OAKLEY CROSSROADS (G)
STREAM & BUFFER RESTORATION

MONITORING REPORT (YEAR 3 OF 5)

Pitt County, North Carolina
SCO Project Number 050659701
EEP Project Number 273

Prepared for:
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Status of Plan: Final
Construction Completed: 2011
Data Collected: 2013
Submission Date: February 2014

Prepared by:

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1.0 Executive Summary / Project Abstract

The overall goal of the Oakley restoration project was to improve water quality and wildlife habitat by restoring a stable stream and riparian buffer system to the project site. The objectives of the project were to restore stream stability and improve aquatic habitat, restore riparian buffer along the stream channel, preserve riverine wetlands, establish a wildlife corridor, divert an unbuffered agricultural ditch system from the stream channel to an irrigation pond, and establish native vegetation within the permanent conservation easement. The project included 3,789 linear feet of stream restoration and 329 linear feet of stream enhancement. Priority II stream restoration involved restoring riffle/pool sequences, the installation of structures, and floodplain grading to improve floodplain connectivity and provide diverse instream habitat. Enhancement II stream restoration involved the planting of native hardwood trees and shrubs. Also, native riparian buffer planting took place on over 18 acres of the site, and an additional 1.37 acres of wetland was preserved. The project will result in 3,931 stream mitigation units (SMUs), 17.2 acres of buffer mitigation units (BMUs), and 0.27 wetland mitigation units (WMUs).

The Monitoring Year 3 [MY3] stem counts within each of the nine (9) vegetative monitoring plots are included in Tables 7 and 9 in Appendix C. Located within the Tar-Pamlico River basin, this project was instituted prior to October 11, 2007 and is therefore eligible for riparian buffer restoration credit up to 200 feet from the top of bank of all perennial and intermittent waterways within the conservation easement area. As such, the vegetative monitoring plots have been assessed for the vegetation success criteria for both buffer (320 planted trees/acre) and streams (MY3 interim criteria of 320 woody stems/acre). All nine vegetative monitoring plots met the vegetation success criteria for riparian buffers. Of the five plots within the 50-foot stream buffer, all are currently meeting the vegetation success criteria for streams.

Minor evidence of beavers and nutria has been observed within the project limits in 2011 and 2012, and was recently noted in the MY3 Initial Assessment in March 2013. During the annual fall monitoring a majority of the Riverine Bottomland Hardwood Forest planting zone was inundated as a result of several beaver dams. APHIS personnel, in November 2013, were able to remove 8 beaver dams within and downstream of the project limits and alleviate the flooding within the project area. During the stream survey, beaver activity was observed throughout the site, with relatively minor damage to the livestakes along the stream banks. Some of the inner berms were lacking herbaceous vegetation after being inundated for an extended period, however, these areas should rebound during the next growing season. Approximately 6-8 inches of fine sediment had accumulated in sections of the stream and this sediment will likely be transported away once the site has a significant precipitation event.

Areas of *Murdannia keisak* (marsh dayflower), observed in previous years, are still present in and along the banks of stream throughout Section 1 but have not expanded. *Murdannia keisak* continues to be most abundant between Station 0+50 and 1+50, between Station 3+50 and 7+00, near Station 21+50, and near Station 28+50. Currently, these areas of *Murdannia keisak* do not pose a threat to native vegetation establishment or stream stability, but they will continue to be monitored during future field visits to document any changes. Small areas of *Mikania scandens* (Climbing hempweed) were observed on planted stems in and around vegetative plots 6 and 7. These areas were below the mapping threshold, but will continue to be monitored as there is potential for the vine to affect planted stems. Additionally, the streambanks on both left and right bank were observed to be bare below the Briley culvert, between

Station 38+25 and 39+00. Overall the planted woody vegetation continues to have excellent vigor and exhibit little to no issues becoming established among the common successional herbaceous species.

The stream survey occurred within one week of the beaver dams being removed, and as a result, water surface and bed elevations are likely skewed as the stream has not had adequate time to adjust following the removal of the dams and subsidence of the flooding. Sections 1, 2, and 3 of the Oakley restoration project were observed generally to be in stable condition even after being flooded by the beaver impoundment for an extended period of time. The channel's profile and cross-section adjusted only minimally from baseline conditions. The channel has good connection to its floodplain. Evidence of bankfull overflow was not discernable during the fall assessment as a result of the beaver impoundment, however, evidence of a bankfull event was observed during the initial assessment in the spring of 2013. The dimension, pattern, and profile survey for MY3 conditions for Section 1 and Section 2 are consistent with the design intent to reduce stream power and erosion potential.

An area of aggradation, noted in previous years, was again observed below the upstream culvert between Station 0+00 and 0+60. Additionally, one area of minor bed downcutting observed between Station 35+00 and 37+00 in 2012 has aggraded. The structures in this area have provided grade control and the area is working toward an equilibrium. The areas of profile adjustment do not currently threaten the stability of the stream. These areas will continue to be monitored during future field visits to document any changes. A few relict nutria burrows were also observed between Station 4+40 and 10+00, but the livestakes are maintaining bank stability and these areas do not threaten the stability of the stream. *Callitriche heterophylla* (water starwort), a non-invasive species, was again observed in several areas along all three sections of the stream. This aquatic plant was also noted to be present in monitoring years 1 and 2 as well as prior to the construction of the restoration project. Neither the nutria nor the water starwort currently threaten the stability of the restored stream. These issues will continue to be monitored during future field visits to document any changes.

The flooding caused by the beaver activity hindered the visual assessment of the vegetative cover of brush mattresses along the entire stream as requested by NCEEP. Areas observed in 2012 where brush mattresses had less than the required 80% vegetative cover remain on Figure 2 in Appendix A, and will be assessed during the initial assessment in spring 2014.

The wetland preservation areas were also visually assessed during the vegetation monitoring. No issues were observed in these areas and existing vegetation appears to be in good condition. These areas will continue to be monitored during future field visits.

Summary information, data, and statistics related to the 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.

2.0 Methodology

Channel stability and vegetation survival were monitored on the project site. Post-restoration monitoring will be conducted for a minimum of five years or until the success criteria are met following the completion of construction to document project success. The Monitoring Year 3 survey was completed using survey grade GPS on November 13, 2013.

2.1 MORPHOLOGICAL PARAMETERS AND CHANNEL STABILITY

2.1.1 Dimension

Dimensional characteristics were monitored at 7 permanent cross-sections (4 riffles, 3 pools) along Section 1 and Section 2. Survey data included points measured at all breaks in slope including top of bank, bankfull, inner berm, edge of water, and thalweg. Dimensional characteristics were compared to baseline conditions. All monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type. Stream channel stability and geomorphic monitoring for Section 3 was documented visually. Natural variability is expected, however the system should not experience trends toward excessive increasing bank erosion, channel degradation, or channel aggradation.

2.1.2 Pattern and Profile

The entire longitudinal profile of Section 1 and Section 2 was surveyed. Stationing from the as-built survey was used. The longitudinal profiles should show that the bedform features are remaining stable. The pools should remain deep with flat water surface slopes, and the riffles should remain steeper and shallower than the pools.

2.1.3 Sediment Transport

As discussed in prior project documentation, additional sediment transport evaluations will not be undertaken during the five-year monitoring period. However, the dimension, pattern, and profile survey for MY3 conditions for Section 1 and Section 2 were analyzed to determine whether the current sediment competency and capacity is consistent with the design.

2.2 VEGETATION

The Carolina Vegetation Survey (CVS) Level 2 methodology was utilized to sample vegetation on October 2, 2013 and November 13, 2013. Nine 100-square meter CVS plots have been established within the project area. In each plot, four plot corners have been permanently located with rebar. Volunteer plant species (Level 2) were recorded this year and will only be considered in vegetative success determinations for the stream portion of this project. As such, volunteer plant species will be recorded for subsequent monitoring years in vegetation plots located within the 50 foot buffer of the restored stream. Refer to Figure 2 in Appendix A. In all vegetation plots species composition, density, and survival of the planted vegetation was monitored.

This project is generating both stream and riparian buffer mitigation assets. Vegetation success for these assets is measured in two ways. Stream mitigation units (SMUs) require 260 planted and volunteer native

hardwood stems (trees and shrubs) per acre for a minimum of 5 years. Buffer mitigation units (BMUs) require 320 planted native hardwood stems (trees only) per acre for a minimum of 5 years. In accordance with North Carolina Division of Water Quality Administrative Code 15A NCAC 02B.0260 (TAR-PAMLICO RIVER BASIN, *Mitigation Program for Protection and Maintenance of Existing Riparian Buffers*) '[planted vegetation] shall include a minimum of at least two native hardwood tree species planted at a density to provide 320 trees per acre at maturity." Also, for SMUs and BMUs, the buffer must be at least 50-feet wide on both sides of the channel.

The interim measure of vegetative success for SMUs for the site will be the survival of at least 320 3-year old stems per acre at the end of year three of the monitoring period and 280 4-year old stems per acre at the end of year four monitoring period. There are no interim measures of vegetative success for BMUs.

2.3 HYDROLOGY

2.3.1 Wetland

Neither wetland restoration nor enhancement credit is being sought for this project. Existing jurisdictional wetlands as depicted in Figure 2 in Appendix A are being preserved. The wetland preservation areas are visually assessed during each monitoring year.

2.3.2 Stream

One crest gauge has been installed onsite and is located near Cross-section 3. Each visit to the site included documentation of the highest stage for the monitoring interval and a reset of the device. Other indications of bankfull flow including the presence of wrack lines, sediment, or flooding were also monitored, and their presence was recorded and documented photographically. Refer to Figure 2 in Appendix A for the location of the crest gauge.

3.0References

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

NCDWQ. 2004. Tar-Pamlico River Basinwide Water Quality Plan. North Carolina Department of Environment and Natural Resources, Division of Water Quality. Raleigh, NC.

NCEEP. 2010. Procedural Guidance and Content Requirements for EEP Monitoring Reports. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 1.3, January 15, 2010.

NCEEP. 2008. Mitigation Plan Document – Format Data Requirements, and Content Guidelines. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 2.0, March 27, 2008.

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

Schafale, M.P. and A.S. Weakley, 1990. Classification of the Natural Communities of North Carolina, Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, NCDEHNR, Raleigh, North Carolina.

United States Army Corps of Engineers – Wilmington District, North Carolina Division of Water Quality, United States Environmental Protection Agency – Region IV, Natural Resources Conservation Service, North Carolina Wildlife Resources Commission. 2003. Stream Mitigation Guidelines.

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4.0Appendices

Appendix A – Project Vicinity Map and Background Tables

Appendix B – Visual Assessment Data

Appendix C – Vegetation Plot Data

Appendix D – Stream Survey Data

Appendix E – Hydrologic Data

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Appendix A. Project Vicinity Map and Background Tables

Figure 1 – Vicinity Map and Directions
Table 1a.b. – Project Restoration Components
Table 2 – Project Activity and Reporting History
Table 3 – Project Contacts
Table 4 – Project Attribute

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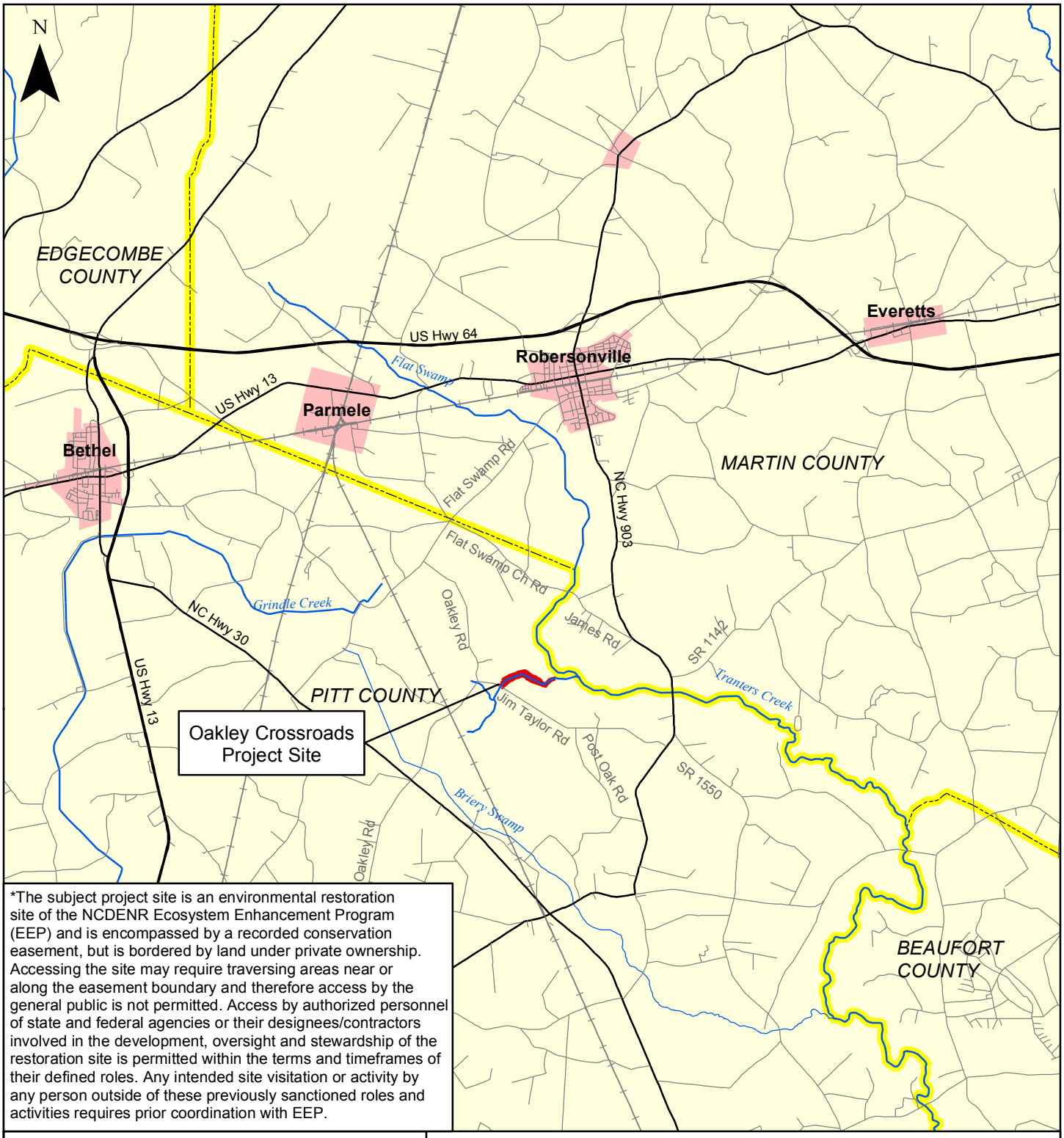
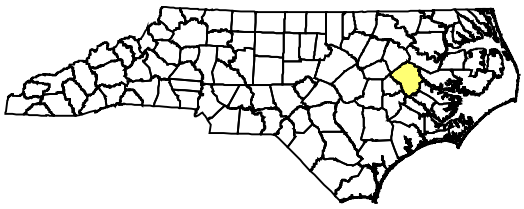


*The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with EEP.



Legend

- Local Roads
- Major Roads
- Railroads
- Conservation Easement
- Streams
- Municipality
- County Boundary

Figure 1. Project Vicinity Map

Oakley Crossroads
Stream & Buffer Restoration
Pitt County, North Carolina

0 0.5 1 2 Miles

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Table 1a. Project Components and Mitigation Credits									
Oakley Crossroads Stream and Buffer Restoration (EEP# 273)									
Project Component or Reach ID	**Existing Feet/Acres**	**Restoration Level**	**Approach**	**Footage or Acreage**	**Stationing/ Location**	**Mitigation Ratio**	**Mitigation Units**	**BMP Elements[1]**	**Comment**
Section 1	2,950	R	PII	3,637	00+00 to 37+98.64	1:1	3,637		Ten foot width of ford crossing removed from total length. 152 LF of restored stream with <50' buffer separated into line item below. Total restoration footage 3,637 LF.
Section 1, <50 ft buffer	152	R	PII	152	~33+00 to ~37+00	1:1	152		152 LF of restored stream has <50' buffer on right bank. Mitigation ratio is likely to change once DWQ publishes reduced SMU calculation for areas with <50 ft of buffer.
Section 2	40	E	EII	40	~38+39 to ~38+79	1.5:1	26.7		Enhancement - log structures, brush mattresses and planting.
Section 3	289	E	EII	289	downstream of Section 2	2.5:1	115.6		Enhancement - planting only.
Riparian Buffer	n/a	R		747,167 sq ft	n/a	1:1	747,167		786,258 sq ft planted, 747,167 sq ft of which are eligible for mitigation credit. Area removed for areas with undiffuse flow, buffer width >200', or buffer width <50'.
Wetlands	1.37	P		1.37	n/a	5:1	0.27		

Table 1b. Component Summations							
Oakley Crossroads Stream and Buffer Restoration (EEP #273)							
Restoration	Stream	Riparian		Non-Ripar	Upland	Buffer	
Level	(lf)	Wetland (Ac)		(Ac)	(Ac)	(Ac)	BMP
		Riverine	Non-Riverine				
Restoration	3789					17.2	
Enhancement							
Enhancement I							
Enhancement II	329						
Creation							
Preservation		1.37					
HQ Preservation							
Totals (Feet/Acres)	**4118**	**1.37**				**17.2**	
MU Totals	**3,931.3**	**0.27**				**17.2**	

Non-Applicable

Table 2. Project Activity and Reporting History		
Oakley Crossroads Stream and Buffer Restoration (EEP# 273)		
Elapsed Time Since Grading Complete:	**30 months**	
Elapsed Time Since Original Planting Complete:	**30 months**	
Number of Reporting Years[1]:	**3**	
	Data Collection	**Completion or**
Activity or Deliverable	**Complete**	**Delivery**
Mitigation Plan	n/a	August 2006
Final Design – Construction Plans	n/a	June 2010
Construction (Grading complete)	n/a	May 2011
Seeding	n/a	May 2011
Planting	n/a	May 2011
As-built (Year 0 Monitoring – baseline)	June 2011	July 2011
Year 1 Monitoring	September 2011	November 2011
Replanting (bareroots)	n/a	January 2012
Year 2 Monitoring	October 2012	November 2012
Year 3 Monitoring	November 2013	Februrary 2014
Year 4 Monitoring	n/a	n/a
Year 5 Monitoring	n/a	n/a

1 = Equals the number of reports or data points produced excluding the baseline

Table 3. Project Contacts Table	
Oakley Crossroads Stream and Buffer Restoration (EEP# 273)	
Designer	Stantec Consulting Services, Inc.
	801 Jones Franklin Rd, Ste 300, Raleigh, NC 27606
Primary project design POC	Nathan Jean (970) 449-8615
Construction Contractor	Ecosystems Grading Solutions, Inc.
	6642 Roper Hollow Rd., Morganton, NC 28655
Construction contractor POC	Bobby Koone (828) 584-3018
Survey Contractor	Turner Land Surveying
	3201 Glenridge Dr., Raleigh, NC 27604
Survey contractor POC	Elizabeth and David Turner (919) 875-1378
Planting Contractor	Bruton Natural Systems, Inc.
	P.O. Box 1197, Remont, NC 27830
Planting contractor POC	Charlie Bruton (919) 242-6555
Seeding Contractor	Ecosystems Grading Solutions, Inc.
	6642 Roper Hollow Rd., Morganton, NC 28655
Contractor point of contact	Bobby Koone (828) 584-3018
Seed Mix Sources	Green Resources
Nursery Stock Suppliers	Southeastern Native Plant Nursery
	South Carolina Super Tree Nursery
	Natives
Monitoring Performers	Stantec Consulting Services, Inc.
	801 Jones Franklin Rd, Ste 300, Raleigh, NC 27606
Stream Monitoring POC	Tim Taylor (980) 297-7669
Vegetation Monitoring POC	Amber Coleman (919)865-7399
Wetland Monitoring POC	n/a

Table 4. Project Baseline Information and Attributes			
Oakley Crossroads Stream and Buffer Restoration (EEP# 273)			
Project Information			
Project County	Pitt		
Project Area (acres)	26.6		
Project Coordinates (latitude and longitude)	35.76692, -77.269077		
Project Watershed Summary Information			
Physiographic Region	Coastal Plain		
River Basin	Tar-Pamlico		
USGS HUC for Project (14 digit)	0302010309002		
NCDWQ Sub-basin for Project	03-03-06		
Project Drainage Area (sq mi)	1.71		
Project Drainage Area % Impervious	<1%		
CGIA Landuse Classification	Cropland and Pasture		
Reach Summary Information			
Reach name	Section 1	Section 2	Section 3
Length of reach (linear feet)	3,799	40	289
Valley classification	VIII	VIII	VIII
Drainage area (acres)	1,014.5	1,014.7	1,092.3
NCDWQ stream identification score	41	40.5	40.5
NCDWQ classification	n/a	n/a	n/a
Morphological description (stream type)	E5	F5	F5
Evolutionary trend	E5	C5	C5
Underlying mapped soils	Bladen	Pantego	Pantego
Drainage class	Poorly drained	Very poorly drained	Very poorly drained
Soil hydric status	Yes	Yes	Yes
Slope	0-2%	0-1%	0-1%
FEMA classification	Zone X	Zone X	Zone X
Native vegetation community	Riverine bottomland hardwood and mesic mixed hardwood forest		
Percent composition of exotic invasive vegetation	0%	0%	10%
Wetland Summary Information			
n/a - wetland preservation only			
Regulatory Considerations			
Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States - Section 404	Yes	Yes	USACE 404 permit
Waters of the United States - Section 401	Yes	Yes	NCDWQ 401 permit
Endangered Species Act	No	n/a	n/a
Historic Preservation Act	No	n/a	n/a
Coastal Zone Management Act (CZMA)/Coastal Aream Management Act (CAMA)	No	n/a	n/a
FEMA Floodplain Compliance	No	n/a	n/a

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Appendix B. Visual Assessment

Figure 2 – Current Condition Plan View (3 Sheets)
Table 5 – Visual Stream Morphology Stability Assessment
Table 6 – Vegetation Condition Assessment
Photos – Stream Stations (S1-S9)
Photos – Vegetation Plots (V1-V19)

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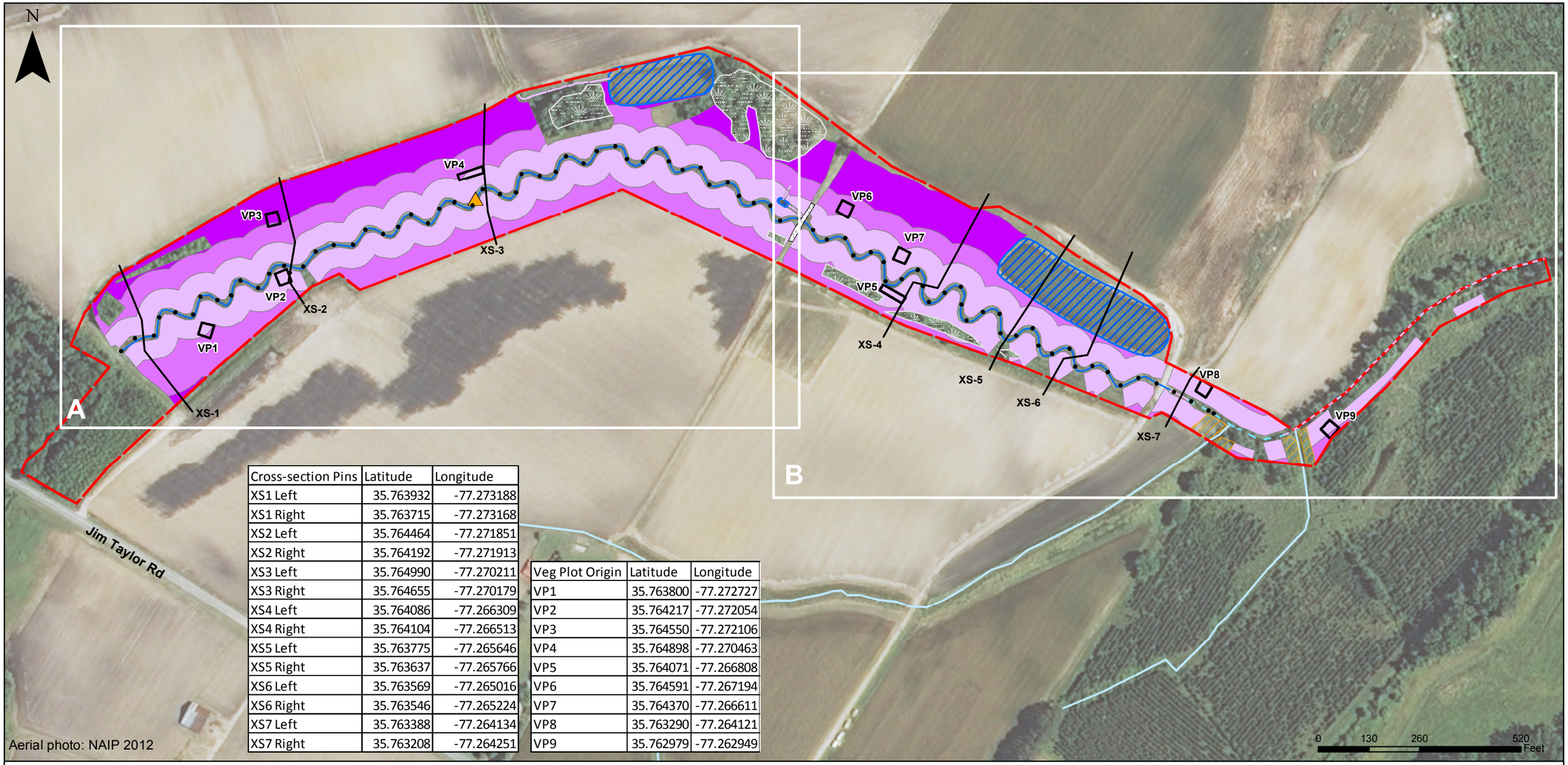

Cross-section Pins	Latitude	Longitude
XS1 Left	35.763932	-77.273188
XS1 Right	35.763715	-77.273168
XS2 Left	35.764464	-77.271851
XS2 Right	35.764192	-77.271913
XS3 Left	35.764990	-77.270211
XS3 Right	35.764655	-77.270179
XS4 Left	35.764086	-77.266309
XS4 Right	35.764104	-77.266513
XS5 Left	35.763775	-77.265646
XS5 Right	35.763637	-77.265766
XS6 Left	35.763569	-77.265016
XS6 Right	35.763546	-77.265224
XS7 Left	35.763388	-77.264134
XS7 Right	35.763208	-77.264251

Veg Plot Origin	Latitude	Longitude
VP1	35.763800	-77.272727
VP2	35.764217	-77.272054
VP3	35.764550	-77.272106
VP4	35.764898	-77.270463
VP5	35.764071	-77.266808
VP6	35.764591	-77.267194
VP7	35.764370	-77.266611
VP8	35.763290	-77.264121
VP9	35.762979	-77.262949

Figure 2. Asset Map MY3

Oakley Crossroads Stream and Buffer Restoration Project
EEP #: 273
Pitt County, North Carolina
November 2013

Ecosystem Enhancement Program

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- Crest gage
- Vegetation monitoring plots (VP 1-9)
- Stream cross-section surveys (XS 1-7)
- Conservation easement

- Section 1 Stream Restoration Centerline MY1
- Section 2 Stream Enhacement II
- Section 3 Stream Enhacement II (planting only)
- Other on-site hydrography
- Non-buffered waterways
- Ponds
- Ford crossing
- Wetland preservation

Buffer Zones (747,167 sqft)*

- Top of Bank - 50 ft (368,217 sqft)
- 50 ft - 100 ft (228,582 sqft)
- 100 ft - 200 ft (150,368 sqft)
- No Credit Non-diffuse/Non-buffered waterways (4,3560 sqft removed per waterway)

* Buffer zones are planted contiguous areas that have a buffer width of at least 50' but not greater than 200'. Areas not included in the buffer credit area include: existing Jurisdictional wetlands, farm ponds, areas that were not planted, and areas surrounding each non-diffuse/non-buffered waterway entering the easement.

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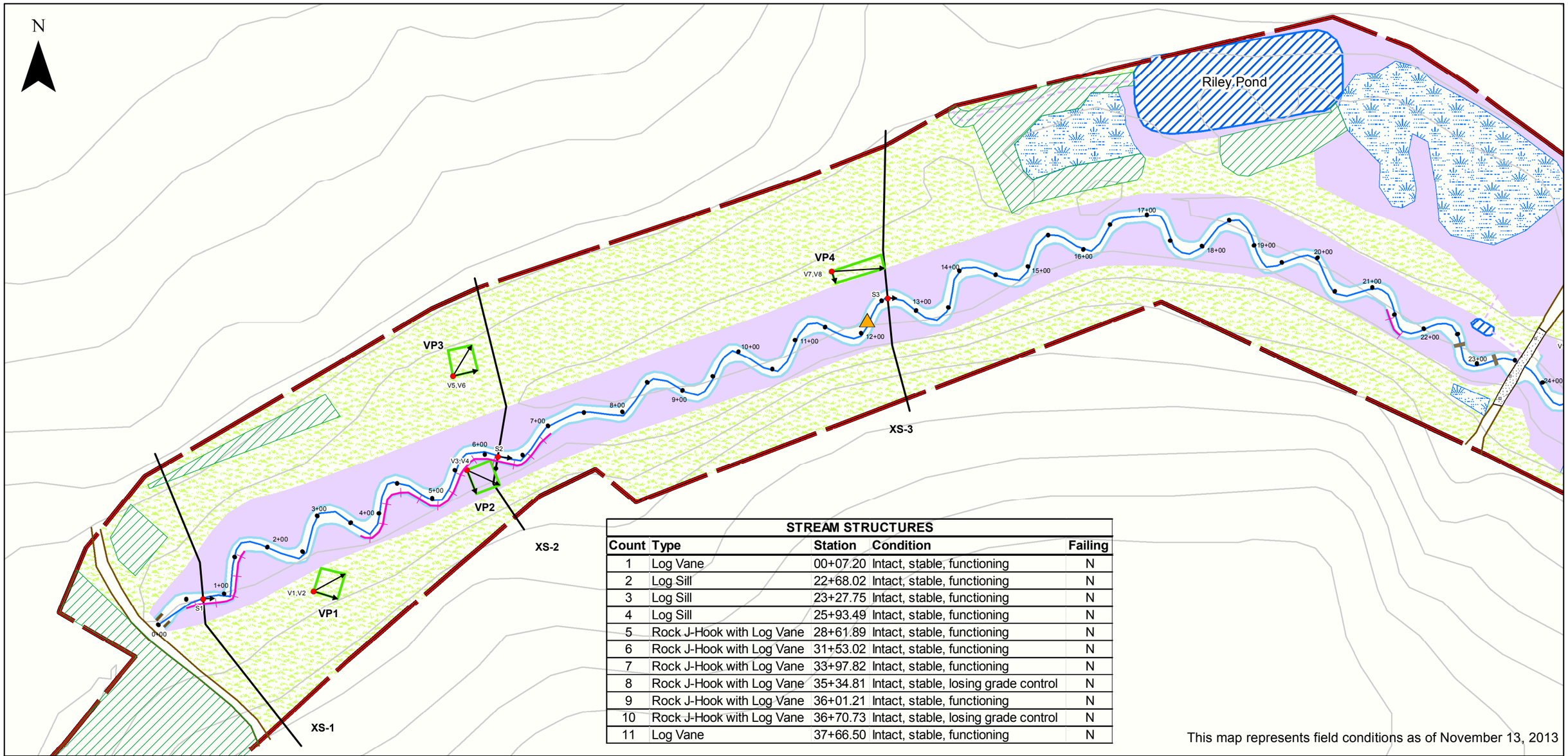

STREAM STRUCTURES

Count	Type	Station	Condition	Failing
1	Log Vane	00+07.20	Intact, stable, functioning	N
2	Log Sill	22+68.02	Intact, stable, functioning	N
3	Log Sill	23+27.75	Intact, stable, functioning	N
4	Log Sill	25+93.49	Intact, stable, functioning	N
5	Rock J-Hook with Log Vane	28+61.89	Intact, stable, functioning	N
6	Rock J-Hook with Log Vane	31+53.02	Intact, stable, functioning	N
7	Rock J-Hook with Log Vane	33+97.82	Intact, stable, functioning	N
8	Rock J-Hook with Log Vane	35+34.81	Intact, stable, losing grade control	N
9	Rock J-Hook with Log Vane	36+01.21	Intact, stable, functioning	N
10	Rock J-Hook with Log Vane	36+70.73	Intact, stable, losing grade control	N
11	Log Vane	37+66.50	Intact, stable, functioning	N

This map represents field conditions as of November 13, 2013

Figure 2a. Current Condition Plan View MY3

Oakley Crossroads Stream and Buffer Restoration Project
EEP #: 273
Pitt County, North Carolina
November 2013

Photo points (Veg=V, Stream=S)
Stream cross-section surveys (XS 1-7)
2' contours
Farm paths
Ford crossing
Conservation easement
Vegetation Plot Success (VP 1-9)
Buffer=Yes, Stream=Yes or n/a
Buffer=No, Stream=n/a
Buffer=No, Stream=No

Section 1 Stream Restoration Thalweg MY1
Section 2 Stream Enhacement II
Section 3 Stream Enhacement II (planting only)
Other on-site hydrography
Non-buffered waterways
Ponds
Wetland Preservation
Crest gage
Log Vane
Log Sill
Rock J-Hook with Log Vane

Planting Zones
Riverine Bottomland Hardwood Forest
Mesic Mixed Hardwood Forest
Livestakes
Existing Trees
Problem Areas
Brush Mattress <80% vegetative cover (2012)
Beaver Dam
Dead livestakes
Murdannia keisak

0 50 100 200 Feet

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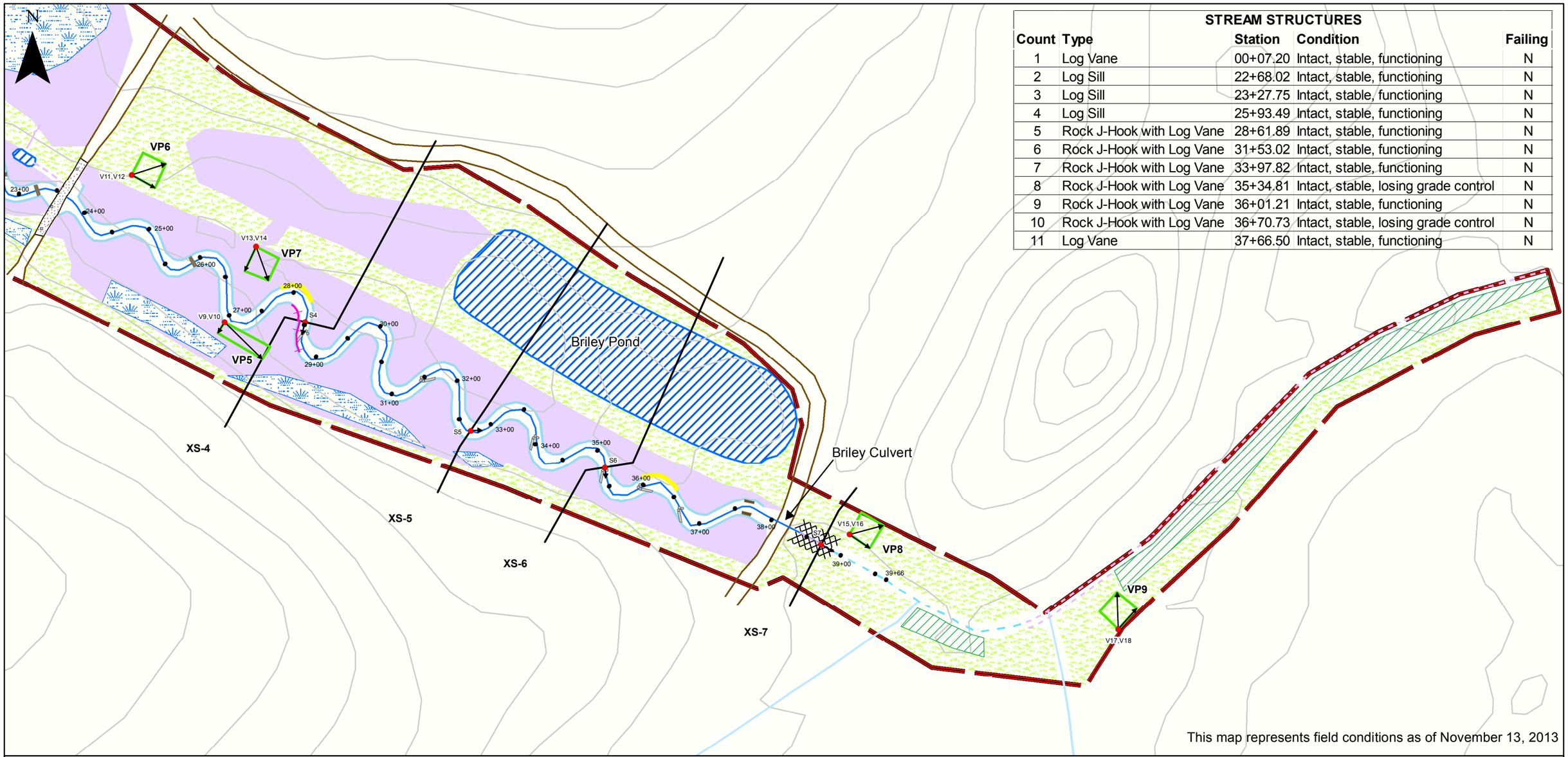

STREAM STRUCTURES

Count	Type	Station	Condition	Failing
1	Log Vane	00+07.20	Intact, stable, functioning	N
2	Log Sill	22+68.02	Intact, stable, functioning	N
3	Log Sill	23+27.75	Intact, stable, functioning	N
4	Log Sill	25+93.49	Intact, stable, functioning	N
5	Rock J-Hook with Log Vane	28+61.89	Intact, stable, functioning	N
6	Rock J-Hook with Log Vane	31+53.02	Intact, stable, functioning	N
7	Rock J-Hook with Log Vane	33+97.82	Intact, stable, functioning	N
8	Rock J-Hook with Log Vane	35+34.81	Intact, stable, losing grade control	N
9	Rock J-Hook with Log Vane	36+01.21	Intact, stable, functioning	N
10	Rock J-Hook with Log Vane	36+70.73	Intact, stable, losing grade control	N
11	Log Vane	37+66.50	Intact, stable, functioning	N

This map represents field conditions as of November 13, 2013

Figure 2b. Current Condition Plan View MY3

Oakley Crossroads Stream and Buffer Restoration Project
EEP #: 273
Pitt County, North Carolina
November 2013

- Photo points (Veg=V, Stream=S)
- Stream cross-section surveys (XS 1-7)
- 2' contours
- Farm paths
- Ford crossing
- Conservation easement

Vegetation Plot Success (VP 1-9)

- Buffer=Yes, Stream=Yes or n/a
- Buffer=No, Stream=n/a
- Buffer=No, Stream=No

- Section 1 Stream Restoration Thalweg MY1
- Section 2 Stream Enhacement II
- Section 3 Stream Enhacement II (planting only)
- Other on-site hydrography
- Non-buffered waterways
- Ponds
- Wetland Preservation
- Crest gage
- Log Vane
- Log Sill
- Rock J-Hook with Log Vane

Planting Zones

- Riverine Bottomland Hardwood Forest
- Mesic Mixed Hardwood Forest
- Livestakes
- Existing Trees

Problem Areas

- Brush Mattress <80% vegetative cover (2012)
- Beaver Dam
- Dead livestakes
- Murdannia keisak

0 50 100 200 Feet

Ecosystem Enhancement Program

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Table 5 **Visual Stream Morphology Stability Assessment**
Reach ID **Reach 1**
Assessed Length **3800**

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	% Stable, 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. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	N/A	56			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	56	56			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	56	56			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	56	56			100%			
		2. Thalweg centering at downstream of meander (Glide)	56	56			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	11	11			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	9	11			82%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	11	11			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	11	11			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	11	11			100%			

Table 6. Vegetation Condition Assessment						
Oakley Crossroads Stream and Buffer Restoration (EEP# 273)						
Planted acreage*	18					
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Planted Acreage**
1. Bare Areas	Very limited cover of woody material	0.1 acres	none	0	0	0.0%
2. Low Stem Density	Woody stem densities below target levels for stem count success criteria	0.1 acres	none	0	0	0.0%
			Total	0	0	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year	0.25 acres	None	0	0	0.0%
			Total	0	0	0.0%
Easement acreage	26.6					
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Easement Acreage**
4. Invasive areas of concern	*Murdannia keisak*	1000 SF	Magenta line with cross-hatches	4 line segments ~3' wide	0.039	0.1%
5. Encroachment areas		none	None	0	0	0.0%

*Total planted acreage

Stream Station Photos

Photo Station S1 – Stream channel looking downstream at cross-section 1 Station 00+72 - Priority 2 (11/13/13 Year 3)

Photo Station S2 –Stream channel looking downstream at cross-section 2 Station 06+17 – Priority 2 (11/13/13 Year 3)

Photo Station S3 – Stream channel looking downstream at cross-section 3
Station 12+59 – Priority 2 (11/13/2013 Year 3)

Photo Station S4 – Stream channel looking downstream at cross-section 4
Station 28+46 – Priority 2 (11/13/2013 Year 3)

Photo Station S5 – Stream channel looking downstream at cross-section 5
Station 32+71 – Priority 2 (11/13/2013 Year 3)

Photo Station S6 – Stream channel looking downstream at cross-section 6
Station 35+24 – Priority 2 (11/13/2013 Year 3)

Photo Station S7 – Stream channel looking downstream at cross-section 7 Station 38+71 – Enhancement 2 (11/13/2013 Year 3)

Photo Station S8 – Crest gauge indicating a bankfull event (3/28/2013 Year 3)

Vegetation Plot Photos

Photo Station V1 - Veg Plot 1 looking southeast (10/2/2013 Year 3)

Photo Station V2 - Veg Plot 1 looking east (10/2/2013 Year 3)

Photo Station V3 - Veg Plot 2 looking south (10/2/2013 Year 3)

Photo Station V4 - Veg Plot 2 looking southeast (10/2/2013 Year 3)

Photo Station V5 - Veg Plot 3 looking east (10/2/2013 Year 3)

Photo Station V6 - Veg Plot 3 looking northeast (10/2/2013 Year 3)

Photo Station V7 - Veg Plot 4 looking south (10/2/2013 Year 3)

Photo Station V8 - Veg Plot 4 looking southeast (10/2/2013 Year 3)

Photo Station V9 - Veg plot 5 looking south (10/2/2013 Year 3)

Photo Station V10 - Veg plot 5 looking southeast (10/2/2013 Year 3)

Photo Station V11 - Veg plot 6 looking east (10/2/2013 Year 3)

Photo Station V12 - Veg plot 6 looking northeast (10/2/2013 Year 3)

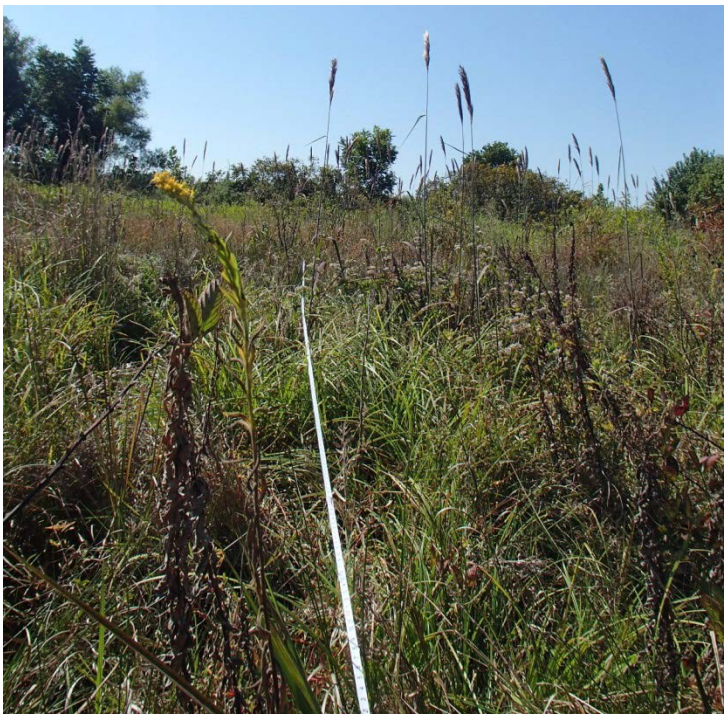

Photo Station V13 - Veg plot 7 looking south (10/2/2013 Year 3)

Photo Station V14 - Veg plot 7 looking southeast (10/2/2013 Year 3)

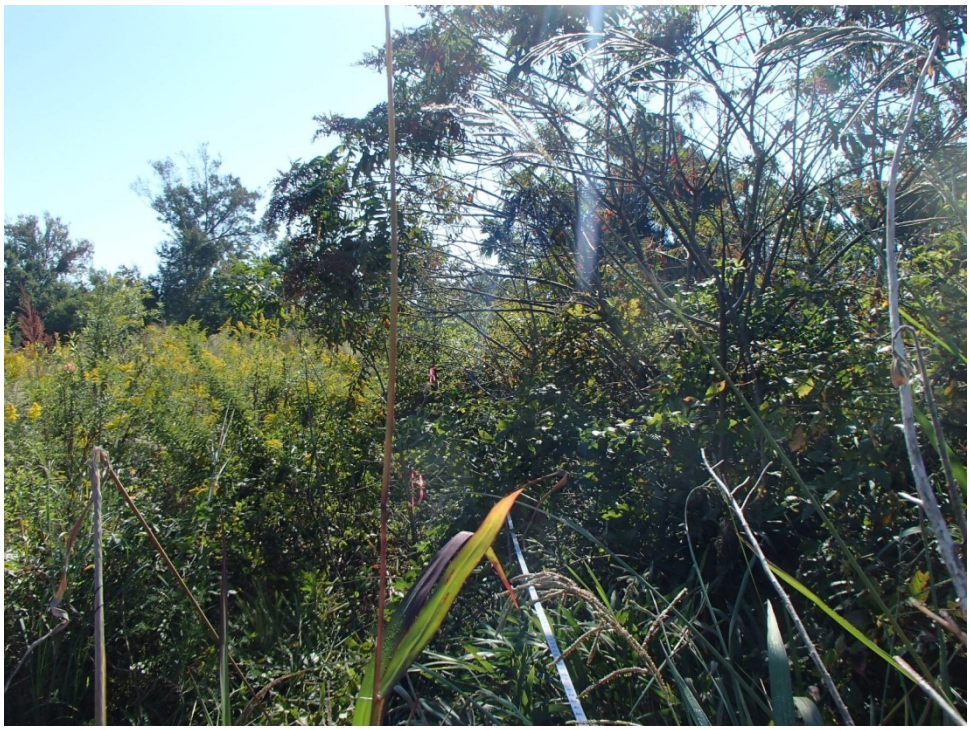

Photo Station V15 - Veg plot 8 looking east (10/2/2013 Year 3)

Photo Station V16 - Veg plot 8 looking northeast (10/2/2013 Year 3)

Photo Station V17 - Veg plot 9 looking northeast (11/13/2013 Year 3)

Photo Station V18 - Veg plot 9 looking north (11/13/2013 Year 3)

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Appendix C. Vegetation Plot Data

Table 7a,b. – Vegetation Plot Mitigation Success Summary
Table 8 – CVS Vegetation Metadata
Table 9 – CVS Stem Count Total and Planted by Plot and Species

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Table 7. Oakley Crossroads (G) (#273)

Year 3 (02-Oct-2013 to 13-Nov-2013)

Vegetation Plot Summary Information

Plot #	Riparian Buffer Stems[1]	Stream/ Wetland Stems[2]	Live Stakes	Invasives	Volunteers[3]	Total[4]	Unknown Growth Form
0001	21	23	0	0	11	**34**	0
0002	14	14	0	0	53	**67**	0
0003	22	22	0	0	6	**28**	0
0004	20	21	0	0	19	**40**	0
0005	9	9	0	0	5	**14**	0
0006	18	18	0	0	78	**96**	0
0007	9	9	0	0	2	**11**	0
0008	16	16	0	0	5	**21**	0
0009	15	15	0	0	14	**29**	0

Wetland/Stream Vegetation Totals

(per acre)

Plot #	Stream/ Wetland Stems[2]	Volunteers[3]	Total[4]	Success Criteria Met?
0001	931	445	1376	Yes
0002	567	2145	2711	Yes
0003	890	243	1133	Yes
0004	850	769	1619	Yes
0005	364	202	567	Yes
0006	728	3157	3885	Yes
0007	364	81	445	Yes
0008	647	202	850	Yes
0009	607	567	1174	Yes
Project Avg	**668**	**868**	**1529**	**Yes**

Riparian Buffer Vegetation Totals

(per acre)

Plot #	Riparian Buffer Stems[1]	Success Criteria Met?
0001	850	Yes
0002	567	Yes
0003	890	Yes
0004	809	Yes
0005	364	Yes
0006	728	Yes
0007	364	Yes
0008	647	Yes
0009	607	Yes
Project Avg	**647**	**Yes**

Stem Class **characteristics**

[1]Buffer Stems — Native planted hardwood trees. Does NOT include shrubs. No pines. No vines.

[2]Stream/ Wetland Stems — Native planted woody stems. Includes shrubs, does NOT include live stakes. No vines

[3]Volunteers — Native woody stems. Not planted. No vines.

[4]Total — Planted + volunteer native woody stems. Includes live stakes. Excl. exotics. Excl. vines.

Color for Density

Exceeds requirements by 10%

Table 8 - CVS Metadata	
Oakley Crossroads Stream and Buffer Restoration - EEP #273	
Report Prepared By	Alex Baldwin
Date Prepared	1/2/2014 16:30
database name	STantec_Oakley_2012cvs-eep-entrytool-v2.3.1.mdb
database location	U:\175613016\project\site_data\vegetation
computer name	BALDWINA-SP1
file size	61751296
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	273
project Name	Oakley Crossroads (G)
Description	Stream and Wetland Restoration
River Basin	Tar-Pamlico
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	9

Table 9. CVS Stem Count Total and Planted by Plot and Species
EEP Project Code 273. Project Name: Oakley Crossroads

			Current Plot Data (MY3 2013)																								Annual Means								
			E273-01-0001			E273-01-0002			E273-01-0003			E273-01-0004			E273-01-0005			E273-01-0006			E273-01-0007			E273-01-0008			E273-01-0009			MY3 (2013)			MY2 (2012)			MY1 (2011)			MY0 (2011)		
Scientific Name	**Common Name**	**Species Type**	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	**red maple**	**Tree**			3			28			2			5			4			78			1						3			124										
Acer rubrum var. rubrum	**red maple**	**Tree**																															147								
Alnus serrulata	hazel alder	Shrub						6																							6			4							
Cornus amomum	silky dogwood	Shrub																															2								
Eubotrys racemosa	swamp doghobble	Shrub																																	1	1	1	1	1	1			
Fraxinus pennsylvanica	**green ash**	**Tree**	4	4	4				4	4	4	5	5	5				4	4	4							5	5	5	22	22	22	22	22	22	13	13	13	13	13	13
Liquidambar styraciflua	**sweetgum**	**Tree**			6			15						11															9			41			33							
Liriodendron tulipifera	**tuliptree**	**Tree**												1																		1										
Magnolia virginiana	**sweetbay**	**Tree**	1	1	1							1	1	1				1	1	1										3	3	3	3	3	3	3	3	3	3	3	3
Morella cerifera	wax myrtle	shrub	2	2	2							1	1	2																3	3	4	3	3	3	3	3	3	3	3	3
Nyssa biflora	**swamp tupelo**	**Tree**				6	6	6													2	2	2							8	8	8	9	9	9	1	1	1	1	1	1
Nyssa sylvatica	**blackgum**	**Tree**	3	3	3				5	5	6	3	3	3	1	1	1	4	4	4										16	16	17	13	13	13	2	2	2	2	2	2
Pinus taeda	loblolly pine	Tree			1																											1									
Platanus occidentalis	**American sycamore**	**Tree**	5	5	5			4	7	7	8	6	6	6				4	4	4	1	1	2				4	4	4	27	27	33	28	28	28	14	14	14	14	14	14
Quercus	**oak**	**Tree**																															2	2	2	7	7	7			
Quercus falcata	**southern red oak**	**Tree**	8	8	8				5	5	6	5	5	6	1	1	1	3	3	3				4	4	4	6	6	8	32	32	36	30	30	30	10	10	10	12	12	12
Quercus lyrata	**overcup oak**	**Tree**				5	5	5			1				1	1	1	1	1	1										7	7	8	7	7	7	7	7	7	4	4	4
Quercus michauxii	**swamp chestnut oak**	**Tree**				1	1	1							2	2	2				1	1	1							4	4	4	6	6	6	7	7	7	9	9	9
Quercus nigra	**water oak**	**Tree**							1	1	1							1	1	1				11	11	11				13	13	13	14	14	14	13	13	13	7	7	7
Quercus pagoda	**cherrybark oak**	**Tree**				1	1	1																1	1	1				2	2	2	3	3	3	2	2	2			
Quercus phellos	**willow oak**	**Tree**				1	1	1							4	4	4				5	5	5							10	10	10	10	10	10	12	12	12	16	16	16
Quercus rubra	**northern red oak**	**Tree**																															1								
Rhus copallinum	flameleaf sumac	shrub			1																					5					6									
Sambucus canadensis	Common Elderberry	Shrub															1														1			3							
Toxicodendron radicans	eastern poison ivy	Vine																															1								
Unknown		Shrub or Tree																																					1	1	1
		Stem count	23	23	34	14	14	67	22	22	28	21	21	40	9	9	14	18	18	96	9	9	11	16	16	21	15	15	29	147	147	340	148	148	339	90	90	90	93	93	93
		size (ares)	1			1			1			1			1			1			1			1			1			9			9			9			9		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.22			0.22			0.22			0.22		
		Species count	6	6	10	5	5	9	5	5	7	6	6	9	5	5	7	7	7	8	4	4	5	3	3	4	3	3	5	12	12	19	12	12	19	14	14	14	14	14	14
		Stems per ACRE	930.8	930.8	1376	566.6	566.6	2711	890.3	890.3	1133	849.8	849.8	1619	364.2	364.2	566.6	728.4	728.4	3885	364.2	364.2	445.2	647.5	647.5	849.8	607	607	1174	661	661	1529	665.5	665.5	1524	404.7	404.7	404.7	418.2	418.2	418.2

***Bolded** hardwood trees are counted toward riparian buffer success criteria.

Color for Density

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

PnoLS = Planted excluding livestakes
P-all = All planted stems including livestakes
T = All planted and natural recruit stems including livestakes
Total includes natural recruit stems

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Appendix D. Stream Survey Data

Figures 3a-j – Cross-Sections with Annual Overlays
Figure 4 – Longitudinal Profiles with Annual Overlays
Table 10a,b. – Baseline – Stream Data Summary
Table 11a. – Monitoring – Cross-section Morphology Data
Table 11b. – Monitoring – Stream Reach Morphology Data

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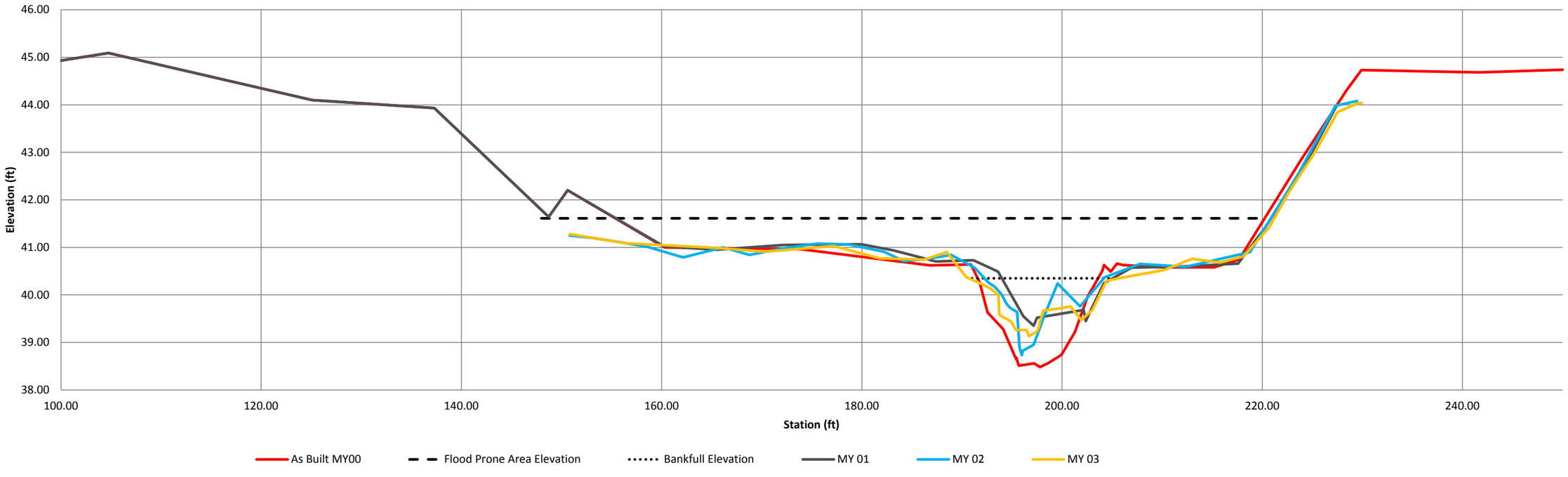
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-1, Riffle, STA 0+72
Drainage Area(sq. mi.)	1.59
Date	11/13/2013
Field Crew	T. Taylor, A. Baldwin

MY 00		MY 01		MY 02		MY 03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
12.21	49.05	12.21	49.05	150.82	41.25	150.84	41.28
19.33	48.29	19.33	48.29	153.07	41.20	156.31	41.09
28.16	46.74	28.16	46.74	155.79	41.11	165.33	40.99
35.77	46.38	35.77	46.38	158.62	41.01	170.30	40.91
47.80	45.82	47.80	45.82	162.14	40.79	177.18	41.03
59.77	45.48	59.77	45.48	166.15	41.00	181.76	40.77
74.68	45.23	74.68	45.23	168.77	40.84	186.24	40.74
81.30	45.02	81.30	45.02	172.16	40.98	188.48	40.90
87.17	45.62	87.17	45.62	175.62	41.08	190.46	40.37
93.57	44.59	93.57	44.59	178.75	41.06	191.75	40.25
98.13	44.87	98.13	44.87	182.20	40.91	192.82	40.14
104.75	45.09	104.75	45.09	184.20	40.71	193.66	39.99
125.09	44.10	125.09	44.10	186.59	40.76	193.73	39.58
137.30	43.93	137.30	43.93	188.93	40.84	194.91	39.44
148.71	41.64	148.71	41.64	191.29	40.57	195.40	39.26
150.62	42.20	150.62	42.20	192.64	40.26	196.46	39.26
160.31	41.00	160.25	41.02	193.29	40.17	196.71	39.13
173.90	40.96	165.47	40.95	194.00	40.00	197.55	39.24
186.83	40.62	172.19	41.05	194.43	39.82	198.10	39.67
190.89	40.64	179.93	41.07	194.80	39.73	199.56	39.71
191.77	40.27	183.19	40.94	195.51	39.64	200.82	39.76
192.56	39.63	187.40	40.70	195.74	38.90	201.92	39.47

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	40.63	40.72	40.57	40.37
Bankfull Cross-Sectional Area	18.33	8.37	9.77	9.15
Bankfull Width	20.80	12.39	15.49	15.73
Flood Prone Area Elevation	42.78	41.63	42.41	41.61
Flood Prone Width	80.66	65.65	78.50	70.36
Max Depth at Bankfull	2.15	1.14	1.84	1.24
Mean Depth at Bankfull	0.88	0.68	0.63	0.58
W/D Ratio	23.64	18.22	24.59	27.12
Entrenchment Ratio	3.88	5.30	5.07	4.47
Bank Height Ratio	1.00	1.00	1.00	1.00
Stream Type	C	C	C	C

Sta. 0+75 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 1, Riffle, Station 0+72



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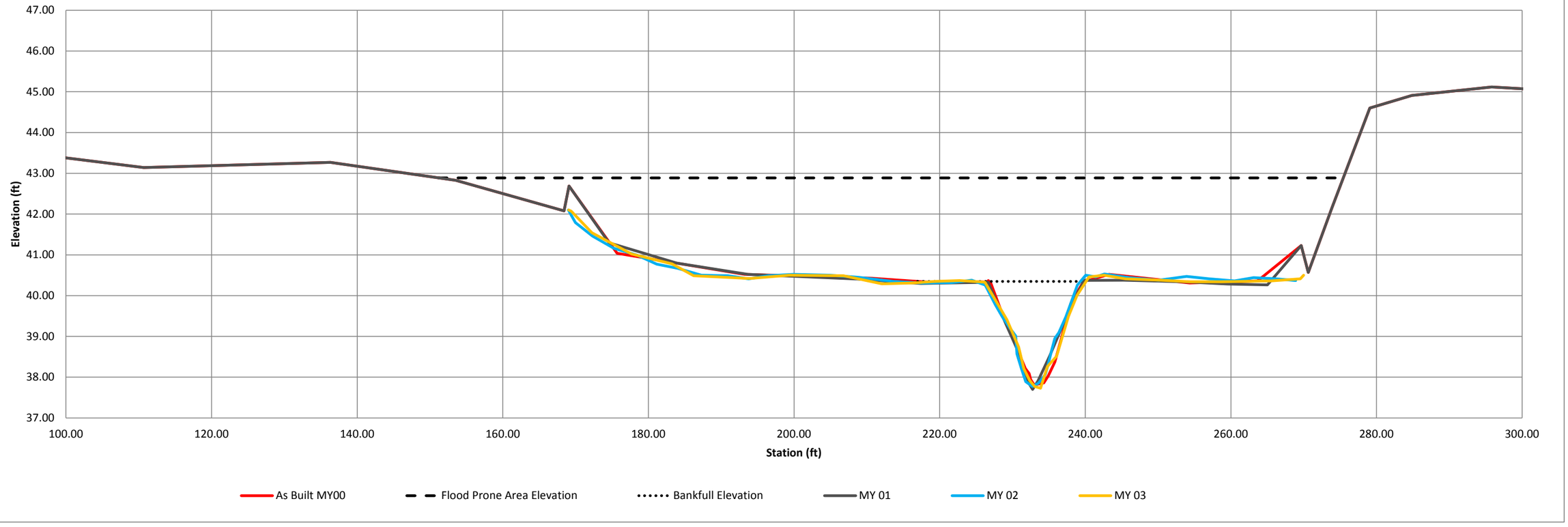
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-2, Riffle, STA 6+17
Drainage Area(sq. mi.)	1.59
Date	11/13/2013
Field Crew	T. Taylor, A. Baldwin

MY 00		MY 01		MY 02		MY 03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
12.76	46.91	12.76	46.91	169.00	42.10	169.04	42.10
33.99	44.63	33.99	44.63	169.98	41.79	169.40	42.07
54.24	44.37	54.24	44.37	172.32	41.46	172.25	41.54
72.47	43.91	72.47	43.91	175.26	41.16	177.69	41.02
92.77	43.54	92.77	43.54	178.46	40.99	183.24	40.78
110.68	43.14	110.68	43.14	181.16	40.77	186.21	40.49
136.32	43.27	136.32	43.27	184.02	40.67	193.91	40.42
153.53	42.83	153.53	42.83	187.28	40.50	199.31	40.50
168.42	42.08	168.42	42.08	190.92	40.49	206.79	40.49
169.10	42.69	169.10	42.69	193.78	40.41	212.08	40.29
175.71	41.04	174.60	41.30	196.48	40.49	216.27	40.31
193.21	40.52	183.93	40.80	199.93	40.52	219.32	40.35
210.45	40.43	193.68	40.52	205.00	40.50	222.74	40.37
219.41	40.32	208.61	40.41	208.82	40.45	226.20	40.33
223.60	40.35	217.46	40.30	213.63	40.35	229.24	39.41
226.57	40.33	226.67	40.33	217.51	40.31	230.85	38.74
226.69	40.37	229.04	39.32	221.63	40.32	231.55	38.21
227.04	40.30	230.82	38.62	224.41	40.38	232.36	37.92
228.42	39.64	231.63	38.04	226.25	40.26	233.06	37.77
229.95	38.99	232.76	37.70	227.67	39.77	233.87	37.73
231.78	38.21	233.53	37.92	228.58	39.49	234.81	38.26
232.29	38.09	235.12	38.52	229.56	39.23	236.06	38.51

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	40.35	40.38	40.38	40.33
Bankfull Cross-Sectional Area	18.16	17.88	18.17	18.06
Bankfull Width	16.60	13.16	15.09	13.85
Flood Prone Area Elevation	42.89	43.06	42.99	42.93
Flood Prone Width	124.27	124.27	124.27	125.00
Max Depth at Bankfull	2.54	2.68	2.61	2.60
Mean Depth at Bankfull	1.09	1.37	1.20	1.30
W/D Ratio	15.23	9.61	12.58	10.65
Entrenchment Ratio	7.49	9.44	8.24	9.03
Bank Height Ratio	1.00	1.00	1.00	1.00
Stream Type	C	C	C	C

Sta. 6+17 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 2, Riffle, Station 6+17



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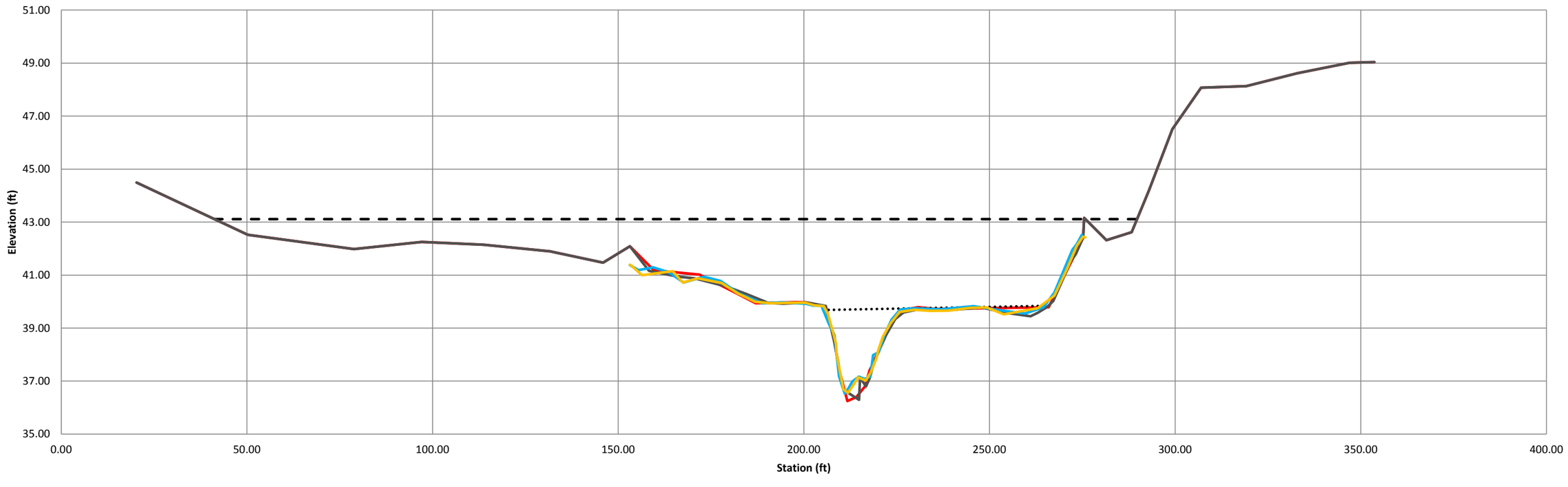
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-3, Pool, STA 12+59
Drainage Area(sq. mi.)	1.59
Date	11/13/2013
Field Crew	T. Taylor, A. Baldwin

MY 00		MY 01		MY 02		MY 03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
20.32	44.49	20.32	44.49	153.13	41.38	153.13	41.39
50.25	42.52	50.25	42.52	155.51	41.19	153.61	41.35
78.82	41.98	78.82	41.98	159.37	41.29	156.40	41.00
97.11	42.25	97.11	42.25	163.57	41.11	164.69	41.15
113.72	42.15	113.72	42.15	167.64	40.72	167.39	40.72
131.64	41.90	131.64	41.90	173.09	40.94	171.43	40.88
145.91	41.47	145.91	41.47	177.54	40.78	177.86	40.70
153.13	42.09	153.13	42.09	182.58	40.30	182.06	40.32
159.54	41.19	158.28	41.16	185.77	40.12	186.87	39.99
171.94	41.02	166.00	40.94	188.89	39.94	191.07	39.94
180.95	40.38	170.52	40.88	194.18	39.97	195.94	39.95
187.04	39.94	179.13	40.57	200.51	39.92	200.44	39.96
197.51	39.98	184.61	40.28	202.61	39.85	202.76	39.86
200.36	39.97	190.41	39.96	204.72	39.85	205.35	39.83
205.21	39.84	194.41	39.92	206.71	39.17	206.48	39.54
205.63	39.82	200.59	39.97	207.89	38.84	208.05	38.73
205.93	39.76	205.91	39.83	208.23	38.73	208.65	38.40
207.79	38.83	208.18	38.48	209.46	37.19	208.82	38.03
209.56	37.40	209.36	37.63	210.59	36.70	209.67	37.40
210.71	36.78	209.67	37.18	211.02	36.53	210.70	36.68
211.70	36.25	210.78	36.66	212.13	36.75	211.91	36.56
214.13	36.40	214.84	36.29	213.04	36.98	213.77	36.95

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	39.68	39.70	39.70	39.61
Bankfull Cross-Sectional Area	36.86	37.87	34.50	32.69
Bankfull Width	20.58	24.45	20.80	19.56
Flood Prone Area Elevation	43.11	43.11	42.87	42.66
Flood Prone Width	248.46	248.07	244.10	245.00
Max Depth at Bankfull	3.43	3.41	3.17	3.05
Mean Depth at Bankfull	1.79	1.55	1.66	1.67
W/D Ratio	11.50	15.77	12.53	11.71
Entrenchment Ratio	12.07	10.15	11.74	12.53
Bank Height Ratio	1.00	1.00	1.00	1.00
Stream Type	C	C	C	C

Sta. 12+59 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 3, Pool, Station 12+59



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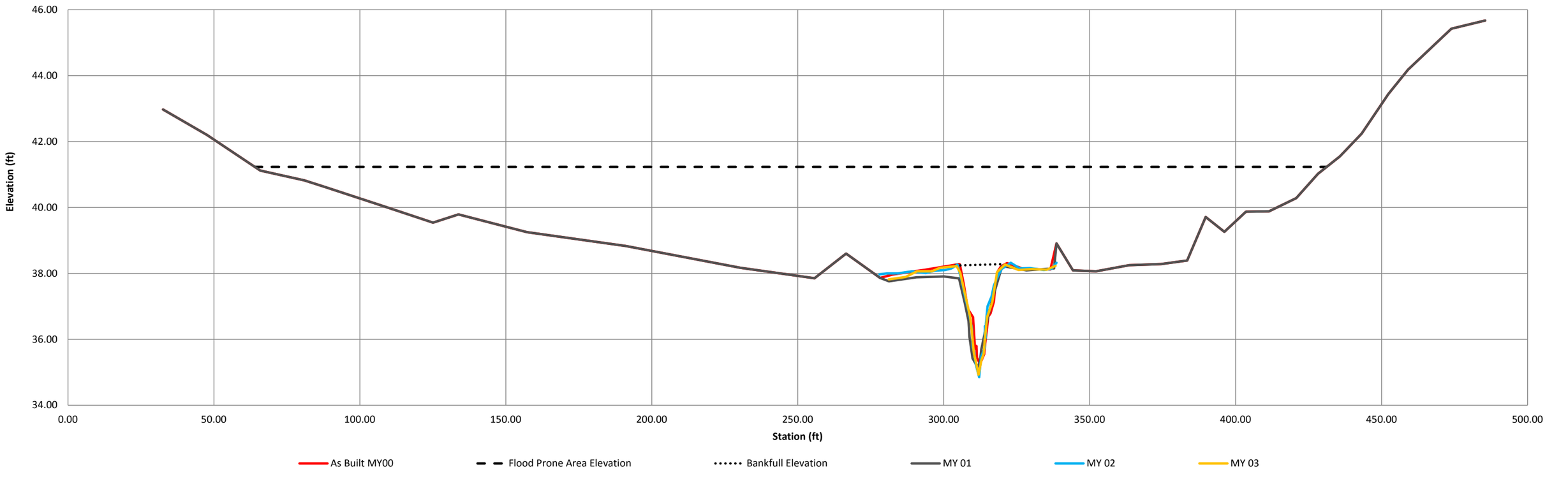
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-4, Riffle, STA 28+46
Drainage Area(sq. mi.)	1.59
Date	11/13/2013
Field Crew	T. Taylor, A. Baldwin

MY 00		MY 01		MY 02		MY 03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
32.58	42.97	32.58	42.97	278.00	37.97	281.19	37.82
47.64	42.20	47.64	42.20	280.52	38.00	286.99	37.89
65.92	41.12	65.92	41.12	284.26	38.00	290.83	38.06
81.03	40.82	81.03	40.82	289.18	38.06	295.88	38.06
88.43	40.61	88.43	40.61	293.86	38.01	298.80	38.17
108.82	40.02	108.82	40.02	296.90	38.08	304.41	38.22
125.06	39.54	125.06	39.54	300.54	38.10	305.66	38.03
133.82	39.79	133.82	39.79	302.64	38.15	309.07	36.68
157.24	39.25	157.24	39.25	304.70	38.27	309.58	36.30
191.12	38.83	191.12	38.83	306.16	37.79	309.72	36.15
230.32	38.17	230.32	38.17	307.54	37.21	310.35	35.59
255.76	37.85	255.76	37.85	308.62	36.83	311.02	35.33
266.56	38.60	266.56	38.60	309.70	36.33	311.95	34.93
278.21	37.86	278.21	37.86	309.97	35.76	312.92	35.37
282.75	37.97	281.24	37.759	310.39	35.64	313.7	35.56
293.74	38.11	290.68	37.881	311.02	35.24	314.1	35.99
305.40	38.28	300.11	37.906	312.16	34.85	314.87	36.67
305.58	38.25	305.26	37.848	312.3	35.04	316.62	37.12
306.89	37.65	307.23	37.095	312.89	35.48	318.28	38.04
308.24	36.93	308.54	36.55	314.04	35.74	321.01	38.27
310.07	36.67	308.85	36.062	314.17	36.4	325.68	38.1
310.71	35.71	309.92	35.422	314.34	36.04	330.21	38.13

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	38.24	37.85	38.13	38.22
Bankfull Cross-Sectional Area	20.90	18.22	19.85	21.57
Bankfull Width	14.64	13.70	14.70	16.10
Flood Prone Area Elevation	41.23	40.54	41.41	41.51
Flood Prone Width	367.14	332.68	367.00	367.00
Max Depth at Bankfull	2.99	2.69	3.28	3.29
Mean Depth at Bankfull	1.43	1.33	1.35	1.34
W/D Ratio	10.24	10.30	10.89	12.01
Entrenchment Ratio	25.08	24.28	24.97	22.80
Bank Height Ratio	1.00	1.00	1.00	1.00
Stream Type	C	C	E	C

Sta. 28+46 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 4, Riffle, Station 28+46



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River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-5, Pool, STA 32+71
Drainage Area(sq. mi.)	1.59
Date	11/13/2013
Field Crew	T. Taylor, A. Baldwin

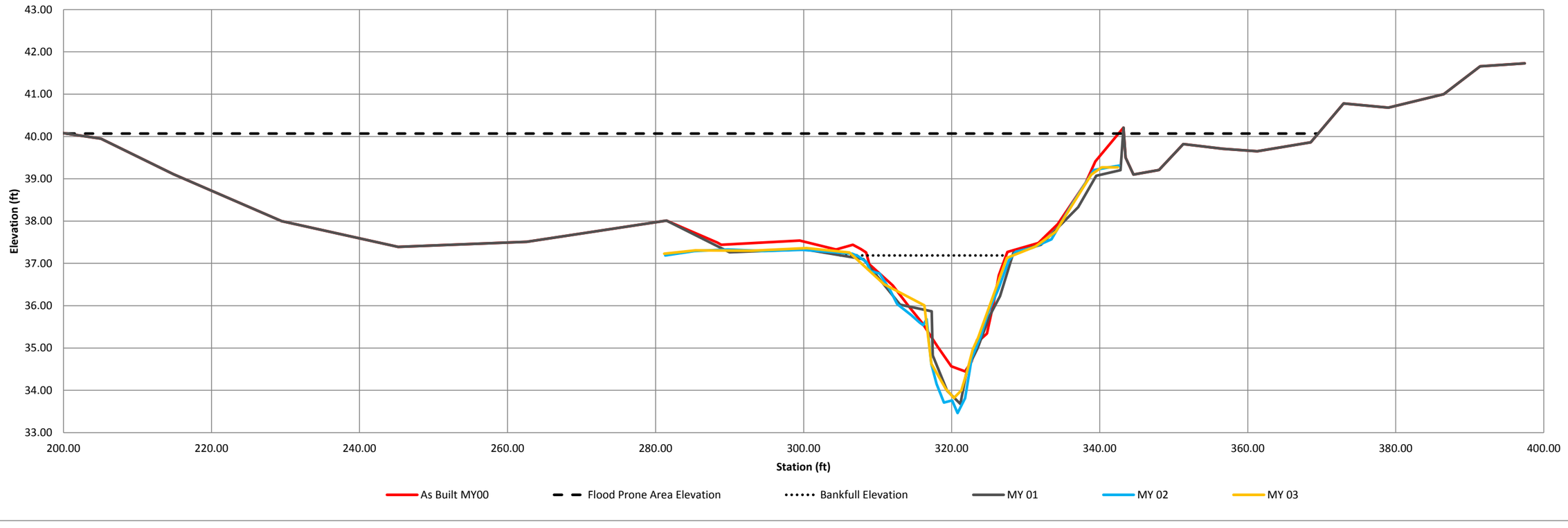
MY 00		MY 01		MY 02		MY 03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
26.15	42.13	26.15	42.13	281.30	37.19	281.17	37.23
36.87	42.19	36.87	42.19	285.24	37.29	285.36	37.31
68.22	41.81	68.22	41.81	289.79	37.33	292.98	37.30
85.37	36.59	85.37	36.59	294.67	37.29	300.40	37.36
90.80	34.92	90.80	34.92	299.78	37.32	306.17	37.26
176.23	35.02	176.23	35.02	303.71	37.27	310.85	36.51
177.81	35.70	177.81	35.70	306.55	37.23	316.32	36.01
185.44	38.11	185.44	38.11	307.36	37.17	317.26	34.63
195.27	40.20	195.27	40.20	308.48	37.03	319.20	34.04
205.06	39.95	205.06	39.95	309.01	36.82	320.31	33.82
214.85	39.11	214.85	39.11	310.26	36.76	321.31	34.00
229.47	38.00	229.47	38.00	311.69	36.37	322.05	34.43
245.21	37.39	245.21	37.39	312.62	36.04	322.85	34.97
262.60	37.51	262.60	37.51	314.52	35.78	323.56	35.24
281.47	38.01	281.47	38.01	315.69	35.60	327.45	37.13
288.37	37.49	289.99	37.262	316.15	35.54	331.31	37.4
288.85	37.44	300.08	37.334	316.61	35.68	334.08	37.75
299.46	37.54	308.08	37.1	317.26	34.62	336.39	38.41
304.38	37.33	313.02	36.025	317.96	34.15	338.86	39.1
306.65	37.44	317.31	35.866	318.95	33.71	340.26	39.27
307.72	37.34	317.44	34.823	320.06	33.763	342.43	39.27
308.44	37.26	319.38	33.992	320.8	33.461		

SUMARY DATA	MY00	MY01*	MY02	MY03
Bankfull Elevation	37.26	37.33	37.23	37.19
Bankfull Cross-Sectional Area	29.47	35.63	34.74	30.33
Bankfull Width	19.06	29.71	23.49	21.70
Flood Prone Area Elevation	40.07	40.98	41.00	40.56
Flood Prone Width	289.16	315.10	301.17	300.00
Max Depth at Bankfull	2.81	3.65	3.77	2.82
Mean Depth at Bankfull	1.55	1.20	1.48	1.40
W/D Ratio	12.30	24.76	15.87	15.50
Entrenchment Ratio	15.17	10.61	12.82	13.82
Bank Height Ratio	1.00	1.00	1.00	1.00
Stream Type	C	C	C	C

*Floodprone width adjusted to not include adjacent farm pond.

Sta. 32+71 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 5 Pool, Station 32+71



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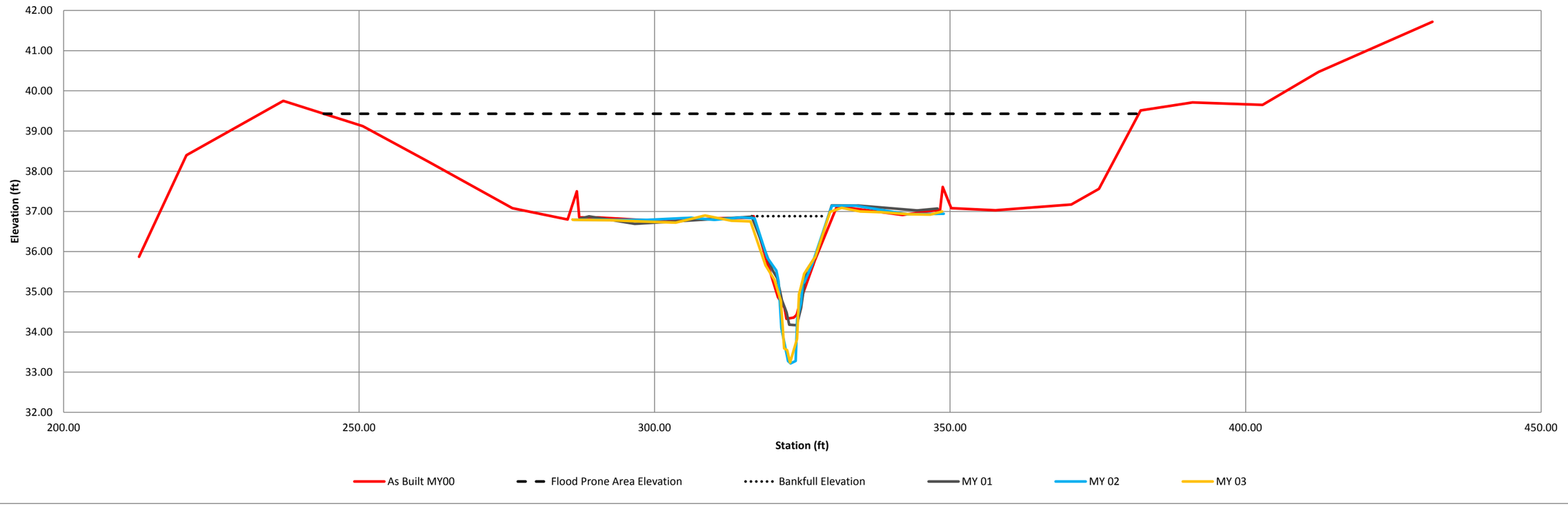
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-6, Riffle, STA 35+24
Drainage Area(sq. mi.)	1.59
Date	11/13/2013
Field Crew	T. Taylor, A. Baldwin

MY 00		MY 01		MY 02		MY 03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
212.76	35.87	212.76	35.87	286.34	36.79	286.10	36.80
220.80	38.40	220.80	38.40	298.82	36.79	286.16	36.79
237.17	39.75	237.17	39.75	306.18	36.84	292.51	36.78
250.63	39.12	250.63	39.12	310.11	36.79	297.54	36.75
261.67	38.24	261.67	38.24	314.68	36.85	303.55	36.72
275.95	37.08	275.95	37.08	316.91	36.83	308.55	36.90
285.28	36.80	285.28	36.80	319.06	35.85	312.98	36.77
286.84	37.50	286.84	37.50	320.59	35.53	316.25	36.75
287.26	36.85	287.26	36.85	320.98	35.25	318.78	35.66
290.35	36.85	287.43	36.82	321.44	34.10	320.27	35.30
301.91	36.75	288.9	36.88	322.57	33.28	321.36	34.78
310.76	36.83	296.65	36.69	323.02	33.22	321.92	33.59
316.51	36.84	316.45	36.87	323.87	33.28	322.42	33.55
316.76	36.88	319.93	35.55	324.13	34.34	322.92	33.24
318.89	35.81	320.76	35.34	324.78	34.72	324.11	33.83
320.87	34.87	321.54	34.79	325.06	35.20	324.44	34.94
321.98	34.60	322.35	34.49	325.33	35.24	324.79	35.13
322.30	34.33	322.78	34.18	326.57	35.65	325.31	35.45
323.55	34.36	324.04	34.17	328.9	36.67	327.21	35.87
324.04	34.43	324.79	34.60	330.01	37.14	329.71	36.99
324.63	34.76	325.66	35.52	334.1	37.14	331.66	37.09
327.11	35.78	327.28	35.89	342.78	36.93	334.82	37.00
330.86	37.13	329.96	37.15	348.93	36.94	338.31	36.98

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	36.88	36.87	36.83	36.75
Bankfull Cross-Sectional Area	18.91	17.43	19.10	18.74
Bankfull Width	17.17	12.92	12.37	12.92
Flood Prone Area Elevation	39.43	39.57	40.44	40.26
Flood Prone Width	158.46	166.08	160.00	160.00
Max Depth at Bankfull	2.55	2.70	3.61	3.51
Mean Depth at Bankfull	1.10	1.35	1.54	1.45
W/D Ratio	15.61	9.59	8.03	8.91
Entrenchment Ratio	9.23	12.82	12.93	12.38
Bank Height Ratio	1.00	0.95	1.00	1.00
Stream Type	C	C	E	E

Sta. 35+24 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 6, Riffle, Station 35+24



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River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-7, Riffle, STA 38+71
Drainage Area(sq. mi.)	1.59
Date	11/13/2013
Field Crew	T. Taylor, A. Baldwin

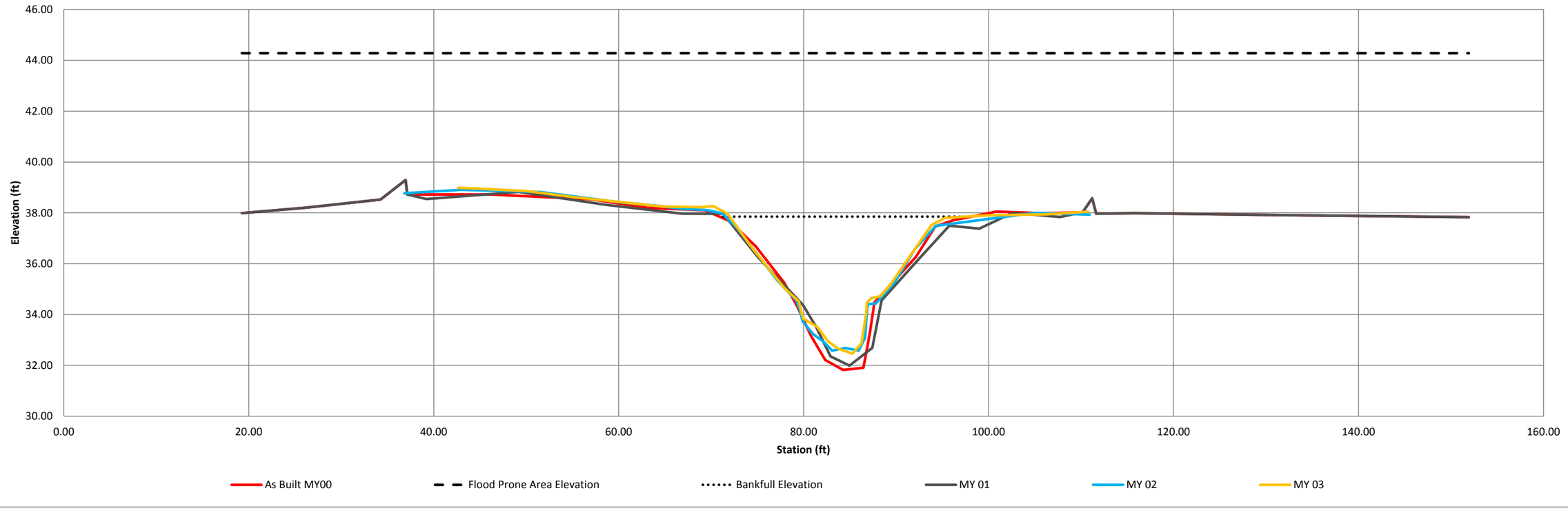
MY 00		MY 01		MY 02		MY 03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
19.24	37.99	19.24	37.99	36.80	38.77	42.64	38.99
26.11	38.20	26.11	38.20	43.00	38.91	50.02	38.86
34.24	38.52	34.24	38.52	51.58	38.82	55.25	38.61
36.95	39.29	36.95	39.29	60.15	38.41	64.77	38.25
37.14	38.72	37.14	38.72	64.02	38.28	68.82	38.22
39.57	38.72	39.21	38.544	66.96	38.15	70.21	38.27
46.18	38.72	49.19	38.823	69.41	38.11	71.74	37.97
57.09	38.53	58.73	38.308	71.14	37.99	74.54	36.57
63.06	38.20	66.87	37.967	72.73	37.43	77.9	35.04
66.76	38.14	71.32	37.96	77.16	35.34	79.48	34.52
69.33	38.10	75.06	36.251	79.17	34.57	79.92	33.85
72.02	37.67	79.92	34.376	79.57	34.2	81.46	33.51
74.83	36.67	81.32	33.533	79.89	33.73	82.62	32.95
77.89	35.25	82.9	32.353	80.99	33.24	83.77	32.65
79.27	34.35	84.95	31.993	82.14	32.93	85.27	32.46
80.79	33.16	87.42	32.686	83.07	32.58	86.26	32.87
82.34	32.21	88.42	34.553	84.53	32.68	86.76	34.07
84.27	31.82	92.45	36.186	85.93	32.58	86.84	34.47
86.46	31.91	95.74	37.49	86.64	33.08	87.31	34.64
87.16	33.28	98.99	37.375	86.87	34.26	88.27	34.72
87.65	34.47	102.57	37.996	86.98	34.41	89.28	35.13
89.37	35.16	107.75	37.837	87.78	34.43	93.79	37.51
92.14	36.27	110.16	38.02	89.78	35.23	95.27	37.80

SUMARY DATA	MY00*	MY01	MY02	MY03
Bankfull Elevation	38.05	38.00	38.00	37.85
Bankfull Cross-Sectional Area	75.91	77.93	71.24	62.90
Bankfull Width	31.46	36.52	34.07	25.52
Flood Prone Area Elevation	44.28	44.01	43.42	43.24
Flood Prone Width	132.69	132.69	>200	200.00
Max Depth at Bankfull	6.23	6.01	5.42	5.39
Mean Depth at Bankfull	2.41	2.13	2.09	2.46
W/D Ratio	13.05	17.15	16.30	10.37
Entrenchment Ratio	4.22	3.63	5.87	7.84
Bank Height Ratio	1.00	1.00	1.00	1.00
Stream Type	C	C	C	E

* REVISED X-SEC DATA

Sta. 38+71 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 7 Riffle, Station 38+71



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Oakley Crossroads Stream and Buffer Restoration - Longitudinal Profile
Station 0+00 to 38+79
2012 Monitoring - Year 0, Year 01, Year 02, Year 03

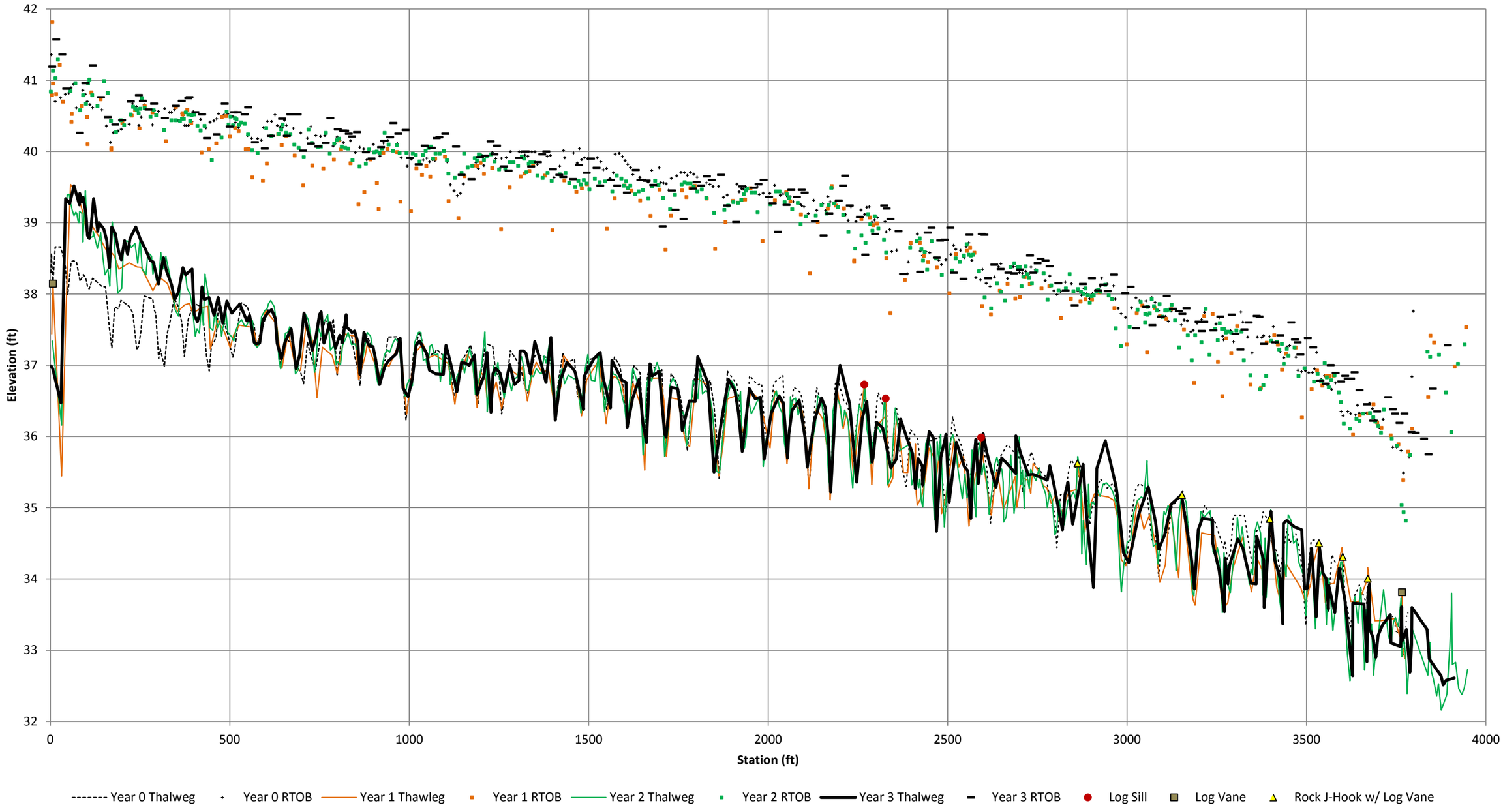

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Table 10a. Baseline Stream Data Summary
Oakley Crossroads Stream and Buffer Restoration / EEP Project No. 273 - Segment/Reach: Mainstem (3,950 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		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)					-	10.40	-	-	-	4	7.80	11.20	-	14.60	-	2	-	12.3	-	14.64	17.31	-	20.82	-	4
Floodprone Width (ft)					-	15.00	-	-	-	4	120.00	126.50	-	133.00	-	2	-	240.0	-	80.66	182.63	-	367.14	-	4
Bankfull Mean Depth (ft)					-	1.80	-	-	-	4	0.70	1.15	-	1.60	-	2	-	1.5	-	0.88	1.13	-	1.43	-	4
[1]Bankfull Max Depth (ft)					-	2.70	-	-	-	4	1.60	1.85	-	2.10	-	2	-	2.4	-	2.15	2.56	-	2.99	-	4
Bankfull Cross Sectional Area (ft^2)					-	19.00	-	-	-	4	9.50	11.05	-	12.60	-	2	-	19.0	-	18.16	19.08	-	20.90	-	4
Width/Depth Ratio					-	5.70	-	-	-	4	4.80	13.60	-	22.40	-	2	-	8.0	-	10.24	16.19	-	23.66	-	4
Entrenchment Ratio					-	1.40	-	-	-	4	8.20	12.65	-	17.10	-	2	-	19.5	-	4.66	10.55	-	21.21	-	4
[1]Bank Height Ratio					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Profile																									
Riffle Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.83	35.98	-	53.02		4
Riffle Slope (ft/ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.002	0.003	-	0.006		4
Pool Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.47	33.67	-	44.45		2
Pool Max depth (ft)					-	-	-	-	-	-	1.7	2.3	-	2.9	-	2	-	4	-	2.81	3.12	-	3.43		2
Pool Spacing (ft)					-	-	-	-	-	-	5	27	35	67	-	4	43	52.5	62	43.4	64.26	-	94.03		2
Pattern																									
Channel Beltwidth (ft)					-	-	-	-	-	-	45	72.5	-	100		2	62	74.0	86	38.56	55.94	-	86.18	-	48.00
Radius of Curvature (ft)					-	-	-	-	-	-	8	12.8	14	21		4	22	27.0	31	19.24	27.81	-	36.28	-	56.00
Rc:Bankfull width (ft/ft)					-	-	-	-	-	-	0.5	1.2	1.4	1.8		4	1.8	2.2	2.5	1.11	1.61	-	2.10	-	56.00
Meander Wavelength (ft)					-	-	-	-	-	-	17	75	100	156		4	86	111	135	85.46	103.92	-	118.61	-	48.00
Meander Width Ratio					-	-	-	-	-	-	5.8	6.3	-	6.8		2	5	6.0	7	2.23	3.23	-	4.98	-	48.00
Transport parameters																									
Reach Shear Stress (competency) lb/ft^2					0.2												0.14			0.093					
Max part size (mm) mobilized at bankfull					-												-			25					
Unit Stream Power (transport capacity) lbs/ft/s per unit width[6]					0.25												0.17			0.16					
Additional Reach Parameters																									
Rosgen Classification					G5c						C5, E5						E5			C4					
Bankfull Velocity (fps)					1.9												1.7			1.65					
Bankfull Discharge (cfs)					30																				
Valley length (ft)					-						-														
Channel Thalweg length (ft)					-						-						-			3950					
Sinuosity (ft)					1.01						1.18						1.28			1.4					
Water Surface Slope (Channel) (ft/ft)					0.0018						0.002						0.0014			0.00146					
BF slope (ft/ft)					-						-						-			**0.00144**					
[3]Bankfull Floodplain Area (acres)					-						-						-			-					
[4]% 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 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3; 6. Units changed from W/m^2 to reflect those provided in original design.

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Oakley Crossroads Stream and Buffer Restoration / EEP Project No. 273 - Segment/Reach: Mainstem (3,950 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%	-	0	-	0	0			-	-	-	-	-			-	-	-	-	-			52	-	48	-	-		
[1]SC% / Sa% / G% / C% / B% / Be%	0	33	67	0	0	0		0	100	0	0	0	0															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)	0.14	0.26	0.5	4.4	7.3	-	30	0.3	0.4	0.5	0.9	1.2	-	-														
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	-	-	-	-	-			-	-	-	-	-										-	-	-	-	-		
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0	-	-	-	-				-	-	-	-											-	-	-	-			

Shaded cells indicate that these will typically not be filled in.

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.
The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.
ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design survey), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-constrution distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavi
the reach. This means that the distributions for these parameters should include data from both the cross-section surveys and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily
a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Oakley Crossroads Stream and Buffer Restoration / EEP Project No. 273 - Segment/Reach: Mainstem (3,950 feet)

	Cross Section 1 (STA 0+72, Riffle)							Cross Section 2 (STA 6+17, Riffle)							Cross Section 3 (STA 12+59, Pool)							Cross Section 4 (STA 28+46, Riffle)							Cross Section 5 (STA 32+71, Pool)						
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		40.49	40.57	40.37					40.38	40.38	40.33					39.70	39.70	39.61					37.85	37.93	38.22					37.33	37.23	37.19			
Bankfull Width (ft)	20.82	12.39	15.49	15.73				16.60	13.16	15.09	13.85				20.58	24.38	20.80	19.56				14.64	13.70	14.70	16.10				19.06	29.71	23.49	21.70			
Floodprone Width (ft)	80.66	65.65	78.50	78.50				124.27	131.28	128.50	125.00				248.08	120.86	244.10	245.00				367.14	332.68	367.00	367.00				289.16	315.10	301.17	300.00			
Bankfull Mean Depth (ft)	0.88	0.68	0.63	0.88				1.09	1.37	1.20	1.30				1.79	1.55	1.66	1.67				1.43	1.33	1.35	1.34				1.55	1.20	1.48	1.40			
Bankfull Max Depth (ft)	2.15	1.14	1.84	2.15				2.54	2.68	2.61	2.60				3.43	3.41	3.17	3.05				2.99	2.69	3.28	3.29				2.81	3.65	3.77	2.82			
Bankfull Cross Sectional Area (ft^2)	18.33	8.37	9.77	9.15				18.16	17.88	18.17	18.06				36.86	37.87	34.50	32.69				20.90	18.22	19.85	21.57				29.47	35.63	34.74	30.33			
Bankfull Width/Depth Ratio	23.66	18.22	24.59	27.12				15.23	9.61	12.58	10.65				11.50	15.73	12.53	11.71				10.24	10.30	10.89	12.01				12.30	24.76	15.87	15.50			
Bankfull Entrenchment Ratio	3.88	5.30	5.07	4.99				7.49	7.51	8.52	9.03				12.05	4.96	11.74	12.53				25.08	24.28	24.97	22.80				15.17	10.61	12.82	13.82			
Bankfull Bank Height Ratio	1.00	0.95	1.00	1.00				1.00	1.00	1.00	1.00				1.00	0.95	1.00	1.00				1.00	0.90	1.00	1.00				1.00	0.98	1.00	1.00			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			

	Cross Section 6 (STA 35+24, Riffle)							Cross Section 7 (STA 38+71, Other)							Cross Section 8 (Riffle)							Cross Section 9 (Pool)							Cross Section 10 (Pool)						
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		36.87	36.83	36.75					38.00	38.00	37.85																								
Bankfull Width (ft)	17.17	12.92	12.37	12.92				31.46	36.52	34.07	25.52																								
Floodprone Width (ft)	158.46	166.08	160.00	160.00				132.69	132.69	>200	200.00																								
Bankfull Mean Depth (ft)	1.10	1.35	1.54	1.45				2.41	2.13	2.09	2.46																								
Bankfull Max Depth (ft)	2.55	2.70	3.61	3.51				6.23	6.01	5.42	5.39																								
Bankfull Cross Sectional Area (ft^2)	18.91	17.43	19.10	18.74				75.91	77.93	71.24	62.90																								
Bankfull Width/Depth Ratio	15.61	9.59	8.03	8.91				13.05	17.15	16.30	10.37																								
Bankfull Entrenchment Ratio	9.23	12.82	12.93	12.38				4.22	3.63	5.87	7.84																								
Bankfull Bank Height Ratio	1.00	0.95	1.00	1.00				1.00	1.00	1.00	1.00																								
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "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 11b. Monitoring Data - Stream Reach Data Summary
Oakley Crossroads Stream and Buffer Restoration / EEP Project No. 273 - Segment/Reach: Mainstem (3,950 feet)

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)	14.6	17.31	-	20.82	-	4	12.4	12.8	12.9	13.16	0.39	4	12.4	14.4	14.9	15.49	1.399	4	12.9	14.7	14.8	16.1	1.5	4												
Floodprone Width (ft)	80.7	182.63	-	367.14	-	4	65.7	118.7	124	166.1	50.4	4	78.5	183.5	144.3	367	126.9	4	78.5	182.6	142.5	367.0	127.4	4												
Bankfull Mean Depth (ft)	0.9	1.13	-	1.43	-	4	0.7	1.1	1.35	1.37	0.39	4	0.6	1.2	1.275	1.54	0.392	4	0.9	1.2	1.3	1.5	0.2	4												
[1]Bankfull Max Depth (ft)	2.2	2.56	-	2.99	-	4	1.1	2.2	2.68	2.703	0.9	4	1.8	2.8	2.945	3.61	0.783	4	2.2	2.9	2.9	3.5	0.6	4												
Bankfull Cross Sectional Area (ft^2)	18.2	19.08	-	20.9	-	4	8.4	8.4	17.4	17.88	5.37	4	9.8	16.7	18.64	19.85	4.686	4	9.2	16.9	18.4	21.6	5.4	4												
Width/Depth Ratio	10.2	16.19	-	23.66	-	4	9.6	12.5	9.61	18.22	4.98	4	8.0	14.0	11.73	24.587	7.289	4	8.9	14.7	11.3	27.1	8.4	4												
Entrenchment Ratio	4.7	10.55	-	21.21	-	4	5.3	9.2	9.44	12.82	3.77	4	5.1	12.9	10.73	24.966	8.682	4	5.0	12.3	10.7	22.8	7.6	4												
[1]Bank Height Ratio	-	-	-	-	-	-	1	1	1	1	0	4	1	1	1	1	0	4	1.0	1	1	1	0	4												
Profile																																				
Riffle Length (ft)	24.8	35.98	-	53.02	-	4	24.2	35.2	-	53.1	-	4	20.28	30.8	-	55.2		4	19.4	33.1		52.1		4												
Riffle Slope (ft/ft)	0.002	0.003	-	0.006	-	4	0.002	0.003	-	0.006	-	4	0.002	0.004	-	0.006		4	0.002	0.004		0.006		4												
Pool Length (ft)	20.47	33.67	-	44.45	-	2	21	32.54	-	45.21	-	2	26.76	38.88	-	51		2	22	33		44		2												
Pool Max depth (ft)	2.81	3.12	-	3.43	-	2	3.41	3.53	-	3.65	-	2	3.17	3.47	-	3.77		2	3.02	3.4		3.77		2												
Pool Spacing (ft)	43.4	64.26	-	94.03	-	2	42.1	65.2	-	95.2	-	2	28.72	64	-	106		33	27.5	64.31		113		33												
Pattern																																				
Channel Beltwidth (ft)	38.6	55.94	-	86.18	-	48																														
Radius of Curvature (ft)	19.2	27.81	-	36.28	-	56																														
Rc:Bankfull width (ft/ft)	1.1	1.61	-	2.1	-	56																														
Meander Wavelength (ft)	85.5	103.92	-	118.61	-	48																														
Meander Width Ratio	2.2	3.23	-	4.98	-	48																														
Additional Reach Parameters																																				
Rosgen Classification	C4,E5						C4,E5						C4,E5						C4,E5																	
Channel Thalweg length (ft)																																				
Sinuosity (ft)	1.4						1.4						1.4						1.4																	
Water Surface Slope (Channel) (ft/ft)	0.00146						0.00145						0.00145						0.00152																	
BF slope (ft/ft)	0.00144						0.00139						0.00137						0.00135																	
[3]Ri% / Ru% / P% / G% / S%	**52**	**-**	**48**	**-**	**-**		**52**	**-**	**48**	**-**	**-**		**52**	**-**	**48**	**-**	**-**		**52**	**-**	**48**	**-**	**-**													
[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																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

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. Hydrology Data

Table 12 – Verification of Bankfull Events

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Table 12 - Verification of Bankfull Events Oakley Crossroads Stream and Buffer Restoration Project - EEP Project No. 273			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo**
September 13, 2011	unknown	Visual observation of wrack lines	n/a
October 4, 2012	unknown	Crest gauge	S9 (MY2)
October 10, 2012	unknown	Visual observation of wrack lines	S8 (MY2)
March 28, 2013	unknown	Crest gauge	S8 (MY3)