UT to Little Coharie Creek (Roseboro Site)
Stream Restoration Project
Sampson County
North Carolina

CU: 030030006
DENR Contract No. 004578
EEP Project No. 314

Monitoring Year 5 of 5
Data Collection: May through November 2013
Submission Date: November 27, 2013

Prepared for:

North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
217 West Jones Street, Suite 3000A
Raleigh, NC 27603

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Prepared by:

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Raleigh, NC 27609

2.0 Table of Contents

3.0 Executive Summary/Project Abstract

Project goals and objectives for the UT to Little Coharie Creek (Roseboro Site) Stream Restoration Project included:

Goal – Improve Water Quality

i. Objective – Reduce nutrients entering the stream from livestock by fencing the conservation easement.
ii. Objective – Reduce nutrient loads by planting a native riparian buffer.
iii. Objective – Reduce water quality impacts from the adjacent aging sewer line by relocating the line and manholes away from the restored stream channel.

Goal - Improve Aquatic and Terrestrial Habitat

i. Objective – Enhance instream habitat with woody debris and deep pools.
ii. Objective – Construct a stable stream system that adequately conveys water and sediment.
iii. Objective – Restore the riparian buffer by planting native species.

Goal – Reduce Erosion and Sedimentation

i. Objective – Construct a stable stream system that adequately conveys water and sediment.
ii. Objective – Restore the riparian buffer.
iii. Objective – Establishment of a fenced conservation easement so that livestock does not enter the stream or the repaired riparian buffer.

The UT to Little Coharie Stream and Buffer Restoration Project restored and enhanced 2,330 feet of unnamed tributaries (UT's) to Little Coharie Creek and its riparian areas. The project is divided into two (2) stream reaches; the Main Reach and the Northern Reach. The Main Reach consists of 1,630 feet of stream restoration while the Northern reach totals 700 feet of stream enhancement.

Seven (7) permanent vegetation plots were established and used in annual vegetation monitoring. Vegetation plots VP3, VP4, and VP6 exceed the minimum success requirements. Vegetation monitoring plots VP1, VP2, VP5, and VP7 fall below the minimum success requirements. By visual observation, a majority of the site is diverse and numerous of planted stems species. For 2013, MY5, the vegetation monitoring identified stem counts below the minimum success criteria for MY5 resulting in an average density of 240 planted stems per acre for the entire site. The vegetative success criteria based on the US Army Corps of Engineers Stream Mitigation Guidelines (USACE, 2003) will require the survival of 260 planted woody stems per acre at the end of the year 5 monitoring period. UT to Little Coharie Creek utilizes a CVS Level 2 protocol for vegetation data collection. This protocol does include volunteer stems during data collection. For vegetation success criteria, only the planted stems are used to determine stems per acre. Vegetation plot locations are identified in Appendix C. Invasive vegetation species Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), mimosa (*Mimosa sp.*), kudzu (*Pueraria lobata),* and Asiatic daylily (*Commelina communis*) have been identified onsite and the location of each are depicted in Figure 2. Multiflora rose (*Rosa multiflora*) and fescue (*Festuca sp.*) have also been identified onsite. Supplemental planting for UT to Little Coharie will be completed in December 2013 and during early 2014, the site will be treated for invasive vegation.

Overall, the stream is functioning well and holding grade, however, the stream has areas that are of concern. Channel dimension and pattern are similar to as-built conditions and currently meeting monitoring minimum success requirement thresholds. The Main Reach channel profile is holding grade and maintaining bedform features. Due to sediment influx from upstream and offsite, there has been some aggradation of sediment in the upstream section of the Main Reach. Specifically, station 10+00 to 300+00.

The Northern Reach channel profile has areas that appear to have sediment deposition also. This sediment deposition may be caused by vegetation growing within the bankfull channel. Asiatic daylily and cattail are growing within the stream bed, causing disruption of sediment transport on parts of the project..

In the Winter/Spring of 2011, a wild fire from an adjacent land parcel to the north of the Northern Tributary, caused damage to planted areas as well as easement fencing west of vegetation plot 6. Site damage was minimal and repairs to easement fencing were completed during 2012.

Wetland restoration or enhancement was not a part of the UT to Little Coharie Creek (Roseboro Site) Stream Restoration Site therefore no wetland monitoring is required.

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 EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

4.0 Methodology

Vegetative sample plots were quantitatively monitored during the growing season. Seven (7) 100m^2 plots were established for site monitoring. Species composition, density, vigor and survival were all monitored. Each plot corner is permanently located with rebar. Year 5 vegetation monitoring was completed in June 2013 utilizing the Carolina Vegetation Survey (CVS) – EEP protocol Level 2 (version 4.1).

Stream monitoring was completed by utilizing total station survey along with Rosgen Level II techniques to determine stream stability and performance. The annual cross-sectional survey included points surveyed at breaks in slope, including bankfull, inner berm, edge of water, and thalweg, if features were present. Longitudinal profile survey was conducted for the entire length of the restored channel for stream reaches. Measurements included thalweg, water surface, and bankfull. Existing onsite benchmarks were used for survey control.

Photo monitoring was conducted by walking each stream reach and taking photos at each predetermined photo point location using a digital camera.

5.0 References

Harrelson, C.C., C.L. Rawlins and J.P. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. United States Department of Agriculture, Fort Collins, CO.

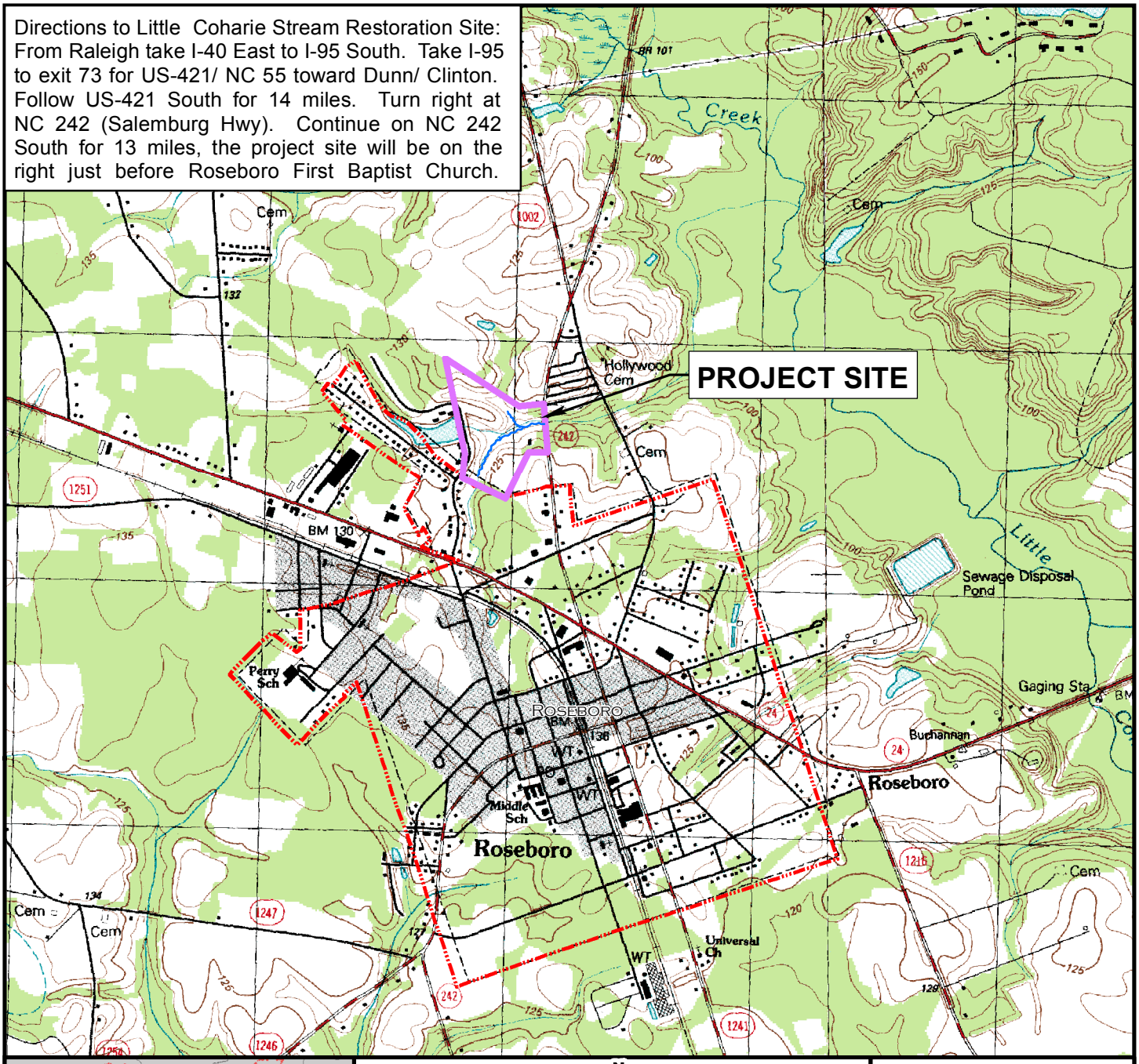
NCEEP. 2006. Content, Format and Data Requirements for EEP Monitoring Reports. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 1.2 November 16, 2006.

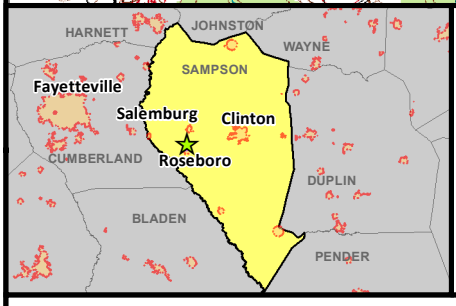
Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO.

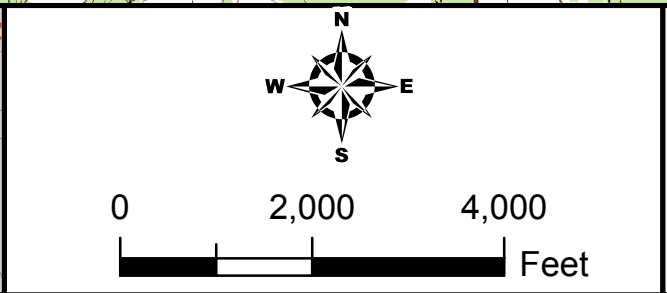
6.0 Appendices for Project Background, Condition and Performance Data

APPENDIX A

Directions to Little Coharie Stream Restoration Site: From Raleigh take I-40 East to I-95 South. Take I-95 to exit 73 for US-421/ NC 55 toward Dunn/ Clinton. Follow US-421 South for 14 miles. Turn right at NC 242 (Salemburg Hwy). Continue on NC 242 South for 13 miles, the project site will be on the right just before Roseboro First Baptist Church.







Ecosystem Enhancement Program

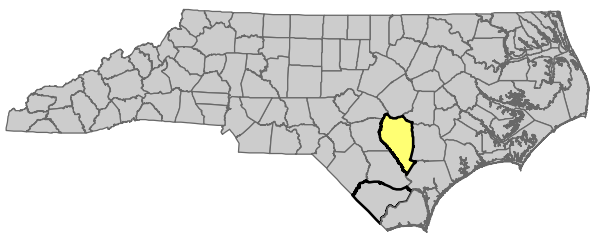


FIGURE 1

Site Location Map

UT to Little Coharie Stream Restoration Project
EEP No. 341
Sampson County, North Carolina
November 2013

Table 1. Project Components and Mitigation Credits
UT to Little Coharie (Roseboro Site) Stream Restoration Project - EEP Project No. 314

Mitigation Credits

	Stream (LF)		Riparian Wetland (acres)		Non-Riparian Wetland (acres)		Buffer (acres)	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	1,590*	280							

Project Components

Project Component	Stationing/Location	Existing Footage/Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
Main	10+00 to 23+00		Priority 1	1300 LF		1:1
North	10+00 to 13+30		Priority 1	330LF		1:1
North	700 feet upstream of 10+00 ending at 10+00		Stream Enhancement Level II	700 LF		2.5:1

Component Summation

Restoration Level	Stream (Linear Feet)	Riparian Wetland (acres)	Non-riparian Wetland (acres)	Buffer (acres)	Upland (acres)
Restoration	1,630				
Stream Enhancement Level II	700				

*Forty (40) LF removed from mitigation credits due to ford stream crossings.

Table 2. Project Activity and Reporting History
UT to Little Coharie (Roseboro Site) Stream Restoration Project - EEP Project No. 314

Activity or Report	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	May 2005	June 2005
Final Design - 90%	NA	May 2005
Construction	NA	4/26/07 to 4/3/08
Temporary S&E mix applied to entire project area	NA	FEB 2008
Permanent seed mix applied to entire project area	NA	FEB 2008
Containerized and B&B plantings	NA	FEB 2008
Mitigation Plan / As-built (Year 0 Monitoring - baseline)	Dec 2009	March 2010
Year 1 Monitoring	August 2009	March 1, 2010
Year 2 Monitoring	Oct 2010	Nov 2010
Year 3 Monitoring	October 2011	October 2011
Year 4 Monitoring	November 2012	November 2012
Year 5 Monitoring	October 2013	November 2013

Table 3. Project Contacts Table UT to Little Coharie (Roseboro Site) Stream Restoration Project (EEP #314)	
Designer Primary project design POC	HSMM, Inc. 1305 Navaho Drive Raleigh, NC 27609 N/A
Construction Contractor Construction contractor POC	Shamrock Environmental Corp. 6106 Corprate Park Drive Browns Summit, NC 27214 N/A
Planting Contractor Planting POC	Habitat Assessment and Restoration Program, Inc. 9305-D Monroe Road Charlotte, NC 28270 N/A
Seeding Contractor Planting POC Seed Mix Sources Nursery Stock Suppliers	Seal Brothers Contracting, LLC 3618 West Pine Street. Mount Airy, NC 27030 N/A Contact Shamrock Environmental Corp. Contact Shamrock Environmental Corp.
Monitoring Performers (MY1, MY2, MY3, MY4)	Rummel, Klepper, and Kahl, LLP. 900 Ridgefield Drive Suite 350 Raleigh, NC 27609
Stream Monitoring POC Vegetation Monitoring POC Wetland Monitoring POC	Pete Stafford (919)878-9560 Pete Stafford (919)878-9560 N/A

Table 4. Project Baseline Information and Attributes UT to Little Coharie Stream (Roseboro Site) Restoration Project - EEP Project No. 314			
Project Information			
Project Name	UT to Little Coharie		
Project County	Sampson		
Project Area	5.3 acres		
Project Coordinates (Lat and Long)	34.963423,-78.514199		
Project Watershed Summary Information			
Physiographic Region	Coastal Plain		
River Basin	Cape Fear		
USGS HUC 8 Digit 03030006	USGS HUC 14 Digit 03030006080030		
NCDWQ Subbasin	03-06-19		
Project Drainage Area	0.19 sq. miles		
Project Drainage impervious cover estimate (%)	< 5 percent		
CGIA Land Use Classification			
Reach Summary Information			
Parameters	Main Reach	Northern Reach	
Length of Reach	1300	1030	
Valley Classification			
Drainage Area	0.7	0.12	
NCDWQ Stream Identification Score			
NCDWQ Water Quality Classification	C, SW	C, SW	
Morphological Description (stream type)	C5	C5	
Evolutionary Trend			
Underlying Mapped Soils	Aycock, Bibb, and Johnston		
Drainage Class	Moderately drained to poorly drained		
Soil Hydric Status	Aycock – No, Bibb – Yes, Johnston - Yes		
Slope	0.7	0.86	
FEMA Classification			
Native Vegetation Community			
Percent Composition Exotic Invasive Vegetation			
Wetland Summary Information			
There are no delineated or restored wetlands as part of this project.			
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States – Section 404	Yes	Yes	Upon Request
Waters of the United States – Section 401	Yes	Yes	Upon Request
Endangered Species Act	Yes	Yes	Upon Request
Historic Preservation Act	Yes	Yes	Upon Request
Coastal Zone Management Act (CZMA) Coastal Area Management Act (CAMA)	No		
FEMA Floodplain Compliance	Yes	Yes	Upon Request
Essential Fisheries Habitat	No		

APPENDIX B

2013
Current Conditions Plan View

UT to Little Coharie
(Roseboro Site)
Stream Restoration Project
EEP No. 314
Sampson County, North Carolina

Legend

- Original Stream Thalweg
- Restored Stream Thalweg
- Cross Section
- Sediment Aggradation
- Location of Japanese honeysuckle
- Location of kudzu
- Location of Asiatic dayflower
- Location of Chinese privet
- Location of mimosa
- Location of multiflora rose
- Log Vane (Bank Stability)
- Log Cross Vane (Grade Control)
- Rootwad
- Photo Station

Vegetation Monitoring Counts

- Less Than 260 Stems per Acre
- More Than 260 Stems per Acre

0 50 100 200 300 Feet

Ecosystem Enhancement Program

November 2013

Table 5 - Visual Stream Morphological Stability Assessment
Reach ID - Main
Assessed Length – 1630 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. Sediment Deposition			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	23	26			88%			
	3. Meander Pool Condition	1. Depth	23	26			88%			
		2. Length	23	26			88%			
	4. Thalweg Condition	1. Thalweg at upstream of meander bend	NA	NA			NA			
		2. Thalweg centering at downstream of meander	NA	NA			NA			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging			0	0	100%			100%
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%			100%
				Totals	0	0	100%			100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	14	14			100%			
	2. Grade Control	Grade Control exhibiting maintenance of grade across the sill	0	0			0%			
	2a. Piping	Structures Lacking any substantial flow underneath sills or arms	0	0			0%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	14	14			100%			
	4. Habitat	Pool forming structures maintaining – Max Pool Depth: Mean Bankfull Depth Ratio $\geq$ 1.6 Rootwads/logs providing some cover at base flow.	0	0			0%			

Table 5 - Visual Stream Morphological Stability Assessment
Reach ID - North
Assessed Length – 700 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. Sediment Deposition			1	75	89.24%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	7	10			70%			
	3. Meander Pool Condition	1. Depth	7	10			70%			
		2. Length	7	10			70%			
	4. Thalweg Condition	1. Thalweg at upstream of meander bend	NA	NA			NA			
		2. Thalweg centering at downstream of meander	NA	NA			NA			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging			0	0	100%			100%
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%			100%
				Totals	0	0	100%			100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	7	7			100%			
	2. Grade Control	Grade Control exhibiting maintenance of grade across the sill	4	4			100%			
	2a. Piping	Structures Lacking any substantial flow underneath sills or arms	0	0			0%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	7	7			100%			
	4. Habitat	Pool forming structures maintaining – Max Pool Depth: Mean Bankfull Depth Ratio $\geq$ 1.6 Rootwads/logs providing some cover at base flow.	4	4			100%			

Table 6 – Vegetation Condition Assessment

Planted Acreage – 5 acres

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	No bare areas located onsite	NA	NA	NA	No bare areas located onsite
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria	100 m^2 0.0247 acre	RED	4	.2 acre	4%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year	100 m^2 0.0247 acre	RED	4	.2 acre	4%

Easement Acreage – 5 acres

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons on map scale)	Individual Stem	See CCPV Legend	NA – Individual stems displayed on CCPV	Individual Stems GPS located – See CCPV	Individual Stems GPS located – See CCPV
2. Easement Encroachment Areas	Areas or points (if too small to render as polygons on map scale)	none	See CCPV Legend	NA	NA	NA

Stream Problem Areas UT to Little Coharie Stream Restoration Project - EEP No. 314			
Feature Issue	**Station Number**	**Suspected Cause**	**Photo Number**
Aggradation	Main 10+00 to 300+00	Sediment influx from upstream and offsite	Cross Section 1 - 3
Aggradation	Northern 11+40 to 12+15	Trapped Sediment/Low Flow	Figure 2

Vegetation Problem Areas UT to Little Coharie Stream Restoration Project - EEP No. 314			
Feature Category	**Station Number**	**Suspected Cause**	**Photo Number**
Cattail	Throughout	Low Flow Conditions	Figure 2
Invasive Vegetation	Various, Refer to Figure to for Location	Offsite seed source	VPA1

Stream Photo Station Photos (all photos recorded on April 18, 2013)

1 - Main Reach Station 0+50 – Looking upstream

2 - Main Reach Station 0+50 – Looking downstream

3 - Main Reach Station 6+50 – Looking upstream

4 - Main Reach Station 6+50 – Looking downstream

5 - Main Reach Station 9+00 – Looking to Northern Reach confluence

6 - Main Reach Station 10+50 – Stream Crossing

7 - Main Reach Station 10+50 – Looking Downstream

8 - Main Reach Station 12+50 – Looking upstream

9 - Main Reach Station 12+50 – Looking downstream (End of Main Reach)

10 - Northern Reach Station 0+50 – Looking upstream

11 - Northern Reach Station 0+50 – Looking downstream

12 - Northern Reach Station 2+00 – Looking downstream

Vegetation Monitoring Plot Photos (all photos recorded on November 18, 2013)

Vegetation Plot 1

Vegetation Plot 2

Vegetation Plot 3

Vegetation Plot 4

Vegetation Plot 5

Vegetation Plot 6

Vegetation Plot 7

Vegetation Problem Areas Photos

VPA1 – Kudzu Encroachment (Figure 2)

APPENDIX C

Table 8. CVS Vegetation Plot Metadata UT to Little Coharie Stream Restoration Project – EEP No. 314	
Report Prepared By	William (Pete) Stafford
Date Prepared	11/20/2013 10:09
Database Name	RKK_UTLittleCoharie-2013.mdb
Database Location	C:\Documents and Settings\pstafford\Desktop\CVS Veg Data
Computer Name	STAFFORDP
Description 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	314
Project Name	UT to Little Coharie
Description	Stream Restoration Project
River Basin	Cape Fear
Length(ft)	2330
Stream-to-edge width (ft)	
Area (sq m)	
Required Plots (calculated)	

Table 7. Vegetation Plot Criteria Attainment UT to Little Coharie Stream Restoration Project – EEP No. 314			
Tract	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**	**Tract Mean**
Reach 2	VP1	N	43%
Reach 2	VP2	N	
Reach 2	VP3	Y	
Reach 2	VP4	Y	
Reach 1	VP5	N	
Reach 1	VP6	Y	
Reach 1	VP7	N	

Table 9 - Total and Planted Counts (Species by Plot with Annual Means)

CURRENT DATA (MY4 2012)																	ANNUAL MEANS											
			Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7		Current Mean**		MY4 (2013)		MY3 (2011)		MY2 (2010)		MY1 (2009)		AB (2008)	
Scientific Name	Common Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Alnus serrulata	Tag Alder	Shrub									1	1					1	1	1	1	1	*	1	*	3	*	*	*
Callicarpa americana	Beautyberry	Shrub					2	2	4	4			3	3	2	2	11	11	11	11	12	*	12	*	5	*	*	*
Liriodendron tulipifera	Tulip Poplar	Tree								1		1	2	2		2	2	6	2	6	2	*	2	*	3	*	*	*
Myrica	Wax Myrtle	Shrub	2	2			2	2	2	1	3	3			3	3	12	11	11	11	11	*	11	*	11	*	*	*
Quercus lyrata	Overcup Oak	Tree							2	2							2	2	2	2	2	*	2	*	5	*	*	*
Quercus michauxii	Sw Chestnut Oak	Tree					2	2					1	1			3	3	3	3	3	*	3	*	1	*	*	*
Quercus phellos	Willow Oak	Tree					1	1	1	1	1	1					3	3	3	3	2	*	2	*	1	*	*	*
Quercus stellata	Post Oak	Tree	1	1					2	2			2	2	1	1	6	6	6	6	7	*	7	*	4	*	*	*
Nyssa biflora	Black gum	Tree			1	1	1	1									2	2	2	2	1		1				*	
Baccharis halimifolia	Silverling	Shrub		1						3							0	4	0	4								
Acer rubrum	Red maple	Tree		58				24				17				2	0	101	0	96								
Pinus taeda	Loblolly pine	Tree						4		4						2	0	10	0	5								
Liquidambar styr.	Sweet gum	Tree						3		16		7		1		6	0	33	0	26								
Ligustrum sinense	Chinese privet	Shrub						3				3					0	6	0	2								
Diospyros virginiana	Persimmon	Tree												1			0	1	0	1								
																	0	0	0	0								
																	0	0	0	0								
		Plot Area (acres)	0.025		0.025		0.025		0.025		0.025		0.025		0.025													
*No baseline data for this project		Species Count	2	4	1	1	5	9	5	9	3	7	4	6	3	7	9	15	9	15	9	*	9	*	8	*	*	*
Type = Tree or Shrub		Stem Count	3	62	1	1	8	42	11	34	5	33	8	10	6	18	42	200	41	179	41	*	41	*	33	*	*	*
P = Planted, T = Total		Stems/Acre	120	2480	40	40	320	1680	440	1360	200	1320	320	400	240	720	240	1143	234	1022	234	*	234	*	190	*	*	*

** 2013 MY5 and 2012 MY 4 vegetation monitoring utilized the CVS Level 2 Protocol. Previous years utilized CVS Level 1 Protocol.

APPENDIX D

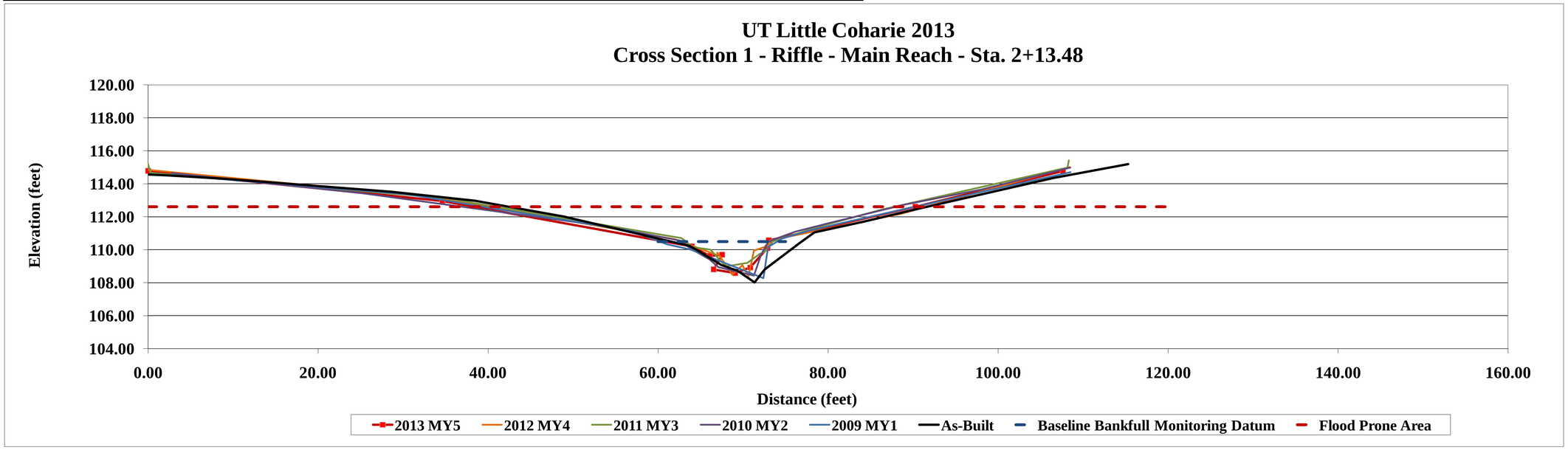
Project Name UT to Little Coharie, MY4
Watershed
Cross Section 1
Drainage Area NA
Date Nov-12
Crew Tutt, Singletary

Photo of Cross-Section 1 - Riffle - Looking Downstream

Picture Taken April 18, 2013

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	114.56		2.80	114.52		2.80	114.65		0.00	115.21		0.00	114.85		0.00	114.78	
2.24	114.51		30.56	113.36		25.13	113.43		0.25	114.67		33.24	113.19		34.61	112.96	
9.04	114.30		56.86	111.14		53.74	111.44		35.13	113.11		62.00	110.64		64.00	110.20	
28.64	113.51		61.01	110.34		63.01	110.51		62.77	110.70		66.93	109.68		66.11	109.63	
38.45	112.98		63.86	110.00		63.29	110.27		64.06	110.16		66.98	109.84		67.54	109.70	
48.90	112.02		72.39	108.28		64.15	109.97		66.15	110.01		68.75	108.49		66.53	108.80	
63.73	110.23		72.94	110.17		66.07	109.41		67.49	109.26		69.93	109.06		69.08	108.58	
64.59	109.97		74.64	110.69		67.12	108.93		68.04	108.99		70.64	108.39		70.85	108.92	
67.49	109.05		77.79	111.15		71.28	108.43		70.49	109.21		71.28	109.95		72.89	110.10	
69.04	108.78		81.70	111.63		72.14	109.71		71.96	109.74		72.93	110.23		73.04	110.57	
69.25	108.77		108.53	114.71		72.99	110.50		72.58	109.88		73.14	110.56		90.29	112.62	
71.33	108.03					76.10	111.08		73.52	110.52		88.54	112.17		107.65	114.77	
71.36	108.02					80.11	111.62		78.74	111.36		108.44	115.01				
71.36	108.02					88.94	112.73		86.17	112.42							
72.55	108.79					98.05	113.66		108.16	114.97							
76.57	110.38					108.50	114.99		108.35	115.43							
78.39	111.05																
84.18	111.70																
89.29	112.32																
106.54	114.36																
115.31	115.20																
117.62	115.42																
121.08	115.92																

Summary Data	
Bankfull Elv.	110.5
BF Area	11.4
BF Width	12.2
Flood Prone Elv.	112.42
Flood Prone Width	48.2
Max Depth	1.9
Mean Depth	0.9
W/D Ratio	13.1
ER	3.9
Bank Height Ratio	
Stream Type	C5



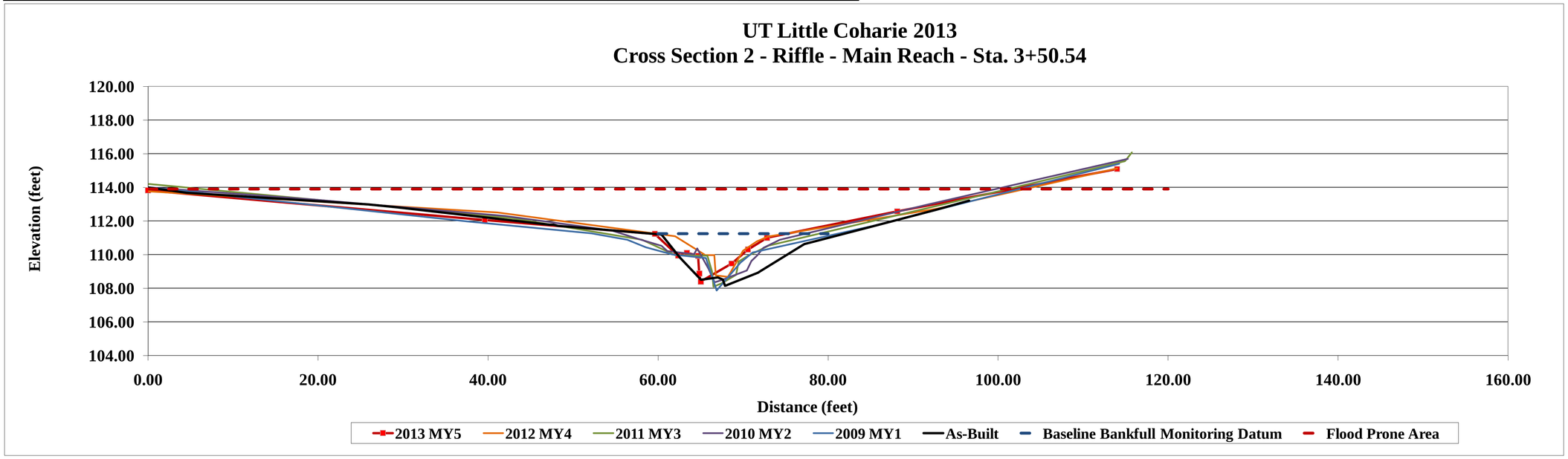
Project Name UT to Little Coharie, MY4
Watershed
Cross Section 2
Drainage Area NA
Date Nov-12
Crew Tutt, Singletary

Photo of Cross-Section 2 - Looking Downstream

Picture Taken April 18, 2013

As-Built Survey As-Built Survey			2009 2009 MY1			2010 2010 MY2			2011 2011 MY3			2012 2012 MY4			2013 2013 MY5		
Station	**Elv**	**Notes**	**Station**	**Elv**	**Notes**	**Station**	**Elv**	**Notes**	**Station**	**Elv**	**Notes**	**Station**	**Elv**	**Notes**	**Station**	**Elv**	**Notes**
0.0	114.00		0.00	114.00		0.00	114.00		0.00	114.20		0.00	113.77		0.00	113.82	
4.5	113.68		37.64	111.97		19.32	113.28		0.20	114.20		41.12	112.51		39.62	112.06	
25.9	113.00		52.18	111.26		42.00	112.31		42.94	112.16		62.00	111.09		59.61	111.24	
29.2	112.82		56.38	110.89		54.54	111.44		58.10	110.89		65.55	109.98		62.35	109.94	
47.2	111.78		58.55	110.43		57.55	110.96		62.00	109.97		66.63	109.97		63.39	110.11	
47.7	111.78		61.70	110.01		60.41	110.53		65.80	109.94		66.79	108.76		64.70	109.93	
48.2	111.71		65.62	109.80		61.09	110.22		66.33	109.02		68.21	108.68		64.85	108.88	
60.4	111.20		66.90	107.87		64.21	110.02		66.52	108.10		70.00	110.24		65.02	108.40	
62.5	109.83		69.68	109.52		64.61	110.38		67.49	108.30		71.60	110.78		68.66	109.47	
65.1	108.52		71.13	110.13		65.93	109.16		69.19	108.81		72.93	111.08		70.57	110.31	
67.0	108.64		85.33	111.72		66.64	108.35		69.49	109.59		92.79	112.73		72.81	111.00	
67.6	108.53		114.24	115.40		67.56	108.51		70.53	109.92		114.00	115.12		88.15	112.57	
67.9	108.15					70.43	109.06		73.05	110.54					114.00	115.09	
67.9	108.15					70.97	109.62		93.70	113.01							
71.8	108.94					71.68	109.95		114.92	115.56							
71.8	108.95					72.40	110.41		115.75	116.07							
71.9	108.98					74.33	110.89										
77.2	110.63					91.81	112.99										
84.3	111.55					115.26	115.71										
92.6	112.66																
96.6	113.21																
98.8	113.43																
104.1	114.01																
113.5	114.93																
117.3	115.30																
121.1	115.65																
132.3	116.65																

Summary Data	
Bankfull Elv.	111.25
BF Area	18.1
BF Width	15.9
Flood Prone Elv.	114.1
Flood Prone Width	103.8
Max Depth	2.8
Mean Depth	1.1
W/D Ratio	14
ER	6.5
Bank Height Ratio	
Stream Type	C5



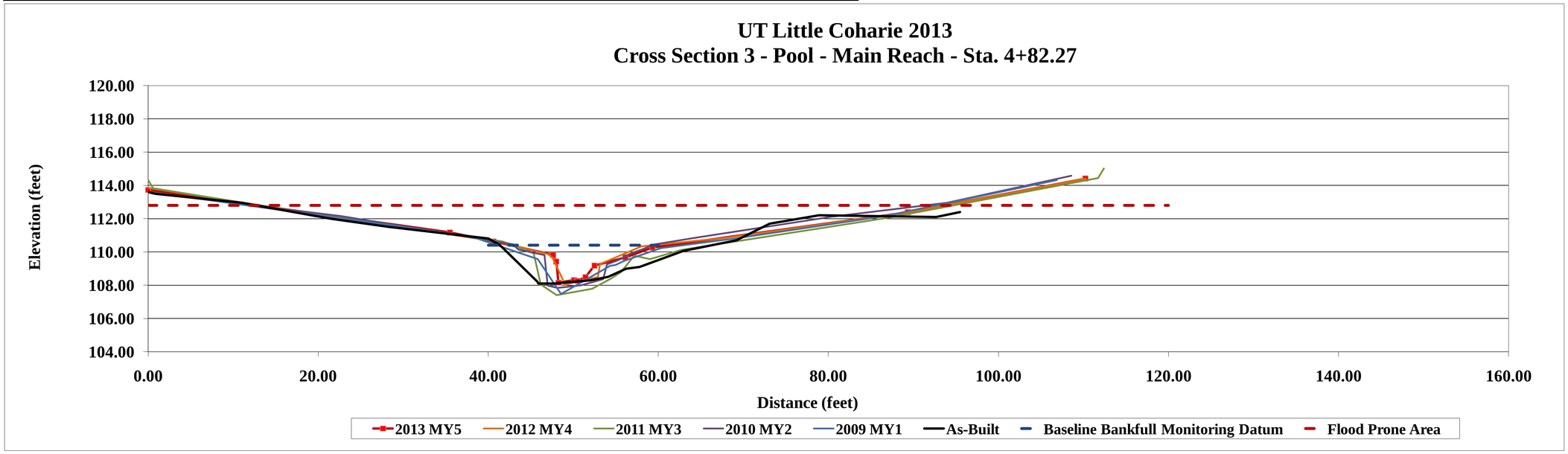
Project Name UT to Little Coharie, MY4
Watershed
Cross Section 3
Drainage Area NA
Date Nov-12
Crew Tutt, Singletary

Photo of Cross-Section 3 - Looking Downstream

Picture Taken April 18, 2013

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	113.60		-8.00	113.71		-8.00	114.08		0.00	114.34		0.00	113.85		0.00	113.73	
0.80	113.50		0.48	113.58		22.71	112.15		0.59	113.83		41.24	110.59		35.49	111.17	
11.00	112.95		37.90	110.94		42.91	110.46		19.91	112.24		47.00	109.88		40.62	110.63	
21.50	112.00		45.84	109.57		43.55	110.15		41.65	110.63		47.54	109.67		47.61	109.83	
28.30	111.50		48.56	107.48		46.61	109.81		45.35	109.92		48.81	108.30		48.00	109.42	
40.00	110.80		54.35	109.16		46.99	107.97		46.17	108.05		48.98	108.01		48.26	108.16	
41.40	110.40		54.98	109.22		48.14	107.83		48.06	107.41		50.72	108.27		50.08	108.31	
45.80	108.20		55.99	109.46		50.91	108.00		52.21	107.78		52.90	108.48		50.49	108.26	
45.90	108.10		60.32	110.24		53.50	108.36		54.37	108.38		53.15	109.26		51.44	108.48	
47.70	108.10		69.02	110.81		53.96	109.26		55.59	108.78		58.02	110.33		52.49	109.18	
47.70	108.10		86.59	112.15		55.33	109.52		57.16	109.78		67.81	110.84		56.14	109.68	
52.00	108.30		106.87	114.32		56.68	109.90		59.03	109.56		89.35	112.39		59.32	110.27	
54.10	108.50					58.07	110.15		62.73	110.12		110.24	114.41		89.35	112.39	
56.20	109.00					59.44	110.44		87.13	112.07					110.24	114.41	
57.80	109.10					64.45	110.87		111.73	114.45							
62.90	110.06					80.43	112.13		112.39	115.01							
69.20	110.70					93.96	112.95										
73.10	111.70					108.56	114.58										
78.90	112.20																
92.70	112.10																
95.50	112.40																
103.20	113.30																
111.50	114.10																
118.80	114.40																
122.70	114.50																

Summary Data	
Bankfull Elv.	110.4
BF Area	15.5
BF Width	18.5
Flood Prone Elv.	112.64
Flood Prone Width	76.8
Max Depth	2.2
Mean Depth	0.8
W/D Ratio	22.1
ER	4.1
Bank Height Ratio	
Stream Type	C5



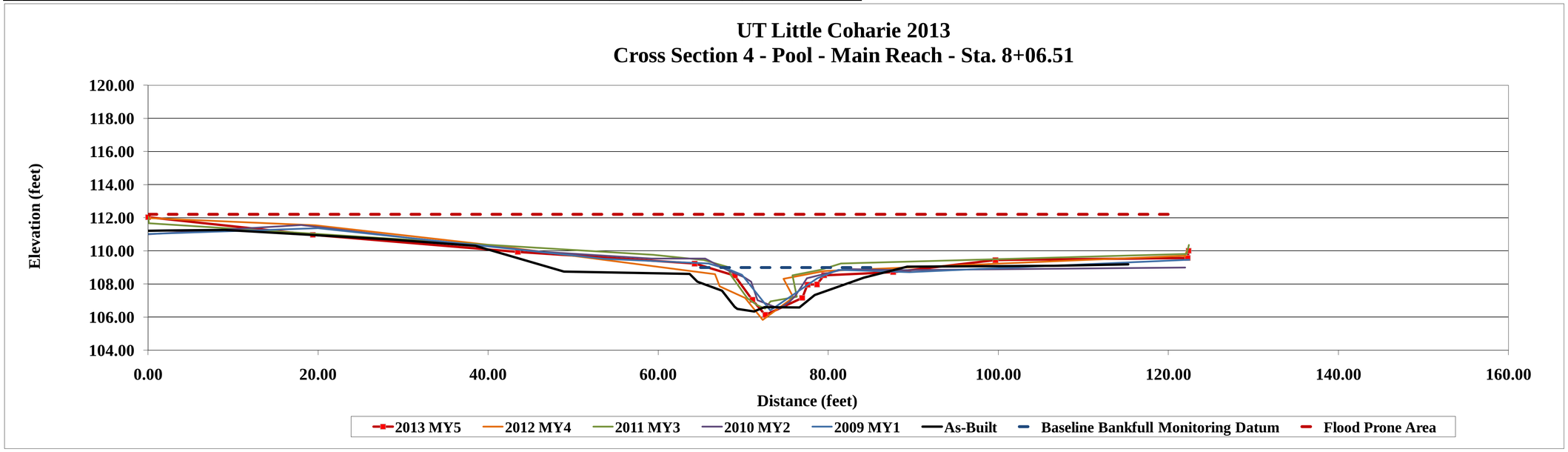
Project Name UT to Little Coharie, MY4
Watershed
Cross Section 4
Drainage Area NA
Date Nov-12
Crew Tutt, Singletary

Photo of Cross-Section 4 - Looking Downstream

Picture Taken April 18, 2013

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	111.21		0.00	111.01		0.00	111.00		0.00	112.12		0.00	111.97		0.00	112.03	
2.20	111.22		20.00	111.36		18.00	111.55		0.11	111.66		19.67	111.53		19.37	110.96	
9.00	111.26		53.69	109.51		31.38	110.74		40.33	110.35		39.86	110.38		43.49	109.94	
28.60	110.69		65.91	109.23		46.54	109.94		59.40	109.76		66.68	108.59		64.30	109.23	
38.50	110.31		68.53	108.83		59.22	109.54		65.37	109.45		67.22	107.86		69.01	108.50	
48.90	108.74		69.83	108.56		65.54	109.53		68.17	109.02		70.22	107.16		71.08	107.04	
63.70	108.60		73.19	106.40		67.19	109.09		68.55	108.52		72.30	105.83		72.60	106.13	
64.60	108.13		78.72	108.34		68.52	108.75		70.18	107.35		75.88	107.19		76.94	107.16	
67.50	107.59		81.19	108.85		70.07	108.42		70.52	107.12		74.74	108.30		77.57	107.95	
69.00	106.61		89.56	108.72		70.92	108.14		71.59	106.73		79.58	108.78		78.68	107.97	
69.30	106.49		97.78	108.91		71.67	107.01		72.55	106.51		122.06	109.71		79.51	108.53	
71.30	106.33		122.45	109.46		74.24	106.52		73.22	106.94		121.89	109.66		87.65	108.71	
71.40	106.37					75.43	106.91		76.31	107.22		122.33	110.12		99.67	109.44	
71.40	106.37					76.07	107.25		75.79	108.52					122.27	109.57	
72.50	106.60					76.85	107.85		79.08	108.86					122.40	110.00	
76.60	106.59					77.51	108.35		81.51	109.24							
78.40	107.34					81.93	108.91		122.15	109.80							
84.20	108.38					88.53	108.83		122.41	110.35							
89.30	109.04					122.00	109.00										
106.50	109.10																
115.30	109.19																
117.60	109.55																
121.10	109.73																
125.80	110.05																
126.70	110.13																

Summary Data	
Bankfull Elv.	109
BF Area	23.7
BF Width	26.6
Flood Prone Elv.	111.87
Flood Prone Width	119.5
Max Depth	2.9
Mean Depth	0.9
W/D Ratio	29.9
ER	4.5
Bank Height Ratio	
Stream Type	C5



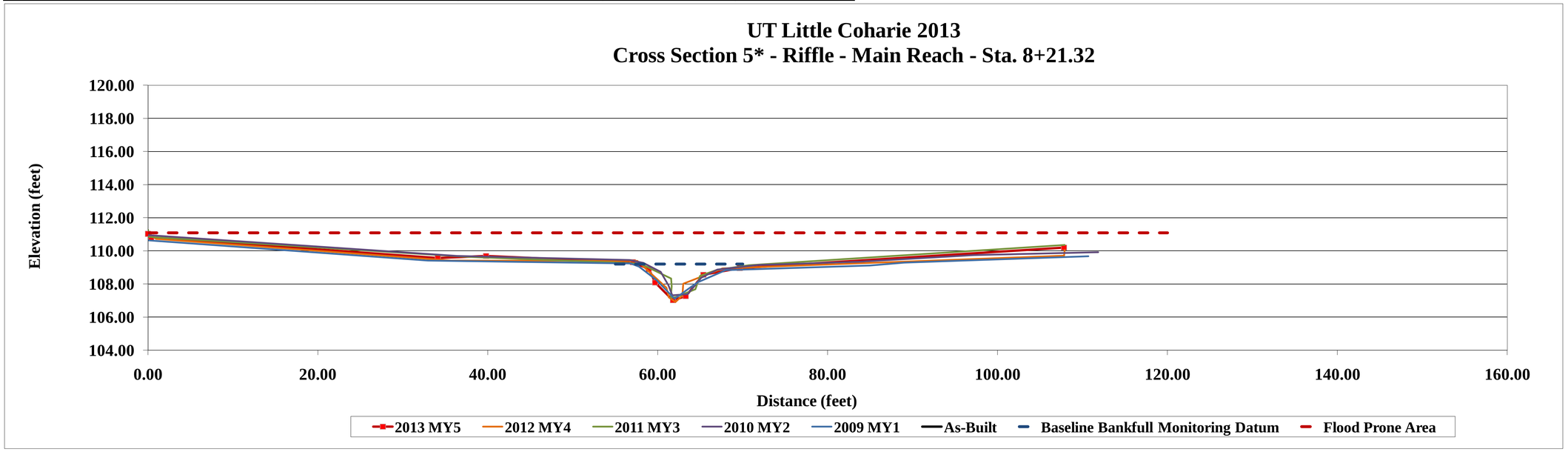
Project Name UT to Little Coharie, MY4
Watershed
Cross Section 5
Drainage Area NA
Date Nov-12
Crew Tutt, Singletary

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
			0.00	110.63		0.00	110.96		0.00	111.26		0.00	111.09		0.00	111.03	
			32.97	109.42		36.45	109.69		0.10	110.85		0.93	110.73		0.36	110.80	
			56.80	109.23		56.68	109.45		37.58	109.64		35.67	109.41		34.11	109.56	
			57.80	109.04		58.31	109.26		57.90	109.24		57.61	109.40		39.79	109.69	
			59.83	108.25		60.37	108.73		61.59	108.33		61.04	107.76		57.08	109.31	
			61.99	107.10		61.28	107.92		61.64	107.87		61.32	107.20		58.95	108.90	
			64.65	108.09		61.70	107.32		61.53	107.18		62.09	106.91		59.69	108.09	
			67.99	108.84		63.51	107.39		62.16	107.22		62.90	107.30		61.79	107.02	
			84.97	109.11		64.22	107.83		64.43	107.69		63.00	108.01		63.30	107.27	
			89.07	109.29		65.09	108.37		64.97	108.48		67.64	108.95		65.36	108.56	
			110.69	109.68		67.02	108.87		65.04	108.50		107.82	109.71		69.66	108.96	
						71.84	109.16		66.98	108.84		107.92	110.06		107.82	110.20	
						74.22	109.18		70.72	109.13							
						83.68	109.34		107.89	110.35							
						97.23	109.75										
						111.86	109.92										

Summary Data	
Bankfull Elv.	109.2
BF Area	12.7
BF Width	19.5
Flood Prone Elv.	111.38
Flood Prone Width	107.8
Max Depth	2.2
Mean Depth	0.7
W/D Ratio	29.8
ER	5.5
Bank Height Ratio	
Stream Type	C5

Photo of Cross-Section 5 - Looking Downstream

Picture Taken April 18, 2013



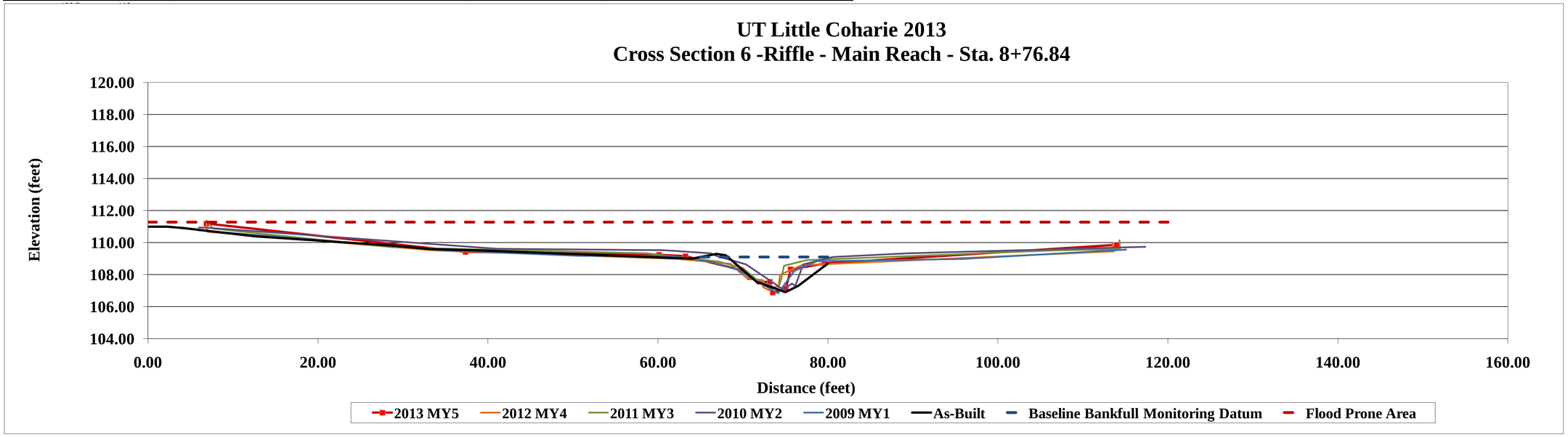
Project Name UT to Little Coharie, MY4
Watershed
Cross Section 6
Drainage Area NA
Date Nov-12
Crew Tutt, Singletary

Photo of Cross-Section 6 - Looking Downstream

Picture Taken April 18, 2013

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	111.00		6.00	110.77		6.00	110.94		6.90	111.37		6.90	111.19		6.88	111.19	
2.30	111.00		34.64	109.53		7.56	110.90		7.65	110.87		6.99	110.67		37.35	109.41	
4.20	110.90		50.74	109.18		41.11	109.61		28.85	109.71		33.77	109.51		60.13	109.24	
12.60	110.40		61.29	109.17		60.70	109.53		58.70	109.32		62.41	108.98		63.24	109.16	
28.90	109.80		65.96	108.84		66.22	109.34		67.10	108.81		68.55	108.67		69.79	108.29	
33.10	109.60		69.32	108.31		67.06	109.15		69.99	108.41		70.38	107.80		70.79	107.83	
39.30	109.50		74.14	106.84		70.36	108.63		71.73	107.62		72.47	107.62		71.95	107.55	
64.00	109.00		76.05	108.23		71.49	108.23		74.11	107.10		72.36	107.23		73.16	107.55	
66.90	109.30		78.70	108.83		73.72	107.43		74.52	107.75		73.01	107.03		73.52	106.87	
68.00	109.20		95.81	108.98		74.37	107.20		74.82	108.54		74.18	107.31		75.05	107.15	
71.70	107.50		115.09	109.56		74.87	107.12		77.48	108.90		74.35	107.99		75.62	108.33	
71.90	107.50					75.77	107.44		106.39	109.51		76.89	108.59		79.60	108.69	
72.40	107.40					76.17	107.29		114.36	109.60		113.68	109.46		113.97	109.86	
75.00	106.90					77.08	108.63		114.32	110.15		113.45	109.94				
75.00	106.90					80.60	109.10										
75.00	106.90					89.36	109.33										
75.00	106.90					117.36	109.74										
75.00	106.90																
75.00	106.90																
76.50	107.30																
80.00	108.70																
80.60	108.80																
89.60	109.10																
90.20	109.10																
90.50	109.10																
91.80	109.20																
92.20	109.20																
116.00	109.30																
119.40	110.00																

Summary Data	
Bankfull Elv.	109.1
BF Area	16.5
BF Width	28
Flood Prone Elv.	111.33
Flood Prone Width	107.1
Max Depth	2.2
Mean Depth	0.6
W/D Ratio	47.4
ER	3.8
Bank Height Ratio	
Stream Type	C5



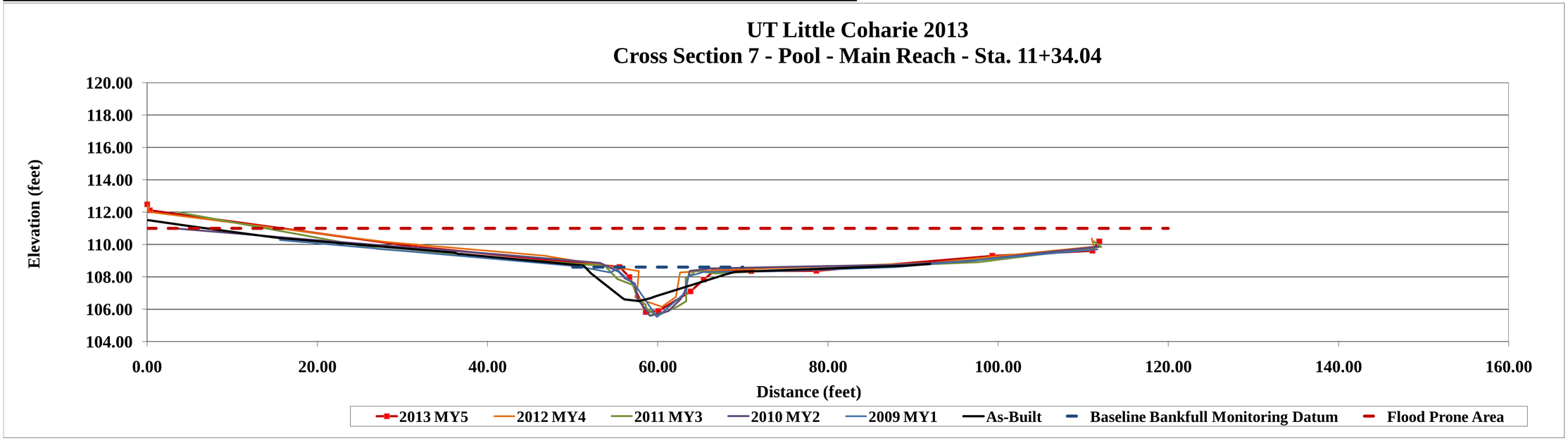
Project Name UT to Little Coharie, MY4
Watershed
Cross Section 7
Drainage Area NA
Date Nov-12
Crew Tutt, Singletary

Photo of Cross-Section 7 - Looking Downstream

Picture Taken April 18, 2013

As-Built Survey As-Built Survey			2009 2009 MY1			2010 2010 MY2			2011 2011 MY3			2012 2012 MY4			2013 2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	111.50		15.6	110.28		3.20	111.00		3.70	111.98		0.00	112.49		0.00	112.49	
0.20	111.50		50.72	108.65		19.84	110.27		27.21	109.72		0.26	112.01		0.33	112.11	
4.90	111.14		54.39	108.27		41.43	109.38		53.81	108.66		28.02	110.15		31.51	109.86	
12.60	110.60		55.18	108.46		53.25	108.86		55.23	107.88		46.66	109.31		55.50	108.61	
15.60	110.40		57.5	107.39		55.42	108.32		57.08	107.50		57.77	108.35		56.67	107.98	
36.10	109.50		59.9	105.52		56.11	107.93		57.67	106.62		57.62	107.32		58.58	105.82	
36.60	109.40		63.32	107.06		57.32	107.57		58.58	106.27		57.36	106.73		60.09	105.89	
36.90	109.40		63.56	108.02		57.64	106.65		58.67	106.05		60.50	106.15		63.85	107.10	
51.30	108.70		65.41	108.3		59.08	105.60		59.85	105.57		62.13	106.75		65.39	107.83	
52.20	108.20		73.5	108.34		61.26	105.89		62.35	106.17		62.62	108.27		66.64	108.37	
55.80	106.70		87.8	108.6		62.68	106.61		63.36	106.50		67.40	108.42		70.98	108.36	
56.10	106.60		111.67	109.69		63.17	107.10		63.28	107.93		92.17	108.87		78.65	108.37	
57.80	106.50					63.77	108.37		64.16	108.22		111.26	109.87		99.32	109.30	
57.80	106.50					66.16	108.52		64.39	108.38		111.01	110.37		111.08	109.62	
57.80	106.50					76.89	108.63		66.77	108.21					111.88	110.19	
59.10	106.68					87.54	108.74		74.08	108.40							
59.70	106.80					96.27	108.95		97.66	108.91							
68.30	108.20					104.84	109.48		112.11	109.85							
69.10	108.30					111.75	109.87		111.21	110.19							
89.30	108.70																
92.00	108.80																
92.80	108.90																
94.40	109.00																
96.20	109.00																
109.30	110.10																
111.30	110.30																
127.40	111.00																
128.10	110.90																
131.30	111.00																

Summary Data	
Bankfull Elv.	108.6
BF Area	21.4
BF Width	28.2
Flood Prone Elv.	111.38
Flood Prone Width	101.4
Max Depth	2.8
Mean Depth	0.8
W/D Ratio	37.2
ER	3.6
Bank Height Ratio	
Stream Type	C5



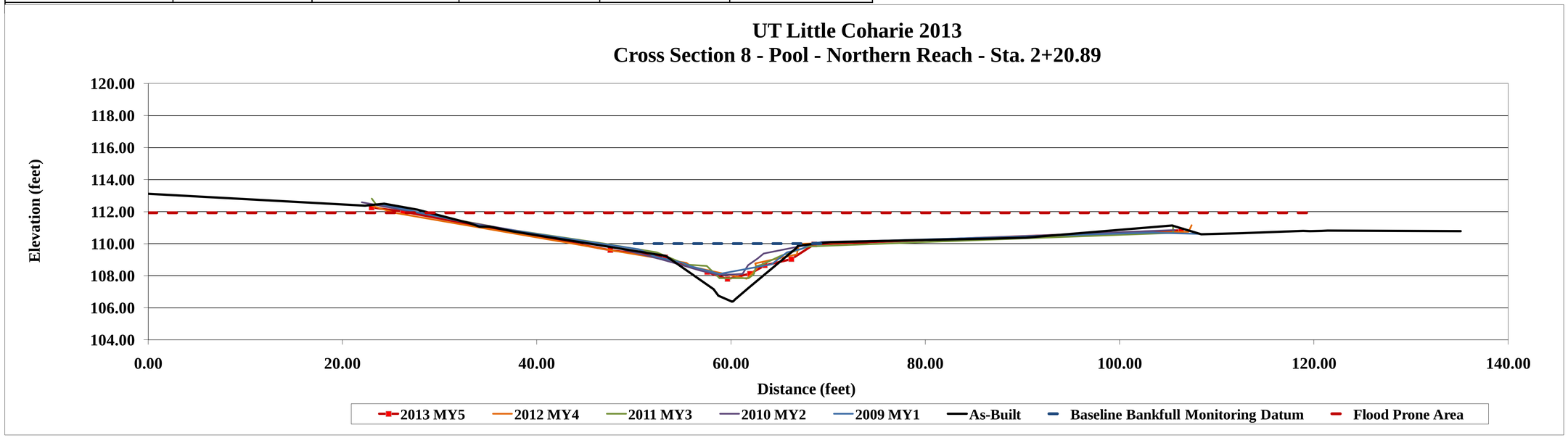
Project Name UT to Little Coharie, MY4
Watershed
Cross Section 8
Drainage Area NA
Date Nov-12
Crew Tutt, Singletary

Photo of Cross-Section 8 - Looking Downstream

Picture Taken April 18, 2013

As-Built Survey As-Built Survey			2009 2009 MY1			2010 2010 MY2			2011 2011 MY3			2012 2012 MY4			2013 2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	113.11		24.00	112.46		22.00	112.58		23.00	112.81		23.00	112.37		23.00	112.26	
22.30	112.38		33.99	111.15		33.77	111.24		23.51	112.42		25.31	111.94		26.22	112.00	
24.30	112.50		50.51	109.65		48.22	109.73		37.10	110.88		47.57	109.60		47.57	109.60	
27.70	112.12		52.19	109.19		52.85	109.01		46.78	110.02		55.39	108.81		53.20	109.15	
33.10	111.27		55.13	108.79		55.24	108.62		52.37	109.46		55.73	108.66		57.55	108.22	
34.10	111.07		55.85	108.60		56.80	108.32		55.36	108.70		56.00	108.55		59.63	107.80	
35.10	111.06		58.82	108.11		58.58	108.08		57.51	108.61		61.60	107.81		61.95	108.13	
37.60	110.76		64.17	108.72		60.16	108.07		58.81	107.85		62.67	108.44		63.47	108.64	
53.20	109.25		65.75	109.46		61.17	108.11		61.81	107.85		62.48	108.77		66.20	109.04	
53.40	109.19		67.30	109.68		61.76	108.66		62.34	108.10		66.77	109.33		68.57	109.96	
58.20	107.16		68.44	110.05		62.71	109.08		62.56	108.59		67.01	109.98		106.33	110.84	
58.70	106.76		103.37	110.69		63.35	109.38		63.19	108.70		77.72	110.22				
60.10	106.39		108.50	110.60		69.36	110.11		65.21	109.26		107.09	110.75				
60.10	106.40					81.85	110.27		68.00	109.82		107.40	111.16				
60.10	106.40					105.68	110.85		105.53	110.68							
60.20	106.40								105.50	111.16							
60.40	106.53																
61.80	107.24																
66.70	109.73																
66.90	109.89																
70.20	110.10																
78.80	110.21																
87.00	110.33																
90.10	110.37																
90.30	110.38																
105.40	111.13																
105.50	111.11																
108.40	110.58																
112.70	110.66																

Summary Data	
Bankfull Elv.	110
BF Area	25.7
BF Width	26.3
Flood Prone Elv.	112.19
Flood Prone Width	82.6
Max Depth	2.2
Mean Depth	1
W/D Ratio	26.9
ER	3.1
Bank Height Ratio	
Stream Type	C5



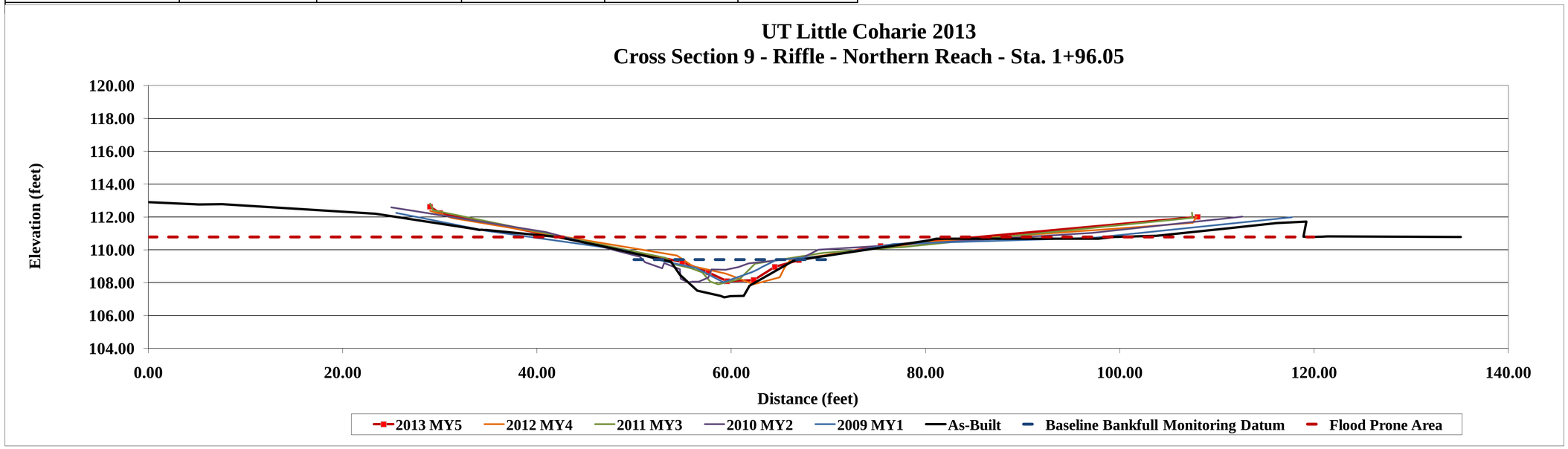
Project Name UT to Little Coharie, MY4
Watershed
Cross Section 9
Drainage Area NA
Date Nov-12
Crew Tutt, Singletary

Photo of Cross-Section 9 - Looking Downstream

Picture Taken April 18, 2013

As-Built Survey As-Built Survey			2009 2009 MY1			2010 2010 MY2			2011 2011 MY3			2012 2012 MY4			2013 2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	112.90		25.50	112.24		25.00	112.58		29.00	112.81		29.00	112.37		29.00	112.62	
5.20	112.77		34.82	111.15		28.03	112.30		29.32	112.42		31.30	111.94		30.02	112.24	
7.60	112.78		48.75	110.00		40.89	111.08		53.26	109.51		54.42	109.66		54.96	109.26	
23.40	112.20		53.00	109.32		48.03	109.97		54.26	109.10		56.05	108.99		57.65	108.63	
33.50	111.27		56.38	108.88		50.58	109.59		55.87	108.87		59.41	108.55		59.57	108.09	
34.10	111.21		59.21	108.03		51.13	109.24		57.00	108.63		59.92	108.44		62.31	108.15	
34.30	111.23		62.15	108.64		52.88	108.87		57.84	108.07		62.29	107.90		64.49	108.95	
34.50	111.21		62.78	108.83		53.11	109.19		58.65	107.91		64.98	108.32		66.96	109.38	
34.80	111.20		63.20	108.96		54.72	108.82		60.88	108.22		65.47	108.90		75.36	110.24	
42.10	110.78		64.62	109.37		54.81	108.24		62.44	109.16		66.11	109.40		108.01	112.00	
46.50	110.26		70.09	109.65		55.55	108.01		69.45	109.82		80.36	110.49				
53.80	109.28		76.76	110.36		55.98	108.07		77.90	110.18		102.64	111.43				
54.70	108.49		97.27	110.74		56.67	108.07		107.49	111.96		107.54	111.64				
56.50	107.52		117.71	111.98		57.64	108.30		107.45	112.27		107.91	112.02				
58.90	107.20					57.96	108.80										
59.30	107.11					59.43	108.78										
59.30	107.11					60.73	108.95										
59.90	107.18					61.79	109.18										
61.30	107.19					67.38	109.52										
61.90	107.81					68.96	110.01										
66.40	109.34					97.13	111.02										
80.30	110.57					112.61	112.03										
81.10	110.68																
97.80	110.67																
99.40	110.78																
103.80	110.86																
111.20	111.32																
116.20	111.63																
119.20	111.72																

Summary Data	
Bankfull Elv.	109.4
BF Area	9.2
BF Width	13.4
Flood Prone Elv.	110.71
Flood Prone Width	41.3
Max Depth	1.3
Mean Depth	0.7
W/D Ratio	19.3
ER	3.1
Bank Height Ratio	
Stream Type	C5



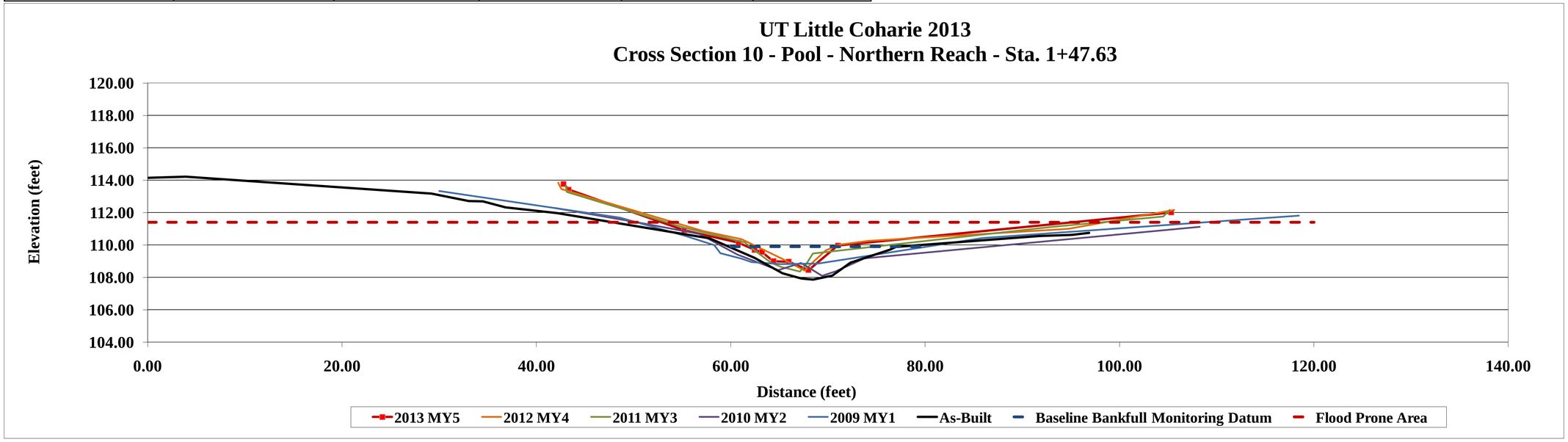
Project Name UT to Little Coharie, MY4
Watershed
Cross Section 10
Drainage Area NA
Date Nov-12
Crew Tutt, Singletary

Photo of Cross-Section 10 - Looking Downstream

Picture Taken April 18, 2013

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.0	114.15		30.00	113.33		41.86	112.29		43.00	113.64		42.25	113.84		42.79	113.77	
3.9	114.22		48.61	111.69		51.16	111.32		43.19	113.26		42.55	113.46		43.32	113.42	
29.2	113.17		55.37	110.55		56.79	110.67		55.24	111.07		57.18	110.85		55.22	110.91	
33.1	112.71		58.31	109.98		60.71	109.40		61.44	110.16		61.10	110.36		60.79	110.14	
34.5	112.69		58.93	109.50		64.89	108.44		62.66	109.56		65.28	109.16		62.45	109.70	
36.8	112.32		61.10	109.15		67.22	108.89		64.16	108.91		67.61	108.41		63.21	109.57	
42.1	111.97		62.14	108.94		67.92	108.65		65.18	108.65		68.31	108.85		64.39	109.00	
57.8	110.41		65.15	108.82		69.39	108.09		67.13	108.35		69.78	109.68		65.97	108.96	
62.4	109.20		69.01	108.86		70.82	108.38		67.81	108.85		71.21	110.01		68.00	108.45	
65.3	108.25		85.91	110.43		73.76	109.17		68.45	109.47		74.15	110.25		71.02	109.97	
67.3	107.93		118.44	111.81		108.24	111.12		93.06	111.11		94.73	111.00		105.32	112.00	
67.8	107.89								104.52	111.75		105.63	112.16				
67.8	107.89								105.16	112.15							
68.5	107.85																
70.5	108.11																
72.3	108.90																
76.4	109.71																
77.0	109.88																
91.8	110.56																
95.1	110.63																
96.9	110.74																
113.4	111.82																
122.6	112.18																
124.0	111.99																

Summary Data	
Bankfull Elv.	109.9
BF Area	7
BF Width	9.2
Flood Prone Elv.	111.35
Flood Prone Width	41.2
Max Depth	1.5
Mean Depth	0.8
W/D Ratio	12.1
ER	4.5
Bank Height Ratio	
Stream Type	C5



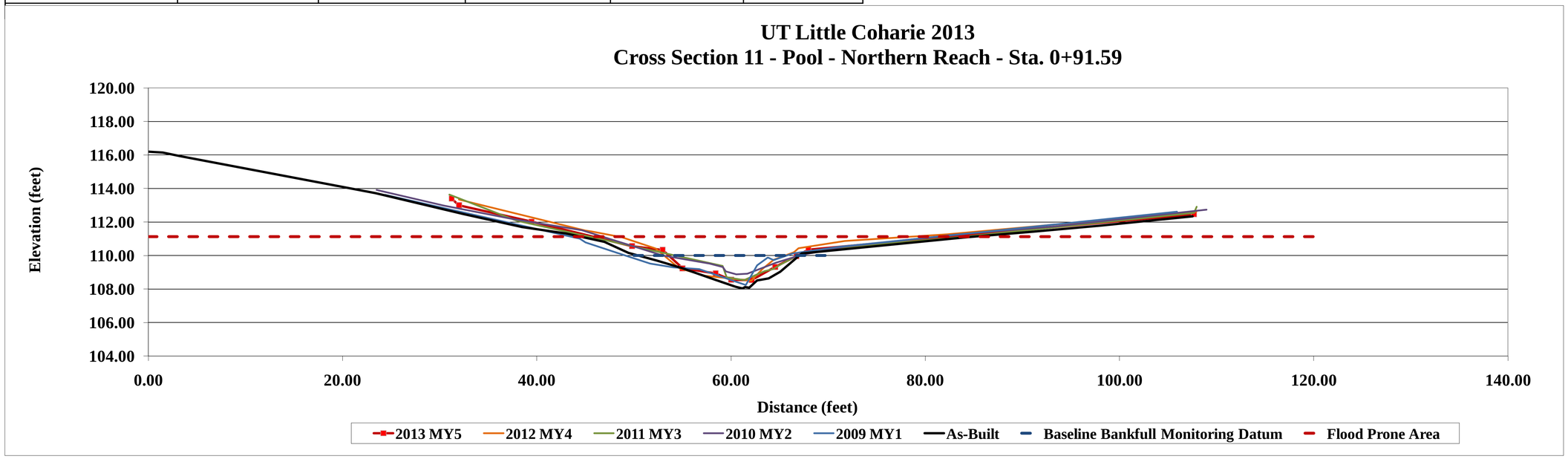
Project Name UT to Little Coharie, MY4
Watershed
Cross Section 11
Drainage Area NA
Date Nov-12
Crew Tutt, Singletary

Photo of Cross-Section 11 - Looking Downstream

Picture Taken April 18, 2013

As-Built Survey As-Built Survey			2009 2009 MY1			2010 2010 MY2			2011 2011 MY3			2012 2012 MY4			2013 2013 MY5		
Station	**Elv**	**Notes**	**Station**	**Elv**	**Notes**	**Station**	**Elv**	**Notes**	**Station**	**Elv**	**Notes**	**Station**	**Elv**	**Notes**	**Station**	**Elv**	**Notes**
0.00	116.20		24.40	113.62		23.50	113.92		31.00	113.64		31.99	113.35		31.23	113.40	
1.49	116.14		44.41	111.00		30.42	112.98		37.92	112.08		45.00	111.49		31.99	113.00	
3.21	115.93		45.03	110.78		37.33	112.20		56.41	109.73		45.62	111.44		39.45	112.03	
23.38	113.72		48.17	110.18		44.67	111.51		59.13	109.38		48.76	111.09		49.80	110.56	
32.44	112.48		51.66	109.51		52.96	110.00		59.56	108.71		52.25	110.42		52.96	110.33	
38.49	111.70		54.06	109.29		57.79	109.51		61.34	108.53		54.65	109.24		55.00	109.24	
43.00	111.32		56.72	109.19		59.17	109.30		63.45	109.08		57.31	108.79		58.41	108.94	
46.95	110.82		61.51	108.24		59.46	109.05		64.32	109.18		62.10	108.49		60.00	108.55	
49.44	110.16		62.67	109.42		60.54	108.87		65.15	109.49		63.26	109.20		62.13	108.54	
52.29	109.70		63.79	109.88		61.68	108.91		66.97	110.03		64.38	109.74		64.56	109.32	
54.81	109.28		64.37	109.72		64.63	109.57		71.68	110.48		66.46	110.19		66.75	109.96	
58.39	108.54		66.35	110.12		67.03	110.00		83.77	111.12		66.94	110.43		67.96	110.35	
60.48	108.13		71.14	110.52		71.60	110.53		107.69	112.55		71.73	110.86		107.66	112.47	
61.09	108.04		81.66	111.14		83.10	111.24		107.94	112.90		82.25	111.26				
61.21	108.05		105.93	112.61		93.57	111.76					107.93	112.62				
61.42	108.12					108.95	112.74										
61.42	108.12																
61.89	108.09																
62.67	108.52																
63.03	108.56																
63.89	108.64																
65.06	109.04																
67.29	110.13																
83.95	111.08																
91.07	111.43																
98.03	111.78																
107.52	112.34																

Summary Data	
Bankfull Elv.	110
BF Area	12.1
BF Width	13.3
Flood Prone Elv.	111.46
Flood Prone Width	45.3
Max Depth	1.5
Mean Depth	0.9
W/D Ratio	14.6
ER	3.4
Bank Height Ratio	
Stream Type	C5



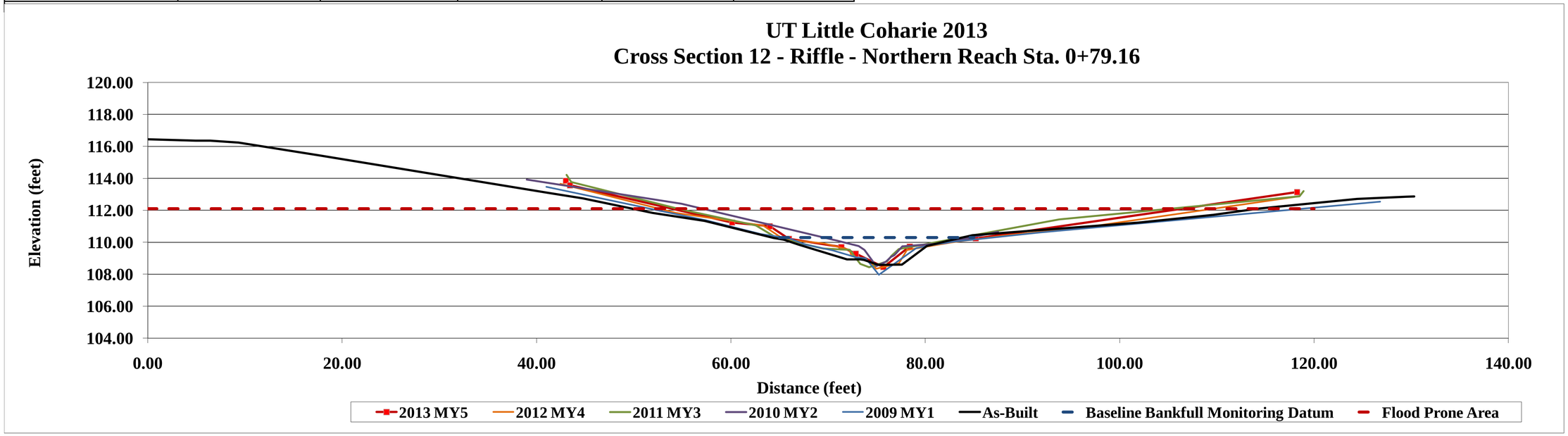
Project Name UT to Little Coharie, MY4
Watershed
Cross Section 12
Drainage Area NA
Date Nov-12
Crew Tutt, Singletary

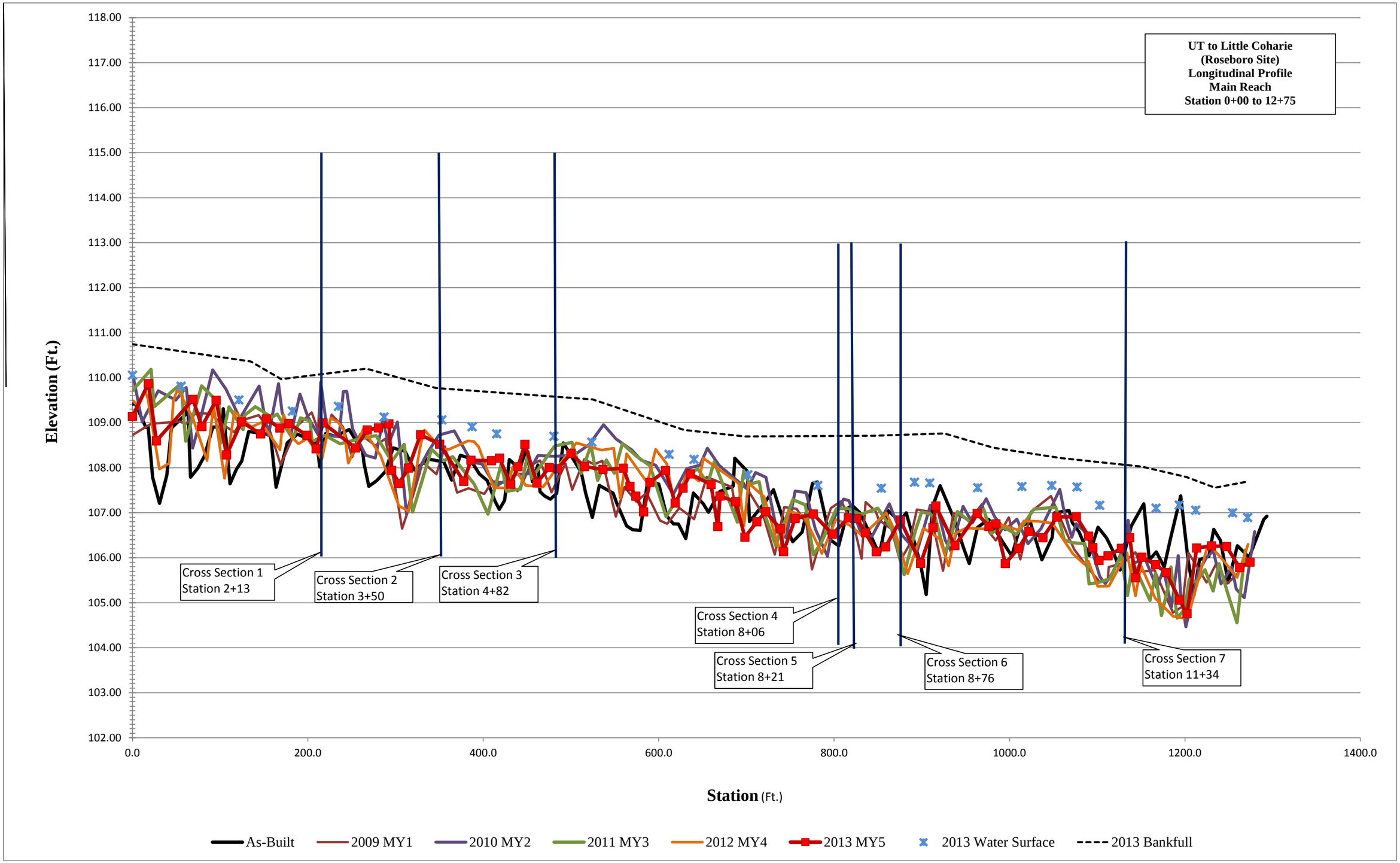
Photo of Cross-Section 12 - Looking Downstream

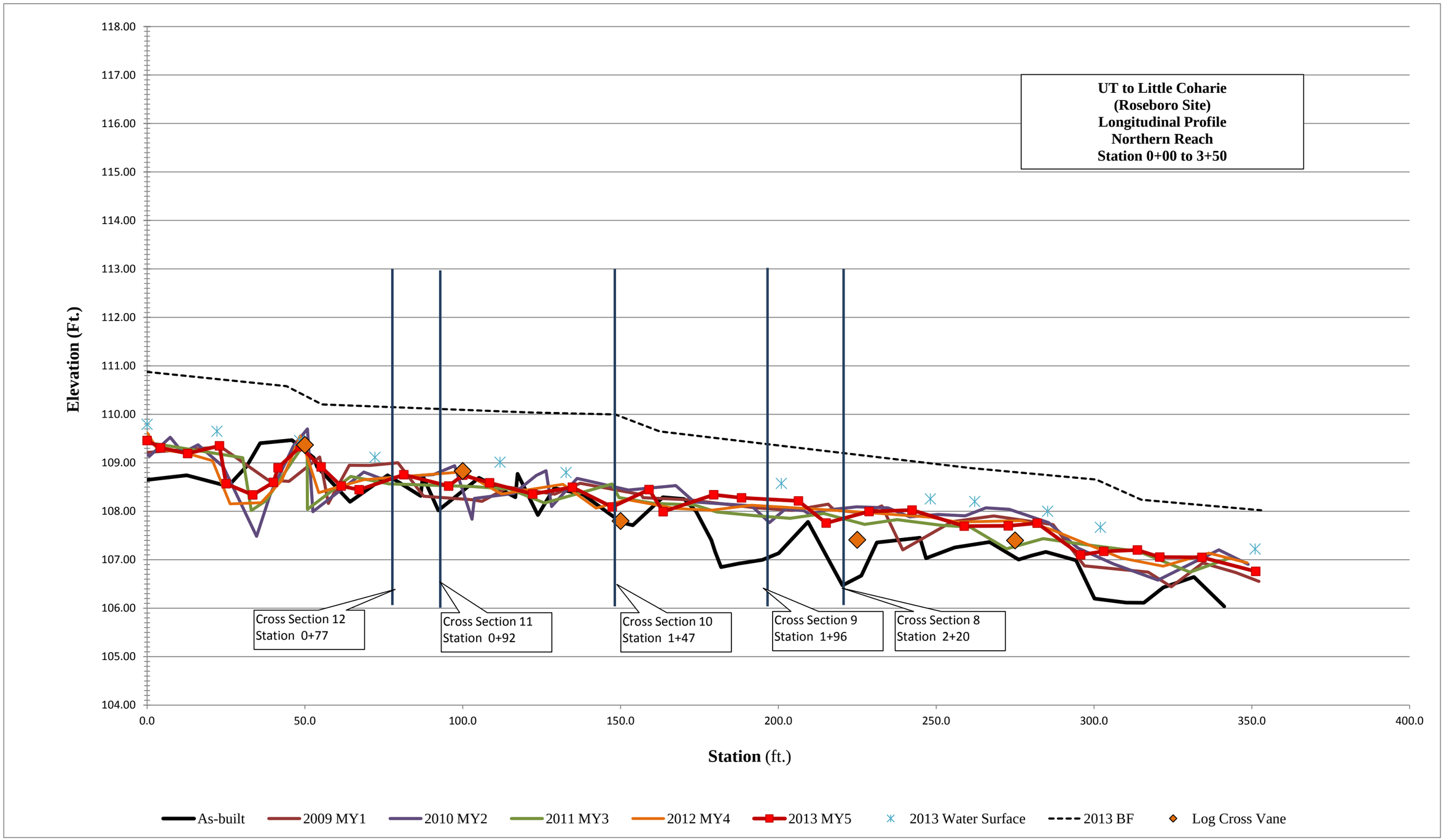
Picture Taken April 18, 2013

As-Built Survey As-Built Survey			2009 2009 MY1			2010 2010 MY2			2011 2011 MY3			2012 2012 MY4			2013 2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	116.44		41.00	113.47		39.00	113.92		43.10	114.21		42.46	113.65		43.03	113.85	
4.93	116.36		52.81	111.96		54.90	112.41		43.57	113.76		54.36	111.84		43.45	113.56	
6.44	116.36		57.48	111.36		65.87	110.83		54.66	112.08		63.33	111.04		60.12	111.24	
9.35	116.23		63.11	110.50		70.99	110.09		62.57	111.04		65.45	110.18		64.01	111.00	
17.71	115.43		65.99	110.25		73.14	109.77		64.70	110.27		69.60	109.93		65.96	110.21	
41.05	113.11		67.64	109.86		73.74	109.52		69.49	109.61		72.20	109.53		71.37	109.70	
44.76	112.75		70.46	109.50		74.95	108.50		72.25	109.52		72.41	109.18		72.85	109.28	
51.96	111.84		72.94	109.05		75.95	108.78		72.76	109.10		74.41	108.73		75.70	108.45	
57.30	111.33		73.88	109.00		76.49	109.09		73.32	108.65		74.95	108.34		78.41	109.74	
64.39	110.28		75.23	107.96		76.83	109.19		74.23	108.44		77.29	108.69		85.20	110.24	
65.43	110.17		79.08	109.64		77.65	109.74		76.05	108.79		78.11	109.52		118.27	113.13	
66.93	109.86		80.19	109.76		82.08	109.96		76.55	109.15		82.54	109.97				
71.94	108.93		82.34	110.00		87.49	110.65		77.29	109.57		87.95	110.40				
72.48	108.93		91.83	110.62					93.78	111.42		96.32	110.92				
73.32	108.93		126.80	112.55					118.50	112.87		117.99	112.83				
73.70	108.90								118.92	113.20							
75.00	108.62																
75.00	108.62																
75.33	108.59																
77.59	108.60																
80.18	109.77																
82.28	110.08																
84.87	110.44																
101.97	111.23																
109.64	111.72																
114.33	112.11																
124.44	112.71																
129.45	112.85																
130.32	112.87																

Summary Data	
Bankfull Elv.	110.3
BF Area	12.6
BF Width	20.1
Flood Prone Elv.	112.15
Flood Prone Width	53.5
Max Depth	1.8
Mean Depth	0.6
W/D Ratio	32.3
ER	2.7
Bank Height Ratio	
Stream Type	C5

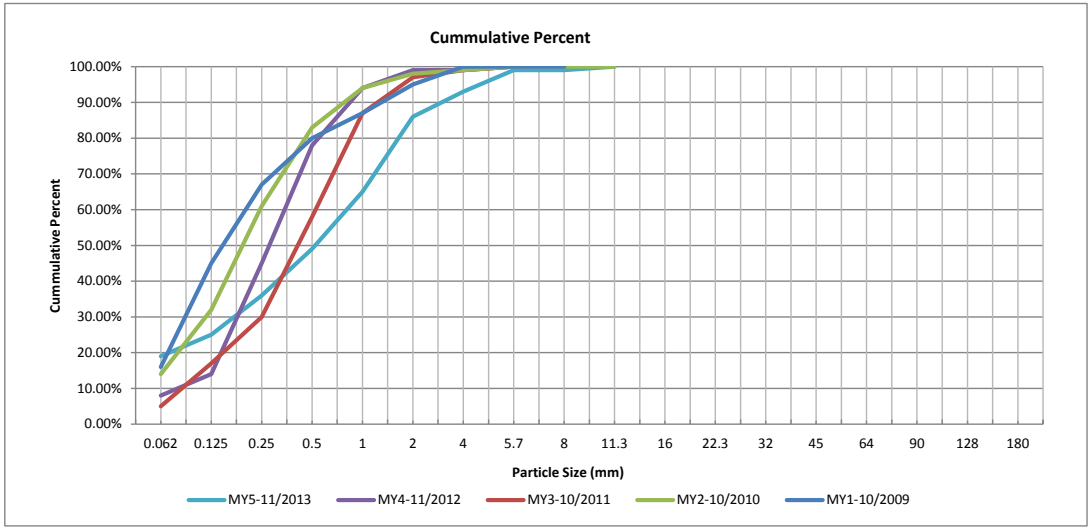


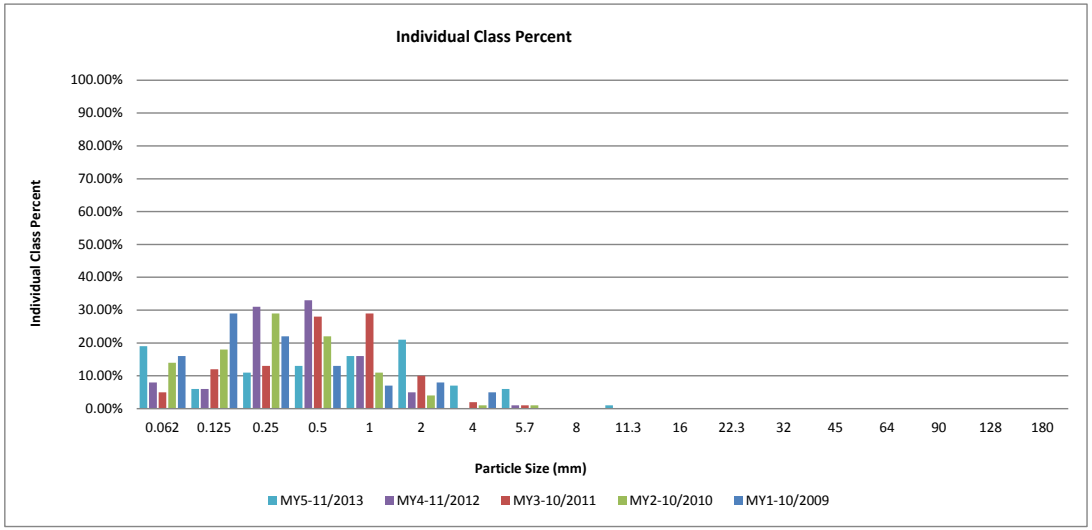

UT to Little Coharie
(Roseboro Site)
Longitudinal Profile
Main Reach
Station 0+00 to 12+75
Elevation (Ft.)
118.00
117.00
116.00
115.00
114.00
113.00
112.00
111.00
110.00
109.00
108.00
107.00
106.00
105.00
104.00
103.00
102.00
0.0
200.0
400.0
600.0
800.0
1000.0
1200.0
1400.0
Cross Section 1
Station 2+13
Cross Section 2
Station 3+50
Cross Section 3
Station 4+82
Cross Section 4
Station 8+06
Cross Section 5
Station 8+21
Cross Section 6
Station 8+76
Cross Section 7
Station 11+34
Station (Ft.)
As-Built
2009 MY1
2010 MY2
2011 MY3
2012 MY4
2013 MY5
2013 Water Surface
2013 Bankfull


UT to Little Coharie
(Roseboro Site)
Longitudinal Profile
Northern Reach
Station 0+00 to 3+50
Elevation (Ft.)
118.00
117.00
116.00
115.00
114.00
113.00
112.00
111.00
110.00
109.00
108.00
107.00
106.00
105.00
104.00
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Station (ft.)
Cross Section 12
Station 0+77
Cross Section 11
Station 0+92
Cross Section 10
Station 1+47
Cross Section 9
Station 1+96
Cross Section 8
Station 2+20
As-built
2009 MY1
2010 MY2
2011 MY3
2012 MY4
2013 MY5
2013 Water Surface
2013 BF
Log Cross Vane

Project Name: UT to Little Coharie Cross Section 1 - Main Reach Monitoring Year 5 - 2013					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	19	19.00%	19.00%
	very fine sand	0.125	6	6.00%	25.00%
	fine sand	0.25	11	11.00%	36.00%
	medium sand	0.5	13	13.00%	49.00%
	coarse sand	1	16	16.00%	65.00%
	very coarse sand	2	21	21.00%	86.00%
GRAVEL	very fine gravel	4	7	7.00%	93.00%
	fine gravel	5.7	6	6.00%	99.00%
	fine gravel	8	0	0.00%	99.00%
	medium gravel	11.3	1	1.00%	100.00%
	medium gravel	16			
	coarse gravel	22.3			
	coarse gravel	32			
	very coarse gravel	45			
	very coarse gravel	64			
COBBLE	small cobble	90			
	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
TOTAL % of whole count:			**100**	**100%**	**100%**

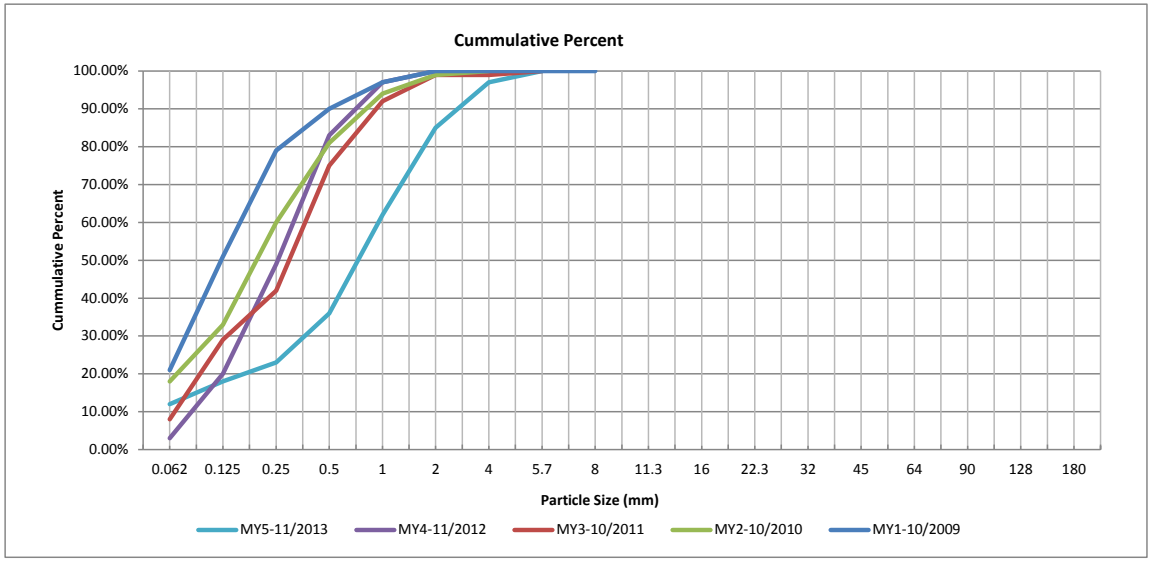
Sumamry Data	
D50	0.52
D84	1.9
D95	4.6

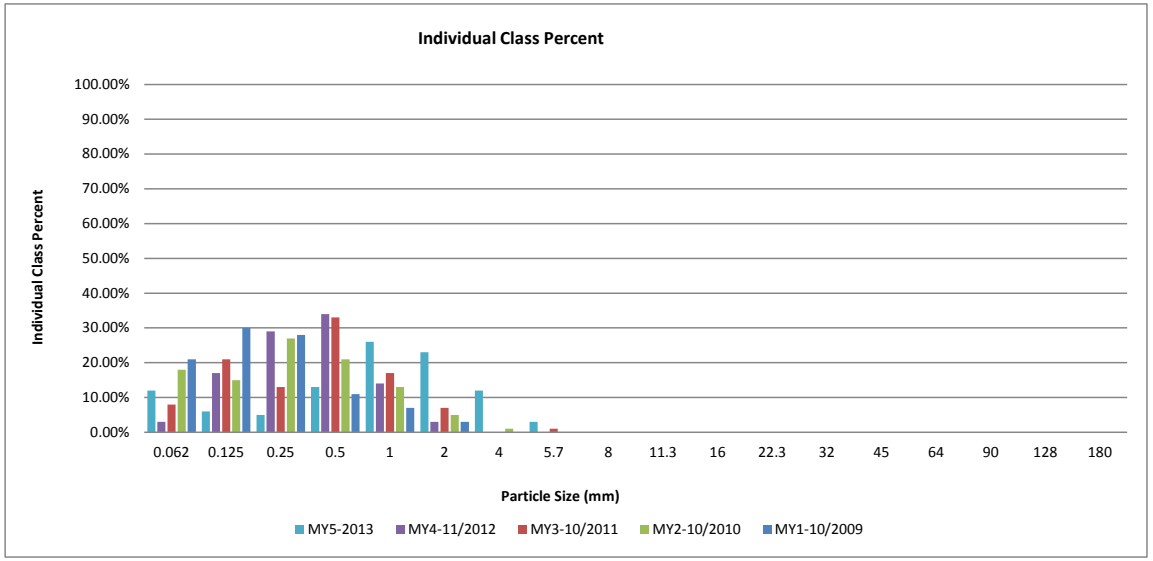




Project Name: UT to Little Coharie Cross Section 3 - Main Reach Monitoring Year 5 - 2013					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	12	12.00%	12.00%
	very fine sand	0.125	6	6.00%	18.00%
	fine sand	0.25	5	5.00%	23.00%
	medium sand	0.5	13	13.00%	36.00%
	coarse sand	1	26	26.00%	62.00%
	very coarse sand	2	23	23.00%	85.00%
GRAVEL	very fine gravel	4	12	12.00%	97.00%
	fine gravel	5.7	3	3.00%	100.00%
	fine gravel	8			
	medium gravel	11.3			
	medium gravel	16			
	coarse gravel	22.3			
	coarse gravel	32			
	very coarse gravel	45			
	very coarse gravel	64			
COBBLE	small cobble	90			
	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
TOTAL % of whole count:			**100**	**100%**	**100%**

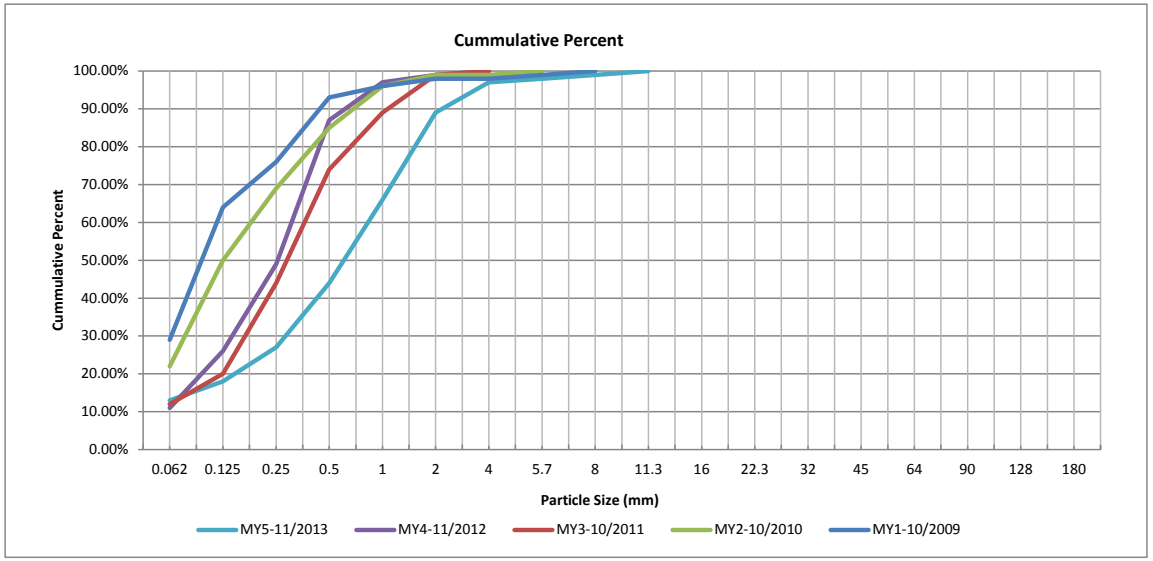
Sumamry Data	
D50	0.73
D84	1.9
D95	3.6

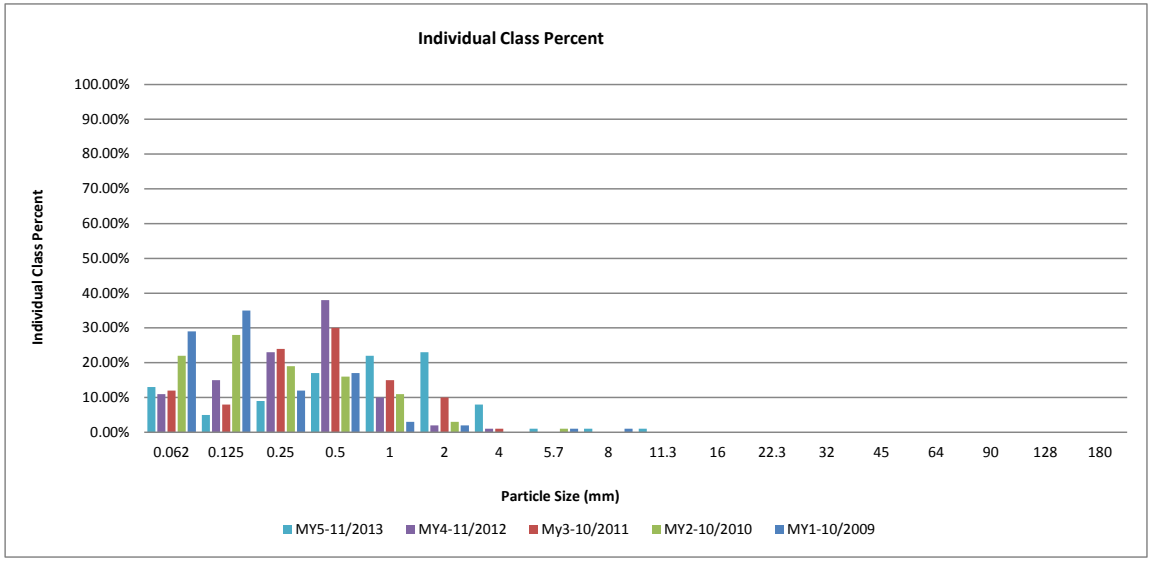




Project Name: UT to Little Coharie Cross Section 6 - Main Reach Monitoring Year 5 - 2013					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	13	13.00%	13.00%
	very fine sand	0.125	5	5.00%	18.00%
	fine sand	0.25	9	9.00%	27.00%
	medium sand	0.5	17	17.00%	44.00%
	coarse sand	1	22	22.00%	66.00%
	very coarse sand	2	23	23.00%	89.00%
GRAVEL	very fine gravel	4	8	8.00%	97.00%
	fine gravel	5.7	1	1.00%	98.00%
	fine gravel	8	1	1.00%	99.00%
	medium gravel	11.3	1	1.00%	100.00%
	medium gravel	16			
	coarse gravel	22.3			
	coarse gravel	32			
	very coarse gravel	45			
	very coarse gravel	64			
COBBLE	small cobble	90			
	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
TOTAL % of whole count:			**100**	**100%**	**100%**

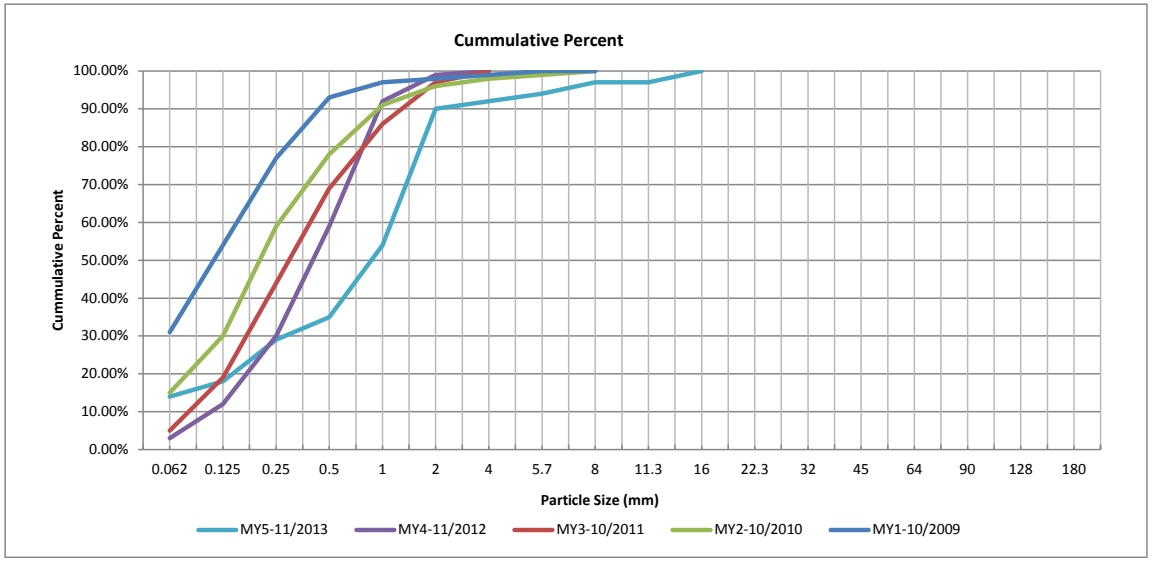
Sumamry Data	
D50	0.6
D84	1.7
D95	3.4

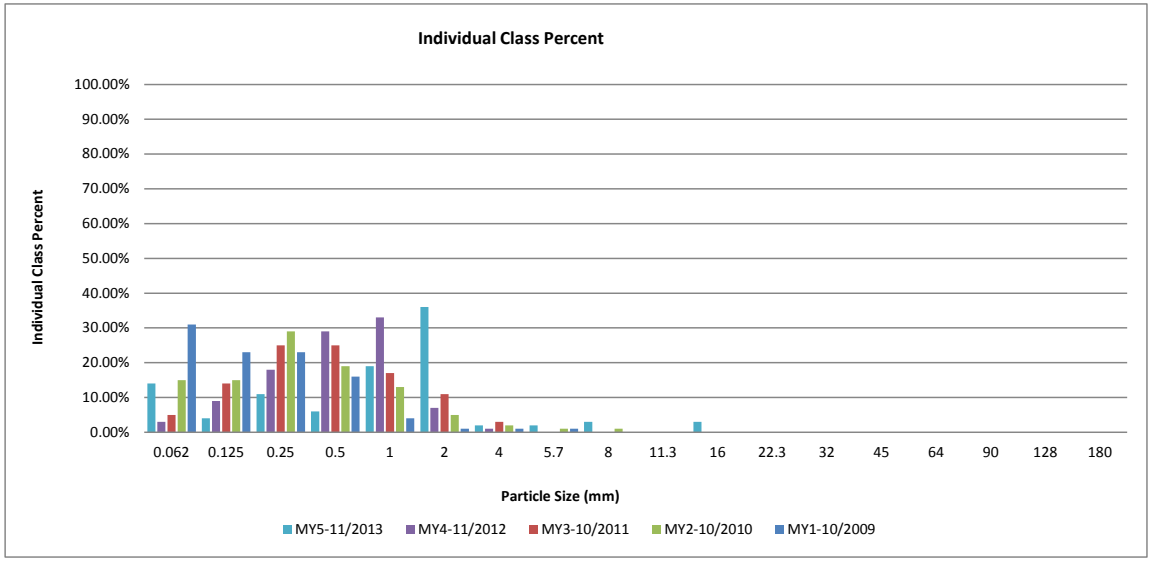




Project Name: UT to Little Coharie Cross Section 7 - Main Reach Monitoring Year 5 - 2013					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	14	14.00%	14.00%
	very fine sand	0.125	4	4.00%	18.00%
	fine sand	0.25	11	11.00%	29.00%
	medium sand	0.5	6	6.00%	35.00%
	coarse sand	1	19	19.00%	54.00%
	very coarse sand	2	36	36.00%	90.00%
GRAVEL	very fine gravel	4	2	2.00%	92.00%
	fine gravel	5.7	2	2.00%	94.00%
	fine gravel	8	3	3.00%	97.00%
	medium gravel	11.3	0	0.00%	97.00%
	medium gravel	16	3	3.00%	100.00%
	coarse gravel	22.3			
	coarse gravel	32			
	very coarse gravel	45			
	very coarse gravel	64			
COBBLE	small cobble	90			
	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
TOTAL % of whole count:			**100**	**100%**	**100%**

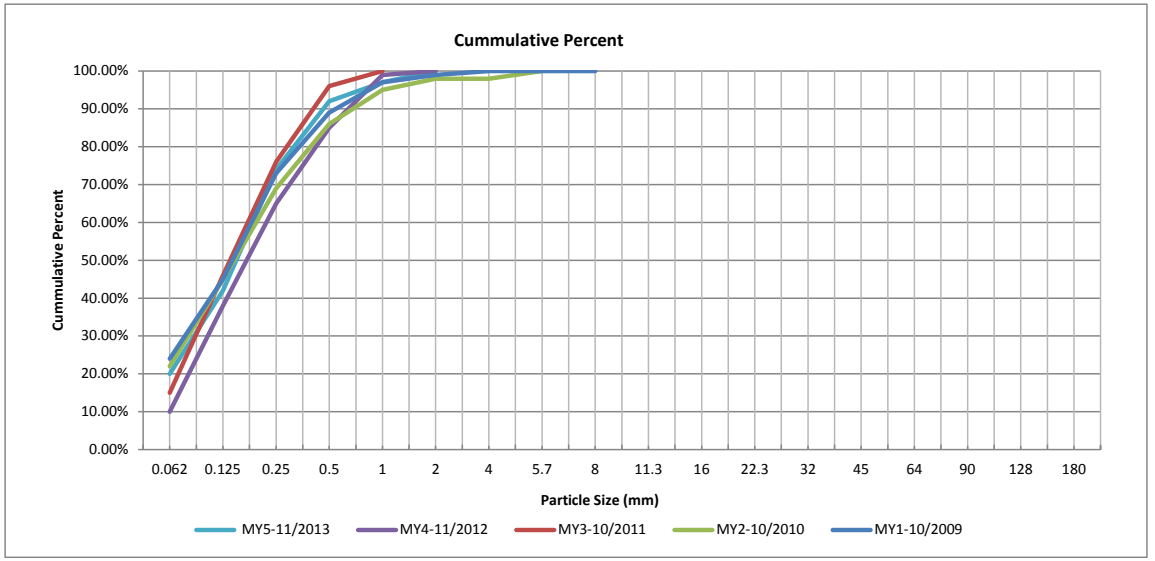
Sumamry Data	
D50	0.86
D84	1.8
D95	6.6

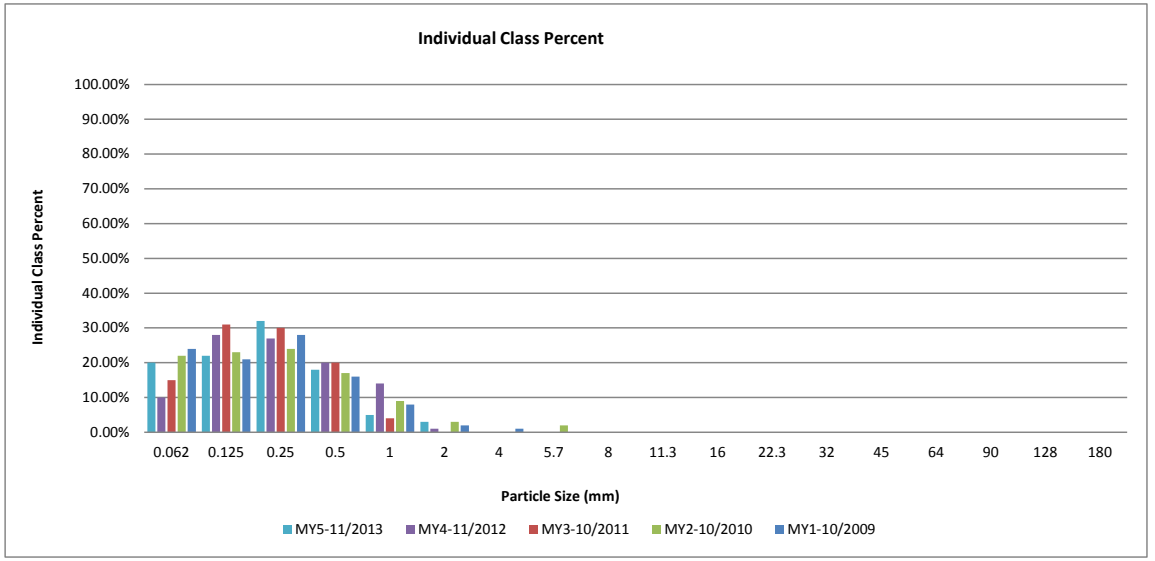




Project Name: UT to Little Coharie Cross Section 8 - Northern Reach Monitoring Year 5 - 2013					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	20	20.00%	20.00%
	very fine sand	0.125	22	22.00%	42.00%
	fine sand	0.25	32	32.00%	74.00%
	medium sand	0.5	18	18.00%	92.00%
	coarse sand	1	5	5.00%	97.00%
	very coarse sand	2	3	3.00%	100.00%
GRAVEL	very fine gravel	4			
	fine gravel	5.7			
	fine gravel	8			
	medium gravel	11.3			
	medium gravel	16			
	coarse gravel	22.3			
	coarse gravel	32			
	very coarse gravel	45			
	very coarse gravel	64			
COBBLE	small cobble	90			
	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
TOTAL % of whole count:			**100**	**100%**	**100%**

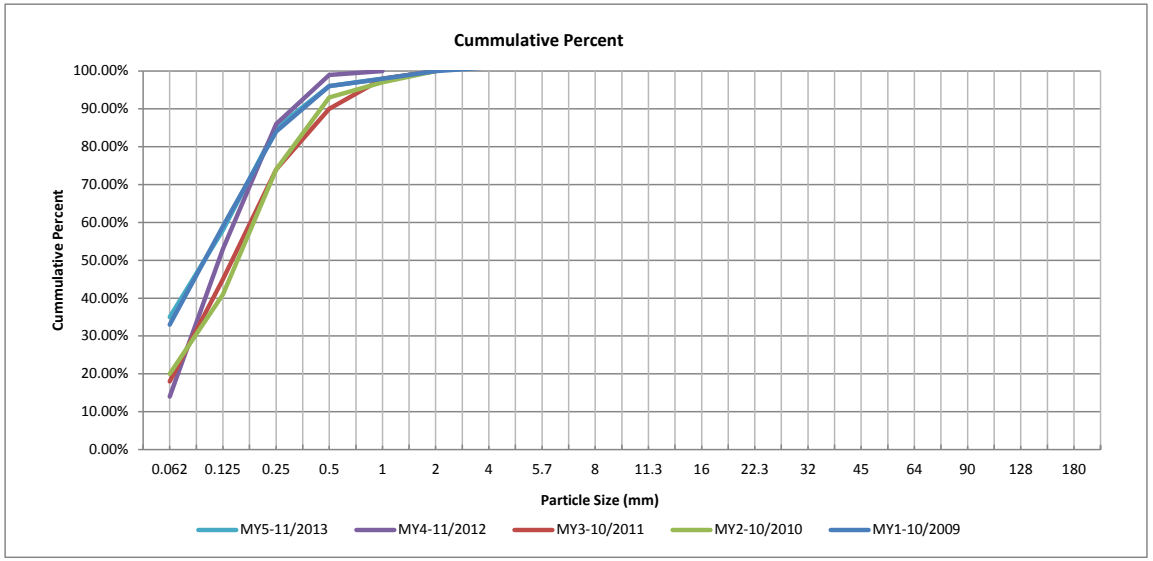
Sumamry Data	
D50	0.15
D84	0.37
D95	0.076





Project Name: UT to Little Coharie Cross Section 12 - Northern Reach Monitoring Year 5 - 2013					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	35	35.00%	35.00%
	very fine sand	0.125	23	23.00%	58.00%
	fine sand	0.25	27	27.00%	85.00%
	medium sand	0.5	11	11.00%	96.00%
	coarse sand	1	2	2.00%	98.00%
	very coarse sand	2	2	2.00%	100.00%
GRAVEL	very fine gravel	4			
	fine gravel	5.7			
	fine gravel	8			
	medium gravel	11.3			
	medium gravel	16			
	coarse gravel	22.3			
	coarse gravel	32			
	very coarse gravel	45			
	very coarse gravel	64			
COBBLE	small cobble	90			
	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
TOTAL % of whole count:			**100**	**100%**	**100%**

Sumamry Data	
D50	0.062
D84	0.24
D95	0.47



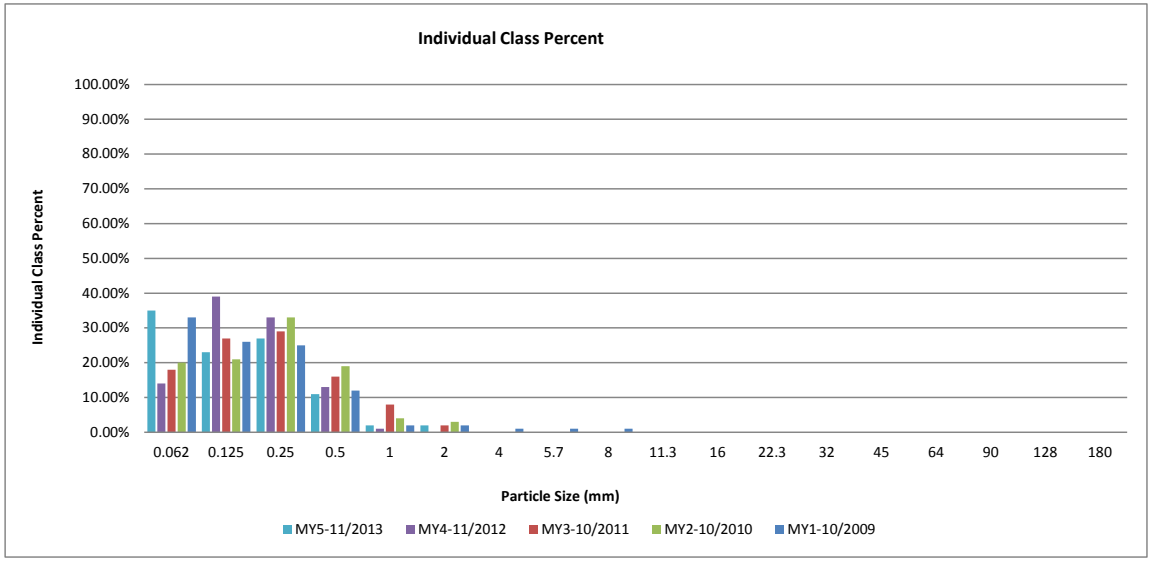


Table 10a. Baseline Stream Data Summary
UT to Little Coharie Stream Restoration Project - EEP No. 314 (2330 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)							5.6						4.9												
Floodprone Width (ft)							50						16				25	27.5	30						
Bankfull Mean Depth (ft)							1.9						0.4					0.88							
[1]Bankfull Max Depth (ft)							3.3						0.7					1.4							
Bankfull Cross Sectional Area (ft^2)							10.7						18					10							
Width/Depth Ratio							2.9						13.3					13							
Entrenchment Ratio													3.3				2.2	2.4	2.6						
[1]Bank Height Ratio																									
Profile																									
Riffle Length (ft)																									
Riffle Slope (ft/ft)																									
Pool Length (ft)					4.5	4		6.1			0.4		1	1.3			1.5	1.75	2						
Pool Max depth (ft)																									
Pool Spacing (ft)							30						23				46		57						
Pattern																									
Channel Beltwidth (ft)							30						35					30							
Radius of Curvature (ft)																									
Rc:Bankfull width (ft/ft)																									
Meander Wavelength (ft)																									
Meander Width Ratio																									
Transport parameters																									
Reach Shear Stress (competency) lb/f^2																									
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					G5						C5						C5								
Bankfull Velocity (fps)																									
Bankfull Discharge (cfs)																									
Valley length (ft)																									
Channel Thalweg length (ft)																									
Sinuosity (ft)					1.02						1.05						1.1								
Water Surface Slope (Channel) (ft/ft)					0.0028						0.0144						0.0017								
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

UT to Little Coharie Stream Restoration Project - EEP No. 314 Segment/Reach: Main Reach

	Cross Section 1*							Cross Section 2*							Cross Section 3*							Cross Section 4*							Cross Section 5*						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	110.50		110.50	110.50	110.50	110.50		111.25		111.25	111.25	111.25	111.25		110.40		110.40	110.40	110.40	110.40		109.00		109.00	109.00	109.00	109.00				109.20	109.20	109.20	109.20	
Bankfull Width (ft)	12.70	11.30	10.00	10.30	10.40	12.20		24.90	15.90	21.60	26.20	16.70	15.90		14.50	10.60	16.20	23.40	16.60	18.50		19.70	35.10	33.50	11.80	29.10	26.60			30.10	16.90	14.70	22.80	19.50	
Floodprone Width (ft)	46.80	42.30	50.20	35.50	51.80	48.20		129.80	64.60	101.80	106.10	103.40	103.80		102.80	50.90	84.20	101.30	80.10	76.80		115.20	101.30	108.70	99.70	122.30	119.50			110.70	111.90	107.90	107.90	107.80	
Bankfull Mean Depth (ft)	1.10	0.90	1.20	0.80	0.90	0.90		1.80	0.90	1.10	1.00	0.80	1.10		1.50	1.00	1.30	1.30	0.90	0.80		0.80	0.50	0.40	0.50	0.80	0.90			0.50	0.60	0.60	0.50	0.70	
Bankfull Max Depth (ft)	2.20	2.00	2.10	1.50	2.10	1.90		3.30	3.10	2.40	3.20	2.60	2.80		2.30	2.10	2.60	3.00	2.40	2.20		2.10	2.20	2.40	2.50	3.20	2.90			2.10	1.90	2.00	2.30	2.20	
Bankfull Cross Sectional Area (ft^2)	13.50	10.20	12.40	8.60	9.00	11.40		43.60	14.40	24.20	26.00	13.80	18.10		21.50	10.60	21.10	31.40	15.30	15.50		15.70	15.90	14.80	14.90	22.20	23.70			15.10	9.40	9.20	11.10	12.70	
Bankfull Width/Depth Ratio	11.90	12.50	8.00	12.30	12.00	13.10		14.20	17.40	19.30	26.40	20.10	14.00		9.70	10.60	12.40	17.40	17.90	22.10		24.70	77.80	75.90	9.40	38.20	29.90			60.10	30.20	23.60	46.80	29.80	
Bankfull Entrenchment Ratio	3.70	3.70	5.00	3.50	5.00	3.90		5.20	4.10	4.70	4.00	6.20	6.50		7.10	4.80	5.20	4.30	4.80	4.10		5.80	2.90	3.20	8.50	4.20	4.50			3.70	6.60	7.30	4.70	5.50	
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)		0.15	0.19	0.41	0.28	0.52										0.12	0.19	0.3	0.26	0.73															

	Cross Section 6*							Cross Section 7*							Cross Section 8							Cross Section 9							Cross Section 10						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	109.10		109.10	109.10	109.10	109.10		108.60		108.60	108.60	108.60	108.6																						
Bankfull Width (ft)	19.6	28	17.6	24.5	42.5	28		17.1	10.3	8.3	29.4	22.4	28.2																						
Floodprone Width (ft)	135.1	109.1	111.4	107	106.5	107.1		86.9	96.1	108.6	103.8	94.3	101.4																						
Bankfull Mean Depth (ft)	0.8	0.5	0.7	0.5	0.4	0.6		1	1.2	1.7	0.7	0.6	0.8																						
Bankfull Max Depth (ft)	2.1	2.1	2.1	2	2.1	2.2		1.8	2.8	2.7	3	2.4	2.8																						
Bankfull Cross Sectional Area (ft^2)	15.7	12.6	12.2	11	17.7	16.5		16.6	12.6	13.8	21.8	12.8	21.4																						
Bankfull Width/Depth Ratio	24.4	62.1	25.4	54.3	102.1	47.4		17.6	8.4	5	39.5	39.4	37.2																						
Bankfull Entrenchment Ratio	6.9	3.9	6.3	4.4	2.5	3.8		5.1	9.3	13.1	3.5	4.2	3.6																						
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)		0.13	0.13	0.29	0.25	0.60			0.062	0.2	0.3	0.4	0.86																						

*It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary.

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

UT to Little Coharie Stream Restoration Project - EEP No. 314 Segment/Reach: Northern

	Cross Section 8*							Cross Section 9*							Cross Section 10*							Cross Section 11*							Cross Section 12*						
Based on fixed baseline bankfull elevation	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	110.00		110.00	110.00	110.00	110.00		109.40		109.40	109.40	109.40	109.40		109.90		109.90	109.90	109.90	109.90		110.00		110.00	110.00	110.00	110.00		110.30		110.30	110.30	110.30	110.30	
Bankfull Width (ft)	23.2	21.6	22.8	28.8	24.1	26.3		14.2	12.8	14.5	11.5	11.1	13.4		17.7	22.4	27.5	12.9	8	9.2		16.6	15	14.1	15.5	12.5	13.3		12.9	12.9	15.2	19.2	21.5	20.1	
Floodprone Width (ft)	135.1	80.2	78	79.7	83.4	82.6		89.3	58.5	48	47.9	48.2	41.3		74.4	48.8	60.8	44.2	44.2	41.2		64.5	47.6	34.6	47.8	42.2	45.3		26.6	101.3	30.4	52.2	59.9	53.5	
Bankfull Mean Depth (ft)	0.8	0.5	0.9	0.8	1	1		1.3	0.6	0.5	0.7	0.9	0.7		1.1	0.7	0.8	0.6	0.7	0.8		1	0.7	0.5	0.7	0.9	0.9		0.8	0.7	0.6	0.7	0.7	0.6	
Bankfull Max Depth (ft)	2.1	2.1	1.9	2.2	2.2	2.2		2.3	1.4	1.5	1.5	1.5	1.3		2.1	1.1	1.8	1.5	1.5	1.5		2	1.7	1.1	1.5	1.5	1.5		1.6	2	1.8	1.9	2	1.8	
Bankfull Cross Sectional Area (ft^2)	15.7	12.6	20.8	22.2	23.9	25.7		18.2	7.8	7.7	7.9	9.7	9.2		19.2	16.3	20.8	7.7	5.5	7		17	10.5	7.4	11	11.8	12.1		10.1	9	8.8	13.1	14.7	12.6	
Bankfull Width/Depth Ratio	24.4	62.1	25.1	37.4	24.4	26.9		11.1	20.8	27.5	16.6	12.6	19.3		16.3	30.7	36.4	21.5	11.8	12.1		16.2	21.2	26.8	21.8	13.2	14.6		16.6	18.3	26.2	28.1	31.6	32.3	
Bankfull Entrenchment Ratio	6.9	3.9	3.4	2.8	3.5	3.1		6.3	4.6	3.3	4.2	4.4	3.1		4.2	2.2	2.2	3.4	5.5	4.5		3.9	3.2	2.5	3.1	3.4	3.4		2.1	7.9	2	2.7	2.8	2.7	
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)		0.13	0.14	0.14	0.17	0.15																							0.062	0.15	0.14	0.11	0.062		

	Cross Section 13							Cross Section 14							Cross Section 15							Cross Section 16							Cross Section 17						
Based on fixed baseline bankfull elevation	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																			
Bankfull Width (ft)																																			
Floodprone Width (ft)																																			
Bankfull Mean Depth (ft)																																			
Bankfull Max Depth (ft)																																			
Bankfull Cross Sectional Area (ft^2)																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			

*It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary.

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
UT to Little Coharie EEP No. 314

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	12.7		18.8	24.9									8.3		21.7	35.1			10.3		23.4	31.4			8		25.25	42.5			9.2		19	28.2		
Floodprone Width (ft)	26		80.55	135.1									26.6		80.85	135.1			35.5		103.8	107.9			42.2		82.25	122.3			41.2		79.7	120		
Bankfull Mean Depth (ft)	0.77		1.26	1.75									0.4		1.1	1.8			0.5		0.8	2.5			0.4		0.7	1			0.6		0.8	1.1		
[1]Bankfull Max Depth (ft)	1.6		2.6	3.6									1.1		2.2	3.3			1.5		2	3.2			1.5		2.35	3.2			1.3		2.2	2.9		
Bankfull Cross Sectional Area (ft^2)	10.11		26.855	43.6									7.4		25.5	43.6			8.6		14.9	31.4			5.5		14.7	23.9			7		14.1	25.7		
Width/Depth Ratio	9.7		17.15	24.6									5		41.4	77.8			9.4		23.6	54.3			11.8		56.95	102.1			12.1		24.5	47.4		
Entrenchment Ratio	2		4.55	7.1									2		7.55	13.1			3.5		4.3	8.5			2.5		4.35	6.2			2.7		3.85	6.5		
[1]Bank Height Ratio																																				
Profile																																				
Riffle Length (ft)	12		18.5	25									8		13.9	19.8			2		8.4	24.7			4		12.55	21.1			6.00		19.73	33.45		
Riffle Slope (ft/ft)															0.64						0.6						0.59						0.61			
Pool Length (ft)	14		24.5	35									9		37.75	66.5			8.7		19.8	35.4			9.5		19.7	29.9			7.30		25.70	44.10		
Pool Max depth (ft)													0.04		1.37	2.7			1.5		2	3.2			0.7		2	3.3			0.60		1.90	3.20		
Pool Spacing (ft)			50										4		42	80			20		24.9	77.6			18		48.1	78.2			16.00		45.15	74.30		
Pattern																																				
Channel Beltwidth (ft)	22		25.5	29																																
Radius of Curvature (ft)	24		28.5	33																																
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)	68		84.5	101																																
Meander Width Ratio			2.3																																	
Additional Reach Parameters																																				
Rosgen Classification	C5												C5						C5						C5						C5					
Channel Thalweg length (ft)	1630												1630						1630						1630						1630					
Sinuosity (ft)	1.2												1.2						1.2						1.2						1.2					
Water Surface Slope (Channel) (ft/ft)	0.16												0.0024						0.0024						0.0025						0.0025					
BF slope (ft/ft)													0.0021						0.0021						0.002						0.002					
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

APPENDIX E

Table 12. Verification of Bankfull Events			
Date of Data Collection	Date of Occurrence	Method	Photo #
April 18, 2013	April 2013	Photographed onsite (Wrack Line)	Stream Photo 3
November 1, 2012	October 2012	Photographed onsite (Wrack Line)	Stream Photo 7
October 22, 2011	September 2011	Photographed onsite (Wrack Line)	Stream Photo 13 of the 2011 MY3 Monitoring Report
November 13, 2010	September 2010	Photographed onsite (Wrack Line)	Stream Photo 6 of the 2010 MY2 Monitoring Report
October 29, 2009	September 2009*	Wrack line observed onsite	Photographic evidence is not available for this occurrence. 2009 MY1