REEDY BRANCH
FINAL MONITORING REPORT
YEAR 2 OF 5
2006

EEP Project # 301
Alamance County, North Carolina

Original Design Firm:
ECOLOGIC ASSOCIATES PC
218-4 Swing Road
Greensboro, NC 27409

Submitted to:

Ecosystem Enhancement Program

NCDENR-EEP
1652 Mail Service Center
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Executive Summary

The North Carolina Ecosystem Enhancement Program (EEP) restored approximately 3,150 linear feet of stream along Reedy Branch. This project is located in Alamance County, NC. This segment of Reedy Branch flows through a moderately dense wooded section surrounded by pasture areas. Prior to restoration, cattle and horses had unlimited access to the stream channels which created areas of severe bank erosion and loss of vegetation. Since the restoration has been complete, the livestock have been fenced out of the stream with the exception of a few crossings that are used throughout the year to move the cattle between pastures.

There were several goals for this stream and buffer restoration project. Goals of the stream project included: reducing the bank erosion; reducing nutrient runoff on the site; stabilizing stream channel banks by planting vegetation; and, helping the stream reach its equilibrium though the proper design ratios for dimension, pattern, and profile.

This report documents the data collected for Year 2 monitoring. The data includes geomorphic and vegetative components. The geomorphic data collected includes: longitudinal profiles, cross-sections, pebble counts, and photo points along the segment of restored stream. The vegetation data collected includes: stem count species and numbers for all of the vegetative plots throughout the project. The geomorphic data collected for Year 2 was compared to previous data collected in Year 1 by overlays of graphs for the longitudinal and cross-section surveys.

Three new cross section locations were established in Year 2 monitoring adding to the three existing cross sections from Year 1. The three cross-sections overlaid between the two years showed no major changes in dimensions. The longitudinal profiles between the two years were inconclusive. No conclusions were made due to discrepancies in stationing between years. This uncertainty in the location of some monitoring features and benchmarks has now been eliminated and therefore subsequent annual comparisons will be fully consistent with the data collection in this report. Some of the structures, as noted in the report, need to be monitored closely over the next year and may need to be repaired.

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APPENDICES

1.0 PROJECT BACKGROUND

1.1 Project Location

This project is near Snow Camp, North Carolina in south-central Alamance County. To reach the site from Raleigh, go west on US 64 to Siler City. In Siler City, go north on Martin Luther King Boulevard; the North Carolina Atlas and Gazetteer (DeLorme 1997) labels the road as Snow Camp Road. Continue north toward the community of Snow Camp (approximately 12 miles). Before entering Snow Camp, take a right on SR 2358 (Workman Rd). Continue on Workman Road approximately 1 mile then take a right on Quakenbush Road. Continue on Quakenbush Road for approximately 1½ miles to a small road crossing over Reedy Branch. The road crossing is at the downstream end of the project. Reedy Branch extends upstream (south) of Quakenbush Road. Figure 1 shows the location of Reedy Branch.

1.2 Project Setting

The project is located entirely on property owned by Sam and Deborah Kiser. Cattle pasture makes up most of the Kiser Farm surrounding the restoration site. The restored stream is enclosed in a moderately dense wooded area and contains large bedrock outcrops as well other sporadic occurrences of bedrock throughout the reach.

Overall, Reedy Branch covers approximately 3155 linear feet of stream. It also contains significant bends as it flows through its valley length. These bends combine for a total valley length of approximately 2,550 feet.

1.3 Project Objectives

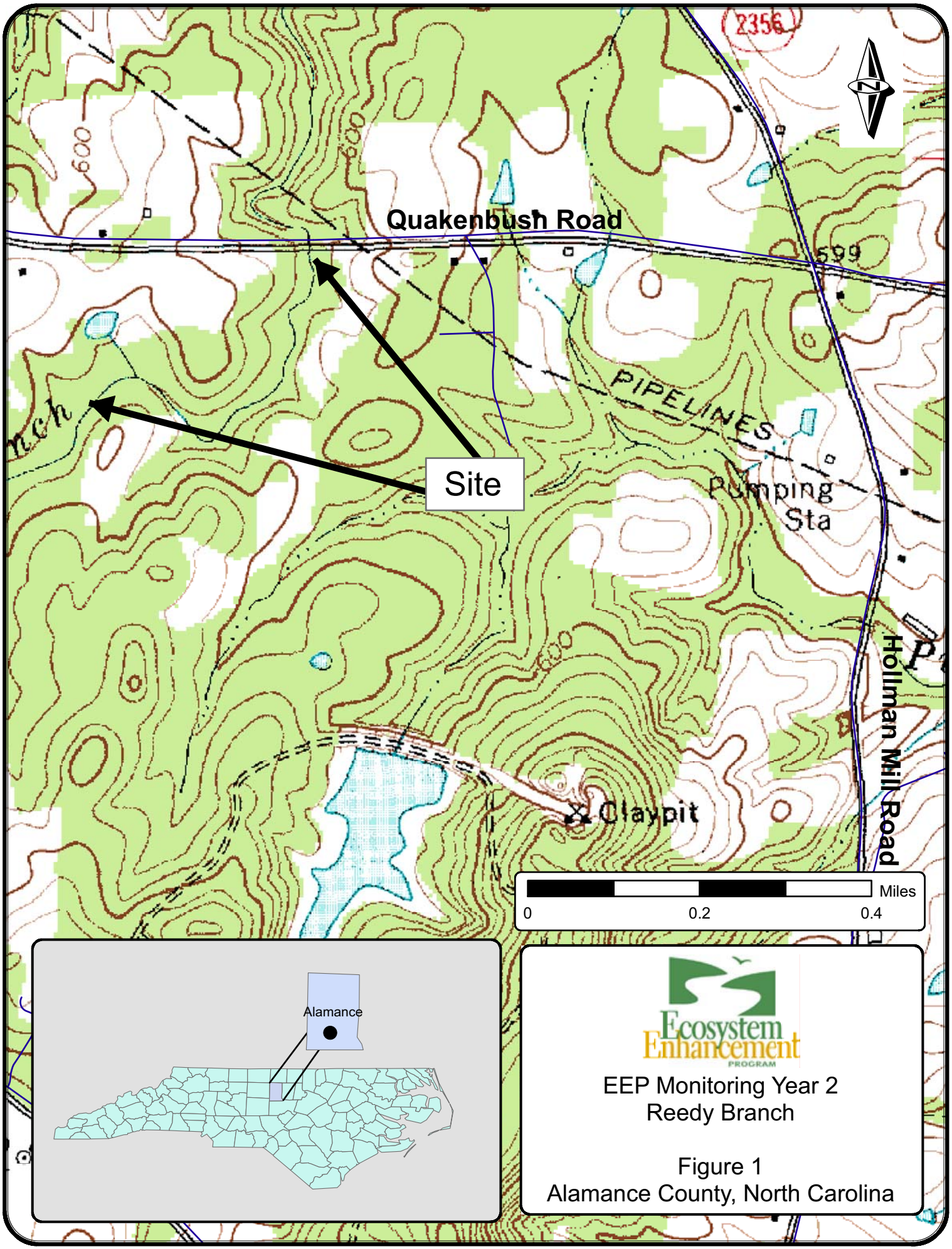
The goal of this stream restoration project is to improve the water quality in the Cape Fear River Basin. Reedy Branch is a typical stream within this and surrounding watersheds, exhibiting instability and degradation in response to current and historical practices with land use. Nutrient input should decrease with the establishment of a riparian buffer and fencing the cattle out of the streams. The buffer will also provide shade to the stream which will encourage wildlife diversity in the area (both aquatic and non-aquatic).

Table I. Project Mitigation Structure and Objectives Table

Reedy Branch/EEP Project Number 301

Project Segment or Reach ID	Mitigation Type	Approach	Linear Footage or Acreage Stationing	Comment
Reedy Branch	*	*	3,155 linear feet	*

"*" denotes raw data being acquired by EEP and will be included in the 2007 monitoring report for the site

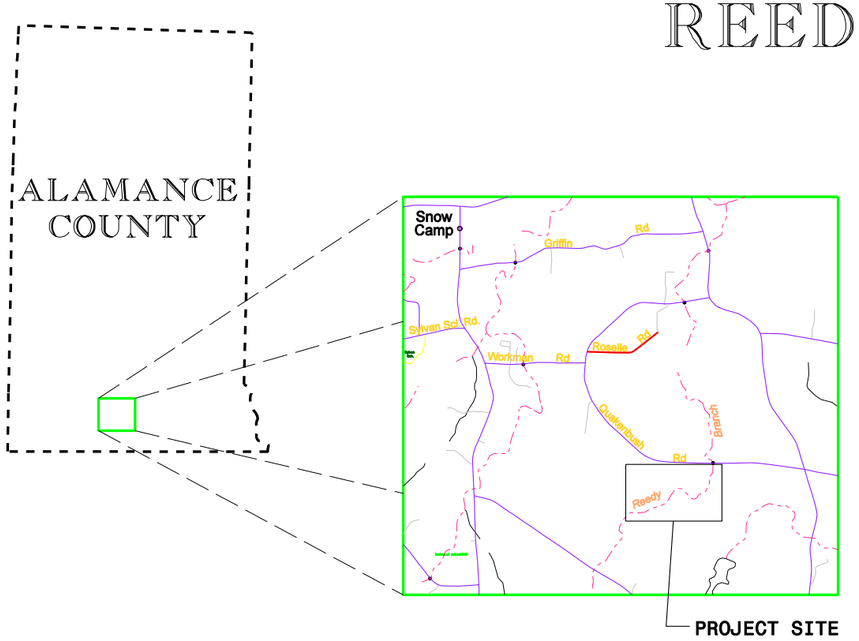


Ecosystem Enhancement Program

EEP Monitoring Year 2
Reedy Branch

Figure 1
Alamance County, North Carolina

REEDY BRANCH



NAD 83

QUAKENBUSH RD.

FLOW

REEDY BRANCH
FIGURE 2

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

Ecosystem Enhancement PROGRAM

LOCATION:	REEDY BRANCH STREAM MONITORING - YEAR 2
PROJ #: 301	COUNTY: ALAMANCE
PREPARED BY:	WDY
CHECKED BY: ATW	DATE: 11/17/06

1.4 History and Background

Historically, cattle had access to all parts of the stream. This resulted in various negative effects to the stream in regards to overall structure, aquatic and non-aquatic habitat, and vegetation (See Monitoring Year 1 Report for more specific details).

Since completion of this project and fencing in of the floodplain and riparian buffer, cattle are no longer able to freely access the stream. There are two stable, stream crossings that the landowner uses to move the cattle between pastures.

Table II. Project Activity and Reporting History

Reedy Branch/EEP Project Number 301

Activity or Report	Scheduled Completion	Data Collection Complete	Actual Completion or Delivery
Restoration Plan			*
Final Design - 90%			*
Construction			November 1, 2003
Temporary S&E mix applied to entire project area			November 1, 2003
Permanent seed mix applied to entire project area			December 1, 2003
Vegetative Planting			January 1, 2003
Mitigation Plan/ As-built (Year 0 Monitoring - baseline)		February 2005	August 1, 2005
Repair Work			Fall 2004
Repair Work			May 1, 2005
Year 1 monitoring		May 2005	August 2005
Year 2 monitoring		June 2006	December 2006
Year 3 monitoring	December 2007		
Year 4 monitoring	December 2008		
Year 5 monitoring	December 2009		
Year 5+ monitoring			

"*" denotes raw data being acquired by EEP and will be included in the 2007 monitoring report for the site

Table III. Project Contract Table	
Reedy Branch/EEP Project Number 301	
Designer Mark Taylor	EcoLogic 218-4 Swing Road Greensboro, NC 27409 336-335-1108
Construction Contractor	Phillips and Jordan, Inc. 8245 Chapel Hill Road Cary, NC 27513 919-388-4222
Planting Contractor	*
Seeding Contractor	*
Monitoring Performers Amanda Todd	SEPI Engineering Group 1025 Wade Avenue Raleigh, NC 27605 919-789-9977
Stream Monitoring POC	Amanda Todd (919) 789-9977
Vegetation Monitoring POC	Phillip Todd (919) 789-9977
Wetland Monitoring POC	N/A

"*" denotes raw data being acquired by EEP and will be included in the 2007 monitoring report for the site

Table IV. Project Background Table	
Reedy Branch/EEP Project Number 301	
Project County	Alamance
Drainage Area	1.6 square miles
Drainage impervious cover estimate (%)	10%
Stream Order	Second
Physiographic Region	Piedmont
Ecoregion	Carolina Slate Belt
Rosgen Classification of As-built	C5
Cowardin Classification	N/A
Dominant soil types	Herndon
Reference site ID	Unknown
USGS HUC for Project and Reference	03030002 Haw River
NCDWQ Sub-basin for Project and Reference	03-06-04
NCDWQ classification for Project and Reference	*
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	N/A
% of project easement fenced	100%

"*" denotes raw data being acquired by EEP and will be included in the 2007 monitoring report for the site

2.0 PROJECT MONITORING METHODOLOGY

2.1 Vegetation Methodology

The following methodology was used for the stem count. The configuration of the vegetation plots were marked out with tape to measure 10 meters by 10 meters (or equivalent to 100 square meters) depending on buffer width. The planted material in the plot was marked with flagging. The targeted vegetation was then identified by species, and the number of each species was recorded in a field book.

2.2 Stream Methodology

The project monitoring for the stream channel included a longitudinal survey, cross-sectional surveys, pebble counts, and photo documentation. These measurements were taken along the entire length of the reach. The stationing was based on thalweg. Methodology for each portion of the stream monitoring is described in detail below.

2.2.1 Longitudinal Profile

The longitudinal profile of the restored stream was surveyed. The heads of features, such as riffles, runs, pools, maximum pool, and glides, were surveyed in the longitudinal profile. At each head of feature, the thalweg, water surface, edge of water, left and right bankfull, and left and right top of bank were surveyed. The average water-surface slope for each feature, pool length, and pool to pool spacing were calculated from this survey. The surveyed features also assisted in drawing out the plan view of the restored stream. Stream pattern data (i.e., meander length, radius of curvature, belt width, and sinuosity) were also measured from the plan view.

The pools that were constructed downstream of the cross vanes were surveyed in the longitudinal profile since they were included in Year 1 monitoring as well. These pools were grouped in to calculate the pool-to-pool spacing and the pool-to-pool spacing to bankfull width ratio calculations. The longitudinal profile for Year 2 was overlain on Year 1 data to note any changes.

2.2.2 Permanent Cross Sections

Six permanent cross sections (four riffles and two pools) were surveyed at Reedy Branch during Year 2 monitoring. Originally, there were only three permanent cross sections established over the total length of the project (two riffles and one pool). Given that the total length of the project exceeded 3000 linear feet, three additional cross sections were established during Year 2 monitoring (two riffles and one pool). The beginning and end of each previously established permanent cross section was originally marked with a metal rebar stake covered with an orange plastic cap. These original stakes were well marked and easy to find. Even so, during Year 2 monitoring, metal conduit stakes were provided on all six cross sections as required by the latest EEP protocol. Cross sections were located and installed perpendicular to the stream flow. The survey noted all changes in slopes, tops of both banks, left and right bankfull, edges of water, thalweg and water surface. The bankfull cross sectional areas were calculated for each cross section based on the drainage area and checked against the design parameters. The cross sections were plotted, and Year 1 monitoring data was overlain on top of Year 2 for comparison. The bankfull mean depth, cross-sectional area, width-to-depth ratios and entrenchment ratios were also compared from Year 1 to Year 2.

2.2.3 Pebble Counts

A modified Wolman pebble count (Rosgen 1993) consisting of 100 samples was taken at each permanent cross section. The cumulative percent was graphed and the D50 and D84 were calculated.

2.3 Photo Documentation

Permanent photo points were established during Year 1 monitoring. Photographs were taken at these points during the field surveys for Year 2 as noted from the monitoring Year 1 report. Directions of the photo points were followed from what was drawn on the Year 1 monitoring plan view sheets.

3.0 PROJECT CONDITIONS AND RESULTS

3.1 Vegetation

3.1.1 Soils Data

Table V. Preliminary Soil Data

Series	Max Depth (in.)	% Clay on Surface	K	T	OM %
Herndon (HdB2)	68	5.0 - 27.0	0.48	*	0.5 - 1.0
Herndon (HeC3)	68	27.0 - 35.0	0.35	*	0.0 - 0.5
Herndon (HdC2)	68	5.0 - 27.0	0.48	*	0.5 - 1.0
Mixed alluvial (Mc)	<<<< High variability of data >>>>				

* the soils information was not available from the Natural Resources Conservation Service (NRCS)

3.1.2 Vegetative Problem Area Plan View

Table VI. Vegetative Problem Areas

Feature/Issue	Station # / Range	Probable Cause	Photo # (Appendix A2)
Invasive/Exotic Populations	entire stream reach	likely remnant from pre-construction	1, 3 and 4
	23+50 - Right bank	dodder - unknown cause	2

There is good herbaceous vegetation growth along all of the monitored stream reach. Japanese grass (*Microstegium viminium*) has established along the entire stream reach with limited areas where it does not dominate. The plan sheets in Appendix D show the location of the vegetation plots.

In many areas along the stream and vegetation plots, Japanese honeysuckle (*Lonicera japonica*) and Japanese grass were prevalent. Japanese grass in many areas is likely limiting the establishment of the planted bare root trees.

Soft rush (*Juncus effuses*) is also prevalent along the stream and many of the vegetation plots, including Vegetation Plots #3, 4, 6, 7, 8, and 9. The thickness of the soft rush may be inhibiting some of the bare root tree establishment.

Another exotic, dodder *(Cuscuta* and *Grammica*), was noted at Station No. 23+50 right bank. This exotic is limited only to this area. However, this plant can overtake an area.

3.1.3 Stem Counts

At planting, the consultant was not notified to identify the planted bare root trees. Assuming a planting rate of 680 trees/acre, there has been great recruitment of trees into the vegetation plots.

Sweet-gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*) and tulip poplar (*Liriodendrum tulipifera*) were not noted with flagging or counted in the vegetation plots. These species were noted in all of the Vegetation Plots except #8 and 9 (refer to Table VII).

3.2 Stream

3.2.1 Longitudinal Profile

Few conclusions can be made from the longitudinal survey data when overlaying Year 2 on Year 1. In Year 2, there were many more data points taken in comparison with Year 1. Also, there is a significant discrepancy in the stationing between Year 2 and Year 1 monitoring. Due to these discrepancies, it is difficult to make any conclusions regarding the longitudinal profile of the stream. Uncertainty in the location of some monitoring features and benchmarks has now been eliminated; therefore, subsequent annual comparisons will be fully consistent with the data collection in this report.

There is one significant aspect to note about the longitudinal profile for Year 2. There is a large stream segment distinguished as a run (Station No. 26+05 to 32+66). This accounts for an exceptionally large maximum pool spacing noted in Table XIII of Appendix B3.

3.2.2 Permanent Cross Sections

From a review of the cross-sectional survey data from Year 2 overlain on Year 1, it can be concluded that the three cross sections from Year 1 have not changed significantly. Comparisons of cross sections from Year 1 and Year 2 are plotted in Appendix B4. These comparisons show very minor changes, if any at all. Any minor differences are most likely due to differences in surveying data analysis between years. For instance, the number of points taken along the cross section is much greater in Year 2 than in Year 1. Also, in Year 2 monitoring, three additional cross sections were surveyed. Once Year 3 data is collected, a better comparison of all cross section problem areas can be made since the Year 2 and Year 3 data will be collected using the same equipment and staff.

3.2.3 Pebble Counts

The following table shows the substrate comparison of Year 1 and Year 2 pebble counts in two riffle cross sections and one pool cross section. As noted previously, three additional cross sections were surveyed in Year 2; therefore, there can be no comparison made for these until Year 3 monitoring.

3.3 Photo Documentation

Photos taken at the photo points and at the cross-sections are provided in Appendices A1 and B2. Comparisons from Year 1 to Year 2 can be made by referring back to the Year 1 Monitoring report.

3.4 Problem Areas

Problem areas were noted throughout the entire reach in regards to structure problems, bank erosion, aggradation, and bar formation. The plan view sheets (in Appendix D) show the location of the problem areas. The plan view sheets also show the structures on them and are color coded for the degree of instability or if the structure is in good condition. Table X in Appendix C describes for the reach the feature issue, station number, and suspected cause.

4.0 OVERALL CONCLUSION FOR YEAR 2 MONITORING

At this time it can be concluded that bare root tree growth may be inhibited by the heavy prevalence of Japanese grass, Japanese honeysuckle and also soft rush. As noted on the vegetation problem area plan sheets, these invasive/exotic species are present along the entire reach and in the designated vegetation plots.

The results of the longitudinal profile comparison of current data and Year 1 data are inconclusive. There is a large discrepancy in the stationing between Year 1 and Year 2 data. Results should be much more conclusive after the completion of Year 3 monitoring because of the uncertainty in the location of some monitoring features and benchmarks has now been eliminated.

In regards to cross sections, it is determined that there have been no significant changes in cross section from Year 1 to Year 2. Three additional cross sections were surveyed in Year 2 and will be compared with future Year 3 monitoring.

Conclusions from the Year 3 monitoring data should be more obtainable. With the establishment of the location of monitoring features, including additional cross sections, and benchmarks, uncertainty in these items has now been eliminated; therefore, subsequent annual comparisons will be fully consistent with the data collection in this report.

REFERENCES

DeLorme. 1997. *The North Carolina Atlas and Gazateer*.

Ecologic. February 2003. *Reedy Branch Stream Restoration (Design Plans)*.

Ecologic. September 2003. *Reedy Branch Stream Restoration Planting Plan (Streamside Revegetation Plan)*.

Ecologic. August 2005. *MY1 (2005) Reedy Branch Monitoring Report.*

Harman, W.H., et al. 1999. *Bankfull Hydraulic Geometry Relationships for North Carolina Streams*. AWRA Wildland Hydrology Symposium Proceedings. Edited by D.S. Olson and J.P. Potyondy. AWRA Summer Synposium. Bozeman, MT.

North Carolina Ecosystem Enhancement Program. September 2005. *Content, Format and Data Requirements for EEP Monitoring Reports*.

Rosgen, D.L. 1994. *A Classification of Natural River*. Catena, Volume 22: 166-169, Elsevier Science, B.V. Amsterdam.

U.S. Department of Agriculture, Soil Conversation Service. April 1960. *Soil Survey Alamance County, North Carolina*.

U.S. Department of Army, Corps of Engineers. 2003. *Stream Mitigation Guidelines*. http://www.saw.usace.army.mil/wetlands/Mitigation/stream_mitigation.html

APPENDIX A1

PHOTOLOG VEGETATION PROBLEM AREAS

APPENDIX A1
PHOTOLOG VEGETATION PROBLEM AREAS

Photo 1: Japanese grass along both banks near Vegetation Plot 10

Photo 4: Japanese grass

Photo 2: Dodder

Photo 3: Japanese grass

APPENDIX A2

PHOTOLOG VEGETATION PLOTS

APPENDIX A2
PHOTOLOG – VEGETATION PLOTS


Vegetation Plot 1


Vegetation Plot 4


Vegetation Plot 2


Vegetation Plot 5


Vegetation Plot 3


Vegetation Plot 6


Vegetation Plot 7


Vegetation Plot 10


Vegetation Plot 8


Vegetation Plot 11


Vegetation Plot 9


Vegetation Plot 12

APPENDIX A3

VEGETATION DATA TABLES

Table VI. Vegetative Problem Areas - Reedy Branch

Feature/Issue	Station # / Range	Probable Cause	Photo #
Bare Bank			
Bare Bench			
Bare Flood Plain	UT - Station 11+80	area washed from storm events	6
	UT - Station 12+50	area washed from storm events	5
	UT - Station 14+20	area washed from storm events	4
	UT - Station 18+50	area washed from storm events	2
Invasive/Exotic Populations	Reach 1 - Station # 20+50 Lt	Japanese grass overtaking area - from off site	8
	Reach 1 - down from Crest Gauge	Japanese grass overtaking area - from off site	1
	Reach 2 - Station #11-13	Japanese grass overtaking area - from off site	7

REEDY BRANCH

Table VII. Stem counts for each species arranged by plot

Species	Plots												Initial Totals*	Year 2 Totals	Survival %**
	1	2	3	4	5	6	7	8	9	10	11	12			
Shrubs															
Cornus ammomum	1														
Salix nigra			11	11				11	11	111	11				
Trees															
Betula nigra															
Carpinus caroliniana	11	111	11	1	1	1	11	11	11	1	1	111			
Carya sp.		111													
Diospyros virginiana		111									1				
Hypericum sp.		11	111	11	1	11	111	11	11	11	1	11			
Juglans nigra				1	111				1			1			
Nyssa sylvatica															
Platanus occidentalis	1		1111	11	1111	111	1111	1	11	11	1111	11 1			
Sambucus canandensis					1										
Quercus alba	1	1111	1												
Quercus michauxii		1		1	1		11		11			111			
Quercus phellos			11	11	1										
Quercus sp.						1									
Rhus copallinum								1							
Ulmus alata															
Total including live stake															
Stems per acre															
Total exluding live stake															
Stems per acre															

LS
C. A.
L. S

1
1 1

Appendix A3

Table VII. Stem counts for each species arranged by plot

Species	Plots									Year 1 Totals	Year 2 Totals	Survival %
	1	2	3	4	5	6	7	8	9			
Shrubs												
Cornus ammomum			3	1	(7 LS)	(5 LS)	(1 LS)		1	11 (12 LS)	4 (13 LS)	36 (100)
Trees												
Betula nigra					3	2		2	2	10	9	90
Carpinus caroliniana					3	3	1	3		11	10	91
Diospyros virginiana										0	2	n/a
Fraxinus pennsylvanica						3	1		2	2	6	300
Juglans nigra	1	2	1	2	1	2	1		3	12	13	108
Nyssa sylvatica										1	0	0
Platanus occidentalis	1	1		1		3	1	5	4	22	16	73
Salix nigra							17			13	17	131
Sambucus canandensis										1	0	0
Quercus michauxii			1	3		1	3		1	16	9	56
Quercus rubra			2							2	2	100
Quercus alba		1		1	2					5	4	80
Quercus marilandica			1							1	1	100
Total including live stake	2	4	8	8	20	19	25	10	14	119	102	86
Stems per acre	95	190	381	364	1000	865	1190	500	667			
Total exluding live stake	2	4	8	9	14	11	21	10	17	107	89	83
Stems per acre	95.2	190.4	380.8	409.5	700	500.5	999.6	500	809.2			

APPENDIX B1

PHOTOLOG STREAM PROBLEM AREAS

NO PHOTOGRAPHS AVAILABLE

APPENDIX B2

PHOTOLOG OF CROSS-SECTIONS AND PHOTO POINTS

APPENDIX B2
PHOTO LOG-CROSS-SECTIONS


Cross-Section 1: Looking Downstream


Cross-Section 1: Looking Upstream


Cross-Section 2: Looking Downstream


Cross-Section 2: Looking Upstream


Cross-Section 3: Looking Downstream


Cross-Section 3: Looking Upstream

Cross-Section 4: Looking Downstream

Cross-Section 4: Looking Upstream

Cross-Section 5: Looking Downstream

Cross-Section 5: Looking Upstream

Cross-Section 6: Looking Downstream

Cross-Section 6: Looking Upstream

Problems

APPENDIX B2
PHOTOLOG – GENERAL PHOTO POINTS


Photo 1


Photo 2


Photo 3


Photo 4


Photo 5


Photo 6


Photo 7


Photo 8


Photo 9


Photo 10


Photo 11


Photo 12


Photo 13


Photo 14


Photo 15


Photo 16


Photo 17


Photo 18


Photo 19


Photo 20


Photo 21


Photo 22


Photo 23


Photo 24


Photo 25


Photo 26


Photo 27


Photo 28


Photo 29


Photo 30


Photo 31


Photo 32


Photo 33


Photo 34


Photo 35


Photo 36


Photo 37

APPENDIX B3

STREAM DATA TABLES

Table VIII. Verification of Bankfull Events - Reedy Branch			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo # (if available)**
8-Aug-06	Unknown	Crest Stage Gauge measurement of approximately 2" on stick (bottom of stick at bkf)	
11-Jan-07	Unknown	Crest Stage Gauge measurement of approximately 6" on stick (bottom of stick at bkf)	

Table B2. Visual Morphological Stability Assessment						
Reedy Branch						
Segment/Reach: Reedy Branch (3097 feet)						
Feature Category	**Metric (per As-built and reference baselines)**	**(#Stable) Number Performing as Intended**	**Total Number per As-built**	**Total Number / feet in unstable state**	**% Performing in Stable Condition**	**Feature Performance Mean or Total**
A. Riffles	1. Present	21	21	NA	100%	
	2. Armor stable	12	21	NA	57%	
	3. Facet grade appears stable	12	21	NA	57%	
	4. Minimal evidence of embedding/fining	12	21	NA	57%	
	5. Length appropriate	12	21	NA	57%	**66%**
B. Pools	1. Present	24	24	NA	100%	
	2. Sufficiently deep	21	24	NA	88%	
	3. Length appropriate	16	24	NA	67%	**85%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering	11	13	NA	85%	
	2. Downstream of meander (glide/inflection) centering	12	13	NA	92%	**88%**
D. Meanders	1. Outer bend in state of limited/controlled erosion	7	13	NA	54%	
	2. Of those eroding, # w/concomitant point bar formation	3	6	NA	50%	
	3. Apparent Rc within specifications	8	13	NA	62%	
	4. Sufficient floodplain access and relief	10	13	NA	77%	**61%**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	21/244	92%	
	2. Channel bed degradation - areas of increasing down cutting or head cutting	NA	NA	0/0	100%	**96%**
F. Bank Condition	1. Actively eroding, wasting, or slumping bank	NA	NA	10/160	95%	**95%**
G. Vanes / J Hooks	1. Free of back or arm scour	17	23	NA	74%	
	2. Height appropriate	17	23	NA	74%	
	3. Angle and geometry appear appropriate	17	23	NA	74%	
	4. Free of piping or other structural failures	17	23	NA	74%	**74%**
H. Wads and Boulders	1. Free of scour	24	30	NA	80%	
	2. Footing stable	24	30	NA	80%	**80%**

Table X. Stream Problem Areas

Reedy Branch (EEP Project #301)

Feature Issue	Station numbers	Suspected Cause	Photo number
Aggradation (grasses)	10+40.33	Channel narrowing.	
	10+61.12		
Rock Cross Vane	10+87.12	Piping around structure.	
Rootwad	11+64.64	Perhaps placed too high. Dried out.	
Aggradation (Pickerelweed)	12+98.04	Narrow channel.	
	13+02.46		
Aggradation (Pickerelweed)	13+69.95	Soil deposits have built up with vegetation growing.	
	13+76.50		
Bank Erosion (left bank)	14+27.09	Lack of bank protection from directed flow onto bank.	
	14+37.75		
Aggradation (grasses)	16+60.65	There is a lot of bedrock in this area with soil settling on top and	
	16+64.93	grass growing.	
Rootwad	18+64.60	Placed too high. Dried out.	
Rootwad	18+69.89	Placed too high. Dried out.	
Bank Erosion (left bank)	19+38.54	Channel is coming out of a wide area and may be trying to narrow itself.	
	19+51.98		
Rock Cross Vane	19+63.53	Top rock placed too low.	
Aggradation (grasses)	19+94.69	Narrow channel.	
	20+23.51		
Rootwad	20+29.31	Placed too high. Dried out.	
Bank Erosion (left bank)	20+76.83	Back eddying behind rootwad.	
	20+82.26		
Aggradation (Pickerelweed)	20+87.81	Narrow channel.	
	20+95.10		
Aggradation (Pickerelweed)	21+30.50	Narrow channel.	
	21+35.37		
Bank Erosion (left bank)	22+15.18	Flow directed onto left bank before piping through rock cross vane.	
	22+23.05		
Rock Cross Vane	22+18.84	Piping around structure.	
Aggradation (cattails & grasses)	22+73.26	Narrow channel.	
	22+82.82		
Bank Erosion (right bank)	23+33.15	Lack of bank protection from directed flow onto bank.	
	23+59.51		
Aggradation (grasses)	23+75.63	Narrow channel after cattle crossing.	421,422
	23+89.29		
Undercut Bank (left bank)	24+23.74	Flow being piped around rock vane.	
	24+41.37		
Rock Vane	24+30.97	Piping around structure creating undercut bank.	
Rootwad	24+59.39	Placed too high. Dried out.	
Rootwad	24+65.21	Placed too high. Dried out.	
Undercut Bank (right bank)	25+16.11	Back eddying behind rootwads	
	25+47.70		
Rock Cross Vane	25+53.39	Piping around structure.	
Bank Erosion (left bank)	26+15.85	Flow directed onto left bank. Lack of bank protection.	
	26+25.23		
Rootwad	26+35.73	Placed too high. Dried out.	
Aggradation (Pickerelweed)	26+73.67	Channel narrowing.	
	26+96.85		
Aggradation (grasses)	27+03.71	Channel narrowing.	
	27+12.09		
Aggradation (Pickerelweed)	27+15.93	Channel narrowing.	
	27+22.42		
Aggradation (Pickerelweed)	27+35.33	Channel narrowing.	
	27+42.67		
Aggradation (grasses)	27+52.21	Channel narrowing.	
	27+66.55		
Aggradation (Pickerelweed)	27+73.71	Channel narrowing.	
	27+79.13		
Bank Erosion (left bank)	29+52.50	Flow directed onto left bank. Lack of bank protection.	
	29+65.55		
Rock Cross Vane	29+69.11	Piping around structure.	
Aggradation (grasses)	29+93.79	Very narrow channel.	
	30+02.22		
Undercut Bank (left bank)	30+62.47	Directed water flow and back eddying.	
	30+76.11		
Undercut Bank (right bank)	30+62.47	Directed water flow and back eddying.	
	30+76.11		
Undercut Bank (left bank)	30+85.79	Directed water flow and back eddying.	
	31+04.81		
Aggradation (grasses)	32+47.54	Channel starting to narrow.	
	32+55.00		
Rock Cross Vane	32+83.44	Filter fabric exposed.	
Aggradation (grasses)	33+44.42	Channel narrowing.	
	33+52.07		
Aggradation (grasses)	35+82.14	Channel narrowing.	
	35+99.28		
Aggradation (Pickerelweed)	37+34.73	Channel narrowing.	
	37+48.72		
Aggradation (Pickerelweed and grasses)	38+52.16	Channel is very wide in this bend. Soil deposits have built up with lots	
	38+72.37	of vegetation growing	
Rock Vane	38+77.57	Piping around structure.	
Rock Cross Vane	39+44.67	Piping around structure. Exposed filter fabric.	
Bank Erosion (right bank)	39+75.47	Channel is possibly too wide and is trying to narrow itself.	
	40+08.23		
Bank Erosion (left bank)	39+79.03	Channel is possibly too wide and is trying to narrow itself.	
	39+97.11		
Bank Erosion (left bank)	40+61.06	Channel is possibly too wide and is trying to narrow itself.	
	40+91.57		
Bank Erosion (right bank)	40+74.73	Channel is possibly too wide and is trying to narrow itself.	
	40+91.71		

Table B1. Categorical Stream Feature Visual Stability Assessment						
Reedy Branch (EEP Project No. 301)						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
A. Riffles	Unknown	Unknown	66%			
B. Pools			85%			
C. Thalweg			88%			
D. Meanders			61%			
E. Bed General			96%			
F. Bank Condition			95%			
G. Vanes / J Hooks etc.			74%			
H. Wads and Boulders			80%			

Table XII Baseline Morphology and Hydraulic Summary

Reedy Branch (EEP Project No. 301)

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Dimension																		
BF Width (ft)																18.9	26.1	18.9
Floodprone Width (ft)																80	100	90
BF Cross Sectional Area (ft)																21.9	23.2	21.9
BF Mean Depth (ft)																0.9	1.2	1.16
Max Depth (ft)																2.1	2.7	2.7
Width/Depth Ratio																16.3	29.3	16.3
Entrenchment Ratio																3.1	5.3	4.8
Bank Heigh Ratio																n/a	n/a	n/a
Wetted Perimeter (ft)																19.9	46.5	31.1
Hydraulic Radius (ft)																0.9	1.4	1.1
Pattern																		
Channel Belthwidth (ft)																37	170	81
Radius of Curvature (ft)																10.9	24	17.1
Meander Wavelength (ft)																60	280	128
Meader Width Ratio																2	9	4.3
Profile																		
Riffle Length																7	35	16
Riffle Slope (ft/ft)																0.0011	0.0410	0.0100
Pool Length (ft)																16	41	29
Pool Spacing (ft)																29	150	59
Substrate																		
d50 (mm)																n/a	n/a	0.8
d84 (mm)																n/a	n/a	6.5
Additional Reach Parameters																		
Valley Length (ft)																n/a	n/a	2990
Channel Length (ft)																n/a	n/a	3090
Sinuosity																n/a	n/a	1.35
Water Surface Slope (ft/ft)																n/a	n/a	0.0033
BF Slope (ft/ft)																n/a	n/a	0.0031
Rosgen Classification																n/a	n/a	C5
*Habitat Index																n/a	n/a	n/a
*Macrobenthos																n/a	n/a	n/a

Table XIII. Morphology and Hydraulic Monitoring Summary

Reedy Branch

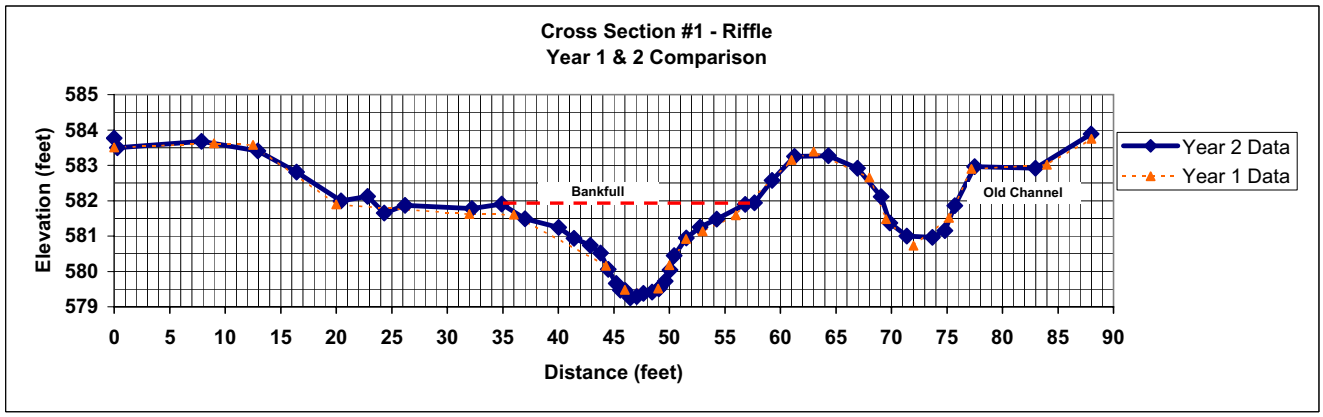
Segment/Reach: Reedy Branch (EEP Project No. 301)

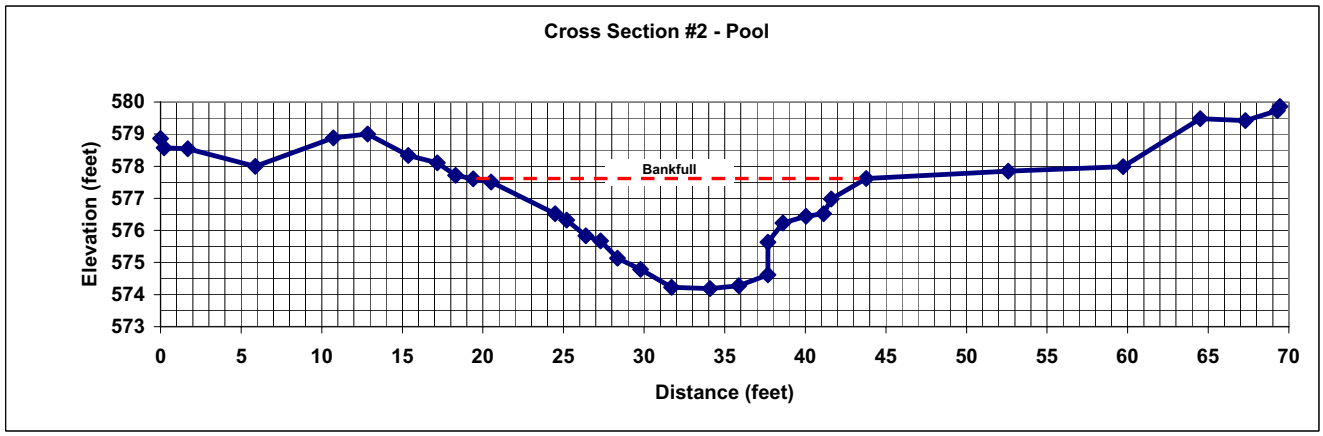
Parameter	Cross Section 1 Riffle						Cross Section 2 Pool						Cross Section 3 Riffle						Cross Section 4 Riffle						Cross Section 5 Pool						Cross Section 6 Riffle					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)	26.1	21.9						24.4						16.6					18.9	20.8					44.8	17.9						22.4				
Floodporne Width (ft)	80	>88						NA						>59					100	>85					NA	NA						>46				
BFCross Sectional Area (ft)	23.2	24.7						44.5						18.5					21.9	25.4					63	37.8						31.2				
BF Mean Depth (ft)	0.9	1.1						1.8						1.1					1.2	1.2					1.4	2.1						1.4				
Width/Depth Ratio	29.3	19.5						NA						14.8					16.3	17					NA	NA						16.1				
Entrenchment Ratio	3.1	>4.0						NA						>3.6					5.3	>4.0					NA	NA						>2.05				
Bank Height Ratio	1	1						NA						1					1	1					NA	NA						1				
Wetted Perimeter (ft)	27	24.3						26.5						23.7					19.9	38.3					46.5	21.3						25.5				
Hydraulic radious (ft)	0.9	1.1						1.7						0.8					1.1	0.7					1.4	1.8						1.2				
Substrate																																				
d50 (mm)	1	0.113						0.062						0.062					1.7	0.12					0.4	0.062						0.125				
d84 (mm)	17	6.5						0.25						0.25					11	0.4					9	0.17						32				

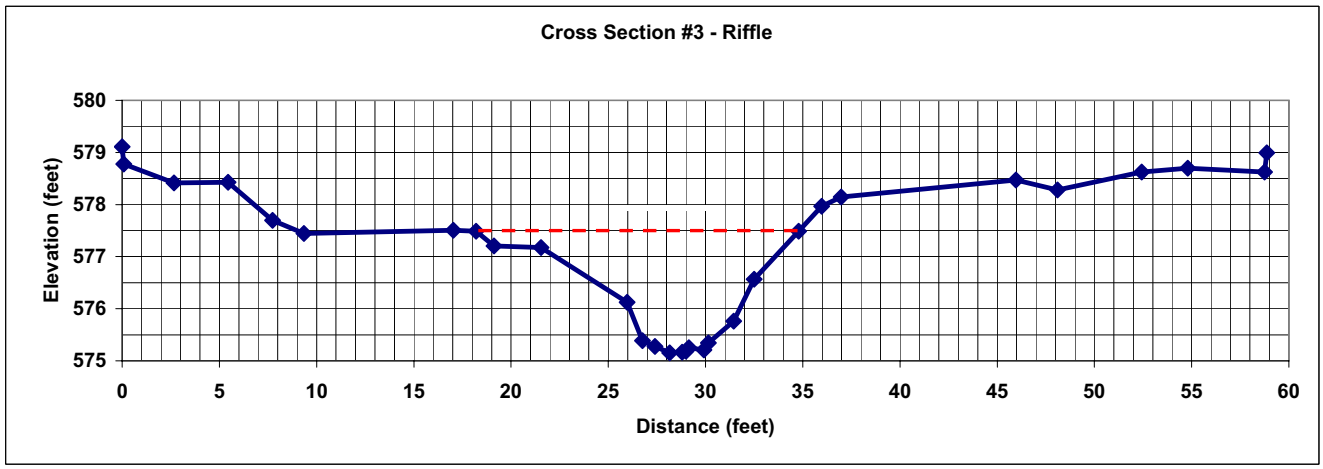
Parameter	MY-01 (2005)			MY-02 (2006)			MY-03 (2007)			MY-04 (2008)			MY-05 (2005)			MY+ (2009)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	37	170	80.87	13.68	165.2	44.32												
Radius of Curvature (ft)	10.9	24	17.1	18.36	106	40.3												
Meander Wavelenght (ft)	60	280	128	80.54	273	156												
Meander Width Ratio	2	9	4.3	0.66	7.9	2.1												
Profile																		
Riffle length (ft)	8	38	17	2.6	93.5	11.3												
Riffle slope (ft/ft)	0.0011	0.05	0.015	0.000	0.05	0.02												
Pool length (ft)	16	40	29	3.9	155.3	44.35												
Pool spacing (ft)	27	152	59	9.1	744.9	64.7												
Additional Reach Parameters																		
Valley Length (ft)	2290			2550														
Channel Length (ft)	3090			3096														
Sinuosity	1.35			1.21														
Water Surface Slope (ft/ft)	0.0036			0.0036														
BF slope (ft/ft)	0.0051			0.0033														
Rosgen Classificatior	C5			C5														
*Habitat Index	N/A			N/A														
*Macrobenthos	N/A			N/A														

APPENDIX B4

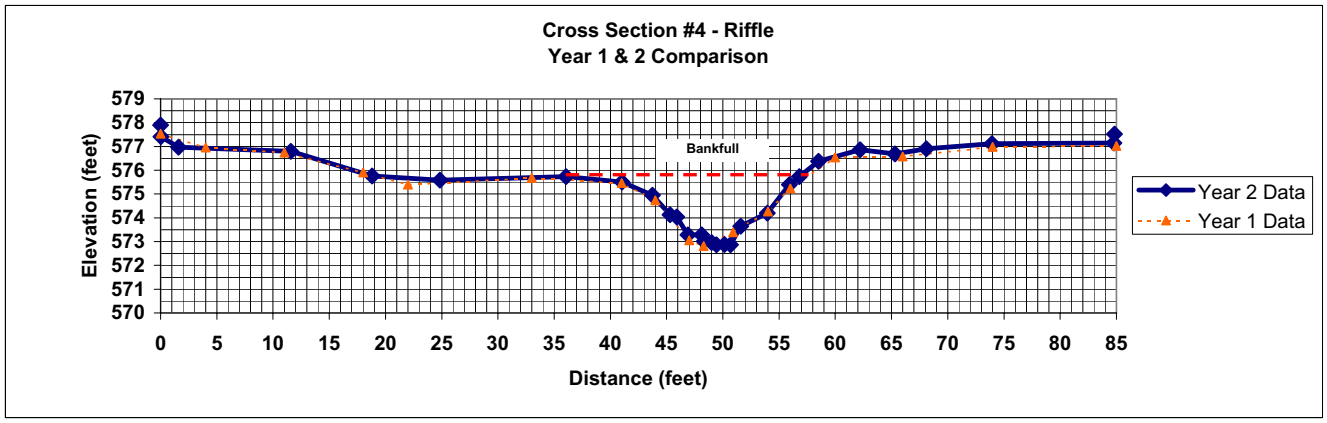
STREAM CROSS-SECTIONS

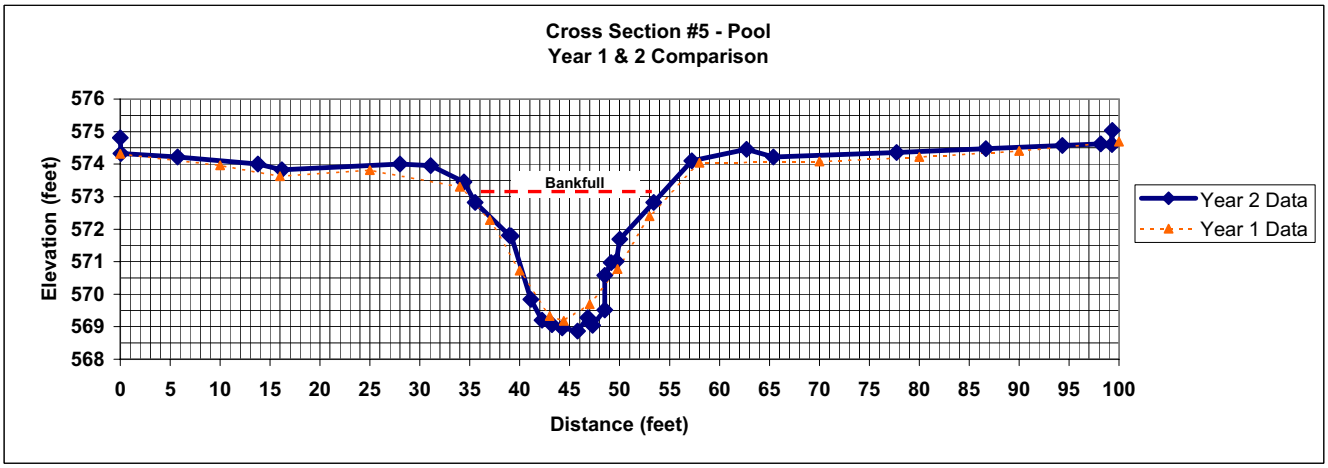


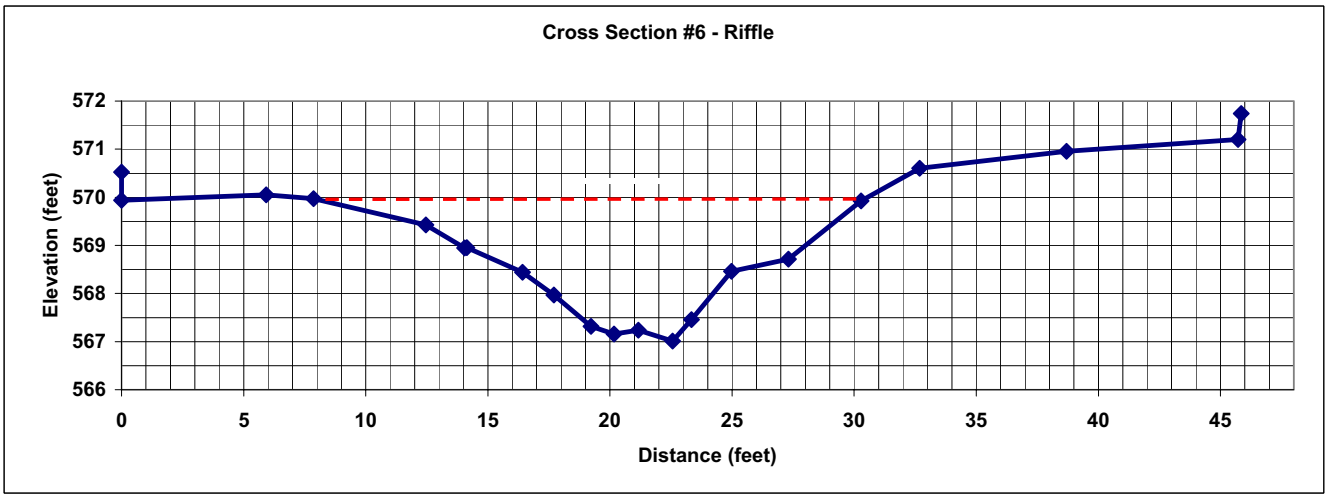




* Cross Sections #2, 3 & 6 installed this year (Year 2). Therefore, there is no Year 1 data to compare.







* Cross Sections #2, 3 & 6 installed this year (Year 2). Therefore, there is no Year 1 data to compare.

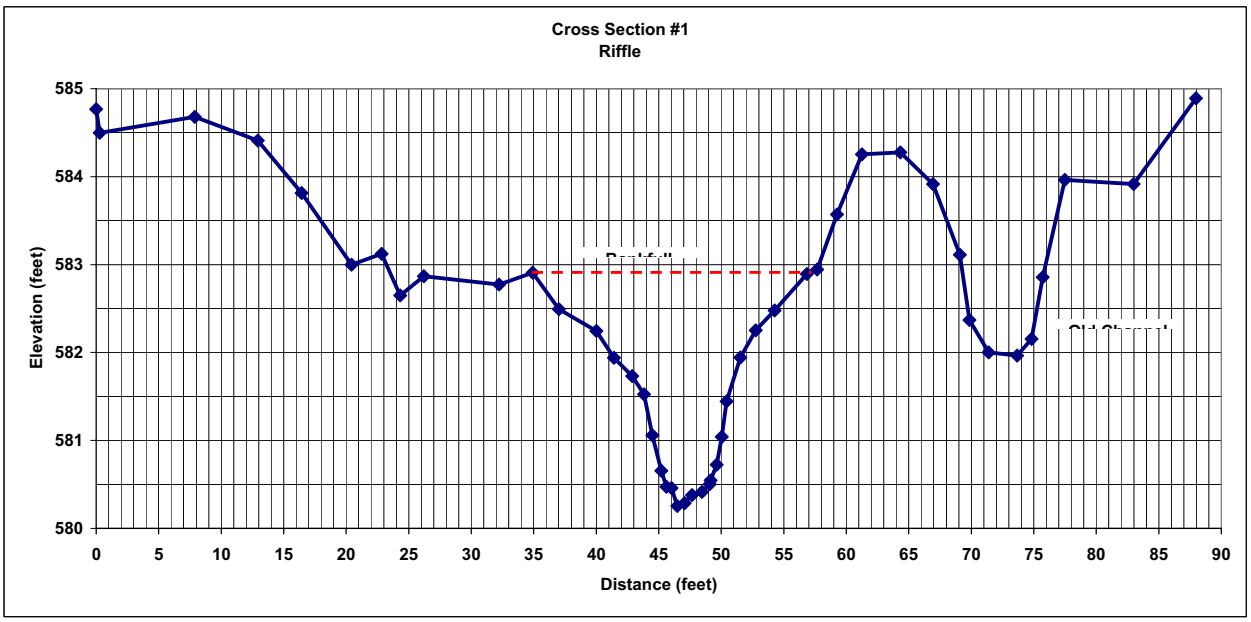
Reedy Branch
Monitoring Year 2
Alamance County, NC

Field Crew:Wyatt Y., John P., David G.
River Basin: Cape Fear
Watershed: Reedy Branch
Stream Reach: Reedy Branch
Drainage Area: 1.6 sq. miles
Date: July, 2006
Station: 11+35.33
Feature: Riffle

STATION (Feet)	ELEVATION (Feet)	NOTES
0.00	584.77	
0.28	584.50	
7.88	584.68	
12.94	584.41	
16.42	583.81	
20.43	583.00	
22.83	583.12	
24.33	582.65	
26.20	582.87	
32.22	582.77	
34.90	582.91	lbkf / ltob
37.02	582.49	
40.02	582.24	
41.42	581.94	
42.87	581.73	
43.82	581.52	
44.49	581.06	
45.21	580.66	
45.60	580.47	
46.03	580.46	
46.48	580.25	
47.07	580.29	
47.66	580.38	
48.45	580.41	
49.06	580.50	
49.14	580.55	
49.63	580.72	
50.05	581.04	
50.43	581.45	
51.52	581.94	
52.76	582.25	
54.28	582.48	
56.84	582.89	rbkf / rtob
57.66	582.95	
59.25	583.57	
61.27	584.25	
64.33	584.27	
66.95	583.92	
69.08	583.11	
69.86	582.37	
71.39	582.00	
73.68	581.96	
74.81	582.16	
75.72	582.86	
77.49	583.96	
82.98	583.91	
87.99	584.89	

	Bankfull Hydraulic Geometry		
	Width (Feet)	Depth (Feet)	Area (Sq. Ft.)
	0.0	0.0	0.0
	2.1	0.4	0.4
	3.0	0.7	1.6
	1.4	1.0	1.1
	1.4	1.2	1.6
	0.9	1.4	1.2
	0.7	1.8	1.1
	0.7	2.3	1.5
	0.4	2.4	0.9
	0.4	2.5	1.0
	0.5	2.7	1.2
	0.6	2.6	1.6
	0.6	2.5	1.5
	0.8	2.5	2.0
	0.6	2.4	1.5
	0.1	2.4	0.2
	0.5	2.2	1.1
	0.4	1.9	0.9
	0.4	1.5	0.6
	1.1	1.0	1.3
	1.2	0.7	1.0
	1.5	0.4	0.8
	2.6	0.0	0.6
TOTALS	21.9		24.7

SUMMARY DATA (BANKFULL)			
A(BKF)	24.7	W(FPA)	>88
W(BKF)	21.9	Slope	0.004
Max d	2.7	Sinuosity	1.21
Mean d	1.1	Area=	A
W/D	19.5	Width=	W
Entrenchment	>4.0	Depth=	D
Stream Type	C	Bankfull=	BKF
Area from Rural Regional Curve			30.1



Reedy Branch
Monitoring Year 2
Alamance County, NC

Field Crew: Wyatt Y. & David G.
River Basin: Cape Fear
Watershed: Reedy Branch
Stream Reach: Reedy Branch
Drainage Area: 1.6 sq. miles
Date: July 2006
Station: 22+41.18
Feature: Pool

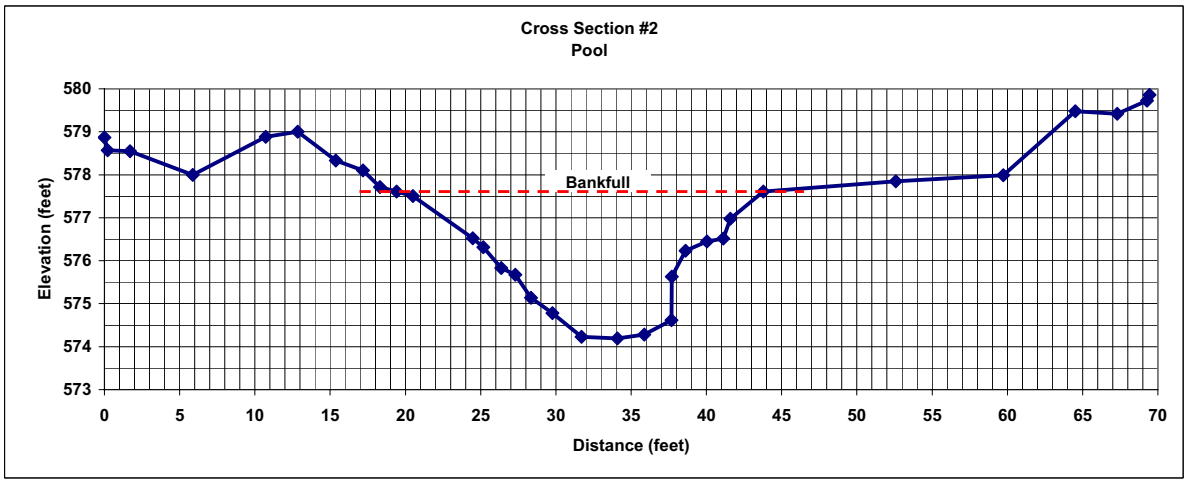
STATION (Feet)	ELEVATION (Feet)	NOTES
0.00	578.87	
0.22	578.57	
1.69	578.55	
5.87	578.00	
10.72	578.88	
12.85	579.00	
15.37	578.33	
17.18	578.10	
18.31	577.72	
19.405	577.61	lbkf(int)/ltob
20.50	577.50	
24.48	576.52	
25.19	576.32	
26.38	575.83	
27.30	575.67	
28.35	575.14	
29.77	574.78	
31.70	574.23	
34.09	574.19	
35.88	574.28	
37.69	574.62	
37.69	575.63	
38.61	576.23	
40.04	576.44	
41.13	576.52	
41.60	576.98	
43.78	577.61	rbkf/rtb
52.59	577.85	
59.72	577.99	
64.51	579.48	
67.30	579.42	
69.28	579.73	
69.44	579.86	

Bankfull/Top of Bank Hydraulic Geometry

	Width (Feet)	Depth (Feet)	Area (Sq. Ft.)
	0.0	0.0	0.0
	1.1	0.1	0.1
	4.0	1.1	2.4
	0.7	1.3	0.8
	1.2	1.8	1.8
	0.9	1.9	1.7
	1.0	2.5	2.3
	1.4	2.8	3.8
	1.9	3.4	6.0
	2.4	3.4	8.2
	1.8	3.3	6.0
	1.8	3.0	5.7
	0.0	2.0	0.0
	0.9	1.4	1.6
	1.4	1.2	1.8
	1.1	1.1	1.2
	0.5	0.6	0.4
	2.2	0.0	0.7
TOTALS	24.4		44.5

SUMMARY DATA (TOB)

A(BKF)	44.5
W(BKF)	24.4
Max d	3.4
Mean d	1.8



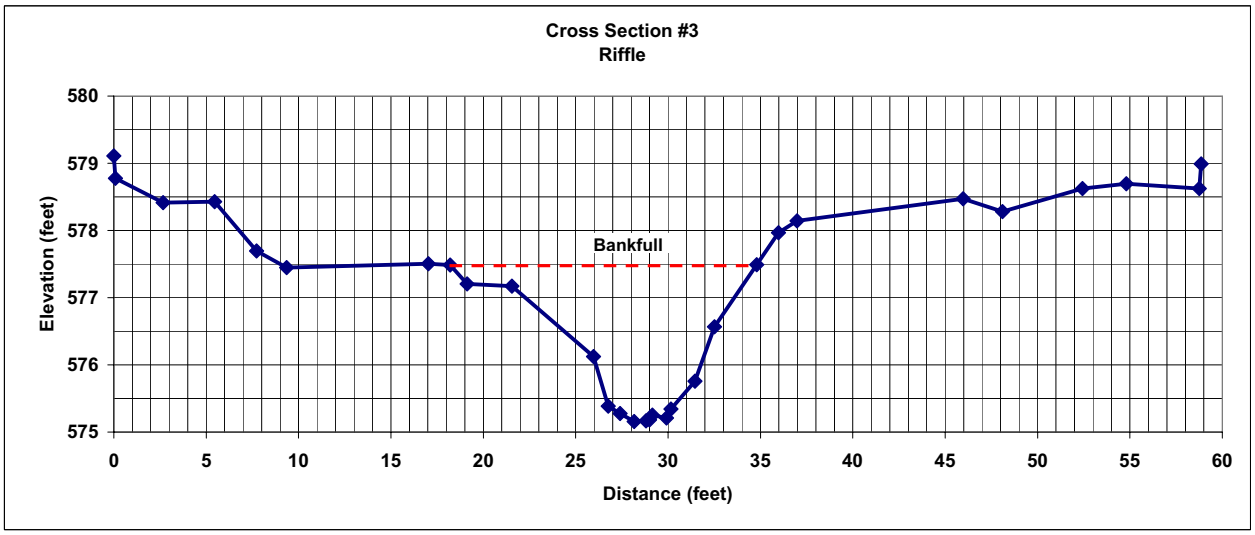
Reedy Branch
Monitoring Year 2
Alamance County, NC

Field Crew: Wyatt Y. & David G.
River Basin: Cape Fear
Watershed: Reedy Branch
Stream Reach: Reedy Branch
Drainage Area: 1.6 sq. miles
Date: July 2006
Station: 22+86.06
Feature: Riffle

STATION (Feet)	HI (Feet)	NOTES
0.00	579.11	
0.08	578.78	
2.67	578.41	
5.45	578.43	
7.73	577.70	
9.35	577.45	
17.03	577.51	
18.21	577.49	lbkf/ltob
19.12	577.21	
21.55	577.17	
25.97	576.12	
26.75	575.39	
27.41	575.28	
28.16	575.16	
28.80	575.17	
29.00	575.18	
29.15	575.25	
29.91	575.21	
30.15	575.34	
31.45	575.76	
32.50	576.57	
34.79	577.49	rbkf(int)/rtob
35.98	577.97	
36.98	578.14	
45.97	578.47	
48.10	578.28	
52.44	578.63	
54.80	578.70	
58.75	578.62	
58.86	578.99	

	Bankfull/TOB Hydraulic Geometry		
	Width (Feet)	Depth (Feet)	Area (Sq. Ft.)
	0.0	0.0	0.0
	0.9	0.3	0.1
	2.4	0.3	0.7
	4.4	1.4	3.7
	0.8	2.1	1.4
	0.7	2.2	1.4
	0.8	2.3	1.7
	0.6	2.3	1.5
	0.2	2.3	0.5
	0.2	2.2	0.4
	0.8	2.3	1.7
	0.2	2.1	0.5
	1.3	1.7	2.5
	1.1	0.9	1.4
	2.3	0.0	1.0
TOTALS	16.6		18.5

SUMMARY DATA (BANKFULL)			
A(BKF)	18.5	W(FPA)	>59
W(BKF)	16.6	Slope	0.004
Max d	2.3	Sinuosity	1.21
Mean d	1.1	Area=	A
W/D	14.8	Width=	W
Entrenchment	>3.6	Depth=	D
Stream Type	C	Bankfull=	BKF
Area from Rural Regional Curve			30.1



Reedy Branch
Monitoring Year 2
Alamance County, NC

Field Crew: Wyatt Y. & David G.
River Basin: Cape Fear
Watershed: Reedy Branch
Stream Reach: Reedy Branch
Drainage Area: 1.6 sq. miles
Date: July 2006
Station: 25+84.85
Feature: Riffle

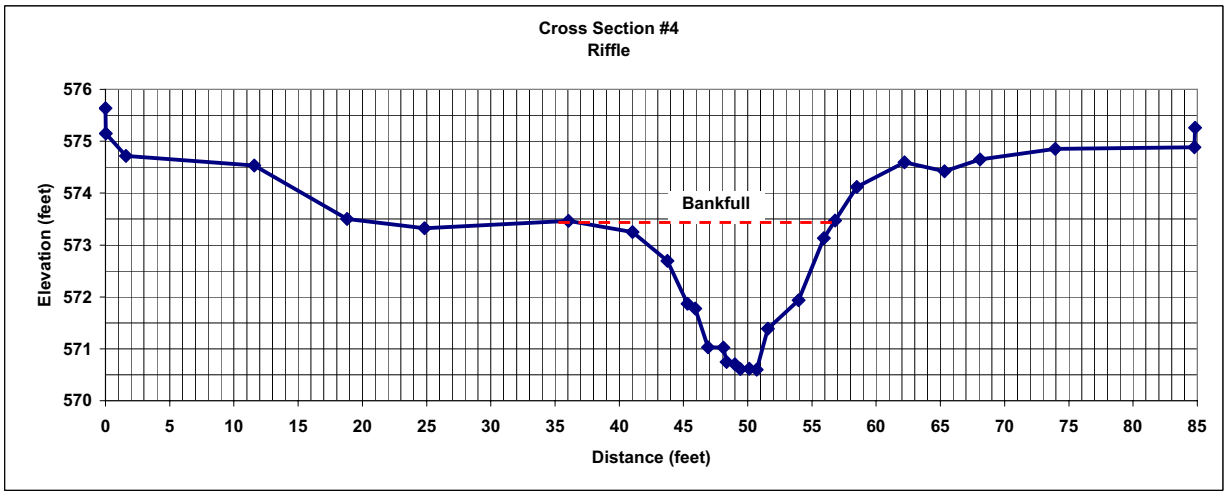
STATION (Feet)	HI (Feet)	NOTES
0.00	575.63	
0.03	575.15	
1.60	574.71	
11.59	574.53	
18.81	573.50	
24.83	573.32	
36.06	573.47	lbkf
41.04	573.25	
43.75	572.69	
45.31	571.87	
45.91	571.78	
46.91	571.03	
48.11	571.02	
48.35	570.75	
49.01	570.70	
49.43	570.61	
50.13	570.61	
50.69	570.60	
51.58	571.39	
53.96	571.94	
55.92	573.13	
56.81	573.47	rbkf(int)
58.50	574.12	
62.21	574.59	
65.32	574.42	
68.09	574.65	
73.93	574.86	
84.78	574.88	
84.83	575.26	

Bankfull/TOB Hydraulic Geometry

	Width (Feet)	Depth (Feet)	Area (Sq. Ft.)
	0.0	0.0	0.0
	5.0	0.2	0.5
	2.7	0.8	1.3
	1.6	1.6	1.8
	0.6	1.7	1.0
	1.0	2.4	2.1
	1.2	2.4	2.9
	0.2	2.7	0.6
	0.7	2.8	1.8
	0.4	2.9	1.2
	0.7	2.9	2.0
	0.6	2.9	1.6
	0.9	2.1	2.2
	2.4	1.5	4.3
	2.0	0.3	1.8
	0.9	0.0	0.1
TOTALS	20.8		25.4

SUMMARY DATA (BANKFULL)

A(BKF)	25.4	W(FPA)	>85
W(BKF)	20.8	Slope	0.004
Max d	2.9	Sinuosity	1.21
Mean d	1.2	Area=	A
W/D	17.0	Width=	W
Entrenchment	>4.0	Depth=	D
Stream Type	C	Bankfull=	BKF
Area from Rural Regional Curve			30.1



Reedy Branch
Monitoring Year 2
Alamance County, NC

Field Crew: Wyatt Y. & David G.
River Basin: Cape Fear
Watershed: Reedy Branch
Stream Reach: Reedy Branch
Drainage Area: 1.6 sq. miles
Date: July 2006
Station: 37+71.66
Feature: Pool

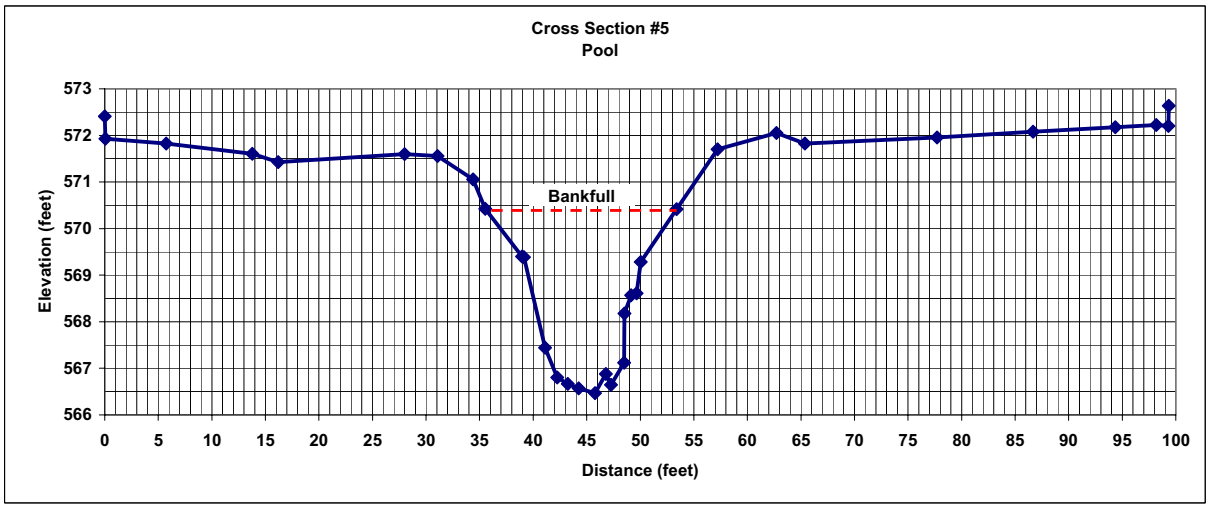
STATION (Feet)	ELEVATION (Feet)	NOTES
0.00	572.41	
0.06	571.93	
5.75	571.82	
13.76	571.60	
16.19	571.43	
27.99	571.60	
31.07	571.55	
34.40	571.05	
35.53	570.42	lbkf/ltob
38.96	569.40	
39.15	569.39	
41.11	567.44	
42.25	566.80	
43.22	566.67	
44.25	566.57	
45.78	566.47	
46.80	566.88	
47.28	566.65	
48.50	567.12	
48.52	568.17	
49.14	568.57	
49.66	568.61	
50.03	569.29	
53.4	570.42	rbkf(int)/rtob
57.23	571.70	
62.70	572.05	
65.38	571.82	
77.72	571.95	
86.66	572.08	
94.34	572.18	
98.18	572.23	
99.30	572.20	
99.34	572.64	

Bankfull/Top of Bank Hydraulic Geometry

	Width (Feet)	Depth (Feet)	Area (Sq. Ft.)
	0.0	0.0	0.0
	3.4	1.0	1.7
	0.2	1.0	0.2
	2.0	3.0	3.9
	1.1	3.6	3.7
	1.0	3.8	3.6
	1.0	3.9	3.9
	1.5	4.0	6.0
	1.0	3.5	3.8
	0.5	3.8	1.8
	1.2	3.3	4.3
	0.0	2.3	0.1
	0.6	1.9	1.3
	0.5	1.8	1.0
	0.4	1.1	0.5
	3.4	0.0	1.9
TOTALS	17.9		37.8

SUMMARY DATA (TOB)

A(BKF)	37.8
W(BKF)	17.9
Max d	4.0
Mean d	2.1



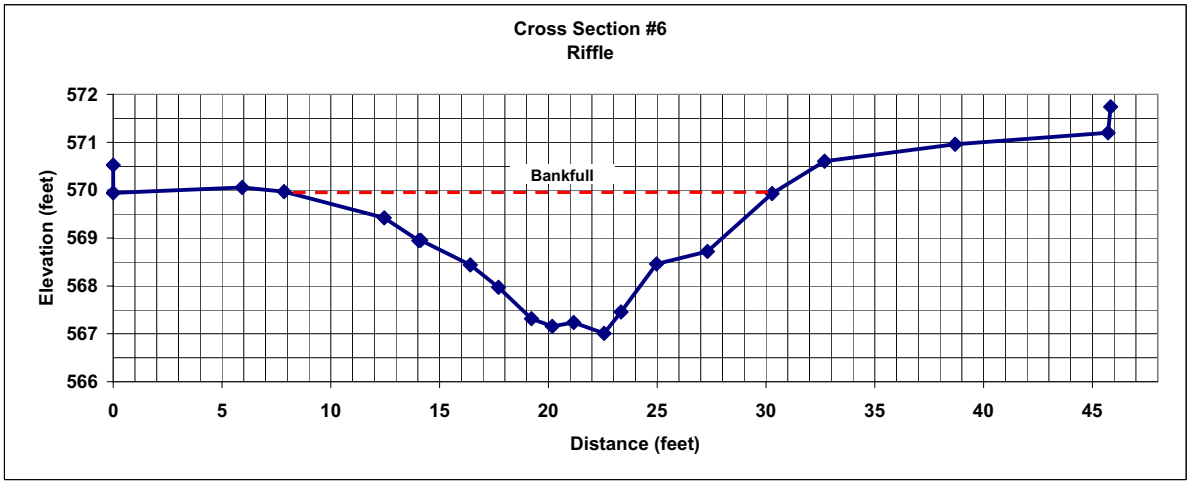
Reedy Branch
Monitoring Year 2
Alamance County, NC

Field Crew: Wyatt Y. & Amanda W.
River Basin: Cape Fear
Watershed: Reedy Branch
Stream Reach: Reedy Branch
Drainage Area: 1.6 sq. miles
Date: July 2006
Station: 39+68.21
Feature: Riffle

STATION (Feet)	HI (Feet)	NOTES
0.00	570.52	
0.00	569.94	
5.93	570.05	
7.86	569.97	lbkf/ltob
12.46	569.42	
14.05	568.95	
14.14	568.95	
16.41	568.44	
17.71	567.97	
19.23	567.32	
20.17	567.16	
21.16	567.24	
22.56	567.01	
23.34	567.46	
24.97	568.46	
27.30	568.72	
30.28	569.93	rbkf/rtob
32.68	570.60	
38.69	570.96	
45.72	571.20	
45.84	571.74	

Bankfull/TOB Hydraulic Geometry		
Width (Feet)	Depth (Feet)	Area (Sq. Ft.)
0.0	0.0	0.0
4.6	0.5	1.3
1.6	1.0	1.2
0.1	1.0	0.1
2.3	1.5	2.9
1.3	2.0	2.3
1.5	2.7	3.5
0.9	2.8	2.6
1.0	2.7	2.7
1.4	3.0	4.0
0.8	2.5	2.1
1.6	1.5	3.3
2.3	1.3	3.2
3.0	0.0	1.9
TOTALS 22.4		31.2

SUMMARY DATA (BANKFULL)			
A(BKF)	31.2	W(FPA)	>46
W(BKF)	22.4	Slope	0.004
Max d	3.0	Sinuosity	1.21
Mean d	1.4	Area= A	
W/D	16.1	Width= W	
Entrenchment	>2.1	Depth= D	
Stream Type	C	Bankfull= BKF	
Area from Rural Regional Curve			30.1



APPENDIX B5

STREAM LONGITUDINAL PROFILE

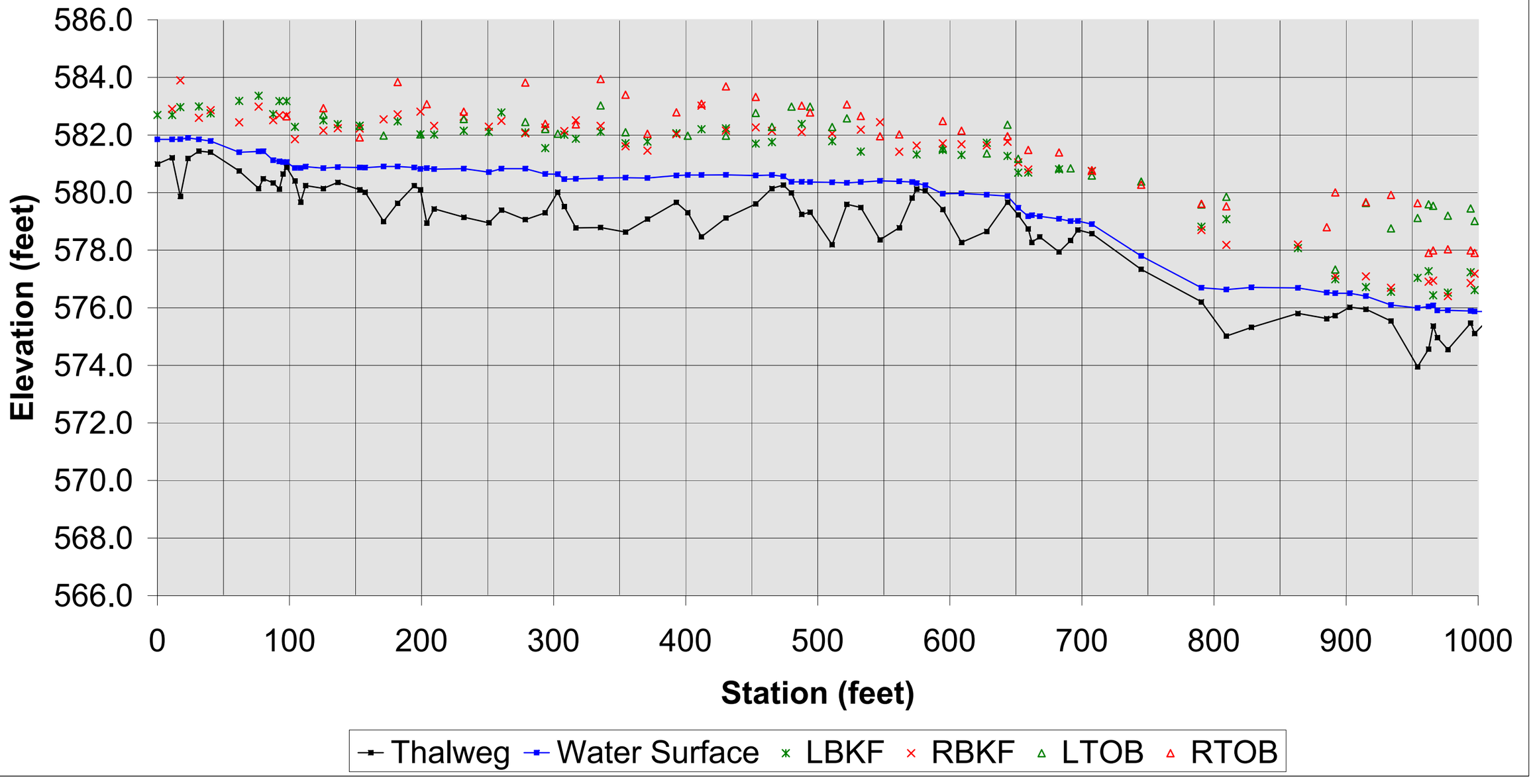
Field Crew: Wyatt Yelverton & David Godley
River Basin: Cape Fear
Stream Reach: Reedy Branch
Draiange Area: 1.6 Sq. Miles
Date: July 2006
Description: Longitudinal Profile

Station	TW	WS (FS)	LBKF (FS)	RBKF (FS)	LTOB (FS)	RTOB (FS)	Notes	Bk Ht/ Bkf Ht.	P-P	Pool Length	Max Pool Depth	Pool Slope	Riffle Length	Riffle Slope	Glide Length	Glide Slope	Run Length	Run Slope
0.0	580.9923537	581.8491924	582.6941635															
11.1	581.2137877	581.8468321	582.6941635	582.9065005			hp		50.8	12.1		0.0000						
17.3	579.8729355	581.8522504	582.9695078	583.8959029			mp				4.02							
23.2	581.1857587	581.8983592					hg								17	0.0065		
31.4	581.4379607	581.8442779	582.9886083	582.5985238			im											
40.3	581.398743	581.7867044	582.7518277	582.8603196			hr						22	0.0180				
61.9	580.746809	581.3979201	583.1815852	582.4374633			hp		25.8	18		0.0000						
76.7	580.1433052	581.4272997	583.3607398	582.9828765			mp				3.22							
80.2	580.4835451	581.4355898					hr						8	0.0423				
87.7	580.3359759	581.1185281	582.722763	582.5152986			hp		16.4	7		0.0082						
92.4	580.1267614	581.0811135	583.1778426	582.6835763			mp				3.05							
95.1	580.6523852	581.0579587					hg								3	0.0000		
97.8	580.8741295	581.0579587	583.1778426	582.6835763		582.6494	hr	1.00					6.30	0.0327				
104.1	580.4011568	580.8518219	582.2806078	581.854814			hp		53.1	8.10		0.0000						
108.5	579.6695451	580.8534769					mp											
112.2	580.2415132	580.9022806					hr						45.0	0.0009				
125.7	580.1452661	580.8466991	582.5085668	582.1516669	582.7068	582.9306	im	1.00										
136.5	580.3559099	580.8826168	582.3744747	582.2359049			im											
153.1	580.0977628	580.8729259	582.3224465	582.2258035	582.3125	581.9139	im	1.00										
157.2	580.015073	580.8632244					hp		42.0	42		0.0011						
171.3	579.0020553	580.9059801		582.5460381	581.9817		mp	1.00			3.54							
181.9	579.6346473	580.9033746	582.4765419	582.7159739		583.8381	im	1.00										
194.4	580.2351096	580.8722					im											
199.2	580.0970901	580.818322	582.0189066	582.8134655	582.0189066		hp	1.00	108.9	104		0.0018						
203.9	578.9408049	580.8461121				583.0732	mp	1.00			4.13							
209.5	579.4348037	580.8139077	582.0168319	582.3192703			im											
232.0	579.1434291	580.8283669	582.1469009	582.6391653	582.5529	582.8126	im	1.00										
250.9	578.9507188	580.7106591	582.1053473	582.2884227			im											
260.5	579.3888908	580.8313703	582.7822442	582.4919448			im											
278.6	579.0571212	580.8280361	582.0903121	582.054167	582.4536	583.8205	im	1.00			1.80							
293.7	579.2971733	580.642276	581.546417	582.2594436	582.2077	582.3879	im	1.00										
303.1	580.0194573	580.6362106			582.0453		hr	1.00					5.0	0.0341				
308.1	579.5106047	580.4659014	582.0078181	582.136453			hp		172.0	122.4		0.0000						
316.8	578.7741027	580.473045	581.868581	582.5072038		582.3677	im	1.00										
335.6	578.7836342	580.5061083	582.1155158	582.3170636	583.0283	583.9455	im	1.00										
354.5	578.6276491	580.5141827	581.71061	581.6099493	582.0968	583.3981	im	1.00										
371.1	579.0749007	580.5026824	581.7696498	581.4567431		582.0439	im	1.00										
392.9	579.6580294	580.5912664	582.0611286	582.0267695		582.7868	im	1.00			2.40							
401.6	579.3098167	580.6103771			581.9734		im											
412.0	578.4682045	580.610505	582.1988934	583.0180988		583.0832	mp	1.00			4.55							
430.5	579.1171062	580.6147503	582.2288282	582.1561224	581.9734	583.6862	hg	1.00							43	0.0012		
453.0	579.6027033	580.58967	581.70007	582.2646953	582.7643	583.322	im	1.00										
465.3	580.1454925	580.61088	581.7539152	582.1426869	582.2825		im	1.00										
473.9	580.2619438	580.5613977					hr						6	0.0308				
480.1	579.986307	580.3701687			582.9869		hp		52.4	42.0		0.0008						
487.8	579.2401143	580.3727	582.3800136	582.1032479		583.022	im	1.00										
494.2	579.3173249	580.368178			582.9824	582.7825	im											
510.9	578.1869299	580.3563786	581.7801487	582.0507088	582.2792		mp	1.00			3.86							
522.1	579.5910344	580.336837			582.5781	583.0627	hr						10.4	0.0000				
532.5	579.48508	580.3652715	581.4198386	582.1812348		582.6573	hp	1.00	62.1	49.0		0.0023						
547.1	578.3609752	580.4083452		582.4456499		581.9555	mp	1.00			4.08							
561.7	578.7810387	580.3910433		581.4188298		582.0199	im	1.00										
571.4	579.8113116	580.364464					im											
574.9	580.1255807	580.3256574	581.3228861	581.6323509			im											
581.5	580.0686703	580.2525919					hr						13.1	0.0223				
594.6	579.4208173	579.9610557	581.481948	581.7083935	581.5291	582.4873	hp	1.00	64.7	49.0		0.0017						
608.8	578.2658466	579.9720312	581.3040479	581.6798082		582.1511	mp	1.00			3.41							
627.9	578.6491783	579.9265905	581.7328598	581.6371997	581.3572		im	1.00										
643.6	579.6667618	579.8799694	581.2695	581.76271	582.3572	581.9569	hr	1.00					15.7	0.0448				
651.8	579.2182128	579.4682372	580.6915355	581.051155	581.1723		im	1.00										
659.3	578.7411185	579.1767911	580.6975991	580.8001615		581.4827	hp	1.00	131.2	37.7		0.0043						
662.1	578.2730261	579.2081036					im											
668.1	578.4572025	579.173265					im											
682.7	577.9400599	579.088497	580.8042497		580.8426	581.3945	mp	1.00			2.86							
691.4	578.3350226	579.0078324			580.8426		im											
697.0	578.7022446	579.0144277					hr						94	0.0248				
707.5	578.5759541	578.899612	580.7497231	580.7430527	580.593	580.7753	im	1.00										
744.9	577.3329246	577.795819			580.3827	580.2716	im											
790.5	576.2090063	576.6918505	578.8138434	578.6982186	579.5881	579.6112	hp	1.00	143.5	124.5		0.0023						
809.3	575.0142378	576.6288729	579.07496	578.183133	579.8533	579.5226	mp	1.00			4.06							
828.3	575.3200548	576.7050468					im											
863.6	575.8067489	576.6895078	578.0708333	578.1908947			im											
885.4	575.6255755	576.5274161				578.7976	im											
891.8	575.7299514	576.5031516	576.9918129	577.1127647	577.3264168	580.0078282	im	1.00										
902.9	576.0189911	576.5050437					im											
915.0	575.9501087	576.404379	576.7173057	577.0918879	579.6420067	579.6656744	hr	1.00					19.0	0.0163				
934.0	575.540265	576.0949749	576.5550365	576.69516	578.7557573	579.9161573	hp	1.00	35.1	28.5		0.0018						
954.1	573.94961	575.9899363	577.0372943		579.1149529	579.634834	mp	1.00			3.09							
962.5	574.5645	576.0441266	577.2716213	576.9056038	579.5916154	577.9019216	hg	1.00							3	-0.0100		
965.9	575.3706519	576.0781526	576.4351142	576.9420287	579.5430579	577.9870775	hr	1.00					3.2	0.0545				
969.1	574.9655591	575.9037914					hp		78.0	70.0		0.0039						
977.1	574.548127	575.9078077	576.5255543	576.4041986	579.1989399	578.0329575	mp	1.00			1.98							
994.3	575.4652217	575.8859437	577.2325613	576.8549717	579.4459685	577.9898216	im	1.00										
997.4	575.1001525	575.8700426	576.6106603	577.1817698	579.0106452	577.9005423	im	1.00										
1007.5	575.582967	575.8673078					im											
1026.3	575.0867503	575.8224482	576.7027395	576.6159298	579.045938	577.7815019	im	1.00										
1035.5	574.8660389	575.7191462		576.6679174	579.0077846	577.5452864	im	1.00										
1039.1	575.1187978	575.6342516	576.4980727	577.2307108	578.870692	577.231324	hr	1.00					8	0.0067				
1047.1	575.0372154	575.5807082					hp		19.2	3.9		0.0000						
1049.7	574.7255567	575.5986253	576.6355828	576.2384369	578.2845557	577.1544678	mp	1.00			1.91							
1051	575.1783851	575.5860037					hg								3.7	0.0033		
1054.7	575.3642344	575.5736301					hr						11.6	0.0075				
1066.3	575.1879594	575.4869465					hp		157.6	152.4		0.0001						
1074.1	574.4445405	575.4956465	576.6985206	576.4736679	577.6301233	579.2216083	mp	1.00										
1087.8	574.8772177	575.4915856					im											
1094.9	574.3181266	575.4897821	576.6402109	576.7528657	578.718749	579.441469	im	1.00										
1111.9	574.2862473	575.486869					im											
1115.5	574.2627753	575.4886158					im											
1134.8	574.2829206	575.4511654	576.5083407	576.3467898	577.9836134	578.7645954	im	1.00										
1148.9	574.4642007	575.5041673	576.2353069	576.5035468	577.4814258	578.650031	im	1.00										
1154.6	574.5645711	575.47266	576.8960213	576.338199	577.639246	578.6098488	im	1.00										
1179.3	574.0518083	575.4573906	576.3688618	576.2595811	577.532417	578.9303237	im	1.00										
1189.9	573.6656877	575.4752228	575.9646044		579.2712878	579.7064	mp	1.01			2.30							
1194.4	574.5262008	575.4598148	577.0356769	576.7087483	579.2152533	578.5793082	im	1.00										
1202.3	574.3007233	575.4787932					im											
1215.3	574.8346681	575.4672126	577.0745641	576.4421772	578.9381687	578.1656615	im	1.00										
1218.7	574.8521474	575.4744659					hr						5.2	0.0074				
1219.7	574.5413419	575.445594	576.7952795	576.6446329	577.6482261	579.5008521	im	1.00										
1223.9	574.654927	575.4362049					hp		119.6	69.6		0.0001						
1258.8	573.9707274	575.4432262	577.0549792	576.2881909	577.69433	578.8007591	mp	1.00			3.08							
1268.9	574.322047	575.4616647	576.3706233	576.3308167	577.3965499	577.9646855	im	1.00										
1277	574.7291452	575.4075939	576.8695217	576.8785518	577.3230307	577.6346638	im	1.00										
1282.7	574.8349745	575.4299566					im											
1293.5	575.2606211	575.4311503	576.4689546	576.9839442	577.5255374	578.1875796	hr	1.00					50	0.0033				
1311.2	574.9373852	575.2730237	576.6989133	576.2420609	577.6916436	577.8697881	im	1.00										
1319.3	574.8344288	575.2545428	576.3330453	576.1284475	577.3383646	578.3705589	im	1.00										
1327.4	574.9608321	575.2393575	576.4372005	576.3384425	577.0792869	578.395306	im	1.00										
1343.5	574.5507091	575.2642346					hp		54.8	13.9		0.0024						
1351.7	573.634188	575.2584978	576.4149343	576.6843023	576.7951344	578.3954087	mp	1.00			3.05							
1357.4	574.3766731	575.2308814	576.0241697	576.503192	576.9784171	578.3417167	hg	1.00							21.8	-0.0016		
1379.2	574.9516056	575.2664981					hr						19.1	0.0511				
1388.2	574.6491845	574.8675121	576.1278623	575.2762384	577.2355688	577.9611511	im	1.00										
1398.3	573.9939947	574.2907332					hp		155.3	155.3		0.0008						
1411.7	572.7248181	574.3146341	575.4360733		576.8086059	578.1521481	mp	1.00			2.71							
1416.1	573.6407707	574.2997731	575.9798823	575.4204184	576.624672	577.4888675	im	1.00										
1422.9	573.9396807	574.3107639	576.0330635	575.662887	576.408836	576.876902	im	1.00										
1428.9	573.8925008	574.2948797					im											
1431.8	573.5983921	574.2836099	575.5588121	575.3082274	576.5812139	576.8411659	im	1.00										
1437.9	572.6954527	574.2431356					im											
1451.7	573.377216	574.2225547	575.4176809	575.3994898	576.8055614	576.7857827	im	1.00										
1464	573.1601286	574.236945	575.6702043	575.488747	578.4787473	577.0806893	im	1.00										
1486.3	572.6717373	574.2124656	575.5459823	575.2658246	577.5190013	577.0089727	im	1.00										
1505.8	573.7149554	574.2500277	575.081701	575.0333287	577.0909694	576.8463083	im	1.00										
1514.2	573.6125369	574.2433749	575.1303174	575.2430285	576.243724	577.4697291	im	1.00										
1547.5	572.6056617	574.1877325	575.5957446	575.173336	576.1740729	578.1987033	mp	1.00			2.99							
1552.3	573.3742264	574.2108913	574.6479572	575.4510384	576.0499739	578.6596811	im	1.00										
1553.6	573.9142368	574.1637607					hp		725.6	46.7		0.0067						
1555.7	573.1569068	573.8522091					im											
1562.5	572.7188345	573.8464812	575.2517047	575.3295445	576.109799	578.4907805	mp	1.00			2.61							
1573.7	573.298963	573.8363685	575.8794589	575.5306924	576.3267984	578.1406657	im	1.00										
1579.3	573.0886003	573.8604424					im											
1600.3	573.5623915	573.8525821	575.339601	575.9089	576.2722545	577.4136128	hr	1.00					4.6	0.0438				
1604.9	573.2410952	573.6509495	575.0931631	574.4094043	576.2186187	576.7020256	hrun	1.00									660.9	0.0017
1615.6	572.8428353	573.6841073					im											
1645.3	573.2152728	573.658632	574.7989401	574.8838831	577.7591457	576.4043	im	1.01										
1671.4	572.950376	573.6651151	574.8170344	574.7879205	578.4062725	576.3422092	im	1.01										
1685	572.6248423	573.6429983	574.8171222	574.4969496	578.0090304	577.6754813	im	1.01										
1687.7	572.8422633	573.5606655	574.8949022	574.8036927	576.2677267	576.981014	im	1.00										
1691.1	572.9546106	573.5510023					im											
1702.4	572.6806135	573.5579912	575.1372055	575.1144929	576.4588332	576.9654277	im	1.00										
1707.9	573.1458909	573.5245932	575.4349453	574.9342209	576.1122491	577.2906577	im	1.00										
1712.1	573.2900622	573.5813728					im											

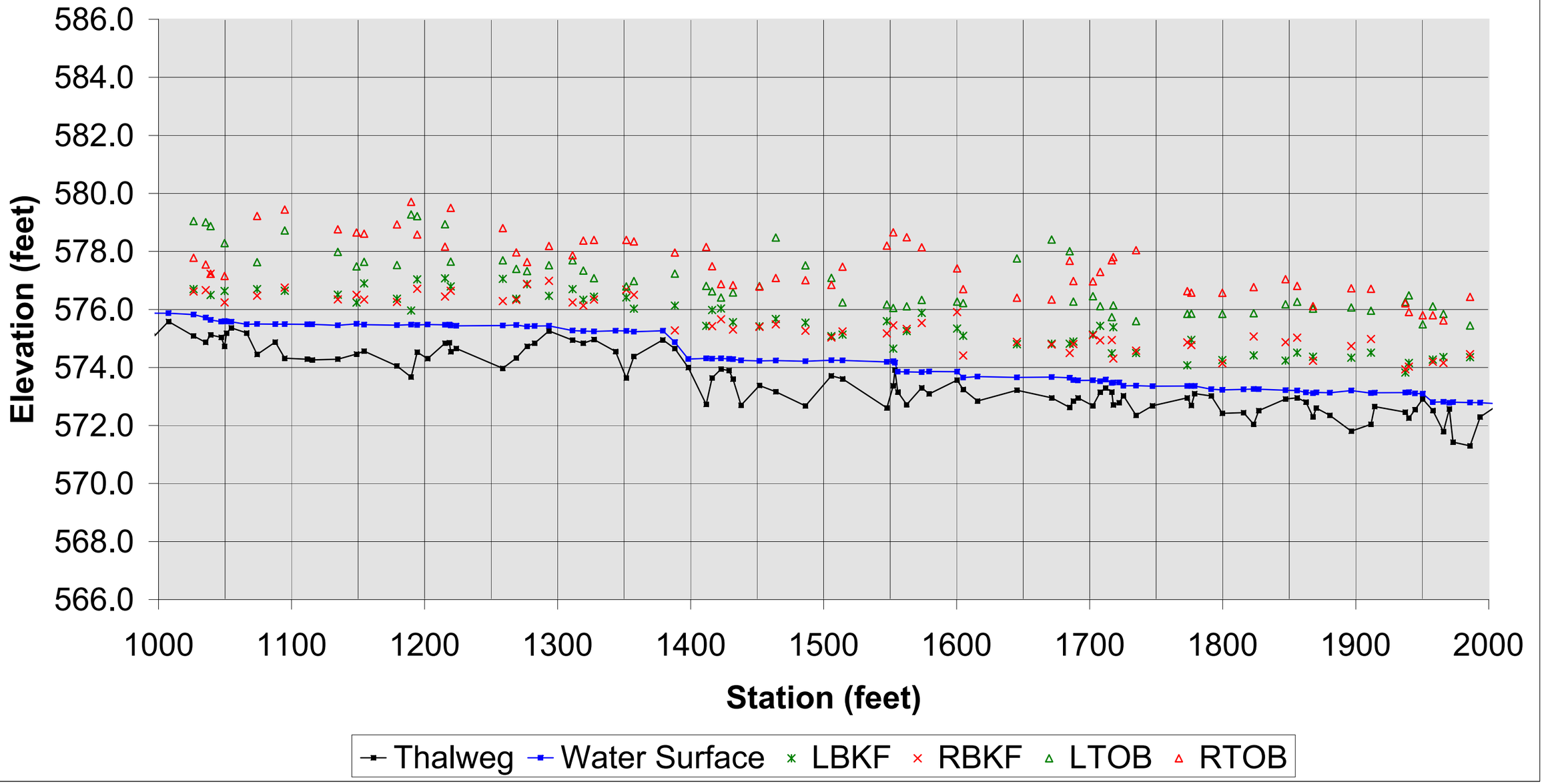
1716.6	573.1552254	573.4656458	574.4842683	574.9472037	575.7351482	577.6919464	im	1.00														
1717.8	572.7063304	573.4747402	575.3858177	574.3068836	576.1452084	577.8036773	im	1.00														
1722.2	572.7867614	573.4797633					im															
1725.3	573.0304723	573.3649109					im															
1734.9	572.3497721	573.3700299	574.5004675	574.5794425	575.5950657	578.0416129	im	1.00														
1747.3	572.679824	573.3530502					im															
1773.4	572.9530216	573.3625548	574.0716868	574.8623831	575.844466	576.6282503	im	1.00														
1776.4	572.6845456	573.3579571	574.9516183	574.773906	575.8517218	576.5769053	im	1.00														
1778.9	573.0972711	573.3601915					im															
1791.4	573.0166646	573.2491385					im															
1799.7	572.4210912	573.2264569	574.2549543	574.1419431	575.8433045	576.5743142	im	1.00														
1815.7	572.4449268	573.2462752					im															
1823.3	572.0440908	573.2562192	574.4148331	575.0687002	575.8712493	576.767417	im	1.00														
1827.1	572.5094273	573.2514485					im															
1847.2	572.9132991	573.2171393	574.2382064	574.8686726	576.1753911	577.044163	im	1.00														
1856	572.9528976	573.2024474	574.510602	575.024459	576.2658057	576.8094856	im	1.00														
1862.5	572.8055704	573.1369973					im															
1867.9	572.2944197	573.1103797	574.3717136	574.2324403	576.0249285	576.1113849	im	1.00														
1870.4	572.5979723	573.1379057					im															
1880.5	572.3516041	573.1255385					im															
1896.6	571.8030868	573.2016288	574.3369964	574.7344819	576.0651532	576.7291646	im	1.00														
1911.4	572.0441394	573.1185249	574.5095175	574.9786545	575.9590557	576.7135214	im	1.00														
1914.3	572.6523633	573.1294004					im															
1937.3	572.4579103	573.133838	573.8256709	573.9320679	576.2561839	576.21079	im	1.00														
1940	572.2504843	573.1462962	574.15653	574.0303372	576.4833384	575.908699	im	1.00														
1944.5	572.5381697	573.104761					im															
1950.3	572.9121893	573.0946795			575.4830685	575.8005233	im															
1958	572.5176378	572.8042166	574.2740432	574.1943111	576.1055701	575.8015665	im	1.00														
1965.9	571.7923457	572.8157031	574.3597777	574.1545199	575.8457206	575.6179108	im	1.00														
1970.3	572.5677877	572.7766294					im															
1973.1	571.4274188	572.8010956					im															
1986	571.2994529	572.7898784	574.3526249	574.4559972	575.4442138	576.4334292	im	1.00														
1993.6	572.2896983	572.7832185					im															
2004.4	572.6297224	572.7554472	573.8194959	573.6067323	575.6360059	576.9928368	im	1.00														
2007.6	572.3204212	572.5544276	573.7743841	573.4316405	575.2688291	576.9280732	im	1.00														
2045.8	571.7995572	572.5994849					im															
2059	571.8902006	572.567841	573.378067	573.7414691	575.8542773	576.5324447	im	1.00														
2071.9	572.0303165	572.5627194	573.9052821	574.0595991	575.9974431	575.8887129	im	1.00														
2075.6	571.3339934	572.5658743	573.6152336	574.1731289	576.6340483	576.2552112	im	1.01														
2085.6	571.6589413	572.602175					im															
2095.9	572.1664111	572.5416357	573.5676713	573.4616994	577.7312471	576.1591501	im	1.01														
2132.5	572.2636221	572.5556248	573.388656	573.9627052	577.3119681	576.2047	im	1.01														
2170.9	572.1134087	572.5413861	574.1361643	573.2262076	576.533196	575.5589214	im	1.00														
2207.7	571.7665832	572.5462896	574.0699209	573.4035638	575.8630189	575.4450305	im	1.00														
2223.5	571.6148237	572.5078906	573.6707084	573.8927701	575.0641995	576.3161964	im	1.00														
2236.8	571.74483	572.5293127	573.3919697	573.8267633	575.1252961	576.7074461	im	1.00														
2243.8	571.9259073	572.5172215					im															
2265.8	572.2742373	572.5146593			575.0890907	576.2003493	hr						13.4	0.0486								
2279.2	571.6913871	571.8632886					hp		9.1	6.5		0.0000										
2282.2	571.4235851	571.860719	573.3350076	574.2301887	574.454171	576.1151844	mp	1.00			2.81											
2285.7	571.7630799	571.8841751					hr						2.6	0.0086								
2288.3	571.6048736	571.8618437					hp		744.9	70.5		0.0000										
2315.5	571.3879835	571.8549899	573.3983881	573.5261161	574.0830936	575.2879857	mp	1.00			2.14											
2318.7	571.4739959	571.8602319	573.5120244	572.952115	576.3582748	575.6404927	im	1.00														
2341.5	571.6422629	571.8706667					im															
2358.8	571.643601	571.8673685	573.0380701	573.2858736	576.2460134	574.7764263	hr	1.01					11.7	0.0435								
2370.5	571.2833254	571.3582017					hrun												662.7	0.0013		
2380.5	570.684995	571.3645847	572.3451129	573.0152156	576.1686565	575.3998079	im	1.01														
2387.8	571.1271204	571.3520032	572.4985089	572.6710142	576.9638468	574.458449	im	1.01														
2400.7	571.0408622	571.3453399					im															
2413.7	570.6809846	571.3404322	572.7636536	573.0477311	577.352915	575.4187041	im	1.01														
2434.6	570.9184387	571.3275963	572.9478759	572.58015	576.7140379	576.2332271	im	1.01														
2463.6	571.2328887	571.3418666					im															
2488.1	571.3230935						im															
2540.8	570.8670089	570.9794956	572.511992	572.876306	575.8913042	575.3946298	im	1.01														
2551.2	571.1254145						im															
2573.8	571.1263584		572.4741528	572.2800324	575.2737404	574.6557302	im	1.00														
2584.6	570.7696066	571.1584325	572.528286	572.3607954	575.2256613	574.5185263	im	1.00														
2602.3	570.9296286	571.1241786			575.033702	574.3293088	im															
2607.3	571.4761437				575.2822819	574.8267667	im															
2620.9	571.2381001		572.6018299	572.4763646	575.608607	574.6269542	im	1.01														
2648.7	570.4090876	570.9766119	572.07731	572.380674	574.4891122	574.7361919	im	1.00														
2684.6	570.8587932		571.9859001	571.9774893	574.8779589	574.2720891	im	1.01														
2719.4	570.3481072	570.8879793	571.8216506	571.7569449	575.0675931	574.9368968	im	1.01														
2726.2	569.9725589	570.8767349	572.0713286	571.8323497	573.9888671	574.9375823	im	1.00														
2760.4	569.8063361	570.8704827	571.9776858	571.8057603	574.0232179	574.7085458	im	1.00														
2768.8	570.5505432	570.8814604	571.56383	571.7508464	573.9626871	574.4879342	im	1.00														
2778.8	570.3627948	570.8627559					im															
2790.6	570.2095577	570.8667422					im															
2821.7	569.4784744	570.8693787	572.1372497	572.0089904	574.379476	574.5198773	im	1.00														
2831.5	570.0499238	570.8801964					im															
2842.8	569.4597898	570.849138	571.926518	572.0874474	574.1187131	574.510229	im	1.00														
2882.6	569.9616753	570.8404995					im															
2888.3	570.6292313	570.8434747	572.1880545	571.5756206	573.828979		im	1.00														
2908.7	570.7246996						im															
2913.7	570.3707668	570.7486057	572.0451753	572.1556613	573.007201	575.5304874	im	1.00														
2931.8	570.2828585		568.9280658	568.7244588	570.6760057	572.468296	im	1.00														
2937.4	570.1915335	570.6199427					im															
2943.2	569.9846773	570.6017295	571.8568377	571.8476681	573.6767389	575.4193111	im	1.00														
2956.4	570.0325374	570.6212844					im															
2977.9	569.7086331	570.6036566	571.8264925	571.7770132	573.8229236	574.6915923	im	1.00														
2985.8	570.1843265	570.607742					im															
2997.8	570.0305599	570.6153988	572.2380669	571.8355088	573.9207107	574.1249084	im	1.00														
3000.1	569.6456158	570.5909408					im															
3003.8	569.3573709	570.6229143			573.191599	573.9717196	im															
3016.2	569.8781468	570.5139155					im															
3024.4	570.1855516	570.4799703	571.8945718	571.4412574	573.4257944	571.9380207	im	1.00														
3033.2	570.0136237	570.5037283	571.5965542	572.1735907	572.429814	573.0439507	hp	1.00	70.6	24.8		0.0001										
3043.6	569.360434	570.5621771	572.212685	572.0189679	572.5257054		mp	1.00			2.85											
3058	569.6233031	570.5008903	571.8513093	571.8676264	573.6634896	573.4425211	hg	1.00									45.8	0.0007				
3063.2	570.0157511	570.5402299	571.53236	571.7715198	573.8408562	573.3841703	im	1.00														
3071.4	570.4659876	570.560381	572.3998989	572.2829559	573.4089008	573.0008868	im	1.00														
3080.3	570.1400504	570.520264	572.5032214	572.0525747	573.8843426	572.9773684	im	1.00														
3097.2	570.3120715	570.5128044	572.8306883	571.5505289	574.9274445	572.8922231	im	1.00														
3103.8	570.5844556	570.4688656					hp			48.8		0.0000										
3110.6	570.0743438	570.4236199					im															
3119.8	569.1406125	570.3960311					mp															
3152.6	570.2417929	570.4973185	571.8898037	572.773914	572.6441047	573.5817897		1.00														

slope	0.0034	0.0036	0.0034	0.0032	0.0033	0.0031																
								Bk Ht/		**Pool**	**Max Pool**	**Pool**	**Riffle**	**Riffle**	**Glide**	**Glide**	**Run**	**Run**		
								Bkf Ht.	**P-P**	**Length**	**Depth**	**Slope**	**Length**	**Slope**	**Length**	**Slope**	**Length**	**Slope**		
BKF W (ft)=	21.9					min		1.00	9.10	3.90	1.80	0.00	2.60	0.00	2.70	-0.01	660.90	0.001		
BKF D (ft)=	1.1					max		1.00	744.90	155.30	4.55	0.01	93.50	0.05	45.80	0.01	662.70	0.002		
BKF Max D (ft)=	2.7					avg		1.00	134.47	54.47	3.06	0.00	17.75	0.03	19.70	0.00	661.80	0.002		
						Min ratio		0.38	0.4		1.60	0.0000		0.000		0.000		0.000		
						Max ratio		0.38	34.0		4.03	0.0004		0.002		0.000		0.000		
						avg ratio		0.38	6.1		2.71	0.0001		0.001		0.000		0.000		

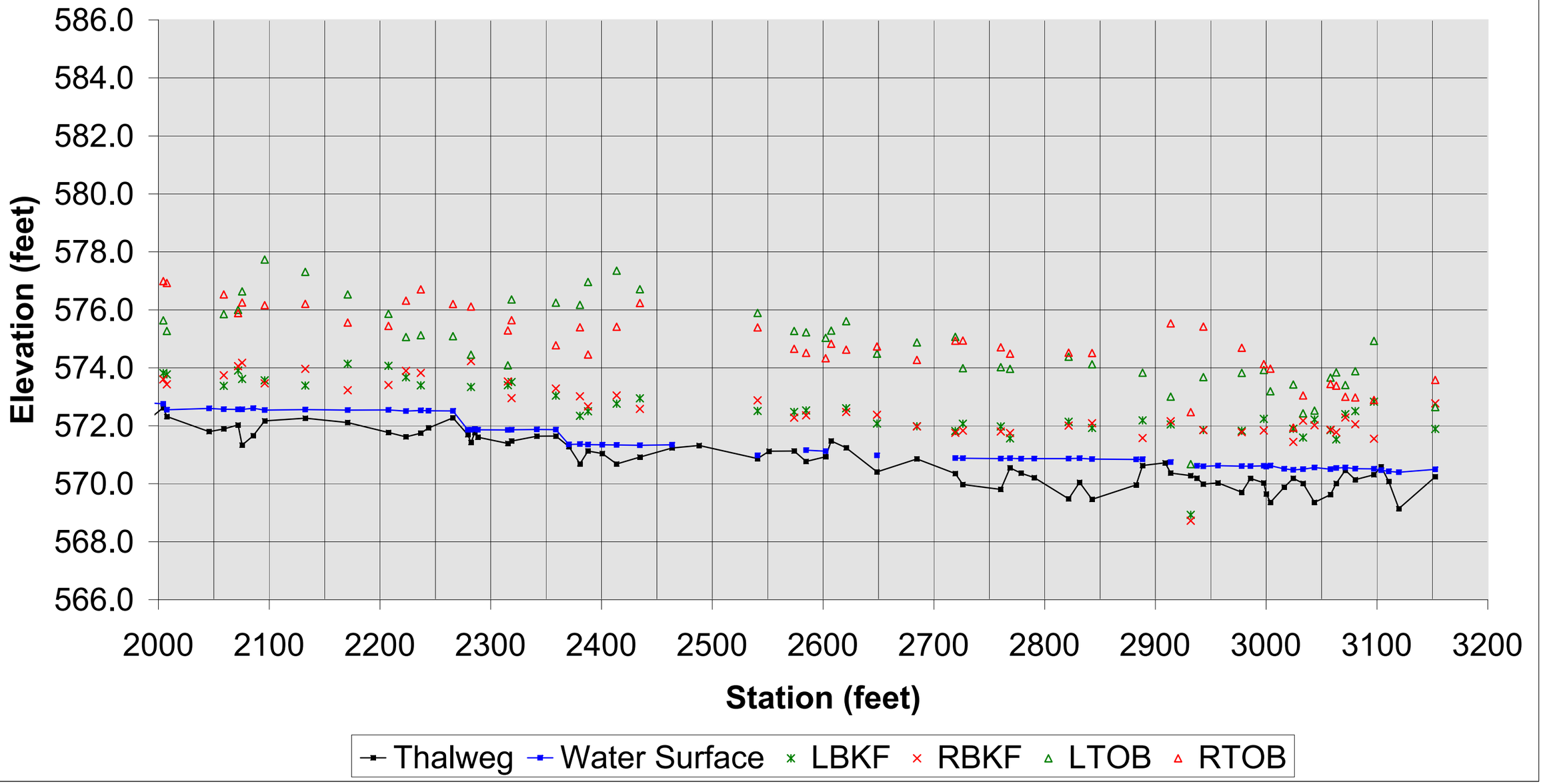
Reedy Branch Longitudinal Profile (Year 2)



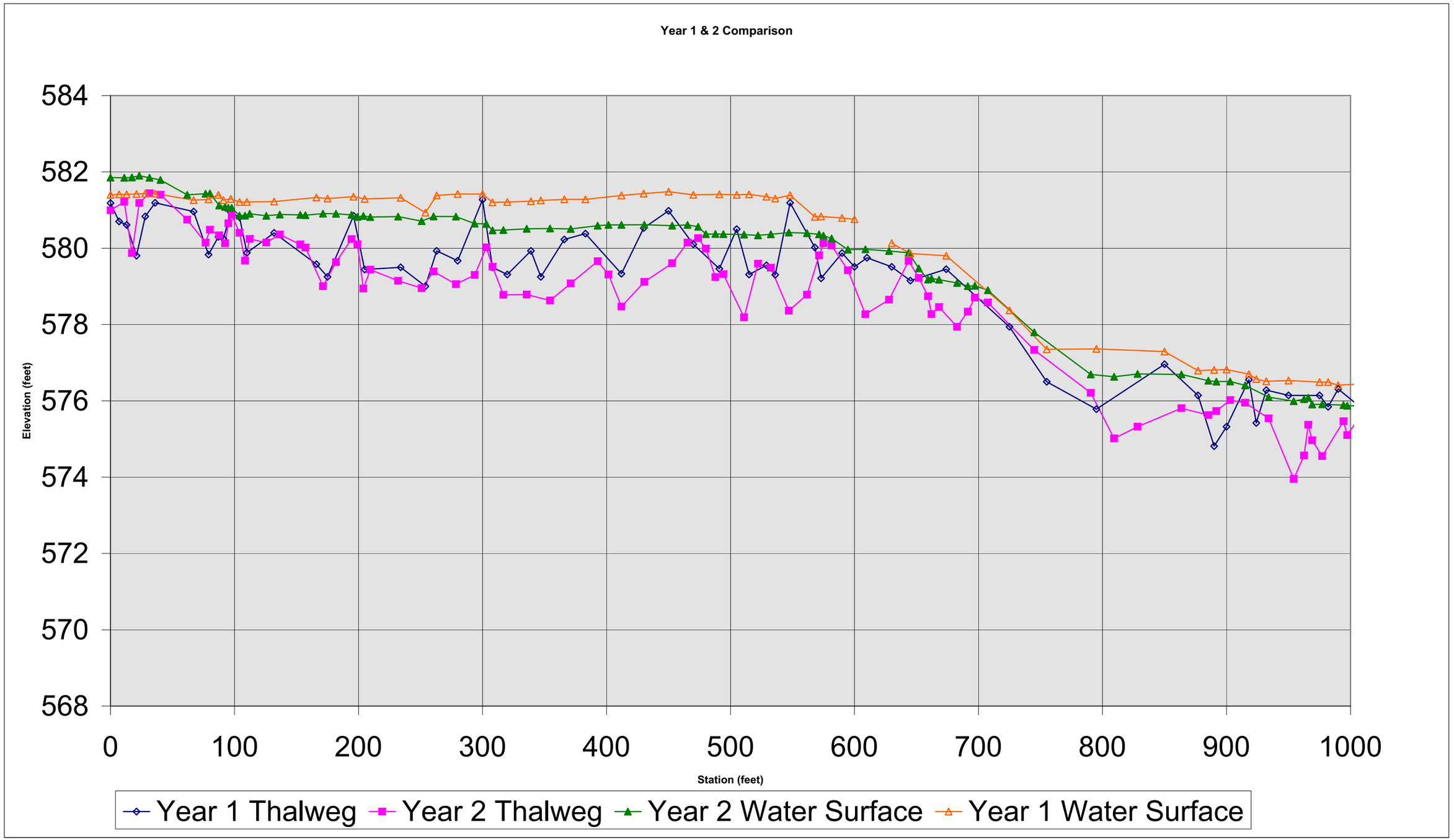
Reedy Branch Longitudinal Profile (Year 2)



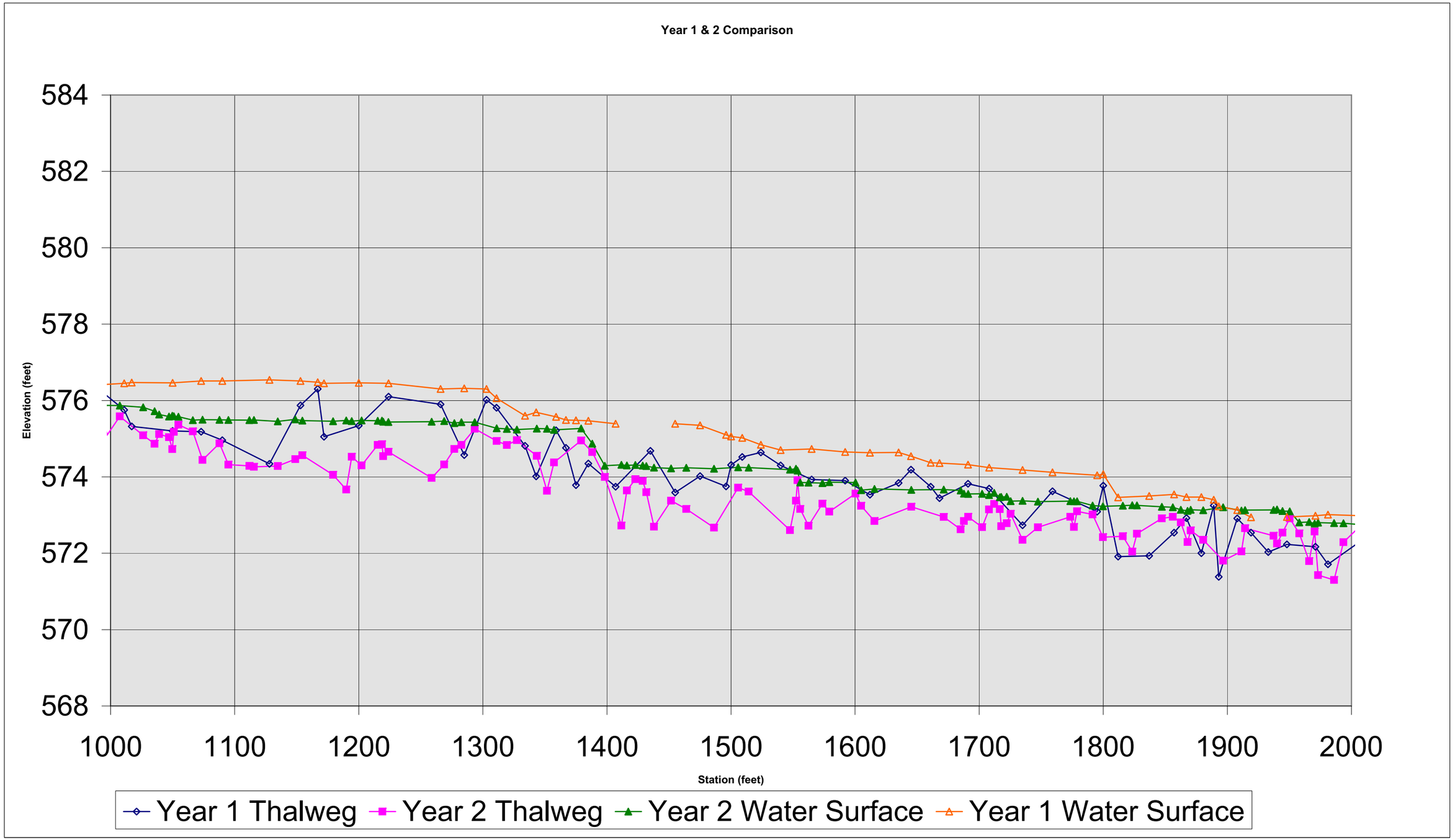
Reedy Branch Longitudinal Profile (Year 2)



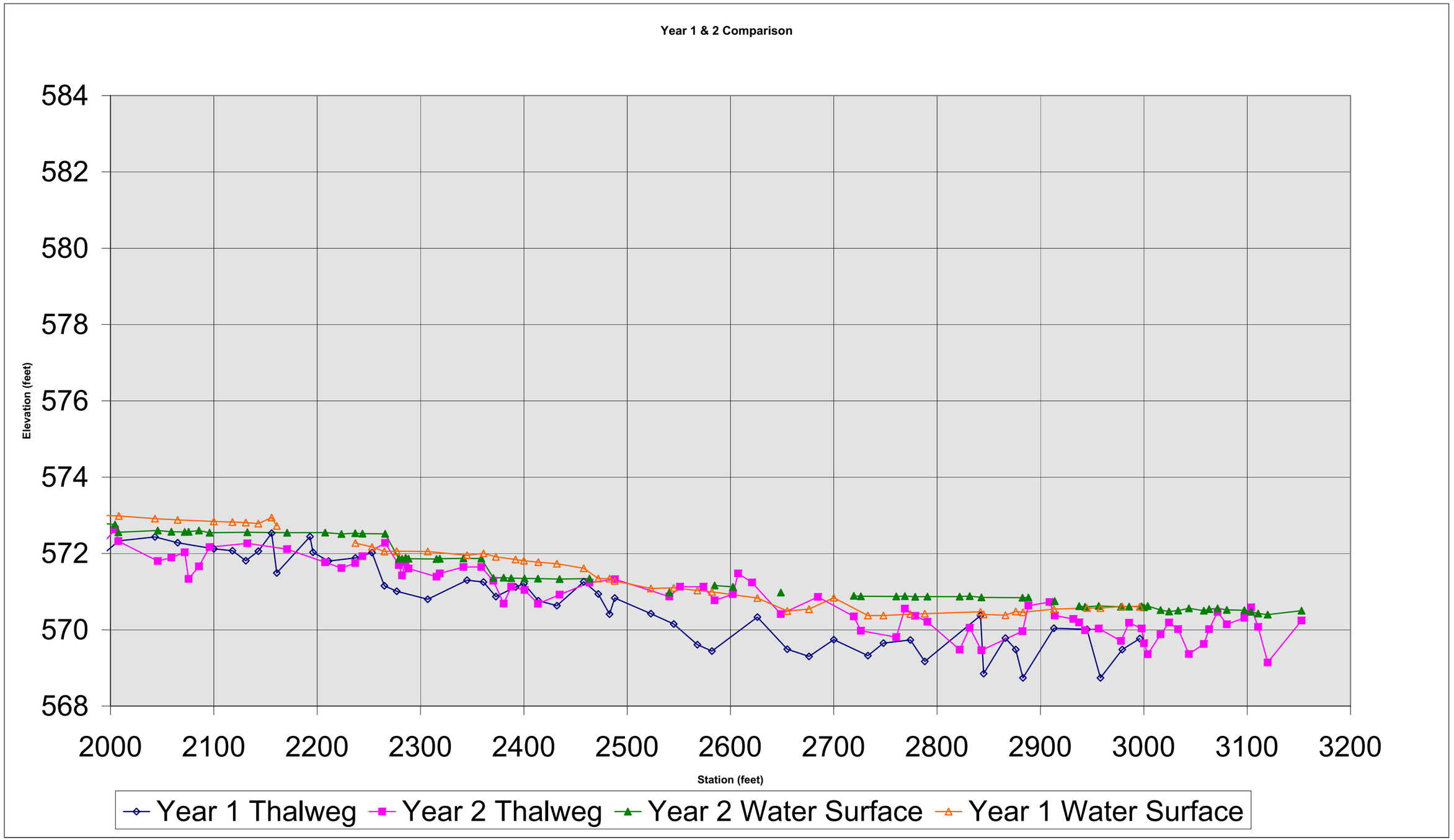
Appendix B5
Longitudinal Comparison



Appendix B5
Longitudinal Comparison



Appendix B5
Longitudinal Comparison



APPENDIX B6

STREAM PEBBLE COUNTS

Reedy Branch
Stream Monitoring
Year 2: 2006
Alamance County, NC

PEBBLE COUNT

Site: Reedy Branch

Party: ATW and WDY

Date: 10/20/2006

Inches	Particle	Millimeters		Cross-Section 1 (Riffle)	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	44	44	44%	44%
	Very Fine	.062-.125	SAND	7	7	7%	51%
	Fine	.125-.25		14	14	14%	65%
	Medium	.25-.50		8	8	8%	73%
	Coarse	.50-1.0		8	8	8%	81%
.04-.08	Very Coarse	1.0-2		1	1	1%	82%
.08-.16	Very Fine	2.0-4.0	GRAVEL	0	0	0%	82%
.16-.22	Fine	4-5.7		1	1	1%	83%
.22-.31	Fine	5.7-8		4	4	4%	87%
.31-.44	Medium	8-11.3		4	4	4%	91%
.44-.63	Medium	11.3-16		3	3	3%	94%
.63-.89	Coarse	16-22.6		4	4	4%	98%
.89-1.26	Coarse	22.6-32		1	1	1%	99%
1.26-1.77	Very Coarse	32-45		0	0	0%	99%
1.77-2.5	Very Coarse	45-64		0	0	0%	99%
2.5-3.5	Small	64-90	COBBLE	1	1	1%	100%
3.5-5.0	Small	90-128		0	0	0%	100%
5.0-7.1	Large	128-180		0	0	0%	100%
7.1-10.1	Large	180-256		0	0	0%	100%
10.1-14.3	Small	256-362	BOULDER	0	0	0%	100%
14.3-20	Small	362-512		0	0	0%	100%
20-40	Medium	512-1024		0	0	0%	100%
40-80	Large	1024-2048		0	0	0%	100%
	Bedrock		**BDRK**	0	0	0%	100%
					100	**100%**	**100%**

Reedy Branch
Stream Monitoring
Year 2: 2006
Alamance County, NC

PEBBLE COUNT

Site: Reedy Branch

Party: ATW and WDY

Date: 10/20/2006

Inches	Particle	Millimeters		Cross-Section 2 (Pool)	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	38	38	38%	38%
	Very Fine	.062-.125	SAND	17	17	17%	55%
	Fine	.125-.25		27	27	27%	82%
	Medium	.25-.50		9	9	9%	91%
	Coarse	.50-1.0		6	6	6%	97%
.04-.08	Very Coarse	1.0-2		0	0	0%	97%
.08-.16	Very Fine	2.0-4.0	GRAVEL	0	0	0%	97%
.16-.22	Fine	4-5.7		0	0	0%	97%
.22-.31	Fine	5.7-8		1	1	1%	98%
.31-.44	Medium	8-11.3		1	1	1%	99%
.44-.63	Medium	11.3-16		0	0	0%	99%
.63-.89	Coarse	16-22.6		0	0	0%	99%
.89-1.26	Coarse	22.6-32		0	0	0%	99%
1.26-1.77	Very Coarse	32-45		1	1	1%	100%
1.77-2.5	Very Coarse	45-64		0	0	0%	100%
2.5-3.5	Small	64-90	COBBLE	0	0	0%	100%
3.5-5.0	Small	90-128		0	0	0%	100%
5.0-7.1	Large	128-180		1	1	1%	101%
7.1-10.1	Large	180-256		0	0	0%	101%
10.1-14.3	Small	256-362	BOULDER	0	0	0%	101%
14.3-20	Small	362-512		0	0	0%	101%
20-40	Medium	512-1024		0	0	0%	101%
40-80	Large	1024-2048		0	0	0%	101%
	Bedrock		**BDRK**	0	0	0%	101%
					101	**101%**	**101%**

Reedy Branch
Stream Monitoring
Year 2: 2006
Alamance County, NC

PEBBLE COUNT

Site: Reedy Branch

Party: ATW and WDY

Date: 10/20/2006

Inches	Particle	Millimeters		Cross-Section 3 (Riffle)	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	38	38	38%	38%
	Very Fine	.062-.125	SAND	28	28	28%	66%
	Fine	.125-.25		14	14	14%	80%
	Medium	.25-.50		12	12	12%	92%
	Coarse	.50-1.0		4	4	4%	96%
.04-.08	Very Coarse	1.0-2		0	0	0%	96%
.08-.16	Very Fine	2.0-4.0	GRAVEL	1	1	1%	97%
.16-.22	Fine	4-5.7		0	0	0%	97%
.22-.31	Fine	5.7-8		1	1	1%	98%
.31-.44	Medium	8-11.3		2	2	2%	100%
.44-.63	Medium	11.3-16		0	0	0%	100%
.63-.89	Coarse	16-22.6		0	0	0%	100%
.89-1.26	Coarse	22.6-32		0	0	0%	100%
1.26-1.77	Very Coarse	32-45		0	0	0%	100%
1.77-2.5	Very Coarse	45-64		0	0	0%	100%
2.5-3.5	Small	64-90	COBBLE	0	0	0%	100%
3.5-5.0	Small	90-128		0	0	0%	100%
5.0-7.1	Large	128-180		0	0	0%	100%
7.1-10.1	Large	180-256		0	0	0%	100%
10.1-14.3	Small	256-362	BOULDER	0	0	0%	100%
14.3-20	Small	362-512		0	0	0%	100%
20-40	Medium	512-1024		0	0	0%	100%
40-80	Large	1024-2048		0	0	0%	100%
	Bedrock		**BDRK**	0	0	0%	100%
					100	**100%**	**100%**

Reedy Branch
Stream Monitoring
Year 2: 2006
Alamance County, NC

PEBBLE COUNT

Site: Reedy Branch

Party: ATW and WDY

Date: 10/20/2006

Inches	Particle	Millimeters		Cross-Section 4 (Riffle)	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	28	28	28%	28%
	Very Fine	.062-.125	SAND	24	24	24%	52%
	Fine	.125-.25		12	12	12%	64%
	Medium	.25-.50		8	8	8%	72%
	Coarse	.50-1.0		14	14	14%	86%
.04-.08	Very Coarse	1.0-2		0	0	0%	86%
.08-.16	Very Fine	2.0-4.0	GRAVEL	0	0	0%	86%
.16-.22	Fine	4-5.7		0	0	0%	86%
.22-.31	Fine	5.7-8		1	1	1%	87%
.31-.44	Medium	8-11.3		5	5	5%	92%
.44-.63	Medium	11.3-16		3	3	3%	95%
.63-.89	Coarse	16-22.6		4	4	4%	99%
.89-1.26	Coarse	22.6-32		0	0	0%	99%
1.26-1.77	Very Coarse	32-45		1	1	1%	100%
1.77-2.5	Very Coarse	45-64		0	0	0%	100%
2.5-3.5	Small	64-90	COBBLE	0	0	0%	100%
3.5-5.0	Small	90-128		0	0	0%	100%
5.0-7.1	Large	128-180		0	0	0%	100%
7.1-10.1	Large	180-256		0	0	0%	100%
10.1-14.3	Small	256-362	BOULDER	0	0	0%	100%
14.3-20	Small	362-512		0	0	0%	100%
20-40	Medium	512-1024		0	0	0%	100%
40-80	Large	1024-2048		0	0	0%	100%
	Bedrock		**BDRK**	0	0	0%	100%
					100	**100%**	**100%**

Reedy Branch
Stream Monitoring
Year 2: 2006
Alamance County, NC

PEBBLE COUNT

Site: Reedy Branch

Party: ATW and WDY

Date: 10/20/2006

Inches	Particle	Millimeters		Cross-Section 5 (Pool)	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	52	52	52%	52%
	Very Fine	.062-.125	SAND	27	27	27%	79%
	Fine	.125-.25		12	12	12%	91%
	Medium	.25-.50		4	4	4%	95%
	Coarse	.50-1.0		1	1	1%	96%
.04-.08	Very Coarse	1.0-2		0	0	0%	96%
.08-.16	Very Fine	2.0-4.0	GRAVEL	0	0	0%	96%
.16-.22	Fine	4-5.7		0	0	0%	96%
.22-.31	Fine	5.7-8		0	0	0%	96%
.31-.44	Medium	8-11.3		0	0	0%	96%
.44-.63	Medium	11.3-16		2	2	2%	98%
.63-.89	Coarse	16-22.6		0	0	0%	98%
.89-1.26	Coarse	22.6-32		0	0	0%	98%
1.26-1.77	Very Coarse	32-45		0	0	0%	98%
1.77-2.5	Very Coarse	45-64		0	0	0%	98%
2.5-3.5	Small	64-90	COBBLE	0	0	0%	98%
3.5-5.0	Small	90-128		2	2	2%	100%
5.0-7.1	Large	128-180		0	0	0%	100%
7.1-10.1	Large	180-256		0	0	0%	100%
10.1-14.3	Small	256-362	BOULDER	0	0	0%	100%
14.3-20	Small	362-512		0	0	0%	100%
20-40	Medium	512-1024		0	0	0%	100%
40-80	Large	1024-2048		0	0	0%	100%
	Bedrock		**BDRK**	0	0	0%	100%
					100	**100%**	**100%**

Reedy Branch
Stream Monitoring
Year 2: 2006
Alamance County, NC

PEBBLE COUNT

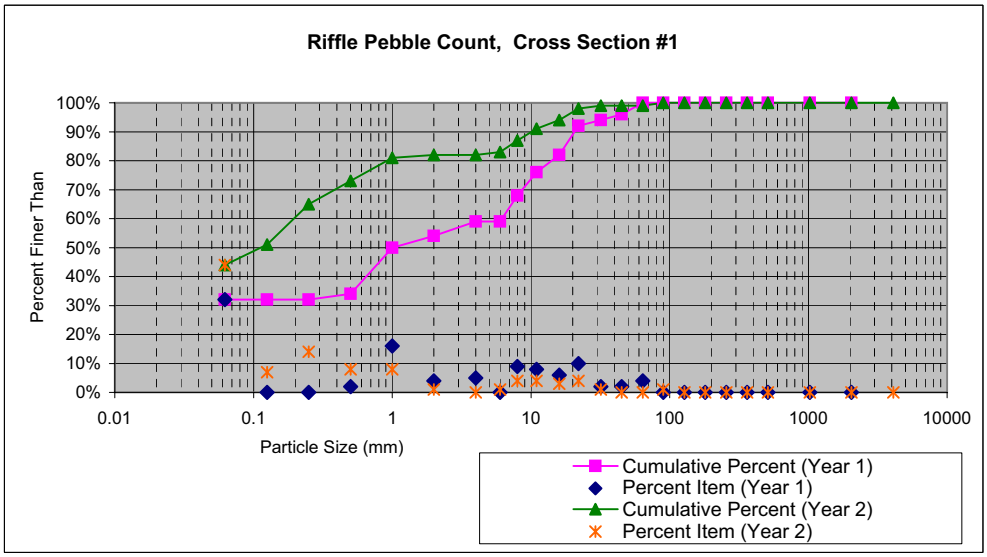
Site: Reedy Branch

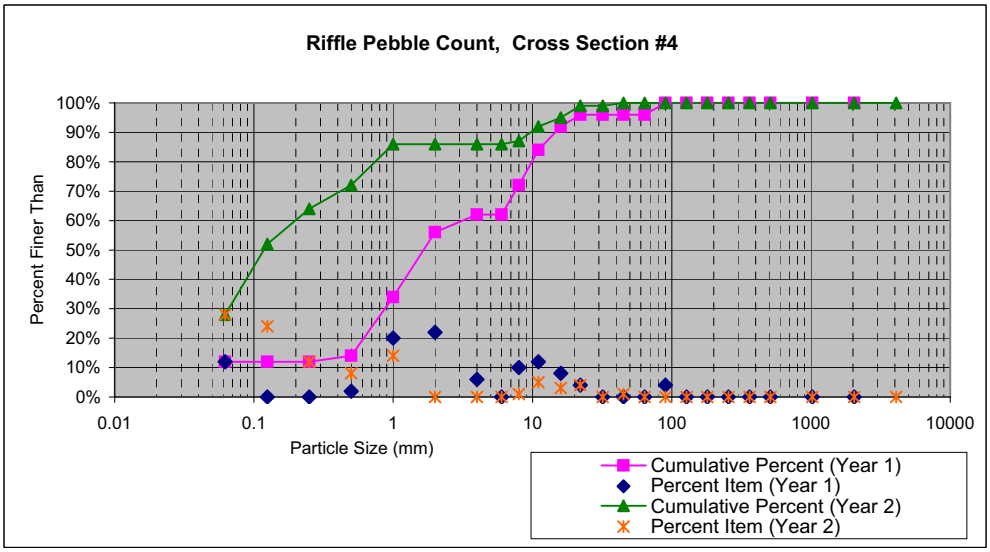
Party: ATW and WDY

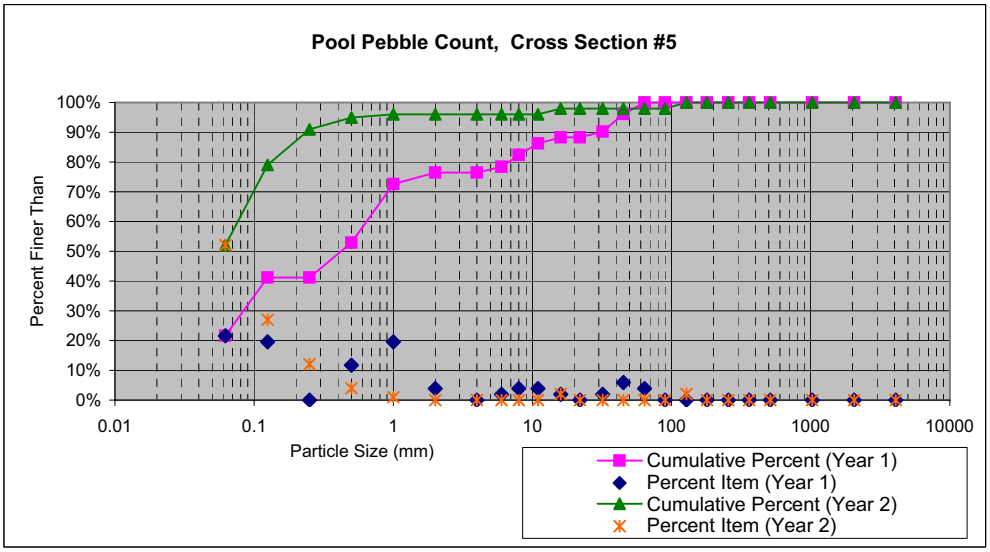
Date: 10/20/2006

Inches	Particle	Millimeters		Cross-Section 6 (Riffle)	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	32	32	32%	32%
	Very Fine	.062-.125	SAND	9	9	9%	41%
	Fine	.125-.25		14	14	14%	55%
	Medium	.25-.50		5	5	5%	60%
	Coarse	.50-1.0		10	10	10%	70%
.04-.08	Very Coarse	1.0-2		0	0	0%	70%
.08-.16	Very Fine	2.0-4.0	GRAVEL	0	0	0%	70%
.16-.22	Fine	4-5.7		0	0	0%	70%
.22-.31	Fine	5.7-8		0	0	0%	70%
.31-.44	Medium	8-11.3		1	1	1%	71%
.44-.63	Medium	11.3-16		5	5	5%	76%
.63-.89	Coarse	16-22.6		5	5	5%	81%
.89-1.26	Coarse	22.6-32		3	3	3%	84%
1.26-1.77	Very Coarse	32-45		2	2	2%	86%
1.77-2.5	Very Coarse	45-64		8	8	8%	94%
2.5-3.5	Small	64-90	COBBLE	3	3	3%	97%
3.5-5.0	Small	90-128		1	1	1%	98%
5.0-7.1	Large	128-180		1	1	1%	99%
7.1-10.1	Large	180-256		1	1	1%	100%
10.1-14.3	Small	256-362	BOULDER	0	0	0%	100%
14.3-20	Small	362-512		0	0	0%	100%
20-40	Medium	512-1024		0	0	0%	100%
40-80	Large	1024-2048		0	0	0%	100%
	Bedrock		**BDRK**	0	0	0%	100%
					100	**100%**	**100%**

Appendix B6
Reedy Branch Pebble Counts
Year 1 and 2 Comparisons







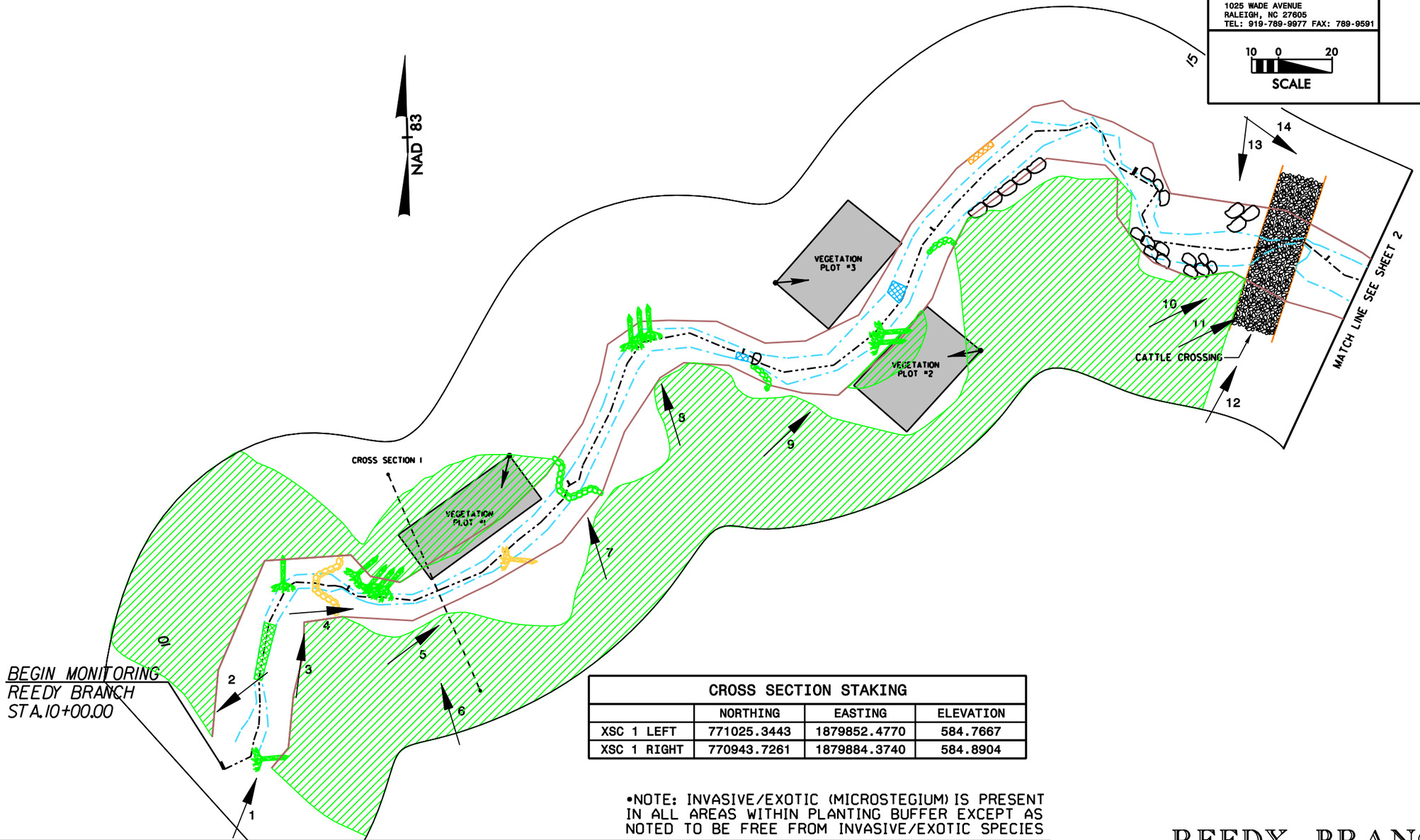
APPENDIX C

PLAN VIEW SHEETS

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
301	7
PROJECT ENGINEER	

10 0 20
SCALE



CROSS SECTION STAKING			
	NORTHING	EASTING	ELEVATION
XSC 1 LEFT	771025.3443	1879852.4770	584.7667
XSC 1 RIGHT	770943.7261	1879884.3740	584.8904

•NOTE: INVASIVE/EXOTIC (MICROSTEGIUM) IS PRESENT IN ALL AREAS WITHIN PLANTING BUFFER EXCEPT AS NOTED TO BE FREE FROM INVASIVE/EXOTIC SPECIES

REEDY BRANCH

LEGEND

- THALWEG 2006
- EDGE OF WATER 2006
- BANKFULL & TOP OF BANK 2006
- CROSS-SECTIONS
- GENERAL PHOTO POINT
- VEGETATION PHOTO POINT
- BANK EROSION (BARE BANK)
- SEVERE BANK EROSION
- AGGRADATION (GRASSES)
- AGGRADATON (PICKERELWEED)
- UNDERCUT BANKS
- AREA FREE OF INVASIVE/EXOTIC SPECIES

STRUCTURE TYPES
ROCK CROSS VANE, J-HOOK VANE, ROCK VANE, ROOTWAD, BEDROCK

COLOR CODE FOR STRUCTURES
- GOOD STRUCTURE
- STRUCTURE WITH POTENTIAL PROBLEM
- FAILING STRUCTURE

Ecosystem Enhancement PROGRAM

LOCATION:
REEDY BRANCH
STREAM MONITORING - YEAR 2

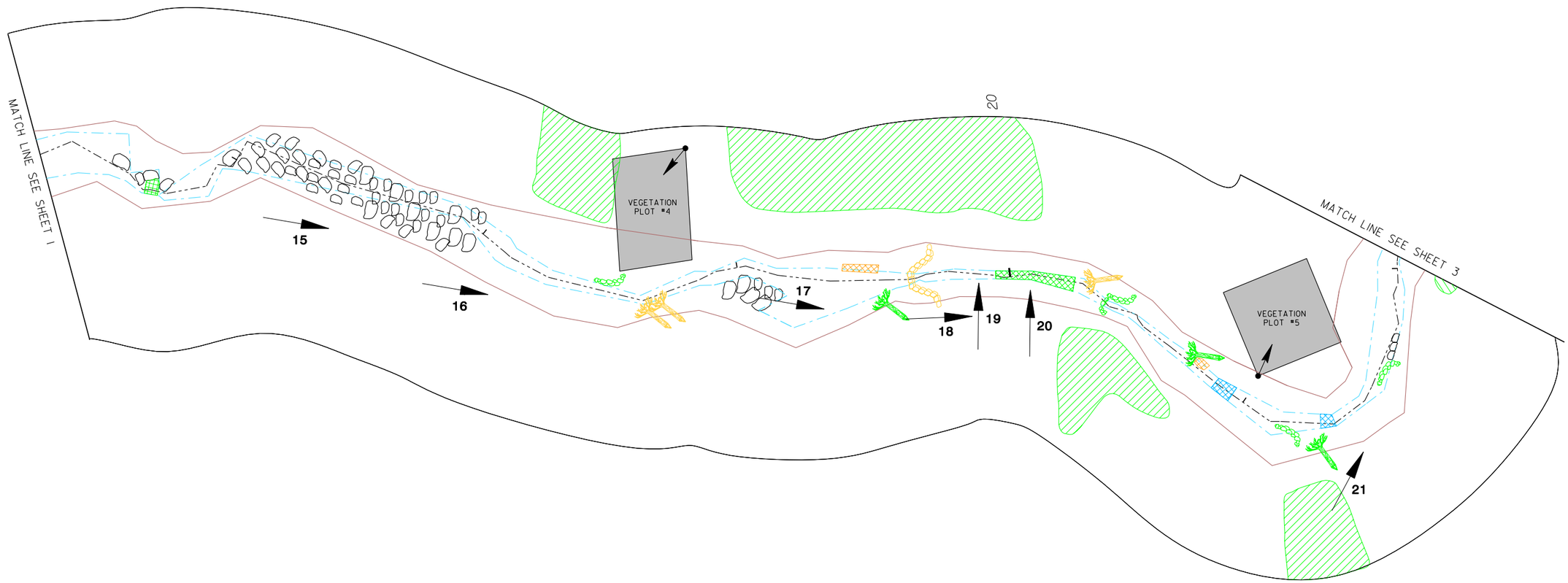
PROJ #:	COUNTY:
301	ALAMANCE
PREPARED BY: WDY	
CHECKED BY: ATW	DATE: 11/17/06

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
301	2
PROJECT ENGINEER	

10 0 20
SCALE

NAD 83



*NOTE: INVASIVE/EXOTIC (MICROSTEGIUM) IS PRESENT IN ALL AREAS WITHIN PLANTING BUFFER EXCEPT AS NOTED TO BE FREE FROM INVASIVE/EXOTIC SPECIES

REEDY BRANCH

LEGEND

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- EDGE OF WATER 2006
- BANKFULL & TOP OF BANK 2006
- CROSS-SECTIONS
- GENERAL PHOTO POINT
- VEGETATION PHOTO POINT
- BANK EROSION (BARE BANK)
- SEVERE BANK EROSION
- AGGRADATION (GRASSES)
- AGGRADATON (PICKERELWEED)
- UNDERCUT BANKS
- AREA FREE OF INVASIVE/EXOTIC SPECIES

STRUCTURE TYPES
- ROCK CROSS VANE
- J-HOOK VANE
- ROCK VANE
- ROOTWAD
- BEDROCK

COLOR CODE FOR STRUCTURES
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Ecosystem Enhancement PROGRAM

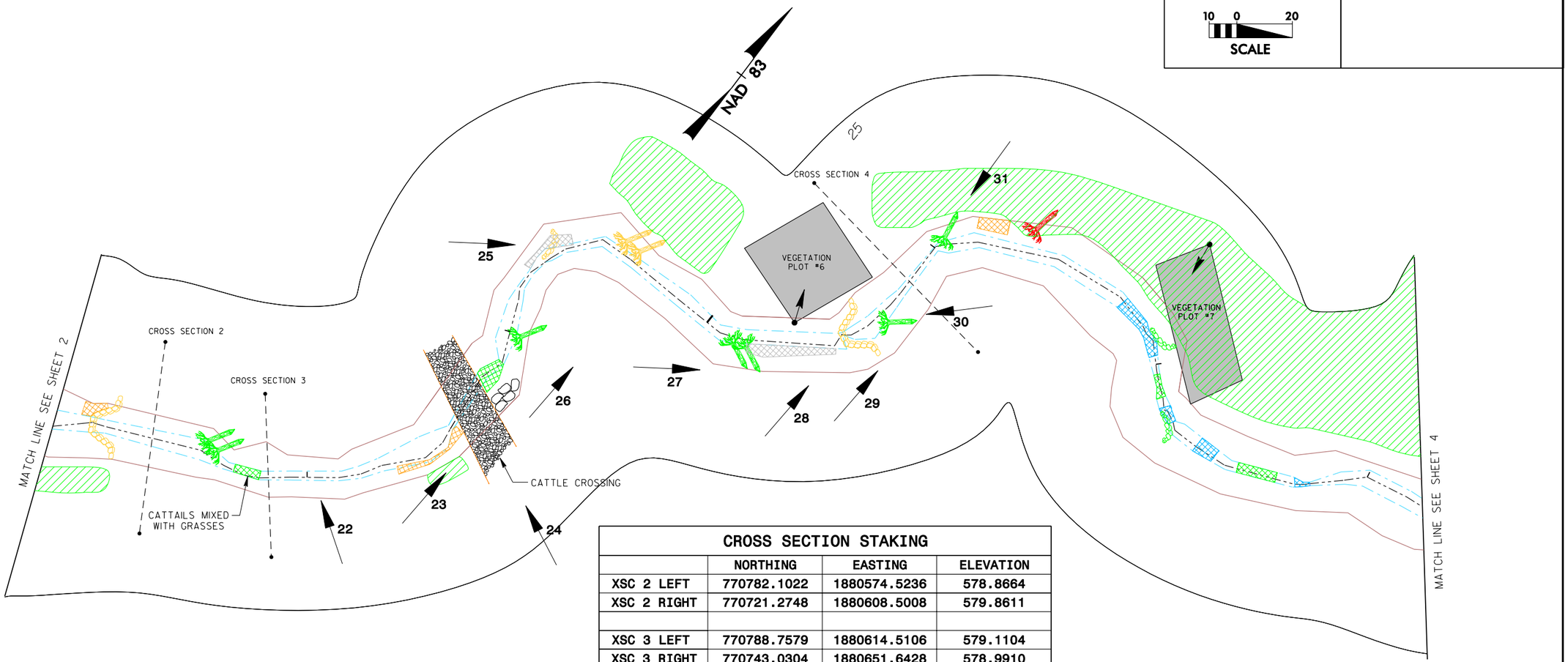
LOCATION:
REEDY BRANCH
STREAM MONITORING - YEAR 2

PROJ #:	COUNTY:
301	ALAMANCE
PREPARED BY: WDY	
CHECKED BY: ATW	DATE: 11/17/06

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
301	3
PROJECT ENGINEER	

10 0 20
SCALE



CROSS SECTION STAKING			
	NORTHING	EASTING	ELEVATION
XSC 2 LEFT	770782.1022	1880574.5236	578.8664
XSC 2 RIGHT	770721.2748	1880608.5008	579.8611
XSC 3 LEFT	770788.7579	1880614.5106	579.1104
XSC 3 RIGHT	770743.0304	1880651.6428	578.9910
XSC 4 LEFT	770968.3605	1880727.1468	575.6349
XSC 4 RIGHT	770955.0930	1880810.9364	575.2575

*NOTE: INVASIVE/EXOTIC (MICROSTEGIUM) IS PRESENT IN ALL AREAS WITHIN PLANTING BUFFER EXCEPT AS NOTED TO BE FREE FROM INVASIVE/EXOTIC SPECIES

LEGEND

- THALWEG 2006
- EDGE OF WATER 2006
- BANKFULL & TOP OF BANK 2006
- CROSS-SECTIONS
- GENERAL PHOTO POINT
- VEGETATION PHOTO POINT
- BANK EROSION (BARE BANK)
- SEVERE BANK EROSION
- AGGRADATION (GRASSES)
- AGGRADATON (PICKERELWEED)
- UNDERCUT BANKS
- AREA FREE OF INVASIVE/EXOTIC SPECIES

STRUCTURE TYPES
ROCK CROSS VANE, J-HOOK VANE, ROCK VANE, ROOTWAD, BEDROCK

COLOR CODE FOR STRUCTURES
- GOOD STRUCTURE
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REEDY BRANCH

Ecosystem Enhancement PROGRAM

LOCATION:
REEDY BRANCH
STREAM MONITORING - YEAR 2

PROJ #:	COUNTY:
301	ALAMANCE
PREPARED BY: WDY	
CHECKED BY: ATW	DATE: 11/17/06

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
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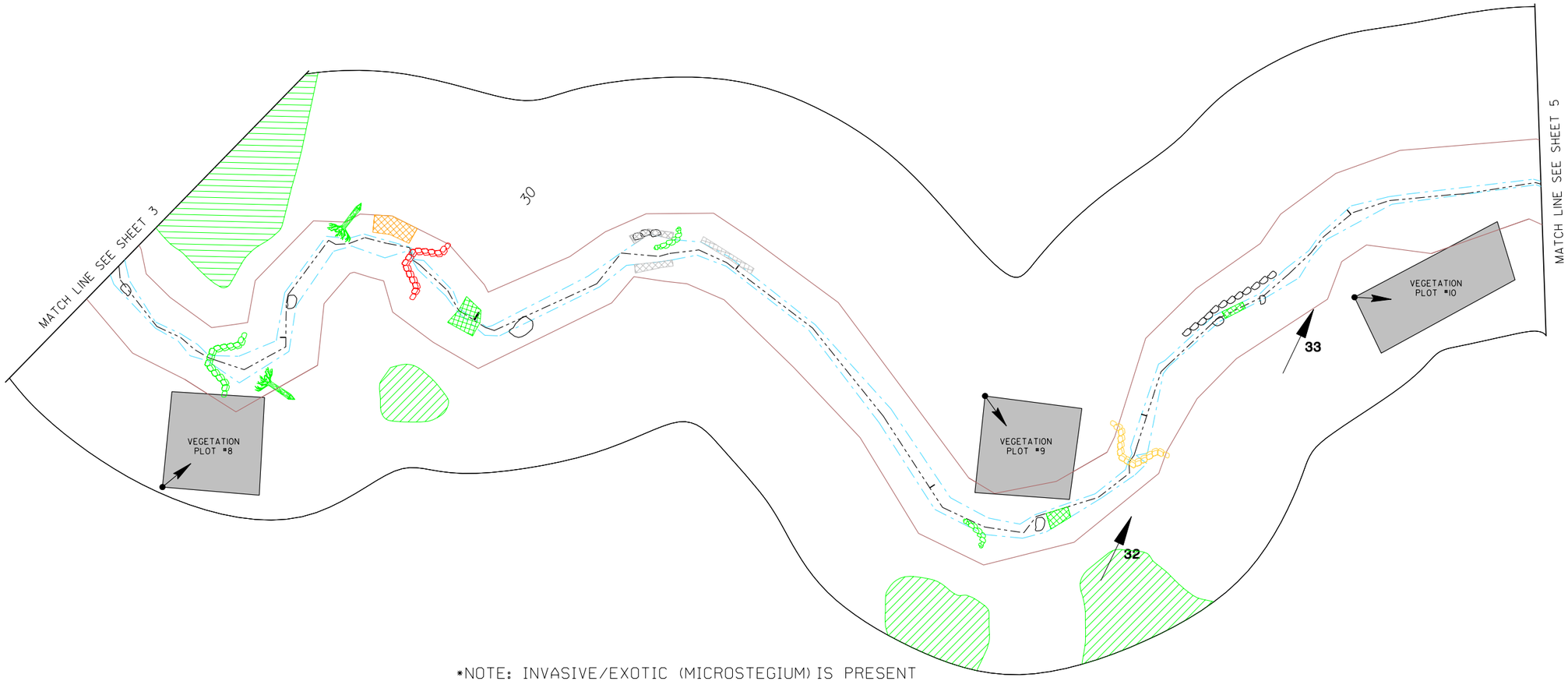
PROJECT REFERENCE NO.	SHEET NO.
301	4
PROJECT ENGINEER	

10 0 20
SCALE

NAD 83



*NOTE: INVASIVE/EXOTIC (MICROSTEGIUM) IS PRESENT IN ALL AREAS WITHIN PLANTING BUFFER EXCEPT AS NOTED TO BE FREE FROM INVASIVE/EXOTIC SPECIES

REEDY BRANCH

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STRUCTURE TYPES
- ROCK CROSS VANE
- J-HOOK VANE
- ROCK VANE
- ROOTWAD
- BEDROCK

COLOR CODE FOR STRUCTURES
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Ecosystem Enhancement PROGRAM

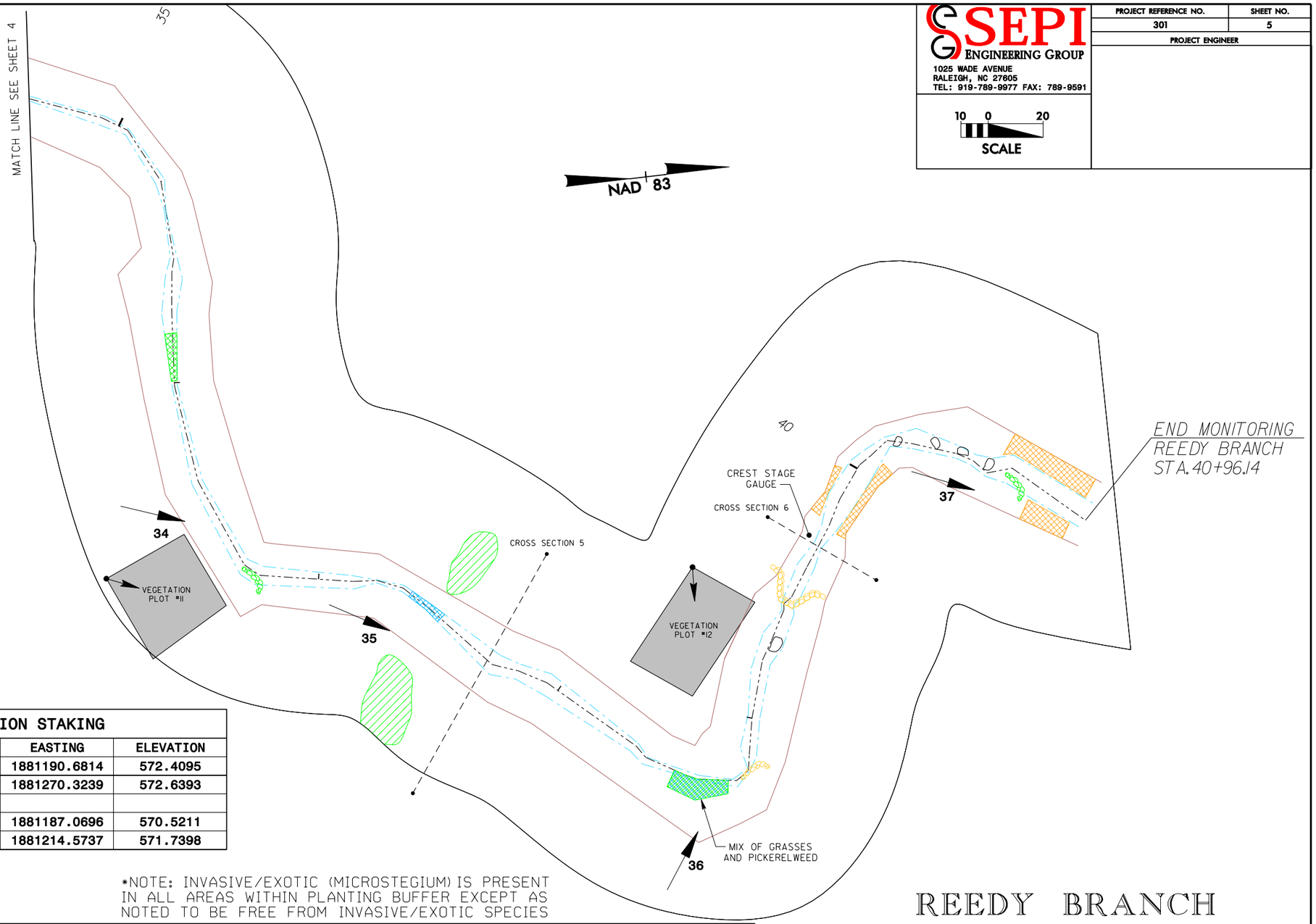
LOCATION:
REEDY BRANCH
STREAM MONITORING - YEAR 2

PROJ #:	COUNTY:
301	ALAMANCE
PREPARED BY: WDY	
CHECKED BY: ATW	DATE: 11/17/06

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
301	5
PROJECT ENGINEER	

10 0 20
SCALE



CROSS SECTION STAKING			
	NORTHING	EASTING	ELEVATION
XSC 5 LEFT	771655.7440	1881190.6814	572.4095
XSC 5 RIGHT	771596.7893	1881270.3239	572.6393
XSC 6 LEFT	771737.2562	1881187.0696	570.5211
XSC 6 RIGHT	771773.7453	1881214.5737	571.7398

*NOTE: INVASIVE/EXOTIC (MICROSTEGIUM) IS PRESENT IN ALL AREAS WITHIN PLANTING BUFFER EXCEPT AS NOTED TO BE FREE FROM INVASIVE/EXOTIC SPECIES

REEDY BRANCH

LEGEND

- THALWEG 2006
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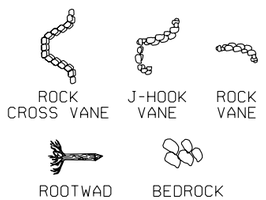
- AGGRADATON (PICKERELWEED)
- UNDERCUT BANKS
- AREA FREE OF INVASIVE/EXOTIC SPECIES

STRUCTURE TYPES



COLOR CODE FOR STRUCTURES

- GOOD STRUCTURE
- STRUCTURE WITH POTENTIAL PROBLEM
- FAILING STRUCTURE

Ecosystem Enhancement PROGRAM

LOCATION:
REEDY BRANCH
STREAM MONITORING - YEAR 2

PROJ #:	COUNTY:
301	ALAMANCE
PREPARED BY: WDY	
CHECKED BY: ATW	DATE: 11/17/06