

Year 2 Monitoring Report

Trout Cove Stream Restoration



March 2008
EEP Project No. 388

Prepared for



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I. Executive Summary / Project Abstract

This report summarizes the monitoring efforts for Year 2 (2007) on the Trout Cove Stream Restoration in Clay County, NC.

Monitoring of the vegetated buffer was performed during the growing season of 2007, by Soil & Environmental Consultants, PA (S&EC). Stem counts were performed within the established vegetation monitoring plots, resulting in a live stem density of approximately 590 stems per acre indicating vegetative success. No vegetative problem areas were observed. No significant infestations of exotic invasives or bare areas of soil that should be addressed.

The stream channel was surveyed, and a visual stability assessment was performed. While several problem areas along the restored channel were observed, the overall channel is deemed stable and successful. Field observations indicate that at least 98% of all stream features, including riffles, pools, meanders, and channel bed and banks were stable. Although select in-channel rock structures were identified to have some minor problems, 95% of site structures were deemed stable. In 2008, Year 3 Monitoring will commence.

II. Project Background

The background information for this report was collected from previous monitoring data submitted to the North Carolina Ecosystem Enhancement Program (NCEEP) by the Biological and Agricultural Engineering (BAE) Department at North Carolina State University (NCSU).

A. Location and Setting

The Trout Cove Stream Restoration Project consists of an approximately 6.32 acre property in southwestern Clay County, NC. The site is located south of US Highway 64 and east of old US Highway 64 approximately 2 miles north of the Georgia state line. The site is located along Trout Cove Road just north of the community of Ogden, NC. This area is shown in detail in the attached vicinity map (Figure 1). To visit the site from I-40, take 19/74 eastbound. Turn left on US 64 in Murphy, NC. Turn left onto Old US 64 and continue past Brasstown, NC. Turn left onto Trout Cove Road and a right onto McCray Road. The site will be located to your right.

B. Structure and Objectives

The restoration site consists of approximately 2,683 linear feet of stream restoration and approximately 6.32 acres of riparian buffer restoration. Explicit project objectives and restoration quantities were not included in the project history provided by NCEEP. Restoration units are estimates based on site data collected. The structure and objectives are detailed in Tables I and II.

Table I: Project Structure Table Trout Cove Stream Restoration Site (EEP Project # 388)	
Segment/Reach ID	Linear Feet or Acreage
Reach 1	1,876 linear feet
Reach 2	807 linear feet
Buffer Restoration	6.32 ac

Table II: Project Objectives Table Trout Cove Stream Restoration Site (EEP Project # 388)			
Segment/Reach ID	Objectives	Linear Feet or Acreage	Comment
Reach 1	Restoration	1,876 linear feet	
Reach 2	Restoration/Enhancement	807 linear feet	
Buffer	Restoration	6.32 Acres	

C. Project History and Background

We have assumed that 2006 served as Monitoring Year 1, therefore 2007 will serve as Monitoring Year 2 of the required 5 years of monitoring. Additional details, to include the project designer, original design parameters, and the history of the project, have not been provided as of the date of this report. Details regarding the timeline of the project are included as Table III.

Table III: Project Activity and Reporting History Trout Cove Stream Restoration Site (EEP Project #388)		
Activity or Report	Calendar Year of Completion or Planned Completion	Actual Completion Date
Restoration Plan	Unknown	Unknown
Site Planted	Unknown	Unknown
Initial-Year 1 monitoring	2006	Dec-06
Year 1 Vegetation Monitoring	2006	Aug-06
Year 2 Monitoring	2007	Nov-07
Year 2 Vegetation Monitoring	2007	Jun-07
Year 3 Monitoring	2008	
Year 3 Vegetation Monitoring	2008	
Year 4 Monitoring	2009	
Year 4 Vegetation Monitoring	2009	
Year 5 Monitoring	2010	
Year 5 Vegetation Monitoring	2010	

Based on data provided by NCEEP, it is unknown at this time which firms designed and constructed the Trout Cove project. Monitoring activities for Year 1 were performed and reported by S&EC. Additional information regarding known contractors is shown in Table IV.

Table IV: Project Contact Table Trout Cove Stream Restoration Site (EEP Project #388)	
Designer	Unknown
Monitoring Performers	Soil & Environmental Consultants, PA 11010 Raven Ridge Road Raleigh, NC 26714
Stream Monitoring POC	Jessica Regan, S&EC
Vegetation Monitoring POC	

The project is located within Clay County, which is located within the Blue Ridge Belt of the Mountains of North Carolina. The site is located within a rural area. Additional information regarding the stream is included as Table V.

Table V: Project Background Table Trout Cove Stream Restoration Site (EEP Project #388)	
Project County	Clay
Drainage Area	0.453 sq. mi.
Drainage impervious cover estimate (%)	5%
Stream Order	1st, 2nd
Physiographic Region	Mountain
Ecoregion	Blue Ridge
Rosgen Classification of As-Built	*
Dominant Soil Types	RhA LoC, FrA
USGS HUC for Project and Reference	06020002
NCDWQ Sub-basin for Project and Reference	04-05-01
NCDWQ classification for Project and Reference	WS-IV
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	No
% of project easement fenced	100%

*Unknown – As-built data not provided

D. Monitoring Plan View

Original site survey data was provided to S&EC by NCEEP including the location of a series of monitoring devices previously installed onsite. The survey included a total of 2,683 linear feet of longitudinal profile and five (5) cross-sections. During our

initial site visit on January 12, 2006, all cross-sections were located. These same cross-sections were surveyed in 2006 and again in 2007.

Using provided survey data from 2005, we located five (5) previously established vegetation monitoring plots. A single corner of each of these plots was marked with iron pin with a plastic yellow cap. Four permanent corners had not been set. During our August 21, 2006 site visit S&EC established permanent corners with 1.5-inch PVC. The permanent corners were located with the survey data collected in November 2006. In Year 2 (2007) NCEEP requested that two (2) additional vegetation plots be installed on the tributary to the main channel. Each surveyed stream cross-section and vegetation monitoring plot is also a designated photo point that is photographed annually. The locations of all monitoring devices are shown on Sheets 1 through 4 (Overall Site Plan and Monitoring Plan View).

III. Project Condition and Monitoring Results

A. Vegetation Assessment

The Trout Cove stream restoration site vegetation is dense and healthy throughout the site with a variety of herbaceous and woody species. The site contains a lush herbaceous layer particularly in the wetland areas and pond edges. Herbaceous species observed included large amounts of goldenrod (*Solidago* sp.), boneset (*Eupatorium perfoliatum*), soft rush (*Juncus effusus*), sedges (*Carex* sp.), ironweed (*Vernonia noveboracensis*), great blue lobelia (*Lobelia siphilitica*), cutgrass (*Leersia oryzoides*) and jewelweed (*Impatiens capensis*).

Larger trees (5-20 feet tall) can be seen throughout the buffer mostly consisting of black willow (*Salix nigra*), river birch (*Betula nigra*) and sycamore (*Platanus occidentalis*). Saplings and smaller individuals of oak, pine, maple, tulip poplar (*Liriodendron tulipifera*) and sweetgum (*Liquidambar styraciflua*) were observed. Shrubs observed in the buffer included pepperbush (*Clethra acuminata*), silky dogwood (*Cornus amomum*), tag alder (*Alnus serrulata*), buttonbush (*Cephalanthus occidentalis*) and possumhaw (*Viburnum nudum*).

The buffer area also contains a large amount of blackberry (*Rubus* sp.) which is extremely dense in some areas. The stream bank vegetation is also extremely dense and primarily made up of tag alder (*Alnus serrulata*) and silky dogwood (*Cornus amomum*).

Exotic, invasive plant species do not appear to be a problem on the Trout Cove restoration site. Japanese honeysuckle (*Lonicera japonica*) was observed but it was not dense or widespread.

Seven (7) vegetation monitoring plots were established onsite as previously described. Five (5) plots are standard 10m x 10m plots and two (2) are non-standard 5m x 20m plots. Two (2) new plots were established on the tributary in 2007 by S&EC.

The vegetative success criteria for the site require a minimum of 320 live stems per acre for the first three (3) years of monitoring. At the end of Year 4, a density of 290 stems per acre is required. At the end of the 5-year monitoring period, a live stem density of 260 stems per acre is required.

1. Soil Data

Table VI: Preliminary Soil Data Trout Cove Stream Restoration Site (EEP Project # 388)					
Series	Max Depth (in.)	% Clay on Surface	K	T	OM %
Reddies Loam, 0-3% slopes (RhA)	80	5-18	0.20	4	3-8
Lonon Loam, 8-15% slopes (LoC)	80	7-20	0.24	5	0-2
French fine sandy loam, 0-3% slopes (FrA)	45	5-20	0.24	4	0-4

2. Problem Areas Plan View (vegetation)

No vegetation problem areas were observed during visual inspection of the restoration site.

3. Stem Counts

On June 12, 2007, S&EC conducted vegetation counts within each vegetation plot. The results of this survey are shown below in Table VIII. The taxonomic standard used for the counts is “Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas” by Alan S. Weakley. Vegetation counts were completed according to CVS-EEP Protocol for Recording Vegetation Version 4.0.

The following tree and shrub species were observed within the vegetation monitoring plots in previous monitoring years according to stem count data collected by S&EC: *Acer Rubrum* (Red Maple), *Alnus serrulata* (Tag Alder), *Betula nigra* (River Birch), *Cephalanthus occidentalis* (Buttonbush), *Cornus amomum* (Silky Dogwood), *Liquidambar styraciflua* (Sweetgum), *Platanus occidentalis* (Sycamore), *Salix nigra* (Black Willow) and *Viburnum nudum* (Possumhaw).

Trout Cove Stream Restoration Vegetation Monitoring (EEP Project# 388) Live Stem Counts per Plot arranged by Species								
Species	Plot #							Year 2 Totals
	Reach 1				Tributary			
	1	2	3	4	5	6	7	
<i>Acer rubrum</i> Red Maple		1		1	1	2		5
<i>Alnus serrulata</i> * Tag Alder	5	3	1	8	13			30
<i>Betula nigra</i> River Birch					1	4	5	10
<i>Cephalanthus occidentalis</i> Buttonbush			1	2	2	1		6
<i>Clethra alnifolia</i> Pepperbush	2			1				3
<i>Cornus amomum</i> * Silky Dogwood	1	6	2	8	10	2		29
<i>Liriodendron tulipifera</i> Tulip poplar				1	1			2
<i>Platanus occidentalis</i> Sycamore	1	1					1	3
<i>Salix nigra</i> Black Willow		6		3	1	2	2	14
Year 2 (2007) Plot Totals								
	9	17	4	24	29	11	8	102
Year 1 (2006) Plot Totals								
	6	18	4	22	28	N/A	N/A	78
Previous Plot Totals								
	5	4	5	22	14	N/A	N/A	50
Plot Live Stem Density								
	364	689	162	972	1175	445	324	
Overall Site Stem Density								
								590

* Numerous volunteers observed – not included in the stem counts shown

The average number of stems per sample plot is approximately 14 stems. Based on this stem count, the 2007 (Year 2) vegetation monitoring of the site revealed an average live stem density of 590 stems per acre.

As shown in Table VIII, one plot (Plot 3) has shown a stem density of less than the desired 320 stems per acre. However, while not quantified in the above table, each plot has shown a large number of volunteers in addition to the original planted stems including additional species such as Red Oak and

Pepperbush. If these new plants are taken into consideration, stem density would likely be much higher than 320 stems per acre in that plot.

4. Vegetation Plot Photos

Photos taken during the June 12, 2007 Vegetation Sampling event are included as Appendix A.

B. Stream Assessment

1. Problem Areas Plan View (Stream)

An assessment of channel stability was performed on June 12, 2007, by S&EC. Areas of concern that were observed and documented included localized bank scour, and stressed or failing structures. These problem areas are shown on Sheets 5 through 7 (Problem Area Plan View) and described in Table IX.

2. Problem Areas Table Summary

Table IX: Stream Problem Areas Trout Cove Stream Restoration Site (EEP Project # 388)			
Feature Issues	Number	Suspected Cause	Photo number
Structure (Rock Shift)	1 (1+40 – 1+55)	Erosion/Undercutting	1-2
	3 (3+60 – 3+70)	Erosion/Undercutting	
	4 (3+95 – 4+05)	Erosion/Undercutting	
	5 (4+60 – 4+70)	Erosion/Undercutting	
	6 (23+05 – 23+15)	Erosion/Undercutting	
	7 (28+30 – 28+40)	Erosion/Undercutting	
Structure (Rock Piping)	2 (2+90 – 3+00)	Erosion	3
Bank Scour	1 (2+50 – 2+60)	Erosion/Undercutting Banks	4-5
	2 (4+10 – 4+18)	Erosion/Undercutting Banks	
	3 (6+20 – 6+27)	Erosion/Undercutting Banks	
	4 (22+55 – 22+95)	Erosion/Undercutting Banks	
	5 (24+96 – 25+00)	Erosion/Undercutting Banks	
	6 (26+00 – 26+05)	Erosion/Undercutting Banks	
	7 (27+40 – 27+95)	Erosion/Undercutting Banks	

3. Numbered Issues Photo Section

Representative photos of each category of stream problem area were taken and are shown in Appendix B.

4. Fixed Photo Station Photos

Photos from established photo stations (at each cross-section) were collected during the stream survey (November 2007). Cross-section photos taken during the Monitoring Year 1 survey (November 2006) are included for comparison. These photos are included in Appendix B.

5. Stability assessment

A visual qualitative assessment was performed to inspect channel facets, meanders, bed, banks, and installed structures. This visual assessment was confirmed and enhanced with a quantitative assessment of the physical stream survey. The goal of this assessment is to provide a percentage of the features listed in Table X that are in a state of stability. Table X was compiled from the data in Table B1 in Appendix B of this report.

Table X: Categorical Stream Feature Visual Stability Assessment Trout Cove Stream Restoration Site (EEP # 388)					
Feature	MY-1 2006	MY-2 2007	MY-3 2008	MY-4 2009	MY-5 2010
A. Riffles	100%	99%			
B. Pools	100%	100%			
C. Thalweg	100%	100%			
D. Meanders	100%	100%			
E. Bed General	99%	98%			
F. Channel General	N/A	N/A			
G. Banks	99.5%	98.6%			
H. Vanes/ J Hooks, etc.	96%	95%			
I. Wads and Boulders	N/A	N/A			

6. Quantitative Morphology

The following tables (Table XI and Table XII) summarize the quantitative data collected from the cross-sectional and longitudinal stream survey. Collected data was analyzed and summarized, and then compared with baseline data available for this project. The Quantitative Morphology Tables illustrate the degree of departure, if any, of the current channel from the baseline data.

2005 stream survey data received from NCEEP, was collected and provided by NCSU. Two reaches of the stream channel originally surveyed in 2005 were again surveyed using assumed vertical and horizontal coordinates.

We understand that a crest gauge has been installed on the site; however at the time of this submittal, no data from that gauge was available to S&EC. A review of available on-line USGS gauge sites was performed to determine if a suitable surrogate gauge was present in the area. No nearby gauge was identified. The closest USGS gauge to the site was on Brasstown Creek (near Brasstown, NC, Gauge Identification Number 03548330) which is approximately 3.3 miles from the project site. Based on this large distance, significant disparity in watershed sizes, and topographic variation, it is unlikely that a conclusive determination regarding the number of bankfull events experienced on the restoration site could be made.

Based on observed site conditions, to include wrack lines, staining of vegetation, displaced/flattened vegetation, and observable sediment deposition, it appears that one or more overbank events have occurred during this monitoring year. Similar observations were made during 2006 by S&EC indicating that one or more bankfull events have occurred onsite in each of the last two monitoring years.

**Table XI. Baseline Morphology and Hydraulic Summary
TROUT COVE STREAM RESTORATION SITE (EEP Project #388)**

Parameter	Pre-Existing Condition			Project Reference Stream			Design			As-built		
	Min	Max	Avg.	Min	Max	Avg.	Min	Max	Avg.	Min	Max	Avg.
Dimension												
BF Width (ft)	*	*	*	*	*	*	*	*	*	*	*	*
Floodprone Width (ft)	*	*	*	*	*	*	*	*	*	*	*	*
BF Cross Sectional Area (ft ²)	*	*	*	*	*	*	*	*	*	*	*	*
BF Mean Depth (ft)	*	*	*	*	*	*	*	*	*	*	*	*
BF Max Depth (ft)	*	*	*	*	*	*	*	*	*	*	*	*
Width/Depth Ratio	*	*	*	*	*	*	*	*	*	*	*	*
Entrenchment Ratio	*	*	*	*	*	*	*	*	*	*	*	*
Bank Height Ratio	*	*	*	*	*	*	*	*	*	*	*	*
Wetted Perimeter (ft)	*	*	*	*	*	*	*	*	*	*	*	*
Hydraulic radius (ft)	*	*	*	*	*	*	*	*	*	*	*	*
Pattern												
Channel Beltwidth (ft)	*	*	*	*	*	*	*	*	*	*	*	*
Radius of Curvature (ft)	*	*	*	*	*	*	*	*	*	*	*	*
Meander Wavelength (ft)	*	*	*	*	*	*	*	*	*	*	*	*
Meander Width ratio	*	*	*	*	*	*	*	*	*	*	*	*
Profile												
Riffle length (ft)	*	*	*	*	*	*	*	*	*	*	*	*
Riffle slope (ft/ft)	*	*	*	*	*	*	*	*	*	*	*	*
Pool length (ft)	*	*	*	*	*	*	*	*	*	*	*	*
Pool spacing (ft)	*	*	*	*	*	*	*	*	*	*	*	*
Substrate												
d50 (mm)	*	*	*	*	*	*	*	*	*	*	*	*
d84 (mm)	*	*	*	*	*	*	*	*	*	*	*	*
Additional Reach Parameters												
Valley Length (ft)		*			*			*			*	
Channel Length (ft)		*			*			*			*	
Sinuosity		*			*			*			*	
Water Surface Slope (ft/ft)		*			*			*			*	
BF slope (ft/ft)		*			*			*			*	
Rosgen Classification		*			*			*			*	
*Habitat Index		*			*			*			*	
*Macrobenthos		*			*			*			*	

* Items denoted with an asterisk have not been provided due to: lack of data provided for previous monitoring years, incorrect data provided for previous monitoring years, or these are items outside the scope of this year's monitoring effort.

**Exhibit Table XII. Morphology and Hydraulic Monitoring Summary
TROUT COVE STREAM RESTORATION SITE (EEP Project #388)**

Parameter	LOWER REACH						UPPER REACH								
	XS1 - POOL 1			XS2 - RIFFLE 2			XS3 - POOL 2			XS4 - RIFFLE 2			XS5 - POOL 3		
	AS BUILT	MY1	MY2	AS BUILT	MY1	MY2	AS BUILT	MY1	MY2	AS BUILT	MY1	MY2	AS BUILT	MY1	MY2
Dimension	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007
BF Width (ft)	*	15.69	10.96	*	9.6	6.79	*	18.63	15.52	*	22.33	21.64	*	12.47	11.13
Floodprone Width (ft)	*	54.22	32.41	*	50	28.13	*	50	32.93	*	50	48.58	*	50	39.88
BF Cross Sectional Area (ft ²)	*	11.21	17.63	*	10.02	8.78	*	10.1	7.16	*	10.3	11.35	*	10.07	8.85
BF Mean Depth (ft)	*	0.71	1.61	*	1.04	1.29	*	0.54	0.46	*	0.46	0.52	*	0.81	0.8
BF Max Depth (ft)	*	2.35	2.22	*	2.3	2.19	*	1.48	1.23	*	1.22	1.43	*	1.81	1.8
Width/Depth Ratio	*	22.1	6.81	*	9.23	5.26	*	34.5	33.74	*	48.54	41.62	*	15.4	13.91
Entrenchment Ratio	*	3.46	2.96	*	5.21	4.15	*	2.68	2.12	*	2.24	2.25	*	4.01	3.58
Bank Height Ratio	*	1.04	1.08	*	1.20	1.26	*	1.54	1.59	*	1.06	1.08	*	1.49	1.52
Wetted Perimeter (ft)	*	16.93	12.77	*	10.88	8.64	*	19.35	15.89	*	22.73	22.07	*	13.57	12.19
Hydraulic radius (ft)	*	0.66	1.38	*	0.92	1.02	*	0.52	0.45	*	0.45	0.51	*	0.74	0.73
Substrate															
d50 (mm)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
d84 (mm)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Parameter	As-built (2005)			MY-1 (2006)			MY-2 (2007)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern									
Channel Beltwidth (ft)	*	*	*	24.28	84.5	45.88	22.06	80.88	47.35
Radius of Curvature (ft)	*	*	*	19.03	38.59	28.26	20.95	35.37	28.49
Meander Wavelength (ft)	*	*	*	87.75	135.06	103.88	57	124.64	90.36
Meander Width ratio	*	*	*	3.92969	6.04837	4.65204	3.2489	11.9116	6.97349
Profile									
Rifle length (ft)	*	*	*	*	*	*	4.69	7.98	5.98
Rifle slope (ft/ft)	*	*	*	0.08714	0.07284	0.04092	0.0239	0.0966	0.0658
Pool length (ft)	*	*	*	4.34	30.09	14.39	4.75	22.33	11.98
Pool spacing (ft)	*	*	*	11.29	105.54	52.21	29.94	87.91	57.62
Additional Reach Parameters									
Valley Length (ft)	*				1746			1746	
Channel Length (ft)	*				1876			1876	
Sinuosity	*				1.07			1.07	
Water Surface Slope (ft/ft)	*				0.04092			0.0409	
BF slope (ft/ft)	*				0.04092			0.0409	
Rosgen Classification	*				C4b			C4b	
Habitat Index*	*				*			*	
Macrobenthos*	*				*			*	

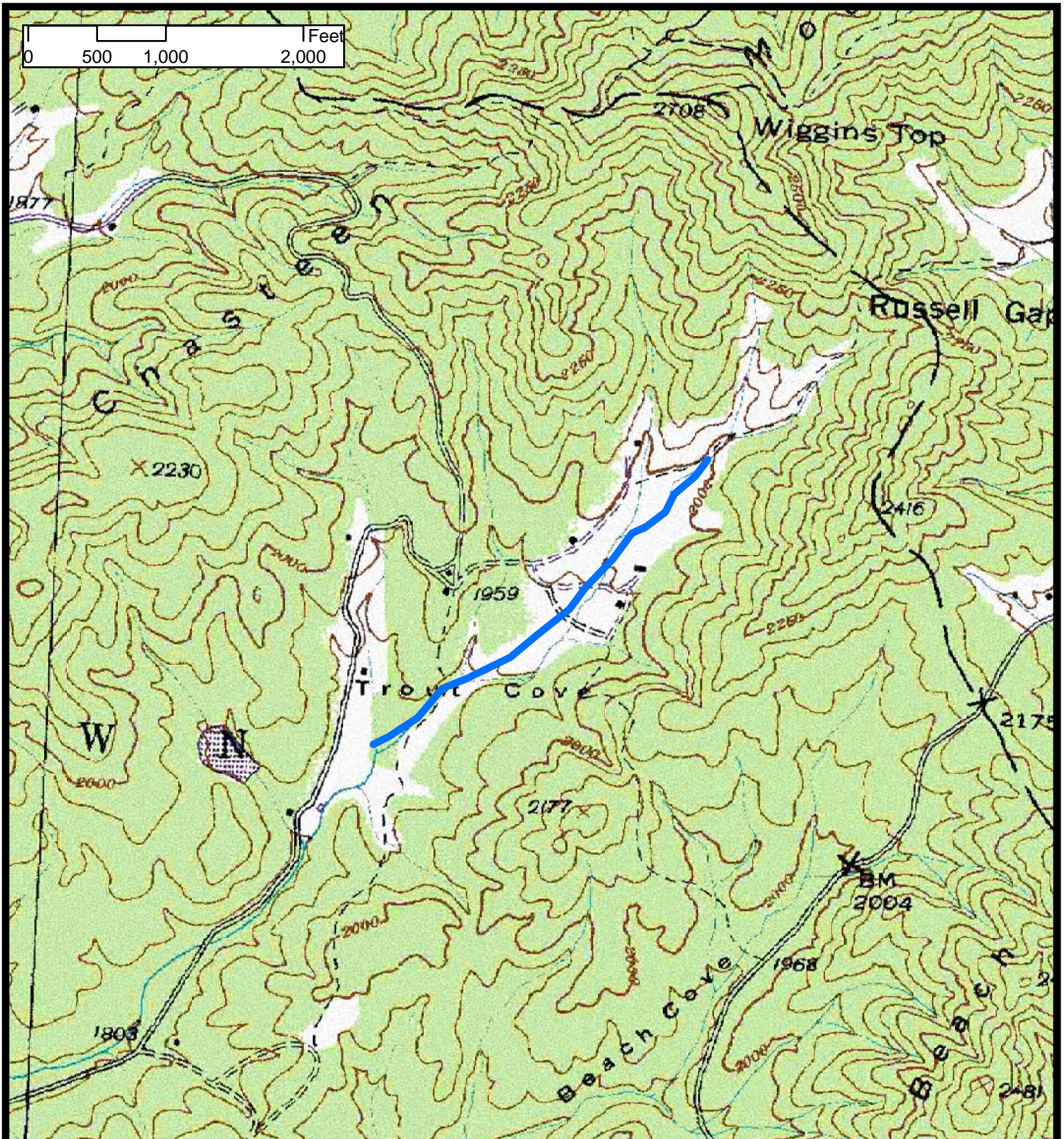
IV. Methodology Section

No unavoidable deviations from initially prescribed methodologies were implemented as a part of monitoring Year 2 (2007) activities. Vegetation counts were completed according to CVS-EEP Protocol for Recording Vegetation Version 4.0.

References

Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation, Version 4.0 (<http://cvs.bio.unc.edu/methods.htm>)

Weakley, Alan S. 2004. Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas.



Project Number:
10079.D2

Project Manager:
JER

Scale:
1" = 1000'

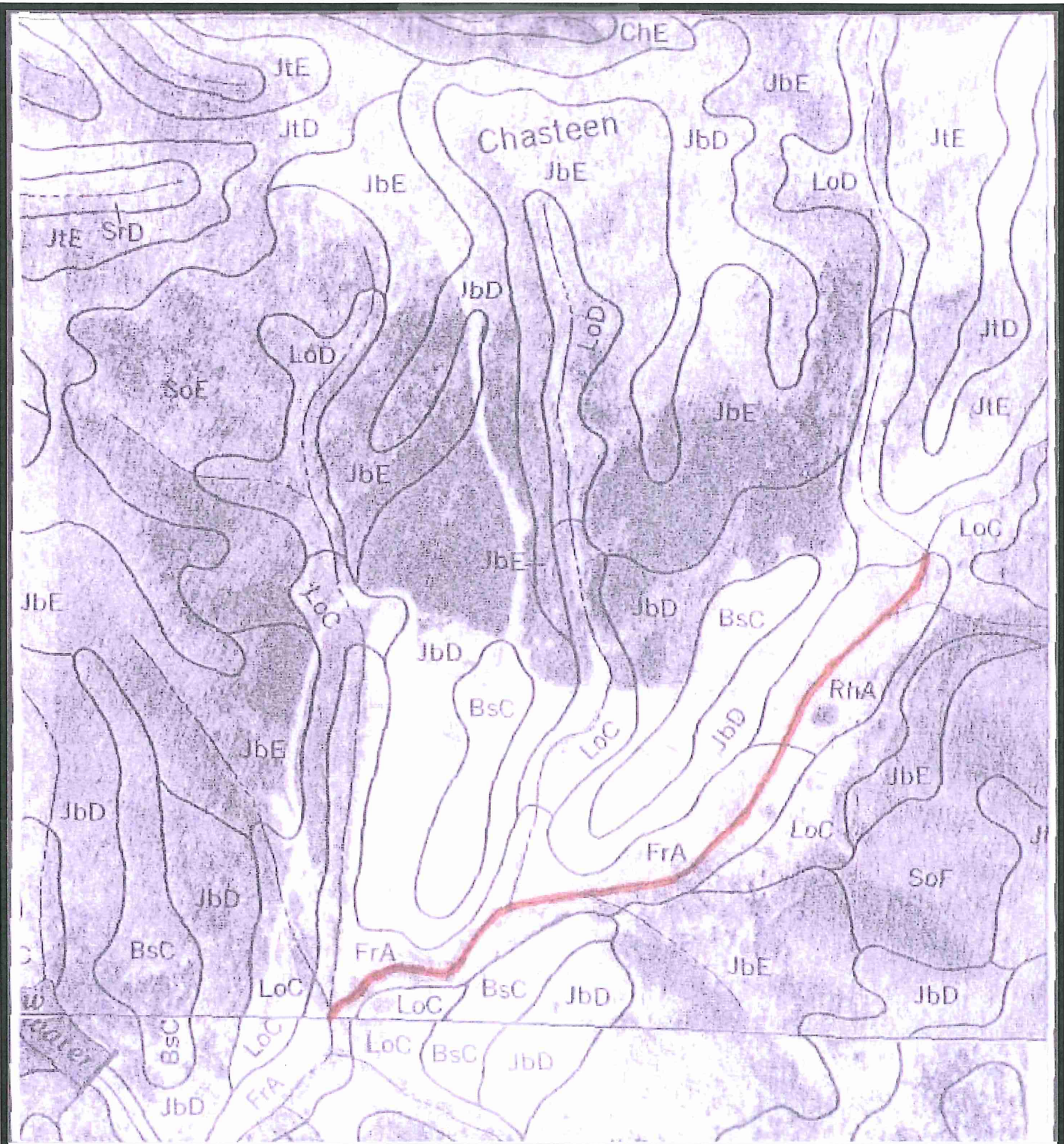
Date:
DECEMBER 2007

Map Title:
Figure 1 - USGS Map
Trout Cove
Stream Restoration
Clay County, NC

Source:
Peachtree Quadrangle



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Web Page: www.SandEC.com



Project Number:
10079.D2

Project Manager:
JER

Scale:
1" = 250'

Date:
JANUARY 2008

Map Title:
Figure 2 - Soils Map
Trout Cove
Stream Restoration
Clay County, NC

Source:
Soil Survey of Clay County, NC







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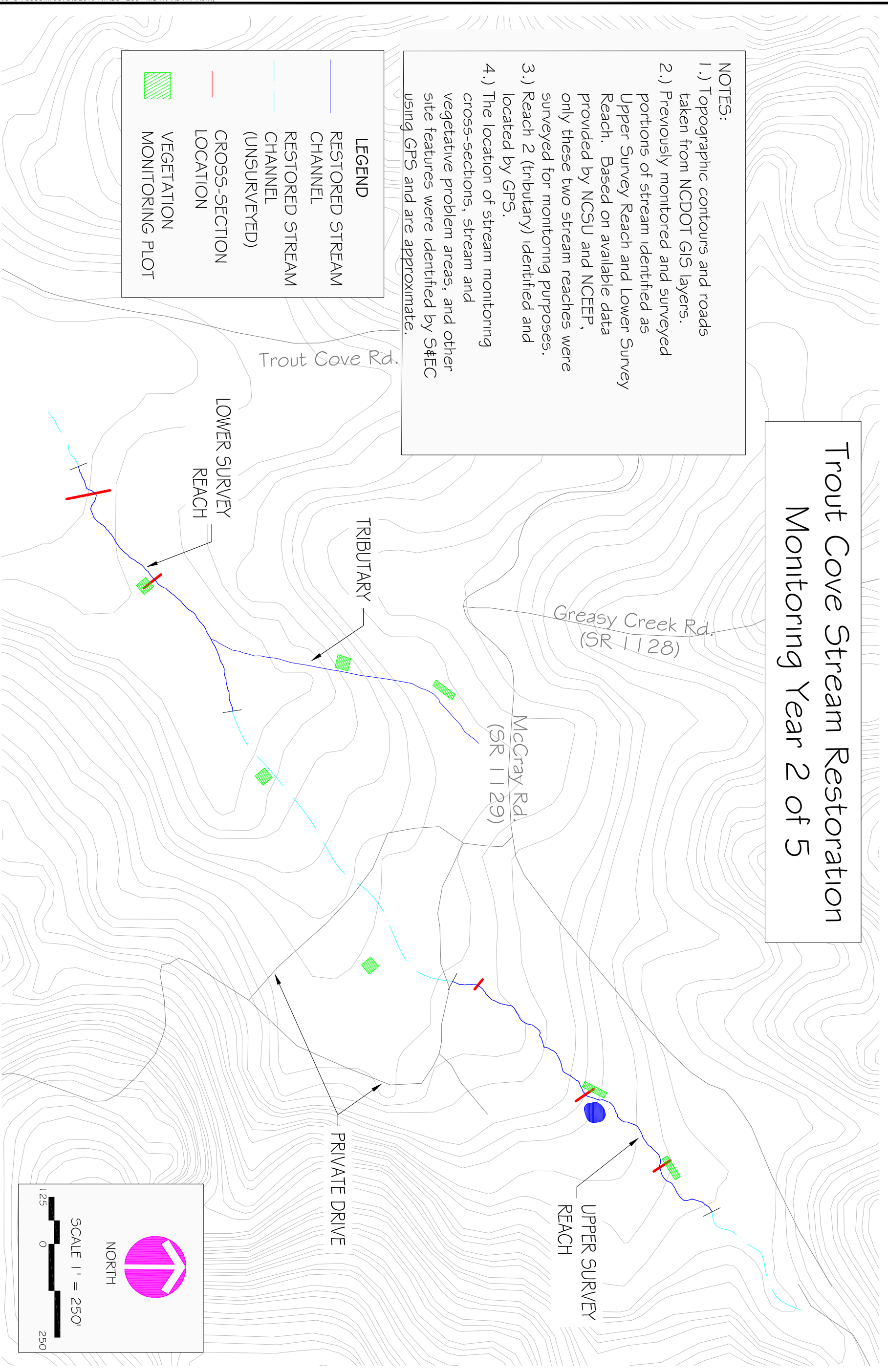
Trout Cove Stream Restoration Monitoring Year 2 of 5


NOTES:

- 1.) Topographic contours and roads taken from NCDOT GIS layers.
- 2.) Previously monitored and surveyed portions of stream identified as Upper Survey Reach and Lower Survey Reach. Based on available data provided by NCSU and NCEEP, only these two stream reaches were surveyed for monitoring purposes.
- 3.) Reach 2 (tributary) identified and located by GPS.
- 4.) The location of stream monitoring cross-sections, stream and vegetative problem areas, and other site features were identified by S&EC using GPS and are approximate.

LEGEND	
	RESTORED STREAM CHANNEL
	RESTORED STREAM CHANNEL (UNSURVEYED)
	CROSS-SECTION LOCATION
	VEGETATION MONITORING PLOT


OVERALL SITE PLAN





NORTH

SCALE 1" = 250'





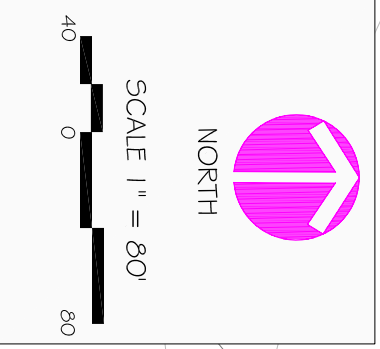
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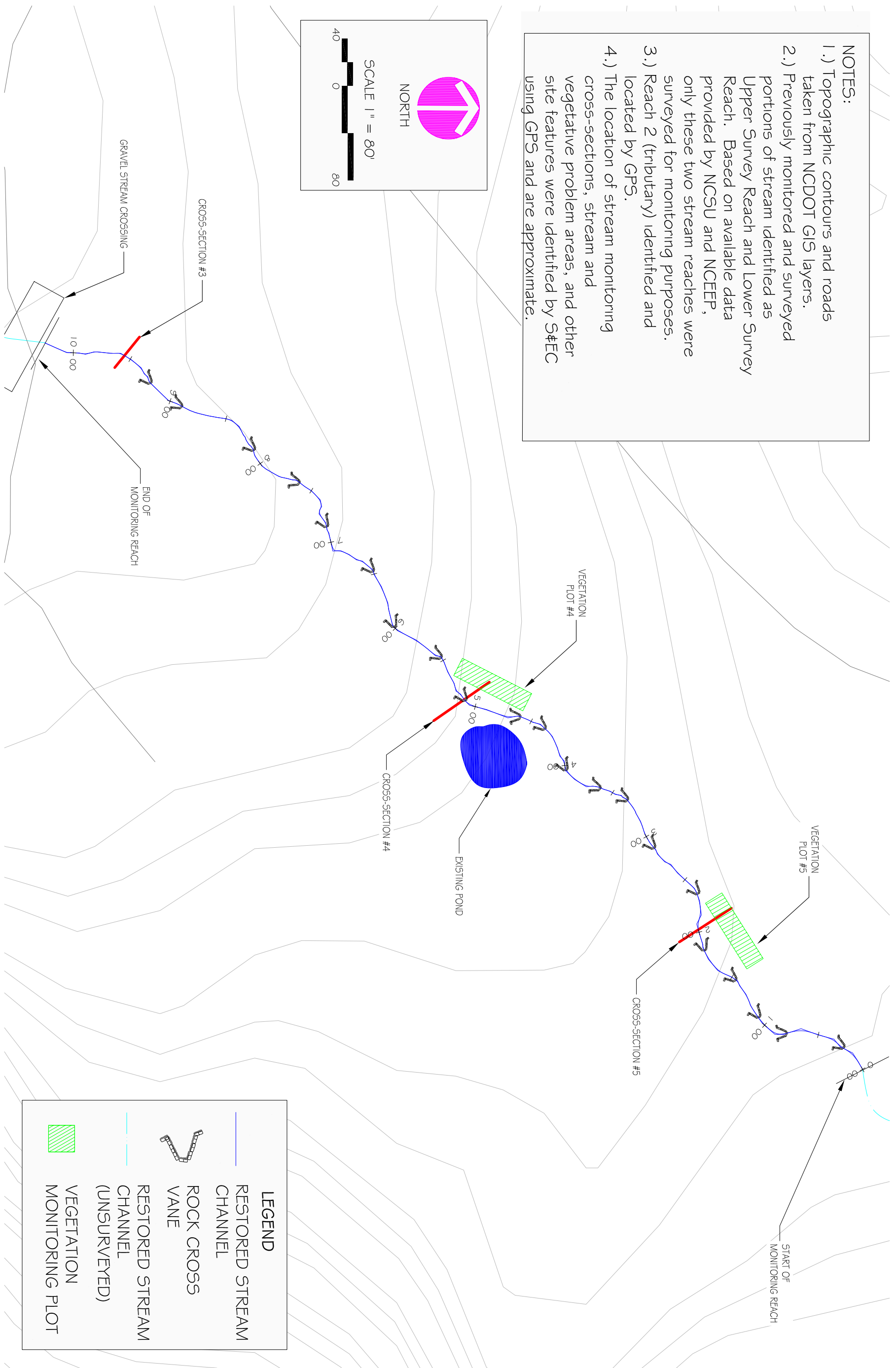
Project: TROUT COVE STREAM RESTORATION		Project No.: 10079.D2
Location: CLAY CO., NC	Client: NCEEP	Proj. Mgr.: JER Drawn: JER
Sheet Title: OVERALL SITE PLAN		Scale: 1" = 250' Sheet No.: 1 of 7

NOTES:





- 1.) Topographic contours and roads taken from NCDOT GIS layers.
- 2.) Previously monitored and surveyed portions of stream identified as Upper Survey Reach and Lower Survey Reach. Based on available data provided by NCSU and NCEEP, only these two stream reaches were surveyed for monitoring purposes.
- 3.) Reach 2 (tributary) identified and located by GPS.
- 4.) The location of stream monitoring cross-sections, stream and vegetative problem areas, and other site features were identified by S&EC using GPS and are approximate.



UPPER SURVEY REACH - MONITORING PLAN VIEW



LEGEND

-  RESTORED STREAM CHANNEL
-  ROCK CROSS VANE
-  RESTORED STREAM CHANNEL (UNSURVEYED)
-  VEGETATION MONITORING PLOT



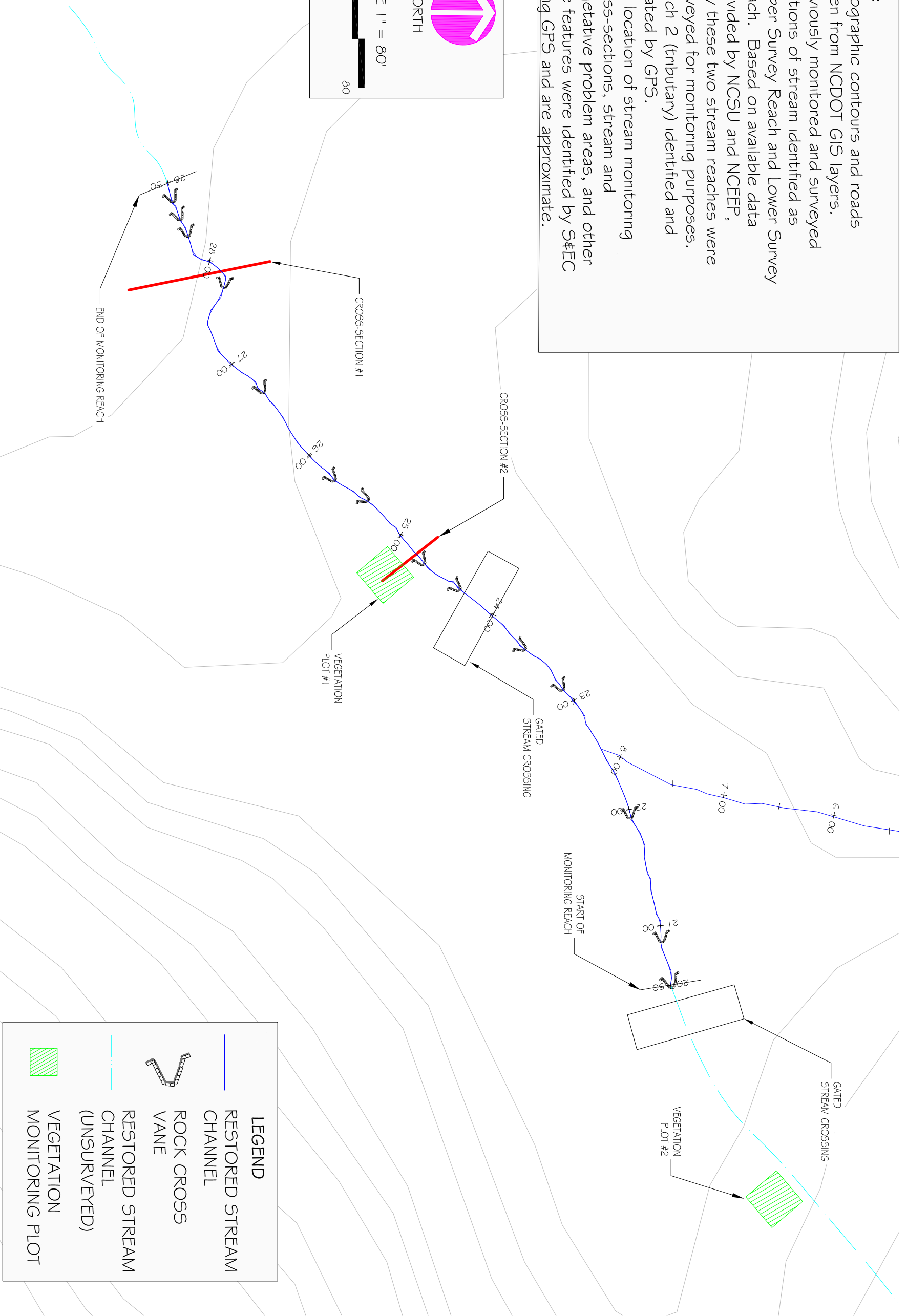
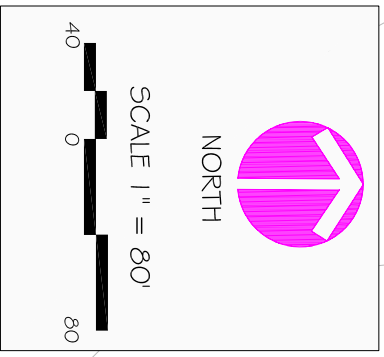
Soil & Environmental Consultants, PA
 11010 Raven Ridge Road · Raleigh, North Carolina 27614 · Phone: (919) 846-5900 · Fax: (919) 846-9467
 www.SandEC.com

Project: TROUT COVE STREAM RESTORATION		Project No.: 10079.D2
Location: CLAY CO., NC	Client: NCEEP	Proj. Mgr.: JER Drawn: JER
Sheet Title: MONITORING PLAN VIEW UPPER SURVEY REACH		Scale: 1" = 80'
		Sheet No.: 2 OF 7

JUNE 2007

JUNE 2007

- NOTES:**
- 1.) Topographic contours and roads taken from NCDOT GIS layers.
 - 2.) Previously monitored and surveyed portions of stream identified as Upper Survey Reach and Lower Survey Reach. Based on available data provided by NCSU and NCEEP, only these two stream reaches were surveyed for monitoring purposes.
 - 3.) Reach 2 (tributary) identified and located by GPS.
 - 4.) The location of stream monitoring cross-sections, stream and vegetative problem areas, and other site features were identified by S&EC using GPS and are approximate.



LEGEND	
	RESTORED STREAM CHANNEL
	ROCK CROSS VANE
	RESTORED STREAM CHANNEL (UNSURVEYED)
	VEGETATION MONITORING PLOT

LOWER SURVEY REACH - MONITORING PLAN VIEW

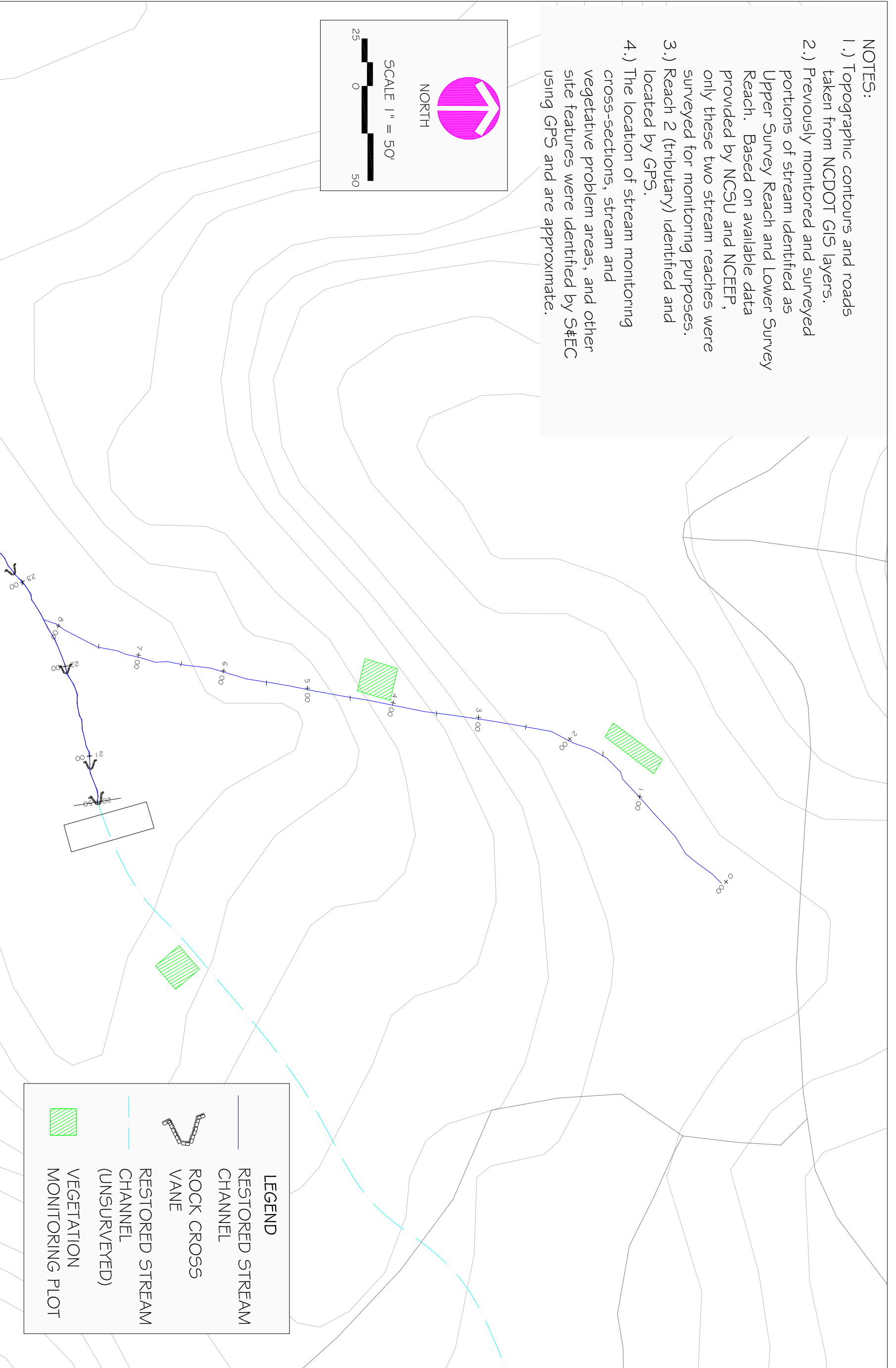
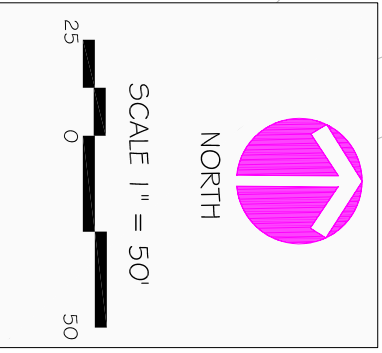


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www.SandEC.com

Project: TROUT COVE STREAM RESTORATION		Project No.: 10079_D2
Location: CLAY CO., NC	Client: NCEEP	Proj. Mgr.: Drawn: JER JER
Sheet Title: MONITORING PLAN VIEW LOWER SURVEY REACH		Scale: 1" = 80'
		Sheet No.: 3 OF 7

- NOTES:
- 1.) Topographic contours and roads taken from NCDOT GIS layers.
 - 2.) Previously monitored and surveyed portions of stream identified as Upper Survey Reach and Lower Survey Reach. Based on available data provided by NCSU and NCEEP, only these two stream reaches were surveyed for monitoring purposes.
 - 3.) Reach 2 (tributary) identified and located by GPS.
 - 4.) The location of stream monitoring cross-sections, stream and vegetative problem areas, and other site features were identified by S&EC using GPS and are approximate.



LEGEND

-  RESTORED STREAM CHANNEL
-  ROCK CROSS VANE
-  RESTORED STREAM CHANNEL (UNSURVEYED)
-  VEGETATION MONITORING PLOT

TRIBUTARY - MONITORING PLAN VIEW



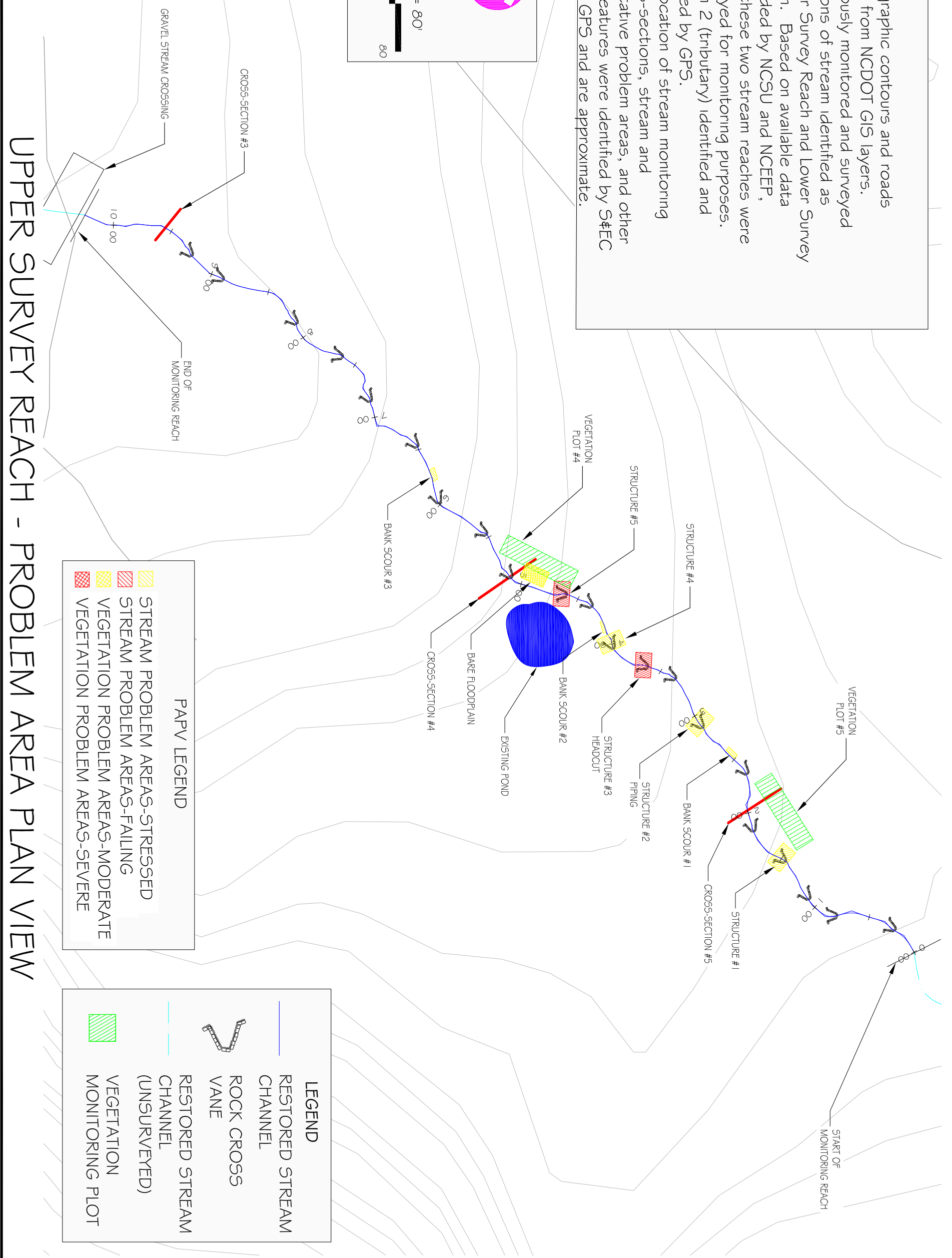
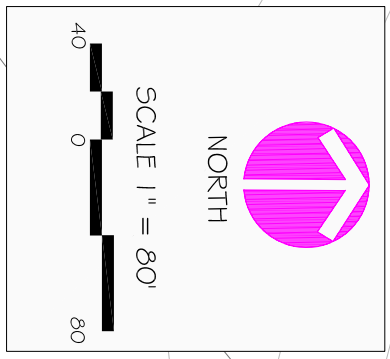
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 11010 Raven Ridge Road • Raleigh, North Carolina 27614 • Phone: (919) 846-5900 • Fax: (919) 846-9467
 www.SandEC.com

Project: TROUT COVE STREAM RESTORATION		Project No.: 10079.D2
Location: CLAY CO., NC	Client: NCEEP	Proj. Mgr.: JER Drawn: JER
Sheet Title: MONITORING PLAN VIEW TRIBUTARY		Scale: 1" = 50'
		Sheet No.: 4 OF 7

JUNE 2007

NOTES:

- 1.) Topographic contours and roads taken from NCDOT GIS layers.
- 2.) Previously monitored and surveyed portions of stream identified as Upper Survey Reach and Lower Survey Reach. Based on available data provided by NCSU and NCEEP, only these two stream reaches were surveyed for monitoring purposes.
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- 4.) The location of stream monitoring cross-sections, stream and vegetative problem areas, and other site features were identified by S&EC using GPS and are approximate.



PAPV LEGEND

- STREAM PROBLEM AREAS-STRESSED
- STREAM PROBLEM AREAS-FALLING
- VEGETATION PROBLEM AREAS-MODERATE
- VEGETATION PROBLEM AREAS-SEVERE

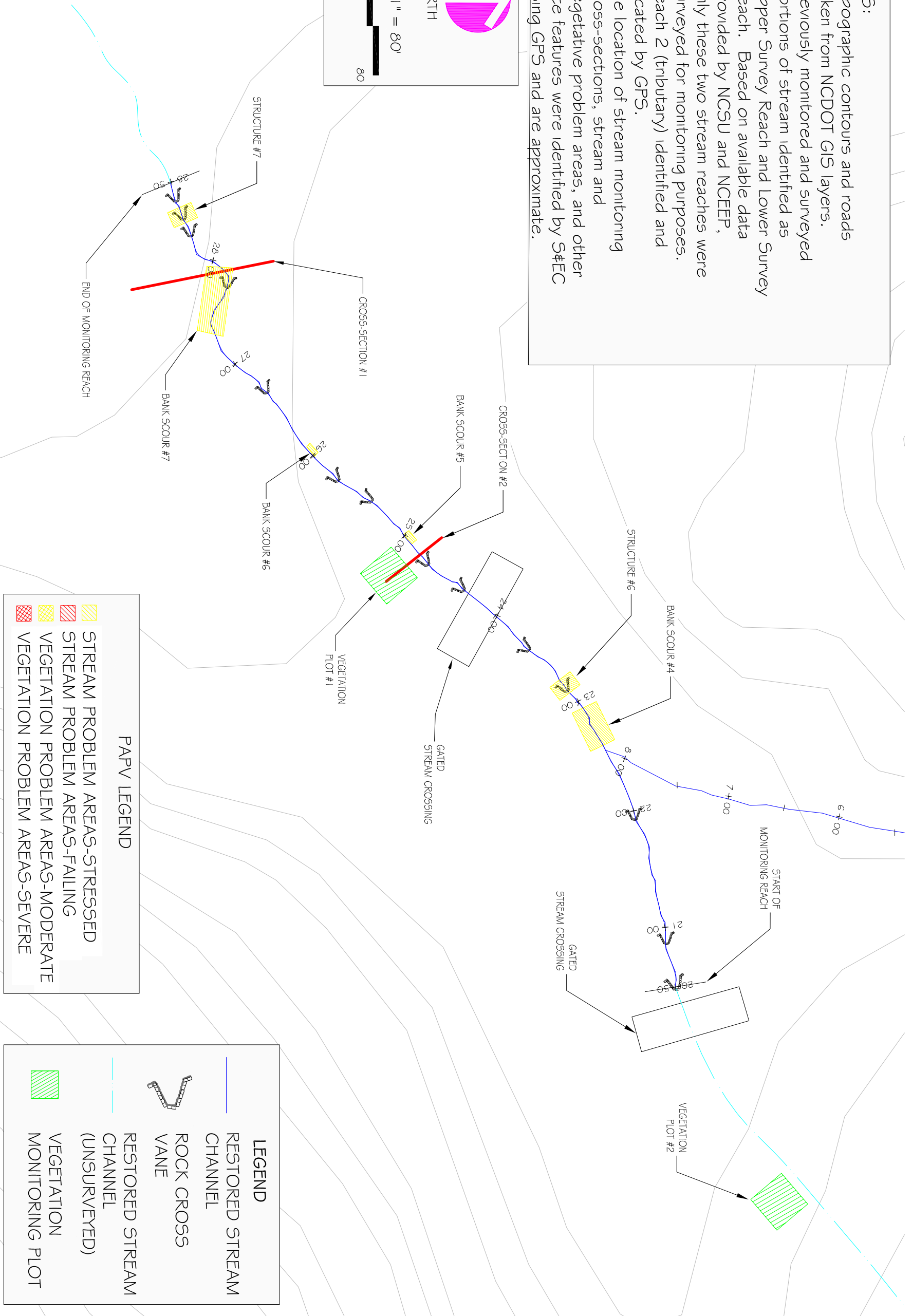
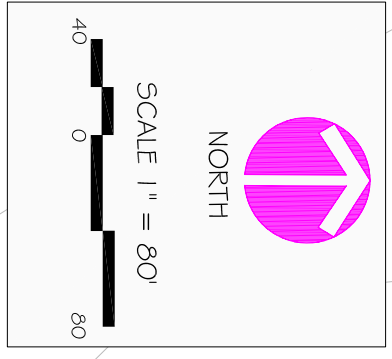
LEGEND

- RESTORED STREAM CHANNEL
- ROCK CROSS VANE
- RESTORED STREAM CHANNEL (UNSURVEYED)
- VEGETATION MONITORING PLOT

UPPER SURVEY REACH - PROBLEM AREA PLAN VIEW

NOTES:

- 1.) Topographic contours and roads taken from NCDOT GIS layers.
- 2.) Previously monitored and surveyed portions of stream identified as Upper Survey Reach and Lower Survey Reach. Based on available data provided by NCSU and NCEEP, only these two stream reaches were surveyed for monitoring purposes.
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PAPV LEGEND

- STREAM PROBLEM AREAS-STRESSED
- STREAM PROBLEM AREAS-FAILING
- VEGETATION PROBLEM AREAS-MODERATE
- VEGETATION PROBLEM AREAS-SEVERE

LEGEND

- RESTORED STREAM CHANNEL
- RESTORED STREAM CHANNEL (UNSURVEYED)
- VEGETATION MONITORING PLOT
- ROCK CROSS VANE

LOWER SURVEY REACH - PROBLEM AREA PLAN VIEW



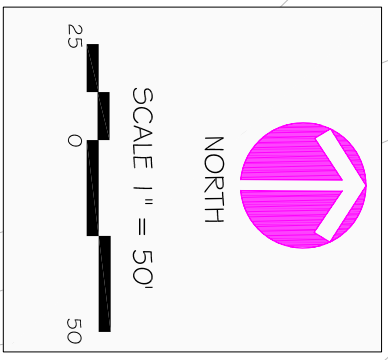
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 11010 Raven Ridge Road • Raleigh, North Carolina 27614 • Phone: (919) 846-5900 • Fax: (919) 846-9467
 www.SandEC.com

Project: TROUT COVE STREAM RESTORATION		Project No.: 10079.D2
Location: CLAY CO., NC	Client: NCEEP	Proj. Mgr.: JER Drawn: JER
Sheet Title: PAPV - LOWER SURVEY REACH		Scale: 1" = 80'
		Sheet No.: 6 OF 7

JUNE 2007

NOTES:

- 1.) Topographic contours and roads taken from NCDOT GIS layers.
- 2.) Previously monitored and surveyed portions of stream identified as Upper Survey Reach and Lower Survey Reach. Based on available data provided by NCSU and NCEEP, only these two stream reaches were surveyed for monitoring purposes.
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- 4.) The location of stream monitoring cross-sections, stream and vegetative problem areas, and other site features were identified by S&EC using GPS and are approximate.



PAPV LEGEND

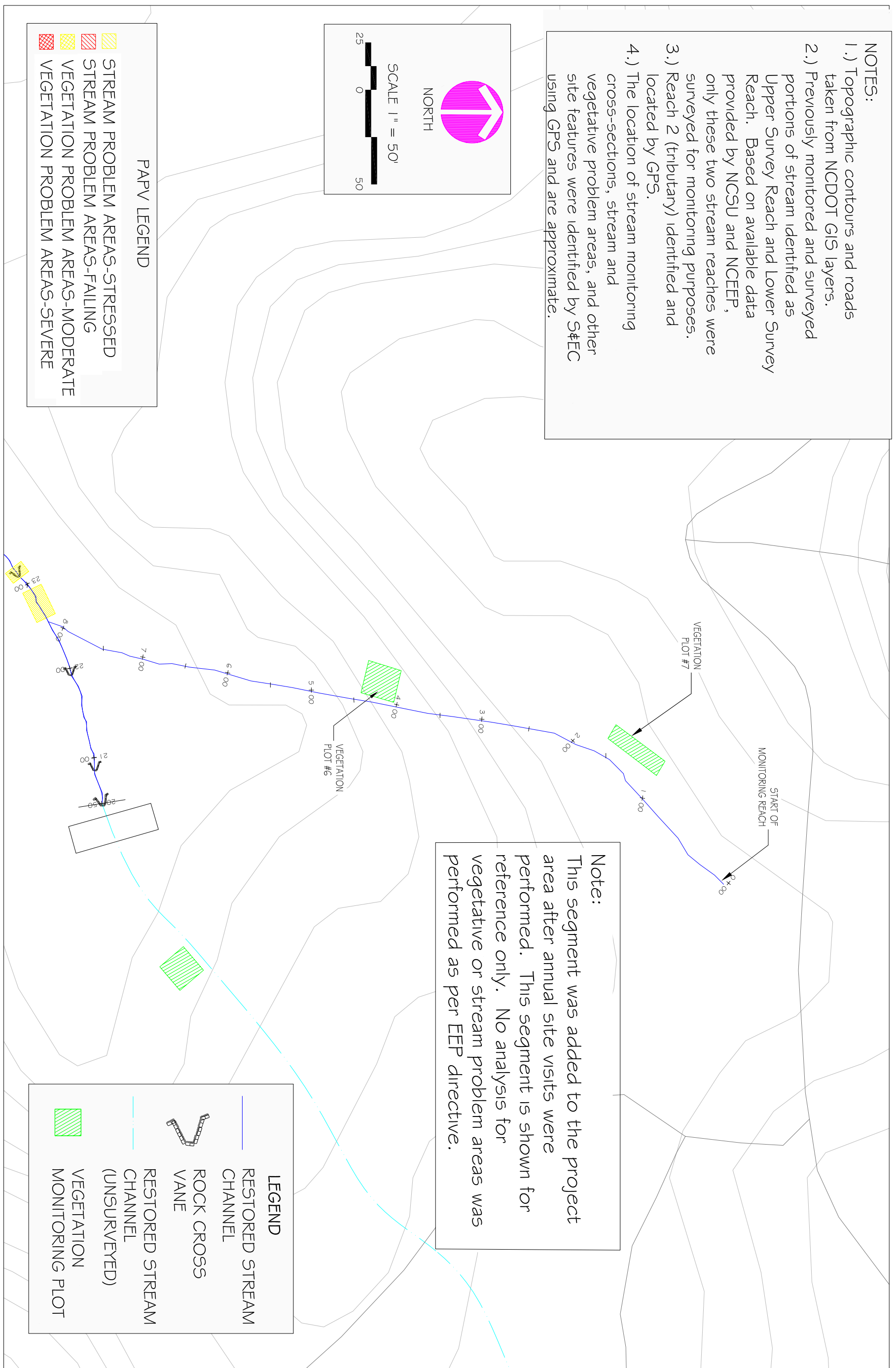
- STREAM PROBLEM AREAS-STRESSED
- STREAM PROBLEM AREAS-FAILING
- VEGETATION PROBLEM AREAS-MODERATE
- VEGETATION PROBLEM AREAS-SEVERE

Note:
This segment was added to the project area after annual site visits were performed. This segment is shown for reference only. No analysis for vegetative or stream problem areas was performed as per EEP directive.

LEGEND

- RESTORED STREAM CHANNEL
- ROCK CROSS VANE
- RESTORED STREAM CHANNEL (UNSURVEYED)
- VEGETATION MONITORING PLOT

TRIBUTARY - PROBLEM AREA PLAN VIEW



APPENDIX A –
Vegetation Data Survey Tables

Trout Cove Stream Restoration Vegetation Monitoring (EEP Project# 388)

Live Stem Counts per Plot arranged by Species

Species	Plot #							Year 2 Totals
	Reach 1					Reach 2		
	1	2	3	4	5	6	7	
<i>Acer rubrum</i> Red Maple		1		1	1			3
<i>Alnus serrulata*</i> Tag Alder	5	3	1	8	13			30
<i>Betula nigra</i> River Birch					1			1
<i>Cephalanthus occidentalis</i> Buttonbush			1	2	2			5
<i>Clethra alnifolia</i> Pepperbush	2			1				3
<i>Cornus amomum*</i> Silky Dogwood	1	6	2	8	10			27
<i>Liriodendron tulipifera</i> Tulip poplar				1	1			2
<i>Platanus occidentalis</i> Sycamore	1	1						2
<i>Salix nigra</i> Black Willow		6		3	1			10
Year 2 (2007) Plot Totals	9	17	4	24	29			83
Year 1 (2006) Plot Totals	6	18	4	22	28	N/A	N/A	78
Previous Plot Totals	5	4	5	22	14	N/A	N/A	50
Plot Live Stem Density	364	689	162	972	1175			

Report Prepared By
Date Prepared

David Ingersoll
6/20/2007 14:32

database name 2007-TC-CVS_EEP_EntryTool_v210.mdb
database location [\\Sec2\jobs10-10999k\10079.D2\Vegetation](#)

DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----

Metadata This worksheet, which is a summary of the project and the project data.
Plots List of plots surveyed.
Vigor Frequency distribution of vigor classes.
Vigor by Spp Frequency distribution of vigor classes listed by species.
Damage List of most frequent damage classes with number of occurrences and p
Damage by Spp Damage values tallied by type for each species.
Damage by Plot Damage values tallied by type for each plot.
Stem Count by Plot and Spp Count of living stems of each species for each plot; dead and missing st

PROJECT SUMMARY-----

Project Code	project Name	Description
TC	Trout Cove	Trout Cove Branch Stream Restoratio

Table 2. – Vegetation Vigor by Species

	Species	4	3	2	1	0	Missing
	Acer rubrum	3	2				
	Alnus serrulata	18	10	2			
	Betula nigra	9	1				
	Cephalanthus occidentalis	4	2				
	Clethra alnifolia	2	1				
	Cornus amomum	17	10	1	1		
	Liriodendron tulipifera	1	1				
	Platanus occidentalis	3					
	Salix nigra	9	4		1		
TOT:		9	66	31	3	2	0

Table 3. – Vegetation Damage by Species

	Species	All Damage Categories	(no damage)	Insect s	(other damage)
	Acer rubrum	5	4	1	
	Alnus serrulata	30	30		
	Betula nigra	10	9	1	
	Cephalanthus occidentalis	6	6		
	Clethra alnifolia	3	2	1	
	Cornus amomum	29	27	2	
	Liriodendron tulipifera	2	2		
	Platanus occidentalis	3	3		
	Salix nigra	14	10	4	
TOT :		9	102	93	9

Table 4. – Vegetation Damage by Plot

	plot	All Damage Categories	(no damage)	Insects	(other damage)
	TC-01-buffer1-year:2	9	9		
	TC-01-buffer2-year:2	17	12	5	
	TC-01-buffer3-year:2	4	4		
	TC-01-buffer4-year:2	24	21	3	
	TC-01-buffer5-year:2	29	28	1	
	TC-01-buffer6-year:2	11	11		
	TC-01-buffer7-year:2	8	8		
TOT:	7	102	93	9	

Table 5. – Stem Count by Plot and Species

Species	Total Stems	# plots	avg# stems	TC-01-buffer1-year:2	TC-01-buffer2-year:2	TC-01-buffer3-year:2	TC-01-buffer4-year:2	TC-01-buffer5-year:2	TC-01-buffer6-year:2	TC-01-buffer7-year:2
Acer rubrum	5	4	1.25		1		1	1	2	
Alnus serrulata	30	5	6	5	3	1	8	13		
Betula nigra	10	3	3.33					1	4	5
Cephalanthus occidentalis	6	4	1.5			1	2	2	1	
Clethra alnifolia	3	2	1.5	2			1			
Cornus amomum	29	6	4.83	1	6	2	8	10	2	
Liriodendron tulipifera	2	2	1				1	1		
Platanus occidentalis	3	2	1.5	1	1					
Salix nigra	14	5	2.8		6		3	1	2	2
9	102			9	17	4	24	29	11	8

APPENDIX A –
Vegetation Monitoring Plot Photos



Vegetation Monitoring Plot #1—Year 2 (June 12, 2007)



Vegetation Monitoring Plot #1—Year 1 (June 20, 2006)



Vegetation Monitoring Plot #2—Year 2 (June 12, 2007)



Vegetation Monitoring Plot #2—Year 1 (June 20, 2006)



Vegetation Monitoring Plot #3—Year 2 (June 12, 2007)



Vegetation Monitoring Plot #3—Year 1 (June 20, 2006)



Vegetation Monitoring Plot #4—Year 2 (June 12, 2007)



Vegetation Monitoring Plot #4—Year 1 (June 20, 2006)



Vegetation Monitoring Plot #5—Year 2 (June 12, 2007)



Vegetation Monitoring Plot #5—Year 1 (June 20, 2006)



Vegetation Monitoring Plot #6—Year 2 (December 12, 2007)



Vegetation Monitoring Plot #7—Year 2 (December 12, 2007)

APPENDIX B –
Stream Problem Areas



Figure 1—Typical Rock Shift (June 12, 2007)



Figure 2—Typical Rock Shift (June 12, 2007)



Figure 3—Typical Rock Piping (June 12, 2007)



Figure 4—Typical Bank Scour (November 13, 2007)

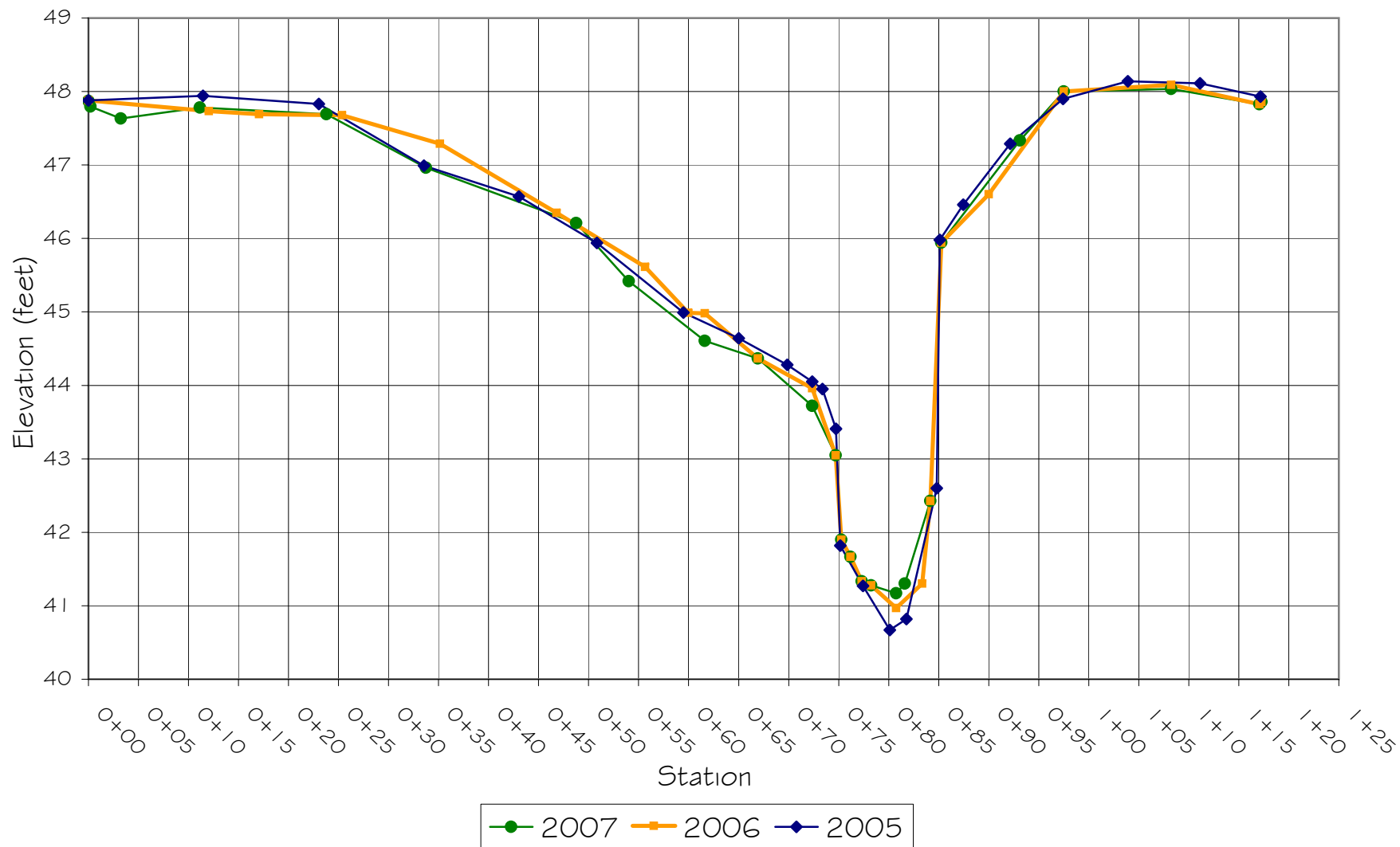


Figure 5—Typical Bank Scour (June 12, 2007)

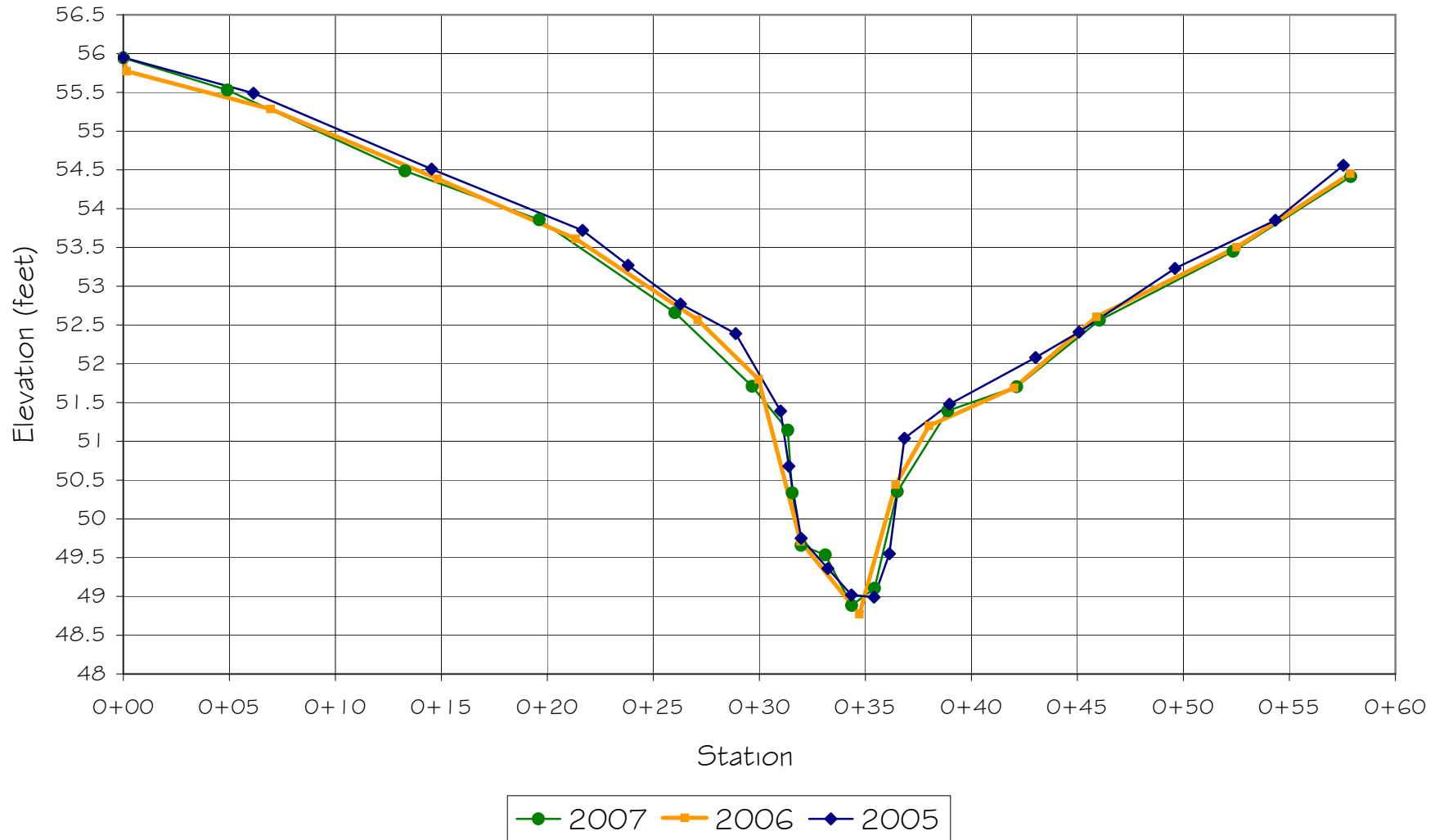
APPENDIX B –

Cross-section Data

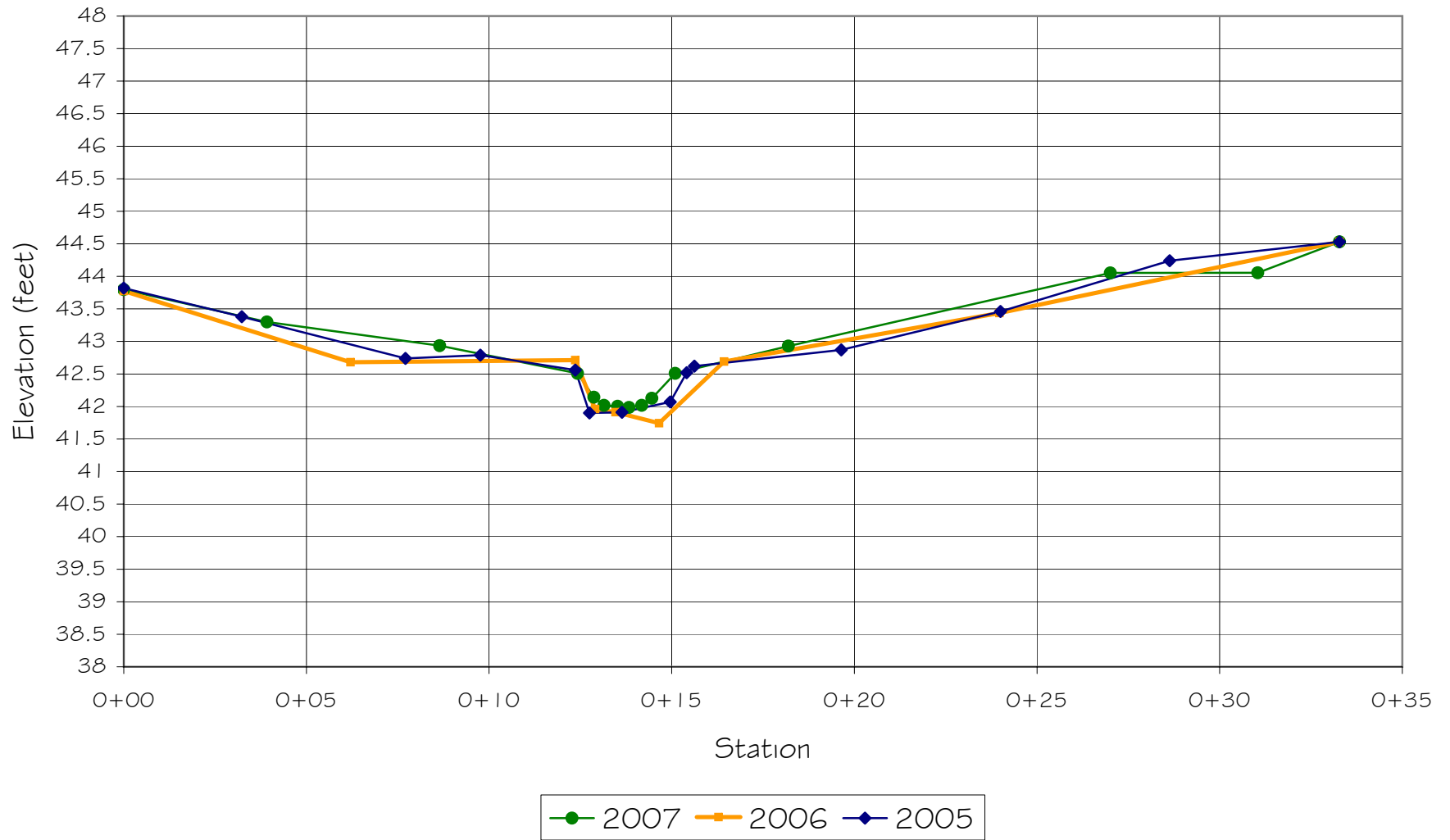
Trout Cove Stream Restoration
Cross-Section #1 - Pool



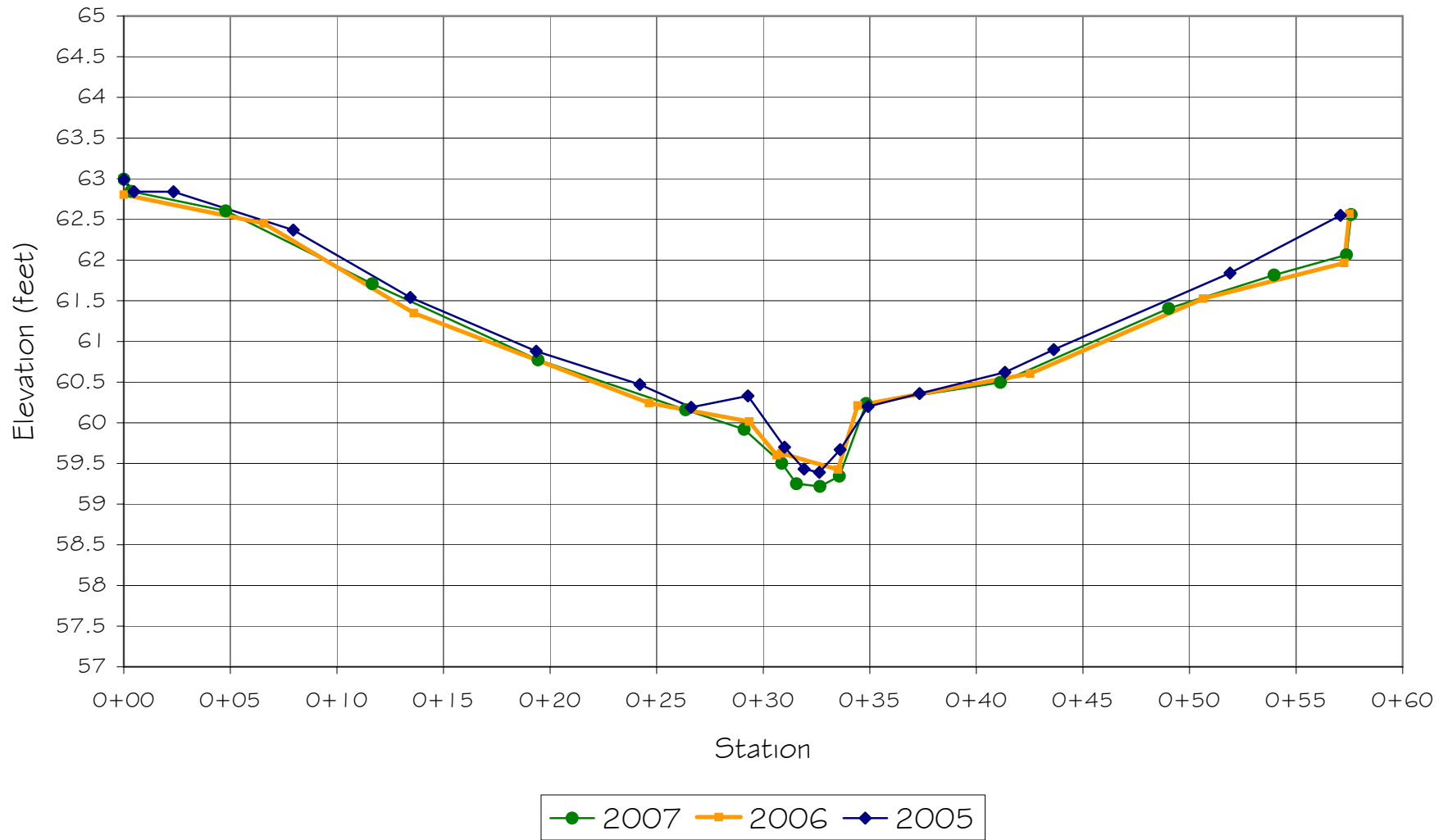
Trout Cove Stream Restoration
Cross-Section #2- Riffle



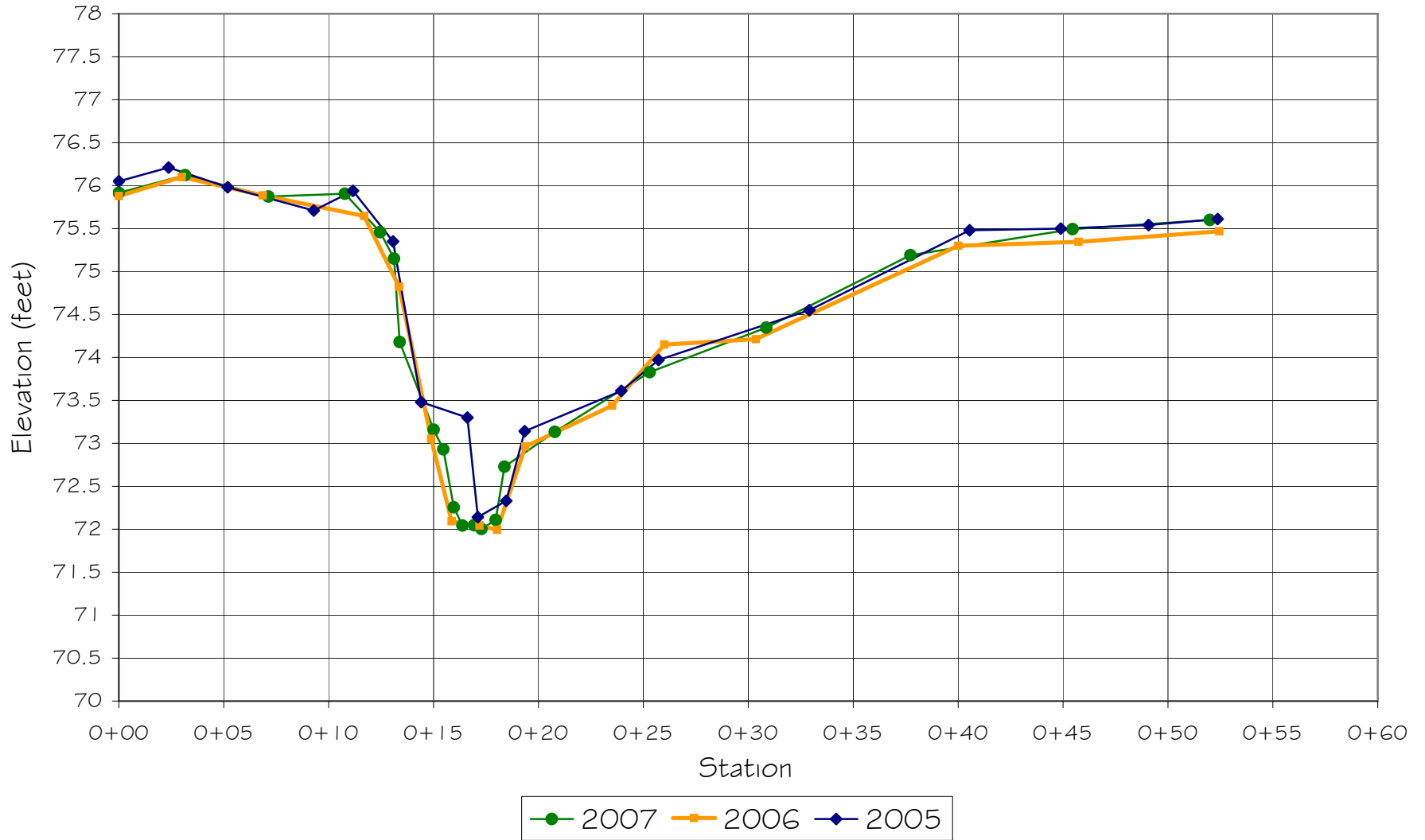
Trout Cove Stream Restoration
Cross-Section #3 - Pool



Trout Cove Stream Restoration
Cross-Section #4 - Riffle



Trout Cove Stream Restoration
Cross-Section #5 - Pool





Cross-section #1—Year 2 (November 13, 2007)



Cross-section #1—Year 1 (November 17, 2006)



Cross-section #2—Year 2 (November 13, 2007)



Cross-section #2—Year 1 (November 17, 2006)



Cross-section #3—Year 2 (November 13, 2007)



Cross-section #3—Year 1 (November 17, 2006)



Cross-section #4—Year 2 (November 13, 2007)



Cross-section #4—Year 1 (November 17, 2006)



Cross-section #5—Year 2 (November 13, 2007)



Cross-section #5—Year 1 (November 17, 2006)

RIVERMORPH CROSS SECTION SUMMARY

 River Name: TROUT COVE
 Reach Name: 2007
 Cross Section Name: XS1
 Survey Date: 11/19/2007

TAPE	ELEV	NOTE
0	0	47.872
0.2	0	47.794
3.24	0	47.631
11.15	0	47.78
23.79	0	47.692
33.75	0	46.963
48.77	0	46.211
54.03	0	45.419
61.61	0	44.606
66.93	0	44.365
72.36	0	43.722
74.7	0	43.048
75.26	0	41.898 LEW
76.18	0	41.665
77.3	0	41.334
78.26	0	41.278
80.75	0	41.17
81.63	0	41.3
84.17	0	42.425 REW
85.28	0	45.941
93.12	0	47.334
97.5	0	48
108.24	0	48.036
117.08	0	47.828
117.28	0	47.859

 Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	45.61	45.61	45.61
Bankfull Elevation (ft)	43.39	43.39	43.39
Floodprone Width (ft)	32.41	-----	-----
Bankfull Width (ft)	10.96	5.48	5.48
Entrenchment Ratio	2.96	-----	-----
Mean Depth (ft)	1.61	1.44	1.78
Maximum Depth (ft)	2.22	2.14	2.22
Width/Depth Ratio	6.81	3.81	3.08
Bankfull Area (sq ft)	17.63	7.87	9.76
Wetted Perimeter (ft)	12.77	8.47	8.58
Hydraulic Radius (ft)	1.38	0.93	1.14
Begin BKF Station	73.51	73.51	78.99
End BKF Station	84.47	78.99	84.47

RIVERMORPH CROSS SECTION SUMMARY

River Name: TROUT COVE
 Reach Name: 2007
 Cross Section Name: XS2
 Survey Date: 11/19/2007

TAPE	FS	ELEV	NOTE
0	0	55.945	
4.91	0	55.53	
13.28	0	54.487	
19.61	0	53.858	
26.02	0	52.659	
29.66	0	51.709	
31.34	0	51.143	
31.55	0	50.335	
31.97	0	49.659	
33.11	0	49.536	
34.35	0	48.885	
35.43	0	49.105	
36.51	0	50.352	
38.88	0	51.393	
42.14	0	51.704	
46.04	0	52.561	
52.35	0	53.451	
57.89	0	54.414	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	53.26	53.26	53.26
Bankfull Elevation (ft)	51.07	51.07	51.07
Floodprone Width (ft)	28.13	-----	-----
Bankfull Width (ft)	6.79	3.39	3.39
Entrenchment Ratio	4.15	-----	-----
Mean Depth (ft)	1.29	1.58	1.01
Maximum Depth (ft)	2.19	2.19	2.1
Width/Depth Ratio	5.26	2.15	3.36
Bankfull Area (sq ft)	8.78	5.36	3.42
Wetted Perimeter (ft)	8.64	6.61	6.23
Hydraulic Radius (ft)	1.02	0.81	0.55
Begin BKF Station	31.36	31.36	34.75
End BKF Station	38.14	34.75	38.14

RIVERMORPH CROSS SECTION SUMMARY

 River Name: TROUT COVE
 Reach Name: 2007
 Cross Section Name: XS3
 Survey Date: 11/19/2007

TAPE	FS	ELEV	NOTE
0	0	43.797	
3.92	0	43.3	
8.65	0	42.935	
12.42	0	42.509	
12.87	0	42.142	
13.15	0	42.018	
13.52	0	42.004	
13.83	0	41.985	
14.18	0	42.018	
14.46	0	42.127	
15.1	0	42.51	
18.19	0	42.928	
27.01	0	44.053	
31.04	0	44.054	
33.28	0	44.53	

 Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	44.46	44.46	44.46
Bankfull Elevation (ft)	43.22	43.22	43.22
Floodprone Width (ft)	32.93	-----	-----
Bankfull Width (ft)	15.52	7.76	7.76
Entrenchment Ratio	2.12	-----	-----
Mean Depth (ft)	0.46	0.34	0.58
Maximum Depth (ft)	1.23	0.96	1.23
Width/Depth Ratio	33.74	22.82	13.38
Bankfull Area (sq ft)	7.16	2.65	4.51
Wetted Perimeter (ft)	15.89	8.84	8.96
Hydraulic Radius (ft)	0.45	0.3	0.5
Begin BKF Station	4.96	4.96	12.72
End BKF Station	20.48	12.72	20.48

RIVERMORPH CROSS SECTION SUMMARY

River Name: TROUT COVE
 Reach Name: 2007
 Cross Section Name: XS4
 Survey Date: 11/19/2007

TAPE	FS	ELEV	NOTE
0	0	62.995	
0.33	0	62.845	
4.78	0	62.604	
11.65	0	61.709	
19.43	0	60.774	
26.36	0	60.159	
29.1	0	59.92	
30.87	0	59.502	
31.56	0	59.25	
32.66	0	59.218	
33.57	0	59.344	
34.83	0	60.236	
41.13	0	60.496	
49.02	0	61.406	
53.97	0	61.816	
57.36	0	62.064	
57.59	0	62.56	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	62.08	62.08	62.08
Bankfull Elevation (ft)	60.65	60.65	60.65
Floodprone Width (ft)	48.58	-----	-----
Bankfull Width (ft)	21.64	10.82	10.82
Entrenchment Ratio	2.25	-----	-----
Mean Depth (ft)	0.52	0.53	0.52
Maximum Depth (ft)	1.43	1.4	1.43
Width/Depth Ratio	41.62	20.42	20.81
Bankfull Area (sq ft)	11.35	5.7	5.65
Wetted Perimeter (ft)	22.07	12.35	12.52
Hydraulic Radius (ft)	0.51	0.46	0.45
Begin BKF Station	20.83	20.83	31.65
End BKF Station	42.47	31.65	42.47

RIVERMORPH CROSS SECTION SUMMARY

 River Name: TROUT COVE
 Reach Name: 2007
 Cross Section Name: XS5
 Survey Date: 11/19/2007

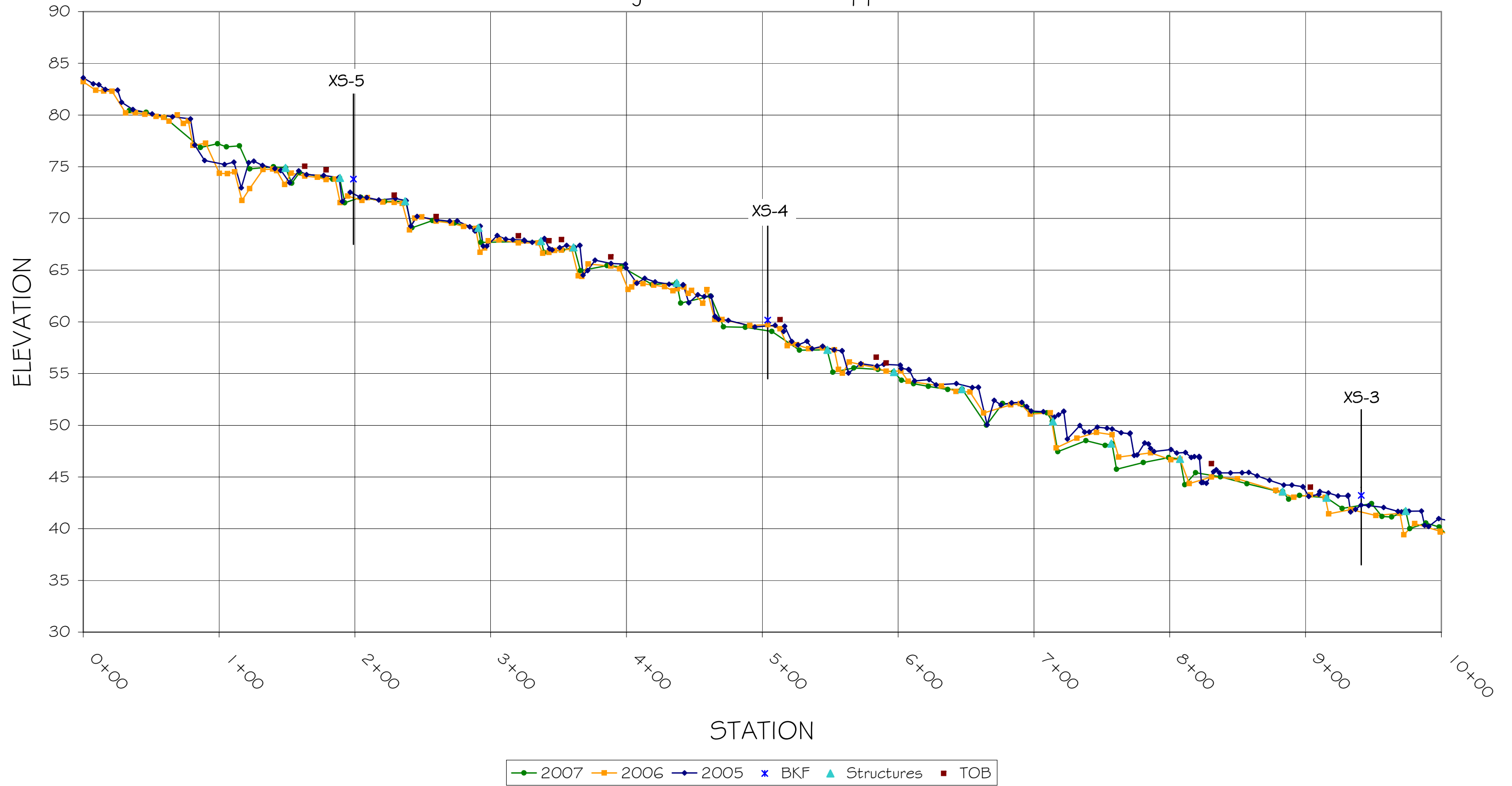
TAPE	FS	ELEV	NOTE
0	0	75.916	
3.15	0	76.122	
7.13	0	75.872	
10.77	0	75.905	
12.46	0	75.458	
13.12	0	75.149	
13.39	0	74.179	
15	0	73.159	
15.47	0	72.93	
15.96	0	72.255	
16.37	0	72.043	
16.94	0	72.048	
17.28	0	72.003	
17.96	0	72.108	
18.38	0	72.727	
20.78	0	73.134	
25.3	0	73.828	
30.86	0	74.346	
37.72	0	75.189	
45.46	0	75.494	
52	0	75.6	

 Cross Sectional Geometry

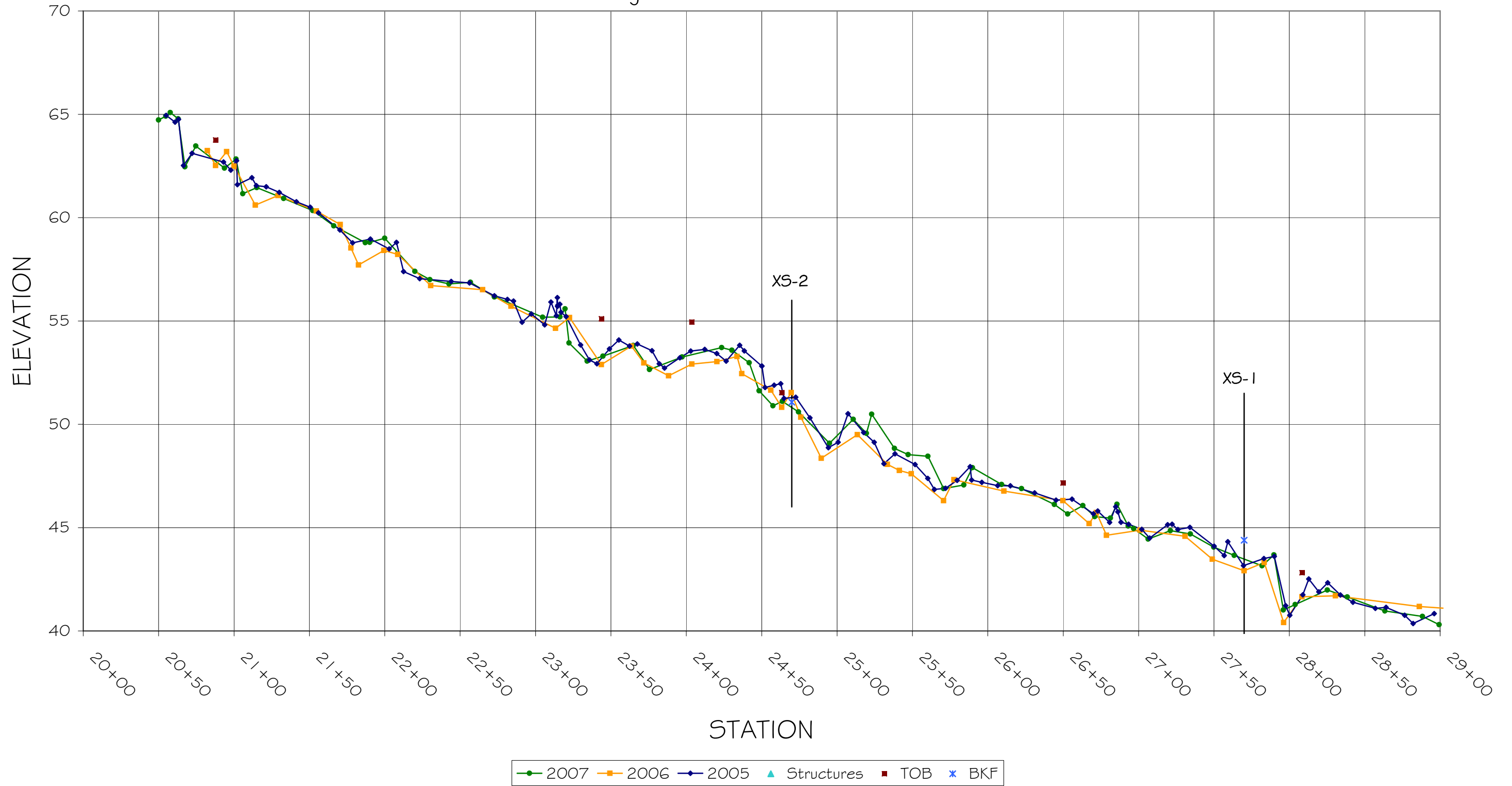
	Channel	Left	Right
Floodprone Elevation (ft)	75.6	75.6	----
Bankfull Elevation (ft)	73.8	73.8	----
Floodprone Width (ft)	39.88	----	----
Bankfull Width (ft)	11.13	12.44	----
Entrenchment Ratio	3.58	----	----
Mean Depth (ft)	0.8	0.8	----
Maximum Depth (ft)	1.8	1.8	----
Width/Depth Ratio	13.91	15.55	----
Bankfull Area (sq ft)	8.85	8.85	----
Wetted Perimeter (ft)	12.19	12.19	----
Hydraulic Radius (ft)	0.73	0.73	----
Begin BKF Station	13.99	13.99	----
End BKF Station	25.12	25.12	----

APPENDIX B –
Longitudinal Profile Data

Trout Cove Stream Restoration Longitudinal Profile - Upper Reach



Trout Cove Stream Restoration Longitudinal Profile - Lower Reach



RI VERMORPH PROFI LE SUMMARY

 River Name: TROUT COVE
 Reach Name: 2007
 Profile Name: UPPER
 Survey Date: 11/19/2007

Survey Data

DIST	CH	WS	BKF	P1	P2	P3	P4
34	80.443	80.843					
46	80.272	80.672					
60	79.8	80.12					
86	76.86	77.36					
99	77.231	77.631					
105	76.931	77.331					
115	77.022	77.422					
123	74.791	75.791					
140	74.996	75.396					
149	74.894	75.294					
154	73.411	74.611					
159	74.437	74.837					
184	73.797	74.197					
189	73.923	74.323					
193	71.51	72.11					
204	72.048	72.448					
222	71.645	72.045					
237	71.662	72.062					
242	69.099	70.099					
257	69.799	70.199					
273	69.559	69.959					
291	69.104	69.504					
293	67.685	68.085					
337	67.809	68.209					
339	66.706	67.106					
353	66.948	67.348					
361	67.199	67.599					
366	64.942	65.742					
386	65.434	65.434					
396	65.325	65.725					
419	63.606	64.006					
437	63.768	64.168					
440	61.82	62.42					
462	62.5	62.9					
471	59.523	59.923					
488	59.468	59.868					
507	59.08	59.48					
527	57.265	57.665					
548	57.293	57.693					
552	55.14	55.84					
567	55.546	55.946					
585	55.408	55.808					
597	55.154	55.554					
603	54.36	54.76					
611	54.023	54.423					
622	53.759	54.159					
637	53.47	53.87					
647	53.495	53.895					
665	50.005	52.005					
677	52.116	52.516					

RI VERMORPH PROFI LE SUMMARY

 Ri ver Name: TROUT COVE
 Reach Name: 2007
 Profi le Name: LOWER
 Survey Date: 11/19/2007

Survey Data

DI ST	CH	WS	BKF	P1	P2	P3	P4
3294	64.727	65.127					
3299	64.91	65.31					
3302	65.083	65.483					
3307	64.78	65.18					
3311	62.455	63.955					
3319	63.463	63.863					
3338	62.392	62.792					
3345	62.833	63.233					
3350	61.156	61.656					
3359	61.452	61.852					
3377	60.928	61.328					
3396	60.345	60.745					
3410	59.602	60.002					
3431	58.788	59.188					
3440	58.8	59.2					
3450	59	59.4					
3460	57.4	57.8					
3470	57	57.4					
3487	56.791	57.191					
3501	56.873	57.273					
3517	56.159	56.559					
3517	56.166	56.566					
3549	55.179	55.579					
3560	55.196	55.596					
3564	55.585	55.985					
3566	53.931	54.331					
3578	53.053	53.453					
3589	53.3	53.7					
3609	53.814	54.214					
3620	52.653	53.653					
3641	53.26	53.66					
3668	53.71	54.11					
3674	53.583	53.983					
3686	52.977	53.377					
3692	51.622	52.022					
3701	50.896	51.296					
3708	51.11	51.51					
3718	50.6	51					
3739	49.083	49.483					
3755	50.242	50.642					
3764	49.559	49.959					
3767	50.488	50.888					
3782	48.838	49.238					
3791	48.534	48.934					
3804	48.452	48.852					
3815	46.891	47.291					
3828	47.06	47.46					
3834	47.898	48.298					
3853	47.084	47.484					
3866	46.888	47.288					

3888	46.123	46.523
3897	45.655	46.055
3907	46.063	46.463
3915	45.527	45.927
3925	45.458	45.858
3930	46.133	46.533
3937	45.079	45.479
3941	44.957	45.357
3950	44.443	44.843
3965	44.853	45.253
3978	44.696	45.096
3994	44.051	44.451
4007	43.659	44.059
4026	43.153	43.553
4034	43.683	44.083
4040	41.01	42.41
4048	41.278	41.678
4069	41.981	42.381
4082	41.646	42.046
4107	40.968	41.368
4132	40.7	41.1
4143	40.301	41.301

Cross Section / Bank Profile Locations

Name	Type	Profile Station
XS1	Pool XS	4042
XS2	Riffle XS	3779
XS3	Pool XS	941
XS4	Riffle XS	504
XS5	Pool XS	199

Measurements from Graph

Bankfull Slope: 0.0271

Variable	Min	Avg	Max
S riffle	0.01092	0.05993	0.13507
S pool	0.00262	0.00613	0.0092
S run	0.0437	0.05933	0.08226
S glide	0.04953	0.07094	0.09932
P - P	22.35	60.93	121.32
Pool length	11.17	16.65	20.75
Riffle length	2.62	10.53	13.32
Dmax riffle	0.35	0.44	0.49
Dmax pool	0.88	1.23	2.05
Dmax run	0.26	0.47	0.72
Dmax glide	0.23	0.55	0.72
Low bank ht	0	0	0

Length and depth measurements in feet, slopes in ft/ft.

RI VERMORPH PROFILE SUMMARY

Notes

 River Name: TROUT COVE
 Reach Name: 2007
 Profile Name: LOWER
 Survey Date: 11/19/2007

DIST Note

691	51.994	52.394
698	51.273	51.673
710	51.2	51.6
714	50.373	50.773
718	47.447	48.747
738	48.514	48.914
753	48.062	48.462
757	48.225	48.625
761	45.75	46.95
781	46.405	46.405
799	46.872	47.272
808	46.744	46.744
811	44.252	45.652
819	45.412	45.812
837	45.022	45.422
857	44.345	44.745
878	43.671	44.071
883	43.607	44.007
888	42.848	43.248
896	43.225	43.625
915	43.003	43.403
927	41.957	42.357
949	42.428	42.828
956	41.18	41.58
963	41.141	41.541
974	41.705	42.105
977	40.006	40.406
989	40.547	40.947
998	40.158	40.558
1003	39.609	40.009

Cross Section / Bank Profile Locations

Name	Type	Profile Station
XS1	Pool XS	4042
XS2	Riffle XS	3779
XS3	Pool XS	941
XS4	Riffle XS	504
XS5	Pool XS	199

Measurements from Graph

Bankfull Slope: 0.04099

Variable	Min	Avg	Max
S riffle	0.02387	0.06575	0.0966
S pool	0.003	0.0078	0.01096
S run	0.01004	0.02667	0.04226
S glide	0.02182	0.02807	0.03096
P - P	29.94	57.62	87.91
Pool length	4.75	11.98	22.33
Riffle length	4.69	5.98	7.98
Dmax riffle	0.39	0.55	0.9
Dmax pool	0.85	1.39	2.42
Dmax run	0.39	0.61	0.79
Dmax glide	0.28	0.62	0.85
Low bank ht	0	0	0

Length and depth measurements in feet, slopes in ft/ft.

RI VERMORPH PROFILE SUMMARY

Notes

River Name: TROUT COVE
Reach Name: 2007
Profile Name: UPPER
Survey Date: 11/19/2007

DIST Note

Table B1. Qualitative Visual Stability Assessment
Date: November, 2007

Project # 10079.D2

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	% perfor. in stable condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	64	64	NA	100%	
	2. Armor stable (e.g. no displacement)?	64	64	NA	100%	
	3. Facet grade appears stable?	64	64	NA	100%	
	4. Stable interval grade?	64	64	NA	100%	
	5. Feature spacing appropriate?	59	64	NA	92%	
	6. Minimal evidence of embedding/fining?	64	64	NA	100%	
	7. Depth appears appropriate for current discharge?	64	64	NA	N/A	
	8. Length appropriate?	54	64	NA	N/A	99%
B. Pools	1. Present? (e.g. not subject to severe aggradation?)	59	59	NA	100%	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6)	59	59	NA	100%	
	3. Thalweg located outer bend?	59	59	NA	100%	
	4. Spacing appropriate?	59	59	NA	N/A	
	5. Non-aggrading (not filling)?	59	59	NA	100%	
	6. Length appropriate?	59	59	NA	N/A	100%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	59	59	NA	100%	
	2. Downstream of meander (glide/inflection) centering?	59	59	NA	100%	100%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	59	59	NA	100%	
	2. Of those eroding, # w/ concomitant point bar formation?	0	59	NA	0%	
	3. Apparent Rc within spec?	N/A	N/A	NA	N/A	
	4. Sufficient floodplain access and relief?	59	59	NA	100%	100%
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	0	100%	
	2. Channel bed degradation - areas of increasing down cutting or head cutting?	NA	NA	75	96%	98%
F. Channel Capac./Dimen	1. Channel width: depth appears out of design/type spec?	NA	NA	N/A	N/A	N/A
G. Banks	1. Apparent scour points from channel processes	NA	NA	0	100%	
	2. Apparent cut points from overland flow	NA	NA	50	99%	
	3. Apparent cut or scour from flood water re-entry to channel (e.g. inadequate floodplain access?)	NA	NA	0	100%	
	4. Tension cracks	NA	NA	0	100%	
	5. Bank gradient in excess of 40%?	NA	NA	200	95%	
	6. Collapse/slumping	NA	NA	124	97%	
	7. Ratio of bank height: bankfull height elevated	NA	NA	N/A	100%	98.6%
H. Vanes	1. Free of back or arm scour?	53	56	NA	95%	
	2. Height appropriate?	51	56	NA	91%	
	3. Angle and geometry appear appropriate?	53	56	NA	95%	
	4. Free of piping or other structural failures?	55	56	NA	98%	95%
I. Wads/Boulders	1. Free of scour?	N/A	N/A	N/A	N/A	N/A
	2. Footing stable?	N/A	N/A	N/A	N/A	N/A

Notes: