

# JOINT PUBLIC NOTICE

October 17, 2016

United States Army  
Corps of Engineers  
New Orleans District  
Regulatory Branch  
Post Office Box 60267  
New Orleans, La. 70160-0267

State of Louisiana  
Department of Environmental Quality  
Post Office Box 4313  
Baton Rouge, La. 70821-4313  
Attn: Water Quality Certifications

(504) 862-2046/ FAX (504) 862-2574  
Brenda.a.Archer@usace.army.mil  
Project Manager  
Brenda Archer  
Permit Application Number  
MVN-2015-00139-MA

(225) 219-[3225] FAX (225) 325-8125  
Project Manager  
Elizabeth Hill  
WQC Application Number  
WQC # 160714-01

Interested parties are hereby notified that a permit application has been received by the New Orleans District of the U.S. Army Corps of Engineers pursuant to: [X] Section 10 of the Rivers and Harbors Act of March 3, 1899 (30 Stat. 1151; 33 USC 403); and/or [X] Section 404 of the Clean Water Act (86 Stat. 816; 33 USC 1344).

Application has also been made to the Louisiana Department of Environmental Quality, for a Water Quality Certification (WQC) in accordance with statutory authority contained in Louisiana Revised Statutes of 1950, Title 30, Chapter 11, Part IV, Section 2074 A(3) and provisions of Section 401 of the Clean Water Act (P.L.95-17).

## **AVOCA ISLAND MITIGATION BANK IN ST MARY PARISH**

**NAME OF APPLICANT:** Avoca Island Mitigation Phase One, LLC c/o Natural Resource Professionals, LLC Attention: Gregg Fell; 7478 Highland Rd Baton Rouge Louisiana 70808

**LOCATION OF WORK:** The site is located approximately less than a mile southeast of Morgan City, Louisiana in St. Mary Parish, as shown on enclosed drawings (Latitude: 29.654075, Longitude: -91.131583). The Project is located within the Terrebonne Basin, Hydrologic Unit Code 08090302.

**CHARACTER OF WORK:** The applicant proposes to remove 7.5 acres of elevated spoil banks; fill 1.2 acres of existing agricultural ditches; install 5 earthen plugs in existing agricultural ditches; and plant bottomland hardwood and cypress swamp communities within this area in order to restore and/or enhance the historical habitat. All work is being done to restore natural hydrology to the area for the purpose of constructing a mitigation bank.

The comment period for the Department of the Army Permit and the Louisiana Department of Environmental Quality WQC will close **30 days** from the date of this joint public notice. Written comments, including suggestions for modifications or objections to the proposed work, stating reasons thereof, are being solicited from anyone having interest in this permit and/or this WQC request and must be mailed so as to be received before or by the last day of the comment period. Letters concerning the Corps of Engineers permit application must reference the applicant's name and the Permit Application Number, and be mailed to the Corps of Engineers

at the address above, **ATTENTION: REGULATORY BRANCH**. Similar letters concerning the **Water Quality Certification must reference the applicant's name and the WQC Application number and be mailed to the Louisiana Department of Environmental Quality at the address above.**

The application for this proposed project is on file with the Louisiana Department of Environmental Quality and may be examined during weekdays between 8:00 a.m. and 4:30 p.m. Copies may be obtained upon payment of costs of reproduction.

### **Corps of Engineers Permit Criteria**

The decision whether to issue a permit will be based on an evaluation of the probable impacts, including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership and, in general, the needs and welfare of the people.

The U.S. Army Corps of Engineers is soliciting comments from the public, federal, state, and local agencies and officials, Indian Tribes, and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the U.S. Army Corps of Engineers to determine whether to make, modify, condition, or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

The New Orleans District is unaware of properties listed on the National Register of Historic Places near the proposed work. The possibility exists that the proposed work may damage or destroy presently unknown archeological, scientific, prehistorical, historical sites, or data. Issuance of this public notice solicits input from the State Archeologist and State Historic Preservation Officer regarding potential impacts to cultural resources.

Our initial finding is that the proposed work would neither affect any species listed as endangered by the U.S. Departments of Interior or Commerce, nor affect any habitat designated as critical to the survival and recovery of any endangered species.

This notice initiates the Essential Fish Habitat (EFH) consultation requirements of the Magnuson-Stevens Fishery Conservation and Management Act. The applicant's proposal would result in the destruction or alteration of N/A acre(s) of EFH utilized by various life stages of red drum and penaeid shrimp. Our initial determination is that the proposed action would not have a substantial adverse impact on EFH or federally managed fisheries in the Gulf of Mexico. Our final determination relative to project impacts and the need for mitigation measures is subject to review by and coordination with the National Marine Fisheries Service.

If the proposed work involves deposits of dredged or fill material into navigable waters, the evaluation of the probable impacts will include the application of guidelines established by the

Administrator of the Environmental Protection Agency. Also, a certification that the proposed activity will not violate applicable water quality standards will be required from the Department of Environmental Quality, before a permit is issued.

Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this application. Requests for public hearings shall state, with particularity, the reasons for holding a public hearing.

You are requested to communicate the information contained in this notice to any other parties whom you deem likely to have interest in the matter.

Martin S. Mayer  
Chief, Regulatory Branch

Enclosure

## Prospectus for the Proposed Avoca Island Mitigation Bank

*St Mary Parish, Louisiana*

August 30, 2016

***Sponsor:***

Avoca Island Mitigation Phase One, L.L.C.  
228 St. Charles Avenue, Suite 1138  
New Orleans, Louisiana 70130

***Agent:***

Bayou Boeuf Mitigation Bank, LLC  
C/O Heritage Land Management, LLC  
8680 Bluebonnet Blvd., Suite F  
Baton Rouge, LA 70810  
POC: David Odom, CEO  
225.757.5317  
[dfodom@heritagelm.us](mailto:dfodom@heritagelm.us)

**Table of Contents**

**1.0 INTRODUCTION.....3**  
 1.1 Site Location.....3  
**2.0 PROJECT GOALS AND OBJECTIVES.....3**  
 2.1 Wetland Functions and Values .....5  
**3.0 ECOLOGICAL SUITABILITY OF THE SITE .....5**  
 3.1 Historical Ecological Characteristics of the Site.....6  
 3.2 Current Ecological Conditions of the Site .....7  
 3.3 General Need for the Project in this Area .....14  
 3.4 Technical Feasibility .....16  
**4.0 ESTABLISHMENT OF THE MITIGATION BANK .....17**  
 4.1 Site Restoration Plan.....17  
 4.2 Proposed Mitigation Features.....18  
 4.3 Current Site Risks.....18  
 4.4 Long-Term Sustainability of the Site .....21  
**5.0 PROPOSED SERVICE AREA.....22**  
**6.0 OPERATION OF THE MITIGATION BANK .....22**  
 6.1 Project Representatives .....22  
 6.2 Qualifications of the Sponsor.....22  
 6.3 Construction and Establishment Fund.....23  
 6.4 Proposed Long-Term Ownership and Management Representatives .....23  
 6.5 Site Protection.....23  
 6.6 Long-Term Strategy.....23  
**7.0 REFERENCES.....24**

*List of Figures*

- |  |   |
|--|---|
| <b>Figure 1</b> – Vicinity Map               | <b>Figure 16</b> – Jurisdictional Determination |
| <b>Figure 2</b> – Aerial Location Map        | <b>Figure 17</b> – Agricultural Removal         |
| <b>Figure 3</b> – 1864 Map                   | <b>Figure 18</b> – Soils/Hydrology Work Plan    |
| <b>Figure 4</b> – 1917 Map                   | <b>Figure 19</b> – Soils/Hydrology Work Plan    |
| <b>Figure 5</b> – 1935 Map                   | <b>Figure 20</b> – Soils/Hydrology Work Plan    |
| <b>Figure 6</b> – 1957 Map                   | <b>Figure 21</b> – Cross Sections               |
| <b>Figure 7</b> – Historical Hydrology       | <b>Figure 22</b> – Cross Sections               |
| <b>Figure 8</b> – Land Use Map               | <b>Figure 23</b> – Cross Sections               |
| <b>Figure 9</b> – Watershed Map              | <b>Figure 24</b> – Post S/H WP Surface Flow     |
| <b>Figure 10</b> – Area Hydrology            | <b>Figure 25</b> – Habitat Work Plan            |
| <b>Figure 11</b> – Elevations/OWHM Map       | <b>Figure 26</b> – Mitigation Features          |
| <b>Figure 12</b> – Drainage/Hydro Monitoring | <b>Figure 27</b> – Hydrologic Projects          |
| <b>Figure 13</b> – Bank Surface Hydrology    | <b>Figure 28</b> – Avoca Island Inundation      |
| <b>Figure 14</b> – Soil Map                  | <b>Figure 29</b> – Rights of Way                |
| <b>Figure 15</b> – Vegetative Communities    | <b>Figure 30</b> – Service Area                 |

*List of Appendices*

**Appendix A** – Photographs; **Appendix B** – Hydrology Data; **Appendix C** – Habitat Work Plan

## **1.0 INTRODUCTION**

Avoca Island Mitigation Phase One, L.L.C. (Sponsor) submits this Prospectus to the US Army Corps of Engineers, New Orleans District (CEMVN), Louisiana Department of Natural Resources (DNR), and the Interagency Review Team (IRT) to initiate evaluation of the proposed Avoca Island Mitigation Bank (Bank, AIMB) in accordance with 33 CFR §332.8(d)(2). The 552.4-Acre Bank will provide compensatory mitigation for unavoidable, permitted impacts to “Waters of the United States” and coastal wetlands if deemed appropriate per 33 CFR § 332.3 (1) (a) and 33 CFR § 332.3 (1) (b) 3, and LAC 43:724. The details pertaining to the use of this site as a mitigation bank will be specified in the subsequent Mitigation Banking Instrument (MBI).

The Bank is located on Avoca Island in the Louisiana Coastal Zone. It is located in St. Mary Parish, immediately south of Morgan City, LA, and is within the United States Geological Survey (USGS) Hydrologic Unit Code 08090302 and the Louisiana Department of Environmental Quality (DEQ) Terrebonne River Basin.

The Bank currently consists of pastures, herbaceous wetlands, low to medium quality forested wetlands, and forested non-wetland areas, with elevations ranging from 0.0'-5.0' NAVD 88 Geoid 12A. The Bank is ecologically suitable for wetland mitigation activities due to the presence of hydric soils and its ability to maintain wetland hydrology. The Sponsor proposes to execute a perpetual conservation servitude, conduct wetland restoration and enhancement activities, facilitate the establishment of a self-sustaining wetland ecosystem, and provide long-term management in order to maximize the wetland functional capacity of the Bank.

### **1.1 Site Location**

The Bank is located at -91.131583 W and 29.654075 N (Approximate Centroid) and within Sections 28, 29 and 33, Township 16 South, and Range 13 East. The 552.4-acre Bank is located south of Morgan City and Amelia, Louisiana and within the Terrebonne River Basin. The Bank is located on the upper portion of Avoca Island. It is bordered to the north and east by Bayou Boeuf, the west by Bayou Shaffer, and to the south by coastal wetlands within Avoca Island (Figures 1 and 2).

## **2.0 PROJECT GOALS AND OBJECTIVES**

The goal of the project is to re-establish, rehabilitate, enhance, and preserve Coastal and Non-Coastal Bottomland Hardwoods (BLH), and Coastal Cypress Swamp (SWP) Habitat. For the purposes of the Bank, 5.0' NAVD 88 Geoid 12A serves as the coastal “boundary.”

The tables below summarize the mitigation features of the Bank.

**BLH and SWP Mitigation Features**

**Coastal BLH**

| <b>Mitigation Type</b> | <b>Acreage</b> |
|------------------------|----------------|
| Re-establishment       | 128.9          |
| Rehabilitation         | 16.2           |
| Preservation           | 162.1          |

**Non-Coastal BLH**

| <b>Mitigation Type</b> | <b>Acreage</b> |
|------------------------|----------------|
| Re-establishment       | 20.3           |
| Rehabilitation         | 1.2            |

**Coastal SWP**

| <b>Mitigation Type</b> | <b>Acreage</b> |
|------------------------|----------------|
| Rehabilitation         | 81.8           |
| Enhancement            | 93.1           |

In order to improve the aquatic resource area, functions, and values of this BLH and SWP ecosystem, the Sponsor will meet the following objectives:

1. Improve historic/natural surface hydrology and sheet flow by leveling surface elevations within the Bank;
2. Remove on-going agricultural/pastoral activities in order to improve water quality and facilitate natural vegetative growth;
3. Conduct vegetative plantings of BLH and SWP species and improve the vegetative composition of existing forested habitat through chemical/mechanical methods;
4. Implement an invasive species control program through the use of chemical and/or mechanical methods where appropriate;
5. Ensure initial, interim, and long-term success through the implementation of a monitoring, management, and maintenance program;
6. Establish appropriate financial mechanisms to ensure the successful completion of the proposed construction, establishment, and long term management activities; and
7. Ensure long-term protection through the execution of a perpetual conservation servitude in accordance with 33 CFR §332.7.

## **2.1 Wetland Functions and Values**

The restored, enhanced, and preserved wetlands will regulate the movement of water within the watershed as well as in the global water cycle (Richardson 1994; Mitsch and Gosselink 1993). Wetlands store precipitation and surface water and then slowly release the water into associated surface water resources, groundwater, and the atmosphere (Taylor et al 1990). Following surface hydrology improvements and the removal of artificial impoundments within the Bank, the oxidation-reduction potential will also reflect that of a seasonally saturated/inundated upper soil profile. This will improve chemical functions such as organic compound breakdown, decomposition, nutrient assimilation, and denitrification.

The planting of BLH and SWP species within the Bank will provide improved habitat, structure, and nesting/breeding grounds for a variety of wildlife species. Following the implementation of the habitat work plan, these habitats, along with existing BLH and SWP habitat will be protected under a perpetual conservation servitude, which will allow these functions to be realized over the long term.

The wetland values that will be provided will occur at the following three levels (Mitsch and Gosselink, 2000):

- Population – Animals harvested for pelts and/or food; wildlife observation/recreation; endangered/threatened species habitat
- Ecosystem – Flood mitigation; storm abatement; aquifer recharge, water quality improvement; aesthetics
- Biosphere – Nitrogen cycle; sulfur cycle; carbon cycle; phosphorus cycle

## **3.0 ECOLOGICAL SUITABILITY OF THE SITE**

The Bank is ecologically suitable to achieve the goals and objectives of the project. This is due to the fact that the Bank was formed under wetland conditions as evident in the presence of hydric soils throughout the site, the location of the Bank in a former delta of the Mississippi River, and its current location at the confluences of the Atchafalaya and Terrebonne Basins. In addition, the Bank is located on Avoca Island, a significant feature in the Louisiana Coastal Zone. All existing pastures and certain forested areas have a Prior Converted (PC) or Farmed Wetland (FW) status by the Natural Resources Conservation Service (NRCS). This indicates that portions of the Bank were formerly wetlands that were converted and/or degraded by agricultural/pastoral activities.

### **3.1 Historical Ecological Characteristics of the Site**

#### **Historical Land Use**

The Bank is located on Avoca Island, which has a well-documented and rich history dating back to at least 1803. Historically, Avoca Island was known as “Cowpen Island,” as the original landowner, Samuel Rice, kept cattle on the tract. William Wofford bought the island in 1825 and changed the name to Avoca Island, which was taken from a glen in Ireland where two rivers meet to form the “Avoca.” Records of sugarcane production are seen as early as 1844, where the plantation was producing 142 hogsheads of sugar per year. In 1860, the Avoca Plantation consisted of 300 acres of cleared land and 1,826 unimproved acres (Kelley 1988). Figure 3 illustrates the conditions of the Bank and surrounding area in 1864.

Following increased sugar production, the Avoca Plantation was owned by the Pharr family in the late 1890s. During the Pharr ownership, a massive drainage district was formed that drained 16,000 acres of Avoca Island by 1917 (Figure 4 illustrates site conditions in 1917). A total of 5,500 acres was used for sugarcane and corn cultivation, and the remainder was reserved for an elaborate livestock-raising venture known as the Louisiana Livestock Company, Inc. However, sugarcane prices fell dramatically in 1920, which was followed by the 1927 Flood. This flood breached the Avoca Island levees, destroyed much of the development on the Island, and bankrupted the Pharr family (Kelley 1988).

In 1928, the Whitney Central Trust and Savings Bank and other creditors foreclosed on the Pharr family holdings on Avoca Island. The property on which they foreclosed was contributed in 1931 to a newly created corporation named Avoca Incorporated in exchange for common stock in the corporation. Figure 5 illustrates site conditions in 1935. In 1937, Avoca Incorporated leased hunting rights on Avoca Island to the Avoca Duck Club. Since that time, the primary land uses within Avoca Island have been duck hunting and oil and gas exploration/production, along with agricultural/pastoral activities within the Bank lands.

There have also been activities adjacent to the Bank that have taken place since approximately 1937. This includes the construction of the Avoca Levee in the 1950’s along with the construction of the Bayou Boeuf Lock Structure (Figure 6).

### **Historical Hydrology**

The Bank is located at the far western portion of the Terrebonne Basin, which represents an abandoned delta complex (CWPRRA). As the Mississippi River migrated, it left behind the waterways that are largely seen today such as the Atchafalaya River, Bayou Teche, Bayou Shaffer, Bayou Chene, and Bayou Boeuf (Figure 7). Due to the location of the Bank at the convergence of these waterways, the Bank would have historically received overland flow and subsequent sediment deposition during high water events.

Beginning in the late 1800's and continuing through approximately 1917 (Figure 4), several internal drainage modifications were made, including the construction of agricultural drainage ditches and associated spoil banks and the installation of 3 large pumping stations in three corners of Avoca Island. These pumping stations moved water out of the island that was collected in two primary drainage canals (Canals A and B).

Following the 1927 Flood and by the 1930s (Figure 5), active drainage to facilitate agricultural/pastoral activities was limited to the northern shore of Avoca Island. The pumping stations were abandoned at this time and have since become relics of the island.

The most significant external hydrology modifications came in the 1950's, when the Avoca Levee (extension of the eastern Atchafalaya guide levee) was constructed as part of U.S. Army Corps of Engineers flood protection measures, in addition to the Bayou Boeuf Lock Structure. This levee system extended the eastern Atchafalaya Guide Levee further south, which disrupted the natural hydrologic exchange between Avoca Island and the Atchafalaya River (Figure 6).

## **3.2 Current Ecological Conditions of the Site**

### **Current Land Use**

The Bank is only accessible by a cable-operated ferry, boat, or by foot through the Bayou Boeuf Lock Structure and therefore receives little-to-no public access. It is currently being used for agricultural/pastoral activities and hunting. There are also oil/gas/utility lines in and around the Bank that require occasional maintenance and inspection activities. Figure 8 illustrates the current land use within 1 mile of the Bank.

### **3.2.1 Current Hydrology**

#### ***Watershed Information and Area Hydrology***

The Bank is located on Avoca Island in the Louisiana Deltaic Plain, Terrebonne River Basin, and the West-Central Louisiana Coastal Cataloging Unit (Figure 9). Avoca Island is located approximately 13 miles upstream of the Atchafalaya River Delta. It is surrounded by Bayou

Shaffer, Bayou Boeuf, Gulf Intracoastal Waterway (GIWW), Bayou Chene, and Bayou Penchant. Other waterways adjacent to Avoca Island include Burke Canal, Tabor Canal, and Bayou Black.

Avoca Island hydrology is influenced by flows from the Atchafalaya River, tidal exchange, and seasonal climatic conditions (i.e. frontal systems, winds, pressure, tropical storms). The effects of these factors are variable depending on which factor is the dominating influence (Figure 10).

Avoca Island is adjacent to Bayou Shaffer and the Atchafalaya River, but the natural hydrologic connection to these waterways is disrupted by the Avoca Levee/East Atchafalaya River Guide Levee. This levee is connected to the Bayou Boeuf Lock Structure and extends an additional six miles south/downstream of Avoca Island and directs River flow south into the Gulf of Mexico (Figure 10). Under non-flooding conditions, the Bayou Boeuf Lock Structure is kept in the open position.

Despite the presence of the Avoca Levee and Bayou Boeuf Lock Structure, Avoca Island receives flow from the Atchafalaya River, which essentially “loops around” the end of the Avoca Levee and will flow north/northeast via the Avoca Island Cutoff waterway. This flow pattern is the dominating factor during Atchafalaya River flood conditions and can seasonally elevate water levels within the island.

Typically, winter/spring represents the highest water level period whereas summer/fall represents the lowest water level period. According to the National Oceanic and Atmospheric Administration (NOAA), flood stages for the Atchafalaya River at Morgan City Gage, #07381600 are 6.0' and 7.0' NGVD29 (6.25 and 7.25 NAVD88 Geoid 12A), for minor and moderate flood stages, respectively.

***Bank Elevations and Slope***

Elevations of the Bank range from ~0.0' - 5.0' NAVD 88 Geoid 12A (Figure 11). Average slopes of the Bank are 0-1%.

***Ordinary High Water Mark***

An Ordinary High Water Mark (OHWM) was determined for the Bank in August 2015 by Moffatt and Nichol and confirmed/approved by CEMVN. After a series of site visits along with analysis of existing USGS gage data, the OHWM was determined to be between 1.9 and 2.3 feet NAVD 88, Geoid 12A (Figure 11).

### ***Bank Hydrology***

The Bank is located on a coastal island that exhibits wetland hydrology due to the hydrologic influences from the Atchafalaya River system, the aforementioned surrounding waterways, and the Gulf of Mexico. Hydrologic influences also include precipitation which averages over 65 inches annually (St. Mary Parish Soil Survey).

Avoca Island represents the contributing drainage area for the Bank (Figure 12). In general, surface water flow follows the natural slope; water flows from the upper portions of the Bank (along Avoca Road) towards the center of Avoca Island to the lower elevations (Figure 13). However, due to the presence of agricultural ditches, minor cross drains, and spoil banks natural surface flow is disrupted (Figure 13).

### ***Surface and Groundwater Monitoring Stations***

The USGS maintains gages within the vicinity of Avoca Island that influence the Bank's surface hydrology. This includes gage #073816501 (Avoca Island Cutoff), #073881600 (Lower Atchafalaya River), #073816503 (Bayou Penchant), and 073814675 (Bayou Boeuf at Amelia). The locations of these gages are illustrated in Figure 10 and the hydrographs of these gages are in Appendix B.

In 2016, the Sponsor also installed data sondes in open water areas within Avoca Island and shallow groundwater wells (piezometers) in select locations within the Bank (Figure 12). Appendix B contains hydrographs of these sondes and piezometers.

### **3.2.2 Soils**

Soils mapped within the boundary of the proposed Bank are illustrated in Figure 14 and include: Baldwin silty clay loam, 0 to 1 percent slopes (BdA); Barbary muck, 0 to 1 percent slopes, frequently flooded (BRA), and Shriever clay, 0 to 1 percent slopes (ShA) (Web soil survey, 2014).

Baldwin silty clay loam, 0 to 1 percent slopes (BdA) is a hydric, poorly drained soil that formed clayey alluvium located on natural levees on deltaic plains. This soil is classified in hydrologic group D and has a seasonally high water table at 12.1 inches from the surface. The average slope gradient for this soil is 0.5 percent (National Cooperative Soil Survey 2014).

Barbary muck, 0 to 1 percent slopes, frequently flooded (BRA) is a hydric, very poorly drained soil that formed in fluid clay backswamp deposits located on swamps within deltaic plains. This soil is classified in hydrologic group D and has a seasonally high water table at 0.0 inches from the surface. The average slope gradient for this soil is 0.5 percent (National Cooperative Soil Survey 2014).

Shriever clay, 0 to 1 percent slopes (ShA) is a hydric, poorly drained soil that formed in clayey alluvium located on backswamps on deltaic plains. This soil is classified in hydrologic group D and has a seasonal high water table at 12.1 inches from the surface. The average slope gradient for this soil is 0.5 percent (National Cooperative Soil Survey 2014).

All soil types within the project area are mapped as hydric by the NRCS, and on-site soil samples throughout the Bank contained hydric soil indicators.

### 3.2.3 Vegetation

The Bank currently consists of a mixture of herbaceous and forested vegetative communities. The location, extent, and composition of these communities are a result of historic and current agricultural/pastoral activities, which were in turn driven by the influence of surface water within the site. In general the OHWM is the main “dividing line” separating vegetative composition, with % overstory decreasing and % understory increasing below this line.

Figure 15 illustrates the location and extent of the vegetative communities within the Bank, which are described below:

- **(1) Herbaceous Non-Wetlands (149.42 Acres):** This community is located in the maintained agricultural/cattle pastures above the OHWM and is composed of an herbaceous layer of 40% bahiagrass (*Paspalum notatum*), 20% Canada goldenrod (*Solidago altissima*), 15% Brazilian vervain (*Verbena brasiliensis*), 15% curly dock (*Rumex crispus*), and 10% sawtooth blackberry (*Rubus argutus*). No trees or shrubs are found in this habitat type. Understory is 100%.
- **(2) Forested Wetlands dominated by Chinese Tallow, Sweetgum, and Water Oak (5.32 Acres):** This community is composed of a tree layer of 37% Chinese tallow (*Triadica sebifera*), 20% sweetgum (*Liquidambar styraciflua*), 14% water oak (*Quercus nigra*), 9% American elm (*Ulmus americana*) and 5% Drummond red maple (*Acer rubrum* var. *drummondii*); a sapling/shrub layer of 45% Drummond red maple, 10% wax myrtle (*Morella cerifera*), and 5% dogwood (*Cornus* sp.); and a herbaceous layer of 15% trumpet creeper (*Campsis radicans*), 5% peppervine (*Ampelopsis arborea*), and 1% Kunth’s maiden fern (*Thelypteris kunthii*). Maximum dbh of Chinese tallow is 10.5 inches, sweetgum is 11.1 inches, and water oak is 22.1 inches. Vegetation cover is 75% overstory, 60% midstory, and 20% understory. This community is adjacent to the herbaceous community types and was mapped as FW by NRCS.

- **(3) Forested Non-Wetlands dominated by Water Oak and Sugarberry (21.63 Acres):** This community type is above the OHWM and is non-wet. It is composed of a tree layer of 80% water oak, 40% sugarberry (*Celtis laevigata*), 25% Drummond red maple, and 5% American elm; a sapling/shrub layer of 20% possumhaw (*Ilex decidua*), 10% Chinese privet (*Ligustrum sinense*), 5% water oak, and 1% Drummond red maple; and a herbaceous layer of 15% dwarf palmetto (*Sabal minor*), 5% trumpet creeper, 3% greenbriar (*Smilax* sp.) 2% poison ivy (*Toxicodendron radicans*), and 1% Japanese climbing fern. The max dbh of water oak is 22.8 inches. Vegetation cover is 85% overstory, 35% midstory, and 20% understory.
- **(4) Forested Wetlands dominated by Water Oak and Sweetgum (145.02 Acres):** This community is composed of a tree layer of 50% water oak, 40% sweetgum, and 15% American elm; a sapling/shrub layer of 45% water oak, 15% Chinese privet, 5% possumhaw, 3% Drummond red maple, and 2% American elm; and a herbaceous layer of 25% Japanese climbing fern (*Lygopodium japonicum*), 20% dwarf palmetto, 15% trumpet creeper, 10% Kunth's maiden fern, and 10% peppervine. The max dbh of water oak is 22.8 inches and sweetgum is 19.4 inches. Vegetation cover is 90% overstory, 30% midstory, and 25% understory.
- **(5) Forested Wetlands dominated by Drummond red maple (17.0 Acres):** This community is composed of tree layer of 35% Drummond red maple, 25% ash (*Fraxinus* sp.), and 15% American elm; a sapling/shrub layer of 35% Drummond red maple, 15% water oak, 10% wax myrtle, 3% dogwood, and 3% possumhaw; and a herbaceous layer of 10% Japanese climbing fern, 5% peppervine, 3% sawtooth blackberry, and 2% Kunth's maiden fern. The max dbh of Drummond red maple is 11.3 inches. Vegetation cover is 70% overstory, 30% midstory, and 10% understory.
- **(6) Herbaceous Wetlands (68.71 Acres):** This community is located in the maintained agricultural/cattle pastures but is below the OHWM. A distinct change in vegetation occurs at the OHWM, below which a number Obligate Wetland species dominate. This community is composed of an herbaceous layer of 80% common rush (*Juncus effusus*), 70% gulf swampweed (*Hygrophila lacustris*), 50% gulf smartweed (*Polygonum hydropiperoides*), 10% hairy pod cowpea (*Vigna luteola*), and 5% anglestem beaksedge (*Rhynchospora caduca*). There are no trees or shrubs in this vegetation community. Understory is 100%.

- **(7) Forested Wetlands dominated by Chinese Tallow and Drummond red maple (5.88 Acres):** This community is composed of a tree layer of 46% Chinese tallow, 26% Drummond red maple, 9% water oak, 7% ash, 3% sweetgum, and 2% sugarberry; a sapling/shrub layer of 15% sweetgum, 5% Drummond red maple, 5% ash, 5% buttonbush, and 2% possumhaw; and a herbaceous layer of 40% swamp smartweed, 35% lizard's tail, and 5% anglestem beaksedge. Compared to Habitat 8, this community has a more closed canopy with fewer herbaceous plants present. Max dbh of Chinese tallow is 10.5 inches and Drummond red maple is 13.2 inches. Vegetation cover is 70% overstory, 35% midstory, and 70% understory.
  
- **(8) Forested Wetlands dominated by Drummond red maple and Chinese Tallow with a prominent herbaceous layer (15.64 Acres):** This community is composed of a tree layer of 49% Drummond red maple, 27% Chinese tallow, 11% ash, 3% sweetgum, and 3% water oak; a sapling/shrub layer of 10% possumhaw and 5% ash; and a herbaceous layer of 80% savannah panicgrass, 20% swamp smartweed, 10% alligatorweed, 5% pickerelweed, 5% dwarf palmetto, and 3% lizard's tail. Compared to Habitat 7 the canopy is more open with a prominent herbaceous layer. Max dbh of Drummond red maple is 14.4 inches and Chinese tallow is 7.4 inches. Vegetation cover is 50% overstory, 35% midstory, and 100% understory.
  
- **(9) Forested Wetlands dominated by Black Willow with a prominent Herbaceous layer (1.17 Acre):** This community is composed of a tree layer of 15% black willow (*Salix nigra*); a sapling/shrub layer of 50% black willow; and a herbaceous layer of 50% savannah panicgrass, 10% pickerelweed, 10% swamp smartweed, 10% alligatorweed, and 10% common rush. Max dbh of black willow is 6 inches. Vegetation cover is 50% overstory, 50% midstory, and 60% understory.
  
- **(10) Forested Wetlands dominated by Black Willow, Drummond red maple, and Chinese Tallow, with a prominent Herbaceous layer (13.39 Acres):** This community is composed of a tree layer of 48% black willow, 16% Chinese tallow, 15% ash, and 5% Drummond red maple; a sapling/shrub layer of 15% Drummond red maple, 10% ash, 10% Chinese tallow, and 3% possumhaw; and a herbaceous layer of 40% swamp gulfweed, 25% swamp smartweed, 15% common rush, and 5% lizard's tail. The max dbh of black willow is 20.4 inches, Drummond red maple is 13.7 inches, and Chinese tallow is 8.3 inches. Vegetation cover is 40% overstory, 30% midstory, and 80% understory.

- **(11) Herbaceous Wetlands dominated by Pickerelweed and Common Rush (1.84 Acres):** This community is found adjacent to Habitat 10 and is dominated by a herbaceous layer of 50% pickerelweed and 50% common rush. No trees or shrubs are found in this habitat type. Understory is 100%.
- **(12) Forested Wetlands dominated by a dense stand of young, same-age Drummond red maple (2.36 Acres):** This community is composed of a tree layer of 49% Drummond red maple, 20% Chinese tallow, 13% American elm, 12% ash, and 5% sweetgum; a sapling/shrub layer of 60% Drummond red maple and 10% ash; and a herbaceous layer of 10% Japanese climbing fern, 3% peppervine, and 1% Chinese tallow. This stand is very dense and all trees appear to be the same age. Max dbh of Drummond red maple is 8.1 inches. Vegetation cover is 60% overstory, 60% midstory, and 10% understory.
- **(13) Forested Wetlands dominated by Drummond red maple and Ash with a prominent herbaceous layer (19.29 Acres):** This community is dominated by a tree layer of 37% Drummond red maple, 34% ash, 13% sweetgum, 7% black willow, 3% Chinese tallow, 2% American elm, and 1% water oak; a sapling/shrub layer of 15% Drummond red maple and 10% buttonbush; and a herbaceous layer of 40% lizard's tail, 40% swamp gulfweed, 25% swamp smartweed, 10% broadleaf arrowhead (*Sagittaria lancifolia*), and 10% pickerelweed. Max dbh of Drummond red maple is 24.1 inches and ash is 19.5 inches. Vegetation cover is 60% overstory, 20% midstory, and 100% understory.
- **(14) Forested Wetlands dominated by Water Oak, Drummond red maple, and possumhaw (2.24 Acres):** This community is composed of a tree layer of 26% water oak, 17% Drummond red maple, 14% ash, 8% Chinese tallow, 7% sweetgum, 6% American elm, and 4% sugarberry; a sapling/shrub layer of 60% possumhaw, 10% Drummond red maple, 5% Chinese tallow, and 2% water oak; and a herbaceous layer of 10% Lizard's tail, 2% Carex sp., 2% poison ivy, and 2% Japanese climbing fern. Max dbh of water oak is 22.6 inches, Drummond red maple is 23.3 inches, and possumhaw is 3.8 inches. Vegetation cover is 95% overstory, 65% midstory, and 15% understory.
- **(15) Forested Wetlands dominated by Ash, Drummond red maple, and Chinese Tallow (4.62 Acres):** This community is composed of a tree layer of 42% ash, 18% Drummond red maple, 16% Chinese tallow, 7% sugarberry, and 5% water oak; a

sapling/shrub layer of 20% possumhaw, 10% Drummond red maple, and 5% ash; and a herbaceous layer of 20% lizard's tail, 15% gulf swampweed, and 5% pickerelweed. This community is likely a transition area to the wetter open canopy of Habitat 13. Max dbh of ash is 22.9 inches, Drummond red maple is 18.5, and Chinese tallow is 8.8 inches. Vegetation cover is 80% overstory, 25% midstory, and 25% understory.

- **(16) Forested Wetlands dominated by Drummond red maple and Ash (29.66 Acres):** This community is dominated by a tree layer of 34% Drummond red maple, 23% ash, 12% sweetgum, 11% water oak, 5% American elm, 2% laurel oak (*Quercus laurifolia*), 2% sugarberry, and 1% Chinese tallow; a sapling/shrub layer of 20% possumhaw, 5% Drummond red maple, 5% ash, and 2% Chinese tallow; and a herbaceous layer of 10% dwarf palmetto, 10% sawtooth blackberry, 2% swamp smartweed, and 2% lizard's tail. Max dbh of Drummond red maple is 18.2 inches and ash is 19.1 inches. Vegetation cover is 80% overstory, 10% midstory, and 20% understory.
- **(17) Forested Wetlands dominated by Black Willow and Ash with a prominent herbaceous layer (21.63 Acres):** This community is composed of a tree layer of 65% black willow, 22% ash, 6% Drummond red maple, and 6% sweetgum; a sapling/shrub layer of 20% possumhaw, 5% Drummond red maple, 5% ash, and 2% Chinese tallow; and a herbaceous layer of 95% pickerelweed, 5% common rush, and 5% shortbristle horned beaksedge (*Rhynchospora corniculata*). The canopy is open and it is likely a transition zone to a marsh habitat type. The max dbh of black willow is 25.2 inches and ash is 27.2 inches. Vegetation cover is 35% overstory, 10% midstory, and 100% understory.

### 3.2.4 Jurisdictional Determination

A Jurisdictional Determination (JD) for the Bank and other portions of Avoca Island was issued on November 12, 2015 (MVN-2014-02006-SR). Figure 16 illustrates the current JD within the Bank.

### 3.3 General Need for the Project in this Area

The Bank is located in the Deltaic Plain, within HUC #08090302, which is in the larger Central Louisiana Coastal Accounting Unit and Lower Mississippi Subregion (USGS). This area is also referred to as the Barataria – Terrebonne Estuary System.

Wetland losses in the northern Gulf Coast Region of the United States are so extensive that they represent critical concerns to government environmental agencies and natural resource managers. In Louisiana,

almost 1,158 square miles of low-lying wetlands converted to open water between 1956 and 2004 (USGS 2013), and the Barataria – Terrebonne Estuary is experiencing between 50 and 61 percent of the land loss for the entire state (BTNEP). Between 1956 and 2004, the Terrebonne Basin lost 321 square miles of land and an additional 17 square miles of land was lost in 2005 due to the effects of Hurricane Katrina and Rita (Terrebonne Parish 2009). Wetland loss in the Terrebonne Basin is contributed to the combination of natural erosional process of sea level rise, subsidence, wind, tides, currents, herbivory, and the anthropogenic effects of channelization, levee construction, and development, which is significant in Coastal Louisiana.

In 2006, over 2 million residents lived in Louisiana Coastal Parishes (US Census Bureau 2007). Among the 50 states, Louisiana ranks 1<sup>st</sup> and 2<sup>nd</sup> in crude oil and natural gas production (including Outer Continental Shelf Production), respectively (LDNR 2007). In 2005, Louisiana's coastal wetlands provided storm protection for ports that carried 457 million tons of waterborne commerce. Five of the top fifteen largest ports in the US are in Louisiana (USACE 2007). In 2006, Louisiana's Commercial Fishing accounted for 21% of the total catch by weight in the lower 48 states (USDOD 2007), and annual expenditures from recreational fishing can amount up to \$1.2 Billion (Gentner et al. 2007).

Bottomland hardwood forests were once a prominent feature of the southeastern United States landscape at the time of European settlement (Allen 1997). These forests extended along nearly the entire lower Mississippi River alluvial valley (LMRAV). During the last century, approximately 24 million acres of bottomland hardwoods were reduced to approximately 5 million acres (MacDonald et al. 1979). The primary cause of this loss is contributed to agriculture. Based on historical records and aerial photography, agricultural and pastoral activities were the primary cause of the loss and degradation of bottomland hardwoods within the Bank.

Swamp forests represent a unique and important ecosystem in the southeastern United States, with bald cypress being the dominant tree in the coastal plain of Louisiana when settlers first arrived in the state. Early estimates of the area of bald cypress forests range from 0.67-3.64 million ha, but following intensive timber harvesting activities from 1890-1925, this number was reduced drastically to only 0.14 million ha. In addition to timber harvesting, other causes of decline include hydrology modifications, invasive species, and natural subsidence (Conner and Toliver 1990).

In order to reverse the historic and current trends of wetland loss within Louisiana and the Terrebonne River Basin, wetland restoration, enhancement, and preservation projects - such as the proposed Bank -

must be conducted, maintained, and managed for the long term. However, to support the socioeconomic values that exist due to the presence of these wetlands, a sustainable approach to land use must also take place. The following organizations have formed to develop plans to address the needs of the watershed:

- ***Terrebonne Parish, Office of Coastal Preservation and Restoration***-Terrebonne Parish has developed a “Comprehensive Plan” for Coastal Restoration that has four objectives: increase integrity of barrier island systems, increase vertical accretion of wetland soils, maximize habitat diversity of coastal wetlands, and ensure development in the Parish is consistent with this plan.
- ***Barataria-Terrebonne National Estuary Program (BTNEP)*** – Some of the goals of the BTNEP include: preserving and restoring wetlands and barrier islands, promoting environmentally responsible economic activities that sustain estuarine resources, realistically supporting diverse, natural biological communities, and developing and maintaining comprehensive watershed planning.

Perhaps the most important programs to ensure a sustainable approach to land-use in the Terrebonne Basin are the Section 404 and Coastal-Use Permitting Programs. As unavoidable impacts to wetlands are authorized in order to satisfy the public need of a particular project, compensatory mitigation must be secured prior to the impact occurring. The Bank will provide this mitigation, in effect allowing the benefit of the project to be realized while at the same time meeting the public need of restoring, enhancing and preserving BLH and SWP. This will certainly expand on the efforts of the Terrebonne Parish Comprehensive Plan and the BTNEP.

The Bank will address the needs of the watershed by contributing to the economy of Louisiana by facilitating the issuance of Section 404 and Coastal-Use Permits. It will also contribute to the environment of Louisiana by providing a variety of biotic and physical functions to the watershed. Providing these functions will then allow the values of these wetlands to be realized.

### **3.4 Technical Feasibility**

The activities proposed to restore and enhance the wetlands within the Bank are routine in nature, and represent well-established techniques that have resulted in successful mitigation projects in other areas of Louisiana. In addition, the existing pastures and certain forested areas are either PC or FW, which represents former wetlands that were cleared and drained to facilitate agricultural/pastoral activities. In combination with hydric soils and the Bank’s close proximity to the Atchafalaya River and Gulf of Mexico, the proposed surface hydrology improvements and subsequent

vegetative plantings, along with proper management will facilitate the establishment of a self-sustaining BLH and SWP ecosystem

#### **4.0 ESTABLISHMENT OF THE MITIGATION BANK**

##### **4.1 Site Restoration Plan**

The Site Restoration Plan (Mitigation Work Plan) involves a soils and hydrology work plan and a habitat work plan. In addition, all existing and ongoing agricultural/pastoral activities and associated features (i.e. fencing, cattle feeding areas, equipment) will be removed from the Bank (Figure 17).

##### **Soils and Hydrology Work Plan**

The Soils and Hydrology work plan (Figures 18-23) involves utilizing heavy machinery (i.e. bulldozers, excavators, dump trucks) to remove minor agricultural cross drains/ditches, and remove elevated spoil banks/berms, with acreages/quantities listed below:

- The removal of 7.54 acres of elevated spoil banks
- The filling/leveling of 1.2 acres of existing agricultural ditches

Vegetation within these areas will be mechanically removed. All excess fill generated will be moved to a non-wetland location within Avoca Island. Following the implementation of the soils and hydrology work plan natural sheet flow will be restored within the Bank as illustrated in Figure 24.

##### **Habitat Work Plan**

The Habitat Work Plan (Figure 25) consists of vegetative plantings within the pastures/herbaceous wetland habitats along with the removal and/or chemical treatment of Chinese tallow tree and other undesirable species followed by vegetative plantings within degraded forested habitats. The Sponsor will plant BLH species above the OHWM and SWP species below the OHWM. Afforestation efforts will include appropriate land-preparation practices where necessary (i.e. ripping, disking) and will utilize an appropriate combination of BLH and SWP bare-root stock in all plantings.

Invasive species (i.e. Chinese tallow tree and Black willow) and undesirable species will be deadened by the application of a basal and/or foliar herbicide and/or removed by mechanical methods.

Appendix C contains detailed information regarding forested habitats that will be improved by invasive/undesirable species treatment, including existing vegetative species composition, relative dominance percentages, and percentages to be treated and removed by chemical or mechanical methods, respectively. Appendix C also contains a proposed planting plan

for each respective habitat type. Planting densities, methods, success criteria/performance standards, and maintenance plans will be specifically described in the MBI, and will be consistent with current CEMVN and DNR requirements.

**4.2 Proposed Mitigation Features**

The following tables summarize the proposed mitigation features (Figure 26) and associated acreages of the Bank that will be realized following the implementation of the Soils and Hydrology Work Plan and Habitat Work Plan:

**Coastal BLH**

| Mitigation Type  | Acreage |
|------------------|---------|
| Re-establishment | 128.9   |
| Rehabilitation   | 16.2    |
| Preservation     | 162.1   |

**Non-Coastal BLH**

| Mitigation Type  | Acreage |
|------------------|---------|
| Re-establishment | 20.3    |
| Rehabilitation   | 1.2     |

**Coastal SWP**

| Mitigation Type | Acreage |
|-----------------|---------|
| Rehabilitation  | 81.8    |
| Enhancement     | 93.1    |

**Credit Assessment Methodology**

The Sponsor will utilize an appropriate credit assessment methodology such as the Louisiana Rapid Assessment Method (LRAM), Wetland Value Assessment (WVA), and/or other suitable metrics that reflect the difference between pre-and post-compensatory mitigation project site conditions.

**4.3 Current Site Risks**

The Bank is owned in fee title by Avoca L.L.C., with no mortgages or liens. There are no issues in regard to water rights. The Bank is adjacent to thousands of acres of coastal wetlands within the Terrebonne Basin and Atchafalaya Basin. Because these wetlands are considered highly valuable, any adjacent land-use projects beyond the control of the

Sponsor should be limited to oil and gas infrastructure, flood protection projects, navigation, and maintenance of existing rights of way.

Current known hydrology projects that may have an effect on the Bank include the Bayou Chene Project and the Increase Atchafalaya Flow to Eastern Terrebonne Project, both of which are in the Louisiana Coastal Protection and Restoration Authority (CPRA) 2012 Coastal Master Plan (Figure 27).

***Increase Atchafalaya to Terrebonne***

The Increase Atchafalaya Flow to Terrebonne Project is also a candidate for the 2017 Coastal Master Plan, and overlaps with portions of the Bank (Figure 27). If constructed, this project would directly impact the Bank. This project is currently seeking 15% funding from state/federal sources. The Sponsor intends to work cooperatively with the CPRA to resolve any potential conflicts between the two projects so that both projects are able to move forward. Additionally, the CPRA has stated they are “aware that the landowner intends to encumber their property with a perpetual conservation servitude that overlaps, in part, with key features of the TE-0110 project. CPRA requests that the permit contain a condition that requires coordination of the proposed activities with CPRA. With that condition CPRA has no objection and this permit application would be consistent with the Master Plan.”

***Bayou Chene Flood Protection Project***

The Bayou Chene Flood Protection Project (Bayou Chene Project), proposed by the St. Mary Levee District (SMLD), includes the construction of a levee along the existing Avoca Road corridor and the construction of a permanent Floodgate within the Bayou Chene channel (Figure 27 and 28). This project was developed following the 2011 Mississippi and Atchafalaya River Flood where a Barge and associated structures were installed in and around Bayou Chene as part of an “Emergency Action.” An “After the Fact Permit” was received in February of 2013. Additionally, in response to the 2016 Mississippi/Atchafalaya Flood (2016 Flood Event), a barge was sunk on January 11, 2016 along with the installation of temporary levees along Avoca Road, although it is not known exactly how this action is being processed by CEMVN and DNR.

The stated purpose for the Bayou Chene Project (and emergency actions) is to minimize high water induced flooding in St. Mary, Terrebonne, St. Martin, Assumption, and Iberville Parishes due to high river stages in the Atchafalaya. The current proposed operational plan is to close the floodgate when the Morgan City Gage reaches 6.36 feet NAVD 88 Geoid 12A and to open the gate when the Bayou Penchant Gage (#073816503) reaches 3.0 feet NAVD 88 Geoid 12A.

Although the SMLD has received its Coastal-Use Permit from the DNR, this project is currently not permitted by CEMVN. It is not funded for full design and is not funded for construction. If approved/constructed, the direct impacts would consist of the footprint of the levee (Avoca Road corridor) thereby reducing bank acreage. While this project has the potential to affect the hydrology of the Bank by increasing inundation durations during Atchafalaya River the cumulative impacts of this project have not been fully addressed.

The 2016 Flood Event presented a unique chance to monitor the effects of both the flood itself and potential impacts of the Flood Protection Project, as the SMLD sank the barge and installed temporary levees in a manner similar to the proposed permanent project. The Sponsor began monitoring water levels within the Bank, with initial data summarized below (all elevations listed below are in NAVD 88 Geoid 12A):

- On January 11, 2016, the SMLD sank the barge in Bayou Chene when the Morgan City Gage was at 6.91'. Any land areas within the Bank below 2.0' were inundated during this time.
- On January 22, 2016, the River crested at 8.25'. Any land areas within the Bank below ~3.0' were inundated during this time.
- On February 10, 2016, the River level was at 5.60'. Any land areas below 2.0' were inundated during this time.

The aforementioned summary data is illustrated in Figure 28. As of June 24, 2016, the barge and temporary levees were still in place; therefore the Sponsor will continue to monitor hydrology and ecosystem health within the Bank and Avoca Island.

### ***Encumbrances***

There are known encumbrances within and adjacent to the Bank. These encumbrances are illustrated in Figure 29 and summarized below:

#### **Within Bank Project Area (13.9 acres)**

- Avoca Road-This road has been in the parish road system for 99 years and is within a 25-foot servitude. The Bank will not encroach on the use of this road and if necessary will be excluded from Bank acreage. As an unimproved road, maintenance activities are limited to the placement of gravel to repair pot holes and mowing along the roadside on 4-5 times per year.
- Shell Pipeline\*-This crude oil pipeline is within a 30-foot ROW.
- Enlink LIG\*-This natural gas pipeline is within a 30-footROW.
- Texas Gas Transmission\*-This Natural Gas pipeline is within a 30-foot ROW.
- CLECO-This segment of power line is within an 80-foot ROW that traverses through the existing forested areas of the Bank and

consists of herbaceous habitat. Typical Maintenance activities include above ground work such as bush hogging and mowing and vegetation/limb clearing 2-4 times per year.

**Adjacent to Bank Project Area**

- CLECO-This segment of power line is within an 80 foot ROW that traverses through the existing forested areas of Avoca Island and consists of herbaceous habitat. Typical Maintenance activities include above ground work such as bush hogging and mowing and vegetation and limb clearing 2-4 times per year.
- Plains Pipeline\*-This crude oil pipeline is within a 25-foot ROW immediately adjacent to Avoca Road
- Columbia Gulf Transmission\*-This natural gas pipeline is within a 20-foot ROW.

\*Typical maintenance activities for the aforementioned pipelines/ROW's include mowing/bush-hogging every 6-10 months and vegetation/limb trimming every 10-15 months. Pipeline inspections are conducted every 1-2 years and may require the excavation and repair/replacement of small segments of pipeline if the inspections detect anomalies. Landowner permission and appropriate permits are required along with restoration of any repair sites to pre-construction conditions.

Because the existing ROWs are currently maintained and primarily surrounding by existing forested areas designated for preservation and/or are outside of the boundaries of the Bank, the Sponsor anticipates minimal impacts to the Bank as a result of the maintenance of these pipeline ROW's. Any ROW's within the limits of the Bank (13.9 acres) will remain as herbaceous wetlands and not be included as mitigation credit acreage.

**4.4 Long-Term Sustainability of the Site**

The Bank will be sustainable for the long-term and will maintain wetland hydrology due to hydrologic influences from the Atchafalaya River, surrounding waterways, Gulf of Mexico, and sub-tropical climate. The soils are suitable for the establishment of BLH and SWP species, and through active and adaptive management techniques and appropriate monitoring activities, the habitat should develop into a self-sustaining system. Furthermore, the Bank is located on Avoca Island, which is primarily owned by Avoca L.L.C., who has a strong commitment to restore and protect this Island. In addition the Sponsor will be the landowner of the Bank and will have full authority to monitor and maintain the Bank for the long term.

## **5.0 PROPOSED SERVICE AREA**

The Sponsor proposes to use the Terrebonne River Basin (HUC #s 08070300 and 08090302) as the primary service area, and the Barataria Basin (HUC #08090301) as the secondary service area (Figure 28). Bank credits within the Coastal Zone will be utilized for impacts occurring within the Coastal Zone as determined by DNR. As impacts occur within these individual watersheds, securing credits from the Bank will have a greater overall benefit to ecosystem processes and overall wetland condition because they are in the same watershed. Use beyond these service areas will be determined by CEMVN and DNR on a case-by-case basis.

## **6.0 OPERATION OF THE MITIGATION BANK**

The Bank will be established and operated in accordance with 33 CFR §332.8, and the Sponsor will comply with all conditions required by the CEMVN and IRT, which will be described in detail in the MBI.

### ***6.1 Project Representatives***

Sponsor: Avoca Island Mitigation Phase One, L.L.C.  
228 St. Charles Ave, Suite 1138  
New Orleans, LA 70130  
POC: Paul Hogan  
504.552.4720

Agent: Bayou Boeuf Mitigation Bank, LLC  
C/O Heritage Land Management, LLC  
8680 Bluebonnet Blvd., Suite F  
Baton Rouge, LA 70810  
POC: David Odom, CEO  
225.757.5317; [dfodom@heritagelm.us](mailto:dfodom@heritagelm.us)

Landowner: Avoca, L.L.C.  
228 St. Charles Avenue, Suite 1138  
New Orleans, LA 70130  
POC Paul Hogan, General Manager

### ***6.2 Qualifications of the Sponsor***

The Sponsor is a wholly owned subsidiary of Avoca, L.L.C, who has been the landowner and steward of the majority of Avoca Island since 1937. Avoca, L.L.C. has a strong commitment to restore Avoca Island, which will begin with AIMB.. The Sponsor has the necessary funds and resources to develop, construct, and establish the Bank and provide appropriate management for the short and long term.

Bayou Boeuf Mitigation Bank, LLC is a wholly owned subsidiary of Heritage Land Management. HLM is a land management company dedicated to designing and implementing sustainable conservation projects on private and public land. David Odom, CEO, has over 25 years of experience in environmental consulting including wetlands permitting, mitigation banks, environmental assessments, and civil engineering design services. He was previously the Director of Gulf Central District of the Shaw Group and is a licensed civil and environmental engineer. For more information, please visit [www.heritagelm.us](http://www.heritagelm.us).

### **6.3 Construction and Establishment Fund**

In order to ensure that sufficient funds are available to construct and establish the Bank, the Sponsor will implement a Construction and Establishment Financial Assurance. This will be in the form of performance bonds, escrow accounts, letters of credit, or other appropriate instrument subject to the approval of CEMVN, DNR, and IRT.

### **6.4 Proposed Long-Term Ownership and Management Representatives**

Avoca, L.L.C. will transfer ownership of the Bank to Avoca Island Mitigation Phase One, L.L.C., who will serve as the Sponsor, long-term manager, and steward of the Bank. The Sponsor will reserve the option of appointing a long-term steward, which must be approved by the CEMVN, DNR, and IRT. The Sponsor anticipates the long-term management requirements will be boundary control, trash/debris cleanup, invasive species control, general maintenance and management, and monitoring.

### **6.5 Site Protection**

The Bank will be protected in perpetuity by a conservation servitude pursuant to Louisiana Revised Statute 9:1271 *et seq.* The servitude will be held by a conservation-oriented 501(c) (3) organization to be determined. The servitude will inure and run with the property title. The servitude will prohibit activities, such as clear cutting, fill discharges, cattle grazing, or other commercial surface development that would diminish the quality or quantity of restored wetlands.

### **6.6 Long-Term Strategy**

The Sponsor will provide long-term management of the Bank in accordance with 33 CFR §332.7. The Sponsor will provide site protection by establishing conservation servitude over the Bank, which will be held by a third-party non-profit corporation. The Bank will be constructed in a way that will not depend on any engineering features. This will result in a self-sustaining ecosystem with natural hydrology that will only require long term management activities such as invasive species control, boundary maintenance, and general site inspections. However, the Sponsor - through coordination with CEMVN, DNR, and the IRT - will employ an Adaptive Management Plan if monitoring or other information indicates

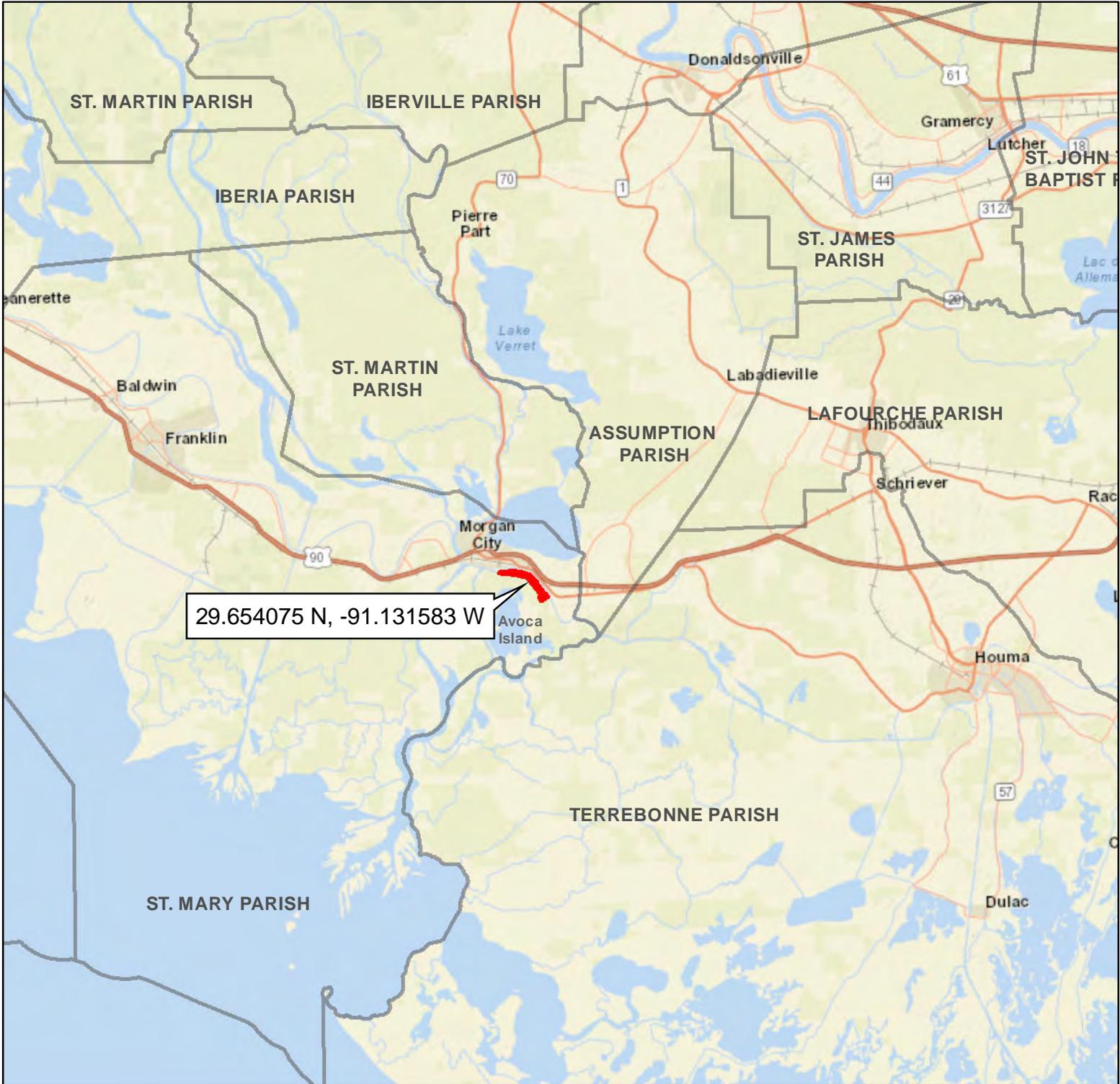
that the Bank is not progressing towards meeting its anticipated performance standards. The Sponsor will also establish a long-term management fund to ensure that monies are available to perform any anticipated management and maintenance needs.

## 7.0 REFERENCES

- Allen, James. 1997. Reforestation of Bottomland Hardwoods and the Issue of Woody Species Diversity. *Restoration Ecology* Vol. 5 No. 2, pp 125-134. Society for Ecological Restoration.
- Barataria-Terrebonne Estuary Program – 2008 Habitat Projects (2010). United States Environmental Protection Agency. Habitat Protection.
- Coastal Restoration Terrebonne Parish. 2009. Comprehensive Plan. Office of Coastal Preservation and Restoration. Halcrow, Inc
- Conner, W.H. and Toliver, J.R., 1990. Long-Term trends in the bald cypress (*Taxodium distichum*) resource in Louisiana (USA). *For. Ecol. Manage.*, 33/34:543-557.
- Gentner, B., M. Price, and S. Steinback. 2001. Marine Angler Expenditures in the Southeast Region, 1999. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. NOAA Technical Memorandum NMFS-F/SPO-48.
- Kelley, David B. 1988. Archeological and Historical Research on Avoca Plantation: Testing of Site 16 SMY 130 and Survey of Proposed Borrow Areas For EABPL Item E-96, St. Mary Parish, Louisiana. Coastal Environments, Inc, Prepared for USACE.
- Louisiana Department of Natural Resources, Technology Assessment Division. 2007. Selected Louisiana Energy Statistics. Louisiana Energy Topic. Baton Rouge, LA.
- Louisiana Department of Wildlife and Fisheries (LDWF), 2009. The Natural Communities of Louisiana, Louisiana Natural Heritage Program.
- McDonald, P.O., W.E. Frayer, and J.K. Clauser. 1979. Documentation, chronology, and future projection of bottomland hardwood habitat loss in the Lower Mississippi Alluvial Plain. Vols. 1 and 2. US Fish and Wildlife Service, Vicksburg, Mississippi.
- Mitsch, William J., and J. G. Gosselink. "Wetlands, 1993." *Von Nostrand Reinhold, New York.*

- Mitsch, W.J., Gosselink, J.G., (2000). The value of wetlands: importance of scale and landscape setting. Special Issue, The Value of Wetlands: Landscapes and Institutional Perspectives. *Ecological Economics* 25 (200) 25-33.
- Richardson, C.J. 1994. Ecological functions and human values in wetlands: A framework for assessing impact. *Wetlands* 14:1-9.
- Science in Your Watershed (2014). <http://water.usgs.gov/wsc/sub/0809.html>
- Soil Survey of St. Mary Parish, Louisiana. 2001. United States Department of Agriculture, Natural Resources Conservation Service.
- Taylor, J.R. Caradmore, M.A., and Mitsch, W.J. (1990). "Bottomland hardwood forests: Their functions and values." *Ecological Processes and cumulative impacts: Illustrated by bottomland hardwood ecosystems*, J.G. Gosselink, L.L.Lee, and T. A. Muir., ed, Lewis Publishers, Chelsea, MI
- The Terrebonne Basin. Coastal Wetlands Planning, Protection, and Restoration Act. [http://lacoast.gov/new/about/Basin\\_data/te/Default.aspx](http://lacoast.gov/new/about/Basin_data/te/Default.aspx)
- University of Missouri, Department of Soils, CARES, The Cooperative Soil Survey (2014) Soil Survey Data. U.S. Department of Agriculture, Natural Resources Conservation Service.
- Trends and Causes of Historical Wetland Loss in Coastal Louisiana (2013). USGS. Fact Sheet 2013-3017
- US Army Corps of Engineers. The Gulf Intracoastal Waterway Project. Structures along the GIWW.
- U.S. Army Corps of Engineers. 2007. Waterborne Commerce of the United States, Calendar Year 2005. Part 5 - National Summaries. Alexandria, VA: Institute for Water Resources, U. S. Army Corps of Engineers.
- U.S. Census Bureau. 2007. Annual Estimates of the Population for Counties: April 1, 2000 to July 1, 2006.
- U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2007. Fisheries of the United States, 2006. Silver Spring, MD.
- Web Soil Survey. 2013. United States Department of Agriculture, Natural Resources Conservation Service. <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

Avoca Island Mitigation Bank  
Figures



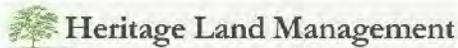
**Legend**

- AIMB (552.4 acres)
- Parish Boundaries



**Map Notes:**

1. The boundary shown is based on the boundary survey provided by the client.
2. Map projected to NAD83 UTM Zone 15.
3. AIMB= Avoca Island Mitigation Bank



**Avoca Island Mitigation Phase One, L.L.C.**

New Orleans, LA

**AIMB VICINITY MAP**

**ST MARY PARISH, LA**

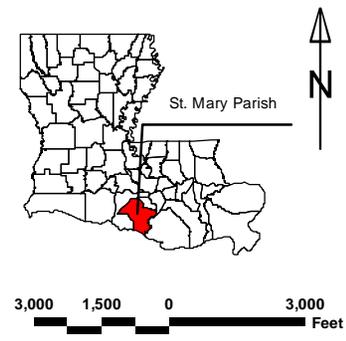
Created : JLW/ArcView

Approved : GLF

Date : 08/25/2016

Map No. :





**Legend**

AIMB (552.4 acres)

Heritage Land Management

**Map Notes:**

1. The boundary shown is based on the boundary survey provided by the client.
2. Map projected to NAD83 UTM Zone 15.
3. AIMB= Avoca Island Mitigation Bank

**Avoca Island Mitigation  
Phase One, L.L.C.**

**New Orleans, LA**

**AIMB AERIAL LOCATION**

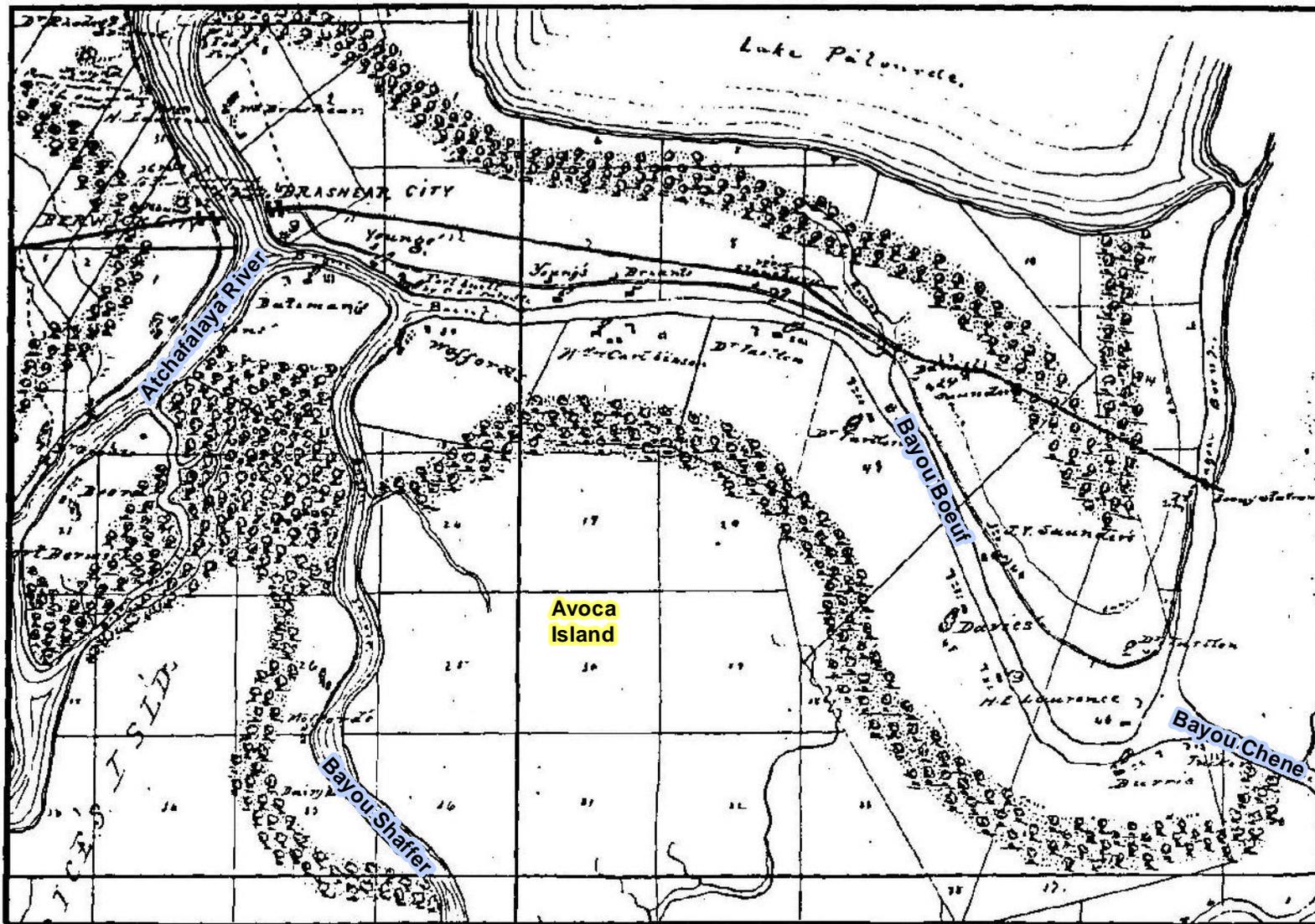
**ST. MARY PARISH, LA**

**Created: JLW/ArcView**

**Approved: GLF**

**Date: 08/25/2016**

**FIGURE 2 of 30**



Heritage Land Management

- Map Notes:**
1. Not to scale.
  2. Map image taken from 1988 CEI report.
  3. AIMB= Avoca Island Mitigation Bank

**Avoca Island Mitigation Bank Phase One, L.L.C.**  
New Orleans, LA

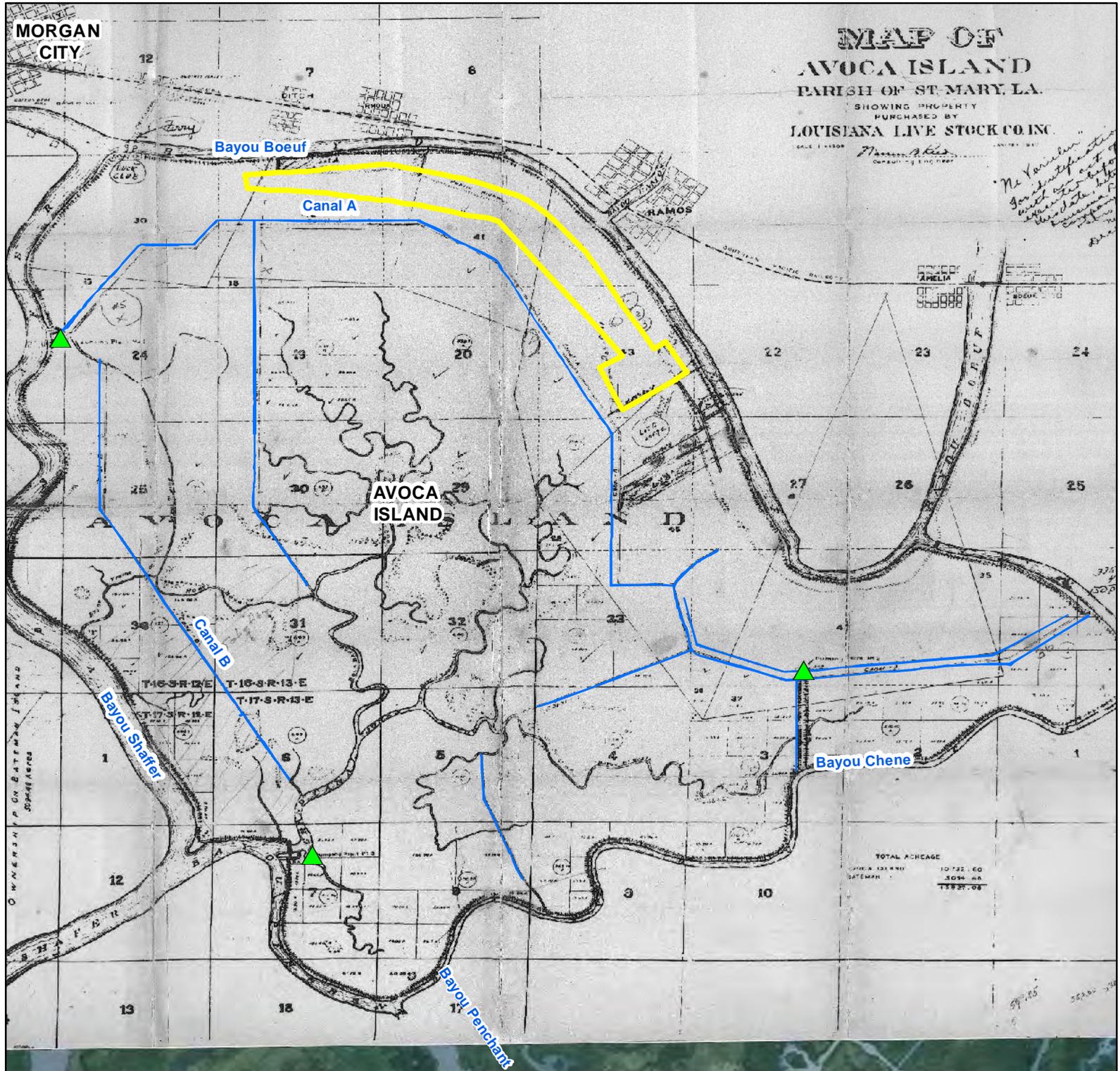
**AIMB 1864 MAP**  
**ST. MARY PARISH, LA**

Created: JLW/ArcView

Approved: GLF

Date: 08/25/2016

**Figure 7. Portion of a map of St. Mary Parish showing the location of structures in the vicinity of the two study areas ca. 1864 (After Confederate States of America 1864).**

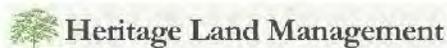


**Legend**

- AIMB (552.4 acres)
- Canal
- Historic Pump Stations

**Map Notes:**

1. Topographic map provided by USGS.
2. AIMB= Avoca Island Mitigation Bank
3. Pump Stations abandoned following the 1927 Flood.



**Avoca Island Mitigation Phase One, L.L.C.**

**New Orleans, LA**

**AIMB 1917 MAP**

**ST. MARY PARISH, LOUISIANA**

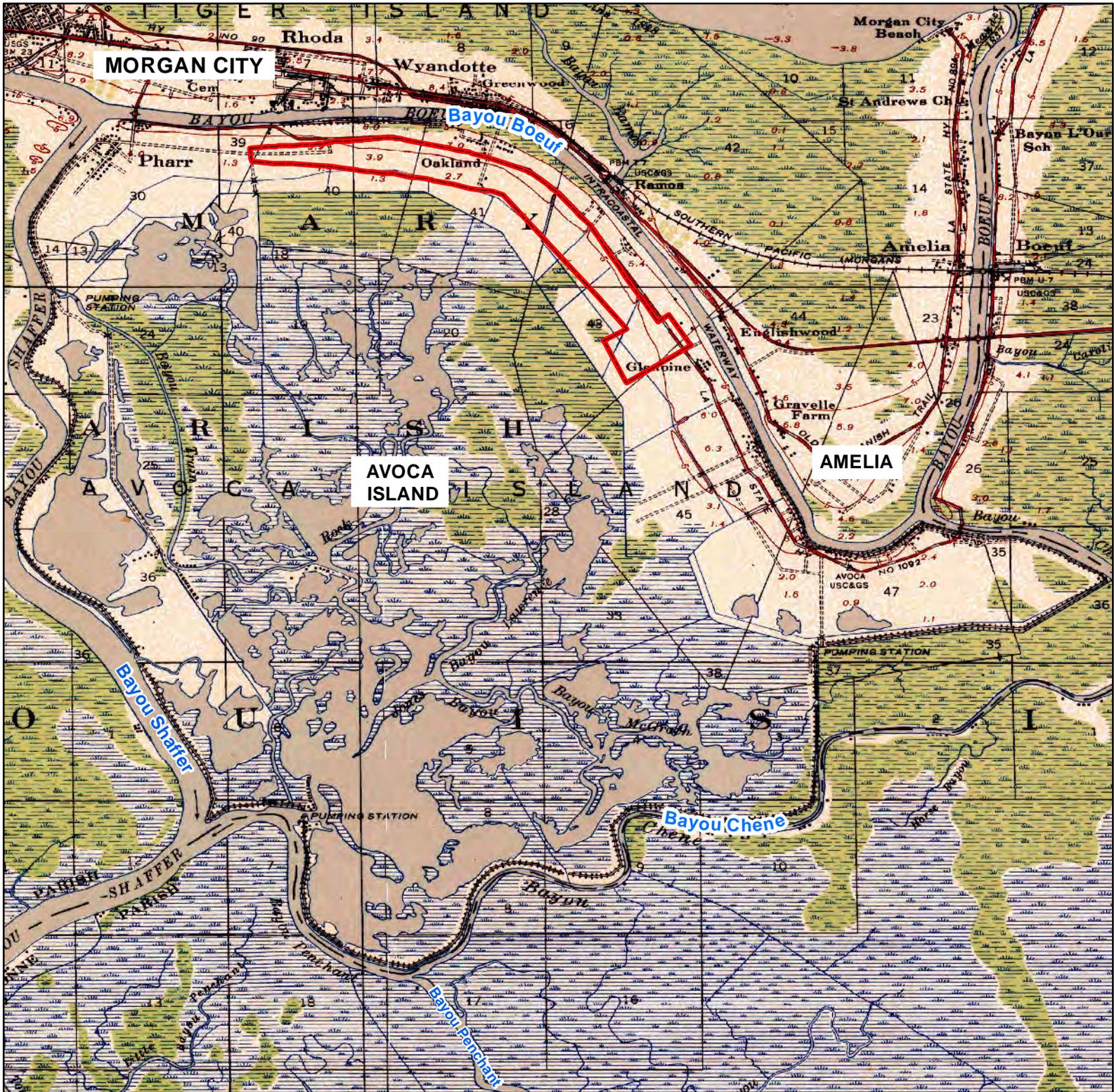
Created : JLW/ArcView

Approved : GLF

Date : 08/25/2016

Map No. :





**Legend**

 AIMB (552.4 acres)



Heritage Land Management



**Map Notes:**

1. Topographic map provided by USGS.
2. AIMB= Avoca Island Mitigation Bank

**Avoca Island Mitigation Phase One, L.L.C.**

New Orleans, LA

AIMB 1935 MAP

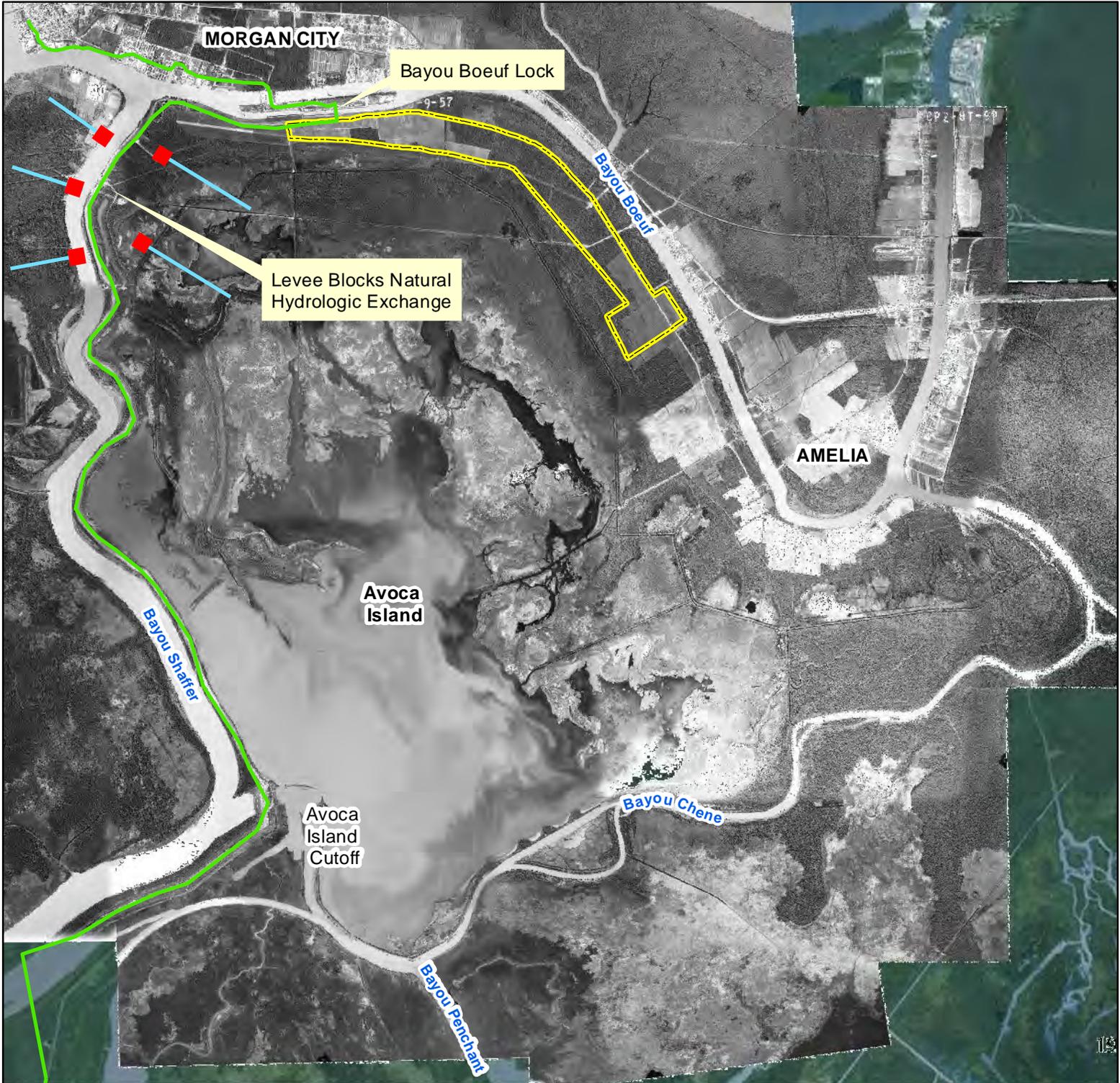
**ST. MARY PARISH, LOUISIANA**

Created : JLW/ArcView

Approved : GLF

Date : 08/25/2016

Map No. :



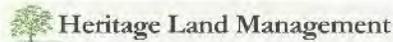
**Legend**

-  AIMB (552.4 acres)
-  East Atchafalaya Guide Levee/ Avoca Levee



**Map Notes:**

1. The boundary shown is based on the boundary survey provided by the client.
2. Map projected to NAD83 UTM Zone 15.
3. AIMB= Avoca Island Mitigation Bank



Avoca Island Mitigation Phase One, L.L.C.

New Orleans, LA  
AIMB 1957 MAP

ST MARY PARISH, LA

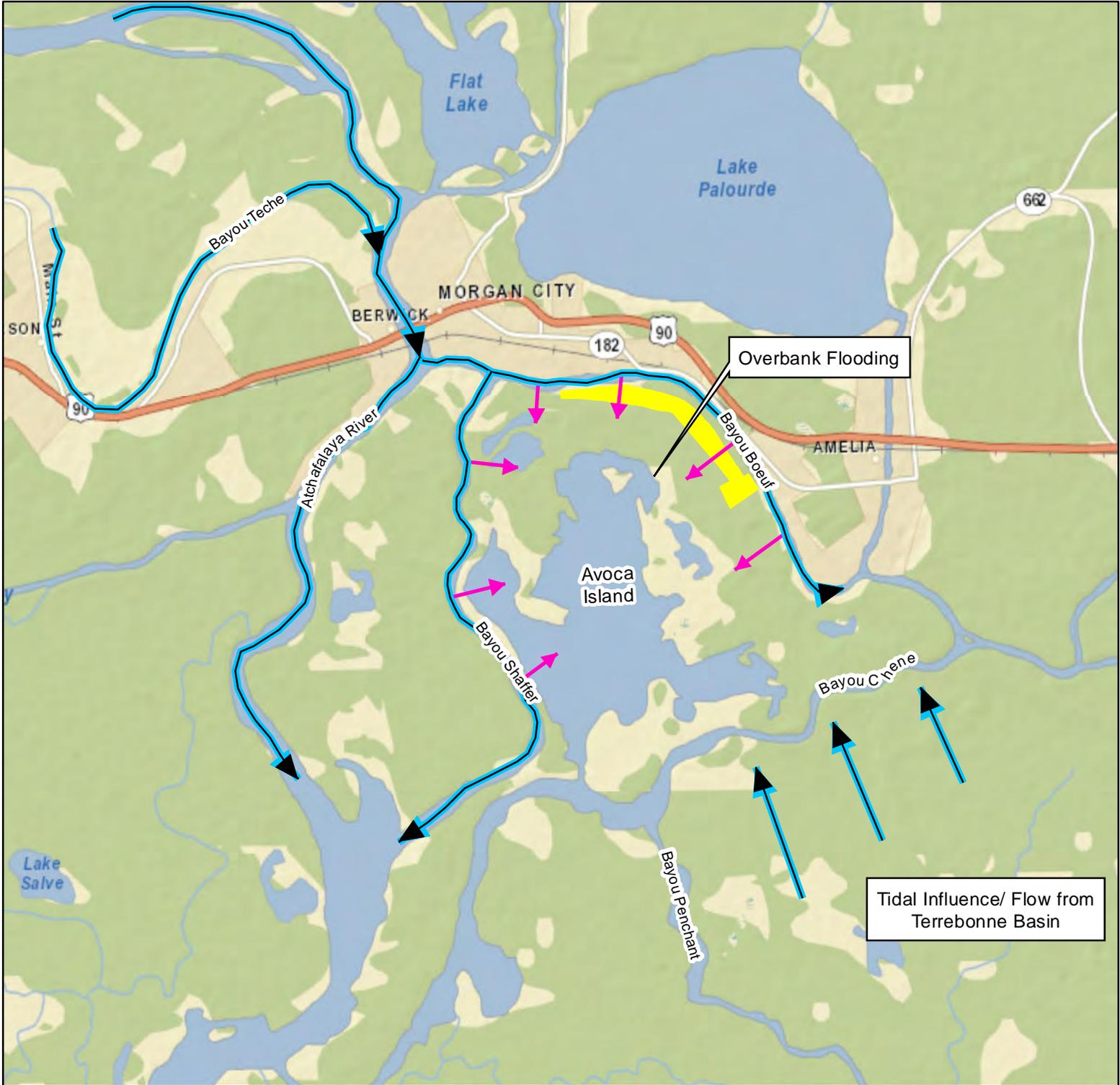
Created : JLW/ArcView

Approved : GLF

Date : 08/25/2016

Map No. :





**Legend**

-  AIMB (552.4 acres)
-  Historic Hydrology Flow
-  Historic Overbank Flooding



- Map Notes:**
1. The boundary shown is based on the boundary survey provided by the client.
  2. Map projected to NAD83 UTM Zone 15.
  3. AIMB= Avoca Island Mitigation Bank

Avoca Island Mitigation Phase One, L.L.C.

New Orleans, LA

**AIMB HISTORIC HYDROLOGY**

**ST MARY PARISH, LA**

Created : JLW/ArcView

Approved : GLF

Date : 08/25/2016

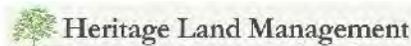
Map No. :





**Legend**

- Phase 1 Project Area (552.4 Acres)
- 1 Mile Radius
- Land Use Types**
- Marsh 25%
- Developed (Non-Agriculture) 25%
- Undeveloped 23%
- Open Water 19%
- Developed (Agriculture) 3%



- Map Notes:**
1. The boundary shown is based on the boundary survey provided by the client.
  2. Map projected to NAD83 UTM Zone 15.
  3. AIMB= Avoca Island Mitigation Bank

**Avoca Island Mitigation Phase One, L.L.C.**

**New Orleans, LA**

**ADJACENT LAND USE MAP**

**ST. MARY PARISH, LA**

Created : AGB/ArcView

Approved : GLF

Date : 08/25/2016

Map No. :





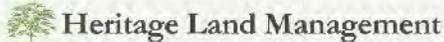
**AIMB (552.4 acres)**

**BATON ROUGE**

**NEW ORLEANS**

**Legend**

- AIMB (552.4 acres)
- Louisiana Coastal Zone Boundary
- Deltaic Plain
- Terrebonne River Basin



08090302- USGS HUC

- Map Notes:**
1. The boundary shown is based on the boundary survey provided by the client.
  2. Map projected to NAD83 UTM Zone 15.
  3. AIMB= Avoca Island Mitigation Bank

**Avoca Island Mitigation Phase One, L.L.C.**

**New Orleans, LA**

**AIMB WATERSHED**

**ST. MARY PARISH, LOUISIANA**

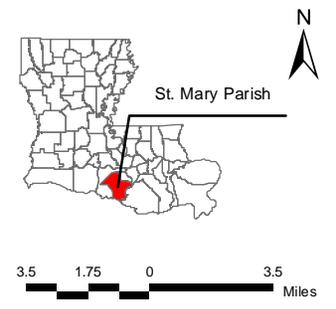
Created : JLW/ArcView

Approved : GLF

Date : 08/25/2016

Map No. :





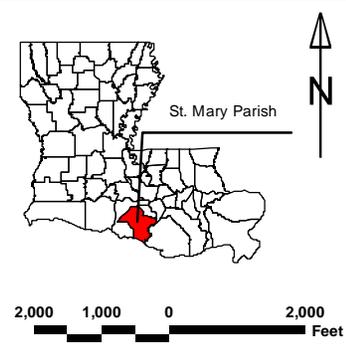
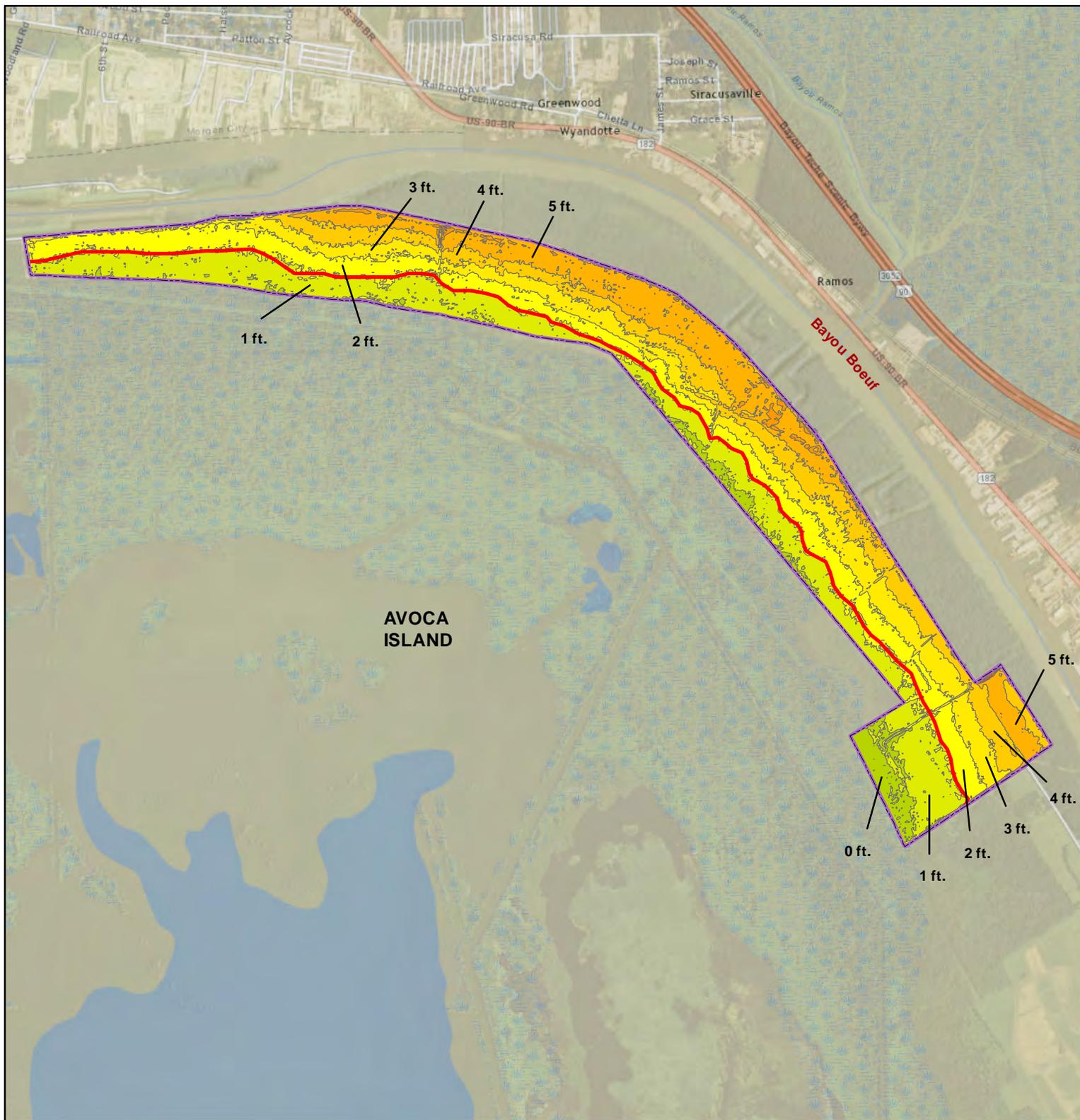
- Legend**
- AIMB (552.4 acres)
  - U.S. Army Corps of Engineers Existing Levees
  - Tidal Flow
  - Atchafalaya Riverine Flow
  - USGS Gauge

**Note:**  
See Appendix B for USGS Hydrographs

Heritage Land Management

- Map Notes:**
1. The boundary shown is based on the boundary survey provided by the client.
  2. Map projected to NAD83 UTM Zone 15.
  3. AIMB= Avoca Island Mitigation Bank
  4. U.S. Army Corps of Engineers Existing Levee positions digitized using U.S. Army Corps of Engineers National Levee Database figures as reference

|  |
|--|
| <b>Avoca Island Mitigation<br/>Phase One, L.L.C.</b> |
| <b>New Orleans, LA</b>                               |
| <b>AIMB AREA HYDROLOGY</b>                           |
| <b>ST. MARY PARISH, LA</b>                           |
| <b>Created: JLW/ArcView</b>                          |
| <b>Approved: GLF</b>                                 |
| <b>Date: 08/25/2016</b>                              |

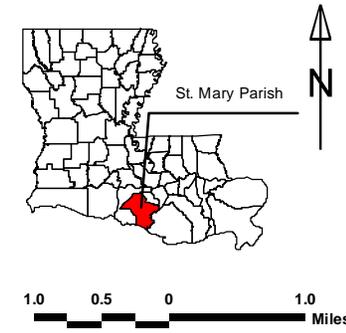
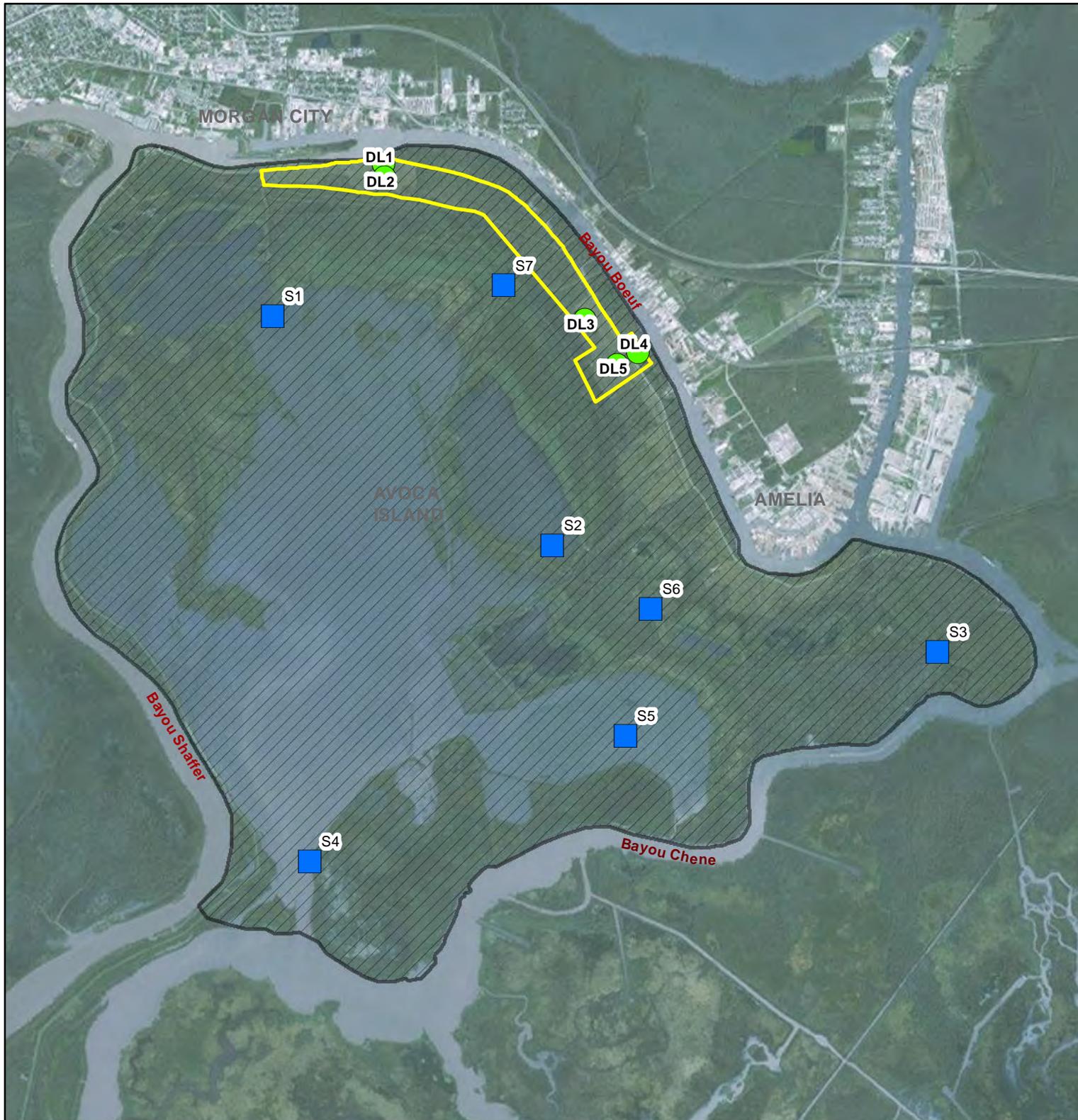


- Legend**
- AIMB (552.4 acres)
  - OHWM (1.9-2.3 ft. NAVD88 Geoid 12A)

Heritage Land Management

- Map Notes:**
1. The boundary shown is based on the boundary survey provided by the client.
  2. Map projected to NAD83 UTM Zone 15.
  3. OHWM= Ordinary High Water Mark
  4. AIMB: Avoca Island Mitigation Bank
  5. Elevations in NAVD88 Geoid 12A

|  |
|--|
| <b>Avoca Island Mitigation<br/>Phase One, L.L.C.</b> |
| <b>New Orleans, LA</b>                               |
| <b>AIMB ELEVATION AND OHWM</b>                       |
| <b>ST. MARY PARISH, LA</b>                           |
| <b>Created: JLW/ArcView</b>                          |
| <b>Approved: GLF</b>                                 |
| <b>Date: 08/25/2016</b>                              |
| <b>FIGURE 11 of 30</b>                               |



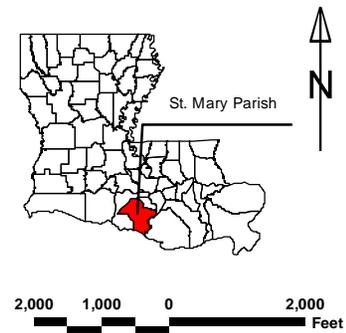
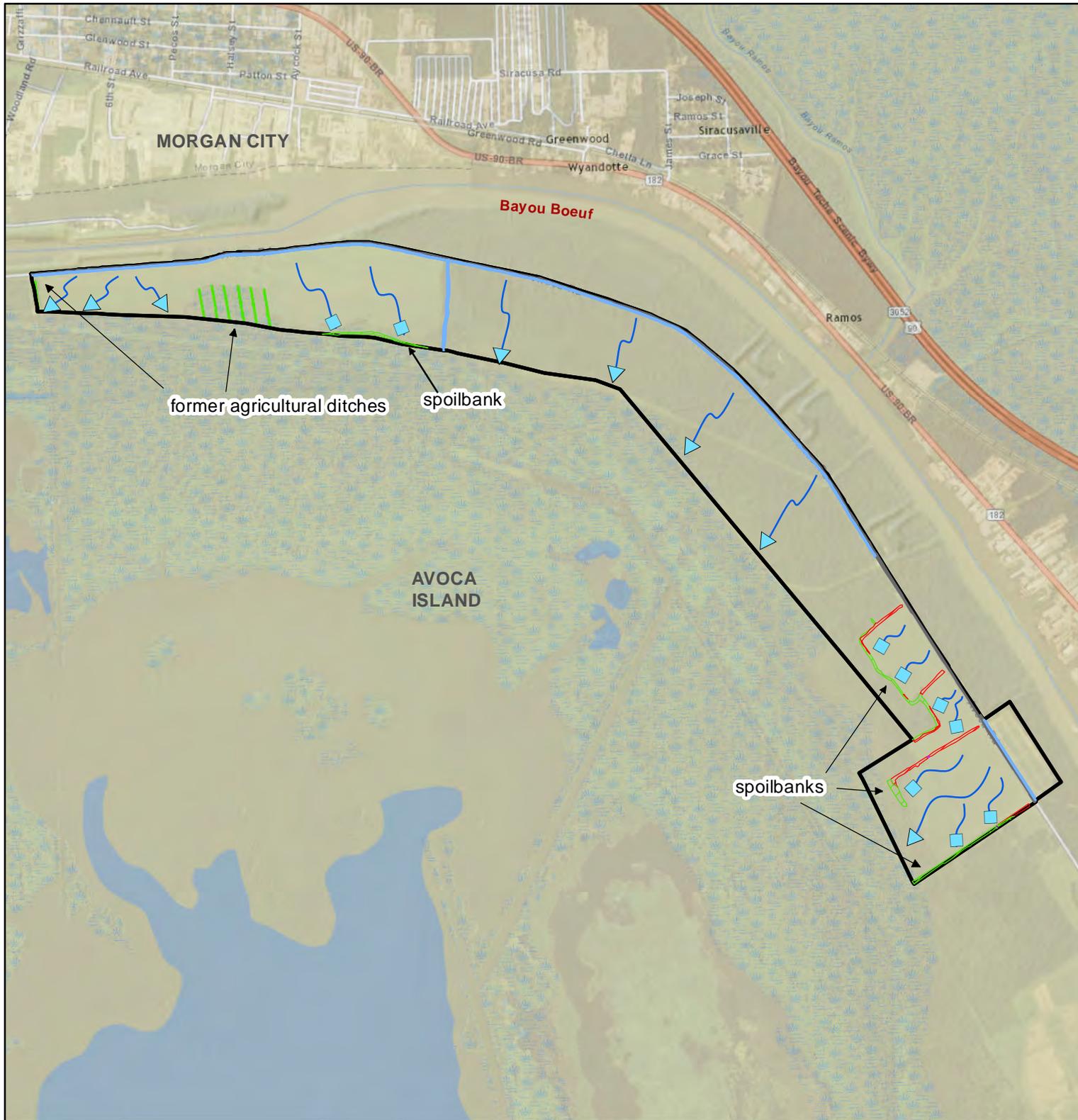
- Legend**
- AIMB (552.4 acres)
  - Drainage Area (16,321.6 acres)
  - Open Water Data Sondes
  - Piezometers

**Note:**  
See Appendix B for Avoca Hydrographs

Heritage Land Management

- Map Notes:**
1. The boundary shown is based on the boundary survey provided by the client.
  2. Map projected to NAD83 UTM Zone 15.
  3. AIMB: Avoca Island Mitigation Bank

|   |
|---|
| <b>Avoca Island Mitigation<br/>Phase One, L.L.C.</b>  |
| <b>New Orleans, LA<br/>AIMB DRAINAGE AREA<br/>HYDROLOGY<br/>MONITORING STATIONS<br/>ST. MARY PARISH, LA</b> |
| <b>Created: JLW/ArcView</b>   |
| <b>Approved: GLF</b>  |
| <b>Date: 08/25/2016</b>   |



**Legend**

- AIMB (552.4 acres)
- Roads (13.9 acres)
- Waterways (1.7 acres)
- ▶ Surface Flow
- Blocked Surface Flow

**Landscape Features**

**Spoilbanks (7.54 acres)**

- Forest (4.7 acres)
- Pasture (2.8 acres)
- Right of Way (0.04 acres)

**Agricultural Ditches (1.2 acres)**

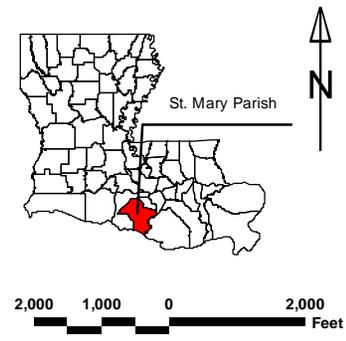
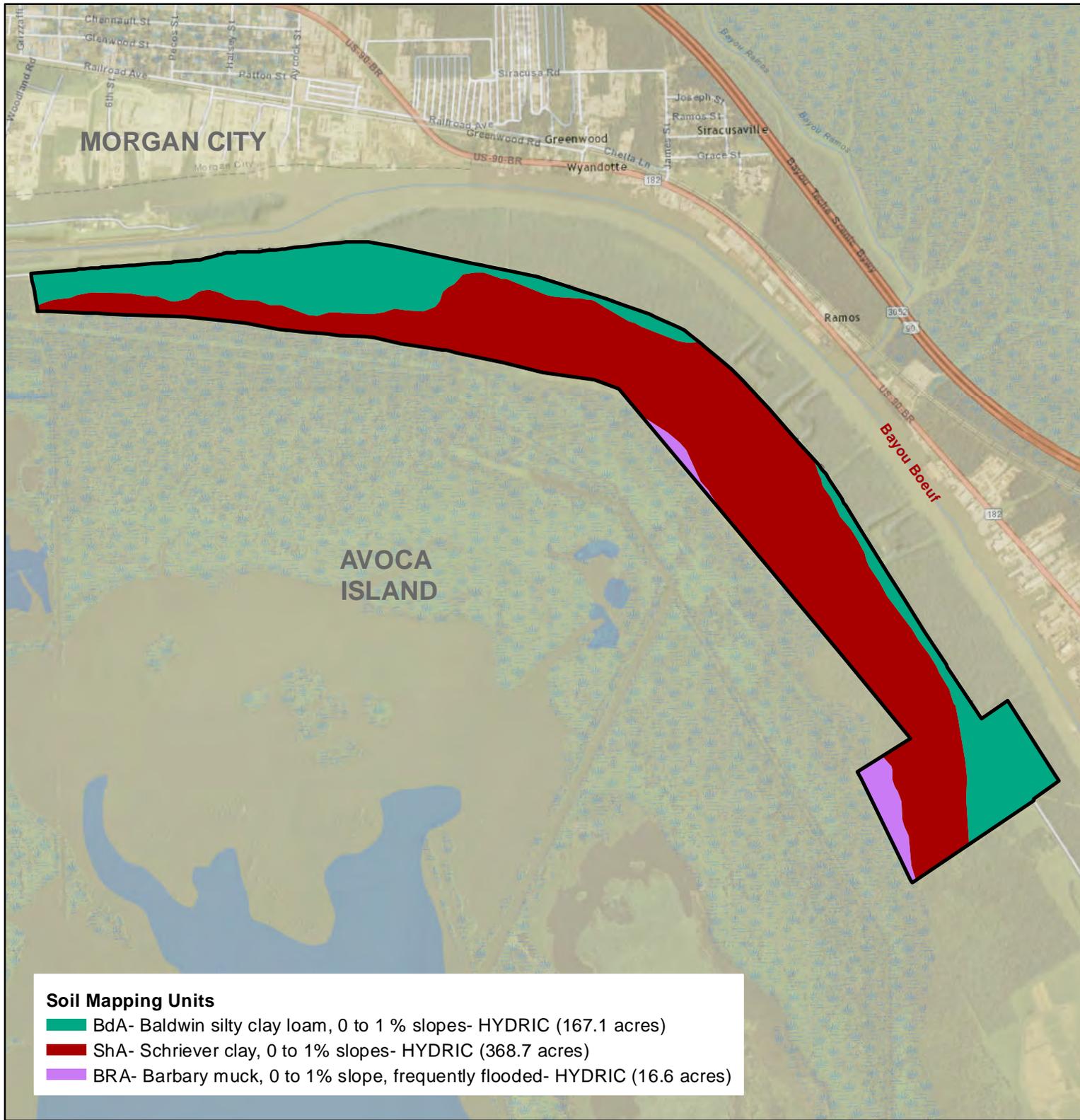
- Forest (1.2 acres)

Heritage Land Management

**Map notes:**

1. The boundary shown is based on the boundary survey provided by the client.
2. Map projected to NAD83 UTM Zone 15.
3. AIMB= Avoca Island Mitigation Bank
4. See Appendix B for hydrology data.

|  |
|--|
| <b>Avoca Island Mitigation<br/>Phase One, L.L.C.</b> |
| <b>New Orleans, LA</b>                               |
| <b>AIMB CURRENT SURFACE<br/>HYDROLOGY</b>            |
| <b>ST. MARY PARISH, LA</b>                           |
| <b>Created: JLW/ArcView</b>                          |
| <b>Approved: GLF</b>                                 |
| <b>Date: 08/25/2016</b>                              |



**Legend**

AIMB (552.4 acres)

Heritage Land Management

- Map Notes:**
1. The boundary shown is based on the boundary survey provided by the client.
  2. Map projected to NAD83 UTM Zone 15.
  3. Soil types based on NRCS Soil Survey
  4. AIMB= Avoca Island Mitigation Bank

**Avoca Island Mitigation Phase One, L.L.C.**

**New Orleans, LA**

**AIMB SOILS**

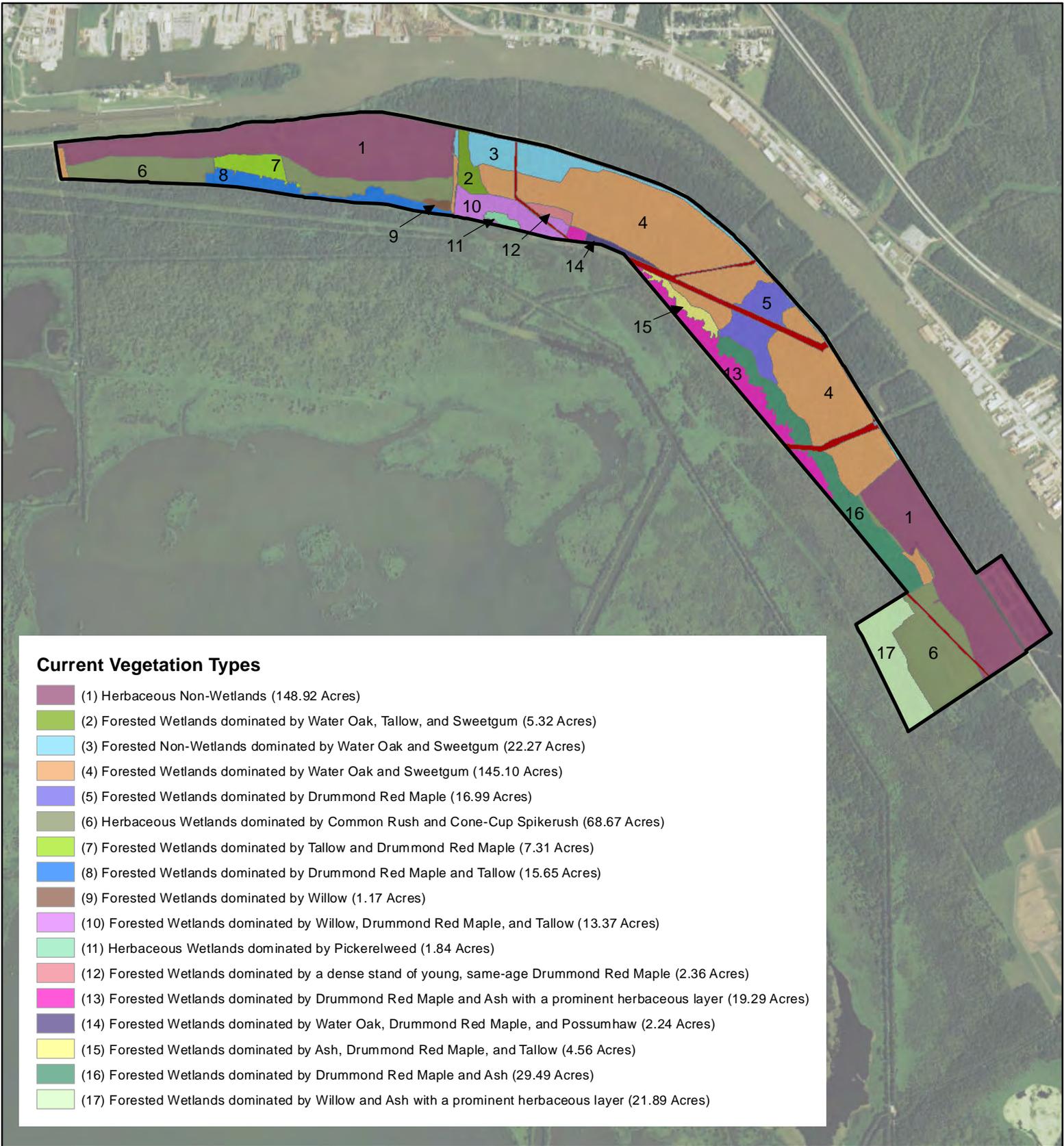
**ST. MARY PARISH, LA**

**Created: JLW/ArcView**

**Approved: GLF**

**Date: 08/25/2016**

| Soil Mapping Units                    |   |
|---------------------------------------|---|
| <span style="color: green;">■</span>  | BdA- Baldwin silty clay loam, 0 to 1 % slopes- HYDRIC (167.1 acres)       |
| <span style="color: red;">■</span>    | ShA- Schriever clay, 0 to 1% slopes- HYDRIC (368.7 acres)                 |
| <span style="color: purple;">■</span> | BRA- Barbary muck, 0 to 1% slope, frequently flooded- HYDRIC (16.6 acres) |



### Current Vegetation Types

- (1) Herbaceous Non-Wetlands (148.92 Acres)
- (2) Forested Wetlands dominated by Water Oak, Tallow, and Sweetgum (5.32 Acres)
- (3) Forested Non-Wetlands dominated by Water Oak and Sweetgum (22.27 Acres)
- (4) Forested Wetlands dominated by Water Oak and Sweetgum (145.10 Acres)
- (5) Forested Wetlands dominated by Drummond Red Maple (16.99 Acres)
- (6) Herbaceous Wetlands dominated by Common Rush and Cone-Cup Spikerush (68.67 Acres)
- (7) Forested Wetlands dominated by Tallow and Drummond Red Maple (7.31 Acres)
- (8) Forested Wetlands dominated by Drummond Red Maple and Tallow (15.65 Acres)
- (9) Forested Wetlands dominated by Willow (1.17 Acres)
- (10) Forested Wetlands dominated by Willow, Drummond Red Maple, and Tallow (13.37 Acres)
- (11) Herbaceous Wetlands dominated by Pickerelweed (1.84 Acres)
- (12) Forested Wetlands dominated by a dense stand of young, same-age Drummond Red Maple (2.36 Acres)
- (13) Forested Wetlands dominated by Drummond Red Maple and Ash with a prominent herbaceous layer (19.29 Acres)
- (14) Forested Wetlands dominated by Water Oak, Drummond Red Maple, and Possumhaw (2.24 Acres)
- (15) Forested Wetlands dominated by Ash, Drummond Red Maple, and Tallow (4.56 Acres)
- (16) Forested Wetlands dominated by Drummond Red Maple and Ash (29.49 Acres)
- (17) Forested Wetlands dominated by Willow and Ash with a prominent herbaceous layer (21.89 Acres)

### Legend

- Phase 1 Boundary (552.41 Acres)
- Other Waters (1.72 Acres)
- Right of Way (13.87 Acres)
- Roads (13.56 Acres)



Heritage Land Management



**Avoca L.L.C.**

**New Orleans, LA  
VEGETATION TYPES**

**ST. MARY PARISH, LA**

Created : AGB/ArcView

Approved : GLF

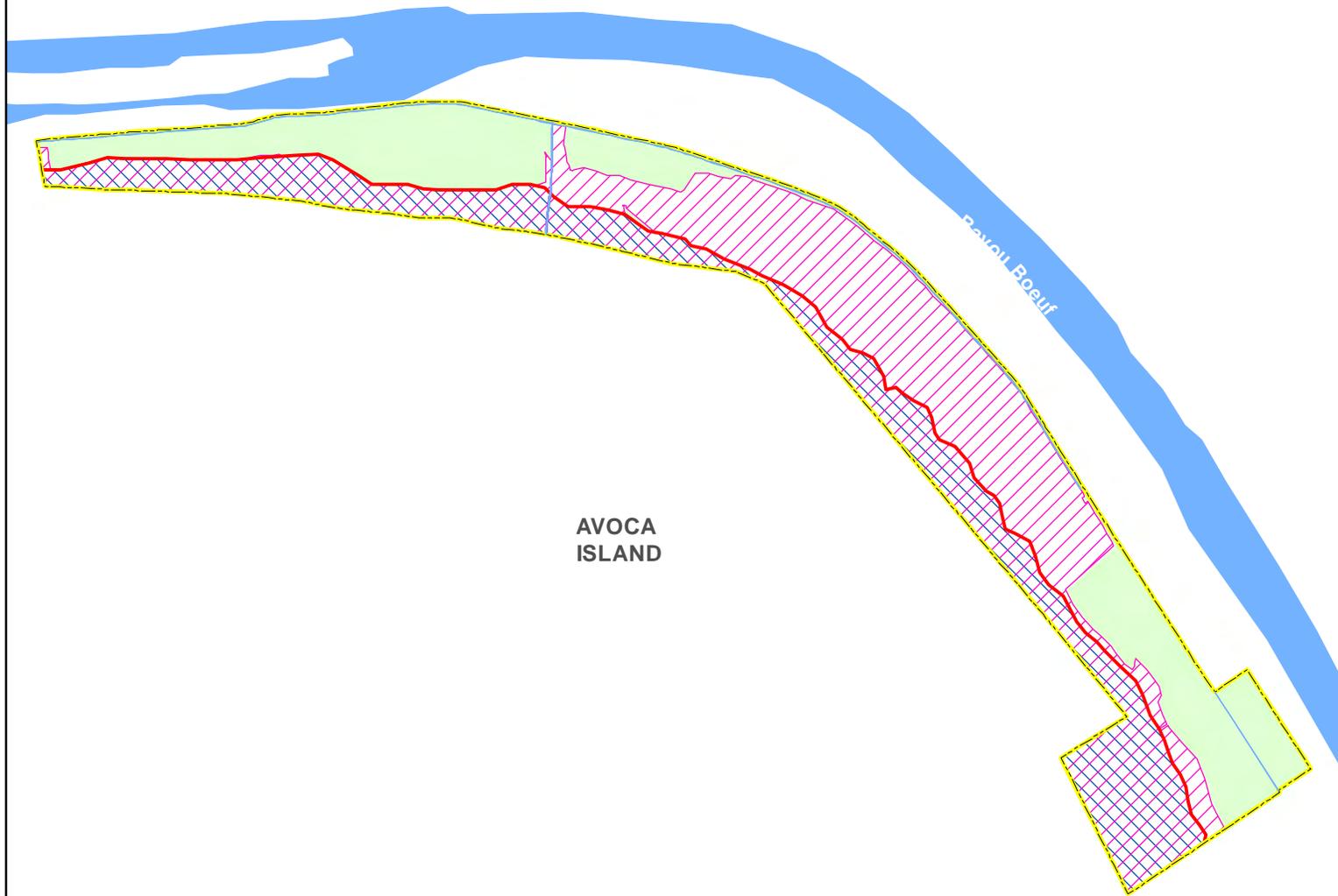
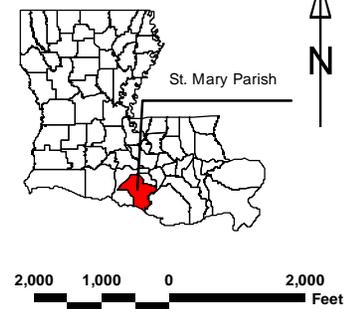
Date : 08/25/2016

Map No. :

FIGURE 15 of 30

### Map Notes:

1. The boundary shown is based on the boundary survey provided by the client.
2. Map projected to NAD83 UTM Zone 15.



**AVOCA ISLAND**

Heritage Land Management

- Map Notes:**
1. The boundary shown is based on the boundary survey provided by the client.
  2. Map projected to NAD83 UTM Zone 15.
  3. OHWM= Ordinary High Water Mark
  4. AIMB= Avoca Island Mitigation Bank
  5. Account Number: MVN-2014-02006-SR

**Avoca Island Mitigation Phase One, L.L.C.**

**New Orleans, LA**

**AIMB JURSDICTIONAL DETERMINATION**

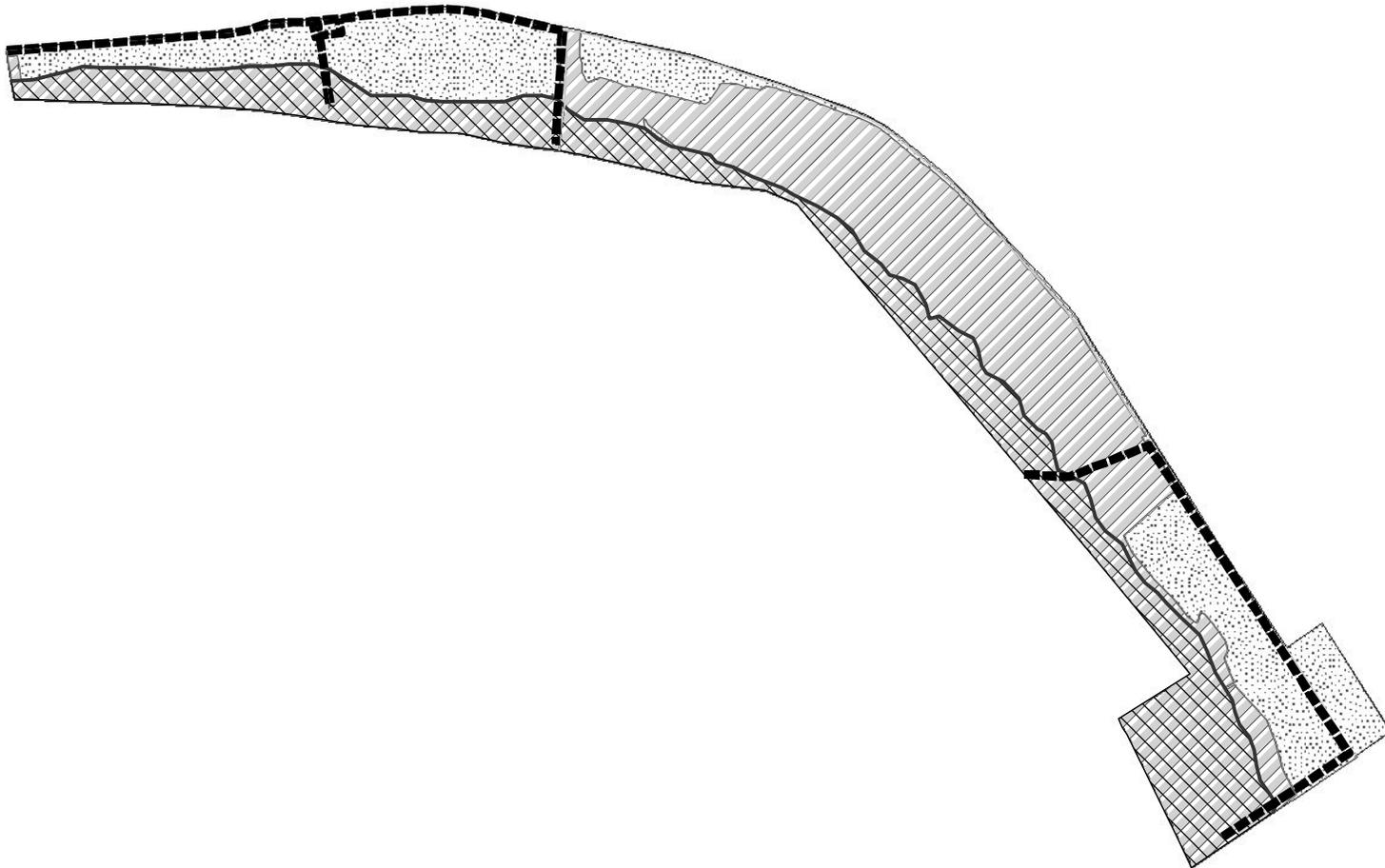
**ST. MARY PARISH, LA**

**Created: JLW/ArcView**

**Approved: GLF**

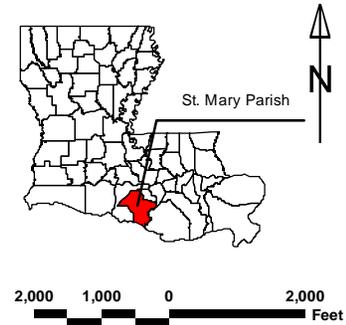
**Date: 08/25/2016**

| Legend  |   |
|---|---|
|  | AIMB (552.4 acres)                                  |
|  | Wetlands (371.0 acres)                              |
|  | Non-Wet (179.7 acres)                               |
|  | Section 10 and 404 Waters of the U.S. (178.3 acres) |
|  | Waterways (1.7 acres)                               |
|  | OHWM (1.9-2.3 ft. NAVD88 Geoid 12A)                 |



**Legend**

-  AIMB (552.4 acres)
-  Wetlands (371.0 acres)
-  Section 10 and 404 Waters of the U.S. (178.3 acres)
-  Non-Wet (179.7 acres)
-  Waterways (1.7 acres)
-  Agricultural/Pastoral Fence to be removed



**Note:**  
Livestock to be removed from bank.



- Map Notes:**
1. The boundary shown is based on the boundary survey provided by the client.
  2. Map projected to NAD83 UTM Zone 15.
  3. OHWM= Ordinary High Water Mark
  4. AIMB= Avoca Island Mitigation Bank
  5. See figure 21, 22, and 23 for cross section

**Avoca Island Mitigation  
Phase One, L.L.C.**

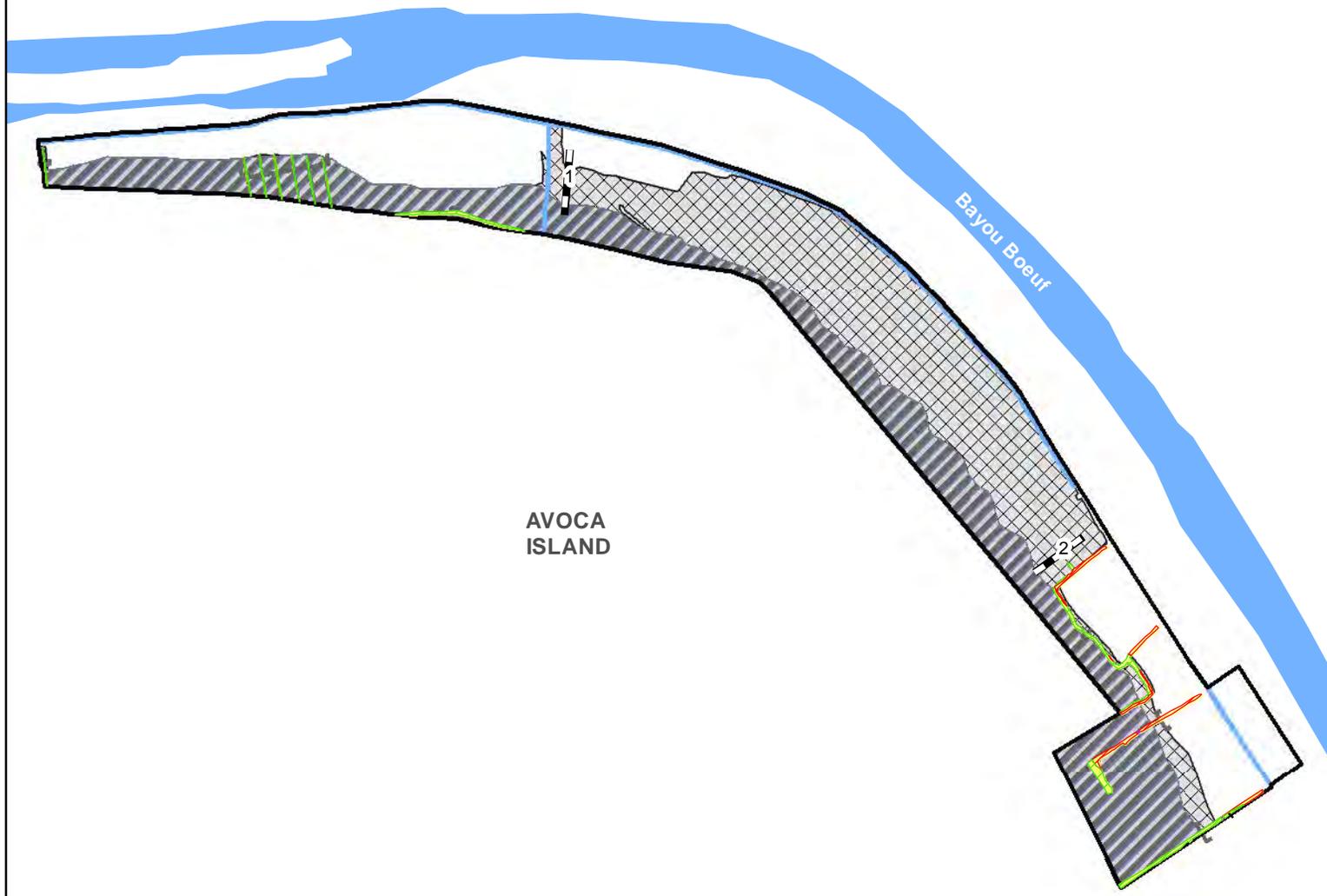
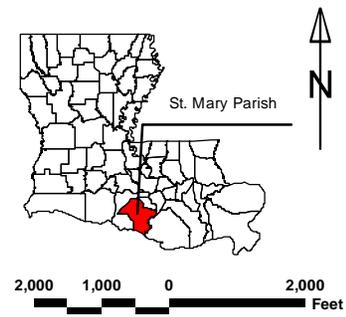
**New Orleans, LA**

**AGRICULTURAL/PASTORAL  
FENCE REMOVAL MAP  
ST. MARY PARISH, LA**

**Created: JLW/ArcView**

**Approved: GLF**

**Date: 08/25/2016**



- Legend**
- AIMB (552.4 acres)
  - Waterways (1.7 acres)
  - Fill (1.2 acres)
  - Reduce to Grade (7.54 acres)
  - Spoilbanks (7.54 Acres)**
    - Right of Way (0.04 acres)
    - Pasture (2.8 acres)
    - Forest (4.7 acres)
  - Agricultural Ditches (1.2 acres)**
    - Forest (1.2 acres)
  - Proposed Wetland Impacts (Excavation)**
    - Section 404 Wetlands (1.9 Acres)
    - Section 404/10 Wetlands (3.7 Acres)
  - Proposed Wetland Impacts (Fill)**
    - Section 404 Wetlands (0.1 Acres)
    - Section 404/10 Wetlands (1.1 Acres)
    - Other Waters
    - Section 404/10 Wetlands (173.3 Acres)
    - Section 404 Wetlands (186.3 Acres)
    - Matchlines

Heritage Land Management

- Map Notes:**
1. The boundary shown is based on the boundary survey provided by the client.
  2. Map projected to NAD83 UTM Zone 15.
  3. OHWM= Ordinary High Water Mark
  4. AIMB= Avoca Island Mitigation Bank

**Avoca Island Mitigation  
Phase One, L.L.C.**

**New Orleans, LA**

**AIMB SOIL AND HYDROLOGY  
WORK PLAN**

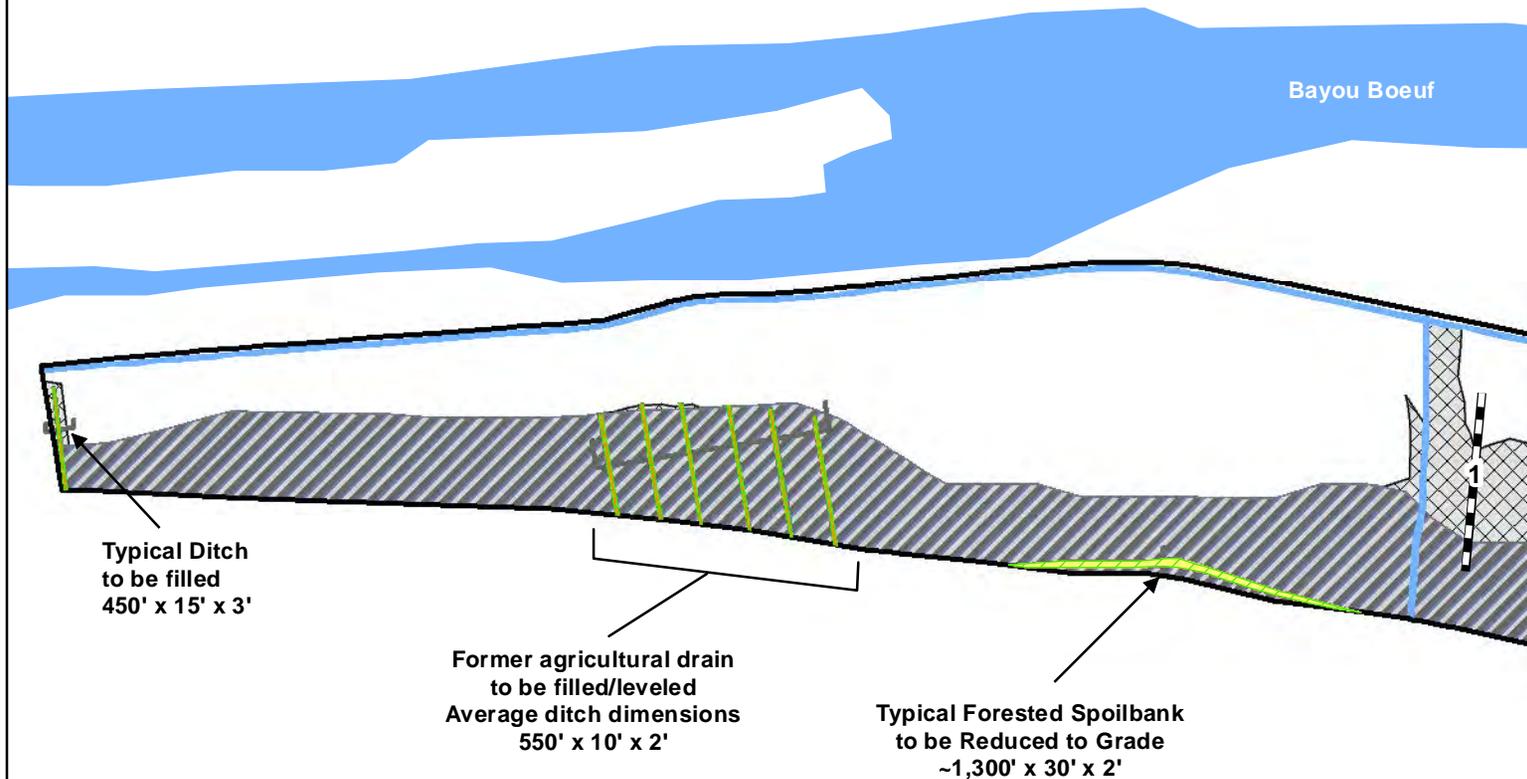
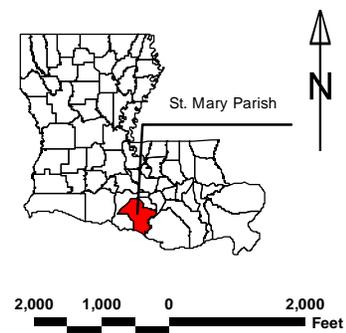
**ST. MARY PARISH, LA**

**Created: JLW/ArcView**

**Approved: GLF**

**Date: 08/25/2016**

**FIGURE 18 of 30**



Heritage Land Management

- Map Notes:**
1. The boundary shown is based on the boundary survey provided by the client.
  2. Map projected to NAD83 UTM Zone 15.
  3. OHWM= Ordinary High Water Mark
  4. AIMB= Avoca Island Mitigation Bank
  5. See Figures 21, 22, and 23 for cross sections

**Avoca Island Mitigation Phase One, L.L.C.**

**New Orleans, LA**

**AIMB SOIL AND HYDROLOGY WORK PLAN**

**ST. MARY PARISH, LA**

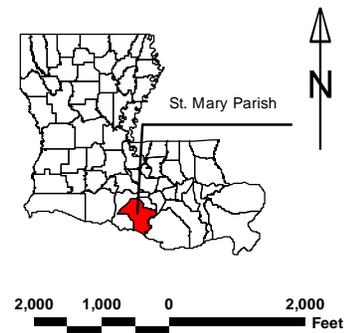
**Created: JLW/ArcView**

**Approved: GLF**

**Date: 08/25/2016**

**AVOCA ISLAND**

- Landscape Features**
- Reduce to Grade (7.54 acres)
  - Fill (1.2 acres)
- Agricultural Ditches (1.2 acres)**
- Forest (1.2 acres)
- Spoilbanks (7.54 acres)**
- Right of Way (0.04 acres)
  - Pasture (2.8 acres)
  - Forest (4.7 acres)
- Wetlands**
- Section 404 Wetlands (186.3 Acres)
  - Section 404/10 Wetlands (173.3 Acres)
  - Section 404 Wetlands (0.1 Acres)
  - Section 404/10 Wetlands (1.1 Acres)
  - Section 404 Wetlands (1.9 Acres)
  - Section 404/10 Wetlands (3.7 Acres)
- Other Waters**



- Legend**
- AIMB (552.4 acres)
  - Waterways (1.7 acres)
  - Cross Section
  - Matchlines
- Landscape Features**
- Right of Way (0.04 acres)
  - Pasture (2.8 acres)
  - Forest (4.7 acres)
- Agricultural Ditches (1.2 acres)**
- Forest (1.2 acres)
  - Fill (1.2 acres)
  - Reduce to Grade (7.54 acres)
- Wetlands**
- Section 404 Wetlands (1.9 Acres)
  - Section 404/10 Wetlands (3.7 Acres)
  - Section 404 Wetlands (0.1 Acres)
  - Section 404/10 Wetlands (1.1 Acres)
  - Other Waters
  - Section 404/10 Wetlands (173.3 Acres)
  - Section 404 Wetlands (186.3 Acres)

**Heritage Land Management**

<http://www.hlm.com>

1. The boundary shown is based on the boundary survey provided by the client.
2. Map projected to NAD83 UTM Zone 15.
3. OHWM= Ordinary High Water Mark
4. AIMB= Avoca Island Mitigation Bank
5. See figure 21, 22, and 23 for cross section

**Avoca Island Mitigation  
Phase One, L.L.C.**

**New Orleans, LA**

**AIMB SOIL AND HYDROLOGY  
WORK PLAN**

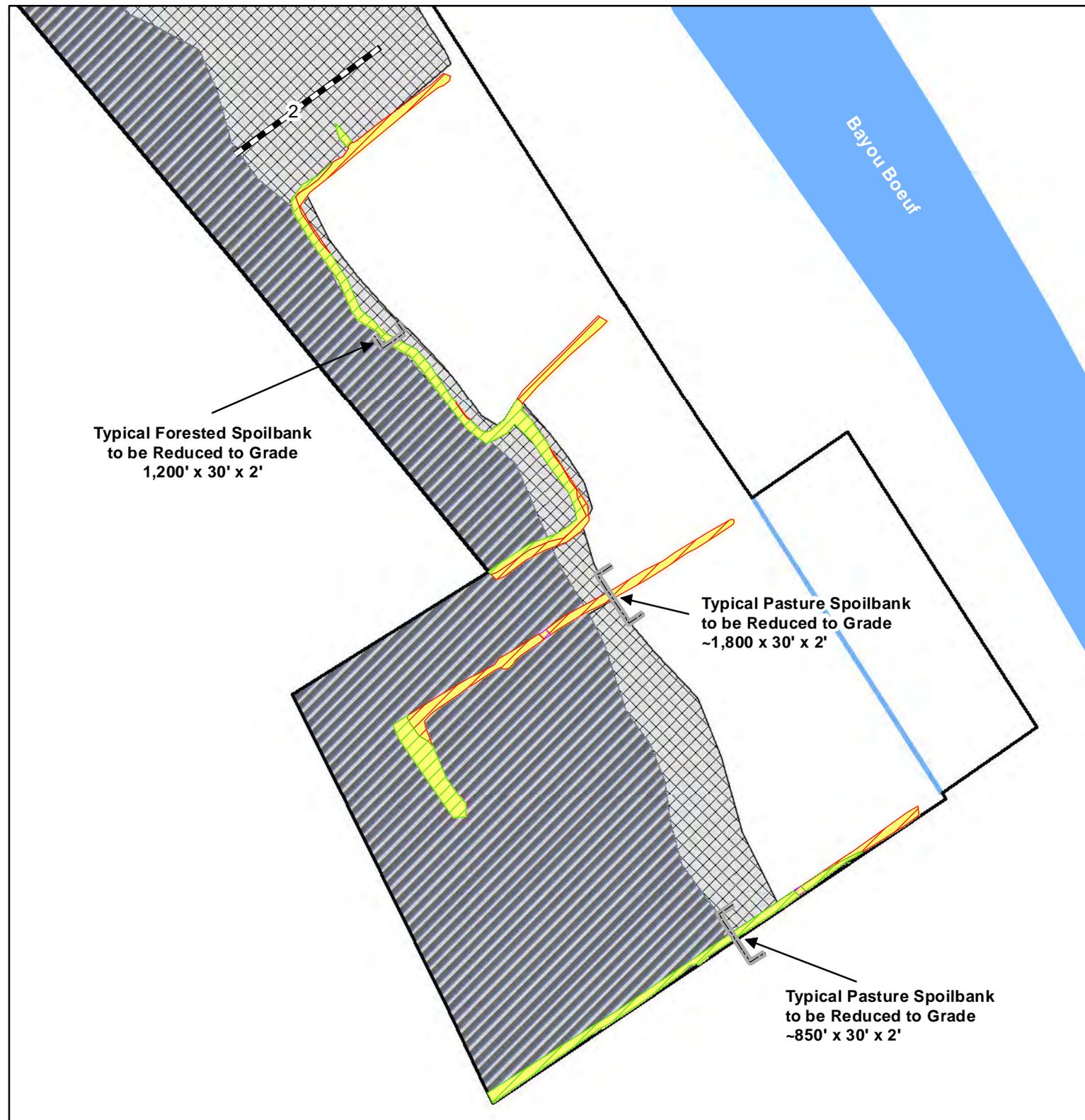
**ST. MARY PARISH, LA**

**Created: JLW/ArcView**

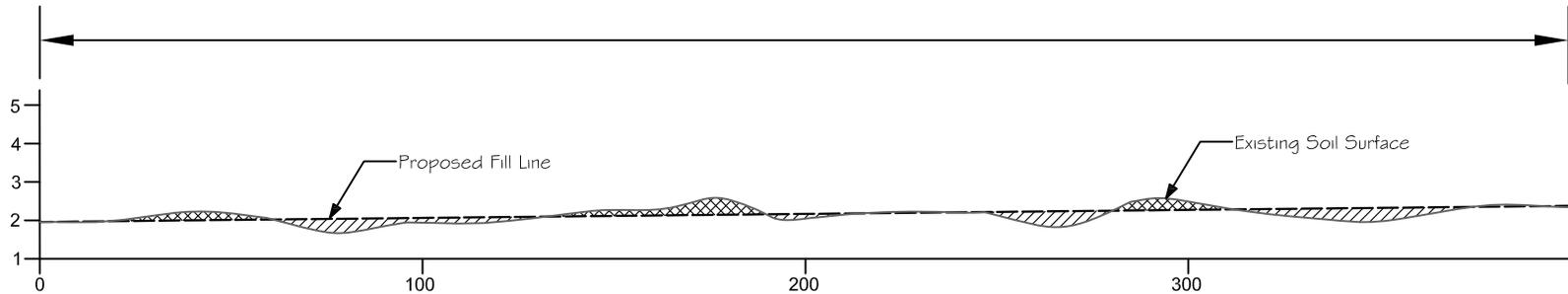
**Approved: GLF**

**Date: 08/25/2016**

**FIGURE 20 of 30**



Existing Forested Wetland  
Fill/Level Former Agricultural Ditches



Typical Agricultural Drains & Invasive Species Removal  
10:1 Vertical Exaggeration

Proposed Excavation:  
Approx. 19,000 cu yds

Proposed Fill:  
Approx. 8,200 cu yds

-  Proposed Excavation
-  Proposed Fill

Notes:

1. Ditch plugs will be 15' L x 10' W x 3' D (ditch depth).
2. Fill material will be obtained from onsite grading of existing spoil banks.
3. All excess fill will be removed and placed in a non wet location (approx. 10,800 cu yds).
4. Vegetation will be removed by grinding/chipping and/or by clearing, stacking, and burning.



Map Notes:

1. The boundary shown is based on the boundary survey provided by the client.
2. Map projected to NAD83 UTM Zone 15.
3. AIMB = Avoca Island Mitigation Bank



Avoca Island Mitigation  
Phase One, L.L.C.  
New Orleans, LA  
CROSS SECTIONS

ST. MARY PARISH, LA

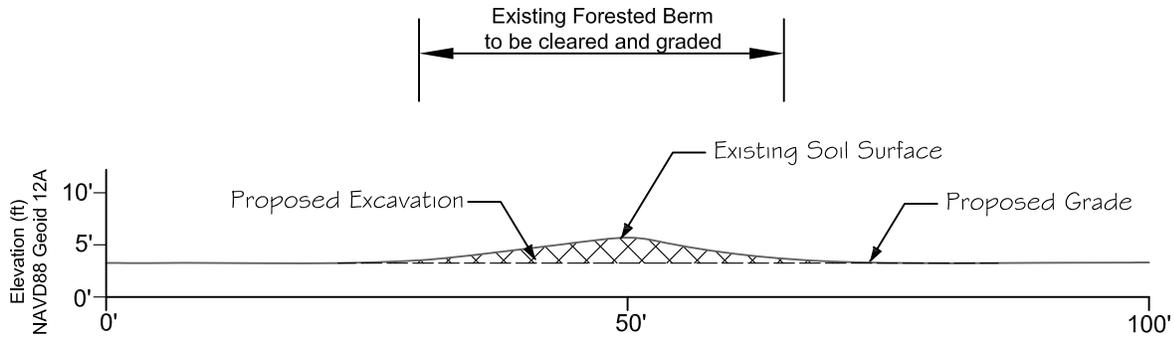
Created: AGB

Approved: GLF

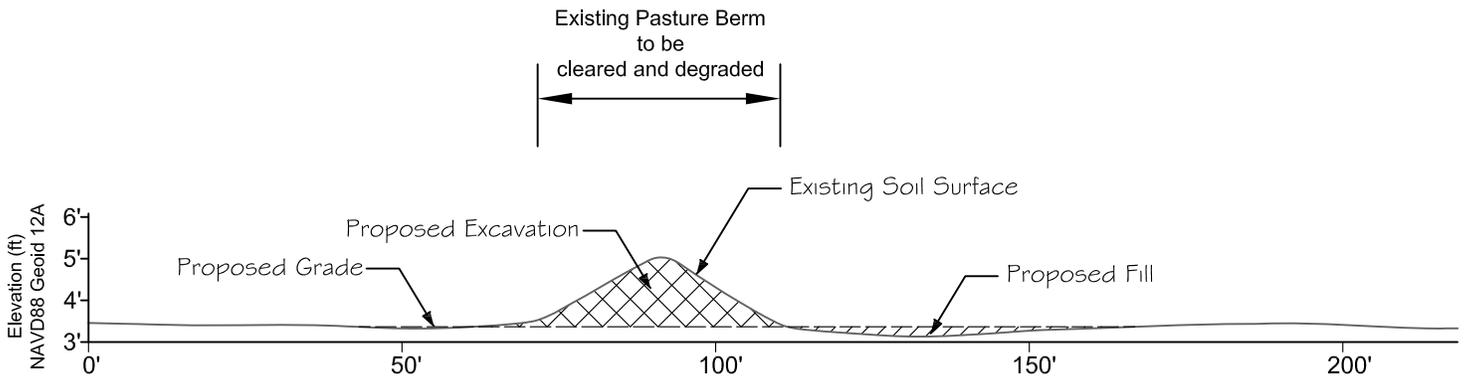
Date: 08/25/2016

Map No.:

FIGURE 21 of 28



Typical Forested Spoil Bank/Berm Removal  
5:1 Vertical Exaggeration



Typical Pasture Spoil Bank/Berm Removal  
5:1 Vertical Exaggeration

Proposed Excavation:  
Approx. 19,000 cu yds

Proposed Fill:  
Approx. 8,200 cu yds

-  Proposed Excavation
-  Proposed Fill

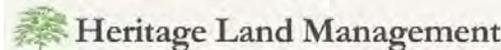
Notes:

1. Ditch plugs will be 15' L x 10' W x 3' D (ditch depth).
2. Fill material will be obtained from onsite grading of existing spoil banks.
3. All excess fill will be removed and placed in a non wet location (10,800 cu yds).
4. Vegetation will be removed by grinding/chipping and/or by clearing, stacking, and burning.



Map Notes:

1. The boundary shown is based on the boundary survey provided by the client.
2. Map projected to NAD83 UTM Zone 15.
3. AIMB = Avoca Island Mitigation Bank



Avoca Island Mitigation  
Phase One, L.L.C.  
New Orleans, LA  
CROSS SECTIONS

ST. MARY PARISH, LA

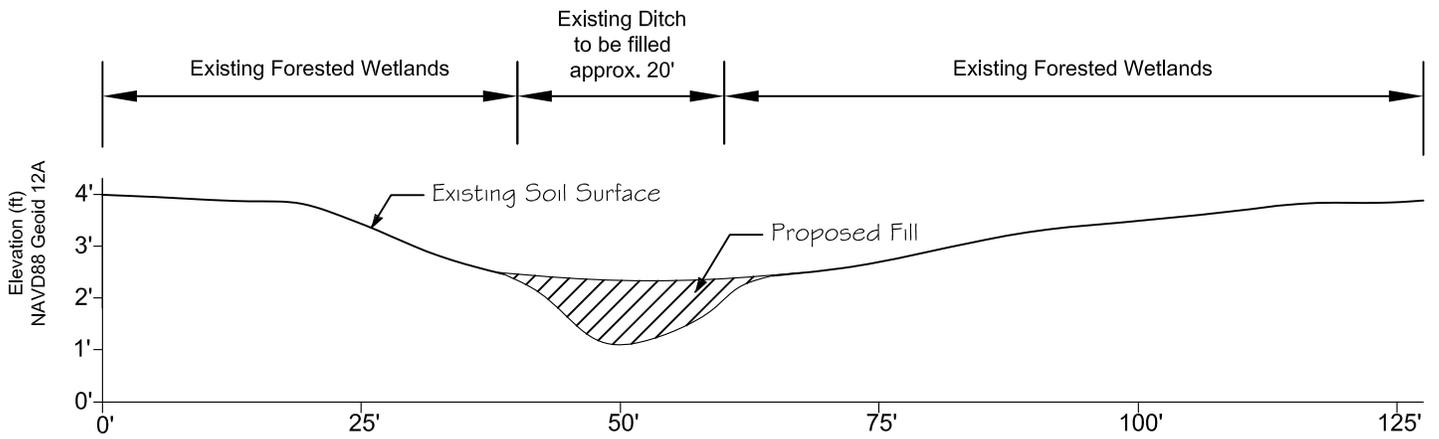
Created: AGB

Approved: GLF

Date: 08/25/2016

Map No.:

FIGURE 22 of 28



Typical Ditch to be Filled  
5:1 Vertical Exaggeration

Proposed Excavation:  
Approx. 19,000 cu yds

Proposed Fill:  
Approx. 8,200 cu yds

-  Proposed Excavation
-  Proposed Fill

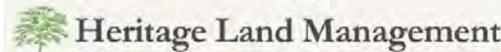
Notes:

1. Ditch plugs will be 15' L x 10' W x 3' D (ditch depth).
2. Fill material will be obtained from onsite grading of existing spoil banks.
3. All excess fill will be removed and placed in a non wet location (10,800 cu yds).
4. Vegetation will be removed by grinding/chipping and/or by clearing, stacking, and burning.



Map Notes:

1. The boundary shown is based on the boundary survey provided by the client.
2. Map projected to NAD83 UTM Zone 15.
3. AIMB = Avoca Island Mitigation Bank



Avoca Island Mitigation  
Phase One, L.L.C.  
New Orleans, LA  
CROSS SECTIONS

ST. MARY PARISH, LA

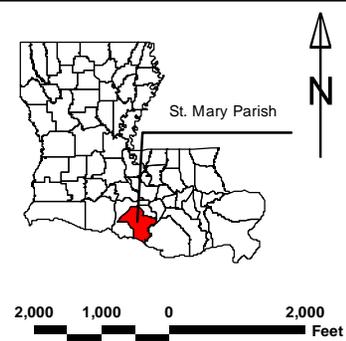
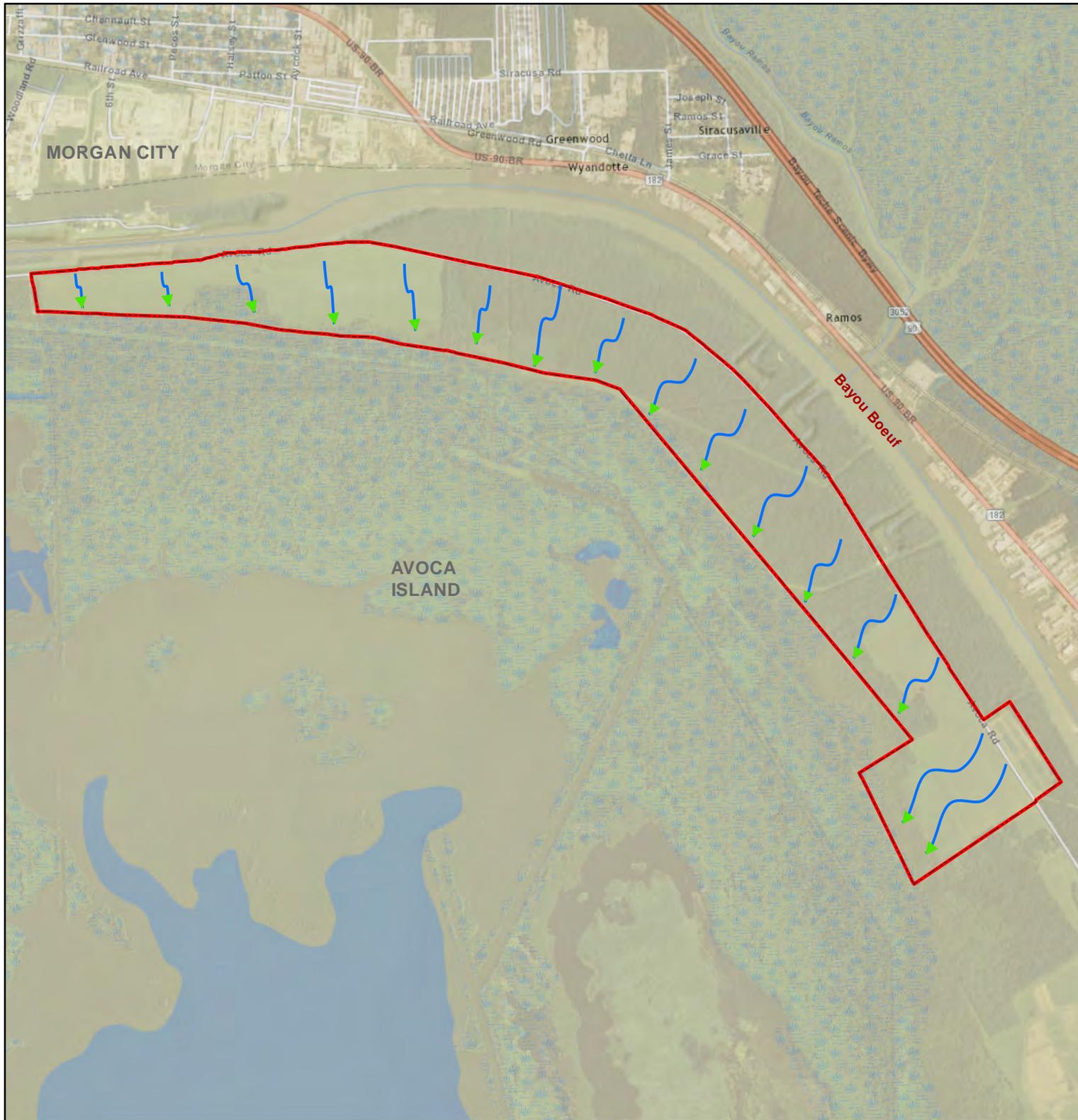
Created: AGB

Approved: GLF

Date: 08/25/2016

Map No.:

FIGURE 23 of 28



**Legend**

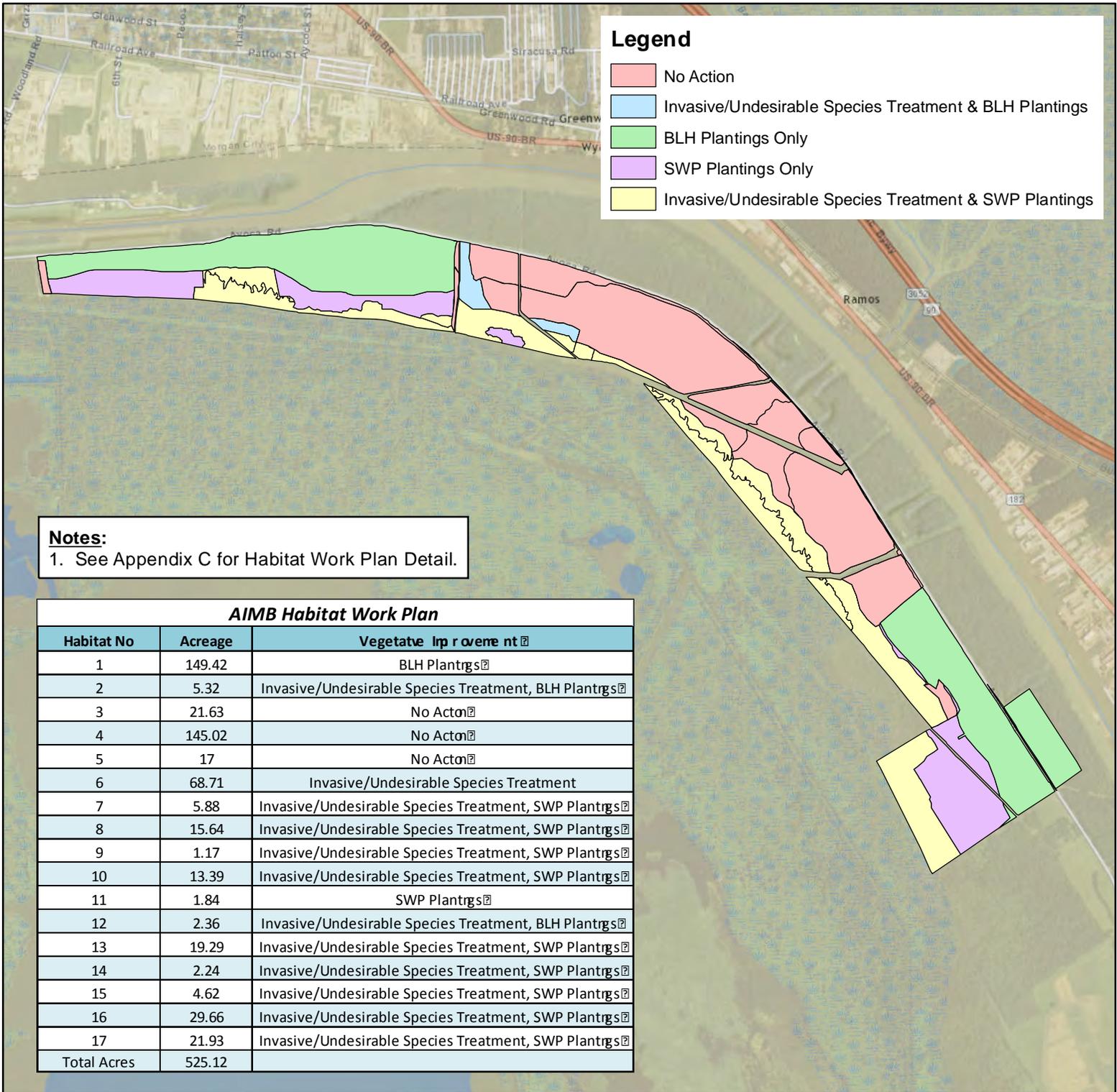
- AIMB (552.4 acres)
- Water Flow

Heritage Land Management

**Map Notes:**

1. The boundary shown is based on the boundary survey provided by the client.
2. Map projected to NAD83 UTM Zone 15.
3. AIMB= Avoca Island Mitigation Bank

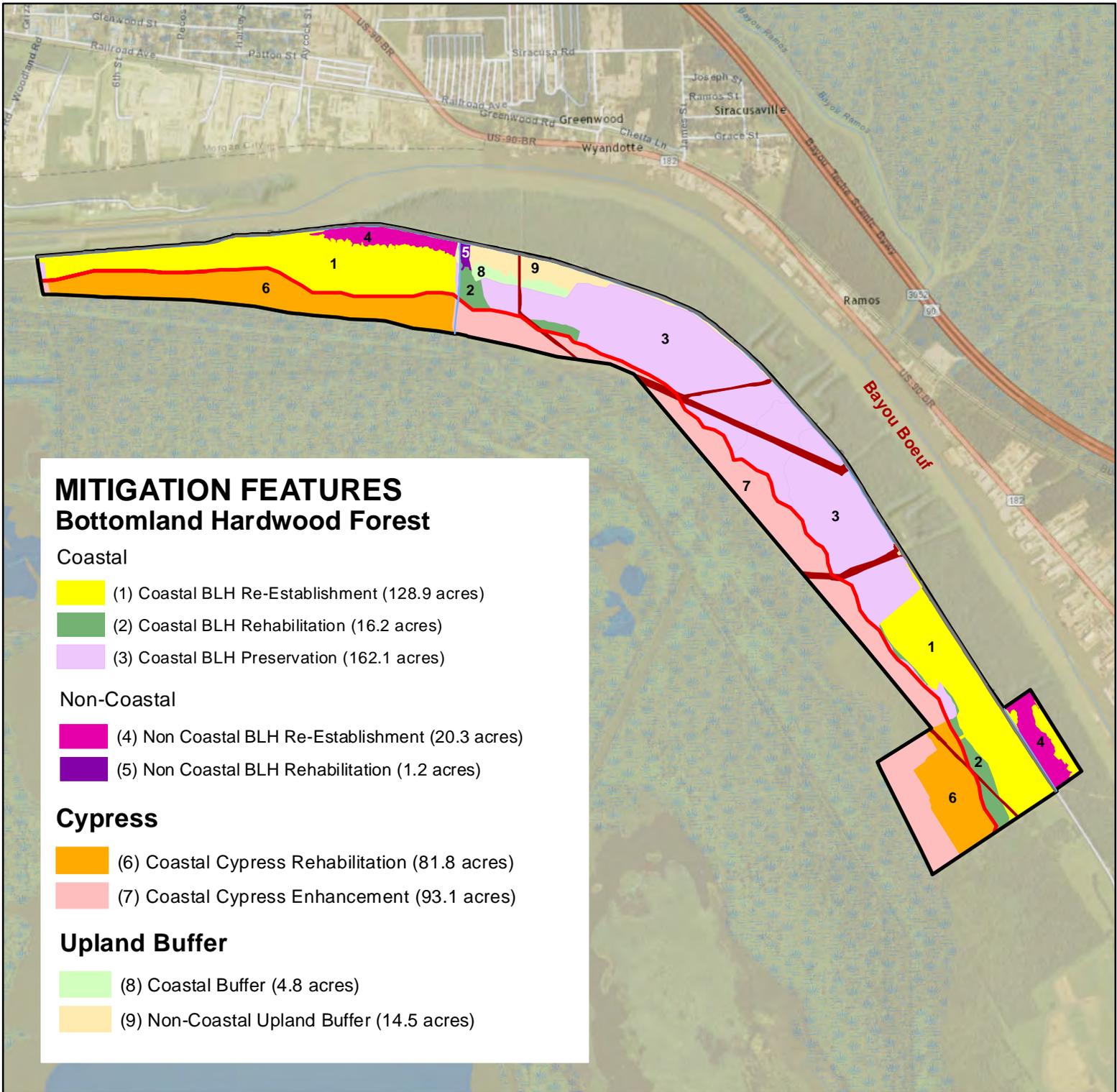
|  |
|--|
| <b>Avoca Island Mitigation<br/>Phase One, L.L.C.</b> |
| <b>New Orleans, LA</b>                               |
| <b>AIMB POST CONSTRUCTION<br/>HYDROLOGY</b>          |
| <b>ST. MARY PARISH, LA</b>                           |
| <b>Created: JLW/ArcView</b>                          |
| <b>Approved: GLF</b>                                 |
| <b>Date: 08/25/2016</b>                              |
| <b>FIGURE 24 of 30</b>                               |



2,000 1,000 0 2,000 Feet

**Map Notes:**  
 1. The boundary shown is based on the boundary survey provided by the client.  
 2. Map projected to NAD83 UTM Zone 15.  
 3. AIMB= Avoca Island Mitigation Bank  
 4. OHWM= Ordinary High Water Mark

Avoca Island Mitigation Phase One, L.L.C.  
 New Orleans, LA  
**AIMB HABITAT WORK PLAN**  
**ST. MARY PARISH**  
 Created : AGB/ArcView  
 Approved : GLF  
 Date : 08/25/2016  
 Map No. :  
**FIGURE 25 of 30**



## MITIGATION FEATURES Bottomland Hardwood Forest

### Coastal

- (1) Coastal BLH Re-Establishment (128.9 acres)
- (2) Coastal BLH Rehabilitation (16.2 acres)
- (3) Coastal BLH Preservation (162.1 acres)

### Non-Coastal

- (4) Non Coastal BLH Re-Establishment (20.3 acres)
- (5) Non Coastal BLH Rehabilitation (1.2 acres)

### Cypress

- (6) Coastal Cypress Rehabilitation (81.8 acres)
- (7) Coastal Cypress Enhancement (93.1 acres)

### Upland Buffer

- (8) Coastal Buffer (4.8 acres)
- (9) Non-Coastal Upland Buffer (14.5 acres)

### Legend

- AIMB (552.4 acres)
- Roads (13.9 acres)
- Right of Way (13.9 acres)
- Waterways (1.7 acres)
- OHWM (1.9- 2.3 ft. NAVD88 Geoid 12A)

### Map Notes:

1. The boundary shown is based on the boundary survey provided by the client.
2. Map projected to NAD83 UTM Zone 15.
3. AIMB= Avoca Island Mitigation Bank
4. OHWM= Ordinary High Water Mark

2,000 1,000 0 2,000 Feet



Avoca Island Mitigation Phase One, L.L.C.

New Orleans, LA

AIMB MITIGATION FEATURES

ST. MARY PARISH

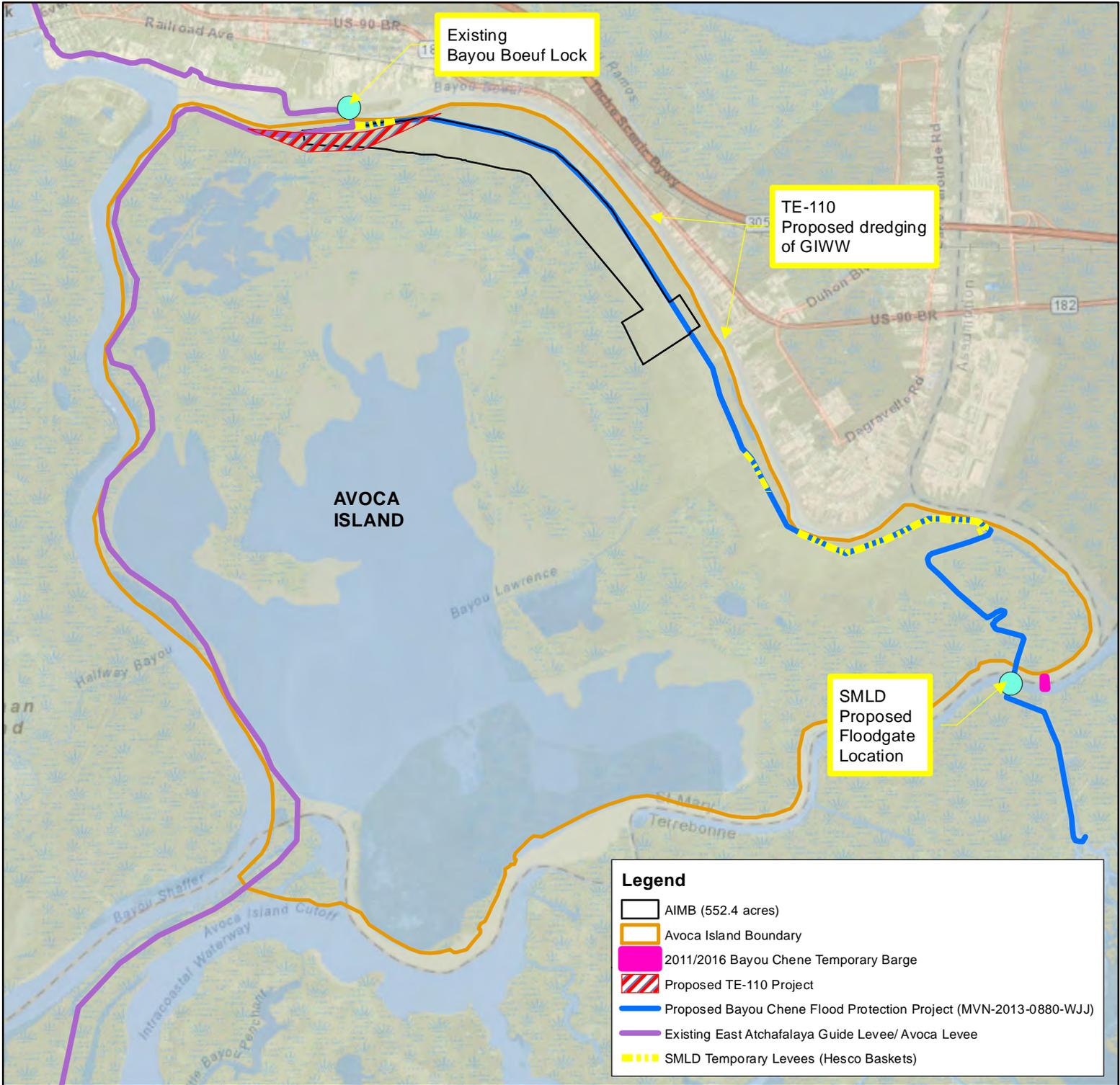
Created : JLW/ArcView

Approved : GLF

Date : 08/25/2016

Map No. :

FIGURE 26 OF 30

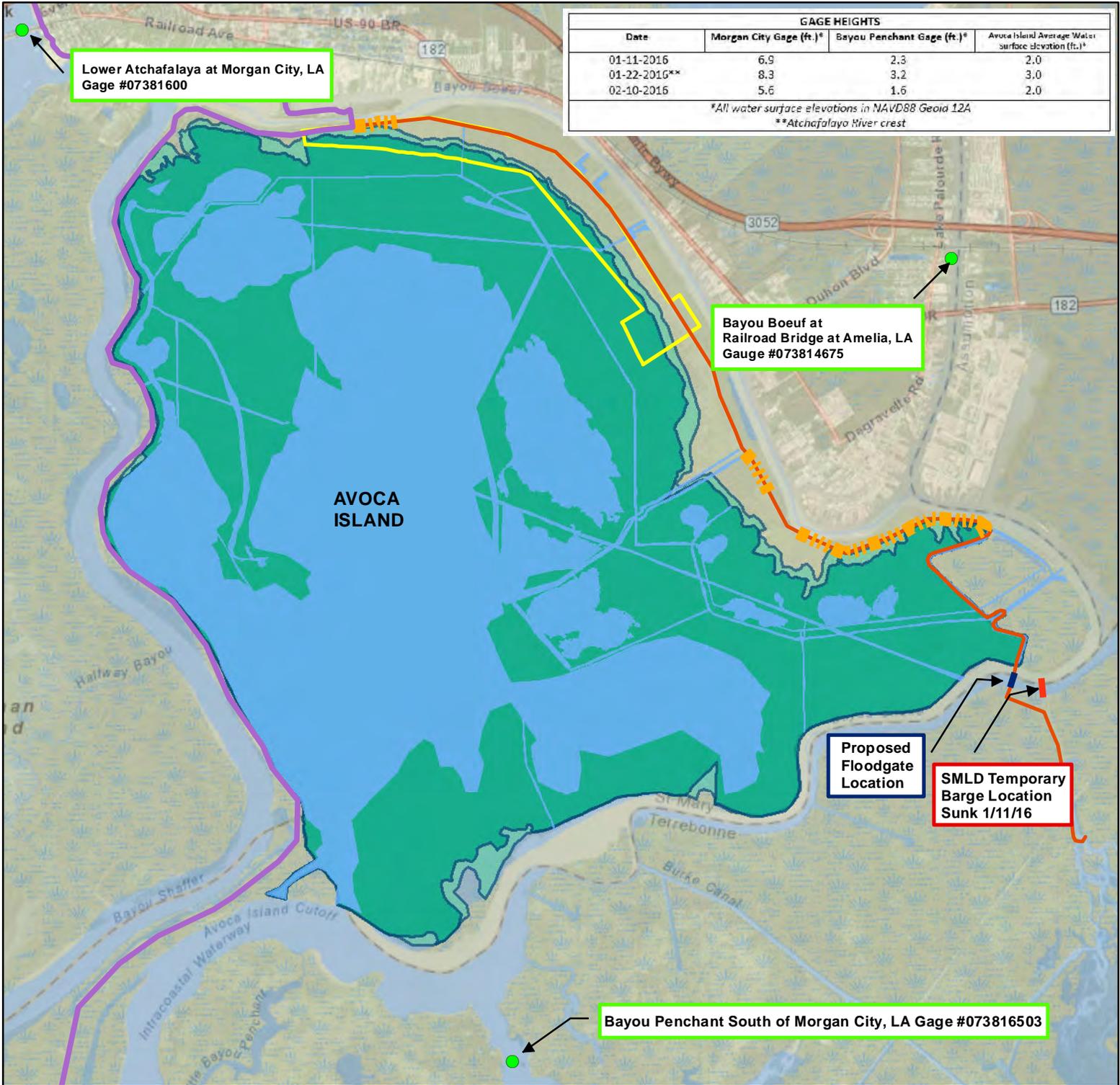


TE-110 = Increase Atchafalaya flow to Terrebonne

- Map Notes:**
1. The boundary shown is based on the boundary survey provided by the client.
  2. Map projected to NAD83 UTM Zone 15.
  3. SMLD= Saint Mary Levee District
  4. AIMB= Avoca Island Mitigation Bank



|   |             |
|---|-------------|
| <b>Avoca Island Mitigation Phase One, L.L.C.</b>              |             |
| New Orleans, LA   |             |
| <b>PROPOSED/TEMPORARY HYDROLOGIC PROJECTS ST. MARY PARISH</b> |             |
| Created :   | AGB/ArcView |
| Approved :  | GLF         |
| Date :  | 08/25/2016  |
| Map No. :   |             |
| <b>FIGURE 27 of 30</b>  |             |



| GAGE HEIGHTS |                         |                            |   |
|--------------|-------------------------|----------------------------|---|
| Date         | Morgan City Gage (ft.)* | Bayou Penchant Gage (ft.)* | Avoca Island Average Water surface elevation (ft.)* |
| 01-11-2016   | 6.9                     | 2.3                        | 2.0   |
| 01-22-2016** | 8.3                     | 3.2                        | 3.0   |
| 02-10-2016   | 5.6                     | 1.6                        | 2.0   |

\*All water surface elevations in NAVD88 Geoid 12A  
 \*\*Atchafalaya River crest

**Legend**

- AIMB (552.4 acres)
- Inundation Area: 3 ft. NAVD88 Geoid 12A (7,452 acres)
- Inundation Area: 2 ft. NAVD88 Geoid 12A (6,389.1 acres)
- SMLD Temporary Levees
- SMLD Proposed Levee
- East Atchafalaya Guide Levee/ Avoca Levee

**Map Notes:**

1. The boundary shown is based on the boundary survey provided by the client.
2. Map projected to NAD83 UTM Zone 15.
3. SMLD= Saint Mary Levee District
4. AIMB= Avoca Island Mitigation Bank

1.0   0.5   0   1.0 Miles

N

Heritage Land Management

**Avoca Island Mitigation Phase One, L.L.C.**

**New Orleans, LA**

**AIMB AVOCA ISLAND INUNDATION**

**ST. MARY PARISH**

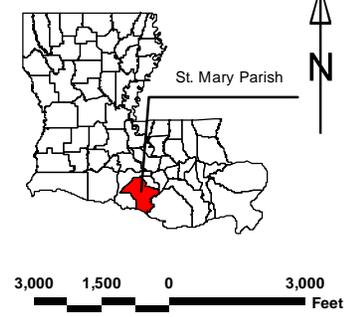
Created : JLW/ArcView

Approved : GLF

Date : 08/25/2016

Map No. :

**FIGURE 28 of 30**



**Legend**

- AIMB (552.4 acres)
- Rights of Way
- Avoca Rd
- Adjacent Rights of Way

Heritage Land Management

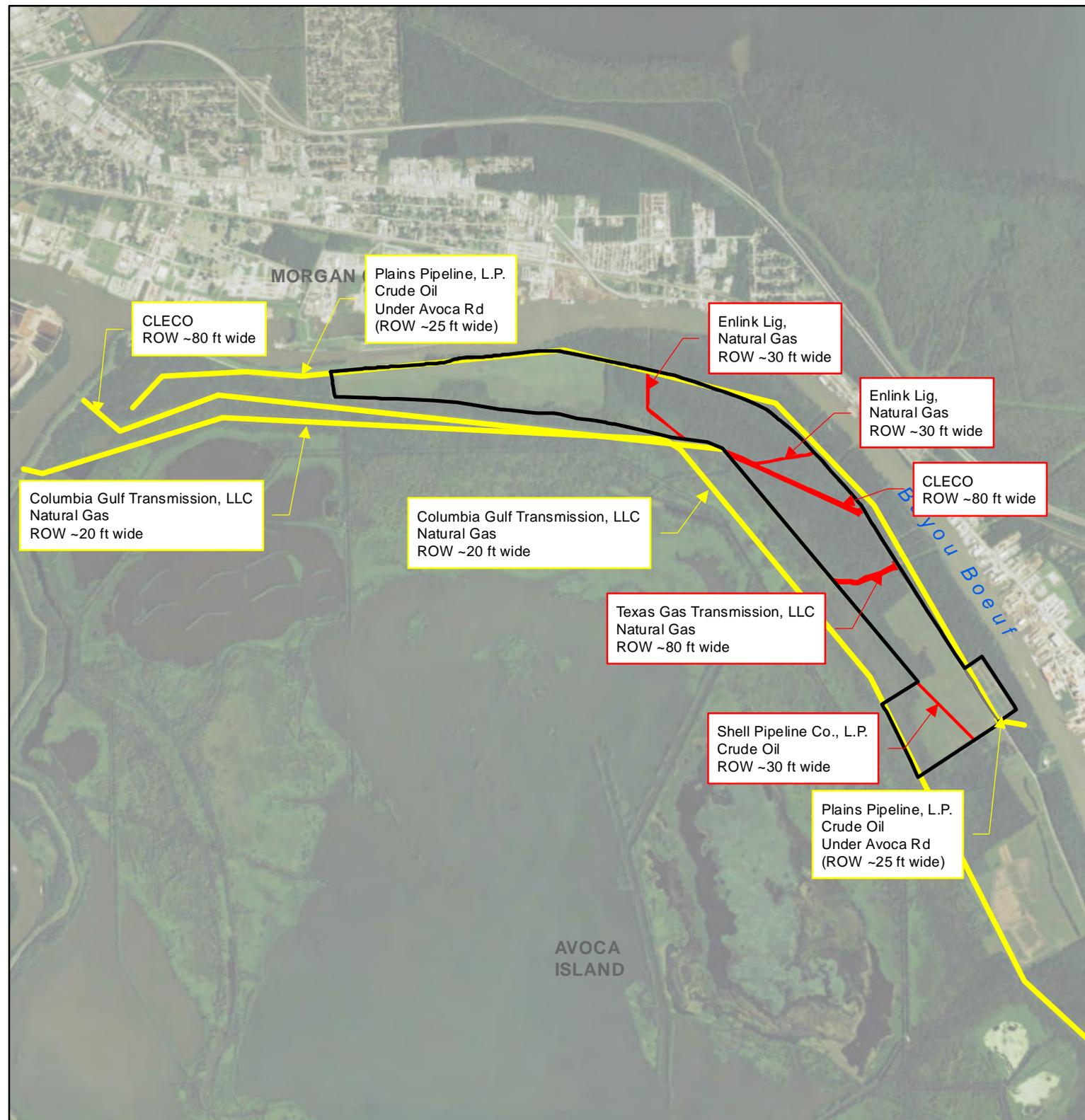
- Map Notes:**
1. The boundary shown is based on the boundary survey provided by the client.
  2. Map projected to NAD83 UTM Zone 15.
  3. AIMB: Avoca Island Mitigation Bank
  4. ROW information obtained from <https://www.npms.phmsa.dot.gov>

**Avoca Island Mitigation Phase One, L.L.C.**  
New Orleans, LA

**EXISTING PIPELINE ROWS**  
**ST. MARY PARISH, LA**

**Created: AGB/ArcView**  
**Approved: GLF**  
**Date: 08/25/2016**

**FIGURE 29 of 30**

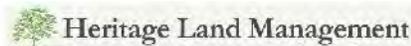




- Legend**
- Louisiana Coastal Zone Boundary
  - Hydrologic Unit**
  - Primary Service Area
  - Secondary
  - ★ AIMB (552.4 acres)



08090302: USGS HUC



**Map Notes:**

1. The boundary shown is based on the boundary survey provided by the client.
2. Map projected to NAD83 UTM Zone 15.
3. AIMB= Avoca Island Mitigation Bank

**Avoca Island Mitigation Phase One, L.L.C.**

**New Orleans, LA**

**AIMB SERVICE AREA MAP**

**ST. MARY PARISH, LA**

Created : JLW/ArcView

Approved : GLF

Date : 08/25/2016

Map No. :



# Avoca Island Mitigation Bank

## Appendix A - Photographs

Avoca Island Mitigation Bank-Prospectus Appendix A -  
Photographs



Photo 1-Aerial View of Upper Pasture near Bayou Boeuf Lock Structure



Photo 2-Aerial View of Upper Pasture, Forested Habitat, and Avoca Island

Avoca Island Mitigation Bank-Prospectus Appendix A -  
Photographs



Photo 3-Aerial View of Lower Pasture and Forested Habitat



Photo 4- Typical Herbaceous Wetland Below the OHWM dominated by Cone-Cup Spikerush,  
Annual Marsh Elder, and Common Rush (SWP Rehabilitation)

Avoca Island Mitigation Bank-Prospectus Appendix A -  
Photographs



Photo 5: Typical Herbaceous Non-Wetland Above the OHWM dominated by Brazilian Vervain, Bushy Bluestem, and Canada Goldenrod (BLH Re-establishment)



Photo 6: Typical Forested Wetland below the OHWM Dominated by Chinese Tallow, American Elm, and Drummond's Maple (SWP Rehabilitation)

Avoca Island Mitigation Bank-Prospectus Appendix A -  
Photographs

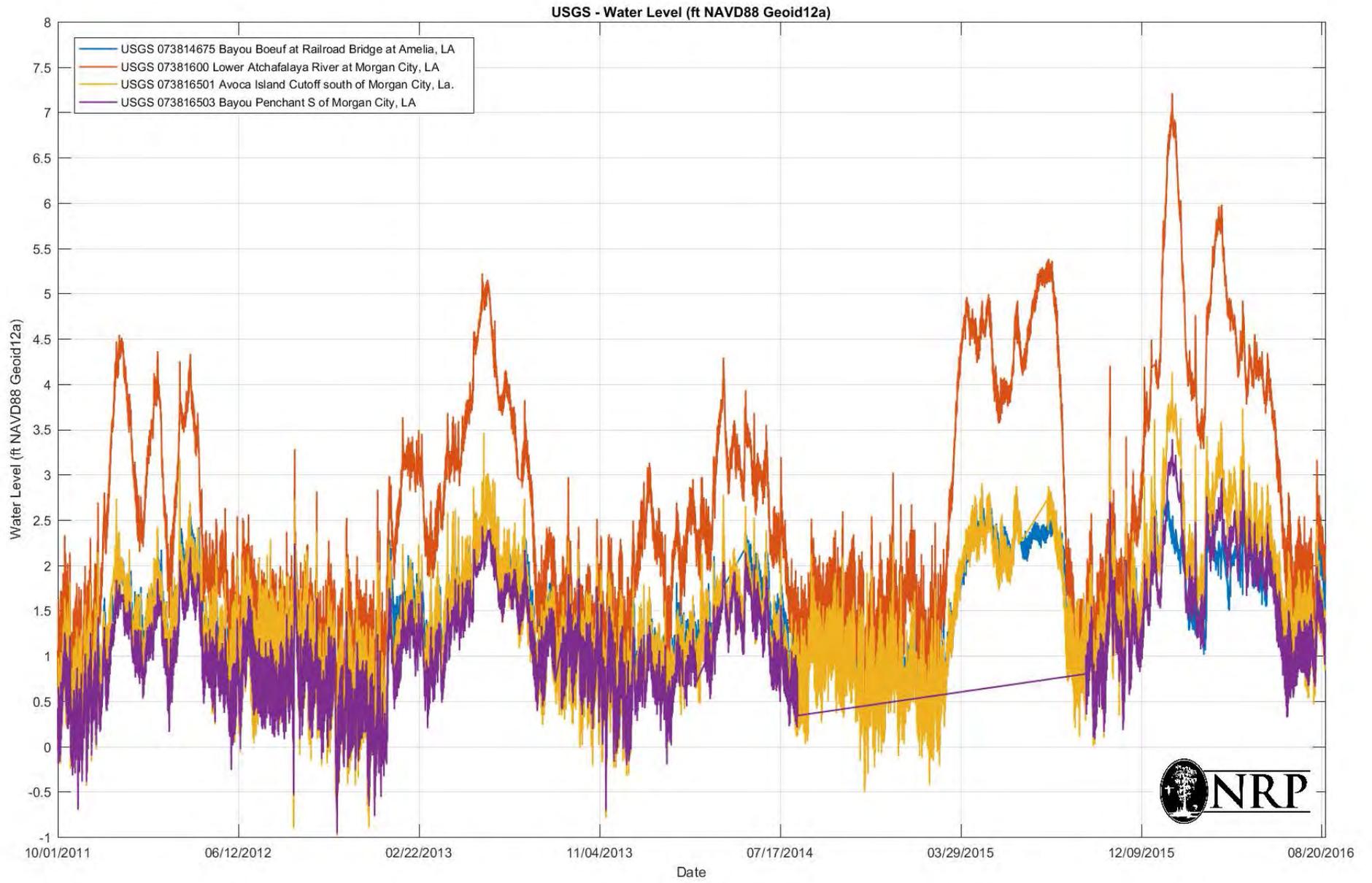


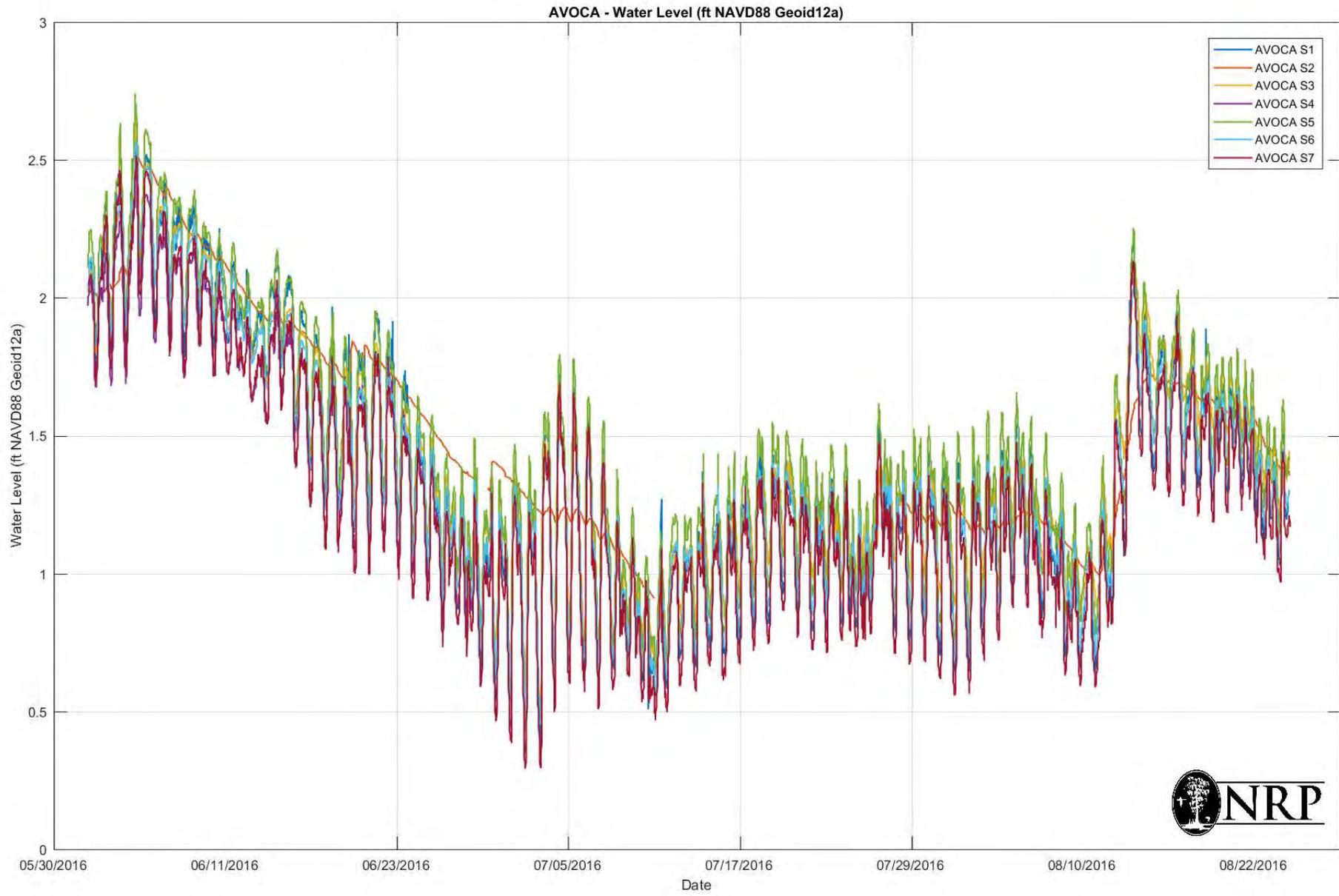
Photo 7: Typical Forested Wetland Above the OHWM Dominated by Water Oak, Sweetgum, and Drummond's Maple (BLH Preservation)



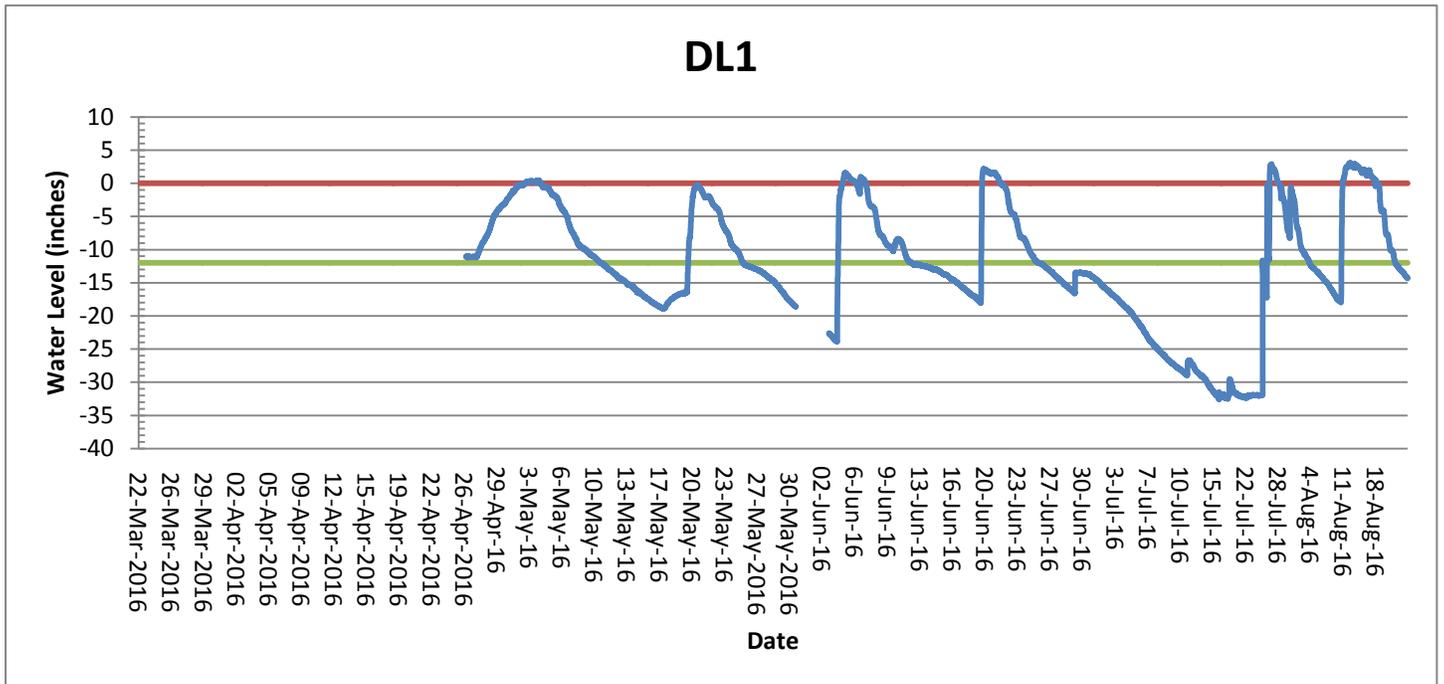
Photo 8: Typical Forested Non-Wetland Dominated by Water Oak, Sugarberry, and Drummond's Maple (Upland Buffer)

Avoca Island Mitigation Bank  
Appendix B – Hydrology Data

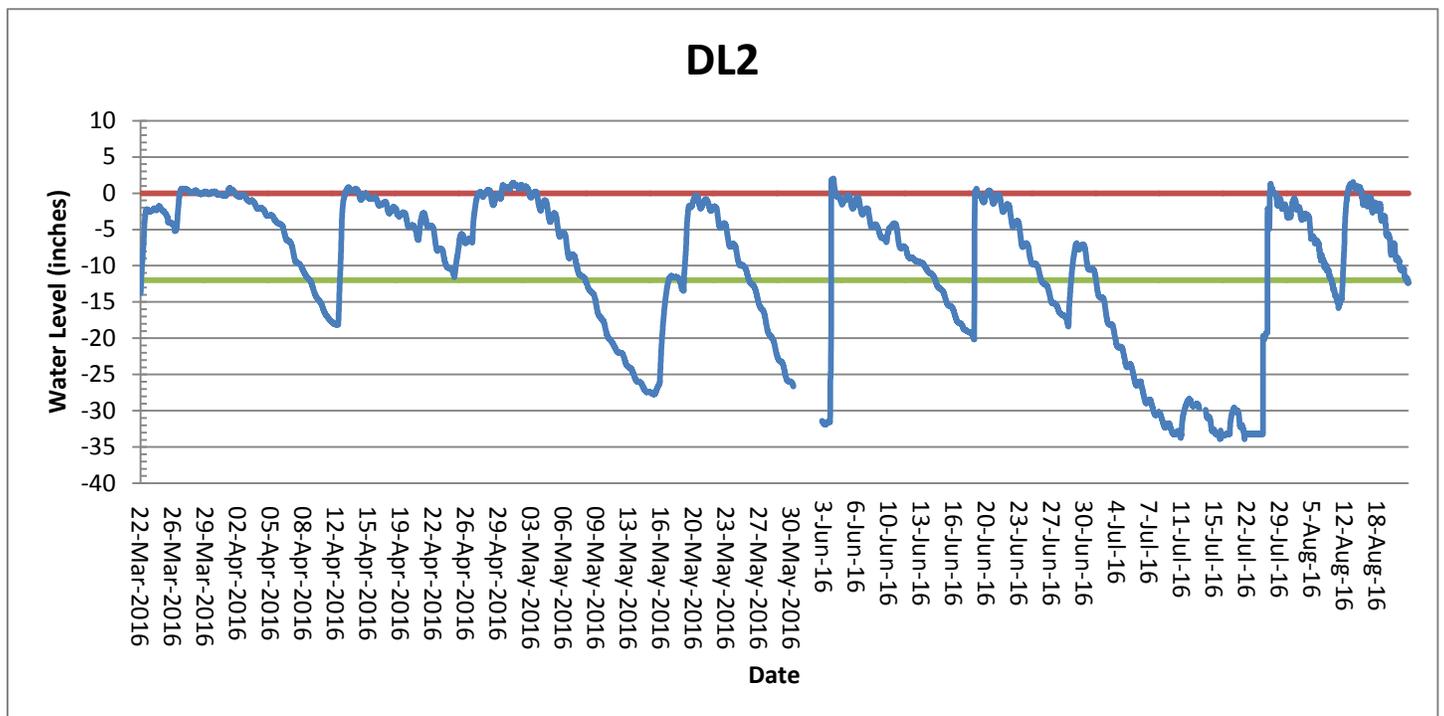




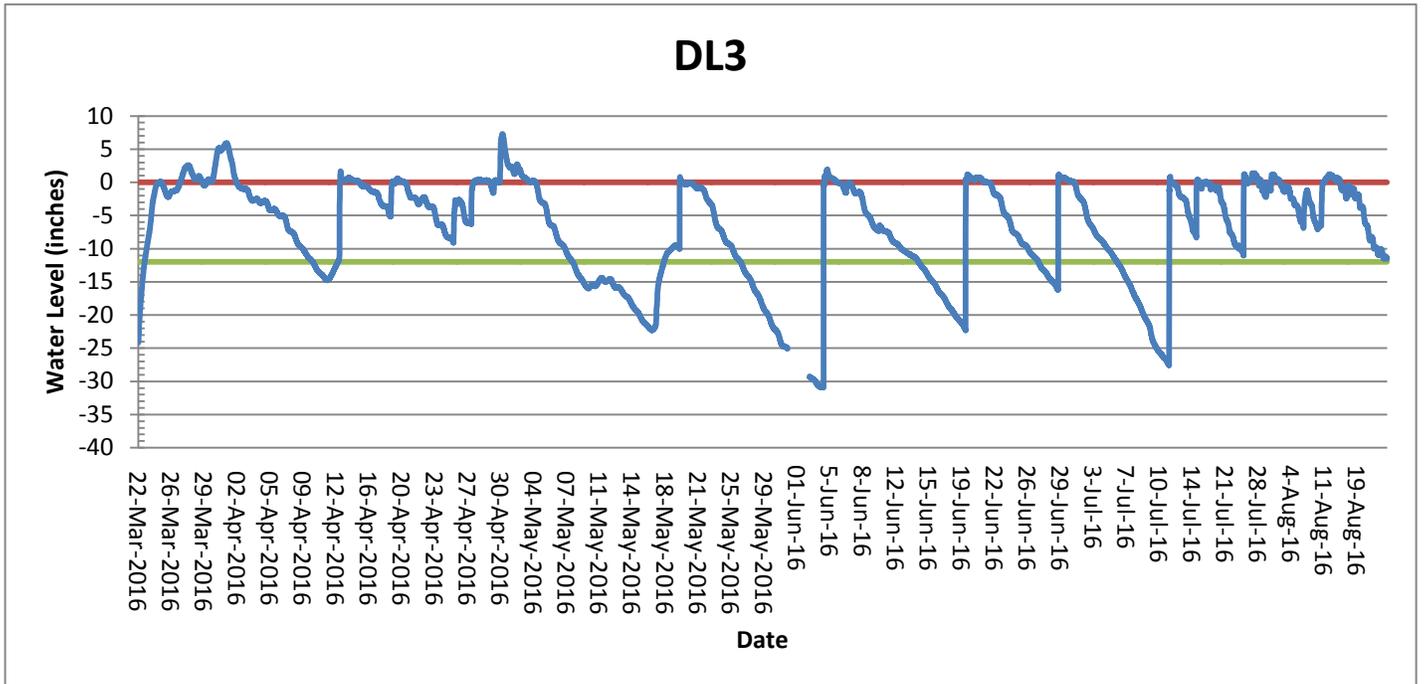
Avoca Island Mitigation Bank- Appendix B  
 Shallow Groundwater Data



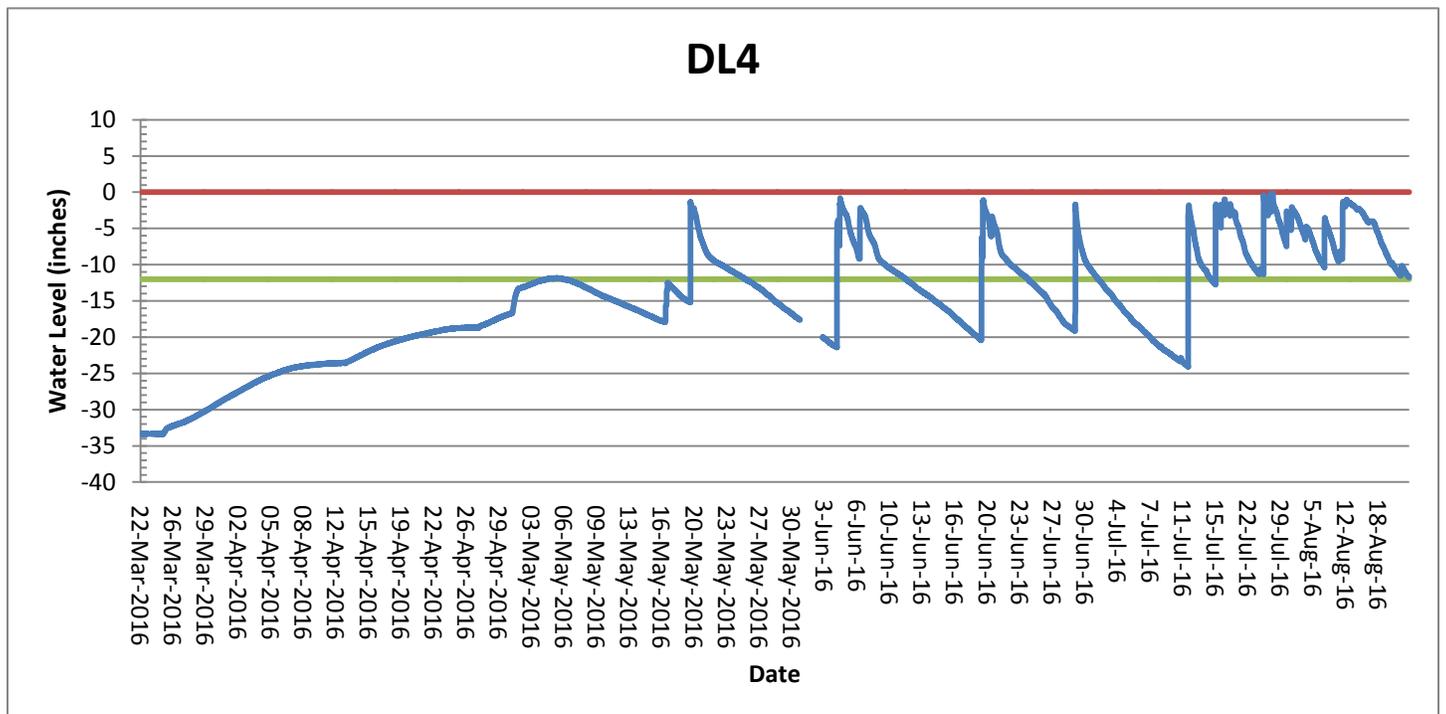
- Groundsurface
- 12" Below Groundsurface
- Water Level (inches)



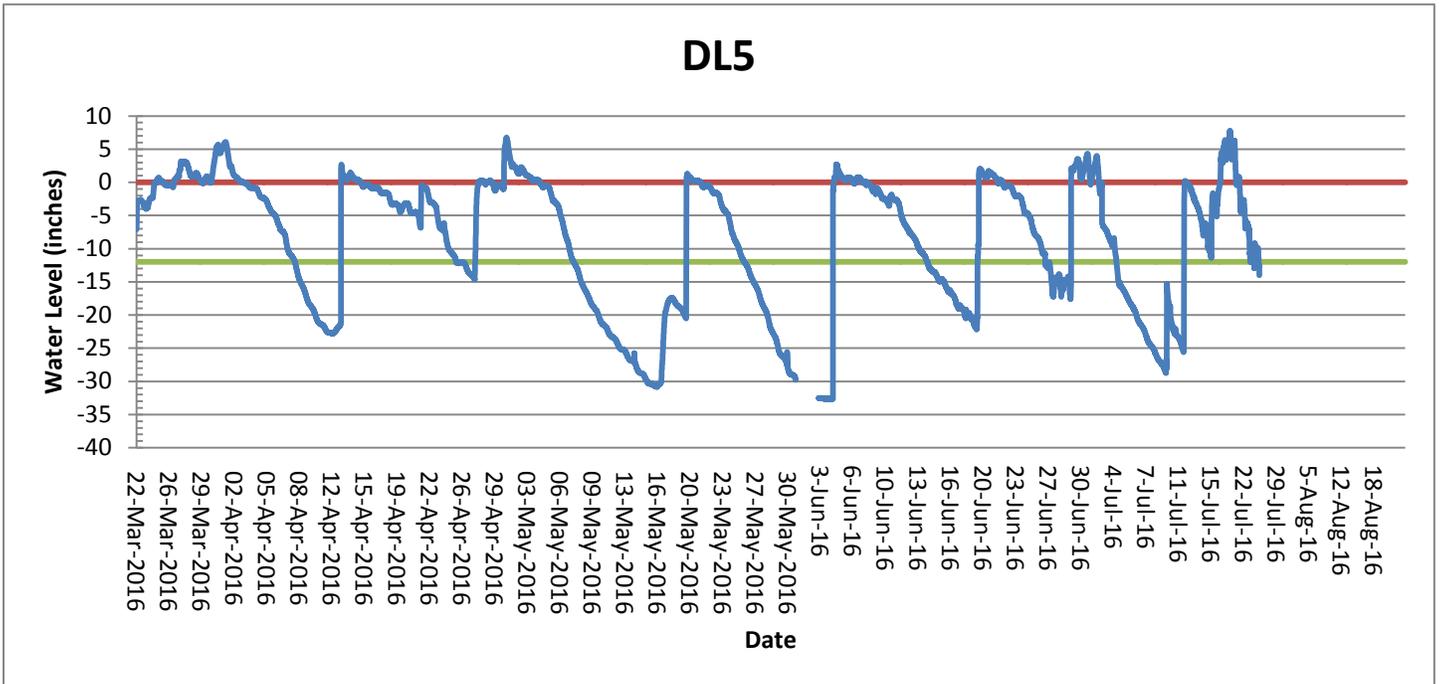
Avoca Island Mitigation Bank- Appendix B  
 Shallow Groundwater Data



- Groundsurface
- 12" Below Groundsurface
- Water Level (inches)

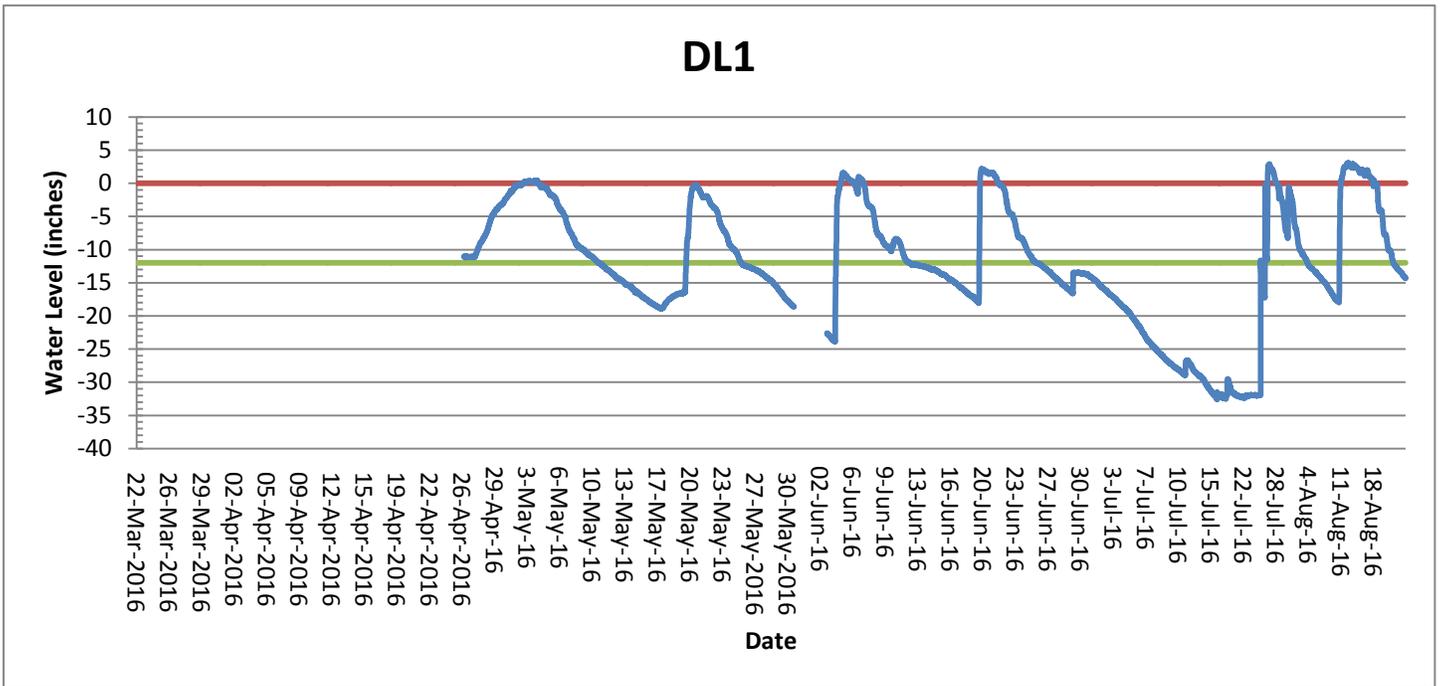


Avoca Island Mitigation Bank- Appendix B  
Shallow Groundwater Data

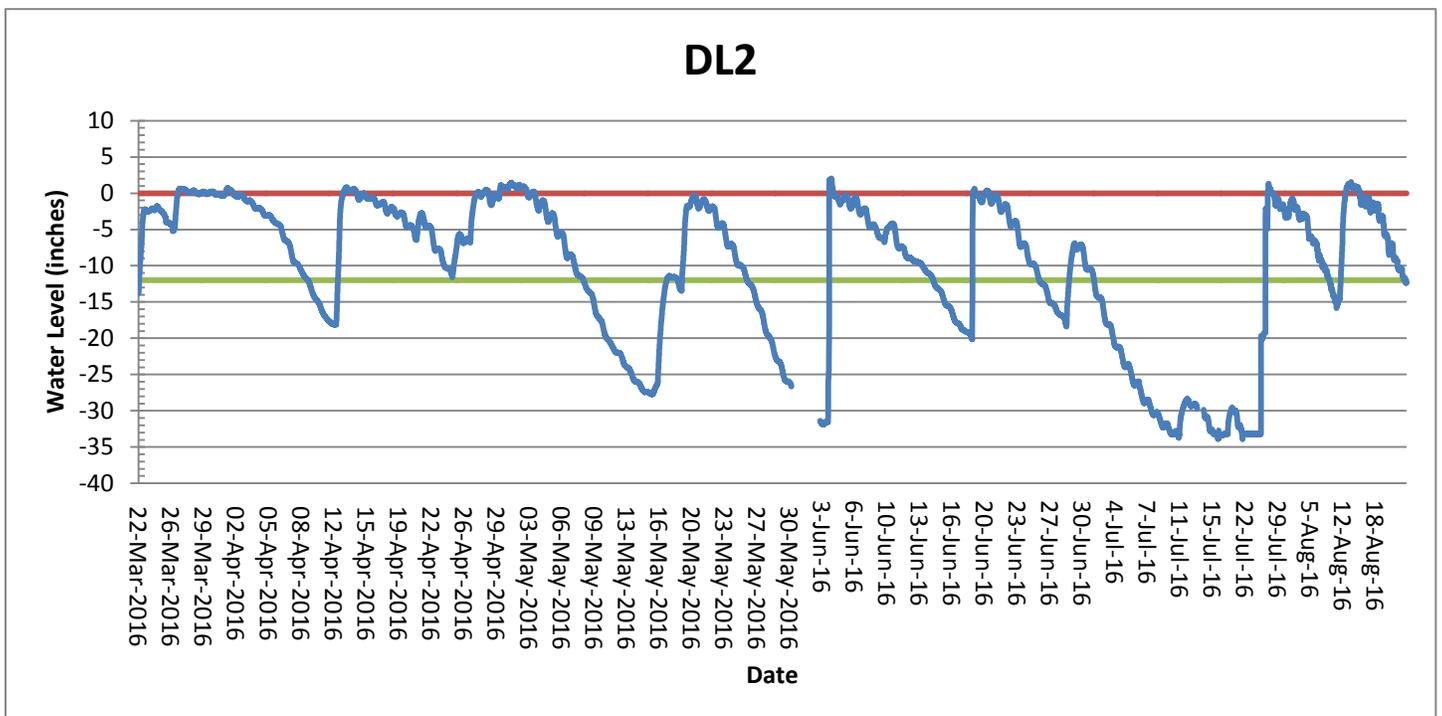


- Groundsurface
- 12" Below Groundsurface
- Water Level (inches)

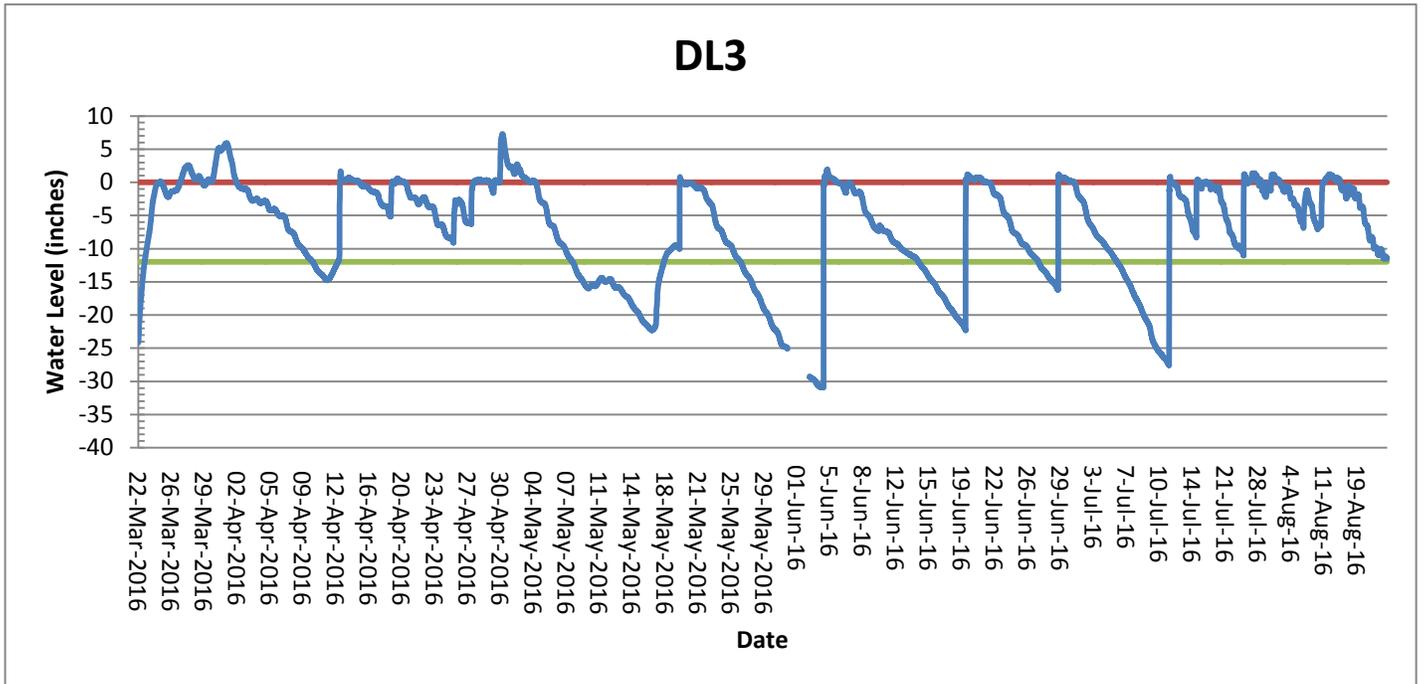
Avoca Island Mitigation Bank- Appendix B  
 Shallow Groundwater Data



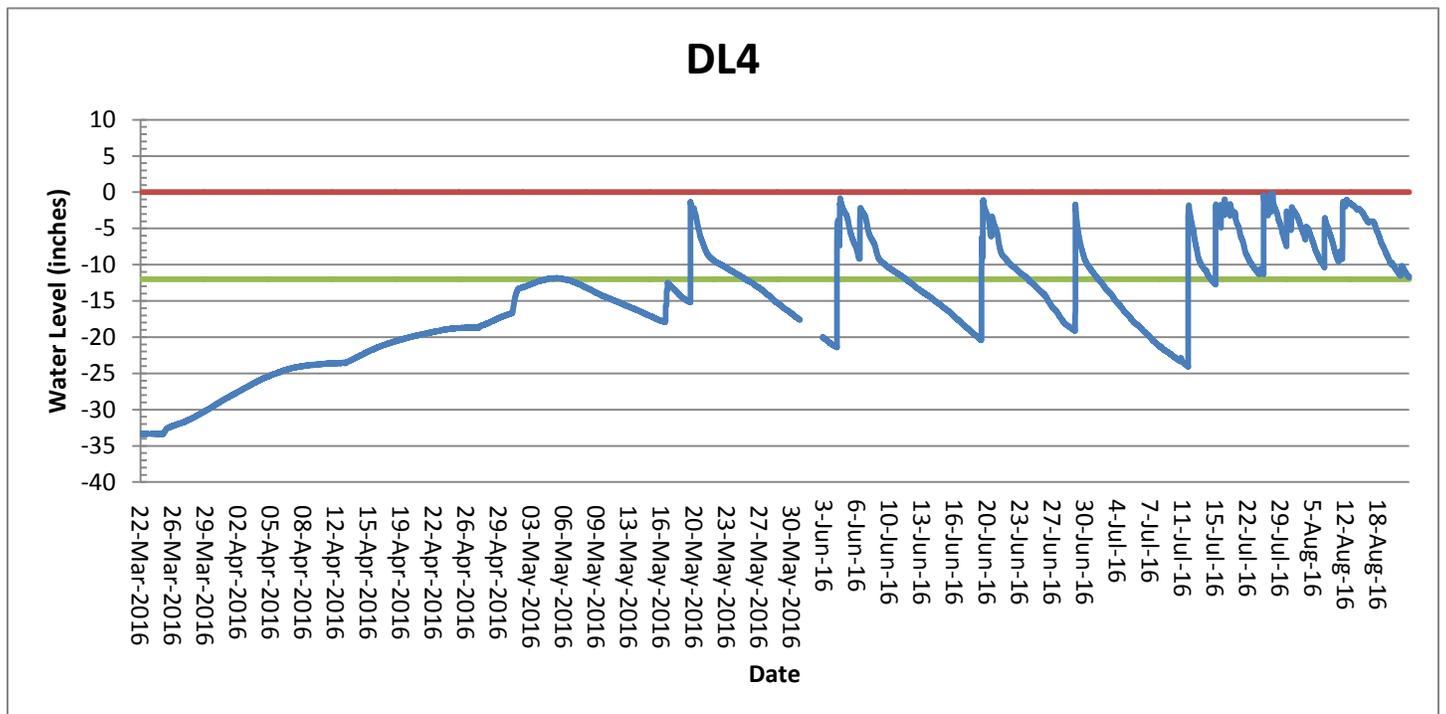
- Groundsurface
- 12" Below Groundsurface
- Water Level (inches)



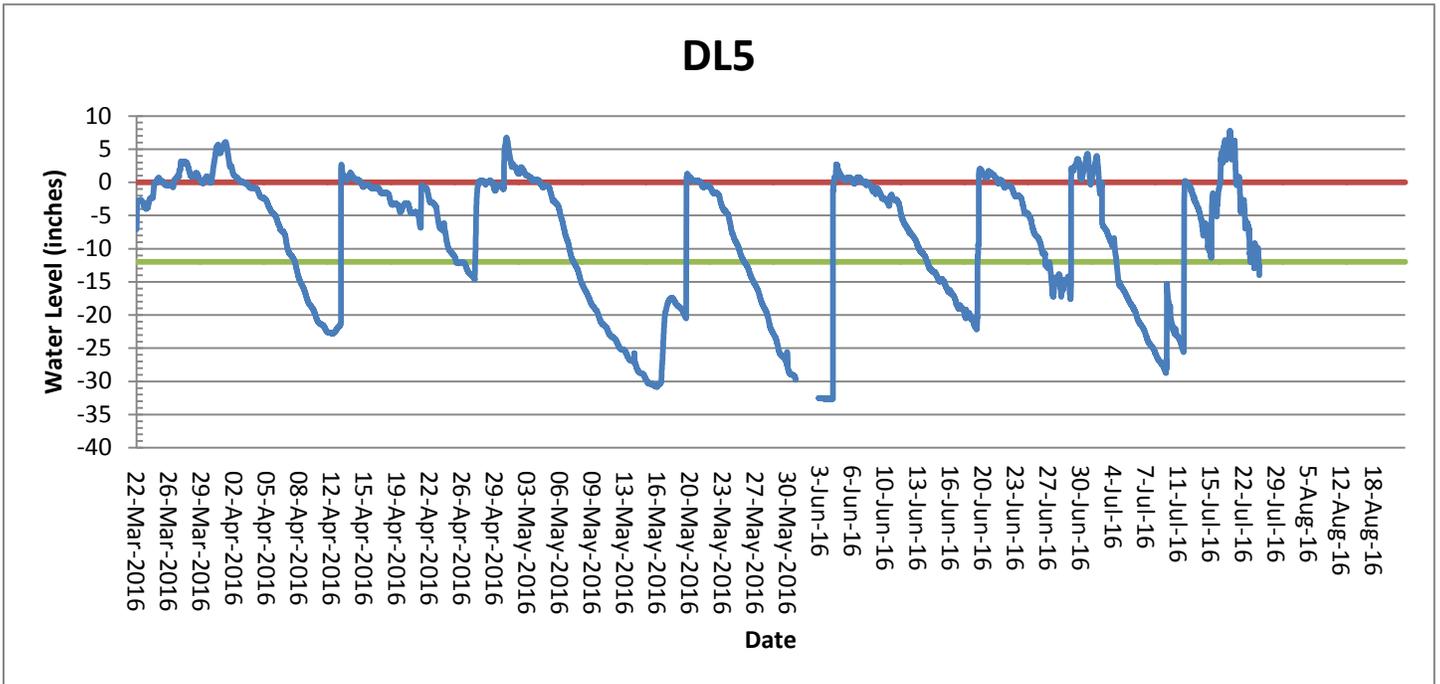
Avoca Island Mitigation Bank- Appendix B  
 Shallow Groundwater Data



- Groundsurface
- 12" Below Groundsurface
- Water Level (inches)



Avoca Island Mitigation Bank- Appendix B  
Shallow Groundwater Data



- Groundsurface
- 12" Below Groundsurface
- Water Level (inches)

Avoca Island Mitigation Bank  
Appendix C – Habitat Work Plan Detail

**Avoca Island Mitigation Bank-Appendix C**  
**Habitat Work Plan Detail-Pre-Treatment Stand Information**

-----

**Introduction**

The tables below provide detail as to the existing forested species to be removed and/or mechanically/chemically treated as part of the Avoca Island Mitigation Phase One Mitigation Bank Habitat Work Plan. Non-wetlands and herbaceous wetland habitat types as defined in Figure 15 and Section 3.2.3 of the Prospectus are excluded from this list.

**Habitat 2: Forested Wetlands dominated by Tallow, Sweetgum, and Water Oak (5.32 Acres); 90% Existing Canopy Cover**

Table 1: Existing Species Composition and Percentage To Be Removed

| Common Name        | Scientific Name                    | Existing Percent Relative Dominance <sup>1</sup> | Percent To Be Removed |
|--------------------|------------------------------------|--|-----------------------|
| Chinese Tallow     | <i>Triadica sebifera</i>           | 37.34%   | 100%                  |
| Sweetgum           | <i>Liquidambar styraciflua</i>     | 19.56%   | 75%                   |
| Water Oak          | <i>Quercus nigra</i>               | 14.22%   | 0%                    |
| Wax Myrtle         | <i>Morella cerifera</i>            | 8.15%  | 75%                   |
| American Elm       | <i>Ulmus americana</i>             | 5.68%  | 75%                   |
| Drummond Red Maple | <i>Acer rubrum var. drummondii</i> | 4.67%  | 75%                   |
| Possumhaw          | <i>Ilex decidua</i>                | 3.25%  | 75%                   |
| Pecan              | <i>Carya illinoensis</i>           | 2.97%  | 0%                    |
| Dogwood            | <i>Cornus foemina</i>              | 2.22%  | 75%                   |
| Persimmon          | <i>Diospyros virginiana</i>        | 1.31%  | 0%                    |
| Ash                | <i>Fraxinus sp</i>                 | 0.55%  | 0%                    |
| Honeylocust        | <i>Gleditsia triacanthos</i>       | 0.09%  | 0%                    |
| Chinese Privet     | <i>Ligustrum sinense</i>           | 0.01%  | 0%                    |

<sup>1</sup> Percent Relative Dominance in Relation to Existing Basal Area

Table 2: Pre and Post Treatment Stand Characteristics

| Habitat 2 Pre-Treatment            |                |                  |            |                    |                  |
|------------------------------------|----------------|------------------|------------|--------------------|------------------|
| Species                            | Stems per Acre | Relative Density | Basal Area | Relative Dominance | QMD <sup>1</sup> |
| <i>Acer rubrum var. drummondii</i> | 40.00          | 4.67             | 4.83       | 4.67               | 4.70             |
| <i>Carya illinoensis</i>           | 3.33           | 0.39             | 3.07       | 2.97               | 13.01            |
| <i>Cornus foemina</i>              | 210.00         | 24.51            | 2.29       | 2.22               | 1.41             |
| <i>Diospyros virginiana</i>        | 13.33          | 1.56             | 1.35       | 1.31               | 4.31             |
| <i>Fraxinus sp.</i>                | 13.33          | 1.56             | 0.57       | 0.55               | 2.79             |
| <i>Gleditsia triacanthos</i>       | 3.33           | 0.39             | 0.09       | 0.09               | 2.20             |
| <i>Ilex decidua</i>                | 110.00         | 12.84            | 3.36       | 3.25               | 2.37             |
| <i>Ligustrum sinense</i>           | 3.33           | 0.39             | 0.01       | 0.01               | 0.70             |
| <i>Liquidambar</i>                 | 73.33          | 8.56             | 20.24      | 19.56              | 7.11             |

|                                 |                |                  |            |                    |       |
|---------------------------------|----------------|------------------|------------|--------------------|-------|
| styraciflua                     |                |                  |            |                    |       |
| Morella cerifera                | 146.66         | 17.12            | 8.44       | 8.15               | 3.25  |
| Quercus nigra                   | 30.00          | 3.50             | 14.72      | 14.22              | 9.48  |
| Triadica sebifera               | 136.66         | 15.95            | 38.64      | 37.34              | 7.20  |
| Ulmus americana                 | 73.33          | 8.56             | 5.87       | 5.68               | 3.83  |
| <b>Total</b>                    | 856.63         |                  | 103.48     |                    |       |
| <b>Habitat 2 Post-Treatment</b> |                |                  |            |                    |       |
| Species                         | Stems per Acre | Relative Density | Basal Area | Relative Dominance | QMD   |
| Acer rubrum var. drummondii     | 10.00          | 4.35             | 0.97       | 3.35               | 4.21  |
| Carya illinoensis               | 3.33           | 1.45             | 3.07       | 10.66              | 13.01 |
| Cornus foemina                  | 52.50          | 22.84            | 0.46       | 1.59               | 1.27  |
| Diospyros virginiana            | 13.33          | 5.80             | 1.35       | 4.69               | 4.31  |
| Fraxinus sp.                    | 13.33          | 5.80             | 0.57       | 1.97               | 2.79  |
| Gleditsia triacanthos           | 3.33           | 1.45             | 0.09       | 0.31               | 2.20  |
| Ilex decidua                    | 27.50          | 11.97            | 0.67       | 2.33               | 2.12  |
| Ligustrum sinense               | 3.33           | 1.45             | 0.01       | 0.03               | 0.70  |
| Liquidambar styraciflua         | 18.33          | 7.98             | 4.05       | 14.05              | 6.36  |
| Morella cerifera                | 36.50          | 15.88            | 1.69       | 5.86               | 2.91  |
| Quercus nigra                   | 30.00          | 13.05            | 14.72      | 51.08              | 9.48  |
| Triadica sebifera               | 0.00           | 0.00             | 0.00       | 0.00               | 0.00  |
| Ulmus americana                 | 18.33          | 7.98             | 1.17       | 4.08               | 3.43  |
| <b>Total</b>                    | 229.81         |                  | 28.81      |                    |       |

<sup>1</sup>Quadratic Mean Diameter (QMD): The Diameter at Breast Height (inches) of the average basal area

### **Habitat 7: Forested Wetlands dominated by Tallow and Drummond Red Maple (5.88 Acres); 75% Existing Canopy Cover**

Table 3: Existing Species Composition and Percentage To Be Removed

| Common Name        | Scientific Name             | Existing Percent Relative Dominance | Percent To Be Removed |
|--------------------|-----------------------------|-------------------------------------|-----------------------|
| Chinese Tallow     | Triadica sebifera           | 46.37%                              | 100%                  |
| Drummond Red Maple | Acer rubrum var. drummondii | 26.15%                              | 90%                   |
| Water Oak          | Quercus nigra               | 8.76%                               | 0%                    |
| Ash                | Fraxinus sp.                | 6.81%                               | 90%                   |
| Possumhaw          | Ilex decidua                | 6.37%                               | 90%                   |
| Sweetgum           | Liquidambar styraciflua     | 3.15%                               | 90%                   |
| Sugarberry         | Celtis laevigata            | 2.08%                               | 90%                   |
| Green Hawthorn     | Crataegus viridis           | 0.24%                               | 0%                    |
| Persimmon          | Diospyros virginiana        | 0.04%                               | 0%                    |

|              |                 |       |    |
|--------------|-----------------|-------|----|
| American Elm | Ulmus americana | 0.07% | 0% |
|--------------|-----------------|-------|----|

Table 4: Pre and Post Treatment Stand Characteristics

| Habitat 7 Pre-Treatment     |                |                  |                           |                    |      |
|-----------------------------|----------------|------------------|---------------------------|--------------------|------|
| Species                     | Stems per Acre | Relative Density | Basal Area (sq ft./ acre) | Relative Dominance | QMD  |
| Acer rubrum var. drummondii | 260.00         | 19.70            | 42.37                     | 26.15              | 5.47 |
| Celtis laevigata            | 20.00          | 1.52             | 3.37                      | 2.08               | 5.56 |
| Crataegus viridis           | 10.00          | 0.76             | 0.39                      | 0.24               | 2.67 |
| Diospyros virginiana        | 5.00           | 0.38             | 0.07                      | 0.04               | 1.60 |
| Fraxinus sp.                | 70.00          | 5.30             | 11.04                     | 6.81               | 5.38 |
| Ilex decidua                | 615.00         | 46.59            | 10.32                     | 6.37               | 1.75 |
| Liquidambar styraciflua     | 25.00          | 1.89             | 5.10                      | 3.15               | 6.12 |
| Quercus nigra               | 40.00          | 3.03             | 14.19                     | 8.76               | 8.06 |
| Triadica sebifera           | 270.00         | 20.45            | 75.08                     | 46.34              | 7.14 |
| Ulmus americana             | 5.00           | 0.38             | 0.11                      | 0.07               | 2.00 |
| <b>Total</b>                | 1320.00        |                  | 162.04                    |                    |      |
| Habitat 7 Post-Treatment    |                |                  |                           |                    |      |
| Species                     | Stems per Acre | Relative Density | Basal Area (sq ft./ acre) | Relative Dominance | QMD  |
| Acer rubrum var. drummondii | 26.00          | 21.14            | 4.24                      | 46.01              | 5.47 |
| Celtis laevigata            | 2.00           | 1.63             | 0.34                      | 3.66               | 5.56 |
| Crataegus viridis           | 10.00          | 8.13             | 0.39                      | 4.22               | 2.67 |
| Diospyros virginiana        | 5.00           | 4.07             | 0.07                      | 0.76               | 1.60 |
| Fraxinus sp.                | 7.00           | 5.69             | 1.10                      | 11.99              | 5.38 |
| Ilex decidua                | 61.50          | 50.00            | 1.03                      | 11.20              | 1.75 |
| Liquidambar styraciflua     | 2.50           | 2.03             | 0.51                      | 5.54               | 6.12 |
| Quercus nigra               | 4.00           | 3.25             | 1.42                      | 15.41              | 8.06 |
| Triadica sebifera           | 0.00           | 0.00             | 0.00                      | 0.00               | 0.00 |
| Ulmus americana             | 5.00           | 4.07             | 0.11                      | 1.18               | 2.00 |
| <b>Total</b>                | 123.00         |                  | 9.21                      |                    |      |

**Habitat 8: Forested Wetlands dominated by Drummond Red Maple and Tallow (15.64 Acres); 40% Existing Canopy Cover**

Table 5: Existing Species Composition and Percentage To Be Removed

| Common Name        | Scientific Name                           | Existing Percent Relative Dominance | Percent To Be Removed |
|--------------------|---|-------------------------------------|-----------------------|
| Drummond Red Maple | <i>Acer rubrum</i> var. <i>drummondii</i> | 49.16%                              | 90%                   |
| Chinese Tallow     | <i>Triadica sebifera</i>                  | 27.04%                              | 100%                  |
| Ash                | <i>Fraxinus</i> sp.                       | 11.12%                              | 0%                    |
| Possumhaw          | <i>Ilex decidua</i>                       | 5.08%                               | 90%                   |
| Sweetgum           | <i>Liquidambar styraciflua</i>            | 3.46%                               | 0%                    |
| Water Oak          | <i>Quercus nigra</i>                      | 2.96%                               | 0%                    |
| American Elm       | <i>Ulmus americana</i>                    | 0.46%                               | 0%                    |
| Buttonbush         | <i>Cephalanthus occidentalis</i>          | 0.18%                               | 0%                    |

Table 6: Pre and Post Treatment Stand Characteristics

| Habitat 8 Pre-Treatment                   |                |                  |            |                    |       |
|---|----------------|------------------|------------|--------------------|-------|
| Species                                   | Stems per Acre | Relative Density | Basal Area | Relative Dominance | QMD   |
| <i>Acer rubrum</i> var. <i>drummondii</i> | 270.00         | 25.12            | 44.35      | 49.16              | 5.49  |
| <i>Cephalanthus occidentalis</i>          | 35.00          | 3.26             | 0.16       | 0.18               | 0.91  |
| <i>Fraxinus</i> sp.                       | 35.00          | 3.26             | 10.03      | 11.12              | 7.25  |
| <i>Gleditsia triacanthos</i>              | 5.00           | 0.47             | 0.00       | 0.00               | 0.20  |
| <i>Ilex decidua</i>                       | 380.00         | 35.35            | 5.08       | 5.63               | 1.56  |
| <i>Liquidambar styraciflua</i>            | 5.00           | 0.47             | 3.12       | 3.46               | 10.70 |
| <i>Quercus nigra</i>                      | 15.00          | 1.40             | 2.67       | 2.96               | 5.71  |
| <i>Triadica sebifera</i>                  | 315.00         | 29.30            | 24.39      | 27.04              | 3.77  |
| <i>Ulmus americana</i>                    | 15.00          | 1.40             | 0.42       | 0.46               | 2.26  |
| <b>Total</b>                              | 1075.00        |                  | 90.22      |                    |       |
| Habitat 8 Post-Treatment                  |                |                  |            |                    |       |
| Species                                   | Stems per Acre | Relative Density | Basal Area | Relative Dominance | QMD   |
| <i>Acer rubrum</i> var. <i>drummondii</i> | 27.00          | 19.18            | 39.92      | 65.57              | 5.49  |
| <i>Cephalanthus occidentalis</i>          | 35.00          | 24.86            | 0.16       | 0.26               | 0.91  |
| <i>Fraxinus</i> sp.                       | 35.00          | 24.86            | 10.03      | 16.47              | 7.25  |
| <i>Gleditsia triacanthos</i>              | 5.00           | 3.55             | 0.00       | 0.00               | 0.20  |
| <i>Ilex decidua</i>                       | 3.80           | 2.70             | 4.57       | 7.50               | 1.56  |
| <i>Liquidambar styraciflua</i>            | 5.00           | 3.55             | 3.12       | 5.13               | 10.70 |

|                   |        |       |       |      |      |
|-------------------|--------|-------|-------|------|------|
| Quercus nigra     | 15.00  | 10.65 | 2.67  | 4.38 | 5.71 |
| Triadica sebifera | 0.00   | 0.00  | 0.00  | 0.00 | 0.00 |
| Ulmus americana   | 15.00  | 10.65 | 0.42  | 0.68 | 2.26 |
| <b>Total</b>      | 140.80 |       | 60.88 |      |      |

**Habitat 9: Forested Wetlands dominated by Willow (1.17 Acre); 75% Existing Canopy Cover**

Table 7: Existing Species Composition and Percentage To Be Removed

| Common Name  | Scientific Name | Existing Percent Relative Dominance | Percent To Be Removed |
|--------------|-----------------|-------------------------------------|-----------------------|
| Black Willow | Salix nigra     | 75.00%                              | 100%                  |

**Habitat 10: Forested Wetlands dominated by Willow, Drummond Red Maple, and Tallow (13.39 Acres); 50% Existing Canopy Cover**

Table 8: Existing Species Composition and Percentage To Be Removed

| Common Name        | Scientific Name             | Existing Percent Relative Dominance | Percent To Be Removed |
|--------------------|-----------------------------|-------------------------------------|-----------------------|
| Black Willow       | Salix nigra                 | 47.65%                              | 100%                  |
| Drummond Red Maple | Acer rubrum var. drummondii | 20.01%                              | 90%                   |
| Chinese Tallow     | Triadica sebifera           | 15.59%                              | 100%                  |
| Ash                | Fraxinus sp.                | 14.99%                              | 90%                   |
| American Elm       | Ulmus americana             | 0.57%                               | 90%                   |
| Sweetgum           | Liquidambar styraciflua     | 0.49%                               | 90%                   |
| Possumhaw          | Ilex decidua                | 0.42%                               | 90%                   |
| Sugarberry         | Celtis laevigata            | 0.25%                               | 0%                    |
| Persimmon          | Diospyros virginiana        | 0.02%                               | 0%                    |

Table 9: Pre and Post Treatment Stand Characteristics

| Habitat 10 Pre-Treatment    |                |                  |                             |                    |      |
|-----------------------------|----------------|------------------|-----------------------------|--------------------|------|
| Species                     | Stems Per Acre | Relative Density | Total Basal Area (sq.ft.ac) | Relative Dominance | QMD  |
| Acer rubrum var. drummondii | 770.00         | 45.56            | 31.23                       | 20.01              | 2.73 |
| Celtis laevigata            | 5.00           | 0.30             | 0.39                        | 0.25               | 3.78 |
| Crataegus viridis           | 2.50           | 0.15             | 0.00                        | 0.00               | 0.30 |
| Diospyros virginiana        | 5.00           | 0.30             | 0.04                        | 0.02               | 1.16 |
| Fraxinus sp.                | 312.50         | 18.49            | 23.41                       | 14.99              | 3.71 |
| Ilex decidua                | 112.50         | 6.66             | 0.65                        | 0.42               | 1.03 |
| Liquidambar                 | 15.00          | 0.89             | 0.77                        | 0.49               | 3.07 |

|                                  |                |                  |                             |                    |       |
|----------------------------------|----------------|------------------|-----------------------------|--------------------|-------|
| styraciflua                      |                |                  |                             |                    |       |
| Salix nigra                      | 95.00          | 5.62             | 74.39                       | 47.65              | 11.98 |
| Triadica sebifera                | 345.00         | 20.41            | 24.34                       | 15.59              | 3.60  |
| Ulmus americana                  | 27.50          | 1.63             | 0.89                        | 0.57               | 2.44  |
| <b>Total</b>                     | 1690.00        |                  | 156.11                      |                    |       |
| <b>Habitat 10 Post-Treatment</b> |                |                  |                             |                    |       |
| Species                          | Stems Per Acre | Relative Density | Total Basal Area (sq.ft.ac) | Relative Dominance | QMD   |
| Acer rubrum var. drummondii      | 77.00          | 56.51            | 28.11                       | 54.39              | 2.73  |
| Celtis laevigata                 | 5.00           | 3.67             | 0.39                        | 0.75               | 3.78  |
| Crataegus viridis                | 2.50           | 1.83             | 0.00                        | 0.00               | 0.30  |
| Diospyros virginiana             | 5.00           | 3.67             | 0.04                        | 0.07               | 1.16  |
| Fraxinus sp.                     | 31.25          | 22.94            | 21.06                       | 40.76              | 3.71  |
| Ilex decidua                     | 11.25          | 8.26             | 0.58                        | 1.13               | 1.03  |
| Liquidambar styraciflua          | 1.50           | 1.10             | 0.69                        | 1.34               | 3.07  |
| Salix nigra                      | 0.00           | 0.00             | 0.00                        | 0.00               | 0.00  |
| Triadica sebifera                | 0.00           | 0.00             | 0.00                        | 0.00               | 0.00  |
| Ulmus americana                  | 2.75           | 2.02             | 0.80                        | 1.56               | 2.44  |
| <b>Total</b>                     | 136.25         |                  | 51.68                       |                    |       |

**Habitat 12: Forested Wetlands dominated by a dense stand of young, same-age Drummond Red Maple (2.36 Acres); 100% Existing Canopy Cover**

Table 10: Existing Species Composition and Percentage To Be Removed

| Common Name        | Scientific Name             | Existing Percent Relative Dominance | Percent To Be Removed |
|--------------------|-----------------------------|-------------------------------------|-----------------------|
| Drummond Red Maple | Acer rubrum var. drummondii | 48.75%                              | 98%                   |
| Chinese Tallow     | Triadica sebifera           | 19.86%                              | 100%                  |
| American Elm       | Ulmus americana             | 13.29%                              | 90%                   |
| Ash                | Fraxinus sp.                | 11.83%                              | 90%                   |
| Sweetgum           | Liquidambar styraciflua     | 4.93%                               | 90%                   |
| Dogwood            | Cornus foemina              | 1.26%                               | 90%                   |
| Sugarberry         | Celtis lavigata             | 0.08%                               | 90%                   |

Table 11: Pre and Post Treatment Stand Characteristics

| Habitat 12 Pre-Treatment    |                |                  |                             |                    |       |
|-----------------------------|----------------|------------------|-----------------------------|--------------------|-------|
| Species                     | Stems per Acre | Relative Density | Total Basal Area (sq.ft.ac) | Relative Dominance | QMD   |
| Acer rubrum var. drummondii | 1900.00        | 69.85            | 53.97                       | 48.75              | 2.28  |
| Celtis lavigata             | 10.00          | 0.37             | 0.09                        | 0.08               | 1.30  |
| Cornus foemina              | 70.00          | 2.57             | 1.40                        | 1.26               | 1.91  |
| Fraxinus sp.                | 440.00         | 16.18            | 13.10                       | 11.83              | 2.34  |
| Liquidambar styraciflua     | 10.00          | 0.37             | 5.45                        | 4.93               | 10.00 |
| Triadica sebifera           | 70.00          | 2.57             | 21.99                       | 19.86              | 7.59  |
| Ulmus americana             | 220.00         | 8.09             | 14.71                       | 13.29              | 3.50  |
| <b>Total</b>                | 2720.00        |                  | 110.72                      |                    |       |
| Habitat 12 Post-Treatment   |                |                  |                             |                    |       |
| Species                     | Stems per Acre | Relative Density | Total Basal Area (sq.ft.ac) | Relative Dominance | QMD   |
| Acer rubrum var. drummondii | 57.00          | 43.18            | 1.08                        | 23.72              | 2.28  |
| Celtis lavigata             | 1.00           | 0.76             | 0.01                        | 0.20               | 1.30  |
| Cornus foemina              | 7.00           | 5.30             | 0.14                        | 3.07               | 1.91  |
| Fraxinus sp.                | 44.00          | 33.33            | 1.31                        | 28.79              | 2.34  |
| Liquidambar styraciflua     | 1.00           | 0.76             | 0.55                        | 11.99              | 10.00 |
| Triadica sebifera           | 0.00           | 0.00             | 0.00                        | 0.00               | 0.00  |
| Ulmus americana             | 22.00          | 16.67            | 1.47                        | 32.34              | 3.50  |
| <b>Total</b>                | 132.00         |                  | 4.55                        |                    |       |

**Habitat 13: Forested Wetlands dominated by Drummond Red Maple and Ash with a prominent herbaceous layer (19.29 Acres); 60% Existing Canopy Cover**

Table 12: Existing Species Composition and Percentage To Be Removed

| Common Name        | Scientific Name             | Existing Percent Relative Dominance | Percent To Be Removed |
|--------------------|-----------------------------|-------------------------------------|-----------------------|
| Drummond Red Maple | Acer rubrum var. drummondii | 36.57%                              | 90%                   |
| Ash                | Fraxinus sp.                | 34.29%                              | 90%                   |
| Sweetgum           | Liquidambar styraciflua     | 12.68%                              | 90%                   |
| Black Willow       | Salix nigra                 | 7.10%                               | 100%                  |
| Possumhaw          | Ilex decidua                | 2.79%                               | 90%                   |
| Chinese Tallow     | Triadica sebifera           | 2.69%                               | 100%                  |
| American Elm       | Ulmus americana             | 1.75%                               | 90%                   |
| Water Oak          | Quercus nigra               | 1.09%                               | 0%                    |

|             |                           |       |     |
|-------------|---------------------------|-------|-----|
| Persimmon   | Diospyros virginiana      | 0.34% | 90% |
| Live Oak    | Quercus virginiana        | 0.29% | 0%  |
| Sugarberry  | Celtis laevigata          | 0.27% | 0%  |
| Buttonbush  | Cephalanthus occidentalis | 0.07% | 90% |
| Baldcypress | Taxodium distichum        | 0.05% | 0%  |
| Dogwood     | Cornus foemina            | 0.01% | 0%  |

Table 13: Pre and Post Treatment Stand Characteristics

| Habitat 13 Pre-Treatment    |                |                  |                             |                    |       |
|-----------------------------|----------------|------------------|-----------------------------|--------------------|-------|
| Species                     | Stems Per Acre | Relative Density | Total Basal Area (sq.ft.ac) | Relative Dominance | QMD   |
| Acer rubrum var. drummondii | 582.50         | 43.71            | 61.29                       | 36.57              | 4.39  |
| Celtis laevigata            | 1.25           | 0.09             | 0.45                        | 0.27               | 8.10  |
| Cornus foemina              | 1.25           | 0.09             | 0.02                        | 0.01               | 1.50  |
| Cephalanthus occidentalis   | 25.00          | 1.88             | 0.12                        | 0.07               | 0.95  |
| Diospyros virginiana        | 46.25          | 3.47             | 0.56                        | 0.34               | 1.50  |
| Fraxinus sp.                | 231.25         | 17.35            | 57.47                       | 34.29              | 6.75  |
| Ilex decidua                | 276.25         | 20.73            | 4.68                        | 2.79               | 1.76  |
| Liquidambar styraciflua     | 37.50          | 2.81             | 21.25                       | 12.68              | 10.19 |
| Quercus nigra               | 2.50           | 0.19             | 1.82                        | 1.09               | 11.56 |
| Quercus virginiana          | 2.50           | 0.19             | 0.49                        | 0.29               | 5.98  |
| Salix nigra                 | 6.25           | 0.47             | 11.90                       | 7.10               | 18.68 |
| Taxodium distichum          | 3.75           | 0.28             | 0.09                        | 0.05               | 2.09  |
| Triadica sebifera           | 82.50          | 6.19             | 4.51                        | 2.69               | 3.17  |
| Ulmus americana             | 33.75          | 2.53             | 2.94                        | 1.75               | 3.99  |
| <b>Total</b>                | 1332.50        |                  | 167.58                      |                    |       |
| Habitat 13 Post-Treatment   |                |                  |                             |                    |       |
| Species                     | Stems Per Acre | Relative Density | Total Basal Area (sq.ft.ac) | Relative Dominance | QMD   |
| Acer rubrum var. drummondii | 58.25          | 43.31            | 3.66                        | 24.03              | 4.39  |
| Celtis laevigata            | 1.25           | 0.93             | 0.45                        | 2.94               | 8.10  |
| Cornus foemina              | 1.25           | 0.93             | 0.02                        | 0.10               | 1.50  |
| Cephalanthus occidentalis   | 2.50           | 1.86             | 0.01                        | 0.08               | 0.95  |
| Diospyros virginiana        | 4.63           | 3.44             | 0.06                        | 0.37               | 1.50  |
| Fraxinus sp.                | 23.13          | 17.19            | 5.75                        | 37.76              | 6.75  |
| Ilex decidua                | 27.63          | 20.54            | 0.47                        | 3.07               | 1.76  |
| Liquidambar styraciflua     | 3.75           | 2.79             | 2.13                        | 13.96              | 10.19 |
| Quercus nigra               | 2.50           | 1.86             | 1.82                        | 11.97              | 11.56 |

|                    |        |      |       |      |      |
|--------------------|--------|------|-------|------|------|
| Quercus virginiana | 2.50   | 1.86 | 0.49  | 3.21 | 5.98 |
| Salix nigra        | 0.00   | 0.00 | 0.00  | 0.00 | 0.00 |
| Taxodium distichum | 3.75   | 2.79 | 0.09  | 0.59 | 2.09 |
| Triadica sebifera  | 0.00   | 0.00 | 0.00  | 0.00 | 0.00 |
| Ulmus americana    | 3.38   | 2.51 | 0.29  | 1.93 | 3.99 |
| <b>Total</b>       | 134.50 |      | 15.22 |      |      |

**Habitat 14: Forested Wetlands dominated by Water Oak, Drummond Red Maple, and Possumhaw (2.24 Acres); 95% Existing Canopy Cover**

Table 14: Existing Species Composition and Percentage To Be Removed

| Common Name        | Scientific Name             | Existing Percent Relative Dominance | Percent To Be Removed |
|--------------------|-----------------------------|-------------------------------------|-----------------------|
| Water Oak          | Quercus nigra               | 26.40%                              | 0%                    |
| Drummond Red Maple | Acer rubrum var. drummondii | 17.44%                              | 90%                   |
| Possumhaw          | Ilex decidua                | 16.85%                              | 98%                   |
| Ash                | Fraxinus sp                 | 14.18%                              | 90%                   |
| Chinese Tallow     | Triadica sebifera           | 7.95%                               | 100%                  |
| American Elm       | Ulmus americana             | 5.54%                               | 90%                   |
| Sugarberry         | Celtis laevigata            | 3.60%                               | 90%                   |
| Dogwood            | Cornus foemina              | 0.34%                               | 90%                   |
| Green Hawthorn     | Crataegus viridis           | 0.30%                               | 0%                    |
| Wax Myrtle         | Morella cerifera            | 0.01%                               | 0%                    |

Table 15: Pre and Post Treatment Stand Characteristics

| Habitat 14 Pre-Treatment    |                |                  |                             |                    |       |
|-----------------------------|----------------|------------------|-----------------------------|--------------------|-------|
| Species                     | Stems Per Acre | Relative Density | Total Basal Area (sq.ft.ac) | Relative Dominance | QMD   |
| Acer rubrum var. drummondii | 90.00          | 5.06             | 27.69                       | 17.44              | 7.51  |
| Celtis laevigata            | 6.67           | 0.37             | 5.72                        | 3.60               | 12.54 |
| Cornus foemina              | 16.67          | 0.94             | 0.54                        | 0.34               | 2.43  |
| Crataegus viridis           | 10.00          | 0.56             | 0.47                        | 0.30               | 2.93  |
| Fraxinus sp.                | 36.67          | 2.06             | 22.51                       | 14.18              | 10.61 |
| Ilex decidua                | 1430.00        | 80.34            | 26.75                       | 16.85              | 1.85  |
| Liquidambar styraciflua     | 10.00          | 0.56             | 11.73                       | 7.39               | 14.66 |
| Morella cerifera            | 3.33           | 0.19             | 0.02                        | 0.01               | 1.00  |
| Quercus nigra               | 66.67          | 3.75             | 41.90                       | 26.40              | 10.73 |
| Triadica sebifera           | 60.00          | 3.37             | 12.62                       | 7.95               | 6.21  |
| Ulmus americana             | 50.00          | 2.81             | 8.80                        | 5.54               | 5.68  |
| <b>Total</b>                | 1780.00        |                  | 158.75                      |                    |       |
| Habitat 14 Post-Treatment   |                |                  |                             |                    |       |

| Species                     | Stems Per Acre | Relative Density | Total Basal Area (sq.ft.ac) | Relative Dominance | QMD   |
|-----------------------------|----------------|------------------|-----------------------------|--------------------|-------|
| Acer rubrum var. drummondii | 9.00           | 6.23             | 2.77                        | 4.17               | 7.51  |
| Celtis laevigata            | 6.66           | 4.61             | 5.72                        | 8.62               | 12.54 |
| Cornus foemina              | 1.66           | 1.15             | 0.05                        | 0.08               | 2.43  |
| Crataegus viridis           | 10.00          | 6.92             | 0.47                        | 0.71               | 2.93  |
| Fraxinus sp.                | 3.66           | 2.53             | 2.25                        | 3.39               | 10.61 |
| Ilex decidua                | 28.60          | 19.78            | 0.54                        | 0.81               | 1.85  |
| Liquidambar styraciflua     | 10.00          | 6.92             | 11.73                       | 17.68              | 14.66 |
| Morella cerifera            | 3.33           | 2.30             | 0.02                        | 0.03               | 1.00  |
| Quercus nigra               | 66.66          | 46.11            | 41.90                       | 63.18              | 10.73 |
| Triadica sebifera           | 0.00           | 0.00             | 0.00                        | 0.00               | 0.00  |
| Ulmus americana             | 5.00           | 3.46             | 0.88                        | 1.33               | 5.68  |
| <b>Total</b>                | 144.57         |                  | 66.33                       |                    |       |

**Habitat 15: Forested Wetlands dominated by Ash, Drummond Red Maple, and Tallow (4.62 Acres); 85% Existing Canopy Cover**

Table 16: Existing Species Composition and Percentage To Be Removed

| Common Name        | Scientific Name             | Existing Percent Relative Dominance | Percent To Be Removed |
|--------------------|-----------------------------|-------------------------------------|-----------------------|
| Ash                | Fraxinus sp.                | 42.20%                              | 90%                   |
| Drummond Red Maple | Acer rubrum var. drummondii | 18.49%                              | 90%                   |
| Chinese Tallow     | Triadica sebifera           | 15.98%                              | 100%                  |
| Sugarberry         | Celtis laevigata            | 7.64%                               | 0%                    |
| Possumhaw          | Ilex decidua                | 7.49%                               | 95%                   |
| Water Oak          | Quercus nigra               | 4.76%                               | 0%                    |
| Sweetgum           | Liquidambar styraciflua     | 1.64%                               | 90%                   |
| American Elm       | Ulmus americana             | 1.28%                               | 90%                   |
| Persimmon          | Diospyros virginiana        | 0.33%                               | 90%                   |
| Green Hawthorn     | Crataegus viridis           | 0.15%                               | 0%                    |
| Dogwood            | Cornus foemina              | 0.03%                               | 0%                    |

Table 17: Pre and Post Treatment Stand Characteristics

| Habitat 15 Pre-Treatment    |                |                  |            |                    |       |
|-----------------------------|----------------|------------------|------------|--------------------|-------|
| Species                     | Stems per Acre | Relative Density | Basal Area | Relative Dominance | QMD   |
| Acer rubrum var. drummondii | 200.00         | 14.76            | 26.38      | 18.49              | 4.92  |
| Celtis laevigata            | 10.00          | 0.74             | 10.90      | 7.64               | 14.14 |
| Cornus foemina              | 5.00           | 0.37             | 0.05       | 0.03               | 1.30  |
| Crataegus viridis           | 10.00          | 0.74             | 0.22       | 0.15               | 2.00  |
| Diospyros virginiana        | 15.00          | 1.11             | 0.47       | 0.33               | 2.40  |
| Fraxinus sp.                | 65.00          | 4.80             | 60.22      | 42.20              | 13.03 |
| Ilex decidua                | 725.00         | 53.51            | 10.69      | 7.49               | 1.64  |
| Liquidambar styraciflua     | 25.00          | 1.85             | 2.35       | 1.64               | 4.15  |
| Quercus nigra               | 35.00          | 2.58             | 6.80       | 4.76               | 5.97  |
| Triadica sebifera           | 205.00         | 15.13            | 22.80      | 15.98              | 4.52  |
| Ulmus americana             | 60.00          | 4.43             | 1.82       | 1.28               | 2.36  |
| <b>Total</b>                | 1355.00        |                  | 142.70     |                    |       |
| Habitat 15 Post-Treatment   |                |                  |            |                    |       |
| Species                     | Stems per Acre | Relative Density | Basal Area | Relative Dominance | QMD   |
| Acer rubrum var. drummondii | 20.00          | 15.09            | 2.64       | 9.55               | 4.92  |
| Celtis laevigata            | 10.00          | 7.55             | 10.90      | 39.47              | 14.14 |
| Cornus foemina              | 5.00           | 3.77             | 0.05       | 0.17               | 1.30  |
| Crataegus viridis           | 10.00          | 7.55             | 0.22       | 0.79               | 2.00  |
| Diospyros virginiana        | 1.50           | 1.13             | 0.05       | 0.17               | 2.40  |
| Fraxinus sp.                | 6.50           | 4.91             | 6.02       | 21.80              | 13.03 |
| Ilex decidua                | 36.25          | 27.36            | 0.53       | 1.93               | 1.64  |
| Liquidambar styraciflua     | 2.50           | 1.89             | 0.23       | 0.85               | 4.15  |
| Quercus nigra               | 35.00          | 26.42            | 6.80       | 24.60              | 5.97  |
| Triadica sebifera           | 0.00           | 0.00             | 0.00       | 0.00               | 0.00  |
| Ulmus americana             | 6.00           | 4.53             | 0.18       | 0.66               | 2.36  |
| <b>Total</b>                | 132.75         |                  | 27.62      |                    |       |

**Habitat 16: Forested Wetlands dominated by Drummond Red Maple and Ash (29.66 Acres); 95% Existing Canopy Cover**

Table 18: Existing Species Composition and Percentage To Be Removed

| Common Name        | Scientific Name             | Existing Percent Relative Dominance | Percent To Be Removed |
|--------------------|-----------------------------|-------------------------------------|-----------------------|
| Drummond Red Maple | Acer rubrum var. drummondii | 33.77%                              | 90%                   |
| Ash                | Fraxinus sp.                | 22.54%                              | 90%                   |
| Sweetgum           | Liquidambar styraciflua     | 12.04%                              | 90%                   |

|                |                                  |        |      |
|----------------|----------------------------------|--------|------|
| Water Oak      | <i>Quercus nigra</i>             | 11.27% | 0%   |
| Possumhaw      | <i>Ilex decidua</i>              | 5.92%  | 90%  |
| American Elm   | <i>Ulmus americana</i>           | 5.41%  | 90%  |
| Laurel Oak     | <i>Quercus laurifolia</i>        | 2.22%  | 0%   |
| Sugarberry     | <i>Celtis laevigata</i>          | 2.21%  | 0%   |
| Chinese Tallow | <i>Triadica sebifera</i>         | 1.35%  | 100% |
| Black Willow   | <i>Salix nigra</i>               | 1.03%  | 100% |
| Honeylocust    | <i>Gleditsia triacanthos</i>     | 0.82%  | 0%   |
| Persimmon      | <i>Diospyros virginiana</i>      | 0.35%  | 0%   |
| Dogwood        | <i>Cornus foemina</i>            | 0.17%  | 0%   |
| Green Hawthorn | <i>Crataegus viridis</i>         | 0.02%  | 0%   |
| Buttonbush     | <i>Cephalanthus occidentalis</i> | 0.01%  | 0%   |

Table 19: Pre and Post Treatment Stand Characteristics

| Habitat 16 Pre-Treatment                  |                |                  |                             |                    |       |
|---|----------------|------------------|-----------------------------|--------------------|-------|
| Species                                   | Stems Per Acre | Relative Density | Total Basal Area (sq.ft.ac) | Relative Dominance | QMD   |
| <i>Acer negundo</i>                       | 6.43           | 0.78             | 1.20                        | 0.87               | 5.85  |
| <i>Acer rubrum</i> var. <i>drummondii</i> | 205.00         | 24.72            | 46.57                       | 33.77              | 6.45  |
| <i>Celtis laevigata</i>                   | 0.71           | 0.09             | 3.05                        | 2.21               | 28.00 |
| <i>Cephalanthus occidentalis</i>          | 2.86           | 0.34             | 0.02                        | 0.01               | 1.04  |
| <i>Cornus foemina</i>                     | 7.14           | 0.86             | 0.23                        | 0.17               | 2.43  |
| <i>Crataegus viridis</i>                  | 0.71           | 0.09             | 0.02                        | 0.02               | 2.50  |
| <i>Diospyros virginiana</i>               | 6.43           | 0.78             | 0.48                        | 0.35               | 3.70  |
| <i>Fraxinus</i> sp.                       | 62.86          | 7.58             | 31.08                       | 22.54              | 9.52  |
| <i>Gleditsia triacanthos</i>              | 0.71           | 0.09             | 1.13                        | 0.82               | 17.00 |
| <i>Ilex decidua</i>                       | 420.71         | 50.73            | 8.17                        | 5.92               | 1.89  |
| <i>Liquidambar styraciflua</i>            | 30.71          | 3.70             | 16.60                       | 12.04              | 9.95  |
| <i>Quercus laurifolia</i>                 | 5.71           | 0.69             | 3.07                        | 2.22               | 9.92  |
| <i>Quercus nigra</i>                      | 11.43          | 1.38             | 15.54                       | 11.27              | 15.79 |
| <i>Salix nigra</i>                        | 0.71           | 0.09             | 1.42                        | 1.03               | 19.10 |
| <i>Taxodium distichum</i>                 | 0.71           | 0.09             | 0.00                        | 0.00               | 0.70  |
| <i>Triadica sebifera</i>                  | 26.43          | 3.19             | 1.86                        | 1.35               | 3.59  |
| <i>Ulmus americana</i>                    | 40.00          | 4.82             | 7.46                        | 5.41               | 5.85  |
| <b>Total</b>                              | 829.29         |                  | 137.90                      |                    |       |
| Habitat 16 Post-Treatment                 |                |                  |                             |                    |       |
| Species                                   | Stems Per Acre | Relative Density | Total Basal Area (sq.ft.ac) | Relative Dominance | QMD   |
| <i>Acer negundo</i>                       | 6.43           | 4.16             | 1.20                        | 3.36               | 5.85  |

|                             |        |       |       |       |       |
|-----------------------------|--------|-------|-------|-------|-------|
| Acer rubrum var. drummondii | 20.50  | 13.26 | 4.66  | 13.04 | 6.45  |
| Celtis laevigata            | 0.71   | 0.46  | 3.05  | 8.55  | 28.00 |
| Cephalanthus occidentalis   | 2.86   | 1.85  | 0.02  | 0.05  | 1.04  |
| Cornus foemina              | 7.14   | 4.62  | 0.23  | 0.65  | 2.43  |
| Crataegus viridis           | 0.71   | 0.46  | 0.02  | 0.07  | 2.50  |
| Diospyros virginiana        | 6.43   | 4.16  | 0.48  | 1.34  | 3.70  |
| Fraxinus sp.                | 6.20   | 4.01  | 3.11  | 8.70  | 9.52  |
| Gleditsia triacanthos       | 0.71   | 0.46  | 1.13  | 3.15  | 17.00 |
| Ilex decidua                | 42.07  | 27.21 | 0.82  | 2.29  | 1.89  |
| Liquidambar styraciflua     | 3.00   | 1.94  | 1.66  | 4.65  | 9.95  |
| Quercus laurifolia          | 5.71   | 3.70  | 3.07  | 8.59  | 9.92  |
| Quercus nigra               | 11.43  | 7.39  | 15.54 | 43.49 | 15.79 |
| Salix nigra                 | 0.00   | 0.00  | 0.00  | 0.00  | 0.00  |
| Taxodium distichum          | 0.71   | 0.46  | 0.00  | 0.01  | 0.70  |
| Triadica sebifera           | 0.00   | 0.00  | 0.00  | 0.00  | 0.00  |
| Ulmus americana             | 4.00   | 2.59  | 0.75  | 2.09  | 5.85  |
| <b>Total</b>                | 118.63 |       | 35.72 |       |       |

**Habitat 17: Forested Wetlands dominated by Willow and Ash with a prominent herbaceous layer (21.93 Acres); 40% Existing Canopy Cover**

Table 20: Existing Species Composition and Percentage To Be Removed

| Common Name        | Scientific Name             | Existing Percent Relative Dominance | Percent To Be Removed |
|--------------------|-----------------------------|-------------------------------------|-----------------------|
| Black Willow       | Salix nigra                 | 64.51%                              | 100%                  |
| Ash                | Fraxinus sp.                | 21.65%                              | 80%                   |
| Drummond Red Maple | Acer rubrum var. drummondii | 5.57%                               | 80%                   |
| Sweetgum           | Liquidambar styraciflua     | 5.52%                               | 80%                   |
| Chinese Tallow     | Triadica sebifera           | 1.09%                               | 100%                  |
| American Elm       | Ulmus americana             | 0.62%                               | 0%                    |
| Possumhaw          | Ilex decidua                | 0.50%                               | 80%                   |
| Honeylocust        | Gleditsia triacanthos       | 0.21%                               | 0%                    |
| Buttonbush         | Cephalanthus occidentalis   | 0.16%                               | 80%                   |
| Laurel Oak         | Quercus laurifolia          | 0.13%                               | 0%                    |
| Persimmon          | Diospyros virginiana        | 0.04%                               | 0%                    |

Table 21: Pre and Post Treatment Stand Characteristics

| Habitat 17 Pre-Treatment |           |          |            |          |     |
|--------------------------|-----------|----------|------------|----------|-----|
| Species                  | Stems per | Relative | Basal Area | Relative | QMD |

|                             |                |                  |            |                    |      |
|-----------------------------|----------------|------------------|------------|--------------------|------|
|                             | Acre           | Density          |            | Dominance          |      |
| Acer rubrum var. drummondii | 113.33         | 12.73            | 9.46       | 5.57               | 3.91 |
| Cephalanthus occidentalis   | 73.33          | 8.24             | 0.27       | 0.16               | 0.83 |
| Diospyros virginiana        | 17.00          | 1.91             | 0.07       | 0.04               | 0.88 |
| Fraxinus sp.                | 173.33         | 19.47            | 36.78      | 21.65              | 6.24 |
| Gleditsia tricanthos        | 10.00          | 1.12             | 0.36       | 0.21               | 2.57 |
| Ilex decidua                | 60.00          | 6.74             | 0.85       | 0.50               | 1.61 |
| Liquidambar styraciflua     | 53.33          | 5.99             | 9.38       | 5.52               | 5.68 |
| Quercus laurifolia          | 6.67           | 0.75             | 0.21       | 0.13               | 2.42 |
| Quercus virginiana          | 3.33           | 0.37             | 0.00       | 0.00               | 0.20 |
| Salix nigra                 | 330.00         | 37.06            | 109.55     | 64.51              | 7.80 |
| Triadica sebifera           | 36.67          | 4.12             | 1.85       | 1.09               | 3.04 |
| Ulmus americana             | 13.33          | 1.50             | 1.04       | 0.62               | 3.79 |
| <b>Total</b>                | 890.33         |                  | 169.83     |                    |      |
| Habitat 17 Post-Treatment   |                |                  |            |                    |      |
| Species                     | Stems per Acre | Relative Density | Basal Area | Relative Dominance | QMD  |
| Acer rubrum var. drummondii | 22.67          | 15.63            | 1.89       | 14.52              | 3.91 |
| Cephalanthus occidentalis   | 14.67          | 10.11            | 0.05       | 0.42               | 0.83 |
| Diospyros virginiana        | 17.00          | 11.72            | 0.07       | 0.55               | 0.88 |
| Fraxinus sp.                | 34.67          | 23.91            | 7.36       | 56.42              | 6.24 |
| Gleditsia tricanthos        | 10.00          | 6.90             | 0.36       | 2.76               | 2.57 |
| Ilex decidua                | 12.00          | 8.28             | 0.17       | 1.30               | 1.61 |
| Liquidambar styraciflua     | 10.67          | 7.36             | 1.88       | 14.39              | 5.68 |
| Quercus laurifolia          | 6.67           | 4.60             | 0.21       | 1.63               | 2.42 |
| Quercus virginiana          | 3.33           | 2.30             | 0.00       | 0.01               | 0.20 |
| Salix nigra                 | 0.00           | 0.00             | 0.00       | 0.00               | 0.00 |
| Triadica sebifera           | 0.00           | 0.00             | 0.00       | 0.00               | 0.00 |
| Ulmus americana             | 13.33          | 9.20             | 1.04       | 8.01               | 3.79 |
| <b>Total</b>                | 145.00         |                  | 13.04      |                    |      |

**Avoca Island Mitigation Bank-Appendix C  
Habitat Work Plan Detail-Vegetative Planting Plan**

---

In the Herbaceous Non-Wetlands above the OHWM identified as Coastal and Non-Coastal BLH Re-Establishment (Vegetative Community 1), hard mast species will account for at least 60 percent of tree plantings with the remaining 40 percent consisting of soft mast species. Tree species selected will be site-appropriate and representative of species on adjacent wetlands and in accordance with BLH species as defined in the Natural Communities of Louisiana (LHNP), with ten or more species selected to ensure adequate species richness (Twedt and Best 2004). Planting densities will be approximately 538 stems per acre at 9 ft. x 9 ft. spacing. Exact species and quantities will be determined by seedling availability at the time of planting from a local commercial source. Table 1 represents the hard and soft mast species to be planted.

In the Herbaceous Wetlands below the OHWM identified as Coastal Cypress Rehabilitation (Vegetative Communities 6 and 11), soft mast species will account for 100 percent of trees planted with the majority being Baldcypress. The remaining species will consist of site appropriate and representative trees on adjacent SWP habitat and in accordance with SWP species as defined in the LHNP. Exact species and quantities will be determined by seedling availability at the time of planting from a local commercial source (Table 2). Since Chinese Tallow is present in the adjacent forested wetlands, and has been observed growing in the restoration area, trees will be planted at 12 ft. centers with 302 stems per acre.

In the Forested Wetlands above the OHWM identified as Coastal and Non-Coastal BLH Rehabilitation (Vegetative Community 2), a mixture of hard and soft mast tree species will be planted to ensure a 60/40 hard to soft mast species ratio at 538 stems per acre (Table 3). Using mechanical and chemical processes the existing stand will be thinned to approximately 230 stems per acre. 308 hard mast stems will then be planted at 9 ft x 9 ft spacing. Exact species and quantities will be determined by seedling availability at the time of planting from a local commercial source and will be site-appropriate and representative of species on adjacent wetlands and in accordance with BLH species as defined in the LHNP, with ten or more species selected to ensure adequate species richness (Twedt and Best 2004).

In the Forested Wetlands below the OHWM identified as Coastal Cypress Enhancement (Vegetative Communities 7, 8, 9, 10, 12, 13, 14, 15, 16, and 17), Baldcypress will account for 100% of the tree species to be planted due to the amount of soft mast currently present. Using mechanical and chemical processes the existing stand will be thinned to approximately 140 stems per acre. Baldcypress will then be planted at approximately 162 stems per acre at 12 ft. centers since Chinese Tallow is present throughout the area to ensure 302 stems per acre are present and at least 125 baldcypress stems are present at the end of year 4.

Table 1: Planting Composition of the Herbaceous Non-Wetlands (Vegetative Community 1)

| BOTTOMLAND HARDWOOD SPECIES                 | SOFTMAST | HARDMAST | COMPOSITION |
|---|----------|----------|-------------|
| Overcup Oak ( <i>Quercus lyrata</i> )       |          | X        | ≤20%        |
| Water Oak ( <i>Quercus nigra</i> )          |          | X        | ≤20%        |
| Nuttal Oak ( <i>Q. nuttallii</i> )          |          | X        | ≤20%        |
| Willow Oak ( <i>Q. phellos</i> )            |          | X        | ≤20%        |
| Water Hickory ( <i>Carya aquatica</i> )     |          | X        | ≤20%        |
| Sweetgum ( <i>Liquidambar styraciflua</i> ) | X        |          | ≤10%        |

|  |   |  |      |
|--|---|--|------|
| Hackberry ( <i>Celtis laevigata</i> )                            | X |  | ≤10% |
| American Elm ( <i>Ulmus americana</i> )                          | X |  | ≤10% |
| Drummond Red Maple ( <i>Acer rubrum</i> var. <i>drummondii</i> ) | X |  | ≤10% |
| Ash ( <i>Fraxinus</i> sp.)                                       | X |  | ≤10% |
| Swamp Dogwood ( <i>Cornus foemina</i> )                          | X |  | ≤10% |
| Hawthorn ( <i>Crataegus</i> sp.)                                 | X |  | ≤10% |

Table 2: Planting Composition of the Herbaceous Wetlands (Vegetative Communities 6 and 11)

| BALDCYPRESS SWAMP SPECIES  | SOFTMAST | HARDMAST | COMPOSITION |
|--|----------|----------|-------------|
| Baldcypress ( <i>Taxodium distichum</i> )                        | X        |          | 50-80%      |
| Swamp Tupelo ( <i>Nyssa biflora</i> )                            | X        |          | ≤20%        |
| Ash ( <i>Fraxinus</i> sp.)                                       | X        |          | ≤20%        |
| Drummond Red Maple ( <i>Acer rubrum</i> var. <i>drummondii</i> ) | X        |          | ≤20%        |
| Water Locust ( <i>Gleditsia aquatica</i> )                       | X        |          | ≤20%        |
| Buttonbush ( <i>Cephalanthus occidentalis</i> )                  | X        |          | ≤20%        |

Table 3: Planting Composition of the Forested Wetlands above the OHWM identified as Coastal and Non-Coastal BLH Rehabilitation (Vegetative Community 2)

| BOTTOMLAND HARDWOOD SPECIES                                      | SOFTMAST | HARDMAST | COMPOSITION |
|--|----------|----------|-------------|
| Overcup Oak ( <i>Quercus lyrata</i> )                            |          | X        | ≤20%        |
| Water Oak ( <i>Quercus nigra</i> )                               |          | X        | ≤20%        |
| Nuttal Oak ( <i>Q. nuttallii</i> )                               |          | X        | ≤20%        |
| Willow Oak ( <i>Q. phellos</i> )                                 |          | X        | ≤20%        |
| Water Hickory ( <i>Carya aquatica</i> )                          |          | X        | ≤20%        |
| Sweetgum ( <i>Liquidambar styraciflua</i> )                      | X        |          | ≤10%        |
| Hackberry ( <i>Celtis laevigata</i> )                            | X        |          | ≤10%        |
| American Elm ( <i>Ulmus americana</i> )                          | X        |          | ≤10%        |
| Drummond Red Maple ( <i>Acer rubrum</i> var. <i>drummondii</i> ) | X        |          | ≤10%        |
| Ash ( <i>Fraxinus</i> sp.)                                       | X        |          | ≤10%        |
| Swamp Dogwood ( <i>Cornus foemina</i> )                          | X        |          | ≤10%        |
| Hawthorn ( <i>Crataegus</i> sp.)                                 | X        |          | ≤10%        |

Table 4: Planting Composition of the Forested Wetlands below the OHWM identified as Coastal Cypress Enhancement (Vegetative Communities 7, 8, 9, 10, 12, 13, 14, 15, 16, and 17)

| BALDCYPRESS SWAMP SPECIES        | SOFTMAST | HARDMAST | COMPOSITION |
|----------------------------------|----------|----------|-------------|
| Baldcypress (Taxodium distichum) | X        |          | 100%        |