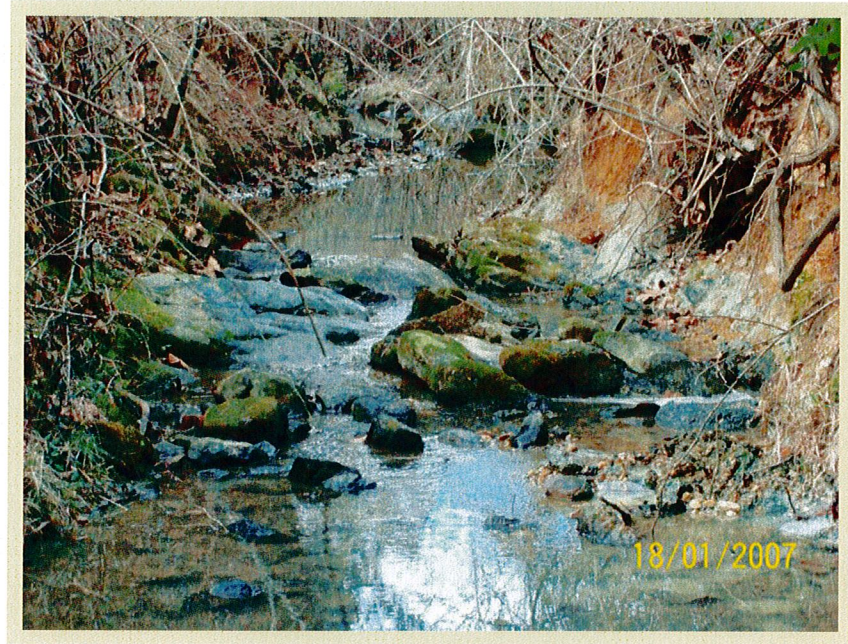


MITIGATION PLAN
and AS-BUILT BASELINE REPORT
UT TO HAW (GWYNN) SITE
ALAMANCE COUNTY, NORTH CAROLINA
(EEP Project No. 92753)

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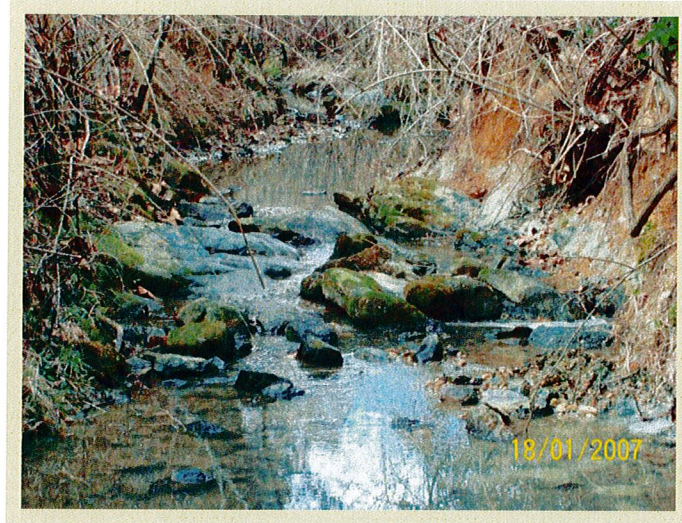


Submitted to:
North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
Raleigh, North Carolina



May 2010

MITIGATION PLAN
and AS-BUILT BASELINE REPORT
UT TO HAW (GWYNN) SITE
ALAMANCE COUNTY, NORTH CAROLINA
(EEP Project No. 92753)



Submitted to:
North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
Raleigh, North Carolina

Prepared by:
Axiom Environmental, Inc.
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May 2010

EXECUTIVE SUMMARY

The North Carolina Ecosystem Enhancement Program (NCEEP) has completed enhancement and preservation of streams and wetlands at the UT to Haw (Gwynn) Site (hereafter referred to as the “Site”) to assist in fulfilling stream and wetland mitigation goals in the area. The Site is located approximately 9 miles north of Burlington, in Alamance County. The Site is located in United States Geological Survey Hydrologic Unit 03030002030010 (North Carolina Division of Water Quality Subbasin 03-06-02) of the Cape Fear River Basin and will service the USGS 8-digit Cataloging Unit (CU) 03030002. The Site is located within a NCEEP Targeted Local Watershed; in addition, this Site was identified for preservation and enhancement as Site 26 (Travis & Tickle 15.4) in the 2008 NCEEP *Little Alamance, Travis, and Tickle Creek Local Watershed Plan* (PTCG 2008).

Prior to construction, the Site was characterized by pasture land utilized for livestock grazing, a drained pond, and disturbed forest. Land use practices including the maintenance and removal of riparian vegetation and hoof shear from livestock had resulted in degraded water quality, unstable channel characteristics (stream entrenchment, erosion, and bank collapse), and reduced storage capacity and floodwater attenuation. In addition, hydric soils were disturbed due to regular plowing, vegetation maintenance, and hoof shear from livestock.

The goals and objectives of this project focus on improving local water quality, enhancing flood attenuation, and restoring aquatic and riparian habitat. These goals were accomplished by the following.

1. Reducing nonpoint sources of pollution by 1) fencing livestock from stream channels, buffers, and wetlands; 2) ceasing the application of agricultural herbicides, pesticides, and fertilizers; and 3) providing a vegetative buffer adjacent to streams and wetlands to treat surface runoff prior to entering Site streams and ultimately the Haw River.
2. Reducing sedimentation/siltation within on-Site and downstream receiving waters by a) eliminating bank erosion associated with livestock hoof shear on Site streams, b) filtering surface runoff and reducing particulate matter deposition into tributaries, and c) providing a forested vegetative buffer adjacent to Site streams and wetlands.
3. Promoting floodwater attenuation and improving stream stability by revegetating Site floodplains to reduce floodwater velocities through increased frictional resistance on floodwaters crossing Site floodplains.
4. Providing increased habitat for aquatic wildlife by 1) increasing organic matter, carbon export, and woody debris in the stream corridor and 2) restoring shade to Site open waters.
5. Providing wildlife habitat including a forested riparian corridor within a region of the state increasingly dissected by residential/agricultural land use.
6. Protecting a Site identified in the 2008 Piedmont Triad Council of Government *Little Alamance, Travis, and Tickle Creek Watersheds Restoration Plan* (PTCG 2008) for preservation due to its location within a remote, rural area along the heavily used Boone Road resulting in increasing development pressure and appeal to developers.

This project was constructed between December 17, 2009 and February 17, 2010. The removal of invasive species and subsequent planting with native riparian vegetation resulted in 2428 linear feet of stream enhancement, 2.0 acres of riparian riverine wetland enhancement, and 0.3 acres of riparian riverine wetland preservation. Site activities provided 971 Stream Mitigation Units and 1.1 riparian riverine Wetland Mitigation Units. The Site will be protected by a permanent conservation easement held by the

State of North Carolina. Baseline measurements/evaluations indicate that Site streams and vegetation compare favorably to plans as set forth in the detailed restoration plan and construction plans.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
1.0 INTRODUCTION	1
1.2 Project Goals and Objectives	1
1.3 Project Structure, Restoration Type, and Approach	2
2.0 MONITORING PLAN	2
2.1 Stream	2
2.2 Vegetation	2
3.0 SUCCESS CRITERIA	3
3.1 Stream Success Criteria	3
3.2 Vegetation Success Criteria	3
4.0 MAINTENANCE AND CONTINGENCY	3
5.0 REFERENCES	4

APPENDICES

Appendix A. General Tables and Figures

Table 1. Site Restoration Structures and Objectives

Table 2. Project Activity and Reporting History

Table 3. Project Contacts Table

Table 4. Project Attributes Table

Figure 1. Site Location Map

Figure 2. Project Map & Restoration Activities

Figure 3. Monitoring Plan View

Appendix B. Stream Data

Pre and Post Construction Photographs

Appendix C. Vegetation Data

Table 5. Vegetation Plot Attribute Table

Table 6. Planted Woody and Herbaceous Species

1.0 INTRODUCTION

1.1 Location and Setting

The North Carolina Ecosystem Enhancement Program (NCEEP) has completed enhancement and preservation of streams and wetlands at the UT to Haw (Gwynn) Site (hereafter referred to as the “Site”) to assist in fulfilling stream and wetland mitigation goals in the area. The Site is located approximately 9 miles north of Burlington, in Alamance County (Figure 1, Appendix A). The Site is located in United States Geological Survey (USGS) Hydrologic Unit (HU) 03030002030010 (North Carolina Division of Water Quality [NCDWQ] Subbasin 03-06-02) of the Cape Fear River Basin and will service the USGS 8-digit Cataloging Unit (CU) 03030002 (USGS 1974). The project HU encompasses approximately 35 square miles and is largely characterized by mixed forest and agriculture land use. Agriculture land is primarily utilized as pasture for livestock and hay production.

Directions to the Site from Burlington, North Carolina:

- Take NC Highway 62 North for approximately 2.5 miles
- Turn left on Union Ridge Road (at the Shell station; Five Points Grocery and Grill)
- Take the third left on Boone Road
- The Site entrance is approximately 2.5 miles ahead on the left/southwest side of Boone Road between 1048 and 1130 Boone Road; the Site entrance is gated and permission is required from the landowner for entrance.
- Coordinates in center of the Site:
 - Latitude 36.1631°N, Longitude 79.4556°W (NAD83/WGS84)

1.2 Project Goals and Objectives

The goals and objectives of this project focus on improving local water quality, enhancing flood attenuation, and restoring aquatic and riparian habitat. These goals were accomplished by the following.

1. Reducing nonpoint sources of pollution by 1) fencing livestock from stream channels, buffers, and wetlands; 2) ceasing the application of agricultural herbicides, pesticides, and fertilizers; and 3) providing a vegetative buffer adjacent to streams and wetlands to treat surface runoff prior to entering Site streams and ultimately the Haw River.
2. Reducing sedimentation/siltation within on-Site and downstream receiving waters by a) eliminating bank erosion associated with livestock hoof shear on Site streams, b) filtering surface runoff and reducing particulate matter deposition into tributaries, and c) providing a forested vegetative buffer adjacent to Site streams and wetlands.
3. Promoting floodwater attenuation and improving stream stability by revegetating Site floodplains to reduce floodwater velocities through increased frictional resistance on floodwaters crossing Site floodplains.
4. Providing increased habitat for aquatic wildlife by 1) increasing organic matter, carbon export, and woody debris in the stream corridor and 2) restoring shade to Site open waters.
5. Providing wildlife habitat including a forested riparian corridor within a region of the state increasingly dissected by residential/agricultural land use.
6. Protecting a Site identified in the 2008 Piedmont Triad Council of Government *Little Alamance, Travis, and Tickle Creek Watersheds Restoration Plan* (PTCG 2008) for preservation due to its location within a remote, rural area along the heavily used Boone Road resulting in increasing development pressure and appeal to developers.

1.3 Project Structure, Restoration Type, and Approach

Prior to construction, the Site was characterized by pasture land utilized for livestock grazing, a drained pond, and disturbed forest. Land use practices including the maintenance and removal of riparian vegetation and hoof shear from livestock had resulted in degraded water quality, unstable channel characteristics (stream entrenchment, erosion, and bank collapse), and reduced storage capacity and floodwater attenuation. In addition, hydric soils were disturbed due to regular plowing and vegetation maintenance and hoof shear from livestock.

As constructed, Site activities restored historic stream and wetland functions, which existed onsite prior to impacts from unrestricted livestock access, riparian and bank vegetation removal, and nutrient loading from surrounding pasture land. The removal of invasive species and subsequent planting with native riparian vegetation resulted in 2428 linear feet of stream enhancement, 2.0 acres of riparian riverine wetland enhancement, and 0.3 acres of riparian riverine wetland preservation (Table 1 and Figure 2, Appendix A). Planting occurred within 8.3 acres of the conservation easement including streambanks, floodplain, wetland enhancement/preservation areas, and upland slopes. The target natural communities consisted of Piedmont/Mountain Swamp Forest in the pond footprint with Piedmont/Mountain Bottomland Forest adjacent to Site streams grading towards a Mesic-Mixed Hardwood Forest (Piedmont subtype) on slopes (Schafale and Weakley 1990). Table 6 (Appendix C) outlines woody species planted within the Site. Species planted within the Site were selected from the list in the construction bid document based on availability from the plant nurseries. Completed project activities, reporting history, completion dates, project contacts, and background information are summarized in Tables 2-4 (Appendix A). Restoration activities at the Site included

- 1) herbicide treatment to control invasive species, primarily Chinese privet, multiflora rose, and Japanese honeysuckle;
- 2) soil amendments based on NCDA&CS Agronomy Division recommendations from preconstruction soil samples;
- 3) plant community restoration; and
- 4) exclusion of livestock by installation of a permanent, non-electric fence around the margins of the easement.

2.0 MONITORING PLAN

Monitoring of Site restoration efforts will be performed for stream and vegetation components of the Site until success criteria are fulfilled. Hydrology will not be monitored since existing Site wetlands are jurisdictional. Vegetation monitoring and success criteria are discussed in more detail below. The establishment, collection, and summarization of monitoring data shall be conducted in accordance with the most current version of the EEP document entitled *Content, Format, and Data Requirements for EEP Monitoring Reports (version 1.2)*.

2.1 Stream

Annual stream monitoring will include vegetation survival (Section 2.2 Vegetation) and a photographic record of preconstruction and postconstruction conditions. Preconstruction photographs are included in Appendix B. Photographs of the enhancement (level II) reach will be taken for each year of the monitoring period. In addition, visual assessments of the stream will be conducted by walking the length of stream and bankfull flow events will be documented.

2.2 Vegetation

After planting was completed, an initial evaluation was performed to verify planting methods were successful and to determine initial species composition and density. Five sample vegetation plots (10-meter by 10-meter) were installed within the Site as per guidelines established in *CVS-EEP Protocol for Recording Vegetation, Version 4.0* (Lee et al. 2006). In each sample plot, vegetation parameters to be

monitored include species composition and species density. Visual observations of the percent cover of shrub and herbaceous species will also be documented by photograph.

3.0 SUCCESS CRITERIA

3.1 Stream Success Criteria

Success criteria for stream enhancement will include 1) success of riparian vegetation and 2) documentation of two bankfull channel events. Based on interagency guidance (USACE et al. 2003), projects that do not alter the bankfull channel will not require evaluation of channel stability. Therefore, stream success criteria will be limited to photographic documentation of channel characteristics. In the event that less than two bankfull events occur during the first five years, monitoring will continue until the second event is documented. In addition, bankfull events must occur during separate monitoring years.

3.2 Vegetation Success Criteria

Characteristic Tree Species include woody tree and shrub species planted at the Site, observed within the reference forest, or outlined for the appropriate plant community in Schafale and Weakley (1990). An average density of 320 stems per acre of Characteristic Tree Species must be surviving in the first three monitoring years. Subsequently, 260 Characteristic Tree Species per acre must be surviving in year 5.

If vegetation success criteria are not achieved based on average density calculations from combined plots over the entire restoration area, supplemental planting may be performed with tree species approved by regulatory agencies. Supplemental planting will be performed as needed until achievement of vegetation success criteria.

4.0 MAINTENANCE AND CONTINGENCY

In the event that success criteria are not fulfilled, a mechanism for contingency will be implemented.

Stream

In the event that stream success criteria are not fulfilled, a mechanism for contingency will be implemented. The method of contingency is expected to be dependent upon stream variables that are not in compliance with success criteria. Primary concerns, which may jeopardize stream success include 1) riparian vegetation and/or 2) documentation of bankfull events.

Vegetation

If vegetation success criteria are not achieved based on average density calculations from combined plots over the entire restoration area, supplemental planting may be performed with tree species approved by regulatory agencies. Supplemental planting will be performed as needed until achievement of vegetation success criteria.

5.0 REFERENCES

- Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation. Version 4.0. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, North Carolina.
- Piedmont Triad Council of Government (PTCG). 2008. Little Alamance, Travis, & Tickle Creek Watersheds Restoration Plan. Available: <http://www.ptcog.org/eep/LATTPHaseIII.pdf> [November 2008]. Piedmont Triad Council of Government, Greensboro, North Carolina.
- Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, North Carolina Department of Environment, Health, and Natural Resources. Raleigh, North Carolina.
- United States Army Corps of Engineers, United States Environmental Protection Agency, North Carolina Wildlife Resources Commission, North Carolina Division of Water Quality (USACE et al.). 2003. Stream Mitigation Guidelines.
- United States Geological Survey (USGS). 1974. Hydrologic Unit Map - 1974. State of North Carolina.

Appendix A.
General Tables and Figures

Table 1. Site Restoration Structures and Objectives

Table 2. Project Activity and Reporting History

Table 3. Project Contacts Table

Table 4. Project Attributes Table

Figure 1. Site Location Map

Figure 2. Project Map & Restoration Activities

Figure 3. Monitoring Plan View

Table 1. Site Restoration Structures and Objectives

Restoration Segment/ Reach ID*	Station Range	Mitigation Type	Priority Approach	Linear Footage/ Acreage	Comment
Main Channel	--	Enhancement (Level II)	--	1987	Invasive species removal, planting with native forest vegetation, and exclusion of livestock.
UT1	--	Enhancement (Level II)	--	93	
UT2	--	Enhancement (Level II)	--	96	
UT3	--	Enhancement (Level II)	--	98	
UT4	--	Enhancement (Level II)	--	121	
UT5	--	Enhancement (Level II)	--	33	
Wetland 1	--	Enhancement	--	1.8	Invasive species removal, planting with native forest vegetation, and exclusion of livestock.
Wetland 2	--	Preservation	--	0.2	Exclusion of livestock.
Wetland 3	--	Preservation	--	0.1	
Wetland 4	--	Enhancement	--	0.2	Invasive species removal, planting with native forest vegetation, and exclusion of livestock.
Component Summation					
Restoration Level	Stream (linear footage)		Riverine Riparian Wetland (acreage)		Planted Riparian Buffer (acreage)
Enhancement (Level II)	2428		--		--
Enhancement	--		2.0		--
Preservation	--		0.3		--
Totals	2428		2.3		8.3
Mitigation Units	971 SMUs		1.1 WMUs		--

* Locations of each reach are depicted on the As-built Drawings in Appendix A

Table 2. Project Activity and Reporting History

Activity or Report	Data Collection Complete	Completion or Delivery
Restoration Plan	--	June 2009
Invasive Species Control	--	February 2010
Soil Amendments	--	February 2010
Site Planting	--	January 2010
Mitigation Plan	February 2010	February 2010

Table 3. Project Contacts Table

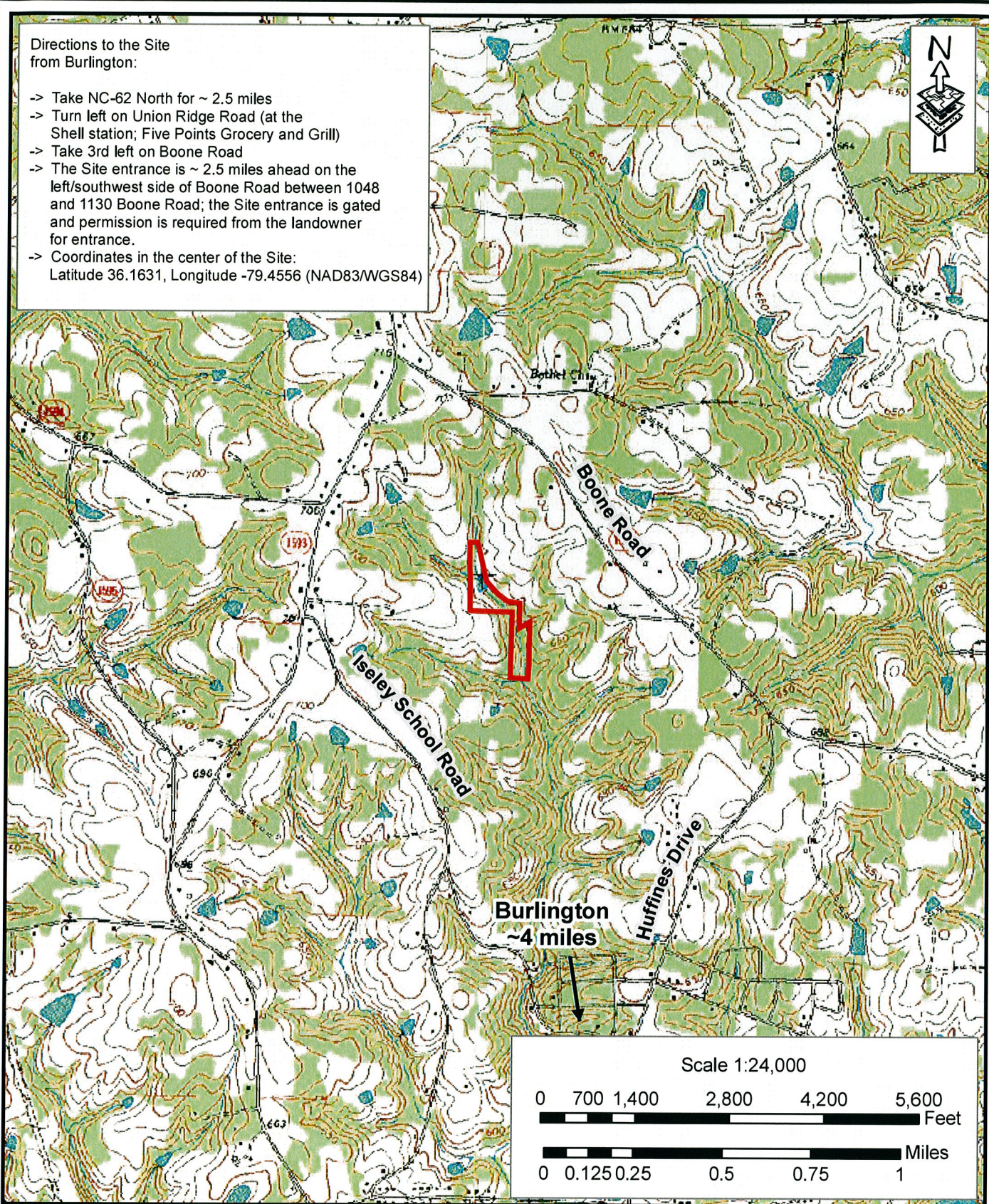
Designer	Axiom Environmental, Inc. 20 Enterprise Street, Suite 7 Raleigh, North Carolina 27607 Grant Lewis (919) 215-1693
Planting, Soil Amendment, and Invasive Species Removal Contractor	Carolina Silvics 908 Indian Trail Road Edenton, North Carolina 27932 Dwight McKinney (252) 482-8491

Table 4. Project Attribute Table

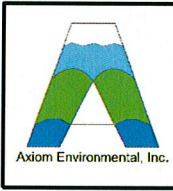
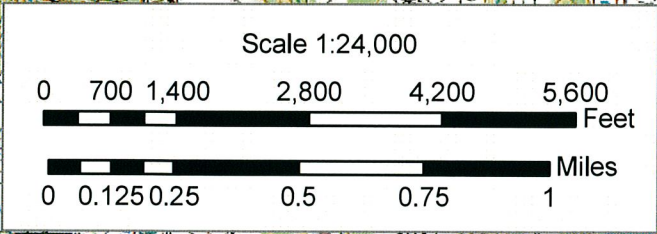
Project County	Alamance County, North Carolina
Physiographic Region	Piedmont
Ecoregion	Southern Outer Piedmont
Project River Basin	Cape Fear
USGS 14-digit HUC	03030002030010
NCDWQ Subbasin	03-06-02
Within EEP Watershed Plan Extent?	Yes-Targeted Local Watershed
WRC Class	Warm
% of project easement fenced	100 %
Beaver activity observed during design phase	No

Directions to the Site
from Burlington:

- > Take NC-62 North for ~ 2.5 miles
- > Turn left on Union Ridge Road (at the Shell station; Five Points Grocery and Grill)
- > Take 3rd left on Boone Road
- > The Site entrance is ~ 2.5 miles ahead on the left/southwest side of Boone Road between 1048 and 1130 Boone Road; the Site entrance is gated and permission is required from the landowner for entrance.
- > Coordinates in the center of the Site:
Latitude 36.1631, Longitude -79.4556 (NAD83/WGS84)



Burlington
~4 miles

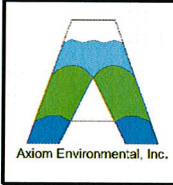
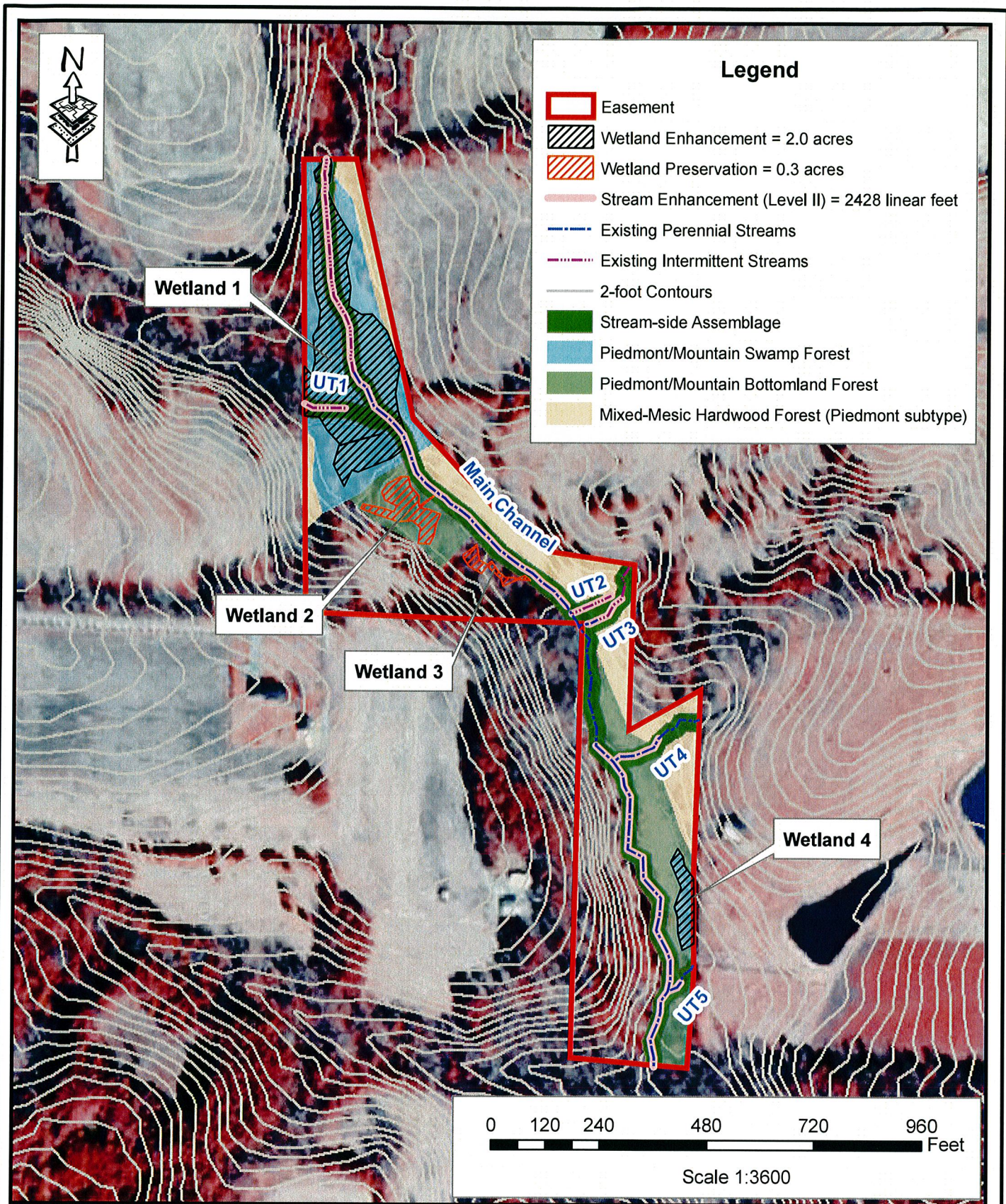


20 Enterprise Street
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Raleigh, NC 27607
(919) 215-1693

SITE LOCATION
UT TO HAW (GWYNN) SITE
Alamance County, North Carolina

Dwn. by: CLF
Date: Feb 2010
Project: 08-027

FIGURE
1



20 Enterprise Street
 Suite 7
 Raleigh, NC 27607
 (919) 215-1693

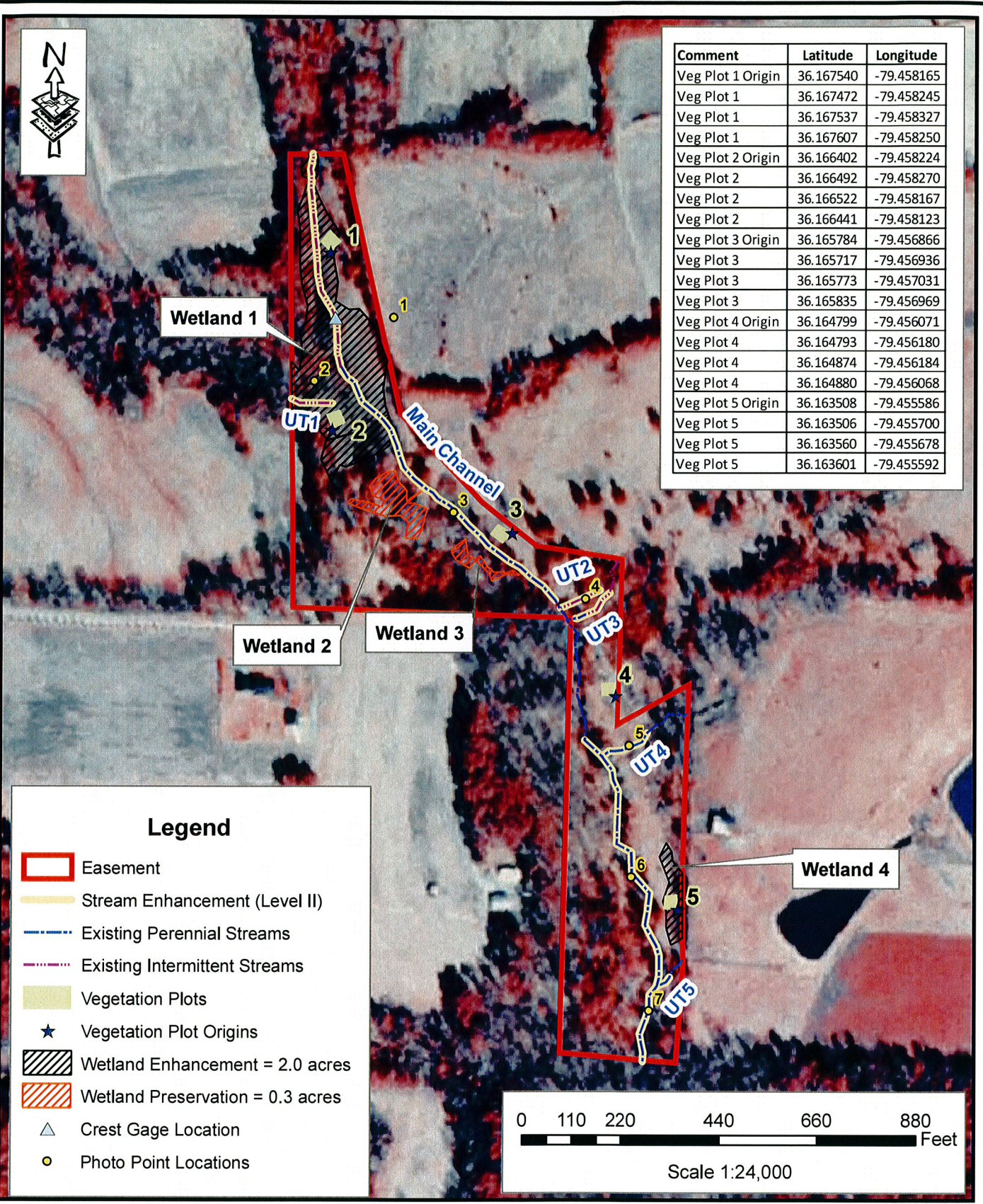
PROJECT MAP & RESTORATION ACTIVITIES
 UT TO HAW (GWYNN) SITE
 Alamance County, North Carolina

Own. by:	CLF
Date:	Feb 2010
Project:	08-027

FIGURE
2



Comment	Latitude	Longitude
Veg Plot 1 Origin	36.167540	-79.458165
Veg Plot 1	36.167472	-79.458245
Veg Plot 1	36.167537	-79.458327
Veg Plot 1	36.167607	-79.458250
Veg Plot 2 Origin	36.166402	-79.458224
Veg Plot 2	36.166492	-79.458270
Veg Plot 2	36.166522	-79.458167
Veg Plot 2	36.166441	-79.458123
Veg Plot 3 Origin	36.165784	-79.456866
Veg Plot 3	36.165717	-79.456936
Veg Plot 3	36.165773	-79.457031
Veg Plot 3	36.165835	-79.456969
Veg Plot 4 Origin	36.164799	-79.456071
Veg Plot 4	36.164793	-79.456180
Veg Plot 4	36.164874	-79.456184
Veg Plot 4	36.164880	-79.456068
Veg Plot 5 Origin	36.163508	-79.455586
Veg Plot 5	36.163506	-79.455700
Veg Plot 5	36.163560	-79.455678
Veg Plot 5	36.163601	-79.455592



Legend

- Easement
- Stream Enhancement (Level II)
- Existing Perennial Streams
- Existing Intermittent Streams
- Vegetation Plots
- ★ Vegetation Plot Origins
- Wetland Enhancement = 2.0 acres
- Wetland Preservation = 0.3 acres
- △ Crest Gage Location
- Photo Point Locations

20 Enterprise Street
Suite 7
Raleigh, NC 27607
(919) 215-1693

Axiom Environmental, Inc.

MONITORING PLAN VIEW
UT TO HAW (GWYNN) SITE
Alamance County, North Carolina

Dwn. by: CLF
Date: May 2010
Project: 08-027

FIGURE
3

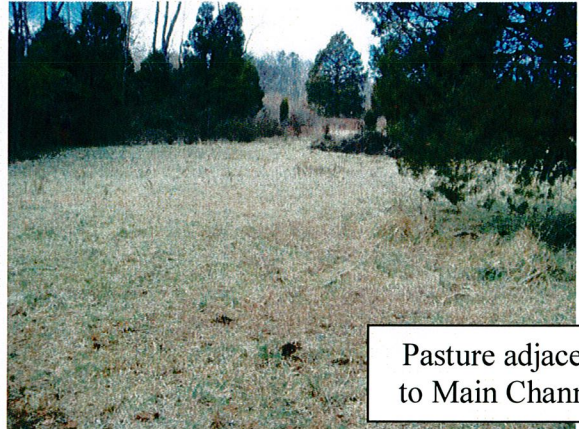
**Appendix B.
Stream Data**

**Pre and Post
Construction Photographs**

**UT to Haw (Gwynn) Site
Preconstruction Pictures
Taken February 2009**



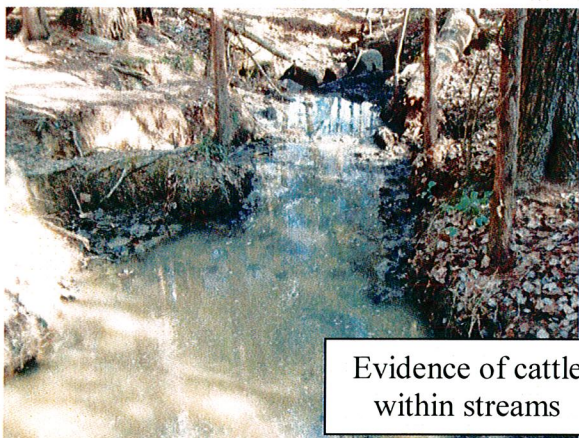
Pond footprint



Pasture adjacent to Main Channel



Cleared riparian buffer adjacent to tributary

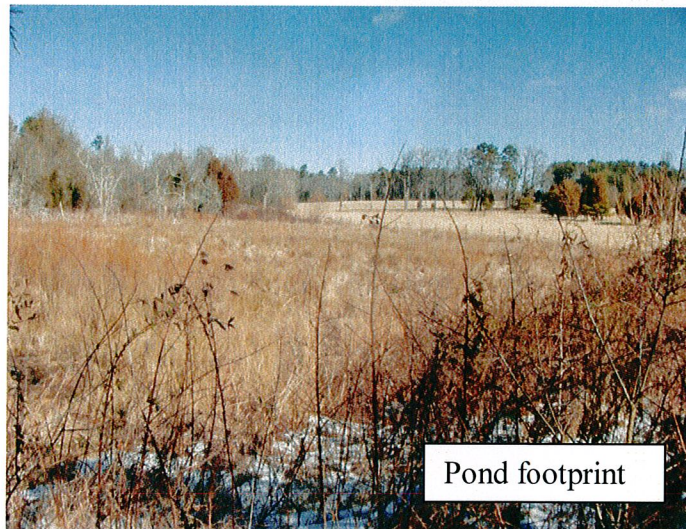
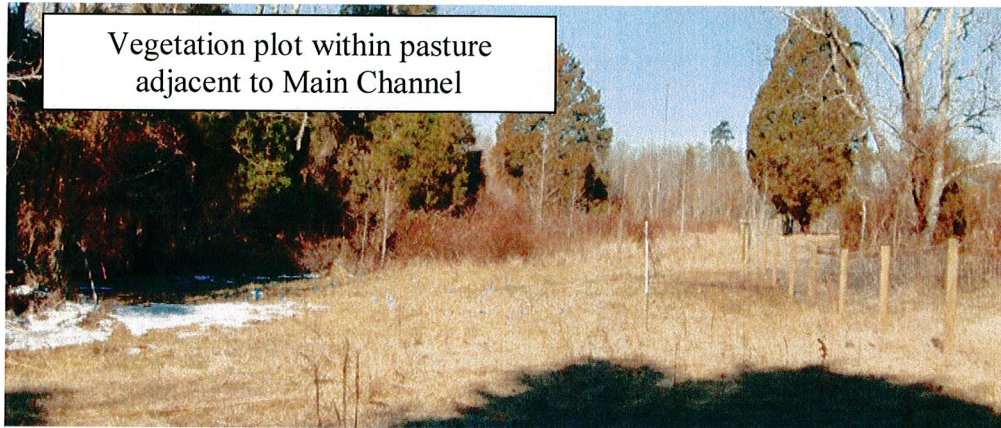


Evidence of cattle within streams



Main Channel

**UT to Haw (Gwynn) Site
Post Construction Pictures
Taken March 2010**



**Appendix C.
Vegetation Data**

Table 5. Vegetation Plot Attribute Table

Table 6. Planted Woody Species

Table 5. Vegetation Plot Attributes Data

Plot ID	Community Type	Planting Zone ID	Reach ID	Associated Gauge	Method	CVS Level
1	Swamp Forest	streamside/floodplain	Main Channel	NA	Vegetation plots will be monitored using the CYS-EEP Protocol for Recording Vegetation Level 1-2 Plot Sampling Only (Version 4.0) (Lee et al. 2006).	
2	Swamp Forest	streamside/floodplain	UT1			
3	Mixed-Mesic Hardwoods	slope	Main Channel			
4	Bottomland Hardwoods/Mixed-Mesic Hardwoods	floodplain/slope	Main Channel			
5	Bottomland Hardwoods/Swamp Forest	floodplain	Main Channel			

Table 6. Planted Woody Vegetation

Species	Quantity
Swamp chestnut oak (<i>Quercus michauxii</i>)	600
Cherrybark oak (<i>Quercus pagoda</i>)	500
Sycamore (<i>Platanus occidentalis</i>)	400
Green ash (<i>Fraxinus pennsylvanica</i>)	400
Willow oak (<i>Quercus phellos</i>)	300
Overcup oak (<i>Quercus lyrata</i>)	300
Northern red oak (<i>Quercus rubra</i>)	400
White oak (<i>Quercus alba</i>)	800
Black cherry (<i>Prunus serotina</i>)	300
Persimmon (<i>Diospyros virginiana</i>)	200
Silky dogwood (<i>Cornus amomum</i>)	4500
Buttonbush (<i>Cephalanthus occidentalis</i>)	1000
Elderberry (<i>Sambucus canadensis</i>)	1200
American beautyberry (<i>Callicarpa americana</i>)	1000
TOTAL	11,700