Unnamed Tributary to Tar River
Stream Restoration
Louisburg, Franklin County, North Carolina
Year 1 Monitoring Report

Monitoring Year: 2006
Measurement Year 1
As-Built Date 2005
NCEEP Project Number 234

January 2007

UNNAMED TRIBUTARY TO TAR RIVER STREAM RESTORATION
YEAR 1 MONITORING REPORT

CONDUCTED FOR THE NORTH CAROLINA DEPARTMENT
OF
ENVIRONMENT AND NATURAL RESOURCES

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I. EXECUTIVE SUMMARY/PROJECT ABSTRACT

The Unnamed Tributary to Tar River Restoration Site encompasses 1,937 linear feet of stream restoration located within the Town of Louisburg, Franklin County, North Carolina. The site was constructed between January 2005 and June 2005. The following report provides the stream restoration monitoring information for Year 1 after construction.

The Priority 2 restoration involved converting the 1,792 linear foot impaired channel into a sinuous channel that meanders for a total of 1,937 linear feet. Rock grade control vanes and rootwads were incorporated for aquatic habitat enhancement and bed and bank stability. A variable width riparian buffer (16'min/150'max) was planted on either side of the stream with native vegetation in December 2005.

Monitoring for the site consisted of evaluating both morphology and vegetation. A few vegetation problem areas were noted on the project. Survival was low during the first year after planting. Only 50 of the original 82 trees and 7 of the original 19 shrubs planted survived providing a density to 225 stems per acre for trees and 256 stems per acre for all woody planted stems (trees and shrubs). This density is below the success criteria threshold for trees at both the 3 and 5 year monitoring period. Replanting will need to occur to increase the stem density so that it may meet the criteria for success at the end of the monitoring period.

Most of the cross sections appeared stable with little or no active bank erosion. Chute formation and a large degree of scour was present at Cross Section 2 and will need to be monitored in the future.

II. PROJECT BACKGROUND

A. Location and Setting

The UT Tar River project site is located in the town of Louisburg in Franklin County, North Carolina (**Figure 1**). Louisburg is located approximately 25 miles north of Raleigh along NC Highway 401. The project site begins at NC Highway 39 and continues towards the northeast between Burnette Road and the Green Hill Country Club. The watershed area for this project is 0.61 square miles. The project is fully contained on publicly owned lands. UT Tar River flows from the southwest to the northeast. The project reach is bound on the west by NC Highway 39, and a small drainage flows off of the country club property and into the conservation easement before entering the UT Tar River from the right bank.

Directions to the site: From Raleigh take US 401 north to Louisburg. Turn right (south) at NC 39 and take the first left onto Burnette Road. The site is on the right running parallel with the road.

Figure 1 Vicinity Map

B. Mitigation Structures and Objectives

The project is a Priority 2 restoration involving converting the 1,792 linear foot impaired channel into a sinuous channel that meanders for a total of 1,937 linear feet. Rock grade control vanes and rootwads were incorporated for aquatic habitat enhancement and bed and bank stability. A variable width riparian buffer (16'min/150'max) was planted on either side of the stream with native vegetation (**Figure 2**).

This project has the following goals and objectives:

- Provide a stable stream channel that neither aggrades nor degrades while maintaining its dimension, pattern, and profile with the capacity to transport its watershed's water and sediment load.
- Improve water quality and reduce further property loss by stabilizing eroding streambanks.
- Reconnect the stream to its floodplain and/or establish a new floodplain at a lower elevation.
- Improve aquatic habitat with the use of natural material stabilization structures such as root wads, cross-vanes, woody debris, and a riparian buffer.
- Provide aesthetic value, wildlife habitat, and bank stability through the creation of a riparian zone.
- Stabilize and enhance the tributary and small drainage that enters the site.

Table I. Project Mitigation Structure and Objectives Table
UT Tar River Stream Mitigation Site/Project No. 234

Project Segment/Reach ID	Mitigation Type	Approach	Linear Footage	Stationing	Comment
Ut Tar River, 1,792 ft	Restoration	Priority 2	1,937 (CL)	10+00 to 29+37.13	1:1 Ratio

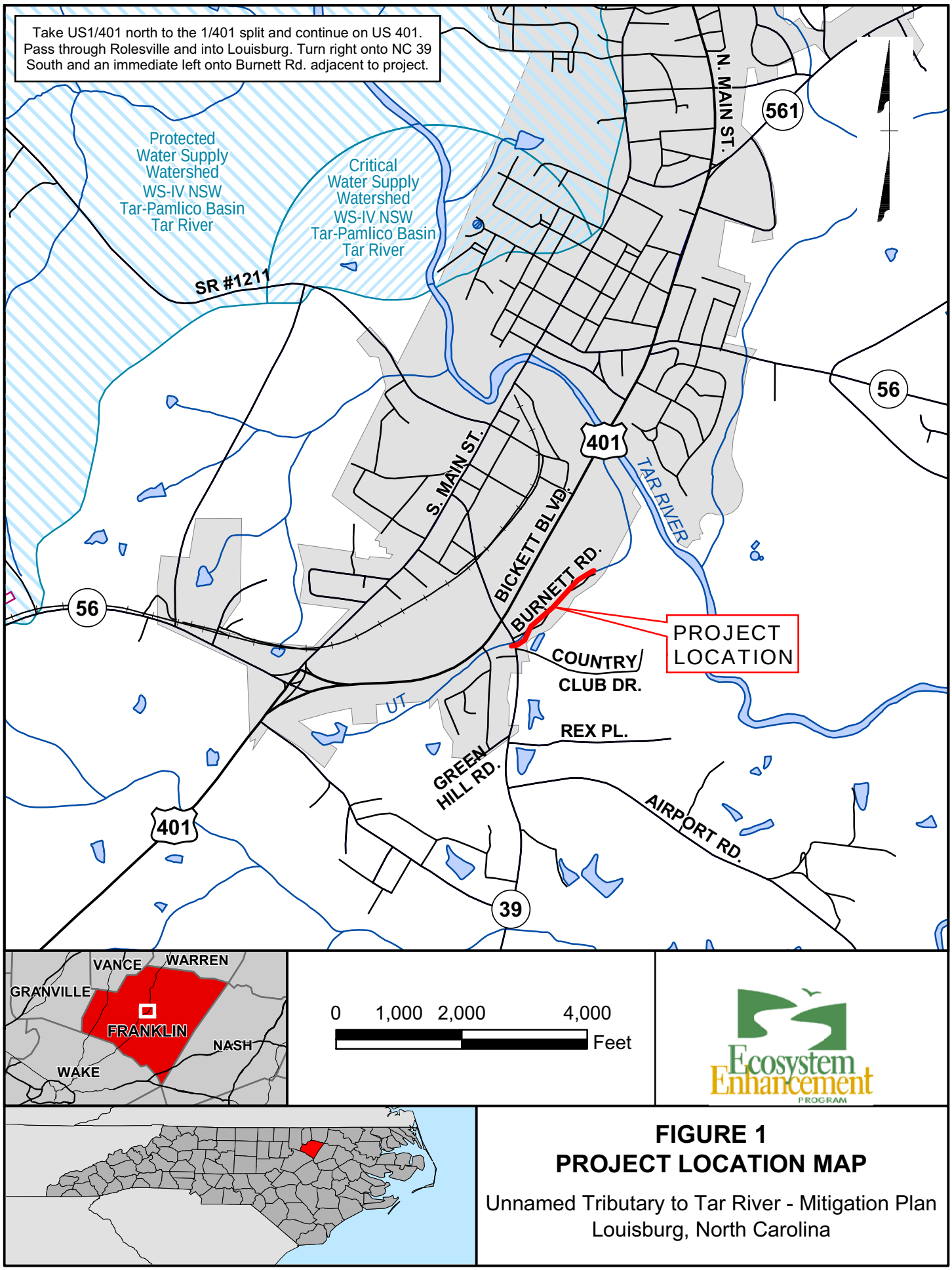


FIGURE 1
PROJECT LOCATION MAP

Unnamed Tributary to Tar River - Mitigation Plan
Louisburg, North Carolina

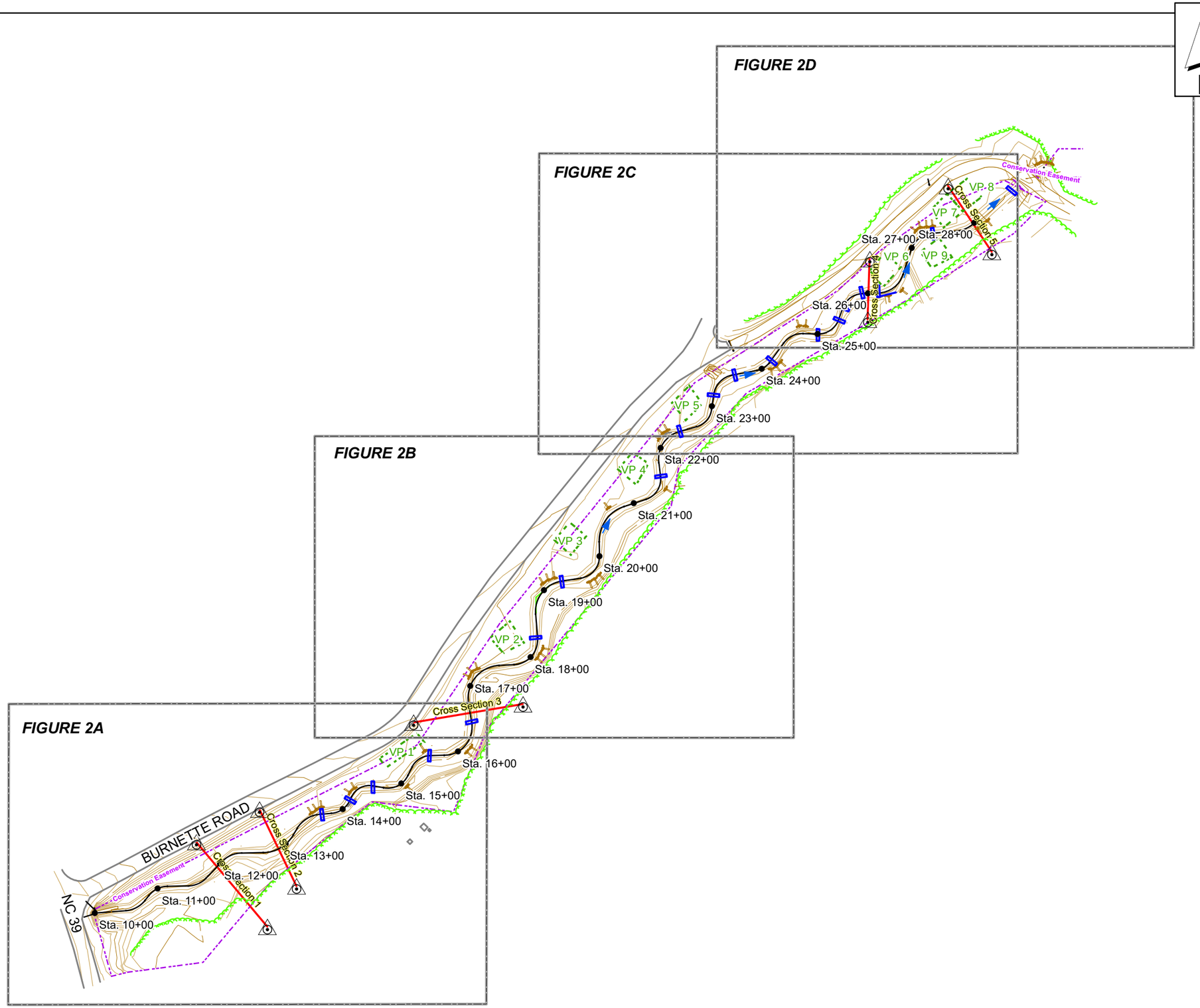
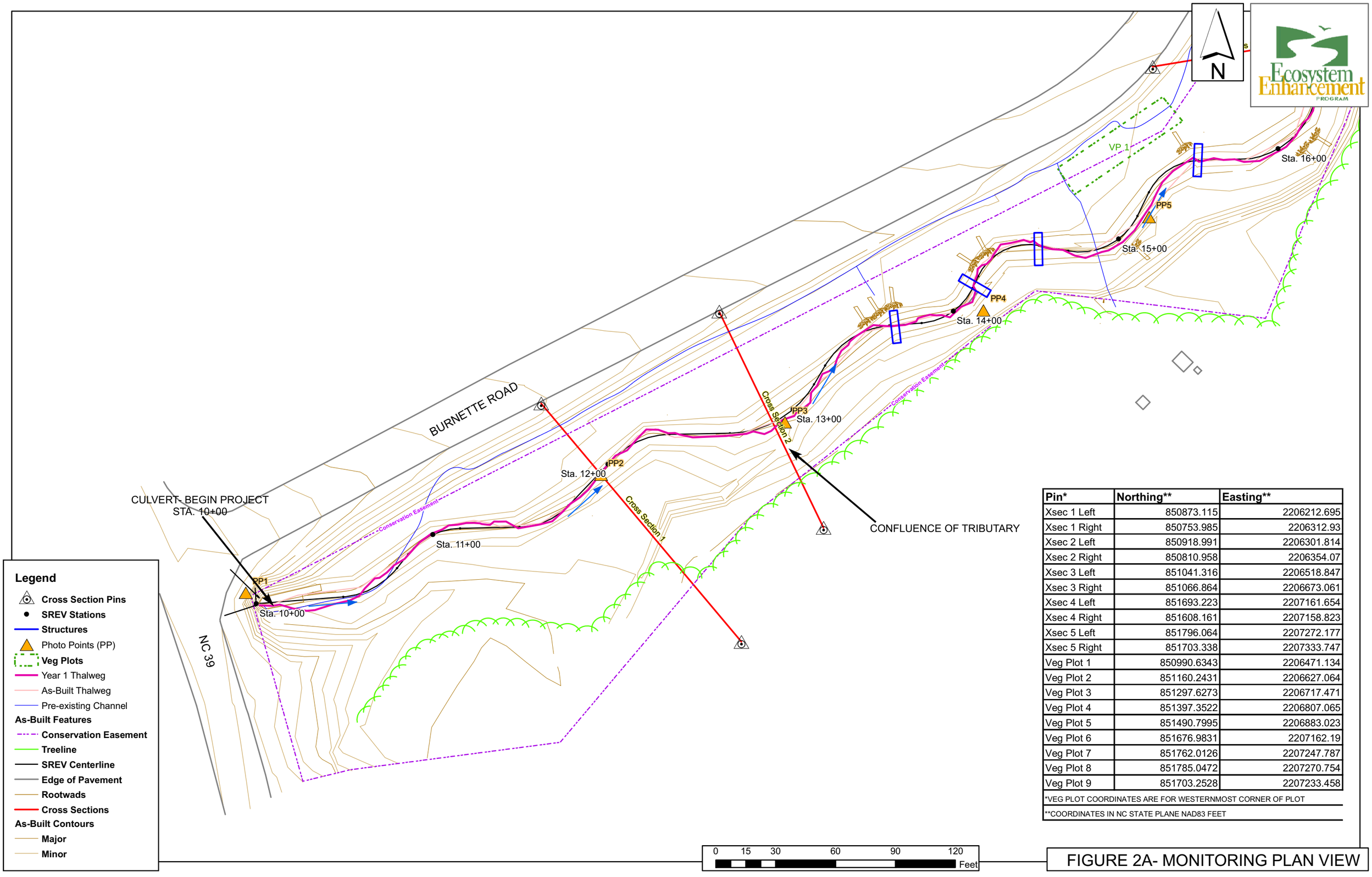


FIGURE 2- MONITORING PLAN VIEW-INDEX

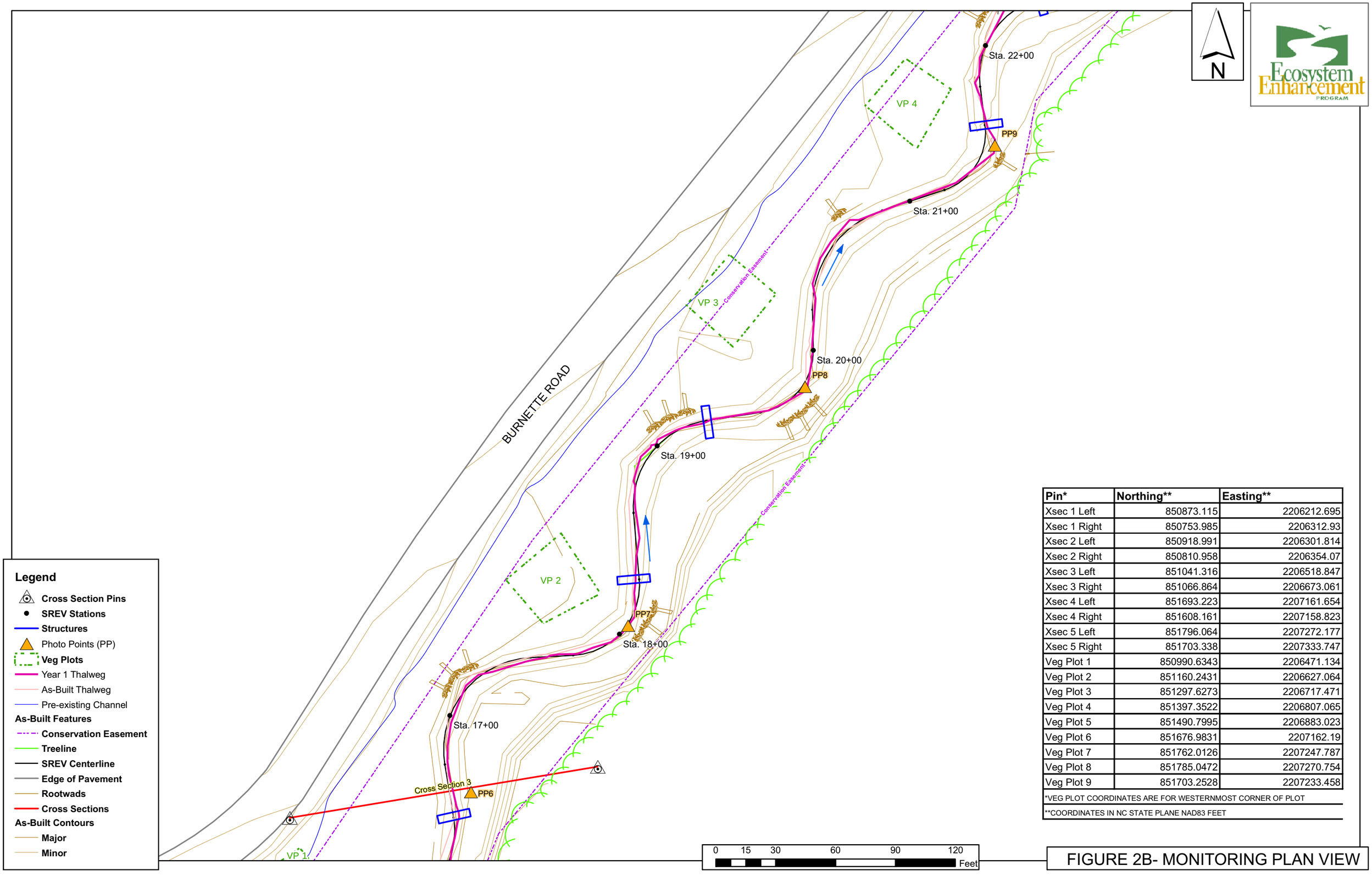


Pin*	Northing**	Easting**
Xsec 1 Left	850873.115	2206212.695
Xsec 1 Right	850753.985	2206312.93
Xsec 2 Left	850918.991	2206301.814
Xsec 2 Right	850810.958	2206354.07
Xsec 3 Left	851041.316	2206518.847
Xsec 3 Right	851066.864	2206673.061
Xsec 4 Left	851693.223	2207161.654
Xsec 4 Right	851608.161	2207158.823
Xsec 5 Left	851796.064	2207272.177
Xsec 5 Right	851703.338	2207333.747
Veg Plot 1	850990.6343	2206471.134
Veg Plot 2	851160.2431	2206627.064
Veg Plot 3	851297.6273	2206717.471
Veg Plot 4	851397.3522	2206807.065
Veg Plot 5	851490.7995	2206883.023
Veg Plot 6	851676.9831	2207162.19
Veg Plot 7	851762.0126	2207247.787
Veg Plot 8	851785.0472	2207270.754
Veg Plot 9	851703.2528	2207233.458

*VEG PLOT COORDINATES ARE FOR WESTERNMOST CORNER OF PLOT

**COORDINATES IN NC STATE PLANE NAD83 FEET

FIGURE 2A- MONITORING PLAN VIEW



Pin*	Northing**	Easting**
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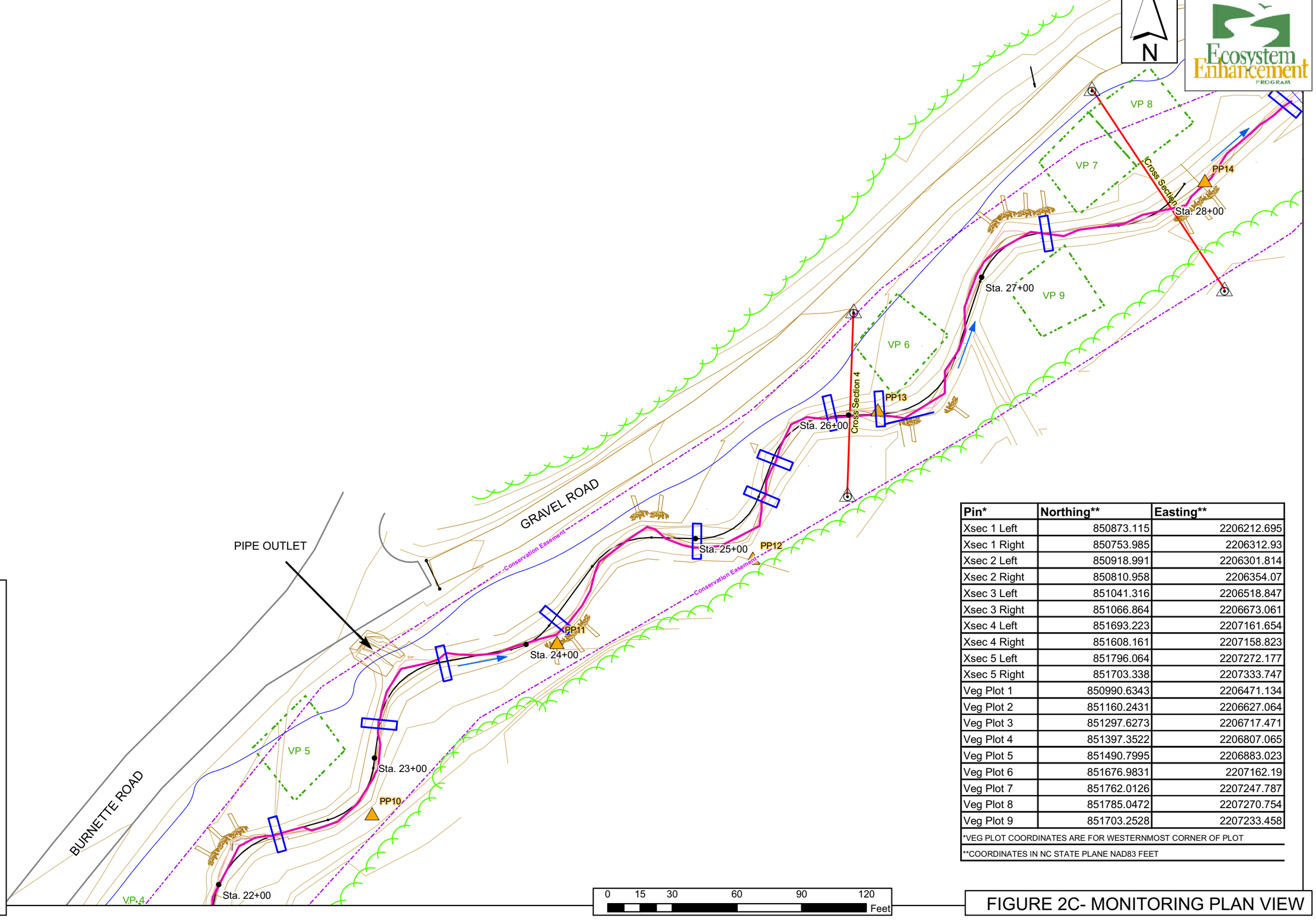
**COORDINATES IN NC STATE PLANE NAD83 FEET

FIGURE 2B- MONITORING PLAN VIEW



Pin*	Northing**	Easting**
Xsec 1 Left	850873.115	2206212.695
Xsec 1 Right	850753.985	2206312.93
Xsec 2 Left	850918.991	2206301.814
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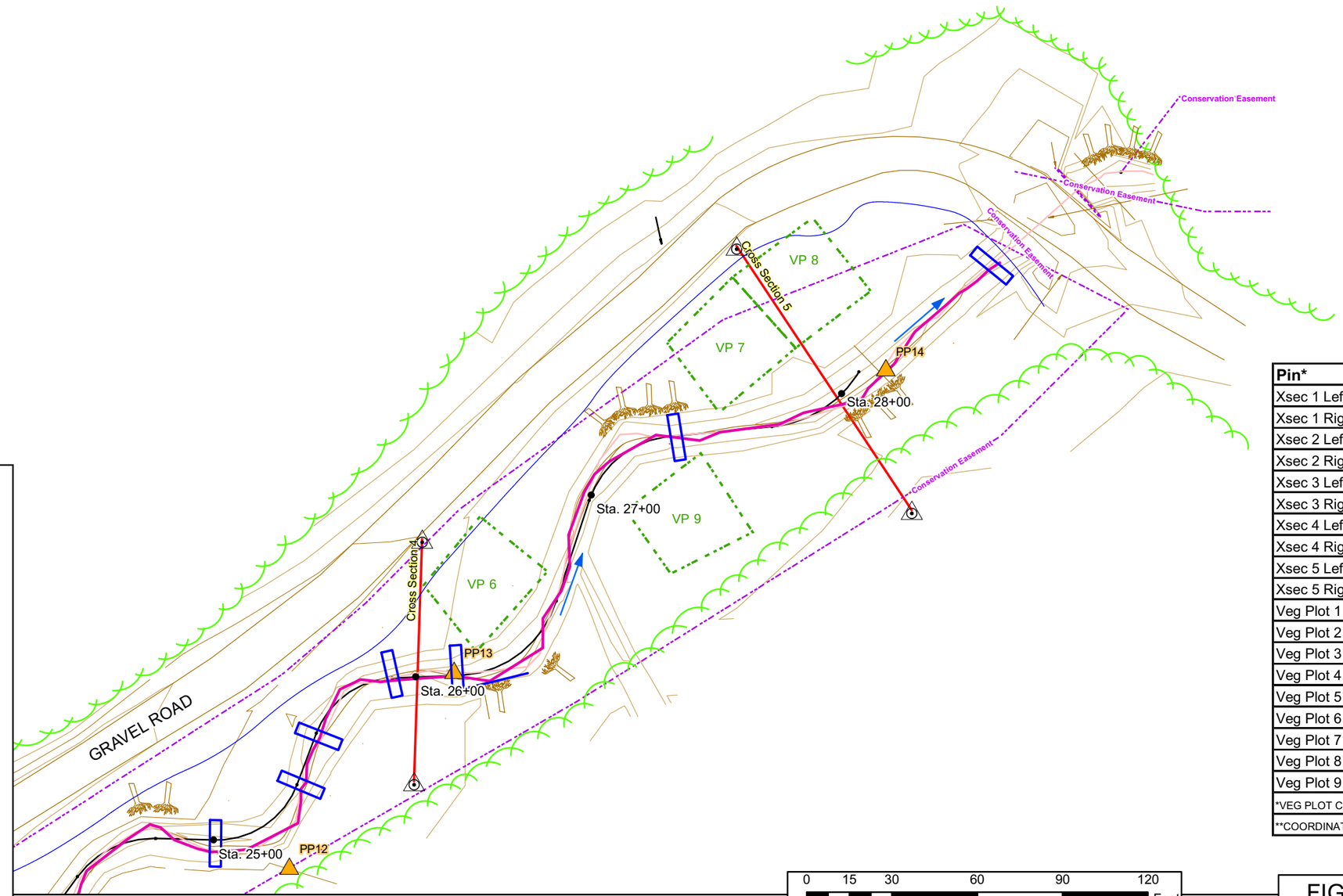
**COORDINATES IN NC STATE PLANE NAD83 FEET

FIGURE 2C- MONITORING PLAN VIEW



Legend

- Cross Section Pins
- SREV Stations
- Structures
- Photo Points (PP)
- Veg Plots
- Year 1 Thalweg
- As-Built Thalweg
- Pre-existing Channel

As-Built Features

- Conservation Easement
- Treeline
- SREV Centerline
- Edge of Pavement
- Rootwads
- Cross Sections

As-Built Contours

- Major
- Minor

Pin*	Northing**	Easting**
Xsec 1 Left	850873.115	2206212.695
Xsec 1 Right	850753.985	2206312.93
Xsec 2 Left	850918.991	2206301.814
Xsec 2 Right	850810.958	2206354.07
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**COORDINATES IN NC STATE PLANE NAD83 FEET

FIGURE 2D- MONITORING PLAN VIEW

C. Project History and Background

The town manager of Louisburg, C. L. Gobble, first identified the UT Tar River as a potential restoration site. His main concern was that streambank erosion would undercut Burnette Road. The lack of vegetation on the banks was one of the main causes of degradation along with past alterations to the stream course. Recent utility work by the town also caused additional channel instability. Typical of many urban streams, the UT Tar River channel was an oversized gully. The town had placed riprap in the channel in some areas to prevent undercutting. Vegetation across the site was minimal due to channel degradation and other disturbances. The combination of extreme streambank erosion, lack of vegetation, and a signed conservation easement made this an excellent potential restoration site.

Table II. Project Activity and Reporting History
Unnamed Tributary to Tar River Stream Mitigation Site/Project No. 234

Activity or Report	Scheduled Completion	Data Collection Complete	Actual Completion Date
Restoration Plan			June 2003
Final Design - 90%			Unknown
Construction			July 26, 2005
Temporary S&E mix applied to entire project area			Throughout Construction
Permanent seed mix applied to entire project area			Throughout Construction
Containerized, B&B, and livestake plantings			December 22, 2005
Mitigation Plan / As-built (Year 0 Monitoring - baseline)	April 2006	April 2006	May 2006
Year 1 Monitoring	Fall 2006	January 2007	January 2007
Year 2 Monitoring	Fall 2007		
Year 3 Monitoring	Fall 2008		
Year 4 Monitoring	Fall 2009		
Year 5 Monitoring	Fall 2010		

Table III. Project Contact Table UT Tar River Stream Restoration Site/Project No. 234	
Designer POC	Earth Tech 701 Corporate Center Drive Suite 475 Raleigh, NC 27607 Bill Jenkins PE (919) 854-6200
Construction Contractor POC	McQueen Construction 619 Patrick Road Bahama, NC 27503 Harvey McQueen (919) 479-4766
Planting Contractor POC	Carolina Environmental Contracting, Inc. P.O. Box 1905 Mount Airy, NC 27030 Joanne Cheatham (336) 320-3849
Seeding Contractor POC	Erosion Solutions 5508 Peakton Dr. Raleigh, NC 27614 Ross Rebne (919) 845-5550
Seed Mix Sources	Not provided by contractor
Nursery Stock Suppliers	Coastal Plain Conservation Nursery (container plants) Ellen Colodney 3067 Conners Drive Edenton, NC 27932 252-482-5707 Cure Nursery (container plants) Jennifer Cure 880 Buteo Road Pittsboro NC 27312 919-542-6186 Gilmore Plant and Bulb Co. Inc. (ball and burlap) Tom Gilmore PO Box 8 Julian, NC 27283 336-685-4451 Foggy Mountain Nursery (live stakes) Glen Sullivan 13213A Hwy 88 W Creston, North Carolina 28615 336-385-2222
Monitoring Performers	Earth Tech 701 Corporation Center Drive, Suite 475 Raleigh, NC 27607 Mr. Ron Johnson (919) 854-6210
Stream Monitoring	Ron Johnson
Vegetation Monitoring	Ron Johnson
Wetland Monitoring	No wetlands monitoring required.

Table IV. Project Background Table Unnamed Tributary to Tar River Stream Mitigation Site/Project No. 234	
Project County	Franklin
Drainage Area	
UT Tar River	0.61 sq mi
Drainage impervious cover estimate (%)	> 30 %
Stream Order	
UT Tar River	1st order
Physiographic Region	Piedmont
Ecoregion	Northern Outer Piedmont
Rosgen Classification of As-Built	C
Cowardin Classification	NA
Dominant Soil Types	Chewacla and Wehadkee loam
	Wedowee-Urbanland_Udorthents complex
Reference site ID	C5 UT Lake Lynn (Wake), C4 UT Hare Snipe Creek (Wake)
USGS HUC for Project	03020101
USGS HUC for Reference	Ut Lake Lynn 03020201, UT Hare Snipe Creek 03020201
NCDWQ Sub-basin for Project	030301
NCDWQ Sub-basin for Reference	Ut Lake Lynn 030402, UT Hare Snipe Creek 030402
NCDWQ Classification for Project	Not Assigned
NCDWQ Classification for Reference	UT Lake Lynn B-NSW, UT Hare Snipe Creek C-NSW
Any portion of any project segment 303D listed?	No
Any portion of any project segment upstream of a 303D listed segment?	No
Reasons for 303D listing or stressor	NA
% of project easement fenced	<5%

III. PROJECT CONDITION AND MONITORING RESULTS

A. Vegetation Assessment

The final vegetative success measure will be the survival of 260 5-year old planted trees per acre at the end of year 5 of the monitoring period. An interim measure of vegetation planting success will be the survival of at least 320 3-year old planted trees per acre at the end of year three of the monitoring period.

1. *Soil Data*

Table V. Preliminary Soil Data
UT Tar Stream Mitigation Site/ Project No. 234

Series	Max Depth (in.)	% Clay on Surface	K	T	OM%
Chewacla and Wehadkee Loam	62	6-35	0.28-0.32	5	1-5
Wedowee Sandy Loam	62	5-45	0.24-0.28	4	0.5-3
Wedowee-Urbanland-Udorthents Complex	62	5-20	0.24-0.28	4	0.5-3

2. *Vegetative Problem Areas*

Table VI. Vegetative Problem Areas
UT Tar Stream Mitigation Site/ Project No. 234

Feature/Issue	Station#/Range	Probable Cause	Photo #
Disturbance	27+08.2	Golf course maintenance intrusion	VPA1
Bank Erosion/Piping Failure	18+83.669	Banks too steep	VPA3
	13+85.856	Banks too steep	VPA4
	12+88.907	Banks too steep	VPA5
Bare Bench	18+83.669	Chute formation	VPA2
	11+46.112	Vegetation scoured away by storm	VPA6

A few vegetation problem areas were noted on the project. One of the problems areas was caused by golf course personnel coming onto the easement to construct/maintain ditches that drain a wetland that occurs between the golf course and the stream. Movement associated with this work caused mortality and ground disturbance in and around vegetation plot 9. The most common vegetation problem area that was encountered on the project was erosion/piping failure that was occurring on the steep banks adjacent to the golf course that remained following the lowering of the grade to create the floodplain. The combination of sandy soils and heavy recent precipitation are causing some of the bank edges to slough off. Flooding and chute formation associated with bankfull events is causing vegetation removal to occur in two areas. Stream repairs to these locations will be necessary before any replanting occurs to ensure future success.

A vegetative problem area plan view is located in Appendix A.

3. *Stem Counts*

Baseline vegetation plots were established on January 31, 2006 after vegetative planting was completed in December 2005. Nine (9) vegetation survival plots were staked out in the floodplain of

UT Tar River. Eight (8) of these plots measured 10m X 10m and the remaining plot measured 5m X 20m to enable placement within the easement area. Survival of rooted vegetation will be evaluated using the nine plots and will continue for at least 5 years to determine survival. Stems were flagged and counted to establish baseline stem counts in 2006 and a Year 1 monitoring stem count was performed on October 4, 2006.

Tree species planted include hackberry (*Celtis laevigata*), green ash (*Fraxinus pennsylvanica*), cherrybark oak (*Quercus pagodafolia*), water oak (*Quercus nigra*), willow oak (*Quercus phellos*), river birch (*Betula nigra*), sycamore (*Platanus occidentalis*), and black gum (*Nyssa sylvatica*). Live stakes and shrubs were also planted in this project. Live stake species including silky dogwood (*Cornus amomum*), buttonbush (*Cephalanthus occidentalis*), silky willow (*Salix sericea*), black willow (*Salix nigra*), and elderberry (*Sambucus canadensis*) were planted along the channel and tops of the bank. Shrub species were planted in the floodplain and concentrated along the tops of the bank and include elderberry, spicebush (*Lindera benzoin*), tag alder (*Alnus serrulata*), wax myrtle (*Myrica cerifera*), clematis (*Clematis virginiana*), and possumhaw (*Viburnum nudum*).

Table VII. Stem Counts for Each Species Arranged by Plot
UT Tar River/ Project No. 234

Species	Plots									MY1 Totals
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	
Trees										
Nyssa sylvatica	2	0	1	2	0	0	0	0	0	5
Quercus pagodafolia	0	1	1	1	0	2	1	0	0	6
Fraxinus pennsylvanica	4	0	0	0	1	2	1	0	0	8
Betula nigra	1	6	1	0	0	1	0	1	1	11
Celtis laevigata	0	0	1	0	0	0	0	0	0	1
Platanus occidentalis	1	3	0	0	0	1	1	1	2	9
Quercus nigra	2	1	2	1	0	0	0	0	0	6
Quercus phellos	1	2	0	0	0	1	0	0	0	4
Totals	**11**	**13**	**6**	**4**	**1**	**7**	**3**	**2**	**3**	**50**
Shrubs										
Sambucus canadensis	0	0	0	0	0	0	1	0	0	1
Viburnum nudum	0	0	0	0	0	1	0	0	0	1
Lindera benzoin	0	0	0	0	0	0	0	0	0	0
Alnus serrulata	0	0	0	0	0	1	0	0	2	3
Myrica cerifera	1	0	0	0	0	0	0	0	1	2
Clematis virginiana	0	0	0	0	0	0	0	0	0	0
Totals	**1**	**0**	**0**	**0**	**0**	**2**	**1**	**0**	**3**	**7**

The baseline vegetation assessment revealed an average of 369 trees per acre across the restoration easement area. Survival was low during the first year after planting. Only 50 of the original 82 trees and 7 of the original 19 shrubs planted survived. This ratio represents a ratio of 61% survival of the trees and 37% survival of the shrubs. This brings the density to 225 stems per acre for trees only and 256 stems per acre for all woody planted stems. This density is below the success criteria threshold for trees at both the 3 and 5 year monitoring period. Replanting will need to occur to increase the stem density so that it may meet the criteria for success at the three-year monitoring period. Mortality likely occurred due to stress-related factors. Soil compaction and droughty conditions were likely contributors to mortality.

A small portion of the reduced survival may be attributed to the disturbance that occurred in VP-09 when the golf course maintenance crew dug out the drainage ditches that are currently connecting the golf course and the stream. One new ditch crosses VP-09 and disturbance occurred to the vegetation plot as a result of vehicle movement associated with constructing/maintaining these ditches.

Many of the flags placed on planted stems were no longer in place during the MY1 stem counts causing differences in stems counts not attributed to low survivability.

A table showing the changes in stems counts from the baseline count to MY1 is shown in Appendix A.

4. *Vegetation Plot Photos*

Photos of the vegetation plots are located in Appendix A.

B. Stream Assessment

The restored reach should remain stable or if changes occur the movement should be in the direction of increased stability. There should be insignificant changes in channel cross-section and longitudinal profile from the as-built condition. The pool/riffle spacing should remain constant. Pools should not be filling in or riffles starting to change to pools. Pebble counts should show a coarsening of the bed material.

1. *Morphometric Criteria*

Cross section and longitudinal surveys were performed on January 17 - 18, 2007. Five cross sections and approximately 1,937 linear feet of stream were surveyed. Photographs were taken at all permanent photo points and a bed material analysis was performed on January 19, 2007.

Cross sections are located at the following locations.

Cross Section #1, Station 11+93.802, midpoint of pool
Cross Section #2, Station 12+93.065, midpoint of riffle
Cross Section #3, Station 16+59.371, midpoint of riffle
Cross Section #4, Station 26+13.491, midpoint of riffle
Cross Section #5, Station 28+15.918, midpoint of run

Most of the cross sections appeared stable with little or no active bank erosion. Only one cross section had a problem area at its location. Chute formation and a large degree of scour was present at Cross Section 2 and will need to be monitored in the future. Survey data collected during future monitoring periods may vary depending on actual rod placement and alignment; however, from this point forward this information should remain similar in overall appearance.

2. *Hydrologic Criteria*

Monitoring requirements state that at least two bankfull events must be documented through the five-year monitoring period. No surface water gauges exist on UT Tar River or its tributaries. A review of known U.S. Geological Survey (USGS) surface water gauges identified three surface water gauges within 20 miles of the mitigation site: one on the Tar River at Louisburg (427.0 square miles), one on Swift Creek at Hilliardston (166.0 square miles), and one on Little Fishing Creek west of White Oak (177.0 square miles). None of the three sites have a comparable drainage area to the UT Tar River

(0.61 square miles) and do not appear to be suitable for use in determining occurrence of bankfull events. Evidence of bankfull deposits from previous events were observed on January 3, 2007. In order to determine future bankfull events for the site it may be necessary to install a stream gauge onsite since comparison to nearby gauges will not be possible given the large difference in watershed area between existing stream gauges and the project stream.

Table VIII. Verification of Bankfull Events UT Tar River Stream Mitigation Site/Project No. 234			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo # (if available)**
2007	Unknown 2006	Photographic - **Near Bankfull**	Shown below

Evidence of bankfull event deposition
on January 3, 2007.

Table IX is not applicable to the MY1 Monitoring Report.

Table X. Stream Problem Areas UT Tar Stream Mitigation Site/ Project No. 234			
Feature/Issue	**Station#/Range**	**Probable Cause**	**Photo #**
Aggradation/Bar Formation	28+23.087	*Aggradation in stream* - Incorrect grade or dimension	SPA 1
	27+29.703	*Point bar formation above sill*-sill in wrong location	SPA 4
	26+20.516	*Buried structure*-Incorrect dimension and structure in wrong location	SPA 7
	20+62.578	*Aggradation on point bar*-Incorrect grade or dimension	SPA 12
	18+83.669	*Chute cutoff and point bar formation*-channel possibly over-sinuous, or bankfull dimensions incorrect.	SPA 14
	14+57.725	*Transverse bar formation*-Incorrect grade or dimension	SPA 17
	11+46.112	*Bar formation/undercut matting*-Incorrect grade or dimension	SPA 20
Bank Scour	28+10.430	*Undercut matting*-bank revetment insufficiently resistant to flow.	SPA 2
	26+90.480	*Matting exposed/bar formation/ ditch dug into stream* - incorrect dimensions and bank revetment insufficiently resistant	SPA 5
	26+43.917	*Undercut matting and point bar formation* - Incorrect dimensions and bank revetment insufficiently resistant	SPA 6
	24+53.274	*Bank erosion on right bank* - bank revetment insufficiently resistant	SPA 10
	19+61.645	*Undercutting on left bank*-bank revetment insufficiently resistant	SPA 13
	17+26.805	*Undercut matting*-bank revetment insufficiently resistant	SPA 15
	16+06.585	*Piping failure/hillside erosion*-slope grade too steep and insufficient vegetation stabilization	SPA 16
	14+03.108	*Excessive piping failure/ bank erosion and sediment deposition* - slope grade too steep and insufficient vegetation stabilization	SPA 18
	12+97.150	*Chute formation and scour* - channel possibly too sinuous	SPA 19
	10+27.461	*Heavily eroded bank/ bar formation* – high-velocity, constricted flow from culvert	SPA 21
Engineered Structures	25+44.777	*Riffle formed into a pool* - Incorrect location of structure and incorrect dimension	SPA 8
	24+89.569	*Erosion behind cross-vane*	SPA 9
	23+89.110	*Backwater pool formation* - insufficient dimension	SPA 11
Other Disturbance	26+83.995	*Runoff ditch dug deeper by golf course maintenance*	SPA 3

Table XI. Categorical Stream Feature Visual Stability Assessment UT Tar River Stream Mitigation Site/Project No. 234					
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**
A. Riffles	100%	10%*			
B. Pools	100%	33%			
C. Thalweg	100%	NA			
D. Meanders	100%	75%			
E. Bed General	100%	50%			
F. Vanes/J Hooks etc.	100%	60%			
G. Wads and Boulders	100%	100%			

*Riffle locations on stream greatly deviate from the designed locations, probably due to the presence of structures at the head of most riffles which have caused pool formation below the structures.

Tables XI and XII provide baseline morphology and hydraulic information for the restored stream reach.

C. Wetland Assessment

There is no wetland restoration associated with this site therefore this table is not applicable to this project.

Table XII. Baseline Morphology and Hydraulic Summary UT Tar River Stream Mitigation Site/Project No. 234																		
Parameter	**USGS Data**			**Regional Curve Interval**			**Pre-Existing Condition**			**Project Reference Stream**			**Design**			**As-built**		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)				5.5	21.0	11.3	10.2	13.8		10	19.1				18.0	17.6	25.2	20.5
BF Cross Sectional Area (ft^2)				6.2	28	15.3	20.8	28.1		5.5	23.4				24.5	19.8	35.1	23.3
BF Mean Depth (ft)				0.75	2.1	1.4			2.0	0.55	1.22				1.38	1.0	1.4	1.25
BF Max Depth (ft)							2.8	3.3		1.0	2.26				2.2	2.0	2.7	2.35
Width/Depth Ratio							5.0	6.8		10.3	20.6				13.2	13.0	20.2	18.7
Entrenchment Ratio							3.9	4.0		1.9	6.6				2.2	2.4	5.0	3.4
Wetted Perimeter (ft)																20.3	28.0	22.6
Hydraulic radius (ft)																0.90	1.3	1.08
Pattern																		
Channel Beltwidth (ft)							8	30		17	41		23	58		29	66	43
Radius of Curvature (ft)							10	60		12	81		36	72		28	58	34.5
Meander Wavelength							265	470		42	59		59	84		80	165	121
Meander Width ratio							0.7	2.5		1.3	3.2		1.3	3.2		1.64	2.61	2.2
Profile																		
Riffle length (ft)							14	316	83							1.50	51.70	13.10
Riffle slope (ft/ft)							0.0018	0.0171	.0115	0.0085	0.075		0.0085	0.0333		0.00	0.04	0.01
Pool length (ft)							10	102	42							3.30	20.70	9.80
Pool spacing (ft)							33	379	226	32	75		32	75		13.60	158.30	57.93
Substrate																		
d50 (mm)							0.5	1.0		0.25	0.5					0.062	0.25	
d84 (mm)							5.7	8.0		11.3	16.0					0.25	0.5	
Additional Reach Parameters																		
Valley Length (ft)									1662									1662
Channel Length (ft)									1792									1937
Sinuosity									1.07	1.25	1.7				1.25			1.17
Water Surface Slope (ft/ft)									0.0068	0.0050	0.0161				0.0042			0.01
BF slope (ft/ft)									0.0061									0.01
Rosgen Classification									E5	C4	C5				C4			
Habitat Index																		
Macrobenthos																		

Table XIII. Morphology and Hydraulic Monitoring Summary UT Tar River Stream Mitigation Site/Project No. 234															
Parameter	**Cross Section 1**			**Cross Section 2**			**Cross Section 3**			**Cross Section 4**			**Cross Section 5**		
	1+94 Pool			**2+91 Riffle**			**6+65 Riffle**			**16+42 Riffle**			**18+49 Run**		
Dimension	MY0	MY1	MY2	MY0	MY1	MY2	MY0	MY1	MY2	MY0	MY1	MY2	MY0	MY1	MY2
BF Width (ft)	22.9	13.0		25.2	31.29		17.6	17.66		21.0	11.53		20.0	15.69	
Floodprone Width (ft) (approx)		77.64		91	83.05		100+	128.11		90	85.9		>100	112.79	
BF Cross Sectional Area (ft^2)	21.7	11.75		35.1	23.89		23.7	20.53		22.9	10.93		19.8	10.75	
BF Mean Depth (ft)	0.9	0.9		1.4	0.76		1.4	1.16		1.1	0.95		1.0	0.69	
BF Max Depth (ft)	2.6	1.78		2.4	1.94		2.7	2.59		2.3	1.74		2.0	1.37	
Width/Depth Ratio		14.44		18.0	41.17		13.0	15.22		19.3	12.14		20.2	22.74	
Entrenchment Ratio		5.97		3.6	2.65		5.6	7.25		4.3	7.45		5.0	7.19	
Wetted Perimeter (ft)		13.71		28.0	33.17		20.3	19.03		23.2	12.18		22.0	16.73	
Hydraulic radius (ft)		0.86		1.3	0.72		1.17	1.08		1.0	0.9		0.9	0.64	
Substrate															
d50 (mm)	.125-.25	1.13		.125-.25	1.05		.125-.25	0.36		.125-.25	0.33		.062-.12	0.44	
d84 (mm)	.25-.5	8.41		.25-.5	6.27		.25-.5	3.33		.25-.5	1.46		.25-.5	0.96	

Parameter	MY-01 (2006)			MY-02 (2007)			MY-03 (2008)			MY-04 (2009)			MY-05 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	8.86	46.2	26.9		66													
Radius of Curvature (ft)	13.5	68.91	29.7															
Meander Wavelength (ft)	77.2	160.9	121.															
Meander Width Ratio	0.5	2.59	1.5															
Profile																		
Riffle Length (ft)	21.1	60	33															
Riffle Slope (ft/ft)	.005	.043	.01															
Pool length (ft)	7.3	90.1	25.7															
Pool spacing (ft)	6	69	30.8															
Additional Reach Parameters																		
Valley Length (ft)	1662																	
Channel Length (ft)	1937																	
Sinuosity	1.17																	
Water Surface Slope (ft/ft)	.01																	
BF Slope (ft/ft)	.01																	
Rosgen Classification	C4																	
Habitat Index*																		
Macrobenthos*																		

Click on the Desired Link Below

Appendix A

Appendix B