UT to Sandy Creek

Randolph County, North Carolina

2012 Year 5 Monitoring Report
EEP Project Number: 403
USGS HUC 03030003020010
EcoEngineering Project Number: EEP-08030

Prepared for:

NCDENR Ecosystem Enhancement Program
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Raleigh, NC 27604

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1.0 Executive Summary/Project Abstract

1.1 Project Goals and Objectives

The goal of the restoration project is to improve the water quality and biological habitat of the site's streams, wetlands, and riparian buffers through the following:

-Restoration (pattern, dimension, and profile) of unstable streams using natural channel design techniques
-Re-establishment of riparian buffers (Kimley-Horn, 2008)
-Enhancement of aquatic and terrestrial habitats
-Reduction in nutrient and sediment loading into stream

1.2 Vegetation Condition and Comparison

Vegetation Plots 1, 2, and 3 are located in a planned low-height planting zone. Vegetation Plots 1, 2, and 3 were abandoned. Three new Vegetation Plots (7, 8, and 9) were added to the project outside of the planned low-height planting zone. The location of Vegetation Plots 7, 8, and 9 are depicted on the Consolidated Current Conditions Plan View **Appendix A**. The 2012 Monitoring Year 5 data was summarized by Carolina Vegetation Survey and was not manipulated for presentation within Table 7 - Stem Count Total and Planted by Plot Species **Appendix C**.

Current stem counts were calculated using vegetation plot monitoring data. Final stem count criteria are 320 trees per acre at the end of the five (5) year monitoring for Randleman Buffers and 260 trees per acre at the end of the five (5) year monitoring for stream mitigation units. As for Monitoring Year 5, UT to Sandy Creek had 6 vegetation plots encompassing 0.15 acres, containing a total of 83 planted stems excluding live stakes. When examining total stems (to include planted stems and volunteer stems) within all 6 vegetation plots, there were a total of 140 stems. In total, the 6 vegetation plots yielded a density of 560 planted trees per acre excluding live stakes. When examining the density total of all trees within all 6 vegetation plots, there was a density of 945 planted trees including volunteer trees. These density totals exceed the requirements by 10% for both planted trees per acre excluding live stakes and planted trees including volunteer trees. With regard to each individual vegetation plot, vegetation plots 4, 6, 7, 8, and 9 exceeded the requirements by 10% when examining planted stems excluding live stakes and when examining planted stems including volunteer stems. Vegetation plot 5 failed to meet the stem count requirement criteria for Randleman Buffers and stream mitigation units.

Exotic/invasive species were observed at the site. The following invasive species were observed at the site: Chinese privet (Ligustrum sinense) and cattail (Typha latifolia). There are nineteen (19) areas in which exotic/invasive species were observed totaling approximately 0.47 acres in size and are approximately 4.63% of the easement acreage. The extent of exotic/invasive species is depicted in the Consolidated Current Condition Plan View **Appendix A**.

During the previous monitoring period there were six (6) areas, totaling approximately 1.19 acres in size, which were determined to be low stem density areas. EEP prescribed supplemental plantings for these six (6) low stem density areas and conducted planting operations on March 8, 2012. The areas which received supplemental plantings are depicted in the Consolidated Current Condition Plan View **Appendix A.** There were a total of 200 containerized stems planted and consisted of the following species: cherrybark oak (*Quercus pagoda*, 25 stems), green ash (*Fraxinus pennsylvanica*, 50 stems), red maple (*Acer rubrum*, 50 stems), shumard oak (*Quercus shumardii*, 25 stems), and sycamore (*Platanus occidentalis*, 50 stems).

1.3 Stream Stability/Condition and Comparison

Overall, the stream system appears stable and is not migrating toward lateral or vertical instability. Based on the prior year comparison using longitudinal profile data, it appears that minor systemic aggradation has occurred throughout the reach, although this condition does not appear to pose an imminent threat to the overall stability of the system.

The primary concern at UT to Sandy Creek is the sporadic flow conditions observed in the channel in past monitoring years although flow was observed during the 2012 Monitoring Year 5 field investigation. The stream was dry during previous site visits during the month of August. Flowing water in the stream channel has been observed approximately half of the time the site has been monitored. To document bankfull events a crest gage is located approximately 50 feet upstream of cross-section 4 and is depicted in the Consolidated Current Condition Plan View **Appendix A**. Evidence of a bankfull event was observed this monitoring year on September 20, 2012. There have been a total of 3 cumulative bankfull events recorded for this project during the five (5) year monitoring period.

1.4 Wetland Conditions and Performance

No wetlands are being monitored for mitigation credits at this project site.

1.5 Monitoring Plan View

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the mitigation and restoration plan documents available on the EEP website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

2.0 Methodology

All monitoring methodologies follow the most current templates and guidelines provided by EEP (EEP, 2006; EEP, 2009). Photographs were taken at high resolution using an Olympus FE-115 5.0 megapixel digital camera. GPS location information was collected using a Trimble Geo XT handheld mapping grade GPS unit. Stream and vegetation problem areas were noted in the field on As-Built Plan Sheets.

The methods used to generate the data in this report are standard fluvial geomorphology techniques as described in *Applied River Morphology* (Rosgen, 1996) and related publications from US Forest Service and the interagency Stream Mitigation Guidelines (USACE, 2003).

Vegetation monitoring methods followed the 2008, Version 4.2 CVS-EEP Protocol for Recording Vegetation (Lee et. al., 2008). Vegetation plot photographs were collected for each vegetation plot. Vegetation monitoring plots were re-marked in the field by replacing all old flagging with new orange flagging. Monitoring taxonomy follows *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas* (Weakley, 2007). Stem height was measured with a folding one-meter rule. Diameter at breast height and decimeter height were measured with calipers.

3.0 References

Ecosystem Enhancement Program (EEP), 2006. Monitoring Report Guidelines, November 16, 2006.

Ecosystem Enhancement Program (EEP), 2009. Monitoring Report Guidelines, June 1, 2009.

Kimley-Horn and Associates, Inc., 2008. UT to Sandy Creek Stream Mitigation Report. Submitted to NCDENR-EEP, March 2008.

Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2 (http://cvs.bio.unc.edu/methods.htm)

Rosgen, D.L. 1996. Applied Morphology. Wildland Hydrology, Pagosa Springs, CO.

US Army Corps of Engineers (USACE), 2003. April 2003 Stream Mitigation Guidelines.

US Army Corps of Engineers (USACE), 2005. Information Regarding Stream Restoration In The Outer Coastal Plain of North Carolina. US Army Corps of Engineers, Wilmington District, Regulatory Division and North Carolina Department of Environment and Natural Resources, Division of Water Quality, December 1, 2005.

Weakley, A. S., 2008. Flora of the Carolinas, Virginia, Georgia, Northern Florida, and surrounding areas. University of North Carolina Herbarium (NCU), North Carolina Botanical Garden, University of North Carolina at Chapel Hill, working Draft as of April 7, 2008.

APPENDIX A

General Figures and Plan View

USGS, 7.5 MINUTE, TOPOGRAPHIC QUADRANGLE;
GRAYS CHAPEL, N.C.; 1974; LAT: 35.8380510° N
LON: 79.6601200° W

PROJECT NO.	EEP-08030
FILENAME:	EEP-08030
SCALE:	1" = 1,000
DATE:	10-18-12

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VICINITY MAP

RANDOLPH COUNTY, NORTH CAROLINA

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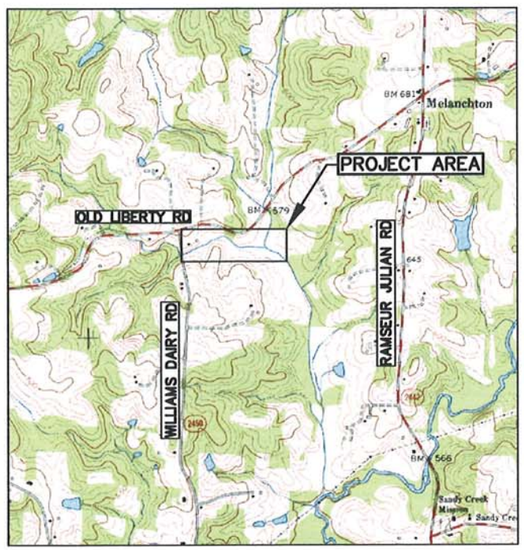
UT TO SANDY CREEK

CONSOLIDATED CURRENT CONDITIONS PLAN VIEW - YEAR FIVE MONITORING

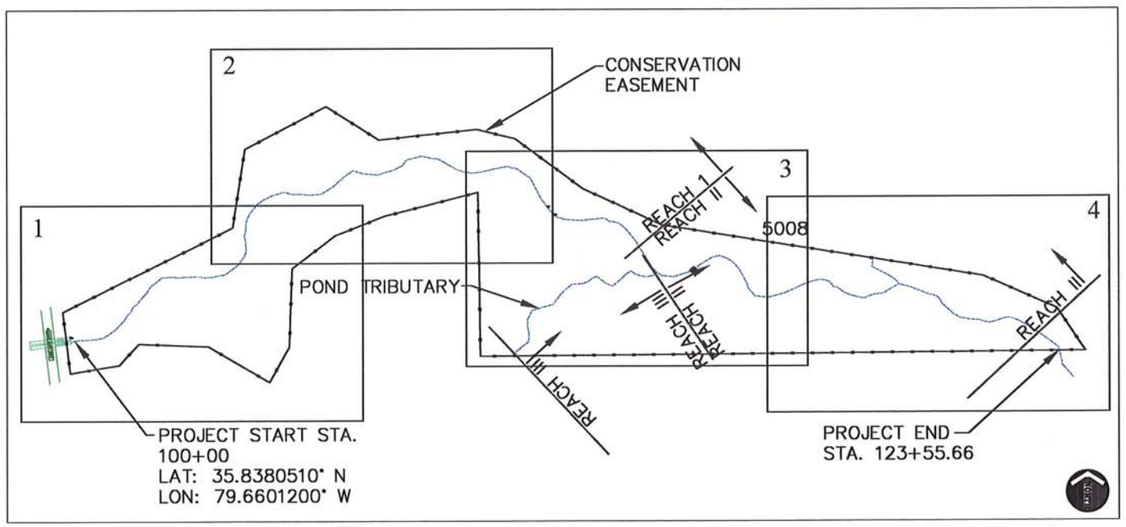
RANDOLPH COUNTY, NORTH CAROLINA
EEP PROJECT NUMBER: 403
DATE: OCTOBER 18, 2012

NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM
NC-EEP CONTACT: MELONIE ALLEN (919) 368-9352

SHEET INDEX



VICINITY MAP
NTS



CONTROL TABLE

POINT NUMBER	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	761098.82	1804283.17	604.12	GS FAY-3 NCDOT
3	760572.44	1804562.50	588.59	TRAV
4	760923.56	1804836.83	575.70	TRAV
5	760864.93	1805782.55	585.77	TRAV
6	760953.87	1804700.65	581.55	BM 1 IRS 1/2
7	760999.25	1805280.24	578.72	BM 2 IRS 1/2
8	760921.29	1805746.59	588.03	BM 3 IRS 1/2
501	760539.44	1804403.40	585.47	NAIL SET
502	760812.18	1804778.30	577.51	NAIL SET
503	760985.74	1805071.84	574.80	NAIL SET
504	760714.98	1805598.90	588.93	NAIL SET
505	760663.85	1808056.94	564.44	NAIL SET
5001	760689.52	1804465.13	583.18	X-SEC1LT(TT20)
5002	760604.10	1804546.58	581.97	X-SEC1RT(TT21)
5003	760658.08	1804584.06	579.79	X-SEC2RT(TTPT23)
5004	760736.88	1804552.53	583.04	X-SEC2LT(TTPT22)
5005	760679.38	1805448.41	570.08	X-SEC6RT(TTPT30)
5006	760690.88	1805414.54	570.30	X-SEC5RT(TTPT28)
5007	760736.90	1805442.44	568.95	X-SEC5/6LT(PT29)
5008	760751.13	1805571.36	568.50	X-SEC3LT
5009	760693.80	1805593.56	567.24	X-SEC3RT
5010	760704.95	1805653.55	567.85	X-SEC4RT
5011	760790.71	1805662.60	567.61	X-SEC4LT
9900	760820.66	1804510.60	580.97	NLF
9901	760679.11	1804723.68	577.63	NLF
9902	760923.80	1804836.79	575.62	TI NLF 4
9903	760914.33	1805065.26	574.81	NLS
9904	760955.55	1805335.31	576.39	NLS
9905	760818.90	1805536.38	568.47	NLS
9906	760833.61	1805765.78	566.14	NLS
9907	760690.08	1805974.43	565.64	NLS
9908	760999.44	1805570.42	587.15	NLS
9909	761073.35	1805201.41	590.62	NLS
9910	761161.75	1804709.24	596.94	NLS
9911	761098.82	1804283.17	604.12	TI 1
9912	760595.72	1804329.27	591.20	TI 2
9913	760528.75	1804383.66	589.04	TI 123
9914	760725.38	1805628.07	567.05	NLS
9915	760851.83	1804521.18	580.06	NLF
9916	760917.91	1804986.69	573.58	NLS
9917	761012.69	1805022.84	576.62	NLS
9918	761006.02	1805180.43	575.10	NLS
9919	760783.20	1805305.43	571.09	NLS
9920	760756.60	1804752.58	577.37	NLS
9921	760629.03	1804839.28	587.57	NLS
9922	761030.59	1804706.32	585.90	NLS
9923	760955.49	1804994.15	573.60	NLS
9924	760715.22	1805939.13	566.22	NLS
9925	760582.71	1806288.27	562.28	NAI
9926	760976.47	1805070.00	574.09	NLS
9950	760544.95	1804479.63	583.08	IRF W\DISC

NOTE: SURVEY DATES OF THALWEG AND TOP-OF-BANK - 09/17/12 TO 09/20/12.

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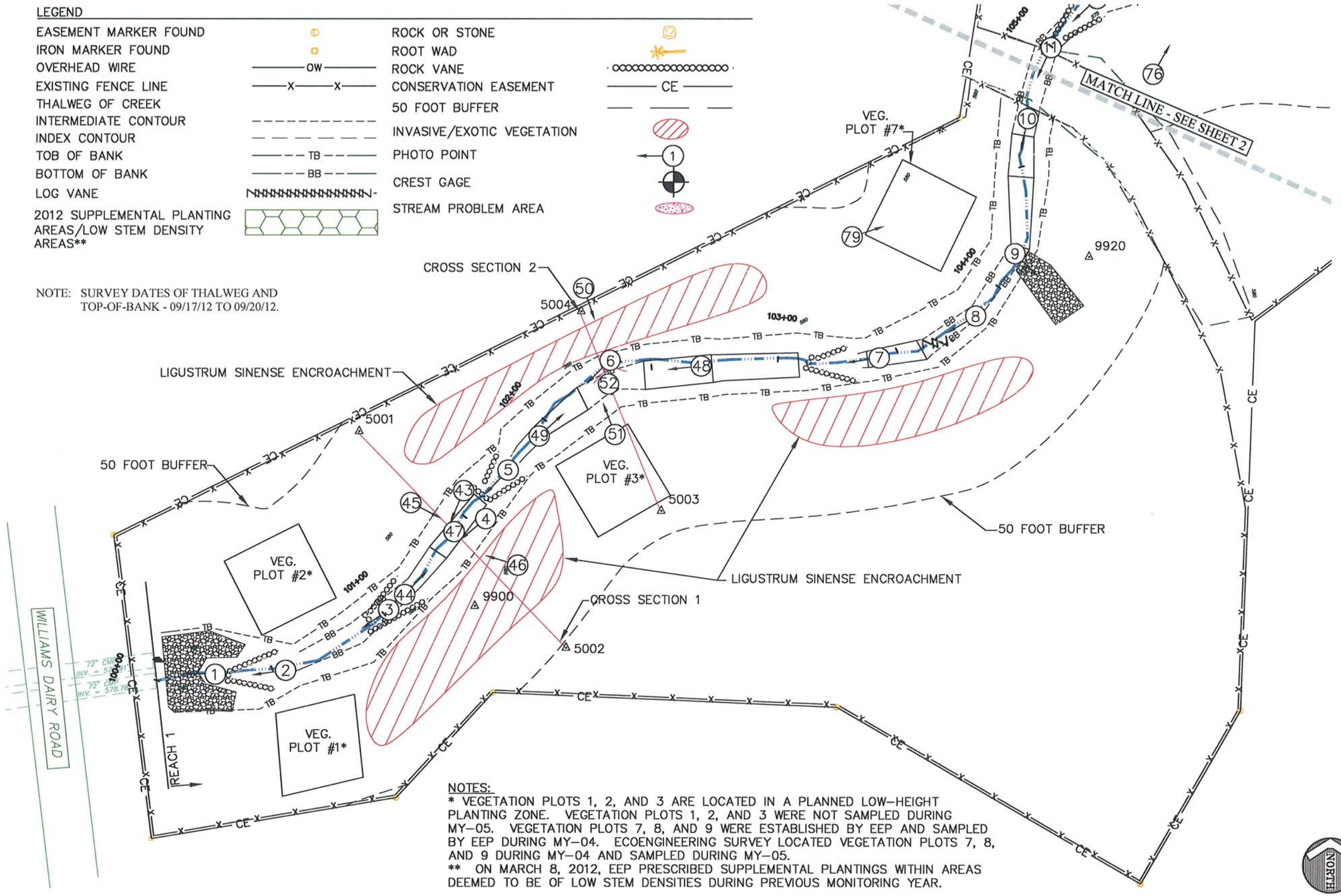
LEGEND

EASEMENT MARKER FOUND	©	ROCK OR STONE	
IRON MARKER FOUND	○	ROOT WAD	
OVERHEAD WIRE	OW	ROCK VANE	
EXISTING FENCE LINE	X X	CONSERVATION EASEMENT	CE
THALWEG OF CREEK		50 FOOT BUFFER	
INTERMEDIATE CONTOUR		INVASIVE/EXOTIC VEGETATION	
INDEX CONTOUR		PHOTO POINT	1
TOB OF BANK	TB	CREST GAGE	
BOTTOM OF BANK	BB	STREAM PROBLEM AREA	
LOG VANE			
2012 SUPPLEMENTAL PLANTING AREAS/LOW STEM DENSITY AREAS**			

NOTE: SURVEY DATES OF THALWEG AND TOP-OF-BANK - 09/17/12 TO 09/20/12.



NOTES:
* VEGETATION PLOTS 1, 2, AND 3 ARE LOCATED IN A PLANNED LOW-HEIGHT PLANTING ZONE. VEGETATION PLOTS 1, 2, AND 3 WERE NOT SAMPLED DURING MY-05. VEGETATION PLOTS 7, 8, AND 9 WERE ESTABLISHED BY EEP AND SAMPLED BY EEP DURING MY-04. ECOENGINEERING SURVEY LOCATED VEGETATION PLOTS 7, 8, AND 9 DURING MY-04 AND SAMPLED DURING MY-05.
** ON MARCH 8, 2012, EEP PRESCRIBED SUPPLEMENTAL PLANTINGS WITHIN AREAS DEEMED TO BE OF LOW STEM DENSITIES DURING PREVIOUS MONITORING YEAR.

NORTH

GRAPHIC SCALE

40 0 20 40 80

1 inch = 40 ft.

SHEET 1 OF 4

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RANDOLPH COUNTY, NORTH CAROLINA

PROJECT NO.	EEP-08030
FILENAME:	EEP-08030X
SCALE:	1" = 40'
DATE:	10-18-12

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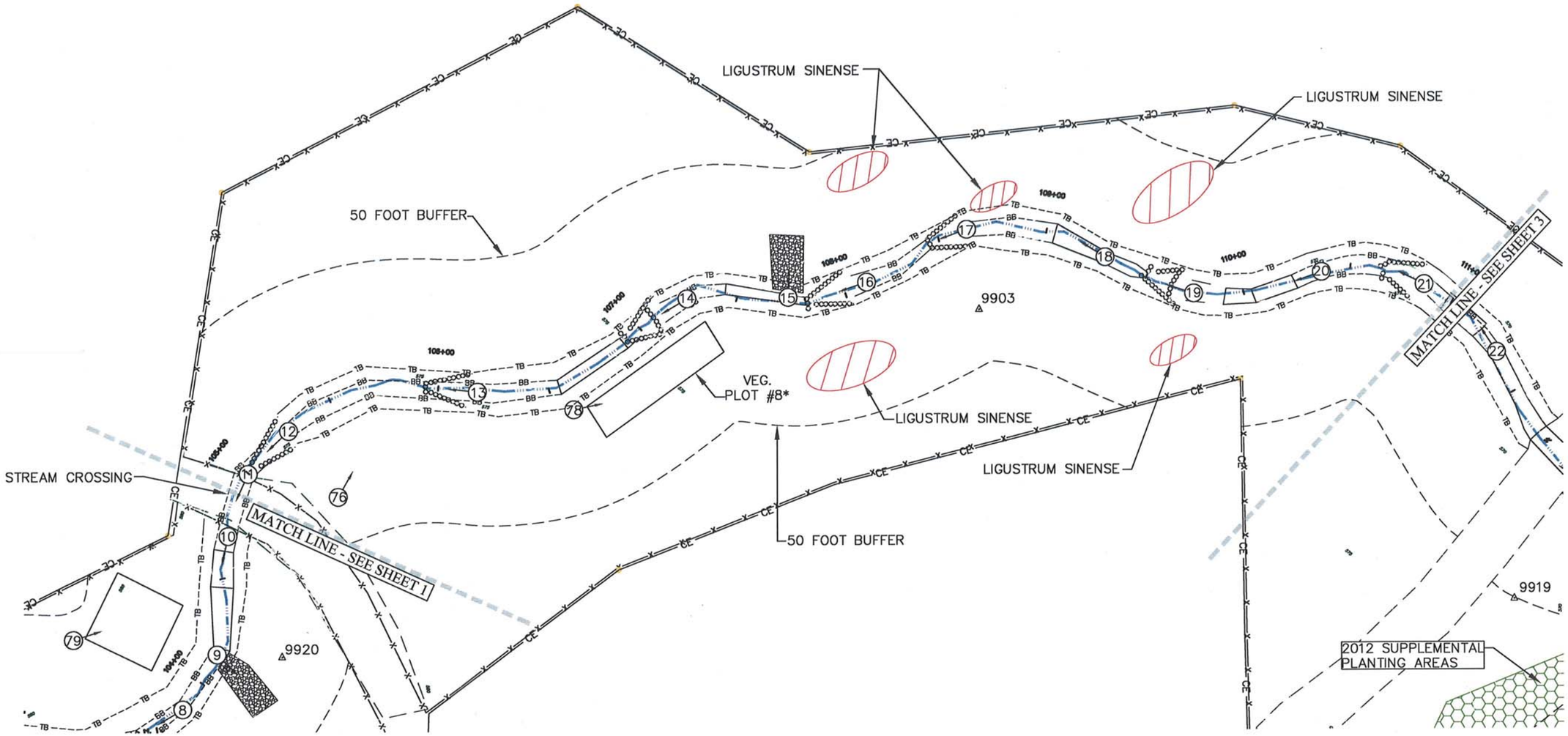

NORTH

GRAPHIC SCALE

50 0 25 50 100

1 inch = 50 ft.

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UT TO SANDY CREEK

CONSOLIDATED CURRENT CONDITIONS PLAN VIEW - YEAR FIVE MONITORING

RANDOLPH COUNTY, NORTH CAROLINA

PROJECT NO.	EEP-08030
FILENAME:	EEP-08030X
SCALE:	1" = 50'
DATE:	10-18-12

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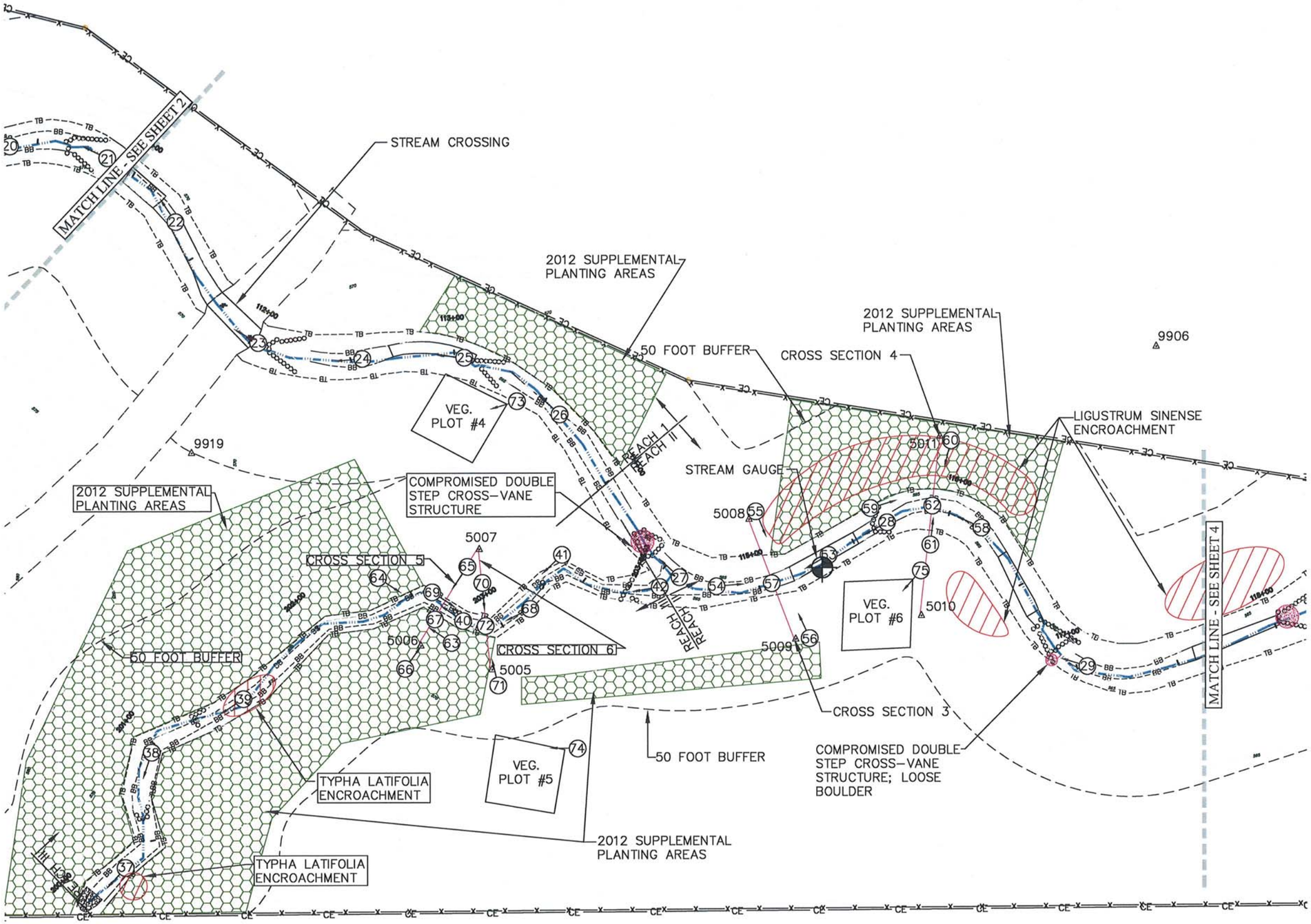

GRAPHIC SCALE

50 0 25 50 100

1 inch = 50 ft.

SHEET 3 OF 4

UT TO SANDY CREEK

CONSOLIDATED CURRENT CONDITIONS PLAN VIEW - YEAR FIVE MONITORING

RANDOLPH COUNTY, NORTH CAROLINA

PROJECT NO.	EEP-08030
FILENAME:	EEP-08030X
SCALE:	1" = 50'
DATE:	10-18-12

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MATCH LINE - SEE SHEET 3

LIGUSTRUM SINENSE ENCROACHMENT

50 FOOT BUFFER

COMPROMISED DOUBLE STEP CROSS-VANE STRUCTURE

50 FOOT BUFFER

2012 SUPPLEMENTAL PLANTING AREAS

TYPHA LATIFOLIA ENCROACHMENT

LIGUSTRUM SINENSE ENCROACHMENT

VEG. PLOT #9*

LIGUSTRUM SINENSE ENCROACHMENT

REACH III

NORTH

GRAPHIC SCALE

40 0 20 40 80

1 inch = 40 ft.

SHEET 4 OF 4

UT TO SANDY CREEK

CONSOLIDATED CURRENT CONDITIONS PLAN VIEW - YEAR FIVE MONITORING

RANDOLPH COUNTY, NORTH CAROLINA

PROJECT NO.	EEP-08030
FILENAME:	EEP-08030X
SCALE:	1" = 50'
DATE:	10-18-12

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APPENDIX B

General Project Tables

Exhibit Table 1. Project Restoration Components UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403								
Project Segment or Reach ID	**Existing Feet/Acres**	**Type**	**Approach**	**Footage or Acreage**	**Mitigation Ratio**	**Mitigation Units**	**Stationing**	**Comment**
Reach 1	1,000	R	P1	1,400	1	1,350	100+00 - 114+00	Mitigation Units exclude 2 ford structures which total 50 feet
Reach II	870	R	P1	900	1	900	114+00 - 123+00	
Reach III	290	R	P1	384	1	384	200+00 - 203+84	Pond Tributary
Mitigation Unit Summations								
Stream	Riparian Wetland		Nonriparian Wetland		Total Wetland		Buffer	Comment
2,634	0		0		0		179,903	

R= Restoration
EI= Enhancement
EII= Enhancement II
S= Stabilization
P1= Priority I
P2= Priority II
P3= Priority III
SS=Stream Bank Stabilization

Exhibit Table 2. Project Activity and Reporting History UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403		
Activity or Report	**Data Collection Complete**	**Actual Completion or Delivery**
Restoration Plan	Winter 04	Jan-05
Final Design – 90%	Summer 06	Winter 06
Construction	Summer 07	Fall 07
Temporary S&E mix applied to entire project area	Summer 07	Fall 07
Permanent seed mix applied to reach/segments 1 & 2	Fall 07	Fall 07
Containerized and B&B plantings for reach/segments 1 & 2	Fall 07	Winter 07
Mitigation Plan / As-built (Year 0 Monitoring – baseline)	Winter 07	Mar-08
Year 1 Monitoring	Oct-08	Nov-08
Year 2 Monitoring	Sep-09	Nov-09
Year 3 Monitoring	Jun-10	0ct-10
Year 4 Monitoring	Apr-11	Jun-11
Year 5 Monitoring	Sep-12	Nov-12

Note: Timeframe estimated from information provided by EEP.

Exhibit Table 3. Project Contacts Table UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403	
Designer Primary project design POC	Kimley-Horn and Associates, Inc. P.O Box 33068, Raleigh, North Carolina 27636 POC name and phone 919-677-2050
Construction Contractor Construction contractor POC	Shamrock Environmental PO Box 14987 Greensboro, NC 27415
Planting Contractor Planting contractor POC	Contact: Appalachian Environmental Services PO Box 52, Webster, NC 28788 phone: 828-586-1973
Seeding Contractor Planting contractor POC	Contact: Appalachian Environmental Services PO Box 52, Webster, NC 28788 phone: 828-586-1973
Seed Mix Sources	Contact: Appalachian Environmental Services phone: 828-586-1973
Nursery Stock Suppliers	Contact: Appalachian Environmental Services phone: 828-586-1973
Monitoring Performers	EcoEngineering - A Division of The John R. McAdams Co. 2905 Meridian Parkway, Durham, NC 27713
Stream Monitoring POC George Buchholz	919-287-0890
Vegetation Monitoring POC George Buchholz	919-287-0890
Wetland Monitoring POC NA	NA

Note: Information obtained from EEP documents and bid tabulation results. Use contacts in table for additional information or to verify data.

Exhibit Table 4. Project Background Table UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403	
Project County	Randolph County
Drainage Area	4.2 square miles
Drainage impervious cover estimate (%) For example	Estimated at 1%
Stream Order	1st for UT to Sandy Creek
Physiographic Region	Piedmont
Ecoregion	Carolina Slate Belt
Rosgen Classification of As-built	C
Cowardin Classification	R3UBH
Dominant soil types	Chewacla loam, Vance
Reference site ID	Reference Reach Tributary to Sandy Creek
USGS HUC for Project and Reference	3030003020010
NCDWQ Sub-basin for Project and Reference	03-06-09
NCDWQ classification for Project and Reference	WSIII
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor	NA
% of project easement fenced	100%

APPENDIX C

Vegetation Assessment Data

Table 5. Vegetation Plot Mitigation Success Summary Table
UT to Sandy Creek Restoration Project/EEP Project ID: 403

Vegetation Plot Summary Information							
Plot #	Riparian Buffer Stems[1]	Stream/ Wetland Stems[2]	Live Stakes	Invasives	Volunteers[3]	Total[4]	Unknown Growth Form
VP4	8	18	0	0	0	18	0
VP5	6	6	0	0	0	6	0
VP6	5	9	0	0	0	9	0
VP7	14	14	0	0	0	15	1
VP8	18	19	0	0	0	19	0
VP9	14	14	0	0	0	16	1

Wetland/Stream Vegetation Totals (per acre)				
Plot #	Stream/ Wetland Stems[2]	Volunteers[3]	Total[4]	Success Criteria Met?
VP4	728	0	728	Yes
VP5	243	0	243	No
VP6	364	0	364	Yes
VP7	567	0	607	Yes
VP8	769	0	769	Yes
VP9	567	0	647	Yes
Project Avg	**540**	**0**	**560**	**Yes**

Riparian Buffer Vegetation Totals (per acre)		
Plot #	Riparian Buffer Stems1	Success Criteria Met?
VP4	324	Yes
VP5	243	No
VP6	202	No
VP7	567	Yes
VP8	728	Yes
VP9	567	Yes
Project Avg	**438**	**Yes**

Notes:

Stem Class	characteristics
[1]Buffer Stems	Native planted hardwood trees. Does NOT include shrubs. No pines. No vines.
[2]Stream/ Wetland Stems	Native planted woody stems. Includes shrubs, does NOT include live stakes. No vines
[3]Volunteers	Native woody stems. Not planted. No vines.
[4]Total	Planted + volunteer native woody stems. Includes live stakes. Excl. exotics. Excl. vines.

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

Table 6. Vegetation Metadata	
UT to Sandy Creek Restoration Project/EEP Project ID: 403	
Report Prepared By	George Buchholz
Date Prepared	11/14/2012 11:14
database name	cvs-eep-entrytool-v2.3.1Rocky and Sandy.mdb
database location	X:\Projects\EEP\EEP-08030 (UT to Sandy Creek)\Storm\CVS Vegetation Data\2012 Vegetation Data\Vegetation CVS Data
computer name	BUCHHOLZ
file size	77217792
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	403
project Name	UT to Sandy Creek (Williams Tract)
Description	UT to Sandy Creek Restoration Project
River Basin	Cape Fear
length(ft)	2,680
stream-to-edge width (ft)	25
area (sq m)	0.02 sq miles (10.2)
Required Plots (calculated)	6
Sampled Plots	6

Table 6A. Vegetation Condition Assessment
UT to Sandy Creek Restoration Project/EEP Project ID: 403

Planted Acreage **7.11**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	----	0	0	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	----	0	0	0.0%
			Total			
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	----	0	0	0.0%
			Cumaltive Total			0.0%

Easement Acreage **10.18**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000 SF	diagonal, red	19	0.47	4.63%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	----	0	0	0.0%

Table 7. Stem Count Total and Planted by Plot Species
UT to Sandy Creek Restoration Project/EEP Project ID: 403
Page 1

			Current Plot Data (MY5 2012)														
			E403-01-VP4			E403-01-VP5			E403-01-VP6			E403-allen-VP7			E403-allen-VP8		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree			2	1	1	3									
Aronia arbutifolia	Red Chokeberry	Shrub													1	1	1
Baccharis halimifolia	eastern baccharis	Shrub															
Betula nigra	river birch	Tree							4	4	6	11	11	11	4	4	4
Carpinus caroliniana	American hornbeam	Tree	1	1	1										1	1	1
Carya	hickory	Tree															
Carya ovata	shagbark hickory	Tree															2
Celtis laevigata	sugarberry	Tree															
Cornus	dogwood	Shrub or Tree															
Cornus amomum	silky dogwood	Shrub	10	10	14												
Cornus florida	flowering dogwood	Tree													1	1	1
Cornus sericea ssp. sericea	redosier dogwood											1	1	1			
Fraxinus pennsylvanica	green ash	Tree	4	4	8			2							5	5	5
Hamamelis virginiana	American witchhazel	Tree				4	4	4				1	1	1	4	4	12
Juglans nigra	black walnut	Tree							1	1	1						
Juniperus	juniper																
Lindera benzoin	northern spicebush	Shrub															
Liquidambar	sweetgum	Tree															
Liquidambar styraciflua	sweetgum	Tree									6			3			2
Mimosa	sensitive plant	Exotic															
Nyssa sylvatica	blackgum	Tree	1	1	1												
Pinus taeda	loblolly pine	Tree												2			
Prunus serotina	black cherry	Tree	1	1	3						2	1	1	3	1	1	1
Quercus	oak	Tree													1	1	1
Quercus nigra	water oak	Tree										1	1	1			
Quercus phellos	willow oak	Tree	1	1	1										1	1	1
Quercus rubra	northern red oak	Tree				1	1	1									
Rhus copallinum	flameleaf sumac	shrub						2									
Unknown		Shrub or Tree															
Viburnum dentatum	southern arrowwood	Shrub							4	4	4						
Stem count			18	18	30	6	6	12	9	9	19	15	15	22	19	19	31
size (ares)			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02		
Species count			6	6	7	3	3	5	3	3	5	5	5	7	9	9	11
Stems per ACRE			728.43	728.43	1214.1	242.81	242.81	485.62	364.22	364.22	768.9	607.03	607.03	890.31	768.9	768.9	1254.5

Notes:

a) Data presented in table was provided to EcoEngineering from the Carolina Vegetation Survey. Data was not manipulated by EcoEngineering. Formatting of table was performed by EcoEngineering.

b) Vegetation Plots 1, 2, and 3 are located in a planned low-height planting zone. Vegetation Plots 1, 2, and 3 were abandoned. Three new Vegetation Plots (7, 8, and 9) were added to the project for sampling outside of the planned low-height planting zone. The location of Vegetation Plots 7, 8, and 9 are depicted on the Consolidated Current Conditions Plan View.

c) An Acer rubrum was surveyed during 2008 monitoring season even though it is not a species listed as being planted. Although acer rubrum is a volunteer stem, it was determined that this specific stem would continued to be monitored in the proceeding monitoring years.

d) PnoLS = Planted Excluding Live Stakes; P-all = All Planted Stems; T = Total Planted and Volunteer Stems

e) Cells highlighted in VIOLET indicate the presence of volunteers.

Color for Density

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

Table 7. Stem Count Total and Planted by Plot Species
UT to Sandy Creek Restoration Project/EEP Project ID: 403
Page 2

			Current Plot Data (MY5 2012)			Annual Means														
			E403-allen-VP9			MY5 (2012)			MY4 (2011)			MY3 (2010)			MY2 (2009)			MY1 (2008)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree			6	1	1	11	1	1	3	1	1	3	1	1	3	1	1	1
Aronia arbutifolia	Red Chokeberry	Shrub				1	1	1	1	1	1									
Baccharis halimifolia	eastern baccharis	Shrub															1			
Betula nigra	river birch	Tree				19	19	21	19	19	20	4	4	4	4	4	4	3	3	3
Carpinus caroliniana	American hornbeam	Tree				2	2	2	3	3	3									
Carya	hickory	Tree	12	12	12	12	12	12	13	13	14									
Carya ovata	shagbark hickory	Tree						2				2	2	2	2	2	2	2	2	2
Celtis laevigata	sugarberry	Tree							1	1	1									
Cornus	dogwood	Shrub or Tree	1	1	1	1	1	1	10	10	12	18	18	24	19	19	25	14	14	14
Cornus amomum	silky dogwood	Shrub				10	10	14	1	1	1									
Cornus florida	flowering dogwood	Tree				1	1	1	1	1	1									
Cornus sericea ssp. sericea	redosier dogwood					1	1	1	11	11	14	17	17	25	11	11	11	14	14	14
Fraxinus pennsylvanica	green ash	Tree				9	9	15	10	10	15	7	7	7	7	7	7	3	3	3
Hamamelis virginiana	American witchhazel	Tree				9	9	17	1	1	1	1	1	1	1	1	1	1	1	1
Juglans nigra	black walnut	Tree				1	1	1	1	1	1									
Juniperus	juniper		1	1	1	1	1	1				1	1	1				1	1	1
Lindera benzoin	northern spicebush	Shrub									1									
Liquidambar	sweetgum	Tree															35			
Liquidambar styraciflua	sweetgum	Tree			2			13				1	1	1	1	1	1			
Mimosa	sensitive plant	Exotic									1									
Nyssa sylvatica	blackgum	Tree				1	1	1	5	5	6				1	1	1	1	1	1
Pinus taeda	loblolly pine	Tree						2	1	1	1									
Prunus serotina	black cherry	Tree	1	1	1	4	4	10	2	2	2									
Quercus	oak	Tree				1	1	1	2	2	2	3	3	3	3	3	3	1	1	1
Quercus nigra	water oak	Tree	1	1	1	2	2	2												
Quercus phellos	willow oak	Tree				2	2	2												
Quercus rubra	northern red oak	Tree				1	1	1												
Rhus copallinum	flameleaf sumac	shrub			2			4						2			1			
Unknown		Shrub or Tree									1									
Viburnum dentatum	southern arrowwood	Shrub				4	4	4	5	5	5	10	10	10	9	9	9	7	7	7
		Stem count	16	16	26	83	83	140	88	88	106	65	65	83	59	59	104	48	48	48
		size (ares)	1			6			6			6			6			6		
		size (ACRES)	0.02			0.15			0.15			0.15			0.15			0.15		
		Species count	5	5	8	20	20	24	18	18	21	11	11	12	11	11	14	11	11	11
		Stems per ACRE	647.5	647.5	1052.2	559.82	559.82	944.27	593.54	593.54	714.94	438.41	438.41	559.82	397.94	397.94	701.46	323.75	323.75	323.75

Notes:

a) Data presented in table was provided to EcoEngineering from the Carolina Vegetation Survey. Data was not manipulated by EcoEngineering. Formatting of table was performed by EcoEngineering.

b) Vegetation Plots 1, 2, and 3 are located in a planned low-height planting zone. Vegetation Plots 1, 2, and 3 were abandoned. Three new Vegetation Plots (7, 8, and 9) were added to the project for sampling outside of the planned low-height planting zone. The location of Vegetation Plots 7, 8, and 9 are depicted on the Consolidated Current Conditions Plan View.

c) An Acer rubrum was surveyed during 2008 monitoring season even though it is not a species listed as being planted. Although acer rubrum is a volunteer stem, it was determined that this specific stem would continued to be monitored in the proceeding monitoring years.

d) PnoLS = Planted Excluding Live Stakes; P-all = All Planted Stems; T = Total Planted and Volunteer Stems

e) Cells highlighted in VIOLET indicate the presence of volunteers.

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

APPENDIX D

Stream Assessment Data

Table 8a. Visual Morphological Stability Assessment
UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403
Reach 1: 1,410 Linear 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	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present ?	12	12	NA	100	
	2. Armor stable (e.g. n o displacement)?	12	12	NA	100	
	3. Facet grade appears stable? (slope ≤ design range)	1	12	NA	12	
	4. Minimal evidence of embedding/fining?	12	12	NA	100	
	5. Length appropriate?	NA	NA	NA	NA	**78**
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	15	15	NA	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	Max Pool / 1.2 > 1.6, 12 of 15	Design = 3.5/1.2 = 2.9 15	NA	77	
	3. Length appropriate? (p-p spacing)	NA	NA	NA	NA	**89**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	10	10	NA	100	
	2. Downstream of meander (glide/inflection) centering?	9	10	NA	100	**100**
D. Meander	1. Outer bend in state of limited/controlled erosion?	10	10	NA	100	
	2. Of those eroding, # w/concomitant point bar formation	10	10	NA	100	
	3. Apparent Rc within spec?	8	10	NA	85	
	4. Sufficient floodplain access and relief?	10	10	NA	100	**95**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	5/25	99	
	2. Channel bed degradation – areas of increasing down-cutting or head cutting?	NA	NA	NA	100	**100**
F. Bank	1. Actively eroding, wasting, or slumping bank	NA	1/18	NA	99	**99**
G. Vanes	1. Free of bank or arm scour?	10	10	NA	100	
	2. Height appropriate?	10	10	NA	100	
	3. Angle and geometry appear appropriate?	10	10	NA	100	
	4. Free of piping or other structural failures?	10	10	NA	100	**100**
H. Wads/ Boulders	1. Free of scour?	NA	NA	NA	100	
	2. Footing stable?	NA	NA	NA	100	**100**

Table 8b. Visual Morphological Stability Assessment
UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403
Reach II: 886 Linear 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	% Perform in Stable Condition	Feature Perform. Mean or Total
	1. Present ?	13	13	NA	100	
	2. Armor stable (e.g. n o displacement)?	13	13	NA	100	
	3. Facet grade appears stable? (slope ≤ design range)	2	13	NA	12	
	4. Minimal evidence of embedding/fining?	13	13	NA	100	
A. Riffles	5. Length appropriate?	NA	NA	NA	NA	**78**
	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	16	16	NA	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	Max Pool / 1.2 > 1.6, 12 of 16	Design = 3.5/1.2 = 2.9 16	NA	77	
B. Pools	3. Length appropriate? (p-p spacing)	NA	NA	NA	NA	**89**
	1. Upstream of meander bend (run/inflection) centering?	10	10	NA	100	
C. Thalweg	2. Downstream of meander (glide/inflection) centering?	10	10	NA	100	**100**
	1. Outer bend in state of limited/controlled erosion?	10	10	NA	100	
	2. Of those eroding, # w/concomitant point bar formation	10	10	NA	100	
	3. Apparent Rc within spec?	9	10	NA	85	
D. Meander	4. Sufficient floodplain access and relief?	10	10	NA	100	**95**
	1. General channel bed aggradation areas (bar formation)	NA	NA	5/25	99	
E. Bed General	2. Channel bed degradation – areas of increasing down-cutting or head cutting?	NA	NA	NA	100	**100**
F. Bank	1. Actively eroding, wasting, or slumping bank	NA	1/18	NA	99	**99**
	1. Free of bank or arm scour?	11	11	NA	100	
	2. Height appropriate?	11	11	NA	100	
	3. Angle and geometry appear appropriate?	11	11	NA	100	
G. Vanes	4. Free of piping or other structural failures?	8	11	NA	73	**93**
	1. Free of scour?	NA	NA	NA	100	
H. Wads/ Boulders	2. Footing stable?	NA	NA	NA	100	**100**

Table 8c. Visual Morphological Stability Assessment
UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403
Reach III: 384 Linear Feet

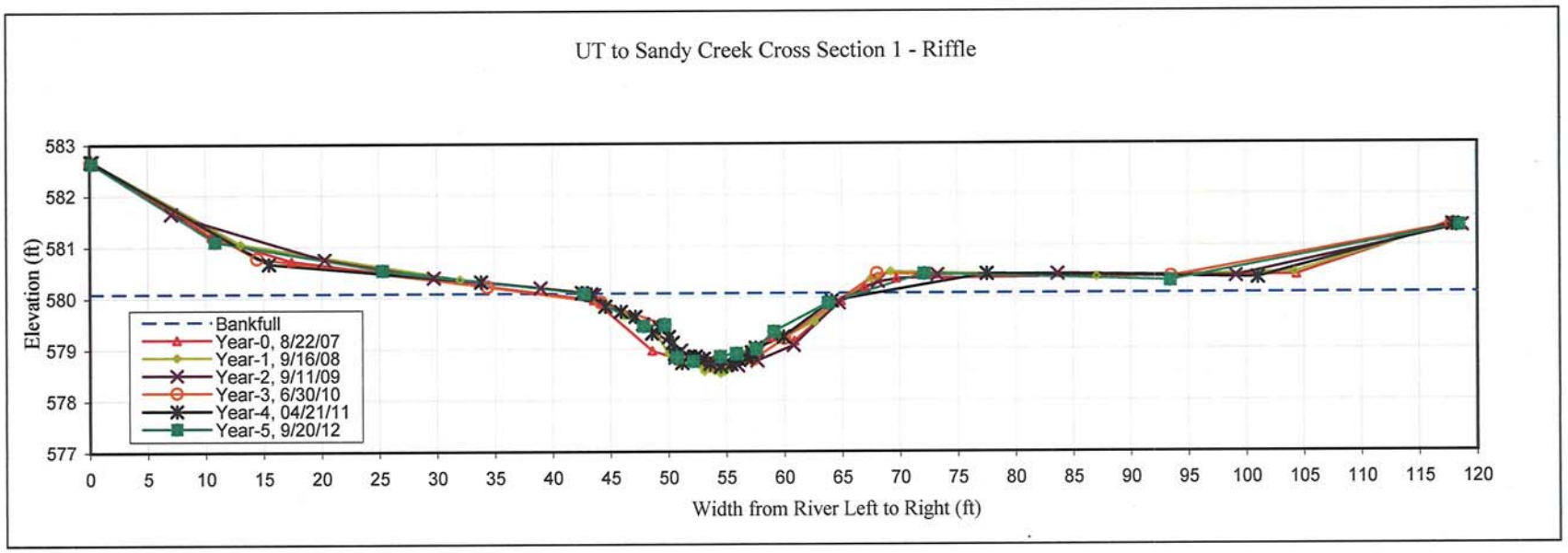
Feature Category	Metric (per As-built and reference baselines)	(# Stable) Number Performing as Intended	Total number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
	1. Present ?	7	7	NA	100	
	2. Armor stable (e.g. n o displacement)?	7	7	NA	100	
	3. Facet grade appears stable? (slope ≤ design range)	5	7	NA	71	
	4. Minimal evidence of embedding/fining?	7	7	NA	100	
A. Riffles	5. Length appropriate?	NA	NA	NA	NA	**93**
	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	5	5	NA	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	Max Pool / 0.5 > 1.6, 4 of 5	Design = 1.9/0.5 = 3.8 5	NA	80	
B. Pools	3. Length appropriate? (p-p spacing)	NA	NA	NA	NA	**90**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	7	8	NA	100	
C. Thalweg	2. Downstream of meander (glide/inflection) centering?	8	8	NA	100	**100**
	1. Outer bend in state of limited/controlled erosion?	8	8	NA	100	
	2. Of those eroding, # w/concomitant point bar formation	8	8	NA	100	
	3. Apparent Rc within spec?	8	8	NA	100	
D. Meander	4. Sufficient floodplain access and relief?	8	8	NA	100	**100**
	1. General channel bed aggradation areas (bar formation)	NA	NA	1/200	48	
E. Bed General	2. Channel bed degradation – areas of increasing down-cutting or head cutting?	NA	NA	NA	100	**74**
F. Bank	1. Actively eroding, wasting, or slumping bank	NA	NA	NA	100	**100**
	1. Free of bank or arm scour?	5	5	NA	100	
	2. Height appropriate?	5	5	NA	100	
	3. Angle and geometry appear appropriate?	5	5	NA	100	
G. Vanes	4. Free of piping or other structural failures?	5	5	NA	100	**100**
	1. Free of scour?	NA	NA	NA	100	
H. Wads/ Boulders	2. Footing stable?	NA	NA	NA	100	**100**

Table 9. Verification of Bankfull Events UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo # (if available)**
06/29/10	Between 09/09/09 and 06/29/10	On-Site Crest Gage located at Station 115+32. Observed elevation on gage at elevation 566.63	Not Available
04/21/11	Between 06/29/10 and 04/21/11	On-Site Crest Gage located at Station 115+32. Observed elevation on gage at elevation 567.51	Not Available
09/20/12	Between 04/21/11 and 09/20/12	On-Site Crest Gage located at Station 115+32. Observed elevation on gage at elevation 567.43	Not Available

Note: A crest gage was installed during the 2009 Monitoring Year 2 field investigations so that bankfull events can be documented during subsequent monitoring years. Monitoring Year 3 is the first monitoring year in which bankfull events were documented. The crest gage is located at Station 115+32 and is depicted in the Consolidated Current Condition Plan View located in Appendix A.

UT to SANDY CREEK **EEP PROJECT # 403** CROSS-SECTION: 1

Year-0		Year-1		Year-2		Year-3		Year-4		Year-5		Year-6	
Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)
0.00	582.65	0.00	582.68	0.21	582.67	0.08	582.63	0.09	582.67	0.09	582.67		
0.14	582.65	13.00	581.05	7.00	581.64	14.44	580.77	15.44	580.67	15.44	580.67		
10.49	581.20	32.00	580.35	20.26	580.75	34.37	580.21	33.8	580.31	33.8	580.31		
17.42	580.72	43.00	580.10	29.73	580.39	44.19	579.90	42.52	580.1	42.52	580.1		
43.54	579.95	46.20	579.65	38.96	580.19	49.63	579.47	43.33	580.07	43.33	580.07		
48.60	578.96	49.00	579.27	43.59	580.05	50.82	578.80	44.54	579.83	44.54	579.83		
50.60	578.81	50.00	578.91	47.81	579.48	54.04	578.70	45.88	579.73	45.88	579.73		
53.53	578.63	51.10	578.69	51.08	578.96	57.34	578.79	47.15	579.63	47.15	579.63		
55.21	578.71	52.00	578.80	52.25	578.82	60.02	579.19	48.57	579.3	48.57	579.3		
57.30	578.81	52.70	578.69	53.64	578.78	68.01	580.45	49.24	579.41	49.24	579.41		
58.88	579.22	53.10	578.56	54.89	578.71	93.49	580.39	49.59	579.43	49.59	579.43		
60.87	579.14	53.60	578.67	55.99	578.67	117.82	581.37	50.03	579.23	50.03	579.23		
64.91	579.93	54.00	578.57	57.68	578.76			50.35	579.12	50.35	579.12		
66.93	580.20	54.50	578.52	60.81	579.07			50.54	578.9	50.54	578.9		
69.69	580.36	54.90	578.56	64.69	579.89			50.57	578.84	50.57	578.84		
104.36	580.42	55.20	578.67	68.08	580.30			51.16	578.73	51.16	578.73		
118.02	581.43	55.80	578.75	73.26	580.43			51.67	578.85	51.67	578.85		
118.10	581.43	56.60	578.80	83.64	580.45			52.33	578.85	52.33	578.85		
		57.00	579.01	99.12	580.40			53.03	578.81				
		59.80	579.19	118.73	581.37			53.6	578.71				
		62.60	579.52					54.51	578.66				
		67.50	580.35					55.39	578.7				
		69.20	580.49					56.08	578.78				
		87.00	580.39					56.74	578.82				
		104.20	580.47					57.18	578.93				
		118.00	581.40					57.24	578.88				
								57.51	579.02				
								59.93	579.23				
								64.1	579.93				
								77.5	580.45				
								101	580.37				
								117.89	581.38				



CROSS SECTION PLOT - LOOKING DOWNSTREAM

YEAR-5, 2012 SURVEY DATA
PROJECT SANDY CREEK
TASK CROSS SECTION
REACH SANDY CREEK
DATE 09/17/2012 to 09/20/2012
CREW BUCHHOLZ/PARRISH

CROSS-SECTION: 1
FEATURE: Riffle

Summary Data
All dimensions in feet.

Bankfull X-sec area	16.01	sq. ft.
Bankfull Width	23.88	ft.
Bankfull Mean Depth	0.67	ft.
Bankfull Max Depth	1.32	ft.
Width/Depth Ratio	35.63	
Entrenchment Ratio	4.19	
Classification	C	
Bankfull Elevation:	580.08	ft.

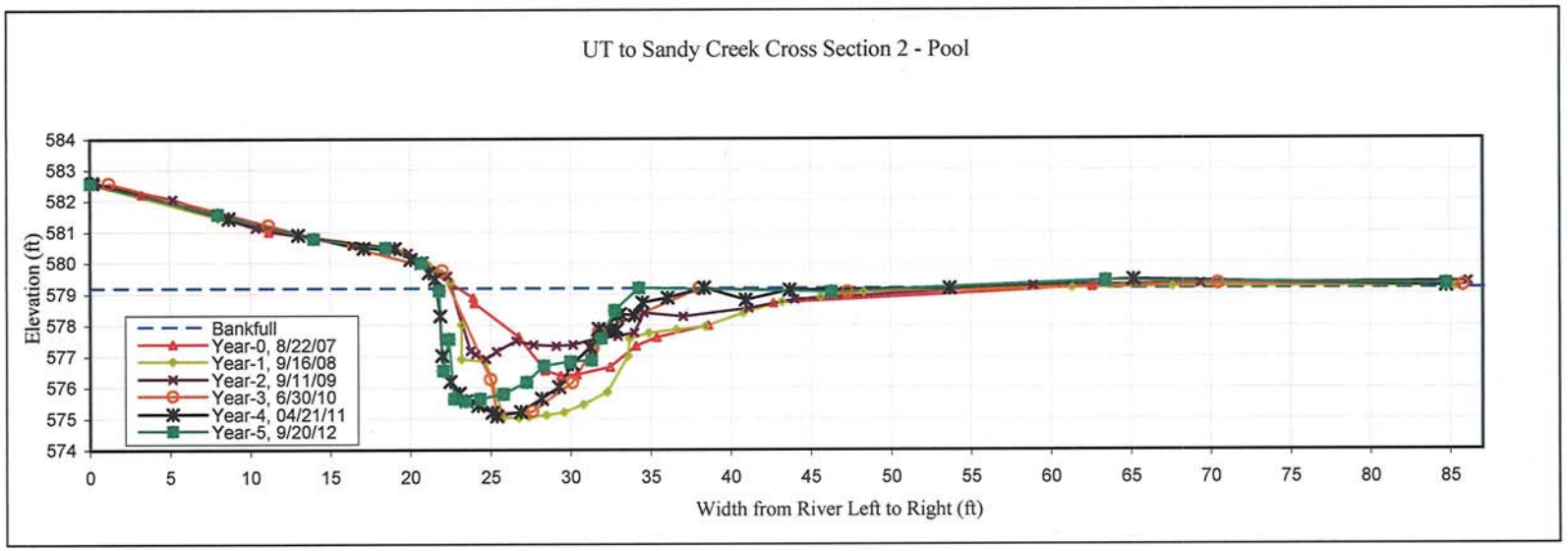
CROSS SECTION PHOTO - LOOKING DOWNSTREAM

Ecosystem Enhancement Program

EcoEngineering
A division of The John R. McAdams Company, Inc.

UT to SANDY CREEK **EEP PROJECT # 403** CROSS-SECTION: 2

Year-0		Year-1		Year-2		Year-3		Year-4		Year-5		Year-6	
Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)
0.00	582.59	0.00	582.55	0.36	582.58	0.17	582.56	0.15	582.59	0.15	582.59		
0.09	582.59	8.00	581.44	5.18	582.05	10.14	581.21	8.64	581.44	8.64	581.44		
3.22	582.21	16.30	580.54	10.34	581.13	21.00	579.74	12.99	580.91	12.99	580.91		
11.17	581.00	19.60	580.36	16.37	580.57	24.01	576.25	17.09	580.48	17.09	580.48		
19.11	580.47	21.10	579.95	19.88	580.32	24.39	575.17	19.03	580.47	19.03	580.47		
23.93	578.88	21.70	579.70	22.34	579.57	26.62	575.22	20.01	580.12	20.01	580.12		
24.00	578.71	22.50	579.40	23.74	577.17	29.11	576.15	20.69	580.00	20.69	580.00		
26.75	577.62	23.20	578.01	24.07	577.05	30.42	577.25	21.16	579.69	21.16	579.69		
28.41	576.54	23.20	576.90	24.73	576.90	30.77	577.78	21.55	579.48	21.55	579.48		
29.38	576.37	24.70	576.82	25.37	577.15	37.03	579.17	21.86	578.30	21.86	578.30		
30.39	576.40	25.80	575.04	26.60	577.48	46.30	579.06	21.98	577.03	21.98	577.03		
32.48	576.65	26.80	575.02	27.69	577.36	69.44	579.32	22.49	576.19	22.49	576.19		
34.08	577.32	27.40	575.06	29.11	577.33	84.81	579.25	23.05	575.81	23.05	575.81		
35.39	577.60	28.50	575.11	30.15	577.37			23.47	575.57	23.47	575.57		
38.60	577.99	29.60	575.20	31.58	577.55			24.21	575.43	24.21	575.43		
42.65	578.71	30.80	575.45	32.96	577.64			25.11	575.20	25.11	575.20		
62.56	579.23	32.30	575.85	33.99	577.75			25.40	575.09	25.40	575.09		
80.54	579.51	33.60	577.00	34.58	578.39			26.90	575.22	26.90	575.22		
84.82	579.31	33.70	577.56	37.02	578.27			28.18	575.64	28.18	575.64		
84.91	579.31	34.90	577.74	41.11	578.54			29.27	576.02	29.27	576.02		
		36.60	577.84	43.99	578.82			30.12	576.75	30.12	576.75		
		38.40	577.94	58.87	579.26			31.22	577.29	31.22	577.29		
		40.80	578.38	69.36	579.33			31.74	577.88				
		43.20	578.74	86.12	579.38			32.40	577.83				
		45.60	578.90					32.89	577.85				
		48.30	579.07					32.91	578.30				
		61.30	579.18					33.10	578.36				
		67.60	579.23					33.99	578.31				
		85.30	579.22					34.48	578.73				
								36.05	578.88				
								38.33	579.20				
								40.92	578.81				
								43.66	579.13				
								53.65	579.18				
								65.14	579.45				
								84.72	579.25				



CROSS SECTION PLOT - LOOKING DOWNSTREAM

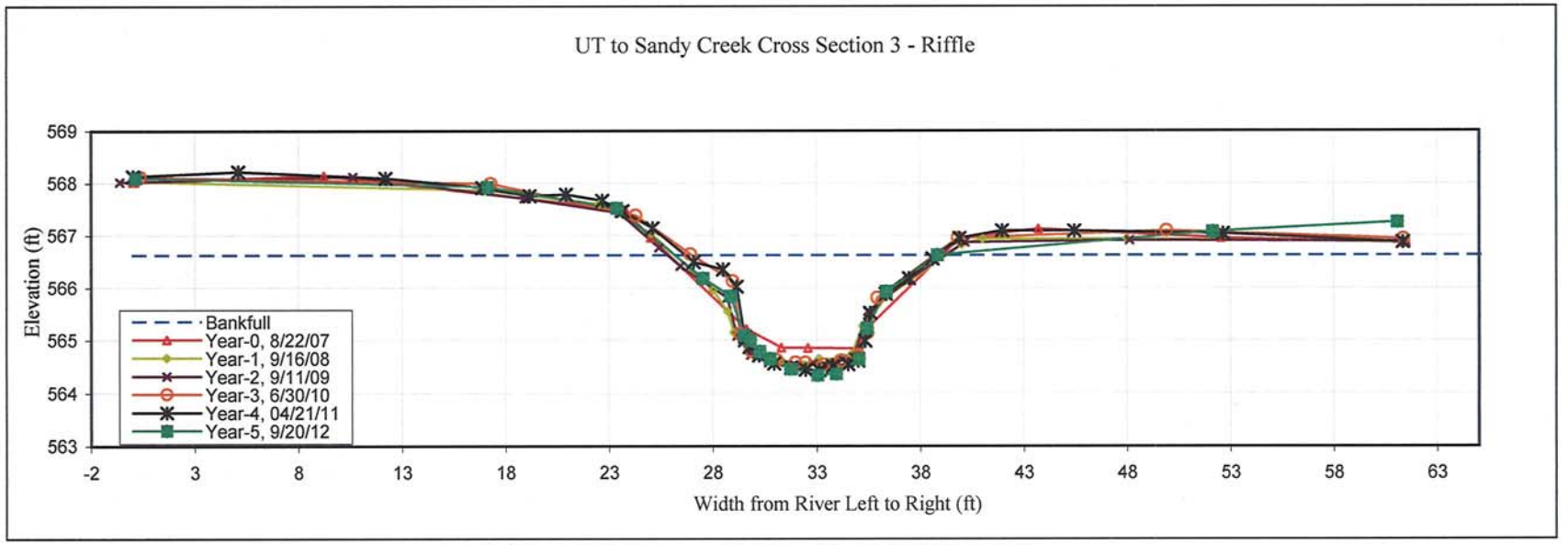
YEAR-5, 2011 SURVEY DATA **CROSS-SECTION:** 2
PROJECT SANDY CREEK **FEATURE:** Pool
TASK CROSS SECTION
REACH SANDY CREEK
DATE 09/17/2012 to 09/20/2012
CREW BUCHHOLZ/PARRISH

Summary Data
All dimensions in feet.

Bankfull X-sec area	31.42	sq. ft.
Bankfull Width	30.47	ft.
Bankfull Mean Depth	1.03	ft.
Bankfull Max Depth	3.62	ft.
Width/Depth Ratio	29.55	
Entrenchment Ratio	0.00	
Classification	n/a	
Bankfull Elevation:	579.19	ft.

CROSS SECTION PHOTO - LOOKING DOWNSTREAM

UT to SANDY CREEK		EEP PROJECT # 403		CROSS-SECTION:	3						
Year-0		Year-1		Year-2		Year-3		Year-4		Year-5		Year-6	
Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)
0.00	568.02	0.00	568.03	-0.62	568.02	0.37	568.11	0.01	568.13	0.01	568.13		
0.09	568.02	17.00	567.86	10.62	568.12	17.28	567.99	5.09	568.22	5.09	568.22		
9.21	568.14	22.50	567.60	18.89	567.71	24.28	567.38	12.2	568.1	12.2	568.1		
23.76	567.49	25.00	567.04	23.48	567.43	26.91	566.64	16.87	567.92	16.87	567.92		
25.00	566.95	28.00	565.96	25.40	566.76	28.95	566.13	19.15	567.76	19.15	567.76		
29.60	565.22	28.70	565.55	26.42	566.41	29.31	565.12	20.91	567.79	20.91	567.79		
31.28	564.86	29.00	565.15	28.69	565.81	29.73	564.94	22.66	567.67	22.66	567.67		
32.56	564.86	29.50	564.95	29.16	565.08	29.82	564.80	23.63	567.47	23.63	567.47		
35.05	564.85	30.40	564.70	29.81	564.72	31.04	564.63	25.08	567.14	25.08	567.14		
35.31	565.18	31.30	564.61	30.68	564.58	31.97	564.58	27.06	566.49	27.06	566.49		
39.92	566.95	32.40	564.54	31.84	564.51	32.45	564.58	28.47	566.35	28.47	566.35		
43.70	567.12	33.10	564.65	32.82	564.57	33.32	564.54	29.13	566.02	29.13	566.02		
52.54	566.95	34.00	564.65	33.59	564.58	34.18	564.62	29.52	565	29.52	565		
61.36	566.85	34.70	564.74	34.21	564.64	34.99	564.71	29.53	565.07	29.53	565.07		
61.50	566.85	35.20	565.27	34.76	564.68	35.44	565.14	29.75	564.88	29.75	564.88		
		36.40	565.83	35.46	565.55	35.92	565.81	30.21	564.72	30.21	564.72		
		40.00	566.82	37.39	566.14	39.81	566.94	30.93	564.57	30.93	564.57		
		41.00	566.93	40.15	566.86	49.89	567.09	31.75	564.49	31.75	564.49		
		48.00	566.93	48.11	566.90	61.37	566.93	32.45	564.45				
		61.50	566.86	61.47	566.88			33.1	564.44				
								33.75	564.51				
								34.5	564.55				
								34.98	564.62				
								35.32	564.99				
								35.56	565.52				
								36.31	565.88				
								37.43	566.18				
								38.57	566.55				
								39.88	566.94				
								41.94	567.09				
								45.43	567.08				
								52.62	567.03				
								61.33	566.87				



CROSS SECTION PLOT - LOOKING DOWNSTREAM

YEAR-5, 2012 SURVEY DATA **CROSS-SECTION:** 3
PROJECT SANDY CREEK **FEATURE:** Riffle
TASK CROSS SECTION
REACH SANDY CREEK
DATE 09/17/2012 to 09/20/2012
CREW BUCHHOLZ/PARRISH

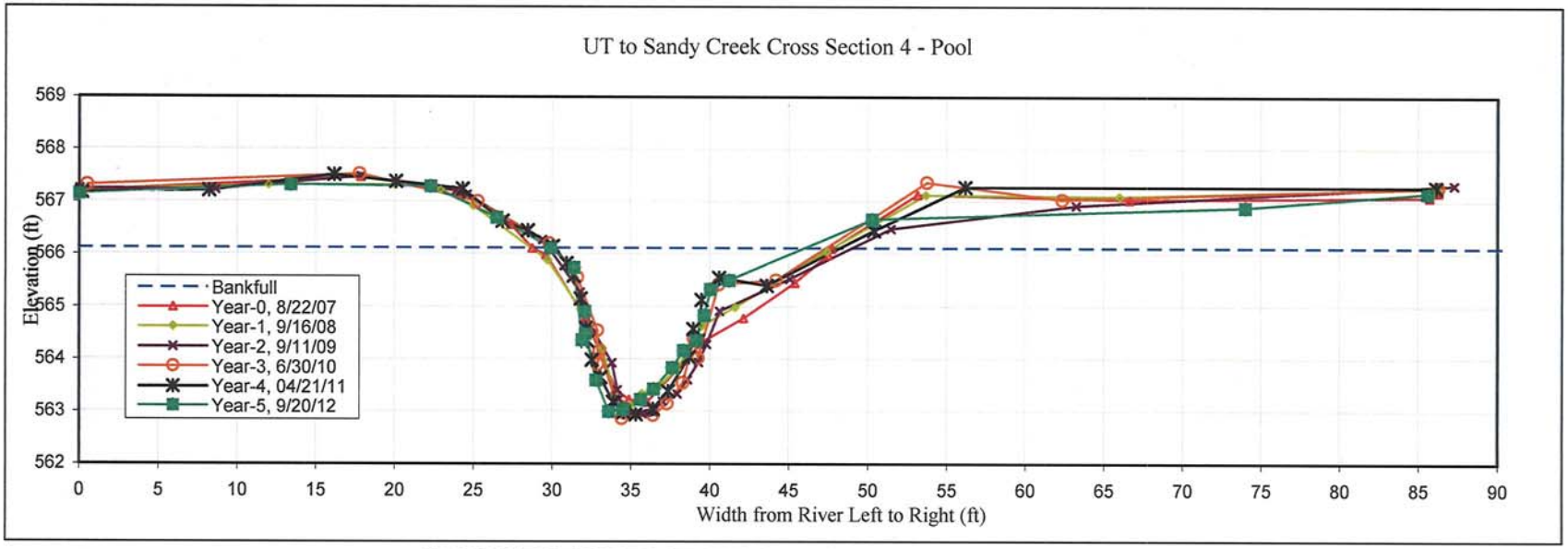
Summary Data
All dimensions in feet.

Bankfull X-sec area	15.81	sq. ft.
Bankfull Width	12.66	ft.
Bankfull Mean Depth	1.25	ft.
Bankfull Max Depth	2.28	ft.
Width/Depth Ratio	10.13	
Entrenchment Ratio	7.90	
Classification	C	
Bankfull Elevation:	566.62	ft.

CROSS SECTION PHOTO - LOOKING DOWNSTREAM

UT to SANDY CREEK **EEP PROJECT # 403** CROSS-SECTION: 4

Year-0		Year-1		Year-2		Year-3		Year-4		Year-5		Year-6	
Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)
0.00	567.19	0.00	567.20	0.03	567.23	0.00	567.30	0.16	567.17	0.16	567.17		
0.07	567.19	12.00	567.31	8.62	567.22	17.27	567.51	8.2	567.21	8.2	567.21		
17.84	567.46	20.00	567.31	17.85	567.48	24.76	566.99	16.15	567.51	16.15	567.51		
24.27	567.17	22.60	567.24	23.91	567.20	29.31	566.19	20.07	567.38	20.07	567.38		
27.39	566.55	22.90	567.22	24.58	567.12	31.10	565.54	24.3	567.24	24.3	567.24		
28.73	566.10	25.00	566.91	29.38	566.26	32.37	564.53	26.83	566.63	26.83	566.63		
29.60	565.97	29.70	565.87	31.79	565.27	32.40	563.89	28.45	566.45	28.45	566.45		
32.11	564.78	31.80	564.94	32.50	564.59	32.51	564.14	30.05	566.15	30.05	566.15		
34.04	563.41	32.30	564.61	33.79	563.92	33.93	562.86	30.9	565.82	30.9	565.82		
34.88	563.22	33.20	564.19	34.15	563.41	35.92	562.92	31.35	565.58	31.35	565.58		
36.03	563.17	34.00	563.29	34.24	563.23	36.79	563.14	31.81	565.15	31.81	565.15		
39.56	564.32	35.00	563.10	35.00	562.96	37.79	563.54	32.12	564.59	32.12	564.59		
42.14	564.77	35.70	563.33	35.73	562.95	38.49	564.38	32.23	564.34	32.23	564.34		
45.37	565.44	36.90	563.50	36.43	562.97	38.75	564.01	32.52	563.98	32.52	563.98		
47.50	565.97	37.90	563.80	37.00	563.19	40.05	565.41	33.07	563.65	33.07	563.65		
47.74	566.10	39.00	564.30	37.93	563.33	43.69	565.49	33.86	563.18	33.86	563.18		
53.16	567.13	39.50	564.63	38.59	563.60	53.25	567.36	34.55	562.98	34.55	562.98		
66.62	567.03	41.60	564.98	39.29	563.93	61.84	567.03	35.31	562.94	35.31	562.94		
85.71	567.08	47.40	566.05	39.78	564.27	85.78	567.27	36.39	563.05	36.39	563.05		
86.21	567.18	53.70	567.12	40.61	564.91			37.36	563.39	37.36	563.39		
86.29	567.18	66.00	567.09	45.05	565.52			38.67	564.04	38.67	564.04		
		86.30	567.25	51.46	566.48			38.95	564.57	38.95	564.57		
				63.23	566.92			39.27	564.35	39.27	564.35		
				87.29	567.32			39.48	565.13				
								40.58	565.55				
								43.6	565.4				
								50.38	566.45				
								56.17	567.28				
								86.11	567.28				



CROSS SECTION PLOT - LOOKING DOWNSTREAM

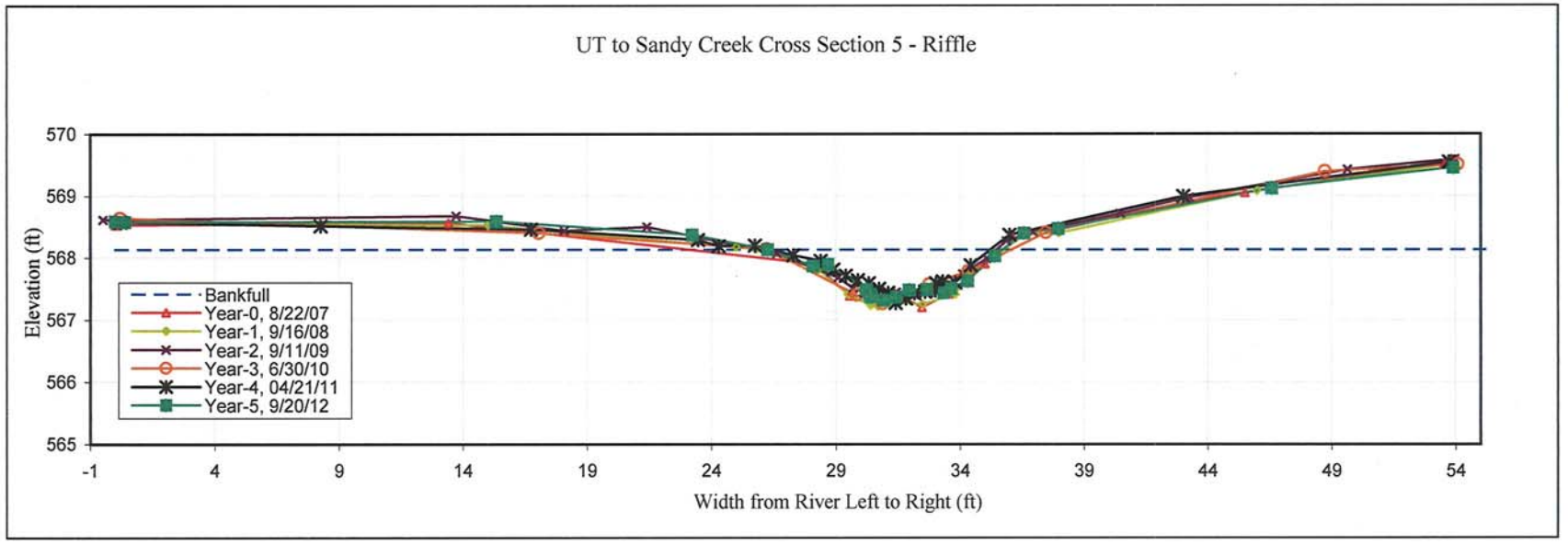
YEAR-5, 2012 SURVEY DATA **CROSS-SECTION:** 4
PROJECT SANDY CREEK **FEATURE:** Pool
TASK CROSS SECTION
REACH SANDY CREEK
DATE 09/17/2012 to 09/20/2012
CREW BUCHHOLZ/PARRISH

Summary Data
All dimensions in feet.

Bankfull X-sec area	22.72	sq. ft.
Bankfull Width	16.12	ft.
Bankfull Mean Depth	1.41	ft.
Bankfull Max Depth	3.12	ft.
Width/Depth Ratio	11.44	ft.
Entrenchment Ratio	0.00	ft.
Classification	n/a	
Bankfull Elevation:	566.11	ft.

CROSS SECTION PHOTO - LOOKING DOWNSTREAM

UT to SANDY CREEK		EEP PROJECT # 403		CROSS-SECTION:	5						
Year-0		Year-1		Year-2		Year-3		Year-4		Year-5		Year-6	
Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)
0.00	568.53	0.00	568.57	-0.49	568.61	0.20	568.64	0.22	568.58	0.22	568.58		
0.09	568.53	15.00	568.53	13.72	568.67	17.05	568.40	8.26	568.52	8.26	568.52		
13.42	568.56	25.00	568.17	18.08	568.44	26.23	568.14	16.73	568.46	16.73	568.46		
28.15	567.90	25.80	568.14	21.40	568.50	29.84	567.40	23.46	568.29	23.46	568.29		
29.56	567.39	28.30	567.81	26.64	568.07	30.89	567.26	24.28	568.19	24.28	568.19		
31.60	567.39	29.50	567.41	29.10	567.68	32.76	567.57	25.74	568.2	25.74	568.2		
32.47	567.20	30.40	567.23	29.70	567.51	34.34	567.78	27.28	568.04	27.28	568.04		
33.55	567.42	30.70	567.22	30.75	567.35	37.47	568.41	28.39	567.95	28.39	567.95		
35.00	567.90	31.10	567.27	31.43	567.45	48.74	569.39	28.9	567.81	28.9	567.81		
36.06	568.37	32.50	567.25	32.17	567.40	54.10	569.50	29.4	567.71	29.4	567.71		
45.50	569.05	33.80	567.41	32.75	567.44			29.88	567.64	29.88	567.64		
53.56	569.52	34.30	567.70	33.44	567.51			30.22	567.47	30.22	567.47		
53.69	569.52	36.60	568.37	34.12	567.74			30.32	567.59	30.32	567.59		
		38.00	568.40	35.07	567.99			30.73	567.5	30.73	567.5		
		46.00	569.08	35.86	568.27			31.1	567.44	31.1	567.44		
		53.90	569.51	36.94	568.42			31.4	567.27	31.4	567.27		
				40.46	568.72			31.81	567.34	31.81	567.34		
				43.26	568.97			32.16	567.43	32.16	567.43		
				49.66	569.42			32.58	567.45	32.58	567.45		
				53.98	569.58			33	567.47	33	567.47		
								33.02	567.59	33.02	567.59		
								33.3	567.62	33.3	567.62		
								33.81	567.6				
								34.42	567.88				
								35.99	568.37				
								43	568.99				
								53.73	569.54				



CROSS SECTION PLOT - LOOKING DOWNSTREAM

YEAR-5, 2012 SURVEY DATA **CROSS-SECTION:** 5
PROJECT SANDY CREEK **FEATURE:** Riffle
TASK CROSS SECTION
REACH SANDY CREEK
DATE 09/17/2012 to 09/20/2012
CREW BUCHHOLZ/PARRISH/PICKENS

Summary Data
All dimensions in feet.

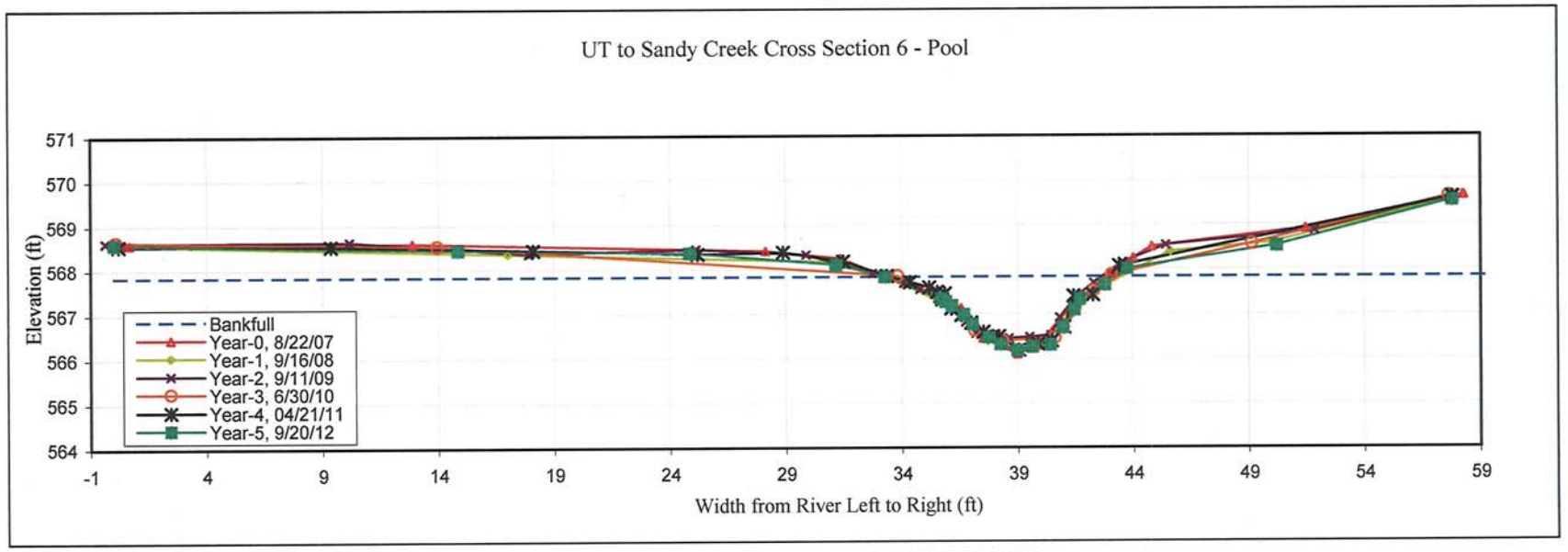
Bankfull X-sec area	4.18	sq. ft.
Bankfull Width	9.46	ft.
Bankfull Mean Depth	0.44	ft.
Bankfull Max Depth	0.81	ft.
Width/Depth Ratio	21.40	ft.
Entrenchment Ratio	10.57	ft.
Classification	C	
Bankfull Elevation:	568.13	ft.

CROSS SECTION PHOTO - LOOKING DOWNSTREAM

Ecosystem Enhancement

EcoEngineering
A division of The John R. McAdams Company, Inc.

UT to SANDY CREEK		EEP PROJECT # 403		CROSS-SECTION:	6						
Year-0		Year-1		Year-2		Year-3		Year-4		Year-5		Year-6	
Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)	Station (ft)	Elev. (ft)
0.50	568.58	0.00	568.57	-0.37	568.62	0.08	568.64	0.21	568.56				
0.68	568.58	17.00	568.35	10.17	568.63	13.95	568.53	9.36	568.54				
12.89	568.59	31.20	568.16	17.91	568.36	33.81	567.84	18.09	568.44				
28.12	568.41	34.10	567.65	25.12	568.46	35.85	567.29	25.18	568.35				
31.34	568.24	35.70	567.24	29.87	568.33	37.13	566.63	28.87	568.39				
36.54	567.12	36.40	567.04	32.73	567.90	38.34	566.39	31.46	568.18				
37.49	566.46	37.70	566.39	33.48	567.84	40.59	566.46	33.34	567.85				
38.98	566.10	38.90	566.19	34.07	567.68	42.27	567.50	34.33	567.71				
39.82	566.29	40.10	566.33	34.77	567.54	43.07	567.86	35.16	567.59				
41.29	567.15	41.00	566.80	35.55	567.34	49.14	568.57	35.5	567.49				
43.08	567.92	41.70	567.21	36.26	567.06	57.65	569.62	35.72	567.32				
43.76	568.13	42.70	567.60	36.73	566.81			35.83	567.45				
44.00	568.24	45.60	568.39	37.18	566.56			36.11	567.12				
44.80	568.50	50.00	568.59	37.97	566.54			36.55	566.97				
51.46	568.90	57.90	569.57	38.61	566.45			36.97	566.8				
58.25	569.65			39.50	566.48			37.5	566.59				
58.30	569.65			40.41	566.52			38.17	566.49				
				40.79	566.91			39.04	566.19				
				41.52	567.38			39.86	566.32				
				42.29	567.68			40.45	566.39				
				43.52	568.15			40.99	566.7				
				45.41	568.54			41.4	567.39				
				51.85	568.86			42.23	567.42				
				57.89	569.65			43.37	568.07				
								57.79	569.61				

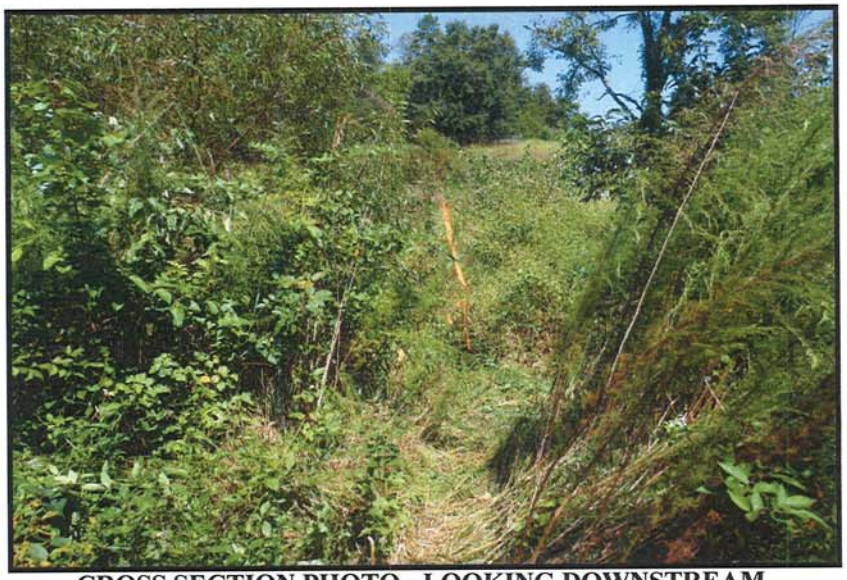


CROSS SECTION PLOT - LOOKING DOWNSTREAM

YEAR-5, 2012 SURVEY DATA **CROSS-SECTION:** 6
PROJECT SANDY CREEK **FEATURE:** Pool
TASK CROSS SECTION
REACH SANDY CREEK
DATE 09/17/2012 to 09/20/2012
CREW BUCHHOLZ/PARRISH

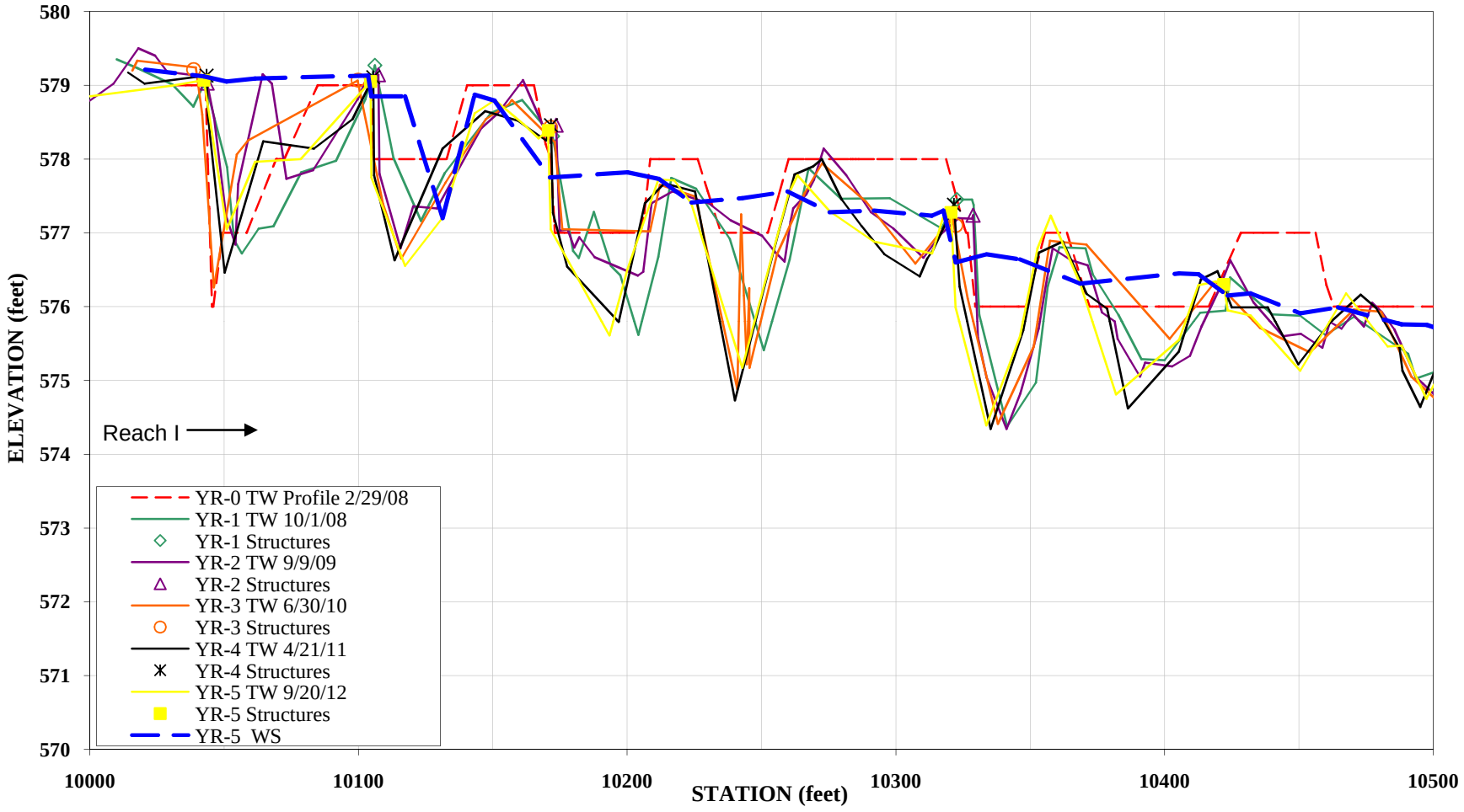
Summary Data
All dimensions in feet.

Bankfull X-sec area	8.34	sq. ft.
Bankfull Width	10.00	ft.
Bankfull Mean Depth	0.83	ft.
Bankfull Max Depth	1.65	ft.
Width/Depth Ratio	12.00	
Entrenchment Ratio	0.00	
Classification	n/a	
Bankfull Elevation:	567.83	ft.



CROSS SECTION PHOTO - LOOKING DOWNSTREAM

UT to Sandy Creek
Longitudinal Profile
2012 (Year-5) Monitoring
Reaches I & II



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally. Elevation data was not changed. Year-5 water surface was sporadic due to low / absent flow; therefore, when connecting water surface data points the dashed line is plotted below ground surface in some locations.

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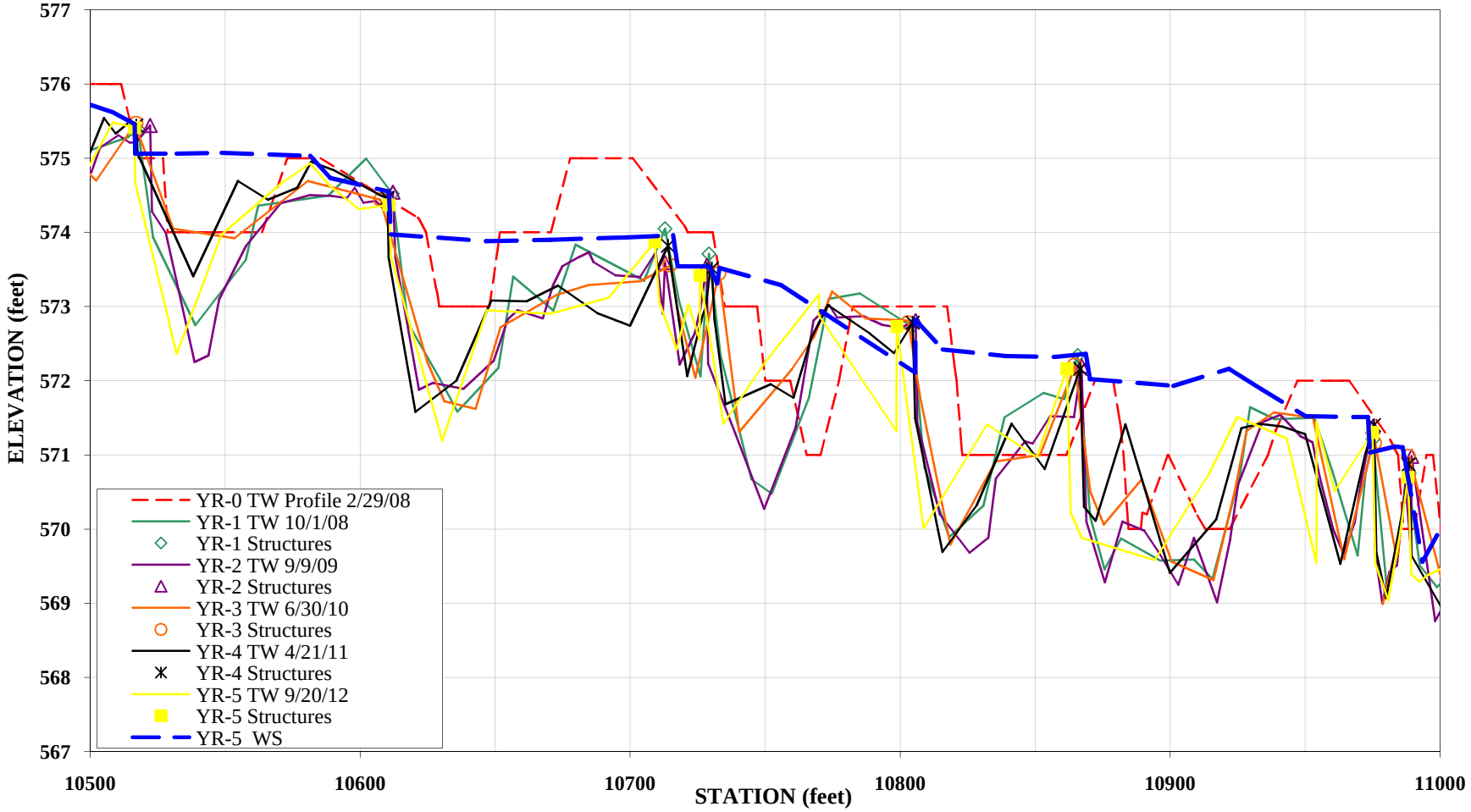
UT to Sandy Creek
Longitudinal Profile
2012 (Year-5) Monitoring
Reaches I & II



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally. Elevation data was not changed. Year-5 water surface was sporadic due to low / absent flow; therefore, when connecting water surface data points the dashed line is plotted below ground surface in some locations.

EcoEngineering
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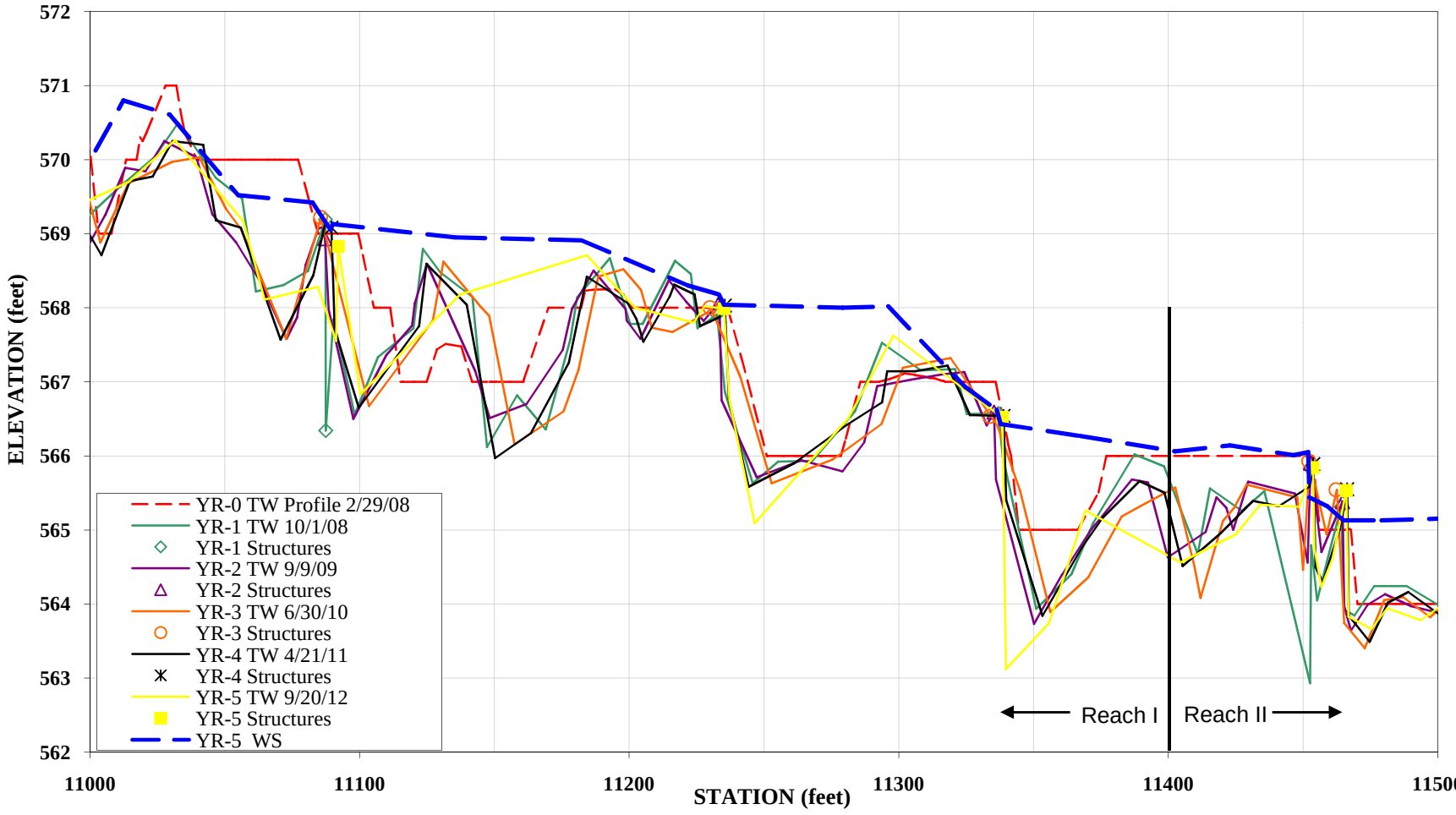
UT to Sandy Creek
Longitudinal Profile
2012 (Year-5) Monitoring
Reaches I & II



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally. Elevation data was not changed. Year-5 water surface was sporadic due to low / absent flow; therefore, when connecting water surface data points the dashed line is plotted below ground surface in some locations.

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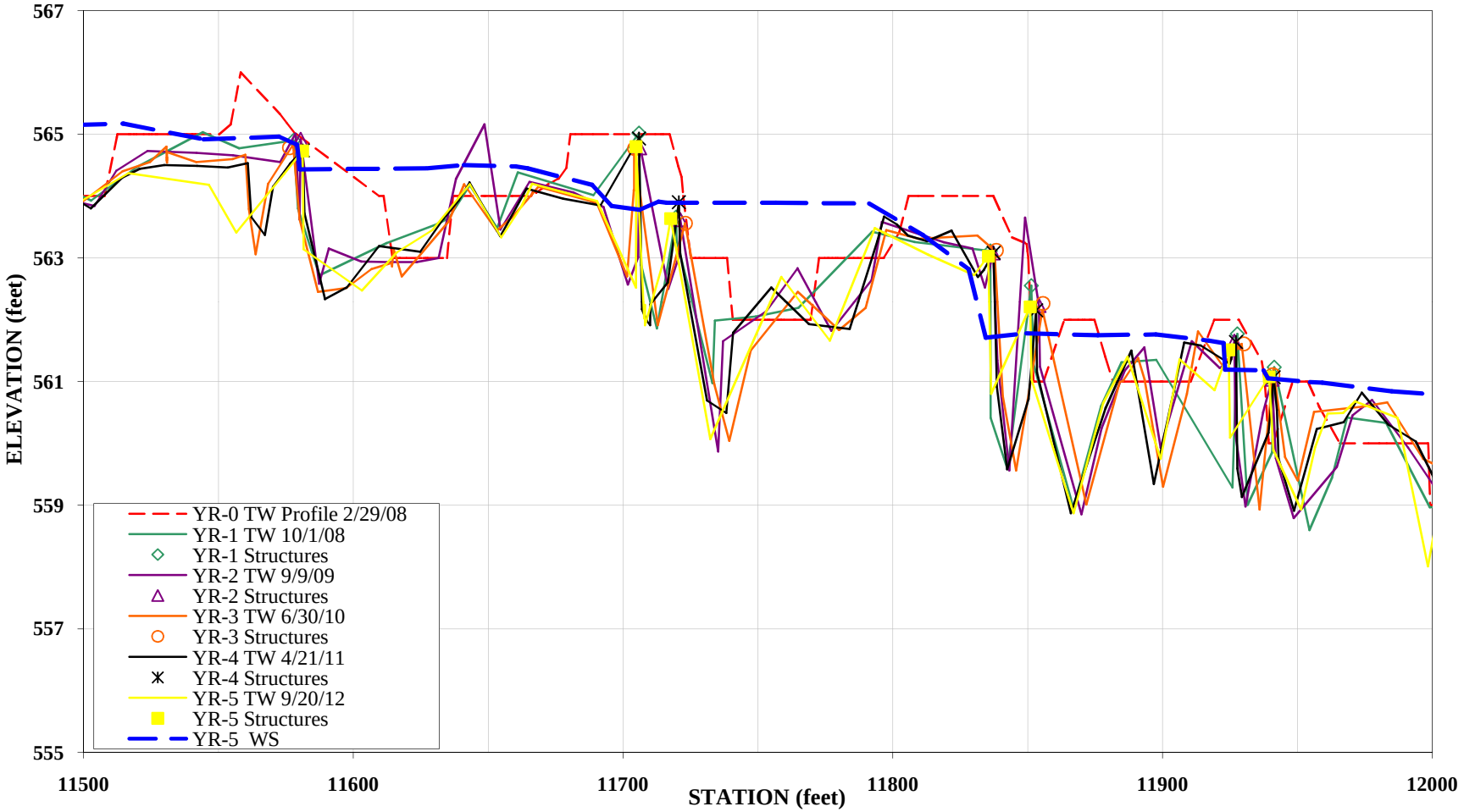
UT to Sandy Creek
Longitudinal Profile
2012 (Year-5) Monitoring
Reaches I & II



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally. Elevation data was not changed. Year-5 water surface was sporadic due to low / absent flow; therefore, when connecting water surface data points the dashed line is plotted below ground surface in some locations.

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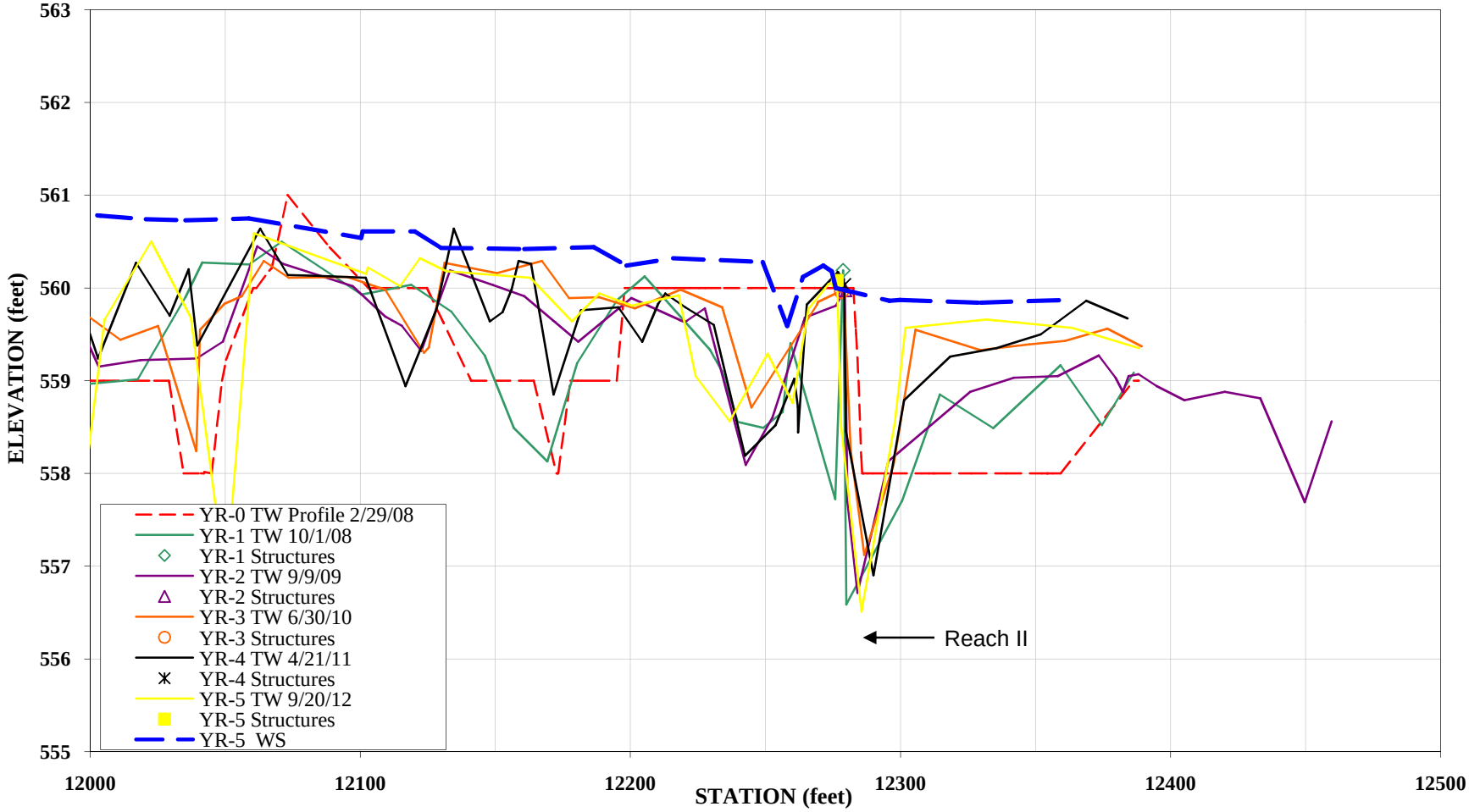
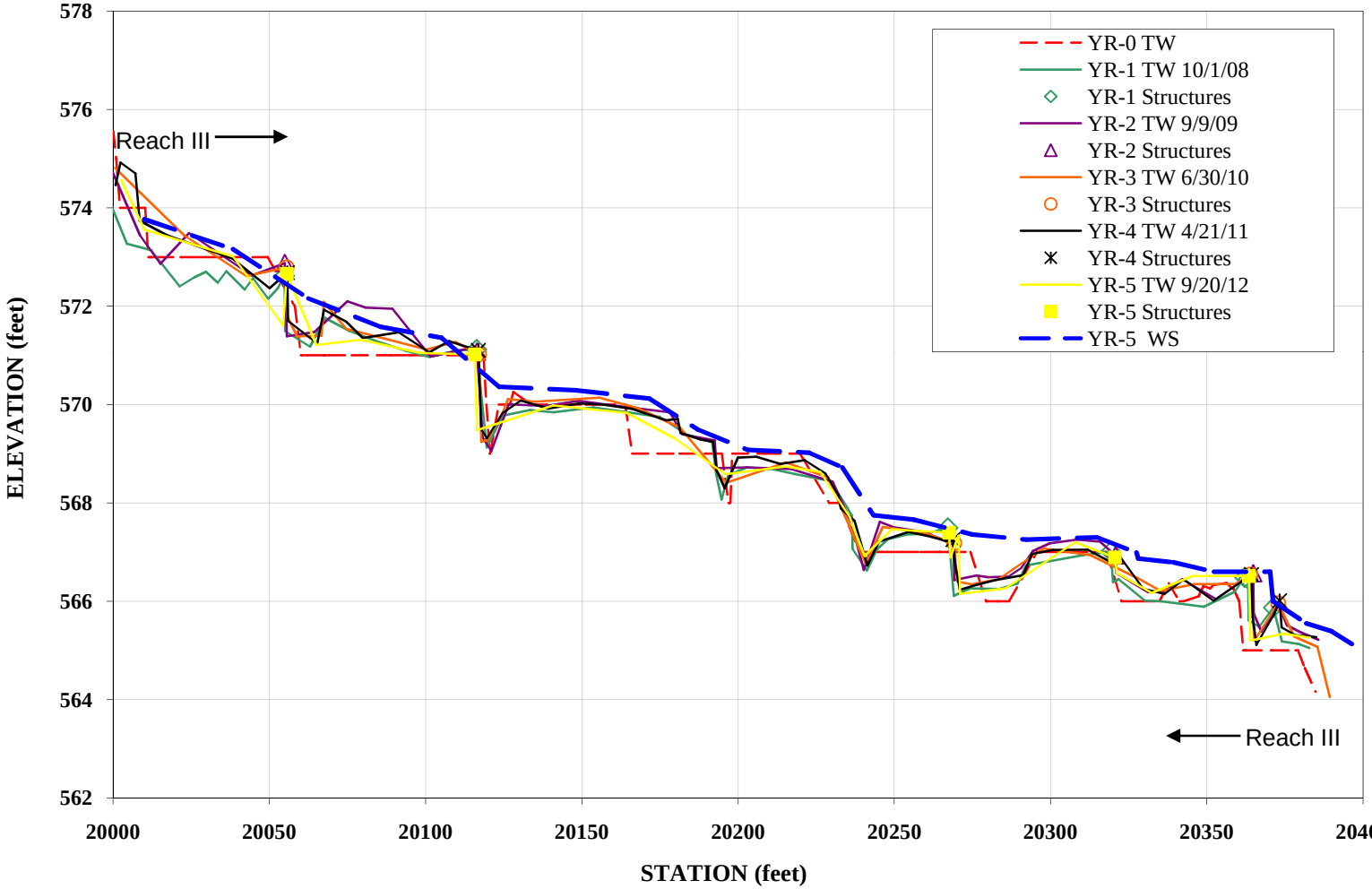
UT to Sandy Creek
Longitudinal Profile
2012 (Year-5) Monitoring
Reaches I & II



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally. Elevation data was not changed. Structures were used as a guide. Year-5 water surface was sporadic due to low / absent flow; therefore, when connecting water surface data points the dashed line is plotted below ground surface in some locations.

UT to Sandy Creek - Tributary
Longitudinal Profile
2012 (Year-5) Monitoring
Reach III



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally on average 10 feet. Structures were used as a guide. Year-5 water surface was sporadic due to low / absent flow; therefore, when connecting water surface data points the dashed line is plotted below ground surface in some locations.

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5-YEAR, 2012 SURVEY DATA

PROJECT NAME UT TO SANDY CREEK

TASK LONGITUDINAL PROFILE
REACHES UT to Sandy Creek and Minor Tributary
DATE 09/17/2012 to 09/20/2012
CREW BUCHHOLZ/PARRISH

FEATURE/FACET SLOPE LENGTH, AND SPACING AND LONGITUDINAL PROFILE DATA

UT to Sandy Creek Reach I

			DESIGN	AVG.
Overall water surface slope =	0.9%		Riffle	0.4%
WS sta. start =	10020.57 ft		Run	---
WS sta. end =	11422.50 ft		p-p spacing	62
ELEV. Start =	579.21 ft msl			
ELEV. End =	566.01 ft msl			

Results

	n =	MIN.	MEDIAN.	AVG.	MAX.
Riffle slopes measured =	11	0.21%	1.58%	2.37%	4.66%
Run slopes measured =	6	1.74%	6.94%	9.53%	26.32%
Pools measured =	20	12	72	68	146

UT to Sandy Creek Reach II

			DESIGN	AVG.
Overall water surface slope =	1%		Riffle	0.4%
WS sta. start =	11427.87 ft		Run	---
WS sta. end =	12349.06 ft		p-p spacing	62
ELEV. Start =	566.01 ft msl			
ELEV. End =	560.59 ft msl			

Results

	n =	MIN.	MEDIAN.	AVG.	MAX.
Riffle slopes measured =	9	0.00%	0.88%	1.66%	5.95%
Run slopes measured =	4	0.89%	2.37%	3.21%	7.20%
Pools measured =	14	19	58	71	135

UT to Sandy Creek Reach III

			DESIGN	AVG.
Overall water surface slope =	2%		Riffle	1.7%
WS sta. start =	20008.47 ft		Run	---
WS sta. end =	20390.92 ft		p-p spacing	46
ELEV. Start =	573.98 ft msl			
ELEV. End =	565.40 ft msl	Results		

	n =	MIN.	MEDIAN.	AVG.	MAX.
Riffle slopes measured =	3	2.06%	8.64%	7.03%	10.39%
Run slopes measured =	4	1.77%	5.88%	8.94%	22.22%
Pools measured =	6	30	54	60	122

All data reported in units of **feet** unless otherwise specified.

Feature	Station	Length	Slope		
		UT to Sandy Creek I			
RIFFLE	133	24	1.43%	n =	11
RIFFLE	265	42	0.21%	MIN =	0.21%
RIFFLE	343	16	3.03%	MEDIAN =	1.58%
RIFFLE	403	7	0.77%	AVG. =	2.37%
RIFFLE	458	15	4.66%	MAX =	4.66%
RIFFLE	571	7	4.13%		
RIFFLE	908	18	1.58%		
RIFFLE	1006	25	4.32%		

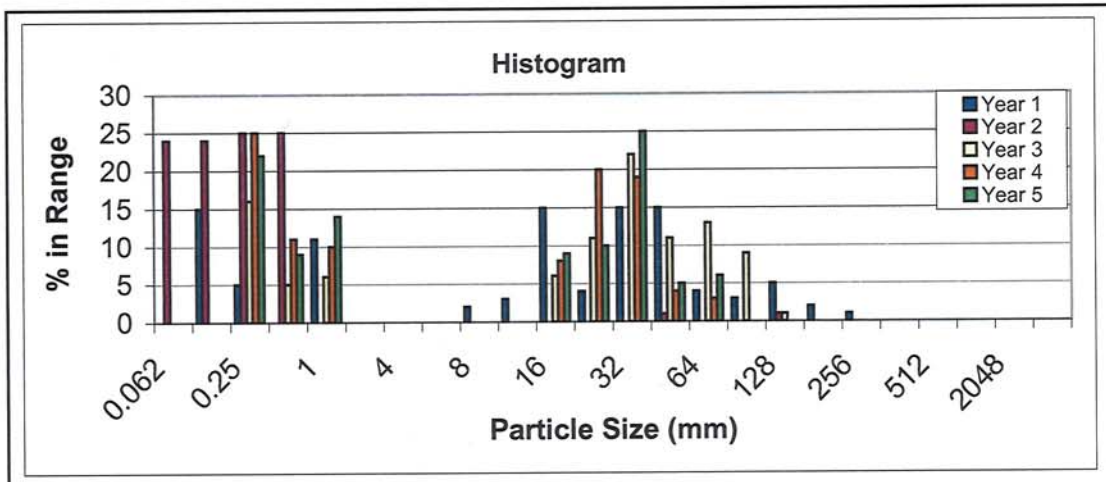
RIFFLE	1158	44	1.58%		
RIFFLE	1272	29	2.76%		
RIFFLE	1399	24	1.57%		
Feature	**Station**	**Length**	**Slope**		
		UT to Sandy Creek II			
RIFFLE	1640	24	1.17%	n =	9
RIFFLE	1760	20	2.17%	MIN =	0.00%
RIFFLE	1797	5	5.95%	MEDIAN =	0.88%
RIFFLE	1928	26	0.27%	AVG. =	1.66%
RIFFLE	2028	42	0.88%	MAX =	5.95%
RIFFLE	2099	31	0.23%		
RIFFLE	2168	17	0.63%		
RIFFLE	2233	7	3.62%		
RIFFLE	2269	62	0.00%		
Feature	**Station**	**Length**	**Slope**		
		UT to Sandy Creek III			
RIFFLE	20114	8	2.06%	n =	3
RIFFLE	20234	9	10.39%	MIN =	2.06%
RIFFLE	20325	2	8.64%	MEDIAN =	8.64%
				AVG. =	7.03%
				MAX =	10.39%
Feature	**Station**	**Length**	**Slope**		
		UT to Sandy Creek I			
RUN	307	3	2.66%	n =	6
RUN	359	13	11.23%	MIN =	1.74%
RUN	579	15	1.74%	MEDIAN =	6.94%
RUN	926	11	2.00%	AVG. =	9.53%
RUN	1031	8	13.25%	MAX =	26.32%
RUN	1301	12	26.32%		
Feature	**Station**	**Length**	**Slope**		
		UT to Sandy Creek II			
RUN	2070	12	1.68%	n =	4
RUN	2130	15	3.06%	MIN =	0.89%
RUN	2185	19	7.20%	MEDIAN =	2.37%
RUN	2331	25	0.89%	AVG. =	3.21%
				MAX =	7.20%

Feature	Station	Length	Slope		
		UT to Sandy Creek III			
RUN	20001	61	2.94%	n =	4
RUN	20122	1	1.77%	MIN =	1.77%
RUN	20243	4	22.22%	MEDIAN =	5.88%
RUN	20327	8	8.82%	AVG. =	8.94%
				MAX =	22.22%

Feature	Station	Length	p-p spacing			
		UT to Sandy Creek I				
POOL	41	19		n =	20	
POOL	107	27	66	MIN =	12	(p-p spacing)
POOL	190	40	83	MEDIAN =	72	
POOL	233	36	43	AVG. =	68	
POOL	324	24	91	MAX =	146	
POOL	372	37	48			
POOL	440	41	69			
POOL	522	32	82			
POOL	613	36	91			
POOL	700	11	87			
POOL	718	23	17			
POOL	792	33	74			
POOL	850	51	59			
POOL	937	18	87			
POOL	955	9	18			
POOL	966	25	12			
POOL	1039	28	72			
POOL	1074	45	35			
POOL	1221	44	146			
POOL	1330	30	109			

Feature	Station	Length	p-p spacing			
		UT to Sandy Creek II				
POOL	1431	7		n =	14	
POOL	1449	14	19	MIN =	19	(p-p spacing)
POOL	1577	48	128	MEDIAN =	58	
POOL	1629	19	52	AVG. =	71	
POOL	1675	10	46	MAX =	135	
POOL	1699	41	24			
POOL	1834	27	135			
POOL	1918	16	84			
POOL	1965	18	47			
POOL	2082	19	116			
POOL	2145	26	64			
POOL	2204	33	58			
POOL	2253	20	49			
POOL	2355	57	103			

Feature	Station	Length	p-p spacing			
		UT to Sandy Creek III				
POOL	20071	12		n =	6	
POOL	20126	7	54	MIN =	30	(p-p spacing)
POOL	20247	8	122	MEDIAN =	54	
POOL	20277	25	30	AVG. =	60	
POOL	20336	24	59	MAX =	122	
POOL	20372	7	36			



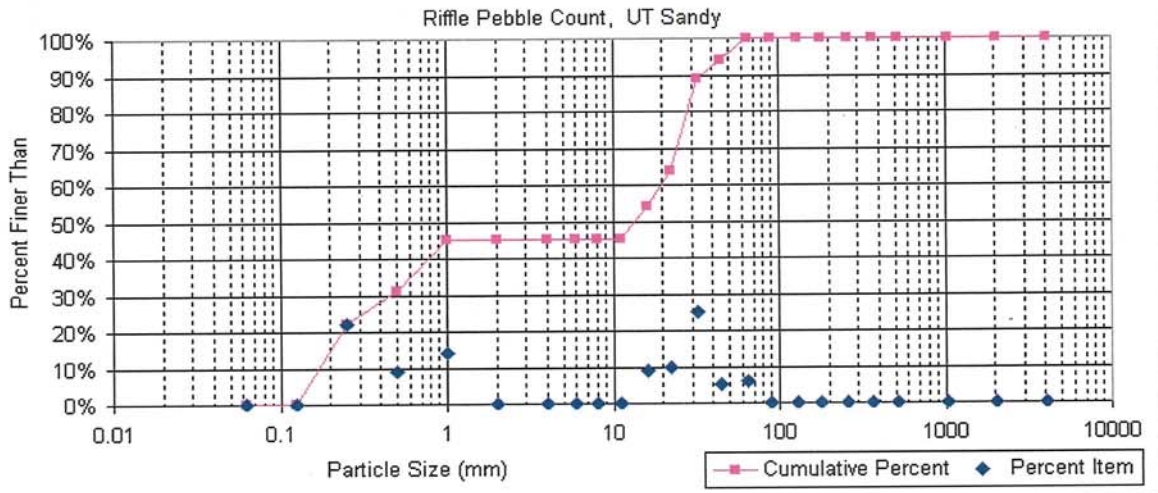
EEP PROJECT ID: 403
CROSS-SECTION: 1 **FEATURE: RIFFLE**

Ecosystem Enhancement PROGRAM

PROJECT UT to SANDY CREEK
TASK PEBBLE COUNT
REACH UT to SANDY CREEK
DATE 09/17/2012 to 09/20/2012
CREW BUCHHOLZ/PARRISH

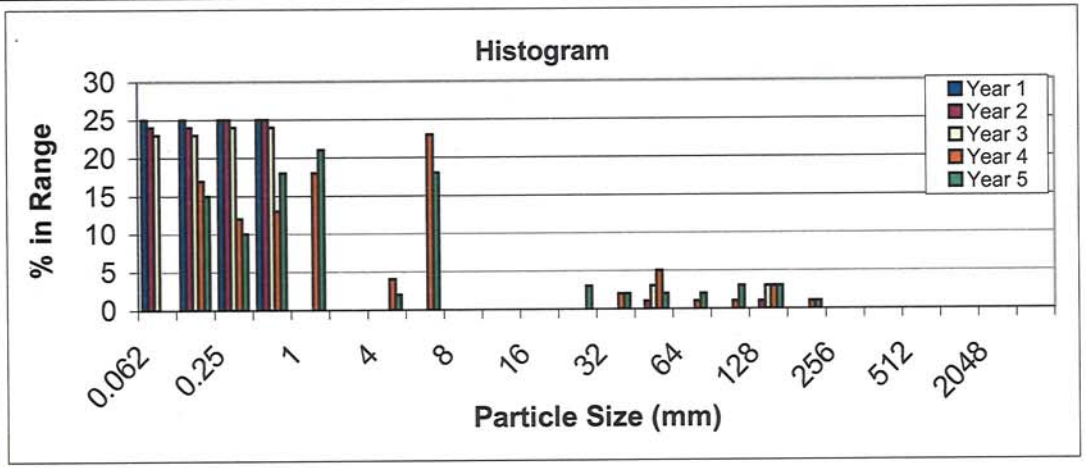
Material	Size Range (mm)		Count
silt/clay	0	0.062	
very fine sand	0.062	0.13	
fine sand	0.13	0.25	22
medium sand	0.25	0.5	9
coarse sand	0.5	1	14
very coarse sand	1	2	
very fine gravel	2	4	
fine gravel	4	6	
fine gravel	6	8	
medium gravel	8	11	
medium gravel	11	16	9
coarse gravel	16	22	10
coarse gravel	22	32	25
very coarse gravel	32	45	5
very coarse gravel	45	64	6
small cobble	64	90	
medium cobble	90	128	
large cobble	128	180	
very large cobble	180	256	
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
bedrock			
	Total Particle Count:		100

Note:	UT Sandy



Size percent less than (mm)				
D16	D35	D50	D84	D95
0.207	0.61	13.5	30	48

Percent by substrate type					
silt/clay	sand	gravel	cobble	boulder	bedrock
0%	45%	55%	0%	0%	0%

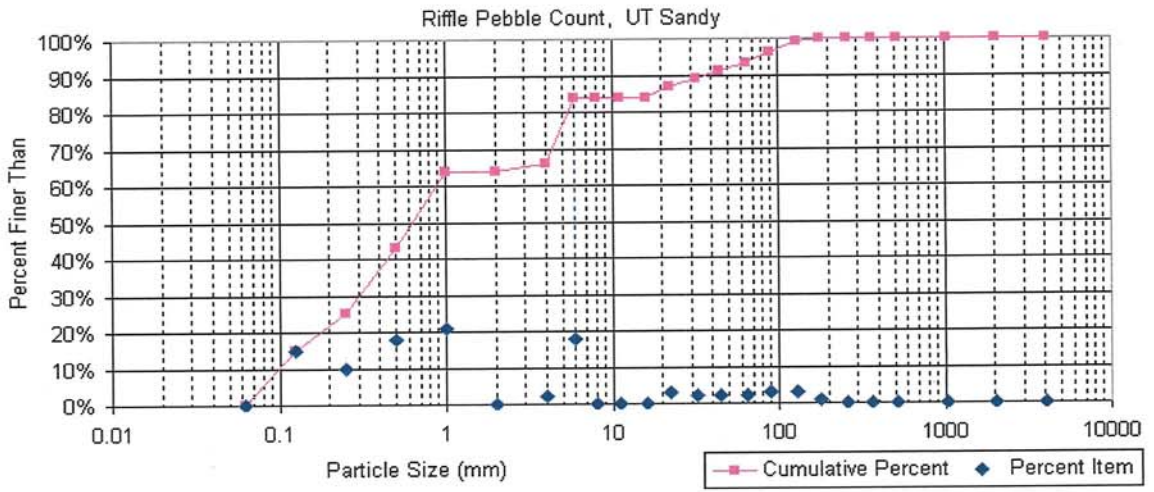


EEP PROJECT ID: 403
CROSS-SECTION: 3 **FEATURE:** RIFFLE

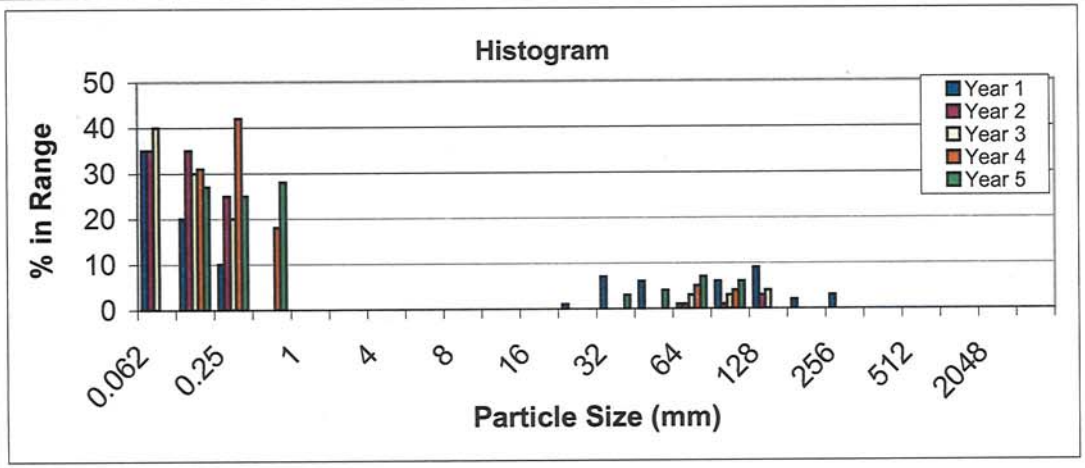
PROJECT UT to SANDY CREEK
TASK PEBBLE COUNT
REACH UT to SANDY CREEK
DATE 09/17/2012 to 09/20/2012
CREW BUCHHOLZ/PARRISH

Material	Size Range (mm)		Count
silt/clay	0	0.062	
very fine sand	0.062	0.13	15
fine sand	0.13	0.25	10
medium sand	0.25	0.5	18
coarse sand	0.5	1	21
very coarse sand	1	2	
very fine gravel	2	4	2
fine gravel	4	6	18
fine gravel	6	8	
medium gravel	8	11	
medium gravel	11	16	
coarse gravel	16	22	3
coarse gravel	22	32	2
very coarse gravel	32	45	2
very coarse gravel	45	64	2
small cobble	64	90	3
medium cobble	90	128	3
large cobble	128	180	1
very large cobble	180	256	
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
bedrock			
	Total Particle Count:		100

Note:	
	UT Sandy



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
0.134	0.37	0.6	6	80	0%	64%	29%	7%	0%	0%

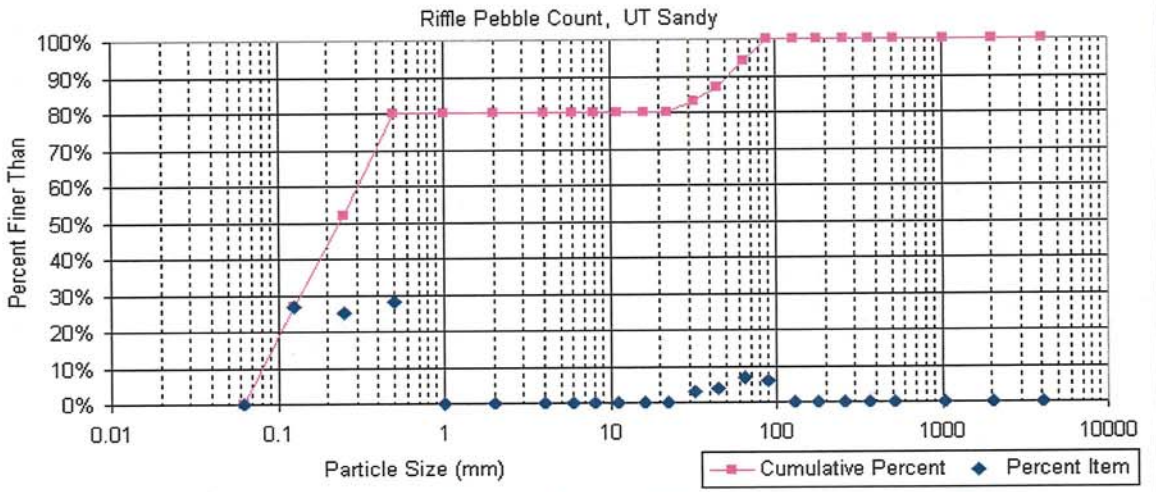


EEP PROJECT ID: 403
CROSS-SECTION: 5 **FEATURE:** RIFFLE

PROJECT UT to SANDY CREEK
TASK PEBBLE COUNT
REACH UT to SANDY CREEK
DATE 09/17/2012 to 09/20/2012
CREW BUCHHOLZ/PARRISH

Material	Size Range (mm)		Count
silt/clay	0	0.062	
very fine sand	0.062	0.13	27
fine sand	0.13	0.25	25
medium sand	0.25	0.5	28
coarse sand	0.5	1	
very coarse sand	1	2	
very fine gravel	2	4	
fine gravel	4	6	
fine gravel	6	8	
medium gravel	8	11	
medium gravel	11	16	
coarse gravel	16	22	
coarse gravel	22	32	3
very coarse gravel	32	45	4
very coarse gravel	45	64	7
small cobble	64	90	6
medium cobble	90	128	
large cobble	128	180	
very large cobble	180	256	
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
bedrock			
Total Particle Count:			100

Note:	UT Sandy



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
0.094	0.16	0.2	35	68	0%	80%	14%	6%	0%	0%

BEHI and Sediment Export Estimates UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403															
Time Point	Segment/ Reach	Linear Footage or Acreage	Extreme		Very High		High		Moderate		Low		Very Low		Sediment Export
			ft	%	ft	%	ft	%	ft	%	ft	%	ft	%	Ton/y

Note: BEHI and NBS assessments were not conducted for the entire project pre-construction as part of the existing conditions survey. Therefore, BEHI and NBS assessments are not applicable during Monitoring Year 5.

APPENDIX E

Wetland Assessment

(Omitted, Not Applicable)

APPENDIX F

Project Photo Stations

PHOTOGRAPH 1: RIP-RAP. HEAD OF UT-1.

PHOTOGRAPH 2: CROSS VANE. STA: 100+12.

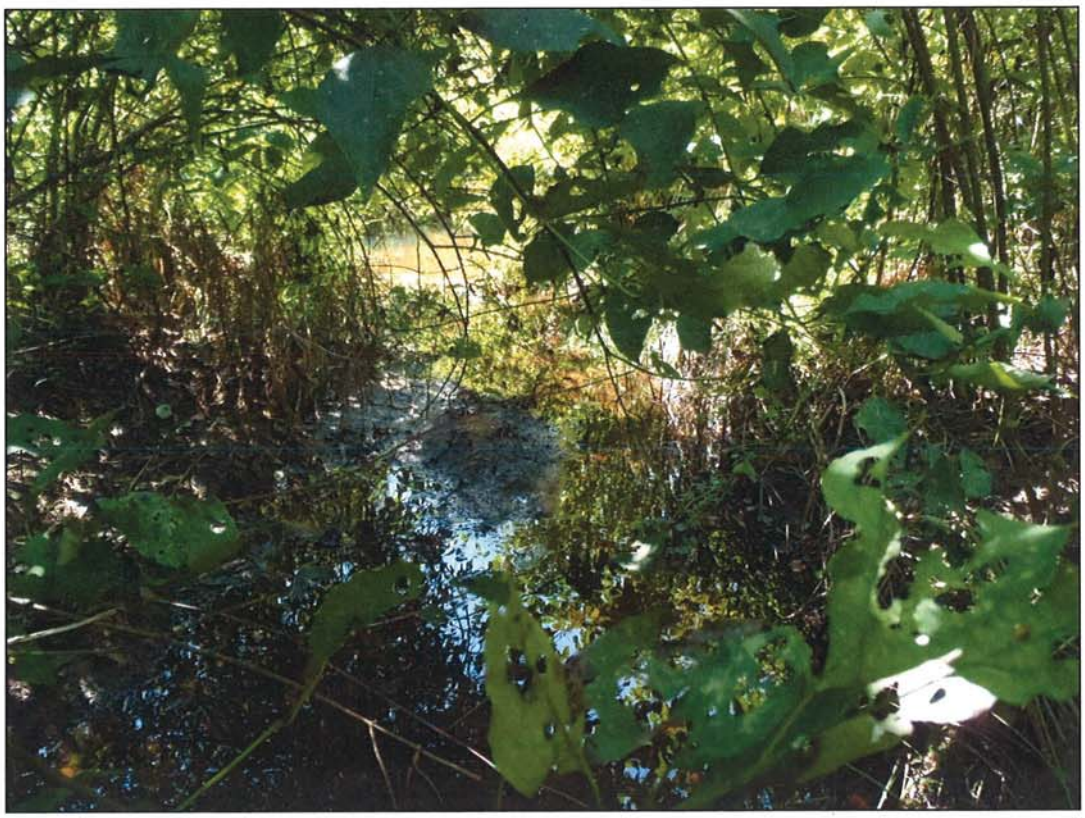
McADAMS	PROJECT NO. EEP-08030 FILENAME: EEP08030X.DWG SCALE: NTS DATE: 10-30-12	Ecosystem Enhancement Program	UT to SANDY CREEK RESTORATION MONITORING PHOTOGRAPHS RANDOLPH COUNTY, NC	EcoEngineering A division of The John R. McAdams Company, Inc. RESEARCH TRIANGLE PARK, NC P.O. BOX 14005 ZIP 27709-4005 (919) 361-5000

PHOTOGRAPH 3: CROSS VANE. STA: 100+73.

PHOTOGRAPH 4: CONSTRUCTED RIFFLE. STA: 101+09.

McADAMS	PROJECT NO. EEP–08030 FILENAME: EEP08030X.DWG SCALE: NTS DATE: 10–30–12	Ecosystem Enhancement Program	**UT to SANDY CREEK RESTORATION** **MONITORING PHOTOGRAPHS** **RANDOLPH COUNTY, NC**	**EcoEngineering** A division of The John R. McAdams Company, Inc. RESEARCH TRIANGLE PARK, NC P.O. BOX 14005 ZIP 27709–4005 (919) 361–5000

PHOTOGRAPH 5: CROSS VANE. STA: 101+40.



PHOTOGRAPH 6: CONSTRUCTED RIFFLE. STA: 102+25.

McADAMS	PROJECT NO. EEP–08030 FILENAME: EEP08030X.DWG SCALE: NTS DATE: 10–30–12	Ecosystem Enhancement PROGRAM	**UT to SANDY CREEK RESTORATION** **MONITORING PHOTOGRAPHS** **RANDOLPH COUNTY, NC**	**EcoEngineering** A division of The John R. McAdams Company, Inc. RESEARCH TRIANGLE PARK, NC P.O. BOX 14005 ZIP 27709–4005 (919) 361–5000

PHOTOGRAPH 7: CROSS VANE. STA: 102+85.

PHOTOGRAPH 8: CONSTRUCTED RIFFLE. STA: 103+15.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	10-30-12

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PHOTOGRAPH 9: RIP-RAP FOR WETLAND AREA.

PHOTOGRAPH 10: CONSTRUCTED RIFFLE. STA: 103+88.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	10-30-12

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PHOTOGRAPH 11: CROSSING. STA: 104+23.

PHOTOGRAPH 12: CROSS VANE. STA: 104+75.

McADAMS	PROJECT NO. EEP-08030 FILENAME: EEP08030X.DWG SCALE: NTS DATE: 10-30-12	Ecosystem Enhancement PROGRAM	**UT to SANDY CREEK RESTORATION** **MONITORING PHOTOGRAPHS** **RANDOLPH COUNTY, NC**	**EcoEngineering** A division of The John R. McAdams Company, Inc. RESEARCH TRIANGLE PARK, NC P.O. BOX 14005 ZIP 27709-4005 (919) 361-5000

PHOTOGRAPH 13: CROSS VANE. STA: 105+62.

PHOTOGRAPH 14: "A" VANE. STA: 106+60.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	10-30-12

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PHOTOGRAPH 15: RIP-RAP.

PHOTOGRAPH 16: CROSS VANE. STA: 107+49.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	10-30-12

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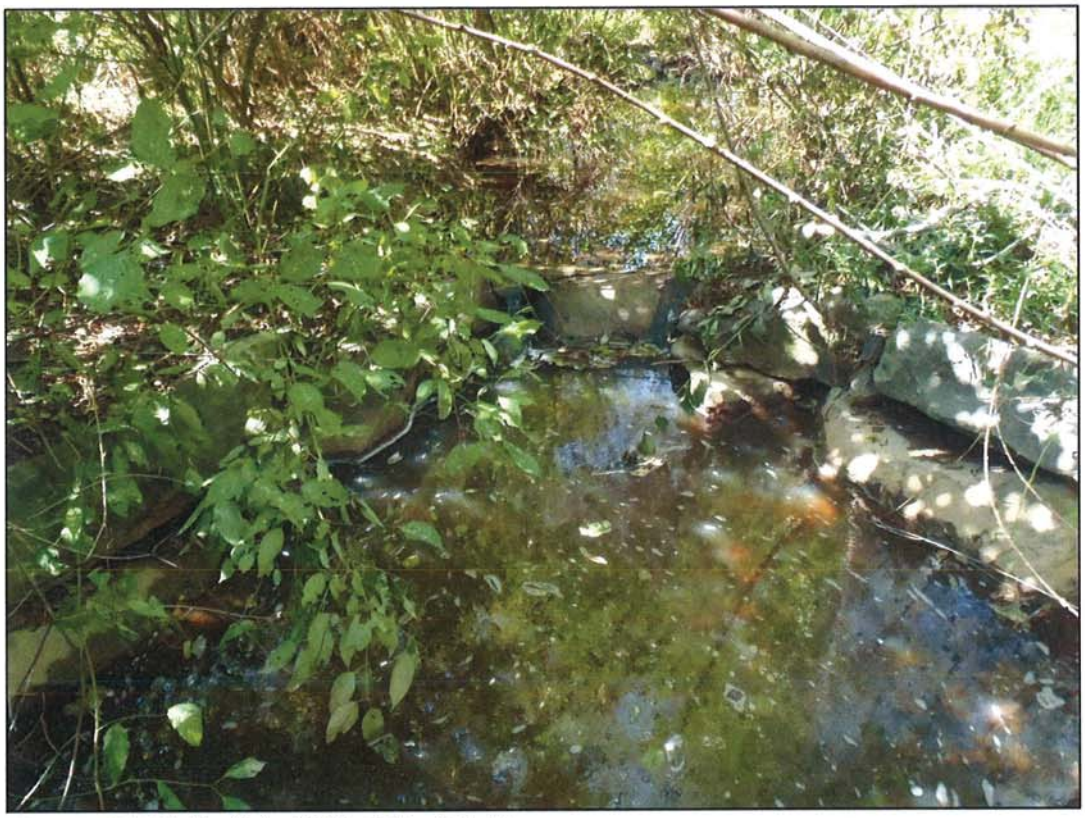
PHOTOGRAPH 17: CROSS VANE. STA: 108+11.

PHOTOGRAPH 18: CONSTRUCTED RIFFLE. STA: 108+77.

McADAMS	PROJECT NO. EEP-08030 FILENAME: EEP08030X.DWG SCALE: NTS DATE: 10-30-12	Ecosystem Enhancement Program	**UT to SANDY CREEK RESTORATION** **MONITORING PHOTOGRAPHS** **RANDOLPH COUNTY, NC**	**EcoEngineering** A division of The John R. McAdams Company, Inc. RESEARCH TRIANGLE PARK, NC P.O. BOX 14005 ZIP 27709-4005 (919) 361-5000



PHOTOGRAPH 19: "A" VANE. STA: 109+14.

PHOTOGRAPH 20: CONSTRUCTED RIFFLE. STA:109+58.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	10-30-12

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PHOTOGRAPH 21: CROSS VANE. STA: 110+26.

PHOTOGRAPH 22: CONSTRUCTED RIFFLE. STA: 110+58.

McADAMS	PROJECT NO. EEP-08030 FILENAME: EEP08030X.DWG SCALE: NTS DATE: 10-30-12	Ecosystem Enhancement Program	**UT to SANDY CREEK RESTORATION** **MONITORING PHOTOGRAPHS** **RANDOLPH COUNTY, NC**	**EcoEngineering** A division of The John R. McAdams Company, Inc. RESEARCH TRIANGLE PARK, NC P.O. BOX 14005 ZIP 27709-4005 (919) 361-5000

PHOTOGRAPH 23: CROSSING. STA: 111+32.

PHOTOGRAPH 24: CROSS VANE. STA: 111+66.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	10-30-12

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PHOTOGRAPH 25: CONSTRUCTED RIFFLE. STA: 112+15.

PHOTOGRAPH 26: CROSS VANE. STA: 112+70.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	10-30-12

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PHOTOGRAPH 27: "A" VANE. STA: 113+80.

PHOTOGRAPH 28: CROSS VANE. STA: 115+15.

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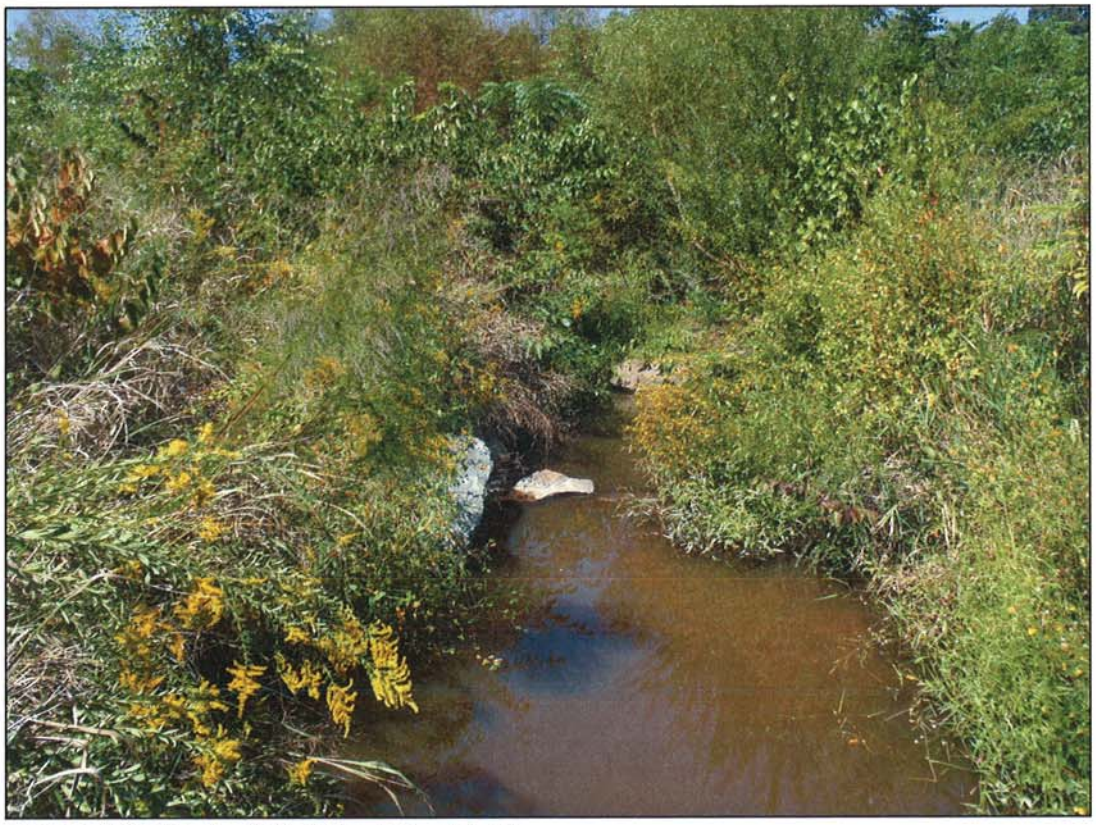

PHOTOGRAPH 29: "A" VANE. STA: 116+29.

PHOTORGAPH 30: "A" VANE. STA: 117+58.

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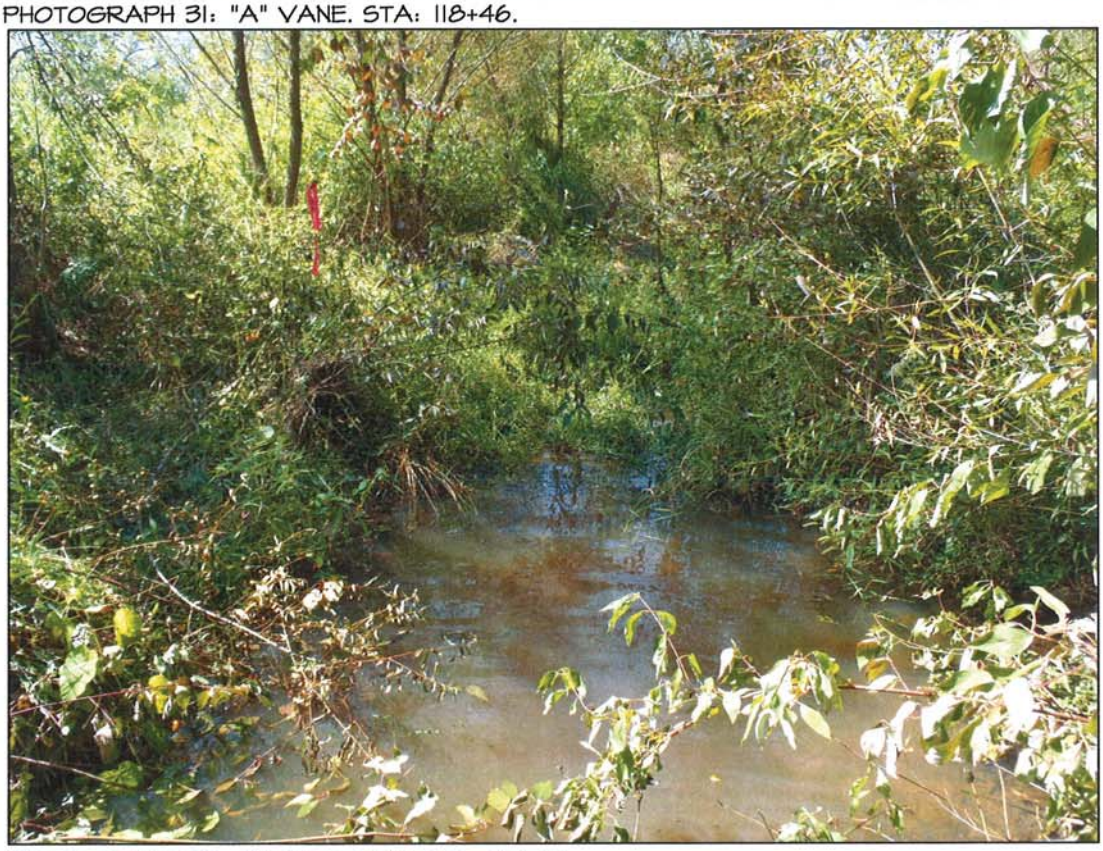
PHOTOGRAPH 31: "A" VANE. STA: 118+46.



PHOTOGRAPH 32: CROSS VANE. STA: 119+07.

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PHOTOGRAPH 33: CONSTRUCTED RIFFLE. STA: 120+25.

PHOTOGRAPH 34: RIP-RAP. WETLAND DRAINAGE.

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PHOTOGRAPH 35: RIP-RAP. WELTAND DRAINAGE.

PHOTOGRAPH 36: CROSS VANE. STA: 122+00.

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PHOTOGRAPH 37: RIP-RAP. HEAD OF UT-2.

PHOTOGRAPH 38: CROSS VANE. STA: 200+57.

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PHOTOGRAPH 39: CROSS VANE. STA: 201+16.

PHOTOGRAPH 40: CROSS VANE. STA: 202+64.

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PHOTOGRAPH 41: CROSS VANE. STA: 203+15.

PHOTOGRAPH 42: CROSS VANE. STA: 203+58.

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PHOTOGRAPH 43: CROSS SECTION I LOOKING UPSTREAM.

PHOTOGRAPH 44: CROSS SECTION I LOOKING DOWNSTREAM.

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PHOTOGRAPH 45: CROSS SECTION I LOOKING AT THE LEFT BANK.

PHOTOGRAPH 46: CROSS SECTION I LOOKING AT THE RIGHT BANK.

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PHOTOGRAPH 47: CROSS SECTION 1 LOOKING AT THE SUBSTRATE COMPOSITION.

PHOTOGRAPH 48: CROSS SECETION 2 LOOKING UPSTREAM.

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PHOTOGRAPH 49: CROSS SECTION 2 LOOKING DOWNSTREAM.

PHOTOGRAPH 50: CROSS SECTION 2 LOOKING AT THE LEFT BANK.

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PHOTOGRAPH 51. CROSS SECTION 2 LOOKING AT THE RIGHT BANK.

PHOTOGRAPH 52: CROSS SECTION 2 LOOKING AT THE SUBSTRATE COMPOSITION.

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PHOTOGRAPH 53: CROSS SEECTION 3 LOOKING UPSTREAM.

PHOTOGRAPH 54: CROSS SECTION 3 LOOKING DOWNSTREAM.

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PHOTOGRAPH 55: CROSS SECTION 3 LOOKING AT THE BANK.

PHOTOGRAPH 56: CROSS SECTION 3 LOOKING AT THE RIGHT BANK.

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PHOTOGRAPH 57: CROSS SECTION 3 LOOKING AT THE SUBSTRATE COMPOSITION.

PHOTOGRAPH 58: CROSS SECTION 4 LOOKING UPSTREAM.

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PHOTOGRAPH 59: CROSS SECTION 4 LOOKING DOWNSTREAM.

PHOTOGRAPH 60: CROSS SECTION 4 LOOKING AT THE LEFT BANK.

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PHOTOGRAPH 61: CROSS SECTION 4 LOOKING AT THE RIGHT BANK.

PHOTOGRAPH 62: CROSS SECTION 4 LOOKING AT THE SUBSTRATE COMPOSITION.

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PHOTOGRAPH 63: CROSS SECTION 5 LOOKING UPSTREAM.

PHOTOGRAPH 64: CROSS SECTION 5 LOOKING DOWNSTREAM.

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PHOTOGRAPH 65: CROSS SECTION 5 LOOKING AT THE LEFT BANK.

PHOTOGRAPH 66: CROSS SECTION 5 LOOKING AT THE RIGHT BANK.

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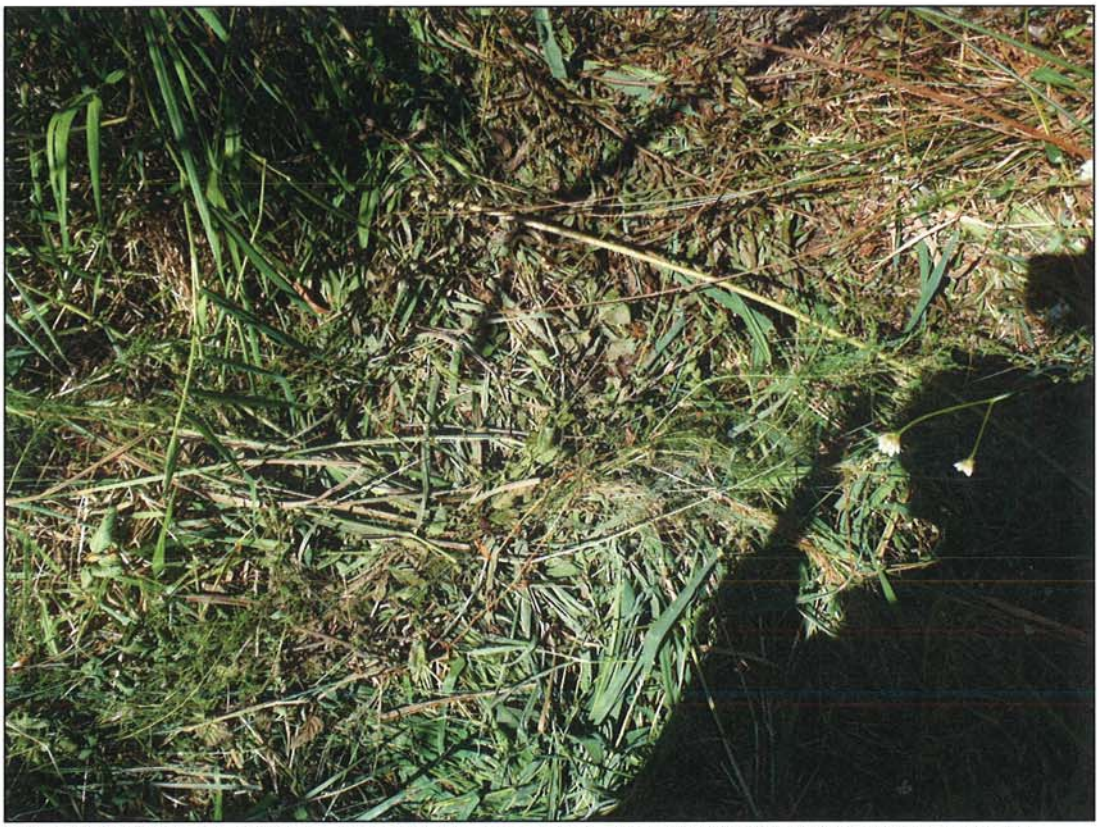

PHOTOGRAPH 67: CROSS SECTION 5 LOOKING AT THE SUBSTRATE COMPOSITION.

PHOTOGRAPH 68. CROSS SECTION 6 LOOKING UPSTREAM.

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PHOTOGRAPH 69: CROSS SECTION 6 LOOKING DOWNSTREAM.

PHOTOGRAPH 70: CROSS SECTION 6 LOOKING AT THE LEFT BANK.

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PHOTOGRAPH 71: CROSS SECTION 6 LOOKING AT THE RIGHT BANK.

PHOTOGRAPH 72: CROSS SECTION 6 LOOKING AT THE SUBSTRATE COMPOSITION.

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PHOTOGRAPH 73: VEGETATION PLOT 4.

PHOTOGRAPH 74: VEGETATION PLOT 5.

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PHOTOGRAPH 75: VEGETATION PLOT 6.

PHOTOGRAPH 76: VIEW OF FLOODPLAIN LOOKING DOWNSTREAM.

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PHOTOGRAPH 17: VEGETATION PLOT 9 LOOKING INTO MONITORING PLOT FROM THE NORTHWEST CORNER. VEGETATION PLOT 9 WAS ESTABLISHED BY EEP AND SAMPLED BY EEP DURING MY-04. ECOENGINEERING SURVEY LOCATED AND PHOTOGRAPHED MONITORING PLOT.

PHOTOGRAPH 18: VEGETATION PLOT 8 LOOKING INTO MONITORING PLOT FROM THE NORTHWEST CORNER. VEGETATION PLOT 8 WAS ESTABLISHED BY EEP AND SAMPLED BY EEP DURING MY-04. ECOENGINEERING SURVEY LOCATED AND PHOTOGRAPHED MONITORING PLOT.

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PHOTOGRAPH 79: VEGETATION PLOT 7 LOOKING INTO MONITORING PLOT FROM THE NORTHWEST CORNER. VEGETATION PLOT 7 WAS ESTABLISHED BY EEP AND SAMPLED BY EEP DURING MY-04. ECOENGINEERING SURVEY LOCATED AND PHOTOGRAPHED MONITORING PLOT.

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