DRAFT
ENVIRONMENTAL ASSESSMENT
for the

HYDROLOGIC RESTORATION AND VEGETATIVE PLANTING IN THE LAC DES ALLEMANDS SWAMP

CWPPRA PROJECT BA-34-2

St. James Parish, Louisiana

Prepared by: The U.S. Environmental Protection Agency, Region 6

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Acronyms

AOI	Area of Interest
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CPRA	Coastal Protection and Restoration Authority of Louisiana
CWA	Clean Water Act
CWPPRA	Coastal Wetlands Planning, Protection and Restoration Act
DBH	Diameter at Breast Height
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FR	Federal Register
GPS RTK	Global Positioning System Real Time Kinematic satellite navigation
HTRW	Hazardous, Toxic and Radiological Waste
LCA	Louisiana Coastal Area
LCWCRTF	Louisiana Coastal Wetlands Conservation and Restoration Task Force
LDEQ	Louisiana Department of Environmental Quality
LDNR	Louisiana Department of Natural Resources
MSL	Mean Sea Level
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
MBTA	Migratory Bird Treaty Act
MR	Mississippi River
MSFCMA	Magnuson–Stevens Fishery Conservation and Management Act
NAAQS	National Ambient Air Quality Standards
NAVD 88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPL	National Priority List
NRCS	Natural Resource Conservation Service
O&M	Operations and Maintenance
PPL	Priority Project List (CWPPRA)
PMT	Project Management Team
RM	River Mile
RSLR	Relative Sea Level Rise

SCPDC	South Central Planning and Development Commission
SHPO	State Historic Preservation Office
SI	Suitability Index
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
WVA	Wetland Value Assessment

Units of Measure

ac	Acres
ft	Feet
ha	Hectares
lbs	Pounds
mi^2	Square Miles
MSL	Mean Sea Level
ppb	Parts Per Billion
ppm	Parts Per Million
yd^3	Cubic Yards

Part 1. Purpose and Need for Proposed Action

1.1 Introduction

Wetland loss is a well-documented and widespread problem throughout coastal Louisiana. The land area loss rate in Louisiana coastal areas was approximately 17 square miles per year from 1985 to 2010. Some 1,883 square miles were lost from 1932 to 2010 (Couvillion et al., 2011). The causes of wetland loss in Louisiana are varied and complex and include subsidence, erosion, sediment deprivation, saltwater intrusion, altered hydrology, and sea level rise (Turner and Cahoon 1987). The effects of natural processes like subsidence and storms have combined with human actions at large and small scales to produce a system on the verge of collapse (LCWCRTF, 1998).

Congress recognized the ongoing severe coastal wetland losses in Louisiana and the increasing impacts on resources when it passed the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) in 1990 (Public Law 101-646, Title III). CWPPRA established a process to identify, assess, design, and fund the construction of coastal wetland restoration projects. CWPPRA seeks to provide long-term conservation of coastal wetlands through the restoration, creation, protection, and enhancement of wetlands. On a yearly cycle, projects are selected from a list of projects ("priority project lists" or PPLs) to fund planning, engineering and design, and construction.

CWPPRA identified five federal agencies as Task Force members to participate in the program. These include the U.S. Army Corps of Engineers (USACE), the U.S. Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS) and the Natural Resource Conservation Service (NRCS). The other critical partner is the Coastal Protection and Restoration Authority of Louisiana (CPRA), which participates in CWPPRA project selection, planning, analysis, implementation and funding.

There are currently 151 active CWPPRA projects. One hundred and one projects have been completed, benefiting over 112,000 acres. Seventeen (17) projects are currently under active construction with 33 additional projects currently in the engineering and design phase of development, three of which were scheduled for construction in FY2014 (lacoast.gov).

The EPA is the federal sponsor for the Hydrologic Restoration and Vegetative Planting in the Lac des Allemands Swamp Project (BA-34-2) and is responsible for oversight of the project, in partnership with the Coastal Protection and Restoration Authority of Louisiana (CPRA).

The proposed project BA-34-2 was approved for construction on the Tenth Priority Project List of the CWPPRA. The Task Force approved Phase 1 funding in January 2001. Originally authorized as the "Mississippi River Reintroduction into Northwestern Barataria Basin (BA-34)," the project was approved for a scope change by the CWPPRA Task Force in June 2013. The scope change eliminated a planned siphon feature and the project was renamed

“Hydrologic Restoration and Vegetative Planting in the Lac des Allemands Swamp” (BA-34-2) (Project Fact Sheet at lacoast.gov). Project BA-34-2 is located within Region 2, Barataria Basin, in the Coast 2050 management unit, “Des Allemands,” St. James Parish. The project area is bordered on the south by Bayou Chevreuil and on the west by Highway LA 20 (Figure 1), near the town of Vacherie, Louisiana. Forest plant species composition, basal area, and vegetative productivity in the project area reflect a degraded cypress-tupelo swamp.

The CWPPRA Standard Operating Procedure (SOP) requires compliance with the National Environmental Policy Act (NEPA). A draft of the Environmental Assessment of the project is submitted with the approval package to the CWPPRA Technical Committee with the request for authorization of Phase II construction funding.

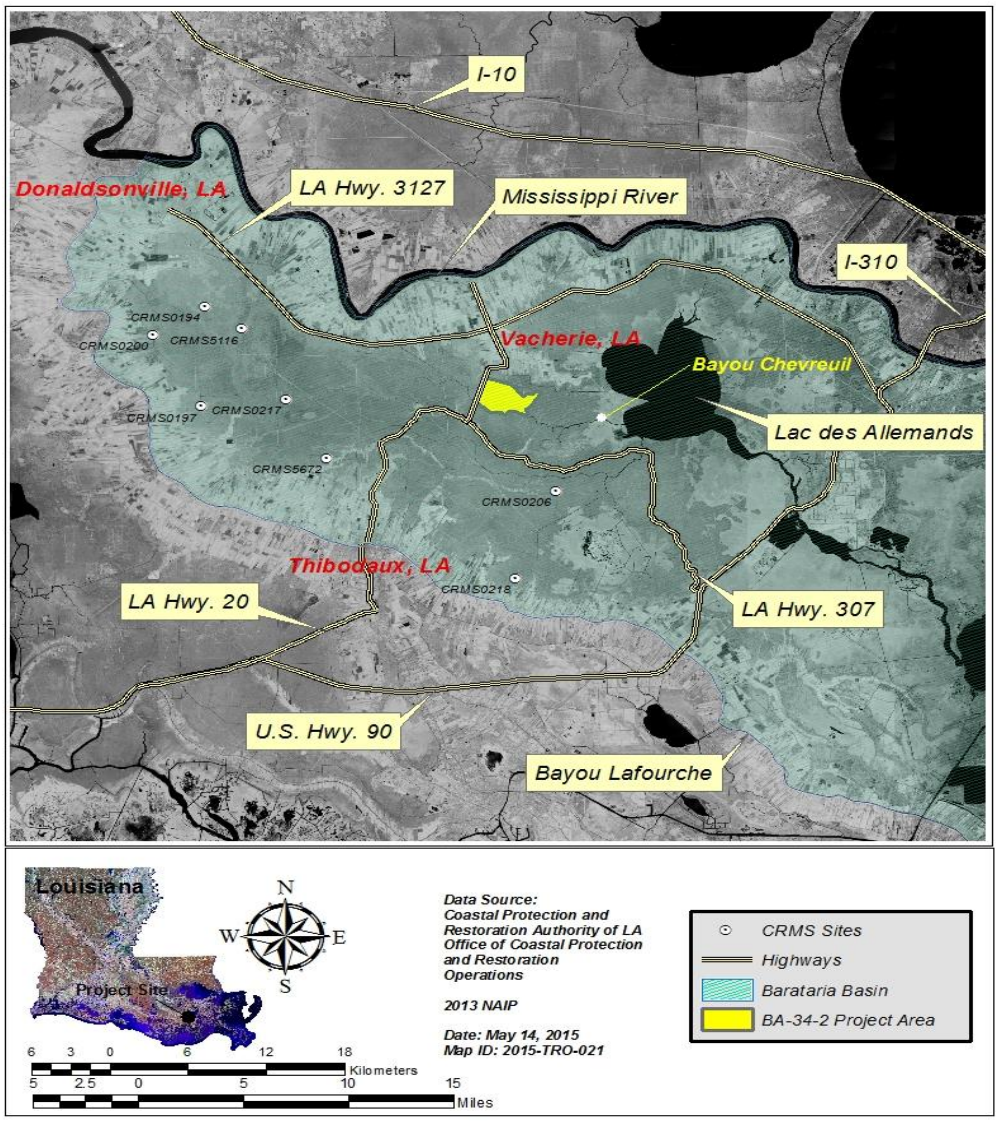

Figure 1. Location Map showing BA 34-2 project area.

1.2 Purpose of Proposed Action

The purpose of this project is to restore and maintain selected cypress-tupelo swamp tracts in the upper Barataria Basin, restore and maintain water quality in the swamp and in Bayou Chevreuil, in support of the coastal restoration objectives of CWPPRA. The project will enhance an area of swamp (2,395 acres with an expected 529.96 Average Annual Habitat Units (AAHUs) of benefit) that would be substantially degraded without the project. The project is expected to continue providing wetland benefits 30 to 40 years after construction. Benefits include reduced swamp submergence, increased regrowth of young trees, denser forests in currently stressed areas, increased swamp productivity, and improved water quality (EPA 2012).

Louisiana is experiencing a land loss crisis that has claimed 1,880 square miles of land since the 1930s. The 2012 Louisiana Master Plan (Master Plan) characterizes this crisis as "nothing short of a national emergency." The Master Plan estimates that expected annual damages from flooding by 2061 would be almost ten times greater than damages in 2012, from a coast-wide total of approximately $2.4 billion to a coast-wide total of $23.4 billion. (Louisiana's Comprehensive Master Plan for a Sustainable Coast, May 23, 2012). Without action to mitigate the factors causing degradation, coastal Louisiana will continue to experience loss of coastal wetland forest functions (SWG, 2005).

The Barataria Basin had a land area of 1,470 square miles in 1932. By 2010, the land area was 1,024, a loss of 455 square miles, or 30 percent over 78 years (Couvillion et al, 2011).

1.3 Problem: The Lac Des Allemands River Basin Initiative identified the following specific problems within the Lac des Allemands Watershed: 1) Drainage impairments; 2) Water quality impairments; 3) Loss of marsh; and 4) Decline of cypress forest. Many years of research in this basin by Louisiana State University and other researchers have demonstrated that the swamps throughout the basin will eventually change to open water, floating aquatic plants, or fresh marsh, due to the effects of subsidence and inadequate accretion of sediments and organic matter. Some areas are already highly stressed and converting to open water, floating aquatic plants, and fresh marsh due to the effects of impoundment, subsidence, and inadequate accretion of sediments and organic matter. The Coast 2050 Plan predicted that 60 percent of the swamps in the basin will change to open water or floating marsh by 2050. These problems are caused by the loss of river water, with its associated sediment and nutrients, due to the Mississippi River levee system. Impoundment caused by roads, drainage canals, and spoil banks is also a major cause of degradation (USDA, 2002).

Forest plant species composition, basal area and vegetative productivity in the project area reflect a degraded cypress-tupelo swamp. Degradation of the swamp forest is due to a combination of historical logging, hydrologic alteration, subsidence, and possibly nutria herbivory. Hydrologic alteration is due to a combination of the elimination of the connection of the swamp to the

Mississippi River, impoundment due to road construction, spoil bank placement, drainage canals, and an impoundment for crawfish aquaculture (EPA 2013).

The area defined as the Des Allemands mapping unit (Figure 2) in the *Coast 2050: Towards a Sustainable Coastal Louisiana* report has undergone rapid land loss rates in the past century. The mapping unit lost some 4,530 acres of the total 23,050 acres of land between 1932 and 1990, which represents approximately 20 percent of the mapping units in the land area. (LCWCRTF 1998).

Historic Land Loss - In 1932, this unit had 23,050 acres of marsh. From 1932 to 1956, approximately 590 acres of wetlands were lost. Most of this loss was due to shoreline erosion in the fresh marshes around Lac Des Allemands and altered hydrology as the Mississippi River levee has severed the flow of freshwater, sediment, and nutrients to the wetlands via natural distributaries and overbank flooding. Canal and levee construction also impeded the natural hydrology, causing impoundment of water which kills wetland vegetation and causes poor regeneration of cypress. The greatest wetland loss in this unit (3,020 acres) occurred from 1956 to 1983. An additional 920 acres of wetlands were lost from 1983 to 1990. The recent loss was caused mainly by wind erosion and altered hydrology. Also, herbivory, primarily by nutria, results in eat-outs of fresh marsh vegetation and poor plant regeneration.
The problems that have led to the wetland loss within the mapping unit are part of a larger problem throughout all of coastal Louisiana. Currently, Louisiana loses approximately 70 km^2 of wetlands per year. The Deltaic Plain accounts for approximately 51 km^2 of these losses (Barras et al. 2008).

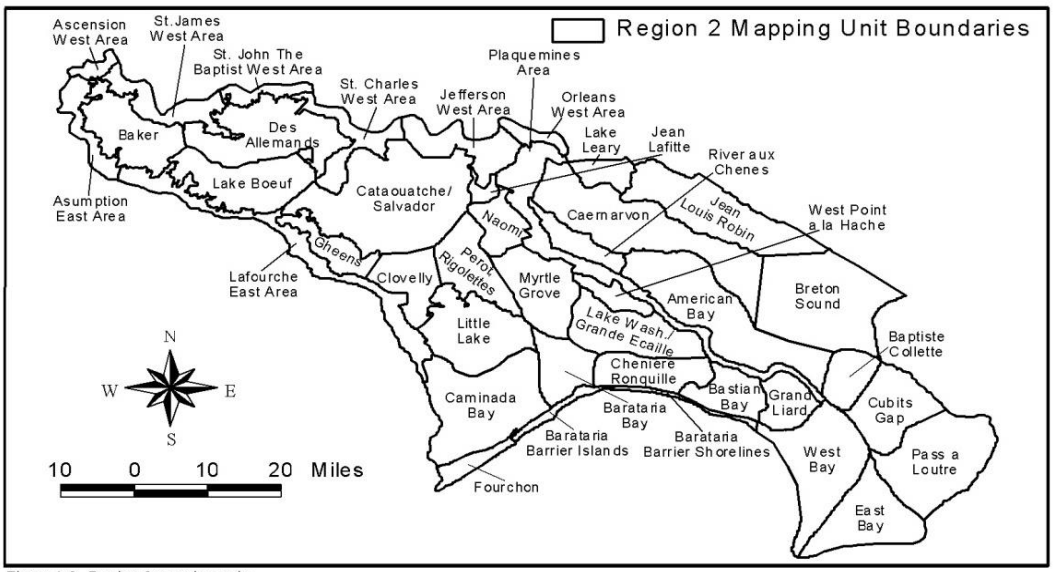

Figure 1-2. Region 2 mapping units.
Figure 2**.** Mapping Units inside CWPPRA Region 2 (LCWCRTF 1998).

Future Land Loss Projections – In 1990, this unit contained 18,520 acres of marsh and 44,560 acres of swamp. By 2050, approximately 6,730 acres of marsh are projected to be lost, primarily due to altered hydrology, wind erosion, herbivory, and subsidence. Over 30 percent of the 1990

marsh will be lost, and over 60 percent (26,740 acres) of the swamp is projected to become open water or floating marsh (LCWCRTF 1998, Appendix D of Coast 2050).

Beneficial Functions - Coastal wetland forests provide a wide range of functions that benefit the human environment and are of significant economic, ecological, cultural, and recreational value to residents of Louisiana and the United States. These beneficial functions include:
-wildlife habitat (including migratory songbirds, waterfowl, and threatened and endangered species;
-flood protection, water quality improvement (including nitrate removal), and storm protection;
-carbon storage and soil stabilization;
-economic benefits of fishing, crawfishing, hunting, timber production, and ecotourism (SWG, 2005).

1.4 Coordination and Consultation

Coordination has been maintained with each of the CWPPRA Task Force agencies, the Louisiana Department of Natural Resources (LDNR), and the Louisiana Coastal Protection and Restoration Authority (CPRA). Consultation has been conducted with the USFWS and Louisiana Department of Wildlife and Fisheries (LDWF), in accordance with the Endangered Species Act of 1973 and the Fish and Wildlife Coordination Act. The EA has been prepared in coordination with NMFS in determining categories of Essential Fish Habitat (EFH) and associated fisheries species within the project vicinity. Submittal of the EA is provided to initiate formal federal consultation requirements pertaining to EFH under the MSFCMA. Federal, State, Tribal and local agencies, as well as other interested stakeholders, will receive a copy of this EA. Consultation has also been conducted with the State Historic Preservation Office (SHPO) in accordance with the National Historic Preservation Act of 1966, and Archaeological and Historic Preservation Act of 1974. Consultation has been initiated with the tribes in regards to cultural resource findings. The final cultural resources investigation report has been shared with those tribes who have requested it.

Under the development of PPL 10, the public, parish representatives, and state and federal agencies, nominated projects across the nine identified hydrologic basins. Ten candidate projects were selected from the list of nominees proposed in the PPL 10 planning year. These PPL 10 candidate projects were evaluated to determine the long-term net wetlands benefits based on a 20-year project life. The candidate projects were also evaluated to determine conceptual project designs and cost estimates. Economic analyses were conducted to determine the total fully funded cost estimate for feasibility planning, construction, and 20 years of operations and maintenance. Cost-effectiveness was calculated for each project using the fully funded cost estimate and net wetland benefits over the 20-year project life. At the end of the PPL 10 development process in 2001, the Task Force authorized the original BA 34 proposed project. The re-scoped BA-34-2 project was approved by the Task Force in June 2013 (LCWCRTF

October 2013). The 30 percent Engineering and Design Review was held in Baton Rouge on July 23, 2015. A 95 percent Engineering and Design Review meeting was held by October 28, 2015. The project management team (PMT) will request approval for construction funding at the CWPPRA Task Force meeting in January 2016.

The PMT has coordinated and consulted with partners and stakeholders - SHPO, tribes, USFWS, LDWLF, USACE, St. James Parish, CPRA, and LDNR throughout the process.

Part 2. Proposed Action and Alternatives

The no-action alternative (Alternative 1) and the proposed action (Alternative 2) are evaluated here. Construction alternatives are designed with a 20-year life span as per the requirements of CWPPRA. The proposed project features and benefits will likely remain after the 20-year life span but detailed analyses beyond the 20-year life span are not completed as a part of this analysis.

There were several alternatives that the project team considered but did not evaluate in greater detail. An explanation of those considered but not evaluated alternatives is given in *Section 2.2, Alternatives Considered But Not Evaluated*.

A number of data-gathering tasks have informed the alternatives analysis. To evaluate the circulation potential in the swamp under various project alternatives, FTN Associates Ltd. developed and utilized a two-dimensional, finite element, hydrodynamic model to simulate movement of water in the Lac des Allemands Swamp (FTN Associates, Ltd., 2015). See Figure 3.

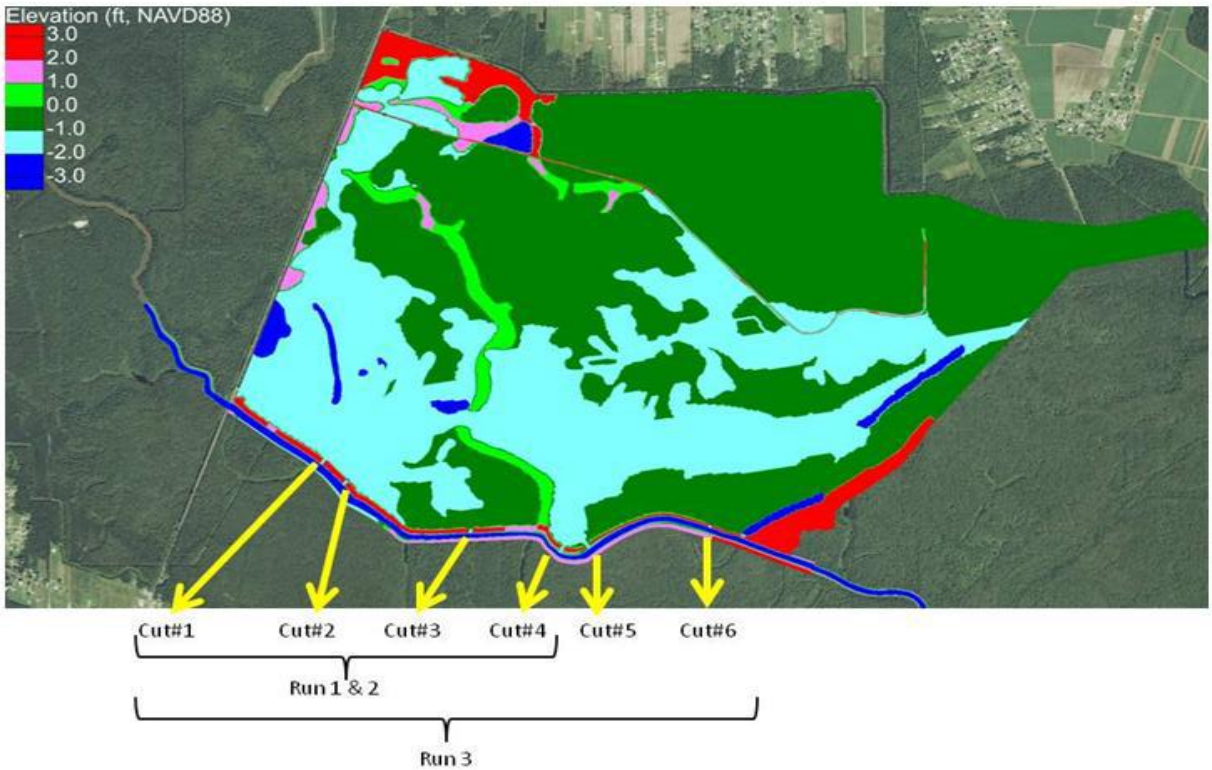

Figure 3. Three scenarios were modeled to show water movement (FTN 2015).

In March and April of 2015, C & C Technologies, Inc., a sub-contractor to Stantec Consultants, conducted detailed topographic, bathymetric, and magnetometer and tree count surveys of the proposed work area (11 gaps), as well as a bathymetry and magnetometer survey of the center line of Bayou Chevreuil. The magnetometer survey was conducted to locate any magnetic anomalies in the project area. (C & C Technologies Inc., 2015a).

A cultural resources survey and investigation was conducted to identify any possible cultural resource sites in the project area. No archeological sites or standing structures were identified within 1.6 km (1.0 mi) of the proposed des Allemands Swamp Project (Royal/RCG&A 2015).

Topographic data was collected for eleven potential gap locations along the northern spoil bank of Bayou Chevreuil. The gaps had five (5) 400 ft. long profiles with the center profile line positioned along the gap centerline and additional profiles positioned at 25 ft. spacing on either side of the centerline. Profiles extended 50 ft. beyond the existing levee into Bayou Chevreuil. Seven (7) 150 ft. long and perpendicular transects spaced at 50 ft. intervals started at the outer levee boundary and extended into the swamp were also taken. Survey transects are shown in Figure 4.

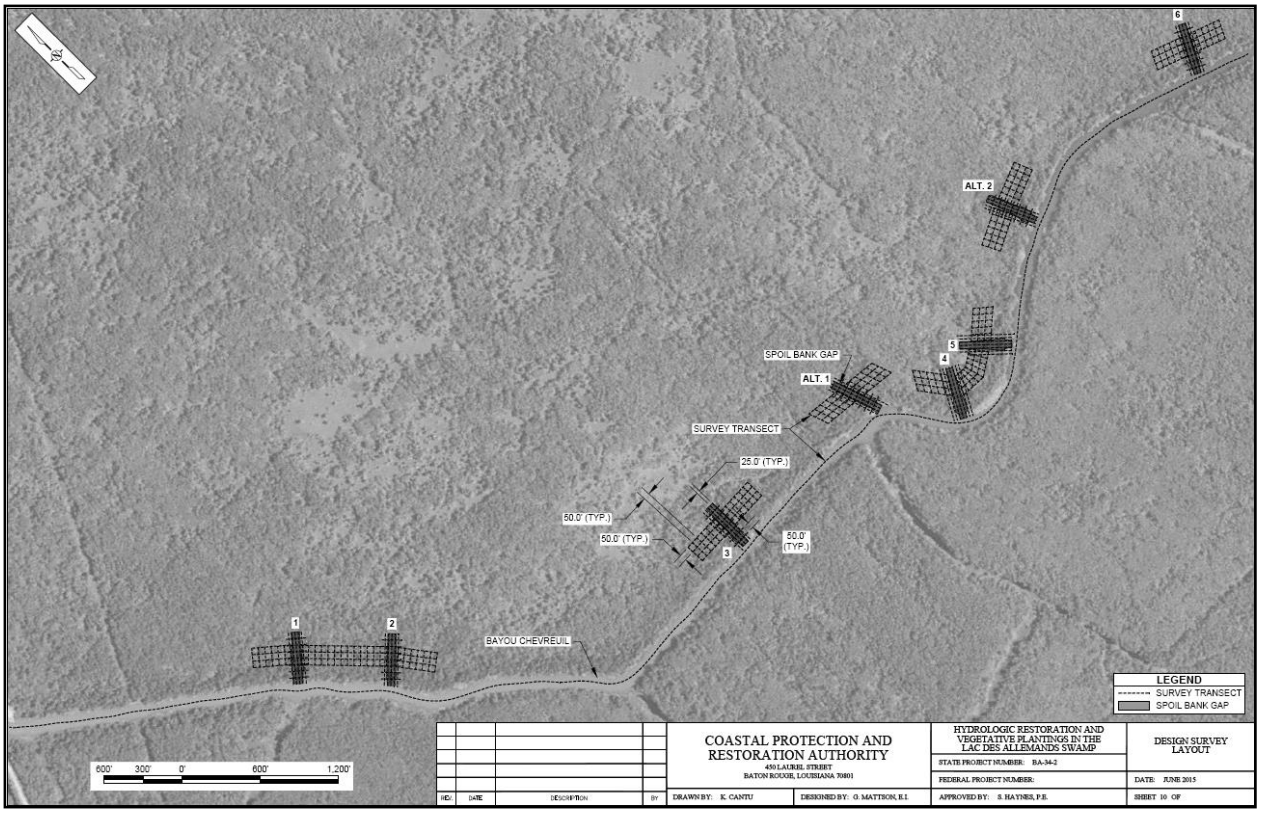

Figure 4. Design Survey Layout (C & C, 2015a).

The design survey was performed from March 2015 to July 2015 by C & C Technologies. All horizontal coordinates are referenced to Louisiana State Plane Coordinate System, North American Datum of 1983 (NAD 83). All elevations are referenced to North American Vertical Datum of 1988 (NAVD 88) GEOID12A. The surveyors verified the Horizontal and Vertical position of the Secondary Monument designated "BA 34 SM 02" which was used as the primary benchmark for the survey (C & C Technologies Inc., 2015a).

2.1 No-Action Alternative 1

Under a no-action alternative, the proposed project would not be constructed. There would be a continuation of baseline conditions in the proposed project area and land loss would be expected to continue, with associated losses of wetland functions and values. The project area would continue to be impounded. Forest plant species composition, basal area, and vegetative productivity in the project area would continue to degrade.

2.2 Alternatives Considered But Not Evaluated

Alternatives that were considered but were eliminated without detailed environmental evaluation are presented here.

Elimination of Siphon Features. The BA 34-2 project was originally funded by the CWPPRA program as the "Mississippi River Reintroduction into Northwestern Barataria Basin, BA 34."

The CWPPRA Task Force approved Phase I engineering and design in January of 2001. The original BA 34 project featured the installation of two siphons to divert water from the MR into the impounded swamp area (Lacoast.gov BA 34 Fact Sheet of June 2004). Modeling and preliminary design efforts conducted between 2001 and 2013 revealed that the planned siphon feature to reintroduce MR water into the project area would not be as efficient in terms of costs and benefits as envisioned (FTN 2011). The project was re-scoped to eliminate the siphon feature and was renamed "Hydrologic Restoration and Vegetative Planting in the Lac des Allemands Swamp Project, BA 34-2" (EPA 2013).

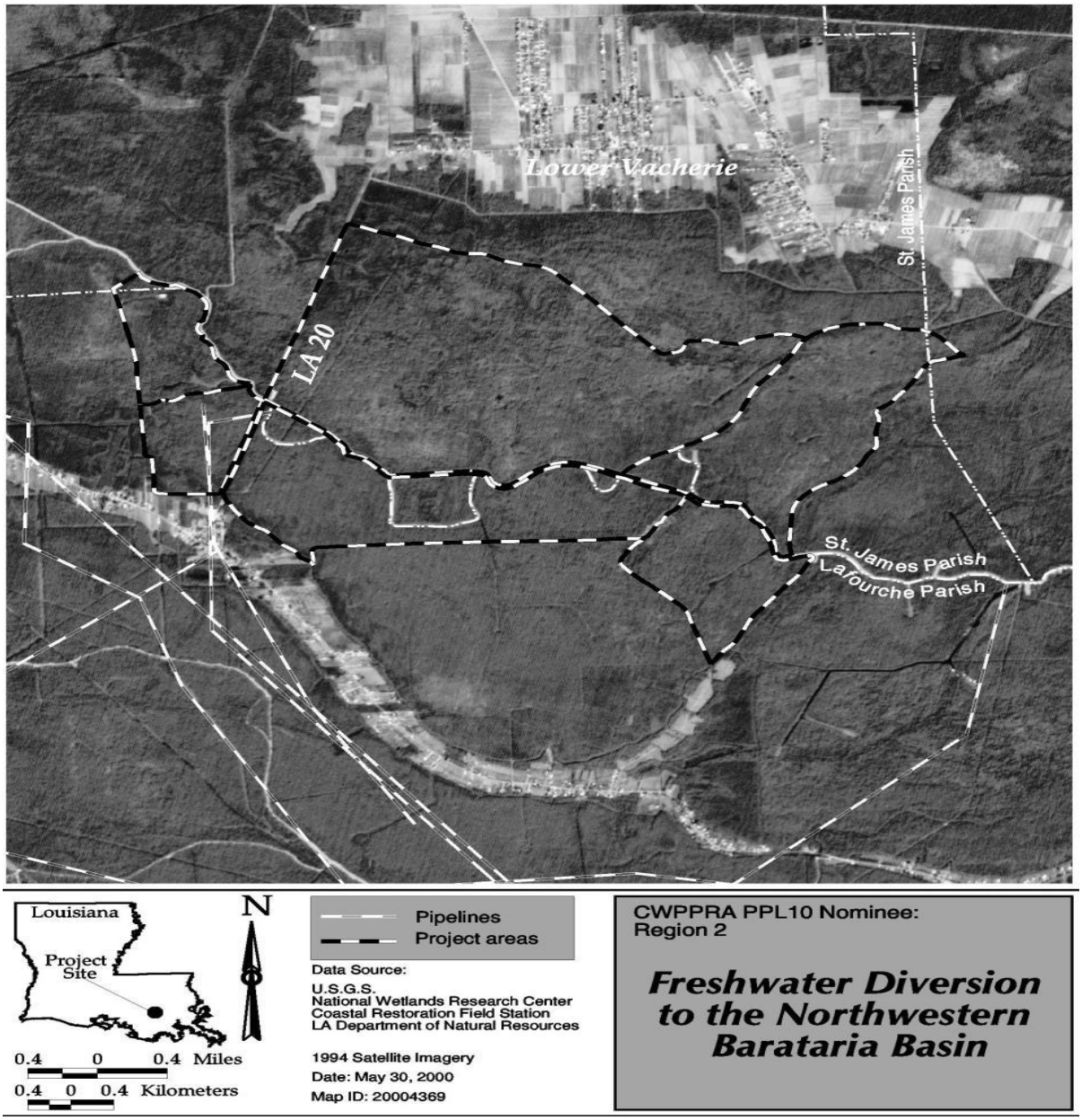

Figure 5. Original BA 34 project, showing the larger project area using a freshwater diversion.

Spoil Bank Cut Analysis. The model evaluated the effectiveness of three project alternatives or scenarios to construct cuts to facilitate the exchange of water between the swamp and Bayou Chevreuil. Of the three scenarios, run number 3 with six cuts at -1.0 ft. NAVD88 produced the greatest water exchange between the swamp and the Bayou and was recommended by the modeling team as the preferred alternative. Two alternate gaps were identified in addition to the initial six gaps, as a fallback in case the cultural resources survey revealed any sites to avoid. The primary and alternate gaps are shown in Figure 6, below. (FTN Associates, 2015).

Spoil Placement Alternatives. The project management team evaluated three soil disposal alternatives for placement: Alternative 1- Offsite Disposal; Alternative 2- Landward of Existing Spoil Bank; Alternative 3- Top of Existing Spoil Bank. Alternative 1 transports the spoil offsite as to reduce the amount of cypress and tupelo trees removed. Alternative 2 places the material landward of the existing spoil bank creating additional upland habitat. Alternative 3 places material atop the existing spoil bank bolstering the existing upland habitat.

Based on cost-benefit analysis and ease of construction, spoil placement alternatives 1 and 3 were eliminated. Alterative 2 is the recommended alternative for the spoil placement portion of the project, and is discussed further in 2.3.1 below (CPRA 2015b).

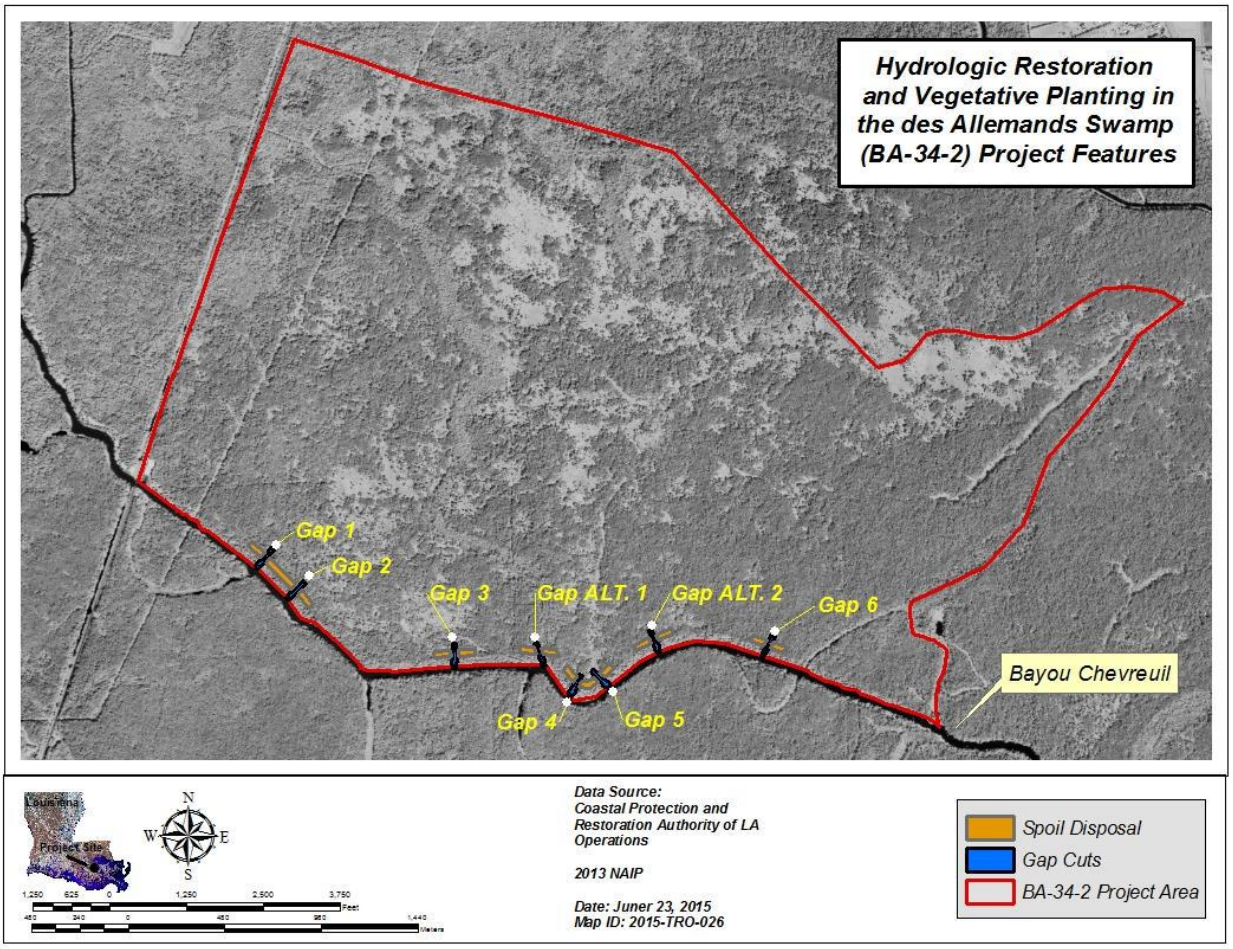

Figure 6. Boundary of Proposed Project Area showing project features.

2.3 Alternative 2 (Proposed Action)

Alternative 2, the proposed action, applies a hydrologic restoration strategy in the form of cuts to spoil banks to open up the impounded swamp. The proposed spoil bank cuts are expected to improve hydrologic circulation and improve swamp health (FTN 2015).

Since the primary goal is to increase water exchange between the swamp and Bayou Chevreuil, Scenario 3 (six (6) gap cuts at -1.0 ft. NAVD88), which produces the greatest exchange, is preferred. The modelers recommended this scenario as the preferred alternative of the three scenarios evaluated during modeling. Six (6) gap cuts induce circulation over a greater swamp area than the alternatives with four cuts (FTN, 2015). As noted above, two alternate gaps were identified in case the cultural resources survey revealed any sites to avoid (Figure 6).

The specifics of each component in this alternative are described below.

2.3.1 Hydrologic Restoration Design

The design of the gaps was determined from existing projects and from the hydrodynamic modeling that was conducted by FTN Associates, Ltd. The model was run for the three

scenarios as described above. Scenario 3, six (6) gaps with -1.0 ft. inverts NAVD 88 and bottom widths of 50 ft. provides the greatest benefit to the existing swamp. The side slopes are based on experience with existing projects with similar characteristics. A side slope of 1V:4H was used. The locations of the proposed gaps are shown in Figure 7 and a typical cross section is shown in Figure 8.

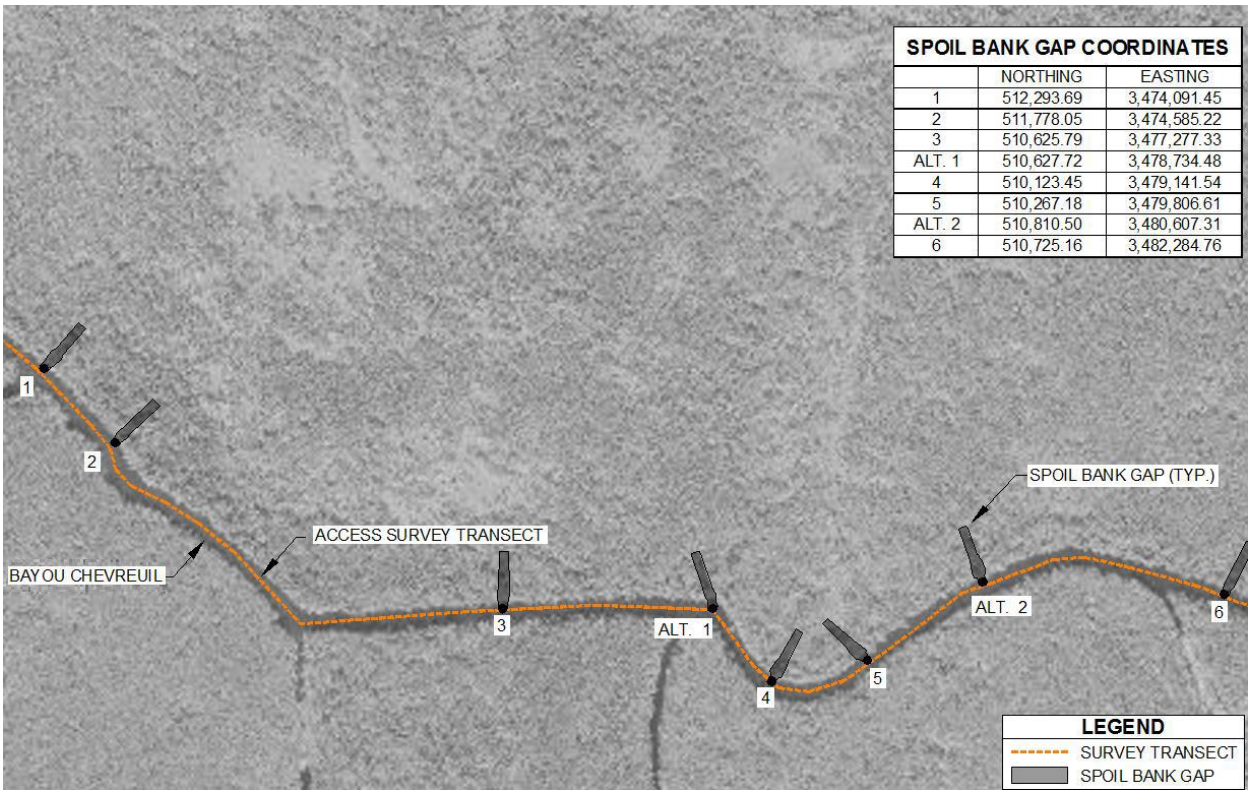

Figure 7. Locations of six (6) proposed gaps (from the 30% Design Report, CPRA, 2015)

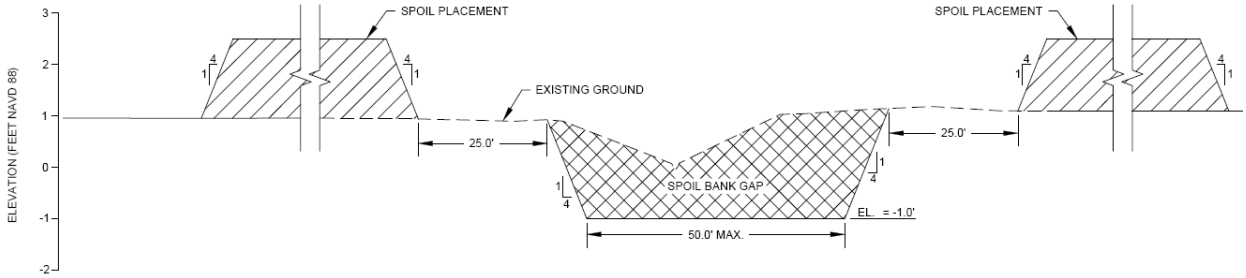

Figure 8. Typical cross-section of spoil bank gap (from the 30% Design Report).

Figure 9. Photo of gap looking towards Bayou Chevreuil taken during field work in March 2015.

Three alternatives were analyzed to determine where to place the spoil that is removed from the gaps. Based on cost-benefit analysis and ease of construction, the alternative chosen places spoil landward of the existing spoil bank to maximum elevation of +2.5 ft. NAVD 88. This alternative offsets spoil placement a minimum 150 ft. landward of the bayou and 25 ft. off the gap, and ensures that no material will slough off into the bayou or excavated gaps (CPRA 2015).

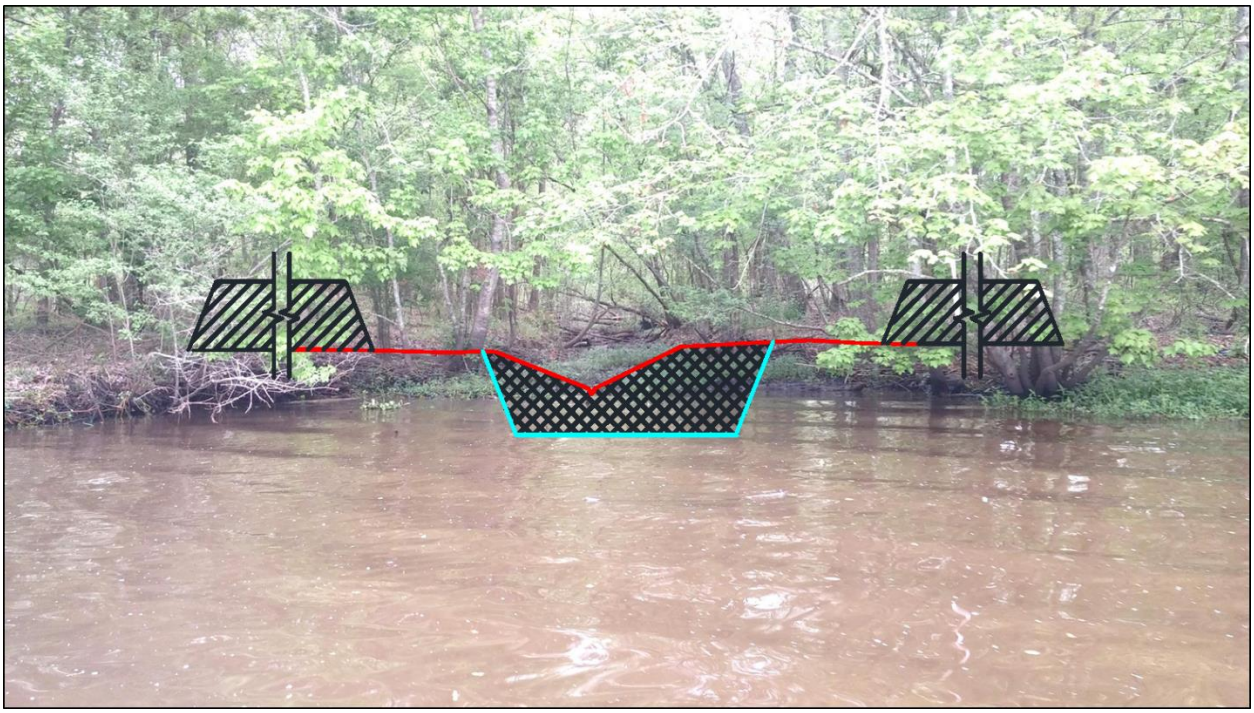

Figure 10. Cross section of design drawing superimposed on photo of typical gap (CPRA 2015).

2.3.2 Vegetative Plantings

Modeling data showed that although hydrodynamic activity will be greatly improved in the project area, the project area will more than likely not ever be completely drained for a period needed to foster the growth of trees. However, for mitigation efforts and increased benefits of the project, some trees will be planted in the spoil disposal areas as shown below. The O&M plan calls for additional trees to be planted during the O&M phase if monitoring data indicates more plantings to be beneficial.

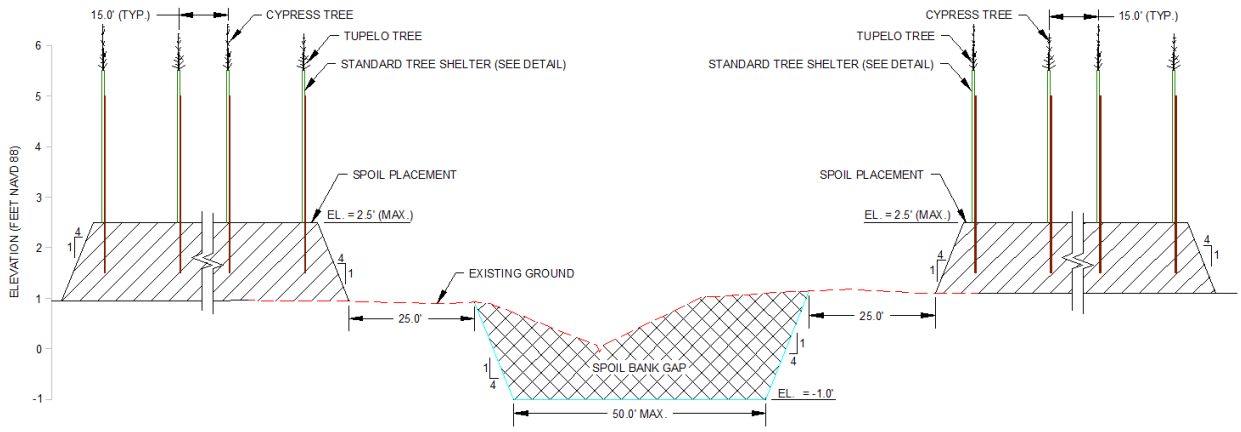

Figure 11. Tree layout, typical section (from 30% Design Report).

Part 3. Affected Environment

3.1 Physical Environment

The Hydrologic Restoration and Vegetative Planting in the Lac des Allemands Swamp proposed project is located in the Lac des Allemands River Basin, in the Mississippi River Alluvial Plain, Southern Holocene Meander Belt Ecoregion (Daigle et al., 2006).

3.1.1 Topography, Geomorphology, and Soils

Topography

The basin is situated between the Mississippi River (MR) and Bayou Lafourche. Elevations range from approximately +15.0 feet mean sea level (MSL) on the flanks of the natural levee of the Mississippi River and gradually decrease away from the river to approximately +1.0 MSL in the swamps and marshes. Elevations gradually increase towards the natural levee of Bayou Lafourche where they again reach +10.0 MSL. The area is laced with several small bayous with natural sand/silt ridges. The average height of these ridges is approximately +5.5 MSL. (USDA 2002).

Geomorphology and Soils

The basin is part of coastal Louisiana which was formed by the MR thousands of years ago as it frequently changed courses. With each course the MR took, the resulting sedimentation created several distinct delta lobes. The size of the soil particle determined when and where it would settle out of the river water. Sand, being the largest and the heaviest soil component of river water, tended to settle out first in a relatively short time frame. Silt and clay particles were respectively lighter and were carried further away from the main flow of the river channel. These processes determined the type of landform (ridge, swamp, marsh) and the corresponding hydrology and vegetative cover it would eventually have. Figure 12 shows a cross-sectional view of a typical successional pattern of land development for a river delta (USDA 2002).

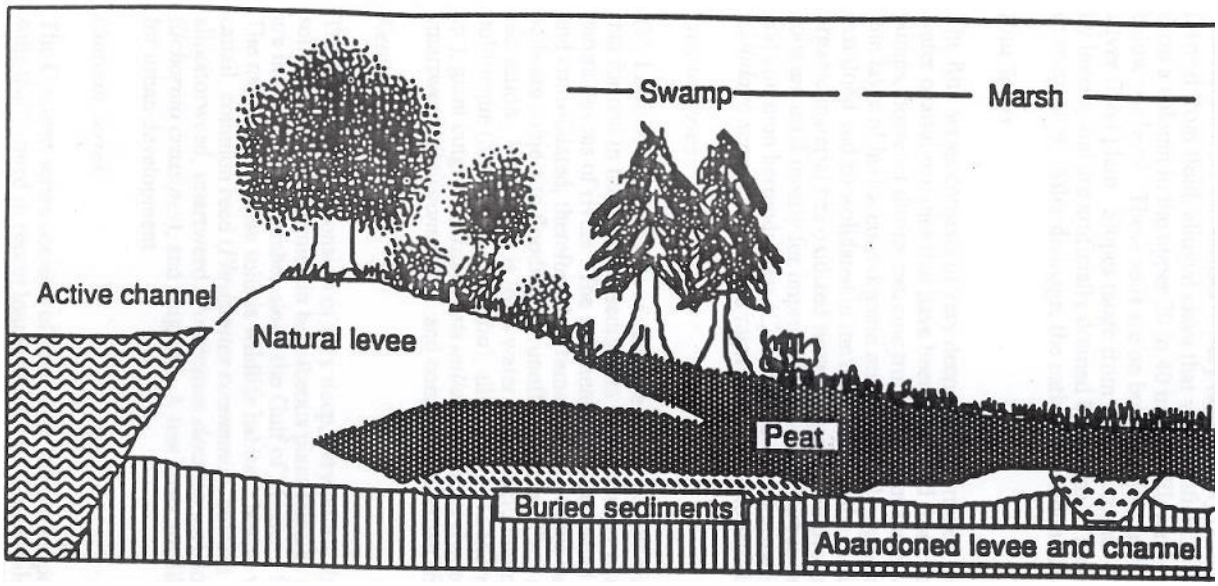

Figure 12. Generalized succession pattern in the delta area (USDA 2002).

The surface and shallow subsurface of the basin is composed of natural levee, marsh, swamp, interdistributary and prodelta deposits. The basin landscape contains a series of old tributary and distributary channels with natural ridges of varying elevations. Sediments deposited as the river overflowed its banks during floods formed these ridges. As these ridges developed and became more elevated, they began to isolate some of the basin areas from regular water movement. These relatively isolated areas became low-energy areas with only seasonal flooding. Floating and submerged aquatic vegetation thrived in these areas and the vegetative remains comprise the fibrous material found in the organic soils.

The soils in the basin are two basic types, organic and mineral. Some organic soils are flotant, or floating soil. This soil is very fragile and is subject to high rates of erosion if increased energy rates are encountered. This could occur when a healthy, protected freshwater, thin mat marsh is subjected to such forces as high winds or strong tidal fluctuations. Mineral soils in the basin are first encountered on the elevated, natural ridges.

This material is usually composed of sand and silt materials. As the ridge progresses down in elevation, loamy soils would be encountered about midway between the swamp areas and the ridge. Finally, the last form of mineral soil would be the heavy clays, which were created by the settling of the fine clay particles in the river water (USDA 2002).

The BA 34-2 proposed project area has mostly Barbary, frequently flooded soils. The Natural Resource Conservation Service (NRCS) produced a Custom Soil Resource Report for the BA 34 project dated December 12, 2012. The BA 34-2 project is contained within the area of interest (AOI) delineated in this report. The Barbary series (BA) consists of very deep, very poorly drained, very slowly permeable soils. These soils formed in recent, slightly fluid to very fluid

clayey sediments that have been deposited in water and are continuously saturated and flooded. These soils are mainly on low, broad, ponded backswamps of the lower Mississippi River Alluvial Plain. Slope is less than one percent. Cancienne silt loam (CmA) and Schriever clay (Sm) soil types also occur in the AOI (USDA 2012).

3.1.2 Climate and Weather

Most of Louisiana has a hot, humid, subtropical climate, and is one of the wettest states, with a yearly average of 57 inches of precipitation. Southern Louisiana has an average January temperature of 55 F˚, and a July average of 82 F˚. Hurricanes sometimes strike the coastal areas of Louisiana, causing loss of life and damage to property. Prevalent winds from the south/southeast bring in warm, moist air from the Gulf, resulting in abundant rainfall. (Crowe and Quayle 2000).

The Lac des Allemands River Basin has long summers which are hot and humid, and mild warm winters occasionally interrupted by incursions of cool air from the north. Rains occur throughout the year with an average annual precipitation of 58 to 62 inches. In winter, the average temperature is 54 degrees F, and the average daily minimum temperature is 44 degrees F. In 50 percent of winters, there is no measurable snowfall, and when snow does occur it is usually of short duration and no more than two to three inches. On occasion, a hurricane impacts the area, which can bring copious amounts of rainfall and strong damaging winds. River fogs are prevalent in the winter and spring, when the temperature of the Mississippi River is somewhat colder than the air temperature (USDA 2002).

3.1.3 Air Quality

National and state ambient air quality standards were developed for specific (criteria) pollutants as a result of the Federal Clean Air Act of 1970. The Clean Air Act Amendments of 1990 mandated a program by which air quality must be improved and maintained so as to meet the National Ambient Air Quality Standards (NAAQS). Under this program, regions are classified as to their attainment status with regard to each criteria pollutant. St. James Parish is currently in attainment of all NAAQS. A Clean Air Act general conformity analysis is not required. (*40 CFR § 93.153(b))*

3.1.4 Surface Water Resources

The proposed project area is in the East Central Louisiana Coastal Watershed. The USGS Hydrologic Unit Code is 08090301. The Barataria Basin, including the subsegment in which the project is located, consists largely of wooded lowlands and fresh to brackish marshes, with some saline marsh on the fringes of Barataria Bay. Elevation in this basin ranges from minus two feet to four feet above sea level. The BA 34-2 project area is located adjacent to Bayou Chevreuil in Louisiana Department of Environmental Quality (LDEQ) Subsegment Number LA020101_00. Subsegment LA020101_00 is defined by LDEQ as “Bayou Verret, Bayou Chevreuil, Bayou

Citamon and Grand Bayou." According to the LA 2014 303(d) list, subsegment LA020101_00 currently supports the following beneficial uses: Agriculture; Primary Contact Recreation; and Secondary Contact Recreation. However, the Fish and Wildlife Propagation Use is not supported due to dissolved oxygen concentrations not meeting the water quality standard (i.e., depressed dissolved oxygen levels) with causes of impairment identified as nutrients and the presence of non-native aquatic species. A total maximum daily load (TMDL) for this segment is in effect to address the low dissolved oxygen levels (LDEQ, Final 2014 Louisiana Water Quality Integrated Report (305(b)/303(d), July 29, 2015).

Jurisdictional Wetlands

In response to EPA's Solicitation of Views of January 17, 2014, the Corps of Engineers, New Orleans District, (USACE) commented in a letter to EPA on February 18, 2014. The USACE noted that the project site may be jurisdictional wetlands or Waters of the U.S., and may require a wetlands delineation. A jurisdictional finding would require a permit from the USACE under CWA Section 404 and Section 10 of the Rivers and Harbors Act. The USACE also noted that the proposed project is in the Louisiana Coastal Zone, and may require a coastal use permit from the Louisiana Department of Natural Resources.

3.1.5 Hydrology

In 1904, a dam was placed at the headwaters of Bayou Lafourche and later in the mid-20th century the Mississippi River was channelized by the construction of artificial levees along its banks for flood control, eliminating the sediment source and substantially impacting the freshwater supply to the northern Barataria forests (Reed 1995). Currently, the only freshwater source in the upper basin is precipitation [150 cm/yr (59 in/yr)] because no rivers or bayous discharge into these northern forests and marshes (Saucier 1994; Reed 1995; Park et al. 2004). The reduced sediment supply has resulted in an increase in subsidence causing water levels in the northern basin to elevate. As a result, the northern Barataria wetland forests have been found to be flooded for longer durations (Conner and Brody 1989; Keim et al. 2006).

The hydrology of the cypress-tupelo forest within the BA-34-2 project area has been further altered by the installation of artificial embankments on three sides. In 1931, an elevated roadbed was built on the western border of the proposed project area during the construction of LA Hwy. 20. In 1956, spoil banks were built along the Bayou Chevreuil shoreline (southern edge of the project area) with material excavated to deepen the channel (Conner and Day 1992a). In 1957, a drainage canal, the Vacherie Canal, was constructed immediately north of the proposed project area and an elevated berm was created with the excavated soil material. In 1969, Board Road was built on the northern perimeter of the proposed project area by excavating local material to build an oil field access road (Conner and Day 1992a). Since 1957, the duration of flooding events has increased to the point of almost constant impoundment of the proposed project area due to these elevated earthen embankments (Conner et al. 1981). Moreover, LA Hwy 20, Board Road, and the Vacherie Canal berm formed the guide levees for a crayfish pond that has since

ceased to operate) (Conner and Day 1992a). In addition, the Cypress Gas Pipeline Company installed a 35.6 cm (14.0 in) gas pipeline and canal within the proposed project area sometime in the 1950's. This pipeline canal bisects the proposed project area and is situated approximately 0.3-0.7 km (0.2-0.4 mi) from LA Hwy. 20. No spoil banks were built along the edges of the canal with the excavated material. Therefore, the pipeline canal is not thought to intensify the drainage restrictions in the project area.

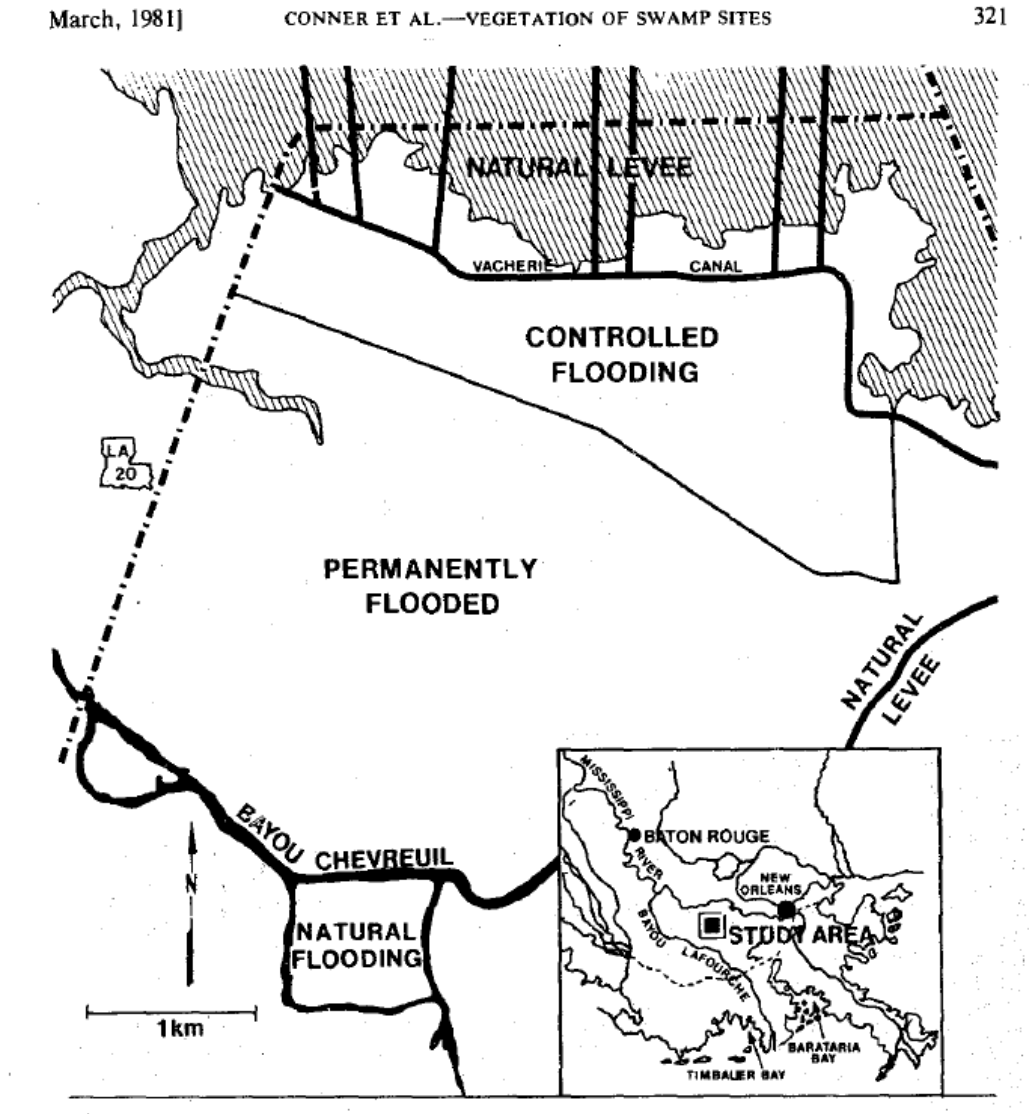

Figure 13. Diagram of proposed project area, and Conner's reference site, ("natural flooding") as well as the adjacent former crawfish farm ("controlled flooding"). From Conner et al. (1981).

The scientific record shows that altered hydrological patterns and increased inundation affect cypress-tupelo habitats. Mature cypress-tupelo wetland forests have been found to be less productive and incur slower vegetative growth in deep-flooded stagnant waters (Conner and Day

1976; Donovan et al. 1988; Conner 1994; Keim et al. 2006; Shaffer et al. 2009; Keim et al. 2012; Keim et al. 2013). Swamp structure and function also have been reported to be inversely impacted in impounded habitats (Conner and Day 1992a; Faulkner et al. 2007; Shaffer et al. 2009). Moreover, tree mortality in cypress-tupelo forest increases under impounded conditions (Conner and Day 1992b; Conner et al. 2002; Shaffer et al. 2009). Vegetative growth in these swamps is greater in flowing water (Conner and Day 1976; Donovan et al. 1988; Shaffer et al. 2009). Regeneration of cypress-tupelo forest is also negatively affected by deep-flooded stagnant waters. Seedlings require drainage to elongate their roots (Pezeshki 1991) and survive (Conner 1988; Pezeshki et al 1993; Keim et al. 2006; Faulkner et al. 2007; Faulkner et al. 2009). Moreover, natural or artificial (planting seedlings) regeneration is not possible in severely impounded swamps without drainage enhancements (Faulkner et al. 2009).

The Bayou Chevreuil swamp area has been the subject of long-term scientific study. Dr. William Conner has chronicled the effects of inundation on the proposed project area and its surroundings since the 1970s (Conner and Day 1976; Conner et al. 1981; Conner and Day 1988; Conner and Brody 1989; Conner and Day 1992a; Conner and Day 1992b; Conner et al. 2002; Conner et al. 2013). He studied three (3) distinct cypress-tupelo habitats - the impounded area (BA 34-2 project area), the crayfish pond (location described above), and the natural site, also known as the "LSU Pocket," located off the south bank of Bayou Chevreuil ("natural flooding," see figure 13).

One of Dr. Conner's studies examined the effects of breaching the Bayou Chevreuil spoil bank (gap creation). This earthen embankment was breached in six (6) locations in 1978. The results of this five (5) year investigation provided evidence that the productivity of cypress-tupelo habitats can be enhanced in the immediate vicinity of gapped locations by improving water exchange. However, productivity in areas progressively further from the gaps did not increase because drainage did not improve (Conner and Day 1992b). Micro-topographical variation in the swamp surface has been suggested as a cause of this inhibited drainage (Conner and Day 1992a). Also, earthen gaps tend to silt in periodically and require maintenance. Currently, these gaps are only partially functioning due to siltation. Gaps alone will not improve drainage throughout most large, impounded swamps. Identification of relief, drainage enhancements, and maintenance are also required to improve cypress-tupelo productivity, survivorship, and regeneration (CPRA, 2015).

The "Controlled Flooding" area, also referred to as the "Crawfish Farm," was previously impounded by the Vacherie Canal and its spoil banks on the north, LA20 on the west, the board road on the south, and a levee constructed to connect the board road and the Vacherie Canal on the east. This impounded area was managed for crawfish production in the 1980s, and the hydrology was managed using pumps. It was flooded to a depth of about 40 cm in the fall and drained from June through August or longer. Vegetation in the "Controlled Flooding" area was a dense, healthy forest when it was actively managed (Conner et al. 1981).

The draft Wetland Value Assessment (WVA) based on the Swamp Model discusses hydrology as 'variable 3 – water regime." As noted in the discussion above, due to the impoundment from dredged material placed along the bayou shoreline, the project area does not naturally drain. Without draining, permanent flooding reduces the likelihood of cypress and tupelo regeneration. The impoundment also limits exchange between the bayou and the project area. This leads to poor water quality and unsuitable habitat for nekton that would normally be present (CPRA 2015c).

Figure 14 below shows the three water level gages for the project area. BA-34-01 and BA34-02 monitor the water levels in Bayou Chevreuil. BA34-08 monitors the water level within the impounded swamp. The existing low spots in the spoil bank along Bayou Chevreuil are currently about +1.5ft. NAVD88. The graph shows that after precipitation events the water level in the bayou rises and falls as expected. In the project area, the water rises, then drains to approximately +1.5ft. Without additional precipitation events, the water level can continue to decrease slowly through evaporation and evapotranspiration. Otherwise, the water level remains fairly consistently around +1.5ft. within the project area while water levels in the bayou fluctuate regularly with tides, precipitation events, and frontal passages.

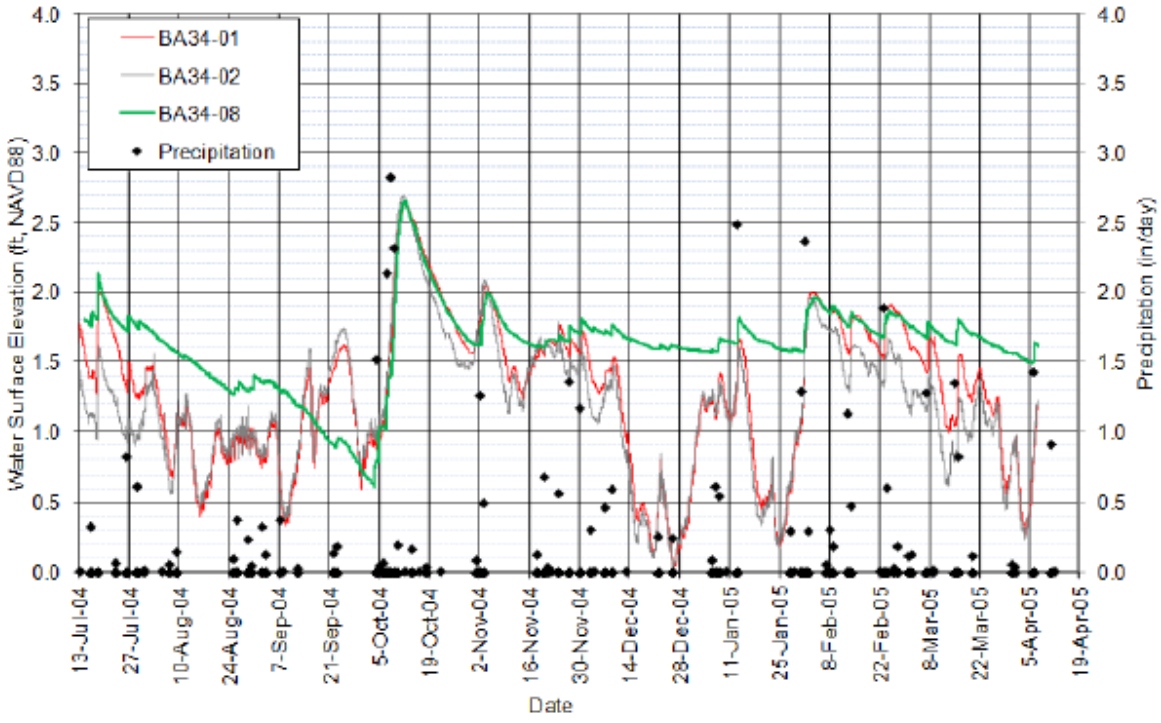

Figure 14. Water level data from July 2004 to April 2005 (FTN 2011).

3.2 Biological Environment

The biological environment of coastal Louisiana is of national importance. The estuarine habitats across coastal Louisiana support approximately 735 species of birds, finfish, shellfish, reptiles, amphibians, and mammals at some point during that organism's life cycle (USACE 2004). The biological characteristics of the proposed project area are described below.

3.2.1 Vegetation

The proposed project area habitats generally consist of cypress-tupelo wetland forest. The dominant soil Barbary association is classified as cypress-tupelo habitat. Reed (1995) cataloged the alluvial river swamps of the upper Barataria Basin as being dominated by *Taxodium distichum* (L.) Rich. (bald cypress) and *Nyssa aquatica* L. (water tupelo) with *Fraxinus profunda* (Bush) Bush (pumpkin ash) and *Acer rubrum* var. *drummundii* L. (swamp red maple) as sub-dominants. Sasser et al. (2007, 2013) classified the area as swamp habitat.

The virgin cypress forests of the upper Barataria Basin were harvested in the late 19th and early 20th centuries. The current wetland forests of the northern basin are second growth. These forests regenerated naturally and were estimated to be approximately 100 years in age in the 1980's (Conner and Day 1976; Conner 1988; Faulkner et al. 2007). Conner and Day noted that in the impounded area, the only trees remaining are those capable of surviving the constant flooding such as *Taxodium distichum* (bald cypress) and *Nyssa aquatica* (water tupelo). Nearly all the *Fraxinus* spp. (ash) and *Acer rubrum* (red maple) had died and those that are surviving are stressed as evidenced by the dead and dying tops (Conner and Day, 1992b).

A mature tree count survey to count bald cypress and tupelo was conducted in June 2015. Mature trees were defined as having a fifteen (15) centimeter diameter measured at roughly six (6) feet above the soil surface. Trees were not catalogued, marked or geo-located. The survey showed 754 mature trees within the six (6) gaps with an average tree count of 92 trees per acre (C & C, 2015b).

The Wetland Value Assessment (WVA) for the proposed project is based on the Swamp Community Model and discusses two variables (V) related to vegetation: stand structure (V1) and stand maturity (V2). A description of the model variables in providing habitat to the modeled community based on available, contemporary peer-reviewed scientific literature can be found in the CWPPRA Wetland Value Assessment Methodology, Swamp Community Model, Version 1.2 (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 2012).

Stand structure (Variable 1 in the model) is the composition of overstory closure, midstory cover, and herbaceous cover. Areas with higher percentages of all three stand components receive a higher suitability index value (SI) (Table 1). To determine stand structure, the PMT used aerial imagery to delineate the project area into different classes (Figure 15). We found that the project

area consisted of classes 1, 3, 4, and 6, with class 6 making up the majority of the project area. Using field data gathered during field work in April-June 2015, the PMT adjusted the preliminary classifications accordingly.

	Overstory Closure		Scrub-shrub/ Midstory Cover		Herbaceous Cover
Class 1.	<33%				
Class 2.	≥33%<50%	and	<33%	and	<33%
Class 3.	≥33%<50%	and	≥33%	or	≥33%
Class 4.	≥50%<75%	and	≥33%	or	≥33%
Class 5.	≥33%<50%	and	≥33%	and	≥33%
Class 6.	≥50%	and	≥33%	and	≥33%
			OR		
	≥75%	and	≥33%	or	≥33%

Table 1. Variable 1 - Stand Structure Classes

The stand maturity variable (V2) is made up of the average diameter at breast height (DBH) of cypress and tupelo, and the basal area in each class. Stands with older, larger trees receive a higher Suitability Index (SI) number representing a more diverse habitat and higher value to wildlife. Suitability Index graphs are unique to each variable and define the relationship between that variable and habitat quality (LCWCRTF 2012). Basal area is the area occupied by tree stems expressed in feet per acre. Stands with higher basal areas receive a higher SI number because they are better suited for nesting, foraging, and other habitat functions.

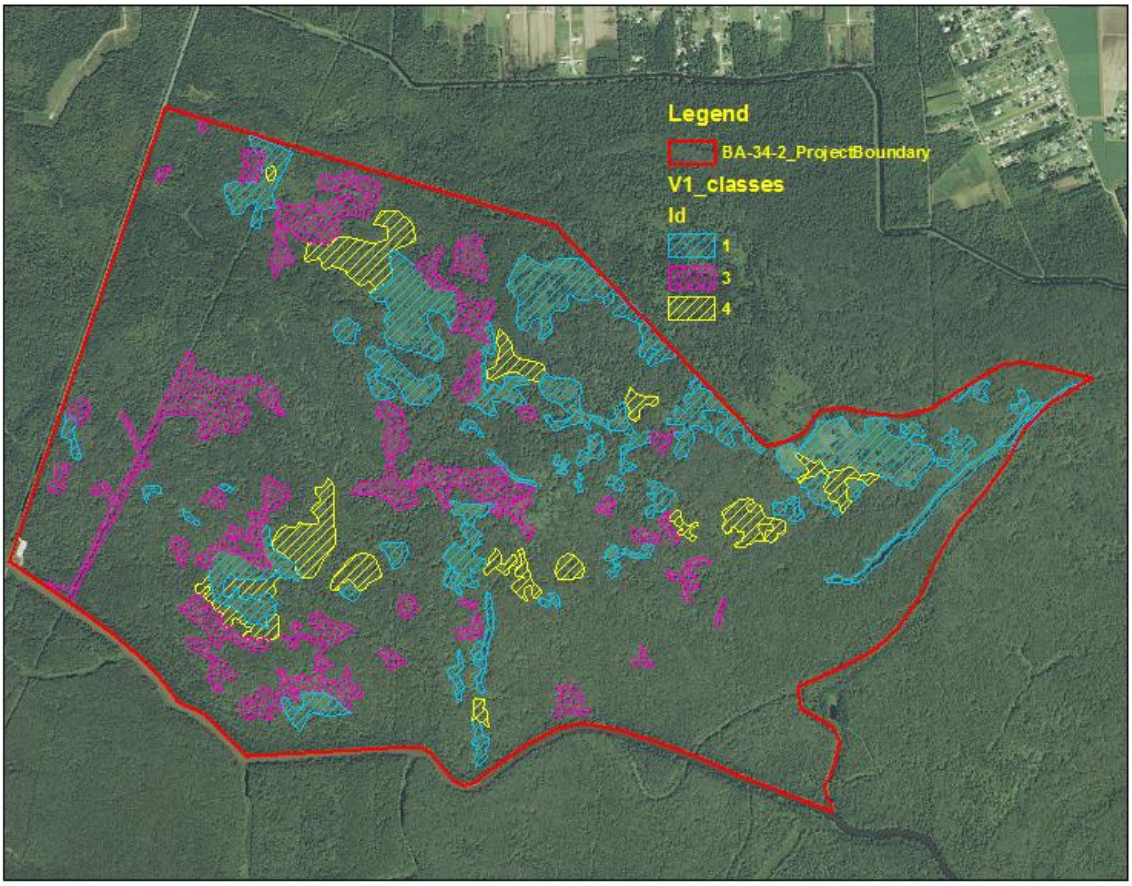

Figure 15. Stand Structure (V1) Classes. Class 6 is the area that is not cross-hatched.

For V2, the PMT sampled twelve plots in 2015 within the proposed project area using the sampling technique recommended in the Swamp Community Model. We measured cypress and tupelo trees DBH of trees that were considered canopy dominant and co-dominant. Using our observed data and the acreage calculated in V1, we were able to extrapolate our findings to the entire project area (Figure 15). The table below shows percentages for each class.

Class	*Acres*	*Percent*
1	267	11.1
3	193	8.0
4	96	4.0
6	1837	76.7

Table 2. Percentages for each stand structure class.

Using growth rates for cypress and tupelo from the 2009 WVA for the Louisiana Coastal Area Amite River Diversion Canal (LCA ARDC) Modification project, we estimated current tree growth rates of .08 in/year for tupelo and .11in/year for cypress (CPRA 2015c).

3.2.2 Essential Fish Habitat

The proposed project area is not in an area identified as essential fish habitat (EFH) by the Gulf of Mexico Fisheries Management Council under the Magnuson-Stevens Fishery Conservation and Management Act, P.L. 104-297; 16 U.S.C. 1801 et seq. (Email from Kimberly Clements, NOAA, July 24, 2015).

3.2.3 Fish and Wildlife Resources

Fisheries

The proposed project area serves as a habitat for freshwater and estuarine species. Freshwater fishes found in the fresh marshes and associated shallow open waters include largemouth bass, yellow bass, black crappie, bluegill, redear sunfish, warmouth, blue catfish, channel catfish, buffalos, freshwater drum, bowfin, and gars. Stable freshwater fisheries occur in the northern portion of the Barataria Basin, especially within the Lac Des Allemands watershed north of U.S. Highway 90. Lac Des Allemands supports a thriving commercial catfish fishery (Clark, 2000).

Fish commonly found in the upper Barataria Estuary may be grouped based on their pattern of movement between aquatic habitats. Species such as gizzard shad (*Dorosoma cepedianum),* buffalo (*Ictiobus* spp*)* and yellow bass (*Morone mississippiensis)* may make seasonal spawning migrations from Lac des Allemands into and up Bayou Chevreuil (Ross 2001; Fontenot 2006). Gizzard shad relative abundance in the upper Barataria Estuary typically increases in January and remains high through the end of April, with spawning occurring from late March through July (Fontenot 2006). Yellow bass make spring spawning runs into tributaries when water temperature reach 16-22 °C (Ross 2001). Buffalo have been reported to congregate in large schools to spawn around the margins of cypress-tupelo swamps on the floodplain of the Yazoo River in Mississippi in April (Ross 2001).

Larval *Dorosoma* spp., *Ictiobus* spp., and *Lepomis* spp. (common sunfish or bluegill) were found to be more abundant in a dredged canal habitat than bayou habitat. *Heterandria formosa* common least killifish) juveniles are more abundant in the bayou habitat than the canal habitat of the upper Barataria Basin, according to a study done in the AOI in 2007 (Jackson, 2009).

Wildlife

Forested lands provide habitat for songbirds such as the mockingbird (*Mimus polyglottos*), yellow-billed cuckoo (*Coccyzus americanus*), northern parula warbler (*Parula Americana*), yellow-rumped warbler (*Densroica coronate*), prothonotary warbler (*Protonotaria citrea*), white-eyed vireo (*Vireo griseus*) and others. Additionally, these areas provide important resting and feeding areas for songbirds migrating across the Gulf of Mexico. Other avian species found in forested habitats include American woodcock (*Philohela minor*), common flicker (*Colaptes auratus*), brown thrasher (*Toxostoma rufum*), belted kingfisher (*Megaceryle alcyon*), loggerhead shrike (*Lanius ludovicianus*), red-headed woodpecker (*Melanerpes erythrocephalus),* and other woodpeckers (Clark 2000).

These habitats also support raptors such as the red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), screech owl (*Otus asio*), great horned owl (*Bubo virginianus*) American kestrel (*Falco sparverius*), and others (Clark 2000). The project management team observed a bald eagle (*Haliaeetus leucocephalus)* over Bayou Chevreuil during a field visit in November 2014. The FWS noted that a bald eagle nest was in the proposed project area. (Figure 15).

Waterfowl found in forested lands and associated water bodies include wood duck (*Aix sponsa*), green-winged teal (*Anas crecca*), mallard (*Anas platyrhynchos*), gadwall (*Anas strepera*), and hooded merganser (*Lophydytes cucullatus*) (Clark 2000).

Wading birds typically occur in wooded swamp and scrub-shrub habitats. Species found in nesting colonies include anhinga (*Anhinga anhinga*), great egret (*Casmerodius albus*), great blue heron (*Ardea Herodias),* yellow-crowned night heron (*Nyctanassa violacea*), black-crowned night heron (*Nycticorax nycticorax*), Louisiana or tricolored heron (*Hydranassa tricolor*), little blue heron (*Florida caerulea*), cattle egret (*Bubulcus ibis*), snowy egret (*Egretta thula*), white-faced ibis (*Plegadis chihi*), glossy ibis (*Plegadis falcinellus*), reddish egret (*Dichromanassa rufescens*) and roseate spoonbill (*Ajaia ajaja*) (Clark 2000). The FWS noted that wading bird rookeries were in the proposed project area. (Figure 15).

Mammals associated with forested lands include nutria (*Myocastor coypus*), muskrat (*Ondatra zibehticus*), raccoon (*Procyon lotor*), swamp rabbit (*Sylvilagus aquaticus),* river otter *(Lutra canadensis),* and white-tailed deer (*Odocoileus virginianus*). Several species of reptiles and amphibians may also occur in the proposed project area. They include the American alligator (*Alligator mississippiensis*), snakes such as the speckled king snake (*Lampropeltis getulus*), snapping turtle (*Chelydra serpentina*), American bullfrog (*Rana catesbeiana*) and the green tree frog (*Hyla cinerea*) (Clark 2000).

3.2.4 Threatened and Endangered Species

Section 7 of the Endangered Species Act, 16 U.S.C. §1536, outlines the requirements for interagency cooperation under the Act. Specifically, Section 7(a)(1), 16 U.S.C. 1536(a)(1), directs Federal agencies to assist in the conservation of endangered species and Section 7(a)(2), 16 U.S.C. 1536(a)(2), requires agencies, through consultation with the U.S. Fish and Wildlife Service, to ensure their activities are not likely to jeopardize the listed species or adversely affect their critical habitat. In compliance with these statutes (Endangered Species Act of 1973, 87 Stat. 884, as amended, 16 U.S.C. 1531 et seq.; the Fish and Wildlife Coordination Act, 48 Stat. 401, as amended, 16 U.S.C. 661 et seq.; and the Migratory Bird Treaty Act (MBTA), 40 Stat. 755, as amended, 16 U.S.C. 703 et seq.), the following Section, in conjunction with Part 2 and *Section 4.2.5*, serve the purpose of a biological assessment as described in *50 CFR 402.12*.

The U.S. Fish and Wildlife Service was consulted regarding any potential threatened and endangered species (T&E) in the proposed project area (USFWS 2015). The USFWS indicated that there are no T&E species in the AOI, but there is a record of a bald eagle nest within the project area, and in proximity to some of the proposed project features (Figure 16). The bald eagle (*Haliaeetus leucocephalus*) was officially removed from the List of Threatened and Endangered Species in August 2007 (72 FR 37346) because their populations had recovered sufficiently to support delisting. Bald eagles are protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Act (Eagle Act).

Credit: Katherine Whitmore, USFWS

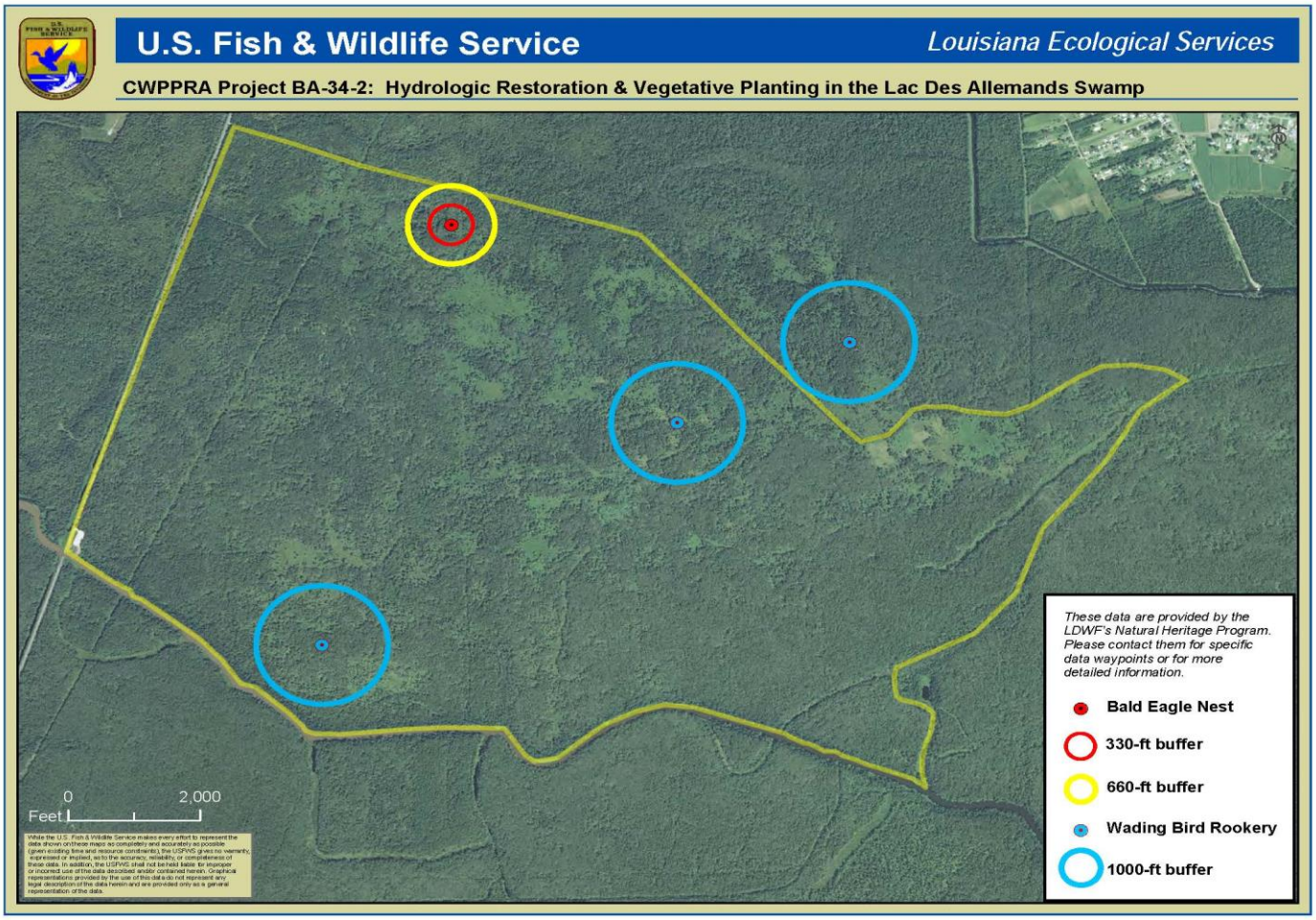

Figure 16. Location of Bald Eagle nest and wading bird rookeries (2008 data) in proposed project area (USFWS, 2015).

Bald Eagles live near rivers, lakes, and marshes where they can find fish, their staple food. Bald Eagles will also feed on waterfowl, turtles, rabbits, snakes, and other small animals and carrion. Bald Eagles require a good food base, perching areas, and nesting sites. Their habitat includes estuaries, large lakes, reservoirs, rivers, and some seacoasts. In winter, the birds congregate near open water in tall trees for spotting prey and night roosts for sheltering. (Found at FWS website, 2015).

3.3 Other Environmental Considerations

3.3.1 Cultural Resources

The Louisiana State Historic Preservation Office indicates that there are no known existing cultural or historic resources in the project area. The closest archaeological site is 2.5 miles away from the proposed project area. The State Archaeologist recommended that the proposed project area be surveyed if the design featured the excavation of the gap areas to the original ground surface. In June and July 2015, R. Christopher Goodwin & Associates, Inc. conducted a cultural

resource (CR) investigation which included background research and field examination of the locations of eight proposed spoil bank cuts positioned along the north bank of Bayou Chevreuil. The finding is that there are no sites or cultural resources in the proposed project area (R. Christopher Goodwin & Associates, 2015). A Notice of No Findings was issued to tribal entities and to the SHPO. By way of a letter dated September 2, 2015, the SHPO has concurred with the No Findings.

3.3.2 Socioeconomics and Environmental Justice

According to the 2010 Census of the United States, the population of St. James Parish is 22,102. The 2014 estimate is 21,638. This number reflects a 2.1 percent loss of population from 2010-2014. The Parish population diversity profile is:

Black or African-American	49.4 percent
White	49.4 percent
Asian-American	0.3 percent
American Indian	0.2 percent
Hispanic or Latino	1.7 percent
White alone, not Hispanic or Latino	48.0 percent

The percent of the population living below the Census definition of poverty was 16.4 percent in 2009-2013, compared with 19.1 percent for the state of Louisiana. The median household income for 2009-2013 was $55,443. This compares to $44,874 for the state of Louisiana.

The St. James Parish land area is approximately 241.54 square miles, with a population density of 91.5 persons per square mile. In comparison, the population density of Louisiana is 104.9. St. James Parish is considered part of the Metropolitan Statistical Area of the New Orleans-Metairie, Louisiana Metro Area (U.S. Census Bureau 2010).

For a project-specific Census 2010 summary report, a one-mile buffer was added around the proposed project area boundary using EPA's "EJScreen" mapping tool. The report showed a population in the buffered proposed project area of 1,056 which represents approximately 4.7 percent of the Parish population.

In comparison with the Parish profile, the proposed project area with the applied buffer has a population density of 72 persons per square mile. The BA 34-2 area with one-mile buffer population diversity profile is:

Black or African-American	33 percent	
White	66 percent	
Some other race	1 percent	(USEPA, 2015)

3.3.3 Infrastructure

Substantial oil and gas activity presently occurs, and has historically occurred since the early 1900's, in coastal Louisiana. Oil and gas industry activities related to seismic exploration,

drilling, production, pipeline infrastructure, spill control and cleanup, and well site closure have greatly impacted the wetlands of coastal Louisiana. Oil and gas activities negatively affect wetland functions by altering marsh habitat and hydrologic regimes (USEPA 1989).

The one (1) known pipeline in the proposed project area has eight (8) feet of mud cover and 12 feet of water cover (Figure 17, C & C Technologies, Inc., 2015a).

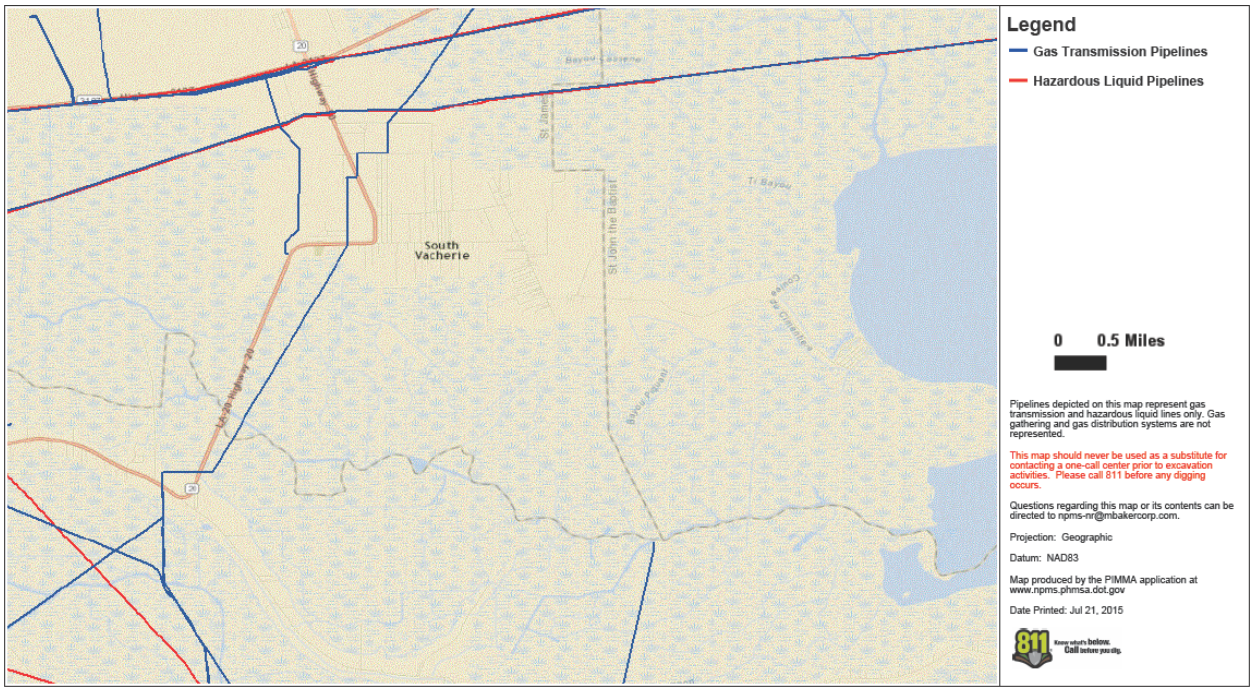

Figure 17. Illustration of oil and gas infrastructure in the proposed project area.

3.3.4 Noise

The proposed project is in a semi-rural area with moderate local traffic on Highway 20. The boat launch area is located at the intersection of Bayou Chevreuil and the highway. Outboard motor boat traffic on Bayou Chevreuil is light to moderate during weekdays and offseason and moderate to heavy on weekends and during fishing season.

3.3.5 Hazardous, Toxic and Radioactive Waste

The discharge of dredged material into waters of the United States is regulated under the Clean Water Act (CWA). In the absence of a known Hazardous, Toxic and Radioactive Waste (HTRW), the proposed project would not qualify for an HTRW investigation.

The USACE Engineer Regulation, ER 1165-2-132, Hazardous, Toxic and Radioactive Waste, states that dredged material and sediments beneath navigable waters proposed for dredging qualify as HTRW only if they are within the boundaries of a site designated by the EPA or a state for a response action (either a removal or a remedial action) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or if they are a part of a

National Priority List (NPL) site under CERCLA. No portion of the project area is included in the NPL.

Based upon a review of the NPL and CERCLA action sites, as well as a review of the Radiation Information Database, the probability of encountering HTRW in connection with this proposed project is very low. The proposed project does not require an HTRW investigation.

3.3.6 Land Use

According to LDEQ, the Land Use/Land Cover in the proposed project area is classified as mostly forested wetland and some shrub/scrub. The Basin Subsegment 020101 land use as a whole is illustrated in figure 18 (LDEQ, 2006).

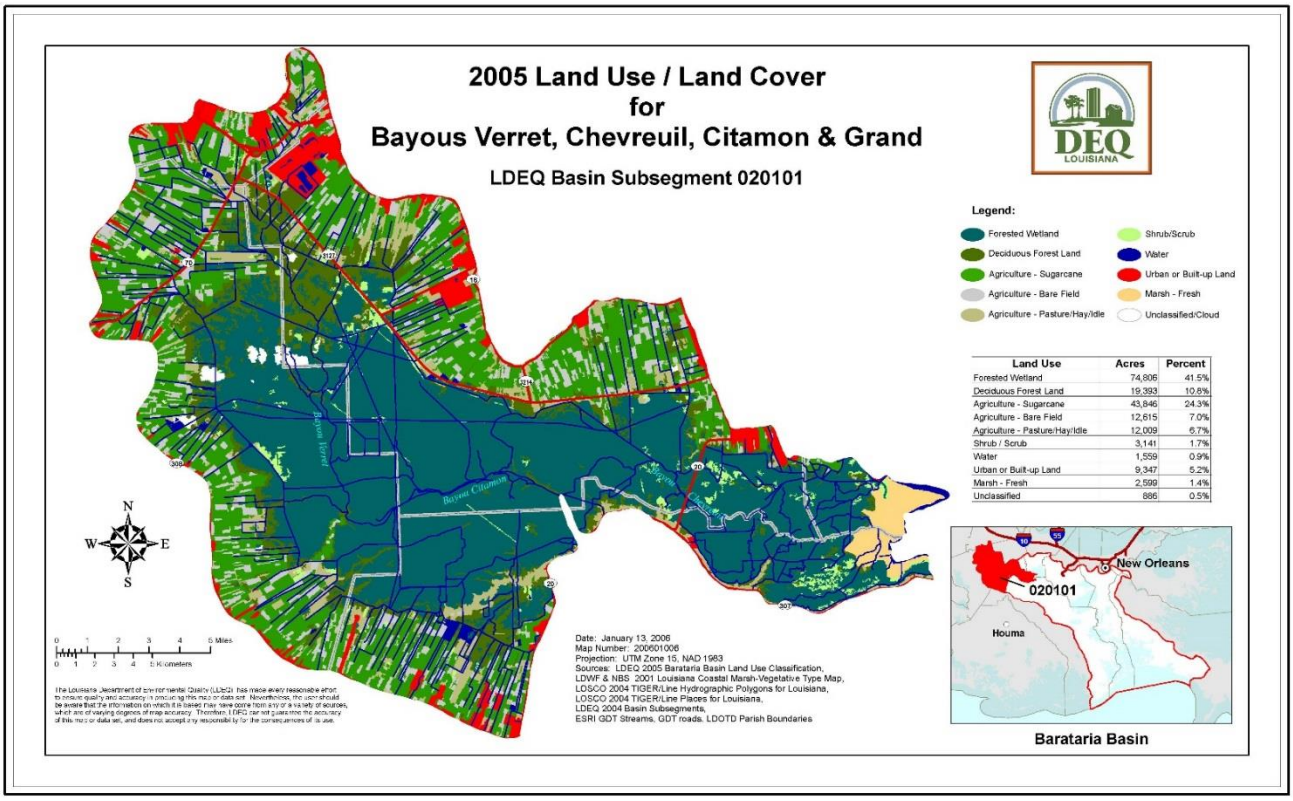

Figure 18. Land Use/Land Cover for Basin Subsegment 020101 (LDEQ 2006).

Part 4. Environmental Consequences

Part 4 evaluates the anticipated environmental impacts that would result from the alternatives evaluated. It includes an analysis of the direct, indirect and cumulative impacts of the proposed project alternatives, including the No-Action Alternative. Alternatives that were considered but not evaluated in Part 2 are not evaluated in this Part.

Each component of the Affected Environment is evaluated across an appropriate spatial and temporal scale (i.e. short term and long term) to determine the environmental impacts associated with each alternative. These impacts are classified as *Direct*, *Indirect* and *Cumulative*. *Direct* and *Indirect* impacts were listed for each alternative and can either be designated as *no impact*, *not significant impact* or *significant impact*.

The assessment of environmental consequences (i.e. impacts) is based upon a review of the best available information and relevant reference materials. Quantitative and qualitative information is used in the assessment. Factors that influence the assessment of impacts include, but are not limited to, the duration of the impact and the abundance or scarcity of the resource.

4.1 Physical Environment

This section describes potential impacts to the physical environment described in *3.1 Physical Environment*. Areas discussed include geomorphology, soils and topography, air quality, climate and weather, hydrology, and surface water resources.

4.1.1 Topography, Geomorphology, and Soils

No Action Alternative 1

Under the no action alternative, the existing wetlands and open water would not experience any construction activity resulting from this proposed project. Under this alternative, the topography of the proposed project area would continue to change as land is lost and converted to open water.

Alternative 2 (Proposed Action)

Direct Impacts: To relieve impoundment and increase movement and interchange between the impounded area and Bayou Chevreuil, six gap/cuts to the spoil bank area will be made. Construction impacts include clearing and grubbing approximately 16 acres, excavating the gaps of approximately 9,500 cubic yards of soil, and removing approximately 1,500 trees. Vegetative plantings will follow the construction activities. The table below shows line items for construction activities and equipment (CPRA, 30% Report, Cost Estimate, 2015).

Work or Material	Quantity	Unit	Notes**
Mobilization/Demobilization	1	LS	3 Marsh Buggies, 1 dozer, 1 barge, 1 tug
Survey	1	LS	Gaps & placement areas + buffer
Clear and Grub	10	Acre	Clearing, grinding and spreading of small to medium brush
Mature Tree Removal	1,700	Each	Tree cutting/stump removal and dropping for pickup
Tree Transport to Dock	150	Load	Loading of 40 cy hopper and transport to staging area
Tree Offsite Disposal	150	Load	40 cy trailer to offsite location + $30 tipping fee per ton (density of tree is 51 pcf)
Gap Excavation/Placement	9,500	CY	Gaps & placement areas
Bald Cypress Tree Plantings	600	Each	$5 per plant, $12.5 for installation; 15 on 15 centers
Water Tupelo Tree Plantings	600	Each	$5 per plant, $12.5 for installation; 15 on 15 centers
Standard Tree Shelters	1,200	Each	Cypress & tupelo trees 15 on 15 centers; 200 trees per acre, tubex protectors

Table 3. Construction Activities and Equipment

Indirect Impacts: It is unlikely that there will be any indirect impacts on topography, geomorphology, and soils resulting from Alternative 2.

4.1.2 Climate and Weather

Neither the No-Action Alternative 1 nor Alternative 2 will impact climate or weather. The scientific record suggests that the improved swamp health from the action alternative may have a beneficial effect and help create a carbon sink and reduce atmospheric carbon dioxide (Burkett and Kusler 2000; Bridgham et al. 2006).

4.1.3 Air Quality

No Action Alternative 1

The No-Action Alternative would not result in any changes in the existing air quality in the area.

Alternative 2 (Proposed Action)

Direct Impacts: Impacts resulting from Alternative 2 would be associated with the emissions of diesel engines that would power the construction equipment, including but not limited to marsh buggies, dozer, electric generators, backhoe, and watercraft. The duration of the impact is limited and will occur over a period of approximately 159 working days or less. Emissions would consist primarily of nitrogen oxides, with smaller amounts of carbon monoxide, sulfur dioxide, particulate matter, and volatile organic compounds.

St. James Parish is currently in attainment of all National Ambient Air Quality Standards (NAAQS). The proposed project is unlikely to affect the Parish's attainment status. However, St. James Parish is represented by the South Central Planning and Development Commission (SCPDC), the metropolitan planning organization (MPO) for the area. The South Central area is at risk for being designated as non-attainment for ozone and particulate matter (PM) NAAQS in the next few years. Due to the sensitivity of ozone and PM levels in the area, the SCPDC has applied to and been accepted by EPA into the EPA Ozone Advance and PM Advance programs. The Advance programs are a collaborative effort between EPA, states, and local

governments to enact expeditious emission reductions to help near non-attainment areas remain in attainment of the NAAQS.

The EPA recommends that to reduce potential short-term air quality impacts associated with construction activities, the agencies responsible for the project should also include a Construction Emissions Mitigation Plan and adopt this plan in the Record of Decision (ROD). In addition to all applicable local, state, or federal requirements, the EPA recommends that the specific mitigation measures be included in the Construction Emissions Mitigation Plan in order to reduce impacts associated with emissions of NOx, CO, PM, SO_2, and other pollutants from construction-related activities (*40 CFR § 1502.14(f) & 1502.16(h))*. Construction emissions will be addressed and minimized with appropriate mitigation measures such as:

Fugitive Dust Source Controls:

- Stabilize open storage piles and disturbed areas by covering and/or applying water or chemical/organic dust palliative where appropriate at active and inactive sites during workdays, weekends, holidays, and windy conditions;
- Install wind fencing and phase grading operations where appropriate, and operate water trucks for stabilization of surfaces under windy conditions; and
- Prevent spillage when hauling material and operating non-earthmoving equipment and limit speeds to 15 miles per hour. Limit speed of earth-moving equipment to 10 mph.

Mobile and Stationary Source Controls:

- Plan construction scheduling to minimize vehicle trips;
- Limit idling of heavy equipment to less than 5 minutes and verify through unscheduled inspections;
- Maintain and tune engines per manufacturer's specifications to perform at EPA certification levels, prevent tampering, and conduct unscheduled inspections to ensure these measures are followed;
- If practicable, utilize new, clean equipment meeting the most stringent of applicable Federal or State Standards. In general, commit to the best available emissions control technology. Tier 4 engines should be used for project construction equipment to the maximum extent feasible;
- Lacking availability of non-road construction equipment that meets Tier 4 engine standards, the responsible agency should commit to using EPA-verified particulate traps, oxidation catalysts and other appropriate controls where suitable to reduce emissions of diesel particulate matter and other pollutants at the construction site; and
- Consider alternative fuels and energy sources such as natural gas and electricity (plug-in or battery).

Administrative controls:

- Prepare an inventory of all equipment prior to construction and identify the suitability of add-on emission controls for each piece of equipment before groundbreaking;

- Develop a construction traffic and parking management plan that maintains traffic flow and plan construction to minimize vehicle trips; and
- Identify sensitive receptors in the project area, such as children, elderly, and infirmed, and specify the means by which impacts to these populations will be minimized (e.g. locate construction equipment and staging zones away from sensitive receptors and building air intakes).

Indirect Impacts: It is unlikely that there will be any indirect impacts on air quality resulting from Alternative 2

4.1.4 Surface Water Resources

No Action Alternative 1

The No-Action Alternative would not have any direct impacts on surface water resources. Impounded conditions would continue and the forest species would continue to degrade. Swamp flooding is assumed to increase due to relative sea level rise.

Alternative 2 (Proposed Action)

Direct Impacts: Future Conditions with the proposed action. With implementation of the proposed action, it is expected that there would be an impact to water quality through a temporary increase in turbidity within the Bayou near construction activity areas. Any increases in turbidity would likely be diminished by the movement of the Bayou, and any free floating sediment would likely settle downstream. Dr. Shaffer noted that hydrologic restoration should improve the water quality of aquatic bodies surrounding the swamp which are often hypoxic in the warm months (Shaffer 2011).

Indirect Impacts: Alternative 2 is not anticipated to negatively impact dissolved oxygen levels within the subsegment or contribute to the causes of the current impairment as identified on the LA 2014 303(d) list. Certain long-term benefits to water quality may be realized in the locale of the proposed project as the increased wetland plant acreage has the ability to take up and sequester nutrients - identified as causative agents of depressed dissolved oxygen levels within the subsegment. However, the impacts of this project are not expected to significantly affect nutrient levels in the subsegment as a whole.

4.1.5 Hydrology

No Action Alternative 1

Under the No-Action Alternative impounded conditions would continue and forest species would continue to degrade. Swamp flooding is assumed to increase due to relative sea level rise.

Alternative 2 (Proposed Action)

Two (2) recent studies completed for the BA-34-2 project indicate that restoration of the cypress-tupelo habitats can be achieved by improving drainage within the proposed project area. Dr. Gary Shaffer (2011) performed an ecological review of the proposed project area through field

investigation and literature review. Dr. Shaffer concluded that it is highly likely that cypress-tupelo habitats of the proposed project area will become sustainable if the impairments to hydrology are removed (Shaffer 2011).

FTN (2015) conducted a 2D hydrodynamic model for the BA 34-2 proposed project using hydrological, topographic, and meteorological data. The model predicted that water levels in the swamp will emulate that of Bayou Chevreuil if the spoil bank is breached in six (6) positions to a depth of -0.3 m (-1.0 ft.) NAVD88. Currently, the water levels in the swamp do not follow that of the bayou due to swamp inundation (FTN 2015).

To quantify the benefits this project will receive for this variable, the PMT used data from the modeling report. Bathymetry along with water level data allowed us to determine how different areas hydrology will be altered. Having this information and knowing the gaps will be excavated to an elevation of -1.0 ft., we can then determine what areas will be relieved of permanent flooding. Areas lower than -1.0 ft. will remain permanently flooded regardless of work. Areas with elevations between -1.0 ft. and +1.5 ft. will be relieved of permanent flooding after the proposed project is constructed. Areas above +1.5 ft. will experience similar flooding regimes with or without the project (CPRA, 2015).

4.2 Biological Environment

This section describes potential impacts to the biological environment described in *3.2 Biological Environment,* which includes vegetation, essential fish habitat, fish and wildlife resources, and threatened and endangered species. The threatened and endangered species section, concurrently with Part 2 and Section 3.2.5 serves as a biological assessment as described in *50 CFR 402.12*.

4.2.1 Vegetation

No Action Alternative 1

Under the no action alternative 1, the project area will continue to be impounded via the spoil bank along Bayou Chevreuil, LA20, and the natural ridge on the east. In addition to flooding caused by impoundment, swamp flooding is assumed to increase due to relative sea level rise (e.g. subsidence+ sea level rise, no accretion).

Vegetation in the project area will continue to degrade. Basal area of both cypress and tupelo will continue to decline as trees die and little or no regeneration occurs in the future. However, the few trees that do survive may grow at a relatively rapid rate due to the lack of competition for light. Stand structure will continue to degrade, with less tree cover over time. Stand maturity will increase over time. As stand maturity increases so will basal area. The basal area will decrease if mortality overcomes regeneration. Water regime continues to be permanently flooded, with little or no flow/exchange.

Alternative 2 (Proposed Action)

Direct Impacts: Under this Alternative, planting of cypress and tupelo trees and alleviation of impoundment will help to slow the rate of degradation of swamp vegetation in the project area, and to reverse it, at least temporarily. Basal area of cypress and tupelo will increase immediately in planted areas, and basal area of all tree species will either decrease more slowly in the future, or increase over time. We expect trees to grow at a slightly lower rate and tree regeneration to increase, particularly episodically during droughts. Stand structure will improve immediately in areas that are planted, and, over time, in all degraded areas, including those areas not planted. Stand maturity and basal area will increase over time throughout the project area, but especially in degraded areas, and even more so in degraded areas that are planted.

As noted in section 4.1.5, we expect that hydrologic restoration will reduce tree mortality, increase regeneration, and improve overall tree health (Shaffer 2011). Combined with the proposed tree plantings, we expect that over time, project features will increase overstory closure in areas with low overstory closure. The spoil bank area has red maple and green ash on it. As these species regenerate faster than cypress and tupelo, they will likely populate the area within a few growing seasons. Tree protectors will be used with all planted seedlings and saplings to guard against nutria herbivory.

Using growth rates for cypress and tupelo from the 2009 WVA for the Louisiana Coastal Area Amite River Diversion Canal (LCA ARDC) Modification project, we estimate future tree growth rates of .1338in/year for tupelo and .1837in/year for cypress for the primary area. For the secondary area we used .1032in/year for tupelo and .1419in/year for cypress. It is assumed that trees in the secondary area will receive reduced benefits and therefore a less than optimal growth rate (CPRA 2015c).

A tallow control program associated with this Alternative should prevent Chinese tallow (*Triadica sebifera*) from becoming established. Chinese tallow is an invasive, non-native species that can prevent or hinder native species such as bald cypress from becoming established. A control program implemented in the O&M phase will help increase the survivability of the bald cypress and tupelo trees planted.

No significant adverse impacts are expected.

Indirect Impacts: Under this Alternative, planted bald cypress and tupelo trees should provide a suitable seed source for additional tree recruitment once the planted trees have reached maturity.

4.2.2 Essential Fish Habitat

As the location of the proposed project is an area that is not identified as EFH, there are no impacts for the No Action nor the Proposed Action and, therefore, no need for consultation.

4.2.3 Fish and Wildlife Resources

No Action Alternative 1

Under a no-action alternative, the proposed project would not be constructed. There would be a continuation of baseline conditions in the proposed project area and land loss would be expected to continue, with associated losses of swamp functions and values. The project area would continue to be impounded. Forest plant species composition, basal area, and vegetative productivity in the project area would continue to degrade and would negatively impact the habitats of the fish and wildlife species which utilize the project area. Continued degradation of the habitat to eventual unvegetated, increasingly open water areas would diminish the habitat value to all species.

Alternative 2 (Proposed Action)

Under this alternative, if the proposed project is constructed, the improved hydrologic and vegetation features will improve the swamp habitat conditions for several species of wildlife including migratory and resident waterfowl, wading birds, raptors, and mammals as described in 3.2.3.

4.2.4 Threatened and Endangered Species

The USFWS identified no species as a threatened or endangered species that may occur within the proposed project area boundary. This section, concurrently with Part 2 and *Section 3.2.5*, serves the function of a biological assessment as described in *50 CFR 402.12*.

No Action Alternative 1 and Alternative 2 (Proposed Action)

Under the No-Action Alternative, no direct or indirect impacts are anticipated for threatened and endangered species. No avoidance measures will be required.

4.3 Other Considerations

4.3.1 Cultural Resources

The No-Action Alternative 1 and Alternative 2 (Proposed Action) will not significantly affect cultural resources. No archeological sites or historic standing structures were identified within the proposed project area during fieldwork. (R. Christopher Goodwin & Associates, Inc. 2015).

4.3.2 Socioeconomics and Environmental Justice

No Action Alternative 1

In the No-Action Alternative, the swamp in the proposed project area would continue to be degrade. The amount of fishery habitat lost in the proposed project area would have no significant impact on the commercial fishery but recreational and subsistence fishermen may be adversely impacted by the conversion of wetlands to open water.

Alternative 2 (Proposed Action)

Direct Impacts: This Alternative may beneficially impact the local economy, Louisiana and some of the other neighboring towns. The Contractor(s) hired to construct the proposed project may need to hire workers locally. Also, the local economy may receive an economic benefit because the workers will likely spend money locally to purchase personal items, food and lodging.

Indirect Impacts: This Alternative may help buffer the AOI from tropical storm impacts (Shaffer, 2011).

This Alternative will have no significant adverse impact and may have a minor beneficial economic impact on the local area. No environmental justice populations will be disproportionately affected by the proposed Action.

4.3.3 Infrastructure

No Action Alternative 1

The No-Action Alternative would not have any direct or indirect effect on infrastructure in the proposed project area.

Alternative 2 (Proposed Action)

Under this Alternative there will be no significant impacts on infrastructure. The pipeline in the proposed project area will not be affected by construction activities.

4.3.4 Noise

No Action Alternative 1

The No-Action Alternative would not cause any change in the existing noise conditions in the proposed project area. There would be no impact to noise levels.

Alternative 2 (Proposed Action)

Under Alternative 2, short-term increases in noise associated with construction activities and equipment use would occur. There would be no long-term changes in the ambient noise levels associated with this project. Hearing protection may be required for construction crew and visitors to the construction site. Noise impacts are limited in to the immediate project area. The closest noise-sensitive receptor is Vacherie Elementary School, which is 2.2 miles northeast of the swamp in a straight line from Bayou Chevreuil. The duration of construction is limited, estimated at approximately 159 working days.

4.3.5 Hazardous, Toxic and Radioactive Waste

There is no hazardous, toxic or radioactive waste within the proposed project area boundary. The No-Action Alternative 1 and the Proposed Action Alternative 2 will not significantly impact Hazardous, Toxic and Radioactive Waste.

4.3.6 Land Use

Under the No-Action Alternative and Action alternative there would be no significant impact on land use in the proposed project area.

4.4 Cumulative Impacts

The cumulative impacts of restoration projects similar to the proposed project are discussed fully in the Louisiana Coastal Wetlands Restoration Plan and the Louisiana Coastal Area Programmatic EIS documents (LCWCRTF 1993; USACE 2004). These documents are incorporated here by reference. To reiterate the problem, coastal Louisiana has been losing land at approximately 70 km^2 per year (Barras et al. 2008). The reasons for this rate of loss include natural subsidence, reduction of riverine inputs of sediment due to the construction of levees and dams (upriver), hurricanes, and hydrologic modification through channelization of marsh habitats. Restoration projects such as the proposed project BA 34-2 seek to offset this land loss through various methods, including hydrologic restoration and vegetative plantings such as the proposed project.

Future restoration projects are not likely to be proposed in the upper Barataria Basin. Agencies are beginning to focus their restoration efforts in other coastal areas as described in the Master Plan in an effort to maximize the limited amount of resources available to restore coastal Louisiana (CPRA, 2012).

4.5 Unavoidable Adverse Impacts

The unavoidable adverse impacts of the Action Alternative 2 are related to construction activities. Construction activities will generate noise and air emissions but their impact is limited and temporary in duration, estimated to be not more than 159 working days.

4.6 Relationship of Short-Term Uses and Long-Term Effects

All action alternatives have some short-term, localized, adverse impacts in the form of lost or disturbed freshwater wetlands and long-term beneficial impacts. These impacts will be mitigated in the short-term through avoidance measures and in the long-term by the creation of additional acres of wetlands. No long-term adverse impacts to the affected resources are expected.

Beneficial impacts in the mid and long-term will be realized by the proposed project. These benefits are expected to be sustained for the duration of the 20-year project life.

Part 5. Conclusion

5.1 Conclusion

Coastal Louisiana is losing wetlands at a rate of approximately 70 km^2 per year (Barras et al. 2008) due to natural and anthropogenic causes. Restoration projects, such as the one proposed, seek to offset these losses in an attempt to slow or prevent the loss of wetland habitat in the future.

This EA finds that the Hydrologic Restoration and Vegetative Planting in the Lac des Allemands Swamp (BA-34-2) proposed project would have long-term beneficial impacts in coastal Louisiana and would not result any significant direct, indirect or cumulative adverse impacts. Construction-related adverse impacts are considered to be minor to moderate and not significant due to their limited duration and best management practices to minimize adverse impacts. This conclusion is based on a comprehensive review of relevant literature, site-specific data, project-specific engineering and environmental reports, as well as cumulative experience gained through other restoration projects in coastal Louisiana. The proposed action is projected to have no significant impacts.

5.2 Interagency Coordination

Coordination in development of the proposed action and its alternative, and the selection of the proposed action has been maintained with each CWPPRA Task Force agency. The project was vetted publicly through the CWPPRA process, which provides opportunities for the public and CWPPRA agencies to comment on the proposed project. Coordination with USFWS and NMFS ensures that impacts to potential threatened or endangered species are evaluated. Coordination with NMFS confirmed that impacts to Essential Fish Habitat were correctly evaluated. In this case, there is no EFH in the project area. The PMT has prepared a Joint Permit Application with supporting documentation on behalf of the landowner as permit holder to submit to the USACE. The Louisiana State Historic Preservation Office (SHPO) also provided guidance on the presence of any historic or cultural resources that may be impacted by the project area, and has reviewed and accepted the No Findings of the Cultural Resources Investigation. Coordination with Tribal entities was initiated. A Notice of No Findings in the project area was sent to the tribal entities on July 23, 2015, with a request for consultation. The Seminole Tribe of Florida, the Choctaw Nation of Oklahoma, the Muscogee (Creek) Nation, and the Jena Band of Choctaw Indians concurred with the No Findings.

5.3 Compliance with Applicable Laws and Regulations

Applicable federal, state and local laws and regulations were taken into account during the development of the proposed action to ensure compliance with these laws and regulations.

5.4 Preparers, U. S. Environmental Protection Agency, Region 6, Dallas, Texas

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