BASELINE MONITORING DOCUMENT AND AS BUILT BASELINE REPORT

FINAL VERSION

UT Altamahaw Site

Alamance County, NC
State Construction Project No. 09-0762301
EEP Project No. 92837

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

2728 Capital Boulevard, Suite 1H 103
Raleigh, NC 27604

March 6, 2012

Prepared by:

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1151 SE Cary Parkway, Suite 101
Cary, NC 27518
919.557.0929

_____
G. Lane Sauls, Jr., Principal

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.

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY/ PROJECT ABSTRACT

The UT Altamahaw Site is located within HUC 03030002 and sub-basin 03-06-02 of the Cape Fear River Basin in Alamance County, North Carolina. It includes portions of two unnamed tributaries to Altamahaw Creek. The enhancement lengths of the main and secondary channels are 1,347 and 130 linear feet, respectively. In addition, 0.026 acres of wetlands were enhanced as part of the overall project. The UT Altamahaw Site is protected for perpetuity under a conservation easement purchased from Mr. Charles Hursey Sr., Charles Hursey II, Christopher Hursey and Carey Hursey in 2008.

Existing landuse issues were the main reason for degradation throughout the Site. These issues included unrestricted livestock access to two unnamed tributaries (UTs) to Altamahaw Creek and their associated riparian areas. This ultimately resulted in gradual degradation throughout the riparian areas. The establishment of a protected conservation easement along these riparian areas 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 the stream channels.

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.

These goals were consistent with the Travis and Tickle Creek Local Watershed Plan (LWP). The LWP, completed in 2008, identified six goals; two of which are met by the Project. These are (1) to improve water quality through stormwater management and (2) identify and rank parcels for retrofits, stream repair, preservation and/or conservation. The Project improved the emergency spillway associated with the existing pond immediately upstream of the Project Site and the existing stream crossing to further prevent erosion into the main stream channel. It also included the design and installation of a modified level spreader to diffuse surface flows from the nearby pasture through a vegetated buffer. In addition, the Site was also one of the specific areas identified through the stakeholder process associated with the LWP.

The LWP process identified nine key watershed stressors and their corresponding management strategies. These stressors were identified via the local stakeholder groups including EEP, Piedmont Land Conservancy, Haw River Assembly, Piedmont Triad Council of Governments, Alamance and Guilford Counties, Natural Resources Conservation Service, Cities of Burlington and Graham, Towns of Elon and Gibsonville, NC Division of Water Quality, NC Wildlife Resources Commission and Resource Conservation & Development. The UT to Altamahaw Stream Enhancement Project combats six of those stressors with the following strategies:

Key Watershed Stressors	Management Strategies
Stream bank erosion	Riparian buffers & livestock exclusion
Lack of adequate buffer	Riparian buffers & livestock exclusion
Stormwater runoff	Stormwater BMPs
Livestock access to streams	Livestock exclusion
Nutrients	Agricultural BMPs, riparian buffers & stormwater BMPs
Fecal coliform	Agricultural BMPs & stormwater BMPs

The objectives were to exclude livestock in their entirety from the easement area and install plantings designed to maintain vertical stability, lateral stability and habitat, as well as re-vegetate and supplement those areas lacking suitable vegetation along the easement area. An alternative water supply was provided and the existing crossing was improved to prevent further erosion. In addition, enhancement of the auxiliary spillway associated with the pond immediately upstream of the Site and construction of a modified level spreader to combat surface flows from the pasture were also completed as part of implementation activities. Ultimately, this supplemental planting will provide increased opportunities for the filtration of pollutants and nutrients prior to entering the stream channel as well as, the stabilization of sediment along the associated stream banks.

Based on existing protocols, baseline data is generally 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 project schedule being delayed approximately one year. Therefore, this baseline document also serves as an existing conditions survey because of this delay.

2.0 PROJECT BACKGROUND AND ATTRIBUTES

2.1 Location and Setting

The UT Altamahaw Creek Site (hereinafter referred to as “the Site”) is in northern Alamance County, east of the community of Altamahaw, approximately two miles east of NC 87 and 0.3 miles south of Altamahaw Union Ridge Road (Figure 1). It is situated in the Piedmont physiographic province and the Cape Fear River Basin (Hydrologic Unit Code 03030002). The Site encompasses approximately 3.6 acres of riparian land situated between two existing pastures and is immediately downstream of a 4.3-acre agricultural pond.

Elevations across the Site range between approximately 625 feet to 640 feet above Mean Sea Level. The following chart depicts existing condition information regarding the Site.

Existing Conditions Summary

Physiographic Province	Piedmont	**County**	Alamance
River Basin Name	Cape Fear	**Property Owner Name**	Charles Hursey
USGS 8-digit HUC	03030002		
USGS 14-digit HUC	03030002030010	**Stream #1 (Main Channel) Name**	UT Altamahaw Creek
NCDWQ Subbasin	03-06-02	**Drainage Area**	0.51 sq. mi. (334 acres)
Underlying Mapped Soil(s)	Worsham sandy loam	**NCDWQ Score**	44.25 & 46.75 (Perennial)
Drainage Class	Poorly drained	**Rosgen Classification**	C/E 5
Hydric Status	A	**Stream #2 (Tributary) Name**	UT to UT Altamahaw Creek
Slope	0-3 %	**Drainage Area**	0.39 sq. mi. (251 acres)
Available Water Capacity	Moderate	**NCDWQ Score**	39.25 (Perennial)
FEMA Classification	Zone AE (lower end)	**Rosgen Classification**	C/E 5
Native Vegetation Observed	Green ash (*Fraxinus pennsylvanica*), white oak (*Quercus alba*), northern red oak (*Quercus rubra*), sweetgum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), mockernut hickory (*Carya tomentosa*), sycamore (*Platanus occidentalis*), willow oak (*Quercus phellos*), blackgum (*Nyssa sylvatica*), ironwood (*Carpinus caroliniana*), red maple (*Acer rubrum*), boxelder (*Acer negundo*), black willow (*Salix nigra*), Eastern red cedar (*Juniperus virginiana*), flowering dogwood (*Cornus florida*), American holly (*Ilex opaca*), grape (*Vitis* sp.), poison ivy (*Toxicodendron radicans*), greenbrier (*Smilax* sp.), thistle (*Carduus* sp.), blackberry (*Rubus* sp.),		
Exotic Vegetation Observed	Tree-of-heaven (*Ailanthus altissima*) – limited number Chinese privet (*Ligustrum sinense*) – limited number		

Source: NCDENR Ecosystem Enhancement Program, 2010

2.2 Project Structure, Restoration Type and Approach

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

As previously noted in Section 1.0, current landuse activities are primarily responsible for the degradation of the streams, wetland and riparian areas at the Site. Cattle had no barriers preventing their access to these areas. In addition, the auxiliary spillway associated with the pond immediately upstream was eroding due to cattle-hoof shear, lack of vegetation and lack of grade control. The overall enhancement of the Site included livestock exclusion from these sensitive areas, stabilization of the auxiliary spillway and the supplemental planting of native vegetation.

2.3 Project History, Contacts and Attribute Data

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.

The EEP Local Watershed Plan identified the Site as one of the critical parcels, currently lacking any controls to prohibit livestock access within the riparian system associated with the unnamed tributaries flowing into the Haw River. According to PTCOG (2008), this parcel is situated along a tributary of Basin Creek (unnamed on current the current US Geological Survey Map), which is the most degraded stream in the Travis and Tickle Creek Watershed. Recommendations included preserving this property and its surrounding area for agriculture and open space. Fencing, stream and associated riparian enhancements were also recommended. EEP purchased a Conservation Easement from Charles Hursey Sr., Charles Hursey II, Christopher Hursey and Carey Hursey in 2008 (Deed Book 1765, Page 523, Plat Book 67, Page 207). Mitigation implementation including

stream and wetland enhancement, fencing, spillway enhancement and supplemental planting was completed in 2011.

3.0 SUCCESS CRITERIA

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

3.1 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.

3.2 Vegetation

Vegetation success criteria at the Site is consistent with the USACE Wilmington Regulatory District's guidance for wetland mitigation which documents the survival of a minimum of 320 planted woody stems/acre after Monitoring Year 3 (MY3). The mortality rate of 10% will be allowed after MY4 assessments (288 stems/acre) and correspondingly, MY5 assessments (260 stems/acre). Invasive, exotic species were present prior to implementation and criteria will also include the removal of all such species prior to project closeout.

4.0 MONITORING PLAN GUIDELINES

4.1 Hydrology

A crest gage was installed near the downstream end of the Site along the main UT (Figure 3). This gage will verify the on-site occurrences of bankfull events. In addition to the crest gage, observations of wrack and deposition will also serve to validate gage observations, as necessary. 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 year's report. Based on the elevation of the crest gage, any readings observed higher than 12 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 Burlington/Alamance Airport, approximately 8.5 miles south of the Site. These amounts will be used to help determine the dates of important rainfall events.

4.2 Vegetation

Vegetation 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 five permanently placed 10-meter^2 vegetation plots (Figure 3). Assessments will be conducted for both planted and natural stems.

4.3 Digital Photographs

Baseline photographs were taken January 5, 2012 to document existing conditions at the Site (Appendix B). Included are 28 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 ultimately result in a summary of vegetation succession at the Site.

5.0 MAINTENANCE AND CONTINGENCY PLANS

The annual reports will document any existing 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 August 2011 once construction implementation activities were completed. A copy of the drawing set is presented in Appendix C.

6.2 Baseline Data Collection

Monitoring feature installation occurred between November 2011 and January 2012 and baseline data collection occurred in early January 2012. As previous noted, assessments covered the easement area (visually) and five vegetation plots. Vegetation Plots were established as 10-meter by 10-meter squares with corners consisting of by 1" x 5' PVC pipes attached to 1/2" x 2" rebar posts. Planted stems within the plot were marked with red/white striped flagging. 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 28 established photostations. These photostations are not individually denoted in the field but tied generally with an identified object (i.e., vegetation plot corner, fence post, etc.).

According to the EEP-CVS vegetation assessment, the Site currently exhibits a mean of approximately 283 planted stems per acre. This is lower than the required number of 320 stems/acre after MY3. Prior to baseline assessments, it was discovered that cattle had accessed the easement area between the completion of implementation activities and baseline assessments. Damages were unrealized at the time; however, based on vegetation counts, it appears that overall seedling mortality can be attributed to this occurrence in addition to common mortality rationales such as drought, inferior specimens, etc. Baseline CVS data is presented in Appendix D.

During December, two bankfull events were documented on the crest gage. These events likely occurred during November 2011. The following chart depicts information from the nearby weather station.

Observation Date	Observation Amount (inches)*	Bankfull Event	Observation Date	Observation Amount (inches)*	Bankfull Event
Nov. 3 & 4, 2011	2.40	Likely	Dec. 5 – 7, 2011	0.34	Not Likely
Nov. 10, 2011	0.02	Not Likely	Dec. 16 & 17, 2011	0.60	Not Likely
Nov. 16 & 17, 2011	1.63	Likely	Dec. 20 – 23, 2011	1.06	Not Likely
Nov. 23, 2011	0.08	Not Likely	Jan. 1 & 2, 2012	0.02	Not Likely
Nov. 28 & 29, 2011	1.73	Likely			

*Precipitation data from Burlington/Alamance Airport weather station (NC State Climate Office, 2012).

7.0 Report and Data Submission

Monitoring reports will be submitted to the regulatory agencies on an annual basis. All drawings and monitoring 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 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

March 2011	Construction/planting activities completed.
August 2012	Complete Year One Monitoring.
December 2012	Submit Year One Monitoring Report.
August 2013	Complete Year Two Monitoring.
December 2013	Submit Year Two Monitoring Report.
August 2014	Complete Year Three Monitoring.
December 2014	Submit Year Three Monitoring Report.
August 2015	Complete Year Four Monitoring.
December 2015	Submit Year Four Monitoring Report.
August 2016	Complete Year Five Monitoring.
December 2016	Submit Year Five Monitoring Report.

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, 2011. UT Altamahaw Creek Final Report. Prepared by Ecological Engineering, LLP.

NCDENR Ecosystem Enhancement Program, 2010. UT Altamahaw Creek Final Mitigation Plan. Prepared by Ecological Engineering, LLP.

NC State Climate Office, 2012. Daily Precipitation Data from Burlington/Alamance Airport (KBUY), Alamance County (www.nc-climate.ncsu.edu).

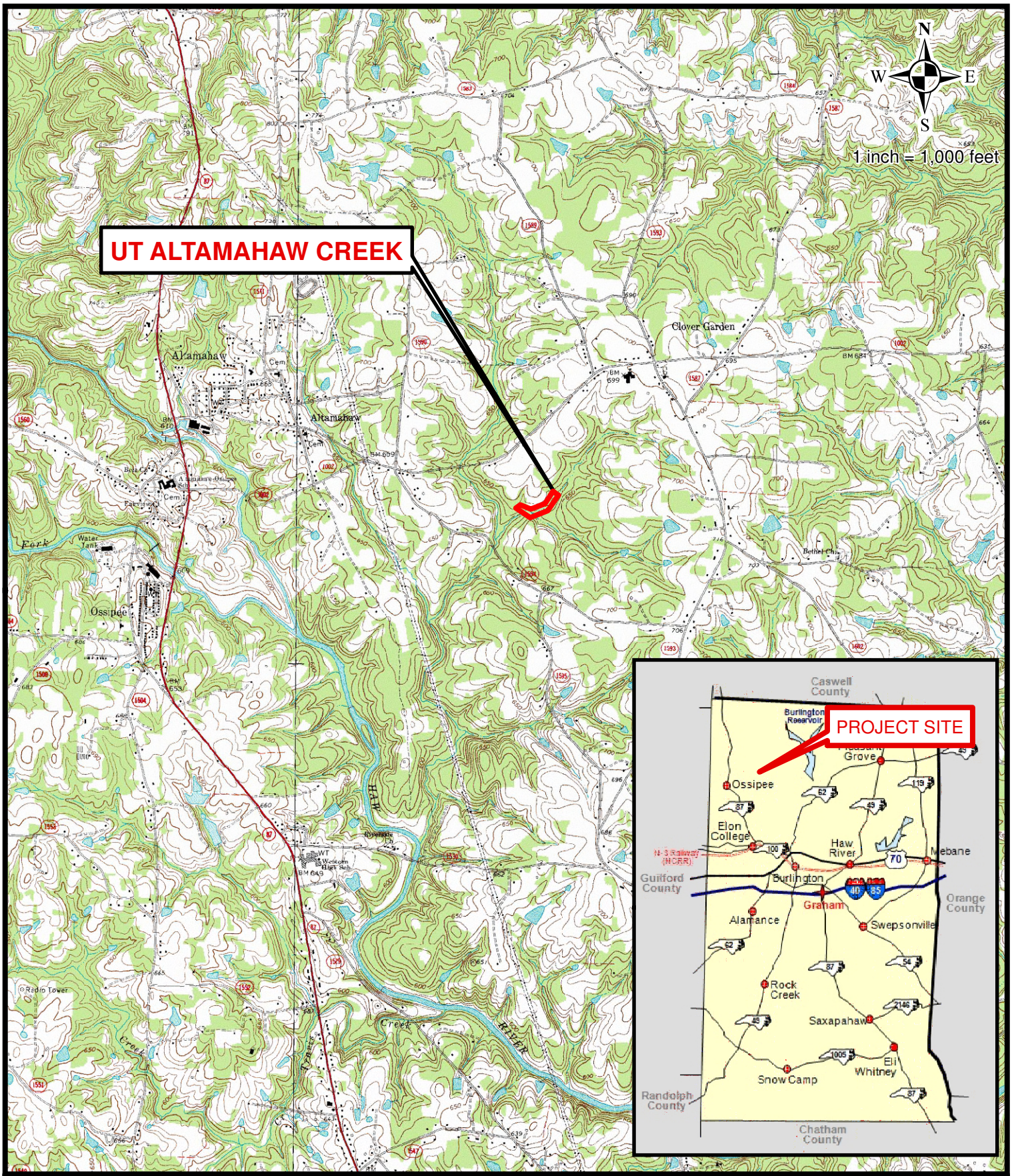
Piedmont Triad Council of Government (PTCOG), 2008. Little Alamance, Travis and Tickle Creek Watershed Restoration Plan. Prepared for and Funded by EEP. Available: http://www.nceep.net/pages/lwplanning.htm.).

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



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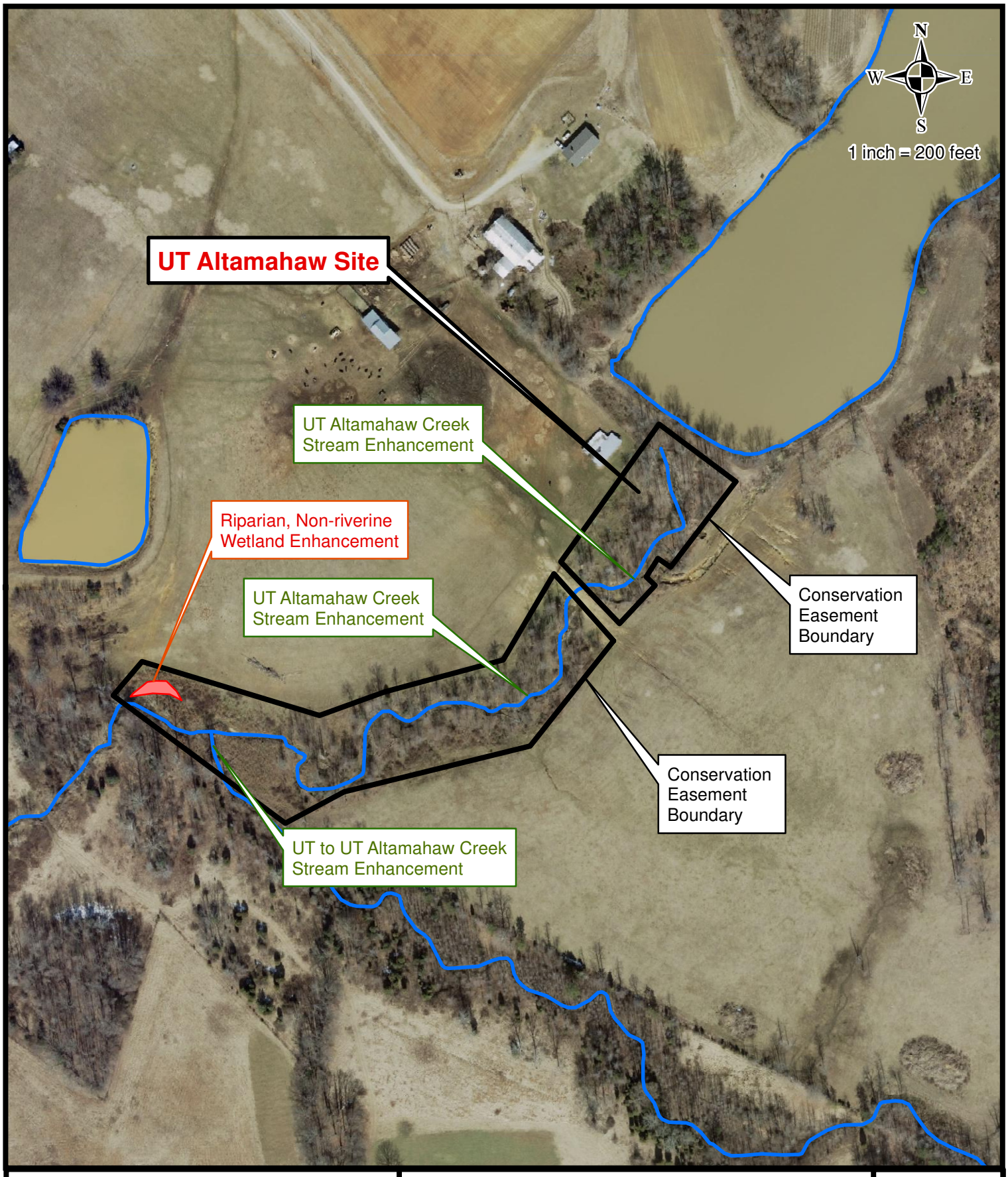
PROJECT SITE VICINITY MAP

UT Altamahaw Creek Site
Alamance County, NC
SCO Project No. 09-0762301
January 19, 2012
Source: NCDOT and NC Atlas & Gazetteer
USGS Quadrangle Maps Ossipee and Lake Burlington

FIGURE 1



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Ecosystem Enhancement Program

AERIAL MAP AND MITIGATION COMPONENTS

UT Altamahaw Creek Site

Alamance County, NC

SCO Project No. 09-0762301

January 19, 2012

Source: NCEEP Orthoimagery server and Alamance County

FIGURE 2

LEGEND

1 PHOTOGRAPH LOCATION

CREST GAGE

50 25 0 50 100

PERMANENT ACCESS EASEMENT

PEGGY GOLDEN REGISTER
DB 2174, PG 834
SAMUEL O BASHAM
JUDI G BASHAW
LIFE ESTATE RESERVED

NCGS "OSSIPEE"
N = 884,322.400 U.S. SURVEY FEET
E = 1,849,778.376 U.S. SURVEY FEET
NC GRID (NAD83-2001)
(NAVD88 VERTICAL)

ERB - COR 8 - EL=628.74
N = 884,216.211 U.S. SURVEY FEET
E = 1,859,012.443 U.S. SURVEY FEET
NC GRID (NAD83-2001)

VEGETATION PLOT #1

CONSERVATION EASEMENT

N 89°20'28" W
9234.88' GROUND DISTANCE
9234.68' GRID DISTANCE
CGF = 0.9999775

CONSERVATION EASEMENT
0.74 AC

CHARLES SYLVESTER HURSEY, SR
CHARLES SYLVESTER HURSEY II
CHRISTOPHER ROBERT HURSEY
CAREY ELIZABETH HURSEY
DB 1765, PG 523
PL B 67, PG 207

CREST GAGE

VEGETATION PLOT #4

UT TO ALTAMAHAW

CONSERVATION EASEMENT
3.01 AC (BY PLAT)
2.92 AC (BY FIELD LOCATION)

VEGETATION PLOT #2

VEGETATION PLOT #5

VEGETATION PLOT #3

CONSERVATION EASEMENT

JAMES E WEBSTER
WILLA JEAN WEBSTER
DB 322, PG 545

CHARLES SYLVESTER HURSEY, SR
CHARLES SYLVESTER HURSEY II
CHRISTOPHER ROBERT HURSEY
CAREY ELIZABETH HURSEY
DB 1765, PG 523
PL B 67, PG 207

REVISIONS

MONITORING PLAN VIEW
FOR THE
UT TO ALTAMAHAW CREEK SITE
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

JANUARY 9, 2012	50512-001	FIGURE 3
DATE	PROJECT NO.	
PLAN VIEW		
SHEET		

Ecological Engineering PLLC
1151 SE Cary Parkway
Suite 101
Cary, NC 27518

Table 1. Project Components and Mitigation Credits
UT Altamahaw/ 92837

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	738.5			0.013					

Project Components

Project Component	Stationing/Location	Existing Footage/ Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
Rip. Non-riverine	Northwest boundary	0.026 acres	E	0.013	0.013 acres	2 to 1
UT Altamahaw Creek	Center of Project Area	1,347 linear feet	EII	673.5	673.5 lf	2 to 1
UT to UT Altamahaw Creek	Southwest boundary	130 linear feet	EII	65	65 lf	2 to 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			0.026 acres			
Enhancement I						
Enhancement II	1,477 linear feet					
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 Dentention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer.

Table 2. Project Activity and Reporting History UT Altamahaw/ 92837		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Mitigation Plan	May-10	May-10
Final Design - Construction Plans	June-10	June-10
Construction		February-11
Temporary S&E Mix Applied to Entire Project Area		February-11
Permanent Seed Mix Applied to Entire Project Area		February-11
Bare Root, Live Stake and Tubling Plantings Applied		February-11
Baseline Monitoring Document	January-12	February-12
Year 1 Monitoring		
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

Table 3. Project Contact Table UT Altamahaw/ 92837	
Designer	**Firm Information/ Address**
Ecological Engineering, LLP Jenny S. Fleming, PE	1151 SE Cary Parkway, Suite 101, Cary, NC 27518 (919) 557-0929
Construction Contractor	**Firm Information/ Address**
Riverworks, Inc. Bill Wright	8000 Regency Parkway, Suite 800, Cary, NC 27518 (919) 459-9001
Planting Contractor	**Firm Information/ Address**
Riverworks, Inc. George Morris	8000 Regency Parkway, Suite 800, Cary, NC 27518 (919) 459-9001
Seeding Contractor	**Firm Information/ Address**
Riverworks, Inc. George Morris	8000 Regency Parkway, Suite 800, Cary, NC 27518 (919) 459-9001
Seed Mix Sources	Green Resource (336) 855-6363
Nursery Stock Suppliers	ArborGen (843) 851-4129 Cure Nursery (919) 542-6186 Foggy Mountain Nursery (336) 384-5323 Mellow Marsh Farm (919) 742-1200 Superior Tree (850) 971-5159
Monitoring Performer	**Firm Information/ Address**
Ecological Engineering, LLP G. Lane Sauls Jr. (stream, vegetation & wetland)	1151 SE Cary Parkway, Suite 101, Cary, NC 27518 (919) 557-0929

Table 4. Project Baseline Information and Attributes UT Altamahaw/ 92837			
Project Information			
Project Name	UT Altamahaw		
County	Alamance		
Project Area	3.6 acres		
Project Coordinates (latitude and longitude)	36°10'43.56'' North/ 79°28'37.91" West		
Project Watershed Summary Information			
Physiographic Province	Piedmont		
River Basin	Cape Fear		
USGS Hydrologic Unit 8-digit	3030002	USGS Hydrologic Unit 14-digit	3030002030010
DWQ Subbasin	03.06.02		
Project Drainage Area	0.51 sq. mi. (334 acres)		
Project Drainage Area Percentage of Impervious Area	Less than 1%		
CGIA Land Use Classification	Agricultural Land		
Reach Summary Information			
Parameters	**Reach 1**	**Reach 2**	
Length of Reach	1,347 linear feet	130 linear feet	
Valley Classification	Valley Type VIII	Valley Type VIII	
Drainage Area	0.51 sq. mi. (334 acres)	0.39 sq. mi. (251 acres)	
NCDWQ Stream ID Score	46.75	39.25	
NCDWQ Water Quality Classification	C NSW	C NSW	
Morphological Description (stream type)	C/E 5	C/E 5	
Evolutionary Trend	E-C-G-F-E-C	E-C-G-F-E-C	
Underlying Mapped Soils	Worsham sandy loam	Worsham sandy loam	
Drainage Classification	Poorly drained	Poorly drained	
Soil Hydric Status	Hydric A	Hydric A	
Slope	0 to 3%	0 to 3%	
FEMA Classification	Zone AE - lower end	Zone AE - lower end	
Native Vegetation Community	Piedmont Alluvial Forest	Piedmont Alluvial Forest	
Percent Composition of Exotic Invasive Species	Less than 5%		
Wetland Summary Information			
Size of Wetland	0.026 acres		
Wetland Type	Seepage		
Mapped Soil Series	Worsham sandy loam		
Drainage Classification	Poorly drained		
Soil Hydric Status	Hydric A		
Source of Hydrology	Groundwater		
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.

Baseline Photographs

UT Altamahaw Baseline Photographs

Photostation 1. Facing south east along y-axis of Vegetation Plot 1.

Photostation 2. Facing south across Vegetation Plot 1.

Photostation 3. Facing northeast towards Vegetation Plot 1.

Photostation 4. Facing east (upstream) along UT Altamahaw Creek.

Photostation 5. Facing north from east corner of existing crossing.

Photostation 6. Facing southwest from south corner of existing crossing.

Photostation 7. Facing south along UT Altamhaw Creek from existing crossing.

Photostation 8. Facing southwest from corner at existing west corner of crossing.

Photostation 9. Facing upstream along UT Altamahaw Creek north of Vegetation Plot 2.

Photostation 10. Facing north along x-axis of Vegetation Plot 2.

Photostation 11. Facing northwest across Vegetation Plot 2.

Photostation 12. Facing west at riparian area from Vegetation Plot 2.

Photostation 13. Facing upstream along UT Altamahaw Creek.

Photostation 14. Facing downstream along UT Altamahaw Creek.

Photostation 15. Facing north along x-axis of Vegetation Plot 3.

Photostation 16. Facing northwest across Vegetation Plot 3.

Photostation 17. Facing north along x-axis of Vegetation Plot 4.

Photostation 18. Facing northwest across Vegetation Plot 4.

Photostation 19. Facing northwest along easement boundary.

Photostation 20. Facing northeast along easement boundary.

Photostation 21. Facing downstream along UT Altamahaw Creek at the crest gage.

Photostation 22. Facing downstream along UT Altamahaw Creek.

Photostation 23. Facing upstream along UT Altamahaw Creek.

Photostation 24. Facing northwest along southern easement boundary.

Photostation 25. Facing northwest along southern easement boundary.

Photostation 26. Facing north along x-axis of Vegetation Plot 5.

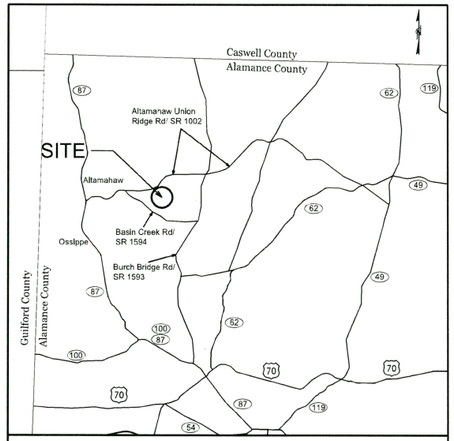
Photostation 27. Facing northwest across Vegetation Plot 5.

Photostation 28. Facing downstream from confluence of two unnamed tributaries.

APPENDIX C.

Record Drawings

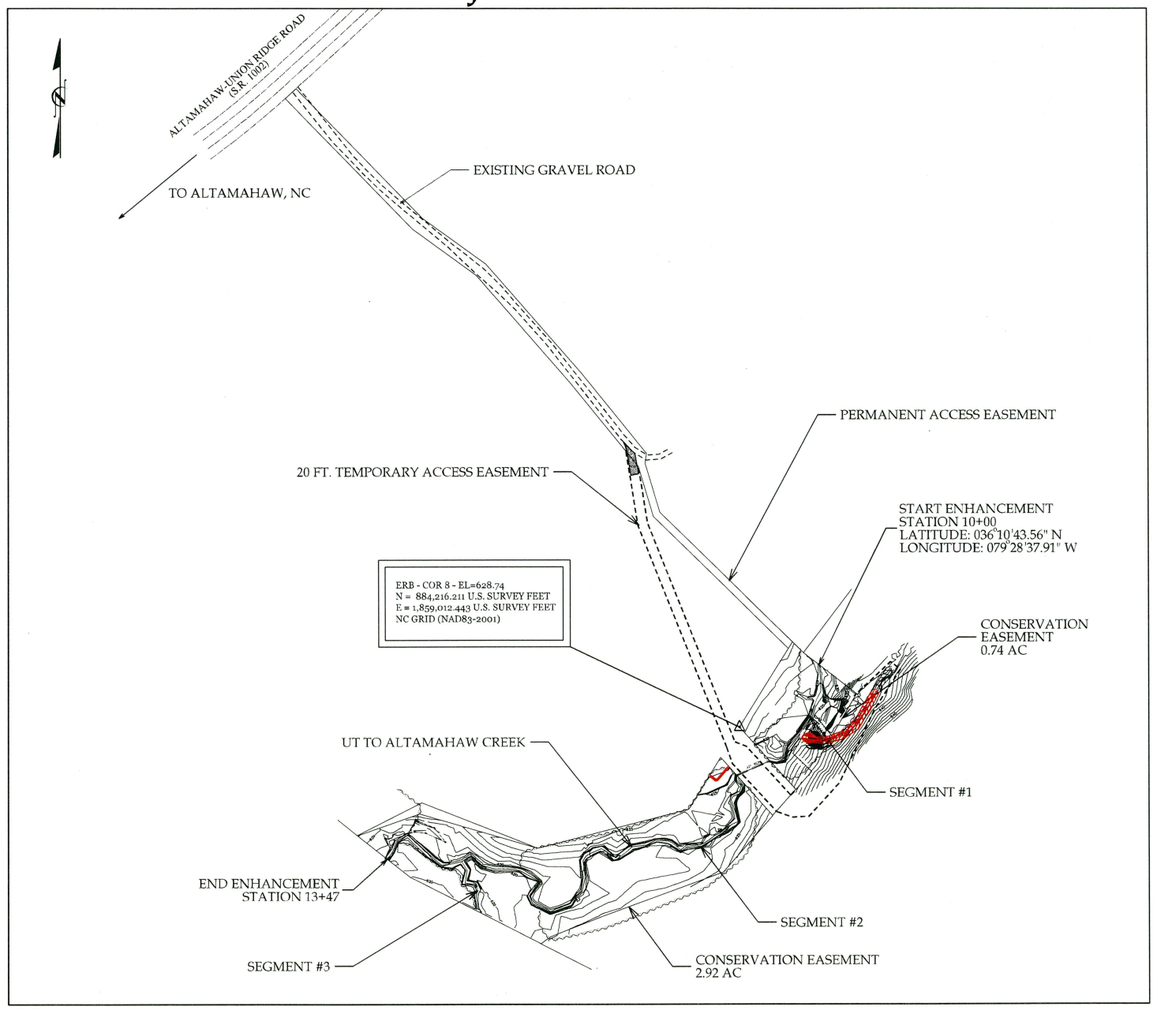
FINAL RECORD DRAWINGS
FOR
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION AND RIPARIAN PLANTING
ALAMANCE COUNTY, NC
SCO PROJECT #09-07623-01



VICINITY MAP
NOT TO SCALE

DIRECTIONS TO PROJECT SITE

- I-40/85 TO NC 87 NORTH.
- NC 87 NORTH TO SR 1002 (ALTAMAHAW UNION RIDGE ROAD).
- PROCEED APPROXIMATELY 2.0 MILES EAST ON ALTAMAHAW UNION RIDGE ROAD.
- TURN RIGHT (SOUTH) ONTO GRAVEL DRIVE BETWEEN WHITE HOUSE AND SINGLE-WIDE MOBILE HOME.
- PROCEED APPROXIMATELY 1,000 FEET ON GRAVEL DRIVE. SITE IS WITHIN FENCE AT END OF GRAVEL DRIVE.



811 Know what's below. Call before you dig.

DISTURBED AREA ACREAGE: 0.75 AC

PROJECT LENGTH:

SEGMENT 1 (ORIGINAL CHANNEL) 243 LF
SEGMENT 2 (ORIGINAL CHANNEL) 1,104 LF
SEGMENT 3 (TRIBUTARY) 130 LF

WETLAND ENHANCEMENT: 0.026 AC

INDEX OF SHEETS

DESIGN FIRM CONTACT INFORMATION:

JENNY S. FLEMING, PE
SENIOR PROJECT ENGINEER

MIRANDA L. SALZLER, PE
SENIOR PROJECT DESIGNER

G. LANE SAULS
PROJECT MANAGER

919.557.0929
PHONE NUMBER

PREPARED FOR THE OFFICE OF:

ECOSYSTEM ENHANCEMENT PROGRAM
EEP Project Manager: Kristie Corson
EEP Review Coordinator: Lin Xu
SCO# 09-0762301

Ecosystem Enhancement Program

CONTRACTOR CONTACT INFORMATION:

RIVER WORKS, INC.
8000 Regency Parkway
Suite 800
Cary, NC 27518
919.459.9001

Bill Wright, Vice President

PROJECT ENGINEER
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 25506 JENNY STUART FLEMING
6/31/11

REVISIONS
- 5/23/11 ADDED PSH-09 TO INDEX
- OF SHEETS, CONTRACTOR INFO
- 8/30/11 ADDED "RECORD
- DRAWINGS" TO SHEET

UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

AUGUST 30, 2011	50512-001	
DATE	PROJECT NO.	
PSH-01		
SHEET		

Ecological Engineering PLLC
128 Raleigh Street
Holly Springs, NC 27540

LEGEND

BOUNDARIES AND PROPERTY:

- Property Line
- Existing Iron Pin (EIP)
- Property Corner
- Proposed Woven Wire Fence
- Existing Electric Fence
- Existing Wetland Boundary (WLB)
- Conservation Easement
- Temporary Access Easement
- Construction Limits
- Limits Of Disturbance
- NCDOT Benchmark

HYDROLOGY:

- Stream or Body of Water
- Flow Arrow
- Bankfull
- Thalweg
- Top Of Bank

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement

VEGETATION:

- Single Tree
- Single Shrub
- Woods Line

EXISTING STRUCTURES:

- Pipe Culvert

UTILITIES:

POWER:

- Existing Power Pole
- Overhead Power Line (OHP)

PROPOSED STABILIZATION WORK:

- Energy Dissipator Basin
- Base Ditch for Spillway
- Construction Access Road

EROSION CONTROL FEATURES:

- Temporary Construction Entrance/Exit
- Sediment Barrier/Silt Fence

PLANTING ZONES:

- Zone 1: Streamside
- Zone 2: Semi–Forested
- Zone 3: Open
- Zone 3: Wetland

SPECIAL NOTES ON CHANGES

BASE DITCH FOR SPILLWAY WAS SHORTENED BASED ON EXISTING FIELD CONDITIONS.

ENERGY DISSIPATER BASIN WAS SHORTENED SLIGHTLY DOWNSTREAM AS A RESULT OF EXISTING FIELD CONDITIONS.

DIVERSION DITCH (MODIFIED LEVEL SPREADER) WAS RELOCATED BASED ON EXISTING FIELD CONDITIONS.

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JAMES M. SUMMERLIN IV

5/23/11

REVISIONS

5/23/11 ADDED SPECIAL NOTES

LEGEND SHEET
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

MAY 23, 2011 DATE

50512-001 PROJECT NO.

PSH-02 SHEET

NOT TO SCALE

Ecological Engineering PA
128 Raleigh Street
Holly Springs, NC 27540

CONSTRUCTION SEQUENCE AND GENERAL NOTES

1. Staging areas, stockpile areas, construction entrances and access roads will be identified and located according to the Construction Documents.
2. The primary construction entrance will be installed for access to the property.
3. The Contractor will install silt fencing at applicable staging and spoil areas, diversions and the energy dissapator basin, as noted on the Erosion Control Plans.
4. The proposed construction will be located as shown on the Construction Documents. Final locations will be field-determined by onsite designer.
5. The Contractor will stockpile materials in designated staging areas.
6. Existing non-native vegetation within the proposed limits of construction will be removed and disposed of off-site.
7. General details associated with all sections include:
    a. Temporary seed mix, including applicable mulching, will be applied to the disturbed areas at the end of each working day as definable sections are completed. Erosion control matting will be installed on top of the seed and straw according to the Construction Documents.
    b. Excavated material that is stockpiled will follow erosion and sediment control guidelines as they relate to material storage and stockpiling.
    c. All remaining disturbed areas are to be seeded and covered according to the Construction Documents.
    d. Materials used for enhancement will be delivered through the primary construction entrance and stockpiled in designated areas.

SECTION 1 UT TO ALTAMAHAW STABILIZATION

8. Contractor will only use the existing 42" RCP to cross the stream channel.
9. Contractor is responsible for supplying and installing temporary fencing to keep livestock out of the work area.
10. Contractor will excavate side slopes of existing spillway ditch to 3:1 side slopes where feasible. 10" rip rap is to be placed according to the Spillway Stabilization detail.
11. The Contractor will construct the Energy Dissapator Basin at the bottom of the newly stabilized ditch. Water is to sheet flow from the apron of the Basin.
12. Contractor is to construct Diversion Ditch as noted in the construction drawings and divert the concentrated runoff into the stabilized ditch at the easement boundary. Fill existing washout within the easement upon completion of diversion.
13. The Contractor will be responsible for the application of seed and straw, as applicable, to any disturbed areas.

SECTION 2 UT TO ALTAMAHAW BUFFER AREA

14. The Contractor will install bare rooted seedlings, live stakes, and tublings according to methodology denoted in the Construction Documents.
15. The Contractor will be responsible for the application of seed and straw, as applicable, to any disturbed areas.
16. The Contractor will provide a second herbicide treatment at the end of the growing season (two weeks prior to end date).

1. This plan is based on the principles of natural channel design.
2. All elevations shown on these plans are referenced to a NAVD 88 datum.
3. The location of all equipment and material staging areas, haul roads and access points to be located as noted on these plans. Limits of silt fencing, tree protection fencing, construction staging areas and construction access roads are shown as approximate on plans. Limits and locations will be field coordinated with the designer.
4. Equipment will remain outside of channel for the entirety of construction. NO in-stream work is anticipated for successful placement of dissipater basin and ditch excavation.
5. All mechanized equipment operated near the stream or its tributaries shall be inspected regularly and maintained to prevent contamination of stream waters from fuels, lubricants, hydraulic fluids or other toxic materials. Any equipment repairs, maintenance or refueling activities shall not be done while the equipment is in the stream or its tributaries.
6. Contractor to dispose of all waste material off-site and in accordance with all federal, state and local regulations.
7. All disturbed areas will be seeded immediately, as specified in the project specifications.
8. Unless otherwise directed by the designer, a 50-foot minimum width permanently vegetated buffer shall be planted on each side of channel.
9. Existing non-native vegetation within the proposed limits of construction will be removed and disposed of off-site.
10. Contractor to provide temporary plant bedding area on site for temporary storage of vegetation transplants. Transplants to be kept watered, mulched and shaded at all times as specified in the project specifications.
11. Construction personnel should park all vehicles within the limits of the designated construction staging areas. All other construction equipment and vehicles should be parked within the construction staging areas when not in use.
12. Contractor shall keep all topsoil stockpiled on site separately from other soil materials.
13. Contractor shall be responsible for complying with NCDENR NPDES requirements, including, but not limited to maintaining rain gauge on site, documentation of rainfall amounts and dates, inspections and maintenance of erosion control devices, weekly reports and any other supporting documentation as required.
14. Existing utilities noted at the time of the field survey are shown for size, material, type, and relative location only. This plan is not a comprehensive inventory or an as-built survey of existing site utilities. The Contractor is to determine the existence and location of all utilities within the work area.
15. The Contractor shall be responsible for the location and/or relocation of all utilities and coordination with the appropriate utility agency or company. The Contractor is required to call before digging.
16. Contractor is to be responsible for repairs to any damage to existing utilities, including but not limited to, overhead and underground utilities, curb and gutter, pavement, sidewalks, storm drainage systems, sanitary sewer systems or fencing. Any required repairs to be made in accordance with any and all applicable state and or local municipality or utility agency standards.
17. The Contractor shall keep the project work area clean of litter and excess debris at all times.

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JEFFREY T. FLEMING SUMMERLIN PLEMING 5/28/10

REVISIONS

CONSTRUCTION SEQUENCE
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

PSH-03 SHEET	NOT TO SCALE	
MAY 28, 2010 DATE	50512-001 PROJECT NO.	

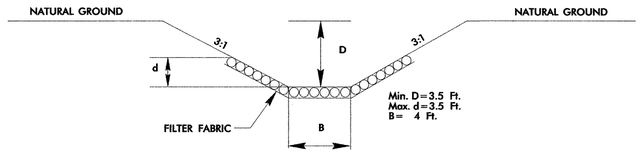
Ecological Engineering PLLC
128 Raleigh Street
Holly Springs, NC 27540

DETAILS

STORMWATER MANAGEMENT

NOT TO SCALE

DETAIL 1



*When B is < 6.0'
Type of Liner = CLASS I Rip-Rap (d50 = 10")

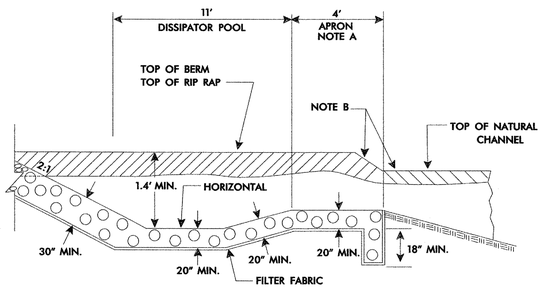
SPILLWAY STABILIZATION Ss

DETAIL 2

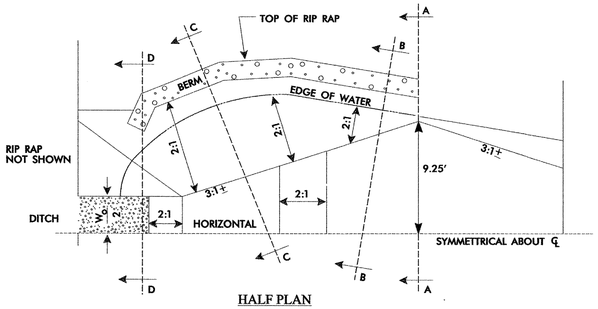
NOTES

A. IF EXIT VELOCITY OF BASIN IS SPECIFIED, EXTEND BASIN AS REQUIRED TO OBTAIN SUFFICIENT CROSS SECTIONAL AREA AT SECTION A-A SUCH THAT Q /(CROSS SECTION AREA AT SEC. A-A) = SPECIFIED EXIT VELOCITY.

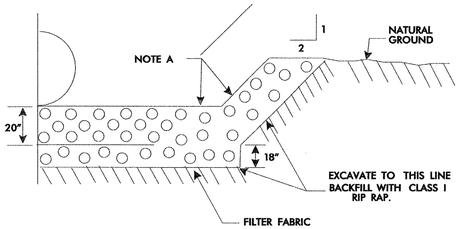
B. WARP BASIN TO CONFORM TO NATURAL STREAM CHANNEL. TOP OF RIPRAP IN FLOOR OF BASIN SHOULD BE AT SAME ELEVATION OR LOWER THAN NATURAL CHANNEL BOTTOM AT SEC. A-A. PROVIDE SMOOTH TRANSITION FROM END OF APRON TO NATURAL CHANNEL WIDTH.



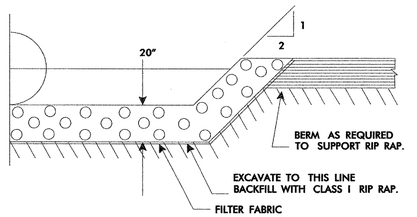
C SECTION
L



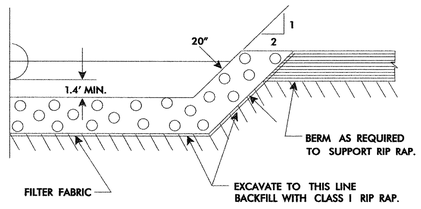
HALF PLAN



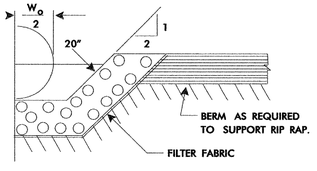
SEC. A-A



SEC. B-B



SEC. C-C



SEC. D-D

NOTE:
W_o = WIDTH OF RIP-RAP LINED BASE DITCH

RIP-RAPPED ENERGY DISSIPATOR BASIN Db

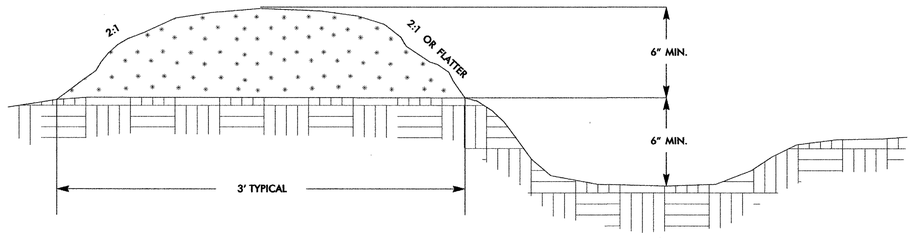
DETAIL 3

NOTES

A. TOP OF BERM TO BE CONSTANT ELEVATION.

B. USE TEMPORARY SEED AND MULCH DIVERSION DITCH UPON COMPLETION.

C. STORMWATER DIVERSION TO BE INCLUDED WHEN SITE IS PERMANENTLY SEEDED.



STORMWATER DIVERSION (MODIFIED LEVEL SPREADER) Dd

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JESSICA NOBLE SUMMERLIN FLEMING

5/28/10

REVISIONS

STORMWATER MANAGEMENT DETAILS
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

MAY 28, 2010
DATE

50512-001
PROJECT NO.

PSH-04.a
SHEET

NOT TO SCALE

Ecological Engineering PLLC
128 Raleigh Street
Holly Springs, NC 27540

DETAILS

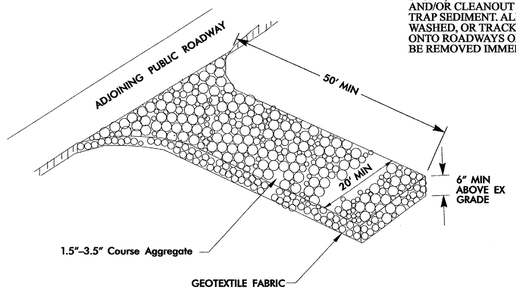
EROSION CONTROL

NOT TO SCALE

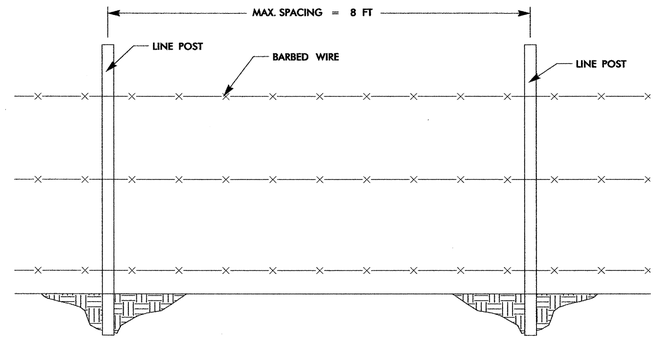
NOTES:

1. USE 1.5"-3.5" STONE ON PAD. PAD TO BE MINIMUM 50' LONG x 20' WIDE x 6" DEEP.
2. TURNING RADIUS SHOULD BE SUFFICIENT TO ACCOMODATE LARGE TRUCKS.
3. ENTRANCE(S) SHOULD BE LOCATED AS TO PROVIDE MAXIMUM UTILITY BY ALL CONSTRUCTION VEHICLES.
4. ENTRANCE(S) MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO ADJACENT ROADWAYS. PERIODIC TOP DRESSING WITH STONE MAY BE NECESSARY.
5. ANY MATERIAL WHICH FINDS ITS WAY ONTO THE ADJACENT ROADWAY MUST BE CLEANED UP IMMEDIATELY.

THE ENTRANCE/EXIT SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT THE FLOW OF MUD ONTO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC TOPDRESSING WITH 1.5"-3.5" STONE, AS CONDITIONS DEMAND, AND REPAIR AND/OR CLEANOUT OF ANY STRUCTURES TO TRAP SEDIMENT. ALL MATERIALS SPILLED, DROPPED, WASHED, OR TRACKED FROM VEHICLES OR SITE ONTO ROADWAYS OR INTO STORM DRAINS MUST BE REMOVED IMMEDIATELY.



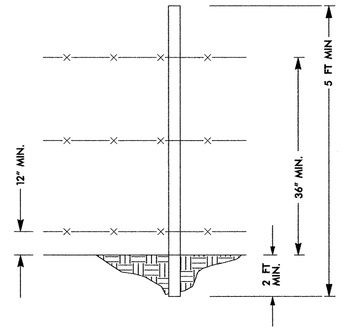
CRUSHED STONE CONSTRUCTION ENTRANCE/EXIT (Co)



LINE PANEL

LINE POSTS

1. WOODEN: MIN 4" DIAMETER OR 4" SQUARE.
2. STEEL: STUDDED OR PUNCHED T, U, OR Y SHAPED WITH ANCHOR PLATES. MIN. WEIGHT 1.3 LBS/FT (EXCLUDING ANCHOR PLATE)



BARBED WIRE

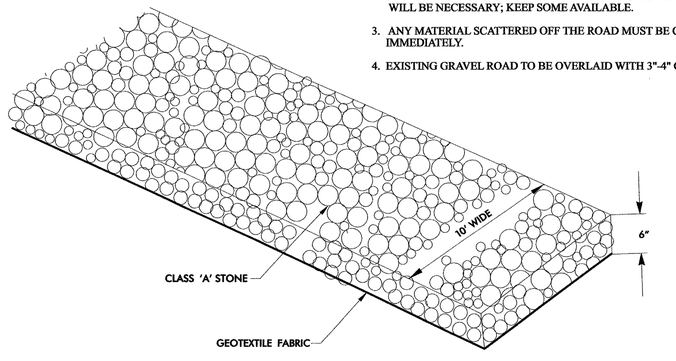
BARBED WIRE

1. ASTM CLASS 3 GALVANIZED WIRE, DOUBLE STRAND
2. STANDARD WIRE MIN. 12 1/2 GAUGE HIGH TENSILE WIRE MIN. 15 1/2 GAUGE.
3. 3 WIRES MIN. NEEDED
4. SPACING AT 12" ABOVE THE GROUND.

TEMPORARY FENCING

NOTES:

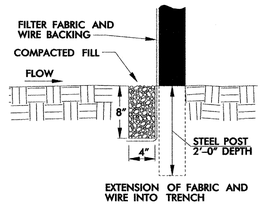
1. CLASS 'A' STONE SHALL BE USED. ROAD TO BE APPROXIMATELY 10'W x 6"D. (MAY BE WIDER IN PASTURE LOCATION, EXISTING GRAVEL ROAD PORTION NOT TO BE WIDENED)
2. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD AROUND ROAD. PERIODIC TOPDRESSING WITH STONE WILL BE NECESSARY; KEEP SOME AVAILABLE.
3. ANY MATERIAL SCATTERED OFF THE ROAD MUST BE CLEANED UP IMMEDIATELY.
4. EXISTING GRAVEL ROAD TO BE OVERLAID WITH 3"-4" OF CLASS A STONE.

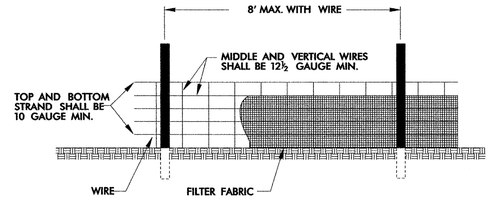


CONSTRUCTION ACCESS ROAD

NOTES:

1. WIRE SHALL BE A MINIMUM OF 32" IN WIDTH AND SHALL HAVE A MINIMUM OF 6 LINE WIRES WITH 12" STAY SPACING.
2. FILTER FABRIC SHALL BE A MINIMUM OF 36" IN WIDTH AND SHALL BE FASTENED ADEQUATELY TO THE WIRE AS DIRECTED BY THE DESIGNER.
3. STEEL POST SHALL BE 5'-0" IN HEIGHT AND BE OF THE SELF-FASTENER ANGLE STEEL TYPE.





SILT FENCE (Sf)

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JAMES SUMMERLIN FLEMING

5/28/10

REVISIONS

EROSION CONTROL DETAILS
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

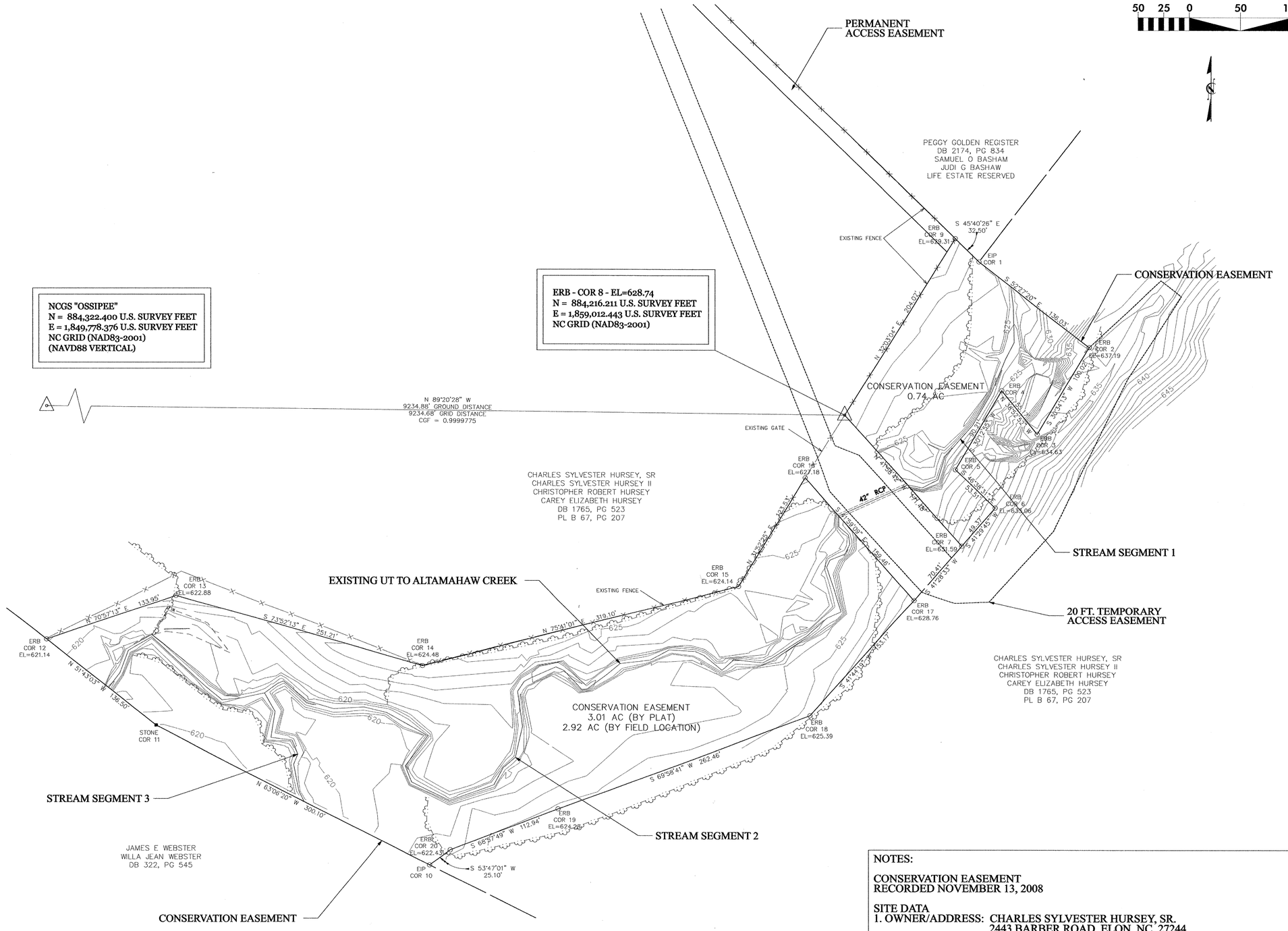
MAY 28, 2010 DATE

50512-001 PROJECT NO.

PSH-04.b SHEET

NOT TO SCALE

Ecological Engineering PLLC
128 Raleigh Street
Holly Springs, NC 27540



NOTE:

NO STAKING REQUIRED FOR CONSTRUCTION.

NOTES:

CONSERVATION EASEMENT
RECORDED NOVEMBER 13, 2008

SITE DATA
1. OWNER/ADDRESS: CHARLES SYLVESTER HURSEY, SR.
2443 BARBER ROAD, ELON, NC 27244.
2. DEED REFERENCES: DEED BOOK 1765 PAGE 523.
3. TAX PARCELS: 4 - 10 - 138.
4. PIN: 8858849144.
5. TOTAL AREA: 4.63 ACRES INCLUDING ACCESS & CONSERVATION EASEMENTS. AREA COMPUTATION BY COORDINATE METHOD.
6. NO GEODETIC MONUMENTS WITHIN 2000' OF SURVEY.

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JEFFREY LEE FLEMING
5/28/10

REVISIONS

CONSTRUCTION LAYOUT
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING
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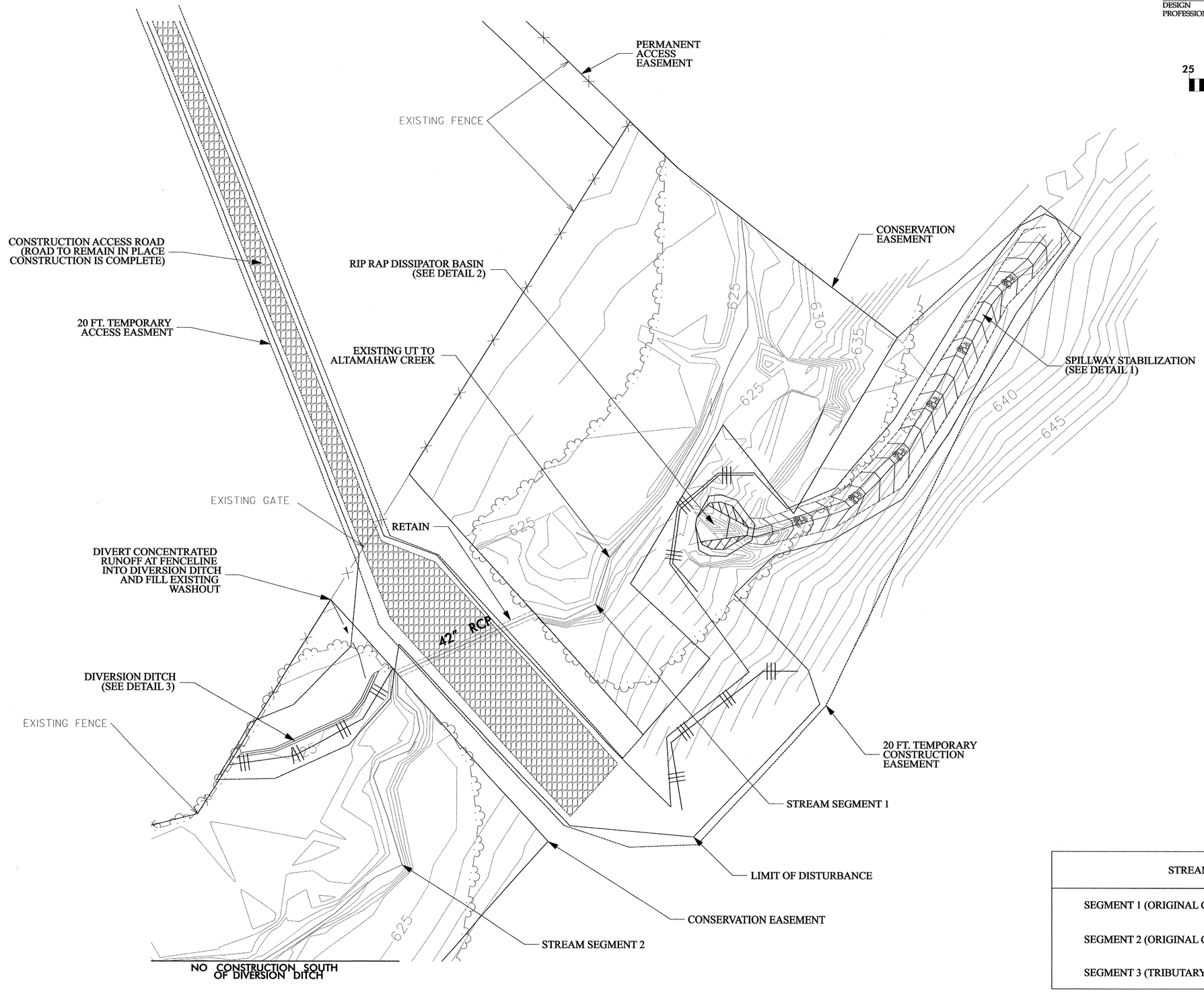
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

MAY 28, 2010
DATE

50512-001
PROJECT NO.

PSH-05.a
SHEET

Ecological Engineering PLLC
128 Raleigh Street
Holly Springs, NC 27540



DEVELOPMENT REFERENCE

DESIGN PROFESSIONAL

ECOLOGICAL ENGINEERING, LLP
128 RALEIGH STREET
HOLLY SPRINGS, NC 27540
PHONE: (919) 557-0929

25 12.5 0 25 50

STREAM LENGTHS
SEGMENT 1 (ORIGINAL CHANNEL) 243 LF
SEGMENT 2 (ORIGINAL CHANNEL) 1104 LF
SEGMENT 3 (TRIBUTARY) 130 LF

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JOHN D. SUMMERLIN PLEMMONS

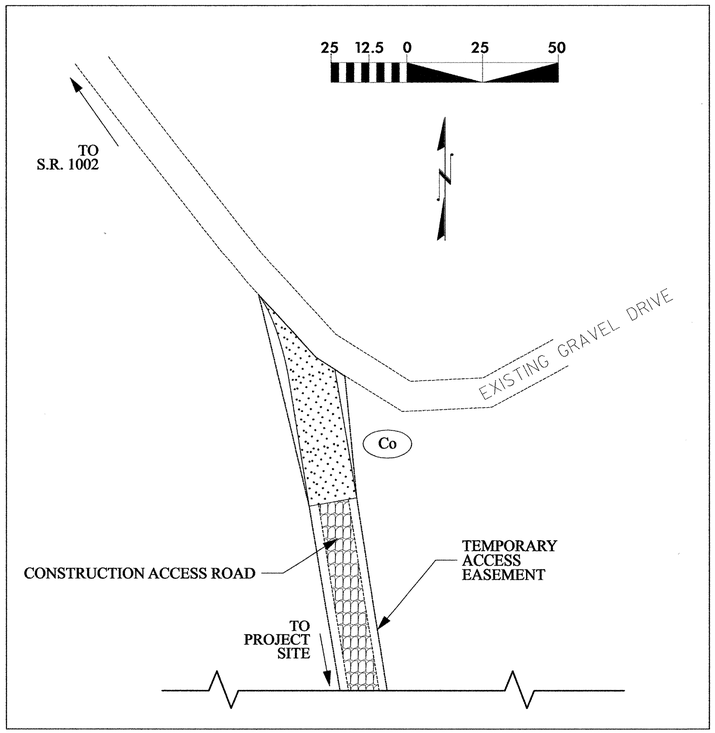
5/28/10

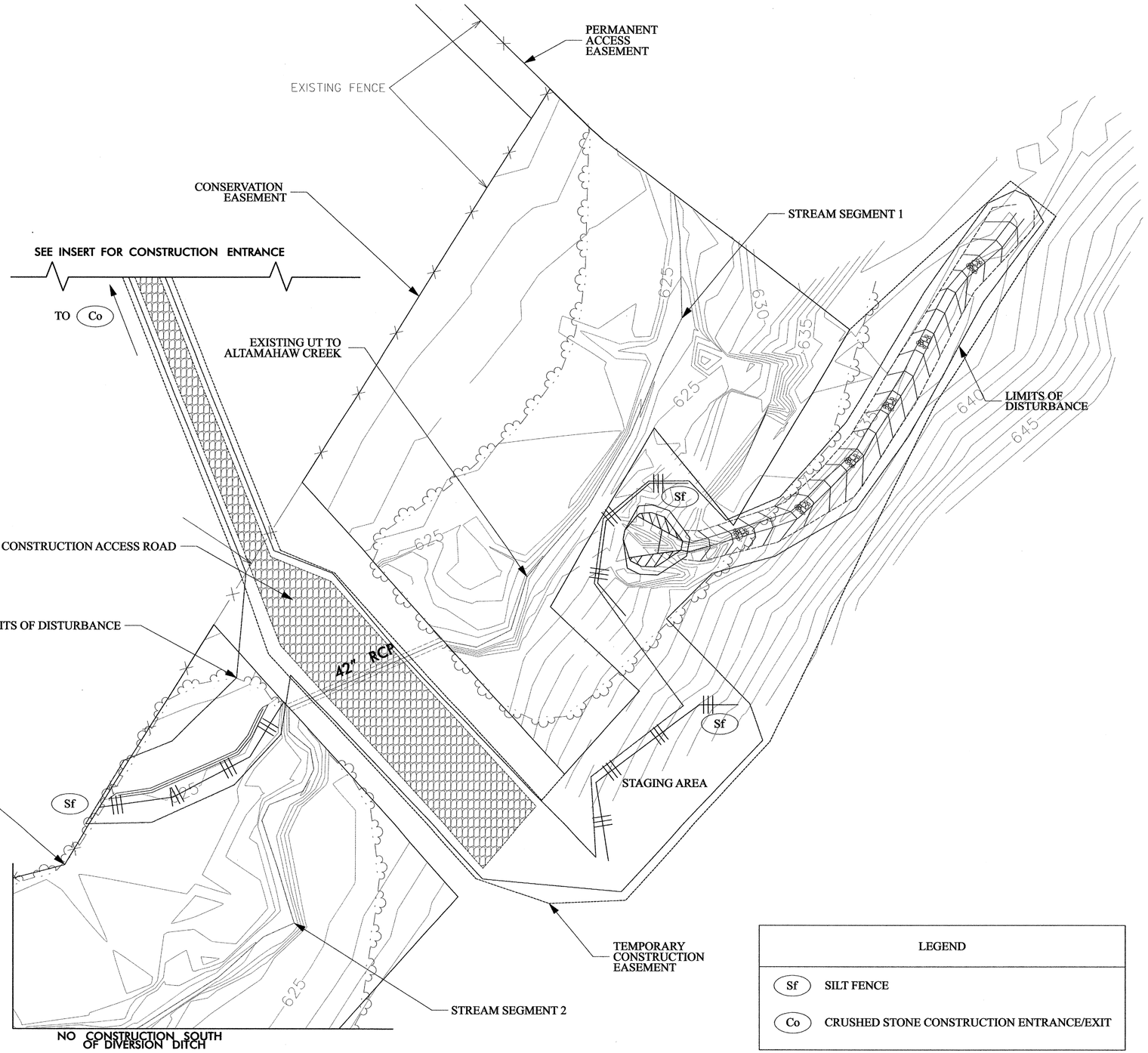
REVISIONS

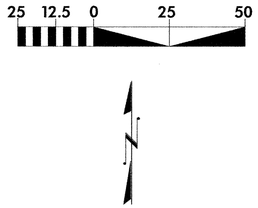
PLAN VIEW
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

MAY 28, 2010	50512-001	
DATE	PROJECT NO.	
PSH-05.b		
SHEET		

Ecological Engineering
128 Raleigh Street
Holly Springs, NC 27540







LEGEND	
Sf	SILT FENCE
Co	CRUSHED STONE CONSTRUCTION ENTRANCE/EXIT

DEVELOPMENT REFERENCE

DESIGN PROFESSIONAL	ECOLOGICAL ENGINEERING, LLP 128 RALEIGH STREET HOLLY SPRINGS, NC 27540 PHONE: (919) 557-0929

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JENNIFER C. SUMMERLIN PLANNING
5/28/10

REVISIONS

EROSION CONTROL
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
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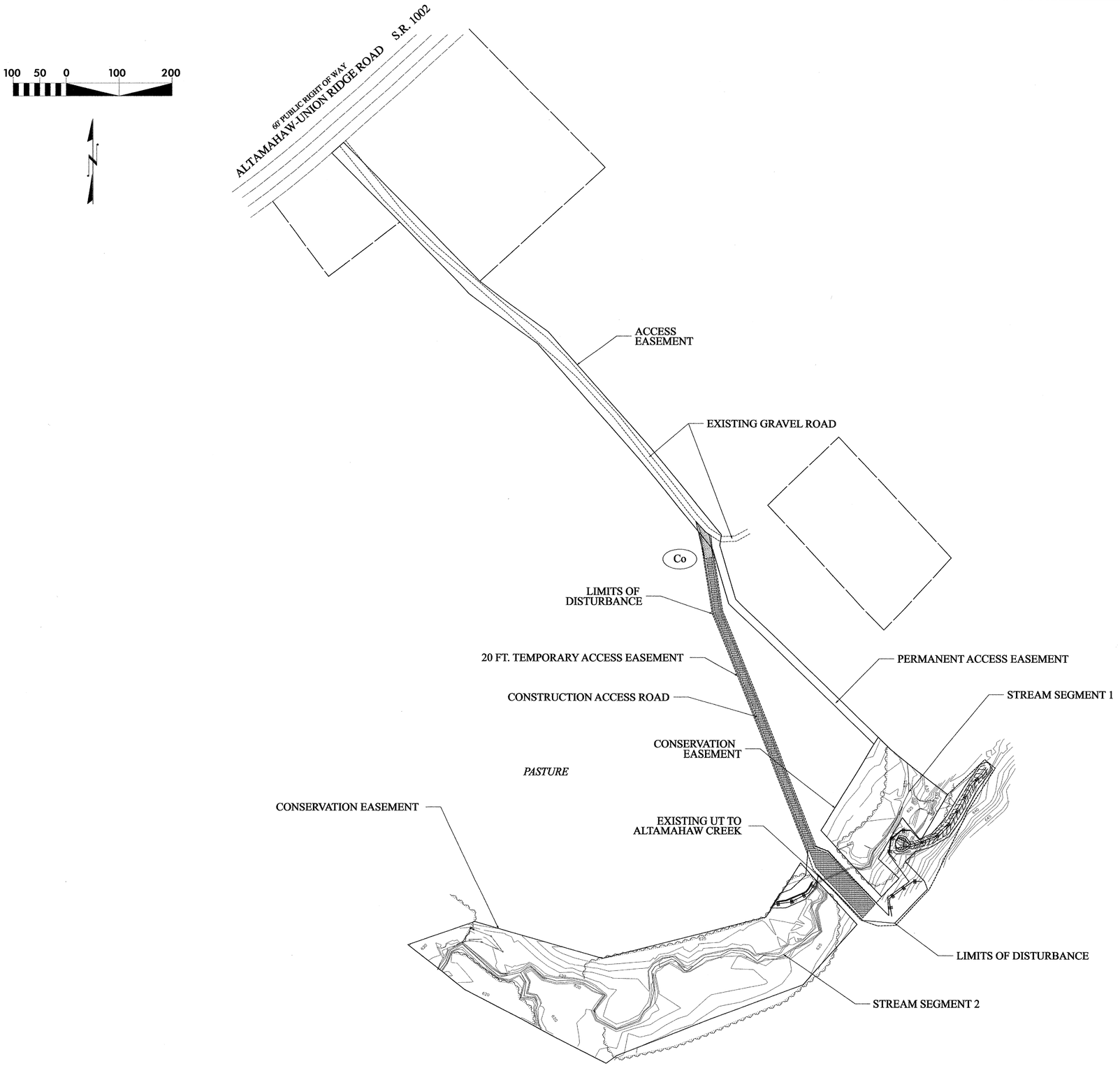
ECOSYSTEM ENHANCEMENT PROGRAM

MAY 28, 2010
DATE

50512-001
PROJECT NO.

PSH-05.c
SHEET

Ecological Engineering PLLC
128 Raleigh Street
Holly Springs, NC 27540



DEVELOPMENT REFERENCE

DESIGN PROFESSIONAL	ECOLOGICAL ENGINEERING, LLP 128 RALEIGH STREET HOLLY SPRINGS, NC 27540 PHONE: (919) 557-0929

LEGEND	
Co	CRUSHED STONE CONSTRUCTION ENTRANCE/EXIT

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JENNIFER SUMMERLIN FLEMING

5/28/10

REVISIONS

EROSION CONTROL
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

MAY 28, 2010 DATE	50512-001 PROJECT NO.	
PSH-05.d SHEET		

Ecological Engineering LLP
128 Raleigh Street
Holly Springs, NC 27540

CALCULATIONS

ENERGY DISSIPATOR

Energy Dissipators (HEC-14)

Station:	15+00	Input
Q (cfs)	270.0	Output
Pipe Size - D (inches)	48	
Pipe Material	RIP RAP	
Pipe Slope (%)	0.0	

For Partial Flow determine Depth of Flow (Mannings Equation)

Depth of Flow - d (ft)	3.16	$Y_o/D = d/D$	0.79
Velocity (ft/s)	6.3		

From Table III-2 determine A/D^2

A/D^2	2.6600	A (ft^2)	42.56
		Y_e (ft) = $(A/2)^{1/2}$	4.61

Dimensionless Scour Geometry (Partial Flow) $\alpha_e[Q/(g^{1/2}Y_e^{5/2}]^{\beta}(t/t_o)^{0}$

where:			α_e	β	0
t (min)	30	Depth (H_s)	1.76	0.45	0.09
t_o (min)	316	Width (W_s)	6.94	0.57	0.06
		Length (L_s)	16.10	0.51	0.17

Therefore:

D	**Depth (H_s) ft**	**1.4**
W_p	**Width (W_s) ft**	**6.2**
L_p	**Length (L_s) ft**	**11.0**

Determine Thickness of Rip Rap

d_{50} (inches)	10	d_{50}/Y_e	0.18
		Froud No. (Fr)	0.52
h_s/Y_e (Figure XI-2)	0.00	h_s (ft)	0.00
		h_s/d_{50}	0.00
Compare with L_p (use greater number):		10 (h_s)	0.0
		3 (W_o)	12
Length of Apron (L_a) ft		5 (h_s)	**0.0**
		W_o	**4.0**
Thickness of Rip Rap (T) ft		2 (d_{50})	**1.7**

Use greater number

SPILLWAY STABILZATION (DITCH CALCULATIONS)

DA = 330 AC or 0.52 SQ. MI. (to spillway)
S = 0.0169

Existing:
2:1 Side Slopes
4' Base
n = 0.022 (clean earth channel)
Q_{10} = 270 cfs

Depth of flow => 2.56'
Velocity => 11.56 ft/s

Proposed:
3:1 Side Slopes
4' Base
n = 0.045 (channel lined with CLASS I (d = 10") rip rap)
Q_{10} = 270 cfs

Depth of flow => 3.16'
Velocity => 6.34 ft/s

DIVERSION DITCH DESIGN (MODIFIED LEVEL SPREADER)

DA = 4.24 AC

Time of Concentration:

Sheet Flow
L = 100 ft.
n = 0.15 (grass)
S= 0.0351
P2 = 3.5"

t_{sheet} = 7.5 min

Shallow, Concentrated Flow
L = 400 ft.
S= 0.0333
(unpaved)

$t_{shallow}$= 2.28 min

Open Channel Flow
L = 495 ft
S = 0.0263
n = 0.035
A = 2.5 sq. ft.
Wp = 3.2 ft/

t_{open} = 1.2 min

Tc = 7.5 min. + 2.28 min + 1.20 min. = 11.0 min.
Cn = 69
Q_{10} = 12.5 cfs

Level Spreader Design
As per pg 8-7 of the DWQ BMP manual, with Grass or THICK GROUND COVER FILTER STRIP it is optimal to use 13 ft. of level spreader per 1 cfs of flow.

Design Length = 13 x 12.5 = 163 ft.

However, due to size constraints within the easement, a feasible length was determined based on the easement boundaries and existing topography.

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JENNIFER L. SUMMERLIN 5/28/10

REVISIONS

CALCULATIONS
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

MAY 28, 2010 DATE

50512-001 PROJECT NO.

PSH-05.e SHEET

NOT TO SCALE

Ecological Engineering PLLC
128 Raleigh Street
Holly Springs, NC 27540

SITE STABILIZATION PLAN

TEMPORARY SEEDING

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

SOIL AMENDMENTS

Zone 1 – Streamside Area						**Acres**	**0.5**
Mechanical Treatment	**Approx. Date**	**Ground Cover Fabric**	**Mulch Type**	**Mulch Density / Thickness**	**Nutrient Amendments**	**Nutrient Total lbs[1]**	
n/a	4/10 - 9/10	n/a	n/a	n/a	n/a	n/a	
					Subtotal	**n/a**	
Zone 2 – Semi-Forested Area						**Acres**	**2.1**
Mechanical Treatment	**Approx. Date**	**Ground Cover Fabric**	**Mulch Type**	**Mulch Density / Thickness**	**Nutrient Amendments**	**Nutrient Total lbs**	
Herbicide[1]	4/10 - 9/10	n/a	n/a	n/a	n/a	n/a	
n/a	4/10 - 9/10	n/a	n/a	n/a	Pellet Fertilizer 33-0-0	400	
n/a	4/10 - 9/10	n/a	n/a	n/a	Pellet Fertilizer 18-46-0	400	
					Subtotal	**800**	
Zone 3 – Open Area						**Acres**	**1**
Mechanical Treatment	**Approx. Date**	**Ground Cover Fabric**	**Mulch Type**	**Mulch Density / Thickness**	**Nutrient Amendments**	**Nutrient Total lbs**	
Herbicide[1]	4/10 - 9/10	n/a	n/a	n/a	n/a	n/a	
n/a	4/10 - 9/10	n/a	n/a	n/a	Pellet Fertilizer 33-0-0	225	
n/a	4/10 - 9/10	n/a	n/a	n/a	Pellet Fertilizer 18-46-0	225	
					Subtotal	**450**	
Zone 4 – Wetland Area						**Acres**	**<0.1**
Mechanical Treatment	**Approx. Date**	**Ground Cover Fabric**	**Mulch Type**	**Mulch Density / Thickness**	**Nutrient Amendments**	**Nutrient Total lbs**	
n/a	4/10 - 9/10	n/a	n/a	n/a	n/a	n/a	
					Subtotal	**n/a**	
					Total	**1,250**	**4.6**

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JASON NEELY SUMMERLIN FLEMING 5/28/10

REVISIONS

SITE STABILIZATION PLAN
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

MAY 28, 2010 DATE

50512-001 PROJECT NO.

PSH-06 SHEET

NOT TO SCALE

Ecological Engineering PLLC
128 Raleigh Street
Holly Springs, NC 27540

VEGETATION PLANTING ZONES
(SPECIES LISTED on PSH-06.b)

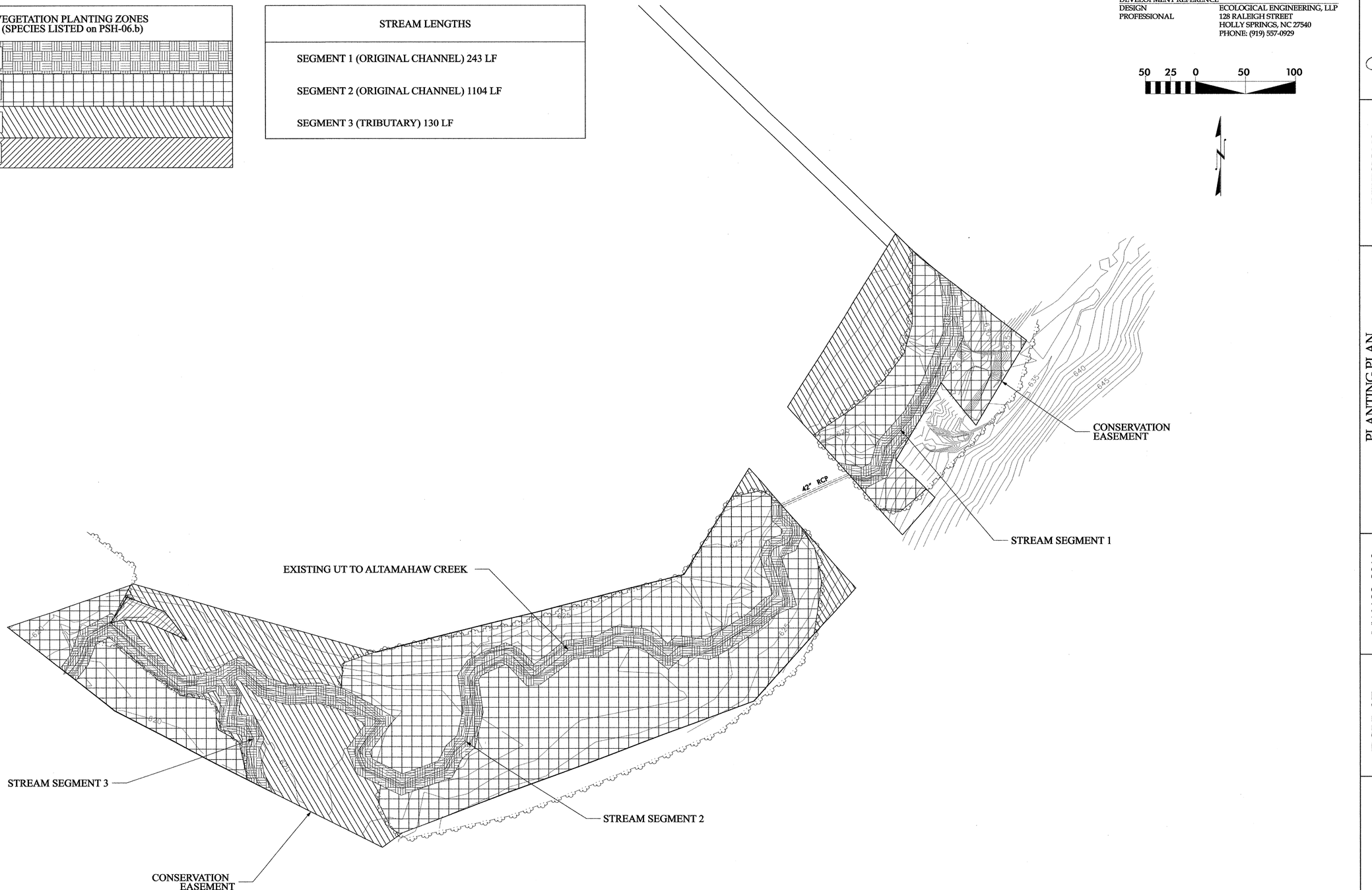
ZONE 1

ZONE 2

ZONE 3

ZONE 4

STREAM LENGTHS
SEGMENT 1 (ORIGINAL CHANNEL) 243 LF
SEGMENT 2 (ORIGINAL CHANNEL) 1104 LF
SEGMENT 3 (TRIBUTARY) 130 LF



DEVELOPMENT REFERENCE

DESIGN	ECOLOGICAL ENGINEERING, LLP
PROFESSIONAL	128 RALEIGH STREET
	HOLLY SPRINGS, NC 27540
	PHONE: (919) 557-0929

50 25 0 50 100

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JAMES C. SUMMERLIN PLANNING

5/28/10

REVISIONS

PLANTING PLAN
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

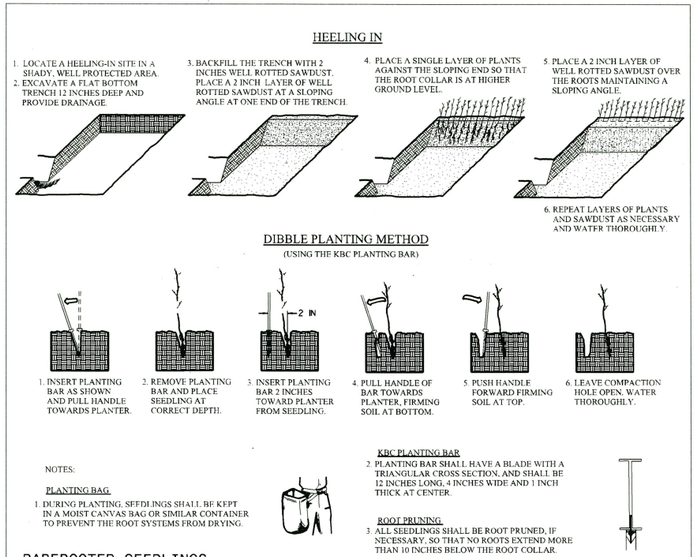
MAY 28, 2010	DATE
50512-001	PROJECT NO.
PSH-07.a	SHEET

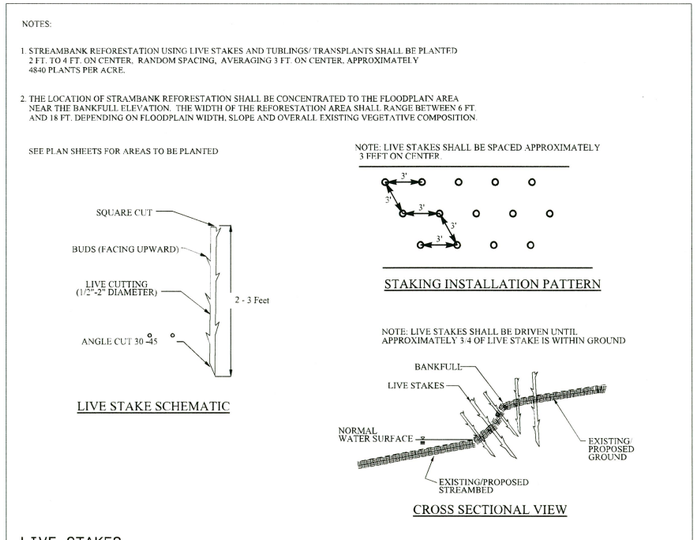
Ecological Engineering PLLC
128 Raleigh Street
Holly Springs, NC 27540

PLANTING DETAILS AND SPECIES

NOT TO SCALE

PLANTING DETAILS





PLANT SPECIES PER ZONE

PLANT SPECIES PER ZONE

SCIENTIFIC NAME	COMMON NAME	PROPOSED STEMS	STEMS PLANTED	TYPE	DENSITY	SPACING	NOTES
Zone 1: Streamside Area							
Alnus serrulata	Tag alder	200	200	Tubling	4840 stems/ acre	3 feet on center	Plants will be randomly staggered along both sides of the existing channel. Planting emphasis will be placed along outsides of meanderbends. Point bars are not to be planted.
Cornus amomum	Silky dogwood	600	600	Live stake			
Salix nigra	Black willow	600	600	Live stake			
Sambucus canadensis	Elderberry	500	500	Live stake			
	Zone 1 Total	1900	1900				
Zone 2: Semi-Forested Area							
Asimina triloba	Paw paw	64	75	Bare root	300 stems/ acre	12 feet on center	Plants will be randomly staggered throughout the existing forested areas. Average spacing of planted stems is 12 feet on center, although open areas may receive higher density plantings.
Carpinus caroliniana	Ironwood	64	75	Bare root			
Carya ovata	Shagbark hickory	64	75	Bare root			
Celtis laevigata	Sugarberry	64	75	Bare root			
Cornus florida	Flowering dogwood	64	50	Bare root			
Fraxinus pennsylvanica	Green ash	64	100	Bare root			
Ilex opaca	American holly	64	0	Bare root			
Quercus michauxii	Swamp chestnut oak	64	100	Bare root			
Quercus falcata var. pagodaefolia	Cherrybark oak	64	75	Bare root			
Ulmus americana	American elm	64	50	Bare root			
	Zone 2 Total	640	675				
Zone 3: Open Area							
Asimina triloba	Paw paw	68	75	Bare root	680 stems/ acre	8 feet on center	Plants will be randomly staggered throughout the existing open areas. Average spacing of planted stems is 8 feet on center.
Carpinus caroliniana	Ironwood	68	75	Bare root			
Carya ovata	Shagbark hickory	68	75	Bare root			
Celtis laevigata	Sugarberry	68	75	Bare root			
Cornus florida	Flowering dogwood	68	50	Bare root			
Fraxinus pennsylvanica	Green ash	68	100	Bare root			
Ilex opaca	American holly	68	0*	Bare root			
Quercus michauxii	Swamp chestnut oak	68	100	Bare root			
Quercus falcata var. pagodaefolia	Cherrybark oak	68	75	Bare root			
Ulmus americana	American elm	68	50	Bare root			
	Zone 3 Total	680	675				
Zone 4: Wetland Area							
Alnus serrulata	Tag alder	6	6	Tubling	680 stems/ acre	8 feet on center	Plants will be randomly staggered throughout the existing wetland area. Average spacing is 8 feet on center.
Cephalanthus occidentalis	Buttonbush	6	6	Tubling			
Salix nigra	Black willow	6	6	Tubling			
	Zone 4 Total	18	18				
	Project Total	3238	3268				

*NOTE: Ilex opaca was not available at the time of the planting. The contractor requested that this species be removed from the plant list with an increase in subsequent numbers of the remaining stems . Cornus florida and Ulmus americana were available although the actual number of stems were less than originally requested. The designer concurred with the planting revisions requested by the contractor.

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JAMES M. KNIGHT SUMMERFIELD

8/31/11

REVISIONS

8/30/11 REV. PLANTING LIST

PLANTING DETAILS AND SPECIES
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

AUGUST 30, 2011
DATE

50512-001
PROJECT NO.

PSH-07.b
SHEET

NOT TO SCALE

Ecological Engineering
128 Raleigh Street
Holly Springs, NC 27540

INVASIVE SPECIES MANAGEMENT AND PLANTING NOTES

INVASIVE SPECIES MANAGEMENT

Vegetative Species

Invasive species observed within the Project Site include Chinese privet (*Ligustium sinense*) and tree-of-heaven (*Ailanthus altissima*). If less unrestricted, these species could become the dominant species within and surrounding the Project Site. Therefore, steps must be followed to ensure that these species are controlled to a point where they do not provide competition for native vegetative species.

Control methods are widely variable concerning species types and density. Invasive species within the Project Site are competing with native vegetation; however, they are in the process of being controlled by existing landuse variables, such as cattle browse and periodic mowing. Once cattle are restricted from the area and the site is allowed to undergo natural succession, this vegetation will compete with native and planted vegetation.

Initially, mechanical control of Chinese privet and tree-of-heaven is the preferred method. Mechanical control will significantly reduce the plant statures, whereby stimulating a cluster of young growth, which provide an easier, more effective herbicide application. Mechanical control of these species should be done in early spring or late fall. Applications of four to six pints per acre of imazapyr herbicide during the active growing season will provide effective control of these species. This herbicide will be applied via a backpack sprayer directly to each individual. No other vegetation will be treated during this time. The herbicide will not come in contact with any areas of standing water.

The construction contractor will provide mechanized removal for stems of Chinese privet and tree-of-heaven. These individuals will be removed in their entirety and disposed in an appropriate manner.

The Contractor will provide a second herbicide treatment at the end of the growing season (two weeks prior to end date).

PLANTING NOTES

BARE ROOT SEEDLINGS

Plant Selection

- Species listed for the project should be grown from stock that corresponds to the same physiographic province in which they will be used.
- The designer reserves the right to reject any plant stock due to inferior qualities.

Planting & Handling

- Bare root seedlings will be planted according to vegetation details or as directed by the designer.
- All vegetation will be planted during the dormant season (December to March). Temperatures ranging from 36 to 60 degrees Fahrenheit are ideal for planting. Planting will not take place during periods exceeding this range of temperature. Planting will not take place during excessively windy conditions or other extreme conditions which may reduce vigor of the planting material.
- The designer reserves the right to reject any bare root seedling due to inferior quality. The designer also reserves the right to have any plant replanted due to improper planting techniques.
- All vegetation designated for a particular planting zone will be culled for inferior quality before being loaded into planting bags. Furthermore, these species will be thoroughly mixed prior to loading the planting bag, such that each planting zone will be planted in a random manner.
- All vegetation will be reviewed by the designer to ensure the highest quality of planting material throughout the entire process.

Storage

- Plant stock will be stored at temperatures between 36 to 40 degrees Fahrenheit in appropriate bags supplied by the plant producer when long-term storage is necessary.
- Only the necessary quantities of plant stock will be transported to the site on a daily basis. Large quantities of planting material will not be stored on-site during the planting process unless proper refrigeration is provided by the planting contractor.

LIVE STAKING

Plant Selection

- All plant species used for live staking should conform to the specifications set forth in the vegetation details.
- Plant species listed for use as live stakes will be selected from plants found on the project site or as directed by the designer.
- Plant species used as live stakes will be collected during the dormant season (December to March) and during normal average daily temperatures for this period.

Preparation & Handling

- Plant species will be collected to conform to sizes specified in the vegetation details.
- Live stakes will be prepared by making a straight cut at the narrow end of the plant material forming a blunt end. The thicker end (toward the trunk) of the plant will be formed into a point.
- Live stake preparation will be done according to vegetation details unless otherwise specified by the designer.

Planting

- Live stakes should be prepared and planted immediately following collection. Proper storage techniques should be followed to ensure the highest rate of survival.
- Live stakes will be planted with the point of the live stake going into the soil and the blunt end facing up.
- Live stakes will be placed as deep as possible and as close to the water table as possible.
- Live staking will be done according to the vegetation details unless otherwise specified by the designer. The designer reserves the right to reject any live stake due to inferior quality. Likewise, any improperly planted live stake will be corrected by the planting contractor.

Storage

- Live stakes will be bundled and stored completely submerged in the stream channel in the event immediate staking is not permissible. Temporary storage will not exceed a three week period.

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JENNIFER SUMMERLIN FLEMING

5/28/10

REVISIONS

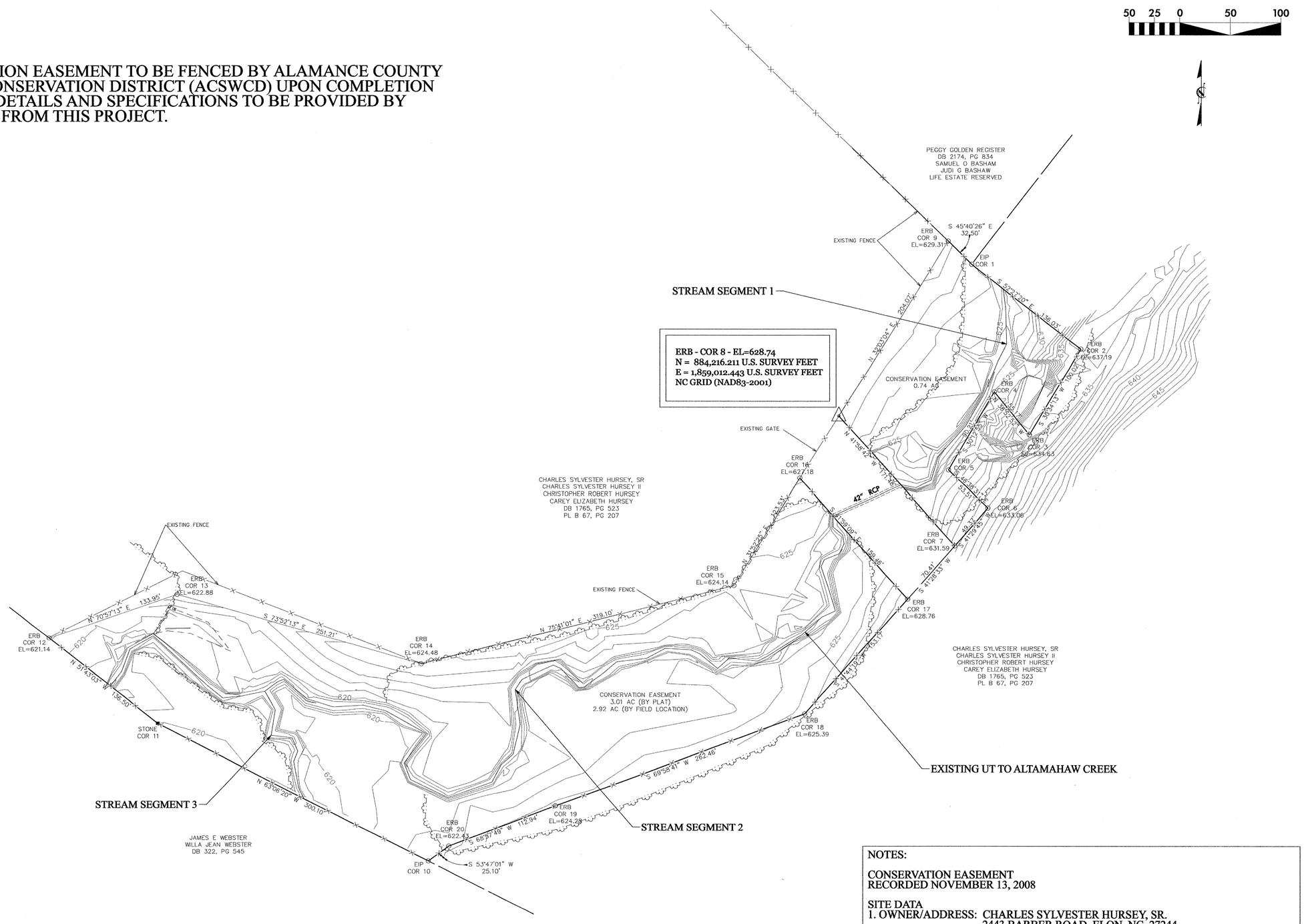
INVASIVE SPECIES MANAGEMENT AND PLANTING NOTES
FOR THE
UT TO ALTAMAHAW CREEK SPILLWAY
STABILIZATION AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

MAY 28, 2010 DATE	50512-001 PROJECT NO.	
PSH-07.c SHEET	NOT TO SCALE	

Ecological Engineering PLLC
128 Raleigh Street
Holly Springs, NC 27540

NOTE:

ENTIRE CONSERVATION EASEMENT TO BE FENCED BY ALAMANCE COUNTY SOIL AND WATER CONSERVATION DISTRICT (ACSWCD) UPON COMPLETION OF THE PLANTING. DETAILS AND SPECIFICATIONS TO BE PROVIDED BY ACSWCD SEPARATE FROM THIS PROJECT.



NOTES:

CONSERVATION EASEMENT
RECORDED NOVEMBER 13, 2008

SITE DATA
1. OWNER/ADDRESS: CHARLES SYLVESTER HURSEY, SR.
2443 BARBER ROAD, ELON, NC 27244.
2. DEED REFERENCES: DEED BOOK 1765 PAGE 523.
3. TAX PARCELS: 4 - 10 - 138.
4. PIN: 88558849144.
5. TOTAL AREA: 4.63 ACRES INCLUDING ACCESS & CONSERVATION EASEMENTS. AREA COMPUTATION BY COORDINATE METHOD.
6. NO GEODETIC MONUMENTS WITHIN 2000' OF SURVEY.

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JOHN D. HALLUM AMERICAN

5/28/10

REVISIONS

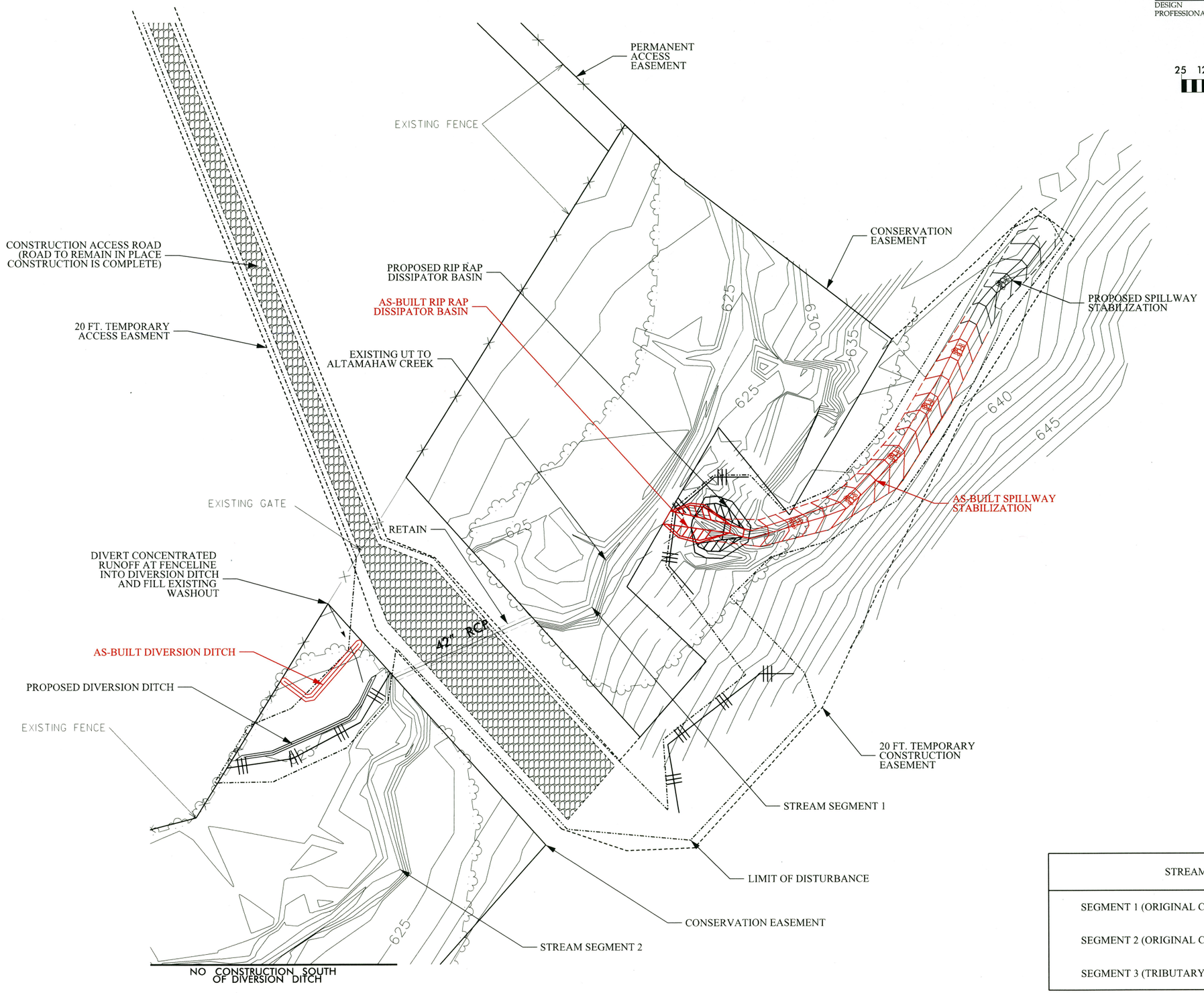
BOUNDARY MARKING PLAN
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

MAY 28, 2010
DATE

50512-001
PROJECT NO.

PSH-08
SHEET

Ecological Engineering PA
128 Raleigh Street
Holly Springs, NC 27540



DEVELOPMENT REFERENCE

DESIGN PROFESSIONAL	ECOLOGICAL ENGINEERING, LLP 128 RALEIGH STREET HOLLY SPRINGS, NC 27540 PHONE: (919) 557-0929

25 12.5 0 25 50

N

STREAM LENGTHS
SEGMENT 1 (ORIGINAL CHANNEL) 243 LF
SEGMENT 2 (ORIGINAL CHANNEL) 1104 LF
SEGMENT 3 (TRIBUTARY) 130 LF

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25506 ENGINEER JAMES R. PALMERLIN FLEMING

5/23/11

REVISIONS

RECORD DRAWING
FOR THE
UT TO ALTAMAHAW CREEK
SPILLWAY STABILIZATION
AND RIPARIAN PLANTING
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

MAY 23, 2011 DATE	50512-001 PROJECT NO.	
PSH-09 SHEET		

Ecological Engineering
128 Raleigh Street
Holly Springs, NC 27540

APPENDIX D.

CVS Data

APPENDIX D. Table 1. Vegetation Metadata UT Altamahaw Site / 92837	
Report Prepared By	Lane Sauls
Date Prepared	1/9/2012 13:02
database name	EcologicalEngineering-2012-UTAltamahawBaseline-A.mdb
database location	S:\Projects\50000 State\EEP 50512\50512-001 EEP Altamahaw Creek\MONITORING\Baseline
computer name	LANE
file size	35729408
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	92837
project Name	UT ALTAMAHAW
Description	
River Basin	Cape Fear
length(ft)	1347
stream-to-edge width (ft)	50
area (sq m)	12512.77
Required Plots (calculated)	5
Sampled Plots	5

APPENDIX D. Table 2. Vigor by Species
UT Altamahaw Site / 92837

	Species	CommonName	4	3	2	1	0	Missing	Unknown
	Betula nigra	river birch		1					
	Cornus florida	flowering dogwood		1	1				
	Fraxinus pennsylvanica	green ash		4	3				
	Oxydendrum arboreum	sourwood			1				
	Quercus michauxii	swamp chestnut oak		1	3				
	Quercus pagoda	cherrybark oak		3	8				
	Quercus	oak			1				
	Platanus occidentalis	American sycamore		2	1				
	Ulmus americana	American elm		2					
	Unknown			1	2				
TOTALS:	**10**	**9**		**15**	**20**				

APPENDIX D. Table 3. Damage by Species
UT Altamahaw Site / 92837

	Species	CommonName	Count of Damage Categories	(no damage)	Unknown
	Betula nigra	river birch	0	1	
	Cornus florida	flowering dogwood	1	1	1
	Fraxinus pennsylvanica	green ash	3	4	3
	Oxydendrum arboreum	sourwood	1		1
	Platanus occidentalis	American sycamore	1	2	1
	Quercus	oak	1		1
	Quercus michauxii	swamp chestnut oak	2	2	2
	Quercus pagoda	cherrybark oak	8	3	8
	Ulmus americana	American elm	0	2	
	Unknown		2	1	2
TOTALS:	**10**	**9**	**19**	**16**	**19**

APPENDIX D. Table 4. Planted Stems by Plot and Species
UT Altamahaw Site / 92837

	Comment	Species	CommonName	Total Planted Stems	# plots	avg# stems	plot 92837-LS-0001	plot 92837-LS-0002	plot 92837-LS-0003	plot 92837-LS-0004	plot 92837-LS-0005
		Betula nigra	river birch	1	1	1					1
		Cornus florida	flowering dogwood	2	2	1				1	1
		Fraxinus pennsylvanica	green ash	7	4	1.75	2		1	3	1
		Oxydendrum arboreum	sourwood	1	1	1					1
		Platanus occidentalis	American sycamore	3	2	1.5		2			1
		Quercus	oak	1	1	1				1	
		Quercus michauxii	swamp chestnut oak	4	2	2		2	2		
		Quercus pagoda	cherrybark oak	11	4	2.75		2	2	6	1
		Ulmus americana	American elm	2	2	1		1	1		
		Unknown		3	3	1	1	1			1
TOTALS:	**0**	**10**	**9**	**35**	**10**		**3**	**8**	**6**	**11**	**7**

APPENDIX A. Table 5. All Stems by Plot and Species
UT Altamahaw Site / 92837

	Comment	Species	CommonName	Total Stems	# plots	avg# stems	92837-LS-0001	92837-LS-0002	92837-LS-0003	92837-LS-0004	92837-LS-0005
		Betula nigra	river birch	1	1	1					1
		Cornus florida	flowering dogwood	2	2	1				1	1
		Fraxinus pennsylvanica	green ash	7	4	1.75	2		1	3	1
		Oxydendrum arboreum	sourwood	1	1	1					1
		Platanus occidentalis	American sycamore	3	2	1.5		2			1
		Quercus	oak	1	1	1				1	
		Quercus michauxii	swamp chestnut oak	4	2	2		2	2		
		Quercus pagoda	cherrybark oak	11	4	2.75		2	2	6	1
		Salix nigra	black willow	2	1	2	2				
		Ulmus americana	American elm	2	2	1		1	1		
		Unknown		3	3	1	1	1			1
TOTALS:	**0**	**11**	**10**	**37**	**11**		**5**	**8**	**6**	**11**	**7**

APPENDIX D. Table 6. Stream, Wetland and Buffer Densities
UT Altamahaw Site / 92837
Year 0 (02-Jan-2012 to 06-Jan-2012)

Vegetation Plot Summary Information

Plot #	Riparian Buffer Stems1	Stream/ Wetland Stems2	Live Stakes	Invasives	Volunteers3	Total4	Unknown Growth Form
1	n/a	n/a	0	0	2	**5**	5
2	n/a	n/a	0	0	0	**8**	8
3	n/a	n/a	0	0	0	**6**	6
4	n/a	n/a	0	0	0	**11**	11
5	n/a	n/a	0	0	0	**7**	7

Wetland/Stream Vegetation Totals
(per acre)

Plot #	Stream/ Wetland Stems2	Volunteers3	Total4	Success Criteria Met?
1	n/a	81	202	
2	n/a	0	324	
3	n/a	0	243	
4	n/a	0	445	
5	n/a	0	283	
Project Avg				

Source: EEP

EEP Project Code 92837. Project Name: UT ALTAMAHAW

			Current Plot Data (MY0 2012)															Annual Means		
			E92837-LS-0001			E92837-LS-0002			E92837-LS-0003			E92837-LS-0004			E92837-LS-0005			MY0 (2012)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Betula nigra	river birch	Tree													1	1	1	1	1	1
Cornus florida	flowering dogwood	Shrub Tree										1	1	1	1	1	1	2	2	2
Fraxinus pennsylvanica	green ash	Tree	2	2	2				1	1	1	3	3	3	1	1	1	7	7	7
Oxydendrum arboreum	sourwood	Shrub Tree													1	1	1	1	1	1
Platanus occidentalis	American sycamore	Tree				2	2	2							1	1	1	3	3	3
Quercus	oak	Shrub Tree										1	1	1				1	1	1
Quercus michauxii	swamp chestnut oak	Tree				2	2	2	2	2	2							4	4	4
Quercus pagoda	cherrybark oak	Tree				2	2	2	2	2	2	6	6	6	1	1	1	11	11	11
Salix nigra	black willow	Tree			2															2
Ulmus americana	American elm	Tree				1	1	1	1	1	1							2	2	2
Unknown		unknown	1	1	1	1	1	1							1	1	1	3	3	3
		Stem count	3	3	5	8	8	8	6	6	6	11	11	11	7	7	7	35	35	37
		size (ares)	1			1			1			1			1			5		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.12		
		Species count	2	2	3	5	5	5	4	4	4	4	4	4	7	7	7	10	10	11
		Stems per ACRE	121.4	121.4	202.3	323.7	323.7	323.7	242.8	242.8	242.8	445.2	445.2	445.2	283.3	283.3	283.3	283.3	283.3	299.5

Color for Density

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%