



Coastal Protection and
Restoration Authority of Louisiana

**State of Louisiana
Coastal Protection and Restoration
Authority**

Project Completion Report

for

**Hydrologic Restoration and
Vegetative Plantings in the Des
Allemands Swamp (BA-34-2)**

State Project Number BA-34-2

St. James Parish

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Table of Contents

Table of Contents.....	1
List of Tables.....	2
List of Photographs.....	2
1. Project Description & History	1
2. Project Personnel	2
3. Items of Work & Key Project Cost Elements	3
4. Final As-Built Features.....	4
5. Major Equipment Used.....	4
6. Discussion of Construction Sequences and Activities, Problems Encountered	5
6.1. Mobilization	5
6.2. Clearing and Grubbing	5
6.3. Pre-Construction Survey	6
6.4. Magnetometer Survey	6
6.5. Channel Excavation	7
6.6. As-Built Surveys	7
6.7. Tree Planting	8
6.8. Demobilization & Final Inspection	9
6.9. Construction Progress by Chronology	9
7. Safety, Additional Observations, and Recommendations for Improvement	13
Appendix A: Construction Photographs	N/A
Appendix B: CWPPRA Fact Sheet.....	N/A
Appendix C: Vicinity Map	N/A
Appendix D: Gap Locations	N/A
Appendix E: Planting Layout	N/A

List of Tables

Table 1 Project Personnel Associated with Construction	2
Table 2 Bid Items With Construction Cost.....	3
Table 3 CPRA Costs Through Project Conception + Duration	3
Table 4 Pre-Construction Volume Comparison.....	6
Table 5 As-Built Vs. Pre-Construction Volume Comparison.....	8
Table 6 Final Inspection Attendees	9
Table 7 Construction Progress by Location, Activity, & Duration.....	10

List of Photographs

(Appendix A Page #)

Photograph 1 - Initial Chipping Activities Begin on Gap #1.....	1
Photograph 2 - Contractor clears a path to backside of gap and then works back to front.	1
Photograph 3 - Image of cleared gap looking from Bayou Chevreuil.	2
Photograph 4 - Gap #1 post stump clearing.....	2
Photograph 5 - Long Reach Excavator excavating spoil while encountering submerged logs.....	3
Photograph 6 - Buoyant woody debris left over from excavation activities.	3
Photograph 7 - Contractor placing excavated material.	4
Photograph 8 - Finished East Spoil Placement Area on Gap #1.....	4
Photograph 9 - Finished West Spoil Placement Area on Gap #1.	5
Photograph 10 - Perspective of finished channel on Gap #1 from Bayou Chevreuil.	5
Photograph 11 - Perspective of Gap #1 from Bayou Chevreuil showing swamp draining clear dark water.	6
Photograph 12 - Evolving connection between the backside of Gap #1 and the swamp.....	6
Photograph 13 - Subcontractor RES mobilizing Trees & Field Crew.	7
Photograph 14 - Subcontractor loading plants from trailer to skiff.	7
Photograph 15 - Field Crew performing initial tree planting and layout on Gap #1.	8
Photograph 16 - Completed Bald Cypress installation on West Spoil Placement Area of Gap #1.....	8
Photograph 17 - Entrance to Gap #1 showing freshly installed tree saplings.....	9
Photograph 18 - Backside of Gap #1 showing freshly installed tree saplings.	9
Photograph 19 - East Spoil Placement Area of Gap #1 showing freshly installed tree saplings.	10
Photograph 20 - West Spoil Placement Area of Gap #1 showing freshly installed tree saplings.....	10
Photograph 21 – MPH crew using a jackhammer to drive rods to refusal.....	11
Photograph 22 – Bullet cap screwed onto the last rod with concrete drying around the PVC shell.....	11

1. Project Description & History

The Hydrologic Restoration and Vegetative Plantings in the Lac Des Allemands Swamp project is one of the CWPPRA projects listed in Project Priority List 10. It is listed as a "Hydrologic Restoration/ Vegetative Planting" type project. The Project Management Team (PMT) consisted of the Coastal Protection and Restoration Authority (CPRA) and the US Environmental Protection Agency (EPA). It is located approximately 5.0 miles west of Lac des Allemands in St. James Parish, Louisiana. It is bounded by LA Hwy. 20 on the west, by Board Road and the Vacherie Canal to the north, and by Bayou Chevreuil on the south. The project will attempt to restore the hydrology of a semi-impounded 2,395 acre cypress-tupelo swamp. Specific goals include:

1. Restore the hydrology of the cypress-tupelo forest to mimic the water levels in Bayou Chevreuil;
2. Increase the productivity, survivorship, and function of the cypress-tupelo forest;
3. Increase the canopy cover of the cypress-tupelo forest by the end of the twenty year project life;
4. Increase regenerative success of both canopy and mid-story species;
5. Increase the rate of mineral accretion within the southern segments of the project area adjacent to the Bayou Chevreuil shoreline; and
6. Enhance the survival rate of artificially planted seedlings.

The original proposed restoration strategy called for two siphons with a capacity of 400 cubic feet per second to divert water from the Mississippi River; gaps in the spoil banks on Bayou Chevreuil and along the LA20 borrow canal; culverts under LA20; and drainage improvements in the impounded swamp. However, after hydrologic modeling (FTN, 2011) and more detailed engineering/design and cost estimation, the River diversion option was determined not to be viable due to cost. Subsequently, upon the project sponsors' re-scope request, the CWPPRA Task Force approved the project as a hydrologic restoration project. In the revised scope, the siphon/diversion feature was eliminated keeping the remaining project features. The PMT anticipates that the proposed hydrologic improvements "should reverse the impoundment effects that are such serious impediments to swamp health. Planting cypress seedlings will help reestablish the swamp forest in highly stressed areas. Over time, project benefits should include reduced swamp submergence and increased swamp productivity. This strategy will, in turn, provide wildlife, fishery, and storm buffering benefits" (CWPPRA BA-34-2 General Project Fact Sheet, Appendix B).

The poor hydrology in the 2,395 acre area is due to multiple manmade and natural levees in the area. The project area was impounded beginning in 1930, when Highway LA 20 was completed on the western boundary of the project area. A natural ridge runs along the southeastern boundary. The Vacherie Canal to the north was dredged in 1955 which eliminated connectivity of the benefit area with bottomland hardwood swamps and uplands to the north due to spoil banks. Bayou Chevreuil to the south was dredged in 1959, along the southern boundary of the project area which impounded the area with spoil banks. The northern portion of the project area was isolated from the south by construction of a board

road for a gas well in 1969, and a levee was constructed from the end of the board road, north to the Vacherie Canal in 1970.

Project goals will be achieved through breaching the almost continuous Bayou Chevreuil spoil bank in six (6) locations to reduce the duration of rain driven flooding events. The nomenclature for these base bid gaps are as follows; Gap No. 1, Gap No. 2, Gap No. 3, Gap No. 4, Gap No. 5, and Gap No. 6. Two (2) extra gaps were designed and subsequently approved when the base bids came in significantly under budget. The designation for these two gaps is Gap No. Alt 1 and Gap No. Alt 2. All of these gaps have two dredged material disposal areas that are positioned east and west of each gap.

2. Project Personnel

The following is the list of individuals associated with project construction, including their functions and contact information:

Table 1 Project Personnel Associated with Construction

Organization/Function	Name	Contact Number
CPRA Const. Engineer & Inspector	Benjamin Hartman, P.E.	(985) 449-5073
CPRA Project Manager	Renee Bennett, P.M.P.	(225) 342-4592
CPRA Engineer of Record	Shannon Hayes, P.E.	(225) 342-9424
CPRA Project Engineer	Gregory Mattson, E.I.	(225) 342-4496
CPRA Monitoring Scientist	Glen Curole	(985) 447-0995
EPA Project Engineer	Adrian Chavarria	(214) 665-3103
EPA Project Engineer	Patricia Taylor, Ph.D., P.E.	(214) 665-6403
Magnolia Project Manager	Terry Songy	(504) 462-0611
Magnolia Construction Superintendent	Jason Williams	(985) 630-0703
Magnolia Construction Superintendent	Junior Wade	(985) 212-9175
Magnolia Construction Superintendent	Avery Castille	(337) 342-5717
Frogco Personnel Manager	Roland Pitre	
Frogco Airboat Operator	Eric Gros	
Frogco Equipment Operator	Leroy Walker	(985) 992-0852
Frogco Equipment Operator	Paul Prestenback	
Bayou Country Surveying, P.L.S.	Henry Schwartz, P.L.S.	(985) 688-3987
Resource Environmental Solutions	Frank Cuccio	(337) 288-1497
Resource Environmental Solutions	Aaron Pierce	(985) 637-9720

3. Items of Work & Key Project Cost Elements

The following is the list of bid items and bid unit prices for the entire project:

Table 2 Bid Items With Construction Cost

Item	Unit	Quantity	Unit Price	Total Price
Mobilization and Demobilization	Lump Sum	1	83,195.50	83,195.50
Surveys	Lump Sum	1	55,000.00	55,000.00
Clear and Grub	Lump Sum	1	16,500.00	16,500.00
Tree Removal and Disposal	Lump Sum	1	145,200.00	145,200.00
Excavation and Placement	Cubic Yards	9,488	3.58	33,967.04
Bald Cypress Trees	Each	700	22.00	15,400.00
Water Tupelo Trees	Each	100	22.00	2,200.00
Tree Shelters	Each	800	8.80	7,040.00
Addition for Alternate Gap 1	Lump Sum	1	67,000.00	67,000.00
Addition for Alternate Gap 2	Lump Sum	1	67,000.00	67,000.00

The bid was awarded with bird abatement as a line item; however, this line item was removed in Change Order No. 1 since construction window occurred outside nesting season. Change Order No. 1 also shifted the ratio of trees from 600 of each species to the above mentioned quantities. Both Alternatives included 100 trees of each species plus incidental tree shelters; the final As-Built quantity of trees is 800 (700 Bald Cypress, 100 Water Tupelo) which represents a 25% reduction from the initial 1,200 of contract quantity. The total construction cost for Table 2 is \$492,502.54. This does not include the separate installation of a permanent deep rod monument, which was also charged to Construction.

Table 3 below shows CPRA's cost.

Table 3 CPRA Costs Through Project Conception + Duration

Phase	Cost	Duration	Additional Comments
Engineering & Design, Project Admin & Management	\$1,044,327		\$607,791 direct cost + \$234,697*1.86 personnel cost
Construction Oversight	\$49,777 (est.)		\$26,761*1.86 personnel cost
Operations And Maintenance	\$1,272,400	20 years	Annual Inspections + 3 Maintenance Events
Monitoring	\$1,412,388	20 years	

From Phase I authorization (i.e. beginning of E&D) through Phase II (i.e. construction completion), the project cost roughly 1.6 million dollars (\$1,600,000). Hydrologic modeling and design surveys took up a little over 38% of the cost; engineering and design took 20%; construction and inspection took another 34%; while project administration and management took 8%.

Design cost roughly twice as much as construction, which is likely attributed to the unexpectedly low bids; the original estimate for the scope was over one million dollars. Moreover, the decision to perform administration & inspection in-house at the low cost of ~\$50,000 saved \$250,000, since the original estimate was \$304,512.

4. Final As-Built Features

There are 3 principal As-Built features, which include:

1. Eight (8) strategically designed cuts to the northern Bayou Chevreuil spoil bank;
2. Sixteen (16) spoil placement areas extending from the banks of each channel (2 per gap);
3. Seven Hundred (700) Bald Cypress and One Hundred (100) Water Tupelo saplings covered by plastic tree shelters and installed in the freshly constructed spoil placement areas.

Each 400' long gap had a 50' bottom width and invert at -1.0' NAVDD 88. Three to one (3:1) side slopes extend in a linear direction until they intersect with the natural ground. The natural ground varied in elevation due height differences between the swamp, spoil placement areas, and existing spoil banks along Bayou Chevreuil.

Disposal of the excavated material was evenly placed along the backside of the existing spoil bank adjacent to the excavated cuts. Each gap has two of these disposal areas; one located east and another due west of the gap. The 100'x100' gently sloping placement areas vary in elevation between +2.0 to +3.0' NAVD 88.

Fifty-six bald cypress trees were planted in 7 rows of 8 at approximately 14' and 12' centers at each disposal area, respectively. Water tupelo trees were planted only along the edge of both banks of the constructed channels, with each side having a row of 20 trees at 10' to 15' spacing. See planting layout in Appendix E.

5. Major Equipment Used

Project scope was completed using the following equipment:

- (1) Airboat
- (1) Crew Boat
- (1) 2011 CAT 320 Long Reach Marshbuggy Excavator (Cutter Head attachment).
 - 32.5 Tons in weight
 - 165 Horse Power CAT 320

- 50' Reach Length
 - 18' Wide X 30' Long
 - Each Pontoon 5' High, 5' Wide, 30' Long
- (1) Short Reach Marshbuggy (Bucket attachment)
- 32.5 Tons in weight
 - 165 Horse Power CAT 320
 - Standard Reach Length
 - 18' Wide X 30' Long
 - Each Pontoon 5' High, 5' Wide, 30' Long

All heavy equipment was provided by the subcontractor Frogco Amphibious Equipment (Frogco); Magnolia provided only the crew boat which was used for fueling approximately once per week and transporting crew to/from the job site and boat launch.

6. Discussion of Construction Sequences and Activities, Problems Encountered

6.1. Mobilization

Magnolia Dredge & Dock, LLC (Magnolia) was awarded the construction contract as lowest bidder and a notice proceed was issued September 26th 2017. Equipment and personnel were on site and active Monday through Friday 6:30 AM to 4:30 PM and, due to hunting season, only worked the occasional weekend. Heavy equipment accessed Bayou Chevreuil east of the wooden dock located at approximately 1598 LA 20 and was stored at the gaps overnight. The Contractor pushed marsh buggies, using either the airboat or crew boat attached via ratchet straps, between the gaps.

6.2. Clearing and Grubbing

In order to facilitate data collection in the thickly vegetated swamp, Magnolia requested authorization to perform Tree Removal ahead of the Pre-Construction Survey. CPRA approved the request and tree clearing began October 25. Construction photos can be found in Appendix A.

The Contractor's initial tree clearing activities in Gaps No. 1 & 2 were solely limited to the gap footprint. The gaps were cleared simultaneously with the chipping and placement of tree mulch in the spoil placement areas. This became complicated as Magnolia had to predict the excavated volumes and construct the spoil placement areas just wide enough to fall within the outlined tolerances. An engine block fire gave them extra time to think, as Frogco conducted eight consecutive days of repair. Preventative measures (chicken wire was installed over the engine ventilation slots) were taken to prevent future combustion. The Contractor moved back to Gap No. 1, where the spoil placement areas were cleared, before proceeding to Gap No. 3.

Clearing and Grubbing activities were similar across all gaps, with the exclusion of Alt No. 1 & 2 (as described above), and Gap No. 6. The Alternates were located on existing, semi-

functional channels and thus required less clearing along the centerline. Gap No. 6 was heavily forested and took additional time to clear.

6.3. Pre-Construction Survey

Pre-Construction surveys were performed by Bayou Country Surveying on an incremental basis throughout the project, keeping ahead of the excavation work. Surveying of the first four gaps (No. 1-2 plus Alt No. 2) was completed while tree clearing took place on Gap No. 5. This was due to site conditions not allowing a full survey of each channel prior to clearing and grubbing. Surface data was collected on the remaining gaps just as stump excavation finished on Gap No. 4. Surveying activities came close to bottlenecking progress.

Payment for Excavation & Placement was made by cubic yard with initial volume estimates contained in design plans. A comparison between CPRA estimates and pre-construction survey quantities can be seen below.

Table 4 Pre-Construction Volume Comparison

Location	Pre-Con Volume (CY)	Design Volume (CY)	% Difference
Gap No .1	1,828	1,679	8.9 %
Gap No .2	1,568	1,447	8.4 %
Gap No .3	1,555	1,532	1.5 %
Alt. No. 2	844	585	44.4 %
Gap No .4	2,316	1,869	23.9 %
Gap No .5	1,616	1,539	5.0 %
Alt. No. 1	1,908	1,628	17.2 %
Gap No .6	1,469	1,422	3.3 %
Average % Difference			14.1 %

Cross sections were approximately 25' apart with data being collected every 20' feet in the spoil placement areas. Points within the channel were collected approximately every 10'. Flagging and a nail at +3.0' NAVD 88 were established at each gap to indicate max height of spoil.

6.4. Magnetometer Survey

The magnetometer survey could only be completed once a channel was completely cleared and grubbed as it was important that the magnetometer did not experience too much up-and-down motion to achieve a successful survey. It was also necessary to be completed with the survey prior to channel excavation so the Contractor could find any potential

obstructions prior to the start of excavation. The survey was achieved by attaching the magnetometer onto the end of a wooden boom which was mounted at the front of the airboat. The survey consisted of three parallel passes in each channel; one in the middle of the channel, and two other passes close to each bank. After each straight pass the operator would make a zig-zag pass on the way back. This was done to ensure coverage within the channel layout. Survey results showed no obstructions. The contractor was cleared to begin excavation.

6.5. Channel Excavation

Excavation began on November 15 using a short reach marsh buggy for stump removal taking place as tree clearing was nearing the final gaps. The short reach equipment had a mechanical advantage over its long reach counterpart, as the shorter lever arm minimize bending moment imparted on the device. The two complemented each other; the long reach excavator placed material farther without having to move the tracks. The short reach operator pushed stumps from the main channel deep into the placement areas along with dirt and other refuse that the long reach would have incidentally handled. Stump clearing was completed by December 11 with the short reach excavator being subsequently demobilized.

With tree clearing activities complete on November 29, the long reach marsh buggy swapped attachments for a bucket and began excavation and placement of spoil. CPRA authorized Magnolia to go deeper than the tolerances shown in the plans and specifications, resulting in slightly larger excavated quantities, seen in

Table 5. The deeper dredge tolerances were seen as beneficial to maintenance, as it would take more time for the gaps to fill in and less dredging will be required. Magnolia requested the change to guarantee they would achieve target quantities for payment. Field personnel utilized a newly installed staff gage between the shoreline and eastern tip of the wooden dock located at the boat launch to monitor daily water surface elevation and corresponding bottom elevation across gaps. The staff gage was provided by the Thibodaux Field Office of CPRA (leftover from previous projects) and placed on a wooden 4"x4" driven to refusal. All excavation and placement was completed by December 20.

6.6. As-Built Surveys

As-built surveys of the channels were conducted after all excavation activities were complete. The Contractor remained on site until CPRA double checked quantities and approved the As-Built. Surveys for the spoil placement areas were not completed until 3-4 weeks post construction to allow waterlogged soil to consolidate. A comparison between As-Built and pre-construction survey quantities can be seen below.

Table 5 As-Built Vs. Pre-Construction Volume Comparison

Location	As-Built Volume (CY)	Estimated Pre-Con Volume (CY)	% Difference
Gap No .1	2,369	1,828	29.6 %
Gap No .2	1,747	1,568	11.4 %
Gap No .3	1,608	1,555	3.4 %
Alt. No. 2	1,589	844	88.2 %
Gap No .4	2,161	2,316	-6.7 %
Gap No .5	1,636	1,616	1.2 %
Alt. No. 1	2,202	1,908	15.4 %
Gap No .6	1,910	1,469	30.0 %
Average % Difference			21.6 %

Comparing the Design volume in Table 4 to the As-Built volume in

Table 5 shows that Magnolia excavated larger quantities than CPRA initially predicted. This was attributed to variations in the design and pre-con survey plus the directive explained in section 6.5. Similarly, nearly all excavated As-Built quantities were greater than Pre-Con volumes, with the omission of Gap No. 4.

Gap No. 1, Gap No. 4, and Alt No. 1 all had over 2,000 cubic yards removed from the channel alignment. Alt No. 2 had the least amount of material removed; however, it was still nearly twice as much as the Pre-Con quantities predicted and nearly three times more than the design estimate. Shoaling may have occurred between the design and pre-con surveys (as it was a previously existing gap) while the contractor likely over-excavated to achieve adequate quantities.

6.7. Tree Planting

Change Order No. 1 was issued adjusting the contract quantity of water tupelo from 600 to 100 and increasing the bald cypress from 600 to 700. This was necessary as the spoil placement areas were too high for water tupelo to have success. Staff biologists indicated this would be a problem during construction after seeing the original 2.5' NAVD 88 target spoil elevation on the plan set, meaning this was a built in oversight; a change order would have been necessary regardless of whether the Contractor dug shallower or utilized a larger spoil box. A nursery inspection was conducted on January 9th to observe and ensure the health of tree saplings. Trees were delivered to the boat launch January 16th, 2018, just before the hardest freeze of the season; lows for the next three days ranged between 14 to 29 degrees Fahrenheit. Ecological Resource Solutions (RES) was able to plant nearly 400

bald cypress trees on January 16th before taking a 3 day weather induced break. Unplanted trees remained in three-gallon containers at the boat launch; Water tupelo trees were stored at ground level while the bald cypress trees were stored two feet off ground in a cattle trailer. The remaining trees were planted from January 20-22.

Specifications called for two inches by two inch wooden stakes to be driven on each side of the tree with the tree protector fastened around both stakes. Size limitations within the tree shelter inner area and concerns about negatively impacting the root mass dictated only one be used. Two stakes were not needed as the soil strength and sapling size caused the trees to remain upright.

6.8. Demobilization & Final Inspection

Upon completion and CPRA approval of the As-Built surveys, demobilization of boats (airboat & crewboat) was conducted. Demobilization of the long reach buggy occurred over a three week period as Frogco took their time obtaining permits for road transport. By the time tree plantings were complete, all equipment had been demobilized.

Final Inspection of project features occurred on 02/02/18. One item was required by CPRA to fulfill bid specifications: equipment data sheets, which was added to the Construction Punch List. These were submitted 02/15. Attendance is listed in Table 6, below.

Table 6 Final Inspection Attendees

Organization/Function	Name	Contact Number
CPRA Const. Engineer & Inspector	Benjamin Hartman, P.E.	(985) 449-5073
CPRA Project Manager	Renee Bennett, P.M.P.	(225) 342-4592
CPRA Engineer of Record	Shannon Hayes, P.E.	(225) 342-9424
CPRA Project Engineer	Gregory Mattson, E.I.	(225) 342-4496
CPRA Engineer Tech	Shane Faust	(225) 342-4599
CPRA Media Relations Manager	Chuck Perrodin	(225) 342-7615
CPRA Coastal Resource Scientist	Todd Hubble	(985) 447-0994
EPA Project Engineer	Adrian Chavarria	(214) 665-3103
Magnolia Project Manager	Terry Songy	(504) 462-0611
USGS Ecologist, CWPPRA Outreach	Sinead Borchert	(337) 266-8626

6.9. Construction Progress by Chronology

This section contains a table of information regarding construction progress in increments by location, activity/function, and duration with a discussion and helpful observations.

Table 7 Construction Progress by Location, Activity, & Duration

Location	Feature	Date		Construction Day		
		Begin	Complete	Duration	Delays	Reason
	Notice To Proceed					
Gap #1	Clear & Grub	10/25	11/06	2.5	8	Engine Fire, Filter Issues
Gap #2	Clear & Grub	10/26	11/03	2.5		
Gap #3	Clear & Grub	11/06	11/08	2		
Alt #2	Clear & Grub	11/08	11/10	2		
Gap #4	Clear & Grub	11/10	11/13	3	1	Sunday Off
Gap #5	Clear & Grub	11/13	11/15	2		
Alt #1	Clear & Grub	11/16	11/20	2.0	2	Hose Issues, Hunters, Sunday Off
Gap #6	Clear & Grub	11/20	11/28	3	4.5	Thanksgiving
Gap #1	Pre-Con Survey	11/13	11/13	1/3		
Gap #2	Pre-Con Survey	11/13	11/13	1/3		
Gap #3	Pre-Con Survey	11/13	11/13	1/3		
Alt #2	Pre-Con Survey	11/14	11/14	1/3		
Gap #4	Pre-Con Survey	11/14	11/14	1/3		
Gap #5	Pre-Con Survey	11/27	11/27	1/3		
Alt #1	Pre-Con Survey	11/27	11/27	1/3		
Gap #6	Pre-Con Survey	11/29	11/29	1/3		
Gap #1	Mag Survey	11/15	11/15	1/6		
Gap #2	Mag Survey	11/15	11/15	1/6		
Gap #3	Mag Survey	11/15	11/15	1/6		
Alt #2	Mag Survey	11/15	11/15	1/6		
Gap #4	Mag Survey	11/15	11/15	1/6		
Gap #5	Mag Survey	11/15	11/15	1/6		
Alt #1	Mag Survey	11/27	11/27	1/6		
Gap #6	Mag Survey	11/27	11/27	1/6		

Gap #1	Excavation (Stumps)	11/16	11/17	1.5		
Gap #2	Excavation (Stumps)	11/17	11/17	1		
Gap #3	Excavation (Stumps)	11/17	11/20	1.5	1.5	Half Sat, Off Sunday
Alt #2	Excavation (Stumps)	11/20	11/27	2.5	4.5	Thanksgiving
Gap #4	Excavation (Stumps)	11/27	11/30	3		
Gap #5	Excavation (Stumps)	11/30	12/01	1		
Alt #1	Excavation (Stumps)	12/01	12/05	2	2	Weekend
Gap #6	Excavation (Stumps)	12/05	12/12	3.5	3	Off Weekend, 3 Snow days
Gap #1	Excavation & Placement	11/30	12/05	3.5	2	Off weekend
Gap #2	Excavation & Placement	12/05	12/11	3	3	Off Weekend, 3 Snow days
Gap #3	Excavation & Placement	12/11	12/13	2		
Alt #2	Excavation & Placement	12/13	12/14	1		
Gap #4	Excavation & Placement	12/14	12/17	3		
Gap #5	Excavation & Placement	12/17	12/18	1		
Alt #1	Excavation & Placement	12/19	12/20	1		
Gap #6	Excavation & Placement	12/20	12/20	1		
C.O. #1	Bird Abatement, Tree Planting	01/10	01/10	N/A	N/A	N/A
Gap #1	Tree Planting	01/16	01/16	1/3		
Gap #2	Tree Planting	01/16	01/16	1/3		
Gap #3	Tree Planting	01/16	01/16	1/3		
Alt #2	Tree Planting	01/20	01/20	1/3		
Gap #4	Tree Planting	01/20	01/20	1/3		
Gap #5	Tree Planting	01/20	01/20	1/3		
Alt #1	Tree Planting	01/22	01/22	.25		

Gap #6	Tree Planting	01/22	01/22	.25		
Overall	Clear & Grub	10/25	11/28	19	15.5	
Overall	Pre-Con Survey	11/13	11/29	3		
Overall	Mag Survey	11/15	11/27	3		
Overall	Excavation (Stumps)	11/16	12/12	16	11	
Overall	Excavation & Placement	11/30	12/20	15.5	5	
Overall	Tree Planting	01/16	01/22	2.5	4	Off Sunday

Useful observations can be made from Table 7, specifically regarding duration of individual tasks.

- Excavation of stumps and placement of spoil took a combined 31.5 days of effort,
- Clearing and grubbing needed 19 days,
- Pre-construction surveys (including mag work) took approximately a week when accounting for post-processing.
- Information regarding the As-Builts show data collection took approximately 7 days.
- Tree planting took 2.5 days.
- Heavy equipment operated for 35.5 total workdays since most activities occurred simultaneously; the long reach excavator operated for 12 work days before and 8 days after the short reach excavator was on site.

6.10 Installation of Deep Rod Monument

After the completion of the original contract scope, a separate scope to install a deep rod monument was awarded to Morris P. Hebert Inc. through the IDIQ contract process. This monument is a necessary feature for monitoring gap elevations and acts as a replacement for the missing BA-34 SM-02 monument. The placement of this feature was shifted from the original location by ~50 feet to account for future expansion of highway 20.

Construction of this feature took place April 4th, 2018 with a three man crew and half a work day. Threaded dowel rods were driven to refusal by hand, followed by a rotating jackhammer (Photograph 21) to a depth of 71.8 feet. A 3” threaded tip caps the rod (Photograph 22) and is enclosed by a sand filled 6” PVC pipe set in concrete. The edge of the last rod warped somewhat due to heat and force, leaving the bullet tip slightly crooked on an otherwise linear dowel. The adjusted NAVD88 elevation was recorded as 1.129 feet.

7. Safety, Additional Observations, and Recommendations for Improvement

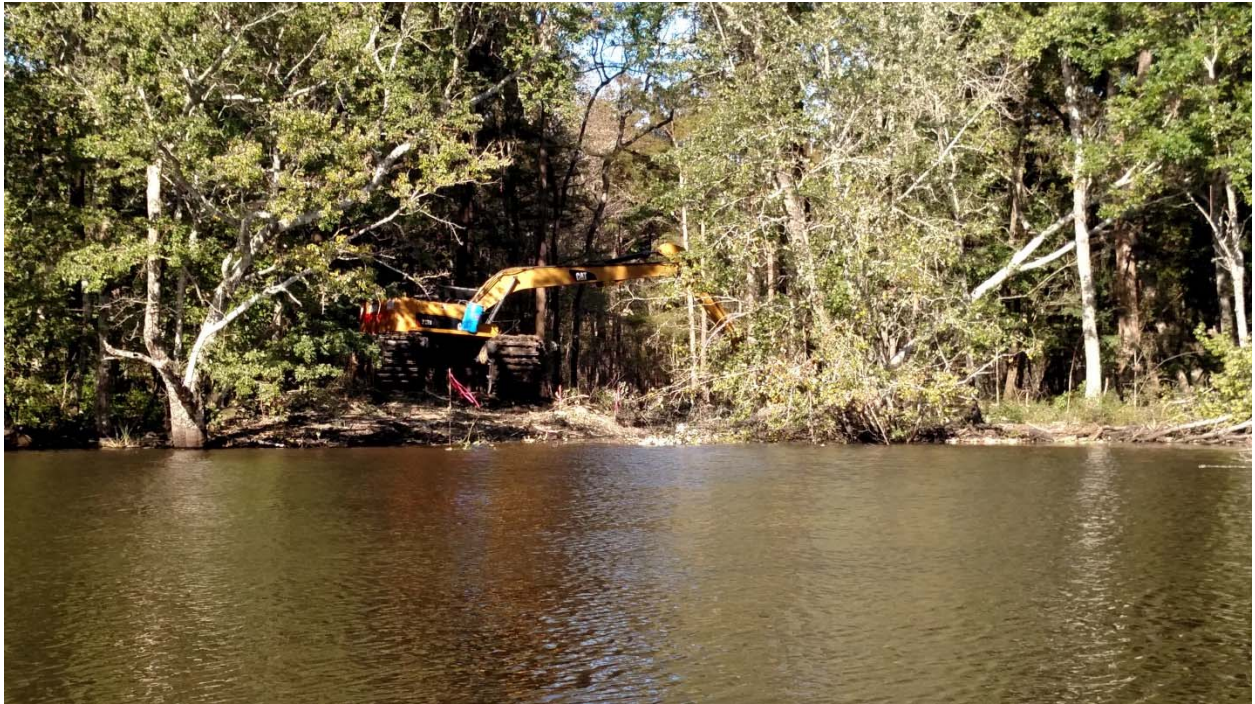
A good safety record was achieved: no injuries occurred, but there was one accident recorded. During the first few hours of tree clearing, the long reach operator cut a tall tree with approximately 40-50 feet of trunk above the cutter head blade. The portion of the tree above the cutter head fell directly on the equipment boom before rolling down towards the engine compartment and rupturing a fire extinguisher. The tree was heavy enough to crush the operator/engine compartments. Magnolia & Frogco were instructed to slow down and keep safety first. The long reach operator took extra care while chipping tall trees.

The Contractor could have lessened the construction duration by mobilizing the short reach sooner and tasking the operator to excavate and place spoil otherwise handled by the long reach. This would not be the optimal utilization of both machinery's physical capabilities (as discussed in section 6.5), but it would constrain duration further. Longer durations at the various gaps were attributed to delays due to equipment breakdowns, holidays, hunting, weather, or weekend breaks. Excavation of stumps progressed more quickly as the operator began placing increasingly large amounts of channel material in placement areas. Consequently, Excavation and Placement began slowly but sped up as the operator had diminishing quantities to place.

Soil with increased water content and organic material was encountered in several areas that were excavated. The issues related to the handling of this material (sloughing back into the gap and subsequent drying time required before surveying) resulted in increased construction durations and a loss of productivity. However, the Contractor only needed about half of the 182 construction days to complete excavation and placement. In the future, the contractor should include time their construction sequencing and schedule for dewatering prior to surveying and/or tree planting.

An excessive amount of floating woody debris (Photograph 6) remained in the channels after clearing and excavation was completed. This was noticed at all gaps before flushing (due to rainfall) pushed nearly all refuse out of most of the gaps. Weeks later, floating woody debris remained in Gaps No. 5 and No. 6, indicating poor connectivity. This may attributed to higher elevations in the surrounding vicinity, greater energy loss (higher roughness coefficients, longer hydraulic lengths), or less of an established channel. Also, the existence of an internal tree ridge may be funneling water to the four western most gaps. Removal of such material should be included in future contracts. The presence and eventual degradation of floating woody debris will not be a long term issue as shifting water levels will provide oxygen for bacterial decay.

Appendix A: Construction Photographs



Photograph 1 - Initial Chipping Activities Begin on Gap #1.



Photograph 2 - Contractor clears a path to backside of gap and then works back to front.



Photograph 3 - Image of cleared gap looking from Bayou Chevreuil.



Photograph 4 - Gap #1 post stump clearing.



Photograph 5 - Long Reach Excavator excavating spoil while encountering submerged logs.



Photograph 6 - Buoyant woody debris left over from excavation activities.



Photograph 7 - Contractor placing excavated material.



Photograph 8 - Finished East Spoil Placement Area on Gap #1.



Photograph 9 - Finished West Spoil Placement Area on Gap #1.



Photograph 10 - Perspective of finished channel on Gap #1 from Bayou Chevreuil.



Photograph 11 - Perspective of Gap #1 from Bayou Chevreuil showing swamp draining clear dark water.



Photograph 12 - Evolving connection between the backside of Gap #1 and the swamp.



Photograph 13 - Subcontractor RES mobilizing Trees & Field Crew.



Photograph 14 - Subcontractor loading plants from trailer to skiff.



Photograph 15 - Field Crew performing initial tree planting and layout on Gap #1.



Photograph 16 - Completed Bald Cypress installation on West Spoil Placement Area of Gap #1.



Photograph 17 - Entrance to Gap #1 showing freshly installed tree saplings.



Photograph 18 - Backside of Gap #1 showing freshly installed tree saplings.



Photograph 19 - East Spoil Placement Area of Gap #1 showing freshly installed tree saplings.



Photograph 20 - West Spoil Placement Area of Gap #1 showing freshly installed tree saplings.



Photograph 21 – MPH crew using a jackhammer to drive rods to refusal.



Photograph 22 – Bullet cap screwed onto the last rod with concrete drying around the PVC shell.

Appendix B: QWPPRA Fact Sheet



Hydrologic Restoration and Vegetative Planting in the des Allemands Swamp (BA-34-2)

Project Status

Approved Date: 2001 **Project Area:** 2,394 acres

Approved Funds: \$5.22 M **Total Est. Cost:** \$7.88 M

Net Benefit After 20 Years: N/A

Status: Construction

Project Type: Hydrologic Restoration/ Vegetative Planting

PPL #: 10

Location

The project is located west of Lac des Allemands in St. James Parish, Louisiana, south of the town of South Vacherie, bordered on the south by Bayou Chevreuil, and on the east by LA Highway 20.

Problems

The Lac des Allemands River Basin Initiative identified the following specific problems within the Lac des Allemands Watershed: drainage impairments; water quality impairments; loss of marsh; and decline of cypress forest. Many years of study by Louisiana State University researchers in these swamps have demonstrated that, because of impoundment, subsidence, and inadequate accretion of sediments and organic matter, some areas are already highly stressed and converting to open water, floating aquatic plants, and fresh marsh. Also, the Coast 2050 report suggests that other areas of the swamps throughout the basin will likely convert to open water or floating marsh by the year 2050. These problems are caused by the loss of river water along with the associated sediment and nutrients necessary for swamp health. The loss of river water can be attributed to the leveeing of the Mississippi River. Impoundment caused by roads, drainage canals, and spoil banks is also a major cause of degradation of these swamps.

Restoration Strategy

The original proposed restoration strategy included installing two small siphons (averaging 400 cubic feet per second) to divert water from the Mississippi River; gapping spoil banks on Bayou Chevreuil; gapping spoil banks along the borrow canal beside Louisiana Highway 20; installing



Recent photo at the edge of the swamp. The impoundment has led to a negative effect on cypress and tupelo trees and encouraged the growth of herbaceous marsh plants.

culverts under Louisiana Highway 20; improving drainage in impounded swamps; and planting cypress and tupelo seedlings in highly degraded swamp areas. The proposed diversion from the Mississippi River was to bring fresh water, fine-grained sediments, and nutrients into the upper des Allemands swamps, which would have helped maintain swamp elevation, improve swamp water quality, and increase productivity and regrowth of young trees as older trees die. However, after hydrologic modeling and more detailed engineering/design and cost estimation, it was determined that the siphon would cost far more than originally anticipated. For that reason, the CWPPRA Task Force approved the project sponsors' request to re-scope the project to eliminate the siphon feature, and to focus on the remaining project features.

The remaining project features include six spoil bank gaps into the impounded swamp to reverse the impoundment effects that are serious impediments to healthy swamp structure and function. Planting cypress and tupelo seedlings will help reestablish the swamp forest in highly stressed areas. Over time, project benefits should include reduced swamp submergence and increased swamp productivity. This strategy will, in turn, provide wildlife, fishery, and storm buffering benefits. The project will enhance an area of swamp (2,395 acres) that would continue to degrade without the project.

Progress to Date

The Louisiana Coastal Wetlands Conservation and Restoration Task Force approved Phase I funding at their January 10, 2001 meeting. There is a cooperative agreement between the U.S. Environmental Protection Agency and Louisiana Coastal Protection and Restoration Authority. Engineering & design tasks have been underway for a number of years. Hydrologic modeling, additional development of project features, improved cost estimates, and consultation with an expert swamp ecologist led the project team to conclude that the siphon feature was not sufficiently cost-effective to continue pursuing. In June 2013, the CWPPRA Task Force approved a request to change the scope of the project to eliminate the siphon feature and focus on the remaining original hydrologic restoration and vegetative planting project features.

After the kick-off meeting in January 2014, project sponsors completed hydrologic modeling and developed a preferred alternative for construction to best achieve project goals. Topographic, magnetometer, and spoil placement survey work is complete. The project team completed engineering and design, environmental compliance, real estate negotiations, operation & maintenance, and monitoring planning, and a cultural resources investigation to the 95% design level as required by the CWPPRA standard operating procedures. The 95% design review meeting was held October 28, 2015. All items as required by the CWPPRA SOP were provided to the Tech Committee as part of the Phase II Request.

The Phase II Request was presented to the CWPPRA Tech Committee on December 10, 2015. On January 22, 2016, the CWPPRA Task Force approved Phase II funds for construction. Construction started in the fall of 2017 and is expected to last approximately 182 working days. The estimated completion date is early spring of 2018.

This project is on Priority Project List 10.

For more information, please contact:



Federal Sponsor:

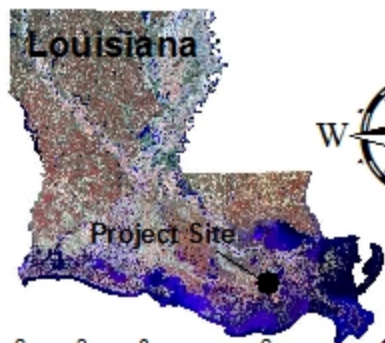
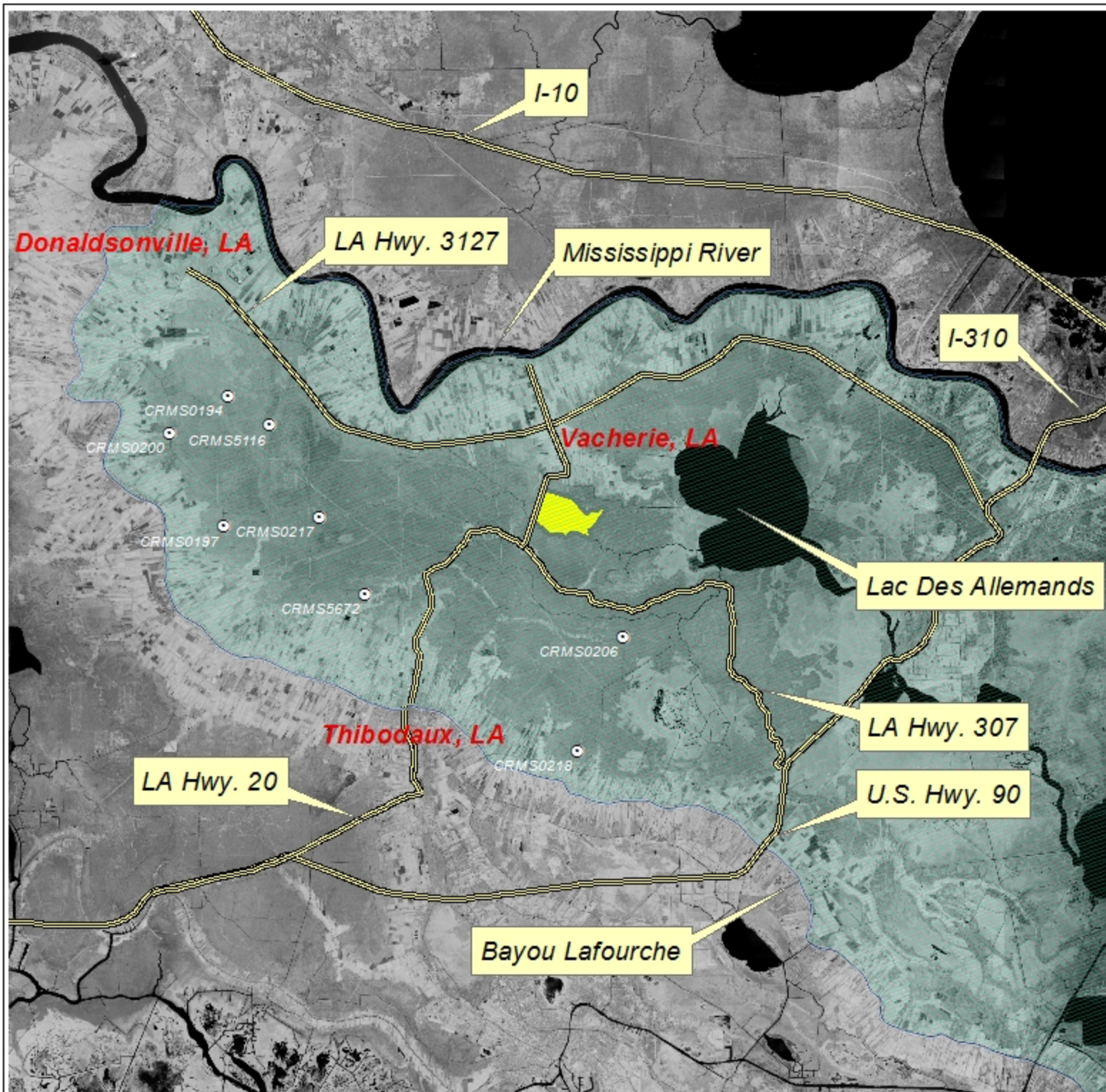
U.S. Environmental Protection Agency
Dallas, TX
(214) 665-2712



Local Sponsor:

Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736

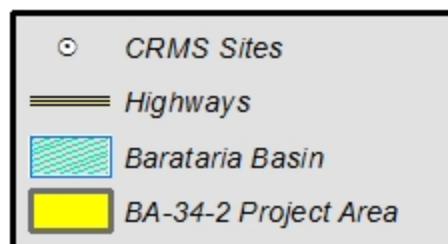
Appendix C: Vicinity Maps



Data Source:
Coastal Protection and
Restoration Authority of LA
Office of Coastal Protection
and Restoration
Operations

2013 NAIP

Date: May 14, 2015
Map ID: 2015-TRO-021



Appendix D: Gap Locations

SPOIL BANK GAP CENTERLINE COORDINATES				
SPOIL BANK GAP	BEGINNING (BAYOU)		ENDING (SWAMP)	
	NORTHING	EASTING	NORTHING	EASTING
1	512,293.69	3,474,091.45	512,590.01	3,474,356.63
2	511,778.05	3,474,585.22	512,056.28	3,474,872.60
3	510,625.79	3,477,277.33	511,025.76	3,477,286.74
ALT. 2	510,627.72	3,478,734.48	511,015.93	3,478,614.66
4	510,123.45	3,479,141.54	510,474.34	3,479,334.75
5	510,267.18	3,479,806.61	510,541.43	3,479,514.94
ALT. 1	510,810.50	3,480,607.31	511,191.80	3,480,467.43
6	510,725.16	3,482,284.76	511,080.31	3,482,465.54

ESTIMATED GAP EXCAVATION QUANTITIES		
SPOIL BANK GAP	VOLUME (CY)	AREA (ACRES)
1	1,679	0.6
2	1,447	0.6
3	1,532	0.6
4	1,869	0.6
5	1,539	0.6
6	1,422	0.6
ALT. 1	1,628	0.6
ALT. 2	585	0.6

AVAILABLE SPOIL PLACEMENT AREA QUANTITIES		
SPOIL DISPOSAL AREA	VOLUME (CY)	AREA (ACRES)
1	2,518	1.1
2	2,170	1.0
3	2,297	1.0
4	2,803	1.0
5	2,307	0.9
6	2,132	0.8
ALT. 1	2,442	0.9
ALT. 2	878	0.5



STATE OF LOUISIANA
SHANNON McCLAIN HAYNES
License No. 30632
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING
6/12/17

NOTE:
WORK AREAS CONTAIN APPROXIMATELY 150 TREES
PER ACRE OR 1,800 TREES TOTAL.



REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION AND
RESTORATION AUTHORITY

150 TERRACE AVENUE
BATON ROUGE, LOUISIANA 70802

DRAWN BY: K. CANTU

DESIGNED BY: G. MATTSON, E.I.

HYDROLOGIC RESTORATION AND
VEGETATIVE PLANTING IN THE
DES ALLEMANDS SWAMP

STATE PROJECT NUMBER: BA-34-2

FEDERAL PROJECT NUMBER: BA-34-2

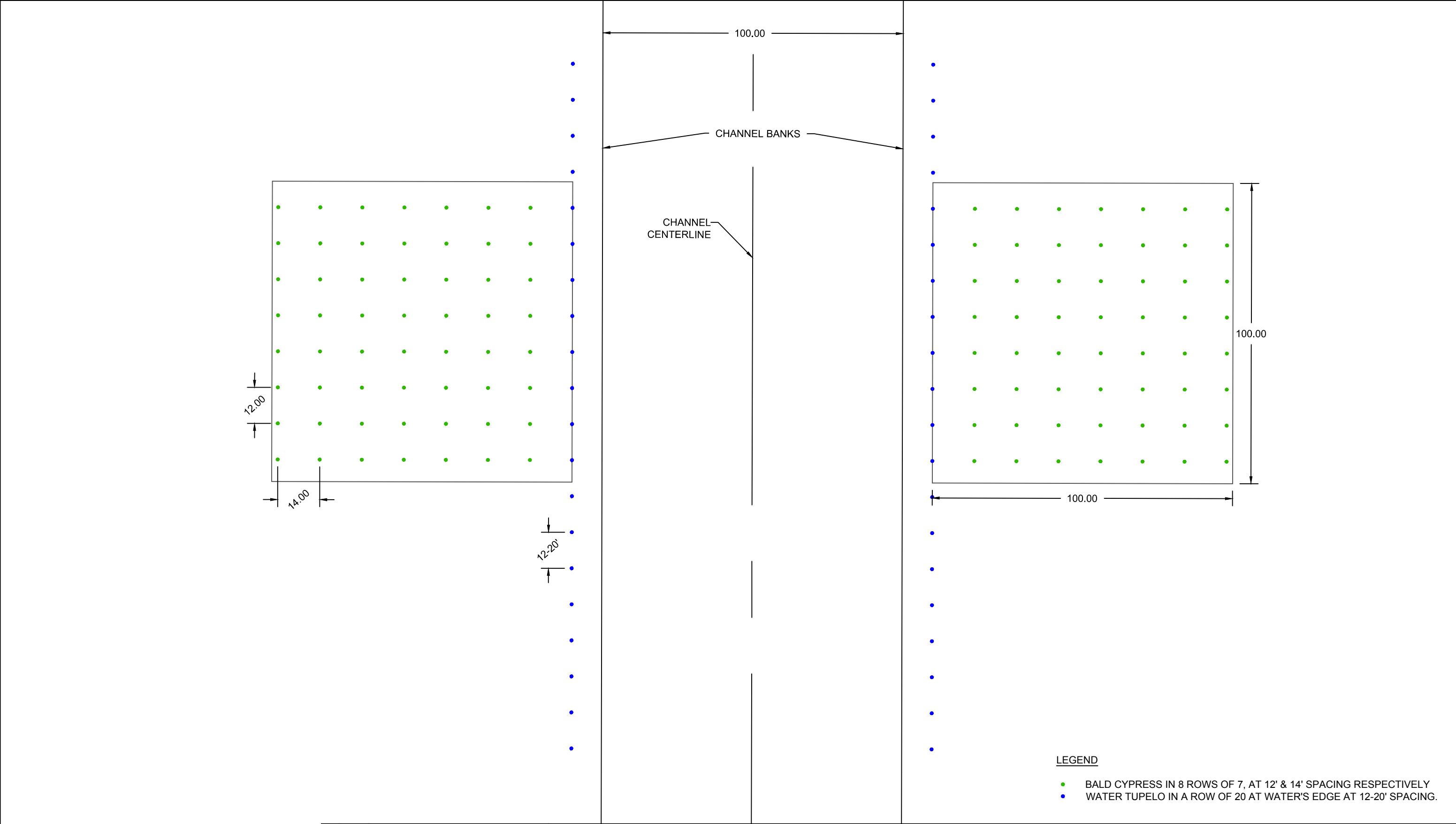
APPROVED BY: S. HAYNES, P.E.

PROJECT LAYOUT

DATE: JUNE 2017

SHEET 3 OF 20

Appendix E: Planting Layout



NOTES:
ALL TREES WRAPPED IN 3' PROTECTIVE TREE SHELTER AND ANCHORED BY TWIST TIES AND A SINGLE WOODEN STAKE.
PLANTED 01/16 - 01/22

REV.	DATE	DESCRIPTION	BY

PLANTED BY RES
AS-BUILT BY CPRA

COASTAL PROTECTION AND RESTORATION AUTHORITY 450 LAUREL STREET BATON ROUGE, LOUISIANA 70801		BA-34-2 PLANTING AS-BUILTS		TYPICAL LAYOUT	
		STATE PROJECT NUMBER: BA-34-2			
				FEDERAL PROJECT NUMBER: BA-34-2	DATE: 02/09/18
DRAWN BY: B.J.H.		DESIGNED BY: B.J.H.		APPROVED BY: B.J.H.	SHEET 1 OF 1