Surface waters that do not meet the standards necessary to allow their designated uses must be included in the biennial 303(d) list of impaired waters, and TCEQ must calculate a Total Maximum Daily Load (TMDL) for each impaired water. The TMDL establishes the maximum amount of a pollutant allowed in a waterbody and serves as the starting point or planning tool for restoring water quality. TCEQ manages point and nonpoint source discharges of pollutants to these waters by issuing permits under the Texas Pollutant Discharge Elimination System (USACE and Texas General Land Office [GLO] 2021). Any activity that would result in discharges of pollutants to impaired water would be subject to review and permitting under the Texas Pollutant Discharge Elimination System.

A.2.1.2 Air Quality

Pursuant to the Clean Air Act, as last amended in 1990, the U.S. Environmental Protection Agency (EPA) has set National Ambient Air Quality Standards (NAAQS) for six principal criteria air pollutants (i.e., ground-level ozone, lead, carbon monoxide, nitrogen dioxide, sulfur dioxide, and particulate matter)

that are known to be harmful to public health, especially to sensitive populations such as children, the elderly, and individuals with certain health conditions (USEPA 2024a). Areas that do not meet these standards for one or more criteria pollutants are designated as nonattainment areas. The Clean Air Act requires states to submit state implementation plans for all nonattainment areas to outline the measures to be taken to improve air quality and to demonstrate progress toward meeting the NAAQS. Federal actions that take place within nonattainment areas may be subject to general conformity requirements to ensure that the action conforms with the state implementation plan and would not cause or contribute to exceedances of the NAAQS. However, projects that are expected to result in de minimis levels of emissions (40 C.F.R. § 93.153) are generally exempt from conformity requirements (TCEQ 2024). Brazoria and Chambers counties are within the Houston-Galveston-Brazoria area, which has been designated as a serious nonattainment area for ozone (USEPA 2024b). Ozone is generated primarily from emissions of volatile organic compounds and nitrous oxides from nonpoint sources (i.e., vehicles, area sources, and agriculture) and stationary or point sources (e.g., power plants and industrial activities). No other nonattainment or maintenance areas for any criteria pollutants are present within the seven-county region containing the considered alternatives (USEPA 2024b).

A.2.2 Biological Resources

A.2.2.1 Wildlife Species

The Migratory Bird Treaty Act (MBTA) is the primary legislation in the United States that protects migratory birds. The statute makes it unlawful to pursue, hunt, take, capture, kill, or sell the parts, nests, or eggs of migratory birds without a waiver. Nonnative bird species, such as European starling (*Sturnus vulgaris*) and house sparrow (*Passer domesticus*) are not protected under the MBTA. Another statute, the Bald and Golden Eagle Protection Act of 1940 (BGEPA), further protects bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) within the United States. In addition to similar protections afforded migratory birds, the BGEPA protects eagles from disturbance and human-induced alterations that may impact nesting areas.

A.2.2.2 Marine and Estuarine Resources

Marine and estuarine fauna and fishery resources are protected under the Fish and Wildlife Coordination Act of 1958, as amended; the Endangered Species Act of 1973 (ESA); the Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended (MSA; 16 U.S.C. 1801 *et seq.*); the Magnuson-Stevens Act Reauthorization of 2006; the Coastal Zone Management Act; and the Estuary Protection Act. Additionally, the National Marine Fisheries Service (NMFS) manages highly migratory species (e.g., sharks) for which EFH is identified by geographical area, rather than habitat type.

A.2.2.3 Protected Species

Protected species consist of designated wildlife and plant species protected from harm or harassment by law. The ESA protects all federally listed wildlife and plant species, and the designated critical habitat of these species, in the United States. The ESA requires that federal agencies ensure any action authorized, funded, or carried out by an agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat. Other protected species include marine mammals such as the common bottlenose dolphin (*Tursiops truncatus*), protected by the Marine Mammal Protection Act of 1972 (MMPA), and migratory birds, protected by the MBTA and BGEPA. The primary regulatory agencies responsible for ESA compliance are the U.S. Fish and Wildlife Service (USFWS) and NMFS. Critical habitat is defined as an area containing the physical or biological features essential to a listed species' conservation. Any action authorized, funded,

or carried out by a federal agency is prohibited from destroying or adversely modifying designated critical habitat.

A.2.3 Socioeconomic Resources

A.2.3.1 Cultural Resources

NEPA recognizes that a unique characteristic of an environment is its relation to historic or cultural resources. However, under NEPA, no definition is provided for "cultural resources." The National Register of Historic Places, which was established under the National Historic Preservation Act of 1966, as amended (NHPA) (54 U.S.C. §§ 3001 *et seq.*), identifies historic properties based on their relationship to significant historic events or individuals; important stylistic or engineering trends; or in their potential to provide information about the local, regional, or national past (36 C.F.R. § 60.1). Historic properties may include archaeological sites, historic structures, historic districts, landscapes, battlefields, or shipwrecks. Also included are Traditional Cultural Properties, which may be defined as locations that are eligible for the National Register of Historic Places due to their association with practices or beliefs of a modern community that are tied to a community's sense of history, place, or identity (Parker and King 1998).

Under Section 106 of the NHPA, agencies are required to attempt to identify, in coordination with other interested parties, including State Historic Preservation Officers and federally recognized Native American tribal groups, whether historic properties are present within the area of effect of an undertaking and whether they would be significantly impacted by that undertaking. Projects which are directed, overseen, funded, partially funded, or permitted by a federal agency are considered undertakings.

A.3 Affected Environment and Resource Impacts Specific to Each Alternative

This section includes a summary of the project, a description of the relevant affected environment, and an analysis of the environmental consequences according to resource category for each alternative in this RP/EA #3. Figure A-1 shows approximate locations of the eight project alternatives along the Texas coast.

A.3.1 Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration

The project site is within the Jocelyn Nungaray National Wildlife Refuge (NWR), which is managed by the USFWS. Dredged material would provide fill for four dredge placement cells, using containment levees built from material collected on site to restore up to 550 acres of intertidal marsh.

The predominant wetland habitats in the project area are characterized as salt and brackish marsh and estuarine open water. The combination of rising sea levels, subsidence, and reduced sediment supplies has resulted in significant loss of wetlands and other coastal habitats in the project area. Subsidence and sea level rise are rapidly converting emergent marsh to open water. This project is consistent with regional efforts to counteract land and habitat loss through dune restoration, hydrology enhancements, and estuarine marsh restoration.

The overarching project goal is to restore and conserve wetlands and coastal habitats in the Jocelyn Nungaray NWR by beneficially using dredged material to create a viable, vegetated wetland habitat for fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage. The primary objective of this project is to return current submerged

shallow open water habitat in the Jocelyn Nungaray NWR to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass (*Sporobolus alterniflorus*) and saltmeadow cordgrass (*Sporobolus pumilus*). This project would place up to 650,000 cubic yards (cy) of suitable hydraulically dredged material within levees constructed from on-site sediment. Dredge material would be placed in the levees to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 550 acres of marsh habitat, including the conversion of approximately 380 acres of existing open water to intertidal marsh habitat (Figure A-2).

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the GIWW, private dredging sources, and material mined from dredged material placement areas. The specific sources of dredged material would be determined during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source. Resources of the affected environment are described in Section A.3.1.1; project-level environmental consequences are summarized in Table A-2 and described in Section A.3.1.2.

This section presents the affected resources of the *Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration* project and the environmental consequences of the proposed actions in context of the project-specific affected environment.

Table A-1 Summary of Adverse and Beneficial Impacts from Implementation of the *Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration* Project

Resource Category	Resource Subcategories	Benefits	Adverse Short Term	Adverse Long Term
Physical Resources	Geology and substrates	Yes	Minor	Minor
	Hydrology and water quality	Yes	Minor	Minor
	Air quality	Yes	Minor	NE
	Noise	NE	Minor	NE
Biological Resources	Habitats	Yes	Minor to moderate	NE
	Wildlife species	Yes	Minor to moderate	NE
	Marine and estuarine resources	Yes	Minor to moderate	NE
	Protected species	Yes	Minor	Minor
Socioeconomic Resources	Socioeconomics	Yes	NE	NE
	Cultural resources	NE	NE	NE
	Infrastructure	NE	NE	NE
	Land and marine management	NE	NE	NE
	Tourism and recreational use	Yes	Minor	NE

Resource Category	Resource Subcategories	Benefits	Adverse Short Term	Adverse Long Term
	Fisheries and aquaculture	Yes	Minor	NE
	Land and marine transportation	NE	NE	NE
	Aesthetics and visual resources	Yes	Minor to moderate	NE
	Public health and safety	NE	NE	NE

Notes:
Adverse short-term and long-term effects are designated as minor, moderate, or major.
NE: no effect
Yes: provides benefits

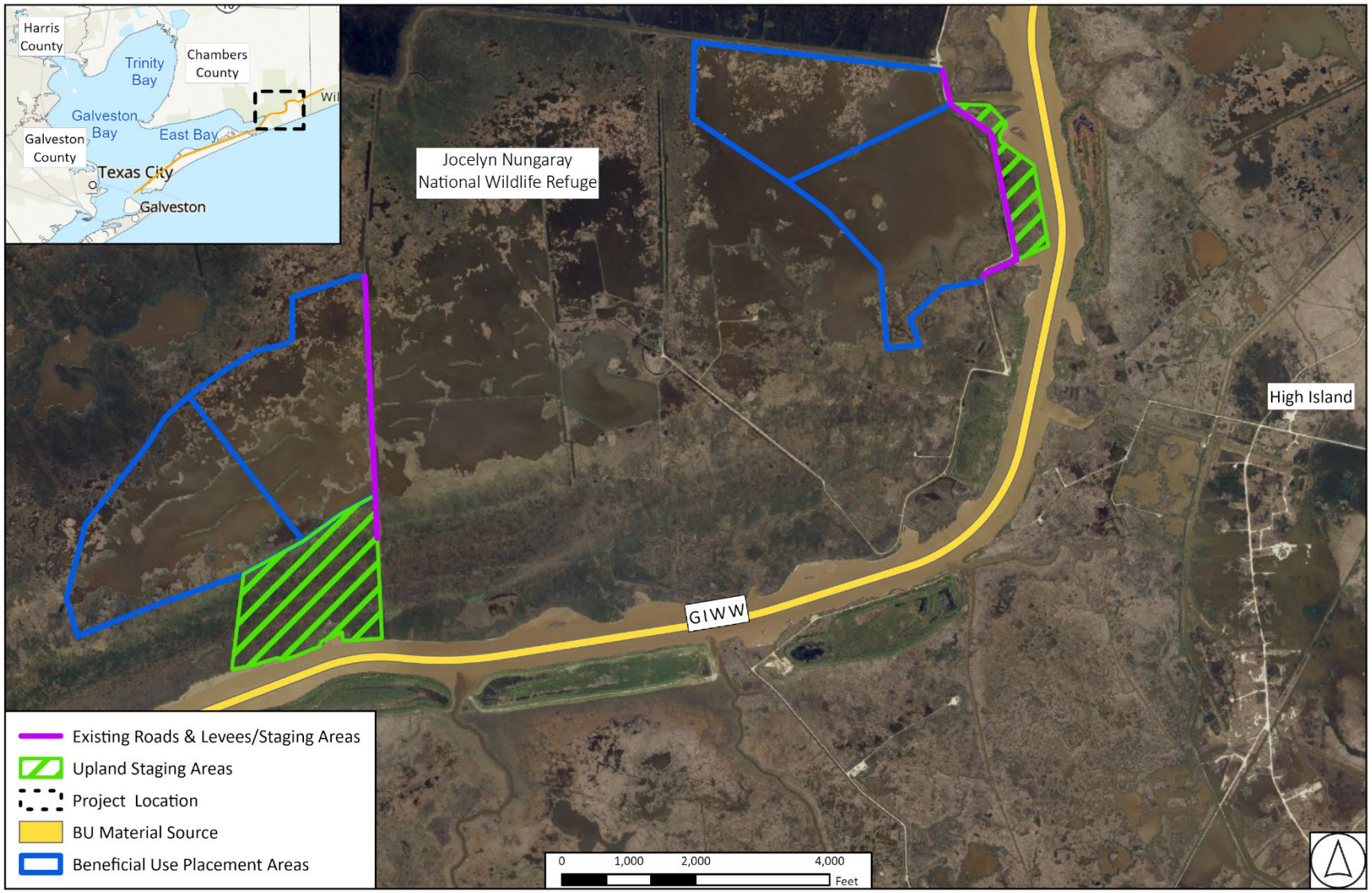


Figure A-2 **Location of Proposed Restoration Areas for the *Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland* Project**

The description and analysis of the project are based on the 60% basis of design concepts developed under the *Texas Dredged Material Planning for Wetland Restoration* project authorized in RP/EA #1. The descriptions for each of the construction elements are preliminary and based on current planning efforts and resource agency experience with similar marsh restoration projects.

The impacts from the project are anticipated to be largely beneficial, and the adverse impacts are anticipated to be short-term and minor (Table A-2). Benefits to the biological, physical, human uses, and socioeconomics environment would result if the project were implemented. Best practices required in the permit, consultations, or environmental analyses would be followed. Additionally, best practices described in Appendix 6.A of the Final PDARP/PEIS (DWH NRDA Trustees 2016) would be considered and applied where appropriate to reduce or eliminate adverse impacts to the environment.

A.3.1.1 Affected Environment

This section discusses the Affected Environment of the project area including physical resources, biological resources, and socioeconomic resources.

A.3.1.1.1 Physical Resources

The physical resources are divided into geology and substrates, hydrology and water quality, air quality, and noise characteristics of the area.

Geology and Substrates

The project area is located in the Chenier Plain, which was formed by the reworking of riverine sediments with the Mississippi River being the main source of sediments. The geologic substrate of the Chenier Plain region is primarily composed of Holocene sediments with some subsurface Pleistocene outcroppings. According to the *Salt Bayou Watershed Restoration Plan* (Salt Bayou Marsh Workgroup 2013):

> The Chenier plain was developed by lateral oscillations of the Mississippi River over long periods of time and the reworking of sediments that were deposited during these shifts. Mudflats were formed along the shoreline by the fine-grained sediments from the Mississippi River. These sediments were pushed west by longshore transport and were ultimately deposited along the shoreline through nearshore currents (Britsch and Dunbar 1993). Eastward shifts in the course of the Mississippi River resulted in a decline of the westward sediment transport. This decline in sediments resulted in coastal processes reworking and eroding the sediments along the shore. These coastal processes concentrated the coarse, large-grained sediments forming higher ridges or cheniers (Britsch and Dunbar 1993). When the Mississippi River oscillated westward again, new sediments were deposited along the existing shoreline, and the cycle of ridge and mudflat formation began again. Repetition of sediment accretion and erosion from coastal processes over time created the alternating ridges separated by marshlands, which is now called the Chenier plain (Britsch and Dunbar 1993).

The BUDM restoration technique emulates riverine deltaic and other coastal sediment processes that have been interrupted by human alterations to the land and seascape. Emulating these natural accretion processes is a useful restoration tool to restore valuable coastal habitats where the rate of relative sea level rise exceeds accretion.

Hydrology and Water Quality

The project area is within the East Galveston Bay watershed (Hydrologic Unit Code 120402020300). The 34,339-acre Jocelyn Nungaray NWR is dissected by four estuarine bayous which drain into East Galveston Bay or the GIWW. Most of the NWR is subject to frequent tidal and freshwater flooding. Marsh habitats on the NWR include fresh, intermediate, brackish, and saline marshes, with intermediate marsh being the predominant marsh type (USFWS 2008).

Surface water quality in the region and the Texas Chenier Refuge Complex is influenced by industrial and agricultural practices, flood management practices, and various human alterations to its hydrology. The movement of saltwater from the Gulf and bays through the bayou and marsh systems varies depending upon tidal action, storms, and storm runoff. Channel construction, including the GIWW and channelization of natural waterways, has facilitated the movement of saltwater from the Gulf further into the bayous and marsh systems than what occurred historically, or what would occur under natural conditions. The level and impacts of saltwater intrusion vary by area (USFWS 2008).

According to the *2022 Texas Integrated Report*, Segment 0702 Intracoastal Waterway Tidal fully supports aquatic life (TCEQ 2022). The waterbody does not support fish consumption due to polychlorinated biphenyls (PCBs) and dioxin in edible tissue, does not support contact recreation due to a bacteria impairment, and has a concern for screening level for chlorophyll-*a*. The Texas Surface Water Quality Standards classify Intracoastal Waterway Tidal as suitable for primary contact recreation, and its waters are designated high for aquatic life (TCEQ Water Quality Standards 2018, 30 Texas Administrative Code (TAC) Section 307.10(1), Appendix A). The *draft 2024 Texas Integrated Report* de-listed the bacteria in water impairment for Segment 0702 based on new data (TCEQ 2024).

Air Quality

The project area is located in the Houston-Galveston-Brazoria Air Quality Control Region (Region 12). The Region is in nonattainment for 8-hour ozone (TCEQ 2021a).

Electricity production, vehicular movements, and commercial and residential buildings using electricity generate criteria air pollutants. The project's impacts on air quality are considered.

Noise

The project location is near the GIWW, a heavily used maritime channel. Due to its location, the Jocelyn Nungaray NWR project area experiences the ambient noise of marine transportation. Recreational and commercial waterborne traffic are common around the project area.

A.3.1.1.2 Biological Resources

The wetland habitats on the upper Texas coast provide important wintering and migration stopover habitat for migratory birds, including Central Flyway waterfowl, shorebirds, wading birds, and marsh and waterbirds. A complex of protected lands along the coast, including NWRs such as Jocelyn Nungaray and state -managed Wildlife Management Areas (WMAs), serve as critical staging areas for waterfowl migrating to and from Mexico. The Galveston Bay estuary is a vital habitat for fish and shellfish species found in the Gulf. The biological resources discussion is divided into habitats, wildlife species, marine and estuarine resources, and protected species.

Habitats

The coastal marshes of the NWR and the project area support many species of birds; fish; and other wildlife, such as the northern river otter (*Lontra canadensi*), bobcat (*Lynx rufus*), gray fox (*Urocyon*

cinereoargenteus), coyote (*Canis latrans*), and American alligator (*Alligator mississippiensis*). The lower elevations of the NWR and the project area are predominantly a salt to brackish marsh complex comprised of emergent marshes, shallow subtidal flats, and open water. These shallow flats support benthic communities that provide food sources for migratory waterfowl, estuarine fish and invertebrate species, and other marsh fauna.

Wildlife Species

The coastal marshes in Jocelyn Nungaray NWR and the project area provide shallow water feeding, breeding, and resting habitat for numerous shorebirds, wading birds, and other marsh and waterbirds. The NWR is a primary wintering area for Central Flyway ducks and geese and serves as a critical staging area for waterfowl migrating to and from Mexico. Hundreds of thousands of shorebirds, wading birds, and other marsh and water birds also overwinter or migrate through the area. The area also supports a large waterfowl population in the winter and a variety of year-round bird species. Wading birds and shorebirds utilize mudflats and shallow marsh ponds located throughout the area. Wintering waterfowl include gadwall (*Mareca strepera*), northern pintail (*Anas acuta*), lesser scaup (*Aythya affinis*), American widgeon (*Mareca americana*), and blue-winged teal (*Spatula discors*). Other birds such as clapper rail (*Rallus crepitans*), seaside sparrow (*Ammodramus maritimus*), and other secretive marsh species use the marsh as well.

Marine and Estuarine Resources

Estuarine habitats in the Jocelyn Nungaray NWR and the project area provide nursery and foraging habitat that supports various life stages of forage species and recreationally important marine fishery species, such as spotted seatrout (*Cynoscion nebulosus*), southern flounder (*Paralichthys lethostigma*), Atlantic croaker (*Micropogonias undulatus*), black drum (*Pogonias cromis*), Gulf menhaden (*Brevoortia patronus*), striped mullet (*Mugil cephalus*), and blue crab (*Callinectes sapidus)* (Nelson 1992). Estuarine habitats also support many benthic animals, including marine worms and crustaceans, which are consumed by higher trophic-level predators such as shrimp, crabs, and black drum. Invertebrates such as blue crab, brown shrimp (*Farfantepenaeus aztecus*), and white shrimp (*Litopenaeus setiferus*) are common in the region.

Protected Species

Protected species and their habitats include: ESA-listed species and designated critical habitats, which are regulated by either USFWS or NMFS; marine mammals protected under the MMPA; EFH protected under the MSA; migratory birds protected under the MBTA; and eagles protected under the BGEPA.

Threatened or Endangered Species

The threatened or endangered species that could potentially be affected by project activities are listed in Table A-3 (USFWS 2024). No activities related to implementation of the project would take place in any area designated as critical habitat.

Table A-2 Federal Threatened and Endangered Species Potentially Affected in the *Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Habitat Restoration* Project Area

Common Name	Status
Piping plover	Threatened

Common Name	Status
Red knot	Threatened
Eastern black rail	Threatened
West Indian manatee	Threatened
Loggerhead sea turtle	Threatened
Green sea turtle	Threatened
Hawksbill sea turtle	Endangered
Leatherback sea turtle	Endangered
Kemp's ridley sea turtle	Endangered

Eastern black rails (*Laterallus jamaicensis jamaicensis)* occur across an elevational gradient that lies between lower and wetter portions of the marsh and their adjacent uplands. These habitat gradients have gentle slopes so wetlands can have large areas of shallow inundation (sheet water). Eastern black rails also require adjacent higher elevation areas (i.e., the wetland-upland transition zone) with dense cover to survive high water events. The dense vegetative cover allows movement underneath the canopy to avoid predators. The dense plant structure is more important than plant species composition in predicting habitat suitability. This project would have minimal benefits to black rail habitat.

The red knot (*Calidris canutus*) and piping plover (*Charadrius melodus*) are winter residents on the Texas coast and in Chambers County. Both species are known to use the tidal shorelines and intertidal flats of bays and the Gulf. There is no critical habitat for red knot or piping plover in the project area.

There are infrequent sightings of the West Indian manatee *(Trichechus manatus*) in Texas estuaries.

Loggerhead sea turtles (*Caretta caretta*), green sea turtles (*Chelonia mydas*), hawksbill sea turtles (*Eretmochelys imbricata)*, leatherback sea turtles (*Dermochelys coriacea*), and Kemp's ridley sea turtles (*Lepidochelys kempii*) may be present in the project area.

EFH

The MSA promotes the stewardship of economically important marine and estuarine fisheries by requiring NMFS, regional Fishery Management Councils, and other federal agencies to identify and protect EFH during the review of projects to be conducted under federal permits and licenses or other authorities that affect or have the potential to affect such habitat. The MSA defines EFH as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. Specific habitats include all estuarine water and substrate (mud, sand, shell, and rock) and all associated biological communities, such as subtidal vegetation (seagrasses and algae) and the adjacent intertidal vegetation (marshes and mangroves). Of the fish species considered by NMFS to potentially occur within the project area, EFH for these species consists of tidally influenced waters and tidally influenced marsh. Table A-4 provides a list of managed EFH species in the project area, habitat preference, and life stage when they may be expected to occur (NMFS 2021).

Table A-3 EFH for Estuarine Habitats within the *Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration* Project Area

Name	Larvae/ Eggs	Post-Larvae	Juvenile	Subadult	Adult	Habitat Type
Brown shrimp	X					Water column associated
Brown shrimp			X			Emergent marsh, soft bottom
Brown shrimp				X		Soft bottom
Pink shrimp *(Farfantepenaeus duorarum)*			X	X		Soft bottom
White shrimp		X				Water column associated
White shrimp			X			Emergent marsh, soft bottom
White shrimp				X	X	Soft bottom
Red drum (*Sciaenops ocellatus*)	X					Water column associated, soft bottom (larvae)
Red drum		X				Emergent marsh, soft bottom
Red drum			X			Emergent marsh (late juvenile), soft bottom
Red drum					X	Emergent marsh, soft bottom
Spanish mackerel (*Scombridae*)			X		X	Estuarine, water column associated
Gray snapper *(Lutjanus griseus)*					X	Soft bottom, emergent marsh
Cobia (*Rachycentron canadum)*	X					Water column associated
Lane snapper (*Lutjanus synagris*)	X	X				Water column associated
Lane snapper			X			Soft bottom

Marine Mammals

The only marine mammal regularly found in East Galveston Bay and the GIWW is the bottlenose dolphin. There are infrequent reports of sightings of West Indian manatees within the Galveston Bay estuary.

Bald and Golden Eagles

Bald eagles potentially forage within the project location, and golden eagles may occasionally migrate through the project area.

Migratory Birds

Many species of birds spend all or a portion of their life cycle along the Gulf using a variety of habitats at different stages. Major groups of birds that inhabit the northern Gulf include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh-dwelling birds, and passerines. Birds protected under the MBTA and Texas Parks and Wildlife Code may nest in the project area.

A.3.1.1.3 Socioeconomic Resources

This section includes descriptions of socioeconomics, cultural resources, infrastructure, land and marine management, tourism and recreational use, fisheries and aquaculture, land and marine transportation, aesthetics and visual resources, and public health and safety.

Socioeconomics

Chambers County has a total population of 53,876, an increase of 15.7% since 2020, based on the 2023 U.S. Census population estimates. Median household income (2018 to 2022) in Chambers County is $106,103 (USCB 2024a).

Cultural Resources

Reviews under Section 106 of the NHPA will be initiated for the project. A preliminary analysis of the Texas Historical Commission (THC) Texas Historic Sites Atlas database indicated that no known historic sites or significant cultural, scientific, or historic resources exist in the area within the boundaries of the project area (THC 2024).

Infrastructure

The Railroad Commission of Texas (RRC) maintains an oil and gas pipeline and well database. According to the RRC geographic information system (GIS) viewer (RRC 2020), some active and decommissioned natural gas wells and pipelines lie in close proximity to the site. Additionally, the GLO Texas Sediment Geodatabase GIS viewer shows that buried pipelines run near the site (GLO 2017). Care was taken to avoid this infrastructure with the proposed design. Further delineation of pipeline easements and restrictions may be developed during the final design stage and before construction.

Land and Marine Management

The NWR encompasses 34,000 acres in Chambers and Galveston counties, Texas, along the GIWW east of East Galveston Bay and north of High Island. It is undeveloped, except for oil and gas infrastructure. The maritime commerce on the GIWW flows through the NWR. The project area includes two sites, both are near the GIWW, and it is likely that sediments would be transported to the site via the GIWW. The project area is undeveloped, including unpaved NWR access roads. The land is managed by USFWS.

Tourism and Recreational Use

The Jocelyn Nungaray NWR marsh is managed by USFWS as part of the Texas Chenier Plain Refuge Complex, which also includes Texas Point, McFaddin, and Moody NWRs. Management of the NWR and site includes use of the marsh for recreational fishing and waterfowl hunting. Hunting, fishing, hiking, and wildlife viewing are regularly enjoyed by the public.

Fisheries and Aquaculture

This area is an important nursery for marine and estuarine fishery species, including several that are important to the local economy. Recreational fishing in the area focuses on spotted seatrout, red drum, southern flounder, and other species. Commercially valuable species include brown shrimp, white shrimp, blue crab, black drum, and Gulf menhaden.

Land and Marine Transportation

The project area is relatively remote. There are several access roads into the NWR but no through traffic. The project area is situated in proximity to canals, levees, the GIWW, Oyster Bayou, and East Galveston Bay.

Aesthetics and Visual Resources

The affected environment consists of the construction footprint of the project. The landscape in the vicinity of the proposed wetland restoration is characterized by a mosaic of saline and brackish marsh and open water. The site near the GIWW is a busy maritime channel. The NWR is undeveloped, and the viewshed is dominated by the natural appearance of the area. There are no designated protected viewsheds in the vicinity of the project. Equipment and construction activities related to the restoration actions would be visible.

Public Health and Safety

The recreational users of the Jocelyn Nungaray NWR are accustomed to navigating the marsh via the existing channels and avoiding shallow areas and areas that contain obstructions. The immediate vicinity of the project area was historically intermediate and brackish marsh, but it has since converted to areas of open water primarily due to subsidence and relative sea level rise. This has had adverse impacts on coastal habitats and deleterious effects on the area's functionality as a buffer for storm surges.

A.3.1.2 Environmental Consequences

This section analyses the Environmental Consequences of the project to the Affected Environment including physical resources, biological resources, and socioeconomic resources.

A.3.1.2.1 Physical Resources

Geology and Substrates

Short- and long-term, minor adverse impacts to geology and substrates could occur due to the placement of dredged material in shallow water areas, which may affect sediment dynamics. Placement of materials (such as dredged material or riprap) would result in long-term, but localized, adverse impacts to the existing substrate. Additionally, the project would require implementation of best practices to minimize or avoid adverse impacts. Best practices, such as silt curtains, buffer zones, and water quality monitoring, would be used to minimize such effects.

It is anticipated that the project would provide long-term benefits to wetlands and other shoreline habitats by raising substrate elevations affected by subsidence and sea level rise and re-establishing natural hydrology needed to restore the function of coastal wetland communities. This approach helps stabilize substrates, which increases the longevity of coastal wetlands to sea level rise and reduces coastal erosion.

Hydrology and Water Quality

Short- and long-term, minor adverse impacts to hydrology and water quality could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands in the project area. Short-term impacts could result from increased turbidity during dredging activities and placement of fill material. Areas where dredged material would be placed for wetland restoration would be isolated from surrounding waters by temporary containment levees with weir structures to minimize the discharge of turbid water. These impacts would be localized to the project area and would be temporary in nature. The fill material would eventually settle in the placement area, and turbidity due to project activities would no longer occur. Similar impacts due to turbidity at the borrow site would occur regardless of the implementation of the project, because maintenance dredging is a routine activity of USACE and is scheduled independently of the project. Long-term, minor adverse impacts to hydrology where tidal connectivity is modified per the project design may result from the placement of dredged materials onto existing substrate. Measures to control turbidity and sediment movement would be in place to ensure water quality standards are met and sensitive resources are not affected. These measures may include appropriate water control structures to decant water and the installation of silt fences or curtains, hay bales, filter-fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement.

It is anticipated that the project would provide long-term benefits from the restoration and levee protection of the marsh. The project would maintain hydrologic linkages within the broader coastal and nearshore ecosystem by facilitating the natural movement of water, sediments, energy, and nutrients among habitats.

Air Quality

Short-term, minor adverse impacts to air quality could occur due to project equipment used during construction and monitoring. Engine exhaust from barges, boats, excavators, and equipment would contribute to an increase in localized emissions. Best practices would be considered and applied where appropriate and practical to reduce the release of emissions. Best practices considered would include the deployment of energy-efficient machinery and equipment, and the incorporation of anti-idling procedures. Adverse impacts to air quality would be short-term, occurring only during active construction.

It is anticipated that the project would provide long-term benefits for air quality. Wetland and marsh soils are important sinks for carbon sequestration. Reconstruction of marsh habitat and revegetation of newly deposited sediments would capture carbon and provide enduring environmental benefits.

Noise

Short-term, minor adverse impacts to soundscapes could occur due to noise from construction activities. Heavy equipment can cause direct, localized, and minor adverse impacts due to noise. This impact would be short term and limited to the period of construction. Mitigation measures to reduce adverse impacts due to noise could include timing noise-producing activities to minimize disturbance to nesting

birds. All placement of dredged material would occur in the interior of the Jocelyn Nungaray NWR and would not be directly adjacent to residential areas.

A.3.1.2.2 Biological Resources

Habitats

Short-term, minor-to-moderate adverse impacts to habitats could occur including disturbance to wetland vegetation during construction.

It is anticipated that the project would provide long-term benefits to the local ecosystem. Mosaics of shallow open water and vegetated marsh have been shown to have higher ecologic function than either of these habitats in isolation (Whaley and Minello 2002). Therefore, the final design would ensure adequate shallow open water would remain in the project area to maintain the synergies between these two habitats.

Wildlife Species

Short-term, minor-to-moderate adverse impacts to wildlife species could occur due to project activities including levee construction, sediment deposition, and staging of equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important wildlife species. The creation of additional marsh habitat provides benefits for a number of marsh wildlife species and is anticipated to benefit the local ecosystem, enhancing the food web and supporting many ecologically and economically important wildlife species.

Marine and Estuarine Resources

Short-term, minor-to-moderate adverse impacts to marine and estuarine species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important marine and estuarine fauna. The creation of additional marsh habitat provides benefits for a number of marsh dependent marine and estuarine fauna and is anticipated to benefit the local ecosystem, enhancing the food web and supporting ecologically and economically important marine and estuarine fauna.

Protected Species

Environmental consequences for protected species are addressed as a summary of the impacts to each of the protected species described in the Affected Environment section including threatened or endangered species, EFH, marine mammals, bald and golden eagles, and migratory birds. Short- and long-term, minor adverse impacts to protected species, including displacement of land-based or aquatic fauna species, could occur as a result of staging equipment and materials. Long-term, minor adverse impacts could include conversion of one wetland vegetation type to another (e.g., saline vegetation to more freshwater vegetation), which could result in changes to the distribution of faunal communities. These impacts are expected to be confined to the immediate vicinity of the project, and best practices would be implemented to avoid and minimize adverse impacts.

Long-term benefits to EFH would occur from the improvement of habitat for commercially important prey species. The creation of additional estuarine marsh generates additional EFH that is anticipated to

benefit the local ecosystem by enhancing the food web and supporting many ecologically and economically important fish species. Many of the species that directly utilize coastal estuarine marshes as juveniles later migrate offshore, where they serve as prey for ecologically and economically important open-ocean species. Thus, these highly productive habitats support ecological connectivity both within the coastal ecosystem and between the coastal, nearshore, and open-ocean ecosystems through the movement of species that use wetlands during their life cycle to grow and reproduce.

Placement of BUDM to create estuarine emergent marsh would have a long-term beneficial effect on the habitat's ability to support eastern black rails. The proposed project aims to restore estuarine emergent marsh, which would protect and improve sensitive resources utilized by these species. In addition, the proposed project would improve water quality by trapping sediments and filtering nutrients prior to water entering nearby waterways used by sea turtles and West Indian manatees. Long-term effects of project restoration activities would be beneficial to the eastern black rail, as this is an estuarine marsh restoration project, which would ultimately protect and enhance suitable eastern black rail foraging and nesting habitat.

The project has been designed to meet the project design criteria (PDC) for marsh creation, maintenance, or enhancement as described in NMFS' *Framework Biological Opinion on Final PDARP/PEIS* (NMFS 2016). The programmatic consultation described therein implements a framework to streamline the ESA Section 7 consultation process for all DWH Natural Resource Damage Assessment restoration projects that fit within the scope of the programmatic analysis. The scope of the analysis is defined by PDC. NMFS's PDC consider where construction would occur, construction methodologies, best practices that would be implemented, and reporting requirements (NMFS 2016). Best practices included in NMFS' *Measures for Reducing the Entrapment Risk to Protected Species* (NMFS 2012) would be followed to avoid and minimize impact to protected sea turtle species. Additionally, either a hydraulic cutter-head dredge or clamshell dredge would be used to place sediments into the project site because these methods do not pose a risk to pelagic aquatic organisms, such as sea turtles. A hydraulic dredge pipeline would transport material to the placement area. The dredge pipeline would be routed to avoid disturbance to sensitive resource areas if identified along the pipeline route. Any areas containing such resources in the construction area and pipeline route would be protected using best practices such as hay bales, silt fences, or other appropriate methods.

Efforts would be made to avoid construction activities during the nesting season for protected migratory birds (February 15 through July 31). However, if construction activities occur during the nesting season, the area affected by project activities would be surveyed for the presence of nesting birds by a qualified biologist. If nesting birds are present or indications of pre-nesting behavior are observed, appropriate best practices would be employed to ensure that no incidental take of any individuals occurs. Best practices may include signage, exclusion zones for workers and equipment, hazing, and/or deterrents. Best practice activities would be coordinated with USFWS and Texas Parks and Wildlife Department (TPWD) biologists.

A.3.1.2.3 Socioeconomic Resources

Socioeconomics

No adverse short- or long-term impacts to socioeconomics are anticipated.

This restoration project would help restore an environment that benefits all citizens, populations, and groups in the region. The project would have a positive, beneficial socioeconomic impact on surrounding

communities. No residential communities are located adjacent to the project. As a result, there would be no potential for short-term impacts from construction.

Cultural Resources

No adverse short- or long-term impacts to cultural resources are anticipated.

For each project selected for implementation under this RP/EA #3, a comprehensive review under Section 106 of the NHPA would be completed before the implementation of any regulated project activities to develop practices that minimize or mitigate adverse effects on historic properties within the project area. The project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. If culturally or historically important resources are identified during project preparations or pre-deployment surveys, consultation would be re-initiated.

Infrastructure

No adverse short-term or long-term impacts to infrastructure are anticipated.

The project is not anticipated to affect energy production, transport, or infrastructure. The project is anticipated to have no impact to infrastructure because new infrastructure would not be built, and existing infrastructure in the area would be avoided to the extent practicable. Final E&D would include measures to avoid, as much as practicable, known oil and gas pipelines in the project area.

Land and Marine Management

No adverse short-term or long-term impacts to land and marine management are anticipated.

The proposed action is anticipated to have no impact to land and marine management because the project would be consistent with the prevailing management, practices, plans, and direction governing the use of the areas where restoration actions would take place. The USFWS's *Comprehensive Conservation Plan, and Draft Land Protection Plan for Texas Chenier Plain NWR Complex* (USFWS 2008), which includes management of the Jocelyn Nungaray NWR evaluates expansion of the NWR by up to 60,000 acres to achieve conservation of coastal wetlands and preservation of wildlife as part of land and marine management. The purpose in developing the conservation plan is to provide refuge managers with a 15-year strategy for achieving refuge purposes and contributing toward the mission of the NWR System, consistent with sound principles of fish and wildlife science, conservation, legal mandates, and service policies. Habitat restoration efforts in this area would contribute to furthering that Plan.

Tourism and Recreational Use

Short-term, minor adverse impacts to tourism and recreational use could occur due to limits on recreational activities near the construction area to protect public safety and temporary increases in road traffic due to movement of construction vehicles.

It is anticipated that the project would provide long-term benefits to recreationalists through enhanced experiences for wildlife viewing, kayaking, canoeing, fishing, and other activities. The marsh habitat in the NWR is a foundation for many recreational activities. Long-term benefits would come from restoring the nursery habitat of many recreationally important fish species, which would benefit recreational fishing in the area. Benefits to the local economy could accrue through an increase in employment and associated spending during construction and increased expenditures due to increased recreational visitation following completion of the restoration project.

Fisheries and Aquaculture

Short-term, minor adverse impacts to fisheries could occur due to construction activities such as dredging, addition of sediments or borrow materials, and removal of sediments.

It is anticipated that the project would provide long-term benefits through increased fishing opportunities (both commercial and recreational) from restoring coastal habitats that benefit fish. Long-term benefits would arise from the improvement of habitat for commercially important brown and white shrimp fisheries and the recreational red drum fishery. To the extent that these increased recreational opportunities result in increased visitation, local businesses may benefit from visitors' increased expenditures.

Land and Marine Transportation

No short- or long-term adverse impacts to land and marine transportation are anticipated.

Transportation routes would be identified prior to the beneficial use operations to prevent any impacts to marine transportation. It is expected that activities would not significantly interrupt the channel traffic. Most of the commercial traffic takes place on a routine schedule, and construction activities would be timed to reduce interference with commercial operators. The dredged material pipeline route would be clearly marked to avoid vessel strikes.

Aesthetics and Visual Resources

Short-term, minor-to-moderate adverse impacts to aesthetics and visual resources could occur due to the presence of construction equipment, sediment containment levees, or other changes to the surrounding environment. These impacts would be minor in nature and limited to the construction period.

It is anticipated that the project would provide long-term benefits to the area's aesthetics and visual resources. The creation of marsh habitat and planting of vegetation would improve the overall viewscape of the project area. In addition, the new habitat is anticipated to attract additional birds and wildlife, which could be enjoyed by recreational users of the area.

Public Health and Safety

No adverse short- or long-term impacts to public health and safety are anticipated.

Due to the location and nature of the project area, no adverse impacts to public health and safety are anticipated as a result of this project. All occupational and marine safety regulations and laws would be followed to ensure the safety of all workers and monitors. The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. Best practices in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport, and disposal of all hazardous substances. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. Due to the potential increase in small boat traffic

(construction related) in the area, appropriate safety measures would be employed to ensure water related accidents and conflicts are minimized.

A.3.2 Goose Island Wetland Restoration

The project area is within Aransas Bay on or adjacent to Goose Island State Park. Dredged material would provide fill for two containment cells constructed at the site of an earlier marsh restoration project on Goose Island, as well as two new cells on the northern side of the existing cells. The containment levees would be constructed and rehabilitated using on-site sediments.

The predominant wetland habitats near the project site are characterized as salt marsh, seagrasses, and estuarine open water. The combination of rising sea levels, erosion, subsidence, and reduced sediment supplies has resulted in loss of wetlands and other coastal habitats on Goose Island. This project is consistent with regional efforts to counteract land and habitat loss through estuarine marsh restoration.

The overarching goal for this project is to restore and conserve wetlands and coastal habitats by beneficially using dredged material to create a viable, vegetated wetland habitat for fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage.

The primary objective of this project is to return current shallow open water habitat within the project site to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 195,000 cy of suitable hydraulically dredged material within containment levees. As part of the project, existing levees would be rehabilitated and additional levees constructed. Sediment would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 40 acres of marsh habitat, including the conversion of approximately 34 acres of existing open water to intertidal and high marsh habitat (Figure A-3).

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the GIWW, private dredging sources, and material mined from dredged material placement areas. The specific sources of dredged material would be determined during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source. The impact analysis for this alternative is based in the analyses presented in the *Aquatic Ecosystem Restoration for Gulf Intracoastal Waterway – Beneficial Use of Dredged Material, Aransas County, Texas, Detailed Project Report and Environmental Assessment* (USACE 2024a). Resources of the affected environment are described in Section A.3.2.1; project-level environmental consequences are summarized in Table A-5 and described in Section A.3.2.2.

This section presents the affected resources of the *Goose Island Wetland Restoration* project and the environmental consequences of the proposed actions in context of the project-specific affected environment.

Throughout the USACE project E&D process, every practical attempt would be made to avoid or minimize potentially adverse environmental and cultural resource impacts. The following descriptions for each of the construction elements are preliminary and based on current planning efforts and resource agency experience with similar marsh restoration projects. Although the Texas TIG does not consider it likely, it is possible that the 100% E&D process could generate a plan that has adverse environmental impacts that are different in type or magnitude from those discussed in this document. If

that is the case, the Texas TIG would consider whether further environmental impacts analysis would be necessary.

The impacts from the project are anticipated to be largely beneficial and the adverse impacts would generally be short-term and minor (Table A-5). Benefits to the biological, physical, human uses, and socioeconomics environment would result if the project was implemented. Best practices required in the permit, consultations, or environmental analyses would be followed. Additionally, best practices described in Appendix 6.A of the Final PDARP/PEIS would be considered and applied where appropriate to reduce or eliminate adverse impacts to the environment.



Figure A-3 Location of Proposed Restoration Areas for the *Goose Island Wetland Restoration* Project

Table A-4 Summary of Adverse and Beneficial Impacts from Implementation of the *Goose Island Wetland Restoration* Project

Resource Category	Resource Subcategories	Benefits	Adverse Short Term	Adverse Long Term
Physical Resources	Geology and substrates	Yes	Minor	Minor
	Hydrology and water quality	Yes	Minor	Minor
	Air quality	Yes	Minor	NE
	Noise	NE	Minor	NE
Biological Resources	Habitats	Yes	Minor to moderate	NE
	Wildlife species	Yes	Minor to moderate	NE
	Marine and estuarine resources	Yes	Minor to moderate	NE
	Protected species	Yes	Minor	Minor
Socioeconomic Resources	Socioeconomics	Yes	NE	NE
	Cultural resources	NE	NE	NE
	Infrastructure	NE	NE	NE
	Land and marine management	NE	NE	NE
	Tourism and recreational use	Yes	Minor	NE
	Fisheries and aquaculture	Yes	Minor	NE
	Land and marine transportation	NE	NE	NE
	Aesthetics and visual resources	Yes	Minor to moderate	NE
	Public health and safety	NE	NE	NE

Notes:
Adverse short-term and long-term effects are designated as minor, moderate, or major.
NE: no effect
Yes: would provide benefits

A.3.2.1 Affected Environment

A.3.2.1.1 Physical Resources

Geology and Substrates

The coastline in and near the project area is the coastal belt of the Texas Coastal Plain, extending from Galveston Bay to Nueces Bay underlain by sedimentary strata of the Mesozoic and Cenozoic Eras. The coastal belt is a gently sloping area bordering the Gulf underlain by the Beaumont clays and the Lissie Formation, both of Pleistocene age. Geophysical data suggest that the strata within these two formations represent multiple episodes of deposition, erosion, and soil formation (Paine et al. 2018). The fluctuating advance and recession of glaciers during the Pleistocene era caused large changes in sea

level and created rivers and valleys. During the Holocene Era, as sea level rose to its current level, the river valleys were flooded, and sediments were dispersed from deltaic headlands. The drowned river valleys became the current bays and estuaries of the Texas coast. The shorelines of Aransas and adjacent Copano Bays are in a state of erosion. The erosion is caused by relative sea level rise and a lack of new sediment entering the system (Evans et al. 2012 as cited in USACE 2024a).

The most common sediment type in the Mission-Aransas Estuary is mud, which is comprised of silt and clay. Aransas Bay has a higher proportion of clay. Copano Bay also has areas where the sediments have as high as 75% shell material occurring near oyster reefs. There is a high percentage of sand in the margins of Copano and Aransas Bays (White et al. 1983 as cited in Evans et al. 2012).

The BUDM restoration technique emulates riverine deltaic and other coastal sediment processes that have been interrupted by human alterations to the land and seascape. Emulating these natural accretion processes is a useful restoration tool to restore valuable coastal habitats where the rate of relative sea level rise exceeds accretion.

Hydrology and Water Quality

The Mission and Aransas Rivers flow into Copano Bay and provide the main freshwater inflows for Copano and Aransas Bays (Evans et al. 2012). Aransas Bay borders San Jose Island with Aransas Pass providing the tidal outlet to the Gulf. The bays experience large ranges in salinity because of drought, low freshwater inflows, tidal fluctuations, and high evaporation rates.

The *Goose Island Wetland Restoration* project area is within the Aransas Bay watershed (Hydrologic Unit Code 121004050400) and within Reservoir Segment 2472 Copano Bay/Port Bay/Mission Bay. There are no water quality concerns or impairments on the waterbody, except a concern for chlorophyll-*a* in Assessment Unit 03, according to the 2022 Texas Integrated Report. Copano Bay/Port Bay/Mission Bay carries a primary contact recreation designation in the 2018 Texas Surface Water Quality Standards (30 TAC Section 307.10(1), Appendix A).

Air Quality

The project area is located in the Corpus Christi Air Quality Control Region (Region 14). The Region is in attainment for 8-hour ozone and in compliance with the NAAQS for all other criteria pollutants (TCEQ 2021b).

Electricity production, vehicular movements, and commercial and residential buildings using electricity generate criteria air pollutants. The project's impacts on air quality are considered.

Noise

The project is located between Aransas and St. Charles Bays, close to Copano Bay. The surrounding area is residential and agricultural. Recreational fishing and boating are popular around the site. Due to its location, the project area experiences ambient noise from marine transportation and recreational traffic.

A.3.2.1.2 Biological Resources

Wetland habitats on the Texas coast provide important wintering and migration stopover habitat for migratory birds, including Central Flyway waterfowl, shorebirds, wading birds, and marsh and waterbirds. The Aransas Bay estuary is a vital habitat for fish and shellfish species found in the Gulf. The

biological resources discussion is divided into habitats, wildlife species, marine and estuarine resources, and protected species.

Habitats

The Goose Island project site contains primarily tidal salt marshes and mudflats with small patches of seagrass beds and oyster reefs (NOAA 2006). The project site consists primarily of shallow open water with some small pockets of marsh and some deeper cuts and channels.

Wildlife Species

Saline marshes and shallow open water are the primary habitats within the project area. These habitats are critical for many species of plants, fish, birds, and other wildlife. Bird species, such as snowy egrets (*Egretta thula*), great egrets (*Ardea alba*), roseate spoonbills (*Platalea ajaja*), yellow-crowned night herons (*Nyctanassa violacea*), black-crowned night herons (*Nycticorax nycticorax*), and great blue herons (*Ardea herodias*) use marsh as feeding habitat. The area also supports a large waterfowl population in the winter and a variety of year-round bird species. Wading birds and shorebirds utilize the mudflats and shallow marsh ponds located throughout the area. Wintering waterfowl include gadwall, northern pintail, lesser scaup, American widgeon, and blue-winged teal. Other birds such as clapper rail, seaside sparrows and other secretive marsh species use the marsh as well.

Marine and Estuarine Resources

Saline marshes and shallow open water are the primary habitats within the project area. The wetland edge is a particularly important habitat for white and brown shrimp (Whaley and Minello 2002). Other marsh-dwelling species include blue crab, red drum, spotted seatrout, Atlantic croaker, southern flounder, and Gulf menhaden. Wetlands serve as nurseries to hundreds of noncommercial species that comprise a large part of the estuarine food web. Invertebrates such as blue crab and brown and white shrimp are common in the region.

Protected Species

Threatened or Endangered Species

The threatened or endangered species that could potentially be affected are listed in Table A-6 (USFWS 2024).

Table A-5 Federal Threatened and Endangered Species Potentially Affected in the *Goose Island Wetland Restoration* Project Area

Common Name	Status
Piping plover	Threatened
Red knot	Threatened
Eastern black rail	Threatened
Whooping crane	Endangered
West Indian manatee	Threatened
Loggerhead sea turtle	Threatened
Green sea turtle	Threatened

Common Name	Status
Hawksbill sea turtle	Endangered
Leatherback sea turtle	Endangered
Kemp's ridley sea turtle	Endangered

The last wild flock of whooping cranes (*Grus americana*) winter on the Texas coast in and around the Aransas NWR. Whooping cranes feed on blue crabs, so the integrity of the blue crab population is vital to maintaining the health of the population. The construction activities for this project are unlikely to affect whooping cranes, which usually inhabit an area east of the project site.

The eastern black rail can be present anywhere suitable habitat is present along the Texas coast. Suitable habitat consists of high estuarine marsh and palustrine wet prairies containing dense perennial herbaceous wetland vegetation and proximity to shallow standing water (typically ≤3 centimeters [cm]) that may be ephemeral. No critical habitat has been designated for this species. Eastern black rails occur across an elevational gradient that lies between lower and wetter portions of the marsh and their adjacent uplands. These habitat gradients have gentle slopes so wetlands can have large areas of shallow inundation (sheet water). Eastern black rails also require adjacent higher elevation areas (i.e., the wetland-upland transition zone) with dense cover to survive high water events. The dense vegetative cover allows movement underneath the canopy to avoid predators. The dense plant structure is more important than plant species composition in predicting habitat suitability. This marsh restoration provided by this project would have long-term beneficial impacts on eastern black rail habitat.

The red knot and piping plover are winter residents on the Texas coast and in Aransas County. Both species are known to use the shoreline of bays and mudflats. There is no critical habitat for red knot or piping plover in the project area.

The West Indian manatee has been found in Texas estuaries on rare occasions.

Loggerhead, green, hawksbill, leatherback, and Kemp's ridley sea turtles may be present in the project area.

EFH

Of the fish species considered by NMFS to potentially occur within the project area, EFH for these species consists of tidally influenced waters and tidally influenced marsh. Table A-7 provides a list of managed EFH species in the *Goose Island Wetland Restoration* project area, habitat preference, and life stage when they may be expected to occur (NMFS 2021).

Table A-6 EFH for Estuarine Habitats Within the *Goose Island Wetland Restoration* Project Area

Name	Larvae/ Eggs	Post-Larvae	Juvenile	Subadult	Adult	Habitat Type
Brown shrimp	X					Water column associated
Brown shrimp			X			Emergent marsh, soft bottom
Brown shrimp				X		Soft bottom

Name	Larvae/ Eggs	Post-Larvae	Juvenile	Subadult	Adult	Habitat Type
Pink shrimp			X	X		Soft bottom
White shrimp		X				Water column associated
White shrimp			X			Emergent marsh, soft bottom
White shrimp				X	X	Soft bottom
Red drum	X					Water column associated, soft bottom (larvae)
Red drum		X				Emergent marsh, soft bottom
Red drum			X			Emergent marsh (late juvenile), soft bottom
Red drum					X	Emergent marsh, soft bottom
Spanish mackerel			X		X	Estuarine, water column associated
Gray snapper					X	Soft bottom, emergent marsh
Cobia	X					Water column associated
Lane snapper	X	X				Water column associated
Lane snapper			X			Soft bottom

Marine Mammals

The only marine mammal regularly found in Aransas Bay is the bottlenose dolphin. There are infrequent sightings of the West Indian manatee in Texas estuaries.

Bald and Golden Eagles

Bald eagles potentially forage within the project area, and golden eagles may occasionally migrate through the project area.

Migratory Birds

Many species of birds spend all or a portion of their life cycle along the Gulf using a variety of habitats at different stages. Major groups of birds that inhabit the northern Gulf include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh-dwelling birds, and passerines. It is possible that birds protected under the MBTA and Texas Parks and Wildlife Code may nest in the project area.

A.3.2.1.3 Socioeconomic Resources

Socioeconomics

Aransas County has a total population of 25,374, an increase of 6.5% since 2020, based on the 2023 U.S. Census population estimates. Median household income (2018 to 2022) in Aransas County is $58,168 (USCB 2024b).

Cultural Resources

Coordination under Section 106 of the NHPA will be initiated for the project. A preliminary analysis of the THC Atlas database indicated that no known historic sites or significant cultural, scientific, or historic resources exist within the boundaries of the project area (THC 2024).

Infrastructure

According to the RRC GIS viewer (RRC 2020), there are no identified pipelines or wells located in the immediate vicinity of the Goose Island Wetland Restoration project area. Additionally, the GLO Texas Sediment Geodatabase GIS viewer shows no buried natural gas and crude oil pipelines running under the site (GLO 2017). Further delineation of pipeline easements and restrictions may be developed during the final design stage of the site before construction.

Land and Marine Management

The project area is located within Aransas Bay on or adjacent to Goose Island State Park. The site is undeveloped with no vehicular access. A GLO Coastal Surface Lease would be acquired prior to project initiation to allow for construction activities.

Tourism and Recreational Use

The project area offers recreational opportunities for the public, including fishing and wildlife viewing. Recreational fishing in the area focuses on spotted seatrout, red drum, southern flounder, and other species.

Fisheries and Aquaculture

This area is an important nursery for marine and estuarine fishery species, including several that are important to the local economy. Recreational fishing in the area focuses on spotted seatrout, red drum, southern flounder, and other species. Commercially valuable species include brown shrimp, white shrimp, blue crab, black drum, and Gulf menhaden.

Land and Marine Transportation

The project area is adjacent to residential and agricultural land transportation routes. There is a road from the mainland to the island that parallels the bayside shoreline. The road does not extend to the project area. The site is 5 miles from the GIWW. There are shallow draft channels in close proximity to the site that are used to access the residences north of the site.

Aesthetics and Visual Resources

The landscape in the vicinity of the proposed wetland restoration is characterized by open water. There are no designated protected viewsheds in the vicinity of the project. Equipment and construction activities related to the restoration actions would be visible.

Public Health and Safety

The recreational users of Goose Island are accustomed to navigating around the marsh via the existing channels and avoiding shallow areas and areas that contain obstructions.

A.3.2.2 Environmental Consequences

This section analyzes the Environmental Consequences of the project to the Affected Environment including physical resources, biological resources, and socioeconomic resources.

A.3.2.2.1 Physical Resources

Geology and Substrates

Short- and long-term, minor adverse impacts to geology and substrates could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands at the project area. Impacts from construction activities, use of heavy equipment, and trenching for sediment transport can cause direct localized and short-term, minor adverse impacts from sediment disturbance and compaction. Long-term, minor adverse impacts on the physical environment could occur from the placement of dredged material, which may affect sediment dynamics. Mitigation measures to minimize adverse impacts to geology and substrates could include employment of standard best practices for construction to reduce loss of sediments.

It is anticipated that the project would provide long-term benefits to geology and substrate in the project area by restoring historical marsh habitat. The *Goose Island Wetland Restoration* project would benefit wetlands and other shoreline habitats by raising substrate elevations affected by subsidence, erosion, and sea level rise and re-establishing natural hydrology needed to restore the function of coastal wetland communities. This approach helps stabilize substrates, which increases the longevity of coastal wetlands to sea level rise and reduces coastal erosion.

Hydrology and Water Quality

Short- and long-term, minor adverse impacts to hydrology and water quality could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands at the project area. Short-term impacts could result from increased turbidity during dredging activities and placement of fill material. Areas where dredged material would be placed for wetland restoration would be isolated from surrounding waters by temporary containment levees with weir structures to minimize the discharge of turbid water. These impacts would be localized to the project area and would be temporary in nature. The fill material would eventually settle in the placement area, and turbidity due to project activities would no longer occur. Similar impacts due to turbidity at the borrow site would occur regardless of the implementation of the project, because maintenance dredging is a routine activity of USACE and is scheduled independently of the project. Long-term, minor adverse impacts may occur to the existing substrate due to placement of dredged materials. This may have long-term, minor adverse impacts to hydrology where tidal connectivity is modified per the project design. Measures to control turbidity and sediment movement would be in place to ensure water quality standards are met and sensitive resources are not affected. These measures may include appropriate water control structures to decant water and the installation of silt fences or curtains, hay bales, filter-fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement.

It is anticipated that the project would provide long-term benefits from the restoration and levee protection of the marsh. The project would maintain hydrologic linkages within the broader coastal and

nearshore ecosystem by facilitating the natural movement of water, sediments, energy, and nutrients among habitats.

Air Quality

Short-term, minor adverse impacts to air quality could occur due to vehicle emissions from equipment used during construction and monitoring. Engine exhaust from barges, boats, excavators, and equipment would contribute to an increase in localized emissions. Best practices would be considered and applied, where appropriate and practical, to reduce the release of emissions. Best practices considered could include the deployment of energy-efficient machinery and equipment, the incorporation of anti-idling procedures, and/or the use of gasoline rather than diesel. Adverse impacts to air quality would be short-term, occurring only during active construction.

It is anticipated that the project would provide long-term benefits for air quality. Wetland and marsh soils are important sinks for carbon sequestration. Reconstruction of marsh habitat and revegetation of newly deposited sediments would capture carbon and provide enduring environmental benefits.

Noise

Short-term, minor adverse impacts to soundscapes could occur due to noise from construction activities. Heavy equipment can cause short-term, minor adverse impacts due to noise. This impact would be limited to the period of construction. Mitigation measures to reduce adverse impacts due to noise could include timing noise-producing activities to minimize disturbance to nesting birds. To prevent disturbance to nearby residential communities, construction activities that produce significant noise would be limited to daylight hours.

A.3.2.2.2 Biological Resources

Habitats

Short-term, minor-to-moderate adverse impacts to habitats could occur due to disturbance to wetland vegetation during construction.

It is anticipated that the project would provide long-term benefits to the local ecosystem. Mosaics of shallow open water and vegetated marsh have been shown to have higher ecologic function than either of these habitats in isolation (Whaley and Minello 2002). Therefore, the final design would ensure adequate shallow open water would remain in the project area to maintain the synergies between these two habitats.

Wildlife Species

Short-term, minor-to-moderate adverse impacts to wildlife species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important wildlife species. The creation of additional marsh habitat benefits a number of marsh wildlife and is anticipated to benefit the local ecosystem, enhancing the food web and supporting many ecologically and economically important wildlife species.

Marine and Estuarine Resources

Short-term, minor-to-moderate adverse impacts to marine and estuarine species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important marine and estuarine fauna. The creation of additional marsh habitat provides benefits for a number of marsh dependent marine and estuarine fauna and is anticipated to benefit the local ecosystem, enhancing the food web, and supporting ecologically and economically important marine and estuarine fauna.

Protected Species

There would be short- and long-term, minor adverse impacts to protected species. Impacts to wildlife would be avoided or minimized via management guidelines and techniques as appropriate. Best practices, including the *Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS 2006) and *Measures for Reducing Entrapment Risk to Protected Species* (NMFS 2012), would be followed during levee construction to avoid entrapping marine mammals and other resources.

During construction, there would be short-term, minor adverse impacts to EFH through dredged material deposition and increased turbidity. Long-term, minor adverse impacts could include conversion of one wetland vegetation type to another with changes in the distribution of fauna communities. These impacts are expected to be confined to the immediate vicinity of the project, and best practices would likely be implemented to minimize adverse impacts.

Long-term benefits to EFH would occur from the improvement of habitat for commercially important prey species. The creation of additional estuarine marsh generates additional EFH that is anticipated to benefit the local ecosystem by enhancing the food web and supporting many ecologically and economically important fish species. Many of the species that directly utilize coastal estuarine marshes as juveniles later migrate offshore, where they serve as prey for ecologically and economically important open-ocean species. Thus, these highly productive habitats support ecological connectivity both within the coastal ecosystem and between the coastal, nearshore, and open-ocean ecosystems through the movement of species that use wetlands during their life cycle to grow and reproduce.

Placement of BUDM to create estuarine emergent marsh would have a long-term beneficial effect on the habitat's ability to support sea turtles, West Indian manatees, and eastern black rails. The proposed project aims to restore estuarine emergent marsh, which would protect and improve sensitive resources utilized by these species. In addition, the proposed project would improve water quality by reducing sedimentation from subsidence and coastal erosion into the GIWW and shallow bay systems utilized by sea turtles and West Indian manatees. Long-term effects of project construction activities would be beneficial for the eastern black rail, as this is an estuarine marsh restoration project, which would ultimately protect and enhance thousands of acres of suitable eastern black rail foraging and nesting habitat.

The project has been designed to meet the marsh creation, maintenance, or enhancement PDC described in NMFS' *Framework Biological Opinion on PDARP/PEIS* (NMFS 2016), which considers where construction would occur, construction methodologies, best practices that would be implemented, and reporting requirements. Best practices included in NMFS' *Measures for Reducing the Entrapment Risk to Protected Species* (NMFS 2012) would be followed to avoid and minimize impacts to protected sea turtle species. Additionally, either a hydraulic cutter-head dredge or clamshell dredge would be used to place

sediments into the project site because these do not pose a risk to pelagic aquatic organisms, such as sea turtles. A hydraulic dredge pipeline would transport material to the placement area. The dredge pipeline would be routed to avoid disturbance to sensitive resource areas if identified along the pipeline route. Any areas containing such resources in the construction area and pipeline route would be protected using best practices such as placement of hay bales, silt fences, or other appropriate methods.

Efforts would be made to avoid construction activities during the nesting season for protected migratory birds (February 15 through July 31). However, if construction activities occur during the nesting season, the area affected by project activities would be surveyed for the presence of nesting birds by a qualified biologist. If nesting birds are present or indications of pre-nesting behavior are observed, appropriate best practices would be employed to ensure that no incidental take of any individuals occurs. Best practices may include use of signage, exclusion zones for workers and equipment, hazing, and deterrents. Best practice activities would be coordinated with USFWS and TPWD biologists.

A.3.2.2.3 Socioeconomic Resources

Socioeconomics

No adverse short- or long-term impacts to socioeconomics are anticipated.

This restoration project would help restore an environment that benefits all citizens, populations, and groups in the region. The project would have a positive, beneficial socioeconomic impact on surrounding communities. Best practices would be implemented during construction to avoid short-term impacts to nearby residential communities.

Cultural Resources

No adverse short- or long-term impacts to cultural resources are anticipated.

A complete review of the project under Section 106 of the NHPA would be completed prior to the implementation of regulated project activities to develop practices that would avoid, minimize, or mitigate any adverse effects on historic properties located within the project area. The project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. If culturally or historically important resources are identified during project preparations or pre-deployment surveys, consultation would be re-initiated.

Infrastructure

No adverse short-term or long-term impacts to infrastructure are anticipated.

The project is not anticipated to affect energy production, transport, or infrastructure because new infrastructure would not be built, and existing infrastructure in the area would be avoided to the extent practicable. Final E&D would include measures to avoid, as much as practicable, known oil and gas pipelines in the project area.

Land and Marine Management

No adverse short-term or long-term impacts to land and marine management are anticipated.

The proposed action is anticipated to have no impact to land and marine management because the project would be consistent with the prevailing management, practices, plans, and direction governing the use of the areas where restoration actions would take place.

Tourism and Recreational Use

Short-term, minor, adverse impacts to tourism and recreational use could occur due to limits on recreational activities near the construction area to protect public safety and temporary increases in road traffic due to movement of construction vehicles.

It is anticipated that the project would provide long-term benefits to recreationists through enhanced experiences for wildlife viewing, kayaking, canoeing, fishing, and other activities. Long-term benefits would result from restoring the nursery habitat of many recreationally important fish species, which would benefit recreational fishing in the area. Benefits to the local economy could accrue through an increase in employment and associated spending during construction and increased expenditures due to increased recreational visitation following completion of the restoration project.

Fisheries and Aquaculture

Short-term, minor adverse impacts to fisheries could occur due to construction activities such as dredging, addition of sediments or borrow materials, and removal of sediments.

It is anticipated that the project would provide long-term benefits to the public through increased fishing opportunities (both commercial and recreational) by restoring coastal habitats that benefit fish. Long-term benefits would arise from the improvement of habitat for commercially important brown and white shrimp fisheries and the recreational red drum fishery. To the extent that these increased recreational opportunities result in increased visitation, local businesses may benefit from visitors' increased expenditures.

Land and Marine Transportation

No short- or long-term adverse impacts to land and marine transportation are anticipated.

Since there is minimal access to the site, there would be no impact to land-based traffic. Boating routes would be identified prior to the beneficial use operations to prevent any impacts to marine transportation. It is expected that activities would not significantly interrupt the channel traffic. Most of the commercial traffic takes place on a routine schedule, and construction activities would be timed to reduce interference with commercial operators. The dredged material pipeline route would be clearly marked to avoid vessel strikes.

Aesthetics and Visual Resources

Short-term, minor-to-moderate adverse impacts to aesthetics and visual resources could occur due to the presence of construction equipment and the barren, muddy appearance during the revegetation period.

It is anticipated that the project would provide long-term benefits to the area's aesthetics and visual resources. The creation of marsh habitat and planting of vegetation would improve the overall viewscape of the project area. In addition, the new habitat is anticipated to attract additional birds and wildlife, which could be enjoyed by recreational users of the area.

Public Health and Safety

No adverse short- or long-term impacts to public health and safety are anticipated.

Due to the location and nature of the project area, no adverse impacts to public health and safety are anticipated as a result of this project. All occupational and marine safety regulations and laws would be

followed to ensure safety of all workers and monitors. The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. Best practices in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport, and disposal of all hazardous substances. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. Due to the potential increase in small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure water related accidents and conflicts are minimized.

A.3.3 Guadalupe River Old Delta Wetland Restoration

The project site is at the northern portion of San Antonio Bay, on a peninsula between Hynes Bay to the west and Guadalupe Bay to the east. Dredged material would provide fill for four dredge placement cells, using containment levees built from material collected on site to restore up to 1,140 acres of intertidal marsh in degraded portions of the delta.

Over the past several decades, the vegetated marsh of the site has deteriorated through erosion of portions of the marshes encompassing the site, as well as the expansion of interior open water areas. This change is particularly noticeable along the southern boundary of the delta where it is exposed to San Antonio Bay.

The predominant wetland habitat in the *Guadalupe River Old Delta* project site is characterized as a mosaic of brackish marsh and estuarine open water. The combination of rising sea levels, erosion, storm impacts, and reduced sediment supplies has resulted in significant loss of wetlands and other coastal habitats in the project area. This project is consistent with regional efforts to counteract land and habitat loss through hydrology enhancements and estuarine marsh restoration.

The overarching goal of the project is to restore and conserve wetlands and coastal habitats by beneficially using dredged material to create a viable, vegetated, wetland habitat for fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage. The primary objective of this project is to return current submerged open water in the project site to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 1.91 million cy of suitable hydraulically dredged material within levees constructed from on-site sediments. Dredge material would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 1,140 acres of marsh habitat, including the conversion of up to 480 acres of existing open water to intertidal marsh (Figure A-4).

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the Victoria Barge Canal (VBC), private dredging sources, and material mined from dredged material placement areas. The specific sources of dredged material would be determined during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source. Resources

of the affected environment are described in Section A.3.3.1; project-level environmental consequences are summarized in Table A-8 and described in Section A.3.3.2.

This section presents the affected resources of the *Guadalupe River Old Delta Wetland Restoration* project and the environmental consequences of the proposed actions in context of the project-specific affected environment.



Figure A-4 Location of Proposed Restoration Areas for the *Guadalupe River Old Delta Wetland Restoration* Project

Table A-7 Summary of Adverse and Beneficial Impacts from Implementation of the *Guadalupe River Old Delta Wetland Restoration* Project

Resource Categories	Resource Subcategories	Benefits	Adverse Short Term	Adverse Long Term
Physical Resources	Geology and substrates	Yes	Minor	Minor
	Hydrology and water quality	Yes	Minor	Minor
	Air quality	Yes	Minor	NE
	Noise	NE	Minor	NE
Biological Resources	Habitats	Yes	Minor to moderate	NE
	Wildlife species	Yes	Minor to moderate	NE
	Marine and estuarine resources	Yes	Minor to moderate	NE
	Protected species	Yes	Minor	Minor
Socioeconomic Resources	Socioeconomics	Yes	NE	NE
	Cultural resources	NE	NE	NE
	Infrastructure	NE	NE	NE
	Land and marine management	NE	NE	NE
	Tourism and recreational use	Yes	Minor	NE
	Fisheries and aquaculture	Yes	Minor	NE
	Land and marine transportation	NE	NE	NE
	Aesthetics and visual resources	Yes	Minor to moderate	NE
	Public health and safety	NE	NE	NE

Notes:
Adverse short-term and long-term effects are designated as minor, moderate, or major.
NE: no effect
Yes: would provide benefits

The description and analysis of the project are based on the 60% basis of design concepts developed under the *Texas Dredged Material Planning for Wetland Restoration* project authorized in RP/EA #1. Throughout the completion of the 100% designs under this process, every practical attempt would be made to avoid or minimize potentially adverse environmental and cultural resource impacts. The following descriptions for each of the construction elements are preliminary and based on current planning efforts and resource agency experience with similar marsh restoration projects. Although the Texas TIG does not consider it likely, it is possible that the 100% E&D process could generate a plan that has adverse environmental impacts that are different in type or magnitude from those discussed in this document. If that is the case, the Texas TIG would consider whether further environmental impacts analysis would be necessary.

The impacts from the project are anticipated to be largely beneficial, and the adverse impacts would generally be short-term and minor to moderate (Table A-8). Benefits to the biological, physical, human uses, and socioeconomics environment would result if the project was implemented. Best practices

required in the permit, consultations, or environmental analyses would be followed. Additionally, best practices described in Appendix 6.A of the Final PDARP/PEIS would be considered and applied where appropriate to reduce or eliminate adverse impacts to the environment.

A.3.3.1 Affected Environment

A.3.3.1.1 Physical Resources

Geology and Substrates

The project area is located in the Texas coastal plain, which is underlain by a complex assemblage of fluvial, deltaic, estuarine, and marine-influenced deposits that make up two Pleistocene formations: the younger Beaumont Formation and the older Lissie Formation. Geophysical data suggest that the strata within these two formations represent multiple episodes of deposition, erosion, and soil formation (Paine et al. 2018). Surface geology is of the late Pleistocene Beaumont Formation and younger deposits. The Beaumont Formation was deposited as a large alluvial plain, after which sea levels fell during a period of glacial advance. A period of erosion then followed, with incision of stream channels. At the end of the last glacial period, as sea levels rose again, the area was flooded, and a series of estuaries and bays formed. The soils currently feature river floodplain muds and fluvial-deltaic sands (Thomas and Durkin 2012).

The BUDM restoration technique emulates riverine deltaic and other coastal sediment processes that have been interrupted by human alterations to the land and seascape. Emulating these natural accretion processes is a useful restoration tool to restore valuable coastal habitats where the rate of relative sea level rise exceeds accretion.

Hydrology and Water Quality

The Guadalupe River, the San Antonio River, and their associated watersheds provide freshwater inflows to the San Antonio Bay system. The Guadalupe Delta formed as a result of the San Antonio and Guadalupe Rivers depositing sediments at the mouth of the Guadalupe River where it enters San Antonio Bay. Historically, the delta gradually enclosed an open-bay area, forming what is now Green Lake, and more recently, the delta is in the process of filling in and around Mission Lake. Traylor's Cut on the Guadalupe River was excavated in 1935 and effectively diverts water and sediment under normal and high flows into Mission Lake and Guadalupe Bay. Under overbank conditions, water and sediment flood the entire delta; however, this diversion has limited delta maintenance, and erosion along the delta shoreline has resulted (Tremblay and Calnan 2011).

The site is within the Hynes Bay-San Antonio Bay watershed (Hydrologic Unit Code 121004040000). The 2022 Integrated Report for San Antonio Bay/Hynes Bay/Guadalupe Bay/Mission Lake (Segment 2462) identifies a water quality concern for chlorophyll-*a*, but otherwise the water body fully supports aquatic life and contact recreation (TCEQ 2022). The Texas Surface Water Quality Standards designate San Antonio Bay/Guadalupe Bay/Mission Lake as suitable for primary contact recreation, and its waters are classified excellent for aquatic life (30 TAC Section 307.10(1), Appendix A).

Air Quality

Guadalupe River Old Delta Wetland Restoration project is located in the Corpus Christi Air Quality Control Region (Region 14). The Region is in attainment for 8-hour ozone and in compliance with the NAAQS for all other criteria pollutants (TCEQ 2021b).

Electricity production, vehicular movements, and commercial and residential buildings using electricity generate criteria air pollutants. The project's impacts on air quality are considered.

Noise

The project location is adjacent to the VBC. Due to its location, the site experiences ambient noise from marine transportation. Recreational and commercial waterborne traffic are common.

A.3.3.1.2 Biological Resources

The wetland habitats on the Texas coast provide important wintering and migration stopover habitat for migratory birds, including Central Flyway waterfowl, shorebirds, wading birds, and marsh and waterbirds. The San Antonio Bay estuary is a vital habitat for fish and shellfish species found in the Gulf. The biological resources discussion is divided into habitats, wildlife species, marine and estuarine resources, and protected species.

Habitats

The project area is composed of intertidal marshes and open water. The physical components of the site currently provide habitat for a variety of coastal plants and animals. The salt flats and tidal marshes serve as habitat for a variety of bird species, crabs, and juvenile fish. The brackish waters further inland within the marsh support blue crab and other species of shellfish, egrets, herons, and many others. Smooth cordgrass is the most common marsh vegetation species encountered at the site. This plant filters the water of pollutants and provide habitat, nesting, and foraging for many of species that inhabit this local area.

Wildlife Species

Tidal marshes and shallow open water are the primary habitats within the *Guadalupe River Old Delta Wetland Restoration* marsh. These habitats are critical for many species of plants, fish, birds, and other wildlife. Bird species, such as snowy egrets, great egrets, roseate spoonbills, yellow-crowned night herons, black-crowned night herons, and great blue herons use marsh as feeding habitat. The area also supports a large waterfowl population in the winter and a variety of year-round bird species. Wading birds and shorebirds utilize mudflats and shallow marsh ponds located throughout the area. Wintering waterfowl include gadwall, northern pintail, lesser scaup, American widgeon, and blue-winged teal. Other birds such as clapper rail, seaside sparrows and other secretive marsh species use the marsh as well.

Marine and Estuarine Resources

Tidal marshes and shallow open water are the primary habitats within the project area. The wetland edge is a particularly important habitat for white and brown shrimp (Whaley and Minello 2002). Other marsh-dwelling species include blue crab, red drum, spotted seatrout, Atlantic croaker, southern flounder, and Gulf menhaden. Wetlands act as nurseries to hundreds of noncommercial species that comprise a large part of the estuarine food web. Invertebrates such as blue crab and brown and white shrimp are common in the region.

Protected Species

Threatened or Endangered Species

The threatened or endangered species that could potentially be affected are listed in Table A-9 (USFWS 2024). No activities related to implementation of the project would take place in any area designated as critical habitat.

Table A-8 Federal Threatened and Endangered Species Potentially Affected in the *Guadalupe River Old Delta Wetland Restoration* Project Area

Common Name	Status
Piping plover	Threatened
Red knot	Threatened
Eastern black rail	Threatened
Whooping crane	Endangered
West Indian manatee	Threatened
Loggerhead sea turtle	Threatened
Green sea turtle	Threatened
Hawksbill sea turtle	Endangered
Leatherback sea turtle	Endangered
Kemp's ridley sea turtle	Endangered

The last wild flock of whooping cranes winters on the Texas coast in the area around San Antonio Bay. Whooping cranes feed on blue crabs, so the integrity of the blue crab population is vital to maintaining the health of the whooping crane. Low levels of freshwater inflows have threatened the blue crab population in San Antonio Bay in recent years. The state has initiated planning for freshwater inflows to San Antonio Bay to address this problem. The construction activities for the project are unlikely to affect whooping cranes, which usually inhabit an area west of the project on Blackjack Peninsula in Aransas NWR.

The eastern black rail can be present anywhere suitable habitat is present along the Texas coast. Suitable habitat consists of high estuarine marsh and palustrine wet prairies containing dense perennial herbaceous wetland vegetation and proximity to shallow standing water (typically ≤3 cm) that may be ephemeral. No critical habitat has been designated for this species. Eastern black rails occur across an elevational gradient that lies between lower and wetter portions of the marsh and their adjacent uplands. These habitat gradients have gentle slopes so wetlands can have large areas of shallow inundation (sheet water). Eastern black rails also require adjacent higher elevation areas (i.e., the wetland-upland transition zone) with dense cover to survive high water events. The dense vegetative cover allows movement underneath the canopy to avoid predators. The dense plant structure is more important than plant species composition in predicting habitat suitability. The project would have minimal benefits to black rail habitat.

The red knot and piping plover are winter residents on the Texas coast and in Refugio County. Both species are known to use the shoreline of bays and mudflats. There is no critical habitat for red knot or piping plover in the *Guadalupe River Old Delta Wetland Restoration* project area.

The West Indian manatee has been found in Texas estuaries on rare occasions.

Loggerhead, green, hawksbill, leatherback, and Kemp's ridley sea turtles may be present in the project area.

EFH

Of the fish species considered by NMFS to potentially occur within the project area, EFH for these species consists of tidally influenced waters and tidally influenced marsh. Table A-10 provides a list of managed EFH species in the *Guadalupe River Old Delta Wetland Restoration* project area, habitat preference, and life stage when they may be expected to occur (NMFS 2021).

Table A-9 EFH for Estuarine Habitats Within the Guadalupe River Old Delta Wetland Restoration Project Area

Name	Larvae/ Eggs	Post-Larvae	Juvenile	Subadult	Adult	Habitat Type
Brown shrimp	X					Water column associated
Brown shrimp			X			Emergent marsh, soft bottom
Brown shrimp				X		Soft bottom
Pink shrimp			X	X		Soft bottom
White shrimp		X				Water column associated
White shrimp			X			Emergent marsh, soft bottom
White shrimp				X	X	Soft bottom
Red drum	X					Water column associated, soft bottom (larvae)
Red drum		X				Emergent marsh, soft bottom
Red drum			X			Emergent marsh (late juvenile), soft bottom
Red drum					X	Emergent marsh, soft bottom
Spanish mackerel			X		X	Estuarine, water column associated
Gray snapper					X	Soft bottom, emergent marsh
Cobia	X					Water column associated
Lane snapper	X	X				Water column associated
Lane snapper			X			Soft bottom

Marine Mammals

The only marine mammal regularly found in San Antonio Bay is the bottlenose dolphin. West Indian manatees are rarely sighted on the Texas coast.

Bald and Golden Eagles

Bald eagles potentially forage within the project location, and golden eagles may occasionally migrate through the project area.

Migratory Birds

Many species of birds spend all or a portion of their life cycle along the Gulf using a variety of habitats at different stages. Major groups of birds that inhabit the northern Gulf include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh-dwelling birds, and passerines. It is possible that birds protected under the MBTA and Texas Parks and Wildlife Code may nest in the project area.

A.3.3.1.3 Socioeconomic Resources

Socioeconomics

Refugio County has a total population of 6,666, a decrease of 1.2% since 2020, based on the 2023 U.S. Census population estimates. Median household income (2018 to 2022) in Refugio County is $54,304 (USCB 2024c).

Cultural Resources

Coordination under Section 106 of the NHPA will be initiated for the project. A preliminary analysis of the THC Atlas database indicated that no known historic sites or significant cultural, scientific, or historic resources exist in the area within the boundaries of the project area (THC 2024).

Infrastructure

According to the RRC GIS viewer (RRC 2020), there are no identified pipelines or wells located in the immediate vicinity of the Guadalupe River Old Delta project area. Additionally, the GLO Texas Coastal Sediment Geodatabase GIS viewer shows no buried pipelines running near the site (GLO 2017). Further delineation of pipeline easements and restrictions may be developed during the final design stage of the site before construction.

Land and Marine Management

The project area is used primarily for hunting and fishing. It borders the VBC on the east. The adjacent land is either undeveloped or used for agricultural purposes. Maritime traffic can be observed from the site. The project area is inaccessible by vehicles.

Tourism and Recreational Use

The project area is adjacent to bay waters, and, therefore, portions are accessible to the public and are used for fishing, boating, and wildlife viewing.

Fisheries and Aquaculture

This area is an important nursery for marine and estuarine fishery species, including several that are important to the local economy. Recreational fishing in the area focuses on spotted seatrout, red drum,

southern flounder, and other species. Commercially valuable species include brown shrimp, white shrimp, blue crab, black drum, and Gulf menhaden.

Land and Marine Transportation

Guadalupe River Old Delta Wetland Restoration area is relatively remote with no public roads within its boundaries and limited pedestrian access. The site is adjacent to the VBC.

Aesthetics and Visual Resources

The affected environment consists of the construction footprint of the project. The landscape in the vicinity of the proposed wetland restoration is characterized by a mosaic of saline and brackish marsh and open water. The site is adjacent to the VBC, a busy maritime channel. There are no designated protected viewsheds in the vicinity of the project. Equipment and construction activities related to the restoration actions would be visible.

Public Health and Safety

The recreational users of the area are accustomed to navigating the marsh via the existing channels and avoiding shallow areas and areas that contain obstructions. The immediate vicinity of the project area was historically salt and brackish marsh, but it has since been inundated primarily due to relative sea level rise, erosion, and storm surge. This has had adverse impacts on coastal longevity and deleterious effects on the area's functionality as a buffer for storm surges.

A.3.3.2 Environmental Consequences

A.3.3.2.1 Physical Resources

Geology and Substrates

Short- and long-term, minor adverse impacts to geology and substrates could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands. Impacts from construction activities, use of heavy equipment, and trenching for sediment transport can cause direct, localized, and short-term, minor adverse impacts from sediment disturbance and compaction. Long-term, minor adverse impacts on the physical environment could occur from the placement of dredged material, which may affect sediment dynamics. Mitigation measures to minimize adverse impacts to geology and substrates could include employment of standard best practices for construction to reduce erosion and loss of sediments.

It is anticipated that the project would provide long-term benefits by restoring the area to a suitable elevation to sustain historical marsh habitat.

Hydrology and Water Quality

Short- and long-term, minor adverse impacts to hydrology and water quality could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands. The project would have short-term, minor adverse impacts to water quality from increased turbidity during dredging activities and placement of fill material. Areas where dredged material would be placed for wetland restoration would be isolated from surrounding waters by temporary containment levees with weir structures to minimize the discharge of turbid water. These impacts would be localized to the project area and would be temporary in nature. The fill material would eventually settle in the placement area, and the turbidity due to project activities would no longer occur. Similar impacts due to turbidity at the

borrow site would occur regardless of the implementation of the project, because maintenance dredging of the VBC is a routine activity of USACE and is scheduled independently of the project. Long-term, minor adverse impacts may occur to the existing substrate due to placement of dredged materials. This may have long-term, minor adverse impacts to hydrology where tidal connectivity is modified per the project design. Measures to control turbidity and sediment movement would be in place to ensure water quality standards are met and sensitive resources are not affected. These measures may include appropriate water control structures to decant water and the installation of silt fences or curtains, hay bales, filter-fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement.

It is anticipated that the project would provide long-term benefits from the restoration of the marsh. The project would maintain linkages within the broader coastal and nearshore ecosystem by facilitating the natural movement of water, sediments, energy, and nutrients among habitats.

Air Quality

Short-term, minor adverse impacts to air quality could occur due to vehicle emissions from equipment used during construction and monitoring. Engine exhaust from barges, boats, excavators, and equipment would contribute to an increase in emissions. Best practices would be considered and applied, where appropriate and practical, to reduce the release of emissions. Best practices considered could include the use of energy-efficient machinery and equipment, the incorporation of anti-idling procedures, and/or the use of gasoline rather than diesel. Adverse impacts to air quality would be short-term, occurring only during active construction.

It is anticipated that the project would provide long-term benefits for air quality. Wetland and marsh soils are important sinks for carbon sequestration. Restoration of marsh habitat and revegetation of newly deposited sediments would capture carbon and provide enduring environmental benefits.

Noise

Short-term, minor adverse impacts to soundscapes could occur due to noise from construction activities. Heavy equipment can cause direct, localized, and minor adverse impacts due to noise. This impact would be short term and limited to the period of construction. Mitigation measures to reduce adverse impacts due to noise could include timing noise-producing activities to minimize disturbance to nesting birds.

A.3.3.2.2 Biological Resources

Habitats

Short-term, minor-to-moderate adverse impacts to habitats could occur due to the conversion of shallow open water to intertidal marsh habitat.

It is anticipated that the project would provide long-term benefits to the local ecosystem. Mosaics of shallow open water and vegetated marsh have been shown to have higher ecologic function than either of these habitats in isolation (Whaley and Minello 2002). Therefore, the final design would ensure adequate shallow open water would remain in the project area to maintain the synergies between these two habitats.

Wildlife Species

Short-term, minor-to-moderate adverse impacts to wildlife species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important wildlife species. The creation of additional marsh habitat provides benefits for a number of marsh wildlife and is anticipated to benefit the local ecosystem, enhancing the food web and supporting many ecologically and economically important wildlife species.

Marine and Estuarine Resources

Short-term, minor-to-moderate adverse impacts to marine and estuarine species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important marine and estuarine fauna. The creation of additional marsh habitat provides benefits for a number of marsh dependent marine and estuarine fauna and is anticipated to benefit the local ecosystem, enhancing the food web, and supporting ecologically and economically important marine and estuarine fauna.

Protected Species

There would be short- and long-term, minor adverse impacts to protected species. Impacts to wildlife would be avoided via management guidelines and techniques as appropriate. Best practices, including the *Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS 2006) and *Measures for Reducing Entrapment Risk to Protected Species* (NMFS 2012), would be followed during levee construction to avoid entrapping marine mammals and other resources.

During construction, there would be short-term, minor adverse impacts to EFH through dredged material deposition and increased turbidity. Long-term, minor impacts could include conversion of one wetland vegetation type to another with changes in the distribution of fauna communities. These impacts are expected to be confined to the immediate vicinity of the project, and best practices would likely be implemented to minimize adverse impacts.

Long-term benefits to EFH would occur from the improvement of habitat for commercially important prey species. The creation of additional estuarine marsh generates additional EFH that is anticipated to benefit the local ecosystem by enhancing the food web and supporting many ecologically and economically important fish species. Many of the species that directly utilize coastal estuarine marshes as juveniles later migrate offshore, where they serve as prey for ecologically and economically important open-ocean species. Thus, these highly productive habitats support ecological connectivity both within the coastal ecosystem and between the coastal, nearshore, and open-ocean ecosystems through the movement of species that use wetlands during their life cycle to grow and reproduce.

Placement of BUDM material to create estuarine emergent marsh would have a long-term beneficial effect on the habitat's ability to support sea turtles, West Indian manatees, and eastern black rails. The proposed project aims to restore estuarine emergent marsh, which would protect and improve sensitive resources utilized by these species. In addition, the proposed project would improve water quality by reducing sedimentation from subsidence and coastal erosion into the GIWW and shallow bay systems utilized by sea turtles and West Indian manatees. Long-term effects of project construction activities are considered to be beneficial to the eastern black rail, as this is an estuarine marsh restoration project,

which would ultimately protect and enhance thousands of acres of suitable eastern black rail foraging and nesting habitat.

The project has been designed to meet the marsh creation, maintenance, or enhancement PDC described in NMFS' *Framework Biological Opinion on Final PDARP/PEIS* (NMFS 2016), which considers where construction would occur, construction methodologies, best practices that would be implemented, and reporting requirements (NMFS 2016). Best practices included in NMFS' *Measures for Reducing the Entrapment Risk to Protected Species* (NMFS 2012) would be followed to avoid and minimize impact to protected sea turtle species. Additionally, either a hydraulic cutter-head dredge or clamshell dredge would be used to place sediments into the project site, because these do not pose a risk to pelagic aquatic organisms, such as sea turtles. A hydraulic dredge pipeline would transport material to the placement area. The dredge pipeline would be routed to avoid disturbance to sensitive resource areas if identified along the pipeline route. Any areas containing such resources in the construction area and pipeline route would be protected using best practices such as placement of hay bales, silt fences, or other appropriate methods.

Efforts would be made to avoid construction activities during the nesting season for protected migratory birds (February 15 through July 31). However, if construction activities occur during the nesting season, the area affected by project activities would be surveyed for the presence of nesting birds by a qualified biologist. If nesting birds are present or indications of pre-nesting behavior are observed, appropriate best practices would be employed to ensure that no incidental take of any individuals occurs. Best practices may include signage, exclusion zones for workers and equipment, hazing, and deterrents. Best practice activities would be coordinated with USFWS and TPWD biologists.

A.3.3.2.3 Socioeconomic Resources

Socioeconomics

No adverse short- or long-term impacts to socioeconomics are anticipated.

This restoration project would help restore an environment that benefits all citizens, populations, and groups in the region. The project would have a positive, beneficial socioeconomic impact on surrounding communities. No residential communities are located adjacent to the project. As a result, there would be no potential for short-term impacts from construction.

Cultural Resources

No adverse short- or long-term impacts to cultural resources are anticipated.

A complete review of the project under Section 106 of the NHPA would be completed prior to the implementation of any regulated project activities to develop practices that would avoid, minimize, or mitigate any adverse effects on historic properties located within the project area. The project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. If culturally or historically important resources are identified during project preparations or pre-deployment surveys, consultation would be re-initiated.

Infrastructure

No adverse short- or long-term impacts to infrastructure are anticipated.

The project is not anticipated to affect energy production, transport, or infrastructure. The project is anticipated to have no impact to infrastructure because new infrastructure would not be built, and

existing infrastructure in the area would be avoided to the extent practicable. Final E&D would include measures to avoid, as much as practicable, known oil and gas pipelines in the project area.

Land and Marine Management

No adverse short- or long-term impacts to land and marine management are anticipated.

The proposed action is anticipated to have no impact to land and marine management because the project would be consistent with the prevailing management, practices, plans, and direction governing the use of the areas where restoration actions would take place.

Tourism and Recreational Use

Short-term, minor adverse impacts to tourism and recreational use could occur due to limits on recreational activities near the construction area and temporary increases in road traffic due to movement of construction vehicles. In addition, recreational opportunities would be limited during the construction period and while the marsh is revegetating.

It is anticipated that the project would provide long-term benefits to recreationists through enhanced experiences for wildlife viewing, kayaking, canoeing, hunting, fishing, and other activities. Long-term benefits would come from restoring the nursery habitat of many recreationally important fish species, which would benefit recreational fishing in the area. Benefits to the local economy could accrue through an increase in employment and associated spending in the project area during construction and increased expenditures due to increased recreational visitation following completion of the restoration project.

Fisheries and Aquaculture

Short-term, minor adverse impacts to fisheries could occur due to construction activities such as dredging, addition of sediments or borrow materials, and removal of sediments.

It is anticipated that the project would provide long-term benefits to the public through increased fishing opportunities (both commercial and recreational) by restoring coastal habitats that benefit fish. Long-term benefits would arise from the improvement of habitat for commercially important brown and white shrimp fisheries and the recreational red drum fishery. To the extent that these increased recreational opportunities result in increased visitation, local businesses may benefit from visitors' increased expenditures.

Land and Marine Transportation

No adverse short- or long-term impacts to land and marine transportation are anticipated.

Since there is minimal access to the site, there would be no impact to land-based traffic. Boating routes would be identified prior to the beneficial use operations to prevent any impacts to marine transportation. It is expected that activities would result in a short-term, minor interruption to the channel traffic. Most of the commercial traffic takes place on a routine schedule, and construction activities would be timed to reduce interference with commercial operators. The dredged material pipeline route would be clearly marked to avoid vessel strikes to the pipeline.

Aesthetics and Visual Resources

Short-term, minor-to-moderate adverse impacts to aesthetics and visual resources could occur due to the presence of construction equipment and the barren, muddy appearance during the revegetation period.

It is anticipated that the project would provide long-term benefits to the area's aesthetics and visual resources. The creation of marsh habitat and planting of vegetation would improve the overall viewscape of the project area. In addition, the new habitat is anticipated to attract additional birds and wildlife, which could be enjoyed by recreational users of the area.

Public Health and Safety

No adverse short- or long-term impacts to public health and safety are anticipated.

Due to the location and nature of the project area, no adverse impacts to public health and safety are anticipated as a result of this project. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. Best practices in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport, and disposal of all hazardous substances. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. Due to the potential increase in small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure water related accidents and conflicts are minimized.

A.3.4 Lower Neches Wildlife Management Area Old River Unit Wetland Restoration

The project area is within the Old River Unit of the Lower Neches WMA, which is managed by TPWD. The Old River Unit of the WMA consists of 4,386 acres on the north shore of Old River Cove of Sabine Lake, near the GIWW. Dredged material would provide fill for six marsh restoration placement cells, using containment levees built from material collected on site to restore up to 224 acres of intertidal marsh.

The site is composed primarily of intertidal marsh and shallow open water. Over the past several decades, the vegetated marsh at the site has deteriorated, resulting in the expansion of shallow open water. The combination of rising sea levels, subsidence, and reduced sediment supplies has resulted in significant, rapid loss of wetlands and other coastal habitats in the region. This project is consistent with regional efforts to combat land and habitat loss through dune restoration, hydrology enhancements, and estuarine marsh restoration.

The overarching goal of the project is to restore and conserve wetlands at the project site by beneficially using dredged material to create a viable, vegetated, wetland habitat for fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage. The primary objective of this project is to restore shallow open water habitat in Lower Neches WMA Old River Unit to reference marsh elevations to support habitat restoration and revegetation with

native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 400,000 cy of suitable hydraulically dredged material within levees constructed from on-site sediment. Dredge material would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 224 acres of intertidal marsh, including the conversion of 96 acres of existing open water to intertidal marsh (Figure A-5).

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the SNWW, private dredging sources, and material mined from dredged material placement areas. The specific sources of dredged material would be determined during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source. Resources of the affected environment are described in Section A.3.4.1; project-level environmental consequences are summarized in Table A-11 and described in Section A.3.4.2.

This section presents the affected resources of the L*ower Neches Wildlife Management Area Old River Unit Wetland Restoration* project and the environmental consequences of the proposed actions in context of the project-specific affected environment.

The description and analysis of the project are based on the 60% basis of design concepts developed under the *Texas Dredged Material Planning for Wetland Restoration* project authorized in RP/EA #1. Throughout the completion of the 100% designs under this process, every practical attempt would be made to avoid and minimize potentially adverse environmental and cultural resource impacts. The following descriptions for each of the construction elements are preliminary and based on current planning efforts and resource agency experience with similar marsh restoration projects. Although the Texas TIG does not consider it likely, it is possible that the 100% E&D process could generate a plan that has adverse environmental impacts that are different in type or magnitude from those discussed in this document. If that is the case, the Texas TIG would consider whether further environmental impacts analysis would be necessary.

The impacts from the project are anticipated to be largely beneficial, and the adverse impacts would generally be short-term and minor to moderate (Table A-11). Benefits to the biological, physical, human uses, and socioeconomics environment would result if the project was implemented. Best practices required in the permit, consultations, or environmental analyses would be followed. Additionally, best practices described in Appendix 6.A of the Final PDARP/PEIS would be considered and applied where appropriate to reduce or eliminate adverse impacts to the environment.



Figure A-5 **Location of Proposed Restoration Areas for the L*ower Neches Wildlife Management Area Old River Unit Wetland Restoration* Project**

Table A-10 Summary of Adverse and Beneficial Impacts from Implementation of the *Lower Neches Wildlife Management Area Old River Unit Wetland Restoration* Project

Resource Categories	Resource Subcategories	Benefits	Adverse Short Term	Adverse Long Term
Physical Resources	Geology and substrates	Yes	Minor	Minor
	Hydrology and water quality	Yes	Minor	Minor
	Air quality	Yes	Minor	NE
	Noise	NE	Minor	NE
Biological Resources	Habitats	Yes	Minor to moderate	NE
	Wildlife species	Yes	Minor to moderate	NE
	Marine and Estuarine Resources	Yes	Minor to moderate	NE
	Protected species	Yes	Minor	Minor
Socioeconomic Resources	Socioeconomics	Yes	NE	NE
	Cultural resources	NE	NE	NE
	Infrastructure	NE	NE	NE
	Land and marine management	NE	NE	NE
	Tourism and recreational use	Yes	Minor	NE
	Fisheries and aquaculture	Yes	Minor	NE
	Land and marine transportation	NE	NE	NE
	Aesthetics and visual resources	Yes	Minor to moderate	NE
	Public health and safety	NE	NE	NE

Notes:
Adverse short-term and long-term effects are designated as minor, moderate, or major.
NE: no effect
Yes: provides benefits

A.3.4.1 Affected Environment

A.3.4.1.1 Physical Resources

Geology and Substrates

The project area is located in the Chenier Plain region of Texas. A distinguishing feature of the region is the cheniers, which are ridges representing ancient Gulf shorelines generally aligned parallel to the Gulf or as fan-shaped alluvial deposits at the mouths of rivers. The Chenier Plain formed from a Pleistocene promontory overlain by Holocene marginal-deltaic sediments (King 2007). The geologic substrate of the Chenier Plain region is primarily composed of sediments deposited during the late recent epoch with some subsurface Pleistocene outcropping. These deposits are overlain at the coast by a geologically recent series of inland ridges representing stranded beaches that align parallel to the coast. Accumulation of fine-grained sediment deposited between these multiple beach ridges formed marshes

and mudflats. (USFWS 2008).The ground surface within the project area is mostly comprised of chenier plain and coastal plain sediments deposited by fluvial, tidal, littoral, and deltaic processes. The coastal plain is characterized as seaward-thickening sediment deposits to depths of thousands of feet below the present land surface. The terrain is relatively flat to gently sloping. Two types of landforms characterize the area: broad marshes containing organic clays and peat and long, narrow relict cheniers, which appear as ridges parallel to the coast. Chenier ridges form as a result of cyclic shoreline advance and retreat and are typically mixtures of silt, sand, and shell fragments. They are slightly elevated features and attain elevations of 5 to 10 feet above sea level (Federal Energy Regulatory Commission [FERC] 2011).

The BUDM restoration technique emulates riverine deltaic and other coastal sediment processes that have been interrupted by human alterations to the land and seascape. Emulating these natural accretion processes is a useful restoration tool to restore valuable coastal habitats where the rate of relative sea level rise exceeds accretion.

Hydrology and Water Quality

The *Lower Neches Wildlife Management Area Old River Unit Wetland Restoration* project area is within the Old River Bayou watershed (Hydrologic Unit Code 120402010500), which includes Sabine Lake in Texas and Louisiana and the SNWW. The Sabine and Neches Rivers discharge into Sabine Lake from the north. The Sabine Pass Channel is at the southern end of the watershed. This narrow tidal inlet is the outlet for this system to the Gulf. Wind-driven tides predominate the area and affect the estuary environment, producing wind-tidal flats and marshes (FERC 2011).

The Sabine and Neches River basins provide about 85% of the freshwater inflows in the Sabine-Neches estuary. Additional freshwater enters the system through streams; municipal, industrial, and agricultural flows; and precipitation. The Neches River floodplain, which includes the project area, is characterized by marsh areas that drain primarily through existing stream channels, and, in some cases, flow goes directly to wetland areas. Most likely, flow to the project area occurs primarily through rainfall and tidal push (USACE 2017).

USACE is building a coastal storm risk management project near the project site. The Orange 3 coastal storm risk management project would consist of a 26.7-mile-long levee/floodwall system along the edge of the Sabine and Neches River floodplains from Orange to the vicinity of Orangefield, Texas. This system, which would be directly north of the project area, could affect hydrology. Its effects would be considered in the project's final design phase.

There is a fish consumption advisory related to PCBs in edible fish tissue in Sabine Lake (Segment 2412) documented in the 2022 Integrated Report, but otherwise the water body fully supports aquatic life and contact recreation (TCEQ 2022). The Texas Surface Water Quality Standards classify Sabine Lake as suitable for primary contact recreation, and its waters are designated high aquatic life use (30 TAC Section 307.10(1), Appendix A).

Air Quality

The Old River Unit is located in the Beaumont-Port Arthur Air Quality Control Region (Region 10). The Region is in attainment for 8-hour ozone and in compliance with the NAAQS for all other criteria pollutants (TCEQ 2021c).

Electricity production, vehicular movements, and commercial and residential buildings using electricity generate criteria air pollutants. The project's impacts on air quality are considered.

Noise

The project location is in the Old River Unit of the Lower Neches WMA, which is largely undeveloped. The recreational uses of the WMA create a low level of ambient noise. The project location is a few miles south of Bridge City, a community of about 8,000 residents.

A.3.4.1.2 Biological Resources

The wetland habitats on the upper Texas coast provide important wintering and migration stopover habitat for migratory birds, including Central Flyway waterfowl, shorebirds, wading birds, and marsh and waterbirds. A complex of protected lands along the coast, including NWRs and state-managed WMAs such as Lower Neches WMA, serves as a critical staging area for waterfowl migrating to and from Mexico. The Sabine Lake estuary is a vital habitat for fish and shellfish species found in the Gulf. The biological resources discussion is divided into habitats, wildlife species, marine and estuarine resources, and protected species.

Habitats

The wetlands of the Sabine Lake estuary contribute nutrients to and enhance productivity of Sabine Lake and serve as important nursery and adult habitat for a variety of oligohaline and marine fish and invertebrate species. Sabine Lake is a low-salinity, estuarine embayment of the Gulf and is characterized by shallow, productive waters. The Neches River in the vicinity of the site is tidally influenced and part of the Sabine Lake estuary. The land and waters surrounding the project area support a wide array of birds, wildlife, fish, and plant species. Phytoplankton, zooplankton, and aquatic invertebrates living in these habitats provide food web support for a variety of fish and bird species. No seagrasses or oyster reefs were identified in the vicinity of the project site.

Wildlife Species

Intermediate marshes and shallow open water are the primary habitats within the Lower Neches WMA Old River Unit. These habitats are critical for many species of plants, fish, birds, and other wildlife. Bird species, such as snowy egrets, great egrets, roseate spoonbills, yellow-crowned night herons, black-crowned night herons, and great blue herons use marsh as feeding habitat. The area also supports a large waterfowl population in the winter and a variety of year-round bird species. Wading birds and shorebirds utilize the mudflats and shallow marsh ponds located throughout the area. Wintering waterfowl include gadwall, northern pintail, lesser scaup, American widgeon, and blue-winged teal. Other birds such as clapper rail, seaside sparrows and other secretive marsh species use the marsh as well.

Marine and Estuarine Resources

The tidal marshes and shallow open water are the primary habitats within the project area. The wetland edge is a particularly important habitat for white and brown shrimp (Whaley and Minello 2002). Other marsh-dwelling species include blue crab, red drum, spotted seatrout, Atlantic croaker, southern flounder, and Gulf menhaden. Wetlands act as nurseries to hundreds of noncommercial species that comprise a large part of the estuarine food web. Invertebrates such as blue crab and brown and white shrimp are common in the region.

Protected Species

Threatened or Endangered Species

The threatened or endangered species that could potentially be affected are listed in Table A-12 (USFWS 2024). No activities related to implementation of the project would take place in any area designated as critical habitat.

Table A-11 Federal Threatened and Endangered Species Potentially Affected by the *Lower Neches Wildlife Management Area Old River Unit Wetland Restoration* Project Area

Common Name	Status
Piping plover	Threatened
Red knot	Threatened
Eastern black rail	Threatened
West Indian manatee	Threatened

The eastern black rail can be present anywhere suitable habitat is present along the Texas coast. Suitable habitat consists of high estuarine marsh and palustrine wet prairies containing dense perennial herbaceous wetland vegetation and proximity to shallow standing water (typically ≤3 cm) that may be ephemeral. No critical habitat has been designated for this species. Eastern black rails occur across an elevational gradient that lies between lower and wetter portions of the marsh and their adjacent uplands. These habitat gradients have gentle slopes so that wetlands can have large areas of shallow inundation (sheet water). Eastern black rails also require adjacent higher elevation areas (i.e., the wetland-upland transition zone) with dense cover to survive high water events. The dense vegetative cover allows movement underneath the canopy to avoid predators. The dense plant structure is more important than plant species composition in predicting habitat suitability. This project would have minimal benefits to black rail habitat.

The red knot and piping plover are winter residents on the Texas coast and in Orange County. Both species are known to use the shoreline of bays and mudflats.

The West Indian manatee has been found in Texas estuaries on rare occasions. There have been infrequent reports of manatee sightings in the Sabine-Neches estuary.

EFH

Of the fish species considered by NMFS to potentially occur within the project area, EFH for these species consists of tidally influenced waters and tidally influenced marsh. Table A-13 provides a list of managed EFH species in the *Lower Neches Wildlife Management Area Old River Unit Wetland Restoration* project area, habitat preference, and life stage when they may be expected to occur (NMFS 2021).

Table A-12 EFH for Estuarine Habitats within the *Lower Neches Wildlife Management Area Old River Unit Wetland Restoration* Project Area

Name	Larvae/ Eggs	Post-Larvae	Juvenile	Subadult	Adult	Habitat Type
Brown shrimp	X					Water column associated
Brown shrimp			X			Emergent marsh, soft bottom
Brown shrimp				X		Soft bottom
Pink shrimp			X	X		Soft bottom
White shrimp		X				Water column associated
White shrimp			X			Emergent marsh, soft bottom
White shrimp				X	X	Soft bottom
Red drum	X					Water column associated, soft bottom (larvae)
Red drum		X				Emergent marsh, soft bottom
Red drum			X			Emergent marsh (late juvenile), soft bottom
Red drum					X	Emergent marsh, soft bottom
Spanish mackerel			X		X	Estuarine, water column associated
Gray snapper					X	Soft bottom, emergent marsh
Cobia	X					Water column associated
Lane snapper	X	X				Water column associated
Lane snapper			X			Soft bottom

Marine Mammals

The only marine mammal regularly found in Sabine Lake is the bottlenose dolphin. There are infrequent reports of sightings of West Indian manatees within the estuary.

Bald and Golden Eagles

Bald eagles potentially forage within the project location, and golden eagles may occasionally migrate through the project area.

Migratory Birds

Many species of birds spend all or a portion of their life cycle along the Gulf using a variety of habitats at different stages. Major groups of birds that inhabit the northern Gulf include waterfowl and other

water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh-dwelling birds, and passerines. It is possible that birds protected under the MBTA and Texas Parks and Wildlife Code may nest in the project area.

A.3.4.1.3 Socioeconomic Resources

Socioeconomics

Orange County has a total population of 85,722, an increase of 1.1% since 2020, based on the 2023 U.S. Census population estimates. Median household income (2018 to 2022) in Orange County is $71,910 (USCB 2024d).

Cultural Resources

Coordination under Section 106 of the NHPA will be initiated for the project. A preliminary analysis of the THC Atlas database indicated that no known historic sites or significant cultural, scientific, or historic resources exist in the area within the boundaries of the project area (THC 2024).

Infrastructure

Various oil and gas pipelines and wells exist at the site. RRC maintains an oil and gas pipeline and well database with a GIS viewer, which shows the infrastructure within the boundaries of the Lower Neches WMA Old River Unit (RRC 2020). Additionally, GLO Texas Sediment Geodatabase GIS viewer shows buried natural gas and crude oil pipelines running under the site (GLO 2017). Further delineation of pipeline easements and restrictions may be developed during the final design stage of the site before construction.

Land and Marine Management

The Lower Neches WMA Old River Unit is comprised of 4,386 acres located in Orange County, Texas, south of Bridge City and bordering the Neches River and Old River Cove to the west and south, which connects to Sabine Lake and the greater Sabine-Neches estuary. The project area does not have any road access to the placement location. The WMA is managed by TPWD.

Tourism and Recreational Use

Hunting, fishing, hiking, and wildlife viewing are regularly enjoyed by the public in the Lower Neches WMA Old River Unit and these activities are accessible in the project area.

Fisheries and Aquaculture

This area is an important nursery for marine and estuarine fishery species, including several that are important to the local economy. Recreational fishing in the area focuses on spotted seatrout, red drum, southern flounder, and other species. Commercially valuable species include brown shrimp, white shrimp, blue crab, black drum, and Gulf menhaden.

Land and Marine Transportation

Lower Neches WMA Old River Unit is relatively remote with one public road within its boundaries and limited pedestrian and water access.

Aesthetics and Visual Resources

The affected environment consists of the construction footprint of the project. The landscape in the vicinity of the proposed wetland restoration is characterized by a mosaic of brackish and intermediate marsh and open water. The site is undeveloped. There are no designated protected viewsheds in the vicinity of the project. Equipment and construction activities related to the restoration actions would be visible.

Public Health and Safety

The recreational users of the Lower Neches WMA Old River Unit are accustomed to navigating the marsh via the existing channels and avoiding shallow areas and areas that contain obstructions. The immediate vicinity of the project area was historically intermediate marsh, but it has since been inundated primarily due to subsidence and relative sea level rise. This has had adverse impacts on coastal longevity and deleterious effects on the area's functionality as a buffer for storm surges.

A.3.4.2 Environmental Consequences

A.3.4.2.1 Physical Resources

Geology and Substrates

Short- and long-term, minor adverse impacts to geology and substrates could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands. Impacts from construction activities, use of heavy equipment, and trenching for sediment transport can cause localized and short-term, minor adverse impacts from sediment disturbance and compaction. Long-term, minor adverse impacts on the physical environment could occur from the placement of dredged material, which may affect sediment dynamics. Mitigation measures to minimize adverse impacts to geology and substrates could include employment of standard best practices for construction to reduce loss of sediments.

It is anticipated that the project would provide long-term benefits by restoring the area to a suitable elevation to sustain historical marsh habitat.

Hydrology and Water Quality

Short- and long-term, minor adverse impacts to water quality could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands. The project would have short-term, minor adverse impacts to water quality from increased turbidity during dredging activities and placement of fill material. Areas where dredged material would be placed for wetland restoration would be isolated from surrounding waters by temporary containment levees with weir structures to minimize the discharge of turbid water. These impacts would be localized to the project area and would be temporary in nature. The fill material would eventually settle in the placement area, and the turbidity due to project activities would no longer occur. Similar impacts due to turbidity at the borrow site would occur regardless of the implementation of the project because maintenance dredging of the SNWW is a routine activity of USACE and is scheduled independently of the project. Long-term, minor adverse impacts may occur to the existing substrate due to placement of dredged materials. This may have long-term, minor adverse impacts to hydrology where tidal connectivity is modified per the project design. Measures to control turbidity and sediment movement would be in place to ensure water quality standards are met and sensitive resources are not affected. These measures may include appropriate water control structures to decant water and the installation of silt fences or curtains, hay bales, filter-

fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement.

It is anticipated that the project would have long-term benefits from the restoration and levee protection of the marsh. The project would maintain linkages within the broader coastal and nearshore ecosystem by facilitating the natural movement of water, sediments, energy, and nutrients among habitats.

Air Quality

Short-term, minor adverse impacts to air quality could occur due to vehicle emissions from equipment used during construction and monitoring. Engine exhaust from barges, boats, excavators, and equipment would contribute to an increase in emissions. Best practices would be considered and applied, where appropriate and practical, to reduce the release of emissions. Best practices considered could include the deployment of energy-efficient machinery and equipment, the incorporation of anti-idling procedures, and/or the use of gasoline rather than diesel. Adverse impacts to air quality would be short-term, occurring only during active construction.

It is anticipated that the project would provide long-term benefits for air quality. Wetland and marsh soils are important sinks for carbon sequestration. Reconstruction of marsh habitat and revegetation of newly deposited sediments would capture carbon and provide enduring environmental benefits.

Noise

Short-term, minor adverse impacts to soundscapes could occur due to noise from construction activities. Heavy equipment can cause direct, localized, and minor adverse impacts due to noise. This impact would be short term and limited to the period of construction. Mitigation measures to reduce adverse impacts due to noise could include timing noise-producing activities to minimize disturbance to nesting birds. To prevent disturbance to nearby residential communities, construction activities that produce significant noise would be limited to daylight hours.

A.3.4.2.2 Biological Resources

Habitats

Short-term, minor-to-moderate adverse impacts to the habitat could occur due to the conversion of shallow open water to intertidal marsh habitat.

It is anticipated that the project would provide long-term benefits to the local ecosystem. Mosaics of shallow open water and vegetated marsh have been shown to have higher ecologic function than either of these habitats in isolation (Whaley and Minello 2002). Therefore, the final design would ensure adequate shallow open water would remain in the project area to maintain the synergies between these two habitats.

Wildlife Species

Short-term, minor-to-moderate adverse impacts to wildlife species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important wildlife species. The creation of additional marsh habitat provides benefits for a

number of marsh wildlife and is anticipated to benefit the local ecosystem, enhancing the food web and supporting many ecologically and economically important wildlife species.

Marine and Estuarine Resources

Short-term, minor-to-moderate adverse impacts to marine and estuarine species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important marine and estuarine fauna. The creation of additional marsh habitat provides benefits for a number of marsh dependent marine and estuarine fauna and is anticipated to benefit the local ecosystem, enhancing the food web and supporting ecologically and economically important marine and estuarine fauna.

Protected Species

There would be short- and long-term, minor adverse impacts to protected species. Impacts to wildlife would be avoided via management guidelines and techniques as appropriate. Best practices, including *the Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS 2006) and *Measures for Reducing Entrapment Risk to Protected Species* (NMFS 2012), would be followed during levee construction to avoid entrapping marine mammals and other resources.

During construction, there would be short-term, minor adverse impacts to EFH through dredged material deposition and increased turbidity. Long-term, minor adverse impacts could include conversion of one wetland vegetation type to another with changes in the distribution of fauna communities. These impacts are expected to be confined to the immediate vicinity of the project, and best practices would likely be implemented to minimize adverse impacts.

Long-term benefits to EFH would occur from the improvement of habitat for commercially important prey species. The creation of additional estuarine marsh generates additional EFH that is anticipated to benefit the local ecosystem by enhancing the food web and supporting many ecologically and economically important fish species. Many of the species that directly utilize coastal estuarine marshes as juveniles later migrate offshore, where they serve as prey for ecologically and economically important open-ocean species. Thus, these highly productive habitats support ecological connectivity both within the coastal ecosystem and between the coastal, nearshore, and open-ocean ecosystems through the movement of species that use wetlands during their life cycle to grow and reproduce.

Placement of BUDM material to create estuarine emergent marsh would have a long-term beneficial effect on the habitat's ability to support sea turtles, West Indian manatees, and eastern black rails. The proposed project aims to restore estuarine emergent marsh, which would protect and improve sensitive resources utilized by these species. In addition, the proposed project would improve water quality by reducing sedimentation from subsidence and coastal erosion into the GIWW and shallow bay systems utilized by sea turtles and West Indian manatees. Long-term effects of project construction activities are considered to be beneficial to the eastern black rail, as this is an estuarine marsh restoration project, which would ultimately protect and enhance thousands of acres of suitable eastern black rail foraging and nesting habitat.

The project has been designed to meet the marsh creation, maintenance, or enhancement PDC described in NMFS' *Framework Biological Opinion on Final PDARP/PEIS* (NMFS 2016), which considers where construction would occur, construction methodologies, best practices that would be

implemented, and reporting requirements (NMFS 2016). Best practices included in NMFS' *Measures for Reducing the Entrapment Risk to Protected Species* (NMFS 2012) would be followed to avoid and minimize impact to protected sea turtle species. Additionally, either a hydraulic cutter-head dredge or clamshell dredge would be used to place sediments into the project site, because these do not pose a risk to pelagic aquatic organisms, such as sea turtles. A hydraulic dredge pipeline would transport material to the placement area. The dredge pipeline would be routed to avoid disturbance to sensitive resource areas, if identified along the pipeline route. Any areas containing such resources in the construction area and pipeline route would be protected using best practices such as placement of hay bales, silt fences, or other appropriate methods.

Efforts would be made to avoid construction activities during the nesting season for protected migratory birds (February 15 through July 31). However, if construction activities occur during the nesting season, the area affected by project activities would be surveyed for the presence of nesting birds by a qualified biologist. If nesting birds are present or indications of pre-nesting behavior are observed, appropriate best practices would be employed to ensure no incidental take of any individuals occurs. Best practices may include signage, exclusion zones for workers and equipment, hazing, and deterrents. Best practice activities would be coordinated with USFWS and TPWD biologists.

A.3.4.2.3 Socioeconomic Resources

Socioeconomics

No adverse short- or long-term impacts to socioeconomics are anticipated.

This restoration project would help restore an environment that benefits all citizens, populations, and groups in the region. The project would have a positive, beneficial socioeconomic impact on surrounding communities. Best practices would be implemented during construction to avoid short-term impacts to nearby residential communities.

Cultural Resources

No adverse short- or long-term impacts to cultural resources are anticipated.

A complete review of the project under Section 106 of the NHPA would be completed prior to implementation of regulated project activities to develop practices that would avoid, minimize, or mitigate any adverse effects on historic properties located within the project area. The project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. If culturally or historically important resources are identified during project preparations or pre-deployment surveys, consultation would be re-initiated.

Infrastructure

No adverse short- or long-term impacts to infrastructure are anticipated.

The project is not anticipated to affect energy production, transport, or infrastructure. The project is anticipated to have no impact to infrastructure because new infrastructure would not be built, and existing infrastructure in the area would be avoided to the extent practicable. Final E&D would include measures to avoid, as much as practicable, known oil and gas pipelines in the Lower Neches WMA Old River Unit.

Land and Marine Management

No adverse short- or long-term impacts to infrastructure are anticipated.

The proposed action is anticipated to have no impact to land and marine management because the project would be consistent with the prevailing management, practices, plans, and direction governing the use of the areas where restoration actions would take place.

Tourism and Recreational Use

Short-term, minor adverse impacts to tourism and recreational use could occur due to limits on recreational activities near the construction area and temporary increases in road traffic due to movement of construction vehicles. In addition, recreational opportunities would be limited during the construction period and while the marsh is revegetating.

It is anticipated that the project would provide long-term benefits to recreationalists through enhanced experiences for wildlife viewing, kayaking, canoeing, hunting, fishing, and other activities. Long-term benefits would come from restoring the nursery habitat of many recreationally important fish species, which would benefit recreational fishing in the area. Benefits to the local economy could accrue through an increase in employment and associated spending in the project area during construction and increased expenditures due to increased recreational visitation following completion of the restoration project.

Fisheries and Aquaculture

Short-term, minor adverse impacts to fisheries could occur due to construction activities such as dredging, addition of sediments or borrow materials, and removal of sediments.

It is anticipated that the project would provide long-term benefits to the public through increased fishing opportunities (both commercial and recreational) from restoring coastal habitats that benefit fish. Long-term benefits would arise from the improvement of habitat for commercially important brown and white shrimp fisheries and the recreational red drum fishery. To the extent that these increased recreational opportunities result in increased visitation, local businesses may benefit from visitors' increased expenditures.

Land and Marine Transportation

No adverse short- or long-term impacts to land and marine transportation are anticipated.

Since there is minimal access to the site, there would be no impact to land-based traffic. Shipping and boating routes would be identified prior to the beneficial use operations to prevent any impacts to marine transportation. It is expected that activities would not significantly interrupt the channel traffic. Most of the commercial traffic takes place on a routine schedule, and construction activities would be timed to reduce interference with commercial operators. The dredged material pipeline route would be clearly marked to avoid vessel strikes to the pipeline.

Aesthetics and Visual Resources

Short-term, minor-to-moderate adverse impacts to aesthetics and visual resources could occur due to the presence of construction equipment during the construction period and the barren, muddy appearance during the revegetation period.

It is anticipated that the project would provide long-term benefits to the area's aesthetics and visual resources. The creation of marsh habitat and planting of vegetation would improve the overall viewscape of the project area. In addition, the new habitat is anticipated to attract additional birds and wildlife, which could be enjoyed by recreational users of the area.

Public Health and Safety

No adverse short- or long-term impacts to public health and safety are anticipated.

Due to the location and nature of the project area, no adverse impacts to public health and safety are anticipated as a result of this project. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. Best practices in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport, and disposal of all hazardous substances. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. Due to the potential increase in small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure water related accidents and conflicts are minimized.

A.3.5 McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration

The project site is located in the McFaddin NWR, which is managed by the USFWS. The restoration site boundaries were based on a previous effort to regenerate marsh using terraces within subtidal open water areas surrounding Willow Lake. The addition of dredge material to the terraced area would restore up to 218 acres of intertidal marsh habitat.

The predominant wetland habitats near McFaddin NWR are characterized as salt and brackish marsh and estuarine open water. The combination of rising sea levels, subsidence, and reduced sediment supplies has resulted in significant loss of wetlands by rapidly converting emergent marsh to open water. This project is consistent with regional efforts to combat land and habitat loss through dune restoration, hydrology enhancements, and estuarine marsh restoration.

The overarching goal of the project is to restore and conserve wetlands and coastal habitats in Willow Lake by beneficially using dredged material to create a viable, vegetated, wetland habitat for fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage. The primary objective of this project is to restore shallow open water habitat in Willow Lake to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 475,000 cy of suitable hydraulically dredged material within levees constructed from on-site material. Sediment would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 218 acres of marsh habitat, including the conversion of up to 140 acres of existing open water to low marsh (Figure A-6).

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the GIWW and SNWW, private dredging sources, and material mined from dredged material placement areas. The specific sources of dredged material would be determined during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source. Resources of the affected environment are described in Section A.3.5.1; project-level environmental consequences are summarized in Table A-14 and described in Section A.3.5.2.

This section presents the affected resources of the *McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration* project and the environmental consequences of the proposed actions in context of the project-specific affected environment.

The description and analysis of the project are based on the 60% basis of design concepts developed under the *Texas Dredged Material Planning for Wetland Restoration* project authorized in RP/EA #1. Throughout the completion of the 100% designs under this process, every practical attempt would be made to avoid and minimize potentially adverse environmental and cultural resource impacts. The following descriptions for each of the construction elements are preliminary and based on current planning efforts and resource agency experience with similar marsh restoration projects. Although the Texas TIG does not consider it likely, it is possible that the 100% E&D process could generate a plan that has adverse environmental impacts that are different in type or magnitude from those discussed in this document. If that is the case, the Texas TIG would consider whether further environmental impacts analysis would be necessary.

The impacts from the project are anticipated to be largely beneficial, and the adverse impacts would generally be short-term and minor to moderate (Table A-14). Benefits to the biological, physical, human uses, and socioeconomics environment would result if the project was implemented. Best practices required in the permit, consultations, or environmental analyses would be followed. Additionally, best practices described in Appendix 6.A of the Final PDARP/PEIS would be considered and applied where appropriate to reduce or eliminate adverse impacts to the environment.



Figure A-6 **Location of Proposed Restoration Areas for the *McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration* Project**

Table A-13 Summary of Adverse and Beneficial Impacts from Implementation of the *Mcfaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration* Project

Resource Categories	Resource Subcategories	Benefits	Adverse Short Term	Adverse Long Term
Physical Resources	Geology and substrates	Yes	Minor	Minor
	Hydrology and water quality	Yes	Minor	Minor
	Air quality	Yes	Minor	NE
	Noise	NE	Minor	NE
Biological Resources	Habitats	Yes	Minor to moderate	NE
	Wildlife species	Yes	Minor to moderate	NE
	Marine and estuarine resources	Yes	Minor to moderate	NE
	Protected species	Yes	Minor	Minor
Socioeconomic Resources	Socioeconomics	Yes	NE	NE
	Cultural resources	NE	NE	NE
	Infrastructure	NE	NE	NE
	Land and marine management	NE	NE	NE
	Tourism and recreational use	Yes	Minor	NE
	Fisheries and aquaculture	Yes	Minor	NE
	Land and marine transportation	NE	NE	NE
	Aesthetics and visual resources	Yes	Minor to moderate	NE
	Public health and safety	NE	NE	NE

Notes:
Adverse short-term and long-term effects are designated as minor, moderate, or major.
NE: no effect
Yes: would provide benefits

A.3.5.1 Affected Environment

A.3.5.1.1 Physical Resources

Geology and Substrates

McFaddin NWR is located in the Chenier Plain region of Texas. It is comprised of a mainland beach fronting a chenier plain that formed from a Pleistocene promontory overlain by Holocene marginal-deltaic sediments (King 2007). The geologic substrate of the Chenier Plain region is primarily composed of sediments deposited during the late recent epoch with some subsurface Pleistocene outcropping. These deposits are overlain at the coast by a geologically recent series of inland ridges representing stranded beaches that align parallel to the coast. Accumulation of fine-grained sediment deposited between these multiple beach ridges formed marshes and mudflats. Tidal channels lie between successive ridges. The shore of the coast is formed by a narrow beach or washover terrace that

developed over time through the deposition of sand and shell. The coastline is breached by inlets that connect estuaries extending inland upriver valleys. (USFWS 2008).

The ground surface within the project area is mostly comprised of chenier plain and coastal plain sediments deposited by fluvial, tidal, littoral, and deltaic processes. The coastal plain is characterized as seaward-thickening sediment deposits to depths of thousands of feet below the present land surface. The terrain is relatively flat to gently sloping. Two types of landforms characterize the area: broad marshes containing organic clays and peat and long, narrow relict cheniers, which appear as ridges parallel to the coast. Chenier ridges form as a result of cyclic shoreline advance and retreat and are typically mixtures of silt, sand, and shell fragments. They are slightly elevated features and attain elevations of 5 to 10 feet above sea level (FERC 2011).

The BUDM restoration technique emulates riverine deltaic and other coastal sediment processes that have been interrupted by human alterations to the land and seascape. Emulating these natural accretion processes is a useful restoration tool to restore valuable coastal habitats where the rate of relative sea level rise exceeds accretion.

Hydrology and Water Quality

Historically, hurricanes and other rain events brought large volumes of freshwater that would slowly flow across the coastal prairies and marshes of the Texas Chenier Plain complex. The natural drainage of the cheniers allowed a pattern of drying and flooding under which wetland plants evolved and adapted. These wetland plants in turn supported a variety of wildlife, but manufactured changes over the last century have altered the landscape's hydrology (USACE 2016). Coastal marshes in the Texas Chenier Plain area have been impacted by major alterations of historic hydrology, including loss of freshwater and sediment inflows and increased saltwater intrusion. Construction of the GIWW and the SNWW has significantly affected hydrology of coastal marshes in the project area. Collectively, altered hydrological regimes resulting in saltwater intrusion, reduced freshwater supplies, reduction of mineral sediment supply to marsh systems, sea level rise, and land subsidence are resulting in coastal erosion and shoreline retreat along the Gulf and bay shorelines and the conversion of interior vegetated marshes to open water (USFWS 2008).

The project area lies south of the GIWW in the Salt Bayou watershed. Those areas are cut off from the sheet flow of freshwater from the north, resulting in the wetlands becoming intermediate and brackish due to lack of freshwater inflows that occurred prior to the creation of the GIWW (TPWD 2013).

The project area is within the Salt Bayou watershed (Hydrologic Unit Code 120402010300) and within Stream Segment 0702 Intracoastal Waterway Tidal. In the 2022 Texas Integrated Report, Segment 0702 Intracoastal Waterway Tidal did not support fish consumption due to PCBs and dioxin in edible tissue and contact recreation due to bacteria. Segment 0702 is designated for primary contact recreation use and intermediate aquatic life use in the 2018 Texas Surface Water Quality Standards (30 TAC Section 307.10(1), Appendix A).

Air Quality

The McFaddin NWR is located in the Beaumont-Port Arthur Air Quality Control Region (Region 10). The Region is in attainment for 8-hour ozone and in compliance with the NAAQS for all other criteria pollutants (TCEQ 2021c).

Electricity production, vehicular movements, and commercial and residential buildings using electricity generate criteria air pollutants and emissions. The project's impacts on air quality are considered.

Noise

The project location is adjacent to the GIWW, a heavily used maritime channel. Due to its location, the McFaddin NWR project area experiences ambient noise from marine transportation. Recreational and commercial waterborne traffic are common at the Lake Terraces site.

A.3.5.1.2 Biological Resources

The wetland habitats on the upper Texas coast provide important wintering and migration stopover habitat for migratory birds, including Central Flyway waterfowl, shorebirds, wading birds, and marsh and waterbirds. A complex of protected lands along the coast, including NWRs such as McFaddin and state-managed WMAs, serve as critical staging areas for waterfowl migrating to and from Mexico. The nearby Sabine-Neches estuary is a vital habitat for fish and shellfish species found in the Gulf.

Habitats

The coastal marshes of McFaddin NWR, including the project area, support many species of birds; fish; and other wildlife, such as the northern river otter, bobcat, gray fox, coyote, and American alligator. The NWR is a primary wintering area for Central Flyway ducks and geese and serves as a critical staging area for waterfowl migrating to and from Mexico and other locations. The McFaddin NWR is predominantly a saline-brackish marsh complex comprised of emergent marshes, shallow subtidal flats, and open water. These shallow flats support ecologically productive benthic communities that provide food sources for migratory waterfowl, estuarine fish and invertebrate species, and other marsh fauna. The southern edge of McFaddin NWR borders the Gulf. The low saline marsh landward of the beach ridge is dominated by smooth cordgrass and black rush. Upland brackish marsh is vegetated with saltmeadow cordgrass, saltgrass (*Distichlis spicata*), and saltmarsh bulrush (*Scirpus maritimus*).

Wildlife Species

Tidal brackish marshes and shallow open water are the primary habitats within the McFaddin NWR, including the project area. These habitats are critical for many species of plants, fish, birds, and other wildlife. Bird species, such as snowy egrets, great egrets, roseate spoonbills, yellow-crowned night herons, black-crowned night herons, and great blue herons use marsh as feeding habitat. The area also supports a large waterfowl population in the winter and a variety of year-round bird species. Wading birds and shorebirds utilize the mudflats and shallow marsh ponds located throughout the area. Wintering waterfowl include gadwall, northern pintail, lesser scaup, American widgeon, and blue-winged teal. Other birds such as clapper rail, seaside sparrows and other secretive marsh species use the marsh as well.

Marine and Estuarine Resources

The tidal marshes and shallow open water are the primary habitats within the project area. The wetland edge is a particularly important habitat for white and brown shrimp (Whaley and Minello 2002). Other marsh-dwelling species include blue crab, red drum, spotted seatrout, Atlantic croaker, southern flounder, and Gulf menhaden. Wetlands act as nurseries to hundreds of noncommercial species that comprise a large part of the estuarine food web. Invertebrates such as blue crab and brown and white shrimp are common in the region.

Protected Species

Threatened or Endangered Species

The threatened or endangered species that could potentially be affected are listed in Table A-15 (USFWS 2024). No activities related to implementation of the project would take place in any area designated as critical habitat.

Table A-14 Federal Threatened and Endangered Species Potentially Affected in the *McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration* Project Area

Common Name	Status
Piping plover	Threatened
Red knot	Threatened
Eastern black rail	Threatened
West Indian manatee	Threatened
Loggerhead sea turtle	Threatened
Green sea turtle	Threatened
Hawksbill sea turtle	Endangered
Leatherback sea turtle	Endangered
Kemp's ridley sea turtle	Endangered

The eastern black rail can be present anywhere suitable habitat is present along the Texas coast. Suitable habitat consists of high estuarine marsh and palustrine wet prairies containing dense perennial herbaceous wetland vegetation and proximity to shallow standing water (typically ≤3 cm) that may be ephemeral. No critical habitat has been designated for this species. Eastern black rails occur across an elevational gradient that lies between lower and wetter portions of the marsh and their adjacent uplands. These habitat gradients have gentle slopes so that wetlands can have large areas of shallow inundation (sheet water). Eastern black rails also require adjacent higher elevation areas (i.e., the wetland-upland transition zone) with dense cover to survive high water events. The dense vegetative cover allows movement underneath the canopy to avoid predators. The dense plant structure is more important than plant species composition in predicting habitat suitability. This project would have minimal benefits to black rail habitat.

The red knot and piping plover are winter residents on the Texas coast and occur in Jefferson County. Both species are known to use the shoreline of bays and mudflats. There is no critical habitat for red knot or piping plover in the McFaddin NWR.

The West Indian manatee has been found in Texas estuaries on rare occasions.

Loggerhead, green, hawksbill, leatherback, and Kemp's ridley sea turtles may be present in the project area.

EFH

Of the fish species considered by NMFS to potentially occur within the project area, EFH for these species consists of tidally influenced waters and tidally influenced marsh. Table A-16 provides a list of

managed EFH species in the Texas Point NWR Wetland Restoration project area, habitat preference, and life stage when they may be expected to occur (NMFS 2021).

Table A-15 EFH for Estuarine Habitats Within the *McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration* Project Area

Name	Larvae/ Eggs	Post-Larvae	Juvenile	Subadult	Adult	Habitat Type
Brown shrimp	X					Water column associated
Brown shrimp			X			Emergent marsh, soft bottom
Brown shrimp				X		Soft bottom
Pink shrimp			X	X		Soft bottom
White shrimp		X				Water column associated
White shrimp			X			Emergent marsh, soft bottom
White shrimp				X	X	Soft bottom
Red drum	X					Water column associated, soft bottom (larvae)
Red drum		X				Emergent marsh, soft bottom
Red drum			X			Emergent marsh (late juvenile), soft bottom
Red drum					X	Emergent marsh, soft bottom
Spanish mackerel			X		X	Estuarine, water column associated
Gray snapper					X	Soft bottom, emergent marsh
Cobia	X					Water column associated
Lane snapper	X	X				Water column associated
Lane snapper			X			Soft bottom

Marine Mammals

The only marine mammal regularly found in the adjacent GIWW is the bottlenose dolphin. There are infrequent reports of sightings of West Indian manatees in the nearby estuary.

Bald and Golden Eagles

Bald eagles potentially forage within the project location, and golden eagles may occasionally migrate through the project area.

Migratory Birds

Many species of birds spend all or a portion of their life cycle along the Gulf using a variety of habitats at different stages. Major groups of birds that inhabit the northern Gulf include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh-dwelling birds, and passerines. It is possible that birds protected under the MBTA and Texas Parks and Wildlife Code may nest in the project area.

A.3.5.1.3 Socioeconomic Resources

Socioeconomics

Jefferson County has a total population of 251,496, a decrease of 2% since 2020, based on the 2023 U.S. Census population estimates. Median household income (2018 to 2022) in Jefferson County is $57,294 (USCB 2024e).

Cultural Resources

Coordination under Section 106 of the NHPA will be initiated for the project. A preliminary analysis of the THC Atlas database indicated that no known historic sites or significant cultural, scientific, or historic resources exist in the area within the boundaries of the project area (THC 2024).

Infrastructure

According to the RRC Public GIS viewer (RRC 2020), no existing oil and gas infrastructure is present on the site. Additionally, the GLO Texas Sediment Geodatabase GIS viewer shows no buried natural gas and crude oil pipelines running under the site (GLO 2017). Further delineation of pipeline easements and restrictions may be developed during the final design stage of the site before construction.

Land and Marine Management

The McFaddin NWR encompasses 58,861 acres located in Jefferson County, Texas, on the upper Texas coast west of the Sabine-Neches estuary. The NWR is bounded on the south by the Gulf with approximately 20 miles of Gulf shoreline. It is bounded on the east by Sea Rim State Park. The GIWW forms part of the northern boundary, and it transects the northeastern portion of the NWR near where the Willow Lake Terraces site is located. The project area is not accessible to the public but is accessible by service road. The project area is managed by TPWD.

Tourism and Recreational Use

The McFaddin NWR marsh is managed by USFWS as part of the Texas Chenier Plain Refuge Complex, which also includes Texas Point, Jocelyn Nungaray, and Moody NWRs. Management includes use of the marsh for recreational fishing and waterfowl hunting. Hunting, fishing, hiking, and wildlife viewing are regularly enjoyed by the public in the McFaddin NWR.

Fisheries and Aquaculture

This area is an important nursery for marine and estuarine fishery species, including several that are important to the local economy. Recreational fishing in the area focuses on spotted seatrout, red drum, southern flounder, and other species. Commercially valuable species include brown shrimp, white shrimp, blue crab, black drum, and Gulf menhaden.

Land and Marine Transportation

McFaddin NWR is relatively remote with no public roads within its boundaries and limited pedestrian and water access. The site is adjacent to the GIWW.

Aesthetics and Visual Resources

The affected environment consists of the construction footprint of the project. The landscape in the vicinity of the proposed wetland restoration is characterized by a mosaic of saline and brackish marsh, elevated cheniers, and open water. The site is adjacent to the GIWW, a busy waterbody. The NWR is undeveloped and, other than the maritime traffic on the GIWW, the viewshed is dominated by the nature features of the area. There are no designated protected viewsheds in the vicinity of the project. Equipment and construction activities related to the restoration actions would be visible.

Public Health and Safety

The recreational users of the McFaddin NWR are accustomed to navigating the marsh via the existing channels and avoiding shallow areas and areas that contain obstructions. The immediate vicinity of the project area was historically brackish marsh, but it has since been predominated by open water primarily due to subsidence and relative sea level rise. This has had adverse impacts on coastal longevity and deleterious effects on the area's functionality as a buffer for storm surges.

A.3.5.2 Environmental Consequences

A.3.5.2.1 Physical Resources

Geology and Substrates

Short- and long-term, minor adverse impacts to geology and substrates could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands. Impacts from construction activities, use of heavy equipment, and trenching for sediment transport can cause direct localized and short-term, minor adverse impacts from sediment disturbance and compaction. Long-term, minor adverse impacts on the physical environment could occur from the placement of dredged material, which may affect sediment dynamics. Mitigation measures to minimize adverse impacts to geology and substrates could include employment of standard best practices for construction to reduce loss of sediments.

It is anticipated that the project would provide long-term benefits by restoring the area to a suitable elevation to sustain historical marsh habitat.

Hydrology and Water Quality

Short- and long-term, minor adverse impacts to hydrology and water quality could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands. The project would have short-term, minor adverse impacts to water quality from increased turbidity during construction activities and placement of fill material. Areas where dredged material would be placed for wetland restoration would be isolated from surrounding waters by temporary containment levees with weir structures to minimize the discharge of turbid water. These impacts would be localized to the project area and would be temporary in nature. The fill material would eventually settle in the placement area, and the turbidity due to project activities would no longer occur. Similar impacts due to turbidity at the borrow site would occur regardless of the implementation of the project because maintenance dredging is a routine activity of USACE and is scheduled independently of the project. Long-term, minor adverse

impacts may occur to the existing substrate due to placement of dredged materials. This may have long-term, minor adverse impacts to hydrology where tidal connectivity is modified per the project design. Measures to control turbidity and sediment movement would be in place to ensure water quality standards are met and sensitive resources are not affected. These measures may include appropriate water control structures to decant water and the installation of silt fences or curtains, hay bales, filter-fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement.

It is anticipated that the project would provide long-term benefits from the restoration and levee protection of the marsh. The project would maintain linkages within the broader coastal and nearshore ecosystem by facilitating the natural movement of water, sediments, energy, and nutrients among habitats.

Air Quality

Short-term, minor adverse impacts to air quality could occur due to vehicle emissions from equipment used during construction and monitoring. Engine exhaust from barges, boats, excavators, and equipment would contribute to an increase in emissions. Best practices would be considered and applied, where appropriate and practical, to reduce the release of emissions. Best practices considered could include the deployment of energy-efficient machinery and equipment, the incorporation of anti-idling procedures, and/or the use of gasoline rather than diesel. Adverse impacts to air quality would be short-term, occurring only during active construction.

It is anticipated that the project would provide long-term benefits for air quality. Wetland and marsh soils are important sinks for carbon sequestration. Reconstruction of marsh habitat and revegetation of newly deposited sediments would capture carbon and provide enduring environmental benefits.

Noise

Short-term, minor adverse impacts to soundscapes could occur due to noise from construction activities. Heavy equipment can cause direct localized and minor adverse impacts due to noise. This impact would be short term, limited to the period of construction. Mitigation measures to reduce adverse impacts due to noise could include timing noise-producing activities to minimize disturbance to nesting birds. All placement of dredged material would occur in the interior of the McFaddin NWR and would not be directly adjacent to residential areas.

A.3.5.2.2 Biological Resources

Habitats

Short-term, minor-to-moderate adverse impacts to the habitat could occur due to the conversion of shallow open water to intertidal marsh habitat.

It is anticipated that the project would provide long-term benefits to the local ecosystem. Mosaics of shallow open water and vegetated marsh have been shown to have higher ecologic function than either of these habitats in isolation (Whaley and Minello 2002). Therefore, the final design would ensure adequate shallow open water would remain in the project area to maintain the synergies between these two habitats.

Wildlife Species

Short-term, minor-to-moderate adverse impacts to wildlife species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important wildlife species. The creation of additional marsh habitat provides benefits for a number of marsh wildlife and is anticipated to benefit the local ecosystem, enhancing the food web and supporting many ecologically and economically important wildlife species.

Marine and Estuarine Resources

Short-term, minor-to-moderate adverse impacts to marine and estuarine species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important marine and estuarine fauna. The creation of additional marsh habitat provides benefits for a number of marsh dependent marine and estuarine fauna and is anticipated to benefit the local ecosystem, enhancing the food web and supporting ecologically and economically important marine and estuarine fauna

Protected Species

There would be short- and long-term, minor adverse impacts to protected species. Impacts to wildlife would be avoided via management guidelines and techniques as appropriate. Best practices, including the *Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS 2006) and *Measures for Reducing Entrapment Risk to Protected Species* (NMFS 2012), would be followed during levee construction to avoid entrapping marine mammals and other resources.

During construction, there would be short-term, minor adverse impacts to EFH through dredged material deposition and increased turbidity. Long-term, minor adverse impacts could include conversion of one wetland vegetation type to another with changes in the distribution of fauna communities. These impacts are expected to be confined to the immediate vicinity of the project, and best practices would likely be implemented to minimize adverse impacts.

Long-term benefits to EFH would occur from the improvement of habitat for commercially important prey species. The creation of additional estuarine marsh generates additional EFH that is anticipated to benefit the local ecosystem by enhancing the food web and supporting many ecologically and economically important fish species. Many of the species that directly utilize coastal estuarine marshes as juveniles later migrate offshore, where they serve as prey for ecologically and economically important open-ocean species. Thus, these highly productive habitats support ecological connectivity both within the coastal ecosystem and between the coastal, nearshore, and open-ocean ecosystems through the movement of species that use wetlands during their life cycle to grow and reproduce.

Placement of BUDM to create estuarine emergent marsh would have a long-term beneficial effect on the habitat's ability to support sea turtles, West Indian manatees, and eastern black rails. The proposed project aims to restore estuarine emergent marsh, which would protect and improve sensitive resources utilized by these species. In addition, the proposed project would improve water quality by reducing sedimentation from subsidence and coastal erosion into the GIWW and shallow bay systems utilized by sea turtles and West Indian manatees. Long-term effects of project construction activities are considered to be beneficial to the eastern black rail, as this is an estuarine marsh restoration project,

which would ultimately protect and enhance thousands of acres of suitable eastern black rail foraging and nesting habitat.

The project has been designed to meet the marsh creation, maintenance, or enhancement PDC described in NMFS' *Framework Biological Opinion on Final PDARP/PEIS* (NMFS 2016), which considers where construction would occur, construction methodologies, best practices that would be implemented, and reporting requirements (NMFS 2016). Best practices included in NMFS' *Measures for Reducing the Entrapment Risk to Protected Species* (NMFS 2012) would be followed to avoid and minimize impact to protected sea turtle species. Additionally, either a hydraulic cutter-head dredge or clamshell dredge would be used to place sediments into the project site, because these do not pose a risk to pelagic aquatic organisms, such as sea turtles. A hydraulic dredge pipeline would transport material to the placement area. The dredge pipeline would be routed to avoid disturbance to sensitive resource areas, if identified along the pipeline route. Any areas containing such resources in the construction area and pipeline route would be protected using best practices such as hay bales, silt fences, or other appropriate methods.

Efforts would be made to avoid construction activities during the nesting season for protected migratory birds (February 15 through July 31). However, if construction activities occur during the nesting season, the area affected by project activities would be surveyed for the presence of nesting birds by a qualified biologist. If nesting birds are present or indications of pre-nesting behavior are observed, appropriate best practices would be employed to ensure that no incidental take of any individuals occurs. Best practices may include signage, exclusion zones for workers and equipment, hazing, and deterrents. Best practice activities would be coordinated with USFWS and TPWD biologists.

A.3.5.2.3 Socioeconomic Resources

Socioeconomics

No adverse short- or long-term impacts to socioeconomics are anticipated.

This restoration project would help restore an environment that benefits all citizens, populations, and groups in the region. The project would have a positive, beneficial socioeconomic impact on surrounding communities. No residential communities are located adjacent to the project. As a result, there would be no potential for short-term impacts from construction.

Cultural Resources

No adverse short- or long-term impacts to cultural resources are anticipated.

A complete review of the project under Section 106 of the NHPA would be completed prior to implementation of regulated project activities to develop practices that would avoid, minimize, or mitigate any adverse effects on historic properties located within the project area. The project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. If culturally or historically important resources are identified during project preparations or pre-deployment surveys, consultation would be re-initiated.

Infrastructure

No adverse short- or long-term impacts to infrastructure are anticipated.

The project is not anticipated to affect energy production, transport, or infrastructure. The project is anticipated to have no impact to infrastructure because new infrastructure would not be built, and

existing infrastructure in the area would be avoided to the extent practicable. Final E&D would include measures to avoid, as much as practicable, known oil and gas pipelines in the McFaddin NWR.

Land and Marine Management

No adverse short- or long-term impacts to land and marine management are anticipated.

The project is anticipated to have no impact to land and marine management because the project would be consistent with the prevailing management, practices, plans, and direction governing the use of the areas where restoration actions would take place.

Tourism and Recreational Use

Short-term, minor adverse impacts to tourism and recreational use could occur due to limits on recreational activities near the construction area and temporary increases in road traffic due to movement of construction vehicles. In addition, recreational opportunities would be limited during the construction period and while the marsh is revegetating.

It is anticipated that the project would provide long-term benefits to recreationists through enhanced experiences for wildlife viewing, kayaking, canoeing, hunting, fishing, and other activities. Long-term benefits would come from restoring the nursery habitat of many recreationally important fish species which, in turn, would benefit recreational fishing in the area. Benefits to the local economy could accrue through an increase in employment and associated spending in the project area during construction and increased expenditures due to increased recreational visitation following completion of the restoration project.

Fisheries and Aquaculture

Short-term, minor adverse impacts to fisheries could occur due to construction activities such as dredging, addition of sediments or borrow materials, and removal of sediments.

It is anticipated that the project would provide long-term benefits to the public through increased fishing opportunities (both commercial and recreational) from restoring coastal habitats that benefit fish. Long-term benefits would arise from the improvement of habitat for commercially important brown and white shrimp fisheries and the recreational red drum fishery. To the extent that these increased recreational opportunities result in increased visitation, local businesses may benefit from visitors' increased expenditures.

Land and Marine Transportation

No adverse short- or long-term impacts to land and marine transportation are anticipated.

Since there is minimal access to the site, there would be no impact to land-based traffic. Shipping and boating routes would be identified prior to the beneficial use operations to prevent any impacts to marine transportation. It is expected that activities would not significantly interrupt the GIWW traffic. Most of the commercial traffic takes place on a routine schedule and construction activities would be timed to reduce interference with commercial operators. The dredged material pipeline route would be clearly marked to avoid vessel strikes to the pipeline.

Aesthetics and Visual Resources

Short-term, minor-to-moderate adverse impacts to aesthetics and visual resources could occur due to the presence of construction equipment and the barren, muddy appearance during the revegetation period.

It is anticipated that the project would provide long-term benefits to the area's aesthetics and visual resources. The creation of marsh habitat and planting of vegetation would improve the overall viewscape of the project area. In addition, the new habitat is anticipated to attract additional birds and wildlife, which could be enjoyed by recreational users of the area.

Public Health and Safety

No adverse short- or long-term impacts to public health and safety are anticipated.

Due to the location and nature of the project area, no adverse impacts to public health and safety are anticipated as a result of this project. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. Best practices in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport, and disposal of all hazardous substances. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. Due to the potential increase in small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure water related accidents and conflicts are minimized.

A.3.6 San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration

The project site is located on the San Bernard NWR, which is managed by USFWS. Dredged material would provide fill for a contained placement area within the abandoned oil field adjacent to the GIWW to restore up to 200 acres of intertidal marsh.

The predominant wetland habitats in the project area are characterized as salt and brackish marsh and estuarine open water. Over the past several decades, the vegetated marsh at the site has deteriorated, resulting in the expansion of shallow open water. The combination of rising sea levels, subsidence, and reduced sediment supplies has resulted in significant loss of wetlands and other coastal habitats in the region. This project is consistent with regional efforts to combat land and habitat loss through beach renourishment, dune restoration, hydrology enhancements, and estuarine marsh restoration.

The overarching goal of the project is to restore and conserve wetlands and coastal habitats in the Sargent Oil Field by beneficially using dredged material to create a viable, vegetated, wetland habitat for fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage. The primary objective of this project is to restore shallow open water to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 120,000 cy of

suitable hydraulically dredged material within levees constructed from on-site sediment. Dredge material would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 200 acres of marsh habitat, including the conversion of up to 119 acres of existing open water to low marsh (Figure A-7).

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the GIWW, private dredging sources, and material mined from dredged material placement areas. The specific sources of dredged material would be determined during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source. Resources of the affected environment are described in Section A.3.6.1; project-level environmental consequences are summarized in Table A-17 and described in Section A.3.6.2.

This section presents the affected resources of the *San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration* project and the environmental consequences of the proposed actions in context of the project-specific affected environment.

The description and analysis of the project are based on the 60% basis of design concepts developed under the *Texas Dredged Material Planning for Wetland Restoration* project authorized in RP/EA #1. Throughout the completion of the 100% designs under this process, every practical attempt would be made to avoid and minimize potentially adverse environmental and cultural resource impacts. The following descriptions for each of the construction elements are preliminary and based on current planning efforts and resource agency experience with similar marsh restoration projects. Although the Texas TIG does not consider it likely, it is possible that the 100% E&D process could generate a plan that has adverse environmental impacts that are different in type or magnitude from those discussed in this document. If that is the case, the Texas TIG would consider whether further environmental impacts analysis would be necessary.

The impacts from the project are anticipated to be largely beneficial, and the adverse impacts would generally be short-term and minor to moderate (Table A-17). Benefits to the biological, physical, human uses and socioeconomics environment would result if the project was implemented. Best practices required in the permit, consultations, or environmental analyses would be followed. Additionally, best practices described in Appendix 6.A of the Final PDARP/PEIS would be considered and applied where appropriate to reduce or eliminate adverse impacts to the environment.



Figure A-7 **Location of Proposed Restoration Areas for the *San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration* Project**

Table A-16 Summary of Adverse and Beneficial Impacts from Implementation of *the San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration* Project

Resource Categories	Resource Subcategories	Benefits	Adverse Short Term	Adverse Long Term
Physical Resources	Geology and substrates	Yes	Minor	Minor
	Hydrology and water quality	Yes	Minor	Minor
	Air quality	Yes	Minor	NE
	Noise	NE	Minor	NE
Biological Resources	Habitats	Yes	Minor to moderate	NE
	Wildlife species	Yes	Minor to moderate	NE
	Marine and estuarine resources	Yes	Minor to moderate	NE
	Protected species	Yes	Minor	Minor
Socioeconomic Resources	Socioeconomics	Yes	NE	NE
	Cultural resources	NE	NE	NE
	Infrastructure	NE	NE	NE
	Land and marine management	NE	NE	NE
	Tourism and recreational use	Yes	Minor	NE
	Fisheries and aquaculture	Yes	Minor	NE
	Land and marine transportation	NE	NE	NE
	Aesthetics and visual resources	Yes	Minor to moderate	NE
	Public health and safety	NE	NE	NE

Notes:
Adverse short-term and long-term effects are designated as minor, moderate, or major.
NE: no effect
Yes: Would provide benefits

A.3.6.1 Affected Environment

A.3.6.1.1 Physical Resources

Geology and Substrates

The San Bernard NWR Sargent Oil Field is located in the Texas coastal plain, which is underlain by a complex assemblage of fluvial, deltaic, estuarine, and marine-influenced deposits that make up two Pleistocene formations: the younger Beaumont Formation and the older Lissie Formation. Geophysical data suggest that the strata within these two formations represent multiple episodes of deposition, erosion, and soil formation (Paine et al. 2018). Surface geology is of the late Pleistocene Beaumont Formation and younger deposits. The Beaumont Formation was deposited as a large alluvial plain, after which sea levels fell during a period of glacial advance. A period of erosion then followed, with incision of stream channels. At the end of the last glacial period, as sea levels rose again, the area was flooded,

and a series of estuaries and bays formed. The soils currently feature river floodplain muds and fluvial-deltaic sands (Thomas and Durkin 2012).

The BUDM restoration technique emulates riverine deltaic and other coastal sediment processes that have been interrupted by human alterations to the land and seascape. Emulating these natural accretion processes is a useful restoration tool to restore valuable coastal habitats where the rate of relative sea level rise exceeds accretion.

Hydrology and Water Quality

The *San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration* project area is within the East Matagorda Bay watershed (Hydrologic Unit Code 120904020400), and flows into Reservoir Segment 2501 and Stream Segment 1304. Surface water quality in the region is influenced by industrial and agricultural practices and saltwater intrusion. The movement of saltwater from the Gulf and bays inland through the bayou and marsh systems varies depending upon tidal action, storms, and storm runoff. Channel construction, including the GIWW and channelization of natural waterways such as the MSC, has facilitated the movement of saltwater further inland than what occurred historically or what would occur under natural conditions.

The portion of the GIWW that is adjacent to the project site is not a designated stream segment and historic water quality data is not available. However, the 2022 Water Quality Inventory documents that East Matagorda Bay (Stream Segment 2441), located near the western edge of the project site, fully supports aquatic life, contact recreation, and general uses (TCEQ 2022). The Texas Surface Water Quality Standards classify East Matagorda Bay as suitable for primary contact recreation, and its waters are designated excellent aquatic life (30 TAC Section 307.10(1), Appendix A).

Air Quality

San Bernard NWR is located in the Houston-Galveston-Brazoria Air Quality Control Region (TCEQ Region 12). The Region is in nonattainment for 8-hour ozone (TCEQ 2021a).

Electricity production, vehicular movements, and commercial and residential buildings using electricity generate criteria air pollutants and emissions. The project's impacts on air quality are considered.

Noise

The project location is adjacent to the GIWW. Due to its location, project area experiences the ambient noise of marine transportation. Recreational and commercial waterborne traffic are common around the San Bernard NWR Sargent Oil Field project area.

A.3.6.1.2 Biological Resources

San Bernard NWR includes an important coastal marsh wilderness that provides habitat for millions of migrating and nesting birds, including over 230 different species annually. Some of these include geese, herons, egrets, terns, and gulls, and neotropical bird species. Terrestrial habitats support mammals, such as bobcats, and reptiles, such as alligators. Marine habitats comprise estuaries that support fish and shellfish (such as reefs of colonial oysters) and supply a feeding ground for adult fish and crabs (Houston-Galveston Area Council 2012).

Habitats

The physical components of the site currently provide habitat for a variety of coastal plants and animals. The marsh vegetation occurs in somewhat distinct communities within the site. Smooth cordgrass

dominates within the open-water area and those that are most tidally affected. The saltier flats that are intermittently flooded in the southeastern portion of the area are dominated by saltwort. Vegetation in the eastern and northern portions of the site are dominated by saltgrass in the intermittently flooded sites and transitions to Gulf cordgrass as the elevation rises. The site provides migrating and wintering habitat for migratory waterfowl and provides year-round habitat for resident mottled ducks.

Wildlife Species

Tidal marshes and shallow open water are the primary habitats within the project area. These habitats are critical for many species of plants, fish, birds, and other wildlife. Bird species, such as snowy egrets, great egrets, roseate spoonbills, yellow-crowned night herons, black-crowned night herons, and great blue herons use marsh as feeding habitat. The area also supports a large waterfowl population in the winter and a variety of year-round bird species. Wading birds and shorebirds utilize the mudflats and shallow marsh ponds located throughout the area. Wintering waterfowl include gadwall, northern pintail, lesser scaup, American widgeon, and blue-winged teal. Other birds such as clapper rail, seaside sparrows and other secretive marsh species use the marsh as well.

Saline marshes and shallow open water are the primary habitats within the project area. These habitats are critical for many species of plants, fish, birds, and other wildlife. The wetland edge is a particularly important habitat for white and brown shrimp (Whaley and Minello 2002). Other marsh-dwelling species include blue crab, red drum, spotted seatrout, Atlantic croaker, southern flounder, and Gulf menhaden. Wetlands act as nurseries to hundreds of noncommercial species that comprise a large part of the estuarine food web.

Bird species such as snowy egrets, great egrets, roseate spoonbills, yellow-crowned night herons, black-crowned night herons, and great blue herons use marsh as feeding habitat. The area also supports a large waterfowl population in the winter and a variety of year-round bird species. Wading birds and shorebirds utilize the mudflats and shallow marsh ponds located throughout the area. Wintering waterfowl include gadwall, northern pintail, lesser scaup, American widgeon, and blue-winged teal. Other birds such as king rail, seaside sparrow, and other secretive marsh species use the marsh as well.

Marine and Estuarine Resources

Tidal marshes and shallow open water are the primary habitats within the project area. The wetland edge is a particularly important habitat for white and brown shrimp (Whaley and Minello 2002). Other marsh-dwelling species include blue crab, red drum, spotted seatrout, Atlantic croaker, southern flounder, and Gulf menhaden. Wetlands act as nurseries to hundreds of noncommercial species that comprise a large part of the estuarine food web. Invertebrates such as blue crab and brown and white shrimp are common in the region.

Protected Species

Threatened or Endangered Species

The threatened or endangered species that could potentially be affected are listed in Table A-18 (USFWS 2024). No activities related to implementation of the project would take place in any area designated as critical habitat.

Table A-17 Federal Threatened and Endangered Species Potentially Affected in the *San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration* Project Area

Common Name	Status
Piping plover	Threatened
Red knot	Threatened
Eastern black rail	Threatened
Whooping crane	Endangered
West Indian manatee	Threatened
Loggerhead sea turtle	Threatened
Green sea turtle	Threatened
Hawksbill sea turtle	Endangered
Leatherback sea turtle	Endangered
Kemp's ridley sea turtle	Endangered

The last wild flock of whooping cranes winters on the Texas coast in the area around San Antonio Bay, southwest of East Matagorda Bay. The construction activities for the project are unlikely to affect whooping cranes, which usually inhabit an area west of the project on Blackjack Peninsula in Aransas NWR.

The eastern black rail can be present anywhere suitable habitat is present along the Texas coast. Suitable habitat consists of high estuarine marsh and palustrine wet prairies containing dense perennial herbaceous wetland vegetation and proximity to shallow standing water (typically ≤3 cm) that may be ephemeral. No critical habitat has been designated for this species. Eastern black rails occur across an elevational gradient that lies between lower and wetter portions of the marsh and their adjacent uplands. These habitat gradients have gentle slopes so that wetlands can have large areas of shallow inundation (sheet water). Eastern black rails also require adjacent higher elevation areas (i.e., the wetland-upland transition zone) with dense cover to survive high water events. The dense vegetative cover allows movement underneath the canopy to avoid predators. The dense plant structure is more important than plant species composition in predicting habitat suitability. This project would have minimal benefits to black rail habitat.

The red knot and piping plover are winter residents on the Texas coast and occur in Matagorda County. Both species are known to use the shoreline of bays and mudflats. There is no critical habitat for piping plover or red knot in San Bernard NWR.

The West Indian manatee has been found in Texas estuaries on rare occasions.

Loggerhead, green, hawksbill, leatherback, and Kemp's ridley sea turtles may be present in the project area.

EFH

Of the fish species considered by NMFS to potentially occur within the project area, EFH for these species consists of tidally influenced waters and tidally influenced marsh. Table A-19 provides a list of

managed EFH species in the project area, habitat preference, and life stage when they may be expected to occur (NMFS 2021).

Table A-18 EFH for Estuarine Habitats Within the *San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration* Project Area

Name	Larvae/ Eggs	Post-Larvae	Juvenile	Subadult	Adult	Habitat Type
Brown shrimp	X					Water column associated
Brown shrimp			X			Emergent marsh, soft bottom
Brown shrimp				X		Soft bottom
Pink shrimp			X	X		Soft bottom
White shrimp		X				Water column associated
White shrimp			X			Emergent marsh, soft bottom
White shrimp				X	X	Soft bottom
Red drum	X					Water column associated, soft bottom (larvae)
Red drum		X				Emergent marsh, soft bottom
Red drum			X			Emergent marsh (late juvenile), soft bottom
Red drum					X	Emergent marsh, soft bottom
Spanish mackerel			X		X	Estuarine, water column associated
Gray snapper					X	Soft bottom, emergent marsh
Cobia	X					Water column associated
Lane snapper	X	X				Water column associated
Lane snapper			X			Soft bottom

Marine Mammals

The only marine mammal regularly found in East Matagorda Bay is the bottlenose dolphin. There are infrequent reports of sightings of West Indian manatees in this part of the Texas coast.

Bald and Golden Eagles

Bald eagles potentially forage within the project location, and golden eagles may occasionally migrate through the project area.

Migratory Birds

Many species of birds spend all or a portion of their life cycle along the Gulf using a variety of habitats at different stages. Major groups of birds that inhabit the northern Gulf include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh-dwelling birds, and passerines. It is possible that birds protected under the MBTA and Texas Parks and Wildlife Code may nest in the project area.

A.3.6.1.3 Socioeconomic Resources

Socioeconomics

Matagorda County has a total population of 36,359, an increase of 0.3% since 2020, based on the 2023 U.S. Census population estimates. Median household income (2018 to 2022) in Matagorda County is $56,412 (USCB 2024f).

Cultural Resources

Coordination under Section 106 of the NHPA will be initiated for the project. A preliminary analysis of the THC Atlas database indicated that no known historic sites or significant cultural, scientific, or historic resources exist in the area within the boundaries of the project area (THC 2024).

Infrastructure

According to the RRC GIS viewer (RRC 2020), some active and decommissioned natural gas wells and pipelines lie in close proximity to the proposed site. Additionally, the GLO Texas Sediment Geodatabase GIS viewer shows buried pipelines running near the site (GLO 2017). Care was taken to avoid this infrastructure with the proposed 60% design. Further delineation of pipeline easements and restrictions may be developed during the final design stage of the site before construction.

Land and Marine Management

The San Bernard NWR encompasses 54,000 acres located in Brazoria and Matagorda counties, Texas. The project area is in the western part of the refuge, which is bordered on the south by the GIWW. The community of Sargent is located adjacent to its western boundary. The project area is not accessible by the public but is accessible by service roads. The NWR is managed by USFWS.

Tourism and Recreational Use

The San Bernard NWR is managed by USFWS as part of the Texas Mid-Coast Refuge Complex, which also includes Brazoria and Big Boggy NWRs. Management includes use of the marsh for recreational fishing and waterfowl hunting. Hunting, fishing, hiking, and wildlife viewing are regularly enjoyed by the public in the San Bernard NWR.

Fisheries and Aquaculture

This area is an important nursery for marine and estuarine fishery species, including several that are important to the local economy. Recreational fishing in the area focuses on spotted seatrout, red drum, southern flounder, and other species. Commercially valuable species include brown shrimp, white shrimp, blue crab, black drum, and Gulf menhaden.

Land and Marine Transportation

The project area has no public roads within its boundaries and limited pedestrian and water access. The site is adjacent to the commercially important GIWW.

Aesthetics and Visual Resources

The affected environment consists of the construction footprint of the project. The landscape in the vicinity of the proposed wetland restoration is characterized by a mosaic of saline and brackish marsh and open water. The site is adjacent to the GIWW, a busy maritime channel. There are no designated protected viewsheds in the vicinity of the project. Equipment and construction activities related to the restoration actions would be visible.

Public Health and Safety

The recreational users of the San Bernard NWR are accustomed to navigating the marsh via the existing channels and avoiding shallow areas and areas that contain obstructions. The immediate vicinity of the project area was historically salt and brackish marsh, but it has since been inundated primarily due to subsidence and relative sea level rise. This has had adverse impacts on coastal longevity and deleterious effects on the area's functionality as a buffer for storm surges.

A.3.6.2 Environmental Consequences

A.3.6.2.1 Physical Resources

Geology and Substrates

Short- and long-term, minor adverse impacts to geology and substrates could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands. Impacts from construction activities, use of heavy equipment, and trenching for sediment transport can cause direct localized and short-term, minor adverse impacts from sediment disturbance and compaction. Long-term, minor adverse impacts on the physical environment could occur from the placement of dredged material, which may affect sediment dynamics. Mitigation measures to minimize adverse impacts to geology and substrates could include employment of standard best practices for construction to reduce loss of sediments.

It is anticipated that the project would provide long-term benefits by restoring the area to a suitable elevation to sustain historical marsh habitat.

Hydrology and Water Quality

Short- and long-term, minor adverse impacts to hydrology and water quality could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands. The project would have short-term, minor adverse impacts to water quality from increased turbidity during construction activities and placement of fill material. Areas where dredged material would be placed for wetland restoration would be isolated from surrounding waters by temporary containment levees with weir structures to minimize the discharge of turbid water. These impacts would be localized to the project area and would be temporary in nature. The fill material would eventually settle in the placement area, and the turbidity due to project activities would no longer occur. Similar impacts due to turbidity at the borrow site would occur regardless of the implementation of the project because maintenance dredging of the GIWW is a routine activity of USACE and is scheduled independently of the project. Long-term, minor adverse impacts may occur to the existing substrate due to placement of dredged materials. This may have long-term, minor, adverse impacts to hydrology where tidal connectivity is modified per the project design. Measures to control turbidity and sediment movement would be in place to ensure water quality standards are met and sensitive resources are not affected. These measures may include appropriate water control structures to decant water and the installation of silt fences or curtains, hay

bales, filter-fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement.

It is anticipated that the project would provide long-term benefits from the restoration and levee protection of the marsh. The project would maintain linkages within the broader coastal and nearshore ecosystem by facilitating the natural movement of water, sediments, energy, and nutrients among habitats.

Air Quality

Short-term, minor adverse impacts to air quality could occur due to vehicle emissions from. Equipment used during construction and monitoring. Engine exhaust from barges, boats, excavators, and equipment would contribute to an increase in emissions. Best practices would be considered and applied, where appropriate and practical to reduce the release of emissions. Best practices considered could include the deployment of energy-efficient machinery and equipment, the incorporation of anti-idling procedures, and/or the use of gasoline rather than diesel. Adverse impacts to air quality would be short-term, occurring only during active construction.

It is anticipated that the project would provide long-term benefits for air quality. Wetland and marsh soils are important sinks for carbon sequestration. Reconstruction of marsh habitat and revegetation of newly deposited sediments would capture carbon and provide enduring environmental benefits.

Noise

Short-term, minor adverse impacts to soundscapes could occur due to noise from construction activities. Heavy equipment can cause direct localized and minor adverse impacts due to noise. This impact would be short term and limited to the period of construction. Mitigation measures to reduce adverse impacts due to noise could include timing noise-producing activities to minimize disturbance to nesting birds. All placement of dredged material would occur in the interior of the San Bernard NWR and would not be directly adjacent to residential areas.

A.3.6.2.2 Biological Resources

Habitats

Short-term, minor-to-moderate adverse impacts to habitats could occur due to the conversion of shallow open water to intertidal marsh habitat.

It is anticipated that the project would provide long-term benefits to the local ecosystem. Mosaics of shallow open water and vegetated marsh have been shown to have higher ecologic function than either of these habitats in isolation (Whaley and Minello 2002). Therefore, the final design would ensure adequate shallow open water would remain in the project area to maintain the synergies between these two habitats.

Wildlife Species

Short-term, minor-to-moderate adverse impacts to wildlife species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important wildlife species. The creation of additional marsh habitat provides benefits for a

number of marsh wildlife and is anticipated to benefit the local ecosystem, enhancing the food web and supporting many ecologically and economically important wildlife species.

Marine and Estuarine Resources

Short-term, minor-to-moderate adverse impacts to marine and estuarine species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important marine and estuarine fauna. The creation of additional marsh habitat provides benefits for a number of marsh dependent marine and estuarine fauna and is anticipated to benefit the local ecosystem, enhancing the food web and supporting ecologically and economically important marine and estuarine fauna.

Protected Species

There would be short- and long-term, minor adverse impacts to protected species. Impacts to wildlife would be avoided via management guidelines and techniques as appropriate. Best practices, including the *Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS 2006) and *Measures for Reducing Entrapment Risk to Protected Species* (NMFS 2012), would be followed during levee construction to avoid entrapping marine mammals and other resources.

During construction, there would be short-term, minor adverse impacts to EFH through dredged material deposition and increased turbidity. Long-term, minor impacts could include conversion of one wetland vegetation type to another with changes in the distribution of fauna communities. These impacts are expected to be confined to the immediate vicinity of the project and best practices would likely be implemented to minimize adverse impacts.

Long-term benefits to EFH would occur from the improvement of habitat for commercially important prey species. The creation of additional estuarine marsh generates additional EFH that is anticipated to benefit the local ecosystem by enhancing the food web and supporting many ecologically and economically important fish species. Many of the species that directly utilize coastal estuarine marshes as juveniles later migrate offshore, where they serve as prey for ecologically and economically important open-ocean species. Thus, these highly productive habitats support ecological connectivity both within the coastal ecosystem and between the coastal, nearshore, and open-ocean ecosystems through the movement of species that use wetlands during their life cycle to grow and reproduce.

Placement of BUDM to create estuarine emergent marsh would have a long-term beneficial effect on the habitat's ability to support sea turtles, West Indian manatees, and eastern black rails. The proposed project aims to restore estuarine emergent marsh, which would protect and improve sensitive resources utilized by these species. In addition, the proposed project would improve water quality by reducing sedimentation from subsidence and coastal erosion into the GIWW and shallow bay systems utilized by sea turtles and West Indian manatees. Long-term effects of project construction activities are considered to be beneficial to the eastern black rail, as this is an estuarine marsh restoration project, which would ultimately protect and enhance thousands of acres of suitable eastern black rail foraging and nesting habitat.

The project has been designed to meet the marsh creation, maintenance, or enhancement PDC described in NMFS' *Framework Biological Opinion on Final PDARP/PEIS* (NMFS 2016), which considers where construction would occur, construction methodologies, best practices that would be

implemented, and reporting requirements (NMFS 2016). Best practices included in NMFS' *Measures for Reducing the Entrapment Risk to Protected Species* (NMFS 2012) would be followed to avoid and minimize impact to protected sea turtle species. Additionally, either a hydraulic cutter-head dredge or clamshell dredge would be used to place sediments into the project site, because these do not pose a risk to pelagic aquatic organisms, such as sea turtles. A hydraulic dredge pipeline would transport material to the placement area. The dredge pipeline would be routed to avoid disturbance to sensitive resource areas, if identified along the pipeline route. Any areas containing such resources in the construction area and pipeline route would be protected using BMPs such as hay bales, silt fences, or other appropriate methods.

Efforts would be made to avoid construction activities during the nesting season for protected migratory birds (February 15 through July 31). However, if construction activities occur during the nesting season, the area affected by project activities would be surveyed for the presence of nesting birds by a qualified biologist. If nesting birds are present or indications of pre-nesting behavior are observed, appropriate best practices would be employed to ensure that no incidental take of any individuals occurs. Best practices may include signage, exclusion zones for workers and equipment, hazing, and deterrents. Best practice activities would be coordinated with USFWS and TPWD biologists.

A.3.6.2.3 Socioeconomic Resources

Socioeconomics

No adverse short- or long-term impacts to socioeconomics are anticipated.

This restoration project would help restore an environment that benefits all citizens, populations, and groups in the region. The project would have a positive, beneficial socioeconomic impact on surrounding communities.

Cultural Resources

No adverse short- or long-term impacts to cultural resources are anticipated.

A complete review of the project under Section 106 of the NHPA would be completed prior to implementation of regulated project activities to develop practices that would avoid, minimize, or mitigate any adverse effects on historic properties located within the project area. The project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. If culturally or historically important resources are identified during project preparations or pre-deployment surveys, consultation would be re-initiated.

Infrastructure

No adverse short- or long-term impacts to infrastructure are anticipated.

The project is not anticipated to affect energy production, transport, or infrastructure. The project is anticipated to have no impact to infrastructure because new infrastructure would not be built, and existing infrastructure in the area would be avoided to the extent practicable. Final E&D would include measures to avoid, as much as practicable, known oil and gas pipelines in the San Bernard NWR.

Land and Marine Management

No adverse short- or long-term impacts to land and marine management are anticipated.

The proposed action is anticipated to have no impact to land and marine management because the project would be consistent with the prevailing management, practices, plans, and direction governing the use of the areas where restoration actions would take place.

Tourism and Recreational Use

Short-term, minor adverse impacts to tourism and recreational use could occur due to limits on recreational activities near the construction area and temporary increases in road traffic due to movement of construction vehicles. In addition, recreational opportunities would be limited during the construction period and while the marsh is revegetating.

It is anticipated that the project would provide long-term benefits to recreationists through enhanced experiences for wildlife viewing, kayaking, canoeing, hunting, fishing, and other activities. Long-term benefits would come from restoring the nursery habitat of many recreationally important fish species, which would benefit recreational fishing in the area. Benefits to the local economy could accrue through an increase in employment and associated spending in the project area during construction and increased expenditures due to increased recreational visitation following completion of the restoration project.

Fisheries and Aquaculture

Short-term, minor adverse impacts to fisheries could occur due to construction activities such as dredging, addition of sediments or borrow materials, and removal of sediments.

It is anticipated that the project would provide long-term benefits to the public through increased fishing opportunities (both commercial and recreational) by restoring coastal habitats that benefit fish. Long-term benefits would arise from the improvement of habitat for commercially important brown and white shrimp fisheries and the recreational red drum fishery. To the extent that these increased recreational opportunities result in increased visitation, local businesses may benefit from visitors' increased expenditures.

Land and Marine Transportation

No adverse short- or long-term impacts to land and marine transportation are anticipated.

Since there is minimal access to the site, there would be no impact to land-based traffic. Shipping and boating routes would be identified prior to the beneficial use operations to prevent any impacts to marine transportation. It is expected that activities would not significantly interrupt the GIWW traffic. Most of the commercial traffic takes place on a routine schedule, and construction activities would be timed to reduce interference with commercial operators. The dredged material pipeline route would be clearly marked to avoid vessel strikes to the pipeline.

Aesthetics and Visual Resources

Short-term, minor-to-moderate adverse impacts to aesthetics and visual resources could occur due to the presence of construction equipment and the barren, muddy appearance during the revegetation period.

It is anticipated that the project would provide long-term benefits to the area's aesthetics and visual resources. The creation of marsh habitat and planting of vegetation would improve the overall viewscape of the project area. In addition, the new habitat is anticipated to attract additional birds and wildlife, which could be enjoyed by recreational users of the area.

Public Health and Safety

No adverse short- or long-term impacts to public health and safety are anticipated.

Due to the location and nature of the project area, no adverse impacts to public health and safety are anticipated as a result of this project. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. Best practices in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport and disposal of all hazardous substances. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. Due to the potential increase in small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure water related accidents and conflicts are minimized.

A.3.7 Schicke Point Wetland Restoration

The project site is located adjacent to Schicke Point, which is a peninsula separating Matagorda Bay and Carancahua Bay. A segmented rubble-mound breakwater was constructed along the shoreline facing Matagorda Bay in 2017. Dredged material would provide sediment to restore up to 72 acres of intertidal marsh behind the existing breakwater.

Over the past several decades, the marsh portion of the site has deteriorated through erosion of its bay-ward boundary, as well as the expansion of interior open water areas. The predominant wetland habitats at Schicke Point are characterized as salt and brackish marsh and estuarine open water. The combination of rising sea levels, erosion, reduced sediment supplies, wind-wave erosion, and storm impacts has resulted in significant loss of wetlands and other coastal habitats in the region. This project is consistent with regional efforts to combat land and habitat loss through hydrology enhancements, oyster reef, and estuarine marsh restoration.

The overarching goal of the project is to restore and conserve wetlands and coastal habitats in Schicke Point by beneficially using dredged material to create a viable, vegetated, wetland habitat for fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage.

The primary objective of this project is to restore shallow open water habitat in Schicke Point to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 182,000 cy of suitable hydraulically dredged material within levees constructed from on-site sediment. Dredge material would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 72 acres of marsh habitat (Figure A-8).

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the MSC, private dredging sources, and material mined from dredged

material placement areas. As part of the completion of E&D for the BUDM site, the specific sources of dredged material would be determined during project implementation. Any dredged material used would pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source. Resources of the affected environment are described in Section A.3.7.1; project-level environmental consequences are summarized in Table A-20 and described in Section A.3.7.2.



Figure A-8 Location of Proposed Restoration Areas for the *Schicke Point Wetland Restoration* Project

Table A-19 Summary of Adverse and Beneficial Impacts from Implementation of the *Schicke Point Wetland Restoration* Project

Resource Categories	Resource Subcategories	Benefits	Adverse Short Term	Adverse Long Term
Physical Resources	Geology and substrates	Yes	Minor	Minor
	Hydrology and water quality	Yes	Minor	Minor
	Air quality	Yes	Minor	NE
	Noise	NE	Minor	NE
Biological Resources	Habitats	Yes	Minor to moderate	NE
	Wildlife species	Yes	Minor to moderate	NE
	Marine and estuarine resources	Yes	Minor to moderate	NE
	Protected species	Yes	Minor	Minor
Socioeconomic Resources	Socioeconomics	Yes	NE	NE
	Cultural resources	NE	NE	NE
	Infrastructure	NE	NE	NE
	Land and marine management	NE	NE	NE
	Tourism and recreational use	Yes	Minor	NE
	Fisheries and aquaculture	Yes	Minor	NE
	Land and marine transportation	NE	NE	NE
	Aesthetics and visual resources	Yes	Minor to moderate	NE
	Public health and safety	NE	NE	NE

Notes:
Adverse short-term and long-term effects are designated as minor, moderate, or major.
NE: no effect
Yes: would provide benefits

This analysis expands upon the relevant portions of Section 6.4.1.1 of the Final PDARP/PEIS in relation to the project. The description and analysis of the project below are based on the 60% basis of design concepts developed under the *Texas Dredged Material Planning for Wetland Restoration* project authorized in RP/EA #1. Throughout the completion of the 100% designs under this process, every practical attempt would be made to avoid and minimize potentially adverse environmental and cultural resource impacts. The following descriptions for each of the construction elements are preliminary and based on current planning efforts and resource agency experience with similar marsh restoration projects. Although the Texas TIG does not consider it likely, it is possible that the 100% E&D process could generate a plan that has adverse environmental impacts that are different in type or magnitude from those discussed in this document. If that is the case, the Texas TIG would consider whether further environmental impacts analysis would be necessary.

The impacts from the project are anticipated to be largely beneficial, and the adverse impacts would generally be short-term and minor to moderate (Table A-20). Benefits to the biological, physical, human uses, and socioeconomics environment would result if the project was implemented. Best practices required in the permit, consultations, or environmental analyses would be followed. Additionally, best practices described in Appendix 6.A of the Final PDARP/PEIS would be considered and applied where appropriate to reduce or eliminate adverse impacts to the environment.

A.3.7.1 Affected Environment

A.3.7.1.1 Physical Resources

Geology and Substrates

The *Schicke Point Wetland Restoration* project area is located in the Texas coastal plain, which is underlain by a complex assemblage of fluvial, deltaic, estuarine, and marine-influenced deposits that make up two Pleistocene formations: the younger Beaumont Formation and the older Lissie Formation. Geophysical data suggest that the strata within these two formations represent multiple episodes of deposition, erosion, and soil formation (Paine et al. 2018). Surface geology is of the late Pleistocene Beaumont Formation and younger deposits. The Beaumont Formation was deposited as a large alluvial plain, after which sea levels fell during a period of glacial advance. A period of erosion then followed, with incision of stream channels. At the end of the last glacial period, as sea levels rose again, the area was flooded, and a series of estuaries and bays formed. The soils currently feature river floodplain muds and fluvial-deltaic sands (Thomas and Durkin 2012).

The BUDM restoration technique emulates riverine deltaic and other coastal sediment processes that have been interrupted by human alterations to the land and seascape. Emulating these natural accretion processes is a useful restoration tool to restore valuable coastal habitats where the rate of relative sea level rise exceeds accretion.

Hydrology and Water Quality

The project area is within the Central Matagorda Bay watershed (Hydrologic Unit Code 121004010500). Surface water quality in the region is influenced by industrial and agricultural practices and saltwater intrusion. The movement of saltwater from the Gulf and bays inland through the bayou and marsh systems varies depending upon tidal action, storms, and storm runoff. Channel construction, including the GIWW and channelization of natural waterways such as the MSC, has facilitated the movement of saltwater further inland than what occurred historically or what would occur under natural conditions.

The 2022 Water Quality Inventory has inadequate data to assess most water quality metrics in Matagorda Bay/Powderhorn Lake (Segment 2451). The Texas Surface Water Quality Standards classify Matagorda Bay/Powderhorn Lake as suitable for primary contact recreation, and its waters are designated excellent aquatic life use (30 TAC Section 307.10(1), Appendix A).

Air Quality

Schicke Point Wetland Restoration project area is located in the Corpus Christi Air Quality Control Region (Region 14). The Region is in attainment for 8-hour ozone and in compliance with the NAAQS for all other criteria pollutants (TCEQ 2021b).

Electricity production, vehicular movements, and commercial and residential buildings using electricity generate criteria air pollutants and emissions. The project's impacts on air quality are considered.

Noise

The project location is remote, located on a peninsula between Carancahua and Matagorda Bays. Nearby land is residential, undeveloped, or used for agriculture. Due to its location, the Schicke Point project area experiences ambient noise from marine transportation. Recreational and commercial waterborne traffic are common around Schicke Point.

A.3.7.1.2 Biological Resources

Relatively undeveloped compared to other Texas bay systems, Matagorda Bay is a biologically productive environment home to an array of coastal plants, fish, and wildlife. It boasts an impressive avian species assemblage and productive fishing grounds. The region provides habitat for millions of migrating and nesting birds. Some of these include geese, herons, terns, and gulls, and neotropical bird species. It also supports fish, shellfish, and blue crab.

Habitats

The physical components of Schicke Point currently provide habitat for a variety of coastal plants and animals. The salt flats and tidal marshes serve as habitat for bird species including killdeer, black-necked stilt, and willet, as well as crabs and juvenile flounder. The brackish waters further inland within the marsh support blue crab and other species of shellfish, egrets, herons, and many others (USACE 2019). Smooth cordgrass is the most common marsh vegetation species encountered at the site. This plant filters the water of pollutants and provides habitat, nesting, and foraging for many species that inhabit this area.

Wildlife Species

Saline marshes and shallow open water are the primary habitats within the project area. These habitats are critical for many species of plants, fish, birds, and other wildlife. Bird species, such as snowy egrets, great egrets, roseate spoonbills, yellow-crowned night herons, black-crowned night herons, and great blue herons use marsh as feeding habitat. The area also supports a large waterfowl population in the winter and a variety of year-round bird species. Wading birds and shorebirds utilize the mudflats and shallow marsh ponds located throughout the area. Wintering waterfowl include gadwall, northern pintail, lesser scaup, American widgeon, and blue-winged teal. Other birds such as clapper rail, seaside sparrows and other secretive marsh species use the marsh as well.

Marine and Estuarine Resources

Saline marshes and shallow open water are the primary habitats within the project area. The wetland edge is a particularly important habitat for white and brown shrimp (Whaley and Minello 2002). Other marsh-dwelling species include blue crab, red drum, spotted seatrout, Atlantic croaker, southern flounder, and Gulf menhaden. Wetlands act as nurseries to hundreds of non-commercial species that comprise a large part of the estuarine food web. Invertebrates such as blue crab and brown and white shrimp are common in the region.

Protected Species

Threatened or Endangered Species

The threatened or endangered species that could potentially be affected are listed in Table A-21 (USFWS 2024). No activities related to implementation of the project would take place in any area designated as critical habitat.

Table A-20 Federal Threatened and Endangered Species Potentially Affected in the *Schicke Point Wetland Restoration* Project Area

Common Name	Status
Piping plover	Threatened
Red knot	Threatened
Eastern black rail	Threatened
Whooping crane	Endangered
West Indian manatee	Threatened
Loggerhead sea turtle	Threatened
Green sea turtle	Threatened
Hawksbill sea turtle	Endangered
Leatherback sea turtle	Endangered
Kemp's ridley sea turtle	Endangered

The last wild flock of whooping cranes winters on the Texas coast in the area around San Antonio Bay, southwest of Matagorda Bay. The construction activities for the project are unlikely to affect whooping cranes, which usually inhabit an area west of the project on Blackjack Peninsula in Aransas NWR.

The eastern black rail can be present anywhere suitable habitat is present along the Texas coast. Suitable habitat consists of high estuarine marsh and palustrine wet prairies containing dense perennial herbaceous wetland vegetation and proximity to shallow standing water (typically ≤3 cm) that may be ephemeral. No critical habitat has been designated for this species. Eastern black rails occur across an elevational gradient that lies between lower and wetter portions of the marsh and their adjacent uplands. These habitat gradients have gentle slopes so that wetlands can have large areas of shallow inundation (sheet water). Eastern black rails also require adjacent higher elevation areas (i.e., the wetland-upland transition zone) with dense cover to survive high water events. The dense vegetative cover allows movement underneath the canopy to avoid predators. The dense plant structure is more important than plant species composition in predicting habitat suitability. This project would have minimal benefits to black rail habitat.

The red knot and piping plover are winter residents on the Texas coast and in Calhoun County. Both species are known to use the shoreline of bays and mudflats. There is no critical habitat for red knot or piping plover in Schicke Point.

The West Indian manatee has been found in Texas estuaries on rare occasions.

Loggerhead sea turtles, green sea turtles, hawksbill sea turtles, leatherback turtles, and Kemp's ridley sea turtles may be present in the project area.

EFH

Of the fish species considered by NMFS to potentially occur within the project area, EFH for these species consists of tidally influenced waters and tidally influenced marsh. Table A-22 provides a list of managed EFH species in the *Schicke Point Wetland Restoration* project area, habitat preference, and life stage when they may be expected to occur (NMFS 2021).

Table A-21 EFH for Estuarine Habitats Within the *Schicke Point Wetland Restoration* Project Area

Name	Larvae/ Eggs	Post-Larvae	Juvenile	Subadult	Adult	Habitat Type
Brown shrimp	X					Water column associated
Brown shrimp			X			Emergent marsh, soft bottom
Brown shrimp				X		Soft bottom
Pink shrimp			X	X		Soft bottom
White shrimp		X				Water column associated
White shrimp			X			Emergent marsh, soft bottom
White shrimp				X	X	Soft bottom
Red drum	X					Water column associated, soft bottom (larvae)
Red drum		X				Emergent marsh, soft bottom
Red drum			X			Emergent marsh (late juvenile), soft bottom
Red drum					X	Emergent marsh, soft bottom
Spanish mackerel			X		X	Estuarine, water column associated
Gray snapper					X	Soft bottom, emergent marsh
Cobia	X					Water column associated
Lane snapper	X	X				Water column associated
Lane snapper			X			Soft bottom

Marine Mammals

The only marine mammal that is regularly found in Matagorda Bay is the bottlenose dolphin. There are infrequent reports of sightings of West Indian manatees within the estuary.

Bald and Golden Eagles

Bald eagles potentially forage within the project location, and golden eagles may occasionally migrate through the project area.

Migratory Birds

Many species of birds spend all or a portion of their life cycle along the Gulf using a variety of habitats at different stages. Major groups of birds that inhabit the northern Gulf include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh-dwelling birds, and

passerines. It is possible that birds protected under the MBTA and Texas Parks and Wildlife Code may nest in the project area.

A.3.7.1.3 Socioeconomic Resources

Socioeconomics

Calhoun County has a total population of 19,696, a decrease of 2% since 2020, based on the 2023 U.S. Census population estimates. Median household income (2018 to 2022) in Calhoun County is $62,267 (USCB 2024g).

Cultural Resources

Coordination under Section 106 of the NHPA will be initiated for the project. A preliminary analysis of the THC Atlas database indicated that no known historic sites or significant cultural, scientific, or historic resources exist in the area within the boundaries of the project area (THC 2024).

Infrastructure

According to the RRC GIS viewer (RRC 2020), no active and decommissioned oil or natural gas wells or pipelines lie in close proximity to the proposed site. Additionally, the GLO Texas Sediment Geodatabase GIS viewer shows no buried pipelines running near the site (GLO 2017). No pipelines or wells were identified during the recent design and construction of the offshore breakwater. Further delineation of pipeline easements and restrictions may be developed during the final design stage of the site before construction.

Land and Marine Management

The Schicke Point project area is located on a peninsula in Matagorda Bay at the mouth of Carancahua Bay. It is adjacent to private land used for residential purposes. The project site is publicly accessible.

Tourism and Recreational Use

Schicke Point is located adjacent to private residential land, and the bay waters are open to the public for fishing, boating, and wildlife viewing.

Fisheries and Aquaculture

The area is an important nursery for marine and estuarine fishery species, including several that are important to the local economy. Recreational fishing in the area focuses on spotted seatrout, red drum, southern flounder, and other species. Commercially valuable species include brown shrimp, white shrimp, blue crab, black drum, and Gulf menhaden.

Land and Marine Transportation

Schicke Point is relatively remote with a few public roads providing access to the small adjacent residential community.

Aesthetics and Visual Resources

Schicke Point is relatively remote with a few public roads providing access to the small adjacent residential community.

Public Health and Safety

The people residing in the adjacent residential properties would be affected by the construction, as would recreational boaters who pass the site. The immediate vicinity of the project area was historically salt and brackish marsh, but it has since been inundated primarily due to erosion and relative sea level rise. This has had adverse impacts on coastal longevity and deleterious effects on the area's functionality as a buffer for storm surges.

A.3.7.2 Environmental Consequences

A.3.7.2.1 Physical Resources

Geology and Substrates

Short- and long-term, minor adverse impacts to geology and substrates could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands. Impacts from construction activities, use of heavy equipment, and trenching for sediment transport can cause localized and short-term, minor adverse impacts from sediment disturbance and compaction. Long-term, minor adverse impacts on the physical environment could occur from the placement of dredged material, which may affect sediment dynamics. Mitigation measures to minimize adverse impacts to geology and substrates could include employment of standard best practices for construction to reduce erosion and loss of sediments.

It is anticipated that the project would provide long-term benefits by restoring the area to a suitable elevation to sustain historical marsh habitat.

Hydrology and Water Quality

Short- and long-term, minor adverse impacts to hydrology and water quality could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands. The project would have short-term, minor adverse impacts to water quality from increased turbidity during dredging activities and placement of fill material. Areas where dredged material would be placed for wetland restoration would be isolated from surrounding waters by temporary containment levees with weir structures to minimize the discharge of turbid water. These impacts would be localized to the project area and would be temporary in nature. The fill material would eventually settle in the placement area, and the turbidity due to project activities would no longer occur. Similar impacts due to turbidity at the borrow site would occur regardless of the implementation of the project, as maintenance dredging of the GIWW is a routine activity of USACE and is scheduled independently of the project. Long-term, minor adverse impacts may occur to the existing substrate due to placement of dredged materials. This may have long-term, minor adverse impacts to hydrology where tidal connectivity is modified per the project design. Measures to control turbidity and sediment movement would be in place to ensure water quality standards are met and sensitive resources are not affected. These measures may include appropriate water control structures to decant water, and the installation of silt fences or curtains, hay bales, filter-fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement.

It is anticipated that the project would provide long-term benefits from the restoration and levee protection of the marsh. The project would maintain linkages within the broader coastal and nearshore ecosystem by facilitating the natural movement of water, sediments, energy, and nutrients among habitats.

Air Quality

Short-term, minor adverse impacts to air quality could occur due to vehicle emissions from equipment used during construction and monitoring. Engine exhaust from barges, boats, excavators, and equipment would contribute to an increase in emissions. Best practices would be considered and applied, where appropriate and practical to reduce the release of emissions. Best practices considered could include the deployment of energy-efficient machinery and equipment, the incorporation of anti-idling procedures, and/or the use of gasoline rather than diesel. Adverse impacts to air quality would be short-term, occurring only during active construction.

It is anticipated that the project would provide long-term benefits for air quality. Wetland and marsh soils are important sinks for carbon sequestration. Reconstruction of marsh habitat and revegetation of newly deposited sediments would capture carbon and provide enduring environmental benefits.

Noise

Short-term, minor adverse impacts to soundscapes could occur due to noise from construction activities. Heavy equipment can cause localized, minor adverse impacts due to noise. This impact would be short term and limited to the period of construction. Mitigation measures to reduce adverse impacts due to noise could include timing noise-producing activities to minimize disturbance to nesting birds. To prevent disturbance to nearby residential communities, construction activities that produce significant noise would be limited to daylight hours. All placement of dredged material would occur on the south side of Schicke Point and so would not be directly adjacent to residential areas.

A.3.7.2.2 Biological Resources

Habitats

Short-term, minor-to-moderate adverse impacts to habitats could occur due to the conversion of shallow open water to intertidal marsh habitat.

It is anticipated that the project would provide long-term benefits to the local ecosystem. Mosaics of shallow open water and vegetated marsh have been shown to have higher ecologic function than either of these habitats in isolation (Whaley and Minello 2002). Therefore, final project design would ensure adequate shallow open water would remain in the project area to maintain the synergies between these two habitats. The creation of additional salt marsh generates habitat for a number of marsh residents and is anticipated to benefit the local ecosystem, enhancing the food web and supporting many ecologically and economically important fish and invertebrate species.

Wildlife Species

Short-term, minor-to-moderate adverse impacts to wildlife species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important wildlife species. The creation of additional marsh habitat provides benefits for a number of marsh wildlife and is anticipated to benefit the local ecosystem, enhancing the food web and supporting many ecologically and economically important wildlife species.

Marine and Estuarine Resources

Short-term, minor-to-moderate adverse impacts to marine and estuarine species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important marine and estuarine fauna. The creation of additional marsh habitat provides benefits for a number of marsh dependent marine and estuarine fauna and is anticipated to benefit the local ecosystem, enhancing the food web and supporting ecologically and economically important marine and estuarine fauna.

Protected Species

There would be short- and long-term, minor adverse impacts to protected species. Impacts to wildlife would be avoided via management guidelines and techniques as appropriate. Best practices, including *the Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS 2006) and *Measures for Reducing Entrapment Risk to Protected Species* (NMFS 2012), would be followed during levee construction to avoid entrapping marine mammals and other resources.

During construction, there would be short-term, minor adverse impacts to EFH through dredged material deposition and increased turbidity. Long-term, minor impacts could include conversion of one wetland vegetation type to another with changes in the distribution of fauna communities. These impacts are expected to be confined to the immediate vicinity of the project, and best practices would likely be implemented to minimize adverse impacts.

Long-term benefits to EFH would occur from the improvement of habitat for commercially important prey species. The creation of additional estuarine marsh generates additional EFH that is anticipated to benefit the local ecosystem by enhancing the food web and supporting many ecologically and economically important fish species. Many of the species that directly utilize coastal estuarine marshes as juveniles later migrate offshore, where they serve as prey for ecologically and economically important open-ocean species. Thus, these highly productive habitats support ecological connectivity both within the coastal ecosystem and between the coastal, nearshore, and open-ocean ecosystems through the movement of species that use wetlands during their life cycle to grow and reproduce.

Placement of BUDM to create estuarine emergent marsh would have a long-term beneficial effect on the habitat's ability to support sea turtles, West Indian manatees, and eastern black rails. The proposed project aims to restore estuarine emergent marsh, which would protect and improve sensitive resources utilized by these species. In addition, the proposed project would improve water quality by reducing sedimentation from coastal erosion into the GIWW and shallow bay systems utilized by sea turtles and West Indian manatees. Long-term effects of project construction activities are considered to be beneficial to the eastern black rail, as this is an estuarine marsh restoration project, which would ultimately protect and enhance thousands of acres of suitable eastern black rail foraging and nesting habitat.

The project has been designed to meet the marsh creation, maintenance, and enhancement PDC described in NMFS' *Framework Biological Opinion on Final PDARP/PEIS* (NMFS 2016), which considers where construction would occur, construction methodologies, best practices that would be implemented, and reporting requirements. Best practices included in NMFS' *Measures for Reducing the Entrapment Risk to Protected Species* (NMFS 2012) would be followed to avoid and minimize impact to protected sea turtle species. Additionally, either a hydraulic cutter-head dredge or clamshell dredge

would be used to place sediments into the project site because these do not pose a risk to pelagic aquatic organisms, such as sea turtles. A hydraulic dredge pipeline would transport material to the placement area. The dredge pipeline would be routed to avoid disturbance to sensitive resource areas if identified along the pipeline route. Any areas containing such resources in the construction area and pipeline route would be protected using best practices such as use of hay bales, silt fences, or other appropriate methods.

Efforts would be made to avoid construction activities during the nesting season for protected migratory birds (February 15 through July 31). However, if construction activities occur during the nesting season, the area affected by project activities would be surveyed for the presence of nesting birds by a qualified biologist. If nesting birds are present or indications of pre-nesting behavior are observed, appropriate best practices would be employed to ensure that no incidental take of any individuals occurs. Best practices may include signage, exclusion zones for workers and equipment, hazing, and deterrents. Best practice activities would be coordinated with USFWS and TPWD biologists.

A.3.7.2.3 Socioeconomic Resources

Socioeconomics

No adverse short- or long-term impacts to socioeconomics are anticipated.

This restoration project would help restore an environment that benefits all citizens, populations, and groups in the region. The project would have a positive, beneficial socioeconomic impact on surrounding communities. Best practices would be implemented during construction to avoid short-term impacts to nearby residential communities.

Cultural Resources

No adverse short- or long-term impacts to cultural resources are anticipated.

A complete review of the project under Section 106 of the NHPA would be completed prior to implementation of regulated project activities to develop practices that would avoid, minimize, or mitigate any adverse effects on historic properties located within the project area. The project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. If culturally or historically important resources are identified during project preparations or pre-deployment surveys, consultation would be re-initiated.

Infrastructure

No adverse short- or long-term impacts to infrastructure are anticipated.

The project is not anticipated to affect energy production, transport, or infrastructure. The project is anticipated to have no impact to infrastructure because new infrastructure would not be built, and existing infrastructure in the area would be avoided to the extent practicable. Final E&D would include measures to avoid, as much as practicable, known oil and gas pipelines in Schicke Point.

Land and Marine Management

No adverse short- or long-term impacts to land and marine management are anticipated.

The proposed project is anticipated to have no impact to land and marine management because the project would be consistent with the prevailing management, practices, plans, and direction governing the use of the areas where restoration actions would take place.

Tourism and Recreational Use

Short-term, minor adverse impacts to tourism and recreational use in the immediate area could occur due to limits on recreational activities near the construction area and temporary increases in road traffic due to movement of construction vehicles. In addition, recreational opportunities would be limited during the construction period and while the marsh is revegetating.

It is anticipated that the project would provide long-term benefits to recreationists through enhanced experiences for wildlife viewing, kayaking, canoeing, hunting, fishing, and other activities. Long-term benefits would come from restoring the nursery habitat of many recreationally important fish species, which would benefit recreational fishing in the area. Benefits to the local economy could accrue through an increase in employment and associated spending in the project area during construction and increased expenditures due to increased recreational visitation following completion of the restoration project.

Fisheries and Aquaculture

Short-term, minor adverse impacts to fisheries could occur due to construction activities such as dredging, addition of sediments or borrow materials, and removal of sediments.

It is anticipated that the project could provide long-term benefits to the public through increased fishing opportunities (both commercial and recreational) by restoring coastal habitats that benefit fish. Long-term benefits would arise from the improvement of habitat for commercially important brown and white shrimp fisheries and the recreational red drum fishery. To the extent that these increased recreational opportunities result in increased visitation, local businesses may benefit from visitors' increased expenditures.

Land and Marine Transportation

No adverse short- or long-term impacts to land and marine transportation are anticipated.

Since there is minimal access to the site, there would be no impact to land-based traffic. There are no transportation channels in the area; therefore, there would be no impact on marine beneficial use operations transportation. The dredged material pipeline route would be clearly marked to avoid vessel strikes to the pipeline.

Aesthetics and Visual Resources

Short-term, minor-to-moderate adverse impacts to aesthetics and visual resources could occur due to the presence of construction equipment and the barren, muddy appearance during the revegetation period.

It is anticipated that the project would provide long-term benefits to the area's aesthetics and visual resources. The creation of marsh habitat and planting of vegetation would improve the overall viewscape of the project area. In addition, the new habitat is anticipated to attract additional birds and wildlife, which could be enjoyed by recreational users of the area.

Public Health and Safety

No adverse short- or long-term impacts to public health and safety are anticipated.

Due to the location and nature of the project area, no adverse impacts to public health and safety are anticipated as a result of this project. All occupational and marine safety regulations and laws would be

followed to ensure safety of all workers and monitors. The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. Best practices in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport and disposal of all hazardous substances. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. Due to the potential increase in small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure water related accidents and conflicts are minimized.

A.3.8 Texas Point National Wildlife Refuge Wetland Restoration

The project site is within the Texas Point NWR managed by the USFWS. Dredged material would provide fill for three marsh restoration cells, using containment levees built from sediments collected on site to restore up to 623 acres of intertidal marsh.

The predominant wetland habitats near the Texas Point NWR are characterized as salt and brackish marsh and estuarine open water. Over the past several decades, the vegetated marsh at the site has deteriorated, resulting in the expansion of shallow open water. The combination of rising sea levels, erosion, and reduced sediment supplies has resulted in significant loss of wetlands and other coastal habitats in the region and project site. This project is consistent with regional efforts to combat land and habitat loss through dune restoration, hydrology enhancements, and estuarine marsh restoration.

The overarching goal of the project is to restore and conserve wetlands and coastal habitats by beneficially using dredged material to create viable, vegetated, wetland habitat for a variety fish and wildlife. In addition, rebuilding the wetlands would create buffers that protect adjacent natural areas from storm surge damage.

The primary objective of this project is to restore shallow submerged open water habitat in the Texas Point NWR to reference marsh elevations to support habitat restoration and revegetation with native vegetation such as smooth cordgrass and saltmeadow cordgrass. This project would place up to 1.6 million cy of suitable hydraulically dredged material within levees constructed from on-site sediment. Dredge material would be placed in the site to build elevations suitable for marsh growth as determined from adjacent healthy wetlands. The final target elevation would consider sediment compaction and expected sea level rise. Project actions would restore up to 623 acres of marsh habitat, including the conversion of up to 239 acres of existing open water to intertidal marsh (Figure A-9).

The potential sources of dredged material for the project include material obtained through USACE maintenance dredging from the SNWW, private dredging sources, or material mined from dredged material placement areas. The specific sources of dredged material would be determined during project implementation. Any dredged material used must pass all environmental compliance and permitting requirements to be suitable for the project, regardless of source. Resources of the Affected Environment are described in Section A.3.8.1; project-level environmental consequences are summarized in Table A-23 and described in Section A.3.8.2.

This section presents the affected resources of the *Texas Point National Wildlife Refuge Wetland Restoration* project and the environmental consequences of the proposed actions in context of the project-specific affected environment.



Figure A-9 Location of Proposed Restoration Areas for the *Texas Point National Wildlife Refuge Wetland Restoration* Project

Table A-22 Summary of Adverse and Beneficial Impacts from Implementation of the *Texas Point National Wildlife Refuge Wetland Restoration* Project

Resource Categories	Resource Subcategories	Benefits	Adverse Short Term	Adverse Long Term
Physical Resources	Geology and substrates	Yes	Minor	Minor
	Hydrology and water quality	Yes	Minor	Minor
	Air quality	Yes	Minor	NE
	Noise	NE	Minor	NE
Biological Resources	Habitats	Yes	Minor to moderate	NE
	Wildlife species	Yes	Minor to moderate	NE
	Marine and estuarine resources	Yes	Minor to moderate	NE
	Protected species	Yes	Minor	Minor
Socioeconomic Resources	Socioeconomics	Yes	NE	NE
	Cultural resources	NE	NE	NE
	Infrastructure	NE	NE	NE
	Land and marine management	NE	NE	NE
	Tourism and recreational use	Yes	Minor	NE
	Fisheries and aquaculture	Yes	Minor	NE
	Land and marine transportation	NE	NE	NE
	Aesthetics and visual resources	Yes	Minor to moderate	NE
	Public health and safety	NE	NE	NE

Notes:
Adverse short-term and long-term effects are designated as minor, moderate, or major.
NE: no effect
Yes: Would provide benefits

The description and analysis of the project are based on a 60% basis of design concept, rather than 100% engineering plans. Throughout the design process, every practical attempt would be made to avoid and minimize potentially adverse environmental and cultural resource impacts. The following descriptions for each of the construction elements are preliminary and based on current planning efforts and resource agency experience with similar marsh restoration projects. Although the Texas TIG does not consider it likely, it is possible that the E&D process could generate a plan that has adverse environmental impacts that are different in type or magnitude from those discussed in this document. If that is the case, the Texas TIG would consider whether further environmental impacts analysis would be necessary.

The impacts from the project are anticipated to be largely beneficial, and the adverse impacts would generally be short-term and minor to moderate (Table A-23). Benefits to the biological, physical, human uses, and socioeconomics environment would result if the project were implemented. Best practices required in the permit, consultations, or environmental analyses would be followed. Additionally, best

practices described in Appendix 6.A of the Final PDARP/PEIS would be considered and applied where appropriate to reduce or eliminate adverse impacts to the environment.

A.3.8.1 Affected Environment

A.3.8.1.1 Physical Resources

Geology and Substrates

The Texas Point NWR is located in the Chenier Plain region of Texas. It is comprised of a mainland beach fronting a chenier plain that formed from a Pleistocene promontory overlain by Holocene marginal-deltaic sediments (King 2007). The geologic substrate of the Chenier Plain region is primarily composed of sediments deposited during the late recent epoch with some subsurface Pleistocene outcropping. These deposits are overlain at the coast by a geologically recent series of inland ridges representing stranded beaches that align parallel to the coast. Accumulation of fine-grained sediment deposited between these multiple beach ridges formed marshes and mudflats. Tidal channels lie between successive ridges. The shore of the coast is formed by a narrow beach or washover terrace that developed through the deposition of sand and shell. The coastline is breached by inlets that connect estuaries extending inland up-river to valleys (USFWS 2008).

The ground surface within the project area is mostly comprised of chenier plain and coastal plain sediments deposited by fluvial, tidal, littoral, and deltaic processes. The coastal plain is characterized as seaward-thickening sediment deposits to depths of thousands of feet below the present land surface. The terrain is relatively flat to gently sloping. Two types of landforms characterize the area: broad marshes containing organic clays and peat and long, narrow relict cheniers, which appear as ridges parallel to the coast. Chenier ridges form as a result of cyclic shoreline advance and retreat and are typically mixtures of silt, sand, and shell fragments. They are slightly elevated features and attain elevations of 5 to 10 feet above sea level (FERC 2011).

The BUDM restoration technique emulates riverine deltaic and other coastal sediment processes that have been interrupted by human alterations to the land and seascape. Emulating these natural accretion processes is a useful restoration tool to restore valuable coastal habitats where the rate of relative sea level rise exceeds accretion.

Hydrology and Water Quality

The project site is within the Gulf watershed (Hydrologic Unit Code 120402020500), downstream of Sabine Lake, and within Reservoir Segment 2411 Sabine Pass. The Sabine and Neches Rivers discharge into Sabine Lake from the north. The Sabine Pass Channel, which borders the Texas Point NWR, is at the southern end of the watershed. This narrow tidal inlet is the outlet for this system to the Gulf. Wind-driven tides predominate the area and affect the estuary environment, producing wind-tidal flats and marshes (FERC 2011).

The Sabine and Neches River basins provide about 85% of the freshwater inflows in the Sabine-Neches estuary. Additional freshwater enters the system through streams; municipal, industrial, and agricultural flows; and precipitation. The SNWW Navigation Channel is a deep-draft channel that runs through the Sabine Pass Channel and serves as a pathway for both freshwater from the inflowing rivers and saltwater from the Gulf. Saltwater is denser than freshwater. This results in highly stratified conditions in the navigation channel, bringing saltwater up the SNWW and into the northwest corner of Sabine Lake and the lower reaches of the Neches River (USACE 2011).

In the 2022 Texas Integrated Report, Segment 2411 Intracoastal Waterway Tidal is not supporting fish consumption due to PCBs in edible tissue. Segment 2411 is designated for primary contact recreation use and intermediate aquatic life use in the 2018 Texas Surface Water Quality Standards (30 TAC Section 307.10(1), Appendix A).

Air Quality

The Texas Point NWR is located in the Beaumont-Port Arthur Air Quality Control Region (Region 10). The region is in attainment for 8-hour ozone and in compliance with the NAAQS for all other criteria pollutants (TCEQ 2021c).

Electricity production, vehicular movements, and commercial and residential buildings using electricity generate criteria air pollutants and emissions. The project's impacts on air quality are considered.

Noise

The project location is adjacent to the SNWW, the fourth-busiest waterway in the United States in terms of gross tonnage as of 2018 (USDOT 2021). Due to its location, the Texas Point NWR experiences ambient noise from marine transportation. Recreational and commercial waterborne traffic are common around Texas Point NWR.

A.3.8.1.2 Biological Resources

The wetland habitats on the upper Texas coast provide important wintering and migration stopover habitat for migratory birds, including Central Flyway waterfowl, shorebirds, wading birds, and marsh and waterbirds. A complex of protected lands along the coast—including NWRs such as Texas Point and state-managed WMAs—serve as critical staging areas for waterfowl migrating to and from Mexico. The Sabine Lake estuary is a vital habitat for fish and shellfish species found in the Gulf.

Habitats

The Texas Point NWR is predominantly a saline-brackish marsh complex comprised of emergent marshes, shallow subtidal flats, and open water. These shallow flats support benthic communities that provide food sources for migratory waterfowl, estuarine fish and invertebrate species, and other marsh fauna. The southeastern portion of the Texas Point NWR, where the project is located, is strongly influenced by daily tidal action. This low saline marsh is dominated by smooth cordgrass and black rush. Upland brackish marsh is vegetated with saltmeadow cordgrass, seashore saltgrass, and saltmarsh bulrush. Small areas of intermediate marsh are found in the western and northern portions of the NWR. Slightly elevated chenier ridges, aligned east to west, traverse the marshes.

Wildlife Species

Tidal marshes and shallow open water are the primary habitats within the Texas Point NWR marsh. These habitats are critical for many species of plants, fish, birds, and other wildlife. Bird species, such as snowy egrets, great egrets, roseate spoonbills, yellow-crowned night herons, black-crowned night herons, and great blue herons use marsh as feeding habitat. The area also supports a large waterfowl population in the winter and a variety of year-round bird species. Wading birds and shorebirds utilize the mudflats and shallow marsh ponds located throughout the area. Wintering waterfowl include gadwall, northern pintail, lesser scaup, American widgeon, and blue-winged teal. Other birds such as clapper rail, seaside sparrows and other secretive marsh species use the marsh as well.

Marine and Estuarine Resources

Tidal marshes and shallow open water are the primary habitats within the project area The wetland edge is a particularly important habitat for white and brown shrimp (Whaley and Minello 2002). Other marsh-dwelling species include blue crab, red drum, spotted seatrout, Atlantic croaker, southern flounder, and Gulf menhaden. Wetlands act as nurseries to hundreds of noncommercial species that comprise a large part of the estuarine food web. Invertebrates such as blue crab and brown and white shrimp are common in the region.

Protected Species

Threatened or Endangered Species

The threatened or endangered species that could potentially be affected are listed in Table A-24 (USFWS 2024). No activities related to implementation of the project would take place in any area designated as critical habitat.

Table A-23 Federal Threatened and Endangered Species Potentially Affected in the *Texas Point National Wildlife Refuge Wetland Restoration* Project Area

Common Name	Status
Piping plover	Threatened
Red knot	Threatened
Eastern black rail	Threatened
West Indian manatee	Threatened
Loggerhead sea turtle	Threatened
Green sea turtle	Threatened
Hawksbill sea turtle	Endangered
Leatherback sea turtle	Endangered
Kemp's ridley sea turtle	Endangered

The eastern black rail can be present anywhere suitable habitat is present along the Texas coast. Suitable habitat consists of high estuarine marsh and palustrine wet prairies containing dense perennial herbaceous wetland vegetation and proximity to shallow standing water (typically ≤3 cm) that may be ephemeral. No critical habitat has been designated for this species. Eastern black rails occur across an elevational gradient that lies between lower and wetter portions of the marsh and their adjacent uplands. These habitat gradients have gentle slopes so that wetlands can have large areas of shallow inundation (sheet water). Eastern black rails also require adjacent higher elevation areas (i.e., the wetland-upland transition zone) with dense cover to survive high water events. The dense vegetative cover allows movement underneath the canopy to avoid predators. The dense plant structure is more important than plant species composition in predicting habitat suitability.

The red knot and piping plover are winter residents on the Texas coast and in Jefferson County. Both species are known to use the shoreline of bays and mudflats. There is no critical habitat for red knot or piping plover in the Texas Point NWR.

The West Indian manatee has been found in Texas estuaries on rare occasions.

Loggerhead sea turtles, green sea turtles, hawksbill sea turtles, leatherback turtles, and Kemp's ridley sea turtles may be present in the project area.

EFH

Of the fish species considered by NMFS to potentially occur within the project area, EFH for these species consists of tidally influenced waters and tidally influenced marsh. Table A-25 provides a list of managed EFH species in the project area, habitat preference, and life stage when they may be expected to occur (NMFS 2021).

Table A-24 EFH for Estuarine Habitats Within the *Texas Point National Wildlife Refuge Wetland Restoration* Project Area

Name	Larvae/ Eggs	Post-Larvae	Juvenile	Subadult	Adult	Habitat Type
Brown shrimp	X					Water column associated
Brown shrimp			X			Emergent marsh, soft bottom
Brown shrimp				X		Soft bottom
Pink shrimp			X	X		Soft bottom
White shrimp		X				Water column associated
White shrimp			X			Emergent marsh, soft bottom
White shrimp				X	X	Soft bottom
Red drum	X					Water column associated, soft bottom (larvae)
Red drum		X				Emergent marsh, soft bottom
Red drum			X			Emergent marsh (late juvenile), soft bottom
Red drum					X	Emergent marsh, soft bottom
Spanish mackerel			X		X	Estuarine, water column associated
Gray snapper					X	Soft bottom, emergent marsh
Cobia	X					Water column associated
Lane snapper	X	X				Water column associated
Lane snapper			X			Soft bottom

Marine Mammals

The only marine mammal regularly found in Sabine Lake is the bottlenose dolphin. There are infrequent reports of sightings of West Indian manatees within the estuary.

Bald and Golden Eagles

Bald eagles potentially forage within the project location, and golden eagles may occasionally migrate through the project area.

Migratory Birds

Many species of birds spend all or a portion of their life cycle along the Gulf using a variety of habitats at different stages. Major groups of birds that inhabit the northern Gulf include waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, marsh-dwelling birds, and passerines. It is possible that birds protected under the MBTA and Texas Parks and Wildlife Code may nest in the project area.

A.3.8.1.3 Socioeconomic Resources

Socioeconomics

Jefferson County has a total population of 251,496, a decrease of 2% since 2020, based on the 2023 U.S. Census population estimates. Median household income (2018 to 2022) in Jefferson County is $57,294 (USCB 2024e).

Cultural Resources

Coordination under Section 106 of the NHPA would be initiated for the project. A preliminary analysis of the THC Atlas database indicated that no known historic sites or significant cultural, scientific, or historic resources exist in the area within the boundaries of the project area (THC 2024). However, two shipwrecks have been reported near the project area, part of a cluster of shipwrecks in the Outer Bar Channel: the Ella, a sail-steam merchant vessel, wrecked in 1866; and the Catherine, a schooner, wrecked in 1862 (Gaines 2008). The site has not been evaluated for eligibility for the National Register of Historic Places.

Infrastructure

Various oil and gas pipelines and wells exist at the site. RRC maintains an oil and gas pipeline and well database with a GIS viewer, which shows four plugged wells within the boundaries of the NWR and several “dry hole” locations and pipelines near the wells (RRC 2020). Additionally, GLO Texas Sediment Geodatabase GIS viewer shows buried natural gas and crude oil pipelines running under the site (GLO 2017). Further delineation of pipeline easements and restrictions may be developed during the final design stage of the site before construction.

Land and Marine Management

The Texas Point NWR encompasses 8,972 acres located in Jefferson County, Texas, on the southeastern tip of the upper Texas coast. The Texas Point NWR is bounded on the south by the Gulf with approximately 6 miles of Gulf shoreline. It is bounded on the east by a narrow strip of private land adjacent to the SNWW, which connects the Sabine-Neches estuary with the Gulf and on the west and north by Sea Rim State Park. The project area contains no access roads. The project area is managed by USFWS.

Tourism and Recreational Use

The Texas Point NWR is managed by USFWS as a part of the Texas Chenier Plain Refuge Complex, which also includes McFaddin, Jocelyn Nungaray, and Moody NWRs. Management includes use of the marsh for recreational fishing and waterfowl hunting. Hunting, fishing, hiking, and wildlife viewing are regularly enjoyed by the public in the Texas Point NWR.

Fisheries and Aquaculture

This area is an important nursery for marine and estuarine fishery species, including several that are important to the local economy. Recreational fishing in the area focuses on spotted seatrout, red drum, southern flounder, and other species. Commercially valuable species include brown shrimp, white shrimp, blue crab, black drum, and Gulf menhaden.

Land and Marine Transportation

Texas Point NWR is relatively remote with no public roads within its boundaries and limited pedestrian and water access. The site is adjacent to the commercially important SNWW.

Aesthetics and Visual Resources

The affected environment consists of the construction footprint of the project. The landscape in the vicinity of the proposed wetland restoration is characterized by a mosaic of saline and brackish marsh, elevated cheniers, and open water. The site is adjacent to the SNWW, a highly industrialized waterbody, and though the NWR is adjacent and undeveloped, the viewshed is dominated by the industrial nature of the area. There are no designated protected viewsheds in the vicinity of the project. Equipment and construction activities related to the restoration actions would be visible.

Public Health and Safety

The recreational and industrial users of the Texas Point NWR are accustomed to navigating the marsh via the existing channels and avoiding shallow areas and areas that contain obstructions. The immediate vicinity of the project area was historically salt and brackish marsh, but it has since been inundated primarily due to erosion and relative sea level rise. This has had adverse impacts on coastal longevity and deleterious effects on the area's functionality as a buffer for storm surges.

A.3.8.2 Environmental Consequences

A.3.8.2.1 Physical Resources

Geology and Substrates

Short- and long-term, minor adverse impacts to geology and substrates could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands. Impacts from construction activities, use of heavy equipment, and trenching for sediment transport can cause localized and short-term, minor adverse impacts from sediment disturbance and compaction. Long-term, minor adverse impacts on the physical environment could occur from the placement of dredged material, which may affect sediment dynamics. Mitigation measures to minimize adverse impacts to geology and substrates could include employment of standard best practices for construction to reduce erosion and loss of sediments.

It is anticipated that the project would provide long-term benefits by restoring the area to a suitable elevation to sustain historical marsh habitat.

Hydrology and Water Quality

Short- and long-term, minor adverse impacts to hydrology and water quality could occur due to construction activities related to creating, restoring, and enhancing coastal wetlands. The project would have short-term, minor adverse impacts to water quality from increased turbidity during dredging

activities and placement of fill material. Areas where dredged material would be placed for wetland restoration would be isolated from surrounding waters by temporary containment levees with weir structures to minimize the discharge of turbid water. These impacts would be localized to the project area and would be temporary in nature. The fill material would eventually settle in the placement area, and the turbidity due to project activities would no longer occur. Similar impacts due to turbidity at the borrow site would occur regardless of the implementation of the project because maintenance dredging of the GIWW is a routine activity of USACE and is scheduled independently of the project. Long-term, minor adverse impacts may occur to the existing substrate due to placement of dredged materials. This may have long-term, minor adverse impacts to hydrology where tidal connectivity is modified per the project design. Measures to control turbidity and sediment movement would be in place to ensure water quality standards are met and sensitive resources are not affected. These measures may include appropriate water control structures to decant water and the installation of silt fences or curtains, hay bales, filter-fabric, and/or temporary levees to control sediments and avoid negative impacts associated with the fill placement.

It is anticipated that the project would provide long-term benefits from the restoration and levee protection of the marsh. The project would maintain linkages within the broader coastal and nearshore ecosystem by facilitating the natural movement of water, sediments, energy, and nutrients among habitats.

Air Quality

Short-term, minor adverse impacts to air quality could occur due to vehicle emissions from equipment used during construction and monitoring. Engine exhaust from barges, boats, excavators, and equipment would contribute to an increase in emissions. Best practices would be considered and applied, where appropriate and practical, to reduce the release of emissions. Best practices considered could include the deployment of energy-efficient machinery and equipment, the incorporation of anti-idling procedures, and/or the use of gasoline, rather than diesel. Adverse impacts to air quality would be short-term, occurring only during active construction.

It is anticipated that the project would provide long-term benefits for air quality. Wetland and marsh soils are important sinks for carbon sequestration. Reconstruction of marsh habitat and revegetation of newly deposited sediments would capture carbon and provide enduring environmental benefits.

Noise

Short-term, minor adverse impacts to soundscapes could occur due to noise from construction activities. Heavy equipment can cause localized, minor adverse impacts due to noise. This impact would be short term and limited to the period of construction. Mitigation measures to reduce adverse impacts due to noise could include timing noise-producing activities to minimize disturbance to nesting birds. All placement of dredged material would occur in the interior of the Texas Point NWR and would not be directly adjacent to residential areas.

A.3.8.2.2 Biological Resources

Habitats

Short-term, minor-to-moderate adverse impacts to habitats could occur due to the conversion of shallow open water to intertidal marsh habitat.

It is anticipated that the project would provide long-term benefits to the local ecosystem. Mosaics of shallow open water and vegetated marsh have been shown to have higher ecologic function than either of these habitats in isolation (Whaley and Minello 2002). Therefore, the final design would ensure adequate shallow open water would remain in the Texas Point NWR project area to maintain the synergies between these two habitats.

Wildlife Species

Short-term, minor-to-moderate adverse impacts to wildlife species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important wildlife species. The creation of additional marsh habitat provides benefits for a number of marsh wildlife and is anticipated to benefit the local ecosystem, enhancing the food web, and supporting many ecologically and economically important wildlife species

Marine and Estuarine Resources

Short-term, minor-to-moderate adverse impacts to marine and estuarine species could occur due to project activities including levee construction, sediment deposition, and staging equipment and materials.

It is anticipated that the project would provide long-term benefits for many ecologically and economically important marine and estuarine fauna. The creation of additional marsh habitat provides benefits for a number of marsh dependent marine and estuarine fauna and is anticipated to benefit the local ecosystem, enhancing the food web, and supporting ecologically and economically important marine and estuarine fauna.

Protected Species

There would be short- and long-term, minor adverse impacts to protected species. Impacts to wildlife would be avoided via management guidelines and techniques as appropriate. Best practices, including the *Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS 2006) and *Measures for Reducing Entrapment Risk to Protected Species* (NMFS 2012), would be followed during levee construction to avoid entrapping marine mammals and other resources.

During construction, there would be short-term, minor adverse impacts to EFH through dredged material deposition and increased turbidity. Long-term, minor impacts could include conversion of one wetland vegetation type to another with changes in the distribution of fauna communities. These impacts are expected to be confined to the immediate vicinity of the project, and best practices would likely be implemented to minimize adverse impacts.

Long-term benefits to EFH would occur from the improvement of habitat for commercially important prey species. The creation of additional estuarine marsh generates additional EFH that is anticipated to benefit the local ecosystem by enhancing the food web and supporting many ecologically and economically important fish species. Many of the species that directly utilize coastal estuarine marshes

as juveniles later migrate offshore, where they serve as prey for ecologically and economically important open-ocean species. Thus, these highly productive habitats support ecological connectivity both within the coastal ecosystem and between the coastal, nearshore, and open-ocean ecosystems through the movement of species that use wetlands during their life cycle to grow and reproduce.

Placement of BUDM to create estuarine emergent marsh would have a long-term beneficial effect on the habitat's ability to support sea turtles, West Indian manatees, and eastern black rails. The proposed project aims to restore estuarine emergent marsh, which would protect and improve sensitive resources utilized by these species. In addition, the proposed project would improve water quality by reducing sedimentation from subsidence and coastal erosion into the GIWW and shallow bay systems utilized by sea turtles and West Indian manatees. Long-term effects of project construction activities are considered to be beneficial to the eastern black rail, as this is an estuarine marsh restoration project, which would ultimately protect and enhance thousands of acres of suitable eastern black rail foraging and nesting habitat.

The project has been designed to meet the marsh creation, maintenance, and enhancement PDC described in NMFS' *Framework Biological Opinion on PDARP/PEIS* (NMFS 2016), which considers where construction would occur, construction methodologies, best practices that would be implemented, and reporting requirements. Best practices included in NMFS' *Measures for Reducing the Entrapment Risk to Protected Species* (NMFS 2012) would be followed to avoid and minimize impact to protected sea turtle species. Additionally, either a hydraulic cutter-head dredge or clamshell dredge would be used to place sediments into the project site because these do not pose a risk to pelagic aquatic organisms, such as sea turtles. A hydraulic dredge pipeline would transport material to the placement area. The dredge pipeline would be routed to avoid disturbance to sensitive resource areas if identified along the pipeline route. Any areas containing such resources in the construction area and pipeline route would be protected using best practices such as hay bales, silt fences, or other appropriate methods.

Efforts would be made to avoid construction activities during the nesting season for protected migratory birds (February 15 through July 31). However, if construction activities occur during the nesting season, the area affected by project activities would be surveyed for the presence of nesting birds by a qualified biologist. If nesting birds are present or indications of pre-nesting behavior are observed, appropriate best practices would be employed to ensure that no incidental take of any individuals occurs. Best practices may include signage, exclusion zones for workers and equipment, hazing, and deterrents. Best practice activities would be coordinated with USFWS and TPWD biologists.

A.3.8.2.3 Socioeconomic Resources

Socioeconomics

No adverse short- or long-term impacts to socioeconomics are anticipated.

This restoration project would help restore an environment that benefits all citizens, populations, and groups in the region. The project would have a positive, beneficial socioeconomic impact on surrounding communities. No residential communities are located adjacent to the project. As a result, there would be no potential for short-term adverse impacts from construction.

Cultural Resources

No adverse short- or long-term impacts to cultural resources are anticipated.

A complete review of the project under Section 106 of the NHPA would be completed prior to implementation of regulated project activities to develop practices that would avoid, minimize, or mitigate any adverse effects on historic properties located within the project area. The project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. If culturally or historically important resources are identified during project preparations or pre-deployment surveys, consultation would be re-initiated.

Infrastructure

No adverse short- or long-term impacts to infrastructure are anticipated.

The project is not anticipated to affect energy production, transport, or infrastructure. The project is anticipated to have no impact to infrastructure, since new infrastructure would not be built, and existing infrastructure in the area would be avoided to the extent practicable. Final E&D would include measures to avoid, as much as practicable, known oil and gas pipelines in the Texas Point NWR.

Land and Marine Management

No adverse short- or long-term impacts to land and marine management are anticipated.

The proposed action is anticipated to have no impact to land and marine management because the project would be consistent with the prevailing management, practices, plans, and direction governing the use of the areas where restoration actions would take place.

Tourism and Recreational Use

Short-term, minor adverse impacts to tourism and creational use could occur due to limits on recreational activities near the construction area and temporary increases in road traffic due to movement of construction vehicles. In addition, recreational opportunities would be limited during the construction period and while the marsh is revegetating.

It is anticipated that the project would provide long-term benefits to recreationists through enhanced experiences for wildlife viewing, kayaking, canoeing, hunting, fishing, and other activities. Long-term benefits would come from restoring the nursery habitat of many recreationally important fish species, which would benefit recreational fishing in the area. Benefits to the local economy could accrue through an increase in employment and associated spending in the project area during construction and increased expenditures due to increased recreational visitation following completion of the restoration project.

Fisheries and Aquaculture

Short-term, minor adverse impacts to fisheries could occur due to construction activities such as dredging, addition of sediments or borrow materials, and removal of sediments.

It is anticipated that the project would provide long-term benefits to the public through increased fishing opportunities (both commercial and recreational) by restoring coastal habitats that benefit fish. Long-term benefits would arise from the improvement of habitat for commercially important brown and white shrimp fisheries and the recreational red drum fishery. To the extent that these increased recreational opportunities result in increased visitation, local businesses may benefit from visitors' increased expenditures.

Land and Marine Transportation

No adverse short- or long-term impacts to land and marine transportation are anticipated.

Since there is minimal access to the site, there would be no impact to land-based traffic. Shipping and boating routes would be identified prior to the beneficial use operations to prevent impacts to marine transportation. It is expected that activities would not significantly interrupt the SNWW traffic. Most of the commercial traffic takes place on a routine schedule, and construction activities would be timed to reduce interference with commercial operators. The dredged material pipeline route would be clearly marked to avoid vessel strikes to the pipeline.

Aesthetics and Visual Resources

Short-term, minor-to-moderate adverse effects to aesthetics and visual resources could occur due to the presence of construction equipment and the barren, muddy appearance during the revegetation period.

It is anticipated that the project would provide long-term benefits to the area's aesthetics and visual resources. The creation of marsh habitat and planting of vegetation would improve the overall viewscape of the project area. In addition, the new habitat is anticipated to attract additional birds and wildlife, which could be enjoyed by recreational users of the area.

Public Health and Safety

No adverse short- or long-term impacts to public health and safety are anticipated.

Due to the location and nature of the project area, no adverse impacts to public health and safety are anticipated as a result of this project. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. Best practices in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport and disposal of all hazardous substances. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. Due to the potential increase in small boat traffic (construction related) in the area, appropriate safety measures would be employed to ensure water-related accidents and conflicts are minimized.

A.4 No Action Analysis

If the No Action alternative is selected, implementation of projects included within the RP/EA #3 would not occur, and no action would be taken to restore or protect coastal wetlands within the project area. Marsh loss would continue to occur, resulting in a decline in fish, wildlife, and marine productivity. Under the No Action alternative, project areas reviewed within the RP/EA #3 would likely continue to be altered by ongoing processes of shoreline erosion, shoreline breaching, and marsh deterioration. This would result in continued loss of coastal wetland resources that are vital for fish, wildlife, and marine organisms that depend on these habitats. The No Action alternative does not provide the substantial

environmental benefits to injured natural resources and services that would occur through active restoration and does not fulfill the Texas TIG's goal to create, restore, and enhance coastal wetlands.

The No Action Alternative is anticipated to result in long-term, moderate-to-major adverse impacts to physical resources such as geology and substrates and hydrology and water quality from degraded hydrologic connectivity, continued wetland habitat degradation, and conversion of wetlands to open water. Continued wetland degradation would also result in long-term, moderate-to-major adverse impacts to biological resources such as habitats, wildlife species, marine and estuarine resources, and protected species. Continued wetland degradation would also result in long-term, minor adverse impacts to socioeconomic resources including infrastructure, land and marine management, tourism and recreational use, fisheries and aquaculture, aesthetics and visual resources, and public health and safety.

Natural resources would not recover without restoration, and the public would not be compensated for losses to natural resources and their services during this recovery time period.

A.5 NEPA Consideration of Additional Reasonably Foreseeable Environmental Effects

A.5.1 Methodology

The Final PDARP/PEIS (Section 6.17.2) stated that consideration of environmental effects of proposed alternatives in RP/EAs should build on the programmatic analyses and focus on site-specific issues (DWH NRDA Trustees 2016). Section 6.6 and Appendix 6B of the Final PDARP/PEIS are incorporated by reference into the following analysis, including methodologies for assessing these impacts, identification of affected resources, and the reasonably foreseeable environmental effects scenario. The Final PDARP/PEIS found that implementation of restoration projects under the Wetlands, Coastal and Nearshore Habitats Restoration Type would be consistent with the Final PDARP/PEIS Restoration Goals and would not be expected to contribute substantially to short- and long-term adverse reasonably foreseeable environmental effects on physical, biological, or socioeconomic resources when analyzed in combination with other past, present, and reasonably foreseeable future actions.

A.5.2 Resources Affected by the Proposed Alternatives

Section A.3 of this document includes an environmental consequences analysis for each of the proposed alternatives/projects. Many of the resources analyzed would only have negligible to minor adverse effects. Resources with negligible-to-minor effects are not included in the reasonably foreseeable environmental effects analysis to appropriately narrow the scope of the analysis to issues that would have an influence on the decision-making process or deserve attention from an environmental perspective. Resources excluded from this analysis based on their negligible-to-minor adverse effects are listed as follows:

- Physical Resources: hydrology and water quality; air quality; and noise.
- Socioeconomics: socioeconomics; cultural resources; infrastructure; land and marine management; tourism and recreational; fisheries and aquaculture; land and marine transportation; aesthetics and visual resources; and public health and safety.

The following resources were analyzed in detail for environmental consequences that could result from implementation of the proposed alternatives/projects:

- Physical Resources: geology and substrates.
- Biological Resources: habitats; wildlife species; marine and estuarine resources; and protected species.

To effectively consider the potential reasonably foreseeable environmental effects, the Texas TIG identified past, current, and reasonably foreseeable future actions that are considered relevant to identifying any effects the alternatives may have on a local scale. These actions fall inside the counties of Aransas, Calhoun, Chambers, Jefferson, Matagorda, Orange, and Refugio located within the Texas coastal zone. For RP/EA #3, the Texas TIG considered past, present, and reasonably foreseeable future actions through outreach to local, state, and/or federal experts familiar with major environmental and development initiatives that have a potential to contribute to reasonably foreseeable environmental effects. Projects considered in previous restoration plans (*Deepwater Horizon Oil Spill: Programmatic and Phase III Early Restoration Plan and Early Restoration Programmatic Environmental Impact Statement* (DWH NRDA Trustees 2014), *Deepwater Horizon Oil Spill Final Phase IV Early Restoration Plan and Environmental Assessments* (DWH NRDA Trustees 2015), the Final PDARP/PEIS, RP/EA #1, and *Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final Restoration Plan/Environmental Assessment #2: Restoration of Wetlands, Coastal, and Nearshore Habitats; Nutrient Reduction; Oysters; Sea Turtles; and Birds* [Texas TIG 2022a]) were also reviewed to develop this list of actions. The Texas TIG also relied on expert judgments, primarily qualitative, about the potential for adverse impacts, using publicly available information about the likely design and location of these actions. Table A-26 provides the resulting list of past, present, and reasonably foreseeable future actions considered.

A.5.3 Reasonably Foreseeable Environmental Effects Analysis

The following section provides the reasonably foreseeable environmental effects analysis for RP/EA #3. Table A-26 provides the resulting list of past, present, and reasonably foreseeable future actions considered.

Section A.3 analyzes the environmental consequences for each of the alternatives proposed for implementation in this RP/EA #3. The alternatives evaluated in this RP/EA #3 are designed to create, enhance, or restore coastal wetlands. Adverse effects would not be anticipated to extend beyond the construction period for the projects. None of the projects included in this RP/EA #3 would result in any long-term adverse effects that rise above a moderate adverse impact. Most of the projects would result in short-term, minor-to-moderate, localized adverse impacts to geology and substrates and biological resources such as habitats, wildlife species, marine resources, and protected species.

Geology and substrates would primarily experience short-term, minor adverse, localized impacts to substrates from sediment-disturbing activities such as the construction of sediment containment levees, dredging, and placement of dredged materials. Impacts would be caused by the conversion of soft bottom to hard-bottom habitats and the removal and burial of sediments. There would be negligible adverse impacts across the region from the depletion of sediment resources because materials would be beneficially reused from other maintenance projects (e.g., dredging of a waterway) or would be or have been specifically identified for the project. Natural sediment transport processes would replenish dredge borrow sites. Once implemented, the proposed alternatives/projects would provide long-term benefits to geology and substrates from reduction in erosion, replenishment of historic substrates, protection of geology and substrates, and addition of hard-bottom substrates.

Biological resources, including habitats, wildlife species, marine and estuarine resources, and protected species would primarily experience short-term, minor-to-moderate adverse, localized impacts from human disturbance associated with project implementation. Minor impacts would be caused by turbidity and noise during construction activities. Typically, species most affected would be in the benthos but would recover quickly. No moderate or major adverse impacts would affect protected species. There would be negligible-to-minor adverse impacts across the region from the temporary changes in habitat quality. Resources would recover quickly and affect only a fraction of the local population. Once implemented, the proposed alternatives would provide long-term benefits to wildlife species and marine and estuarine resources from improvements in habitat.

The Texas TIG has concluded that although some of the projects may have an incremental contribution to adverse impacts across the region, the contribution would not be substantial over the long term. Many of the alternatives have the potential to provide long-term beneficial impacts to physical, biological, and socioeconomic resources. Thus, the Texas TIG concludes that the Wetlands, Coastal, and Nearshore Habitats Restoration Type alternatives in this RP/EA #3 would not contribute substantially to adverse reasonably foreseeable environmental effects when added to other past, present, or reasonably foreseeable future actions as outlined in Table A-26.

Table A-25 List of Past, Present, and Reasonably Foreseeable Future Actions Considered in This Analysis

Activities	Action	Action Description	Key Resource Areas with Potential for Reasonably Foreseeable Environmental Effects
Restoration Projects Related to DWH Oil Spill	DWH funded habitat restoration projects (including NRDA, National Fish and Wildlife Foundation-Gulf Environmental Benefit Fund, and the Resources and Ecosystem Sustainability, Tourist Opportunity, and Revived Economies of the Gulf Coast States Act)	These programs leverage other funding sources to achieve habitat restoration. These programs seek to restore habitat, water quality, wildlife species, and marine and estuarine resources. Currently funded projects aim to restore marsh habitat; improve avian, oyster, and sea turtle populations; restore dune habitat; and improve coastal habitats through shoreline protection.	Geology and substrate Wildlife species and marine and estuarine resources Habitats; protected species
Resource Stewardship Activities	Oyster restoration	Significant efforts have occurred and are underway to restore oyster reefs along the Texas coast. Restoration projects are adding habitat for oysters to colonize or restoring oyster reefs that have been lost from overharvesting, hurricanes, and changes in freshwater inflow.	Geology and substrates Wildlife species and marine and estuarine fauna Habitats; protected species
Resource Stewardship Activities	Marsh restoration	Marsh restoration occurs and will continue to occur along the Texas coast. Marshes assist in protection of infrastructure during storm events; provide valuable habitat for fish, wildlife, and marine organisms; improve water quality via nutrient filtration; and provide groundwater recharge functions.	Geology and substrates Wildlife species and marine and estuarine resources Habitats; protected species

Activities	Action	Action Description	Key Resource Areas with Potential for Reasonably Foreseeable Environmental Effects
Resource Stewardship Activities	Land acquisition	Land acquisition by state and federal agencies and other organizations for the purpose of restoration and preservation has occurred in the past and is likely to continue occurring in Texas coastal areas.	Geology and substrates Wildlife species and marine and estuarine resources
Resource Stewardship Activities	Restoration programs administered through GLO (Coastal Erosion Planning and Response Act, Coastal Impact Assistance Program, Coastal Management Program, Beach Maintenance Reimbursement Fund)	Funding programs administered through GLO to reduce the effects of coastal erosion, remediate the impact of offshore oil and gas exploration, implement projects in the coastal zone (e.g., water sediment quantity and quality improvements; ecotourism; public access), increase knowledge through research, and clean and maintain Gulf beaches have occurred in the past and will continue to occur in Texas coastal areas.	Geology and substrates Wildlife species and marine and estuarine resources Habitat; protected species
Energy Activities	Ongoing oil and gas exploration	The coastal region of Texas is among the most productive for oil and gas exploration and production. During 2023, wells in Texas produced over 1.92 billion barrels, and operators produced over 2.01 trillion cubic feet of natural gas (RRC 2024). In addition to the drilling of wells and construction of liquefied natural gas facilities, the transport of staff, equipment, and supplies necessary to support this exploration and production effort requires a large number of surface vessels and helicopters that will continue to occur in Texas coastal areas.	Geology and substrates Wildlife species and marine and estuarine resources Habitat; protected species
Dredged Material Disposal	USACE maintenance dredging	Ship channels leading to Texas ports, as well as the GIWW, are routinely dredged to maintain authorized depths to facilitate waterborne cargo transportation. Dredged materials are either beneficially used as part of another project or deposited in a	Geology and substrates Wildlife species and marine and

Activities	Action	Action Description	Key Resource Areas with Potential for Reasonably Foreseeable Environmental Effects
		designated disposal location. Maintenance dredging activities will continue to occur in Texas coastal areas. The projects described in this RP/EA #3 are beneficially using dredged material.	estuarine resources Habitat; protected species
Coastal Development and Land Use	Commercial and residential development	The Texas coastal area is rapidly developing and will continue to be developed. The rate of development is often tied to the economy and has been increasing since the end of the 2008 to 2009 recession. According to the 2020 Census, the Gulf Coast region has a population of about 7.3 million, or 25% of the state's total population. The need for commercial and residential housing is expected to continue growing with Texas coastal areas.	Geology and substrates Wildlife species and marine and estuarine resources Habitat; protected species
Coastal Development and Land Use	Shoreline armoring	Armoring of waterways (e.g., GIWW) and other bay and gulf shorelines has been implemented to protect marine transportation and/or decrease erosion. Activities have occurred and will continue to occur along the Texas coast. Armoring may be used to protect infrastructure or as part of a habitat restoration and protection project.	Geology and substrates Wildlife species and marine and estuarine resources Habitat; protected species
Coastal Development and Land Use	Beach nourishment	Texas has a scheduled maintenance plan to renourish engineered beaches. Beaches in the maintenance plan range from South Padre Island to the Texas/Louisiana border. GLO will continue to maintain and renourish beaches within Texas coastal areas. The Texas General Land Office is in the process of completing a large-scale beach nourishment project adjacent to the McFaddin NWR that will have synergistic benefits to the wetland system that contains the McFaddin NWR Willow Lakes Terraces site.	Geology and substrates Wildlife species and marine and estuarine resources Habitat: protected species
Fisheries and Aquaculture	Recreational fishing	The Texas coast is a popular destination for bay, beachfront, and offshore fishing. In 2022, there were approximately 1.7 million saltwater anglers (National Opinion Research Center at the University of Chicago 2022) and 1,644 all-water fishing guides licensed in Texas (Z.	Wildlife species and marine and estuarine resources

Activities	Action	Action Description	Key Resource Areas with Potential for Reasonably Foreseeable Environmental Effects
		Thomas from Texas Parks and Wildlife, personal communication, November 21, 2024). According to the American Sports Fishing Association (ASA), the direct economic impact of these fishing trips is estimated at over $7.7 billion (ASA 2023).	Habitat; protected species
Fisheries and Aquaculture	Commercial fishing	The Texas coast supports a fleet of commercial fishing vessels that target primarily demersal bay species, as well as offshore reef fish and pelagic species. During 2023, licensed fishermen landed 1.3 billion pounds of finfish valued at $9.1 million (NOAA 2022).	Wildlife species and marine and estuarine resources Habitat; protected species
Marine Transportation	Marine transportation including shipping	The Texas coastline has 13 shallow-draft ports and 15 deep-draft ports, as well as 423 miles along the Texas portion of the GIWW, for a total of 760 miles of shallow-draft and 240 miles of deep-draft channels (USACE 2024b). Deep-draft ports handle commercial cargo and shipping activities, while shallow-draft ports are used for commercial and recreational fishing. Texas ports are connected by the GIWW in Texas. In 2020, 75 million tons of goods were moved on the Texas portion of the GIWW (Texas Department of Transportation [TxDOT] 2022). Texas leads the nation in the total volume of intrastate maritime cargo (TxDOT 2022). There are no planned marine transportation projects that would negatively impact these eight restoration sites.	Geology and substrates Wildlife species and marine and estuarine resources Habitat; protected species

A.6 Comparison of Alternatives

The environmental analysis demonstrated that there would primarily be short-term, minor adverse impacts and long-term, minor adverse impacts, as well as beneficial effects from implementation of the RP/EA #3 alternatives. In general, implementation of the RP/EA #3 alternatives would result in short-term, minor adverse impacts to physical resources including geology and substrates and hydrology and water quality. Implementation of the RP/EA #3 alternatives would result in short-term, minor adverse impacts to air quality and short-term, minor-to-moderate impacts to noise. There would be some long-term, minor adverse impacts to geology and substrates and hydrology and water quality associated with alternatives that involve sediment removal and placement for implementation.

In general, implementation of the RP/EA #3 alternatives would result in short-term, minor adverse impacts to biological resources, including protected species, and short-term, minor-to-moderate impacts to habitats, wildlife species, and marine and estuarine resources. Biological resources would primarily experience short-term, minor-to-moderate adverse impacts from human- and construction -related disturbances associated with project implementation. There would be some long-term, minor adverse impacts to protected species due to material placement. Overall, biological resources, including wildlife species and marine and estuarine resources, would experience long-term benefits from improved habitats. In general, implementation of the RP/EA #3 alternatives would result in short-term, minor adverse impacts to socioeconomic resources, including tourism and recreational use, fisheries and aquaculture, and public health and safety, and short-term, minor-to-moderate impacts to aesthetics and visual resources. The RP/EA #3 alternatives would result in short-term, minor-to-moderate adverse impacts to aesthetics and visual resources. No long-term adverse impacts are anticipated. Most alternatives evaluated in this RP/EA #3 would result in short- and long-term benefits to socioeconomic resources, in particular, tourism and recreation, aesthetics and visual resources, and public health and safety.

All RP/EA #3 alternatives would result in benefits to physical resources, including geology and substrates, hydrology and water quality, and air quality ; biological resources including habitats, wildlife species, marine and estuarine resources, and protected species; and socioeconomic resources including socioeconomics, tourism and recreational use, fisheries and aquaculture, aesthetics and visual resources, and public health and safety.

The No Action alternative is anticipated to result in long-term, minor-to-major adverse impacts. A summary of impacts for each restoration alternative and the No Action alternative is provided in Table A-27.

Table A-26 Summary of Impact for Each Restoration Alternative and the No Action Alternative

Project	Geology and Substrates	Hydrology and Water Quality	Air Quality	Noise	Habitats	Wildlife Species	Marine and Estuarine Resources	Protected Species	Socioeconomics	Cultural Resources	Infrastructure	Land and Marine Management	Tourism and Recreational Use	Fisheries and Aquaculture	Land and Marine Transportation	Aesthetics and Visual Resources	Public Health and Safety
No Action	L	L	NE	NE	L	L	L	L	NE	NE	l	l	l	l	NE	l	l
Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Goose Island Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Guadalupe River Old Delta Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Lower Neches Wildlife Management Area Old River Unit Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Schicke Point Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Texas Point National Wildlife Refuge Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE

Notes:
+: beneficial effect
l: long-term, minor adverse effect
L: long-term, moderate-to-major adverse effect
NE: no adverse effect
s: short-term, minor adverse effect
s*: short-term, minor-to-moderate effect
S: short-term, moderate-to-major adverse effect

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U.S. Department of Agriculture (USDA)	Ronald Howard Craig Johnson Jon Morton
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Agency/Firm	Name
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	Aaron Horine
	Chemaine Koester
	Lean Krumholz
	Julianne Lee
Sarosdy Consulting	Jane Sarosdy

Appendix C. List of Repositories

Port Arthur, Texas
Port Arthur Public Library
4615 9th Avenue
Port Arthur, Texas 77642

Galveston, Texas
Jack K. Williams Library
Texas A&M University at Galveston
200 Seawolf Parkway Building #3010
Galveston, Texas 77554

Rockport, Texas
Aransas County Public Library
701 East Mimosa Street
Rockport, Texas 78382

Appendix D. Impact Intensity Definitions

The impact intensity definitions used to evaluate potential environmental impacts from the reasonable range of alternatives considered in this RP/EA #3 are provided in the following table. These definitions are also provided in Table 6.3-2 in the Final PDARP/PEIS.[2]

[2] The definitions provided herein are incorporated by reference from the DWH Trustees (2016) PDARP/PEIS and have been modified for consistency with current laws and regulations.

Table D-1 Impact Intensity Definitions

Resource	Impact Duration	Minor Intensity	Moderate Intensity	Major Intensity
Geology and Substrates	**Short-term:** During construction period **Long-term:** Over the life of the project or longer	Disturbance to geologic features or soils could be detectable but small and localized. There might be no change to local geologic features or soil characteristics. Erosion and/or compaction might occur in localized areas.	Disturbance could occur over local and immediately adjacent areas. Impacts on geology or soils might be readily apparent and result in changes to the soil character or local geologic characteristics. Erosion and compaction impacts might occur over local and immediately adjacent areas.	Disturbance could occur over a widespread area. Impacts on geology or soils might be readily apparent and result in changes to the character of the geology or soils over a widespread area. Erosion and compaction might also occur over a widespread area. Disruptions to substrates or soils may be permanent.
Hydrology and Water Quality	**Short-term:** During construction period **Long-term:** Over the life of the project or longer	**Hydrology:** The effect on hydrology might be measurable but small and localized. The effect might only temporarily alter the area's hydrology, including surface and groundwater flows. **Water Quality:** Impacts could result in a detectable change to water quality, but the change expected might be small and localized. Impacts could quickly become undetectable. State water quality standards as required by the Clean Water Act could not be exceeded. **Floodplains:** Impacts could result in a detectable change to water quality, but the change expected might be small and localized. Impacts might quickly become undetectable. State water quality standards as required by the Clean Water Act could not be exceeded. **Wetlands:** The effect on wetlands could be measurable but small in terms of area and the nature of the impact. A small impact on the size, integrity, or connectivity of the wetlands could occur; however, wetland function might not be affected, and natural restoration might occur if left alone.	**Hydrology:** The effect on hydrology might be measurable but small and localized. The effect might only temporarily alter the area's hydrology including surface and groundwater flows. **Water Quality:** Impacts on water quality could be observable over a relatively large area. Impacts could result in a change to water quality that might be readily detectable and limited to local and adjacent areas. Change in water quality might persist; however, it would likely not exceed the state water quality standards required by the Clean Water Act. **Floodplains:** Impacts could result in a change to natural and beneficial floodplain values and might be readily detectable but limited to local and adjacent areas. The location of operations in floodplains could increase risk of flood loss, including impacts on human safety, health, and welfare. **Wetlands:** The action could cause a measurable effect on wetlands indicators (size, integrity, or connectivity) or might result in a permanent loss of wetland acreage across local and adjacent areas. However, wetland functions might be permanently altered only in limited areas.	**Hydrology:** The effect on hydrology might be measurable and widespread. The effect could permanently alter hydrologic patterns including surface and groundwater flows. **Water Quality:** Impacts could likely result in a change to water quality that might be readily detectable and widespread. Impacts could likely result in exceedance of state water quality standards and/or might impair designated uses of a waterbody. **Floodplains:** Impacts could result in a change to natural and beneficial floodplain values and could have substantial consequences over a widespread area. The location of operations could increase risk of flood loss, including impacts on human safety, health, and welfare. **Wetlands:** The action could cause a permanent loss of wetlands across a widespread area. The character of the wetlands might change and the functions typically provided by the wetland permanently lost.

Resource	Impact Duration	Minor Intensity	Moderate Intensity	Major Intensity
Air Quality	**Short-term:** During construction period **Long-term:** Over the life of the project or longer	The impact on air quality might be measurable but localized and temporary, such that the emissions do not exceed the Environmental Protection Agency's (EPA's) de minimis criteria for a general conformity determination under the Clean Air Act (40 CFR § 93.153).	The impact on air quality might be measurable and limited to local and adjacent areas. Emissions of criteria pollutants might be at EPA's de minimis criteria levels for a general conformity determination.	The impact on air quality might be measurable over a widespread area. Emissions are high, such that they might exceed EPA's de minimis criteria for a general conformity determination.
Noise	**Short-term:** During construction period **Long-term:** Over the life of the project or longer	Increased noise could attract attention, but its contribution to the soundscape would be localized and unlikely to affect current user activities.	Increased noise could attract attention and contribute to the soundscape, including in local areas and those adjacent to the action, but might not dominate. User activities might be affected.	Increased noise could attract attention and dominate the soundscape over widespread areas. Noise levels might eliminate or discourage user activities.
Habitats	**Short-term:** Lasting less than two growing seasons **Long-term:** Lasting longer than two growing seasons	Impacts on native vegetation may be detectable but might not alter natural conditions and might be limited to localized areas. Infrequent disturbance to individual plants could be expected but would not affect local or regional population stability. Infrequent or insignificant one-time disturbance to locally suitable habitat could occur, but sufficient habitat could remain functional at both the local and regional scales to maintain the viability of the species. Opportunity for increased spread of non-native species might be detectable but would be temporary and localized and would not displace native species' populations and distributions.	Impacts on native vegetation could be measurable but limited to local and adjacent areas. Occasional disturbance to individual plants could be expected. These disturbances could adversely affect local populations but would not be expected to affect regional population stability. Some impacts might occur in key habitats, but sufficient local habitat might retain function to maintain the viability of the species both locally and regionally. Opportunity for increased spread of non-native species might be detectable and limited to local and adjacent areas but might only result in temporary changes to native species' population and distributions.	Impacts on native vegetation might be measurable and widespread. Frequent disturbances of individual plants could be expected, with adverse impacts on both local and regional population levels. These disturbances could adversely affect regional population stability. Some impacts might occur in key habitats, and habitat impacts might adversely affect the viability of the species, both locally and regionally. Actions could result in the widespread increase of non-native species and result in broad and permanent changes to native species' populations and distributions.

Resource	Impact Duration	Minor Intensity	Moderate Intensity	Major Intensity
Wildlife Species (including birds)	**Short-term:** Lasting up to two breeding seasons, depending on length of breeding season **Long-term:** Lasting more than two breeding seasons	Impacts on native species, their habitats, or the natural processes sustaining them might be detectable, but localized, and might not measurably alter natural conditions. There could be infrequent responses to disturbance by some individuals but without interference to feeding, reproduction, resting, migrating, or other factors, affecting population levels. Small changes to local population numbers, population structure, and other demographic factors could occur. Sufficient habitat might remain functional at both the local and regional scales to maintain the viability of the species. Opportunity for increased spread of non-native species might be detectable but temporary and localized, and these species might not displace native species' populations and distributions.	Impacts on native species, their habitats, or the natural processes sustaining them could be measurable but limited to local and adjacent areas. There could be occasional responses to disturbance by some individuals, with some adverse impacts on feeding, reproduction, resting, migrating, or other factors, affecting local population levels. Some impacts might occur in key habitats. However, sufficient population numbers or habitat might retain function to maintain the viability of the species both locally and regionally. Opportunity for increased spread of non-native species might be detectable and limited to local and adjacent areas but might result only in temporary changes to native species' population and distributions.	Impacts on native species, their habitats, or the natural processes sustaining them might be detectable and widespread. There could be frequent responses to disturbance by some individuals, with adverse impacts on feeding, reproduction, migrating, or other factors, resulting in a decrease in both local and regional population levels and habitat type. Impacts might occur during critical periods of reproduction or in key habitats and could result in direct mortality or loss of habitat that might affect the viability of a species. Local population numbers, population structure, and other demographic factors might experience large changes or declines. Actions could result in the widespread increase of non-native species and result in broad and permanent changes to native species' populations and distributions.
Marine and Estuarine Fauna (fish, shellfish, benthic organisms)	**Short-term:** Lasting up to two spawning seasons, depending on length of season **Long-term:** Lasting more than two spawning seasons	Impacts might be detectable and localized but small. Disturbance of individual species could occur; however, there might be no change in the assemblage or local populations of marine and estuarine species. Any disturbance could not interfere with key behaviors such as feeding and spawning. There could be no restriction of movements daily or seasonally. Opportunity for increased spread of non-native species might be detectable but temporary and localized, and these species might not displace native species' populations and distributions.	Impacts might be readily apparent and result in a change in marine and estuarine species populations in local and adjacent areas. Areas being disturbed may display a change in species assemblages; however, overall populations might not be altered. Some key behaviors might be affected but not to the extent that species viability is affected. Some movements might be restricted seasonally. Opportunity for increased spread of non-native species might be detectable and limited to local and adjacent areas but might result only in temporary changes to native species' population and distributions.	Impacts might be readily apparent and could substantially change marine and estuarine species populations over a wide-scale area, possibly river-basin-wide. Disturbances could result in a decrease in fish species' assemblages and populations. The viability of some species might be affected. Species' movements might be seasonally constrained or eliminated. Actions could result in the widespread increase of non-native species and result in broad and permanent changes to native species' populations and distributions.

Resource	Impact Duration	Minor Intensity	Moderate Intensity	Major Intensity
Protected Species	**Short-term:** Lasting up to one breeding/ growing season **Long-term:** Lasting more than one breeding/ growing season	Impacts on protected species, their habitats, or the natural processes sustaining them might be detectable, but small and localized, and could not measurably alter natural conditions. Impacts might likely result in a "may affect, not likely to adversely affect" determination for at least one listed species.	Impacts on protected species, their habitats, or the natural processes sustaining them might be detectable and some alteration in the numbers of protected species or occasional responses to disturbance by some individuals might be expected, with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local and adjacent population levels. Impacts might occur in key habitats, but sufficient population numbers or habitat might remain functional to maintain the viability of the species both locally and throughout their range. Some disturbance to individuals or impacts to potential or designated critical habitat could occur. Impacts might likely result in a "may affect, likely to adversely affect" determination for at least one listed species. No adverse modification of critical habitat could be expected.	Impacts on protected species, their habitats, or the natural processes sustaining them could be detectable, widespread, and permanent. Substantial impacts to the population numbers of protected species, or interference with their survival, growth, or reproduction could be expected. There could be impacts to key habitat, resulting in substantial reductions in species numbers. Results in an "is likely to jeopardize proposed or listed species/adversely modify proposed or designated critical habitat (impairment)" determination for at least one listed species.
Socioeconomics	**Short-term:** During construction period **Long-term:** Over the life of the project or longer	A few individuals, groups, businesses, properties, or institutions could be affected. Impacts might be small and localized. These impacts are not expected to substantively alter social and/or economic conditions.	Many individuals, groups, businesses, properties, or institutions could be affected. Impacts might be readily apparent and detectable in local and adjacent areas and might have a noticeable effect on social and/or economic conditions.	A large number of individuals, groups, businesses, properties, or institutions could be affected. Impacts might be readily detectable and observed, extend over a widespread area, and have a substantial influence on social and/or economic conditions.
Cultural Resources	**Short-term:** During construction period **Long-term:** Over the life of the project or longer	The disturbance of a site(s), building, structure, or object might be confined to a small area with little, if any, loss of important cultural information potential.	The disturbance of a site(s), building, structure, or object is not expected to result in a substantial loss of important cultural information.	The disturbance of a site(s), building, structure, or object might be substantial and may result in the loss of most or all its potential to yield important cultural information.

Resource	Impact Duration	Minor Intensity	Moderate Intensity	Major Intensity
Infrastructure	**Short-term:** During construction period **Long-term:** Over the life of the project or longer	The action could affect public services or utilities, but the impact might be localized and within operational capacities. There might be negligible increases in local daily traffic volumes, resulting in perceived inconvenience to drivers but no actual disruptions to traffic.	The action could affect public services or utilities in local and adjacent areas, and the impact might require the acquisition of additional service providers or capacity. There could be a detectable increase in daily traffic volumes (with slightly reduced speed of travel), resulting in slowed traffic and delays, but no change in level of service (LOS). Short service interruptions (temporary closure for a few hours) to roadway and railroad traffic might occur.	The action could affect public services or utilities over a widespread area, resulting in the loss of certain services or necessary utilities. Extensive increase in daily traffic volumes (with reduced speed of travel) could result in an adverse change in LOS to worsened conditions. Extensive service disruptions (temporary closure of one day or more) to roadways or railroad traffic might occur.
Land and Marine Management	**Short-term:** During construction period **Long-term:** Over the life of the project or longer	The action could require a variance or zoning change or an amendment to a land use, area comprehensive, or management plan but could not affect overall use and management beyond the local area.	The action could require a variance or zoning change or an amendment to a land use, comprehensive area plan, or management plan and could affect overall land use and management in local and adjacent areas.	The action could cause permanent changes to and conflict with land uses or management plans over a widespread area.
Tourism and Recreational Use	**Short-term:** During construction period **Long-term:** Over the life of the project or longer	There could be partially developed recreational site closures to protect local public safety. The same site capacity and visitor experience might remain unchanged after construction. The impact might be detectable and/or only affect some recreationists. Users might likely be aware of the action, but changes in use might be slight. There might be a change in local recreational opportunities; however, it might affect relatively few visitors or not affect any related recreational activities.	There could be complete site closures to protect public safety. However, the sites might be reopened after activities occur. There might be slightly reduced site capacity. The visitor experience might be slightly changed but still available. The impact might be readily apparent and/or affect many recreationists locally and in adjacent areas. Users might be aware of the action. Some users might choose to pursue activities in other local or regional areas available.	Developed facilities might be closed and removed, and all developed site capacity might be eliminated. Visitors might be displaced to facilities over a widespread area, and visitor experiences might no longer be available in many locations. The impact could affect most recreationists over a widespread area. Users might be highly aware of the action and choose to pursue activities in other available regional areas.
Fisheries and Aquaculture	**Short-term:** Lasting up to two spawning seasons, depending on length of season **Long-term:** Lasting more than two spawning seasons	A few individuals, groups, businesses, properties, or institutions could be affected. Impacts might be small and localized. These impacts are not expected to substantively alter social and/or economic conditions.	Many individuals, groups, businesses, properties, or institutions could be affected. Impacts might be readily apparent and detectable in local and adjacent areas and have a noticeable effect on social and/or economic conditions.	A large number of individuals, groups, businesses, properties, or institutions could be affected. Impacts might be readily detectable and observed, extend over a widespread area, and have a substantial influence on social and/or economic conditions.

Resource	Impact Duration	Minor Intensity	Moderate Intensity	Major Intensity
Marine Transportation	**Short-term:** During construction period **Long-term:** Over the life of the project or longer	The action could affect public services or utilities, but the impact might be localized and within operational capacities. There might be negligible increases in local daily marine traffic volumes, resulting in perceived inconvenience to operators, but no actual disruptions to transportation.	The action could affect public services or utilities in local and adjacent areas, and the impact might require the acquisition of additional service providers or capacity. Detectable increase in daily marine traffic volumes might occur (with slightly reduced speed of travel), resulting in slowed traffic and delays. Short service interruptions might occur (temporary delays for a few hours).	The action could affect public services utilities over a widespread area resulting in the loss of certain services or necessary utilities. Extensive increase in daily marine traffic volumes might occur (with reduced speed of travel), resulting in extensive service disruptions (temporary closure of one day or more).
Aesthetics and Visual Resources	**Short-term:** During construction period **Long-term:** Over the life of the project or longer	There could be a change in the viewshed that was readily apparent but could not attract attention, dominate the view, or detract from current user activities or experiences.	There could be a change in the viewshed that was readily apparent and attracts attention. Changes might not dominate the viewscape, although they might detract from the current user activities or experiences.	Changes to the characteristic views could dominate and detract from current user activities or experiences.
Public Health and Safety, Including Flood and Shoreline Protection	**Short-term:** During construction period **Long-term**: Over the life of the project or longer	Actions could not result in the following: 1) soil, groundwater, and/or surface water contamination; 2) exposure of contaminated media to construction workers or transmission line operations personnel; and/or 3) mobilization and migration of contaminants currently in the soil, groundwater, or surface water at levels that could harm the workers or general public. Increased risk of potential hazards (e.g., increased likelihood of storm surge) to visitors, residents, and workers from decreased shoreline integrity could be temporary and localized.	Actions could result in the following: 1) exposure, mobilization and/or migration of existing contaminated soil, groundwater, or surface water to an extent that requires mitigation; and/or 2) detectable levels of contaminants to soil, groundwater, and/or surface water in localized areas within the project boundaries such that mitigation/remediation is required to restore the affected area to the pre-construction conditions. Increased risk of potential hazards to visitors, residents, and workers from decreased shoreline integrity could be sufficient to cause a permanent change in use patterns and area avoidance in local and adjacent areas.	Actions could result in the following: 1) soil, groundwater, and/or surface water contamination at levels exceeding federal, state, or local hazardous waste criteria, including those established by 40 *Code of Federal Regulations* (CFR) 261; 2) mobilization of contaminants currently in the soil, groundwater, or surface water, resulting in exposure of humans or other sensitive receptors such as plants and wildlife to contaminant levels that could result in health effects; and 3) the presence of contaminated soil, groundwater, or surface water within the project area, exposing workers and/or the public to contaminated or hazardous materials at levels exceeding those permitted by the federal Occupational Safety and Health Administration (OSHA) in 29 CFR 1910. Increased risk of potential hazards to visitors, residents, and workers from decreased shoreline integrity could be substantial and could cause permanent changes in use patterns and area avoidance over a widespread area.

Appendix E. Monitoring and Adaptive Management Plans

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San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration Project Monitoring and Adaptive Management Plan

Texas Point National Wildlife Refuge Wetland Restoration Project Monitoring and Adaptive Management Plan

Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration Project Monitoring and Adaptive Management Plan

1. Introduction

This Monitoring and Adaptive Management Plan (MAM Plan) identifies the performance criteria and monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project consistent with the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Final PDARP/PEIS; *Deepwater Horizon* Natural Resource Damage Assessment Trustees [DWH NRDA Trustees] 2016). This plan was developed according to the Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.1 (MAM Manual; DWH NRDA Trustees 2024) and was adapted to fit the needs of the Texas Dredged Material Planning for Wetland Restoration–*Jocelyn Nungaray National Wildlife Refuge (NWR) Roberts Mueller Tract Wetland Restoration* project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document would be made publicly available through National Oceanic and Atmospheric Administration (NOAA) Data Integration Visualization Exploration and Reporting (DIVER) and accessible through the *Deepwater Horizon* (DWH) Natural Resource Damage Assessment (NRDA) Trustee Council's website (https://www.gulfspillrestoration.noaa.gov).

1.1 Project Overview

The project would restore wetlands through the beneficial use of dredged material in the Jocelyn Nungaray NWR located in Chambers County, Texas (Figure 1). The project is one of the eight restoration sites identified for engineering and design under the *Texas Dredged Material Planning for Wetland Restoration* project selected in the *Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters* (Texas Trustee Implementation Group [Texas TIG] 2017). The project would beneficially use suitable sediment to restore coastal wetlands. The placement of dredged material from navigation channels and dock berths, construction of containment levees, and associated planting of estuarine marsh vegetation would restore up to 550 acres of intertidal marsh.

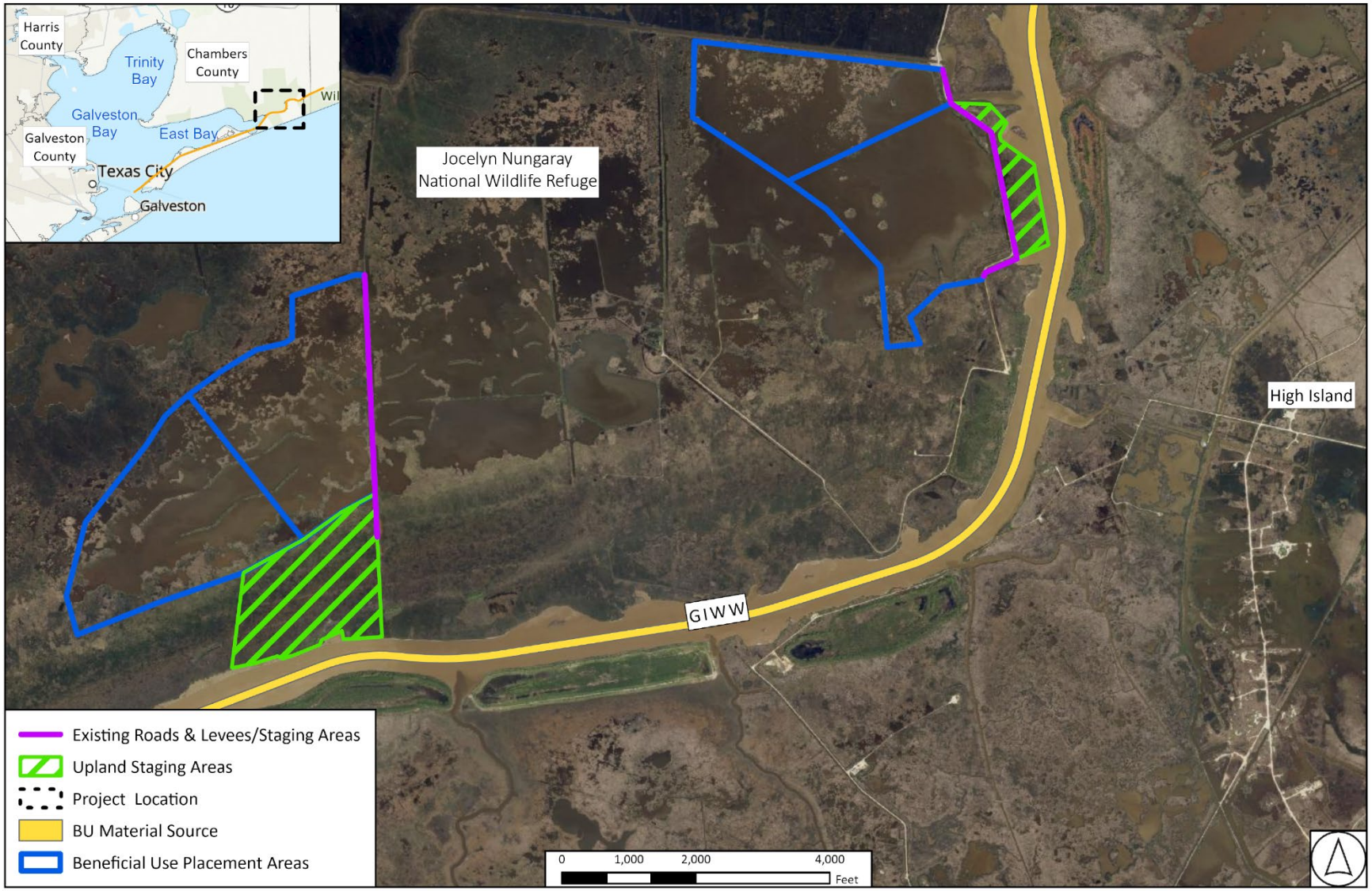


Figure 1 **Vicinity Map Showing the Location of the *Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration* Project Site in Chambers County, Texas**

This project is being implemented as restoration for the DWH oil spill NRDA, consistent with the Final PDARP/PEIS. Per the Final PDARP/PEIS, the project falls into the following restoration categories:

a) **Programmatic Goal:** Restore and conserve habitat

b) **Restoration Type:** Wetlands, coastal, and nearshore habitats

c) **Restoration Approach:** Create, restore, and enhance coastal wetlands

d) **Restoration Technique:** Create or enhance coastal wetlands through placement of dredged material

e) **Trustee Implementation Group:** Texas Trustee Implementation Group

f) **Restoration Plan**: Texas Trustee Implementation Group Restoration Plan and Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats

1.2 Restoration Type Goals and Project Restoration Objectives

This project is designed to address the Wetlands, Coastal, and Nearshore Habitat Restoration Type. As summarized in Chapter 5 of the Final PDARP/PEIS, the Restoration Type goals are:

a) Restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf Coast states to maintain a varied ecosystem, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities.

b) Restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability.

c) While acknowledging the existing distribution of habitats throughout the Gulf, restore habitats in appropriate combinations for any given geographic area. Consider design factors, such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats.

To accomplish the Restoration Type goals, the project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands and 2) establish estuarine marsh vegetation.

1.3 Conceptual Setting

The project would restore priority areas within the Roberts Mueller Tract located within the 34,000-acre Jocelyn Nungaray NWR, Chambers County, Texas. The Roberts Mueller Tract is located in East Galveston Bay on the north side of the Gulf Intracoastal Waterway, northwest of High Island, Texas (Figure 1). The predominant wetland habitats near the NWR are characterized as salt and brackish marsh and estuarine open water. The project is composed of two areas with primarily open water and some remnants of fragmented marsh. The westernmost area contains terraces in some of the open-water area from a project completed in 2011. The project areas identified for restoration were historically healthy marsh but, over the past two decades, have eroded away into mostly open water. Sea level rise, subsidence, insufficient sediment inflow due to anthropogenic alterations, and erosion have severely degraded marsh and wetland habitat in the region. This habitat degradation is exhibited by the increase in the areal extent of open water and the decrease in estuarine marsh area. Restoration and protection of

marshes in the region would ensure ecological longevity for the habitats, as well as reduce vulnerability of critical infrastructure to hurricanes and storm surges.

The project would be a continuation of similar marsh restoration efforts in the region that are beneficially using dredged material. The initial establishment of marsh vegetation is anticipated to occur within two years of the placement of dredged material within the restoration cells.

This project would rely on external partners, such as the U.S. Army Corps of Engineers (USACE), to provide sediment dredged from sites in close proximity to the restoration site. The quantity, quality, and timing of availability of dredged sediments would be key drivers of the final acreage of intertidal marsh habitat restored.

1.4 Sources of Uncertainty

Although the likelihood of project success is evaluated under Oil Pollution Act regulations (15 CFR § 990.54(a)(3)), uncertainties may exist regarding how to best implement projects to achieve the greatest benefits for the injured resources. These uncertainties may arise from an incomplete understanding of the current conceptual setting; from unknown conditions in the future; or from project elements that do not perform as anticipated. For this project, the uncertainties (summarized in Table 1) could affect project success and could, therefore, be key drivers of corrective actions or adaptive management decisions. Sections 2 and 3 summarize project monitoring protocols and describe how this information would be used to inform adaptive management to address these uncertainties.

Potential uncertainties are defined as those that may affect the ability to achieve project restoration objective(s). To aid in the identification of uncertainties, Trustees utilized a variety of sources, including but not limited to, Final PDARP/PEIS Monitoring and Adaptive Management (MAM) Section 5.5.15 (DWH NRDA Trustees 2016); the MAM Manual (DWH NRDA Trustees 2024); and other documents. Monitoring activities can be implemented to inform these uncertainties and appropriate corrective actions in the event the Project is not meeting its performance criteria.

Table 1 Key Uncertainties

Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision-Making
Extreme weather	Extreme weather may result in damage to the project prior to, during, or post construction. This could result in the need to postpone construction or reconstruct damaged portions of the project. Extreme weather could also affect the growth/survival of transplanted vegetation and/or allow invasive species to be established and/or dominate the vegetation community.
Survival of transplanted vegetation	Survival of transplanted vegetation could be hindered by extreme weather, precipitation, and sediment elevation.
Vegetation recruitment and/or colonization	Recruitment and/or colonization patterns of flora may be insufficient.
Precipitation patterns	Drought could hinder growth and/or survival of transplanted vegetation and/or allow nontarget vegetation communities to evolve (e.g., invasive species).
Sea level rise and subsidence	Site-specific rates of sea level rise and subsidence may impact the proper functioning of the elevation gradient needed to support estuarine marsh.

Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision-Making
Market instability	Unforeseen market instability may delay, prevent, or change the spatial extent of construction of the Project.
Contractor controls	Dredging contracts would be held by the USACE or other project partners, and the Implementing Trustee may have limited direct control over contractor actions and communications. This could produce communication delays resulting in contractors overfilling or underfilling portions of the restoration site.
Source and quality of dredged material	The source and quality (e.g., grain size distribution) of sediments can have an impact on time and elevation of sediment settlement and marsh development.

The list of key uncertainties in Table 1 is not exhaustive. Additional uncertainties may be identified as the project is implemented and monitored. These uncertainties may affect the achievement of the restoration objectives of the project. If any drivers or stressors are negatively impacting the Project, adaptive management may be necessary to ensure that Project objectives are being achieved.

2. Project Monitoring, Performance Criteria, and Potential Corrective Actions

The monitoring described in this MAM Plan was developed to evaluate project performance and identify potential corrective actions, if needed. Information on each monitoring parameter is provided below, organized by objective (Table 2). Monitoring data would be evaluated to 1) determine whether the project, once implemented, has met its objectives and 2) inform the need for potential corrective actions. Note that Table 2 does not include all possible options for corrective actions; rather, it includes a list of potential actions for each individual parameter to be considered if the Project is not performing as expected once implemented. Other corrective actions may be identified post-construction, as appropriate. The project site includes multiple marsh restoration cells that may be constructed over multiple dredging events. Monitoring for each restoration cell will be initiated when a corresponding dredging event for that cell is identified.

Table 2 1Project Objectives, Parameters, Data Collection Activities, Performance Criteria, and Potential Corrective Actions

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Structural Integrity (Completed as Designed) *(i.e., of levees and water control structures)*	As-built topographic surveys of the containment berms would be collected as deemed appropriate by the project engineer. Subsequent surveys would consist of visual surveys to ensure physical integrity of the berms and water control structures and would be documented with photographs.	Topographic surveys, visual inspections, and field and aerial photographic documentation would be conducted annually until a management decision is made for berm breaching and water control structures (approximately 1-year post-construction).	One survey/inspection per entire construction area site.	As-built elevation, integrity, and function of the containment berms and water control structures is maintained as designed until a management decision is made for berm breaching and water control structure removal (approximately 1-year post-construction).	Reshaping or repairing containment berms, adding additional sediments to the berms, repairing or modifying water control structures, or lowering contained water levels.
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Elevation, Habitat	Topographic surveys of the marsh restoration cells would be conducted along parallel transects 300 feet apart (a minimum of three transects per marsh restoration cell). Transect locations would be established during the preconstruction survey and reoccupied during subsequent survey events. Survey points would be collected every 100 feet (a minimum of 24 points per restoration cell) along each transect and at locations with a noticeable break in slope. Survey points would also be collected at each settlement plate location.	Annual topographic surveys, visual inspections, and field and aerial photographic documentation would be conducted over the 5-year monitoring period near the end of the growing season.	One survey/inspection per entire construction cell.	70% of sediment fill area within target elevation 5 years post-construction.	Reshaping sediments, adding additional sediments, breaching containment berms, and removing water containment structures.

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Structural Integrity (Consolidation)	Settlement plates would be installed within the marsh restoration cells prior to the placement of dredged material to monitor compaction of the fill material and underlying native soils during and after construction. Monitoring would be conducted either by manual survey or through automated telemetry.	Annual topographic surveys, visual inspections, and field and aerial photographic documentation at the settlement plates would be conducted over the 5-year monitoring period near the end of the growing season.	One survey/inspection per entire construction area cell. Minimum of one settlement plate per 75 acres or three per cell.	70% of sediment fill area within target elevation 5 years postconstruction.	Reshaping sediments, adding additional sediments, breaching containment berms, and removing water containment structures.
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Area (Habitat by type)	The aerial extent of the project and habitat boundaries would be mapped using aerial imagery collected by airplane, helicopter, unmanned aerial systems, satellite imagery, or other appropriate remote sensing platforms. Imagery would map the extent of vegetated marsh and open water within the restoration cell.	Aerial imagery would be collected during preconstruction to establish pre-project baseline conditions. Subsequent aerial imagery collection would be conducted at 1-, 3-, and 5-years post-construction and, if needed, after events that could alter habitat within the project area such as severe storms, flooding, or oil spills.	One survey/inspection per entire construction area cell.	Vegetated estuarine marsh habitat occupies no more than 60%–80% of the marsh restoration cell area 5 years post-construction.	Reshaping sediments, adding additional sediments, breaching containment berms, removing water control structures, and making hydrologic modifications (construction of ponds and channels).
Establish estuarine marsh vegetation	Percent Cover, Vegetation	Monitoring transects would be established with 300 feet between transects. One 1 by 1-m plot would be established every 100 feet or a minimum of 24 plots per restoration cell. The corners of each plot would be recorded with GPS and marked with corner poles for	Annual vegetation percent cover surveys would be conducted during the monitoring period near the end of the growing season. The monitoring period is expected to be 5 years or less and is dependent upon when	Monitoring plots of 1- by 1 m (minimum of 24 plots per restoration cell) would be established at 1 year post-construction or when the managers decide to remove berms and water	One of two criteria should be met: 1) percent cover is maintained at or greater than 70% in monitoring subplots, 5 years after planting activities initiated; and 2) percent cover is within ±5% of the	Replanting/reseeding, invasive species removal, and/or transplanting of native estuarine marsh plants species. The Texas TIG may extend monitoring for 5 years or until performance criteria are met. If the

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
		revisiting over time. Visual estimates of total plant cover (sum of all plant species) would be recorded at each plot. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots. Vegetation percent cover and composition would be simultaneously collected from the same plots.	the performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports	control structures. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration site plots.	reference control cell.	monitoring period is changed, the decision would be documented in annual MAM reports.
Establish estuarine marsh vegetation	Species Composition, Vegetation	Monitoring transects would be established 300 feet between transects. One 1- by 1-m plot will be established every 100 feet or a minimum of 24 plots per restoration cell. The corners of each plot would be recorded with GPS and marked with corner poles for revisiting over time. Visual estimates of total plant cover per species would be recorded at each plot. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots. Vegetation percent cover and composition would be simultaneously collected from the same plots.	Annual vegetation percent cover surveys would be conducted during the monitoring period near the end of the growing season. The monitoring period is expected to be 5 years or less and is dependent upon when the performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports	Monitoring plots of 1- by 1-m (minimum of 24 plots per cell) would be established at 1-year post-construction or when the managers decide to remove berms and water control structures. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots.	Vegetation composition should be similar to reference cell. No more than 5% coverage of the plant species present are exotic invasive plants.	Corrective actions could include replanting/reseeding, invasive species removal, and/or transplanting of native estuarine marsh plants species. The Texas TIG may extend monitoring for 5 years or until performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports.

3. Adaptive Management

Adaptive management decisions may include how to improve the likelihood of achieving favorable project outcomes or selecting corrective actions in the event a project is not performing as expected and intended. Due to the nature of this project and the use of standard restoration techniques that have been successfully implemented in similar projects, the Texas TIG does not anticipate the need for rigorous adaptive management. If assessment of project monitoring data indicates that objectives are not being met, the Texas TIG may implement corrective actions as identified in Table 2 and/or identify corrective actions as necessary.

4. Evaluation

Project MAM includes planned evaluations of the selected parameters (see Table 2) throughout the project's lifetime. By thoughtfully designing evaluation methods for the design and implementation of project restoration activities, the Implementing Trustee can assess if the project is meeting its restoration objectives and determine the need for adaptive management or corrective actions, as well as identify lessons learned, previously unrecognized uncertainties, and/or unanticipated events unrelated to the restoration project that potentially affected the monitoring results (e.g., extreme weather such as hurricanes). At a minimum and as part of the annual reporting of monitoring data (Section 6), annual evaluations of monitoring data would be conducted to determine if corrective actions are needed. Evaluations of monitoring data can occur more often as needed or as triggered by project milestones such as completion of construction.

5. Monitoring Schedule

The schedule for the project monitoring activities is shown in Table 3 by monitoring parameter. The project site includes multiple marsh restoration cells that may be constructed over multiple dredging events. Monitoring for each restoration cell would be initiated when a corresponding dredging event for that cell is identified.

Table 32 Monitoring Schedule

Monitoring Parameter	Preconstruction Monitoring	Construction Monitoring (As Built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Structural Integrity (Completed as Designed)	N/A	X	X	X	X	X	X
Elevation, Habitat	X	X	X	X	X	X	X
Structural Integrity (Consolidation)	N/A	N/A	X	X	X	X	X
Area (Habitat by type)	X	N/A	X	N/A	X	N/A	X
Percent Cover, Vegetation	N/A	N/A	X	X	X	X	X
Species Composition, Vegetation	N/A	N/A	X	X	X	X	X

Note:
PM: post-construction monitoring

6. Data Management

Project data would be generated through site visits, topographic surveys, aerial imagery, ground photography, and vegetation surveys. Data collection would occur as shown in Table 2. Data would be managed in accordance with the DWH Trustee Council Standard Operating Procedures (SOPs; DWH NRDA Trustees 2021) and guidance provided in the MAM Manual (DWH NRDA Trustees 2024). Original data sheets would be scanned, which would be retained by the Implementing Trustee for the time period specified by the SOPs following project closeout. Compiled data and digital imagery would be stored in a secure, central or cloud-based system that is automatically backed up off site.

6.1 Data Description

Topographic survey data for latitude, longitude, and elevation would be collected and stored in digital formats and processed into digital elevation models as raster imagery format files. Aerial imagery would similarly be stored with ground photography. Vegetation monitoring data would be collected either by electronic tablet into spreadsheets or project data sheets. Geographic Information System (GIS) data would typically be in shapefiles with supporting metadata. Data collected on hard copy forms would be scanned or transcribed to digital spreadsheets.

6.2 Data Review and Clearance

Prior to being added to DIVER, all data would go through the appropriate quality assurance/quality control (QA/QC) process in accordance with the SOPs and MAM Manual.

GIS metadata would be verified for compliance with the Federal Geographic Data Committee (FGDC) and International Organization for Standardization (ISO) metadata standards, as well as any Implementing Trustee agency requirements. Appropriate metadata could include a data dictionary to define codes and fields used in the dataset; and/or a Readme file describing how data was collected, QA/QC procedures, and other information about data such as meaning, relationships to other data, origin, usage, and format.

Project data that are handwritten would be transcribed into a standard digital format and verified by one or more reviewers. For QA/QC procedures, generated electronic data sheets would be verified against the original hard copy, and any validation and transcription errors would be corrected as appropriate before data are used for any analyses or published to the DIVER Restoration Portal.

Implementing Trustees would verify and validate MAM data and information and would ensure that all data are entered or converted into a commonly used digital format and labeled with metadata to the extent practicable and in accordance with FGDC, ISO, and Implementing Trustee agency standards. The Implementing Trustee would give the other Texas TIG members time to review the data before making such information publicly available in DIVER. The Implementing Trustee is responsible for ensuring that the data submitted to DIVER are consistent with the data standards.

6.3 Data Storage and Accessibility

The Implementing Trustee is responsible for ensuring that documents and electronic data files are stored in a secure location in such a way that accessibility is guaranteed for as long as the agency requires. Original hard copy data, digital data, and photographs would be retained by the Implementing Trustee. Digital data and scanned hard copy photographs and forms would be stored on the NOAA-supported TIG

SharePoint site. After data has been verified by QA/QC procedures, it would be stored on DIVER and, where applicable, on Implementing Trustee databases, in accordance with DWH reporting requirements (e.g., within one year of collection).

6.4 Data Sharing

Implementing Trustees would ensure data sharing follows standards and protocols set forth in the DWH Trustee Council SOPs (Section 11.4 of SOPs; DWH NRDA Trustees 2021). Data would be made publicly available, in accordance with the federal Open Data Policy (Executive Order 13642, May 4, 2013), through DIVER. Prior to being made publicly available, any personal identifiable information would be redacted. Some MAM data may be exempt from the Open Data Policy due to protection from public disclosure under other regulatory requirements. No data release can occur if it is contrary to other federal or state laws.

7. Reporting

Project monitoring information, including a summary of monitoring information and decision of potential corrective actions, would be prepared and uploaded to DIVER annually. The Implementing Trustee would develop a final, high-level summary report prior to project closeout.

8. Roles and Responsibilities

Implementing Trustees for this project would be identified via a TIG Resolution. The Implementing Trustee would be responsible for execution of the MAM Plan, oversight of any contractors used to perform MAM tasks, annual and final reporting in DIVER, and informing the Texas TIG of project details, including the need for potential corrective action. Other Texas TIG members may assist with monitoring data collection, data verification, draft project report review and editing, and providing technical support to the Implementing Trustee. The decision to implement corrective action would be determined by Texas TIG consensus.

9. References

Deepwater Horizon Natural Resource Damage Assessment Trustees (DWH NRDA Trustees), 2016. Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. February 2016. Accessed August 3, 2024. Available at: http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan

DWH NRDA Trustees, 2021. Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the Deepwater Horizon (DWH) Oil Spill. Revised August 2, 2021. Accessed September 14, 2024. Available at: https://www.gulfspillrestoration.noaa.gov/media/document/2021-08-02-final-revised-sop-clean-copy-30pdf

DWH NRDA Trustees, 2024. Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.1. Appendix to the Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill. Revised September 2024. Accessed November 1, 2024. Available at: https://www.gulfspillrestoration.noaa.gov/monitoring-and-adaptive-management

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Texas Trustee Implementation Group, 2017. Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters. Accessed August 6, 2024. Available at: https://www.gulfspillrestoration.noaa.gov/media/document/dwh-arz000631pdf

Goose Island Wetland Restoration Project Monitoring and Adaptive Management Plan

1. Introduction

This Monitoring and Adaptive Management Plan (MAM Plan) identifies the performance criteria and monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project consistent with the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Final PDARP/PEIS; Deepwater Horizon Natural Resource Damage Assessment Trustees [DWH NRDA Trustees] 2016). This plan was developed according to the Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.1 (MAM Manual; DWH NRDA Trustees 2024) and was adapted to fit the needs of the *Texas Dredged Material Planning for Wetland Restoration–Goose Island Wetland Restoration* project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document would be made publicly available through National Oceanic and Atmospheric Administration (NOAA) Data Integration Visualization Exploration and Reporting (DIVER) and accessible through the *Deepwater Horizon* (DWH) Natural Resource Damage Assessment (NRDA) Trustee Council's website (https://www.gulfspillrestoration.noaa.gov).

1.1 Project Overview

The project would restore wetlands through the beneficial use of dredged material adjacent to Goose Island located within Aransas County, Texas, at the end of Lamar Peninsula north of Rockport, Texas, at the north end of Aransas Bay (Figure 1). The project is one of the eight restoration sites identified for engineering and design under the *Texas Dredged Material Planning for Wetland Restoration* project selected in the *Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters* (Texas Trustee Implementation Group [Texas TIG] 2017). The project would beneficially use suitable sediment to restore coastal wetlands. The placement of dredged material from navigation channels and dock berths, construction of containment levees, and associated planting of estuarine marsh vegetation would restore up to 40 acres of intertidal marsh.



Figure 1 **Vicinity Map Showing the Location of the *Goose Island Wetland Restoration* Project in Aransas County, Texas**

This project is being implemented as restoration for the DWH oil spill NRDA, consistent with the Final PDARP/PEIS (DWH NRDA Trustees 2016). Per the Final PDARP/PEIS, the project falls into the following restoration categories:

a) **Programmatic Goal:** Restore and conserve habitat

b) **Restoration Type:** Wetlands, coastal, and nearshore habitats

c) **Restoration Approach:** Create, restore, and enhance coastal wetlands

d) **Restoration Technique:** Create or enhance coastal wetlands through placement of dredged material

e) **Trustee Implementation Group:** Texas Trustee Implementation Group

f) **Restoration Plan**: Texas Trustee Implementation Group Restoration Plan and Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats

1.2 Restoration Type Goals and Project Restoration Objectives

This project is designed to address the Wetlands, Coastal, and Nearshore Habitat Restoration Type. As summarized in Chapter 5 of the Final PDARP/PEIS, the Restoration Type goals are:

a) Restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf Coast states to maintain a varied ecosystem, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities.

b) Restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability.

c) While acknowledging the existing distribution of habitats throughout the Gulf, restore habitats in appropriate combinations for any given geographic area. Consider design factors, such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats.

To accomplish the Restoration Type goals, the project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands and 2) establish estuarine marsh vegetation.

1.3 Conceptual Setting

The project would restore marsh habitats on or adjacent to Goose Island in Aransas County, Texas (Figure 1). Historically, the upland area of Goose Island was much larger, but decades of tidal erosion, rising sea levels, subsidence, and altered sediment supplies have reduced the area to its current footprint. Habitat degradation is exhibited by the increase in the aerial extent of open water and the decrease in estuarine marsh area.

Containment dikes and an offshore breakwater were constructed in 2008 during a previous attempt to restore the island encompassed by the two existing cells. The previous restoration effort did not create a functional marsh elevation, likely due to inadequate quantities of fill material provided opportunistically

from a nonfederal channel during development of a community just north of the state park. Since 2008, no additional restoration efforts have been undertaken at this location.

Over the past decade, the containment dikes have eroded due to tidal movement, wave energy, and storm impacts, and the previously pumped material has settled substantially, as well as been lost. To successfully place new material, the existing containment dikes would be repaired by excavating sediment on site to increase elevation.

The project would be a continuation of similar marsh restoration efforts in the region that are beneficially using dredged material. The initial establishment of marsh vegetation is anticipated to occur within two years of the placement of dredged material within the restoration cells.

This project would rely on external partners, such as the U.S. Army Corps of Engineers (USACE), to provide sediment dredged from sites in close proximity to the restoration site. The quantity, quality, and timing of availability of dredged sediments would be a key driver in the final acreage of intertidal marsh habitat restored.

1.4 Sources of Uncertainty

Although the likelihood of project success is evaluated under Oil Pollution Act regulations (15 CFR § 990.54(a)(3)), uncertainties may exist regarding how to best implement projects to achieve the greatest benefits for the injured resources. These uncertainties may arise from an incomplete understanding of the current conceptual setting; from unknown conditions in the future; or from project elements that do not perform as anticipated. For this project, the uncertainties (summarized in Table 1) could affect project success and could, therefore, be key drivers of corrective actions or adaptive management decisions. Sections 2 and 3 summarize project monitoring protocols and describe how this information would be used to inform adaptive management to address these uncertainties.

Potential uncertainties are defined as those that may affect the ability to achieve project restoration objective(s). To aid in the identification of uncertainties, Trustees utilized a variety of sources, including but not limited to, Final PDARP/PEIS Monitoring and Adaptive Management (MAM) Section 5.5.15 (DWH NRDA Trustees 2016); MAM Manual (DWH NRDA Trustees 2024); and other documents. Monitoring activities can be undertaken to inform these uncertainties, and appropriate corrective actions can be implemented in the event the Project is not meeting its performance criteria.

Table 1 Key Uncertainties

Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision-Making
Extreme weather	Extreme weather may result in damage to the project prior to, during, or post construction. This could result in the need to postpone construction or reconstruct damaged portions of the project. Extreme weather could also affect the growth/survival of transplanted vegetation and/or allow invasive species to be established and/or dominate the vegetation community.
Survival of transplanted vegetation	Survival of transplanted vegetation could be hindered by extreme weather, precipitation, and sediment elevation.
Vegetation recruitment and/or colonization	Recruitment and/or colonization patterns of flora may be insufficient.

Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision-Making
Precipitation patterns	Drought could hinder growth and/or survival of transplanted vegetation and/or allow nontarget vegetation communities to evolve (e.g., invasive species).
Sea level rise and subsidence	Site-specific rates of sea level rise and subsidence may impact the proper functioning of the elevation gradient needed to support estuarine marsh.
Market instability	Unforeseen market instability may delay, prevent, or change the spatial extent of construction of the Project.
Contractor controls	Dredging contracts would be held by the USACE or other project partner, and the Implementing Trustee may have limited direct control over contractor actions and communications. This could produce communication delays, resulting in contractors overfilling or underfilling portions of the restoration site.
Source and quality of dredged material	The source and quality (e.g., grain size distribution) of sediments can have an impact on time and elevation of sediment settlement and marsh development.

The list of key uncertainties in Table 1 is not exhaustive. Additional uncertainties may be identified as the project is implemented and monitored. These uncertainties may affect the achievement of the restoration objectives of the project. If any drivers or stressors are negatively impacting the project, adaptive management may be necessary to ensure that project objectives are being achieved.

2. Project Monitoring, Performance Criteria, and Potential Corrective Actions

The monitoring described in this MAM Plan was developed to evaluate project performance and identify potential corrective actions, if needed. Information on each monitoring parameter is provided below, organized by objective (Table 2). Evaluations of monitoring data are used to 1) determine whether the project, once implemented, has met its objectives and 2) to inform the need for potential corrective actions (see Table 2). Note that Table 2 does not include all possible options for corrective actions; rather, it includes a list of potential actions for each individual parameter to be considered if the project is not performing as expected once implemented. Other corrective actions may be identified post-construction, as appropriate. The project site includes multiple marsh restoration cells that may be constructed over multiple dredging events. Monitoring for each restoration cell would be initiated when a corresponding dredging event for that cell is identified.

Table 2 Project Objectives, Parameters, Data Collection Activities, Performance Criteria, and Potential Corrective Actions

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Structural Integrity (Completed as Designed) *(i.e., of levees and water control structures)*	As-built topographic surveys of the containment berms would be collected as deemed appropriate by the project engineer. Subsequent surveys would consist of visual surveys to ensure physical integrity of the berms and water control structures and would be documented with photographs.	Topographic surveys, visual inspections, and field and aerial photographic documentation would be conducted annually until a management decision is made for berm breaching and water control structures (approximately 1-year post-construction).	One survey/inspection per entire construction area site.	As-built elevation, integrity, and function of the containment berms and water control structures is maintained as designed until a management decision is made for berm breaching and water control structure removal (approximately 1-year post-construction).	Reshaping or repairing containment berms, adding additional sediments to the berms, repairing or modifying water control structures, or lowering contained water levels.
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Elevation, Habitat	Topographic surveys of the marsh restoration cells would be conducted along parallel transects 300 feet apart (a minimum of three transects per marsh restoration cell). Transect locations would be established during the preconstruction survey and reoccupied during subsequent survey events. Survey points would be collected every 100 feet (a minimum of 24 points per restoration cell) along each transect and at locations with a noticeable break in slope. Survey points would also be collected at each settlement plate location.	Annual topographic surveys, visual inspections, and field and aerial photographic documentation would be conducted over the 5-year monitoring period near the end of the growing season.	One survey/inspection per entire construction cell.	70% of sediment fill area within target elevation 5 years post-construction.	Reshaping sediments, adding additional sediments, breaching containment berms, and removing water containment structures.

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Structural Integrity (Consolidation)	Settlement plates would be installed within the marsh restoration cells prior to the placement of dredged material to monitor compaction of the fill material and underlying native soils during and after construction. Monitoring would be conducted either by manual survey or through automated telemetry.	Annual topographic surveys, visual inspections, and field and aerial photographic documentation at the settlement plates would be conducted over the 5-year monitoring period near the end of the growing season.	One survey/inspection per entire construction area cell. Minimum of one settlement plate per 75 acres or three per cell.	70% of sediment fill area within target elevation 5 years post-construction.	Reshaping sediments, adding additional sediments, breaching containment berms, and removing water containment structures.
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Area (Habitat by type)	The aerial extent of project and habitat boundaries would be mapped using aerial imagery collected by airplane, helicopter, unmanned aerial systems, satellite imagery, or other appropriate remote sensing platforms. Imagery would map the extent of vegetated marsh and open water within the restoration cell.	Aerial imagery would be collected during preconstruction to establish pre-project baseline conditions. Subsequent aerial imagery collection would be conducted at 1-, 3-, and 5-years post-construction and, if needed, after events that could alter habitat within the project area such as severe storms, flooding, or oil spills.	One survey/inspection per entire construction area cell.	Vegetated estuarine marsh habitat occupies no more than 60%–80% of the marsh restoration cell area 5 years after Project construction.	Reshaping sediments, adding additional sediments, breaching containment berms, removing water control structures, and making hydrologic modifications (construction of ponds and channels).
Establish estuarine marsh vegetation	Percent Cover, Vegetation	Monitoring transects would be established with 300 feet between transects. One 1 by 1-m plot would be established every 100 feet or a minimum of 24 plots per restoration cell. The corners of each plot would	Annual vegetation percent cover surveys would be conducted during the monitoring period near the end of the growing season. The monitoring period is expected to be 5 years or less and is dependent	Monitoring plots of 1- by 1 m (minimum of 24 plots per restoration cell) would be established at 1 year post-construction or when project managers decide to remove berms and water control	One of two criteria should be met: 1) percent cover is maintained at or greater than 70% in monitoring subplots, 5 years after planting activities initiated; and/or 2) percent	Replanting/reseeding, invasive species removal, and/or transplanting of native estuarine marsh plants species. The Texas TIG may extend monitoring for 5 years or until performance criteria are met. If the

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
		be recorded with GPS and marked with corner poles for revisiting over time. Visual estimates of total plant cover (sum of all plant species) would be recorded at each plot. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots. Vegetation percent cover and composition would be simultaneously collected from the same plots.	upon when the performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports.	structures. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration site plots.	cover is within ±5% of the reference control cell.	monitoring period is changed, the decision would be documented in annual MAM reports.
Establish estuarine marsh vegetation	Species Composition, Vegetation	Monitoring transects would be established 300 feet between transects. One 1- by 1-m plot would be established every 100 feet or a minimum of 24 plots per restoration cell. The corners of each plot would be recorded with GPS and marked with corner poles for revisiting over time. Visual estimates of total plant cover per species would be recorded at each plot. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots.	Annual vegetation percent cover surveys would be conducted during the monitoring period near the end of the growing season. The monitoring period is expected to be 5 years or less and is dependent upon when the performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports.	Monitoring plots of 1- by 1-m (minimum of 24 plots per cell) would be established at 1-year post-construction or when resource managers decide to remove berms and water control structures. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots.	Vegetation composition should be similar to reference cell. No more than 5% coverage of the plant species present are exotic invasive plants.	Corrective actions could include replanting/reseeding, invasive species removal, and/or transplanting of native estuarine marsh plants species. The Texas TIG may extend monitoring for 5 years or until performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports.

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
		Vegetation percent cover and composition would be simultaneously collected from the same plots.				

3. Adaptive Management

Adaptive management decisions may include how to improve the likelihood of achieving favorable project outcomes or selecting corrective actions in the event a project is not performing as expected and intended. Due to the nature of this project and the use of standard restoration techniques that have been successfully implemented in similar projects, the Texas TIG does not anticipate the need for rigorous adaptive management of the project. If assessment of project monitoring data indicates that Project objectives are not being met, the Texas TIG may implement corrective actions as identified in Table 2 and/or identify corrective actions as necessary.

4. Evaluation

Project MAM includes planned evaluations of the selected parameters (see Table 2) throughout the project's lifetime. By thoughtfully designing evaluation methods for the design and implementation of project restoration activities, the Implementing Trustee can assess if the project is meeting its restoration objectives and determine the need for adaptive management or corrective actions, as well as identify lessons learned, previously unrecognized uncertainties, and/or unanticipated events unrelated to the restoration project that potentially affected the monitoring results (e.g., extreme weather such as hurricanes). At a minimum and as part of the annual reporting of monitoring data (Section 6), annual evaluations of monitoring data would be conducted to determine if corrective actions are needed. Evaluations of monitoring data can occur more often as needed or as triggered by project milestones such as completion of construction.

5. Monitoring Schedule

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Table 3 Monitoring Schedule

Monitoring Parameter	Preconstruction Monitoring	Construction Monitoring (As Built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Structural Integrity (Completed as Designed)	N/A	X	X	X	X	X	X
Elevation, Habitat	X	X	X	X	X	X	X
Structural Integrity (Consolidation)	N/A	N/A	X	X	X	X	X
Area (Habitat by type)	X	N/A	X	N/A	X	N/A	X
Percent Cover, Vegetation	N/A	N/A	X	X	X	X	X
Species Composition, Vegetation	N/A	N/A	X	X	X	X	X

Note:
PM: post-construction monitoring

6. Data Management

Project data would be generated through site visits, topographic surveys, aerial imagery, ground photography, and vegetation surveys. Data collection would occur as shown in Table 2. Data would be managed in accordance with the DWH Trustee Council Standard Operating Procedures (SOPs; DWH NRDA Trustees 2021) and guidance provided in the MAM Manual (DWH NRDA Trustees 2024). Original data sheets would be scanned, which would be retained by the Implementing Trustee for the time period specified by the SOPs following project closeout. Compiled data and digital imagery would be stored in a secure, central or cloud-based system that is automatically backed up off site.

6.1 Data Description

Topographic survey data for latitude, longitude, and elevation could be collected and stored in digital formats, such as *.csv files or similar formats, and processed into digital elevation models as raster imagery format files. Aerial imagery could similarly be stored with ground photography. Vegetation monitoring data could be collected either by electronic tablet into spreadsheets or project data sheets. Geographic Information System (GIS) data would typically be in shapefiles with supporting metadata. Data collected on hard copy forms would be scanned or transcribed to digital spreadsheets.

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The Implementing Trustee is responsible for ensuring that documents and electronic data files are stored in a secure location in such a way that accessibility is guaranteed for as long as the agency requires. Original hard copy data, digital data, and photographs would be retained by the Implementing Trustee. Digital data and scanned hard copy photographs and forms would be stored on the NOAA-supported TIG SharePoint site.

After data has been verified by QA/QC procedures, it would be stored on DIVER and, where applicable, on Implementing Trustee databases, in accordance with DWH reporting requirements (e.g., within one year of collection).

6.4 Data Sharing

Implementing Trustees would ensure data sharing follow standards and protocols set forth in the DWH SOPs (Section 11.4 of SOPs; DWH NRDA Trustees 2021). Data would be made publicly available, in accordance with the federal Open Data Policy (Executive Order 13642, May 4, 2013), through DIVER. Prior to being made publicly available, any personal identifiable information would be redacted. Some MAM data may be exempt from the Open Data Policy due to protection from public disclosure under other regulatory requirements. No data release can occur if it is contrary to other federal or state laws.

7. Reporting

Project monitoring information, including a summary of monitoring information and decision of potential corrective actions, would be prepared and uploaded to DIVER annually. The Implementing Trustee would develop a final, high-level summary report prior to project closeout.

8. Roles and Responsibilities

Implementing Trustees for this project would be identified in a TIG Resolution and would be responsible for execution of the MAM Plan, oversight of any contractors used to perform MAM tasks, annual and final reporting to DIVER, and informing the Texas TIG of project details, including the need for potential corrective action. Other Texas TIG members may assist with monitoring data collection, data verification, draft project report review and editing, and providing technical support to the Implementing Trustee. The decision to implement corrective action would be determined by Texas TIG consensus.

9. References

Deepwater Horizon Natural Resource Damage Assessment Trustees (DWH NRDA Trustees), 2016. Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. February 2016. Accessed August 3, 2024. Available at: http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan

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Lower Neches Wildlife Management Area Old River Unit Wetland Restoration Project Monitoring and Adaptive Management Plan

1. Introduction

This Monitoring and Adaptive Management Plan (MAM Plan) identifies the performance criteria and monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project consistent with the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Final PDARP/PEIS; Deepwater Horizon Natural Resource Damage Assessment Trustees [DWH NRDA Trustees] 2016). This plan was developed according to the Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.1 (MAM Manual; DWH NRDA Trustees 2024) and was adapted to fit the needs of the Texas Dredged Material Planning for Wetland Restoration–*Lower Neches Wildlife Management Area Old River Unit Wetland Restoration* project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document would be made publicly available through National Oceanic and Atmospheric Administration (NOAA) Data Integration Visualization Exploration and Reporting (DIVER) and accessible through the *Deepwater Horizon* (DWH) Natural Resource Damage Assessment (NRDA) Trustee Council's website (https://www.gulfspillrestoration.noaa.gov).

1.1 Project Overview

The project would restore wetlands through the beneficial use of dredged material in the Lower Neches Wildlife Management Area (WMA) located south of Bridge City and north of Sabine Lake in Orange County, Texas (Figure 1). The project is one of the eight restoration sites identified for engineering and design under the *Texas Dredged Material Planning for Wetland Restoration* project as presented in the *Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters* (Texas Trustee Implementation Group [Texas TIG] 2017). The project would beneficially use suitable sediment to restore coastal wetlands. The placement of dredged material from navigation channels and dock berths, construction of containment levees, and associated planting of estuarine marsh vegetation would restore up to 224 acres of intertidal marsh.



Figure 1 **Vicinity Map Showing the Location of the *Lower Neches Wildlife Management Area Old River Unit Wetland Restoration* Project in Orange County, Texas**

This project is being implemented as restoration for the DWH oil spill NRDA, consistent with the Final PDARP/PEIS (DWH NRDA Trustees 2016). Per the Final PDARP/PEIS, the project falls into the following restoration categories:

a) **Programmatic Goal:** Restore and conserve habitat

b) **Restoration Type:** Wetlands, coastal, and nearshore habitats

c) **Restoration Approach:** Create, restore, and enhance coastal wetlands

d) **Restoration Technique:** Create or enhance coastal wetlands through placement of dredged material

e) **Trustee Implementation Group:** Texas Trustee Implementation Group

f) **Restoration Plan:** Texas Trustee Implementation Group Restoration Plan and Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats

1.2 Restoration Type Goals and Project Restoration Objectives

This project is designed to address the Wetlands, Coastal, and Nearshore Habitat Restoration Type. As summarized in Chapter 5 of the Final PDARP/PEIS, the Restoration Type are:

a) Restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf Coast states to maintain a varied ecosystem, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities.

b) Restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability.

c) While acknowledging the existing distribution of habitats throughout the Gulf, restore habitats in appropriate combinations for any given geographic area. Consider design factors, such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats.

To accomplish the Restoration Type goals, the project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands and 2) establish estuarine marsh vegetation.

1.3 Conceptual Setting

The project would restore priority areas in the Lower Neches WMA Old River Unit, which consists of 4,386 acres on the north shore of Old River Cove of Sabine Lake, near the Gulf Intracoastal Waterway (Figure 1). The site is composed primarily of marsh land and open water. Sea level rise, subsidence, insufficient sediment inflow due to anthropogenic alterations, and erosion have severely degraded marsh and wetland habitat in the region. This habitat degradation is exhibited by the increase in the areal extent of open water and the decrease in estuarine marsh area. Restoration and protection of marshes in the region would ensure ecological longevity for the habitats.

The project would be a continuation of similar marsh restoration efforts in the region that are beneficially using dredged material. The initial establishment of marsh vegetation is anticipated to occur within two years of the placement of dredged material within the restoration cells.

This project would rely on external partners, such as the U.S. Army Corps of Engineers (USACE), to provide sediment dredged from sites in close proximity to the restoration site. The quantity, quality, and timing of availability of dredged sediments would be a key driver in the final acreage of intertidal marsh habitat restored.

1.4 Sources of Uncertainty

Although the likelihood of project success is evaluated under Oil Pollution Act regulations (15 CFR § 990.54(a)(3)), uncertainties may exist regarding how to best implement projects to achieve the greatest benefits for the injured resources. These uncertainties may arise from an incomplete understanding of the current conceptual setting; from unknown conditions in the future; or from project elements that do not perform as anticipated. For this project, the uncertainties (summarized in Table 1) could affect project success and could, therefore, be key drivers of corrective actions or adaptive management decisions. Sections 2 and 3 summarize project monitoring protocols and describe how this information would be used to inform adaptive management to address these uncertainties.

Potential uncertainties are defined as those that may affect the ability to achieve project restoration objective(s). To aid in the identification of uncertainties, Trustees utilized a variety of sources, including but not limited to, Final PDARP/PEIS Monitoring and Adaptive Management (MAM) Section 5.5.15 (DWH NRDA Trustees 2016); MAM Manual (DWH NRDA Trustees 2024); and other documents. Monitoring activities can be undertaken to inform these uncertainties, and appropriate corrective actions can be implemented in the event the project is not meeting its performance criteria.

Table 1 Key Uncertainties

Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision-Making
Extreme weather	Extreme weather may result in damage to the project prior to, during, or post construction. This could result in the need to postpone construction or reconstruct damaged portions of the project. Extreme weather could also affect the growth/survival of transplanted vegetation and/or allow invasive species to be established and/or dominate the vegetation community.
Survival of transplanted vegetation	Survival of transplanted vegetation could be hindered by extreme weather, precipitation, and sediment elevation.
Vegetation recruitment and/or colonization	Recruitment and/or colonization patterns of flora may be insufficient.
Precipitation patterns	Drought could hinder growth and/or survival of transplanted vegetation and/or allow nontarget vegetation communities to evolve (e.g., invasive species).
Sea level rise and subsidence	Site-specific rates of sea level rise and subsidence may impact the proper functioning of the elevation gradient needed to support estuarine marsh.
Market instability	Unforeseen market instability may delay, prevent, or change the spatial extent of construction of the Project.
Contractor controls	Dredging contracts would be held by the USACE or other project partners, and the Implementing Trustee may have limited direct control over contractor actions and communications. This could produce

Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision-Making
	communication delays, resulting in contractors overfilling or underfilling portions of the restoration site.
Source and quality of dredged material	The source and quality (e.g., grain size distribution) of sediments can have an impact on time and elevation of sediment settlement and marsh development.

The list of key uncertainties in Table 1 is not exhaustive. Additional uncertainties may be identified as the project is implemented and monitored. These uncertainties may affect the achievement of the restoration objectives of the project. If any drivers or stressors are negatively impacting the project, adaptive management may be necessary to ensure that project objectives are being achieved.

2. Project Monitoring, Performance Criteria, and Potential Corrective Actions

The monitoring described in this MAM Plan was developed to evaluate project performance and identify potential corrective actions, if needed. Information on each monitoring parameter is provided below, organized by objective (Table 2). Evaluations of monitoring data are used to 1) determine whether the project, once implemented, has met its objectives and 2) to inform the need for potential corrective actions (see Table 2). Note that Table 2 does not include all possible options for corrective actions; rather, it includes a list of potential actions for each individual parameter to be considered if the project is not performing as expected once implemented. Other corrective actions may be identified post-construction, as appropriate. The project site includes multiple marsh restoration cells that may be constructed over multiple dredging events. Monitoring for each restoration cell would be initiated when a corresponding dredging event for that cell is identified.

Table 2 Project Objectives, Parameters, Data Collection Activities, Performance Criteria, and Potential Corrective Actions

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Structural Integrity (Completed as Designed) *(i.e., of levees and water control structures)*	As-built topographic surveys of the containment berms would be collected as deemed appropriate by the project engineer. Subsequent surveys would consist of visual surveys to ensure physical integrity of the berms and water control structures and would be documented with photographs.	Topographic surveys, visual inspections, and field and aerial photographic documentation would be conducted annually until a management decision is made for berm breaching and water control structures (approximately 1-year post-construction).	One survey/inspection per entire construction area site.	As-built elevation, integrity, and function of the containment berms and water control structures is maintained as designed until a management decision is made for berm breaching and water control structure removal (approximately 1-year post-construction).	Reshaping or repairing containment berms, adding additional sediments to the berms, repairing or modifying water control structures, or lowering contained water levels.
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Elevation, Habitat	Topographic surveys of the marsh restoration cells would be conducted along parallel transects 300 feet apart (a minimum of three transects per marsh restoration cell). Transect locations would be established during the preconstruction survey and reoccupied during subsequent survey events. Survey points would be collected every 100 feet (a minimum of 24 points per restoration cell) along each transect and at locations with a noticeable break in slope. Survey points would also be collected at each settlement plate location.	Annual topographic surveys, visual inspections, and field and aerial photographic documentation would be conducted over the 5-year monitoring period near the end of the growing season.	One survey/inspection per entire construction cell.	70% of sediment fill area within target elevation 5 years post-construction.	Reshaping sediments, adding additional sediments, breaching containment berms, and removing water containment structures.

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Structural Integrity (Consolidation)	Settlement plates would be installed within the marsh restoration cells prior to the placement of dredged material to monitor compaction of the fill material and underlying native soils during and after construction. Monitoring would be conducted either by manual survey or through automated telemetry.	Annual topographic surveys, visual inspections, and field and aerial photographic documentation at the settlement plates would be conducted over the 5-year monitoring period near the end of the growing season.	One survey/inspection per entire construction area cell. Minimum of one settlement plate per 75 acres or three per cell.	70% of sediment fill area within target elevation 5 years post-construction.	Reshaping sediments, adding additional sediments, breaching containment berms, and removing water containment structures.
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Area (Habitat by type)	The aerial extent of project and habitat boundaries would be mapped using aerial imagery collected by airplane, helicopter, unmanned aerial systems, satellite imagery, or other appropriate remote sensing platforms. Imagery would map the extent of vegetated marsh and open water within the restoration cell.	Aerial imagery would be collected during preconstruction to establish pre-project baseline conditions. Subsequent aerial imagery collection would be conducted at 1-, 3-, and 5-years post-construction and, if needed, after events that could alter habitat within the project area such as severe storms, flooding, or oil spills.	One survey/inspection per entire construction area cell	Vegetated estuarine marsh habitat occupies no more than 60%–80% of the marsh restoration cell area 5 years after project construction.	Reshaping sediments, adding additional sediments, breaching containment berms, removing water control structures, and making hydrologic modifications (construction of ponds and channels).
Establish estuarine marsh vegetation	Percent Cover, Vegetation	Monitoring transects would be established with 300 feet between transects. One 1 by 1-m plot would be established every 100 feet or a minimum of 24 plots per restoration cell. The corners of each plot would be recorded with GPS and marked with corner poles for	Annual vegetation percent cover surveys would be conducted during the monitoring period near the end of the growing season. The monitoring period is expected to be 5 years or less and is dependent upon when the	Monitoring plots of 1- by 1 m (minimum of 24 plots per restoration cell) would be established at 1 year post-construction or when the managers decide to	One of two criteria should be met: 1) percent cover is maintained at or greater than 70% in monitoring subplots, 5 years after planting activities initiated; and 2) percent cover is	Replanting/reseeding, invasive species removal, and/or transplanting of native estuarine marsh plants species. The Texas TIG may extend monitoring for 5 years or until performance criteria are met. If the monitoring period is changed, the decision would be

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
		revisiting over time. Visual estimates of total plant cover (sum of all plant species) would be recorded at each plot. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots. Vegetation percent cover and composition would be simultaneously collected from the same plots.	performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports.	remove berms and water control structures. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration site plots.	within ±5% of the reference control cell.	documented in annual MAM reports.
Establish estuarine marsh vegetation	Species Composition, Vegetation	Monitoring transects would be established 300 feet between transects. One 1- by 1-m plot would be established every 100 feet or a minimum of 24 plots per restoration cell. The corners of each plot would be recorded with GPS and marked with corner poles for revisiting over time. Visual estimates of total plant cover per species would be recorded at each plot. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots. Vegetation percent cover and composition would be	Annual vegetation percent cover surveys would be conducted during the monitoring period near the end of the growing season. The monitoring period is expected to be 5 years or less and is dependent upon when the performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports.	Monitoring plots of 1- by 1-m (minimum of 24 plots per cell) would be established at 1-year post-construction or when the managers decide to remove berms and water control structures. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots.	Vegetation composition should be similar to reference cell. No more than 5% coverage of the plant species present are exotic invasive plants.	Corrective actions could include replanting/reseeding, invasive species removal, and/or transplanting of native estuarine marsh plants species. The Texas TIG may extend monitoring for 5 years or until performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports.

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
		simultaneously collected from the same plots.				

3. Adaptive Management

Adaptive management decisions may include how to improve the likelihood of achieving favorable project outcomes or selecting corrective actions in the event a project is not performing as expected and intended. Due to the nature of this project and the use of standard restoration techniques that have been successfully implemented in similar projects, the Texas TIG does not anticipate the need for rigorous adaptive management. If assessment of project monitoring data indicates that project objectives are not being met, the Texas TIG may implement corrective actions as identified in Table 2 and/or identify corrective actions as necessary.

4. Evaluation

Project MAM includes planned evaluations of the selected parameters (see Table 2) throughout the project's lifetime. By thoughtfully designing evaluation methods for the design and implementation of project restoration activities, the Implementing Trustee can assess if the project is meeting its restoration objectives and determine the need for adaptive management or corrective actions, as well as identify lessons learned, previously unrecognized uncertainties, and/or unanticipated events unrelated to the restoration project that potentially affected the monitoring results (e.g., extreme weather such as hurricanes). At a minimum and as part of the annual reporting of monitoring data (Section 6), annual evaluations of monitoring data would be conducted to determine if corrective actions are needed. Evaluations of monitoring data can occur more often as needed or as triggered by project milestones such as completion of construction.

5. Monitoring Schedule

The schedule for the project monitoring activities is shown in Table 3 by monitoring parameter. The project site includes multiple marsh restoration cells that may be constructed over multiple dredging events. Monitoring for each restoration cell would be initiated when a corresponding dredging event for that cell is identified.

Table 3 Monitoring Schedule

Monitoring Parameter	Preconstruction Monitoring	Construction Monitoring (As Built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Structural Integrity (Completed as Designed)	N/A	X	X	X	X	X	X
Elevation, Habitat	X	X	X	X	X	X	X
Structural Integrity (Consolidation)	N/A	N/A	X	X	X	X	X
Area (Habitat by type)	X	N/A	X	N/A	X	N/A	X
Percent Cover, Vegetation	N/A	N/A	X	X	X	X	X
Species Composition, Vegetation	N/A	N/A	X	X	X	X	X

6. Data Management

Project data would be generated through site visits, topographic surveys, aerial imagery, ground photography, and vegetation surveys. Data collection would occur as shown in Table 2. Data would be managed in accordance with the DWH Trustee Council Standard Operating Procedures (SOPs; DWH NRDA Trustees 2021) and guidance provided in the MAM Manual (DWH NRDA Trustees 2024). Original data sheets would be scanned, which would be retained by the Implementing Trustee for the time period specified by the SOPs following project closeout. Compiled data and digital imagery would be stored in a secure, central or cloud-based system that is automatically backed up off site.

6.1 Data Description

Topographic survey data for latitude, longitude, and elevation would be collected and stored in digital formats and processed into digital elevation models as raster imagery format files. Aerial imagery would similarly be stored with ground photography. Vegetation monitoring data would be collected either by electronic tablet into spreadsheets or project data sheets. Geographic Information System (GIS) data would typically be in the form of shapefiles with supporting metadata. Data collected on hard copy forms would be scanned or transcribed to digital spreadsheets.

6.2 Data Review and Clearance

Prior to being added to DIVER, all data would go through the appropriate quality assurance/quality control (QA/QC) process in accordance with the SOPs and MAM Manual.

GIS metadata would be verified for compliance with the Federal Geographic Data Committee (FGDC) and International Organization for Standardization (ISO) metadata standards, as well as any Implementing Trustee agency requirements. Appropriate metadata could include a data dictionary to define codes and fields used in the dataset; and/or a Readme file describing how data was collected, QA/QC procedures, and other information about data such as meaning, relationships to other data, origin, usage, and format.

Project data that are handwritten would be transcribed into a standard digital format and verified by one or more reviewers. For QA/QC procedures, generated electronic data sheets would be verified against the original hard copy, and any validation and transcription errors would be corrected as appropriate before data are used for any analyses or published to DIVER.

Implementing Trustees would verify and validate MAM data and information and ensure that all data are entered or converted into a commonly used digital format and labeled with metadata to the extent practicable and in accordance with FGDC, ISO, and Implementing Trustee agency standards. The Implementing Trustee would give the other Texas TIG members time to review the data before making such information publicly available in DIVER. The Implementing Trustee is responsible for ensuring that the data submitted to DIVER are consistent with the data standards.

6.3 Data Storage and Accessibility

The Implementing Trustee is responsible for ensuring that documents and electronic data files are stored in a secure location in such a way that accessibility is guaranteed for as long as the agency requires. Original hard copy data, digital data, and photographs would be retained by the Implementing Trustee. Digital data and scanned hard copy photographs and forms would be stored on the NOAA-supported TIG SharePoint site.

After data has been verified by QA/QC procedures, it would be stored on DIVER and, where applicable, on Implementing Trustee databases, in accordance with DWH reporting requirements (e.g., within one year of collection).

6.4 Data Sharing

Implementing Trustees would ensure data sharing follows standards and protocols set forth in the DWH SOPs (Section 11.4 of SOPs; DWH NRDA Trustees 2021). Data would be made publicly available, in accordance with the federal Open Data Policy (Executive Order 13642, May 4, 2013), through DIVER. Prior to being made publicly available, any personal identifiable information would be redacted. Some MAM data may be exempt from the Open Data Policy due to protection from public disclosure under other regulatory requirements. No data release can occur if it is contrary to other federal or state laws.

7. Reporting

Project monitoring information, including a summary of monitoring information and decision of potential corrective actions, would be prepared and uploaded to DIVER annually. The Implementing Trustee would develop a final, high-level summary report prior to project closeout.

8. Roles and Responsibilities

Implementing Trustees for this project would be identified in a TIG Resolution and would be responsible for execution of the MAM Plan, oversight of any contractors used to perform MAM tasks, annual and final reporting to DIVER, and informing the Texas TIG of project details, including the need for potential corrective action. Other Texas TIG members may assist with monitoring data collection, data verification, draft project report review and editing, and providing technical support to the Implementing Trustee. The decision to implement corrective action would be determined by Texas TIG consensus.

9. References

Deepwater Horizon Natural Resource Damage Assessment Trustees (DWH NRDA Trustees), 2016. Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. February 2016. Accessed August 3, 2024. Available at: http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan

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Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters. Accessed August 6, 2024. Available at: https://www.gulfspillrestoration.noaa.gov/media/document/dwh-arz000631pdf

McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration Project Monitoring and Adaptive Management Plan

1. Introduction

This Monitoring and Adaptive Management Plan (MAM Plan) identifies the performance criteria and monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project consistent with the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Final PDARP/PEIS; Deepwater Horizon Natural Resource Damage Assessment Trustees [DWH NRDA Trustees] 2016). This plan was developed according to the Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.1 (MAM Manual; DWH NRDA Trustees 2024) and was adapted to fit the needs of the Texas Dredged Material Planning for Wetland Restoration–*McFaddin National Wildlife Refuge (NWR) Willow Lake Terraces Wetland Restoration* project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document would be made publicly available through National Oceanic and Atmospheric Administration (NOAA) Data Integration Visualization Exploration and Reporting (DIVER) and accessible through the *Deepwater Horizon* (DWH) Natural Resource Damage Assessment (NRDA) Trustee Council's website (https://www.gulfspillrestoration.noaa.gov).

1.1 Project Overview

The project would restore wetlands through the beneficial use of dredged material in the McFaddin NWR located along the Gulf Intracoastal Waterway (GIWW) in Jefferson County, Texas (Figure 1). The project is one of the eight restoration sites identified for engineering and design under the *Texas Dredged Material Planning for Wetland Restoration* project as presented in the *Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters* (Texas Trustee Implementation Group [Texas TIG] 2017). The project would beneficially use suitable sediment to restore coastal wetlands. The placement of dredged material from navigation channels and dock berths, construction of containment levees, and associated planting of estuarine marsh vegetation would restore up to 218 acres of intertidal marsh.



Figure 1 **Vicinity Map Showing the Location of the *McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration* Project in Jefferson County, Texas**

This project is being implemented as restoration for the DWH oil spill NRDA, consistent with the Final PDARP/PEIS (DWH NRDA Trustees 2016). Per the Final PDARP/PEIS, the project falls into the following restoration categories:

a) **Programmatic Goal:** Restore and conserve habitat

b) **Restoration Type:** Wetlands, coastal, and nearshore habitats

c) **Restoration Approach:** Create, restore, and enhance coastal wetlands

d) **Restoration Technique:** Create or enhance coastal wetlands through placement of dredged material

e) **Trustee Implementation Group:** Texas Trustee Implementation Group

f) **Restoration Plan**: Texas Trustee Implementation Group Restoration Plan and Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats Restoration Type Goals and Project Restoration Objectives

1.2 Restoration Type Goals and Project Restoration Objectives

This project is designed to address the Wetlands, Coastal, and Nearshore Habitat Restoration Type. As summarized in Chapter 5 of the Final PDARP/PEIS, the Restoration Type are:

a) Restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf Coast states to maintain a varied ecosystem, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities.

b) Restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability.

c) While acknowledging the existing distribution of habitats throughout the Gulf, restore habitats in appropriate combinations for any given geographic area. Consider design factors, such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats.

To accomplish the Restoration Type goals, the project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands and 2) establish estuarine marsh vegetation.

1.3 Conceptual Setting

The project would restore priority areas in the McFaddin NWR, which includes 58,681 acres in Jefferson County, Texas, along the GIWW (Figure 1). The predominant wetland habitats near the McFaddin NWR are characterized as salt and brackish marsh and estuarine open water. The site boundaries were predetermined by a previous effort in 2014 to regenerate marsh using terraces within open-water areas surrounding Willow Lake. Sea level rise, subsidence, insufficient sediment inflow due to anthropogenic alterations, and erosion have severely degraded marsh and wetland habitat in the region. This habitat degradation is exhibited by the increase in the areal extent of open water and the decrease in estuarine marsh area. The loss of this marsh habitat has increased the risk of storm surge impacts to economically important industries and nationally significant ports along the Texas Coast. Restoration and protection of

marshes in the region would ensure ecological longevity for the habitats, as well as reduce vulnerability of critical infrastructure to hurricanes and storm surges.

The project would be a continuation of similar marsh restoration efforts in the region that are beneficially using dredged material. The initial establishment of marsh vegetation is anticipated to occur within two years of the placement of dredged material within the restoration cells.

This project would rely on external partners, such as the U.S. Army Corps of Engineers (USACE), to provide sediment dredged from sites in close proximity to the restoration site. The quantity, quality, and timing of availability of dredged sediments would be a key driver in the final acreage of intertidal marsh habitat restored.

1.4 Sources of Uncertainty

Although the likelihood of project success is evaluated under Oil Pollution Act regulations (15 CFR § 990.54(a)(3)), uncertainties may exist regarding how to best implement projects to achieve the greatest benefits for the injured resources. These uncertainties may arise from an incomplete understanding of the current conceptual setting; from unknown conditions in the future; or from project elements that do not perform as anticipated. For this project, the uncertainties (summarized in Table 1) could affect project success and could, therefore, be key drivers of corrective actions or adaptive management decisions. Sections 2 and 3 summarize project monitoring protocols and describe how this information would be used to inform adaptive management to address these uncertainties.

Potential uncertainties are defined as those that may affect the ability to achieve project restoration objective(s). To aid in the identification of uncertainties, Trustees utilized a variety of sources, including but not limited to, Final PDARP/PEIS Monitoring and Adaptive Management (MAM) Section 5.5.15 (DWH NRDA Trustees 2016); MAM Manual (DWH NRDA Trustees 2024); and other documents. Monitoring activities can be undertaken to inform these uncertainties, and appropriate corrective actions can be implemented in the event the Project is not meeting its performance criteria.

Table 1 Key Uncertainties

Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision-Making
Extreme weather	Extreme weather may result in damage to the project prior to, during, or post-construction. This could result in the need to postpone construction or reconstruct damaged portions of the project. Extreme weather could also affect the growth/survival of transplanted vegetation and/or allow invasive species to be established and/or dominate the vegetation community.
Survival of transplanted vegetation	Survival of transplanted vegetation could be hindered by extreme weather, precipitation, and sediment elevation.
Vegetation recruitment and/or colonization	Recruitment and/or colonization patterns of flora may be insufficient.
Precipitation patterns	Drought could hinder growth and/or survival of transplanted vegetation and/or allow nontarget vegetation communities to evolve (e.g., invasive species).
Sea level rise and subsidence	Site-specific rates of sea level rise and subsidence may impact the proper functioning of the elevation gradient needed to support estuarine marsh.

Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision-Making
Market instability	Unforeseen market instability may delay, prevent, or change the spatial extent of construction of the Project.
Contractor controls	Dredging contracts would be held by the USACE or other project partners, and the Implementing Trustee may have limited direct control over contractor actions and communications. This could produce communication delays, resulting in contractors overfilling or underfilling portions of the restoration site.
Source and quality of dredged material	The source and quality (e.g., grain size distribution) of sediments can have an impact on time and elevation of sediment settlement and marsh development.

The list of key uncertainties in Table 1 is not exhaustive. Additional uncertainties may be identified as the project is implemented and monitored. These uncertainties may affect the achievement of the restoration objectives of the project. If any drivers or stressors are negatively impacting the project, adaptive management may be necessary to ensure that project objectives are being achieved.

2. Project Monitoring, Performance Criteria, and Potential Corrective Actions

The monitoring described in this MAM Plan was developed to evaluate project performance and identify potential corrective actions, if needed. Information on each monitoring parameter is provided below, organized by objective (Table 2). Evaluations of monitoring data are used to 1) determine whether the project, once implemented, has met its objectives and 2) to inform the need for potential corrective actions (see Table 2). Note that Table 2 does not include all possible options for corrective actions; rather, it includes a list of potential actions for each individual parameter to be considered if the project is not performing as expected once implemented. Other corrective actions may be identified post-construction, as appropriate. The project site includes multiple marsh restoration cells that may be constructed over multiple dredging events. Monitoring for each restoration cell would be initiated when a corresponding dredging event for that cell is identified.

Table 2 Project Objectives, Parameters, Data Collection Activities, Performance Criteria, and Potential Corrective Actions

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Structural Integrity (Completed as Designed) *(i.e., of levees and water control structures)*	As-built topographic surveys of the containment berms would be collected as deemed appropriate by the project engineer. Subsequent surveys would consist of visual surveys to ensure physical integrity of the berms and water control structures and would be documented with photographs.	Topographic surveys, visual inspections, and field and aerial photographic documentation would be conducted annually until a management decision is made for berm breaching and water control structures (approximately 1-year post-construction).	One survey/inspection per entire construction area site.	As-built elevation, integrity, and function of the containment berms and water control structures is maintained as designed until a management decision is made for berm breaching and water control structure removal (approximately 1-year post-construction).	Reshaping or repairing containment berms, adding additional sediments to the berms, repairing or modifying water control structures, or lowering contained water levels.
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Elevation, Habitat	Topographic surveys of the marsh restoration cells would be conducted along parallel transects 300 feet apart (a minimum of three transects per marsh restoration cell). Transect locations would be established during the preconstruction survey and reoccupied during subsequent survey events. Survey points would be collected every 100 feet (a minimum of 24 points per restoration cell) along each transect and at locations with a noticeable break in slope. Survey points would	Annual topographic surveys, visual inspections, and field and aerial photographic documentation would be conducted over the 5-year monitoring period near the end of the growing season.	One survey/inspection per entire construction cell.	70% of sediment fill area within target elevation 5 years post-construction	Reshaping sediments, adding additional sediments, breaching containment berms, and removing water containment structures.

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
		also be collected at each settlement plate location.				
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Structural Integrity (Consolidation)	Settlement plates would be installed within the marsh restoration cells prior to the placement of dredged material to monitor compaction of the fill material and underlying native soils during and after construction. Monitoring would be conducted either by manual survey or through automated telemetry.	Annual topographic surveys, visual inspections, and field and aerial photographic documentation at the settlement plates would be conducted over the 5-year monitoring period near the end of the growing season.	One survey/inspection per entire construction area cell. Minimum of one settlement plate per 75 acres or three per cell.	70% of sediment fill area within target elevation 5 years post-construction.	Reshaping sediments, adding additional sediments, breaching containment berms, and removing water containment structures.
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Area (Habitat by type)	The aerial extent of project and habitat boundaries would be mapped using aerial imagery collected by airplane, helicopter, unmanned aerial systems, satellite imagery, or other appropriate remote sensing platforms. Imagery would map the extent of vegetated marsh and open water within the restoration cell.	Aerial imagery would be collected during preconstruction to establish pre-project baseline conditions. Subsequent aerial imagery collection would be conducted at 1-, 3-, and 5-years post-construction and, if needed, after events that could alter habitat within the Project area such as severe storms, flooding, or oil spills.	One survey/inspection per entire construction area cell	Vegetated estuarine marsh habitat occupies no more than 60%–80% of the marsh restoration cell area 5 years after Project construction.	Reshaping sediments, adding additional sediments, breaching containment berms, removing water control structures, and making hydrologic modifications (construction of ponds and channels).
Establish estuarine marsh vegetation	Percent Cover, Vegetation	Monitoring transects would be established with 300 feet between transects. One 1 by 1-m plot would be established every 100 feet or a minimum of 24 plots per restoration cell. The	Annual vegetation percent cover surveys would be conducted during the monitoring period near the end of the growing season. The monitoring period is	Monitoring plots of 1- by 1 m (minimum of 24 plots per restoration cell) would be established at 1 year post-construction or	One of two criteria should be met: 1) percent cover is maintained at or greater than 70% in monitoring subplots, 5 years after planting	Replanting/reseeding, invasive species removal, and/or transplanting of native estuarine marsh plants species. The Texas TIG may extend monitoring for 5 years or until performance

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
		corners of each plot would be recorded with GPS and marked with corner poles for revisiting over time. Visual estimates of total plant cover (sum of all plant species) would be recorded at each plot. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots. Vegetation percent cover and composition would be simultaneously collected from the same plots.	expected to be 5 years or less and is dependent upon when the performance criteria are met. If the monitoring ends prior to 5 years because the performance criteria have been met, it would be documented in the annual MAM report.	when resource managers decide to remove berms and water control structures. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration site plots.	activities initiated; and 2) percent cover is within ±5% of the reference control cell.	criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports.
Establish estuarine marsh vegetation	Species Composition, Vegetation	Monitoring transects would be established 300 feet between transects. One 1- by 1-m plot would be established every 100 feet or a minimum of 24 plots per restoration cell. The corners of each plot would be recorded with GPS and marked with corner poles for revisiting over time. Visual estimates of total plant cover per species would be recorded at each plot. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots. Vegetation percent cover	Annual vegetation percent cover surveys would be conducted during the monitoring period near the end of the growing season. The monitoring period is expected to be 5 years or less and is dependent upon when the performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports.	Monitoring plots of 1- by 1-m (minimum of 24 plots per cell) would be established at 1-year post-construction or when resource managers decide to remove berms and water control structures. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots.	Vegetation composition should be similar to reference cell. No more than 5% coverage of the plant species present are exotic invasive plants.	Corrective actions could include replanting/reseeding, invasive species removal, and/or transplanting of native estuarine marsh plants species. The Texas TIG may extend monitoring for 5 years or until performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports.

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
		and composition would be simultaneously collected from the same plots.				

3. Adaptive Management

Adaptive management decisions may include how to improve the likelihood of achieving favorable project outcomes or selecting corrective actions in the event a project is not performing as expected and intended. Due to the nature of this project and the use of standard restoration techniques that have been successfully implemented in similar projects, the Texas TIG does not anticipate the need for rigorous adaptive management. If assessment of project monitoring data indicates that project objectives are not being met, the Texas TIG may implement corrective actions as identified in Table 2 and/or identify corrective actions as necessary.

4. Evaluation

Project MAM includes planned evaluations of the selected parameters (see Table 2) throughout the project's lifetime. By thoughtfully designing evaluation methods for the design and implementation of project restoration activities, the Implementing Trustee can assess if the project is meeting its restoration objectives and determine the need for adaptive management or corrective actions, as well as identify lessons learned, previously unrecognized uncertainties, and/or unanticipated events unrelated to the restoration project that potentially affected the monitoring results (e.g., extreme weather such as hurricanes). At a minimum and as part of the annual reporting of monitoring data (Section 6), annual evaluations of monitoring data would be conducted to determine if corrective actions are needed. Evaluations of monitoring data can occur more often as needed or as triggered by project milestones such as completion of construction.

5. Monitoring Schedule

The schedule for the project monitoring activities is shown in Table 3 by monitoring parameter. The project site includes multiple marsh restoration cells that may be constructed over multiple dredging events. Monitoring for each restoration cell would be initiated when a corresponding dredging event for that cell is identified.

Table 3 Monitoring Schedule

Monitoring Parameter	Preconstruction Monitoring	Construction Monitoring (As Built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Structural Integrity (Completed as Designed)	N/A	X	X	X	X	X	X
Elevation, Habitat	X	X	X	X	X	X	X
Structural Integrity (Consolidation)	N/A	N/A	X	X	X	X	X
Area (Habitat by type)	X	N/A	X	N/A	X	N/A	X
Percent Cover, Vegetation	N/A	N/A	X	X	X	X	X
Species Composition, Vegetation	N/A	N/A	X	X	X	X	X

6. Data Management

Project data would be generated through site visits, topographic surveys, aerial imagery, ground photography, and vegetation surveys. Data collection would occur as shown in Table 2. Data would be managed in accordance with the DWH Trustee Council Standard Operating Procedures (SOPs; DWH NRDA Trustees 2021) and guidance provided in the MAM Manual (DWH NRDA Trustees 2024). Original data sheets would be scanned, which would be retained by the Implementing Trustee for the time period specified by the SOPs following project closeout. Compiled data and digital imagery would be stored in a secure, central or cloud-based system that is automatically backed up off site.

6.1 Data Description

Topographic survey data for latitude, longitude, and elevation would be collected and stored in digital formats and processed into digital elevation models as raster imagery format files. Aerial imagery would similarly be stored with ground photography. Vegetation monitoring data would be collected either by electronic tablet into spreadsheets or Project data sheets. Geographic Information System (GIS) data would typically be in the form of shapefiles with supporting metadata. Data collected on hard copy forms would be scanned or transcribed to digital spreadsheets.

6.2 Data Review and Clearance

Prior to being added to DIVER, all data would go through the appropriate quality assurance/quality control (QA/QC) process in accordance with the SOPs and MAM Manual.

GIS metadata would be verified for compliance with the Federal Geographic Data Committee (FGDC) and International Organization for Standardization (ISO) metadata standards, as well as any Implementing Trustee agency requirements. Appropriate metadata could include a data dictionary to define codes and fields used in the dataset; and/or a Readme file describing how data was collected, QA/QC procedures, and other information about data such as meaning, relationships to other data, origin, usage, and format.

Project data that are handwritten would be transcribed into a standard digital format and verified by one or more reviewers. For QA/QC procedures, generated electronic data sheets would be verified against the original hard copy, and any validation and transcription errors would be corrected as appropriate before data are used for any analyses or published to DIVER.

Implementing Trustees would verify and validate MAM data and information and ensure that all data are entered or converted into a commonly used digital format and labeled with metadata to the extent practicable and in accordance with FGDC, ISO, and Implementing Trustee agency standards. The Implementing Trustee would give the other Texas TIG members time to review the data before making such information publicly available in DIVER. The Implementing Trustee is responsible for ensuring that the data submitted to DIVER are consistent with the data standards.

6.3 Data Storage and Accessibility

The Implementing Trustee is responsible for ensuring that documents and electronic data files are stored in a secure location in such a way that accessibility is guaranteed for as long as the agency requires. Original hard copy data, digital data, and photographs would be retained by the Implementing Trustee. Digital data and scanned hard copy photographs and forms would be stored on the NOAA-supported TIG SharePoint site.

After data has been verified by QA/QC procedures, it would be stored on DIVER and, where applicable, on Implementing Trustee databases, in accordance with DWH reporting requirements (e.g., within one year of collection).

6.4 Data Sharing

Implementing Trustees would ensure data sharing follows standards and protocols set forth in the DWH SOPs (Section 11.4 of SOPs; DWH NRDA Trustees 2021). Data would be made publicly available, in accordance with the federal Open Data Policy (Executive Order 13642, May 4, 2013), through DIVER. Prior to being made publicly available, any personal identifiable information would be redacted. Some MAM data may be exempt from the Open Data Policy due to protection from public disclosure under other regulatory requirements. No data release can occur if it is contrary to other federal or state laws.

7. Reporting

Project monitoring information, including a summary of monitoring information and decision of potential corrective actions, would be prepared and uploaded to DIVER annually. The Implementing Trustee would develop a final, high-level summary report prior to project closeout.

8. Roles and Responsibilities

Implementing Trustees for this project would be identified in a TIG Resolution and would be responsible for execution of the MAM Plan, oversight of any contractors used to perform MAM tasks, annual and final reporting to DIVER, and informing the Texas TIG of Project details, including the need for potential corrective action. Other Texas TIG members may assist with monitoring data collection, data verification, draft project report review and editing, and providing technical support to the Implementing Trustee. The decision to implement corrective action would be determined by Texas TIG consensus.

9. References

Deepwater Horizon Natural Resource Damage Assessment Trustees (DWH NRDA Trustees), 2016. Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. February 2016. Accessed August 3, 2024. Available at: http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan

DWH NRDA Trustees, 2021. Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the Deepwater Horizon (DWH) Oil Spill. Revised August 2, 2021. Accessed September 14, 2024. Available at: https://www.gulfspillrestoration.noaa.gov/media/document/2021-08-02-final-revised-sop-clean-copy-30pdf

DWH NRDA Trustees, 2024. Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.1. Appendix to the Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill. Revised September 2024. Accessed November 1, 2024. Available at: https://www.gulfspillrestoration.noaa.gov/monitoring-and-adaptive-management

Exec. Order No. 13642, 78 Fed. Reg. 28111 (May 14, 2013). Accessed August 6, 2024. Available at: https://www.govinfo.gov/content/pkg/DCPD-201300318/pdf/DCPD-201300318.pdf

Texas Trustee Implementation Group, 2017. Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Restoration Plan/Environmental

Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters. Accessed August 6, 2024. Available at: https://www.gulfspillrestoration.noaa.gov/media/document/dwh-arz000631pdf

San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration Project Monitoring and Adaptive Management Plan

1. Introduction

This Monitoring and Adaptive Management Plan (MAM Plan) identifies the performance criteria and monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project consistent with the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Final PDARP/PEIS; Deepwater Horizon Natural Resource Damage Assessment Trustees [DWH NRDA Trustees] 2016). This plan was developed according to the Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.1 (MAM Manual; DWH NRDA Trustees 2024) and was adapted to fit the needs of the Texas Dredged Material Planning for Wetland Restoration–*San Bernard National Wildlife Refuge (NWR) Sargent Oil Field Wetland Restoration* project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document would be made publicly available through National Oceanic and Atmospheric Administration (NOAA) Data Integration Visualization Exploration and Reporting (DIVER) and accessible through the Deepwater Horizon (DWH) Natural Resource Damage Assessment (NRDA) Trustee Council's website (https://www.gulfspillrestoration.noaa.gov).

1.1 Project Overview

The project would restore wetlands through the beneficial use of dredged material in the San Bernard NWR located near the NWR's western boundary on the Gulf Intracoastal Waterway (GIWW), south of Bay City, Texas in Matagorda County, Texas (Figure 1). The project is one of the eight restoration sites identified for engineering and design under the *Texas Dredged Material Planning for Wetland Restoration* project as presented in the *Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters* (Texas Trustee Implementation Group [Texas TIG], 2017). The project would beneficially use suitable sediment to restore coastal wetlands. The placement of dredged material from navigation channels and dock berths, construction of containment levees, and associated planting of estuarine marsh vegetation would restore up to 200 acres of intertidal marsh.



Figure 1 **Vicinity Map Showing the Location of the *San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration* Project in Matagorda County, Texas**

This project is being implemented as restoration for the DWH oil spill NRDA, consistent with the Final PDARP/PEIS (DWH NRDA Trustees 2016). Per the Final PDARP/PEIS, the project falls into the following restoration categories:

a) **Programmatic Goal:** Restore and conserve habitat

b) **Restoration Type:** Wetlands, coastal, and nearshore habitats

c) **Restoration Approach:** Create, restore, and enhance coastal wetlands

d) **Restoration Technique:** Create or enhance coastal wetlands through placement of dredged material

e) **Trustee Implementation Group:** Texas Trustee Implementation Group

f) **Restoration Plan:** Texas Trustee Implementation Group Restoration Plan and Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats

1.2 Restoration Type Goals and Project Restoration Objectives

This project is designed to address the Wetlands, Coastal, and Nearshore Habitat Restoration Type. As summarized in Chapter 5 of the Final PDARP/PEIS, the Restoration Type goals are:

a) Restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf Coast states to maintain a varied ecosystem, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities.

b) Restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability.

c) While acknowledging the existing distribution of habitats throughout the Gulf, restore habitats in appropriate combinations for any given geographic area. Consider design factors, such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats.

To accomplish the Restoration Type goals, the project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands and 2) establish estuarine marsh vegetation.

1.3 Conceptual Setting

The project would restore priority areas at the site of an abandoned oil field in the San Bernard NWR in Matagorda County, south of Sargent, Texas, along the Gulf Intracoastal Waterway (Figure 6-2). The San Bernard NWR includes more than 70,000 acres of shallow open water, small pockets of marsh, and some deeper cuts and channels in Brazoria and Matagorda counties (Figure 1). The site consists primarily of shallow open water, some small pockets of marsh, and some deeper cuts and channels. The area was historically healthy marsh, which has eroded away into mostly open water throughout the past three decades. Sea level rise, subsidence, insufficient sediment inflow due to anthropogenic alterations, and erosion have severely degraded marsh and wetland habitat in the region. This habitat degradation is exhibited by the increase in the areal extent of open water and the decrease in estuarine marsh area. The loss of this marsh habitat has increased the risk of storm surge impacts to economically important

industries and nationally significant ports along the Texas coast. Restoration and protection of marshes in the region would ensure ecological longevity for the habitats, as well as reduce vulnerability of critical infrastructure to hurricanes and storm surges.

The project would be a continuation of similar marsh restoration efforts in the region that are beneficially using dredged material. The initial establishment of marsh vegetation is anticipated to occur within two years of the placement of dredged material within the restoration cells.

This project would rely on external partners, such as the U.S. Army Corps of Engineers (USACE), to provide sediment dredged from sites in close proximity to the restoration site. The quantity, quality, and timing of availability of dredged sediments would be a key driver in the final acreage of intertidal marsh habitat restored.

1.4 Sources of Uncertainty

Although the likelihood of project success is evaluated under Oil Pollution Act regulations (15 CFR § 990.54(a)(3)), uncertainties may exist regarding how to best implement projects to achieve the greatest benefits for the injured resources. These uncertainties may arise from an incomplete understanding of the current conceptual setting; from unknown conditions in the future; or from project elements that do not perform as anticipated. For this project, the uncertainties (summarized in Table 6-1) could affect project success and could, therefore, be key drivers of corrective actions or adaptive management decisions. Sections 2 and 3 summarize project monitoring protocols and describe how this information would be used to inform adaptive management to address these uncertainties.

Potential uncertainties are defined as those that may affect the ability to achieve project restoration objective(s). To aid in the identification of uncertainties, Trustees utilized a variety of sources, including but not limited to, Final PDARP/PEIS Monitoring and Adaptive Management (MAM) Section 5.5.15 (DWH NRDA Trustees 2016); MAM Manual (DWH NRDA Trustees 2024); and other documents. Monitoring activities can be undertaken to inform these uncertainties, and appropriate corrective actions can be implemented in the event the project is not meeting its performance criteria.

Table 1 Key Uncertainties

Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision-Making
Extreme weather	Extreme weather may result in damage to the project prior to, during, or post construction. This could result in the need to postpone construction or reconstruct damaged portions of the project. Extreme weather could also affect the growth/survival of transplanted vegetation and/or allow invasive species to be established and/or dominate the vegetation community.
Survival of transplanted vegetation	Survival of transplanted vegetation could be hindered by extreme weather, precipitation, and sediment elevation.
Vegetation recruitment and/or colonization	Recruitment and/or colonization patterns of flora may be insufficient.
Precipitation patterns	Drought could hinder growth and/or survival of transplanted vegetation and/or allow nontarget vegetation communities to evolve (e.g., invasive species).
Sea level rise and subsidence	Site-specific rates of sea level rise and subsidence may impact the proper functioning of the elevation gradient needed to support estuarine marsh.

Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision-Making
Market instability	Unforeseen market instability may delay, prevent, or change the spatial extent of construction of the Project.
Contractor controls	Dredging contracts would be held by the USACE or other project partners, and the Implementing Trustee may have limited direct control over contractor actions and communications. This could produce communication delays, resulting in contractors overfilling or underfilling portions of the restoration site.
Source and quality of dredged material	The source and quality (e.g., grain size distribution) of sediments can have an impact on time and elevation of sediment settlement and marsh development.

The list of key uncertainties in Table 1 is not exhaustive. Additional uncertainties may be identified as the project is implemented and monitored. These uncertainties may affect the achievement of the restoration objectives of the project. If any drivers or stressors are negatively impacting the project, adaptive management may be necessary to ensure that project objectives are being achieved.

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The monitoring described in this MAM Plan was developed to evaluate project performance and identify potential corrective actions, if needed. Information on each monitoring parameter is provided below, organized by objective (Table 2). Evaluations of monitoring data are used to 1) determine whether the project, once implemented, has met its objectives and 2) to inform the need for potential corrective actions (see Table 2). Note that Table 2 does not include all possible options for corrective actions; rather, it includes a list of potential actions for each individual parameter to be considered if the project is not performing as expected once implemented. Other corrective actions may be identified post-construction, as appropriate. The project site includes multiple marsh restoration cells that may be constructed over multiple dredging events. Monitoring for each restoration cell would be initiated when a corresponding dredging event for that cell is identified.

Table 2 Project Objectives, Parameters, Data Collection Activities, Performance Criteria, and Potential Corrective Actions

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Structural Integrity (Completed as Designed) *(i.e., of levees and water control structures)*	As-built topographic surveys of the containment berms would be collected as deemed appropriate by the project engineer. Subsequent surveys would consist of visual surveys to ensure physical integrity of the berms and water control structures and would be documented with photographs.	Topographic surveys, visual inspections, and field and aerial photographic documentation would be conducted annually until a management decision is made for berm breaching and water control structures (approximately 1-year post-construction).	One survey/inspection per entire construction area site.	As-built elevation, integrity, and function of the containment berms and water control structures is maintained as designed until a management decision is made for berm breaching and water control structure removal (approximately 1-year post-construction).	Reshaping or repairing containment berms, adding additional sediments to the berms, repairing or modifying water control structures, or lowering contained water levels.
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Elevation, Habitat	Topographic surveys of the marsh restoration cells would be conducted along parallel transects 300 feet apart (a minimum of three transects per marsh restoration cell). Transect locations would be established during the preconstruction survey and reoccupied during subsequent survey events. Survey points would be collected every 100 feet (a minimum of 24 points per restoration cell) along each transect and at locations with a noticeable break in slope. Survey points would also be collected at each settlement plate location.	Annual topographic surveys, visual inspections, and field and aerial photographic documentation would be conducted over the 5-year monitoring period near the end of the growing season.	One survey/inspection per entire construction cell.	70% of sediment fill area within target elevation 5 years post-construction	Reshaping sediments, adding additional sediments, breaching containment berms, and removing water containment structures.

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Structural Integrity (Consolidation)	Settlement plates would be installed within the marsh restoration cells prior to the placement of dredged material to monitor compaction of the fill material and underlying native soils during and after construction. Monitoring would be conducted either by manual survey or through automated telemetry.	Annual topographic surveys, visual inspections, and field and aerial photographic documentation at the settlement plates would be conducted over the 5-year monitoring period near the end of the growing season.	One survey/inspection per entire construction area cell. Minimum of one settlement plate per 75 acres or three per cell.	70% of sediment fill area within target elevation 5 years post-construction.	Reshaping sediments, adding additional sediments, breaching containment berms, and removing water containment structures.
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Area (Habitat by type)	The aerial extent of project and habitat boundaries would be mapped using aerial imagery collected by airplane, helicopter, unmanned aerial systems, satellite imagery, or other appropriate remote sensing platforms. Imagery would map the extent of vegetated marsh and open water within the restoration cell.	Aerial imagery would be collected during preconstruction to establish pre-project baseline conditions. Subsequent aerial imagery collection would be conducted at 1-, 3-, and 5-years post-construction and, if needed, after events that could alter habitat within the Project area such as severe storms, flooding, or oil spills.	One survey/inspection per entire construction area cell.	Vegetated estuarine marsh habitat occupies no more than 60%–80% of the marsh restoration cell area 5 years after Project construction.	Reshaping sediments, adding additional sediments, breaching containment berms, removing water control structures, and making hydrologic modifications (construction of ponds and channels).
Establish estuarine marsh vegetation	Percent Cover, Vegetation	Monitoring transects would be established with 300 feet between transects. One 1 by 1-m plot would be established every 100 feet or a minimum of 24 plots per restoration cell. The corners of each plot would be recorded with GPS and marked with corner poles for revisiting over time. Visual	Annual vegetation percent cover surveys would be conducted during the monitoring period near the end of the growing season. The monitoring period is expected to be 5 years or less and is dependent upon when the	Monitoring plots of 1- by 1 m (minimum of 24 plots per restoration cell) would be established at 1 year post-construction or when resource managers decide to	One of two criteria should be met: 1) percent cover is maintained at or greater than 70% in monitoring subplots, 5 years after planting activities initiated; and 2) percent cover is within ±5% of	Replanting/reseeding, invasive species removal, and/or transplanting of native estuarine marsh plants species. The Texas TIG may extend monitoring for 5 years or until performance criteria are met. If the monitoring period is changed, the

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
		estimates of total plant cover (sum of all plant species) would be recorded at each plot. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots. Vegetation percent cover and composition would be simultaneously collected from the same plots.	performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports.	remove berms and water control structures. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration site plots.	the reference control cell.	decision would be documented in annual MAM reports.
Establish estuarine marsh vegetation	Species Composition, Vegetation	Monitoring transects would be established 300 feet between transects. One 1- by 1-m plot would be established every 100 feet or a minimum of 24 plots per restoration cell. The corners of each plot would be recorded with GPS and marked with corner poles for revisiting over time. Visual estimates of total plant cover per species would be recorded at each plot. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots. Vegetation percent cover and composition would be simultaneously collected from the same plots.	Annual vegetation percent cover surveys would be conducted during the monitoring period near the end of the growing season. The monitoring period is expected to be 5 years or less and is dependent upon when the performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports.	Monitoring plots of 1- by 1-m (minimum of 24 plots per cell) would be established at 1-year post-construction or when the managers decide to remove berms and water control structures. Reference control plots (minimum of three) would be established in a nearby area of healthy marsh to be monitored with the restoration cell plots.	Vegetation composition should be similar to reference cell. No more than 5% coverage of the plant species present are exotic invasive plants.	Corrective actions could include replanting/reseeding, invasive species removal, and/or transplanting of native estuarine marsh plants species. The Texas TIG may extend monitoring for 5 years or until performance criteria are met. If the monitoring period is changed, the decision would be documented in annual MAM reports.

3. Adaptive Management

Adaptive management decisions may include how to improve the likelihood of achieving favorable project outcomes or selecting corrective actions in the event a project is not performing as expected and intended. Due to the nature of this project and the use of standard restoration techniques that have been successfully implemented in similar projects, the Texas TIG does not anticipate the need for rigorous adaptive management. If assessment of project monitoring data indicates that project objectives are not being met, the Texas TIG may implement corrective actions as identified in Table 2 and/or identify corrective actions as necessary.

4. Evaluation

Project MAM includes planned evaluations of the selected parameters (see Table 2) throughout the project's lifetime. By thoughtfully designing evaluation methods for the design and implementation of project restoration activities, the Implementing Trustee can assess if the project is meeting its restoration objectives and determine the need for adaptive management or corrective actions, as well as identify lessons learned, previously unrecognized uncertainties, and/or unanticipated events unrelated to the restoration project that potentially affected the monitoring results (e.g., extreme weather such as hurricanes). At a minimum and as part of the annual reporting of monitoring data (Section 7), annual evaluations of monitoring data would be conducted to determine if corrective actions are needed. Evaluations of monitoring data can occur more often as needed or as triggered by project milestones such as completion of construction.

5. Monitoring Schedule

The schedule for the project monitoring activities is shown in Table 3 by monitoring parameter. The Project site includes multiple marsh restoration cells that may be constructed over multiple dredging events. Monitoring for each restoration cell would be initiated when a corresponding dredging event for that cell is identified.

Table 3 Monitoring Schedule

Monitoring Parameter	Preconstruction Monitoring	Construction Monitoring (As Built)	PM Year 1	PM Year 2	PM Year 3	PM Year 4	PM Year 5
Structural Integrity (Completed as Designed)	N/A	X	X	X	X	X	X
Elevation, Habitat	X	X	X	X	X	X	X
Structural Integrity (Consolidation)	N/A	N/A	X	X	X	X	X
Area (Habitat by type)	X	N/A	X	N/A	X	N/A	X
Percent Cover, Vegetation	N/A	N/A	X	X	X	X	X
Species Composition, Vegetation	N/A	N/A	X	X	X	X	X

6. Data Management

Project data would be generated through site visits, topographic surveys, aerial imagery, ground photography, and vegetation surveys. Data collection would occur as shown in Table 2. Data would be

managed in accordance with the DWH Trustee Council Standard Operating Procedures (SOPs; DWH NRDA Trustees 2021) and guidance provided in the MAM Manual (DWH NRDA Trustees 2024). Original data sheets would be scanned, which would be retained by the Implementing Trustee for the time period specified by the SOPs following project closeout. Compiled data and digital imagery would be stored in a secure, central or cloud-based system that is automatically backed up off site

6.1 Data Description

Topographic survey data for latitude, longitude, and elevation would be collected and stored in digital formats and processed into digital elevation models as raster imagery format files. Aerial imagery would similarly be stored with ground photography. Vegetation monitoring data would be collected either by electronic tablet into spreadsheets or project data sheets. Geographic Information System (GIS) data would typically be in the form of shapefiles with supporting metadata. Data collected on hard copy forms would be scanned or transcribed to digital spreadsheets.

6.2 Data Review and Clearance

Prior to being added to DIVER, all data would go through the appropriate quality assurance/quality control (QA/QC) process in accordance with the SOPs and MAM Manual.

GIS metadata would be verified for compliance with the Federal Geographic Data Committee (FGDC) and International Organization for Standardization (ISO) metadata standards, as well as any Implementing Trustee agency requirements. Appropriate metadata could include a data dictionary to define codes and fields used in the dataset; and/or a Readme file describing how data was collected, QA/QC procedures, and other information about data such as meaning, relationships to other data, origin, usage, and format.

Project data that are handwritten would be transcribed into a standard digital format and verified by one or more reviewers. For QA/QC procedures, generated electronic data sheets would be verified against the original hard copy, and any validation and transcription errors would be corrected as appropriate before data are used for any analyses or published to DIVER.

Implementing Trustees would verify and validate MAM data and information and ensure that all data are entered or converted into a commonly used digital format and labeled with metadata to the extent practicable and in accordance with FGDC, ISO, and Implementing Trustee agency standards. The Implementing Trustee would give the other Texas TIG members time to review the data before making such information publicly available in DIVER. The Implementing Trustee is responsible for ensuring that the data submitted to DIVER are consistent with the data standards.

6.3 Data Storage and Accessibility

The Implementing Trustee is responsible for ensuring that documents and electronic data files are stored in a secure location in such a way that accessibility is guaranteed for as long as the agency requires. Original hard copy data, digital data, and photographs would be retained by the Implementing Trustee. Digital data and scanned hard copy photographs and forms would be stored on the NOAA-supported TIG SharePoint site.

After data has been verified by QA/QC procedures, it would be stored in DIVER and, where applicable, on Implementing Trustee databases, in accordance with DWH reporting requirements (e.g., within one year of collection).

6.4 Data Sharing

Implementing Trustees would ensure data sharing follows standards and protocols set forth in the DWH SOPs (Section 11.4 of SOPs; DWH NRDA Trustees 2021). Data would be made publicly available, in accordance with the federal Open Data Policy (Executive Order 13642, May 4, 2013), through DIVER. Prior to being made publicly available, any personal identifiable information would be redacted. Some MAM data may be exempt from the Open Data Policy due to protection from public disclosure under other regulatory requirements. No data release can occur if it is contrary to other federal or state laws.

7. Reporting

Project monitoring information, including a summary of monitoring information and decision of potential corrective actions, would be prepared and uploaded to DIVER annually. The Implementing Trustee would develop a final, high-level summary report prior to project closeout.

8. Roles and Responsibilities

Implementing Trustees for this project would be identified in a Texas TIG Resolution and would be responsible for execution of the MAM Plan, oversight of any contractors used to perform MAM tasks, annual and final reporting to DIVER, and informing the Texas TIG of project details, including the need for potential corrective action. Other Texas TIG members may assist with monitoring data collection, data verification, draft project report review and editing, and providing technical support to the Implementing Trustee. The decision to implement corrective action would be determined by Texas TIG consensus.

9. References

Deepwater Horizon Natural Resource Damage Assessment Trustees (DWH NRDA Trustees), 2016. Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. February 2016. Accessed August 3, 2024. Available at: http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan

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DWH NRDA Trustees, 2024. Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.1. Appendix to the Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill. Revised September 2024. Accessed November 1, 2024. Available at: https://www.gulfspillrestoration.noaa.gov/monitoring-and-adaptive-management

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Texas Trustee Implementation Group, 2017. Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters. Accessed August 6, 2024. Available at: https://www.gulfspillrestoration.noaa.gov/media/document/dwh-arz000631pdf

Texas Point National Wildlife Refuge Wetland Restoration Project Monitoring and Adaptive Management Plan

1. Introduction

This Monitoring and Adaptive Management Plan (MAM Plan) identifies the performance criteria and monitoring needed to evaluate progress toward meeting project objectives and to support any necessary adaptive management of the restoration project consistent with the *Deepwater Horizon (DWH) Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Final PDARP/PEIS; Deepwater Horizon Natural Resource Damage Assessment Trustees [DWH NRDA Trustees] 2016). This plan was developed according to the Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.1 (MAM Manual; DWH NRDA Trustees 2024) and was adapted to fit the needs of the Texas Dredged Material Planning for Wetland Restoration–*Texas Point National Wildlife Refuge (NWR) Wetland Restoration* project.

This MAM Plan is a living document and may be updated as needed to reflect changing conditions and/or new information. Any future revisions to this document would be made publicly available through National Oceanic and Atmospheric Administration (NOAA) Data Integration Visualization Exploration and Reporting (DIVER) and accessible through the DWH Natural Resource Damage Assessment (NRDA) Trustee Council's website (https://www.gulfspillrestoration.noaa.gov).

1.1 Project Overview

The project would restore wetlands through the beneficial use of dredged material in the Texas Point NWR located in Jefferson County, Texas (Figure 1). The project is one of the eight restoration sites identified for engineering and design under the *Texas Dredged Material Planning for Wetland Restoration* project selected in the *Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters* (Texas Trustee Implementation Group [Texas TIG] 2017). The project would beneficially use suitable sediment to restore coastal wetlands. The placement of dredged material from navigation channels and dock berths, construction of containment levees, and associated planting of estuarine marsh vegetation would restore up to 623 acres of intertidal marsh.



Figure 1 **Vicinity Map Showing the Location of the *Texas Point National Willdife Refuge Wetland Restoration* Project in Jefferson County, Texas**

This project is being implemented as restoration for the Deepwater Horizon oil spill (DWH oil spill) NRDA, consistent with the Final PDARP/PEIS. Per the Final PDARP/PEIS, the project falls into the following restoration categories:

a) **Programmatic Goal:** Restore and conserve habitat

b) **Restoration Type:** Wetlands, coastal, and nearshore habitats

c) **Restoration Approach:** Create, restore, and enhance coastal wetlands

d) **Restoration Technique:** Create or enhance coastal wetlands through placement of dredged material

e) **Trustee Implementation Group:** Texas Trustee Implementation Group

f) **Restoration Plan**: Texas Trustee Implementation Group Restoration Plan and Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats

1.2 Restoration Type Goals and Project Restoration Objectives

This project is designed to address the Wetlands, Coastal, and Nearshore Habitat Restoration Type. As summarized in Chapter 5 of the Final PDARP/PEIS, the Restoration Type goals are:

a) Restore a variety of interspersed and ecologically connected coastal habitats in each of the five Gulf Coast states to maintain a varied ecosystem, with particular focus on maximizing ecological functions for the range of resources injured by the spill, such as oysters, estuarine-dependent fish species, birds, marine mammals, and nearshore benthic communities.

b) Restore for injuries to habitats in the geographic areas where the injuries occurred, while considering approaches that provide resiliency and sustainability.

c) While acknowledging the existing distribution of habitats throughout the Gulf, restore habitats in appropriate combinations for any given geographic area. Consider design factors, such as connectivity, size, and distance between projects, to address injuries to the associated living coastal and marine resources and restore the ecological functions provided by those habitats.

To accomplish the Restoration Type goals, the project objectives are to 1) increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands and 2) establish estuarine marsh vegetation.

1.3 Conceptual Setting

The project would restore priority areas in the Texas Point NWR, which is located along the western bank of the Sabine Pass Channel and north of the Gulf of America (Figure 1). The area is within the Chenier Plain of southeast Texas and contains estuarine marshes interspersed with elevated fan-shaped, salt prairie known as “cheniers.” Sea level rise, subsidence, insufficient sediment inflow due to anthropogenic alterations, and erosion have severely degraded marsh and wetland habitat in the region. This habitat degradation is exhibited by the increase in the areal extent of open water and the decrease in estuarine marsh area.

The project would be a continuation of similar marsh restoration efforts in the region that are beneficially using dredged material. The initial establishment of marsh vegetation is anticipated to occur within two years of the placement of dredged material within the restoration cells.

This project would rely on external partners, such as the U.S. Army Corps of Engineers (USACE), to provide sediment dredged from sites in close proximity to the restoration site. The quantity, quality, and timing of availability of dredged sediments would be a key driver in the final acreage of intertidal marsh habitat restored.

1.4 Sources of Uncertainty

Although the likelihood of project success is evaluated under Oil Pollution Act regulations (15 CFR § 990.54(a)(3)), uncertainties may exist regarding how to best implement projects to achieve the greatest benefits for the injured resources. These uncertainties may arise from an incomplete understanding of the current conceptual setting; from unknown conditions in the future; or from project elements that do not perform as anticipated. For this project, the uncertainties (summarized in Table 8-1) could affect project success and could, therefore, be key drivers of corrective actions or adaptive management decisions. Sections 2 and 3 summarize project monitoring protocols and describe how this information would be used to inform adaptive management to address these uncertainties.

Potential uncertainties are defined as those that may affect the ability to achieve project restoration objective(s). To aid in the identification of uncertainties, Trustees utilized a variety of sources, including but not limited to, Final PDARP/PEIS Monitoring and Adaptive Management (MAM) Section 5.5.15 (DWH NRDA Trustees 2016); MAM Manual (DWH NRDA Trustees 2024); and other documents. Monitoring activities can be undertaken to inform these uncertainties, and appropriate corrective actions can be implemented in the event the project is not meeting its performance criteria.

Table 1 Key Uncertainties

Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision-Making
Extreme weather	Extreme weather may result in damage to the project prior to, during, or post construction. This could result in the need to postpone construction or reconstruct damaged portions of the project. Extreme weather could also affect the growth/survival of transplanted vegetation and/or allow invasive species to be established and/or dominate the vegetation community.
Survival of transplanted vegetation	Survival of transplanted vegetation could be hindered by extreme weather, precipitation, and sediment elevation.
Vegetation recruitment and/or colonization	Recruitment and/or colonization patterns of flora may be insufficient.
Precipitation patterns	Drought could hinder growth and/or survival of transplanted vegetation and/or allow nontarget vegetation communities to evolve (e.g., invasive species).
Sea level rise and subsidence	Site-specific rates of sea level rise and subsidence may impact the proper functioning of the elevation gradient needed to support estuarine marsh.
Market instability	Unforeseen market instability may delay, prevent, or change the spatial extent of construction of the Project.

Key Uncertainty	Description on How the Uncertainty Could Impact Project Success and/or Decision-Making
Contractor controls	Dredging contracts would be held by the USACE or other project partners, and the Implementing Trustee may have limited direct control over contractor actions and communications. This could produce communication delays, resulting in contractors overfilling or underfilling portions of the restoration site.
Source and quality of dredged material	The source and quality (e.g., grain size distribution) of sediments can have an impact on time and elevation of sediment settlement and marsh development.

The list of key uncertainties in Table 1 is not exhaustive. Additional uncertainties may be identified as the project is implemented and monitored. These uncertainties may affect the achievement of the restoration objectives of the project. If any drivers or stressors are negatively impacting the project, adaptive management may be necessary to ensure that project objectives are being achieved.

2. Project Monitoring, Performance Criteria, and Potential Corrective Actions

The monitoring described in this MAM Plan was developed to evaluate project performance and identify potential corrective actions, if needed. Information on each monitoring parameter is provided below, organized by objective (Table 2). Evaluations of monitoring data are used to 1) determine whether the project, once implemented, has met its objectives and 2) to inform the need for potential corrective actions (see Table 2). Note that Table 2 does not include all possible options for corrective actions; rather, it includes a list of potential actions for each individual parameter to be considered if the project is not performing as expected once implemented. Other corrective actions may be identified post-construction, as appropriate. The project site includes multiple marsh restoration cells that may be constructed over multiple dredging events. Monitoring for each restoration cell would be initiated when a corresponding dredging event for that cell is identified.

Table 2 Project Objectives, Parameters, Data Collection Activities, Performance Criteria, and Potential Corrective Actions

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Structural Integrity (Completed as Designed) *(i.e., of levees and water control structures)*	As-built topographic surveys of the containment berms would be collected as deemed appropriate by the project engineer. Subsequent surveys would consist of visual surveys to ensure physical integrity of the berms and water control structures and would be documented with photographs.	Topographic surveys, visual inspections, and field and aerial photographic documentation would be conducted annually until a management decision is made for berm breaching and water control structures (approximately 1-year post-construction).	One survey/inspection per entire construction area site.	As-built elevation, integrity, and function of the containment berms and water control structures is maintained as designed until a management decision is made for berm breaching and water control structure removal (approximately 1-year post-construction).	Reshaping or repairing containment berms, adding additional sediments to the berms, repairing or modifying water control structures, or lowering contained water levels.
Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Elevation, Habitat	Topographic surveys of the marsh restoration cells would be conducted along parallel transects 300 feet apart (a minimum of three transects per marsh restoration cell). Transect locations would be established during the preconstruction survey and reoccupied during subsequent survey events. Survey points would be collected every 100 feet (a minimum of 24 points per restoration cell) along each transect and at locations with a noticeable break in slope. Survey points would also be collected at each settlement plate location.	Annual topographic surveys, visual inspections, and field and aerial photographic documentation would be conducted over the 5-year monitoring period near the end of the growing season.	One survey/inspection per entire construction cell.	70% of sediment fill area within target elevation 5 years post-construction.	Reshaping sediments, adding additional sediments, breaching containment berms, and removing water containment structures.

Project Objective	Parameter(s)	Method	Timing and Frequency of Data Collection	Sample Size/Cells	Performance Criteria	Potential Corrective Actions
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Increase grade elevations to be suitable for estuarine marsh restoration as determined by adjacent reference wetlands	Area (Habitat by type)	The aerial extent of project and habitat boundaries would be mapped using aerial imagery collected by airplane, helicopter, unmanned aerial systems, satellite imagery, or other appropriate remote sensing platforms. Imagery would map the extent of vegetated marsh and open water within the restoration cell.	Aerial imagery would be collected during preconstruction to establish pre-project baseline conditions. Subsequent aerial imagery collection would be conducted at 1-, 3-, and 5-years post-construction and, if needed, after events that could alter habitat within the project area such as severe storms, flooding, or oil spills.	One survey/inspection per entire construction area cell.	Vegetated estuarine marsh habitat occupies no more than 60%–80% of the marsh restoration cell area 5 years after Project construction.	Reshaping sediments, adding additional sediments, breaching containment berms, removing water control structures, and making hydrologic modifications (construction of ponds and channels).
Establish estuarine marsh vegetation	Percent Cover, Vegetation	Monitoring transects would be established with 300 feet between transects. One 1 by 1-m plot would be established every 100 feet or a minimum of 24 plots per restoration cell. The corners of each plot would be recorded with GPS and marked with corner poles for revisiting over time. Visual estimates of total plant cover	Annual vegetation percent cover surveys would be conducted during the monitoring period near the end of the growing season. The monitoring period is expected to be 5 years or less and is dependent upon when the performance criteria are	Monitoring plots of 1- by 1 m (minimum of 24 plots per restoration cell) would be established at 1 year post-construction or when resource managers decide to remove berms and water control	One of two criteria should be met: 1) percent cover is maintained at or greater than 70% in monitoring subplots, 5 years after planting activities initiated; and 2) percent cover is within ±5% of the	Replanting/reseeding, invasive species removal, and/or transplanting of native estuarine marsh plants species. The Texas TIG may extend monitoring for 5 years or until performance criteria are met. If the monitoring period is changed, the decision would

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4. Evaluation

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Structural Integrity (Consolidation)	N/A	N/A	X	X	X	X	X
Area (Habitat by type)	X	N/A	X	N/A	X	N/A	X
Percent Cover, Vegetation	N/A	N/A	X	X	X	X	X
Species Composition, Vegetation	N/A	N/A	X	X	X	X	X

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GIS metadata would be verified for compliance with the Federal Geographic Data Committee (FGDC) and International Organization for Standardization (ISO) metadata standards, as well as any Implementing Trustee agency requirements. Appropriate metadata could include a data dictionary to define codes and fields used in the dataset; and/or a Readme file describing how data was collected, QA/QC procedures, other information about data such as meaning, relationships to other data, origin, usage, and format.

Project data that are handwritten would be transcribed into a standard digital format and verified by one or more reviewers. For QA/QC procedures, generated electronic data sheets would be verified against the original hard copy, and any validation and transcription errors would be corrected as appropriate before data are used for any analyses or published to DIVER.

Implementing Trustees would verify and validate MAM data and information and ensure that all data are entered or converted into a commonly used digital format and labeled with metadata to the extent practicable and in accordance with FGDC, ISO, and Implementing Trustee agency standards. The Implementing Trustee would give the other Texas TIG members time to review the data before making such information publicly available in DIVER. The Implementing Trustee is responsible for ensuring that the data submitted to DIVER are consistent with the data standards.

6.3 Data Storage and Accessibility

Monitoring data would be stored in a secure location in such a way that accessibility is guaranteed for as long as the Implementing Trustee requires. Original hard copy data, digital data, and photographs would be retained by the Implementing Trustee. Digital data and scanned hard copy photographs and forms would be stored on the NOAA-supported TIG SharePoint site.

After data has been verified by QA/QC procedures, it would be stored on DIVER and, where applicable, on Implementing Trustee databases, in accordance with DWH reporting requirements (e.g., within one year of collection).

6.4 Data Sharing

Implementing Trustees would ensure data sharing follows standards and protocols set forth in the DWH SOPs (Section 11.4 of SOPs; DWH NRDA Trustees 2021). Data would be made publicly available, in accordance with the federal Open Data Policy (Executive Order 13642, May 4, 2013), through DIVER. Prior to being made publicly available, any personal identifiable information would be redacted. Some MAM data may be exempt from the Open Data Policy due to protection from public disclosure under other regulatory requirements. No data release can occur if it is contrary to other federal or state laws.

7. Reporting

Project monitoring information, including a summary of monitoring information and decision of potential corrective actions, would be prepared and uploaded to DIVER annually. The Implementing Trustee would develop a final, high-level summary report prior to project closeout.

8. Roles and Responsibilities

Implementing Trustees for this project would be identified in a TIG Resolution and would be responsible for execution of the MAM Plan, oversight of any contractors used to perform MAM tasks, annual and final reporting to DIVER, and informing the Texas TIG of project details, including the need for potential corrective action as needed. Other Texas TIG members may assist with monitoring data collection, data verification, draft project report review and editing, and providing technical support to the Implementing Trustee. The decision to implement corrective action would be determined by Texas TIG consensus.

9. References

Deepwater Horizon Natural Resource Damage Assessment Trustees (DWH NRDA Trustees), 2016. Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. February 2016. Accessed August 3, 2024. Available at: http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan

DWH NRDA Trustees, 2021. Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the Deepwater Horizon (DWH) Oil Spill. Revised August 2, 2021. Accessed September 14, 2024. Available at: https://www.gulfspillrestoration.noaa.gov/media/document/2021-08-02-final-revised-sop-clean-copy-30pdf

DWH NRDA Trustees, 2024. Monitoring and Adaptive Management Procedures and Guidelines Manual Version 2.1. Appendix to the Trustee Council Standard Operating Procedures for Implementation of the Natural Resource Restoration for the DWH Oil Spill. Revised September 2024. Accessed November 1, 2024. Available at: https://www.gulfspillrestoration.noaa.gov/monitoring-and-adaptive-management

Exec. Order No. 13642, 78 Fed. Reg. 28111 (May 14, 2013). Accessed August 6, 2024. Available at: https://www.govinfo.gov/content/pkg/DCPD-201300318/pdf/DCPD-201300318.pdf

Texas Trustee Implementation Group, 2017. Deepwater Horizon Oil Spill Natural Resource Damage Assessment, Texas Trustee Implementation Group, Final 2017 Restoration Plan/Environmental Assessment: Restoration of Wetlands, Coastal, and Nearshore Habitats; and Oysters. Accessed August 6, 2024. Available at: https://www.gulfspillrestoration.noaa.gov/media/document/dwh-arz000631pdf

Appendix F. Summary of Public Comments on the Draft RP/EA #3 and Texas TIG Responses

F.1 Introduction

The public comment period for the Texas Trustee Implementation Group's (TIG) *Draft Restoration Plan/Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats* (RP/EA #3) opened on January 16, 2025. The TIG accepted public comments through February 18, 2025. To present the Draft RP/EA #3 and encourage public comment, the Texas TIG held a public meeting on January 28, 2025. Additional information on the public comment process is provided in Section 1.6.

The Texas TIG hosted a web-based comment submission site (National Park Service's Planning, Environment, and Public Comment [PEPC] webpage) and provided a mailing address for the public to provide comment. During the public comment period, the Texas TIG received six submissions from federal and local governments, private citizens, and other organizations. Following the comment period, the Texas TIG reviewed all submissions and grouped and summarized similar or related comments for response (see below). All comments submitted during the public comment period were reviewed and considered by the Texas TIG prior to finalizing the RP/EA #3. All public comments will be included in the Administrative Record. After considering the public comments received, the Texas TIG revised the Draft RP/EA #3 to prepare this Final RP/EA #3. A summary of edits made between the Draft and Final document, including edits based on public comment, is included in Section 1.6.2.

F.2 Summarized Comments and Texas TIG Responses

Comment 1: Multiple commenters indicated general support for the Draft RP/EA #3. Support statements agreed with the RP/EA #3 objectives to restore wetland systems impacted by the *Deepwater Horizon* (DWH) oil spill and commended the RP/EA #3's focus on conserving and preserving Texas coastal marshes. In addition to noting appreciation for the continued work of the Texas TIG in the McFaddin National Wildlife Refuge (NWR) beach and dune system, a commenter also expressed support for the beneficial use of dredged material to restore the Texas coast and the collaboration to restore wetlands on state and federal lands.

> **Response:** The Texas TIG acknowledges the support for the RP/EA #3 and the proposed projects.

Comment 2: One commenter provided recommendations for restoration activities, including limiting coastal development and using the funds allotted for RP/EA #3 to acquire private property in flood zones closest to wetlands to protect natural habitat and retreat from sea level rise and flooding. The commenter expressed concern that funds should not be used to dredge or spread toxic material to mitigate areas affected by sea level rise or flooding.

> **Response:** The Texas TIG acknowledges these recommendations and concerns and recognizes that there are various methods which can be used to preserve coastal and wetland habitat. The Texas TIG's first two RP/EAs included multiple acquisition projects to protect and restore coastal habitat. This RP/EA #3 prioritizes the beneficial use of dredged material (BUDM) as a cost-effective tool to restore and conserve wetlands, coastal, and nearshore habitats along the Texas coast. Additionally, the projects listed within RP/EA #3 are consistent with regional efforts to counteract land and habitat loss through dune restoration, hydrology enhancements, and estuarine marsh restoration.

The projects in the RP/EA #3 rely on BUDM, and the analyses of material placement in Appendix A, A.3.1 through A.3.8, focus on the sites where material would be placed. The Texas TIG would not fund any dredging costs but would fund the incremental costs to restore marsh with sediments dredged from other authorized projects. The dredged material used to restore these marsh sites must meet all federal environmental requirements, including those established under the Clean Water Act (CWA) and the Marine Protection, Research, and Sanctuaries Act (MPRSA) (U.S. Environmental Protection Agency [USEPA] 2024).

Comment 3: One commenter expressed the need for early and frequent communication with the U.S. Army Corps of Engineers (USACE) Galveston District's Operations Manager for Beneficial Use to ensure timely implementation of the projects.

Response: The Texas TIG acknowledges this recommendation, and in the development of the RP/EA #3, the Texas TIG communicated with USACE about project possibilities and schedules. The Texas TIG understands the value of open communication and coordination with regulatory agencies and would continue to work with the USACE to ensure timely project implementation.

Comment 4: One commenter asked if the Texas TIG considered the use of wetlands and marshes as tools to help meet water quality standards set by the USEPA under Section 303 of the Clean Water Act, and if modeling would be conducted to ensure water quality standards during and after implementation.

Response: Although the proposed actions could improve water quality, the goal of the RP/EA #3 is focused on meeting the Restore and Conserve Habitats programmatic Restoration Goal identified in the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Final PDARP/PEIS; Deepwater Horizon [DWH] Natural Resource Damage Assessment [NRDA] Trustees 2016) under the Wetlands, Coastal, and Nearshore Habitats Restoration Type (see Section 1.5.1 of the Draft RP/EA #3; Section 1.5.3 of the Final PDARP/PEIS). The projects in the RP/EA #3 propose the BUDM to raise substrate elevations affected by subsidence and sea level rise to re-establish natural hydrology needed to restore the function of coastal wetland communities. By restoring the elevation of these sites, the proposed projects are intended to restore these intertidal habitats which could maintain and improve coastal water quality. Coastal wetlands benefit water quality via nutrient cycling and sediment capture, as well as stabilizing the rate of change in these habitats.

While no water quality modeling would be conducted, best practices would be used to reduce or eliminate environmental impacts during project implementation. For example, best practices could include using buffer zones and decanting structures. Requirements associated with environmental compliance (e.g., consultation for compliance with Endangered Species Act) for sensitive resources would be followed.

Additionally, the Texas TIG develops and implements project Monitoring and Adaptive Management (MAM) plans according to Appendix 5.E of the Final PDARP/PEIS and the Trustees' Monitoring and Adaptive Management Procedures and Guidelines Manual (MAM Manual; available at https://www.gulfspillrestoration.noaa.gov/monitoring-and-adaptive-management). Project MAM plans define the metrics that would be monitored to measure project success and establish adaptive management protocols if thresholds for project success are not met. While many factors may affect project success, project MAM plans focus on gathering and evaluating information about direct influences on project success to inform if and how the

Implementing Trustee may adaptively manage the project. Annual reports on project activities and monitoring are available for viewing on the Trustees' website (https://www.gulfspillrestoration.noaa.gov).

Comment 5: One commenter asked if the Texas TIG's project designs considered factors such as sea level rise, changing environmental conditions, and relationships between evolving habitat conditions and endangered or threatened species that utilize those habitats.

Response: The Texas TIG acknowledges that subsidence and sea level rise are rapidly converting emergent marsh to open water (Draft RP/EA #3, Section 4.3 and Appendix A). BUDM has become an increasingly important tool and a cost-effective approach in coastal restoration, as well as creation and/or preservation of habitat that may be used by threatened and endangered species. The projects listed within RP/EA #3 are consistent with regional efforts to counteract land and habitat loss through dune restoration, hydrology enhancements, and estuarine marsh restoration.

The National Environmental Policy Act (NEPA) and Oil Pollution Act Natural Resource Damage Assessment (OPA NRDA) evaluation processes require that the Texas TIG consider the effects to threatened and endangered species from each project. The biological resources and project-specific considerations for each resource are detailed in the OPA NRDA Evaluation of Alternatives (Chapter 3) and the NEPA Supporting Documentation Report (Appendix A). The alternatives in the RP/EA #3 would benefit wetlands and coastal habitats by beneficially using dredged material to create viable, vegetated wetland habitat for a variety of local wildlife. The final target marsh elevations would consider factors such as sediment compaction and projected sea level rise. As these sites are in close proximity to navigation channels, additional sediments could be added to these sites in future dredging cycles as sea levels continue to rise.

Comment 6: One commenter expressed support for the *Guadalupe River Old Delta Wetland Restoration* project and would like it to be considered a priority in the near future.

Response: The Texas TIG acknowledges this recommendation and support. As described in Chapter 2, factors influencing project selection include likelihood for a project to be funded through other funding sources. At this time, the *Guadalupe River Old Delta Wetland Restoration* project is being considered for completion through outside funding sources. The OPA NRDA analysis in Section 3.4.3 of the Draft RP/EA #3 details the decision-making process that led to this project not being selected as a preferred alternative in this Final RP/EA #3.

Comment 7: One commenter expressed support for the BUDM for the *Texas Point National Wildlife Refuge Wetland Restoration* project, noting such value where the marshland is both fragile and under rising threats from saltwater intrusion, wave action, hurricanes, and tropical storms.

Response: The Texas TIG acknowledges the support for the RP/EA #3 and *Texas Point National Wildlife Refuge Wetland Restoration* project as a preferred alternative.

Comment 8: One commenter expressed support for the beneficial use of dredged materials for the *McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration* project, where marsh die-off has resulted in open water threatening the ecological viability of the surrounding marshes and plant communities. The commenter also notes consistency between the project's goals and the Salt Bayou Watershed Plan.

Response: The Texas TIG acknowledges the support for the RP/EA #3 and *McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration* project as a preferred alternative.

F.3 References

DWH NRDA Trustees, 2016. Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan (PDARP) and Final Programmatic Environmental Impact Statement (PEIS). February 2016. Accessed September 14, 2024. Available at: http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan

USEPA, 2024. Beneficial Use of Dredged Material under CWA Section 404. Accessed February 20, 2024. Available at: https://www.epa.gov/cwa-404/beneficial-use-dredged-material-under-cwa-section-404.

Appendix G. Texas TIG Restoration Plan/Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats Finding of No Significant Impact

G.1 Overview and Background

The Texas Trustee Implementation Group *Final Restoration Plan and Environmental Assessment #3: Wetlands, Coastal, and Nearshore Habitats* (RP/EA #3) is an integrated restoration plan and environmental assessment prepared by the Texas Trustee Implementation Group (Texas TIG or the TIG) to fulfill requirements under the Oil Pollution Act of 1990 (OPA), the OPA Natural Resource Damage Assessment (NRDA) regulations (15 Code of Federal Regulations [CFR] § 990), and the National Environmental Policy Act of 1969 (NEPA). The RP/EA #3 was prepared to partially address injuries to natural resources and their services caused by the *Deepwater Horizon* (DWH) oil spill.

In accordance with OPA, and as set forth in the Consent Decree and described in the DWH Trustees' *2016 Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement* (Final PDARP/PEIS), the Texas TIG is composed of three Texas State Trustee agencies: the Texas Commission on Environmental Quality; Texas Parks and Wildlife Department (TPWD); Texas General Land Office (GLO); and four federal DWH Trustee agencies: the National Oceanic and Atmospheric Administration (NOAA); the U.S. Department of the Interior (DOI); the U.S. Department of Agriculture (USDA); and the U.S. Environmental Protection Agency (USEPA).

The Final PDARP/PEIS is a programmatic document developed by the DWH Trustees to guide and direct the DWH oil spill restoration effort. The Final PDARP/PEIS was prepared in accordance with the OPA NRDA regulations, NEPA statute, and agency-specific NEPA implementing procedures and regulations. The RP/EA #3 tiers from the Final PDARP/PEIS. The Final PDARP/PEIS includes a portfolio of Restoration Types that addresses the suite of injuries that occurred at both regional and local scales. Of five overarching goals set forth in the Final PDARP/PEIS, the RP/EA #3 addresses the programmatic Restoration Goal to "Restore and Conserve Habitat." Within that goal, the RP/EA #3 focuses on the Wetlands, Coastal, and Nearshore Habitats Restoration Type. In the RP/EA #3, the TIG analyzed eight action alternatives and a no action alternative and selects for implementation of six of those alternatives.

G.2.1 Lead and Cooperating Agencies, Adoption of NEPA Analysis by Cooperating Agencies

Pursuant to NEPA, the Texas TIG designated NOAA as the lead federal agency to supervise the preparation of the NEPA analysis for the RP/EA #3 (52 U.S. Code [U.S.C] § 4336a(1)(A)). Each of the other federal and state co-Trustees participated as a cooperating agency pursuant to NEPA (52 U.S.C. § 4336a(3)) and the Trustee Council's *Standard Operating Procedures for Implementation of the Natural Resource Restoration for the Deepwater Horizon Oil Spill* (SOPs; DWH Trustees 2021). Each federal Trustee on the TIG must make its own independent evaluation of the NEPA analysis in support of its decision-making responsibilities. In accordance with § 4336b and the SOPs, each of the federal Trustees has reviewed the RP/EA #3, finds it meets the standards set forth in its own NEPA implementing procedures or regulations, and accordingly adopts the NEPA analysis.

G.2.2 Public Participation

The Texas TIG noticed the availability of the Draft RP/EA #3 in the Federal Register (FR) on January 16, 2025 (90 FR 4725). A notice of availability was also posted on the DWH Trustees' website at https://gulfspillrestoration.noaa.gov/texas. Public materials included a fact sheet translated in Vietnamese and Spanish. The TIG provided a public comment period that ran through February 18, 2025. During the comment period, the TIG held a public meeting in Galveston, Texas on January 28, 2025, to facilitate the public review and comment process. In addition to the public meeting, the public could make comments on the Draft RP/EA #3 through U.S. mail and via a web-based comment submission site.

During the public comment period, the TIG received six submissions from private citizens, public agencies, and other organizations. Public comments received during the comment period were considered and summarized in the Final RP/EA #3. Appendix F of the RP/EA #3 provides further detail, including a summary of all comments received on the Draft RP/EA #3 and the Texas TIG's responses. The Draft RP/EA #3 was finalized after considering input received during the public comment period.

G.2.3 Purpose and Need

The Texas TIG has undertaken this restoration planning effort to meet the purpose of contributing to the compensation for and restoration of natural resources and their services injured in the Texas Restoration Area resulting from the DWH spill. This RP/EA #3 is consistent with the Final PDARP/PEIS, which identified extensive and complex injuries to natural resources and their services across the Gulf and a need to plan for comprehensive restoration consistent with OPA. This RP/EA #3 falls within the scope of the purpose and need identified in the Final PDARP/PEIS. As described in Section 5.3 of the Final PDARP/PEIS, the Restoration Goals work independently and together to benefit injured resources and services. The reasonable range of restoration alternatives in this RP/EA #3 address one of the programmatic Restoration Goals: Restore and Conserve Habitat. Additional information about the purpose and need for DWH NRDA restoration can be found in Section 5.3.2 of the Final PDARP/PEIS.

G.2 Summary of the Proposed Action and Alternatives

In the RP/EA #3, the Texas TIG evaluated eight project alternatives, including six identified as preferred by the TIG (Table G-1). A no action alternative was also analyzed. Through the OPA NRDA evaluation found in Chapter 3 of the Final RP/EA #3, the Texas TIG determines that implementation of six preferred alternatives[3] best meets the purpose and need for restoration over the non-preferred and no action alternatives. Accordingly, the TIG selects the preferred alternatives identified in Table G-1 for funding and implementation at this time. Pursuant to the Consent Decree, the $36,000,000 to implement the selected alternatives will be disbursed from the Texas TIG's settlement allocation under the Wetlands, Coastal, and Nearshore Habitats Restoration Type allocation.

[3] One alternative identified as preferred in the Draft RP/EA #3, *Schicke Point Wetland Restoration*, was found to be non-preferred in the Final RP/EA #3 based on additional information about the project site received following publication of the Draft RP/EA #3.

Table G-1 Alternatives Considered in this RP/EA #3

Alternative	Potential Acres	Preferred or Not Preferred
Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration	550	Preferred
Goose Island Wetland Restoration	40	Preferred
Guadalupe River Old Delta Wetland Restoration	1,140	Not preferred
Lower Neches Wildlife Management Area Old River Unit Wetland Restoration	224	Preferred
McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration	218	Preferred
San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration	200	Preferred
Schicke Point Wetland Restoration	72	Not preferred
Texas Point National Wildlife Refuge Wetland Restoration	623	Preferred

G.3 Summary of the Environmental Assessment

G.3.1 Action Alternatives

Chapter 4 and Appendix A of the RP/EA #3 provide the analysis needed to assess the significance of the impacts of the alternatives. The reasonable range of alternatives is analyzed to determine environmental effects that could result from project implementation. The NEPA analysis for the project alternatives is summarized below, and Table G-2 indicates each project's highest anticipated direct and indirect impacts. Environmental effects of the alternatives considered range from no effect to long-term, minor as defined Table 6.3-2 of the Final PDARP/PEIS and Appendix D of this RP/EA #3. No anticipated effects are determined to be significant considering the context and intensity of the projects' scopes and effects on the resources. The following is a discussion of the criteria the federal Trustees used to determine whether the impacts of the proposed action are significant.

Can the proposed action reasonably be expected to cause both beneficial and adverse impacts that overall may result in a significant effect, even if the effect will be beneficial?

No. It is not reasonably foreseeable that the proposed action will result in significant adverse effects. The proposed action would result in only short-term, minor adverse impacts to physical resources; short-term, minor-to-moderate adverse impacts to biological resources; and short-term, minor adverse impacts to socioeconomic resources.

The proposed action would result in beneficial impacts to those same resources from projects that improve quality and longevity of marsh habitats within the project areas. All the alternatives in this RP/EA #3 would benefit wetlands and coastal habitats by beneficially using dredged material to create viable, vegetated wetland habitat for a variety of local wildlife and would contribute to coastal resiliency by rebuilding wetlands to create buffers against storm surge damage to adjacent natural areas. Biological resources would also experience long-term benefits from wetland restoration and creation.

Can the proposed action reasonably be expected to significantly affect public health or safety?

No. None of the activities proposed in this RP/EA #3 are anticipated to have any adverse effects to public health or safety, either of short- or long-term duration. The creation of marshes can benefit the public's safety by improving water quality and buffering storm surges and damage to adjacent natural areas. Construction of the project alternatives would be managed to prevent impacts to health and safety following appropriate construction practices.

Can the proposed action reasonably be expected to result in significant impacts to unique characteristics of the geographic area, such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?

No. The proposed action would not have a significant effect on the unique characteristics of any geographic area including historic and cultural resources, park lands, wetlands, floodplains, municipal water sources, ecologically critical areas, wild and scenic rivers, parks, wilderness areas, ecologically critical areas, or prime farmlands, beyond those disclosed and evaluated in the Final PDARP/PEIS. Because areas of potential ground disturbance would be surveyed, and any identified cultural resources avoided, project activities are not anticipated to have adverse impacts on cultural or historic resources.

Are the proposed action's effects on the quality of the human environment likely to be highly controversial?

No. The effects of the proposed action on the quality of the human environment are unlikely to be highly controversial. The proposed activities rely on techniques that are regularly used for restoring and conserving habitat with no controversy regarding their impacts to the human environment. A 30-day public comment period was held between January 16 and February 18, 2025. No comments raised any issues of significant environmental concern or included significant new information relevant to environmental concerns.

Are the proposed action's effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

No. The proposed action's effects are not highly uncertain, unique, or unknown. The proposed activities rely on techniques that are regularly used for wetlands, coastal, and nearshore habitats restoration. Beneficial use of dredged material has become an increasingly important tool and a cost-effective approach in coastal restoration and resiliency.

Can the proposed action reasonably be expected to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

No. As shown in the RP/EA #3, no significant impacts would occur under the proposed action or represent a decision in principle about a future consideration. The proposed action neither establishes a precedent for future TIG actions with significant effects nor represents a decision in principle about a future consideration. Future TIG actions will be determined through separate, independent planning processes.

Is the proposed action related to other actions that when considered together will have individually insignificant but cumulatively significant impacts?

No. None of the projects included in this RP/EA #3 would result in any long-term adverse effects that rise above a long-term, minor adverse impact. Thus, in combination with other actions, the proposed action would not contribute significantly to adverse reasonably foreseeable environmental effects to air quality, geology, and substrates; hydrology and water quality; habitats; wildlife species; protected species; marine and estuarine fauna, marine mammals, essential fish habitat (EFH), and managed fish

species; land and marine management; cultural resources, socioeconomics and public health and safety. The proposed action would create long-term aggregate benefits to most of these resources.

Can the proposed action reasonably be expected to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources?

No. Initial review of Texas Historical Commission cultural and historical resources database (Texas Historical Commission 2024) indicates that no known historic sites or significant cultural, scientific, or historic resources exist within the boundaries of the project areas. No adverse impacts to cultural resources are anticipated as a result of the projects. For each project selected for implementation under the Final RP/EA #3, a comprehensive review under Section 106 of the National Historic Preservation Act (NHPA) will be completed before the implementation of regulated project activities, to develop practices that avoid, minimize, or mitigate adverse effects on historic properties within the project area. The projects will be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

Can the proposed action reasonably be expected to have a significant impact on endangered or threatened species, or their critical habitat as defined under the Endangered Species Act of 1973?

No. DOI, on behalf of the Texas TIG, has requested Endangered Species Act (ESA) consultation with the U.S. Fish and Wildlife Service (USFWS) for all species under USFWS jurisdiction, and NOAA has requested ESA consultation with NMFS for species under NMFS jurisdiction. ESA-listed species and their critical habitats are expected to benefit from the proposed action in the long term. Implementing Trustees will provide oversight to minimize overall impacts and to ensure no unanticipated effects to listed species and habitats occur and that all agreed upon best management practices (BMPs) and conservation measures are implemented and continue to function as intended.

Can the proposed action reasonably be expected to result in a violation of federal, state, or local law or requirements imposed for environmental protection?

No. The proposed action is intended to restore wetlands, coastal, and nearshore habitats and will be implemented in compliance with all applicable federal laws and regulations. A summary of the federal regulatory compliance review and approvals as of signature on this document are provided in Table 5-1. Any environmental reviews and consultations not yet completed will be finalized prior to the implementation of the relevant project activities.

Can the proposed action reasonably be expected to adversely affect stocks of marine mammals as defined in the Marine Mammal Protection Act?

No. Implementation of the proposed action is not expected to adversely affect stocks of marine mammals. Short- and long-term, minor adverse effects could result due to displacement during dredging and construction activities. The only marine mammal regularly found in Texas estuaries is the bottlenose dolphin and there are infrequent sightings of the West Indian manatee.

Can the proposed action reasonably be expected to adversely affect managed fish species or essential fish habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act?

No. Implementation of the proposed action could result in short-term, minor adverse impacts to EFH through dredged material deposition and increased turbidity. Long-term, minor adverse impacts could include conversion of one wetland vegetation type to another with changes in the distribution of fauna communities. These impacts are expected to be confined to the immediate vicinity of the project, and

best practices would likely be implemented to minimize adverse impacts. Long-term benefits to EFH would occur from the improvement of habitat for commercially important prey species. The creation of additional estuarine marsh generates additional EFH that is anticipated to benefit the local ecosystem by enhancing the food web and supporting many ecologically and economically important fish species. Overall, the proposed action would not have a significant effect on managed fish species or essential fish habitat.

Can the proposed action reasonably be expected to adversely affect vulnerable marine or coastal ecosystems, species richness, or ecosystem functioning?

No. The proposed action would create short- and long-term, minor-to-moderate adverse impacts to geology and substrates and to terrestrial and marine fauna from disturbances associated with construction activities. However, resources would recover quickly and only a small fraction of any local population would be adversely affected.

Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

No. The proposed action is not expected to result in the introduction or spread of nonindigenous species. Use of BMPs, adaptive management and adherence to permit conditions will minimize the chances for introduction or spread of nonindigenous species.

Table G-2 Summary of the Reasonably Foreseeable Impacts of the Reasonable Range of Restoration Alternatives

Project	Geology and Substrates	Hydrology and Water Quality	Air Quality	Noise	Habitats	Wildlife Species	Marine and Estuarine Resources	Protected Species	Socioeconomics	Cultural Resources	Infrastructure	Land and Marine Management	Tourism and Recreational Use	Fisheries and Aquaculture	Land and Marine Transportation	Aesthetics and Visual Resources	Public Health and Safety
No Action	L	L	NE	NE	L	L	L	L	NE	NE	l	l	l	l	NE	l	l
Jocelyn Nungaray National Wildlife Refuge Roberts Mueller Tract Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Goose Island Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Guadalupe River Old Delta Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Lower Neches Wildlife Management Area Old River Unit Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
McFaddin National Wildlife Refuge Willow Lake Terraces Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
San Bernard National Wildlife Refuge Sargent Oil Field Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Schicke Point Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE
Texas Point National Wildlife Refuge Wetland Restoration	s, l, +	s, l, +	s, +	s	s*, +	s*, +	s*, +	s, l, +	NE, +	NE	NE	NE	s, +	s, +	NE	s*, +	NE

Notes:
+: beneficial effect
l: long-term, minor adverse effect
L: long-term, moderate-to-major adverse effect
NE: no adverse effect
s: short-term, minor adverse effect
s*: short-term, minor-to-moderate effect
S: short-term, moderate-to-major adverse effect

G.3.2 No Action Alternative

Pursuant to the OPA NRDA regulations and NEPA, the Natural Recovery/No Action alternative was analyzed programmatically in Section 5.3.2 of the Final PDARP/PEIS and was found to not meet the purpose and need for implementing alternatives that address lost natural resources and their services. Therefore, Natural Recovery was discarded from further consideration as a viable restoration alternative in subsequent tiered restoration plans.

A No Action Alternative is included in this RP/EA #3 analysis pursuant to NEPA to analyze "any negative environmental impacts of not implementing the proposed agency action" (42 U.S.C. § 4332 (C)(iii).

Natural resources would not recover without restoration, and the public would not be compensated for losses to natural resources and their services during this recovery time period. The No Action alternative would have no beneficial impacts to and no direct adverse effects on physical, biological, or socioeconomic resources. However, taking no action would indirectly allow some ongoing adverse effects on resources to continue, including the following:

Physical Resources

The No Action Alternative is anticipated to result in long-term, moderate-to-major adverse impacts to physical resources such as geology and substrates and hydrology and water quality from degraded hydrologic connectivity, continued wetland habitat degradation, and conversion of wetlands to open water.

Biological Resources

Under the No Action Alternative, Continued wetland degradation would result in long-term, moderate-to-major adverse impacts to biological resources such as habitats, wildlife species, marine and estuarine resources, and protected species.

Socioeconomic Resources

The No Action Alternative is anticipated to result in continued wetland degradation would also result in long-term, minor adverse impacts to socioeconomic resources including infrastructure, land and marine management, tourism and recreational use, fisheries and aquaculture, aesthetics and visual resources, and public health and safety.

G.4 Agency Coordination and Consultation Summary

The Texas TIG has engaged in environmental compliance and/or technical assistance and reviews with the applicable state and federal agencies. The status of those consultations can be found in Table 5-1. Pursuant to the Coastal Zone Management Act, on behalf of the Texas TIG Trustees, NOAA submitted a consistency determination for review. The State has concurred with the determination of consistency of the alternatives with the enforceable policies for the proposed activities (see 15 CFR Part 930).

The TIG will seek concurrence with the relevant State Historic Preservation Offices and with affected Tribes through Tribal consultations. If through the concurrence/consultation process any cultural resources are identified within the project area, the TIG will ensure that all applicable laws concerning the protection of cultural resources are followed.

The Implementing Trustee, on behalf of the Texas TIG, will ensure compliance with all applicable state and local laws and other applicable federal laws and regulations relevant to the selected projects. If any

project changes are recommended during planning and implementation efforts, the Texas TIG would determine whether additional consultation or other environmental compliance is needed. If any further need arises to coordinate and consult with other regulatory authorities, the additional coordination or consultation requirements will be addressed prior to project implementation, or, if project implementation is already underway, as soon as the need is identified. The status of DWH federal regulatory permits/approvals is maintained online and updated as regulatory compliance information changes at (https://www.gulfspillrestoration.noaa.gov/environmentalcompliance/).

The Texas TIG's Finding of No Significant Impact for these projects is issued subject to the completion of all outstanding compliance reviews under applicable federal laws.

G.5 Determination

In view of the NEPA analysis presented in this document and in the supporting RP/EA #3 for implementation of the preferred alternatives, the Texas TIG Trustees have determined that the proposed action to implement the six preferred alternatives will not significantly impact the quality of the human environment. Accordingly, preparation of an environmental impact statement for this action is not necessary.

FOR THE U.S. DEPARTMENT OF THE INTERIOR



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MARY JOSIE BLANCHARD

Principal Representative, Department of the Interior

Date: June 20, 2025

FOR THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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Principal Representative, National Oceanic and Atmospheric Administration

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TONY PENN

Chief, Assessment and Restoration Division

National Ocean Service

Date: _____

FOR THE U.S. DEPARTMENT OF AGRICULTURE



DORIS G. WASHINGTON

Alternate to Principal Representative, U.S. Department of Agriculture

Date: June 10, 2025

FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY



MARY KAY LYNCH

Alternate to Principal Representative, U.S. Environmental Protection Agency

Date: June 2, 2025