

# **BURNETTS CHAPEL BUFFER MITIGATION SITE**

*Guilford County, NC*

*DENR Contract 003996*

*NCEEP Project Number 95009*

## **Baseline Monitoring Document and As-Built Baseline Report FINAL**

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Prepared for:



NCDENR, EEP  
1652 Mail Service Center  
Raleigh, NC  
27699-1652

Prepared by:

Wildlands Engineering, Inc.  
1430 S. Mint Street, #104  
Charlotte, NC 28203  
P – 704-332-7754  
F – 704-332-3306  
Kirsten Y. Gimbert  
[kgimbert@wildlandseng.com](mailto:kgimbert@wildlandseng.com)

# BURNETTS CHAPEL BUFFER MITIGATION SITE

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## **EXECUTIVE SUMMARY**

The Burnetts Chapel Buffer Mitigation Site, hereafter referred to as the Site, is located in rural Guilford County, south of Greensboro, NC, in the Cape Fear River Basin (United States Geological Survey (USGS) Hydrologic Unit 03030003). The primary objectives of the project were to remove harmful nutrients from creek flow, reduce pollution of creek by excess sediment, restore the terrestrial habitat, and improve aesthetics. These goals were achieved by restoring 9.2 acres and preserving 1.5 acres of riparian buffer.

### ***Pre-Construction Site Conditions***

The Site is located in the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998). The Site has historically been forested or used for agricultural purposes. The current property owner has confirmed that the Site has been farmed for more than 100 years and has included activities such as crop production, livestock pastures, and timber. The Site is comprised of two areas on one parcel of land along three (3) perennial streams (Reaches A, B1 and B2) and four intermittent streams (Reaches B2, B3, B4, and B5) that drain to the Randleman Reservoir. At the downstream limits of the project, the drainage area is 366 acres (0.6 square mile).

Prior to construction activities, the primary watershed stressor was the lack of a vegetated buffer and subsequent moderate stream incision from agricultural maintenance activities. Some reaches (A and B1) exhibited only moderate incision with stable bedform and stream banks throughout, while other reaches (B2) exhibited stable geomorphic conditions with no active bed incision or bank erosion. The riparian zones within these areas were maintained in the past and mowed on an annual basis resulting in varying buffer widths. The smaller intermittent channels with small upstream ephemeral channels are located entirely within existing open pasture. These reaches (B3, B4, and B5) entirely lacked suitable woody riparian species and were dominated by various grass and sedge species. As a result of the aforementioned land activities, the Site had poor water quality due to sediment and nutrient pollution and poor in-stream habitat due to lack of riparian vegetation and lack of in-stream bed diversity.

### ***Restoration Approach and Implementation***

The project was completed to provide buffer mitigation units (BMUs) in the Cape Fear River Basin. The project design did not cause adverse impacts to streams or wetlands. The streams and ditches within the project area are tributaries to the Randleman Regional Reservoir. The buffer restoration work will improve water quality and terrestrial habitat throughout the Site. The 50-foot riparian buffer zone restored and re-planted will improve water quality by allowing for the absorption of nutrient runoff from adjacent pastures and cropland and capture sediment from off-site sources by slowing overland flow velocities. Water temperatures will eventually be decreased as the planted trees establish a canopy cover, creating long-term shading. The buffer zones will improve terrestrial habitat for native wildlife and provide further connectivity to existing off-site forested areas and stream riparian zone habitats.

The final mitigation plan was submitted and accepted by the North Carolina Ecosystem Enhancement Program (NCEEP) in February of 2012. Grading activities were completed by the landowner in December of 2011. Planting activities were completed by Bruton Natural Systems, Inc. in March of 2012. The baseline monitoring and as-built survey were completed in April of

2012. There were no significant deviations reported in the project elements in comparison to the design plans. Appendix 1 provides more detailed project activity, history, contact information, and watershed/site background information for this project.

### ***Monitoring***

Baseline monitoring (Year 0 of 5) was conducted in April of 2012. The first annual monitoring assessment (Year 1 of 5) will be completed in September of 2012. The Site will be monitored for a total of five (5) years, with the final monitoring activities conducted in 2016 and the close-out in 2017. Monitoring will consist of collecting vegetative data on an annual basis to assess the project success based on the restoration goals and objectives. The success of the Site will be assessed using measurements of the vegetation monitoring plots. The extent of invasive species coverage will be monitored and controlled as necessary. At the end of the first growing season, species composition, density, and survival will be evaluated. The site will then be evaluated each subsequent year until the final success criteria are achieved.

## 1.0 Project Goals, Background and Attributes

### 1.1 Project Location and Setting

The Site is located within the Randleman Regional Reservoir watershed (NCDWQ Subbasin 03-06-08) of the Cape Fear River Basin (USGS Hydrologic Unit Code 03030003010050). The project is located approximately three miles west of the Town of Pleasant Garden and four miles south of the City of Greensboro in Guilford County, NC. The project is surrounded by fields that are alternately used for cattle and crop production. At the downstream limits of the project, the drainage area is 366 acres (0.6 square mile). The Deep River is the primary river in this HUC which flows into the Randleman Reservoir. The project site streams are direct tributaries to the Randleman Regional Reservoir. The newly created reservoir is a regional water supply and stream buffer protection rules are in place throughout the watershed (<http://portal.ncdenr.org/web/wq/swp/ws/401/riparianbuffers/rules>).

The North Carolina Division of Water Quality (NCDWQ) assigns best usage classifications to State Waters that reflect water quality conditions and potential resource usage. Deep River is classified as Class WS-IV; Critical Area (CA) waters. Class WS-IV waters are used as sources of water supply for drinking or food processing purposes where a more restrictive WS-I, WS-II, or WS-III classification is not feasible. These waters are also protected for Class C uses such as secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, and agriculture. WS-IV waters are generally in moderately to highly-developed watersheds or Protected Areas. This portion flowing into the Randleman Regional Reservoir is located within the Critical Area or area within ½ mile of a water supply.

A conservation easement has been recorded to protect the 12.0 acres of riparian corridor resources in perpetuity within the Ingram parcel (PIN No. 7840-90-6275). Directions and a map of the Site are provided in Figure 1.

### 1.2 Project Goals and Objectives

The goals of the Site address water quality improvements identified in the Cape Fear River Basin Restoration Priorities Report and include the following:

- Remove harmful nutrients from creek flow;
- Reduce pollution of creek by excess sediment;
- Restore terrestrial habitat; and
- Improve aesthetics.

The following project objectives were established to meet these goals:

- Riparian areas will be fenced off from adjacent agricultural activities and runoff will be filtered through buffer zones. Flood flows will be filtered through restored riparian areas, where flood flow will spread through native vegetation. Vegetation will be planted to uptake excess nutrients.

- Streambanks will be further stabilized by increased woody root mass in the banks. Storm flow containing grit and fine sediment will be filtered through restored riparian buffer areas, where flow will spread through native vegetation.
- The establishment and maintenance of riparian buffers will create long-term shading of the channel bed, reducing thermal heating and improving aquatic habitat.
- Adjacent buffer and riparian habitats will be restored with native vegetation and invasive species will be treated as part of the project. Native vegetation will provide cover and food for terrestrial creatures.

Please refer to Appendix 3 for the mitigation plan approval letter from NCDWQ.

### *1.3 Project Structure, Restoration Type and Approach*

#### 1.3.1 Project Structure

Please refer to Figure 2 for the project component/asset map for the monitoring and restoration feature exhibits on the Site and Table 1 for the project component and mitigation credit information.

#### 1.3.2 Restoration Type and Approach

Prior to construction activities, the primary watershed stressor was the lack of a vegetated buffer and subsequent moderate stream incision from agricultural maintenance activities. The project restoration activities completed provides 9.2 buffer mitigation units (BMUs) in the Cape Fear River Basin (Table 1, Appendix 1). As part of the parcel preparation, two small surface water impoundments, located on Reaches B4 and B5, were removed in order to allow for stable stream channels to be constructed and for these areas to qualify for buffer restoration credit. Riparian stream buffers were planted and restored to the dominant natural plant community that exists within the project watershed. This natural community within and adjacent to the project easement is classified as Piedmont Bottomland Forest and was determined based on existing canopy and herbaceous species (Schafale and Weakley, 1990). Plant and seed materials were installed on stream banks out to the project easement limits. These areas were planted with bare root trees and a seed mixture of permanent herbaceous vegetation ground cover.

### *1.4 Project History, Contacts and Attribute Data*

The Site was restored by Wildlands Engineering, Inc. (WEI) through a full-delivery contract with NCEEP. Tables 2, 3, and 4 provide detailed information regarding the Project Activity and Reporting History, Project Contacts, and Project Baseline Information and Attributes.

## **2.0 Success Criteria**

The buffer restoration success criteria for the Site follows the approved success criteria presented in the NCEEP Mitigation Plan Guidance (Version 2.0, 10/01/2010). WEI will oversee annual monitoring of vegetation to assess the condition of the finished project for five years, or until success criteria are met.

## *2.1 Vegetation*

The final vegetative success criteria will be the survival of 320 planted stems per acre in the buffer corridor at the end of year five (5) of the monitoring period. The extent of invasive species coverage will also be monitored and controlled as necessary.

## *2.2 Schedule and Reporting*

Annual monitoring data will be reported using the NCEEP Monitoring Report template (Version 1.3, 11/15/10). The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, population of NCEEP databases for analysis, research purposes, and assist in decision making regarding close-out. The monitoring reports will include the following:

1. Project background which includes project objectives, project structure, restoration type and approach, location and setting, history and background.
2. Monitoring plan view map of major project elements including vegetation plots.
3. Vegetative data as described above including the identification of any invasion by undesirable plant species.
4. A description of damage by animals or vandalism.
5. Maintenance issues and recommended remediation measures will be detailed and documented.

## **3.0 Monitoring Plan**

Monitoring reports will be prepared in the fall of each year of monitoring and submitted to NCEEP.

### *3.1 Vegetation*

Planted woody vegetation will be monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-NCEEP Level 2 Protocol (Lee et al., 2008) to monitor and assess the planted woody vegetation. A total of 22 vegetation plots were established within the project easement area using standard 10 meter by 10 meter vegetation monitoring plots. Plots were randomly established within planted portions of the riparian buffer areas to capture the heterogeneity of the designed vegetative communities. The plot corners have been marked and are recoverable either through field identification or with the use of a GPS unit. Reference photographs at the origin looking diagonally across the plot to the opposite corner were taken with the as-built. Subsequent assessments following baseline survey will capture the same reference photograph locations.

## **4.0 Maintenance and Contingency Plans**

Upon approval for close-out by the NCDWQ, the site will be transferred to the NCDENR Division of Natural Resource Planning and Conservation and Stewardship Program. This party shall be responsible for periodic inspection of the site to ensure that restrictions required in the conservation easement or the deed restriction document(s) are upheld. Endowment funds required to uphold easement and deed restrictions shall be negotiated prior to site transfer to the responsible party.



The NCDENR Division of Natural Resource Planning and Conservation's Stewardship Program currently houses NCEEP stewardship endowments within the non-reverting, interest-bearing Conservation Lands Stewardship Endowment Account. The use of funds from the Endowment Account is governed by North Carolina General Statute GS 113A-232(d)(3). Interest gained by the endowment fund may be used only for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable. The NCDENR Stewardship Program intends to manage the account as a non-wasting endowment. Only interest generated from the endowment funds will be used to steward the compensatory mitigation sites. Interest funds not used for those purposes will be re-invested in the Endowment Account to offset losses due to inflation.

Intensive vegetation management and a rigorous herbicide schedule will be implemented over the first few years of tree establishment in the riparian buffer restoration areas to prevent establishment of invasive species that will attempt to out-compete the planted native vegetation. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDCA) rules and regulations. If, during the course of annual monitoring it is determined the site's ability to achieve site performance standards are jeopardized, WEI will notify NCDWQ of the need to develop a Plan of Corrective Action. Once the Corrective Action Plan is prepared and finalized WEI will:

1. Notify the NCEEP and NCDWQ in writing.
2. Revise performance standards, maintenance requirements, and monitoring requirements as necessary and/or required by the NCDWQ.
3. Obtain other permits as necessary.
4. Implement the Corrective Action Plan.
5. Provide the NCDWQ a Record Drawing of Corrective Actions. This document shall depict the extent and nature of the work performed.

#### *4.1 Vegetation*

Vegetative problem areas will be mapped and included in the Current Condition Plan View (CCPV) map as part of the annual vegetation assessment. Vegetation problems areas may include planted vegetation not meeting success criteria, persistent invasive species, barren areas with little to no herbaceous cover, or grass suffocation/crowding of planted stems. Appropriate remedial actions will be determined with NCEEP correspondence as stated above in section 4.0.

### **5.0 As-Built Condition (Baseline)**

The Burnetts Chapel Buffer Mitigation Site planting and as-built survey was completed during March and April 2012. The baseline monitoring (MY-0 of 5) vegetative survey was completed in April 2012. The baseline vegetation monitoring resulted in an average survival of 752 stems per acre, which is greater than the design density required. There was an average of 19 stems per plot. Please refer to Appendix 2 for vegetation summary tables, raw data tables, and vegetation plot photographs and Appendix 4 for the as-built plan sheets.

## 6.0 References

- Lee, Michael T., Peet, Robert K., Steven D., Wentworth, Thomas R. 2006. CVS-EEP Protocol for Recording Vegetation Version 4.0. Retrieved from <http://www.nceep.net/business/>
- Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina, 3rd approx. North Carolina Natural Heritage Program, Raleigh, North Carolina.
- United States Department of Agriculture (USDA), 2009. Natural Resources Conservation Service, Soil Survey Geographic (SSURGO) database for Guilford County, North Carolina. <http://SoilDataMart.nrcs.usda.gov>
- United States Geological Survey (USGS), 1998. North Carolina Geology. <http://www.geology.enr.state.nc.us/usgs/carolina.htm>
- Weakley, A.S. 2008. *Flora of the Carolinas, Virginia, Georgia, Northern Florida, and Surrounding Areas* (Draft April 2008). University of North Carolina at Chapel Hill: Chapel Hill, NC.
- Wildlands Engineering, Inc. 2012. Burnetts Chapel Buffer Mitigation Site Restoration Plan. NCEEP, Raleigh, NC.

## **APPENDIX 1. General Tables and Figures**

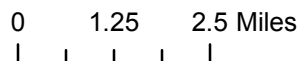
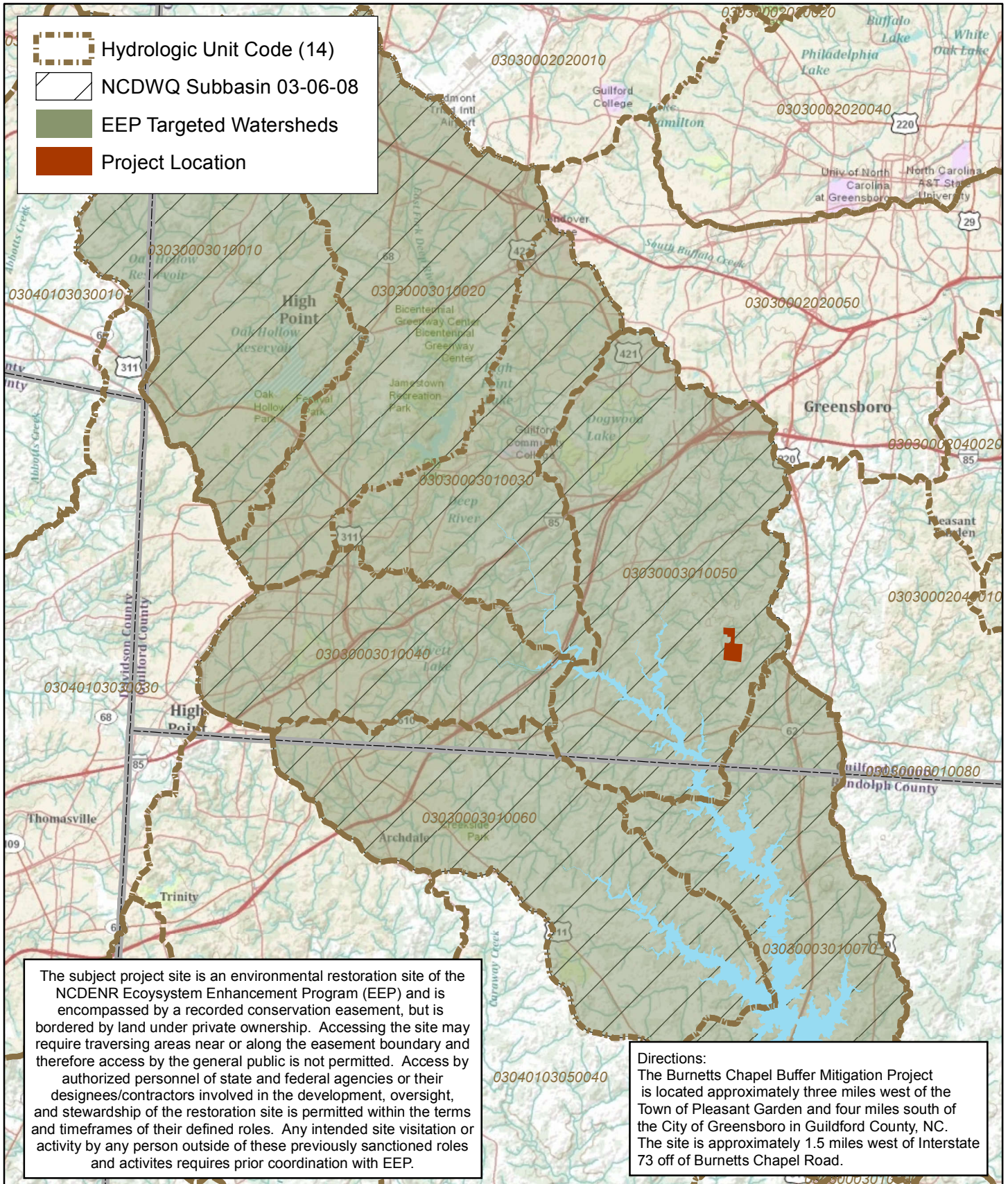
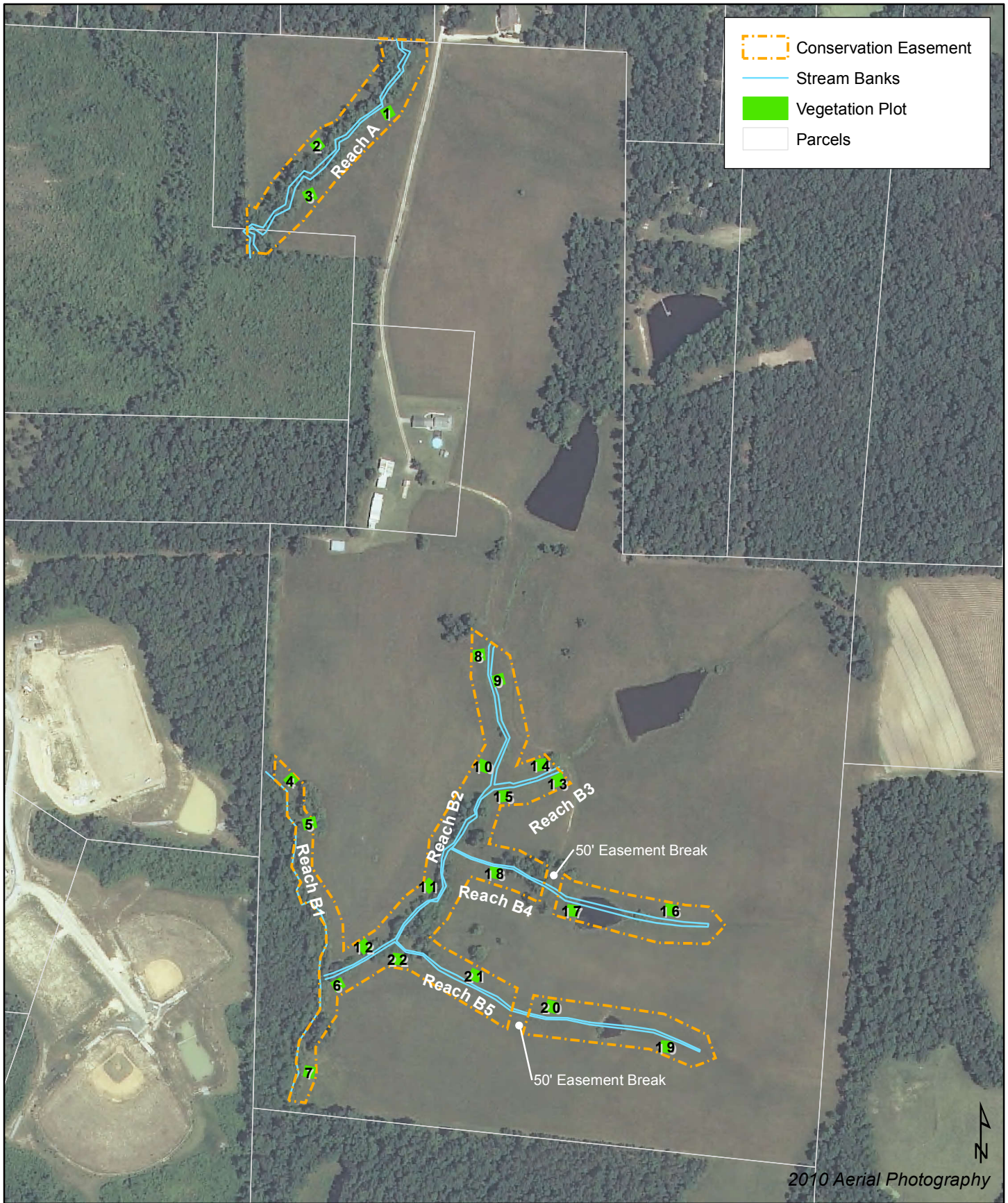


Figure 1. Project Vicinity Map  
 Burnetts Chapel Buffer Mitigation Site  
 NCEEP Project Number 95009  
 Monitoring Year 0 of 5



0 200 400 Feet

Figure 2. Project Component/Asset Map  
 Burnett's Chapel Buffer Mitigation Site  
 NCEP Project Number 95009  
 Monitoring Year 0 of 5

Guilford County, NC

**Appendix 1. General Tables and Figures**

**Table 1. Project Components and Mitigation Credits**  
**Burnetts Chapel Buffer Mitigation Site (NCEEP Project No.95009)**  
**Monitoring Year 0 of 5**

Mitigation Credits									
	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	N/A	N/A	N/A	N/A	N/A	N/A	9.2	N/A	N/A
Project Components									
Reach ID	Stationing/ Location	Existing Footage (LF)	Approach	Restoration or Restoration Equivalent		Area (acres)	Mitigation Ratio		
Reach A	Area A		N/A	Restoration		1.5	1:1		
Reach B1	Area B		N/A	Restoration		0.7	1:1		
Reach B2	Area B		N/A	Restoration		2.7	1:1		
Reach B3	Area B		N/A	Restoration		0.4	1:1		
Reach B4	Area B		N/A	Restoration		1.70	1:1		
Reach B5	Area B		N/A	Restoration		2.2	1:1		
Component Summation									
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-Riparian Wetland (acres)		Buffer (square feet)	Upland (acres)		
		Riverine	Non-Riverine						
Restoration						400,752			
Enhancement									
Enhancement I									
Enhancement II									
Creation									
Preservation									
High Quality Preservation									
BMP Elements									
Elements	Location		Purpose/Function		Notes				

BR = Bioretention Cell; S F= 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

**Appendix 1. General Tables and Figures**  
**Table 2. Project Activity and Reporting History**  
**Burnetts Chapel Buffer Mitigation Site (NCEEP Project No.95009)**  
**Monitoring Year 0 of 5**

<b>Activity or Report</b>	<b>Date Collection Complete</b>	<b>Completion or Delivery</b>
Mitigation Plan	December 2011	February 2012
Final Design - Construction Plans	December 2011	February 2012
Construction	January 2012	January 2012
Temporary S&E mix applied to entire project area*	January 2012	January 2012
Permanent seed mix applied to reach/segments	January 2012	January 2012
Containerized and B&B plantings for reach/segments	March 2012	March 2012
Baseline Monitoring Document (Year 0 Monitoring - baseline)	March 2011/April 2011	May 2012
Year 1 Monitoring	Sept 2012	Dec 2012
Year 2 Monitoring	2013	Dec 2013
Year 3 Monitoring	2014	Dec 2014
Year 4 Monitoring	2015	Dec 2015
Year 5 Monitoring	2016	Dec 2016

\*Seed and mulch is added as each section of construction is completed.

**Appendix 1. General Tables and Figures**

**Table 3. Project Contact Table**

**Burnetts Chapel Buffer Mitigation Site (NCEEP Project No.95009)**

**Monitoring Year 0 of 5**

<b>Designer</b>	<b>Wildlands Engineering, Inc.</b> 5605 Chapel Hill Road, Suite 122 Raleigh, NC 27604 919.851.9986
Daniel Taylor	
<b>Construction Contractor</b>	<b>Landowner</b> 1323 Burnetts Chapel Road Greensboro, NC 27403
Richard L. Ingram	
<b>Planting Contractor</b>	<b>Bruton Natural Systems, Inc.</b> PO Box 1197 Freemont, NC 27830 919.242.6555
Charlie Bruton	
<b>Seeding Contractor</b>	<b>Bruton Natural Systems, Inc.</b> PO Box 1197 Freemont, NC 27830 919.242.6555
Charlie Bruton	
<b>Seed Mix Sources</b>	<b>Mellow Marsh Farm</b>
<b>Nursery Stock Suppliers</b>	<b>Arborgen</b> <b>Dykes and Son Nursery</b> <b>NCForestry Service, Claridge Nursery</b>
<b>Monitoring Performers</b>	<b>Wildlands Engineering, Inc.</b> Kirsten Y. Gimbert 704.332.7754, ext. 110
Vegetation Monitoring, POC	



**Appendix 1. General Tables and Figures**

**Table 4. Project Baseline Information and Attributes**

**Burnetts Chapel Buffer Mitigation Site (NCEEP Project No.95009)**

**Monitoring Year 0 of 5**

Project Information						
Project Name	Burnett's Chapel Buffer Mitigation Site					
County	Guilford					
Project Area (acres)	12					
Project Coordinates (latitude and longitude)	35° 56' 46.0"N, 79° 50' 44.2"W					
Project Watershed Summary Information						
Physiographic Province	Carolina Slate Belt of the Piedmont					
River Basin	Cape Fear					
USGS Hydrologic Unit 8-digit	03030003					
USGS Hydrologic Unit 14-digit	03030003010050					
DWQ Sub-basin	03-06-08					
Project Drainage Area (acres)	366					
Project Drainage Area Percentage of Impervious Area	3%					
CGIA Land Use Classification	52% Forest Land, 41% Cultivated Land, 7% Institutional					
Reach Summary Information						
Parameters	Reach A	Reach B1	Reach B2	Reach B3	Reach B4	Reach B5
Length of reach (linear feet) - Post-Restoration	699	1,025	1,653	768	475	800
Drainage area (acres)	94	366	99	33	12	10
NCDWQ stream identification score	31	41	24.25/	23.25	19.75	22.75
NCDWQ Water Quality Classification	WS-IV; CA, C					
Morphological Description (stream type)	Perennial	Perennial	Int./Per.	Inter-mittent	Inter-mittent/ Ephem.	Inter-mittent/ Ephem.
Evolutionary trend (Simon's Model) - Pre- Restoration	N/A	N/A	N/A	N/A	N/A	N/A
Underlying mapped soils	Ch	HeC	HeC	VaD	HeC	EnB
Drainage class	Poorly-drained	Mod. well- drained	Mod. well- drained	Well-drained	Mod. well- drained	Well- drained
Soil Hydric status	Yes	No	No	No	No	Yes
Slope	0-2%	6-10%	6-10%	10-15%	6-10%	2-6%
FEMA classification	no regulated floodplain					
Native vegetation community	Bottom-land forest					
Percent composition of exotic invasive vegetation - Post-Restoration	0%					
Regulatory Considerations						
Regulation	Applicable?	Resolved?	Supporting Documentation			
Waters of the United States - Section 404	X	X	USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 3689			
Waters of the United States - Section 401	X	X				
Division of Land Quality (Dam Safety)	N/A	N/A	N/A			
Endangered Species Act	X	X	Burnetts Chapel Buffer Mitigation Plan; studies found "no effect" (letter from USFWS)			
Historic Preservation Act	X	X	No historic resources were found to be impacted (letter from SHPO)			
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	N/A	N/A	N/A			
FEMA Floodplain Compliance	N/A	N/A	N/A			
Essential Fisheries Habitat	N/A	N/A	N/A			

U= Unknown

## **APPENDIX 2. Vegetation Plot Data**

**Appendix 2. Vegetation Assessment**

**Table 5a. Planted and Total Stem Counts (Species by Plot with Annual Means)**

**Burnett's Chapel Buffer Mitigation Site (NCEEP Project No. 95009)**

**Reach A and B1**

**Monitoring Year 0 of 5**

Species	Common Name	Type	Current Data (MY0-4/2012)														Annual Means		
			Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7		Current Mean		
			P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	
<i>Betula nigra</i>	River Birch	Tree	6	6	1	1	5	5	2	2	3	3	2	2	6	6	4	4	
<i>Carpinus caroliniana</i>	Ironwood	Tree	2	2	1	1	3	3	4	4			7	7	2	2	3	3	
<i>Fraxinus pennsylvanica</i>	Green Ash	Tree					1	1	1	1	2	2	3	3	1	1	3	3	
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree	1	1	9	9	10	10							1	1	4	4	
<i>Platanus occidentalis</i>	Sycamore	Tree	8	8	4	4	5	5	11	11	11	11	4	4	4	4	5	5	
<i>Quercus michauxii</i>	Swamp Chestnut Oak	Tree			1	1						1	1			2	2	2	2
<i>Quercus phellos</i>	Willow Oak	Tree					1	1	1	1			1	1	1	1	2	2	
<i>Quercus rubra</i>	Northern Red Oak	Tree	1	1	1	1			1	1	1	1	1	1			3	3	
<b>Plot Area (acres)</b>			<b>0.0247</b>																
<b>Species Count</b>			<b>5</b>	<b>5</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>5</b>	<b>5</b>	<b>6</b>	<b>6</b>	<b>7</b>	<b>7</b>	<b>6</b>	<b>6</b>	
<b>Stem Count</b>			<b>18</b>	<b>18</b>	<b>17</b>	<b>17</b>	<b>25</b>	<b>25</b>	<b>20</b>	<b>20</b>	<b>18</b>	<b>18</b>	<b>18</b>	<b>18</b>	<b>17</b>	<b>17</b>	<b>19</b>	<b>19</b>	
<b>Stems per Acre</b>			<b>729</b>	<b>729</b>	<b>688</b>	<b>688</b>	<b>1012</b>	<b>1012</b>	<b>810</b>	<b>810</b>	<b>729</b>	<b>729</b>	<b>729</b>	<b>729</b>	<b>688</b>	<b>688</b>	<b>769</b>	<b>769</b>	

Type=Shrub or Tree

P = Planted

T = Total

**Appendix 2. Vegetation Assessment**

**Table 5b. Planted and Total Stem Counts (Species by Plot with Annual Means)**

**Burnett's Chapel Buffer Mitigation Site (NCEEP Project No. 95009)**

**Reach B2 and B3**

**Monitoring Year 0 of 5**

Species	Common Name	Type	Current Data (MY0-4/2012)																		Annual Means	
			Plot 8		Plot 9		Plot 10		Plot 11		Plot 12		Plot 13		Plot 14		Plot 15		Current Mean			
			P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T		
<i>Betula nigra</i>	River Birch	Tree	1	1	2	2	9	9	4	4			4	4	7	7	2	2	4	4		
<i>Carpinus caroliniana</i>	Ironwood	Tree	2	2	1	1			1	1			3	3			1	1	3	3		
<i>Fraxinus pennsylvanica</i>	Green Ash	Tree	6	6			4	4	3	3	11	11							3	3		
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree	10	10					1	1									4	4		
<i>Platanus occidentalis</i>	Sycamore	Tree			4	4	1	1	9	9	1	1	6	6	3	3	2	2	5	5		
<i>Quercus michauxii</i>	Swamp Chestnut Oak	Tree					1	1	1	1	2	2	2	2	2	2	7	7	2	2		
<i>Quercus phellos</i>	Willow Oak	Tree			2	2	1	1					4	4	3	3	2	2	2	2		
<i>Quercus rubra</i>	Northern Red Oak	Tree			9	9	2	2	1	1	4	4			4	4	8	8	3	3		
<b>Plot Area (acres)</b>			<b>0.0247</b>																			
<b>Species Count</b>			<b>4</b>	<b>4</b>	<b>5</b>	<b>5</b>	<b>6</b>	<b>6</b>	<b>7</b>	<b>7</b>	<b>4</b>	<b>4</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>		
<b>Stem Count</b>			<b>19</b>	<b>19</b>	<b>18</b>	<b>18</b>	<b>18</b>	<b>18</b>	<b>20</b>	<b>20</b>	<b>18</b>	<b>18</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>22</b>	<b>22</b>	<b>19</b>	<b>19</b>		
<b>Stems per Acre</b>			<b>769</b>	<b>769</b>	<b>729</b>	<b>729</b>	<b>729</b>	<b>729</b>	<b>810</b>	<b>810</b>	<b>729</b>	<b>729</b>	<b>769</b>	<b>769</b>	<b>769</b>	<b>769</b>	<b>891</b>	<b>891</b>	<b>769</b>	<b>769</b>		

Type=Shrub or Tree

P = Planted

T = Total

**Appendix 2. Vegetation Assessment**

**Table 5c. Planted and Total Stem Counts (Species by Plot with Annual Means)**

**Burnett's Chapel Buffer Mitigation Site (NCEEP Project No. 95009)**

**Reach B4 and B5**

**Monitoring Year 0 of 5**

Species	Common Name	Type	Current Data (MY0-4/2012)														Annual Means	
			Plot 16		Plot 17		Plot 18		Plot 19		Plot 20		Plot 21		Plot 22		Current Mean	
			P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
<i>Betula nigra</i>	River Birch	Tree	3	3	3	3	7	7	3	3	2	2	1	1	3	3	4	4
<i>Carpinus caroliniana</i>	Ironwood	Tree			4	4					6	6	4	4	2	2	3	3
<i>Fraxinus pennsylvanica</i>	Green Ash	Tree	3	3	2	2	5	5			2	2	5	5	2	2	3	3
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree	1	1	2	2	1	1	3	3	4	4	7	7	3	3	4	4
<i>Platanus occidentalis</i>	Sycamore	Tree	9	9	7	7	3	3	3	3	2	2			9	9	5	5
<i>Quercus michauxii</i>	Swamp Chestnut Oak	Tree							7	7	1	1	1	1			2	2
<i>Quercus phellos</i>	Willow Oak	Tree	1	1			3	3	3	3							2	2
<i>Quercus rubra</i>	Northern Red Oak	Tree							1	1			1	1			3	3
<b>Plot Area (acres)</b>			<b>0.0247</b>															
<b>Species Count</b>			<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>5</b>	<b>5</b>	<b>6</b>	<b>6</b>
<b>Stem Count</b>			<b>17</b>	<b>17</b>	<b>18</b>	<b>18</b>	<b>19</b>	<b>19</b>	<b>20</b>	<b>20</b>	<b>17</b>	<b>17</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>
<b>Stems per Acre</b>			<b>688</b>	<b>688</b>	<b>729</b>	<b>729</b>	<b>769</b>	<b>769</b>	<b>810</b>	<b>810</b>	<b>688</b>	<b>688</b>	<b>769</b>	<b>769</b>	<b>769</b>	<b>769</b>	<b>769</b>	<b>769</b>

Type=Shrub or Tree

P = Planted

T = Total

**Appendix 2. Vegetation Assessment**

**Table 6. CVS Vegetation Tables - Metadata**

**Burnetts Chapel Buffer Mitigation Site (NCEEP Project No. 95009)**

**Monitoring Year 0 of 5**

<b>Report Prepared By</b>	Kirsten Gimbert
<b>Date Prepared</b>	4/30/2012 14:50
<b>database name</b>	<i>Burnetts Chapel-MY0.mdb</i>
<b>database location</b>	<i>Q:\ActiveProjects\005-02130 Burnetts Chapel Buffer Mitigation Site\Monitoring\Baseline Monitoring\Vegetation Assessment</i>
<b>DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----</b>	
<b>Metadata</b>	<i>Description of database file, the report worksheets, and a summary of project(s) and project data.</i>
<b>Plots</b>	<i>Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.</i>
<b>Vigor</b>	<i>Frequency distribution of vigor classes for stems for all plots.</i>
<b>Vigor by Spp</b>	<i>Frequency distribution of vigor classes listed by species.</i>
<b>Damage</b>	<i>List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.</i>
<b>Damage by Spp</b>	<i>Damage values tallied by type for each species.</i>
<b>Damage by Plot</b>	<i>Damage values tallied by type for each plot.</i>
<b>Stem Count by Plot and Spp</b>	<i>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.</i>
<b>PROJECT SUMMARY-----</b>	
<b>Project Code</b>	95009
<b>project Name</b>	Burnetts Chapel Mitigation Site
<b>Description</b>	Buffer Mitigation
<b>length (ft)</b>	
<b>stream-to-edge width (ft)</b>	
<b>area (sq m)</b>	
<b>Required Plots (calculated)</b>	22
<b>Sampled Plots</b>	22

**Appendix 2. Vegetation Assessment**

**Table 7. CVS Vegetation Tables - Vigor by Species**

**Burnetts Chapel Buffer Mitigation Site (NCEEP Project No. 95009)**

**Monitoring Year 0 of 5**

	<i>Species</i>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>Missing</b>
	<i>Betula nigra</i>	river birch	76				
	<i>Carpinus caroliniana</i>	American hornbeam	43				
	<i>Fraxinus pennsylvanica</i>	green ash	51				
	<i>Liriodendron tulipifera</i>	tuliptree	53				
	<i>Platanus occidentalis</i>	American sycamore	105	1			
	<i>Quercus michauxii</i>	swamp chestnut oak	28				
	<i>Quercus phellos</i>	willow oak	23				
	<i>Quercus rubra</i>	northern red oak	35				
<b>TOT:</b>		<b>414</b>	<b>1</b>				

<b>vigor</b>	<b>Count</b>	<b>Percent</b>
0	0	0
1	0	0
2	0	0
3	1	0.2
4	414	99.8
<b>TOT:</b>	<b>415</b>	<b>100</b>

Notes: Vigor Scores

4: Excellent

3: Good

2: Fair

1: Unlikely to survive year

0: Dead

**Appendix 2. Vegetation Assessment**

**Table 8. CVS Vegetation Tables - Damage by Species**

**Burnetts Chapel Buffer Mitigation Site (NCEEP Project No. 95009)**

**Monitoring Year 0 of 5**

<i>Species</i>	<i>All Damage Categories</i>	<i>(no damage)</i>
<i>Betula nigra</i>	river birch	76
<i>Carpinus caroliniana</i>	American hornbeam	43
<i>Fraxinus pennsylvanica</i>	green ash	51
<i>Liriodendron tulipifera</i>	tuliptree	53
<i>Platanus occidentalis</i>	American sycamore	106
<i>Quercus michauxii</i>	swamp chestnut oak	28
<i>Quercus phellos</i>	willow oak	23
<i>Quercus rubra</i>	northern red oak	35
<b>TOT:</b>	<b>0</b>	<b>415</b>

<b>Damage</b>	<b>Count</b>	<b>Percent Of Stems</b>
no damage	415	100



Appendix 2. Vegetation Assessment

Table 9. CVS Vegetation Tables - Stem Count by Plot and Species

Burnetts Chapel Buffer Mitigation Site (NCEEP Project No. 95009)

Monitoring Year 0 of 5

	Species	Total Stems	# plots	avg# stems	95009-WEI-0001	95009-WEI-0002	95009-WEI-0003	95009-WEI-0004	95009-WEI-0005	95009-WEI-0006	95009-WEI-0007	95009-WEI-0008	95009-WEI-0009	95009-WEI-0010	95009-WEI-0011	95009-WEI-0012	95009-WEI-0013	95009-WEI-0014	95009-WEI-0015	95009-WEI-0016	95009-WEI-0017	95009-WEI-0018	95009-WEI-0019	95009-WEI-0020	95009-WEI-0021	95009-WEI-0022
	<i>Betula nigra</i>	76	21	4	6	1	5	2	3	2	6	1	2	9	4		4	7	2	3	3	7	3	2	1	3
	<i>Carpinus caroliniana</i>	43	15	3	2	1	3	4		7	2	2	1		1		3		1		4			6	4	2
	<i>Fraxinus pennsylvanica</i>	51	15	3			1	1	2	3	1	6		4	3	11				3	2	5		2	5	2
	<i>Liriodendron tulipifera</i>	53	13	4	1	9	10				1	10							1	2	1	3	4	7	3	
	<i>Platanus occidentalis</i>	106	20	5	8	4	5	11	11	4	4		4	1	9	1	6	3	2	9	7	3	3	2		9
	<i>Quercus michauxii</i>	28	12	2		1			1		2			1	1	2	2	2	7			7	1	1		
	<i>Quercus phellos</i>	23	12	2			1	1		1	1		2	1			4	3	2	1		3	3			
	<i>Quercus rubra</i>	35	13	3	1	1		1	1	1			9	2	1	4		4	8				1		1	
<b>TOT:</b>	<b>8</b>	<b>415</b>	<b>22</b>	<b>19</b>	<b>18</b>	<b>17</b>	<b>25</b>	<b>20</b>	<b>18</b>	<b>18</b>	<b>17</b>	<b>19</b>	<b>18</b>	<b>18</b>	<b>20</b>	<b>18</b>	<b>19</b>	<b>19</b>	<b>22</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>17</b>	<b>19</b>	<b>19</b>

## Vegetation Photographs



Vegetation Plot 1 (04/12/2012)



Vegetation Plot 2 (04/12/2012)



Vegetation Plot 3 (04/12/2012)



Vegetation Plot 4 (04/12/2012)



Vegetation Plot 5 (04/12/2012)



Vegetation Plot 6 (04/12/2012)



Vegetation Plot 7 (04/12/2012)



Vegetation Plot 8 (04/12/2012)



Vegetation Plot 9 (04/12/2012)



Vegetation Plot 10



Vegetation Plot 11 (04/12/2012)



Vegetation Plot 12 (04/12/2012)



Vegetation Plot 13 (04/12/2012)



Vegetation Plot 14 (04/12/2012)



Vegetation Plot 15 (04/12/2012)



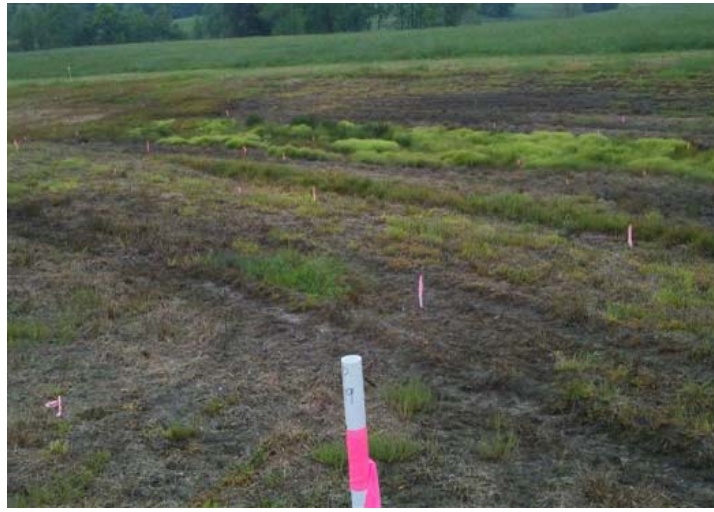
Vegetation Plot 16 (04/10/2012)



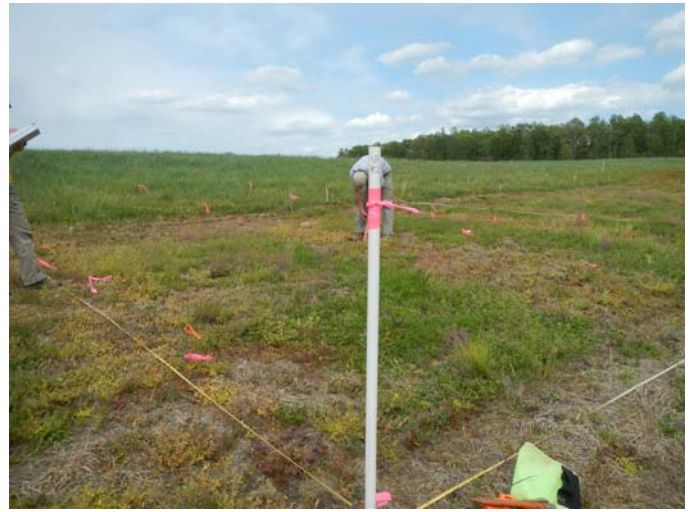
Vegetation Plot 17 (04/10/2012)



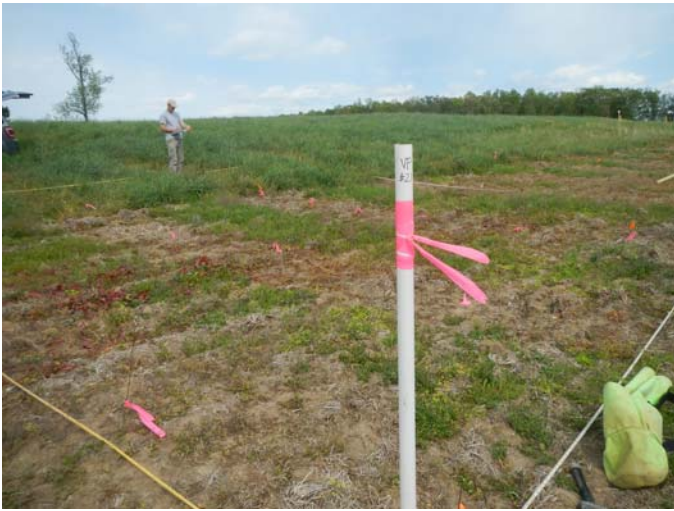
Vegetation Plot 18 (04/10/2012)



Vegetation Plot 19 (04/10/2012)



Vegetation Plot 20 (04/10/2012)



Vegetation Plot 21 (04/10/2012)



Vegetation Plot 22 (04/12/2012)

**APPENDIX 3. NCDWQ Restoration Approval Letter**



North Carolina Department of Environment and Natural Resources

Division of Water Quality

Beverly Eaves Perdue  
Governor

Coleen H. Sullins  
Director

Dee Freeman  
Secretary

October 31, 2011

Kristie Corson  
NC Ecosystem Enhancement Program  
1652 Mail Service Center  
Raleigh, NC 27699-1652

Re: Burnett's Chapel Buffer Mitigation Site  
Guilford County

Dear Ms. Corson:

The Division of Water Quality (DWQ) Winston-Salem Regional Office has reviewed the Memorandum submitted by Wildlands Engineering dated October 17, 2011 (attached). This memorandum accurately summarizes all discussions conducted during two site visits as well as all follow up correspondence.

The Division concurs that that the proposed buffer planting areas as depicted in the attached October 17, 2011 memo and diagrams should qualify for buffer restoration credits in the Randleman Lake watershed provided that the plantings are shown to meet the buffer mitigation success criteria established in 15A NCAC 02B .0252. Please note that the buffer restoration area within the drained ponds is dependent on the success of establishing a stable stream channel through these areas.

If you have any questions related to our comments or this mitigation project, please feel free to contact me at 336-771-4964 or [sue.homewood@ncdenr.gov](mailto:sue.homewood@ncdenr.gov).

Sincerely,

Sue Homewood  
DWQ Winston-Salem Regional Office

Cc: Andrew Williams, USACE Raleigh Regulatory Field Office (via email)  
Andrea Eckardt, Wildlands Engineering (via email)  
DWQ-WSRO





1430 S. Mint Street, Suite 104 · Charlotte, NC 28203 · Phone: 704.332.7754 · Fax: 704.332.3306

---

## MEMORANDUM

---

To: Sue Homewood, NCDWQ

From: Andrea Eckardt

Cc: Kristie Corson  
Tim Baumgartner

Date: 10/14/2011

**Re: Burnetts Chapel Buffer Mitigation Site – Proposed Planting Areas**

---

Representatives of Wildlands Engineering, Inc (WEI), NC Ecosystem Enhancement Program (NCEEP), and NC Division of Water Quality (NCDWQ) attended two site visits to the Burnetts Chapel Buffer Mitigation Site on August 18, 2011 and September 8, 2011. Meeting notes and a draft planting area figure were submitted by WEI for agency review following the site visits. WEI received comments from NCDWQ on the notes and initial planting area map via email September 26, 2011. The proposed planting area for the project has since been revised based on agency comments, updated survey data, and site constraints.

Attached is the updated map showing the proposed planting area for the Burnetts Chapel Buffer Mitigation Site. The conservation easement boundary is 50 feet from the surveyed top of bank. There are two existing ponds located within the conservation easement area (Reaches B4 and B5) that will be removed and the channels restored as part of the proposed project. In those areas the proposed restored stream channel location was used to create the easement boundary.

The project planting area, which is the area that will generate restoration credit, is 9.2 acres out of a 11.4 acre conservation easement area. The jurisdictional streams and ephemeral ditches on the site have been excluded from the planting acreage as well as four areas (Areas 1-4) that do not meet riparian buffer restoration or enhancement criteria based on their existing tree counts of greater than 200 stems per acre.

The locations of the tree count plots are also shown on the attached figure. Areas 1-3 were surveyed at the base of the existing trees, per NCDWQ instruction. The boundary of Area 4 was surveyed along an existing fence line that separates the forested area from open field. The results of the plots are included below in Table 1.

**Table 1. Burnetts Chapel Existing Buffer Vegetation Plots**

<b>Plot</b>	<b>Reach</b>	<b>Dimensions (ft.)</b>	<b>No. Trees ≥ 5" DBH</b>	<b>Tree Density Per Acre</b>
#1	Reach A	30' x 30'	10	484
#2	Reach B1	20' x 40'	9	490
#3	Reach B2	30' x 30'	10	484
#4	Reach B2	30' x 30'	6	290

Below is a summary of the conditions, issues, and mitigation potential at each project Reach.

Reach A – Based on the tree counts performed, 0.67 acres were removed from the planting area. This area will be preserved (no credit). The remainder of the conservation easement area along the reach will be riparian buffer restoration.

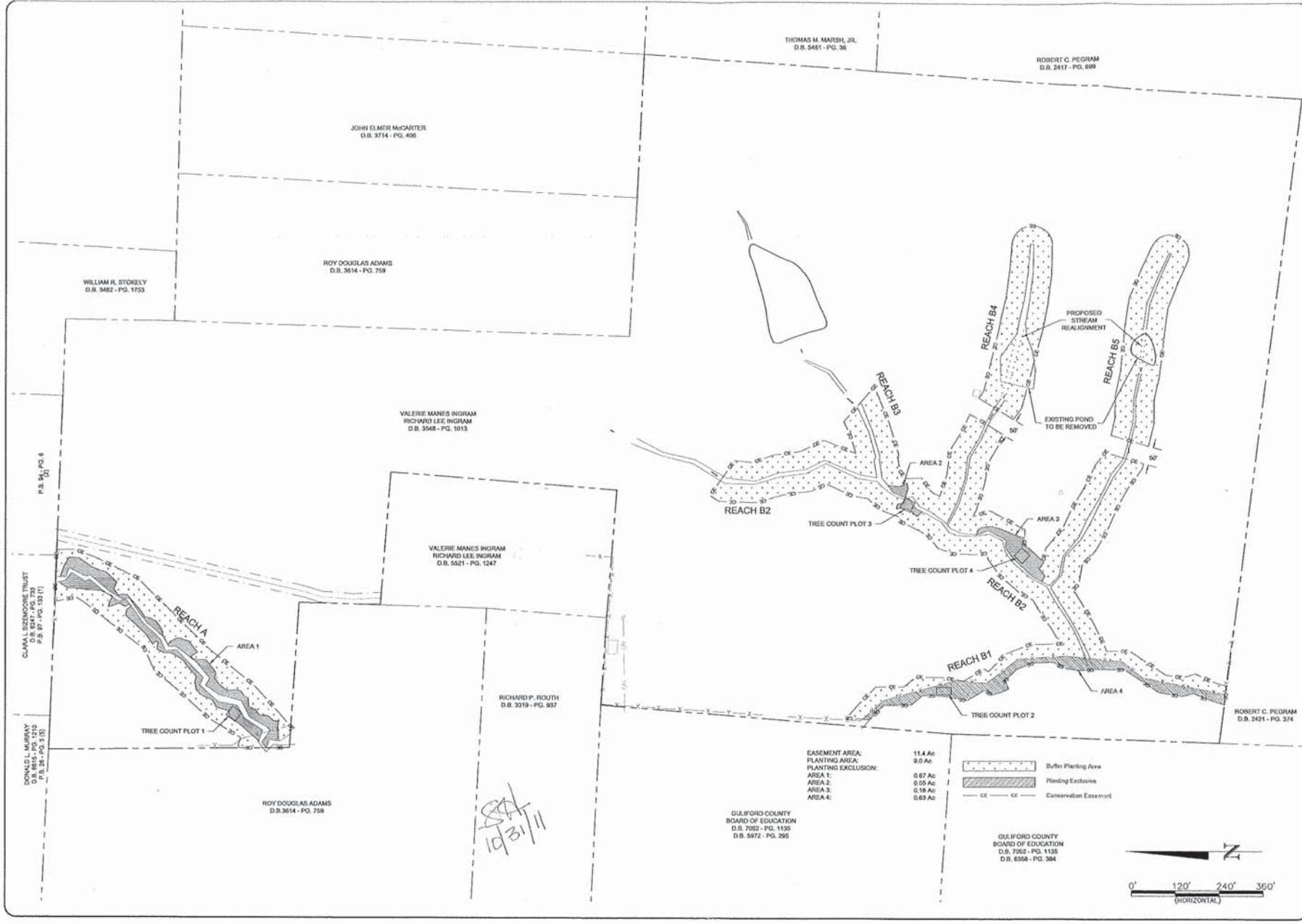
Reach B1 – The portion of the conservation easement west of the existing fence line has been excluded from the planting area (0.63 acres). This area west of the fence will be preserved (no credit). The remainder of the conservation easement area along that reach will be riparian buffer restoration.

Reach B2 – This reach has two areas that were excluded from the planting area (0.05 acres and 0.18 acres) based on the tree counts performed. The remainder of the conservation easement area along this reach will be riparian buffer restoration. The upstream end of the easement area is not “bubbled” as allowed due to an existing road crossing on the property.

Reach B3 – No tree counts were requested on Reach B3. This reach will be riparian buffer restoration. The upstream end of the easement area is not “bubbled” as allowed due to an existing road crossing on the property.

Reach B4 – No tree counts were requested on Reach B4. This reach will be riparian buffer restoration. The knickpoint identified at the second site visit was surveyed and used as the beginning of a true channel form along this reach. The upstream end of the easement area has been “bubbled” 50 feet per NCDWQ guidance. There is also one 50 foot easement break on this reach at an existing road crossing on the property. WEI is currently working with NCDWQ and USACE on the permits for the existing pond removal and channel restoration on the reach.

Reach B5 – No tree counts were requested on Reach B5. This reach will be riparian buffer restoration. The knickpoint identified at the second site visit was surveyed and used as the beginning of a true channel form along this reach. The upstream end of the easement area has been “bubbled” 50 feet per NCDWQ guidance. There is also one 50 foot easement break on this reach at an existing road crossing on the property. WEI is currently working with NCDWQ and USACE on the permits for the existing pond removal and channel restoration on the reach.



**WILDIANDS**  
 ENGINEERS  
 1408 South Main Street, Suite 101  
 Greensboro, NC 27403  
 Tel: 336.332.1754  
 Fax: 336.332.1754  
 P.O. Box 120831

**DRAFT**

**Burnetts Chapel Buffer Mitigation**  
 Guilford County, NC - Cape Fear River Basin  
 Buffer Exhibit

Revision	Date	By	Checked

60% Plans - Not For Construction

## **APPENDIX 4. As-Built Plan Sheets**

# Burnetts Chapel Buffer Mitigation Site

## Guilford County, North Carolina

### Cape Fear River Basin Cataloging Unit 03030003

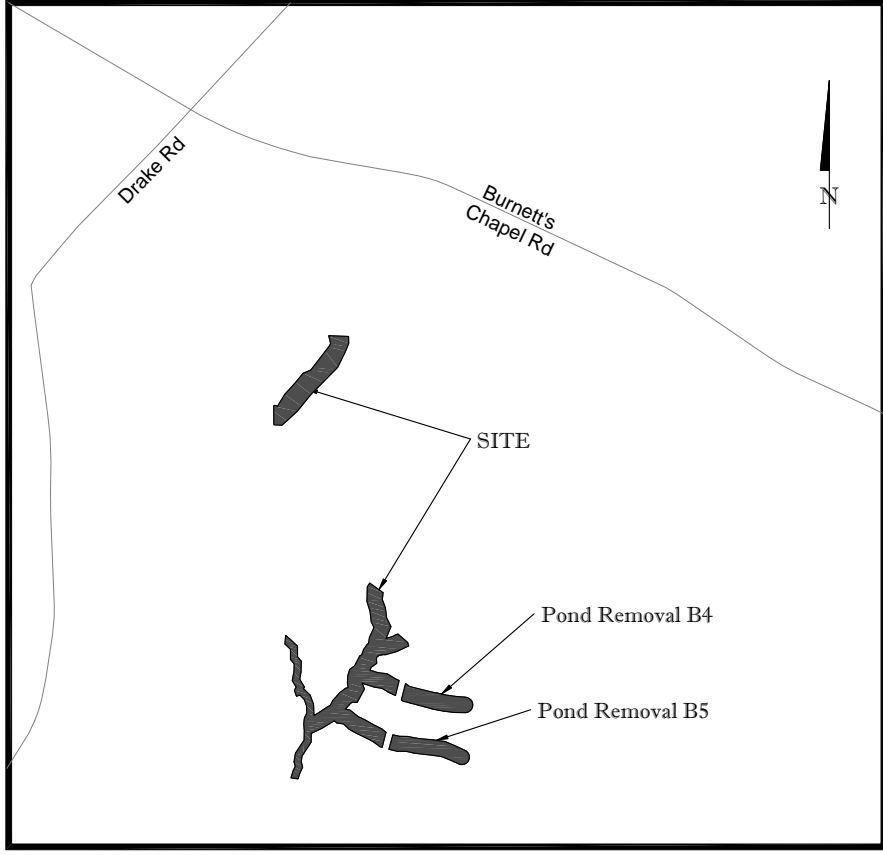
### For North Carolina Ecosystem Enhancement Program



BEFORE YOU DIG  
CALL 1-800-632-4949  
N.C. ONE-CALL CENTER  
IT'S THE LAW!

**FINAL  
RECORD DRAWINGS  
& AS-BUILT PLANS**  
June 8, 2012

REACH ORIGINS		
Reach	Latitude	Longitude
A	N35°57'01.4"	W79°50'49.6"
B1	N35°56'40.0"	W79°50'54.0"
B2	N35°56'43.6"	W79°50'46.1"
B3	N35°56'39.9"	W79°50'43.6"
B4	N35°56'35.5"	W79°50'40.6"
B5	N35°56'32.2"	W79°50'40.3"



**Vicinity Map**  
Not to Scale

#### Sheet Index

Cover Sheet	0.1
Project Overview	0.2
Construction Plans	1.1-1.6
As-Built Plans	2.1-2.6
Overlay Plans	3.1-3.6

#### Project Directory

**Engineering:**  
Wildlands Engineering, Inc  
5606 Chapel Hill Road, Suite 122  
Raleigh, NC 27607  
Jeff Keaton, PE  
919-851-9986

**Owner:**  
Ecosystem Enhancement Program  
NC Department of Environment and  
Natural Resources  
1652 Mail Service Center  
Raleigh, NC 27699-1652  
Guy Pearce  
919-715-1157

**Surveying:**  
CE Robertson Associates  
Gene Robertson, PLS  
310 W. Meadow Road  
Eden, NC 27288-3202  
336-327-0498

EEP Project No. 95009  
DENR Contract No. 003996

**Contractor:**  
Landowner  
Richard L. Ingram  
1323 Burnetts Chapel Rd.  
Greensboro, NC 27403



Burnetts Chapel Buffer Mitigation Site  
Guilford County, North Carolina

Cover Sheet

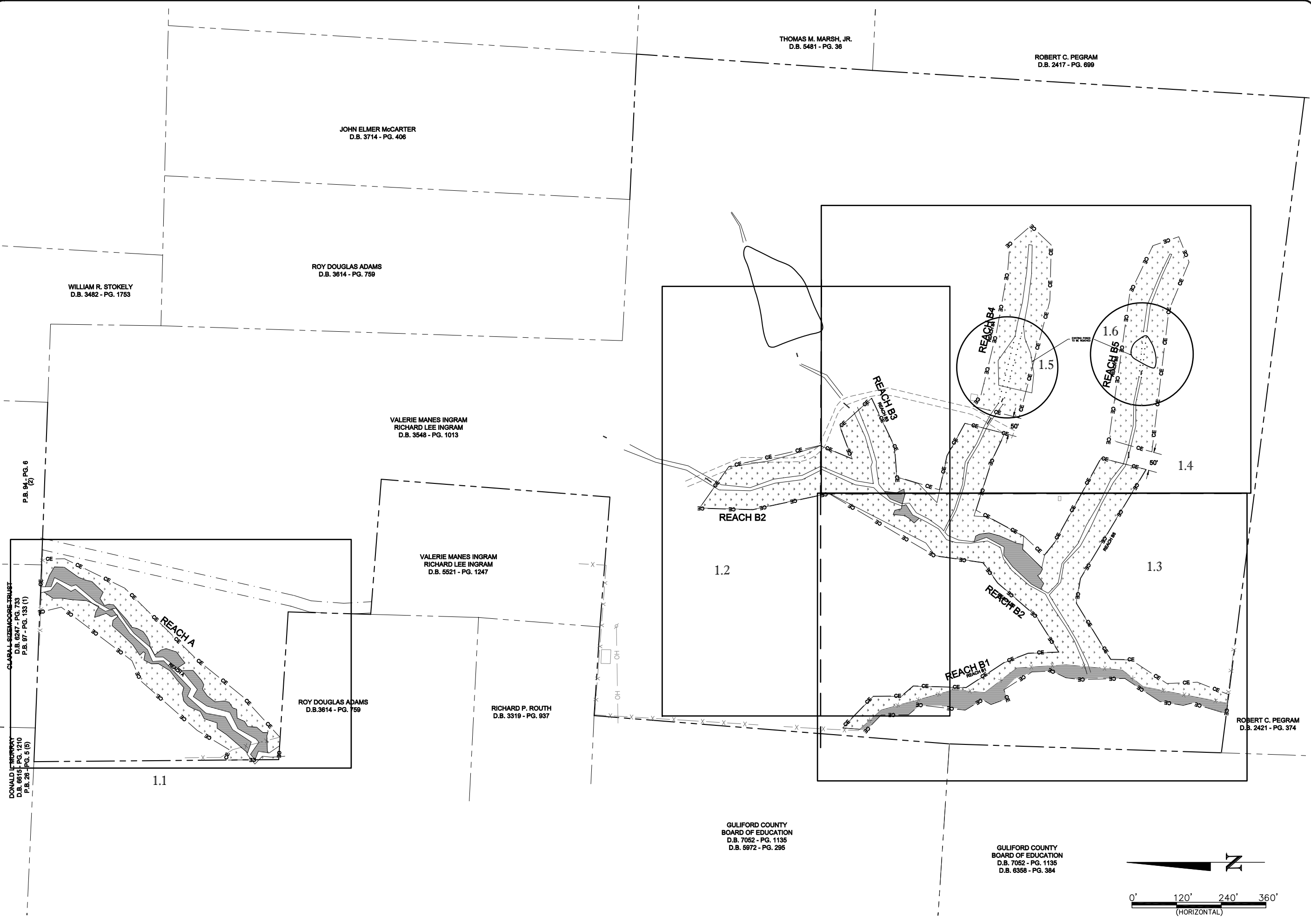
Revisions	

Date: June 8, 2012  
Job Number: 005-02130  
Project Engineer: JNSK  
Drawn By: JCK  
Designed By: EGR

0.1

Sheet

Final As-Built Plans



P.B. 94, PG. 6  
 DONALD L. MORRAY  
 D.B. 6816 - PG. 1210  
 P.B. 28 - PG. 5 (5)

CLARA L. SIZEMORE-TRUST  
 D.B. 6247 - PG. 733  
 P.B. 97 - PG. 133 (1)

ROY DOUGLAS ADAMS  
 D.B. 3614 - PG. 759

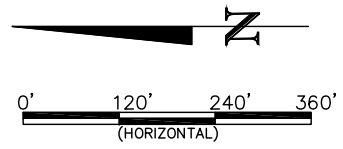
VALERIE MANES INGRAM  
 RICHARD LEE INGRAM  
 D.B. 5821 - PG. 1247

VALERIE MANES INGRAM  
 RICHARD LEE INGRAM  
 D.B. 3548 - PG. 1013

RICHARD P. ROUTH  
 D.B. 3319 - PG. 937

GULFORD COUNTY  
 BOARD OF EDUCATION  
 D.B. 7052 - PG. 1135  
 D.B. 5972 - PG. 295

GULFORD COUNTY  
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 D.B. 7052 - PG. 1135  
 D.B. 6358 - PG. 384



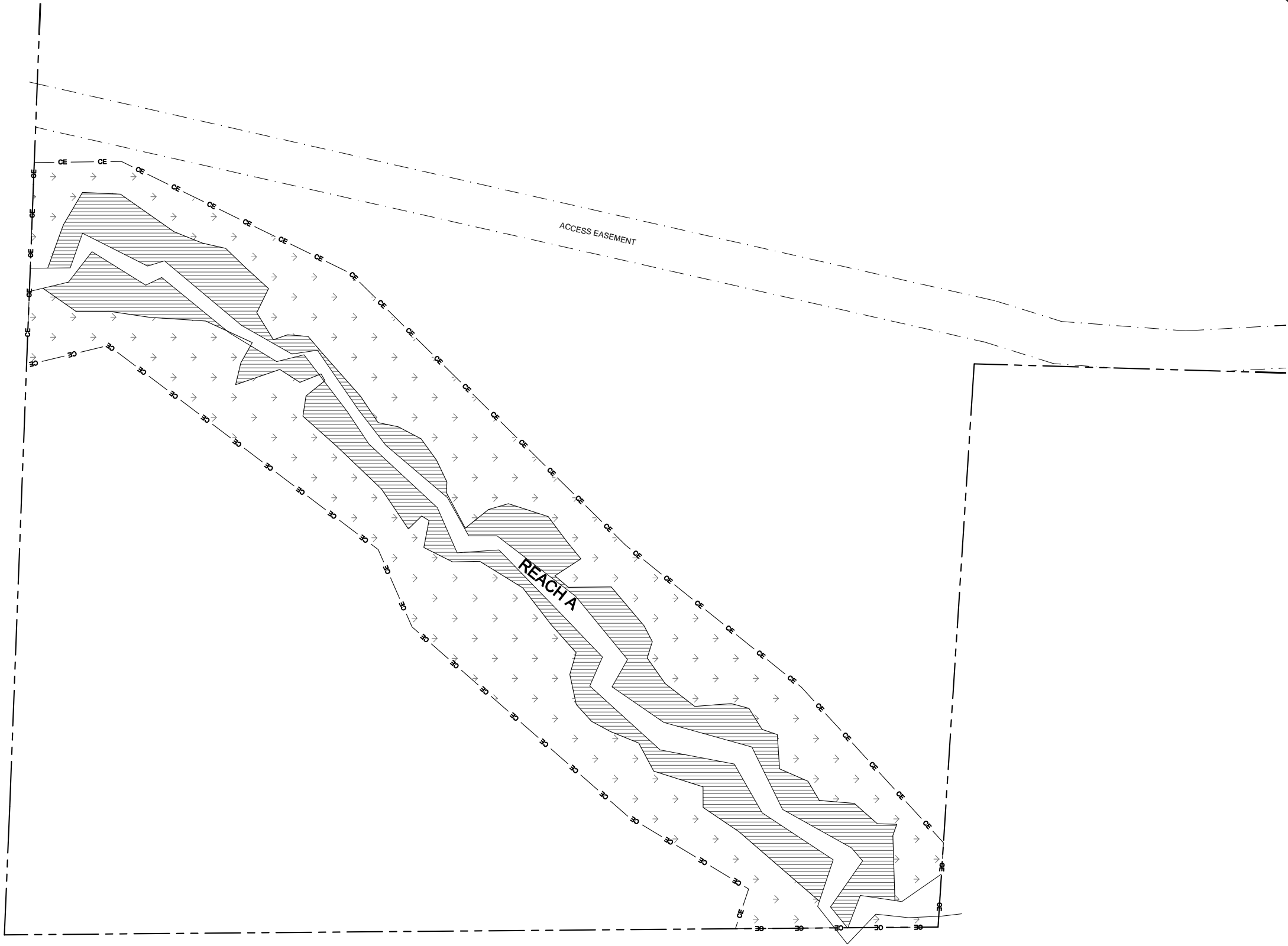
**Burnetts Chapel Buffer Mitigation Site**  
**Guilford County, North Carolina**

Project Overview

Revision	Date	By	Check

Date: June 8, 2012  
 Job Number: 005-02130  
 Project Engineer: JNSK  
 Drawn By: JCK  
 Designed By: EGR

0.2

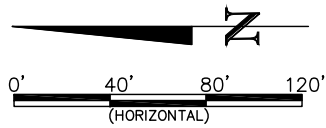
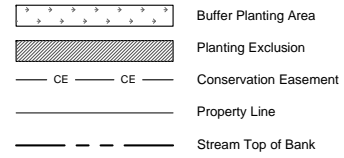


Buffer Restoration Seeding

Scientific Name	Common Name	Wetland Indicator Status
<i>Agrostis stolonifera</i>	Creeping bentgrass	FACW
<i>Andropogon ternarius</i>	Split beardgrass	FACU
<i>Bouteloua curtipendula</i>	Side oats grama	FACU
<i>Bouteloua gracilis</i>	Blue grama	NI
<i>Panicum clandestinum</i>	Deer tongue	FACW
<i>Schizachyrium scoparium</i>	Little bluestem	FACU
<i>Sporobolus clandestinus</i>	Rough dropseed	NI
<i>Vicia villosa</i>	Hairy vetch	NI
<i>Chasmanthium latifolium</i>	River Oats	FAC-
<i>Carex vulpinoidea</i>	Fox sedge	OBL

Buffer Restoration Plants

Scientific Name	Common Name	Size (ft)	Total # of stems	Planting Composition (%)
<i>Cercis canadensis</i>	American Redbud	2-3	425	5
<i>Liriodendron tulipifera</i>	Tulip Poplar	2-3	1275	15
<i>Quercus phellos</i>	Willow Oak	2-3	850	10
<i>Platanus occidentalis</i>	Sycamore	2-3	1700	20
<i>Betula nigra</i>	River Birch	2-3	850	10
<i>Carpinus caroliniana</i>	Ironwood	2-3	850	10
<i>Quercus michauxii</i>	Swamp Chestnut Oak	2-3	425	5
<i>Fraxinus pennsylvanica</i>	Green Ash	2-3	1700	20
<i>Quercus rubra</i>	Northern Red Oak	2-3	425	5
<b>Totals</b>			<b>8500</b>	<b>100</b>



Burnetts Chapel Buffer Mitigation Site  
 Guilford County, North Carolina  
 Reach A  
 Construction Plans

**WILDLANDS**  
 ENGINEERING  
 1430 South Mint Street, Suite 104  
 Charlotte, NC 28203  
 Tel: 704.332.1104  
 Fax: 704.332.1106  
 Firm License No. P-0831

Revisions:


Date: June 8, 2012  
 Job Number: 005-02130  
 Project Engineer: JNK  
 Drawn By: JCK  
 Designed By: EGR



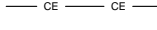


1.1

Buffer Restoration Seeding

Scientific Name	Common Name	Wetland Indicator Status
<i>Agrostis stolonifera</i>	Creeping bentgrass	FACW
<i>Andropogon ternarius</i>	Split beardgrass	FACU
<i>Bouteloua curtipendula</i>	Side oats grama	FACU
<i>Bouteloua gracilis</i>	Blue grama	NI
<i>Panicum clandestinum</i>	Deer tongue	FACW
<i>Schizachyrium scoparium</i>	Little bluestem	FACU
<i>Sporobolus clandestinus</i>	Rough dropseed	NI
<i>Vicia villosa</i>	Hairy vetch	NI
<i>Chasmanthium latifolium</i>	River Oats	FAC-
<i>Carex vulpinoidea</i>	Fox sedge	OBL

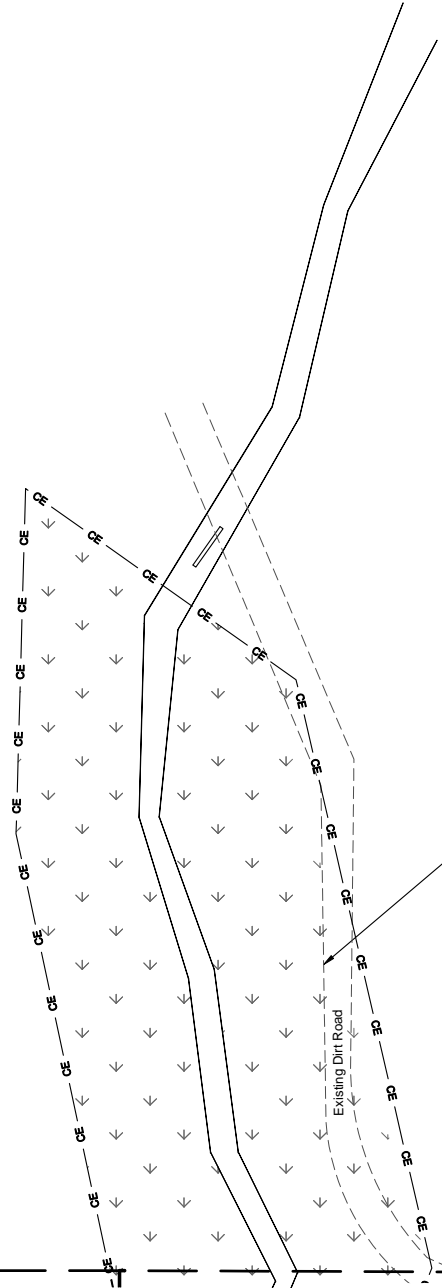
Buffer Restoration Plants

Scientific Name	Common Name	Size (ft)	Total # of stems	Planting Composition (%)
<i>Cercis canadensis</i>	American Redbud	2-3	425	5
<i>Liriodendron tulipifera</i>	Tulip Poplar	2-3	1275	15
<i>Quercus phellos</i>	Willow Oak	2-3	850	10
<i>Plantus occidentalis</i>	Sycamore	2-3	1700	20
<i>Betula nigra</i>	River Birch	2-3	850	10
<i>Carpinus caroliniana</i>	Ironwood	2-3	850	10
<i>Quercus michauxii</i>	Swamp Chestnut Oak	2-3	425	5
<i>Fraxinus pennsylvanica</i>	Green Ash	2-3	1700	20
<i>Quercus rubra</i>	Northern Red Oak	2-3	425	5
<b>Totals</b>			<b>8500</b>	<b>100</b>

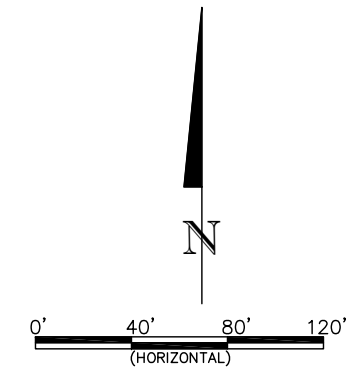
-  Buffer Planting Area
-  Planting Exclusion
-  Conservation Easement
-  Property Line
-  Stream Top of Bank

MATCHLINE - SHEET 1.4

MATCHLINE - SHEET 1.3



Existing Pond



Burnetts Chapel Buffer Mitigation Site  
 Guilford County, North Carolina

Reach B2  
 Construction Plans

Revisions:

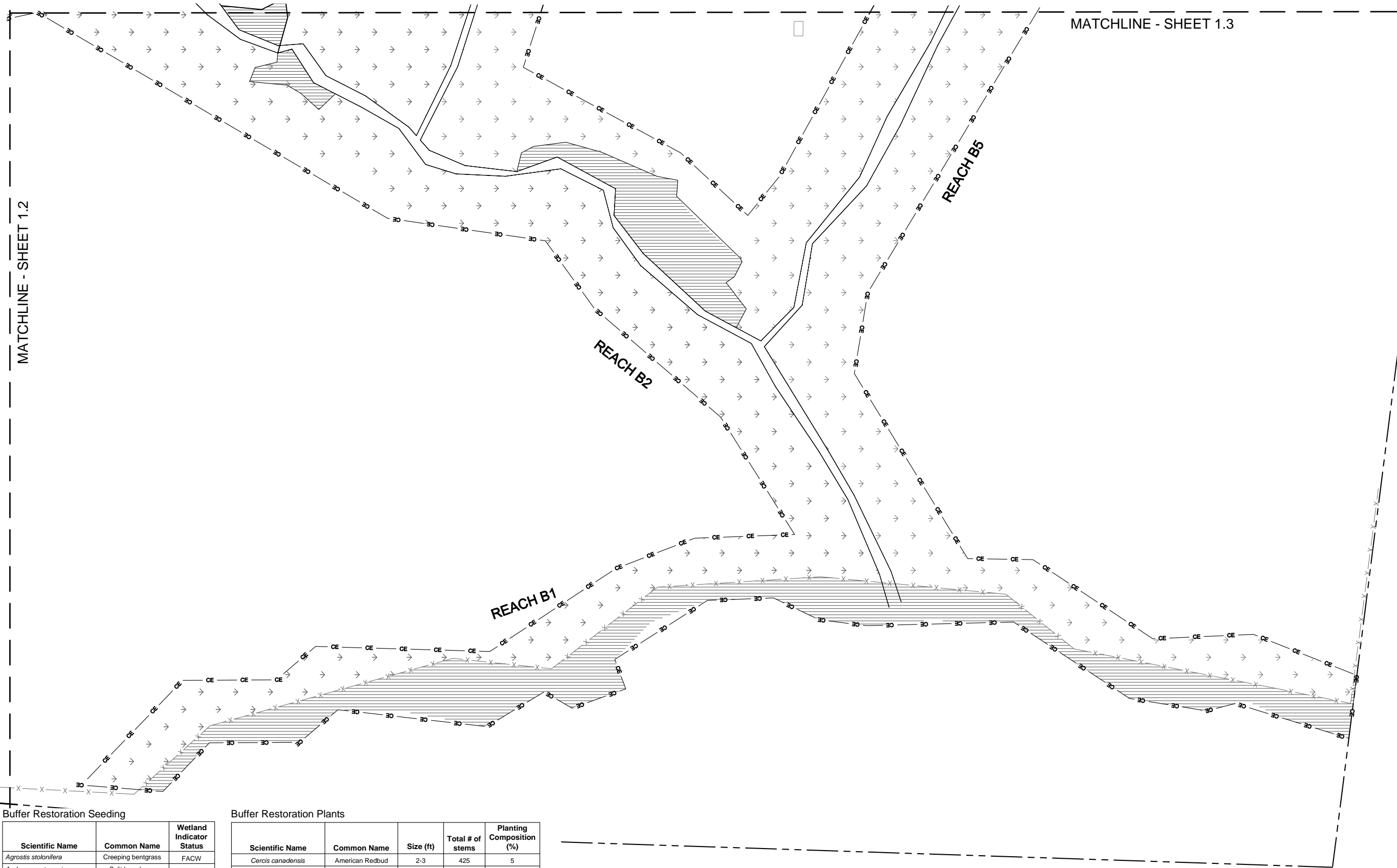

Date: June 8, 2012  
 Job Number: 005-02130  
 Project Engineer: JNSK  
 Drawn By: JCK  
 Designed By: EGR

1.2



MATCHLINE - SHEET 1.2

MATCHLINE - SHEET 1.3



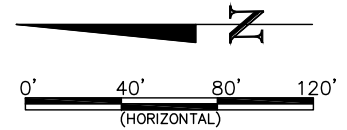
Buffer Restoration Seeding

Scientific Name	Common Name	Wetland Indicator Status
<i>Agrostis stolonifera</i>	Creeping bentgrass	FACW
<i>Andropogon temarius</i>	Split beardgrass	FACU
<i>Bouteloua curtipendula</i>	Side oats grama	FACU
<i>Bouteloua gracilis</i>	Blue grama	NI
<i>Panicum clandestinum</i>	Deer tongue	FACW
<i>Schizachyrium scoparium</i>	Little bluestem	FACU
<i>Sporobolus clandestinus</i>	Rough dropseed	NI
<i>Vicia villosa</i>	Hairy vetch	NI
<i>Chasmanthium latifolium</i>	River Oats	FAC-
<i>Carex vulpinoidea</i>	Fox sedge	OBL

Buffer Restoration Plants

Scientific Name	Common Name	Size (ft)	Total # of stems	Planting Composition (%)
<i>Cercis canadensis</i>	American Redbud	2-3	425	5
<i>Liriodendron tulipifera</i>	Tulip Poplar	2-3	1275	15
<i>Quercus phellos</i>	Willow Oak	2-3	850	10
<i>Plantus occidentalis</i>	Sycamore	2-3	1700	20
<i>Betula nigra</i>	River Birch	2-3	850	10
<i>Carpinus caroliniana</i>	Ironwood	2-3	850	10
<i>Quercus michauxii</i>	Swamp Chestnut Oak	2-3	425	5
<i>Fraxinus pennsylvanica</i>	Green Ash	2-3	1700	20
<i>Quercus rubra</i>	Northern Red Oak	2-3	425	5
<b>Totals</b>			<b>8500</b>	<b>100</b>

- Buffer Planting Area
- Planting Exclusion
- Conservation Easement
- Property Line
- Stream Top of Bank



**Burnetts Chapel Buffer Mitigation Site**  
**Guilford County, North Carolina**  
Reach B1, B2 & B5  
Construction Plans

Revisions:


Date: June 8, 2012  
Job Number: 005-02130  
Project Engineer: JNSK  
Drawn By: JCK  
Designed By: EGR

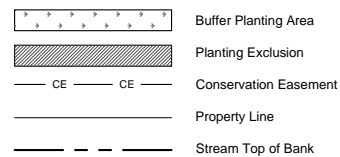
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Buffer Restoration Seeding

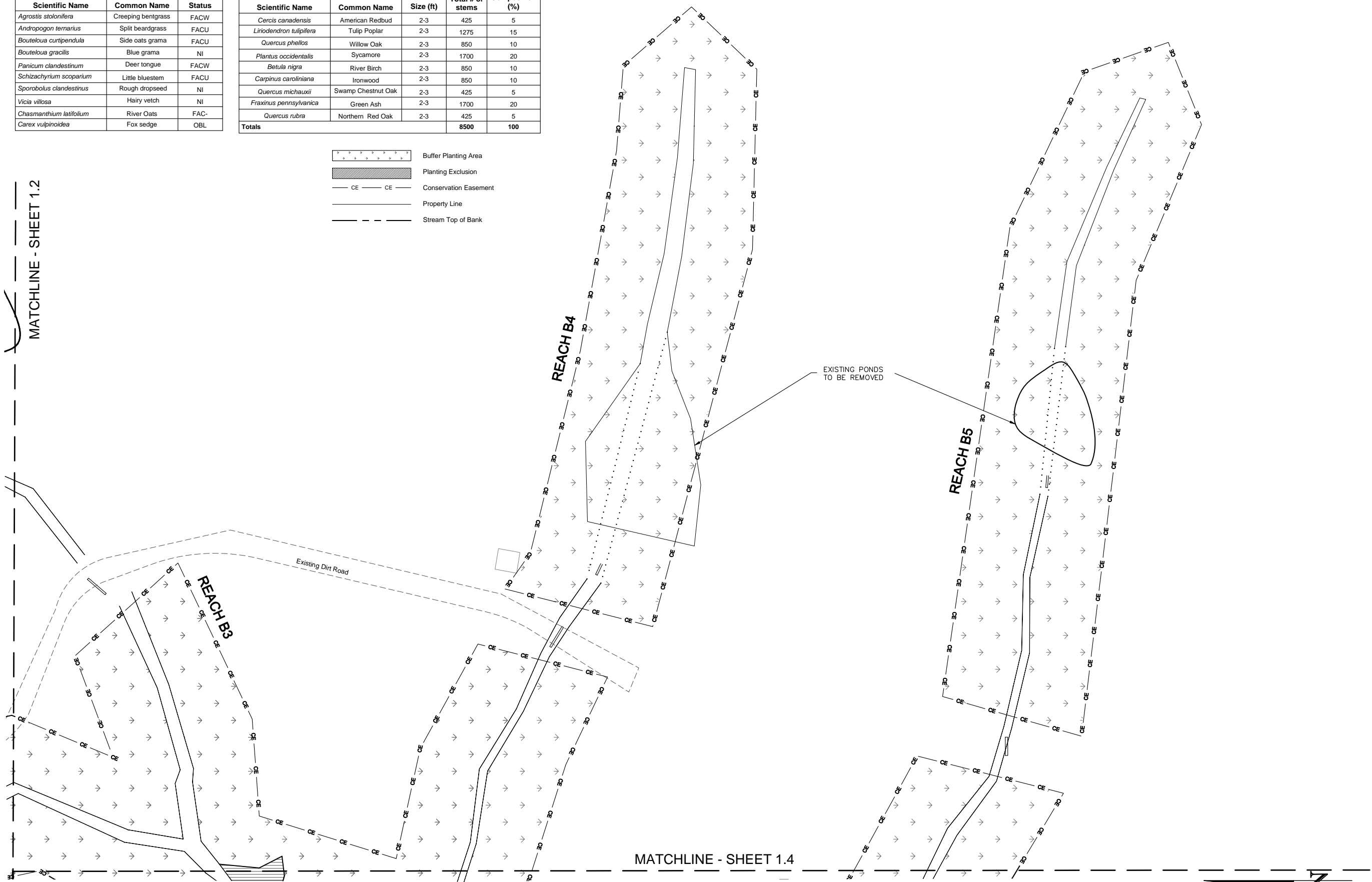
Scientific Name	Common Name	Wetland Indicator Status
<i>Agrostis stolonifera</i>	Creeping bentgrass	FACW
<i>Andropogon ternarius</i>	Split beardgrass	FACU
<i>Bouteloua curtipendula</i>	Side oats grama	FACU
<i>Bouteloua gracilis</i>	Blue grama	NI
<i>Panicum clandestinum</i>	Deer tongue	FACW
<i>Schizachyrium scoparium</i>	Little bluestem	FACU
<i>Sporobolus clandestinus</i>	Rough dropseed	NI
<i>Vicia villosa</i>	Hairy vetch	NI
<i>Chasmanthium latifolium</i>	River Oats	FAC-
<i>Carex vulpinoidea</i>	Fox sedge	OBL

Buffer Restoration Plants

Scientific Name	Common Name	Size (ft)	Total # of stems	Planting Composition (%)
<i>Cercis canadensis</i>	American Redbud	2-3	425	5
<i>Liriodendron tulipifera</i>	Tulip Poplar	2-3	1275	15
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<i>Quercus rubra</i>	Northern Red Oak	2-3	425	5
<b>Totals</b>			<b>8500</b>	<b>100</b>



MATCHLINE - SHEET 1.2



MATCHLINE - SHEET 1.4



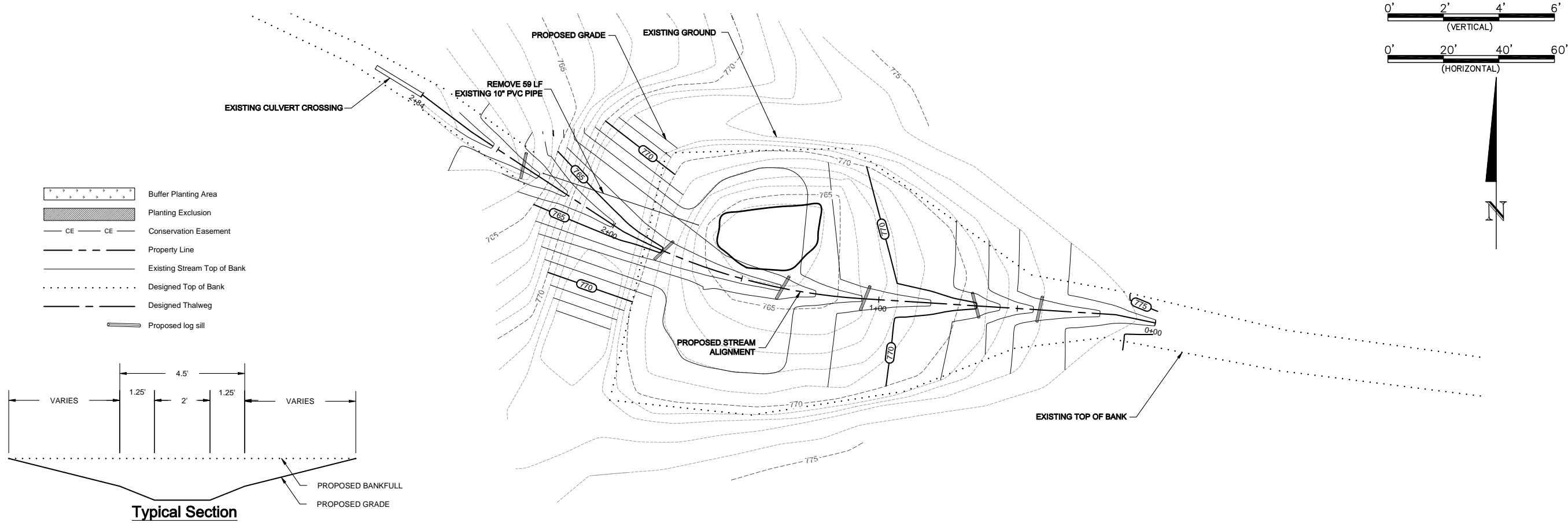
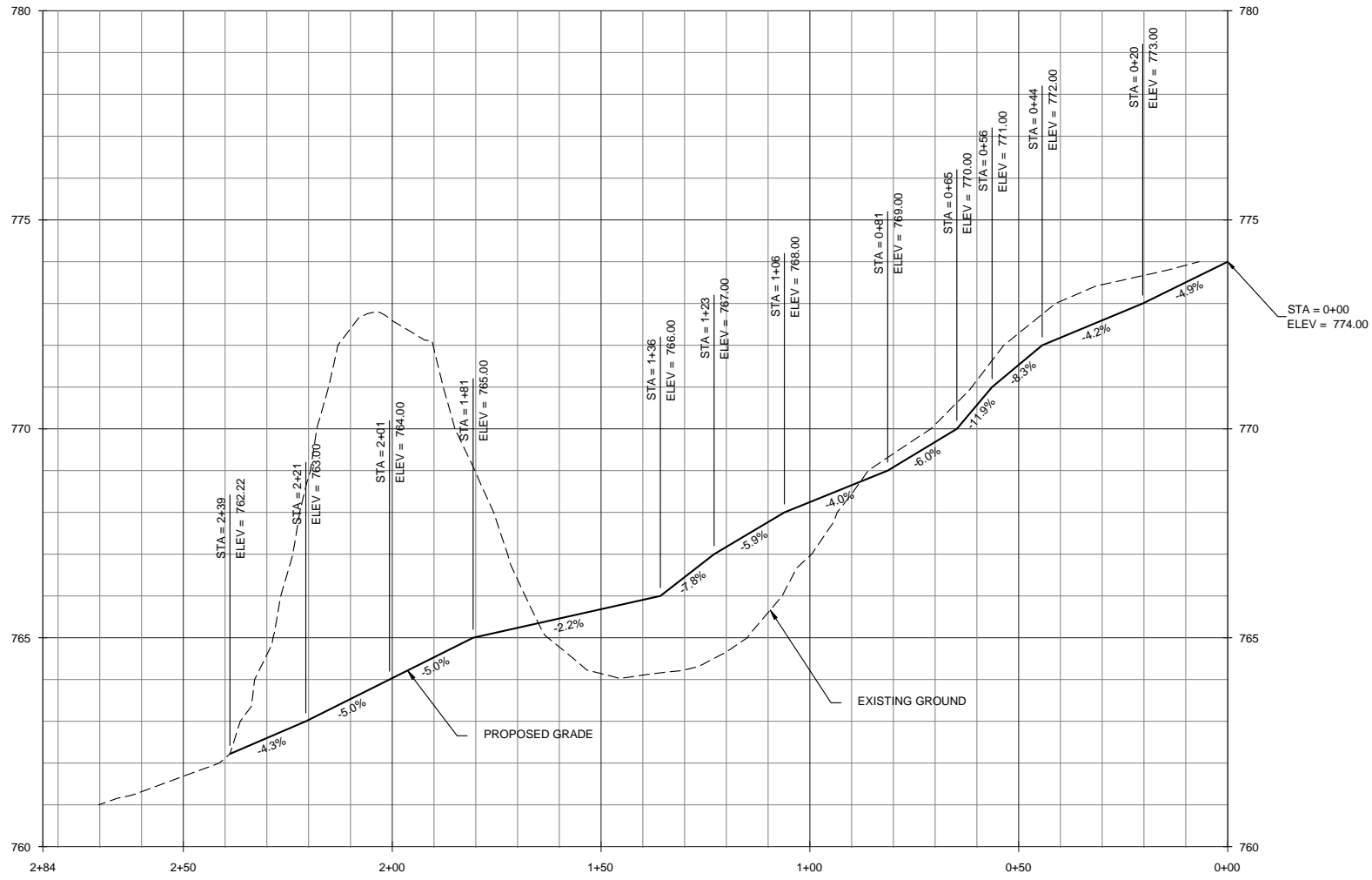
**Burnetts Chapel Buffer Mitigation Site**  
**Guilford County, North Carolina**  
Reach B3, B4 & B5  
Construction Plans

Revisions:


Date: June 8, 2012  
Job Number: 005-02130  
Project Engineer: JNK  
Drawn By: JCK  
Designed By: EGR

1.4

Sheet



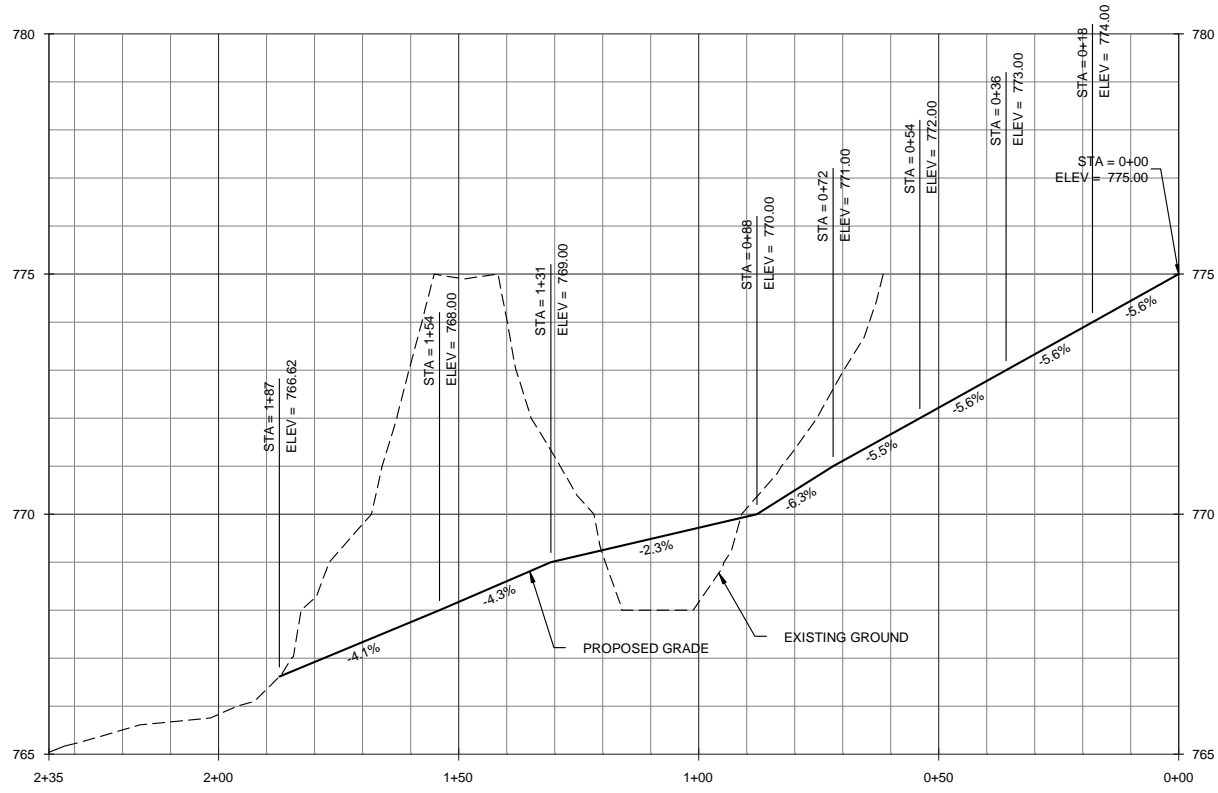
**Burnetts Chapel Buffer Mitigation Site**  
**Guilford County, North Carolina**

B4 Alignment  
 Construction Plans

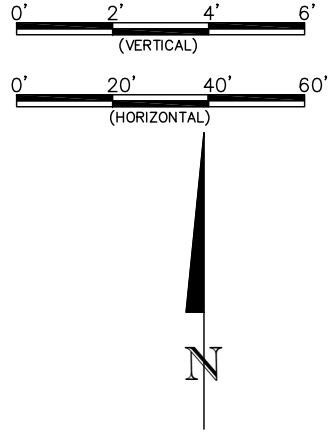
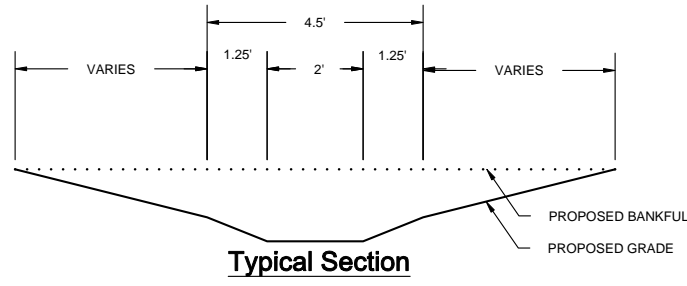
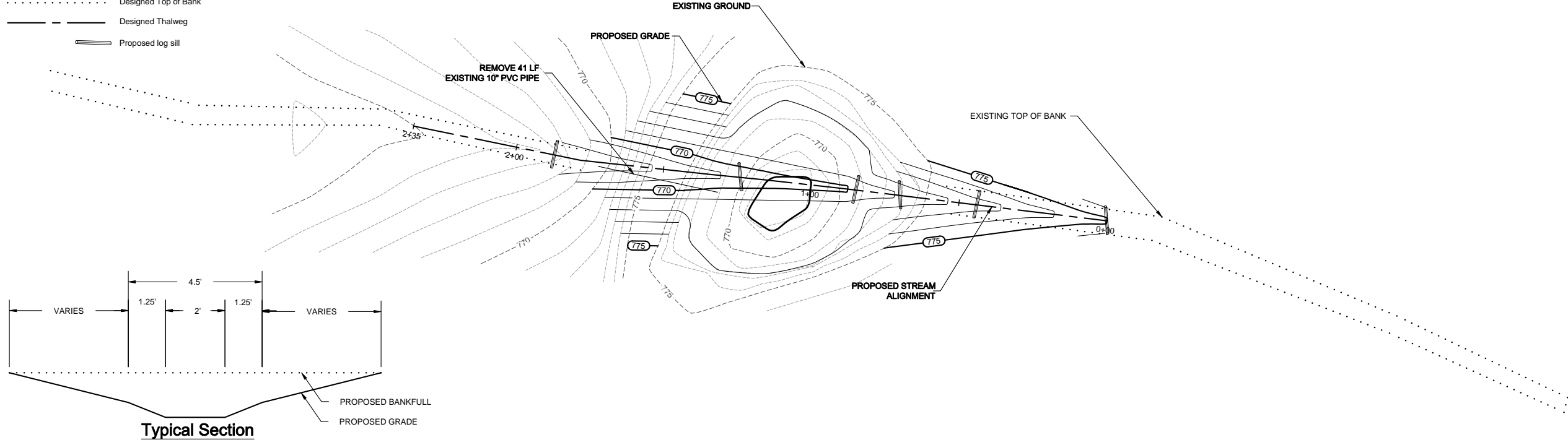
Revisions:


Date: June 8, 2012  
 Job Number: 005-02130  
 Project Engineer: JNSK  
 Drawn By: JCK  
 Designed By: EGR

**1.5**



- Buffer Planting Area
- Planting Exclusion
- Conservation Easement
- Property Line
- Existing Stream Top of Bank
- Designed Top of Bank
- Designed Thalweg
- Proposed log sill



**Burnetts Chapel Buffer Mitigation Site**  
**Guilford County, North Carolina**

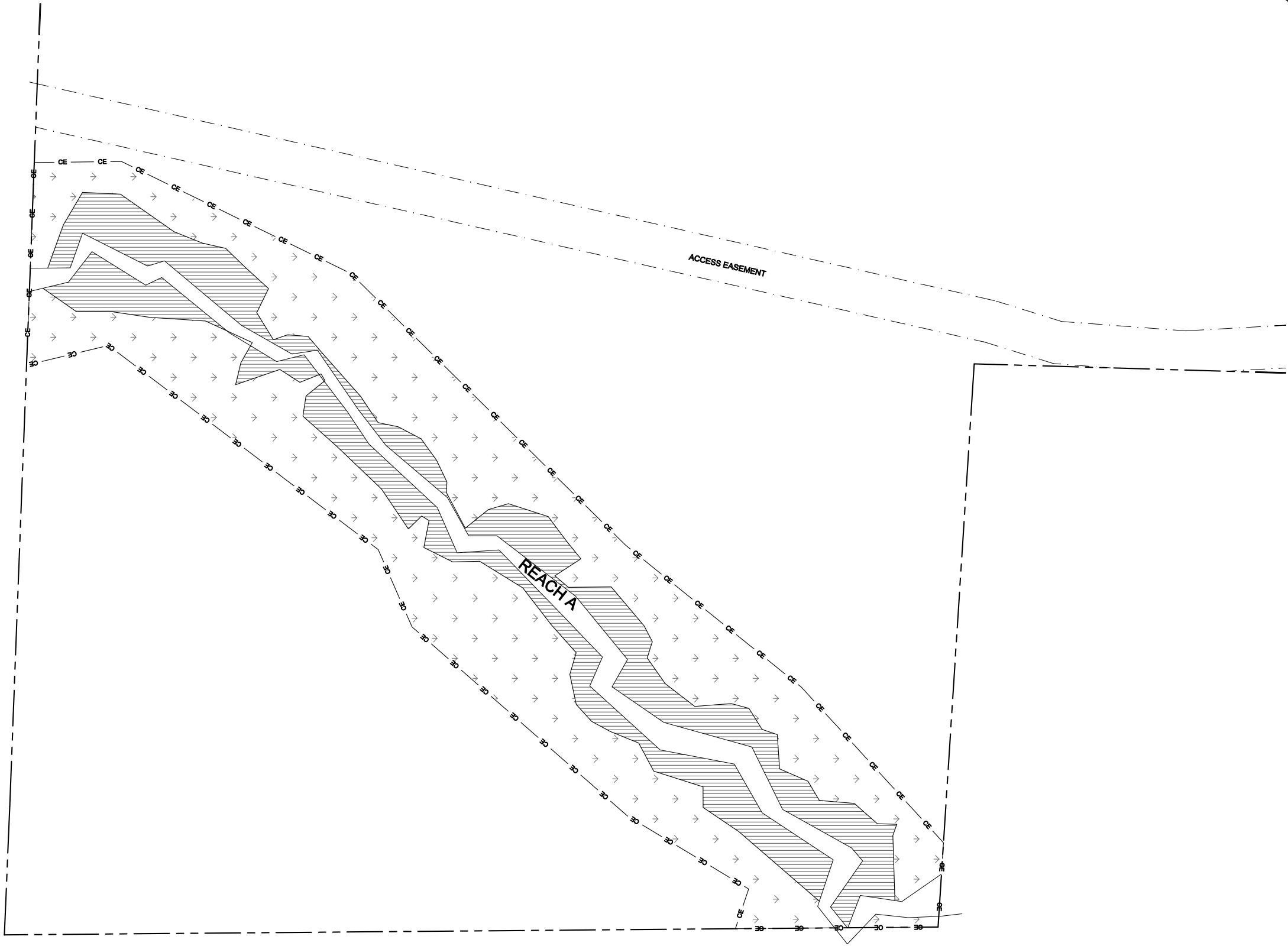
B5 Alignment  
Construction Plans

Revisions:


Date: June 8, 2012  
Job Number: 005-02130  
Project Engineer: JNSK  
Drawn By: JCK  
Designed By: EGR

**1.6**

Sheet



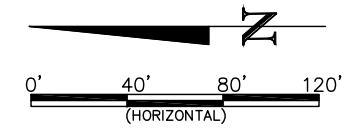
Buffer Restoration Seeding

Scientific Name	Common Name	Wetland Indicator Status
<i>Agrostis stolonifera</i>	Creeping bentgrass	FACW
<i>Andropogon ternarius</i>	Split beardgrass	FACU
<i>Bouteloua curtipendula</i>	Side oats grama	FACU
<i>Bouteloua gracilis</i>	Blue grama	NI
<i>Panicum clandestinum</i>	Deer tongue	FACW
<i>Schizachyrium scoparium</i>	Little bluestem	FACU
<i>Sporobolus clandestinus</i>	Rough dropseed	NI
<i>Vicia villosa</i>	Hairy vetch	NI
<i>Chasmanthium latifolium</i>	River Oats	FAC-
<i>Carex vulpinoidea</i>	Fox sedge	OBL

Buffer Restoration Plants

Scientific Name	Common Name	Size (ft)	Total # of stems	Planting Composition (%)
<i>Cercis canadensis</i>	American Redbud	2-3	425	5
<i>Liriodendron tulipifera</i>	Tulip Poplar	2-3	1275	15
<i>Quercus phellos</i>	Willow Oak	2-3	850	10
<i>Platanus occidentalis</i>	Sycamore	2-3	1700	20
<i>Betula nigra</i>	River Birch	2-3	850	10
<i>Carpinus caroliniana</i>	Ironwood	2-3	850	10
<i>Quercus michauxii</i>	Swamp Chestnut Oak	2-3	425	5
<i>Fraxinus pennsylvanica</i>	Green Ash	2-3	1700	20
<i>Quercus rubra</i>	Northern Red Oak	2-3	425	5
<b>Totals</b>			<b>8500</b>	<b>100</b>

- Buffer Planting Area
- Planting Exclusion
- Conservation Easement
- Property Line
- Stream Top of Bank



Burnetts Chapel Buffer Mitigation Site  
Guilford County, North Carolina  
Reach A  
As-Built Plans



Revisions:


Date: June 8, 2012  
Job Number: 005-02130  
Project Engineer: JNSK  
Drawn By: JCK  
Designed By: EGR






2.1

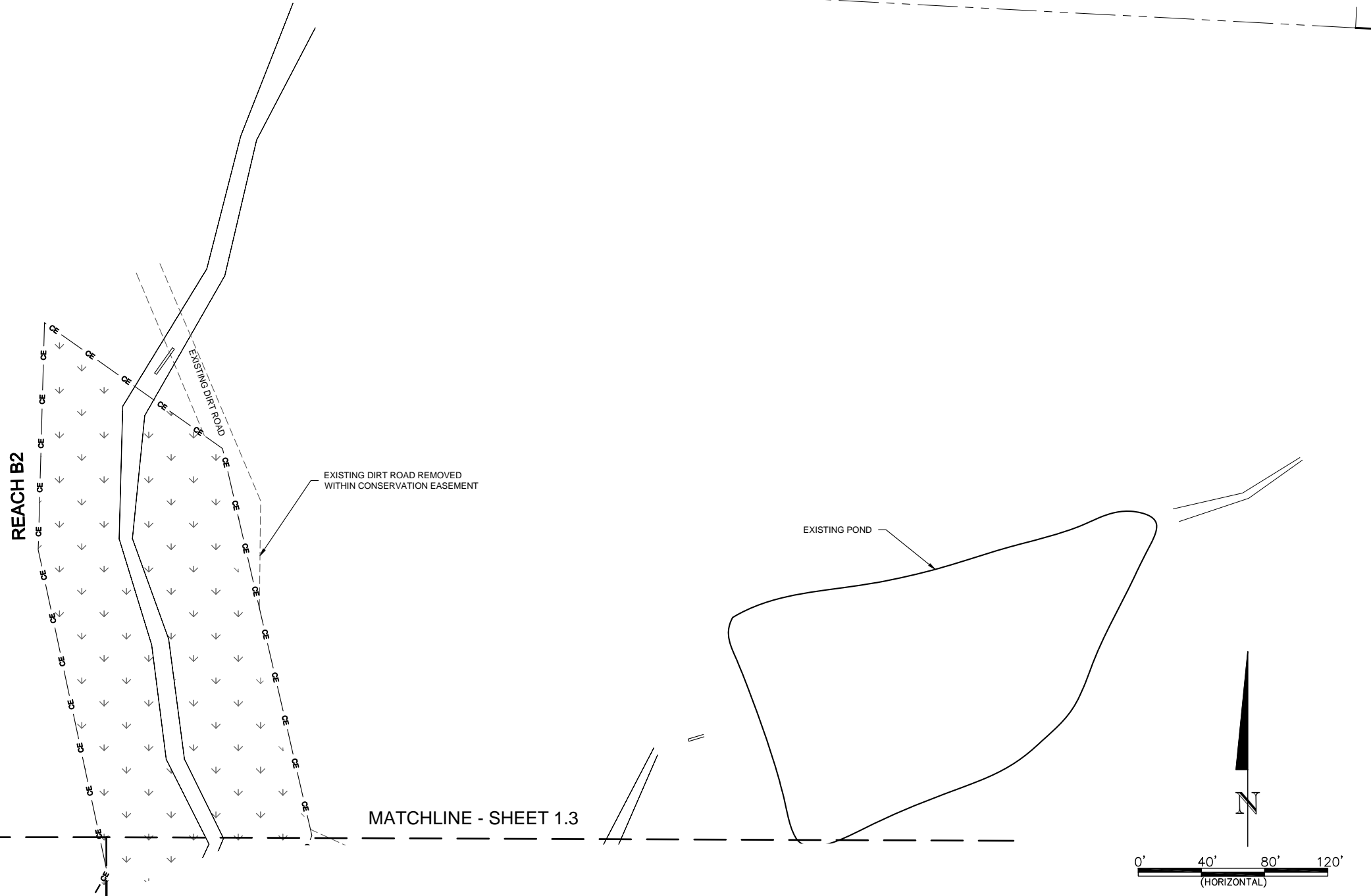
Buffer Restoration Seeding

Scientific Name	Common Name	Wetland Indicator Status
<i>Agrostis stolonifera</i>	Creeping bentgrass	FACW
<i>Andropogon ternarius</i>	Split beardgrass	FACU
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<i>Bouteloua gracilis</i>	Blue grama	NI
<i>Panicum clandestinum</i>	Deer tongue	FACW
<i>Schizachyrium scoparium</i>	Little bluestem	FACU
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<i>Chasmanthium latifolium</i>	River Oats	FAC-
<i>Carex vulpinoidea</i>	Fox sedge	OBL

Buffer Restoration Plants

Scientific Name	Common Name	Size (ft)	Total # of stems	Planting Composition (%)
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<b>Totals</b>			<b>8500</b>	<b>100</b>

-  Buffer Planting Area
-  Planting Exclusion
-  Conservation Easement
-  Property Line
-  Stream Top of Bank



**Burnetts Chapel Buffer Mitigation Site**  
**Guilford County, North Carolina**

Reach B2  
As-Built Plans

Revisions:

Date:	June 8, 2012
Job Number:	005-02130
Project Engineer:	JSK
Drawn By:	JCK
Designed By:	EGR

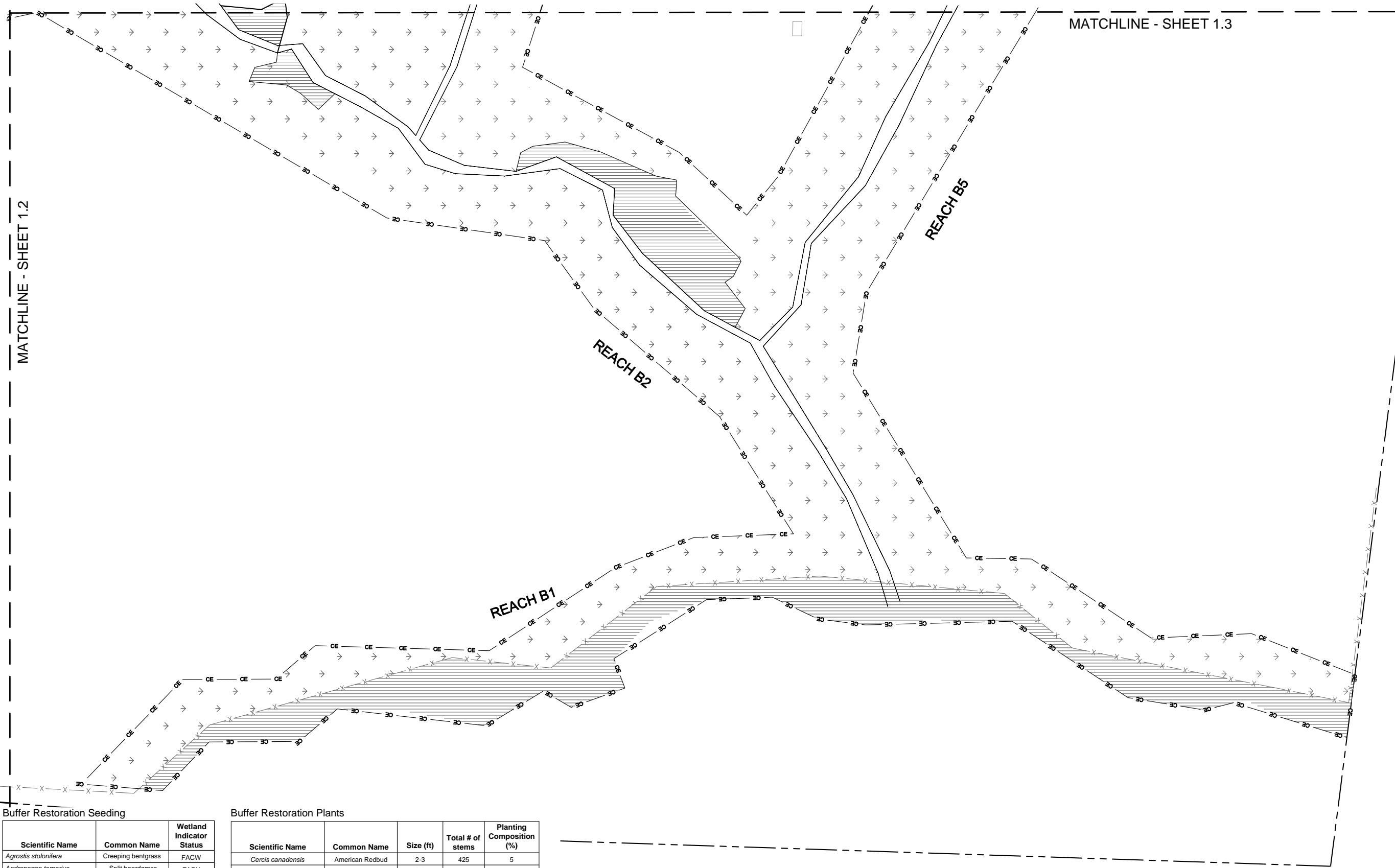
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June 8, 2012

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MATCHLINE - SHEET 1.2

MATCHLINE - SHEET 1.3



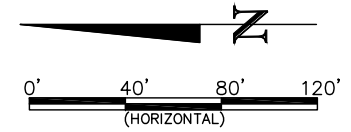
Buffer Restoration Seeding

Scientific Name	Common Name	Wetland Indicator Status
<i>Agrostis stolonifera</i>	Creeping bentgrass	FACW
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<i>Bouteloua gracilis</i>	Blue grama	NI
<i>Panicum clandestinum</i>	Deer tongue	FACW
<i>Schizachyrium scoparium</i>	Little bluestem	FACU
<i>Sporobolus clandestinus</i>	Rough dropseed	NI
<i>Vicia villosa</i>	Hairy vetch	NI
<i>Chasmanthium latifolium</i>	River Oats	FAC-
<i>Carex vulpinoidea</i>	Fox sedge	OBL

Buffer Restoration Plants

Scientific Name	Common Name	Size (ft)	Total # of stems	Planting Composition (%)
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<i>Quercus rubra</i>	Northern Red Oak	2-3	425	5
<b>Totals</b>			<b>8500</b>	<b>100</b>

- Buffer Planting Area
- Planting Exclusion
- Conservation Easement
- Property Line
- Stream Top of Bank



**Burnetts Chapel Buffer Mitigation Site**  
**Guilford County, North Carolina**  
 Reach B1 B2 & B5  
 As-Built Plans

Revisions:


Date: June 8, 2012  
 Job Number: 05-02130  
 Project Engineer: JNSK  
 Drawn By: JCK  
 Designed By: EGR

2.3

Buffer Restoration Seeding

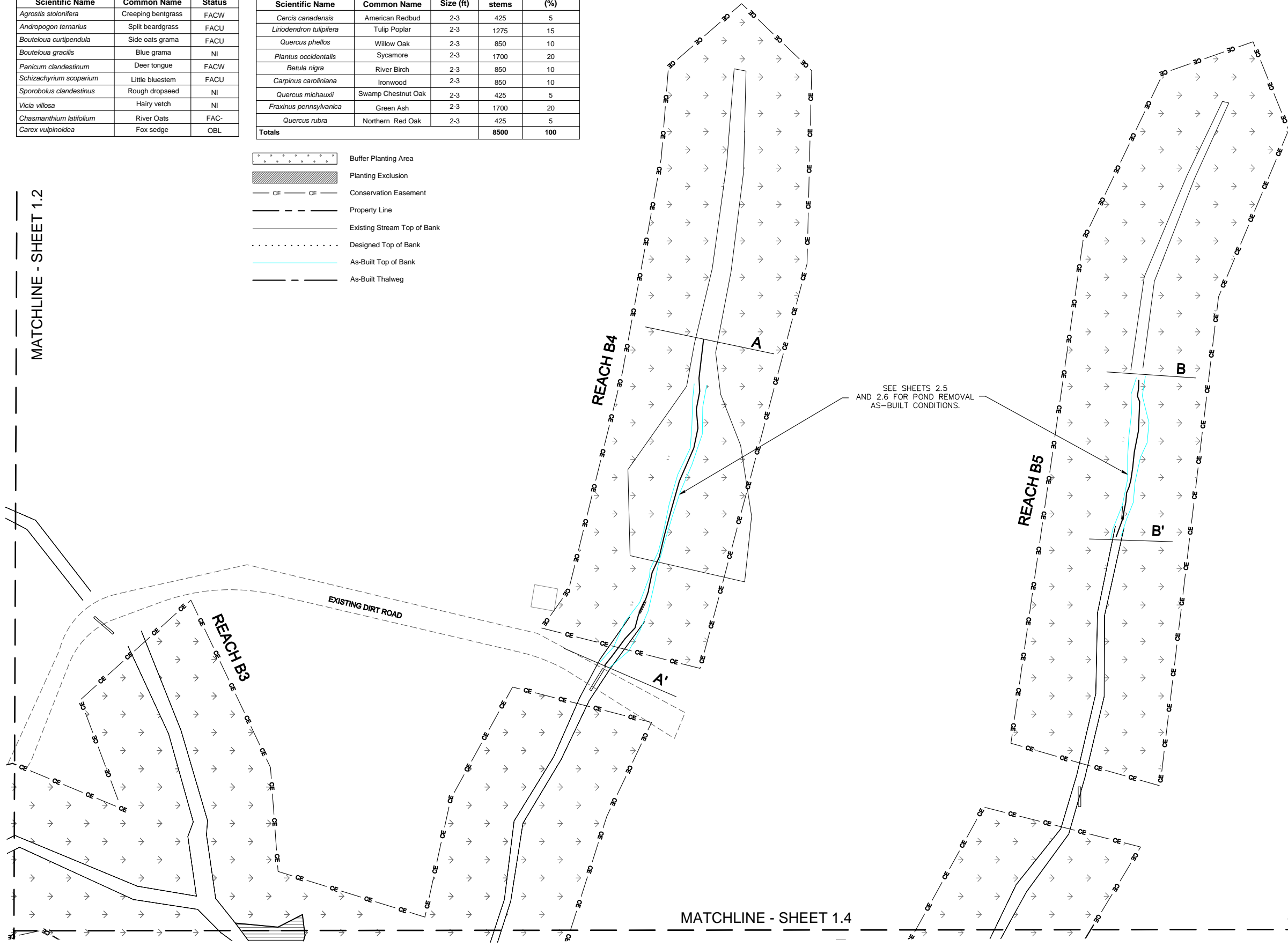
Scientific Name	Common Name	Wetland Indicator Status
<i>Agrostis stolonifera</i>	Creeping bentgrass	FACW
<i>Andropogon ternarius</i>	Split beardgrass	FACU
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<i>Vicia villosa</i>	Hairy vetch	NI
<i>Chasmanthium latifolium</i>	River Oats	FAC-
<i>Carex vulpinoidea</i>	Fox sedge	OBL

Buffer Restoration Plants

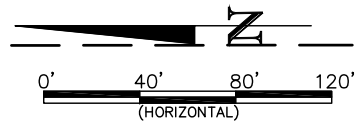
Scientific Name	Common Name	Size (ft)	Total # of stems	Planting Composition (%)
<i>Cercis canadensis</i>	American Redbud	2-3	425	5
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<i>Quercus rubra</i>	Northern Red Oak	2-3	425	5
<b>Totals</b>			<b>8500</b>	<b>100</b>

- Buffer Planting Area
- Planting Exclusion
- Conservation Easement
- Property Line
- Existing Stream Top of Bank
- Designed Top of Bank
- As-Built Top of Bank
- As-Built Thalweg

MATCHLINE - SHEET 1.2



MATCHLINE - SHEET 1.4



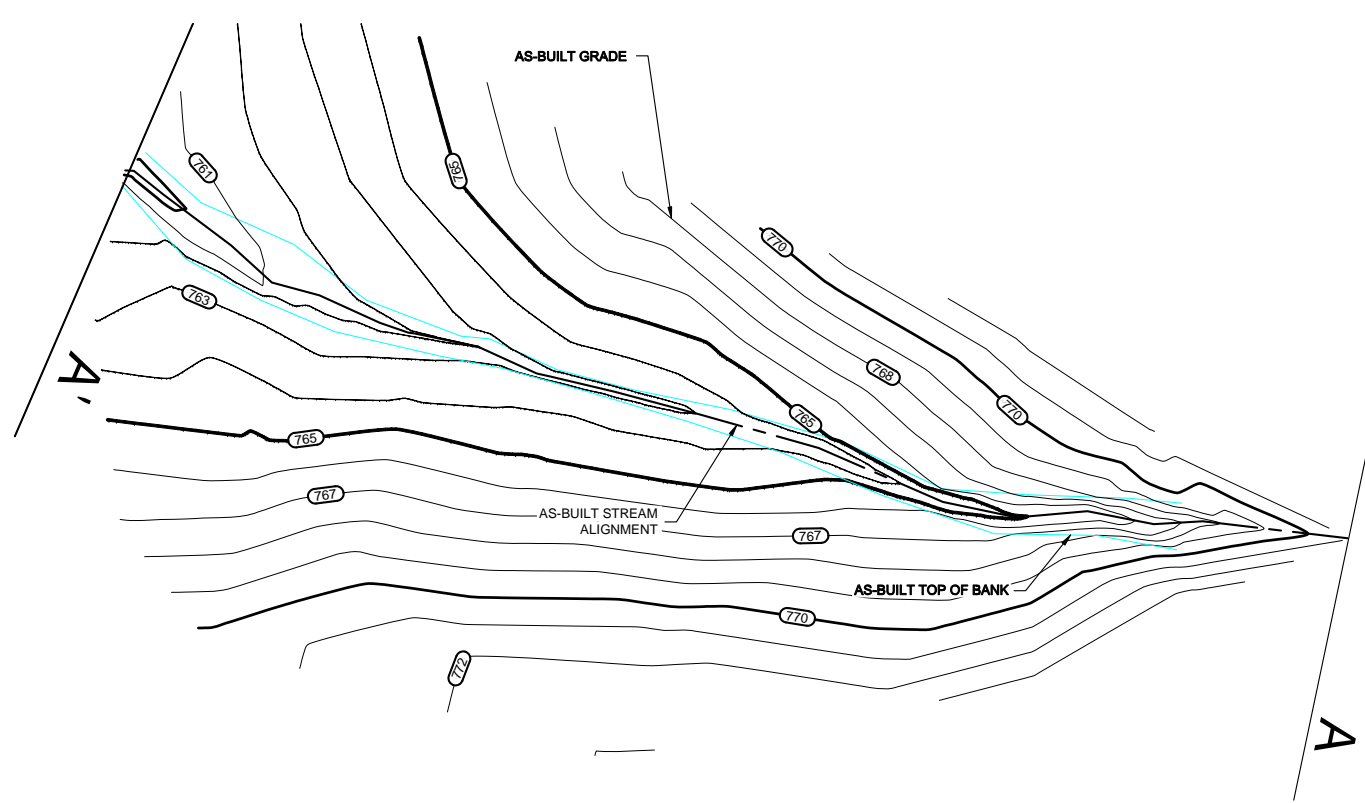
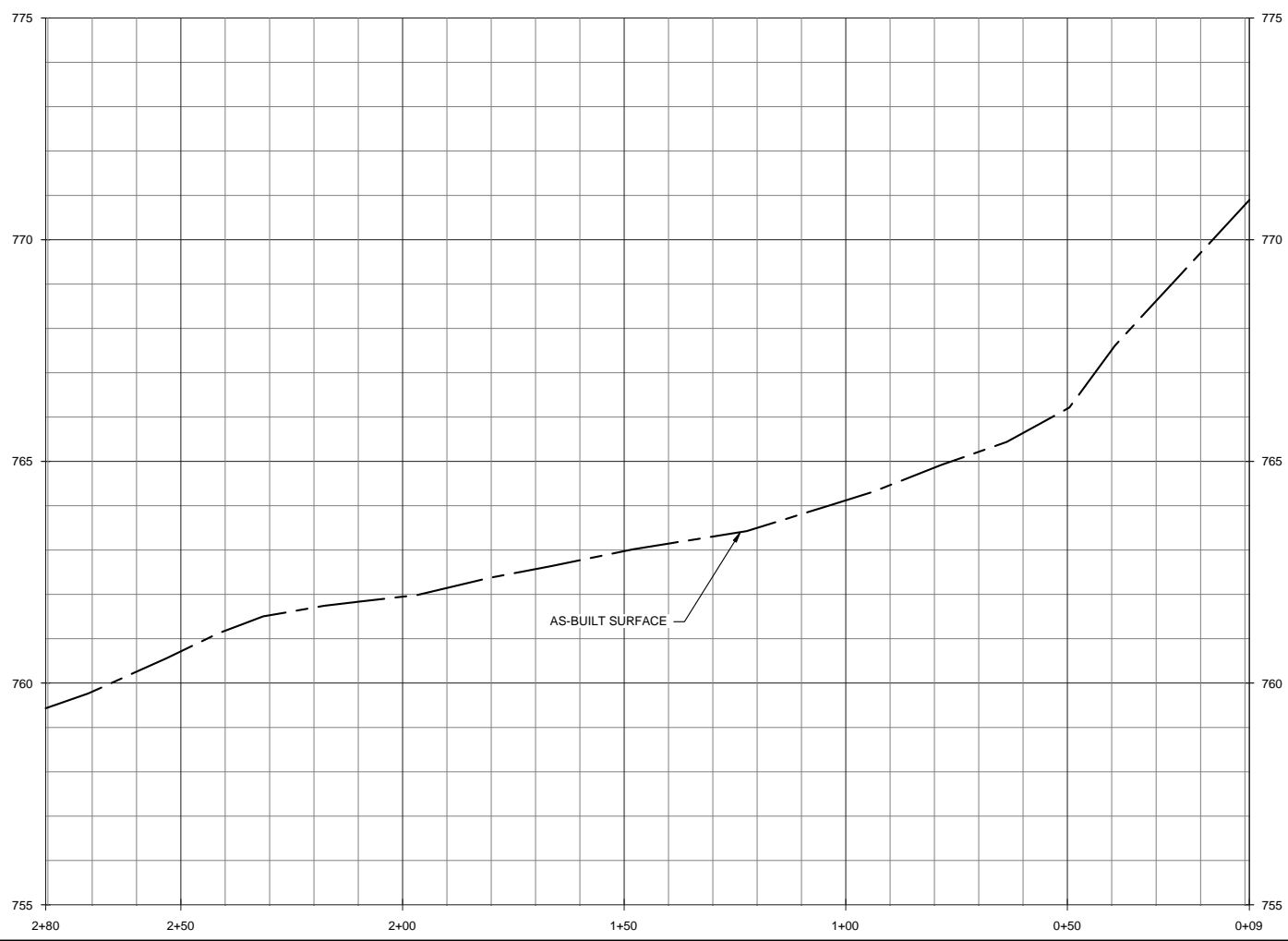
**Burnetts Chapel Buffer Mitigation Site**  
**Guilford County, North Carolina**  
 Reach B3 B4 & B5  
 As-Built Plans

Revisions:

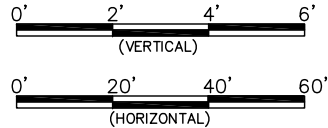

Date: June 8, 2012  
 Job Number: 005-02130  
 Project Engineer: JNSK  
 Drawn By: JCK  
 Designed By: EGR

2.4





- Buffer Planting Area
- Planting Exclusion
- Conservation Easement
- Property Line
- As-Built Top of Bank
- As-Built Thalweg
- Proposed log sill



Date:	June 8, 2012
Job Number:	005-02130
Project Engineer:	JSK
Drawn By:	JCK
Designed By:	EGR

2.5

Sheet

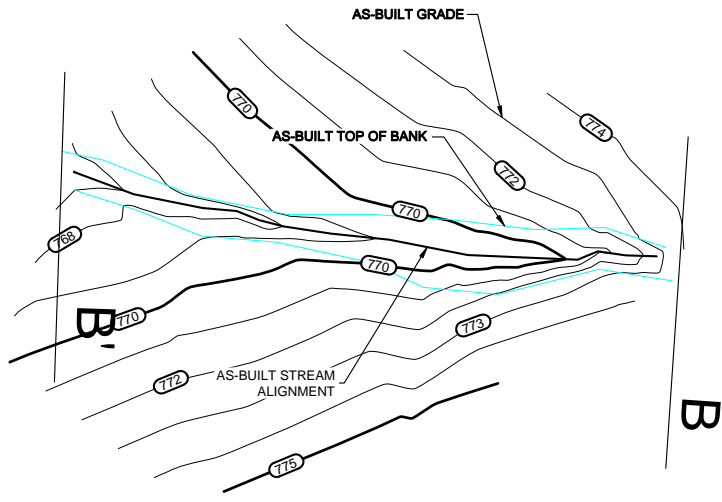
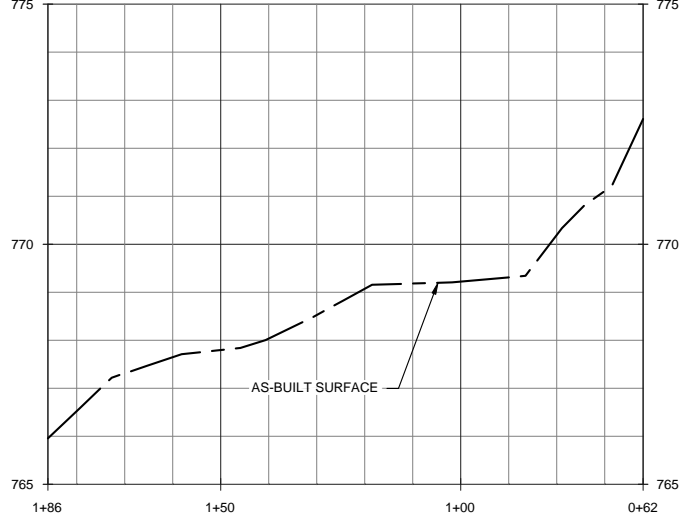
Final As-Built Plans




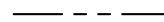

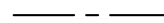

Burnetts Chapel Buffer Mitigation Site  
 Guilford County, North Carolina

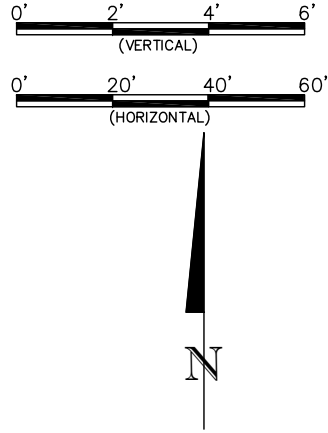
B4 Alignment  
 As-Built Plans



1430 South Mint Street, Suite 104  
Charlotte, NC 28203  
Tel: 704.332.1304  
Fax: 704.332.1306  
Firm License No. P-0831



-  Buffer Planting Area
-  Planting Exclusion
-  Conservation Easement
-  Property Line
-  As-Built Top of Bank
-  As-Built Thalweg
-  Proposed log sill



**Burnetts Chapel Buffer Mitigation Site**  
**Guilford County, North Carolina**

B5 Alignment  
 As-Built Plans

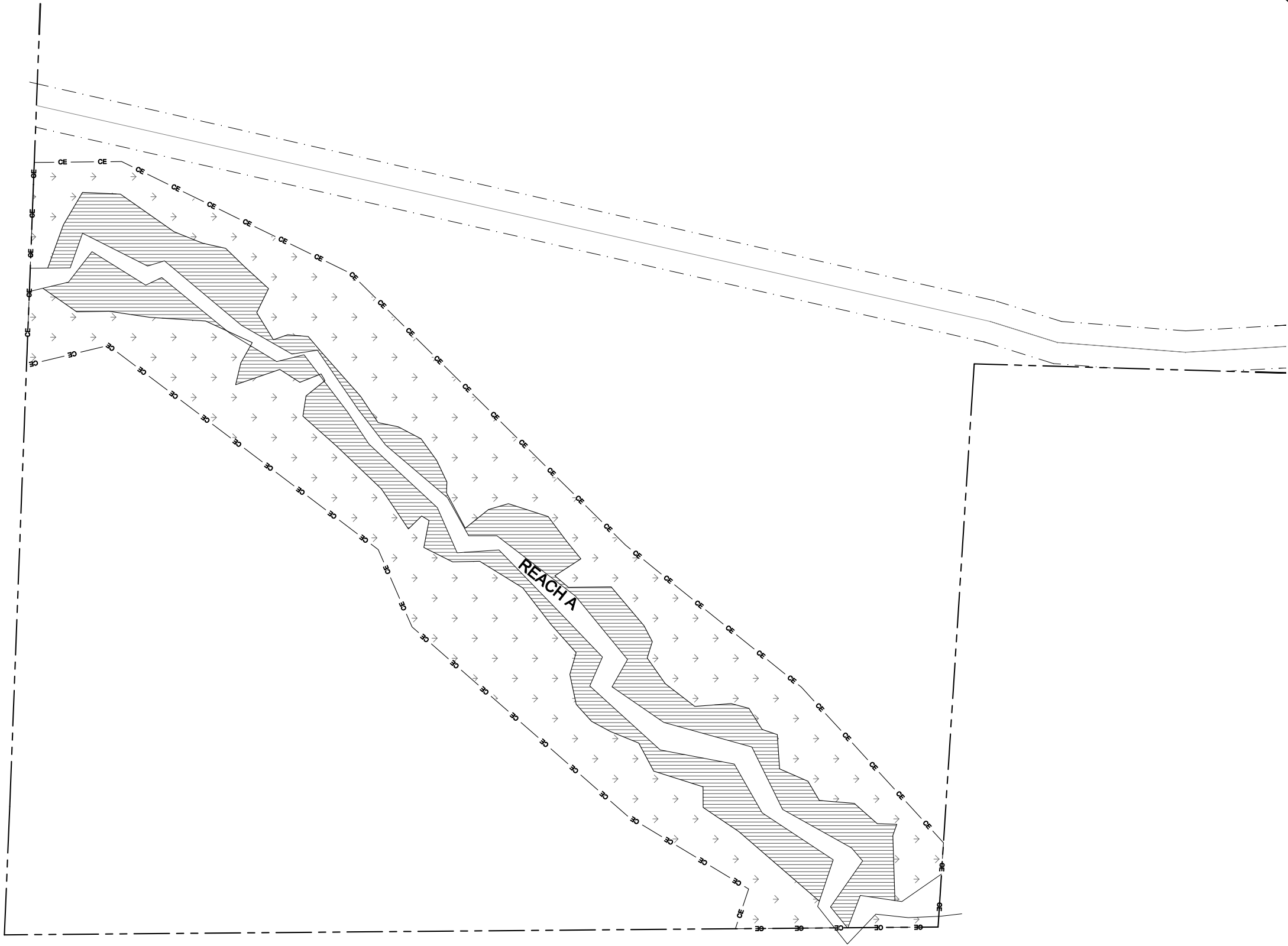
Revisions:


Date: June 8, 2012  
 Job Number: 005-02130  
 Project Engineer: JNSK  
 Drawn By: JCK  
 Designed By: EGR

2.6

Sheet

Final As-Built Plans

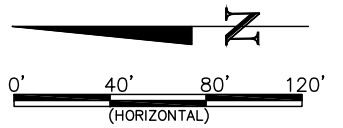
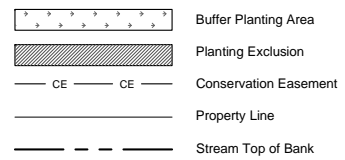


Buffer Restoration Seeding

Scientific Name	Common Name	Wetland Indicator Status
<i>Agrostis stolonifera</i>	Creeping bentgrass	FACW
<i>Andropogon ternarius</i>	Split beardgrass	FACU
<i>Bouteloua curtipendula</i>	Side oats grama	FACU
<i>Bouteloua gracilis</i>	Blue grama	NI
<i>Panicum clandestinum</i>	Deer tongue	FACW
<i>Schizachyrium scoparium</i>	Little bluestem	FACU
<i>Sporobolus clandestinus</i>	Rough dropseed	NI
<i>Vicia villosa</i>	Hairy vetch	NI
<i>Chasmanthium latifolium</i>	River Oats	FAC-
<i>Carex vulpinoidea</i>	Fox sedge	OBL

Buffer Restoration Plants

Scientific Name	Common Name	Size (ft)	Total # of stems	Planting Composition (%)
<i>Cercis canadensis</i>	American Redbud	2-3	425	5
<i>Liriodendron tulipifera</i>	Tulip Poplar	2-3	1275	15
<i>Quercus phellos</i>	Willow Oak	2-3	850	10
<i>Platanus occidentalis</i>	Sycamore	2-3	1700	20
<i>Betula nigra</i>	River Birch	2-3	850	10
<i>Carpinus caroliniana</i>	Ironwood	2-3	850	10
<i>Quercus michauxii</i>	Swamp Chestnut Oak	2-3	425	5
<i>Fraxinus pennsylvanica</i>	Green Ash	2-3	1700	20
<i>Quercus rubra</i>	Northern Red Oak	2-3	425	5
<b>Totals</b>			<b>8500</b>	<b>100</b>



Burnetts Chapel Buffer Mitigation Site  
Guilford County, North Carolina

Reach A  
Overlay Plans

Revisions:


Date: June 8, 2012  
Job Number: 005-02130  
Project Engineer: JNSK  
Drawn By: JCK  
Designed By: EGR

3.1

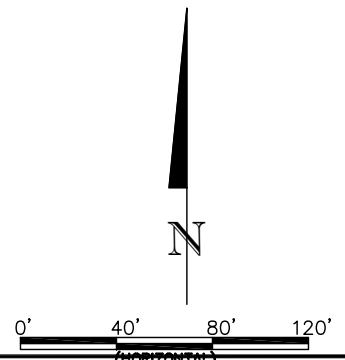
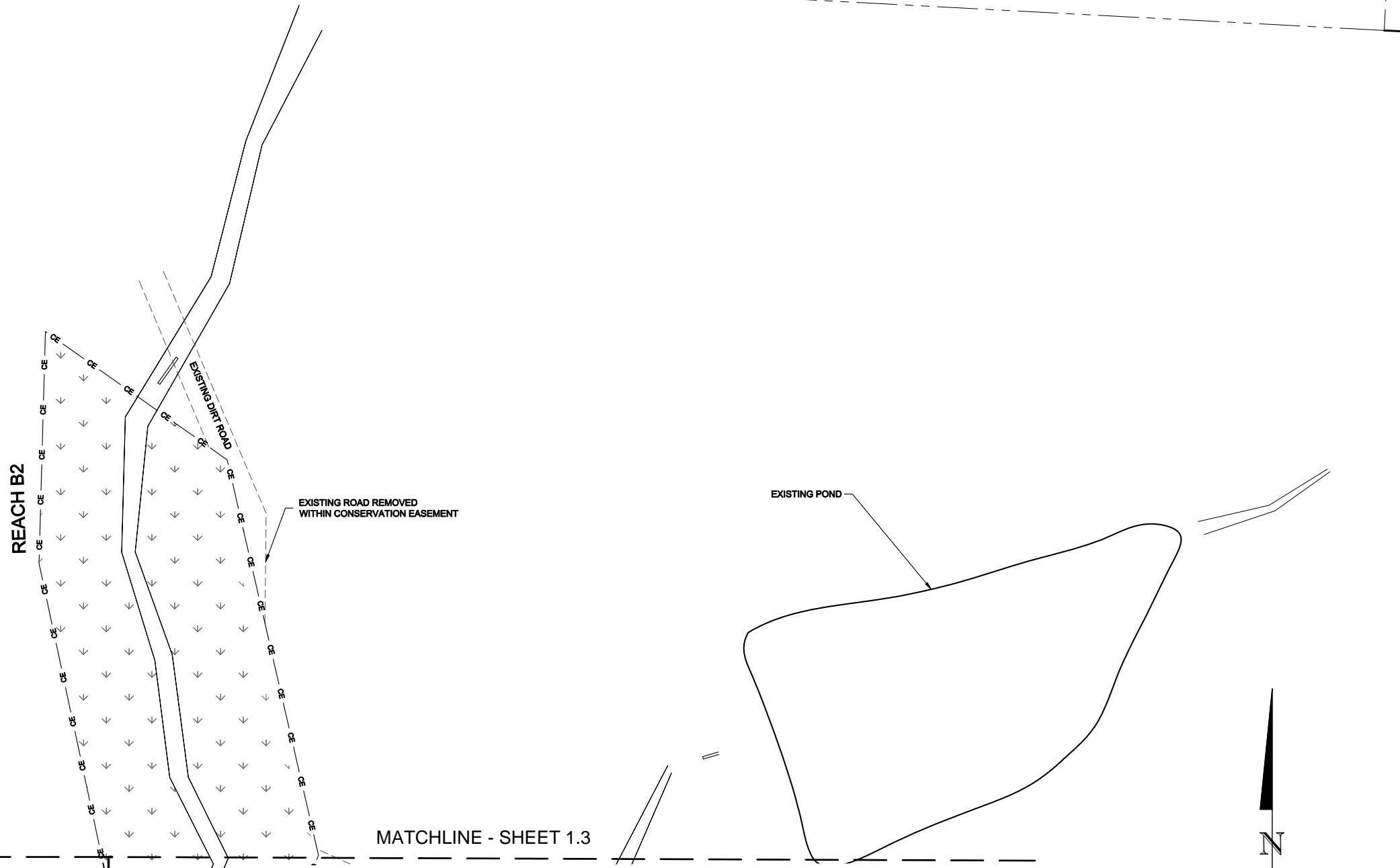
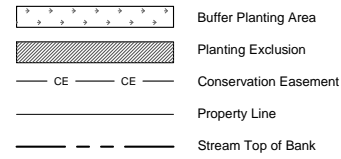
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Buffer Restoration Seeding

Scientific Name	Common Name	Wetland Indicator Status
<i>Agrostis stolonifera</i>	Creeping bentgrass	FACW
<i>Andropogon ternarius</i>	Split beardgrass	FACU
<i>Bouteloua curtipendula</i>	Side oats grama	FACU
<i>Bouteloua gracilis</i>	Blue grama	NI
<i>Panicum clandestinum</i>	Deer tongue	FACW
<i>Schizachyrium scoparium</i>	Little bluestem	FACU
<i>Sporobolus clandestinus</i>	Rough dropseed	NI
<i>Vicia villosa</i>	Hairy vetch	NI
<i>Chasmanthium latifolium</i>	River Oats	FAC-
<i>Carex vulpinoidea</i>	Fox sedge	OBL

Buffer Restoration Plants

Scientific Name	Common Name	Size (ft)	Total # of stems	Planting Composition (%)
<i>Cercis canadensis</i>	American Redbud	2-3	425	5
<i>Liriodendron tulipifera</i>	Tulip Poplar	2-3	1275	15
<i>Quercus phellos</i>	Willow Oak	2-3	850	10
<i>Plantus occidentalis</i>	Sycamore	2-3	1700	20
<i>Betula nigra</i>	River Birch	2-3	850	10
<i>Carpinus caroliniana</i>	Ironwood	2-3	850	10
<i>Quercus michauxii</i>	Swamp Chestnut Oak	2-3	425	5
<i>Fraxinus pennsylvanica</i>	Green Ash	2-3	1700	20
<i>Quercus rubra</i>	Northern Red Oak	2-3	425	5
<b>Totals</b>			<b>8500</b>	<b>100</b>



Revisions:

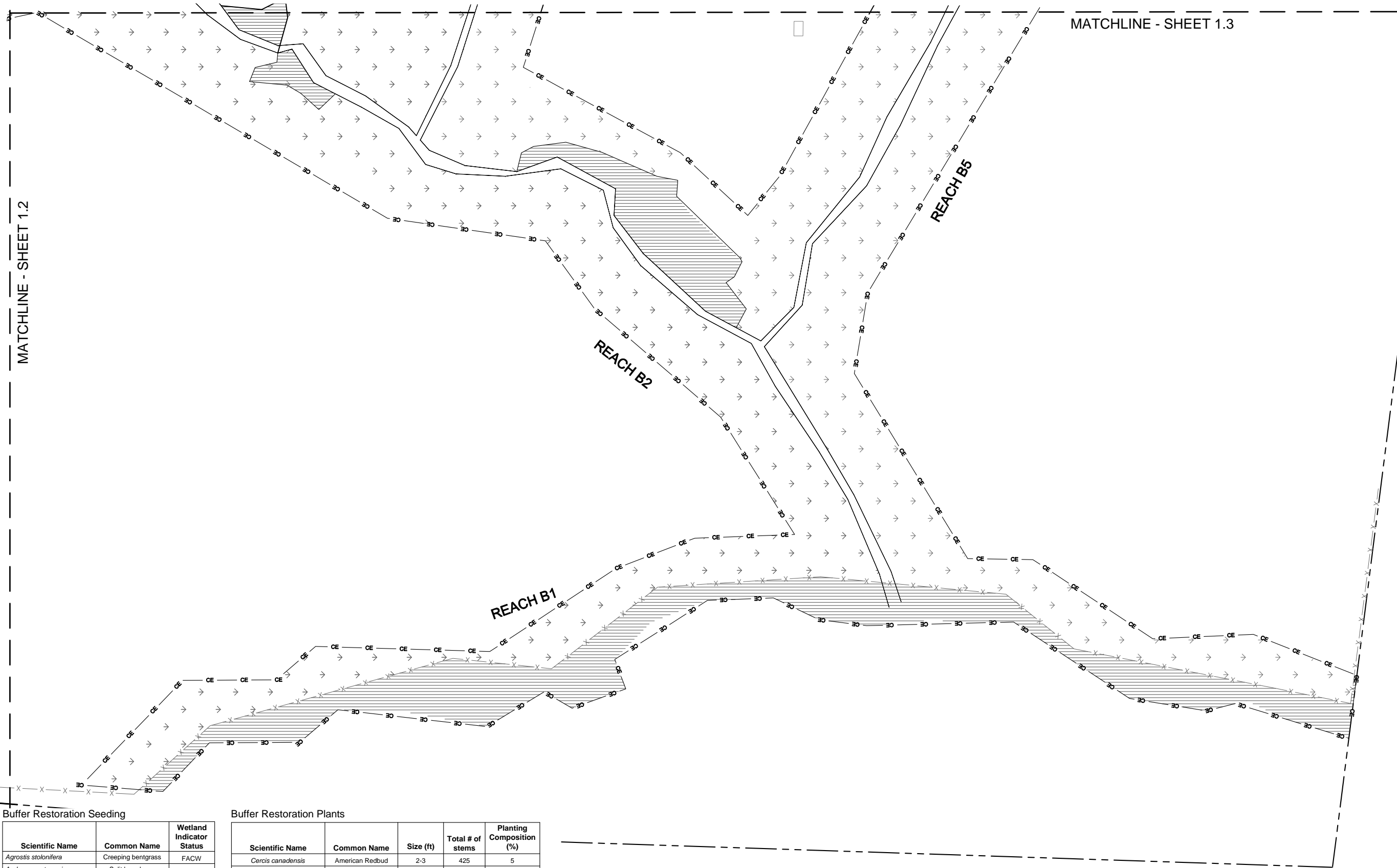

Date: June 8, 2012  
Job Number: 005-02130  
Project Engineer: JNK  
Drawn By: JCK  
Designed By: EGR

3.2

Sheet

MATCHLINE - SHEET 1.2

MATCHLINE - SHEET 1.3

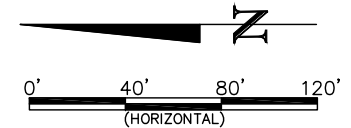
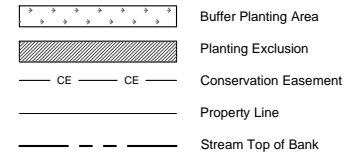


Buffer Restoration Seeding

Scientific Name	Common Name	Wetland Indicator Status
<i>Agrostis stolonifera</i>	Creeping bentgrass	FACW
<i>Andropogon ternarius</i>	Split beardgrass	FACU
<i>Bouteloua curtipendula</i>	Side oats grama	FACU
<i>Bouteloua gracilis</i>	Blue grama	NI
<i>Panicum clandestinum</i>	Deer tongue	FACW
<i>Schizachyrium scoparium</i>	Little bluestem	FACU
<i>Sporobolus clandestinus</i>	Rough dropseed	NI
<i>Vicia villosa</i>	Hairy vetch	NI
<i>Chasmanthium latifolium</i>	River Oats	FAC-
<i>Carex vulpinoidea</i>	Fox sedge	OBL

Buffer Restoration Plants

Scientific Name	Common Name	Size (ft)	Total # of stems	Planting Composition (%)
<i>Cercis canadensis</i>	American Redbud	2-3	425	5
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<i>Fraxinus pennsylvanica</i>	Green Ash	2-3	1700	20
<i>Quercus rubra</i>	Northern Red Oak	2-3	425	5
<b>Totals</b>			<b>8500</b>	<b>100</b>



**Burnetts Chapel Buffer Mitigation Site**  
**Guilford County, North Carolina**  
Reach B1 B2 & B5  
Overlay Plans

Revisions:


Date: June 8, 2012  
Job Number: 005-02130  
Project Engineer: JNSK  
Drawn By: JCK  
Designed By: EGR

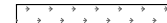



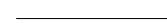



3.3

Buffer Restoration Seeding

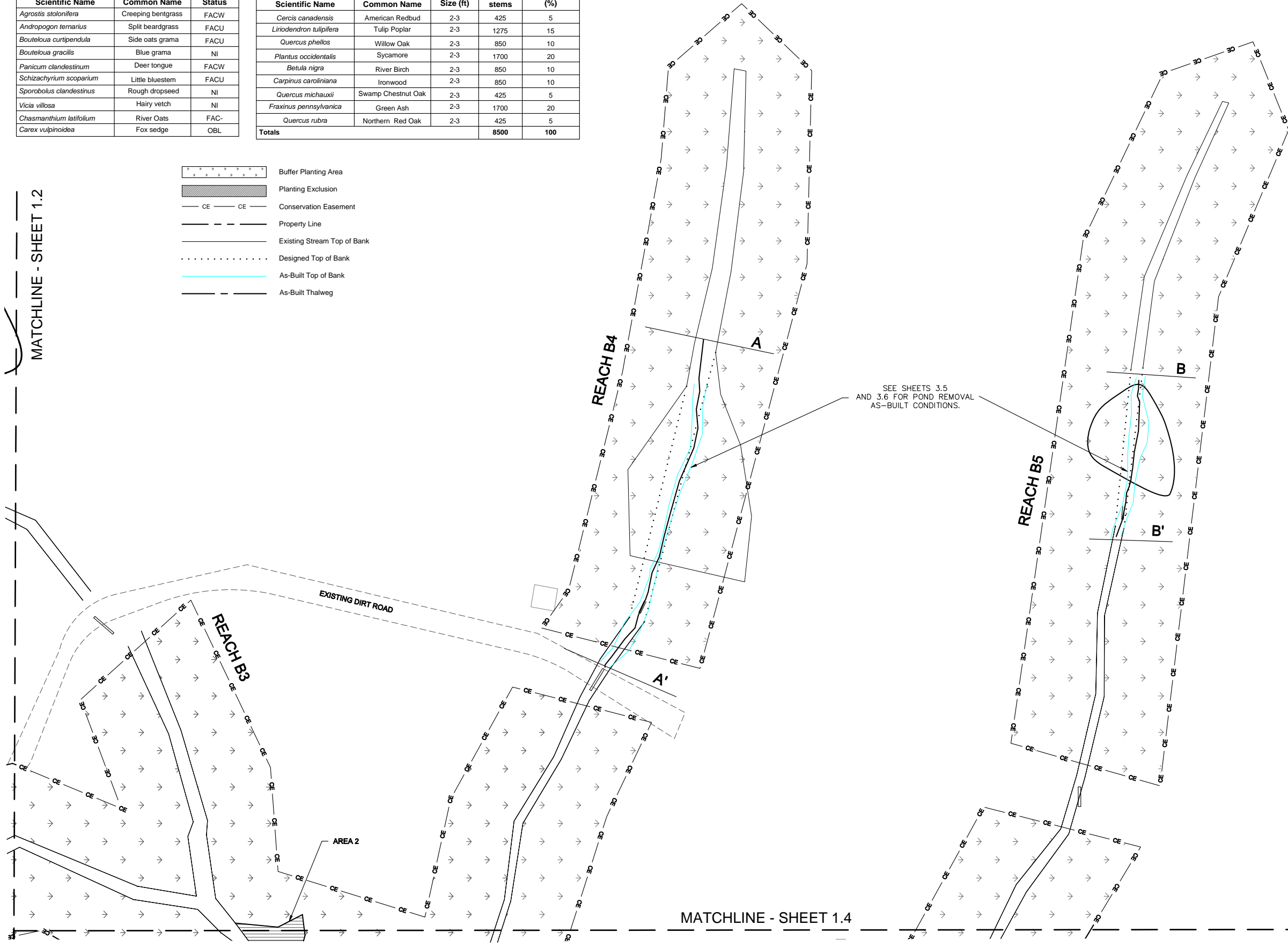
Scientific Name	Common Name	Wetland Indicator Status
<i>Agrostis stolonifera</i>	Creeping bentgrass	FACW
<i>Andropogon ternarius</i>	Split beardgrass	FACU
<i>Bouteloua curtipendula</i>	Side oats grama	FACU
<i>Bouteloua gracilis</i>	Blue grama	NI
<i>Panicum clandestinum</i>	Deer tongue	FACW
<i>Schizachyrium scoparium</i>	Little bluestem	FACU
<i>Sporobolus clandestinus</i>	Rough dropseed	NI
<i>Vicia villosa</i>	Hairy vetch	NI
<i>Chasmanthium latifolium</i>	River Oats	FAC-
<i>Carex vulpinoidea</i>	Fox sedge	OBL

Buffer Restoration Plants

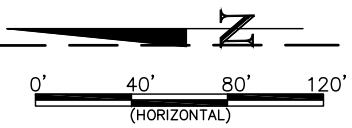
Scientific Name	Common Name	Size (ft)	Total # of stems	Planting Composition (%)
<i>Cercis canadensis</i>	American Redbud	2-3	425	5
<i>Liriodendron tulipifera</i>	Tulip Poplar	2-3	1275	15
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<i>Betula nigra</i>	River Birch	2-3	850	10
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<i>Quercus rubra</i>	Northern Red Oak	2-3	425	5
<b>Totals</b>			<b>8500</b>	<b>100</b>

-  Buffer Planting Area
-  Planting Exclusion
-  Conservation Easement
-  Property Line
-  Existing Stream Top of Bank
-  Designed Top of Bank
-  As-Built Top of Bank
-  As-Built Thalweg

MATCHLINE - SHEET 1.2



MATCHLINE - SHEET 1.4



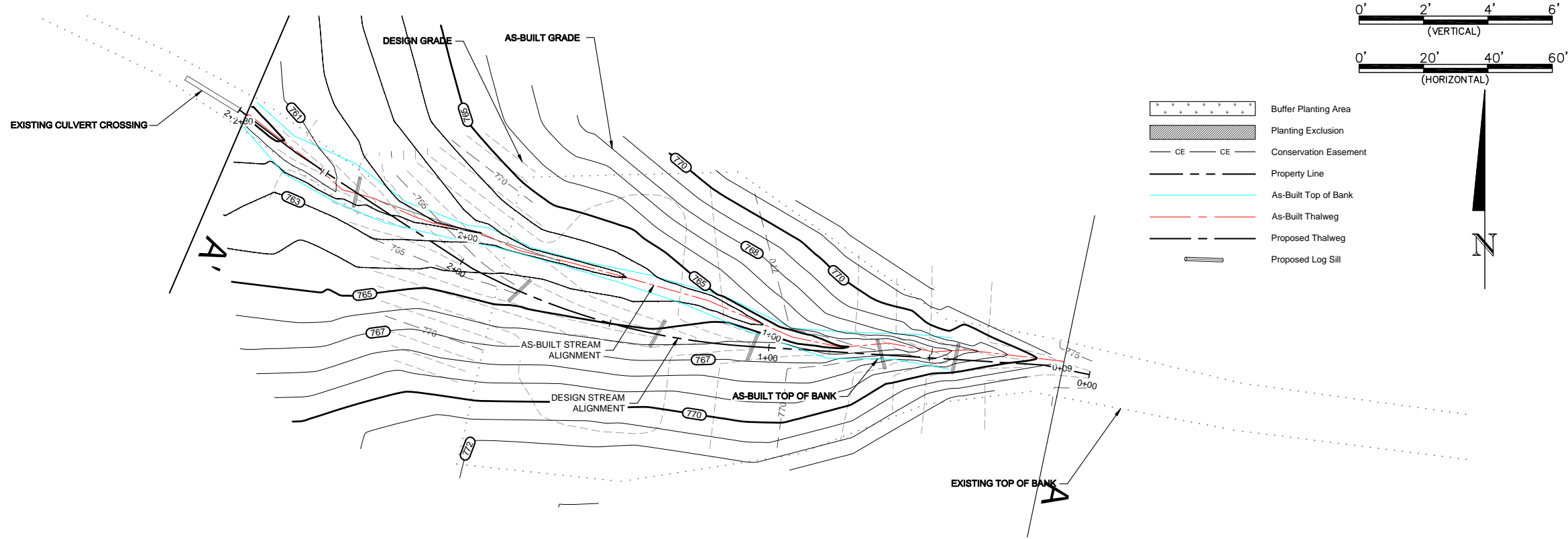
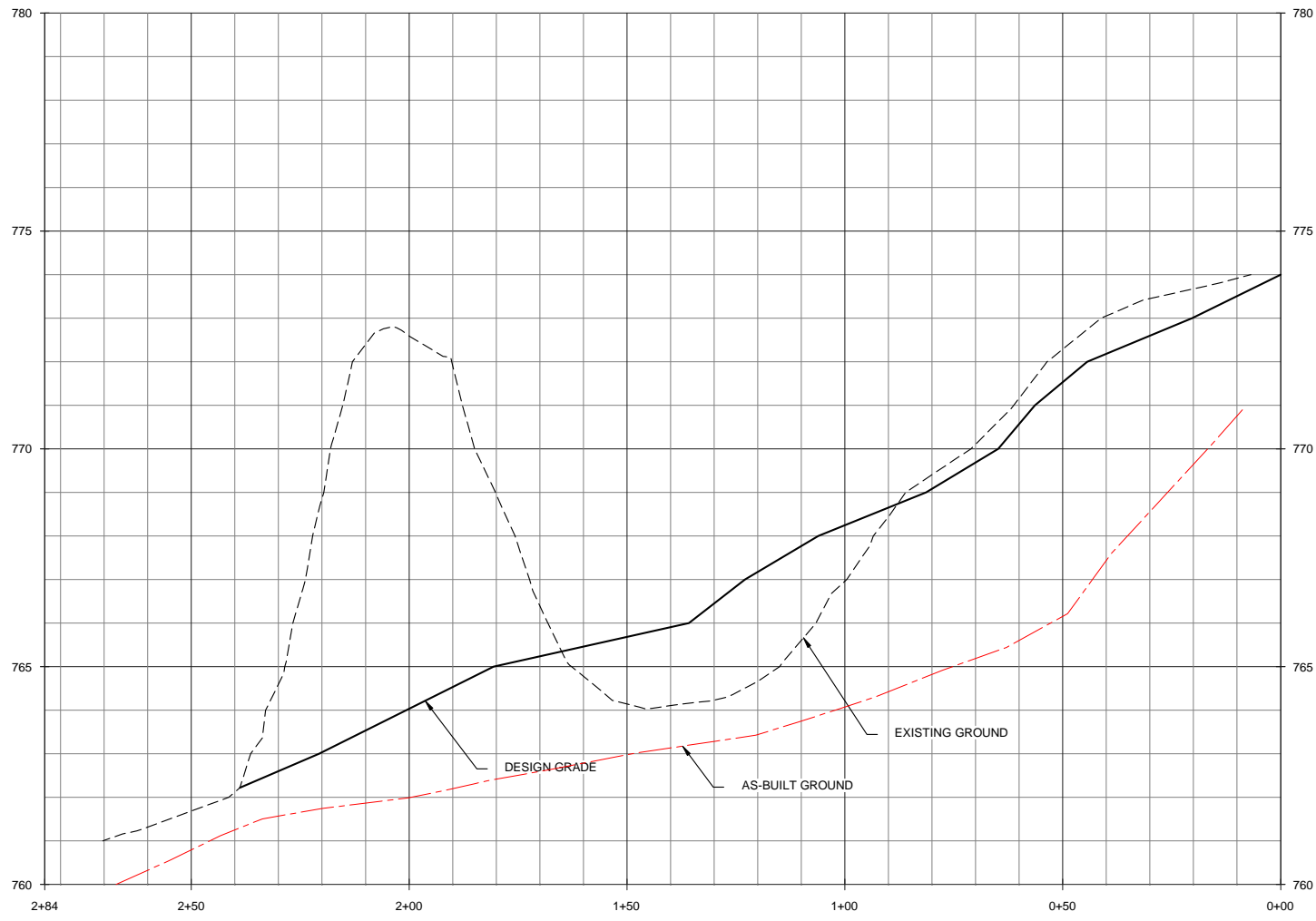
**Burnetts Chapel Buffer Mitigation Site**  
**Guilford County, North Carolina**  
 Reach B3, B4 & B5  
 Overlay Plans

Revisions:


Date: June 8, 2012  
 Job Number: 005-02130  
 Project Engineer: JNSK  
 Drawn By: JCK  
 Designated By: EGR

3.4

Sheet

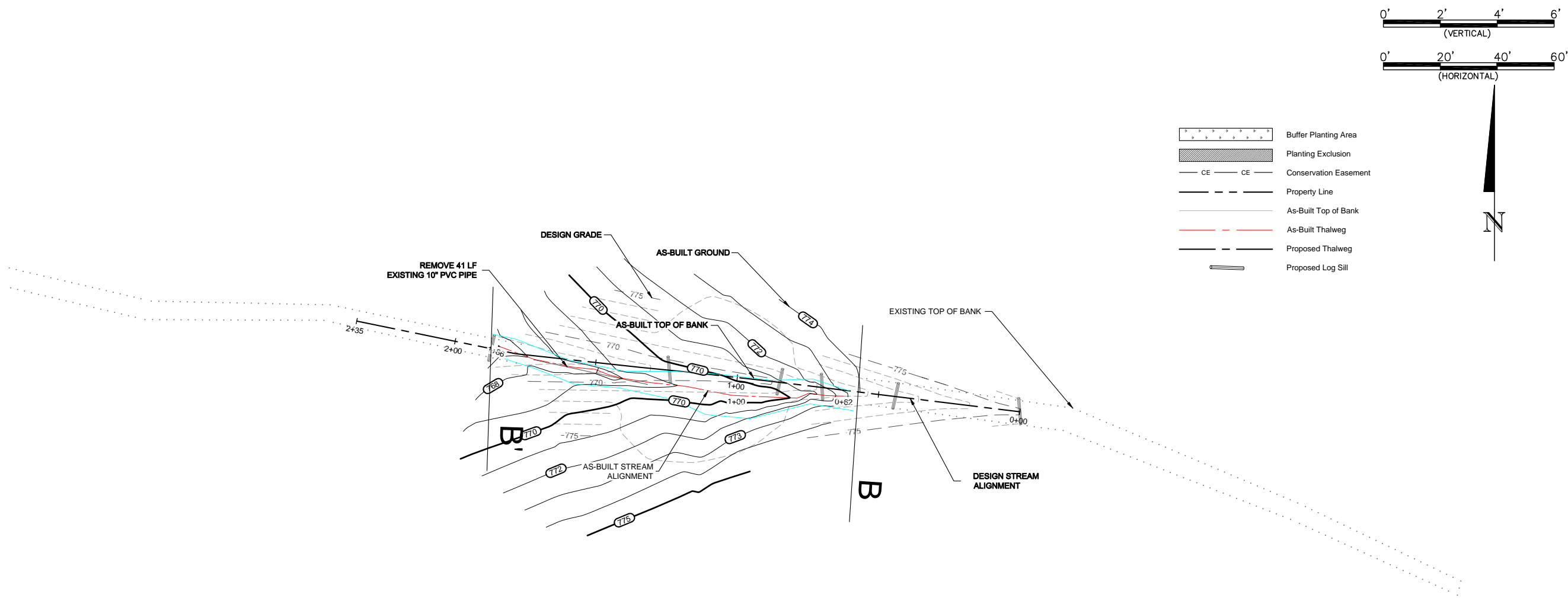
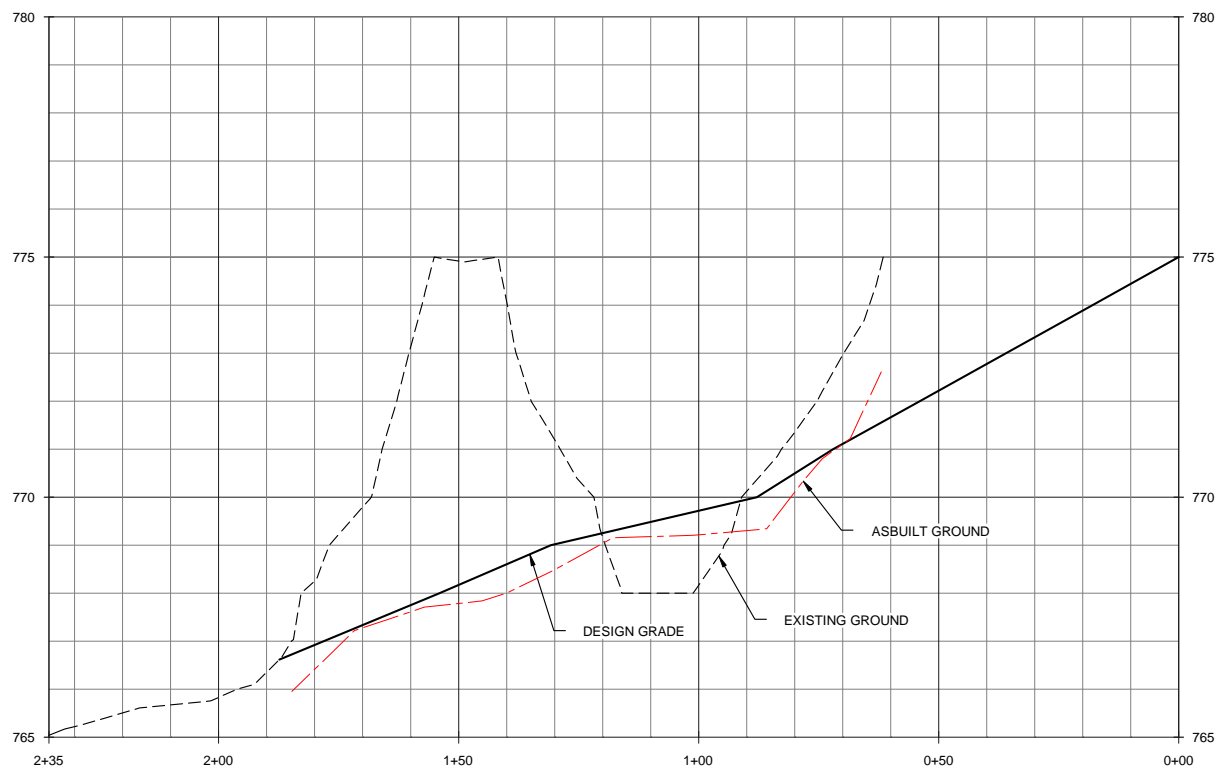


**Burnetts Chapel Buffer Mitigation Site**  
**Guilford County, North Carolina**  
 B4 Alignment  
 Overlay Plans

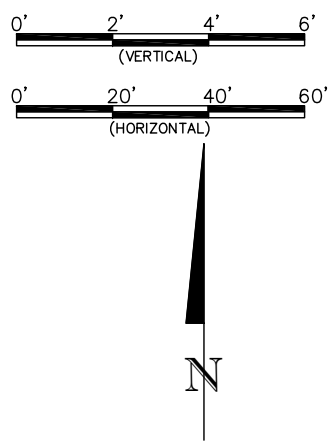
Revision	Description

Date: June 8, 2012  
 Job Number: 0505-02130  
 Project Engineer: JNSK  
 Drawn By: JCK  
 Design By: EGR

3.5



- Buffer Planting Area
- Planting Exclusion
- Conservation Easement
- Property Line
- As-Built Top of Bank
- As-Built Thalweg
- Proposed Thalweg
- Proposed Log Sill



**Burnetts Chapel Buffer Mitigation Site**  
**Guilford County, North Carolina**  
 B5 Alignment  
 Overlay Plans



Revisions:


Date: June 8, 2012  
 Job Number: 0905-02130  
 Project Engineer: JNSK  
 Drawn By: JCK  
 Designed By: EGR

3.6