UT to Sandy Creek

Randolph County, North Carolina

2009 Year 2 Monitoring Report
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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P. O. Box 14005 Research Triangle Park, NC 27709
919-287-4262 FAX 919-361-2269
www.ecoengr.com

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

NORTH

PROJECT NO.	EEP-08030
FILENAME:	EEP-08030
SCALE:	1" = 1,000
DATE:	11-01-09

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Ecosystem Enhancement Program

UT TO SANDY CREEK

VICINITY MAP

RANDOLPH COUNTY, NORTH CAROLINA

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UT TO SANDY CREEK

CONSOLIDATED CURRENT CONDITIONS PLAN VIEW - YEAR TWO MONITORING

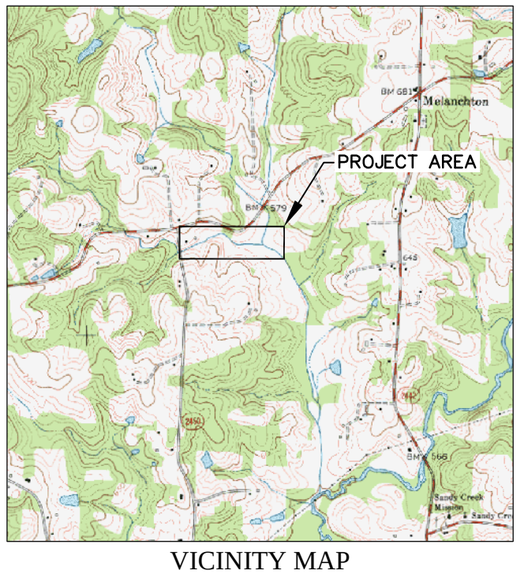
RANDOLPH COUNTY, NORTH CAROLINA
EEP PROJECT NUMBER: 403
DATE: NOVEMBER 1, 2009

NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM
NC-EEP CONTACT: MELONIE ALLEN (919) 715-1973

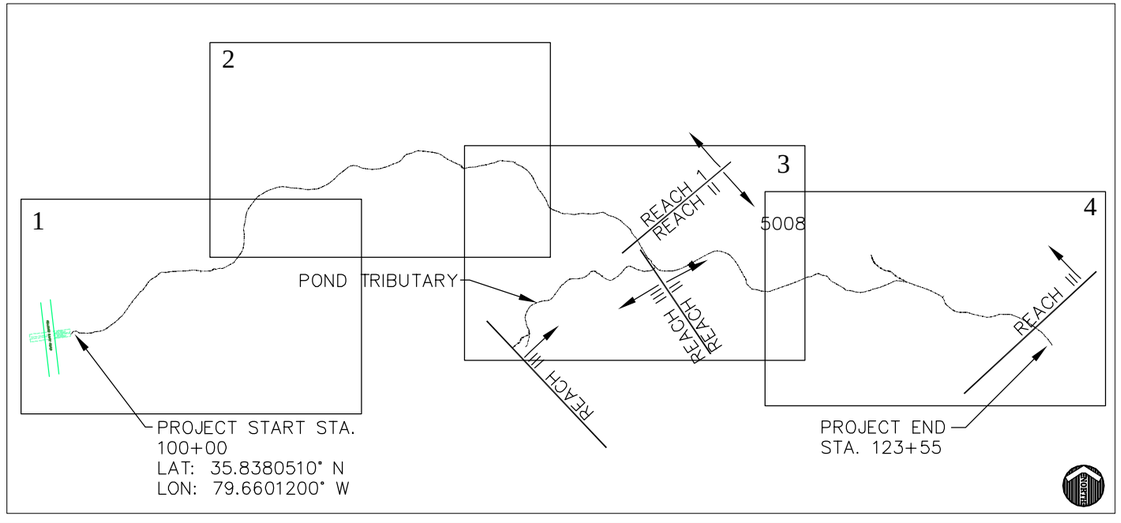
CONTROL TABLE				
POINT NUMBER	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	761096.82	1804283.17	604.12	GS FAY-3 NCDOT
3	760572.44	1804562.50	586.59	TRAV
4	760923.56	1804836.83	575.70	TRAV
5	760864.93	1805782.55	565.77	TRAV
6	760953.87	1804700.65	581.55	BM 1 IRS 1/2
7	760999.25	1805260.24	576.72	BM 2 IRS 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	1805071.64	574.80	NAIL SET
504	760714.98	1805598.90	566.93	NAIL SET
505	760663.85	1806056.94	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	760690.86	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	761096.82	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	760651.83	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	760758.60	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 - 09/09/09 TO 09/11/09
.

SHEET INDEX



VICINITY MAP
NTS



Ecosystem Enhancement PROGRAM

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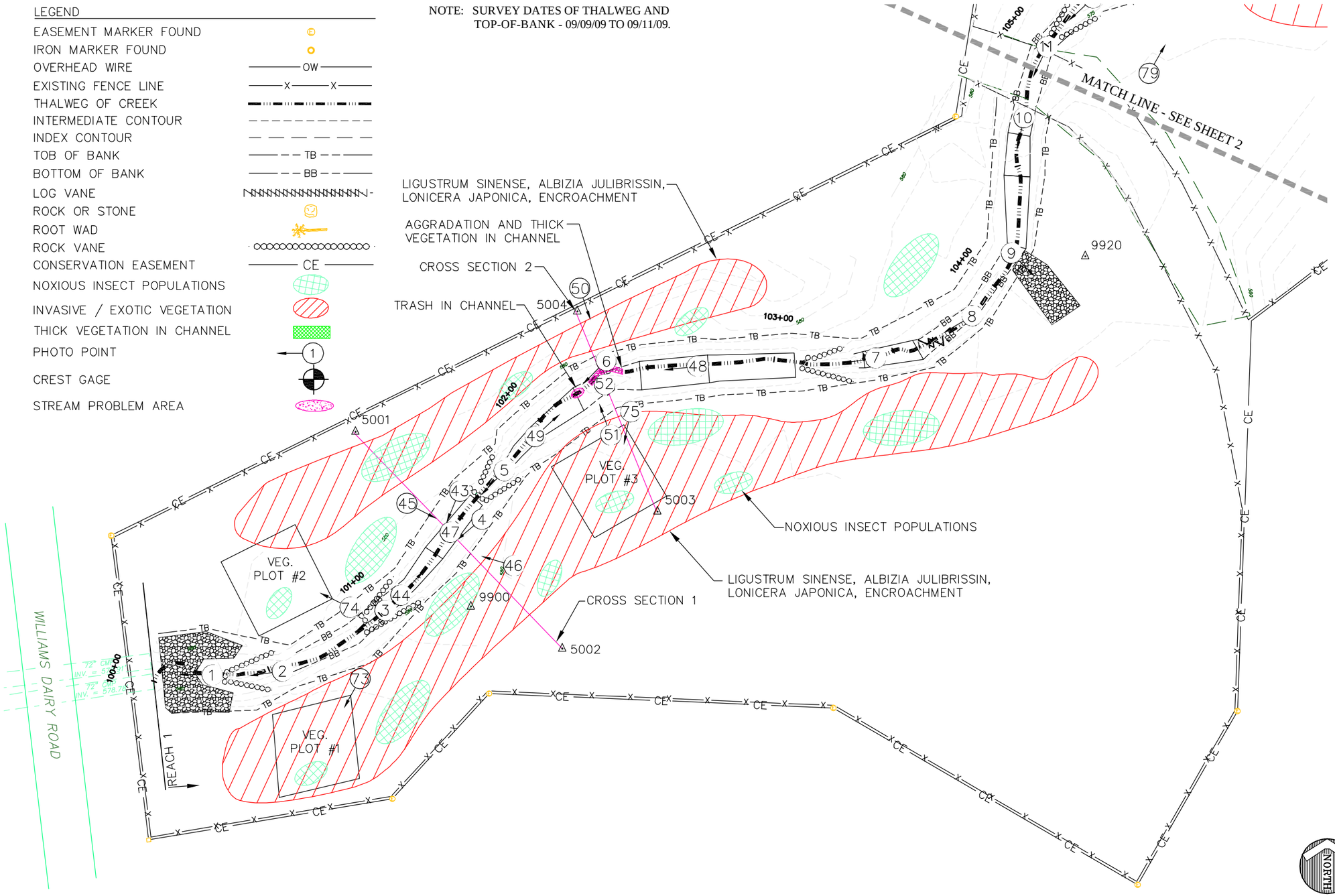
LEGEND

- EASEMENT MARKER FOUND
- IRON MARKER FOUND
- OVERHEAD WIRE — OW
- EXISTING FENCE LINE — X — X
- THALWEG OF CREEK
- INTERMEDIATE CONTOUR
- INDEX CONTOUR
- TOB OF BANK — TB
- BOTTOM OF BANK — BB
- LOG VANE
- ROCK OR STONE
- ROOT WAD
- ROCK VANE
- CONSERVATION EASEMENT — CE
- NOXIOUS INSECT POPULATIONS
- INVASIVE / EXOTIC VEGETATION
- THICK VEGETATION IN CHANNEL
- PHOTO POINT 1
- CREST GAGE
- STREAM PROBLEM AREA

NOTE: SURVEY DATES OF THALWEG AND TOP-OF-BANK - 09/09/09 TO 09/11/09.



GRAPHIC SCALE

40 0 20 40 80

1 inch = 40 ft.

SHEET 1 OF 4

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UT TO SANDY CREEK

CONSOLIDATED CURRENT CONDITIONS PLAN VIEW - YEAR TWO MONITORING

RANDOLPH COUNTY, NORTH CAROLINA

PROJECT NO.	FILENAME:	SCALE:	DATE:
EEP-08030	EEP-08030X	1" = 40'	11-01-09

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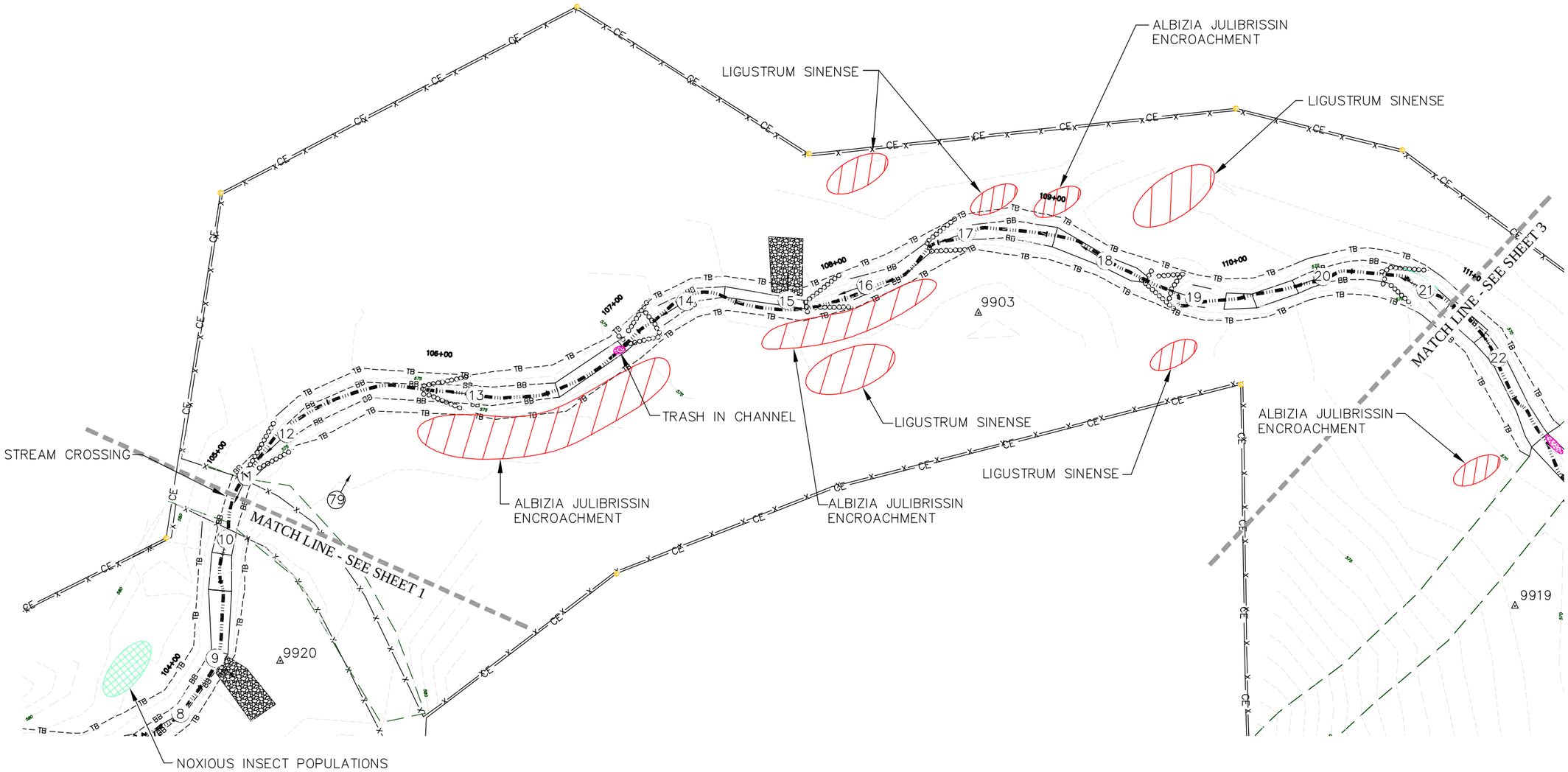

NORTH

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 TWO MONITORING

RANDOLPH COUNTY, NORTH CAROLINA

PROJECT NO.	FILENAME:	SCALE:	DATE:
EEP-08030	EEP-08030X	1" = 50'	11-01-09

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MATCH LINE - SEE SHEET 2

SIDE BAR IN CHANNEL

STREAM CROSSING

ALBIZIA JULIBRISSIN ENCROACHMENT

LIGUSTRUM SINENSE, ALBIZIA JULIBRISSIN, LONICERA JAPONICA ENCROACHMENT

CROSS SECTION 4

9906

9919

VEG. PLOT #4

REACH I

REACH II

STREAM GAUGE

5011

5008

CROSS SECTION 6

CROSS SECTION 5

5007

5006

5005

REACH III

VEG. PLOT #6

5010

5009

LOOSE BOULDER

CROSS SECTION 3

ERODING BANKS

TRASH IN CHANNEL

LIGUSTRUM SINENSE, ALBIZIA JULIBRISSIN, LONICERA JAPONICA ENCROACHMENT

MATCH LINE - SEE SHEET 4

VEG. PLOT #5

TYPHA LATIFOLIA ENCROACHMENT

AGGRADATION AND THICK VEGETATION IN CHANNEL

TYPHA LATIFOLIA AND LONICERA JAPONICA ENCROACHMENT

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 TWO MONITORING

RANDOLPH COUNTY, NORTH CAROLINA

PROJECT NO. EEP-08030

FILENAME: EEP-08030X

SCALE: 1" = 50'

DATE: 11-01-09

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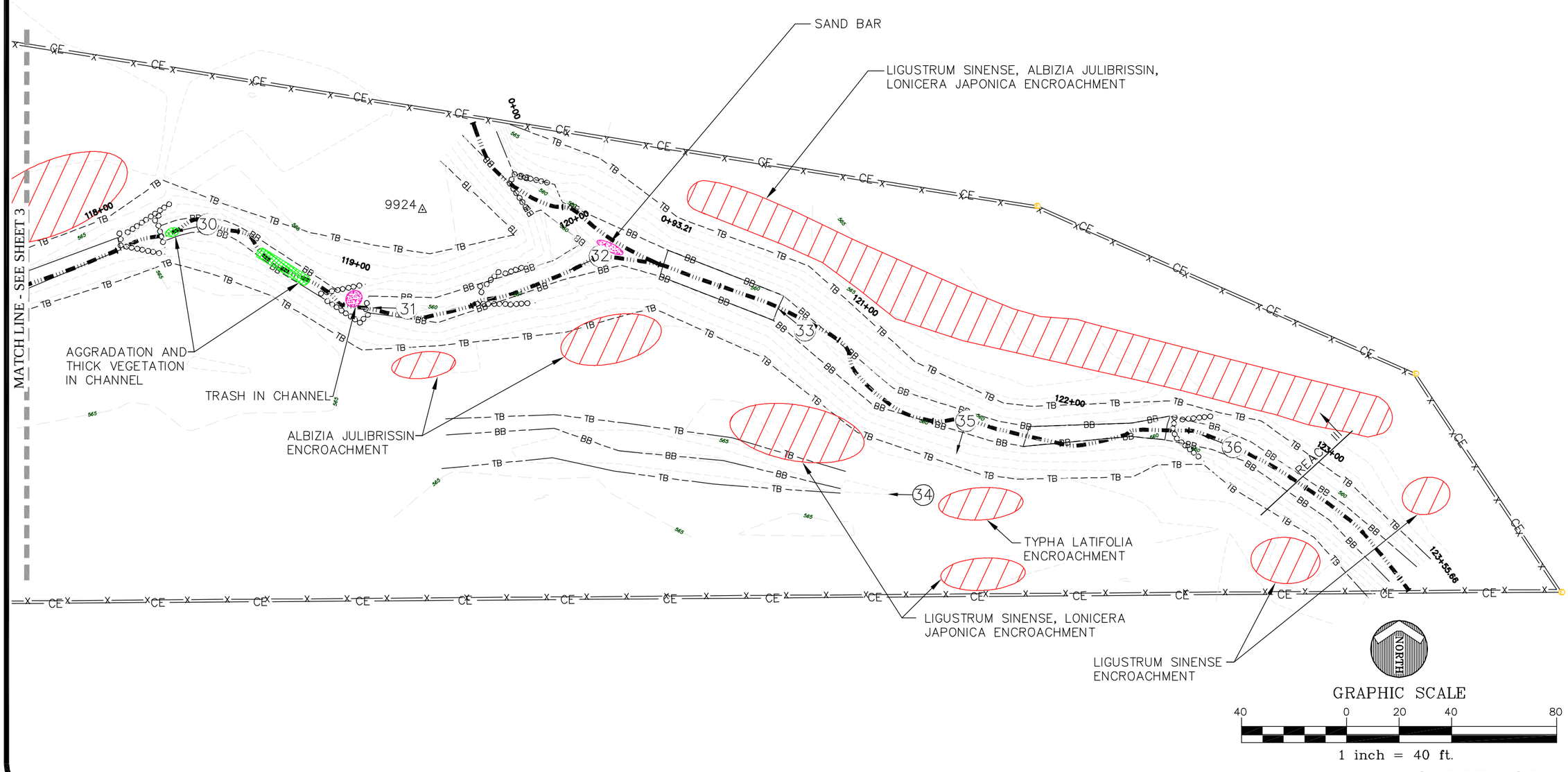

SHEET 4 OF 4

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UT TO SANDY CREEK

CONSOLIDATED CURRENT CONDITIONS PLAN VIEW - YEAR TWO MONITORING

RANDOLPH COUNTY, NORTH CAROLINA

PROJECT NO.	EEP-08030
FILENAME:	EEP-08030X
SCALE:	1" = 50'
DATE:	11-01-09

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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	1,410	1	1,410	100+00 - 114+00	
Reach II	870	R	P1	886	1	886	114+00 - 122+97.27	
Reach III	290	R	P1	384	1	384	200+00 - 203+84.76	Pond Tributary
Mitigation Unit Summations								
Stream (lf)	Riparian Wetland (Ac)		Nonriparian Wetland (Ac)		Total Wetland (Ac)		Buffer (Ac)	Comment
2,680	0		0		0		10.2	

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

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	Appalachian Environmental Services PO Box 52, Webster, NC 28788 phone: 828-586-1973
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%

Table 5. Vegetation Plot Mitigation Success Summary Table			
UT to Sandy Creek Restoration Project/EEP Project ID: 403			
Tract	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**	**Tract Mean**
UT to Sandy Creek	VP1	Y	100%
	VP2	Y	
	VP3	Y	
	VP4	Y	
	VP5	Y	
	VP6	Y	

Note: Threshold criteria based on planted and volunteer species.

Table 6. Vegetation Metadata	
UT to Sandy Creek Restoration Project/EEP Project ID: 403	
Report Prepared By	George Buchholz
Date Prepared	11/2/2009 13:46
database name	EcoEngineering-2009-C.mdb
database location	X:\Projects\EEP\EEP-08030 (UT to Sandy Creek)\Storm\CVS Vegetation Data\2009 Vegetation Data
computer name	BUCHHOLZGE
file size	44904448
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.
PROJECT SUMMARY----------	
Project Code	403
project Name	UT to Sandy Creek (Williams Tract)
Description	
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 7. Stem Count Total and Planted by Plot Species
UT to Sandy Creek Restoration Project/EEP Project ID: 403

			Current Plot Data (MY2 2009)																			Annual Means					
			E403-01-VP1			E403-01-VP2			E403-01-VP3			E403-01-VP4			E403-01-VP5			E403-01-VP6			MY2 (2009)			MY1 (2008)		
Scientific Name	**Common Name**	**Species Type**	**P-LS**	**P-all**	**T**	**P-LS**	**P-all**	**T**	**P-LS**	**P-all**	**T**	**P-LS**	**P-all**	**T**	**P-LS**	**P-all**	**T**	**P-LS**	**P-all**	**T**	**P-LS**	**P-all**	**T**	**P-LS**	**P-all**	**T**
Baccharis halimifolia	eastern baccharis	Shrub Tree												1									1			
Betula nigra	river birch	Tree																	4	4		4	4		3	3
Celtis laevigata	sugarberry	Shrub Tree		2	2																	2	2		2	2
Cornus amomum	silky dogwood	Shrub					2	2		7	13		10	10								19	25		14	14
Fraxinus pennsylvanica	green ash	Tree		3	3		3	3					5	5								11	11		14	14
Juglans nigra	black walnut	Tree																	1	1		1	1		1	1
Nyssa sylvatica	blackgum	Tree											1	1								1	1			
Quercus phellos	willow oak	Tree		1	1		1	1		1	1											3	3		1	1
Viburnum dentatum	southern arrowwood	Shrub Tree		1	1		3	3					1	1		1	1		3	3		9	9		7	7
Rhus copallinum	flameleaf sumac	Shrub Tree						1															1			
Mimosa	sensitive plant	Vine Shrub			4			3			6			22									35			
Hamamelis virginiana	American witchhazel	Shrub Tree					2	2								5	5					7	7		3	3
Lindera benzoin	northern spicebush	Shrub Tree																							1	1
Prunus serotina	black cherry	Shrub Tree														1	1					1	1		1	1
Acer rubrum	red maple	Tree														1	3					1	3		1	1
		Stem count	0	7	11	0	11	15	0	8	20	0	17	40	0	8	10	0	8	8	0	59	104	0	48	48
		size (ares)		1			1			1			1			1			1			6			6	
		size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.15			0.15	
		Species count	0	4	5	0	5	7	0	2	3	0	4	6	0	4	4	0	3	3	0	11	14	0	11	11
		Stems per ACRE	0	283.3	445.2	0	445.2	607	0	323.7	809.4	0	688	1619	0	323.7	404.7	0	323.7	323.7	0	397.9	701.5	0	323.7	323.7

APPENDIX C

Vegetation Assessment Data

Table 5. Vegetation Plot Mitigation Success Summary Table			
UT to Sandy Creek Restoration Project/EEP Project ID: 403			
Tract	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**	**Tract Mean**
UT to Sandy Creek	VP1	Y	100%
	VP2	Y	
	VP3	Y	
	VP4	Y	
	VP5	Y	
	VP6	Y	

Note: Threshold criteria based on planted and volunteer species.

Table 6. Vegetation Metadata	
UT to Sandy Creek Restoration Project/EEP Project ID: 403	
Report Prepared By	George Buchholz
Date Prepared	10/9/2009 16:09
database name	EcoEngineering-2009-C.mdb
database location	X:\Projects\EEP\EEP-08030 (UT to Sandy Creek)\Storm\CVS Vegetation Data\2009 Vegetation Data
computer name	BUCHHOLZGE
file size	44904448
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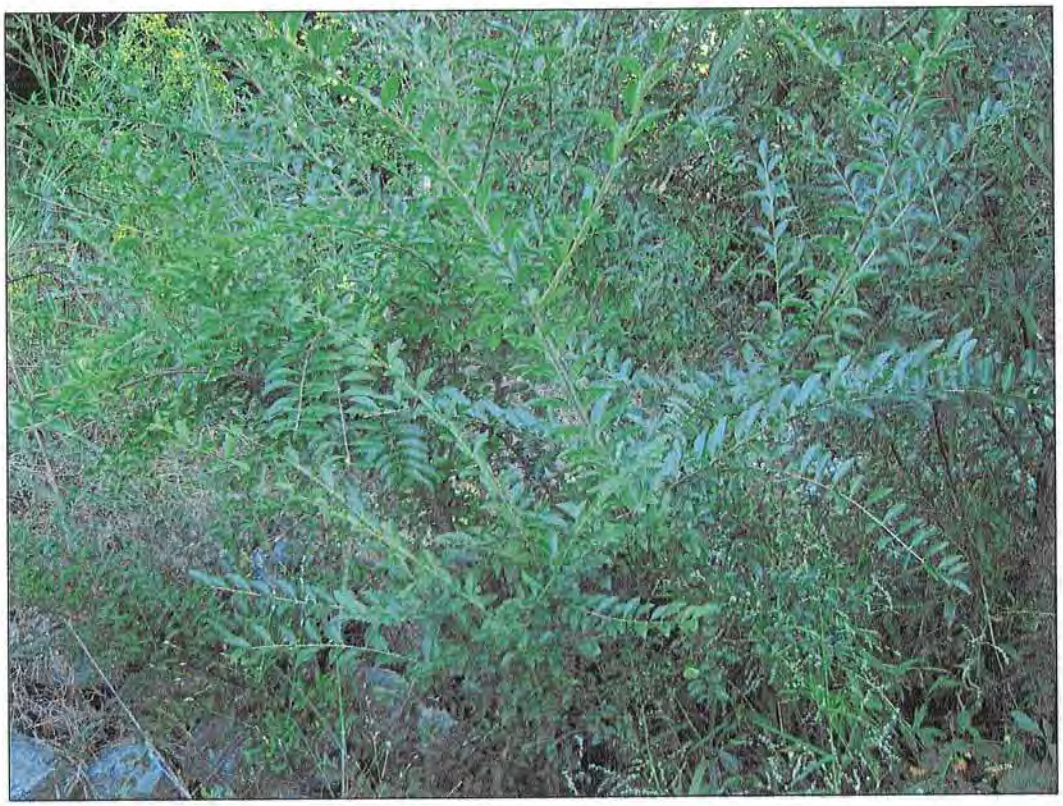
Table 7. Stem Count Total and Planted by Plot Species
UT to Sandy Creek Restoration Project/EEP Project ID: 403

			Current Plot Data (MY2 2009)																			Annual Means					
			E403-01-VP1			E403-01-VP2			E403-01-VP3			E403-01-VP4			E403-01-VP5			E403-01-VP6			MY2 (2009)			MY1 (2008)		
Scientific Name	Common Name	Species Type	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T
Baccharis halimifolia	eastern baccharis	Shrub Tree												1								1				
Betula nigra	river birch	Tree																	4	4		4	4		3	3
Celtis laevigata	sugarberry	Shrub Tree		2	2																	2	2		2	2
Cornus amomum	silky dogwood	Shrub					2	2		7	13		10	10								19	25		14	14
Fraxinus pennsylvanica	green ash	Tree		3	3		3	3					5	5								11	11		14	14
Juglans nigra	black walnut	Tree																	1	1		1	1		1	1
Nyssa sylvatica	blackgum	Tree											1	1								1	1			
Quercus phellos	willow oak	Tree		1	1		1	1		1	1											3	3		1	1
Viburnum dentatum	southern arrowwood	Shrub Tree		1	1		3	3					1	1		1	1		3	3		9	9		7	7
Rhus copallinum	flameleaf sumac	Shrub Tree						1															1			
Mimosa	sensitive plant	Vine Shrub			4			3			6			22									35			
Hamamelis virginiana	American witchhazel	Shrub Tree					2	2								5	5					7	7		3	3
Lindera benzoin	northern spicebush	Shrub Tree																							1	1
Prunus serotina	black cherry	Shrub Tree														1	1					1	1		1	1
Acer rubrum	red maple	Tree														1	3					1	3		1	1
		Stem count	0	7	11	0	11	15	0	8	20	0	17	40	0	8	10	0	8	8	0	59	104	0	48	48
		size (ares)		1			1			1			1			1			1			6			6	
		size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.15			0.15	
		Species count	0	4	5	0	5	7	0	2	3	0	4	6	0	4	4	0	3	3	0	11	14	0	11	11
		Stems per ACRE	0	283.3	445.2	0	445.2	607	0	323.7	809.4	0	688	1619	0	323.7	404.7	0	323.7	323.7	0	397.9	701.5	0	323.7	323.7



VEGETATION PROBLEM AREA 1: LIGUSTRUM SINENSE ENCROACHMENT.

VEGETATION PROBLEM AREA 2: ALBIZIA JULIBRISSIN ENCROACHMENT.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	09-25-09

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VEGETATION PROBLEM AREA 3: LONICERA JAPONICA ENCROACHMENT.

VEGETATION PROBLEM AREA 4: TYPHA LATIFOLIA ENCROACHMENT AT STATION 201+50.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	09-28-09

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VEGETATION PROBLEM AREA 5. FIRE ANT ENCROACHMENT.

VEGETATION PROBLEM AREA 6. THICK HERBACEOUS GROWTH WITHIN STREAM CHANNEL AT STATION 200+00 - 202+00.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	09-28-09

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VEGETATION PROBLEM AREA 7. THICK HERBACEOUS GROWTH WITHIN STREAM CHANNEL AT STATION 118+25.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	09-25-09

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(919) 361-5000

Vegetative Problem Areas Table			
UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403			
Feature/Issue	**Station # / Range**	**Probable Cause**	**Photo #**
Invasive/Exotic Populations	See Plan View	*Ligustrum sinense, Albizia julibrissin, Lonicera japoinca* encroachment	VPA1, VPA2, VPA3
	201+50, 122+00	*Typha latifolia* encroachment	VPA4
Noxious Insect Populations	See Plan View	Fire ant encroachment	VPA5
Thick Vegetation in Channel	200+00 - 202+00, 118+25	Thick vegetation in channel may be due to over seeding and/or low flow or absent flow conditions	VPA6 & VPA7

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[1]	% Perform in Stable Condition[2]	Feature Perform. Mean or Total[3]
	1. Present ?[4]	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	
A. Riffles	5. Length appropriate?	NA	NA	NA	NA	**78**
	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	
B. Pools	3. Length appropriate? (p-p spacing)	NA	NA	NA	NA	**89**
	1. Upstream of meander bend (run/inflection) centering?[5]	10	10	NA	100	
C. Thalweg	2. Downstream of meander (glide/inflection) centering?[5]	9	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?	8	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[6]	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[1]	% Perform in Stable Condition[2]	Feature Perform. Mean or Total[3]
A. Riffles	1. Present ?[4]	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?[5]	10	10	NA	100	
	2. Downstream of meander (glide/inflection) centering?[5]	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[6]	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?	11	11	NA	100	**100**
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[1]	% Perform in Stable Condition[2]	Feature Perform. Mean or Total[3]
A. Riffles	1. Present ?[4]	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?[5]	7	8	NA	100	
C. Thalweg	2. Downstream of meander (glide/inflection) centering?[5]	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[6]	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**

Footnotes:

The above table should be completed using the visual assessment data form for each project reach/segment It is recognized that the various metrics within a feature category

1 Metrics that are spatial estimates that are continuous variables should be entered as:
The number of locales over the reach for which the failing condition is observed / followed by the total linear distance (feet) or area for which the failing

2 In the case of categorical metrics for which a feature count is involved, this is simply calculated as the number of functional features that are in a state of

3 The mean of the metrics for a given feature category.

4 Was the feature actually present as compared to the As-built or has the feature been completely obscured (aggraded) or removed (degraded).

5 Is the Thalweg centering up on the channel in between meander bends?

6 Amount of active bank failure/erosion. This should be the tally of all stressed and failing bank from the problem area plan view, which an then be calculated as indicated in footnote 1 above.

USDA-NRCS (1998) *Stream Visual Assessment Protocol* National Water and Climate Center (Technical Note 99–1)

Rosgen, D L. (1996) *Applied River Morphology* . Wildland Hydrology Books, Pagosa Springs, CO.

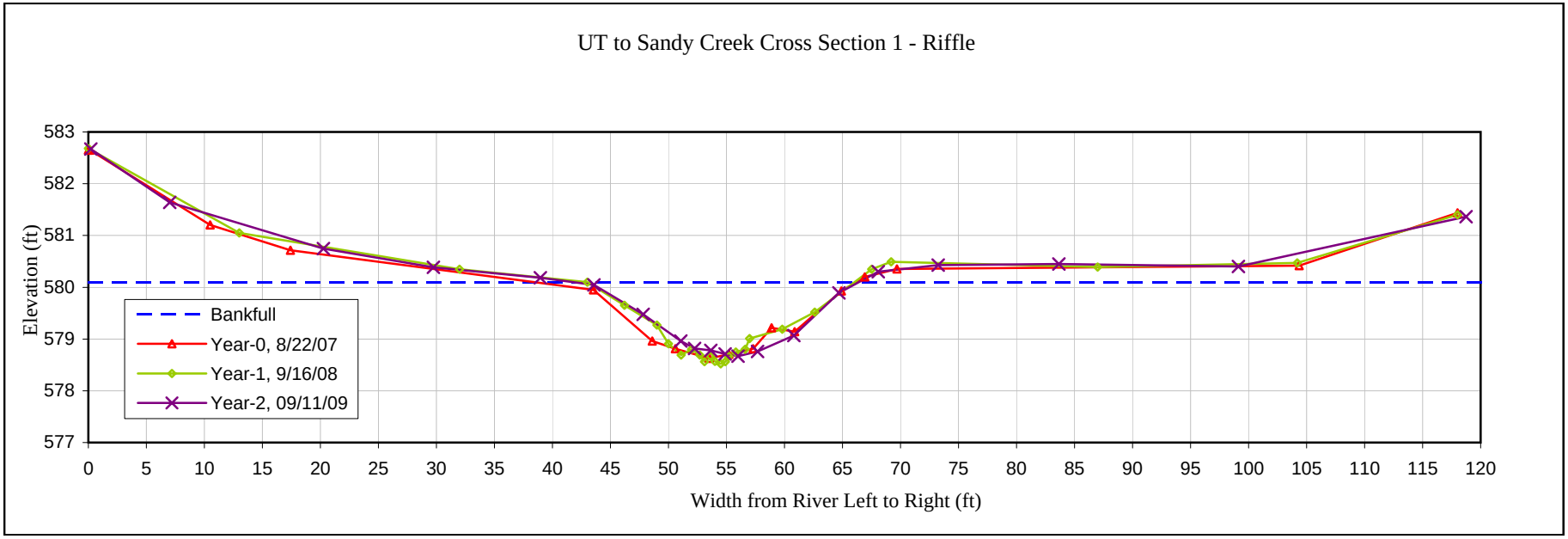
Phankuch, D.J. (1975) Stream reach inventory and channel stability evaluation. USDA Forest Service, R1-75-002. GPO #696-260/200

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)**
Installed 09/09/09*			

Note: A crest gage was installed during the 2009 Monitoring Year 2 field investigations so that bankfull events can be documented during the 2010 Monitoring Year 3 field investigations. The crest gage is 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								
0.14	582.65	13.00	581.05	7.00	581.64								
10.49	581.20	32.00	580.35	20.26	580.75								
17.42	580.72	43.00	580.10	29.73	580.39								
43.54	579.95	46.20	579.65	38.96	580.19								
48.60	578.96	49.00	579.27	43.59	580.05								
50.60	578.81	50.00	578.91	47.81	579.48								
53.53	578.63	51.10	578.69	51.08	578.96								
55.21	578.71	52.00	578.80	52.25	578.82								
57.30	578.81	52.70	578.69	53.64	578.78								
58.88	579.22	53.10	578.56	54.89	578.71								
60.87	579.14	53.60	578.67	55.99	578.67								
64.91	579.93	54.00	578.57	57.68	578.76								
66.93	580.20	54.50	578.52	60.81	579.07								
69.69	580.36	54.90	578.56	64.69	579.89								
104.36	580.42	55.20	578.67	68.08	580.30								
118.02	581.43	55.80	578.75	73.26	580.43								
118.10	581.43	56.60	578.80	83.64	580.45								
		57.00	579.01	99.12	580.40								
		59.80	579.19	118.73	581.37								
		62.60	579.52										
		67.50	580.35										
		69.20	580.49										
		87.00	580.39										
		104.20	580.47										
		118.00	581.40										



CROSS SECTION PLOT - LOOKING DOWNSTREAM

YEAR-2, 2009 SURVEY DATA **CROSS-SECTION:** 1
PROJECT SANDY CREEK **FEATURE:** Riffle
TASK CROSS SECTION
REACH SANDY CREEK
DATE 09/09/2009 to 09/11/2009
CREW BUCHHOLZ/FURRY/PARRISH

Summary Data
All dimensions in feet.

Bankfull X-sec area	19.5	sq. ft.
Bankfull Width	24.6	ft.
Bankfull Mean Depth	0.8	ft.
Bankfull Max Depth	1.4	ft.
Width/Depth Ratio	>12	
Entrenchment Ratio	>2.2	
Classification	C	

Bankfull Elevation: 580.10 ft.

CROSS SECTION PHOTO - LOOKING DOWNSTREAM

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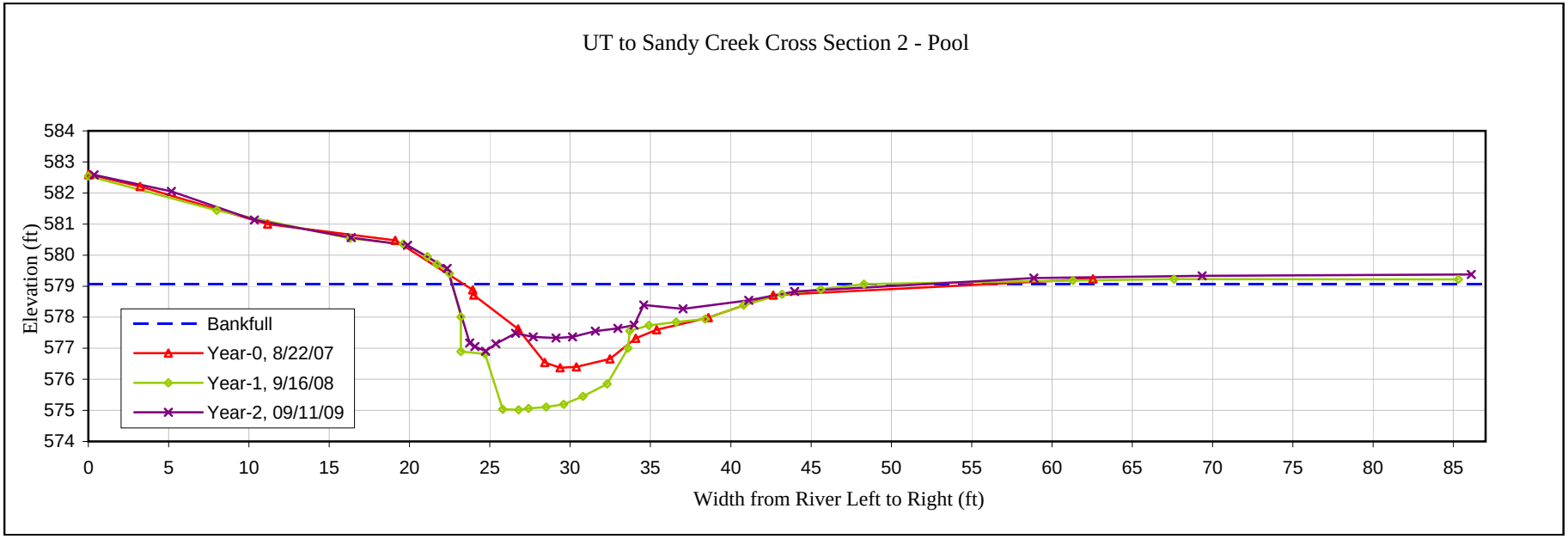
UT to SANDY CREEK **EEP PROJECT # 403** CROSS-SECTION: 2

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								
0.09	582.59	8.00	581.44	5.18	582.05								
3.22	582.21	16.30	580.54	10.34	581.13								
11.17	581.00	19.60	580.36	16.37	580.57								
19.11	580.47	21.10	579.95	19.88	580.32								
23.93	578.88	21.70	579.70	22.34	579.57								
24.00	578.71	22.50	579.40	23.74	577.17								
26.75	577.62	23.20	578.01	24.07	577.05								
28.41	576.54	23.20	576.90	24.73	576.90								
29.38	576.37	24.70	576.82	25.37	577.15								
30.39	576.40	25.80	575.04	26.60	577.48								
32.48	576.65	26.80	575.02	27.69	577.36								
34.08	577.32	27.40	575.06	29.11	577.33								
35.39	577.60	28.50	575.11	30.15	577.37								
38.60	577.99	29.60	575.20	31.58	577.55								
42.65	578.71	30.80	575.45	32.96	577.64								
62.56	579.23	32.30	575.85	33.99	577.75								
80.54	579.51	33.60	577.00	34.58	578.39								
84.82	579.31	33.70	577.56	37.02	578.27								
84.91	579.31	34.90	577.74	41.11	578.54								
		36.60	577.84	43.99	578.82								
		38.40	577.94	58.87	579.26								
		40.80	578.38	69.36	579.33								
		43.20	578.74	86.12	579.38								
		45.60	578.90										
		48.30	579.07										
		61.30	579.18										
		67.60	579.23										
		85.30	579.22										



CROSS SECTION PLOT - LOOKING DOWNSTREAM

YEAR-2, 2009 SURVEY DATA **CROSS-SECTION:** 2
PROJECT SANDY CREEK **FEATURE:** Pool
TASK CROSS SECTION
REACH SANDY CREEK
DATE 09/09/2009 to 09/11/2009
CREW BUCHHOLZ/FURRY/PARRISH

Summary Data
All dimensions in feet.

Bankfull X-sec area	25.6	sq. ft.
Bankfull Width	31.4	ft.
Bankfull Mean Depth	0.9	ft.
Bankfull Max Depth	2.2	ft.
Width/Depth Ratio	>12	
Entrenchment Ratio	n/a	
Classification	n/a	

Bankfull Elevation: 579.07 ft.

CROSS SECTION PHOTO - LOOKING DOWNSTREAM

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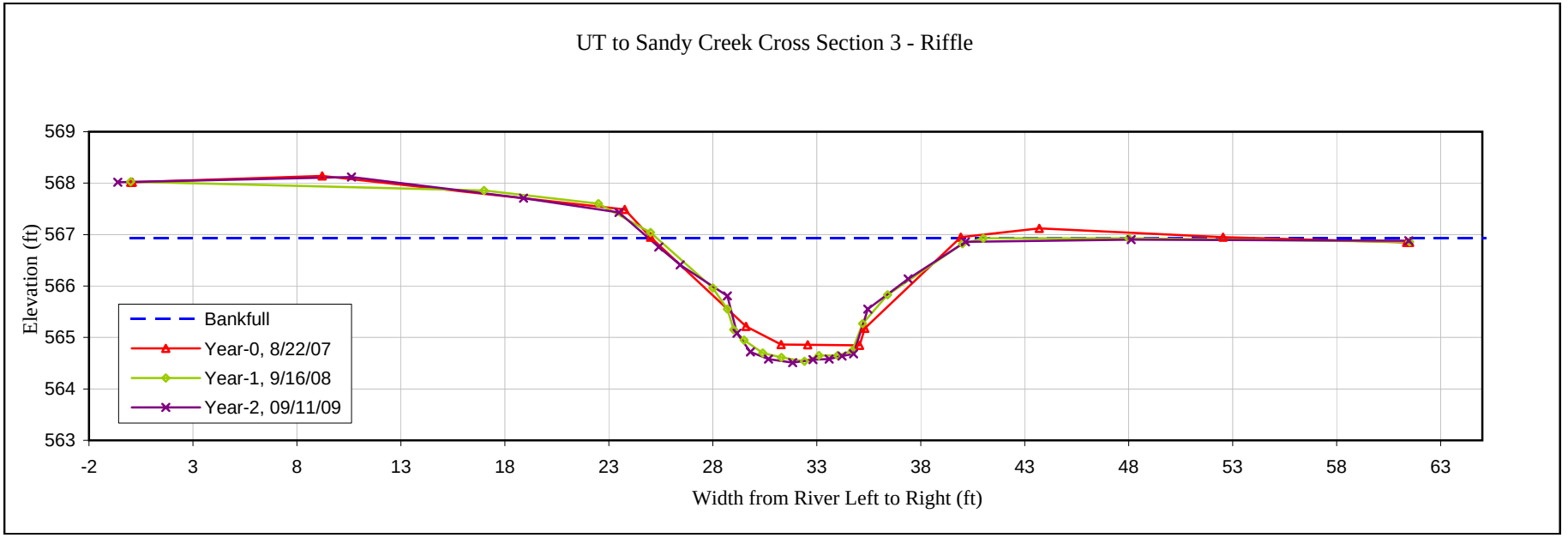
UT to SANDY CREEK **EEP PROJECT # 403** CROSS-SECTION: 3

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								
0.09	568.02	17.00	567.86	10.62	568.12								
9.21	568.14	22.50	567.60	18.89	567.71								
23.76	567.49	25.00	567.04	23.48	567.43								
25.00	566.95	28.00	565.96	25.40	566.76								
29.60	565.22	28.70	565.55	26.42	566.41								
31.28	564.86	29.00	565.15	28.69	565.81								
32.56	564.86	29.50	564.95	29.16	565.08								
35.05	564.85	30.40	564.70	29.81	564.72								
35.31	565.18	31.30	564.61	30.68	564.58								
39.92	566.95	32.40	564.54	31.84	564.51								
43.70	567.12	33.10	564.65	32.82	564.57								
52.54	566.95	34.00	564.65	33.59	564.58								
61.36	566.85	34.70	564.74	34.21	564.64								
61.50	566.85	35.20	565.27	34.76	564.68								
		36.40	565.83	35.46	565.55								
		40.00	566.82	37.39	566.14								
		41.00	566.93	40.15	566.86								
		48.00	566.93	48.11	566.90								
		61.50	566.86	61.47	566.88								



CROSS SECTION PLOT - LOOKING DOWNSTREAM

YEAR-2, 2009 SURVEY DATA **CROSS-SECTION:** 3
PROJECT SANDY CREEK **FEATURE:** Riffle
TASK CROSS SECTION
REACH SANDY CREEK
DATE 09/09/2009 to 09/11/2009
CREW BUCHHOLZ/FURRY/PARRISH

Summary Data
All dimensions in feet.

Bankfull X-sec area	18.9	sq. ft.
Bankfull Width	14.8	ft.
Bankfull Mean Depth	1.3	ft.
Bankfull Max Depth	2.3	ft.
Width/Depth Ratio	11.6	
Entrenchment Ratio	>2.2	
Classification	C	

Bankfull Elevation: 566.93 ft.

CROSS SECTION PHOTO - LOOKING DOWNSTREAM

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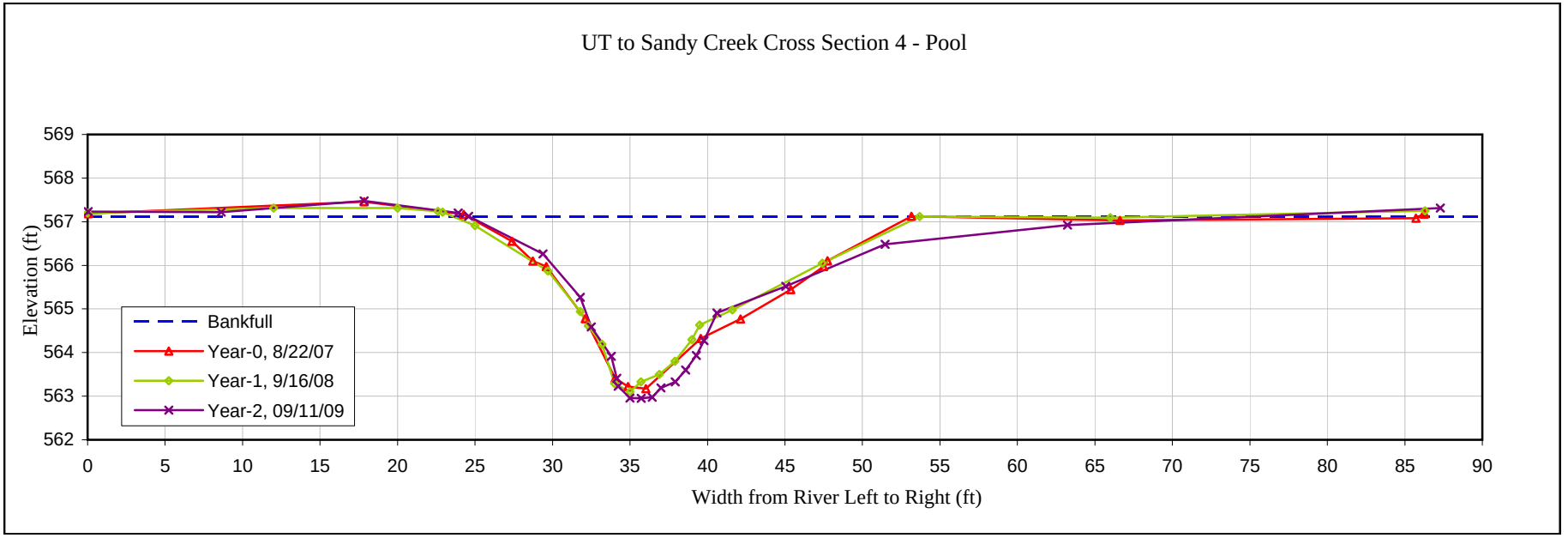
UT to SANDY CREEK **EEP PROJECT # 403** CROSS-SECTION: 4

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								
0.07	567.19	12.00	567.31	8.62	567.22								
17.84	567.46	20.00	567.31	17.85	567.48								
24.27	567.17	22.60	567.24	23.91	567.20								
27.39	566.55	22.90	567.22	24.58	567.12								
28.73	566.10	25.00	566.91	29.38	566.26								
29.60	565.97	29.70	565.87	31.79	565.27								
32.11	564.78	31.80	564.94	32.50	564.59								
34.04	563.41	32.30	564.61	33.79	563.92								
34.88	563.22	33.20	564.19	34.15	563.41								
36.03	563.17	34.00	563.29	34.24	563.23								
39.56	564.32	35.00	563.10	35.00	562.96								
42.14	564.77	35.70	563.33	35.73	562.95								
45.37	565.44	36.90	563.50	36.43	562.97								
47.50	565.97	37.90	563.80	37.00	563.19								
47.74	566.10	39.00	564.30	37.93	563.33								
53.16	567.13	39.50	564.63	38.59	563.60								
66.62	567.03	41.60	564.98	39.29	563.93								
85.71	567.08	47.40	566.05	39.78	564.27								
86.21	567.18	53.70	567.12	40.61	564.91								
86.29	567.18	66.00	567.09	45.05	565.52								
		86.30	567.25	51.46	566.48								
				63.23	566.92								
				87.29	567.32								



CROSS SECTION PLOT - LOOKING DOWNSTREAM

YEAR-2, 2009 SURVEY DATA **CROSS-SECTION:** 4
PROJECT SANDY CREEK **FEATURE:** Pool
TASK CROSS SECTION
REACH SANDY CREEK
DATE 090/09/2009 to 09/11/2009
CREW BUCHHOLZ/FURRY/PARRISH

Summary Data
All dimensions in feet.

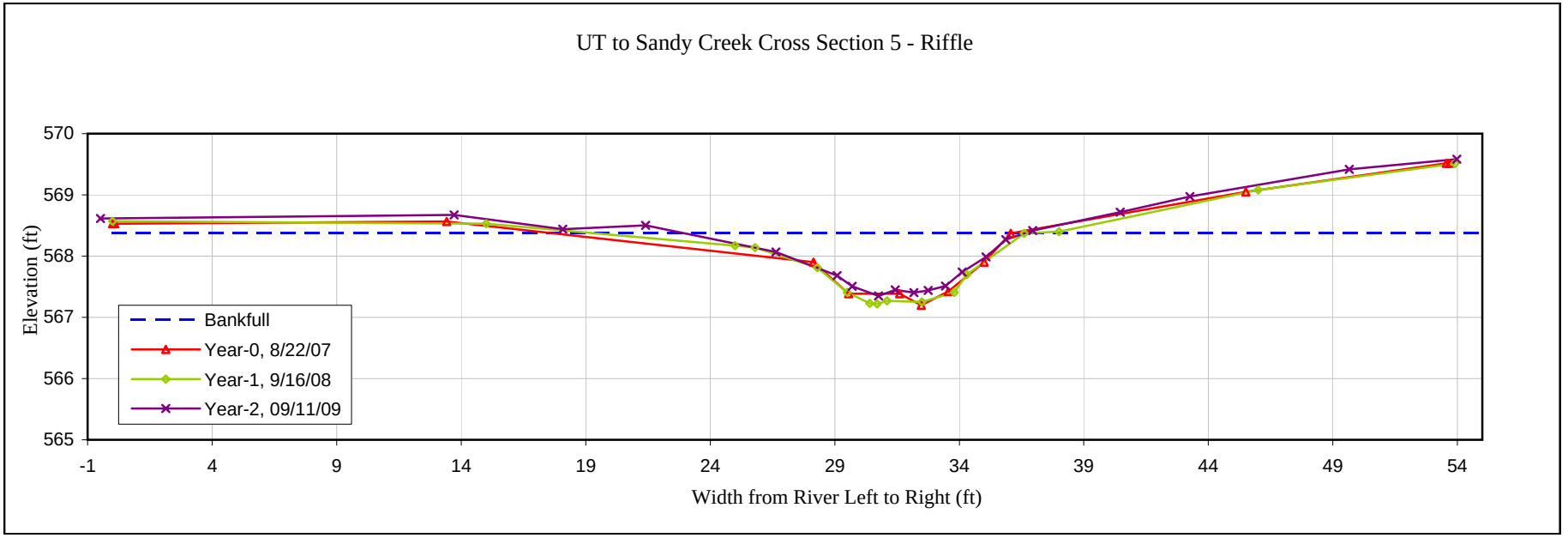
Bankfull X-sec area	57.2	sq. ft.
Bankfull Width	50.7	ft.
Bankfull Mean Depth	1.1	ft.
Bankfull Max Depth	4.2	ft.
Width/Depth Ratio	>12	ft.
Entrenchment Ratio	>2.2	ft.
Classification	n/a	

Bankfull Elevation: 567.12 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								
0.09	568.53	15.00	568.53	13.72	568.67								
13.42	568.56	25.00	568.17	18.08	568.44								
28.15	567.90	25.80	568.14	21.40	568.50								
29.56	567.39	28.30	567.81	26.64	568.07								
31.60	567.39	29.50	567.41	29.10	567.68								
32.47	567.20	30.40	567.23	29.70	567.51								
33.55	567.42	30.70	567.22	30.75	567.35								
35.00	567.90	31.10	567.27	31.43	567.45								
36.06	568.37	32.50	567.25	32.17	567.40								
45.50	569.05	33.80	567.41	32.75	567.44								
53.56	569.52	34.30	567.70	33.44	567.51								
53.69	569.52	36.60	568.37	34.12	567.74								
		38.00	568.40	35.07	567.99								
		46.00	569.08	35.86	568.27								
		53.90	569.51	36.94	568.42								
				40.46	568.72								
				43.26	568.97								
				49.66	569.42								
				53.98	569.58								



CROSS SECTION PLOT - LOOKING DOWNSTREAM

YEAR-2, 2009 SURVEY DATA **CROSS-SECTION:** 5
PROJECT SANDY CREEK **FEATURE:** Riffle
TASK CROSS SECTION
REACH SANDY CREEK
DATE 09/09/2009 to 09/11/2009
CREW BUCHHOLZ/FURRY/PARRISH

Summary Data
All dimensions in feet.

Bankfull X-sec area	7.0	sq. ft.
Bankfull Width	13.6	ft.
Bankfull Mean Depth	0.5	ft.
Bankfull Max Depth	1.0	ft.
Width/Depth Ratio	>12	ft.
Entrenchment Ratio	>2.2	ft.
Classification	C	

Bankfull Elevation: 568.37 ft.

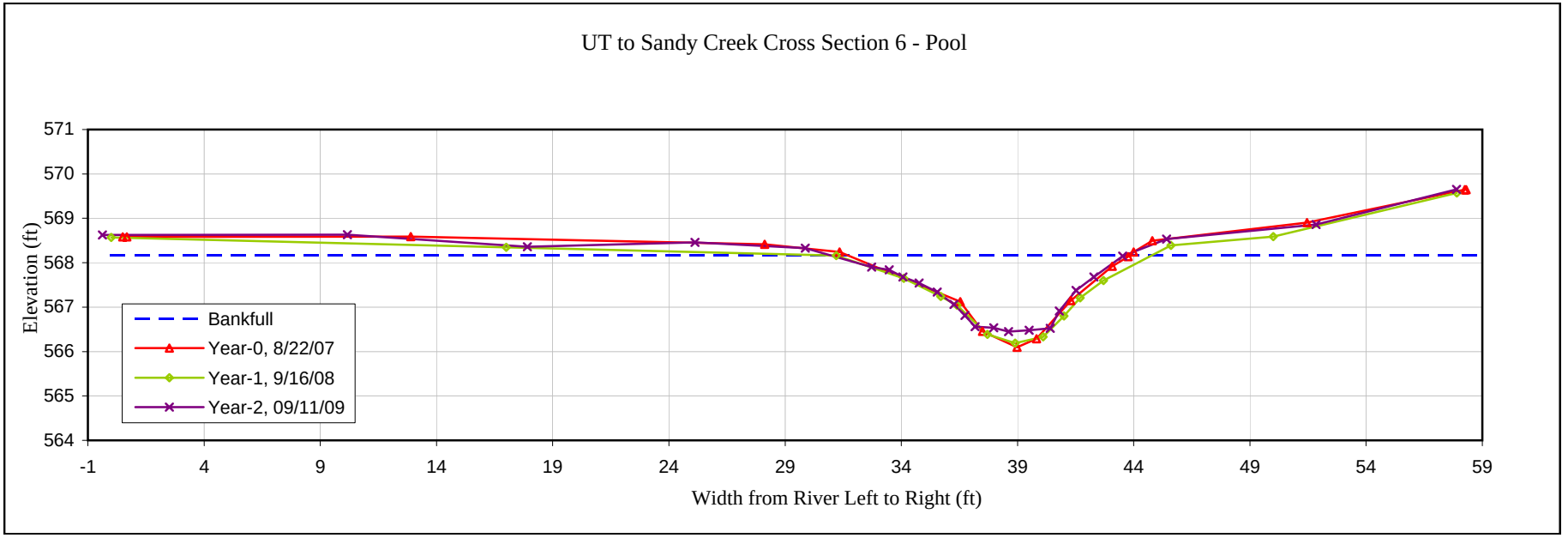
CROSS SECTION PHOTO - LOOKING DOWNSTREAM

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								
0.68	568.58	17.00	568.35	10.17	568.63								
12.89	568.59	31.20	568.16	17.91	568.36								
28.12	568.41	34.10	567.65	25.12	568.46								
31.34	568.24	35.70	567.24	29.87	568.33								
36.54	567.12	36.40	567.04	32.73	567.90								
37.49	566.46	37.70	566.39	33.48	567.84								
38.98	566.10	38.90	566.19	34.07	567.68								
39.82	566.29	40.10	566.33	34.77	567.54								
41.29	567.15	41.00	566.80	35.55	567.34								
43.08	567.92	41.70	567.21	36.26	567.06								
43.76	568.13	42.70	567.60	36.73	566.81								
44.00	568.24	45.60	568.39	37.18	566.56								
44.80	568.50	50.00	568.59	37.97	566.54								
51.46	568.90	57.90	569.57	38.61	566.45								
58.25	569.65			39.50	566.48								
58.30	569.65			40.41	566.52								
				40.79	566.91								
				41.52	567.38								
				42.29	567.68								
				43.52	568.15								
				45.41	568.54								
				51.85	568.86								
				57.89	569.65								



CROSS SECTION PLOT - LOOKING DOWNSTREAM

YEAR-2, 2009 SURVEY DATA **CROSS-SECTION:** 6
PROJECT SANDY CREEK **FEATURE:** Pool
TASK CROSS SECTION
REACH SANDY CREEK
DATE 09/09/2009 to 09/11/2009
CREW BUCHHOLZ/FURRY/PARRISH

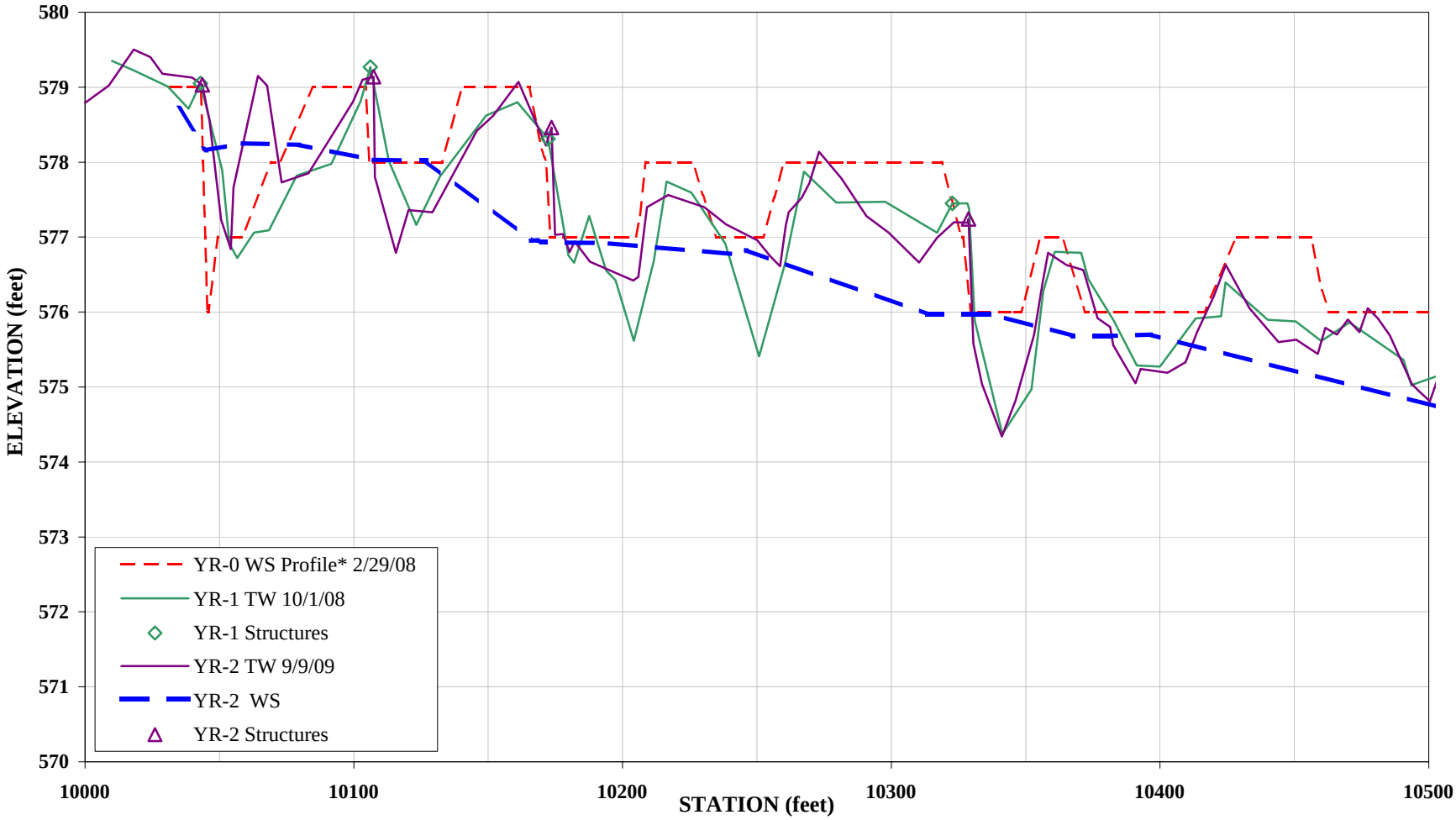
Summary Data
All dimensions in feet.

Bankfull X-sec area	11.0	sq. ft.
Bankfull Width	12.6	ft.
Bankfull Mean Depth	0.9	ft.
Bankfull Max Depth	1.7	ft.
Width/Depth Ratio	>12	
Entrenchment Ratio	>2.2	
Classification	n/a	

Bankfull Elevation: 568.16 ft.

CROSS SECTION PHOTO - LOOKING DOWNSTREAM

UT to Sandy Creek
Longitudinal Profile
2009 (Year-2) Monitoring



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally. Structures were used as a guide. *Water surface was the only profile data provided. Year-1 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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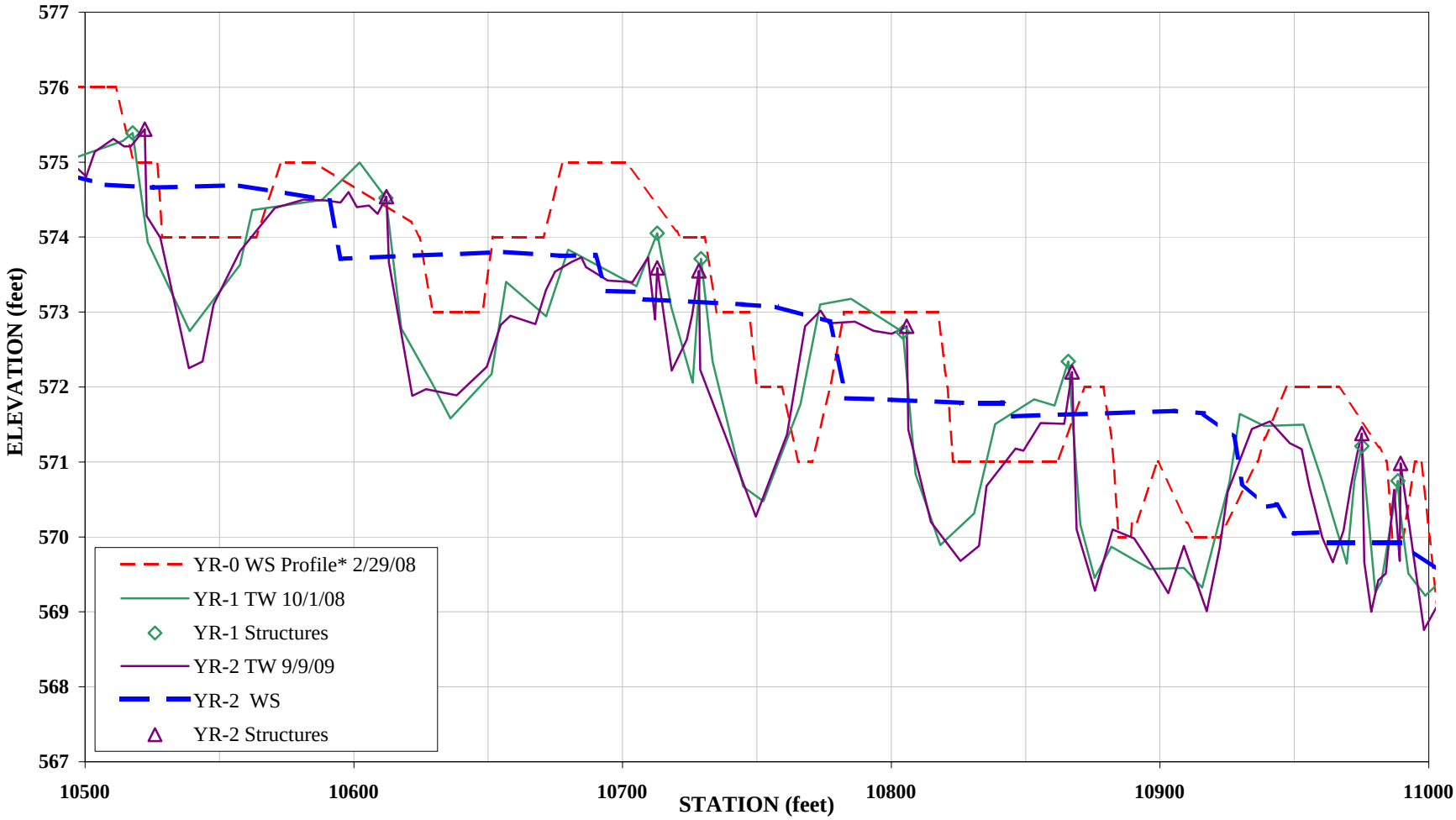
UT to Sandy Creek
Longitudinal Profile
2009 (Year-2) Monitoring



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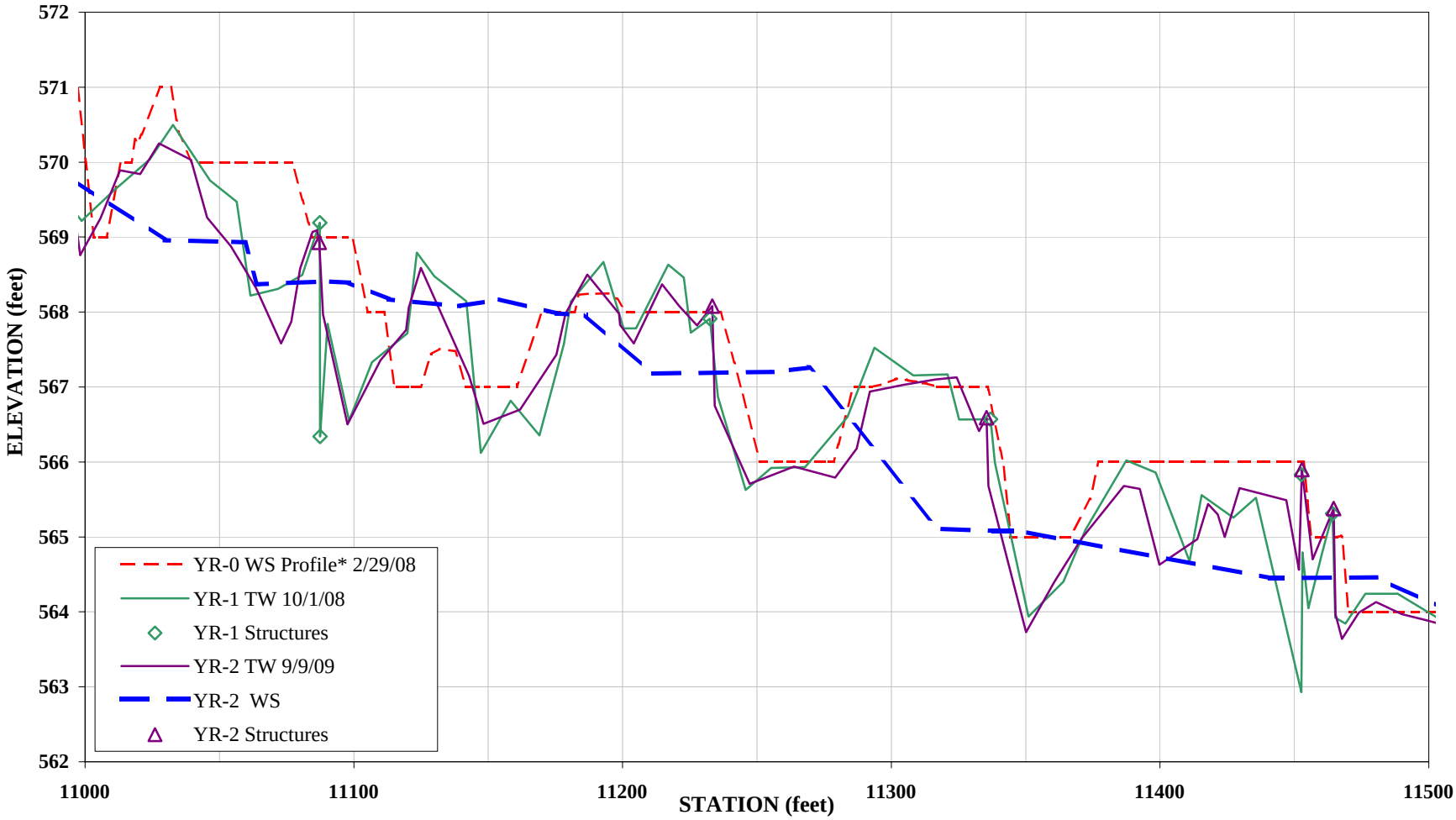
UT to Sandy Creek
Longitudinal Profile
2009 (Year-2) Monitoring



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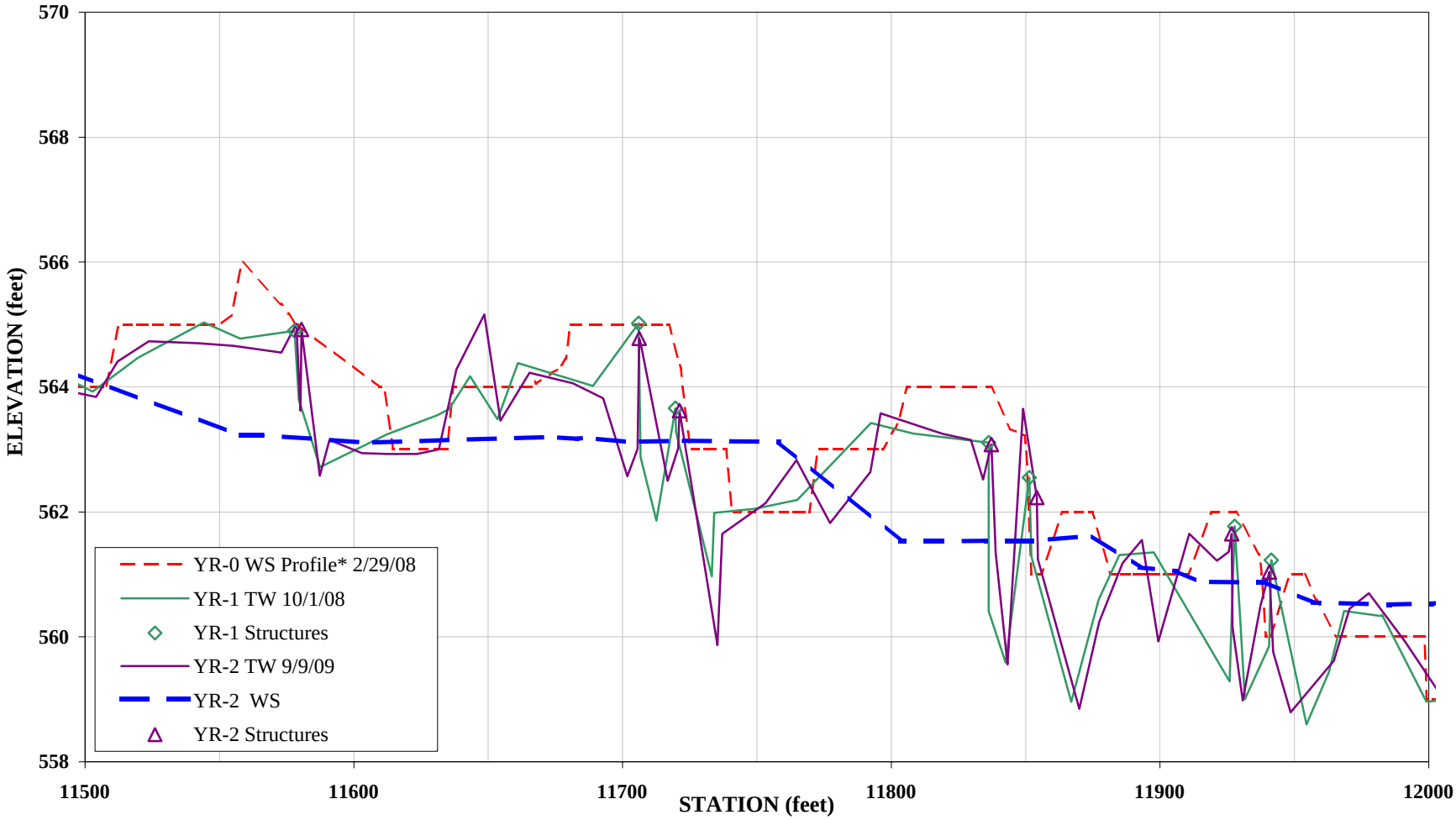
UT to Sandy Creek
Longitudinal Profile
2009 (Year-2) Monitoring



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally. Structures were used as a guide. *Water surface was the only profile data provided. Year-1 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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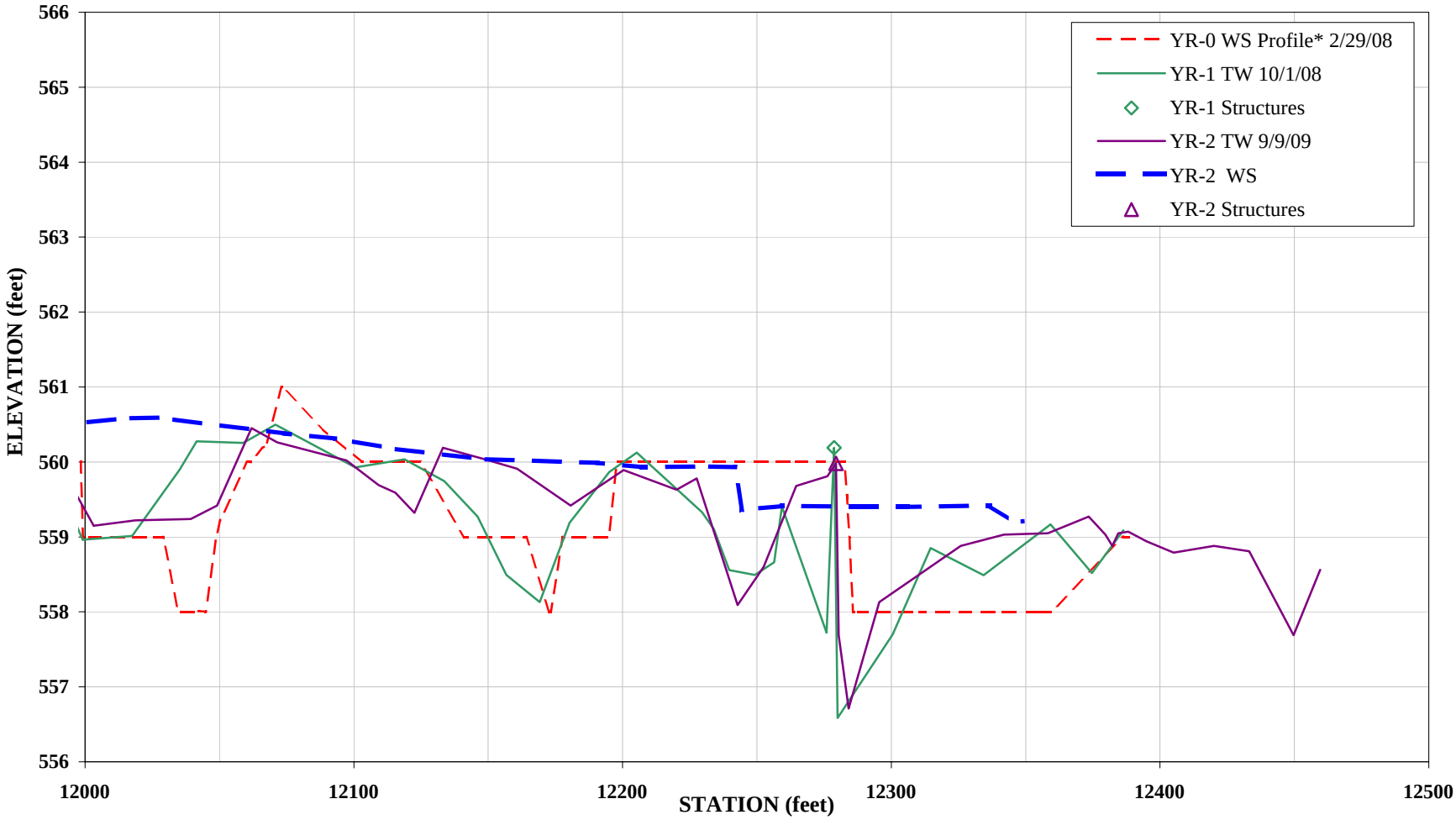
UT to Sandy Creek
Longitudinal Profile
2009 (Year-2) Monitoring



Note: Due to slight differences in thalweg length, longitudinal profile was adjusted horizontally. Structures were used as a guide. *Water surface was the only profile data provided. Year-1 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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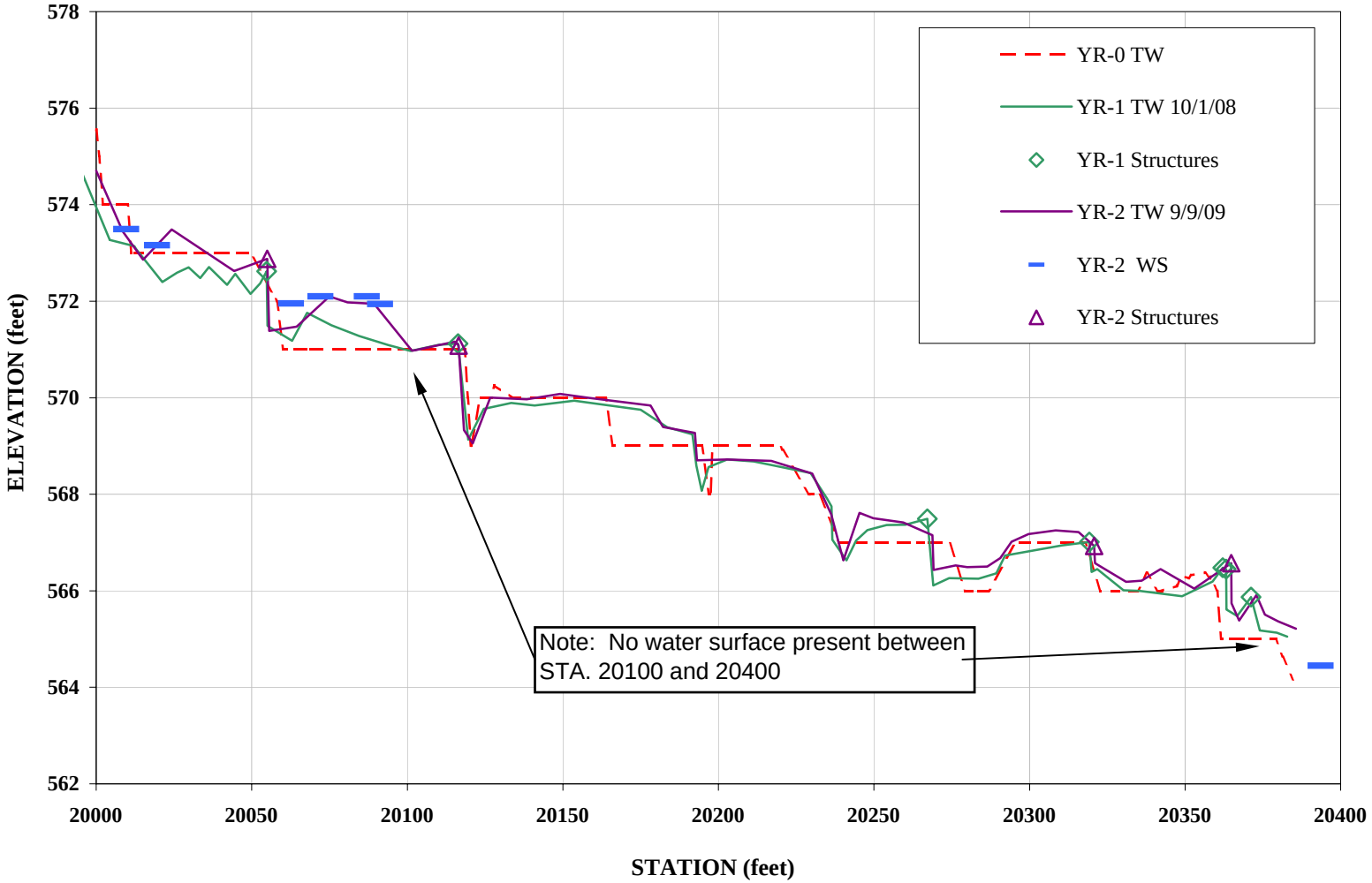
UT to Sandy Creek - Tributary
Longitudinal Profile
2009 (Year-2) Monitoring



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1-YEAR, 2009 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 09/09/2009 to 09/11/2009

CREW BUCHHOLZ/FURRY/PARRISH

UT to Sandy Creek

Overall water surface slope =	0.9%		**DESIGN**	**AVG.**
			Riffle	0.4%
WS sta. start =	10073.38 ft		Run	---
WS sta. end =	12343.93 ft		p-p spacing	62
ELEV. Start =	579.65 ft msl			
ELEV. End =	559.41 ft msl	Results		

	n =	MIN.	MEDIAN.	AVG.	MAX.
Riffle slopes measured =	25	0.0%	0.8%	1.3%	6.2%
Run slopes measured =	20	0.0%	3.1%	4.0%	17.8%
Pools measured =	31	7	71	74	175

Minor Tributary

Overall water surface slope =	1.9%		**DESIGN**	**AVG.**
			Riffle	1.7%
WS sta. start =	20049.74 ft		Run	---
WS sta. end =	20363.85 ft		p-p spacing	46
ELEV. Start =	572.44 ft msl			
ELEV. End =	566.50 ft msl	Results		

	n =	MIN.	MEDIAN.	AVG.	MAX.
Riffle slopes measured =	7	0.3%	0.9%	1.4%	3.6%
Run slopes measured =	5	3.5%	4.2%	7.6%	14.6%
Pools measured =	5	32	52	53	77

All data reported in units of **feet** unless otherwise specified. Elevation data is presented in feet mean sea level.

Feature	Start sta.	End sta.	Length	WS El. Start	WS El. End	Change	Slope
UT to Sandy Creek							
Riffle	10073	10084	11	579.65	579.48	0.17	1.6%
Riffle	10131	10160	29	579.16	578.40	0.76	2.6%
Riffle	10198	10220	22	578.14	578.02	0.12	0.5%
Riffle	10250	10280	30	578.18	578.01	0.17	0.6%
Riffle	10335	10354	19	577.31	577.03	0.28	1.5%
Riffle	10408	10434	26	576.86	576.31	0.55	2.1%
Riffle	10454	10498	44	576.22	575.84	0.38	0.9%
Riffle	10566	10580	14	575.42	575.36	0.06	0.4%
Riffle	10647	10680	34	574.20	574.10	0.10	0.3%
Riffle	10742	10761	19	573.66	573.54	0.12	0.6%
Riffle	10829	10837	8	572.58	572.52	0.06	0.8%
Riffle	10906	10915	9	572.15	571.98	0.17	1.8%
Riffle	11006	11019	14	570.81	569.95	0.86	6.2%
Riffle	11047	11056	9	569.60	569.41	0.19	2.1%
Riffle	11099	11105	7	569.11	569.07	0.04	0.6%
Riffle	11154	11168	15	568.99	568.91	0.08	0.5%
Riffle	11270	11297	27	567.80	567.24	0.56	2.1%
Riffle	11364	11375	11	566.37	566.09	0.28	2.5%

Riffle	11404	11429	26	566.10	566.00	0.10	0.4%
Riffle	11701	11775	74	564.16	563.60	0.56	0.8%
Riffle	11852	11893	41	561.88	561.86	0.02	0.0%
Riffle	11937	11951	14	561.11	561.04	0.07	0.5%
Riffle	12010	12039	29	561.08	560.95	0.13	0.4%
Riffle	12149	12203	54	560.81	560.49	0.32	0.6%
Riffle	12329	12344	15	559.74	559.41	0.33	2.1%

n =	25
MIN =	0.0%
MEDIAN =	0.8%
AVG. =	1.3%
MAX =	6.2%

Minor Tributary

Riffle	20049.74	20057.69	7.95	572.44	572.15	0.29	3.6%
Riffle	20072.82	20106.09	33.27	572.02	571.50	0.52	1.6%
Riffle	20145.91	20180.00	34.09	570.16	569.87	0.29	0.9%
Riffle	20207.78	20234.63	26.85	568.90	568.30	0.60	2.2%
Riffle	20259.04	20272.12	13.08	567.48	567.38	0.10	0.8%
Riffle	20297.10	20315.51	18.41	567.21	567.16	0.06	0.3%
Riffle	20340.34	20363.85	23.51	566.63	566.50	0.13	0.6%

n =	7
MIN =	0.3%
MEDIAN =	0.9%
AVG. =	1.4%
MAX =	3.6%

Feature	Start sta.	End sta.	Length	WS El. Start	WS El. End	Change	Slope
UT to Sandy Creek							
Run	10084	10094	10	579.48	579.28	0.20	2.0%
Run	10160	10162	1	578.40	578.14	0.26	17.8%
Run	10280	10313	33	578.01	577.31	0.70	2.1%
Run	10354	10366	12	577.03	576.86	0.17	1.4%
Run	10434	10454	20	576.31	576.22	0.09	0.4%
Run	10498	10507	9	575.84	575.42	0.42	4.5%
Run	10580	10596	16	575.36	574.20	1.16	7.5%
Run	10680	10693	13	574.10	573.79	0.31	2.4%
Run	10761	10783	23	573.54	572.58	0.96	4.2%
Run	10837	10845	8	572.52	572.15	0.37	4.5%
Run	10915	10930	15	571.98	571.65	0.33	2.3%
Run	10964	10971	7	570.81	570.81	0.00	0.0%
Run	11019	11029	10	569.95	569.60	0.35	3.5%
Run	11056	11064	8	569.41	569.11	0.30	3.7%
Run	11105	11117	12	569.07	569.04	0.03	0.3%
Run	11168	11176	8	568.91	568.11	0.80	10.6%
Run	11297	11313	17	567.24	566.37	0.87	5.2%
Run	11775	11803	28	563.60	562.14	1.46	5.2%
Run	12039	12087	48	560.95	560.81	0.14	0.3%
Run	12203	12209	6	560.49	560.34	0.15	2.6%

n =	20
MIN =	0.0%
MEDIAN =	3.1%
AVG. =	4.0%
MAX =	17.8%

Minor Tributary							
Run	20106	20121	15	571.50	570.86	0.64	4.2%
Run	20180	20197	17	569.87	569.29	0.58	3.5%
Run	20235	20242	7	568.30	567.49	0.81	11.6%
Run	20316	20325	9	567.16	566.79	0.37	3.9%
Run	20364	20368	4	566.50	565.87	0.63	14.6%

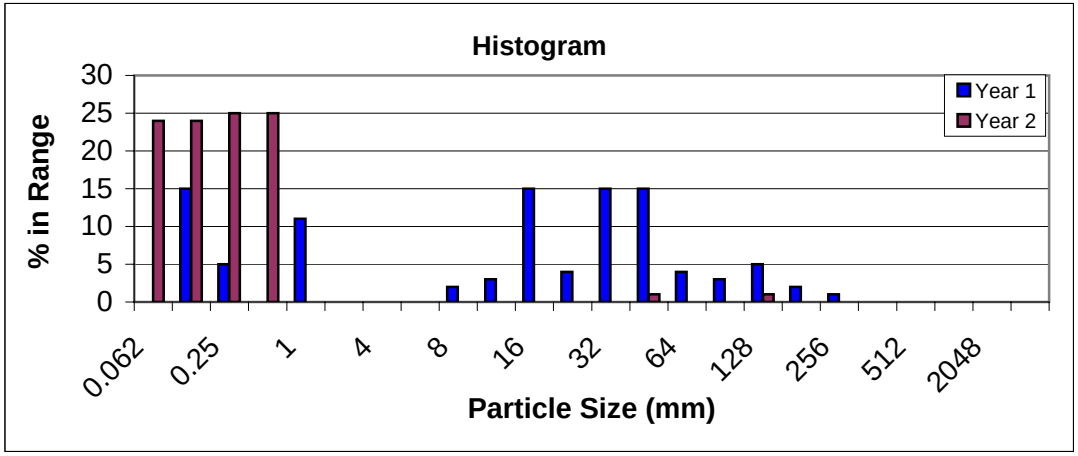
n =	5
MIN =	3.5%
MEDIAN =	4.2%
AVG. =	7.6%
MAX =	14.6%

Feature	Start sta.	End sta.	Length	p-p spacing
Sandy Creek				
Pool	10033	10062	30	
Pool	10095	10114	19	62
Pool	10162	10169	8	67
Pool	10179	10193	14	18
Pool	10220	10243	23	41
Pool	10313	10335	21	93
Pool	10366	10406	40	53
Pool	10507	10546	39	141
Pool	10596	10635	39	89
Pool	10701	10708	7	106
Pool	10709	10742	33	7
Pool	10783	10814	31	75
Pool	10845	10902	57	62
Pool	10930	10944	15	85
Pool	10952	10961	9	22
Pool	11029	11047	18	77
Pool	11064	11095	31	35
Pool	11117	11154	36	53
Pool	11176	11201	25	59
Pool	11211	11259	48	35
Pool	11313	11348	35	102
Pool	11429	11437	7	116
Pool	11441	11453	11	12
Pool	11556	11589	33	115
Pool	11673	11685	12	117
Pool	11803	11817	13	131
Pool	11819	11845	25	16
Pool	11951	12004	53	131
Pool	12126	12149	24	175
Pool	12209	12225	17	83
Pool	12245	12270	25	36

n =	31	
MIN =	7	(p-p spacing)
MEDIAN =	71	
AVG. =	74	
MAX =	175	

Minor Tributary				
Pool	20060	20073	13	
Pool	20121	20130	8	61
Pool	20198	20202	4	77
Pool	20242	20249	8	44
Pool	20274	20294	20	32

n =	5	
MIN =	32	(p-p spacing)
MEDIAN =	52	
AVG. =	53	
MAX =	77	



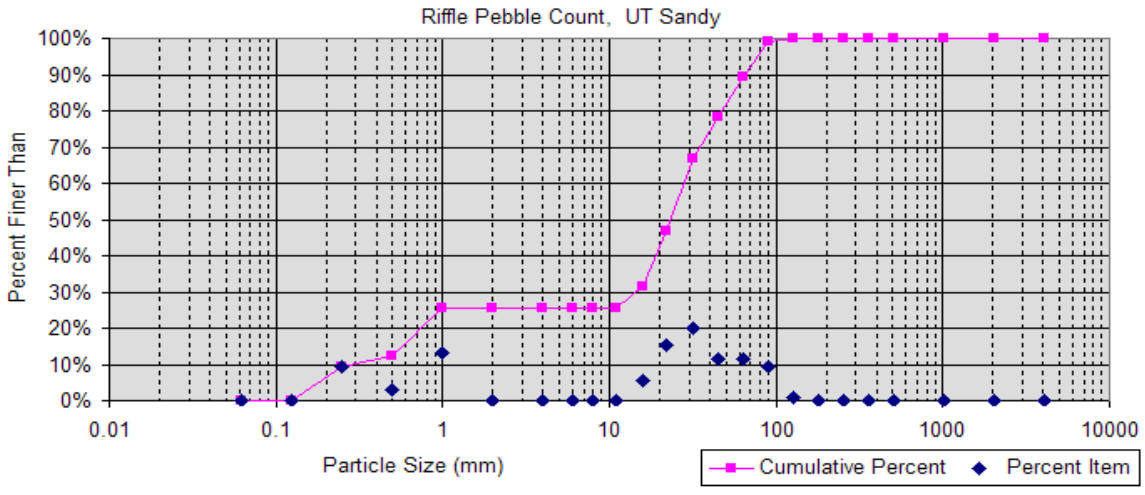
EEP PROJECT ID: 403
CROSS-SECTION: 1 **FEATURE: RIFFLE**

PROJECT UT to SANDY CREEK
TASK PEBBLE COUNT
REACH UT to SANDY CREEK
DATE 09/09/2009 to 09/11/2009
CREW BUCHHOLZ/FURRY/PARRISH

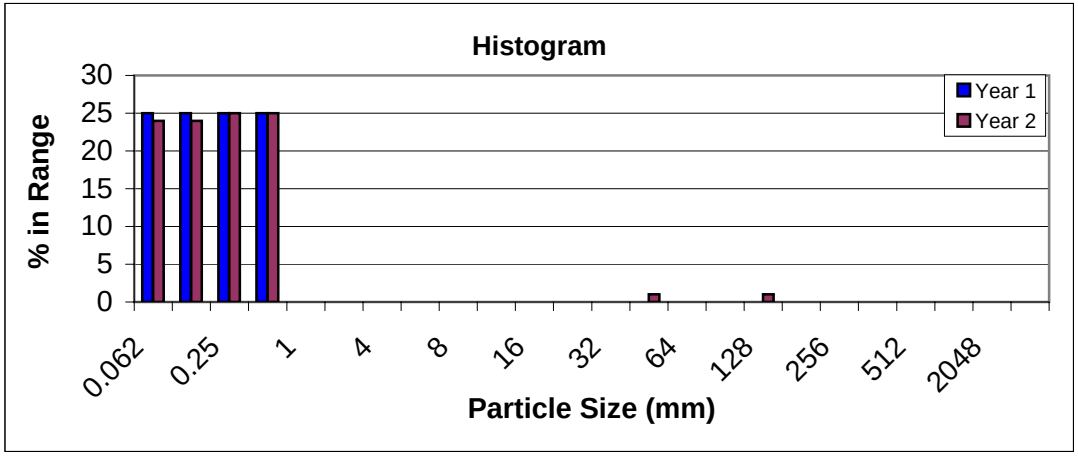
Material	Size Range (mm)		Count
silt/clay	0	0.062	
very fine sand	0.062	0.13	
fine sand	0.13	0.25	10
medium sand	0.25	0.5	3
coarse sand	0.5	1	14
very coarse sand	1	2	
very fine gravel	2	4	
fine gravel	4	6	
fine gravel	6	8	
medium gravel	8	11	
medium gravel	11	16	6
coarse gravel	16	22	16
coarse gravel	22	32	21
very coarse gravel	32	45	12
very coarse gravel	45	64	12
small cobble	64	90	10
medium cobble	90	128	1
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:		105

	UT Sandy

Note:	



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
0.604	17.24	23.4	54	78	0%	26%	64%	10%	0%	0%



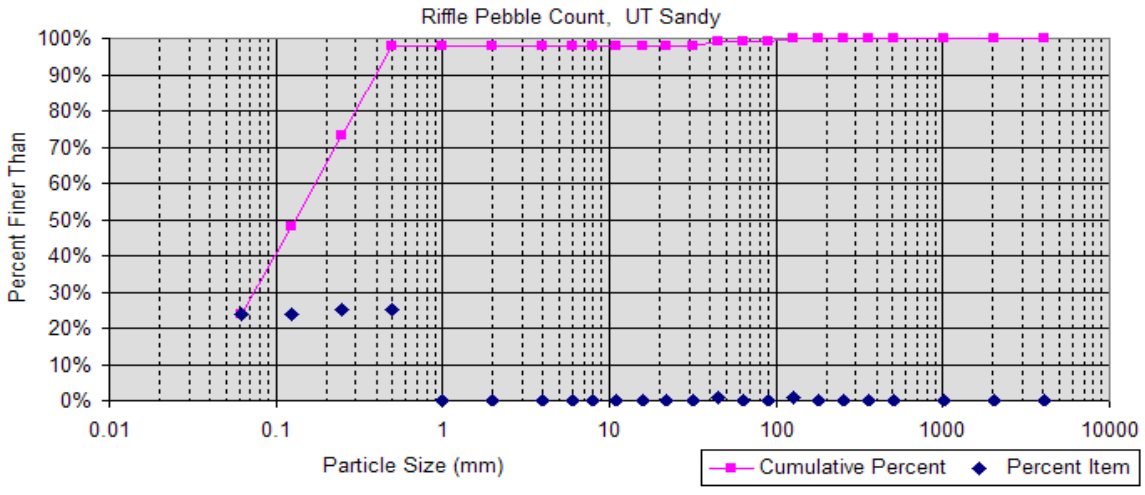
EEP PROJECT ID: 403
CROSS-SECTION: 3 **FEATURE: RIFFLE**

PROJECT UT to SANDY CREEK
TASK PEBBLE COUNT
REACH UT to SANDY CREEK
DATE 09/09/2009 to 09/11/2009
CREW BUCHHOLZ/FURRY/PARRISH

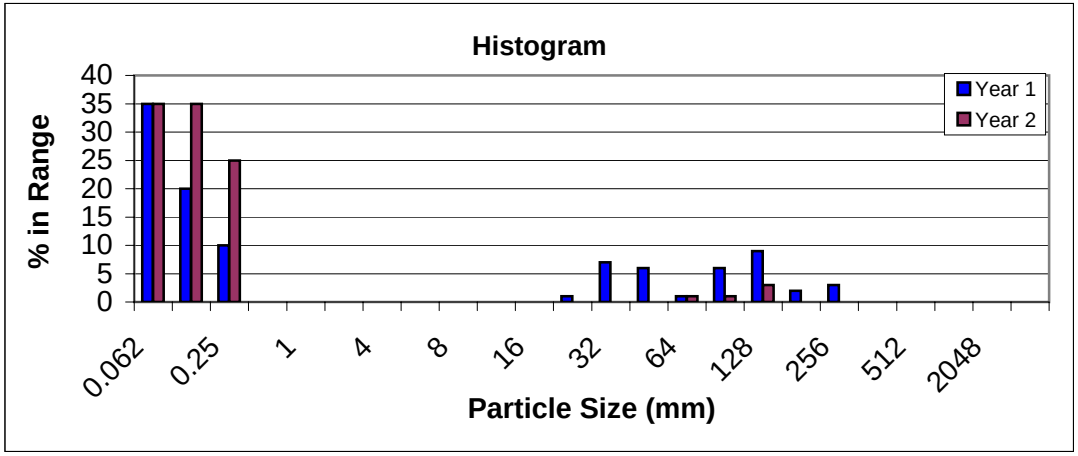
Material	Size Range (mm)		Count
silt/clay	0	0.062	24
very fine sand	0.062	0.13	24
fine sand	0.13	0.25	25
medium sand	0.25	0.5	25
coarse sand	0.5	1	
very coarse sand	1	2	
very fine gravel	2	4	
fine gravel	4	6	
fine gravel	6	8	
medium gravel	8	11	
medium gravel	11	16	
coarse gravel	16	22	
coarse gravel	22	32	
very coarse gravel	32	45	1
very coarse gravel	45	64	
small cobble	64	90	
medium cobble	90	128	1
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

	UT Sandy

Note:	



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
#N/A	0.09	0.1	0	0	24%	74%	1%	1%	0%	0%



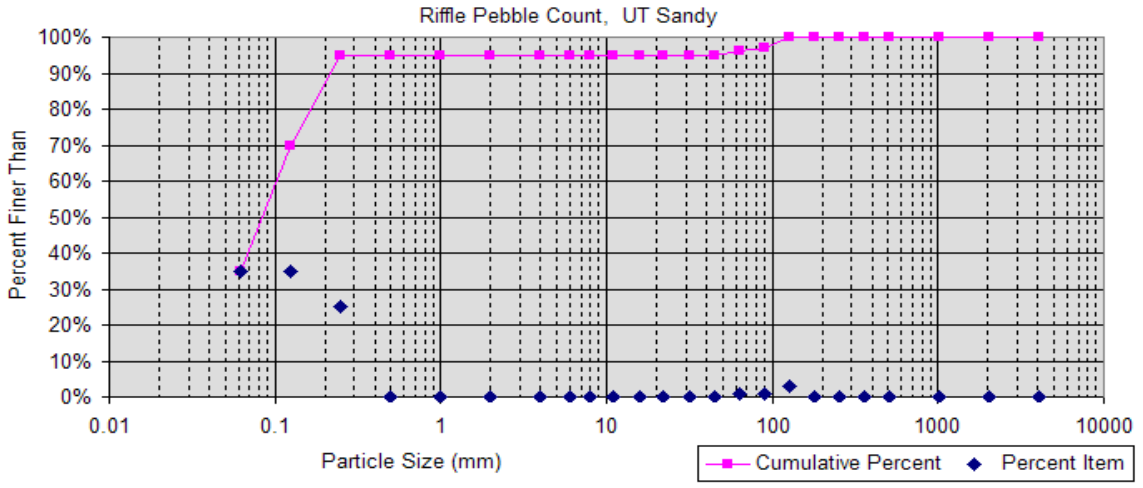
EEP PROJECT ID: 403
CROSS-SECTION: 5 **FEATURE: RIFFLE**

PROJECT UT to SANDY CREEK
TASK PEBBLE COUNT
REACH UT to SANDY CREEK
DATE 09/09/2009 to 09/11/2009
CREW BUCHHOLZ/FURRY/PARRISH

Material	Size Range (mm)		Count
silt/clay	0	0.062	35
very fine sand	0.062	0.13	35
fine sand	0.13	0.25	25
medium sand	0.25	0.5	
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	1
small cobble	64	90	1
medium cobble	90	128	3
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

	UT Sandy

Note:	



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
#N/A	0.06	0.1	0	45	35%	60%	1%	4%	0%	0%

Exhibit Table VIII(a). Baseline Morphology and Hydraulic Summary
UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403
Reach 1: 1,410 Linear Feet

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)						10.8			14.8			12.1			17.3			27.8
Floodprone Width (ft)									130			80			130			110
BF Cross Sectional Area (ft2)						18.4			20.4			17.3			20.0			21.3
BF Mean Depth (ft)						1.4			1.4			1.4			1.1			1.5
BF Max Depth									2.3			2.1			1.6			0.8
Width/Depth Ratio						8			11			9			15			36
Entrenchment Ratio									8.8			6.6			7.5			4.0
Bank Height Ratio									1.0			1.0			1.0			1.0
Wetted Perimeter (ft)																		28.1
Hydraulic radius (ft)																		0.8
Pattern																		
Channel Beltwidth (ft)									13			40			57	30	80	40
Radius of Curvature (ft)						28			30			26			52	22	100	60
Meander Wavelength (ft)						121			80			77	156	242	190	152	258	185
Meander Width ratio									0.9			3.3			3.3	1.1	2.9	1.4
Profile																		
Riffle length (ft)													25	117	54	2	15	4
Riffle slope (ft/ft)									0.011			0.008			0.008	0.050	0.210	0.130
Pool length (ft)													33	83	42	35	50	42
Pool spacing (ft)									65			75			109	81	145	98
Substrate																		
d50 (mm)									0.8				35	76	56			
d84 (mm)																		
Additional Reach Parameters																		
Valley Length (ft)									1000						1085			1102
Channel Length (ft)									1000						1410			1400
Sinuosity									1.0			1.4			1.3			1.3
Water Surface Slope (ft/ft)															0.005			0.010
BF slope (ft/ft)															0.005			0.010
Rosgen Classification						E			E4			E4			C4			C4
*Habitat Index																		
*Macrobenthos																		

*Inclusion will be project specific and determined by As-built monitoring plan/success criteria

Exhibit Table VIII(b). Baseline Morphology and Hydraulic Summary
UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403
Reach II: 886 Linear Feet

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)						10.8			18.6			12.1			17.6			37.0
Floodprone Width (ft)									45			80			80			80
BF Cross Sectional Area (ft2)						18.4			21.2			17.3			20.7			27.5
BF Mean Depth (ft)						1.4			1.1			1.4			1.2			0.7
BF Max Depth									2.2			2.1			1.6			2.3
Width/Depth Ratio						7.7			16.9			8.6			14.9			49.9
Entrenchment Ratio									2.4			6.6			4.5			2.2
Bank Height Ratio									1.7						1.0			1.0
Wetted Perimeter (ft)																		37.9
Hydraulic radius (ft)																		0.7
Pattern																		
Channel Beltwidth (ft)									37			40			58	56	76	66
Radius of Curvature (ft)						28			13			26			53	33	58	43
Meander Wavelength (ft)						121			80			77	158	246	194	190	200	200
Meander Width ratio									2.0			3.3			3.3	1.5	2.1	1.8
Profile																		
Riffle length (ft)													12	83	50	1	16	8
Riffle slope (ft/ft)									0.011			0.008			0.004	0.036	0.145	0.079
Pool length (ft)													50	67	58	10	45	20
Pool spacing (ft)									62			75			111	89	138	116
Substrate																		
d50 (mm)									5				23	46	35			
d84 (mm)																		
Additional Reach Parameters																		
Valley Length (ft)									725						681			699
Channel Length (ft)									870						886			902
Sinuosity									1.2			1.4			1.3			1.3
Water Surface Slope (ft/ft)															0.005			
BF slope (ft/ft)															0.005			
Rosgen Classification						E			C4			E4			C4			C4
*Habitat Index																		
*Macrobenthos																		

*Inclusion will be project specific and determined by As-built monitoring plan/success criteria

Exhibit Table VIII(c). Baseline Morphology and Hydraulic Summary
UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403
Reach III: 384 Linear Feet

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)						10.8			4.7			12.1			7.3			39.5
Floodprone Width (ft)									75			80			180			180
BF Cross Sectional Area (ft2)						18.4			2.2			17.3			3.5			15.5
BF Mean Depth (ft)						1.4			0.7			1.4			0.5			0.4
BF Max Depth									1.8			2.1			0.7			1.4
Width/Depth Ratio						7.7			6.7			8.6			15.2			100.7
Entrenchment Ratio									16.0			6.6			24.7			4.6
Bank Height Ratio									1.6						1.0			1.0
Wetted Perimeter (ft)																		39.8
Hydraulic radius (ft)																		0.4
Pattern																		
Channel Beltwidth (ft)									8			40			24	20	40	30
Radius of Curvature (ft)						28						26			22	16	52	27
Meander Wavelength (ft)						121						77	66	102	80	60	124	80
Meander Width ratio									1.7			3.3			3.3	0.50	1.01	0.75
Profile																		
Riffle length (ft)													15	20	20	2	9	6
Riffle slope (ft/ft)									0.009			0.008			0.017	0.110	0.450	0.150
Pool length (ft)													10	25	21	3	21	14
Pool spacing (ft)												75			46	43	82	77
Substrate																		
d50 (mm)									8				31	69	50			
d84 (mm)																		
Additional Reach Parameters																		
Valley Length (ft)									336						295			319
Channel Length (ft)									340						384			360
Sinuosity									1.0			1.4			1.3			1.1
Water Surface Slope (ft/ft)															0.0124			
BF slope (ft/ft)															0.0124			
Rosgen Classification						E			E5			E4			C4			C4
*Habitat Index																		
*Macrobenthos																		

*Inclusion will be project specific and determined by As-built monitoring plan/success criteria

Exhibit Table IX(a). Morphology and Hydraulic Monitoring Summary
UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403
Reach I: 1,410 Linear Feet

Parameter	Cross Section 1 Riffle						Cross Section 2 Pool					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)	23.0	24.6					25.6	29.8				
Floodprone Width (ft)	100	100					N/A	N/A				
BF Cross Sectional Area (ft2)	19.1	19.5					45.6	25.6				
BF Mean Depth (ft)	0.8	0.8					1.8	0.9				
BF Max Depth (ft)	1.6	1.4					4.1	2.2				
Width/Depth Ratio	>12	>12					>12	>12				
Entrenchment Ratio	>2.2	>2.2					N/A	N/A				
Bank Height Ratio	1.0	1.0					1.0	1.0				
Wetted Perimeter (ft)	23.4	24.8					29.5	31.4				
Hydraulic radius (ft)	0.8	0.8					1.5	0.8				
Substrate												
d50 (mm)	16	23					N/A	N/A				
d84 (mm)	44	54					N/A	N/A				

Parameter	MY-01 (2008)			MY-02 (2009)			MY-03 (2010)			MY-04 (2011)			MY-05 (2012)			MY+ (2013)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	23	79	51	29	80	49												
Radius of Curvature (ft)	19	75	38	29	71	54												
Meander Wavelength (ft)	127	286	187	145	255	183												
Meander Width ratio	1.3	4.4	2.8	1.2	3.2	2.0												
Profile																		
Riffle length (ft)	7	74	19	2	41	15												
Riffle slope (ft/ft)	0.000	0.062	0.008	0.000	0.360	0.029												
Pool length (ft)	7	57	25	5	58	25												
Pool spacing (ft)	7	175	71	14	148	56												
Additional Reach Parameters																		
Valley Length (ft)	1250			1250														
Channel Length (ft)	1400			1400														
Sinuosity	1.1			1.1														
Water Surface Slope (ft/ft)	0.010			0.010														
BF slope (ft/ft)	0.010			0.010														
Rosgen Classification	C4			C4														
Habitat Index*																		
Macrobenthos*																		

Exhibit Table IX(b). Morphology and Hydraulic Monitoring Summary
UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403
Reach II: 886 Linear Feet

Parameter	Cross Section 3 Riffle						Cross Section 4 Pool					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)	15.7	14.8					30.1	50.7				
Floodprone Width (ft)	100	100					N/A	N/A				
BF Cross Sectional Area (ft2)	20.2	18.9					50.3	57.2				
BF Mean Depth (ft)	1.3	1.3					1.7	1.1				
BF Max Depth (ft)	2.4	2.3					4.0	4.2				
Width/Depth Ratio	12.2	11.6					>12	>12				
Entrenchment Ratio	>2.2	>2.2					N/A	N/A				
Bank Height Ratio	1.0	1.0					1.0	1.0				
Wetted Perimeter (ft)	16.8	16.1					31.6	52.5				
Hydraulic radius (ft)	1.2	1.2					1.6	1.1				
Substrate												
d50 (mm)	0.1	0.1					N/A	N/A				
d84 (mm)	N/A	N/A					N/A	N/A				

Parameter	MY-01 (2008)			MY-02 (2009)			MY-03 (2010)			MY-04 (2011)			MY-05 (2012)			MY+ (2013)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	23	79	51	40	78	43												
Radius of Curvature (ft)	19	75	38	36	125	39												
Meander Wavelength (ft)	127	286	187	180	219	194												
Meander Width ratio	1.3	4.4	2.8	2.7	5.3	2.9												
Profile																		
Riffle length (ft)	7	74	19	4	42	10												
Riffle slope (ft/ft)	0.000	0.062	0.008	0.003	0.840	0.033												
Pool length (ft)	7	57	25	10	58	25												
Pool spacing (ft)	7	175	71	18	120	64												
Additional Reach Parameters																		
Valley Length (ft)	853			853														
Channel Length (ft)	956			956														
Sinuosity	1.12			1.12														
Water Surface Slope (ft/ft)	0.010			0.010														
BF slope (ft/ft)	0.007			0.010														
Rosgen Classification	C4			C4														
Habitat Index*																		
Macrobenthos*																		

Exhibit Table IX(c). Morphology and Hydraulic Monitoring Summary
UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403
Reach III: 384 Linear Feet

Parameter	Cross Section 5 Riffle						Cross Section 6 Pool					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)	17.2	13.6					13.6	12.6				
Floodprone Width (ft)	100	100					N/A	N/A				
BF Cross Sectional Area (ft2)	8.4	7.0					12.6	11.0				
BF Mean Depth (ft)	0.5	0.5					0.9	0.9				
BF Max Depth (ft)	1.1	1.0					2.0	1.7				
Width/Depth Ratio	>12	>12					14.6	14.4				
Entrenchment Ratio	>2.2	>2.2					N/A	N/A				
Bank Height Ratio	1.0	1.0					1.0	1.0				
Wetted Perimeter (ft)	19.7	14.8					14.2	13.3				
Hydraulic radius (ft)	0.5	0.5					0.9	0.8				
Substrate												
d50 (mm)	0.1	0.1					N/A	N/A				
d84 (mm)	80	N/A					N/A	N/A				

Parameter	MY-01 (2008)			MY-02 (2009)			MY-03 (2010)			MY-04 (2011)			MY-05 (2012)			MY+ (2013)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	23	79	51	18	40	26												
Radius of Curvature (ft)	19	75	38	9	27	13												
Meander Wavelength (ft)	127	286	187	51	105	71												
Meander Width ratio	1.3	4.4	2.8	1.3	2.9	1.9												
Profile																		
Riffle length (ft)	8	34	24	9	13	11												
Riffle slope (ft/ft)	0.003	0.036	0.009	0.010	0.010	0.011												
Pool length (ft)	4	20	8	8	19	11												
Pool spacing (ft)	32	77	52	50	100	70												
Additional Reach Parameters																		
Valley Length (ft)	336			336														
Channel Length (ft)	387			397														
Sinuosity	1.2			1.2														
Water Surface Slope (ft/ft)	0.060			0.060														
BF slope (ft/ft)	0.019			0.013														
Rosgen Classification	C4			C4														
Habitat Index*																		
Macrobenthos*																		

STREAM PROBLEM AREA 1: SAND BAR LOCATED AT STATION 120+10.

STREAM PROBLEM AREA 2: AGGRADATION AND VEGETATION IN CHANNEL INFLUENCING CHANNEL MORPHOLOGY AT STATION 118+80.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	09-25-09

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STREAM PROBLEM AREA 3: AGGRADATION AND VEGETATION IN CHANNEL INFLUENCING CHANNEL MORPHOLOGY AT STATION 118+25.

STREAM PROBLEM AREA 4: AGGRADATION AND VEGETATION IN CHANNEL INFLUENCING CHANNEL MORPHOLOGY AT STATION 200+00 - 202+00.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	09-25-09

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STREAM PROBLEM AREA 5. SIDE CHANNEL BAR AT STATION 111+70 - 111+80.

STREAM PROBLEM AREA 6. AGGRADATION AND VEGETATION IN CHANNEL INFLUENCING CHANNEL MORPHOLOGY AT STATION 102+25 - 102+40.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	09-28-09

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STREAM PROBLEM AREA 7. ERODING BANKS AT STATION 116+92 - 117+10.

STREAM PROBLEM AREA 8. TRASH IN CHANNEL AT STATION 112+00 IS NO LONGER PRESENT AND HAS WASHED DOWN TO CROSS VANE STATION 115+15 AND TO STATION 119+07.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	09-25-09

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STREAM PROBLEM AREA 9. BOULDER COMING LOOSE AT "A" VANE STA: 116+29.

STREAM PROBLEM AREA 10. EXAMPLE OF TRASH WHICH WAS FORMERLY LOCATED AT STATION 112+00 AND NOW IT HAS WASHED DOWN TO CROSS VANE STATION 115+15 AND TO STATION 119+07 .

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	09-25-09

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Stream Problem Areas Table			
UT to Sandy Creek Stream Restoration Project/EEP Project Number: 403			
Feature Issue	**Station Numbers**	**Suspected Cause**	**Photo Number**
Aggradation/Bar Formation	120+10	Sand Bar at Confluence	SP1
	118+80	Aggradation and Vegetation in Channel Influencing Channel Morphology	SP2
	118+25	Aggradation and Vegetation in Channel Influencing Channel Morphology	SP3
	200+00 - 203+87	Aggradation and Vegetation in Channel Influencing Channel Morphology	SP4
	111+70 - 111+80	Side Channel Bar	SP5
	102+25 - 102+40	Aggradation and Vegetation in Channel Influencing Channel Morphology	SP6
Bank Scour	116+92 - 117+10	Eroding Banks	SP7
Trash in Channel	112+00	Trash in Channel Has Washed Down Stream to Station 115+15 and 119+07.	SP8
	115+15 - 119+07	Trash in Channel	SP10
Engineered structures – back or arm scour Etc.	116+75	Loose Boulder	SP9

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:	09-25-09

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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: 09-28-09	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.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
SCALE:	NTS
DATE:	09-28-09

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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:	09-28-09

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PHOTOGRAPH 9: RIP-RAP FOR WETLAND AREA.

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

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PHOTOGRAPH 11: CROSSING. STA: 104+23.

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

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

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

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PHOTOGRAPH 15: RIP-RAP.

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

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

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

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

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

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

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

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PHOTOGRAPH 23: CROSSING. STA: 111+32.

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

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

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

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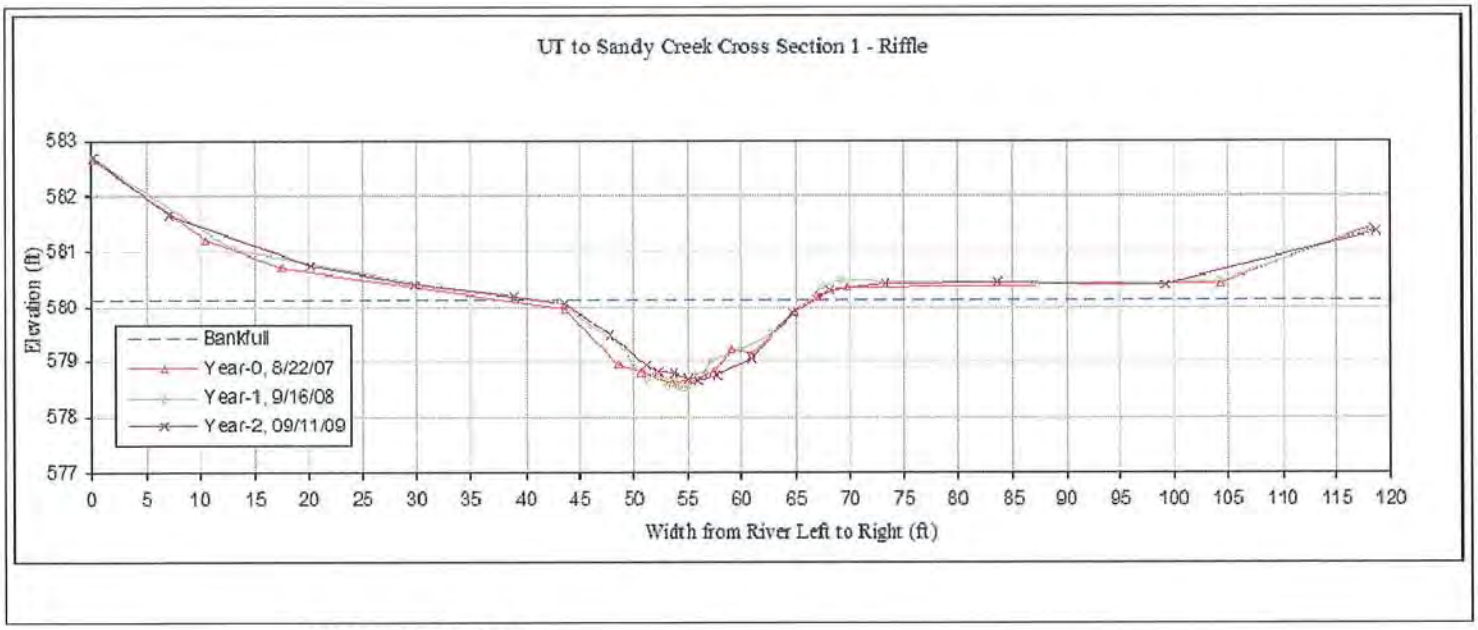
PHOTOGRAPH 47: CROSS SECTION 1 LOOKING AT THE SUBSTRATE COMPOSITION.



CROSS SECTION 1

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PHOTOGRAPH 48: CROSS SECETION 2 LOOKING UPSTREAM.

PHOTOGRAPH 49: CROSS SECTION 2 LOOKING DOWNSTREAM.

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FILENAME:	EEP08030X.DWG
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PHOTOGRAPH 50: CROSS SECTION 2 LOOKING AT THE LEFT BANK.

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

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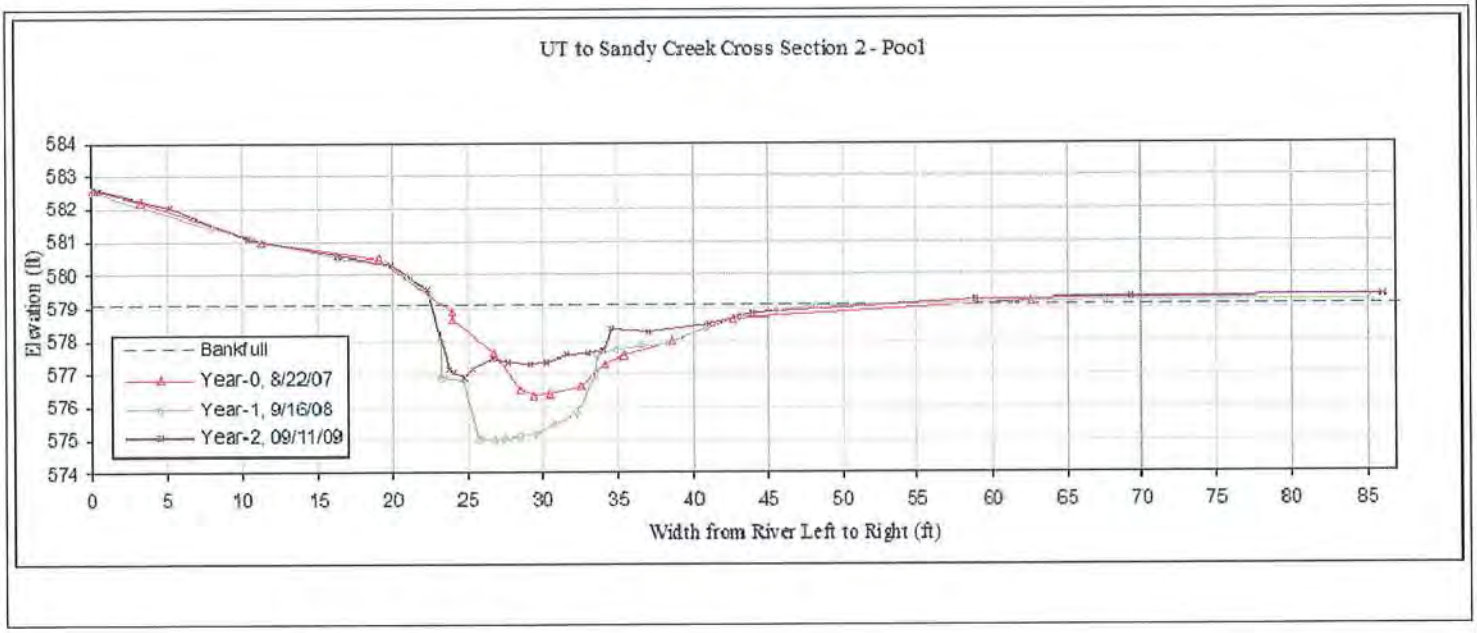
PHOTOGRAPH 52: CROSS SECTION 2 LOOKING AT THE SUBSTRATE COMPOSITION.



CROSS SECTION 2

PROJECT NO.	EEP-08030
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PHOTOGRAPH 53: CROSS SEECTION 3 LOOKING UPSTREAM.

PHOTOGRAPH 54: CROSS SECTION 3 LOOKING DOWNSTREAM.

PROJECT NO.	EEP-08030
FILENAME:	EEP08030X.DWG
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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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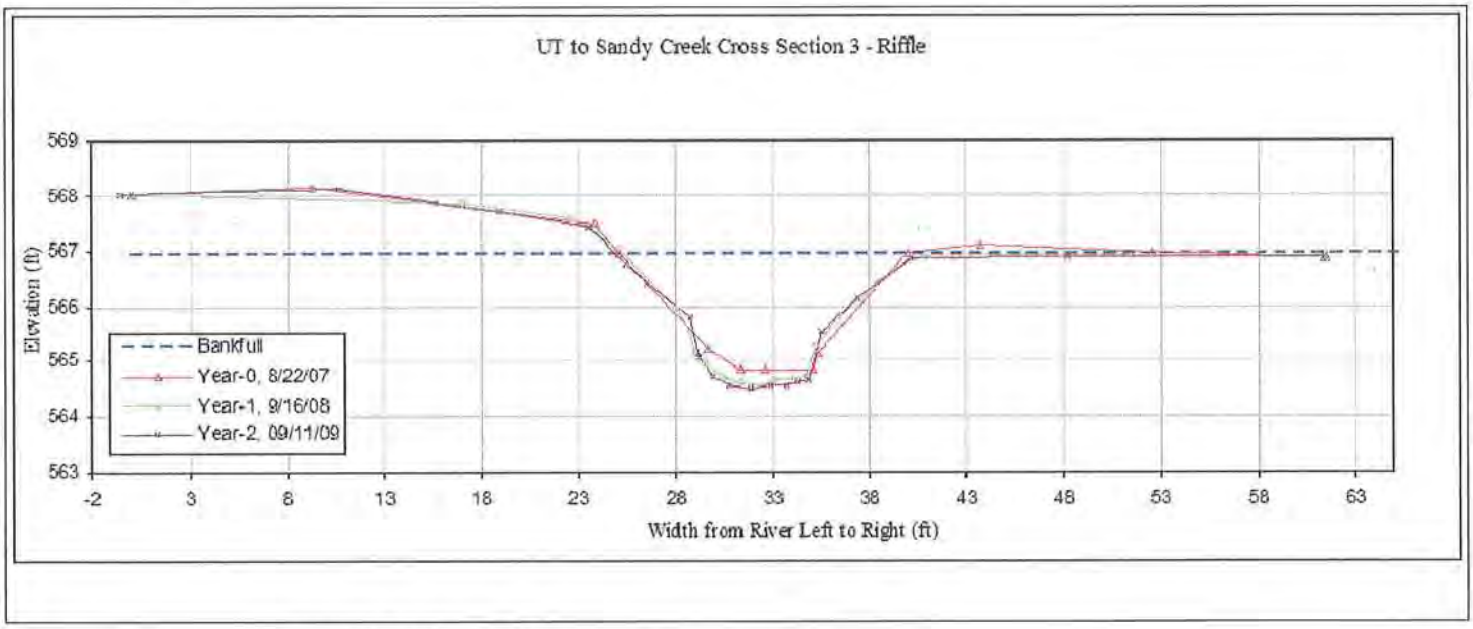
PHOTOGRAPH 57: CROSS SECTION 3 LOOKING AT THE SUBSTRATE COMPOSITION.



CROSS SECTION 3

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PHOTOGRAPH 58: CROSS SECTION 4 LOOKING UPSTREAM.

PHOTOGRAPH 59: CROSS SECTION 4 LOOKING DOWNSTREAM.

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

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

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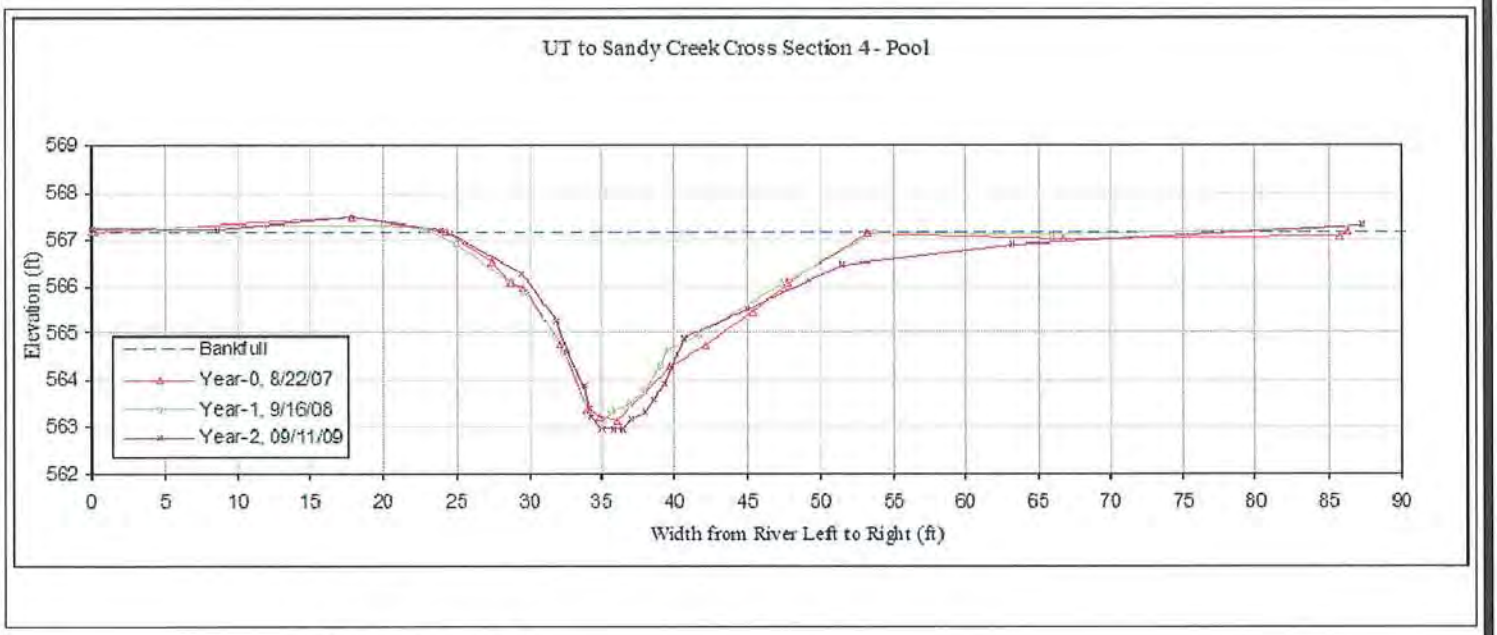
PHOTOGRAPH 62: CROSS SECTION 4 LOOKING AT THE SUBSTRATE COMPOSITION.



CROSS SECTION 4

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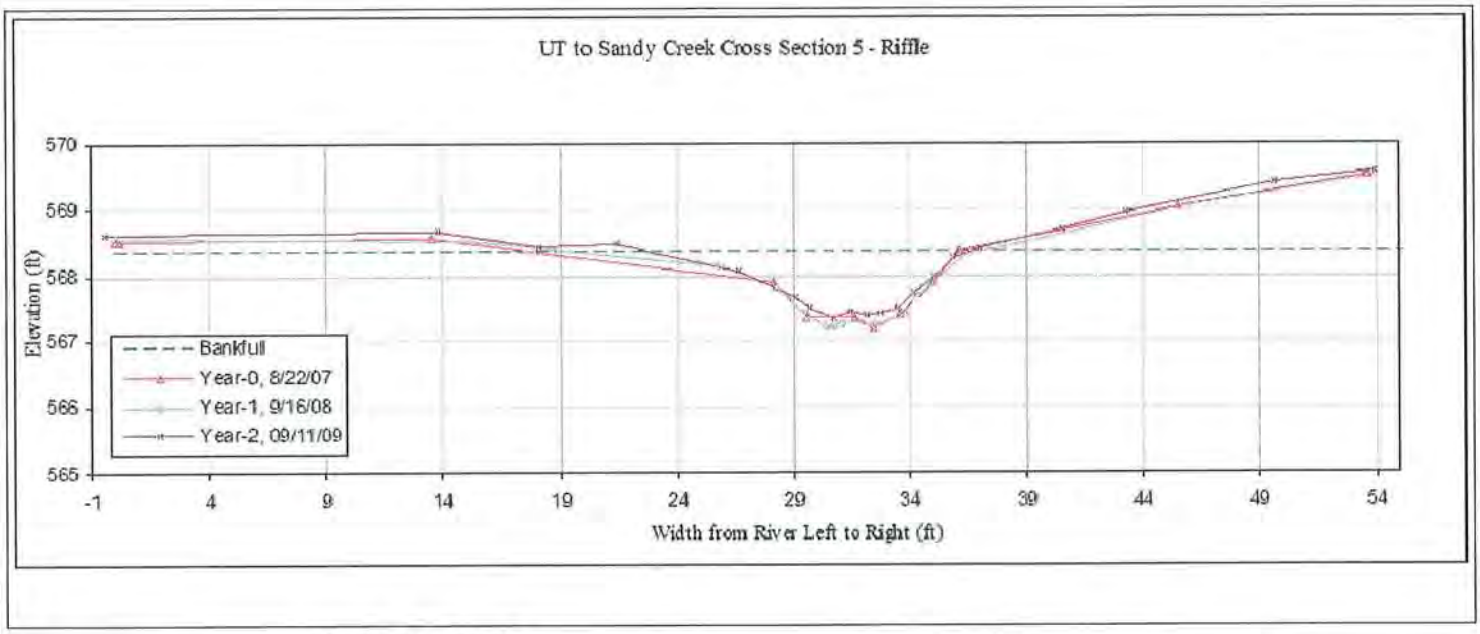
PHOTOGRAPH 67: CROSS SECTION 5 LOOKING AT THE SUBSTRATE COMPOSITION.



CROSS SECTION 5

PROJECT NO.	EEP-08030
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PHOTOGRAPH 68. CROSS SECTION 6 LOOKING UPSTREAM.

PHOTOGRAPH 69: CROSS SECTION 6 LOOKING DOWNSTREAM.

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

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

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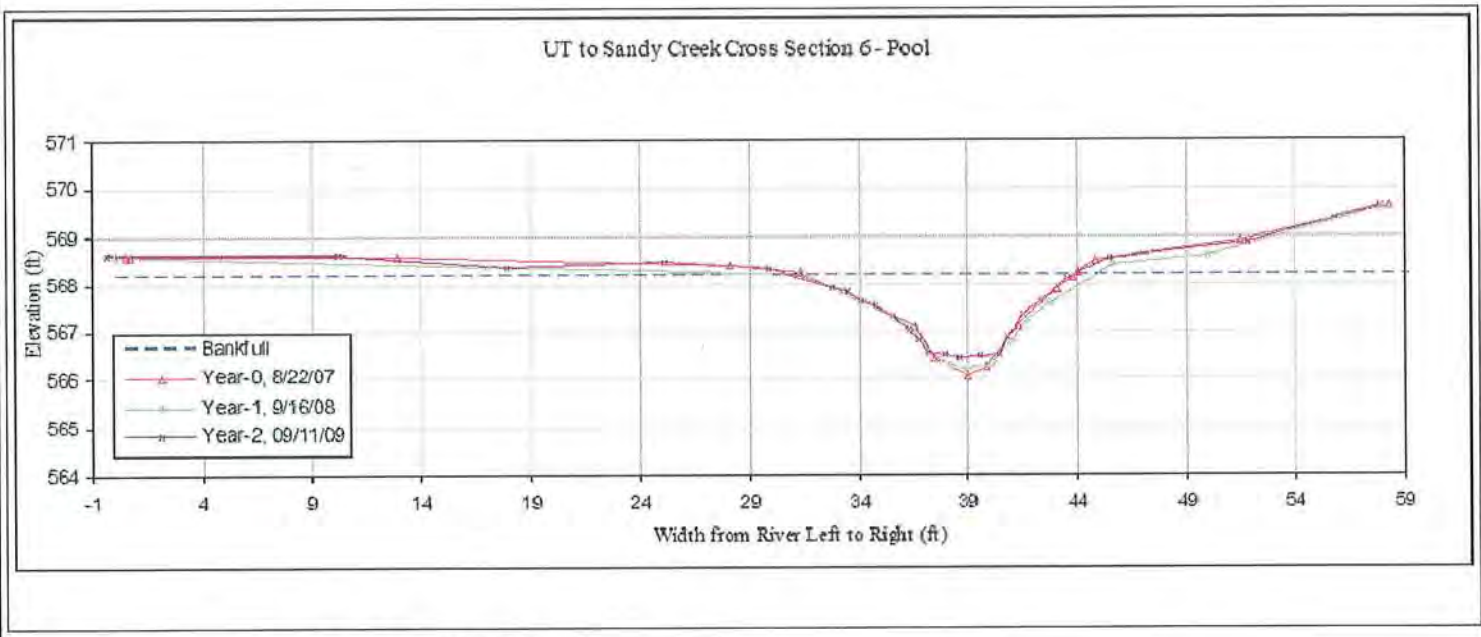
PHOTOGRAPH 72: CROSS SECTION 6 LOOKING AT THE SUBSTRATE COMPOSITION.



CROSS SECTION 6

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PHOTOGRAPH 73: VEGETATION PLOT 1.

PHOTOGRAPH 74: VEGETATION PLOT 2.

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PHOTOGRAPH 75: VEGETATION PLOT 3.

PHOTOGRAPH 76: VEGETATION PLOT 4.

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PHOTOGRAPH 77: VEGETATION PLOT 5.

PHOTOGRAPH 78: VEGETATION PLOT 6.

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PHOTOGRAPH 79: VIEW OF FLOODPLAIN LOOKING DOWNSTREAM.

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