

## SECTION 1

# Introduction

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The Task Force for the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) approved Phase 1 Engineering and Design (E&D) for the Mississippi River Reintroduction into Bayou Lafourche (MRRBL) project in 2001. The project area is shown on Figure 1-1. This report is the first major evaluation of new and refined alternatives being conducted as part of the Phase 1 E&D.

This effort was funded equally by CWPPRA and the State of Louisiana. The U.S. Environmental Protection Agency (EPA) is the lead Task Force agency, and the Louisiana Department of Natural Resources (LDNR) is leading the initial design phase for the state. A decision to proceed beyond the 30 percent design review will be made by the Task Force and the state. Their decision will depend, in part, on willing cost-share partners and on available CWPPRA funding. This report represents the conclusion of the Phase 1 design effort.

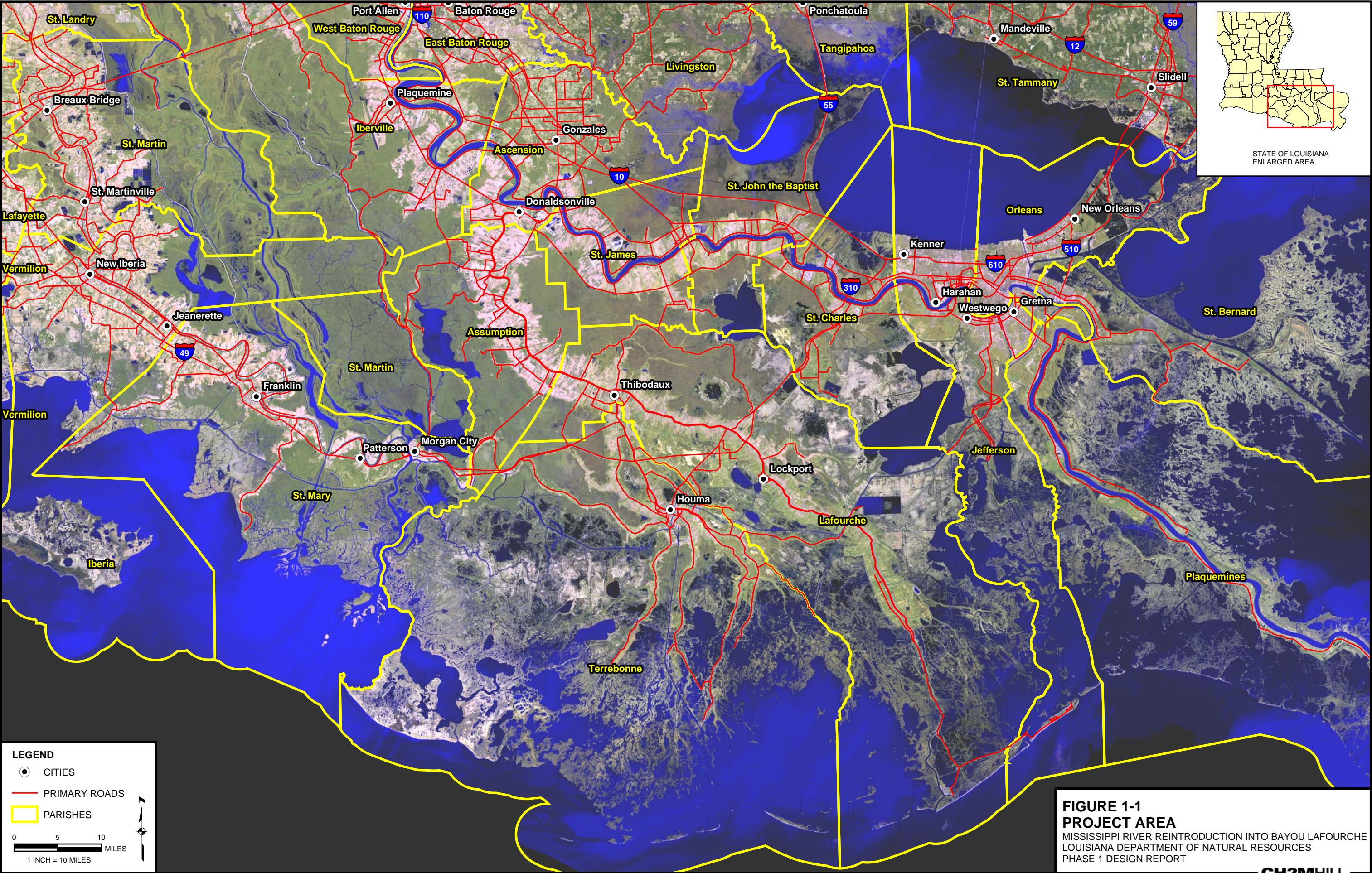
## 1.1 Background

Bayou Lafourche was cut off from Mississippi River at Donaldsonville, Louisiana, in 1903 by a dam and subsequent levee improvements. The bayou was partially reconnected to the river in the 1950s, with the installation of a pump/siphon station that supplies approximately 200 cubic feet per second (cfs) for consumption and water quality maintenance. Historically, the river served to counteract subsidence in the area by introducing fresh water, sediments, and nutrients. In addition, numerous oil field canals, the Gulf Intracoastal Waterway, and the Houma Navigation Canal have altered the natural hydrology of the area. These alterations reduced the freshwater flows to area marshes, and saltwater intrusion impaired drinking water quality.

A conceptual project was identified in the *Louisiana Coastal Wetlands Restoration Plan* (CWPPRA, 1993) to divert fresh water down Bayou Lafourche to benefit the marshes of the Terrebonne and Barataria Basins. In 1995, EPA and the Bayou Lafourche Freshwater District (LFWD) developed a more specific proposal, which was selected for inclusion in the CWPPRA Fifth Priority List. This project, designated PBA-20, was further refined through additional evaluations initiated by EPA in 1996.

The original project proposed the diversion of 2,000 cfs of water from the Mississippi River into Bayou Lafourche at Donaldsonville to promote environmental benefits and meet the needs of downstream freshwater supply withdrawals. The original concept was that the 2,000 cfs would be diverted by means of siphons, and only operated during periods when the difference between river and bayou stage was adequate to accomplish siphon function (January to June in normal water years). Outside of the siphon operations period, diversions would be reduced to those quantities that could be supplied using the existing pump station.







The original project met with substantial public resistance, primarily because of concerns over the negative impacts of increased water levels on residential properties adjacent to the bayou, existing flood control measures, and bank stability. No provision was included in the original project to address property inundation or flood control issues. Because of the anticipated increase in costs to address property and legal issues, the CWPPRA Task Force sought to develop alternatives that would limit the impacts to bayou property owners and regional drainage.

In April 1997, Coastal Engineering and Environmental Consultants, Inc., conducted an alternatives analysis to increase the conveyance capacity of Bayou Lafourche to accommodate the 2,000 cfs that was proposed in the original project without raising water levels above a reference water surface profile. Coastal Engineering and Environmental Consultants, Inc., performed preliminary analyses on the following two alternatives:

- The first alternative was to increase the conveyance capacity by dredging the bayou from Donaldsonville to Thibodaux to a greater extent than was originally proposed. Deployable weirs and extensive bulkheading were included in this alternative to maintain water levels in the bayou when the siphons were not in operation.
- The second alternative included the introduction of fresh water to Bayou Lafourche by additional drainage from marshes on the eastern side of the bayou.

Subsequent to the original project goals and the resulting public concerns, EPA conducted a conceptual redesign of the proposal, and additional alternatives were evaluated. The outcome of this process was the selection of a new project alternative in 1998, which was based on expected impacts, benefits, and cost effectiveness in the *Evaluation of Bayou Lafourche Wetlands Restoration Projects: Coastal Wetlands Planning Protection and Restoration Act Project PBA-20* (1998 Summary Report) (EPA, 1998).

Results of the conceptual redesign of the Bayou Lafourche diversion project are presented in the 1998 Summary Report. The 1998 Summary Report evaluated the original PBA-20 and several other alternatives. In contrast to the original project, the following three features were consistently identified in the additional alternatives considered:

- Pumping capacity was added to provide consistent flows year-round and to maximize freshwater supplies, particularly in the fall when salinity problems are greatest.
- Alternatives were reduced in overall size to reduce impacts and costs (for example, total Mississippi River diversion reduced to 1,000 cfs or less).
- Alternatives incorporated channel improvements and management structures to minimize or control potential adverse effects on bayou water levels and bank stability.

As part of the evaluation, EPA developed a specific project concept referred to as the “optimized project.” The optimized project is a 1,000-cfs diversion that incorporated the features listed above. This project was the focal point of the alternatives that were evaluated. Features, costs, benefits, and impacts were developed to the greatest degree for the optimized project, but remained conceptual in nature. Other project “alternatives” evaluated were primarily modifications of the optimized project, including value engineering revisions to parts of this project (e.g., vinyl sheet piling as opposed to steel sheet piling).

Lingering uncertainties related to project costs and benefits resulted in the project being deferred. In October 2001, the State of Louisiana committed to cost share the Phase 1 E&D effort equally with CWPPRA. In agreeing to accept the state's proposal, CWPPRA requested that an allocation of costs be calculated for any forthcoming recommended alternative and proposed project benefit areas take into consideration operation of other diversion projects (i.e., Davis Pond).

In October 2001, the Breaux Act Task Force agreed to proceed with Phase 1 E&D for the Bayou Lafourche project, subject to, among others, the following stipulations:

- The 30 percent design review will address the costs and benefits of alternative means of achieving the wetlands conservation goal of the Bayou Lafourche project via additional Mississippi River flows.
- The design report will include the following updated cost and benefit estimates and alternative designs and approaches for accomplishing the project's conservation goals:
  - An evaluation of the effects of existing and planned water control and freshwater diversion projects in the basin on the benefits of the Bayou Lafourche Project.
  - Allocation of costs between beneficiaries.

In April 2004, the project purpose was refined as follows:

Maximize the Mississippi River connection to Barataria-Terrebonne Basins to nourish and protect the marsh through the reintroduction of fresh water, sediments, and nutrients. The proposed project has added purposes of ensuring long-term freshwater supply to communities and industries served by the LFWD by limiting saltwater intrusion and enhancing water quality.

The overall environmental goal of the project is to introduce more Mississippi River water into Bayou Lafourche to benefit coastal marshes in the bayou's historical overflow area. The project's expected area for marsh enhancement is located south of Thibodaux in the Lake Fields and Lake Long (both fed by Company Canal), Grand Bayou, Bayou Terrebonne, Houma Navigation Canal, Delta Farms, and Bayou Perot and Bayou Rigolets areas.

This Phase 1 Design Report presents analyses for an array of project alternatives. These alternatives were systematically screened, qualitatively and quantitatively, to result in only a proposed few for the state and Task Force agencies to review. Following their guidance, and incorporating the environmental review process (National Environmental Policy Act [NEPA]), the range of project alternatives will be evaluated in more detail in the 30 percent effort to result in three to five project alternatives that will be carried into the 30 percent design phase. At the conclusion of the 30 percent design effort, one project alternative will be recommended for detailed design and construction.

## 1.2 Purpose of Phase 1 Design Report

This report presents analyses, findings, and a summary of recommendations concerning project alternatives that will be evaluated during the next stage of the project. During this phase, an array of project alternatives that accomplished project objectives were developed

to the Phase 1 level for comparison and screening purposes. The initial steps of this effort required assimilating project data gathered to date and detailing a logical methodology to define, characterize, group, analyze, and compare project alternatives.

## 1.3 Scope

This report documents the Phase 1-level evaluation of alternatives for the MRRBL project. The project, which was awarded to CH2M HILL in July 2003, was separated into the following five major tasks:

- Task 1: Project Initiation and Management
- Task 2: Collect, Inventory, and Review Existing Data and Current Conditions
- Task 3: Formulate Viable Alternative Plans
- Task 4: Alternatives Investigation/Development
- Task 5: Alternatives Analysis

Task 3 developed the following technical memoranda (TM):

- Task 3.1: Verify Existing Alternatives
- Task 3.2: Identify New Alternatives

Task 3.1 reviewed and summarized prior studies' project alternatives. TM 3.1 identified those alternatives and components of alternatives that were considered viable and consistent with the overall project goals and that could be brought forward as concepts for further development. The subsequent TM developed in Task 3.2 provided a description of new potential project alternatives/components and summarized the methodology proposed for evaluating alternatives in the Phase 1 design effort.

Task 4 of the scope includes the engineering analyses for both the Phase 1 and 30 percent efforts. This Phase 1 Design Report provides an evaluation of the updated list of viable alternatives and engineering issues that will require further development as the analysis and design efforts progress. The recommended alternatives include design and policy issues that the Task Force and state will need to consider before finalizing the alternatives that will proceed into the 30 percent design phase.

As part of the Task 4 efforts, a two-dimensional (2D) hydrodynamic and water quality model is under development and will be used to help assess wetlands benefits for a refined set of alternatives in the 30 percent effort. A Phase 1 modeling report is included in Appendix A of this report. Support for the modeling effort has included gathering significant new surveying information and data.

A preliminary hydraulic model of the upstream portion of the project was developed and used to facilitate the Phase 1 design. At the conclusion of the Phase 1 design effort, additional surveying and data collection will be conducted to refine and address issues specific to the limited number of project alternatives.

Task 5 consists primarily of conducting a Wetlands Value Assessment further cost and benefit analyses, and a proposed allocation of costs for the 30 percent design alternatives. This information will be prepared for use in determining which project alternative will proceed to final design.

## 1.4 Report Organization

This Phase 1 Design Report provides a planning-level analysis of the alternatives under consideration. The report is organized into the following sections:

- Section 1 – Introduction
- Section 2 – Overview of Alternatives Development
- Section 3 – Conveyance Evaluation
- Section 4 – Diversion Structures
- Section 5 – Infrastructure, Utility, and Site Modifications
- Section 6 – Dredging, Disposal, and Beneficial Reuse Analysis
- Section 7 – Comparison of Alternatives
- Section 8 – Summary of Recommended Alternatives and Considerations for the 30 Percent Design Evaluation
- Section 9 – Louisiana Department of Natural Resources and U.S. Environmental Protection Agency Review
- Section 10 – References
- Appendix A – Phase 1 Modeling Preliminary Results
- Appendix B – Historical Water Users along Bayou Lafourche
- Appendix C – Historical Water Level Investigation
- Appendix D – Smoke Bend Canal Sizing and Dredging Volumes
- Appendix E – Bayou Lafourche Alignment Conveyance Alternative Matrix/Water Level Profiles
- Appendix F – Mississippi River Stage Elevation 1951 to 2004
- Appendix G – Pump Curve and Sizing Data
- Appendix H – Existing Utility Owners and Pipe Elevations
- Appendix I – Review of the Wetlands Value Assessment Process and Role in Coastal Wetlands Planning, Protection, and Restoration Act
- Appendix J – Phase 1 Geotechnical Report
- Appendix K – Comparing Dredging Requirements with Target Water Levels and Diversion Flows