POWELL PROPERTY WETLAND AND STREAM MITIGATION PLAN

Bertie County
USGS Catalog Unit 03010203
EEP Project No D06065-B
Design Firm: Albemarle Restorations, LLC

Prepared for:

NCDENR/ ECOSYSTEM ENHANCEMENT PROGRAM
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Table of Contents

1.0 Executive Summary 2
2.0 As-Built Report 3
2.1 Project Background 3
2.2 Pre-Existing Site Conditions 4
2.3 Construction and Planting 4
2.4 Post-Construction Conditions 6
3.0 Monitoring Plan 6
3.1 Headwater Swamp Run Monitoring 6
3.1.1 Swamp Run Hydrology Monitoring 6
3.1.2 Swamp Run Vegetation Monitoring 8
3.2 Riverine Wetland Monitoring 8
3.2.1 Riverine Wetland Hydrology Monitoring 8
3.2.2 Riverine Wetland Vegetation Monitoring 9
4.0 Maintenance and Contingency 10
5.0 References 11

Tables:

Table 1: Mitigation Summary 3
Table 2: Project History 4
Table 3: Tree/Shrub Planting Schedule 5

Appendices:

Appendix A: Photographs
Appendix B: As-Built Plan Set and Monitoring Plan Map
Appendix C: Vicinity Map
Appendix D: Reference Wetland Routine Data Form

1.0 EXECUTIVE SUMMARY

This report is submitted by Albemarle Restorations, LLC (AR) to document the completion of the restoration of 48.4 acres of riverine wetlands and 3,310 linear feet of stream (swamp run restoration) on the Powell Property located on Meadow Road near Buzzards Crossroads, Bertie County, North Carolina.

Prior to restoration, the 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 Quioccosin Swamp. 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, 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 to create a continuous travel corridor between habitat blocks and provide 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, to help which reduce sedimentation and erosion downstream, and improve long term water quality within the Chowan River.
4) Passive outdoor recreation and educational opportunities.

In order to achieve these goals, restoration activities, in accordance with the approved Restoration Plan, began June 30, 2008 and were completed on January 29, 2009. Restoration consisted of grading the headwater riverine complex at varying elevations to create microtopography and braided channels that emulated natural "swamp run" systems found within the Chowan 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 27, 28, and 29, 2009, 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.

Ten permanent water level monitoring gauges 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 gauges 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. Ten

vegetative monitoring plots have been 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.

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 gauges 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	Post Construction Acres/ Linear Feet	Credit Ratio (Restoration : WMU)	Total WMU's / SMUs
Riverine Wetland	48.4 acres	1:1	48.4 WMUs
Stream (Swamp Run)	3,310 linear feet	1:1	3,310 SMUs

2.0 AS-BUILT REPORT

2.1 Project Background

The Powell Property, located on Meadow Road (State Road 42) near Buzzards Crossroads, Bertie County, North Carolina was chosen in part because of its location in a targeted watershed and because it provides the opportunity to add contiguous diverse wetland habitat to a high quality forested wetland system directly adjacent to the project area. On July 3, 2006, AR entered into a contract with EEP for the procurement of 70 riverine wetland mitigation units (WMU's) and 3,310 stream mitigation units (SMU's) on the Powell Property. The number of acres proposed for wetland restoration was later reduced to 48.4 (48.4 WMU's) based upon the Army Corps of Engineers request that restoration only be performed on acreage with strong hydric soil characteristics. Restoration of the site occurred during the fall of 2008. **Table 2** below summarizes the project history.

Table 2: Project History

January 2008	Reference Wetland Studied
May, 29 2008	Restoration Plan Approved
June 27, 2008 thru January 15, 2009	Construction
January 27-29, 2009	Planting
January 29, 2009	Monitoring Gauges Installed
December 31, 2009 (Scheduled)	First Monitoring Report (Year 1)

2.2 Pre-existing Site Conditions

The overall Powell property consists of approximately 378 +/- acres, 56 of which are designated for this project site. The project is located on the eastern portion of the farm and has a total drainage area of approximately 871 acres. The site was previously bisected by a large drainage ditch that runs south to north and forms the headwaters of Quioccosin Swamp. There were also several small ditches and drainage tiles that intersected the project area contributing flow to the main ditch. The stream restoration component of the project involved restoring the main drainage ditch and portions of two smaller ditches to a headwater swamp run. The majority of the project area is bordered by agricultural fields to the east and west, with timberland to the south and Quioccosin Swamp to the north. 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 June 27, 2008 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 wide, gently sloping outlet was completed. Additionally, at EEP's request, changes in the original design were made at the confluence of the two swamp runs (see sheets D-2 & D-3).On January 15, 2009 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, 2009 using bare-root seedlings and live stakes (live stakes were used for the black willows, *Salix nigra*). 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 replacement of some species due to availability and planting spacing. Additionally, the planting rate was increased to 601 stems per acre, as opposed to the 350

stems/acre originally proposed in the restoration plan. **Table 3** below summarizes the species planted.

Table 3: Tree/Shrub Planting Schedule

TREE/SHRUB PLANTING SCHEDULE- 55.9 Acres Combined Swamp Run and Riverine Wetland Areas						
	Quantity	Botanical Name	Common Name	Size	Condition	Spacing
Trees:	6,000	*Taxodium distichum*	Bald Cypress	1-3'	Bare Root	8-9' Random Spacing
	900	*Nyssa aquatica*	Water tupelo	1-3'	Bare Root	8-9' Random Spacing
	6,600	*Nyssa biflora*	Swamp Black Gum	1-3'	Bare Root	8-9' Random Spacing
	8,100	*Quercus phellos*	Willow Oak	1-3'	Bare Root	8-9' Random Spacing
	975	*Quercus bicolor*	Swamp White Oak	1-3'	Bare Root	8-9' Random Spacing
	400	*Quercus palustris*	Pin Oak	1-3'	Bare Root	8-9' Random Spacing
	500	*Quercus nigra*	Water Oak	1-3'	Bare Root	8-9' Random Spacing
	3,000	*Quercus michauxii*	Swamp Chestnut Oak	1-3'	Bare Root	8-9' Random Spacing
Total:	26,475					
Shrubs:	160	*Lyonia mariana*	Staggerbush	¼" caliper	Bare Root	8-9' Random Spacing
	237	*Alnus serrulata*	Tag Alder	¼" caliper	Bare Root	8-9' Random Spacing
	352	*Vaccinium corymbosum*	Highbush Blueberry	¼" caliper	Bare Root	8-9' Random Spacing
	600	*Clethra alnifolia*	Sweet Pepperbush	¼" caliper	Bare Root	8-9' Random Spacing
	550	*Itea virginica*	Virginia Sweetspire	¼" caliper	Bare Root	8-9' Random Spacing
	1,300	*Cephalanthus occidentalis*	Button Bush	¼" caliper	Bare Root	8-9' Random Spacing
	723	*Persea palustris*	Swamp Bay	¼" caliper	Bare Root	8-9' Random Spacing
	900	*Ilex glabra*	Inkberry	¼" caliper	Bare Root	8-9' Random Spacing
	1,100	*Myrica cerifera*	Wax Myrtle	¼" caliper	Bare Root	8-9' Random Spacing
	900	*Salix nigra*	Black Willow	Live Stake	Live Stake	8-9' Random Spacing
	300	*Magnolia virginiana*	Sweetbay Magnolia	¼" caliper	Bare Root	8-9' Random Spacing
Total	7,122					

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 May 2009 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 2009 (Year 1) and concluding in 2013 (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 riparian headwater systems will focus on wetland hydrology, vegetative survival, and precipitation-driven flow events. While the methods regarding the monitoring of hydrology and vegetation are well established, flow documentation within zero-order stream systems is the topic of on-going research throughout the Coastal Plain. Both qualitative and quantitative information will be used to properly document the occurrence of flow within the proposed restored zero-order stream valley.

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.*" According to the guidance, 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 the swamp run, continuous water surface 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.

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, three continuous recording pressure transducer type water level loggers suspended in

monitoring gauges have been installed within the limits the of the swamp run. The three monitoring gauges have perforations in the PVC to allow water into gauge so the logger can track surface water influences. These gauges are arranged so that they are at the lowest point of the valley and form a perpendicular axis across the valley when used in conjunction with the monitoring gauges in the riverine wetlands. Data from the gauges 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. The lateral extent of inundation will also be approximated at each site visit and recorded. In order to infer flow, data collected from these gauges will be correlated with elevation data from the longitudinal profiles, the on site rain gauge, and the offsite rain gauges in Murfreesboro and Edenton and presented in graphical format.

Site visits will also be conducted following rain events to document the upstream extent of observed flow within each reach. GPS data will be collected to mark this location. 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.

Qualitative data will be collected during the on-site investigations to document surface water flow. This shall be accomplished using photographic evidence of observed flow coupled with a preponderance of field indicators of recent flow events in the form:

- a natural line impressed on the bank,
- shelving,
- changes in soil characteristics,
- destruction of terrestrial vegetation,
- presence of litter and debris,
- wracking,
- vegetation matted down, bent or absent,
- sediment sorting,
- leaf litter disturbed or washed away,
- scour,
- deposition,
- bed and bank formation,
- water staining,
- and change in plant community.

All field indicators present will be documented in each monitoring report. All quantitative and qualitative data will be used to document the upstream limit of flow, which will provide the basis for length of successful zero order stream restoration (i.e. valley length).

The primary success criteria for the Riparian Headwater/Zero Order Stream system will be the documentation of 2 flow events using the techniques discussed above within a normal rainfall year in 3 of the 5 years of monitoring. Additional monitoring may be necessary in the event of abnormal climatic conditions.

Precipitation Documentation:

Rainfall data will be collected on-site through an event rainfall logger. This gauge has been placed directly adjacent to the project site, and will record rainfall intensity, duration, time and quantity. Rainfall data from two other sites, one in Murfreesboro, North Carolina, approximately 26 miles northwest of the project site and another in Edenton, North Carolina, approximately 20 miles southeast of 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 the 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

One vegetation monitoring plot (plot #2) has been established within the swamp run proper, while two other plots (plots #8 and #10) have been positioned to encompass both the swamp run and the riverine wetland components of the site. Plots will be 10 meter by 10 meter square plots. Plot sampling will coincide with 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 through 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 seven continuous recording water level loggers suspended in two-inch PVC monitoring gauges, installed on January 29, 2009. Sheet M-1 of Appendix B shows locations of the monitoring gauges. The gauges have been located to assess subsurface water levels at various elevations on the site and to coordinate with the gauges in the swamp run. Data will be downloaded from each monitoring gauge four times per year,

and during each site visit hand measurements will be taken to ensure the accuracy of the water level loggers.

Groundwater elevation data collected from each monitoring gauge will be presented relative to the ground surface elevation at the gauge location in graph form to demonstrate whether wetland hydrology has been attained. Wetland hydrology shall be defined as inundation or saturation to within 12 inches of the ground surface for a minimum hydroperiod of 5-8% of the growing season. Based on an average growing season of 231 days for the project area, using the Lewiston WETS table NRCS data which is the closest data point available, success criteria shall be attained if wetland hydrology is achieved within the range of 12 to 19 consecutive days during the growing season

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 January 29, 2009, 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 for inclusion into the monitoring report. Rainfall data from two other sites, one Murfreesboro, North Carolina, approximately 26 miles northwest of the project site and another in Edenton, North Carolina, approximately 20 miles southeast of 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 near the restoration area (Sheet R-1, Appendix B). Two hydrologic monitoring gauges were installed within the reference wetland. The gauges 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 gauges. 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

Seven vegetation monitoring plots (plots #1, #3 through #7, and #9) have been established to provide a representative sample of the riverine wetlands while two other plots (plots #8 and #10) have been positioned to encompass both the swamp run and the riverine wetland components of the site. Plots are 10 meter by 10 meter square plots. The initial plot sampling will occur in November 2009 (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-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 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 gauges were installed for wetland hydrology monitoring. Vegetation in the reference wetland is dominated by woody plants including sweet bay magnolia (*Magnolia virginiana*), willow oak (*Quercus phellos*), water oak (*Quercus nigra*), red maple (*Acer rubrum*), loblolly pine (*Pinus taeda*), sweet gum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), and canebrake (*Arundinaria gigantea*). 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 gauge data shows that wetland hydrology has not been achieved, the gauge data will be analyzed in relation to the reference wetland gauge 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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APPENDIX A

Appendix A: Photographs

Photo 1: At Confluence looking toward upper reaches. First week of May 2009

Photo 2: Channelization at confluence. First week of May 2009.

Photo 3: Channelization at confluence. First week of May 2009.

Photo 4: Channelization at confluence. First week of May 2009.

Photo 5: Channelization at confluence. First week of May 2009.

Photo 6: Deposition lines after receding pooled water. First week of May, 2009

Photo 7: Deposition lines during dry conditions. First week of May 2009.

Photo 8: Dry conditions. First week of May, 2009.

APPENDIX B

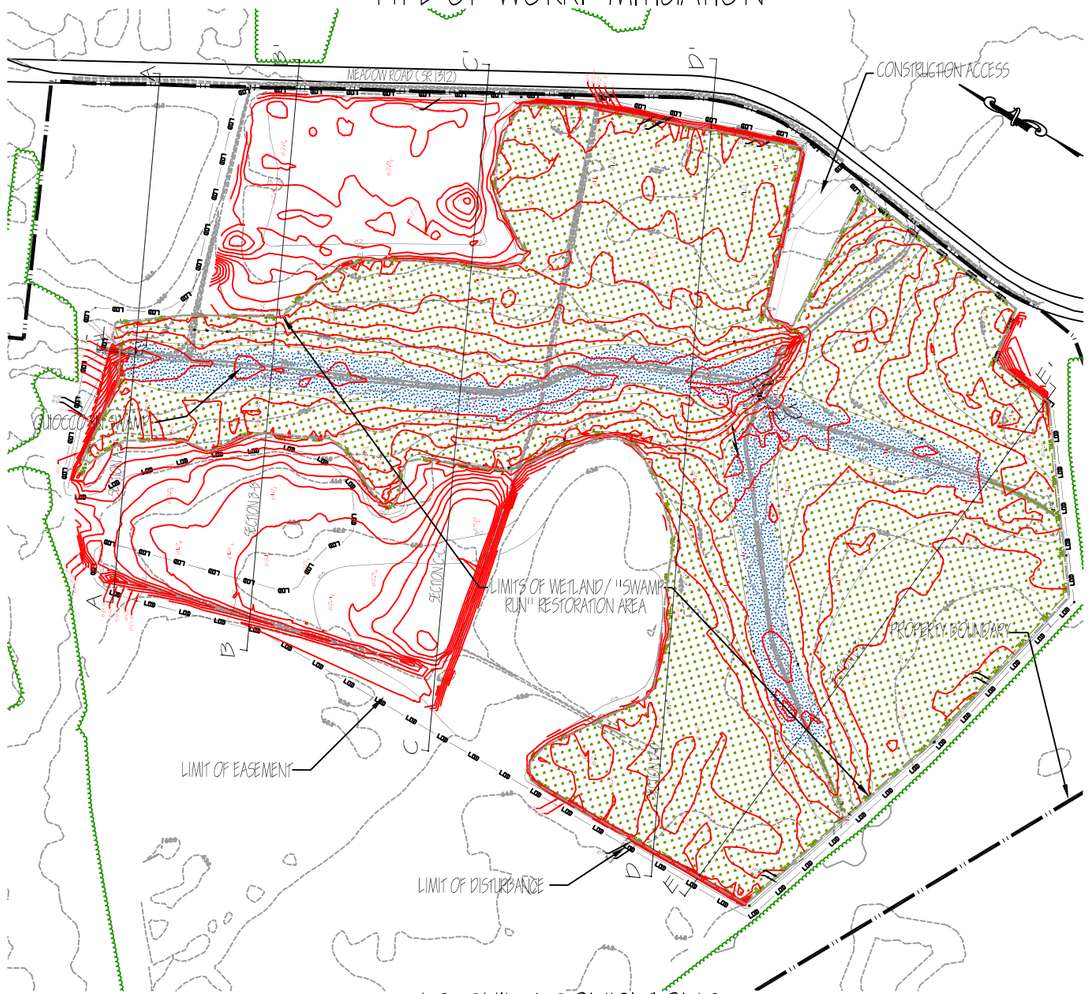
GENERAL NOTES:

1. This as-built wetland and swamp run restoration plan has been prepared for the North Carolina Ecosystem Enhancement Program for the purpose of documenting the restoration of approximately 48.4 acres of riverine wetlands (48.4 WMU's) and 3,310 linear feet of stream restoration (3,310 SMU's) on the Powell property, located within the Tar-Pamlico River Basin.
2. On site grading was completed on January 15, 2009.
3. Installation of woody plant material was completed January 29, 2009.
4. As-built topographic survey completed by True Line Surveying, Inc. on April 2, 2009.

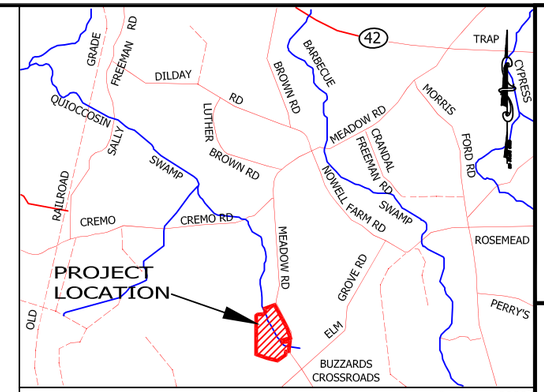
WETLAND & STREAM MITIGATION PROJECT
ALBEMARLE RESTORATIONS, LLC
POWELL SITE
EEP CONTRACT # D06065-B

BERTIE COUNTY

LOCATION: WEST SIDE OF MEADOW ROAD NORTH OF BUZZARDS CROSSROADS
TYPE OF WORK: MITIGATION



AS-BUILT CONDITIONS
SCALE: 1" = 400'



VICINITY MAP

INDEX OF SHEETS

T-1.....TITLE SHEET
G-1.....AS-BUILT GRADING OVERVIEW
G-2.....AS-BUILT GRADING PLAN
G-3.....AS-BUILT GRADING PLAN
G-4.....AS-BUILT GRADING PLAN
G-5.....AS-BUILT GRADING PLAN
G-6.....AS-BUILT GRADING PLAN
G-7.....AS-BUILT GRADING PLAN
D-1.....AS-BUILT DETAILS AND SECTIONS
D-2.....AS-BUILT DETAILS AND SECTIONS
D-3.....AS-BUILT DETAILS AND SECTIONS
R-1.....REFERENCE WETLAND EXHIBIT
M-1.....AS-BUILT MONITORING EXHIBIT

LEGEND

- PROPERTY LINE
- EASEMENT BOUNDARY
- LOD — LIMITS OF DISTURBANCE
- 64.0 — EXISTING GRADE
- 62 — PROPOSED GRADE
- +64 — PROPOSED SPOT ELEVATIONS
- 62 — AS-BUILT GRADE
- +64 — AS-BUILT SPOT ELEVATIONS
- EXISTING FARM LANE
- WRL — RIVERINE WETLAND RESTORATION LIMITS
- "SWAMP RUN" RESTORATION
- RIVERINE WETLAND RESTORATION

400 0 400 800

WETLAND MITIGATION CREDIT SUMMARY

WETLAND RESTORATION AREAS (1:1)	ACREAGE	WMU's
RIVERINE WETLAND RESTORATION	48.4	48.4
Total	48.4	48.4
"SWAMP RUN" RESTORATION	LINEAR FEET	SMU's
"SWAMP RUN" (7.5 ACRES)	3,310	3,310

AS-BUILT TITLE SHEET
MAY, 2009

POWELL PROPERTY MITIGATION AS-BUILT
WETLAND MITIGATION UNITS: 48.4 WMU'S
STREAM MITIGATION UNITS: 3,310 SMU'S
BERTIE COUNTY, NORTH CAROLINA
EEP CONTRACT #: D06065-B

Ecosystem Enhancement Program

PREPARED BY:
ALBEMARLE RESTORATIONS, LLC
WETLAND RESTORATION,
STREAM RESTORATION,
& WILDLIFE HABITAT CREATION
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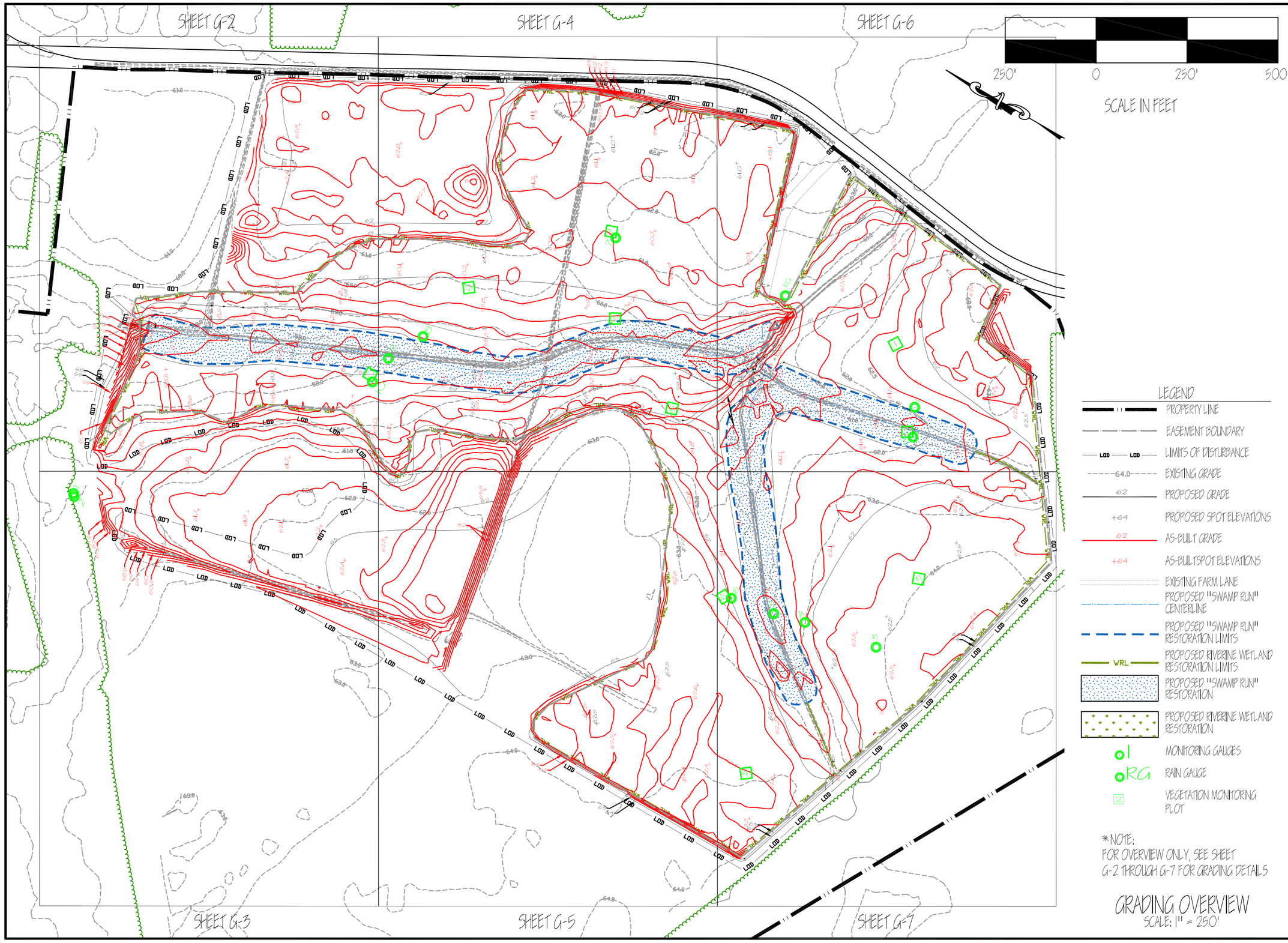
(252) 333-0249 • FAX (252) 357-4892

SHEET T-1



AS-BUILT GRADING PLAN OVERVIEW
MAY, 2009

POWELL PROPERTY MITIGATION AS-BUILT
WETLAND MITIGATION UNITS: 48.4 WMU'S
STREAM MITIGATION UNITS: 3,310 SMU'S
DESHE COUNTY, NORTH CAROLINA
EEP CONTRACT #: D06065-B

Ecosystem Enhancement Program

PREPARED BY:

ALBEMARLE RESTORATIONS, LLC
WETLAND RESTORATION, STREAM RESTORATION, & WILDLIFE HABITAT CREATION
404 COURT STREET • GATESVILLE, NC 27938
(252) 133-0249 • FAX (252) 357-4892

SHEET G-1

SCALE: 1" = 100'

100 0 100 200

SECTION A-A'

SECTION B-B'

MATCHLINE SHEET G-3

MATCHLINE SHEET G-2

MATCHLINE SHEET G-4

WETLAND OUTLET LOCATION, SEE SHEET D-3 FOR DETAILS

LIMIT OF EASEMENT

LIMIT OF DISTURBANCE

EXISTING DITCH FILLED AND ABANDONED

EXISTING DITCH CONVERTED TO SWAMP RUN MORPHOLOGY.

MONITORING GAUGE #1

MONITORING GAUGE #2

VEGETATION MONITORING PLOT #10

LOD

WRL

GRADING PLAN
SCALE: 1" = 100'

LEGEND

- PROPERTY LINE
- EASEMENT BOUNDARY
- LOD — LIMITS OF DISTURBANCE
- 62.0 — EXISTING GRADE
- 63 — PROPOSED GRADE
- +64 — PROPOSED SPOT ELEVATIONS
- 63 — AS-BUILT GRADE
- +64 — AS-BUILT SPOT ELEVATIONS
- APPROXIMATE "SWAMP RUN" LIMIT
- PROPOSED "SWAMP RUN" CENTERLINE
- WRL — PROPOSED RIVERINE WETLAND RESTORATION LIMITS
- PROPOSED "SWAMP RUN" RESTORATION
- PROPOSED RIVERINE WETLAND RESTORATION
- 1 — MONITORING GAUGES
- RG — RAIN GAUGE
- 2 — VEGETATION MONITORING PLOT

AS-BUILT GRADING PLAN
MAY 2009

POWELL PROPERTY MITIGATION AS-BUILT
WETLAND MITIGATION UNITS: 48.4 WMU'S
STREAM MITIGATION UNITS: 3,310 SMU'S
BERTIE COUNTY, NORTH CAROLINA
EEP CONTRACT #: D06065-B

Ecosystem Enhancement Program

PREPARED BY:
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SHEET G-2

LEGEND

- PROPERTY LINE
- EASEMENT BOUNDARY
- LOD — LIMITS OF DISTURBANCE
- 62.0 — EXISTING GRADE
- 63 — PROPOSED GRADE
- +64 — PROPOSED SPOT ELEVATIONS
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- 1 — MONITORING GAUGES
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100 0 100 200

SOIL BORING 4
SOIL BORING 3
MONITORING GAUGE #11
MONITORING GAUGE #12
RG

A
B

SECTION A-
SECTION B-

LIMIT OF DISTURBANCE
LIMIT OF EASEMENT
EXISTING DITCH FILLED AND ABANDONED

MATCHLINE SHEET G-3
MATCHLINE SHEET G-5

GRADING PLAN
SCALE: 1" = 100'

AS-BUILT GRADING PLAN
MAY, 2009

REVISIONS:
DATE:
BY:

POWELL PROPERTY MITIGATION AS-BUILT
WETLAND MITIGATION UNITS: 48.4 WMUS
STREAM MITIGATION UNITS: 5.510 SMUS
BERTIE COUNTY, NORTH CAROLINA
EEP CONTRACT #: D06066-B

Ecosystem Enhancement Program

PREPARED BY:
ALBEMARLE RESTORATIONS, LLC
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SHEET G-3

MATCHLINE SHEET G-2

MATCHLINE SHEET G-4

100 0 100 200

MONITORING GAUGE #6

MONITORING GAUGE #8

VEGETATION MONITORING PLOT #9

LIMIT OF DISTURBANCE

MONITORING GAUGE #7

EXISTING DITCH FILLED AND ABANDONED

VEGETATION MONITORING PLOT #8

VEGETATION MONITORING PLOT #7

VEGETATION MONITORING PLOT #6

EXISTING DITCH CONVERTED TO SWAMP RUN MORPHOLOGY

LIMIT OF EASEMENT

MATCHLINE SHEET G-4

MATCHLINE SHEET G-6

MATCHLINE SHEET G-5

GRADING PLAN
SCALE: 1" = 100'

LEGEND

- PROPERTY LINE
- EASEMENT BOUNDARY
- LOD — LIMITS OF DISTURBANCE
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- 1 — MONITORING GAUGES
- RG — RAIN GAUGE
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AS-BUILT GRADING PLAN
APRIL 2009

POWELL PROPERTY MITIGATION AS-BUILT
WETLAND MITIGATION UNITS: 48.4 WMU'S
STREAM MITIGATION UNITS: 3,910 SMU'S
BERTIE COUNTY, NORTH CAROLINA
EEP CONTRACT #: D06066-9

Ecosystem Enhancement Program

PREPARED BY:

ALBEMARLE RESTORATIONS, LLC

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STREAM RESTORATION,
& WILDLIFE HABITAT CREATION

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(252) 330-0249 • FAX (252) 357-4592

SHEET G-4

LEGEND

- PROPERTY LINE
- EASEMENT BOUNDARY
- LOD — LIMITS OF DISTURBANCE
- 62.0 — EXISTING GRADE
- 63 — PROPOSED GRADE
- +64 — PROPOSED SPOT ELEVATIONS
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- PROPOSED "SWAMP RUN" RESTORATION
- PROPOSED RIVERINE WETLAND RESTORATION

MATCHLINE SHEET G-3

MATCHLINE SHEET G-5

C

C'

SECTION C-C'

EXISTING DITCH FILLED AND ABANDONED

EXISTING DITCH FILLED AND ABANDONED

LOD

LIMIT OF DISTURBANCE

LIMIT OF EASEMENT

D

D'

SECTION D-D'

MATCHLINE SHEET G-4

MATCHLINE SHEET G-5

MATCHLINE SHEET G-2

RIVERINE WETLANDS

RIVERINE WETLANDS

VEGETATION MONITORING PLOT #5

VEG PLC

WRL

100 0 100 200

GRADING PLAN
SCALE: 1" = 100'

AS-BUILT GRADING PLAN
MAY 2009

NO.	DATE	BY	DESCRIPTION

POWELL PROPERTY MITIGATION AS-BUILT
WETLAND MITIGATION UNITS: 48.4 WMU'S
STREAM MITIGATION UNITS: 3,310 SMU'S
BEERTIE COUNTY, NORTH CAROLINA
EEP CONTRACT #: D06065-B

Ecosystem Enhancement Program

PREPARED BY:

ALBEMARLE RESTORATIONS, LLC

WETLAND RESTORATION,
STREAM RESTORATION,
& WILDLIFE HABITAT CREATION

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SHEET G-5

MATCHLINE SHEET G-4

MATCHLINE SHEET G-6

MATCHLINE SHEET G-7

RIVERINE WETLANDS

RAIN GAUGE

RG

WETLAND OUTLET

LIMIT OF EASEMENT

CONSTRUCTION ACCESS

VEGETATION MONITORING PLOT # 2

VEGETATION MONITORING PLOT #1

MONITORING GAUGE #1

MONITORING GAUGE #2

LIMIT OF DISTURBANCE

PROPERTY BOUNDARY

LOD

WRL

LEGEND

- PROPERTY LINE
- EASEMENT BOUNDARY
- LOD — LIMITS OF DISTURBANCE
- 62.0 — EXISTING GRADE
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- 1 — MONITORING GAUGES
- RG — RAIN GAUGE
- 2 — VEGETATION MONITORING PLOT

100 0 100 200

GRADING PLAN
SCALE: 1" = 100'

AS-BUILT GRADING PLAN
MAY, 2009

REVISIONS	DATE
BY:	
DESC:	

POWELL PROPERTY MITIGATION AS-BUILT
WETLAND MITIGATION UNITS: 48.4 WMUS
STREAM MITIGATION UNITS: 5,310 SMUS
BEERTE COUNTY, NORTH CAROLINA
EEP CONTRACT #: D06066-8

Ecosystem Enhancement Program

PREPARED BY:

ALBEMARLE RESTORATIONS, LLC
WETLAND RESTORATION,
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404 COURT STREET • GATESVILLE, NC 27938
(252) 333-0249 • FAX (252) 357-4892

SHEET G-6

MATCHLINE SHEET G-6

MATCHLINE SHEET G-7

RIVERINE WETLANDS

VEGETATION MONITORING PLOT # 4

VEGETATION MONITORING PLOT # 5

MONITORING GAUGE #6

MONITORING GAUGE #5

MONITORING GAUGE #4

MONITORING GAUGE #3

SECTION LINE

LOD

PROPERTY BOUNDARY

LIMIT OF DISTURBANCE

LIMIT OF EASEMENT

RIVERINE WETLANDS

VEGETATION MONITORING PLOT # 3

LEGEND

- PROPERTY LINE
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- LOD — LIMITS OF DISTURBANCE
- 62.0 — EXISTING GRADE
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- 2 — VEGETATION MONITORING PLOT

100 0 100 200

GRADING PLAN
SCALE: 1" = 100'

AS-BUILT GRADING PLAN
MAY, 2009

NO.	REVISIONS	DATE

POWELL PROPERTY MITIGATION AS-BUILT
WETLAND MITIGATION UNITS: 48.4 WMU'S
STREAM MITIGATION UNITS: 3,310 SMU'S
BEAVER COUNTY, NORTH CAROLINA
EEP CONTRACT #: D06065-B

Ecosystem Enhancement PROGRAM

PREPARED BY:

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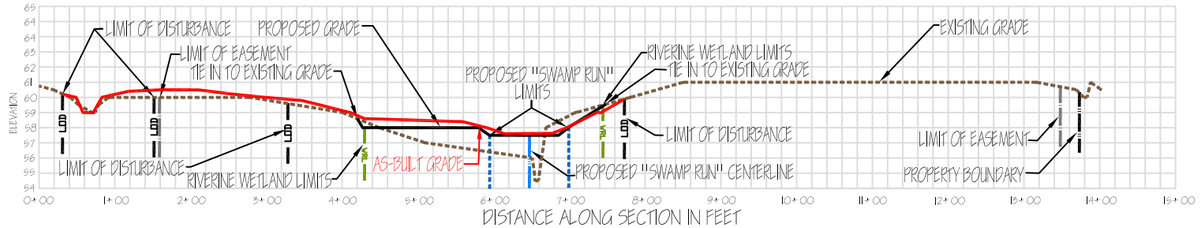
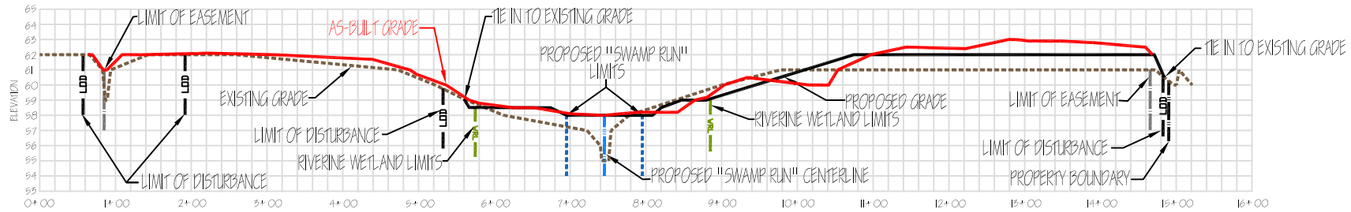
(252) 333-0249 • FAX (252) 357-4892

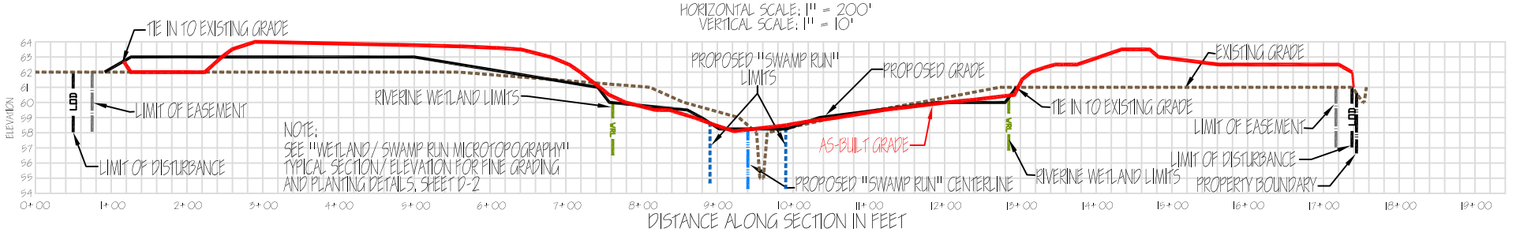
SHEET G-7



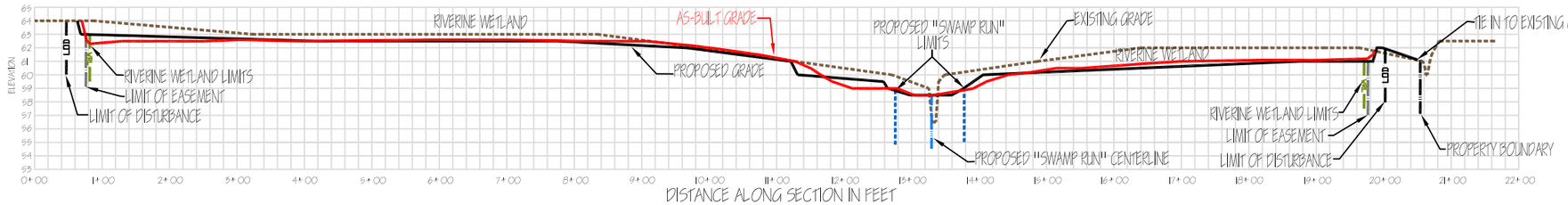
GRADING CROSS SECTION A-A'
HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 10'



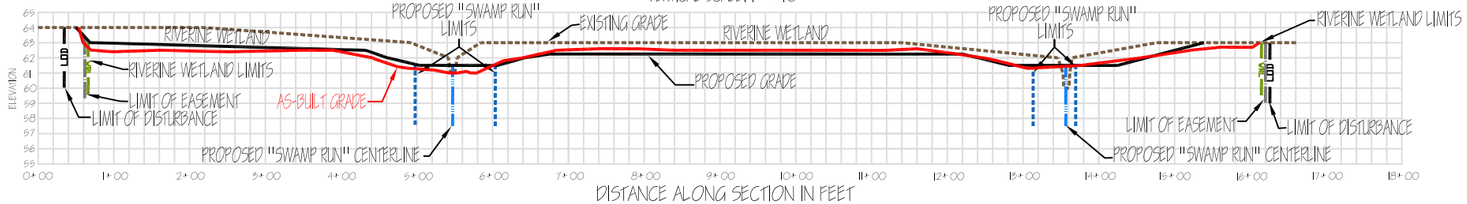
GRADING CROSS SECTION B-B'
HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 10'



GRADING CROSS SECTION C-C'
HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 10'



GRADING CROSS SECTION D-D'
HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 10'



GRADING CROSS SECTION E-E'
HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 10'

AS-BUILT DETAILS AND SECTIONS
MAY 2009

DATE:
REVISIONS:
BY:
DATE:

POWELL PROPERTY MITIGATION AS-BUILT
WETLAND MITIGATION UNITS: 48.4 WMU'S
STREAM MITIGATION UNITS: 3,310 SMU'S
DEERE COUNTY, NORTH CAROLINA
EEP CONTRACT #: D06065-B

Ecosystem Enhancement Program

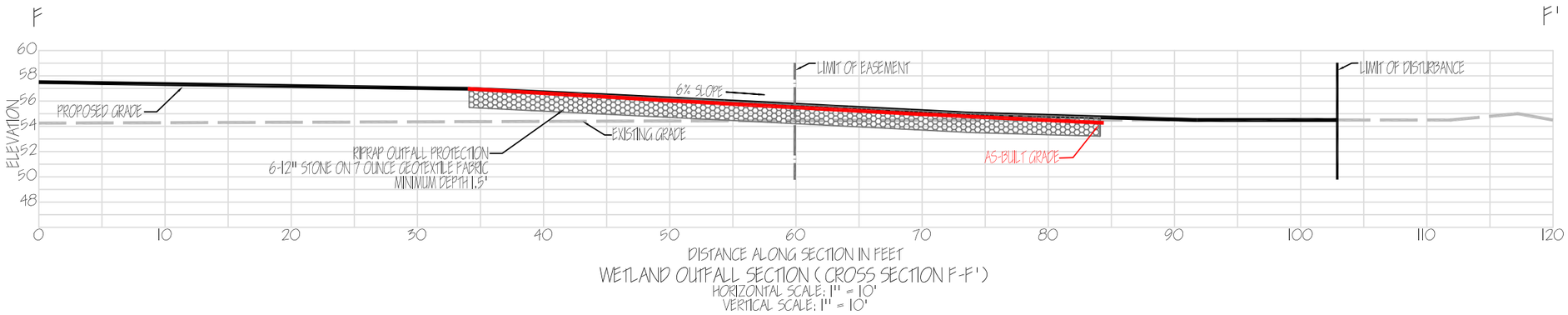
PREPARED BY:

ALBEMARLE RESTORATIONS, LLC

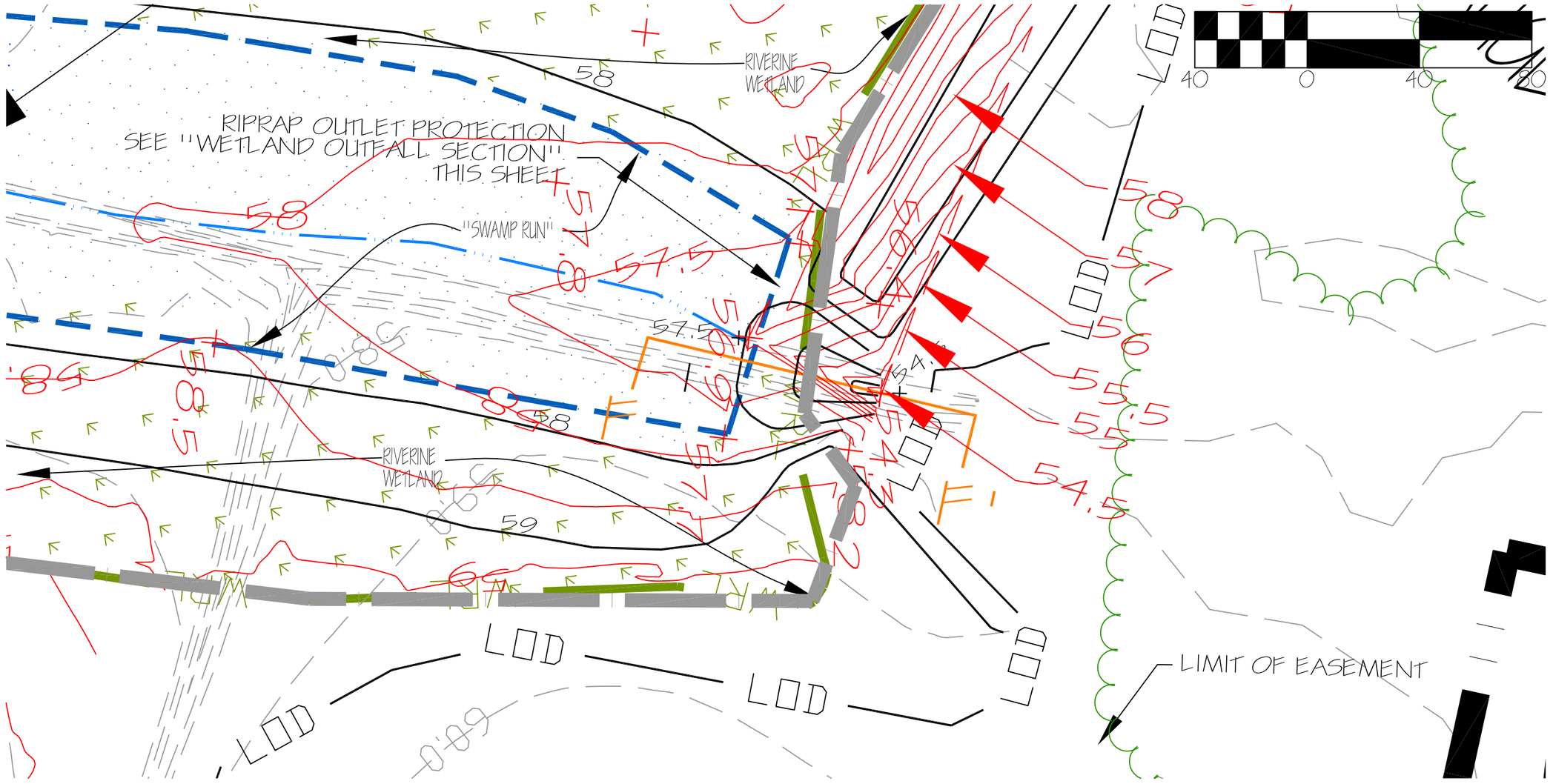
WETLAND RESTORATION,
STREAM RESTORATION,
& WILDLIFE HABITAT CREATION

404 COURT STREET • GATESVILLE, NC 27938
(252) 333-0249 • FAX (252) 357-4892

SHEET D-1



WETLAND OUTFALL SECTION (CROSS SECTION F-F')
HORIZONTAL SCALE: 1" = 10'
VERTICAL SCALE: 1" = 10'



WETLAND OUTFALL DETAIL
SCALE: 1" = 40'

AS-BUILT DETAILS AND SECTIONS
MAY, 2009

POWELL PROPERTY MITIGATION AS-BUILT
WETLAND MITIGATION UNITS: 48.4 WMU'S
STREAM MITIGATION UNITS: 3,510 SMU'S
PIERCE COUNTY, NORTH CAROLINA
EEP CONTRACT #: D06086-B

Ecosystem Enhancement Program

PREPARED BY:

ALBEMARLE RESTORATIONS, LLC
WETLAND RESTORATION,
STREAM RESTORATION,
& WILDLIFE HABITAT CREATION
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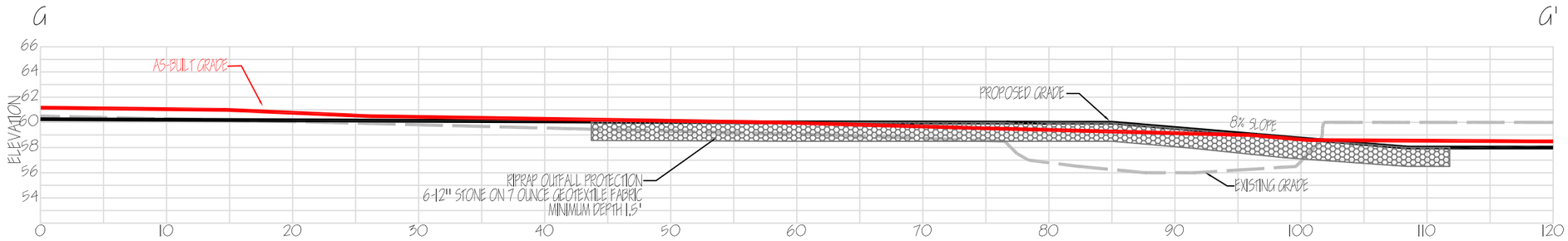
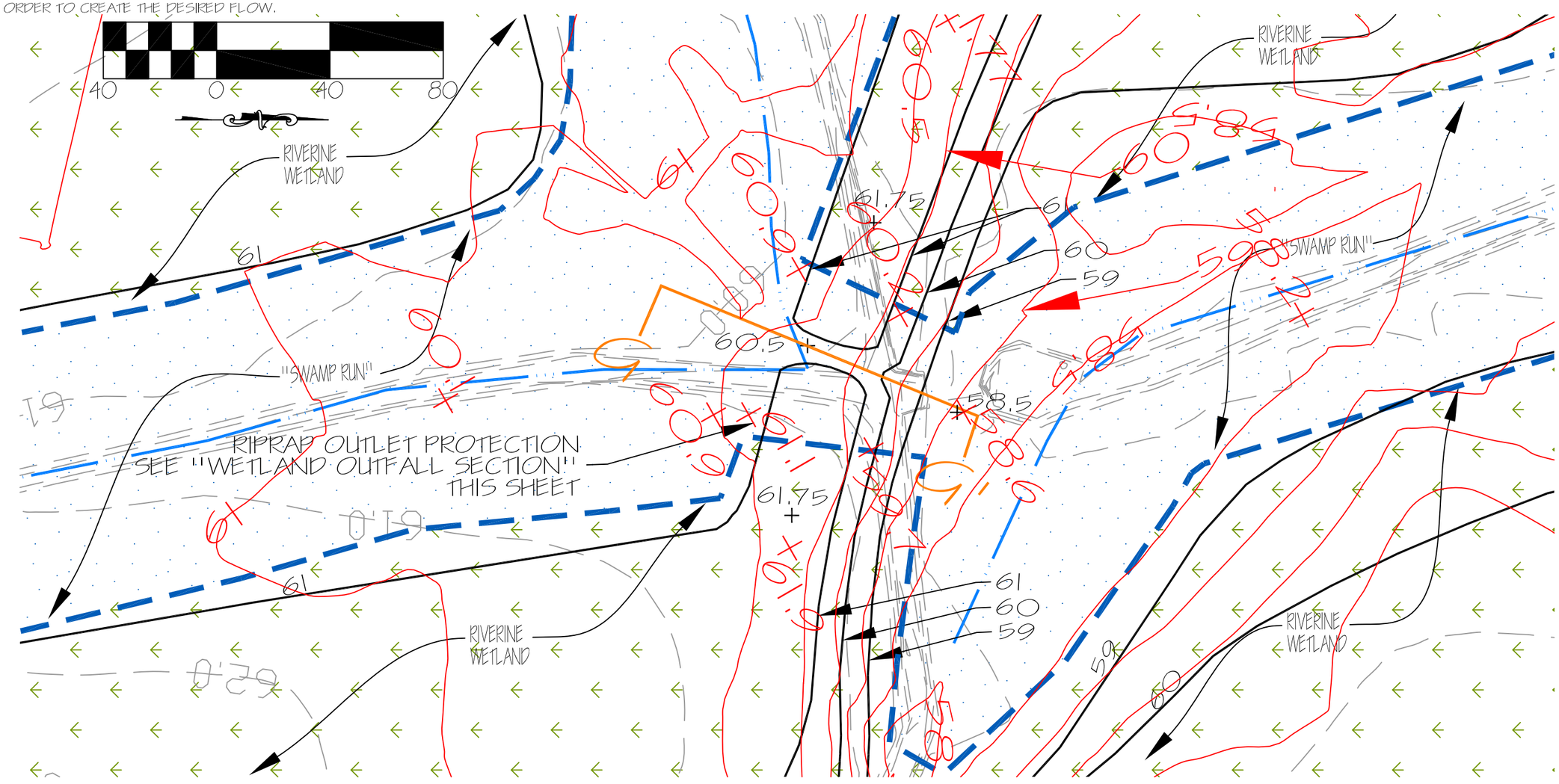
SHEET D-2



NOTE:
FIELD CHANGES WERE MADE FROM THE ORIGINALLY PROPOSED DESIGN OF THE OUTFALL AT THE CONFLUENCE OF THESE TWO SWAMP RUNS. THE ROCK WAS REMOVED, THE SLOPE WAS INCREASED SLIGHTLY, AND ADDITIONAL MICROTOPGRAPHY WAS ADDED TO THE GENERAL AND SURROUNDING AREA IN ORDER TO CREATE THE DESIRED FLOW.

WETLAND OUTFALL SECTION (CROSS SECTION G-G')
HORIZONTAL SCALE: 1" = 10'
VERTICAL SCALE: 1" = 10'



WETLAND OUTFALL DETAIL
SCALE: 1" = 40'

AS-BUILT DETAILS AND SECTIONS
MAY, 2009

POWELL PROPERTY MITIGATION AS-BUILT
WETLAND MITIGATION UNITS: 48.4 WMUS
STREAM MITIGATION UNITS: 3,340 SMUS
BERTIE COUNTY, NORTH CAROLINA
EEP CONTRACT #: D06066-B

Ecosystem Enhancement Program

PREPARED BY:
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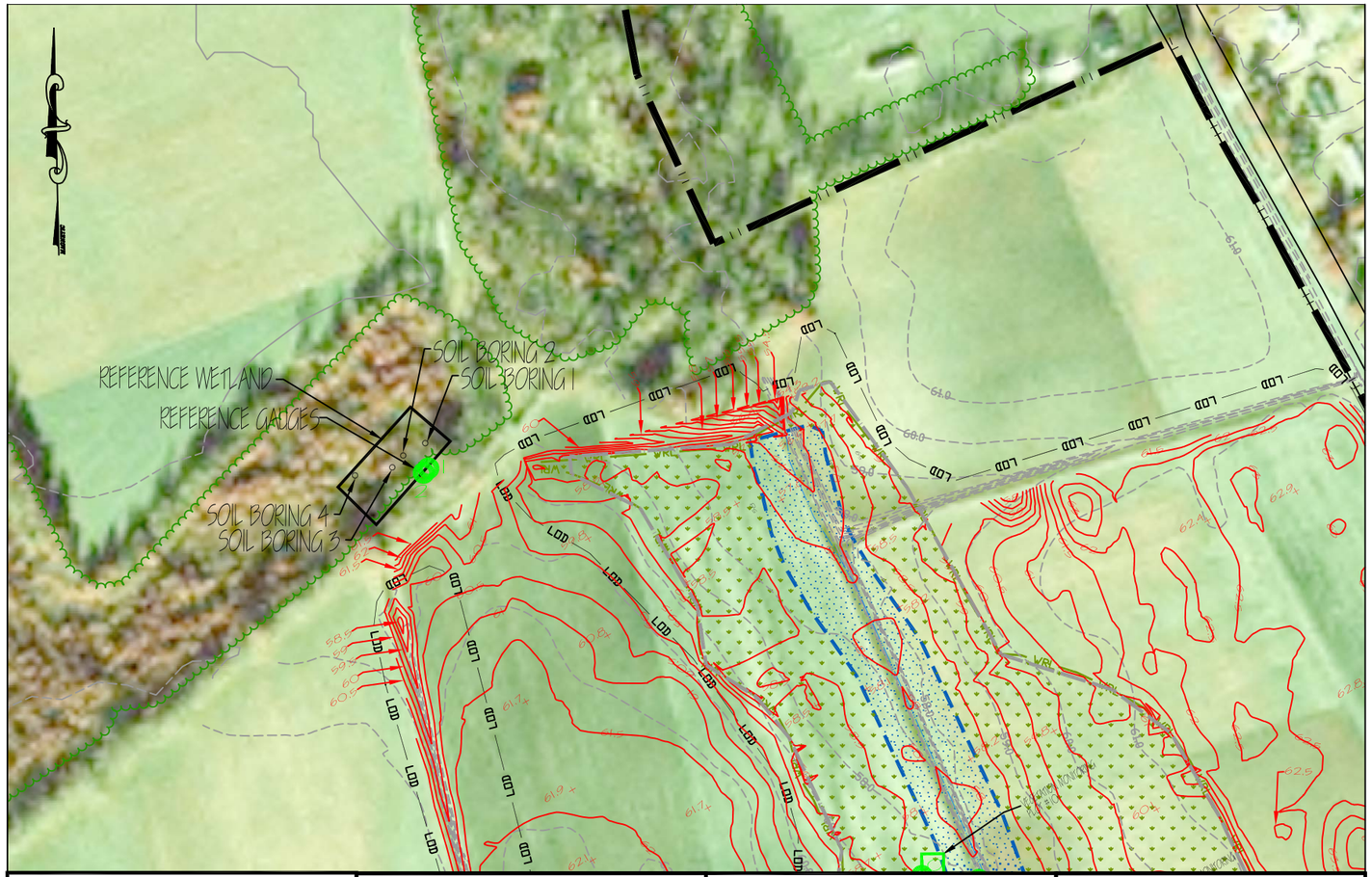
SHEET D-3



PREPARED FOR:

ALBEMARLE RESTORATIONS, LLC

WETLAND RESTORATION,
STREAM RESTORATION,
& WILDLIFE HABITAT CREATION

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(252) 333-0249 • FAX (252) 357-4892

POWELL PROPERTY

RIVERINE WETLAND MITIGATION: 48.4 ACRES
STREAM RESTORATION: 3,310 LINEAR FEET
BERTIE COUNTY, NORTH CAROLINA
CONTRACT #: D06065-B

POWELL REFERENCE WETLAND SITE MAP

SCALE
0 200' 400'

5/2008

DRAWN BY: LMS

REFERENCE MONITORING GAUGE #2

REFERENCE MONITORING GAUGE #1

VEGETATION MONITORING PLOT #9

MONITORING GAUGE #10

MONITORING GAUGE #5

VEGETATION MONITORING PLOT #4

VEGETATION MONITORING PLOT #5

MONITORING GAUGE #6

VEGETATION MONITORING PLOT #6

MONITORING GAUGE #9

MONITORING GAUGE #8

VEGETATION MONITORING PLOT #8

MONITORING GAUGE #4

MONITORING GAUGE #3

VEGETATION MONITORING PLOT #3

MONITORING GAUGE #2

VEGETATION MONITORING PLOT #2

MONITORING GAUGE #1

VEGETATION MONITORING PLOT #1

MONITORING GAUGE #7

VEGETATION MONITORING PLOT #7

RAIN GAUGE

VEGETATION MONITORING PLOT #9

LOD

250' 0 250' 500'

SCALE IN FEET

MONITORING PLAN
MAY, 2009

REVISIONS	
DATE	

POWELL PROPERTY MITIGATION AS-BUILT
WETLAND MITIGATION UNITS: 48.4 WMUS
STREAM MITIGATION UNITS: 3,910 SMUS
BERTIE COUNTY, NORTH CAROLINA
EEP CONTRACT #: D06066-3

PREPARED BY:

ALBEMARLE RESTORATIONS, LLC
WETLAND RESTORATION,
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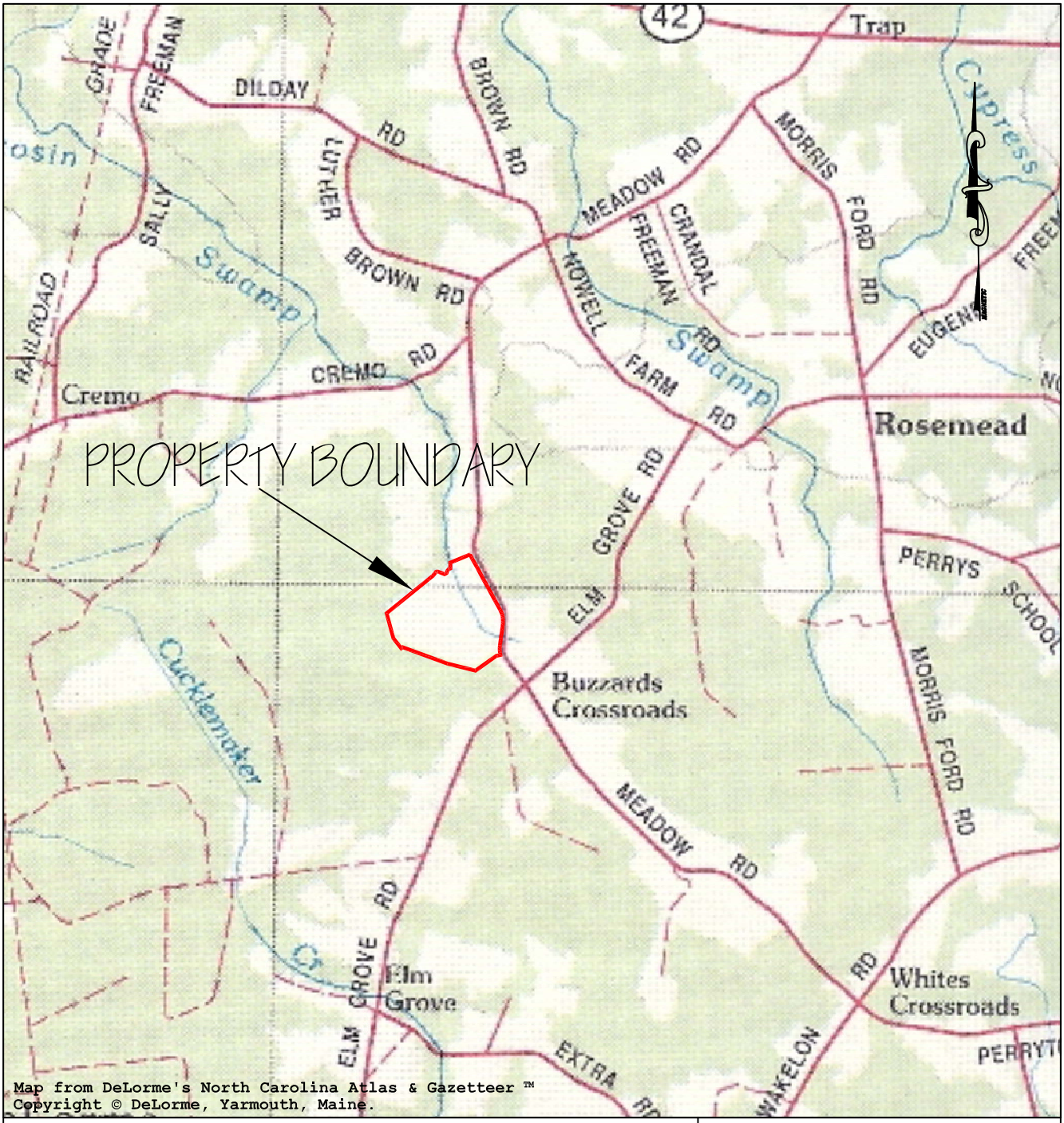
& WILDLIFE HABITAT CREATION
404 COURT STREET • GATESVILLE, NC 27938
(252) 333-0249 • FAX (252) 357-4892

SHEET M-1

APPENDIX C



VICINITY MAP

Scale: 1" = 4000'	4/2008	Drawn By: LMS

PREPARED FOR:

ALBEMARLE RESTORATIONS, LLC

WETLAND RESTORATION,
STREAM RESTORATION,
& WILDLIFE HABITAT CREATION

404 COURT STREET • GATESVILLE, NC 27938
(252) 333-0249 • FAX (252) 357-4892

SCALE

0 4,000' 8,000'

POWELL PROPERTY

RIVERINE WETLAND RESTORATION
48.4 ACRES (48.4 WMU'S)

STREAM RESTORATION
3,310 LINEAR FEET (3,310 SMU'S)

BERTIE COUNTY, NORTH CAROLINA
CONTRACT # 16-D06065-B

APPENDIX D

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

Project Site:	Powell Reference Site	Date:	1/28/2008
Applicant/Owner:		County:	Bertie
Investigator:	ET	State:	North Carolina

			Community ID:	
Do Normal Circumstances exist on the site?	☒ Yes	☐ No		
Is the site significantly disturbed (Atypical Situation)?	☐ Yes	☒ No	Transect ID:	
Is Area a Potential Problem Area? *(if needed, explain on reverse)*	☐ Yes	☒ No	Plot ID:	

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	*Quercus phellos*	Tree	FACW-	8	*Arundinaria gigantea*	Shrub	FACW
2	*Quercus nigra*	Tree	FAC	9	*Magnolia virginiana*	Shrub	FACW+
3	*Acer rubrum*	Tree	FAC	10			
4	*Liquidambar styraciflua*	Tree	FAC+	11			
5	*Nyssa sylvatica*	Tree	FAC	12			
6	*Pinus taeda*	Tree	FAC	13			
7	*Smilax rotundifolia*	Shrub	FAC	14			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks:

HYDROLOGY

☐ Recorded Data (describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

X No recorded data available

Field Observations:
- Depth of Surface Water: 0 (In.)
- Depth to Free Water in Pit: 14 (In.)
- Depth to Saturated Soil: 6 (In.)

Wetland Hydrology Indicators:

Primary Indicators:
- ☐ Inundated
- ☒ Saturated in Upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☒ Drainage Patters in Wetlands

Secondary Indicators (2 or more required):
- ☒ Oxidized Root Channels in Upper 12"
- ☒ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase):
Taxonomy (Subgroup):

Drainage Class:
Field Observations Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-12	A	10YR 2/1			Sandy Loam
12-20	Btg	10YR 4/1			Sandy Clay Loam
20-24	Btg2	10Yr 4/1	10YR 5-6, 10YR 7/1	few	Sandy Clay Loam

Hydric Soil Indicators:
- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquatic Moisture Regime
- ☐ Reducing Conditions
- ☒ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ Organic Streaking in Sandy Soils
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Listed on National Hydric Soils List
- ☒ Listed on Local Hydric Soils List
- ☐ Other (explain in remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	☒ Yes	☐ No	Is this Sampling Point Within a Wetland?	☒ Yes	☐ No
Wetland Hydrology Present?	☒ Yes	☐ No			
Hydric Soils Present?	☒ Yes	☐ No			

Remarks:

Form Content Approved by HQUSACE 3/92