LITTLE RIVER STREAM AND WETLAND ENHANCEMENT

AS-BUILT & BASELINE MONITORING REPORT

Moore County, North Carolina
EEP Project Number 226

Prepared for:
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Status of Plan: Final
Submission Date: December 2011
Data Collection Completed: February 2011

Prepared by:

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EXECUTIVE SUMMARY

The As-Built & Baseline Monitoring Report presented here includes the monitoring plan success criteria, methodology, and baseline conditions for the Little River Wetland Enhancement Restoration site. This southeastern Moore County, North Carolina site is located on the "Little River J-Bar Ranch" property approximately 3.5 miles southeast of US Highway 1 along Little River.

The project is funded by the NC Ecosystem Enhancement Program (EEP). Initial project research and design began in 2002 and was undertaken by BLUE: Land, Water, Infrastructure, PA (BLWI). Multiple scope changes were made and the project went from having a major stream restoration component to primarily wetland enhancement and preservation. The project transitioned from BLWI to Stantec Consulting Services, Inc. (Stantec) in the spring of 2007. Portions of BLWI's initial data collection are presented here. The site was burned in December 2010, planted in January 2011, and the baseline field monitoring was performed in February 2011.

The project is located on the property sometimes referred to as the "Little River J-Bar Ranch," "New J-Bar Ranch," or simply "J-Bar." Historically, the property was sometimes known as the "McKeithen Tract." The property is currently owned by J.J. Barnes and his family. The property is actively managed for wildlife habitat to facilitate hunting on the overall tract.

The project site is bounded on the west by the tract property boundary, on the south by the Little River, and on the east by the tract property boundary. The northern boundary is defined by the conservation easement boundary on the J-Bar parcel. The project site is dominated by a cutover and bedded area. Prior to the initiation of this project, this area was planted with loblolly pine (*Pinus taeda*). Various herbaceous and woody species, in addition to the loblolly pine, are also found at the project site. A bottomland hardwood forest approximately 200 to 500 feet in width is located between the timbered area and the Little River mainstem.

The overall goal of the Little River project is to preserve and enhance a natural Bottomland Hardwood Forest which exhibits desired functions appropriate to the existing geomorphic setting of the site. Specific goals include: 1) preservation of wildlife habitat; and 2) natural community enhancement. The project objectives include: 1) partial removal of undesired vegetation via burning to promote desired species growth; and 2) planting of the project site with specific native species to enhance natural habitat.

Several stream channels traverse the project site. These channels are natural streams with headwaters forming within J-Bar parcel. Small portions of the channels appear to have been altered in the past but currently appear stable. The projected included 3,593 linear feet of stream enhancement on two tributaries to the Little River (Reach 1 & Reach 2), and 210 linear feet of stream preservation of one associated tributary (Reach 3).

Wetlands within the conservation easement boundary were enhanced or preserved. Approximately 39 acres of wetlands in the bottomland hardwood forest adjacent to the Little River channel have been designated for preservation, in addition to approximately 9 acres of successional wetland located in the northwest portion of the project site. The wetlands within the approximately 48-acre loblolly pine plantation area and 7-acre grassy field area have been enhanced through burning of the both areas and the planting of native hardwood trees.

Vegetative sample plots will be quantitatively monitored in the fall of each monitoring year. Sixteen vegetation plots will be monitored as per the CVS-EEP Protocol for Recording Vegetation, version 4.2 (CVS-EEP 2008). The plots will be monitored for a minimum of 5 years. The vegetative success of the restoration site will be evaluated based on the species density and survival rates. Wetland vegetation monitoring will be considered successful if 150 planted woody stems per acre are surviving in year 5 of monitoring in the pine plantation area, while 260 planted woody stems per acre must be surviving after 5 years of monitoring in the grassy field area. Streams will be visually assessed each year to monitor for stability. One crest gauge has been installed onsite and is located adjacent to Vegetation Plot 7.

The project involves the enhancement of existing jurisdictional areas within the pine plantation, and the preservation of existing wetlands and streams within the conservation easement. Therefore, hydrology is already assumed to be present due to the presence of hydric soil indicators and lack of drainage. In order to monitor and confirm the hydrology, five continuous groundwater gauges were installed on the site. Four of the gauges are located in the jurisdictional areas of the pine plantation and a fifth is a reference well located in the reference wetland in a preservation area on the west side of the project. There is no success criterion for wetland hydrology.

Stantec staff installed groundwater wells and completed the baseline vegetation monitoring on February 2, 2011 using the CVS-EEP Protocol for Recording Vegetation, version 4.2 (CVS-EEP 2008). Monitoring was conducted in 16 vegetation plots. According to the data collected, the average plant density among the 16 plots is 329 stems/acre. The original planting plan specified 300 stems/acre for planting Zone 1 (pine plantation) which includes plots 4 - 16; while 600 stems/acre was specified for Zone 2 (grassy field) which includes plots 1, 2 and 3. The highest plant densities occurred in plots 1, 3, 6, and 8. Plots 2, 4, 7, 9, 10, 12, 13 and 14 did not meet the planting density requirements by more than 10%.

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1.0 Project Goals, Background and Attributes

1.1 LOCATION AND SETTING

The Little River project site is part of the J-Bar Ranch, which is owned and operated by J. J. Barnes and his family. The project site is near Vass in Moore County, which is located approximately 60 miles south of Raleigh on US Highway 1. From US Highway 1 in Vass, travel approximately 3.5 miles southeast along Lobelia Road (NC Highway 690) and turn right onto a dirt access road. Follow the dirt road approximately 0.25 miles and then bear left at the fork in the road. Continue an additional 0.65 miles along the dirt road to a second fork. The right hand side of the fork leads into the easement while the left hand fork follows the northern boundary of the easement. Refer to Figure 1 in Appendix A for a vicinity map.

The site is located at 35.22° North / 79.24° West on the northwestern portion of the United States Geological Survey (USGS) 7.5 Minute Topographic Quadrangle *Lobelia* (Figure 1, Appendix A). The project site is located in the Cape Fear River basin, within the USGS 14-digit hydrologic unit 03030004070050.

1.2 PROJECT GOALS AND OBJECTIVES

The overall goal of the Little River project is to preserve and enhance a natural floodplain system which exhibits desired functions appropriate to the existing geomorphic setting of the site. The main functions of this system are nutrient processing, aquatic and terrestrial habitat, and floodwater storage.

The preservation areas of the site will provide for perpetual protection of the currently functioning areas. Wetland enhancement on the site will improve aquatic and terrestrial habitat by restoring a natural diverse plant community to existing wetlands. This diverse plant community will help maintain the streams' connectivity to the adjacent floodplain.

Specific objectives to achieve the goals are:

- Preservation of 210 linear feet of perennial stream channel, 39.3 acres of bottomland hardwood wetlands along the Little River, and 9.3 acres of successional wetlands;

- Enhancement of 3,593 linear feet of perennial stream channels, and 54.8 acres of bottomland hardwood wetlands with planting of native bottomland hardwood species.

The bottomland hardwood wetland enhancement was accomplished with site preparation by removing undesirable existing vegetation and planting native vegetation through a prescribed burn. The conversion of the pine plantation and associated riparian areas to hardwood species will greatly improve the wildlife habitat on the property and improve the aquatic species diversity and abundance in the streams on the site.

1.3 PROJECT STRUCTURE, RESTORATION TYPE AND APPROACH

1.3.1 Project Structure

The project involved enhancement of 3,593 linear feet (LF) of stream (Reach 1 & 2) and 54.8 acres (AC) of riparian and non-riparian wetlands, and preservation of 210 LF of stream (Reach 3) and 48.7 AC of riparian and successional wetlands along the project site. A recorded conservation easement consisting of 125± AC will protect all stream reaches, riparian buffers and wetlands in perpetuity. Refer to Table 1 and Figure 2 in Appendix A for a table and detailed plan view of the project components.

1.3.2 Restoration Type and Approach

Historically, the site had been clear cut and a loblolly pine plantation was established on approximately 55 acres of the site. Additionally, two small areas were maintained as grassy fields for bird hunting. Various herbaceous and woody species, in addition to the loblolly pine, are also found at the project site. A bottomland hardwood forest approximately 200 to 500 feet in width is located between the timbered area and the Little River mainstem.

Several stream channels traverse the project site. These channels are natural streams with headwaters forming within J-Bar parcel. Small portions of the channels appear to have been altered in the past but currently appear stable. A jurisdictional determination of the site in 2007 found approximately 105 acres of existing wetland on the project site.

The purpose of the project was to provide enhancement of existing jurisdictional riparian and wetlands and stream functions to a pine plantation on the site. The project also included preservation of existing jurisdictional riparian and wetlands in the existing bottomland hardwood forest surrounding the pine plantation, and the preservation of some existing streams on the site.

The vegetative components of this project include streambank and wetland planting. Bare-root seedlings were planted within designated areas of the conservation easement. The planting plan for the site included two planting zones: pine plantation (Zone 1) planted at 300 stems/acre, and “grassy field (Zone 2) planted at 600 stems/acre. Both zones were planted with Coastal Plain Bottomland Hardwood Forest as described by Schafale and Weakley (1990) and in the NC Wetland Assessment Method User Manual (2010).

Project components are depicted in Figure 2 of Appendix A.

1.4 PROJECT HISTORY, CONTACTS, AND ATTRIBUTE DATA

The project was initially designed by BLUE: Land, Water, Infrastructure (BLWI) in 2002. The project transitioned from BLWI to Stantec Consulting Services, Inc. (Stantec) in the spring of 2007. The scope of the project was changed to wetland and stream enhancement by EEP in 2009. The project underwent a controlled burn in December 2010 and planting was completed in January 2011. Refer to Tables 2-4 in Appendix A for additional project and contact details.

The 410 acre project watershed is located in the Sandhills physiographic province of North Carolina. The project site is located on a terrace of the Lower Little River. Slopes are generally less than one percent in the floodplain/terrace area with steep slopes farther upslope in the watershed. Elevations on the Little

River enhancement site range from approximately 220 to 310 feet above mean sea level with the most relief being outside the project area. The subsurface geology in the project vicinity consists of the Cape Fear formation, which is comprised of sandstone and sandy mudstone with yellowish gray to bluish gray, mottled red to yellowish orange, indurated, graded and laterally continuous bedding and blocky clay (Geologic Map of North Carolina, NC Geological Survey, 1998). Faint cross-bedding, feldspar and mica are also common.

Soil types from the USDA-NRCS Moore County Soil Survey were combined by BLWI with the digitized USDA-NRCS Moore County Soil Survey field sheets to get a more detailed assessment of the soils in the watershed. The most prevalent soil types are Bibb (33.7%), Kalmia (21.62%), and Ailey (19.53%). Bibb is a poorly drained sandy soil that forms in alluvial deposits, while the well-drained sandy Kalmia occurs on stream terraces and Ailey is a well-drained sandy upland soil (Figure 10.3). However, the soils onsite contain much more clay than those mapped.

The watershed is mixture of mixed shrubs/trees (69.1%), hardwood forest (16.0%), southern yellow pine (11.7%), pasture (1.1%), roadways/pathways (1.1%), cultivated (0.8%), and water (0.1%) (Table 9.2). The majority of the hardwood forest occurs in the floodplain of the Little River, particularly in the vegetated buffer directly adjacent to the primary channel.

Expected foreseeable land use / land cover change in the project site watershed is expected to include general reforestation and expanded habitat management. The new US Highway 1 Bypass in the Vass area is expected to increase land development near the project site as the highway is less than three miles away and includes an exit ramp onto Lobelia Road.

2.0 Success Criteria

Vegetation survival and hydrology will be monitored on the project site. Post-restoration monitoring will be conducted for a minimum of five years or until the success criteria are met following the completion of construction to document project success.

2.1 VEGETATION

The vegetative success of the bottomland hardwood forest will be evaluated based on the density and survival rates. Wetland vegetation monitoring will be considered successful if 150 planted woody stems per acre are surviving in year 5 of monitoring in the pine plantation area (Zone 1), while 260 planted woody stems per acre must be surviving after 5 years of monitoring in the grassy field area (Zone 2). There are two grassy field areas within the conservation easement as depicted in Figure 2, Appendix A. Vegetation plots 1, 2, and 3 are located within these areas. The success criteria for wetland enhancement in Zone 1 is unique, and was discussed with the Interagency Review Team members in January of 2011 (see memorandum in Appendix D).

2.2 HYDROLOGY

2.2.1 Streams

Changes in stream profile and pattern are not included in the stream enhancement project for Little River. As such, cross-section, longitudinal profile surveys, and pebble counts were not performed for the Year 0 monitoring, as directed by NCEEP. However, a general assessment of stream stability and potential problem areas will be performed during field reconnaissance. Photo stations along the stream have been established and will be documented annually for stability and vegetation. While bankfull events are not required for Enhancement II, a crest gauge has been installed along Reach 1 as depicted in Figure 2 in Appendix A.

2.2.2 Wetlands

The project involves the enhancement of existing jurisdictional areas within the timbered areas, and the preservation of existing wetlands and streams within the conservation easement. Therefore, hydrology is already assumed to be present due to the presence of hydric soil indicators and lack of drainage. In order to monitor and confirm the hydrology, five continuous groundwater gauges were installed on the site. Four of the gauges are located in the jurisdictional areas of the pine plantation and a fifth is a reference well located in the reference wetland in a preservation area on the west side of the project. There is no success criterion for wetland hydrology for the site. Wetland extent has already been determined on site as per the jurisdictional determination completed in July 2007 (see Appendix D (9 sheets total)).

3.0 Monitoring Plan Guidelines

3.1 HYDROLOGY

3.1.1 Wetland

Four automated groundwater monitoring gauges have been installed across the project area to document the hydrologic conditions of the site. Refer to Figure 2 in Appendix A for the location of the groundwater monitoring gauges. All four wells have been installed in the riparian areas of the site. Groundwater gauges will be downloaded on at least a bi-monthly basis during the growing season. A reference well is located in the reference wetland in a preservation area on the west side of the project site and is depicted on Figure 2 in Appendix A. All gauges were programmed to record water table data on a daily basis. A rainfall gauge was also located on the site to monitor precipitation, as depicted in Figure 2. In order to determine if the rainfall is normal for the given year, rainfall amounts will be tallied using data obtained from the Moore County WETS Station as well as the on-site rain gauge. Hydrology will be monitored for a minimum of five years.

3.1.2 Stream

One crest gauge has been installed onsite and is located adjacent to Vegetation Plot 7. Each visit to the site will include documentation of the highest stage for the monitoring interval and a reset of the device. Other indications of bankfull flow including the presence of wrack lines, sediment, or flooding will also be recorded and documented photographically. Refer to Figure 2 in Appendix A for the location of the crest gauge. Additionally, the streams will be visually assessed each year for stability.

3.2 VEGETATION

Twelve 10m x 10m ($100m^2$) and four 5m x 20m ($100m^2$) CVS plots were established within the project area, and the four plot corners of each plot were located using a Global Positioning System (GPS) and permanently located with rebar rods. Vegetative sample plots will be quantitatively monitored during September of each monitoring year, per the CVS-EEP Protocol for Recording Vegetation, version 4.2 (CVS-EEP 2008). Planted vegetation (Level 1) was recorded for the baseline monitoring, while both planted vegetation and natural volunteers (Level 2) will be recorded beginning in Monitoring Year 2. Refer to Figure 2 in Appendix A for the locations of the vegetation plots.

The plots will be monitored for a minimum of five years. Baseline monitoring data is provided in the Appendix C data tables. Vegetation sampling plots are proximal to groundwater monitoring gauges, wherever practical, to assist in correlating vegetation and hydrology parameters. Any vegetative problem areas in the project will be noted and reported in each subsequent monitoring report. Vegetative problem areas may include areas that either lack vegetation or include populations of exotic vegetation.

3.3 PHOTO STATIONS

Representative photo station points have been identified and located using GPS. The stations are shown on Figure 2 in Appendix A. Photos will be taken at each location at approximately the same time each year. Vegetation plot photos will be taken during the vegetation monitoring event each year.

3.4 WATERSHED

Any changes to land use in the watershed that would cause changes to flow within the project streams will be assessed over the five-year monitoring period.

3.5 MONITORING PLAN VIEW

A plan view of the monitoring scheme is presented in Figure 2 in Appendix A.

3.6 MAINTENANCE AND CONTINGENCY PLANS

Any maintenance needs will be determined during monitoring visits. During the baseline monitoring year upon completion of construction, the contractor must address any issues under their warranty. In subsequent monitoring years, the monitoring firm will determine maintenance needs. Maintenance items will be coordinated with NCEEP to determine the appropriate course of action.

The monitoring firm will visually assess the site to verify that the stream and wetland are functioning as needed and will note any adjustments that may be necessary. It is not anticipated that invasive plant species will be a significant problem onsite. During the monitoring period, if any invasive species establish to the point of threatening the desired vegetative community, hand cutting and herbicide treatment may be used to treat problem areas.

Wildlife, including but not limited to beavers and deer, have the potential to destroy vegetation and stream features either by foraging or flooding. Some beaver activity was observed on-site during the design phase. Should a significant portion of the site be damaged such that the success criteria cannot be achieved, measures such as trapping, beaver dam removal, or repellents may be implemented.

4.0 As-Built Conditions / Baseline

4.1 AS-BUILT/RECORD DRAWINGS

A controlled burn of the site was completed in December 2010. Planting was completed in January 2011 and the baseline vegetation data collection occurred on February 2, 2011. Because the project involved enhancement via only involved planting, there are no As-Built record drawings associated with the project.

4.2 BASELINE DATA (YEAR 0)

4.2.1 Verification of Plantings

Stantec staff completed the baseline vegetation monitoring on February 2, 2011 using the CVS-EEP Protocol for Recording Vegetation, version 4.2 (CVS-EEP 2008). Monitoring was conducted in 16 vegetation plots. Plots 1, 2 and 3 are located in the grassy area, and the remaining plots (4-16) are located in the pine plantation.

According to the data collected, the average plant density among the 16 plots is 329 stems/acre. The original planting plan specified 300 stems/acre for planting Zone 1 (pine plantation) which includes plots 4 - 16; while 600 stems/acre was specified for Zone 2 (grassy field) which includes plots 1, 2 and 3. The highest plant densities occurred in plots 1, 3, 6, and 8. Plots 2, 4, 7, 9, 10, 12, 13 and 14 didn't meet the planting density requirements by more than 10%. Additionally, success will be met if 150 planted woody stems per acre are surviving in year 5 of monitoring in the pine plantation area, while 260 planted woody stems per acre must be surviving after 5 years of monitoring in the grassy field area. Vegetation sampling details are included in Appendix C.

4.2.2 Photo Documentation

Photo stations were established in 44 locations throughout the project. The location of the stations can be seen in Figure 2 in Appendix A. Baseline stream station photos were taken on February 2, 2011. Stream station photos for the baseline monitoring year are provided in Appendix B. Baseline vegetation station photos were taken on February 2, 2011 during the baseline vegetation monitoring. Vegetation station photos for the baseline monitoring year are provided in Appendix C.

4.2.3 Hydrology

Four 40" Ecotone groundwater monitoring gauges were installed onsite on February 2, 2011 and April 20, 2011. All four gauges are located in the riparian wetland enhancement areas. A reference gauge was also installed on February 2, 2011 and is located in a preservation area of existing wetlands on the west portion of the site. A rain gauge was installed onsite on February 2, 2011. A crest gauge was installed onsite April 20, 2011. The crest gauge will be used in future monitoring to identify bankfull events. The location of the precipitation gauge, crest gauge, reference well, and groundwater monitoring wells are included in Figure 2 in Appendix A.

5.0 References

Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2 (http://cvs.bio.unc.edu/methods.htm)

NCDENR. 2010. N.C. Wetland Assessment Method (NC WAM) User Manual. North Carolina Department of Environment and Natural Resources, N.C. Wetland Function Assessment Team, Raleigh, NC. Version 4.1, October 2010.

NCEEP. 2010. Procedural Guidance and Content Requirements for EEP Monitoring Reports. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 1.3, January 15, 2010.

NCEEP. 2008. Mitigation Plan Document – Format Data Requirements, and Content Guidelines. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 2.0, March 27, 2008.

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Schafale, M.P. and A.S. Weakley, 1990. Classification of the Natural Communities of North Carolina, Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, NCDEHNR, Raleigh, North Carolina.

Stantec 2007. Little River Wetland Enhancement Restoration Plan Moore County, North Carolina. Report prepared by Stantec Consulting, Inc. for the North Carolina Ecosystem Enhancement Program, Raleigh, NC.

United States Army Corps of Engineers – Wilmington District, North Carolina Division of Water Quality, United States Environmental Protection Agency – Region IV, Natural Resources Conservation Service, North Carolina Wildlife Resources Commission. 2003. Stream Mitigation Guidelines.

United States Department of Agriculture-Soil Conservation Service, 1995. Soil Survey of Moore County. Raleigh, NC.

6.0 Appendices

Appendix A – General Tables and Figures

Appendix B – Morphological Summary Data and Plots

Appendix C – Vegetation Data

Appendix D – Supporting Documentation

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Appendix A - General Tables and Figures

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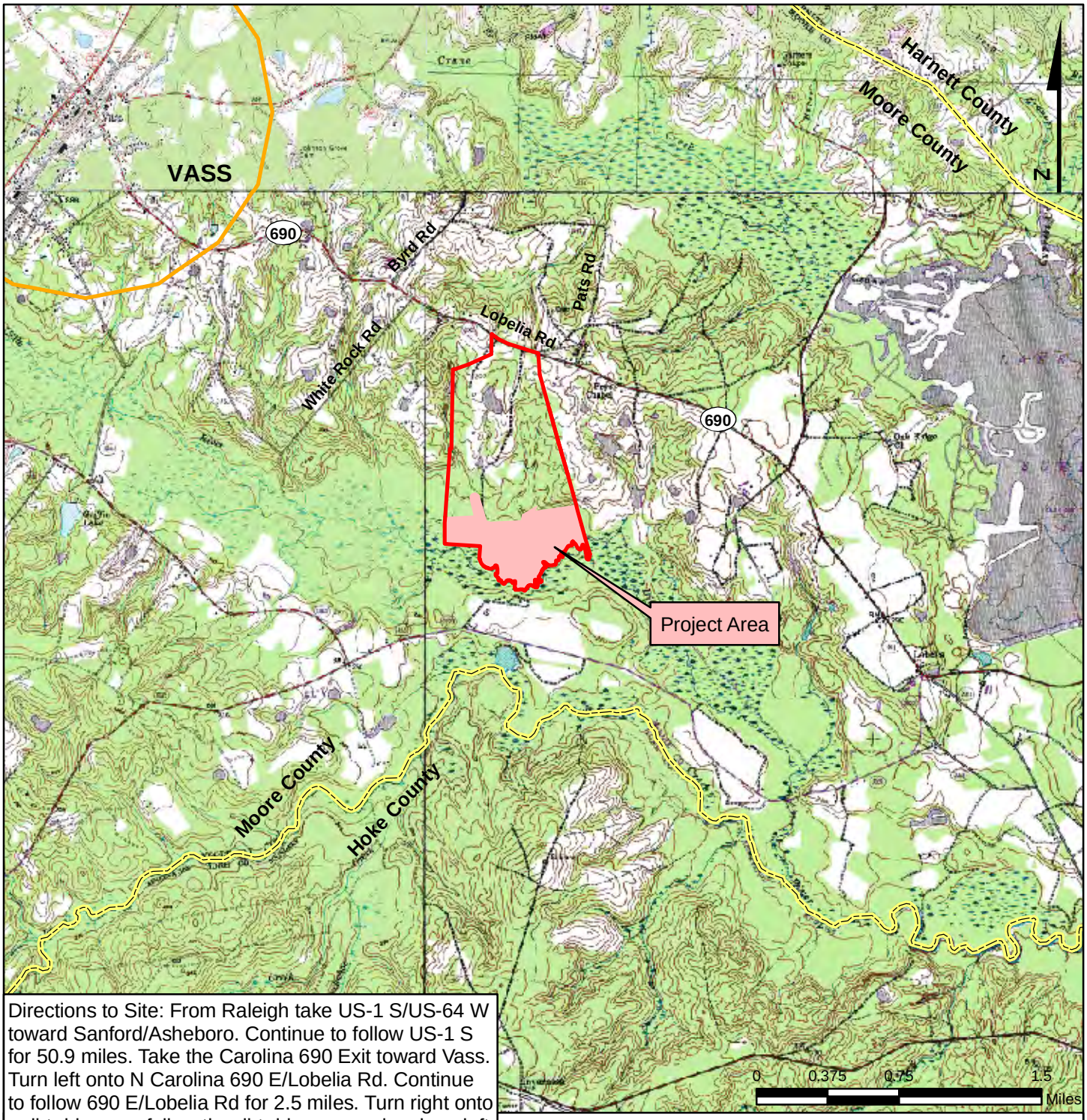

Directions to Site: From Raleigh take US-1 S/US-64 W toward Sanford/Asheboro. Continue to follow US-1 S for 50.9 miles. Take the Carolina 690 Exit toward Vass. Turn left onto N Carolina 690 E/Lobelia Rd. Continue to follow 690 E/Lobelia Rd for 2.5 miles. Turn right onto a dirt driveway, follow the dirt driveway and make a left at the fork. Continue down the dirt road to the NW corner of the site.

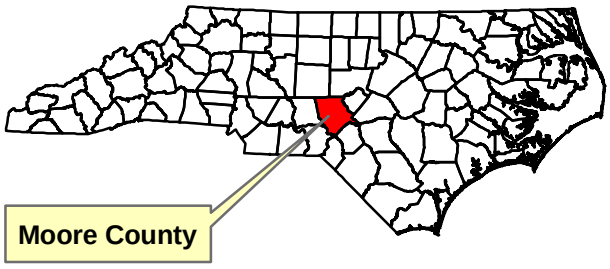

Figure 1. Vicinity Map

Little River Stream and Wetland Enhancement
EEP Project #226
Moore County, NC

7.5' USGS Topoquad Lobelia

Project boundary

J-Bar Ranch parcel boundary

Municipal boundary

Stantec

Ecosystem Enhancement

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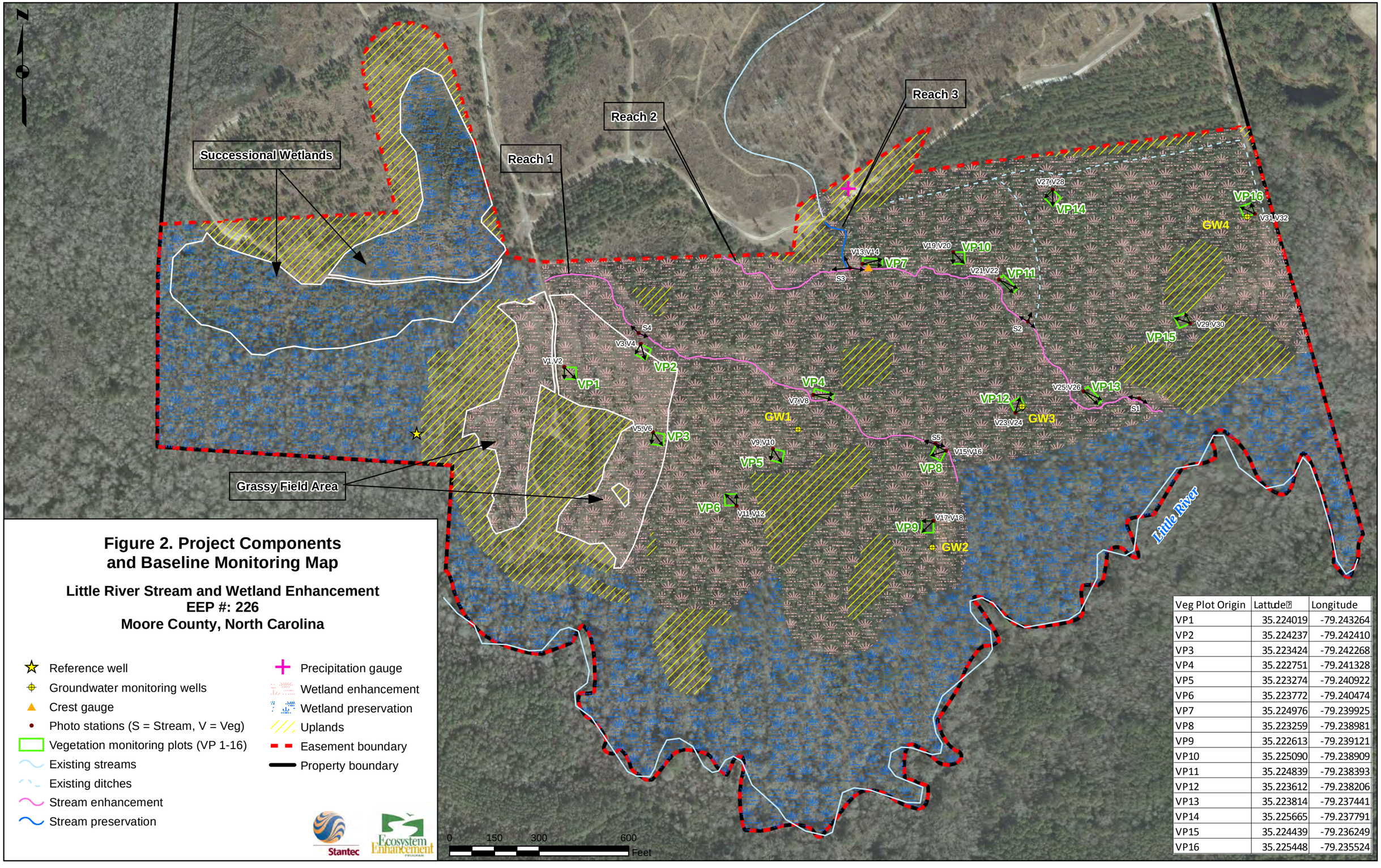

Figure 2. Project Components and Baseline Monitoring Map

Little River Stream and Wetland Enhancement
EEP #: 226
Moore County, North Carolina

- Reference well
- Groundwater monitoring wells
- Crest gauge
- Photo stations (S = Stream, V = Veg)
- Vegetation monitoring plots (VP 1-16)
- Existing streams
- Existing ditches
- Stream enhancement
- Stream preservation
- Precipitation gauge
- Wetland enhancement
- Wetland preservation
- Uplands
- Easement boundary
- Property boundary

Stantec

Ecosystem Enhancement Program

Veg Plot Origin	Latitude	Longitude
VP1	35.224019	-79.243264
VP2	35.224237	-79.242410
VP3	35.223424	-79.242268
VP4	35.222751	-79.241328
VP5	35.223274	-79.240922
VP6	35.223772	-79.240474
VP7	35.224976	-79.239925
VP8	35.223259	-79.238981
VP9	35.222613	-79.239121
VP10	35.225090	-79.238909
VP11	35.224839	-79.238393
VP12	35.223612	-79.238206
VP13	35.223814	-79.237441
VP14	35.225665	-79.237791
VP15	35.224439	-79.236249
VP16	35.225448	-79.235524

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Table 1. Project Components and Mitigation Credits

Little River Stream and Wetland Enhancement Project/EEP Project No. 226

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals		1,479		32.4					

Project Components

Project Component or Reach ID	Stationing/ Location	Existing Footage/ Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio	Comment
Reach 1	Flows NW to SE across the middle of the site	1,726	EII	RE	1,726	2.5:1	Enhancement - planting occurred in the riparian area of both banks
Reach 2	Flows NW to SE across the middle of the site	1,867	EII	RE	1,867	2.5:1	Enhancement - planting occurred in the riparian area of both banks
Reach 3	Enters the site on the middle N boundary, tributary of Reach 2	210	P	RE	210	5:1	Preservation - planting occurred in the riparian area of both banks
Wetland 1	Pine Plantation	47.8	E	RE	47.8	2.5:1	Enhancement - weedy vegetation was suppressed with fire and area was planted
Wetland 2	Grassy Field	7.0	E	RE	7.0	2:1	Enhancement - EI as a result of no trees present in this area. Area was burned and planted
Wetland 3	NW portion of the site and the S boundary of the site	48.7	P	RE	48.7	5:1	Preservation - area is protected by a conervation easement with signage around the boundary

Component Summation

Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-riparian Wetland (Ac)	Buffer (sq ft)	Upland (Ac)
		Riverine	Non-Riverine			
Restoration						
Enhancement		54.8				
Enhancement I						
Enhancement II	3,593					
Creation						
Preservation	210	48.7				
HQ Preservation						

BMP Elements

Element	Location	Purpose/Function	Notes
n/a	n/a	n/a	n/a

Table 2. Project Activity and Reporting History		
Little River Stream and Wetland Enhancement Project/EEP Project No. 226		
Elapsed Time Since Grading Complete:	**n/a**	
Elapsed Time Since Planting Complete:	**1 month**	
Number of Reporting Years[1]:	**0**	
	Data Collection	**Completion or**
Activity or Deliverable	**Complete**	**Delivery**
Mitigation Plan	Sep 2007	Oct 2007
Final Design – Construction Plans	n/a	n/a
Construction	n/a	n/a
Seeding	n/a	n/a
Prescribed Burn	n/a	Dec 2010
Planting	n/a	Jan 2011
As-built (Year 0 Monitoring – baseline)	Feb 2011	Dec 2011
Year 1 Monitoring	n/a	n/a
Year 2 Monitoring	n/a	n/a
Year 3 Monitoring	n/a	n/a
Year 4 Monitoring	n/a	n/a

1 = Equals the number of reports or data points produced excluding the baseline

Table 3. Project Contacts Table	
Little River Stream and Wetland Enhancement Project/EEP Project No. 226	
Designer	Stantec Consulting Services, Inc.
	801 Jones Franklin Road Suite 300, Raleigh, NC 27606
Primary project design POC	Amber Coleman (919)865-7399
Construction Contractor	None
Survey Contractor	None
Planting Contractor	Carolina Silvics, Inc.
	908 Indian Trail Rd, Endenton, NC 27932
Planting contractor POC	Mary-Margaret McKinney (252) 482-8491
Seeding Contractor	None
Seed Mix Sources	None
Nursery Stock Suppliers	ArborGen and Superior Trees
	ArborGen - 180 Westvaco Road, Summerville, SC 29483
	Superior Trees - 12493 E US Highway, Lee, FL 32059
Monitoring Performers (MY0)	Stantec Consulting Services, Inc.
	801 Jones Franklin Rd Suite 300, Raleigh, NC 27606
Stream Monitoring POC	Amber Coleman (919)865-7399
Vegetation Monitoring POC	Amber Coleman (919)865-7399
Wetland Monitoring POC	Amber Coleman (919)865-7399

Table 4. Project Baseline Information and Attributes			
Little River Stream and Wetland Enhancement Project/EEP Project No. 226			
Project Information			
Project County	Moore		
Project Area (acres)	125.8		
Project Coordinates (latitude and longitude)	35.223562, -79.240977		
Project Watershed Summary Information			
Physiographic Region	Sandhills		
River Basin	Cape Fear		
USGS HUC for Project (14 digit)	03030004070050		
NCDWQ Sub-basin for Project	03-03-14		
Project Drainage Area (sq mi)	0.52		
Project Drainage Area % Impervious	<1%		
CGIA Landuse Classification	Active Forest Management and Harvesting; and Unused		
Reach Summary Information			
Parameters	Reach 1	Reach 2	Reach 3
Length of reach (linear feet)	1,726	1,867	210
Valley classification	VIII		
Drainage area (acres)	335		
NCDWQ stream identification score	30	28	28
NCDWQ classification	Perennial		
Morphological description (stream type)	C5	E5	E5
Evolutionary trend	C5	C5	C5
Underlying mapped soils	Bibb		
Drainage class	Poorly drained		
Soil hydric status	Yes		
Slope	0-1%		
FEMA classification	Zone X		
Native vegetation community	Riverine bottomland hardwood		
Percent composition of exotic invasive vegetation	0%	0%	0%
Wetland Summary Information			
Parameters	**Wetland 1**	**Wetland 2**	**Wetland 3**
Size of Wetland (acres)	47.8	7.0	48.7
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Riparian Riverine		
Mapped Soil Series	Bibb		
Drainage class	Poorly drained		
Soil Hydric Status	Hydric		
Source of Hydrology	Overbank flooding and groundwater		
Hydrologic Impairment	None		
Native vegetation community	Riverine bottomland hardwood		
Percent composition of exotic invasive vegetation	0	0	0
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States - Section 404	Yes	Yes	USACE 404 permit
Waters of the United States - Section 401	Yes	Yes	NCDWQ 401 permit
Endangered Species Act	No	n/a	n/a
Historic Preservation Act	No	n/a	n/a
Coastal Zone Management Act (CZMA)/Coastal Aream Management Act (CAMA)	No	n/a	n/a
FEMA Floodplain Compliance	No	n/a	n/a

Appendix B – Morphological Summary Data and Plots

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Stream Monitoring Photos

Photo Station S1 – Reach 2 channel looking upstream (2/2/2011 Year 0)

Photo Station S1 – Reach 2 channel looking downstream (2/2/2011 Year 0)

Photo Station S2 – Reach 2 channel looking upstream (2/2/2011 Year 0)

Photo Station S2 – Reach 2 channel looking upstream towards tributary (2/2/2011 Year 0)

Photo Station S2 – Reach 2 channel looking downstream (2/2/2011 Year 0)

Photo Station S3 – Reach 2 channel looking upstream (2/2/2011 Year 0)

Photo Station S3 – Reach 3 channel looking upstream into tributary (2/2/2011 Year 0)

Photo Station S3 – Reach 3 channel looking downstream (2/2/2011 Year 0)

Photo Station S4 – Reach 1 channel looking upstream (2/2/2011 Year 0)

Photo Station S4 – Reach 1 channel looking downstream (2/2/2011 Year 0)

Photo Station S5 – Reach 1 channel looking upstream (2/2/2011 Year 0)

Photo Station S5 – Reach 1 channel looking downstream (2/2/2011 Year 0)

Note: Tables 5 and 6 – Not applicable

Appendix C - Vegetation Data

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EEP Project Code 226. Project Name: Little River

Table 7 - CVS Stem Count Total and Planted by Plot and Species
EEP Project Code 226. Project Name: Little River

			Current Plot Data (MY0 2011)																																		Annual Means		
			226-02-0001			226-04-0002			226-02-0003			226-04-0004			226-02-0005			226-02-0006			226-01-0007			226-02-0008			226-02-0009			226-03-0010			226-01-0011			226-01-0012			226-01-0013			226-03-0014			226-01-0015			226-01-0016			MY0 (2011)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Aronia arbutifolia	Red Chokeberry	Shrub													1	1	1																													5	5	5	5	5	5
Cyrilla racemiflora	swamp titi	Shrub Tree																																			1	1	1										2	2	2
Fraxinus pennsylvanica	green ash	Tree	1	1	1				1	1	1	3	3	3	1	1	1	1	1	1	6	6	6	5	5	5				2	2	2	2	2	2							4	4	4	3	3	3	1	1	1	30	30	30
Ilex glabra	inkberry	Shrub	1	1	1	1	1	1	2	2	2							3	3	3							1	1	1				1	1	1	3	3	3												12	12	12
Lindera benzoin	northern spicebush	Shrub Tree																															2	2	2	2	2	2							2	2	2				6	6	6
Nyssa biflora	swamp tupelo	Tree	5	5	5	4	4	4	5	5	5				5	5	5	8	8	8				13	13	13	3	3	3				1	1	1	1	1	1												46	46	46
Quercus	oak	Shrub Tree	2	2	2							2	2	2																																				4	4	4
Quercus laurifolia	laurel oak	Tree																															1	1	1	1	1	1												7	7	7
Quercus lyrata	overcup oak	Tree				1	1	1	3	3	3				1	1	1							1	1	1				4	4	4	1	1	1				2	2	2				1	1	1	2	2	2	13	13	13
Unknown		unknown	3	3	3																																1	1	1										1	1	1	5	5	5
		Stem count	12	12	12	6	6	6	11	11	11	5	5	5	8	8	8	12	12	12	6	6	6	19	19	19	4	4	4	6	6	6	8	8	8	7	7	7	4	4	4	5	5	5	8	8	8	9	9	9	130	130	130
		size (ares)	1			1			1			1			1			1			1			1			1			1			1			1			1			1			1			1			16		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.40		
		Species count	5	5	5	3	3	3	4	4	4	2	2	2	4	4	4	3	3	3	1	1	1	3	3	3	2	2	2	2	2	2	6	6	6	4	4	4	3	3	3	2	2	2	4	4	4	4	4	4	10	10	10
		Stems per ACRE	485.6	485.6	485.6	242.8	242.8	242.8	445.2	445.2	445.2	202.3	202.3	202.3	323.7	323.7	323.7	485.6	485.6	485.6	242.8	242.8	242.8	768.9	768.9	768.9	161.9	161.9	161.9	242.8	242.8	242.8	323.7	323.7	323.7	283.3	283.3	283.3	161.9	161.9	161.9	202.3	202.3	202.3	323.7	323.7	323.7	364.2	364.2	364.2	328.8	328.8	328.8

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

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Table 8 - CVS Metadata	
Little River Stream and Wetland Enhancement - EEP #226	
Report Prepared By	Alex Baldwin
Date Prepared	6/30/2011 9:41
Database name	Stantec_LittleRiver-2011-A.mdb
Database location	U:\175613018\project\site_data\vegetation
Computer name	BALDWINA
File size	35229696
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
PROJECT SUMMARY	
Project Code	226
Project Name	Little River
Description	Stream and Wetland Enhancement
River Basin	Cape Fear
Length(ft)	
Stream-to-edge width (ft)	
Area (sq m)	
Required Plots (calculated)	
Sampled Plots	16

Table 9 - CVS Vigor by Species									
Little River Stream and Wetland Enhancement - EEP #226									
	Species	**Common Name**	**4**	**3**	**2**	**1**	**0**	**Missing**	**Unknown**
	Aronia arbutifolia	Red Chokeberry		5					
	Cyrilla racemiflora	swamp titi	1	1					
	Fraxinus pennsylvanica	green ash	11	13	6				
	Ilex glabra	inkberry	7	4		1			
	Nyssa biflora	swamp tupelo	42	3	1				
	Quercus laurifolia	laurel oak		7					
	Quercus lyrata	overcup oak	6	7					
	Quercus	oak	4						
	Lindera benzoin	northern spicebush		6					
	Unknown		4	1					
TOT:	**10**	**9**	**75**	**47**	**7**	**1**			

Table 10 - CVS Vegetation Damage by Species									
Little River Stream and Wetland Enhancement - EEP #226									
	Species	Common Name	Count of Damage Categories	(no damage)	Cut	Other/Unknown Animal	Unknown		
	Aronia arbutifolia	Red Chokeberry	0	5					
	Cyrilla racemiflora	swamp titi	0	2					
	Fraxinus pennsylvanica	green ash	7	23		1	6		
	Ilex glabra	inkberry	1	11			1		
	Lindera benzoin	northern spicebush	0	6					
	Nyssa biflora	swamp tupelo	1	45	1				
	Quercus	oak	0	4					
	Quercus laurifolia	laurel oak	0	7					
	Quercus lyrata	overcup oak	0	13					
	Unknown		0	5					
TOT:	**10**	**9**	**9**	**121**	**1**	**1**	**7**		

Table 11 - CVS Vegetation Damage by Plot								
Little River Stream and Wetland Enhancement - EEP #226								
	plot	Count of Damage Categories	(no damage)	Cut	Other/Unknown Animal	Unknown		
	226-02-0001	2	10	1		1		
	226-04-0002	0	6					
	226-02-0003	0	11					
	226-04-0004	0	5					
	226-02-0005	1	7			1		
	226-02-0006	0	12					
	226-01-0007	5	1			5		
	226-02-0008	0	19					
	226-02-0009	0	4					
	226-03-0010	0	6					
	226-01-0011	0	8					
	226-01-0012	0	7					
	226-01-0013	0	4					
	226-03-0014	0	5					
	226-01-0015	0	8					
	226-01-0016	1	8		1			
TOT:	**16**	**9**	**121**	**1**	**1**	**7**		

Table 12a - CVS Planted Stems by Plot and Species

Little River Stream and Wetland Enhancement - EEP #226

	Comment	Species	CommonName	Total Planted Stems	# plots	avg# stems	plot 226-02-0001	plot 226-04-0002	plot 226-02-0003	plot 226-04-0004	plot 226-02-0005	plot 226-02-0006	plot 226-01-0007	plot 226-02-0008	plot 226-02-0009	plot 226-03-0010	plot 226-01-0011	plot 226-01-0012	plot 226-01-0013	plot 226-03-0014	plot 226-01-0015	plot 226-01-0016
		Aronia arbutifolia	Red Chokeberry	5	1	5																5
		Cyrilla racemiflora	swamp titi	2	2	1					1								1			
		Fraxinus pennsylvanica	green ash	30	12	2.5	1		1	3	1	1	6	5		2	2			4	3	1
		Ilex glabra	inkberry	12	7	1.71	1	1	2			3			1		1	3				
		Lindera benzoin	northern spicebush	6	3	2											2	2			2	
		Nyssa biflora	swamp tupelo	46	10	4.6	5	4	5		5	8		13	3		1	1			1	
		Quercus	oak	4	2	2	2			2												
		Quercus laurifolia	laurel oak	7	5	1.4											1	1		1	2	2
		Quercus lyrata	overcup oak	13	7	1.86		1	3		1			1		4	1		2			
		Unknown		5	3	1.67	3												1			1
TOT:	**0**	**10**	**9**	**130**	**10**		**12**	**6**	**11**	**5**	**8**	**12**	**6**	**19**	**4**	**6**	**8**	**7**	**4**	**5**	**8**	**9**
		Stems per acre					486	243	445	202	324	486	243	769	162	243	324	283	162	202	324	364

Note: Highlighted plots indicate planted density fails to meet requirements by more than 10%

Vegetation Monitoring Plot Photos

Photo Station V1 - Veg Plot 1 looking along X-axis (2/2/2011 Year 0)

Photo Station V2 - Veg Plot 1 looking across (2/2/2011 Year 0)

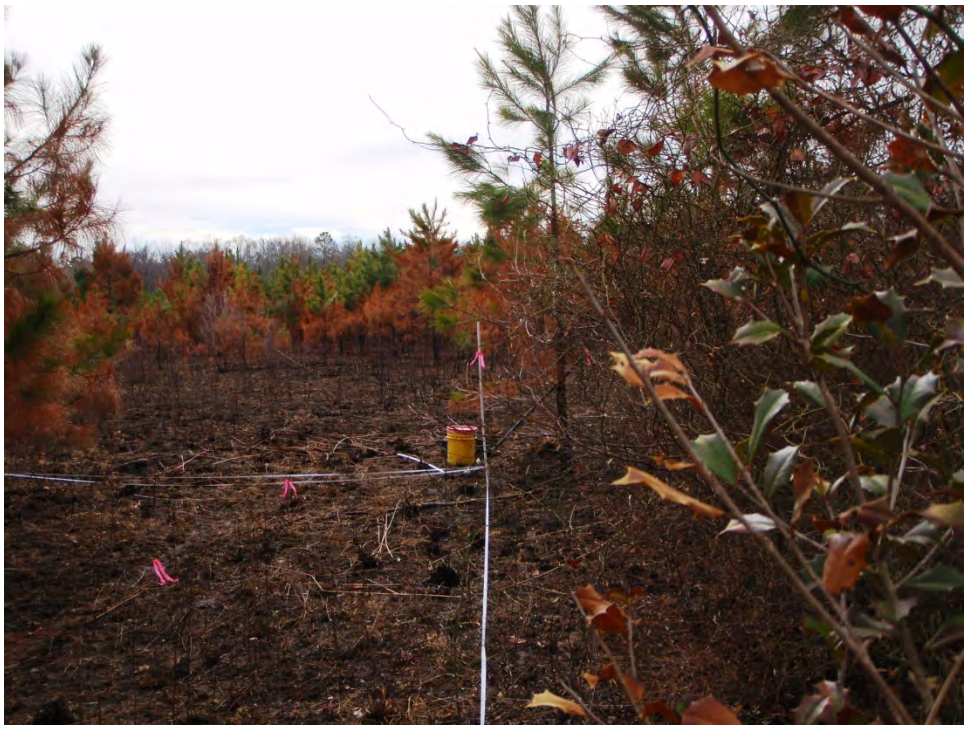

Photo Station V3 - Veg Plot 2 looking along X-axis (2/2/2011 Year 0)

Photo Station V4 - Veg Plot 2 looking across (2/2/2011 Year 0)

Photo Station V5 - Veg Plot 3 looking along X-axis (2/2/2011 Year 0)

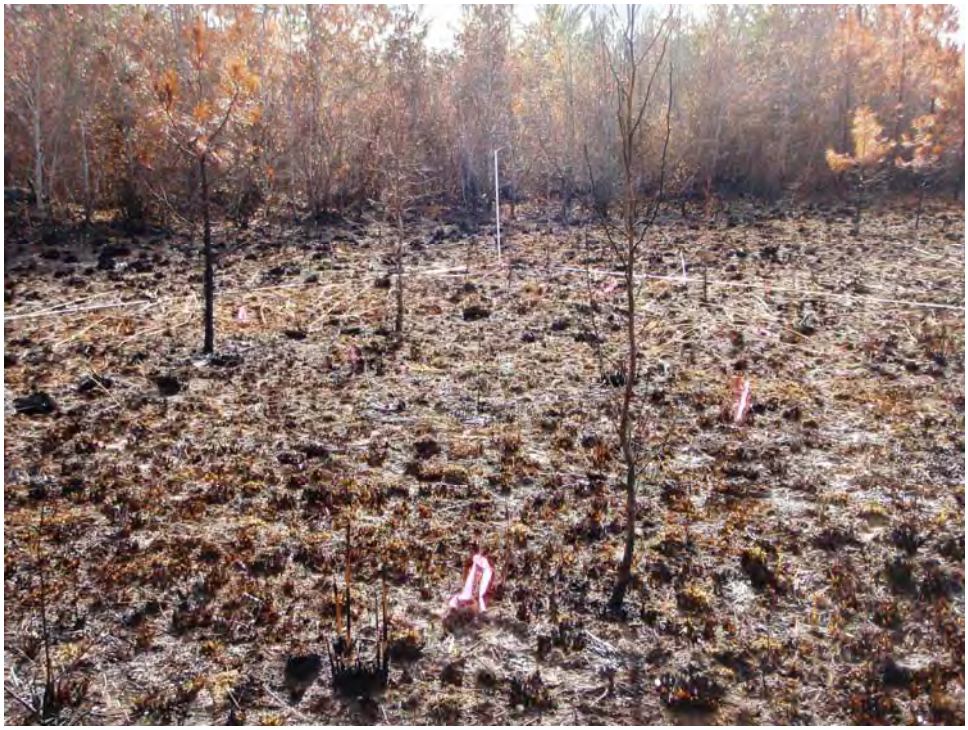

Photo Station V6 - Veg Plot 3 looking across (2/2/2011 Year 0)

Photo Station V7 - Veg Plot 4 looking along X-axis (2/2/2011 Year 0)

Photo Station V8 - Veg Plot 4 looking across (2/2/2011 Year 0)

Photo Station V9 - Veg plot 5 looking along X-axis (2/2/2011 Year 0)

Photo Station V10 - Veg plot 5 looking across (2/2/2011 Year 0)

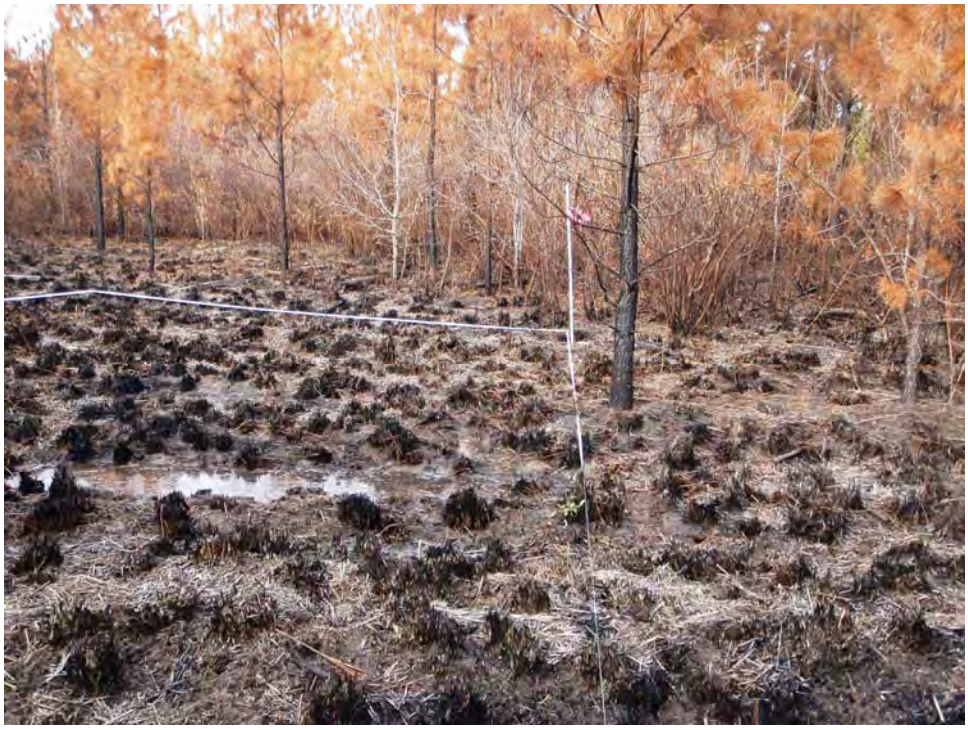

Photo Station V11 - Veg plot 6 looking along X-axis (2/2/2011 Year 0)

Photo Station V12 - Veg plot 6 looking across (2/2/2011 Year 0)

Photo Station V13 - Veg plot 7 looking along X-axis (2/2/2011 Year 0)

Photo Station V14 - Veg plot 7 looking across (2/2/2011 Year 0)

Photo Station V15 - Veg plot 8 looking along X-axis (2/2/2011 Year 0)

Photo Station V16 - Veg plot 8 looking across (2/2/2011 Year 0)

Photo Station V17 - Veg plot 9 looking along X-axis (2/2/2011 Year 0)

Photo Station V18 - Veg plot 9 looking across (2/2/2011 Year 0)

Photo Station V19 - Veg plot 10 looking along X-axis (2/2/2011 Year 0)

Photo Station V20 - Veg plot 10 looking across (2/2/2011 Year 0)

Photo Station V21 - Veg plot 11 looking along X-axis (2/2/2011 Year 0)

Photo Station V22 - Veg plot 11 looking across (2/2/2011 Year 0)

Photo Station V23 - Veg plot 12 looking along X-axis (2/2/2011 Year 0)

Photo Station V24 - Veg plot 12 looking across (2/2/2011 Year 0)

Photo Station V25 - Veg plot 13 looking along X-axis (2/2/2011 Year 0)

Photo Station V26 - Veg plot 13 looking across (2/2/2011 Year 0)

Photo Station V27 - Veg plot 14 looking along X-axis (2/2/2011 Year 0)

Photo Station V28 - Veg plot 14 looking across (2/2/2011 Year 0)

Photo Station V29 - Veg plot 15 looking along X-axis (2/2/2011 Year 0)

Photo Station V30 - Veg plot 15 looking across (2/2/2011 Year 0)

Photo Station V31 - Veg plot 16 looking along X-axis (2/2/2011 Year 0)

Photo Station V32 - Veg plot 16 looking across (2/2/2011 Year 0)

Appendix D – Supporting Documents

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Id#226

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action ID. **SAW-2005-00758** County: **Moore** USGS Quad: **Niagara**

GENERAL PERMIT (REGIONAL AND NATIONWIDE) VERIFICATION

Authorized Agent: **North Carolina Ecosystem Enhancement Program**
Attn to: Mr. Lin Xu
Address: **1652 Mail Service Center**
Raleigh, NC 27699-1652

Telephone No.: **(919) 715-7571**

RECEIVED
MAR 17 2009
NC ECOSYSTEM
ENHANCEMENT PROGRAM

RECEIVED
MAR [redacted] 2009
NC ECOSYSTEM
ENHANCEMENT PROGRAM

Size and location of property (water body, road name/number, town, etc.): **Property is known as the Little River Wetland Restoration Project, a 135 acre site located approximately 3.5 miles southeast of Vass, along Lobelia Road (NC Hwy 690), adjacent to the Little River, Moore County, North Carolina.**

Description of projects area and activity: **This Nationwide permit provide authorization to: (1) restore 2.3 acres of wetland hydrology by means of plugging an existing drainage ditch; (2) enhance 48 acres of wetlands by removing stands of loblolly pines and planting native bottomland hardwood (BLH) species; (3) preserve 4,433 lf of perennial stream channels, 40 acres of BLH wetlands and 9.5 acres of successional wetlands. Plans will fall in accordance with the final Little River Wetland Enhancement Restoration Plan dated September 28, 2007 and the October 28, 2008 Addendum letter of Best Management Practices from Santec Consulting Services, Inc.**

Applicable Law: ☒ Section 404 (Clean Water Act, 33 USC 1344)
☐ Section 10 (Rivers and Harbors Act, 33 USC 403)

Authorization: Regional General Permit Number: **27**
Nationwide Permit Number: _____

Your work is authorized by the above referenced permit provided it is accomplished in strict accordance with the attached conditions and your submitted plans. Any violation of the attached conditions or deviation from your submitted plans may subject the permittee to a stop work order, a restoration order and/or appropriate legal action.

This verification will remain valid until the expiration date identified below unless the nationwide authorization is modified, suspended or revoked. If, prior to the expiration date identified below, the nationwide permit authorization is reissued and/or modified, this verification will remain valid until the expiration date identified below, provided it complies with all requirements of the modified nationwide permit. If the nationwide permit authorization expires or is suspended, revoked, or is modified, such that the activity would no longer comply with the terms and conditions of the nationwide permit, activities which have commenced (i.e., are under construction) or are under contract to commence in reliance upon the nationwide permit, will remain authorized provided the activity is completed within twelve months of the date of the nationwide permit's expiration, modification or revocation, unless discretionary authority has been exercised on a case-by-case basis to modify, suspend or revoke the authorization.

Activities subject to Section 404 (as indicated above) may also require an individual Section 401 Water Quality Certification. You should contact the NC Division of Water Quality (telephone (919) 733-1786) to determine Section 401 requirements.

For activities occurring within the twenty coastal counties subject to regulation under the Coastal Area Management Act (CAMA), prior to beginning work you must contact the N.C. Division of Coastal Management .

This Department of the Army verification does not relieve the permittee of the responsibility to obtain any other required Federal, State or local approvals/permits.

If there are any questions regarding this verification, any of the conditions of the Permit, or the Corps of Engineers regulatory program, please contact Emily Hughes at (910) 251-4635.

Corps Regulatory Official Emily B. Hughes Date: **3/13/2009**

Expiration Date of Verification: **3/13/2011**

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete the Customer Satisfaction Survey located at our website at http://regulatory.usacesurvey.com/ to complete the survey online.

Determination of Jurisdiction:

☐ Based on preliminary information, there appear to be waters of the US including wetlands within the above described project area. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331).

☐ There are Navigable Waters of the United States within the above described project area subject to the permit requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

☒ There are waters of the US and/or wetlands within the above described project area subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

☐ The jurisdictional areas within the above described project area have been identified under a previous action. Please reference jurisdictional determination issued _____. Action ID _____

Basis of Jurisdictional Determination: **This site contains several waterbodies that exhibit an ordinary high water mark and are considered unnamed tributaries to the Little River and the Little River itself, a Navigable Water of the U.S. This site also exhibits wetland criteria as described in the 1987 Corps Wetland Delineation Manual and is adjacent to the unnamed tributaries to the Little River and to the Little River itself. This determination is based on information submitted by the EEP and a site visit by Jennifer Frye on February 8, 2006 and Emily Hughes on January 9, 2009.**

Appeals Information (This information applies only to approved jurisdictional determinations.)

Attached to this verification is an approved jurisdictional determination. If you are not in agreement with that approved jurisdictional determination, you can make an administrative appeal under 33 CFR 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and request for appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the following address:

District Engineer, Wilmington Regulatory Division
Attn: Emily Hughes, Project Manager,
Wilmington Regulatory Field Office
69 Darlington Ave.
Wilmington, North Carolina 28403-1398

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the District Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by **5/13/09**.

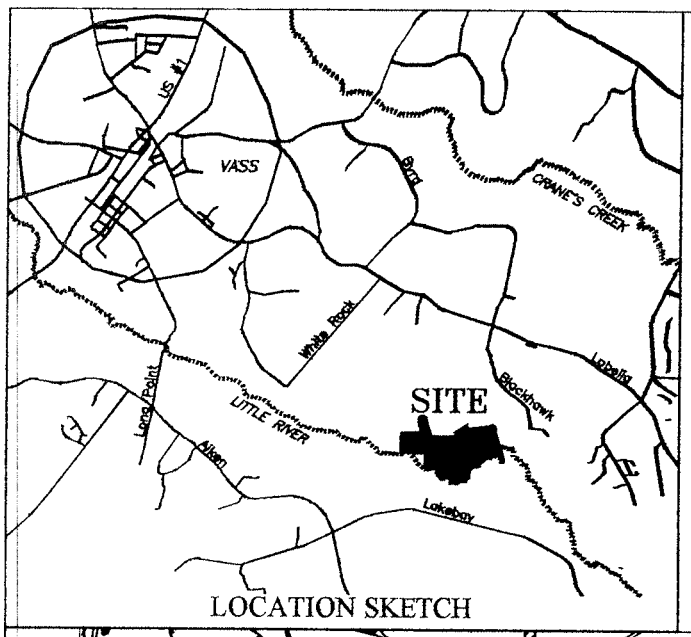
It is not necessary to submit an RFA form to the District Office if you do not object to the determination in this correspondence.

Corps Regulatory Official: EBH

Date **3/13/2009** Expiration Date **3/13/2014**

SURVEY PLATS, FIELD SKETCH, WETLAND DELINEATION FORMS, PROJECT PLANS, ETC., MUST BE ATTACHED TO THE FILE COPY OF THIS FORM, IF REQUIRED OR AVAILABLE.

Copy Furnished:



LOCATION SKETCH

LEGEND

(UNLESS OTHERWISE DENOTED)

- ● EXISTING IRON STAKE
- ■ EXISTING CONCRETE MONUMENT
- ○ SET IRON STAKE
- □ SET CONCRETE MONUMENT
- △ SET P.K. NAIL
- ▲ EXISTING P.K. NAIL
- -W- EXISTING WATER LINE
- EXISTING FIRE HYDRANT
- EXISTING WATER VALVE
- EXISTING WATER METER
- -SS- EXISTING SANITARY SEWER LINE
- (SS) EXISTING SANITARY SEWER MANHOLE
- EXISTING SANITARY SEWER CLEANOUT
- [C] EXISTING CABLE TELEVISION PEDESTAL
- [T] EXISTING TELEPHONE PEDESTAL
- (P) EXISTING POWER STUBOUT
- [P] EXISTING POWER BOX
- EXISTING UTILITY POLE
- -OU- EXISTING OVERHEAD UTILITY LINE

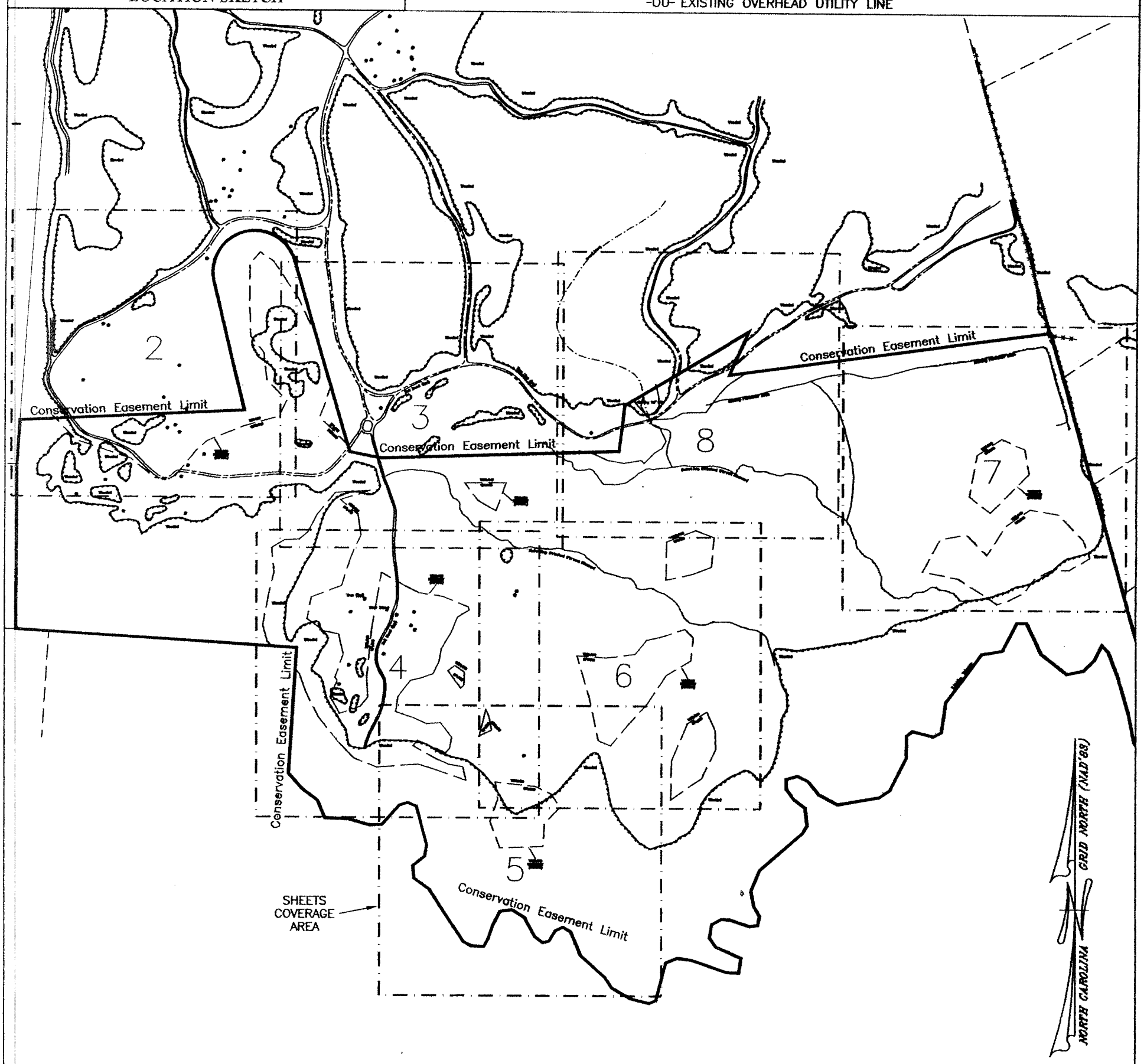
SURVEY NOTES

RATIO OF PRECISION:
1/7,500+

AREA DETERMINED BY
COORDINATE METHOD

NOT INTENDED TO BE
PREPARED IN ACCORDANCE
WITH NCGS 47-30
AS AMENDED

LEGAL REFERENCE:
PLAT CABINET 10, SLIDE 346
DEED BOOK 2225, PAGE 90



FOR NOTES AND CERTIFICATIONS PERTAINING TO THIS SURVEY
SEE SHEET 9 OF 9.

NORTH CAROLINA PROFESSIONAL SEAL L-4449 LAND SURVEYOR JOHN M. MCLEAN, JR.

1-21-09

WETLAND DELINEATION FOR
LITTLE RIVER RESTORATION SITE

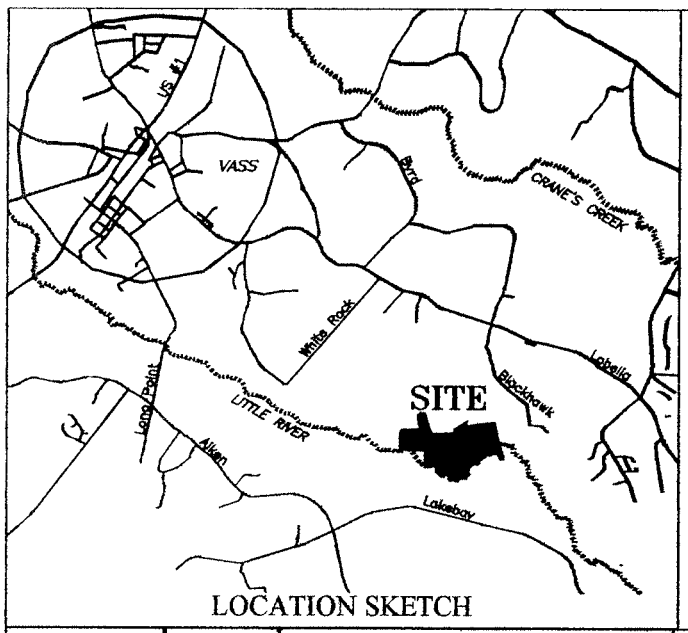
CONSERVATION EASEMENT
J-BAR RANCH, INC.
LITTLE RIVER TOWNSHIP, MOORE COUNTY
NEAR VASS, NORTH CAROLINA
DECEMBER 11, 2008 / 1"=400'

prepared by
JOHN MCLEAN LAND SURVEYING
LAURINBURG, NORTH CAROLINA

400' 200' 0' 400' 800'

JMM
LRK:
FN: LITTLERIVER02.DWG

SHEET 1 OF 8



LOCATION SKETCH

LEGEND
(UNLESS OTHERWISE DENOTED)

- ● EXISTING IRON STAKE
- ■ EXISTING CONCRETE MONUMENT
- ○ SET IRON STAKE
- □ SET CONCRETE MONUMENT
- △ SET P.K. NAIL
- ▲ EXISTING P.K. NAIL
- -W- EXISTING WATER LINE
- EXISTING FIRE HYDRANT
- EXISTING WATER VALVE
- EXISTING WATER METER
- -SS- EXISTING SANITARY SEWER LINE
- (SS) EXISTING SANITARY SEWER MANHOLE
- EXISTING SANITARY SEWER CLEANOUT
- [C] EXISTING CABLE TELEVISION PEDESTAL
- [T] EXISTING TELEPHONE PEDESTAL
- (P) EXISTING POWER STUBOUT
- [P] EXISTING POWER BOX
- EXISTING UTILITY POLE
- -OU- EXISTING OVERHEAD UTILITY LINE

SURVEY NOTES

RATIO OF PRECISION:
1/7,500+

AREA DETERMINED BY
COORDINATE METHOD

NOT INTENDED TO BE
PREPARED IN ACCORDANCE
WITH NCGS 47-30
AS AMENDED

LEGAL REFERENCE:
PLAT CABINET 10, SLIDE 346
DEED BOOK 2225, PAGE 90

FOR NOTES AND CERTIFICATIONS PERTAINING TO THIS SURVEY
SEE SHEET 9 OF 9.

NORTH CAROLINA PROFESSIONAL SEAL L-4449 LAND SURVEYOR JOHN MCLEAN JR.
1-21-09

WETLAND DELINEATION FOR
LITTLE RIVER RESTORATION SITE

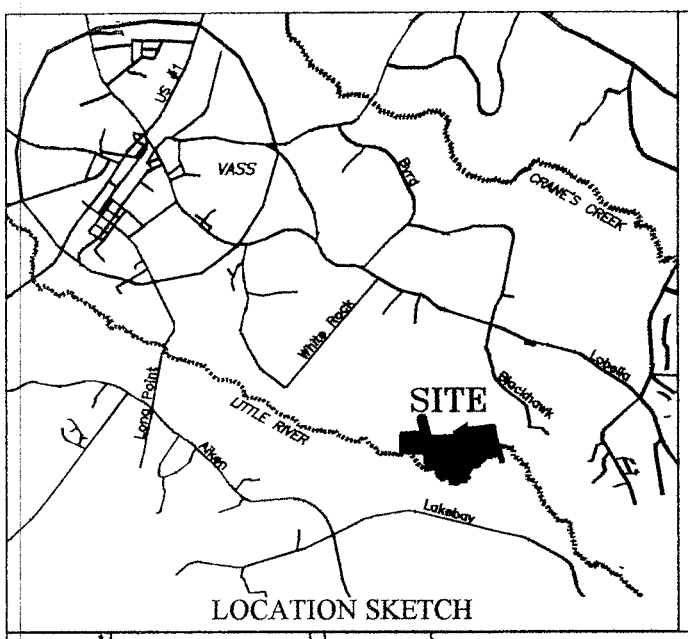
CONSERVATION EASEMENT
J-BAR RANCH, INC.
LITTLE RIVER TOWNSHIP, MOORE COUNTY
NEAR VASS, NORTH CAROLINA
DECEMBER 11, 2008 / 1"=100'

prepared by
JOHN MCLEAN LAND SURVEYING
LAURINBURG, NORTH CAROLINA

100' 50' 0' 100' 200'

JMM
LRK:
FN: LITTLERIVER02.DWG

SHEET 2 OF 8



LOCATION SKETCH

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SURVEY NOTES

RATIO OF PRECISION:
1/7,500+

AREA DETERMINED BY
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DEED BOOK 2225, PAGE 90

FOR NOTES AND CERTIFICATIONS PERTAINING TO THIS SURVEY
SEE SHEET 9 OF 9.

lr-17
lr-18
lr-19
lr-20
lr-44
lr-43
lr-42
lr-41
lr-40
lr-10a
lr-29
lr-30
lr-28b
lr-28a
lr-26
lr-27

Wooded
UPLAND
WETLAND
IRON PIPE
N: 536901.770'
E: 1927269.970'
Conservation Easement Limit
Soil Road (typ)
Tree Line (typ)
WL6007
WL6006
WL6005
WL7003
WL7004
WL7002
WL7001
WETLAND BOUNDARY (TYPICAL)

(68.0'M/) HERON DRIVE

SHEET 2
SHEET 4
SHEET 6

WETLAND DELINEATION FOR
LITTLE RIVER RESTORATION SITE

CONSERVATION EASEMENT
J-BAR RANCH, INC.
LITTLE RIVER TOWNSHIP, MOORE COUNTY
NEAR VASS, NORTH CAROLINA
DECEMBER 11, 2008 / 1"=100'

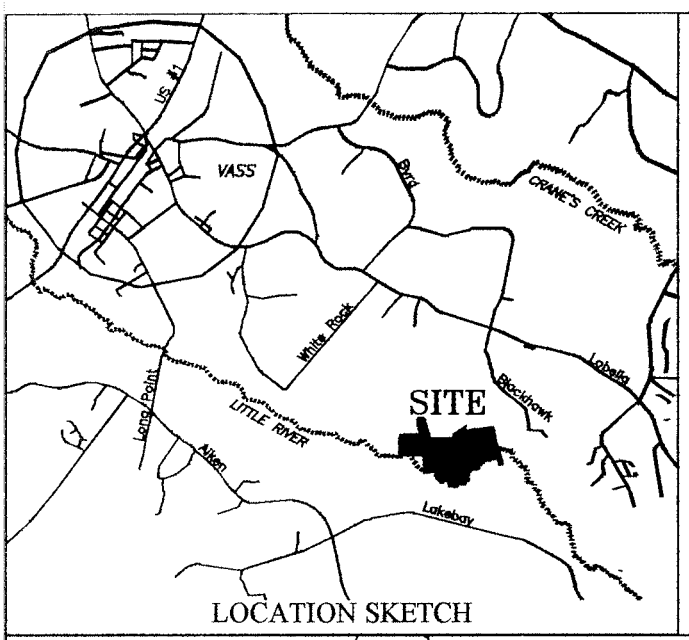
prepared by
JOHN MCLEAN LAND SURVEYING
LAURINBURG, NORTH CAROLINA

NORTH CAROLINA PROFESSIONAL SEAL L-4449 LAND SURVEYOR JOHN M. MCLEAN JR.
1-21-09

100' 50' 0' 100' 200'

JMM
LRK:
FN: LITTLERIVER02.DWG

SHEET 3 OF 8



LOCATION SKETCH

LEGEND

(UNLESS OTHERWISE DENOTED)

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- EXISTING OVERHEAD UTILITY LINE

SURVEY NOTES

RATIO OF PRECISION:
1/7,500+

AREA DETERMINED BY
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AS AMENDED

LEGAL REFERENCE:
PLAT CABINET 10, SLIDE 346
DEED BOOK 2225, PAGE 90

FOR NOTES AND CERTIFICATIONS PERTAINING TO THIS SURVEY SEE SHEET 9 OF 9.

NORTH CAROLINA PROFESSIONAL SEAL L-4449 LAND SURVEYOR JOHN M. MCLEAN JR.

1-21-09

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WETLAND DELINEATION FOR
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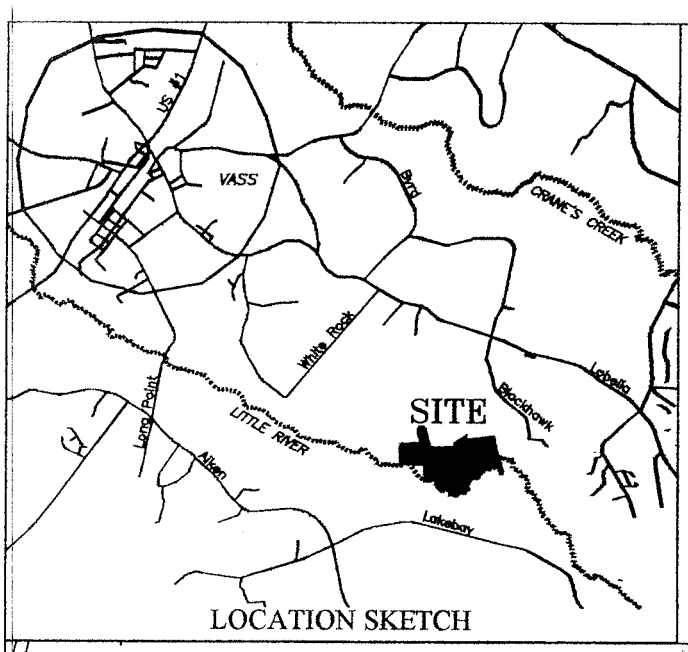
CONSERVATION EASEMENT
J-BAR RANCH, INC.
LITTLE RIVER TOWNSHIP, MOORE COUNTY
NEAR VASS, NORTH CAROLINA
DECEMBER 11, 2008 / 1"=100'

prepared by
JOHN MCLEAN LAND SURVEYING
LAURINBURG, NORTH CAROLINA

100' 50' 0' 100' 200'

SHEET 4 OF 8



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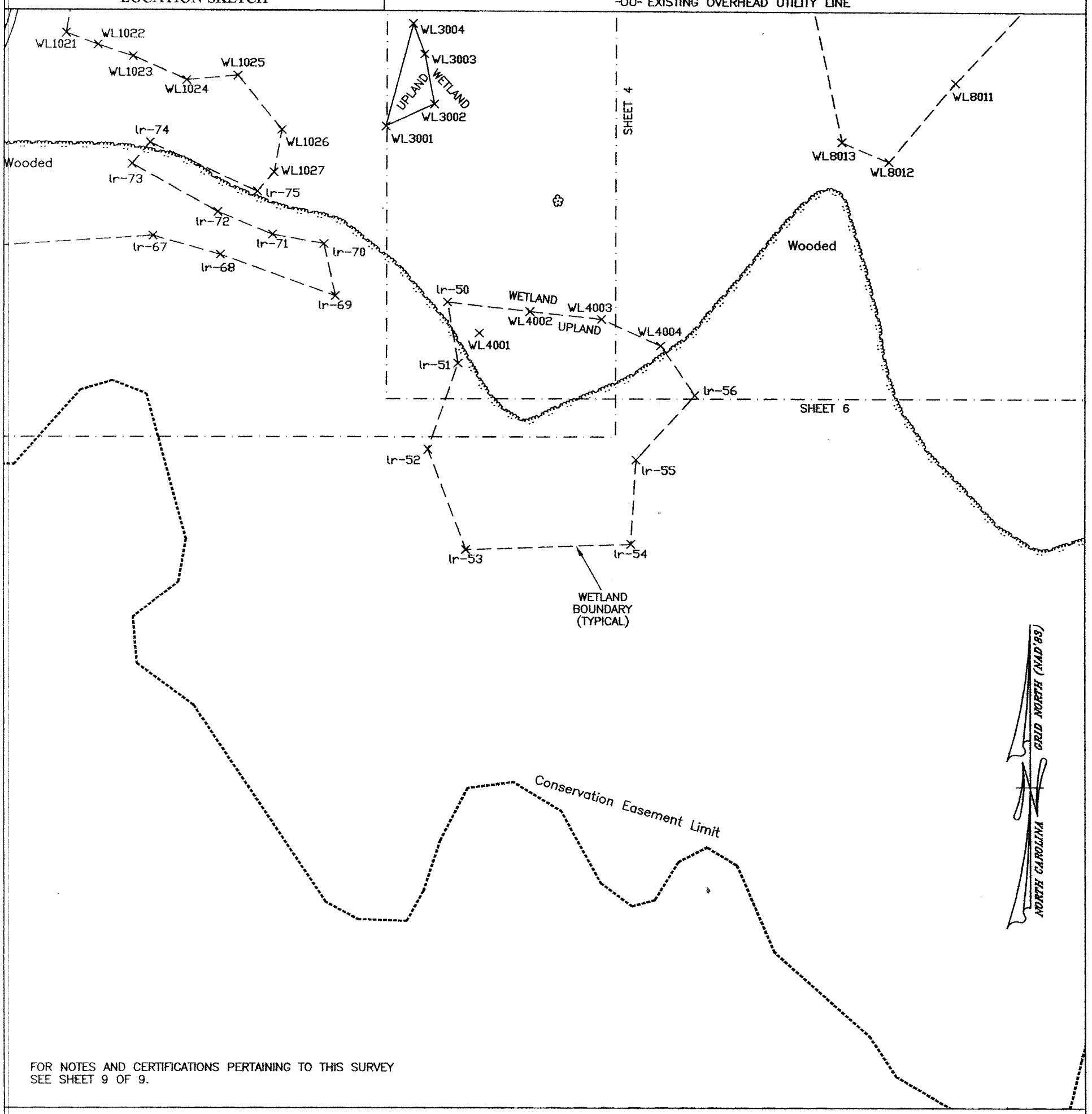

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NORTH CAROLINA PROFESSIONAL SEAL L-4449 LAND SURVEYOR JOHN M. MCLEAN, JR.
1-21-09

WETLAND DELINEATION FOR
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DECEMBER 11, 2008 / 1"=100'

prepared by
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LAURINBURG, NORTH CAROLINA

100' 50' 0' 100' 200'

JMM
LRK:
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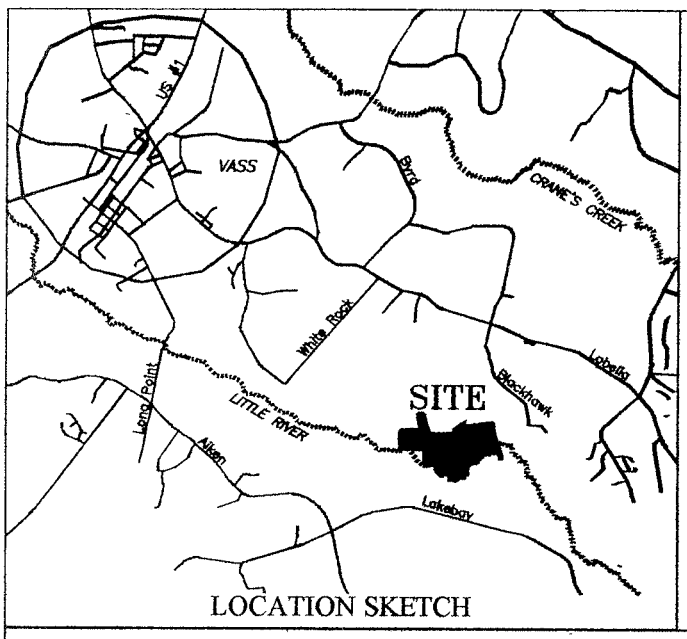
SHEET 5 OF 8



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SURVEY NOTES

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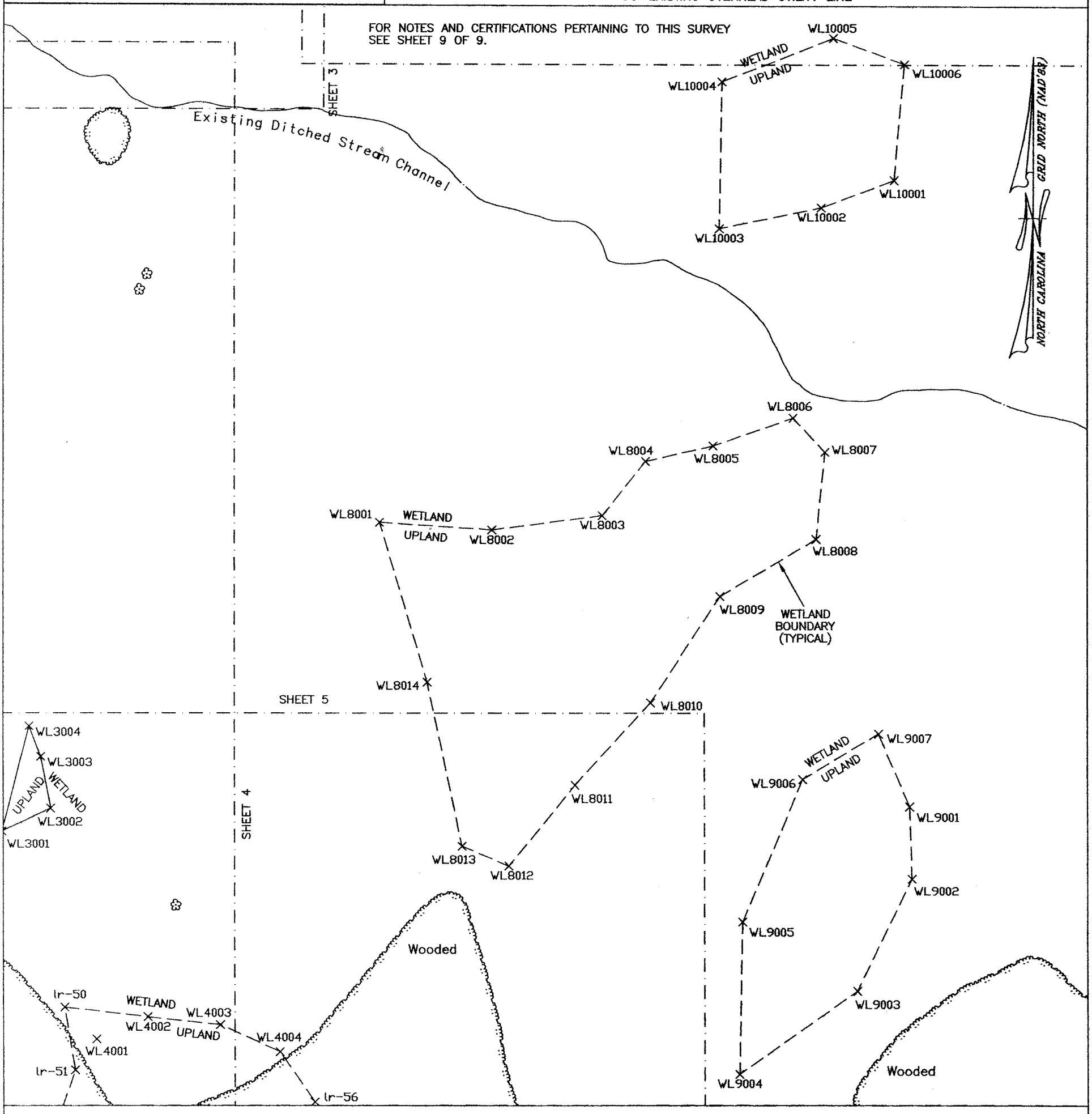

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LITTLE RIVER TOWNSHIP, MOORE COUNTY
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NORTH CAROLINA PROFESSIONAL SEAL L-4449 LAND SURVEYOR JOHN M. MCLEAN, JR.

1-21-09

100' 50' 0' 100' 200'

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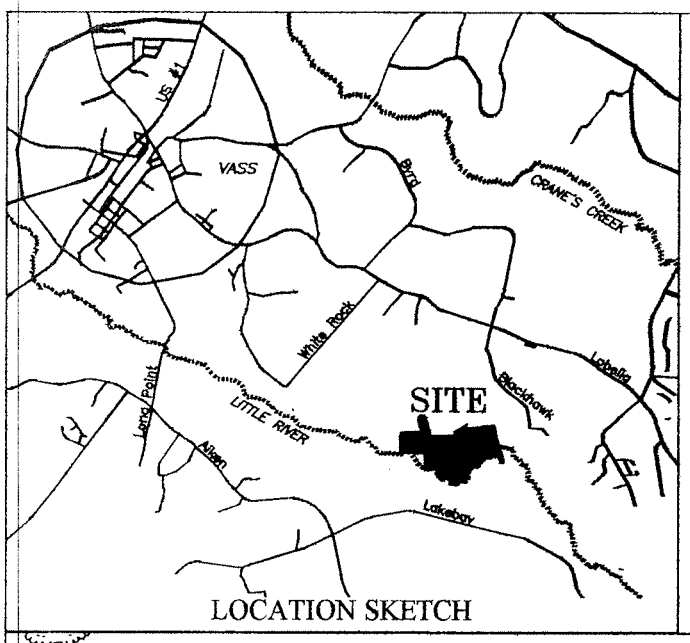
SHEET 6 OF 8



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SURVEY NOTES

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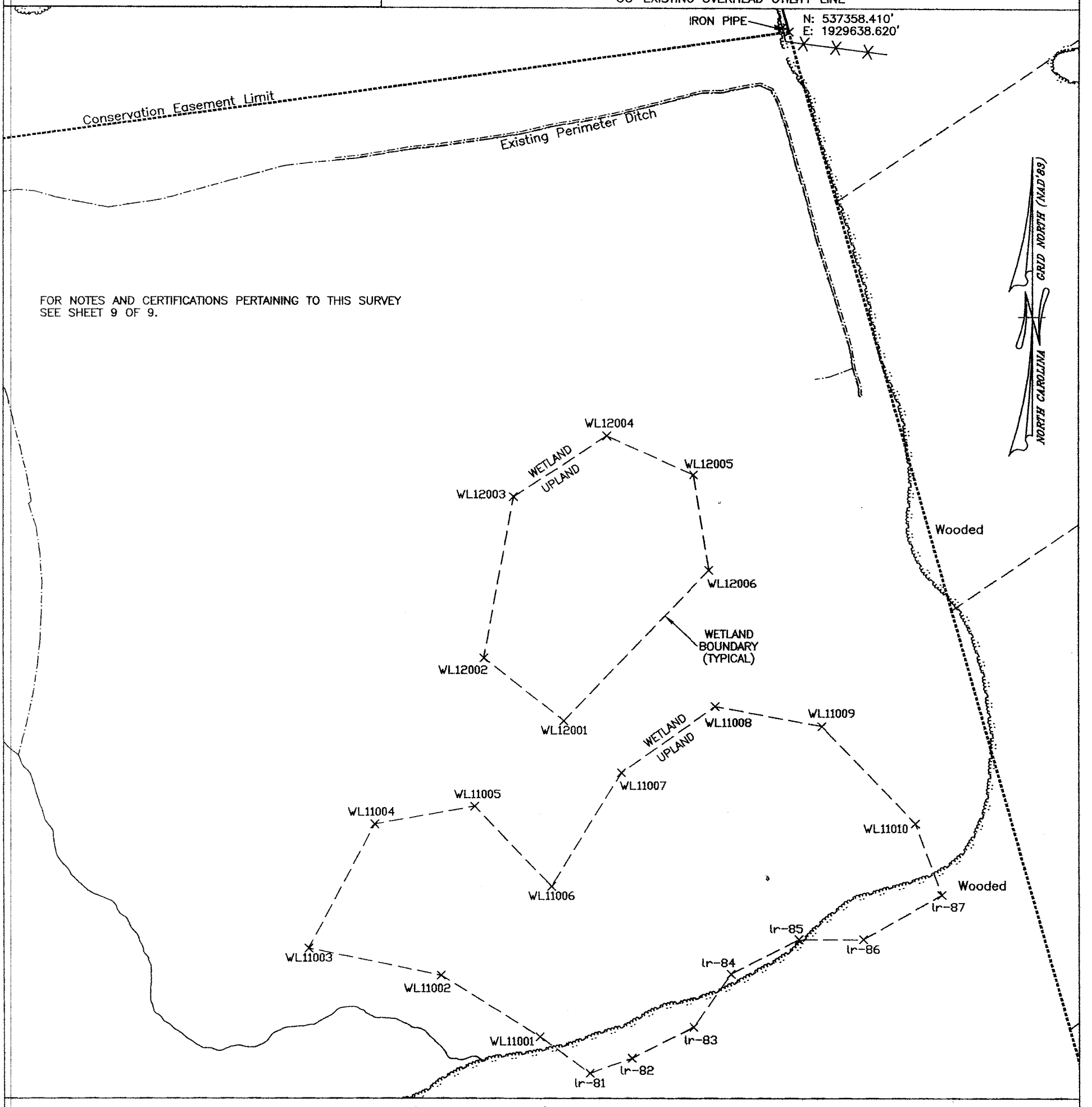

WETLAND DELINEATION FOR
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CONSERVATION EASEMENT
J-BAR RANCH, INC.
LITTLE RIVER TOWNSHIP, MOORE COUNTY
NEAR VASS, NORTH CAROLINA
DECEMBER 11, 2008 / 1"=100'

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LAURINBURG, NORTH CAROLINA

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1-21-09

100' 50' 0' 100' 200'

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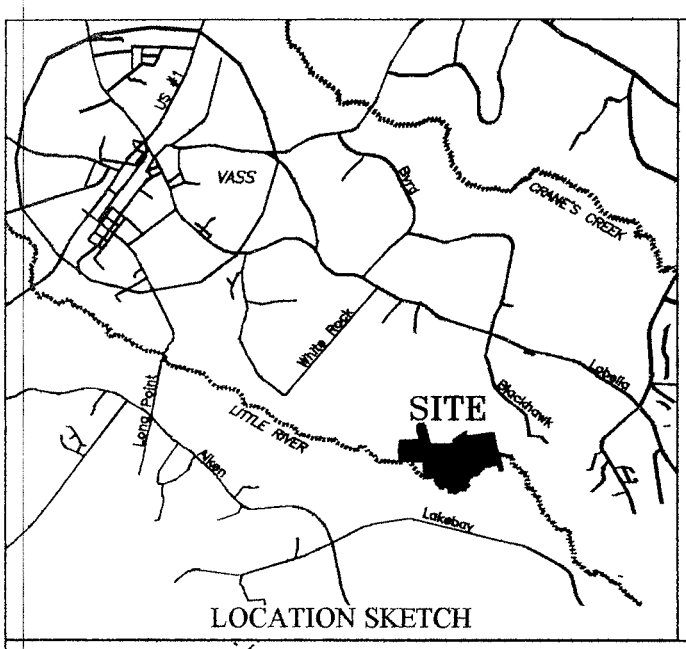
SHEET 7 OF 8



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SURVEY NOTES

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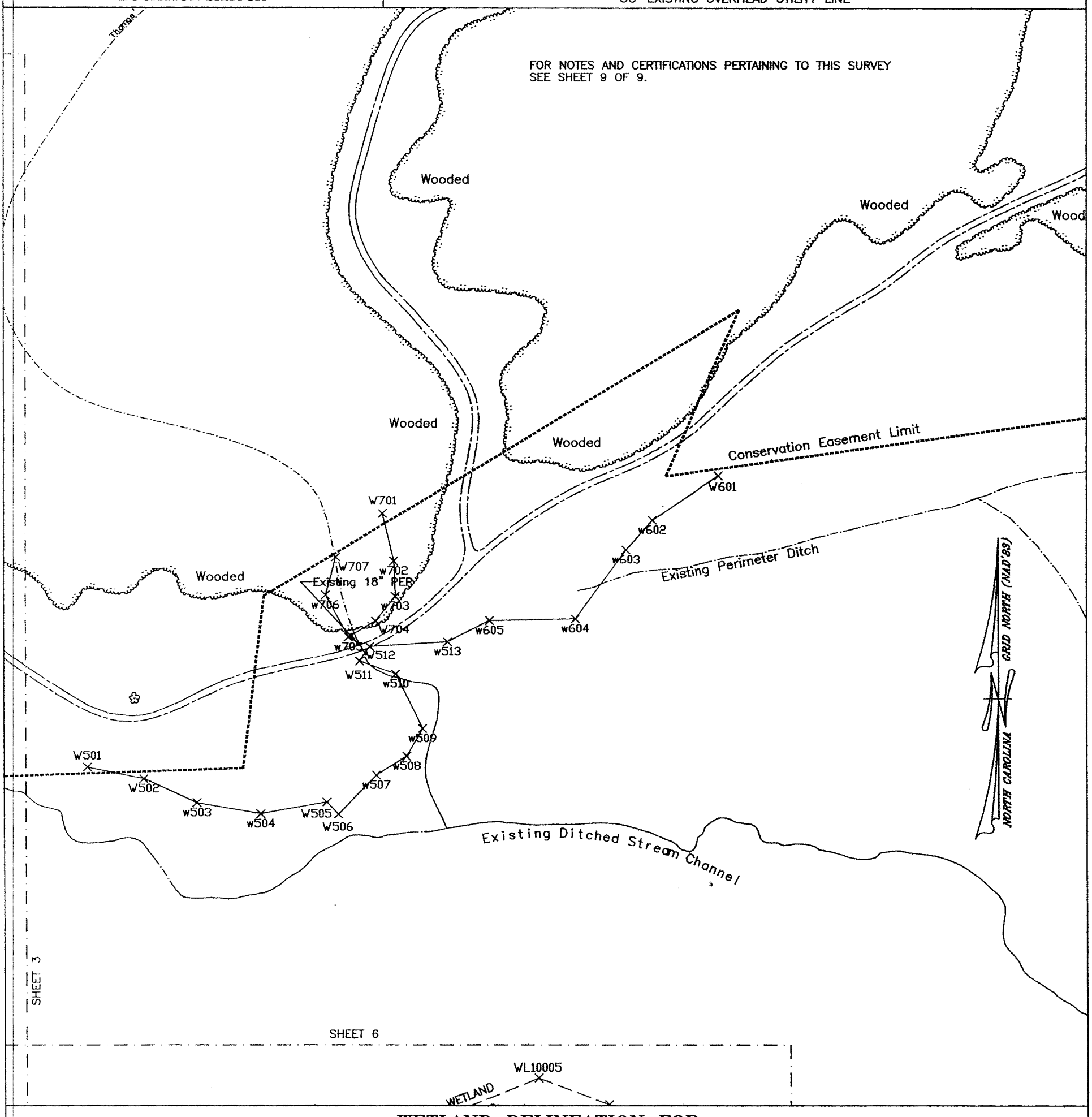

WETLAND DELINEATION FOR
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CONSERVATION EASEMENT
J-BAR RANCH, INC.
LITTLE RIVER TOWNSHIP, MOORE COUNTY
NEAR VASS, NORTH CAROLINA
JANUARY 21, 2009 / 1"=100'

prepared by

JOHN MCLEAN LAND SURVEYING
LAURINBURG, NORTH CAROLINA

NORTH CAROLINA PROFESSIONAL SEAL L-4449 LAND SURVEYOR JOHN M. MCLEAN, JR.

1-21-09

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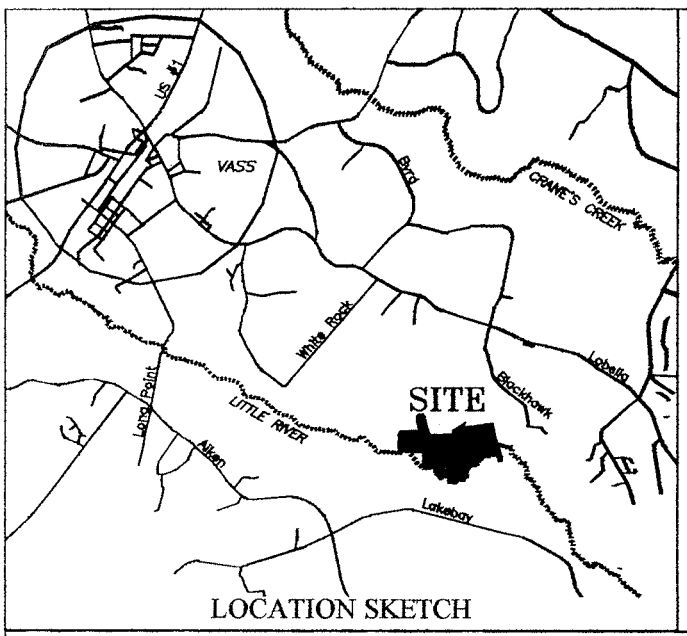

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SURVEY NOTES

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LEGAL REFERENCE:
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DEED BOOK 2225, PAGE 90

DESCRIPTION	NORTHING	EASTING	DESCRIPTION	NORTHING	EASTING	DESCRIPTION	NORTHING	EASTING
WL6007	536750.570	1927126.387	WL10004	536604.527	1928281.963	Ir–27	536607.972	1926981.773
WL6006	536697.321	1927187.546	WL10005	536645.306	1928384.601	Ir–28a	536633.068	1927010.692
WL6005	536623.574	1927198.056	WL10006	536621.235	1928450.045	Ir–28b	536694.724	1927042.066
WL6004	536541.138	1927161.901	WL11001	536420.295	1929405.240	Ir–29	536776.971	1927107.184
WL6003	536443.576	1927131.347	WL11002	536477.303	1929313.393	Ir–30	536785.011	1927230.335
WL6002	536402.318	1927023.521	WL11003	536502.407	1929190.224	w501	536930.922	1927969.572
WL6001	536323.176	1927009.515	WL11004	536618.183	1929251.838	w502	536920.016	1928021.170
WL5006	536281.063	1927067.659	WL11005	536634.674	1929344.990	w503	536897.891	1928069.942
WL5005	536270.411	1927119.357	WL11006	536560.202	1929416.481	w504	536887.662	1928128.588
WL5004	536198.352	1927136.859	WL11007	536665.944	1929481.839	w505	536898.361	1928189.530
WL5003	536118.280	1927107.545	WL11008	536727.854	1929569.884	w506	536887.173	1928200.232
WL5002	536106.008	1927115.370	WL11009	536709.417	1929669.220	w507	536923.089	1928235.256
WL5001	536049.304	1927090.849	WL11010	536618.430	1929756.144	w508	536940.761	1928263.249
WL1001	535990.428	1927124.055	WL12001	536714.638	1929428.321	w509	536966.591	1928278.091
WL1002	536014.500	1927196.114	WL12002	536773.065	1929353.864	w510	537017.241	1928253.398
WL1003	536046.870	1927224.217	WL12003	536923.539	1929381.626	w511	537029.234	1928220.159
WL1004	536120.848	1927219.656	WL12004	536980.042	1929468.748	w601	537201.898	1928552.933
WL1005	536287.180	1927236.996	WL12005	536944.123	1929549.988	w602	537160.437	1928491.324
WL1006	536404.589	1927256.398	WL12006	536854.992	1929564.304	w603	537133.215	1928466.989
WL1007	536489.695	1927271.841	Ir–18	537461.770	1926975.703	w604	537068.654	1928419.863
WL1008	536440.899	1927358.517	Ir–19	537393.458	1927007.948	w605	537067.019	1928340.299
WL1009	536419.046	1927403.606	Ir–20	537323.463	1927043.072	w513	537047.289	1928301.507
WL1010	536406.186	1927489.993	Ir–16a	537595.752	1926885.496	w512	537042.985	1928229.380
WL1011	536368.880	1927579.538	Ir–16b	537628.063	1926838.530	w701	537166.893	1928241.262
WL1012	536356.761	1927582.359	Ir–15	537585.817	1926802.448	w702	537122.978	1928251.822
WL1013	536330.900	1927540.556	Ir–10a	537102.396	1926934.623	w703	537089.858	1928253.104
WL1014	536279.197	1927519.135	Ir–10b	537047.348	1926908.613	w704	537066.611	1928234.985
WL1015	536219.101	1927484.263	Ir–40	536945.815	1927153.668	w705	537051.762	1928209.825
WL1016	536173.872	1927475.848	Ir–41	537022.755	1927074.617	w706	537091.085	1928188.750
WL1017	536131.203	1927454.358	Ir–42	537044.821	1927051.346	w707	537126.952	1928198.250
WL2001	536142.219	1927507.595	Ir–43	537095.464	1927072.406			
WL2002	536159.447	1927532.107	Ir–44	537163.378	1927091.756			
WL2003	536137.786	1927565.428	Ir–50	535749.819	1927675.043			
WL2004	536091.421	1927563.930	Ir–51	535692.431	1927684.783			
WL2005	536080.278	1927552.807	Ir–52	535613.418	1927656.953			
WL2006	536118.140	1927524.427	Ir–53	535520.879	1927692.039			
WL1018	536117.132	1927413.625	Ir–54	535525.858	1927845.272			
WL1019	536106.831	1927373.689	Ir–55	535603.938	1927849.952			
WL1020	536050.437	1927330.947	Ir–56	535662.860	1927904.795			
WL1021	535998.719	1927322.690	Ir–68	535793.476	1927464.969			
WL1022	535988.054	1927351.964	Ir–81	536387.294	1929451.844			
WL1023	535977.301	1927384.413	Ir–82	536401.032	1929491.364			
WL1024	535955.224	1927433.610	Ir–83	536429.340	1929549.353			
WL1025	535959.508	1927480.880	Ir–84	536478.446	1929584.296			
WL1026	535908.876	1927521.512	Ir–85	536510.570	1929647.735			
WL1027	535869.447	1927514.414	Ir–86	536510.577	1929707.585			
WL3001	535912.300	1927617.619	Ir–87	536552.007	1929780.420			
WL3002	535933.209	1927662.524	Ir–61	536131.249	1926980.581			
WL3003	535980.185	1927653.379	Ir–62	536067.408	1927003.258			
WL3004	536008.007	1927642.740	Ir–63	535977.590	1927048.619			
WL4001	535720.765	1927704.430	Ir–65	535832.519	1927174.168			
WL4002	535741.059	1927751.455	Ir–64	535885.237	1927124.256			
WL4003	535733.856	1927817.846	Ir–66	535801.437	1927255.737			
WL4004	535709.179	1927872.761	Ir–67	535810.957	1927403.137			
WL8012	535880.062	1928084.163	Ir–75	535851.723	1927498.916			
WL8013	535898.446	1928040.900	Ir–74	535896.766	1927400.303			
WL8014	536048.661	1928008.955	Ir–73	535876.987	1927383.644			
WL8001	536196.719	1927964.980	Ir–72	535832.761	1927462.787			
WL8002	536189.563	1928068.770	Ir–71	535812.139	1927512.935			
WL8003	536203.029	1928170.920	Ir–70	535803.647	1927560.532			
WL8004	536253.139	1928210.834	Ir–69	535755.461	1927571.010			
WL8005	536267.550	1928273.823	Ir–01	537045.765	1926110.448			
WL8006	536293.215	1928347.829	Ir–02	536962.102	1926191.916			
WL8007	536261.687	1928377.126	Ir–03	536938.042	1926258.738			
WL8008	536180.846	1928369.013	Ir–04	536896.222	1926386.154			
WL8009	536128.242	1928280.103	Ir–05	536823.836	1926474.925			
WL8010	536029.737	1928215.436	Ir–06	536825.321	1926535.974			
WL8011	535954.115	1928145.534	Ir–07	536929.040	1926619.619			
WL9005	535828.192	1928300.877	Ir–08b	536959.056	1926654.398			
WL9006	535959.497	1928356.461	Ir–08a	536985.982	1926718.535			
WL9007	536001.159	1928426.369	Ir–09	537012.597	1926783.545			
WL9001	535934.907	1928455.003	Ir–11	537175.931	1926864.076			
WL9002	535868.010	1928457.139	Ir–12	537272.080	1926853.317			
WL9003	535764.329	1928406.705	Ir–13	537329.908	1926806.527			
WL9004	535688.607	1928297.915	Ir–14	537445.871	1926802.704			
WL7001	536714.389	1927676.206	Ir–17	537526.155	1926933.795			
WL7002	536751.272	1927611.808	Ir–21	536243.085	1926867.233			
WL7003	536814.301	1927564.909	Ir–22	536299.922	1926852.585			
WL7004	536815.133	1927712.034	Ir–23	536405.141	1926871.947			
WL10001	536513.676	1928440.710	Ir–24	536487.871	1926891.551			
WL10002	536488.245	1928373.929	Ir–25	536576.056	1926884.399			
WL10003	536468.570	1928279.687	Ir–26	536605.532	1926931.007			

NOTE: THESE MAPS PREPARED TO SHOW WETLAND LOCATIONS ONLY AND NOT BE CONSIDERED A BOUNDARY SURVEY. BOUNDARY LIMITS OF CONSERVATION EASEMENT TAKEN FROM PLAT RECORDED AT PLAT CABINET 10, SLIDE 346. ALL COORDINATES SHOWN WERE LOCATED BY USING MAPPING GRADE TRIMBLE GPS RECEIVERS POST–PROCESSED USING TRIMBLE PATHFINDER SOFTWARE AND BY CONVENTIONAL TOTAL STATION. PORTION OF DATA USED IS FROM PREVIOUS WORK PERFORMED BY FROM BLUE: LAND, WATER, INFRASTRUCTURE AND "I" JOHN MCLEAN PARTICIPATED IN THE FIELD WORK TO OBTAIN THE DATA USED OF BLUE: LAND, WATER, INFRASTRUCTURE. COORDINATES LOCATED BY GPS ARE NC GRID NAD 83 AND THE POINTS PROVIDED BY BLUE: LAND, WATER, INFRASTRUCTURE THAT COULD BE VERIFIED BY GPS WERE WITHIN THE SUB–METER ACCURACY STANDARD.
TOTAL WETLAND ACREAGE = 106.91±
MAP REVISED ON 1–21–09 TO ADD WETLAND POINTS SHOWN ON SHEET 8 MAKING MAP A TOTAL OF 9 SHEETS.

THIS CERTIFIES THAT THIS COPY OF THIS PLAT ACCURATELY DEPICTS THE BOUNDARY OF THE JURISDICTION OF SECTION 404 OF THE CLEAN WATER ACT AS DETERMINED BY THE UNDERSIGNED ON THIS DATE. UNLESS THERE IS A CHANGE IN THE LAW OR OUR PUBLISHED REGULATIONS, THIS DETERMINATION OF SECTION 404 JURISDICTION MAY BE RELIED UPON FOR A PERIOD NOT TO EXCEED FIVE YEARS FROM THIS DATE. THIS DETERMINATION WAS MADE UTILIZING THE 1987 CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL.

REGULATORY OFFICIAL _____

TITLE _____

DATE _____

USACE ACTION ID _____

NORTH CAROLINA PROFESSIONAL SEAL L–4449 LAND SURVEYOR JOHN M. MCLEAN JR.

1-21-09

WETLAND DELINEATION FOR
LITTLE RIVER RESTORATION SITE

CONSERVATION EASEMENT
J–BAR RANCH, INC.
LITTLE RIVER TOWNSHIP, MOORE COUNTY
NEAR VASS, NORTH CAROLINA
DECEMBER 11, 2008 / 1"=100'

prepared by

JOHN MCLEAN LAND SURVEYING
LAURINBURG, NORTH CAROLINA

100' 50' 0' 100' 200'

JMM
LRK:
FN: LITTLERIVER02.DWG

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MEMORANDUM

TO: Todd Tugwell, Chair
Interagency Review Team

FROM: Tracy Stapleton, Project Manager

THROUGH: Jeff Schaffer, Eastern WPPI Supervisor and Marc Recktenwald, WPPI Manager

RE: Second Follow Up on Project Strategy
Little River (IMS #226)
Cape Fear 03030004

DATE: 19 January 2011

This memo serves as an update of the restoration approach for the subject project, and to seek approval of the monitoring and credit strategy for this project.

As you may recall, the Little River project is located near Vass in Moore County, in CF 04 (Figure 1). It is a WRP-originated project that originally proposed a large amount of stream restoration. In 2001 the site was timbered, streams channelized, soil bedded and loblolly pines planted in much of the floodplain wetlands by the owners for silviculture. The conservation easement was purchased by EEP in 2003. During design development visits to the site with agency staff and a change in design firm delayed and changed the restoration strategy at the site. In 2009, Stantec finalized plans to enhance the bedded pine plantation wetlands by removing pines and re-planting. Concerns at EEP continued, though, including bringing large equipment into the site, and disturbing the recovering soils. After another site visit with agencies, and internal discussion, EEP decided to plant a small portion of the site, below existing pines, for enhancement of the stream and wetlands and comparison of bottomland hardwood community development in planted and unplanted portions of the pine plantation.

Wetland Community type	***Acres***
Wetland pine plantation	48
Wetland grassy fields	7
BLH preservation	49
Total	**104**
Warm Stream	***Linear ft***
Channel A	1726
Channel B	1867
Total	**3593**

As discussed in the June 2010 IRT meeting, an approach being considered for restoration was to contract for burning of the site to clear the existing underbrush for bareroot planting. EEP contracted with ASIS to burn the site in December 2010. The burning was successful in opening up the understory at the site. Therefore EEP is changing its restoration approach and the resulting credits from the approach's implemententation. EEP will now plant all 55 acres of wetland and stream buffer (pine plantation and grassy fields) with bare roots of climax community species. The pine plantation, including stream buffer, will be planted at a rate of 300 stems per acre, with a target of 150 planted stems per acre at Year 5. These bare roots will mimic the understory development of these species, at a lower density than other wetland enhancement projects because of the high density of pines forming a canopy above them. We anticipate more closely mimicking a jump-started successional community by bringing in climax species to the nine year old loblolly stand. The grassy fields will be planted at a rate of 600 stems per acre

Most of EEP's wetland enhancement projects invovle planting bare roots in a jurisdictional wetland barren of woody stems. For these projects, the ratio of 2:1 has been set by agreements that establish EEP policy. For this project, we propose 2.5: 1 credit in pine plantation areas because of the lower density of planted woody stems. In the grassy fields, we anticipate 2:1 credit. This would result in approximately 19.2 credits from the pine plantation, 3.5 credits from the grassy field area, and 9.8 credits from the preservation area. The total anticipated wetland credits from this site are 32.5 riparian wetland mitigation units, all of which are restoration equivalent credits. Stream credits total 1437 credits, attributed to Enhancement II of 3593 linear feet of stream through planting.

Summary Table of Little River Proposed Mitigation

Type	Acres/lf	Ratio	Total Credits
Riparian Wetland Enh (pine plantation)	48	2.5:1	19.2
Riparian Wetland Enh (grassy field)	7	2:1	3.5
Riparian Wetland Pres	49	5:1	9.8
Stream Enh 2	3593	2.5:1	1,437.2

Monitoring

In the pine plantation wetlands, monitoring will include 8 CVS monitoring plots. Success will be met if 150 planted woody stems per acre are surviving in year 5 of monitoring in the pine plantation area, while 260 planted woody stems per acre must be surviving after 5 years of monitoring in the grassy field area. This lower density in the plantation area is a result of the loblolly pine presence and abundance. The grassy field area will have 2 CVS vegetation plots. In addition, five monitoring wells will be re-installed to collect hydrology data about the site.

The stream portion of the site will be equipped with a crest gage, photo points, and 6 CVS vegetation plots. Stream buffer plots, because they are within the planted pine plantation, will also have a stem density requirement of 150 planted woody stems per acre surviving in year 5 of monitoring to meet success.

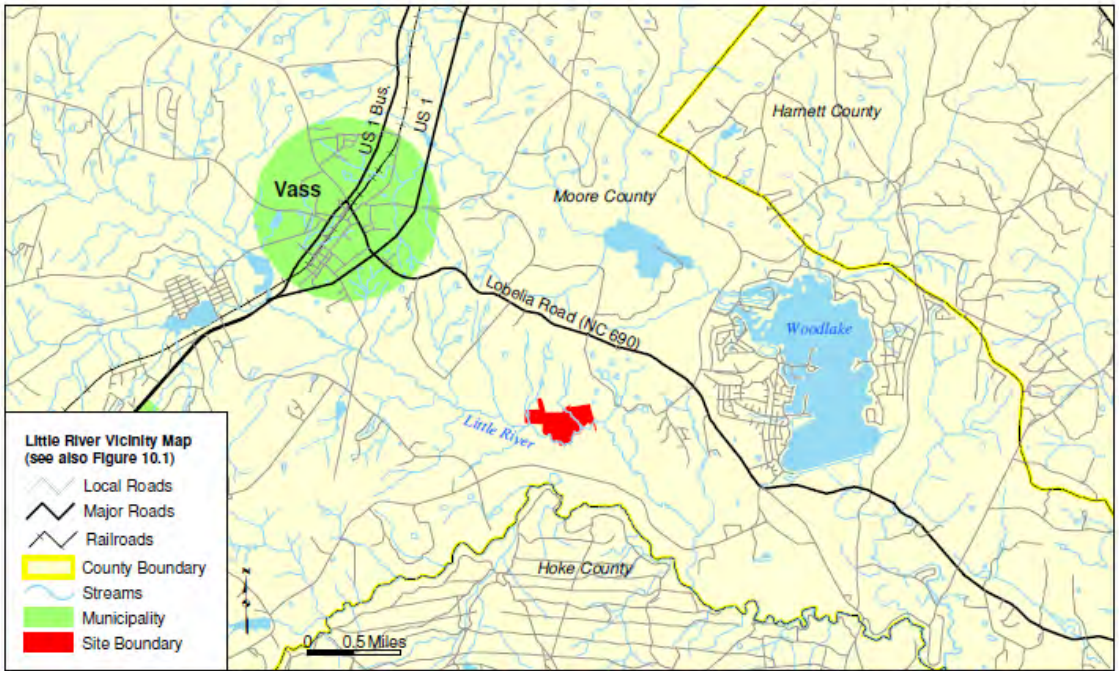
If you have any questions, please feel free to call me at 715-1658.

References

Parker, G.R. and W. T. Swank. *Tree Species Response to Clear-cutting a Southern Appalachian Watershed*, 1982: Coweeta Hydrologic Laboratory, US Forest Service. North Carolina, USA.

Cain, Michael D. and Michael G. Shelton. *Secondary forest succession following reproduction cutting on the Upper Coastal Plain of southeastern Arkansas, USA*, 2000: USDA Forest Service, Southern Research Station, Monticello, Arkansas.

Figure 1.0 Project Vicinity Map and Directions



Directions to Little River project site: *From Raleigh follow US 1 South approximately 50 miles to Vass. Take the NC 690 exit and follow NC 690 east for approximately 2.3 miles. Turn right into project site.*

Figure 2.0 Project Vegetative Communities