

ARMSTRONG PROPERTY WETLAND AND STREAM MITIGATION PLAN

**Hyde County
USGS Catalog Unit 03020104090010
EEP Project No 16-D06012
Design Firm: Albemarle Restorations, LLC**

Prepared for:



**NCDENR/ ECOSYSTEM ENHANCEMENT PROGRAM
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1.0 EXECUTIVE SUMMARY

This report is submitted by Albemarle Restorations, LLC (AR) to document the completion of restoration of 20 acres of riverine wetlands and 2,200 linear feet of stream (swamp run restoration) on the Armstrong Property located just east of State Route 45 near the intersection with US Route 264 at Ponzer in Hyde County, North Carolina. This report will also serve as a baseline for all future monitoring reports submitted pursuant to the requirements set forth in the state of North Carolina's Request for Proposals (RFP) RFP #16-D06012: *Full Delivery Project to Provide Stream, Wetland, and/or Buffer Mitigation in the Tar Pamlico River Basin, Cataloging Unit 03020105.*

Prior to restoration, the 25.0 acre easement area was used entirely for agriculture production, primarily corn, soybeans and cotton. The existing farm fields were drained by several drainage ditches that traverse the site and outfall into Clark Mill Creek. No natural plant communities of any biological value were found within the project area, and all ditches were actively maintained to remove vegetation and debris.

The goal of the project was to restore a diverse riparian headwater "swamp run" system and its associated riverine wetlands to provide the following ecological benefits:

- 1) Water quality improvements, including nutrient, toxicant and sediment retention and reduction, increasing dissolved oxygen levels, as well as reducing excessive algae growth, and reducing surface water temperatures in receiving waters by providing permanent shading in the form of a shrub/scrub and forested headwater wetland system.
- 2) Wildlife habitat enhancement by adding to the existing adjacent forested areas creating a continuous travel corridor between habitat blocks and providing a wide range of habitat areas (open water, emergent, shrub/scrub and forested) for amphibians, reptiles, birds, insects and mammals.
- 3) Flood flow attenuation during storm events which reduces sedimentation and erosion downstream, and improves long term water quality within the Pungo River.
- 4) Passive outdoor recreation and educational opportunities for the landowner and the surrounding community.

In order to achieve these goals, restoration activities, in accordance with the approved restoration Plan, began October 1, 2007, and were completed on November 30, 2007. Restoration consisted of grading the headwater riverine complex at varying elevations to create hummocks and braided channels that emulated natural "swamp run" systems found within the Pungo River Basin. The surrounding riverine wetlands were restored by grading the existing farmland to create wide floodplains and seasonally saturated wetlands. Native trees and shrubs were planted on site during January 28 and 29, 2008, to restore habitat and create a species diverse wetland system. Additionally, an emergent wetland seed mixture was applied concurrent with the finish grading to provide immediate habitat and water quality benefits. All planting and grading was conducted in accordance with the approved restoration plan.

Four permanent water level monitoring wells (monitoring wells #1, 2, 3 and 4) and one backup well (monitoring well #5) were installed on January 29, 2008 at random and varying locations and elevations throughout the riverine wetland portions of the site to measure subsurface water elevations. Additionally, two monitoring wells were installed at a reference wetland site. Locations of all installed and proposed monitoring devices and vegetative plots are shown on Sheet M-1 in Appendix B. Four vegetative monitoring plots, coincident with each monitoring well location, will be permanently monumented. Each plot is a 10m X 10m square, as recommended by the CVS-EEP Protocol for recording vegetation. These quadrants will be monitored for a minimum five-year period, or until success of the project can be validated. To monitor the swamp run component of the project, two water level monitoring wells and three wrack material monitoring stations are proposed within the limits of the swamp run for the specific purpose of monitoring hydrology (both surface and sub-surface) within the swamp run. Two vegetative monitoring plots will be installed and monitored, one coincident with each of the two swamp run monitoring wells. These monitoring devices will be installed upon approval of the Mitigation Plan.

Monitoring Reports will be submitted to the North Carolina Ecosystem Enhancement Program (EEP) by December 31 of the year in which the monitoring was conducted. The reports will include all water elevation data and CVS-EEP Protocol vegetation data. The monitoring wells will be checked four times per year, at which time a visual assessment of inundated areas will be made. The targeted plant community is a swamp run and riverine wetland mosaic. The site will be deemed successful if the acreages of each regime falls within a reasonable range related to the design during normal climatic conditions. Site hydrology during years of excessive rainfall or extreme drought will be assessed with climatic conditions in mind and will be compared with data collected at the reference wetland site.

Table 1: Mitigation Summary

Restoration Type	Pre-Existing Acres/Linear Feet	Post Construction Acres/ Linear Feet	Credit Ratio (Restoration : WMU)	Total WMU's / SMUs
Riverine Wetland	0.0 acres	20.0 acres	1:1	20.0 WMUs
Stream (Swamp Run)	0.0 linear feet	2,200 linear feet	1:1	2,200 SMUs

2.0 AS-BUILT REPORT

2.1 Project Background

The Armstrong Property, located on Route 45 near Ponzer, in Hyde County, North Carolina, was selected because of its location in a targeted watershed and its ability to

add contiguous swamp run and forested wetlands to a high quality cypress-dominated riverine wetland system located adjacent to the project area. On April 5, 2006, AR entered into a contract with EEP for the procurement of 20 riverine wetland mitigation units (WMU's) and 2,200 stream mitigation units (SMU's) on the Armstrong Property. Restoration of the site occurred during the fall of 2007 and the winter of 2008. **Table 2** below summarizes the project history.

Table 2: Project History

June 2007	Reference Wetland Studied
July 31, 2007	Restoration Plan Approved
October 1 thru November 30, 2007	Construction
January 28-29, 2008	Planting
January 29, 2008	Monitoring Wells Installed
December 31, 2008 (Scheduled)	First Monitoring Report (Year 1)

2.2 Pre-existing Site Conditions

The overall Armstrong property consists of approximately 132 +/- acres, 25 of which are designated for this project site. The project is located within the east central portion of the farm and has a drainage area approximately 65 acres. The site was previously intersected by 4 drainage ditches aligned north to south. The ditch located on the western most portion of the project site was the channelized and re-routed tributary to Clark Mill Creek. The stream restoration component of the project involved restoring this ditched tributary to a headwater swamp run system. The majority of the project area is bordered by agricultural fields to the north, south, east, southeast and west. The northeastern portion of the project area is bordered by timberland. Degradation to the channels and surrounding areas by past agricultural activities, including channel straightening and planting of row crops up to the channel edges, has allowed excessive nutrient and sediment accumulation in the channels and downstream receiving waters. These past activities have also served to dramatically reduce the flood flow attenuation capabilities of the channels. **Appendix A** contains photographs taken during a pre-construction site visit, showing the degradation of the channel and the proximity of tilled ground.

2.3 Construction and Planting

Restoration activities, in accordance with the approved Restoration Plan, began on October 1, 2007 with the installation of recommended erosion control practices and grading of the headwater swamp run system. After the swamp run (stream) portion of the project was completed, the adjacent riverine wetlands were graded. Topsoil, which had been stockpiled during initial construction, was redistributed during final grading. Lastly, the project outlet, consisting of a 24" reinforced Aluminum pipe and riprap outlet protection was completed. On November 30, 2007 all grading operations were completed. The As- Built survey for the grading is included in Appendix B, sheets G-2 thru G-3.

Tree and shrub planting on the project site was completed on January 28 and 29, 2008 using containerized and bare-root seedlings. The emergent wetland seed mixture was spread just after grading was completed. All planting was done in accordance with the approved restoration plan, the exception being the size of plant material. Due to availability of plant materials, smaller sized seedlings were installed than what was originally specified in the restoration plan. Also, the site was over planted at a rate of 430 stems per acre, as opposed to the 350 stems/acre specified in the restoration plan. **Table 3** below summarizes the species planted.

Table 3: Tree/Shrub Planting Schedule

TREE/SHRUB PLANTING SCHEDULE- 25.0 Acres Combined Swamp Run and Riverine Wetland Areas						
	Quantity	Botanical Name	Common Name	Size	Condition	Spacing
Trees:	1200	<i>Taxodium distichum</i>	Bald Cypress	1-2'	Bare Root	10' Random Spacing
	1100	<i>Liquidambar styraciflua</i>	Sweetgum	1-2'	Bare Root	10' Random Spacing
	300	<i>Nyssa aquatica</i>	Water tupelo	1-2'	Bare Root	10' Random Spacing
	1400	<i>Nyssa biflora</i>	Swamp Black Gum	1-2'	Bare Root	10' Random Spacing
	1400	<i>Quercus phellos</i>	Willow Oak	1-2'	Bare Root	10' Random Spacing
	300	<i>Quercus bicolor</i>	Swamp White Oak	1-2'	Bare Root	10' Random Spacing
	200	<i>Quercus nigra</i>	Water Oak	1-2'	Bare Root	10' Random Spacing
	1100	<i>Quercus palustris</i>	Pin Oak	1-2'	Bare Root	10' Random Spacing
	1200	<i>Quercus michauxii</i>	Swamp Chestnut Oak	1-2'	Bare Root	10' Random Spacing
Total:	8,200					
Shrubs:	295	<i>Cyrilla racemiflora</i>	Swamp Cyrilla	1-2'	Container	10' Random Spacing
	110	<i>Vaccinium corymbosum</i>	Highbush Blueberry	1-2'	Container	10' Random Spacing
	570	<i>Itea virginica</i>	Virginia Sweetspire	1-2'	Container	10' Random Spacing
	600	<i>Cephalanthus occidentalis</i>	Button Bush	1-2'	Bare Root	10' Random Spacing
	800	<i>Myrica cerifera</i>	Wax Myrtle	1-2'	Bare Root	10' Random Spacing
	400	<i>Magnolia virginiana</i>	Sweetbay Magnolia	1-2'	Container	10' Random Spacing
	Total	2,775				

2.4 Post Construction Site Conditions

Within two months of project completion, the restored swamp run and adjacent riverine wetlands had experienced “overbank” flooding. The swamp run has been inundated during each periodic site visit since the project was completed. Photographs of the site taken in December 2007 & January 2008 are found in **Appendix A**.

3.0 Monitoring Plan

Monitoring of the site is to be completed per EEP’s guidelines titled *Content, Format and Data Requirements for EEP Monitoring Reports* for a five year period, with monitoring beginning in fall 2008 (Year 1) and concluding in 2012 (Year 5). Photographs and/or video footage of major flow events, to the extent that is possible, will be included in each year’s monitoring report. Monitoring methods for the headwater swamp run system will be in accordance with the “*Information Regarding Stream Restoration with Emphasis on the Coastal Plain*” as outlined in 3.1 below, and monitoring for the associated riverine wetlands will consist of vegetative and hydrology monitoring as outlined in sections 3.2 and 3.3 below.

3.1 Headwater Swamp Run Monitoring

3.1.1 Swamp Run Hydrology Monitoring

Monitoring of the headwater swamp run system created on the site will be in accordance with success criteria outlined in “*Information Regarding Stream Restoration with Emphasis on the Coastal Plain*”, as the system has a drainage area under 100 acres. According to the guidance, streams with watersheds less than 100 acres typically do not have defined bed and banks, and thus the monitoring of these systems should be geared toward documenting restored functions rather than using traditional geomorphic studies. Monitoring will consist of assessing groundwater elevations in and adjacent to the system within the riverine wetland areas, continuous surface water elevation documentation, vegetation plot monitoring, and methods to assess flow patterns and duration of inundation. If it is determined that surface water inundation and coverage, surface water flow, and vegetation establishment are all within the attainment criteria set forth below, the restoration of a functional headwater swamp run will be deemed successful.

Three of the wells previously installed within the riverine wetlands adjacent to the swamp run (Monitoring wells 2, 3, and 4) will be used to monitor subsurface water elevations adjacent to the swamp run. In addition, surface and sub-surface hydrology within the swamp run will be monitored and evidence of flow will be documented. To monitor both subsurface and surface water elevations, two continuous recording pressure transducer type water level loggers suspended in monitoring wells will be installed within the limits of the swamp run. The loggers will be set in close proximity to the swamp run cross-sections #1 and #3 to determine the depth and duration of surface water inundation (Sheet M-1, Appendix B). The two monitoring wells will have perforations in the PVC as to

allow water into well so the logger can track surface water influences. During dry periods, sub-surface water elevations will be monitored at these stations. During runoff/storm events, pictures and/or video will be recorded to the extent practicable and provided in the annual monitoring reports in DVD format. Data from the wells will be downloaded from each monitoring station four times per year, and during each site visit hand measurements will be taken and visual observation noted to ensure the accuracy of the water level loggers.

Three permanently monitored cross-sections will be surveyed once per year to determine the extent of surface inundation, and to a lesser extent, to demonstrate stability of the system. Measurements of ground surface elevation will be taken at each break in topography across the section. Surface water depth measurements will also be taken, and the lateral extent of inundation will be documented. Data will be presented in each monitoring report in graphical format. Sheet M-1 in Appendix B shows locations of the two proposed monitoring wells and installed cross-sections. The cross sections for the swamp run monitoring have been installed. Because the swamp run restoration is relatively new and few if any EEP projects have implemented swamp run restoration in the lower coastal plain with commensurate approved success criteria, the continuous recording well monitoring devices have not been installed. Upon approval of the proposed monitoring protocols contained within the Mitigation Plan, the swamp run wells and wrack monitoring stations will be installed.

Flow Monitoring:

Because flow in very low gradient diffuse flow systems is difficult to measure using traditional velocity measuring devices, an alternative method of determining the presence of water moving through the system will be employed. Three wrack material monitoring stations will be installed at varying locations in the swamp run. Each station will consist of an eight-foot long by three foot high section of two-inch woven wire mesh fencing installed parallel to the overall direction of flow. Each section of fencing will be supported by stainless steel tubing driven into the ground such that the fencing material extends perpendicular from the ground surface. Sheet M-1 in Appendix B shows the proposed locations of the wrack material monitoring stations on the site. Four times per year the stations will be monitored and photographed to determine the extent of “wrack” material, or organic detritus, which has accumulated. During each monitoring visit, any accumulated debris will be removed.

The presence of any wrack material at one or more monitoring stations will be used to determine if flow is present in the swamp run system. If evidence of water flow is found one or more times per year, it will be determined that surface hydrology commensurate with a swamp run system is present. In addition to the monitoring described above, other methods will be used in documenting flow, including photographs of wrack material in other areas, silt/sediment buildup on plant material and/or localized scour. Upon approval of the proposed monitoring protocols contained within the Mitigation Plan, the wrack material monitoring stations will be installed.

Precipitation Documentation:

Rainfall data will be collected on-site through an event rainfall logger. This gauge will be placed directly adjacent to the project site, and will record rainfall intensity, duration, time and quantity. Rainfall data from two other sites, one in Pocosin Lakes National Refuge, North Carolina, approximately 10 miles from the project site and another in Aurora, North Carolina, approximately 25 miles from the site will be used as references to determine the deviation from climatologically normal rainfall in the area. The rainfall data will be assessed to determine degree to which climatologic extremes (i.e. drought or excessive rainfall) affect subsurface water levels, and surface water extent and flow.

3.1.2 Swamp Run Vegetation Monitoring

Two vegetation monitoring plots will be established, one at each swamp run monitoring well location, to provide a representative sample of the swamp run vegetative community. Plots will be 10 meter by 10 meter square plots, with one corner of each plot coinciding with the location of the associated monitoring well. Plot sampling will coincide that of the wetland vegetation plots and continue for the duration of the 5-year monitoring period or until the site is deemed successful. Vegetation plot sampling will consist of Level 1: Planted stem inventory plots for the first year, and Level 2: Total woody stem inventory lots for remaining years, as defined in the *CVS-EEP Protocol for Recording Vegetation Version 4.0*.

In accordance with the *US Army Corps of Engineers, Stream Mitigation Guidelines, April 2003*, Albemarle Restorations will maintain survivability of planted woody species at a minimum of 320 stems/acre thru year three. A ten percent mortality rate will be accepted in year four (288 stems/acre) and another ten percent in year five resulting in a required minimum survival rate of 260 trees/acre through year five. The vegetation component of the project will be considered successful if the planted wetland species dominate the tree and shrub layers in the planted wetland areas. It is expected that volunteer species will colonize the site from adjacent and nearby wetland and swamp run areas. If these species become dominant, the wetland indicator status of each species will be assessed, and the site will be deemed successful if the dominant species in each layer are FAC or wetter. Non-native invasive species will not be included in this assessment.

3.2 Riverine Wetland Monitoring

3.2.1 Riverine Wetland Hydrology Monitoring

Monitoring of hydrology on the riverine wetland portion of the restoration site will be completed using four continuous recording water level loggers suspended in two-inch PVC monitoring wells, installed on January 29, 2008. Sheet M-1 of Appendix B shows locations of the monitoring wells. The wells have been located to assess subsurface water levels at various elevations on the site planned as seasonally saturated or temporarily flooded. Data will be downloaded from each monitoring well four times per

year, and during each site visit hand measurements will be taken to ensure the accuracy of the water level loggers. An additional backup water level logger, monitoring well #5, was installed in case of malfunctions which occur from time to time with the data loggers. Data from the backup logger will be utilized if any of the four original loggers malfunction.

Groundwater elevation data collected from each monitoring well will be presented relative to the ground surface elevation at the well location in graph form to demonstrate whether wetland hydrology, defined as inundation or saturation to within 12 inches of the ground surface for a minimum of 21 consecutive days during the growing season, has been attained. The determination will be listed in the Wetland Criteria Attainment Table in each report. Raw data will also be supplied in an appendix to the report.

In addition to measurements of sub-surface water elevations, rainfall data will be collected on site through an event rainfall logger. This gauge, installed on February 5, 2008, and placed at the edge of the project site, will record rainfall intensity, duration, time, and quantity. A visual estimate of the extent of inundation will also be made and documented on site mapping for inclusion into the monitoring report. Rainfall data from two other sites, one at Pocosin Lakes National Wildlife Refuge, North Carolina, approximately 10 miles from the project site and another in Aurora, North Carolina, approximately 25 miles from the site will be used as references to determine the deviation from climatologically normal rainfall in the area. The rainfall data will be assessed to determine degree to which climatologic extremes (i.e. drought or excessive rainfall) affect project hydrology.

To further gauge the affect of seasonal and annual variations in precipitation and to set a target hydrologic range for the restored wetlands, a reference site will be monitored which is near to the restoration area (Sheet R-1, Appendix B). Two hydrologic monitoring wells were installed within the reference wetland. The wells are located in similar position in the landscape as the restored riverine wetlands, and will be monitored in the same manner as the project monitoring wells. In cases where severe drought or other natural occurrences effect groundwater levels which prevent hydrologic success criteria from being achieved, data collected at the reference site will be used to verify that fluctuations in groundwater elevations are due to natural occurrences and not to deficiencies in the project design.

3.2.2 Riverine Wetland Vegetation Monitoring

Four vegetation monitoring plots have been established, one at each original monitoring well location, to provide a representative sample of both shrub/scrub and forested wetland communities. Plots will be 10 meter by 10 meter square plots, with one corner of each plot coinciding with the location of the associated monitoring well. The initial plot sampling will occur in November 2008 (Year 1), with successive vegetative monitoring occurring once per year for 5 years, or until the site is deemed successful. Vegetation plot sampling will consist of Level 1: Planted stem inventory plots for the first

year, and Level 2: Total woody stem inventory lots for remaining years, as defined in the *CVS-EPP Protocol for Recording Vegetation Version 4.0*.

In accordance with the *US Army Corps of Engineers, Stream Mitigation Guidelines, April 2003*, Albemarle Restorations will maintain survivability of planted woody species planted to a minimum of 320 stems/acre thru year three. A ten percent mortality rate will be accepted in year four (288 stems/acre) and another ten percent in year five resulting in a required minimum survival rate of 260 trees/acre through year five. The vegetation component of the project will be considered successful if the planted wetland species dominate the tree and shrub layers in the planted wetland areas. It is expected that volunteer species will colonize the site from adjacent and nearby wetland areas. If these species become dominant, the wetland indicator status of each species will be assessed, and the site will be deemed successful if the dominant species in each layer are FAC or wetter. Non-native invasive species will not be included in this assessment.

In order to set a target vegetative community for the restored wetlands, a reference site was chosen which is near to the restoration area (Sheet R-1, Appendix B). The reference wetland for the target vegetative community is the same wetland where reference wells were installed for wetland hydrology monitoring. Vegetation in the reference wetland is dominated by woody plants including Sweet Bay Magnolia (*Magnolia virginiana*), Swamp White Oak (*Quercus bicolor*), Water Oak (*Quercus nigra*), Wax Myrtle (*Myrica cerifera*), American Holly (*Ilex opaca*), Loblolly Pine (*Pinus taeda*), Red Maple (*Acer rubrum*), Sweet Gum (*Liquidambar styracflua*), Black Gum (*Nyssa sylvatica*), and Bald Cypress (*taxodium distichum*). A Routine Wetland Determination Data Form was completed for the reference wetland and is included in Appendix D.

4.0 Maintenance and Contingency

Maintenance of the site is expected to be minimal, as the site is proposed to function as a natural system. Periodic visual site inspections (four to five times per year) will be conducted to check for any issues of concern. If any of the following contingencies or issues arises during monitoring, Albemarle Restorations will take the necessary maintenance or corrective actions.

The main concern for the site is the introduction of non-native invasive species. No invasive species were encountered during construction, and the site will be monitored to ensure that such species do not become established. If invasive species are found, corrective action including spraying, mowing, or removing such species will be conducted if the invasive species are determined to be detrimental to the project's success.

If installed woody plant material is seen having a survival rate of less than 320 stems/acre, replanting will occur to maintain the required percent survival rate during the first three years of monitoring.

If well data shows that wetland hydrology has not been achieved, the well data will be analyzed in relation to the reference wetland well data and rainfall data obtained on-site and off-site to determine if drought or drier than normal conditions have existed in coincidence with periods of non-attainment of wetland hydrology. If this is found to be the case, AR will ask that the site be evaluated during normal climatic conditions. If it is determined that wetland hydrology has not been achieved, corrective action will be taken to enhance wetland hydrology to the site.

Other potential issues including animal damage, disease or pest infestation, or damage from extreme weather events will be noted during monitoring, with any apparent problem areas mapped for inclusion into the monitoring report. The monitoring will also include any corrective actions taken or proposed.

5.0 References

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- U. S. Army Corps of Engineers, Wilmington District Regulatory Division and North Carolina Department of the Environment and Natural Resources, Division of Water Quality. *Information Regarding Stream Restoration with Emphasis on the Coastal Plain, Version 2*. April 4, 2007
- North Carolina Division of Water Quality. *Identification Methods for the origins of Intermittent and Perennial Streams, Version 3.1*. February 28, 2005.

APPENDIX A



Photo 1: Crop field prior to riverine wetland restoration. Much of the restoration area was formerly cypress swamp which was cleared, drained and graded for agriculture



Photo 2: Ditched stream draining cropland. This ditch was the main stem of the proposed “swamp run” restoration and drains into Clark Mill Creek.



Photo 3. Initial cutting and stockpiling of topsoil for redistribution after final grading.



Photo 4. Cutting, filling and grading of restore swamp run.



Photo 5. Redistribution of topsoil and final grading of restored swamp run and riverine wetlands.



Photo 6. Restored swamp run after final grading.



Photo 7. December 18th - restored swamp run after 3” rain, three weeks after completion of construction.



Photo 8. From January 21-22nd, the project experienced its first “out-of-bank” flooding event.



Photo 9. Overbank flooding into the restored riverine wetlands at the headwaters of the restored swamp run.



Photo 10. Driftlines from out-of bank flooding event, looking downstream.



Photo 11. Project planted to trees and shrubs, looking downstream.

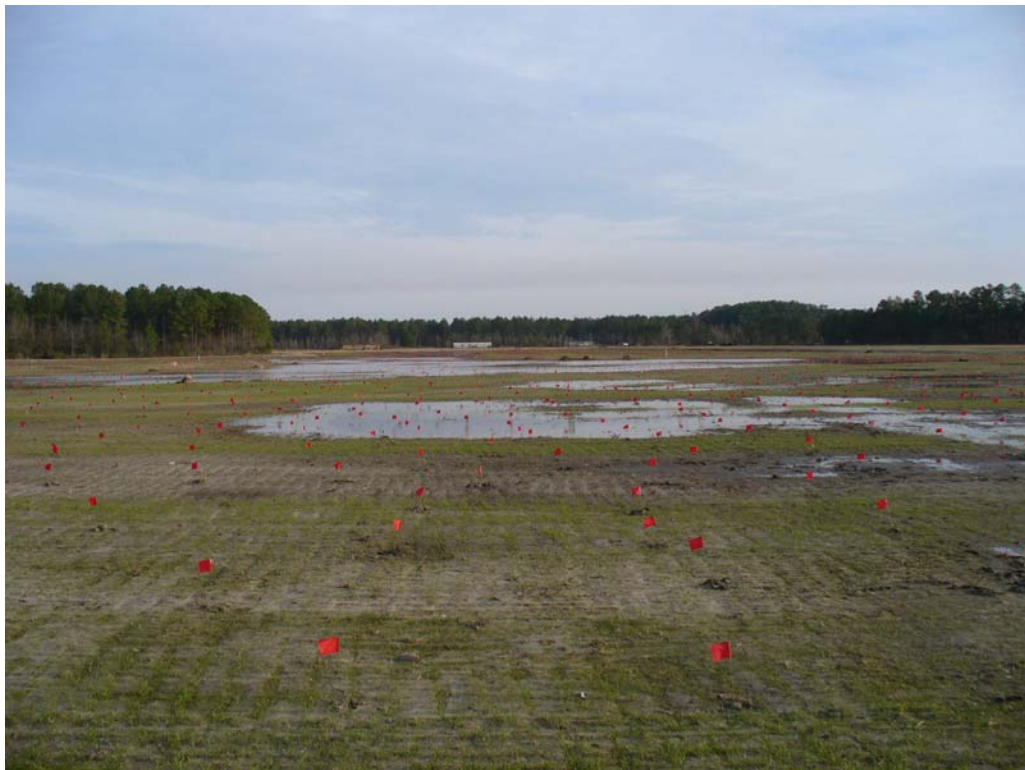


Photo 12. Project planted to trees and shrubs, looking upstream.



Photo 13. Reference wetland well #1 location, located in riparian wetlands Associated with unnamed tributary to Clark Mill Creek.



Photo 14. Reference wetland well #2 well location, located in riparian wetlands associated with unnamed tributary to Clark Mill Creek.



Photo 14. Reference wetland soil profile, representative of the Acredale soil series, located in riparian wetlands associated with unnamed tributary to Clark Mill Creek.

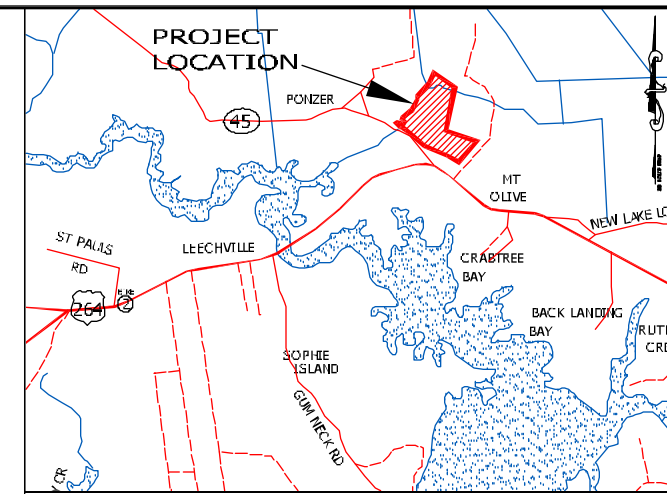
APPENDIX B

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- G-2..... AS-BUILT GRADING
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- D-2..... AS-BUILT DETAILS AND SECTIONS
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- R-1..... REFERENCE WELL EXHIBIT

WETLAND MITIGATION PROJECT
 ALBERMARLE RESTORATIONS, LLC.
 ARMSTRONG SITE
 EEP CONTRACT #D06012-A
 HYDE COUNTY, NC

LOCATION: OFF STATE ROUTE 45, NEAR PONZER, NC
 TYPE OF WORK: MITIGATION



VICINITY MAP



AS-BUILT CONDITIONS

GENERAL NOTES:

1. This as-built wetland restoration plan has been prepared for the North Carolina Ecosystem Enhancement Program for the purpose of documenting the restoration of approximately 20.0 acres of riverine wetlands (20 WML's) and 2,200 linear feet of stream restoration (2,200 SMU's) on the Armstrong property, located within the Tar-Pamlico River Basin.
2. On site grading was completed on November 30, 2007.
3. Installation of woody plant material was completed January 28, 2008.
4. As-built topographic survey completed by True Line Surveying, Inc. during the first week of January 2008.

DATE	BY	REVISION
7/1/2008	SP/ML	ISSUED FOR BIDDING

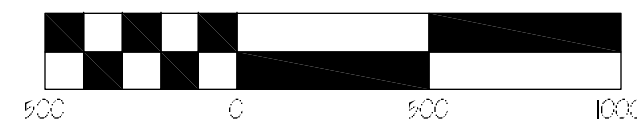
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AS-BUILT SHEET		

ARMSTRONG PROPERTY
 20.0 ACRES
 2,200 LINEAR FEET
 EEP CONTRACT #D06012-A



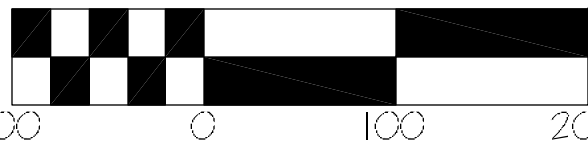
ALBERMARLE RESTORATIONS, LLC
 WETLAND RESTORATION
 STREAM RESTORATION
 & WILDLIFE HABITAT CREATION
 404 COURT STREET - KAYESVILLE, NC 27538
 (252) 333-0248 - FAX (252) 337-0822

SCALE IN FEET

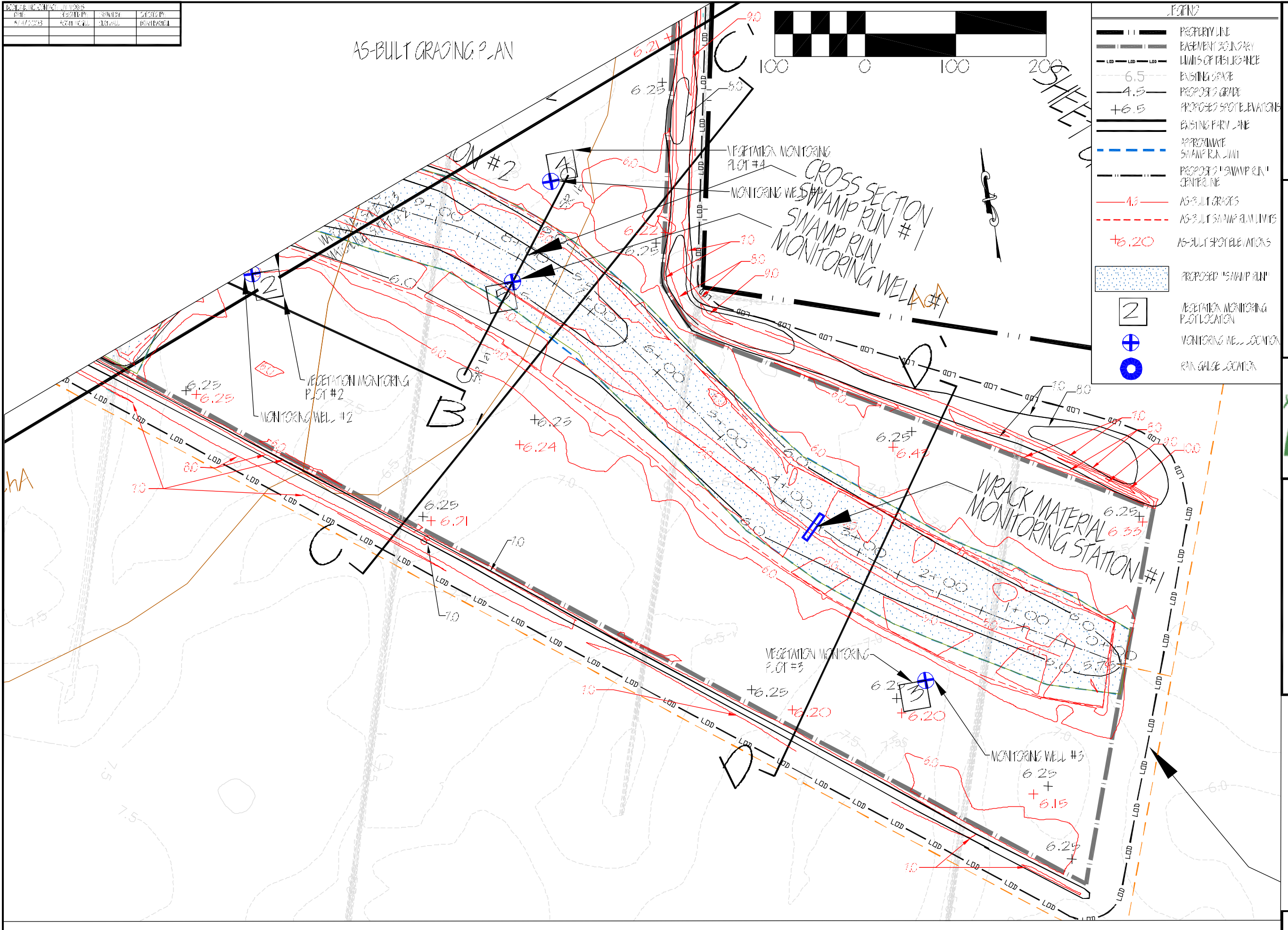


DATE REVISION	BY	CHKD BY	DATE

AS-BUILT GRADING PLAN



LEGEND	
	PROPERTY LINE
	EASEMENT BOUNDARY
	LIMITS OF DISTURBANCE
	EXISTING GRADE
	PROPOSED GRADE
	PROPOSED SPOT ELEVATIONS
	EXISTING PAV. LINE
	APPROXIMATE SWAMP RUN LIMIT
	PROPOSED SWAMP RUN CENTERLINE
	AS-BUILT GRADES
	AS-BUILT SWAMP RUN LIMITS
	AS-BUILT SPOT ELEVATIONS
	PROPOSED SWAMP RUN
	VEGETATION MONITORING PLOT LOCATION
	MONITORING WELL LOCATION
	RAIN GAGE LOCATION



PROJECT	AS-BUILT GRADING PLAN
DATE	11/14/2023
DRAWN BY	
CHECKED BY	
SCALE	

ARVISTRONG PROPERTY
 20000 WILLOW CREEK ROAD
 WILLOW CREEK, MISSISSIPPI 39209
 PROJECT # 23-00124

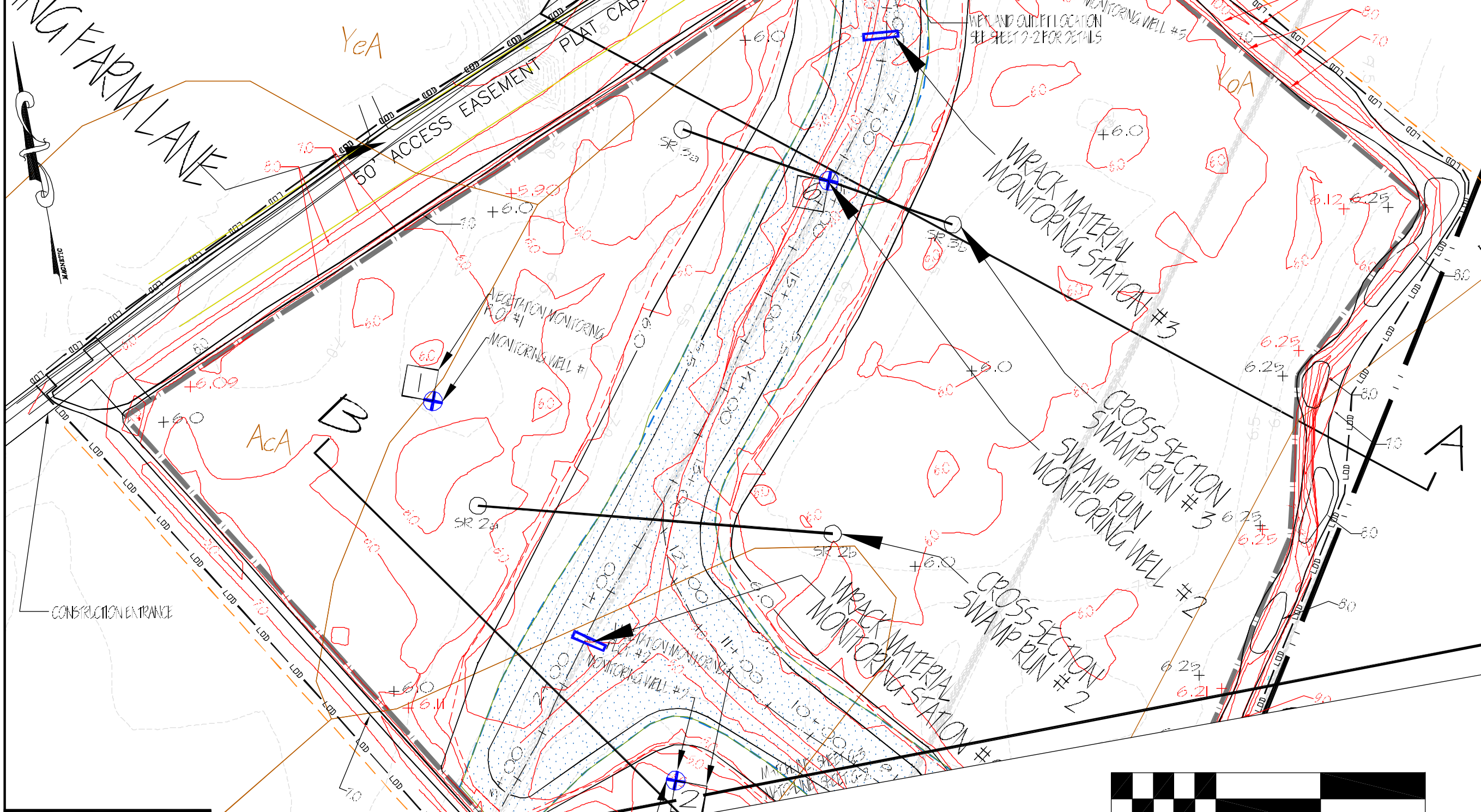


ALBERMARLE RESTORATIONS, LLC
 WETLAND RESTORATION
 & WILDLIFE HABITAT CREATION
 404 COURT STREET - GATHERVILLE, NC 27838
 (919) 233-0228 • FAX (919) 233-0229

SHEET G-2

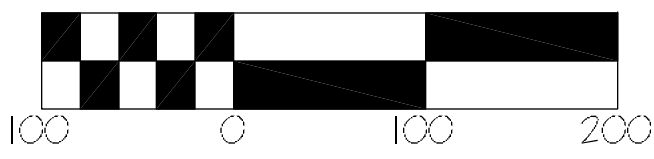
LEGEND

	PROPERTY LINE		APPROXIMATE SWAMP RUN LIMIT
	EASEMENT BOUNDARY		PROPOSED SWAMP RUN CENTERLINE
	LINE OF DISTURBANCE		AS-BUILT SWAMP RUN LIMIT
	EXISTING GRADE		AS-BUILT GRADES
	PROPOSED SPOT ELEVATION		PROPOSED SWAMP RUN
	PROPOSED GRADE		MONITORING WELL LOCATION
	VEGETATION MONITORING PLOT LOCATION		RAIN GAUGE LOCATION
	AS-BUILT SPOT ELEVATIONS		



DATE	BY	CHKD	APP'D
4/4/2005	REARBY	J.P.G.	REARBY

AS-BUILT GRADING PLAN



AS-BUILT GRADING PLAN
MARCH 2005

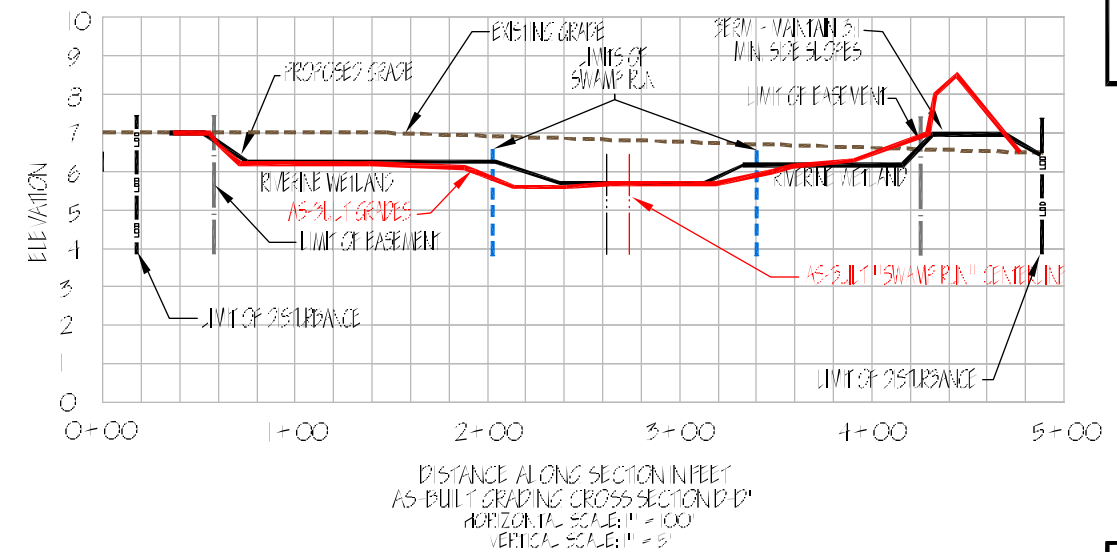
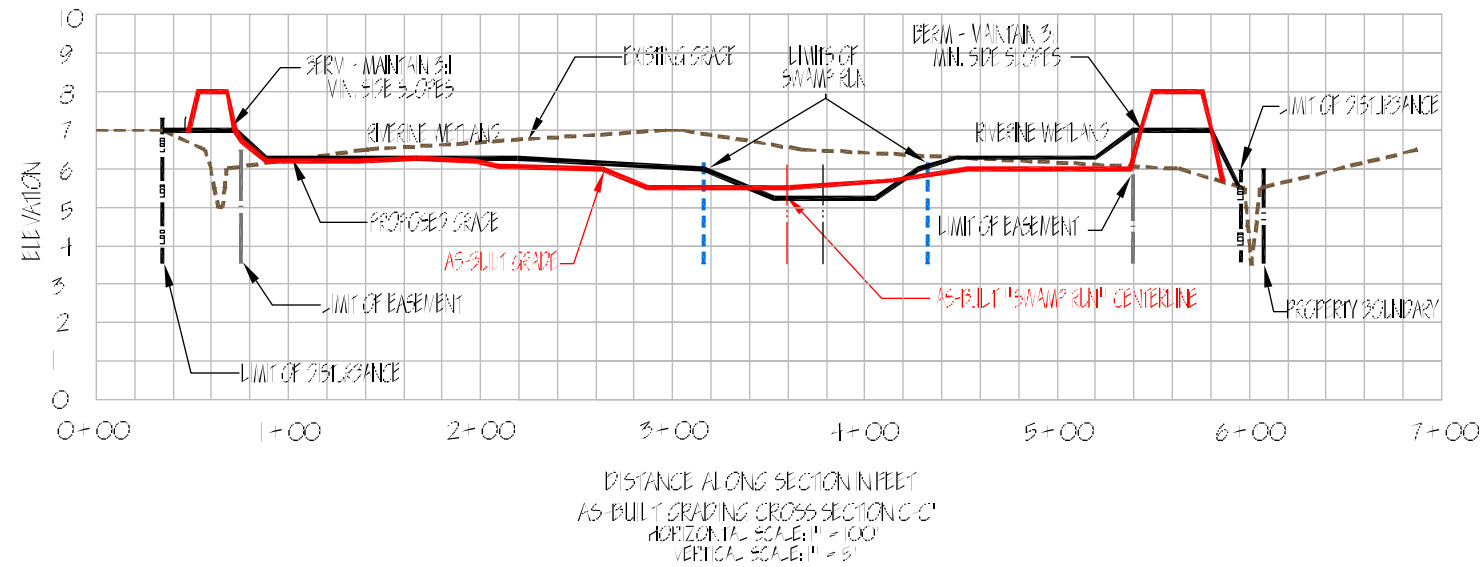
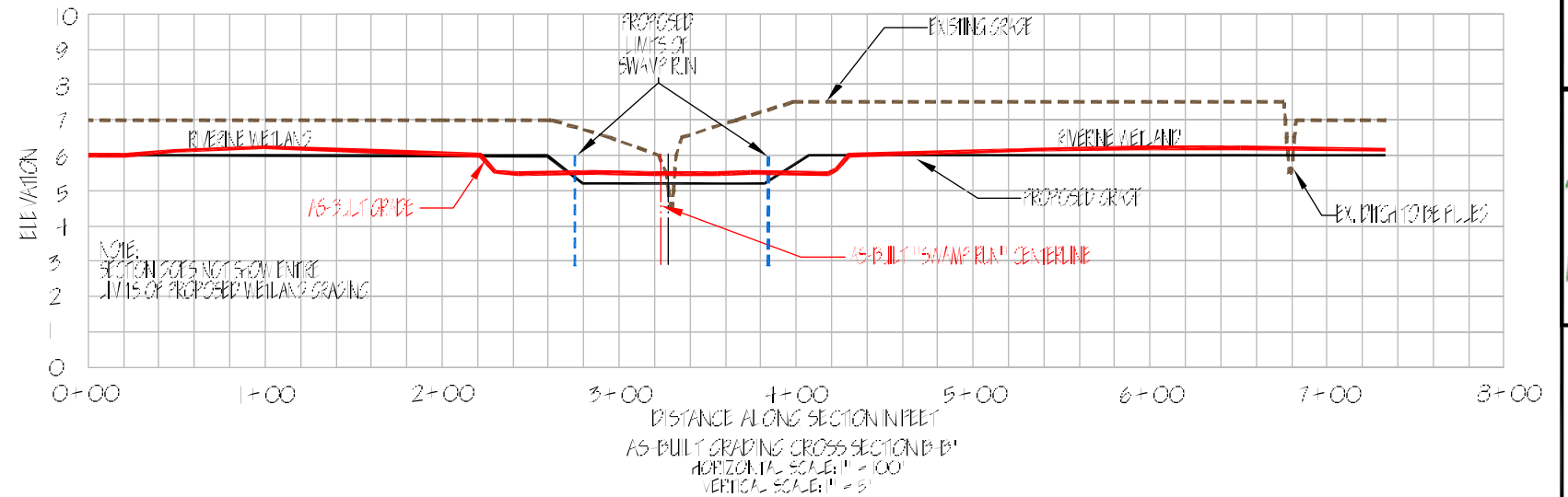
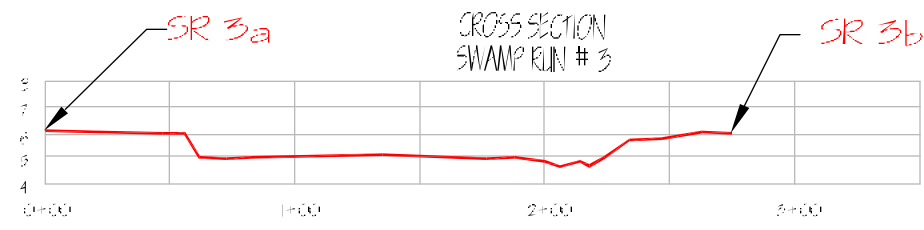
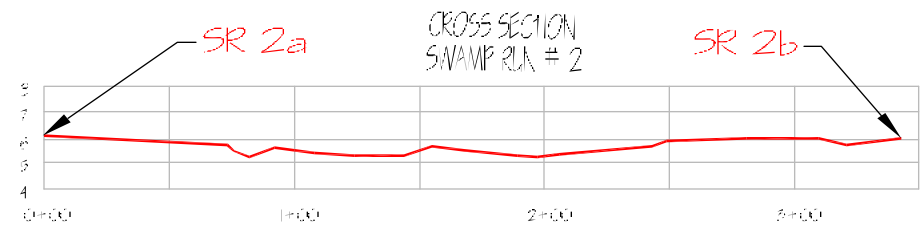
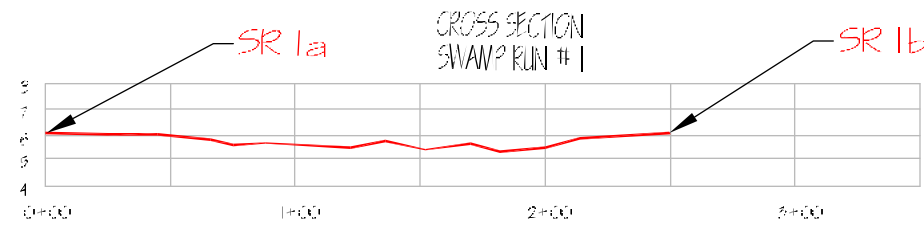
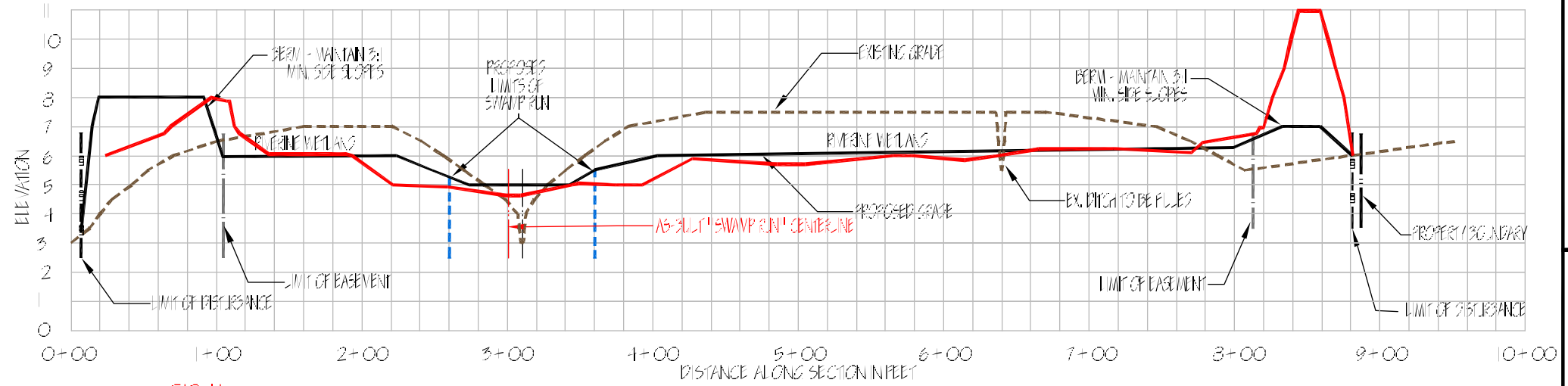
DATE	BY	CHKD	APP'D

ARMSTRONG PROPERTY
3000 W. WILDLIFE WILSONVILLE, OR 97150
SITE VISITATION: 2005, 08/08/07
HIGH COUNTY, WASHINGTON
PFP CONTRACT # 00000000000000000000



ALBERMARIE RESTORATIONS, LLC
WETLAND RESTORATION
& WILDLIFE HABILITATION
404 COURT STREET - GATERSVILLE, NC 27338
(336) 222-0240 - FAX (336) 227-4552

DATE	DESCRIPTION	BY	CHECKED BY

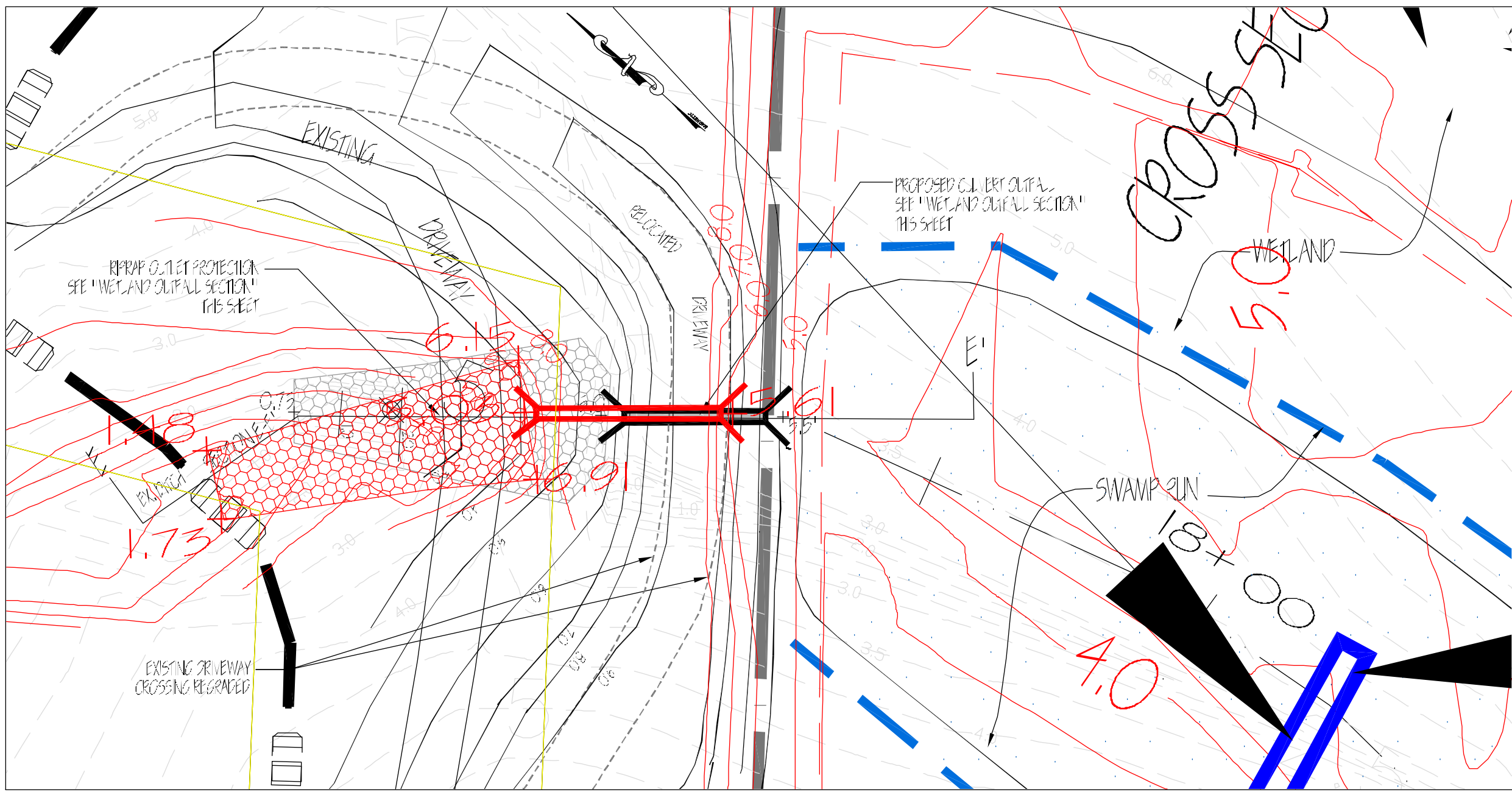
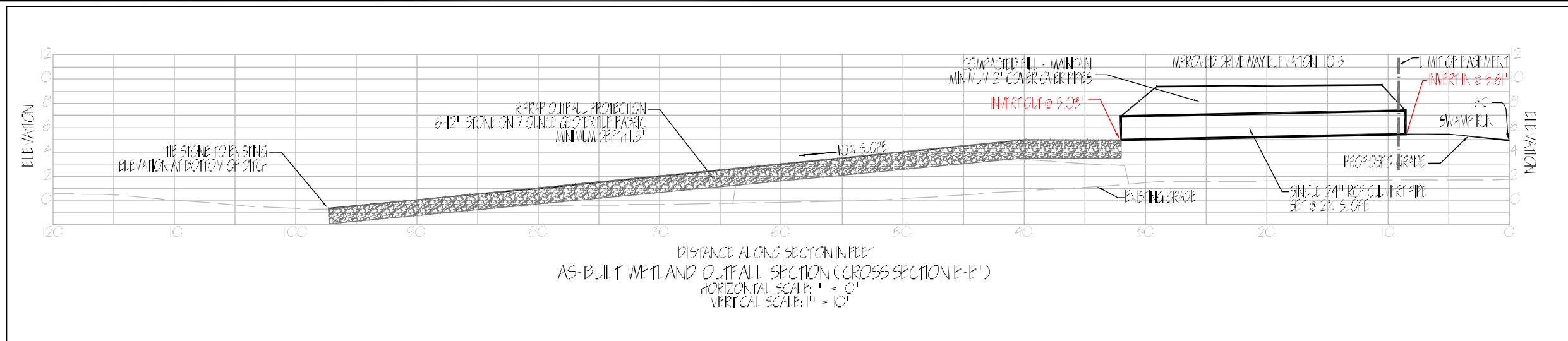


AS-BUILT GRADING SECTIONS
 W/REGA 2006

ARMSTRONG PROPERTY
 SWAMP RESTORATION AND WETLANDS AS-BUILT CROSS SECTION
 SWAMP RESTORATION AS-BUILT CROSS SECTION
 ARMSTRONG PROPERTY
 PROJECT # 14-000000-A



ALBERMARLE RESTORATIONS, LLC
 WETLAND RESTORATION
 STREAM RESTORATION
 & WILDLIFE HABITAT CREATION
 404 COURT STREET - GASTAVILLE, NC 27838
 (828) 333-0280 • FAX (828) 337-4852



DATE	DESCRIPTION	DESIGNED BY	CHECKED BY
4/4/2008	REVISED	SKM	SKM

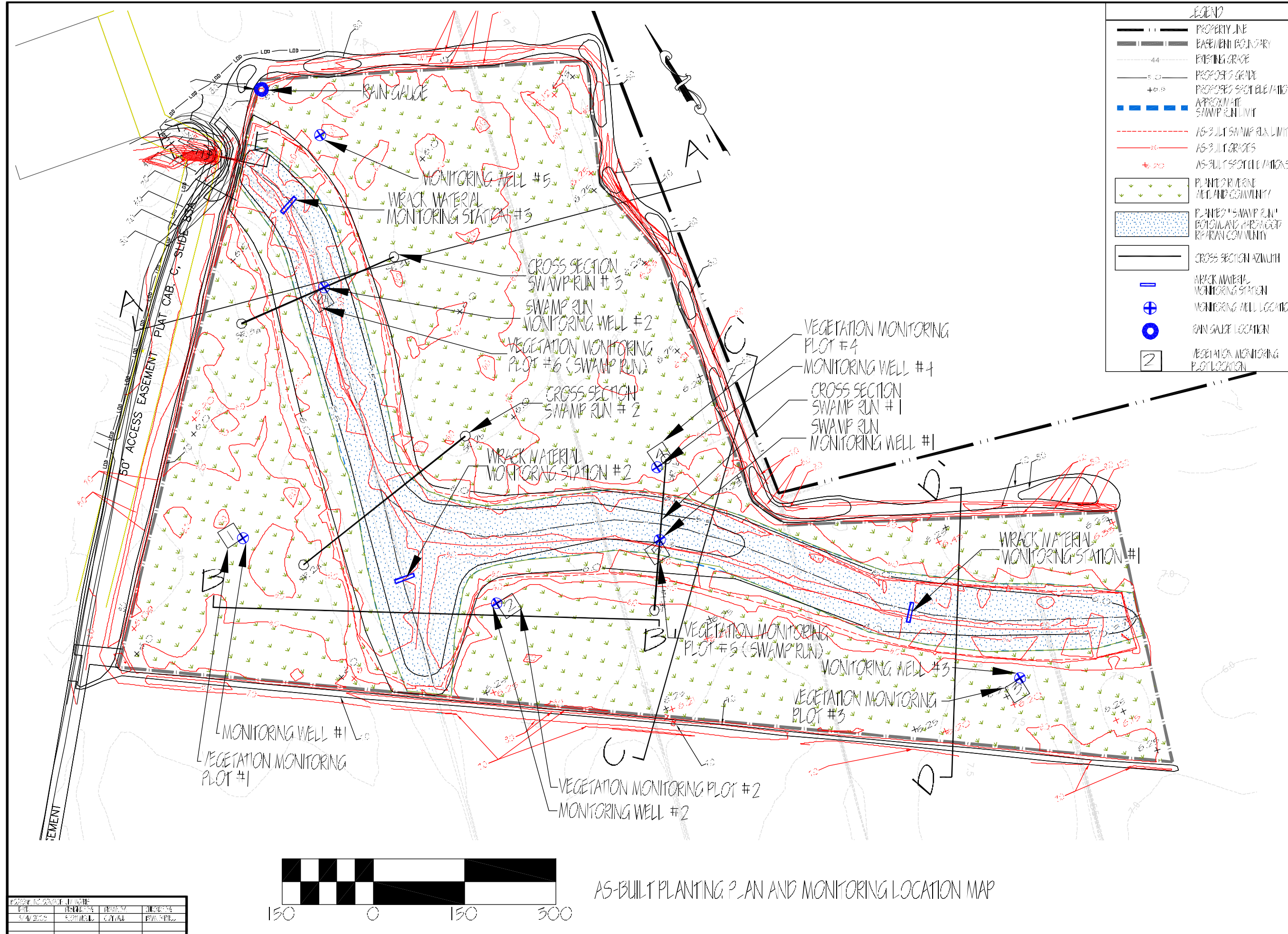
AS-BUILT DETAILS AND SECTIONS
 APRIL 2008

DATE	DESCRIPTION

ARMSTRONG PROPERTY
 4000 E. MAIN ST. WILMINGTON, NC 28403
 910.341.1111
 4100 N. WILMINGTON ST. WILMINGTON, NC 28403
 910.341.1111



ALBERMARLE RESTORATIONS, LLC
 WETLAND RESTORATION
 & WILDLIFE HABITAT CREATION
 404 COURT STREET WILMINGTON, NC 28403
 (910) 341-1111



LEGEND

---	PROPERTY LINE
---	EASEMENT BOUNDARY
---	EXISTING GRADE
---	PROPOSED GRADE
+	PROPOSED SPOT ELEVATION
---	APPROXIMATE SWAMP RUN LIMIT
---	AS-BUILT SWAMP RUN LIMITS
---	AS-BUILT GRACES
+	AS-BUILT SPOT ELEVATIONS
[Green Hatching]	PLANTED RIVERINE WETLAND COMMUNITY
[Blue Dotted Hatching]	PLANTED SWAMP RUN BOTANICAL HERBACEOUS RIPARIAN COMMUNITY
---	CROSS SECTION AZIMUTH
[Blue Rectangle]	WRACK MATERIAL MONITORING STATION
[Blue Circle]	MONITORING WELL LOCATION
[Blue Circle]	RAIN GAUGE LOCATION
[Blue Square]	VEGETATION MONITORING PLOT LOCATION

MONITORING PLAN

DATE:	11/20/2018
BY:	ARV
CHECKED:	
DATE:	

ARV STRONG PROPERTY

REGULATORY NUMBER AS-BUILT: 2000-0005
 STREAM RESTORATION #1: 7-0001-0001-0001
 INV. COUNTY: WASHINGTON
 REF. CONTACT #: 703-602-4



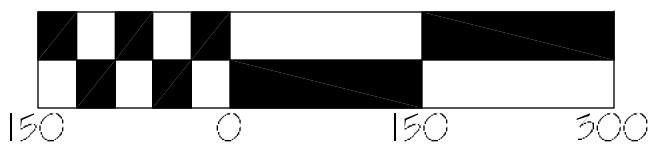
ALBERMARLE RESTORATIONS, LLC

WETLAND RESTORATION
 STREAM RESTORATION
 & WILDLIFE HABITAT CREATION

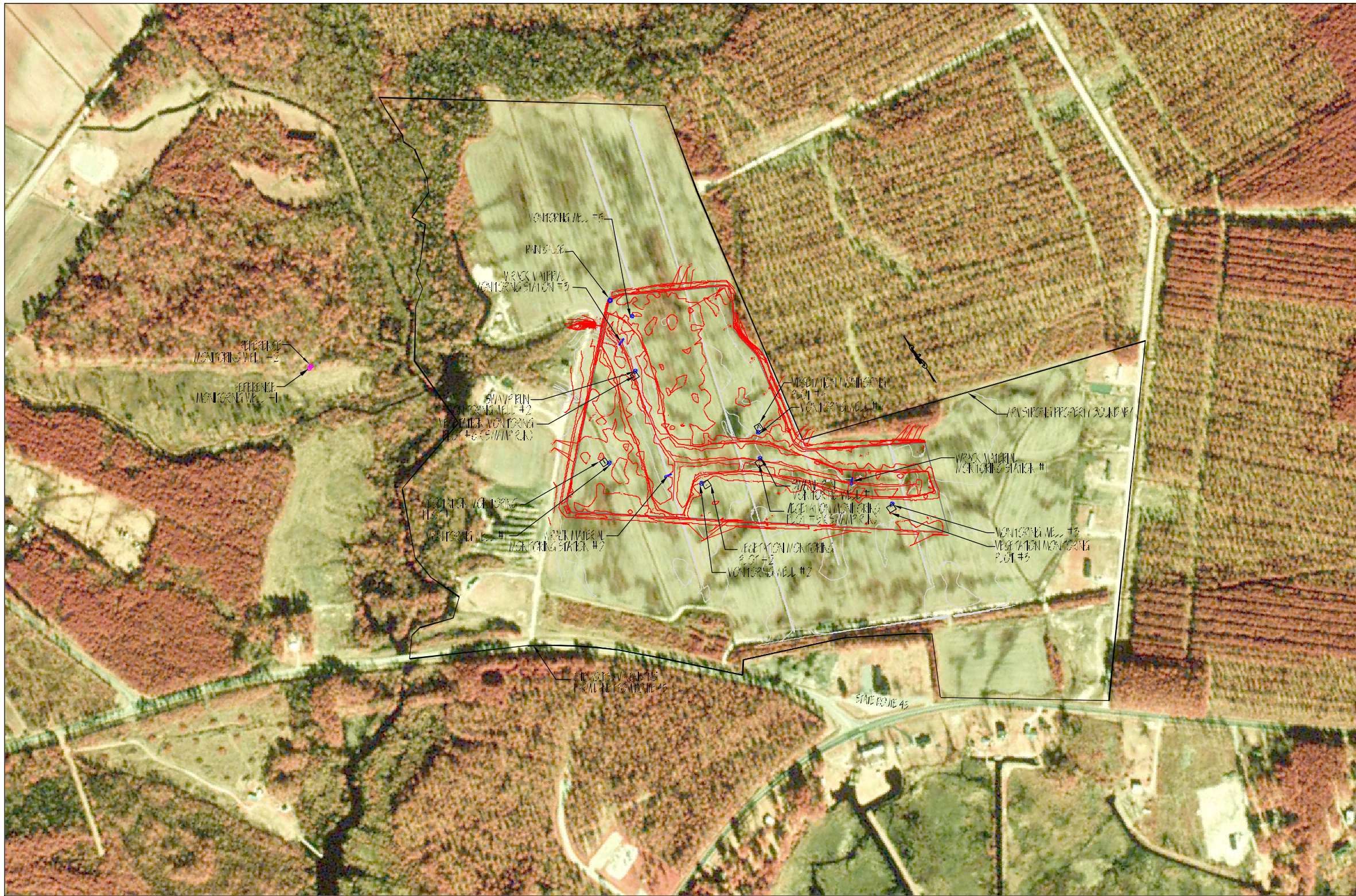
404 COURT STREET • GATINGSVILLE, NC 27324
 (919) 333-0269 • FAX (919) 333-0482

PROJECT INFORMATION

DATE:	DATE:	DATE:	DATE:
DATE:	DATE:	DATE:	DATE:

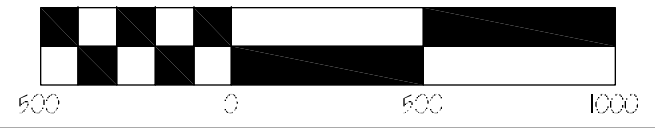


AS-BUILT PLANTING PLAN AND MONITORING LOCATION MAP



REFERENCE WELL EXHIBIT

SCALE IN FEET



DATE	BY	CHKD BY	APP'D BY
5/1/2008	SMITH	CPH	AWH

ARVSTRONG PROPERTY	
ARVSTRONG PROPERTY	ARVSTRONG PROPERTY
ARVSTRONG PROPERTY	ARVSTRONG PROPERTY
ARVSTRONG PROPERTY	ARVSTRONG PROPERTY
ARVSTRONG PROPERTY	ARVSTRONG PROPERTY

ARVSTRONG PROPERTY
 ARVSTRONG PROPERTY
 ARVSTRONG PROPERTY
 ARVSTRONG PROPERTY
 ARVSTRONG PROPERTY



ALBERMARIE RESTORATIONS, LLC
 WETLAND RESTORATION
 & WILDLIFE HABITAT CREATION
 4046 COURT STREET • WATERVILLE, NC 27988
 (252) 338-0248 • FAX (252) 337-6852

APPENDIX C

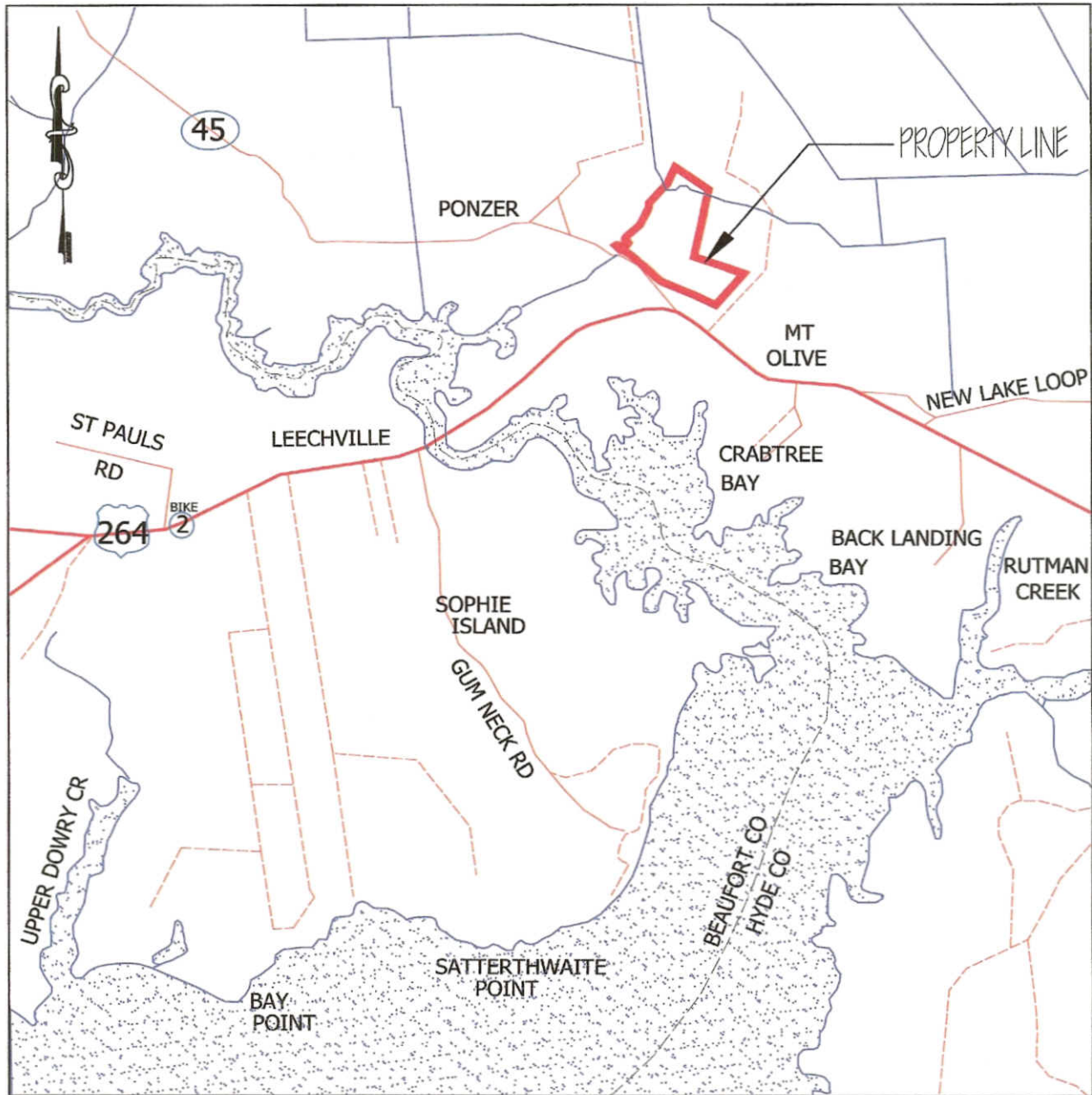


FIGURE 1
VICINITY MAP



Scale: 1" = 4000'

5/2007

Drawn By: LMS

PREPARED BY:

ECOTONE, INC.

ENVIRONMENTAL CONSULTING, PERMITTING & DESIGN,
FOREST & WETLAND CREATION &
STREAM RESTORATION.

P.O. Box 5 • 1204 BALDWIN MILL ROAD • JARRETTSVILLE, MARYLAND 21084
(410) 692-7500 • FAX (410) 692-7503 • EMAIL INFO@ECOTONEINC.COM

PREPARED FOR:

ALBERMARLE RESTORATIONS, LLC

WETLAND RESTORATION,
STREAM RESTORATION,
& WILDLIFE HABITAT CREATION

404 COURT STREET • GATESVILLE, NC 27638
(252) 333-0249 • FAX (252) 357-4892



ARMSTRONG PROPERTY
RIVERINE WETLAND MITIGATION
20.0 ACRES
STREAM MITIGATION
2,000 LINEAR FEET
HYDE COUNTY, NORTH CAROLINA
EEP CONTRACT #: D06012-A

APPENDIX D

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Armstrong Property Reference Wetland</u>	Date: <u>3/31/08</u>
Applicant/Owner: _____	County: <u>Hyde</u>
Investigator: <u>Ashby Brown</u>	State: <u>NC</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: <u>Wetland-reference</u>
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: _____

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Sweet Bay Magnolia	Tree	FACW+	8 Sweet Gum	Tree	FACW
2 Swamp White Oak	Tree	FACW+	9 Black Gum	Tree	FAC
3 Water oak	Tree	FAC	10 Bald Cypress	Tree	OBL
4 Wax Myrtle	Mid	FAC+	11		
5 American Holly	Tree	FAC-	12		
6 Loblolly Pine	Tree	FAC	13		
7 Red Maple	Tree	FAC	14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): _____

Remarks: _____

HYDROLOGY

<input type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input checked="" type="checkbox"/> No recorded data available	Wetland Hydrology Indicators: Primary Indicators: <input type="checkbox"/> Inundated <input checked="" type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input checked="" type="checkbox"/> Drainage Patters in Wetlands Secondary Indicators (2 or more required): <input checked="" type="checkbox"/> Oxidized Root Channels in Upper 12" <input checked="" type="checkbox"/> Water-Stained Leaves <input checked="" type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Field Observations: Depth of Surface Water: _____ (In.) Depth to Free Water in Pit: <u>15</u> (In.) Depth to Saturated Soil: <u>8</u> (In.)	
Remarks: <u>Depth to water in pit is the average depth to water in the two wells at this site.</u>	

SOILS

Map Unit Name (Series and Phase): <u>Acredale silt loam</u>	Drainage Class: <u>Poorly Drained</u>																								
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? <input checked="" type="checkbox"/> Yes																								
Profile Description: <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Depth (inches)</th> <th>Horizon</th> <th>Matrix Color (Munsell Moist)</th> <th>Mottle Colors (Munsell Moist)</th> <th>Mottle Abundance/ Size/Contrast</th> <th>Texture, Concretions, Structure, etc.</th> </tr> </thead> <tbody> <tr> <td>0-3</td> <td>O</td> <td>10YR 3/2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3-8</td> <td>A</td> <td>10YR 5/1</td> <td>10YR 5/5</td> <td>20%</td> <td></td> </tr> <tr> <td>8-12</td> <td>B</td> <td>10YR 5/2</td> <td>10YR 5/5</td> <td>40%</td> <td></td> </tr> </tbody> </table>		Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.	0-3	O	10YR 3/2				3-8	A	10YR 5/1	10YR 5/5	20%		8-12	B	10YR 5/2	10YR 5/5	40%	
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.																				
0-3	O	10YR 3/2																							
3-8	A	10YR 5/1	10YR 5/5	20%																					
8-12	B	10YR 5/2	10YR 5/5	40%																					
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Aquatic Moisture Regime <input checked="" type="checkbox"/> Reducing Conditions <input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Concretions <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Listed on National Hydric Soils List <input checked="" type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Other (explain in remarks)																									
Remarks: _____																									

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Hydric Soils Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Remarks: <u>Reference area meets a three wetland criteria.</u>	