Mississippi Valley Division,
Regional Planning and Environment Division South

Pearl River Basin, Mississippi Federal Flood Risk Management Project

Revised Draft: Environmental Impact Statement

July 2025

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Cover Page

Pearl River Basin, Mississippi Federal Flood Risk Management Project Revised Draft Environmental Impact Statement

Counties: Rankin and Hinds Counties, Mississippi

Lead Agency: U.S. Army Corps of Engineers (USACE), Mississippi Valley Division (MVD), Vicksburg District

Cooperating Agencies: U.S. Fish and Wildlife Service; Federal Emergency Management Agency; United States Environmental Protection Agency Region 4; Mississippi Department of Environmental Quality; Mississippi Department of Wildlife and Fisheries Protection; Louisiana Department of Natural Resources; Mississippi Department of Archives & History, Louisiana Department of Environmental Quality

Abstract: The Pearl River Basin, Mississippi Federal Flood Risk Management Feasibility Study (study) for flood damage reduction in Rankin and Hinds Counties, Mississippi (Study Area), is authorized by Section 3104 of the Water Resources Development Act (WRDA) of 2007 which modified Section 401(e)(3) of WRDA 1986 to authorize the Secretary of the Army to construct the National Economic Development (NED) plan, or the Locally Preferred Plan (LPP), or some combination thereof, subject to certain determinations.

The Revised Draft Environmental Impact Statement (RDEIS) is an analysis of flood risk management plans that can be implemented under Section 3104. Alternatives considered and evaluated for selection are Alternative D1 (With Weir) and Alternative E1 (Without Weir).The proposed project would have adverse impacts to the environment requiring mitigation along with an associated monitoring and an adaptive management plan.

The RDEIS is available for a 45 day comment period. Comments must be submitted by August 18th, 2025. The DEIS is available at: https://www.mvk.usace.army.mil/Missions/Programs-and-Project-Management/Pearl-River-FRM/ Submit comments to the following:

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Attention: Jason Emery, Acting Chief,
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EXECUTIVE SUMMARY

REVISED DRAFT: ENVIRONMENTAL IMPACT STATEMENT FOR THE PEARL RIVER BASIN MISSISSIPPI FEDERAL FLOOD RISK MANAGEMENT PROJECT RANKIN AND HINDS COUNTIES, MISSISSIPPI

The U.S. Army Corps of Engineers (USACE) has prepared this Revised Draft Environmental Impact Statement (RDEIS) for the Pearl River Basin, Mississippi Federal Flood Risk Management Project (MS) project. This public review of the Draft EIS, reflecting changes made since the initial draft was released in June 2024. The purpose of this RDEIS is to document the existing conditions and opportunities within the project area, describe the affected environment, and identify the range of measures and alternatives considered to address flood risk in the Pearl River Basin, specifically in the area of Jackson, MS and the surrounding communities. This RDEIS details the potential environmental impacts of each alternative – including impacts to water resources, habitat, and communities – to inform decision-makers as they develop a recommendation for implementing flood risk management features. As part of the National Environmental Policy Act (NEPA) requirements, this RDEIS is being made available for a 45-day public review and comment period.

Numerous studies of the Pearl River and Tributaries have been conducted beginning in 1949 and led to the construction of the Jackson (Fairgrounds) and East Jackson levees along with four gated outlets and two pump stations which were completed in 1968 by the Corps.

The “Pearl River Basin, Mississippi: Report of the Chief of Engineers” was completed and subsequently authorized in the Water Resources Development Act (WRDA) of 1986. This initial authorization was later modified by the WRDA of 2007, which directed the USACE to construct project features generally in accordance with – the Preliminary Draft dated February 2007, “Pearl River Watershed, Mississippi, Feasibility Study Main Report.” In 2022 the non-federal interest (NFI), Rankin-Hinds, submitted to the Assistant Secretary of the Army, under Section 211 of WRDA 1996, “Pearl River Basin, Mississippi Federal Flood Risk Management Project, Hinds & Rankin Counties Integrated Final Feasibility Study & Environmental Impact Statement,” (NFI Section 211 Report) for consideration of federal participation in a flood risk management project for the area.

These reports and subsequent authorizations are underscored by a history of significant flood events, including the Easter Flood of 1979, the May Flood of 1983, and the devastating February 2020 flood. These events demonstrate the ongoing flood risk in the region and the importance of developing effective flood risk reduction strategies.
his RDEIS evaluates flood risk management alternatives for the Pearl River Basin, as authorized under Section 3104 of the Water Resources Development Act (WRDA) of 2007. The initial set of alternatives considered included those presented in the NFI Section 211 report (Pearl River

Watershed Feasibility Report): a no-action plan, a non-structural plan (Alternative A), a levee plan (Alternative B), and a river channel improvement and weir construction plan (Alternative C), which was identified as the locally preferred plan.
Following collaboration between the USACE and the NFI, these alternatives were screened from further consideration (due lack of functionality of the features within the Alternatives or economic reasons) or modified, resulting in a set of USACE-developed alternatives. These include a no-action plan, a modified non-structural plan focusing on elevating, floodproofing, and acquiring structures (Alternative A1), and two "Combination Thereof" (CTO) plans (Alternatives D and E). The CTO plans combine Alternative A1 with structural flood damage reduction features, with Alternative D including a new weir and Alternative E. These alternatives were initially presented in the Draft EIS (DEIS), released for public review on June 7, 2024.

Since the release of the DEIS, the USACE has further refined these alternatives based on analytical findings, public input, and agency coordination. The non-structural alternative A1, has been modified to include Canton Club Levee. Alternative D (With Weir) and Alternative E (without Weir) were further modified to include expanding the Canton Club Levee and adding the McLeod Club Levee, Cany Creek Levee, and Richland Levee to both CTO alternatives. As a result of these modifications, the original CTO alternatives D and E are now referred to as D1 and E1, respectively. Both D1 and E1 incorporate the added levees, but D1 includes the construction of a weir as mentioned in Alternative D, while E1 does not. For this RDEIS, the no action plan, and Alternatives A1 (NED Plan, not recommended), D1 (Modified LPP), and E1 are considered the final array.

This RDEIS provides a comprehensive evaluation of flood risk management alternatives for the Pearl River Basin. This document was prepared in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) NEPA implementing regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508), as reflected in the USACE Engineer Regulation (ER) 200-2-2 (33 CFR Part 230) and coordinating laws and regulations. This RDEIS drew heavily on the Non-Federal Interest's (NFI) Section 211 Report, which is incorporated by reference and made available upon request. The information presented herein will inform decision-making regarding the implementation of flood risk reduction measures in the Pearl River Basin.

Authority

Original Project Authority: Section 401(e)(3) of Water Resource Development Act (WRDA) 1986 (100 Stat. 4132)

1. Additional Authorized Projects:

   Pearl River Basin, including Shoccoe, Mississippi. --The Secretary is authorized to construct a project for the purpose of providing flood control for the Pearl River Basin in Mississippi, including, but not limited to, Carthage, Jackson, Monticello, and Columbia, Mississippi, consisting of--

a) the project for flood control, Pearl River Basin, Mississippi: Report of the Chief of Engineers, dated March 17, 1986, at a total cost of $80,100,000, with an estimated first Federal cost of $56,070,000 and an estimated first non-Federal cost of $24,030,000; and
b) for the purpose of providing flood control for the upstream areas of the Pearl River Basin in Mississippi-

i) a combination roadway crossing of the Pearl River and floodwater detention and storage facility in east central Leake County, Mississippi;
ii) a levee system in the south part of Carthage, Mississippi, which will upgrade, extend, and improve the protective levee system on the south side of Highway 16 in Leake County and the city of Carthage;
iii) appropriate drainage structure and bridge modifications to expand and improve the stormwater conduits under Mississippi Highway 35, south of Carthage, Mississippi, for the purposes of reducing backwater influence for areas upstream of such highway;
iv) upstream reservoirs on the Pearl River;
v) such other structures as may be necessary to alleviate unforeseen flooding in the Leake County area as a result of the construction of the Shoccoe Dry Dam; and
vi) channel improvements on the upstream Pearl River.

Project Authority Modified by Section 3104 of the Water Resources Development Act (WRDA) of 2007 (Public Law 110-114)

SEC. 3104. PEARL RIVER BASIN, MISSISSIPPI.

1) IN GENERAL.—The project for flood damage reduction, Pearl River Basin, including Shoccoe, Mississippi, authorized by section 401(e)(3) of the Water Resources Development Act of 1986 (100 Stat. 4132), is modified to authorize the Secretary, subject to subsection (c), to construct the project generally in accordance with the plan described in the ‘‘Pearl River Watershed, Mississippi, Feasibility Study Main Report, Preliminary Draft’’, dated February 2007, at a total cost of $205,800,000, with an estimated Federal cost of $133,770,000 and an estimated non-Federal cost of $72,030,000.

2) COMPARISON OF ALTERNATIVES— Before initiating construction of the project, the Secretary shall compare the level of flood damage reduction provided by the plan that maximizes national economic development benefits of the project and the locally preferred plan, referred to as the LeFleur Lakes plan, to that portion of Jackson, Mississippi and vicinity, located below the Ross Barnett Reservoir Dam.

3) IMPLEMENTATION OF PLAN—

a) IN GENERAL— If the Secretary determines under subsection (b) that the locally preferred plan provides a level of flood damage reduction that is equal to or greater than the level of flood damage reduction provided by the national economic development plan and that the locally preferred plan is environmentally acceptable and technically feasible, the Secretary

may construct the project identified as the national economic development plan, or the locally preferred plan, or some combination thereof.

b) CONSTRUCTION BY NON-FEDERAL INTERESTS— The non- Federal interest may carry out the project under section 211 of the Water Resources Development Act of 1996 (33 U.S.C. 701b–13).

4) PROJECT FINANCING— In evaluating and implementing the project under this section, the Secretary shall allow the non-Federal interests to participate in the financing of the project in accordance with section 903(c) of the Water Resources Development Act of 1986 (100 Stat. 4184) if the detailed project report evaluation indicates that applying such section is necessary to implement the project.

5) NON-FEDERAL COST SHARE— If the locally preferred plan is selected for construction of the project, the Federal share of the cost of the project shall be limited to the share as provided by law for the elements of the national economic development plan.

Demonstration Program Authority

WRDA 2018 (PL 115-270) SEC 1176 PRECONSTRUCTION ENGINEERING DESIGN DEMONSTRATION PROGRAM.

1) DEFINITION OF ENVIRONMENTAL IMPACT STATEMENT. In this section, the term ‘‘environmental impact statement’’ means the detailed written statement required under section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(C)).

2) DEMONSTRATION PROGRAM. The Secretary shall establish a demonstration program to allow a project authorized to execute pursuant to section 211 of the Water Resources Development Act of 1996 (33 U.S.C. 701b–13) (as in effect on the day before the date of enactment of the Water Resources Reform and Development Act of 2014 (128 Stat. 1193)) to begin preconstruction engineering and design on a determination by the Secretary that the project is technically feasible, economically justified, and environmentally acceptable.

3) REQUIREMENTS. For each project authorized to begin preconstruction engineering and design under subsection (b)—

   a) the project shall conform to the feasibility study and the environmental impact statement approved by the Secretary; and
   b) the Secretary and the non-Federal sponsor shall jointly agree to the construction design of the project.

4) SECRETARY REVIEW OF POTENTIAL ADVERSE IMPACTS. When reviewing the feasibility study and the environmental impact statement for a project under subsection (b), the Secretary shall follow current USACE Policy, Regulations, and Guidance, to assess potential adverse downstream impacts to the Pearl River Basin. Upon completion of the Secretary’s determination under subsection (b), the non-Federal sponsor shall design the project in a

manner that addresses any potential adverse impacts or that provides mitigation in accordance with section 906 of the Water Resources Development Act of 1986 (33 U.S.C. 2283).

5) SUNSET. The authority to carry out the demonstration program under this section shall terminate on the date that is 5 years after the date of enactment of this Act.

6) SAVINGS PROVISION. Nothing in this section supersedes, precludes, or affects any applicable requirements for a project under subsection (b) under—

    a) section 906 of the Water Resources Development Act of 1986 (33 U.S.C. 2283); or
    b) the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9601 et seq.).

Congressional Resolutions Adopted 9 May 1979 Authorized Studies of the Pearl River Watershed, Mississippi.

Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Pearl River Basin, Mississippi and Louisiana, published as House Document Number 282, Ninety-Second Congress, Second Session, and other pertinent reports, with a particular view toward determining whether any further improvements for flood damage prevention and related purposes are advisable at this time. The alternatives are to be reviewed with local interests to insure a viable, locally supported project.

Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors is hereby requested to review the report of the Chief of Engineers on the Pearl River and Tributaries, Mississippi, contained in House Document 441, 86th Congress, and other reports with a view to determining whether measures for prevention of flood damages and related purposes are advisable at this time, in Rankin County, Mississippi.

Resolved by the Committee on Environment and Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, and is hereby requested to review the reports of the Chief of Engineers on Pearl River Basin, Mississippi and Louisiana submitted in House Document Numbered 92-282, 92d Congress, 2nd Session and other pertinent reports with a view to determining whether any further improvements for flood damage prevention and related purposes are warranted at this time.

Purpose and Need of the Proposed Action

Study Area

The Pearl River Basin, encompassing approximately 8,760 square miles across south-central Mississippi and a portion of southeastern Louisiana, is prone to both flash and riverine flooding. It is bounded on the north by the Tombigbee River Basin, on the east by the Pascagoula River

Basin, on the south by Lake Borgne and the Mississippi Sound, and on the west by the Mississippi River Basin and several streams that drain the eastern portion of Louisiana. There are numerous lakes within the watershed but only a few of significant size. The largest of these is Ross Barnett Reservoir, which is located on the Pearl River about 12 miles northeast of downtown Jackson. Key municipalities within the Study Area include Jackson, Flowood, Pearl, and Richland, located within Madison, Hinds and Rankin counties. Numerous tributaries, including Cany, Eubanks, and Richland Creeks, contribute to ongoing flood damage. (Figure ES - 1).

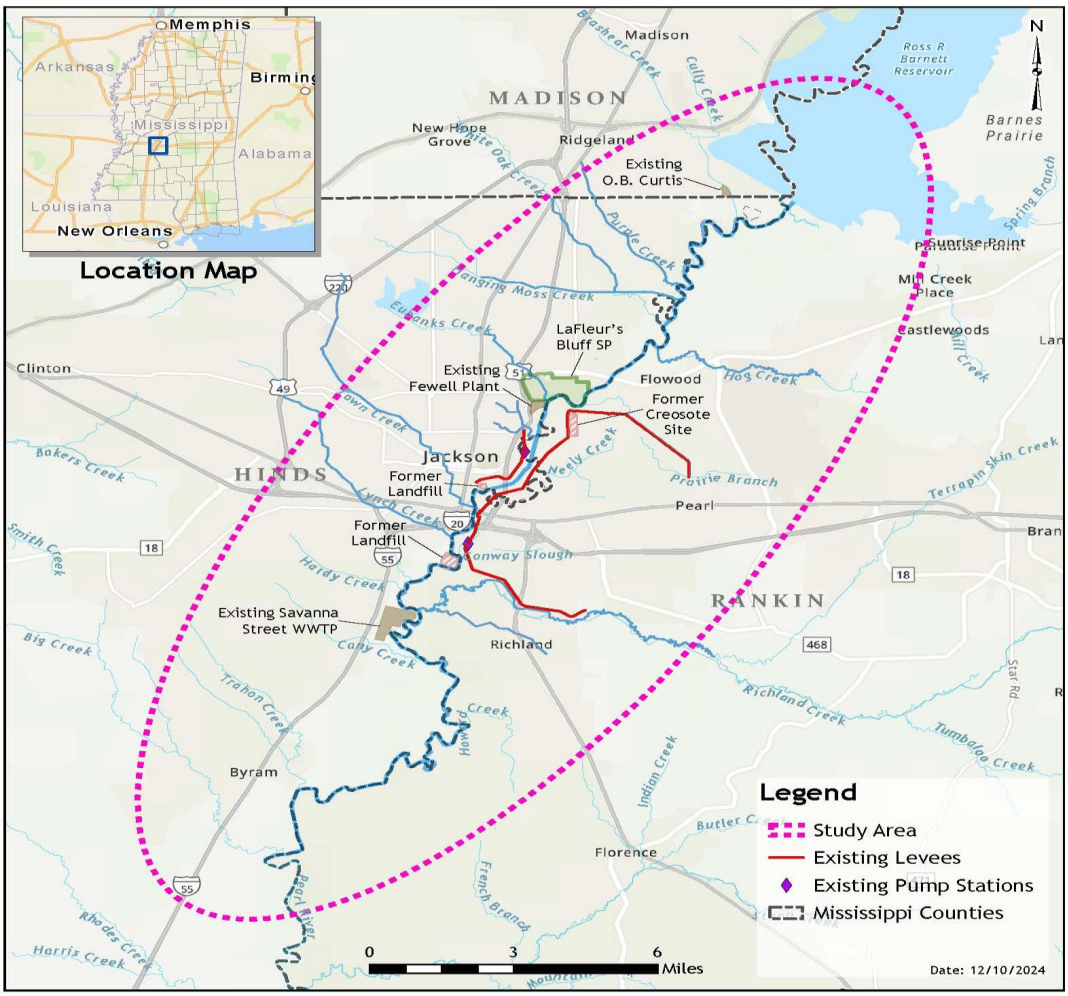

Figure ES-1: Study Area

Scope:

This Revised Draft Environmental Impact Statement (RDEIS) evaluates a range of actions, alternatives, and their direct, indirect, and cumulative impacts within the Study Area. The scope of this evaluation encompasses both the human and natural environments to identify reasonable flood risk management alternatives.

Purpose:

The purpose of the RDEIS is to evaluate flood risk management alternatives that address the problem in the study area and may be implemented under Section 3104 of WRDA 2007.

Problem:

For more than 100 years, headwater flooding of the Pearl River (greater than 10 feet deep in some areas) has caused disruption to businesses and industry throughout the Jackson, Mississippi, metropolitan area. This area of flood risk includes 5,000 commercial and residential structures and affects a population of over 500,000. The area has a history of devastating flood events, including those in 1979, 1983, and 2020. The 1979 Easter Flood caused approximately 223 million in damages (equivalent to over 1.2 billion today). The February 2020 flood event saw the Pearl River crest at 36.67 feet in Jackson – the third highest level ever recorded – with the communities of Duttoville and Canton Club experiencing the most severe impacts.

These recurring events demonstrate the critical need for flood risk management measures to protect the region's economy, infrastructure, and communities. This project is essential to mitigate future damages and ensure the continued economic vitality of the Jackson metropolitan area.

Objectives:

As a result of the identified problem, the objectives below formed the basis for the evaluation of the final array of alternative plans:

- reduce risk of flooding for the city of Jackson, MS and adjacent areas in Hinds and Rankin Counties, MS;
- reduce flood risk to human life and well-being;
- reduce flood risk to critical infrastructure (e.g., medical centers, schools, transportation, etc.;)
- create a self-sustaining project that allows for minimal operation and maintenance cost; and
- minimize the potentially reasonably foreseeable impacts to downstream areas, the environment, and cultural resources.

Opportunities:

- As a result of the objectives stated above, the following opportunities may be considered in the evaluation of the final array:
- consider the regional economic impacts associated with the development of recreational opportunities along the Pearl River in the Project Area;
- provide recreational opportunities along the Pearl River for the city of Jackson, MS and adjacent areas in Hinds and Rankin Counties, MS; and
- the regional economic impacts associated with the development of recreational opportunities along the Pearl River in the Project Area.

Constraints and Considerations:

The following were identified as constraints and considerations:

- Constraint - avoid promoting development within the floodplain (in accordance with E.O. 11988) to the maximum extent practicable, which contributes to increased life safety risk.
- Considerations - avoid or minimize adverse impacts to:
  - Threatened or endangered (T&E) and protected species;
  - T&E designated critical habitat;
  - Water quality; and
  - Cultural, historic, and Tribal-trust resources;
  - avoid or minimize impacts to Hazardous, Toxic and Radioactive Waste Sites (HTRW);
  - maintain consistency with local floodplain management plans by not inducing flooding in other areas; and
  - closely coordinate with operators of Ross Barnett Reservoir on operations and maintenance of minimum flows.

Alternatives Considered

This RDEIS considers the no action alternative, and action alternatives that address the study objective, the problems in the study area, and consider the opportunities, considerations, and constraints. The evaluation of alternatives has evolved over time from the NFI Section 211 Report, through the release of the DEIS, to the current RDEIS.

Final Array of Alternatives Presented in the NFI Section 211 Report

1. **No Action Alternative:** This alternative is considered the Future without project condition. Under this alternative the Federal government would take no action to address the problems of flood risk management in the area. Flood risk would continue as it currently described in the without project conditions.

2. **Alternative A** – **Nonstructural Plan:** a nonstructural plan including the acquisition (buyout) of structures with subsequent relocation or demolition of each structure. This alternative removes structures out of the 20% annual exceedance probability (AEP) floodplain (5-year flood) and acquires the land where they reside. A 5-year flood means a flood of a certain magnitude is expected to occur, on average, once every 5 years.

3. **Alternative B – Levee Plan:** This alternative involved upgrading existing levees, constructing new levee segments and floodwalls, federalizing a non-Federal levee, and adding pump stations and gated structures.

4. **Alternative C – River Channel Improvements (Locally Preferred Plan):** This alternative focused on river channel improvements (clearing and expansion), weir demolition and reconstruction (with recreational and water supply benefits), Federal levee improvements, and federalization of a non-Federal levee around the Savanna Street Wastewater Treatment Plant (WWTP). It includes features to avoid and/or minimize impacts to Federally listed threatened, endangered, and protected species. This alternative would have adverse impacts to the

environment requiring compensatory habitat mitigation along with associated monitoring and adaptive management plans.

USACE Developed Alternatives – Refinement and Modifications to Final Array

1. **Alternative A1 – Nonstructural Plan + Canton Club Levee:** In accordance with USACE policy, a non-structural approach was re-evaluated. This alternative proposes elevation of residential structures to the future 1% (100-year flood) Annual Exceedance Probability (AEP) flood stage extending up to 13 feet above ground level, and floodproofing of nonresidential structures up to 3 feet above the ground level. A 100-year flood is a flood event that, on average, is expected to be reached or exceeded once every 100 years. This means is has a 1% chance of occurring in any given year. This term (100-year flood) is used to describe a flood of a specific magnitude, not necessarily that a flood that will happen every 100 years.

Based on incremental cost analysis, the maximum number of structures impacted for the 4% flood event is 54, which includes 28 residential and 26 nonresidential. The option of nonstructural property acquisition (buyout) on a voluntary basis is also included in the implementation plan. It should be noted that current USACE policy does not allow for voluntary buyout, a waiver to this policy will be required. In the event the waiver is not approved, this alternative may require mandatory buy-out. This alternative A1 includes construction of a 1.4-mile levee segment on the west bank of the Pearl River, providing additional protection for approximately 100 acres and over 250 homes in the Canton Club area. Alternative A1 is the only alternative with a positive benefit-to-cost ratio and can be used for comparing the level of flood risk reduction, environmental acceptability, and technical feasibility of the proposed Alternatives. However, Alternative A1 is not an effective solution, and has been screened from further consideration, and is not recommended for implementation.

2. **Combination Thereof (CTO) Alternatives:** To further optimize flood risk reduction benefits while minimizing adverse impacts and costs, the USACE evaluated various combinations of project features. This evaluation led to the development of two additional alternatives (D1 and E1) integrating structural levees, and weir considerations.

    a) **Alternative D1 – (with Weir):** This alternative combines structural and non-structural measures for a comprehensive approach. It includes: the non-structural elements of A1; Canton Club Levee as described in Alternative A1; additional levee segments at McCloud, Cany Creek, and Richland; construction of a new weir downstream of Interstate 20, creating permanent impoundment for recreational opportunities.

    b) **Alternative E1 – (without Weir):** This alternative is similar in scope to Alternative D1, providing the same level of flood risk reduction and inducement. However, it excludes the construction of the weir and could potentially offer reduced recreational opportunities.

The action alternatives described as the USACE Developed Alternatives, in addition to the no action plan are carried forward for evaluation for this RDEIS. The status quo, or no-action alternative, would not meet the purpose and need for the proposed action; however, as required by NEPA, the no-action alternative is carried forward for analysis in this RDEIS. The no-action

alternative analyzes the consequences of not undertaking the proposed action and serves to establish a comparative baseline for the analysis of the action alternatives.

Cost and Economic Evaluation of Alternatives

Table ES.1 provides a comparative summary of the cost and economic analysis for each action alternative.

For the no action alternative, the expected annual damages in the without-project condition in the Study Area are $27.1M when accounting for the flooding that occurs from the main stem of the Pearl River and the backwater flooding that occurs on the tributaries.

Significant uncertainties and risks are associated with the implementation of Alternative A1 including a potentially reduced participation rate from the assumed rate, the inability of residents to address ineligible project costs (i.e., bringing residential structures to code), and residual impacts that are not addressed by the alternative. Residual impacts include the headwater flooding along the tributaries contributing to high frequency flooding; roadways being inundated by flood events across the Study Area, impacting emergency services; and impacts to water distribution and wastewater treatment.

Net benefits for Alternative A1 were the highest among the assessed alternatives; however, these significant residual risks and the inability of this alternative to address the stated problems and objectives of the Project may prohibit selection of Alternative A1 as the NED plan.

Alternatives Considered for Selection: D1 and E1

a. **Alternative D1 – (with Weir):** estimated project first cost between $873M and $917M million and accrues annual benefits of $25M with annual net benefits between ($11 M) and ($12.8 M) resulting in a BCR of 0.7.

b. **Alternative E1 – (without Weir):** estimated project first cost between $708M and $753M and accrues annual benefits of $25 million, with annual net benefits between ($3.8M) and ($5.6M), resulting in a BCR between 0.8 and 0.9.

Neither Alternatives D1 nor E1 yield positive net benefits, which preclude their selection as the NED plan. However, both plans produce total benefits of approximately $25M, far exceeding the nearly $2M generated by A1. Furthermore, both D1 and E1 reduce residual damages from flooding by approximately 70% compared to the 10% damage reduction from Alternative A1.

Of the implementable alternatives assessed, and considering the potential for varying cost or plan participation during implementation, Alternatives D1 and E1 minimize implementation risks, maximize the reduction in residual damages from flooding, and satisfy the USACE Planning Principles and Guidelines (P&G) criteria of completeness, effectiveness, and acceptability. Accordingly, either alternatives D1 or E1 could be considered for selection.

Table ES-1-1: Comparison of Alternatives

	D1-Low Cost ($ million)	D1-High Cost ($ million)	E1-Low Cost ($ million)	E1-High Cost ($ million)
Project First Cost	$873.1	$917.8	$708.3	$753.4
Average Annual Investment Cost	$35.5	$37.3	$28.8	$30.6
Average Annual O&M Cost	$0.7	$0.7	$0.2	$0.2
Total Average Annual Cost	$36.2	$38.0	$29.0	$30.8
Damages Reduced	$19.7	$19.7	$19.8	$19.8
Recreation Benefits	$5.4	$5.4	$5.4	$5.4
Total Benefits	$25.2	$25.2	$25.2	$25.2
Net Benefits	($11.0)	($12.8)	($3.8)	($5.6)
BC Ratio	**0.7**	**0.7**	**0.9**	**0.8**

Environmental Resources, Consequences, and Mitigation Requirements

Important resources identified include, but are not limited to, migratory birds; threatened and endangered species (T&E) and protected species; forested uplands; forested wetlands; aquatic resources; essential fish habitat (EFH); water quality; air quality; Tribal resources; cultural resources; socioeconomics; agricultural lands; Hazardous, Toxic, and Radioactive Waste (HTRW); recreation; aesthetics; and noise. Detailed descriptions of these resources and associated impact analyses are included respectively in Section 2 and Section 4 of this report.

The Project area includes mixed forested wetlands, emergent wetlands, mixed scrub-shrub wetlands, mixed upland forests, upland scrub-shrub, grassland, evergreen forest, and riverine habitat. Table E-1 displays the unavoidable direct habitat impacts associated with the Pearl River Flood Risk Management (PR FRM) Project. A preliminary mitigation plan has been developed and is located in Appendix F. A project specific mitigation plan will be developed in a subsequent phase(s) and included in a subsequent NEPA document(s). The goal of this mitigation plan is to fully compensate, in kind, for the unavoidable impacts to significant fish and wildlife habitat resources that would occur due to implementation of the PR FRM project. The Interagency Mitigation Team (IMT), which includes the US Fish and Wildlife Service (the Service), EPA, USACE MVK, NFI, and MDWFP, will work closely to complete a detailed mitigation plan. This mitigation plan will include all of the components set forth in laws, guidance, policy, and regulations.

Table ES-1-2: Preliminary Unavoidable Direct Fish and Wildlife Habitat Impacts Requiring Mitigation

Habitat	A1 Acres of Impact	A1 AAHUs	D1 Acres of Impact	D1 AAHUs	E1 Acres of Impact	E1 AAHUs
Lacustrine/Open Water	0	0	81	497	81	497
BLH wet	1.5	4	684	1,732	684	1,732
Swamp	0	0	55	135	55	135
Forested Uplands	9	35	260	999	260	999
Riverine*	.04	.03	232	164	.1	.1

Fish and Wildlife Coordination Act. The Service provided a Coordination Act Report (CAR) dated January 2020 in response to the EIS effort conducted by the NFI. They then provided a Draft CAR on August 23, 2023, and on November 13, 2024, the Service provided an interim draft CAR. Since the submission of the interim draft CAR in November 2024, the USACE has included additional levee features in the Alternatives. The Service will submit another CAR during public review of this EIS. The Draft CARs are located in Appendix J. The FWS recommendations and USACE responses are in Section 7.

Endangered Species Act. USACE has coordinated with the Service through development of a Biological Assessment which includes potential impacts to and features to avoid and minimize impacts to threatened and endangered species, bald eagles, and other protected species. Coordination under the ESA is ongoing. Based on currently available historical data, a review of current literature and studies, and with the employment of avoidance measures, the USACE has determined that Alternative A1 may affect but would not likely adversely affect the monarch butterfly and would have no effect on the remaining listed species in the area. Alternative D1 may affect but would not likely adversely affect the Northern Long Eared Bat (NLEB) and the Tricolored Bat (TCB); would likely adversely affect but not jeopardize the continued existence of the Gulf Sturgeon (GS), ringed map turtle, Alligator Snapping Turtle (AST), Pearl River Map Turtle (PRMT), Louisiana pigtoe, and monarch butterfly. Alternative E1 may affect but would not likely adversely affect the GS, NLEB, TCB, LA pigtoe, and monarch butterfly; would likely adversely affect the ringed map turtle, AST, and PRMT. Based upon the assessment completed, it was determined that Alternative D1 and E1 would not result in an adverse modification to Gulf sturgeon critical habitat.

The Service has recommended measures under ESA Section 7(a)(1) for Alt E1 that would advance the recovery of several listed riverine species. These measures will be considered in subsequent phase(s). The measures recommended for consideration are located in section 7.10 of this EIS.

Tribal Resources. USACE is continuing to consult with federally recognized Tribal Governments on a Government-to-Government basis as required in E.O. 13175 ("*Consultation and Coordination with Indian Tribal Governments*;" U.S. President 2000) and USACE Tribal Consultation Policy (December 05, 2023), as described in Section 2 of this report.

Section 106 NHPA Consultation. USACE is continuing to follow its Section 106 NHPA procedures described in Section 2 of this report to develop a project-specific Programmatic Agreement (PA) in furtherance of USACE's Section 106 NHPA responsibilities for this Undertaking. The Section 106 NHPA PA would then govern USACE's subsequent NHPA compliance efforts.

Clean Water Act (CWA) Section 401, 402 and Section 404. A Section 401 water quality certification would be obtained prior to construction of the proposed action. A Section 402 National Pollutant Discharge Elimination System (NPDES) permit will be obtained prior to construction. A Section 404(b)(1) regulatory form will be prepared prior to the Final EIS. A civil works 404 (b) (1) long form will be provided for public review and comment during PED.

Environmental Site Assessment. There is a high probability of encountering HTRW during construction with implementation of Alternative D1 and Alternative E1. Prior to construction, an ASTM E 1527-13 Phase I & II Environmental Site Assessment (ESA) would be completed due the findings that were discovered during the NFI's reconnaissance of the Study Area.

Hazardous, Toxic, and Radioactive Waste (HTRW). Reference the HTRW section within the Environmental Consequence section of this document for additional information regarding any HTRW concerns.

Public Involvement and Agency Coordination

Public Involvement

On May 18, 2023 the USACE published a Notice of Intent to the Federal Register (88 Fed. Reg. 31738) notifying the public of the USACE's intent to prepare a draft EIS for the Pearl River Flood Risk Management Project, Pearl River Watershed, Rankin and Hinds Counties, Mississippi. This was published as an update to the original July 25, 2013 notice declaring the Rankin-Hinds Pearl River Flood and Drainage Control District, the non-Federal interest (NFI) and USACE's intent to conduct a Feasibility Study and EIS process.

The draft EIS was published on June 7, 2024 for a 45-day public review period, at the request of reviewers, the review period was extended by 15 days and closed on August 6, 2024. Public outreach meetings were held twice a day on July 10, 2024 and July 11, 2024, and virtually once on June 27, 2024 at 6pm. Multiple social media channels and local newspaper were used for notification of the public regarding to the release of the DEIS . Recorded presentations of the scoping meetings were uploaded to the study website for those who could not attend. Questions were answered live during each meeting. Scoping comments were received through the end of the review period, August 6, 2024, which was established as the last day to provide comments to inform the study planning process. There were 6,729 comments received. A majority of the comments were emails that included what is considered a form letter representing the same comments, these were considered as a single comment made by multiple individuals. Input received from the public meetings assisted the team in refining study problems and opportunities, goals, objectives, potential features, and alternative plans.
The top five common themes identified include: downstream impacts; flood risk concern; habitat

impact; economics; and opposition to the project. The input received was considered during the assessment and reevaluation of the alternatives.

Agency Coordination

Cooperating and participating agencies include:

- United States Fish & Wildlife Service (The Service) Jackson, MS and Lafayette, LA offices;
- Federal Emergency Management Agency Region IV (FEMA);
- United States Environmental Protection Agency (EPA) Region 4; and
- Mississippi Department of Environmental Quality (MDEQ).

Agencies invited to participate as participating agencies include:

- Mississippi Department of Wildlife, Fisheries and Parks (MDWFP);
- Mississippi Department of Mineral Resources (MDMR);
- Mississippi Natural Resources Conservation Service (MNRCS);
- Louisiana Department of Wildlife and Fisheries (LDWF);
- Louisiana Department of Environmental Quality (LDEQ);
- Louisiana Department of Natural Resources (LDNR);
- Louisiana Coastal Protection and Restoration Authority (CPRA); and
- Mississippi Department of Archives & History (MDAH; MS SHPO).

Federally recognized Tribes were invited to become Cooperating or Participating agencies for this Action; however, to-date, no Tribal governments have elected to participate in either role.

Participants in the Section 106 National Historic Preservation Act (NHPA) consultation process include:

- Rankin-Hinds Pearl River Flood and Drainage Control District (RHDD);
- Mississippi Department of Archives and History (MDAH);
- Advisory Council on Historic Preservation (ACHP)

The following federally recognized Tribes that have expressed aboriginal interest in Mississippi and the Study Area:

- Alabama-Coushatta Tribe of Texas (ACTT);
- Chickasaw Nation (CN);
- Choctaw Nation of Oklahoma (CNO);
- Chitimacha Tribe of Louisiana (CTL);
- the Jena Band of Choctaw Indians (JBCI);
- the Mississippi Band of Choctaw Indians (MBCI; which also holds reservation lands in close proximity to the Study Area);
- Muscogee (Creek) Nation (MCN);
- Quapaw Nation (QN);
- Tunica-Biloxi Tribe of Mississippi (TBTL).

The RHDD, MDAH, ACHP, QN, MBCI, and CNO are participating as consulting parties in the Section 106 NHPA process.

Prior Environmental reports related to this project include An Environmental Justice assessment which was consistent with the requirements of NEPA (PL 91-190), Section 122 of the River and Harbor Act of 1970 (PL 91-611) and other essential considerations of national policy including, Executive Order 12898 and the more recent Executive Orders (EOs) signed by President Biden, EOs 13985, 14008 and 14096. All three of the Executive Orders directed Federal agencies to identify and address adverse, disproportionate impacts to communities with Environmental Justice (EJ) concerns and to engage with the community in those efforts.

Environmental Justice considerations have been removed from this RDEIS in accordance with President Trump's EO 14173, titled "Ending Illegal Discrimination and Restoring Merit-Based Opportunity," EO 14148, titled "Initial Rescissions of Harmful Executive Orders and Actions", and EO 14151, titled "Ending Radical and Wasteful Government DEI Programs and Preferencing."

Conclusion and Recommendation

As of release of this RDEIS the intent is for the USACE to present for public consideration the problems and opportunities in the study area, the evolution of the evaluation of the alternatives, the effected environment in the study area, and the impact of the actionable alternatives on that environment. Upon conclusion of the public review period, and after consideration of the comments received, and updated analysis (if warranted), the USACE will consider recommendation of an alternative to the OASA(CW) for decision.

Other Considerations

Incomplete or Unavailable Information: Section 6.17 provides a discussion regarding incomplete or unavailable information to inform the alternative evaluation and assessment.

Timeline: The RDEIS is available for 45 days and we will receive public comments through August 18, 2025.

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SECTION ONE

1 INTRODUCTION

This Revised Draft Environmental Impact Statement (RDEIS) is prepared at the direction of the Assistant Secretary of the Army for Civil Works (ASA-CW). The purpose is to evaluate flood risk management alternatives, for the Pearl River Basin Project, to identify the National Economic Development (NED) Plan as well as any Locally Preferred Plan (LPP), to determine if the project is environmentally acceptable and technically feasible, and compare the level of flood damage reduction provided by the LPP to that provided by the NED plan Upon selection by the Secretary of the Army may be implemented for construction as authorized in Section 3104 of Water Resource Development Act (WRDA) of 2007.

The Non-Federal Interest (NFI) prepared a feasibility level report to evaluate alternatives for flood risk reduction in the Pearl River Basin, under the authority of Section 211 of WRDA 1996. This report is referred to as the NFI final Section 211 Report (Pearl River Watershed Feasibility Report). This RDEIS considers the final array of alternatives from the NFI Final Section 211 Report as well modified alternatives developed by USACE in collaboration with the NFI based on analytical findings, public input and comment, and agency coordination.

Alternatives considered include the NFI final array of alternatives as described in the Final Section 211 Report to include, a "nonstructural plan" (Alternative A), a "levee plan" (Alternative B) and a "channel clearing/weir/levee plan" (Alternative C). USACE-developed alternatives include a modified nonstructural plan proposing elevating/floodproofing/acquisition of structures with a structural levee feature for flood damage risk reduction (Alternative A1) as well as Combination Thereof (CTO) Alternatives. The CTO Alternative is referenced in the Water Resources Development Act (WRDA) Section 3104 authority (referenced as Section 3104 authority from this point forward). CTO Alternatives considered include Alternatives D and E, which combine Alternative A1 and flood damage risk reduction structural features that were presented within the June 7, 2024, Draft Environmental Impact Statement (DEIS). Since the June 2024 release of the DEIS, USACE-developed additional features that were incorporated within the alternatives defined within this report. The non-structural alternative (Alternative A1) now includes a FRM feature: Canton Club Levee. For Alternative D and E, these alternatives are now labeled as D1 (with Weir also Likely Locally Preferred Plan) and E1 (without Weir). These alternatives now include three additional FRM features: McLeod Levee, Cany Creek Levee, Richland Levee in addition to Canton Club Levee. USACE alternatives were developed based on analytical findings, public input and comment, and agency coordination.

The NFI Final Section 211 Report, responding to the Section 3104 authority, was submitted to the ASA-CW as a recommendation for Federal participation in flood risk management within the Pearl River Basin in Mississippi. The NFI Draft Report underwent an Independent External Peer Review (IEPR) and USACE Agency Technical Review (ATR) in 2018. The Reviews concluded in 2020.

The "scope," or extent of the evaluation, includes the identification of a range of actions and alternatives that could address the need within the identified geographical area. The scope of the analysis is considered plan for further design and implementation. This RDEIS was prepared in accordance with the NEPA and the CEQ NEPA implementing regulations (40 Federal CFR Parts 1500-1508), as reflected in the USACE Engineer Regulation (ER) 200-2-2 (33 CFR Part 230). This RDEIS drew heavily on the NFI Section 211 Report to the extent that NFI project information was available, and the schedule and budget allowed. The NFI Section 211 Report is incorporated by reference and is available upon request.

1.1 Study Authority

This RDEIS is prepared for the Pearl River Basin Project as authorized by section 401(e)(3) of the Water Resources Development Act (WRDA) of 1986 (100 Stat. 4132*)* and modified by Section 3104 of the WRDA of 2007 (Public Law 110-114).

(a) In General - The project for flood damage reduction, Pearl River Basin, including Shoccoe, Mississippi, authorized by section 401(e)(3) of the Water Resources Development Act of 1986 (100 Stat. 4132), is modified to authorize the Secretary, subject to subsection (c), to construct the project generally in accordance with the plan described in the 'Pearl River Watershed, Mississippi, Feasibility Study Main Report, Preliminary Draft', dated February 2007, at a total cost of $205,800,000, with an estimated Federal cost of $133,770,000 and an estimated non-Federal cost of $72,030,000.

(b) Comparison of Alternatives - Before initiating construction of the project, the Secretary shall compare the level of flood damage reduction provided by the plan that maximizes national economic development benefits of the project and the locally preferred plan, referred to as the Lefleur Lakes plan, to that portion of Jackson, Mississippi, and vicinity, located below the Ross Barnett Reservoir Dam.

(1) IN GENERAL- If the Secretary determines under subsection (b) that the locally preferred plan provides a level of flood damage reduction that is equal to or greater than the level of flood damage reduction provided by the national economic development plan and that the locally preferred plan is environmentally acceptable and technically feasible, the Secretary may construct the project identified as the national economic development plan, or the locally preferred plan, or some combination thereof.

(2) CONSTRUCTION BY NON-FEDERAL INTERESTS- The Non-Federal interest may carry out the project under section 211 of the Water Resources Development Act of 1996 (33 U.S.C. 701b-13).

(c) Project Financing- In evaluating and implementing the project under this section, the Secretary shall allow the non-Federal interests to participate in the financing of the project in accordance with section 903(c) of the Water Resources Development Act of 1986 (100 Stat. 4184) if the detailed project report evaluation indicates that applying such section is necessary to implement the project.

(d) Non-Federal Cost Share- If the locally preferred plan is selected for construction of the project, the Federal share of the cost of the project shall be limited to the share as provided by law for the elements of the national economic development plan.

The NFI Section 211 Report was completed under authority of Section 211 of WRDA 1996, pursuant to terms prescribed in the Memorandum of Agreement (MOA) executed July 19, 2012, between the NFI and the USACE. Table 1-1 lists the authorized flood risk management projects within the Pearl River watershed.

Table 1-1: Pearl River Flood Risk Management Project Authorizations

Year	Public Law	Relevance
1960	86-645	Authorized Jackson West and East Levees and channelization of the pearl
1983	98-63	Authorized interim flood control plan
1986	99-662 (401(e)(3))	Authorized construction for the Pearl River Basin
2007	110-114 (3104)	Modified authorization (WRDA 1986) to construct NED, LPP, or combination thereof subject to certain determinations and NFI may carry out project under Section 211 of WRDA 1996.
2016	114-322 (1322(b)(4)(A))	Instructs Secretary to expedite its review and decision,
2018	115-270 (1176)	Instructs the Secretary to allow a project previously authorized under Section 211 to proceed after determining it is technically feasible (including assessment of potential downstream impacts), economically justified, and environmentally acceptable. *

* The authority expired in October 2023; however, consistent with Section 1176 of WRDA 2018, the RDEIS will assess potential downstream impacts to the Pearl River Basin.

1.2 Study Area

The Pearl River Basin, as shown on Figure 1-1, is located in the southern-central portion of Mississippi and in a small section of southeastern Louisiana. It is bounded on the north by the Tombigbee River Basin, on the east by the Pascagoula River Basin, on the south by Lake Borgne and the Mississippi Sound, and on the west by the Mississippi River Basin, and several coastal streams that drain the eastern portion of Louisiana. There are numerous lakes within the watershed but only a few of significant size. The largest of these is Ross Barnett Reservoir, which is located on the Pearl River about 12 miles northeast of downtown Jackson.

The Pearl River watershed lies within the East Gulf Coastal Plain, which is physiographically subdivided into the North Central Hills (or Plateau), Jackson Prairie, Southern Pine Hills, and Coastal Pine Meadows districts. Elevations in the watershed range from mean sea level (0.0 feet) to approximately 650 feet above sea level referenced to National Geodetic Vertical Datum (NGVD).

The Pearl River drains an area of 8,760 square miles consisting of all, or parts, of 23 counties in Mississippi and parts of three parishes in Louisiana. The Pearl River Watershed is broken into the Upper Pearl, Middle Pearl-Strong, Middle Pearl-Silver, Bogue Chitto, and Lower Pearl. The focus for this study is on the Middle Pearl-Strong Basin (HUC-03180002). Both the Pearl River and all of the significant tributaries: Richland, Cany, Lynch, Town, Hanging Moss, Purple, White Oak, Eubanks, Prairie Branch, and Hog Creek have documented flooding, whether from flash flooding or riverine flooding, and repetitive flood loss damages are ongoing.

Municipalities within the Study Area include Jackson, Flowood, Pearl, and Richland. The Study Area includes parts of three counties--Madison, Hinds, and Rankin. Major tributaries of the Pearl River within the Study Area include Cany, Eubanks, Hanging Moss, Hog, Lynch, Prairie Branch, Purple, Richland and Town Creek. The Study Area is primarily affected by headwater flooding caused by unusually heavy and intense rainfall over the upper Pearl River Watershed.

Per the NFI Section 211 report, the Study Area denotes the area that implementation of the project would potentially impact, which is different from the Project Area, the actual site the project would occupy.

1.2.1 Project Area

The Project Area comprises the Pearl River Basin between River Mile (RM) 270.0 just south of Byram, Mississippi, and RM 301.77 at the dam of Ross Barnett Reservoir. The Ross Barnett Reservoir is a non-Federal project operated by the Pearl River Valley Water Supply District project primarily for water supply and recreation. However, the reservoir does participate and provide some flood risk reduction benefits. The Project Area was examined to determine features and alternatives that would address the needs of the area and provide opportunities to reduce risk from flooding.

The Project Area for Alternative D1 is shown in Figure 1-2 and Alternative E1 is shown in Figure 1-3. The Project Area would be limited to the area where specific improvements would be implemented.

1.2.1 Project Scope

The ‘scope’ or extent of the evaluation includes the identification of a range of actions and alternatives that could address the need within the identified geographical area. However, there is sufficient detail for the ASA to select a plan for further analysis, design, and implementation Prior to construction, further analysis and design would be conducted and released in further NEPA or additional NEPA documents in order to refine the current range of actions to a specific path forward.

This RDEIS was prepared with consideration of the USACE Planning Guidance Notebook (ER 1105-2-103), NEPA and CEQ guidance, and coordinating regulations, policies, and Executive Orders.

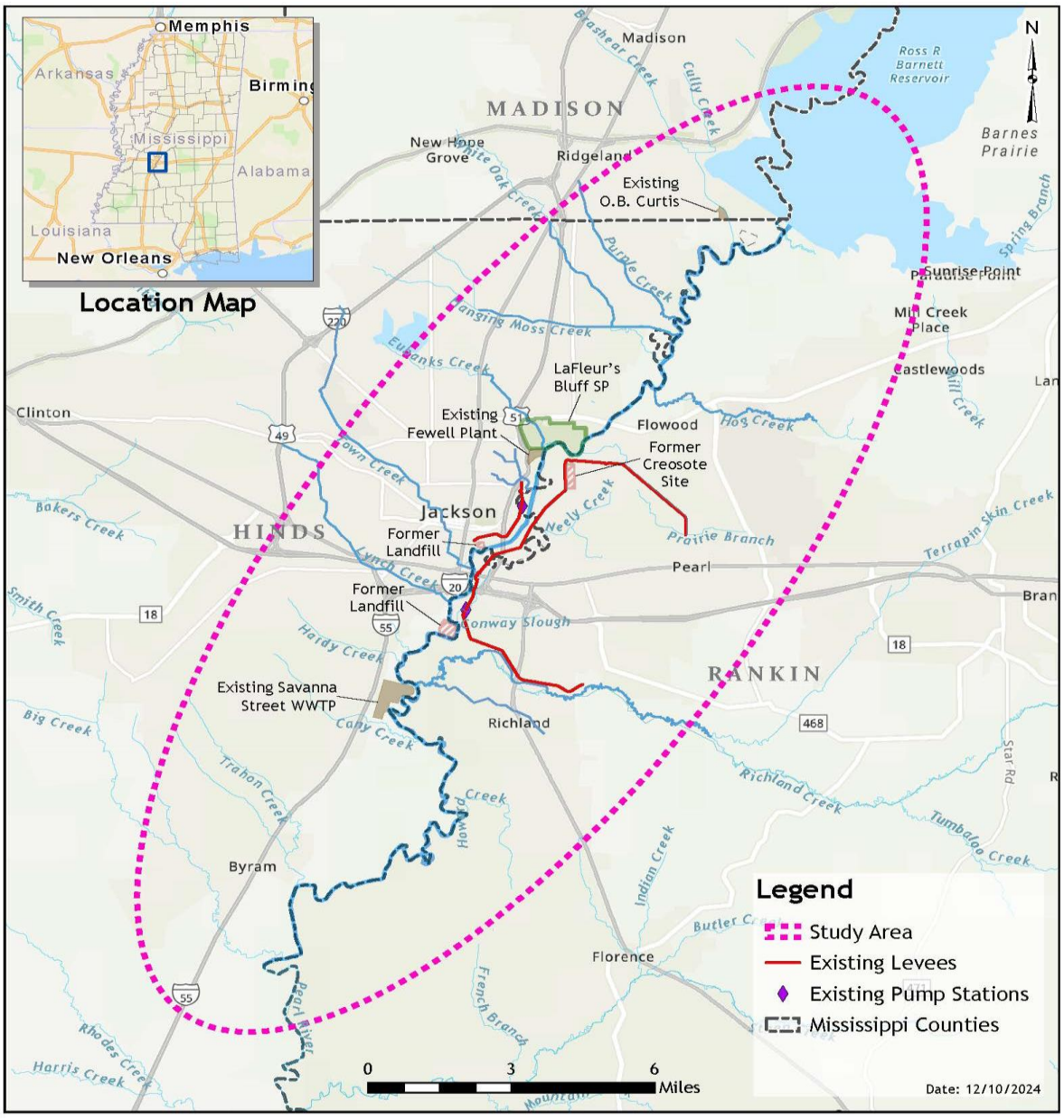

Figure 1-1: Study Area

1.2.2 Proposed Action

The NFI Section 211 Report final array of alternatives included a "nonstructural plan" (Alternative A), a "levee plan" (Alternative B) and a "channel clearing/weir/levee plan" (Alternative C). In addition to these alternatives, USACE developed three alternatives that were presented within the June 2024 DEIS (Alternative A1, Alternative D, Alternative E). These alternatives were later refined as a modified nonstructural plan proposing elevating/floodproofing/acquisition and FRM features (Alternative A1) and "combination thereof plans" to propose a combination of features that could achieve flood damage risk reduction (Alternative D1 and Alternative E1).

Section 3 includes the discussion on the alternative formulation process. The terms “weir” vs “dam” and “lake” vs “reservoir” are frequently used interchangeably throughout this report. The dam and reservoir as proposed meets the USACE Engineering Regulation (ER)1110-2-1156: Safety of Dams – Policy and Procedures. In addition, the terms “fish passage” and “fish ladder” are used interchangeably. A fish ladder is also known as a fishway, fish pass, fish steps, or fish cannon and is a structure built on or around artificial and natural barriers to facilitate fish migration.

The analysis presented within this report was conducted by a multi-disciplinary project delivery team (PDT) comprised of professionals with the appropriate expertise to identify the water resource problems, review and assess the NFI identified alternatives to determine if they meet USACE planning policies and guidelines, and identify additional alternatives to address the problems and need to reduce repetitive flooding in Rankin and Hinds Counties, MS.

The NFI, cooperating, and participating agencies are an integral part of the plan formulation process. Throughout the study process, the PDT coordinated with and integrated input from the NFI and the USACE vertical team; which includes: the Major Subordinate Command (MSC), Mississippi Valley Division; USACE Headquarters (HQUSACE); and the ASA-CW office.

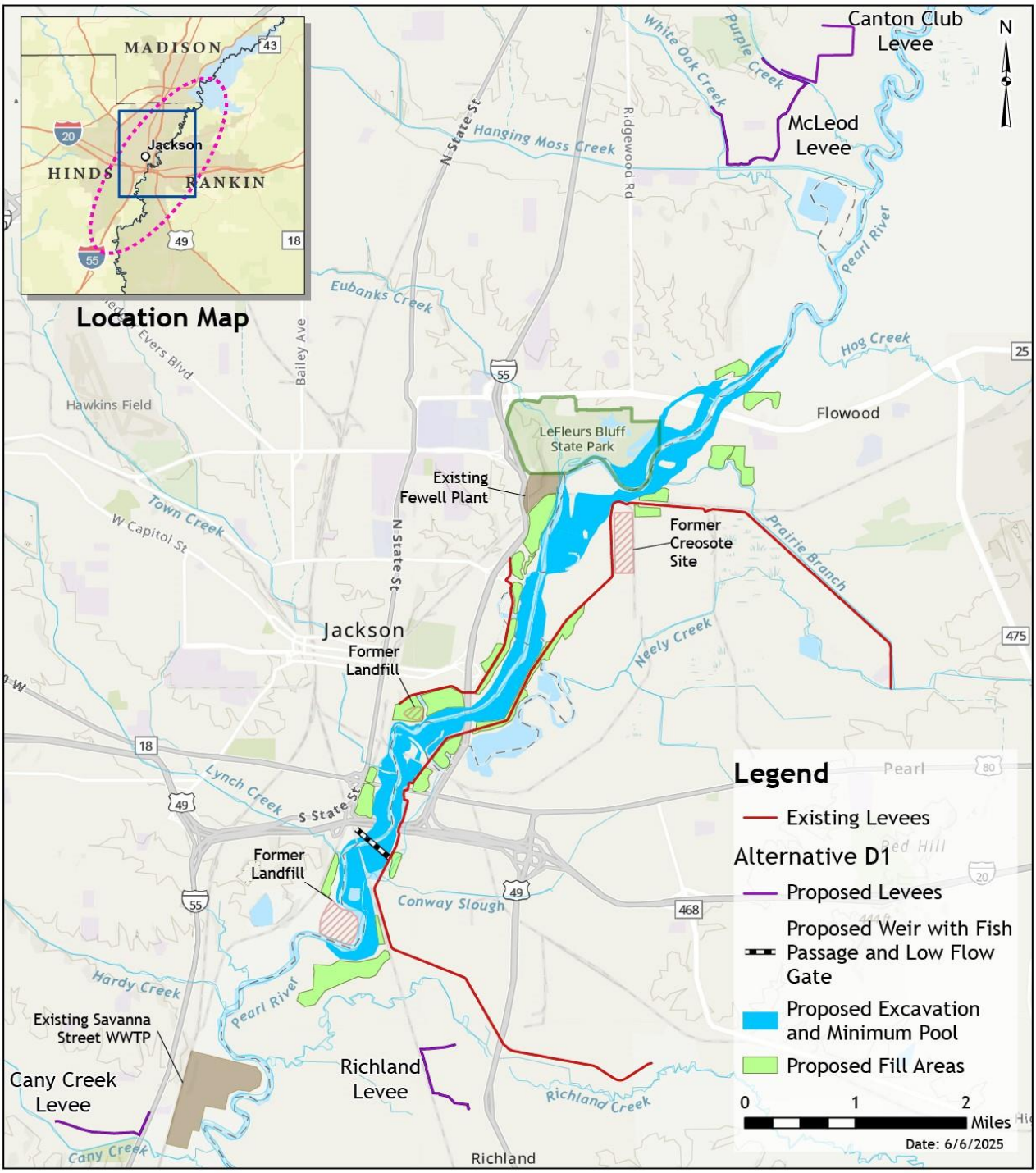

Figure 1-2: Alternative D1 Project Area

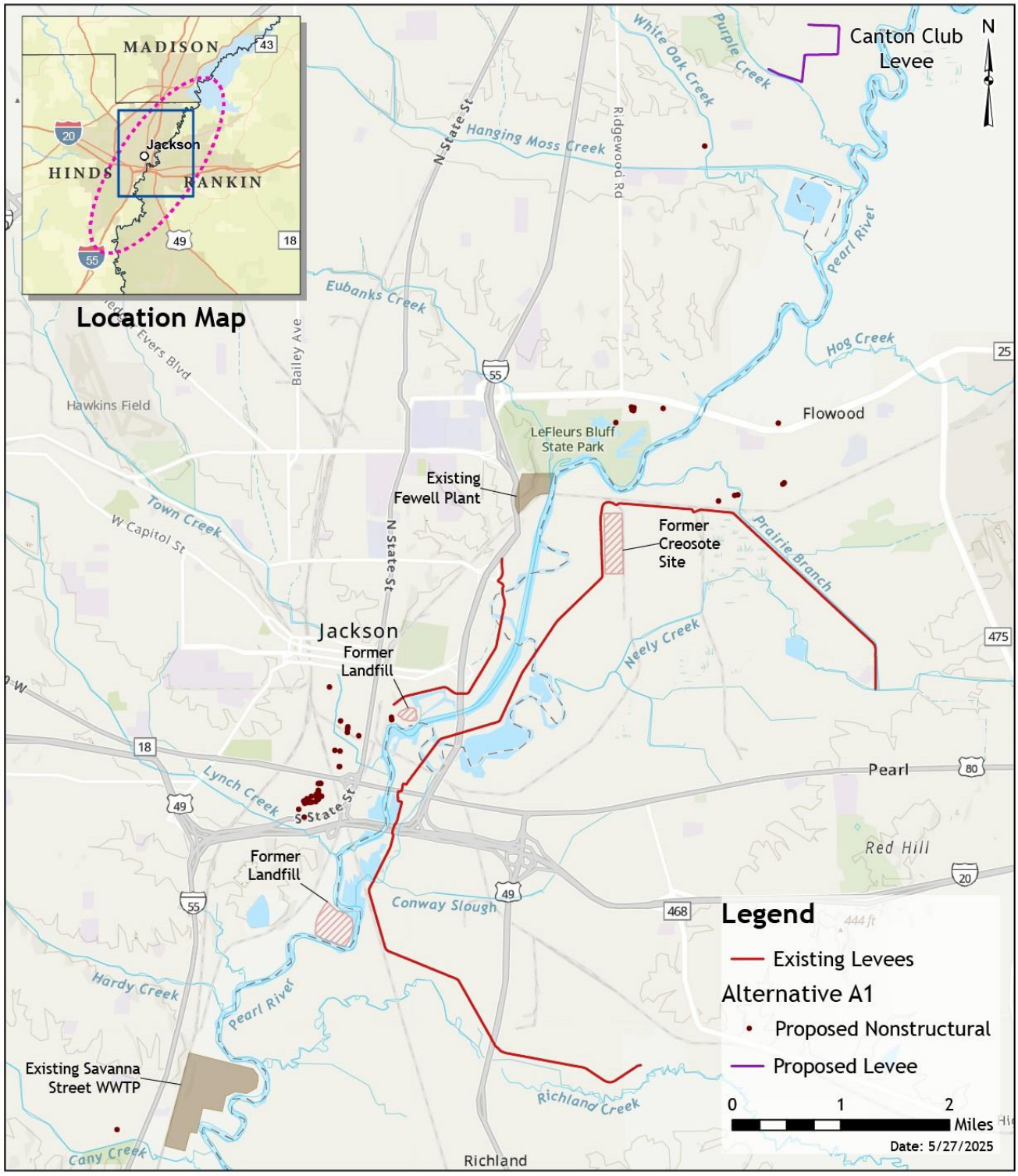

Figure 1-3: Alternative A1 Project Area

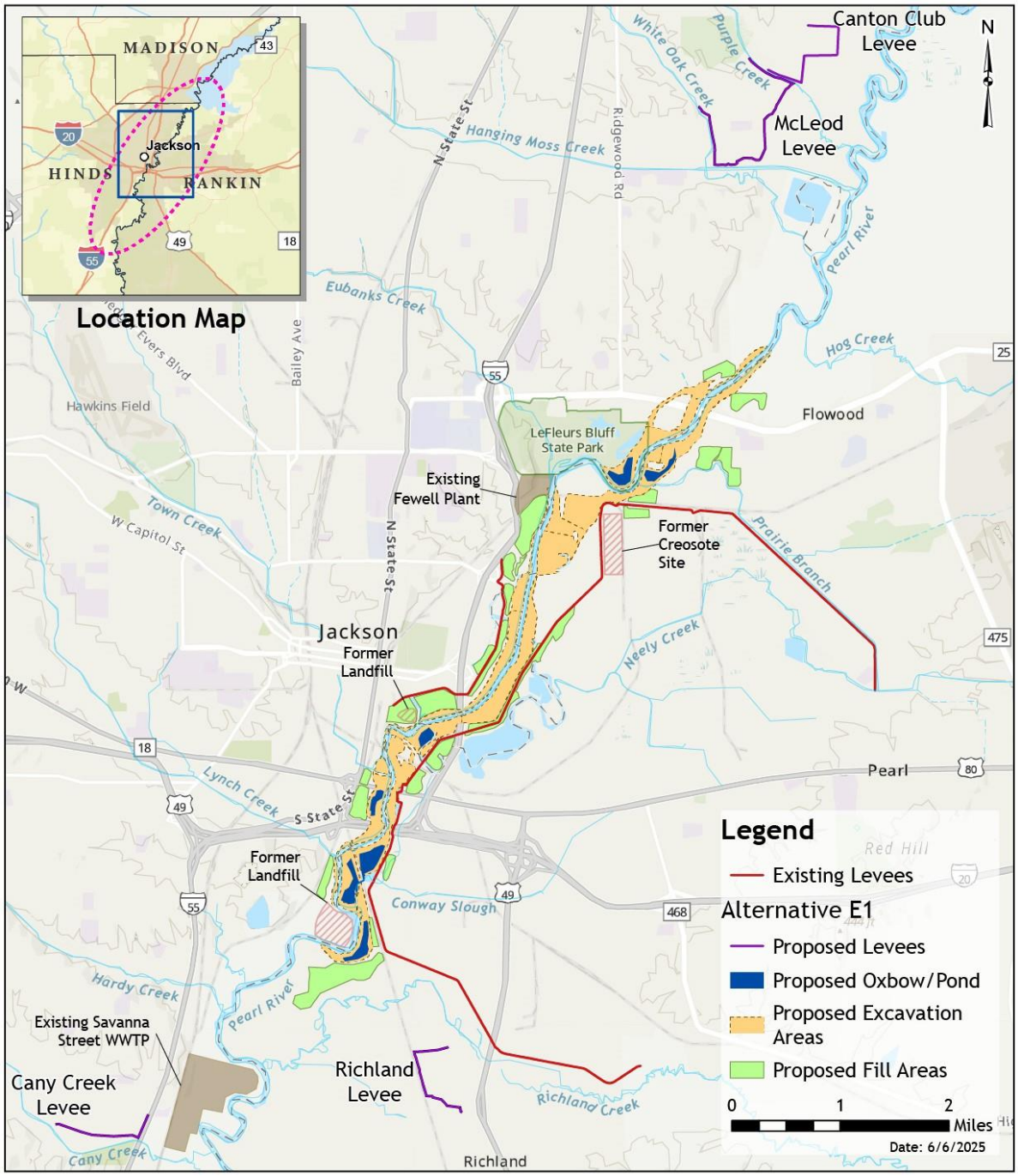

Figure 1-4: Alternative E1 Project Area

1.2.3 Purpose and Need

The NFI Final Section 211 Report dated July 2022, was completed under Section 211, Construction of Flood Control Projects by the NFI, in response to comments received from the 2018 IEPR Report and the 2020 USACE ATR Report. A summary of each of those reviews are provided in the below subsections.

Per the NFI Final Section 211 report, the purpose is to provide a recommendation for Federal participation in the Pearl River, Mississippi, flood risk management along the Pearl River in Hinds and Rankin Counties, Mississippi. Critical flood risk reduction needs were identified based on historic problems experienced within the Study Area. Over the past thirty years, multiple studies have been conducted on the Pearl River watershed ranging from reconnaissance level studies to feasibility level studies.

The most recent USACE report, the *Pearl River Watershed, Mississippi, Feasibility Study Main Report, Preliminary Draft*, dated February 2007 (2007 Preliminary Feasibility Study) included updated levee information from the 1996 study and an analysis of the Lefleur Lakes flood control plan. The Lefleur Lakes plan was the designated LPP in the 2007 report. Were an LPP selected, the NFI would be responsible for covering any additional project costs exceeding the Federal share allocated to the NED.

The purpose of the RDEIS is to evaluate alternatives that could address the flooding problems within the Study Area and that could be implemented under Section 3104 of WRDA 2007. For more than 100 years, headwater flooding of the Pearl River (greater than 10 feet deep in some areas) caused disruption to businesses and industry throughout the Jackson, MS, metropolitan area. This area of flood risk currently includes 5,000 commercial and residential structures and affects a population of over 500,000.

Numerous flood events have affected the Area, most notably the Easter Flood of 1979, the May Flood of 1983, and the February flood of 2020. The 1979 event flooded transportation routes, homes, and businesses, causing damages that, at that time, totaled approximately $223 million. If the same event occurred in the present day, damages would surpass $1.2 billion. More recently, the Pearl River crested at 36.67 feet in Jackson on February 17, 2020, the third highest crest ever recorded. The communities sustaining the most devastation from the 2020 flood event were Duttoville and Canton Club.

In the Rankin and Hinds portions of the Jackson metropolitan statistical area (MSA), there are more than 13,000 businesses employing over 180,000 people. As the capital of Mississippi, Jackson's downtown central business district, a flood-prone area, is home to many State and Federal offices. Flooding affects major transportation routes, including two interstate highways, U.S. and four State highways, local streets, and major rail carriers. The average daily traffic count of commercial and vehicular traffic for the impacted highways and interstates ranges from 35,000 to 115,000 per Mississippi Department of Transportation (MDOT) Traffic Count https://mdot.ms.gov/portal/traffic_volume. Flooding has caused significant infrastructure damage, including damage to the 46 million gallons per day Savanna Street WWTP, which serves the region, per the NFI Section 211 July 2022 Report.

Appendix P, Flood Risk and Other Social Effects (OSE) Community Impacts, provides additional information on Community Impacts from repeated flooding.

1.2.4 Existing Projects and Prior Reports

1.2.4.1 Existing Projects

Federal involvement in the Pearl River watershed in Mississippi, with respect to flood control features, dates to the early 1900s, while existing water projects date back to the early 1960s. Table 1-2 identifies prior USACE studies and reports concerning flood risk management (FRM) in the Pearl River watershed. There are four Federally authorized and constructed FRM projects in the Study Area:

1 The existing federalized levees in the Study Area include the Jackson (Fairgrounds) and East Jackson levees that were initially completed in 1968 by the USACE as a result of the USACE FRM Survey Report of the Pearl River and Tributaries, Mississippi (1959). In 1984, an extension on the north end of the Fairgrounds levee was constructed to eliminate flanking of the levee. The locations of the levees are shown on Figure 1-6. The project consists of two earthen levees, four gated outlets, and six pumping stations. Some 5.34 miles of river channel work was involved in constructing the plan. The Fairgrounds levee reduces flood risk to approximately 800 acres in the Fairgrounds area of Jackson on the west side of the river. The longer, East Jackson levee reduces flood risk to 5,870 acres, including the town of Pearl and portions of Flowood and Richland. Currently, USACE has certified the existing levees meet the criteria for flood risk reduction for the 1 percent annual chance exceedance flooding event.

2 In 1983, channel modification was conducted at the Highway 25 bridge, which consisted of removing material from the west bank of the Pearl River approximately 600 feet upstream and downstream of the bridge to increase the conveyance of the stream at that location. The Pearl River Basin Development District (PRBDD) completed this work in 1983. The location of this work is shown on Figure 1-6.

3 In 1984, the PRBDD, acting as local sponsor, completed the floodway clearing plan that was a result of the 1981 USACE Reconnaissance Pearl River Basin Interim Report on Flood Control recommendations. The clearing occurred from about 0.5 miles below the old Jackson sanitary landfill to the Woodrow Wilson Bridge, a total of 3.3 river miles (Floodway Clearing Project). The project consisted of 237 acres of complete clearing, 20 acres of selective clearing, 89 acres of partial clearing, and the placement of 39,000 tons of riprap for protection around bridges. To offset unavoidable impacts to fish and wildlife associated with the clearing plan, approximately 320 acres of bottomland hardwood were acquired as mitigation.

4 In 1991, the U.S. Department of Agriculture Natural Resources Conservation Service flood control project for the Richland Creek Watershed was completed under Public Law 83-566. The project included land treatment features, three floodwater-retarding structures, and 17.6 miles of channel work. The plan provides a reduction in headwater flooding along Richland Creek and tributaries and along two relatively small streams in the common floodplain with the Pearl River.

1.2.4.2 Ongoing Projects

Numerous projects, in various development phases, are currently underway by local government entities within the Pearl River Tributaries. Below in Figure 1-7 and Table 1-1 are a listing of on-going projects by local governments and the status of the projects. In addition, the City of Jackson has committed to fund channel cleanout activities with ongoing coordination to determine the scope of those efforts.

Drainage improvements, to include clearing and grubbing of approximately 100,000 linear feet of various creeks, tributaries, and ditches will be conducted by the city. This will include the removal of all vegetation and debris obstructing the creeks to enhance flow capacity and reduce flooding risks. During the clearing operation, proper construction methods will address the immediate need of any erosion items. Bridge clearing would include removal of debris obstructing the flow of water around the bridge pilings. The removal process would be conducted carefully to avoid further disturbance to the creek bed and banks. Overgrown vegetation around the bridge structures would be cleared to restore visibility and reduce the risk of erosion. Finally, the clearing of inlets obstructed by debris, sediment, and vegetation to restore functionality and improve storm runoff is planned for 5 locations.

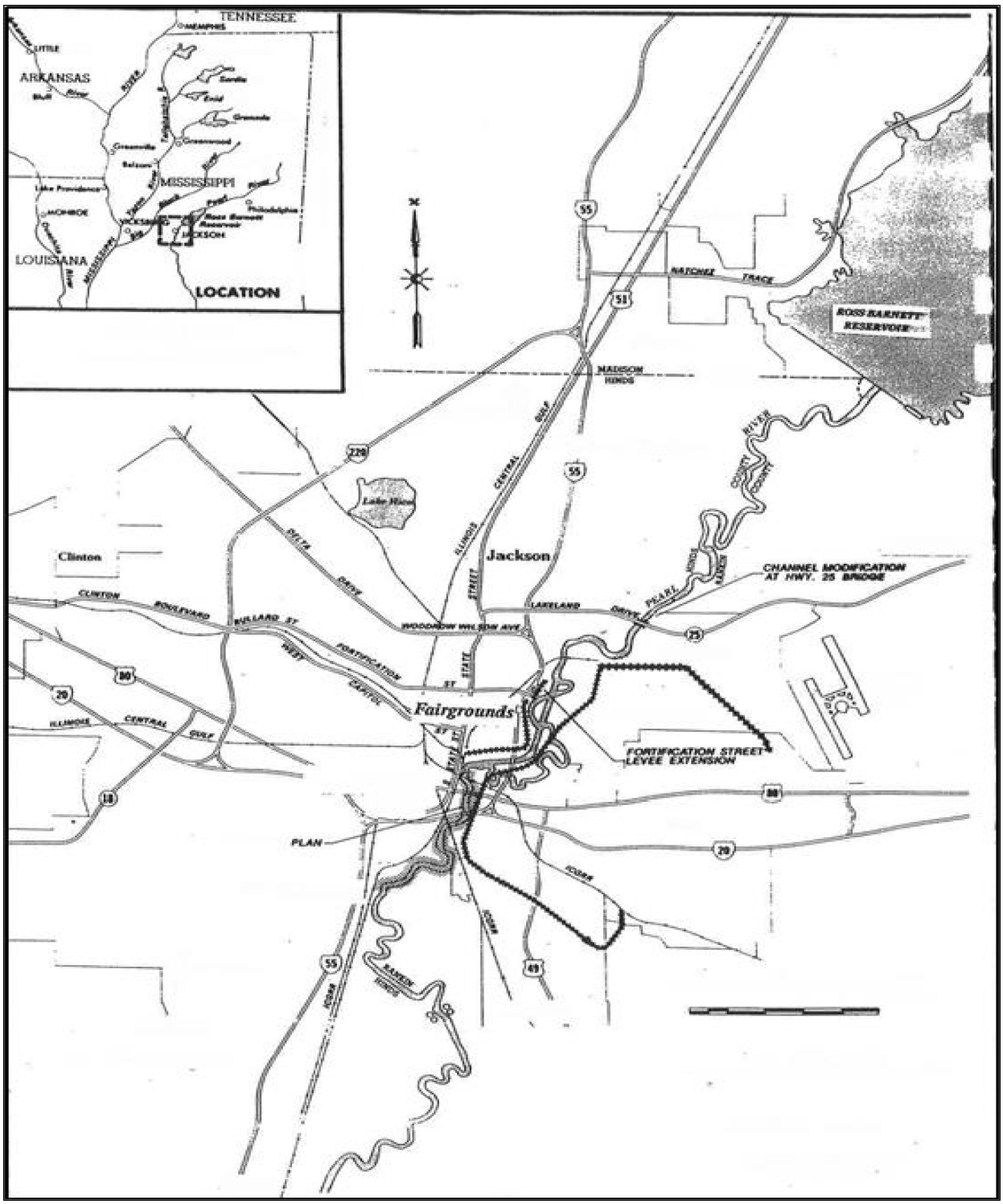

Figure 1-5: Existing USACE FRM Projects in Study Area

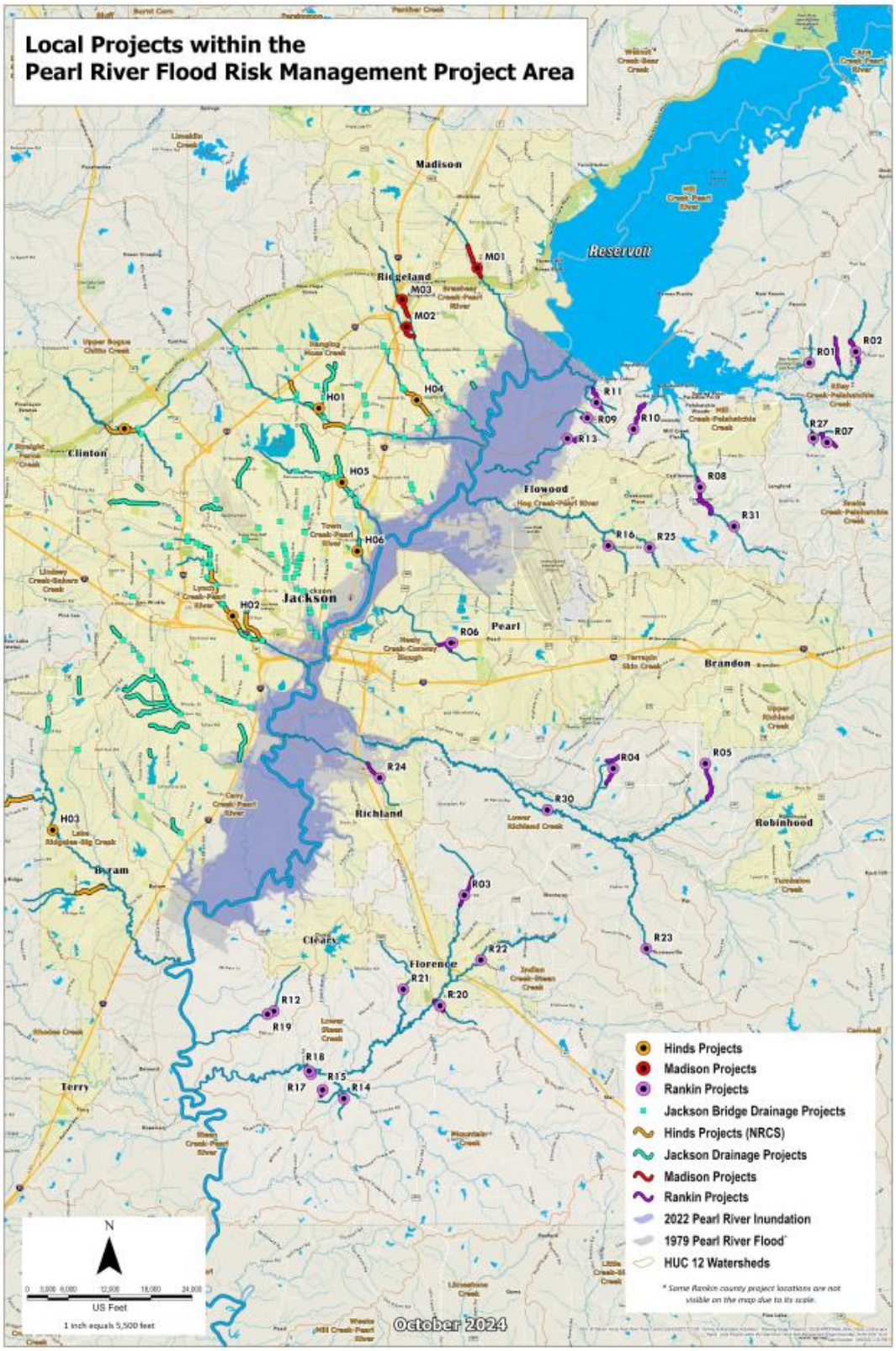

Figure 1-6: Pearl River Watershed, Jackson MSA- Work by Others

Table 1-2: Ongoing Projects by Others

Project Name	Type of Project	Lead Agency	Stage of Project	Funding Source	Status of Completion
HINDS COUNTY					
Hanging Moss Creek	FRM; Streambank Stabilization	MS Soil & Water Conservation Commission	Planning; EA	NRCS Watershed and Flood Prevention Program (WFPO)	Planning Dec 2024 Design Dec 2025 Construction Dec 2028
Lynch Creek – Pearl River	FRM; Streambank Stabilization	MS Soil & Water Conservation Commission	Planning; EA	NRCS Watershed and Flood Prevention Program (WFPO)	Planning Dec 2024 Design Dec 2025 Construction Dec 028
Lake Ridgelea – Big Creek	FRM	MS Soil & Water Conservation Commission	Planning; EA	NRCS Watershed and Flood Prevention Program (WFPO)	Planning Dec 2024 Design Dec 2025 Construction Dec 2028
White Oak Creek	Streambank Stabilization	Hinds County Board of Supervisors	Construction	MS State Legislature	Construction 2025
Eubanks Creek	FRM; Streambank Stabilization	City of Jackson	Design	MS State Legislature	Design 2023
Belhaven Creek	FRM; Streambank Stabilization	City of Jackson	Completed	City of Jackson	Completed 2022
RANKIN COUNTY					
Rankin County Watershed Based Stormwater Mgmt. Program (R1-29)	FRM; Streambank Stabilization & WQ restoration	Rankin County	Construction	ARPA, State and Local Fiscal Recovery Funds Program (SLFRF)	Construction 2026
Richland Creek Watershed Improvements	FRM; Streambank Stabilization & WQ restoration	Rankin County	Design	USACE; NRCS	Planning completed. Planning Jan 2025 Construction Dec 2026
Mill Creek & Pelahatchie Watershed Improvements	FRM; Streambank Stabilization & WQ restoration	Rankin County	Planning	USACE; NRCS; NRCS	Planning Jan 2024 Design Dec 2025 Construction Dec 2027
Richland Creek - Sec 219 Environmental Infrastructure Watershed Improvements	FRM; Streambank Stabilization & WQ restoration	USACE	Planning	USACE; Rankin County	Planning April 2024 Design July 2025 Construction July 2026
MADISON COUNTY					
Brashear Creek	FRM; Streambank Stabilization & WQ restoration	City of Ridgeland	Planning	Section 219 WRDA	TBD
Purple Creek Flood Mitigation & Restoration	FRM	City of Ridgeland	Planning	FEMA Pre-Disaster Mitigation	Planning Jan 2024 Design Dec 2025 Construction Dec 2026

Project Name	Type of Project	Lead Agency	Stage of Project	Funding Source	Status of Completion
MADISON COUNTY					
Purple Creek	FRM; Streambank Stabilization &	City of Ridgeland	Design	ARPA, SLFRF	Design Sep 2024
Basin Drainage	WQ restoration			Program	Construction Dec
Improvements &					2026
Stormwater Park					
Brashear Creek	FRM; Streambank Stabilization &	USACE	Planning	USACE; Madison	Planning March
and Hanging	WQ restoration			County	2024
Moss Creek - Sec					Design June 2025
219					Construction July
Environmental					2026
Infrastructure					
Watershed					
Improvements					
CITY OF JACKSON, MS- TRIBUTARY IMPROVEMENTS					
Drainage Improvements- White Oak Creek, Hanging Moss Creek, Lynch Creek, Eubanks Creek, Woodhaven Creek, Big Creek, Cany Creek, Hardy Creek, Trahon Creek, Belhaven Creek, Purple Creek, Parker Creek, Bogue Chitto Creek, Town Creek, Bakers Creek, Three Mile Creek, Small Creek, and Numerous Unnamed Tributaries.	FRM	City of Jackson			
Bridge Clearing	FRM	City of Jackson			
Inlet Clearing	FRM	City of Jackson			

A description of on-going projects by others is provided below. The number in front of the project name is the project ID number.

1.2.5 Rankin County Projects

R1 Hydrologic Restoration of Stormwater Infrastructure near Reservoir East Subdivision: Repair dam structure north of Holly Bush Road. Dredge three detention ponds south of Reservoir East Subdivision to original capacity levels. Clear obstructions, vegetation, and sediment from the unnamed tributary (UT) of Clarke Creek from Holly Bush Road southward to the outfall at Clarke Creek. Restore and/or increase hydraulic section along the reach, as well as stabilize bank sections as necessary.

R2 Flood Mitigation UT Clark Creek near Hollybush Road: Build detention upstream of the roadway to mitigate flooding and consider increasing hydraulic capacity of the drainage structure to aid with floodplain connectivity.

R3 Indian Creek Bank Stabilization at Gunter-Shenandoah: Runoff from storm events has resulted in Indian Creek overtopping Gunter Road. Streambank erosion is occurring due to the hydraulic constrictions of the site. Project would allow increased hydraulic capacity and include bank stabilization measures.

R4 Stormwater Detention Restoration and Hydrologic Restoration near Live Oaks Subdivision: Restore original capacity for detention ponds and increase hydraulic capacity of drainage ditches and channels in the area.

R5 UT Richland Creek Bank Stabilization near Tara Road: Create larger hydraulic capacity along the reach by clearing, potentially widening, and then stabilizing the portion of ditch that does not encroach on wetlands. Build detention facility along this section as well. The portion of channel that falls within federal wetlands should only be cleared of obstructions.

R6 UT Neely Creek Ditch Flood Impacts at Hwy 80: Remove, repair, and replace hydraulically inadequate structures along the reach.

R7 Hydrologic Restoration near Mellomeade: Increase hydraulic capacity of ditches, channels, and drainage structures in the area to accommodate runoff evacuation.

R8 Mill Creek Bank Stabilization: Stabilization of banks along the reach providing adequate hydraulic section.

R9 Vernon Jones: Increase hydraulic opening under Vernon Jones, widen downstream section of ditch and stabilize banks.

R10 UT Pelahatchie Creek Flood Mitigation – Pinebrook: This project would address frequent localized flooding and erosion by increasing hydraulic capacity downstream of the site.

R11 Oak Grove Ditch Bank Stabilization and Hydrologic Restoration: Clear sediment, obstructions and vegetation from channel and restore hydraulic capacity. Stabilize banks as necessary.

R12 UT Holcomb Branch in Deer Valley: Runoff from storm events causes ponding on adjacent road; Project would allow increased hydraulic capacity and include bank stabilization measures.

R13 Barnett Bend Stormwater Detention Restoration: Clear sediment, obstructions and vegetation from channel and restore hydraulic capacity. Stabilize banks as necessary.

R14 UT Mountain Creek Erosion Mitigation at Foster Road: Roadway realignment needed to accommodate the hydraulic need of the channel at the location.

R15 UT Steen Creek Bank Stabilization near White Road: This project seeks to stabilize banks along the reach and insure adequate hydraulic capacity of the channel and any incidental structures along the reach.

R16 UT Hog Creek Detention near Amanda Drive: Clear debris, obstruction, and small caliper vegetation along the reach. Stabilize banks as needed. Build detention along the reach south of Henderson Road and west of Amanda Drive.

R17 Steen Creek Relief – A at White Road: Replacement of bridge because of substandard load carrying capacity/substantial bridge roadway geometry deficiency. Stabilization of banks, as necessary, would aid in decreasing erosion, increasing water movement and provide re-establishment of floodplain connectivity. Activities would not cause degradation upstream or downstream of the proposed location.

R18 Steen Creek Relief - B at White Road: Replacement of bridge because of substandard load carrying capacity/substantial bridge roadway geometry deficiency. Stabilization of banks, as necessary, would aid in decreasing erosion, increasing water movement and provide re-establishment of floodplain connectivity. Activities would not cause degradation upstream or downstream of the proposed location.

R19 Holcomb Branch at Hickory Ridge: The project requires replacement of bridge to restore hydraulic capacity and includes improvements to the hydrologic connectivity within the channel by clearing sediment, obstructions, and vegetation from channel which would also aid in re-establishing appropriate hydraulic capacity for movement of surface water runoff. Minor bank stabilization improvements would occur upstream and downstream of the bridge to alleviate erosional and sediment issues along the bridge.

R20 UT Steen Creek at Erlich Road: Replacement of bridge because of substandard load carrying capacity/substantial bridge roadway geometry deficiency. The project would consist of improving hydrologic connectivity within the channel by clearing sediment, obstructions, and vegetation from channel, which would also aid in re-establishing appropriate hydraulic capacity for movement of surface water runoff. Minor bank stabilization improvements would occur upstream and downstream of the bridge to alleviate erosional and sediment issues along the bridge.

R21 UT Steen Creek at White Road: Replacement of bridge because of substandard load carrying capacity/substantial bridge roadway geometry deficiency. The project would consist of improving hydrologic connectivity within the channel by clearing sediment, obstructions, and vegetation from channel, which would also aid in re-establishing appropriate hydraulic capacity for movement of surface water runoff. Minor bank stabilization improvements would occur upstream and downstream of the bridge to alleviate erosional and sediment issues along the bridge.

R22 Butler Creek at Williams Road: Replacement of bridge because of substandard load carrying capacity/substantial bridge roadway geometry deficiency. The project will consist of improving hydrologic connectivity within the channel by clearing sediment, obstructions, and vegetation from channel, which would also aid in re-establishing appropriate hydraulic capacity

for movement of surface water runoff. Minor bank stabilization improvements would occur upstream and downstream of the bridge to alleviate erosional and sediment issues along the bridge.

R23 Dry Creek at Thomasville Road: Replacement of bridge because of substandard load carrying capacity/substantial bridge roadway geometry deficiency. The project would consist of improving hydrologic connectivity within the channel by clearing sediment, obstructions, and vegetation from channel, which would also aid in re-establishing appropriate hydraulic capacity for movement of surface water runoff. Minor bank stabilization improvements would occur upstream and downstream of the bridge to alleviate erosional and sediment issues along the bridge.

R24 Squirrel Branch at Lowe Circle; Replacement of bridge because of substandard load carrying capacity/substantial bridge roadway geometry deficiency. The project would consist of improving hydrologic connectivity within the channel by clearing sediment, obstructions, and vegetation from channel, which would also aid in re-establishing appropriate hydraulic capacity for movement of surface water runoff. Minor bank stabilization improvements would occur upstream and downstream of the bridge to alleviate erosional and sediment issues along the bridge.

R25 Hog Creek at Henderson Road: Replacement of bridge because of substandard load carrying capacity/substantial bridge roadway geometry deficiency. The project would consist of improving hydrologic connectivity within the channel by clearing sediment, obstructions, and vegetation from channel, which would also aid in re-establishing appropriate hydraulic capacity for movement of surface water runoff. Minor bank stabilization improvements would occur upstream and downstream of the bridge to alleviate erosional and sediment issues along the bridge.

R26 Purvis Creek at Diamond D Lake Road: Replacement of bridge because of substandard load carrying capacity/substantial bridge roadway geometry deficiency. The project would consist of improving hydrologic connectivity within the channel by clearing sediment, obstructions, and vegetation from channel, which would also aid in re-establishing appropriate hydraulic capacity for movement of surface water runoff. Minor bank stabilization improvements would occur upstream and downstream of the bridge to alleviate erosional and sediment issues along the bridge.

R27 Plummer Slough at Oakdale Road: Replacement of bridge because of substandard load carrying capacity/substantial bridge roadway geometry deficiency. The project would consist of improving hydrologic connectivity within the channel by clearing sediment, obstructions, and vegetation from channel, which would also aid in re-establishing appropriate hydraulic capacity for movement of surface water runoff. Minor bank stabilization improvements would occur upstream and downstream of the bridge to alleviate erosional and sediment issues along the bridge.

R28 Clear Creek Relief at Haynes Chapel Road A: Stabilization of banks, as necessary, would aid in decreasing erosion, increasing water movement and provide re-establishment of floodplain connectivity. Activities would not cause any degradation upstream and downstream of the proposed location.

R29 Clear Creek Relief at Haynes Chapel Road B: Replacement of bridge because of substandard load carrying capacity/substantial bridge roadway geometry deficiency. The project

would consist of improving hydrologic connectivity within the channel by clearing sediment, obstructions, and vegetation from channel, which would also aid in re-establishing appropriate hydraulic capacity for movement of surface water runoff. Minor bank stabilization improvements would occur upstream and downstream of the bridge to alleviate erosional and sediment issues along the bridge.

1.2.6 Prior Reports

Ongoing projects within the area that affect the hydrology and water resources, but are not FRM projects include the following:

O.B. Curtis Water Treatment Plant (WTP): On 29 August 2022, the city of Jackson declared a water system emergency and the State requested an emergency measures declaration. It was identified that the chemical composition of the water in Ross Barnett Reservoir, which supplies raw water to the O.B. Curtis WTP, changed such that it compromised the WTP's ability to function properly and cut off the water supply to more than 150,000 residents and businesses in Jackson. The next day, a federal state of emergency was declared, authorizing the Department of Homeland Security and FEMA to coordinate disaster relief efforts. The USACE received a FEMA mission assignment (MA) on 1 September 2022 to provide technical assistance to the city of Jackson. As part of the overall MA, USACE was tasked with developing a resiliency playbook to assist with long-term improvements to the Jackson water treatment facilities, O.B. Curtis and J.H. Fewell.

The Ross Barnett Reservoir: A Non-Federal project operated by the Pearl River Valley Water Supply District project, was constructed between 1960 and 1962 for the purposes of water supply and recreation. The dam and reservoir location are shown in Figure 1-6.

Although the reservoir can and has provided some flood reduction during extreme events, it was not designed as a traditional flood control reservoir. In regard to existing conditions for this study, the Ross Barnett Reservoir is assumed to operate as a run-of-river dam, and the reservoir provides minimal reduction to peak discharges. This criterion is consistent with previous USACE flood control evaluations in the Pearl River watershed.

J. H. Fewell WTP: In 1915, to ensure a reliable source of water supply, the city of Jackson constructed a weir at the J. H. Fewell WTP identified on Figure 1-2. Jackson's current water supply still draws on this weir, along with the O.B. Curtis WTP, which withdraws water from the Ross Barnett Reservoir.

Water and Wastewater Infrastructure Improvements: USACE, specifically MVK, entered into a project partnership agreement with the City of Jackson, Mississippi on 6 February 2023, as part of the Environmental Infrastructure Program, as authorized by Section 219 of WRDA 1992, as amended. The Section 219 authority provides for $125 million to the City of Jackson to provide water and wastewater infrastructure improvements to the area of Jackson. The first increment of work would be the purchase of a pump with a 100 million gallons per day capacity at the Savanna Street WWTP. The City of Jackson would determine future projects subject to Federal law and regulation.

Safe Drinking Water Act (SDWA): The EPA is authorized under Section 1442(b) of the SWDA to provide technical assistance and grants to states and public water systems to assist in responding to and alleviating emergency situations. For the city of Jackson, $600M has been appropriated, in which $150 million comes from SDWA Section 1442(b) of the SWDA and another $450 million from the Clean Water State Revolving Fund (SRF) grant funds. The SRF grant funds come from the EPA but are administered through the state.

Table 1-3: Prior USACE Studies and Reports

Project/Report	Relevant Dates	Status
USACE Survey study of the Pearl River and Tributaries, Mississippi	May 2, 1949: Authorization. June 2, 1959: Report Released.	Completed construction of existing levees in 1968.
Comprehensive Survey of the Pearl River Basin, MS, and LA Report	1970: Report Released Included Structural and NS features.	Projects were never implemented.
Edinburg Dam Phase I Design Memorandum	January 1972: Memo Released identifying only Edinburg Dam economically justified. 1974: WRDA authorized Edinburg Dam Project. 1980: No longer economically justified.	USACE re-evaluated in 2007.
Survey Report on the Feasibility of Flood Protection Measures for Town Creek at Jackson	August 1970: Report Released.	No economically feasible flood control plan for Town Creek was identified.
Three Continuing Authorities Program (CAP) Section 205 of the Flood Control Act of 1948 Study Report for Richland Creek in Rankin County	1979: Report Released.	No economically feasible flood control plan for Richland Creek was identified.
Reconnaissance Pearl River Basin Interim Report on Flood Control	November 1981: Report Released with Four Point Plan developed. 1983: The Four Point Plan was authorized for construction in the FY 83 Supplemental Appropriations Bill.	May 1984: DM No. 1, "Flood Control for Jackson, Mississippi," contained documentation for the Four Point Plan with only the clearing plan moving forward at HWY 25.
CAP Section 205 of the Flood Control Act of 1948 Study Report for Sellers Creek in Ranking County	October 1984: Report Released.	No economically feasible flood control plan for Sellers Creek was identified.
The Pearl River Basin Interim Report on Flood Control	July 1985: Report Released with recommendation of Shoccoe Dam. 1986 WRDA: Authorized construction of Shoccoe Dam.	Shockoe Dam later identified as not implementable.
Carthage/Leake County, MS Interim Flood Control Report	February 1987: Report Released with recommendation of Shoccoe Dam, levees, and channel improvements.	Not implemented as later found to be not economically feasible.

Project/Report	Relevant Dates	Status
CAP Section 205 Flood Control Study Report for Neely Creek	May 1988: Report Released with recommendation of 2 miles of channel enlargement on a tributary.	Later identified as not implementable due to NFI found the plan unacceptable.
Reconnaissance FRM and Bank Stabilization Study Report for Cany Creek, MS	November 1990: Report Released.	No economically justifiable plan was identified, and further studies were not recommended.
Draft Feasibility Flood Risk Reduction Report for Jackson Metropolitan Area, MS	1996: DRAFT Report released with recommendation of the comprehensive levee plan.	July 1998: was found to be not implementable due to lack of local support.
DRAFT Flood Control, Pearl River Basin, Mississippi, Jackson Metropolitan Area, Mississippi, Feasibility and EIS	2007: DRAFT Report released. No plan recommended but Comprehensive Levee Plan was economically justified and the Lefleur Lakes (LL) Plan was found not justified due to not meeting environmental policy objectives.	
ATR Summary Report for the Pearl River Watershed Integrated Feasibility Report and Environmental Impact Statement	June 2020: ATR of the draft and final report products from June 2017 to April 2020. ATR was closed with significant concerns that were identified during review of the final report documents.	
Letter Report for Water and Wastewater Infrastructure, Jackson, MS Savanna Street WWTP Improvements	December 2022: Mississippi Division approved the Letter Report for increment of work for the Savanna Street WWTP Improvements	

SECTION TWO

2 AFFECTED ENVIRONMENT

2.1 Environmental Setting

The Pearl River watershed is located in the south-central portion of Mississippi and in a small part of southeastern Louisiana. It is bounded on the north by the Tombigbee River Basin, on the east by the Pascagoula River Basin, on the south by Lake Borgne and the Mississippi Sound, and on the west by the Mississippi River Basin and several coastal streams that drain the eastern portion of Louisiana. There are numerous lakes within the watershed but only a few of significant size. The largest of these is Ross Barnett Reservoir, which is located on the Pearl River about 12 miles northeast of downtown Jackson.

The Pearl River watershed lies within the East Gulf Coastal Plain, which is physiographical subdivided into the North Central Hills (or Plateau), Jackson Prairie, Southern Pine Hills, and Coastal Pine Meadows districts. These districts all cross the watershed generally in a northwesterly direction. Elevations in the watershed range from mean sea level (0.0 feet) to approximately 650 feet above sea level referenced to National Geodetic Vertical Datum (NGVD).

Sand and clay, in various proportions, constitute nearly all the immense prism of sedimentary deposits extending from the northern part of the watershed to the coast. Also, a few thin units of marl, limestone, and glauconitic and lignite material are present in several places. Individual sand beds are irregular in thickness, and few can be traced more than 5 miles.

The Pearl River is formed in Neshoba County, Mississippi, by the confluence of Nanih Waiya and Tallahaga Creeks and flows southwesterly for 130 miles to the vicinity of Jackson (including the 43-mile-long Ross Barnett Reservoir), then southeasterly for 233 miles to the head of its outlet channels, the Pearl and West Pearl Rivers. The width of the channel varies from about 100 to 300 feet between Jackson and Edinburg.

The United States Geological Survey published the frequencies of the 1979 and 1983 flood events at the Jackson gage, which were annual 0.5 percent and 2.86 percent chance exceedance events, respectively. Floods equivalent to the annual 20 percent to 10 percent chance exceedance events occurred on 21 March 1980; 14-17 April 1981; 6 December 1982; 8-9 April 1983; 5 May 1991; and 11 April 2014. Most recently, the Pearl River reached the third highest recorded crest in Jackson on 17 February 2020, peaking at 36.67 feet.

2.1.1 Climate and Weather Patterns

Currently, the climate within the Study Area is mild, humid, and primarily subtropical with abundant precipitation. The summers are long and hot, and the winters are short and mild. The average high temperature is 76°F and the average low temperature is 54°F. Average monthly temperatures range from 35°F in January to 92°F in July.

The average annual rainfall in the Study Area is approximately 54 inches, and annual rainfall averages 4.5 inches per month. Normal monthly rainfall varies from 3.0 inches in September to 6.1 inches in December (https://usclimatedata.com).

The Time Series Toolbox (https://climate.sec.usace.army.mil/tst_app/) was also used to analyze multiple time periods of concern, including the entire period of record for the Pearl River at Jackson, Mississippi Gage, from the construction of the Ross Barnett Reservoir to Present, and from 1980 to present (time period since last extreme event).

For all time periods analyzed, no statistically significant trends were detected by the t-Test, Mann-Kendall Test, or the Spearman Rank-Order Test.

2.1.2 Physiographic and Geologic Standpoint

As indicated by the *Geologic Map of Mississippi*, the geology of this area consists of outcrops of the Yazoo Clay Formation of the Jackson Group. The Yazoo Clay, named from exposures in the bluffs along the Yazoo River, outcrops along a northwest to southeast trending belt that extends from the Alabama State line to the edge of the Yazoo watershed in Yazoo County, Mississippi.

From a geological standpoint, the Pearl River Watershed is not a contained unit because formations extend beyond topographic divides into the adjoining stream basins. Generally speaking, the formations at the surface tend to be sedimentary and range from Eocene to recent. These formations dip in a southwest orientation throughout the northern three- fourths of the river watershed except where they are interrupted by structural features such as the Jackson Dome and other smaller salt domes.

The Yazoo Clay consists of homogeneous clays throughout, with the exception of the upper 50-foot interval which contains several thin limestones and bentonitic clay beds. The uniformity of the Yazoo Clay across the State indicates the uniformity of the near shore marine conditions present during deposition of the clay in upper Eocene time (approximately 40 million years ago). Non-weathered Yazoo Clay is blue gray, slightly silty, fairly calcareous, massively bedded clay. Fresh Yazoo Clay weathers quickly to a dark olive-gray and then to a buff to tan clay. These color changes are irrespective of bedding. Alteration during weathering is accompanied by alternate swelling when wet and shrinking when dry so that bedding is soon obliterated. When the Yazoo Clay becomes wet or saturated, the swelling clay particles compress and further decrease the effective permeability of the Yazoo Clay.

The Yazoo Clay is generally considered to be an impermeable formation and a barrier to contiguous groundwater aquifers or ponded surface waters.

Sand and clay, in various proportions, constitute nearly all the immense prism of sedimentary deposits extending from the northern part of the watershed to the coast. Also, a few thin units of marl, limestone, and glauconitic and lignite material are present in several places. Individual sand beds are irregular in thickness, and few can be traced more than 5 miles. However, predominantly

sandy zones, as differentiated from predominantly clayey zones, can be correlated over wide areas, some throughout much of the watershed. The formations dip southwestward at 20 to 80 feet per mile throughout the northern three-fourths of the watershed, except where they are interrupted by such structural features as the Jackson Dome and many smaller salt domes. The rate of dip becomes steeper in the southern part of the watershed, where pronounced down warping toward the Mississippi River structural trough has resulted in a dip of 100 feet per mile or more.

2.1.3 Topography and Physiography

The Pearl River Watershed lies within the East Gulf Coastal Plain which is physiographically subdivided into the North Central Hills (or Plateau), Jackson Prairie, Southern Pine Hills, and Coastal Pine Meadows districts. These districts all cross the watershed generally in a northwesterly direction.

The proposed Project Area lies within the Jackson Prairie topographic region. The Jackson Prairie Belt is one of two physiographic regions in Mississippi containing prairies and is known as a "Blackland Prairie". One of ten topographic regions in the State of Mississippi, the Jackson Prairie Belt extends across the central portion of the State from the edge of the Loess Bluff Region to the eastern border of the state. The Jackson Prairie Belt is characterized by gently rolling terrain with black, fertile soils. More specifically, the Project Area contains gently rolling terrain with elevations that range from approximately 280 feet NGVD to approximately 220 feet NGVD.

2.1.4 Pearl River Watershed and Land Cover

The Pearl River drains nearly 78,000 square miles in Mississippi and 900 in Louisiana, running from Edinburg, Mississippi to near the Rigolets at the Gulf of America. Furthermore, the Pearl River Watershed is comprised of the Upper, Middle, and Lower Watersheds (Figure 2-1) The Ross Barnett Reservoir exists in the Middle Watershed and drains 35% of the basin, primarily from the Upper and Middle Watersheds. The watershed contains areas of 19 counties in both Mississippi and Louisiana before flowing into the Gulf of America. Major tributaries of the Pearl River are the Strong River, which contributes flow just below Georgetown, Mississippi, and the Bogue Chitto, which meets the Pearl River north of Pearl River, Louisiana. The land uses of the Pearl River Watershed mainly composed of forests, wetlands, pastures, and urban areas. Most of the soils are classified as hydrologic soil group D and C and are mostly coarse-loamy in texture. The watershed is known for experiencing periodic flooding, and some of these floods have caused significant damage to damage to infrastructure.

2.1.4.1 Hydrologic Conditions

Previous Events: There have been numerous flood events that have affected the Study Area, most notably the Easter Flood of 1979, the May Flood of 1983, and the February 2020 flood event. The 1979 event flooded transportation routes, homes, and businesses, causing damages that, at that time, totaled approximately $223 million. If the same event occurred in the present day, damages would surpass $1.2 billion. More recently, the Pearl River crested at 36.67 feet in Jackson on February 17, 2020, the third highest crest ever recorded. The communities sustaining the most devastation from this flood event were located in minority and low-income areas of Jackson.

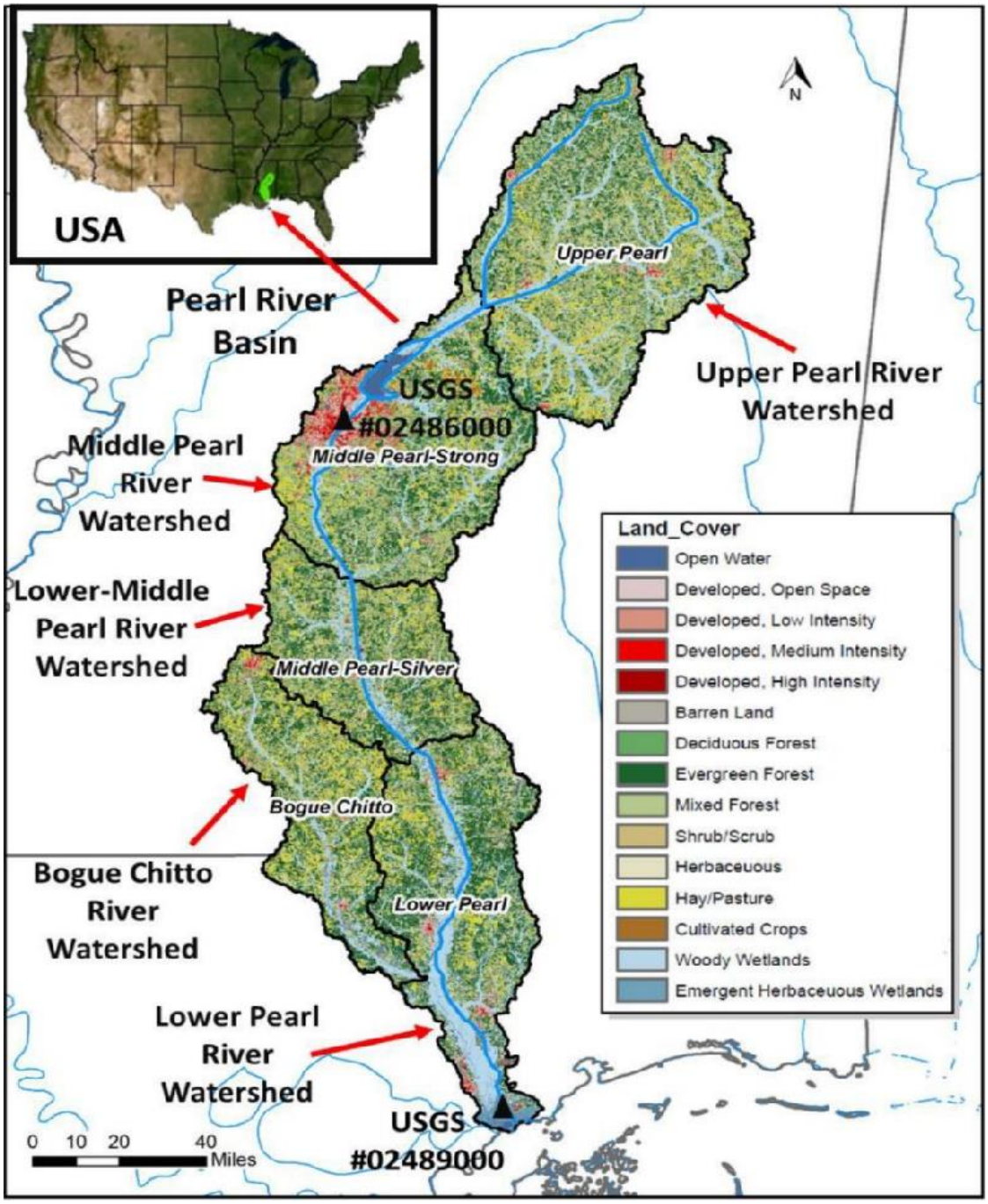

Figure 2-1: Pearl River Watershed source Mississippi Dept of Environmental Quality

History of Region/River: According to Mississippi Folklife (2017): "The Pearl River begins in Neshoba County, Mississippi, where several creeks come together including Nanih Waiya.

Variously translated as "stooping hill" or "place of creation," the creek shares its name with a nearby Native American mound central to Choctaw origin myths and venerated as their mother mound. From the swamps of the Tribe's reservation the Pearl flows hundreds of miles south, eventually splitting into two channels, and later infinitely more, forking into marshes and bayous that lead to Lake Borgne and the Rigolets, and then the Gulf of [America]." The Choctaw, and their ancestors, have called Mississippi and the region encompassing the Pearl River home for centuries. Spanish Explorers discovered the river in 1519. The first mention of the Choctaw name in modern history was recorded in 1675 by a Spanish priest in Florida. He warned early settlers against traveling too far to the west lest they meet the fearsome "*Chahta.*" This name is still what the Choctaw call themselves today (Mississippi Band of Choctaw Indians 2024). In 1699, Jean-Baptiste Le Moyne, Sieur de Bienville, initiated the first sustained contact with the Choctaw and called the stream *La Riviere des Perles*; a translation of the Acolapissa Indian name. In 1732, Lt. Sieur Louis Joseph Guillaume de Régis Du Roullet explored the Pearl River from Source to Mouth. He noted a raft of driftwood choking the lower river. (National Geographic 2023). Mississippi became a State in 1817 and in 1820 a new capital city was founded on the Pearl River, at LeFleur's Bluff, a small village founded by French-Canadian trader Louis LeFleur (City of Jackson Mississippi 2023).

The Steamboat Choctaw was the first to make it to Jackson in 1835, and by 1840 there was regular traffic along the river, likely only traveling as far north as Jackson during higher river stages. (Sea Coast Echo 2022) By 1856, the Pearl, had been heavily cleared and became threatened environmentally. According to the Mississippi Band of Choctaw Indians (2024), rivercane, also known locally as swamp cane, "became increasingly difficult to find in its original wild setting. Like many facets of Choctaw life, basketry is steeped in Tribal culture. Part of Choctaw life for centuries, it is a practice that blends tradition with innovation. The method of cutting and preparing the cane is the same used by Choctaw for generations. Fall is the ideal time to gather the cane, although it is hardly an easy task, given that wet, swampy areas are its natural habitat. In years gone by, baskets were used in the field and in the home. Modern times see the baskets holding a place in treasured Choctaw collections. However, Tribal programs have and continue to establish swamp cane fields for artisans. It is important to the Choctaw that swamp cane is readily available, so the art of Choctaw basketry is preserved." Further, planters and rivermen cut off river bends to increase the water's flow rate and to shorter distances along the river, but this loss of pool increased flooding. In addition, timber clearance on the banks increased silting and erosion. Nevertheless, the Pearl remained a key transportation highway until the late-nineteenth century (Mississippi Encyclopedia 2018).

Earliest Recorded Flooding Events 1874-1902: The earliest recorded events are a series of floods occurring between 1874 and 1902. Peak stage/flow measurements are available from 1874, and stage data are available at the Jackson gage from 1901 to the present. The floods of April 25, 1874, December 5, 1880, and April 21, 1900, were added to the gage record from data provided by local residents and newspaper records. Periodic weather observations are also available from 1849-1871 and 1873-1876 prior to the gage development to help inform the historical flood record. The 1902 event was the historical flood of record with a recorded discharge of 85,000 cubic feet per second (cfs). (Grice 2006, USGS 2023).

J.H. Fewell WTP and Weir-1915: In 1915, to ensure a reliable source of water supply, the city of Jackson constructed a weir at the J. H. Fewell WTP (Figure 1-2). Per Rankin- Hinds, this weir has been improved over time, the last of which was in the 1980s'. Jackson's current water supply still draws on this weir, along with the O.B. Curtis WTP, which withdraws water from the Ross Barnett Reservoir.

Ross Barnett-1965: The Ross Barnett Reservoir is a 33,000-acre impoundment just upstream of Jackson, Mississippi. The lake provides water supply for the city of Jackson and various recreational opportunities. Construction began in 1960, and the lake reached full pool by 1965. The Pearl River Valley Water Supply District maintains the reservoir between 296 to 297.5 feet. Although the reservoir does not have a flood reduction mission, in recent years the reservoir has been operating under large inflow events in conjunction with the Lower Mississippi River Forecast Center and MVK, to implement future informed releases within the lake limits to delay or decrease peak releases for events with a forecasted peak discharge above 35,000 cfs. The principal spillway consists of ten 40-foot (width) by 21-foot (height) gates with a discharge capacity of 180,000 cfs. The emergency spillway is a fuse plug type with a discharge capacity of 70,000 cfs. (State of Mississippi 2023; FTN Associates 2011)

Bridges in the Area- 1960s: There are many road crossings throughout the project reach, many of which were constructed in the 1960's. Table 2-1 is a listing of each crossing from upstream to downstream.

Table 2-1: Local Bridges and Construction Date (Road Crossings: Clarion Leger 2023)

Bridge Location	Date of Construction / Date of Major Reconstruction
Highway 25 (West)	1965/2001
Highway 25 (East)	1965/2001
Highway 25 Relief (West)	1965/2001
Highway 25 Relief (East)	1965/2001
Abandoned Railroad (GM&O)	1927 (Historical Marker Database)
I-55 over Pearl (North)	1967/1998
I-55 over Pearl (South)	1967/1997
Woodrow Wilson (Old Brandon Road)	1925
KCS Railroad (Gulf, Mobile and Ohio RR)	1838/1868 (Newspapers.com 2023)
US Highway 80	1938
I20 (West)	1965
I20 (East)	1965/1998
Canadian National Railroad	Unknown

Federal Levees and Channel Straightening-1960s (Figure 2-2): The Jackson Fairgrounds and East Jackson Levees were authorized in the Flood Control Act of 1960, with construction completed in

1968. This work included two earthen embankments, 5.34 miles of river channel work, four gated outlets, and two pumping plants. (Rankin Hinds 2021).

Figure 2-2: Levees and Channel Straightening. (Source: Rankin Hinds 2021)

The Savanna Street Wastewater Treatment Plant-*circa* 1970 Source: (https://frs-public.epa.gov/ords/frs_public2/fii_query_dtl.disp_program_facility?p_registry_id=110000727394; Figure 2-3), also known as the "Jackson Publicly Owned Treatment Works" was constructed between 1971-1973 on the western bank of the Pearl River south of the I-20 crossing. In 2012 the City of Jackson entered a Consent Decree with the EPA, which included this structure. As of March 20, 2023, this facility was listed as "Significant/Category 1-Noncompliance (https://echo.epa.gov/detailed-facility-report?fid=110000727394#summary; EPA 2023) Work by multiple entities is currently ongoing at this facility to move toward compliance.

The wastewater treatment plant is surrounded by the 2.69-mile Jackson-East Jackson Flood Control Project Levee System. April 1979 (Figure 2-4; 2-5; 2-6): The winter of 1978-1979 was exceptionally wet, December and January received at least 150 percent above normal rainfall, and February through April 9 also received well above average precipitation in 1979. On April 11, 1979, a squall line associated with a slow-moving cold front began to move over the area. Four to five inches of rainfall fell over the Jackson Metropolitan Area and induced flash flooding. The National Weather Service office in the Jackson area measured 4.5 inches of rainfall accumulation in just over an hour (NWS 2023a, b). The cold front continued to western Mississippi on April 12, 1979, and became stationary. Eight to ten inches of rain fell over the headwaters of the Pearl, Noxubee, and Tombigbee Rivers in one day. Total rainfall for the basin for the event is shown in Figure 2-4 (NWS 2023a, b).

Figure 2-3: Savanna Wastewater Treatment Plant

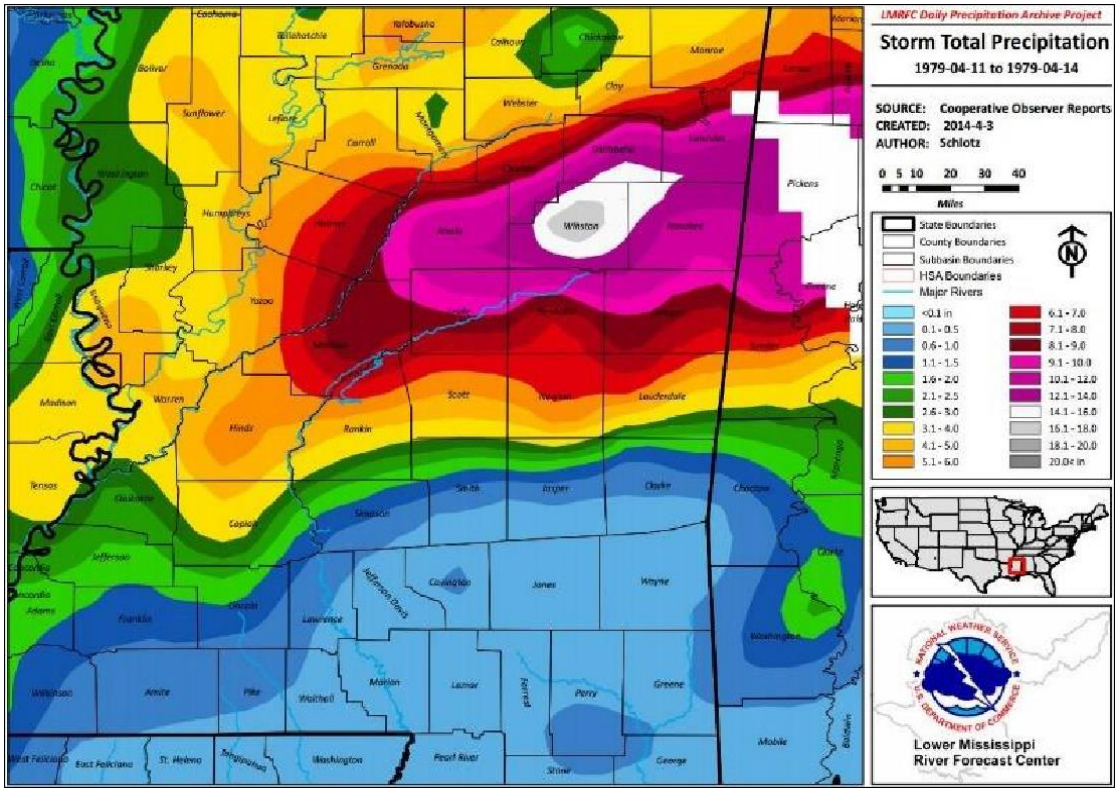

Figure 2-4: Total Rainfall 1979 Event (Source: NWS 2023a)

At 6 a.m. Friday morning, April 13, 1979, the river was at 33.5 feet and rising rapidly. At approximately 34 feet, river flooding began affecting homes and businesses, leading to rising water levels impacting properties. Later in the day, reservoir officials (after coordination with USACE and NWS) decided to try and lower the reservoir pool to provide storage for large inflows forecasted in the next few days. By April 14, 1979, the historic flood of record (1902-37.5 feet) was exceeded, and stage continued to rise rapidly. I-55 South was closed at approximately 5 p.m. on April 14, 1979, when water began to encroach in multiple places. (NWS 2023a, b).

On Easter Sunday, April 15, 1979, wide streams of water began to overtop the fairground levee. Workers attempted to plug the gaps but were unable to stop the floodwaters from flanking the levee at Fortification Street. By late Monday the Ross Barnett Dam, which now held a record pool, began showing signs of stress, and emergency workers reinforced weak spots. Peak flows into the Reservoir were estimated at 160,000 cfs. (NWS 2023a, b)

On the Rankin County side of the river, hundreds perhaps thousands of volunteers worked feverishly night and day to keep the levees intact. By the time they had finished, they had added about 3 feet to the levee. (NWS 2023a, b)

The river crested at 43.28 feet around 3 p.m. on Tuesday, April 17, 1979. Many homes in the northeast section of the city were under water for a week. Many businesses in the downtown area were flooded by backwater from a creek that runs through town. Other businesses were impacted when the river flanked around the levee. (NWS 2023a, b).

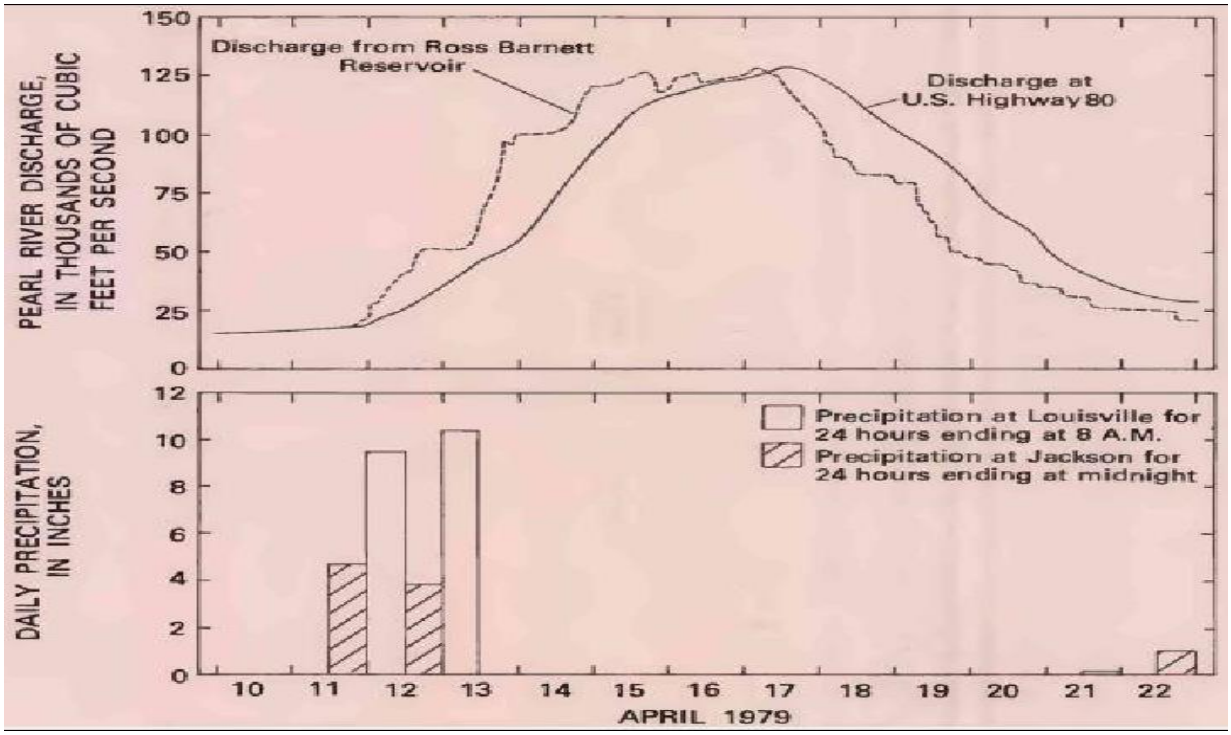

Figure 2-5: 1979 Routing-USGS Publication (Source: USGS 2023d)

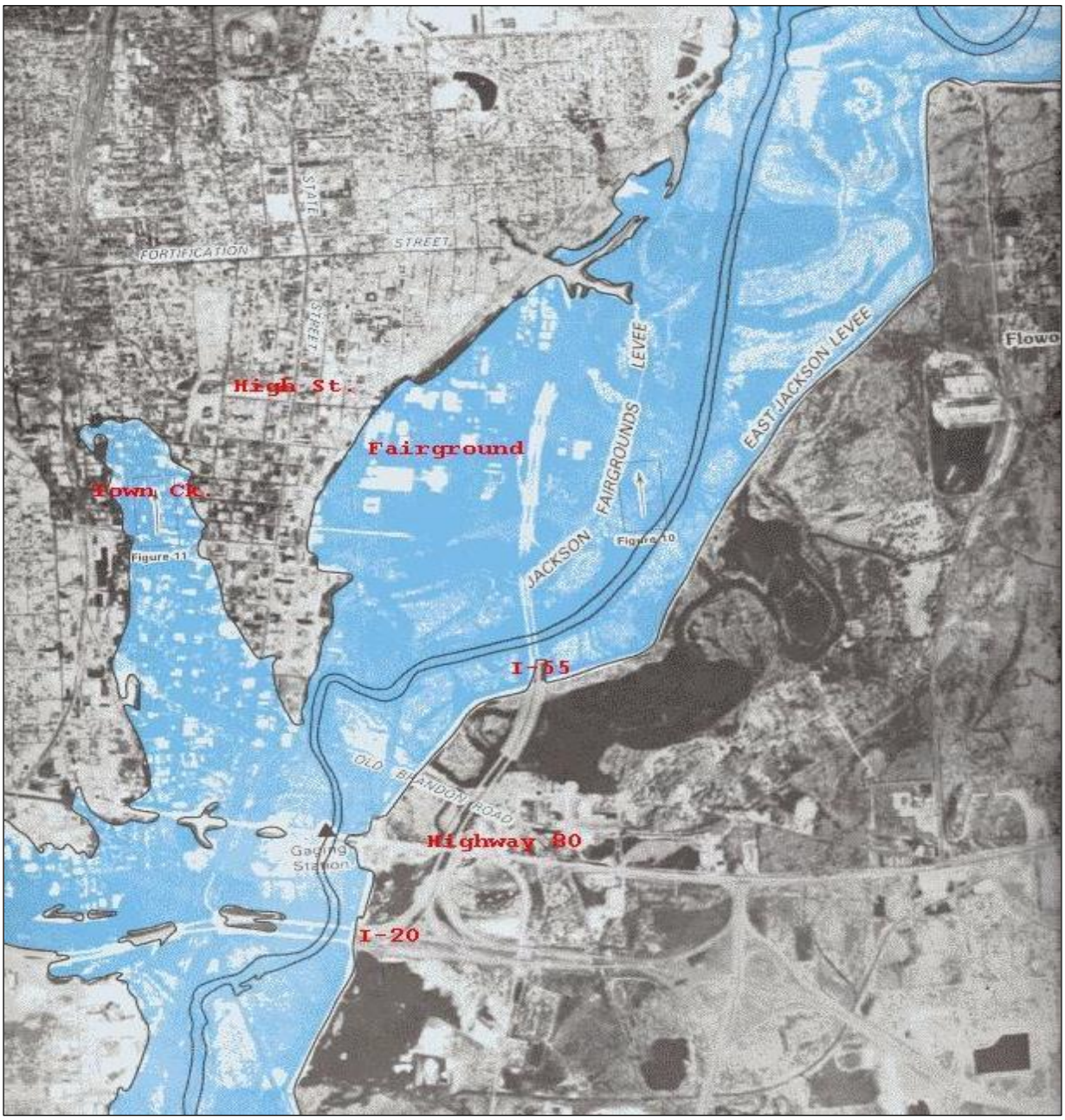

Figure 2-6: Inundation Extent 1979 Flood (Source: USGS 2023a)

In May 1983 another severe rainfall in the upper Pearl River Basin generated a peak inflow into the Ross Barnett Reservoir of 117,000 cfs. Downstream of the dam, the peak at the Jackson gage was 78,000 cfs. The resulting peak stage at the Jackson Gage was 39.6 feet, the second highest recorded peak stage. (Rankin Hinds 2021)

Levee Extension – 1984 (Figure 2-7): The Fortifications Street Levee Extension to the Jackson Fairgrounds levee was completed in 1984. This extension involved building up Fortification at the I-55 Northbound Access Ramp, adding a side fill levee on the river side of the ramp, and providing dikes across the Interstate 55 median and the ditch on the west side of the southbound lane of the interstate. (USACE 1985)

Figure 2-7: 1984 Levee Extension to Prevent Flanking

Clearing-1983 to 1985 - In 1983, channel modification was conducted at the Highway 25 bridge, which consisted of removing material from the west bank of the Pearl River approximately 600 feet upstream and downstream of the bridge to increase the conveyance of the stream at that location. The Pearl River Basin Development District completed this work in 1983.

A 3.3-Mile-long overbank clearing, and channel enlargement work was also authorized in the Supplemental Appropriations Act of 1983 and completed in 1985. This project consisted of 237 acres of complete clearing, 20 acres of selective clearing, 89 acres of partial clearing, and the placement of riprap around some bridges. The Pearl River Basin Development District was also the sponsor of this activity.

Additional Pump Capacity - The Jackson East Levee Pumping Station consists of four 67,000 gallon per minute or 150 cubic feet per second (cfs) pumps. Three of these pumps are contained in the same building and were constructed in 1968. In 1993, the local sponsor constructed an additional pump adjacent to the existing pumping station. The pump platform was placed in the

approach channel to the existing gravity structure. (USACE 2012a)

Three identical pumps are installed in the Fairgrounds Pumping Station. The station was constructed in 1966 as part of the Jackson Flood Control Project. The station capacity was increased in 1996 by the addition of a new 42 inches vertical shaft pump rated at 44.56 CFS at 15 feet. The station has a total pumping capacity of 89.34 CFS when pumping against a static head of 19.0 feet. (USACE 2012b)

Mowing/Spraying- 2013/2014 - The Pearl River Basin Development District (PRBDD) areas of Operation and Maintenance (O&M) responsibility were transferred to the Rankin-Hinds Pearl River Flood and Drainage Control District when the PRBDD closed its doors in 2018. The district no longer had adequate funding due to decreased participation and lack of grants and Federal funding. (Thompson 2017)

The excess vegetation was removed from these locations and regular O&M was resumed in the 2013/2014 time period.

February 2020 - A very wet January and February, led to a saturated river system. Between February 10 and 13, a swath of 5 to 10 inches of rain fell over the Pearl, Big Black, and Tombigbee Rivers (Figure 2-8); NWS 2023c).

The river crested at 36.7 feet at the Jackson Gage on February 17, 2020, and was the third highest crest of the gage's period of record (Figure 2-9). Roughly 120 homes and businesses were damaged from the flood, and many more businesses and homes were temporarily inaccessible due to roadway overtopping. No levees were overtopped during this event. (NWS 2023c).

Loading Differences: Another factor to consider in the existing condition is that the Pearl River appears to be passing more cubic feet per second (cfs) at similar water level stages than it did in the past (Figure 2-11 and Table 2-2). This was seen during the 2020 event when neighbors north of Lakeland Drive were experiencing flooding more than expected with a 38 feet river stage at the Jackson gauge while areas south of Lakeland Drive (Figure 2-10), particularly in downtown Jackson, were experiencing flood patterns more typical of previous events (NWS 2023c).

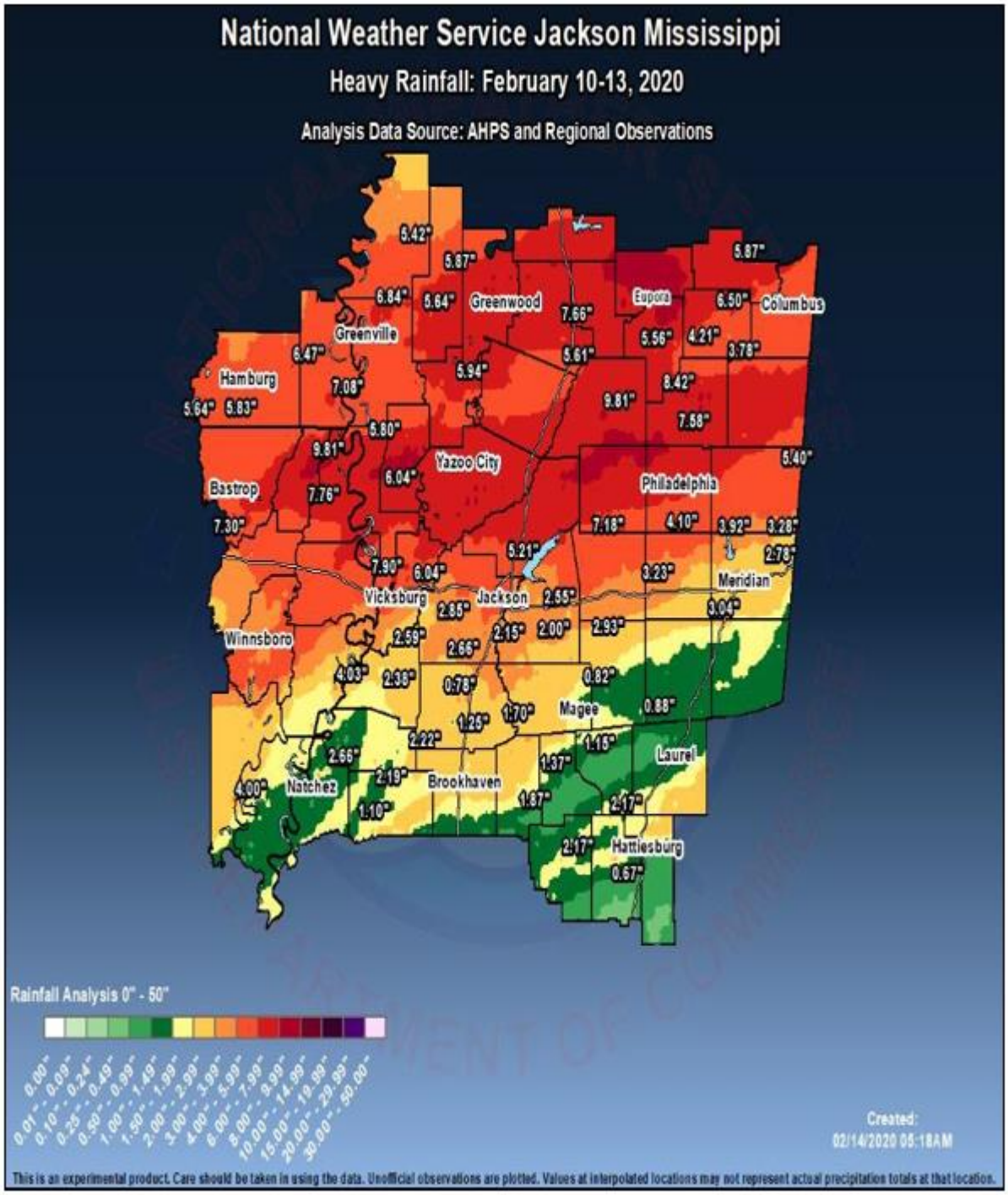

Figure 2-8: 2020 Rainfall Totals (Source: USGS 2023c)

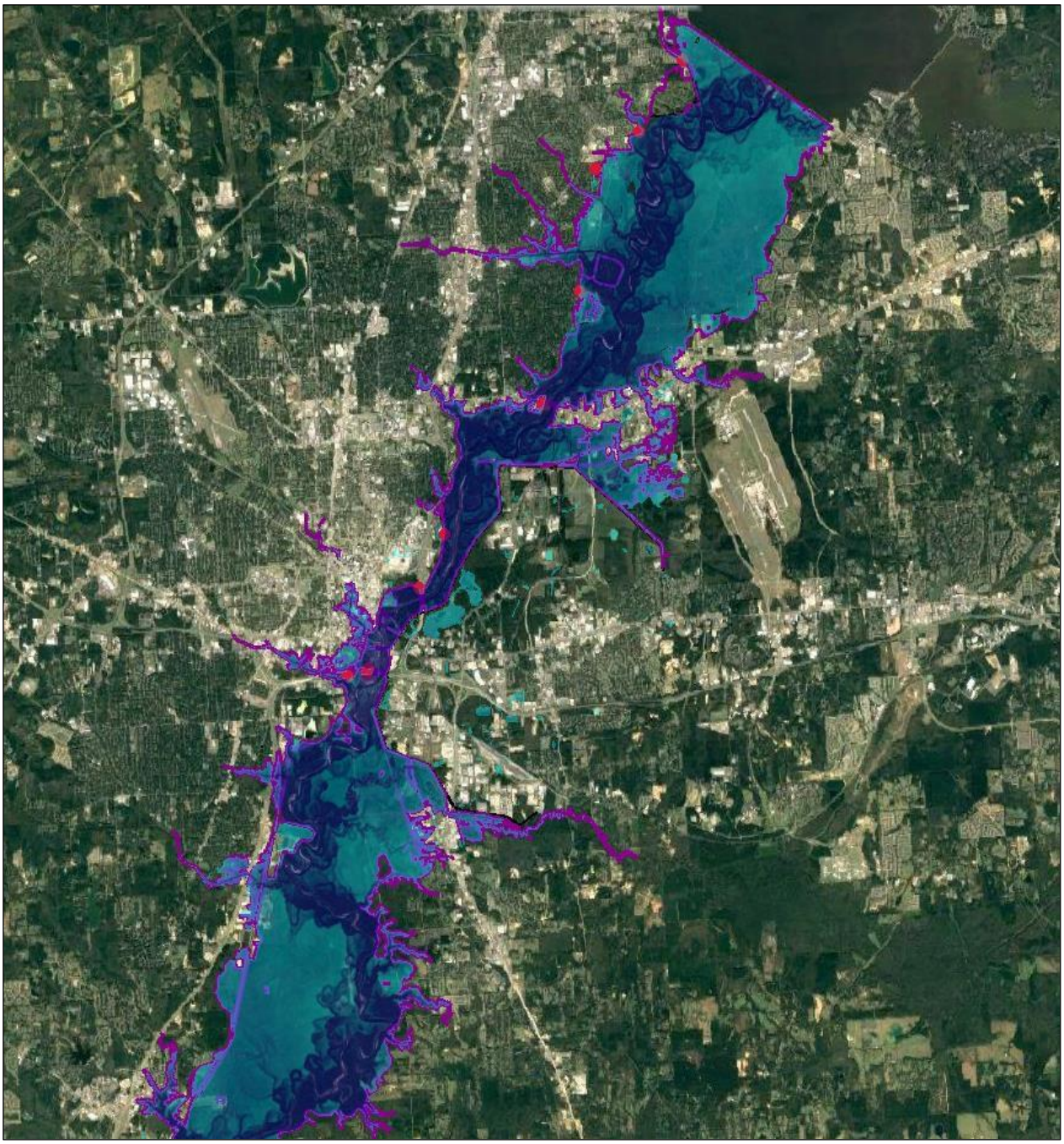

Figure 2-9: 2020 Inundation Extent

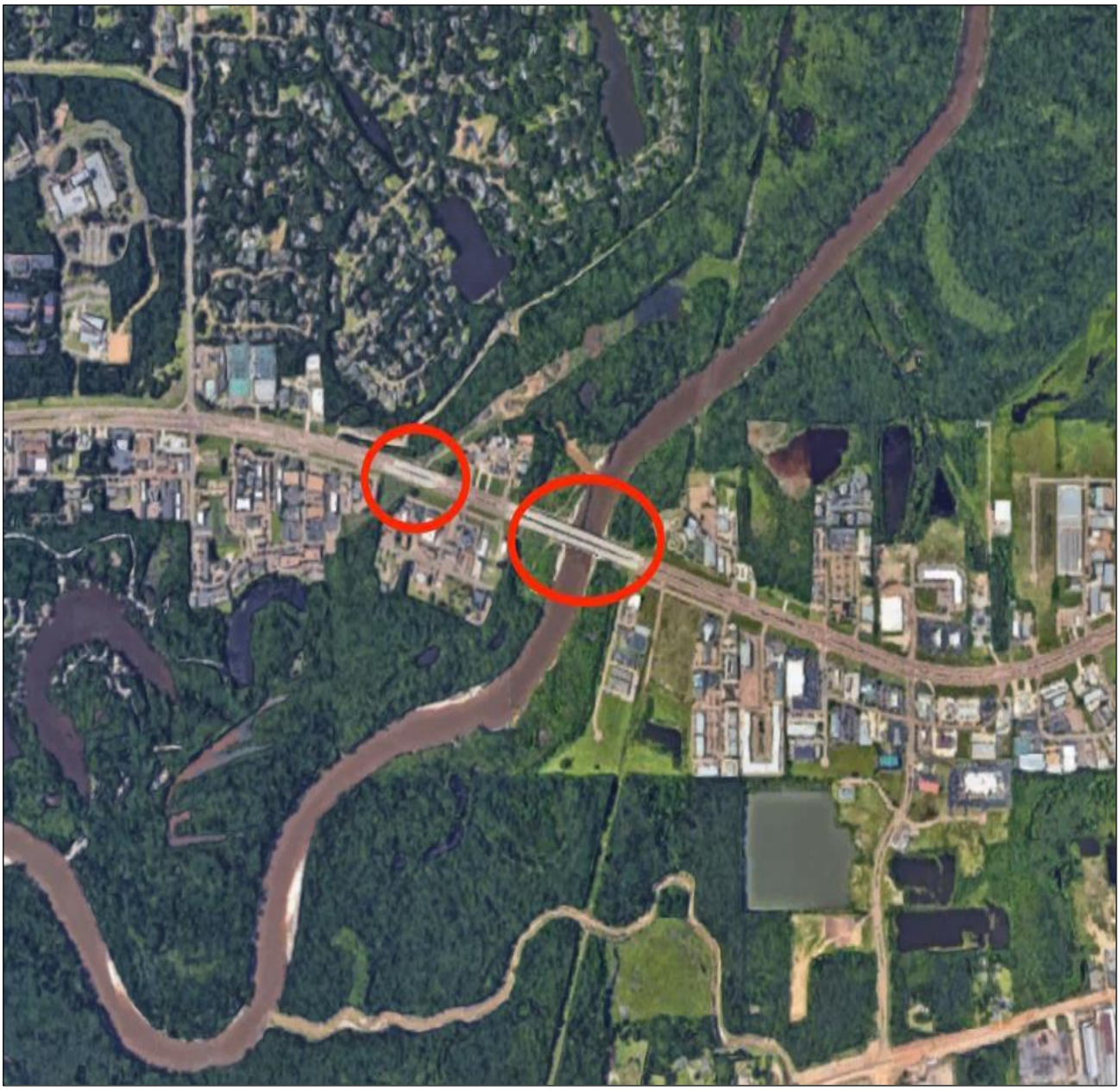

Figure 2-10: Lakeland Drive/HWY 25 Bridge and Overflow Bridge

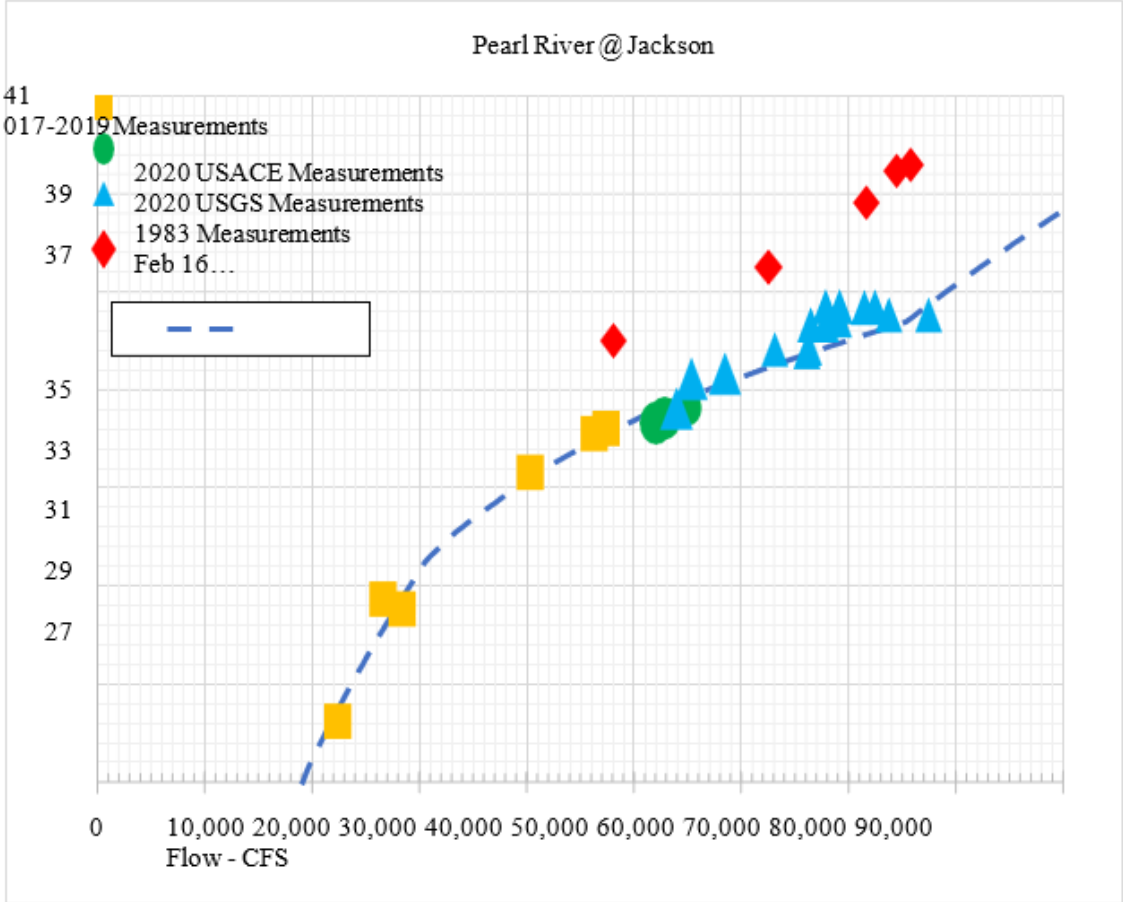

Figure 2-11: Updated Rating Curve with Discharge Measurements

Table 2-2: 1983 and 2020 Stage and Flow Data

Flood Event Year	Flow at Hwy 80 Gage (CFS)	Elevation at Hwy 80 Gage (Feet, NAVD 88)
1983	79,500	272.9
2020	77,300	270.0

2.1.4.2 Ross Barnett Release Discrepancy

Along with the channel efficiency adjustments, the Ross Barnett Reservoir releases were underestimated prior to 1999. It is noted in the 1999 Downstream Impact and Reservoir Regulation Flood Control and Development Plan for the Jackson Metropolitan Area (1999) that "part of the problem may be in the way the reservoir calculated discharge at its gate…Also study of the gate construction plans indicates that the cables which elevate the gates, produce lift in excess of the amount calculated. Based on analysis, the reservoir is understating discharges during major floods (such as the 1979 flood) by about 10%." Table 2-3 indicates that at the maximum pool of 300 feet MSL (1979 was at elevation 299.9) flows could have been miscalculated by as much as 15,000

cfs.
This revises the original 1979 Ross Barnett Discharge from 124,500 CFS to 137,000 CFS, and the 1983 peak discharge from 78,000 to 85,000. The Ross Barnett Reservoir operators updated their reporting method in at some point between the 1983 flood event and the 1999 report described in the section, and; therefore, all recent peaks are considered valid.

Table 2-3: Rating Adjustments at the Ross Barnett Reservoir

Water @ 300' MSL Gate Elevation	Calculated Flow Rate	Reported Flow Rate	Discrepancy
288	125,500	112,000	13,500
289	135,000	121,000	14,000
290	144,000	131,400	12,600
291	154,000	139,000	15,000
292	163,500	149,000	14,500

2.2 Relevant Resources

This section contains a description of relevant resources that exist within the Study Area. The relevant resources described are those recognized: by laws, executive orders, regulations, and other standards of national, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public. Relevance based on institutional recognition means that the importance of an environmental resource is acknowledged in the laws, adopted plans, and other policy statements of public agencies, federally recognized Tribes, and private groups. Relevance based on public recognition means that some segment of the general public recognizes the importance of an environmental resource. Relevance based on technical recognition means that the importance of an environmental resource is based on scientific or technical knowledge or judgment of critical resource characteristics. See Appendix K: *Environmental*, for a summary of the institutional, technical, and public importance of these resources.

Prior drafts of this report (draft EIS) included an Environmental Justice assessment which was consistent with the requirements of NEPA (PL 91-190), Section 122 of the River and Harbor Act of 1970 (PL 91-611) and other essential considerations of national policy including Executive Order 12898 and the more recent Executive Orders (EOs) signed by President Biden, EOs 13985, 14008 and 14096. All three of the Executive Orders directed Federal agencies to identify and address adverse, disproportionate impacts to communities with Environmental Justice (EJ) concerns and to engage with the community in those efforts. Environmental Justice considerations have been removed from the current RDEIS in accordance with President Trump's EO 14173, titled "Ending Illegal Discrimination and Restoring Merit-Based Opportunity", EO 14148, titled "Initial Rescissions of Harmful Executive Orders and Actions", and EO 14151, titled "Ending Radical and Wasteful Government DEI Programs and Preferencing".

2.2.1 Wetland Resources

The Project Area is located within the Pearl River Basin, including parts of both Hinds and Rankin Counties as well as the Jackson Metropolitan Area. The Project Area consists mainly of undeveloped forested land historically influenced by urban development and previous flood control management. It encompasses the Pearl River channel and its tributaries as well as adjacent riparian, wetland, and interspersed upland habitats.

Wetland habitats identified within the area include forested wetlands such as cypress/tupelo sloughs and bottomland hardwoods (BLH), scrub-shrub wetlands, emergent wetlands, open water, and wetland drains. The information below is summarized from more detailed habitat descriptions included in the 2020 US Fish and Wildlife Service Coordination Act Report, the 2014 Habitat Evaluation Procedures (HEP) Report, and the Wetlands Determination and Delineation Report included as Appendix D of the NFIR DEIS.

The majority of wetland habitat in the Project Area consists of mixed hardwood and pine forest. This habitat type is directly associated with the Pearl River and tributaries or depressions where acorns and other mast settle after flood waters recede. These forested wetlands contribute to water control and purification, groundwater recharge, soil enrichment, and erosion control. Typical vegetation includes hardwoods such as sweetgum, various oaks, red maple, and tupelo gum as well bald cypress and loblolly pine in the over-story; maple, box elder, water oak, hornbeam, and green ash in the mid-story; and privet, switch cane, palmetto, and holly in the understory. These forested wetlands are important wildlife habitat.

Cypress/tupelo sloughs are also interspersed throughout the Project Area in locations associated with old river meanders that experience permanent to semi-permanent inundation. These sloughs function to facilitate hydrology within the area, to support stabilization of the hydro-period, and to provide nutrient cycling and wildlife habitat.

Scrub-shrub and emergent wetlands are also found within the Project Area where conditions support these habitat types. Scrub-shrub wetlands in the Project Area are either naturally regenerating cutover or found within floodway management areas and are important for flood relief. Typical vegetation for this habitat type includes sweetgum, American elm, willow elk, box elder, button bush, red maple, privet, and various briars and grasses. These areas typically experience inundation and saturated soils. Emergent wetlands are found in areas that have been actively cleared (e.g., for transmission line rights-of-way or for flood relief management) and experience seasonal flooding. Typical vegetation in this habitat type includes rushes and sedges as well as other species such as smartweed and lizard’s tail.

Other wetland habitats found in the Project Area include open water and wetland drains. Open water areas are typically associated with man-made impoundments or ponds. This habitat type functions to assist in flood storage capacity. Wetland drains are depressional features vegetated with species typical of emergent and scrub-shrub wetlands in the area. They facilitate hydrology and drainage by directing stormwater and flood water into connected sloughs and streams.

The Mississippi Department of Transportation (MDOT) has a mitigation bank adjacent to the project area. The MDOT Pearl River Basin (PRB) Mitigation Bank (the Fannye Cook Natural Area) contains highly functional riverine wetlands.

2.2.2 Forested Uplands

Upland forests are known to occur throughout the Project Area. The predominant tree species found within the upland forest habitats generally contain pine timber stands, as well as mixed pine and hardwood stands. Mixed pine and hardwood forests provide excellent food and shelter for a variety of game and nongame species. Pine forests are the chief habitat for some birds such as the pine warbler, brown-headed nuthatch, and Bachman's warbler.

Forested uplands are currently impacted by conversion of land uses, development activities such as construction of roads, pipelines, and utilities, invasive and exotic species, fire suppression, physical damage from timber harvesting, and contamination by chemicals (herbicides, fertilizers).

2.2.3 Aquatic and Fisheries Resources and Water Bottoms

The Study Area is located within the Pearl River watershed, containing the Pearl River, Ross Barnett Reservoir, numerous tributaries, and several other smaller lakes such as Mayes and Crystal Lake. The identified Study Area provides a variety of riverine, lacustrine, palustrine and wetland habitats for aquatic resources.

The Pearl River is a meandering river with many established point bars. While sand bars are present, they are often mixed with finer sediments such as clay and mud. The main channel consists of mostly fine to medium sands. Instream structure is moderate along the banks in the form of trees, bushes, and fallen logs. The Ross Barnett Reservoir inhibits flow. Additionally, sediment load is restricted by the Ross Barnett Reservoir weir. The Pearl River at the Jackson gauge has an average flow of around 5000 cfs and a mean depth of 5.4 ft.

The Pearl River system supports a variety of freshwater fish species. There are 124 species of freshwater fishes known to occur within the system. The fish assemblage is dominated by minnows (27 species), darters (22 species), suckers and sunfish (14 species each) (Killgore et al., 2006). The Ross Barnett Reservoir, Pearl River, related tributaries, and lakes are utilized for recreational fishing opportunities by the local population. Common exploitable fish species are found within the Study Area are Largemouth Bass, White Bass, Bluegill, Redear Sunfish, White Crappie, Black Crappie, Channel Catfish, and Blue Catfish. Additionally, there is a known mussel bed north of the low head dam near LeFleur Bluff State Park that is inhabited by almost 20 different mussel species including several rare species (Weiland 2000).

2.2.4 Wildlife

Though the Project Area is located within the Jackson metropolitan area and habitat quality has been somewhat reduced by urban development and management associated with previously completed flood control projects, the floodplain areas along the river continue to support game and non-game wildlife. The larger Pearl River Basin supports a high diversity of varied wildlife

species, and most common species are found in the Project Area. For example, the forested floodplain provides low to high quality habitat mammals, ducks, and migratory waterfowl, and neotropical migratory birds.

Mammal species found in the Project Area include white-tailed deer, swamp and cottontail rabbits, fox squirrels, coyotes, armadillos, bobcats, nutria, beavers, skunks, opossums, deer mice, raccoons, minks, nutria, muskrats, and cotton rats. A recent phenomenon in the Project Area is the introduction of feral (wild) hogs, considered an invasive species. Feral hogs have been recently observed within the more southern portions of the Project Area, and it can be assumed that they would continue to migrate and spread throughout the Project Area.

The mix of various floodplain habitats in the Project Area supports a wide variety of birds including common species such as blue birds, blue jays, and American robins along with other songbird species such as brown thrashers, Eastern Meadowlarks, and indigo buntings. Wetland habitats in the Project Area support species such as herons, egrets, ibises, rails, cormorants, pelicans, stilts, sandpipers, gulls, terns, and barred owls. The area also occasionally hosts populations of eastern wild turkey, which is an important game bird in the state.

In addition, the Pearl River channel along with associated tributaries, lakes, and sloughs in the Project Area support significant populations of migratory waterfowl on a seasonal basis, including wood ducks and mallards, as well as other migratory species such as mourning doves. The river watershed also supports populations of many species of freshwater fish and shellfish, common reptiles including turtles and snakes, and common amphibian species.

2.2.5 Threatened, Endangered, and Protected Species

Through consultation with the service as well as a search on the U.S. Fish and Wildlife Service (Service) Information for Planning and Consulting (IPaC) site, conducted on March 21, 2023, resulted in a list of species that should be considered when assessing the impacts of this project. That list includes the Gulf sturgeon, ringed sawback (ringed map) turtle, Northern long-eared bat, Pearl River map turtle, alligator snapping turtle, and monarch butterfly. Email correspondence with the Service dated March 21, 2023, confirmed this list, and concluded that the monarch butterfly, as a candidate species, has no legal regulations under the Endangered Species Act. However, on April 21, 2023, email correspondence with The Service stated that they had been informed to expect a listing decision on the monarch butterfly in the near future. Therefore, USACE has decided to include the monarch butterfly in this analysis. On April 10, 2023, the Service informed USACE via email (attached) that the Louisiana pigtoe and the tricolored bat had been recently proposed for listing. Therefore, those two species would also be assessed.

Gulf sturgeon (*Acipenser oxyrhynchus desotoi*) (Threatened)

The Gulf sturgeon (GS) is an anadromous fish (ascending rivers from the sea for breeding) that have historically inhabited coastal rivers from the Mississippi in Louisiana to the Tampa Bay in Florida. The GS is one of two geographically dispersed subspecies of the Atlantic Sturgeon (*Acipenser oxyrhynchus*). The GS is characterized by a sub-cylindrical body that is imbedded with

bony plates or "scutes." The snout of the fish is greatly extended and bladelike and includes four fleshy barbells in front of the mouth. They generally range in size from 6 to 8 feet in length and are typically light brown to dark brown in color. They benthic feeders – they feed on organisms located in or on the bottom, such as crabs, grass shrimp, lancets, brachiopods, and marine worms. Recent studies for the GS have not been conducted in this reach of the Pearl River and survey data from this area is not prevalent. However, in 2021, a GS was detected above the waterworks sill in LeFleur's Bluff State Park and in 2022 the same sturgeon was detected closer to the spillway of Ross Barnet (Michael J. Andres, Ph.D., personal communication January 12, 2023). There are also unconfirmed sightings of GS as far upstream as the City of Jackson, Mississippi, in Hinds County (Morrow et. al. 1996; Lorio 2000; Slack, pers. comm. 2002). There have been 24 GS captured by commercial fishermen, eight of which being captured within the action area and the most recent of those captures occurring in 2008.

GS have been historically and are currently being impacted by incidental catch in other fisheries, habitat losses associated with the construction of water control structures including dams and sills, and declining water quality. Dam construction in several of the rivers has severely restricted the sturgeon's access to historic migration routes and spawning areas.

On March 19, 2003, The Service and NMFS published the Final Rule in the Federal Register designating critical habitat for the GS. Based upon the identified physical and biological features (PBFs) for the GS, The Service and NMFS identified a total of fourteen (14) Critical Habitat Units. Critical Habitat Unit 1 covers the proposed Project Area and includes the Pearl River System in St. Tammany and Washington Parishes in Louisiana and Walthall, Hancock, Pearl River, Marion, Lawrence, Simpson, Copiah, Hinds, Rankin, and Pike Counties in Mississippi. Of the 7 PBFs identified for Gulf sturgeon critical habitat, riverine spawning sites and riverine aggregation (resting) areas are not present in the action area.

The PBFs found in the Action Area are food, flow regime, water quality, sediment quality, and migratory pathways.

Ringed Sawback (ringed map) Turtle *(Graptemys oculifera)* (Threatened)

The Ringed Sawback (map) Turtle is a small (7.5 to 22 cm) narrow-headed turtle with laterally compressed, black, spine-like vertebral projections and a slightly serrated posterior carapacial margin. The carapace is dark olive-green and each pleural has a broad yellow or orange circular mark. The ringed map turtle is a wholly carnivorous species, with insects and mollusks constituting their principal diet. In addition, they are also thought to be opportunistic in their feeding habits with fish and carrion as occasional food sources. The ringed map turtle's habitat is typically riverine with a moderate current and numerous basking structures. This species has also been observed in oxbow lakes that are connected or disconnected from the main river system.

Populations are known to occur within the Pearl River system from the Neshoba County, Mississippi headwaters area, southward downstream through St. Tammany Parish, Louisiana. The ringed map turtle populations are restricted primarily to the main channel of the Pearl River and the lower portions of its largest tributary, the Bogue Chitto River. To date, the highest densities of

turtles have been documented in two survey areas, above the Ross Barnett Reservoir and below the Ross Barnett Reservoir dam southward to approximately MS Highway 25, upstream of the proposed Project Area. Ringed map turtles are found throughout all reaches of the Pearl River.

Decline in populations of the ringed map turtle have been attributed to habitat modifications, primarily associated with dredging and/or other navigational and flood control projects, water quality degradation, over-collecting of the species for the pet trade, recreational activities may also cause habitat destruction, predation of nests, and direct mortality associated with recreational and commercial fishing and boating (USFWS 2019).

Northern Long-Eared Bat (NLEB) (*Myotis septentrionalis*) (Endangered)

NLEB, a wide-ranging bat species, found in 37 states in North America, typically overwinters in caves or mines and spends the remainder of the year in forested habitats. The NLEB individuals are typically approximately 3.0 to 3.7 inches in length with a wingspan of approximately 9.0 to 10.0 inches. The bat is distinguished by its long ears, particularly when compared to the other bats in the same genus, Myotis. The primary diet for the NLEB is insects including moths, flies, leafhoppers, caddisflies, and beetles.

At this point, the Service does not have survey data that would indicate what the migration patterns are for the NLEB. More specifically, little is known whether the available summertime woodland habitat present within the Project Area is being utilized by the NLEB. No existing data is available that would indicate that the NLEB currently utilizes the Project Area during the summer migration. However, the Service has identified what is referred to as the White-Nose Syndrome Buffer Zone that includes all areas within 150 miles of the boundaries of U.S. counties or Canadian districts where the fungus has previously been detected. The established buffer zone includes both Hinds and Rankin Counties within the Project Area.

The NLEB is one of the species of bats that have been most impacted by the spread of the white-nose syndrome (WNS) disease and has experienced significant declines in populations because of the disease's spread. Secondary threats to the NLEB include the disturbance of roosts and hibernation areas, forest management practices, and forest habitat modifications (development, wind power development).

Pearl River Map Turtle (PRMT) *(Graptemys pearlensis)* (Threatened)

The PRMT is a moderate-sized highly aquatic turtle found in the Pearl River drainage area of Louisiana and Mississippi. It exhibits a high-domed shell with a median keel, featuring salient spines on the rear portions of the anterior vertebral scutes. The PRMT is a wholly carnivorous species, with insects and mollusks constituting their principal diet. In addition, they are also thought to be opportunistic in their feeding habits with fish and carrion as occasional food sources. The PRMT is endemic to the Pearl River drainage in Mississippi and Louisiana. Rankin and Hinds Counties are included in the Counties with known records for the species in the State of Mississippi. PRMTs can be found within the Project Area despite the lack of a well-defined riparian buffer, lack of preferred habitat, sedimentation accumulation, relatively low stream velocities, lack of

basking habitat, and a smaller percentage of sandbars. It has been shown in studies that population densities for the species are higher above and below the Project Area.

Climate change, poor water quality, habitat degradation, invasive species, collection, dredging and channelization, impoundment of rivers, and disease all influence the persistence of the Pearl River map turtle.

Alligator Snapping Turtle (AST) *(macrochelys temminckii)* (Proposed Threatened)

The AST is the largest freshwater species of turtle in North America and is among the most aquatic. ASTs are characterized as having a large head, long tail, and an upper jaw with a hooked beak. They have three keels with posterior elevations on the scutes of the carapace, which is dark brown and often found with algae growth adding to the overall camouflage of the turtle. ASTs are hunters and scavengers that feed on fish, mollusks, and other turtles as well as frogs, snakes, snails, small mammals, insects, and aquatic plants.

The AST is found within river systems that flow into the Gulf of America, extending from right before the Suwannee River in Florida to the San Antonio River in Texas. Currently, the species is known to occur in Alabama, Arkansas, Florida, Georgia, Illinois, Kentucky, Louisiana, Missouri, Mississippi, Oklahoma, Tennessee, and Texas. ASTs are usually associated with the deeper waters of large rivers, major tributaries, bayous, canals, swamps, lakes, ponds, and oxbows. Hatchlings and juveniles, in comparison, are usually associated with shallower waters. In general, the species uses shallower water in early summer and deeper depths in late summer and mid-winter, which may be a thermoregulatory shift (Fitzgerald and Nelson 2011).

The Service divides the AST range into seven analysis units. The analysis unit focused on in relation to the Project Area is the Alabama unit which encompasses eastern Mississippi, western Alabama, and small parts of Louisiana and Florida. The Pearl River is listed under the Alabama unit as a water body that currently or historically supported ASTs.

Adult harvest (legal and illegal), incidental catch in other fisheries, habitat alteration due to activities such as dams, dredging, deadhead logging, removal of riparian cover, channelization, stream bank erosion, siltation, and land use adjacent to rivers, nest predation, climate change, and disease influence the existence of the alligator snapping turtle.

Louisiana Pigtoe (LA pigtoe)*(pleurobema riddellii)* (Proposed Threatened)

The LA pigtoe is a medium-sized freshwater mussel (shell lengths to greater than 62 mm) with a brown to black, triangular to subquadrate shell without external sculpturing, sometimes with greenish rays. They occur in gravel and coarse sandy substrates of rivers and streams. Mussels are filter feeders that rely on natural, high quality (pollutant free) flowing water of sufficient volume to support their life cycle, and that of their host fishes, which are essential for reproduction.

The range of the LA pigtoe extends into portions of east Oklahoma, southeast Arkansas, south Louisiana, and west Mississippi. LA pigtoe currently occupies areas across seven major river

basins (San Jacinto, Neches, Sabine, Big Cypress-Sulphur, Red, Calcasieu- Mermentau, and Pearl). Johnson et al. (2023) genetically confirmed the presence of the Louisiana pigtoe in the Pearl River with the range of the species reaching from the East Pearl River and West Pearl River in the south to the Spillway of Ross Barnett Reservoir in the north.

Degraded water quality, altered hydrology, substrate changes, habitat fragmentation, direct mortality, invasive species, and climate change all influence the existence of the LA pigtoe.

Tricolored Bat (TCB) (*perimyotis subflavus*) (Proposed Endangered)

TCB is one of the smallest bats in eastern North America and is distinguished by its unique tricolored fur that appears dark at the base, lighter in the middle, and dark at the tip (Barbour and Davis 1969, p. 115). TCB primarily roost in foliage of live and dead trees in the spring, summer, and fall, and hibernate in caves and other subterranean habitats during the winter. TCB are opportunistic feeders feeding on small insects such as moths, beetles, flies, wasps, and flying ants. TCB are known to occur in 39 states, one of which is Mississippi, Washington D.C., 4 Canadian Provinces, Guatemala, Honduras, Belize, Nicaragua, and Mexico.

The TCB has been impacted by the spread of the WNS disease and has experienced significant declines in populations because of the disease's spread. Other threats to the TCB include wind related mortality due to wind power development, climate change, and habitat loss.

Monarch Butterfly (*danaus plexippus)* (Proposed Threatened)

Adult monarch butterflies are large (3 to 4 inches) and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. The black border has a double row of white spots, present on the upper side of the wings. Milkweed and flowering plants are needed for monarch habitat. Adult monarchs feed on the nectar of many flowers during breeding and migration, but they can only lay eggs on milkweed plants.

Migratory individuals in eastern North America predominantly fly south or southwest to mountainous overwintering grounds in central Mexico, and migratory individuals in western North America generally fly shorter distances south and west to overwintering groves along the California coast into northern Baja California (Solensky 2004).

The eastern population of monarchs overwinter in Mexico, where this microclimate is provided by forests primarily composed of oyamel fir trees (Abies religiosa). Migratory monarchs in the western population primarily overwinter in groves along the coast of California and Baja California which include blue gum eucalyptus (Eucalyptus globulus), Monterey pine (Pinus radiata), and Monterey cypress (*Hesperocyparis macrocarpa*) (Griffiths and Villablanca 2015). Monarch butterflies are found throughout North America and are highly likely to utilize portions of the Project Area.

Loss and degradation of habitat from conversion of grasslands to agriculture, widespread use of herbicides, logging/thinning at overwintering sites in Mexico, senescence, and incompatible

management of overwintering sites in California, urban development, drought, exposure to insecticides, drought, and effects of climate change are all factors in the decline of the monarch population.

2.2.6 Other Protected Species

Other protected species, specifically bald eagles, and migratory birds, have potential to be present in the Study Area. Bald eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA). Currently, 1,093 species of birds are protected under the MBTA.
The bald eagle was near extinction approximately forty years ago throughout most of its range. Habitat destruction and degradation, illegal shooting, and the contamination of its food source, largely as a consequence of DDT, decimated the eagle population. However, the banning of DDT, habitat protection, and conservation features through the ESA, have afforded a remarkable recovery for the species. The bald eagle was removed from the endangered species list in 2007 but continues to be protected under the BGEPA and the MBTA.

Many of the 1,093 species of birds protected under the Migratory Bird Treaty Act are experiencing population declines due to increased threats across the landscape. Millions of acres of bird habitat is lost or degraded every year due to development, agriculture, and forestry practices. In addition, millions of birds are directly killed by human-caused sources such as collisions with man-made structures such as windows and communication towers.

Bald eagles' nest in tall trees (usually cypress or pine in this area) near water and typically in the months of October through May. Migratory birds have varying nesting behaviors and seasons depending on the species. Conservatively, the nesting season for migratory birds is February 15 through September 15. Wading/water birds typically nest in trees or shrubs near water. Shorebirds typically nest on ground level in sand, small rocks, dunes, or ground vegetation. Many migratory birds (other than wading/water birds and shorebirds) are opportunistic nesters and would nest in trees, shrubs, building overhangs, house gutters, etc.

2.2.7 Soils and Prime and Unique Farmlands

Information obtained from the Soil Survey of Hinds County, Mississippi and the Soil Survey of Rankin County, Mississippi indicates that the three primary soil association units (General Soil Map Units) underlying the proposed Project Area consists of the Cascilla-Arkabutla and Tippo-Leverett-Guyton soil associations in Rankin County and the Cascilla-Bonn-Deerford soil association in Hinds County.

The Cascilla-Arkabutla soil association in Rankin County consists of the well-drained Cascilla soils that formed in silty alluviums near the low scarps and on the slightly higher elevations on natural levees of flood plains along the Pearl River. The Arkabutla soils are somewhat poorly drained and formed in broad flats and in small depressions along the Pearl River. The Tippo-Leverett-Guyton soil association is also found in the Rankin County area. The Tippo soils consist of somewhat poorly drained, nearly level soils that formed in silty alluvium and are typically found

on low stream terraces and flood plains along the Pearl River. Leverett soils are deep, well-drained soils that formed in silty alluvium and are found on low stream terraces along the Pearl River as well. The Guyton soils consist of deep, poorly drained, nearly level soils that formed in silty alluvium. These soils are typically found on low stream terraces and flood plains along the Pearl River as well.

The Cascilla-Bonn-Deerford soil association is found within the Hinds County portion of the Project Area. These soils are frequently flooded and found in the flood plains of the Pearl River. Bonn soils are typically found in broad, level areas and in depressions. The Deerford soils are generally found in the slightly higher areas of the broad flats.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables. It has the special combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the soil to economically produce sustainable high yields of these crops when properly managed. Approximately 250 acres or 9.8 percent of the land within the Project Area is currently in agricultural use. An additional 384 acres or 15.0 percent are classified as hay fields (National Land Cover Database). This is the only readily available data that depicts actual acreages within the project boundary. Prime and unique farmland are located within the Study Area but not specifically within the Project Area. Soils found in agricultural areas include: Tippo silt loam (prime farmland if protected from flooding) and Tippo Urban land (not prime farmland) complex. Coordination with the Mississippi State Office of the Natural Resources Conservation Service regarding prime farmland was completed on 17 June 2023.

The Project Area denoted by the light blue oval in Figure 2-12 represents approximately 79,400 acres. Farmland classification identifies prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978 (NRCS, 2023; Appendix C: Agency Coordination).

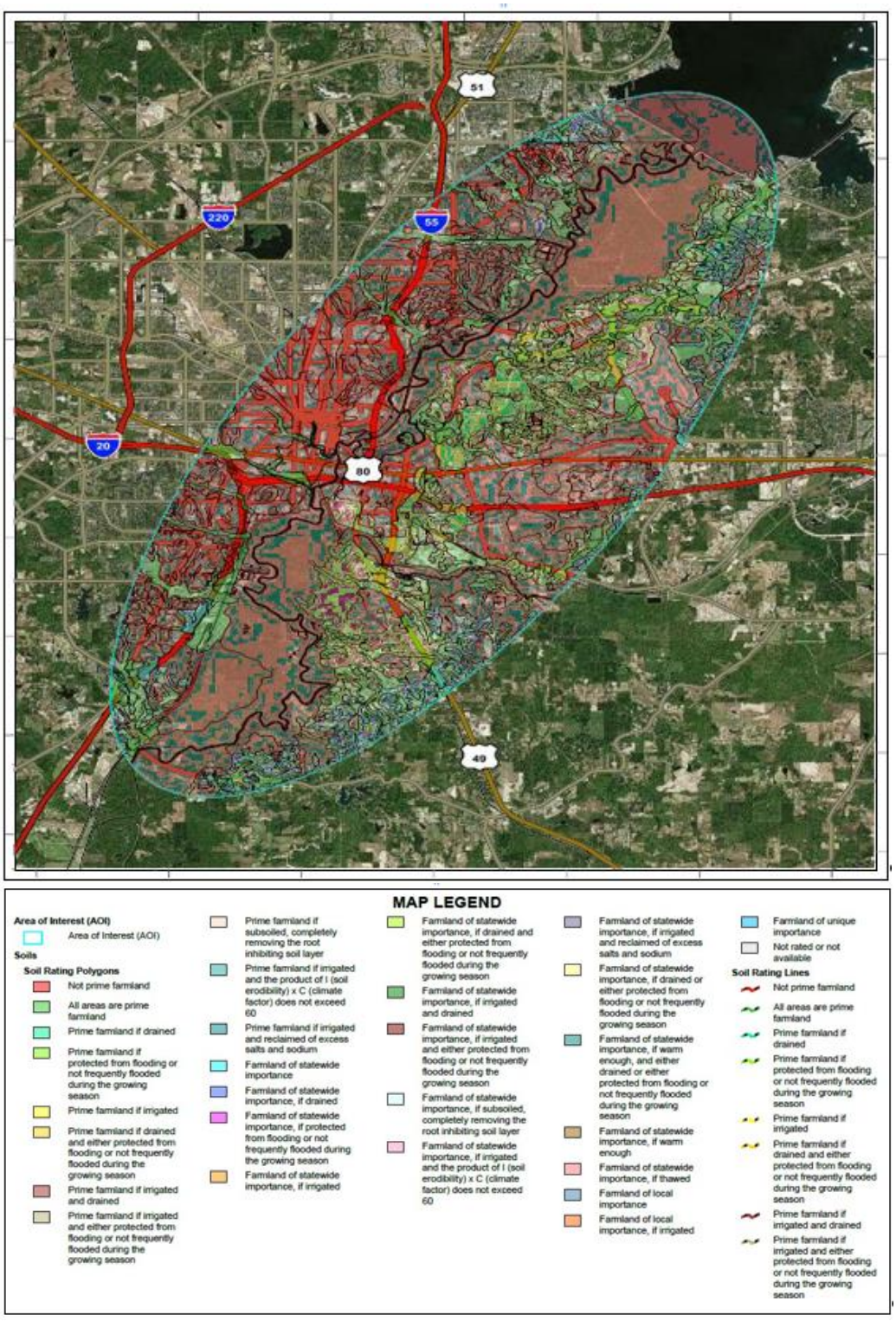

Figure 2-12: Prime and unique farmland classification in the Study Area. (Source: NRCS, web soil survey National Cooperative Soil Survey)

2.2.8 Water Quality

Anthropogenic and human activities occurring in various land uses throughout the Pearl River watershed can potentially affect water quality. Each land use can either improve or deteriorate water quality, depending on the management practices taking place. The primary land use in the Middle pearl watershed is forestland, which is important for clean surface water because it can absorb rainfall to slow runoff, maintain water temperature, refill underground aquifers, and provide habitats for fish and wildlife (MDEQ 2000). Wetlands make up another major land use in the watershed that also serve to improve water quality by absorbing and filtering sediments and other contaminants. Pasturelands have cattle production and poultry litter application, while agricultural lands have fertilizer and pesticide applications as well as tillage operations (MDEQ 2000). These practices can be a threat to water quality, especially if they are not managed appropriately. Developing urban areas can also deteriorate water quality by allowing contaminated stormwater runoff to be easily transported to nearby streams.

Section 305(b) of the CWA requires each State to monitor and report on surface and groundwater quality, which the EPA synthesizes into a report to Congress. The MDEQ produces a Section 305(b) Water Quality Report every two years that provides a status report on the quality of Mississippi's surface water, and the methodology of data collection for surface water. It also identifies impaired water bodies. Most recently, the MDEQ released the Mississippi 2024 Statewide 303 (d) and 305(b) Water Quality Report.

Section 303(d) of the CWA requires states to identify waterbodies that are impaired or in danger of becoming impaired due to exceedances of Federally approved water quality standards. The State of Mississippi and the EPA have established surface water quality standards to assess ambient water quality conditions and to establish a priority ranking for such waters (Miss. Code Ann. §§ 49-2-1, et seq. and 49-17-1, et seq.). The MDEQ divides waterbodies into classifications for water quality assessment purposes. Four designated uses were established for surface waters in Mississippi: Fish & Wildlife, Public Water Supply, Recreation, Shellfish Harvesting, Ephemeral. After the water body is labeled within the four designated areas, the waterbody is placed into five assessment categories with a possibility of 4 sub categories: Category 1- Attaining all uses, Category 2- Attaining some uses but insufficient information for assessment of other uses, Category 3- Insufficient information to assess any use, Category 4- Not attaining a use but a TMDL is not necessary, 4A, 4B, 4C, Category 5- Not attaining a use and a TMDL is needed., 5R.

Water quality criteria are elements of State water quality standards that represent the quality of water that would support a particular designated use. These criteria are expressed as constituent concentrations, levels, or narrative statements. If a waterbody does not meet the water quality criteria appropriate for its designated use, then it is designated as "impaired" with respect to those constituents for which criteria are not met. The development of a total maximum daily load (TMDL) is most often the next step in the process. A TMDL is a determination of the maximum amount of a given pollutant that a waterbody can receive and not exceed the water quality standards for its designated use.

Within Mississippi, there are nine drainage basins that MDEQ categorized: Big Black River, Coastal Streams, North Independent Streams, Pascagoula River, Pearl River, South Independent Streams including the Lower Mississippi River, Tennessee River, Tombigbee River, and Yazoo River including Upper Mississippi River. The Study Area focuses on the Pearl River drainage basin and is labeled as one 4-digit Hydrologic Unit: Pearl-0318.

According to MDEQ, the pearl river basin is located within portions of Mississippi and Louisiana and is located East of the Mississippi River. This basin drains roughly 8,000 square miles from thirteen counties within Mississippi. The basin can be broken into two 8- digit Hydrologic Units; Upper Pearl-03180001 and Middle Pearl Strong- 03180002.

The Study Area consists of three counties within Mississippi: Madison County, Hinds County and Rankin County. Within these counties, there are four 12-digit Hydrologic Units; Hog Creek-Pearl River Watershed-031800020603, Town Creek-Pearl River Watershed - 031800020604, Neely Creek-Conway Slough Watershed -031800020605, and Lynch Creek- Pearl River Watershed - 031800020606.

The Mississippi 2024 Statewide 305 (b) Water Quality Report, MDEQ outlines one watershed that is within the Study Area that is found in the Mississippi 2024 §305(b) Water Quality Assessment Report: Lynch Creek 509311. The Lynch Creek sample site is located within the Jackson City limits. Within the Mississippi 2024 Section 303(d) List of Impaired Water Bodies, MDEQ outlines one watershed that are within the Study Area that is found within the Impaired Waters Listing: Lynch Creek 509311. The watershed (Figure 2-13) was found to be impaired for aquatic life use support and contain a biological impairment. The Lynch Creek sample site is located within the Jackson City limits. The water bodies in the planning area support a variety of the designated uses. Figure 2-14 depicts the classifications of streams and waterbodies within the Pearl River Drainage Basin.

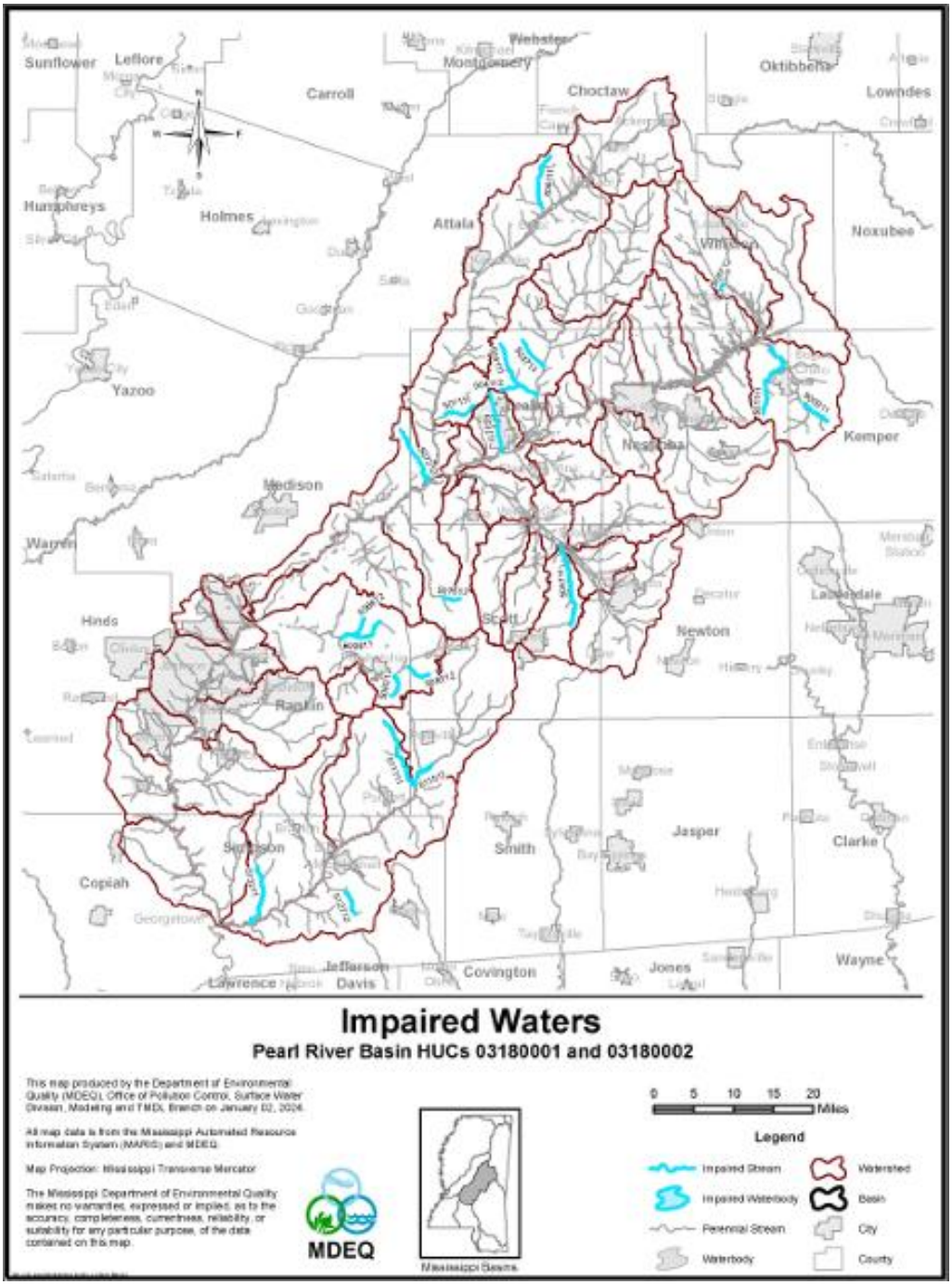

Figure 2-13: Impaired Waters within the Pearl River Basin, Mississippi

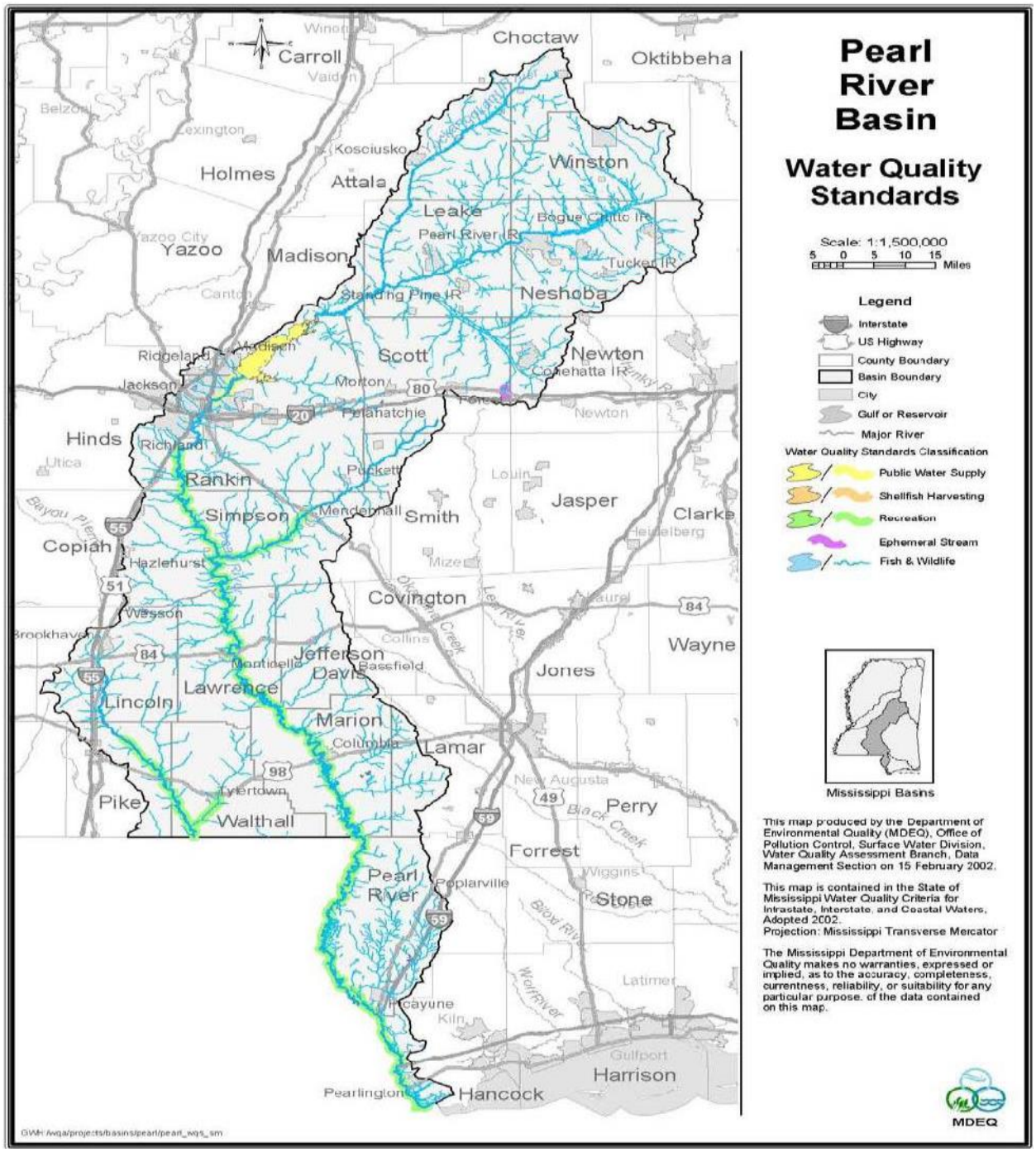

Figure 2-14: Water Quality Standards for the Pearl River Basin, Mississippi

2.2.9 Water Supply

The Jackson Metropolitan Area (MSA) receives potable water from various sources. A listing of current water sources is listed below (Table 2-4). There are two plants within the Jackson MSA receiving water from the Pearl River, the O.B. Curtis and J.H. Fewell (Figure 2-15).

Table 2-4: Water Supply Sources

Jackson's drinking water comes from the Ross Barnett Reservoir and the Pearl River. The water is treated and provided to residents in Jackson through two facilities, O. B. Curtis, and J. H. Fewell Water Treatment Plants.
The city of Madison's water sources come from four locations treated at local wells and distributed to residents. Bear Creek Water Association, Inc. also serves the south region of Madison County
The city of Brandon has 10 water wells from groundwater sources called the Sparta and Cockfield formation aquifers.
Ridgeland's water source is two deep-water supply wells in the Cockfield Aquifer and four deep-water supply wells in the Sparta Aquifer.
The water sources in Flowood come from two wells, the Cockfield Formation and Sparta Sand Aquifer.
The City of Clinton's water supply comes from two groundwater sources, the Sparta and Cockfield aquifers. The water is pumped from 10 deep wells, six pulling from the Sparta and four from the Cockfield aquifer.
Byram buys its water from the city of Jackson from Jackson's O.B. Curtis Water Plant. Byram also has six wells that pump additional water to residents
Canton obtains its water supply from wells in the Sparta Aquifer, as well as the Bear Creek Water Association, Inc, via a system of wells. (BCWA)
Flora receives water from three well pumps purified through an aquifer.

Source: Clarion Ledger. Where do Jackson and Surrounding Cities get Their Water.

Drinking water at the City of Jackson, Mississippi's O. B. Curtis Water Treatment Plant is processed from two separate treatment systems, a conventional system built in 1993, and a membrane system built in 2007. This plant is indicated by a green outline, just south of the Ross Barnett Reservoir (Figure 2-16), from which it draws water. Each system was designed to provide 25 million gallons of water per day for a total of 50 million gallons of water to the city of Jackson. (City of Jackson, 2022, FTN Assoc, 2011, MEMA 2022)

Water is also taken from the Pearl River near the LeFleur's Bluff State Park at the J.H. Fewell Plant, which is indicated as a green outline toward the center of the above image. Built in 1914, the system was designed to provide a total of 20 million gallons per day. (City of Jackson, 2022, MEMA 2022)

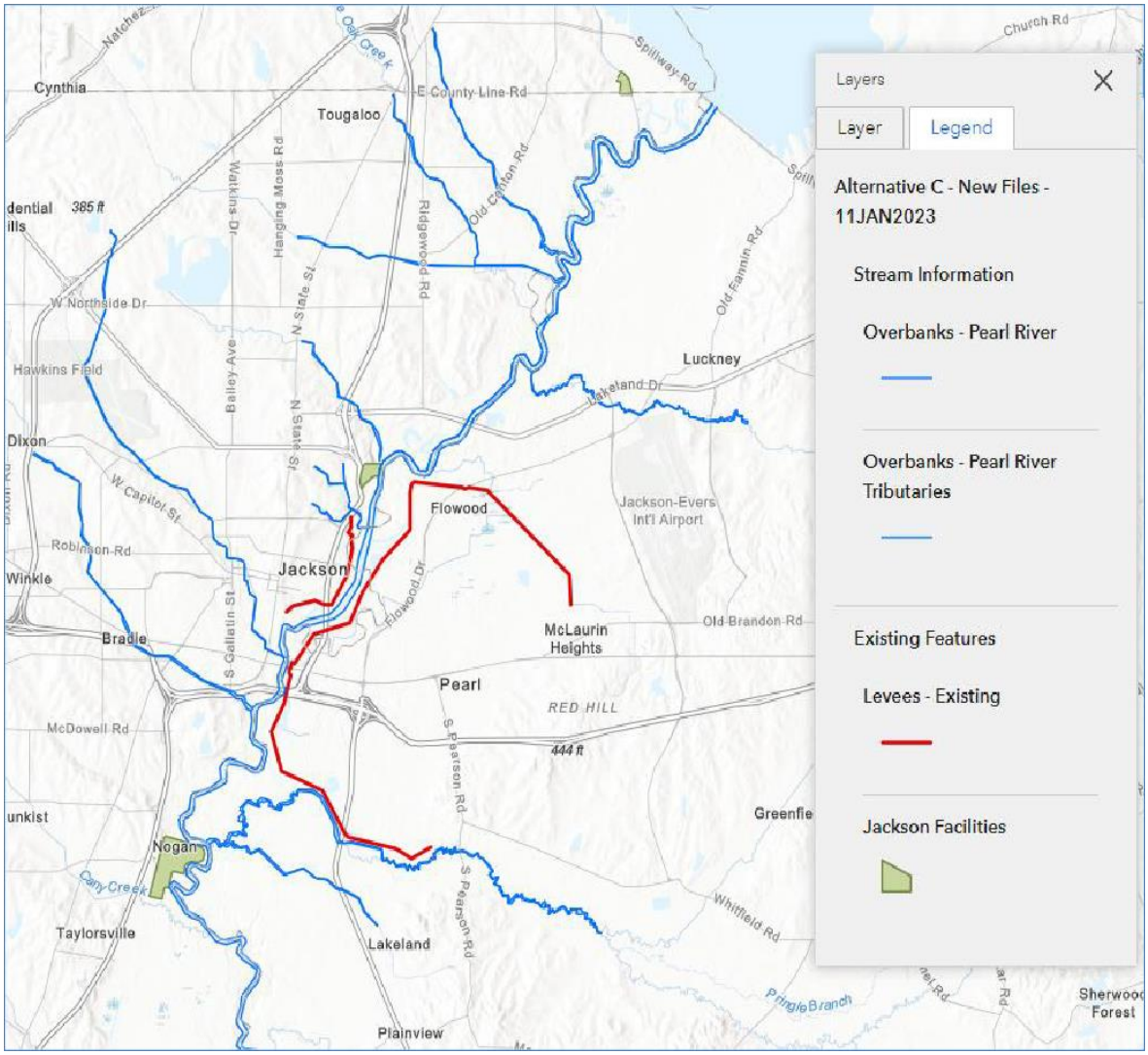

Figure 2-15: Water Treatment Locations along the Pearl River downstream of the Ross Barnett Reservoir. (Source: USACE Project Dashboard 2022)

Following a February 2020 inspection, the EPA declared that conditions within the city's drinking water system were in violation of standards, according to an emergency administrative order issued that month by the agency. Among its requirements, the order mandated that the city make numerous repairs or replacements at drinking water facilities and address disinfection and pH control. (EPA, 2022). Work is currently ongoing for this effort. The city of Jackson experienced below freezing temperatures in a winter storm that began on February 14, 2021. Frozen pipes in the distribution system created a system failure that left some Jackson residents without water for weeks. (Landers, 2022).

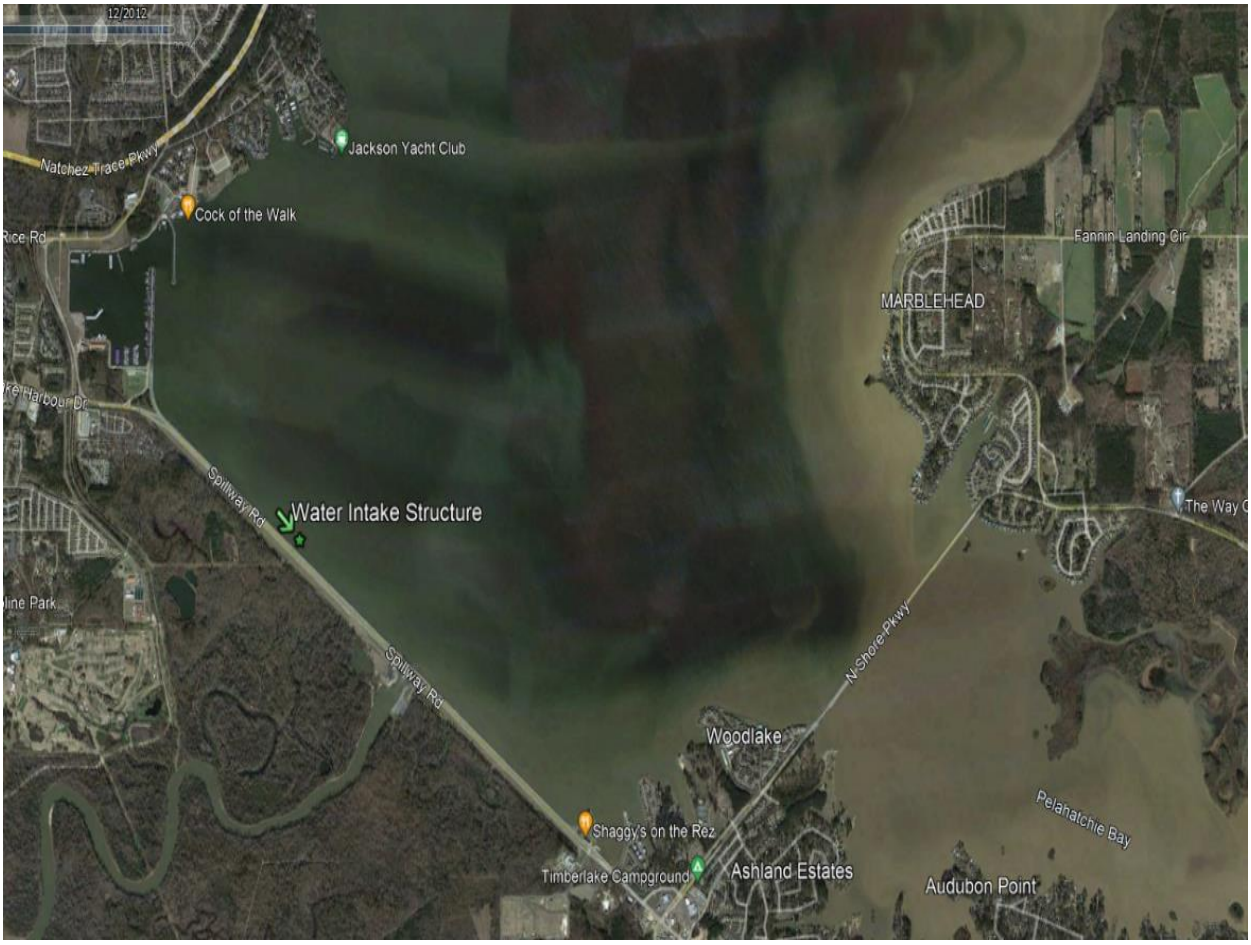

Figure 2-16: Ross Barnett Reservoir near the O.B. Curtis Plant Intake, Feb 2020 (Source: Google Earth Areal Imagery. Dec. 2012)

The City of Jackson Surface Water System was impacted by recent flooding in August 2022. A previous boil-water advisory was still in effect on August 29, 2022, due to prior incidents when floodwaters on the Pearl River in the Ross Barnett Reservoir altered the chemistry of the incoming water to be treated at the Curtis facility, interrupting operations. Additional sediment, likely similar to the sediment plume shown in the image from February 2020, in combination to the critical staffing limitation, was the significant cause of this failure. Failed pumps at the facility contributed to the conditions that caused pressures to drop within the distribution system. Both the O.B. Curtis and J.H. Fewell water treatment plants had reduced water output that created pressure problems in the system. The City lacked sufficient pressures in some areas of the City to sustain adequate access to flush toilets and maintain optimal disinfection for drinking water. Both O.B. Curtis and J.H. Fewell water treatment plants lacked sufficient Class A Operators and maintenance staff. The boil water notices were lifted on September 16, 2022. (Landers, 2022; MEMA 2022)

"Returning Jackson's drinking water system to a state of good repair would require overcoming a host of challenges, many of which have been in play for decades. At the root of the problem, Jackson's drinking water issues are the result of "decades of disinvestment in the city's water

infrastructure," says Erik Olson, the senior strategic director for health and food at the Natural Resources Defense Council. (Landers, 2022) Many agencies, state, and local officials worked together to implement a "playbook" to prioritize repairs, and these repairs have now begun to increase efficiency and resilience, as well as to improve staffing shortages using contract labor. (MEMA 2022; City of Jackson, 2022)

2.2.10 Tribal Resources

To augment USACE's background research regarding Tribal rights, lands, and resources, USACE engaged in targeted Government to Government Consultation and subsequent Section 106 NHPA PA meetings and correspondence with the participating federally recognized Tribes (Letter dated June 13, 2023, Appendix C, and Letter dated February 15, 2023, Appendix G). A synopsis of significant Tribal considerations and concerns identified include:

- The Quapaw Nation recommended avoiding archaeological resources to the greatest extent possible.
- The Choctaw Nation of Oklahoma identified additional areas of interest including Trail of Tears removal routes, the Natchez Trace, and areas that have Choctaw place names.
- The Quapaw Nation requested that suitable passage for the eel (*Anguilla rostrata*) be considered with any impoundment feature option to allow migration within the Pearl River and continued use by the Tribe.
- The Choctaw Nation of Oklahoma recommended the avoidance of, or implementation of measures focused on conservation and/or ecological restoration of cultural keystone species. Cultural keystone species can be a plant, animal or other natural resource that has greatly shaped the cultural identity of a group of people. The cultural keystone species identified, include, but are not limited to, rivercane (*Arundinaria gigantea*), switch cane (*Arundinaria tecta*), and other resources including the clay collection areas for clays used to make pottery.
- The Mississippi Band of Choctaw Indians requested consideration for a flood risk management study and measures, under a separate authority, in the vicinity of the community of Edinburgh, Mississippi, which is to the north and outside the Study Area. This is beyond the scope of the current study and study authority but is recommended for future coordination and consideration.

Government-to-Government consultations with federally recognized tribes also focused on the potential to leverage indigenous traditional ecological knowledge (ITEK) and scientific ecological knowledge to develop and implement sustainable practices for long-term successful cultural keystone species conservation and/or restoration and stewardship. Additional consultations with the Mississippi Band of Choctaw Indians and Choctaw Nation of Oklahoma regarding rivercane planting at habitat mitigation sites and as a potential treatment measure to mitigate adverse effects to historic properties, as appropriate. Assistance in these discussions came from the Rivercane Restoration Alliance and the USACE Tribal Nations Technical Center of Expertise, which considered the feasibility of rivercane restoration in the study and recommendations regarding suitable geographic locations for planning (see Appendix G).

Restoration of rivercane has the potential to improve riverine habit, water quality, erosion control, and cultural revitalization, of practices threatened by development and agricultural pressures. Stewardship and conserving a cultural keystone species require a holistic approach; one that accounts for the relationships between places, ecosystems, and cultures. USACE will continue to engage in consultation with tribes during the selection of habitat mitigation sites. Efforts should be directed towards the restoration of rivercane (*Arundinaria gigantea*), switch cane (*Arundinaria tecta*), and/or other cane species of documented cultural significance and appropriateness for propagation within the Pearl River Basin. This consultation may result in stewardship/access agreements between USACE, the Tribes, NFI, FWS, and others, as appropriate (see Appendix G). On June 13, 2023, the following federally recognized tribes were invited to participate in the planning process as Participating Agencies: Alabama-Coushatta Tribe of Texas, Chitimacha Tribe of Louisiana, Choctaw National of Oklahoma, Jena Band of Choctaw Indians, Mississippi Band of Choctaw Indians, Muscogee (Creek) Nation, Quapaw Nation, and Tunica Biloxi Tribe of Louisiana. To date, no Tribes have accepted the invitation to become Participating Agencies (see Appendix A: *Scoping Report*).

2.2.11 Identification of Consulting Parties

The consulting parties identified for this study include the Mississippi State Historic Preservation Officer (SHPO) and the Mississippi Department of Archives and History (MDAH), the non-federal interest: Rankin-Hinds Pearl River Flood Drainage and Control District, the Advisory Council on Historic Preservation (ACHP) and the nine federally recognized tribes. The SHPO identified the City of Jackson as a certified local government. A certified local government is a municipality with a commitment to historic preservation through compliance with requirements established by the SHPO, to include the establishment of qualified historic preservation commission and a maintenance of a system to survey and inventory local historic resources. The City of Jackson and the Mississippi Department of Transportation were also invited to participate in consultation.

The Area of Potential Effect (APE) is defined as the geographic area in which historic properties may be directly or indirectly affected by the undertaking. For this study, the Study Area (Figure 1-1) is also the APE as it encompasses the elements of the alternatives as they are currently known. The APE may be adjusted to incorporate other elements, such as access, staging, and construction areas, once they are known.

The cultural prehistory and history of the east-central and southwest Mississippi is shared with much of the southeast. The generalized Pre-Contact cultural chronology for the region according to Rees (2010:12) is divided into five primary archaeological components, or "periods", as follows: *Paleoindian* (11,500-8000 B.C.), *Archaic* (8000-800 B.C.), *Woodland* (800 B.C. – 1200 A.D.), *Mississippian* (1200-1700 A.D.), and *Historic* (1700 A.D. – present). Regionally, these periods have been further divided into sub-periods based on material culture, settlement patterns, subsistence practices, and sociopolitical organization. Further the APE contains archaeological sites and above-ground resources (e.g. mounds) associated with both the prehistoric period and the historic period of significance correlating to the following MDAH Historic Themes (MDAH

2019): *Traditional Cultural Properties*; *Antebellum Mississippi*; *Civil Rights*; *Depression Era* (including New Deal projects constructed between 1933 to 1939); *Education*; *Historic Indian*; *Industrial/Commercial*; *Landscape/Landscape Features*; *Military*; *Post Reconstruction*; *Pre-World War II Period*; *Reconstruction*; *Technology/Engineering*; *Transportation/Communication*; *Historic Bridges of Mississippi*; and others.

USACE conducted a review of existing documentation in the National Register of Historic Places database, the *MDAH Historic Resources Inventory Database* (MDAH Website), MDAH Site Cards, historic map research, a review of cultural resources survey reports and other pertinent data and identified multiple historic properties within the APE. Approximately 179 archaeological sites have been previously recorded within the APE that collectively span the entire spectrum of Pre-Contact and Post-Contact/historic cultural components generally recognized for the region, encompassing roughly some 10,000 years or more.

Further, the APE contains archaeological sites (Figure 2-17) and above-ground resources associated with both the prehistoric period and the historic period of significance spanning from the early- to mid-nineteenth century up until the mid-twentieth century. It is also important to stress that many known sties in the APE have cultural components encompassing more than one of these cultural/temporal periods, attesting to the long-ranging cultural importance of the region. However, the current distribution of known historic resources in the APE is largely indicative of project specific federal and state compliance activities, rather than activity specific survey for this undertaking. Therefore, in addition to considering the documented archaeological resources within the APE, the APE must also be further assessed for unevaluated resources.

For example, the APE falls partially within the footprint of the National Park Service (NPS) American Battlefield Protection Program Civil War Sites Advisory Commission Report's "Battle of Jackson" (Public Law 101-628). Although it is unlikely that the landscape retains sufficient visual integrity to convey the battlefield's significance, it is possible that intact Civil War-era archaeological deposits still exist within the APE, such as the likely location of the Pearl River Bridge Prisoner of War Camp and other defensive structures along the Pearl River, as indicated on historic maps. USACE has also determined that the APE contains:

- over 5,006 inventoried, built-environment resources (above-ground);
- 57 historic properties individually listed on the National Register of Historic Places,
- four National Historic Landmarks, including the Eudora Welty House and Garden, the Mississippi State Capitol, the Governor's Mansion, and the (Old) Mississippi State Capitol; and
- 10 National Register-listed historic districts, including Belhaven, Belhaven Heights as amended, Farish Street Neighborhood, as amended, Poindexter Park, Smith Park Architectural, as amended, Spengler's Corner, as amended, West Capitol Downtown, Downtown Fondren, Southwest Midtown, and Upper Midtown.

There are also several sites of state significance within the APE, including four locally designated historic districts, three of which correspond to, in whole or in part, with National Register-listed

historic districts:

- Belhaven Heights Historic District
- Farish Street Historic District
- Morris Historic District
- Belhaven Historic District

The APE also contains 54 Mississippi Landmarks. Some of these landmarks are in close proximity to the footprint of the alternatives. The Mississippi Landmark designation is the highest form of recognition bestowed on properties by the State of Mississippi and offers the fullest protection against changes that might alter a property's historic character. Publicly owned properties that are determined to be historically or architecturally significant may be considered for designation. Significant publicly owned archaeological sites are automatically deemed Mississippi Landmarks under the Mississippi Antiquities Law.

No comprehensive systematic built-environment survey has been conducted throughout the entire APE. The APE and associated viewshed APE must also be further assessed for unevaluated cultural resources.

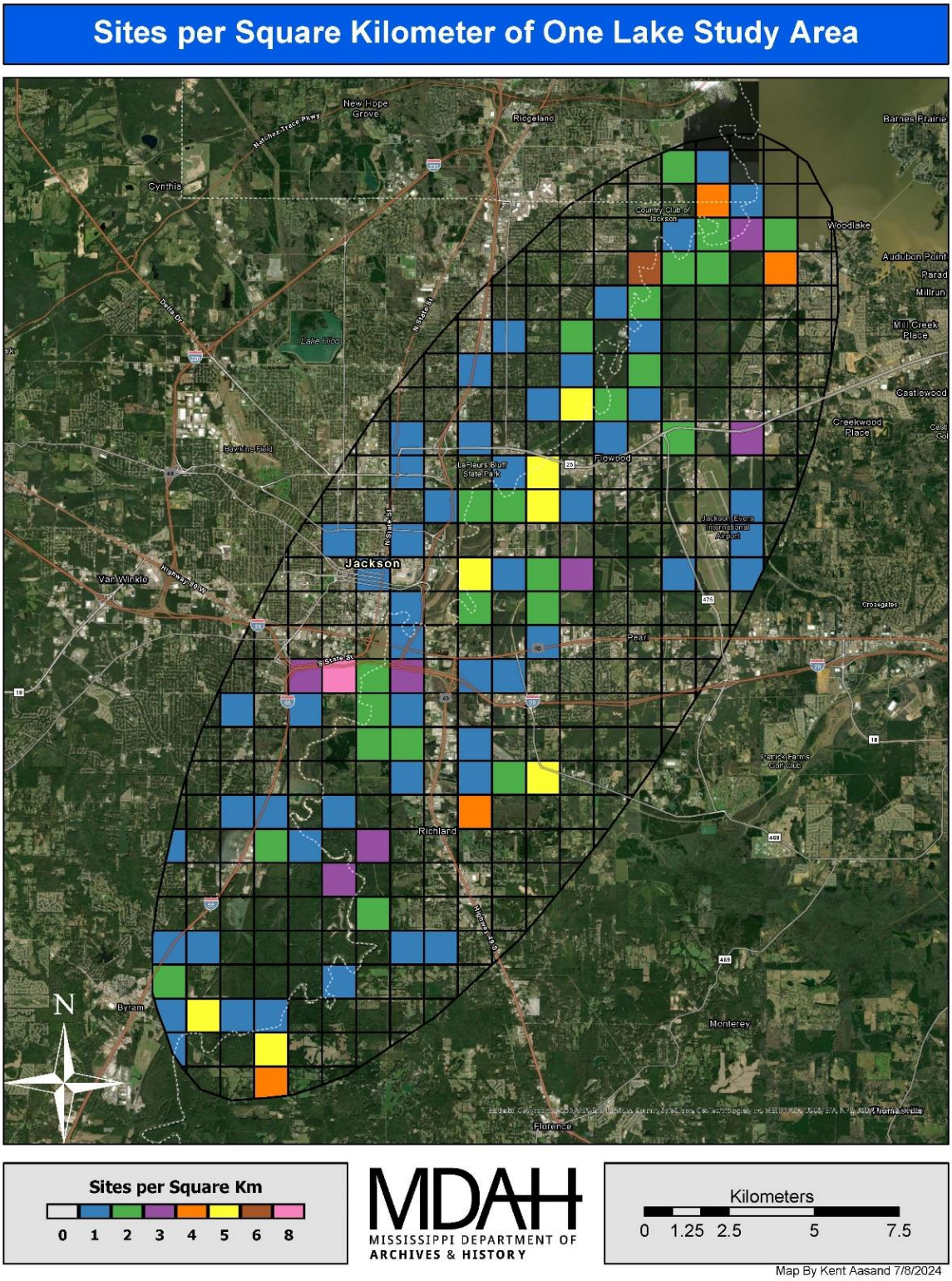

Figure 2-17: Sites per Square Kilometer within APE. (Source: MDAH 2024)

2.2.12 Recreation

This resource is institutionally important because of the Federal Water Project Recreation Act of 1965, as amended and the Land and Water Conservation Fund Act of 1965, as amended. Recreational resources are technically important because of the high economic value of these recreational activities and their contribution to local, state, and national economies. Recreational resources are publicly important because of the high value that the public places on outdoor recreation as sustenance to individual wellness, community health, and consumptive leisure activities like hunting and fishing. The public's recreation wants and needs are often measured and valued through Statewide Comprehensive Outdoor Recreation Plans (SCORP) which serve as a guide for all public outdoor recreation in neighborhoods, cities, and regions for a given state (MS SCORP 2025-2029).

Public recreation in the Study Area includes numerous city and community parks consisting of playgrounds, swimming pools, golf courses, tennis courts, picnic grounds, and shared-use paths. Additional public recreation areas near the Ross Barnett Reservoir are maintained by the Pearl River Valley Water Supply District and the Pearl River Basin Development District. Consumptive recreational activities in the area include fishing and, to a limited degree, hunting. Non-consumptive recreational activities include hiking, canoeing, boating, outdoor photography, biking, ATV riding, camping, and wildlife observation. The Mississippi Department of Wildlife, Fisheries and Parks' (MDWFP) LeFleur's Bluff State Park is also located within the Study Area and is sited along Pearl River.

Public access to the Pearl River itself is significantly limited due to private ownership along much of the waterfront. Public boat ramps on the Pearl River are limited to two locations, one at LeFleur's Bluff State Park and another at the Ross Barnett Reservoir Dam. The existing weir at the City of Jackson's Waterworks (RM 290.7) also limits watercraft access along much of the Pearl River in the area.

According to the United States Department of the Interior National Park Service Land & Water Conservation Fund (LWCF), 24 recreation projects have been supported since 1965 (Table 2-5). Of those 24 recreation projects, 9 pertain to LeFleur's Bluff State Park along Pearl River. The LWCF was enacted to help preserve, develop, and ensure access to outdoor recreation resources. (54 USC 200301 et seq.)

Table 2-5: Recreation Projects Supported with LWCF Funding

Grant Element Title	County	Municipality	Fiscal Year	Amount
Flowood River Park	Rankin	Flowood	1991	$25,000
Pearl City Park	Rankin	Pearl	1974	$75,000
Pearl City Parks	Rankin	Pearl	1979	$217,000
Wilton Jackson Ramp	Rankin	Pearl	1970	$2,700
Wilton Jackson Rec Area	Rankin	Pearl	1971	$34,100
MS Consolidated Project Phase III	Hinds	Jackson	1979	$17,500
Airport Park	Hinds	Jackson	1976	$67,700
Hinds County Parks	Hinds	Regional	1981	$157,100
Jackson City Park	Hinds	Jackson	1972	$89,400
Jackson Swimming Pool Complex	Hinds	Jackson	1974	$480,000
Jackson Tennis Center	Hinds	Jackson	1976	$225,000
Jackson Urban Parks	Hinds	Jackson	1980	$376,800
Jackson Urban Playgrounds	Hinds	Jackson	1985	$44,800
*LeFleur's Bluff Nature Trail	Hinds	Regional	2017	$20,000
*LeFleur's Bluff Bank Stabilization	Hinds	Regional	2018	$294,000
*LeFleur's Bluff Gatehouse	Hinds	Regional	2018	$250,000
*LeFleur's Bluff Playground	Hinds	Regional	2018	$200,000
*LeFleur's Bluff State Park	Hinds	Regional	1984	$100,000
*LeFleur's Bluff Park Expansion	Hinds	Regional	1990	$73,300
*LeFleur's Bluff State Park	Hinds	Regional	1971	$317,100
*LeFleur's Bluff State Park	Hinds	Regional	1973	$36,100
*LeFleur's Bluff State Park	Hinds	Regional	1974	$132,600
Poindexter Park	Hinds	Jackson	1995	$30,000
Smith Park	Hinds	Jackson	1974	$198,300
Total LWCF Funding				**$3,500,000**
* These projects establish a LWCF boundary inseparable from the 305-acre park property line				

Source: https://lwcf.tplgis.org/ ; https://www.mdwfp.com/parks-destinations/park/lefleurs-bluff-state-park

2.2.13 Aesthetics

This resource is institutionally important because of the laws and policies that affect visual resources, including but not limited to NEPA, USACE ER 1105-2-100, the Wild and Scenic Rivers Act of 1968 with amendments, and the National and Local Scenic Byway Program. Aesthetic resources are technically important because of the high value placed on the preservation of unique geological, botanical, and cultural features. Aesthetic resources are publicly important in that environmental organizations and the public support the preservation of natural pleasing vistas.

The Study Area has experienced a significant amount of development over time. Aerial imagery analysis over the last 20 years shows an increase in developed land uses and deforestation concentrated around the municipalities of Jackson, Flowood, Pearl, and Richland. Urbanization patterns within the Study Area have transformed visual components over time from what was once a primary bottomland hardwood riparian habitat to a mosaic of forested corridors, cropland patches, and interconnected municipal clusters which is characteristic of the Mississippi Valley Loess Plains Ecoregion (Chapman, et.al, 2004). Additionally, previous flood control projects along the Pearl River floodplain and its tributaries have transformed aesthetic and visual resources within the Study Area. This urbanization is largely due to growth within the municipalities listed and along the transportation corridors transecting the area.

The primary source of public visual access is along major transportation routes. In the northern portion of the Study Area and just south of the Ross Barnett Reservoir, MS Hwy 25 (Lakeland Drive) crosses the Pearl River from east to west and connects Flowood with Jackson. In the southern portion of the Study Area, Interstate 20 and Hwy 80/MS Hwy 18 also cross the Pearl River from east to west and connect Pearl with Jackson. Both Interstate 55 and Hwy 51 (N. State Street) transect the Study Area from north to south and connect Richland with Jackson. Additionally, the Natchez Trace Parkway is located to the west of the Study Area. This byway is a part of the Mississippi Scenic Byways Program (MSBP) under the Mississippi Department of Transportation (MDOT) which helps to preserve, enhance, and protect the state's intrinsic resources for visitors and residents of the state.

In 1999, the Mississippi Scenic Stream Stewardship Act was created to "encourage voluntary private conservation efforts along Mississippi's unique and outstanding rivers and streams by riparian (streamside) landowners. In a non-regulatory framework, landowners would be assisted in voluntary management agreements which seek to maintain scenic values while ensuring their rights to continue customary uses along the stream." This is a non-binding agreement between the MDWFP and the landowner.

Regional tourism programs include, but are not limited to, www.visitjackson.com and www.visitmississippi.org.

2.2.14 Air Quality

The EPA, Office of Air Quality Planning and Standards has set National Ambient Air Quality Standards, (NAAQS), for six principal pollutants, called "criteria" pollutants (Table 2-6). They are carbon monoxide, nitrogen dioxide, ozone, lead, particulates of 10 microns or less in size (PM-10 and PM-2.5), and sulfur dioxide. Ozone is the only parameter not directly emitted into the air, but it forms in the atmosphere when three atoms of oxygen (Ozone 03) are combined by a chemical reaction between oxides of nitrogen and volatile organic compounds in the presence of sunlight. Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents are some of the major sources of nitrogen and volatile organic compounds, also known as ozone precursors. Strong sunlight and hot weather can cause ground-level ozone to form in harmful concentrations in the air.

Table 2-6: NAAQS Criteria Pollutants Exceedance Levels

Pollutant [links to historical tables of NAAQS reviews]	Primary/ Secondary		Averaging Time	Level	Form
Carbon Monoxide CO)	Primary		8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)	primary and secondary		Rolling 3-month average	0.15 µg/m^3 (1)	Not to be exceeded
Nitrogen Dioxide (NO2)	Primary		1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	primary and secondary		1 year	53 ppb (2)	Annual Mean
Ozone (O3)	primary and secondary		8 hours	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution	PM2.5	primary	1 year	9.0 µg/m^3	annual mean, averaged over 3 years
		secondary	1 year	15.0 µg/m^3	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 µg/m^3	98th percentile, averaged over 3 years
(PM)	PM10	primary and secondary	24 hours	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO2)		primary	1 hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	1 year	10 ppb	Not to be exceeded more than once per year

Pollutant [links to historical tables of NAAQS reviews]	Primary/ Secondary	Averaging Time	Level	Form

1. In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.
2. The level of the annual NO2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1- hour standard level.
3. Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O3 standards are not revoked and remain in effect for designated areas. Additionally, some areas may have certain continuing implementation obligations under the prior revoked 1- hour (1979) and 8-hour (1997) O3 standards.
4. The previous SO2 standards (0.14 ppm 24-hour and 0.03 ppm annual) would additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO2 standards or is not meeting the requirements of a SIP call under the previous SO2 standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a State to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS. Table Source: https://www.epa.gov/criteria-air-pollutants/naaqs-table, 29 April 2024

The air quality within the Study Area, which includes Madison County, Hinds County and Rankin County, is currently in attainment status according to EPA and MDEQ. The EPA has set air quality standards for six principal pollutants: nitrogen dioxide, ozone, sulfur dioxide, particulate matter, carbon dioxide, and lead. Currently, Mississippi meets all air quality standards.

2.2.15 Noise

Noise pollution adversely affects the lives of millions of people. Inadequately controlled noise presents a growing danger to the health and welfare of the nation's population and studies have shown that there are direct links between noise and health, particularly in urban areas. Noise Induced Hearing Loss (NIHL) is the most common and often discussed health impact, but research has shown that exposure to constant or high levels of noise can cause countless adverse health impacts, including but not limited to sleep disturbances, stress, mood changes, emotional imbalance, mental fatigue, headaches, cognitive and learning disorders, cardiovascular effects, and high blood pressure. (US EPA)

The Noise Control Act of 1972 establishes a national policy to regulate and promote an environment for all Americans free from noise that jeopardizes their health or welfare, and the Occupational Safety and Health Administration Standards (29 CFR Part 1910) set standards regarding protection against the effects of noise exposure. The Act also serves to:

1. Establish a means for effective coordination of federal research and activities in noise control.
2. Authorize the establishment of federal noise emission standards for products distributed in commerce.
3. Provide information to the public respecting the noise emission and noise reduction characteristics of such products.

The Science of Sound

Sound is often generated by activities as a part of everyday life. Human response to sound varies depending on the type and characteristics of the sound, distance between the source and the receptor, sensitivity of the receptor, and the time of day the disturbance takes place. Sound becomes unwanted, referred to as noise, when it either interferes with normal activities, such as sleeping or conversation, or has a negative impact on the quality of life.

At a scientific level, sound and noise are technically the same. Both are vibrations in the air (or in water) that are picked up by the ear, converted to electrical impulses, and sent to the brain to be processed. The larger the sound waves, the stronger the vibrations, and the louder the sound. Sounds can be used to communicate, warn, navigate, and as a form of entertainment. Alternatively, noise is defined as any sound that is undesirable or disturbing because it interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. So, while all noise is sound, not all sound is noise.

Sound varies by both intensity and frequency and the human ear responds differently to different frequencies. Hertz, (Hz), is the standard unit of frequency in the International System of Units (SI), and it is equal to one cycle per second. Sound intensity, described in decibels (dB), is the amount of energy in a confined space. Loudness refers to how audible sounds are perceived, but it is not directly proportional to sound intensity. How loud something sounds differs from the actual intensity of that sound, and even if two sounds have equal intensity, it does not mean they are equally loud. A sound that seems loud in a quiet room might not be noticeable while amid heavy traffic. The risk of hearing damage increases with the intensity of the sound, not the loudness of sound.

A-weighing, described in *a-weighted decibels* (dBA), is a noise metric that describes steady noise levels. Since very few noises are, in fact, constant; a noise metric, A-weighted Day- night Sound Level (ADNL) was developed. Day-night Sound Level (DNL) is defined as the average sound energy in a 24-hour period with a 10-dB penalty added to the nighttime levels (10 P.M. to 7 A.M.). DNL is a useful descriptor for noise because (1) it averages ongoing yet intermittent noise, and (2) it measures total sound energy over a 24-hour period. In addition, Equivalent Sound Level (Leq) is often used to describe the overall noise environment. Leq is the average sound level in dB.

Natural factors such as topography and vegetation can help reduce noise levels over long distances. When ground cover or normal unpacked earth exists between the source and receptor, the ground becomes absorptive of noise energy. Refraction of sound waves occurs when sound passes through vegetative barriers and bends around plant structures. Leaves, twigs, and branches on trees, shrubs, and herbaceous growth absorb and deflect sound energy.

Sounds encountered in daily life and their approximate levels in dBA are provided in the following Table 2-7:

Table 2-7: Sound Level for Daily Life Activities

Sound Level (dBa)	Indoor	Outdoor	Human Response
0	The softest sound that can be heard		Sounds at these levels typically don't cause any hearing damage.
10	Normal breathing	A leaf in the wind	
20	Ticking watch	Leaves rustling	
30	Whisper	Soft music	
40	Library	Babbling brook	
50	Refrigerator	Gentle rainfall	
60	Sewing Machine	Normal Conversation	
70	TV Audio	Freeway Traffic (50ft)	Some Annoyance
80	Ringing Telephone	Downtown (large city)	Elevated annoyance
85	Blender	Gas lawnmower	Damage to hearing possible after 2 hours of exposure
90	Indoor concert	Motorcycle	

There are many different existing sources of noise throughout the project area, which is adjacent to the Jackson Metropolitan Area. As an urban area, the primary noise contributors are associated with the daily normal urban activities including operation of commercial and private vehicles (cars, trucks, trains); aircraft; operation of machinery and motors; and human industry-related noise (such as business operations). The noise levels in the affected area are typically low in subdivisions and in outlying areas and are higher in the proximity of major streets and highways.

Background noise levels are variable depending on the time of day and climatic conditions. Contributing activities include construction (road and highway), and development and industrial activities, particularly within the eastern and southern portions of the project area. Nearby developed areas, automobile, and train traffic, and to a lesser extent air traffic, contribute to the background noise levels.

2.2.16 Hazardous, Toxic and Radioactive Waste

In accordance with USACE ER 1165-2-132, a NFI is responsible for providing a clean site for construction of the project, and USACE is prohibited from undertaking HTRW work on behalf of the NFI. The performance and costs of HTRW cleanup and response would not be included as part of the Federal project. A NFI for a project must perform, or ensure performance of, any investigations for HTRW that are determined necessary to identify the existence and extent of any HTRW regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, and any other applicable law, that may exist in,

on, or under real property interests that the federal government determines to be necessary for construction, operation, and maintenance of the project. A NFI must also agree, as between the federal government and the non-federal interest, to be solely responsible for the performance and costs of cleanup and response of any HTRW regulated under applicable law that are located in, on, or under real property interest required for construction, operation, and maintenance of the project, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination, without reimbursement or credit by the federal government. Finally, the non-federal interest must agree, as between the federal government and the non-Federal interest, that the non-federal interest shall be considered the owner and operator of the project for the purpose of CERCLA liability or other applicable law, and to the maximum extent practicable shall carry out its responsibilities in a manner that would not cause HTRW liability to arise under applicable law.

ER 1165-2-132, Section 8.d.1, which further details Army policy on the avoidance of HTRW Sites: "Avoidance of HTRW sites. Civil Works plan formulation and plan selection may be substantially influenced by the presence of HTRW in the Project Area. HTRW sites would be avoided whenever practicable. They may be a significant factor in project alternative design even though cost may be greater than a plan that provides for HTRW response action. Consideration may be given to designating an HTRW avoidance alternative as the National Economic Development plan when costs and risks of response actions are uncertain."

A HTRW Phase I & a limited Phase II Environmental Site Assessment was conducted by the Non-Federal Interest in September 2014 and updated in August 2021. A technical memorandum was conducted by the NFI in December 2023 and a desktop analysis was conducted by USACE in April 2025 of the Project Area. Several Recognized Environmental Conditions were identified within the Project Area including an Unpermitted Gallatin Street Landfill Site, Unpermitted Lefleurs Landing "Jefferson Street Landfill", Gulf State Creosoting Company Site, Sonford Products Lumber Mill "Registered Superfund site", Rival Crockpot Site "Former superfund site", and three former automotive salvage yards. Though analysis was conducted by the NFI, additional investigation and site visits are recommended.

2.2.17 Socioeconomics

2.2.17.1 Region of Influence

The region of influence is comprised of the following three counties in Mississippi: Hinds County, Madison County, and Rankin County.

2.2.17.2 Population & Housing

Table 2-8 shows historic population from 1970 – 2020 among each of the three counties that are within the region of influence of the Study Area. Each of the counties experienced increases in population from 1970 until 1990. This is largely in part to the growth of the State capital of Jackson, situated in Hinds County. The growth here fueled suburbanization of the surrounding area during this time. By 2000, individuals began leaving the urban area of Jackson and relocating to other counties in the area. Economic opportunities were also beginning to decrease in Jackson during

the 1990s as a result of decreasing manufacturing and textile demand during this time. These trends continued to play a large role in the decreasing population of Hinds County in addition to the relocation of individuals to other counties within the Study Area.

Table 2-8: Population by County Households

Populations by County (000's)								
County	**1970**	**1980**	**1990**	**2000**	**2010**	**2020**	**2030**	**2040**
Hinds County (MS)	215	252	255	250	246	236	230	221
Madison County (MS)	30	42	54	75	96	105	124	136
Rankin County (MS)	44	70	88	116	142	154	164	172

Source: US Census Bureau (BOC), Moody's Analytics (ECCA) Forecast

Table 2-9 shows the number of households broken into counties that are within the region of influence. Similar to the trend in population, there were increasing households among all counties from 1970 – 1990. Hinds County experienced increased households by 2000, but at a much lesser rate of growth than previously experienced. After 2000, the number of households in Hinds County declined and is projected to continue declining. This is largely due economic factors that the county was experiencing, including increased suburbanization of the Jackson, MS area, the recession the United States experienced beginning in 2008, as well as inundation that was experienced in this area by the Pearl River. Frequent inundation causes damages to structures that may be unfixable, causing a steep decline in the number of households residing in the area.

Table 2-9: Households by County

Number of Households by County (1970 - 2040) (000's)								
County	**1970**	**1980**	**1990**	**2000**	**2010**	**2020**	**2030**	**2040**
Hinds County (MS)	63	86	91	91	92	89	92	91
Madison County (MS)	8	13	19	27	36	40	50	56
Rankin County (MS)	11	22	30	42	53	57	66	71

Source: US Census Bureau (BOC), Moody's Analytics (ECCA) Forecast

2.2.17.3 Employment, Business, and Industrial Activity

Historical employment data from 1990 to 2020 is presented in Table 2-10. This decrease in employment is consistent with the economic recessions that took place in both the 1990s and the 2000s. The urban area of Jackson, MS, which resides in Hinds County, decreases in population closely mirror that of employment levels in the region of influence. Additional factors that cause a declining employment level would be the COVID-19 pandemic, which halted hiring and caused many temporary layoffs and permanent dismissal.

Table 2-10: Employment by County

County	1990	2000	2010	2020	2030	2040
Hinds County (MS)	121	117	103	99	96	96
Madison County (MS)	25	38	45	50	57	64
Rankin County (MS)	45	61	66	70	75	81

Source: US Census Bureau (BOC), Moody's Analytics (ECCA) Forecast

2.2.17.4 Employment by Industry

Figure 2-18 demonstrates the aggregated industry among the region of influence from year to year starting in 2018 until 2021. This figure indicates that the largest employment industry is the trade, transportation, and utilities sector. This industry experienced a decreasing rate of growth in the year 2020. According to the Bureau of Economic Analysis, from 2019 to 2020, the aggregated number of employer establishments for the region of influence decreased by 0.5 percent. Both the State of Mississippi and the United States saw an increase in employer establishments of 0.92 percent and 2.48 percent respectively. The labor market in the region of influence is heavily influenced by community factors, including inundation of businesses causing damages and pauses in demand. In 2021, Hinds County continued to see a decrease in employer establishments of 1.76 percent.

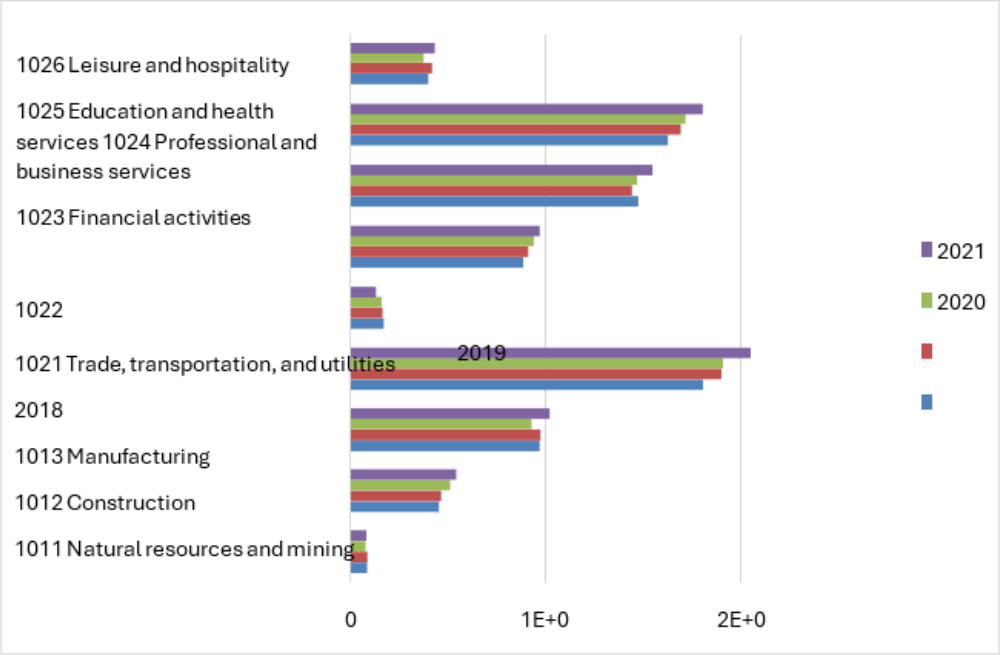

Figure 2-18: Employment by Industry Public Facilities & Services

Table 2-11 indicates the number of critical infrastructure and the types that are within the region of influence.

Table 2-11: Critical Infrastructure

Type of Infrastructure	Count
Fire Stations	10
Hospitals	5
Law Enforcement	15
Nursing Homes	5
Correctional Facilities	3
Schools	33
Energy Substations	22
Colleges & Universities	10

2.2.17.5 Community Cohesion

Places of Worship

According to the USGS's survey on Places of Worship in 2022, there are 132 places of worship within the Study Area. One Hundred of those places of worship are situated in the city of Jackson specifically. Places of worship allow for members of a congregation to have an understanding and

representation of themselves as both individuals and members within a community.

Community Centers

In addition to places of worship, there are several community centers located in the Study Area. The Jackson, MS government has several recreation activities that it supports each year for children and adolescents that provide a sense of belonging and identity. In addition to recreation and athletic programs, the City of Jackson also supports several community centers that provide a location for a community to safely engage with other members and create relationships among each other.

2.2.17.6 Infrastructure

The incorporated areas within the Study Area are serviced by public water and wastewater facilities, gas, electricity, telecommunications, and solid waste collection. Generally, the utility providers are sufficient to supply the population with uninterrupted access to utilities. Wastewater treatment facilities currently run parallel to the Pearl River. The wastewater interceptor traverses the Pearl River floodplain before entering the Savana Street WWTP on the west bank of the Pearl River. The plant is surrounded by a levee that is not USACE- certified. Existing water infrastructure becomes stressed under flood conditions of the Pearl River. In 2022, there was unprecedented stress as an indirect effect of the Pearl River flooding, causing individuals to lose access to clean drinking water.

2.2.17.7 Transportation

Roadway Networks

The Study Area is comprised of several roadway classifications, including interstate highways, US highways, State highways, State routes, and local roads.

Access to transportation for both individuals using their own vehicle or using public transportation is necessary as it allows employment to be reached outside of walking distance. Residents of this area depend on transportation corridors as shown in 2. According to the Mississippi Department of Transportation, several of the site have decreased their average daily traffic use. This decrease is a direct result of the COVID-19 Pandemic that occurred in 2020, halting necessity for many individuals commuting to work. Despite this overarching decrease, the demand is still very large for these roadways, and they are necessary to access employment establishments as well as essential services, like healthcare and grocers.

Table 2-12: Major Transportation Routes in the Region of Interest

Location	Site ID	2019 ADT	2021 ADT
Lakeland at Ridgewood	251,050	47,000	61,000
I-55 near Eastover Dr	250,990	106,000	121,000

US Hwy 80 near I-55	610,230	16,000	14,000
I-20 near Childre Road	610,570	72,000	75,000
Lakeland at Treetops Blvd	610,840	51,000	51,000
US hwy 49 at Quinn/McBride	610,520	48,000	51,000
Old Hwy 49N at Club Oak Dr	611,620	5,400	5,600
Old Brandon Rd at I-55	616,004	5,400	5,900

2.2.17.8 Public Transportation

Figure 2-19 describes the CDC's Social Vulnerability Index as it relates to the Transportation and Housing theme. Within the city of Jackson, there are several census tracts that are in the 80th percentile or higher for having no vehicle. These tracts are particularly dependent on public transportation, including the Jackson Transit System (JTran). Access to this mode of transportation allows for individuals to gain employment opportunities outside of walking distance, access to grocery stores and other essential services that may be required. Inundation on roadways presents an existing impact on roadways and therefore public transportation that is present in the region of interest.

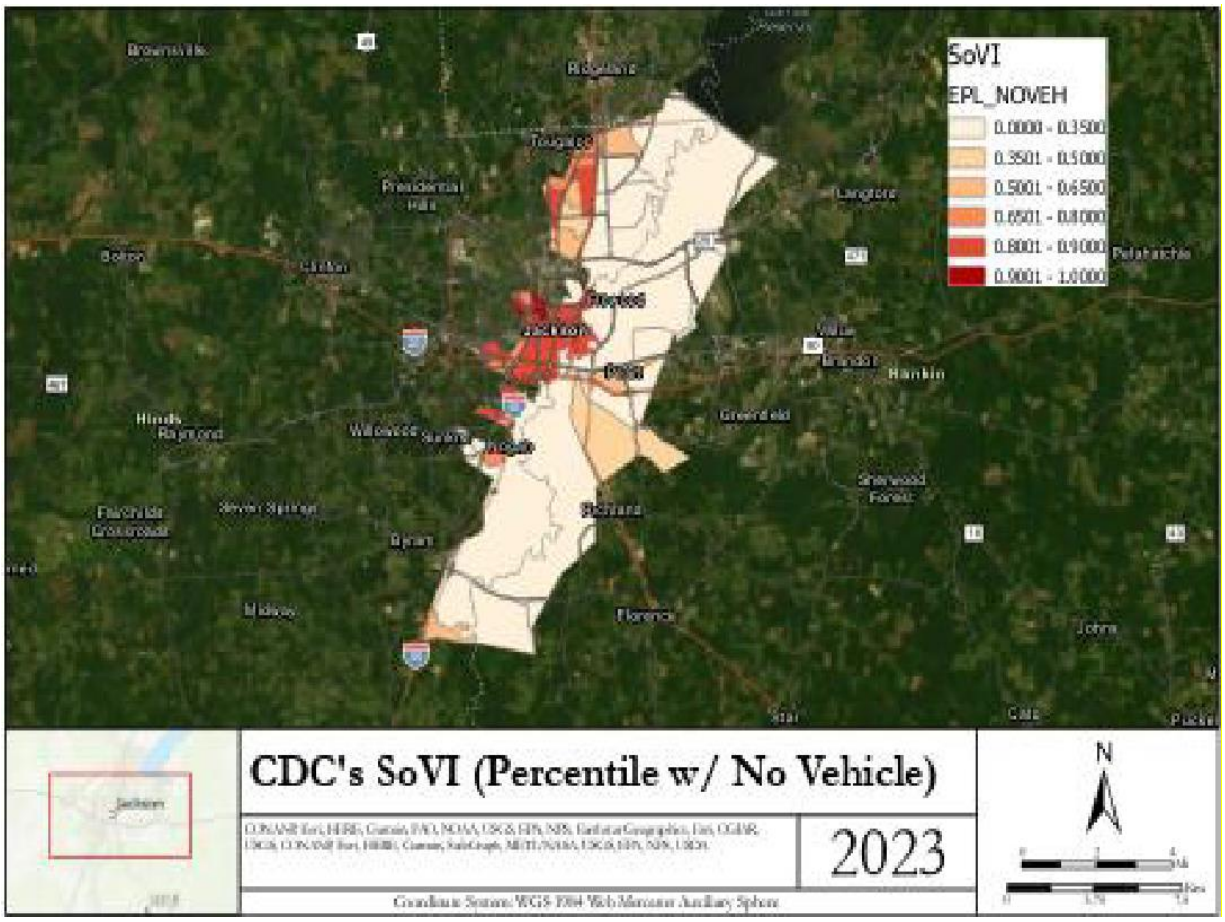

Figure 2-19: CDC's Social Vulnerability Index

SECTION THREE

3 ALTERNATIVES

The USACE evaluation of alternatives included a review and analysis of the final array of alternatives as presented in the NFI Section 211 Report, and three new alternatives developed by USACE. The NFI Section 211 Report final array of alternatives included the following a "nonstructural plan" (Alternative A), a "levee plan" (Alternative B) and a "channel clearing/weir/levee plan" (Alternative C). In addition, USACE in collaboration with NFI, developed three new alternatives identified as a modified nonstructural plan proposing elevating/floodproofing/acquisition of structures with a structural levee feature for flood damage risk reduction (Alternative A1) as well as Combination Thereof (CTO) Alternatives. The CTO Alternative is referenced in the Water Resources Development Act (WRDA) Section 3104 authority (referenced as Section 3104 authority from this point forward). CTO Alternatives considered include Alternatives D and E, which combined Alternative A1 and flood damage risk reduction structural features that were presented within the June 7, 2024, Draft Environmental Impact Statement (DEIS). Since the June 2024 release of the DEIS, USACE developed additional features that were incorporated within the alternatives within this report. The non-structural alternative (Alternative A1) now includes a FRM feature: Canton Club Levee. For Alternative D and E, these alternatives are now labeled as D1 (with Weir) and E1 (without Weir). These alternatives now include three additional FRM features as well as the prior FRM features: McLeod Levee, Cany Creek Levee, Richland Levee, Canton Club. A description of the alternatives is provided below.

3.1 NFI Final Array of Alternatives

Alternative A – This alternative is a nonstructural plan that would include the acquisition (buyout) of structures and subsequent relocation or demolition of that structure. This alternative would remove structures impacted by a five-hundred-year event (0.2 percent AEP) in the floodplain and acquire the land where the structures reside. The total number of structures is estimated to be approximately 3,000 including residential, commercial, government and public buildings, schools, and hospitals. This alternative does not include the structures located behind existing levees, although flood risk in these areas may still exist.

Alternative B – This alternative is considered a levee plan consisting of upgrading existing levees, construction of additional earthen levee segments and/or floodwalls in unprotected areas, upgrading an existing non-Federal levee into a Federalized ring levee as well as the addition of pumps and gated structures. Additional project features would include staging areas, conveyance improvements (clearing and grubbing), fertilizing, seeding, and mulching. It is expected that heavy construction equipment such as dump trucks, excavators, and bulldozers would be used for construction.

Alternative C – Per the NFI Section 211 Report, Alternative C is the Locally Preferred Plan (LPP), and NFI recommended plan. Though no longer identified as such, Alternative C was considered

the LPP in the NFI Section 211 Report. The plan consists of clearing and expanding cross-sectional area of the river channel corridor to increase hydraulic conveyance, demolition of the existing weir near the J. H. Fewell WTP site, construction of a new weir with a low-flow gate structure further downstream to approximate river mile 284.3 to create a year-round recreational water body and provide an alternative raw water supply intake location should one be needed in the future, improvements to Federal levees (excavated material plan), and upgrading an existing non-Federal levee into a federalized ring levee around the Savanna Street WWTP. Alternative C includes mitigation measures, and several features required to avoid and/or minimize impacts to federally listed species.

3.1.1 USACE Developed Alternatives:

Alternative A1- Includes elevating and floodproofing structures within the cumulative 4 percent AEP floodplain (25 year flood) and creation of the Canton Club Levee. Residential structures are to be elevated to the 1 percent (100 year) AEP/Base Flood Elevation (BFE), or higher if required by USACE or local ordinance, based on year 2082 hydrology. With a limit of up to 13 feet (NAVD88) above the ground, these structures would be subject to Perpetual Restrictive Easement, which would restrict development of the ground floor. Nonresidential structures would be floodproofed up to 3 feet (NAVD88) above the ground. As an alternative to elevating, floodproofing of NRHP-listed or eligible residential structures would be considered on a case-by-case basis. All nonstructural components would be on a voluntary basis by the property owner if a wavier for voluntary basis is approved. If a wavier is not achieved, then the nonstructural component would be mandatory not voluntary. This alternative includes approximately 54 structures, 28 residential and 26 nonresidential. The option of nonstructural property acquisition (i.e., "buyout") on a voluntary basis is included in the nonstructural implementation plan (Appendix N). Acquired properties would become greenspace that is publicly owned and maintained by a nonfederal sponsor (NFS).

Federal levee improvements consist of the proposed construction of the Canton Club Levee, a levee segment of approximately 1.4 miles, located on the west bank of the Pearl River in northeast Jackson. This levee would provide additional flood risk reduction for approximately 100 acres of high density developed neighborhoods. The resulting area of FRM protection benefit is bounded on the north by the North Canton Club Circle and Beechcrest Drive on the south. It is estimated this would reduce flood risk for over 250 homes. The levee will range from natural high ground surface up to 9 feet in height.

Alternative CTO – The "Combination There Of," alternatives are a combination of the features associated with the presented alternatives discussed above that would provide the same or better flood risk reduction. Two alternatives were assessed utilizing a combination of the features listed below; with and without the construction of a new weir (Alternative D1 and E1 respectively), which may include:

- Alternative A1 Non-Structural Plan (further refined for CTO).
- Excavation of main channel and placement of excavated material.
- Federal levee improvements (fill, seepage reduction at existing federal levees)

- Construction of Local Levees: Canton Club Levee, McLeod Levee, Cany Creek Levee, and Richland Levee
- New weir and fish ladder.
- Utilization of existing weir.
- Non-Federal levee improvements (Savanna Street WWTP).
- Countermeasures for bridges.
- Mitigation features.
- Incidental recreational features.

3.2 Planning

In accordance with the Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, the Federal objective of water and related land resources planning is to contribute to NED consistent with protecting the nation's environment pursuant to national environmental statutes, applicable executive orders (EO), and other Federal planning requirements.

3.2.1 Objectives

As a result of the problem identification process, the objectives listed below formed the basis for the evaluation of the final array of alternative plans. These objectives are in consonance with the intent of the USACE P&G and other planning guidance:

- Reduce risk of flooding for the city of Jackson, MS and adjacent areas in Hinds and Rankin Counties, MS.
- Reduce flood risk to human life and wellbeing.
- Reduce flood risk to critical infrastructure (e.g., medical centers, schools, transportation, etc.).
- Create a self-sustaining project that allows for minimal operation and maintenance cost.
- Minimize the potentially reasonably foreseeable impacts to downstream areas, the environment, and cultural resources.

3.2.2 Opportunities

As a result of the objectives stated above, the following opportunities could be considered:

- Consider the regional economic impacts associated with the development of recreational opportunities along the Pearl River in the Project Area.
- Provide recreational opportunities along the Pearl River for the city of Jackson, MS and adjacent areas in Hinds and Rankin Counties, MS.

Public testimony and comment from across the Pearl River watershed and within the Study Area reveal a multitude of concerns that may be addressed through other authorities or by other entities. No single authority can solve all the problems immediately; therefore, a systematic approach involving multiple projects from several different programs and under several different authorities

would be required to effectively outline the array of problems and opportunities in the watershed. These items are not considered to be part of the subject project, but are opportunities noted that could be undertaken separately from this effort:

- *Reconnecting the Community to the River*. Multiple testimonies and comments from interests within the Study Area, and presented conceptual plans speak to improving the connection of communities to the river. Within the Study Area, there are few immediate access points to the river and few green spaces for the public. LeFleur's Bluff State Park is a large public space adjacent to the river corridor; however, even its connection to the river is restricted. Entities associated with economic and community development, colleges, the medical center, and employers are all seeking improved public spaces and greenways that can retain and attract a new development of labor force. Furthermore, expanded public spaces and greenways serve as recreation areas where existing communities come together and connect with nature, activities with proven physical, mental, spiritual, and social benefits. Community leaders from south Jackson and other economically struggling areas, see opportunity in economic development associated with a reconnection to the river. Local entities may consider executing projects that reconnect the community to the river.

- *Operation of the Ross Barnett Reservoir*. The Pearl River Valley Water Supply District operates the water control features of the Ross Barnett Reservoir and in their vision for operation of the reservoir acknowledges there is a flood reduction capability associated with the reservoir. The Ross Barnett Reservoir, a non-Federal project operated by the Pearl River Valley Water Supply District, was constructed in 1962 for the purposes of water supply and recreation. Although the reservoir was not designed for flood control, the reservoir does provide some flood reduction benefits. The reservoir does not have a requirement to implement flood reduction in any specific way but has been actively reducing peak flows during large inflow events since at least 1979 with an estimate that peak flows are reduced by as much as 28 percent due to these operations. However significant stress to the dam in the 1979 event means there are significant concerns with holding a higher pool as part of a formal operations process. Public comments across the watershed highlighted concerns with reservoir operations. State and local entities may consider operational changes at the Ross Barnett Reservoir and revising the Ross Barnett Water Control Manual to formalize continued flood reduction capacity inform future discharge operations. A sensitivity analysis shows that reducing the flows from the Ross Barnett Reservoir by 20 percent, reduces damages to the Project Area. The goal of this consideration is to formalize future informed releases within the reservoir limits to delay or decrease peak releases for events with a forecasted peak discharge above 35,000 cfs. Further changes to rate of change rules could further limit erosion and bank caving.

- *Water Supply and Quality*. The EPA and USACE are currently working projects outside of the current RDEIS under section 219 as authorized by WRDA of 1992 with the City of Jackson to address local water and wastewater infrastructure under existing federal authorities. This work addresses the immediate and to some extent long standing problems with aging local environmental infrastructure. The J.H. Fewell Water Treatment Plant is 90 years old and remains in service, and under court order is being upgraded. The Ross Barnett Reservoir and Pearl River surface water are the two primary sources of drinking water for the surrounding communities. Flood control projects in the area must directly account for substantive work occurring and ensure alignment with such infrastructure modernization work.

- *Downstream Concerns on the Pearl River*. Public testimony and comments from communities south of the Project Area demonstrated current problems on the lower Pearl River. Public testimony included observations of extended periods of flooding and extended periods of low water, sand bars forming in the river threatening tributary access, low water flows impacting the Louisiana Wildlife Management Areas, and low water flows enabling saltwater intrusion into fishing grounds and oyster beds. Concerns included the impacts of legacy federal projects (weirs, locks, and dams) on public safety, downstream water quantity and quality, and the loss of wildlife habitat. Since the deauthorization of the Pearl River as a federal navigation project, USACE executes maintenance of waterway features with funding available and as authorized by caretaker status. The following considerations have potential to improve downstream conditions and inform a strategy to restore the lower Pearl River.

- *Comprehensive Watershed Study*. A comprehensive watershed study of the Pearl River is necessary to fully understand the basin's hydrology, hydrodynamics, and ecosystem. The scope of the study should be from the headwaters to the terminus at the Gulf of America. A watershed study would inform disposition of legacy federal infrastructure, opportunities for sustaining and managing flowrates through the basin, and enhancement of habitat for the basin's wildlife, flora, and fauna. Authorization via a Water Resources Development Act is required.

- *Water Control Agreement and Improved Monitoring*. Since the Pearl River is not an authorized federal project, the states of Louisiana and Mississippi should consider entering into a water control agreement that sets conveyance requirements through the lower Pearl River. The agreement may set flowrate requirements at specific river miles during specified times of the year. Additional instrumentation may be required at specified river miles and with funding and authorization, USACE can support acquisition, installation, and continuous monitoring.

3.2.3 Constraints and Considerations

A planning constraint is to avoid promoting development within the floodplain (in accordance with E.O. 11988) to the maximum extent practicable, which contributes to increased life safety risk. Planning considerations in the plan formulation process included:

- Avoid or minimize adverse impacts to:
  - Threatened or endangered (T&E) and protected species.
  - T&E designated critical habitat.
  - Water quality.
  - Cultural, historic, and Tribal-trust resources.
- Avoid or minimize impacts to HTRW.
- Maintain consistency with local floodplain management plans by not inducing flooding in other areas.
- Closely coordinate with operators of Ross Barnett Reservoir on operations and maintenance of minimum flows.

3.2.4 Formulation and Evaluation of Alternatives

Formulation of alternatives developed by the NFI is described within Appendix M: *NFI Report* and Appendix A: *Plan Formulation*. Three alternatives in the NFI Section 211 Report final array of alternatives were removed from further analysis, The three Alternatives removed are listed below:

1) Alternative A, a nonstructural plan, included the acquisition (buyout) of structures and then either relocation or demolition of that structure. The "buyout" allows for removing structures out of the 0.2% AEP (500-year flood) floodplain and acquiring the land upon which the structures reside. The total number of structures to be relocated would be more than 3,000, including residential structures, commercial structures, government and public buildings, schools, and hospitals. This does not include structures behind existing levees, although there is some probability that damage and risk in these areas would still exist. It was determined by the NFI, and concurred in by USACE, that the alternative was impractical due to the logistics and costs associated with implementation. Removal of all structures from the 500-year floodplain would remove significant components of the city's economic infrastructure and was determined to be not economically justified.

2) Alternative B, the levee plan, was determined not to be the NED Plan or the LPP in the NFI Section 211 Report. USACE conducted a qualitative assessment and concluded that even with a significant design and cost reduction, the Alternative would not be Federally justified. Based on this determination, no further evaluation of Alternative B, was conducted.

3) Alternative C, NFI Channel Improvement/Weir/Levee Plan, is no longer identified as the LPP as of August 5, 2024 per the NFI. The selection of Alternative D as the new LPP was due to advancements of the listed array of alternatives within the June

> 2024 DEIS. The NFI indicated that Alternative D was chosen as the LPP because it provides the only optionality for a modern, environmentally superior water plant in South Jackson, as expressed in public comments by JXN Water and the only option which provides Jackson an equitable, resilient, and sustainable clean water supply. In addition to the removal of the LPP status and it was determined that this alternative would not be the NED Plan per the associated BCR.

USACE developed five new alternatives identified as "Alternative A1," a modified nonstructural plan, Alternative D a modified NFI Alternative C which includes the addition of one federal levee improvement, Alternative D1 a modified NFI Alternative C which includes the addition of four federal levee improvements, Alternative E which mimics Alternative D except it does not include the construction of a weir, and Alternative E1 which mimics Alternative D1 except it does not include the construction of a weir. Alternatives D1 and E1 were created in result of the guidance per the WRDA 2007 Section 3104 guidance that states, "may select a combination of any or all of the features, so long as the combined features provide the same, or better, level of flood risk reduction as the NED Plan."

Alternative A1– USACE Developed Nonstructural Plan and the Canton Club Levee: A modified nonstructural plan with improvements to a federal levee, Alternative A1, was developed consisting of elevation, floodproofing, and proposed voluntary property acquisition. The option of nonstructural property acquisition (buyout) on a voluntary basis is included in the nonstructural implementation plan (Appendix I). Acquired properties would become permanent/perpetual greenspace that is publicly owned and maintained by an NFS. This alternative is anticipated to have very minimal adverse impacts to the environment. This alternative would not be expected to require compensatory habitat mitigation. For the federal levee improvement, Alternative A1 includes a levee segment, designated as the Canton Club levee, which is approximately 1.4 miles long, on the west bank of the Pearl River in northeast Jackson. This levee would provide additional flood risk reduction for approximately 100 acres of high density developed neighborhoods. This area is bounded on the north by the North Canton Club Circle and Beechcrest Drive on the south. It is estimated this would reduce flood risk for over 250 homes. The levee will range from natural high ground, to up to 9 feet high. While Alternative A1 has garnered support from nongovernmental organizations and certain federal agencies, it falls short in effectiveness and practicality, making it insufficient for maintaining long-term FRM as outlined in Section 3104. In addition to the risks mentioned above, Alternative A1 fails to fully satisfy the four criteria within Planning and General accounts- Other Social Effects (OSE) for Completeness, Efficiency, Effectiveness, and Acceptability.

Completeness: Alternative A1 includes a non-structural component, which includes the raising of residential homes and flood proofing of non-residential structures. Successful implementation of this plan is dependent on the participation rate of owners and may include additional cost incurred by the homeowners that are not covered in the Federal cost. As a result, implementation of the non-structural plan is dependent on actions from others (i.e. the homeowners). Homeowner participation has not been projected with specificity.

Efficiency: Alternatives D1 and E1 offer enhanced efficiencies by addressing additional opportunities for recreational benefits, and future opportunities to address water supply, that result from construction of the weir, at no additional cost to the federal government. While these opportunities are not captured in the Economic Analysis, as they do not directly address, or provide benefits related to the FRM purpose of the project a qualitative assessment indicates that Alternatives D1 and E1 may generate regional economic benefits (RED account) in the Pearl River watershed, through increased recreational usage, and opportunity for water supply reliability. These alternatives also offer potential positive impacts on Other Social Effects (OSE), by enhancing community resilience and quality of life. Alternatives D1 and E1, also provide Environmental Quality (EQ) benefits. There is an existing non-Federal levee, located around the Savanna Street Wastewater Treatment Plant (WWTP). Alternatives D1 and E1, will incorporate this non-Federal levee into the Federal levee system and require it to be brought up to design standards consistent with Federal projects. This provides ancillary EQ benefits by reducing the risk of flood and damages to the WWTP that may result in additional risk to water supply sources in the area and allows for the community to have needed utilities in the aftermath of a flood event.

Effectiveness: As detailed in Tables 3 thru 5, the Future Without Project (FWOP) estimated annual damages (EAD) are $27.9 million. While Alternative A1, the only alternative with a positive benefit-to-cost ratio, reduces EAD by $ 1.8 million, it still leaves a substantial residual risk of $26.1 million. This represents a mere 6% reduction in damages, leaving the majority of the population and infrastructure vulnerable to flooding and potential loss of life. In contrast, Alternatives D1 and E1 offer significantly greater reduction in EAD, reducing residual damages to $8.2 million – a 71% reduction in EAD, and a corresponding residual risk of only 29%. Alternatives D1 and E1, may be considered more efficient, as these alternatives better address residual flood risk for communities located behind the proposed levees.

Acceptability: The concept of acceptability plays a crucial role in evaluating alternatives and determining their viability. Key considerations include Stakeholder Approval, Long-Term Sustainability, and Feasibility & Practicality. While Alternative A1 has garnered support from nongovernmental organizations and certain federal agencies, it falls short in effectiveness and practicality, making it insufficient for addressing the long-term flood risk problem in the area. Both the NFI and the City of Jackson advocate for an alternative that incorporates a new weir. Currently, the only plan that includes a weir (Near River Mile 286.5) s Alternative D1, while this alternative is not considered the LPP as of release of the RDEIS, it is most similar to previous LPP. Additionally, communities within the Jackson Metropolitan Area, including Canton Club, have expressed support for Alternative D1 and E1, primarily due to the levee improvements designed to reduce risk to the neighborhood.

Because of the factors mentioned prior, this alternative is removed for future considerations but remains part of the RDEIS process.

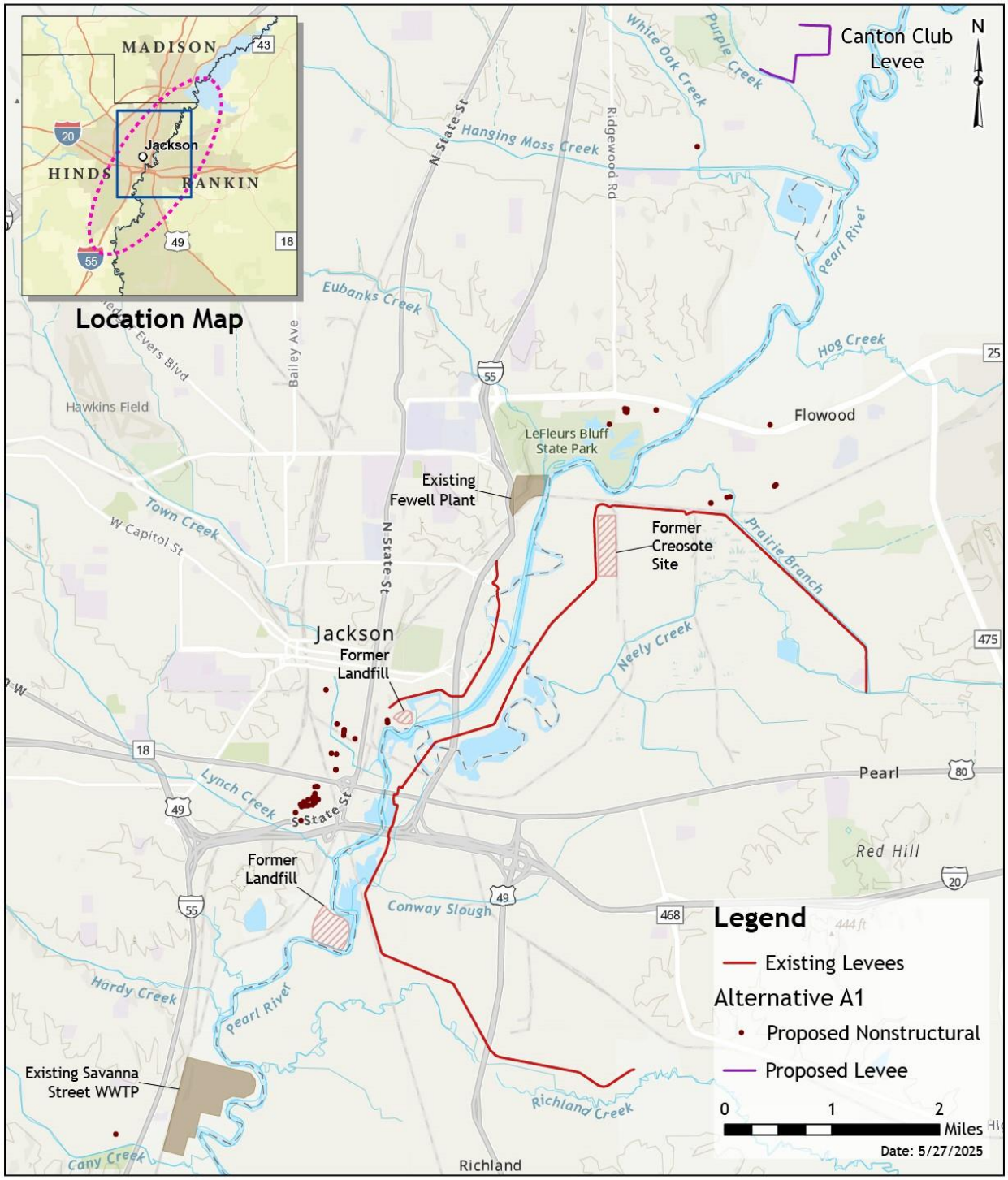

Figure 3-1 Select Alternative A1 Features – Non-structural and Canton Creek Levee

Alternative D (With Weir): A modified structural plan was presented within the June 2024 DEIS. This plan was created as one of the two CTO options presented within the Section 3104 authority. This plan mimicked the NFI's Original LPP plan, Alterative C, except this plan included a different location for the Weir proposal, reduced excavation of the main channel, federal levee improvements, fish ladder, utilization of the existing weir (J. H. Fewell), Non-Federal levee improvements (Savanna Street WWTP), and countermeasures for bridges (initial scoping with MDOT in the EIS; major evaluation will be a Pre-construction Engineering and Design (PED) effort and not part of the EIS assessment. This plan on August 5, 2024 was labeled as the new LPP per a supporting letter from the NFI. This alternative is currently being represented as Alternative D1 due to the inclusion of additional FRM measures. Due to this reason, Alternative D is no longer being carried forward within this RDEIS.

Alternatives D1 (With Weir): A modified structural plan similar to Alternative D presented within the June 2024 DEIS. This plan includes the same features presented within Alternative D except this plan includes additional federal levee improvements. Due to public feedback and additional engineering scoping, three levee segments have been included within this Alternative: McLeod Club Levee, Cany Creek Levee, Richland Levee. This plan currently is labeled as likely the new LPP.

Alternative E (Without Weir): A modified structural plan that was presented within the June 2024 DEIS. This plan was created as one of the two CTO options presented within the Section 3104 authority. This plan mimicked the NFI's LPP plan, Alterative C, except this plan did not include the construction of a new weir and fish ladder. However this plan did include reduced excavation of the main channel, federal levee improvements, utilization of the existing weir, Non-Federal levee improvements (Savanna Street WWTP), countermeasures for bridges (initial scoping with MDOT in the EIS; major evaluation will be a Pre-construction Engineering and Design (PED) effort and not part of the EIS assessment). This alternative is currently being represented as Alternative E1 due to the inclusion of additional FRM measures. Due to this reason, Alternative E is no longer being carried forward within this RDEIS.

Alternative E1 (Without Weir): A modified structural plan similar to Alternative E presented within the June 2024 DEIS. This plan includes the same features presented within Alternative E except this plan includes additional federal levee improvements. Due to public feedback and additional engineering scoping, three levee segments have been included within this Alternative: McLeod Club Levee, Cany Creek Levee, Richland Levee.

Additional H&H analysis and evaluations of the proposed features resulted in the following features being removed from further evaluation as part of the Alternative D1 and Alternative E1:

- Clean out and sustained maintenance of tributaries: This feature was removed from further consideration in the CTO alternative upon identifying that this work is being undertaken by the NRCS, State and other local entities through the Mississippi Watershed projects.
- Levee setbacks: This feature was determined to provide limited flood risk reduction benefits and therefore was removed from further consideration.

- Demolition of the existing weir: Demolition of the existing weir is not needed as the existing weir is submerged and does not impede water flow. The existing weir would also be necessary to maintain adequate water supply should a new weir not be constructed.

Based on the results of the USACE's analysis, H&H modeling and agency coordination, Alternatives D1 and E1, could be comprised of any, or all, of the remaining features as described in Section 3.4 and Appendix I: *Project Descriptions*. Should the ASA select a different combination of features, or all of the features, as the CTO, additional analysis, modeling, and supplemental NEPA analysis would be required.

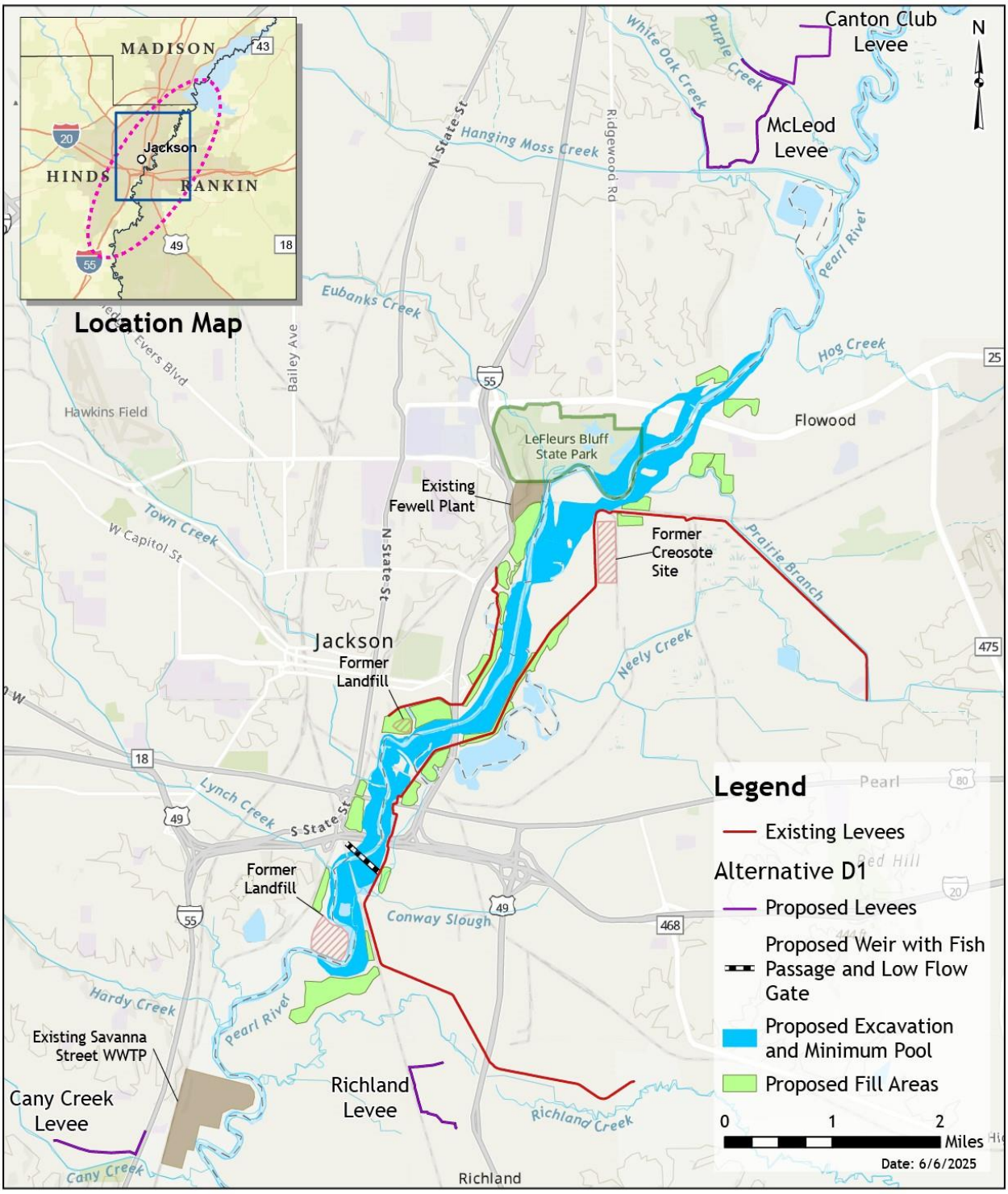

Figure 3-2: Select Alternative D1 Features – Excavation, Fill, and Weir

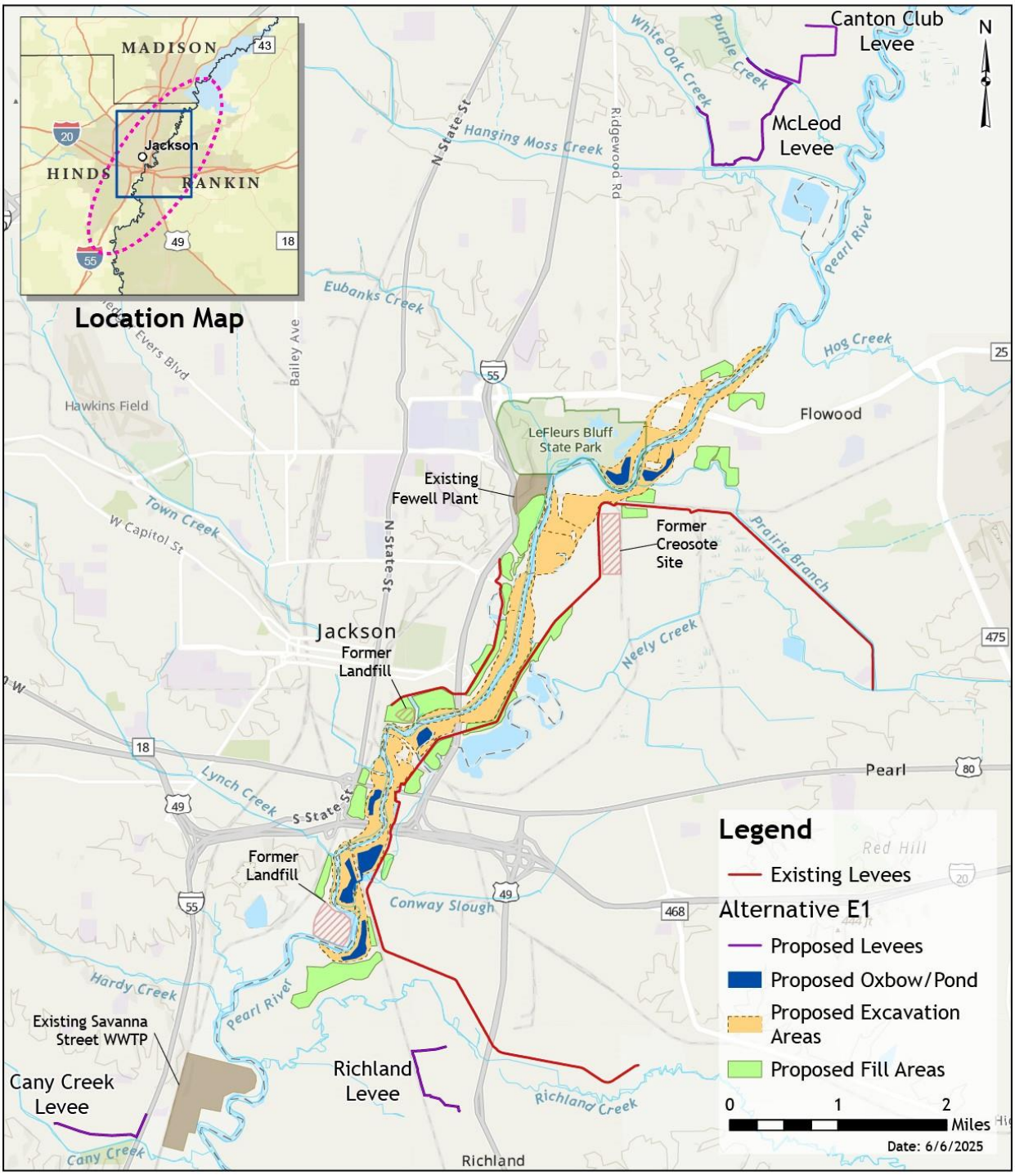

Figure 3-3: Select Alternative E1 Features – Excavation and Fill

3.3 Evaluation Tools and Modeling

Described below are the tools USACE utilized for hydraulic, hydrologic, and economic analysis of the Alternative A1, Alternative D1, and Alternative E1.

3.3.1 Hydrology & Hydraulics Evaluation Tools and Modeling

The *Hydrology & Hydraulics* (H&H) Appendix E provides the hydrologic, hydraulic, and statistical analysis that was conducted by USACE. For hydraulics and hydrology, a HEC- RAS 6.4.1 unsteady state hydraulic modeling with a combination of one-and two- dimensional elements is used throughout the analysis. A HEC- Hydrologic Modeling System HMS version 4.10 (HEC, July 2022) model was developed to model the incremental local flows downstream of the Ross Barnett dam. The Hydrologic Engineering Center Statistical Software Package (HEC-SSP) version 2.3 was used to update the flow frequencies at key gaged locations within the Basin. To confirm dam safety hazard classification to inform life safety and design, four breach scenarios were completed with Alternative C project conditions (i.e., new weir), to confirm the dam safety hazard classification. This was not completed for alternatives D1 and E1, as no changes are expected at the screening level without the full Life Safety Analysis.

3.3.2 Economic Evaluation Tools and Modeling

The structure inventory used for alternative assessments uses the National Structure Inventory 2022 as a base for structure points, occupancy types, population information, and square footage. The foundation heights and structure values were assigned based on statistics gathered via Google Street View surveys. These surveys involved observing random samples by reach and occupancy type to gather information, such as foundation height, foundation type, effective age, and condition. This was used to inform both the values and the first-floor elevations and depreciation factors. The RS Means Square Foot Costs 2023 catalog was used to calculate structure values incorporating locality adjustments and were updated to FY 2025 values using the RS Means Historic Cost Indices

To estimate damages, HEC-FDA model version 1.4.3 was used. It uses a point-based structure inventory. Hydraulic stage data from H&H model outputs were used to determine the flood depths at each structure, and structure depth; damage curves are used to estimate damages. In addition to the traditional damage categories of structures, contents, vehicles, and debris removal, the economic analysis also includes traffic delay costs, emergency response costs, and infrastructure damages assessed by Rankin-Hinds.

Expected annual damages were calculated for the without-project condition and the with-project condition. Annualized costs and benefits over a 50-year period of analysis will be compared to determine the net benefits and the benefit-cost ratio (BCR) for each alternative. These benefits will be summarized, along with other comprehensive benefits, and presented to USACE decision makers.

3.3.3 Development of Nonstructural Costs

3.3.3.1 Nonstructural Costs: Residential Structures

Elevation costs were based on the difference in the number of feet between the original first floor elevation and the target elevation (the 1% AEP/ BFE, plus one foot) for each structure. Elevation costs by structure were summed to yield an estimate of total structure elevation costs. For screening to the final number of structures included in the nonstructural plan, the cost per square foot for raising a structure was based on data obtained during interviews with representatives of three major metropolitan New Orleans area firms that specialize in the structure elevation (Table 3-1). Composite costs, based on recent New Orleans District finalized studies, were derived for residential structures by type: slab and pier foundation, one story and two-story configuration, and for manufactured, modular, and mobile homes. These composite unit costs also vary by the number of feet that structures may be elevated. The cost per square foot to raise an individual structure to the target height was multiplied by the footprint square footage of each structure to compute the costs to elevate the structure. Using previous USACE nonstructural study costs estimates, a cost of $23,000 per structure was used to account for the potential real estate cost of implementation. Preconstruction, engineering, and design (PED) and construction management were accounted for by taking 12% and 9% of the construction costs respectively. Also, a contingency of 43% was added to the cost of implementation. This contingency was selected for use from another recent Feasibility Study consisting of nonstructural features with certified costs. Table 3-1 shows the cost per square foot of structure raising by occupancy type and height raised.

3.3.3.2 Nonstructural Costs: Non-Residential Structures

The dry flood proofing feature was applied to all non-residential structures. Separate cost estimates were developed to flood proof these structures based on their relative square footage. If the square footage was between 0 and 20,000, then the total cost equaled $150,200; between 20,000 and 100,000 square feet equaled $464,400; and greater than 100,000 square feet equaled $1,168,300. These costs were developed by contacting local contractors and were escalated to FY 2025 prices. PED and construction management were accounted for by taking 12% and 9% of the construction costs respectively. Also, a contingency of 43% was added to the cost of implementation.

3.3.3.3 Nonstructural Costs: Operations, Maintenance, Relocations, Rehabilitation, and Repair

The elevation features are anticipated to operate as intended and as such, there are no further resources necessary to ensure that the engineered activity operates as intended. Periodic inspection of the of the floodproofing efforts, if required, are expected to not be significant (approximately $500 per structure over several years). The inspection costs are an extremely small percentage of the overall cost of implementation and can be considered capitalized in the initial cost of implementation. Section 10 of Appendix N-Nonstructural Implementation Plan provides additional information regarding periodic inspections.

Table 3-1: Cost per Square Foot of Structure Raising by Occupancy Type and Number of Feet raised, FY 2025 Price Level

Ft. Elevated	1STY-SLAB	2STY-SLAB	1STY-PIER	2STY-PIER	MOBILE HOME
1	114	126	101	112	56
2	114	126	101	112	56
3	117	128	105	116	56
4	121	137	105	116	56
5	121	137	105	116	69
6	123	139	108	118	69
7	123	139	108	118	69
8	127	144	111	121	69
9	127	144	111	121	69
10	127	144	111	121	69
11	127	144	111	121	69
12	127	144	111	121	69
13	132	151	112	123	69

3.3.4 Development of Costs

Class 4 construction cost estimates were developed for Alternatives D1 and E1. Cost estimates were compiled in the Micro-Computer Aided Cost Engineering System (MCACES) software and used the standard approaches for a feasibility estimate structure regarding labor, equipment, materials, crews, unit prices, quotes, sub-contractor markups and prime contractor markups. This approach was taken wherever practical. It was supplemented with estimating information from other sources where necessary such as from quotes, the Levee Safety Center's Levee Safety Tool, bid data, and Architect-Engineer (A-E) estimates. These estimates are intended to allow for relative cost comparison between alternatives only. More detailed, higher level cost estimates will be developed for the selected plan as project scope and design details are refined during the design process.

3.3.4.1 Real Estate Costs

No further real estate analysis was conducted beyond what was provided in the NFI Section 211 Report.

For alternatives D1 and E1 no further real estate analysis was conducted. A proper real estate analysis will be a part of the Real Estate Plan, provided in PED. The Real Estate Plan will identify and describe the lands, easements and Rights-of-Way, including any relocations, borrow material and dredged/excavated material disposal required for the construction, operation and maintenance of the project. The Real Estate Plan will include a brief gross appraisal and all incidental and administrative federal cost. The Real Estate Plan will be completed during PED.

3.4 Alternative Descriptions

The project description for the alternatives evaluated include three USACE alternatives. The USACE alternatives are Alternative A1 a modified nonstructural plan with a FRM component, Alternative D1 a modified FRM plan from the original NFI section 211 report that includes a weir, and Alternative E1 a modified FRM plan from the original NFI section 211 report that does not include a weir.

3.4.1 Alternative Combination Thereof Plan

USACE modeling of Alternative C considered a variety of upgrades to the NFI routing. These included calibration to the recent 2020 flood event, which had not occurred at the time of NFI modeling, incorporating more recent flow record data (1980s to 2022), updating all runs to unsteady state routing, inclusion of tributary flow, and the inclusion of lateral structures to represent the levees. Updated calibration has shown that the system response has changed since the 1979 event to be more efficient, as illustrated by the comparable events from 1983 and 2020. The two events had similar flows at Pearl River gage in Jackson, but the stage was reduced by approximately 2.9 ft for the 2020 event.

By combining the features of other alternatives, Alternative D1 and E1 provides certain benefits from the other alternatives while reducing environmental impacts, avoids HTRW sites and lowers specific costs.

As stated within the authority, the Secretary of the Army may select any or all of the features identified below to create a final array of features to form Alternatives D1 and E1, so long as the combined features provide the same level of flood risk reduction as the NED Plan, or better. Alternatives D1 and E1 could be any combination of the following features:

- Excavation of Main Channel,
- Federal levee improvements: Canton Club Levee, Mcleod Levee, Richland Levee, Cany Creek Levee
- Construction of new weir, Fish passage (Only for Alternative D1)
- Non-Federal levee improvements (Savannah Street WWTP)
- Bridge modifications
- Mitigation features

The clean out of tributaries was removed from further consideration in Alternatives D1 and E1 upon identifying that this work is being undertaken by the NRCS, State and other local entities through the Mississippi Watershed projects. Levee Setbacks were removed from this plan as it was determined that these features would provide limited flood risk reduction benefits. Demolition of the existing weir was removed from this plan as the existing weir is submerged and does not impede water flow. The existing weir would also be necessary to maintain adequate water supply should a new weir not be constructed.

3.4.2 Alternative D1 and E1 Features Summary

Table 3-2 Provides a listing of the project features of the CTO alternative with (Alternative D1) and without (Alternative E1) a weir for comparative purposes.

Table 3-2: Alternatives D1 and E1 Comparison

FEATURE	ALT D1 Quantity	ALT E1 Quantity	UNITS
STRUCTURAL			
Channel Overbank Improvements			
Clearing and Grubbing	954	954	acres
Excavation Area	954	954	acres
Excavation Volume	9.38	9.38	MCY
Acquisitions/Right of Way	Xx	Xx	structures
	xx	xx	acres
Excavated Material Plan			
Clearing and Grubbing	523	523	acres
Fill Area	523	523	acres
Features Created due to Excavation			
Hard Point in tributary channels to prevent tributary incision	525	525	Feet (crossing river)
Stabilization or armoring for bridge abutments	7	7	bridges
Stabilization or armoring for RR bridge abutments	1	1	bridges
Slurry Wall Savanna Street WWTP	6,000	6,000	feet
Savanna Street WWTP Levee Raise	N/A	N/A	Levee was verified by to have sufficient height
J H Fewell and Mays Lake Armoring	98,000	98,000	tons-rock
Weir and Associated Features			
Weir and new gate	1	Existing Maintained	each
Water Surface Area	1556	0	acres
Seepage Jackson East	1	0	each
Seepage Jackson Fairgrounds	1	0	each
Pump Station	360	0	cfs
Other interior drainage features – Existing Levee Jackson East Fairgrounds	1	0	each
Levee Features			

FEATURE	ALT D1 Quantity	ALT E1 Quantity	UNITS
Canton Club Levee	1.4	1.4	miles
McLeod Levee	2.3	2.3	miles
Richland Levee	1.15	1.15	miles
Cany Creek Levee	0.75 to 1	0.75 to 1	miles
Recreational Features			
Utility Relocation	1	1	each
RV, Tent Camping	150	150	each
Fishing Piers	6	6	each
Boat Ramp and Parking	6	6	lane
Trails	79,000	79,000	linear feet
OPERATIONS AND MAINTENANCE			
Weir and new gate	1	0	each
Fish Passage	1	0	each
Lake (sediment/vegetation)	1	0	each
Upgraded Interior Drainage	1	0	each
Mowing of Excavated Areas	0	1	each
Rock Armoring	1	1	each
New Levee Systems	4	4	each
Forested Wetlands and Uplands Habitat Monitoring	11	11	events
Lacustrine Habitat Monitoring	0	10	events
Riverine Habitat Monitoring	10	0	events
Sandbars Monitoring	6	0	events
Monitoring and adaptive management of fish passage channel			
Recreational Features	1	1	each
MITIGATION			
T&E-Fish Passage	5000-6000	0	feet
Replacement of obsolete aquatic barrier(s) (riverine mitigation)	1	0	structure
Oxbow and Ponding (Lacustrine Mitigation)	0	105	acres
Forested Wetlands and Uplands Mitigation	5,512 – 11,612	5,512 – 11,612	acres
T&E- Sandbar surveys within construction area(s) every 2-days during construction and the nesting season (May 1 – October 3) (90/year)	90	0	events/year
T&E- Capture, tag, and relocation of listed turtles	827	0	turtles

FEATURE	ALT D1	ALT E1	UNITS
	Quantity	Quantity	
T&E - Incubation of listed turtle eggs. Raise juveniles for at least one year, release	408	103	turtles
T&E- Riverbank preservation	10	0	river miles
T&E- Revegetate riverbanks/water surface edges	42	77	acres
T&E- Sandbars (material from excavation)	31	0	acres
T&E- Species monitoring of Gulf sturgeon (GS)	3	0	events
T&E- Water velocity monitoring	10	0	events
T&E- Water quality monitoring	6	0	events
T&E- sedimentation analysis	1	1	study

3.4.3 NFI Channel Improvement/Weir/Levee Plan Components

Both Alternative D1 and E1 provide similar flood risk reduction as the NFI Alternative C with a smaller footprint. Alternatives D1 and E1 consists of the construction of channel improvements for Alternative E, plus a new weir for Alternative D1 which includes a low-flow gate structure downstream while simultaneously creating a water surface area for recreational opportunities (Figure 3-4). Federal levee improvements (excavated material plan) and reinforcing an existing non-Federal ring levee (the Savanna Street WWTP Levee) are included in both plan D1 and E1.

Modifications include constructing a weir upstream of the location identified for Alternative C, reducing excavation depths and extent (reduces excavation and fill volume) and thus reducing environmental impacts throughout the project footprint. The new weir would also have a lower elevation than proposed for Alternative C. These changes could reduce environmental impacts especially to HTRW sites within the project footprint.

The Alternatives D1 and E1 seeks to realize flood risk management through a reduced scope of measures. Flood risk management is realized by both Alternative D1 and E1 through lowering of the channel overbanks within the project footprint, thereby improving conveyance of water through the project area and lowering the water surface elevation of the river by over 4 feet (1.2 m) in some places within the project area. Water surface elevation reductions due to this excavation would provide reduction of flood elevations not only within the reach of excavation, but additional elevation reductions upstream for over 8 miles upstream of the excavation limits (as far as the Ross Barnett Reservoir).

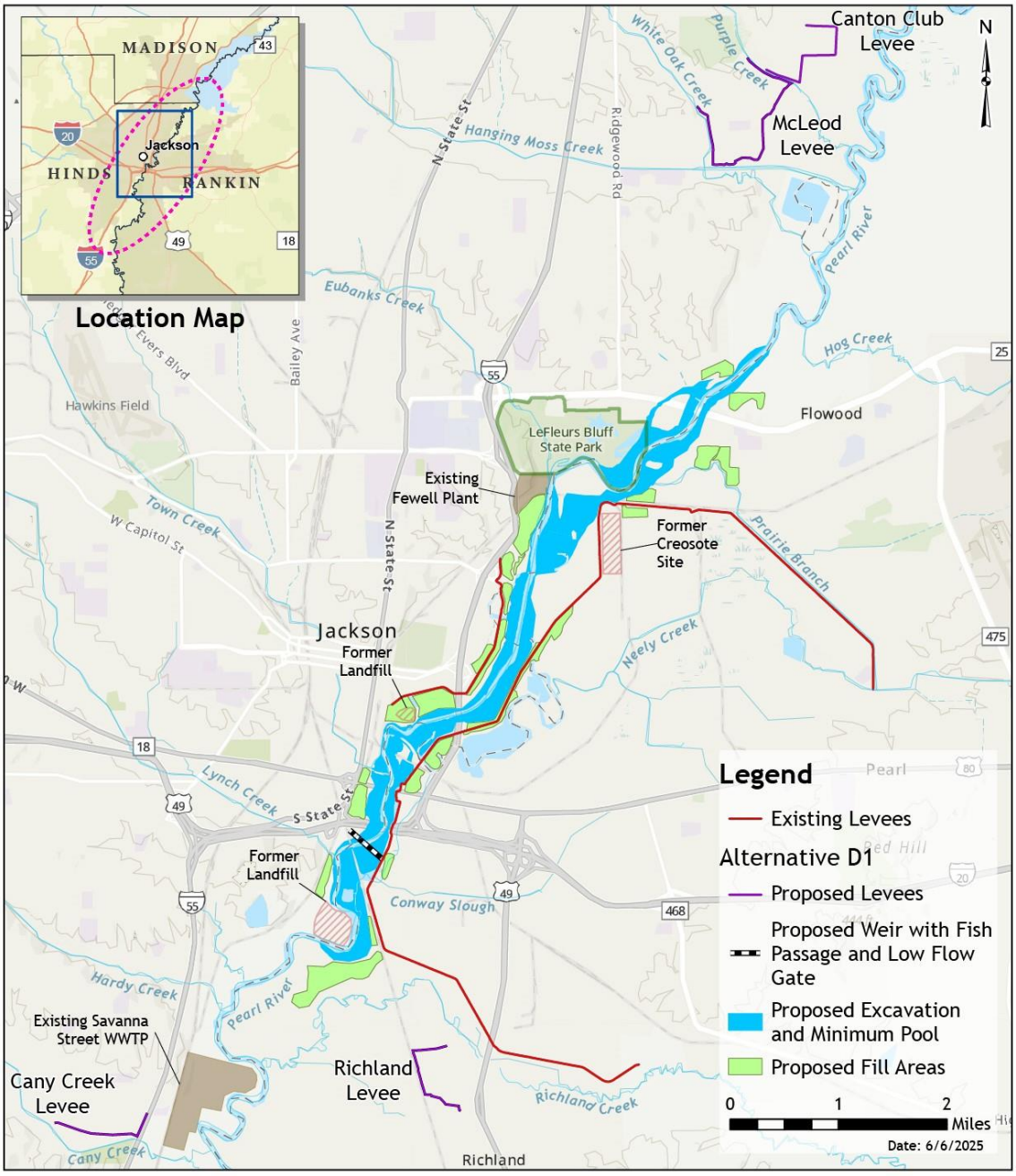

Figure 3-4: Select Alternative D1 Features – Excavation, Fill, and Weir

Construction of the project could require relocations and/or improvements to various utilities and infrastructure (e.g. existing roadways or similar, as well as any homes or businesses located within a project feature) and any discovered hazardous waste sites within the floodplain, avoidance and minimization features required under the ESA, and the creation of habitat mitigation areas to offset losses within the project area.

There are numerous utilities within the project area, but all efforts will be made to avoid, monitor, maintain clearance requirements, and protect these structures. If avoidance is not possible, then utility relocation or raising of lines/protection of structures would be necessary. It is assumed that a subset of these lines will require additional utility relocation costs. Coordination with the operating entity to determine specific requirements of each utility will be conducted during PED.

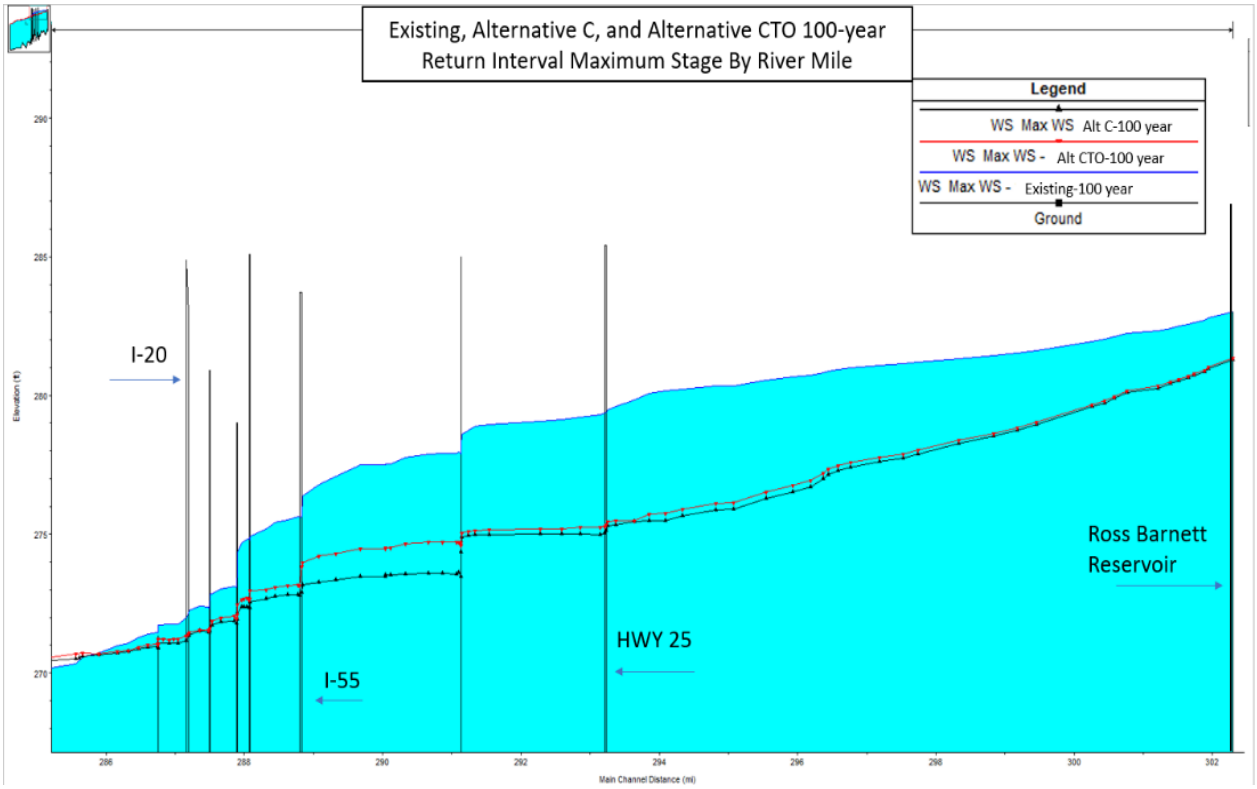

Figure 3-5: USACE modeling Results for the 1% AEP (100-year) With and Without Project Routing Scenario

3.5 Overbank Modifications

Channel improvements (Figure 3-6) consist of excavating areas along the Pearl River to improve conveyance from RM 285 to 294, which includes sections previously channelized during the original levee construction. The channel improvement footprint includes up to 954 acres in which excavation would occur. Excavated areas (954 acres) will be cleared and grubbed ahead excavation work. The excavation will be of various widths ranging from 500 to 2,600 feet (152-793 m) including the river width. Excavation depths will vary between 0-13 feet to meet the proposed bottom elevation of 252.0 NGVD. Approximately 9.11 million cubic yards of material will be excavated from the floodplain and channel overbanks. The existing river channel will not be widened, instead excavation of the overbank areas will occur.

It is currently assumed that excavation areas within the floodplain will be completed over a 3-year construction period. It is assumed that scour of the disturbed area during flood events will require an additional 3 percent of the volume of each excavated area for each exposed construction year to be reworked. The total estimated volume of material to be removed and disposed will be around 270,000 cubic yards.

The preliminary project layout includes islands within the channel improvement excavation area that would be maintained and/or expanded upon from RM 288.0 to RM 292.0. Further, sand bars could be constructed inside the floodplain and along the existing islands to compensate for the loss of sand bar habitat.

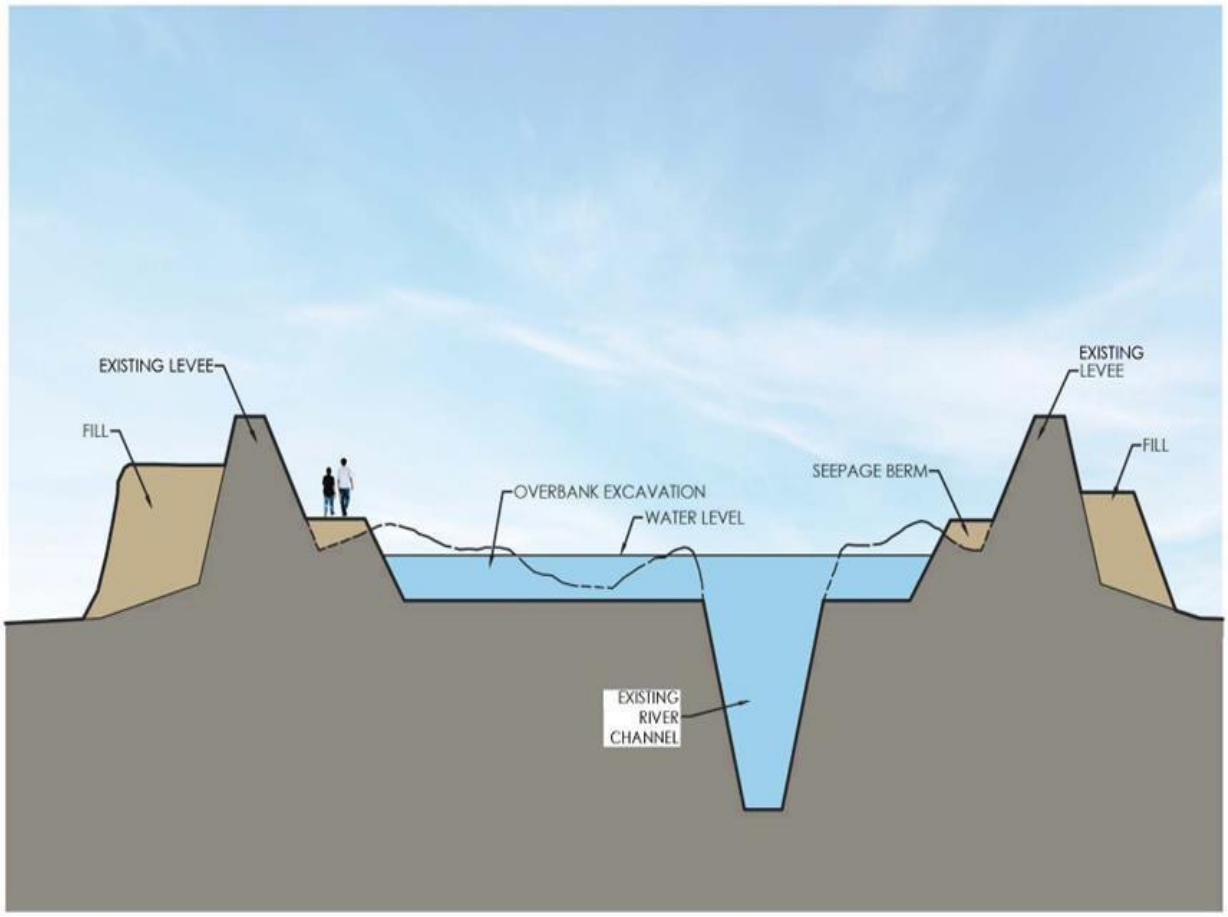

Figure 3-6: Channel Improvements with a Relocated Weir

The existing overbank areas of the Pearl River channel would be lowered to increase conveyance of flood flows. Existing levees would remain in place and would be maintained to current flood protection levels and to aid in haul access. Excavation limits near the existing levees would be determined during final design.

Station 10+00 through 140+00. Specific items included in this reach are the I-20 Interstate bridges (Sta. 95+00±) as well as the U.S. Highway 80 (Sta. 110+00), Old Brandon Road (Sta. 135+00±),

and railroad bridges (Sta. 70+00±, Sta. 130+00±). Two high-pressure gas lines run through this reach and will would have to be carefully monitored as excavation and grading activities progress. Multiple access points on both sides of the river would have to be maintained and monitored from a perspective of public safety and construction use.

Station 140+00 through 290+00. This reach contains excavation of the overbank areas around high points such that high points would appear as islands. As with the previous reach segment, numerous access points would require management and maintenance for use and safety. A creosote slough area (Sta. 240+00±) will be avoided during construction, to not disturb or cause any objectionable material to be exposed or mixed with other excavated material.

Station 290+00 through 400+00. As with the previous downstream reaches, there are bridges to work around (Highway 25 near Sta. 360+00), and gas lines and transmission lines that must be monitored during earthmoving operations. An existing abandoned railroad embankment of the Gulf, Mobile & Northern/Gulf Mobile and Ohio (GM&N/GM&O) Railroad Bridge could also be affected, and portions of this structure will be removed. Some excavation would be required in this reach such that high points would appear as islands. The existing weir at the water works bend near Station 290+00 would require protection along bank tie-ins.

3.5.1 Excavated Material Plan (Fill material)

Federal levees exist within much of this reach and Alternative D1 and E1 would upgrade existing levees with excess excavation placed at the Toe where possible. Excavated fill would be placed in designated disposal areas on the protected and unprotected side of existing levees as well as other locations within the flood plain. One specific location fill would be used, where suitable, is in the construction of the new local levees. The disposal fill areas would impact approximately 523 acres (211.6 ha) (Figure 3-1).

Clearing and grubbing of approximately 523 acres would occur prior to placement of the excavated fill material from the channel overbank lowering. The excavated material would be used to create areas of higher elevation within the Jackson and the surrounding cities. These areas would be graded to be at the same elevation or lower than existing levees. However, if any structures are to be built on top of any portion of a designed seepage feature, the feature would need to be maintained as a whole and utilities, or any other structure or penetrations would be limited to within the sections built above the designed seepage feature. The newly created area could allow for expanded riverfront access, natural areas, along with recreational opportunities.

3.5.1.1 Material Provided to NFI

Up to 1,660,000 cy (1,269,000 yd^3) of fill material (estimated as 100 acres (40.5 hectares) of fill 10 feet high) would be provided to the NFI for additional usage within the project footprint. This material would be either hauled directly from the excavation site or moved to a staging area for removal by the NFI. Existing fill areas would be used as staging areas after clearing and grubbing but prior to fill activities. The final fill locations and volume of fill will be refined in PED. All fill is currently costed as if government would be placing this fill. This will also be refined in engineering and design prior to construction.

3.6 Hardpoints at Base of Tributaries

Multiple tributary inflow points exist within this reach and Alternative D1 and E1 will add a hardpoint, via a rock chute to prevent backward erosion at each tributary inflow where the excavation of overbanks decreased the tributary channel bottom elevation at or near the confluence of those tributaries with the Pearl River. It is assumed that no sheet pile stabilization is needed for cuts as all cuts are less than 5 feet in depth. This protection is limited to areas at the edge of excavation and should not negatively impact access to water, or the flow of water at any given location.

These rock checks will utilize riprap to prevent incisions working up the affected tributaries and reduce the amount of sediment that is introduced into the project via incision and upstream sediment transportation. This prevents the excavated area from slowly filling in with sediment over time. The estimated total width of rock checks required is 525 linear feet.

3.6.1 Reinforcement of Railway and Roadway Bridge Abutments

If any stabilization or armoring, such as riprap, slope paving, slide repairs, etc., is required, it will be carried out prior to clearing and any major channel work. Following its own analysis, the MDOT has informed the Rankin-Hinds Flood Control District (the Flood Control District), that MDOT agrees to collaborate with the Flood Control District in "the advancement of this project and to ensure countermeasures are included, if determined necessary during the future design process." (Letter to G. Rhoads, dated February 26, 2024) To this end, the Flood Control District developed a range of cost estimates for potential structural and hydraulic countermeasures that could be recommended if countermeasures are determined necessary. The array of countermeasure features analyzed that will mitigate potential impacts to MDOT bridges that will be identified during the PED phase. The estimated cost for these features is based upon known costs for the construction of hydraulic and structural countermeasures on another MDOT project at downstream hydraulic crossings of the Pearl River. When additional information becomes available during PED, adjustments to the design can and will be made to reduce potential impacts. Any proposed countermeasure design and implementation will be conducted with MDOT's concurrence, review, and approval.

Rough estimations of the level of effort required to mitigate for bridge impacts include improvements for approximately 36 bents, 12 piers, abutment scour, as well as funding to conduct monitoring surveys. A pile is a concrete post that is driven into the ground to act as a leg or support for a bridge. A bent is a combination of the cap and the pile. Together, with other bents, act as supports for the entire bridge.

There are a total of 2 active railroad bridges within the Project Area. All efforts would be made to avoid, monitor, and protect these structures. Additional modeling is required to validate these assumptions during PED. If avoidance is not possible, then coordination with the operating entity to determine specific requirements of each railway bridge will be conducted during PED. All alterations of railroad bridges would be in accordance with Section 3 of the 1946 Flood Control Act (22 USC 701p).

3.6.2 Construction of New Weir and Gate with Fish Ladder

Alternative D1 may include a new weir to be constructed near RM 286.5 at the southern end of the channel improvements area. It should be noted that the Alternative D1 does not include any modifications to the existing J. H. Fewell weir (only overbanks). This new weir would provide for a larger body of water within the Pearl River channel to the north of the weir and fish ladder.

Downstream low-water hydrologic flows (extreme drought condition minimum flows) within the Pearl River channel would be maintained by means of a 12 x 12-foot low-flow gate. Also note that the gate is required for any future maintenance which requires drawdown of the lake. A low flow channel will be constructed to route water from the channel bottom to the gate. Portions of the weir would be submerged during normal flow allowing excess water to pass downstream. Water would pass over the weir with inflow into the lake approximately equaling outflow at any given time (with the exception of the extreme drought, which has a minimum release and outflow could be greater than inflow. However, this is expected to occur very rarely, as the Ross Barnett Reservoir also has a minimum release requirement that would pass through the system). As opposed to the existing weir, the new weir would be constructed to a higher elevation of approximately 256 feet. NAVD 88 with a length of up to 2,200 feet with a fish ladder located on the southern end of the proposed channel improvements area. The weir would impound approximately 4 feet of water along the excavated overbanks and up to 22 feet across the main channel. This would impound an area of approximately 1556 acres, of this area approximately 637 acres are upstream of the J. H. Fewell Water Treatment Plant Weir.

A unique feature of this cross section is the concrete steps on the back side of the structure that are designed to dissipate energy and prevent the current that results in drowning deaths downstream of low head dams. This type of feature is considered mandatory for a modern designed low head dam. The concrete weir is assumed to be able to be ground supported due to the limited height (except for the portion over the river plug). The river will need to be plugged during construction for any weir option selected. The plug is a reinforced part of the foundation of the dam located at the original river channel, as this is the tallest point of the dam, with expected sandy soils. A sheetpile will also be required on the upstream face of the structure to mitigate seepage and maintain stability.

A fish ladder (Figure 3-7) would be excavated around the relocated weir within the Project Area. The fish ladder is conceptually designed to be approximately between 5,000 - 6,000 feet (1524-1829 m) in length. The fish ladder would be constructed at an approximate 0.004 ft/ft slope and tie into the Conway Slough which connects to the Pearl River 0.8 miles downstream of the CN Railroad Bridge. The fish ladder design would be coordinated with US Fish and Wildlife, state agencies, and Tribes during the PED phase.

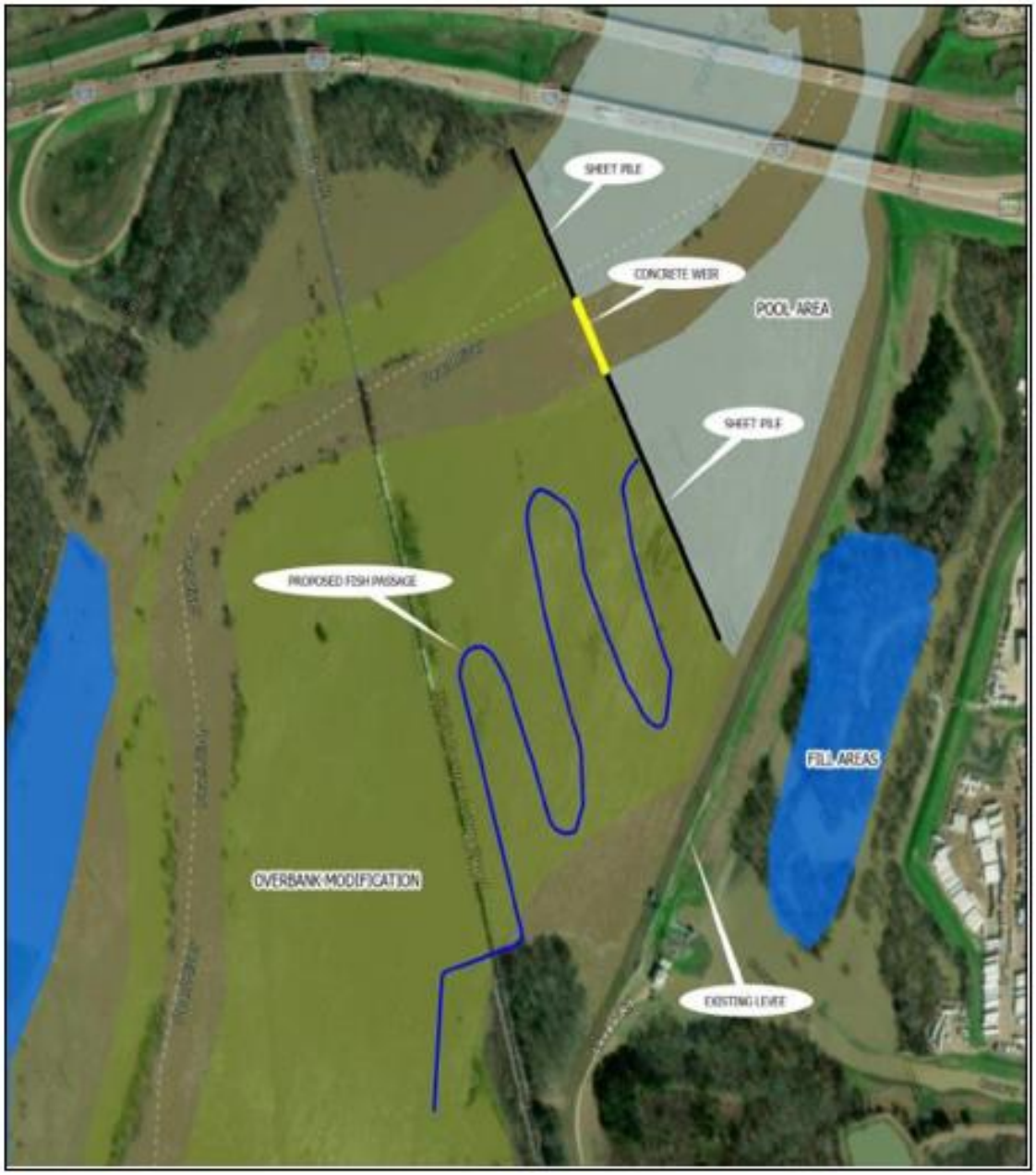

Figure 3-7: Proposed Weir (Black) and Fish Ladder (Blue) Exact Dam Design to be determined in PED

The proposed weir meets USACE and State criteria to be defined as a dam based on the height of the structure and water storage. As a result, the dam would be designed and constructed to meet USACE and State of Mississippi criteria for a dam.

The construction of the weir necessitates additional pumping needs at existing levees as well as seepage protection in the form of berms and slurry walls on existing levee features upstream of the weir. However, the weir provides a water body for attractive locations for recreation and future economic development. The proposed weir would result in an expanded, year-round water body capable of supporting recreational facilities. Potential recreation sites would be limited to areas disturbed by construction and design of these facilities would be coordinated during PED (Figure 3-8). The incidental recreational features could include boat ramps, camping areas, fishing piers, trails, or wildlife viewing areas.

Implementation of this alternative would be subject to the non-Federal sponsor agreeing to comply with the applicable federal laws and policies prescribed in the model Partnership Agreement for Authorized Structural Flood Risk Management Projects. The Flood Control District, the non-Federal sponsor, anticipates recreation operations and maintenance will be solely its responsibility. As such, recreation design and construction would be cost shared.

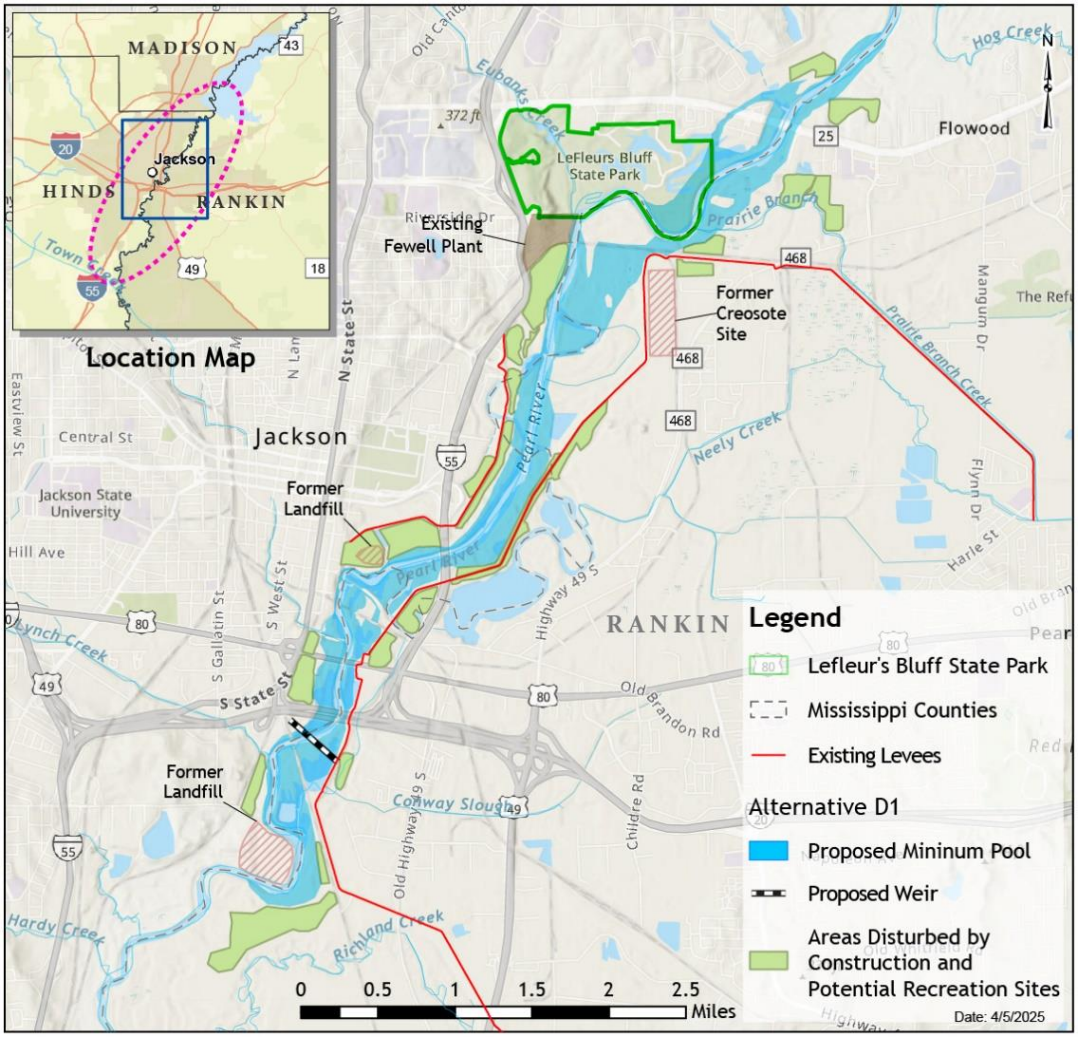

Figure 3-8: Potential Sites for Incidental Recreational Features

3.7 Pumping Needs at Existing Federal Levees

The existing levees contain drainage structures that allow water to drain from the interior of the leveed area when the Pearl River is low. When the Pearl River water level is high, the drainage structures are closed, and pump stations are used to pump water out of the leveed area. The original design of these features called for the drainage structure to handle a 1 percent AEP interior drainage flow, and the pumps were originally designed for a smaller event. Alternative D1 calls for the construction of a new weir with a minimum pool at elevation 256.0 ft. As a result, the drainage for the Jackson Fairgrounds Levee would always impound at least multiple feet of water on the structure and would no longer be able to operate via gravity flow in order to prevent the new lake from flooding the interior leveed areas. A new pump station will be constructed to pump these flows. The pump station flowrate required is up to 360 (cubic feet per second) CFS at 19 feet static head. The Jackson Fairgrounds also contains 2 sluice gates which will be permanently impounded. These structures will be grouted in or removed to reduce risk to levee. The proposed new weir was placed upstream of the east Jackson levee drainage structure, so the pool should not impact the operation of the drainage structure Savanna Street WWTP levee.

This is an existing non-federal levee that provides flood risk reduction to the Savanna Street WWTP near RM 282 (Jackson-East Jackson Flood Control Project NLDID: 14050000124).

An existing non-Federal levee protects the Savanna Street WWTP near RM 282. The levee would undergo additional upgrades, to ensure levee meets the items needed for certification for a 1 percent AEP flood event in advance of the channel widening construction. (Figure 3-9). The new Federalized levee around the WWTP consists of a 10-foot crown width with 1V on 3H landside and riverside slopes and slurry wall for seepage mitigation would be added. Additional pumps would not be needed since the existing pumps are being replaced as part of the Section 219 Environmental Infrastructure Program discussed in Section 1.5.2 of this report. To limit seepage, an 18-inch-wide cutoff wall will need to extend from Sta. 45+00 to 105+00 (approximately 6,000 linear feet). The cutoff wall will have an average depth of 40 feet (overall depths ranging from 30 to 45 feet).

Figure 3-9: Proposed Federalized Levee at Savanna WWTP

3.8 Operations and Maintenance (Channel, Weir, Seepage Berms, Fish Ladder, Levee updates)

Operations and Maintenance is ongoing for existing features within the Rankin-Hinds Area of Responsibility, additional Operations and Maintenance will be implemented for each constructed feature to USACE Standards. Existing Levee and Pumping Plant manuals will be updated. New features, such as the local levees, channel overbanks (Alternative E1) and the new weir and water body (Alternative D1) will require development of new O&M manuals. The district commander is responsible for developing an O&M manual for each project and separable element constructed under a separate project cooperation agreement (PCA), or functional portion of a project or separable element, reporting the status of the manual through the project management system as required by ER 5-7-1(FR). Normally, the Engineering Division will be assigned the overall responsibility for preparing a draft OMRR&R manual with appropriate inputs from other disciplines and, in consultation with the project sponsor, furnishing the draft manual to the project manager for coordination with the project sponsor, and preparing the final OMRR&R manual for approval. For a functional portion, the OMRR&R manual is an interim manual pending completion of the entire project or separable element. The major subordinate commander is responsible for review and approval of the manual. The project sponsor, normally through a permanent committee consisting of our headed by an official usually called the "superintendent" is responsible for carrying out the provisions of the OMRR&R manual. The OMRR&R manual will include

coverage of all OMRR&R subjects required by the PCA and existing regulations, in detail sufficient to ensure proper OMRR&R accomplishment by the project sponsor. Project sponsors, subject to review and approval of the district commander, may prepare supplements to the manual.

3.8.1 Levees Plan

3.8.1.1 Canton Club Levee

A levee segment of approximately 1.4 miles is proposed on the west bank of the Pearl River in northeast Jackson (Figure 3-10). This levee would provide additional flood risk reduction for approximately 100 acres of high density developed neighborhoods. This area is bounded on the north by the North Canton Club Circle and Beechcrest Drive on the South. It is estimated this would reduce flood risk for over 250 homes. The levee will range from natural high ground, to up to 9 feet high. Exact elevation will be set as the with-project 100-year flood event with 90 percent assurance levels in PED.

Figure 3-10: Proposed Canton Club Levee (orange line)

Some portions of the levee system could be more designed as a short floodwall due to space constraints, though further analysis would be required. Where smaller loadings occur, a berm may be an option. Typically, during a flood event on the Pearl River or its tributaries, rainfall occurs on

both the flood and protected slide of the levee. A means of draining for the rainfall runoff from the leveed area is required. The drainage area for local rainfall is less than 200 acres, and therefore it is assumed that much of the water can evacuate the system prior to peak stages on the Pearl River and its tributaries. There are three possible locations that will require interior gravity drainage structures along the Canton Club Levee. These structures will be 100' long, 36" reinforced concrete pipes with a flap gate closure. The structures will utilize existing ditches and will require minor earthwork.

Construction of the project will require relocations and/or improvements to various utilities and infrastructure (e.g. existing roadways or similar), and the creation of new habitat mitigation areas to offset losses within the project area.

3.8.1.2 McLeod Levee

A levee segment of approximately 2.3 miles is proposed on the west bank of the Pearl River in northeast Jackson. This levee would provide additional flood risk reduction for approximately 170 acres of high density developed neighborhoods. However, 2 homes constructed at the riverbank will have to be acquired for construction of this feature. This area ties into Old Canton Road on either end. The levee begins at the Old Canton Club at Purple Creek and extends downstream and back up a tributary to end at the intersection of Old Canton Club at White Oak Creek. Portions of this levee alignment may require floodwalls or additional acquisitions due to space constraints along White Oak Creek. It is estimated this would reduce flood risk for 415 homes. The levee will range from natural high ground, to up to 10 feet high. Exact elevations will be set as the with-project 100-year flood event with 90 percent assurance levels in PED.

Typically, during a flood event on the Pearl River or its tributaries, rainfall also falls behind the levee. The rainfall runoff needs a way to leave the leveed area. The drainage area for local rainfall is less than 300 acres, and therefore it is assumed that much of the water can evacuate the system prior to peak stages on the Pearl River and its tributaries. There are five possible locations that will require interior gravity drainage structures along the McLeod Club Levee. For the purposes of this study, these structures will be 50 feet long, 36" reinforced concrete pipes with a flap gate closure. The structures will utilize existing ditches, and they will require minor earthwork.

Some portions of the levee alignment could be designed as a short floodwall due to space constraints, though further analysis would be required. Where smaller loadings occur, a berm may be an option.

Construction of the project will require relocations and/or improvements to various public and private utilities and infrastructure, avoidance and minimization features required under the ESA, and the creation of new habitat mitigation areas to offset losses within the project's construction footprint areas.

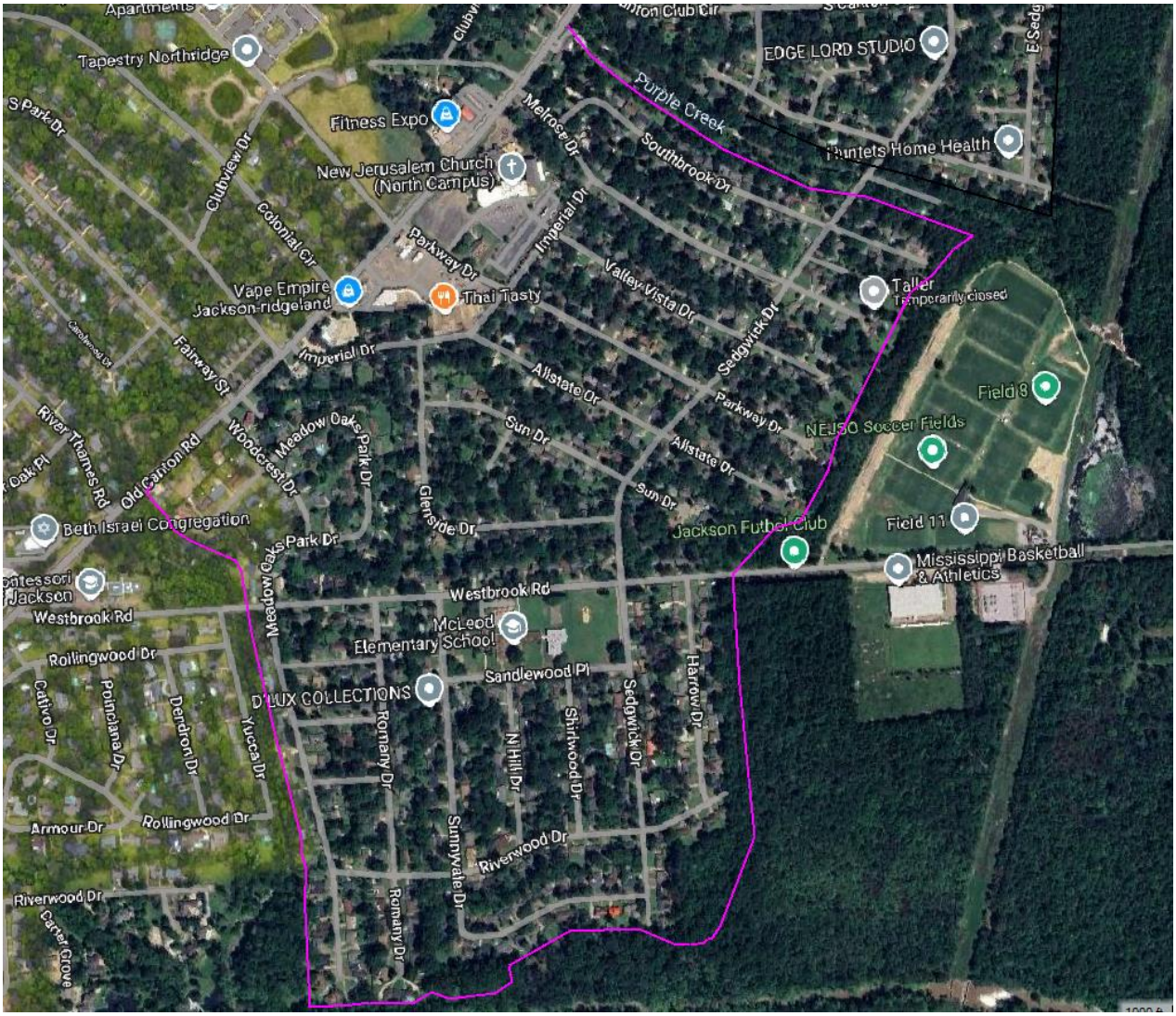

Figure 3-11: Proposed McLeod Club Levee (Purple Line)

3.8.1.3 Cany Creek Levee

A levee segment of up to 1.0 miles is proposed on the west bank of the Pearl River in south Jackson. It is likely that 1250 feet of this extent is limited in flow capacity due to the existence of Interstate 55, and therefore the levee would only be approximately 0.75 miles. This levee would provide additional flood risk reduction for approximately 137 acres of residential area. This area is bounded on the upstream end of Cany Creek near Terry Road and extends downstream to Interstate 55. It is estimated this would reduce flood risk for 40 homes. The levee will range from natural high ground, to up to 9 feet high. Exact elevations will be set as the with-project 100-year flood event with 90 percent assurance levels in PED.

Typically, during a flood event on the Pearl River or its tributaries, rainfall also falls behind the levee. The rainfall runoff needs a way to leave the leveed area. The drainage area for local rainfall

is less than 500 acres, and therefore it is assumed that much of the water can evacuate the system prior to peak stages on the Pearl River and its tributaries. There are five possible locations that will require interior gravity drainage structures along the Cany Creek Levee. For the purposes of this study, these structures will be 50 long, reinforced concrete pipes with a flap gate closure. The structures will utilize existing ditches, and they will require minor earthwork.

Construction of the project will require relocations and/or improvements to various public and private utilities and infrastructure, avoidance and minimization features required under the ESA, and the creation of new habitat mitigation areas to offset losses within the project's construction footprint areas.

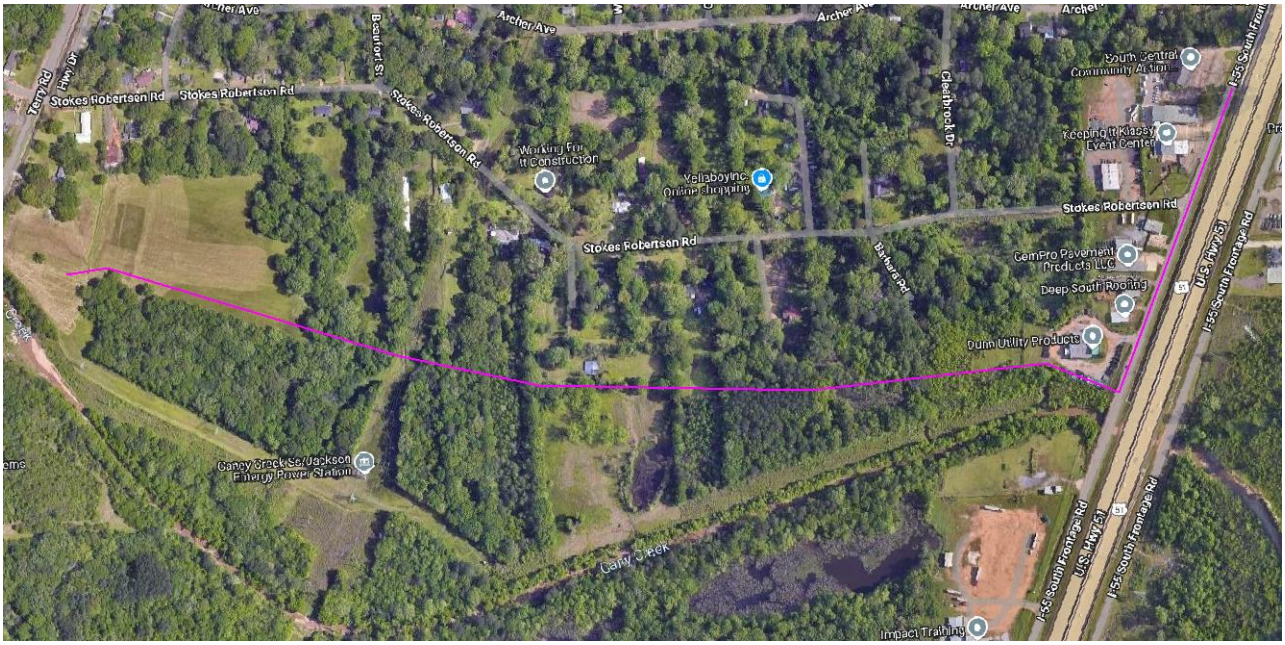

Figure 3-12: Proposed Cany Creek Levee (Purple line)

3.8.1.4 Richland Levee

A levee segment of approximately 1.15 miles is proposed on the east bank of the Pearl River in Richland. This levee would provide additional flood risk reduction for approximately 122 acres of industrial area. This area is bounded on the north by the Old Highway 49 just north of Walker Circle and Old Highway 49 near Wynn St. on the South. It is estimated this would reduce flood risk for 40 structures, mostly industrial. The levee will range from natural high ground, to up to 9 feet high. Exact elevations will be set as the with-project 100-year flood event with 90 percent assurance levels in PED.

Typically, during a flood event on the Pearl River or its tributaries, rainfall also falls behind the levee. The rainfall runoff needs a way to leave the leveed area. The drainage area for local rainfall is less than 175 acres, and therefore it is assumed that much of the water can evacuate the system

prior to peak stages on the Pearl River and its tributaries. There are six possible locations that will require interior gravity drainage structures along the Richland Levee. For the purposes of this study, these structures will be 50 foot long, reinforced concrete pipes with a flap gate closure. The structures will utilize existing ditches, and they will require minor earthwork.

Some sections of levee alignment could be designed as a short floodwall, typically an I or T wall, due to space constraints, though further analysis would be required. Where smaller loadings occur, a berm may be an option.

Construction of the project will require relocations and/or improvements to various public and private utilities and infrastructure, avoidance and minimization features required under the ESA, and the creation of new habitat mitigation areas to offset losses.

3.9 Borrow Plan

A borrow plan has not been developed at this stage of the analysis. It is conceivable that there is enough borrow material from the material excavated but it is unknown at this time if the material is suitable for constructing levees. Should the excavated material be determined to be unsuitable, borrow material would need to be identified for construction of any levees. There is potential borrow sources within close proximity of the Project Area (10-mile radius). Reference Figure 3-8 for potential source. Borrow opportunities would be further investigated during PED and a supplemental NEPA document would be prepared at that time.

3.10 Operations and Maintenance (All Levees)

Operations and Maintenance will be implemented for each constructed feature to USACE Standards. The district commander is responsible for developing an OMRR&R manual for each project and separable element constructed under a separate project cooperation agreement (PCA), or functional portion of a project or separable element, reporting the status of the manual through the project management system as required by ER 5-7-1(FR). Normally, the Engineering Division will be assigned the overall responsibility for preparing a draft OMRR&R manual with appropriate inputs from other disciplines and, in consultation with the project sponsor, furnishing the draft manual to the project manager for coordination with the project sponsor, and preparing the final OMRR&R manual for approval. For a functional portion, the OMRR&R manual is an interim manual pending completion of the entire project or separable element. The major subordinate commander is responsible for review and approval of the manual. The project sponsor, normally through a permanent committee consisting of our headed by an official usually called the "superintendent" is responsible for carrying out the provisions of the OMRR&R manual. The OMRR&R manual will include coverage of all OMRR&R subjects required by the PCA and existing regulations, in detail sufficient to ensure proper OMRR&R accomplishment by the project sponsor. Project sponsors, subject to review and approval of the district commander, may prepare supplements to the manual.

3.11 Mitigation Component

Habitat Mitigation would be achieved by implementing Corps constructed mitigation projects and/or purchasing of mitigation bank credits. Further planning and analysis would be completed

during PED to determine which strategies, stand alone, or combined, would fully compensate for habitat impacts.

Mitigation features may be required for the Creosote Slough that is located within the Project Area. The site, or portions thereof, may require avoidance, remediation, or some other mitigating features. Groundwater controls and a slurry wall may be appropriate remedial actions in this event. Final remedial designs would be coordinated with appropriate Federal and State agencies to determine necessary actions to prevent and/or eliminate potential leaching of chemicals to the groundwater and movement of groundwater into the proposed channel improvement area prior to the initiation of excavation activities at this location.

Coordination with appropriate local, State, and Federal agencies would determine site actions to eliminate potential leaching of landfill waste to the groundwater and movement of groundwater into the proposed channel improvement.

3.12 Comparison of Level of Flood Risk Reduction

Alternative A1 would accrue flood annual damage reductions of $1.8 Million, approximately 10 percent of the without-project damages. Alternatives D1 and E1 would accrue expected annual damage (EAD) reductions of $ 19.7 Million, approximately 70 percent of the without-project EAD of $27.9 Million.

3.12.1 Alternative A1

Preliminary economic analysis identified Alternative A1 as the potential NED Plan. However, significant implementation risks associated with Alternative A1 are described below hinder Alternative A1 from being recommended within the DEIS. Due to these reasons, Alternative A1 is screened from further consideration within the DEIS.

3.12.1.1 Assumed Participation Rate

Participation rates for eligible property owners in structure elevation programs have been shown to vary considerably. The ongoing structure elevation program associated with the Southwest Coastal study in southwest Louisiana is currently tracking at approximately 80%. However, pilot programs across a thirty-year period in the Cumberland Basin in Tennessee have stayed at a consistent 50%.

3.12.1.2 Ineligible Costs

Not all implementation costs will be borne by the Federal Government and/or Non-federal Interest. The required non-structural alternative implementation agreement will obligate structure owners to expend any and all costs that may be necessary in connection with the elevation of the structure which are not deemed “eligible costs”. Ineligible project costs include:

- Any structural and system repair due to existing deficiencies.
- Modifications or improvements to a septic system except for extension of lines from the raised structure.

- Cost for elevation above the identified target design elevation.
- Modifications to structures that are NOT attached to the eligible residential or commercial structure.
- Modifications to tubs, pools, spas, hot tubs, and related structures or accessories
- Modifications to decks and patios not connected to or immediately adjacent to the structure except for modifications that are expressly required by building codes.
- Proper remediation, removal and disposal or environmental contaminants including but not limited to HTRW, asbestos, and asbestos-containing materials in damaged for friable form.
- Costs associated with bringing a non-conforming structure into compliance with current building code, housing code, and/or other applicable codes.
- Costs associated with special access improvements, aside from those covered by the Americans with Disabilities Act (ADA), that are not deemed eligible; and
- Improvements to structures not considered the primary residence.

Significant portions of the Study Area have been identified as low-income communities; therefore, it is likely that some structure owners may not have the financial ability to address any potential additional, ineligible project costs. Preliminary visual assessment of the residences within the Project Area has indicated that many of these structures may require rehabilitation to be eligible to participate in the non-structural alternative. The potential owner-borne costs may prevent structure owners from participating thereby reducing the effectiveness provided by the non-structural plan.

3.12.2 CTO Alternatives (D1 and E1)

3.12.2.1 Economic Comparison

Of the remaining implementable alternatives assessed (i.e., Alternatives D1 and E1), the economic summary contained within Table 3-3 indicates that the CTO without Weir Alternative provides the highest net benefits when assuming high costs, and therefore could be considered as the NED plan. Costs developed in this estimate are detailed in Appendix R, and include construction, relocations, design, construction management, and mitigation of each project feature.

Table 3-3: Summary of Economic Assessment at FY25 Price Level and Discount Rate

	D1		E1	
	High Cost	**Low Cost**	**High Cost**	**Low Cost**
Project First Cost	$917,847,000	$873,079,000	$753,374,000	$708,301,000
Interest During Construction	$41,995,630	$39,947,300	$34,470,250	$32,408,000
Total Investment Cost	$959,842,630	$913,026,300	$787,844,250	$740,709,000
Average Annual Cost	$37,304,800	$35,485,200	$30,619,956	$28,788,020
Average Annual O&M Cost	$730,000	$730,000	$197,000	$197,000
Total AA Cost	$38,034,800	$36,215,200	$30,816,956	$28,985,020
Damages Reduced	$19,746,640	$19,746,640	$19,766,090	$19,766,090

Recreation Benefits	$5,438,700	$5,438,700	$5,438,700	$5,438,700
Total Benefits	$25,185,340	$25,185,340	$25,204,790	$25,204,790
Net Benefits	($12,849,460)	($11,029,860)	($5,612,166)	($3,780,230)
BC Ratio	0.7	0.7	0.8	0.9

3.12.2.2 Ancillary Benefits

Alternatives D1 and E1 would also produce additional incidental recreational benefits which would further meet the National Economic Development objective. Both Alternatives D1 and E1 have the potential to support incidental recreational features to include boat ramps, boating, camping, fishing piers, nature/hiking trails, and/or wildlife viewing (Figure 3-13 and 3-14).

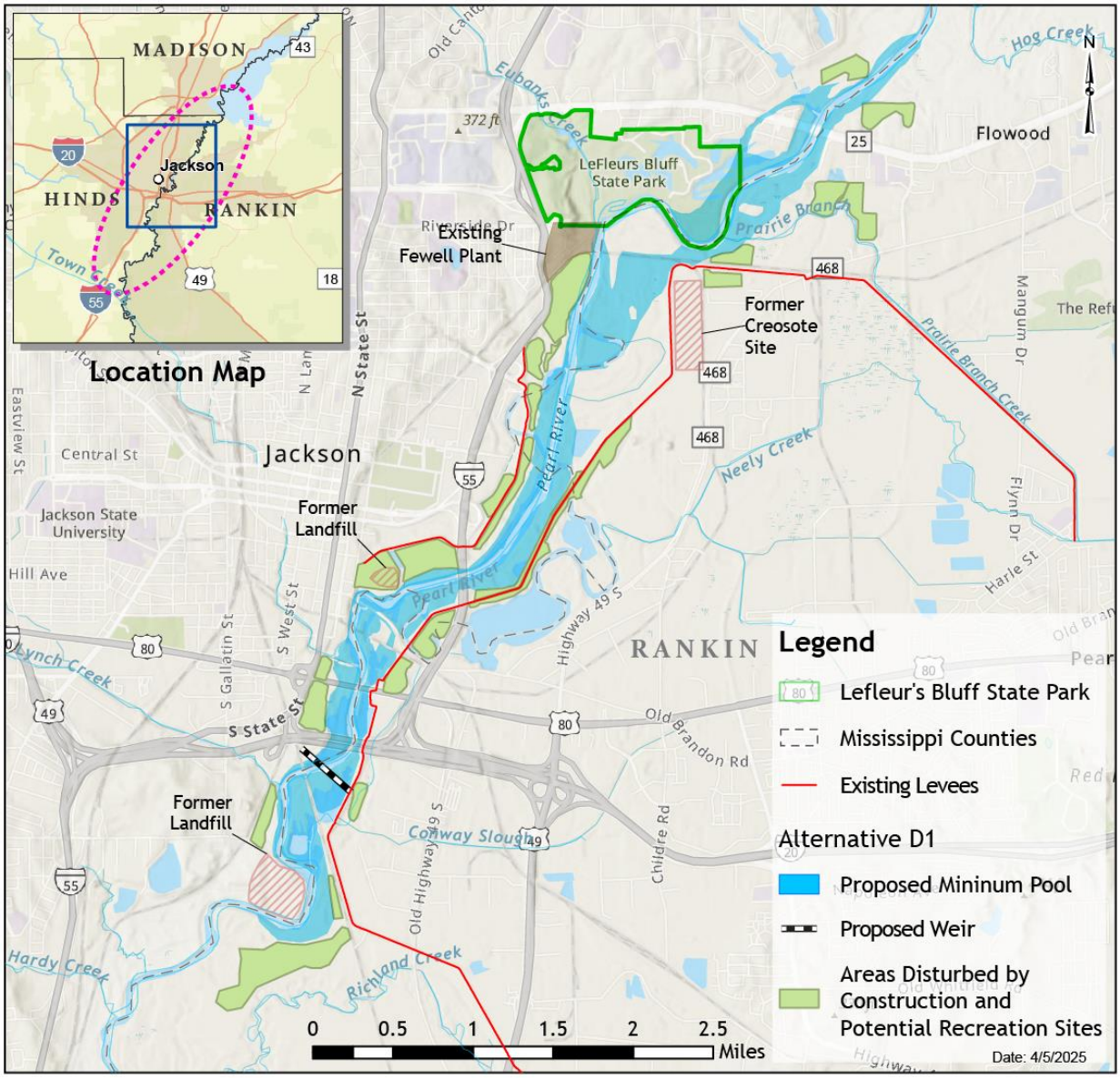

Figure 3-13: Alternative D1 Potential Sites for Recreational Opportunities

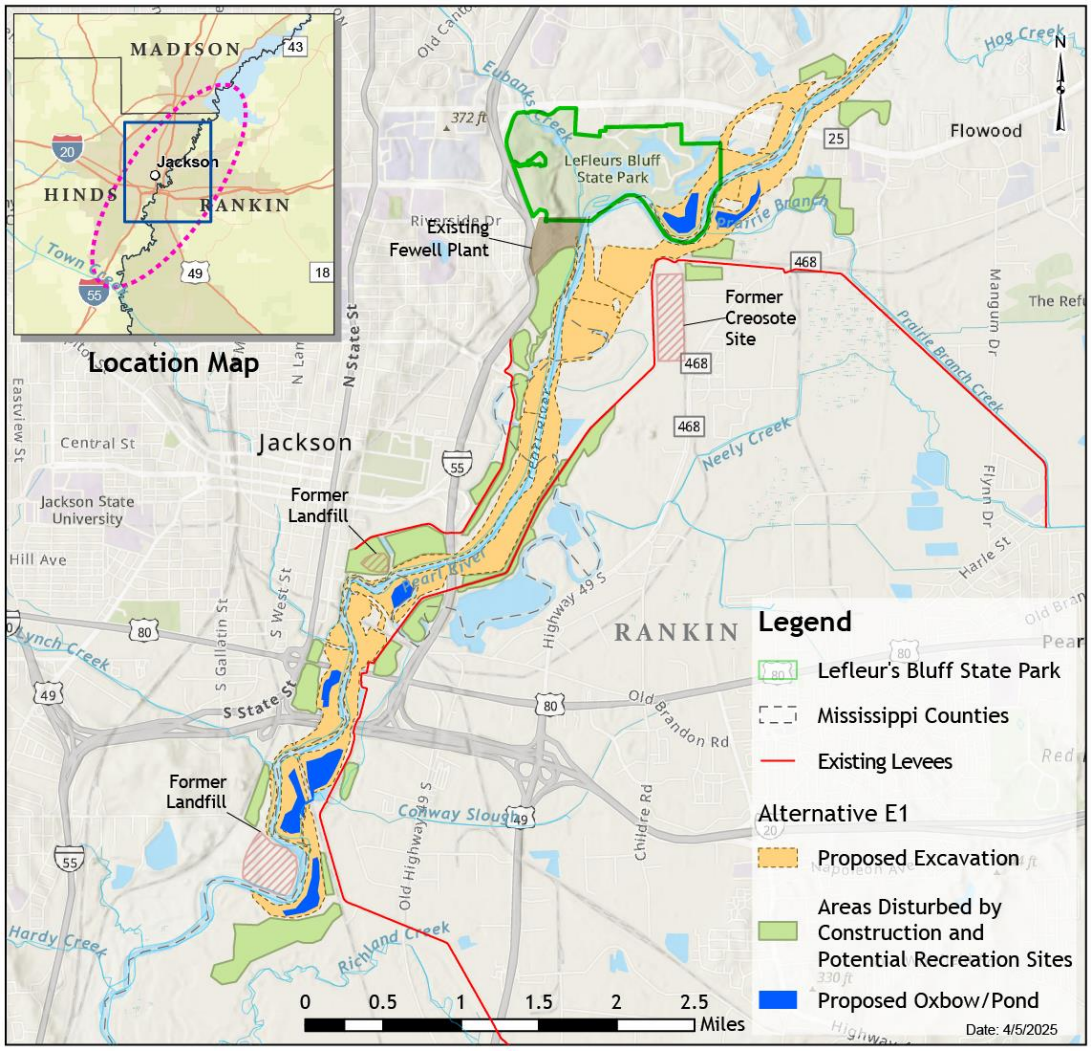

Figure 3-14: Alternative E1 Potential Sites for Recreational Opportunities

3.12.3 Additional Considerations

3.12.3.1 Flood Event Impacts to Roadways and Accessibility

Non-structural features will not be applied to transportation infrastructure and Structural features will partially address impacts to roadways and associated accessibility. The City of Jackson has identified over 50 streets within the city impacted by various flood events associated with the Pearl River. Should a non-structural plan be implemented, eligible and participating structures would have risk reduction benefits. A structural plan will reduce the risk of flooding on some currently impacted streets. However, the potential for residents being unable to return due to impassable roadways during and post event, preventing them from accessing properties for the extent of the flood event, will remain to varying degrees. Certain roadways impacted by flood events may also render emergency facilities inaccessible and inhibit emergency services from accessing structure owners or residents who attempt to return to or choose to remain in their residence. Alternative D1 or E1 could improve these issues in areas that benefit from flood risk reduction.

3.12.3.2 Flood Event Impacts to Water Supply

The City of Jackson has experienced numerous water-related crises associated with flood events including water treatment plant failures, and the inability to provide safe drinking water for residents for extended periods of time post-event. A recent event in 2022 resulted in state of emergency and federal disaster declarations, and approximately 160,000 residents were impacted by water supply disruption. (This event was triggered due to sedimentation issues outside of the Project Area.) Structural plans would also not eliminate certain operational flood risks previously experienced by the existing water supply infrastructure. As a result, residents may still be unable to return to or utilize their residences due to the lack of adequate drinking water should the water supply continue to be impacted. Further water quality and sedimentation studies will need to be performed to determine the potential for impacts from sewer overflows, storm sewer drainage, contamination during high floods, and sedimentation related to water treatment and supply for any identified plan.

3.12.3.3 Flood Event Impacts to Sewage System

The sewage system of the City of Jackson is also impacted by flood events. There are documented, repeated overloading of the sewage system, which have resulted in sewage overflows through open culverts into the Pearl River and adjacent waterways. Both the non- structural and structural plan provide some limited reduction in exposure to sewage overflows. Non-structural by lifting participating structures above water levels, and structural by reducing the footprint of flood inundation. However, residents participating in the non-structural plan may be unable to return to or utilize their residences, regardless of reduced exposure, due to the lack of functioning sewage systems, and/or the health hazards associated with potential exposure to raw sewage from flood related overflows in the vicinity of their properties. The Alternative D1 or E1 could improve these issues in areas that benefit from flood risk reduction.

SECTION FOUR

4 Environmental Consequences

In accordance with NEPA, this section includes the scientific and analytic basis for comparison of the alternatives A1, D1, E1, and the "No-Action" Alternative. The alternatives are assessed for their potential impacts on the relevant resources discussed in Section 2.

The discussion includes an analysis of potential beneficial and adverse effects on the resources, including a discussion of direct, indirect, and cumulative impacts, the relationship between short-term uses and long-term productivity, and any irreversible or irretrievable commitments of resources.

The alternatives assessed in this RDEIS include the no action alternative and the USACE developed alternatives discussed in Section 3. These alternatives include the nonstructural alternative with the Canton Club (Alternative A1); Alternative D1 a modified FRM plan from the original NFI section 211 report that includes a weir, and Alternative E1 a modified FRM plan from the original NFI section 211 report that does not include a weir.

The alternatives described in Section 3.8 were used to assess potential resource impacts that could occur if this combination of features were selected. At this phase of the study, the analysis of Alternative A1, D1, and E1 are preliminary and based off the information currently on hand. Further analysis and a supplemental NEPA document would be necessary to fully assess the alternative selected for construction, including any potential compensatory mitigation in the next phase of the study. The alternatives are assessed for potential impacts with a new weir and without a weir since construction of the weir does not provide any flood risk reduction benefits but does provide opportunity for recreational benefits if constructed. The level of analysis is commensurate with the level of data and information available at this time.

Table 4.1 presents a detailed comparison of specific features for each alternative within the RDEIS. It includes material quantities along with their respective units.

Table 4-1: Final Array of Alternatives Comparison

Feature	ALT D1	ALT E1	Units
	Quantity	Quantity	
STRUCTURAL			
Channel Overbank Improvements			
Clearing and Grubbing	954	954	acres
Excavation Area	954	954	acres
Excavation Volume	1.17	1.17	MCY

Feature	ALT D1	ALT E1	Units
	Quantity	Quantity	
Acquisitions/Right of Way	Xx xx	Xx xx	Structures Acres
EXCAVATED MATERIAL PLAN			
Clearing and Grubbing	523	523	acres
Fill Area	523	523	acres
FEATURES CREATED DUE TO EXCAVATION			
Hard Point in tributary channels to prevent tributary incision	525	525	Feet (crossing river)
Stabilization or armoring for bridge abutments	7	7	bridges
Stabilization or armoring for RR bridge abutments	1	1	bridges
Slurry Wall Savanna Street WWTP	6,000	6,000	feet
Savanna Street WWTP Levee Raise	N/A	N/A	Levee was verified by to have sufficient height
J H Fewell and Mays Lake Armoring	98,000	98,000	Tons-rock
WEIR AND ASSOCIATED FEATURES			
Weir and new gate	1	0	each
Lake Area	1556	0	acres
Seepage Jackson East	1	0	each
Seepage Jackson Fairgrounds	1	0	each
Pump Station	360	0	cfs
Other interior drainage features – Existing Levee Jackson East Fairgrounds	1	0	each
LEVEE FEATURES			
Canton Club Levee	1.4	1.4	miles
McLeod Levee	2.3	2.3	miles
Richland Levee	1.15	1.15	miles
Cany Creek Levee	0.75 to 1	0.75 to 1	miles
RECREATIONAL FEATURES			
Utility Relocation	1	1	each
RV, Tent Camping	150	150	each
Fishing Piers	6	6	each
Boat Ramp and Parking	6	6	lane

Feature	ALT D1	ALT E1	Units
	Quantity	Quantity	
Trails	79,000	79,000	linear feet
OPERATIONS AND MAINTENANCE			
Weir and new gate	1	0	each
Fish Passage	1	0	each
Lake (sediment/vegetation)	1	0	each
Upgraded Interior Drainage	1	0	each
Rock Armoring	0	1	each
New Levee Systems	4	4	each
Forested Wetlands and Uplands Habitat Monitoring	11	11	events
Lacustrine Habitat Monitoring	0	10	events
Riverine Habitat Monitoring	10	0	events
Sandbars Monitoring	6	0	events
Monitoring and adaptive management of fish passage channel			
Recreational Features	1	1	each
MITIGATION			
T&E-Fish Passage	5000-6000	0	feet
Replacement of obsolete aquatic barrier(s) (riverine mitigation)	1	0	structure
Oxbows and Ponds (Lacustrine Mitigation)	0	105	acres
Forested Wetlands and Uplands Mitigation	5,512-11,612	5,512-11,612	acres
T&E- Sandbar surveys within construction area(s) every 2-days during construction and the nesting season (May 1 – October 3) (90/year)	90	0	events/year
T&E- Capture, tag, and relocation of listed turtles	827	0	turtles
T&E - Incubation of listed turtle eggs. Raise juveniles for at least one year, release	408	103	turtles
T&E- Riverbank preservation	10	0	River Miles
T&E- Revegetate riverbanks/lake edges	42	77	acres
T&E- Sandbars (material from excavation)	31	0	acres
T&E- Species monitoring of	3	0	events

Feature	ALT D1	ALT E1	Units
	Quantity	Quantity	
Gulf sturgeon (GS)			
T&E- Water velocity monitoring	10	0	events
T&E- Water quality monitoring	6	0	events
T&E- sedimentation analysis	1	1	study

4.1 Summary of Environmental Consequences

Table 4-2 is a summary table of the potential environmental consequences by resource for each alternative considered. The No Action plan alternative would result in a continuation of existing trends and is not included in the table. However, the No Action is included in the assessment of impacts throughout this section for a comparative analysis.

Table 4-2: Summary of Potential Environmental Consequences by Resource

Resources	Alt A1: USACE Nonstructural Plan with Canton Club Levee	Alt D1 (with weir):	Alt E1 (without weir):
Wetland	D/I/C = (-/0/-)	D/I/C = (-/-/-)	D/I/C = (-/-/-)
Forested Uplands	D/I/C = (-/0/-)	D/I/C = (-/-/-)	D/I/C = (-/-/-)
Aquatic Fisheries	D/I/C = (-/-/-)	D/I/C = (-/-/-)	D/I/C = (-/-/-)
Wildlife Resources	D/I/C = (-/-/-)	D/I/C = (-/-/-)	D/I/C = (-/-/-)
T& E; Protected Species	D/I/C = (0/0/0)	D/I/C = (-/--/-)	D/I/C = (-/-/-)
Soils; P&U Farmlands	D/I/C = (0/0/0)	D/I/C = (0/0/0)	D/I/C = (0/0/0)
Cultural Resources	D/I/C = (-/-/-)	D/I/C = (-/-/-)	D/I/C = (-/-/-)
Recreation	D/I/C = (0/0/0)	D/I/C = (+/+/+)	D/I/C = (+/+/+)
Aesthetics	VRAP not completed; could be – or +	VRAP not completed; could be – or +	VRAP not completed; could be – or +
Air Quality	D/I/C= (0/0/0)	D/I/C = (-/0/0)	D/I/C = (-/0/0)
Noise Quality	D/I/C= (-/-/-)	D/I/C = (-/-/-)	D/I/C = (-/-/-)
H&H Resources	D/I/C = (0/0/0)	Sediment study not completed; could be – with weir/impoundment	without weir could be (+/0/-)

Water Quality	D/I/C = (0/0/0)	Depending on ASA's Selection of Features. Water Quality analysis is not complete, could be – or +	Water Quality analysis is not complete, could be – or +
Water Supply	D/I/C = (0/0/0)	Availability: +++; quality needed to be able to use for water supply --	D/I/C = (0/0/0)
Socioeconomics	Not complete; could be D/I/C = (0/0/0)	Incomplete information to assess; could be D/I/C = (+/+0/0)	Incomplete information to assess; could be D/I/C = (+/+0/0)
HTRW	D/I/C= (+-/0/0)	Incomplete information to assess, could be D/I/C = could be – or +. HTRW Phase I was not conducted;	Incomplete information to assess, could be D/I/C = could be – or +. HTRW Phase I was not conducted;
Greenhouse Gas	Incomplete, could be – or +	Incomplete information to assess, could be D/I/C = – or +	Incomplete information to assess, could be D/I/C = – or +

D/I/C = Direct, Indirect, Cumulative Impacts Positive Impacts are denoted by + Negative impacts are denoted by –No impacts are denoted by 0

4.2 Relevant Resources

Prior drafts of this report included an Environmental Justice assessment which was consistent with the requirements of NEPA (PL 91-190), Section 122 of the River and Harbor Act of 1970 (PL 91-611) and other essential considerations of national policy including, Executive Order 12898 and the more recent Executive Orders (EOs) signed by President Biden, EOs 13985, 14008 and 14096. All three of the Executive Orders direct Federal agencies to identify and address adverse, disproportionate impacts to communities with Environmental Justice (EJ) concerns and to engage with the community in those efforts. Environmental Justice considerations have been removed from the current draft report in accordance with President Trump's EO 14173, titled "Ending Illegal Discrimination and Restoring Merit-Based Opportunity", EO 14148, titled "Initial Rescissions of Harmful Executive Orders and Actions", and EO 14151, titled "Ending Radical and Wasteful Government DEI Programs and Preferencing".

4.2.1 Wetland Resources

4.2.1.1 No Action Alternative – Future without Project Condition

Past impacts to wetland habitats (including the historically predominant bottomland hardwood habitat) have occurred from development activities in and around the Project Area. Without action, wetlands within the Project Area would likely continue to persist as described in the affected environment, Section 2, and experience the effects of ongoing urbanization and maintenance activities (e.g., mowing and silviculture) as well as changing river conditions.

4.2.1.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

With implementation of this alternative, approximately 1.5 acres of BLH habitat would be directly impacted with the construction of levees. Indirect impacts to wetlands are not anticipated as the proposed levee borders developed areas. The direct adverse impacts are considered insignificant due to such minimal impacts that would be mitigated in kind to fully compensate for these impacts. These impacts would be minor in intensity and potentially long-term in duration. Cumulative impacts of the alternative along with additional impacts from other previous projects in the area are anticipated to be major in intensity and long-term in duration. Impacts to wetlands from Alternative A1 would add to the impacts that have occurred over time and are expected to continue due to ongoing development and activities in and around the Project Area. Mitigation actions would be developed in coordination with the resource agencies and the NFI to fully compensate for the impacts from Alternative A1. With Alternative A1, wetlands within the Project Area (including the historically predominant bottomland hardwood habitat) would likely continue to decline as result of ongoing urbanization, changing river conditions, and continued maintenance associated with flood control. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.1.3 Alternative D1 (With Weir)

Construction, particularly excavation and fill, would directly impact approximately 689 acres of BLH and approximately 55 acres of swamp habitat. Construction of Alternative D1 would transition these acres to open water (lacustrine) habitat and unvegetated uplands. The NFI has coordinated with the adjacent Mississippi Department of Transportation (MDOT) PRB mitigation bank and has determined that there would be no direct impacts.

Indirect impacts and associated mitigation requirements to wetlands, including the MDOT PRB mitigation bank (Fannye Cook Natural Area), will be determined and quantified in subsequent phases using a certified model and would consider wetland impacts up to the 5-year floodplain as this would provide a more conservative estimate of the nature and magnitude of potential wetland impacts.

Cumulative impacts, including both direct and indirect impacts of the alternative along with additional impacts from other, previous projects in the area, are anticipated to be major in intensity and long-term in duration. Impacts to wetlands from Alternative D1 would add to the impacts that have occurred over time and are expected to continue due to ongoing development and activities in and around the Project Area. With Alternative D1, wetlands within the Project Area (including the historically predominant bottomland hardwood habitat) would likely continue to decline as result of ongoing urbanization, changing river conditions, and continued maintenance associated with flood control.

The adverse impacts are considered significant. However, mitigation actions would fully compensate for these impacts; therefore, these impacts would be offset.

4.2.1.4 Alternative E1 (Without Weir)

Direct, indirect, and cumulative impacts to wetlands due to implementation of Alternative E1 would be similar to those discussed for Alternative D1 as excavation and fill would still take place. However, the acres directly impacted would not be converted to open water, but to floodplain meadow and unvegetated uplands.

4.2.2 Forested Uplands

4.2.2.1 No Action Alternative – Future without Project Condition

With the No Action Alternative, no action would be taken to lessen or worsen the current trend of impacts discussed in section 3.2.1.3 and therefore that current trend would likely continue and so would the destruction of this habitat.

4.2.2.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

With implementation of this alternative, approximately 9 acres of forested upland habitat would be directly impacted with the construction of levees. Indirect impacts to forested uplands are not anticipated. The direct adverse impacts are considered insignificant due to such minimal impacts that would be mitigated in kind to fully compensate for these impacts. These impacts would be minor in intensity and potentially long-term in duration. Cumulative impacts of the alternative along with additional impacts from other previous projects in the area are anticipated to be major in intensity and long-term in duration. Impacts to forested uplands from Alternative A1 would add to the impacts that have occurred over time and are expected to continue due to ongoing development and activities in and around the Project Area. Mitigation actions would be developed in coordination with the resource agencies and the NFI to fully compensate for the impacts from Alternative A1. With Alternative A1, forested uplands within the Project Area would likely continue to decline as result of ongoing urbanization, changing river conditions, and continued maintenance associated with flood control. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.2.3 Alternative D1 (with Weir)

Approximately 260 acres of forested uplands are anticipated to be directly impacted due to excavation (clearing) and fill activities. Construction of Alternative D1 would transition these acres to open water (lacustrine) habitat and unvegetated uplands. Indirect impacts to forested uplands associated with Alternative D1 would be the potential introduction of water onto once dry habitat adjacent to the Project Area. Indirect impacts will be quantified in subsequent phase(s). Cumulative impacts, including direct and indirect impacts of the alternative along with additional impacts from other, previous projects in the area are anticipated to be major in intensity and long-term in duration. Impacts to forested uplands from Alternative D1 would add to the impacts that have occurred over time and are expected to continue due to ongoing development and activities in and around the Project Area. With Alternative D1, forested uplands within the Project Area would likely continue to decline as result of ongoing urbanization, changing river conditions, and continued maintenance associated with flood control.

The direct adverse impacts are considered significant. However, mitigation actions would fully compensate for these impacts and therefore the significance of the impacts would be offset.

4.2.2.4 Alternative E1 (Without Weir)

Direct, indirect, and cumulative impacts to forested uplands due to implementation of Alternative E1 would be similar to those discussed for D1 as excavation and fill activities would still take place. However, the acres directly impacted would not be converted to open water, but to floodplain meadow and unvegetated uplands.

4.2.3 Aquatic and Fisheries Resources and Water Bottoms

4.2.3.1 No Action Alternative – Future without Project Condition

The no action alternative would likely not have a large impact on aquatic resources or water bottoms. The current trend of urbanization in the area could lead to increased nutrients from runoff, leading to decreased water quality. Additionally, it is not likely urban sprawl would impact available aquatic habitat, due to the frequent flooding that occurs in the area. Based on historical imagery, the riverbanks and rate of meander migration in the Study Area appear to be relatively stable. Therefore, it is not expected that the river and subsequent water bottoms would change dramatically over time. The current available habitat would likely remain unchanged and support the present aquatic species.

4.2.3.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

For Alternative A1, this plan could potentially result in direct, indirect, and cumulative impacts to aquatic resources. Potential direct impacts from the construction of levee segment would include the conversion of fisheries habitat to levees and their associated structures. Possible indirect affects would be disconnecting adjacent wetlands from hydrological connectivity. The levee would prevent seasonally flooding and impede the flow of small streams. The direct and indirect adverse impacts are considered insignificant due to minimal impacts that would be mitigated in kind to fully compensate for these impacts. These impacts would be minor in intensity and long-term in duration.

Cumulative impacts, including both direct and indirect impacts of the alternative along with additional impacts from other previous projects in the area are anticipated to be minor in intensity and long-term in duration. Impacts to fisheries and aquatic resources from Alternative A1 would add to the impacts that have occurred over time and are expected to continue due to ongoing development and activities in and around the Project Area. Mitigation actions would be developed in coordination with the resource agencies and the NFI to fully compensate for the impacts from Alternative A1. With Alternative A1, fisheries habitat within the Project Area would likely continue to decline as result of ongoing urbanization, changing river conditions, and continued maintenance associated with flood control. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.3.3 Alternative D1 (With Weir)

The impacts to fisheries and aquatic resources are similar to those from Alternative C found within Appendix Q, section 4.2.1.1.11. It is assumed that Alternative D1 will still result in the loss of all riverine habitat, and the direct, indirect, and cumulative impacts will be similar except for the additional impacts caused by the construction of the McCleod, Richland, and Cany Creek levees and their associated features. Alternative D also includes the construction of hardpoints at the tributaries as they enter the river to prevent erosion. These additional construction activities will displace mobile aquatic species and may smother sessile species. Temporary impacts due to increased turbidity may also occur. Overall, this alternative will still cause major long-term negative impacts to fisheries and aquatic resources.

The direct adverse impacts are considered significant. However, mitigation actions would fully compensate for these impacts and therefore the significance of the impacts would be offset.

4.2.3.4 Alternative E1 (Without Weir)

Impacts from Alternative E1 will be similar to Alternative D1, but it will not include the construction of a new weir. This will preserve the riverine habitat in low to normal water levels. During high water events, aquatic species will be able to temporarily use the space created by excavation as lacustrine habitat, but benthic species would not likely utilize the maintained turf as habitat. The excavation activities will still have a negative long-term effect on the riparian habitat around Pearl River. Impacts to lacustrine habitat from excavation will be mitigated through the creation of oxbow lakes and/or ponds. Additionally, instream habitat restoration may be included as part of this project as design maturity increases. Overall, this alternative will cause minor long term negative impacts to fisheries and aquatic species.

4.2.4 Wildlife

4.2.4.1 No Action Alternative – Future without Project Condition

Several wildlife species would likely be impacted by continued degradation of ecosystem structure and function due to ongoing urban growth and development adjacent to the Project Area. As urban growth continues, overall suitable wildlife habitat and the quality of that habitat within the Project Area would likely be further reduced following recent trends.

Ongoing maintenance within the Project Area associated with flood control would also continue to impact wildlife habitat quality and availability. Feral hogs are expected to spread throughout the Project Area in coming years and could further damage habitat quality and compete with other native wildlife species for available habitat and other resources.

4.2.4.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

With implementation of this alternative, approximately 10.5 acres of wildlife habitat would be directly impacted with the construction of levees. This habitat would no longer be available for use by wildlife discussed in section 2.1.11. Indirect impacts to wildlife would be displacement due to loss of habitat. The direct and indirect adverse impacts are considered insignificant due to

available adjacent habitat and such minimal impacts that would be mitigated in kind to fully compensate for the loss. These impacts would be minor in intensity and potentially long-term in duration.

Cumulative impacts of the alternative on wildlife would be the direct and indirect impacts of the project in addition to impacts that have occurred over time and are expected to continue due to ongoing development and activities in and around the Project Area. Mitigation actions would be developed in coordination with the resource agencies and the NFI to fully compensate for the impacts from Alternative A1. With Alternative A1, wildlife within the Project Area would likely continue to be displaced as result of ongoing urbanization, changing river conditions, and continued maintenance associated with flood control. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.4.3 Alternative D1 (With Weir)

With implementation of this alternative, approximately 998 acres of wildlife habitat would be directly impacted by excavation, fill activities, and the construction of levees. This habitat would no longer be available for use by wildlife discussed in section 2.1.11. Indirect impacts to wildlife would be displacement due to loss of habitat and potential fatalities due to vehicular strikes and human interaction. Construction of Alternative D1 would likely eliminate riverine habitat that many aquatic species depend on. For this draft, a conservative approach is being taken and therefore this alternative is expected to have the same direct, indirect, and cumulative impacts as Alternative C found within Appendix Q, section 4.2.1.1.15. However, these impacts would be to a lesser degree as approximately 232 acres of riverine habitat would be converted to lacustrine habitat. Wildlife dependent on riverine system ecology would suffer with this conversion. Velocity analysis, like that conducted for Alternative C, will be conducted to better understand the potential impact of Alternative D1 on the riverine system. This data will be conducted and included in subsequent phase(s). These impacts are considered significant and long-term. However, mitigation actions would fully compensate for these impacts; therefore, these impacts would be offset.

4.2.4.4 Alternative E1 (Without Weir)

Direct and indirect impacts to wildlife from this alternative would be similar to those for Alternative D1. Excavation for channel improvements and the use of fill areas for dredge disposal would result in permanent loss of habitat and associated resources that would be long term as the excavated and fill areas would not be revegetated. However, the wildlife dependent on riverine system ecology would not be impacted as the Pearl River would continue to function as a riverine system except in high water events. This would not be much different from the current conditions during high water events and the impacts would be temporary and to a much lesser extent than with a weir.

The conversion of existing wildlife habitats within the Project Area would result in cumulative, adverse impacts that would be moderate in intensity and long-term in duration. Impacts to wildlife from Alternative E1 would add to continued degradation of ecosystem structure and function

expected from ongoing urban growth and development adjacent to the Project Area. Ongoing maintenance within the Project Area associated with flood control would also continue to impact wildlife habitat quality and availability, including contributing to increases in invasive species such as feral hogs. These impacts are considered significant and long-term. However, mitigation actions would fully compensate for these impacts; therefore, these impacts would be offset.

The Service recommended some restoration features under ESA Section 7(a)(1) for Alternative E. Those features include protection, enhancement, or creation of instream habitat such as shoals, gravel bars, woody debris, and sandbars as well as reforestation of the riparian buffer along the Pearl River within the Project Area. If these features are implemented, various wildlife species would likely benefit from this alternative as the features would provide suitable habitat for various species and uses. These features will be considered in subsequent phase(s).

4.2.5 Threatened, Endangered and Protected Species Gulf sturgeon (GS)

4.2.5.1 No Action Alternative

With the No Action Alternative, no action would be taken to address the stressors causing the current trend discussed in section 3.2.1.8 and therefore the decline of Gulf sturgeon numbers would likely continue.

4.2.5.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

Alternative A1 would have no direct, indirect, or cumulative impacts or benefits to Gulf sturgeon. Based upon literature review and available survey data, the USACE has determined that implementation of Alternative A1 would have no effect on the Gulf sturgeon. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.5.3 Alternative D1 (With Weir)

It is assumed that construction of Alternative D1 would likely eliminate riverine habitat that the GS depends on. For this draft a conservative approach is being taken and therefore this alternative would have the same direct, indirect, and cumulative impacts as well as determination as Alternative C found within Appendix Q, section 4.2.1.1.17.3. Velocity analysis, like that conducted for Alternative C, is being conducted to better understand the potential impact of Alternative D1 on the riverine system.

The Service has provided reasonable and prudent measures (RPMs) and terms and conditions for the GS under Alternative D1. These RPMs and T&Cs can be found in the Biological Opinion (BO) located in Appendix D.

4.2.5.4 Alternative E1 (Without Weir)

With the construction of Alternative E1 there would be no permanent long-term changes to water velocity, water surface elevation, and water quality. Indirect impacts in the way of changes to

water velocity, water surface elevation, and water quality may occur during high water events. This would not be much different from the current conditions during high water events. These impacts are considered insignificant.

Based upon literature review, available survey data, the current status of the species, the environmental baseline for the action area, and the effects of the action, USACE has determined that implementation of Alternative E1 may affect but is not likely to adversely affect the GS or GS critical habitat.

The Service recommended some restoration features under ESA Section 7(a)(1) for Alternative E. Those features include protection, enhancement, or creation of instream habitat such as shoals, gravel bars, woody debris, and sandbars as well as reforestation of the riparian buffer along the Pearl River within the Project Area. If these features are implemented, Gulf sturgeon would likely benefit from this alternative as the features would provide suitable habitat and improved water quality. These features will be considered in subsequent phase(s).

4.2.6 Ringed Sawback (ringed map) Turtle

4.2.6.1 No Action Alternative

With the No Action Alternative, no action would be taken address the stressors causing the current trend discussed in section 3.2.1.8 and therefore the decline of ringed map turtle populations would likely continue.

4.2.6.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

There are no direct, indirect, or cumulative impacts nor any actions to address the stressors to the ringed map turtle associated with Alternative A1. Therefore, the decline of ringed map turtle populations would likely continue. Based upon literature review and available survey data, the USACE has determined that implementation of Alternative A1 would have no effect on the ringed map turtle. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.6.3 Alternative D1 (With Weir)

It is assumed that, like Alternative C, construction of Alternative D1 would likely eliminate riverine habitat that the ringed map turtle depends on. For this draft a conservative approach is being taken and therefore this alternative would have the same direct, indirect, and cumulative impacts as well as determination as Alternative C found within Appendix Q, section 4.2.1.1.18.3. Velocity analysis, like that conducted for Alternative C, is being conducted to better understand the potential impact of Alternative D1 on the riverine system.

The Service has provided reasonable and prudent measures (RPMs) and terms and conditions for the ringed map turtle under Alternative D1. These RPMs and T&Cs can be found in the Biological Opinion (BO) located in Appendix D.

4.2.6.4 Alternative E1 (Without Weir)

With construction of Alternative E1, direct impacts are expected by the way of the species avoiding the area during construction activities. Additionally, there is the potential for some individuals being directly killed during overbank excavation activities. This would be mitigated by surveying the area during construction activities and relocating individuals and nests if found. There would be temporary impacts due to decreased water quality during construction activities. Indirect impacts in the way of changes to water velocity, water surface elevation, and water quality may occur during high water events. This would not be much different from the current conditions during high water events. Impacts to the riparian zone would remain as excavation activities would still take place. Cumulative impacts, including both direct and indirect impacts of the Alternative E1, along with additional impacts from other previous projects in the area are anticipated to be minor in intensity and short-term in duration. These impacts are considered insignificant when mitigation measures are considered.

Based upon literature review and available survey data, and the effects of the action, although substantially less than that with a weir, the USACE has determined that implementation of Alternative CTO without a weir is likely to adversely affect but is not likely to jeopardize the continued existence of the ringed map turtle. This determination is due to the overbank excavation and the need to capture and relocate ringed map turtles.

The Service has provided reasonable and prudent measures (RPMs) and terms and conditions for the ringed map turtle under Alternative E1. These RPMs and T&Cs can be found in the Biological Opinion (BO) located in Appendix D.

The Service recommended some restoration features under ESA Section 7(a)(1) for Alternative E. Those features include protection, enhancement, or creation of instream habitat such as shoals, gravel bars, woody debris, and sandbars as well as reforestation of the riparian buffer along the Pearl River within the Project area. If these features are implemented, the ringed map turtle would likely benefit from this alternative as the features would provide suitable habitat and improved water quality. These features will be considered in subsequent phase(s).

4.2.7 Northern Long-eared Bat (NLEB)

4.2.7.1 No Action Alternative

With the No Action Alternative, no action would be taken address the stressors causing the current trend discussed in section 3.2.1.8, and, therefore, the decline of the species would likely continue.

4.2.7.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

There are no direct, indirect, or cumulative impacts to the NLEB associated with Alternative A1, but no action would be taken to address the stressors either. Based upon literature review and available survey data, the USACE has determined that implementation of Alternative A1 would have no effect on the NLEB. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.7.3 Alternative D1 (With Weir)

Alternative D1 would have the same direct, indirect, and cumulative impacts as well as determination as Alternative C found within Appendix Q, section 4.2.1.1.19.3 as excavation and fill would still take place. However, the impacts would be to a lesser degree.

4.2.7.4 Alternative Alt E1 (Without Weir)

Alternative E1 would have the same direct, indirect, and cumulative impacts as well as determination as Alternative D1.

4.2.8 Pearl River Map Turtle (PRMT)

4.2.8.1 No Action Alternative

With the No Action Alternative, no action would be taken address the stressors causing the current trend discussed in section 3.2.1.8, and, therefore, the current trend of impacts to the persistence of the species would likely continue.

4.2.8.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

There are no direct, indirect, or cumulative impacts to the PRMT associated with Alternative A1 nor are there any actions to address the stressors. Based upon literature review and available survey data, the USACE has determined that implementation of Alternative A1 would have no effect on the PRMT. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.8.3 Alternative D1 (With Weir)

It is assumed that, like Alternative C, construction of Alternative D1 would likely eliminate riverine habitat that the PRMT depends on. For this draft a conservative approach is being taken and therefore this alternative would have the same direct, indirect, and cumulative impacts as well as determination as Alternative C found within Appendix Q, section 4.2.1.1.20.3. Velocity analysis, like that conducted for Alternative C, is being conducted to better understand the potential impact of Alternative D1 on the riverine system.

The Service has provided reasonable and prudent measures (RPMs) and terms and conditions for the PRMT under Alternative D1. These RPMs and T&Cs can be found in the Biological Opinion (BO) located in Appendix D.

4.2.8.4 Alternative E1 (Without Weir)

With the construction of Alternative E1, direct impacts are expected by the way of the species avoiding the area during construction activities. Additionally, there is the potential for some individuals being directly killed during overbank excavation activities. There would be temporary impacts due to decreased water quality during construction activities. Indirect impacts in the way of changes to water velocity, water surface elevation, and water quality may occur during high

water events. This would not be much different from the current conditions during high water events and the impacts would be temporary and to a much lesser extent than with a weir. Impacts to the riparian zone would remain as excavation activities would still take place. Cumulative impacts, including both direct and indirect impacts of the alternative without the weir, along with additional impacts from other previous projects in the area are anticipated to be minor in intensity and short-term in duration.

Based upon literature review and available survey data, and the effects of the action, the USACE has determined that implementation of Alternative E1 is likely to adversely affect but is not likely to jeopardize the continued existence of the PRMT. This determination is due to the overbank excavation and the need to capture and relocate PRMTs.

The Service has provided reasonable and prudent measures (RPMs) and terms and conditions for the PRMT under Alternative E1. These RPMs and T&Cs can be found in the Biological Opinion (BO) located in Appendix D.

The Service recommended some restoration features under ESA Section 7(a)(1) for Alternative E. Those features include protection, enhancement, or creation of instream habitat such as shoals, gravel bars, woody debris, and sandbars as well as reforestation of the riparian buffer along the Pearl River within the Project area. If these features are implemented, the Pearl River map turtle would likely benefit from this alternative as the features would provide suitable habitat and improved water quality. These features will be fully assessed in subsequent phase(s).

4.2.9 Alligator Snapping Turtle (AST)

4.2.9.1 No Action Alternative

With the No Action Alternative, no action would be taken address the stressors causing the current trend discussed in section 3.2.1.8 and therefore the current trend of impacts to the existence of the species would likely continue.

4.2.9.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

There are no direct, indirect, or cumulative impacts to the AST associated with Alternative A1 nor would any action be taken to address the stressors. Based upon literature review and available survey data, the USACE has determined that implementation of Alternative A1 would have no effect on the AST. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.9.3 Alternative D1 (With Weir)

It is assumed that, like Alternative C, construction of Alternative D1 would likely eliminate riverine habitat that the AST depends on. For this draft a conservative approach is being taken and therefore this alternative would have the same direct, indirect, and cumulative impacts as well as determination as Alternative C found in Appendix Q, Section 4.2.1.1.21.3. Velocity analysis, like that conducted for Alternative C, is being conducted to better understand the potential impact of

Alternative D1 on the riverine system.

The Service has provided reasonable and prudent measures (RPMs) and terms and conditions for the AST under Alternative D1. These RPMs and T&Cs can be found in the Biological Opinion (BO) located in Appendix D.

4.2.9.4 Alternative E1 (Without Weir)

With the construction of Alternative E1, direct impacts are expected by the way of the species avoiding the area during construction activities. Additionally, there is the potential for some individuals being directly killed during excavation activities. Temporary indirect impacts in the way of changes to water quality during construction and removal of natural buffers may occur. The potential benefits associated with a weir would not be realized with no weir.

Cumulative impacts, including both direct and indirect impacts of the alternative along with additional impacts from other previous projects in the area are not anticipated to be major in intensity or long-term in duration. Impacts to the AST from Alternative E1 would add to the impacts that have occurred over time and are expected to continue due to ongoing development and activities in and around the Project Area.

The impacts discussed above are considered insignificant and with the inclusion of minimization features and reasonable and prudent features anticipated from the Service, the impacts would be offset.

Based upon literature review and available survey data, and the effects of the action, although substantially less than that with a weir, USACE has determined that implementation of Alternative E1 is likely to adversely affect but not likely to jeopardize the continuing existence of the AST. This determination is due to the fact that some individuals could be killed during overbank excavation activities.

The Service has provided reasonable and prudent measures (RPMs) and terms and conditions for the AST under Alternative E1. These RPMs and T&Cs can be found in the Biological Opinion (BO) located in Appendix D. The same RPMs and associate T&Cs apply to all of the listed turtle species in the project area and therefore are required to be implemented even though the AST is a proposed species.

The Service recommended some restoration features under ESA Section 7(a)(1) for Alternative E. Those features include protection, enhancement, or creation of instream habitat such as shoals, gravel bars, woody debris, and sandbars as well as reforestation of the riparian buffer along the Pearl River within the Project area. If these features are implemented, the alligator snapping turtle would likely benefit from this alternative as some of the features would provide suitable habitat and improved water quality. These features will be fully assessed in subsequent phase(s).

4.2.10 Louisiana Pigtoe

4.2.10.1 No Action Alternative

With the No Action Alternative, no action would be taken address the stressors causing the current trend discussed in section 3.2.1.8 and therefore the current trend of impacts to the existence of the species would likely continue.

4.2.10.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

There are no direct, indirect, or cumulative impacts to the LA pigtoe associated with Alternative A1 nor would any actions be taken to address the stressors. Based upon literature review and available survey data, the USACE has determined that implementation of Alternative A1 would have no effect on the LA pigtoe. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.10.3 Alternative D1 (With Weir)

It is assumed that, like Alternative C, construction of Alternative D1 would likely eliminate riverine habitat that the LA pigtoe depends on. For this draft a conservative approach is being taken and therefore this alternative would have the same direct, indirect, and cumulative impacts as well as determination as Alternative C found in Appendix Q, Section 4.2.1.1.22.3. Velocity analysis, like that conducted for Alternative C, is being conducted to better understand the potential impact of Alternative D1 on the riverine system.

The Service has provided reasonable and prudent measures (RPMs) and terms and conditions for the LA pigtoe under Alternative D1. These RPMs and T&Cs can be found in the Biological Opinion (BO) located in Appendix D. However, since the LA pigtoe is a proposed species, these RPMs and associated T&Cs are not required to be implemented unless the species is listed prior to construction.

4.2.10.4 Alternative E1 (Without Weir)

With the construction of Alternative E1, there are no direct impacts expected. Additionally, there is the potential for some individuals being directly killed during excavation activities. Temporary indirect impacts in the way of changes to water quality during construction and removal of natural buffers may occur.

Cumulative impacts, including both direct and indirect impacts of the alternative along with additional impacts from other previous projects in the area are not anticipated to be major in intensity or long-term in duration. Impacts to the LA pigtoe from Alternative E1 would add to the impacts that have occurred over time and are expected to continue due to ongoing development and activities in and around the Project Area. The impacts discussed above are considered insignificant and short term.

Based upon literature review, available survey data, the current status of the species, the environmental baseline for the action area, and the effects of the action, USACE has determined that implementation of Alternative E1 may affect but is not likely to adversely affect the Louisiana pigtoe.

The Service recommended some restoration features under ESA Section 7(a)(1) for Alternative E. Those features include protection, enhancement, or creation of instream habitat such as shoals, gravel bars, woody debris, and sandbars as well as reforestation of the riparian buffer along the Pearl River within the Project area. If these features are implemented, the Louisiana pigtoe would likely benefit from this alternative as the features would provide suitable habitat and improved water quality. These features will be fully assessed in subsequent phase(s).

4.2.11 Tricolored Bat (TCB)

4.2.11.1 No Action Alternative

With the No Action Alternative, no action would be taken address the stressors causing the current trend discussed in section 3.2.1.8, and, therefore, the current trend of TCB population decline would likely continue.

4.2.11.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

There are no direct, indirect, or cumulative impacts to the TCB associated with Alternative A1 nor would any stressors be addressed. Based upon literature review and available survey data, the USACE has determined that implementation of Alternative A1 would have no effect on the TCB. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.11.3 Alternative D1 (With Weir)

This alternative would have the same direct, indirect, and cumulative impacts as well as determination as Alternative C found in Appendix Q, Section 4.2.1.1.23.3. However, the impacts would be to a lesser degree.

4.2.11.4 Alternative E1 (Without Weir)

This alternative would have the same direct, indirect, and cumulative impacts as well as determination as Alternative D1 as excavation and fill would still take place.

4.2.12 Monarch Butterfly

4.2.12.1 No Action Alternative

With the No Action Alternative, no action would be taken address the stressors causing the current trend discussed in section 3.2.1.8 and therefore the current trend of monarch population decline would likely continue.

4.2.12.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

Direct impacts to the Monarch butterfly associated with Alternative A1 would be the potential for collision with construction equipment during raising of structures. Although collision with vehicles on nearby roadways is a regular occurrence, the construction activities could increase the number of individuals impacted. However, the species is highly mobile, and the equipment is rather slow moving, so it is expected that any individuals present could escape the impact. Indirect benefits could be assumed if the levees are planted with milkweed and mowing occurs less frequently during breeding and/or migrating season and/or if structures are relocated, and the area is allowed to self-vegetate into greenspace. Cumulative impacts would be the potential adverse impacts and benefits due to this alternative plus any benefits or adverse impacts attributable to other previous, existing, and reasonably foreseeable projects within the Study Area. USACE has determined that Alternative A1 may affect but would not likely adversely affect the monarch butterfly. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.12.3 Alternative D1 (With Weir)

This alternative would have the same direct, indirect, and cumulative impacts as well as determination as Alternative C found in Appendix Q, Section 4.2.1.1.24.3. However, the impacts would be to a lesser degree.

The Service has provided reasonable and prudent measures (RPMs) and terms and conditions for the monarch butterfly under Alternative D1. These RPMs and T&Cs can be found in the Biological Opinion (BO) located in Appendix D. However, since the monarch butterfly is a proposed species, these RPMs and associated T&Cs are not required to be implemented unless the species is listed prior to construction.

4.2.12.4 Alternative E1 (Without Weir)

Alternative E1 would incur the same direct impacts as Alternative D1. Indirect impacts would be the potential benefit of providing suitable habitat for the monarch butterfly if the excavated areas are allowed to self-vegetate with wildflowers which would provide suitable habitat and a food source. If the excavated areas are mowed regularly and only allowed to self-vegetate with grass the indirect impact would be the conversion of desired habitat to grassy uplands and elimination of food source. Cumulative impacts, including both direct and indirect impacts of the alternative along with additional impacts from other, previous projects in the area are anticipated to be minor in intensity and long-term in duration.

Based upon literature review and available survey data, and the effects of the action, the USACE has determined that implementation of E1 may affect but is not likely to adversely affect the monarch butterfly.

4.2.13 Other Protected Species

4.2.13.1 No Action Alternative

With the No Action Alternative, no action would be taken to address the stressors causing the current trend discussed in section 3.2.1.8, and, therefore, the current trend of migratory bird population decline would likely continue and there would be no impacts to the bald eagle.

4.2.13.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

There are no direct, indirect, or cumulative impacts to bald eagles associated with Alternative A1. A qualified biologist would survey the area prior to construction to determine if any migratory birds are nesting within structures to be removed. There could be direct impacts to migratory birds if any are found nesting in any of the structures to be removed.

Coordination with The Service and MDWFP would determine what actions should be taken depending on the species present. Indirect benefits could be assumed for some species of migratory birds if structures are relocated, and the area is allowed to self-vegetate into greenspace. Cumulative impacts would be the potential benefits or impacts due to this alternative plus any benefits or adverse impacts attributable to other previous, existing, and reasonably foreseeable projects within the Study Area. The impacts discussed above are considered insignificant. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.13.3 Alternative D1 (With Weir)

This alternative would have the same direct, indirect, and cumulative impacts as well as determination as Alternative C found in Appendix Q, Section 4.2.1.1.25.3. However, the impacts would be to a lesser degree.

4.2.13.4 Alternative E1 (Without Weir)

Alternative E1 would have the same impacts as Alternative D1.

4.2.14 Soils and Prime and Unique Farmlands

4.2.14.1 No Action Alternative – Future without Project Condition

Without implementation of the proposed project, no action would be taken to lessen or worsen the current trend of anthropogenic and natural impacts to soils and prime and unique farmland in the Project Area, therefore, existing trends would likely continue.

4.2.14.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

No adverse direct, indirect, or cumulative impacts to soils and prime and unique farmlands are anticipated due to implementation of Alternative A1, to include the Canton Club levee, and no action would be taken to lessen the current trend. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result,

Alternative A1 has been excluded from the final array of alternatives.

4.2.14.3 Alternative D1 (With Weir)

This alternative would not have an adverse effect on soils and prime and unique farmlands. There would be no indirect impacts anticipated to soils and prime and unique farmlands due to implementation of Alternative CTO with Weir (and the 3 added levees) and no action would be taken to lessen the current trend. Cumulatively, there would not be incremental direct and indirect impacts of implementing and operating this alternative on soils and prime and unique farmlands plus the direct and indirect impacts attributable to other previous, existing, and reasonably foreseeable projects within the Study Area.

4.2.14.4 Alternative E1 (Without Weir)

This alternative would not have an adverse effect on soils and prime and unique farmlands. There would be no indirect impacts anticipated to soils and prime and unique farmlands due to implementation of Alternative CTO without Weir (and the 3 added levees) and no action would be taken to lessen the current trend. Cumulatively, there would not be incremental direct and indirect impacts of implementing and operating this alternative on soils and prime and unique farmlands plus the direct and indirect impacts attributable to other previous, existing, and reasonably foreseeable projects within the Study Area.

4.2.15 Hydrology & Hydraulics

4.2.15.1 No Action Alternative – Future without Project Condition

The Pearl River Study Area has experienced historic flooding, 1979, 1983, and 2020 that has caused damages to the City of Jackson MSA. Main channel flooding is a result of the intense flood season within the Study Area between December through April (Tennessee Valley Authority, 2004). In addition to the flood season, summer storms have been documented to be intense causing localized flooding within the tributaries (Tennessee Valley Authority, 2004). When the Pearl River reaches a certain stage, near 28 feet, riverine flooding begins within the Study Area, causing a backwater influence on the tributaries within the Jackson area (US Department of Commerce, NOAA, National Weather Service). It is noted that there have been over 51 crests that have reached a moderate flood stage of 33 feet and 41 crests that have reached a major flood stage of 36 or more since 1874 (US Department of Commerce, NOAA, National Weather Service, Historical Crests n.d.). Within the past 5 years, there have been a reported 8 flood events that have reached at or above flood stage (US Department of Commerce, NOAA, National Weather Service, Recent crests). These flood events can lead to direct, indirect, and cumulative impacts to the main channel as well as the surrounding tributaries.

As described in section 2.1.4.6, there are many road crossings through the project reach, many of which were constructed in the 1960s. Figure 4-1 plots the profile of the peak of the 2020 flood event in blue (stage is on the vertical axis) and the location of bridges (vertical lines). This plot shows approximated water surface increases occurring due to the bridge constrictions at each crossing with the bumps in stage at the vertical lines.

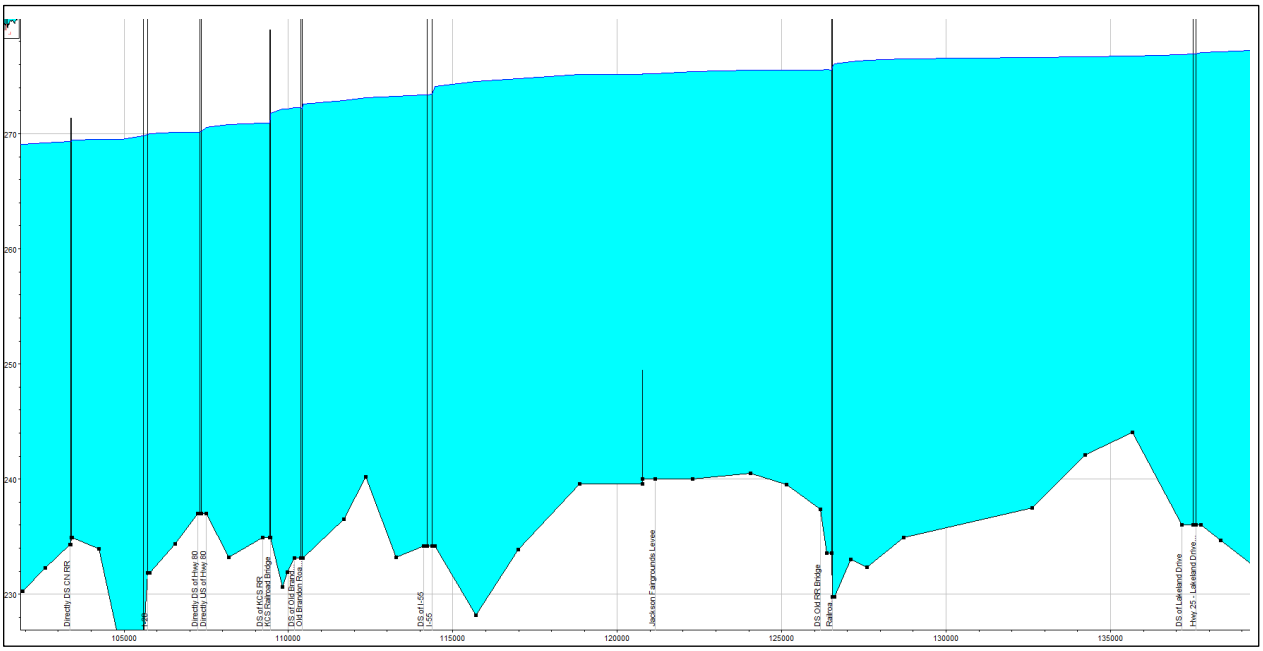

Figure 4-1: 2020 Profile of the Peak of the Flood Event

The direct and indirect impacts from flooding include increased erosion rates, increased sediment load, a decrease in water quality, and water supply issues (In 2022 floodwater impacts to water quality within the upstream Ross Barnett Reservoir led to the loss of water supply for the City of Jackson). Without the implementation of a plan that would address the flooding within the Study Area, there would continue to be negative impacts.

4.2.15.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

Because Alternative A1 only addresses flood proofing or raising currently existing structures, there would be no foreseeable changes to the current hydraulics and hydrology due to the implementation of this alternative. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.15.3 Alternative D1 (With Weir)

Alternative D1 was designed to reduce flooding by removing areas that constrict the floodplain along with deepening of the channel overbanks within the project footprint; thereby improving downstream conveyance of water through the Project Area and lowering the water surface elevation of the river. Water surface elevation reductions due to this excavation would provide reduction of flood elevations not only within the reach of excavation, but additional elevation reductions upstream of the excavation. Alternative D1 also consists of a weir, fish passage, and related seepage mitigation and pumping features as described in Section 3. The largest change hydraulically from this alternative is the creation of an impoundment behind the weir which converts the area from riverine flow to a slower flow across a larger area. Currently, during flood

events (even smaller ones) in the current state, overflow into riparian and/or wetland areas along the banks of the river would occur to varying extents. Under Alternative D1, many of these areas would be deepened and consistently contain open water. Some areas outside of the project area would flood less frequently. Areas downstream of the project might flood with a slightly deeper flood (up to 0.3 feet at the 100-year flood) but these impacts quickly dissipate as you move away from the project area.

4.2.15.4 Alternative E1 (Without Weir)

Alternative E1 was designed to reduce flooding by removing areas that constrict the floodplain along with deepening of the channel overbanks within the project footprint; thereby improving downstream conveyance of water through the Project Area and lowering the water surface elevation of the river. Water surface elevation reductions due to this excavation would provide reduction of flood elevations not only within the reach of excavation, but additional elevation reductions upstream of the excavation. All features are described in detail in section 3. Currently, during flood events (even smaller ones) in the current state, overflow into riparian and/or wetland areas along the banks of the river would occur to varying extents. Under Alternative E1, many of these areas would be deepened and flood more frequently. Some areas outside of the project area would flood less frequently. Areas downstream of the project might flood with a slightly deeper flood (up to 0.3 feet at the 100-year flood) but these impacts quickly dissipate as you move away from the project area.

4.2.15.5 Alternative D1 and E1 – Hydraulic Summary

A detailed description of the hydraulic and hydrologic analysis regarding Alternative D1 and E1 is located in Hydraulic and Hydrologic Appendix E *H&H Report*. Key points are summarized below. Note that CTO as defined is a feature-by-feature selection at the ASA discretion. Any change to the selection of features, would impact hydraulic results.

While both results for D1 and E1 have been analyzed separately, the final water surface elevations are similar enough to discuss together in this section. Unless otherwise specified, all information in this section applies to both D1 and E1. Key differences between the Alternative D1 and E1 without weir lie at low flows, where with E1 there will be no added permanent impoundment for recreation. This reduces construction cost as compared to D1, by reducing the need for pumping capacity at the Jackson Fairgrounds Levee, fish passage, some riverine mitigation impacts, and the need for additional seepage protection at the Existing Federal Levees. At high flows (estimated to be about the 5-year return interval and above) the water levels for D1 and E1 are shown to be about the same.

The Hydrologic Engineering Center Statistical Software Package (HEC-SSP) version 2.3 was used to model Alternative A1 and Alternative D1 and E1, with the USACE team ensuring the full period of record from the outflow at the Ross Barnett Reservoir was included. This period of record was supplemented with data from the downstream Jackson gage (from 1874 to 2022) and the latest information from United States Geological Survey. In addition, the local drainage, bridge constrictions and other constraints that are present in the system were added to the model. The

model treated flows from the Ross Barnett reservoir generally as run-of-river even though it can somewhat limit peak flows. This is consistent with current and likely future Ross Barnett operations. The USACE team calibrated this model to the 2020 flood event.

Figure 4-2 and Table 4-3 shows the current extent of flooding versus the flooding extent with Alternative D1 – with yellow and orange showing areas with flood reduction and blues showing areas that would still be inundated.

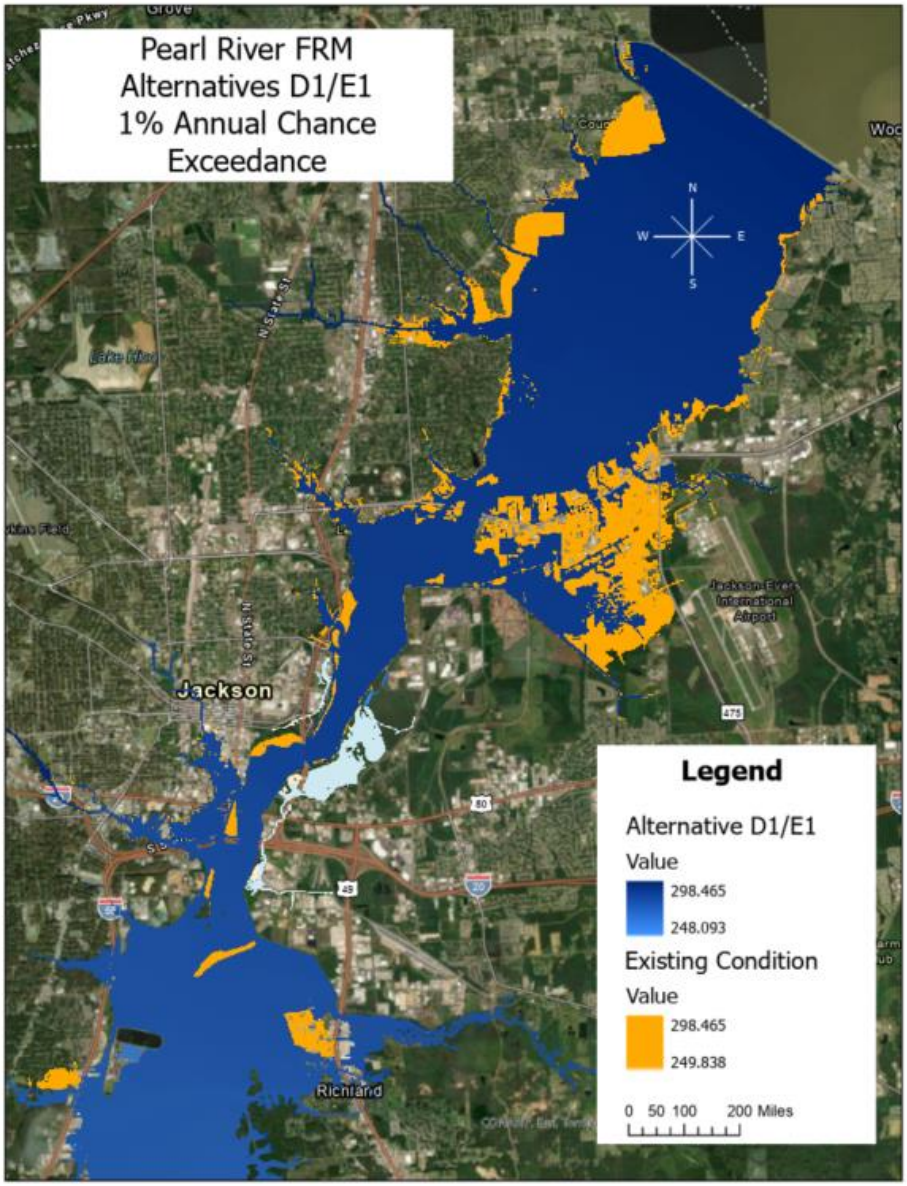

Figure 4-2: Alternative D1 and E1 100-year Flood Extent Reduction (Tributary and Pearl River Impacts)

Downstream inducements in river overbank lowering, where a channelized river system forces water downstream more rapidly, can increase erosion and channel instability, impacting areas farther downstream. This happens because channelization, like straightening or widening, alters natural river flow patterns, leading to increased velocity and the potential for more sediment transport, erosion, and even flooding. A more detailed assessment of flow and stage impacts was completed for all frequencies analyzed (5, 10, 25, 50-, 100-, 200-, and 500-year events) this assessment extended for 20 miles downstream of the project extent. Both D1 and E1 are modeled but the modeling results are very similar and can be considered the same for the purposes of this screening level assessment. An earlier assessment which was completed for the previous Alternative C for the 20% AEP and 1% AEP frequencies, to represent a relatively frequent event as well as a more extreme scenario, is used as an upper bound below this extent. There were flow and stage inducements identified (Table 4-3). Reduced project features create less downstream inducements than with the previous alternative C. The inducements due to the any event less than the 100-year event appear to resolve to less than 0.25 feet of added water less than 20 miles downstream of the project and resolve just prior to the Copiah Creek confluence, approximately 32 miles downstream of the project (from previous analysis).

Table 4-3: Acres of Inducement for the 1% & 20 % AEP Events from Project Location to Copiah Creek

Total Acres Included by Increment of Inducement (Feet) – to 20 miles downstream of project.	1 % AEP- Acres, flooded above 0.25 feet	1% AEP - Structures
100-year frequency and below combined	81	11
200-and 500-year frequencies combined	5,822	97

The table above shows estimated acres and structures impacted due to construction of Alternative D1 or E1 for the full range of modeled events. As there were minimal impacts at the less than 1% AEP, all damages for all frequencies analyzed were lumped into categories of 1% AEP and below, then frequencies analyzed that would occur less frequently than the 1% AEP .. Structures in this assessment were taken from the national structure inventory, then structures no longer existing or habitable were removed from the list. This list of structures was compared to the depth of water at that location to determine if it was likely that water would be flooding the ground floor of a building. Structures above the water surface were removed from the list. An example would be if a house was in an area that was flooded 1 foot deep, but the house was built 4 to 5 feet off the ground on a raised foundation. This was considered acceptable for this analysis, as impacts to land are considered separately.

Estimated acres of land impacted were limited to the area outside of the FEMA floodway. This was used in proxy of the ordinary high-water marks, as this marks areas frequently flooded by water from the river and can be indicated by things such as riverbank features, and plant types. Modeled areas with an additional 0.25 feet or more of inundation are listed in this analysis. The PDT is confident that a land area with flooding 0.25 feet or less higher for approximately the same amount of time would not likely cause damage, when accounting separately for any structure use.

It is likely that it would take a larger added depth of flooding than 0.25 feet to cause appreciable damage to a property (i.e. woods, parking lot, yard), but further analysis would need to be completed in PED to verify this assumption.

Additional assessment of the changes to the downstream boundary was conducted for the 1% AEP event. Further analysis would be needed to validate the total impacts, specifically to verify sediment and velocity impacts of the additional water moving downstream. However, major impacts to the downstream watershed beyond the RM 200 (approximately 5 miles north of Monticello, MS) are highly unlikely. No impacts to the State of Louisiana or Gulf Coast Region are expected to occur.

4.2.16 Water Quality

4.2.16.1 No Action Alternative – Future without Project Condition

Impacts from a flood event may include an increase in erosion that would cause an increase the level of turbidity. The increase in turbidity would temporarily increase the water temperature due to suspended solids within the water column (Paaijmans, K P et al., 2008). This increase in water temperature would result in the decrease of dissolved oxygen within the impacted area (Dissolved Oxygen and Water | U.S. Geological Survey, 2019). Without the implementation of a plan that would address the flooding within the Study Area, there is a possibility that the water quality within the Study Area would either remain the same or decline.

4.2.16.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

For Alternative A1, this plan could potentially result in direct, indirect, and cumulative impacts to water quality. Potential direct impacts from the construction of levee segment would include temporary increases in turbidity and suspended solids in adjacent water bodies – the Pearl River and tributaries. Erosion control feature could decrease the amount of sedimentation, but the sheer volume of material to be moved makes turbidity in the system likely. The impacts to water quality due to the proposed project are inconclusive due to the lack of data, modeling inaccuracies, and the usage of outdated modeling methodologies of the Project Area. In order to determine if this project is viable additional analysis is required. Please reference appendix E, Hydrologic and Hydraulic Analysis for a more detailed water quality assessment.

Coordination with MDEQ is currently on-going. A stormwater pollution prevention plan would be developed to minimize any potential effects to water quality during construction. A section 404 (b) (1) evaluation would be conducted after further data is provided. A section 401 pre- filing meeting request was submitted to MDEQ on July 11, 2023, and was reissued on April 26, 2024, and reissued on April 10, 2025 due to the inclusion of additional features within the Alternatives within this DEIS. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.16.3 Alternative D1 (With Weir)

This plan could potentially result in direct, indirect, and cumulative impacts to water quality.

Potential direct impacts from the construction and existence of channel improvements, overbank modifications, maintenance berms, construction of a weir and gate with fish ladder, and improved levee segments would include temporary increases in turbidity and suspended solids in adjacent water bodies – the Pearl River and tributaries. Erosion control feature could decrease the amount of sedimentation, but the sheer volume of material to be moved makes turbidity in the system likely. The impacts to water quality due to the proposed project are inconclusive due to the lack of data, modeling inaccuracies, and the usage of outdated modeling methodologies of the Project Area. In order to determine if this project is viable additional analysis is required. Please reference appendix E, Hydrologic and Hydraulic Analysis for a more detailed water quality assessment.

Coordination with MDEQ is currently on-going. A stormwater pollution prevention plan would be developed to minimize any potential effects to water quality during construction. A section 404 (b) (1) evaluation would be conducted after further data is provided. A section 401 pre- filing meeting request was submitted to MDEQ on July 11, 2023, and was reissued on April 26, 2024, and reissued on April 10, 2025, due to the inclusion of additional features within the Alternatives within this DEIS.

4.2.16.4 Alternative E1 (Without Weir)

This plan could potentially result in direct, indirect, and cumulative impacts to water quality. Potential direct impacts from the construction and existence of channel improvements, overbank modifications, maintenance berms, and improved levee segments would include temporary increases in turbidity and suspended solids in adjacent water bodies – the Pearl River and tributaries. Erosion control feature could decrease the amount of sedimentation, but the sheer volume of material to be moved makes turbidity in the system likely. The impacts to water quality due to the proposed project are inconclusive due to the lack of data, modeling inaccuracies, and the usage of outdated modeling methodologies of the Project Area. In order to determine if this project is viable additional analysis is required. Please reference appendix E, Hydrologic and Hydraulic Analysis for a more detailed water quality assessment.

Coordination with MDEQ is currently on-going. A stormwater pollution prevention plan would be developed to minimize any potential effects to water quality during construction. A section 404 (b) (1) evaluation would be conducted after further data is provided. A section 401 pre- filing meeting request was submitted to MDEQ on July 11, 2023, and was reissued on April 26, 2024, and reissued on April 10, 2025, due to the inclusion of additional features within the Alternatives within this DEIS.

The Service recommended some restoration features under ESA Section 7(a)(1) for Alternative E. One of those features is reforestation of the riparian buffer along the Pearl River within the Project area. If this feature is implemented, water quality would likely benefit from this alternative as the forested riparian zone would intercept non-point source pollutants, stabilize the riverbank minimizing erosion, enhance habitat diversity, and control light quantity and quality in the river. This feature will be fully assessed in subsequent phase(s).

4.2.17 Water Supply

4.2.17.1 No Action Alternative – Future without Project Condition

While there are current and ongoing negative impacts to the watershed, there are no foreseeable negative changes for water supply by USACE for a future without project scenario. Local officials have continued major repair efforts of local water supply facilities within the city of Jackson, and therefore, short-term improvements to the water supply system are expected to occur.

4.2.17.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

While there are current and ongoing negative impacts to the watershed, there are no foreseeable negative changes for water supply by USACE for Alternative A1 scenario. Local officials have continued major repair efforts of local water supply facilities within the city of Jackson, and therefore short-term improvements to the water supply system are expected to occur. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.17.3 Alternative D1 (Without Weir)

There are potential positive and negative impacts to the water supply due to the implementation of Alternative D1. Per ER 1105-2-100 (ER 1105-2-103), USACE does not have authority/purpose for conveyance for water supply. This is under Section 219 of the Environmental Infrastructure Assistance.

Potential direct impacts to water supply due to the deterioration of water quality from the construction of channel improvements, overbank modifications, maintenance berms, demolition of existent weir and construction of a weir and gate with fish ladder, and improved levee segments would include temporary increases in turbidity and suspended solids in adjacent water bodies. Additional assessment would be required to allow for planned construction of the project in a manner to limit impacts to potable water.

Potential direct impacts to water supply due to the deterioration of water quality from the existence of the proposed weir could impact sediment load within the newly formed reservoir due to reduced velocities and entrainment potential. During design, additional study and verification would be needed to confirm that adding a large weir would not induce sediment loads to alter the incoming chemistry in such a way to induce failure at the existing J.H. Fewell Plant or any other proposed structure along the newly ponded area. A sedimentation study has been proposed to be completed during the PED phase of this study.

Potential direct impacts to water supply due to the coexistence of known HTRW sites and probable exposure to contaminants within the ponded area created by the proposed weir. During the preliminary assessments, the NFI identified several recognized environmental conditions (RECs) within the Project Area. Within the Unpermitted Gallatin Street Landfill Site, the proposed construction details excavating roughly 40 acres of material and relocating the material to the western portion of the Gallatin Street Landfill. Within the NFI sponsor's consultant report, it was

found that soil borings discovered garbage roughly 3 to 34 feet deep. Water samples from monitoring wells within this landfill resulted in concentrations of cadmium, lead, and nickel above the maximum contaminant levels for the Safe Drinking Water Act. The consultant who sampled this landfill stated there is a clay layer possibly holding the potential leachate material from entering the nearby groundwater. For the Unpermitted LeFleur's Landing "Jefferson Street Landfill", benzene was found within soil and water samples to be three times the regulated limit. Reconnaissance from the consultant showed that the landfill had evidence of waste/debris exposed due to possible erosion. It was also found that the landfill had no signs of a constructed cap or liner to prevent possible leachate from the landfill to nearby groundwater. In addition to the two landfills mentioned above, there is additional potential proposed work if a site is unable to be avoided due to construction: Gulf States Creosoting Company Site. EPA conducted an onsite soil sampling analysis in December 2003 and discovered chemicals such as barium, cobalt, manganese, zinc, and creosote residuals including a variety of semi-volatile polynuclear aromatic hydrocarbons. Though this site was not placed on the EPA's Superfund list, elevated levels of organic and inorganic chemicals remain onsite and are possibly being released into the oxbow lake water and into the Pearl River during high flows/flood events. Due to this risk, if dredging, bank stabilization, or any form of construction is done near the Gulf States Creosoting Company Site, there is a risk that the known chemicals discovered onsite could either leach into the Pearl River or to nearby groundwater.

Potential positive opportunities for impact to water supply would be the creation of the ponded area behind the proposed weir. Ancillary benefits of this water surface would be that the City of Jackson, or other municipalities adjacent to the proposed ponded surface, would have access to a larger area with readily available water, with which to site potential future water treatment facilities and to ensure the ongoing access for current water treatment facilities (Fewell).

4.2.17.4 Alternative E1 (Without weir)

This alternative without weir could have limited impacts to existing water quality and thus existing water supply. However, without a new weir, the benefit to the City of Jackson for a larger area for future water supply does not happen. Per ER 1105-2-100 (ER 1105-2-103), USACE does not have authority/purpose for conveyance for water supply. This is under Section 219 of the Environmental Infrastructure Assistance.

Potential direct impacts to water supply due to the deterioration of water quality from the construction of channel improvements, overbank modifications, maintenance berms, demolition of existent weir and construction of a weir and gate with fish ladder, and improved levee segments would include temporary increases in turbidity and suspended solids in adjacent water bodies. Additional assessment would be required to allow for planned construction of the project in a manner to limit impacts to potable water

4.2.18 Cultural and Historical Resources

4.2.18.1 No Action Alternative – Future without Project Condition

Impacts to cultural and historic resources within the APE (also see: Section 2.1.18; Figure 1-1)

have resulted from both natural processes, (e.g., flooding and erosion) and human activities (e.g., development, flood control features, recreational use, and vandalism). Riverine environments are dynamic and impacts to cultural and historic resources would continue at the current trend because of natural processes and anthropogenic modifications to the landscape. The No-Action Alternative would have no immediate impact on archaeological resources. Artificial and natural processes would likely continue to erode and deteriorate known archaeological resources, while exposing previously undocumented sites and/or artifacts.

The No-Action Alternative would also have no immediate impact on historic buildings, structures, and other infrastructure. However, the built environment would not remain static over time and would continue to evolve. Adverse impacts that are expected to occur to some built-environment resources include non-compatible modifications, deterioration due to neglect and abandonment, and damage from flooding or other natural disasters. Other income-producing historic buildings qualifying for Federal and state rehabilitation tax credits and those administered under the Certified Local Government federal-state-local partnership program funded through annual appropriations from the Federal Historic Preservation Fund that provides direct access to SHPO staff for assistance with their commission, building assessments, surveys and nominations, and general preservation assistance would likely be maintained and/or restored in manners consistent with the Secretary of the Interior's (SOI) Standards for the Treatment of Historic Properties (48 FR 44716-42, September 29, 1983).

Other federal actions or undertakings would continue to be reviewed in accordance with Section 106 of the NHPA. Further, the number of NRHP-eligible built-environment properties would increase over time as resources continue to age and gather historical significance. Additionally, the Mississippi Landmark program (39-7-41, Miss. Annotated Code 1972, as amended) requires prior to the start of any project involving designated or potential Mississippi Landmarks of historic, architectural or archaeological significance, as determined by MDAH, that the proposed alterations must be approved in advance by the Mississippi Landmark Review Committee of the MDAH Board of Trustees. This process ensures that Mississippi's historic, architectural, and cultural heritage is preserved for future generations.

4.2.18.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

Direct Impacts

A review of Alternative A1 indicates that due to the known distribution of sites (Figure 2-17) the APE has a high potential to possess both previously recorded and undocumented archaeological resources and that the considered action includes ground disturbing activities (e.g., access, staging, foundation work and hardening, demolition, Canton Club levee construction, site cleanup, and other associated site work) within the project footprint that has reasonably foreseeable potential to directly adversely affect archeological resources in a manner that will diminish the integrity of the historic property's location, design, setting, materials, workmanship, feeling, and/or association. Alternative A1 also has potential for significant reasonably foreseeable adverse effects to historic built-environment resources (e.g., residential, commercial, and public structures). USACE has developed a Draft Section 106 NHPA PA (Appendix G) to identify a process to address ways to avoid, minimize, and/or mitigate the direct adverse effects to historic properties for this alternative.

Historic structures within the APE have unique architectural and design characteristics that many property-owners strive to maintain and enhance. The considered action includes direct modifications (i.e., elevation, flood proofing, retrofit, and/or demolition) to build environment historic properties that have the potential to diminish the integrity of the property's design, materials, and/or workmanship, but also have the potential to cause other types of direct effects to the integrity of the property's location, setting, feeling, or association.

USACE anticipates that many of the potential direct adverse effects to archaeological resources can be avoided or minimized by confining nonstructural work to substantially within the existing building/structure footprint and adherence to "Lower-Impact Demolition Stipulations" (LIDS; i.e., work restrictions; see: Appendix N) designed to avoid impacts to archaeological resources developed in consultation with SHPO(s), federally-recognized Tribes, and other Consulting Parties that would be incorporated into the PA and implemented during design and construction. Except for in the case of acquisitions, USACE anticipates that many of the potential direct adverse effects to build-environment resources would be avoided or minimized through the "design review" process in which USACE would seek ways to revise the scope of the project to substantially conform to the SOI *Standards*, and/or avoid or minimize adverse effects for NRHP-listed or eligible historic properties, that would be included within the Section 106 NHPA PA. The nonstructural treatment selected should, whenever possible, utilize design principles and practices that retain or minimize changes to the building's historic features, integrity, and character. Should the proposal have a direct adverse effect on a historic property that cannot be avoided or minimized, USACE would work toward a resolution of adverse effects with SHPO, federally recognized Tribes, and other Consulting Parties following the procedures negotiated in the Section 106 NHPA PA. Any additional conditions or requirements would be documented at that time.

Indirect Impacts

In addition to individual historic properties where nonstructural features are implemented, Alternative A1 also has the potential for indirect impacts to known and undocumented built-environment resources in the larger context of the surrounding viewshed that the building(s) occupy, or are adjacent to, through the successive introduction of new visual elements and/or modifications to the viewshed and overall visual landscape of known and presently undocumented historic properties (e.g., individual/contributing NRHP-eligible structures, local and NRHP-listed or eligible NRHDs, and Mississippi/National Historic Landmarks), that may diminish the integrity of these property's location, setting, and feeling resulting in a reasonably foreseeable indirect adverse effect to historic properties. USACE has developed a Draft Section 106 NHPA PA (Appendix G) to identify a process to address ways to avoid, minimize, and/or mitigate the indirect adverse effects to historic properties for this alternative.

USACE anticipates that many of the potential indirect adverse effects to build-environment resources would be localized and could be avoided or minimized through the design review process that would be included within the Section 106 NHPA PA (Appendix G). The nonstructural features represent a framework in which a range of potential flood risk reduction actions are required to be considered, each with a unique range of planning considerations and constraints, including

neighborhood context. Where possible, by integrating both traditional and innovative nonstructural design approaches, it is still possible to reinforce a historic building's physical relationship to its site, neighboring buildings, the street on which it is located, as well as the neighborhood or historic district it may be located within or adjacent to, in a sensitive manner, to produce the best individualized approach for a given historic building, neighborhood, and/or historic district. These approaches can reduce the damaging visual effects of altering historic properties in a manner that maintains or complements their individual character and setting. Appropriate techniques to avoid or minimize potential indirect negative visual effects could include considering ways to revise the scope of the project to substantially conform to the SOI *Standards*; limiting elevation heights; floodproofing historic structures as opposed to elevation; shifting specific project elements away from the historic property to lessen the adverse effect (e.g., buffering); aesthetic camouflaging treatments; and/or use of sympathetic infill panels and landscaping features to visually shield project elements from historic properties within the surrounding viewshed.

Further, the arrangement of structures within their community represents a distinct pattern of cultural development that should be valued and preserved. The type, scale, location, and pattern of historic properties define the overall character of a neighborhood. A nonstructural design proposal for a single property, regardless of if the individual structure is historic or not, must also consider its relationship to historic properties within the neighborhood and/or historic district in which it is located. The treatment of an individual property's site features, design, materials, and/or workmanship can play a critical role in avoiding or minimizing the potentially disruptive indirect visual impacts that nonstructural features can have on a surrounding neighborhood, historic district, or other types of built-environment resources.

Although Alternative A1 has the reasonably foreseeable potential to cause indirect adverse effects to multiple historic properties, one of the most significant outcomes of this effort would be to reduce risk to historic structures from future flood events so they maintain their character in relation to other historic buildings within each neighborhood or historic district. Therefore, Alternative A1 may also have positive indirect effects towards preserving at-risk unique architectural and design characteristics that the communities and historic districts in the APE strive to maintain and enhance.

Cumulative Impacts

Cumulative impacts to cultural resources within the APE would be the additive combination of the direct and indirect impacts of Alternative A1 and other Federal, state, local, and private, flood risk projects existing and/or authorized for construction within the Pearl River Basin (Table 1-2). Activities associated with these projects have the potential to directly and/or indirectly effect existing and presently undocumented cultural resources within the project footprints, surrounding viewsheds, and communities where they occur. The assessment of direct, indirect, and cumulative impacts for Alternative A1 may require a comprehensive inventory and NRHP evaluation of built-environment resources at each site where nonstructural features are proposed in addition to the larger surrounding viewshed and would need to be completed in PED; it is recommended that inventory work for each site should be conducted no more than five (5) years in advance of construction.

Reasonably foreseeable adverse effects resulting from Alternative A1 may include direct, indirect, and cumulative effects to properties included in or eligible for inclusion in the NRHP and cultural resources significant at the state, local, and national level and/or of significance to federally-recognized Tribes that may be listed or eligible for the NRHP, including archaeological sites, historic structures, local and NRHDs, other built-environment resources, and/or potentially properties of religious or cultural significance to federally-recognized Tribes, or TCP(s). USACE has developed a Draft Section 106 NHPA PA (Appendix G) to identify a process to address ways to avoid, minimize, and/or mitigate the cumulative adverse effects to historic properties for this alternative.

Conversely, the Alternative A1 may have long-term positive net impacts to cultural resources within communities in the APE. USACE acknowledges that the Alternative A1 may result in modifications to historic buildings or other built-environment resources potentially not meeting the SOI *Standards*. However, the overarching goal of this effort is to reduce risk from future flood events within the Jackson MSA, thus; potentially protecting the architectural qualities of the community as a whole. Therefore, Alternative A1 may also have positive cumulative impacts towards preserving nonrenewable, at-risk, unique architectural and design characteristics that the communities and historic districts strive to maintain and enhance. Otherwise, damage to, or widespread loss of, cultural resources could lead to the loss of connection to place, causing a net loss of cultural diversity within the APE and its surrounding communities. This is important because the cultural resources within many portions of the APE are understudied and/or not duplicated or replaced at other locations. Because most cultural resources are nonrenewable this would constitute a significant direct and cumulative impact. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.18.3 Alternative D1 (with Weir)

Alternative D1 (with weir) has reasonably foreseeable additive incremental direct, indirect, and cumulative adverse effects similar to Alternatives A1 and D and as described in described in Appendix Q; Section 4.2.1.1.49; though greater in magnitude than Alternative E (without) weir scenario described below; but at the same time still would provide a similar level of protection as that of Alternate D towards preserving archaeological sites and at-risk unique architectural and design characteristics that the communities and historic districts in the APE strive to maintain and enhance.

4.2.18.4 Alternative E1 (without Weir)

Alternative E1 (without weir) has reasonably foreseeable additive incremental direct, indirect, and cumulative adverse effects similar to Alternatives A1 and E and as described in Appendix Q; Section 4.2.1.1.49. However, due to the reduction of individual work items and reduced footprint is assumed to generally have less potential to directly, indirectly, and cumulatively effect historic properties than that of the “with” weir scenario evaluated above; but at the same time still would provide a similar level of protection as that of Alternate E described in Appendix Q; Section

4.2.1.1.49 towards preserving archaeological sites and at-risk unique architectural and design characteristics that the communities and historic districts in the APE strive to maintain and enhance.

4.2.18.5 Next Steps

For all of the aforementioned action alternatives, in partial fulfillment of its Section 106 NHPA responsibilities, USACE has initiated consultation to negotiate a Draft Section 106 NHPA PA (Appendix G) that sets out the procedures the USACE will implement to resolve adverse effects through avoidance, minimization, and/or mitigation (36 CFR § 800.14(b)). A Section 106 NHPA PA is appropriate when the undertaking is complex; the undertaking would adversely affect a significant historic property; the extent of effects is unknown; there is public controversy; and/or the parties involved overwhelmingly prefer it. The goal of this Section 106 consultation is to provide a framework for addressing this Undertaking and establish protocols for continuing consultation with the MS SHPO, federally recognized Tribal governments, and other stakeholders.

The Section 106 NHPA PA would identify Consulting Parties, define applicability, establish review timeframes, stipulate roles and responsibilities of stakeholders, include procedures for consultation with federally-recognized Tribes, consider the views of the SHPO/THPO(s) and any other Consulting Parties, afford for public participation, develop programmatic allowances to exempt certain actions from Section 106 review, outline a standard review process, determine an appropriate level of field investigation to identify and evaluate historic properties and determine the potential to affect historic properties and/or sites of religious and cultural significance, streamline the assessment and resolution of adverse effects to historic properties through avoidance, minimization, and programmatic treatment approaches for mitigation, establish reporting frequency and schedule, provide provisions for post-review unexpected discoveries and unmarked burials, and incorporate the procedures for amendments, duration, termination, dispute resolution, and implementation.

The Section 106 NHPA PA would then govern USACE's subsequent NHPA compliance efforts. The Section 106 NHPA PA will be executed before a ROD is issued, ideally before the final EIS. A copy of the Draft Section 106 NHPA Section 106 NHPA PA as well as other documentation prepared in partial fulfillment of USACE's responsibilities in accordance with 36 CFR §800.11(e) regarding the proposed undertaking and its potential to effect historic properties and views provided by consulting parties, the public, SHPO, and affected Indian Tribes is included as Appendix G. USACE will continue to update Appendix G as the Section 106 NHPA consultation progresses.

4.2.19 Recreation

Table 4-4: Incidental Recreation Opportunities

Alternatives	Potential Public Outdoor Recreation Features*							
	Nonstructural Greenspace	Levee Green-way Trails	Wildlife Viewing	Multi-use Trails	Fishing Piers	RV Pads	Boat Ramps	Kayak / Canoe Blueway Trails
No Action Alternative	No	No	No	No	No	No	No	No
A1: Modified Nonstructural Alternative	Yes	Yes	Yes	No	No	No	No	No
D1: Alternative CTO with Weir	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E1: Alternative CTO without Weir	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* On public, project lands only

4.2.19.1 No Action Alternative – Future without Project Condition

With the no action alternative, recreational resources would continue to be influenced by land use trends and natural processes over the course of time. Public access to recreational resources in the Study Area would continue to be in demand. Demand for and access to recreational resources would be subject to ongoing operation and maintenance activities associated with existing flood control projects and the management of future development and growth in and around Jackson and Central Mississippi.

4.2.19.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

Direct and Indirect Impacts

The nonstructural components of Alternative A1 include the elevation, floodproofing, acquisition, and/or relocation of existing potentially affected structures within the Study Area. Any site disturbance associated with the nonstructural components of Alternative A1 would not directly impact recreational activities that take place within the Study Area. The potential for indirect, adverse impacts associated with the nonstructural components of Alternative A1 would be minor in intensity and short in duration. There is the small chance that the process of working on some structures may temporarily interfere with some existing recreational sites' access. An indirect impact of elevating structures is that building costs of future recreational buildings may limit the number of facilities being constructed. Sites that would no longer have structures could have incidental recreation potential with opportunities for greenspace and nature observation depending on location.

The approximately 1.4-mile Canton Club Levee addition of Alternative A1 is estimated to reduce the flood risk for over 250 homes in a developed neighborhood. While no direct adverse impacts to recreational facilities is anticipated within the leveed neighborhood, there is the small chance

that construction activities may temporarily impact passive recreation near the levee footprint like walking, running, or nature observation. Incidental recreational opportunities like walking, running, or nature observation may become more accessible along this new leveed greenway (Table 4-4).

Cumulative Impacts

Cumulative impacts would be the progressive direct and indirect impacts of implementing and operating the nonstructural components of Alternative A1 and the Canton Club Levee addition, as well as the direct and indirect impacts due to other previous, existing, and authorized projects within the Pearl River Watershed. Any anticipated cumulative adverse impacts would be minor in intensity and short in duration. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.19.3 Alternative E1 (Without Weir)

Direct and Indirect Impacts

Alternative E1 includes the same features found in Alternative D1, however Alternative E1 does not include a new weir with a low-flow gate structure and associated fish-passage. Without the weir, there would be no expanded, year-round water body. There would be temporary limitations on existing recreational activities adjacent to and within the levee and the Pearl River during construction. The potential for incidental recreational opportunities, like those indicated for Alternative D1, would also exist for Alternative E1 and be limited to the channel and bank areas disturbed by construction (Figure 4-3). The potential recreational opportunities could include boat ramps and public access points to the Pearl River, kayak/canoe launches, camping, fishing piers, biking/hiking trails, and/or wildlife viewing (Table 4-4). These features will be fully assessed in subsequent phase(s).

The nonstructural components of Alternative E1 would have similar impacts as those analyzed for Alternatives D1. The four proposed levee features and recreation impacts are identical to those of Alternative D1.

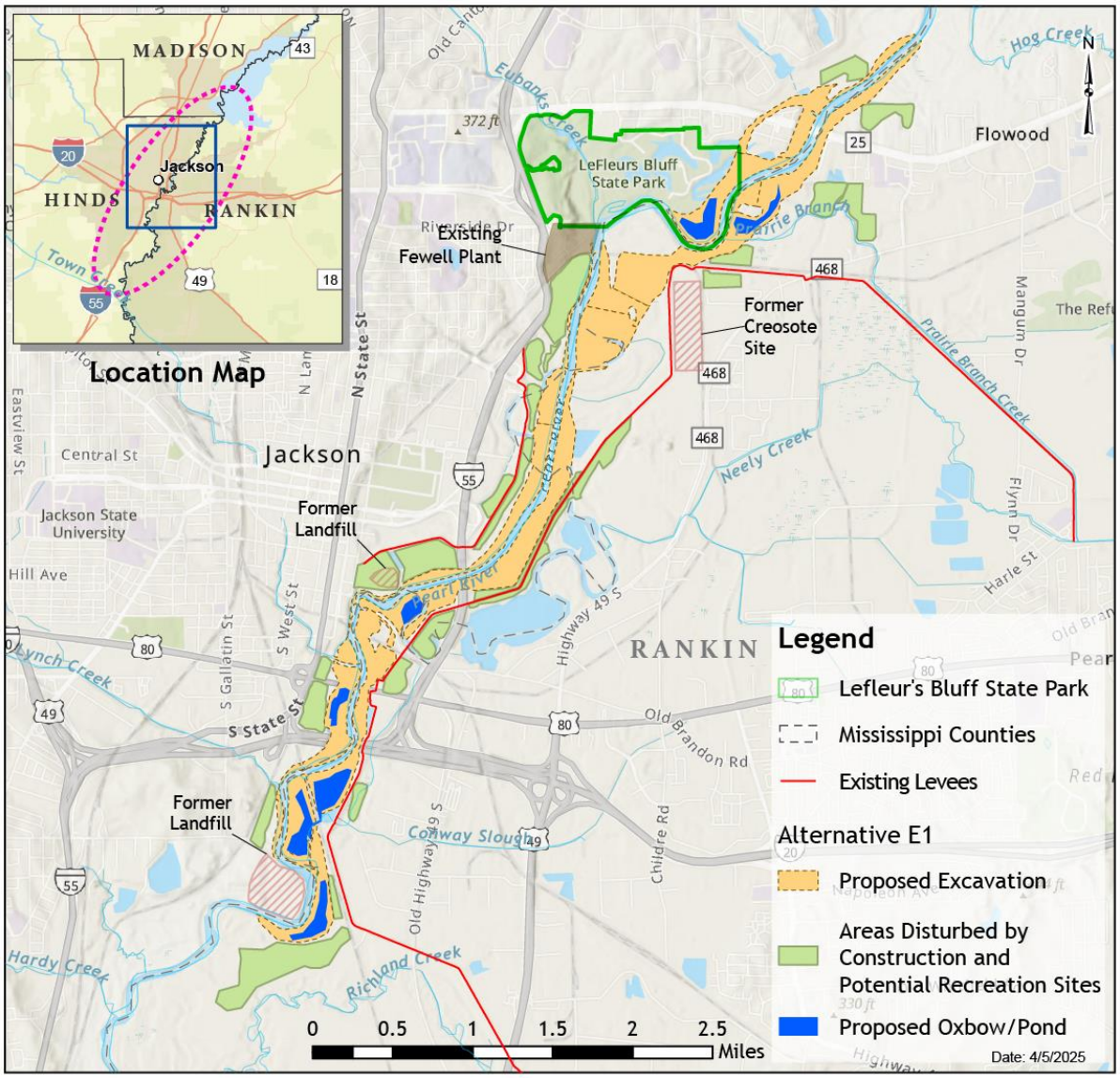

Figure 4-3: Alternative E1 Potential Sites for Recreation

Mitigation features include the creation of 105 acres of oxbow lake/ponds with reforestation of the riparian buffer along the Pearl River within the Project area. Additionally, the Service has recommended some features under ESA Section 7(a)(1) for Alternative E1. Those features include protection, enhancement, or creation of instream habitat such as shoals, gravel bars, woody debris, and sandbars. If these features are implemented, the improved wildlife and fisheries habitat goals would provide potential incidental recreation benefits like improved fishing and wildlife observation opportunities. These features will be fully assessed in subsequent phase(s). Potential direct and indirect, adverse impacts to the LeFleur's Bluff State Park and associated recreational activities (Figure 4-4), including access to and use of the site, would be avoided, minimized, or mitigated (see Mitigation, Section 5) through the continued coordination with the MDWFP and the NFI. Approximately 50 acres of undeveloped land at LeFleur's Bluff State Park would be

excavated yet retained for outdoor recreation use. According to the United States DOI National Park Service LWCF, 9 recreation projects – totaling approximately $1.4 million, have been completed at LeFleur's Bluff State Park (Table 2-5).

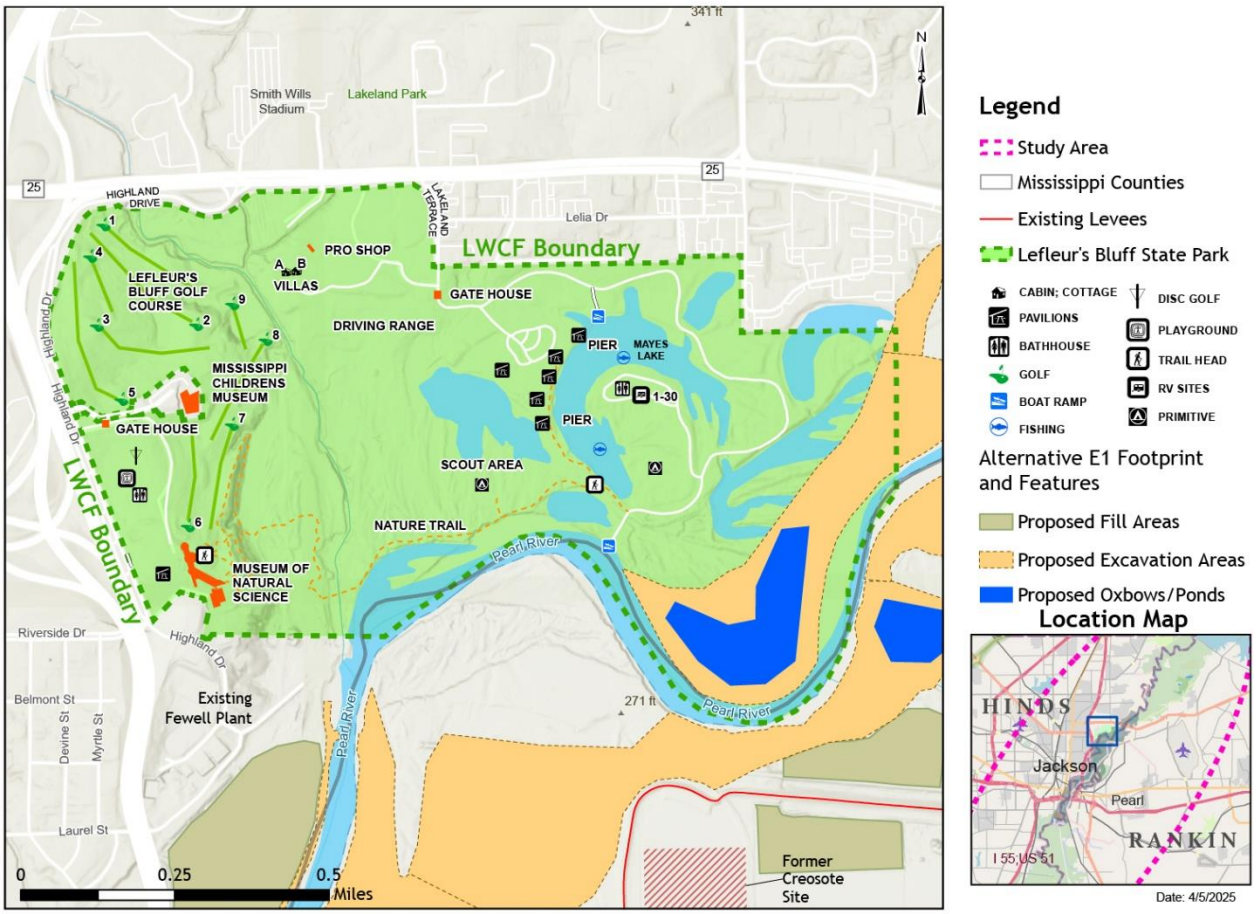

Figure 4-4: Alternative E1 Potential Land Water Conservation Fund Grant Impacts

Cumulative Impacts

Cumulative impacts would be the progressive direct and indirect impacts of implementing the Alternative E1 plus the direct and indirect impacts to recreation resources by other previous, existing, and authorized projects within the Pearl River Watershed. There would be new and incidental recreational opportunities that are available post-construction due to implementing this alternative. This increased potential for new and incidental recreational opportunities in the area would continue to depend on the public's ability to access and use the areas in proximity to the Pearl River waterfront.

4.2.19.4 Alternative D1 (With Weir)

Direct and Indirect Impacts

Alternative D1 includes the construction of channel improvements, associated weir structure, existing levee improvements, nonstructural components similar to Alternative A1, four proposed levee features and incidental recreational features. The implementation of this alternative would result in a significant shift from terrestrial to water-dependent recreational activities for areas in proximity to the Pearl River waterfront. There would be temporary limitations on all existing recreational activities adjacent to and within the Pearl River during construction.

As opposed to the existing weir, the new weir would be constructed to a higher elevation resulting in an expanded, year-round 1556-acre water body capable of supporting incidental recreational facilities. Potential recreation sites would be limited to areas disturbed by construction (Figure 4-5). The potential recreational opportunities could include boat ramps, recreational boating, camping, fishing piers, nature/hiking trails, and/or wildlife viewing (Table 4-4). Recreational watercraft would not be impeded by the replacement weir except in low water conditions due to drought.

The nonstructural components of Alternative D1 would have similar direct and indirect effects as those analyzed for Alternative A1.

The four proposed levee features for Alternative D1 include the approximately 1.4-mile Canton Club Levee, the approximately 2.3-mile McLeod Levee, the approximately 1.15-mile Richland Levee, and the approximately .75 to 1-mile Cany Creek Levee which are all estimated to reduce the flood risk for homes and businesses. While no direct adverse impacts to recreational facilities are anticipated within the leveed areas, there is the small chance that construction activities may temporarily impact passive recreation near the levee footprints like walking, running, or nature observation. Consequentially, incidental recreational opportunities like walking, running, or nature observation may become more accessible along these new leveed greenways.

Potential direct and indirect, adverse impacts to the LeFleur's Bluff State Park and associated recreational activities (Figure 4-6), including access to and use of the site, would be avoided, minimized, or mitigated (see Mitigation, Section 5) through the continued coordination with the MDWFP and the NFI. Approximately 50 acres of undeveloped land at LeFleur’s Bluff State Park would transition to open water yet be retained for outdoor water recreational use and become accessible from Pearl River. According to the United States DOI National Park Service LWCF, 9 recreation projects – totaling approximately $1.4 million, have been completed at LeFleur’s Bluff State Park (Table 2-5).

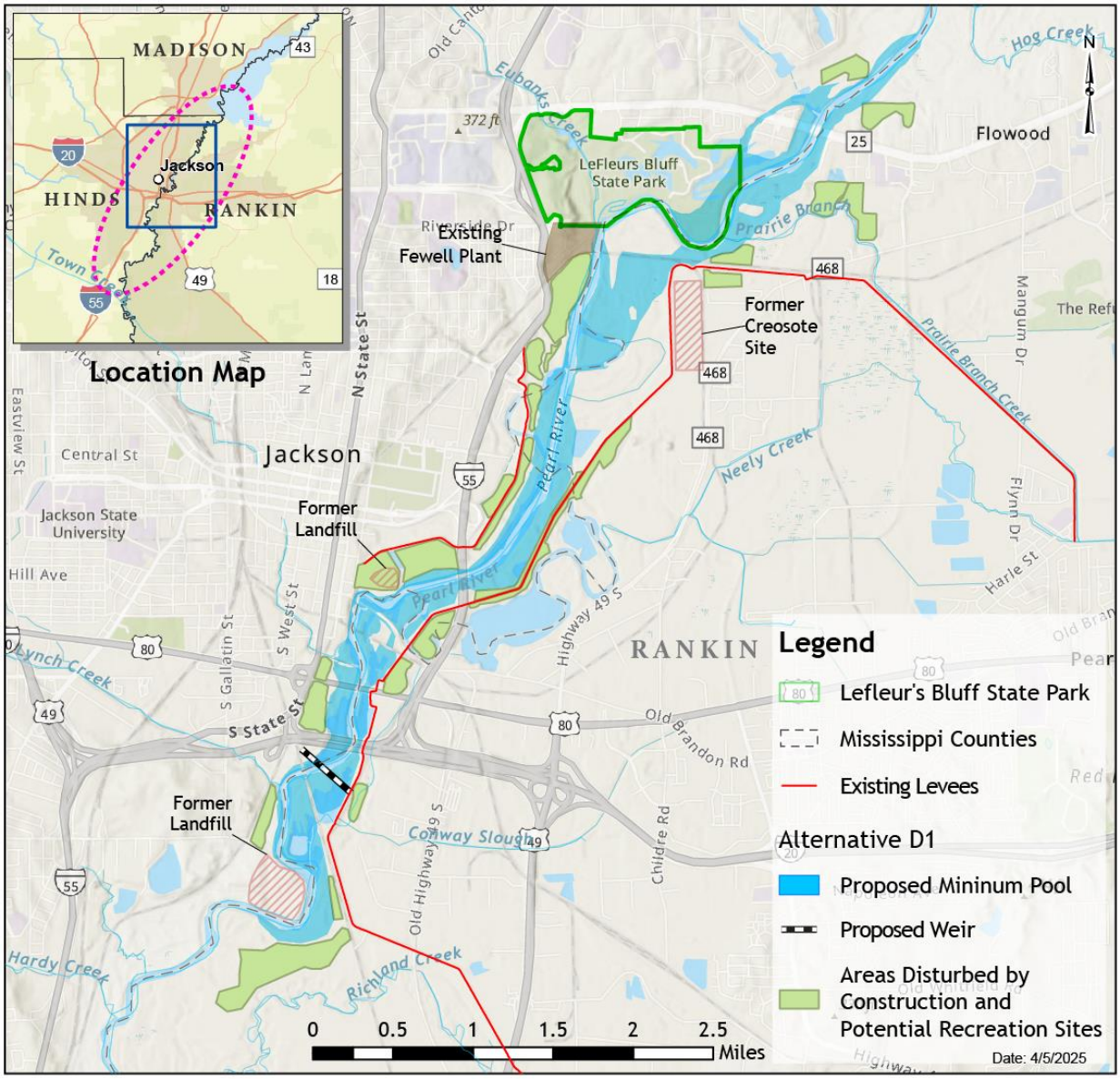

Figure 4-5: Alternative D1 Potential Sites for Recreational Features

Cumulative Impacts

Cumulative impacts would be the progressive direct and indirect impacts of implementing Alternative D1 plus the direct and indirect impacts to recreation resources by other previous, existing, and authorized projects within the Pearl River Watershed. There would be a shift in the types of recreational opportunities that are available post-construction correlating with the significant shift in habitat anticipated with this alternative. This increased potential for new water-based recreational opportunities in the area would continue to depend on the public's ability to access and use the areas in proximity to the Pearl River waterfront.

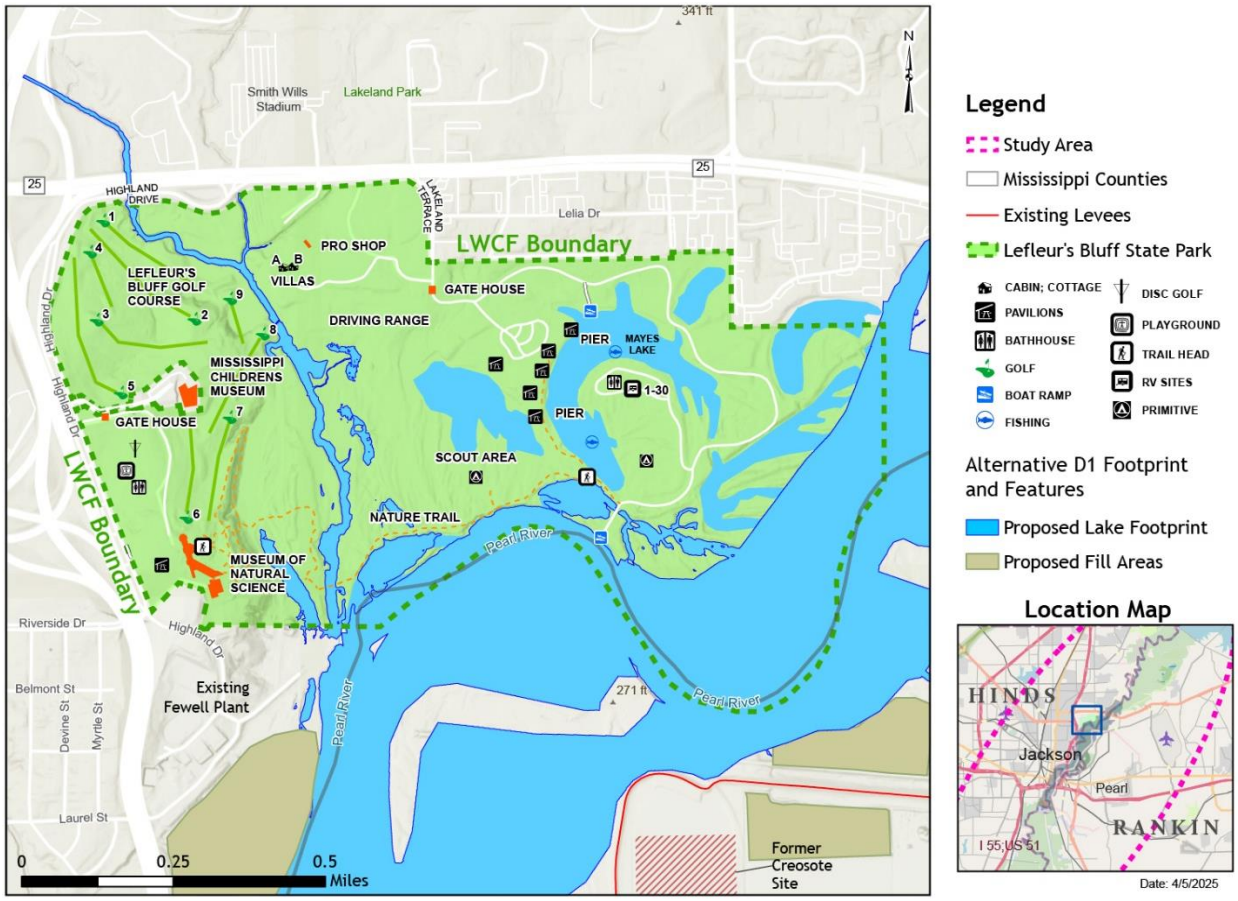

Figure 4-6: Alternative D1 Potential Land Water Conservation Fund Grant Impacts

4.2.20 Aesthetics

4.2.20.1 No Action Alternative – Future without Project Condition

With the No Action Alternative, visual resources would closely correspond with future land use trends regarding development and growth in and around Jackson and Central Mississippi. Ongoing operation and maintenance activities associated with existing flood control projects would continue to impact visual resources in the Study Area depending on the individual project's location and scope.

4.2.20.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

Direct and Indirect Impacts

The nonstructural components of Alternative A1 include the elevation, floodproofing, acquisition, and/or relocation of existing potentially affected structures within the Study Area. Elevating existing structures would not cause adverse impacts to visual resources. Structures being raised are currently present, their elevation would change, but the site is still occupied either way. Direct and indirect impacts to visual resources would occur when a structure is demolished by eliminating

that visual element from that site. When a structure is removed and open land is created, this may be perceived as naturalistic or a void within an established community depending on aesthetic response. During construction, adverse impacts would be minor in intensity and short in duration.

For further discussion regarding approaches that can reduce the damaging visual effects of altering historic properties to the historical viewshed, refer to Cultural and Historic Resources Section in this document. USACE has developed a Draft Section 106 NHPA PA (Appendix G) to identify a process to address ways to avoid, minimize, and/or mitigate the potential direct and indirect adverse effects to historic properties for this alternative.

Alternative A1 includes the construction of the Canton Club levee feature. Activities associated with the construction of this structural component would have direct, adverse impacts to visual resources within and adjacent to the construction footprint. The introduction of new or modified visual elements (e.g., flood control structures and a new levee) would alter visual elements including landform, vegetation, land use and user activity in the area. Visual elements that are not located within the project footprint would be further preserved and benefit from these flood risk management efforts.

Cumulative Impacts

Cumulative impacts would be the progressive direct and indirect impacts of implementing and operating/maintaining the nonstructural and structural components, as well as the direct and indirect impacts due to other previous, existing, and authorized projects within the Pearl River Watershed. Any anticipated cumulative impacts would be minor in intensity and short in duration. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.20.3 Alternative E1 (without weir)

Direct and Indirect Impacts

The proposed levees, overbank modifications and resulting excavated area would be like the modifications proposed in Alternative D1, however Alternative E1 does not include a new weir with a low-flow gate structure and associated fish-passage. Without the weir, there would be no expanded, year-round water body. Activities associated with the construction of this alternative would have direct, temporary, adverse impacts to visual resources within the construction footprint. The introduction of new or modified visual elements (e.g., newly created land, excavated areas, expanded levee footprints, and new levees) would alter visual elements including landform, water, vegetation, land use and user activity in the area. Forested areas would be cleared of existing vegetation and newly created land and would take many years to revegetate. Existing forestland would be cleared and excavated for areas in proximity to the Pearl River waterfront. A broad and unbroken grassland capable detaining temporary floodwaters would spatially contrast with adjacent urban development. A review of current existing inventory and evaluation of all aesthetic resources, or Visual Resources Assessment Procedure (VRAP), would need to be completed for the area per ER 1105-2-100 Appendix C Environmental Evaluation & Compliance, section C-5

"Aesthetic Resources." Visual elements that are not located within the project footprint would be further preserved and benefit from these flood risk management efforts.

For further discussion regarding approaches that can reduce the damaging visual effects of altering historic properties to the historical viewshed, refer to Cultural and Historic Resources Section in this document. USACE has developed a Draft Section 106 NHPA PA (Appendix G) to identify a process to address ways to avoid, minimize, and/or mitigate the potential direct and indirect adverse effects to historic properties for this alternative.

Mitigation features include the creation of 105 acres of oxbow lake/ponds with reforestation of the riparian buffer along the Pearl River within the Project area. Additionally, the Service recommended some restoration features under ESA Section 7(a)(1) for Alternative E1. Those features include protection, enhancement, or creation of instream habitat such as shoals, gravel bars, woody debris, and sandbars. If these features are implemented, the improved wildlife and fisheries habitat goals would further harmonize the visual elements of landform, vegetation, and water with increased diversity in a natural setting. Depending upon the public's access to these features, land use and user activity in the area would increase.

4.2.20.4 Alternative D1 (With Weir)

Direct and Indirect Impacts

Alternative D1 includes the construction of channel improvements, associated weir structure, existing levee improvements, nonstructural components like Alternative A1, four proposed levee features and incidental recreational features. Activities associated with the construction of this alternative would have temporary, adverse impacts to visual resources within the construction footprint. The introduction of new or modified visual elements (e.g., flood control structures, newly created land, inundated areas, expanded levee footprints, and new levees) would alter visual elements including landform, water, vegetation, land use and user activity in the area. Forested areas would be cleared of existing vegetation and newly created land and would take many years to revegetate if not further developed in the future or converted to open water. Existing forestland would shift to open water for areas in proximity to the Pearl River waterfront. A large waterbody would invoke a pleasing sensory response from high concentration of urban users. Increased access to vantagepoints and recreation potential would lead to increased user activity in the area. Visual elements that are not located within the project footprint would be further preserved and benefit from these flood risk management efforts. A review of current existing inventory and evaluation of all aesthetic resources, or Visual Resources Assessment Procedure (VRAP), would need to be completed for the area per ER 1105-2-100 Appendix C Environmental Evaluation & Compliance, section C-5 "Aesthetic Resources."

The nonstructural components of Alternative D1 would have similar direct and indirect impacts as those analyzed for Alternative A1. For further discussion regarding approaches that can reduce the damaging visual effects of altering historic properties to the historical viewshed, refer to Cultural and Historic Resources Section in this document. USACE has developed a Draft Section 106 NHPA PA (Appendix G) to identify a process to address ways to avoid, minimize, and/or mitigate the potential direct and indirect adverse effects to historic properties for this alternative.

Cumulative Impacts

Cumulative impacts would be the overall shift in visual elements including landform, water, vegetation, land use and user activity as is characteristic of ongoing development in the area and like those of the Ross Barnett Reservoir immediately north of the Study Area. The cumulative impacts on visual resources associated with the implementation of Alternative D1 would be considered moderate in intensity and long in duration.

4.2.21 Air Quality

4.2.21.1 No Action Alternative – Future without Project Condition

Without implementation of the Proposed Alternatives, no direct, indirect, or cumulative impacts to air quality would occur.

4.2.21.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

During construction of this project, there is a probability of an increase in air emissions from the usage of internal combustion engines (Gasoline and Diesel), creation of particulate emissions during project construction, and increase in dust due to vehicular traffic. The potential emissions would include 1) exhaust emissions from operations of various types of non-road construction equipment and 2) fugitive dust due to earth disturbance. The emissions from supply trucks and workers commuting to work would temporarily impact air quality in the vicinity of the Project Area. Operation of construction equipment and support vehicles would also generate Volatile Organic Compounds (VOCs), Particulate Matter (PM)10, PM2.5, Nitrogen Oxides (NOx), Carbon Monoxide (CO), Ozone (O3) and Sulfur Oxides (SOX) emissions from diesel engine combustion. During the construction of the proposed action, proper and routine maintenance of all vehicles and other construction equipment would be implemented to ensure that emissions are within the design standards of all construction equipment.

Currently Madison County, Hinds County and Rankin County, are in attainment status of all NAAQS according to EPA and MDEQ. If the construction duration is projected to be short term, any increases or impacts on ambient air quality would be expected to be short-term and minor and would not be expected to cause or contribute to a violation of Federal or State ambient air quality standards. If the construction duration is projected to be long term, there is a possibility that air quality may be impacted, and further analysis would be needed.

There would be no adverse indirect impacts to air quality in the counties with construction from the proposed action.

Significant cumulative adverse impacts are not anticipated from activities associated with the projected alternatives when considered with past, present, or reasonably foreseeable future actions. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.21.3 Alternative D1 (with Weir)

During construction of this project, there is a probability of an increase in air emissions from the usage of internal combustion engines (Gasoline and Diesel), creation of particulate emissions during project construction, and increase in dust due to vehicular traffic. The potential emissions would include 1) exhaust emissions from operations of various types of non-road construction equipment and 2) fugitive dust due to earth disturbance. The emissions from supply trucks and workers commuting to work would temporarily impact air quality in the vicinity of the Project Area. Operation of construction equipment and support vehicles would also generate Volatile Organic Compounds (VOCs), Particulate Matter (PM)10, PM2.5, Nitrogen Oxides (NOx), Carbon Monoxide (CO), Ozone (O3) and Sulfur Oxides (SOX) emissions from diesel engine combustion. During the construction of the proposed action, proper and routine maintenance of all vehicles and other construction equipment would be implemented to ensure that emissions are within the design standards of all construction equipment.

Currently Madison County, Hinds County and Rankin County, are in attainment status of all NAAQS according to EPA and MDEQ. If the construction duration is projected to be short term, any increases or impacts on ambient air quality would be expected to be short-term and minor and would not be expected to cause or contribute to a violation of Federal or State ambient air quality standards. If the construction duration is projected to be long term, there is a possibility that air quality may be impacted, and further analysis would be needed.

There would be no adverse indirect impacts to air quality in the counties with construction from the proposed action.

Significant cumulative adverse impacts are not anticipated from activities associated with the projected alternatives when considered with past, present, or reasonably foreseeable future actions.

4.2.21.4 Alternative E1 (without Weir)

During construction of this project, there is a probability of an increase in air emissions from the usage of internal combustion engines (Gasoline and Diesel), creation of particulate emissions during project construction, and increase in dust due to vehicular traffic. The potential emissions would include 1) exhaust emissions from operations of various types of non-road construction equipment and 2) fugitive dust due to earth disturbance. The emissions from supply trucks and workers commuting to work would temporarily impact air quality in the vicinity of the Project Area. Operation of construction equipment and support vehicles would also generate Volatile Organic Compounds (VOCs), Particulate Matter (PM)10, PM2.5, Nitrogen Oxides (NOx), Carbon Monoxide (CO), Ozone (O3) and Sulfur Oxides (SOX) emissions from diesel engine combustion. During the construction of the proposed action, proper and routine maintenance of all vehicles and other construction equipment would be implemented to ensure that emissions are within the design standards of all construction equipment.

Currently Madison County, Hinds County and Rankin County, are in attainment status of all NAAQS according to EPA and MDEQ. If the construction duration is projected to be short term,

any increases or impacts on ambient air quality would be expected to be short-term and minor and would not be expected to cause or contribute to a violation of Federal or State ambient air quality standards. If the construction duration is projected to be long term, there is a possibility that air quality may be impacted, and further analysis would be needed.

There would be no adverse indirect impacts to air quality in the counties with construction from the proposed action.

Significant cumulative adverse impacts are not anticipated from activities associated with the projected alternatives when considered with past, present, or reasonably foreseeable future actions.

4.2.22 Noise

4.2.22.1 No Action Alternative – Future without Project Condition

Noise impacts would most likely be similar to those under existing conditions. There would be no direct, indirect, or cumulative impacts since the proposed action would not be implemented. Future noise levels would likely continue to be dictated by normal daily activities in the area.

4.2.22.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

Stationary equipment consists of equipment that generates noise from one general area and includes items such as pumps, generators, compressors, etc. This type of equipment operates at a constant noise level under normal operation and is classified as non-impact equipment. Other types of stationary equipment such as pile drivers, jackhammers, pavement breakers, blasting operations, etc., produce variable and sporadic noise levels and often produce impact-type noises. Impact equipment is equipment that generates impulsive noise, where impulsive noise is defined as noise of short duration (generally less than one second), high intensity, abrupt onset, rapid decay, and often rapidly changing spectral composition. For impact equipment, the noise is produced by the impact of a mass on a surface, typically repeating over time.

Mobile equipment, including but not limited to dozers, scrapers, and graders, may operate in a cyclic fashion in which a period of full power is followed by a period of reduced power. Other equipment such as compressors, although generally considered to be stationary when operating, can be readily relocated to another location for the next operation.

Direct Impacts

The direct impacts resulting from Alternative A1 would be caused by activities associated with elevation and/or destruction (in the case of buyout) of selected structures. Noise would be generated from the use of heavy mobile construction equipment including, but not limited to backhoes, bulldozers, excavators, and haul trucks. Noise would be of varying levels, ranging anywhere from 80dB (backhoe), up to 130dB (jackhammer).

Impacts are expected to be short term in nature, however there is the possibility of noise lasting longer than expected from the use of stationary equipment. Since the project area is developed, project noises would likely be heard by a large number of individuals both in commercial and

residential areas, however the increased noise levels would only be present during daylight hours during construction. While noise impacts may cause a temporary inconvenience to residents and facilities in the immediate area, noise levels associated with construction activities would be temporary and monitored to ensure acceptable standards are maintained. Given this, the intensity of the direct impacts to noise levels within the Project Area would not be considered significant.

Indirect Impacts

The same conditions can be stated for the indirect impacts from the implementation of Alternative A1. The indirect impacts to the adjoining areas would be associated with the short-term increase in noise levels during the construction period, with the potential for slightly longer durations from stationary equipment, depending on the recipient's proximity to the source.

Cumulative Impacts

Cumulative impacts would be the incremental direct and indirect impacts of implementing and operating Alternative A1, as well as the direct and indirect impacts attributable to other previous, existing, and authorized projects within the Pearl River Watershed. Given the determination that direct or indirect impacts to the noise levels within the Project Area or adjacent areas beyond the construction period would not be likely with the Alternative A1 implementation, potential cumulative adverse impacts would likewise be considered as minor and short-term in duration. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.22.3 Alternative D1 (with weir)

Direct Impacts

With the construction of the weir, direct impacts from noise would be similar to those impacts described in Alternative A1, ranging anywhere from 80dB, up to 130dB. The sound of the equipment could potentially be muffled by the buildings and trees in the project areas. Overall, the direct impacts to noise levels with the implementation of Alternative CTO would be short-term, minor, adverse conditions during the construction period.

Indirect Impacts

Indirect impacts to noise levels would be somewhat higher and for a longer duration than those identified in Alternative A1 . Additionally, due to construction of the weir resulting in an expanded water body capable of supporting recreational activities, the additional sound of activities associated with camping, boating, fishing, and other recreational activities would result in a permanent increase in the level of noise already within the area.

Cumulative Impacts

Cumulative impacts would be the incremental direct and indirect impacts of implementing and operating Alternative CTO plus the direct and indirect impacts attributable to other previous, existing, and authorized projects within the Pearl River Watershed.

Given the determination that direct or indirect impacts to the noise levels within the Project Area or adjacent areas beyond the construction period would likely be increased with the Alternative CTO implementation, the potential cumulative impacts from this alternative would be permanent, yet insignificant as it pertains to overall noise levels in the area.

4.2.22.4 Alternative E1 (Without Weir)

Direct Impacts

Due to the equipment that would be used, direct impacts from noise for Alternative CTO would be similar to those impacts described in Alternative A1 and Alternative D1. Noise generated from construction equipment used would be of varying levels, ranging anywhere from 80dB, up to 130dB. While the equipment that would be working may produce sound levels of between approximately 80dB and 86dB, buildings and trees in the project areas tend to restrict the effects of sound; therefore, construction noise may be muffled in some areas.

Overall, the direct impacts to noise levels with the implementation of Alternative CTO would be short-term, minor, adverse conditions during the construction period.

Indirect Impacts

Indirect impacts to noise levels would be somewhat higher than those identified in Alternative A1 and Alternative D1. With much of the area adjacent to the project already developed, there is a considerable level of noise currently present. Therefore, any increases in noise levels, would not be significant. As a result, the potential indirect, adverse impacts to noise levels would also be considered as minor in intensity when compared with the overall existing noise levels already in the area.

Cumulative Impacts

Cumulative impacts would be the incremental direct and indirect impacts of implementing and operating Alternative CTO plus the direct and indirect impacts attributable to other previous, existing, and authorized projects within the Pearl River Watershed.

Given the determination that direct or indirect impacts to the noise levels within the Project Area or adjacent areas beyond the construction period would likely be increased with the Alternative CTO implementation, the potential cumulative impacts from this alternative would be permanent, yet insignificant as it pertains to overall noise levels in the area.

4.2.23 HTRW

4.2.23.1 No Action Alternative – Future without Project Condition

Without implementation of the Proposed Alternatives, no direct, indirect, or cumulative impacts to HTRW would occur.

4.2.23.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

The NFI would conduct a Phase 1 Environmental Site Assessment for each structure subject to modification and acceptance into the project. Compliance with applicable hazardous waste management laws and regulations (e.g., RCRA, CERCLA) would be achieved prior to construction. If any substances regulated under these laws were discovered, the NFI would comply with all applicable requirements. Since compliance with hazardous waste management laws and regulations is an eligibility criterion prior to construction, no impacts arising from any HTRW issues are anticipated with implementation of the project. A Phase I Environmental Site Assessment has not been conducted and would need to be done prior to construction to identify any recognized environmental conditions within the proposed Project Area regarding the Canton Club Levee. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.23.3 Alternative D1 (with Weir)

A Phase I Environmental Site Assessment has not been conducted that included the additional FRM features for the alternative and would need to be done prior to construction to identify any recognized environmental conditions within the proposed Project Area. A technical memorandum was conducted by the NFI in December 2023 of the Project Area. Since a Phase I Environmental Site Assessment was not done, there are levels of uncertainty for portions of the Alternative D1 that was not evaluated within the NFI Phase I. A partial site visit of the LeFleur's Landing "Jefferson Street Landfill" and the Gulf States Creosoting Company Site was conducted on April 16, 2024. It was found that both sites exhibited the same RECs as identified within the NFI Phase I 2016 assessment. The Gallatin Street Landfill was not visited on this site visit. Due to the limited access during the site visits and the conditions they were in, it is recommended that further analysis, Phase I and/or Phase II, would be needed of all sites within the Project Area to ensure HTRW is not present during any form of construction or fill placement by the NFI.

4.2.23.4 Alternative E1 (without Weir)

A Phase I Environmental Site Assessment was not conducted for the additional FRM features added to Alternative E1 and would need to be done prior to construction to identify any recognized environmental conditions within the proposed Project Area. Since a Phase I Environmental Site Assessment was not done, there are levels of uncertainty for portions of the alternative that was not evaluated within the NFI Phase I. If Alternative E1 does not include the construction of the new weir, there is a potential that the impacts to the recognized environmental conditions, could be lower depending on the details of Alternative D1.

4.2.24 Socio Economics

4.2.24.1 Population and Housing

4.2.24.1.1 No Action Alternative – Future without Project Condition

The no action alternative presents no direct or indirect impacts in relation to population and housing. Additionally, Moody's analytics (ECCA) forecast presents a decline in the population,

and therefore households, for Hinds County and growth in Madison and Rankin Counties. These trends would be expected to continue as flooding continues to occur.

4.2.24.1.2 Alternative A1 – Nonstructural and Canton Club Levee and the Canton Club Levee

Alternative A1 presents a direct beneficial impact on population and housing because of elevating residential structures and flood proofing nonresidential structures within high-frequency floodplains in the Study Area. Indirect impacts could include a slower, yet still declining rate of population due to an increased number of elevated homes. Frequent flooding of communities can have a detrimental impact on population due to residents ultimately relocating instead of repeatedly bearing the direct and indirect cost of repair and temporary displacement. A1 provides flood risk reduction for the residents at most risk of bearing the effects of high frequency flooding. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.24.1.3 Alternative E1 (Without Weir)

This alternative could have similar impacts to Alternative A1 with the possibility of an increase in population and housing as a result of stage reductions in the region of influence for residential and commercial structures.

4.2.24.1.4 Alternative D1 (with Weir)

This alternative would have similar impacts to alt E1

4.2.24.2 Employment, Business, and Industrial Activity

4.2.24.2.1 No Action Alternative – Future without Project Condition

The no action alternative does not present any direct or indirect impacts to employment and business activity in the ROI. There would be a continued downward trend in employment as indicated by Moody's Analytics ECCA forecast for Hinds County and increase employment in Rankin and Madison Counties as establishments move outward from the affected area.

4.2.24.2.2 Alternative A1 – USACE Developed Nonstructural Plan and Canton Club Levee

Alternative A1 presents positive direct impacts on employment via opportunities created during construction of the project. Adverse indirect impacts would be experienced in the ROI as the inundation would still be present on roadways affecting sectors heavily reliant on transportation corridors. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.24.2.3 Alternative E1 (without Weir)

Alt E1 presents positive direct impacts to employment and business activity through construction investment during implementation. It would also have positive indirect impacts on employment as transportation corridors would be better accessed and allow for businesses to operate at full

capacity. It could forestall the loss of some business and employment in the Study Area to the extent that such attrition would be due to limited accessibility from flooded roadways.

4.2.24.2.4 Alternative D1 (with weir)

This alternative could have similar impacts in the long-term compared to Alternative E1. Furthermore, since the creation of the lake could lead to additional opportunities for recreation, there is potential for employment to increase in the dining and entertainment sectors.

4.2.24.3 Public Facilities and Services

4.2.24.3.1 No Action Alternative - Future without Project Condition

The no action alternative does not present any direct or indirect impacts to the existing public facilities and services in the ROI. These facilities would continue to have service interruptions during an inundation event and would remain in place.

4.2.24.3.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

Alternative A1 does not present any direct or indirect impacts to the existing public facilities and services in the ROI as inundation on roadways would continue to inhibit the capabilities of emergency services. These facilities would continue to have service interruptions during an inundation event and would remain in place. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.24.3.3 Alternative E1 (without Weir)

Alt E1 does not present any direct impacts on the public facilities and services in the ROI. Positive indirect impacts would be experienced as a result of decreased flooding on roadways and facilities within the ROI.

4.2.24.3.4 Alternative D1 (with Weir)

This alternative would have similar impacts in the long-term compared to Alternative E1.

4.2.24.4 Tax Revenues and Property Values

4.2.24.4.1 No Action Alternative - Future without Project Condition

Tax revenues and property values would possibly decrease somewhat due to projected population decreases under the future without project condition.

4.2.24.4.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

Property values could increase for structures included in the nonstructural plan and on the interior of the Canon Club levee. The implementation of Alternative A1 could lead to a temporary increase in sales tax revenue due to workers making purchases in the Study Area. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.24.4.3 Alternative E1 (Without Weir)

Property values could increase for structures benefiting from the implementation of Alternative E1. The implementation of E1 could lead to a temporary increase in sales tax revenue due to workers making purchases in the Study Area.

4.2.24.4.4 Alternative D1 (With Weir)

This alternative could have similar impacts in the long-term compared to Alternative E1. Long-term increases in sales tax revenue could occur due to out-of-state visitors taking advantage of recreational opportunities created by the lake.

4.2.24.5 Community Cohesion

4.2.24.5.1 No Action Alternative – Future without Project Condition

The no action alternative does not have any direct or indirect impacts to community cohesion in the ROI. Community centers and places of worship would continue to experience inundation at the structure and on roadways in this alternative.

4.2.24.5.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

Alternative A1 presents adverse direct impacts on community cohesion via the separation of neighbors during elevation of residential homes. There would also be adverse indirect impacts on community cohesion as there would be a large portion of individuals who are not mitigated for under this alternative. Additionally, community center and places of worship would still remain inaccessible during inundation events due to flooding on roadways. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.24.5.3 Alternative E1 (Without Weir)

Alternative E1 presents no direct impacts to community cohesion. Indirect positive impacts to community cohesion include increased accessibility on roadways, as well as a reduction in damages to structures for community facilities. In addition, community cohesion would be positively impacted as more structures in the community would be mitigated.

4.2.24.5.4 Alternative D1 (With Weir)

This alternative would have similar impacts in the long-term compared to Alternative E1.

4.2.24.6 Infrastructure

4.2.24.6.1 No Action Alternative ‑ Future without Project Condition

The no action alternative would have no direct or indirect impact on the existing infrastructure. These facilities would continue to be stressed during an inundation event.

4.2.24.6.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

Alternative A1 would have no direct or indirect impacts to existing infrastructure. Under this

alternative, there would be continued stress on the facilities during inundation events. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.24.6.3 Alternative E1 (without Weir)

Alternative E1 presents no direct impacts to infrastructure. There is a positive indirect impact to infrastructure as there would be opportunity for investment and expansion for the existing facilities.

4.2.24.6.4 Alternative D1 (with Weir)

This alternative would have similar impacts in the long-term compared to Alternative E1

4.2.24.7 Transportation

4.2.24.7.1 No Action Alternative - Future without Project Condition

The no action alternative does not present any direct or indirect impacts on transportation in the ROI. Suburbanization would continue in the city of Jackson, increasing the reliance on transportation corridors.

4.2.24.7.2 Alternative A1 – USACE Developed Nonstructural Plan and the Canton Club Levee

Alternative A1 does not present any direct or indirect impacts to the ROI in relation to transportation. These transportation corridors would continue to be inundated and cause transportation issues. While the impacts of Alternative A1 are presented within Section 4, they primarily reflect potential future programmatic measures. As a result, Alternative A1 has been excluded from the final array of alternatives.

4.2.24.7.3 Alternative E1 (Without Weir)

Alternative E1 presents no significant direct impacts to transportation. Positive indirect impact would result as transportation corridors would have a reduction of stages during inundation events.

4.2.24.7.4 Alternative D1 (With Weir)

This alternative would have similar impacts in the long-term compared to Alternative E1.

SECTION FIVE

5 Habitat Mitigation

This section includes a summary of the preliminary mitigation plan presented in Appendix F. The preliminary mitigation plan outlines the unavoidable direct habitat impacts and preliminary mitigation plan associated with the PR FRM Project. All Alternatives would incur unavoidable direct and/or indirect habitat impacts that would require compensatory mitigation.

Indirect impacts have not been quantified yet and therefore the mitigation need for indirect impacts has not been determined. This RDEIS includes qualitative assessments of indirect impacts. The indirect impacts and associated mitigation requirements will be determined and quantified in subsequent phase(s) using a certified model and would consider wetland impacts up to the 5-year floodplain as this would capture a more accurate estimate of the nature and magnitude of potential wetland impacts.

USACE will continue to coordinate with Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) and the non-federal interest regarding potential impacts to the Lefleur's Bluff State Park as a result of the PR FRM Project. There are no anticipated direct impacts to the MDOT mitigation bank (Fannye Cook Natural Area). However, USACE and the NFI will continue to coordinate with MDOT regarding potential impacts.

An Interagency Mitigation Team (IMT) was developed which initially included the U.S. Fish and Wildlife Service (the Service), USACE, Rankin Hinds Pearl River Flood & Drainage Control District (non-federal interest (NFI)) and MDWFP (identified as the initial IMT). Since the release of the draft EIS, the Environmental Protection Agency (EPA) Region 4 has been included on the team (identified as the IMT). Federally identified Tribes will be included in subsequent phase(s) to ensure that cultural keystone species, specifically rivercane, are appropriately considered during development of the project specific mitigation plan. The IMT will work closely to complete the project specific mitigation plan in subsequent phase(s).

When a recommendation is made on which FRM alternative(s) to fully analyze, the USACE will prepare additional NEPA documentation to adequately assess the impacts. This additional NEPA document will include a project specific mitigation plan which will include all required components. Construction of any FRM features will not commence in waters of the United States, or in any fish and wildlife habitat, until the USACE has coordinated with the interagency mitigation team (IMT) on the mitigation plan for each compensatory mitigation feature and all in-lieu fee program/mitigation bank credits have been purchased and/or compensatory mitigation sites have been secured for each mitigation feature (e.g., acquired via fee title acquisition or protected via conservation easement).

Alternative D1 includes a fish passage to allow aquatic species access above the proposed weir. This minimizes impacts to federally listed and other aquatic species in the PR. Alternative D1 also reduces the footprint of the FRM project area (previously eliminated Alternative C) thereby minimizing impacts to various habitat types and avoiding impacts to HTRW sites. Alternative E1

reduces the footprint even more than Alternative D1 by not including a new weir which avoids impacts to riverine habitat and to federally listed aquatic species. Alternatives D1 and E1 include armoring on the western bank of the PR to enhance the integrity of the bank and preserve the oxbow lakes adjacent to that bank. Even after such minimization and avoidance measures, unavoidable impacts to fish and wildlife are anticipated for each Alternative.

The initial IMT met on several occasions to discuss direct habitat impacts and assumptions to apply to mitigation for this phase. Those assumptions can be found in Appendix F Section 5.

Model outputs measure habitat value in "average annual habitat units" (AAHUs). Table 5-1 displays the impacts for each of the habitat types based on the initial IMT assumptions. In subsequent phase(s), the types of models would be revisited, agreed upon, and conducted to determine the project specific AAHUs of each habitat impacted and the mitigation potentials at proposed mitigation sites.

Table 5-1: Preliminary Direct Impacts Based on the IMT Assumptions

Habitat	Alt A1 (Acres)	Alt A1 (AAHU)	Alt D1 (Acres)	Alt D1 (AAHU)	Alt E1 (Acres)	Alt E1 (AAHU)
Lacustrine/Open Water	0	0	81 self-mitigating	497 self-mitigating	81	497
BLH wet	1.5	4	689	1,732	689	1,732
Swamp			55	135	55	135
Forested Uplands	9	35	260	999	260	999
Riverine/stream	.04	.03	232	164	.1	.1

The number of AAHUs impacted per habitat type is equivalent to the number of AAHUs required for mitigation. The required acres, however, are not a one-to-one equivalency and are based on the habitat quality of the mitigation site and the mitigation strategy to be implemented. That being said, as stated prior, impacts were determined using the 2014 HEP and the 2006 ERDC aquatic analysis results. During subsequent phase(s) appropriate certified models would be conducted to determine the mitigation requirements for each habitat type impacted.

In kind mitigation would replace natural resource functions similar to those lost or degraded as a result of construction and operation of the PR FRM project. Such compensation sites would be in a similar geomorphic position (e.g. riverine wetlands up to the 5-year floodplain) to areas adversely affected by the project and would support communities of fish and wildlife species similar to those adversely affected by the project.

The following preliminary mitigation objectives would be satisfied in the Pearl River watershed. Lacustrine impacts are assumed to be self-mitigated with Alt D1. If Alternative E1 were to be implemented, then lacustrine habitat would need to be mitigated. Preliminary sites within the newly excavated area have been identified for lacustrine mitigation.

It should be noted that these are preliminary objectives based on this preliminary analysis and during a later phase(s), and development of a project specific mitigation plan, the habitat models

would need to be revisited to accurately determine the units of impact for each habitat type and the mitigation strategy to sufficiently compensate for the impacts.

5.1 Alt A1

- Compensate for the loss of 4 AAHUs BLH
- Compensate for the loss of 35 AAHUs forested uplands
- Compensate for the loss of .03 AAHUs stream habitat

5.2 Alt D1

- Compensate for the loss of 1,732 AAHUs BLH
- Compensate for the loss of 135 AAHUs swamp
- Compensate for the loss of 999 AAHUs forested uplands
- Compensate for the loss of 164 AAHUs riverine habitat

5.3 Alt E1

- Compensate for the loss of 497 AAHUs of lacustrine habitat
- Compensate for the loss of 1,732 AAHUs BLH
- Compensate for the loss of 135 AAHUs swamp
- Compensate for the loss of 999 AAHUs forested uplands
- Compensate for the loss of .1 AAHUs stream habitat

For this phase, the team has used the NFI's mitigation plan and similar recently constructed USACE mitigation projects to determine the acres required to satisfy the forested wetlands and uplands objectives. Additionally, the acres required are being presented using a range due to the level of uncertainties at this time. The number of acres required for mitigation of forested wetlands and uplands would be between 5,512 and 11,612 acres (see Appendix F, Section 6 for further details).

The team is assuming that the very minimal stream impacts that would be incurred by Alternatives A1 and E1 could be mitigated through mitigation bank credit purchases. Potential riverine mitigation measures have been identified but only one carried forward for this planning phase. The replacement of at least one obsolete aquatic barrier downstream from the new weir could mitigate for all or a portion of the riverine impacts. Further analysis is needed to determine if this measure is feasible. The team has identified several other potential riverine mitigation measures. However, further analysis is needed to determine the locations at which they could be implemented and the level of mitigation each could produce.

The IMT has identified general, but habitat specific, success criteria, monitoring plans, and an adaptive management plan based on the preliminary mitigation measures carried forward. In subsequent phase(s), when a project specific mitigation plan is developed, these success criteria, monitoring plans, and adaptive management plan will be refined. See Sections 13 and 14 of Appendix F for further details.

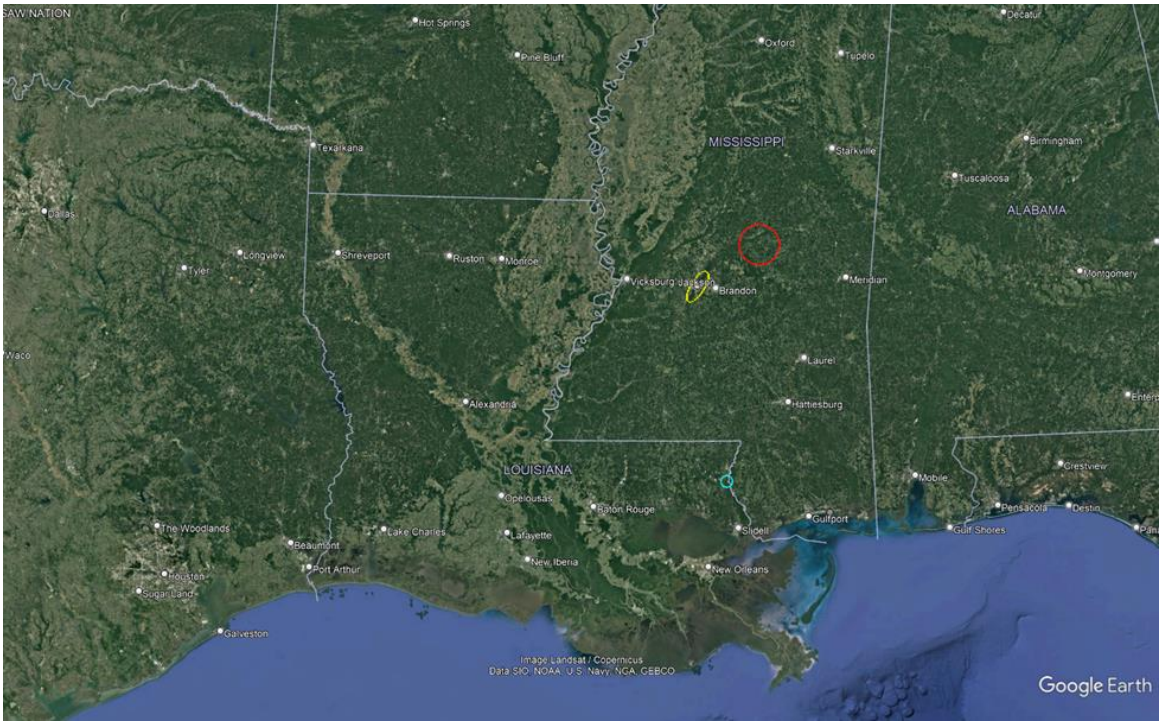

Figure 5-1: Locations of FRM project and Potential Lacustrine Mitigation (yellow), Potential Forested Wetlands and Uplands Mitigation (red), Potential Riverine Mitigation (blue)

Note: all mitigation measures are preliminary and not proposed. Future analysis in subsequent phase(s) will identify proposed mitigation measures.to be used.

The number of AAHUs impacted per habitat type is equivalent to the number of AAHUs required for mitigation. The required acres, however, are not a one-to-one equivalency and are based on the habitat quality of the mitigation site and the mitigation strategy to be implemented. That being said, as stated prior, habitat mitigation requirements have not been adequately quantified at this time. Instead, impacts were determined using the 2014 HEP and the 2006 ERDC aquatic analysis results. During subsequent phase(s) appropriate certified models would be conducted to determine the mitigation requirements for each habitat type impacted.

This preliminary plan focuses on combining some habitat types for mitigation purposes. The following preliminary mitigation objectives would be satisfied in the Pearl River watershed. Lacustrine impacts are assumed to be self-mitigated with Alt D1. If Alternative E1 were to be implemented, then lacustrine habitat would need to be mitigated.

It should be noted that these are preliminary objectives based on this preliminary analysis and during a later phase(s), and development of a project specific mitigation plan, the habitat models would need to be revisited to accurately determine the units of impact for each habitat type and the mitigation strategy to sufficiently compensate for the impacts.

SECTION SIX

6 IMPLEMENTATION OF ALTERNATIVES

Section 3104 of WRDA 2007 authorizes construction of Pearl River Basin, MS project to include a flood damage reduction at a total cost of $205,800,000 based on 2007 dollars. The features of the flood damage risk reduction project will be determined by the ASA-CW decision on which alternative to implement. The current cost estimate at the current FY25 price level is $1,033,106,000 with a fully funded cost estimate of $1,226,079,000. The USACE Section 902 Cost Limit recalculated for FY 2025 as the maximum cost is $475,688,000.

6.1 Alternative A1

The Implementation plan for the Nonstructural component of A1 is located in Appendix N for reference. For the structural component, the Canton Club Levee, an implementation plan will be developed within PED. Based on current cost estimates, Alternative A1 could be implemented in its entirety and would require minimal additional analysis during the PED phase.

6.2 Alternative D1/ E1

Implementation of a combination of the flood risk reduction features are presented for consideration, Alternative D1 or E1, and may be implemented under Section 3104, subject to not exceeding the maximum total project cost as established by Section 902 of WRDA 1986, as amended. If alternative D1 or E1 were to be selected for implementation based on the estimated total project cost additional authority would be required. A decision document to request revised authority will be prepared. This authority may include an increase in the total authorized project cost under Section 3104 If one of these alternatives is selected for implementation, then during PED a detailed cost estimate will be developed to determine a total project cost. This cost estimate will be based on additional analysis and design, feasibility level decision documents, and project specific mitigation plan. If the cost exceeds the 902 limit a decision document to request revised authority will be prepared. In addition, supplemental NEPA documentation will be required during the PED phase if such solutions are recommended.

6.2.1 Additional Authorities or by Other Entities

Public testimony and comment from across the Pearl River watershed and within the Study Area reveal a multitude of concerns that may be addressed through other authorities or by other entities. No one authority can solve all the problems immediately; therefore, a systematic approach involving multiple projects from several different programs and under several different authorities would be required to effectively address the array of problems in the watershed.

The Pearl River Valley Water Supply District could consider operational changes at the Ross Barnett Reservoir and revising the Ross Barnett Water Control Manual to formalize continued flood reduction capacity though future informed operations.

EPA could use existing authorities to provide water supply in addition to local water infrastructure improvements currently being implemented in the City of Jackson under the USEPA authorities and the USACE Environmental Infrastructure Program (Section 219) project. Furthermore, the City of Jackson Water/Sewer Utilities Division could make local water infrastructure improvements.

A NFI could excavate the channel for recreational and economic development. Since the Pearl River is not an authorized federal navigation project, the states of Louisiana and Mississippi could consider entering into a water control agreement that sets conveyance requirements through the lower Pearl River. The agreement may set flowrate requirements at specific river miles during specified times of the year. Additional instrumentation may be required at specified river miles and with funding and authorization, USACE can support acquisition, installation, and continuous monitoring. A comprehensive watershed study of the Pearl River is warranted to fully understand the basin's hydrology, hydrodynamics, and ecosystem. The scope of the study should be from the headwaters to the terminus at the Gulf of America. A watershed study would inform disposition of legacy federal infrastructure, opportunities for sustaining and managing flowrates through the basin, and enhancement of habitat for the basin's wildlife, flora, and fauna. Authorization via a Water Resources Development Act or other authorities would be required.

6.2.2 Downstream Impacts

Alternative A1 Nonstructural Plan would not change the hydrology within the Pearl River; therefore, no downstream impacts would occur. The risk of flooding will be reduced behind the Canton Club Levee, but no impacts are expected outside of the leveed area. For this reason, downstream impacts of alternative A1 are not described in the subsequent sections.

Alternative D1 could change the hydrology downstream and hence have indirect impacts on forested wetlands, forested uplands, wildlife and listed species dependent on riverine habitat. These indirect impacts would be quantified and mitigated in subsequent phases.

Alternative E1 could indirectly impact some wildlife within the project area by removing the habitat they depend on and hence potentially increasing the chances of hybridization and fatalities by vehicle strikes or human interaction.

6.2.3 Flow and Stage Downstream with Alternative D1/E1

A more detailed assessment of flow and stage impacts was completed for all frequencies analyzed (5, 10, 25, 50-, 100-, 200-, and 500-year events) this assessment extended for 20 miles downstream of the project extent. Both D1 and E1 are modeled but the modeling results are very similar and can be considered the same for the purposes of this screening level assessment. An earlier assessment which was completed for the previous Alternative C for the 20% AEP and 1% AEP frequencies, to represent a relatively frequent event as well as a more extreme scenario is used as an upper bound below this extent. There were flow and stage inducements identified (Table 6-1). Reduced project features create less downstream inducements than with the previous alternative

C. The inducements due to the any event less than the 100-year event appear to resolve to less than 0.25 feet of added water less than 20 miles downstream of the project and completely resolve just prior to the Copiah Creek confluence, approximately 32 miles downstream of the project (from previous analysis) just prior to the Copiah Creek confluence, approximately 32 miles downstream of the project.

Table 6-1: Impacted Areas from Project Area to 20 miles Downstream

Total Acres Included by Increment of Inducement (Feet) – to 20 miles downstream of project.	1 % AEP- Acres, flooded above 0.25 feet	1% AEP - Structures
100-year frequency and below combined	81	11
200- and 500- year frequencies combined	5,822	97

Table 6-1 above show estimated acres and structures impacted due to construction of Alternative D1 or E1 for the full range of modeled events. Areas with any increase in water surface elevation were compared to the structures in the area. Structures in this assessment were taken from the national structure inventory, then structures no longer existing or habitable were removed from the list. This list of structures was compared to the depth of water at that location to determine if it was likely that water would be flooding the ground floor of a building. Structures above the water surface were removed from the list. An example would be if a house was in an area that was flooded 1 foot deep, but the house was built 4 to 5 feet off the ground on a raised foundation. This was considered acceptable for this analysis, as impacts to land are considered separately.

Estimated Acres of land impacted was limited to the area outside of the FEMA floodway. This was used in proxy of the ordinary high-water marks, this marks areas frequently flooded by water from the river and can be indicated by things such as riverbank features, and plant types. Modeled areas with an additional 0.25 feet or more of inundation are listed in this analysis. The PDT is confident that a land area flooding 0.25 feet or less higher for approximately the same amount of time would not likely cause damage, when accounting separately for any structure use. It is likely that it would take a larger added depth of flooding than 0.25 feet to cause appreciable damage to a property (i.e. woods, parking lot, yard), but further analysis would need to be completed in PED to verify this assumption.

Additional assessment of the changes to downstream boundary was conducted for the 1% AEP event. Further analysis would be needed to validate the total impacts, specifically to verify sediment and velocity impacts of the additional water moving downstream. However, major impacts to the downstream watershed beyond the RM 200 (approximately 5 miles north of Monticello, MS) are highly unlikely. No impacts to the State of Louisiana or Gulf Coast Region are expected to occur.

6.2.4 Sediment Analysis and Management Downstream with Alternative D1/E1

Potential direct impacts to water supply and flood conveyance due to the deterioration of water quality or quantity from the existence of the proposed weir that could impact sediment load within the newly formed reservoir (Alt D1) due to reduced velocities and entrainment potential. A

sedimentation study would be necessary to assess the viability of project features. The impacts to water quality and conveyance to the proposed project are inconclusive due to the lack of data, and modeling efforts within the Project Area. No sediment samples have been provided or analyzed from the Ross Barnett Reservoir or downstream Project Area either on the main Pearl River channel or tributaries for use in this study.

To determine if impacts are acceptable, additional analysis is needed. Verification would be needed to demonstrate that adding a large weir would not induce sediment loads to alter the incoming chemistry in such a way to induce failure at the existing J.H. Fewell Plant or any other proposed structure along the newly ponded area. Determination of Sediment Oxygen Demand (SOD) for Pearl River sediments that would lie under Preferred Project Lake is needed for Alternative D1.

Impoundment would increase the depth over the sediments potentially decreasing DO in water column immediately adjacent to sediments. Deeper waters when combined with SOD could possibly result in bottom water hypoxia and anoxia. Verification also would be needed to verify that sedimentation passed from the Ross Barnett Reservoir within a proposed ponded feature would not impact storage or conveyance of flood waters. Assessment of the tributaries for sediment load as well as the requirement of Hard Points in tributary channels to prevent incision and additional sediment into newly constructed lake would be needed.

Potential direct impacts to water supply and flood conveyance due to the deterioration of water quality or quantity from the existence of the channel overbank lowering (Alt E1) due to increased velocities and entrainment potential. A sedimentation study would be necessary to assess the viability of project features. The impacts to water quality and conveyance to the proposed project are inconclusive due to the lack of data, and modeling efforts within the Project Area. No sediment samples have been provided or analyzed from the Ross Barnett Reservoir or downstream Project Area either on the main Pearl River channel or tributaries for use in this study.

6.2.5 Water Quality Downstream with Alternative D1/E1

The NFI provided two distinct modeling studies, which used available data to evaluate water quality impacts of construction of a new lake (Alternative C) on the Pearl River below Ross Barnett Reservoir. USACE reviewed the NFI's work and recommendations for any future efforts. Updated modeling to confirm how these assumptions applied to Alternative D1 and E1 are needed future study.

Modeled impacts predicted were of short duration and limited reach. A major premise of the efforts is that the waters filling the new lake are essentially those of Ross Barnett, so no significant water quality issues are expected. The studies concluded that below the proposed lake, water quality impacts in the Pearl River due to any flow alterations are muted and not substantial.

A key aspect of these studies is that the waters of the proposed lake are essentially those released from Ross Barnett and that they receive no loadings while in the proposed lake which may degrade water quality conditions. The study concluded that the three existing point sources that contribute

to the Project Area are either not significant enough or don't directly contribute to the proposed lake waterbody, so as to not degrade the new lake water quality. However, the impact of stormwater loads upon the receiving waters of the proposed lake is poorly understood and characterized. Compounding this issue are the condition of the Jackson sewer system and the reported number of overflows and leaks. A common assumption is that sanitary sewer leaks potentially reach receiving waters via the stormwater drainage system. The degree to which the watershed of the proposed lake is susceptible to receiving sanitary sewage overflows via the stormwater collection system and ongoing and future efforts to address these issues is unknown at this time.

6.2.6 Life Safety Analyses- Dam/Levee for Alternative D1/E1 Life Safety – Dam Breach D1/E1

Original life safety analysis work was completed using Alternative C. As no life risk was determined due to breach screenings, this work was not recompleted for Alternatives D1/E1, and there are smaller or no proposed impounding water bodies.

Four pool loadings were modeled with a breach / non-breach pair using the loading and parameters listed below. A proxy ½ PMF (2022) provided by the Ross Barnett Reservoir Staff was routed downstream to mimic a design storm that would be calculated at the proposed dam location. Note that this analysis was only completed for the Alternative C geometry due to the time constraints associated with the addition of Alternative D1 modeling. It is reasonable to assumed that the Alternative D1 has less impact due to a breach of a structure, given the smaller dam size, and smaller impounded water volume. It is probable but not proven that the Alternative D1 proposed weir may be considered a low hazard dam.

Table 6-2: Hydraulic Loadings for Breach Testing (Alternative C)

Pool Loading (ft)	Flow Ratio	Breach Bottom Elevation (ft)	Breach Width (ft)	Breach Formation Time (hr.)
260.1 (approximate top of dam)	0.01% AEP x 0.15	248	1900	0.1
260.3	0.01% AEP x 0.2	248	1900	0.1
260.8	0.01% AEP x 0.3	248	1900	0.1
275.2	½ PMF*	248	1900	0.1

The Alternative C breach at a pool of 260.1ft showed additional flooding focused within the downstream area. The identified structures appear to be hunting cabins or temporary raised structures. The breach at a pool of 260.8ft (0.01% AEP x 0.3) showed a minimal incremental difference in the breach and non-breach pair. No structures are impacted by the 260.8 ft breach scenario. The breach at 275.2 ft (1/2 PMF) showed no incremental difference in the breach and non-breach pair.

6.2.7 Weir Design Requirement Estimation – Alternative D1

Original life safety analysis work was completed using Alternative C. As no life risk was determined due to breach screenings, this work was not recompleted for Alternatives D1, and the proposed impounding water body is smaller.

Four breach scenarios were completed with the Alternative C model, to confirm dam safety hazard classification. Per FEMA's dam safety report 333, there are three hazard classifications as shown below in Figure 6-1, ranging from high to low. Per USACE guidelines 1110-8-2(FR) there are 4 classifications (Table 6-3), 1-4. Given that the proposed weir retains a large volume of water, a high hazard dam would automatically be a standard 1, a significant hazard dam would be either a Standard 1 or 3 depending on amount of property impacts, and low hazard dam would be a standard 2.

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable. One or more expected	Yes (but not necessary for this classification)

Figure 6-1: Hazard Potential Classifications

Table 6-3: USACE Design Standards for Dams

Standard	Description	Inflow Design Flood
1	Risk to life and property	Probably Maximum Flood (PMF)
2	Run of river projects (e.g., Navigation)	Standard Project Flood (SPF)
3	Negligible incremental impacts due to failure	Base Safety Condition*** (Minimum ½ PMF)
4	Small dams	1% Annual Exceedance

Two structures that are not listed within the study structure inventory were incrementally damaged by this event for Alternative C. Therefore, there would be no life loss associated with these structures. They appear to be tractor sheds or deer camps that would not be significantly impacted by the additional water when shallow, and at higher flow/elevation breaches, there are no structures that are incrementally damaged. Therefore, for current study purposes the proposed weir for Alternative C will be considered to a significant hazard, standard 3 dam, which requires a ½ PMF design storm.

It is reasonable to assumed that the Alternative D1 has less impact due to a breach of a structure, given the smaller dam size, and smaller impounded water volume. It is probable but not proven that the Alternative D proposed weir may be considered a low hazard dam. A more formal legal review of terms and damages incurred will be needed to confirm this determination and for any other alternative including a dam moved forward to further study.

6.2.8 Breaching Analysis of Existing Analysis for Alternative D1/E1

No formal breaching analysis occurred after a review of elevation profiles along the river and existing leveed areas. As the flows increase in the river, risk would be attributed to a riverine flow regime, rather than a ponded body of water. The images below(Figure 6-2) show elevations ranges within the existing levees and demonstrate that there would be very little structure impact and reasonably no life loss if a structure were to breach due to the low flow ponded surface. (Above which risk is not attributed to the weir, but instead to a riverine flooding aspect.)

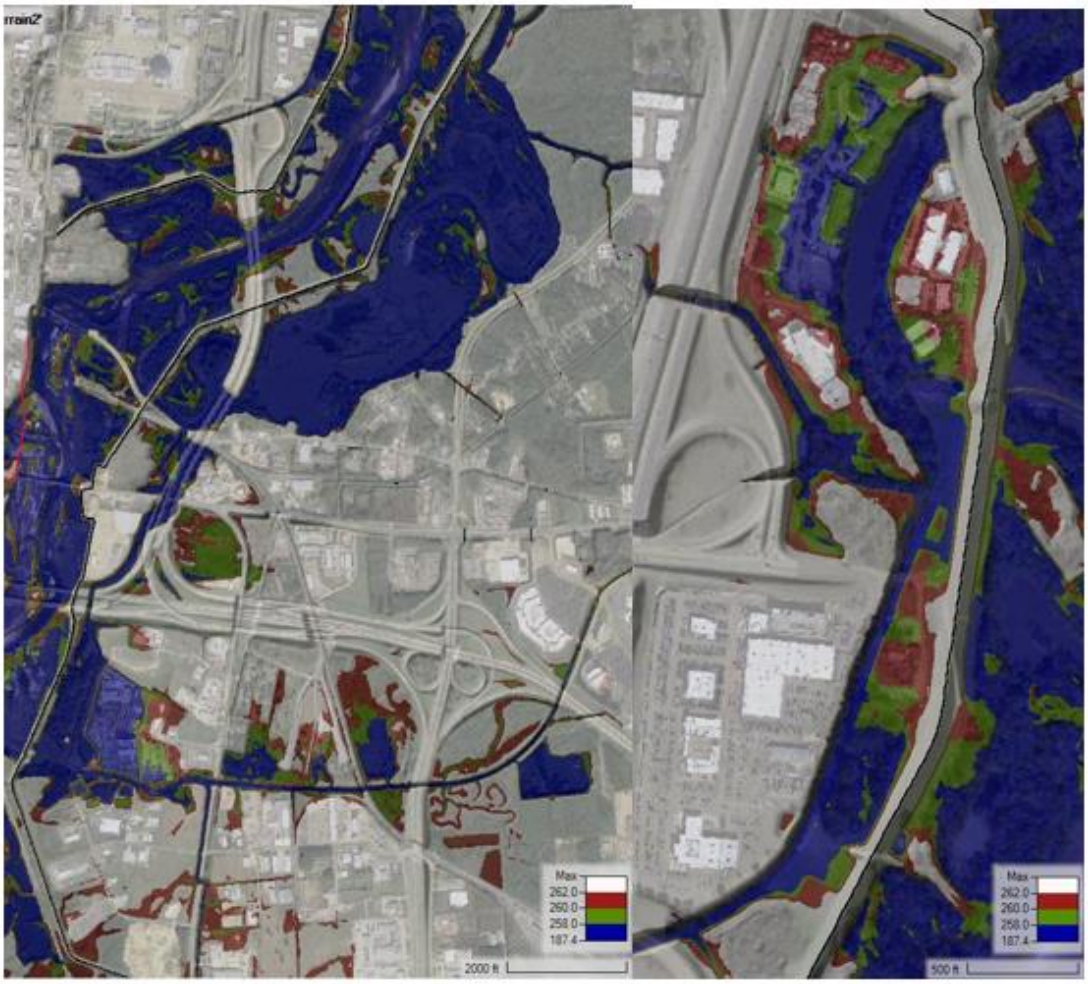

Figure 6-2: Terrain Mapping at Existing USACE Levees – Jackson East (Left) and Jackson Fairgrounds (Right)

6.2.9 Levee Safety Risk Analysis- Pearl River Project Alternative D1/E1

As part of the USACE review of the current study report, a qualitative evaluation of the potential life safety impacts only considering available information is included. This evaluation focusses on the Alt C plan(s) in terms of levee risk.

Please note that the Alternative D1 plan is not included in this assessment, and further investigation will need to be completed after final selection of features. Alternative D1 can be assumed to have the same order of magnitude life safety concerns as Alternative C (ranging from same results to less risk to life loss). Alternative E1 will have less impacts from a Life Safety perspective.
There are three existing levee systems that are impacted as part of the Alt C plans that are shown in the National Levee Database (NLD).

1. Jackson Fairgrounds MS (NLD System # 5905000002)
2. East Jackson MS (NLD System # 5905000015)
3. Jackson-East Jackson Flood Control Project (NLD System # 1405000124)

USACE has completed screening level risk assessments for the Jackson Fairgrounds MS and East Jackson MS levee systems evaluating the life safety risks associated with the existing levees. USACE developed the risk screenings using available data in the NLD, the data included in the feasibility report, screening level risk assessments of the existing Jackson Fairground MS and East Jackson MS levee systems completed by USACE, and evaluation of this data. Additionally, the uncertainties and impacts of each of these alternatives are included, along with recommendations to reduce these data gaps and comply with USACE policy as the project advances to PED.

6.2.10 Jackson Fairgrounds MS (NLD System # 5905000002)

6.2.10.1 Alternative C – Overtopping Risks:

The currently proposed Alt C being evaluated by USACE does not include any alignment or height changes to the existing Jackson Fairgrounds Levee. The proposed plan would decrease the overtopping risk to the system by reducing the frequency of overtopping. The new, less frequent, overtopping frequency of the system cannot be accurately determined based on information included in the current study. This overtopping frequency and location would need to be calculated in PED phases.

6.2.10.2 Alternative C – Prior to Overtopping Risks – Jackson Fairgrounds MS Levee System:

The proposed Alt C plan would reduce the frequency of loading on the levee which does reduce the probability of high loading levels that could trigger a failure of the levee due to seepage.

Adjacent to the Jackson Fairgrounds MS levee system, the Alt C plan includes placement of fill areas on the riverside of the levee. The Alt C plan includes construction of a minimum 40-ft wide maintenance berm on the riverside of the levee where there is a permanent pool. The riverside fill and maintenance berm will not have a negative impact on the seepage performance of the existing levee system and may reduce the risk of the levee from a seepage failure.

The channel excavations within the Pearl River floodway provide the economic and life safety benefits for this project by reducing the frequency of loading on the existing levee system. A potential negative impact of the channel excavations is their proximity to the existing levee system. Excavations within the channel have the potential to remove riverside fine-grained blanket soils and create an effective seepage entry point closer to the levee. These excavations have the potential to increase the probability of initiation and progression of a seepage failure mode that can lead to breach. The Alt C plan does include the construction of a 40-ft wide maintenance berm on the riverside of the levee where there is a permanent pool. It is expected that the final design will be optimized during PED to widen the berm towards the riverside to eliminate the negative impacts of the channel excavation impacting the performance.

One area on the levee system where permanent pool may be against the levee and where the minimum 40-ft wide maintenance berm cannot be constructed is at an existing pump station. At this location the presence of the permanent pool may require cutoff walls and/or relief wells. If required, these mitigation measures would reduce the probability of failure of the existing levee system to a tolerable level compared with the overall levee overtopping risks.

6.2.11 East Jackson MS (NLD System # 5905000015)

6.2.11.1 Alternative C – Overtopping Risks:

The currently proposed Alt C being evaluated by USACE does not include any alignment or height changes to the existing East Jackson Levee. The proposed plan would *decrease the overtopping risk for a majority* of the system by reducing the frequency of overtopping.

However, inducements below the CN railroad raise the overtopping frequency by up to 0.4 feet for the 1% ACE. The new overtopping frequency of the system cannot be accurately determined based on information included in the current feasibility study. It is also unknown whether the proposed alternative will change the overtopping location on the levee system. This overtopping frequency and location would need to be calculated in PED phases.

6.2.11.2 Alternative D1 – Prior to Overtopping Risks – East Jackson MS Levee System:

The proposed Alt D1 plan would reduce the frequency of loading on the levee which does *reduce* the probability of high loading levels that could trigger a failure of the levee due to seepage. Adjacent to the East Jackson MS levee system, the Alt D1 plan includes the construction of spoil disposal areas on the landside of the levee. These soil disposal areas will effectively function as "seepage berms" in the areas where they are constructed. Thus, the probability of breach due to seepage at a given flood stage will likely *decrease* in areas where spoil disposal is placed on the landside of the levee. This decrease would only occur in areas where the "seepage berms" are placed as part of spoil disposal. The feasibility study does not identify whether the proposed locations of the spoil piles are in the most critical seepage areas. Therefore, the overall probability of a seepage failure of the levee system during a given flood stage may not decrease but would not increase due to of the placement of spoil piles.

The channel excavations within the Pearl River floodway provide the economic and life safety benefits for this project by reducing the frequency of loading on the existing levee system upstream of the CN railroad Bridge. The channel excavations within the Pearl River floodway induce flooding and increase the frequency of loading on the existing levee system downstream of the CN railroad Bridge. Another potential negative impact of the channel excavations is their proximity to the existing levee system. Excavations within the channel have the potential to remove riverside fine-grained blanket soils and create an effective seepage entry point closer to the levee. These excavations have the potential to increase the probability of initiation and progression of a seepage failure mode that can lead to breach. The Alt D1 plan does include the construction of a 40-ft wide maintenance berm on the riverside of the levee where there is a permanent pool. It is expected that the final design will be optimized during PED to widen the berm towards the riverside to eliminate the potential negative impacts of the channel excavation negatively impacting the performance of the existing levee system.

One area on the East Jackson levee system where the minimum 40-ft wide maintenance berm cannot be constructed and where permanent pool may be against the levee is at an existing pump station and major sump area. The existing levee south of the pump station may also be subject to a permanent pool, but the most critical location will be near the pump station. The presence of the permanent pool will likely require additional seepage control measures such as cutoff walls and/or relief wells. Although unlikely, there is the potential that isolated areas along the existing levee may require seepage mitigation south of the pump station, but that is unknown at this time and would need to be evaluated during PED. If required, these mitigation measures would reduce the probability of failure of the existing levee system to a tolerable level compared with the overall levee overtopping risks.

6.2.11.3 Jackson-East Jackson Flood Control Project (NLD System # 1405000124)

The NLD has limited information regarding this levee system. The Jackson-East Jackson Flood Control Project is a non-Federal levee system. The condition of the levee is unknown by USACE, and a risk assessment has not been completed for this levee. The levee is approximately 2.69 miles long and provides flood risk reduction to the wastewater treatment facility for the city of Jackson, MS. The levee system is believed to have not overtopped or breached during past flood events, in part due to flood fighting. Anecdotally, there may be potential seepage concerns for the existing levee. Upgrades to the existing levee will likely be required to bring the existing levee up to USACE standards. The extent of these potential upgrades is unknown but could be extensive.

6.2.12 Frequency of Overtopping for Alternative D1/E1

A formal re-analysis of specific overtopping frequency by plan was paused for the purposes of this study. The HEC-RAS modeling shows that the Jackson East, Jackson Fairgrounds, Pearson, the local levee behind Jackson East, and the Savanna Street WWTP Levees protect to the 100-year level of protection for Existing Conditions. The Brashear's Creek Levee does not protect to the 100-year level of protection.

Jackson East will have flood elevations both raised and lowered along the levee profile. The Jackson Fairground and Pearson Levees will not have flood elevations raised along the levee profile. However, constant loading along the Jackson East and Jackson Fairground will be raised significantly. The Savanna Street WWTP levee will require a levee modification that has not yet been fully designed to combat inducements for Alternative D1 and E1.

Local Levees included within the project have not had analysis due to lack of design and will be further analyzed in PED, if selected.

6.3 Incomplete or Unavailable Information

6.3.1 Implementation Plan

a) Only non-structural implementation plan exists at this time.

6.3.2 Mitigation Plan

For this phase, USACE was directed to use existing data to the extent possible and not to conduct additional analysis. Therefore, a preliminary mitigation plan was developed using existing data and assumptions agreed upon by the team, with the understanding that in subsequent phase(s), a detailed project specific mitigation plan would need to be developed.

For this phase, the Rankin Hinds District's 2014 HEP analysis results were used for direct impacts to forested habitat. In subsequent phase(s) habitat models would be conducted to more accurately capture the lost functions and values of the impacted habitats.

For this phase, the 2006 ERDC impact assessment for the "two lakes" project was used for direct impacts to riverine habitat. During subsequent phase(s), appropriate obligate riverine species would be used to run models for a more accurate impact assessment.

The AAHUs of impacts used to generate mitigation requirements came from the Rankin Hinds 2014 HEP analysis. USACE used the NFI 2022 mitigation plan and assumptions from recent USACE mitigation projects to determine a range of acres required.

Potential forested wetland mitigation lands have been identified by the NFI and the team is assessing the ability of those lands to fully compensate for forested wetlands and forested uplands impacts. The NFI has identified more lands, if needed, to the west of the lands being considered.

The acres required to sufficiently mitigate impacts due to the PR FRM project would be somewhere between 5,512 and 11,612 acres. The IMT is concerned that 5,512 acres may be too low due to the absence of indirect impact assessment and due to a large portion of the lands identified being preservation. The NFI is concerned that 11,612 acres, and the associated costs, are too high due to the assumptions applied. The acres required and the costs will be reassessed in subsequent phase(s).

The riverine mitigation measure carried forward for planning purposes (replacement of obsolete

aquatic barrier(s) with rock chute(s)) has not been fully analyzed. There are concerns about authority to remove and replace these structures. Further consideration of other methods of riverine mitigation would need to occur in subsequent phase(s).

Parametric mitigation costs were developed using recent USACE constructed mitigation projects. USACE costs include site prep, seedlings, planting, monitoring, maintenance, and acquisition. These costs will need to be revisited once mitigation strategies and acres required are calculated at each site. A project specific mitigation plan will be formulated consistent with USACE policies and developed in subsequent phase(s) at which time refined mitigation costs will be developed.

Indirect impacts and associated mitigation requirements to wetlands have not yet been determined. Indirect impacts will be determined and quantified in subsequent phase(s) using a certified model and would consider wetland impacts up to the 5-year floodplain. It is important to note that these indirect impacts could be significant, and if so, this could significantly increase the cost of mitigation.

6.3.3 Threatened and Endangered Species:

Since the LA pigtoe is a proposed species, unless the species is listed prior to construction start, the RPMs and T&Cs for this species are not required to be implemented. However, the USACE has developed preliminary costs for the relocation effort which would be about $135,000/acre. The number of acres of mussels to be relocated are unknown at this time. Discussions would continue with the USFWS regarding the level of effort required to offset potential impacts to the species should it be listed as threatened or endangered; therefore, mitigation costs would be updated, if necessary. Similarly, the Reasonable and Prudent Measure identified in the draft Biological Opinion requiring the creation of mussel bed(s) downstream from the new weir would be developed during in-depth consultation with the USFWS should the species be listed. Depending on the size and extent of effort required to create habitat to support a freshwater mussel community where none currently exists, the costs could be significant but would be developed as the process proceeds. Since the monarch butterfly is a proposed species, unless the species is listed prior to construction start, the RPMs and T&Cs for this species are not required to be implemented. However, the USACE has developed preliminary costs for this effort which range from $270,000 to $900,000. Additionally, the feasibility of this effort would need to be further assessed if mitigation is required.

The full extent of impacts to listed riverine species has not been properly captured as velocity, sedimentation, and water quality analysis needs to be conducted. The USACE has committed to conducting these analyses in subsequent phase(s).

6.4 Environmental Factors

a) In accordance with the January 9, 2023, CEQ guidance for Greenhouse Gas (GHG), both direct and indirect evaluations of GHG and the reduction features would be evaluated of the proposed project once when additional information is gathered. A GHG evaluation will be conducted (if sufficient data is available) prior to the release of the final EIS.

b) An environmental evaluation for HTRW was conducted by the NFI September 2014 and updated by the NFI in August 2021 of the Project Area. A technical memorandum was conducted by the NFI in December 2023 of the Project Area. Though the evaluation discovered contamination at two locations, additional sampling and reconnaissance is needed to truly determine the level of HTRW within the Study Area and the RECs identified. Once HTRW evaluation is finalized, appropriate remedial actions will be selected.

c) Within the Gallatin Street Landfill, it was noted within the NFI's Appendix L that there was limited sampling of the surface water to truly detect if the landfill is leaching or not. Per the contractor, the sampling was insufficient to truly determine whether leachate was released to the Pearl River.

d) Within the LeFleur's Landing Site, it was noted within the NFI's appendix L that there is an uncertainty if a constructed cap or liner system is currently present within the landfill.

e) Additional sampling is needed to determine the level of contamination within the Study Area and the RECs identified: Heavy Metal Analysis, BTEX, organic and inorganic, Radioactive Isotope analysis, etc.

f) USACE will continue to engage in consultation with federally recognized Tribes for the selection of habitat mitigation sites. Efforts should be directed towards the restoration of Rivercane (Arundinaria Gigantea), Switch cane (Arundinaria Tecta), and/or other cane species of documented cultural significance and appropriateness for propagation within the Pearl River Basin. This consultation may result in Stewardship/Access Agreements between USACE, Federally- Recognized Tribes, NFI, FWS, and others, as appropriate.

g) USACE will continue to coordinate with the NFI, MDWFP, and the USDOI NPS regarding LWCF land located at LeFleur's Bluff State Park to ensure that it remains in public recreation use. The LWCF was enacted to help preserve, develop, and ensure access to outdoor recreation resources (54 USC 200301 et seq.). "In accordance with the LWCF, no property acquired or developed with Land and Water Conservation funding shall, without the approval of the DOI, be converted to other than public recreation use. Further, DOI shall approve a conversion only if DOI finds it to be in accordance with the then existing comprehensive statewide outdoor recreation plan (SCORP) and only on conditions that DOI considers necessary to ensure the substitution of other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location."

h) A review of current existing inventory and evaluation of all aesthetic resources, or Visual Resources Assessment Procedure (VRAP), would need to be completed for the area per ER 1105-2-100 Appendix C Environmental Evaluation & Compliance,

section C-5 "Aesthetic Resources." This would occur prior to plan selection and inform design.

i) Nature-based feature types are in the process of being explored further with the NFI, coordinating agencies, stakeholders, and the public. These will be further assessed for performance optimization and strategic placement in subsequent decision documents. Some nature-based feature types already under consideration, but not limited to include:

NBS Type	Description
Controlled Shoals	Protection, enhancement, or creation of instream habitat.
Gravel Bars	
Sandbars	
Instream Woody Material	
Reforestation	Protection, enhancement, or creation of native habitat along the riparian buffer.
Planting Benches	
Oxbow Lakes	Creation within the excavated floodplain
Revetments	Use of hybrid green/gray technologies for shoreline stabilization that create habitat and mitigate erosion.
Rivercane	Conservation or restoration of cultural keystone species to mitigate erosion and maintenance costs.

6.5 Economic Factors

With and without project and Future with and without project H&H for the CTO and subsequent economic analysis have not been completed as part of this document. The CTO will be assessed in subsequent decision documents

6.5.1 Real Estate Factors

A formal real estate plan was not requested or required at this time. Instead, a limited market analysis was conducted for specific micro areas within the project footprint, providing estimated price-per-square-foot values for identified structures based on Multiple Listing Service data and comparable sales in those areas. However, a Gross Appraisal, including a comprehensive parcel-by-parcel analysis, is necessary to accurately estimate the total real estate project cost.

6.5.2 Engineering Factors

6.5.2.1 Borrow Plan

A borrow plan has not been developed at this stage of the analysis for the Alternatives. It is conceivable that there is enough borrow material from the material excavated but it is unknown at this time if the material is suitable for constructing levees. Should the excavated material be determined to not be suitable, borrow material would need to be identified for construction of any levees. There is potential borrow sources within close proximity of the Project Area (10-mile radius). Borrow opportunities would be further investigated during PED and a supplemental NEPA

document would be prepared at that time.

6.5.2.2 Hydrology and Hydraulic Factors/Sediment Analysis and Management

See discussion in section 6.6.1. Additional analysis required to validate the selected alternative and determine any mitigation and operation planning. Results from this analysis would be necessary to complete an O&M Plan.

6.5.2.3 Water Quality Analyses

See discussion in section 6.6.1.3. Additional analysis required to validate the selected alternative and determine any mitigation and operation planning.

6.5.2.4 Downstream Gaging

It is recommended that additional stream flow and stage gaging locations be added to the project location during future study to better understand localized impacts.

6.5.2.5 Bridge Impacts

If any stabilization or armoring, such as riprap, slope paving, slide repairs, etc., is required, it will be carried out prior to clearing and any major channel work. Following its own analysis, the Mississippi Department of Transportation (MDOT) has informed the Rankin-Hinds Flood Control District (the Flood Control District), MDOT agrees to collaborate with the Flood Control District in "the advancement of this project and to ensure countermeasures are included, if determined necessary during the future design process." (letter to G. Rhoads, dated February 26, 2024) To this end, the Flood Control District developed a range of potential structural and hydraulic countermeasures that could be recommended if countermeasures are determined necessary. The array of countermeasure features analyzed will mitigate potential impacts to MDOT bridges that will be identified during the PED phase. When additional information becomes available during PED, adjustments to the design would be made to reduce potential impacts. Any proposed countermeasure design and implementation will be conducted with MDOT's concurrence.

Rough estimations of the level of effort required to mitigate for bridge impacts include improvements for approximately 36 bents, 12 piers, abutment scour, as well as funding to conduct monitoring surveys. A pile is a concrete post that is driven into the ground to act as a leg or support for a bridge. A bent is a combination of the cap and the pile. Together, with other bents, act as supports for the entire bridge.

There are a total of 2 active railroad bridges within the Project Area. All efforts would be made to avoid, monitor, and protect these structures. Additional modeling is required to validate these assumptions during PED. If avoidance is not possible, then coordination with the operating entity to determine specific requirements and cost estimates to reduce risk to each railway bridge will be conducted during PED. All alterations of railroad bridges would be in accordance with Section 3 of the 1946 Flood Control Act (22 USC 701p) and any effects to NRHP-eligible bridges that cannot be avoided and/or minimized would be mitigated in accordance with the Section 106 NHPA PA.

6.5.2.6 Survey of Existing Levees

It is recommended that a survey of all existing levees be incorporated into the model to better understand and design levee assurances and ability to protect interior areas.

6.5.2.7 Coincidence Flows- Local Tributary versus Ross Barnett Releases

It was determined to be reasonably conservative to assume full coincidence with a three-day lag for the current effort. This coincidence and timing pattern were observed in the case of the catastrophic 1979 flood event.

It is recommended that a survey of tributaries and structures along the tributaries be incorporated into the model to better estimate flooding and impacts along tributaries.

To adequately size drainage structures through selected alternatives if alternatives are available to continue this effort, it is recommended that a Watershed Analysis Tool (WAT) model be developed to combine meteorological inputs, HEC-HMS rainfall-runoff calculations, and HEC-ResSim reservoir operations and routing later in the project.

Consideration would also be given to storm sewer or other drainage features.

6.5.2.8 Level 3 Cost Analysis and Associated Design

Cost estimates for interior drainage, seepage reduction, and bridge mitigation were applied to alternatives as applicable. Further design analysis on interior drainage and pump sizing would be required during further phase of study. Final design of seepage reduction would be required during further phases of study. Final design of bridge replacement or protection would be required during further phases of study. Final design of local levees or other water management features would be required during further phases of study. Final design of dam, if selected would be required during further phases of study. Additionally updated Life Safety analyses would be required for any feature that impounds water.

6.5.2.9 Weir Design

The proposed weir in Alternative C meets USACE and State criteria for a dam and a rough cost estimate was added to the project cost to account for design and constructing the weir to Federal and State criteria for a dam. Collaboration with MDEQ's Dam Safety group and further design would be needed to ensure the weir is designed to meet all required USACE and State Standards for safety.

6.5.2.10 Operation and Maintenance of Proposed Hydraulic Features

The Operation and Maintenance of proposed hydraulic features have not been developed. Procedures, costs, and schedules would need to be further refined to improve confidence in project costs.

6.5.2.11 Threatened and Endangered Species

Velocity analysis on the area of impoundment, downstream of the impoundment, and on the fish passage is needed to accurately assess impacts to GS. If the weir is included in the alternative for implementation, then velocity analysis would be conducted during PED.

Sedimentation analysis is needed to accurately determine the impacts on listed species. If the weir is included in the alternative for implementation, then sedimentation analysis would be conducted during PED.

SECTION SEVEN

7 ENVIRONMENTAL LAWS AND REGULATIONS

This Section provides a summary of the compliance status with various Executive Orders and Environmental compliance laws. A more exhaustive listing of the Relevant Environmental Federal Statutory Authorities and Executive Orders is included in Appendix L. Correspondence and coordination documents are located within the applicable appendix corresponding to the environmental law.

7.1 Executive Orders

7.1.1 Executive Order 14154: Unleashing American Energy

Executive Order 14154 removes the inclusion of Social Cost of Carbon and similar metrics within the federal decision making regarding to Greenhouse Gas Emissions.

7.1.2 Executive Order 14173: Ending Illegal Discrimination and Restoring Merit-Based Opportunity

Executive Order 14173 rescinds Executive Order 12898, which was established in 1994 to address environmental justice in minority and low-income populations.

7.1.3 Executive Order 11988: Floodplain Management

Executive Order 11988 directs Federal agencies to reduce flood loss risk; minimize flood impacts on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains. Agencies must consider alternatives to avoid adverse and incompatible development in the flood plain. If the only practical alternative requires action in the floodplain, agencies must design or modify their action to minimize adverse impacts. Some project features would extend into floodplains; however, Alternative A1 would not promote future development within the floodplain that otherwise would not occur. The study is compliant with the order. Alternative C and CTO would have some project features within the floodplain (channel excavation and proposed weir) that will not promote future development within the floodplain. Alternative C and CTO would also have features to promote future development (Land Creation) within the historic 1 percent AEP flood plain. However, those areas designed such that they would no longer be located within the updated 1 percent AEP floodplain upon project completion. Verification during PED would be necessary to ensure compliance with this executive order. Alternative C would also create a rise in the 1 percent AEP floodplain downstream of the project site and would require mitigation.

7.1.4 Executive Order 11990: Protection of Wetlands

Executive Order 11990 directs Federal agencies to assess the likely impacts to wetlands associated with any proposed action, This is met through the following: (a) avoid long and short term adverse impacts associated with the destruction or modification of wetlands; (b) avoid direct or indirect

support of new construction in wetlands; (c) minimize the destruction, loss or degradation of wetlands; (d) preserve and enhance the natural and beneficial values served by wetlands; and (e) involve the public throughout the wetlands protection decision- making process. All unavoidable impacts would be mitigated as described in Chapter 5 for all Alternatives.

7.1.5 Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

It is the policy of the Federal government to consult with federally recognized Tribal Governments on a Government-to-Government basis as required in E.O. 13175 (Consultation and Coordination with Indian Tribal Governments; U.S. President 2000). The requirement to conduct coordination and consultation with federally recognized Tribes on and off of Tribal lands for "any activity that has the potential to significantly affect protected Tribal resources, Tribal rights (including treaty rights), and Indian lands" finds its basis in the constitution, Supreme Court cases, and is clarified in later planning laws. The USACE Tribal Consultation Policy, December 05, 2023, updated the implementation of this E.O. and later Presidential guidance. The 2023 USACE Tribal Consultation Policy and Related Documents provide definitions for key terms, such as Tribal resources, Tribal rights, Indian lands, consultation, as well as guidance on the specific trigger for consultation.

7.2 Federal Acts and Laws

7.2.1 Clean Air Act of 1970, as Amended

The Clean Air Act (CAA) sets goals and standards for the quality and purity of air and requires the EPA to set national ambient air quality standards (NAAQS) for pollutants considered harmful to public health and the environment. The Study Area is currently in attainment of NAAQS. No general conformity determination is required.

7.2.2 Clean Water Act of 1972, as Amended – Sections 401, 402 and 404

The CWA sets and maintains goals and standards for water quality and purity. Section 401 requires a Water Quality Certification from the MDEQ and LDEQ that a proposed project does not violate established effluent limitations and water quality standards. A Section 401 Water Quality Certificate application was submitted to MDEQ on 11 July 2023, April 26, 2024, and April 10, 2025, due to the inclusion of features within the current alternatives. Current coordination with MDEQ is ongoing. Section 402 of the CWA requires a NPDES wastewater discharge permit. A NPDES permit will be prepared to help mitigate the potential impacts from runoff from construction activities. As required by Section 404(b)(1) of the CWA, an evaluation is underway to assess the short- and long-term impacts associated with the placement of fill materials into waters of the United States resulting from implementation of the proposed action. A Section 404(b)(1) evaluation will be conducted once when additional data is available. A USACE 404 (b)(1) will be prepared prior to the final EIS. The public will be provided an opportunity to review and comment prior to finalization of the 404(b)(1) and approval.

7.2.3 Endangered Species Act of 1973

Consultation with the Service is complete under the ESA for potential project impacts to multiple

threatened and endangered species and their critical habitat. A draft Biological Assessment (BA) was submitted to the Service on January 22, 2024. The Service responded to the draft BA via letter dated February 13, 2024. Based on comments from the Service and further coordination, the USACE revised the draft BA and submitted it to the Service by letter dated February 26, 2024. Since the February submission, the CTO alternative has been further refined and USACE submitted a another revised BA to the Service on May 28, 2024. The Service submitted a biological opinion on November 21, 2024. USACE submitted an addendum to the revised BA dated June 10, 2025, to include impacts to the monarch butterfly due to levee construction for Alternative A1. ESA coordination is ongoing. ESA coordination documents are available in Appendix D. Refer to Section 4 for a summary of the BA.

Based on currently available historical data, a review of current literature and studies, and with the employment of avoidance measures, the USACE has determined that Alternative A1 may affect but would not likely adversely affect the monarch butterfly and would have no effect on the remaining listed species in the project area. Alternative D1 may affect but would not likely adversely affect the NLEB and the TCB; would likely adversely affect the GS, ringed map turtle, AST, PRMT, LA pigtoe, and monarch butterfly. Alternative E1 may affect but would not likely adversely affect the GS, NLEB, TCB, LA pigtoe, and monarch butterfly; would likely adversely affect the ringed map turtle, AST, and PRMT. Based upon the assessment completed, it was determined that none of the Alternatives would not result in an adverse modification to Gulf sturgeon critical habitat.

ESA Section 7(a)(1) directs all Federal agencies to carry out programs within their authorities to advance the recovery of endangered and threatened species. Section 7(a)(1) states that Federal agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species. While Federal agencies have considerable discretion about which measures to undertake as part of their conservation programs, agencies' core obligation to comply with ESA Section 7(a)(1) is not discretionary. The language in Section 7(a)(1) indicates that new sources of authority are not necessary to comply with ESA Section 7(a)(1)'s directive. Under Section 7(a)(1), an agency's obligation to comply does not depend on any triggering actions, and the conservation duty technically begins for any threatened and endangered species as soon as it is listed. The Service has recommended measures under Section 7(a)(1) for Alt E1 that would advance the recovery of several listed riverine species. The measures listed below will be considered during PED.

- Protection, enhancement, or creation of instream habitat (shoals, gravel bars, woody debris) within the Project Area
- Protection, enhancement, or creation of sandbars within the Project Area
- Reforestation of the riparian buffer along the Pearl River within the Project area

7.2.4 Farmland Protection Policy Act

The Farmland Protection Policy Act of 1981 is intended to minimize the impact federal programs

have on the unnecessary and irreversible conversion of farmland to non- agricultural uses. The USDA-NRCS is responsible for designating prime or unique farmland protected by the act. Prime farmland is land with the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops that is available for these uses. It can be cultivated land, pastureland, forestland, or other land, but is not urban or built-up land or water areas. Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops, such as citrus, tree nuts, olives, and vegetables. There would be no impacts anticipated to designated prime and unique farmlands resulting from implementation of Alternatives A1, D1 and E1. Determination of not likely to impact prime, unique, statewide, or local important farmland, as defined by the Farmland Protection Policy Act (FPPA), was made in coordination with the Mississippi National Resources Conservation Service (NRCS) State Soil Scientist on 2 May 2024 as there is no designated farmland in the area, therefore, no further FPPA documentation would be required.

7.2.5 Fish And Wildlife Coordination Act of 1958

The Fish and Wildlife Coordination Act (FWCA) provides authority for the Service and NMFS involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features. It requires Federal agencies that construct, license, or permit water resource development projects to first consult with the Service, NMFS, and State resource agencies regarding the impacts on fish and wildlife resources and features to mitigate these impacts. Section 2(b) requires the Service to produce a Coordination Act Report (CAR) that details existing fish and wildlife resources in a Study Area, potential impacts due to a proposed project and recommendations for a project. USACE initiated coordination in December 2022. The Service provided a letter in response to USACE's NOI on June 14, 2023, and a draft CAR on August 23, 2023. Since the August draft, the CTO alternative was further defined. As a result of time constraints and the last-minute updates of the CTO alternative, there was not sufficient time for The Service to provide a revised Draft CAR. The Service provided a draft interim Fish and Wildlife Coordination Act Report on November 14, 2024. This is presented in partial fulfillment of FWCA and does not constitute the final report of the Secretary of the Interior as required by Section 2(b) of the FWCA. The Service considers this a partial fulfillment since the USACE is still reviewing a range of alternatives to achieve flood damage reductions, and the plan for implementation has not been identified and further refined. Since the November 2024 submittal, the USACE has included additional levee features for each alternative. The Service has committed to providing another Draft CAR after reviewing the June 2025 RDEIS. The Draft CAR dated August 2023 and the interim FWCAR are located in Appendix J. The November 2024 Draft Service Conservation Measures and Recommendations and USACE responses are listed below:

1. Fully evaluate the river and floodplain restoration potential of Alternative E.

Since no weir would be installed with Alternative E, we anticipate there will be current and future opportunities by the USACE, Service, and other federal, state, and local partners to restore and enhance existing river functions after flood risk management activities are completed. These measures could include the placement of instream habitat (shoals, gravel bars, woody debris),

enhancement or creation of sandbars, the creation of oxbows in the newly excavated floodplain (i.e., similar to riverside levee borrow pits along the MS River; see USACE website), and the reforestation of the riparian buffer along the Pearl River within the Project area. Selection of this alternative also allows the future opportunity to retrofit the existing weir at the J.H. Fewell WTP for improved fish passage, or possibly the complete removal of the weir if the WTP is eventually decommissioned. Provided such measures do not negatively impact flood storage and conveyance, we anticipate they could significantly improve the fish and wildlife resources found within the Project area, especially for those areas of the river that have been previously channelized and have reduced riparian vegetation (i.e., mowing, herbicide areas). Such measures could fulfill the USACE's responsibilities under Section 7(a)(1) of the Endangered Species Act, which directs all federal agencies to carry out "programs for the conservation of endangered and threatened species".

Finally, Alternative E provides the opportunity to restore rivercane (Arundinaria gigantea) and switch cane (Arundinaria tecta) to suitable sites within the Project area. These species were identified by Tribal Nations as Cultural Keystone Species that should be conserved and restored. Therefore, we request these measures and opportunities be evaluated in the final EIS and considered when selecting a final plan for implementation. Such measures would be permanently eliminated for future consideration should a weir and impoundment be constructed.

USACE Response: Concur. USACE will include a qualitative assessment of river and floodplain restoration potentials of Alt E in the current report. Detailed assessments will be conducted in subsequent phase(s).

2. Fully evaluate the recreational and economic development potential of Alternative E.

The USACE, in developing the DEIS, has failed to consider and describe the recreational and economic development opportunities associated with Alternative E. The DEIS incorrectly assumes Alternative E would not provide any of the recreational opportunities that Alternative D would provide, such as biking/hiking trails, boat ramps, kayak launches, camping, and wildlife viewing. Many of these recreational opportunities are realized on urban rivers across the United States, and it's unclear as to why such opportunities have not been furthered explored in the DEIS. For example, the existing multi-use Museum Trail and greenway could be expanded along the existing levee system and new fill material areas. An expanded trail system such as this would not require the establishment of a new lake to be successful. New boat ramps and public access points to the Pearl River south of the J.H. Fewell WTP weir could alleviate reduced river access that currently exists. The creation of a series of oxbow lakes/borrow pits along the newly excavated Pearl River floodplain could create fishing opportunities that may be lacking in the Jackson metropolitan area. Such river-based recreational opportunities could result in increased economic development within the Jackson metropolitan area while preserving and restoring fish and wildlife resources that would be lost with the creation of a new lake.
Such features associated with Alternative E could also assist in creating a new greenway and blueway system connecting public lands (i.e., Fannye Cook Natural Area, LeFleur's Bluff State Park, Crystal Lake) through the Jackson metropolitan area, further improving recreational access

to the river and economic development associated with such sustainable development of the river. The DEIS as currently written fails to realize these benefits and implies such opportunities can only be gained via creation of a new lake. Therefore, we recommend these recreational and economic development opportunities be evaluated in the final EIS and considered before a plan for implementation is selected.

USACE Response: Concur. USACE will include a qualitative assessment of recreational and economic development opportunities associated with Alternative E in the current report. Detailed assessments will be conducted in subsequent phase(s).

3. Develop a site-specific riverine mitigation strategy for Alternatives C and D before selecting a plan for implementation.

We recommend identifying the specific riverine mitigation strategy and/or location of mitigation lands before selecting either Alternative C or D for plan implementation. With the significant impacts to riverine species that are expected with either of the weir alternatives, we believe it would be prudent to identify specific sites and measures that will be conducted to offset riverine impacts before either weir plan is selected.

Many experts indicate that riverine mitigation is challenging, since loss of both habitat and function are difficult to compensate (National Academy of Sciences 1992, King et al. 1991). Mitigation efforts that restore in-stream functions elsewhere within the range of at-risk species could offset expected habitat loss to those resources. Mitigation efforts on the main stem of the Pearl River and its tributaries (e.g., Strong River, Bogue Chitto) should be a priority. Measures to promote fish passage, such as removing obsolete barriers (i.e., Poole's Bluff and Bogue Chitto Sills) and incorporating monitoring and adaptive management could benefit the Gulf sturgeon, southeastern blue sucker, Alabama shad, American eel, striped bass, various darters, mussels, and others.

Riparian protection via land acquisition or conservation easements could provide benefits to at-risk species through removal of threats associated with sedimentation and riparian forest loss. Maintaining or implementing vegetated streamside management zones in agricultural areas could also stabilize the bank, protect water quality, benefit aquatic habitat, and provide habitat and travel corridors for wildlife. Removing threats associated with channel clearing/disengaging could also provide benefits to the alligator snapping turtle and other riverine turtles. Many of these conservation efforts could also benefit freshwater mussels, one of the most imperiled taxonomic groups in the country.

USACE Response: Acknowledged. A preliminary riverine mitigation plan has been developed in coordination with the resource agencies. A site-specific mitigation plan will be developed in subsequent phases once a FRM project is identified for further analysis.

4. Conduct a sediment analysis for Alternatives C and D.

A watershed and sedimentation analysis could aid in determining impacts and developing

mitigation measures. Where the Pearl River and tributary stream water levels will be increased or decreased by project implementation, the potential extent of resulting channel re-adjustment or other hydrogeomorphic changes (e.g., bank erosion, channel incision) should be analyzed and appropriate mitigation measures implemented, such as in-stream structures, to ameliorate negative impacts to stream habitat and benthic and aquatic fauna. Impacts resulting from tributary channel re-adjustment and proposed mitigation should be quantified and included in the impact and mitigation analysis including increased sedimentation and loss of riparian habitat. The potential for reduced flows during droughts and the resulting impact to downstream aquatic resources is a concern. Reduced flows could result in poor water quality conditions from downstream discharges further impacting aquatic resources.

USACE Response: Concur. USACE has committed to conducting sedimentation analysis in subsequent phase(s) and prior to implementation.

5. Avoid and minimize impacts to sandbar habitat for Alternative E.

The vulnerable riverine sandbar habitat, especially the less modified sites located outside of the channelized areas, has high wildlife resource value and is becoming relatively scarce on a regional and national basis. The Service's mitigation goal for this habitat type is no net loss of in-kind habitat value. Measures to avoid and minimize impacts should be developed and implemented for Alternative E. Mitigation measures could also include implementation of some of the recovery criteria for the threatened ringed map turtle and should explore the inclusion of measures to help protect and restore habitat for those Pearl River endemic species.
USACE Response: Concur. The USACE is working and will continue to work closely with USFWS to ensure avoidance, minimization, and mitigation of sandbar habitat.

6. Conduct a comprehensive assessment of changes in the Pearl River Basin's hydrology and land uses.

Alteration of the Pearl River Basin's floodplain has contributed to the decline in the overall function and values of the Pearl River as evidenced by the increased loss or decline of riverine dependent species, including some at-risk species, within the watershed and the loss of species diversity. A comprehensive assessment of changes in the Pearl River Basin's hydrology and land uses should be conducted to determine their influence on flooding and the ecosystem response with a goal of identifying and developing ecosystem restoration projects that can reduce flood risk throughout the Basin.

USACE Response: Acknowledged. The current authority does not afford opportunity to conduct such a comprehensive assessment.

Additional Service recommendations for Alternatives C and D only:

7. Continue to coordinate with the Service on construction of a fish passage structure to

ensure designs facilitate appropriate velocities and staging/resting areas for fish and turtles.

USACE Response: Concur. USACE will continue to coordinate with the Service throughout all phases of the project.

8. In consultation with the natural resource agencies, a plan should be developed to identify and designate shoreline usage areas within the Project area, as well as down and upstream areas influenced by the project. Designations should include: 1) limited development, 2) public recreation, 3) protected shoreline, and 4) prohibited access areas (e.g., public safety). This would help ensure that fish and wildlife mitigation, including minimization, associated with the project are maintained and would aid in complying with ER 1110-2-8154.

USACE Response: Acknowledged. These designated shoreline usage areas will be considered in subsequent phase(s). Some of these designations could be considered in the project specific mitigation plan to be developed.

9. During low-flow periods, including droughts, sufficient flow should be maintained even if water levels fall below target pool elevations, matching the discharge from the RBR.

USACE Response: Acknowledged. An operation plan will be developed in subsequent phases and in coordination with the natural resource agencies.

10. When filling the pool, the downstream flow should at least maintain the minimum required discharge from the RBR, while also allowing portions of flood flows to pass downstream. Develop a plan to aid in sediment flushing.

USACE Response: Acknowledged. An implementation and operation plan will be developed in subsequent phase(s) and will be coordinated closely with the natural resource agencies.

11. Gate operations at reservoirs have been used to help flush sediment captured within pools downstream (Fruchard and Camenen 2012, Espa et al. 2013); therefore, development of an operational plan to aid sediment flushing should be undertaken. Since benthic communities can be at risk of impairment (Cattaneo et al. 2021), such a plan should include ecological objectives and operations should limit or avoid adverse impacts downstream.

USACE Response: Acknowledged. An operations plan will be developed in subsequent phase(s) and coordinated with the natural resource agencies.

12. Release of contaminants during construction and pool filling, and their impact on fish and wildlife resources is a concern that should be addressed via the development of a contaminant investigation and report on methods for addressing this potential issue.

USACE Response: Prior to any construction, an American Society for Testing Materials (ASTM) Phase I and Phase II will be conducted to ensure this concern is addressed.

13. Long-term water quality and quantity monitoring up and down stream and within the expanded channel should be undertaken pre- and post-construction. Measured parameters should include at minimum temperature, DO, total suspended sediments, nitrogen, pH, fecal coliforms, velocity, discharge, and water levels, as well as other physical and chemical parameters necessary to maintain the life cycle of selected aquatic species. This water quality monitoring plan should be developed in cooperation with the natural resource agencies and should be used to ensure aquatic AAHUs mitigated by the pool are achieved (ER 1110-2-8154; engineer regulation on water quality).

USACE Response: Concur. WQ monitoring is required per the ESA consultation and the mitigation monitoring plan.

14. Loss of any flows and the resulting potential changes to water quality, including salinities, within the Mississippi Sound should be monitored. Details regarding water quality parameters and location should be developed with the LDWF Marine Fisheries staff.

USACE Response: Acknowledged. Current H&H models show no impacts to the MS Sound. If additional analysis, which will be conducted in subsequent phase(s), indicate any changes as far down as the MS Sound, USACE will coordinate with the Service on appropriate monitoring efforts.

Additional Service Recommendations for Alternatives C, D, and E:

15. On-site contract personnel including project-designated inspectors should be trained to identify colonial nesting birds and their nests and avoid impacting them during the breeding season (i.e., the period outside the activity window). Should on-site contractors and inspectors observe potential nesting activity, coordination with the MDWFP and the Service should occur.

USACE Response: Concur. The EIS states that a qualified biologist would survey the area prior to construction to determine the presence of nesting birds. Coordination with The Service and MDWFP would establish buffer zones and other guidelines to be implemented for nesting migratory birds depending on the species present.

16. Bald eagles (Haliaeetus leucocephalus) are found within the Project area and are protected under the Bald and Golden Eagle Protection Act (BGEPA). During project construction, on-site personnel should be informed of the possible presence of nesting bald eagles near the project boundary, and should identify, avoid, and immediately report any such nests to this office. If an active or inactive eagle nest is discovered within two miles of the project footprint, then follow the bald and golden eagle guidelines to determine whether

disturbance will occur and/or an incidental take permit is needed.

USACE Response: Concur. The EIS states that a qualified biologist would survey the area prior to construction to determine the presence of nesting birds. If eagle nests are found in the project area, the USACE MVK would apply for an incidental eagle take permit and would implement avoidance and minimization features described in the National Bald Eagle Management Guidelines until a permit with applicable requirements is received.

17. Continue to include the Service in planning and project collaboration during the PED phase once a plan for implementation has been selected.

USACE Response: Concur. USACE will continue to coordinate with The Service throughout all phases of the project.

18. Creation and reforestation of a riparian zone from the toe of the levee to the river or lake should be undertaken where feasible to provide riparian habitat and provide erosion protection to the fill areas.

USACE Response: Acknowledged. Some creation or reforestation of a portions of this area near the edges of the river or lake could be added in subsequent phase(s). However riparian habitat will not be feasible everywhere. Further testing would need to occur to show that the reforestation would not significantly impact flood level reduction. It may be easier to create forested areas, at edges of excavation area, rather than along edge of river for portions of Alternative E.

19. Mitigation should be implemented concurrent with construction.

USACE Response: Concur. Mitigation will be implemented prior to or concurrent with construction of any FRM measures.

20. Mitigation for unavoidable losses of fish and wildlife habitat, as reflected by loss of AAHUs, as well as loss of function, should be implemented within the Pearl River Basin. We recommend maintaining the interagency mitigation team for planning, coordination, future sampling, and HEP analysis. At minimum plan components should include:
    a. criteria for determining ecological success;
    b. monitoring until after successful completion;
    c. a description of available lands for mitigation and the basis for the determination of availability;
    d. incorporate a public land measure for any impacts to public lands;
    e. identification of the entity responsible for monitoring;
    f. development of a contingency plan (i.e., adaptive management);
    g. during consideration of mitigation sites, recovery goals for ESA listed species within the Project area should be considered as well as habitat that would help conserve at-risk species;
    h. implement riverbank protection/stabilization in areas that are experiencing

instability, gravel bar protection/restoration, sand and gravel mine restoration; and

i. establish a consultation process with appropriate federal and state agencies to determine acceptable means of mitigation and success criteria.

USACE Response: Concur. The natural resource agencies will continue to be included in all phases of the project. As stated in the preliminary mitigation plan, loss of value and function of each habitat type will be mitigated in kind and within the PR basin. Each component listed will be included in the project specific mitigation plan to be developed during subsequent phases.

21. Impacts to the public lands, such as LeFleur's Bluff State Park, and other conservation lands (Fannye Cook Natural Area) should be avoided and minimized. Mitigation for such impacts should be located on public lands or property that is placed into the public trust.

USACE Response: Concur. USACE has requested input from MDWFP regarding properties MDWFP would be interested in receiving as a substitution for USACE' S consideration in mitigating potential impacts to park property from the PR FRM project. USACE will continue to coordinate with MDWFP on this matter.

22. A conservation easement, in perpetuity, should be recorded on the deed of any mitigation sites not transferred to public ownership.

USACE Response: Concur: any mitigation lands not transferred to public ownership will have a conservation easement, in perpetuity, recorded on the deed.

23. Adequate turbidity, silt, and spoil containment barriers should be used to protect aquatic and wetland resources.

USACE Response: Concur. A storm water pollution prevention plan (SWPPP) is required and will include measures to be implemented during construction to address turbidity, siltation, and sluffing of soils.

24. Incorporate sediment and erosion control measures during construction and re-vegetate all disturbed areas not proposed for future access or staging immediately following construction. Incorporate measures to identify potential erosion issues, and control erosion and potential head-cutting downstream.

USACE Response: Concur. A SWPPP is required and will include measures to be implemented during construction to address erosion. Re-vegetation of cleared areas not intended for FRM or future access/staging will be considered in PED.

25. Assess existing constrictions within the main stem of the Pearl River and identify solutions for flood reduction considerations (i.e., in stream debris-clean up, road and railroad bridge obstructions and inadequacy for flow).

USACE Response: Acknowledged. This has been partially completed at this time, i.e. removal of abandoned railroad embankment just south of the Fewell Weir. Further analysis of "pinch points" could be completed in subsequent phase(s). Generally, stream debris issues are more significant on the tributaries rather than the Pearl River itself and would not be expected to show a significant improvement to flood stages from flooding caused by the Pearl River.

26. Sediment testing for contaminants is recommended in areas proposed for use as borrow or that would be flooded by the project, especially those around known contaminated areas that are proposed for use in levees, berms, or islands, where contaminant exposure to fish and wildlife is probable. The testing and response plan for any contaminated soil should be developed in cooperation with the natural resource agencies.

USACE Response: Concur. Borrow material whether being brought onto USACE property or taken from USACE property shall be screened for environmental contaminants prior to transfer. Soils that exhibit hazardous waste characteristics (40 CFR 261.21- 261.24), even if naturally occurring, are not eligible as borrow material. Professional judgement will be used to identify material that is suitable. USACE will ensure that the guidelines outlined within ER 1165-2-132 and the guidelines outlined within the Mississippi Department of Environmental Quality Groundwater Assessment Remediation Division and Waste Division are followed if testing and response to contaminated material is needed.

27. An invertebrate, fishery, and aquatic turtle monitoring plan should be developed to ensure that all impacts of the project have been mitigated and that mitigation features (e.g., river restoration) are functioning as intended. This long-term plan should incorporate various gear types (e.g., electro-shocking, seines, gill nets) to maximize the detection of various riverine guild species most susceptible to water resource development projects. This plan should be developed in cooperation with the natural resource agencies.

USACE Response: Concur. A detailed monitoring plan for the project specific mitigation plan will be developed in coordination with the natural resource agencies in subsequent phase(s) and prior to implementation.

28. A monitoring and adaptive management plan addressing upstream and downstream geomorphology impacts should be developed in coordination with the natural resource agencies to determine the need to implement grade or other erosion control (e.g., bank stabilization) features to minimize project impacts to the Pearl River and its tributaries. That plan should include at minimum the use of aerial photographs, geographical information systems, gauge and cross-section data, as well as other parameters deemed necessary during development of that plan. The plan should be developed in cooperation with the natural resource agencies. Monitoring may result in the determination of additional monitoring and/or mitigation needs from such impacts. The plan should incorporate a request for pre-authorization for such mitigation if it is determined necessary.

USACE Response: Concur. A preliminary monitoring and adaptive management plan has been developed in coordination with the natural resource agencies. A detailed monitoring and adaptive management plan will be developed in subsequent phase(s) in cooperation with the natural resource agencies.

29. Undeveloped portions of the floodplain serve to absorb and store storm run-off and reduce additional flood damages. Restrictive use zoning or non-development easements should be implemented by the NFI, prior to project construction, and contain language stringent enough to ensure that flood-prone development does not occur and that undeveloped lands in the floodplain are used for floodwater storage, wildlife, outdoor recreation, and other flood compatible land uses. Floodplain ordinances could be an effective measure to avoid additional future flood damages throughout the Jackson metropolitan area.

USACE Response: Acknowledged.

7.2.6 Golden Eagle Protection Act and Migratory Bird Treaty Act Amended

USACE has coordinated with the Service through development of a BA submitted May 28, 2024, which includes potential impacts to and measures to avoid and minimize impacts to bald eagles and migratory birds. Coordination is complete.

The MBTA is the primary legislation in the United States established to conserve migratory birds. The MBTA prohibits taking, killing, or possessing of migratory birds unless permitted by regulations promulgated by the Secretary of the Interior. The Service and the Department of Justice are the Federal agencies responsible for administering and enforcing the statute. USACE has coordinated with the Service through development of a BA which includes potential impacts to and features to avoid and minimize impacts to birds protected under the MBTA.

The bald eagle is protected under the Bald and Golden Eagle Protection Act (BGEPA) and the MBTA. The Service developed the National Bald Eagle Management (NBEM) Guidelines to provide landowners, land managers, and others with information and recommendations to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the BGEPA. A copy of the NBEM Guidelines is available at:extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.fws.gov/sites/default/files/documents/national-bald-eagle-management-guidelines_0.pdf

These guidelines recommend: (1) maintaining a specified distance between the activity and the nest (buffer area); (2) maintaining natural areas (preferably forested) between the activity and nest trees (landscape buffers); and (3) avoiding certain activities during the breeding season. During construction of features in areas where nests could occur (e.g. forested areas), on-site personnel should be informed of the possible presence of nesting bald eagles in the vicinity of the project boundary, and should identify, avoid, and immediately report any such nests to USACE. If a bald eagle nest occurs or is discovered within 660 feet of the project footprint, then an evaluation must be performed to determine whether the construction and/or operation of the project is likely to disturb nesting bald eagles. An evaluation would be conducted in accordance with the procedures

outlined by The Service. Following completion of the evaluation, a determination would be made as to whether additional consultation is necessary or not. During nesting season, construction must take place outside of The Service buffer zones. A USACE Biologist and a Biologist with The Service would survey for nesting birds prior to the start of construction.

7.2.7 National Historic Preservation Act of 1966, as Amended (NHPA)

USACE has determined that this project is a Federal Undertaking, as defined by 54 U.S.C. § 300320 and 36 CFR § 800.16(y). Section 106 of the NHPA, 54 U.S.C. § 306108, and its implementing regulations under 36 CFR § 800 (2004) requires Federal agencies to consider the effects of their undertakings on historic properties (i.e., historic, cultural, and Tribal-trust resources) and allow the ACHP an opportunity to comment. Historic properties are identified by qualified agency representatives in consultation with interested parties.

7.2.8 National Wild and Scenic Rivers Act (16 U.S.C. § 1271)

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. The Act is notable for safeguarding the special character of these rivers, while also recognizing the potential for their appropriate use and development. It encourages river management that crosses political boundaries and promotes public participation in developing goals for river protection. Subpart A, Section 297. D6 Requires Federal agencies to consider potential environmental effects of proposed water resource projects on Federally designated wild and scenic rivers.

There are no federally designated Wild and Scenic Rivers under the Federal Wild and Scenic Rivers Act, 16 U.S.C. §1271, *et seq* within the Study Area.

7.3 Engineering Regulations

7.3.1 Hazardous, Toxic, and Radioactive Waste

Pursuant to USACE policy, (ER 1165-2-132), potential Hazardous, Toxic, and Radioactive Waste concerns are to be identified early and construction in HTRW-contaminated areas is to be avoided to the extent practicable. A Phase I & II Environmental Site Assessment (ESA) was conducted by the Non-Federal Interest (NFI) September 2014 and updated by the NFI in August 2021 and December 2023 to assess the potential for HTRW materials within the footprints of the Study Area. Within the Study Area, it was found that there is a probability of encountering HTRW during construction. Prior to construction, an ASTM E 1527-13 Phase I and possibly a Phase II, depending on the selected construction footprint, ESA would be completed. Reference Section 4.2.1.1 HTRW for additional information.

SECTION EIGHT

8 Public Involvement

8.1 Public Involvement

The involvement of the Public in the planning and decision-making process is an important part of the NEPA process. Federal, State and Local agencies, NGOs, and individual citizens provide valuable information that is utilized in the planning, evaluation and analysis presented in this EIS. The NEPA affords individuals, organizations, and governments an opportunity to review and comment on proposed major Federal actions such as this proposed action. Engaging with and receiving input from the public, interested parties, stakeholders, government entities, and NGOs in the evaluation process throughout all stages of the process is critical to achieving the USACE objective of enhancing trust and understanding with customers, stakeholders, teammates, and the public through strategic engagement and communication.

USACE began its coordination efforts in November 2022 with the NFI and initiated discussions and meetings with the Service in December 2022. Weekly project delivery team meetings were held and attended by NFI representatives and Resource agencies.

Geospatial files, the NFI Section 211 Report/EIS and other information provided by the NFI were evaluated to determine what work conducted by the NFI could be utilized for this RDEIS. The exchange of information between the USACE, Service, Tribes, and other agencies is ongoing and will continue throughout the process to completion of a Final EIS and approved Record of Decision.

As part of the early coordination by the NFI, two public outreach meetings were held: (1) 11 February 2020, at the Mandeville Community Center, and (2) 12 February 2020, in the Slidell Civic Auditorium. PowerPoint presentations presented information about the project and PDT members were available to discuss issues of local concern that would factor into the planning process and analysis. Both public meetings were well attended by municipal and parish officials, along with a large contingent of local residents. Information received from the public was incorporated into the planning process. Information was distributed regarding how to submit comments via letter, email, and telephone.

A public website page was created to aide interested parties in obtaining study information and provide feedback. The project website address it as follows: https://www.mvk.usace.army.mil /Missions/Programs-and-Project-Management/Project- Management/Pearl-River/

A Notice of Intent was published on May 18, 2023 (88 Fed. Reg. 3,1738), notifying the public of the USACE intent to prepare a RDEIS and to conduct public outreach for a study to evaluate potential FRM features in the Study Area and to analyze FRM plans that can be implemented under Section 3104 of WRDA of 2007 for the Pearl River Flood Risk Management Project, Pear River Watershed, Rankin and Hinds Counties, Mississippi . This notice updated the original Notice of

Intent declaring the Rankin-Hinds Pearl River Flood and Drainage Control District, the NFI and USACE's intent to conduct a Feasibility Study and EIS process, which was published in the Federal Register on July 25, 2013.

8.1.1 Scoping

NEPA affords all persons, organizations, and government agencies the right to review and comment on proposed major Federal actions that are evaluated by a NEPA document. This is known as the scoping process. The scoping process is the initial step in the preparation of an Environmental Impact Statement. The scoping process is an early and open process to help determine the scope of issues to address and identify the significant issues related to the proposed action.

Therefore, the scoping process would help identify (1) the range of actions (project, procedural changes), (2) alternatives—both those to be rigorously explored and evaluated and those that may be eliminated, and (3) the environmental resources considered in the evaluation of potential environmental impacts.
Cooperating agencies include the Service Jackson MS and Lafayette, LA offices, FEMA, EPA region 4, and MDEQ. As cooperating agencies, they were invited to participate in the study planning and in the PDT meetings. Participating agencies invited to participate in the planning process include: MDWFP, MDMR, MNRCS, LDWF, LDEQ, LDNR, CPRA, and Mississippi Department of Archives & History.

In addition, participating agencies in the Section 106 consultations include the following federally-recognized Tribes that have historic interest in Mississippi and the Study Area were also invited to participate in the planning process as participating agencies: Alabama- Coushatta Tribe of Texas (ACTT), Chickasaw Nation (CN), the Choctaw Nation of Oklahoma (CNO), the Chitimacha Tribe of Louisiana (CTL), the Jena Band of Choctaw Indians (JBCI), the Mississippi Band of Choctaw Indians (MBCI), the Muscogee (Creek) Nation (MCN), Quapaw Nation (QN), and the Tunica-Biloxi Tribe of Mississippi (TBTL). The QN, MBCI and the CNO are participating as consulting parties and are invited as a signatory party to the Section 106 Programmatic Agreement.

8.1.2 Public Outreach

Public outreach meetings were held twice a day on July 10, 2024 and July 11, 2024, and virtually once on June 27, 2024 at 6pm. The In-Person public meetings were held on July 10, 2024, in Jackson, MS, at the Mississippi Public Broadcasting Auditorium at 2pm and and Mississippi Trade Mart at 6pm. For the In-Person meetings on July 11, 2024, the first public meeting was hosted at the Slidell Municipal within Slidell, LA at 11 am and at the Monticello Civic Center within Monticello, MS at 6pm. The virtual meeting was broadcast from the MVK office at 6 p.m. The public was notified about the meetings through publication of the NOI, as well as through multiple social media channels and local newspaper. Recorded presentations of the scoping meetings were uploaded to the study website for those who could not attend. Questions were answered live by the PDT during both meetings.

Scoping comments were received through 6 August 2024, which was established as the last day to provide comments to inform the study planning process. There were 6,729 comments received. A majority of the emails received included a similar letter considered a form letter representing the same comments therefore they were counted as one comment made by multiple individuals.

Input received from the public meetings assisted the team in refining study problems and opportunities, goals, objectives, potential features, and alternative plans.

The comments were evaluated to identify common Themes of concern. The top five common themes identified include:

- Downstream Impacts (164)
- Flood Risk Concern (156)
- Habitat Impact (153)
- Economics (150)
- Oppose project (134)

Reference Appendix A: Scoping Report for the Notice of Intent, public notices, coordination letters, Scoping Report, and public comments received to date.

8.1.3 Public Comment Period

A Notice of Availability announcing the availability of the DEIS for a 45-day public comment period was published in the Federal Register on June 7, 2024. The comment period was extended 15-days to August 6, 2024, as a result of multiple requests for an extension. A public notice and the announcement of public hearings dates and venues was published on the project website, MVK District PAO Media Announcement page. Approximately 6,729 comments were received during the official public comment period. The majority of these emails were considered form email/letters. Form letters/emails are those that have the same comments but submitted by multiple persons. Form letters are counted as one comment submitted by multiple persons. There were approximately 4 different types of form letters submitted. Although they are not considered as official comments, approximately 2324 form letter/emails were submitted prior to the start of the official comment period of June,7 2024 and 95 submitted after the official closing of the comment period which was August 6, 2024.

8.1.4 Agency Coordination

Preparation of the DEIS was coordinated with the appropriate, Federal, Tribal, state, and local interests, as well as environmental groups and other interested parties. The following agencies all agreed to be cooperating and or participating agencies, and participate in the NEPA process:

Federal Emergency Management Agency (FEMA) Region IV
Louisiana Coastal Protection and Restoration Authority (CPRA)
Louisiana Department of Environmental Quality (LDEQ) Louisiana Department of Natural Resources (LDNR)

Louisiana Department of Wildlife and Fisheries (LDWF)
Mississippi Department of Archives & History
Mississippi Department of Environmental Quality (MDEQ)
Mississippi Department of Marine Resources (MDMR)
Mississippi Department of Wildlife Fisheries and Parks (MDWFP)
Mississippi Natural Resources Conservation Service (MNRCS)
U.S. Department of Interior, Fish and Wildlife Service, Jackson, MS District
U.S. Department of Interior, Fish and Wildlife Service, Lafayette, LA District
U.S. Environmental Protection Agency, Region 4

8.1.5 Public Hearings

Public Hearings were scheduled during the public review period. Four In-Person hearings occurred within both Mississippi and Louisiana:

- July 10, 2024, 2 p.m.: Mississippi Public Broadcasting Auditorium, 3825 Ridgewood Road, Jackson, MS 39211
- July 10, 2024, 6 p.m.: Mississippi Trade Mart, 1200 Mississippi St, Jackson, MS 39202
- July 11, 2024, 11 a.m.: Slidell Municipal, 2056 2nd Street, Slidell, LA 70458
- July 11, 2024, 6 p.m.: Monticello Civic Center, 125 E Broad Street, Monticello, MS 39654

One virtual hearing occurred:

- June 27, 2024, 6 p.m.: The virtual meeting transcripts, presentation, and additional information for the virtual meeting can be found on the USACE Vicksburg District Website. https://www.mvk.usace.army.mil/Missions/Programs-and-Project-Management/Project-Management/Pearl-River/

SECTION NINE

9 SUMMARY DISCUSSION

9.1 Conclusion

This RDEIS presents four alternatives, prepared in accordance with NEPA and USACE ER 1105-2-100, for evaluation and consideration.

The USACE conducted a review and analysis on the NFI Section 211 Report final array of alternatives. As discussed in Section 3, the NFI final array included a nonstructural plan (Alternative A), a levee plan (Alternative B) and a channel improvement/weir/levee plan (Alternative C). In addition, the USACE developed alternatives including a modified nonstructural plan (Alternative A1), Alternative D a modified NFI Alternative C which includes the addition of one federal levee improvement, Alternative D1 a modified NFI Alternative C which includes the addition of four federal levee improvements, Alternative E which mimics Alternative D except it does not include the construction of a weir, and Alternative E1 which mimics Alternative D1 except it does not include the construction of a weir.

Alternatives A and B were determined to not be economically justified and were removed from further consideration early in the evaluation process. Alternative C, NFI Channel Improvement/Weir/Levee Plan, is no longer identified as the LPP as of August 5, 2024. Alternative D was labeled as the LPP. In addition to the removal of the LPP status, it was determined that this alternative would not be the NED Plan per the associated BCR. Because of these reasons, Alternative C was removed from further consideration. Significant risks are associated with the implementation of Alternative A1 including a potentially reduced participation rate from the assumed rate, the inability of residents to address ineligible project costs, inaccessible or unusable structures and emergency services due to roadways impacted by flood events, and impacts to water and sewage systems resulting from flood events preventing structure owners and residents from returning or utilizing impacted structures during and post flood event. These significant residual risks and the inability of this alternative to address the stated problems and objectives of the Project may prohibit selection of Alternative A1 as the NED plan.

Of the remaining implementable alternatives assessed, the Alternative E1 (without weir) minimizes implementation risks, maximizes the difference between monetized benefits and costs, and satisfies the USACE Planning Principles and Guidelines (P&G) criteria of completeness, effectiveness, efficiency, and acceptability. Accordingly, the Alternative E1 without weir could be considered the preliminary NED plan.

Regardless of the plan that is chosen by the ASA-CW, given the magnitude of the Pearl River Basin, Mississippi, flood risk, water supply and water quality concerns, it has become apparent that a systematic approach involving multiple projects from several different programs would be required to effectively deal with magnitude of the concerns identified.

To fully understand the hydrology and hydrodynamic conditions of the Pearl River Basin, a Watershed study under Section 729 of the WRDA of 1986, would be highly beneficial. A watershed study would facilitate an understanding of local, state, and Federal actions under consideration in the Pearl River Basin.

9.1.1 View Of the Non-Federal Interest

The Pearl River Basin Flood Risk Management Project, Alternative D1 would provide community benefits for Hinds County, Rankin County, and the Cities of Jackson, Flowood, Pearl, and Richland. The plan includes the environmental, social, and other public benefits that are difficult to quantify but that would have a positive impact on these communities.

Certain land areas, throughout the project footprint, would be designated for the quality-of- life benefits considering a mix of recreation (pedestrian/bike connectivity) public use, natural, and open space, and improved transportation access.

The plan would make currently inaccessible land areas adjacent to the Pearl River behind the existing levee structures, more accessible for the local communities. These land areas historically have been subject to inundation and flood risk but now would provide recreation and revitalization opportunities that would have direct and indirect benefits to the Metro Area environmentally, economically, and socially. It is the intent of the Rankin Hinds Flood Control District (District) that the effort evaluates the economic and social benefits that revitalization of these areas would provide at the community and regional levels.

It is expected that distinct and transformative opportunities from implementation of Alternative D1 could be realized in the areas of cultural, physical fitness and educational facilities.

9.1.2 Recreation

The Project envisions expanding on the current efforts of connecting the four existing museums within the LeFleur Museum District via bike and pedestrian trails. There will be further connection to the new public areas by the Pearl Riverbank that will be made possible via the implementation of Alternative C . This will include additional parks, natural areas, and other public amenities. Residents and visitors will be able to enjoy visiting the museums, LeFleur’s Bluff State Park Mayes Lake, State Fairgrounds, Belhaven Beach, and downtown Jackson.

9.1.3 Physical Fitness

Studies have shown that the City of Jackson has one of the highest rates of obesity and has the highest rate of hypertension. Currently there are limited public parks and recreation activities in the Project Area. The project’s improvements of public access to the river and recreation opportunities in the metropolitan area, specifically for the City of Jackson residents who have limited transportation options, will open outside opportunities currently unavailable in the area. The project will also provide recreation opportunities (including public aquatic recreation opportunities) for low income and minority communities in much closer proximity of their homes and places of work and therefore, would easily be accessed by walking or public transportation.

Currently there is only one park with river access, which limits river usage due to the existing weir. The park itself floods numerous times a year forcing it to completely close. The ability to securely bike or walk across an expanded and connected bike and pedestrian trail along the riverbanks will greatly add exercise and other leisure and outdoor activity options that are not currently available to residents and visitors. It will be a magnet for attracting people of all ages, fitness levels, and income levels to enjoy these resources along with kayaking and canoeing or walking on the riverbanks of the Pearl River.

The newly available land area generated by Alternative D1 or E1 provides a rare opportunity by establishing specific outdoor areas of public interest such as playgrounds, an outdoor amphitheater, a healthy exercise course for all ages and ability levels, a botanical garden, and a covered pavilion where people can enjoy other recreational activities, such as playing pickleball or other court sports. Riverside enjoyment can completely and positively connect and revitalize the Cities of Jackson, Flowood and Richland within Hinds and Rankin Counties and provide a beautiful setting for the residents to walk, run, bike, exercise and enjoy multiple outdoor activities. This project can be a transformational catalyst for enhancing the quality of life of these communities for decades.

9.1.4 Educational Facilities

The project will provide educational and field trip opportunities for schools and visitors to the museums for vocational and STEM activities. Despite the relatively small population in the State of Mississippi, the Metropolitan Area is recognized regionally as a magnet for college and vocational students alike. Amongst the higher learning institutions in or near the Alternative D1 or E1 Project Area, we can list 13 universities, technical colleges, and junior colleges.

The implementation of Alternative D1 or E1 can provide many qualities of life, community and social benefits which will cause an economic revival with a riverside focus that simply does not currently exist. The proper riverside focus on amenities available to residents and visitors can become a focal point of transformation of these communities and reinforce the desire of Mississippians and visitors to live, work and play in the Metropolitan Area. Community benefits include but are not limited to:

- Sustainability/green building opportunities
- Set asides for neighborhood organizations, community centers, childcare centers, and other non-profits.
- Construction of parks and other recreational facilities
- Affordable housing requirements
- Job training programs
- Local, Minority and Women Owned Business participation.
- Retail/commercial space set asides for small and local business and big box retail restrictions
- Mitigation in excess of those required under federal/state/local regulations to address parking, traffic, increased pollution, and other environmental impacts.
- Potential revitalization of communities due to project features

SECTION TEN

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SECTION ELEVEN

11 REFERENCES AND RESOURCES

11.1 Project References

Bear Creek Water Association (BCWA). 2023. https://www.bcwaterms.org/

Chapman, S.S, Griffith, G.E., Omernik, J.M., Comstock, J.A., Beiser, M.C., and Johnson, D., 2004, Ecoregions of Mississippi, (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,000,000)

City of Jackson. RFP for Professional Services for Operation, Maintenance and Management of O.B. Curtis Water Treatment Plant, J.H. Fewell Water Treatment Plant, Tanks, and Well Facilities. 2022. https://www.jacksonms.gov/documents/rfp-for- professional-services-for-operation-maintenance-and-management-of-o-b-curtis-water- treatment-plant-j-h-fewell-water-treatment-plant-tanks-and-well-facilities/

Dissolved oxygen and water | U.S. Geological Survey. (2019, October 22). https://www.usgs.gov/special-topics/water-science-school/science/dissolved-oxygen-and-water

FTN Associates, Ltd. 2011, Source Water Protection Plan for the O.B. Curtis Drinking Water Intake. https://www.mdeq.ms.gov/wp-content/uploads/2011/11/RossBarnettSWAP.pdf

Griffiths J, Villablanca F. 2015. Managing monarch butterfly overwintering groves: Making room among the eucalyptus. California Fish and Game 101:40-50.

Killgore, K. J., Hoover, J. J., Murphy, C. E., & George, S. G., Pearl River Watershed Feasibility Study Two Lakes Flood Control Plan: Aquatic Evaluation III 48-III 71 (2006). Vicksburg, MS; Army Engineer Research and Development Center.

Landers, J. Jackson Water Crisis Reveals Perils of Neglected Infrastructure. ASCE.org. 2022 https://www.asce.org/publications-and-news/civil-engineering-source/civil- engineering-magazine/article/2022/11/jackson-water-crisis-reveals-perils-of-neglected- infrastructure

Lower Pearl River Watershed Assessment: Preliminary Report, Abdullah O. Dakhlalla, Prem B. Parajuli, Bulletin 1216, 2014. https://efaidnbmnnnibpcajpcglclefindmkaj/https://www.mafes.msstate.edu/publications/bulletins/b1216.pdf

Mississippi Band of Choctaw Indians. 2024. Chahta Culture Art Forms; Taposhshik Imma (Basketry). https://www.choctaw.org/culture/

Mississippi Emergency Management Agency. 2022. O.B. Curtis and J.H. Fewell Operational Summary COJ Water Crisis 2022. https://www.msema.org/wp-content/uploads/OPSUM-COJ-Water-Crisis-OB-Curtis-11.21.22.pdf

Mississippi Folklife. 2017. Pearl River. https://mississippifolklife.org/articles/pearl-river

Mississippi Statewide Comprehensive Outdoor Recreation Plan (MS SCORP): Improving Outdoor Recreation in Mississippi, 2025-2029, MDWFP. https://www.mdwfp.com/sites/default/files/2024-12/Statewide%20Comprehensive%20Outdoor%20Recreation%20Plan%20%28SCORP%29.pdf

National Park Service. 2004. National Register Bulletin 38, Guidelines for Evaluating and Documenting Traditional Cultural Places (https://www.nps.gov/subjects/nationalregister/publications.htm).

Paaijmans, K P et al. "The effect of water turbidity on the near-surface water temperature of larval habitats of the malaria mosquito Anopheles gambiae." International journal of biometeorology vol. 52,8 (2008): 747-53. doi:10.1007/s00484-008-0167-2

Soil, Gridded Pecip, NLCD, mannings, terrain, USGS, NWS

Solensky MJ. 2004. Overview of monarch migration. Pp. 79-83 in Oberhauser KS, Solensky MJ, eds. The Monarch Butterfly: Biology and Conservation. Ithaca, NY: Cornell University Press.

Spencer, Ellsworth National Institute for Occupational Safety and Health, Center for Disease Control, Pittsburgh PA https://www.cdc.gov/

Tennessee Valley Authority. (2004). CITY OF JACKSON – J. H. FEWEL INTAKE JACKSON, MISSISSIPPI SOURCE WATER ASSESSMENT. Mississippi Department of Environmental Quality. https://www.mdeq.ms.gov/wp- content/uploads/2017/06/FewelIntakeSWA

US Department of Commerce, NOAA, National Weather Service. (n.d.-b). National Weather Service Advanced Hydrologic Prediction Service. https://water.weather.gov/ahps2/hydrograph.php?wfo=jan&gage=jacm6&hydro_type=2

US Department of Commerce, NOAA, National Weather Service. (n.d.). *Historical Crests for Pearl River at Jackson.* https://water.weather.gov/ahps2/crests.php?wfo=jan&gage=jacm6&crest_type=historic

US Department of Commerce, NOAA, National Weather Service. (n.d.-b). Recent crests for Pearl River at Jackson. https://water.weather.gov/ahps2/crests.php?wfo=jan&gage=jacm6&crest_type=recent

U.S. Department of Transportation, Federal Highway Administration, Office of Planning, Environmental and Realty (HEP) 2017 Sound Level Descriptors (FHWA-HEP-17-053)

U.S. Department of Transportation, Federal Highway Administration, Office of Planning, Environmental and Realty (HEP) 2004 Synthesis of Noise Effects on Wildlife Populations (FHWA-HEP-06-016)

U.S. Department of Transportation, Federal Highway Administration, Office of Planning, Environmental and Realty (HEP), Construction Noise Handbook https://www.nrc.gov/docs/

U.S. Environmental Protection Agency. 2022. Safe Drinking Water Act Compliance Investigation. Certified Letter. https://www.epa.gov/system/files/documents/2021-07/neic-civil-investigation- report_city-of-jackson-public-water-system.pdf

Weiland, R. 2000. Ecology and vegetation of LeFleur's Bluff State Park, Jackson, Mississippi. Journal of the Mississippi Academy of Sciences. Vol. 45, No. 3: 150-185.

Williams, J. 2022. "Where do Jackson's Surrounding Cities Get Their Water, We Explain." Clarion Ledger https://www.clarionledger.com/story/news/2022/09/01/where-do-jackson-and-surrounding-cities-get-their-water/65466376007/

11.1 Websites

11.1.1 Recreation Sources

https://www.jacksonms.gov/departments/parks-recreation-department/ https://lwcf.tplgis.org/
http://www.pearlparksandrec.com/ https://www.cityofflowood.com/recreation
http://www.richlandms.org/city-government/parks-recreation/ https://www.mdwfp.com/parks-destinations/state-parks/lefleurs-bluff https://www.mdwfp.com/

11.1.2 Noise Resources

https://noiseawareness.org/info-center/common-noise-levels/
https://www.techtarget.com/searchmobilecomputing/definition/hertz
https://letstalkscience.ca/educational-resources/stem-explained/sound-vs-noise

11.1.3 Aesthetics Sources

https://www.nps.gov/natr/index.htm https://mdot.ms.gov/portal/scenic_byways_program
www.visitjackson.com
www.visitmississippi.org
https://www.mdwfp.com/fishing-boating/public-waters-program/scenic-streams-program/

SECTION TWELVE

12 ACRONYMS AND ABBREVIATIONS

AAHU	Average Annual Habitat Unit
ACHP	Advisory Council on Historic Preservation
ACD	American Community Survey
ACTT	Alabama-Coushatta Tribe of Texas
ADCIRC	Advanced Circulation Model
AEP	Annual Exceedance Probability
AMM	Alternative Milestone Meeting
APE	Area of Potential Effects
AQCR	Air Quality Control Region
ASA(CW)	Assistant Secretary of the Army of Civil Works
ASCII	American Standard Code for Information Exchange
ASTM	American Society for Testing Materials
BBA	Bipartisan Budget Act
BCR	Benefit to Cost Ration
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
BLH	Bottomland Hardwood
CAA	Clean Air Act
CAR	Coordination Act Report
CDP	Census Designated Place
CEMVN	USACE New Orleans District
CEMVK	USACE Vicksburg
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CLG	Certified Local Government
CFS	Cubic Feet Per Second
CN	Chickasaw Nation
CNO	Choctaw Nation of Oklahoma
CO	Carbon Monoxide
CPRA	Coastal Protection and Restoration Authority
FLOAT	Flood Loss Outreach and Awareness Taskforce
FRM	Flood Risk Management
FWCA	Fish and Wildlife Coordination Act
FWCAR	Fish and Wildlife Coordination Act Report
FWS	Fish and Wildlife Service
FWP	Future with Project
FWOP	Future without Project
GHG	Greenhouse Gas
GIS	Geographic Information System

GOMESA	Gulf of Mexico Energy Security Act
H&H	Hydraulics and Hydrology
HEC-FDA	The Flood Damage Reduction Analysis
HEC-RAS	Hydraulic Engineering Center – River Analysis System
HMGP	Hazard Mitigation Grant Program
HTRW	Hazardous, Toxic, and Radioactive Waste
HQUSACE	Headquarters Unites States Army Corps of Engineers
IMT	Interagency Mitigation Team
IUCN	International Union for Conservation of Nature
JBCI	Jena Band of Choctaw Indians
LACPR	Louisiana Coastal Protection and Restoration
LADOTD	Louisiana Department of Transportation and Development
LDEQ	Louisiana Department of Environmental Quality
LDNR	Louisiana Department of Natural Resources
LDOA	Louisiana Division of Archeology
LDRIPs	Long Term Disaster Recovery Investment Plans
LDWF	Louisiana Department of Wildlife and Fisheries
LERRD	Lands, Easements, Rights of Way, Relocations, and Disposal Areas
LIDAR	Light Detection and Ranging
LPP	Locally Preferred Plan
LPRW	Lower Pearl River Watershed
LSRA	Louisiana Scenic Rivers Act
LWCF	Land and Water Conservation Fund
LWFMP	Louisiana Statewide Comprehensive Water Based Floodplain Mgmt Program
MAV	Mississippi Alluvial Valley
MBCI	Mississippi Band of Choctaw Indians
MBTS	Migratory Bird Treaty Act
MCACES	Micro-Computer Aided Cost Estimating System
MCN	Muscogee (Creek) Nation
MDEQ	Mississippi Department of Environmental Quality
MDMR	Mississippi Department of Mineral Resources
MDWFP	Mississippi Department of Wildlife and Fisheries
MDAH	Mississippi Division of Archives and History
MSC	Major Subordinate Command
MSL	Mean Sea Level
MVD	Mississippi Valley Division
NAAQS	National Ambient Air Quality Standards
NAWMO	North American Waterfowl Management Plan
NB	Nature Based
NBEM	National Bald Eagle Management
NCDC	National Climatic Data Center
NED	National Economic Development
NEPA	National Environmental Policy Act

NFI	Non Federal Interest
NGVD	National Geographic Vertical Datum
NHL	National Historic Landmarks
NHPA	National Historic Preservation Act
NLEB	Northern Long-Eared Bat
NMFS	National Marine Fisheries Service
NLAA	Not Likely to Adversely Affect
NOA	Notice of Availability
NO2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPA	National Park Service
NRCS	Natural Resource Conservation Service
NRHD	National Register of Historic District
NRHP	National Register of Historic Places
NS	Nonstructural
O&M	Operation and Maintenance
OCD	Office of Community Development
OMRR&R	Operations, Maintenance, Repair, Rehabilitation, and Replacement
OSE	Other Social Effects
O3	Ozone
PA	Public Assistance/Programmatic Agreement
Pb	Lead
PPA	Project Partnership Agreement
PBF	Physical Biological Features
P&G	Principles and Guidelines
PED	Pre-Construction Engineering and Design
PDT	Project Delivery Team
Phase 1 ESA	Phase 1 Environmental Site Assessment
OM	Particulate Matter
PMP	Project Management Plan
PPA	Project Partnership Agreement
PPT	Parts Per Thousand
PRMT	Pearl River Map Turtle
PRBDD	Pearl River Basin Development District
PRVWSD	Pearl River Valley Water Supply District
QN	Quapaw Nation
RCRA	Resource Conservation and Recovery Sites
REC	Recognized Environmental Condition
RED	Regional Economic Development
REP	Real Estate Plan
RM	River Mile(s)
RMP	Risk Management Plan
ROD	Record of Decision

ROE	Right of Entry
ROM	Rough Order of Magnitude
ROW	Right of Way
RPEDS	Regional Planning and Environment Division South
RSLC	Relative Sea Level Change
RSLR	Relative Sea Level Rise
SELA	Southeast Louisiana Urban Flood Control Project
SHPO	State Historic Preservation Officer
SLC	Sea Level Change
SMART	Specific Measurable Attainable Risk Informed Timely
SO2	Sulfur Dioxide
STLDCD	St. Tammany Levee, Drainage and Conservation District
STPG	St. Tammany Parish Government
SWPP	Stormwater Pollution Prevention Plan
T&E	Threatened and Endangered Species
TBTL	Tunica-Biloxi Tribe of Louisiana
TCP	Traditional Cultural Place
TIF	Tag Image File Format
TRI	Toxic Release Inventory
TSCA	Toxic Substances Control Act
TSP	Tentatively Selected Plan
URA	Uniform Relocation Assistance Act
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compound
VRAP	Visual Resources Assessment Procedure
WBDHU12	United States Geological Survey Watershed Boundary Dataset Hydrologic Unit 12
WIIN	Water Infrastructure Improvement Act for the Nation
WSE	Water Surface Elevation
WMA	Wildlife Management Area
WQC	Water Quality Certificate
WRDA	Water Resources Development Act
WRRDA	Water Resources Reform and Development Act
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
WVA	Wetlands Value Assessment