

BASELINE MONITORING DOCUMENT AND AS BUILT BASELINE REPORT

FINAL VERSION

Charles Williams Stream Wetland and Buffer Site

Randolph County, NC

State Construction Project No. 07-07125-01A

EEP Project No. 80



**Prepared for the
NC Department of Environment and Natural Resources
Ecosystem Enhancement Program**

**217 West Jones Street, Suite 3000A
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September 25, 2013

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Under Contract with:



*This assessment and report are consistent with NCDENR Ecosystem Enhancement Program Template Version 2.0 (10/14/10)
for Baseline Monitoring Document Format, Data Requirements and Content Guidance.*

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1.0 EXECUTIVE SUMMARY/ PROJECT ABSTRACT

The Charles Williams Stream, Wetland and Buffer Site, hereinafter referred to as the “Project Site” or “Site,” is located in Randolph County, North Carolina, within US Geological Survey (USGS) 8-digit Hydrologic Unit Code (HUC) 03030003 and NC Division of Water Quality (NCDWQ) sub-basin 03-06-09 of the Cape Fear River Basin (Figure 1). The project involved the enhancement of 1,753 linear feet of an unnamed tributary (UT) to Sandy Creek, 1.96 acres of wetlands and 4.7 acres of riparian buffer. The Site is protected for perpetuity under a conservation easement purchased from Mr. Charles Williams in 2006.

Existing land use and practices, including unrestricted livestock access were the main reasons for degradation throughout the Site. The establishment of a protected conservation easement along these areas, channel enhancements, and the planting of supplemental vegetation will ultimately uplift existing natural and biological processes. It will also improve the overall function and habitat associated with both the UT and its receiving stream, Sandy Creek.

The Project Site is located in the 14-digit Upper Cape Fear Hydrologic Unit Code (HUC) 03030003020010, identified as the Sandy Creek Watershed. This HUC is identified as a Targeted Local Watershed (TLW) in EEP’s Draft 2009 Cape Fear River Basin Restoration Priority (RBRP) Plan (available at the EEP web site under the link <http://www.nceep.net/pages/lwplanning.htm>).

The Project’s goals were to:

- reduce nutrient and sediment water quality stressors,
- provide for uplift in water quality functions,
- improve instream and wetland aquatic habitats, including riparian terrestrial habitats, and
- provide for greater overall instream and wetland habitat complexity and quality.

Stream enhancement, the primary component, served as the dominant input for achieving this goal.

No restoration goals were identified in the Cape Fear River Basinwide Management Plan (NCDWQ, 2005) with regard to the Sandy Creek watershed. There were no sources or stressors listed for the watershed area associated with the Project Site. The NC Department of Environment and Natural Resources Ecosystem Enhancement Program (EEP) develops River Basin Restoration Priorities (RBRP) to guide its restoration activities within each of the state’s 54 cataloging units. RBRPs delineate specific watersheds that exhibit both the need and opportunity for wetland, stream and riparian buffer restoration. These watersheds are called Targeted Local Watersheds (TLWs) and receive priority for EEP planning and restoration project funds. The 2009 Draft Cape Fear River RBRP identified HUC 03030003020010, which includes the Project Site, as a Targeted Local Watershed. The following information is taken directly from the RBRP. “...This is a largely rural HU. The main stream, Sandy Creek, flows through Randolph County to Sandy Creek Reservoir, a drinking water supply for Ramseur and Franklinville. As of 2006, the HU had no streams on DWQ’s list of impaired waters, however, the reservoir shows indications of high nutrient levels, likely related to the large number of animal operations in the HU. The HU is a Water Supply Watershed and a long portion of Sandy Creek is recognized by the State’s NHP as a Significant Natural Heritage Area. EEP has been active in the HU with five projects that include components of preserving wetlands (3 acres) and streams (5,100 linear feet) and restoring wetlands (15 acres) and streams (15,000 linear feet). Piedmont Land Conservancy has also been active in protecting

streamside buffers in the HU. Continued implementation of practices to reduce nutrient inputs to Sandy Creek Reservoir is recommended for this HU.”

2.0 PROJECT GOALS, BACKGROUND AND ATTRIBUTES

2.1 Location and Setting

The Project Site is situated in northeastern Randolph County, west-southwest of the town of Liberty, and six miles north of Ramseur (Figure 1). It is bordered to the north and west by undeveloped land, the east by Ramseur-Julian Road and the south by Sandy Creek. Northeastern Randolph Middle School is on the property opposite of Sandy Creek, to the south. The Project Site can be accessed by using the following directions from US Highway 64.

- Turn north on US 421 in Siler City, towards the Town of Liberty.
- Proceed approximately 9.5 miles and turn south (left) onto NC 49.
- Proceed approximately 0.7 miles along NC 49 and turn north (right) onto SR 2459 (Sandy Creek Church Road).
- Follow Sandy Creek Church Road approximately 4.5 miles until it intersects with SR 2442 (Ramseur-Julian Road) and turn north (right),
- Follow Ramseur-Julian Road approximately 0.3 miles, crossing over Sandy Creek. The Charles Williams Site is on the west (left) side of the roadway, immediately north of Sandy Creek.

Situated in the Piedmont physiographic province and the Cape Fear River Basin, the Project Site encompasses approximately 18 acres of former pasture and existing riparian forest. Elevations across the Site range between approximately 550 and 560 feet above Mean Sea Level. The following chart depicts pre-implementation existing condition information regarding the Site.

Pre-Implementation Existing Conditions Summary

Physiographic Province	Piedmont	County	Randolph
River Basin Name	Cape Fear	Property Owner Name	Charles Williams
USGS 8-digit HUC	03030003	Stream #1 Name	UT to Sandy Creek
USGS 14-digit HUC	03030002020010	Drainage Area	4.9 sq. mi.
NCDWQ Subbasin	03-06-09	NCDWQ Score	(Perennial)
Underlying Mapped Soil(s)	Chewacla loam	Rosgen Classification	C5
Drainage Class	Somewhat poorly drained		
Hydric Status	B		
Slope	0-2 %		
Available Water Capacity	Moderate to High		
FEMA Classification	Zone AE		
Exotic Vegetation Observed	Multiflora rose (<i>Rosa multiflora</i>) Chinese privet (<i>Ligustrum sinense</i>)		

2.2 Project Goals and Objectives

The Project goals are to:

- reduce nutrient and sediment water quality stressors,
- provide for uplift in water quality functions,
- improve instream and wetland aquatic habitats, including riparian terrestrial habitats, and
- provide for greater overall instream and wetland habitat complexity and quality.

Stream enhancement, the primary component, serves the dominant input for achieving this goal.

Historic and contemporary land management practices have been the main reasons for the degradation of biological processes within the Project area. The absence of barriers to livestock movement had resulted in stream bank erosion, degradation of in-stream habitat, and of suppression of forest succession within the riparian zone and adjacent wetland areas. Project enhancements were designed to combat various watershed stressors through the following strategies:

Key Watershed Stressors

Stream bank erosion
Absence of vegetative buffer
Livestock access to streams
Nutrients
Fecal coliform

Management Strategies

riparian buffers & livestock exclusion
riparian buffers & livestock exclusion
Livestock exclusion
agricultural BMPs, riparian buffers & livestock exclusion
agricultural BMPs, riparian buffers & livestock exclusion

The objectives were to exclude livestock in their entirety from the Conservation Easement area, install stream structures and plantings designed to maintain vertical stability, lateral stability and habitat, eradicate non-native invasive vegetation, and re-vegetate and supplement those areas lacking suitable vegetation along the easement area. In addition all areas void of woody vegetation (former pasture) were ripped to alleviate soil compaction and to facilitate growth of supplemental plantings.

An alternative water supply and livestock exclusion fencing were provided by the Randolph County Soil and Water Conservation District. The combination of physical improvements to the riparian corridor and improved land use practices in and around the project area will stabilize sediment export and provide an increase in pollutant and nutrient uptake of overland flows prior to entering the stream channel.

Current monitoring protocols require baseline data to be collected 21 days after the project is accepted as complete by EEP and the State Construction Office. However, delays were encountered during the contracting process between project implementation and the collection of baseline data. This resulted in the stream baseline data collection being delayed approximately six months.

2.3 Project Structure, Restoration Type, and Approach

Two main mitigation components exist at the Site: (1) riparian, riverine wetland enhancement and (2) stream enhancement (Level I). These components are depicted on Figure 2 and summarized in Table 1.

As previously noted in Section 1.0, historical landuse activities were primarily responsible for the degradation of the streams, wetland and riparian areas at the Site. With no barriers to livestock the unnamed tributary exhibited severe erosion due to cattle-hoof shear, lack of vegetation and lack of grade control. The overall enhancement of the Site included livestock exclusion from the riparian corridor, stabilization of the stream banks and livestock crossings, eradication of non-native invasive vegetation and the planting of native hardwood vegetation.

Enhancement (Level I) of the UT utilized natural channel design methodologies consistent with Priority Level IV stream restoration protocols. These protocols specifically include the stabilization of the existing channel in place. A Conservation Easement recorded on February 22, 2006 affords protection to the Project Site for perpetuity. Stream enhancement will ultimately result in the reduction of bank erosion and associated sediment contributions as well as the enhancement and improvement of aquatic and terrestrial habitats.

Wetland enhancement work was performed throughout the existing wetland areas. These wetlands were severely degraded as a result of continuous soil compaction and grazing from livestock. The enhancement work included livestock removal via exclusion fencing and supplemental plantings. Benefits include water quality improvement by trapping nutrients such as nitrogen and phosphorous, toxic substances and disease-causing microorganisms. Wetlands also slow and intercept surface runoff, protect stream banks from erosion, protect upland areas from flooding, as well as provide valuable habitat for wildlife.

Riparian buffers, extending a minimum of 50 feet from the top of bank outward, have been established along both sides of the UT and the north side of Sandy Creek. These areas will be enhanced with the installation of supplemental plantings during the 2013-2014 dormant season (Figure 4). Buffers are one of the most functionally beneficial and biologically diverse systems that also provide services of great economic and social value. The benefits associated with a forested buffer include water quality enhancement, stormwater and floodwater management, stream bank stabilization, water temperature modification, wildlife habitat protection and absorption of airborne pollutants. This enhancement, along with stream and wetland enhancement, will aid in reducing overall sediment inputs at the site, as well as downstream. The newly established buffer areas have been afforded protection from livestock grazing through the installation of livestock exclusion fencing. Additionally, two non-native invasive species (Chinese privet and multiflora rose) dominated the stream side vegetation along UT to Sandy Creek. These species were removed mechanically and herbicide was applied to all remaining stumps and stems. Herbicide was also applied to the non-native invasive plants (multiflora rose and Japanese stilt grass) found within the riparian and wetland areas (Figure 5).

The project also offered EEP an opportunity to test multiple permanent seed mixes. Three seeding variations were developed for a cost benefit analysis of seed mix and application rates. Additional goals of this test include the evaluation of less expensive seed mixes, evaluation of reduced seed application rates, evaluation of shade tolerant species, evaluation of nitrogen-fixing legumes and the evaluation of red fescue for sediment and erosion control. Along UT to Sandy Creek, upstream of the culvert, the riparian area was divided into two planting zones. Downstream of the culvert the riparian area was also divided into two planting zones. The riparian area along Sandy Creek was designated as a third planting zone (Figure 6). Zone 1 received a seed mix of red fescue, red clover, little bluestem, Virginia wild rye, deer tongue, river oats, and upland bentgrass. Zone 2 received the same species with the exception of red fescue. The seed mixes were applied at a rate of 30 pounds per acre in both Zones 1 and 2. Zone 3 received the same mix of species as Zone 2; however, the application rate in Zone 3 was half (15 pounds per acre) of the rate applied in Zone 2. EEP will monitor and collect data throughout the monitoring period to evaluate germination success, effectiveness in site stabilization, and benefits to the tree seedling installations. It is important to note the testing of permanent seed mixes is not a regulatory requirement of the project.

2.4 Project History, Contacts and Attribute Data

A mitigation feasibility study and draft mitigation plan for the Site was developed by the NC Department of Transportation (NCDOT) in 1999 for stream and wetland mitigation needs related to the Greensboro Bypass and other transportation projects in the Cape Fear River Basin. The Site was not immediately developed by the NCDOT and it was eventually transferred to EEP for implementation. In 2006, NCDOT acquired a conservation easement from Mr. Charles Williams (Book 102, Page 99). Mitigation implementation including stream and wetland enhancement, fencing, stream crossings, and live-stake planting was completed in early 2013.

Tables 2, 3 and 4 provide project reporting and milestone history, project consultants, contractors and suppliers and relevant attributes/data at the project level and for the individual restoration components. These tables are provided as a summary of background data.

3.0 SUCCESS CRITERIA

Mitigation success criteria at the Site will be based on USACE (2003) stream mitigation guidelines, Monitoring Level I Criterion.

3.1 Morphologic Parameters and Channel Stability

The morphologic contribution to uplift in hydrologic, water quality and habitat functions stem from two main objectives. The first being the maintenance of a restored or enhanced floodplain connection and associated dimension that facilitates the transport of in-stream sediment loads in equilibrium and dissipates energy associated with floodflows. The second is the maintenance of a longitudinal profile/gradient, which supports these same transport and energy management outcomes. Monitoring will assess and compare the annual dimension adjustments via cross section overlays and measurements of the substrate at each of the four established cross sections. It will also assess the longitudinal profile via the annual measurement along thalweg of the channel. Any trends occurring with regards to cross-sectional area, aggradation or degradation will be noted. Pattern measurements will not be necessary since no changes were performed as part of overall implementation.

3.2 Hydrology

A minimum of two bankfull events must be documented within the standard five-year monitoring period. In order for the hydrology-based monitoring to be considered complete, the two events must occur in separate monitoring years.

3.3 Vegetation

The criteria for vegetation success are dictated by the desired mitigation. Vegetation within the stream and wetland mitigation areas will meet the USACE Wilmington Regulatory District's guidance for stream and wetland mitigation. The Wilmington District requires the survival of a minimum of 320 planted woody stems per acre after monitoring year 3 (MY3). A 10% mortality rate will be allowed for the subsequent monitoring years with a final requirement of 260 stems per acre survival in monitoring year 5 (MY5). Riparian buffer mitigation areas will meet the NC Division of Water Resources criteria for buffer mitigation. NCDWR requires the survival of 320 stems per acres in monitoring year 5 (MY5). Success criteria will also require treatment and

removal of all non-native invasive species prior to project closeout. Bare-root and containerized tree species will be planted between December 15, 2013 and March 15, 2014.

4.0 MONITORING PLAN GUIDELINES

4.1 Hydrology

A crest gage was installed near the downstream end of the Site (Figure 3). This gage will verify the on-site occurrences of bankfull events. In addition, observations of wrack and deposition will serve to validate gage observations. Documentation of the highest stage during the monitoring interval will be assessed during each Site visit and the gage will be reset. The data related to bankfull verification will be summarized in each annual report. Based on the elevation of the crest gage, any readings observed higher than 20 inches on the gage will reflect a bankfull or above bankfull event.

In addition, daily precipitation amounts will be ascertained from the weather station at the Siler City Airport (SILR), approximately 12 miles southwest of the Site. These amounts will be used to help determine the dates of important rainfall events.

4.2 Stream Channel Stability and Geomorphology

As previously mentioned, four cross sections have been strategically placed along the UT (Figure 3). Exhibit Tables 5 and 6 depict the project's hydraulic and geomorphic data. This data is also graphically depicted in Appendix B.

4.3 Vegetation

Once vegetation has been planted, it will be assessed using plot layouts consistent with the EEP/Carolina Vegetation Survey (CVS) Level II Vegetation Protocol. Stem count data will be ascertained from 12 permanently placed 100 meter² vegetation plots (Figure 3). Assessments will be conducted for both planted and natural stems.

4.4 Digital Photographs

Baseline photographs were taken in June 2013 to document existing conditions at the Site (Appendix C). Included are 20 individual, strategically placed photostations (Figure 3). Each annual monitoring assessment and report will depict photographs taken at the same location for that particular year. This will result in a visual depiction of vegetation succession at the Site.

5.0 MAINTENANCE AND CONTINGENCY PLANS

Annual reports submitted for a minimum of six consecutive years (vegetation only in MY6) will document any observed or anticipated problems with achieving success. Recommendations including increased monitoring, maintenance or repair may be documented in these reports. Problem areas will be depicted on the monitoring report plan view and described in detail. In addition, problem severity, as well as probable cause will also be noted.

6.0 BASELINE CONDITION

6.1 Record Drawings

Record Drawings were submitted in early 2013 once construction implementation activities were completed. A copy of the drawing set is presented in Appendix D.

6.2 Baseline Data Collection

Monitoring feature installation and baseline data collection occurred during June 2013. These assessments covered the easement area (visually), enhanced stream channel and crest gage. Vegetation plots were not included under this assessment since bare-rooted and containerized vegetation implementation will not occur until the winter/spring of 2013/2014. The actual plot locations were established however. They consist of 12 vegetation plots existing as either 10-meter by 10-meter squares or 5-meter by 20-meter rectangles with corners consisting of 1" x 5' PVC pipes attached to 1/2" x 2" rebar posts. The crest gage was purchased from Remote Data Systems (RDS) and attached to a steel L-brace buried in the streambank. It was reset upon evaluation. Photographs were taken at each of the 20 established photostations. These photostations are not individually denoted in the field but tied generally with an identified object (i.e., vegetation plot corner or cross section).

During June and July 2013, approximately two bankfull events were documented on the crest gage. These events occurred during early June and late/early June/July 2013. The following chart depicts information from the nearby weather station.

Observation Date(s)	Observation Amount (inches)*	Bankfull Event
6/2/2013 to 6/10/2013	4.36	Likely
6/26/2013 to 7/3/2013	4.16	Likely

*Precipitation data from Siler City Airport (SILR) weather station, approximately 12 miles southwest of the Project Site (NC State Climate Office, 2013).

7.0 Report and Data Submission

Monitoring reports will be submitted to the regulatory agencies on an annual basis. All assessments and reporting will follow EEP protocols established during the project period. It is understood that EEP will coordinate any necessary monitoring report submittals with the regulatory agencies. If the monitoring reports indicate any deficiencies in achieving the success criteria on schedule, EEP will coordinate with the resource agencies, as applicable, to determine the extent of remedial actions necessary. In some cases, EEP may be required to submit a remedial action plan, as necessary, as part of the annual monitoring report. Vegetative monitoring will be conducted during the late summer months (growing season) of each monitoring year. Monitoring reports will be provided no later than December 15. The proposed schedule is provided below detailing the monitoring dates.

Proposed Monitoring Schedule

February 2013	Construction activities completed.
October 2013	Complete Year One Monitoring.
December 2013	Submit Year One Monitoring Report.
August 2014	Complete Year Two Monitoring.
December 2014	Submit Year Two Monitoring Report.
August 2015	Complete Year Three Monitoring.
December 2015	Submit Year Three Monitoring Report.
August 2016	Complete Year Four Monitoring.
December 2016	Submit Year Four Monitoring Report.
August 2017	Complete Year Five Monitoring.
December 2017	Submit Year Five Monitoring Report.
August 2018	Complete Year Six Monitoring Report (vegetation only)
December 2018	Submit Year Six Monitoring Report (vegetation only)

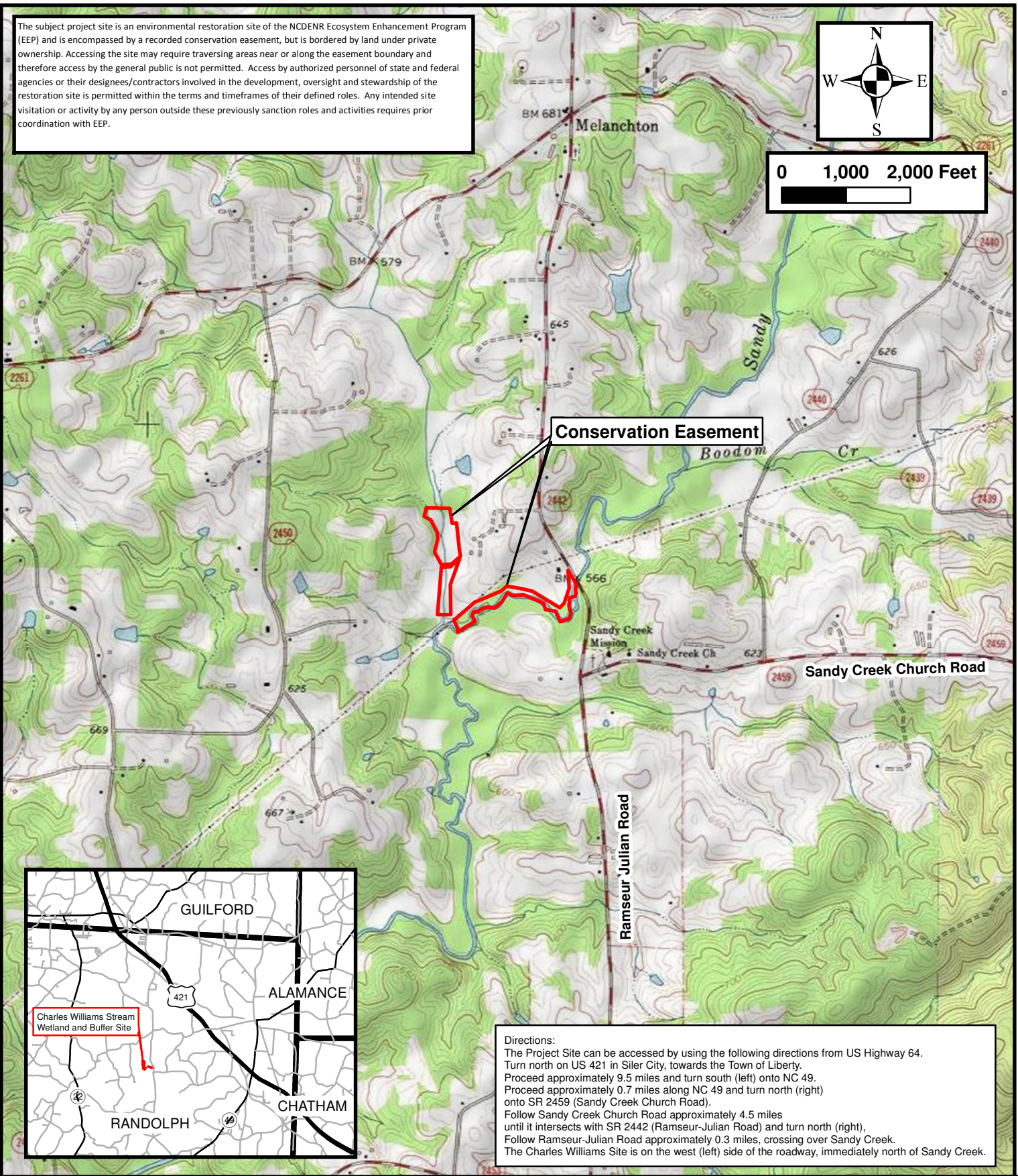
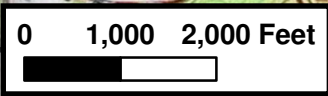
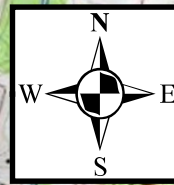
8.0 References

- Lee, Michael T., R.K. Peet, S.D. Roberts and T.R. Wentworth, 2006. CVS-EEP Protocol for Recording Vegetation, Version 4.0 (<http://cvs.bio.unc.edu/methods.htm>).
- NCDENR Ecosystem Enhancement Program, 2013. Charles Williams Site Final Report. Prepared by Ecological Engineering, LLP.
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- Piedmont Triad Council of Government (PTCOG), 2008. Little Alamance, Travis and Tickle Creek Watershed Restoration Plan. Prepared for and Funded by EEP. Available: <http://www.nceep.net/pages/lwplanning.htm>).
- US Army Corps of Engineers, US Environmental Protection Agency, NC Wildlife Resources Commission and NC Department of Environment Division of Water Quality, 2003. Stream Mitigation Guidelines.
- US Army Corps of Engineers, 1987. Corps of Engineers Wetland Delineation Manual. Technical Report Y-87-1. AD/A176.

Appendix A.

General Figures and Tables

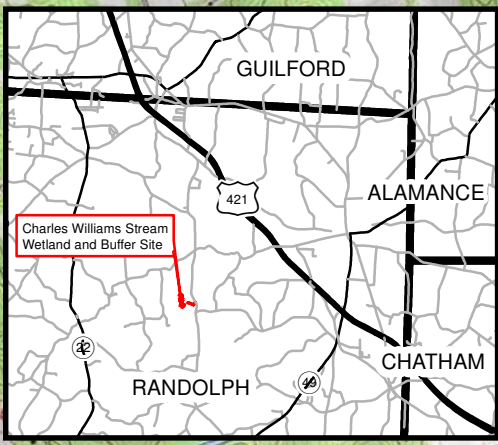
The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside these previously sanctioned roles and activities requires prior coordination with EEP.



Conservation Easement

Sandy Creek Church Road

Ramseur-Julian Road



Directions:
 The Project Site can be accessed by using the following directions from US Highway 64. Turn north on US 421 in Siler City, towards the Town of Liberty. Proceed approximately 9.5 miles and turn south (left) onto NC 49. Proceed approximately 0.7 miles along NC 49 and turn north (right) onto SR 2459 (Sandy Creek Church Road). Follow Sandy Creek Church Road approximately 4.5 miles until it intersects with SR 2442 (Ramseur-Julian Road) and turn north (right). Follow Ramseur-Julian Road approximately 0.3 miles, crossing over Sandy Creek. The Charles Williams Site is on the west (left) side of the roadway, immediately north of Sandy Creek.

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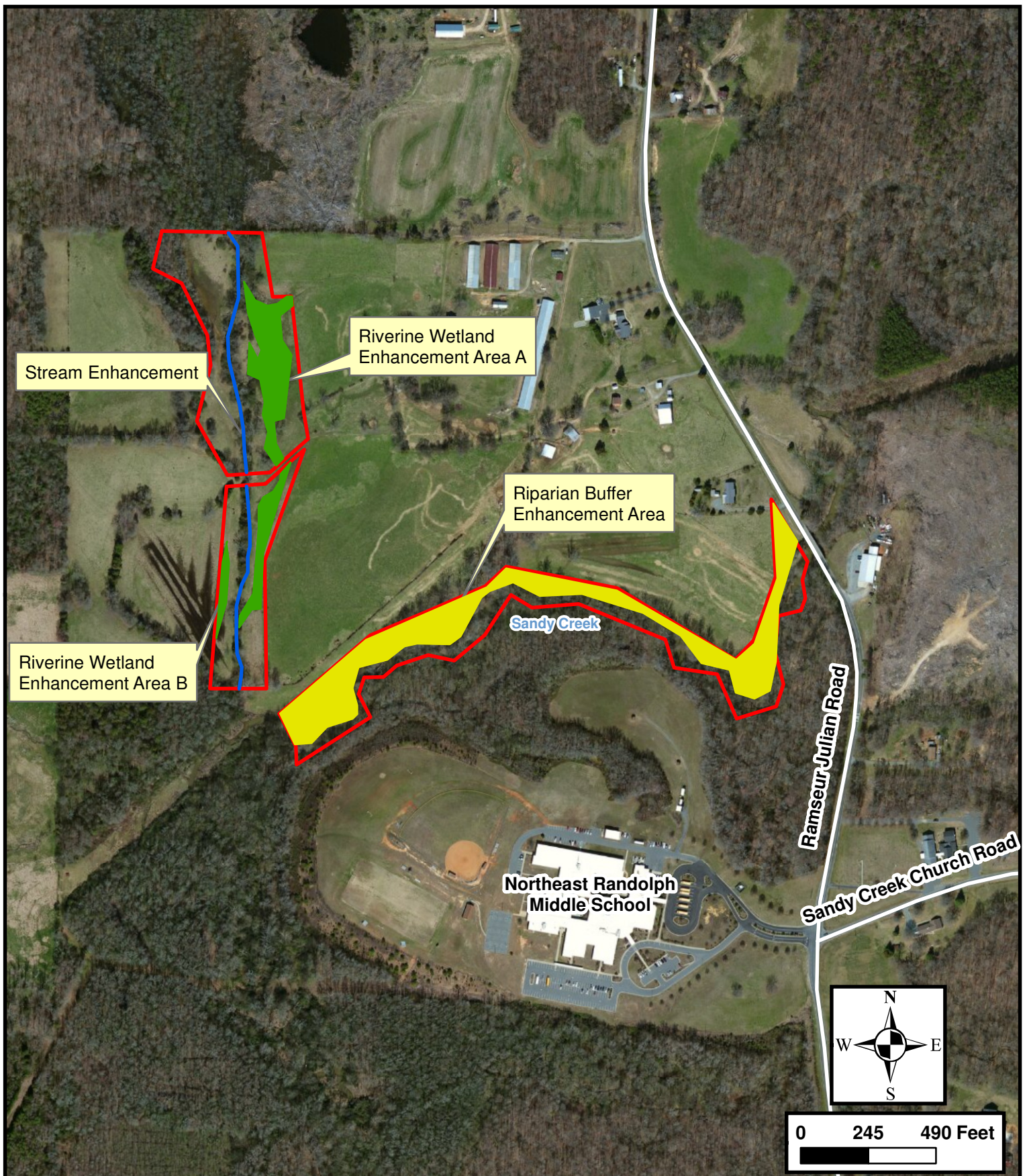
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**Charles Williams Site
 Vicinity Map
 Randolph County, NC
 EEP Contract No. D08035S
 July 2013**

Source: USGS Quadrangle Maps (Grays Chapel)

**FIGURE
 1**



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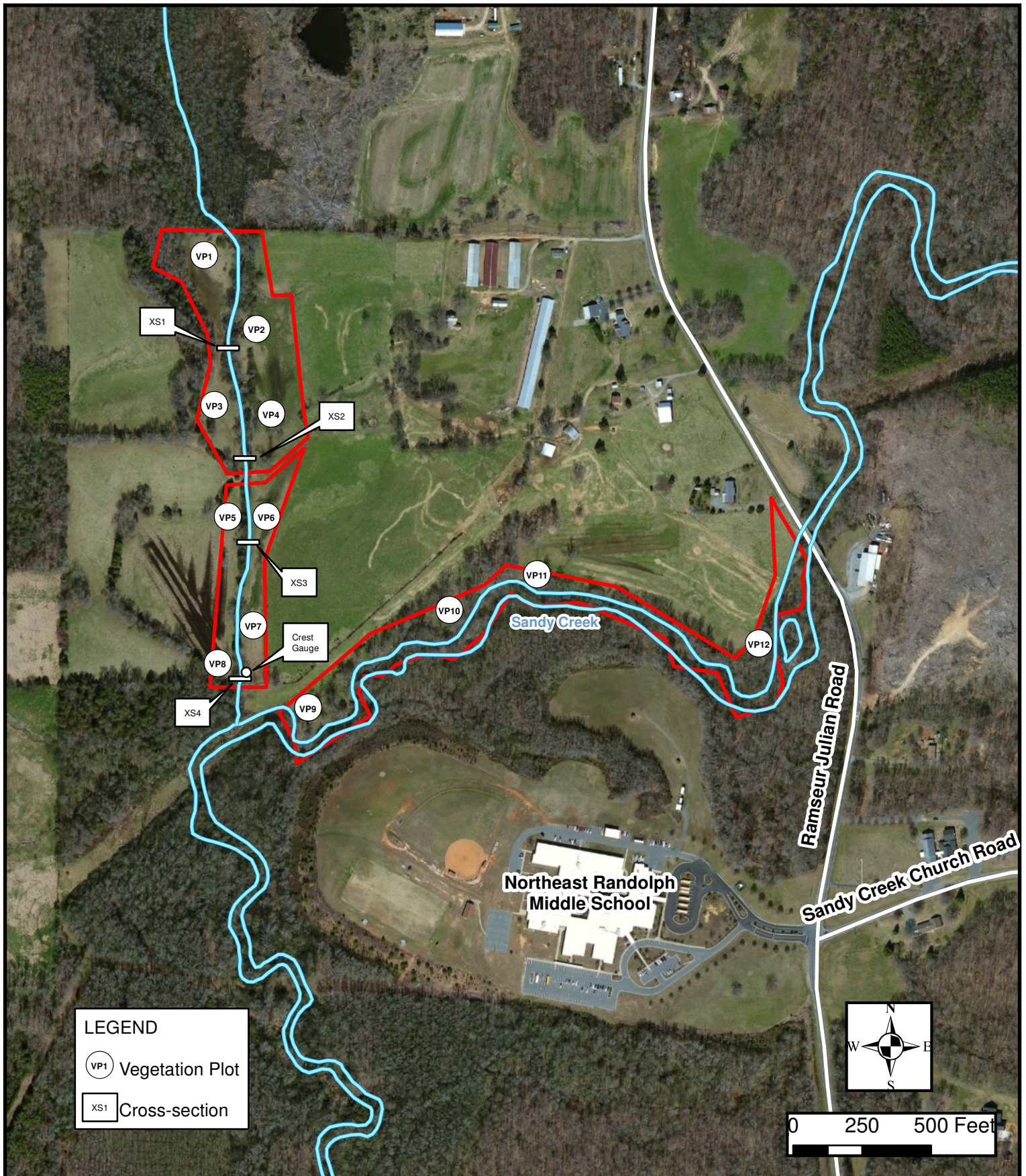


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**Charles Williams Site
 Mitigation Components
 Randolph County, NC
 EEP Contract No. D08035S
 July 2013**

**FIGURE
 2**




LEGEND

VP1 Vegetation Plot


XS1 Cross-section

0 250 500 Feet

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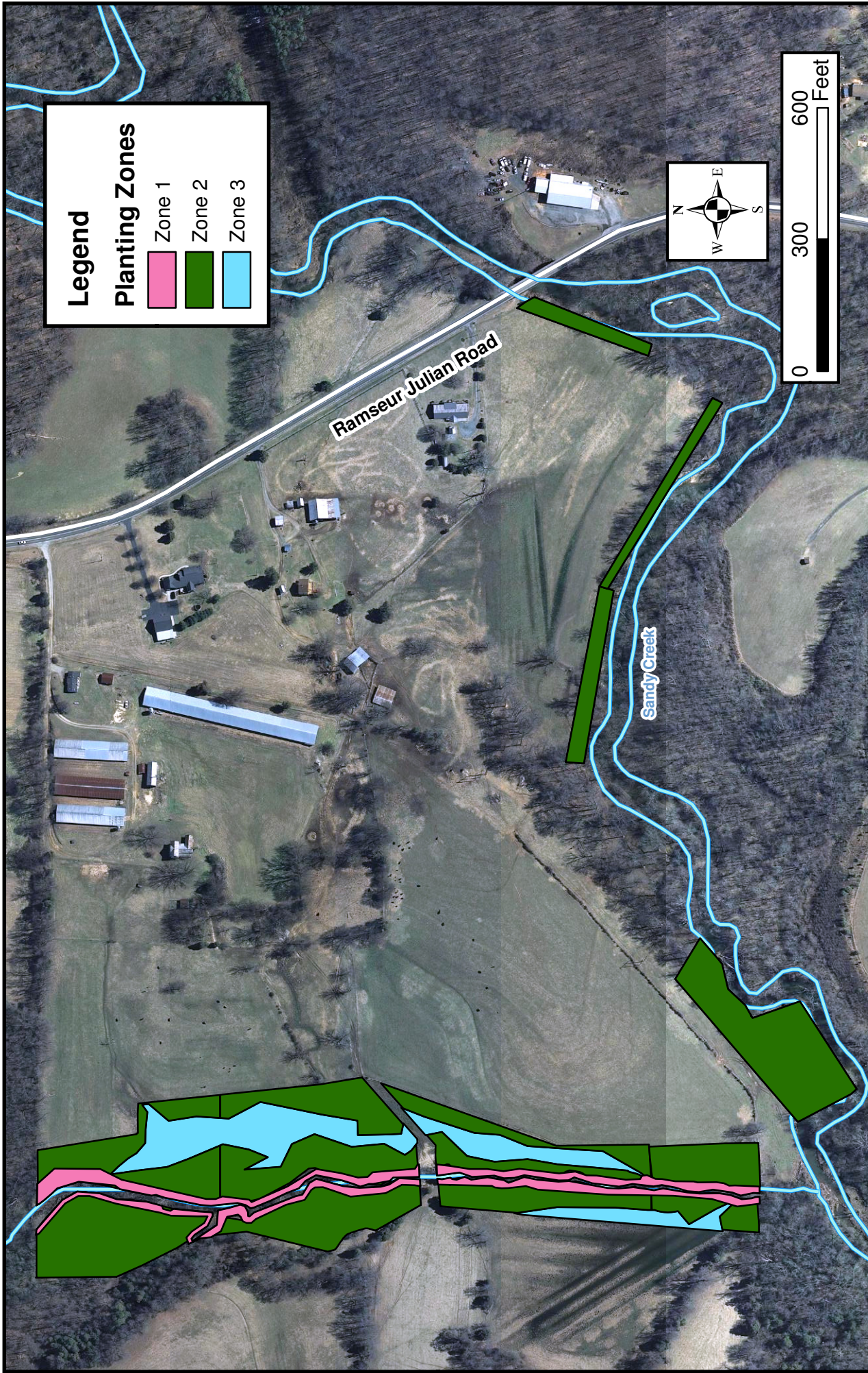


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Charles Williams Site
Site Features
Randolph County, NC
EEP Contract No. D08035S
July 2013

FIGURE
3



Legend

Planting Zones

- Zone 1
- Zone 2
- Zone 3

**Charles Williams Site
Planting Zones
Randolph County, NC
EEP Contract No. D08035S
July 2013**

Source: USGS Quadrangle Maps (Grays Chapel)

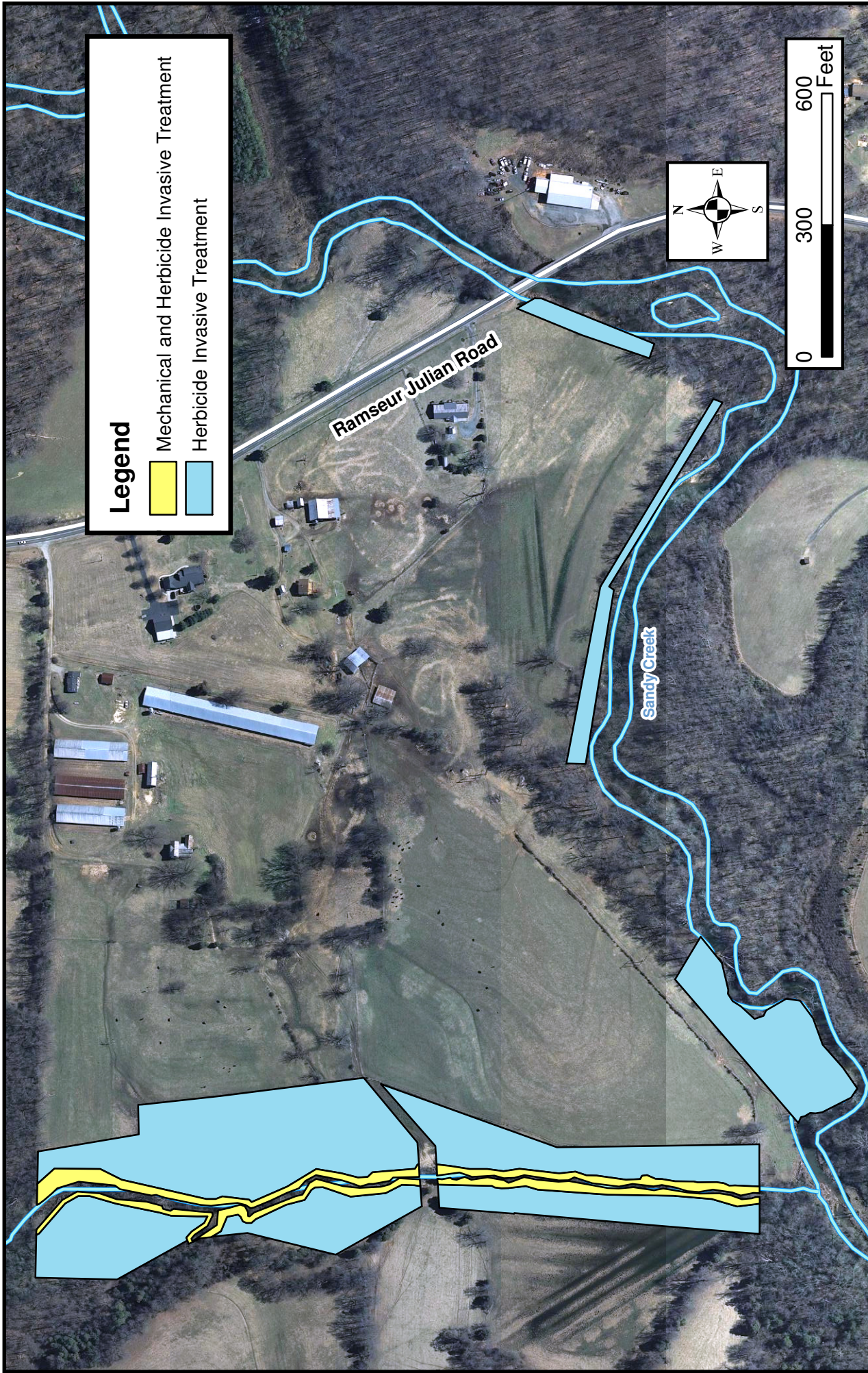
**FIGURE
4**



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Legend

- Mechanical and Herbicide Invasive Treatment
- Herbicide Invasive Treatment



**Charles Williams Site
 Invasive Treatment
 Randolph County, NC
 EEP Contract No. D08035S
 July 2013**

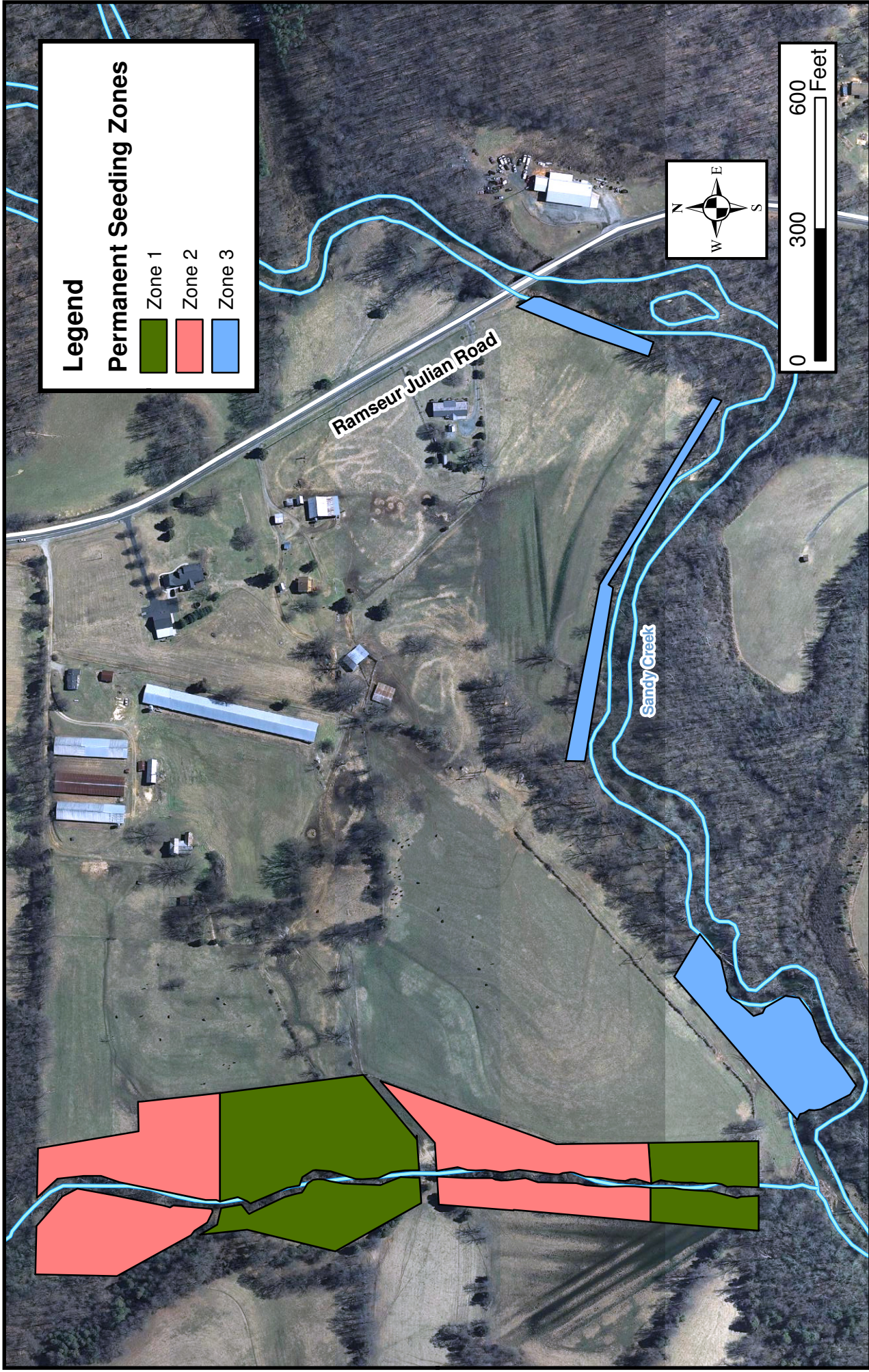
Source: USGS Quadrangle Maps (Grays Chapel)

**FIGURE
 5**

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Legend

Permanent Seeding Zones

- Zone 1
- Zone 2
- Zone 3

Charles Williams Site
Permanent Seeding Zones
Randolph County, NC
EEP Contract No. D08035S
July 2013

Source: USGS Quadrangle Maps (Grays Chapel)

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ECOLOGICAL ENGINEERING

Ecosystems Enhance & Nurture

FIGURE 6

**Table 1. Project Components and Mitigation Credits
Charles Williams Stream, Wetland and Buffer Site / 80**

Mitigation Credits									
	Stream		Riparian Wetland		Non-riparian wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals		1,169		0.98			94,351.00		
Project Components									
Project Component	Stationing/Location		Existing Footage/Acreage		Approach	Restoration or Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio	
UT to Sandy Creek	10+00 to 27+53		1,753 linear feet		EI	RE	1,165.16	1.5 : 1	
Sandy Creek Riparian Buffer	area adjacent to Sandy Creek		94,351 square feet		R	R	94,351.00	1 : 1	
Riverine Wetland Area A	area east of UT to Sandy Creek		1.65 acres		E	RE	0.825	2 : 1	
Riverine Wetland Area B	area west of UT to Sandy Creek		0.31 acres		E	RE	0.155	2 : 1	
Component Summation									
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)	Upland (acres)			
		Riverine	Non-riverine						
Restoration									
Enhancement							94,351.00		
Enhancement I	1,753								
Enhancement II									
Creation									
Preservation									
HQ Preservation									
BMP Elements									
Element	Location	Purpose/Function			Notes				
BMP Elements									
BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer.									

**Table 2. Project Activity and Reporting History
Charles Williams Stream Wetland and Buffer Site / 80**

Activity or Report	Data Collection Complete	Completion or Delivery
Mitigation Plan	September-08	May-09
Final Design - Construction Plans	November-09	April-12
Construction		February-13
Temporary S&E Mix Applied to Entire Project Area		January-13
Permanent Seed Mix Applied to Entire Project Area		January-13
Live Stake Plantings Applied		January-13
Bare-rooted Planting Applied*		* see note below
Baseline Monitoring Document	June-13	July-13
Year 1 Monitoring		
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		
Year 6 Monitoring (vegetation only)		

* Note: Bare-root planting will occur between December 15, 2013 and March 15, 2014

**Table 3. Project Contact Table
Charles Williams Stream Wetland and Buffer Site / 80**

Designer Ecological Engineering, LLP Jenny S. Fleming, PE	Firm Information/ Address 1151 SE Cary Parkway, Suite 101, Cary, NC 27518 (919) 557-0929
Construction Contractor Riverworks, Inc. Bill Wright	Firm Information/ Address 8000 Regency Parkway, Suite 800, Cary, NC 27518 (919) 459-9001
Hauling Contractor Strader Fencing, Inc.	Firm Information/ Address 5434 Amick Road, Julian, NC 27283 (336) 697-7005
Planting Contractor Riverworks, Inc. George Morris	Firm Information/ Address 8000 Regency Parkway, Suite 800, Cary, NC 27518 (919) 459-9001
Seeding Contractor Strader Fencing, Inc. Kenneth L. Strader	Firm Information/ Address 5434 Amick Road, Julian, NC 27283 (336) 697-7005
Seed Mix Sources	Green Resource, LLC (336) 855-6363
Nursery Stock Suppliers (live stakes only)	Foggy Mountain Nursery (336) 384-5323 Mellow Marsh Farm (919) 742-1200
Monitoring Performer Ecological Engineering, LLP Lane Sauls (stream, vegetation & wetland)	Firm Information/ Address 1151 SE Cary Parkway, Suite 101, Cary, NC 27518 (919) 557-0929

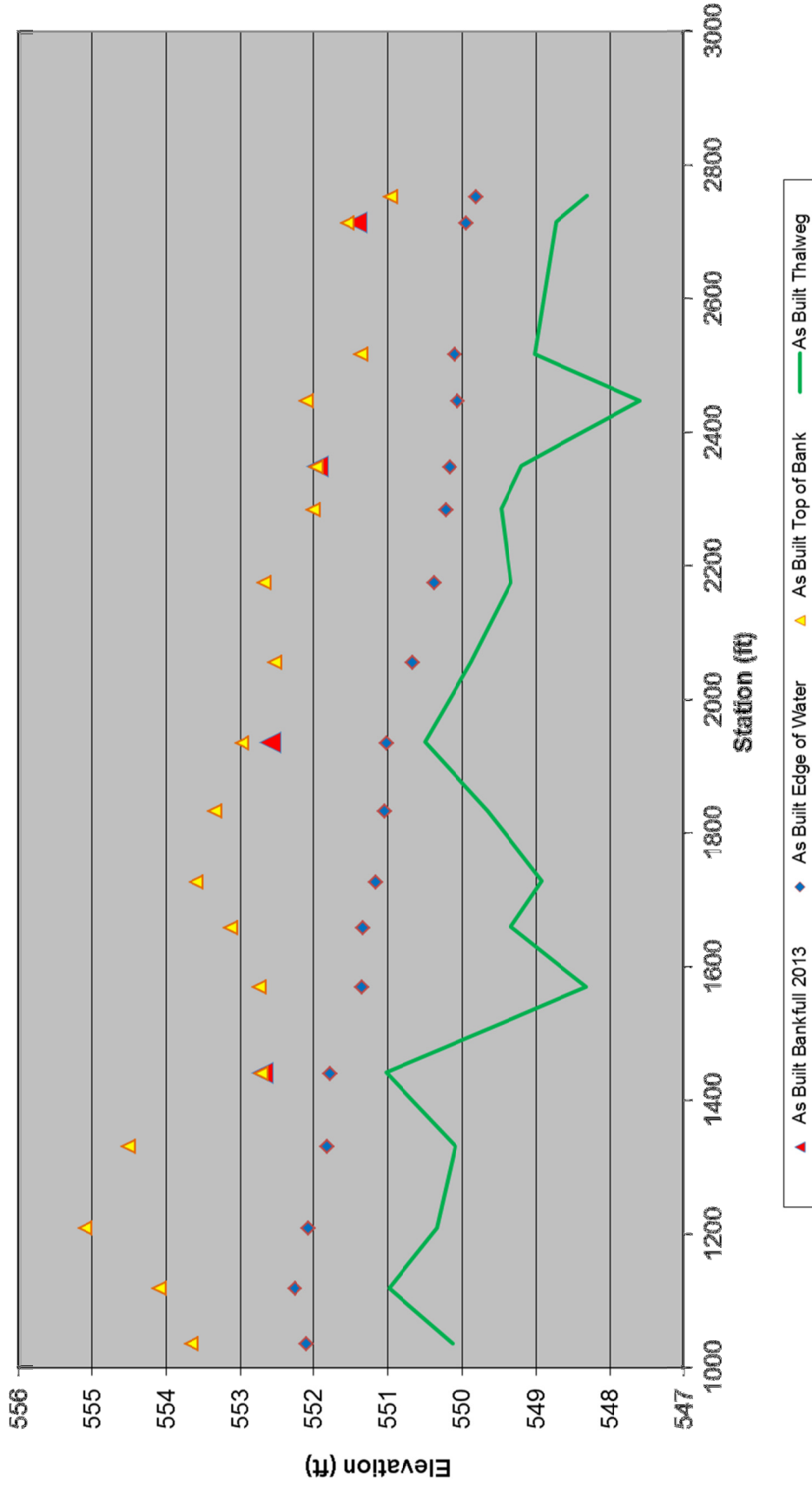
**Table 4. Project Baseline Information and Attributes
Charles Williams Stream Wetland and Buffer Site / 80**

Project Information			
Project Name	Charles Williams Stream Wetland and Buffer Site		
County	Randolph		
Project Area	18 acres		
Project Coordinates (latitude and longitude)	35°49'31.95" North/ 79°39'02.64" West		
Project Watershed Summary Information			
Physiographic Province	Piedmont		
River Basin	Cape Fear		
USGS Hydrologic Unit 8-digit	03030003	USGS Hydrologic Unit 14-digit	03030003020010
DWQ Subbasin	03-06-09		
Project Drainage Area	4.9 sq. mi.		
Project Drainage Area Percentage of Impervious Area	5 to 6%		
CGIA Land Use Classification	Agricultural Land		
Reach Summary Information			
Length of Reach	1,753 linear feet		
Valley Classification	Valley Type VIII		
Drainage Area	4.9 sq. mi.		
NCDWQ Stream ID Score	>50		
NCDWQ Water Quality Classification	WS-III		
Morphological Description (stream type)	C5		
Evolutionary Trend	C-G-F-E-C		
Underlying Mapped Soils	Chewacla loam		
Drainage Classification	Poorly drained		
Soil Hydric Status	Hydric B		
Slope	0 to 2%		
FEMA Classification	Zone AE		
Native Vegetation Community	Piedmont Alluvial Forest		
Percent Composition of Exotic Invasive Species	Less than 5%		
Wetland Summary Information			
Size of Wetland	1.96 acres		
Wetland Type	Riverine		
Mapped Soil Series	Chewacla loam		
Drainage Classification	Somewhat poorly drained		
Soil Hydric Status	Hydric B		
Source of Hydrology	Overbank flooding		
Hydrologic Impairment	None		
Native Vegetation Community	Piedmont Alluvial Forest		
Percent Composition of Exotic Invasive Species	Less than 5%		
Regulatory Considerations			
Waters of the United States - Section 404	Resolved		
Waters of the United States - Section 401	Resolved		
Endangered Species Act	Resolved		
Historic Preservation Act	Resolved		
Coastal Zone/Area Management Acts (CZMA/CAMA)	Not Applicable		
FEMA Floodplain Compliance	Resolved		
Essential Fisheries Habitat	Not Applicable		

Appendix B.

Cross Section and Profile Data

Profile Reach
 (UT Sandy Creek Sta. 10+00 to 17+53)



Appendix C.

Baseline Photographs

Baseline Photographs Taken July 2013



Vegetation Plot #1 – Facing southwest



Vegetation Plot #2 – Facing southwest



Vegetation Plot #3 – Facing southwest



Vegetation Plot #4 – Facing southwest



Vegetation Plot #5 – Facing southwest



Vegetation Plot #6 – Facing southwest



Vegetation Plot #7 – Facing southwest



Vegetation Plot #8 – Facing southwest



Vegetation Plot #9 – Facing southwest



Vegetation Plot #10 – Facing southwest



Vegetation Plot #11 – Facing southwest



Vegetation Plot #12 – Facing southwest



Cross Section #1 – Facing downstream



Cross Section #1 – Facing west



Cross Section #2 – Facing downstream



Cross Section #2 – Facing west



Cross Section #3 – Facing downstream



Cross Section #3 – Facing west



Cross Section #4 – Facing downstream



Cross Section #4 – Facing west

Appendix D.

Record Drawings



VICINITY MAP
NOT TO SCALE

DIRECTIONS TO PROJECT SITE

- US 421 TO NC 49.
- TURN SOUTH ON NC 49.
- PROCEED APPROXIMATELY 0.7 MILES AND TURN NORTH ON SR 2459 (SANDY CREEK CHURCH ROAD).
- PROCEED APPROXIMATELY 4.5 MILES TO INTERSECTION WITH SR 2442 (RAMSEUR JULIAN ROAD). TURN NORTH.
- PROCEED APPROXIMATELY 0.3 MILES AND CROSS OVER SANDY CREEK. PROJECT ENTRANCE IS ALONG THE WEST SIDE OF ROADWAY, IMMEDIATELY NORTH OF THE BRIDGE OVER SANDY CREEK.

DISTURBED AREA ACREAGE: 4.8 AC

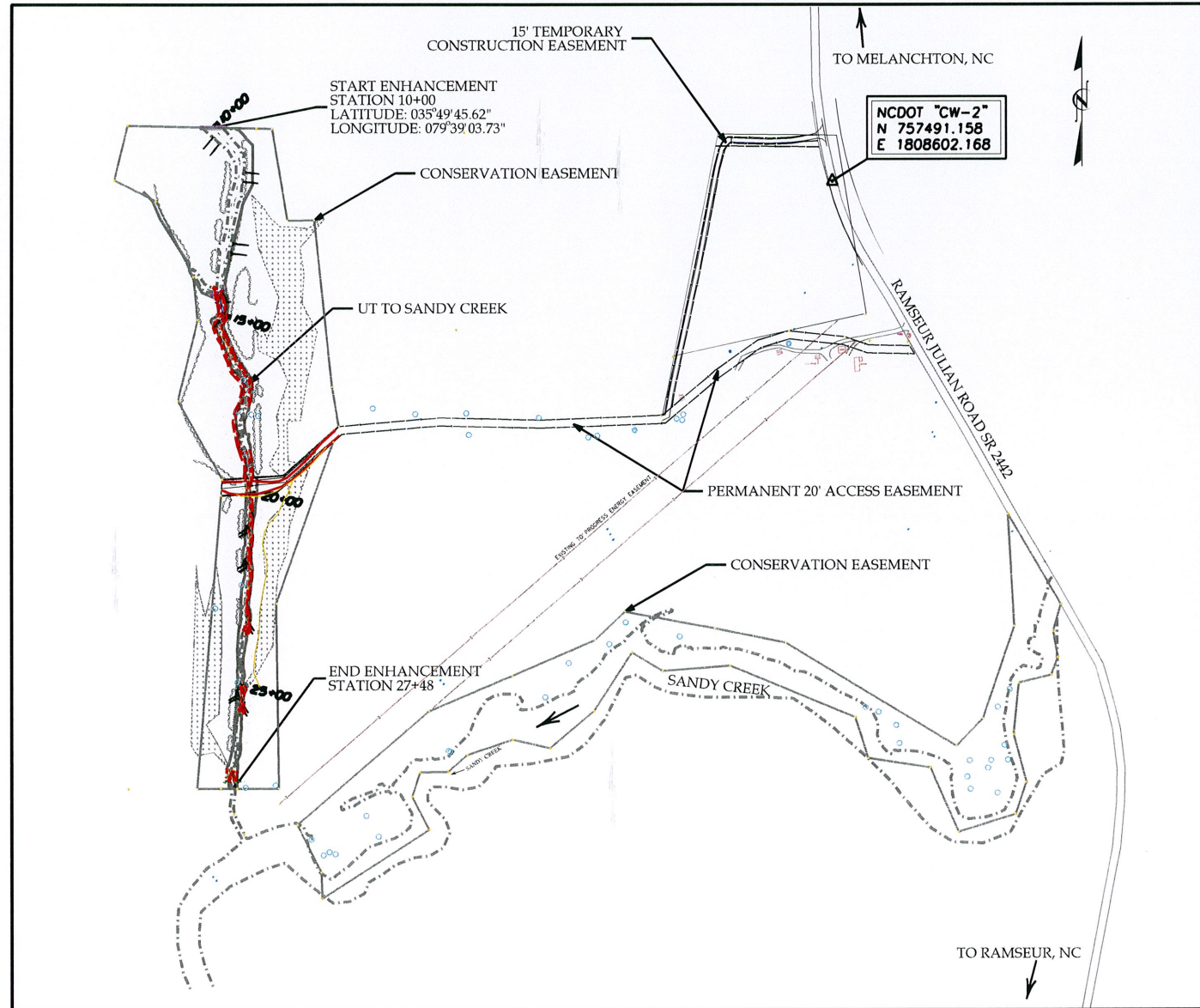
PROJECT LENGTH:

UT TO SANDY CREEK LENGTH: 1,748 LF
SANDY CREEK BUFFER ENHANCEMENT: 4.7 AC
WETLAND ENHANCEMENT: 1.96 AC

SANDY CREEK-CHARLES WILLIAMS STREAM, WETLAND AND BUFFER SITE

RANDOLPH COUNTY, NC

SCO PROJECT #070712501
EEP PROJECT #80



INDEX OF SHEETS

SHEET NUMBER	SHEET
PSH-01	Title Sheet
PSH-07	Structure Data
PSH-08 b, c	Grading Plans Plan and Profile
PSH-09.a	Site Stabilization Plan

JENNY SUMMERLIN FLEMING, PE
SENIOR PROJECT ENGINEER

G. LANE SAULS
PROJECT MANAGER

(919) 557-0929
OFFICE PHONE NUMBER

PREPARED FOR THE OFFICE OF:

ECOSYSTEM ENHANCEMENT PROGRAM
EEP Project Manager: Melonie Allen
EEP Review Coordinator: Wyatt Brown
SCO# 070712501

PROJECT ENGINEER
4/9/13

REVISIONS

SANDY CREEK-CHARLES WILLIAMS
STREAM, WETLAND AND BUFFER SITE
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

April 9, 2013
DATE

10227-010
PROJECT NO.

PSH-01
SHEET

**ECOLOGICAL
ENGINEERING**
1151-101, SE Cary Parkway, Cary, NC 27518-9155, 919.557.0929

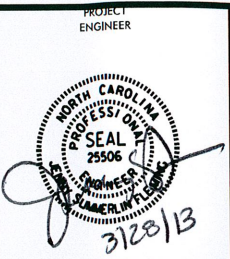
RECORD DRAWINGS

STRUCTURE DATA

Structure Table							
UT to Sandy Creek (Design)				UT to Sandy Creek (Constructed)			
Structure Number	Structure Type	Station	Thalweg Elevation	Bankfull Elevation	Constructed Invert Elevation	Constructed Arm Angle	Constructed Arm Slope
1	Cross Vane	14+40	551.39	553.99	551.62	20°	3.10%
2	Log Vane	14+90	551.25	553.85	550.94	30°	7.06%
3	Log Vane	15+17	550.68	553.28	Eliminated		
6	Log Vane	20+38	549.10	551.70	549.97	20°	2.00%
7	Log Vane w/ Rootwads	20+77	549.04	551.64	Eliminated		
8	Log Vane	21+25	548.96	551.56	550.17	24°	2.00%
9	Log Vane w/ Rootwads	21+65	548.90	551.50	Eliminated		
10	Log Vane w/ Rootwads	23+15	548.61	551.21	Only Root Wads Installed		
11	Log Vane w/ Rootwads	25+04	548.22	550.82	Eliminated		
12	Log Vane w/ Rootwads	25+29	548.17	550.77	549.73	30°	3.20%
13	Cross Vane	27+27	547.76	550.36	549.37	30°	5.30%

Constructed Riffle Table						
UT to Sandy Creek (Design)				UT to Sandy Creek (Constructed)		
Structure Number	Type	Station	Beginning Elevation	Ending Elevation	Beginning Elevation	Ending Elevation
5	At-grade stream crossing	19+87	549.18	549.15	550.88	550.79

Stream Crossing Table						
UT to Sandy Creek (Design)				UT to Sandy Creek (Constructed)		
Structure Number	Type	Station	Beginning Elevation	Ending Elevation	Beginning Elevation	Ending Elevation
4	2 @ 60" CSP	19+67	545.21	545.18	548.83	548.73



REVISIONS					
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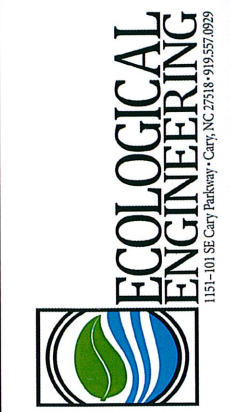
STRUCTURE DATA
FOR THE
SANDY CREEK-CHARLES WILLIAMS
STREAM, WETLAND AND BUFFER SITE
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

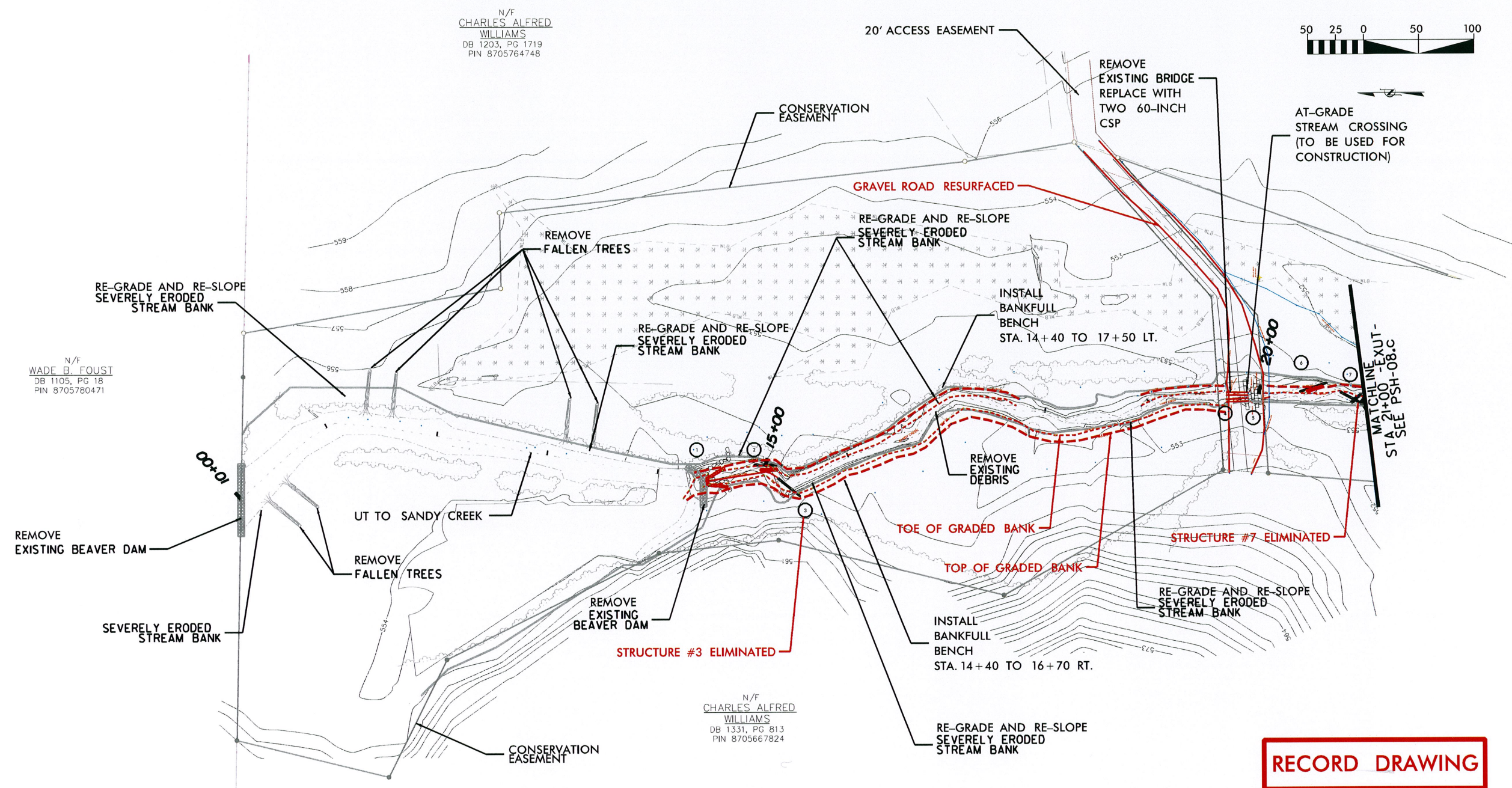
MARCH 28, 2013
DATE

10227-010
PROJECT NO.

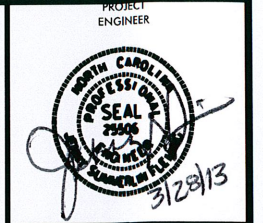
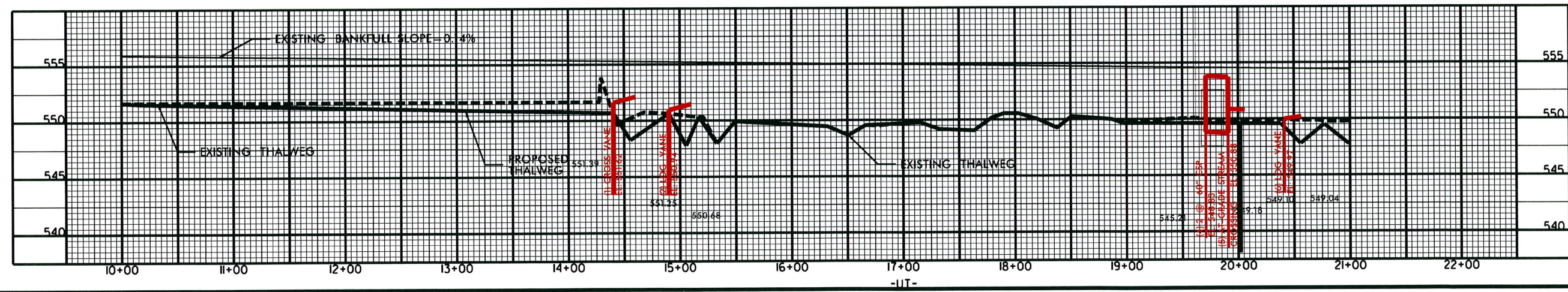
PSH-07
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NOT TO SCALE





RECORD DRAWING

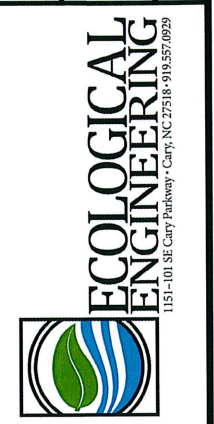


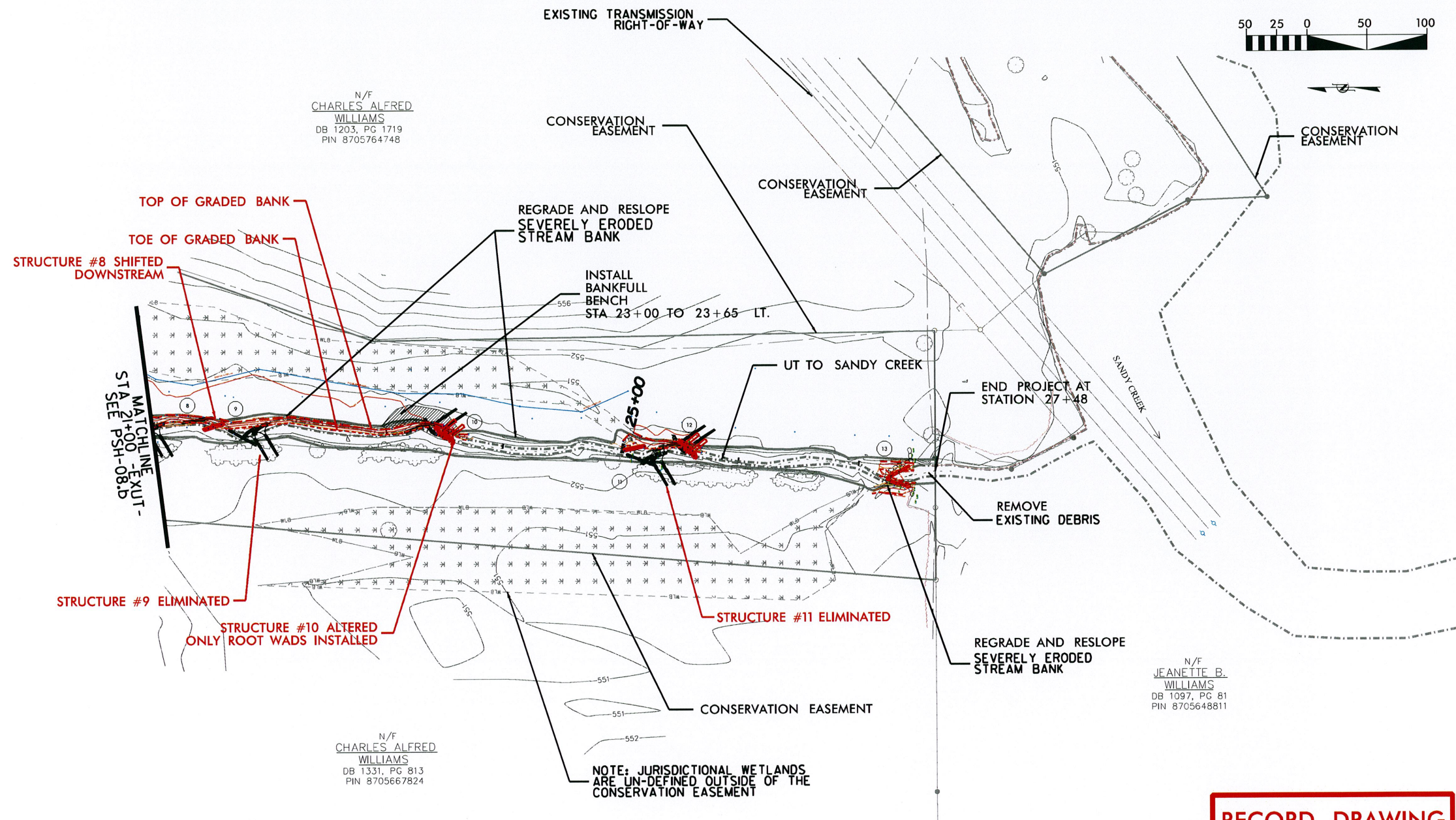
REVISIONS

PLAN AND PROFILE
SANDY CREEK-CHARLES WILLIAMS
STREAM, WETLAND AND BUFFER SITE
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

MARCH 28, 2013 DATE	10227-010 PROJECT NO.
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PSH-08.b	
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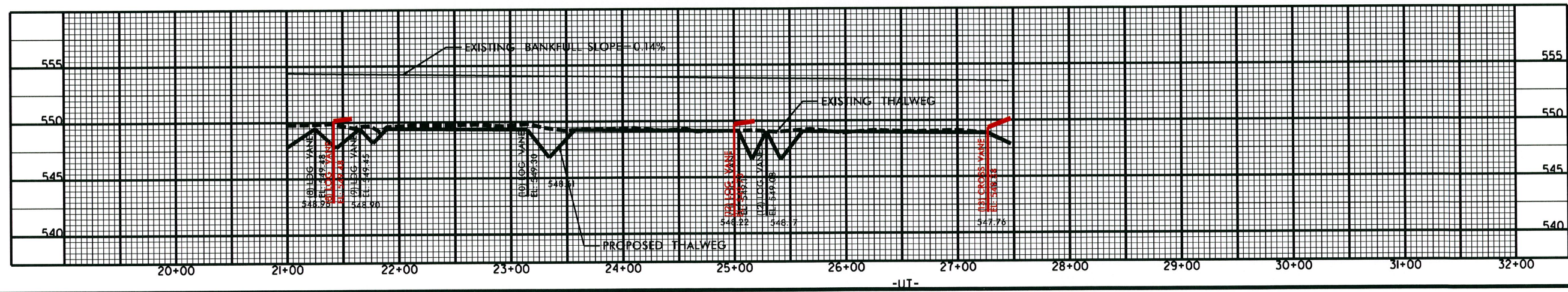
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CHARLES ALFRED
WILLIAMS
DB 1203, PG 1719
PIN 8705764748

N/F
CHARLES ALFRED
WILLIAMS
DB 1331, PG 813
PIN 8705667824

N/F
JEANETTE B.
WILLIAMS
DB 1097, PG 81
PIN 8705648811

NOTE: JURISDICTIONAL WETLANDS
ARE UN-DEFINED OUTSIDE OF THE
CONSERVATION EASEMENT

RECORD DRAWING



REVISIONS

PLAN AND PROFILE
SANDY CREEK-CHARLES WILLIAMS
STREAM, WETLAND AND BUFFER SITE
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NC DEPARTMENT OF ENVIRONMENT
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ECOSYSTEM ENHANCEMENT PROGRAM

MARCH 28, 2013 DATE	10227-010 PROJECT NO.
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PSH-08.c SHEET	
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SITE STABILIZATION PLAN

PERMANENT SEEDING (BY ZONE) Ds3

Zone 1					Acres	4.23
Species Name	Stratum	Commo	Rate: lbs/ac	Total lbs	Mix applied at rate of approx. 30 lbs/ acre	
<i>Festuca rubra</i>	Herb	Red	12 (40%)	50.1		
<i>Trifolium pratense</i>	Herb	Red	6 (20%)	25.4		
<i>Schizachrium scoparium</i>	Herb	Little	4.5 (15%)	19.0		
<i>Elymus virginicus</i>	Herb	Virginia	3 (10%)	12.7		
<i>Panicum clandestinum</i>	Herb	Deer	1.5 (5%)	6.3		
<i>Chasmanthium latifolium</i>	Herb	River	1.5 (5%)	6.3		
<i>Agrostis perennans</i>	Herb	Upland	1.5 (5%)	6.3		
Subtotal			30 (100%)	96.1		
Zone 2					Acres	4.71
Species Name	Stratum	Commo	Rate: lbs/ac	Total lbs	Mix applied at rate of approx. 30 lbs/ acre	
<i>Trifolium pratense</i>	Herb	Red	9 (30%)	42.4		
<i>Schizachyrium scoparium</i>	Herb	Little	7.5 (25%)	35.3		
<i>Elymus virginicus</i>	Herb	Virginia	4.5 (15%)	21.2		
<i>Panicum clandestinum</i>	Herb	Deer	3 (10%)	14.1		
<i>Chasmanthium latifolium</i>	Herb	River	3 (10%)	14.1		
<i>Agrostis perennans</i>	Herb	Upland	3 (10%)	14.1		
Subtotal			30 (100%)	141.2		
Zone 3					Acres	2.27
Species Name	Stratum	Commo	Rate: lbs/ac	Total lbs	Mix applied at rate of approx. 15 lbs/ acre	
<i>Trifolium pratense</i>	Herb	Red	4.5 (30%)	10.2		
<i>Schizachyrium scoparium</i>	Herb	Little	3.75 (25%)	8.5		
<i>Elymus virginicus</i>	Herb	Virginia	2.25 (15%)	5.1		
<i>Panicum clandestinum</i>	Herb	Deer	1.5 (10%)	3.4		
<i>Chasmanthium latifolium</i>	Herb	River	1.5 (10%)	3.4		
<i>Agrostis perennans</i>	Herb	Upland	1.5 (10%)	3.4		
Subtotal			15 (100%)	34.0		
Total (Permanent Seeding)				271.3	11.2	

NOTE:

WETLANDS = 2 ACRES, SEEDED WITH TREATMENT 1 OR TREATMENT 2 SEED MIX.

PERMANENT SEEDING AND PELLETIZED SOIL AMENDMENTS APPLIED TO ALL DISTURBED AREAS, INCLUDING THOSE REQUIRING HERBICIDE TREATMENT.

ALL FESCUE AND MICROSTEGIUM WITHIN EASEMENT TREATED VIA BACKPACK SPRAY APPLICATION OF HERBICIDE. PRIVET AND ROSE TREATED VIA BACKPACK SPRAY APPLICATION OF HERBICIDE OR BASAL BARKED AND PAINTED WITH HERBICIDE.

TEMPORARY SEEDING Ds2

Temporary Seeding Throughout Disturbed Areas				Acres	4.8
Year round	<i>Secale cereale</i>	Herb	Grain rye	130 lbs/ac	Single species to be applied
May - September	<i>Panicum ramosum</i>	Herb	Brown top millet	40 lbs/ac	
May - September	<i>Setaria italica</i>	Herb	German millet	25 lbs/ac	
September - March	<i>Dactylis glomerata</i>	Herb	Orchard grass	15 lbs/ac	

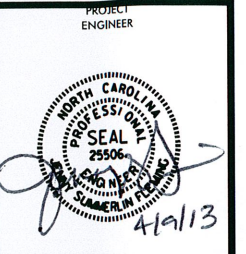
SOIL PREPARATION AND AMENDMENTS

Soil Preparation and Amendment Summary per Zone							
Charles Williams Site - SCO Project Number 070712501, EEP Project Number 80							
Zone 1 - Streamside Area						Acres	0.7
Mechanical Treatment	Approx. Date	Ground Cover Fabric	Mulch Type	Mulch Density / Thickness	Nutrient Amendments	Nutrient Total lbs ¹	
Disking	1/10 - 3/10	Coir	Wheat straw	75% cover	n/a	n/a	
Subtotal						0	
Zone 2 - Riparian Area						Acres	15.1
Mechanical Treatment	Approx. Date	Ground Cover Fabric	Mulch Type	Mulch Density / Thickness	Nutrient Amendments	Nutrient Total lbs	
Herbicide	1/10	n/a	n/a	n/a	n/a	n/a	
Disking	1/10 - 3/10	n/a	Wheat straw	75% cover	10/10/10 Pellet Fertilizer	3020	
n/a	1/10 - 3/10	n/a	n/a	n/a	Ground Limestone	3020	
Subtotal						6040	
Total						6040	15.8

LIVE STAKING/TUBLING

Species	Common Name	Max Spacing	Unit Type	Size	Stratum	Indiv. Spacing	# of Stems
<i>Salix nigra</i>	Black Willow	2'	L	2' - 3'	Subcanopy	4'	1000
<i>Cornus amomum</i>	Silky Dogwood	2'	L	2' - 3'	Shrub	4'	3000
<i>Alnus serrulata</i>	Tag Alder	10'	T	N/A	Shrub	20'	800
<i>Sambucus canadensis</i>	Elderberry	2'	L	2' - 3'	Shrub	4'	3000
<i>Salix sericea</i>	Silky Willow	2'	L	2'-3'	Subcanopy	4'	2000
Total							9800

NOTE: UNIT TYPE CHOICES INCLUDE LIVE STAKE (L) AND TUBLING (T).



REVISIONS
4/20/12-Revised Perm. Seeding Specs per EEP
5/30/12-Revised Soil Amendments

SITE STABILIZATION PLAN FOR THE SANDY CREEK-CHARLES WILLIAMS STREAM, WETLAND AND BUFFER SITE PREPARED FOR NC DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES ECOSYSTEM ENHANCEMENT PROGRAM

April 9, 2013 DATE
10227-010 PROJECT NO.

PSH-09.a SHEET
NOT TO SCALE

