Chapter 11: Proposed Shell Belt and Coden Belt Roads Living Shoreline Project

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11.1 Shell Belt and Coden Belt Roads Living Shoreline Project: Project Description

11.1.1 Project Summary

The proposed Shell Belt and Coden Belt Roads Living Shoreline Project would employ shoreline restoration techniques to increase benthic productivity and enhance the growth of planted native marsh vegetation. The proposed project would be located in the Portersville Bay portion of Mississippi Sound, seaward of the southernmost portions of Shell Belt and Coden Belt Roads in Coden, Alabama. As the lead implementing Trustee, the Alabama Department of Conservation and Natural Resources (ADCNR) would construct shoreline breakwaters to dampen wave energy and protect newly planted emergent vegetation while also providing habitat and increasing benthic secondary productivity. The specific breakwater elevations, construction techniques and design would be developed to maximize project success and meet state regulatory requirements. Over time, the breakwaters are expected to develop into reefs that support benthic secondary productivity, including, but not limited to, bivalve mollusks, annelid worms, shrimp, and crabs. Marsh vegetation is expected to become established further enhancing both primary and secondary productivity adjacent to the breakwaters.

11.1.2 Background and Project Description

The proposed Shell Belt and Coden Belt Roads Living Shoreline Early Restoration project is located in Mississippi Sound, Alabama (see Figure 11-1, Figure 11-2, and Figure 11-3).

This living shoreline project area is located along the stretch of shoreline between Bayou la Batre and Bayou Coden in Mississippi Sound, Alabama. Mississippi Sound is an estuarine system separated from the Gulf of Mexico by barrier islands in Alabama and Mississippi. Habitats in and around Mississippi Sound include tidal wetlands and swamps, salt marshes, aquatic grass beds, oyster reefs, maritime and palustrine upland forests, and estuarine soft-bottom habitat.

Construction activities would include placement of intertidal breakwaters waterward of the shoreline that may utilize artificial Wave Attenuation Units (WAUs) and that would generally follow a +0.5 to +1.0 foot Mean Lower Low Water (MLLW) target crest elevation. The breakwaters would likely have 10 foot crest widths, based on desired wave reduction, and would be designed with a height that falls within the mean high and low water lines (intertidal). The specific breakwater elevations and technique designs would be selected to maximize project effectiveness and meet federal and state regulatory requirements. Over time, the breakwaters are expected to develop into reefs that support benthic secondary productivity, including, but not limited to, bivalve mollusks, annelid worms, shrimp, and crabs.

Figure 11-1. Site Location

Figure 11-2. Proposed Project Layout – Shell Belt and Coden Belt Roads Living Shoreline

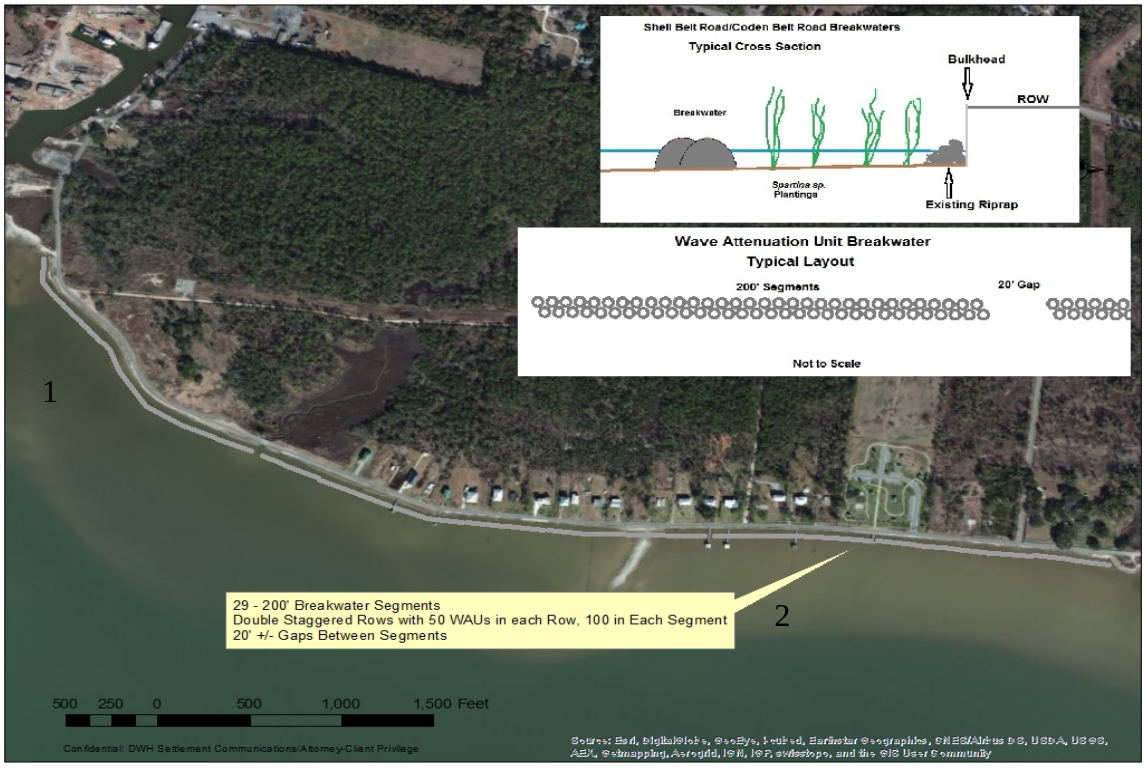
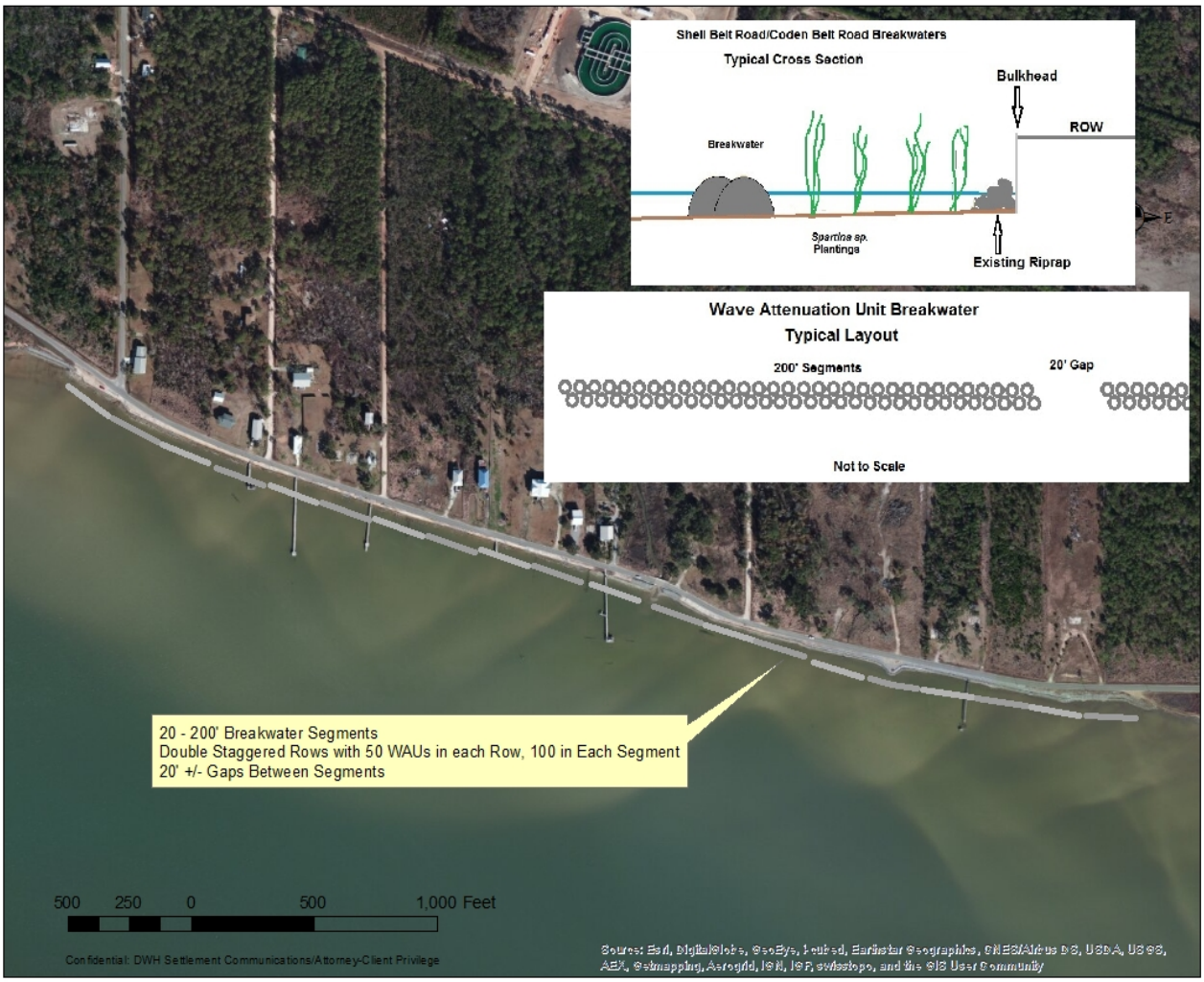


Figure 11-3. Proposed Project Layout – Shell Belt and Coden Belt Roads Living Shoreline



11.1.3 Evaluation Criteria

This proposed project meets the evaluation criteria established by OPA regulations and the Framework Agreement. The north central Gulf coast experienced a loss of salt marsh habitat and benthic secondary productivity, as a result of the Spill. The project would restore injured benthic secondary productivity by constructing breakwaters, enhance injured salt marsh habitat by planting new marsh vegetation, and compensate for interim losses of salt marsh habitat and benthic secondary productivity in Alabama. Thus, the nexus to resources injured by the Spill is clear (see 15 C.F.R. § 990.54(a)(2) and Sections 6a-6c of the Early Restoration Framework Agreement).

The project is technically feasible utilizing commonly used restoration techniques and can be implemented with minimal delay. Several studies of living shoreline techniques have found that these projects can successfully reduce shoreline erosion while providing habitat and water quality benefits (LaPeyre, et al. 2013[1], Scyphers et al. 2012[2], Berman et al. 2007[3]). ADCNR has successfully implemented similar shoreline projects throughout Mobile Bay. For these reasons, the project has a high likelihood of success (See 15 C.F.R. § 990.54(a)(3) and Section 6e of the Early Restoration Framework Agreement).

A thorough environmental assessment, including review under applicable environmental statutes and regulations, is described in Section 11.2. That preliminary review indicates that adverse effects from the project would largely be minor, localized, and of short duration. In addition, the best management practices and measures to avoid or minimize adverse effects described in Section 11.2 would be implemented. As a result, collateral injury would be avoided or minimized during project implementation (15 C.F.R. § 990.54(a)(4)).

Cost estimates are based on similar past projects, and indicate that the project can be implemented at a reasonable cost. (See C.F.R. § 990.54(a)(1)). Therefore, the project is feasible, cost effective, and consistent with long-term restoration needs (See C.F.R. § 990.54(a)(1),(3), and Sections 6d-6e of the Early Restoration Framework Agreement).

11.1.4 Performance Criteria and Monitoring

The overall goal of this restoration project is to create habitat that supports benthic secondary productivity thus enhancing the ecosystem function of the area. Monitoring activities at the site are planned over a 5-year period. The project's monitoring approach will incorporate a mix of quantitative and qualitative monitoring efforts to ensure project designs are correctly implemented during construction and in a subsequent period, defined by the contract developed for the implementation of this project, where corrective actions could be taken by the implementing Trustee (ADCNR) to ensure the project meets the objectives described below.

The specific restoration objectives relevant for this monitoring plan are: 1) construction of breakwaters that meet project design criteria and that are sustained for the expected lifespan of the project to support benthic secondary productivity, 2) support habitat utilization of the breakwaters invertebrate

[1] La Peyre, M.K., Schwarting, Lindsay, and Miller, Shea, 2013, Preliminary assessment of bioengineered fringing shoreline reefs in Grand Isle and Breton Sound, Louisiana: U.S. Geological Survey Open-File Report 2013–1040, 34 p.

[2] Scyphers, S.B., SB, Powers, S.P., SP, Heck, K.L. KL Jr.,, Byron, D. (2011) Oyster Reefs as Natural Breakwaters Mitigate Shoreline Loss and Facilitate Fisheries. PLoS ONE 6(8): e22396. doi:10.1371/journal.pone.0022396.

[3] Berman, Marcia, Harry Berquist, Julie Herman, Karinna Nunez, 2007. The Stability of Living Shorelines – An Evaluation: Final Report submitted to NOAA Chesapeake Bay Program Office under grant number NA04NMF4570358.

infauna and epifauna to increase secondary benthic productivity at the project site, and 3) protection of newly planted salt marsh vegetation. The monitoring plan for this project is provided in Appendix B.

Performance criteria will be used to determine restoration success or the need for corrective action (15 C.F.R. § 990.55(b)(1)(vii)). For restoration projects, since full recovery may occur over a long time frame, performance criteria typically represent interim milestones that will help project managers determine if the project is yielding improvements along an acceptable trajectory. The specific performance criteria and details for subsequent monitoring are provided in the monitoring plan for this project included in Appendix B.

11.1.5 Maintenance

There would be no short- or long-term maintenance activities required for these structures due to the materials being utilized. As navigational signage weathers and wears it would be replaced as appropriate, but this would involve replacing the sign face and would not include additional ground disturbance.

11.1.6 Offsets

For the purposes of negotiations of Offsets with BP in accordance with the Framework Agreement, the Trustees used Resource Equivalency Analysis (REA) and Habitat Equivalency Analysis (HEA) to estimate appropriate biological and habitat Offsets for the Shell Belt and Coden Belt Roads Living Shoreline Project. Habitat Offsets were expressed in DSAYs[4] of Salt Marsh Habitat; the biological Offsets were expressed as DKg-Ys of benthic Secondary Productivity.

Habitat Offsets were estimated for salt marsh habitat protected by this restoration project, based on the expected spatial extent and duration of improvements attributable to the project. In estimating DSAYs, the Trustees considered a number of factors, including, but not limited to, anticipated protection of newly created marsh provided by the project and the time period over which the project would continue to provide benefits. The Trustees and BP agreed that if this restoration project is selected for implementation, BP would receive Offsets of 50 DSAYs of Salt Marsh Habitat[5], applicable to Salt Marsh Habitat injuries in Alabama, as determined by the Trustees' total assessment of injury for the Spill.

If the combination of Offsets for Salt Marsh Habitat injuries from the Phase I and Phase III early restoration projects in Alabama and from the Shell Belt and Coden Belt Roads Living Shoreline Project exceeds the Salt Marsh Habitat injuries in Alabama, then the remaining unused Salt Marsh Habitat DSAYs from this project will be converted to Secondary Productivity[6] (at a rate of 1,000 Dkg-Ys of

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[4] **Discounted Service Acre Years (DSAYs)** are defined in Appendix C.

[5] **Salt Marsh Habitat** is defined in Appendix C.

[6] **Secondary Productivity** is defined in Appendix C

Secondary Productivity per Salt Marsh Habitat DSAY) and applied to Estuarine Dependent Aquatic Biomass[7] injuries first in Alabama waters and then, if that category of injury is exhausted in Alabama waters, to such injury in federal waters on the Continental Shelf. These NRD Offsets for Salt Marsh Habitat (and, if applicable, Secondary Productivity) shall not apply to injuries in Texas, Louisiana, Mississippi and/or Florida.

Benthic Secondary Productivity Offsets were estimated for expected increases in invertebrate infaunal and epifaunal biomass attributable to the restoration project. In estimating DKg-Ys, the Trustees considered a number of factors, including, but not necessarily limited to, typical productivity in the project area, estimated project lifespan and project size. The Trustees and BP agreed that if this restoration project is selected for implementation, BP would receive Offsets of 129,632 DKg-Ys of benthic Secondary Productivity, applicable to benthic Secondary Productivity injuries in Alabama, as determined by the Trustees' total assessment of injury for the Spill.

If the combination of Offsets for benthic Secondary Productivity from the Phase III early restoration projects in Alabama and from this Shell Belt and Coden Belt Roads Living Shoreline Project exceeds the injury to benthic Secondary Productivity in Alabama waters then the remaining unused Offsets for benthic Secondary Productivity from this project will be applicable to injuries to Estuarine Obligate Fishes and Mobile Crustaceans Dependent on Oyster Reefs and Other Estuarine Hard Bottom/Structural Habitat[8] at a rate of 5 Dkg-Ys of Estuarine Obligate Fishes and Mobile Crustaceans Dependent on Oyster Reefs and Other Estuarine Hard Bottom/Structural Habitat per 100 Dkg-Ys benthic Secondary Productivity (up to a maximum of 6,482 Dkg-Ys of Estuarine Obligate Fishes and Mobile Crustaceans Dependent on Oyster Reefs and Other Estuarine Hard Bottom/Structural Habitat). These remaining Offsets will be applied first to offset such injuries in Alabama waters and then, if that category of injury is exhausted in Alabama waters, to such injuries in federal waters on the Continental Shelf. These NRD Offsets for benthic Secondary Productivity (and, if applicable, Estuarine Obligate Fishes and Mobile Crustaceans Dependent on Oyster Reefs and Other Estuarine Hard Bottom/Structural Habitat) shall not apply to injuries in Texas, Louisiana, Mississippi and/or Florida.

Appendix C provides further definitions applicable to the Offsets detailed in this section. These Offset types and amounts are reasonable for this project.

11.1.7 Estimated Cost

The estimated cost for this project is $8,050,000. This cost reflects cost estimates developed from the most current information available to the Trustees at the time of the project negotiation. The cost includes provisions for planning, design, implementation, and monitoring.

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[7] **Estuarine Dependent Aquatic Biomass** is defined in Appendix C.

[8] **Estuarine Obligate Fishes and Mobile Crustaceans Dependent on Oyster Reefs and Other Estuarine Hard Bottom/Structural Habitat** is defined in Appendix C.

11.2 Shell Belt and Coden Belt Roads Living Shoreline Project: Environmental Assessment

The proposed restoration project involves placement of breakwater segments. The specific breakwater elevations, construction techniques and design would be developed to maximize project success and meet federal and state regulatory requirements.

11.2.1 Introduction, Background, Purpose and Need

CEQ encourages federal agencies to "tier" their NEPA analyses from other applicable NEPA documents to create efficiency and reduce redundancy, and has issued new guidance on the use of programmatic NEPA documents for tiering (CEQ 2014a).

Tiering has the advantage of not repeating information that has already been considered at the programmatic level so as to focus and expedite the preparation of the tiered NEPA review(s). When a programmatic environmental assessment (PEA) or programmatic environmental impact statement (PEIS) has been prepared and an action is one anticipated in, consistent with, and sufficiently explored within the programmatic NEPA review, the agency need only summarize the issues discussed in the broader statement and incorporate discussion from the broader statement by reference and concentrate on the issues specific to the subsequent tiered proposal (CEQ 2014a).

A federal agency may PEIS to evaluate broad actions (40 C.F.R. § 1502.4(b); see Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18026 (1981). When a federal agency prepares a PEIS, the agency may "tier" subsequent narrower environmental analyses on site-specific plans or projects from the PEIS (40 C.F.R. § 1502.4(b); 40 C.F.R. § 1508.28). Federal agencies are encouraged to tier subsequent narrower analyses from a PEIS to eliminate repetitive discussions of the same issues and to focus on the actual issues ripe for decision at each level of environmental review (40 C.F.R. § 1502.20). The 2014 Final Programmatic and Phase III Early Restoration Plan and Programmatic Environmental Impact Statement (Final Phase III ERP/PEIS) was prepared for use in tiering subsequent early restoration plans and projects, such as Phase IV.

This project is proposed as part of Phase IV of the Early Restoration program. This EA tiers from the programmatic portion of the Final Phase III ERP/PEIS. This EA qualifies for tiering from the Final Phase III ERP/PEIS in accordance with Department of the Interior regulations (43 C.F.R. § 46.140, Using Tiered Documents, b and c).

This project type is consistent with the Final Phase III ERP/PEIS's Preferred Alternative as described in the 2014 Record of Decision (79 Fed. Reg. 64831-64832 (October 31, 2014)) and the Trustees find that the conditions and environmental effects described in the broader NEPA document (with updates as described in Chapter 2) are valid. Specifically, this project tiers from the analyses found in sections of the PEIS that describe Alternative 4 (Preferred Alternative: Contribute to Restoring Habitats, Living Coastal and Marine Resources and Recreational Opportunities) under Project Type 2: Protect Shorelines and Reduce Erosion including Section 5.3.3.2 and Environmental Consequences, Section 6.3.2. This EA incorporates by reference the analysis found in the PEIS in those sections. This EA also incorporates by

reference all Early Restoration introductory, process, background, and Affected Environment information and discussion provided in the PEIS (Chapters 1 through 6).

11.2.1.1 Background

This living shoreline project area is located along the stretch of shoreline between Bayou la Batre and Bayou Coden in Mississippi Sound, Alabama, adjacent to an already hardened shoreline in an unvegetated mudflat. Mississippi Sound is an estuarine system separated from the Gulf of Mexico by barrier islands in Alabama and Mississippi. Habitats in and around Mississippi Sound include tidal wetlands and swamps, salt marshes, aquatic grass beds, oyster reefs, maritime and palustrine upland forests, and estuarine soft-bottom habitat.

Construction activities would include placement of intertidal breakwaters waterward of the shoreline that may utilize artificial WAUs and that would generally follow a +0.5 to +1.0 foot MLLW target crest elevation. The breakwaters would likely have 10 foot crest widths, based on desired wave reduction, and would be designed with a height that falls within the mean high and low water lines (intertidal). The specific breakwater elevations and technique designs would be selected to maximize project effectiveness and meet federal and state regulatory requirements. Over time, the breakwaters are expected to develop into reefs that support benthic secondary productivity, including, but not limited to, bivalve mollusks, annelid worms, shrimp, and crabs.

This project also includes plantings of emergent marsh vegetation such as *Spartina alterniflora* or other similar native marsh vegetation species. ADCNR proposes to plant four rows of vegetation with approximately five feet between each individual plant. The planting would occupy approximately 50 feet between the shoreline and the constructed breakwater. Construction techniques would be determined by the selected contractor and conducted in compliance with all permit conditions and best management practices.

11.2.1.2 Purpose and Need

The purpose and need for this actions falls within the scope of the purpose and need of the programmatic portions of the Final Phase III ERP/PEIS because it would accelerate meaningful restoration of injured natural resources and their services resulting from the Spill. The proposed project's purpose is to restore for natural resources injured in Alabama as a result of the *Deepwater Horizon* incident. The proposed project is needed to provide habitat, increase benthic secondary productivity, and protect and enhance coastal resources thus enhancing resources in coastal Alabama that were injured as a result of the Spill.

11.2.2 Scope of the EA

This project is proposed as part of Phase IV of Early Restoration. This EA tiers from the Final Phase III ERP/PEIS. The broader environmental analyses of these types of actions as a whole are discussed in the Final Phase III ERP/PEIS from which this EA is tiered. The information and analysis in this document supplements the programmatic analysis with site-specific information. This EA provides NEPA analysis

for potential impacts for site specific issues and concerns anticipated from implementation of the proposed action and the no action alternative.

The Trustees' Early Restoration project selection process is described in Section 2.1 of the Final Phase III ERP/PEIS. As described there, potential projects evolve from public scoping, ongoing public input through internet-accessible databases, review of current federal and state management plans and programs, and Trustee expertise and experience. From this broad list of project ideas, the Trustees' Early Restoration project selection process initially results in a set of proposed projects that, consistent with the Framework Agreement, are submitted to BP for review and consideration. One area considered for Early Restoration included protection of shorelines and measures to reduce erosion.

11.2.3 Project Alternatives – No Action Alternative

Both OPA and NEPA require consideration of the No Action alternative. For this section, there are two alternatives, the No Action and Proposed Action, Shell Belt and Coden Belt Roads Living Shoreline Project.

Under the No Action alternative the Trustees would not pursue the Shell Belt and Coden Belt Roads Living Shoreline Project as part of Phase IV Early Restoration. Under No Action, the existing conditions described in Chapter 3 of the Final Phase III ERP/PEIS would prevail. Restoration benefits associated with this project would not be achieved at this time.

11.2.4 Project Alternatives – Proposed Action

11.2.4.1 Project Location

The proposed Shell Belt and Coden Belt Roads Living Shoreline Project is located in south Mobile County in Coastal Alabama. The proposed project area is on the northern side of Mississippi Sound along the stretch of shoreline between Bayou la Batre and Bayou Coden in Alabama state waters (see Figure 11-1, Figure 11-2, and Figure 11-3).

11.2.4.2 Project Scope

The proposed Shell Belt and Coden Belt Roads Living Shoreline Project would employ living shoreline restoration techniques by creating rows of approximately 200 foot segments made of WAUs. In total approximately 49 segments are proposed with an approximate 20 foot gap between each segment, creating approximately 10,800 linear feet of breakwaters. The exact WAU type and number of segments may vary depending on final project design. The specific breakwater elevations and number of segments, construction techniques and design would be developed to maximize project success and meet regulatory requirements.

Upon completion of planning, design and permitting, a request for construction bids would be issued and a contract for construction issued in accordance with Alabama bid and procurement laws and regulations. It is anticipated that construction of the breakwaters would take place from the Shell Belt and Coden Belt Roads right of way (ROW), using large flatbed trucks to transport the breakwater units to

the sites. A large long-reach track-hoe or other similar equipment located on the adjacent water bottoms would then be utilized to place the breakwater units in the appropriate configuration. After planning and design are complete, if it is more feasible, the construction of the breakwaters could take place using shallow draft barges and tugs to transport the breakwater units. Actual equipment and construction techniques would be determined by the selected contractor and conducted in compliance with all permit conditions and best management practices. The following assumptions about vehicle and barge operation for the implementation of the proposed project are based on previous similar construction operations conducted by ADCNR. It is anticipated that the above described equipment would be on site approximately 2 months. A work day would range from between 8 and 14 hours.

Over time, the breakwaters are expected to provide habitat that supports benthic secondary productivity, including, but not limited to, bivalve mollusks, annelid worms, shrimp, crabs, and small forage fishes.

This project also includes plantings of emergent marsh vegetation such as *Spartina alterniflora* or other similar native marsh vegetation species. ADCNR proposes to plant four rows of vegetation with approximately five feet between each individual plant. The planting will occupy approximately 50 feet between the shoreline and the constructed breakwater. Construction techniques would be determined by the selected contractor and conducted in compliance with all permit conditions and best management practices.

The implementation of the Shell Belt and Coden Belt Roads Living Shoreline Project would take up to approximately 24 months and would include the following activities:

- Planning, site investigations, and design - approximately 6 to 12 months; concurrently it would take approximately 6 months for permitting and consultation.
- Construction – approximately 2 months.

No maintenance activities would be required due to the materials being utilized. As navigational signage weathers and wears it would be replaced as appropriate, but this would involve replacing the sign face and would not include additional ground disturbance.

11.2.5 Affected Environment and Environmental Consequences

Under the NEPA, federal agencies must consider environmental effects of their actions that include, among others, impacts on social, cultural, and economic resources, as well as natural resources. The following sections describe the affected resources and environmental consequences of the project.

In order to determine whether an action has the potential to result in significant impacts, the **context and intensity** of the action must be considered. **Context** refers to area of impacts (local, state-wide, etc.) and their duration (e.g., whether they are short- or long-term impacts). **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, etc.). Intensity is also described in terms of whether the impact would be beneficial or adverse.

For purposes of this document, impacts are characterized as minor, moderate or major, and temporary or long-term. The analysis of beneficial impacts focuses on the duration (short- or long-term), without attempting to specify the intensity of the benefit. The definition of these characterizations is consistent with that used in the Final Phase III ERP/PEIS, and can be found in Appendix D.

According to the CEQ Regulations for Implementing NEPA (Section 1502.1 and 1502.2) agencies should "focus on significant environmental issues" and for other than significant issues there should be "only enough discussion to show why more study is not warranted." The programmatic environmental analysis looked at a series of resources as part of the biological, physical, and socioeconomic environment. As appropriate in a tiered analysis, the evaluation of each project focuses on the specific resources with a potential to be affected by the proposed project. To avoid redundant or unnecessary information, resources that are not expected to be affected are considered but not evaluated further. For this project, the resource areas that have not been analyzed in detail are listed below, along with the reasons why they are not expected to be affected.

- Socioeconomics/Environmental Justice: The socioeconomic environment consists of demographics, the local and regional economy, and environmental justice. Executive Order 12898 (General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations) requires all agencies to incorporate these topics into their environmental assessments by identifying and addressing disproportionately high and adverse human health or environmental effects of their proposed actions on minorities and low-income populations or communities. Placement of the breakwaters would not result in a net change of the current racial and ethnic composition, existing industries, or employment in Mobile County. Furthermore, no environmental effects on minorities or low-income populations—as defined in the Environmental Protection Agency's Draft Environmental Justice Guidance (July 1996)—are expected. Therefore, the socioeconomic environment is not carried forward for detailed analysis in this assessment.

- Noise: Noise from the construction equipment would be evident in the project area. While this noise would be evident to those workers on the job and any users of the shoreline in proximity of the project, it would be short-term and negligible. Return to normal noise levels would be achieved at the end of each workday and after completion of the job. The project is not anticipated to increase vessel traffic or noise impacts in the long term. Because impacts from noise would be at low levels and short-term this impact area is not carried forward for detailed analysis in this assessment.

For those resources carried forward for detailed analysis, the analysis first considers if the impacts of the proposed project are within the impacts evaluated for the project type within the Final Phase III ERP/PEIS. After consideration of how the impacts of the proposed project are evaluated in context of the programmatic document, site specific impacts are evaluated.

11.2.5.1 Physical Environment

11.2.5.1.1 Geology and Substrates

Affected Resources

Geology

Mississippi Sound is within the East Gulf Coast Plain physiographic province. This physiographic province is bounded by the fall line to the north and by coastal lowlands to the south and is generally characterized by subtle topography and diverse estuarine and tidal areas. The Shell Belt and Coden Belt Roads Living Shoreline Project site falls within the Gulf Barrier Islands and Coastal Marshes Level IV Ecoregion.

Subaqueous Soils

The sediments of the Mississippi Sound range from sand to clays with various mixtures of sand, silt, and clay covering most of the bay bottom (USGS 2007). Soils at the Shell Belt and Coden Belt Roads Living Shoreline Project site are primarily Axis mucky sandy clay loam, which is a very poorly drained soil with frequent flooding and ponding (Soil Survey Staff 2015).

Environmental Consequences

No Action

Under the no action alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to geology and substrates would occur. The beneficial impacts from implementation of this project, including habitat enhancement would not be realized.

Proposed Action

Sections 6.3.2 and 6.7.1.1 of the Final Phase III ERP/PEIS describe the impacts to geology and substrates from early restoration projects to protect shorelines and reduce erosion. The Final Phase III ERP/PEIS found that placement of breakwaters and living shorelines could benefit geology and substrates by reducing erosion and increasing the lifespan of shorelines near passes, inlets, or in areas where erosion rates are high and sediment supply is limited. These beneficial effects would be long-term because they would last beyond the construction period. It also noted that there would be the potential for short-term impacts to geology and substrates from installation of shore protection systems. Use of equipment in submerged substrates would disturb sediments; these actions would result in short-term minor adverse effects limited to the area where construction activity occurred. For this project, impacts to geology and substrates were analyzed adequately within the PEIS as the site-specific impacts discussed below fall within the range of impacts for this project type in the Final Phase III ERP/PEIS.

The geological and substrate resources in the project area would be affected through the modification of soft bottom bay habitat into breakwaters (hardened substrate). The project footprint would occur in

fine-grained sediment and soft bottoms that would be covered with breakwater segments. Additionally, appropriate signage for marine traffic would be placed on approximately 12-inch diameter posts adjacent to the breakwaters, which would impact a small area of soft bottom. Construction of all elements is anticipated to take 2 months. A full schedule would be dependent on the date funding becomes available and contractor award times.

There would be long-term, minor, adverse impacts from the disturbance to geology and substrates due to placement of hard, structural material over soft bottom. The installation of the pilings would have a short term, minor adverse impact to sediments. It is anticipated that all construction would occur from existing roadways along the shoreline, preventing potential impacts from compaction along the shoreline. Should this approach not be feasible, construction would occur in water and would still avoid issues of compaction along the shoreline. A long term benefit to the bottom substrates would be expected due to stabilization of sediments by the breakwater structures.

A range of potential mitigation measures for impacts to geology and substrates are found in Appendix 6A of the Final Phase III ERP/PEIS. BMPs planned to be implemented for this effort would include:

- Employment of standard BMPs for construction to reduce erosion.
- Use of existing access ways whenever possible. Temporary access roads would not be built in locations that would suggest a likelihood of excessive erosion (e.g., large slopes, erosive soils, proximity to water body). All temporary access roads would be restored when the action is completed, the soil would be stabilized, and the site would be re-vegetated.
- Selection and operation of heavy equipment to minimize adverse effects to the environment (e.g., minimally-sized, low-pressure tires, minimal hard turn paths for tracked vehicles, temporary mats or plates within wet areas or sensitive soils).

11.2.5.1.2 Hydrology and Water Quality

Affected Resources

Water Quality

Mississippi Sound has salinity levels of 10 to 28 parts per thousand (ppt) (Northern Economics 2014). This is lower than the Atlantic Ocean's average salinity of 35 ppt, due in part to the sound's estuarine environment. Water quality in the area is considered to be impaired due to the presence of *Enterococcus* bacteria (USEPA 2012). Turbidity is a common occurrence due to shallow depths, silts, windy conditions, and storm events. The major point source of pollution in the Portersville Bay portion of Mississippi Sound (where the project is located) is municipal discharge/sewage from the Bayou la Batre wastewater treatment plant, which is regulated under a National Pollutant Discharge Elimination System (NPDES) permit. Non-point sources are limited to septic systems, sanitary sewer overflow, and general stormwater runoff.

Floodplains

The project is located in FEMA designated Flood Zones according to the Flood Insurance Rate Maps (FIRMS) for Mobile County. (FIRM No. 01097C0768K Mobile County, (effective date March 17, 2010)). The project is located in Zone VE with base flood elevation of 15 feet. VE indicates coastal flood zones with velocity hazards (wave action) with base flood elevations determined.

Wetlands

The project is located in open water with little to no emergent herbaceous wetlands in the immediate project area. There are emergent wetlands directly east and west of the site. Emergent herbaceous wetlands are characterized by perennial non-woody plants, which can account for approximately 80 percent of the vegetative cover (MRLCC 2015). The soil or substrate in these wetlands is periodically saturated or covered with water. Emergent wetlands include marshes, meadows, and fens. There are no submerged aquatic vegetation (SAV) beds in the project area (Vittor 2009).

Environmental Consequences

No Action

Under the No Action Alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to hydrology or water quality would occur. The beneficial impacts from implementation of this project, including a reduction in storm surges on coastal wetlands and limiting the shoreward extent of saltwater flow, would not be realized.

Proposed Action

Sections 6.3.2 and 6.7.2.1 of the Final Phase III/ERP PEIS describe the impacts to hydrology and water quality from early restoration projects to protect shorelines and reduce erosion. The Final Phase III ERP/PEIS found that shoreline protection and erosion reduction could result in long-term beneficial impacts by reducing storm surges on coastal wetlands, and limiting the shoreward extent of saltwater flow. During construction, minor short-term adverse impacts were possible due to the risk of water quality contamination from equipment usage and boating traffic in construction areas and a potential increase in turbidity. For this project, impacts to geology and substrates were analyzed adequately within the PEIS as the site-specific impacts discussed below fall within the range of impacts for this project type in the Final Phase III ERP/PEIS.

Potential mitigation measures for impacts to each of the hydrology and water quality categories discussed below are found in Appendix 6A of the Final Phase III ERP/PEIS. BMPs planned to be implemented for this effort include:

- Use of existing access ways whenever possible. Temporary access roads would not be built in locations that would suggest a likelihood of excessive erosion (e.g., large slopes, erosive soils, proximity to water body). All temporary access roads would be restored when the action is

completed, the soil would be stabilized, and the site would be re-vegetated. Temporary roads in wet or flooded areas would be restored shortly after the work period was complete.

- Maintenance of generators, cranes, and any other stationary equipment operated within 150 feet of any natural or wetland area as necessary to prevent leaks and spills from entering the water.

- Employment of standard BMPs for construction to reduce erosion.

Hydrology

Tides, currents, and salinity would be unaffected because the proposed project would have a minimal footprint located adjacent to the shoreline. There would be no anticipated impacts from placement of the breakwater structures since each structure would have gaps at least twenty feet wide that would allow normal tidal fluctuation around the breakwaters. Further, the breakwaters would be porous and water would be able to interchange through the structure.

Water Quality

Short term impacts to water quality would result from increased turbidity during material placement. During construction, BMPs, such as floating turbidity barriers, may be used to contain turbid water and reduce impacts to ambient water quality conditions. In the long term, the breakwaters are expected to contribute to localized water quality improvement due to the filtration capacity of oysters and other bivalves that would be anticipated to colonize the reefs. In terms of regulatory compliance, the placement of breakwaters as proposed under this project is considered "fill." No other fill and/or dredging would occur under this effort. The proposed discharge of fill material (placement of breakwaters) into waters of the United States, including wetlands, or work affecting navigable waters associated with this project would be coordinated with the U.S. Army Corps of Engineers (USACE) pursuant to the Clean Water Act Section 404 and Rivers and Harbors Act (CWA/RHA). Coordination with the USACE and final authorization pursuant to CWA/RHA would be completed prior to project implementation. A state water quality certification would be obtained from the Alabama Department of Environmental Management prior to construction.

Floodplains

The project is located below the MHWL and would not impact the floodplain in the project area.

Wetlands

The project would not adversely affect wetlands as the breakwaters would be constructed from the Shell Belt Road and Coden Belt ROW. If construction entirely from the roadway is not possible, any in-water construction efforts would be in open water and would not impact wetlands. After construction, the breakwaters would be anticipated to reduce wave energy reaching the shoreline and would help protect the planted fringe of salt marsh habitat.

11.2.5.1.3 Air Quality and Greenhouse Gas Emissions

Affected Resources

The EPA defines ambient air in 40 C.F.R. Part 50 as "that portion of the atmosphere, external to buildings, to which the general public has access." In compliance with the 1970 Clean Air Act (CAA) and the 1977 and 1990 Clean Air Act Amendments (CAAA), the EPA has promulgated National Ambient Air Quality Standards (NAAQS). Under the CAA, the EPA establishes primary and secondary air quality standards. Primary air quality standards protect the public health, including the health of "sensitive populations, such as people with asthma, children, and older adults." Secondary air quality standards protect public welfare by promoting ecosystems health, and by preventing decreased visibility, and damage to crops and buildings. The EPA has set NAAQS for the following six criteria pollutants: ozone, particulate matter (PM 2.5 and 10), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and lead. Individual states may promulgate their own ambient air quality standards for these "criteria" pollutants, provided that they are at least as stringent as the federal standards. In Table 11-1, below, both State of Alabama and federal primary ambient air quality standards for criteria air pollutants are presented. The Mobile area is currently in attainment with NAAQS required by EPA (40 C.F.R. Part 50) (USEPA 2015).

Table 11-1. State and federal ambient standards for criteria air pollutants

POLLUTANT	AVERAGING PERIOD	FEDERAL PRIMARY STANDARD	ALABAMA STATE STANDARD
Ozone	8-hour	0.075 ppm	Same as Federal
PM2.5	Annual (arithmetic mean)	12.0 µg/m3	Same as Federal
	24-hour	35 µg/m3	Same as Federal
PM10	24-hour	150 µg/m3	Same as Federal
Carbon Monoxide	8-hour	9 ppm	Same as Federal
	1-hour	35 ppm	Same as Federal
Nitrogen Dioxide	Annual (arithmetic mean)	0.053 ppm	Same as Federal
	1-hour	0.100 ppm	Same as Federal
Sulfur Dioxide	1-hour	75 ppb	Same as Federal
ppm = parts per million ppb = parts per billion Source: EPA, 2015 http://www.epa.gov/air/criteria.html And http://www.adem.state.al.us/alEnviroReglaws/files/Division3.pdf			

Greenhouse Gases

Greenhouse Gases (GHGs) are chemical compounds found in the Earth's atmosphere that absorb and trap infrared radiation as heat. Global atmospheric GHG concentrations are a product of continuous emission (release) and removal (storage) of GHGs over time. In the natural environment, this release and storage is largely cyclical. For instance, through the process of photosynthesis, plants capture

atmospheric carbon as they grow and store it in the form of sugars. Human activities such as deforestation, soil disturbance, and burning of fossil fuels disrupt the natural cycle by increasing the GHG emission rate over the storage rate, which results in a net increase of GHGs in the atmosphere. The principal GHGs emitted to the atmosphere through human activities are carbon dioxide (CO2), methane, nitrous oxide, and fluorinated gases, such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, with CO2 accounting for the largest quantity GHG emitted.

Criteria air pollutants and GHG emissions are largely generated by electricity production, vehicular movements, and commercial and residential buildings using electricity. GHG emissions would result from both the implementation and operation of the proposed project from the use of vessels during construction and monitoring activities.

Environmental Consequences

No Action

Under the No Action Alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to air quality or GHG would occur.

Proposed Action

Sections 6.3.2 and 6.7.3.1 of the Final Phase III ERP PEIS describe the impacts to air quality and greenhouse gases from early restoration projects to protect shorelines and reduce erosion. The Final Phase III ERP/PEIS found that short-term minor to moderate adverse impacts to air quality in the project vicinity could occur from the use of construction equipment and the potential for short-term minor adverse impacts from fugitive dust. For this project, impacts to air quality and GHG were analyzed adequately within the PEIS as the site-specific impacts discussed below fall within the range of impacts for this project type in the Final Phase III ERP/PEIS.

Potential mitigation measures for impacts to air quality and greenhouse gases are found in Appendix 6A of the Final Phase III ERP/PEIS. BMPs that would be implemented as part of this action would include:

- Use of existing access ways whenever possible. Temporary access roads would not be built in locations that would suggest a likelihood of excessive erosion (e.g., large slopes, erosive soils, proximity to water body). All temporary access roads would be restored when the action is completed, the soil would be stabilized, and the site would be re-vegetated.

- Maintenance of generators, cranes, and any other stationary equipment operated within 150 feet of any natural or wetland area as necessary to prevent leaks and spills from entering the water.

Air Quality

Project implementation would require the use of heavy equipment. Specifically, diesel-powered trucks or tug boats would be used to move the WAUs to the project site and a diesel excavator would be used

to place the WAUs. This equipment would emit criteria pollutants such as PM2.5 and NO_2. However, the emissions from either construction method would not occur in proximity to sensitive receptors and the impact on ambient concentrations in the immediate vicinity of the construction activity would be temporary. No air quality permits are required for this type of project and violations of state air quality standards are not expected. Air quality impacts during construction are expected to be localized, minor, and short-term.

Greenhouse Gas Emissions

The use of trucks and an excavator to construct the project would contribute to a temporary increase in GHG emissions. If construction would occur in water, cars, trucks, cranes, crew boats, backhoes, small craft vessels, tugboats, and other equipment could be utilized.

A unit of 25,000 metric tons of CO_2-equivelent[9] (CO2e) GHG emissions per annum is used here as a threshold to gauge whether a more detailed analysis should be considered for construction period emissions from the proposed project. The 25,000 metric tons of CO_2 provides a useful threshold for discussion and disclosure of GHG emissions because it has been used and proposed in rulemaking under the Clean Air Act (e.g., USEPA Mandatory Reporting of Greenhouse Gases Final Rule, 74 Fed. Reg. 56260, October 30, 2009). In addition, revised draft NEPA guidance from CEQ on climate change and GHG effects also uses the reference point of 25,000 metric tons of CO2e greenhouse gas emissions, although this figure is not a significance threshold (CEQ 2014b).

To determine if the proposed project has the potential to exceed 25,000 metric tons CO_2e, the potential emissions associated with haul truck and excavator use were quantified. A simplified emissions modeling exercise using MOVES2014, which includes the calculation methods used by NONROAD2008 for off-road constriction equipment. The analysis was conducted for January 2015, using EPA-default data for Mobile County, Alabama. The resulting CO_2 emission factor for a 600 horsepower (HP) excavator was 536.33 grams per HP-Hour or 321,798 grams/hr. Assuming 8 hours of operation per weekday at maximum load for two months (320 hours), this would result in a total of 103 metric tons of CO2 from the use of the excavator. A similar quantity of emissions could result from haul truck operations for a 12 hour period. Therefore it can be concluded that total project emissions would be well under 25,000 metric tons CO_2-equivelent and further detailed greenhouse gas emissions analysis is not warranted.

[9] CO2-equivelent is a metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). For example, methane has a GWP of 21, which means that methane will cause 21 times as much warming as an equivalent mass of carbon dioxide over a 100-year time period. Expressing GHG emissions on CO2-equivelent basis provides a common unit for comparing the total emissions of various GHGs.

If in-water construction occurs, the analysis assumed a 650 horsepower (HP) diesel tugboat operating 8 hours per weekday for two months or 320 hours total. 650 HP is equivalent to 484.7 kilowatts. The equation for calculating emissions is as follows:

Emissions (grams) = engine power (kW) x LF x activity (hours) x EF (g/kW-hr)

Where:

engine power = rated engine power

LF = load factor for the engine

activity = hours at the given load

EF = emissions factor that expresses mass emissions (grams) in terms of kW-hrs (g/kW-hr)

The source of the tugboat engine emissions factors was an emissions inventory study conducted for the Port Authority of New York and New Jersey in 2012 (PANYNJ 2012). This study reported the following tugboat engine greenhouse gas emission factors:

- CO2: 690 g/kW-hr
- N2O: 0.08 g/kW-hr
- CH4: 0.23 g/kW-hr

To ensure tugboat emissions were assessed conservatively, a load factor of 100% was used (engine operating at maximum power during all hours of operating). A more realistic load factor cited in the PANYNJ study for tugboat harbor operations is 31%.

Based on these assumptions, the total greenhouse gas emissions attributable to tugboat operations during construction is 112 tons CO2-equivelent. Emissions from a small excavator on the barge would be considerably less than this value, therefore it can be concluded total project emissions would be well under 25,000 metric tons CO2-equivelent and further detailed greenhouse gas emissions analysis is not warranted if in-water construction is utilized.

Impacts from GHG emissions during construction are expected to be localized, minor, and short-term (no long term effect to air quality). Mitigation measures would further offset project GHG emissions and the project would have short-term, minor releases during construction. No long-term emissions of GHGs are anticipated.

11.2.5.1.4 Summary of Impacts to the Physical Environment

Impacts to the physical environment from implementation of the Shell Belt and Coden Belt Roads Living Shoreline Project would include:

- Short term, minor, adverse impacts to geology and substrates due to disturbance from the placement of hard, structural material over soft bottom and long-term benefits to the bottom

substrates due to stabilization of sediments by hardened reef structures, as well as long-term benefits to the shoreline from reduction in erosion.

- No impacts to floodplains or hydrology would occur. Short term minor impacts to water quality would result from increased turbidity during material placement with long term beneficial impacts as the reefs are expected to contribute to localized water quality improvement due to the filtration capacity of oysters and other bivalves that would be anticipated to colonize the reefs. Long-term beneficial impacts would also occur from the breakwater protection of wetlands.

- Minor short-term adverse impacts to air quality and GHG emissions would result from the use of construction equipment. Impacts would be localized and last only during the construction period.

11.2.5.2 Biological Environment

Alabama is ranked fifth in the nation for biodiversity, with a total of 4,533 different plant and animal species (Stein 2002). This distinction is mainly a result of the relatively high number of species of freshwater fish (297), marine animals (250), reptiles (85), amphibians (68), and vascular plants (2,902). This incredible species richness includes 144 endemic species, or organisms found only in the state of Alabama. The coastal ecosystems of Mobile Bay and Mississippi Sound provide valuable habitat to a large percentage of our diverse floral and faunal populations (MBNEP 2008).

The Mississippi Sound system supports an array of biological communities and species characteristic of a northern Gulf of Mexico estuary. Estuarine habitats include tidal flats, benthic microalgae communities, sea grass beds, oyster beds, tidal marshes, planktonic communities, and pelagic communities.

11.2.5.2.1 Living Coastal and Marine Resources

Living coastal and marine resources with the potential to be affected by the proposed action include: SAV; benthos, invertebrates and fish; essential fish habitat (EFH); marine mammals; terrestrial species; and threatened and endangered species. The affected environment and impacts for each of these resources under the proposed action is discussed individually below. Overall impacts to living coastal and marine resources for the no action and proposed action are summarized here.

No Action

Under the no action alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to living coastal and marine resources would occur. Beneficial impacts from the placement of breakwaters which would protect these resources and enhance habitat would not occur.

Proposed Action

Sections 6.3.2 and 6.7.6.1 of the Final Phase III ERP/PEIS describe the impacts to living coastal and marine resources for all topics discussed below (SAV; benthos, invertebrates and fish; EFH; marine mammals; terrestrial species; and threatened and endangered species) from early restoration projects to protect shorelines and reduce erosion. The Final Phase III ERP/PEIS found that placement of breakwaters and living shorelines would provide long-term benefits by protecting eroding wetlands and shallow water habitats and, in some cases, would allow for additional wetlands and shallow water habitat creation on the shore side of the constructed breakwaters. These actions would provide long-term benefits to benthic populations, pelagic microfaunal communities, and finfish, by increasing habitat and foraging areas.

Placement of breakwaters and living shorelines could require use of in-water heavy equipment and sediment placement, which would increase human activity, noise, vibration, and turbidity in the short-term. These activities could result in short-term, mostly minor, adverse impacts to species in the area from displacement and mortality of individual species. Long-term moderate impacts are possible due to displacement of sea turtles and shorebirds. For this project, impacts to living coastal and marine resources were analyzed adequately within the PEIS as the site-specific impacts discussed below fall within the range of impacts for this project type in the Final Phase III ERP/PEIS.

Potential mitigation measures for impacts to each of the living and coastal marine resource categories discussed below are in Appendix 6A of the Final Phase III ERP/PEIS. BMPs that would be implemented as part of this action include:

- Use of existing access ways whenever possible. Temporary access roads would not be built in locations that would suggest a likelihood of excessive erosion (e.g., large slopes, erosive soils, proximity to water body). All temporary access roads would be restored when the action is completed, the soil would be stabilized, and the site would be re-vegetated. .
- Maintenance of generators, cranes, and any other stationary equipment operated within 150 feet of any natural or wetland area as necessary to prevent leaks and spills from entering the water.
- Employment of standard BMPs for construction to reduce erosion.
- Development and implementation of spill prevention and control plans to minimize the risk of release of petroleum and oil products into receiving waters.
- Cleaning of construction equipment as needed before moving between sites to prevent spread of invasive species.
- Identification of mooring locations for restoration-related barges and other boats to best avoid EFH and minimize damage to existing healthy reefs.

The potential introduction of terrestrial and aquatic non-native invasive species of plants, animals, and microbes is a concern for any proposed project. Non-native invasive species could alter existing terrestrial or aquatic ecosystems, may cause economic damages and losses, and are the second most common reason for protecting species under the Endangered Species Act. The species that are or may become introduced, established, and invasive are difficult to identify. The analysis focuses on pathway control or actions/mechanisms that may be taken or implemented to prevent the spread of invasive species on site or introduction of species to the site. Surveys have not been conducted to determine if invasive species are present.

This project involves placement of artificial breakwater material. A variety of in-water construction equipment would be used. Each of these actions and pieces of equipment serve as a potential pathway to introduce or spread invasive species. BMPs would be implemented to ensure these pathways are "broken" and do not spread or introduce species (See BMPs listed below). The implementation of these BMPs meets the spirit and intent of EO 13112. Due to the implementation of BMPs, the Trustees expect risk from invasive species introduction and spread to be short-term and minor.

The Phase III ERP/PEIS provided mitigation measures in Appendix 6A. The following mitigation measures and environmental review would result in the avoidance and minimization of the introduction and spread of invasive species:

- All equipment to be used during the project, including personal gear, would be inspected and cleaned such that there is no observable presence of mud, seeds, vegetation, insects and other species.
- Breakwater habitat material would be treated or inspected to remove "non-target" species.
- Cleaning of construction equipment as needed before moving between sites to prevent spread of invasive species.

Submerged Aquatic Vegetation

Affected Resources

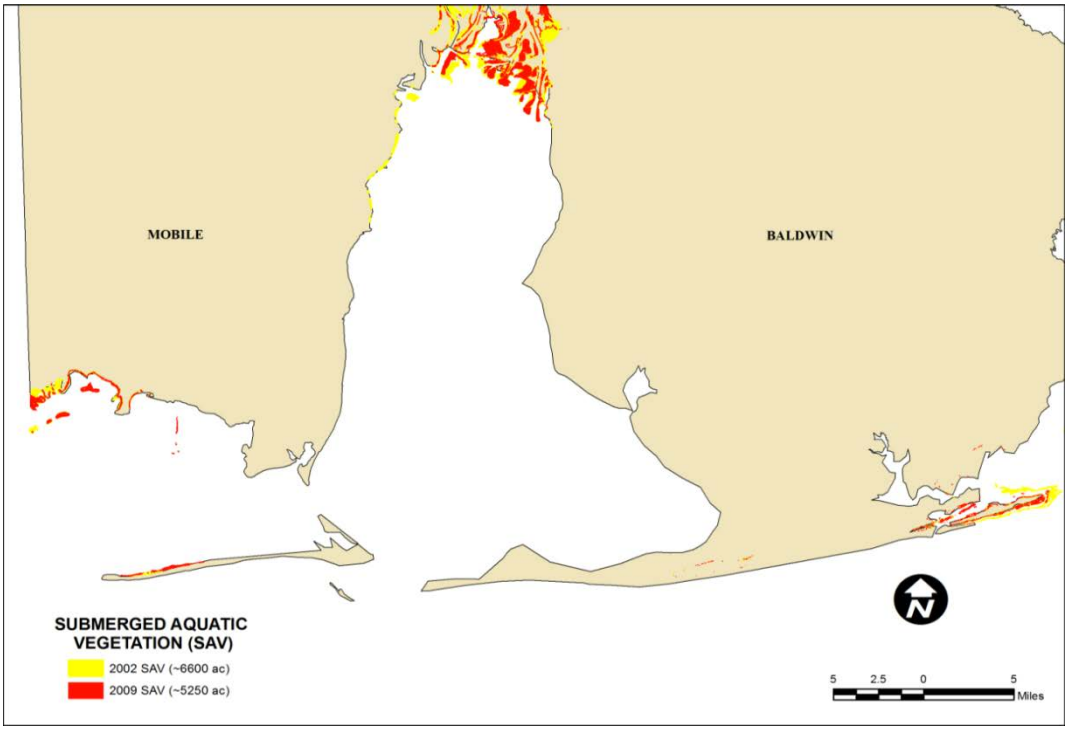
Submerged aquatic vegetation consists of rooted vascular plants that grow in fresh, brackish, and saltwater. These beds of SAV provide important foraging grounds and habitats for many species in the Gulf of Mexico. No formal SAV survey has been performed for the project area. However, SAV in the Mobile Bay and the Mississippi Sound were systematically evaluated using aerial photographs in 2002, 2004, and 2009. Results of these surveys indicate that there are no known SAV beds in the vicinity of Shell Belt and Coden Belt Roads (Vittor and Associates 2009), see Figure 11-4. Earlier SAV inventories of Mobile Bay (Stout et al. 1982; USACE 1985) identified as many as 20 species of SAV occurring in the shallow shoreline areas of Mobile Bay. Data show that through the 1960s and 1970s, grassbeds in the bay have steadily declined. Historically, a combination of changes has occurred to produce a decline in submerged grassbeds in Mobile Bay. Recent studies of SAV coverage in Mobile Bay have been conducted by the Mobile Bay National Estuary Program and ADCNR. Results of these coverage studies indicate that between 2002 (the first mapping date) and 2009, SAV coverage in Mobile Bay has

continually declined. However, during that same time, coverage in lower Perdido Bay increased and there were large scale fluctuations in coverage in Mississippi Sound (Vittor and Associates 2009).

The largest factor contributing to SAV decline in Mobile Bay is ambient water quality, specifically nutrients and turbidity. Turbidity can be defined as muddiness created by stirring up sediment or having foreign particles suspended in the water column. The turbid water commonly seen in Mobile Bay due to its shallow depth and high suspended sediment load (4.85 million metric tons per year), which represents turbidity caused by both natural and anthropogenic factors. Turbidity negatively affects SAV by reducing light penetration through the water column. Stormwater runoff contributes to high turbidity levels by delivering sediments into the water column and providing nutrients that stimulate algae growth.

Over-enrichment of nutrients (particularly nitrogen) comes from the use of agricultural and household fertilizers on fields and lawns as well as waste from wild and domestic animals. Other human activities detrimental to SAV survival include recreational and commercial boating which causes a re-suspension of sediments (increase in turbidity) from propellers and boat wakes along bay edges. Further, grounding of outboard motor props rips sea grass and harm rhizomes, leaving behind "prop scars" that can take three to five years to recover (MBNEP 2008). Some other human activities impacting SAV growth include commercial and recreational trawling, which disturbs the substrate in which the plants grow and increases turbidity by stirring up sediments, and deposition of dredged materials (MBNEP 2008).

Figure 11-4. Submerged Aquatic Vegetation distribution between 2002 and 2009



Environmental Consequences

No Action

Under the No Action Alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to SAV would occur. Beneficial impacts from the placement of breakwaters which would enhance habitat would not occur.

Proposed Action

Given that there are no SAV in the project area, potential adverse effects to SAV are not expected.

Benthos, Invertebrates, and Fish

Affected Resources

Vittor and Associates, Inc. (1982) named several opportunistic benthic species that are ubiquitous near the Gulf of Mexico's shores. These species, though sometimes low to moderate in abundance, occur in a wide range of environmental conditions. They are usually the most successful at early colonization and thus tend to strongly dominate the sediment after disturbances. These species include bristleworm (*Mediomastus spp.; Myriochele oculata; Sigambra tentaculata; Linopherus-Paraphinome; Magelona cf. phyllisae*), Fringe-gill Mudworm (*Paraprionospio pinnata*), Owenia worm (*Owenia fusiformis*), and Lumbrineris worm (*Lumbrineris spp.*). Bristleworm and Owenia worm are the predominant genera in Mississippi Sound.

Data collected between 1981 and 2003 concerning selected species such as brown shrimp (*Penaeus aztecus)*, white shrimp (*Penaeus setiferus*), pink shrimp (*Penaeus duararum*), blue crab (*Callinectes sapidus*), lesser blue crab (*Callinectes similis*), hardhead catfish (*Arius felis*), Gulf butterfish (*Peprilus berti*), white trout (*Cynoscion arenarias*), Gulf menhaden (*Brevooria patrouis*), spot (*Leiostomus xanthurus)*, and Atlantic croaker (*Micropogonias undulatus*) were evaluated to summarize species status, to identify species requiring additional management, and to make recommendations to increase their abundance (Valentine et al. 2006). In 2008, another statistical analysis of the Fisheries Assessment and Monitoring Program data sets from 1981 through 2007 was completed (Riedel, et al. 2010). Both studies were in agreement that, for most species, no significant changes in abundance were revealed over this time frame with notable exceptions for brown shrimp and blue crabs.

The eastern oyster (*Crassostrea virginica*) is the primary oyster species found in the Gulf and is a major commercial species. Oysters are important as both organisms and habitat with an integral role in the functioning of the ecosystem. In the Gulf of Mexico, oysters are distributed throughout the coastal area and are found in higher abundance in near-shore, shallow, semi-enclosed water bodies, close to freshwater sources (OTTF 2012). The majority of oysters are found off of Louisiana, followed by Florida, Texas, and Mississippi. Alabama has the lowest density of oysters in the Gulf of Mexico. Oyster reefs in Alabama are, however, important to the Mobile Bay and Mississippi Sound ecosystems as they remove excess nutrient and suspended particles from the water column.

Numerous fish species occur in the project area with the most common including: Atlantic croaker (*Micropogonias undulatus*), spot (*Leiostomus xanthurus*), bay anchovy (*Anchoa mitchilli*), and Gulf menhaden (*Brevoortia patronus*) (Swingle 1971; Riedel et al. 2010).

Environmental Consequences

No Action

Under the No Action Alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to benthos, invertebrates and fish would occur. Beneficial impacts from the placement of breakwaters which would enhance habitat would not occur.

Proposed Action

Potential adverse effects to benthic organisms, invertebrates, and fish may occur during construction activities such as breakwater placement; however, these effects would be short term, localized, and minor. The project may reduce habitat utilization by species in the area, as most mobile invertebrates and fishes would likely avoid the project area during the construction process. There would be no change in the diversity or local populations of marine and estuarine species. Disturbances would not interfere with key behaviors such feeding and spawning. There would be no restriction of movements daily or seasonally.

Following construction, there is expected to be increased habitat utilization of the breakwaters and near-shore environment by these species and a beneficial, long-term impact is anticipated.

Essential Fish Habitat

Affected Resources

Essential Fish Habitat is defined as "those waters and substrates necessary to fish for spawning, breeding, feeding or growth to maturity" (16 U.S.C. § 1802(10)). The designation and conservation of EFH seeks to minimize adverse effects on habitat caused by fishing and non-fishing activities. The NMFS has identified EFH habitats for the Gulf of Mexico in its Fishery Management Plan Amendments (see Figure 11-5). These habitats include estuarine emergent wetlands, seagrass beds, algal flats, mud, sand, shell, and rock substrates, and the estuarine water column. EFH components that exist within the project area include emergent wetlands, mud substrate, and estuarine water columns.

The 1996 amendments to the Magnuson-Stevens Act set forth a mandate for NMFS, regional Fishery Management Councils (FMC), and other Federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats need to be maintained and restored. A provision of the Magnuson-Stevens Act requires that FMCs identify and protect EFH for every species managed by a Fishery Management Plan (FMP) (U.S.C. 1853(a)(7)). There are FMPs in the Gulf region for shrimp, red drum, reef fishes, coastal migratory pelagics, and highly migratory species (e.g., sharks).

During the process of analyzing, identifying, and describing EFH for each managed species, the Gulf Council refined their designations by establishing five "eco-regions." Within each eco-region, EFH was further defined as occurring either in estuarine (inside barrier islands and estuaries), nearshore (waters less than 18-meters/60-feet deep) or offshore waters (greater than 18-meters/60-feet deep). The proposed project is within Eco-region 3, which extends from Pensacola Bay, Florida, to the Mississippi River Delta. The restoration activities would be located within estuarine waters of Mississippi Sound.

EFH within estuaries is defined as, "all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves)," (*Generic Amendment Number 3 for Addressing Essential Fish Habitat Requirements, Habitat Areas of Particular Concern, and Adverse Effects of Fishing in the following Fishery Management Plans of the Gulf of Mexico, Gulf of Mexico Fishery Management Council*, *March 2005*). Estuarine habitats such as shallow waters, submerged aquatic vegetation, emergent marshes, mangroves, oyster reefs, and unvegetated soft bottom substrates all provide EFH for multiple fish species managed by the Gulf Council that inhabit the estuary for part of their life cycle. Table 11-2 summarizes EFH categories for estuarine waters within Eco-region 3 within the vicinity of the proposed project.

Figure 11-5. Essential Fish Habitat in the Gulf of Mexico

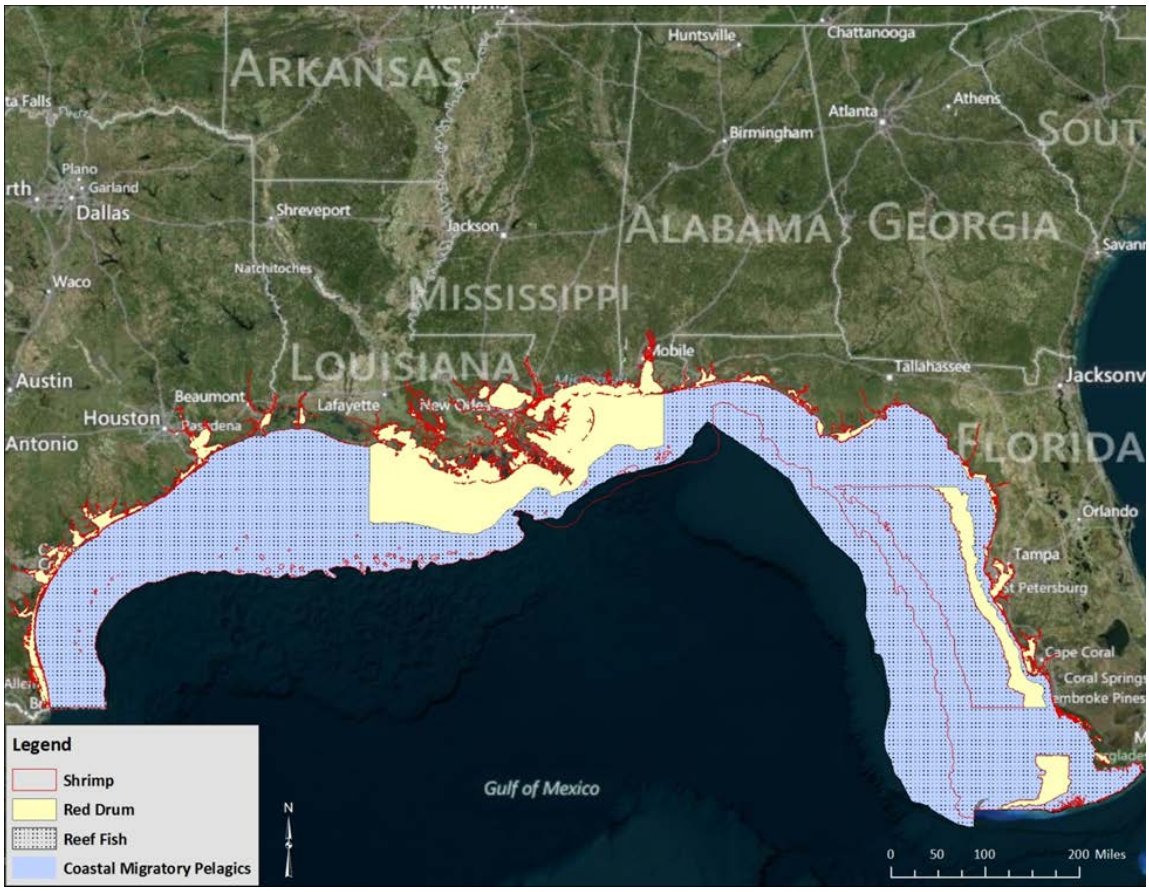


Table 11-2. Estuarine Habitats for Gulf Council Managed Species Within Eco-Region 3 Present Near the Project Site

(● indicates habitat type designated as EFH for species' life stage)

Estuarine Emergent Marsh							
Species Common Name	**Eggs**	**Larvae**	**Post Larvae**	**Early Juvenile**	**Late Juvenile**	**Adult**	**Spawning Adult**
Red Drum			●	●		●	
Gray Snapper						●	
Brown Shrimp				●			
White Shrimp				●			
Estuarine Submerged Aquatic Vegetation							
Species Common Name	**Eggs**	**Larvae**	**Post Larvae**	**Early Juvenile**	**Late Juvenile**	**Adult**	**Spawning Adult**
Red Drum		●	●		●	●	
Lane Snapper			●	●	●		
Brown Shrimp				●			
Pink Shrimp				●			
Estuarine Pelagic							
Species Common Name	**Eggs**	**Larvae**	**Post Larvae**	**Early Juvenile**	**Late Juvenile**	**Adult**	**Spawning Adult**
Spanish Mackerel				●	●	●	
Estuarine Oyster Reef							
Species Common Name	**Eggs**	**Larvae**	**Post Larvae**	**Early Juvenile**	**Late Juvenile**	**Adult**	**Spawning Adult**
Brown Shrimp				●			
Estuarine Sand and Shell Bottom							
Species Common Name	**Eggs**	**Larvae**	**Post Larvae**	**Early Juvenile**	**Late Juvenile**	**Adult**	**Spawning Adult**
Red Drum			●			●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
Estuarine Mud/Soft Bottom							
Species Common Name	**Eggs**	**Larvae**	**Post Larvae**	**Early Juvenile**	**Late Juvenile**	**Adult**	**Spawning Adult**
Red Drum		●	●	●		●	
Gray Snapper						●	
Lane Snapper				●	●		
Brown Shrimp				●			
White Shrimp				●			

The NMFS manages the highly migratory species (HMS), such as tunas, billfish, and sharks, within EEZ and state territorial waters and provides the EFH designations for HMS. The EFH designations for HMS are primarily based on limited available species distribution data, which led NMFS to identify geographic areas as EFH rather than specific habitat types typically identified in the Gulf Council designations .

HMS managed by NMFS with EFH located within Eco-region 3 in Mississippi Sound within the vicinity of the proposed project are included in Table 11-3 below.

Table 11-3. Highly Migratory Species EFH Designations – State Waters of Eco-Region 3 within the Project Area

Species Common Name	Life Stage Within Estuarine Waters
Hammerhead Shark	Neonate, Juvenile & Adult
Scalloped Hammerhead Shark	Neonate, Juvenile & Adult
Blacktip Shark	Neonate, Juvenile & Adult
Bull Shark	Neonate, Juvenile & Adult
Spinner Shark	Juvenile
Tiger Shark	Juvenile
Bonnethead Shark	Neonate, Juvenile & Adult
Atlantic Sharpnose Shark	Neonate, Juvenile & Adult
Finetooth Shark	Neonate, Juvenile & Adult

Environmental Consequences

No Action

Under the No Action Alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to EFH would occur. Beneficial impacts from the placement of breakwaters which would protect these resources and enhance habitat would not occur.

Proposed Action

Construction activities and equipment noise associated with construction may temporarily reduce habitat utilization by EFH species in the immediate area. These effects would be short term, localized, and minor. Because the proposed project footprint itself is located in unvegetated open water soft bottom habitat, there would be no adverse impacts to wetlands, seagrasses, or oyster reef habitats. Minor spatially limited adverse effects to EFH would occur within the direct footprint of the breakwater due to the conversion of 0.55 acres of estuarine soft bottom habitat to hard substrate habitat. However, hard substrate habitat and oyster reef habitat created by the breakwater would also directly provide estuarine benthic habitat diversity and EFH benefits to federally managed species such as brown shrimp, red drum, gray and red snapper which utilize shell bottom and oyster reef habitats.

Indirect adverse impacts are not expected in the short or longer term. Once the proposed project is complete, beneficial indirect effects on water quality are expected as a result of increased filtration capacity from the newly established bivalves (Coen et al. 2007). Oysters and other bivalves can also indirectly enhance EFH by offsetting the effects of coastal nutrient loading (Dalrymple 2013), potentially reducing the frequency and magnitude of hypoxia and fish kills. Additionally, oyster and other bivalves have been shown to indirectly promote SAV colonization, which may further enhance EFH, due to sediment stabilization and increased water clarity (Meyer et al. 1997).

ADCNR, in consultation with the contractors, would take all practicable precautions to avoid and minimize negative impacts to EFH. The following BMPs would be implemented specific to minimization of impacts to EFH resources:

- BMPs would be implemented during construction to reduce impacts from project implementation. Contractors would access the site with shallow draft vessels during tide levels which are sufficient to avoid prop washing. Contractors would be notified of the location of seagrasses inland of the proposed project footprint and would be instructed not to enter seagrass beds during construction.

- The contractor would follow the USFWS standard manatee construction conditions and standard sea turtle and smalltooth sawfish conditions, as required under Endangered Species Section 7 consultations. The construction procedures outlined in these documents require boats to operate at idle speed and ensure that contractors visually assess the construction area for manatees and sea turtles. Following these guidelines would also help minimize potential prop dredging, and subsequent bottom disturbance, and would help minimize impacts to individual fish species.

- Monitoring would be conducted before, during, and after project implementation to ensure compliance with project design. If immediate post-construction monitoring reveals that unavoidable impacts to EFH have occurred, appropriate coordination with regional EFH personnel would take place to determine appropriate response measures, possibly including mitigation.

Marine Mammals

Affected Resources

Marine mammals found in the Gulf of Mexico include 21 species of cetaceans (whales and dolphins) and the West Indian manatee (*Trichechus manatus*). Two species commonly occur at nearby Gulf Islands National Seashore and Mobile Bay and may therefore occur in the waters surrounding the proposed project area: the bottlenose dolphin (*Tursiops truncates*) and the Atlantic spotted dolphin (*Stenella frontalis*). The West Indian manatee will be discussed in the section on threatened and endangered species.

Dolphin Species

The bottlenose dolphin and the Atlantic spotted dolphin are the two most common marine mammals found in the Gulf of Mexico. Both species feed primarily on fish, squid and crustaceans. While the Atlantic spotted dolphin spends the majority of its life offshore, the bottlenose dolphin often travels into coastal bays and inlets for feeding and reproduction.

No Action

Under the No Action Alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to marine mammals would occur. Beneficial impacts from the placement of breakwaters which would protect these resources and enhance habitat would not occur.

Proposed Action

Environmental Consequences

Potential minor adverse effects due to noise, prey availability, and turbidity associated with breakwater placement may temporarily disturb certain dolphin species in the vicinity of the project area. However, the mobility of these species reduces the risk of injury due to construction activity. Furthermore, the short duration of construction activities, localized nature of the project and best management practices would prevent take of dolphins.

11.2.5.2.2 Terrestrial Species

Vegetation

Affected Resources

The coastal land cover near Shell Belt and Coden Belt Roads consists mainly of fragmented development (e.g. open space, low intensity), barren land, and emergent herbaceous wetlands (MRLCC 2015). The low intensity development consists of a mixture of constructed materials—mainly single family homes—and vegetation where impervious surfaces account for 20-49 percent of the land. Barren land is characterized by bare rock, gravel, sand, silt, clay, or other earthen material, with little or no "green" vegetation present regardless of its inherent ability to support life. Vegetation, if present, is more widely spaced and scrubby than grassland or forested communities; furthermore, lichen cover may be extensive. Finally, emergent herbaceous wetlands are areas where perennial herbaceous vegetation accounts for 80 percent of the cover and the soil or substrate is periodically saturated or covered with water. Emergent wetlands include marshes, meadows, and fens.

Environmental Consequences

No Action

Under the No Action Alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to vegetation would occur.

Proposed Action

Sparse patches of grass exist on the barren land between Shell Belt Road, Coden Belt Road and Portersville Bay. Since construction equipment would be operating and constructing the breakwater units from the ROW or from open water, potential adverse effects to terrestrial vegetation are expected to be short-term, localized, and minor.

Birds

Affected Resources

Many species of birds spend all or a portion of their life cycle along the Gulf of Mexico using a variety of habitats at different stages. Major groups of birds that use habitats throughout the northern Gulf of Mexico include: waterfowl and other water-dependent species, pelagic seabirds, raptors, colonial waterbirds, shorebirds, secretive marsh birds, and passerines.

Many bird species migrate between breeding and wintering habitat and, upon reaching the Gulf Coast, migrate east-west along the northern Gulf Coast and/or cross the Gulf of Mexico each fall and spring. Central, Mississippi, and Atlantic Flyways are used by millions of birds that converge on the Gulf Coast where they either migrate along the northern Gulf Coast before reaching their destination on the Gulf of Mexico; follow the Mexico-Texas coastline; or cross the Gulf of Mexico between Mexico's Yucatan Peninsula and the Texas Coast (trans-Gulf migrants) (TPWD 2015). The groups of bird species utilizing habitats within vicinity of Shell Belt and Coden Belt Roads are described below in Table 11-4.

Table 11-4. Groups of bird species utilizing habitats within the vicinity of Shell Belt and Coden Belt Roads

SPECIES	BEHAVIOR	SPECIES/HABITAT IMPACTS
Waterfowl (geese, swans, ducks, loons, and grebes)	Foraging, feeding, resting, and roosting	Waterfowl forage, feed, rest, and roost in the project area. As such, they may be impacted locally and temporarily by the project. It is expected that they would be able to move to another nearby location to continue foraging, feeding and resting. These birds primarily roost and nest in low vegetation.

SPECIES	BEHAVIOR	SPECIES/HABITAT IMPACTS
Other water birds (terns, gulls, skimmers, double-crested cormorant, American white pelican, brown pelican)	Foraging, feeding, resting, and roosting	These birds forage, feed, rest, and roost in the project area. As such, they may be impacted locally and temporarily by the project. It is expected that they would be able to move to another nearby location to continue foraging, feeding and resting. These birds primarily roost outside of the project area.
Raptors (osprey, hawks, eagles, owls)	Foraging, feeding, and resting	Raptors forage, feed, and rest in the project area. As such, they may be impacted locally and temporarily by the project. It is expected that they would be able to move to another nearby location to continue foraging, feeding and resting. Most raptors are aerial foragers and soar long distances in search of food. The areas in the NERR where these birds roost and nest are not within the project area. The project is expected to improve foraging habitat for raptors.
Colonial Wading birds (herons, egrets, ibises, American flamingo)	Foraging, feeding, and resting	Wading birds primarily forage and feed at the water's edge. As such, they may be impacted locally and temporarily by the project. It is expected that they would be able to move to another nearby location to continue foraging, feeding and resting. These birds primarily nest and roost in trees or shrubs (e.g. pines, *Bacchurus* and mangroves), which occur outside the project area. In addition, this project is likely to improve shoreline habitat conditions and near-shore habitat.
Shorebirds (plovers, oystercatchers, stilts, sandpipers)	Foraging, feeding, resting, and roosting	Shorebirds forage, feed, rest, and roost in the project area. As such, they may be impacted locally and temporarily by the project. It is expected that they would be able to move to another nearby location to continue foraging, feeding and resting. These birds primarily nest or roost outside the immediate area of disturbance.
Marsh birds (passerine species; grebes, bitterns, rails, gallinules, and limpkin)	Foraging, feeding, resting, and roosting	Marsh birds forage, feed, rest, and roost in the vicinity of the project area. As such, they may be impacted locally and temporarily by the project. However, it is expected that they would be able to move to another nearby location to continue foraging, feeding and resting if disturbed by the project.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 U.S.C. §§ 703 *et seq.*) makes it "unlawful at any time, by any means or in any manner, to […] take, capture, kill, attempt to take, capture, or kill, possess, […] ship, […] transport

or cause to be transported […] any migratory bird, any part, nest, or egg of any such bird." The MBTA applies to migratory bird species that occur in the United States as the result of natural biological or ecological processes. Over 800 species of birds occurring in the United States are protected under the MBTA.

Environmental Consequences

No Action

Under the No Action Alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to birds would occur.

Proposed Action

The MBTA requires the protection of all migratory bird species and protection of ecosystems of special importance to migratory birds against detrimental alteration, pollution, and other environmental degradation.

The project would have a minor, short term impact to birds during construction due to elevated noise levels and presence and operation of equipment. Given the small project footprint and the species' mobility, any species foraging within the project area during construction would be able to avoid direct impacts. Potential effects to prey resources may occur during construction; however, these would be minor and temporary.

The proposed action would result in minor, short-term, localized adverse impacts to transient bird individuals during construction, but these species are mobile and would likely exit the area during construction (no impacts to overall population). If nesting birds are observed during project construction, the USFWS would be contacted to determine if BMPs are necessary to avoid take. The Trustee would implement any BMPs such that the proposed action would not result in take under the MBTA. The proposed action would have a long-term minor beneficial impact due to increasing habitat for juvenile finfish and shellfish as a source of food for shorebirds and wading birds. The proposed action would not result in indirect impacts to birds.

Mammals

Affected Resources

North American River Otter

The North American river otter (*Lontra canadensis*) is a member of the weasel family. River otters are found in a variety of freshwater habitats including rivers, streams and marshes. Their home ranges can be as small as 5 miles and as large as 40 since they are able to travel over land to reach water sources. They typically feed on a variety of fish, freshwater mussels, crayfish, frogs, snakes, and turtles. North American river otters build dens in the burrows of other mammals, in natural hollows, such as under a

log, or in riverbanks. Dens have underwater entrances and a tunnel leading to a nest chamber that is lined with leaves, grass, moss, bark, and hair (NatureServe 2015).

Environmental Consequences

No Action

Under the No Action Alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to mammals would occur.

Proposed Action

Potential adverse effects from noise and other activity associated with construction could temporarily disturb river otters; however, it is unlikely that this species would be present in the construction area as it is saltwater. River otters would more likely be found in Bayou la Batre and Bayou Coden; therefore, impacts to river otters are not anticipated.

Reptiles

Affected Resources

Diamondback Terrapins

Diamondback terrapins (*Malaclemys terrapin*) are believed to be the only turtle in the world that lives exclusively in brackish water habitats (e.g., tidal marshes, estuaries, and lagoons). The species primarily forages on fish, invertebrates (e.g. snails, worms, clams, crabs), and marsh grass. Nesting for the species occurs in sandy beach and/or shell habitats. Terrapin hatchlings emerge from August to October. Only 1 to 3 percent of the eggs laid produce a hatchling, and the number of hatchlings that survive to adulthood is believed to be similarly low (Defenders of Wildlife 2011). Most terrapins hibernate during the winter by burrowing into the mud of marshes. Decreases in terrapin populations have been documented throughout their range due to interactions with commercial crab/lobster industries, coastal development and incidental injury from motorboats (ADCNR 2010). It is for these reasons that diamondback terrapins have received “species of special concern” status in many states including Alabama.

American Alligators

American alligators (*Alligator mississippiensis*) are an important part of the environment; not only do they control populations of prey species, they also create peat and “alligator holes,” which are invaluable to other species (Britton 1999). Alligators are known to dig holes in mud where water fluctuates to provide protection from heat. These animals are carnivores that feed on anything; they eat fish, snails, birds, frogs, turtles, and mammals near the water’s edge (Schechter and Street 2000). Although they are primarily freshwater animals, alligators will also venture into brackish salt water (Savannah River Ecology Laboratory 2012). Their populations have increased as a result of strict conservation measures, but alligator habitat is still being destroyed. Alligators are good indicators of

environmental factors, such as toxin levels – increased levels of mercury have been found in alligator blood samples (Britton 1999). The first few years of an alligator hatchling's life are the most dangerous, as they are preyed upon by snakes, wading birds, osprey, raccoons, otters, large bass, and garfish (Schechter and Street 2000). Alligators are hunted for their skin, which is commercially used for wallets, purses, boots, and other consumer goods (Schechter and Street 2000). Alligators are also raised in captivity for the production of their meat and skin, resulting in a multimillion dollar industry (Schechter and Street 2000). In addition, alligators are a tourist attraction, especially in Florida (Schechter and Street 2000).

Environmental Consequences

No Action

Under the No Action Alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to reptiles would occur. Beneficial impacts from the placement of breakwaters which would protect these resources and enhance habitat would not occur.

Proposed Action

Potential minor adverse effects due to noise and other activity associated with breakwater placement may temporarily disturb diamondback terrapin and alligators that are in the project area. Construction activities may also temporarily increase the potential for boat collisions with these species; however, contractors would operate their vessels at idle/no wake speed during construction activities as required by the Marine Mammal Protection Act. The mobility of both the alligator and diamondback terrapin reduces the risk of injury due to construction activity. Furthermore, the short duration of construction activities and localized nature of the project would aid in preventing incidental take of reptiles.

11.2.5.2.3 Threatened and Endangered Species

Birds

Affected Resources

Three Federally listed bird species, wood stork (*Mycteria americana*), piping plover (*Charadrius melodus*), and red knot (*Calidris canutus rufa*) are known to occur in Mobile County, Alabama.

The wood stork (*Mycteria americana*) is a threatened species originally listed by USFWS in 1984. The wood stork is the largest wading bird breeding in the United States and is typically associated with freshwater habitats and prefers swamps, coastal shallows, ponds, and flooded pastures (Stokes 1996). During times of drought, depressions in brackish marshes become important habitat components. Wood storks are residents of the Southeast specifically along the Gulf Coast from Texas to Florida. This species does not have a breeding population within the state of Alabama (USFWS 2007), but non-breeding transient individuals may be present in summer and early fall in the western inland Coastal Plain near the Tombigbee River, lakes in Hale, Marengo, and Perry Counties, and at ponds near Montgomery. The Shell Belt and Coden Belt Roads Living Shoreline Project would not impact any habitat typically used by

the wood stork. Wood Storks are not known to forage in the project area and there are no known wood stork breeding colonies or roost sites within close proximity of the project area.

The piping plover is a small North American shorebird with three distinct populations that breed in the Great Lakes, the Northern Great Plains and the Atlantic Coast. The Atlantic Coast population breeds from North Carolina to Newfoundland and winters in the Caribbean and along the Atlantic and Gulf Coasts. Piping plovers typically utilize sand beaches, mixed sand and gravel beaches and exposed sandy tidal flats. In Alabama, critical habitat for piping plovers is largely limited to the Gulf barrier islands. Piping plover has designated critical habitat near the project area at Isle aux Herbes (unit AL-1) and Dauphin Island (unit AL-2). Unit AL-1 is at least a mile from any project activity and Unit AL-2 is at least nine miles from any project activity.

The PCEs for piping plover wintering habitat are those habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support these habitat components. The PCEs are found in geologically dynamic coastal areas that support intertidal beaches and flats (between annual low tide and annual high tide) and associated dune systems and flats above annual high tide. Additional information on each specific unit included in the designation can be found at 66 FR 36038. PCEs of wintering piping plover critical habitat include:

1) Intertidal flats with sand or mud flats (or both) with no or sparse emergent vegetation.

2) Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting piping plovers. Such sites may have debris, detritus, or microtopographic relief (less than 50 cm above substrate surface) offering refuge from high winds and cold weather.

3) Important components of the beach/dune ecosystem include surf-cast algae, sparsely vegetated back beach and salterns, spits, and washover areas.

4) Washover areas are broad, unvegetated zones, with little or no topographic relief, that are formed and maintained by the action of hurricanes, storm surge, or other extreme wave action.

Activities that affect PCEs include those that directly or indirectly alter, modify, or destroy the processes that are associated with the formation and movement of barrier islands, inlets, and other coastal landforms. Those processes include erosion, accretion, succession, and sea-level change. The integrity of the habitat components also depends upon daily tidal events and regular sediment transport processes, as well as episodic, high-magnitude storm events (Service 2001b).

Between 1981 and 2014, piping plover sightings in Mobile and Baldwin counties indicate that there is an average high count of approximately 8 individuals occurring in March and an average low count of less than 1 individual occurring in June (eBird 2015).

The red knot is the largest of the stints in North America. It is a medium-sized, bulky bird with a short, straight, black bill. The red knot makes one of the longest yearly migrations of any bird, as breeding occurs in the high Arctic and most wintering occurs in South America. In Alabama, the red knot is rare as it migrates through the area between its breeding and wintering habitats. Red knots can winter along the Gulf coast and, when present, they are typically found in mudflats and along sandy shores.

Bald and Golden Eagle Protection Act

The bald eagle (*Haliateetus leucocephalus*) is no longer protected under the ESA as the species has achieved recovery. The bald eagle is, however, protected by the U.S. government under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Bald eagles occur most commonly in areas close to coastal areas, bays, rivers, lakes, or other bodies of water that provide concentrations of food sources, including fish, waterfowl, and wading birds. Usually, the bald eagle nests in tall trees (mostly live pines) that provide clear views of surrounding area. In the Southeast, bald eagles typically nest between September and May.

Suitable habitat for the bald eagle is likely present between the shoreline and the proposed project site. However, occurrences of bald eagles in Mobile County are very low (ebird 2015). In the last fifty years, bald eagle counts have averaged between zero and two individuals annually (ebird 2015).

Environmental Consequences

No Action

Under the no action alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to threatened and endangered birds would occur. Beneficial impacts from the placement of breakwaters which would protect these resources and enhance habitat would not occur.

Proposed Action

Potential adverse effects to threatened birds would be minimal and include elevated noise levels and the presence of breakwater construction equipment. These species are mobile and would likely exit the area during construction (no impacts to overall population). Therefore, adverse effects would be short term, localized, and minor. Land based-deployment is the preferred method for WAU placement. Therefore, it is anticipated that all impacts to birds would be related to the use and presence of land-based construction equipment. Although not anticipated, if it is determined that in-water work would be necessary, BMPs would be implemented to mitigate any potential impacts to threatened and endangered birds.

Piping plover and red knot may use nearby shoreline habitats for resting or foraging during winter months. Potential impacts to these species could include elevated noise levels during project construction. However, given the fact that the project site is bordered by a seawall and riprap, it is unlikely that these species forage in this area. Therefore any impacts to piping plovers and red knot are unlikely and/or would be short-term, localized, and minor.

The nearest designated critical habitat for piping plover is located at Isle aux Herbes (unit AL-1) and Dauphin Island (unit AL-2). Unit AL-1 is approximately one mile from any project activity and Unit AL-2 is approximately 9 miles from any project activity. Given this distance, noise from land-based construction equipment would not likely impact piping plover critical habitat. Land based-deployment is the preferred method for WAU placement. However, although not anticipated, if it is determined that in-water work would be necessary, construction barges, tugs and other watercraft would most likely be staged in either Bayou la Batre and/or Coden, and associated watercraft would have no reason to be in close proximity to either critical habitat unit. Given predominant wave direction and current in Portersville Bay, and the distance to Units Al-1 and AL-2, the breakwaters would have no impacts on either unit. Therefore, no impact to piping plover critical habitat is anticipated.

Wood Storks are not known to forage in the project area and there are no known wood stork breeding colonies or roost sites within close proximity of the project area. Therefore no effect on this species is expected.

Land based-deployment is the preferred method for WAU placement and in-water work is not anticipated. However, if it is determined that in-water work would be necessary, best management practices would include:

- Conducting construction activities outside of nesting season, if nests are present; if a nest is present and it is not possible to avoid construction, maintain a buffer of at least 660 feet from the nest; and,
- Minimize the number of boat trips passing within 660 feet of the nest location.

No bald eagle nests are currently documented within close proximity to the project area. Pre-construction surveys would be conducted for bald eagle nests. If bald eagle nests are located, Bald and Golden Eagle Protection Act best management practices would be followed to minimize harm to bald eagles.

Fish

Affected Resources

Gulf Sturgeon

The NMFS and USFWS listed the Gulf sturgeon (*Acipenser oxyrinchus)* as a threatened species on September 30, 1991. The Gulf sturgeon, also known as the Gulf of Mexico sturgeon, is a subspecies of the Atlantic sturgeon. Adults are 180 to 240 cm (71-95 inches) in length, with adult females larger than adult males. Adult fish are bottom feeders, eating primarily invertebrates, including brachiopods, insect larvae, mollusks, worms and crustaceans. The Gulf sturgeon is an anadromous fish that migrates from salt water into coastal rivers during the warmer months to spawn. The sturgeon often stays in the Gulf of Mexico and its estuaries and bays in cooler months (NMFS 2013). Most adult feeding takes place in the Gulf of Mexico and its estuaries. The fish return to breed in the river system in which they hatched. Spawning occurs in areas of deeper water with clean (rock and rubble) bottoms. The eggs are sticky and

adhere in clumps to snags, outcroppings, or other clean surfaces. Sexual maturity is reached between the ages of 8 and 12 years for females and 7 and 10 years for males. The Gulf sturgeon historically was threatened because of overfishing and then by habitat loss due to construction of water control structures, dredging, groundwater extraction, and flow alterations.

This portion of Mississippi Sound is not designated as Gulf sturgeon critical habitat; however, USFWS includes the Gulf sturgeon on the list of species likely to occur in Mobile County, Alabama. Sturgeon have been observed, collected, and tagged in the Mobile Bay. Sturgeons were observed using the marine and estuarine waters of the bay, but were not observed moving through the bay toward the Mobile River or spawning. The tagged sturgeon from Mobile Bay returned to the Choctawhatchee River in Florida (Mettee et al. 2009; NMFS 2013).

Environmental Consequences

No Action

Under the no action alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to threatened and endangered fish would occur. Beneficial impacts from the placement of breakwaters which would protect these resources and enhance habitat would not occur.

Proposed Action

Potential adverse effects to the Gulf sturgeon include elevated noise levels and the presence of WAU placement equipment. Land based-deployment is the preferred method for WAU placement. It is anticipated that noise from land-based WAU placement equipment would have minimal impacts on Gulf sturgeon. Immediately following WAU placement, turbidity may increase, but impacts would be minimal and short-term. WAU placement would occur in less than five feet of water in areas of silty sand to stiff clay waterbottoms. These shallow waterbottoms are not known to be favored Gulf Sturgeon foraging areas. Additionally, If the work takes place during the spring and summer months, Gulf Sturgeon are not likely to be present in inshore shallow waters. During the winter month daylight hours, because of low winter tides, the project area is extremely shallow, less than one foot deep. If present, Gulf Sturgeon are mobile and would likely exit the area during construction (no impacts to overall population). Some soft bottom habitat would be converted to hard bottom. The use of breakwaters as a living shoreline technique may provide an indirect benefit to Gulf sturgeon by enhancing the diversity of prey available by creating patchwork reefs that, over time, provide more structurally complex habitat for prey species. Throughout the duration of the project, the breakwaters would help mitigate coastal erosion and also encourages nektonic production that could lead to greater prey availability in the immediate project area for Gulf sturgeon.

This project is not taking place within Gulf Sturgeon critical habitat. Potential adverse impacts to gulf sturgeon due to noise from land-based construction activities would be minimal. Land based-deployment is the preferred method for WAU placement. However, although not anticipated, if it is determined that in-water work would be necessary, construction barges, tugs and other watercraft

would most likely be staged in either Bayou la Batre and/or Coden, and associated watercraft would have no reason to enter Gulf Sturgeon critical habitat. Therefore, no impact to Gulf Sturgeon estuarine critical habitat is anticipated.

Mammals

Affected Resources

The West Indian Manatee

The West Indian Manatee (*Trichechus manatus*) is listed as endangered under the ESA. The species is endangered due to its small population size (less than 2,500 mature individuals with possible population decline), the possibility of at least a 50 percent future reduction in population size, and near- and long-term threats from human-related activities (USFWS 2010; FFWC 2007). Between October and April, manatees concentrate in areas of warmer water. During summer months, the species may migrate as far west as the Louisiana and Texas coast on the Gulf of Mexico. In Alabama, a number of manatees (one to fifteen individuals) are routinely seen in the calm, shallow waters of rivers and sub-embayments of Mobile Bay and the Mobile-Tensaw Delta. Manatees inhabit both salt and fresh water of sufficient depth (about 5 feet to usually less than 18 feet). Manatees will consume any aquatic vegetation available to them including sometimes grazing on the shoreline vegetation.

Environmental Consequences

No Action

Under the no action alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to threatened and endangered mammals would occur. Beneficial impacts from the placement of breakwaters which would protect these resources and enhance habitat would not occur.

Proposed Action

Minor adverse impacts due to noise from land-based WAU placement equipment and turbidity associated with WAU placement may temporarily disturb manatees in the vicinity of the project area. However, the mobility of this species reduces the risk of adverse impacts. Furthermore, the short duration of construction activities and localized nature of the project would aid in minimizing impacts and preventing incidental take, including disturbance of manatees. Potential adverse impacts to manatees due to noise from land-based construction activities would be minimal. Land based-deployment is the preferred method for WAU placement. However, although not anticipated, if it is determined that in-water work would be necessary, all construction activities would follow the Standard Manatee Conditions for In-Water Work (USFWS 2011) to minimize impacts to West Indian manatees to an insignificant and discountable level. Because of manatee sightings in Mobile Bay and its tributaries in recent years, extreme care would be taken during construction not to disturb or injure manatees.

Although not anticipated, if in-water work is determined to be necessary for project implementation, best management practices which would be implemented in accordance with the Standard Manatee Conditions for In-Water Work (USFWS 2011) are as follows:

- All vessels associated with the construction project would operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom.
- All vessels would follow routes of deep water whenever possible. Siltation or turbidity barriers would be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment.
- Barriers would not impede manatee movement.
- All in-water operations, including vessels, will be shut down if a manatee(s) comes within 50 feet of the operation.
- Activities would not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation.
- Temporary signs concerning manatees would be posted prior to and during all in-water project activities.

Reptiles

Affected Resources

Snakes

The black pine snake (*Pituophis melanoleucus lodingi*) is a large (48 to 64 inches long) stocky snake and is only proposed for threatened status by the US Fish and Wildlife Service. Its back and belly are uniformly black or dark brown. Faint blotches may be seen on the hindbody or tail (USFWS 2015). The snake has a range that extends from southwestern Alabama, through southern Mississippi, and into southeastern Louisiana. In each of these states it is considered imperiled or critically imperiled, and the U.S. Fish and Wildlife Service proposed the snake for federal listing under the Endangered Species Act on October 10, 2014. The snake is known to occur in Mobile County, largely in upland, open longleaf pine forests with dense herbaceous groundcover (USFWS 2015). The distribution of remaining populations has become highly restricted due to the destruction and fragmentation of the longleaf pine habitat, which has become one the most critically endangered ecosystems in the United States (USFWS 2013). In Alabama, populations occurring on properties managed as gopher tortoise habitat are likely the best opportunities for long-term survival of the black pine snake (USFWS 2013).

The eastern indigo snake (*Drymarchon corais couperi*) is a large (60 to 74 inches) snake with a black and iridescent blue body (USFWS 2015). The chin and throat are reddish or white, and the color may extend down the body (USFWS 2015). The belly is cloudy orange and blue-gray (USFWS 2015). Historically, the eastern indigo snake lived throughout Florida, the coastal plain of southern Georgia, extreme south Alabama, and extreme southeast Mississippi (USFWS 2015). Today the indigo snake survives in Florida

and southeast Georgia, and has been extirpated from Alabama and Mississippi (USFWS 2015); therefore, it is extremely unlikely to exist in the project area. The Indigo Snake is often dependent upon the deep burrows dug by the gopher tortoise and uses them as a refuge from extreme temperatures (ADCNR 2015). This restricted habitat is even more isolated by the snake's preference for the interspersion of wet lowlands like cypress ponds (ADCNR 2015). These preferred areas are usually found where rivers and creeks run thru sand hills habitat (ADCNR 2015).

Turtles and Tortoises

There are five species of sea turtles that are found in the Gulf of Mexico: green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), loggerhead sea turtle (*Caretta caretta*), Kemp's Ridley sea turtle (*Lepidochelys kempii*), and leatherback sea turtle (*Dermochelys coriacea*). All five species are listed under the ESA. The Gulf populations of hawksbill, Kemp's Ridley, and leatherback sea turtles are listed as endangered. Loggerhead (northwest Atlantic distinct population segment) and green (except the Florida breeding population) sea turtles are listed as threatened. In Mobile County, there is also one endangered freshwater turtle, the Alabama red-bellied turtle (*Pseudemys alabamensis*), and one threatened tortoise, the Gopher tortoise (*Gopherus polyphemus*).

Sea turtles in the Gulf (with the exception of the leatherback turtle) have a life history cycle where hatchlings develop in open ocean areas (e.g., continental shelf) and juvenile and adult turtles move landward and inhabit coastal areas. Leatherback turtles spend both the developmental and adult life stages in the open oceanic areas of the Gulf of Mexico (Dow Piniak 2012). Sea turtles nest on low and high energy ocean beaches and on sandy beaches in some estuarine areas. Immediately after hatchlings emerge from the nest, they begin a period of frenzied activity. During this active period, hatchlings move from their nest to the surf, swim, and are swept through the surf zone, and continue swimming away from land for up to several days (NMFS 2013). Once hatchling turtles reach the juvenile stage, they move to nearshore coastal areas to forage. As adults, they utilize many of the same nearshore habitats as during the juvenile developmental stage. Sea turtles utilize resources in coral reefs, shallow water habitat (including areas of seagrasses), and areas with rocky bottoms.

Sea turtles maintain a variety of Gulf habitats including SAV beds and coral reefs. Grazing on SAV by turtles helps to increase nutrient cycling in those habitats and prevents an over-accumulation of decaying SAV on the seafloor (Thayer et al. 1984). In addition to maintaining habitats, sea turtles also aid in balancing the food web in their marine environments. Leatherbacks, for example, prey primarily upon jellyfish and help to prevent the proliferation of this group that can easily outcompete fish species in the same area (Lynam et al. 2006).

The Alabama red-bellied turtle is typically found in shallow vegetated backwaters of freshwater streams, rivers, bays, and bayous in or adjacent to Mobile Bay. They prefer habitats having soft bottoms and extensive beds of submergent aquatic macrophytes (aquatic plants that grow in or near water).

The gopher tortoise usually lives in relatively well-drained, sandy soils generally associated with longleaf pine and dry oak sandhills. They also live in scrub, dry hammock, pine flatwoods, dry prairie, coastal

grasslands and dunes, mixed hardwood-pine communities, and a variety of habitats that have been disturbed or altered by man, such as power line rights-of-way, and along roadsides.

Environmental Consequences

No Action

Under the no action alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to threatened and endangered reptiles would occur. Beneficial impacts from the placement of breakwaters which would protect these resources and enhance habitat would not occur.

Proposed Action

Potential adverse effects on sea turtles would be minimal and include noise and the presence of construction equipment. However, these impacts are expected to be short-term, localized, and minor. Due to the species' mobility and the implementation of NMFS's Sea Turtle and Small-tooth Sawfish Construction Conditions, the risk of injury from construction would be negligible. Land based-deployment is the preferred method for WAU placement and it is anticipated that all potential impacts to sea turtles would be due to land-based WAU placement equipment. However, it is extremely unlikely that noise from construction equipment would have a measurable impact sea turtles. Immediately following WAU placement, turbidity may increase, but impacts would be minimal and short-term. If it is determined that in-water work would be necessary, best management practices which would be implemented in accordance with the National Marine Fisheries Service's Sea Turtle and Small-tooth Sawfish Construction Conditions (NMFS 2006) to minimize adverse impacts to sea turtles are as follows:

- All vessels associated with the construction project would operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom.
- All project work would be in-water and no sea turtle nesting habitat exists in the project area. All construction personnel would be trained on what they are to do if the presence of a sea turtle is detected.
- All construction personnel would be notified of the potential presence of sea turtles in the water and would be reminded of the need to avoid sea turtles.
- If any sea turtles are found to be present in the immediate project area during activities, construction would be halted until species moves away from project area.
- Construction activities would occur during daylight hours to the maximum extent possible and noise would be kept to the minimum feasible.
- All construction personnel would be notified of the criminal and civil penalties associated with harassing, injuring, or killing sea turtles.

Sea turtle entrapments is a concern with certain types of WAUs and/or similarly shaped artificial reefs, especially large units placed on sandy sediments in high current areas. The waterbottoms at the project site consist of stiff clay to silty sandy sediments. As such the WAUs would most likely settle six to eight

inches into the sediments. This settlement, which is taken into account during engineering and design, would prevent sea turtles from entering the WAUs from gaps between the waterbottoms and the bottom of the WAU. Additionally, the WAUs themselves, including the holes in the proposed WAUs, are smaller than the offshore units where sea turtle entrapment has been observed. The size of the WAUs and the size of the holes in the WAUs to be used at the project site would prevent adult sea turtles from entering the units. Finally, the proposed project site is located in brackish, relatively turbid waters, where sea turtles rarely are known to forage. Based on these factors, sea turtle entrapment is the risk of sea turtle entrapment is very low.

Since the Alabama red-bellied turtle rarely occurs in saltwater, and considering most of the populations occur in the backwaters of upper Mobile Bay, no impacts are expected.

Since construction equipment would be operating and constructing breakwaters from either the existing ROW or in the open water, no potential adverse effects to the gopher tortoise, Eastern indigo snake, or black pine snake are expected.

11.2.5.2.4 Summary of Impacts to the Biological Environment

Impacts to the biological environment from implementation of the Shell Belt and Coden Belt Roads Living Shoreline Project would include:

- SAV: SAV are not present in the area and there would be no impacts.
- Benthos, invertebrates and fish: Potential short-term minor adverse effects to benthic organisms, invertebrates, and fish may occur during construction activities due to breakwater placement and noise. Following construction, there is expected to be increased habitat utilization of the breakwaters and near-shore environment by these species and a beneficial, long-term impact is anticipated.
- EFH: Potential short-term minor adverse effects to EFH components such as soft bottom substrates are expected. Construction activities and equipment noise associated with construction may reduce habitat utilization by EFH species in the area. Long-term benefits to EFH, especially for shrimp, and red drum, include foraging habitat, increased cover for juveniles and improved water quality.
- Marine mammals: Short-term minor adverse effects due to noise, prey availability, and turbidity associated with breakwater placement may temporarily disturb certain dolphin species in the vicinity of the project area. The short duration of construction activities and localized nature of the project would aid in preventing incidental take of dolphins.
- Terrestrial species: Short-term minor adverse impacts to terrestrial vegetation would occur due to use of construction equipment along the shoreline. Potential short-term minor adverse effects could occur to birds and reptiles from elevated noise levels during construction. No impacts to mammals would occur.
- Potential impacts to threatened and endangered species are presented below in Table 11-5.

Table 11-5. Threatened and Endangered Species Potentially Affected by the Proposed Project

Common Name	Scientific Name	Federal Status	Trustees' Affect Determination
Gulf sturgeon	Acipenser oxyrinchus desotoi	Threatened	NLAA
West Indian manatee	Trichechus manatus	Endangered	NLAA
Loggerhead sea turtle	*Caretta caretta*	Threatened	NLAA
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	NLAA
Green sea turtle	*Chelonia mydas (P)*	Threatened	NLAA
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	NLAA
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	NLAA
Gopher tortoise	*Gopherus polyphemus*	Threatened (Mobile County)/Candidate Species (Baldwin County)	No Effect
Alabama red-belly turtle	Pseudemys alabamensis	Endangered	No Effect
Black pine snake	*Pituophis melanoleucus lodingi*	Proposed Threatened	No Effect
Eastern indigo snake	*Drymarchon corais couperi*	Threatened	No Effect
Piping plover	*Charadrius melodus*	Threatened	No Effect
Red knot	*Calidris canutus rufa*	Threatened	No Effect
Wood stork	*Mycteria americana*	Threatened	No Effect

11.2.5.3 Human Uses

11.2.5.3.1 Cultural Resources

Affected Resources

The Shell Belt and Coden Belt Roads Living Shoreline Project is currently being reviewed under NHPA Section 106 to identify any historic properties located within the project area and to evaluate whether the project would affect any historic properties. An initial review of the project has not identified the presence of a historic property within the project area. The Section 106 review process is ongoing and management of Section 106 compliance is being led by the Department of the Interior. A list of properties in the Alabama Register of Historic Places from Mobile County was consulted. There were no properties found at the location of the project area (AHC 2013a). A list of Alabama properties in the National Register of Historic Places, from Mobile County was referenced and there were no properties found at the location of the project area. The Leatherbury George House was a listed property on Shell Belt Road, Southeast of Sans Souci Beach, but was destroyed during Hurricane Katrina in 2005 (AHC 2013b).

Environmental Consequences

No Action

Under the no action alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to cultural resources would occur.

Proposed Action

No known cultural resources are located in or adjacent to the area that could be impacted by the Proposed Action. A complete review of this project under Section 106 is ongoing. That review would be completed prior to undertaking any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

11.2.5.3.2 Infrastructure

Affected Resources

The project area is in the offshore water in Portersville Bay, Alabama. Shell Belt and Coden Belt Roads are directly adjacent to the shoreline along the project areas. The land is developed for human habitation and there are structures to water supply, and utilities near land to project area. There is an existing bulkhead seaward of the ROW along the Portersville Bay shoreline.

Environmental Consequences

No Action

Under the no action alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to infrastructure would occur.

Proposed Action

Sections 6.4.3 and 6.7.9.1 of the Final Phase III ERP/PEIS describe the impacts to infrastructure from early restoration projects to protect shorelines and reduce erosion. The Final Phase III ERP/PEIS found that projects involving ground- or substrate-disturbing construction activities, such as the placement of engineered shoreline protection structures, could lead to short and long-term minor to major adverse impacts to infrastructure. These impacts would result if there were inadvertent damage to unknown submerged offshore pipeline infrastructure or buried onshore utility infrastructure. Projects requiring land-based construction activities and associated movement of construction materials and equipment by road could lead to short and long-term minor to major adverse impacts to infrastructure. For this project, impacts to infrastructure were analyzed adequately within the PEIS as the site-specific impacts discussed below fall within the range of impacts for this project type in the Final Phase III ERP/PEIS.

The logistics of the construction process are dependent upon the construction contractor. At this time, it is anticipated that the construction contractor would use existing land based facilities and loading areas to stage breakwater materials along with construction equipment. It is anticipated that all construction activities would take place from the existing ROW along the project area.

It is anticipated that that the breakwater materials and a long-arm track-hoe would be staged along the ROW. This track-hoe could then place the breakwater materials to its seawards side. Temporary road closures on Shell Belt and Coden Belt Roads would likely be set in place during construction. Placement of the breakwater units would be monitored to insure the breakwaters are constructed as specified. Temporary road closures would have short-term minor impacts to infrastructure due to their temporary nature and traffic mitigation measures put in place during construction. Should work occur in-water, no road closures would be necessary. No other impacts to infrastructure under either construction method are anticipated.

Potential mitigation measures for impacts to land and marine management are found in Appendix 6A of the Final Phase III ERP/PEIS. Any of these measures that would apply to the Shell Belt and Coden Belt Roads Living Shoreline Project may be used to minimize adverse impacts.

11.2.5.3.3 Land and Marine Management

Affected Resources

Land Use

The land in the general area is mainly private ownership. This primarily included single family homes, empty lots and undeveloped lands. There is one public park along the northern side of Coden Belt Road.

Coastal Zone Management

The project is located in a coastal area that may be regulated by the federal CZMA of 1972, which is implemented through the Alabama Coastal Area Management Program (ACAMP). The CZMA defines coastal zones wherein development must be managed to protect areas of natural resources unique to coastal regions. In addition, the CZMA requires federal agency activities to be fully consistent with a state's approved coastal management program.

The Federal Trustees are submitting an early consistency determination for state review coincident with public review of this document. The project will also remain subject to further review for consistency during permitting processes to be completed prior to project implementation.

Environmental Consequences

No Action

Under the no action alternative, the proposed living shoreline project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to land and marine management would occur. Beneficial impacts for land management from the protection of the breakwaters would not be realized.

Proposed Action

Sections 6.4.4 and 6.7.10.1 of the Final Phase III ERP/PEIS describe the impacts to land and marine management from early restoration projects to protect shorelines and reduce erosion. The Final Phase III ERP/PEIS found that project types related to restoration activities would have no impact to land and marine management, since projects would generally be consistent with the prevailing management plans and direction governing the use of the land and marine areas where the projects would take place. Some short-term minor to moderate adverse impacts could occur if these activities require temporary closure of areas that are managed for fishing or recreational use. In the long-term, because projects aimed at habitat restoration and conservation of living resources would align with and further the management goals of marine protected areas, these projects are expected to have beneficial impacts on marine management. For this project, impacts to land and marine management were analyzed adequately within the PEIS as the site-specific impacts discussed below fall within the range of impacts for this project type in the Final Phase III ERP/PEIS.

This project is located in the State of Alabama's designated coastal zone. Therefore, the project would require a determination of whether the project is consistent with the CZMA and the ACAMP. ADEM would review the project for consistency with the ACAMP. This process is typically completed during the USACE CWA Section 404 permitting process and the ADCNR – State Lands Division permitting process. Under the CZM, any federal activity or federally-funded activity that would have an effect on a state's coastal zone is subject to review for consistency with the applicable approved state coastal zone management plan (based on effects rather than a geographic boundary).

The proposed action would be constructed consistent with the CZMA and the ACAMP and would not result in adverse short or long-term impacts to land and marine management within the project area There would be a potential long-term beneficial impact to land management of the Shell Belt and Coden Belt shoreline due to reducing shoreline erosion landward of the breakwater structure.

Potential mitigation measures for impacts to land and marine management are found in Appendix 6A of the Final Phase III ERP/PEIS. BMPs that would be implemented for this action would include construction workers and volunteers employed in the projects associated with restoration techniques would be adequately trained to ensure that impacts are minimized.

11.2.5.3.4 Aesthetics and Visual Resources

Affected Resources

The shoreline landward of the proposed action area is developed, public and private land. There is a road along the shoreline near the proposed breakwater areas. Portersville Bay is used for water-based recreation, fishing, agriculture, propagation of fish and wildlife, and shell-fishing (USEPA 2012). Visual receptors of the shoreline include recreational and commercial boaters. The current view from the water to the shoreline is unobstructed.

Aesthetics and Visual Resources Environmental Consequences

No Action

Under the No Action Alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to aesthetic and visual resources would occur because the existing visual landscape would remain unchanged.

Proposed Action

Sections 6.4.8 and 6.7.10.1 of the Final Phase III ERP/PEIS describe the impacts to aesthetics and visual resources from early restoration projects to protect shorelines and reduce erosion. The Final Phase III ERP/PEIS found that project types involving the use of construction equipment, including equipment used for the movement and placement of materials (i.e. barges) and barriers enacted to protect public safety would result in some minor to moderate short-term adverse impacts on aesthetics and visual quality. During the construction period, visible impedances would detract from the natural landscape and create visual contrast for observers visiting the project areas. The severity of impacts would depend to a large degree on the location of the proposed projects, the degree to which these activities would be visible, the duration of the construction activities and how commonplace these activities and equipment are in certain areas. Impacts would likely be greatest in areas frequented by large groups of visitors and in areas where more natural viewsheds exist (i.e. barrier islands). For projects resulting in the long-term placement of structures and signage, long-term minor adverse impacts to aesthetics would occur, though these types of objects are often commonplace and would become less intrusive over time. For this project, impacts to aesthetics and visual resources were analyzed adequately within the PEIS as the site-specific impacts discussed below fall within the range of impacts for this project type in the Final Phase III ERP/PEIS.

As a result of this project, new navigational signs would be installed along the breakwater segments to warn marine traffic of the potential underwater obstruction. The signs would not dominate the view or detract from the current user activities or experiences; however, the intent of the signage is to attract attention in order to inform the public for their safety.

The proposed action would result in minor, short term visual impacts while construction equipment is used at the project site. The placement of navigational signs would result in a direct, long term, minor

adverse impact on the aesthetics and visual resources of the area and these signs would become less intrusive overtime.

Potential mitigation measures for impacts to aesthetic and visual resources are found in Appendix 6A of the Final Phase III ERP/PEIS. BMPs that would be implemented as part of this action include:

- Use of existing access ways whenever possible. Temporary access roads would not be built in locations that would suggest a likelihood of excessive erosion (e.g., large slopes, erosive soils, proximity to water body). All temporary access roads would be restored when the action is completed, the soil would be stabilized, and the site would be re-vegetated.
- Maintenance of generators, cranes, and any other stationary equipment operated within 150 feet of any natural or wetland area as necessary to prevent leaks and spills from entering the water.
- Employment of standard BMPs for construction to reduce erosion.
- Development and implementation of spill prevention and control plans to minimize the risk of release of petroleum and oil products into receiving waters.

11.2.5.3.5 Tourism and Recreation

Affected Resources

The affected resources include the waters, water bottoms and estuaries along the Shell Belt and Coden Belt shoreline, which is primarily in public ownership. These resources are used by the public primarily for recreational boating, fishing, and bird watching. The shoreline is developed with roadways and private residences.

Environmental Consequences

No Action

Under the No Action Alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to tourism and recreation would occur.

Proposed Action

Sections 6.4.5 and 6.7.11.1 of the Final Phase III ERP/PEIS describe the impacts to tourism and recreation from early restoration projects to protect shorelines and reduce erosion. The Final Phase III ERP/PEIS found that project types involving ground or substrate disturbing construction activities as well as restoration activities could result in some short-term minor to moderate adverse impacts to wildlife viewing, short-term minor to moderate adverse impacts to hunting, beach and waterfront visitors, and tourism and short-term minor to moderate adverse impacts to fishing. Long-term benefits would occur from the improvement of wildlife and aquatic species habitat and associated increases in wildlife and aquatic species populations, diversity and viewing opportunities. For this project, impacts to tourism and

recreation were analyzed adequately within the PEIS as the site-specific impacts discussed below fall within the range of impacts for this project type in the Final Phase III ERP/PEIS.

During construction of the breakwaters, there would be short-term, minor adverse impacts to public access and use of open water areas for boat traffic; access would be restricted due to safety concerns. Following construction, there would be minor adverse impacts to public access and recreation since the breakwaters would prevent free-flowing transit between the reef and the shoreline. To avoid any significant navigational disturbances, permanent navigation markers or signage would be installed to assure safe navigation for marine traffic.

The proposed action would have a short term, adverse impact to recreational use of the area during construction since the area would be avoided by recreational boaters. The action would result in a beneficial impact due to increased use of created reef for fishing due to the expected use of the reef by recreationally important fish such as speckled trout and red drum. The project would result in a long-term, minor adverse impact due to the placement of new navigational signs where none currently exist. The project would not result in adverse long term indirect impacts to recreational use.

Potential mitigation measures for impacts to tourism and recreational use are found in Appendix 6A of the Final Phase III ERP/PEIS. Any of these measures that would apply to the Shell Belt and Coden Belt Roads Living Shoreline project may be used to minimize adverse impacts.

11.2.5.3.6 Public Safety and Shoreline Protection

Affected Resources

The project area is on the waterbottoms of Portersville Bay, Mobile County, Alabama. Shell Belt and Coden Belt Roads are directly adjacent to the shoreline along the project areas. There is an existing bulkhead seaward of the road ROW along the shoreline. The shoreline landward of the road ROW is developed public and private land. Breakwater construction has the potential to impact the shoreline and human safety. A number of boat launches and roads exist near the potential construction site.

Environmental Consequences

No Action

Under the No Action Alternative, the proposed living shorelines project would not be constructed at Shell Belt and Coden Belt Roads and no impacts to public health, safety, and shoreline protection would occur.

Proposed Action

Any disturbances from this project would occur within the established road network, with limited potential for the public to encounter hazardous material. No chemical waste would be created during construction. Any hazardous material from machinery would be contained through appropriate barriers to prevent potential spills and leaks. Because health and safety measures would be followed during construction, adverse impacts are not expected.

11.2.5.3.7 Summary of Impacts to Human Uses

Impacts to human uses from implementation of the Shell Belt and Coden Belt Roads Living Shoreline Project would include:

- Cultural Resources: A complete review of this project under Section 106 is ongoing. That review would be completed prior to undertaking any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area.
- Land and Marine Management: The proposed action would be constructed consistent with the CZMA and the ACAMP and would not result in adverse short or long-term impacts to land and marine management within the project area. There would be a potential long-term beneficial impact to adjacent public lands by reducing shoreline erosion landward of the reef structure.
- Aesthetics and Visual Resources: The proposed action would result in minor, short term visual impacts while construction equipment is used at the project site. The placement of navigational signs would result in a direct, long term, minor adverse impact on the aesthetics and visual resources of the area and these signs would become less intrusive over time.
- Tourism and Recreation: There would be short-term, minor adverse impacts to public access and use of open water areas for boat traffic during construction. Following construction, there would be minor adverse impacts to public access and recreation since the reefs could prevent free-flowing transit between the reef and the shoreline. Increased use of the created reef for fishing would be long-term and beneficial.
- Public Safety and Shoreline Protection: All health and safety measures would be followed during construction and no adverse impacts are expected.

11.2.6 Cumulative Impacts

As discussed in Chapter 4, the CEQ regulations to implement NEPA require the assessment of cumulative impacts in the decision-making process for federal projects, plans, and programs. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 C.F.R. § 1508.7).

The Shell Belt and Coden Belt Roads Living Shoreline Project cumulative impacts analysis tiers from the Final Phase III ERP/PEIS analysis of Alternative 4 (Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities), which evaluated the type of restoration activity proposed for the Shell Belt and Coden Belt Roads Living Shoreline Project. The Final Phase III ERP/PEIS analysis of cumulative impacts relevant to the proposed Shell Belt and Coden Belt Roads Living Shoreline Project is incorporated by reference into the following cumulative impacts analysis. The following analysis focuses on the potential additive effects of the proposed Shell Belt and Coden Belt Roads Living Shoreline Project to the effects of past actions evaluated in the Final Phase III ERP/PEIS cumulative impacts analysis and the effects of some past, present, and reasonably foreseeable future actions not analyzed in the Final Phase III ERP/PEIS.

11.2.6.1 Site Specific Review and Analysis of Cumulative Impacts to Relevant Resources

This section describes past, present, and reasonably foreseeable future actions that were not discussed in the Final Phase III ERP/PEIS, but which are relevant to identifying any cumulative impacts the proposed Shell Belt and Coden Belt Roads Living Shoreline Project may have on a local scale. Context and intensity, defined in Section 11.2.5, are used to determine whether a potential significant cumulative impact from the Shell Belt and Coden Belt Roads Living Shoreline Project exists.

For the Shell Belt and Coden Belt Roads Living Shoreline Project, specifically, the relevant affected resources analyzed in this EA are:

- Geology and Substrates
- Hydrology and Water Quality
- Air Quality and Greenhouse Gas Emissions
- Living and Coastal Marine Resources
- Infrastructure
- Land and Marine Management
- Tourism and Recreation Use
- Aesthetics and Visual Resources

Those resources described in Section 11.2.5 as considered but not carried forward for further analysis would not have impacts and therefore, would not have cumulative impacts. Local and site-specific past, present and reasonably foreseeable future actions not analyzed in the Final Phase III ERP/PEIS were investigated through conversations with ALDCNR staff and searching websites relevant to the Shell Belt and Coden Belt Roads Living Shoreline Project. The local action area is defined as the site of the living shoreline project and immediate surroundings of those areas. Actions that would be relevant to the Shell Belt and Coden Belt Roads Living Shoreline Project cumulative impacts analysis are defined here as those with similar scope, timing, impacts or location. Websites searched include:

- http://www.nfwf.org/whoweare/mediacenter/pr/Pages/gulf-main-pr-14-1117.aspx
- http://eli-ocean.org/gulf/restoration-projects-database/

This search provided the following additional information on actions relevant to the Shell Belt and Coden Belt Roads Living Shoreline Project cumulative impacts analysis.

- ERP I - Marsh Island Restoration: The Marsh Island (Portersville Bay) Restoration Project involves the creation of salt marsh along Marsh Island, a state-owned island in the Portersville Bay portion of Mississippi Sound, Alabama. This project will restore approximately 50 acres of salt marsh through the placement of a permeable segmented breakwater, the placement of sediments and the planting of native marsh vegetation. Additionally, the breakwater will provide protection for the existing 24 acres of Marsh Island, which has been experiencing shoreline loss at the rate of 5-10 feet per year. The Marsh Island Restoration Project is approximately 3 miles from the Shell Belt and Coden Belt Roads Living Shorelines Project site.

The Shell Belt and Coden Belt Roads Living Shoreline Project and the Marsh Island Restoration Project would both involve habitat restoration and construction of both projects could occur at the same time and contribute to cumulative impacts for the resources discussed below.

Geology and Substrates

This analysis tiers from the Final Phase III ERP/PEIS, Section 6.8.4.1.1 Geology and Substrates. The Final Phase III ERP/PEIS found that when Alternative 4 was analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to geology and substrates would likely occur. However Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts had the potential to result in some long-term beneficial cumulative impacts to geology and substrates in localized areas. Alternative 4 was not expected to contribute substantially to cumulative adverse impacts. The Shell Belt and Coden Belt Roads Living Shoreline Project is anticipated to fall within the expected range of the Final Phase III ERP/PEIS cumulative impacts.

The analysis in Section 11.2.5.1.1 determined that the Shell Belt and Coden Belt Roads Living Shoreline Project would have a short term, minor, adverse impacts to geology and substrates. Activities that would occur in support of the Marsh Island Restoration Project would be expected to have a similar level of impact during construction. Both projects would have long-term benefits from enhanced shoreline protection and habitat creation.

Based on these findings, the Shell Belt and Coden Belt Roads Living Shoreline Project is not expected to contribute significantly to adverse cumulative impacts to geology and substrates.

Hydrology and Water Quality

This analysis tiers from the Final Phase III ERP/PEIS, Section 6.8.4.1.2 Hydrology and Water Quality. The Final Phase III ERP/PEIS found that When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 4 would not contribute substantially to short-term or long-term cumulative adverse impacts to water quality and hydrology. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to hydrology and water quality in the Gulf Coast region because of the potential for synergistic effects of Alternative 4 project types with these other environmental stewardship and restoration activities. The Shell Belt and Coden Belt Roads Living Shoreline Project is anticipated to fall within the expected range of the Final Phase III ERP/PEIS cumulative impacts.

The analysis in Section 11.2.5.1.2 determined the Shell Belt and Coden Belt Roads Living Shoreline Project would have a short term, minor, adverse impacts to water quality and minimal impacts to hydrology. Activities that would occur in support of the Marsh Island Restoration Project would be expected to have a similar level of impact during construction. Both projects would have long-term benefits from enhanced shoreline protection and habitat creation.

Based on these findings, the Shell Belt and Coden Belt Roads Living Shoreline Project is not expected to contribute significantly to adverse cumulative impacts to hydrology and water quality.

Air Quality and Greenhouse Gases

This analysis tiers from the Final Phase III ERP/PEIS, Section 6.8.4.1.3, Air Quality and Greenhouse Gases. The Final Phase III ERP/PEIS found that when analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 4 would not contribute substantially to short-term or long-term cumulative adverse impacts to air quality or greenhouse gas emissions. To the extent that they increase CO2 absorption, Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts may result in some long-term beneficial cumulative impacts to greenhouse gas emissions because of the potential for synergistic effects of Alternative 4 project types with these other environmental stewardship and restoration activities. The Shell Belt and Coden Belt Roads Living Shoreline Project is anticipated to fall within the expected range of the Final Phase III ERP/PEIS cumulative impacts.

As described in Section 11.2.5.1.3, the Shell Belt and Coden Belt Roads Living Shoreline Project would have a temporary, minor adverse impact on air quality and GHGs. When taken into consideration with the Marsh Islands Restoration Project which would also have temporary and localized impacts, the expected cumulative impacts are consistent with those analyzed in the Final Phase III ERP/PEIS.

Based on these findings, the Shell Belt and Coden Belt Roads Living Shoreline Project is not expected to contribute significantly to adverse cumulative impacts to air quality and GHG levels.

Living Coastal and Marine Resources

This analysis tiers from the Phase III ERP/PEIS, Section 6.8.4.2.2, Living Coastal and Marine Resources. The Final Phase III ERP/PEIS found that when analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 4 would not contribute substantially to short-term or long-term cumulative adverse impacts to living coastal and marine resources. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to living coastal and marine resources in the Gulf Coast region because of the potential for synergistic effects of Alternative 4 project types with these other environmental stewardship and restoration activities. The Shell Belt and Coden Belt Roads Living Shoreline Project is anticipated to fall within the expected range of the Final Phase III ERP/PEIS cumulative impacts analysis.

As described in Section 11.2.5.2.1, the Shell Belt and Coden Belt Roads Living Shoreline Project is anticipated to have short-term and localized impacts to living coastal and marine resources with long-term beneficial impacts from habitat creation and shoreline protection. During construction, similar short-term, localized minor adverse impacts would be expected as a result of the Marsh Islands project, with similar long-term benefits. While construction could occur at the same time, impacts of each project would be localized and are not expected to contribute to adverse cumulative impacts. Once completed, the area would experience long-term benefits of both of these projects.

Based on these findings, the Shell Belt and Coden Belt Roads Living Shoreline Project is not expected to contribute significantly to adverse cumulative impacts to living coastal and marine resources.

Infrastructure

This analysis tiers from the Phase III ERP/PEIS, Section 6.8.4.3.3, Infrastructure. The Final Phase III ERP/PEIS found that when analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 4 would not contribute substantially to short-term or long-term cumulative adverse impacts to infrastructure. Alternative 4 carried out in conjunction with other infrastructure improvement projects may result in long-term beneficial cumulative impacts to infrastructure in the Gulf Coast region because of the potential for synergistic effects of Alternative 4 project types with these other activities. The Shell Belt and Coden Belt Roads Living Shoreline Project is anticipated to fall within the expected range of the Final Phase III ERP/PEIS cumulative impacts analysis.

As described in Section 11.2.5.3.2, the Shell Belt and Coden Belt Roads Living Shoreline Project is anticipated to have short-term and localized impacts to infrastructure due to short-term roadway closures. Any potential impacts to infrastructure from the Marsh Islands project during the same timeframe would be removed geographically from the road closures, and any impacts would not have interaction with each other.

Based on these findings, the Shell Belt and Coden Belt Roads Living Shoreline Project is not expected to contribute significantly to adverse cumulative impacts to infrastructure.

Land and Marine Management

This analysis tiers from the Phase III ERP/PEIS, Section 6.8.4.3.4, Land and Marine Management. The Final Phase III ERP/PEIS found that when analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 4 would not contribute substantially to short-term or long-term cumulative adverse impacts to land and marine management. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to land and marine management in the Gulf Coast region because of the potential for synergistic effects of Alternative 4 project types with these other environmental stewardship and restoration activities from the alignment of management goals and assistance provided to management and staff to best manage properties from restoration, conservation and recovery efforts. The Shell Belt and Coden Belt Roads Living Shoreline Project is anticipated to fall within the expected range of the Final Phase III ERP/PEIS cumulative impacts analysis.

As described in Section 11.2.5.3.3, the Shell Belt and Coden Belt Roads Living Shoreline Project is anticipated to have a minor, short-term adverse impact on land and marine management, lasting during construction activities, with all applicable laws and regulations regarding coastal zone management being adhered to and minimizing potential impacts. There would be a potential long-term beneficial impact to adjacent public lands by reducing shoreline erosion landward of the reef structure. The Marsh Islands project would be expected to result in similar short-term minor adverse impacts, but due to their

localized nature, would not contribute to cumulative impacts when combined with the Shell Belt and Coden Belt Roads Living Shoreline Project. Long-term benefits from both projects would occur.

Based on these findings, the Shell Belt and Coden Belt Roads Living Shoreline Project is not expected to contribute significantly to adverse cumulative impacts to land and marine management.

Aesthetics and Visual Resources

This analysis tiers from the Phase III ERP/PEIS, Section 6.8.4.3.8, Aesthetics and Visual Resources. The Final Phase III ERP/PEIS found that when analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 4 would not contribute substantially to short-term or long-term cumulative adverse impacts to aesthetics and visual resources. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to aesthetics and visual resources in the Gulf Coast region because of the potential for synergistic effects of Alternative 4 project types with these other environmental stewardship and restoration activities. The Shell Belt and Coden Belt Roads Living Shoreline Project is anticipated to fall within the expected range of the Final Phase III ERP/PEIS cumulative impacts analysis.

As described in Section 11.2.5.3.4, the Shell Belt and Coden Belt Roads Living Shoreline Project could result in a minor, long-term impact on aesthetic and visual resources, from the placement of navigational signage. When taken into consideration with Marsh Island project, the minor, long-term adverse visual impact is of both projects would be minor and localized.

Based on these findings, the Shell Belt and Coden Belt Roads Living Shoreline Project is not expected to contribute significantly to adverse cumulative impacts to aesthetics and visual resources.

Tourism and Recreational Use

This analysis tiers from the Phase III ERP/PEIS, Section 6.8.4.3.5, Tourism and Recreational Use. The Final Phase III ERP/PEIS found that when analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 4 would not contribute substantially to short-term or long-term cumulative adverse impacts to tourism and recreational use. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to tourism and recreational use in the Gulf Coast region because of the potential for synergistic effects of Alternative 4 project types with these other environmental stewardship and restoration activities. The Shell Belt and Coden Belt Roads Living Shoreline Project is anticipated to fall within the expected range of the Final Phase III ERP/PEIS cumulative impacts analysis.

As described in Section 11.2.5.3.5, the Shell Belt and Coden Belt Roads Living Shoreline Project is anticipated to have a minor short term, adverse impact to recreational use of the area during construction since the area would be avoided by recreational boaters. The action would result in a beneficial impact due to increased use of created reef for fishing due to the expected use of the reef by recreationally important fish such as speckled trout and red drum. Any closures to recreational use from the Marsh Islands project would be localized, and would not interact with any potential closures from

the Shell Belt and Coden Belt Roads Living Shoreline project. Long-term beneficial cumulative impacts are anticipated to recreational use in the area after both projects are completed.

Based on these findings, the Shell Belt and Coden Belt Roads Living Shoreline Project is not expected to contribute significantly to adverse cumulative impacts to tourism and recreational use.

11.2.6.2 Potential Cumulative Impacts When Evaluated with Other Phase III and Proposed Phase IV Projects

Due to the minor, local and temporary impacts from the project, the Shell Belt and Coden Belt Roads Living Shoreline Project is not anticipated to contribute to potential adverse cumulative impacts in combination with other Phase IV projects. In terms of location, the closest Phase IV proposed project to the Shell Belt and Coden Belt Roads Living Shoreline Project is the Point aux Pins Living Shoreline Project. That project consists of creating a living shoreline to reduce shoreline erosion. Cumulatively, these two projects would produce minor, short-term adverse environmental impacts from disturbance to natural and human resources (water quality, geology and substrates, coastal and marine resources, noise, tourism and recreation, and visual and aesthetics). Both of these efforts would contribute to beneficial impacts through the reduction in shoreline erosion, protection of water resources from breakwaters, and habitat enhancement. Phase III projects in the vicinity of the Shell Belt and Coden Belt Roads Living Shoreline Project include the Swift Tract Living Shoreline Project and the Alabama Oyster Cultch Project. The Swift Track Living Shorelines project will employ living shoreline techniques that utilize natural and/or artificial breakwater material to stabilize shorelines along an area in the eastern portion of Bon Secour Bay, Alabama. Cumulatively, these two projects would not produce adverse environmental impacts in the short-term as construction activities would not be expected to occur at the same time. Further, the Swift Tract site is approximately 25 miles from the Shell Belt and Coden Belt Roads Living Shoreline Project site, and is geographically disconnected from each other for contribution to adverse impacts. Both projects would contribute to beneficial impacts through the reduction in shoreline erosion, protection of water resources from breakwaters, and habitat enhancement in the general area. The Alabama Oyster Cultch Project would enhance and improve the oyster populations in the estuarine waters of Alabama by placing approximately 30,000 – 40,000 cubic yards of suitable oyster shell cultch over approximately 319 acres of subtidal habitat in Mobile County, Alabama. The construction of this project would not occur at the same time as the Shell Belt and Coden Belt Roads Living Shoreline Project and is not expected to have short-term cumulative impacts. Long-term, both projects would enhance habitat in the area, resulting in beneficial impacts.

The Shell Belt and Coden Belt Roads Living Shoreline Project would not contribute adverse cumulative impacts when added to past, present or reasonably foreseeable future actions.

11.2.7 Summary and Next Steps

The proposed Shell Belt and Coden Belt Roads Living Shoreline project would increase benthic productivity and protect planted native marsh vegetation. The project is consistent with Alternative 4 (Preferred Alternative) of the Final Phase III ERP/EIS. Draft NEPA analysis of the environmental consequences suggests that while minor adverse impacts to some resource categories, no moderate to

major adverse impacts are anticipated to result. The project would provide long-term benefits by creating habitat and protecting shorelines. The Trustees have started coordination and reviews under the Endangered Species Act, the Magnuson-Stevens Fishery and Conservation Act, the National Historic Preservation Act, the Marine Mammal Protection Act, the Bald and Golden Eagle Protection Act, Coastal Zone Management Act, and other federal statutes. The Trustees will consider public comment and information relevant to environmental concerns bearing on the proposed actions or their impacts. The final determination on this project will be included in the final Phase IV ERP/EA and Finding of No Significant Impact, if applicable.

11.3 References

Alabama Department of Conservation and Natural Resources. 2010. The Diamondback Terrapin in Alabama: Causes for Decline and Strategy for Recovery. Final Performance Report for SWG Grant Number: T-3-03.

Alabama Historical Commission. 2013a. The Alabama Register of Landmarks and Heritage. Accessed online at: http://preserveala.org/pdfs/AR/AL_Register_of_Landmarks_and_Heritage_List_June2013.pdf

Alabama Historical Commission. 2013b. Alabama Properties Listed on the National Register of Historic Places. Accessed online at: http://preserveala.org/pdfs/NR/NR_Properties_AL.pdf

Austin, G.B., 1954. On the Circulation and Tidal Flushing of Mobile Bay, Alabama. College Station, Texas: Texas A&M University, Department of Geography Technical Report No. 12 OCS No. 65, 22p.

Britton, A. 1999. "*Alligator mississippiensis* in the Crocodilians, natural History and Conservation". Accessed online at: http://www.flmnh.ufl.edu/cnhc/csp_amis.htm

Council on Environmental Quality. 2014. Revised Draft Guidance on the Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews https://www.whitehouse.gov/sites/default/files/docs/nepa_revised_draft_ghg_guidance_searchable.pdf, Last Accessed March 25, 2015

Council on Environmental Quality. 2014a. Final Guidance for Effective Use of Programmatic NEPA Reviews. December 18, 2014. Accessed online at: https://www.whitehouse.gov/sites/default/files/docs/effective_use_of_programmatic_nepa_reviews_final_dec2014_searchable.pdf

Dalrymple, D.J. 2013. Effects of ontogeny on nitrogen sequestration and removal capacity of oysters. Master's Thesis University of South Alabama. Mobile, Alabama.

Defenders of Wildlife. 2011. Fact Sheet: Diamondback Terrapins. Accessed online at: http://www.defenders.org/diamondback-terrapin/basic-facts

Department of the Navy. 1986. Draft Environmental Impact Statement, United States Navy Gulf Coast Strategic Homeporting. Appendix V, Mobile, Alabama.

Dow Piniak W. E., Eckert, S. A., Harms, C. A. and Stringer, E. M. 2012. Underwater hearing sensitivity of the leatherback sea turtle (*Dermochelys coriacea*): Assessing the potential effect of anthropogenic noise. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Headquarters, Herndon, VA. OCS Study BOEM 2012-01156. 35pp.

eBird. 2015. An online database [web application]. eBird, Ithaca, New York. Accessed online at: http://www.ebird.org.

Ellis, J. et al., 2008. Final Report: Land-Use and Land-Cover Change from 1974-2008 around Mobile Bay, AL. NASA, MS & MBNEP, AL.

Florida Fish and Wildlife Conservation Commission. 2007. Florida Manatee Management Plan (*Trichechus manatus latirostris*). Accessed online at: http://myfwc.com/media/214332/manatee_mgmt_plan.pdf

Jenkins, S.O. 2013. Letter to Denise A. Walker, NOAA Senior Attorney, from Steve O. Jenkins, Chief Field Operations Division ADEM. Re: State of Alabama Coastal Consistency Determination Phase III Early Restoration Actions for the Deepwater Horizon Oil Spill as described in the Draft Programmatic and Phase III Early Restoration Plan & Draft Early Restoration Programmatic Environmental Impact Statement, 1. Swift Tract, 2. Gulf State Park Enhancement, and 3. Oyster Cultch Restoration (Mobile County, AL). ADEM-2014-067-NRDA. December 31.

Lynam, C.P., Gibbons, M.J., Axelsen, B.E., Sparks, C.A.J., Coetzee, J., Heywood, B.G., Brierley, A.S., 2006. Jellyfish overtake fish in a heavily fished ecosystem. Current Biology 16, R492 R493. Accessed online at: https://www.st-andrews.ac.uk/~perg/Lynam_et_al_Current_Biology_16_2006.pdf

McPhearson, B.F. 1970. The Hydrography of Mobile Bay and Mississippi Sound, Alabama, Marine Scientific Journal, No. 1, Vol. 2, p83.

Mettee, M. F., P. E. O'Neil, and S. J. Rider. 2009. Paddlefish movements in the lower Mobile River Basin, Alabama. Pages 66-81 in C. P. Paukert and G. D. Scholten, editors. Paddlefish management, propagation, and conservation in the 21st century: building from 20 years of research and management. American Fisheries Society, Symposium 66, Bethesda, MD.

Mobile Bay National Estuary Program. 2008. State of Mobile Bay: A Status Report on Alabama's Coastline from the Delta to our Coastal Waters. MBNEP, Mobile, Alabama.

Multi-Resolution Land Characteristics Consortium. 2015. Consortium viewer based on the National Land Cover Database 2011. Accessed online at: http://www.mrlc.gov/finddata.php

National Estuarine Research Reserve System (NERR). 2009. Animal Life and Endangered Species, NERRS, Week's Bay. Accessed online at: http://nerrs.noaa.gov/NERRSReserve.aspx?ID=238&ResID=WKB.

National Marine Fisheries Service. 2015. Essential Fish Habitat (EFH) Mapper. Accessed online at: http://www.habitat.noaa.gov/protection/efh/efhmapper/

National Marine Fisheries Service. 2013a. NOAA Fisheries Office of Protected Resources. Gulf Sturgeon (*Acipenser oxyrinchus desotoi*). Accessed online at: http://www.nmfs.noaa.gov/pr/species/fish/gulfsturgeon.htm.

National Marine Fisheries Service. 2013b. Sea Turtles. Accessed online at: http://www.nmfs.noaa.gov/pr/species/turtles/.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life. Accessed online at: http://www.natureserve.org/explorer.

New York State Department of Environmental Conservation. 2015. The Ecological Importanec of Natural Shorelines and Proper Shorelines Stabilization. Accessed online at: http://www.dec.ny.gov/permits/50534.html

NOAA National Marine Fisheries Service. 2006. Sea Turtle and Smalltoothed Sawfish Construction Conditions. Accessed online at: http://sero.nmfs.noaa.gov/protected_resources/section_7/guidance_docs/documents/sea_turtle_and_smalltooth_sawfish_construction_conditions_3-23-06.pdf.

Northern Economics. 2014. Assessment of the Value of Shellfish Aquaculture in the Gulf of Mexico as

Habitat for Commercial and Recreational Fish Species. Accessed online at: http://www.auburn.edu/~wcw0003/files/final-report-3_25_14.pdf

Oyster Technical Task Force. 2012. The Oyster Fishery of the Gulf of Mexico, United States: A Regional Management Plan. Gulf States Marine Fisheries Commission, Ocean Springs, MS.

Riedel, R. H. Perry, L. Hartman and S. Heath. 2010. Population Trends of Demersal Species from Inshore Waters of Mississippi and Alabama. Final Report to the Mississippi-Alabama Sea Grant Consortium, 89 pp.

Ross, C. 1989. Crocodiles and Alligators. New York, New York: Facts on File, Inc.

Savannah River Ecology Laboratory. 2015. Eastern Indigo Snake 'Drymarchon couperi'. Accessed online at: http://srelherp.uga.edu/snakes/drycou.htm

Savannah River Ecology Laboratory. 2012. American Alligator, Fact Sheet. Accessed online at: http://srelherp.uga.edu/alligators/allmis.htm

Schechter, B. and R. Street. 2000. "*Alligator mississippiensis*." Accessed online at: http://animaldiversity.org/accounts/Alligator_mississippiensis/.

Soil Survey Staff. Web Soil Survey. 2015. Natural Resources Conservation Service, United States Department of Agriculture. Accessed online at: http://websoilsurvey.nrcs.usda.gov/.

Stein, B. A. 2002. States of the Union: ranking America's biodiversity. Arlington: NatureServe. Accessed online at: http://www.natureserve.org/library/stateofunions.pdf

Stout, J.P., et al. 1982. An Inventory of Land Use Within the Mobile-Tensaw River Delta, 1981-1982.

Swingle, H. 1971. Biology of Alabama Estuarine Areas-Cooperative Gulf of Mexico Estuarine Inventory. Alabama Marine Resources Bulletin 5:1-123.

Texas Parks and Wildlife Department. 2015. Trans-Gulf Migrants. Accessed online at: https://tpwd.texas.gov/huntwild/wild/birding/migration/transgulf_migrants/

Thayer, G.W., W.J. Kenworthy, and M.S. Fonseca. 1984. The ecology of eelgrass meadows of the Atlantic coast: a community profile. FWS/OBS-84/02. U.S. Fish and Wildlife Service, Washington, D.C. 147 pp.

U.S. Army Corps of Engineers. 1985. Long Range Plan for Disposal of Dredged Material from the Upper Mobile Harbor, Alabama. COE, Mobile District.

U.S. Environmental Protection Agency. 2015. The Green Book Nonattainment Areas for Criteria Pollutants. http://www.epa.gov/airquality/greenbook/, Last accessed March 25 2015.

U.S. Environmental Protection Agency. 2012. Watershed Assessment, Tracking & Environmental Results. Accessed online at: http://iaspub.epa.gov/waters10/attains_waterbody.control?p_au_id=AL03170009-0201-200&p_list_id=AL03170009-0201-200&p_cycle=2012#attainments

U.S. Environmental Protection Agency. 2005. The National Coastal Condition Report II. Washington, DC. Accessed online at: http://water.epa.gov/type/oceb/2005_downloads.cfm

U.S. Fish and Wildlife Service. 2011. Standard Manatee and Marine Turtle Construction Conditions for In-Water Work. Updated, July 2011.

U.S. Fish and Wildlife Service. 2010. Florida Manatee Recovery Plan (*Trichechus manatus latirostris*) Third Revision. U.S. Fish and Wildlife Service Southeast Region.

Valentine, J.F., Kirsch, K.D., and Blackmon, D.C. 2006. An Analysis of the Long Term Fisheries Assessment and Monitoring Program Data Set Collected by the Marine Resources Division of the Alabama Department of Conservation and Natural Resources. A Final Report to the Mobile Bay National Estuary Program, contract CIAP AL-15-01. Mobile, AL.

Vittor, B.A. and Associates. 2009. Submerged Aquatic Vegetation Mapping in Mobile Bay and Adjacent Waters of Coastal Alabama in 2008 and 2009. A report to the Mobile Bay National Estuary Program. Mobile, Alabama.

Vittor, B. A. and Associates. 1982. Benthic Macroinfauna Community Characterizations in Mississippi Sound and Adjacent Waters. Contract Report to U. S. Army Corps of Engineers, Mobile District, Mobile, Alabama.

Withers, K. 2002. Shorebird Use of Coastal Wetland and Barrier Island Habitat in the Gulf of Mexico. Scientific World Journal 2:514-536. Accessed online at: http://downloads.hindawi.com/journals/tswj/2002/154026.pdf