

Draft Environmental Assessment for Back Bay Living Shoreline to Enhance Community and Military Coasts

Unique ID (EAXX-007-57-UAF-1736258665)

KEESLER AIR FORCE BASE BILOXI, MISSISSIPPI



PREPARED BY:

Department of the Air Force

TBD 2025

This Draft [Environmental Impact Statement (EIS)/Environmental Assessment (EA)] has been provided for public comment in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality NEPA Implementing Regulations (Title 40 Code of Federal Regulations [CFR] §§ 1500–1508), and 32 CFR § 989, Environmental Impact Analysis Process (EIAP), which provides an opportunity for public input on United States Department of the Air Force (DAF) decision-making, allows the public to offer input on alternative ways for DAF to accomplish what it is proposing, and solicits comments on DAF’s analysis of environmental effects.

Public input allows DAF to make better-informed decisions. Letters or other written or verbal comments provided may be published in this [EIS/EA]. Providing personal information is voluntary. Private addresses will be compiled to develop a stakeholders inventory. However, only the names of the individuals making comments and specific comments will be disclosed. Personal information, home addresses, telephone numbers, and email addresses will not be published in this [EIS/EA].

Section 508 of the Rehabilitation Act of 1973:

The digital version of this [EIS/EA] and its project website are compliant with Section 508 of the Rehabilitation Act of 1973 because assistive technology (e.g., “screen readers”) can be used to help the disabled to understand these electronic media. Due to the nature of graphics, figures, tables, and images occurring in the document, accessibility may be limited to a descriptive title for each item.

This page intentionally left blank.

**Draft Environmental Assessment for the
Construction of Living Shoreline**

**Keesler Air Force Base
Biloxi, Mississippi**

Unique ID (EAXX-007-57-UAF-1736258665)

Responsible Agencies: Department of the Air Force, Air Education and Training Command, 81st Training Wing, Keesler Air Force Base (AFB), Mississippi

Affected Location: Biloxi Veterans Administration Medical Center, City of Biloxi Hiller Park, Keesler AFB, Harrison County, Mississippi,

Proposed Action: Construction of Living Shoreline to Enhance Community and Military Coasts

Report Designation: Environmental Assessment

Responsible Agency: Department of the Air Force

Keesler AFB Point of Contact: David Randolph, Keesler AFB, MS 39534;
david.randolph.6.ctr@us.af.mil

Abstract: The Department of the Air Force (DAF) has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act, as implemented by the Council on Environmental Quality Regulations and Air Force regulations for implementing National Environmental Policy Act. The Proposed Action would construct a living shoreline along the southern shoreline of Biloxi's Back Bay, shared by Keesler Air Force Base, Biloxi Veterans Administration Medical Center, and City of Biloxi's Hiller Park, thereby improving water quality, increasing installation resilience, protecting existing infrastructure, and providing more diverse habitat. This EA evaluates the potential environmental effects associated with the Proposed Action and No Action alternatives to the following resource areas: land use and visual resources, airspace and airfield operations, air quality, noise, earth resources, water resources, biological resources, cultural resources, hazardous materials and wastes, utilities, transportation and traffic, and safety and occupational health.

Date by which comments must be received: April 30, 2025

This page intentionally left blank.

Contents

| | |
|---|----|
| 1. Purpose of and Need for Action..... | 1 |
| 1.1. Introduction..... | 1 |
| 1.2. Purpose of Action..... | 4 |
| 1.3. Need for Action..... | 4 |
| 1.4. Interagency / Intergovernmental Coordination and Consultations..... | 5 |
| 1.5. Public Participation..... | 5 |
| 2. Alternatives Including the Proposed Action..... | 8 |
| 2.1. Proposed Action | 8 |
| 2.2. No Action Alternative..... | 12 |
| 2.3. Alternative 1: Bulkhead | 12 |
| 2.4. Alternative 2: Riprap Revetment | 12 |
| 2.5. Alternatives Eliminated..... | 12 |
| 2.6. Permits, Licenses and Other Authorizations..... | 13 |
| 2.7. Comparison of Environmental Consequences & Mitigations by Alternative..... | 13 |
| 3. Affected Environment and Environmental Consequences..... | 17 |
| 3.1. Introduction..... | 17 |
| 3.1.1. Resources Not Carried Forward for Detailed Analysis..... | 17 |
| 3.1.2. Past, Present, Reasonably Foreseeable Future Actions Considered..... | 20 |
| 3.2. Air Installation Compatible Use Zone/Land Use | 20 |
| 3.2.1. Affected Environment..... | 22 |
| 3.2.2. Environmental Consequences..... | 23 |
| 3.2.2.1. Proposed Action..... | 23 |
| 3.2.2.2. Proposed Action Alternative(s) | 24 |
| 3.2.2.3. No Action Alternative..... | 24 |
| 3.2.2.4. Cumulative Effects..... | 24 |
| 3.2.2.5. Mitigation..... | 24 |
| 3.3. Air Quality | 25 |
| 3.3.1. Affected Environment..... | 26 |
| 3.3.2. Environmental Consequences..... | 26 |
| 3.3.2.1. Proposed Action..... | 26 |
| 3.3.2.2. Proposed Action Alternative(s) | 27 |
| 3.3.2.3. No Action Alternative..... | 27 |
| 3.3.2.4. Cumulative Effects..... | 27 |
| 3.3.2.5. Mitigation..... | 27 |
| 3.4. Water Resources | 27 |
| 3.4.1. Affected Environment..... | 29 |
| 3.4.2. Environmental Consequences..... | 31 |
| 3.4.2.1. Proposed Action..... | 31 |
| 3.4.2.2. Proposed Action Alternative(s) | 33 |
| 3.4.2.3. No Action Alternative..... | 33 |
| 3.4.2.4. Cumulative Effects..... | 33 |
| 3.4.2.5. Mitigation..... | 33 |
| 3.5. Hazardous Materials/Waste..... | 33 |
| 3.5.1. Affected Environment..... | 34 |
| 3.5.2. Environmental Consequences..... | 35 |
| 3.5.2.1. Proposed Action..... | 35 |
| 3.5.2.2. Proposed Action Alternative(s) | 35 |
| 3.5.2.3. No Action Alternative..... | 36 |
| 3.5.2.4. Cumulative Effects..... | 36 |

| | |
|---|----|
| 3.5.2.5. Mitigation..... | 36 |
| 3.6. Biological Resources | 36 |
| 3.6.1. Affected Environment..... | 36 |
| 3.6.2. Environmental Consequences..... | 44 |
| 3.6.2.1. Proposed Action..... | 44 |
| 3.6.2.2. Proposed Action Alternative(s) | 49 |
| 3.6.2.3. No Action Alternative..... | 49 |
| 3.6.2.4. Cumulative Effects..... | 49 |
| 3.6.2.5. Mitigation..... | 49 |
| 3.7. Cultural Resources | 50 |
| 3.7.1. Affected Environment..... | 50 |
| 3.7.2. Environmental Consequences..... | 51 |
| 3.7.2.1. Proposed Action..... | 51 |
| 3.7.2.2. Proposed Action Alternative(s) | 51 |
| 3.7.2.3. No Action Alternative..... | 51 |
| 3.7.2.4. Cumulative Effects..... | 51 |
| 3.7.2.5. Mitigation..... | 51 |
| 3.8. Geological Resources | 52 |
| 3.8.1. Affected Environment..... | 52 |
| 3.8.2. Environmental Consequences..... | 52 |
| 3.8.2.1. Proposed Action..... | 54 |
| 3.8.2.2. Proposed Action Alternative(s) | 54 |
| 3.8.2.3. No Action Alternative..... | 55 |
| 3.8.2.4. Cumulative Effects..... | 55 |
| 3.8.2.5. Mitigation..... | 55 |

Tables & Figures

| | |
|--|----|
| Figure 1 1 Keesler AFB, Biloxi VAMC, and Hiller Park..... | 2 |
| Figure 1 2 Keesler AFB Historical Shoreline Erosion..... | 4 |
| Figure 2-1 Proposed Segmented Breakwaters..... | 8 |
| Figure 2-2 Proposed Breakwaters and Marsh Vegetation..... | 9 |
| Figure 2-3 Proposed Project Phases..... | 10 |
| Figure 2-4 Hiller Park Proposed Living Shoreline..... | 11 |
| Figure 3-1 BASH Relevancy Area..... | 22 |
| Figure 3-2 Existing Land Use Types at Keesler AFB..... | 23 |
| Figure 3-3 Proposed Action Area and FEMA Flood Zones..... | 30 |
| Figure 3-4 Wetland Resources at the Proposed Action Area..... | 31 |
| Figure 3-5 Soil Units at the Proposed Alternative Sites..... | 54 |
| | |
| Table 2-1 Permits, Licenses, and Other Authorizations..... | 13 |
| Table 2-2 Comparison of Environmental Consequences and Mitigations by Alternative..... | 13 |
| Table 3-1 Resources Not Carried Forward for Detailed Analysis..... | 18 |
| Table 3-2 Federal and State Threatened/Endangered Species List..... | 37 |
| Table 3-3 Migratory Birds Potentially Present within Proposed Action Area..... | 41 |

ABBREVIATIONS AND ACRONYMS

| | |
|-----------------|---|
| ACM | Asbestos Containing Materials |
| AFB | Air Force Base |
| AFI | Air Force Instruction |
| AFPD | Air Force Policy Directive |
| AICUZ | Air Installation Compatibility Use Zone |
| BASH | Bird and Wildlife Aircraft Strike Hazard |
| BCC | Bird of Conservation Concern |
| BCR | Bird Conservation Regions |
| BMP | Best Management Practices |
| BMP | Best Management Practices |
| CAA | Clean Air Act |
| CEQ | Council on Environmental Quality |
| CH ₄ | Methane |
| CMP | Coastal Management Programs |
| CO | Carbon Monoxide |
| CWA | Clean Water Act |
| DAF | Department of the Air Force |
| DOD | Department of Defense |
| CZ | Clear Zones |
| EA | Environmental Assessment |
| EIAP | Environmental Impact Analysis Process |
| EIS | Environmental Impact Statement |
| FAA | Federal Aviation Administration |
| FEMA | Federal Emergency Management Agency |
| FONSI | Finding of No Significant Impact |
| FY | Fiscal Year |
| HAFZ | Hazards to Aircraft Flight Zones |
| HWMP | Hazardous Waste Management Plan |
| IICEP | Interagency and Intergovernmental Coordination for Environmental Planning |

| | |
|----------|--|
| INRMP | Integrated Natural Resources Management Plan |
| LBP | Lead Based Paint |
| MDAH | Mississippi Department of Archives and History |
| MDEQ | Mississippi Department of Environmental Quality |
| MDMR | Mississippi Department of Marine Resources |
| MNHP | Mississippi Natural Heritage Program |
| MSAT | Mobile Source Air Toxics |
| MSU CREC | Mississippi State University Coastal Research and Extension Center |
| NAAQS | National Ambient Air Quality Standards |
| NCRF | National Coastal Resilience Fund |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| NO2 | Nitrogen Oxide |
| NOI | Notice of Intent |
| NRHP | National Register of Historic Places |
| NWI | National Wetlands Inventory |
| O3 | Ozone |
| PCB | Polychlorinated Biphenyls |
| POL | Petroleum Oil and Lubricants |
| RCRA | Resource Conservation and Recovery Act |
| SFHA | Special Flood Hazard Areas |
| SIP | State Implementation Plans |
| SO2 | Sulfur Dioxide |
| SPCC | Spill prevention Control and Countermeasures |
| UAS | Unmanned Aircraft System |
| USACE | United States Army Corps of Engineers |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| VA | Veterans Affairs |
| VAC | Veterans Affairs Center |

VAMC Veterans Administrations Medical Center

This page intentionally left blank.

1.0 PURPOSE OF AND NEED FOR ACTION

1.1 Introduction

The Department of the Air Force (DAF) has prepared this Environmental Assessment (EA) to evaluate potential environmental effects associated with the proposed construction of a living shoreline using segmented breakwaters to address coastal erosion along the southern shoreline of the Back Bay of Biloxi shared by Keesler Air Force Base (AFB), the Biloxi Veterans Administration Medical Center (VAMC), and the City of Biloxi's Hiller Park. Satellite imagery shows this shoreline is eroding at approximately 1 ft. per year thought to be driven by a high amount of boat wakes in the nearby channel. In addition to mitigating marsh loss, the shoreline restoration project would increase community resilience in the Back Bay of Biloxi, Mississippi, by protecting existing infrastructure including an active AFB runway from sea-level rise and storm surges.

Keesler AFB

Keesler AFB occupies 1,646 acres within the boundaries of the city of Biloxi, which is located in Harrison County, Mississippi (see Figure 1-1; black polygon). The base is situated on the lower end of the Biloxi Peninsula, which is eight miles long (east-to-west) and one mile wide. A one-half mile wide estuary, called the Back Bay of Biloxi, separates the Biloxi peninsula from the mainland to the north. The installation comprises training, administration and housing facilities, runway and airfield facilities, the Keesler Medical Center, base support, and recreation facilities including a marina and golf course. The shoreline along Keesler AFB has several piers and is characterized by natural marsh elements, small lengths of beach, and some riprap.

Biloxi VAMC

The Biloxi VAMC is a complex of buildings organized in a campus-like setting that occupies more than 100 acres along the southern shore of Back Bay (Figure 1-1; red polygon). The VAMC provides medical care and rehabilitation services to Veterans. The shoreline along the VAMC is made up of mostly natural marsh with scattered beach elements as well as some riprap.

Hiller Park

Hiller Park, the City of Biloxi's largest park, is a 77.87-acre facility along the southern shore of Back Bay that houses numerous outdoor amenities and the department's administrative offices and recreational areas (Figure 1-1; green polygon). The shoreline along the Hiller Park area consists of natural marsh.

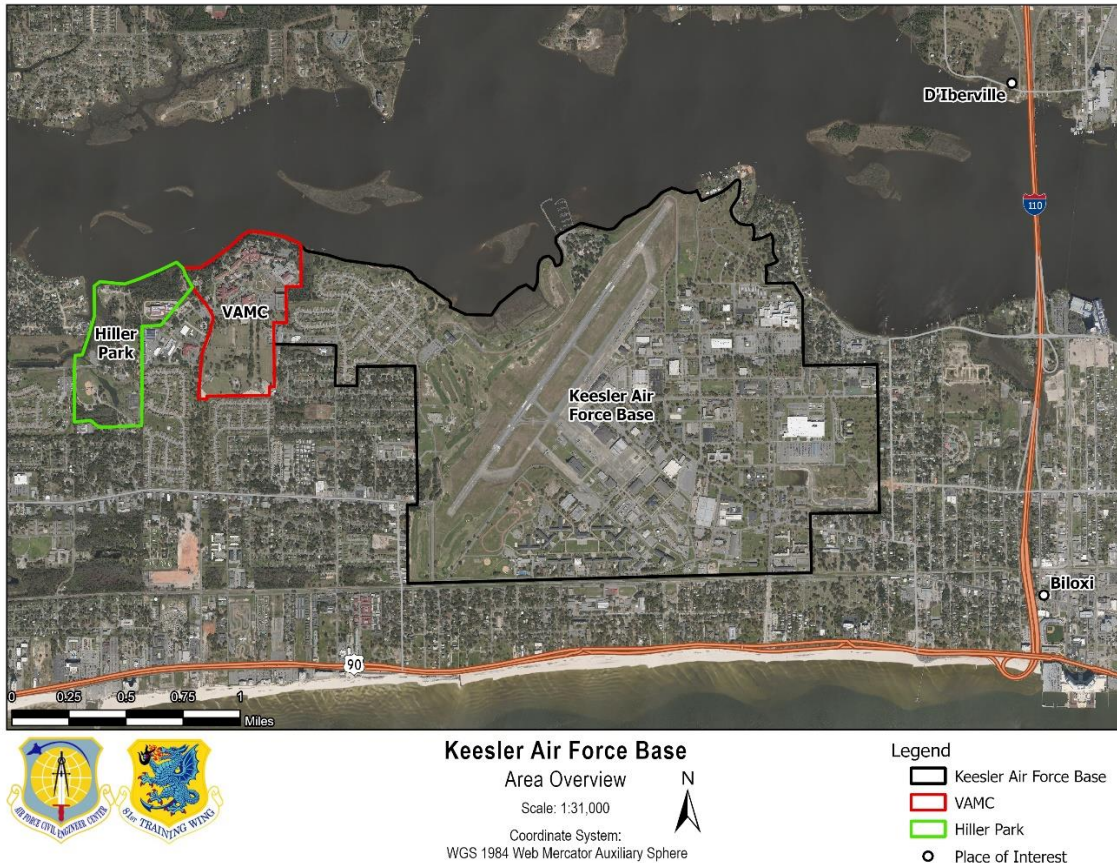


Figure 1-1 Keesler AFB, Biloxi VAMC, and Hiller Park

In 2020, the Environmental Manager at Keesler AFB invited MSU to the base to do a shoreline assessment and help develop a plan for protecting the base's wetlands along the shoreline. Keesler AFB reached out to MSU due to the living shoreline technical assistance programs they provide. A tentative plan for installation of breakwaters along the base shoreline was developed. The National Coastal Resilience Fund (NCRF) opportunity was then released in 2022 and was identified as a potential funder for this work. Additionally, as this project aims to conserve essential fish habitat and address coastal flooding in vicinity of Keesler AFB, it was identified for partnership with the Readiness and Environmental Protection Integration Program (REPI) and funding was approved in 2024. Through discussions with community partners leading up to submission of the NCRF proposal, the neighboring VA Hospital and Hiller Park shorelines were identified as project locations as well. MSU led a submission to this competition, and it was awarded to fund a shoreline protection project along the shoreline of Hiller Park (Phase 1), Biloxi VAMC (Phase 2), and Keesler AFB (Phase 3).

NEPA, as amended, requires federal agencies to consider environmental consequences in the decision-making process. The President's CEQ issued regulations to implement NEPA that include provisions for both the content and procedural aspects of the required environmental

analysis. The DAF EIAP is accomplished through adherence to the procedures set forth in CEQ regulations (40 CFR §§ 1500-1508) and 32 CFR § 989, EIAP. These federal regulations establish the administrative process and substantive scope of the environmental impact evaluation that are designed to ensure that deciding authorities have a proper understanding of the potential environmental consequences of a contemplated course of action.

This EA identifies, describes, and evaluates potential environmental impacts associated with the implementation of the Back Bay (MS) Living Shoreline to Enhance Community and Military Coasts project. This EA includes an analysis of potential environmental impacts associated with the preferred action and alternative. The environmental resources initially evaluated in this EA include: air quality, water resources, geological resources, cultural resources, biological resources, air Installation compatible use zone/land use, visual resources, airspace, hazardous materials and waste, and socioeconomics. Due to the type of project and potential impacts, the EA will only analyze: land use, air quality, hazardous materials/waste, water resources, geological resources, biological resources, cultural resources, health and safety, transportation, and socioeconomic resources. These potential impacts are the only ones to consider when assessing a breakwater-based shoreline protection project given the intent is to reduce wave energy impacting shorelines with no work occurring above the mean high water line. Finally, the EA identifies measures to reduce impacts or best management practices (BMP) to prevent or minimize environmental impacts, if required.

Ultimately, Keesler AFB must decide whether the environmental effects of implementing the Proposed Action would support either a Finding of No Significant Impact (FONSI) or would require publishing in the Federal Register a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS). Keesler AFB will publish an NOI if the potential adverse environmental effects associated with implementing the Proposed Action remain significant even after all reasonable mitigation measures have been implemented.

The DAF has prepared this EA in pursuant to the National Environmental Policy Act of 1969 (NEPA) (Title 42 of the United States Code [USC] §§ 4321–4347); Council on Environmental Quality (CEQ) Final Rule dated July 16, 2020, Update to the Regulations for Implementing the Procedural Provisions of National Environmental Policy Act (Title 40 of the Code of Federal Regulations [CFR] §§ 1500–1508); and the Department of Air Force Environmental Impact Analysis Process (EIAP) (32 CFR § 989). The CEQ Final Rule dated April 20, 2022, National Environmental Policy Act Implementing Regulations Revisions, amends certain provisions of the regulations modified in 2020. Revisions to the 2020 CEQ regulations update went into effect on May 20, 2022. Additionally, in accordance with Executive Orders 11988 & 11990, the DAF is required to avoid activities that may cause adverse impacts to wetlands or floodplains unless these activities cannot be avoided, in which case a Finding of No Practicable Alternative (FONPA) is required. While this project will be constructed entirely in the floodplain, due to its conservative nature, no negative impacts to the floodplain or wetlands are anticipated as detailed in section 3.4.3.

The DAF is aware of the November 12, 2024 decision in *Marin Audubon Society v. Federal Aviation Administration*, No. 23-1067 (D.C. Cir. Nov. 12, 2024). To the extent that a court may conclude that the Council on Environmental Quality (CEQ) regulations implementing NEPA are not judicially enforceable or binding on this agency action, the DAF has nonetheless elected to follow those regulations at 40 CFR Parts 1500– 1508, in addition to the DAF's

procedures/regulations implementing NEPA at 32 CFR 989, to meet the agency's obligations under NEPA, 42 U.S.C. §§ 4321 et seq.

1.2 Purpose of Action

The purpose of the Proposed Action is to implement floodplain stabilization and resilience to: 1) reduce shoreline erosion through the reduction of wave energy along the southern shoreline of the Back Bay of Biloxi shared by Keesler AFB, the Biloxi VAMC, and the City of Biloxi's Hiller Park; 2) conserve and promote the expansion of marshes and associated ecosystem services (e.g., flood protection, water purification, increased biodiversity); and 3) increase community resilience in the Back Bay of Biloxi, Mississippi, by protecting vital infrastructure from sea-level rise and storm surges.

1.3 Need for Action

The proposed Action is needed to address the Back Bay of Biloxi's susceptibility to coastal flooding and to minimize disruptions to Keesler AFB's military mission from storm-related flooding of critical base infrastructure and operational areas. Analysis of satellite imagery of this area shows that marshes are being lost at a rate of nearly 1 ft per year and some areas, particularly Keesler AFB (Figure 1-2), Hiller Park, and the VAMC, only have a narrow band of marsh habitat remaining. Most of this erosion can be attributed to vessel traffic in the nearby boat channel and will be exacerbated with increasing rates of sea-level rise and increased frequency of storms. Predictive modeling points to sea-level rise increasing at a higher rate along the northern Gulf Coast than will occur on average nationwide (Sweet et al. 2022). Improved coastal resiliency and wetland protection are identified needs for both the City of Biloxi and Keesler AFB. Protecting shorelines provides community resilience benefits by reducing shoreline loss during storm events, mitigating flooding that would damage vital infrastructure, and more readily adapting to climate impacts such as sea-level rise. Increased resilience is critical to the City of Biloxi which has a poverty rate above the national average. Additionally, conservation and enhancement of these shorelines provides a fish and wildlife benefit in offering increased habitat and cleaner waters.

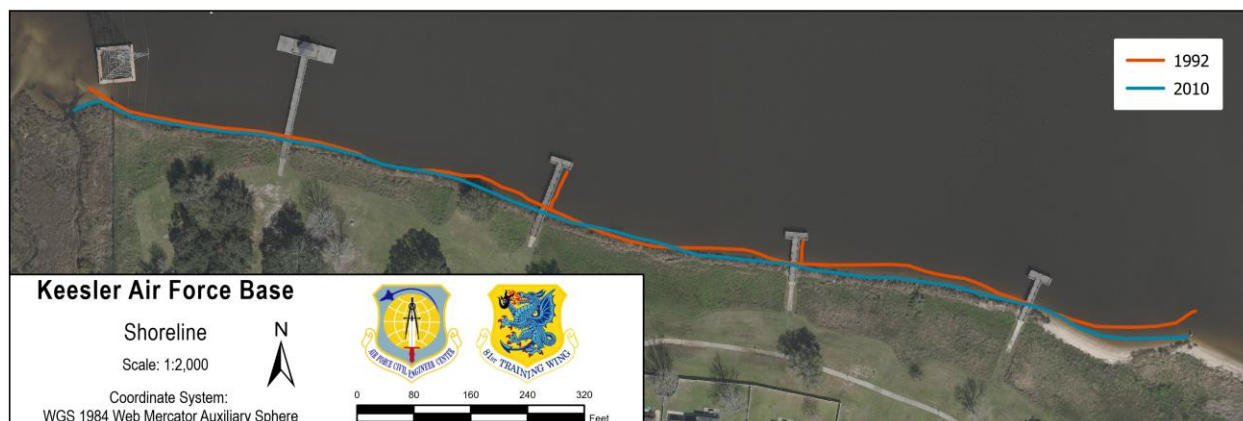


Figure 1-2 Keesler AFB Historical Shoreline Erosion

1.4 Interagency/Intergovernmental Coordination and Consultations

The EIAP, in compliance with NEPA guidance, includes public and agency review of information pertinent to a proposed action and alternatives. The DAF's compliance with the requirement for intergovernmental coordination and agency participation begins with the scoping process (40 CFR § 1501.9). Accordingly, the DAF notified federal, state, and local agencies and tribal governments with jurisdiction that could potentially be affected by the Proposed Action and Alternatives via written correspondence during the development of this EA. A mailing list of the recipients of this correspondence as well as a sample of the outgoing letters and all responses are included in **Appendix B**.

The Intergovernmental Coordination Act (29 CFR § 1902.5) and EO 12372, Intergovernmental Review of Federal Programs, require the proponent of an action to issue intergovernmental notifications before making any detailed statement of environmental effects. Through the process of Interagency and Intergovernmental Coordination for Environmental Planning (IICEP), the proponent must notify concerned federal, state, and local agencies and allow them the time necessary to evaluate potential environmental effects of a proposed action. The proponent is also required to engage in government-to-government consultations with Native American tribes that may be affected by the proposed actions. This consultation process must respect tribal sovereignty and remain in compliance with Executive Order 13175. Through the IICEP process, the DAF has notified the University of Southern Mississippi, Biloxi Veterans Hospital, US Army Corps of Engineers (Mobile District & Biloxi Satellite Office), Mississippi Department of Wildlife Fisheries and Parks, City of Biloxi, Harrison County Utility Authority, Environmental Protection Agency, Southern Mississippi Planning and Development District, Gulf Regional Planning Commission, Harrison County, Mississippi Department of Marine Resources, Tunica-Biloxi Tribe of Louisiana, Mississippi Band of Choctaw Indians, Jena Band of Choctaw Indians, Choctaw Nation of Oklahoma, US Fish and Wildlife Service, and Mississippi Department of Archives and History.

The joint living shoreline general permit application to the MDMR and USACE Mobile District was approved on May 31, 2024 for the Hiller Park portion. To qualify for a living shoreline general permit within the State of Mississippi, there are several conditions that must be met. Some of those are size conditions such as length (not greater than 500 linear ft), width (cannot exceed project footprint more than 30 ft offshore of mean high water), and environmental such as must have planting component and no negative impacts to submerged aquatic vegetation. All of those conditions are met for the Hiller Park portion of this project and as such it is permitted that way. Before issuance of this permit, CZMA consultation was coordinated through the MS Department of Marine Resources. The intent is for the VA and Keesler AFB portions of the project to be permitted in a similar manner, but as an individual permit due to exceedance of the 500ft linear ft limit. All other conditions for the Living Shoreline General Permit should be met though.

1.4 Public Participation

The EIAP, in accordance with NEPA, additionally requires the notification of the public to ensure transparency and to gather input on potential environmental impacts. The DAF satisfies these requirements by way of a 30-day public comment period. A notice of availability is posted to the

DAF website, and the draft EA is made available for comment at the Biloxi Public Library. All comments received from the public during this period are considered and implemented in the final draft, including the DAF's explanations on how the feedback was incorporated or otherwise resolved.

This page intentionally left blank.

2.0 Alternatives Including the Proposed Action

2.1 Proposed Action

Segmented breakwaters and plantings: Given that the data indicates vessel wakes are the cause of excessive erosion at the proposed project site, the most beneficial design was determined to be segmented breakwaters. Other designs considered were a bulkhead, riprap revetment, or no action. A segmented breakwater complex is a structure usually made of rocks or concrete pieces that is placed parallel to the shoreline followed by a gap and another breakwater. The intent of these types of breakwaters is to reduce wave energy while the gaps allow hydrological flow. The proposed breakwaters would be designed with a crest height at least 1.5 ft above mean high water, which would leave them exposed (i.e., above water level) for most of the time and protect sensitive shorelines from the impacts of vessel wakes. Each breakwater for all 3 phases of the project is proposed to be a maximum of 100ft in length x 8ft wide with at least 25ft gaps between breakwaters. Behind the breakwaters, along the shoreline, native grasses would be planted. *Spartina alterniflora* would be planted in the lower elevations with *Juncus roemerianus* in the higher elevations (see Figures 2-1 & 2-2). This action also represents the most environmentally preferable alternative as it best promotes the policies expressed in section 101 of NEPA by maximizing environmental benefits by way of improvements to native wetlands and floodplain protection.



Figure 2-1 Proposed Segmented Breakwaters

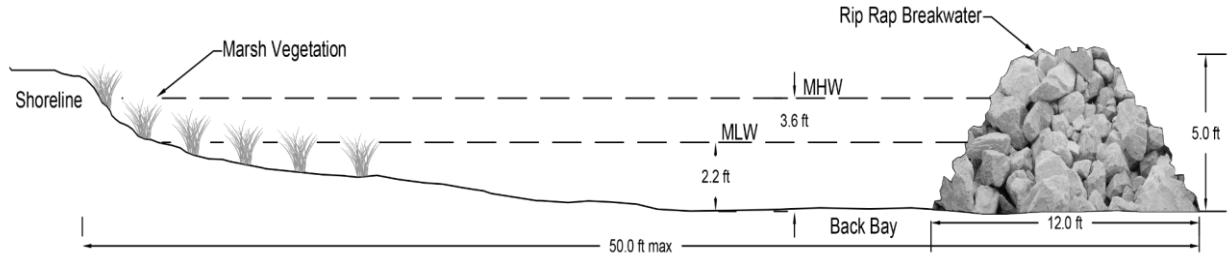


Figure 2-2 Proposed Breakwaters and Marsh Vegetation

Though enhancement of native vegetation along the shoreline is desirable, the creation of wetlands, and other wildlife attractants, would need to be balanced against the potential bird aircraft strike hazard (BASH) issues associated with flightline activities. Only those shoreline areas that would not provide additional BASH dangers are considered for planting. In order to properly assess for BASH and other potential issues, project partners suggested a phased approach so that the project design could be adaptively managed throughout the construction process. As the phases of the project progress, designs may be modified using partner and stakeholder input to account for current and future wildlife (see environmental monitoring section below) and sea level conditions to ensure long-term benefits from the proposed project. The proposed project would occur in three phases (Figure 2-3). Phase 1 would occur in Year 1 (Spring/Summer 2025) and would consist of breakwater construction offshore of the Hiller Park shoreline. Phase 2 would begin in Year 2 (Summer/Fall 2026) and would consist of breakwater construction offshore of the Biloxi VAMC shoreline. In year 3 (Summer/Fall 2027), the final phase (3) would consist of the construction of the remaining breakwaters along the Keesler AFB shoreline.



Figure 2-3 Proposed Project Phases

Approvals/permitting: Approvals from the littoral landowners have been obtained. These landowners include the City of Biloxi, University of Southern Mississippi, Biloxi VAC (Veterans Affairs Center), and Keesler AFB. The joint living shoreline general permit application to the MDMR and USACE Mobile District was approved on May 31, 2024 for the Hiller Park portion (Appendix A). To qualify for a living shoreline general permit within the State of Mississippi, there are several conditions that must be met. Some of those are size conditions such as length (not greater than 500 linear ft), width (cannot exceed project footprint more than 30 ft offshore of mean high water), and environmental such as must have planting component and no negative impacts to submerged aquatic vegetation. All of those conditions are met for the Hiller Park portion of this project and as such it is permitted that way. Before issuance of this permit, CZMA consultation was coordinated through the MS Department of Marine Resources. The intent is for the VA and Keesler AFB portions of the project to be permitted in a similar manner, but as an individual permit due to exceedance of the 500ft linear ft limit. All other conditions for the Living Shoreline General Permit should be met though. It is anticipated that the permit application for the VA and Keesler AFB portions of the project will be submitted by May 2025.

Phase 1. Hiller Park: The living shoreline design has been completed for Hiller Park. Five segmented rip-rap breakwaters will be placed along the shoreline. Each breakwater will be 100 ft long x 8 ft wide (Figure 2-4). The crest height of these breakwaters will be 3.5ft high (about 1 ft about mean high water). Each breakwater will be made up of 71 cubic yards of riprap for a total of 365 cubic yards of riprap among the five breakwaters. 25 ft gaps will be

between each breakwater. The breakwaters will be placed no more than 30 feet waterward of the mean high water ([MHW]; 0.25m NAVD88).

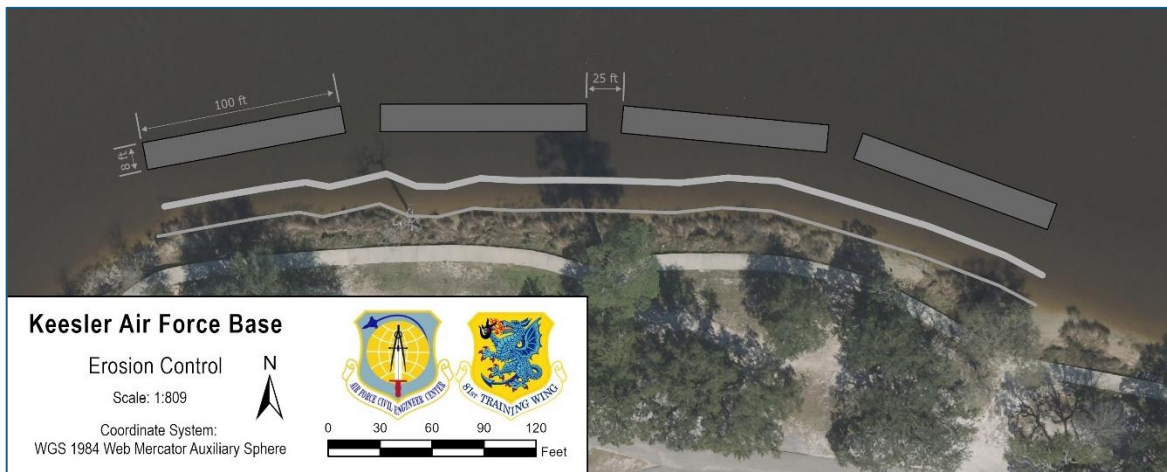


Figure 2-4 Hiller Park Proposed Living Shoreline

Phases 2 (VA) and 3 (Keesler AFB): Proposed actions in these phases will be similar to Phase 1 with the exception of no planting along the shoreline in Phases 2 and 3. Breakwaters complexes in Phases 2 and 3 will be longer and consist of more breakwaters (Figure 2-1 and Figure 2-3), but each breakwater will be constructed with the same dimensions and gaps and at a similar distance offshore.

Environmental monitoring: Monitoring will occur 6 months prior to construction, during construction phases, and at least 12 months post-construction in all phases to assess the effectiveness of these approaches at mitigating erosion and providing broader ecosystem benefits. Given the phased approach described in the construction section above, Phase 1 construction will be monitored for 6 months prior to construction, during construction, and for 3 years post-construction. Phase 2 will be monitored for at least 1 year pre-construction, during construction, and for at least 2 years post-construction. Finally, Phase 3 will have at least 2 years of pre-monitoring and 1 year post-monitoring to assess impacts. One of the suggested reasons for the phased construction approach was to build and observe living shorelines' potential to attract birds along the non-AFB portions of the project to ensure there is no increased risk of bird strikes at the AFB.

Based on information provided by the AFB and literature reviews, the potential for increased bird strikes is extremely low, but the phased approach would allow the team to assess this factor in Phases 1 and 2 of the proposed project before construction along the AFB shoreline. The primary bird species of concern at Keesler AFB for bird strikes based on previous base-specific information does not include many of the same bird species that are associated with shoreline habitats. Shoreline associated birds are typically wade feeders and low altitude flyers (Greenberg et al., 2014). Additionally, the proposed action isn't near the end of the Keesler AFB runway. Gathering monitoring information specific to bird usage would increase the transferability of results, approaches, and lessons-learned to other military operations.

The monitoring approach will be consistent across all 4 years of the proposed project and would occur bimonthly. One portion of the monitoring program would consist of game cameras staked along construction and control shorelines to monitor baseline wildlife (targeting birds) activity and post-construction activity. Additionally, the non-AFB portions of the shoreline would be mapped with a high-resolution camera (1 cm per pixel at 40m altitude) mounted to a UAS (Unmanned Aircraft System). This timeline of geo-referenced imagery would be used to assess the stability of structures, wildlife use, shoreline position (erosion or accretion), and marsh vegetation dynamics (expansion or reduction). Additional field-based monitoring would occur at these locations to measure changes in shoreline slope, erosion, nekton abundance and diversity, wildlife abundance and diversity, vegetation coverage and diversity, and wave energy using peer-reviewed methods.

2.2 No Action Alternative

Under the No Action Alternative, the proposed living shoreline would not be implemented, and the project site would continue to experience shoreline erosion at a rate of 1 foot per year exacerbated by the frequency and intensity of future storm events. This alternative does not meet the purpose and need of the Proposed Action. The No Action Alternative is carried forward for analysis in the EA to provide a comparison of baseline conditions to the Proposed Action, as required by the CEQ NEPA implementing regulations.

2.3 Alternative 1: Bulkhead creation

Hardening the shoreline with a bulkhead would help to prevent future erosion and loss of property. However, wave energy from the boat channel through the project site would lead to eventual bulkhead failure over time. Bulkheads are also less resilient to storms than living shorelines. Bulkheads prevent natural marsh migration and can lead to seaward erosion. The bulkhead would also negatively impact wildlife by eliminating potential habitat. In addition, bulkhead construction would entail removal of wetland vegetation that stabilizes the soil. This alternative would, therefore, not be a feasible long-term solution for this project and was eliminated from further consideration as it would not accomplish the purpose and need described for the Proposed Action.

2.4 Alternative 2: Riprap Revetment

In order to minimize loss of sediment fill, riprap could be installed along the shoreline. This approach, however, would eliminate shallow water habitat. It would also interrupt the natural functions of the shoreline like limiting habitat and filtering pollution. Riprap revetments are costly and are also susceptible to displacement and deterioration. They require special inspections after high water events and need maintenance to replace deteriorated rock as needed. Riprap revetments do not provide a feasible and nature friendly solution to the project. Consequently, this alternative was eliminated from further consideration as it would not accomplish the purpose and need described for the Proposed Action.

2.5 Alternatives eliminated

The No Action, Alternative 1: Bulkhead creation, and Alternative 2: Riprap Revetment were eliminated from consideration based on the reasons described in the subsections above. The Proposed Action of segmented breakwaters was deemed to have the most positive effects and lowest negative effects.

2.6 Permits, Licenses, and Other Authorizations

Table 2-1 Permits, Licenses, and Other Authorizations

| Permit, license, or other authorization | Date acquired or estimated application date |
|---|---|
| Joint Living Shoreline General Permit from MS Department of Marine Resources and US Army Corps of Engineers Permit for Phase 1. Obtaining this permit includes CZMA and Section 404 compliance. | Permit acquired in May 2024 |
| Joint Individual Permit from MS Department of Marine Resources and US Army Corps of Engineers Permit for Phases 2 and 3. Obtaining this permit includes CZMA and Section 404 compliance. | Preapplication meeting held. Anticipate submitting permit application in May 2025 |

2.7 Comparison of Environmental Consequences and Mitigations by Alternative

Table 2-2 Comparison of Environmental Consequences and Mitigations by Alternative

| Alternative | Environmental Consequences and Mitigations |
|---|---|
| Proposed Action: segmented breakwater - | Under the Proposed Action scenario, shoreline erosion could be reduced and shoreline wetland habitats conserved through construction of a segmented breakwater. A segmented breakwater complex is a structure usually made of rocks or concrete pieces that is placed parallel to the shoreline followed by a gap and another breakwater. The intent of these types of breakwaters is to reduce wave energy while the gaps allow hydrological flow. The overall effect of this action could be positive with conservation of existing wetlands contributing to enhancements in biological and water resources and contributing to the protection of shoreline infrastructure over time. During construction, there is potential for some temporary negative environmental effects, such as carbon emissions, potential low quantity fuel/oil contamination, and noise from construction equipment. However, best management practices will be implemented by the contracted construction team, such as efficient transport of materials, use of floating booms and cleanup protocols if |

a fuel/oil contamination event occurs, and on-site operation during daylight hours.

Proposed
Alternative Action
1: bulkhead

Under the Proposed Action Alternative Bulkhead scenario, shoreline erosion could be temporarily reduced but with long-lasting environmental consequences. A bulkhead is a vertical wall constructed near the mean high water line and often backfilled with sediment. The intent of bulkheads are to reduce shoreline erosion. The overall effect of this action could be positive for shoreline and infrastructure protection in the short-term, but negative for the environment in the long-term. Bulkheads degrade and are susceptible to damage from ambient and storm-based wave action. Additionally, bulkheads are known to reduce shoreline habitat by limiting connectivity and enhancing scour associated erosion of coastal wetlands. Therefore, this action would have long-term negative effects on biological, water, and geological resources. During construction, there is potential for some temporary negative environmental effects, such as carbon emissions, potential low quantity fuel/oil contamination, and noise from construction equipment. However, best management practices will be implemented by the contracted construction team, such as efficient transport of materials, use of floating booms and cleanup protocols if a fuel/oil contamination event occurs, and on-site operation during daylight hours.

Proposed
Alternative Action
2: riprap revetment

Under the Proposed Action Alternative riprap revetment scenario, shoreline erosion could be reduced and some upper portions of shoreline wetland habitats conserved. A riprap revetment is a sloping structure made of large rocks or concrete that protects shorelines and streambanks from erosion. The overall effect of this action could be positive for shoreline and infrastructure protection in the short-term, but negative for the environment in the long-term. Riprap revetments are known to reduce shoreline habitat by limiting connectivity and limiting growth areas of shoreline wetlands. Therefore, this action would have long-term negative effects on biological and water resources. During construction, there is potential for some temporary negative environmental effects, such as carbon emissions, potential low quantity fuel/oil contamination, and noise from construction equipment. However, best management practices will be implemented by the contracted construction team, such as efficient transport of materials, use of floating booms and cleanup protocols if a fuel/oil contamination event occurs, and on-site operation during daylight hours.

No Action

Under the No Action Alternative, there would be no change from existing conditions. However, if the No Action Alternative is chosen, improvements to the existing shoreline would not be made. Shoreline erosion would continue at historical rates exacerbated by the

frequency and intensity of future storm events. Over time, the shoreline infrastructure protection area and fringing wetlands would continue to narrow, jeopardizing existing vital infrastructure and leading to a reduction in habitat and environmental benefits.

This page intentionally left blank.

3.0 Affected Environment and Environmental Consequences

3.1 Introduction

This section describes relevant existing environmental conditions at Keesler AFB and potential effects resulting from implementing the Proposed Action and alternatives. In accordance with guidelines established by NEPA, CEQ regulations, and the EIAP, the impact analysis in this EA focuses only on aspects of the environment potentially subject to effects resulting from the Proposed Action and alternatives. This EA evaluates those effects on the following resources: land use and visual resources, airspace and airfield operations, air quality, noise, earth resources, water resources, biological resources, cultural resources, hazardous materials and wastes, utilities, transportation and traffic, and safety and occupational health.

Each alternative is evaluated for its potential to affect physical, biological, and socioeconomic resources in accordance with 40 CFR § 1508.1. In accordance with 40 CFR § 1501.3, the DAF analyzed the affected environment and degree of the potential effects of the action to determine whether they would be significant. The analysis of effects includes considering short- and long- term effects; whether effects are beneficial or adverse; their impact on public health and safety; and whether the action would violate federal, state, tribal, or local laws or regulations that protect the environment. This EA characterizes effects as follows:

- None—No effects are expected to occur.
- Negligible—The effect would not be readily perceptible when compared to existing conditions.
- Less than significant—The effect would be readily perceptible when compared to existing conditions, but not severe, widespread, or prolonged.
- Significant—The effect would be severe, widespread, or prolonged or exceed a regulatory threshold. The effect would be considered significant unless mitigable to a less-than- significant level.

3.1.1 Resource Not Carried Forward for Detailed Analysis

CEQ regulations in 40 CFR § 1502.15 & 1501.5(c)(1) state that the lead agency shall identify and eliminate from detailed study the issues or resources that are not significant or that have been covered by prior environmental reviews, narrowing the discussion of those issues in the document to a brief justification that demonstrates a less-than-significant effect on the human environment.

After considering information gathered, factors used to evaluate the potentially affected environment, and the degree of effect of the alternatives, the DAF determined that the following resources would not experience any measurable effects: safety and occupational health, infrastructure and utilities, transportation, noise, socioeconomic, visual resources, and airspace as described below. Accordingly, no further discussion of these resource areas is included in the EA analysis. A table (3-1) below lists these resources and rationale for them not being carried forward.

Table 3-1 Resources Not Carried Forward for Detailed Analysis

| Resource | Justification for not carrying forward |
|--------------------------------|---|
| Safety and Occupational Health | Assessment of Safety and Occupational Health impacts is not included in this document; all contractors would be responsible for compliance with applicable occupational Safety and Health Act regulations concerning occupational hazards and specifying appropriate protective measures for all employees. During construction, all safety procedures and BMPs will be followed in order to ensure the safety of construction workers and the public. |
| Infrastructure and Utilities | Assessment of infrastructure and utility impacts is not included in this document. Infrastructure and utilities include basic resources and services required to support planned construction and operations and the continued operation of existing facilities. The Proposed Action would not have an effect on infrastructure and utilities. |
| Transportation | Assessment of transportation impacts, which addresses roads, waterways, and circulation, is not included in this document. Transportation near Keesler AFB and its neighboring properties is mainly achieved via road and street networks. The Proposed Action area includes shorelines, intertidal zones, and inland waterways. Barges and skiffs would be primarily used for the transport and placement of the segmented breakwaters. Therefore, construction activities would not have an effect on pedestrian walkways, roads, or overall traffic volume for Keesler AFB, Biloxi VAMC, or Hiller Park. The Back Bay of Biloxi is a large navigable water that supports commercial and recreational fisheries, and recreational users in vessels of varying sizes. In the location of the project, water depths are around 3 feet, so only smaller vessels (kayaks, flat-bottomed skiffs) frequently utilize the area. Only Phase 1 of the project has been designed. However, Phases 2 and 3 are projected to have similar construction schedules. |
| Noise | Assessment of noise impacts is not included in this document because the Proposed Action area is outside the Keesler AFB Air Installation Compatibility Use Zone (AICUZ) noise contours, and the noise generated from construction activities (barge traffic, placement of segmented breakwaters) would be minor and temporary. Each of the three phases of the proposed project are anticipated to require only 1-3 days of construction and no more than 5 barge trips per 500 linear ft of shoreline. As the Back Bay is typically subject to boat traffic of various sizes, the noise impacts to nearby property owners would be negligible when compared to existing water traffic for the area. Therefore, the noise effect would not be readily perceptible when compared to the existing high noise levels at Keesler AFB from daily flight operations and existing water |

| | |
|------------------|---|
| | <p>traffic for the area and has therefore been eliminated from further consideration. Additionally, the work will occur between the hours of 7am and 10pm, which aligns with the target timeframes for noise generating work in the Harrison County and City of Biloxi noise ordinances.</p> |
| Socioeconomics | <p>Assessment of socioeconomic impacts is not included in this document because the Proposed Action would not have an effect on recreational or commercial fisheries, as well as county-wide or AFB employment. As previously discussed, each of the three phases of the project are anticipated to require only 1-3 days of construction and no more than 5 barge trips for every 500 linear ft of breakwater. In addition, the Back Bay of Biloxi supports various amounts of both commercial and recreational fishing activity throughout the year. Fishermen who reach this area by small craft, would still have the ability to navigate around the project area to reach alternative angling locations. Fishers who use the Hiller Park Pier or the AFB piers could be minimally and temporally impacted by construction noise and water turbidity. However, they could either fish a different area, if they have the ability to reach a different pier/bank, or fish early in the morning or later in the evening when construction was not occurring. Commercial fishing would not be impacted by construction activities. Therefore, due to short construction times and minimal impacts to water/biological resources, the proposed project would have negligible effects on recreational fisheries and no effects on commercial fisheries. Additionally, the proposed project could improve water quality and habitat leading to positive effects on recreational fisheries. A minimal number of off-base contracts would be awarded as a result of this project. While these expenditures would benefit the local economy, the economic impact would be considered negligible in context to county-wide or AFB spending. Thus, socioeconomic impacts would be minimal and have therefore been eliminated from further consideration.</p> |
| Visual resources | <p>Visual resource concerns the impact on visually sensitive locations. Example concerns could include excess light emissions or viewshed alterations. The proposed action and alternatives considered are all low-relief with the majority of the proposed action occurring below mean sea level. Due to the low relief, no significant visual resource impacts would result from the proposed action or the alternatives. Therefore, visual resource issues were eliminated from further analysis.</p> |
| Airspace | <p>Airspace concerns any alterations or restrictions to airspace. The proposed action and alternatives considered are all low-relief with the majority of the proposed action occurring below mean sea level. Due to the low relief, no significant impact on airspace would result</p> |

| | |
|--|---|
| | from the proposed action or the alternatives. Therefore, airspace issues were eliminated from further analysis. |
|--|---|

3.1.2 Past, Present, Reasonably Foreseeable Future Actions Considered

Outside of historical and projected erosion and sea level rise (as described in other sections), no other past, present, or reasonably foreseeable future actions were considered. The location of these proposed actions along the shoreline and low profile of each leads to actions occurring related to water level and shoreline erosion being the most applicable to consider.

3.2 Air Installation Compatible Use Zone/Land Use

The attributes of land use addressed in this analysis include air installations compatible use zones (AICUZ) and visual resources. Land use focuses on general land use patterns, as well as management plans, policies, ordinances, and regulations. These provisions determine the types of uses that are allowable and identify appropriate design and demolition and construction standards to address specially designated or environmentally sensitive areas. Visual resources are identified as the natural and manufactured features that constitute the aesthetic qualities of an area.

Air Installations Compatible Use Zones: The Air Installations Compatible Use Zones (AICUZ) program is an ongoing Department of Defense (DoD) plan designed to promote compatible land uses in the areas around military airfields. The purpose of the AICUZ program is to minimize the effects of flying operations on land uses adjacent to installations, to prevent incompatible development in high noise-exposure areas and accident potential areas, and to maintain operational capability through compatible land use planning and control. The objectives of the AICUZ program are achieved primarily through encouraging local government officials to implement compatible land uses. The AICUZ Program recommends that local land use agencies incorporate noise zones, Clear Zones (CZs), Accident Potential Zones (APZs), and Hazards to Aircraft Flight Zones (HAFZs) associated with military operations into local community planning programs to maintain the airfield’s operational requirements while minimizing the impact to residents in the surrounding community.

Hazards to Aircraft Flight Zone: Certain land uses and activities pose potential hazards to flight. To ensure land uses and activities are examined for compatibility; the Air Force has identified the HAFZ, which is defined as the area within the Imaginary Surfaces that are described in the UFC 3-260-01, and in Federal Aviation Regulation (FAR) § 77, Objects Affecting Navigable Airspace, Subpart C, Obstruction Standards. Unlike noise zones and safety zones, the HAFZ does not have recommended land use compatibility tables. Instead, it is a consultation zone recommending that project applicants and local planning bodies consult with the Air Force to ensure the project is compatible with Air Force operations. These land use and activity compatibility considerations include: height, visual interference, light emission, BASH, radio frequency/electromagnetic interference, and drones/UAS.

Bird/Wildlife Aircraft Strike Hazard: Keesler AFB implements a BASH program because there is movement of resident and migratory birds that creates hazardous conditions for aircraft. The

purpose of the BASH program is to minimize the potential for bird strikes to aircraft and any associated adverse impacts to the Keesler AFB mission. Base Operations maintains records of daily bird counts and bird shoots. Responsibilities and recordkeeping requirements for the BASH program are detailed in the Keesler AFB BASH Plan (81st TRW 2016). To help maximize safety, the FAA (Federal Aviation Administration) recommends a minimum five-mile radius extending outward from the military installation to be free of wildlife attractants. The five-mile radius of the BASH relevancy area for Keesler AFB is illustrated in Figure 3.1 (GRPC 2017). The Proposed Action area is within this radius. The FAA also developed a Wildlife Strike Report Database to help track and analyze wildlife strike incidents throughout the United States. From 1990 to 2013, 142,675 wildlife strikes were reported, 97% involved birds. According to Bird Strike Committee USA, three types of birds represent 75% of all reported bird strikes: waterfowl (31%), gulls (26%), and raptors (18%).

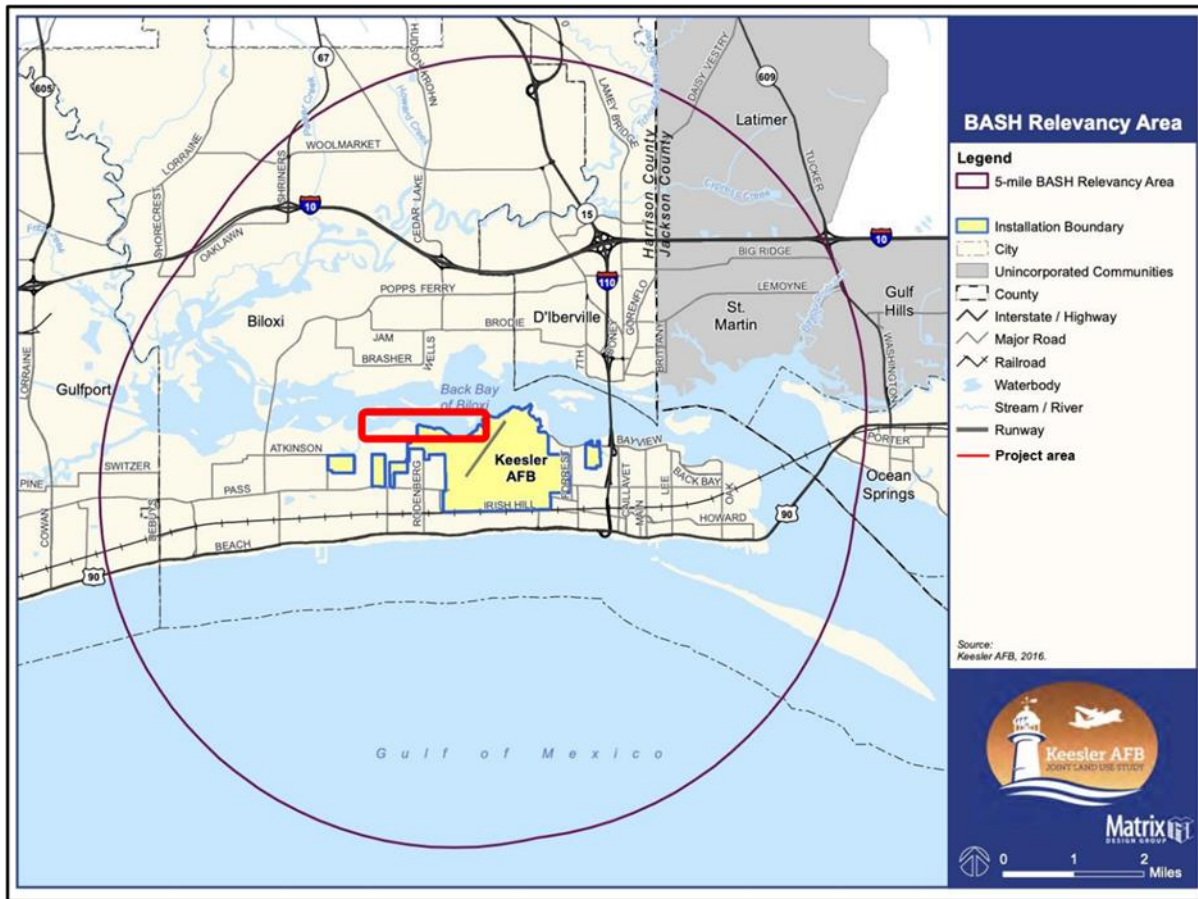


Figure 3-1 BASH Relevancy Area

3.2.1 Affected Environment

The Keesler AFB installation comprises training, administration and housing facilities, runway and airfield facilities, the Keesler Medical Center, and Base support and recreation facilities, including a marina and golf course. Land use categories on Keesler AFB are as shown in Figure 3-2. Parts of the Proposed Action are located in open space/buffer zone land use categories along the northern perimeter of the base (GRPC 2017).

Bird attractants, such as wetlands and trees, are located on and around Keesler’s installation and its neighboring properties, especially along the Back Bay shoreline, creating the potential for bird aircraft strikes. Additionally, the Mississippi migratory bird flyway, the most used bird migration path in North America passes over the area. Since 1985, Keesler AFB has experienced 508 bird air strikes (GRPC 2017). Approximately 33% of these strikes were doves, 9% were swallows, and 4% were killdeer. In 2015, Keesler AFB experienced 17 bird air strikes (GRPC 2017).

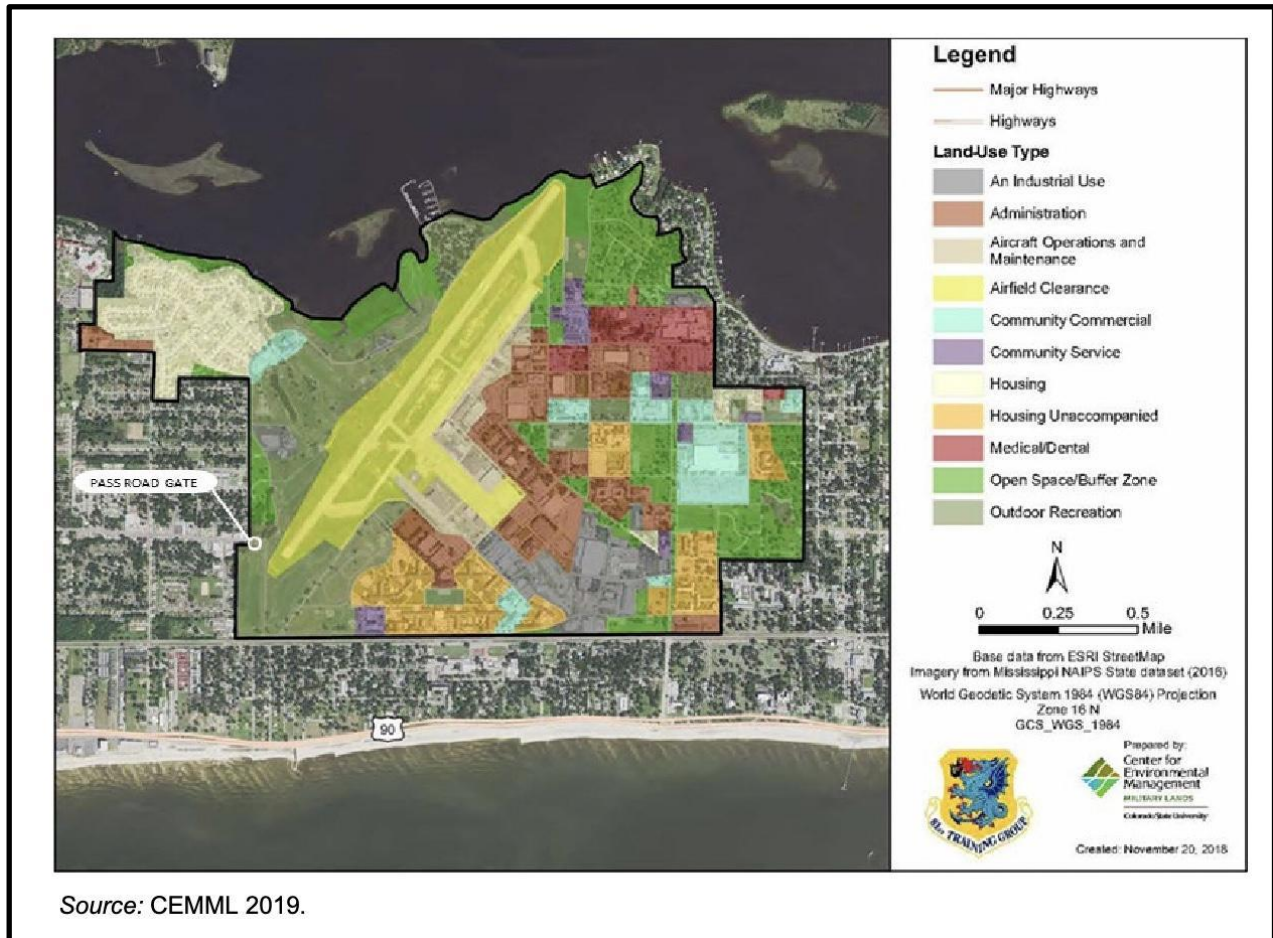


Figure 3-2 Existing Land Use Types at Keesler AFB

3.2.2. Environmental Consequences

3.2.2.1 Proposed Action

Under the Proposed Action, the construction of a living shoreline using segmented breakwaters would be implemented to reduce shoreline erosion through the reduction of wave energy along the southern shoreline of the Back Bay of Biloxi. The proposed project would not change any existing land use at Keesler AFB as most of the Proposed Action area is located in the open space buffer zone. Overtime, the reduction in erosion from the living shoreline would conserve and possibly enhance the expansion of the surrounding wetlands. This would provide a beneficial effect to the visual character of the shoreline. However, bird attractants such as

wetlands create the potential for increased bird aircraft strikes. The FAA and UAF land use planning documents recommend spaces close to the runway be free of bird/wildlife attractants.

Based on information provided by Keesler AFB and literature reviews, the potential for increased bird strikes from the construction of the proposed living construction is extremely low (Greenberg et al., 2014). The project action area already contains some wetlands. Furthermore, the phased design approach of the project will allow the project team to assess BASH in Phases 1 and 2 of the project before construction of the living shoreline along Keesler AFB. The proposed project would monitor habitat development to inform Keesler AFB and other coastal military airfields of the projected impact of new habitat as an attractant to BASH. Additionally, in compliance with the Air Installation Compatible Use Zone Program, the DAF will adhere to land use guidelines by avoiding high-noise zones and accident potential areas in order to support safety and compatibility with nearby military airfield operations.

Furthermore, during living shoreline construction, there is the possibility of short-term, minor adverse aesthetic and visual impacts for residents and people who use the bay for recreation and commerce due to construction equipment/vessel traffic in and around the project area.

3.2.2.2 Proposed Action Alternatives

The proposed action alternatives of a bulkhead or riprap revetment would have similar negligible impacts on air Installation compatible use zone/land use. Both are similar to the proposed action in that they are low relief shoreline protection techniques that would be in the same general location as the proposed action.

3.2.2.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur; therefore, there would be no change in land use or HAFZs, or more specifically BASH. However, if the No Action Alternative is chosen, improvements to the existing shoreline would not be made. Shoreline erosion would continue at historical rates exacerbated by the frequency and intensity of future storm events. Over time, the shoreline infrastructure protection area would continue to narrow, jeopardizing existing vital infrastructure.

3.2.2.4 Cumulative Effects

The cumulative effects of the proposed action on air Installation compatible use zone/land use should be positive in that it will provide shoreline protection that is more adaptable to changing water levels than the proposed action alternatives. The segmented breakwater should protect the shoreline while allowing the vegetation to migrate upslope over time. The proposed alternatives would provide shoreline protection, but will be less effective and adaptable to changing conditions as the proposed action. The no action alternative would continue to allow shoreline erosion that accretes toward infrastructure.

3.2.2.5 Mitigation Measures

Under the Proposed Action, the construction of a living shoreline using segmented breakwaters would be implemented to reduce shoreline erosion through the reduction of wave energy along the southern shoreline of the Back Bay of Biloxi. The proposed project

would not change any existing land use at Keesler AFB as most of the Proposed Action area is located in the open space buffer zone.

During living shoreline construction, there could be short-term, minor adverse aesthetic and visual impacts for residents and people who use the bay for recreation and commerce due to construction equipment/vessel traffic in and around the project area. However, each phase of the project would require only 1-3 days and 5 barge trips per 500ft of breakwater. The water traffic from project construction activities would be negligible when compared to existing water traffic for the area.

Therefore, implementation of the Proposed Action is expected to have negligible impacts to Air Installation Compatible Use Zone/Land Use.

3.3 Air Quality

The Clean Air Act (CAA) is the federal law regulating air emissions from stationary and mobile sources. It tasks the U.S. Environmental Protection Agency (USEPA) with setting primary and secondary air quality standards. Primary standards protect public health, especially vulnerable populations like those with asthma, children, and older adults, while secondary standards protect welfare, including ecosystem health and visibility. The USEPA establishes National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: carbon monoxide (CO), lead, nitrogen oxides (NO₂), ozone (O₃), particulate matter (PM₁₀ and PM_{2.5}), and sulfur dioxide (SO₂). Under the CAA, a geographic area with air quality that is cleaner than the primary ambient air quality standard is an attainment area; areas that do not meet the primary standard are nonattainment areas. Maintenance areas include areas previously classified as nonattainment but are now in compliance with the NAAQS as a result of implementation of the state air quality management plan. While each state has the authority to adopt standards stricter than those established under the federal program, the State of Mississippi has accepted the federal standards (MDEQ 2022).

State agencies having nonattainment or maintenance areas within their jurisdiction are charged with developing air quality control plans, called State Implementation Plans (SIP), that include strategies and measures to bring the area back into compliance with the NAAQS by a US EPA prescribed deadline. SIPs are also devised to maintain compliance with a NAAQS once attainment is achieved.

The General Conformity Rule of the Federal CAA mandates that the Federal government does not engage, support or provide financial assistance for licensing or permitting, or approve any activity not conforming to an approved SIP. This rule applies to all Federal actions except highway and transit actions which are instead regulated by the Transportation Conformity Rule. The rule considers air pollutant emissions associated with actions that are Federally funded, licensed, permitted, or approved, and ensures that such emissions do not cause or contribute to air quality degradation, thus preventing the achievement of state and Federal air quality goals.

The Air Force's EIAP for air quality promulgated at 32 CFR § 989.30 requires that NEPA documents such as this EA address General Conformity applicability. Because the Mobile (Alabama)-Pensacola-Panama City (Florida)-Southern Mississippi Interstate Air Quality

Control Region (AQCR), which contains Keesler AFB, Biloxi VAMC, and Hiller Park, meets all NAAQS, the region is considered in attainment for all pollutants (MDEQ 2022). Therefore, the State of Mississippi is not required to develop an emissions inventory or attainment demonstration SIP for the region, and the General Conformity Rule does not apply to the Proposed Action or alternatives.

Mobile Source Air Toxics (MSATs) are emissions originating from highway vehicles and non-road equipment (e.g., marine barges) that contain compounds known or suspected to cause cancer or other severe health and environmental effects. These pollutants, (e.g., benzene, formaldehyde, and diesel particulate matter) are typically released during the combustion of fuel in engines.

Greenhouse gases trap heat in the atmosphere and regulate the Earth's temperature. These gases include water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), ground-level O₃, and fluorinated gases such as chlorofluorocarbons and hydrochlorofluorocarbons. Scientific consensus has identified human-related emission of greenhouse gases above natural levels (USCCSP 2009).

3.3.1 Affected Environment

Local Existing Air Quality

The Mississippi Department of Environmental Quality (MDEQ) is responsible for the development and maintenance of state specific air emission standards, and monitors all of these pollutants with the exception of lead. The MDEQ ceased lead monitoring on June 30, 2016 (MDEQ 2022). Monitoring sites for the five criteria pollutants are widely dispersed throughout the state, typically near urban areas. Keesler AFB, Biloxi VAMC, and Hiller Park are located in the Mobile (Alabama)-Pensacola-Panama City (Florida)- Southern Mississippi Interstate AQCR 5. One active monitoring station is located in Harrison County and monitors for ozone and PM_{2.5} (continuous) (MDEQ 2022). According to the MDEQ 2022 Air Quality Data Summary, the entire state of Mississippi is in compliance with all current NAAQS, and is classified as in attainment for all NAAQS pollutants. Due to the designation as an attainment area, a CAA conformity determination is not required.

Emissions at Keesler AFB

Based on the potential to emit, Keesler AFB is classified as a major source of air pollutants and is currently operating under a Synthetic-Minor Operating Permit (No. 1020-00006). The permit was issued for the operation of air emissions equipment at a synthetic minor source (i.e., a source with potential to emit regulated "New Source Review" pollutants at or above thresholds for major sources) and expires on 30 October 2028 (State of Mississippi Office of Pollution Control 2018). The largest sources of actual regulated pollutant emissions at Keesler AFB are external combustion (mostly boilers and heaters), followed by internal combustion (emergency generators). The 81 TRW partnered with MDEQ to develop a plan for reducing air contaminant emissions during an air-pollution alert, warning, or emergency. Actions include reduction or cessation of nonessential vehicle trips, engine operation, boiler operation, fire training, painting and corrosion-control activities, construction work, and other electrical and fuel consumption activities.

3.3.2 Environmental Consequences

3.3.2.1 Proposed Action

Under the Proposed Alternative, the construction of the living shoreline could generate small, localized air quality impacts due to the use of heavy equipment (loaders, cranes), vehicles, and vessels (barge, skiffs). Temporary electric power may be supplied by portable diesel generators. Emissions from construction equipment, vehicles, and vessels could temporarily increase the levels of some of the criteria pollutants, including carbon monoxide, nitrogen dioxide, ozone, PM10, and non-criteria pollutants such as volatile organic compounds. This could generate a temporary and localized decrease in air quality from construction equipment that would be minimal and not anticipated to cause any long-term adverse impacts on air quality. An estimated 4,000 gallons of diesel fuel will be used to transport breakwater on land and on barges throughout the project. This equates to an estimated 45 metric tons of CO₂ spread over the entire 3 year construction period. A conformity determination under the CAA is not required because Harrison County is located in an area of attainment for the NAAQS.

Under the Proposed Alternative, there would be no long-term changes to operational emissions at Keesler AFB. Consequently, the implementation of the Proposed Alternative would not cause an exceedance of the NAAQS, nor exceed any de minimis threshold for any criteria pollutant. Therefore, operational emissions under the Proposed Alternative would involve no impact to long-term air quality and operational emissions would remain similar to those described in Section 3.3.2, Emissions at Keesler AFB.

3.3.2.2 Proposed Action Alternatives

The proposed action alternatives of a bulkhead or revetment would have similar impacts as the proposed action (segmented breakwater) on air quality. Both action alternatives require similar levels of transportation of materials and supplies.

3.3.2.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur; therefore, there would be no change to baseline air quality. Therefore, no significant impacts to air quality or air resources would occur with the implementation of the No Action Alternative.

3.3.2.4 Cumulative Effects

The cumulative effects of the proposed action and alternative actions on air quality should be negligible in that emissions associated with the project are small relative to normal boat and vehicle traffic. Conservation and enhancement of vegetation will provide some air quality and carbon sequestration improvements, but these will be relatively small. The no action alternative would continue to allow shoreline erosion and loss of vegetation, but would not generate emissions.

3.3.2.5 Mitigation Measures

Contractors (subrecipients) will use construction BMPs such as minimizing running time for engines and use of properly maintained equipment as well as ultra-low sulfur diesel fuel.

Therefore, implementation of the Proposed Action Alternative would result in less than significant impacts to Air Quality.

3.4 Water Resources

Water resources at Keesler AFB and neighboring properties include wetlands, streams, ponds, floodplains, stormwater, and coastal zone resources in the Mississippi Coastal watershed (USGS Hydrologic Unit Code [HUC] 03170009). The Mississippi Coastal watershed drains an area of about 1545 square miles and empties into the Gulf of Mexico. Major water bodies in the basin include the Wolf, Jourdan, Little and Big Biloxi, and Tchoutacabouffa rivers, as well as the Bays of Biloxi and St. Louis.

Mississippi's List of Impaired Water Bodies

Section 303(d) of the Clean Water Act (CWA) and the implementing federal regulations at 40 CFR §130.7 require the state to identify those waters within its jurisdiction for which effluent limitations are not sufficient to implement one or more applicable water quality standards and for which TMDLs are not yet completed. The state is to establish a priority ranking for such waters, taking into account the severity of the pollution and the designated uses to be made of such waters. Mississippi's 2022 Section 303(d) List of Impaired Water Bodies fulfills the state's obligation with respect to §303(d) of the CWA to develop a listing of the state's impaired waters. Mississippi's water quality standards specify the appropriate levels for which various water quality parameters or indicators support a water body's designated use(s). Each use assessed for a water body is determined to be either "Attaining" or "Not Attaining" in accordance with the applicable water quality standards and EPA guidelines for assessments pursuant to §305(b).

Wetlands

The CWA of 1977 regulates pollutant discharges that could affect aquatic life forms or human health and safety, and Section 404 of the CWA and EO 11990, Protection of Wetlands, regulates development activities in or near streams or wetlands. Section 404 also regulates development in streams and wetlands and requires a permit from the USACE for dredging and filling in wetlands. As such, wetlands cannot be impacted without prior approval from the USACE and the State of Mississippi through the Section 404 permitting program.

Coastal Wetlands Protection Law (MS Code § 49-27-1 et seq) Coastal wetlands means all publicly owned lands subject to the ebb and flow of the tide which are below the watermark of ordinary high tide, all publicly owned accretions above the watermark of ordinary high tide, and all publicly owned submerged water bottoms below the watermark of ordinary high tide.

Floodplains

Floodplains are defined by EO 11988, Floodplain Management, as "the lowland and relatively flat areas adjoining inland and coastal waters including flood-prone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year" (that area inundated by a 100-year flood). Floodplain vegetation promotes bank stability, filters excess nutrients, pollutants, and sediments from the water, and moderates flooding by absorbing surface water runoff. EO 11988 requires that federal agencies avoid adverse impacts associated with the occupancy and modification of floodplains and avoid floodplain development whenever possible. Federal agencies are also required to make every effort to reduce the risk of flood loss, minimize the impact of floods on human health, safety, and welfare, and preserve the natural beneficial value of floodplains. Areas identified as located within Special Flood Hazard Areas (SFHA) are those areas determined by the Federal

Emergency Management Agency (FEMA) that would be inundated by a flood having a one percent chance of occurring in any given year. This area is designated the “100-year floodplain.

Coastal Zone Management Act

Actions involving federal activities, federal licenses or permits, and federal assistance programs that affect coastal resources are required to be consistent with the MDMR to the “maximum extent practicable,” in accordance with the federal Coastal Zone Management Act of 1972 (CZMA) (16 U.S.C. § 1451). The goal of the CZMA is to “preserve, protect, develop, and where possible, to restore or enhance the resources of the nation’s coastal zone.” The Coastal Zone Enhancement Program, established under Section 309 of the CZMA of 1972, as amended, encourages state coastal management programs (CMPs) to strengthen and improve their programs in one or more of nine enhancement areas: wetlands, debris, public access, ocean resources, coastal hazards, special area management plans, cumulative & secondary impacts, aquaculture, and energy and government facility siting. Harrison County is one of three Mississippi counties defined within the designated coastal zone. Therefore, Keesler AFB must determine whether their activities are reasonably likely to affect any coastal use or resource and to conduct the activities in a manner that is compliant to the maximum extent practicable with the Mississippi Coastal Program. Under Mississippi CMP’s Assessment and Strategy for the Enhancement Cycle of Fiscal Year (FY) 2021-2025, wetlands and coastal hazards (flooding, storm surge, shoreline erosion, and sea-level rise) enhancement areas ranked as high priorities.

3.4.1 Affected Environment

Surface Waters

The Back Bay of Biloxi is a tidal estuary located along the northern edge of Keesler AFB and receives the majority of the stormwater discharged from the base. The Back Bay of Biloxi, including Big Lake at its western end, encompasses an area of approximately 10 square miles (6,400 acres). Principal water sources for the Back Bay of Biloxi include freshwater streams from the Biloxi River basin, Tchoutacabouffa River basin, Bernard Bayou basin, Old Fort Bayou basin, and Biloxi Peninsula. The saline waters of the Mississippi Sound enter the Back Bay via Biloxi Bay. The Back Bay of Biloxi basin is classified as recreation-use waters as well as Old Fort Bayou basin, the Tchoutacabouffa River basin, and Big Lake (MDEQ 2022). The Biloxi River basin and Bernard Bayou basin are classified as fish and wildlife-use waters (MDEQ 2022).

The MDEQ is responsible for assessing waters of the State to determine if they meet water quality standards set for the waterbody consistent with CWA Section 303(d). States submit a list of impaired waters—those not meeting water quality standards based on their designated use—to EPA every 2 years (MDEQ 2022). For 2022, Bernard Bayou basin is listed as impaired for aquatic life use support (MDEQ 2022).

Prior to the issuance of the living shoreline general or individual permit for these projects, a Section 404 permit will required from USEPA. This type of permit is required before dredged or fill material may be discharged into waters of the United States. Consultation for this permit is required during the living shoreline general or individual permitting process and will be secured then.

Groundwater

Groundwater in Harrison County is stored in surficial coastal deposits, including the Citronelle and Miocene aquifers. Keesler AFB's primary water source is the Miocene aquifer system (CEMML 2019).

Floodplains

Keesler AFB experienced flooding problems throughout the base during Hurricanes George and Katrina. The effects of Hurricane Katrina severely damaged major portions of all of the on-base housing areas along with significant damage to other structures throughout the base. FEMA categorizes floodplains into several categories, called SFHA based on their chance of flooding in any given year. EO 11988 requires Federal agencies to avoid direct or indirect support or development within or affecting the 100-year floodplain whenever there is a practicable alternative. EO 11988 further directs all Federal agencies to refrain from conducting, supporting, or allowing actions in floodplains unless it is the only practicable alternative. Keesler AFB and its neighboring properties are located almost entirely in either a 100-year floodplain (an area with a 1.0 percent annual chance of flood hazard) or a 500-year floodplain (an area with a 0.2 percent annual chance of flood hazard). The Proposed Action area is located entirely in the FEMA SFHA Zone AE (100-year floodplain; Figure 3-3).



Figure 3-3 Proposed Action Area and FEMA Flood Zones

Wetlands

A coastal marsh, characterized by emergent wetlands and dominated by smooth cordgrass (*Spartina alterniflora*) and needlegrass rush (*Juncus roemerianus*), borders parts of Keesler AFB and its neighboring properties along the northern shoreline adjacent to the Back Bay of Biloxi. There is also a small island of smooth cordgrass and needlegrass rush marsh just west of the AFB marina and north of the golf course. Numerous other islands of cordgrass and rushes are located in the Back Bay of Biloxi. These shallow coastal fringe marshes along the shoreline are influenced by tidal and estuarine flows and receive surface discharge from both Keesler AFB and off-base sources (CEMML 2019).

In 2002 and 2006, USACE performed a wetlands delineation for Keesler AFB and estimated that the base encompasses approximately 28 acres of jurisdictional wetlands (i.e., ones that fall under Section 404 of the CWA along the shore of the Back Bay of Biloxi) (CEMML 2019). These wetland lines were verified by base personnel and MDMR in 2012. A wetland delineation is valid for five years and an updated delineation is only required if a Section 404 permit is needed (construction activities involving placement of fill in U.S. waters or wetlands) (CEMML 2019).

The USFWS (United States Fish and Wildlife Service) has completed large-scale (7.5-minute topographic quadrangle, in which 1 inch = 2,000 feet) National Wetlands Inventory (NWI) maps, which include the wetlands associated with Keesler AFB. The NWI maps estimate a total of 15.4 acres of wetlands on the entire base (CEMML 2019). This difference is attributed to the fact that the survey was conducted via field verification whereas the NWI maps are estimated from aerial photographs. Figure 3.4 depicts wetland resources present at the Proposed Action area. Wetland types include both estuarine and marine deep-water and estuarine and marine wetland. White dotted lines represent proposed segmented breakwaters.

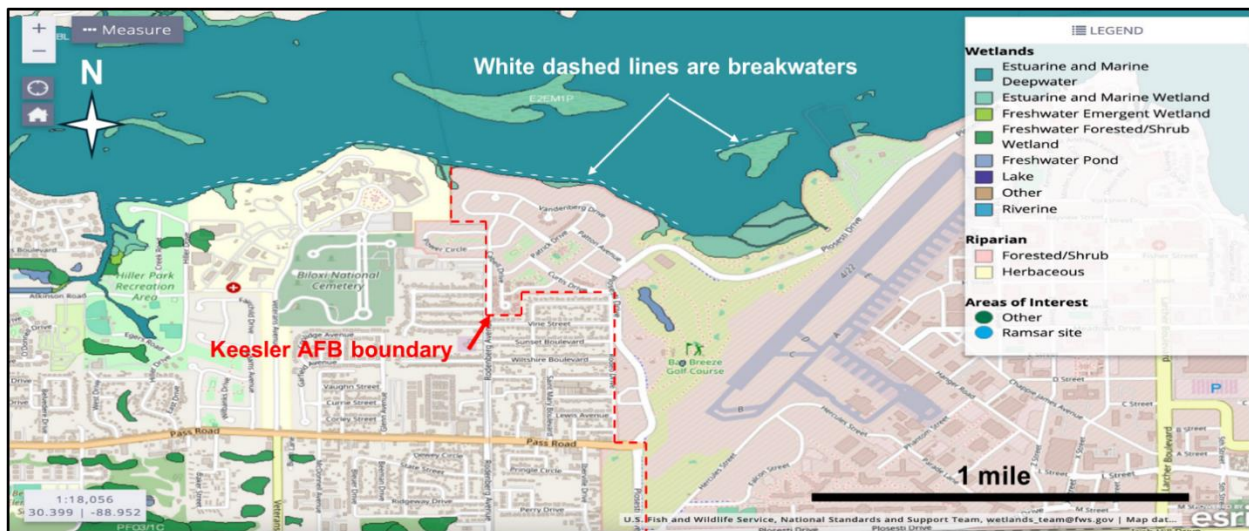


Figure 3-4 Wetland Resources at the Proposed Action Area

Coastal Zone Management Act Consistency

A Consistency Determination and supporting materials must be submitted to the state at least 90 days before starting the proposed activity. An assessment of the consistency of the proposed activities with the enforceable policies of the MDMR is provided at issuance of the permit for these types of projects.

3.4.2 Environmental Consequences

3.4.2.1 Proposed Action

Surface water, stormwater, and water quality: Implementation of the Proposed Action would result in construction activities that could potentially affect water quality within the Back Bay of Biloxi. The placement of the breakwaters will likely result in short-term, minor adverse impacts to water quality (increased turbidity) as a result of the deployment of the breakwaters as well as the resuspension of sediment by vessels (barges, skiffs) moving in and out of the project area. Increases in turbidity within the nearshore environment could have potential impacts on aquatic wildlife (refer to Section 3.6, Biological Resources). However, any increases in turbidity would be temporary and localized as disturbed sediments would settle out within 1-2 days following completion of living shoreline construction. Furthermore, in order to reduce the severity of these impacts, turbidity blankets and coir logs would be installed in the affected areas to control turbidity and minimize wave break in the work area. Construction of the living shoreline would also occur in phases and not simultaneously. Each phase would require only 1-3 days of construction with a maximum of 5 barge trips per 500ft of breakwater.

The Proposed Action could result in minor long-term beneficial impacts to water quality by decreasing suspended sediment in the water column by reducing wave energy from reaching the shoreline. Once new vegetation becomes established, the natural filtration process would further enhance water quality by trapping sediment and nutrients. The restoration and enhancement of wetland vegetation could help filter stormwater runoff from the base that flows into the Back Bay. Furthermore, the positive impact of wetland protection and enhancement would fulfill goals in Keesler's Integrated Natural Resources Management Plan (INRMP) and Mississippi's CMP.

In addition to turbidity, water quality could be adversely impacted by hazardous materials associated with heavy construction equipment and vessels (e.g., fuel and other petroleum, oils, and lubricants (POLs)) during the construction of the breakwaters. Impacts, if any, would be short-term and localized. Their presence along the Back Bay shoreline could result in the increased potential for accidental release and associated contamination of the Back Bay. However, all standard BMPs would be implemented during construction, including regular inspection of construction equipment for leaks. Any potential minor spills or releases would be handled according to procedures outlined in the base's Spill Prevention and Emergency Response Plans.

Groundwater

Implementation of the Proposed Action would not result in the potential for impacts to groundwater quality.

Floodplains

The Proposed Action area is within FEMA's 100-year floodplain. There is no practicable alternative to maintaining the shoreline without working within the 100-year floodplain of the Back Bay. Use of preservation fencing throughout the construction period would preserve the existing clumps of marsh grasses along the shoreline. The restoration would provide a positive impact to the shoreline especially during periods of high water or storm events by buffering against storm wave energy and flooding conditions as discussed earlier. The Proposed Action would have a positive impact on the coastal zone, wetlands, and floodplains. The final result of

the Proposed Action would be to increase the native wetland resources, halt existing erosion conditions, and stabilize a retreating shoreline.

Finding of No Practicable Alternative (FONPA)

In accordance with Executive Order 11990, "Protection of Wetlands," federal agencies are required to assess the impacts of projects located within floodplains or protected wetlands and to implement measures that avoid, mitigate, or minimize any adverse effects or potential harm. The proposed action, while located entirely in the floodplain, will provide long-term benefits to the shoreline and marsh in the form of reducing storm surge and wave action while simultaneously increasing erosion protection. Additionally, the shoreline protection measures proposed include negative effect mitigation efforts in the form of regularly spaced gaps along the constructed breakwater allowing for uninterrupted tidal exchange flows and waterway access. Accordingly, although being completely in the floodplain, the proposed action will involve no significant adverse impacts to the wetlands or floodplain.

3.4.2.2 Proposed Action Alternatives

The proposed action alternatives of a bulkhead or riprap revetment would have less positive effects on water resources than the proposed action (segmented breakwater). The bulkhead would likely facilitate the loss of fringing wetlands offshore through scour processes. Loss of these wetlands would lead to reduced nutrient removal capacity that wetlands provide and associated decreases in water quality. The rip rap revetment would provide some wetland protection, but could restrict wetland colonization areas near the water's edge.

3.4.2.3 No Action Alternative

Under the No-Action Alternative, the Proposed Action would not occur; therefore, water resources would remain unchanged from baseline conditions as described in Section 3.4, Water Resources. However, based on historic erosion patterns, it is likely that shoreline erosion would continue at a rate of 1 foot per year exacerbated by the frequency and intensity of future storm events. No new wetlands would be established to help filter runoff, improve water quality, enhance habitat and biodiversity, and provide coastal landscape protection.

3.4.2.4 Cumulative Effects

The cumulative effects of the proposed action on water resources should be positive in that it will provide shoreline protection that is more adaptable to changing water levels than the proposed action alternatives. The segmented breakwater should protect the shoreline while allowing the vegetation to migrate upslope over time, thereby enhancing wetlands and water filtration capacity. The proposed alternatives would provide shoreline protection, but will be less effective and adaptable to changing conditions as the proposed action and would provide less water resource benefits. The no action alternative would continue to allow shoreline wetland erosion.

3.4.2.5 Mitigation Measures

Construction BMPs for turbidity would be implemented. Therefore, implementation of the Proposed Action would result in less than significant impacts to Water Resources.

3.5 Hazardous Materials/Waste

Hazardous materials are defined in 49 CFR § 171.8 “as a substance or material that the Secretary of Transportation has determined is capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and has designated as hazardous under Section 5103 of federal hazardous material transportation law (49 U.S.C. §§ 5103).” The term includes hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (49 CFR § 172.101), and materials that meet the defining criteria for hazard classes and divisions in Part 173 of subchapter C. Transportation of hazardous materials is regulated by the U.S. Department of Transportation regulations in 49 CFR §§ 105–108.

Hazardous wastes are defined by the Resource Conservation and Recovery Act (RCRA) (42 U.S.C. § 6903(5)), as amended by the Hazardous and Solid Waste Amendments, “as a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

The Air Force Policy Directive (AFPD) 32-70 and the Air Force Instruction (AFI) 32-7000 series incorporate the requirements of all federal regulations and other AFIs and DoD directives for the management of hazardous materials, hazardous wastes, and special hazards. Evaluation extends to generation, storage, transportation, and disposal of hazardous wastes when such activity occurs at or near the project site of a proposed action.

Special hazards are those substances that might pose a risk to human health and are addressed separately from other hazardous substances. Special hazards include asbestos-containing materials (ACM), polychlorinated biphenyls (PCBs), and lead-based paint (LBP). The EPA is given authority to regulate these special hazard substances under the Toxic Substances Control Act (15 U.S.C. Chapter 53).

The EPA has authorized the MDEQ Hazardous Waste Management Program to administer a hazardous waste regulatory program and to enforce the RCRA requirements in Mississippi. The Mississippi hazardous waste management regulations are provided in 11 Miss. Admin. Code Pt.3, Ch. 1–5.

3.5.1 Affected Environment

Hazardous materials are used throughout Keesler AFB for various routine functions, including shop operations and maintenance; ground support equipment maintenance; and facilities maintenance and repair. Sources of these materials may include electrical components; heating and cooling systems; generators; storage tanks; chemical pest control; and POLs (i.e., fuels, grease, lubricating oil, solvents, and coolants).

Keesler AFB has a base-specific hazardous materials and waste management program implemented through the 81 TRW Hazardous Waste Management Plan (HWMP) and Spill Prevention, Control, and Countermeasures (SPCC) Plan (Keesler AFB 2020; 81 TRW 2021). The HWMP provides guidance to personnel who work with hazardous waste and prescribe the

roles and responsibilities with respect to the waste stream inventory, waste analysis plan, hazardous waste management procedures, training, emergency response, and pollution prevention. The SPCC Plan provides guidance specific to hazardous material and petroleum containment, handling, disposal, and emergency response. All guidance documents for operations conducted at Keesler AFB are regularly reviewed by the installation hazardous waste program manager to ensure compliance with current federal, state, and local requirements regarding the management of hazardous wastes as they relate to environmental protection and worker safety. The guidance documents apply to all base personnel, contractors, and external support organizations on Keesler AFB.

Keesler AFB is regulated as a large-quantity generator of hazardous waste, which means the base generates more than 2,200 pounds of hazardous waste in a single month. Additionally, the project location is not located near any ERP or PFAS sites.

3.5.2 Environmental Consequence

3.5.2.1 Proposed Action

Hazardous Materials

Construction activities associated with the implementation of the Proposed Action would not involve the use of any hazardous materials, with the exception of fuel and other POLs. The construction of breakwaters could result in a short-term increase in hazardous materials associated with heavy construction equipment and vessels (e.g., fuel and other petroleum, oils, and lubricants (POLs)) during the construction of the breakwaters. Impacts, if any, would be short-term and localized. Their presence along the Back Bay shoreline could result in the increased potential for accidental release and associated contamination of the Back Bay. However, all standard BMPs would be implemented during construction, including regular inspection of construction equipment for leaks. Any potential minor spills or releases would be handled according to procedures outlined in the base's Spill Prevention and Emergency Response Plans. If hazardous materials are encountered, all construction activities will be paused to minimize human exposure risks and assess future steps. The selected contractor will be responsible for any cleanup activities following OSHA guidelines.

Hazardous Waste

Generation of appreciable amounts of construction hazardous wastes is not anticipated. In the event of fuel spillage during construction, the contractor would be responsible for its containment, cleanup, and related disposal costs. The contractor would have sufficient spill supplies readily available on the pumping vehicle and/or at the site to contain any spillage. In the event hazardous material is discovered, or used, it would be identified, accumulated and removed in accordance with Federal, state, and local laws/regulations.

Asbestos and Lead-Based Paint Management

No materials containing asbestos or lead-based paint would be used for this project. All existing riprap materials are assumed to be free of those materials, since they are composed mainly of granite or limestone rocks.

Solid waste

Unusable materials would be taken off-site by the contractor to an approved recycling facility or landfill. No significant environmental consequences on landfill capacity would be expected from the Proposed Action.

3.5.2.2 Proposed Action Alternatives

The proposed action alternatives of a bulkhead or riprap revetment would have similar levels of hazardous materials/waste as the proposed action (segmented breakwater). Both proposed action alternatives involve the use of similar materials and quantities with the exception of either lumber or vinyl sheeting being needed for the bulkhead.

3.5.2.3 No-Action Alternative

Under the No-Action Alternative, the Proposed Action would not occur. Hazardous materials/Waste would remain unchanged from baseline conditions; therefore, there would be no effects on hazardous materials usage and hazardous waste management.

3.5.2.5 Cumulative Effects

The cumulative effects of the proposed action and alternative actions on hazardous waste should be negligible in that the only hazardous waste materials associated with these actions are associated with vessels and vehicles (fuel and oil). In the event there is a spill, cleanup activities will be initiated by the contractor leading to only a temporary impact. The no action alternative would not have any potential hazardous materials associated with it.

3.5.2.5 Mitigation Measures

All standard construction BMPs would be implemented, including regular inspection of construction equipment and vessels for leaks.

Therefore, implementation of the Proposed Action would result in no significant impacts to Hazardous Materials/Waste.

3.6 Biological Resources

Biological resources include native or naturalized plants, fish, wildlife, and the habitats in which they occur. Sensitive biological resources are defined as those plant, fish, and wildlife species, and their habitat that are federally and state listed as threatened, endangered, of special concern, or candidate. This section organizes biological resources under three general categories: vegetation, fish and wildlife, and sensitive species.

3.6.1 Affected Environment

3.6.1.1 Vegetation

The vegetation at Keesler AFB and neighboring properties is largely characterized by urban and suburban flora, with a few naturally vegetated wetlands bordering the Back Bay of Biloxi. The vegetation communities on the base include areas developed for mission activities, underdeveloped grass areas, coastal wetlands, and urban forest (CEMML 2019).

- Undeveloped but maintained open areas are dominated by Bermudagrass (*Cynodon dactylon*), centipede grass (*Eremochloa ophiuroides*), and St. Augustine grass (*Stenotaphrum secundatum*).
- Coastal wetlands are dominated by smooth cordgrass (*Spartina alterniflora*) and needlegrass rush (*Juncus roemerianus*). These areas cover approximately 28 acres along the northern border of the base adjacent to the Back Bay of Biloxi. There is also a small island of smooth cordgrass and needlegrass rush marsh just west of the marina and north of the golf course. Numerous other islands of cordgrass and rushes are located in the Back Bay of Biloxi.
- Urban forests occupy open areas between buildings and semi-improved areas and are dominated by live oak (*Quercus virginiana*) and slash pine (*Pinus elliottii*). Other common native trees include water oak (*Quercus nigra*), northern red oak (*Quercus rubra*), turkey oak (*Quercus laevis*), river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), and sweetgum (*Liquidambar styraciflua*). Common nonnative trees include Callery pear (*Pyrus calleryana*) and crapemyrtle (*Lagerstroemia indica*).

Based on the USFWS National Wetland Inventory (NWI), wetlands are present along the border of the Back Bay and its small islands. Wetland types include Estuarine and Marine Deepwater (E1UBL) and Estuarine and Marine Wetland (E2M1P). Figure 3.4 depicts wetland resources at the Proposed Action area. Dotted lines represent the proposed living shoreline.

3.6.1.2 Fish and Wildlife

A natural habitat inventory was conducted for Keesler AFB in 2001. There are three main fish and wildlife management areas at Keesler AFB: the airstrip, the marina, and the wetlands. Fish and wildlife resources at the airstrip are managed via the Keesler AFB BASH program. The marina is managed at Keesler AFB for boating, fishing, and recreational purposes. Wetlands along the Back Bay of Biloxi are considered to be a multiple-use resource, but they are protected under the CWA of 1972.

3.6.1.3 Special Species

THREATENED AND ENDANGERED SPECIES

Based on the USFWS IPaC, there are federally listed threatened, endangered, or candidate species potentially present in the Proposed Action project area (Harrison County, Mississippi), as summarized in Table 3-1. Additionally, the Mississippi Natural Heritage Program (MNHP) online database lists species in the project area (Harrison County) as State endangered. These species could potentially be present in the Proposed Action project area (see Table 3-1).

Table 3-2 Federal and State Threatened/Endangered Species List

| Taxa | Common Name | Federal Status | State Status |
|---------|--|----------------|--------------|
| Mammals | <i>Trichechus manatus</i> West Indian Manatee | LT | LE |

| | | | | |
|---------------------------|--|----------------------------|----|----|
| Birds | <i>Laterallus jamaicensis ssp. Jamaicensis</i> | Eastern Black Rail | LT | |
| | <i>Charadrius melodus</i> | Piping Plover | LT | LE |
| Reptiles | <i>Pseudemys alabamensis</i> | Alabama Red-bellied Turtle | LE | LE |
| | <i>Macrochelys temminckii</i> | Alligator Snapping Turtle | PT | |
| | <i>Pituophis melanoleucus lodingi</i> | Black Pine Snake | | LE |
| Amphibians | <i>Rana sevosa</i> | Dusky Gopher Frog | | LE |
| Insects | <i>Danaus plexippus</i> | Monarch Butterfly | C | |
| Ferns & Allies | <i>Isoetes louisianensis</i> | Louisiana Quillwort | LE | |

C = Candidate

LE = Listed as Endangered

LT = Listed as Threatened

PE = Proposed as Endangered

PT = Proposed Threatened

West Indian Manatee (*Trichechus manatus*)

This species uses both fresh and saltwater habitats such as coastal rivers, bays, bayous, and estuaries. The manatee is an occasional visitor to Mississippi's coasts, although migration into the area is poorly understood. During the warm months, an unknown portion of the Florida manatee population migrates northward into Georgia and the Carolinas, and westward along the Gulf coast into Alabama, Mississippi, and Louisiana (Fertl et al. 2005). In coastal areas, they are particularly drawn to areas where seagrass beds flourish. They prefer water at least 4 to 7 ft in depth. Manatees frequently seek out freshwater sources such as rivers and river mouths and have been known to be found near estuaries (Fertl et al. 2005). Historically, in Mississippi (1978–2006), the greatest number of manatee sightings occurred in the open waters of Mississippi Sound (with more manatees reported in rivers and subembayments in recent years). There is no designated critical habitat for the West Indian manatee within the Proposed Action area.

Eastern Black Rail (*Laterallus jamaicensis ssp. Jamaicensis*)

The eastern black rail is a tiny marsh bird that walks or runs through the marsh and is rarely seen in flight. No critical habitat has been designated for this species. The status of the eastern black rail in Mississippi is very poorly known and undocumented. Turcotte and Watts (1999) in the Birds of Mississippi note it is a mysterious bird, being hard to detect due to its small size and

secretive nocturnal habits, as well as being widespread but distributed very locally were found in Mississippi. A few documented occurrences are scattered across the central portion of the state with additional records concentrated along the Gulf of Mexico coast. In a recent distribution and status assessment for the eastern black rail, Watts (2016) noted that eastern black rails are undocumented as breeding along the coast or across the state. In 2021, Woodrey et al. (2022) conducted breeding season point count surveys in high marsh habitats across coastal Mississippi and Mobile County in Alabama. Only 3 individual black rails were detected out of 144-point count surveys completed, and none of the detections were along the Back Bay nor were they in habitats that would likely be created by living shorelines projects such as the one proposed as part of our project.

Piping Plover (*Charadrius melodus*)

Piping plovers do not nest in Mississippi; however, this species uses Gulf Coast beaches and barrier islands for wintering (MDWFP 2001). Plovers use sparsely vegetated sand beaches, mudflats, and salt marshes for roosting and foraging. There is no designated or proposed critical habitat for piping plovers within the Proposed Action area. The diet of the piping lover consists of insects, marine invertebrates, and crustaceans.

Alabama Red-bellied Turtle (*Pseudemys alabamensis*)

The habitat of the Alabama red-bellied turtle includes fresh and brackish waters with submerged and emergent aquatic vegetation. This includes channels with little current bordered by extensive open marshes (fresh, brackish, and salt marshes) comprised principally of black needle rush (*Juncus roemerianus*) and habitats farther upstream such as lakes, ditches, ponds, cypress swamps, and oxbows with ample aquatic vegetation. (MDWFP 2001; USFWS 2013). The endangered Alabama red-bellied turtle is present in the lower Pascagoula River, Bluff Creek, Escatawpa River, Old Fort Bayou, Tchoutacabouffa River, Biloxi River, and Back Bay of Biloxi. It is often locally abundant within its narrow distribution in Mississippi and seems to be limited more by the availability of clear, shallow water supporting submerged aquatic plants than by any other factor.). Nesting occurs from mid-May to mid-July (MDWFP 2001). Stream modification and clearing along stream banks have adversely impacted the habitat of these species (Chandler 2007).

Alligator Snapping Turtle (*Macrochelys temminckii*)

The alligator snapping turtle is a massive, highly aquatic turtle that inhabits deep waters, primarily deep rivers with steep banks, but also lakes and swamps (Pritchard 1989, 1992). The species' range includes the southeastern United States. Within such habitats, individuals may be found under or in logjams, beneath undercut banks or rock shelters (MDWFP 2001).

Black Pine Snake (*Pituophis melanoleucus lodingi*)

The imperiled Black Pine Snake shows a preference for upland areas characterized by well-drained, sandy soils within forests dominated by pine, particularly the longleaf variety (MDWFP 2014). Critical habitat is found in Forrest, George, Greene, Harrison, Jones, Marion, Perry, Stone, and Wayne Counties (MDWFP 2014). No critical habitat is found in the Proposed Action area.

Dusky Gopher Frog (*Rana sevosa*)

The endangered Dusky Gopher Frog once inhabited various regions across southern Mississippi. Its habitat comprised both upland areas historically covered in longleaf pine forests and isolated temporary wetlands nestled within the forested terrain. Throughout their lives, adult and subadult Dusky Gopher Frogs predominantly dwell underground, taking refuge in stump holes and small mammal burrows, with occasional usage of Gopher Tortoise burrows. Breeding occurs in small, shallow, and secluded depressional ponds, unconnected to other water bodies, which undergo periodic drying cycles. Emergent herbaceous vegetation plays a crucial role in facilitating egg attachment. Rainfall within their localized watersheds serves as the primary water source for these ponds. In Mississippi, the dusky gopher frog has been recorded in Forrest, Greene, Hancock, Harrison, Jackson, Pearl River, and Perry counties. No critical habitat is found in the Proposed Action area.

Monarch Butterfly (*Danaus plexippus*)

In North America, the eastern monarch populations overwinter in the mature oyamel fir forests in the mountains of central Mexico. In March, they begin their seasonal migration to the northern U.S. and Canada (USFWS 2023a). Monarchs travel only during the day and require roost sites at night. Pine, fir, and cedar trees are often chosen for roosting (USDA USFS 2023). During the breeding season, monarchs are typically found in open grassy areas, laying their eggs exclusively on the milkweed plant (USFWS 2023a). Milkweed plants can be found in a wide range of habitats including, but not limited to, prairies, fields, open woodlands, and roadsides (Xerces Society 2023a). Throughout all times of the year, monarchs rely on a diversity of nectar-rich plants for energy (Xerces Society 2023b).

Louisiana Quillwort (*Isoetes louisianensis*)

Louisiana quillwort is found along small blackwater streams (water often tea-colored, stained with tannins released from leaf decomposition), often on sand/gravel/mud bars and stream banks (LDWF and BTNEP 2023). During higher water plants may be partially submersed and leaves may be seen trailing in the current (LDWF and BTNEP 2023). Adjacent forest type is small stream forest, with laurel oak (*Quercus laurifolia*), water oak (*Q. nigra*), loblolly pine (*Pinus taeda*), sweetbay magnolia (*Magnolia virginiana*), and swamp blackgum (*Nyssa biflora*) (LDWF and BTNEP 2023). Coarser, more stable substrate is apparently preferred, and Louisiana quillwort is not usually rooted in soft fine mucky substrate (LDWF and BTNEP 2023). Louisiana quillwort was known to occur at only two sites in Louisiana when designated as an endangered species on 10-28-1992 (AFC 2023). To date, there are eight populations in Louisiana, three populations in Alabama and 30 populations in Mississippi. Critical habitat has not been designated for this species (AFC 2023).

MIGRATORY BIRD SPECIES

Based on the USFWS IPaC, there are a total of 43 birds listed under the Migratory Bird Treaty Act with potential to be present within the project action area (Biloxi, Harrison County, Mississippi), as summarized in Table 3-3.

Bird Conservation Regions (BCRs) are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues (USFWS 2008). The USFWS identifies *Bird of Conservation Concern (BCC)* within ecological BCRs that are priorities for

conservation action, with the intent to prevent or eliminate the need for the ESA, Section 4, as amended; listing by taking proactive management and conservation actions. The project action area is located within the Southeastern Coastal Plain BCR 27 (USFWS 2008).

Bird Conservation Region 27 – Southeastern Coastal Plain

This region includes extensive riverine swamps and marsh complexes along the Atlantic Coast. Interior forest vegetation is dominated by longleaf, slash, and loblolly pine forests. Priority landbirds include the Red-cockaded Woodpecker, Painted Bunting, Bachman’s Sparrow, Swainson’s Warbler, and Swallow-Tailed Kite. Coastal intertidal habitats provide critical wintering areas for American Oystercatcher, important wintering and spring migration areas for Short-billed Dowitcher and Dunlin, and important fall staging areas for Red Knot. Sizable numbers of Brown Pelicans and various terns breed on offshore islands. Coastal areas provide important nesting and foraging habitats for large numbers of herons, egrets, ibis, terns, and other species. Coastal areas winter large numbers of Canvasback, Mallard, American Wigeon, Redhead, and the majority of the continent’s population of Tundra Swans. Managed impoundments in coastal areas are important to migrating and wintering dabbling ducks, including American Black Duck.

Table 3-3 Migratory Birds Potentially Present within Proposed Action Area

| Bird Group | Name | Level of Concern | Breeding Season |
|--------------------|--|-------------------------|------------------------|
| Raptors | American Kestrel <i>Falco sparverius paulus</i> | BCC-BCR | Apr 1 to Aug 31 |
| | Bald Eagle <i>Haliaeetus leucocephalus</i> | Non-BCC Vulnerable | Sept 1 to Jul 31 |
| | Swallow-tailed Kite <i>Elanoides forficatus</i> | BCC Rangewide | Mar 10 to Jun 30 |
| Shore birds | American Oystercatcher <i>Haematopus palliatus</i> | BCC Rangewide | Apr 15 to Aug 31 |
| | Lesser Yellowlegs <i>Tringa flavipes</i> | BCC Rangewide | Breeds elsewhere |
| | Marbled Godwit <i>Limosa fedoa</i> | BCC Rangewide | Breeds elsewhere |
| | Pectoral Sandpiper <i>Calidris melanotos</i> | BCC Rangewide | Breeds elsewhere |

| | | | |
|-----------------|---|-----------------------|------------------|
| | Ruddy Turnstone <i>Arenaria interpres morinella</i> | BCC-BCR | Breeds elsewhere |
| | Semipalmated Sandpiper <i>Calidris pusilla</i> | BBC-BCR | Breeds elsewhere |
| | Wilson's Plover <i>Charadrius wilsonia</i> | BCC Rangewide | Apr 1 to Aug 20 |
| | Whimbrel <i>Numenius phaeopus hudsonicus</i> | BBC-BCR | Breeds elsewhere |
| | Short-billed Dowitcher <i>Limnodromus griseus</i> | BCC Rangewide | Breeds elsewhere |
| | Willet <i>Tringa semipalmata</i> | BCC Rangewide | Apr 20 to Aug 5 |
| Seabirds | Black Skimmer <i>Rynchops niger</i> | BCC Rangewide | May 20 to Sep 15 |
| | Brown Pelican <i>Pelecanus occidentalis</i> | Non-BCC Vulnerable | Jan 15 to Sep 30 |
| | Gull-billed Tern <i>Gelochelidon nilotica</i> | BCC Rangewide | May 1 to Jul 31 |
| | Magnificent Frigatebird <i>Fregata magnificens</i> | BCC-BCR | Breeds elsewhere |
| | Least Tern <i>Sternula antillarum antillarum</i> | Non-BCC Vulnerable | Apr 25 to Sep 5 |
| | Sooty Tern <i>Onychoprion fuscatus</i> | BCC Rangewide | Mar 10 to Jul 31 |
| | Ring-billed Gull <i>Larus delawarensis</i> | Non-BCC Vulnerable | Breeds elsewhere |
| | Royal Tern <i>Thalasseus maximus</i> | Non-BCC Vulnerable | Apr 15 to Aug 31 |

| | | | |
|-------------------------|---|-----------------------|---------------------|
| | Pomarine Jaeger <i>Stercorarius pomarinus</i> | Non-BCC Vulnerable | Breeds elsewhere |
| Waterfowl | Common Loon <i>Gavia immer</i> | Non-BCC Vulnerable | Apr 15 to Oct 31 |
| | Black Scoter <i>Melanitta nigra</i> | Non-BCC Vulnerable | Breeds elsewhere |
| | Double-crested Cormorant <i>Phalacrocorax auritus</i> | Non-BCC Vulnerable | Apr 20 to Aug 31 |
| | Long-tailed Duck <i>Clangula hyemalis</i> | Non-BCC Vulnerable | Breeds elsewhere |
| | Surf Scoter <i>Melanitta perspicillata</i> | Non-BCC Vulnerable | Breeds elsewhere |
| | White-winged Scoter <i>Melanitta fusca</i> | Non-BCC Vulnerable | Breeds elsewhere |
| | Red-breasted Merganser <i>Mergus serrator</i> | Non-BCC Vulnerable | Breeds elsewhere |
| Marsh birds | King Rail <i>Rallus elegans</i> | BCC Rangewide | May 1 to Sep 5 |
| Forest birds | Kentucky Warbler <i>Oporornis formosus</i> | BCC Rangewide | Apr 20 to Aug 20 |
| | Chuck-will's-widow <i>Antrostomus carolinensis</i> | BCC-BCR | May 10-Jul 10 |
| | Brown-headed Nuthatch <i>Sitta pusilla</i> | BCC-BCR | Mar 1 to Jul 15 |
| | Cerulean Warbler <i>Dendroica cerulea</i> | BCC Rangewide | Apr 26 to Jul 20 |
| | Prairie Warbler <i>Dendroica discolor</i> | BCC Rangewide | May 1 to Jul 31 |
| | Prothonotary Warbler | BCC Rangewide | Apr 1 to Jul 31 |

| | | | |
|---------------|---|---------------|------------------|
| | <i>Protonotaria citrea</i> | | |
| | Coastal (wayne's) Black-throated Green Warbler <i>Setophaga virens waynei</i> | BCC-BCR | May 1 to Aug 15 |
| | Red-headed Woodpecker <i>Melanerpes erythrocephalus</i> | BCC Rangewide | May 10 to Sep 10 |
| | Wood Thrush <i>Hylocichla mustelina</i> | BCC Rangewide | May 10 to Aug 31 |
| | Bachman's Sparrow <i>Aimophila aestivalis</i> | BCC Rangewide | May 1 to Sep 30 |
| | Henslow's Sparrow <i>Centronyx henslowii</i> | BCC Rangewide | Breeds elsewhere |
| | Painted Bunting <i>Passerina ciris</i> | BCC-BCR | Apr 25 to Aug 15 |
| Swifts | Chimney Swift <i>Chaetura pelagica</i> | BCC Rangewide | Mar 15 to Aug 25 |

BALD & GOLDEN EAGLES

Based on the USFWS IPaC, Bald eagles (*Haliaeetus leucocephalus*) are known to be potentially present in the Proposed Action area. Non-BCC vulnerable: This is not a Bird of Conservation Concern (BCC) in this area but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. Bald eagles breed from Sept 1 to July 31.st

3.6.2. Environmental Consequences

3.6.2.1 Proposed Action

The list below was developed using the best available information and a consultation with USFWS in July 2024. The only changes from the original list resulting from that consultation was to change from “no effect” to “may effect” for the Eastern black rail and Alabama red-bellied turtle. There was concurrence with the presented rationale that there should not significantly impact the species are found within or near the project area.

Sea turtles: The Proposed Action area does not include nesting habitat for the five sea turtle species; therefore, there will be no effect to nesting sea turtles. Additionally, there is no designated or proposed critical habitat for sea turtles within the Proposed Action area. However, in-water project work may coincide with sea turtle presence (i.e., spring/summer). During this

time construction crews would be operating mechanized equipment in the water including barges and light watercraft. The noise produced by the machinery and movement of the machinery in the water, and placement of materials could disturb sea turtles. The project is anticipated to have no more than 9 construction days over 3 years. All sea turtle species are highly mobile and project activities would not impede transitory routes. Furthermore, the implementation of BMPs would minimize any potential risks to sea turtles to an insignificant and discountable effect. We anticipate the living shoreline project to show tangible reductions of wave energy impacting the shorelines, reducing erosion and turbidity, and increasing overall vegetation coverage and water clarity, all potential benefits to sea turtles. **Therefore, the Proposed Action activities “may affect, but are not likely to adversely affect,” the five species of sea turtles.**

West Indian manatees may occur in the Proposed Action area. However, their preferred habitat is lacking from the project area: seagrass beds and a freshwater source such as a river mouth. Short-term minor impacts could occur if manatees come into contact with construction activities. Construction equipment such as a barge could cause increased levels of turbidity at the local scale and noise in the water column which may affect the species within a particular distance. Construction work could startle an individual, or project debris or vessels could strike a manatee, resulting in injury or mortality. However, the project is anticipated to have no more than 9 construction days over 3 years. Manatees are a mobile species and are known to avoid turbid and noisy habitats. Additionally, appropriate avoidance and minimization measures [Standard Manatee Conditions for In-Water Work (USFWS 2011)] will be taken to ensure that any effects to the West Indian manatee are insignificant or discountable. If individuals enter the project areas, construction would be halted until the individual leaves the area of its own volition. Additionally, construction activities at the project site will not affect manatees’ migration routes. We anticipate the living shoreline project to show tangible reductions of wave energy impacting the shorelines, reducing erosion and turbidity, and increasing overall vegetation coverage and water clarity, all potential benefits to West Indian manatees. **Therefore, the Proposed Action activities “may affect, but are not likely to adversely affect,” the West Indian manatee.**

Eastern black rail occurrence within the Proposed Action area is highly unlikely. There is very little marsh habitat at the project site as most of the project site is developed and/or experiencing substantial shoreline erosion. No critical habitat has been designated for this species. Short-term minor impacts could occur should an Eastern black rail come into contact with construction activities, such as disturbances to foraging, feeding, and resting activities. However, it is expected that they would be able to move to another nearby location to continue foraging, feeding and resting. Should an Eastern black rail enter the project area, construction activities will be halted, and the rail will be allowed to exit the workspace without harm and of its own volition. Furthermore, we anticipate the living shoreline project to show tangible reductions of wave energy impacting the shorelines, reducing erosion and turbidity, increasing overall vegetation coverage (including marsh habitat) and water clarity, and enhancing benthic fauna and nekton, all potential benefits to the eastern black rail. **Therefore, the Proposed Action activities are anticipated to have “may effect” on the Eastern black rail.**

Piping plovers may occur within the Proposed Action area since the area is within its migration corridor. Short-term minor impacts could occur should a piping plover come into contact with construction activities (work crews, vehicles, machinery), such as disturbances to foraging, feeding, and resting activities. However, it is expected that they would be able to move to

another nearby location to continue foraging, feeding and resting. The project is anticipated to have no more than 9 construction days over 3 years. Therefore, it is not expected that temporary displacement would interrupt or have long-term consequences to normal behaviors. Should a piping plover enter the project area, construction activities will be halted, and the plover will be allowed to exit the workspace without harm and of its own volition. We anticipate the living shoreline project to show tangible reductions of wave energy impacting the shorelines, reducing erosion and turbidity, increasing overall vegetation coverage (including salt marshes) and water clarity, and enhancing benthic fauna and nekton, all potential benefits to piping plovers. **Therefore, the Proposed Action activities “may affect, but are not likely to adversely affect,” the piping plover.**

Alabama red-bellied turtle occurrence within the Proposed Action area is highly unlikely due to the turbid, brackish conditions and lack of SAVs for foraging and forested uplands for nesting. The project area also lacks appropriate features for basking opportunities like stumps and downed trees. If by chance turtles are present during project construction, activity will be halted and proper measures for relocation of turtles will be taken through coordination with the USFWS. **Therefore, the Proposed Action activities are anticipated to have “may effect” on the Alabama red-bellied turtle.**

Alligator snapping turtle occurrence within the Proposed Action area is highly unlikely due to the lack of suitable habitat. Only one alligator snapping turtle has been observed in recent years in Harrison County (May 2019 on the Wolf River; iNaturalist 2023). If by chance turtles are present during project construction, activity will be halted and proper measures for relocation of turtles will be taken through coordination with the USFWS. **Therefore, the Proposed Action activities are anticipated to have “no effect” on alligator snapping turtles.**

Black pine snake occurrence within the Proposed Action area is highly unlikely due to the lack of suitable habitat. The imperiled species shows a preference for upland areas characterized by well-drained, sandy soils within forests dominated by pine, particularly the longleaf variety. Furthermore, no critical habitat for the species is found in the Proposed Action area. If by chance, a black pine snake is present during project construction, activity will be halted and proper measures for relocation of the snake will be taken through coordination with the USFWS. **Therefore, the Proposed Action activities are anticipated to have “no effect” on black pine snakes.**

Dusky gopher frog occurrence within the Proposed Action area is highly unlikely. These frogs are predominantly found in upland forested areas. Furthermore, no critical habitat is found in the Proposed Action area. If by chance, a frog is present during project construction, activity will be halted and proper measures for relocation of the frog will be taken through coordination with the USFWS. **Therefore, the Proposed Action activities are anticipated to have “no effect” on Dusky gopher frogs.**

Monarch butterflies may occur in the Proposed Action area since it falls within the species' migration corridor. However, the project area lacks their preferred habitat and a sufficient supply of native milkweed. Butterflies are a mobile species and project activities would not impede transitory routes. **Therefore, the Proposed Action activities are anticipated to have “no effect” on the monarch butterfly.**

Louisiana quillwort requires very specific conditions: mature stream bed, an intermittent stream flow, low turbidity, and some amount of canopy cover or protection from late afternoon sun. These conditions do not exist within the Proposed Action area. **Therefore, the Proposed Action activities are anticipated to have “no effect” on Louisiana quillwort.**

Migratory Birds-Raptors, including Bald Eagle

Raptors forage, feed, and rest in the Proposed Action area. Short-term minor impacts could occur should they enter the project area. Potential adverse effects to migratory birds include elevated noise levels due to the presence of construction equipment. However, it is expected that they would be able to move to another nearby location (within their normal daily movement pattern) to continue foraging, feeding and resting. Most raptors are aerial foragers and soar long distances in search of food. This project would occur in intertidal zones away from potential nesting areas; therefore, it is not anticipated to impact nesting. Project workers will be notified of possible bald eagle occurrences within 5 miles of the area and implement appropriate best management practices as outlined in the USFWS National Bald Eagle Management Guidelines. **Project activities are not reasonably anticipated to cause a take of bald eagles, including their parts, nests, or eggs.** We anticipate the living shoreline project to show tangible reductions of wave energy impacting shorelines, reducing erosion, increasing vegetation coverage, and enhancing benthic fauna and nekton. Breakwaters support significantly more abundant and diverse faunal communities along the shoreline. The living shoreline will increase spawning habitats for aquatic life including fish as well as habitats for invertebrates. Potential benefits to raptors include an increase in forage areas and greater prey abundance (fish and insects). The American kestrel and swallow-tailed kite feed primarily on insects, and bald eagles feed primarily on fish.

Migratory Birds-Shorebirds

Shorebirds forage, feed, rest, and roost in the action area. Short-term minor impacts could occur should they enter the project area. Potential adverse effects to migratory birds include elevated noise levels due to the presence of construction equipment. However, 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 the dunes. This project would occur in intertidal zones away from potential shorebird nesting areas; therefore, it is not anticipated to impact nesting. We anticipate the living shoreline project to show tangible reductions of wave energy impacting shorelines, reducing erosion, increasing vegetation coverage, and enhancing benthic fauna and nekton. Breakwaters support significantly more abundant and diverse faunal communities along the shoreline. Potential benefits to shore birds include an increase in forage areas and greater prey abundance. The living shoreline will increase habitats for aquatic life including benthic invertebrates, the main diet of shore birds.

Migratory Birds-Seabirds

Seabirds forage, feed, rest, and roost in the action area. Short-term minor impacts could occur should they enter the project area. Potential adverse effects to migratory birds include elevated noise levels due to the presence of construction equipment. However, it is expected that they would be able to move to another nearby location to continue foraging, feeding and resting. These birds primarily roost in the dunes. This project would occur in intertidal zones away from

potential nesting areas; therefore, it is not anticipated to impact nesting. We anticipate the living shoreline project to show tangible reductions of wave energy impacting shorelines, reducing erosion, increasing vegetation coverage, and enhancing benthic fauna and nekton. Breakwaters support significantly more abundant and diverse faunal communities along the shoreline. Potential benefits to seabirds include an increase in forage areas and greater prey abundance. The living shoreline will increase habitats for aquatic life including crustaceans and fish, the main diet of sea birds.

Migratory Birds-Waterfowl

Waterfowl forage, feed, rest, and roost in the Proposed Action area. As such, they may be impacted locally and temporarily by the project. Potential adverse effects to migratory birds include elevated noise levels due to the presence of construction equipment. However, 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. This project would occur mostly in intertidal zones away from potential nesting areas; therefore, it is not anticipated to impact nesting. Furthermore, we anticipate the living shoreline project to show tangible reductions of wave energy impacting shorelines, reducing erosion, increasing vegetation coverage, and enhancing benthic fauna and nekton. Breakwaters support significantly more abundant and diverse faunal communities along the shoreline. Potential benefits to waterfowl include an increase in forage areas and greater prey abundance. The living shoreline will increase habitats for aquatic life including aquatic insects, crustaceans and fish, the main diet of waterfowl.

Migratory Birds-Marsh birds

The king rail is found in fresh and brackish marshes, rice fields, and swamps. It will use a variety of habitats with shallow fresh or brackish water and dense cover. Important plants include cattails, bulrushes, spartina, and others. Wetland loss and alteration are considered the major drivers responsible for declines in king rails. It remains locally common near the Atlantic and Gulf coasts. King rail occurrence in the project area is highly unlikely given the lack of suitable habitat. The Proposed Action area is mostly developed. Short-term minor impacts could occur should a king rail come into contact with construction activities, such as disturbances to foraging, feeding, and resting activities. However, it is expected that they would be able to move to another nearby location to continue foraging, feeding and resting. Should a king rail enter the project area, construction activities will be halted, and the rail will be allowed to exit the workspace without harm and of its own volition. We anticipate the living shoreline project to show tangible reductions of wave energy impacting shorelines, reducing erosion, increasing vegetation coverage, and enhancing benthic fauna and nekton. Breakwaters support significantly more abundant and diverse faunal communities along the shoreline. Potential benefits to rails include an increase in preferred habitats (marshes) and greater prey abundance.

Migratory Birds-Forest birds

These birds are primarily associated with forests with thick understory and are typically absent from areas where the ground cover and understory have been disturbed. The Proposed Action area is mostly developed, and the project action area would occur in intertidal zones away from forest birds' habitat. Forest birds are unlikely to occur at the project action area. However, the

project action area falls within the species' migration corridor. Therefore, project activities are not anticipated to adversely affect forest birds.

Migratory Birds-Swifts

This species spends most of its life airborne and occurs in open skies over rural and urban areas with sufficient flying insects to feed on. Additionally, habitat requirements include suitable roosting sites including chimneys and interior walls of man-made structures such as barns, silos, wells, and cisterns. The Proposed Action area would occur in intertidal zones away from potential nesting areas; therefore, it is not anticipated to impact nesting. However, the project action area falls within the species' migration corridor. Given the aerial nature of the species and lack of potential nesting sites immediately within the project area, project activities are not anticipated to adversely affect the chimney swift.

Therefore, the Proposed Action activities "may affect, but are not likely to adversely affect," migratory birds including Bald Eagles.

3.6.2.2 Proposed Action Alternatives

The proposed action alternatives of a bulkhead or riprap revetment would have less positive effects and more negative effects on biological resources than the proposed action. Bulkheads are known to limit biological resources such as fish and wildlife shoreline access and loss of habitat. For example, the Alabama red-bellied turtle is known to be directly impacted through limited shoreline access by bulkheads. In response to that issue there are currently local pilot projects to retrofit bulkheads with "ladders" to allow these turtles to traverse bulkheads. Riprap revetments have less negative impacts than the bulkhead on biological resources, but still can lead to limited access and loss of certain portions of nearshore waterbottom habitat for fish and wildlife.

3.6.2.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur; therefore, there would be no change to baseline biological resources. Therefore, no significant impacts to biological resources would occur with the implementation of the No Action Alternative.

3.6.2.4 Cumulative Effects

The cumulative effects of the proposed action on biological resources should be positive in that it will provide shoreline protection that is more adaptable to future conditions than the proposed action alternatives. The segmented breakwater should protect the shoreline while allowing the vegetation to migrate upslope over time, thereby enhancing wetlands and water quality. Many of the local fauna and species listed above rely on healthy wetlands for at least portions of their life cycle. The proposed alternatives would provide shoreline protection, but will be less effective and adaptable to changing conditions as the proposed action and would provide less biological resource benefits. The no action alternative would continue to allow shoreline wetland erosion and general loss of habitat for biological resources.

3.6.2.5 Mitigation Measures

General BMPs

- Material used for construction cannot contain trash, debris, and/or toxic pollutants.
- Transiting vessels/barges will occur at slow transit speeds (5 knots or less).
- The project would comply with Measures for Reducing Entrapment Risk to Protected Species.
- Sediment curtains/boom will be used when placement of breakwater material creates sediment disturbance.
- Any other BMPs identified by MS Department of Marine Resources or USACE in the permitting process.

West Indian Manatee

- Comply with USFWS Standard Manatee Conditions (A-D) for In-Water Work (USFWS 2011)
- All construction personnel would be notified of the potential presence of West Indian Manatee in the water and reminded of the criminal and civil penalties associated with harassing, injuring, or killing West Indian Manatees.
- All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s).
- All in-water operations, including vessels, must be shut down if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) have 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. Animals must not be herded away or harassed into leaving.
- All vessels associated with the construction project shall 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 will follow routes of deep water whenever possible.
- Care would be taken when lowering equipment into the water and the sediment in order to ensure that no harm is caused to West Indian Manatee that may potentially be in the water within the construction area.
- Construction noise would be kept to the minimum feasible.

There were no other BMPs suggested from consultations.

3.7 Cultural Resources

Cultural resources may include prehistoric and historical archaeological sites, buildings, structures, districts, artifacts, objects, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, or religious purposes. Under 36 CFR § 800, federal agencies must take into consideration the potential effect of an undertaking on "historic properties," which refers to cultural resources listed in, or eligible for inclusion in, the National Register of Historic Places (NRHP).

Cultural resources at Keesler AFB are managed in accordance with environmental laws: Air Force Regulation 126-7, *Historic Preservation*; AFI 32-7061; the *National Historic Preservation Act* (NHPA) of 1966, as amended, and its implementing regulations, 36 CFR § 800; EO 11593 of 1971; *Archaeological and Historic Preservation Act* of 1974 (Public Law [PL.] 93-291); the *Archaeological Resources Protection Act* of 1979 (PL 96-95); the *American Indian Religious Freedom Act* of 1978 (PL 95-341); the *Native American Graves Protection and Repatriation Act* of 1990 (PL. 101-601); and Mississippi Department of Archives and History (MDAH) guidelines.

3.7.1 Affected Environment

Keesler AFB is required to consider the effects of its undertakings on historic properties listed, or eligible for listing, in the National Register. The NHPA obligations to a federal agency are independent from NEPA and must be complied even when an environmental document is not required. As per AFI 32-7065 Sections 3.3.1 and 3.3.2, and 36 CFR 800.8, Keesler AFB incorporates NHPA Section 106 review into the NEPA process or substitutes the NEPA process for a separate NHPA Section 106 review of alternatives.

3.7.2 Environmental Consequences

3.7.3.1 Proposed Action

Implementation of the Proposed Action would not include any construction activities that would affect facilities at Keesler AFB, Biloxi VMA, or Hiller Park, including buildings or historic districts that are eligible for listing under the NRHP. Consequently, construction-related impacts associated with the implementation of the Proposed Action would be limited to potential impacts to buried archaeological resources. Under the Proposed Action, segmented breakwaters could potentially be placed on top of buried archaeological resources. However, Keesler AFB is thought to have a low potential for on-site archaeological resources due to previous construction activities and subsequent development associated with Keesler AFB. Additionally, the area associated with the Proposed Action is highly dynamic and regularly affected by coastal processes, including shoreline erosion, which may have also exposed/damaged archaeological resources. Additionally, past construction activities have not uncovered any archaeological resources. Consequently, implementation of the Proposed Action would anticipate no impact on cultural resources at Keesler AFB. However, in the event that construction-related activities encounter archaeological resources, Keesler AFB would cease work and comply with Section 106, including coordinating identification and mitigation actions with the Virginia SHPO, in accordance with federal law and Air Force regulations.

3.7.2.2 Proposed Alternatives

The proposed action alternatives of a bulkhead or riprap revetment would more or similar effects on cultural resources as the proposed action. Installation of the bulkhead would require excavation for anchors and driving of pilings. These activities have the potential to impact any potential buried cultural resources. The riprap revetment would have similar impacts on cultural resources as the proposed action as both involve no excavation and only placing of rip rap material on the waterbottom.

3.7.2.3 No-Action Alternative

Under the No Action Alternative, the Proposed Action would not occur; therefore, no disturbance of an historic, archaeological, or American Indian resource would occur. Therefore, no effects on cultural resources would result under the No Action Alternative.

3.7.2.4 Cumulative Effects

The cumulative effects of the proposed action, alternative rip rap revetment action, and no action scenario on cultural resources should be negligible. None of those action scenarios involve excavation of sediment and, thus, could not lead to disturbance of cultural resources. The alternative bulkhead scenario would involve some excavation and backfilling that would lead to soil disturbance and potential disturbance of cultural resources if they were present.

3.7.2.5 Mitigation Measures

If buried human remains or historic artifacts were uncovered during the construction of the living shoreline, all activities would be suspended until a qualified archaeologist could recover and determine the significance of the resource(s), in compliance with Section 106 of the NHPA.

Therefore, no effects are expected to occur to Cultural Resources with the implementation of the Proposed Action Alternative.

3.8 Geological Resources

Geological resources consist of surface and subsurface materials and their properties. Principal geologic factors affecting the ability to support structural development include seismic properties (i.e., the potential for subsurface shifting, faulting, or crustal disturbance), soil stability, and topography. The term soil, in general, refers to unconsolidated materials overlying bedrock or other parent material. Soil structure, elasticity, strength, shrink-swell potential, and erodibility all determine the ability for the ground to support man-made structures. Soils typically are described in terms of their complex type, slope, physical characteristics, and relative compatibility or constraining properties with regard to particular construction activities and types of land use. Topography is the change in elevation over the surface of a land area. An area's topography is influenced by many factors, including human activity, underlying geologic material, seismic activity, climatic conditions, and erosion. A discussion of topography typically encompasses a description of surface elevations, slope, and distinct physiographic features (e.g., mountains) and their influence on human activities.

3.8.1 Affected Environment

Topography

Keesler AFB is located within the Coastal Meadows (Flatwoods) topographical division of the Gulf Coast region. The Coastal Meadows are generally flat to slightly elevated, with elevations ranging from sea level in the marshes along the Back Bay of Biloxi shoreline to approximately 30 feet AMSL near the southwest portion of the base (CMML 2019). Local relief is primarily the result of past depositional and more recent erosional processes. The elevation range at Hiller

Park is -0.83 m to 1.41 m NAVD88. The VAMC has an elevation range of -0.82 m to 1.22 m NAVD88, and Keesler has an elevation range of -0.82m to 0.79m NAVD88.

Geology and Soils

Keesler AFB is located within the Gulf Coast Geosynclines, which are large, sinking troughs of delta-deposited sediments in the Gulf of Mexico. The geologic units underlying Keesler AFB are not disrupted by faulting or other geologic discontinuities. The coastal area of Mississippi has not been seismically active in recent time (HDR 2015). Surficial geology at Keesler AFB consists of unconsolidated coastal deposits, composed primarily of sand, gravel, loam, and clay (USGS 2021). The majority of these soils have low erosion potential, low shrink-swell potential, and are nutrient poor. They have good-to-fair drainage capacity and an estimated weight-bearing capacity of 3,000 to 5,000 pounds per square foot.

The Proposed Action area lies within the Gulf Barrier Islands and Coastal Marshes Level IV Ecoregion. Regional soils are predominantly derivatives of beaches, dunes, marine estuaries, tidal flats, and low terraces. Local lowlands and marshes are found on silty organic soils, whereas uplands are well drained, nutrient-poor soils consisting of sands and silty loams. According to the National Resources Conservation Service (NRCS) online database, soil units at the Proposed Alternative sites include the Ha and EuE soil series (see Figure 3.5). These soil units have the following characteristics:

Handsboro association: This series consists of deep, very poorly drained, moderately permeable soils that formed in thick accumulations of highly decomposed herbaceous plant remains that have thin strata of mineral soil sediments. These soils are in regularly flooded salt marshes in estuaries of the Eastern Gulf Coast Flatwoods and Atlantic Coast Flatwoods Major Land Resource Areas. Slopes are less than 1 percent.

Use and vegetation: Handsboro soils are used mainly as nursery areas for various marine species and by waterfowl and shorebirds. Native vegetation is dominantly black needlerush, smooth cordgrass, sea lavender, and marsh aster.

Drainage And Permeability: Very poorly drained. Permeability is moderate. These soils are subject to inundation with brackish water at high tide every day. Water table is always near or above the soil surface.

Wadley and Poarch soils

Wadley: The Wadley series consists of very deep, well drained and somewhat excessively drained soils that formed in sandy and loamy marine sediments. They are on sandy uplands on the North Central Florida Ridge and the Atlantic Coast Flatwoods. Permeability is rapid in the A and E horizons and moderate in the Bt horizon. Slopes range from 0 to 40 percent.

Use and vegetation: Most areas have been planted to pine or are in pasture. Some small areas are used for irrigated crops. Other areas remain in their natural vegetation or have been subdivided for residential development. Natural vegetation consists mainly of live oak, turkey oak, bluejack oak, chapman oak, and longleaf pine in the overstory, and pineland threeawn, lopsided indiagrass, bluestems, panicums, scattered saw palmetto, blackberry, running oak, reindeer moss and other forbs in the understory.

Drainage and permeability: Wadley soils are well or somewhat excessively drained. The water table is below a depth of 72 inches throughout the year during most years. Permeability is rapid in the A and E horizons and moderate in the Bt horizon.

Poarch: The Poarch series consists of very deep, moderately well and well drained, moderately permeable soils on uplands of the Southern Coastal Plain Major Land Resource Area. They formed in unconsolidated sandy and loamy marine sediments. Near the type location, the mean annual temperature is about 66 degrees F., and the mean annual precipitation is about 56 inches. Slopes range from 0 to 8 percent.

Use And Vegetation: Most areas of Poarch soils are cleared and used for the production of corn, cotton, soybeans, peanuts, small grains and truck crops. Other areas are used for pasture and woodland. The forested areas have longleaf pine, loblolly pine, slash pine along with some hardwood.

Drainage And Permeability: Well and moderately well drained. Slow to medium runoff and moderate to moderately slow permeability.

Geographic Setting: Poarch soils are on nearly level to gently sloping uplands of the Coastal Plain. They formed in loamy and clayey marine sediments. Slopes range from 0 to 8 percent. The climate is humid subtropical. Near the type location the average annual temperature is 66 degrees F., and the average annual rainfall is about 58 inches.

Typical profile: Ap - 0 to 7 inches: fine sandy loam; E - 7 to 12 inches: loam; Bt - 12 to 32 inches: loam; Btv1 - 32 to 66 inches: loam; Btv2 - 66 to 80 inches: fine sandy loam.



Figure 3-5 Soil Units at the Proposed Alternative Sites. A link to descriptions of each soil type can be found [HERE](#).

3.8.2 Environmental Consequences

3.8.2.1 Proposed Action

Geology and substrates: Placement of structures such as breakwaters will permanently cover existing geology and substrates. The adverse effects will be minor to moderate and long-term, because they will affect substrate/geologic characteristics of the project footprint and could extend beyond the construction period. The project will result in long-term benefit resulting from the development of substrate (breakwater materials) into living reefs that support benthic secondary productivity. There will be long-term benefits to shorelines and marsh resulting from the placement of breakwater along eroding shorelines. Breakwaters will reduce the wave energy, thereby slowing shoreline and marsh erosion and resulting in the long-term protection of the shoreline. Therefore, the project will have a long-term beneficial impact on geology and substrate.

Hydrology, tides and currents: Shoreline protection and erosion reduction could generally help reduce storm surges on shorelines and marshes. Breakwater construction could reduce the loss of the wetlands. Gaps will be present between breakwater segments that will allow tidal exchange flows and waterway access. Breakwaters will change natural current patterns, sediment accretion and erosion rates. Wave energy and resulting erosion will be reduced. This could be a long-term beneficial effect to shorelines that will extend beyond the construction period.

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. A long-term benefit to the bottom substrates would be expected due to stabilization of sediments by the breakwater structures.

3.8.2.2 Proposed Action Alternatives

The proposed action alternatives of a bulkhead or riprap revetment would more negative or similar effects on geological resources as the proposed action. Installation of the bulkhead would require excavation for anchors and driving of pilings as well as scour of soft nearshore sediments just offshore of the bulkhead. These activities will lead to fill or mixing of geological resources and also reduced stability of soft sediments just offshore of the breakwater. The riprap revetment would have similar impacts on geological resources as the proposed action as both involve no excavation and only placing of rip rap material on the waterbottom.

3.8.2.3 No Action Alternative

Under the No Action Alternative, the proposed living shorelines project would not be constructed and no impacts to geology and substrates would occur. The beneficial impacts from implementation of this project including habitat enhancement would not be realized.

3.8.2.4 Cumulative Effects

The cumulative effects of the proposed action and alternative rip rap revetment action on geological resources should be positive. Both of those actions will lead to the stabilization of soft sediments and the shoreline. The alternative bulkhead action would involve some excavation and backfilling that would lead to soil disturbance. Wave action impacting the front of the bulkhead would lead to scouring and disturbance of nearshore sediment. The no action scenarios would lead to continued erosion and disturbance of nearshore geological resources.

3.8.2.5 Mitigation Measures

- Employment of standard BMPs for construction to reduce erosion.
- Employment of turbidity barriers to reduce erosion.

This page intentionally left blank.

APPENDIX A: REFERENCES

81 TRW (81st Training Wing). 2016. Bird/Wildlife Aircraft Strike Hazard Plan. 81st Training Wing, Keesler Air Force Base, Biloxi, Mississippi.

Hazardous Waste Management Plan. 81st Training Wing, Keesler Air Force Base, Biloxi, Mississippi.

2021. Spill Prevention, Control and Countermeasures Plan. 81st Training Wing, Keesler Air Force Base, Biloxi, Mississippi.

AFC (Alabama Forest Commission). 2023. Louisiana Quillwort. Available: https://forestry.alabama.gov/Pages/Informational/Endangered/Louisiana_Quillwort.pdf (December 2023).

Barbour, R.W. and W.H. Davis. 1969. Bats of America. The University Press of Kentucky, Lexington, Kentucky.

CEMML (Center for Environmental Management of Military Lands). 2019. U.S. Air Force Integrated Natural Resources Management Plan Update. Prepared for Keesler Air Force Base, Biloxi, Mississippi, by the Center for Environmental Management of Military Lands, Colorado State University, Fort Collins, Colorado.

Chandler, S. C., 2007. Wildlife Biologist, U. S. Department of the Interior, Fish and Wildlife Service. Dec. 3, 2007 letter to R. Jenkins-Price, MS Dept. of Marine Resources regarding review of Environmental Assessment for Mississippi Gulf Coast National Heritage Area and compliance with the Endangered Species Act.

Fertl, D., A.J. Schiro, G.T. Regan, C.A. Beck, N. Adimey, L. Price-May, A. Amos, G.A.J. Worthy, and R. Crossland. 2005. Manatee Occurrence in the Northern Gulf of Mexico, West of Florida. *Gulf and Caribbean Research* 17:69-94

GRPC (Gulf Regional Planning Commission). 2017. Keesler Air Force Base Joint Land Use Study Report. GRPC, Biloxi, Mississippi. (Accessed May 2024). <https://grpc.com/wp-content/uploads/2022/06/Keesler-AFB-JLUS-Report.pdf>

HDR. 2015. Installation Development Plan, Keesler Air Force Base, Biloxi, Mississippi.

Keesler AFB (Keesler Air Force Base). 2020. Hazardous Waste Management Plan. 81st Training Wing, Keesler Air Force Base, Biloxi, Mississippi.

2022. Cultural Resources Management Plan for Keesler Air Force Base, Mississippi. Keesler Air Force Base, Mississippi.

2023. Environmental assessment of construction and operation of a Pass Road gate, 2. Department of the Air Force, Air Education and Training Command, 81st Training Wing, Keesler Air Force Base, Mississippi. (Accessed May 2024). https://www.keesler.af.mil/Portals/14/FONSI_FINAL%20KAFB%20Pass%20Road%20Gate.pdf_safe.pdf

LDWF (Louisiana Department of Wildlife and Fisheries) and BTNEP (Barataria-Terrebonne National Estuary Program). 2023. Rare Plants of Louisiana. (Accessed December 2023). https://www.wlf.louisiana.gov/assets/Resources/Publications/Rare_Plant_Species_Fact_Sheets/Fern-and-Ferns-Allies/LA_quillwort_fact_sheet.pdf

MDEQ (Mississippi Department of Environmental Quality). 2022a. State of Mississippi air quality data summary for calendar year 2022. MDEQ, Jackson, Mississippi. (Accessed May 2024) <https://www.mdeq.ms.gov/wp-content/uploads/2023/07/2022-Air-Quality-Data-Summary-FINAL.pdf>

2022b. Mississippi's 2022 list of impaired water bodies. Mississippi Department Of Environmental Quality, Surface Water Division Of The Office Of Pollution Control, Jackson, Mississippi. (Accessed May 2024). <https://www.mdeq.ms.gov/wp-content/uploads/2022/03/ADOPTED-2022-303d-List-Report-02242022-Proposed.pdf>

MDWFP (Mississippi Department of Wildlife, Fisheries, and Parks). 2001. Endangered Species of Mississippi. Mississippi Museum of Natural Science. Jackson Mississippi .

MMNS (Mississippi Museum of Natural Science). 2014. Endangered species of Mississippi. Mississippi Department of Wildlife, Fisheries, and Parks, Mississippi Museum of Natural Science, Jackson, Mississippi.

NOAA Fisheries. 2024a. Hawksbill Turtle (*Eretmochelys imbricata*). NOAA Fisheries Office of Protected Resources. Accessed: May 2024. Available: <https://www.fisheries.noaa.gov/species/hawksbill-turtle>

2024b. Kemp's ridley Turtle (*Lepidochelys kempii*). NOAA Fisheries Office of Protected Resources. Accessed: May 2023. Available: <https://www.fisheries.noaa.gov/species/kemps-ridley-turtle>

2024c. Loggerhead Turtle (*Caretta caretta*). NOAA Fisheries Office of Protected Resources. Accessed: May 2024. Available: <https://www.fisheries.noaa.gov/species/loggerhead-turtle>

Niles, L.J., H.P. Sitters, A.D. Dey, P.W. Atkinson, A.J. Baker, K.A. Bennett, K.E. Clark, N.A. Clark, C. Espoz, P.M. Gonzalez, B.A. Harrington, E.E. Hernandez, K.S. Kalasz, R. Matus, C.D.T. Minton, R.I.G. Morrison, M.K. Peck, and I.L. Serrano. 2007. Status of the red knot (*Calidris canutus rufa*) in the Western Hemisphere. Report to the U.S. Fish and Wildlife

Service. New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Endangered and Nongame Species Program, Trenton, New Jersey. 236p.

Pritchard, P. C. H. 1989. The Alligator Snapping Turtle. Biology and Conservation. Milwaukee Public Museum, Milwaukee. 104 pp.

1992. Alligator snapping turtle. *Macroclemys temminckii* (Harlan). Pp. 171-177. In: P. E. Moler (editor). Rare and Endangered Biota of Florida. Volume III. Amphibians and Reptiles. University Press of Florida, Gainesville, Florida. 292 pp.

Rogillio, H.E., Ruth, R.T., Behrens, E.H., Doolittle, C.N., Granger, W.J., and Kirk, J.P. 2007. Gulf sturgeon movements in the Pearl River drainage and the Mississippi Sound. North American Journal of Fisheries Management 27: 89–95.

Ross, S. T., Slack, W.Y., Heise, R.J., Dugo, M.A., Rogillio, H., Bowen B.R., Mickle, P. and Heard, R. 2009. Estuarine and coastal habitat use of Gulf sturgeon (*Acipenser oxyrinchus desotoi*) in the North-Central Gulf of Mexico. Estuar. Coast 32. 360-364. 360–374.

Sweet, W.V., B.D. Hamlington, R.E. Kopp, C.P. Weaver, P.L. Barnard, D. Bekaert, W. Brooks, M. Craghan, G. Dusek, T. Frederikse, G. Garner, A.S. Genz, J.P. Krasting, E. Larour, D. Marcy, J.J. Marra, J. Obeysekera, M. Osler, M. Pendleton, D. Roman, L. Schmied, W. Veatch, K.D. White, and C. Zuzak, 2022: Global and Regional Sea Level Rise Scenarios for the United States: Updated Mean Projections and Extreme Water Level Probabilities Along U.S. Coastlines. NOAA Technical Report NOS 01. National Oceanic and Atmospheric Administration, National Ocean Service, Silver Spring, MD, 111 pp. (Accessed May 2024). <https://oceanservice.noaa.gov/hazards/sealevelrise/sealevelrise-tech-report-sections.html>

Turcotte, W.H. and D.L. Watts. 1999. Birds of Mississippi. University Press of Mississippi, Jackson, Mississippi

USCCSP (U.S. Climate Change Science Program). 2009. Climate literacy, the essential principles of climate sciences. A guide for individuals and communities. Accessed May 2024). <https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/ocp2009.pdf>

U.S. Fish and Wildlife Service (USFWS).2008. Birds of Conservation Concern. U.S. Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia.

2013. Habitat Descriptions Federally Endangered and Threatened and Candidate Species of Mississippi. Mississippi Field Office.

2021. Species Status Assessment (SSA) Report for the Tricolored Bat (*Perimyotis subflavus*). U.S. Fish and Wildlife Service, Northeast Region, Hadley, Massachusetts. (accessed May 2024). <https://ecos.fws.gov/ServCat/DownloadFile/221212>

2023. Environmental Conservation Online System, Monarch butterfly (*Danaus plexippus*). Available at: <https://ecos.fws.gov/ecp/species/9743>. Accessed December 2023.

2024. IPaC Information for Planning and Consultation. (Accessed May 2024). <https://ipac.ecosphere.fws.gov/>

Watts, B. D. 2016. Status and distribution of the eastern black rail along the Atlantic and Gulf Coasts of North America. The Center for Conservation Biology Technical Report Series, CCBTR-16-09. College of William and Mary / Virginia Commonwealth University, Williamsburg, VA. 148 pp.

Woodrey, M. S., P. J. Kappes, and M. J. Sukiennik. 2022. A Preliminary Status Assessment of the Eastern black rail (*Laterallus jamaicensis jamaicensis*) in Mississippi: Historic Records and Current Surveys. Final Report: 1 January 2019 – 31 March 2022. Final Report submitted to the Mississippi Department of Wildlife, Fisheries, & Parks (Award #: E-1-33/MSU Grant #: G00004350), Jackson, Mississippi.

Xerces Society. 2023a. Regional Roadside Habitat for Monarchs: Milkweeds of Arkansas, Louisiana, and Mississippi. Available at: http://rightofway.erc.uic.edu/wp-content/uploads/2019/09/MJV-Xerces_Regional-Milkweed-Guides. Accessed December 2023.

2023b. Monarch Nectar Plant Guides. Available at: <https://www.xerces.org/monarchs/monarch-nectar-plant-guides>. Accessed December 2023.

APPENDIX B: PUBLIC AND AGENCY COMMUNICATIONS

| IICEP Letters Checklist | | |
|--|--|-------------------|
| Organization | Recipient | Response |
| University of Southern Mississippi | kelly.lucas@usm.edu | Y |
| Biloxi Veterans Hospital | shaun.shenk@va.gov | Y |
| Army Corps of Engineers Mobile District | dylan.c.hendrix@usace.army.mil | Y (w/Comments) |
| MS Department of Environmental Quality | mrclark@mdeq.ms.gov | Y (w/Comments) |
| MS Department of Wildlife, Fisheries, and Parks | dennisar@mdwfp.state.ms.us | Y |
| City of Biloxi | jcreel@biloxi.ms.us | N |
| Harrison County Utility Authority | dperkins@hcua-ms.us | N |
| NEPA Program Office | kajumba.ntale@epa.gov | Y (w/Comments) |
| Southern Mississippi Planning and Development District | ejackson@smpdd.com | N |
| Gulf Regional Planning Commission | kyarrow@grpc.com | N |
| Harrison County | jmturner@co.harrison.ms.us | Y |
| Mississippi Department of Marine Resources | dmrpermitting@dmr.ms.gov | Y |
| Tunica-Biloxi Tribe of LA | earlii@tunica.org | N |
| Mississippi Band of Choctaw Indians | Melanie.Carson@choctaw.org | N |
| Jena Band of Choctaw Indians | jflynn@jenachoctaw.org' | N |
| Choctaw Nation of Oklahoma | ithompson@choctawnation.com | N |
| US Fish and Wildlife Service | paul_necaise@fws.gov | Y |
| Historic Preservation District | Online Section 106 Portal | Y (w/Comments) |
| Army Corps of Engineers Biloxi Satellite Office | CESAM-RD@sam.usace.army.mil | N |