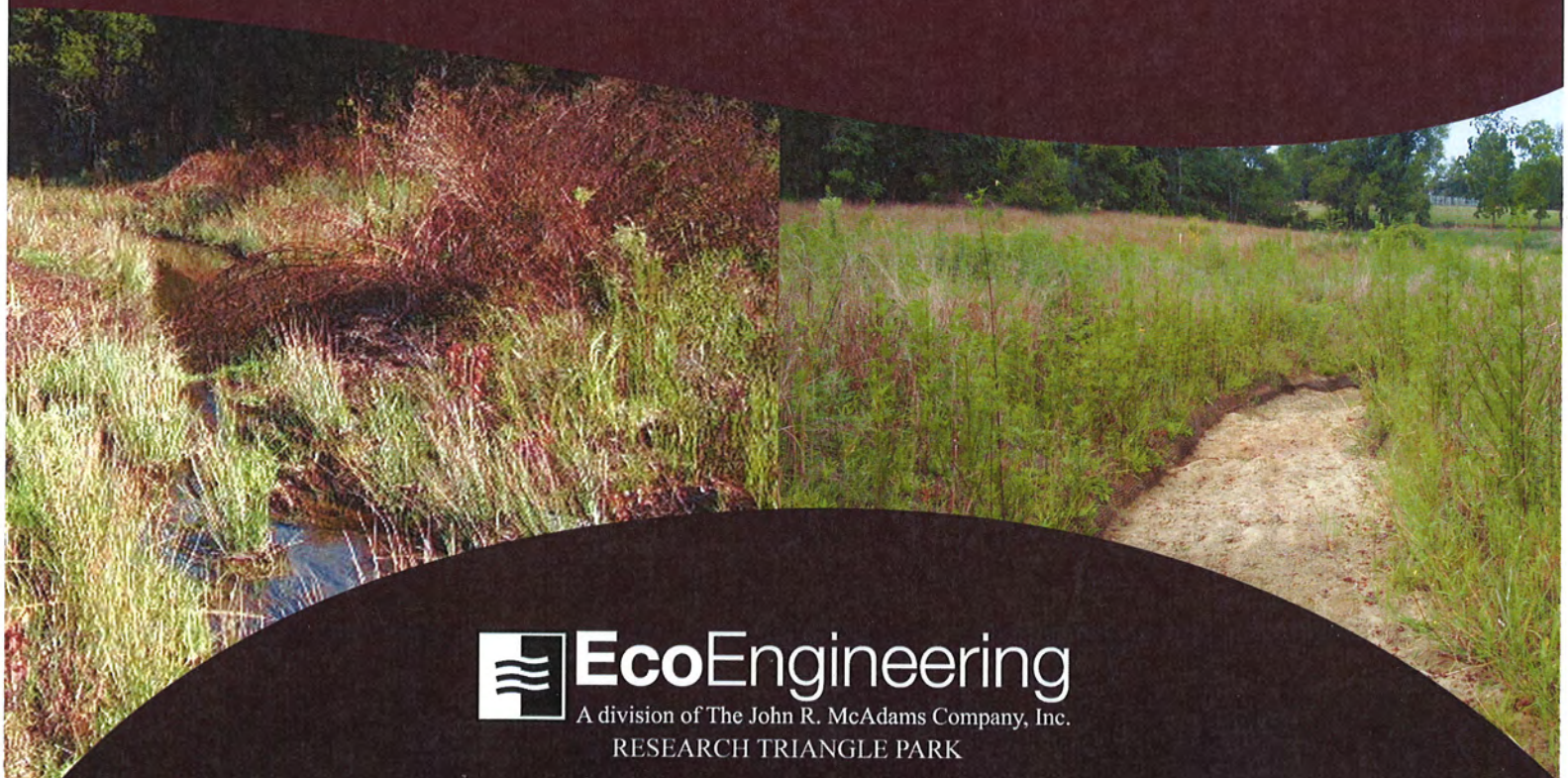
UT to Sandy Creek

Randolph County, North Carolina

2011 Year 4 Monitoring Report - Final
EEP Project Number: 403
USGS HUC 03030003020010
EcoEngineering Project Number: EEP-08030

Prepared for:

NCDENR Ecosystem Enhancement Program
2728 Capital Blvd., Suite 1H 103
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 for MY-04. Three new Vegetation Plots (7, 8, and 9) were added to the project for sampling during MY-04 outside of the planned low-height planting zone. Vegetation Plots 7, 8, and 9 were established by EEP and sampled by EEP during the 2011 Monitoring Year 4 period. EcoEngineering survey located Vegetation Plots 7, 8, and 9 during the 2011 Monitoring Year 4 field investigations. The location of Vegetation Plots 7, 8, and 9 are depicted on the Consolidated Current Conditions Plan View **Appendix A**. For Vegetation Plots 4, 5, and 6, original baseline vegetation monitoring data was not provided prior to the 2008 Monitoring Year 1 and 2008 is also considered a drought year. The 2009 Monitoring Year 2 is considered the baseline datum because after two years of monitoring it is assumed all planted stems within a vegetation monitoring plot have been surveyed and accounted for. Therefore, any additional species observed in proceeding monitoring years are considered volunteer species. The 2011 Monitoring Year 4 data was provided 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. As for Monitoring Year 4, UT to Sandy Creek had 6 vegetation plots encompassing 0.15 acres, containing a total of 88 planted stems excluding live stakes. When examining total stems within all 6 vegetation plots, there were 106 planted stems including volunteer stems. In total, the 6 vegetation plots yielded a density of 593 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 715 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, all of the vegetation plots exceeded the requirements by 10% when examining planted stems excluding live stakes and when examining planted stems including volunteer stems.

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 sixteen areas in which exotic/invasive species were observed totaling approximately 0.47 acres in size and are approximately 4.61% 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 11 areas, totaling approximately 2.26 acres in size, which were determined to be low stem density areas. EEP prescribed supplemental plantings for these 11 low stem density areas and conducted planting operations on March 8, 2011. The areas which received supplemental plantings are depicted in the Consolidated Current Condition Plan View **Appendix A.** There were a total of 355 containerized stems planted and consisted of the following species: black cherry (*Prunus serotina*, 22 stems), cherrybark oak (*Quercus pagoda*, 25 stems), ironwood (*Carpinus caroliniana*, 70 stems), red maple (*Acer rubrum*, 8 stems), red oak (*Quercus rubra*, 66 stems), river birch (*Betula nigra*, 7 stems), water oak (*Quercus nigra*, 50 stems), willow oak (*Quercus phellos*, 62 stems), arrowwood (*Viburnum dentatum*, 25 stems), red chokeberry (*Aronia arbutifolia*, 20 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 2011 Monitoring Year 4 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.

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.

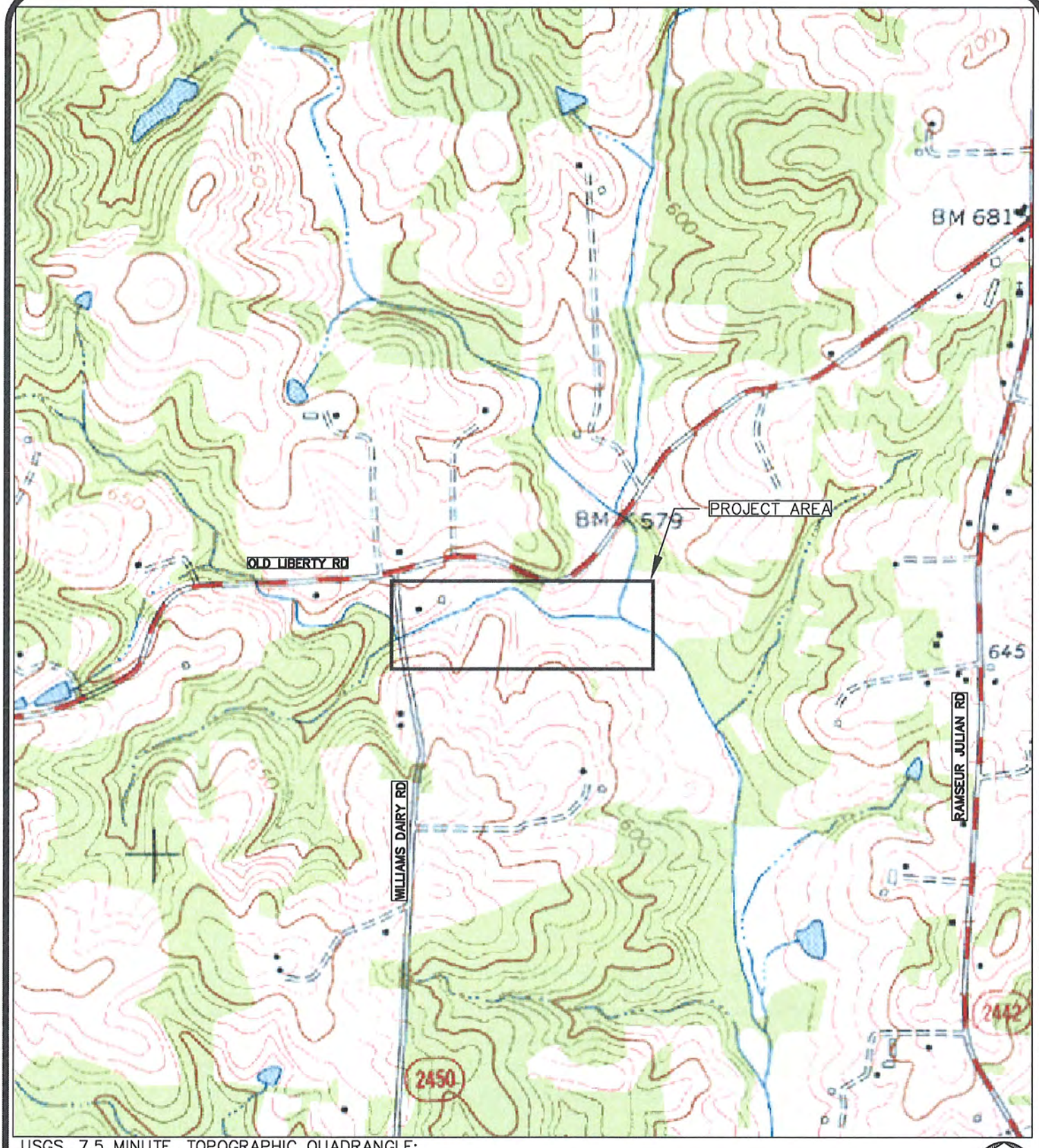
US Army Corps of Engineers (USACE), 2003. April 2003 Stream Mitigation Guidelines.

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;
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LON: 79.6601200° W

PROJECT NO.	EEP–08030
FILENAME:	EEP–08030
SCALE:	1" = 1,000
DATE:	04–29–11

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UT TO SANDY CREEK

VICINITY MAP

RANDOLPH COUNTY, NORTH CAROLINA

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UT TO SANDY CREEK

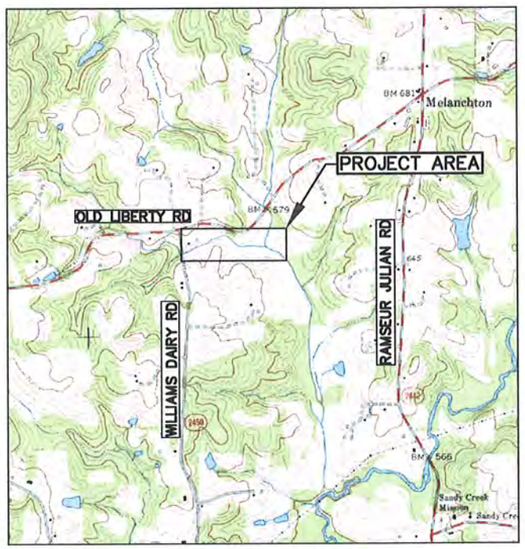
CONSOLIDATED CURRENT CONDITIONS PLAN VIEW - YEAR FOUR MONITORING

RANDOLPH COUNTY, NORTH CAROLINA
EEP PROJECT NUMBER: 403
DATE: APRIL 29, 2011

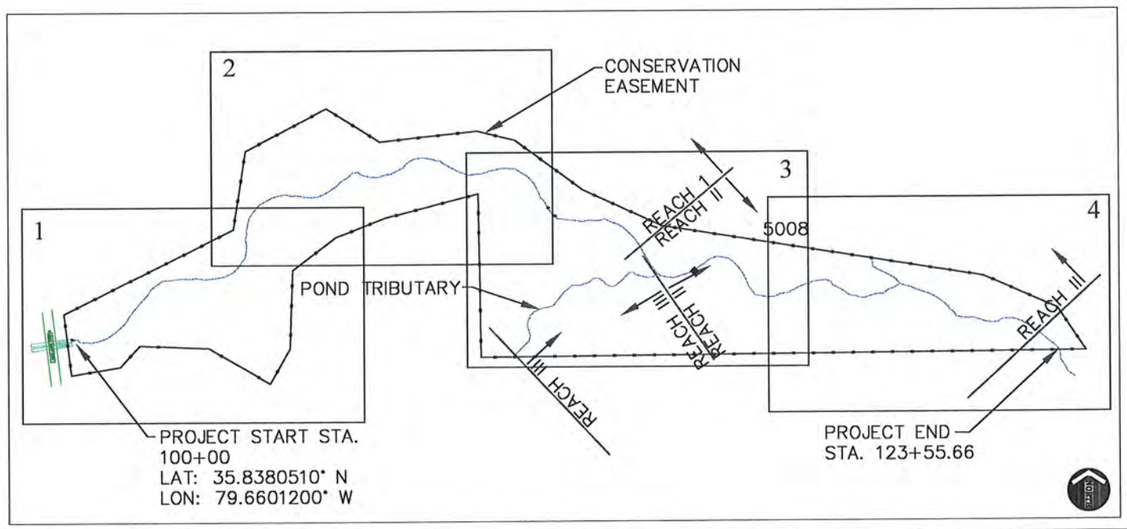
NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM
NC-EEP CONTACT: MELONIE ALLEN (919) 368-9352

SHEET INDEX

1 of 4 CONSOLIDATED PLAN VIEW (STA. 100+00 TO 105+00)
2 of 4 CONSOLIDATED PLAN VIEW (STA. 105+00 TO 111+00)
3 of 4 CONSOLIDATED PLAN VIEW (STA. 111+00 TO 118+00)
4 of 4 CONSOLIDATED PLAN VIEW (STA. 118+00 TO 123+55)



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	586.59	TRAV
4	760923.56	1804836.83	575.70	TRAV
5	760884.93	1805782.55	565.77	TRAV
6	760953.87	1804700.65	581.55	BM 1 IRS 1/2
7	760999.25	1805260.24	576.72	BM 2 IRS 1/2
8	760921.29	1805746.59	568.03	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	568.93	NAIL SET
505	760683.85	1806056.94	564.44	NAIL SET
5001	760889.52	1804485.13	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	1805682.60	567.61	X-SEC4LT
9900	760620.68	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	1805085.26	574.81	NLS
9904	760955.55	1805335.31	576.39	NLS
9905	760818.90	1805536.38	568.47	NLS
9906	760833.61	1805785.78	566.14	NLS
9907	760690.08	1805974.43	565.84	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	760763.20	1805305.43	571.09	NLS
9920	760758.60	1804752.58	577.37	NLS
9921	760829.03	1804839.28	587.57	NLS
9922	761030.59	1804706.32	585.90	NLS
9923	760955.40	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 - 04/19/11 TO 04/21/11.

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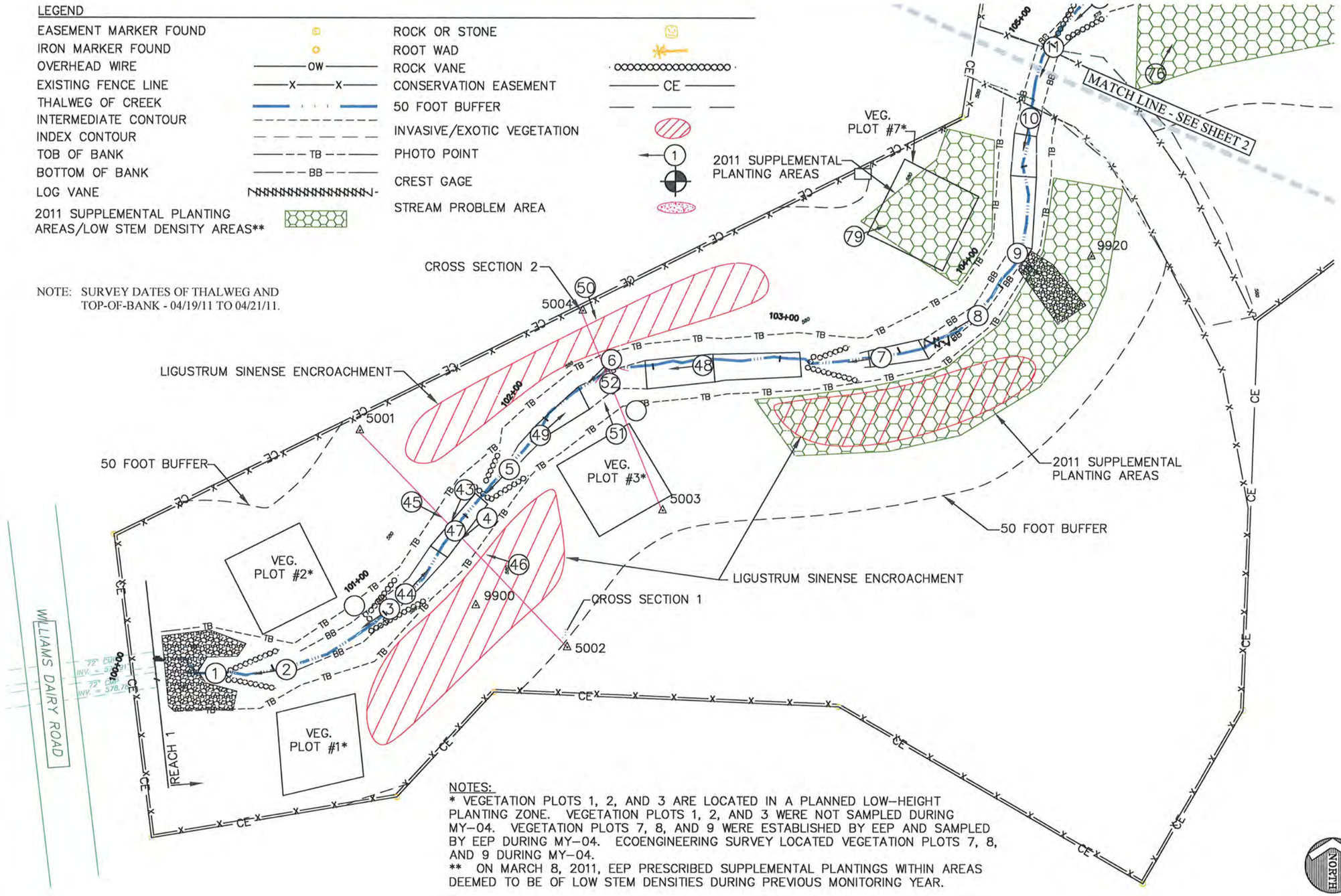
LEGEND

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			
2011 SUPPLEMENTAL PLANTING AREAS/LOW STEM DENSITY AREAS**			

NOTE: SURVEY DATES OF THALWEG AND TOP-OF-BANK - 04/19/11 TO 04/21/11.



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-04. 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.
** ON MARCH 8, 2011, 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.	FILENAME:	SCALE:	DATE:
EEP-08030	EEP-08030X	1" = 40'	04-29-11

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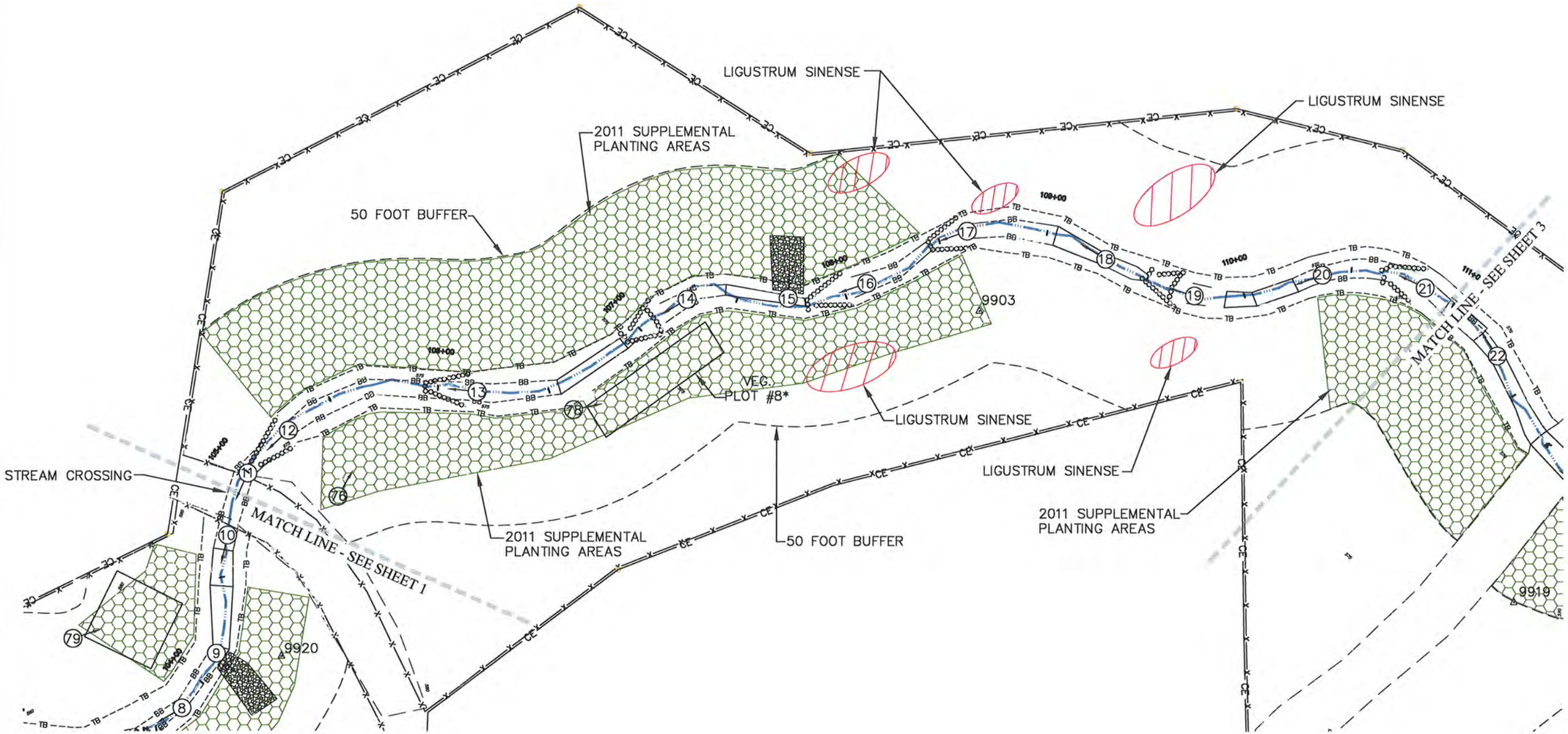

NORTH

GRAPHIC SCALE

50 0 25 50 100

1 inch = 50 ft.

SHEET 2 OF 4

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UT TO SANDY CREEK

CONSOLIDATED CURRENT CONDITIONS PLAN VIEW - YEAR FOUR MONITORING

RANDOLPH COUNTY, NORTH CAROLINA

PROJECT NO.	EEP-08030
FILENAME:	EEP-08030X
SCALE:	1" = 50'
DATE:	04-29-11

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STREAM CROSSING

2011 SUPPLEMENTAL PLANTING AREAS

2011 SUPPLEMENTAL PLANTING AREAS

2011 SUPPLEMENTAL PLANTING AREAS

MATCH LINE - SEE SHEET 2

50 FOOT BUFFER

CROSS SECTION 4

9906

LIGUSTRUM SINENSE ENCROACHMENT

VEG. PLOT #4

9919

REACH 1

REACH 2

STREAM GAUGE

5011

COMPROMISED DOUBLE STEP CROSS-VANE STRUCTURE

5008

CROSS SECTION 6

5007

CROSS SECTION 5

2011 SUPPLEMENTAL PLANTING AREAS

VEG. PLOT #6

5010

50 FOOT BUFFER

5006

5009

5005

CROSS SECTION 3

MATCH LINE - SEE SHEET 4

50 FOOT BUFFER

VEG. PLOT #5

COMPROMISED DOUBLE STEP CROSS-VANE STRUCTURE; LOOSE BOULDER

TYPHA LATIFOLIA ENCROACHMENT

2011 SUPPLEMENTAL PLANTING AREAS

TYPHA LATIFOLIA ENCROACHMENT

NORTH

GRAPHIC SCALE

50 0 25 50 100

1 inch = 50 ft.

SHEET 3 OF 4

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RANDOLPH COUNTY, NORTH CAROLINA

PROJECT NO.	EEP-08030
FILENAME:	EEP-08030X
SCALE:	1" = 50'
DATE:	04-29-11

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MATCH LINE - SEE SHEET 3

LIGUSTRUM SINENSE ENCROACHMENT

2011 SUPPLEMENTAL PLANTING AREAS

50 FOOT BUFFER

COMPROMISED DOUBLE STEP CROSS-VANE STRUCTURE

50 FOOT BUFFER

2011 SUPPLEMENTAL PLANTING AREAS

TYPHA LATIFOLIA ENCROACHMENT

LIGUSTRUM SINENSE ENCROACHMENT

LIGUSTRUM SINENSE ENCROACHMENT

REACH III

NORTH

GRAPHIC SCALE

40 0 20 40 80

1 inch = 40 ft.

SHEET 4 OF 4

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CONSOLIDATED CURRENT CONDITIONS PLAN VIEW - YEAR FOUR MONITORING

RANDOLPH COUNTY, NORTH CAROLINA

PROJECT NO.	EEP-08030
FILENAME:	EEP-08030X
SCALE:	1" = 50'
DATE:	04-29-11

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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

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 Jim Halley	919-287-4262
Vegetation Monitoring POC Jim Halley	919-287-4262
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			
Planted Excluding Live Stakes Summary			
Tract	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**	**Tract Mean**
UT to Sandy Creek	VP4	Y	100%
	VP5	Y	
	VP6	Y	
	VP7	Y	
	VP8	Y	
	VP9	Y	
Total Planted and Volunteer Stem Summary			
Tract	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**	**Tract Mean**
UT to Sandy Creek	VP4	Y	100%
	VP5	Y	
	VP6	Y	
	VP7	Y	
	VP8	Y	
	VP9	Y	

Table 6. Vegetation Metadata	
UT to Sandy Creek Restoration Project/EEP Project ID: 403	
Report Prepared By	George Buchholz
Date Prepared	5/16/2011 14:45 PM
database name	EcoEngineering-2010-C.mdb
database location	X:\Projects\EEP\EEP-08030 (UT to Sandy Creek)\Storm\CVS Vegetation Data\2011 Vegeation Data
computer name	BUCHHOLES
file size	49008640
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	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	16	0.47	4.61%
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 (MY4 2011)														
			403-allen-VP7			403-allen-VP8			403-allen-VP9			E403-01-VP4			E403-01-VP5		
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													1	1	3
Aronia arbutifolia	Red Chokeberry	Shrub				1	1	1									
Baccharis halimifolia	eastern baccharis	Shrub Tree															
Betula nigra	river birch	Tree	11	11	11	4	4	4									
Carpinus caroliniana	American hornbeam	Shrub Tree				1	1	1				2	2	2			
Carya	hickory	Tree						1	13	13	13						
Celtis laevigata	sugarberry	Shrub Tree															
Cornus	dogwood	Shrub Tree							1	1	1						
Cornus amomum	silky dogwood	Shrub										10	10	12			
Cornus florida	flowering dogwood	Shrub Tree				1	1	1									
Cornus sericea ssp. sericea	redosier dogwood		1	1	1												
Fraxinus pennsylvanica	green ash	Tree				5	5	5				6	6	8			1
Hamamelis virginiana	American witchhazel	Shrub Tree	1	1	1	4	4	9							5	5	5
Juglans nigra	black walnut	Tree															
Juniperus	juniper								1	1	1						
Lindera benzoin	northern spicebush	Shrub Tree															
Liquidambar	sweetgum							1									
Mimosa	sensitive plant	Vine Shrub															
Nyssa sylvatica	blackgum	Tree															
Pinus taeda	loblolly pine	Tree			1												
Prunus serotina	black cherry	Shrub Tree	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1
Quercus	oak	Shrub Tree				1	1	1									
Quercus nigra	water oak	Tree	1	1	1				1	1	1						
Quercus phellos	willow oak	Tree				1	1	1				1	1	1			
Rhus copallinum	flameleaf sumac	Shrub Tree															
Unknown		unknown			1												
Viburnum dentatum	southern arrowwood	Shrub Tree													1	1	1
		Stem count	15	15	18	19	19	26	17	17	17	20	20	24	8	8	11
		size (ares)	1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02		
		Species count	5	5	7	9	9	11	5	5	5	5	5	5	4	4	5
		Stems per ACRE	607.03	607.03	728.43	768.9	768.9	1052.2	687.97	687.97	687.97	809.37	809.37	971.25	323.75	323.75	445.15

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 for MY-04. Three new Vegetation Plots (7, 8, and 9) were added to the project for sampling during MY-04 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) For Vegetation Plots 4, 5, and 6, original baseline vegetation monitoring data was not provided prior to the 2008 Monitoring Year 1 and 2008 is considered a drought year. The 2009 Monitoring Year 2 is considered the baseline datum because after two years of monitoring it is assumed all planted stems within a vegetation monitoring plot have been surveyed and accounted for. Therefore, any additional species observed in proceeding monitoring years are considered volunteer species.

d) 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.

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

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

Color for Density of Planted Excluding Live Stakes	Color for Density of Total Planted and Volunteer Stems
Exceeds requirements by 10%	Exceeds requirements by 10%
Exceeds requirements, but by less than 10%	Fails to meet requirements, 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 (MY4 2011)			Annual Means											
			E403-01-VP6			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
Acer rubrum	red maple	Tree				1	1	3	1	1	3	1	1	3	1	1	1
Aronia arbutifolia	Red Chokeberry	Shrub				1	1	1									
Baccharis halimifolia	eastern baccharis	Shrub Tree												1			
Betula nigra	river birch	Tree	4	4	5	19	19	20	4	4	4	4	4	4	3	3	3
Carpinus caroliniana	American hornbeam	Shrub Tree				3	3	3									
Carya	hickory	Tree				13	13	14									
Celtis laevigata	sugarberry	Shrub Tree							2	2	2	2	2	2	2	2	2
Cornus	dogwood	Shrub Tree				1	1	1									
Cornus amomum	silky dogwood	Shrub				10	10	12	18	18	24	19	19	25	14	14	14
Cornus florida	flowering dogwood	Shrub Tree				1	1	1									
Cornus sericea ssp. sericea	redosier dogwood					1	1	1									
Fraxinus pennsylvanica	green ash	Tree				11	11	14	17	17	25	11	11	11	14	14	14
Hamamelis virginiana	American witchhazel	Shrub Tree				10	10	15	7	7	7	7	7	7	3	3	3
Juglans nigra	black walnut	Tree	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Juniperus	juniper					1	1	1									
Lindera benzoin	northern spicebush	Shrub Tree							1	1	1				1	1	1
Liquidambar	sweetgum							1									
Mimosa	sensitive plant	Vine Shrub												35			
Nyssa sylvatica	blackgum	Tree							1	1	1	1	1	1			
Pinus taeda	loblolly pine	Tree						1									
Prunus serotina	black cherry	Shrub Tree				5	5	6				1	1	1	1	1	1
Quercus	oak	Shrub Tree				1	1	1									
Quercus nigra	water oak	Tree				2	2	2									
Quercus phellos	willow oak	Tree				2	2	2	3	3	3	3	3	3	1	1	1
Rhus copallinum	flameleaf sumac	Shrub Tree									2			1			
Unknown		unknown						1									
Viburnum dentatum	southern arrowwood	Shrub Tree	4	4	4	5	5	5	10	10	10	9	9	9	7	7	7
		Stem count	9	9	10	88	88	106	65	65	83	59	59	104	48	48	48
		size (ares)	1			6			6			6			6		
		size (ACRES)	0.02			0.15			0.15			0.15			0.15		
		Species count	3	3	3	18	18	21	11	11	12	11	11	14	11	11	11
		Stems per ACRE	364.22	364.22	404.69	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 for MY-04. Three new Vegetation Plots (7, 8, and 9) were added to the project for sampling during MY-04 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) For Vegetation Plots 4, 5, and 6, original baseline vegetation monitoring data was not provided prior to the 2008 Monitoring Year 1 and 2008 is considered a drought year. The 2009 Monitoring Year 2 is considered the baseline datum because after two years of monitoring it is assumed all planted stems within a vegetation monitoring plot have been surveyed and accounted for. Therefore, any additional species observed in proceeding monitoring years are considered volunteer species.
d) 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.
e) PnoLS = Planted Excluding Live Stakes; P-all = All Planted Stems; T = Total Planted and Volunteer Stems.
f) Cells highlighted in VIOLET indicate the presence of volunteers.

Color for Density of Planted Excluding Live Stakes	Color for Density of Total Planted and Volunteer Stems
Exceeds requirements by 10%	Exceeds requirements by 10%
Exceeds requirements, but by less than 10%	Fails to meet requirements, 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
A. Riffles	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	
	5. Length appropriate?	NA	NA	NA	NA	**78**
B. Pools	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	
	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?	10	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?	9	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?	11	11	NA	100	
	2. Height appropriate?	11	11	NA	100	
	3. Angle and geometry appear appropriate?	11	11	NA	100	
	4. Free of piping or other structural failures?	8	11	NA	73	**93**
H. Wads/ Boulders	1. Free of scour?	NA	NA	NA	100	
	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

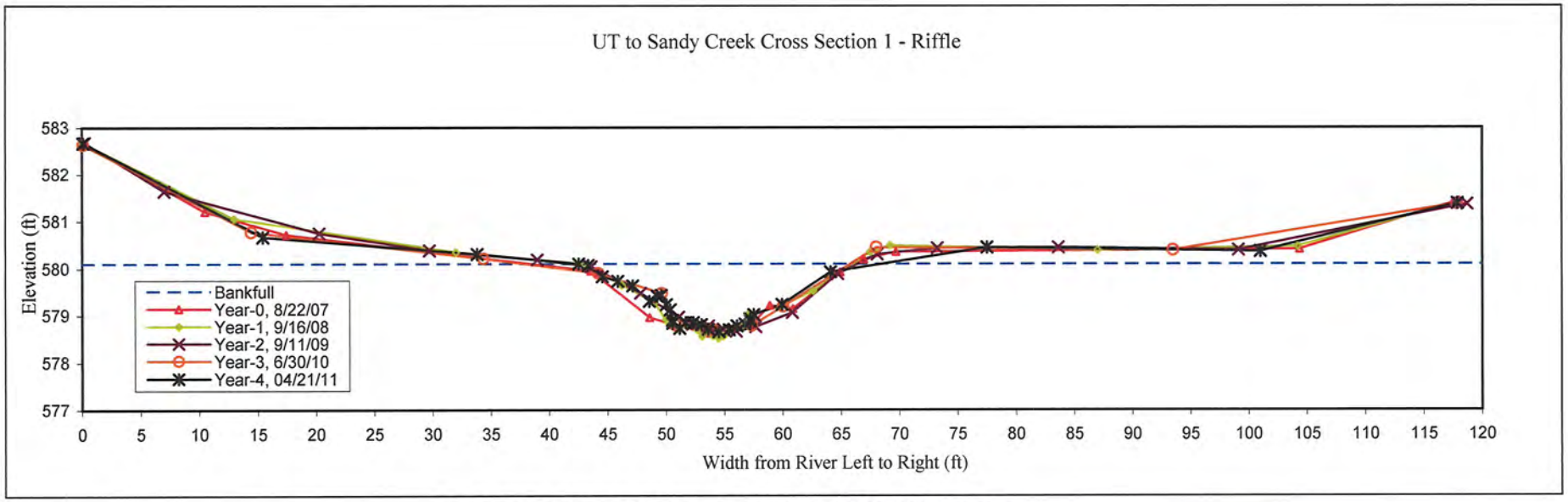
Feature Category	Metric (per As-built and reference baselines)	(# Stable) Number Performing as Intended	Total number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present ?	7	7	NA	100	
	2. Armor stable (e.g. n o displacement)?	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	
	5. Length appropriate?	NA	NA	NA	NA	**93**
B. Pools	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	
	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**
D. Meander	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	
	4. Sufficient floodplain access and relief?	8	8	NA	100	**100**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	1/200	48	
	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**
G. Vanes	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	
	4. Free of piping or other structural failures?	5	5	NA	100	**100**
H. Wads/ Boulders	1. Free of scour?	NA	NA	NA	100	
	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

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				
0.14	582.65	13.00	581.05	7.00	581.64	14.44	580.77	15.44	580.67				
10.49	581.20	32.00	580.35	20.26	580.75	34.37	580.21	33.8	580.31				
17.42	580.72	43.00	580.10	29.73	580.39	44.19	579.90	42.52	580.1				
43.54	579.95	46.20	579.65	38.96	580.19	49.63	579.47	43.33	580.07				
48.60	578.96	49.00	579.27	43.59	580.05	50.82	578.80	44.54	579.83				
50.60	578.81	50.00	578.91	47.81	579.48	54.04	578.70	45.88	579.73				
53.53	578.63	51.10	578.69	51.08	578.96	57.34	578.79	47.15	579.63				
55.21	578.71	52.00	578.80	52.25	578.82	60.02	579.19	48.57	579.3				
57.30	578.81	52.70	578.69	53.64	578.78	68.01	580.45	49.24	579.41				
58.88	579.22	53.10	578.56	54.89	578.71	93.49	580.39	49.59	579.43				
60.87	579.14	53.60	578.67	55.99	578.67	117.82	581.37	50.03	579.23				
64.91	579.93	54.00	578.57	57.68	578.76			50.35	579.12				
66.93	580.20	54.50	578.52	60.81	579.07			50.54	578.9				
69.69	580.36	54.90	578.56	64.69	579.89			50.57	578.84				
104.36	580.42	55.20	578.67	68.08	580.30			51.16	578.73				
118.02	581.43	55.80	578.75	73.26	580.43			51.67	578.85				
118.10	581.43	56.60	578.80	83.64	580.45			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-4, 2011 SURVEY DATA **CROSS-SECTION:** 1
PROJECT SANDY CREEK **FEATURE:** Riffle
TASK CROSS SECTION
REACH SANDY CREEK
DATE 04/19/2011 to 04/21/2011
CREW BUCHHOLZ/PARRISH/PICKENS

Summary Data
All dimensions in feet.

Bankfull X-sec area	17.80	sq. ft.
Bankfull Width	26.00	ft.
Bankfull Mean Depth	0.70	ft.
Bankfull Max Depth	1.40	ft.
Width/Depth Ratio	38.00	
Entrenchment Ratio	3.90	
Classification	C	
Bankfull Elevation:	580.10	ft.

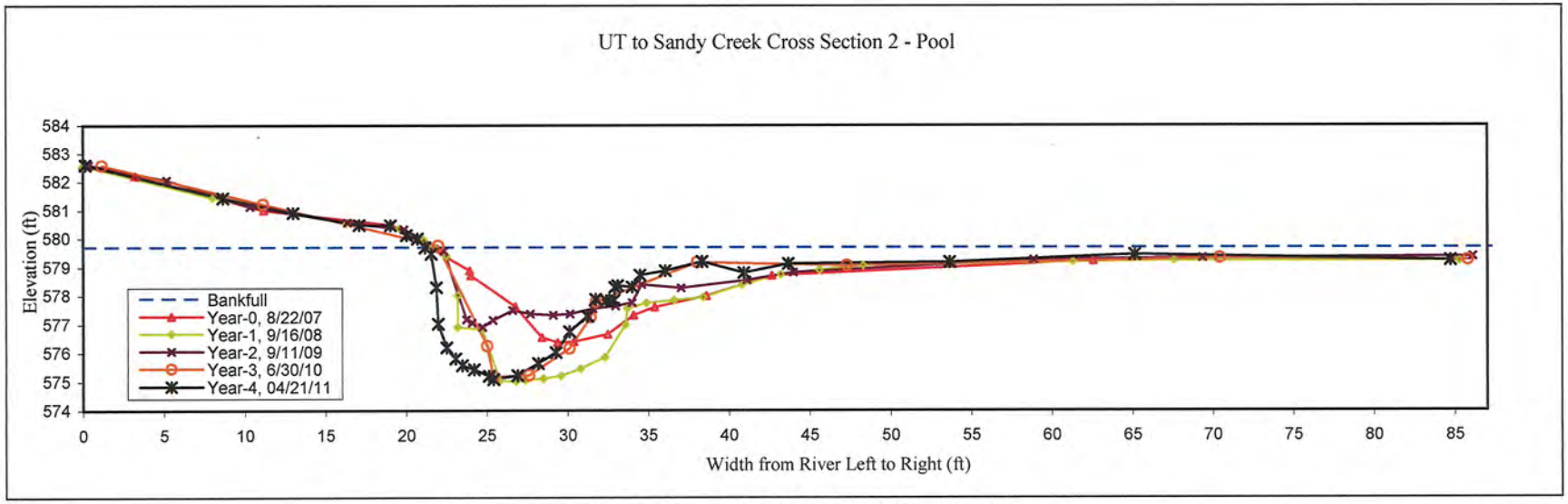
CROSS SECTION PHOTO - LOOKING DOWNSTREAM

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				
0.09	582.59	8.00	581.44	5.18	582.05	10.14	581.21	8.64	581.44				
3.22	582.21	16.30	580.54	10.34	581.13	21.00	579.74	12.99	580.91				
11.17	581.00	19.60	580.36	16.37	580.57	24.01	576.25	17.09	580.48				
19.11	580.47	21.10	579.95	19.88	580.32	24.39	575.17	19.03	580.47				
23.93	578.88	21.70	579.70	22.34	579.57	26.62	575.22	20.01	580.12				
24.00	578.71	22.50	579.40	23.74	577.17	29.11	576.15	20.69	580.00				
26.75	577.62	23.20	578.01	24.07	577.05	30.42	577.25	21.16	579.69				
28.41	576.54	23.20	576.90	24.73	576.90	30.77	577.78	21.55	579.48				
29.38	576.37	24.70	576.82	25.37	577.15	37.03	579.17	21.86	578.30				
30.39	576.40	25.80	575.04	26.60	577.48	46.30	579.06	21.98	577.03				
32.48	576.65	26.80	575.02	27.69	577.36	69.44	579.32	22.49	576.19				
34.08	577.32	27.40	575.06	29.11	577.33	84.81	579.25	23.05	575.81				
35.39	577.60	28.50	575.11	30.15	577.37			23.47	575.57				
38.60	577.99	29.60	575.20	31.58	577.55			24.21	575.43				
42.65	578.71	30.80	575.45	32.96	577.64			25.11	575.20				
62.56	579.23	32.30	575.85	33.99	577.75			25.40	575.09				
80.54	579.51	33.60	577.00	34.58	578.39			26.90	575.22				
84.82	579.31	33.70	577.56	37.02	578.27			28.18	575.64				
84.91	579.31	34.90	577.74	41.11	578.54			29.27	576.02				
		36.60	577.84	43.99	578.82			30.12	576.75				
		38.40	577.94	58.87	579.26			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-4, 2011 SURVEY DATA **CROSS-SECTION:** 2
PROJECT SANDY CREEK **FEATURE:** Pool
TASK CROSS SECTION
REACH SANDY CREEK
DATE 04/19/2011 to 04/21/2011
CREW BUCHHOLZ/PARRISH/PICKENS

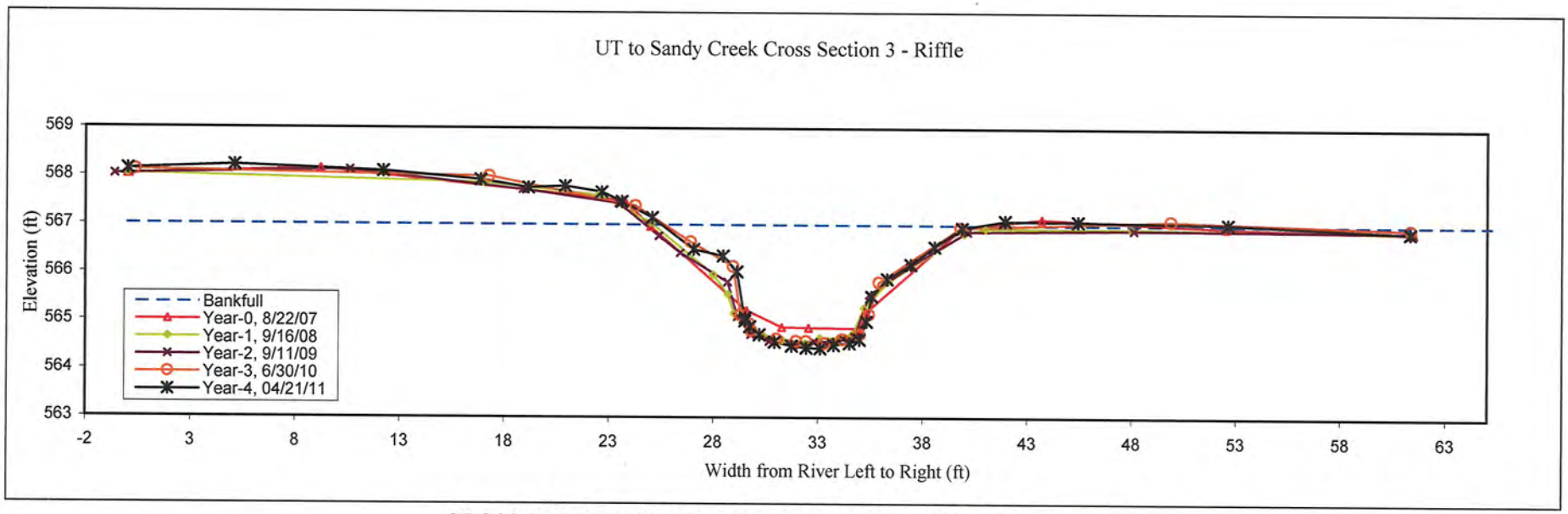
Summary Data
All dimensions in feet.

Bankfull X-sec area	64.6	sq. ft.
Bankfull Width	63.6	ft.
Bankfull Mean Depth	1.0	ft.
Bankfull Max Depth	4.6	ft.
Width/Depth Ratio	62.5	
Entrenchment Ratio	0.0	
Classification	n/a	
Bankfull Elevation:	579.69	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				
0.09	568.02	17.00	567.86	10.62	568.12	17.28	567.99	5.09	568.22				
9.21	568.14	22.50	567.60	18.89	567.71	24.28	567.38	12.2	568.1				
23.76	567.49	25.00	567.04	23.48	567.43	26.91	566.64	16.87	567.92				
25.00	566.95	28.00	565.96	25.40	566.76	28.95	566.13	19.15	567.76				
29.60	565.22	28.70	565.55	26.42	566.41	29.31	565.12	20.91	567.79				
31.28	564.86	29.00	565.15	28.69	565.81	29.73	564.94	22.66	567.67				
32.56	564.86	29.50	564.95	29.16	565.08	29.82	564.80	23.63	567.47				
35.05	564.85	30.40	564.70	29.81	564.72	31.04	564.63	25.08	567.14				
35.31	565.18	31.30	564.61	30.68	564.58	31.97	564.58	27.06	566.49				
39.92	566.95	32.40	564.54	31.84	564.51	32.45	564.58	28.47	566.35				
43.70	567.12	33.10	564.65	32.82	564.57	33.32	564.54	29.13	566.02				
52.54	566.95	34.00	564.65	33.59	564.58	34.18	564.62	29.52	565				
61.36	566.85	34.70	564.74	34.21	564.64	34.99	564.71	29.53	565.07				
61.50	566.85	35.20	565.27	34.76	564.68	35.44	565.14	29.75	564.88				
		36.40	565.83	35.46	565.55	35.92	565.81	30.21	564.72				
		40.00	566.82	37.39	566.14	39.81	566.94	30.93	564.57				
		41.00	566.93	40.15	566.86	49.89	567.09	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-4, 2011 SURVEY DATA
PROJECT SANDY CREEK
TASK CROSS SECTION
REACH SANDY CREEK
DATE 04/19/2011 to 04/21/2011
CREW BUCHHOLZ/PARRISH/PICKENS

CROSS-SECTION: 3
FEATURE: Riffle

Summary Data
All dimensions in feet.

Bankfull X-sec area	19.0	sq. ft.
Bankfull Width	14.2	ft.
Bankfull Mean Depth	1.3	ft.
Bankfull Max Depth	2.5	ft.
Width/Depth Ratio	10.6	
Entrenchment Ratio	7.0	
Classification	C	
Bankfull Elevation:	566.99	ft.

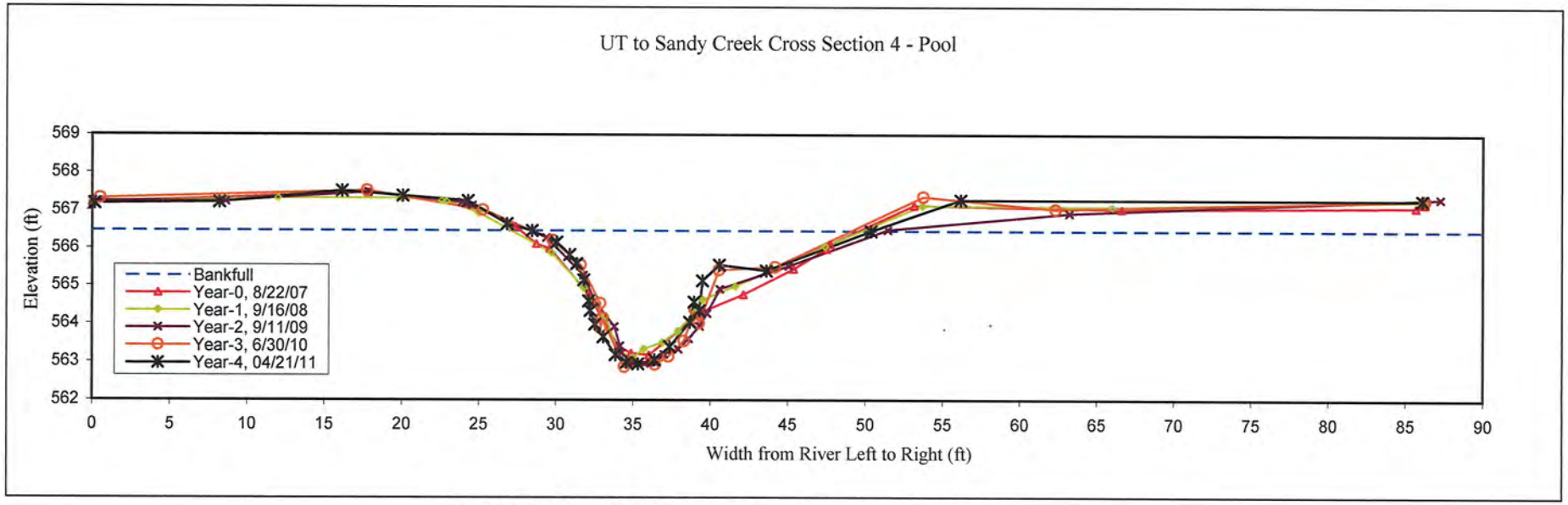
CROSS SECTION PHOTO - LOOKING DOWNSTREAM

Ecosystem Enhancement Program

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

UT to SANDY CREEK **EEP PROJECT # 403** CROSS-SECTION: 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				
0.07	567.19	12.00	567.31	8.62	567.22	17.27	567.51	8.2	567.21				
17.84	567.46	20.00	567.31	17.85	567.48	24.76	566.99	16.15	567.51				
24.27	567.17	22.60	567.24	23.91	567.20	29.31	566.19	20.07	567.38				
27.39	566.55	22.90	567.22	24.58	567.12	31.10	565.54	24.3	567.24				
28.73	566.10	25.00	566.91	29.38	566.26	32.37	564.53	26.83	566.63				
29.60	565.97	29.70	565.87	31.79	565.27	32.40	563.89	28.45	566.45				
32.11	564.78	31.80	564.94	32.50	564.59	32.51	564.14	30.05	566.15				
34.04	563.41	32.30	564.61	33.79	563.92	33.93	562.86	30.9	565.82				
34.88	563.22	33.20	564.19	34.15	563.41	35.92	562.92	31.35	565.58				
36.03	563.17	34.00	563.29	34.24	563.23	36.79	563.14	31.81	565.15				
39.56	564.32	35.00	563.10	35.00	562.96	37.79	563.54	32.12	564.59				
42.14	564.77	35.70	563.33	35.73	562.95	38.49	564.38	32.23	564.34				
45.37	565.44	36.90	563.50	36.43	562.97	38.75	564.01	32.52	563.98				
47.50	565.97	37.90	563.80	37.00	563.19	40.05	565.41	33.07	563.65				
47.74	566.10	39.00	564.30	37.93	563.33	43.69	565.49	33.86	563.18				
53.16	567.13	39.50	564.63	38.59	563.60	53.25	567.36	34.55	562.98				
66.62	567.03	41.60	564.98	39.29	563.93	61.84	567.03	35.31	562.94				
85.71	567.08	47.40	566.05	39.78	564.27	85.78	567.27	36.39	563.05				
86.21	567.18	53.70	567.12	40.61	564.91			37.36	563.39				
86.29	567.18	66.00	567.09	45.05	565.52			38.67	564.04				
		86.30	567.25	51.46	566.48			38.95	564.57				
				63.23	566.92			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-4, 2011 SURVEY DATA
PROJECT SANDY CREEK
TASK CROSS SECTION
REACH SANDY CREEK
DATE 04/19/2011 to 04/21/2011
CREW BUCHHOLZ/PARRISH/PICKENS

CROSS-SECTION: 4
FEATURE: Pool

Summary Data
All dimensions in feet.

Bankfull X-sec area	31.4	sq. ft.
Bankfull Width	21.9	ft.
Bankfull Mean Depth	1.4	ft.
Bankfull Max Depth	3.5	ft.
Width/Depth Ratio	15.3	ft.
Entrenchment Ratio	0.0	ft.
Classification	n/a	
Bankfull Elevation:	566.45	ft.

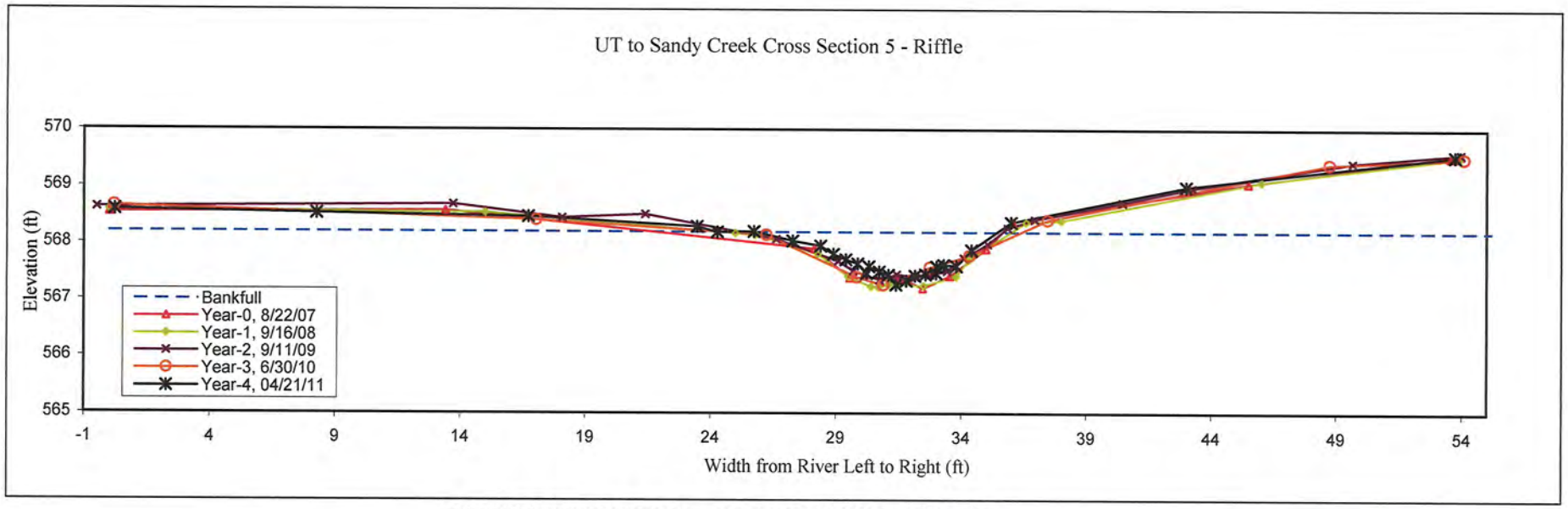
CROSS SECTION PHOTO - LOOKING DOWNSTREAM

Ecosystem Enhancement Program

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

UT to SANDY CREEK **EEP PROJECT # 403** CROSS-SECTION: 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				
0.09	568.53	15.00	568.53	13.72	568.67	17.05	568.40	8.26	568.52				
13.42	568.56	25.00	568.17	18.08	568.44	26.23	568.14	16.73	568.46				
28.15	567.90	25.80	568.14	21.40	568.50	29.84	567.40	23.46	568.29				
29.56	567.39	28.30	567.81	26.64	568.07	30.89	567.26	24.28	568.19				
31.60	567.39	29.50	567.41	29.10	567.68	32.76	567.57	25.74	568.2				
32.47	567.20	30.40	567.23	29.70	567.51	34.34	567.78	27.28	568.04				
33.55	567.42	30.70	567.22	30.75	567.35	37.47	568.41	28.39	567.95				
35.00	567.90	31.10	567.27	31.43	567.45	48.74	569.39	28.9	567.81				
36.06	568.37	32.50	567.25	32.17	567.40	54.10	569.50	29.4	567.71				
45.50	569.05	33.80	567.41	32.75	567.44			29.88	567.64				
53.56	569.52	34.30	567.70	33.44	567.51			30.22	567.47				
53.69	569.52	36.60	568.37	34.12	567.74			30.32	567.59				
		38.00	568.40	35.07	567.99			30.73	567.5				
		46.00	569.08	35.86	568.27			31.1	567.44				
		53.90	569.51	36.94	568.42			31.4	567.27				
				40.46	568.72			31.81	567.34				
				43.26	568.97			32.16	567.43				
				49.66	569.42			32.58	567.45				
				53.98	569.58			33	567.47				
								33.02	567.59				
								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-4, 2011 SURVEY DATA **CROSS-SECTION:** 5
PROJECT SANDY CREEK **FEATURE:** Riffle
TASK CROSS SECTION
REACH SANDY CREEK
DATE 04/19/2011 to 04/21/2011
CREW BUCHHOLZ/PARRISH/PICKENS

Summary Data
All dimensions in feet.

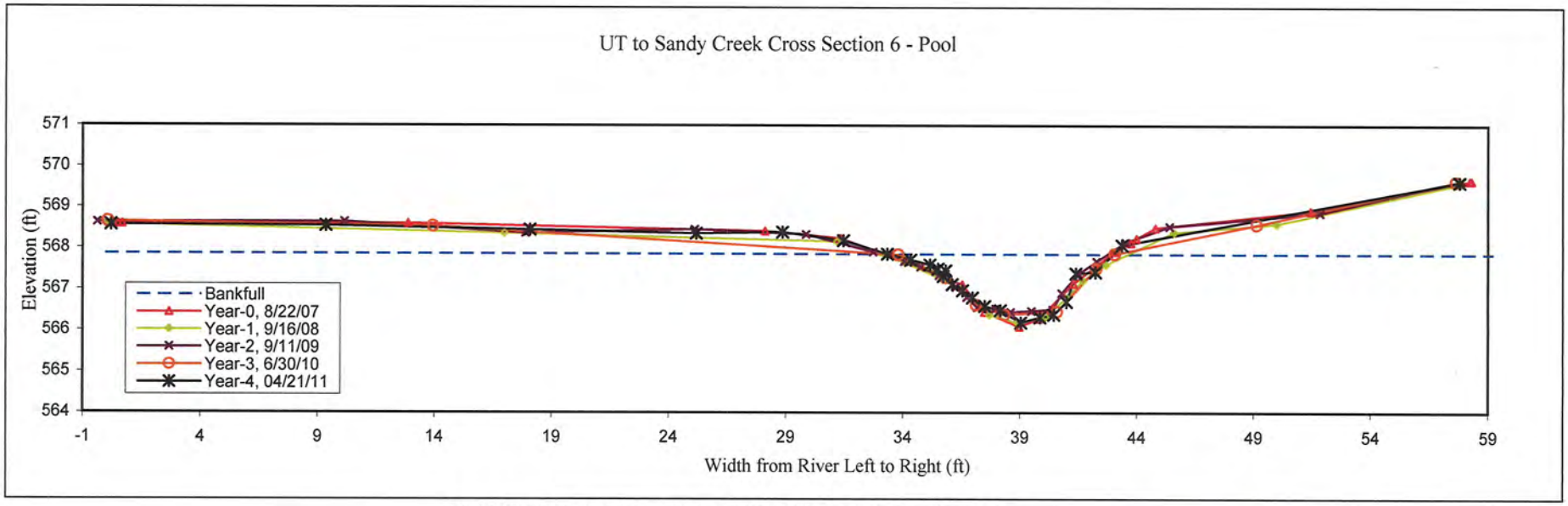
Bankfull X-sec area	4.2	sq. ft.
Bankfull Width	9.6	ft.
Bankfull Mean Depth	0.4	ft.
Bankfull Max Depth	0.9	ft.
Width/Depth Ratio	22.0	ft.
Entrenchment Ratio	10.4	ft.
Classification	C	
Bankfull Elevation:	568.19	ft.

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:	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

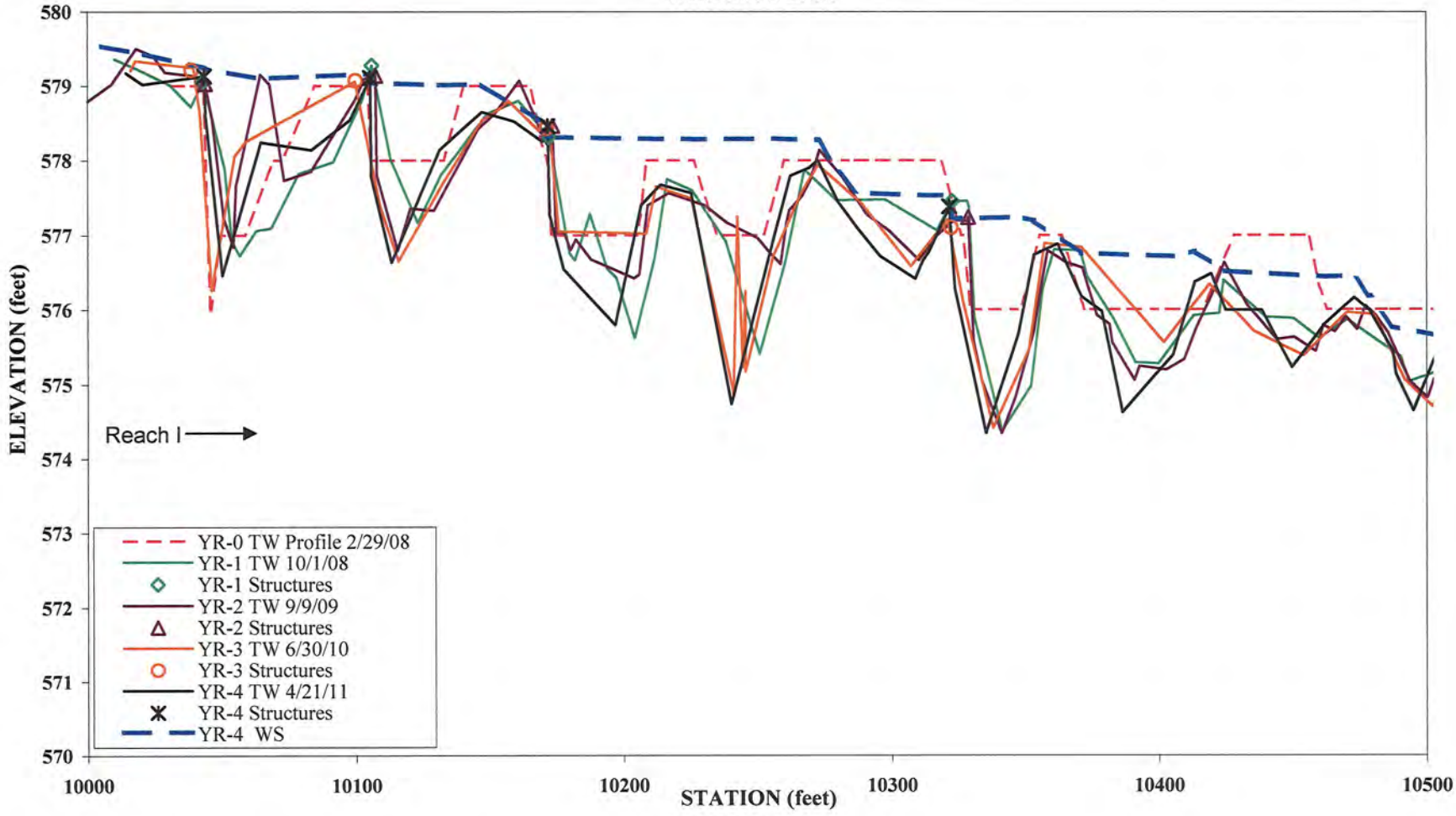
YEAR-4, 2011 SURVEY DATA **CROSS-SECTION:** 6
PROJECT SANDY CREEK **FEATURE:** Pool
TASK CROSS SECTION
REACH SANDY CREEK
DATE 04/19/2011 to 04/21/2011
CREW BUCHHOLZ/PARRISH/PICKENS

Summary Data
All dimensions in feet.

Bankfull X-sec area	8.0	sq. ft.
Bankfull Width	9.6	ft.
Bankfull Mean Depth	0.8	ft.
Bankfull Max Depth	1.7	ft.
Width/Depth Ratio	11.7	
Entrenchment Ratio	0.0	
Classification	n/a	
Bankfull Elevation:	567.85	ft.

CROSS SECTION PHOTO - LOOKING DOWNSTREAM

UT to Sandy Creek
Longitudinal Profile
2011 (Year-4) Monitoring
Reaches I & II



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally. Elevation data was not changed.

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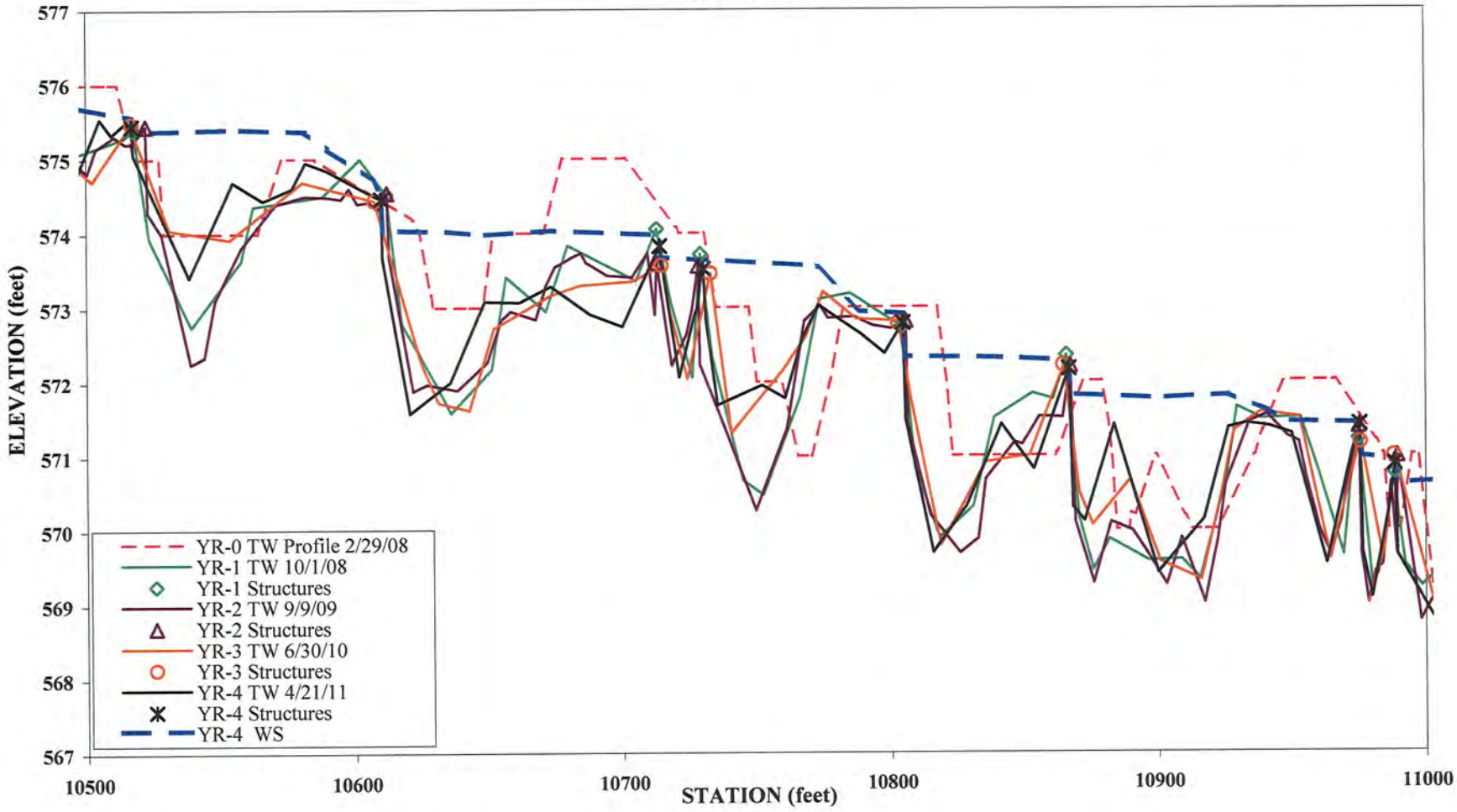
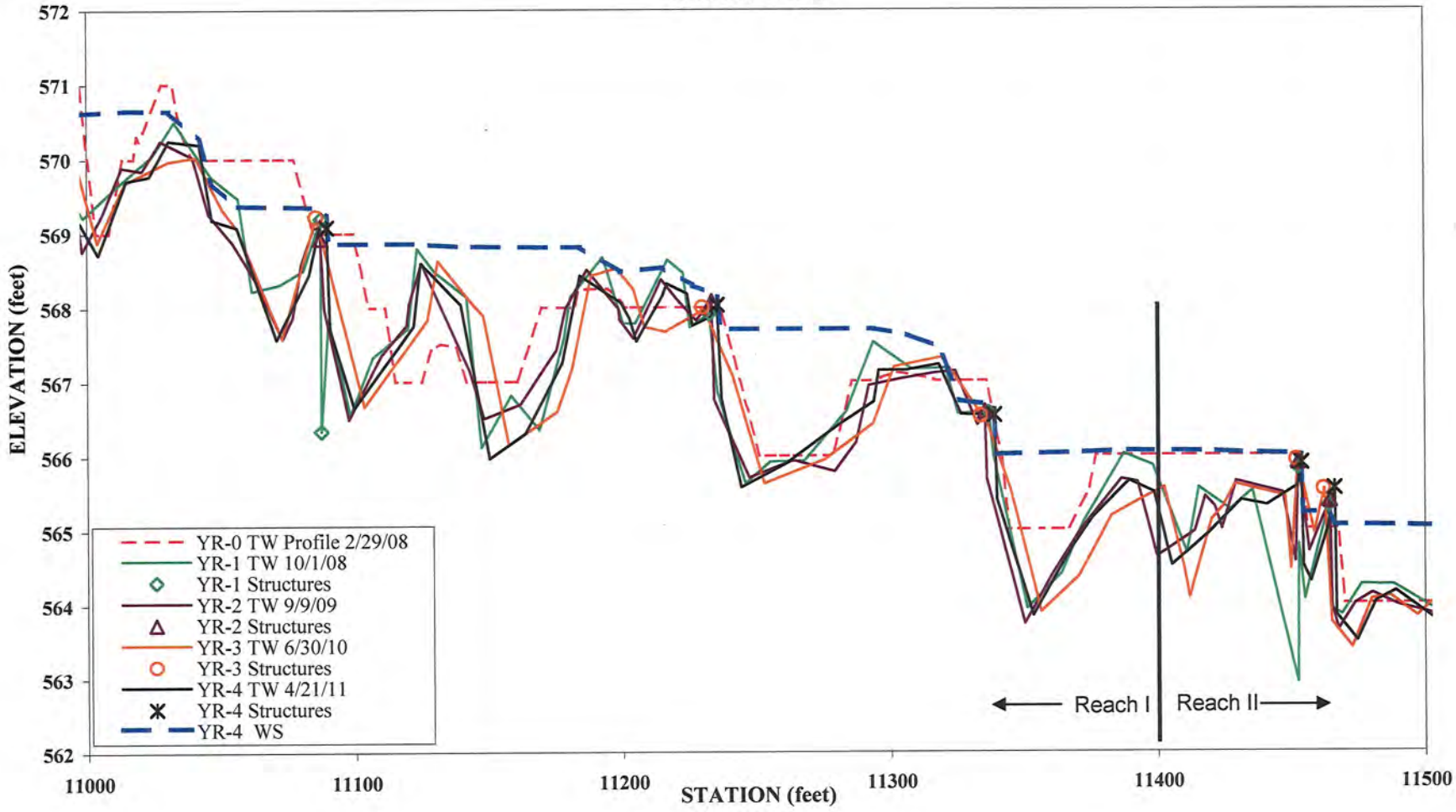
UT to Sandy Creek
Longitudinal Profile
2011 (Year-4) Monitoring
Reaches I & II



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally. Elevation data was not changed.

UT to Sandy Creek
Longitudinal Profile
2011 (Year-4) Monitoring
Reaches I & II



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally. Elevation data was not changed.

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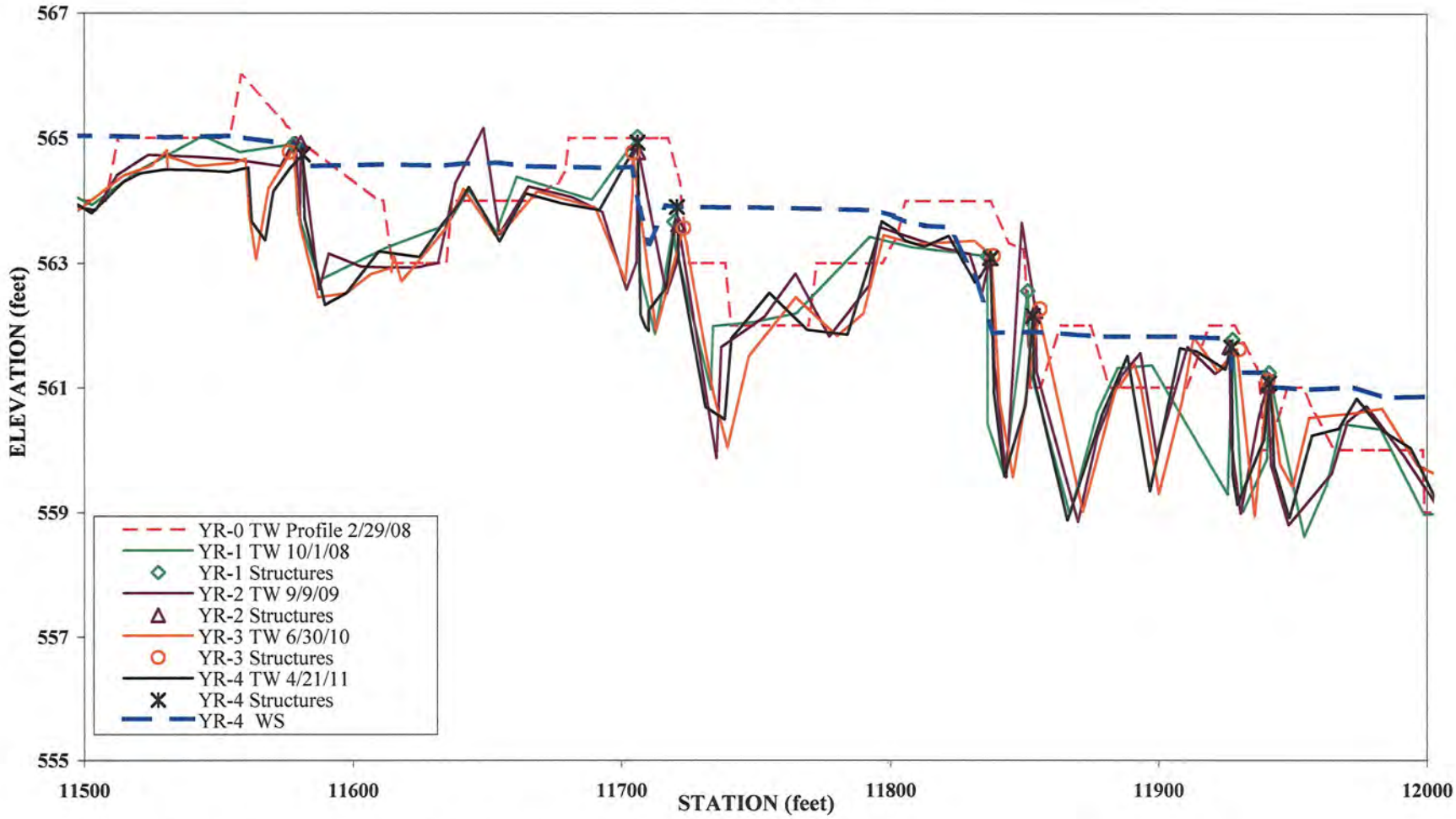
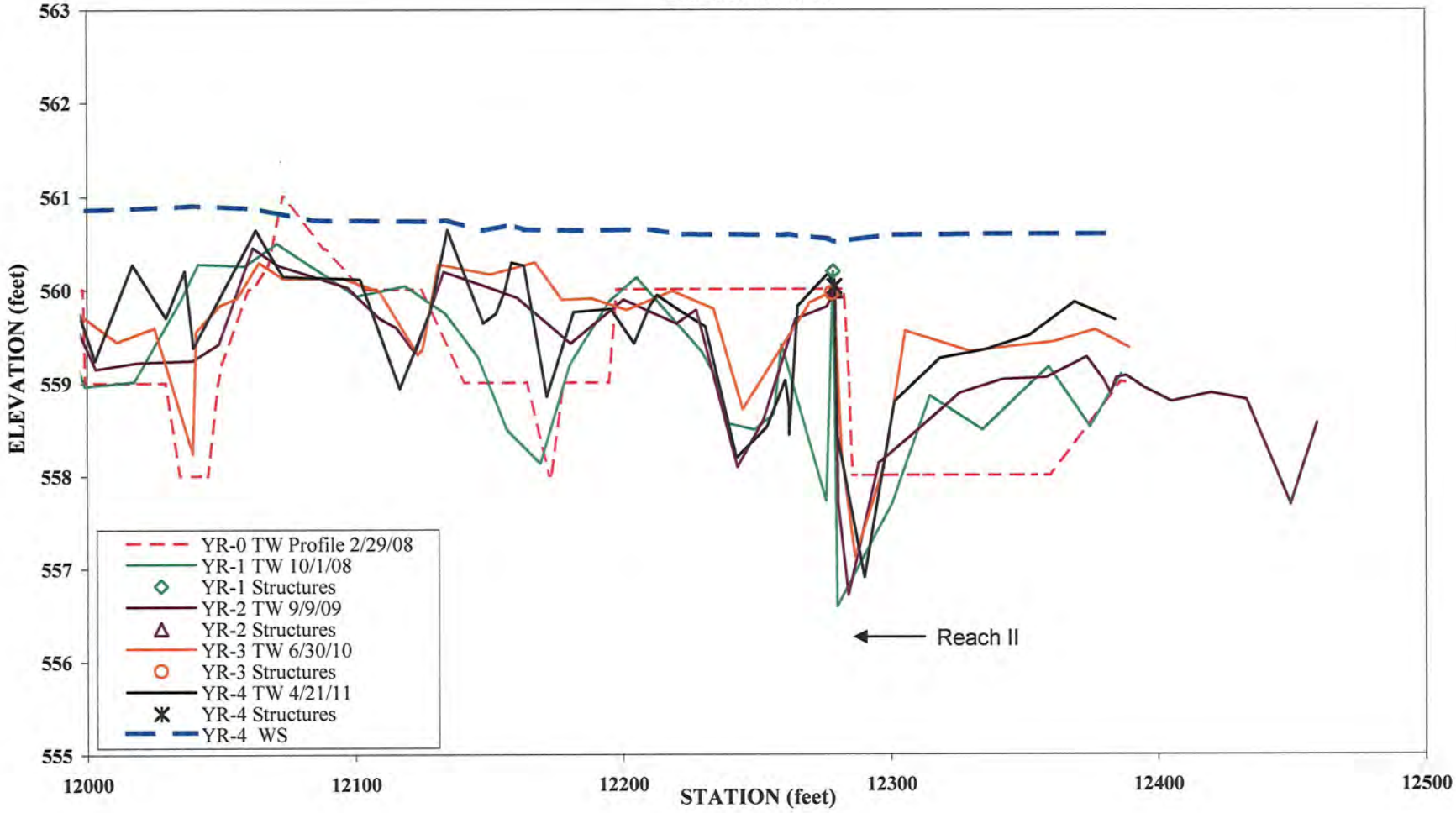
UT to Sandy Creek
Longitudinal Profile
2011 (Year-4) Monitoring
Reaches I & II



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally. Elevation data was not changed.

UT to Sandy Creek
Longitudinal Profile
2011 (Year-4) Monitoring
Reaches I & II



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally. Elevation data was not changed.

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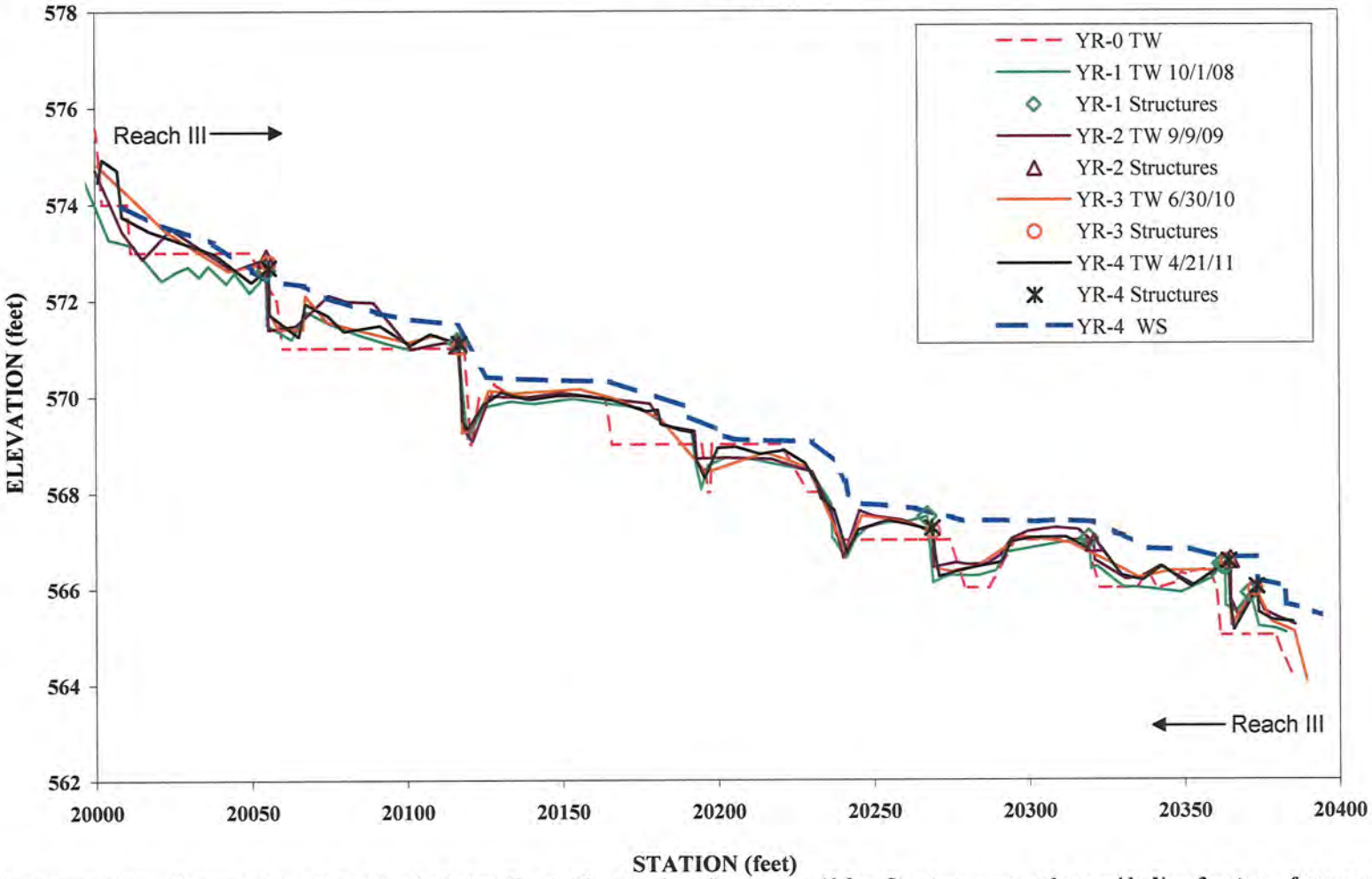
UT to Sandy Creek - Tributary
Longitudinal Profile
2011 (Year-4) Monitoring
Reach III



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally on average 10 feet. **Structures were used as a guide. Year-3 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.**

4-YEAR, 2011 SURVEY DATA

PROJECT NAME UT TO SANDY CREEK

TASK LONGITUDINAL PROFILE

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

REACHES UT to Sandy Creek and Minor Tributary

DATE 04/19/2011 to 04/21/2011

CREW BUCHHOLZ/PARRISH

UT to Sandy Creek Reach I

Overall water surface slope =	1.0%		**DESIGN**		**AVG.**
			Riffle		0.4%
WS sta. start =	10005.27 ft		Run		---
WS sta. end =	11405.34 ft		p-p spacing		62
ELEV. Start =	579.53 ft msl				
ELEV. End =	566.03 ft msl				
		Results			
	n =	MIN.	MEDIAN.	AVG.	MAX.
Riffle slopes measured =	16	0.34%	2.90%	4.41%	22.27%
Run slopes measured =	14	0.08%	8.20%	9.16%	28.70%
Pools measured =	23	14	56	59	109

UT to Sandy Creek Reach II

Overall water surface slope =	1%		**DESIGN**		**AVG.**
			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 =	8	0.65%	2.20%	3.06%	7.52%
Run slopes measured =	9	0.11%	6.09%	8.31%	20.53%
Pools measured =	14	17	48	63	168

UT to Sandy Creek Reach III

Overall water surface slope =	2%		**DESIGN**		**AVG.**
			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	136	23	1.76%	n =	16
RIFFLE	261	15	6.14%	MIN =	0.34%
RIFFLE	303	7	7.76%	MEDIAN =	2.90%
RIFFLE	342	18	3.15%	AVG. =	4.41%
RIFFLE	403	11	3.32%	MAX =	22.27%
RIFFLE	462	14	4.98%		
RIFFLE	571	20	2.18%		
RIFFLE	706	2	22.27%		

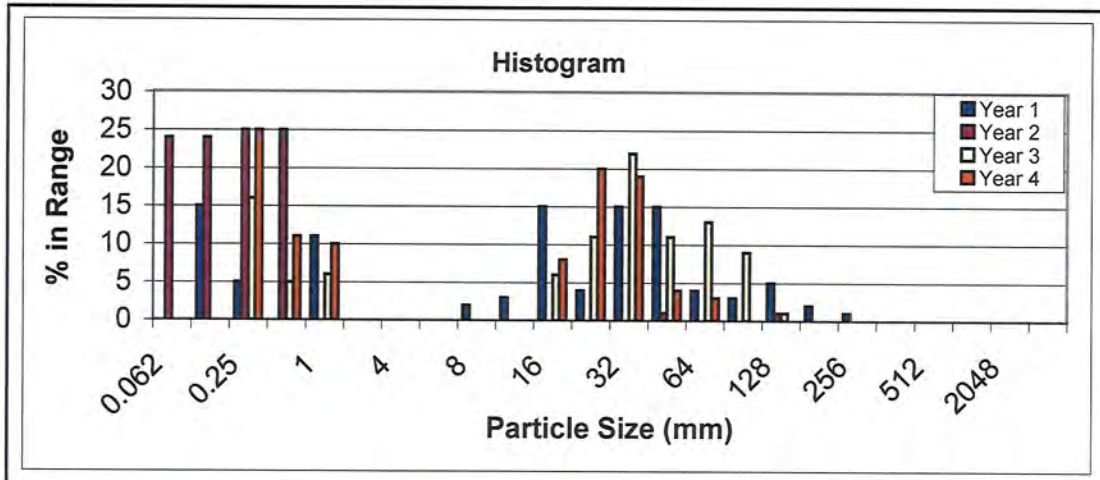
RIFFLE	751	16	2.45%		
RIFFLE	904	24	0.34%		
RIFFLE	1005	25	4.62%		
RIFFLE	1099	15	3.68%		
RIFFLE	1158	15	2.35%		
RIFFLE	1191	17	2.65%		
RIFFLE	1270	31	1.92%		
RIFFLE	1405	21	0.91%		
Feature	**Station**	**Length**	**Slope**		
		UT to Sandy Creek II			
RIFFLE	1759	37	1.56%	n =	8
RIFFLE	1873	17	2.02%	MIN =	0.65%
RIFFLE	1939	10	5.32%	MEDIAN =	2.20%
RIFFLE	2028	21	2.38%	AVG. =	3.06%
RIFFLE	2100	13	7.52%	MAX =	7.52%
RIFFLE	2124	5	0.65%		
RIFFLE	2178	7	2.02%		
RIFFLE	2230	12	3.04%		
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	159	2	11.29%	n =	14
RUN	276	8	4.51%	MIN =	0.08%
RUN	310	1	9.86%	MEDIAN =	8.20%
RUN	360	8	2.62%	AVG. =	9.16%
RUN	414	25	3.11%	MAX =	28.70%
RUN	476	1	28.70%		
RUN	591	3	1.60%		
RUN	767	16	0.88%		
RUN	928	9	19.36%		
RUN	1030	15	10.24%		
RUN	1114	11	19.60%		
RUN	1174	6	9.03%		
RUN	1207	2	7.37%		
RUN	1300	13	0.08%		
Feature	**Station**	**Length**	**Slope**		
		UT to Sandy Creek II			
RUN	1426	2	20.53%	n =	9
RUN	1797	6	6.62%	MIN =	0.11%
RUN	1890	2	15.15%	MEDIAN =	6.09%
RUN	1949	19	5.52%	AVG. =	8.31%
RUN	2049	18	0.11%	MAX =	20.53%
RUN	2113	5	2.10%		
RUN	2128	8	16.83%		
RUN	2185	10	1.81%		
RUN	2242	2	6.09%		

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	39	21		n =	23	
POOL	102	25	63	MIN =	14	(p-p spacing)
POOL	186	34	83	MEDIAN =	56	
POOL	229	43	43	AVG. =	59	
POOL	285	24	56	MAX =	109	
POOL	324	24	40			
POOL	375	34	51			
POOL	439	37	63			
POOL	484	27	45			
POOL	527	37	43			
POOL	604	38	77			
POOL	699	12	95			
POOL	713	36	14			
POOL	794	36	80			
POOL	850	32	57			
POOL	937	18	87			
POOL	954	10	17			
POOL	978	25	24			
POOL	1045	27	66			
POOL	1074	31	29			
POOL	1124	38	51			
POOL	1218	57	94			
POOL	1327	28	109			

Feature	Station	Length	p-p spacing			
		UT to Sandy Creek II				
POOL	1431	9		n =	14	
POOL	1449	22	17	MIN =	17	(p-p spacing)
POOL	1564	51	115	MEDIAN =	48	
POOL	1674	10	110	AVG. =	63	
POOL	1696	34	22	MAX =	168	
POOL	1807	12	111			
POOL	1831	25	24			
POOL	1894	12	63			
POOL	1914	15	19			
POOL	2082	44	168			
POOL	2118	8	36			
POOL	2137	32	19			
POOL	2207	40	71			
POOL	2255	21	48			

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			



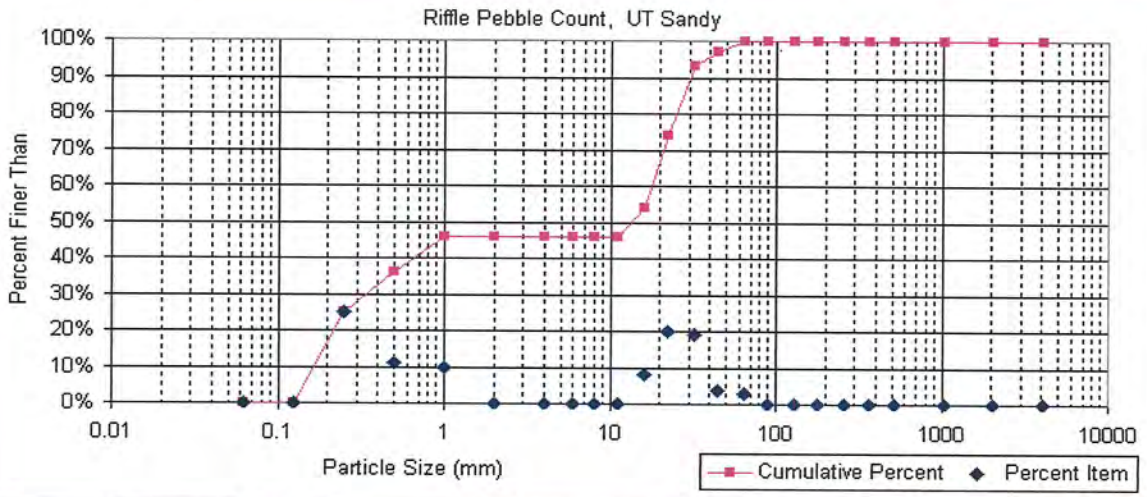
EEP PROJECT ID: 403
CROSS-SECTION: 1 **FEATURE:** RIFFLE

Ecosystem Enhancement PROGRAM

PROJECT UT to SANDY CREEK
TASK PEBBLE COUNT
REACH UT to SANDY CREEK
DATE 04/19/2011 to 04/21/2011
CREW BUCHHOLZ/PARRISH

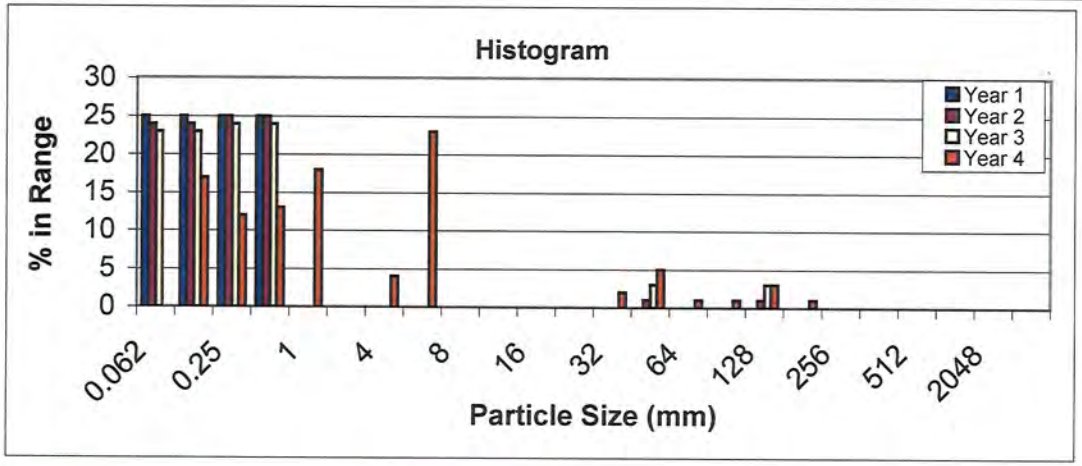
Material	Size Range (mm)		Count
silt/clay	0	0.062	
very fine sand	0.062	0.13	
fine sand	0.13	0.25	25
medium sand	0.25	0.5	11
coarse sand	0.5	1	10
very coarse sand	1	2	
very fine gravel	2	4	
fine gravel	4	6	
fine gravel	6	8	
medium gravel	8	11	
medium gravel	11	16	8
coarse gravel	16	22	20
coarse gravel	22	32	19
very coarse gravel	32	45	4
very coarse gravel	45	64	3
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
0.195	0.47	13.3	27	38

Percent by substrate type					
silt/clay	sand	gravel	cobble	boulder	bedrock
0%	46%	54%	0%	0%	0%



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

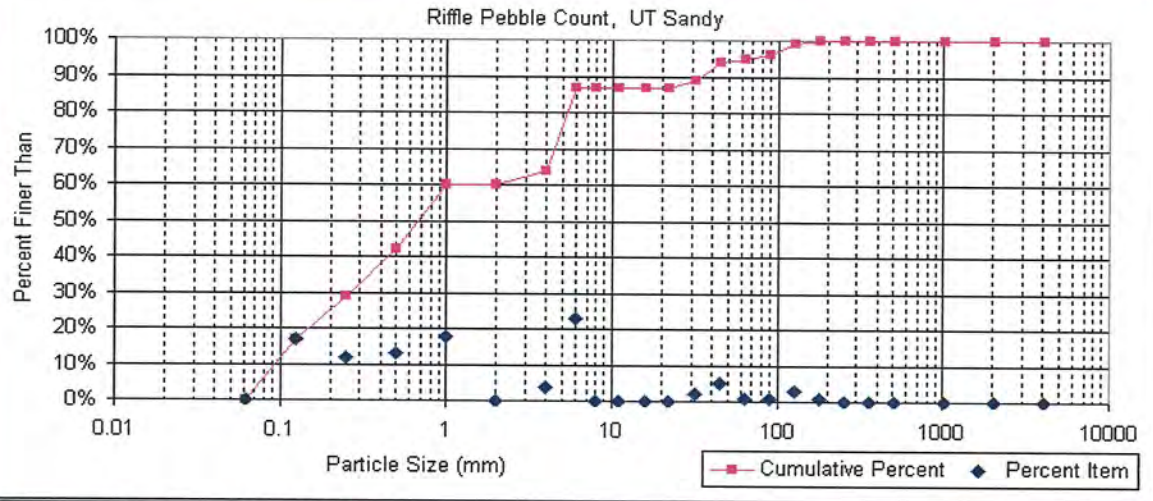
Ecosystem Enhancement PROGRAM

PROJECT UT to SANDY CREEK
TASK PEBBLE COUNT
REACH UT to SANDY CREEK
DATE 04/19/2011 to 04/21/2011
CREW BUCHHOLZ/PARRISH

Material	Size Range (mm)		Count
silt/clay	0	0.062	
very fine sand	0.062	0.13	17
fine sand	0.13	0.25	12
medium sand	0.25	0.5	13
coarse sand	0.5	1	18
very coarse sand	1	2	
very fine gravel	2	4	4
fine gravel	4	6	23
fine gravel	6	8	
medium gravel	8	11	
medium gravel	11	16	
coarse gravel	16	22	
coarse gravel	22	32	2
very coarse gravel	32	45	5
very coarse gravel	45	64	1
small cobble	64	90	1
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

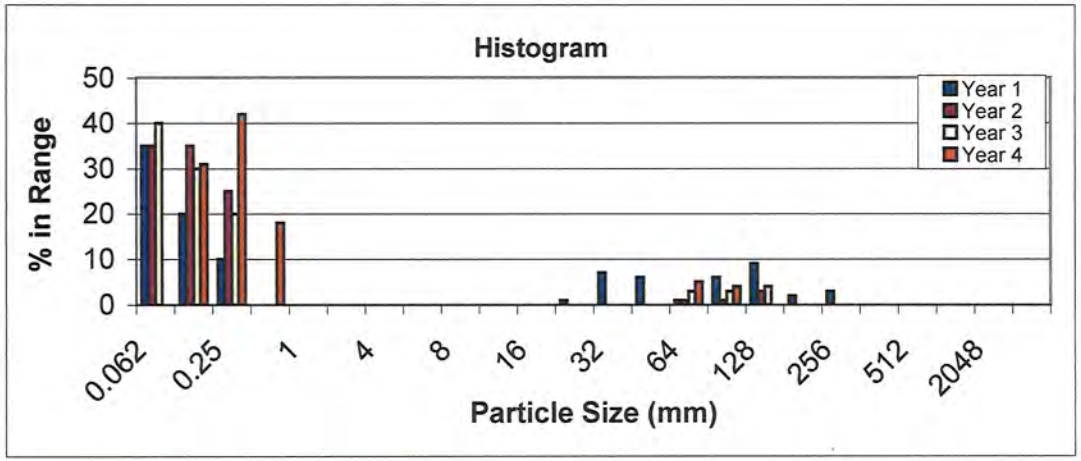
	UT Sandy

Note:	



Size percent less than (mm)				
D16	D35	D50	D84	D95
0.120	0.34	0.7	6	64

Percent by substrate type					
silt/clay	sand	gravel	cobble	boulder	bedrock
0%	60%	35%	5%	0%	0%



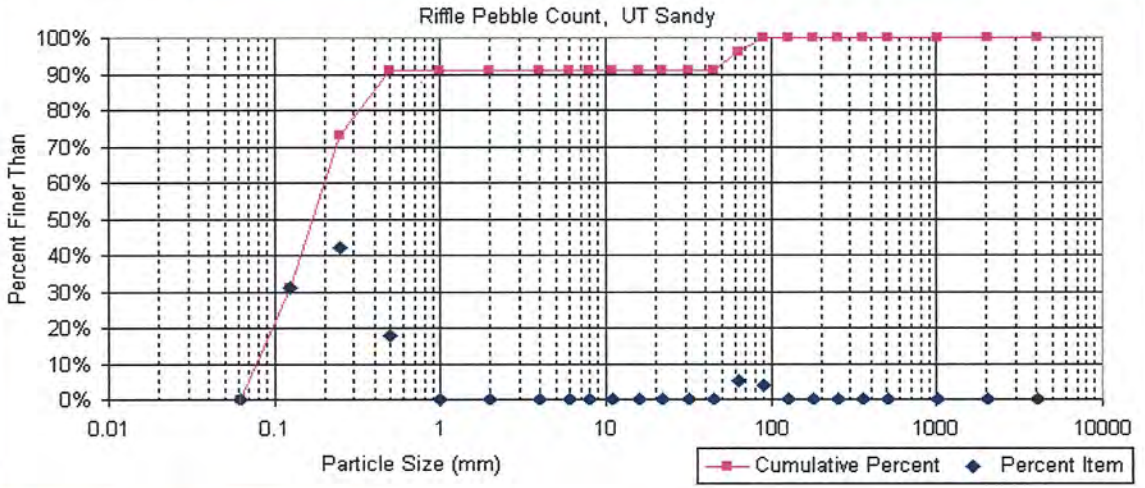
EEP PROJECT ID: 403
CROSS-SECTION: 5 **FEATURE: RIFFLE**

Ecosystem Enhancement PROGRAM

PROJECT UT to SANDY CREEK
TASK PEBBLE COUNT
REACH UT to SANDY CREEK
DATE 04/19/2011 to 04/21/2011
CREW BUCHHOLZ/PARRISH

Material	Size Range (mm)		Count
silt/clay	0	0.062	
very fine sand	0.062	0.13	31
fine sand	0.13	0.25	42
medium sand	0.25	0.5	18
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	
very coarse gravel	32	45	
very coarse gravel	45	64	5
small cobble	64	90	4
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
0.089	0.13	0.2	0	60

Percent by substrate type					
silt/clay	sand	gravel	cobble	boulder	bedrock
0%	91%	5%	4%	0%	0%

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.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	04-26-11

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Ecosystem Enhancement Program

UT to SANDY CREEK RESTORATION

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

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

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	04-26-11

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

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

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

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

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	04-26-11

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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:	04-26-11

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PHOTOGRAPH 11: CROSSING. STA: 104+23.

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

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	04-26-11

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

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

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	04-26-11

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PHOTOGRAPH 15: RIP-RAP.

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

PROJECT NO.	EEP-08030
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SCALE:	NTS
DATE:	04-26-11

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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: 04–26–11	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:	04-26-11

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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: 04-26-11	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:	04-26-11

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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:	04-26-11

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

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

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	04-26-11

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

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

McADAMS	PROJECT NO. EEP-08030 FILENAME: EEP08030X.DWG SCALE: NTS DATE: 04-26-11	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 31: "A" VANE. STA: 118+46.

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

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	04-26-11

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UT to SANDY CREEK RESTORATION

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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 1 LOOKING UPSTREAM.

PHOTOGRAPH 44: CROSS SECTION 1 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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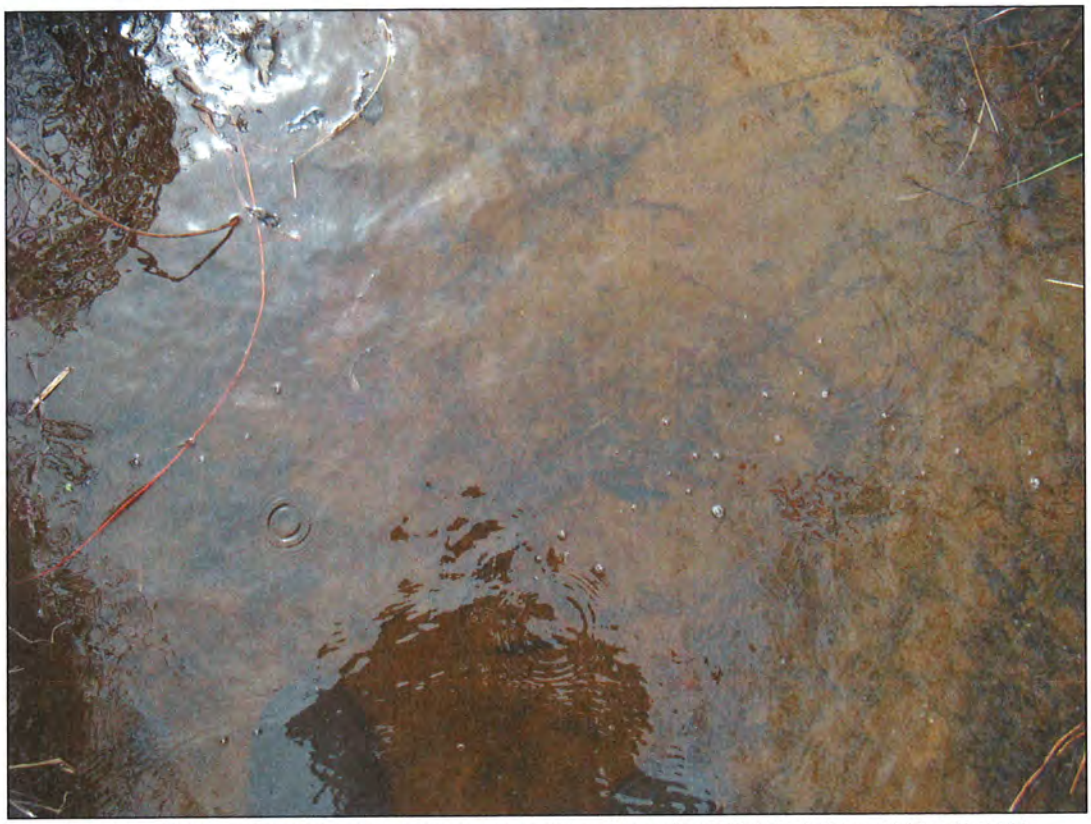

PHOTOGRAPH 57: CROSS SECTION 3 LOOKING AT THE SUBSTRATE COMPOSITION.

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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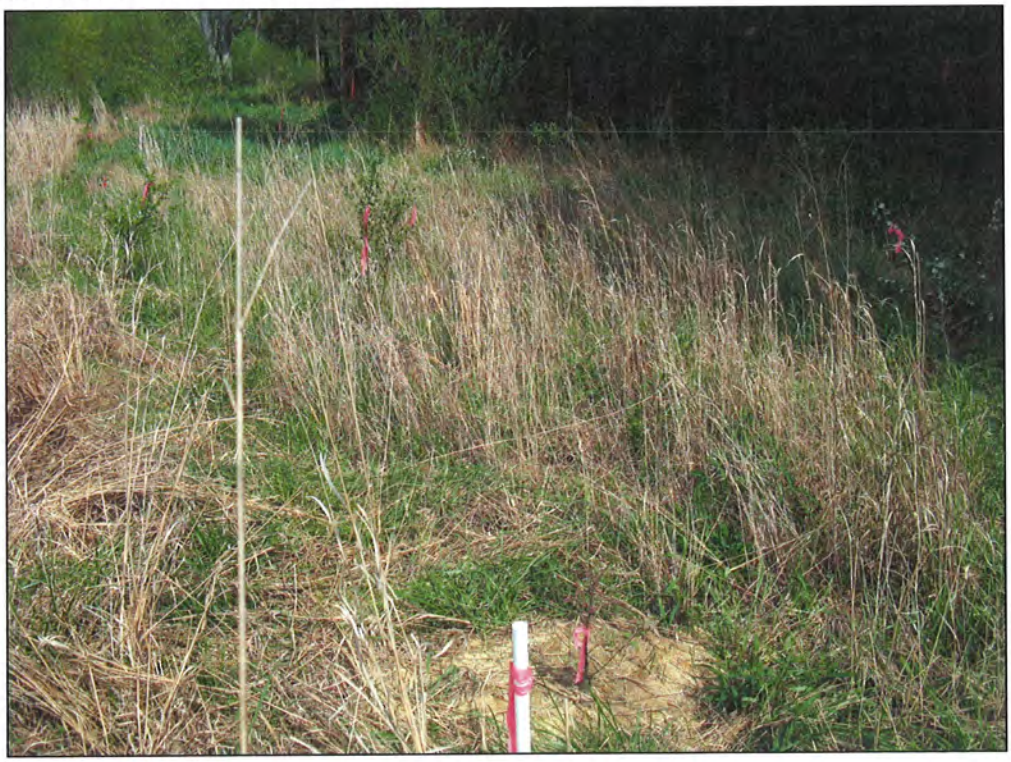
PHOTOGRAPH 77: VEGETATION PLOT 9 LOOKING INTO MONITORING PLOT FROM THE NORTHWEST CORNER. VEGETATION PLOT 9 WAS ESTABLISHED BY EEP AND SAMPLED BY EEP DURING MY-04. ECOENGINEERING SURVEY LOCATED AND PHOTOGRAPHED MONITORING PLOT.



PHOTOGRAPH 78: 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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