

**Jacob's Landing  
Stream Restoration Monitoring Report  
DMS Project # 95024  
DMS Contract # 003984  
Monitoring Year 03**



Submitted to:

NCDEQ-DMS, 1652 Mail Service Center, Raleigh, NC 27699-1652

**Construction Completed: January 2014**

**Data Collection: 2016**

**Submitted: December 2016**

## **Design and Monitoring Firm**



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Project No: 20110675**

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## 1.0 EXECUTIVE SUMMARY / PROJECT ABSTRACT

The Jacob's Landing Stream Restoration Site is a full-delivery project that was developed for the North Carolina Division of Mitigation Services (DMS). Construction was completed in November 2013. The site includes the restoration of 4,484 linear feet of restoration and 109 linear feet of enhancement on four tributaries to Irish Buffalo Creek in the Yadkin-Pee Dee River Basin. The project is located west of China Grove and north of Kannapolis off of Saw Road in Rowan County (Figure 1, Appendix A). This project will expand aquatic and terrestrial habitat in the Rocky River Watershed (03040105). The project is within the 03040105020040 Irish Buffalo Creek Local Watershed Unit (14-digit HUC) (NCDENR, EEP 2009). In DMS' most recent publication of excluded and Targeted Local Watersheds/Hydrologic Units, the 03040105020040 14-digit HUC has been identified as a Targeted Local Watershed. The project is located in the Piedmont Physiographic Province and the project streams initiate as headwater systems out of moderately-sloped, forested hills before reaching the floodplain of Irish Buffalo Creek. The site's 0.72-square mile watershed is mostly pasture and mixed hardwoods with small pockets of rural residential development. Prior to construction the site was actively used for timber and cattle production for over five generations.

The project goals and objectives are listed below.

### *Project Goals*

- Restore a diverse riparian corridor that connects forested stream systems upstream and downstream of the project.
- Reduce the sediment supply entering Irish Buffalo Creek.

### *Project Objectives*

- Restore stable channel planforms to streams that have been straightened and modified.
- Reshape and stabilize eroding stream banks.
- Plant the site with native trees to help reestablish a diverse riparian corridor.
- Install exclusion fencing and alternative watering options to keep livestock out of the project streams.

Vegetation success is based on the criteria established in the USACE Stream Mitigation Guidelines (2003). This document states that vegetation monitoring results should have the following planted stem density minimums in the corresponding monitoring years: 320 stems/acre through Year Three, 288 stems/acre in Year Four, and 260 stems/acre in Year Five. The third-year vegetation monitoring was based on the Level 2 CVS-EEP vegetation monitoring protocol. The site's average density for this monitoring period is 411 planted stems/acre, with none of the plots having live stakes planted in them. Nine of the thirteen plots had greater than 320 planted stems/acre. There are four monitoring plots that have calculated planted stem densities less than 320 stems/acre; (Plots 1, 3, 4, and 6). This is not seen as problematic given the high potential for desirable volunteers to become established in the plots and across the site. Like natural vegetative communities, some areas will have slightly higher densities than others, but the data from the vegetation monitoring plots reveal that the site has an adequate average stem density. To ensure continued vegetative success, some parts of the site received supplemental planting in early 2015. Including volunteers, the monitoring plots averaged 1,161 total stems/acre. The overall vegetation assessment found the site to be on track to meeting the vegetative success criterion.

Third-year monitoring found the Jacob's Landing Site to be stable, with only minor changes from the as-built conditions. Two small areas of bank erosion that were reported on T1 in last year's report were repaired with soil lifts in the beginning of 2016. The monitoring components were installed in February/March 2014. Two automatic recording gauges have been installed along T1 and T2. Both stream gauges recorded several bankfull events during 2016. The monitoring plan for each tributary is as follows: T1 has a 1,500 foot longitudinal profile,

3 riffle cross-sections, and 1 pool cross-section; T2 has a 1,500 foot longitudinal profile, 5 riffle cross-sections and 2 pool cross-sections; T1A and T2A are being monitored visually since they are short reaches and small channels. Pebble counts were conducted at all eleven cross-sections. Ten permanent photo reference points have been established with a total of twenty-two photos to be taken annually. The third year of monitoring found the site to be functioning and T2 shows little change from the baseline conditions with the exception of two areas of aggradation near the end of the reach. T1 shows areas of aggradation throughout the upper three quarters of the reach. This is likely due to the high volume of sediment moving through the reach and the yearly fluctuations that this creates. It is not seen as an indicator of instability in the reach, but will be monitored to ensure it does not become a problem for the site.

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 Baseline Monitoring Report and in the Mitigation Plan documents available on the DMS' website. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

## **2.0 METHODOLOGY**

The survey data were collected with a total station instrument on June 10, 16, 17, and December 8, 2016.

Some of the cross-sections have shown minor settling in the floodplain. The bankfull elevations at these cross-sections have not been changed to reflect this. For calculating cross-sectional morphologic data the cross-section width has been limited to a width that appropriately reflects the top of bank location so as not to inaccurately skew data.

The CVS-EEP protocol, Level 2 (<http://cvs.bio.unc.edu/methods.htm>) was used to collect vegetation data from the site. The vegetation monitoring was completed on June 31, 2016.

## **3.0 REFERENCES**

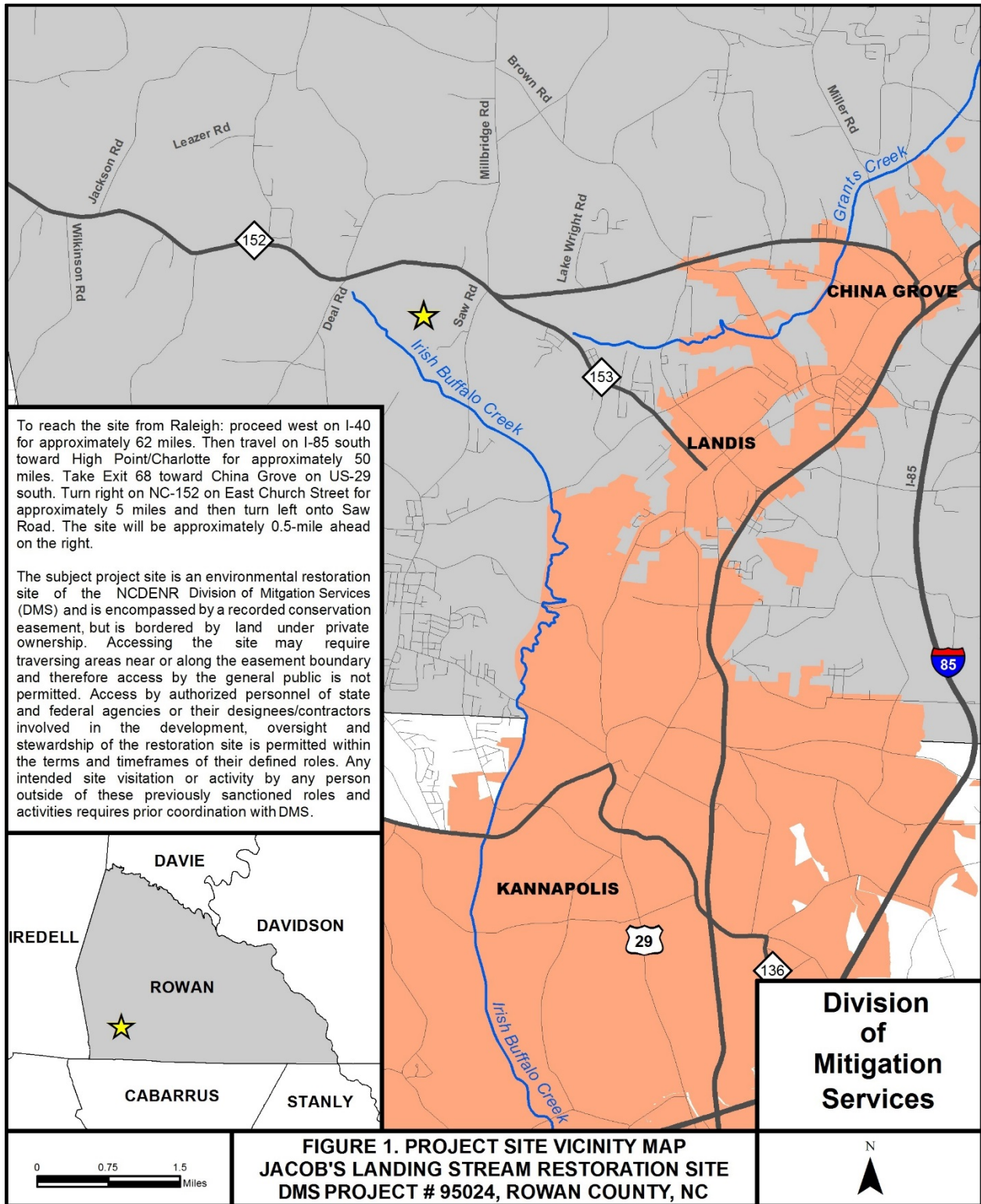
Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2 (<http://cvs.bio.unc.edu/methods.htm>)

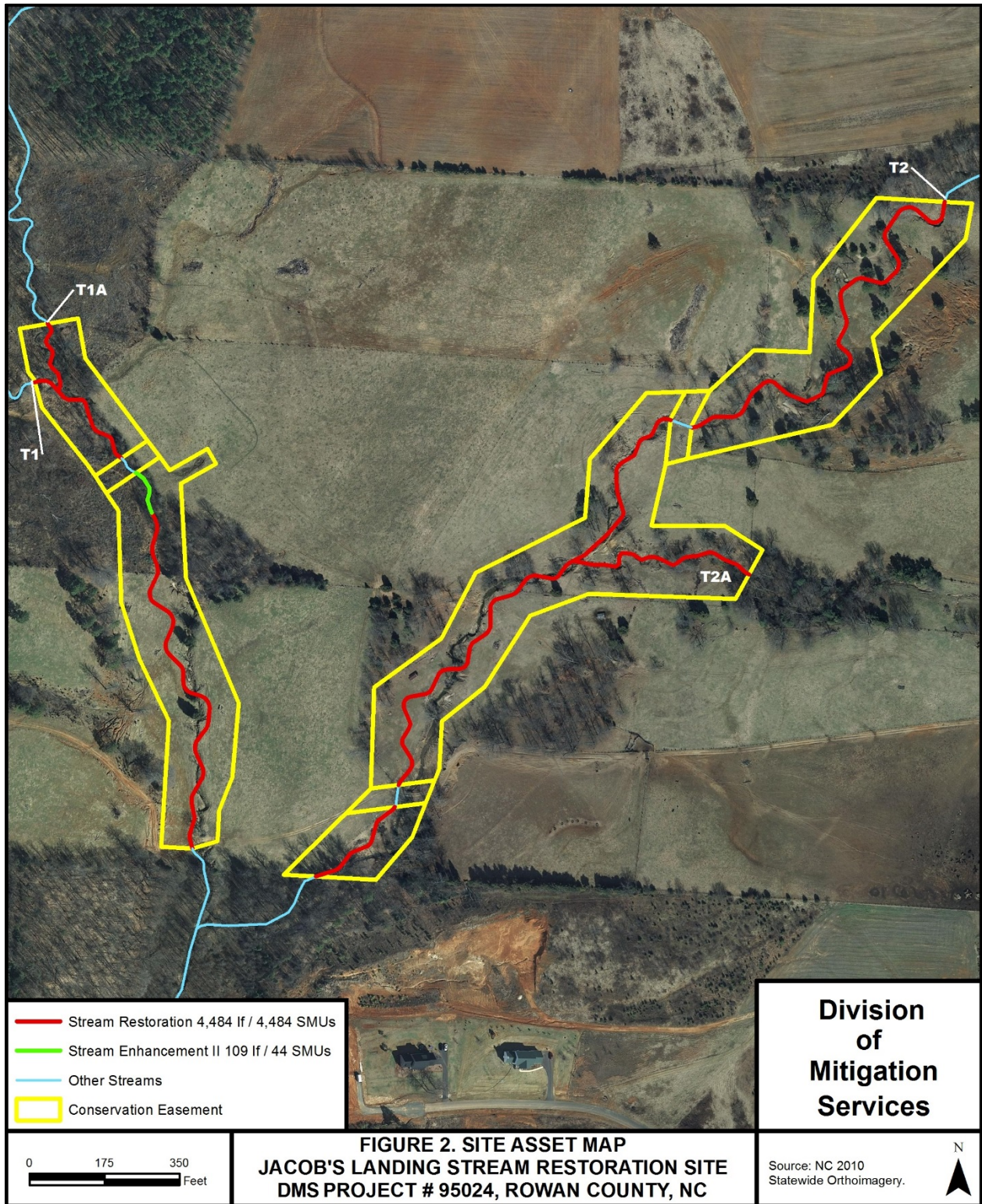
NCDENR, Ecosystem Enhancement Program. 2009. Lower Yadkin Pee-Dee River Basin Priorities 2009. Raleigh, NC.  
[http://www.nceep.net/services/restplans/Yadkin\\_Pee\\_Deer\\_RBRP\\_2009\\_Final.pdf](http://www.nceep.net/services/restplans/Yadkin_Pee_Deer_RBRP_2009_Final.pdf)

USACE. 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

# **Appendix A**

## **Project Vicinity Map and Background Tables**







<b>Table 1. Project Components and Mitigation Credits Jacob's Landing Stream Restoration Site, DMS Project # 95024</b>						
<b>Mitigation Credits</b>						
	<b>Stream</b>		<b>Riparian Wetland</b>	<b>Non-riparian Wetland</b>	<b>Buffer</b>	<b>Nitrogen Nutrient Offset</b>
Type	R	EII				
Length	4,484	109				
Credits	4,484	44				
<b>TOTAL CREDITS</b>	4,528					
<b>Project Components</b>						
<b>Project Component -or- Reach ID</b>	<b>Design Stationing/ Location</b>	<b>Existing Footage</b>	<b>Approach (PI, PII etc.)</b>	<b>Restoration -or- Restoration Equivalent</b>	<b>Restoration Footage</b>	<b>Mitigation Ratio</b>
T1	10+00 – 13+03	326	P2	Restoration	303	1:1
T1	13+52 – 14+61	158	-	Enhancement II	109*	1:2.5
T1	14+61 – 23+54	846	P2	Restoration	893	1:1
T1A	40+00 – 41+78	294	P2	Restoration	178	1:1
T2	50+00 – 77+45	2,935	P2	Restoration	2,645*	1:1
T2A	100+00 – 104+65	465	P2	Restoration	465	1:1
<b>Component Summation</b>						
<b>Restoration Level</b>	<b>Stream (linear feet)</b>		<b>Mitigation Units (SMU)</b>			
Total Restoration	4,484		4,484			
Total Enhancement II	109		44			
<b>TOTAL SMU</b>			<b>4,528</b>			

\*Mitigation units have been calculated to exclude the easement exceptions and water utility easements.

Though not formal BMPs, several small water quality detention structures were installed throughout the project to improve water quality from the surrounding drainage area.

<b>Table 2. Project Activity &amp; Reporting History Jacob's Landing Stream Restoration Site, DMS Project # 95024</b>		
<b>Activity or Report</b>	<b>Data Collection Complete</b>	<b>Actual Completion or Delivery</b>
Mitigation Plan		Sept 12
Final Design - Construction Plans		Dec 12
Construction		Nov 13
Planting		Jan 14
Baseline Monitoring/Report	Feb/March 14	April 14
Year 1 Monitoring	Nov 14	Nov 14
Supplemental Planting		March 15
Year 2 Monitoring	August 15	Dec 15
Bank erosion repair		Jan 16
Year 3 Monitoring	June 16	Dec 16

<b>Table 3. Project Contacts Jacob's Landing Stream Restoration Site, DMS Project # 95024</b>	
<b>Design Firm</b>	KCI Associates of North Carolina 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512 Fax: (919) 783-9266
<b>Construction Contractor</b>	Wright Contracting, LLC 160 Walker Road Lawndale, NC 28090 Contact: Mr. Stephen James Phone: (704) 692-4633
<b>Planting Contractor</b>	Forestree Management Co. 1280 Maudis Road Bailey, NC 27807 Contact: Mr. Tony Cortez Phone: (252) 243-2513
<b>Monitoring Performers</b>	
<b>MY-00 - MY-03</b>	KCI Associates of North Carolina 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266

<b>Table 4. Project Information Jacob's Landing Stream Restoration Site, DMS Project # 95024</b>				
<b>Project Name</b>	Jacob's Landing Stream Restoration Site			
<b>County</b>	Rowan County			
<b>Project Area (acres)</b>	13.9 acres			
<b>Project Coordinates (lat. and long.)</b>	35.552956 N, 80.653116 W			
<b>Project Watershed Summary Information</b>				
<b>Physiographic Province</b>	Piedmont			
<b>River Basin</b>	Yadkin-Pee Dee			
<b>USGS Hydrologic Unit 8-digit</b>	03040105	<b>USGS Hydrologic Unit 14-digit</b>	03040105020040	
<b>DWQ Sub-basin</b>	13-17-09			
<b>Project Drainage Area</b>	459 acres/0.72 square miles			
<b>Project Drainage Area Percentage of Impervious Area</b>	2.3% / 6 acres			
<b>CGIA Land Use Classification</b>	4.8% Cultivated, 60.1% Managed Herbaceous Cover, and 35.1% Mixed Upland Hardwoods.			
<b>Reach Summary Information (Post-Restoration)</b>				
<b>Parameters</b>	<b>T1</b>	<b>T1A</b>	<b>T2</b>	<b>T2A</b>
Length of reach (linear feet)	1,305	178	2,645	465
Valley classification	VIII	VIII	VIII	VIII
Drainage area (acres)	258.6 acres	136.9 acres	200.6 acres	35.7 acres
NCDWQ Water Quality Classification	Class C, WSIII	Class C, WSIII	Class C, WSIII	Class C, WSIII
Morphological Description (stream type)	C4	B4c/C4	C4	B4c/C4
Evolutionary trend	Stage II (Constructed)	Stage II (Constructed)	Stage II (Constructed)	Stage II (Constructed)
Mapped Soil Series	Chewacla loam	Chewacla loam	Pacolet sandy loam and Chewacla loam	Pacolet sandy loam
Drainage class	Poorly drained	Well drained	Poor to Well drained	Well drained
Soil Hydric status	Non hydric	Non hydric	Non hydric	Non hydric
Slope	0-2%	0-2%	0-2%	0-2%
FEMA classification	N/A	N/A	N/A	N/A
Native vegetation community	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Mesic Mixed Hardwood Forest
Percent composition of exotic invasive vegetation	0%	0%	0%	0%
<b>Regulatory Considerations</b>				
<b>Regulation</b>	<b>Applicable?</b>	<b>Resolved?</b>		<b>Supporting Documentation</b>
Waters of the United States – Section 404	Yes	Yes, received 404 permit.		N/A
Waters of the United States – Section 401	Yes	Yes, received 401 permit.		N/A
Endangered Species Act	No	N/A		N/A
Historic Preservation Act	No	N/A		N/A
Coastal Zone Management Act* (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A		N/A
FEMA Floodplain Compliance	Yes	Floodplain development permit obtained through Rowan County		N/A
Essential Fisheries Habitat	No	N/A		N/A

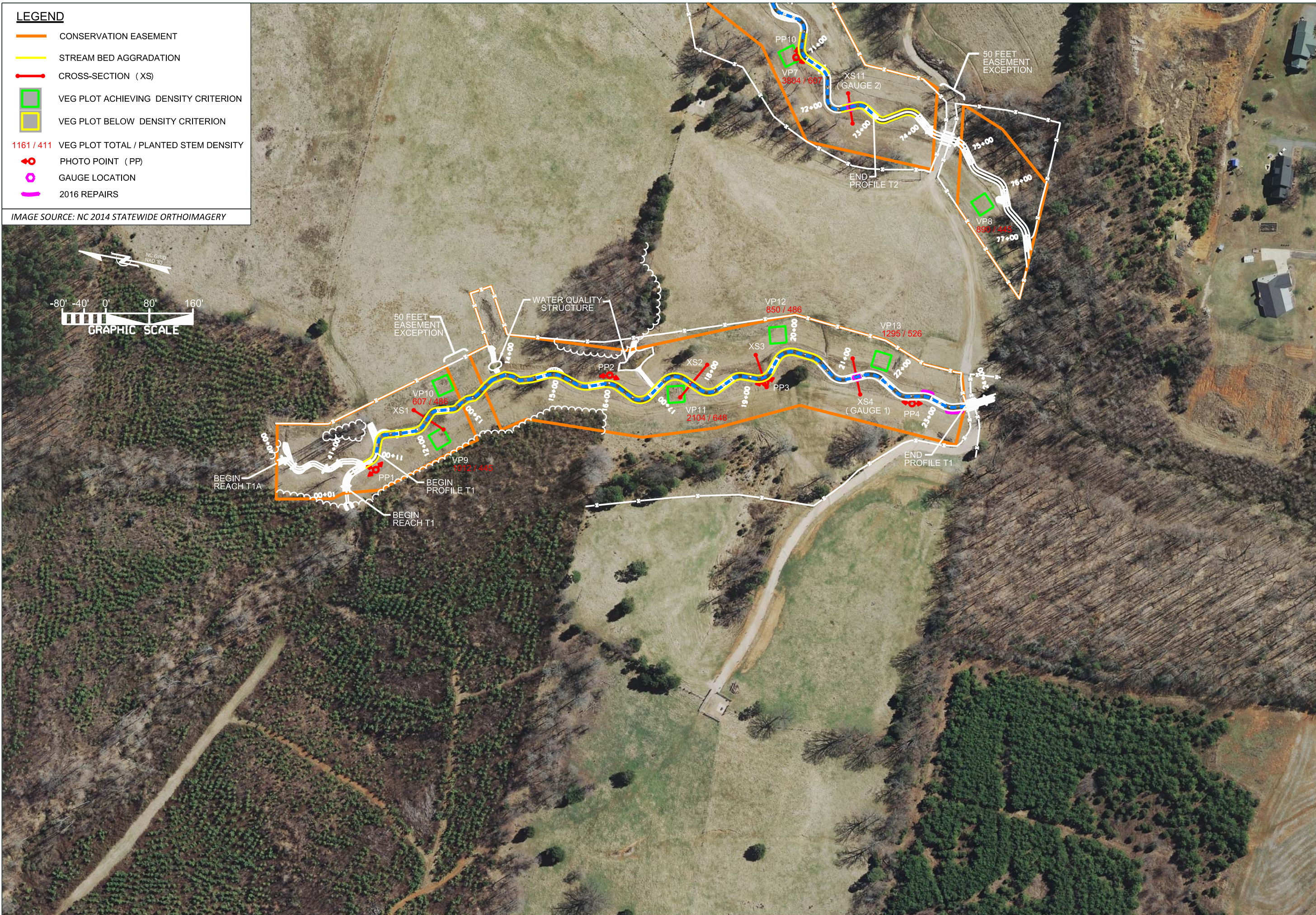
# **Appendix B**

## **Visual Assessment Data**

**LEGEND**

- CONSERVATION EASEMENT
- STREAM BED AGGRADATION
- CROSS-SECTION (XS)
- VEG PLOT ACHIEVING DENSITY CRITERION
- VEG PLOT BELOW DENSITY CRITERION
- 1161 / 411 VEG PLOT TOTAL / PLANTED STEM DENSITY
- PHOTO POINT (PP)
- GAUGE LOCATION
- 2016 REPAIRS

IMAGE SOURCE: NC 2014 STATEWIDE ORTHOIMAGERY



NO.	DATE	DESCRIPTION	REVISIONS

**NCDEQ DIVISION OF MITIGATION SERVICES**

**KCI**  
 ASSOCIATES OF NC  
 ENGINEERS PLANNERS SCIENTISTS  
 4505 FALLS OF NEUSE ROAD  
 RALEIGH, NORTH CAROLINA 27609

JACOB'S LANDING  
 STREAM MITIGATION PROJECT  
 MONITORING YEAR 3  
 CHINA GROVE, ROWAN COUNTY, NORTH CAROLINA  
 REACH T1

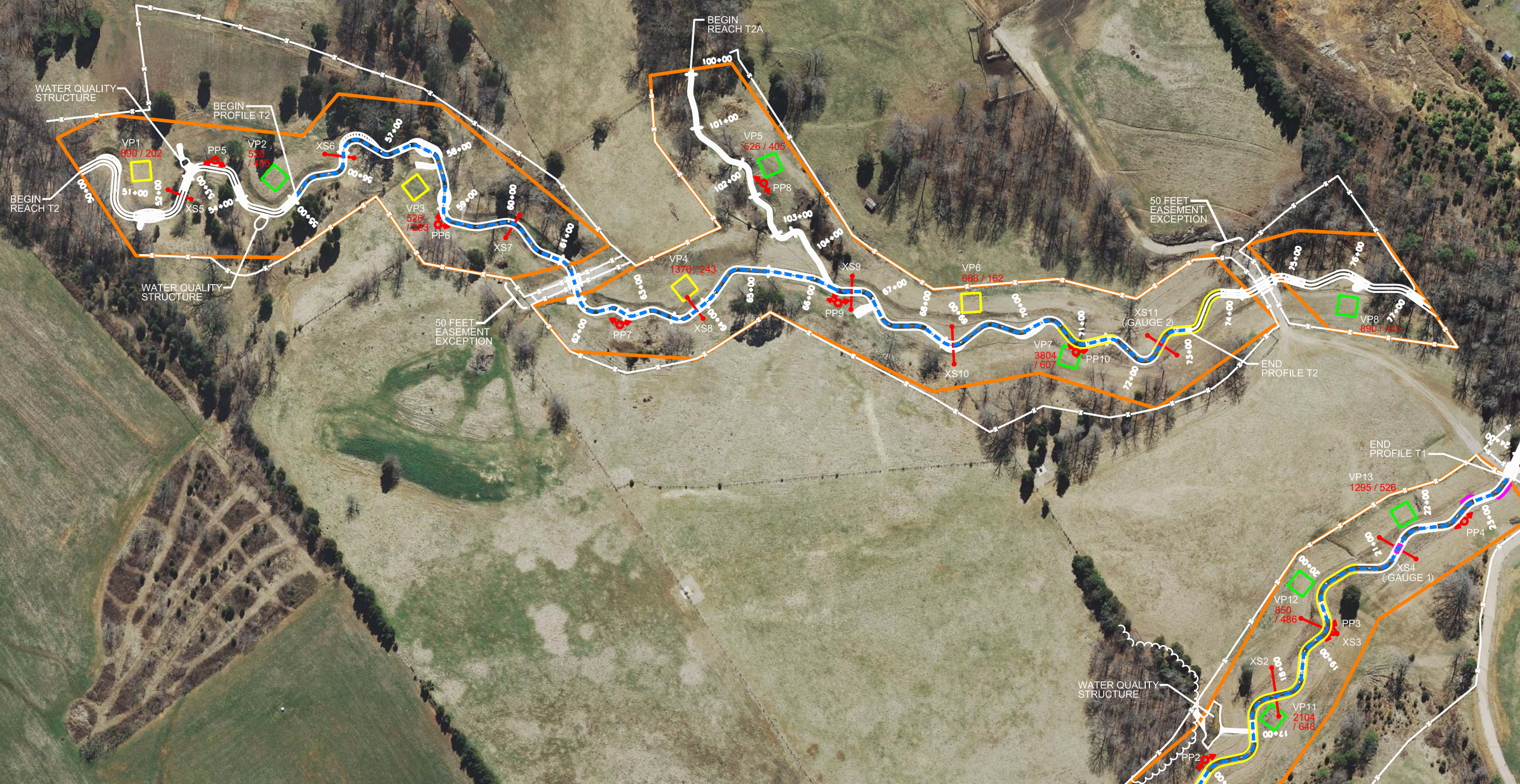
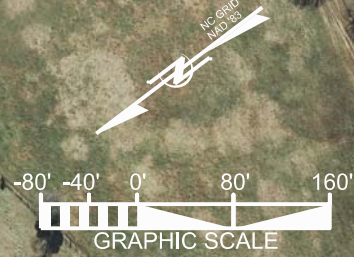
DATE: NOV 2016  
 SCALE: GRAPHIC

CURRENT  
 CONDITION  
 PLAN VIEW

**LEGEND**

- CONSERVATION EASEMENT
- STREAM BED AGGRADATION
- CROSS-SECTION (XS)
- VEG PLOT ACHIEVING DENSITY CRITERION
- VEG PLOT BELOW DENSITY CRITERION
- 1068 / 445 VEG PLOT TOTAL / PLANTED STEM DENSITY
- ⊙ PHOTO POINT (PP)
- ⊙ GAUGE LOCATION
- 2016 REPAIRS

IMAGE SOURCE: NC 2014 STATEWIDE ORTHOIMAGERY



NO.	DATE	DESCRIPTION	REVISIONS

**NCDEQ DIVISION OF MITIGATION SERVICES**

**KCI**  
ASSOCIATES OF NC  
 ENGINEERS · PLANNERS · SCIENTISTS  
 4505 FALLS OF NEUSE ROAD  
 RALEIGH, NORTH CAROLINA 27609

**JACOB'S LANDING  
 STREAM MITIGATION PROJECT  
 MONITORING YEAR 3**  
 CHINA GROVE, ROWAN COUNTY, NORTH CAROLINA  
 REACH T2

DATE: NOV 2016  
 SCALE: GRAPHIC

**CURRENT  
 CONDITION  
 PLAN VIEW**

Table 5. Visual Stream Morphology Stability Assessment							
Jacob's Landing Stream Restoration Site, DMS Project # 95024							
Assessed Length 2,389			Reach - T1				
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
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			1	962	60%
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	21	21			100%
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6)	16	16			100%
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	16	16			100%
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	11	11			100%
	2. Thalweg centering at downstream of meander (Glide)	10	10			100%	
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%
<b>Totals</b>					0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	6	6			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	6	6			100%
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	0	0			N/A
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	6	6			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			N/A

Table 5. Visual Stream Morphology Stability Assessment								
Jacob's Landing Stream Restoration Site, DMS Project # 95024								
Assessed Length 2,084				Reach - T2				
Major Channel Category	Channel Category	Sub-Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			2	243	88%	
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%	
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	13	23				57%
		3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6)	8				26
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	8	26				31%
	4. Thalweg Position*	1. Thalweg centering at upstream of meander bend (Run)						N/A
2. Thalweg centering at downstream of meander (Glide)				N/A				
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion						0
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	
<b>Totals</b>					0	0	100%	
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	15	15				100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	15	15				100%
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1				100%
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	6	6				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				N/A

\*Due to this reach's small size and the scale of the pattern, the exact position of the thalweg in relation to the meanders and morphological features is inconsistent and not practical to evaluate



<b>Table 6. Vegetation Condition Assessment</b>						
<b>Jacob's Landing Stream Restoration Site, DMS Project # 95024</b>						
<b>Planted Acreage 12.83</b>			<b>Easement Acreage 13.9</b>			
<b>Vegetation Category</b>	<b>Definitions</b>	<b>Mapping Threshold</b>	<b>CCPV Depiction</b>	<b>Number of Polygons</b>	<b>Combined Acreage</b>	<b>% of Planted Acreage</b>
<b>1. Bare Areas</b>	Very limited cover of both woody and herbaceous material.	0.1 acre	Pattern and Color	0	0.00	0.0%
<b>2. Low Stem Density Areas</b>	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acre	Pattern and Color	0	0.00	0.0%
<b>Total</b>				0	0.00	0.0%
<b>3. Areas of Poor Growth Rates or Vigor</b>	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acre	Pattern and Color	0	0.00	0.0%
<b>Cumulative Total</b>				0	0.00	0.0%
<b>4. Invasive Areas of Concern</b>	Areas or points (if too small to render as polygons at map scale).	1,000 SF	Pattern and Color	0	0.00	0.0%
<b>5. Easement Encroachment Areas</b>	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

## Stream Station Photos



**Photo Point 1u: MY-00 – 3/11/14**



**Photo Point 1u: MY-03 – 11/15/16**



**Photo Point 1d: MY-00 – 3/11/14**



**Photo Point 1d: MY-03 – 11/15/16**



**Photo Point 1 Tributary: MY-00 – 3/11/14**



**Photo Point 1 Tributary: MY-03 – 11/15/16**



**Photo Point 2u: MY-00 – 3/11/14**



**Photo Point 2u: MY-03 – 11/15/16**



**Photo Point 2d: MY-00 – 3/11/14**



**Photo Point 2d: MY-03 – 11/15/16**



**Photo Point 3u: MY-00 – 3/11/14**



**Photo Point 3u: MY-03 – 11/15/16**



**Photo Point 3d: MY-00 – 3/11/14**



**Photo Point 3d: MY-03 – 11/15/16**



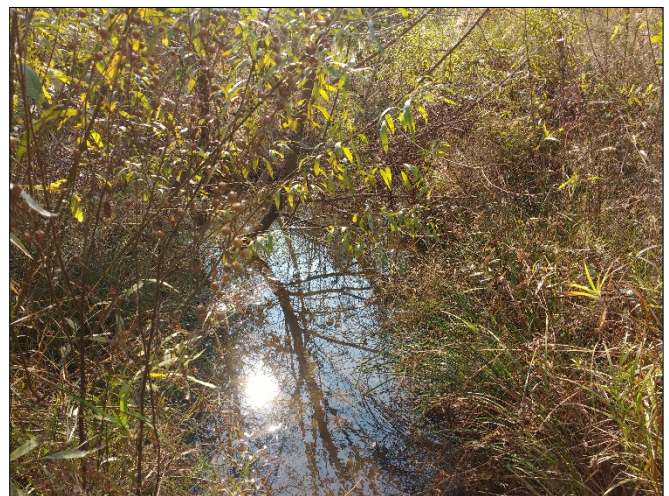
**Photo Point 4u: MY-00 – 3/11/14**



**Photo Point 4u: MY-03 – 11/15/16**



**Photo Point 4d: MY-00 – 3/11/14**



**Photo Point 4d: MY-03 – 11/15/16**



**Photo Point 5u: MY-00 – 3/11/14**



**Photo Point 5u: MY-03 – 11/15/16**



**Photo Point 5d: MY-00 – 3/11/14**



**Photo Point 5d: MY-03 – 11/15/16**



**Photo Point 6u: MY-00 – 3/11/14**



**Photo Point 6u: MY-03 – 11/15/16**



**Photo Point 6d: MY-00 – 3/11/14**



**Photo Point 6d: MY-03 – 11/15/16**



**Photo Point 7u: MY-00 – 3/11/14**



**Photo Point 7u: MY-03 – 11/15/16**



**Photo Point 7d: MY-00 – 3/11/14**



**Photo Point 7d: MY-03 – 11/15/16**



**Photo Point 8u: MY-00 – 3/11/14**



**Photo Point 8u: MY-03 – 11/15/16**



**Photo Point 8d: MY-00 – 3/11/14**



**Photo Point 8d: MY-03 – 11/15/16**



**Photo Point 9u: MY-00 – 3/11/14**



**Photo Point 9u: MY-03 – 11/15/16**



**Photo Point 9d: MY-00 – 3/11/14**



**Photo Point 9d: MY-03 – 11/15/16**



**Photo Point 9 Tributary: MY-00 – 3/11/14**



**Photo Point 9 Tributary: MY-03 – 11/15/16**



**Photo Point 10u: MY-00 – 3/11/14**



**Photo Point 10u: MY-03 – 11/15/16**





**Photo Point 10d: MY-00 – 3/11/14**



**Photo Point 10d: MY-03 – 11/15/16**

## Vegetation Monitoring Plot Photos



**Plot 1 Photo:** 8/31/16 – MY03



**Plot 2 Photo:** 8/31/16 – MY03



**Plot 3 Photo:** 8/31/16 – MY03



**Plot 4 Photo:** 8/31/16 – MY03



**Plot 5 Photo:** 8/31/16 – MY03



**Plot 6 Photo:** 8/31/16 – MY03



**Plot 7 Photo:** 8/31/16 – MY03



**Plot 8 Photo:** 8/31/16 – MY03



**Plot 9 Photo:** 8/31/16 – MY03



**Plot 10 Photo:** 8/31/16 – MY03



**Plot 11 Photo:** 8/31/16 – MY03



**Plot 12 Photo:** 8/31/16 – MY03



**Plot 13 Photo:** 8/31/16 – MY03

# **Appendix C**

## **Vegetation Plot Data**

<b>Table 7. Vegetation Plot Criteria Attainment</b>			
<b>Jacob's Landing Stream Restoration Site, DMS Project # 95024</b>			
<b>Vegetation Plot ID</b>	<b>Vegetation Survival Threshold Met?</b>	<b>Monitoring Year 03 Planted Stem Density (stems/acre)</b>	<b>Monitoring Year 03 Total Stem Density (stems/acre)</b>
1	No	202	890
2	Yes	405	526
3	No	283	526
4	No	243	1,376
5	Yes	405	526
6	No	162	688
7	Yes	607	3,804
8	Yes	445	890
9	Yes	445	1,012
10	Yes	486	607
11	Yes	647	2,104
12	Yes	486	850
13	Yes	526	1,295

<b>Table 8. CVS Vegetation Plot Metadata Jacob's Landing Stream Restoration Site, DMS Project # 95024</b>	
<b>Report Prepared By</b>	Randall Jones
<b>Date Prepared</b>	9/2/2016 13:59
<b>database name</b>	KCI-2014-L.mdb
<b>database location</b>	M:\2011\20110675-Jacobs Landing\Monitoring\Vegetaton CVS Database
<b>computer name</b>	12-3ZV4FP1
<b>file size</b>	62001152
<b>DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----</b>	
<b>Metadata</b>	Description of database file, the report worksheets, and a summary of project(s) and project data.
<b>Proj, planted</b>	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
<b>Proj, total stems</b>	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.
<b>Plots</b>	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
<b>Vigor</b>	Frequency distribution of vigor classes for stems for all plots.
<b>Vigor by Spp</b>	Frequency distribution of vigor classes listed by species.
<b>Damage</b>	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
<b>Damage by Spp</b>	Damage values tallied by type for each species.
<b>Damage by Plot</b>	Damage values tallied by type for each plot.
<b>Planted Stems by Plot and Spp</b>	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
<b>ALL Stems by Plot and spp</b>	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.
<b>PROJECT SUMMARY-----</b>	
<b>Project Code</b>	95024
<b>project Name</b>	Jacob's Landing
<b>Description</b>	Stream Restoration Site
<b>River Basin</b>	Yadkin-Pee Dee
<b>length(ft)</b>	4593
<b>area (sq m)</b>	0.72
<b>Required Plots (calculated)</b>	13
<b>Sampled Plots</b>	13

Table 9. CVS Stem Count Total and Planted by Plot and Species																										
DMS Project Code 95024. Project Name: Jacob's Landing			Current Plot Data (MY3 2016)																							
Scientific Name	Common Name	Species Type	95024-01-0001			95024-01-0002			95024-01-0003			95024-01-0004			95024-01-0005			95024-01-0006			95024-01-0007			95024-01-0008		
			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 negundo	boxelder	Tree																							1	
Baccharis	baccharis	Shrub																								
Baccharis halimifolia	eastern baccharis	Shrub																								
Betula nigra	river birch	Tree	1	1	1	8	8	8	2	2	2	4	4	4				1	1	1	10	10	11	3	3	3
Callicarpa americana	American beautyberry	Shrub																								
Diospyros virginiana	common persimmon	Tree						1						1						1						
Fraxinus pennsylvanica	green ash	Tree									1									1						
Juglans nigra	black walnut	Tree												1												
Juniperus virginiana	eastern redcedar	Tree												1									1			
Liquidambar styraciflua	sweetgum	Tree			17			1			5			25			3			11			75		8	
Liriodendron tulipifera	tuliptree	Tree										1	1	1									1			
Nyssa biflora	swamp tupelo	Tree																1	1	1						
Pinus taeda	loblolly pine	Tree																							1	
Platanus occidentalis	American sycamore	Tree	4	4	4				3	3	3	1	1	1				2	2	2	2	2	2			
Quercus	oak	Tree						1																		
Quercus alba	white oak	Tree				2	2	2																		
Quercus palustris	pin oak	Tree														7	7	7								
Quercus phellos	willow oak	Tree							2	2	2									2	2	2	8	8	8	
Quercus rubra	northern red oak	Tree														3	3	3				1	1	1		
Salix nigra	black willow	Tree																					1		1	
Sambucus canadensis	Common Elderberry	Shrub																								
Ulmus americana	American elm	Tree																								
Unknown		Shrub or Tree																								
<b>Stem count</b>			5	5	22	10	10	13	7	7	13	6	6	34	10	10	13	4	4	17	15	15	94	11	11	22
<b>size (ares)</b>			1			1			1			1			1			1			1			1		
<b>size (ACRES)</b>			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
<b>Species count</b>			2	2	3	2	2	5	3	3	5	3	3	7	2	2	3	3	3	6	4	4	8	2	2	6
<b>Stems per ACRE</b>			202	202	890	405	405	526	283	283	526	243	243	1376	405	405	526	162	162	688	607	607	3804	445	445	890



**Table 9. CVS Stem Count Total and Planted by Plot and Species**

DMS Project Code 95024. Project Name: Jacob's Landing			Current Plot Data (MY3 2016)															Annual Means											
Scientific Name	Common Name	Species Type	95024-01-0009			95024-01-0010			95024-01-0011			95024-01-0012			95024-01-0013			MY3 (2016)			MY2 (2015)			MY1 (2014)			MY0 (2014)		
			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 negundo	boxelder	Tree								1			1			3			6			6			3				
Baccharis	baccharis	Shrub			1														1										
Baccharis halimifolia	eastern baccharis	Shrub																				2							
Betula nigra	river birch	Tree				3	3	3	7	7	7	1	1	1	1	1	1	41	41	42	43	43	45	44	44	44	44	44	
Callicarpa americana	American beautyberry	Shrub				3	3	3	4	4	4	1	1	1	1	1	1	9	9	9	9	9	9	11	11	12			
Diospyros virginiana	common persimmon	Tree																	3			1			1				
Fraxinus pennsylvanica	green ash	Tree	3	3	3				4	4	4				2	2	2	9	9	11	9	9	9	1	1	1			
Juglans nigra	black walnut	Tree																		1			3						
Juniperus virginiana	eastern redcedar	Tree																				2			4				
Liquidambar styraciflua	sweetgum	Tree			8						2			31			8			12			206			171		272	
Liriodendron tulipifera	tuliptree	Tree			1						1			1			4	1	1	9	3	3	10	11	11	17			
Nyssa biflora	swamp tupelo	Tree																1	1	1									
Pinus taeda	loblolly pine	Tree																											
Platanus occidentalis	American sycamore	Tree			3									2				12	12	17	16	16	19	21	21	32	3	3	3
Quercus	oak	Tree																		1						11	11	11	
Quercus alba	white oak	Tree																2	2	2	4	4	4	3	3	4	1	1	1
Quercus palustris	pin oak	Tree																7	7	7	5	5	5	5	5	5			
Quercus phellos	willow oak	Tree	7	7	7	6	6	6				9	9	9	9	9	9	43	43	43	46	46	46	41	41	41	54	54	54
Quercus rubra	northern red oak	Tree							1	1	1							5	5	5	6	6	6	5	5	5			
Salix nigra	black willow	Tree			1																	3							
Sambucus canadensis	Common Elderberry	Shrub	1	1	1							1	1	1				2	2	2	2	2	3	1	1	1			
Ulmus americana	American elm	Tree									1											1							
Unknown		Shrub or Tree																			1	1	1	6	6	6	133	133	133
<b>Stem count size (ares)</b>			11	11	25	12	12	15	16	16	52	12	12	21	13	13	32	132	132	373	144	144	344	149	149	444	246	246	246
<b>size (ACRES)</b>			1			1			1			1			1			13			13			13			13		
<b>Species count</b>			0.02			0.02			0.02			0.02			0.02			0.32			0.32			0.32			0.32		
<b>Stems per ACRE</b>			3	3	8	3	3	5	4	4	9	4	4	6	4	4	7	11	11	21	11	11	17	11	11	14	6	6	6
<b>Stems per ACRE</b>			445	445	1012	486	486	607	647	647	2104	486	486	850	526	526	1295	411	411	1161	448	448	1071	464	464	1382	766	766	766

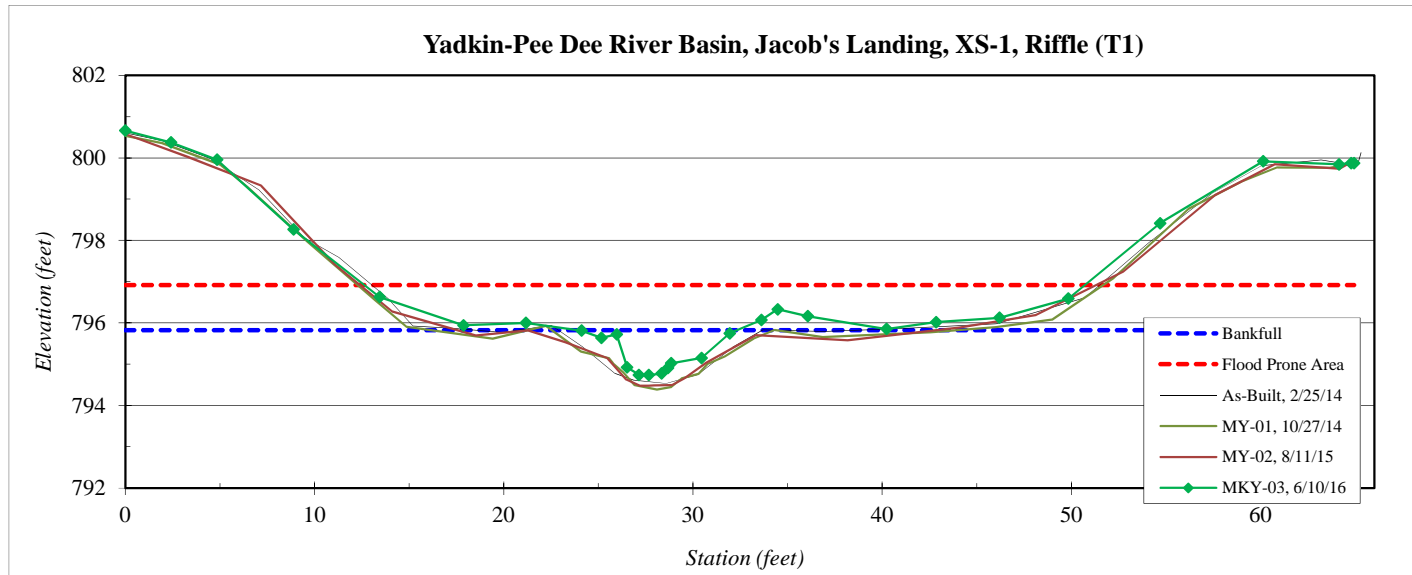
# **Appendix D**

## **Stream Survey Data**

<b>River Basin:</b>	Yadkin-Pee Dee
<b>Watershed:</b>	Jacob's Landing
<b>XS ID</b>	XS-1, Riffle (T1)
<b>Drainage Area (sq mi):</b>	0.37
<b>Date:</b>	6/10/2016
<b>Field Crew:</b>	T. Seelinger and R. Jones

Station (ft)	Elevation (ft)
0.0	800.7
2.4	800.4
4.8	800.0
8.9	798.3
13.4	796.6
17.9	795.9
21.2	796.0
24.1	795.8
25.2	795.6
26.0	795.7
26.5	794.9
27.1	794.7
27.7	794.7
28.3	794.8
28.7	794.9
28.9	795.0
30.5	795.2
31.9	795.8
33.6	796.1
34.5	796.3
36.1	796.2
40.2	795.9
42.8	796.0
46.2	796.1
49.8	796.6
54.7	798.4
60.1	799.9
64.1	799.8
64.8	799.9
64.9	799.9

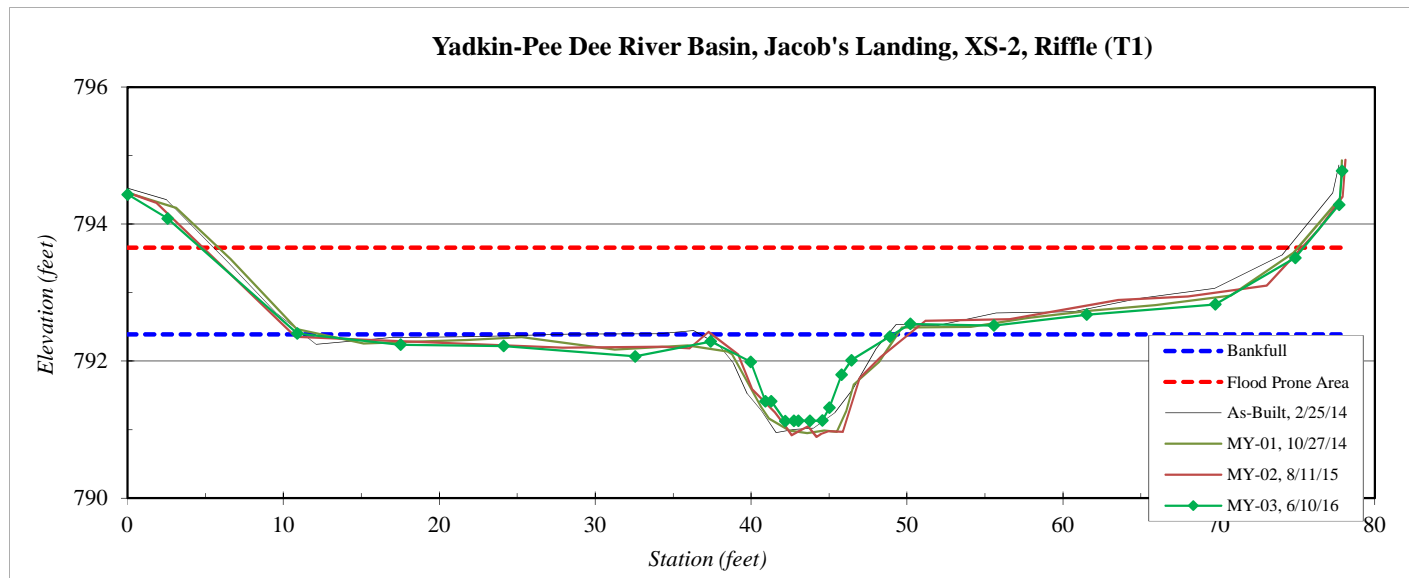
SUMMARY DATA	
<b>Bankfull Elevation (ft):</b>	795.8
<b>Bankfull Cross-Sectional Area (ft<sup>2</sup>):</b>	4.7
<b>Bankfull Width (ft):</b>	8.4
<b>Flood Prone Area Elevation (ft):</b>	796.9
<b>Flood Prone Width (ft):</b>	38.0
<b>Max Depth at Bankfull (ft):</b>	1.1
<b>Mean Depth at Bankfull (ft):</b>	0.6
<b>W / D Ratio:</b>	15.0
<b>Entrenchment Ratio:</b>	4.5
<b>Bank Height Ratio:</b>	1.0



<b>River Basin:</b>	Yadkin-Pee Dee
<b>Watershed:</b>	Jacob's Landing
<b>XS ID</b>	XS-2, Riffle (T1)
<b>Drainage Area (sq mi):</b>	0.37
<b>Date:</b>	6/10/2016
<b>Field Crew:</b>	T. Seelinger and R. Jones

Station (ft)	Elevation (ft)
0.0	794.4
2.6	794.1
10.9	792.4
17.5	792.2
24.1	792.2
32.6	792.1
37.4	792.3
40.0	792.0
40.9	791.4
41.3	791.4
42.2	791.1
42.7	791.1
43.0	791.1
43.8	791.1
44.6	791.1
45.0	791.3
45.8	791.8
46.4	792.0
48.9	792.4
50.2	792.5
55.6	792.5
61.5	792.7
69.8	792.8
74.9	793.5
77.7	794.3
77.9	794.8

SUMMARY DATA	
<b>Bankfull Elevation (ft):</b>	792.4
<b>Bankfull Cross-Sectional Area (ft<sup>2</sup>):</b>	7.7
<b>Bankfull Width (ft):</b>	11.7
<b>Flood Prone Area Elevation (ft):</b>	793.7
<b>Flood Prone Width (ft):</b>	70.8
<b>Max Depth at Bankfull (ft):</b>	1.3
<b>Mean Depth at Bankfull (ft):</b>	0.7
<b>W / D Ratio:</b>	17.8
<b>Entrenchment Ratio:</b>	6.1
<b>Bank Height Ratio:</b>	1.0

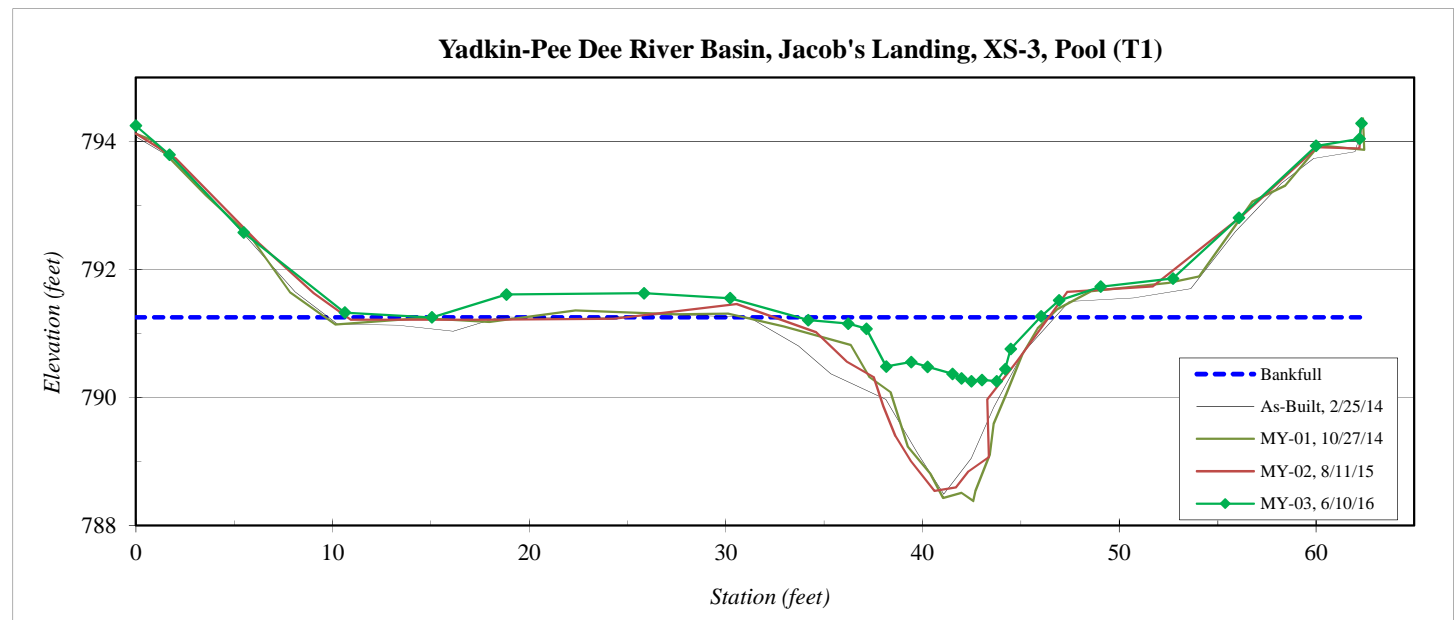


<b>River Basin:</b>	Yadkin-Pee Dee
<b>Watershed:</b>	Jacob's Landing
<b>XS ID</b>	XS-3, Pool (T1)
<b>Drainage Area (sq mi):</b>	0.37
<b>Date:</b>	6/10/2016
<b>Field Crew:</b>	T. Seelinger and R. Jones



Station (ft)	Elevation (ft)
0.0	794.2
1.7	793.8
5.5	792.6
10.6	791.3
15.0	791.3
18.8	791.6
25.8	791.6
30.2	791.5
34.2	791.2
36.2	791.2
37.1	791.1
38.1	790.5
39.4	790.6
40.3	790.5
41.5	790.4
42.0	790.3
42.5	790.3
43.0	790.3
43.8	790.3
44.2	790.4
44.5	790.8
46.0	791.3
46.9	791.5
49.1	791.7
52.7	791.9
56.1	792.8
60.0	793.9
62.2	794.0
62.3	794.3

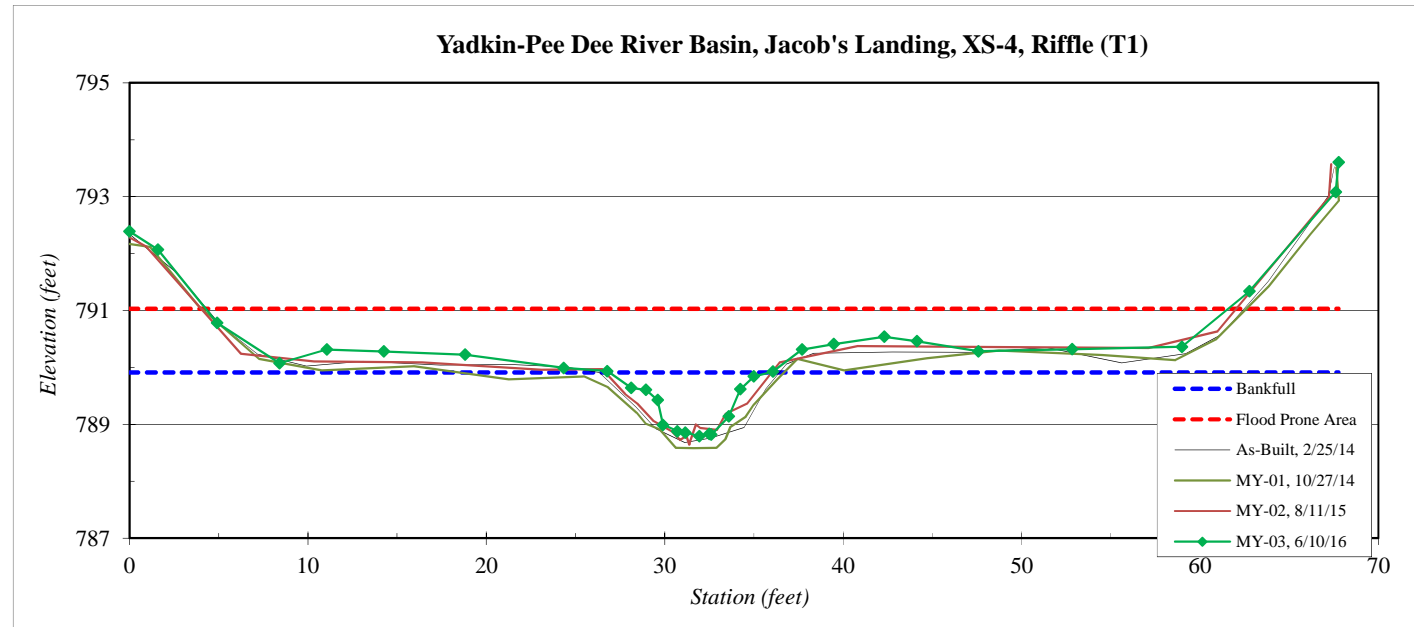
SUMMARY DATA	
<b>Bankfull Elevation (ft):</b>	791.3
<b>Bankfull Cross-Sectional Area (ft<sup>2</sup>):</b>	6.5
<b>Bankfull Width (ft):</b>	12.3
<b>Flood Prone Area Elevation (ft):</b>	-
<b>Flood Prone Width (ft):</b>	-
<b>Max Depth at Bankfull (ft):</b>	1.0
<b>Mean Depth at Bankfull (ft):</b>	0.5
<b>W / D Ratio:</b>	-
<b>Entrenchment Ratio:</b>	-
<b>Bank Height Ratio:</b>	-



<b>River Basin:</b>	Yadkin-Pee Dee
<b>Watershed:</b>	Jacob's Landing
<b>XS ID</b>	XS-4, Riffle (T1)
<b>Drainage Area (sq mi):</b>	0.37
<b>Date:</b>	6/10/2016
<b>Field Crew:</b>	T. Seelinger and R. Jones

Station (ft)	Elevation (ft)
0.0	792.4
1.6	792.1
4.9	790.8
8.4	790.1
11.1	790.3
14.3	790.3
18.8	790.2
24.3	790.0
26.8	789.9
28.1	789.6
28.9	789.6
29.6	789.4
29.9	789.0
30.7	788.9
31.2	788.9
31.9	788.8
32.5	788.8
32.6	788.8
33.6	789.1
34.2	789.6
35.0	789.8
36.1	789.9
37.7	790.3
39.5	790.4
42.3	790.5
44.1	790.5
47.6	790.3
52.8	790.3
59.0	790.4
62.8	791.3
67.6	793.1
67.8	793.6

SUMMARY DATA	
<b>Bankfull Elevation (ft):</b>	789.9
<b>Bankfull Cross-Sectional Area (ft<sup>2</sup>):</b>	5.1
<b>Bankfull Width (ft):</b>	8.9
<b>Flood Prone Area Elevation (ft):</b>	791.0
<b>Flood Prone Width (ft):</b>	57.3
<b>Max Depth at Bankfull (ft):</b>	1.1
<b>Mean Depth at Bankfull (ft):</b>	0.6
<b>W / D Ratio:</b>	15.5
<b>Entrenchment Ratio:</b>	6.4
<b>Bank Height Ratio:</b>	1.0



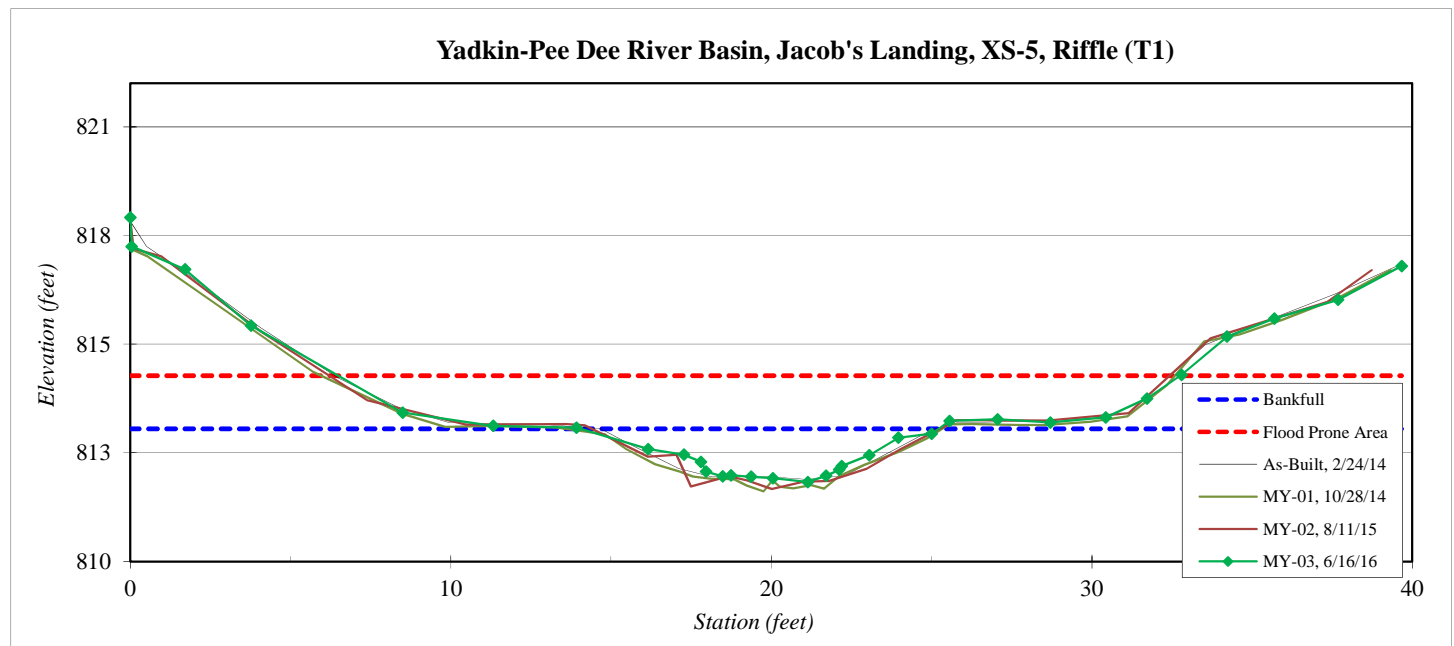
<b>River Basin:</b>	Yadkin-Pee Dee
<b>Watershed:</b>	Jacob's Landing
<b>XS ID</b>	XS-5, Riffle (T1)
<b>Drainage Area (sq mi):</b>	0.37
<b>Date:</b>	6/16/2016
<b>Field Crew:</b>	T. Seelinger and R. Jones



Station (ft)	Elevation (ft)
0.0	818.6
0.0	817.9
1.7	817.3
3.8	815.9
8.5	813.7
11.3	813.4
13.9	813.4
16.2	812.8
17.3	812.7
17.8	812.5
18.0	812.3
18.5	812.1
18.7	812.2
19.4	812.1
20.1	812.1
21.1	812.0
21.7	812.2
22.1	812.3
22.2	812.4
23.1	812.7
24.0	813.1
25.0	813.2
25.6	813.5
27.1	813.6
28.7	813.5
30.4	813.6
31.7	814.1
32.8	814.7
34.2	815.6
35.7	816.1
37.7	816.6
39.7	817.4

SUMMARY DATA	
<b>Bankfull Elevation (ft):</b>	813.3
<b>Bankfull Cross-Sectional Area (ft<sup>2</sup>):</b>	8.1
<b>Bankfull Width (ft):</b>	11.2
<b>Flood Prone Area Elevation (ft):</b>	814.7
<b>Flood Prone Width (ft):</b>	26.3
<b>Max Depth at Bankfull (ft):</b>	1.3
<b>Mean Depth at Bankfull (ft):</b>	0.7
<b>W / D Ratio:</b>	15.5
<b>Entrenchment Ratio:</b>	2.3
<b>Bank Height Ratio:</b>	1.0

Yadkin-Pee Dee River Basin, Jacob's Landing, XS-5, Riffle (T1)

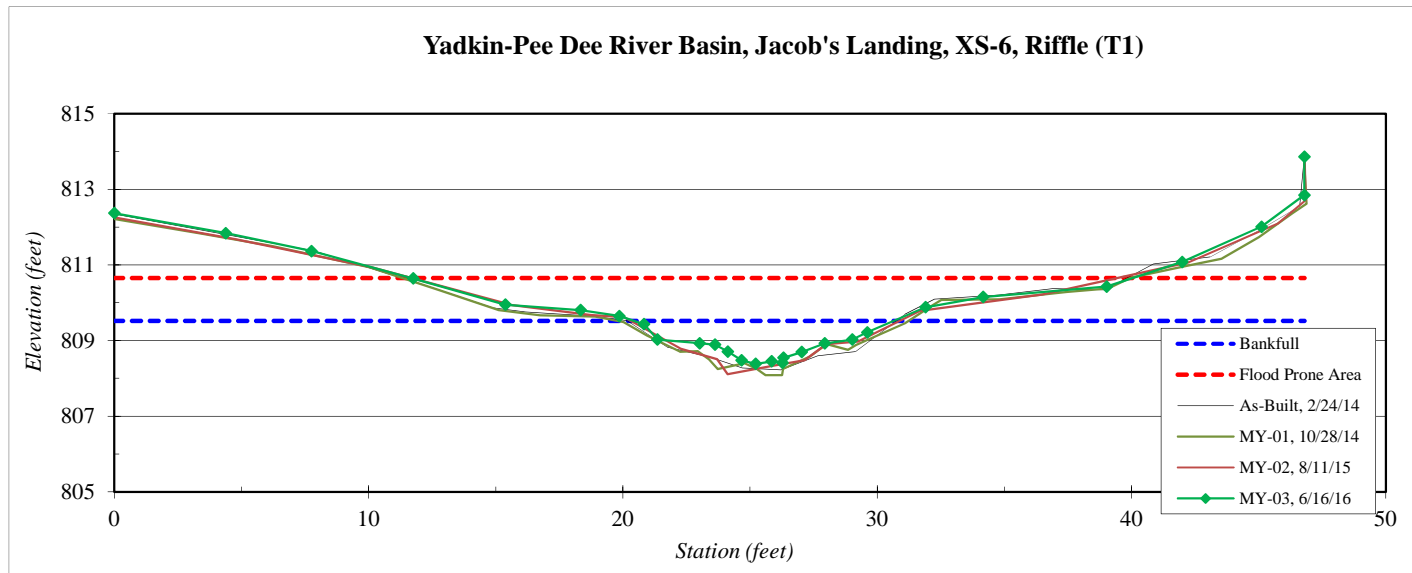


<b>River Basin:</b>	Yadkin-Pee Dee
<b>Watershed:</b>	Jacob's Landing
<b>XS ID</b>	XS-6, Riffle (T1)
<b>Drainage Area (sq mi):</b>	0.37
<b>Date:</b>	6/16/2016
<b>Field Crew:</b>	T. Seelinger and R. Jones



Station (ft)	Elevation (ft)
0.0	812.4
4.4	811.8
7.8	811.4
11.8	810.6
15.4	810.0
18.3	809.8
19.9	809.7
20.8	809.4
21.4	809.0
23.0	808.9
23.6	808.9
24.1	808.7
24.7	808.5
25.2	808.4
25.8	808.5
26.3	808.4
26.3	808.5
27.0	808.7
27.9	808.9
29.0	809.0
29.6	809.2
31.9	809.9
34.2	810.2
39.0	810.4
42.0	811.1
45.1	812.0
46.8	812.9
46.8	813.9

SUMMARY DATA	
<b>Bankfull Elevation (ft):</b>	809.5
<b>Bankfull Cross-Sectional Area (ft<sup>2</sup>):</b>	6.4
<b>Bankfull Width (ft):</b>	10.2
<b>Flood Prone Area Elevation (ft):</b>	810.7
<b>Flood Prone Width (ft):</b>	28.4
<b>Max Depth at Bankfull (ft):</b>	1.1
<b>Mean Depth at Bankfull (ft):</b>	0.6
<b>W / D Ratio:</b>	16.3
<b>Entrenchment Ratio:</b>	2.8
<b>Bank Height Ratio:</b>	1.0





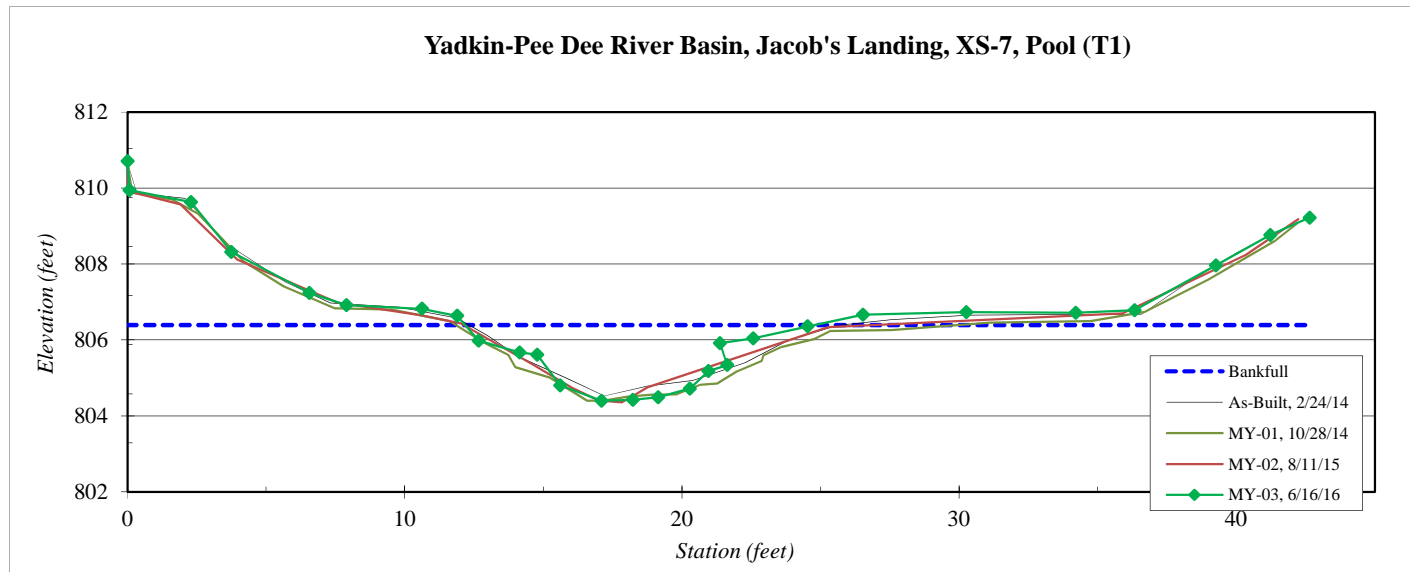
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<b>Watershed:</b>	Jacob's Landing
<b>XS ID</b>	XS-7, Pool (T1)
<b>Drainage Area (sq mi):</b>	0.37
<b>Date:</b>	6/16/2016
<b>Field Crew:</b>	T. Seelinger and R. Jones



Station (ft)	Elevation (ft)
0.0	810.7
0.1	809.9
2.3	809.6
3.7	808.3
6.6	807.2
7.9	806.9
10.6	806.8
11.9	806.6
12.7	806.0
14.1	805.7
14.8	805.6
15.6	804.8
17.1	804.4
18.2	804.4
19.1	804.5
20.3	804.7
21.0	805.2
21.6	805.3
21.4	805.9
22.6	806.0
24.5	806.4
26.5	806.7
30.3	806.7
34.2	806.7
36.3	806.8
39.3	808.0
41.2	808.8
42.7	809.2

SUMMARY DATA	
<b>Bankfull Elevation (ft):</b>	806.4
<b>Bankfull Cross-Sectional Area (ft<sup>2</sup>):</b>	13.5
<b>Bankfull Width (ft):</b>	12.6
<b>Flood Prone Area Elevation (ft):</b>	-
<b>Flood Prone Width (ft):</b>	-
<b>Max Depth at Bankfull (ft):</b>	2.0
<b>Mean Depth at Bankfull (ft):</b>	1.1
<b>W / D Ratio:</b>	-
<b>Entrenchment Ratio:</b>	-
<b>Bank Height Ratio:</b>	-

Yadkin-Pee Dee River Basin, Jacob's Landing, XS-7, Pool (T1)

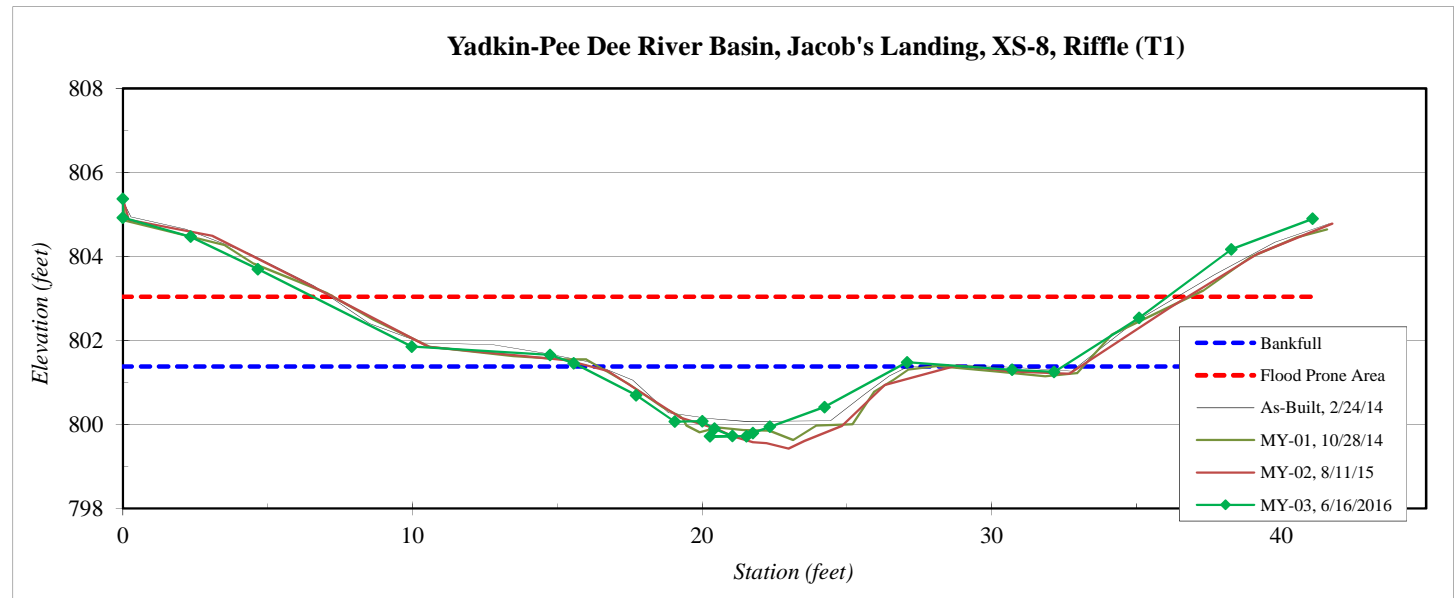


<b>River Basin:</b>	Yadkin-Pee Dee
<b>Watershed:</b>	Jacob's Landing
<b>XS ID</b>	XS-8, Riffle (T1)
<b>Drainage Area (sq mi):</b>	0.37
<b>Date:</b>	6/16/2016
<b>Field Crew:</b>	T. Seelinger and R. Jones



Station (ft)	Elevation (ft)
0.0	805.4
0.0	804.9
2.3	804.5
4.7	803.7
10.0	801.9
14.7	801.7
15.6	801.5
17.7	800.7
19.1	800.1
20.0	800.1
20.4	799.9
21.0	799.7
20.3	799.7
21.5	799.7
21.7	799.8
22.3	799.9
24.2	800.4
27.1	801.5
30.7	801.3
32.2	801.3
35.1	802.5
38.3	804.2
41.1	804.9

SUMMARY DATA	
<b>Bankfull Elevation (ft):</b>	801.4
<b>Bankfull Cross-Sectional Area (ft<sup>2</sup>):</b>	10.4
<b>Bankfull Width (ft):</b>	11.0
<b>Flood Prone Area Elevation (ft):</b>	803.0
<b>Flood Prone Width (ft):</b>	29.5
<b>Max Depth at Bankfull (ft):</b>	1.7
<b>Mean Depth at Bankfull (ft):</b>	0.9
<b>W / D Ratio:</b>	11.6
<b>Entrenchment Ratio:</b>	2.7
<b>Bank Height Ratio:</b>	1.0

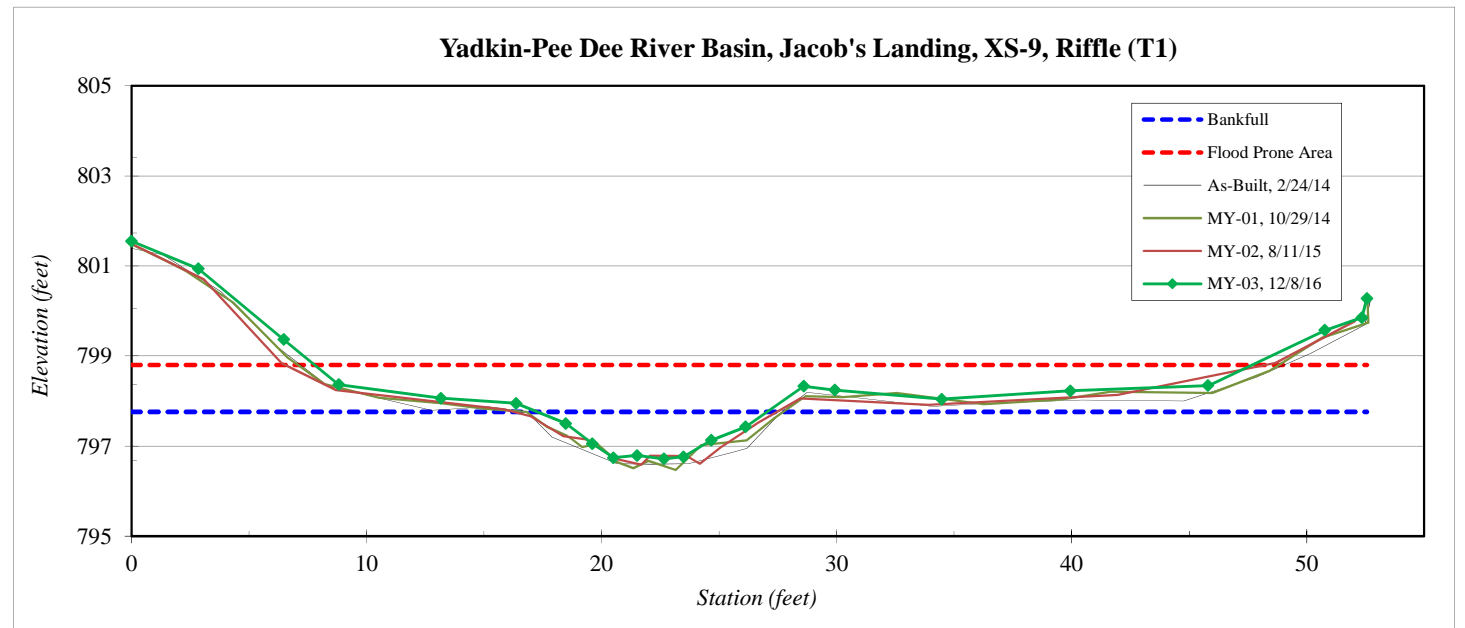


<b>River Basin:</b>	Yadkin-Pee Dee
<b>Watershed:</b>	Jacob's Landing
<b>XS ID</b>	XS-9, Riffle (T1)
<b>Drainage Area (sq mi):</b>	0.37
<b>Date:</b>	12/8/2016
<b>Field Crew:</b>	T. Seelinger and R. Jones



Station (ft)	Elevation (ft)
0.0	801.55
2.8	800.94
6.5	799.37
8.8	798.37
13.2	798.06
16.4	797.95
18.5	797.50
19.6	797.06
20.5	796.74
21.5	796.79
22.7	796.72
23.5	796.77
24.7	797.13
26.1	797.43
28.6	798.33
29.9	798.25
34.5	798.04
39.9	798.23
45.8	798.34
50.8	799.57
52.4	799.85
52.6	800.28

SUMMARY DATA	
<b>Bankfull Elevation (ft):</b>	797.8
<b>Bankfull Cross-Sectional Area (ft<sup>2</sup>):</b>	6.3
<b>Bankfull Width (ft):</b>	9.8
<b>Flood Prone Area Elevation (ft):</b>	798.8
<b>Flood Prone Width (ft):</b>	39.9
<b>Max Depth at Bankfull (ft):</b>	1.0
<b>Mean Depth at Bankfull (ft):</b>	0.6
<b>W / D Ratio:</b>	15.2
<b>Entrenchment Ratio:</b>	4.1
<b>Bank Height Ratio:</b>	1.0

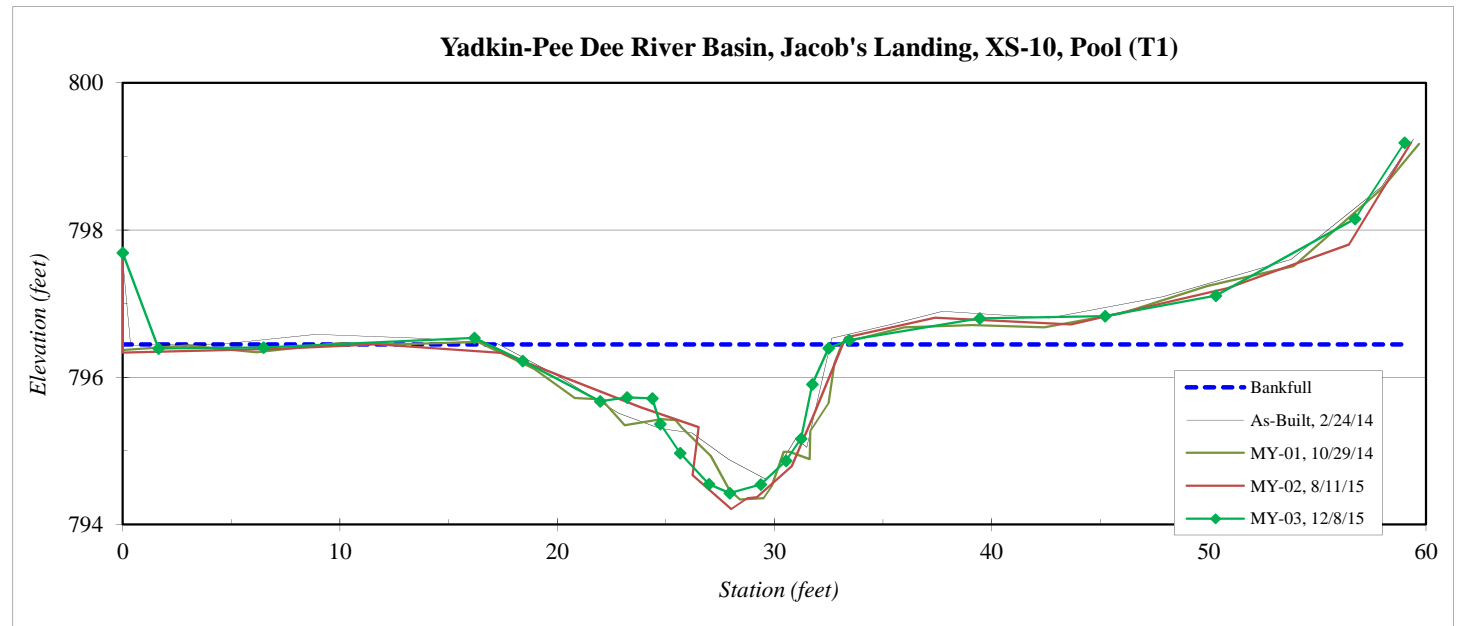


<b>River Basin:</b>	Yadkin-Pee Dee
<b>Watershed:</b>	Jacob's Landing
<b>XS ID</b>	XS-10, Pool (T1)
<b>Drainage Area (sq mi):</b>	0.37
<b>Date:</b>	12/8/2016
<b>Field Crew:</b>	T. Seelinger and R. Jones



Station (ft)	Elevation (ft)
0.0	797.69
1.6	796.39
6.5	796.40
16.2	796.54
18.4	796.22
22.0	795.68
23.2	795.73
24.4	795.71
24.7	795.37
25.7	794.97
27.0	794.55
27.9	794.43
29.4	794.55
30.5	794.87
31.2	795.17
31.7	795.91
32.5	796.40
33.4	796.50
39.4	796.80
45.2	796.83
50.3	797.11
56.7	798.15
59.0	799.19

SUMMARY DATA	
<b>Bankfull Elevation (ft):</b>	796.5
<b>Bankfull Cross-Sectional Area (ft<sup>2</sup>):</b>	20.4
<b>Bankfull Width (ft):</b>	16.3
<b>Flood Prone Area Elevation (ft):</b>	-
<b>Flood Prone Width (ft):</b>	-
<b>Max Depth at Bankfull (ft):</b>	2.0
<b>Mean Depth at Bankfull (ft):</b>	1.3
<b>W / D Ratio:</b>	-
<b>Entrenchment Ratio:</b>	-
<b>Bank Height Ratio:</b>	-

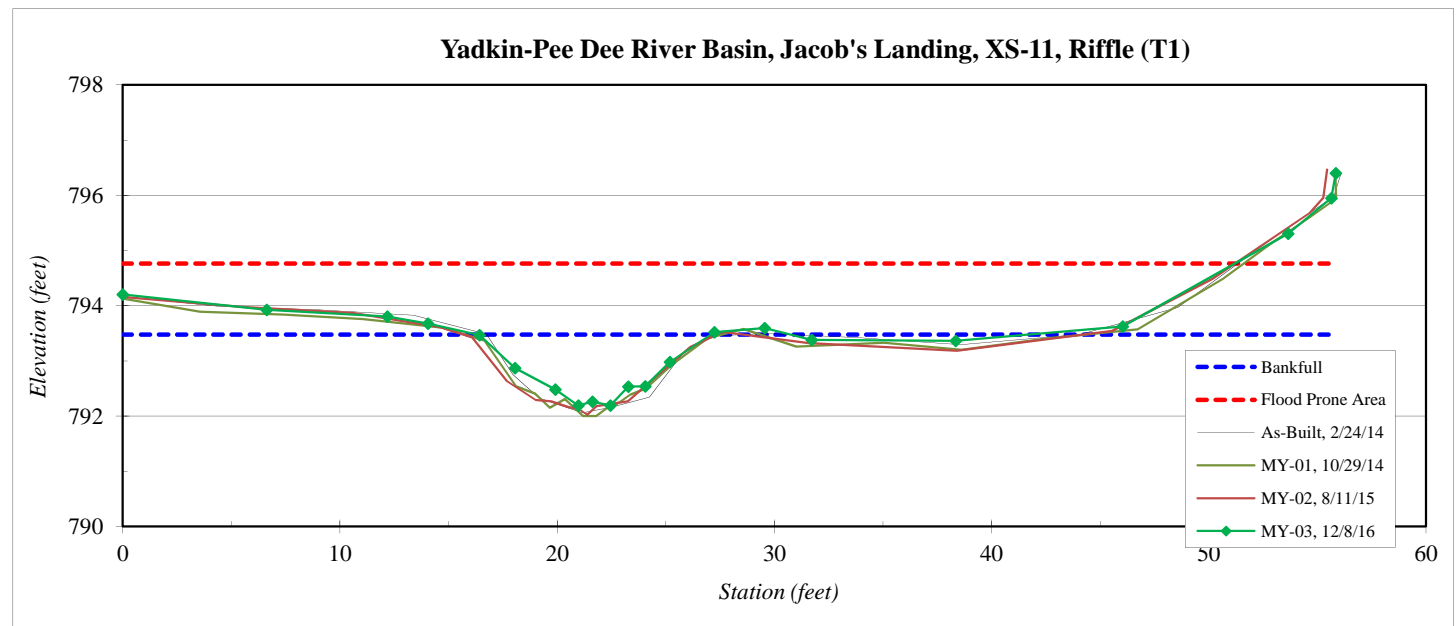


<b>River Basin:</b>	Yadkin-Pee Dee
<b>Watershed:</b>	Jacob's Landing
<b>XS ID</b>	XS-11, Riffle (T1)
<b>Drainage Area (sq mi):</b>	0.37
<b>Date:</b>	12/8/2016
<b>Field Crew:</b>	T. Seelinger and R. Jones

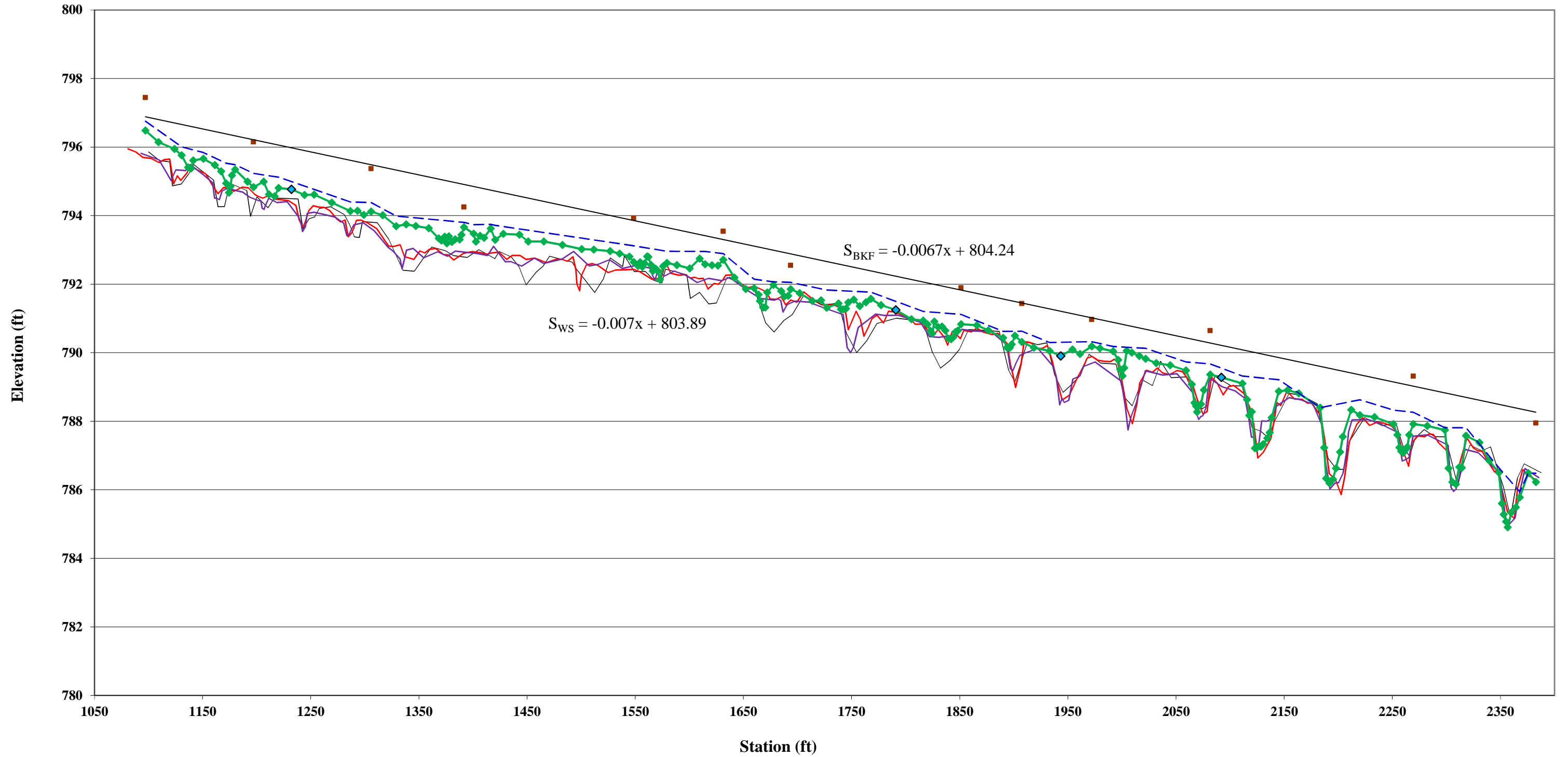


Station (ft)	Elevation (ft)
0.0	794.20
6.6	793.93
12.2	793.80
14.1	793.68
16.4	793.47
18.1	792.87
19.9	792.49
21.0	792.19
21.6	792.26
22.5	792.19
23.3	792.54
24.1	792.54
25.2	792.98
27.2	793.52
29.6	793.60
31.7	793.38
38.4	793.36
46.0	793.62
53.7	795.31
55.6	795.95
55.8	796.40

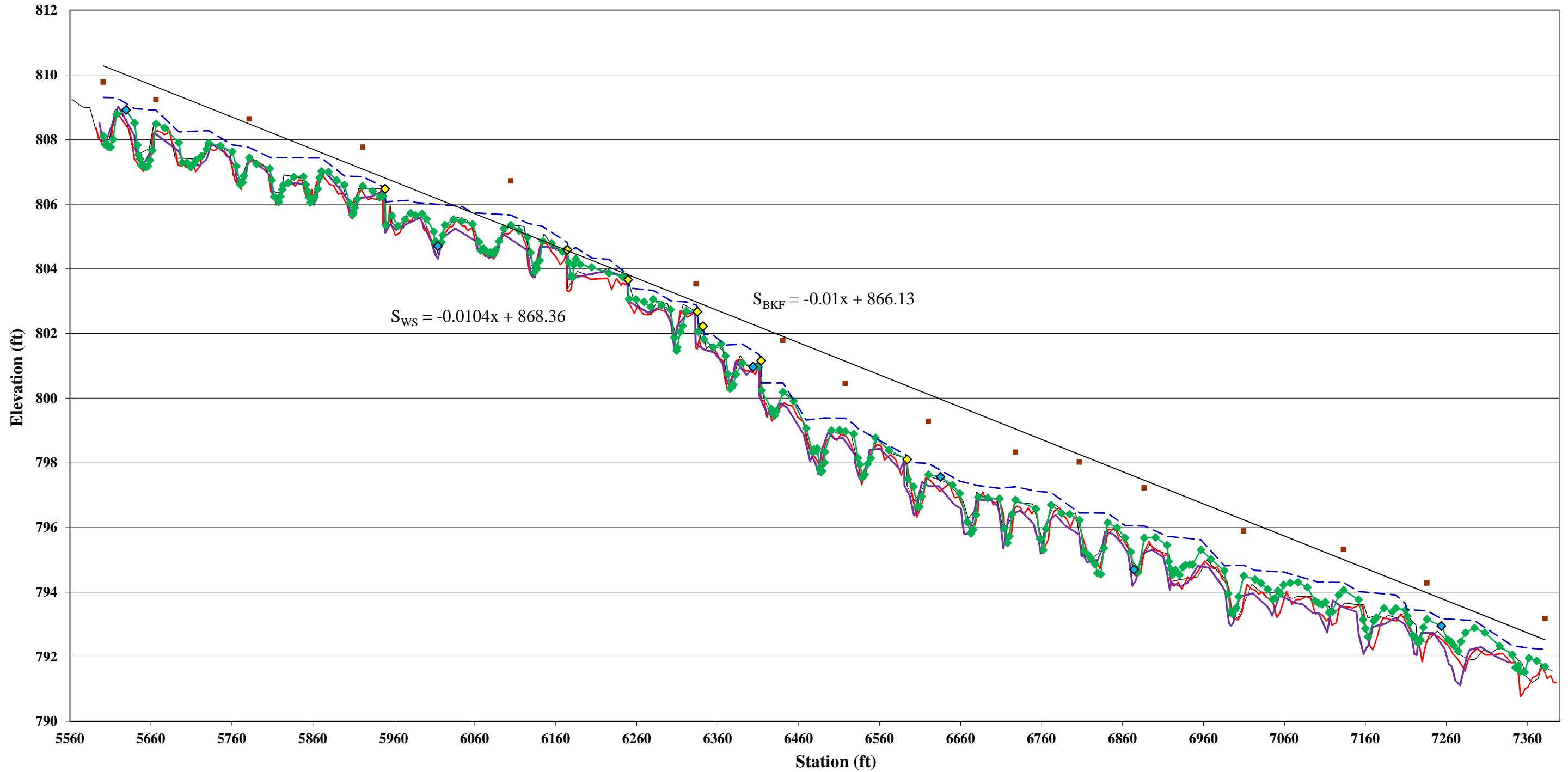
SUMMARY DATA	
<b>Bankfull Elevation (ft):</b>	793.5
<b>Bankfull Cross-Sectional Area (ft<sup>2</sup>):</b>	8.0
<b>Bankfull Width (ft):</b>	10.8
<b>Flood Prone Area Elevation (ft):</b>	794.8
<b>Flood Prone Width (ft):</b>	51.2
<b>Max Depth at Bankfull (ft):</b>	1.3
<b>Mean Depth at Bankfull (ft):</b>	0.7
<b>W / D Ratio:</b>	14.6
<b>Entrenchment Ratio:</b>	4.7
<b>Bank Height Ratio:</b>	1.0



# Jacob's Landing Stream Restoration Site Longitudinal Profile T1 MY-03

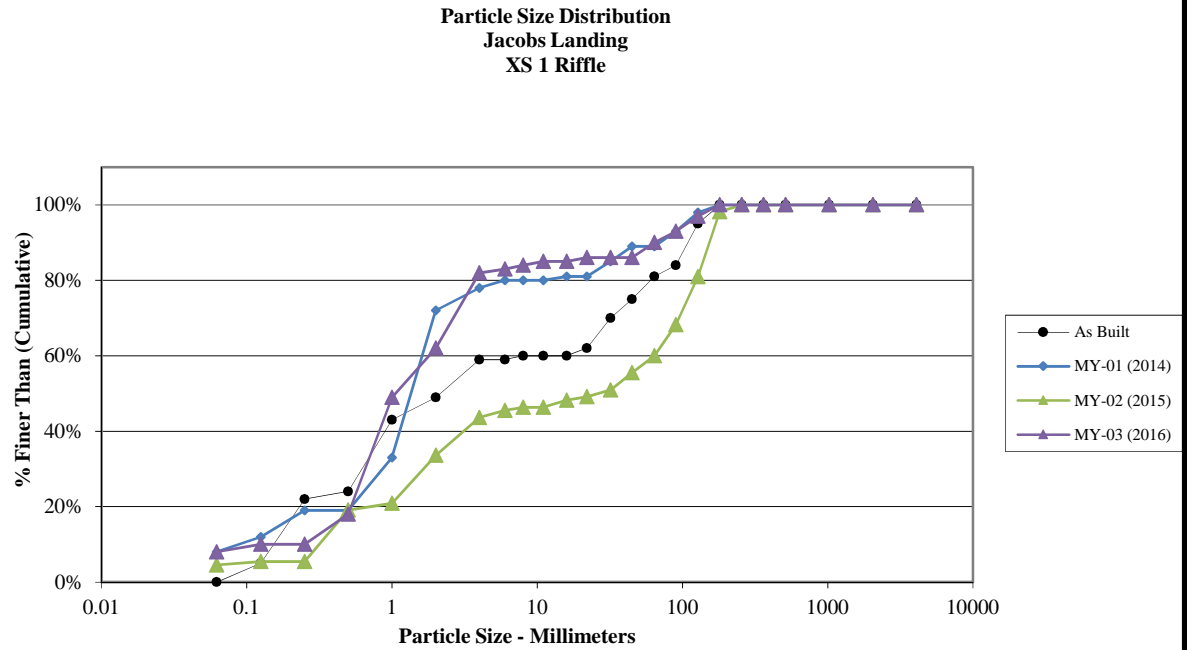


# Jacob's Landing Stream Restoration Site Longitudinal Profile T2 MY-03



- |                     |                   |                  |                    |            |                     |              |                  |
|---------------------|-------------------|------------------|--------------------|------------|---------------------|--------------|------------------|
| — As-Built, 2/19/14 | — MY-01, 10/29/14 | — MY-02, 8/12/15 | —◆— MY-03, 6/17/16 | ■ Bankfull | - - - Water Surface | ◆ Structures | ◆ Cross-sections |
|---------------------|-------------------|------------------|--------------------|------------|---------------------|--------------|------------------|

Cross-Section 1 Riffle - MY-03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	8
Very Fine	.062 - .125	S	2
Fine	.125 - .25	A	
Medium	.25 - .50	N	8
Coarse	.50 - 1	D	31
Very Coarse	1 - 2	S	13
Very Fine	2 - 4		20
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	1
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		4
Small	64 - 90	C	3
Small	90 - 128	O	4
Large	128 - 180	B	3
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	<b>100</b>
Note:			



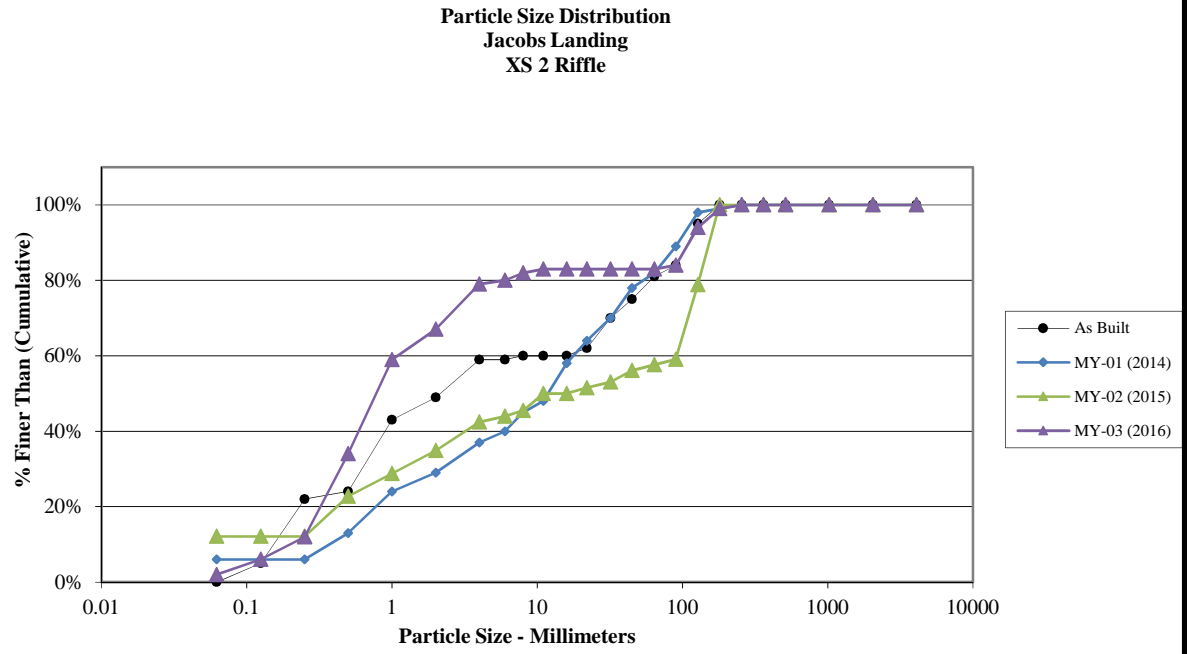
Size (mm)	
D16	0.42
D35	0.73
D50	1.1
D65	2.2
D84	8
D95	110

Size Distribution	
mean	1.8
dispersion	4.9
skewness	0.20

Type	
silt/clay	8%
sand	54%
gravel	28%
cobble	10%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%



Cross-Section 2 Riffle - MY-03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	2
Very Fine	.062 - .125	S	4
Fine	.125 - .25	A	6
Medium	.25 - .50	N	22
Coarse	.50 - 1	D	25
Very Coarse	1 - 2	S	8
Very Fine	2 - 4		12
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	1
Small	90 - 128	O	10
Large	128 - 180	B	5
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	<b>100</b>
Note:			

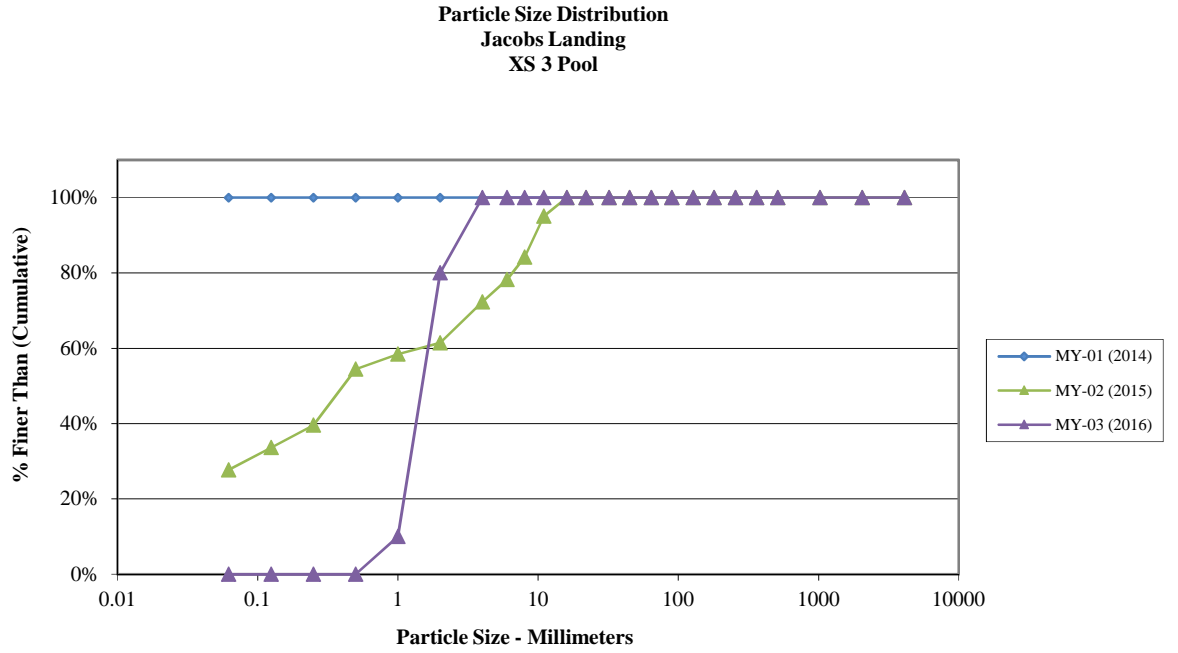


Size (mm)	
D16	0.28
D35	0.51
D50	0.78
D65	1.7
D84	90
D95	140

Size Distribution	
mean	5.0
dispersion	59.1
skewness	0.51

Type	
silt/clay	2%
sand	65%
gravel	16%
cobble	17%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 3 Pool - MY-03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	10
Very Coarse	1 - 2	S	70
Very Fine	2 - 4		20
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	100



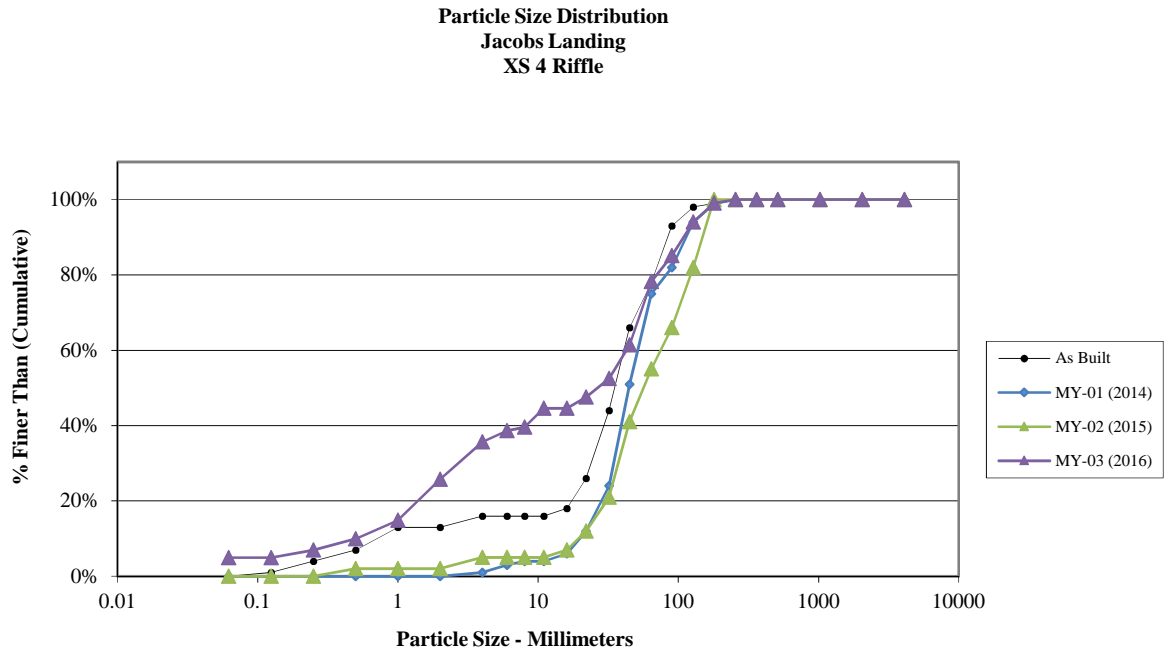
Size (mm)	
D16	1.1
D35	1.3
D50	1.5
D65	1.7
D84	2.3
D95	3.4

Size Distribution	
mean	1.6
dispersion	1.4
skewness	0.04

Type	
silt/clay	0%
sand	80%
gravel	20%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Note:

Cross-Section 4 Riffle - MY-03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	5
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	2
Medium	.25 - .50	N	3
Coarse	.50 - 1	D	5
Very Coarse	1 - 2	S	11
Very Fine	2 - 4		10
Fine	4 - 5.7	G	3
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	5
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	3
Coarse	22.6 - 32	L	5
Very Coarse	32 - 45	S	9
Very Coarse	45 - 64		17
Small	64 - 90	C	7
Small	90 - 128	O	9
Large	128 - 180	B	5
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	101



Note:

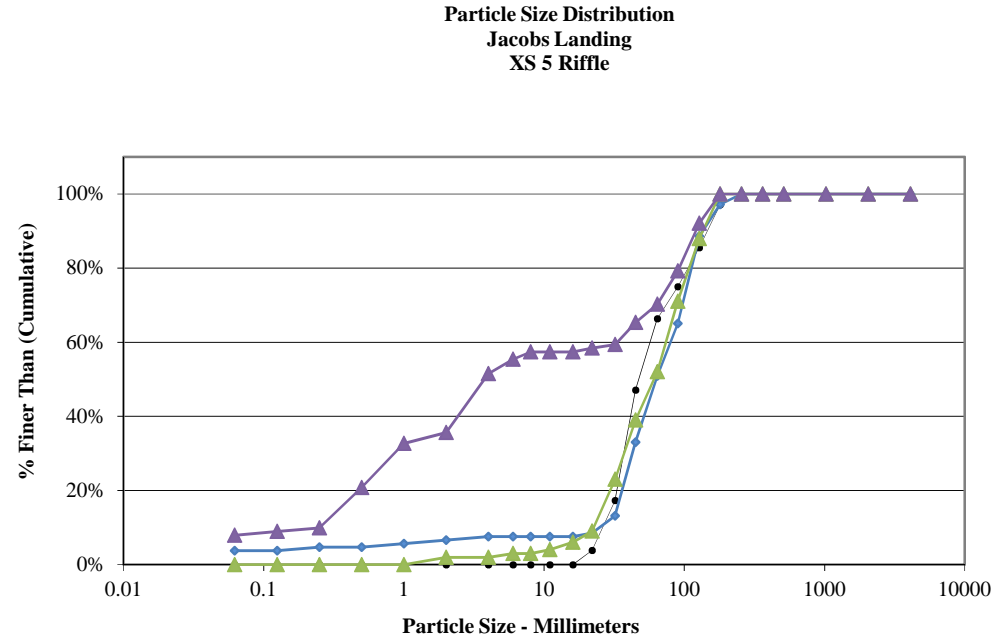
Size (mm)	
D16	1.1
D35	3.8
D50	27
D65	49
D84	85
D95	140

Size Distribution	
mean	9.7
dispersion	13.8
skewness	-0.32

Type	
silt/clay	5%
sand	21%
gravel	52%
cobble	22%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 5 Riffle - MY-03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	8
Very Fine	.062 - .125	S	1
Fine	.125 - .25	A	1
Medium	.25 - .50	N	11
Coarse	.50 - 1	D	12
Very Coarse	1 - 2	S	3
Very Fine	2 - 4		16
Fine	4 - 5.7	G	4
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	1
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	6
Very Coarse	45 - 64		5
Small	64 - 90	C	9
Small	90 - 128	O	13
Large	128 - 180	B	8
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	101

Note:

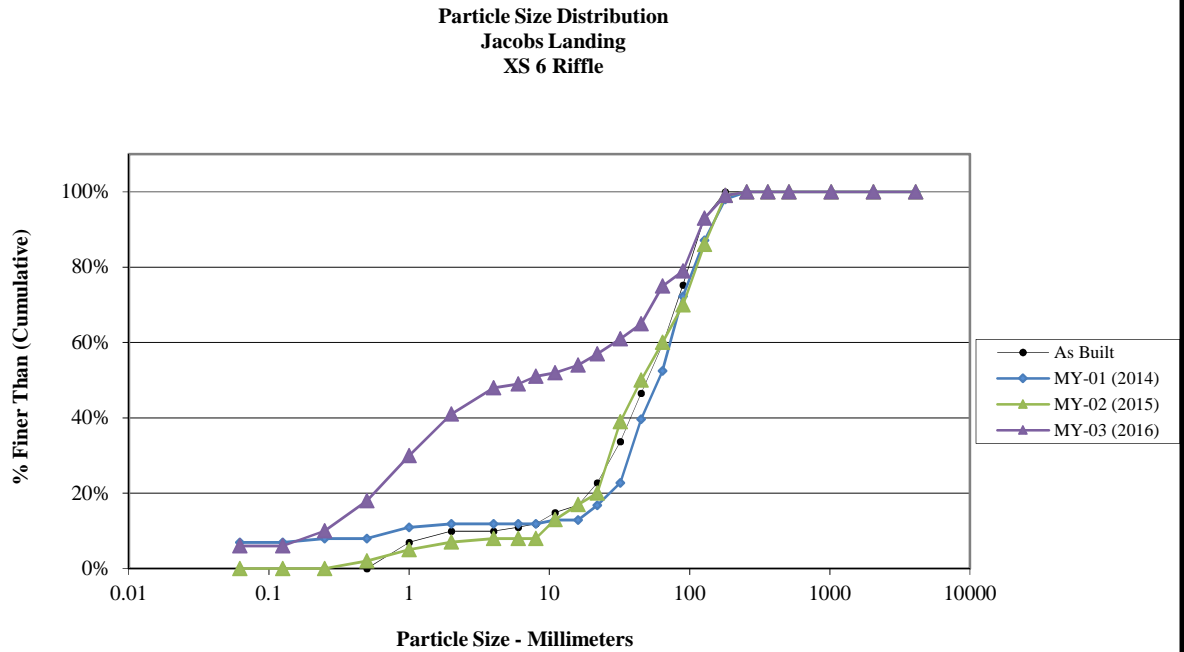


Size (mm)	
D16	0.37
D35	1.7
D50	3.7
D65	44
D84	100
D95	150

Size Distribution	
mean	6.1
dispersion	18.5
skewness	0.14

Type	
silt/clay	8%
sand	28%
gravel	35%
cobble	30%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 6 Riffle -MY-03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	6
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	4
Medium	.25 - .50	N	8
Coarse	.50 - 1	D	12
Very Coarse	1 - 2	S	11
Very Fine	2 - 4		7
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	2
Coarse	16 - 22.6	E	3
Coarse	22.6 - 32	L	4
Very Coarse	32 - 45	S	4
Very Coarse	45 - 64		10
Small	64 - 90	C	4
Small	90 - 128	O	14
Large	128 - 180	B	6
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	100



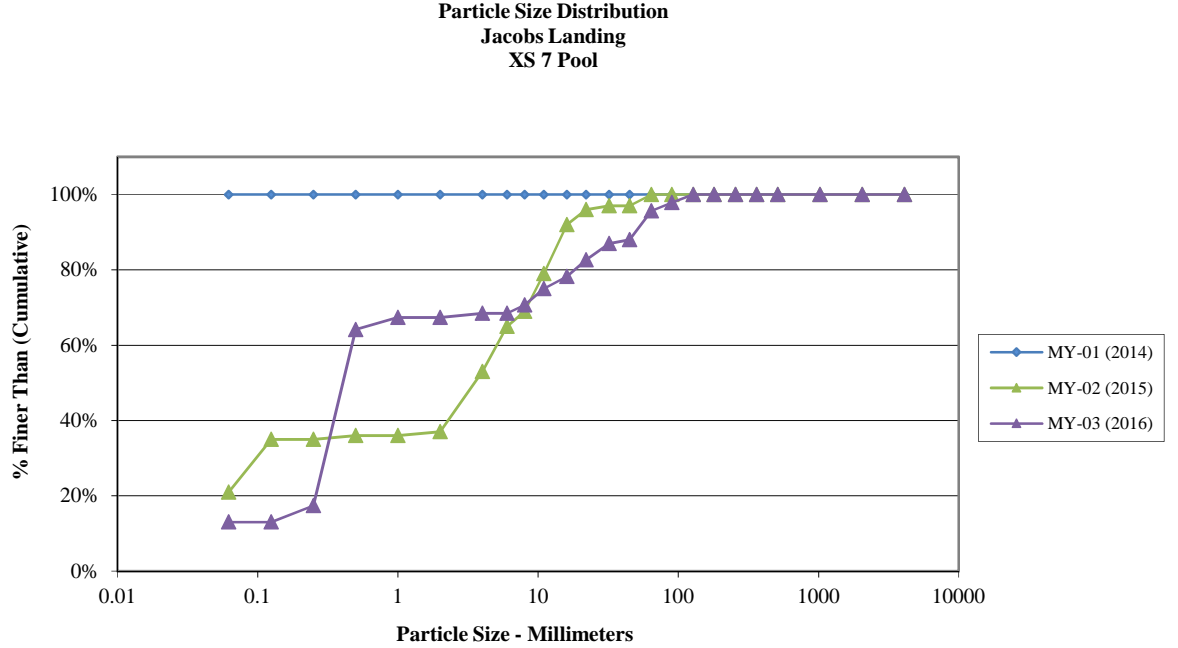
Note:

Size (mm)	
D16	0.42
D35	1.4
D50	6.9
D65	45
D84	100
D95	140

Size Distribution	
mean	6.5
dispersion	15.5
skewness	-0.02

Type	
silt/clay	6%
sand	35%
gravel	34%
cobble	25%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 7 Pool -MY-03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	12
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	4
Medium	.25 - .50	N	43
Coarse	.50 - 1	D	3
Very Coarse	1 - 2	S	
Very Fine	2 - 4		1
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	4
Medium	11.3 - 16	V	3
Coarse	16 - 22.6	E	4
Coarse	22.6 - 32	L	4
Very Coarse	32 - 45	S	1
Very Coarse	45 - 64		7
Small	64 - 90	C	2
Small	90 - 128	O	2
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	92



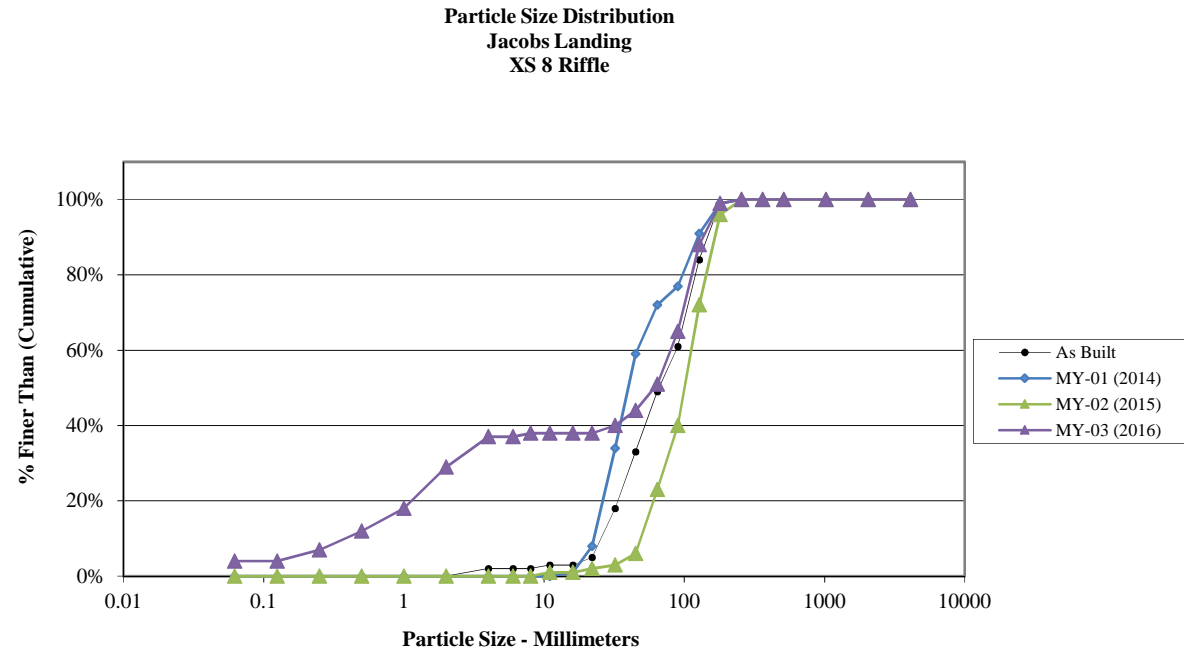
Note:

Size (mm)	
D16	0.2
D35	0.32
D50	0.41
D65	0.6
D84	25
D95	62

Size Distribution	
mean	2.2
dispersion	31.5
skewness	0.51

Type	
silt/clay	13%
sand	54%
gravel	28%
cobble	4%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 8 Riffle -MY-03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	4
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	3
Medium	.25 - .50	N	5
Coarse	.50 - 1	D	6
Very Coarse	1 - 2	S	11
Very Fine	2 - 4		8
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	2
Very Coarse	32 - 45	S	4
Very Coarse	45 - 64		7
Small	64 - 90	C	14
Small	90 - 128	O	23
Large	128 - 180	B	11
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	100



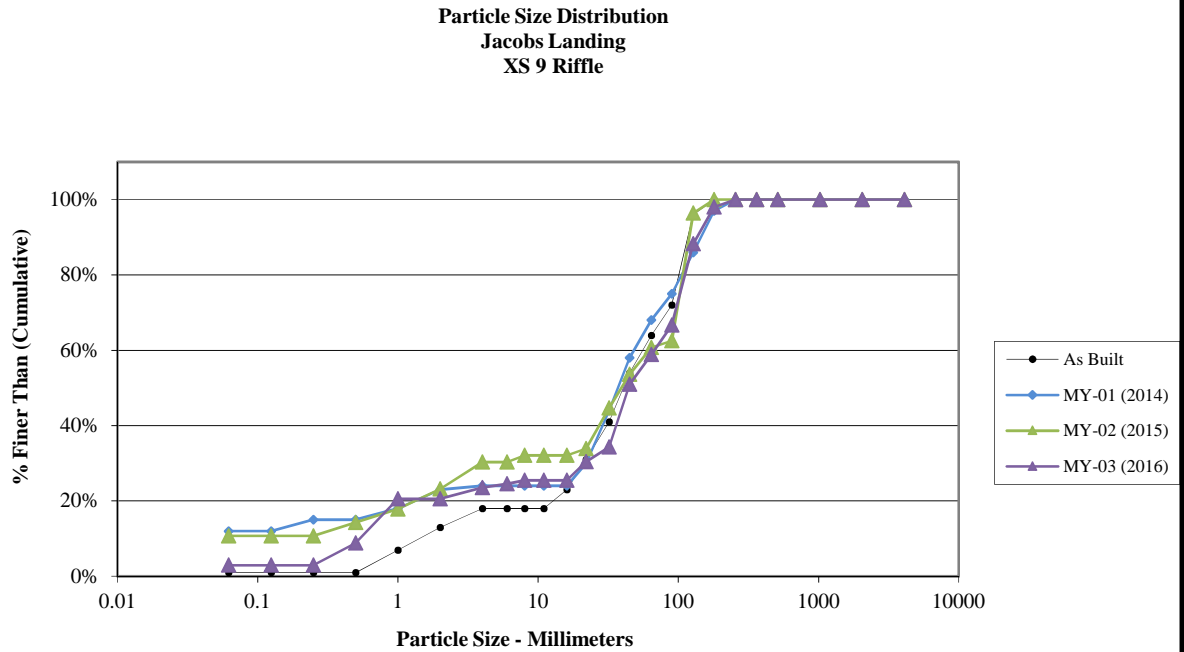
Size (mm)	
D16	0.79
D35	3.4
D50	61
D65	90
D84	120
D95	160

Size Distribution	
mean	9.7
dispersion	39.6
skewness	-0.54

Type	
silt/clay	4%
sand	25%
gravel	22%
cobble	49%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Note:

Cross-Section 9 Riffle - MY-03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	3
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	6
Coarse	.50 - 1	D	12
Very Coarse	1 - 2	S	
Very Fine	2 - 4		3
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	5
Coarse	22.6 - 32	L	4
Very Coarse	32 - 45	S	17
Very Coarse	45 - 64		8
Small	64 - 90	C	8
Small	90 - 128	O	22
Large	128 - 180	B	10
Large	180 - 256	L	2
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	102



Note:

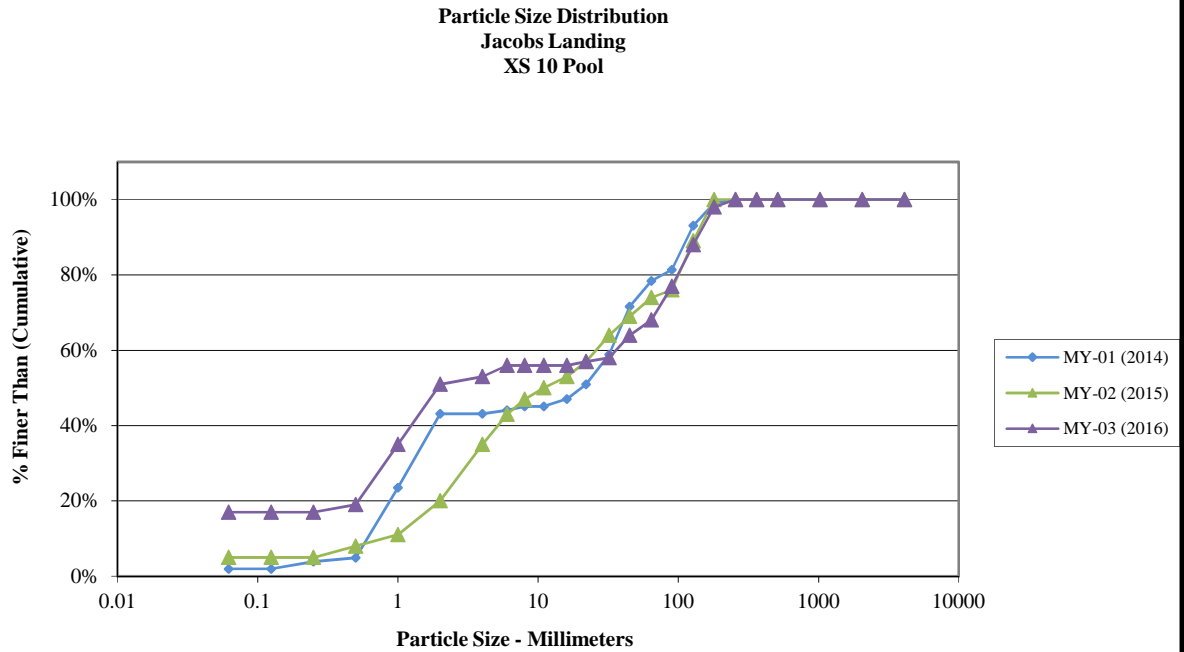
Size (mm)	
D16	0.76
D35	32
D50	44
D65	84
D84	120
D95	160

Size Distribution	
mean	9.5
dispersion	30.3
skewness	-0.45

Type	
silt/clay	3%
sand	18%
gravel	38%
cobble	41%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%



Cross-Section 10 Pool - MY-03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	17
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	2
Coarse	.50 - 1	D	16
Very Coarse	1 - 2	S	16
Very Fine	2 - 4		2
Fine	4 - 5.7	G	3
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	1
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	6
Very Coarse	45 - 64		4
Small	64 - 90	C	9
Small	90 - 128	O	11
Large	128 - 180	B	10
Large	180 - 256	L	2
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	100



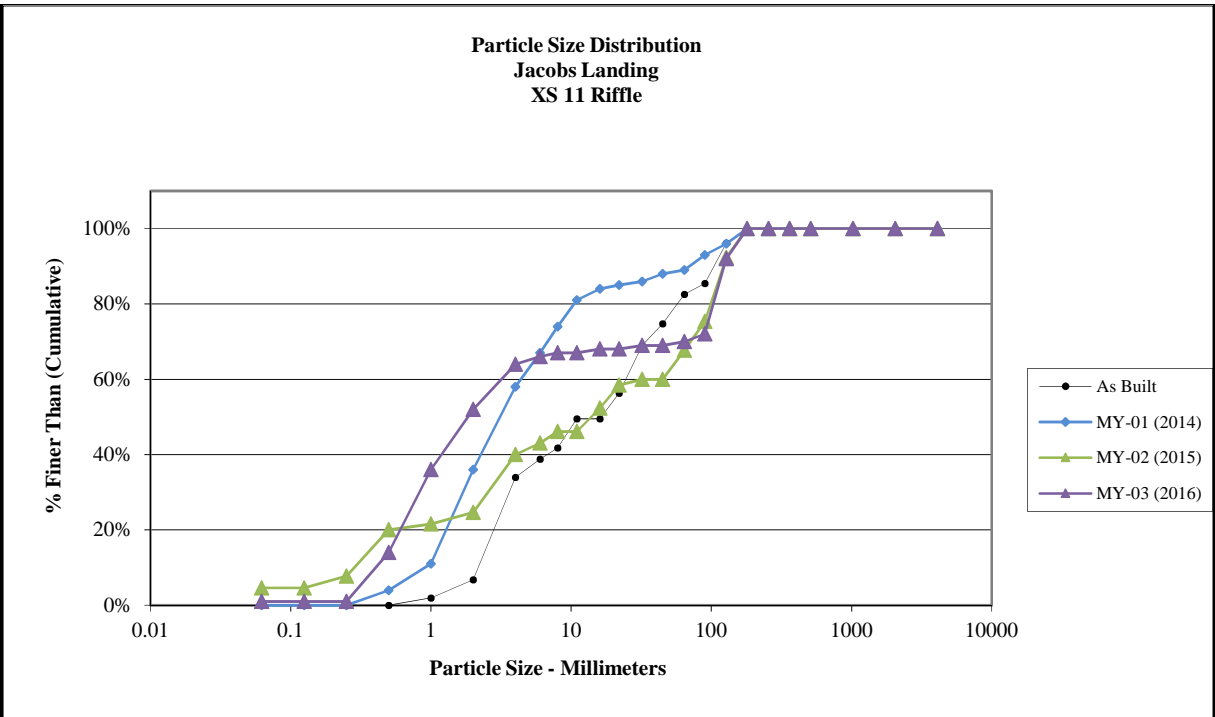
Note:

Size (mm)	
D16	0.062
D35	1
D50	1.9
D65	49
D84	110
D95	160

Size Distribution	
mean	2.6
dispersion	44.3
skewness	0.08

Type	
silt/clay	17%
sand	34%
gravel	17%
cobble	32%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 11 Riffle - MY-03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	1
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	13
Coarse	.50 - 1	D	22
Very Coarse	1 - 2	S	16
Very Fine	2 - 4		12
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		1
Small	64 - 90	C	2
Small	90 - 128	O	20
Large	128 - 180	B	8
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	100
Note:			



Size (mm)	
D16	0.53
D35	0.97
D50	1.8
D65	4.9
D84	110
D95	150

Size Distribution	
mean	7.6
dispersion	32.3
skewness	0.41

Type	
silt/clay	1%
sand	51%
gravel	18%
cobble	30%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

<b>Table 10a. T1 Baseline Stream Data Summary</b>																	
<b>Jacob's Landing Stream Restoration Site, DMS Project # 95024</b>																	
<b>Parameter</b>	<b>Pre-Existing Condition</b>					<b>Reference Reach(es) Data</b>					<b>Design</b>		<b>As-built</b>				
<b>Dimension - Riffle</b>	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n	
Bankfull Width (ft)	6.5			9.1	4	6.9				1	11.5	12.2	10.1	11.0	12.1	3	
Floodprone Width (ft)	1			26	4	23				1	25	70	40	56	71	3	
Bankfull Mean Depth (ft)	0.9			1.8	4	1.1				1	1.0	1.0	0.8	0.8	0.8	3	
Bankfull Max Depth (ft)	1.1			2.8	4	1.6				1	1.5	1.6	1.2	1.3	1.4	3	
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	8.6			12.1	4	7.4				1	11.2	12.6	7.9	8.8	10.0	3	
Width/Depth Ratio	3.7			9.6	4	6.4				1	12.0	12.0	12.9	13.8	14.6	3	
Entrenchment Ratio	1.5			3.3	4	3.4				1	2.2	4.9	3.7	5.1	5.9	3	
Bank Height Ratio	1.6			2.2	4	1.0				1	1.0	1.0	1.0	1.0	1.0	3	
<b>Pattern</b>																	
Channel Beltwidth (ft)	13			26	2	14	26		38	2	25	50	25	38	50		
Radius of Curvature (ft)	6			30	2	12	19		25	2	20	45	20	33	45		
Rc:Bankfull width (ft/ft)	0.7			4.6	2	1.7	2.7		3.6	2	2.0	4.0	2.0	3.0	4.0		
Meander Wavelength (ft)	75			110	2	43	73		102	2	65	125	65	95	125		
Meander Width Ratio	1.4			4.0	2	2	3.8		5.5	2	1.9	3.5	1.9	3.0	3.5		
<b>Profile</b>																	
Riffle Length (ft)													11	22	32	21	
Riffle Slope (ft/ft)	0.007			0.043	2	0.011			0.025	2	0.007	0.012	0.001	0.013	0.026	21	
Pool Length (ft)						16			23		12	30	6	18	38	23	
Pool Spacing (ft)						28			57		20	75	30	56	79	23	
<b>Substrate and Transport Parameters</b>																	
SC% / Sa% / G% / C% / B% / Be%	0% / 24% / 76% / 0% / 0% / 0%										0% / 25% / 52% / 23% / 0% / 0%						
d16 / d35 / d50 / d84 / d95 (mm)	1 / 5 / 7 / 10 / 17 / 25										5 / 15 / 22 / 38 / 94 / 143						
<b>Additional Reach Parameters</b>																	
Channel length (ft)	1,330										1,305		1,305				
Drainage Area (SM)	0.40										0.16		0.40		0.40		
Rosgen Classification	G4										E4		C4		C4		
Sinuosity	1.07-1.15										1.18		1.09-1.12		1.09-1.12		
Water Surface Slope (ft/ft)	0.009-0.014										0.0070		0.007-0.010		0.007		

<b>Table 10b. T1A Baseline Stream Data Summary</b>																	
<b>Jacob's Landing Stream Restoration Site, DMS Project # 95024</b>																	
<b>Parameter</b>	<b>Pre-Existing Condition</b>					<b>Reference Reach(es) Data</b>					<b>Design</b>		<b>As-built</b>				
<b>Dimension - Riffle</b>	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n	
Bankfull Width (ft)	7.7				1	6.9				1	8.5						
Floodprone Width (ft)	15				1	23				1	19						
Bankfull Mean Depth (ft)	0.8				1	1.1				1	0.7						
Bankfull Max Depth (ft)	1.2				1	1.6				1	1.2						
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	6.4				1	7.4				1	6.2						
Width/Depth Ratio	9.3				1	6.4				1	12.0						
Entrenchment Ratio	1.9				1	3.4				1	2.2						
Bank Height Ratio	2.2				1	1.0				1	1.0						
<b>Pattern</b>																	
Channel Beltwidth (ft)	20			75	1	14	26		38	2	19	24					
Radius of Curvature (ft)	8			24	1	12	19		25	2	10	25					
Rc:Bankfull width (ft/ft)	1			3.1	1	1.7	2.7		3.6	2	1.2	2.9					
Meander Wavelength (ft)	25			50	1	43	73		102	2	50	55					
Meander Width Ratio	2.6			9.7	1	2	3.8		5.5	2	2.2	2.8					
<b>Profile</b>																	
Riffle Length (ft)																	
Riffle Slope (ft/ft)	0.013			0.019	1	0.011			0.025	2	0.010	0.012					
Pool Length (ft)						16			23		7	14					
Pool Spacing (ft)						28			57		22	34					
<b>Substrate and Transport Parameters</b>																	
SC% / Sa% / G% / C% / B% / Be%																	
d16 / d35 / d50 / d84 / d95 (mm)																	
<b>Additional Reach Parameters</b>																	
Channel length (ft)		294										178		178			
Drainage Area (SM)		0.21							0.40			0.21		0.21			
Rosgen Classification		E4							B4c			B4c/C4		B4c/C4			
Sinuosity		2.10							1.20			1.11					
Water Surface Slope (ft/ft)		0.023							0.013			0.017					

<b>Table 10c. T2 Baseline Stream Summary</b>																
<b>Jacob's Landing Stream Restoration Site, DMS Project # 95024</b>																
<b>Parameter</b>	<b>Pre-Existing Condition</b>					<b>Reference Reach(es) Data</b>					<b>Design</b>		<b>As-built</b>			
<b>Dimension - Riffle</b>	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	8.8			12.3	4	6.9				1	10.4	11.6	10.4	10.9	12.0	5
Floodprone Width (ft)	17			20	4	23				1	23	50	27	32	42	5
Bankfull Mean Depth (ft)	1.0			1.0	4	1.1				1	0.9	1.0	0.8	0.8	0.9	5
Bankfull Max Depth (ft)	1.3			1.8	4	1.6				1	1.4	1.5	1.2	1.3	1.4	5
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	9.2			11.7	4	7.4				1	9.1	11.1	8.8	9.2	9.7	5
Width/Depth Ratio	8.4			12.9	4	6.4				1	12.0	12.0	11.8	12.9	15.2	5
Entrenchment Ratio	1.4			2.3	4	3.4				1	2.2	4.3	2.6	3.2	4.2	5
Bank Height Ratio	1.5			4.7	4	1.0				1	1.0	1.0	1.0	1.0	1.0	5
<b>Pattern</b>																
Channel Beltwidth (ft)	10			60	2	14	26		38	2	25	50	25	38	50	
Radius of Curvature (ft)	8			35	2	12	19		25	2	20	45	20	33	45	
Rc:Bankfull width (ft/ft)	0.9			3.9	2	1.7	2.7		3.6	2	2.0	4.0	2.0	3.0	4.0	
Meander Wavelength (ft)	65			130	2	43	73		102	2	60	130	60	95	130	
Meander Width Ratio	1.1			6.8	2	2	3.8		5.5	2	2.2	4.8	2.2	4.0	4.8	
<b>Profile</b>																
Riffle Length (ft)													14	22	36	33
Riffle Slope (ft/ft)	0.003			0.011	2	0.011			0.025	2	0.006	0.017	0.004	0.016	0.041	33
Pool Length (ft)						16			23	2	8	35	7	18	35	31
Pool Spacing (ft)						28			57	2	30	95	42	59	107	31
<b>Substrate and Transport Parameters</b>																
SC% / Sa% / G% / C% / B% / Be%	6% / 25% / 68% / 1% / 0% / 0%												0% / 6% / 58% / 32% / 3% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)	1 / 2 / 3 / 6 / 12 / 24												16 / 30 / 44 / 65 / 109 / 144			
<b>Additional Reach Parameters</b>																
Channel length (ft)	2,935										2,641		2,641			
Drainage Area (SM)	0.31										0.31		0.31			
Rosgen Classification	E4, F4										C4		C4			
Sinuosity	1.09-1.45										1.18		1.16-1.31			
Water Surface Slope (ft/ft)	0.007-0.010										0.0007		0.009-0.0100			

<b>Table 10d. T2A Baseline Stream Data Summary</b>																	
<b>Jacob's Landing Stream Restoration Site, DMS Project # 95024</b>																	
<b>Parameter</b>	<b>Pre-Existing Condition</b>					<b>Reference Reach(es) Data</b>					<b>Design</b>		<b>As-built</b>				
<b>Dimension - Riffle</b>	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n	
Bankfull Width (ft)	6.6				1	6.9				1	6.5						
Floodprone Width (ft)	11				1	23				1	14						
Bankfull Mean Depth (ft)	0.5				1	1.1				1	0.5						
Bankfull Max Depth (ft)	1.1				1	1.6				1	0.9						
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	3.4				1	7.4				1	3.5						
Width/Depth Ratio	12.8				1	6.4				1	12.0						
Entrenchment Ratio	1.7				1	3.4				1	2.2						
Bank Height Ratio	6.3				1	1.0				1	1.0						
<b>Pattern</b>																	
Channel Beltwidth (ft)	8			15	1	14	26		38	2	8	15					
Radius of Curvature (ft)	10			12	1	12	19		25	2	10	25					
Rc:Bankfull width (ft/ft)	1.5			1.8	1	1.7	2.7		3.6	2	1.5	3.8					
Meander Wavelength (ft)	50			63	1	43	73		102	2	50	63					
Meander Width Ratio	1.2			2.3	1	2	3.8		5.5	2	1.2	2.3					
<b>Profile</b>																	
Riffle Length (ft)																	
Riffle Slope (ft/ft)	0.010			0.017	1	0.011			0.025	2	0.010	0.012					
Pool Length (ft)						16			23	2	4	15					
Pool Spacing (ft)						28			57	2	22	42					
<b>Substrate and Transport Parameters</b>																	
SC% / Sa% / G% / C% / B% / Be%																	
d16 / d35 / d50 / d84 / d95 (mm)																	
<b>Additional Reach Parameters</b>																	
Channel length (ft)	465										465		465				
Drainage Area (SM)	0.06										0.40		0.06		0.06		
Rosgen Classification	G4										B4c		B4c/C4		B4c/C4		
Sinuosity	1.16										1.20		1.13				
Water Surface Slope (ft/ft)	0.019										0.013		0.014				

<b>Table 11. Cross-Section Morphology Data Tables</b>																																			
<b>Jacob's Landing Stream Restoration Site, DMS Project # 95024</b>																																			
<b>Dimension and Substrate</b>	<b>Cross-Section 1 (T1-Riffle)</b> Station 12+29							<b>Cross-Section 2 (T1-Riffle)</b> Station 17+79							<b>Cross-Section 3 (T1-Pool)</b> Station 19+25							<b>Cross-Section 4 ( T1-Riffle)</b> Station 21+36							<b>Cross-Section 5 (T2-Riffle)</b> Station 52+53						
	<b>Based on fixed baseline elevation</b>	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
Bankfull Width (ft)	10.8	11.8	12.1	8.4				12.1	24.1	12.8	11.7				15.5	15.3	13.9	12.3				10.1	11.9	9.2	8.9				10.4	11.7	10.8	11.2			
Floodprone Width (ft)	40.0	41.2	40.7	38.0				71.0	70.6	72.4	70.8				-	-	-	-				58.0	59.8	58.8	57.3				27.0	27.4	26.8	26.3			
Bankfull Mean Depth (ft)	0.8	0.8	0.7	0.6				0.8	0.5	0.8	0.7				1.2	1.1	1.2	0.5				0.8	0.7	0.7	0.6				0.9	0.9	0.9	0.7			
Bankfull Max Depth (ft)	1.3	1.4	1.4	1.1				1.4	1.4	1.5	1.3				2.8	2.9	2.7	1.0				1.2	1.3	1.3	1.1				1.3	1.6	1.5	1.3			
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	8.5	9.0	8.7	4.7				10.0	12.5	10.3	7.7				18.1	17.2	17.3	6.5				7.9	8.6	6.3	5.1				9.0	10.5	10.0	8.1			
Bankfull Width/Depth Ratio	13.7	15.5	16.8	15.0				14.6	46.5	15.9	17.8				-	-	-	-				12.9	16.7	13.4	15.5				12.0	13.0	11.8	15.5			
Bankfull Entrenchment Ratio	3.7	3.5	3.4	4.5				5.9	2.9	5.7	6.1				-	-	-	-				5.7	5.0	6.4	6.4				2.6	2.3	2.5	2.3			
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0				1.0	1.0	1.0	1.0				-	-	-	-				1.0	1.0	1.0	1.0				1.0	1.0	1.0	1.0			
d50 (mm)	2.1	1.4	27	1.1				28	12	11	0.78				-	-	-	-				35	44	56	27				47	63	61	3.7			
<b>Dimension and Substrate</b>	<b>Cross-Section 6 (T2-Riffle)</b> Station 56+18							<b>Cross-Section 7 (T2-Pool)</b> Station 60+09							<b>Cross-Section 8 (T2-Riffle)</b> Station 63+84							<b>Cross-Section 9 (T2-Riffle)</b> Station 66+63							<b>Cross-Section 10 (T2-Pool)</b> Station 68+61						
	<b>Based on fixed baseline elevation</b>	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
Bankfull Width (ft)	10.6	12.5	10.5	10.2				13.3	13.5	14.3	12.6				10.7	11.4	12.5	11.0				10.8	11.8	11.1	9.8				12.5	16.5	21.2	20.7			
Floodprone Width (ft)	29.0	31.9	31.0	28.4				-	-	-	-				30.0	30.0	31.1	29.5				42.0	43.1	42.7	39.9				-	-	-	-			
Bankfull Mean Depth (ft)	0.8	0.7	0.8	0.6				1.0	1.2	1.0	1.1				0.9	1.0	1.0	0.9				0.9	0.7	0.7	0.6				1.2	1.0	0.8	1.3			
Bankfull Max Depth (ft)	1.3	1.4	1.4	1.1				1.9	2.0	2.0	2.0				1.3	1.8	2.0	1.7				1.2	1.3	1.2	1.0				1.8	2.1	2.2	2.0			
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	8.8	8.8	7.9	6.4				13.8	16.5	13.9	13.5				9.7	11.8	12.8	10.4				9.2	8.0	7.6	6.3				14.5	17.2	17.1	17.2			
Bankfull Width/Depth Ratio	12.8	18.6	13.8	16.3				-	-	-	-				11.8	11.0	12.2	11.6				12.7	17.8	16.2	15.2				-	-	-	-			
Bankfull Entrenchment Ratio	2.7	2.5	3.0	2.8				-	-	-	-				2.8	2.6	2.5	2.7				3.9	3.6	3.9	4.1				-	-	-	-			
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0				-	-	-	-				1.0	1.0	1.0	1.0				1.0	1.0	1.0	1.0				-	-	-	-			
d50 (mm)	49	60	45	6.9				-	-	-	-				66	40	100	61				41	37	29	44				-	-	-	-			
<b>Dimension and Substrate</b>	<b>Cross-Section 11 (T2-Riffle)</b> Station 72+48																																		
	<b>Based on fixed baseline elevation</b>	Base	MY1	MY2	MY3	MY4	MY5	MY+																											
Bankfull Width (ft)	12.0	11.7	11.5	10.8																															
Floodprone Width (ft)	>50	>50	>50	>50																															
Bankfull Mean Depth (ft)	0.8	0.8	0.8	0.7																															
Bankfull Max Depth (ft)	1.4	1.5	1.5	1.3																															
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	9.5	9.6	9.7	8.0																															
Bankfull Width/Depth Ratio	15.2	14.3	13.7	14.6																															
Bankfull Entrenchment Ratio	4.2	4.5	4.5	4.7																															
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0																															
d50 (mm)	16	3.1	14	1.8																															

**Table 11b. Stream Reach Morphology Data Tables**  
**Jacob's Landing Stream Restoration Site, DMS Project # 95024**  
**Reach: T1 (2,389 ft.)**

Parameter	MY01 (2014)						MY02 (2015)						MY03 (2016)						MY04 (2017)						MY05 (2018)					
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
<b>Dimension</b>																														
Bankfull Width (ft)	11.8	15.9	11.9	24.1	7.0	3	9.2	11.3	12.1	12.8	1.9	3	8.4	9.7	8.9	11.7	1.8	3												
Floodprone Width (ft)	41.2	57.2	59.8	70.6	14.9	3	40.7	57.3	58.8	72.4	15.9	3	38	55	57	71	16.5	3												
Bankfull Mean Depth (ft)	0.5	0.7	0.7	0.8	0.1	3	0.7	0.7	0.7	0.8	0.1	3	0.6	0.6	0.6	0.7	0.1	3												
Bankfull Max Depth (ft)	1.3	1.4	1.4	1.4	0.1	3	1.3	1.4	1.4	1.5	0.1	3	1.1	1.2	1.1	1.3	0.1	3												
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	8.6	10.0	9.0	12.5	2.1	3	6.3	8.4	8.7	10.3	2.0	3	4.7	5.8	5.1	7.7	1.6	3												
Width/Depth Ratio	15.5	26.2	16.7	46.5	17.6	3	13.4	15.4	15.9	16.8	1.7	3	15.0	16.1	15.5	17.8	1.5	3												
Entrenchment Ratio	2.9	3.8	3.5	5.0	1.1	3	3.4	5.1	5.7	6.4	1.6	3	4.5	5.7	6.1	6.4	1.0	3												
Bank Height Ratio	1.0	1.0	1.0	1.0	0	3	1.0	1.0	1.0	1.0	0	3	1.0	1.0	1.0	1.0	0	3												
<b>Pattern</b>																														
Channel Beltwidth (ft)	25.0	38.0		50.0																										
Radius of Curvature (ft)	20.0	33.0		45.0																										
Rad. of Curv. : Bankfull Width (ft/ft)	2.0	3.0		4.0																										
Meander Wavelength (ft)	65.0	95.0		125.0																										
Meander Width Ratio	1.9	3.0		3.5																										
<b>Profile</b>																														
Riffle Length (ft)	3.0	34.0	32.0	85.0	16.1	21.0	10.9	31.1	31.9	44.6	10.1	21	4.3	27.5	28.9	66.5	14.6	22												
Riffle Slope (ft/ft)	0.01	0.02	0.01	0.05	0.01	20	0.006	0.01	0.01	0.03	0.007	21	0.0002	0.01	0.01	0.04	0.009	22												
Pool Length (ft)	4.0	13.0	10.0	27.0	7.4	14.0	4.0	9.7	8.7	21.5	4.4	17	5.3	11.3	11.0	22.8	5.1	18												
Pool Max Depth (ft)	2.9	2.9		2.9		1	2.7	2.7		2.7		1	1.0	1.0		1.0		1												
Pool Spacing (ft)	41.0	83.0	62.0	233.0	60.4	13.0	36.9	74.5	56.2	231.1	51.6	16	16.1	71.6	67.6	196.6	45.7	17												
<b>Additional Reach Parameters</b>																														
Channel Thalweg Length (ft)				1,305						1,305						1,305														
Sinuosity				1.09-1.12						1.09-1.12						1.09-1.12														
Water Surface Slope (ft/ft)				0.0068						0.0066						0.0070														
Bankfull Slope (ft/ft)				0.0068						0.0064						0.0067														
Rosgen Classification				C4						C4						C4														
SC% / Sa% / G% / C% / B% / Be%				29%/22%/36%/14%/0%/0%						11%/22%/35%/32%/0%/0%						4%/55%/29%/12%/0%/0%														
d16/d35/d50 / d84 / d95				7/10/14/49/88						7/11/24/104/128						1/2/8/14/46/98														
% of Reach with Eroding Banks				0%						1%						0%														



**Table 11c. Stream Reach Morphology Data Tables**  
**Jacob's Landing Stream Restoration Site, DMS Project # 95024**  
**Reach: T2 (2,084 ft.)**

Parameter	MY01 (2014)						MY02 (2015)						MY03 (2016)						MY04 (2017)						MY05 (2018)					
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
<b>Dimension</b>																														
Bankfull Width (ft)	11.4	11.8	11.7	12.5	0.4	5	10.5	11.3	11.1	12.5	0.8	5	9.8	10.6	10.8	11.2	0.6	5												
Floodprone Width (ft)	27.4	36.9	31.9	52.3	10.5	5	26.8	36.7	31.1	51.9	10.4	5	26.3	35.1	29.5	51.2	10.4	5												
Bankfull Mean Depth (ft)	0.7	0.8	0.8	1.0	0.2	5	0.7	0.8	0.8	1.0	0.1	5	0.6	0.7	0.7	0.9	0.1	5												
Bankfull Max Depth (ft)	1.3	1.5	1.5	1.8	0.2	5	1.2	1.5	1.5	2.0	0.3	5	1.0	1.3	1.3	1.7	0.2	5												
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	8.0	9.7	9.6	11.8	1.5	5	7.6	9.6	9.7	12.8	2.1	5	6.3	7.8	8.0	10.4	1.7	5												
Width/Depth Ratio	11.0	15.0	14.3	18.6	3.2	5	11.8	13.5	13.7	16.2	1.7	5	11.6	14.6	14.6	16.3	1.8	5												
Entrenchment Ratio	2.3	3.1	2.6	4.5	0.9	5	2.5	3.3	3.0	4.5	0.9	5	2.3	3.3	3.3	4.7	1.0	5												
Bank Height Ratio	1.0	1.0	1.0	1.0	0	5	1.0	1.0	1.0	1.0	0	5	1.0	1.0	1.0	1.0	0.0	5												
<b>Pattern</b>																														
Channel Beltwidth (ft)	25.0	38.0		50.0																										
Radius of Curvature (ft)	20.0	33.0		45.0																										
Rad. of Curv. : Bankfull Width (ft/ft)	2.0	3.0		4.0																										
Meander Wavelength (ft)	60.0	95.0		130.0																										
Meander Width Ratio	2.2	4.0		4.8																										
<b>Profile</b>																														
Riffle Length (ft)	5.0	14.0	17.0	24.0	5.9	15	7.8	32.4	30.4	61.6	11.5	27	6.2	23.1	21.6	46.8	8.9	32												
Riffle Slope (ft/ft)	0.007	0.02	0.02	0.05	0.01	14	0.001	0.02	0.02	0.03	0.006	27	0.002	0.02	0.02	0.04	0.007	32												
Pool Length (ft)	4.1	15.8	14.7	26.9	6.5	29	5	13	12	28	6	25	3.5	13.3	11.8	29.5	5.8	30												
Pool Max Depth (ft)	2.0	2.1		2.1		2	2.0	2.1		2.2		2	2.0	2.0		2.0		2												
Pool Spacing (ft)	31.8	61.8	54.4	160.9	29.0	28	42.7	69.5	59.9	173.7	34.2	24	41.9	60.1	55.9	127.6	18.5	29												
<b>Additional Reach Parameters</b>																														
Channel Thalweg Length (ft)	2,641						2641						2641																	
Sinuosity	1.16-1.31						1.16-1.31						1.16-1.31																	
Water Surface Slope (ft/ft)	0.0106						0.0107						0.0104																	
Bankfull Slope (ft/ft)	0.0109						0.0106						0.0100																	
Rosgen Classification	C4						C4						C4																	
SC% / Sa% / G% / C% / B% / Be%	29%/22%/36%/14%/0%/0%						6%/10%/46%/38%/0%/0%						7%/35%/27%/30%/0%/0%																	
d16 / d35 / d50 / d84 / d95	12/21/32/46/83/127						14/26/38/105/134						0.4/6/17/45/98/140																	
% of Reach with Eroding Banks	0%						0%						0%																	

# **Appendix E**

## **Hydrologic Data**

**Table 12. Verification of Bankfull Events**

**Jacob's Landing Stream Restoration Site, DMS Project # 95024**

<b>Date of Data Collection</b>	<b>Date of Occurrence</b>	<b>Method</b>	<b>Photo Number</b>
4/19/2015	4/19/2015	On-site automatic gauge	N/A
10/3/2015	10/3/2015	On-site automatic gauge	N/A
11/9/2015	11/9/2015	On-site automatic gauge	N/A
Unkown	12/17/2015	Wracklines and flattened vegetation observed at bankfull	1 - 2
12/23/2015	12/23/2015	On-site automatic gauge	N/A
12/30/2015	12/30/2015	On-site automatic gauge	N/A
2/23/2016	2/23/2016	On-site automatic gauge (T1 only)	N/A
5/16/2016	5/16/2016	On-site automatic gauge (T1 only)	N/A
5/25/2016	5/25/2016	On-site automatic gauge (T1 only)	N/A
6/14/2016	6/14/2016	On-site automatic gauge (T1 only)	N/A
10/8/2016	10/8/2016	On-site automatic gauge (T1 only)	N/A

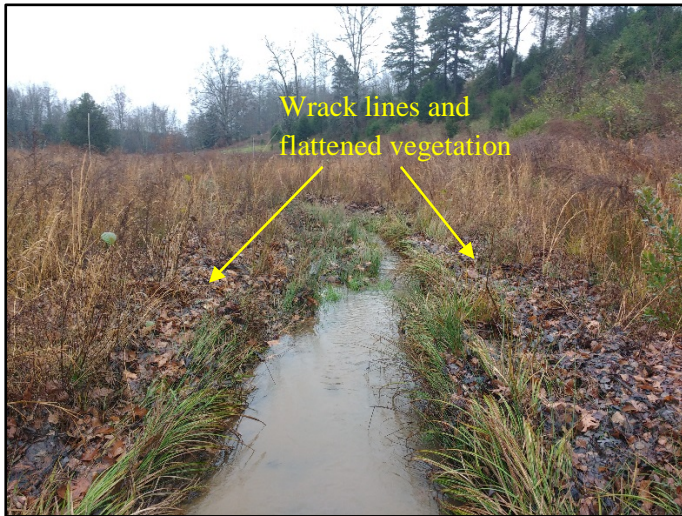


Photo 1. Bankfull indicators T1, 12/17/2015

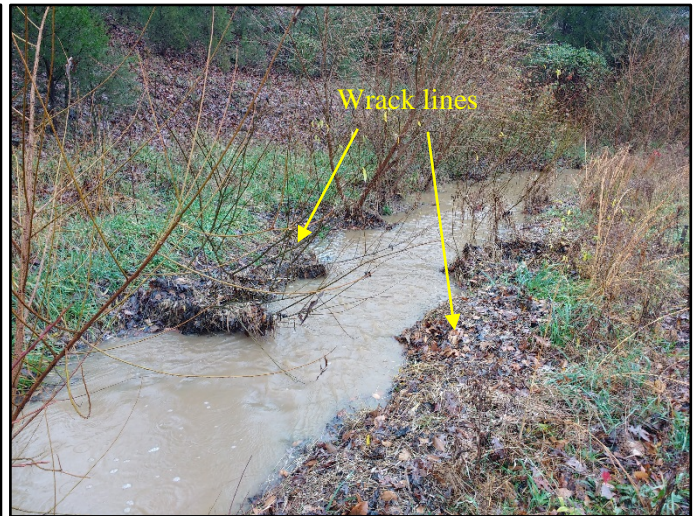
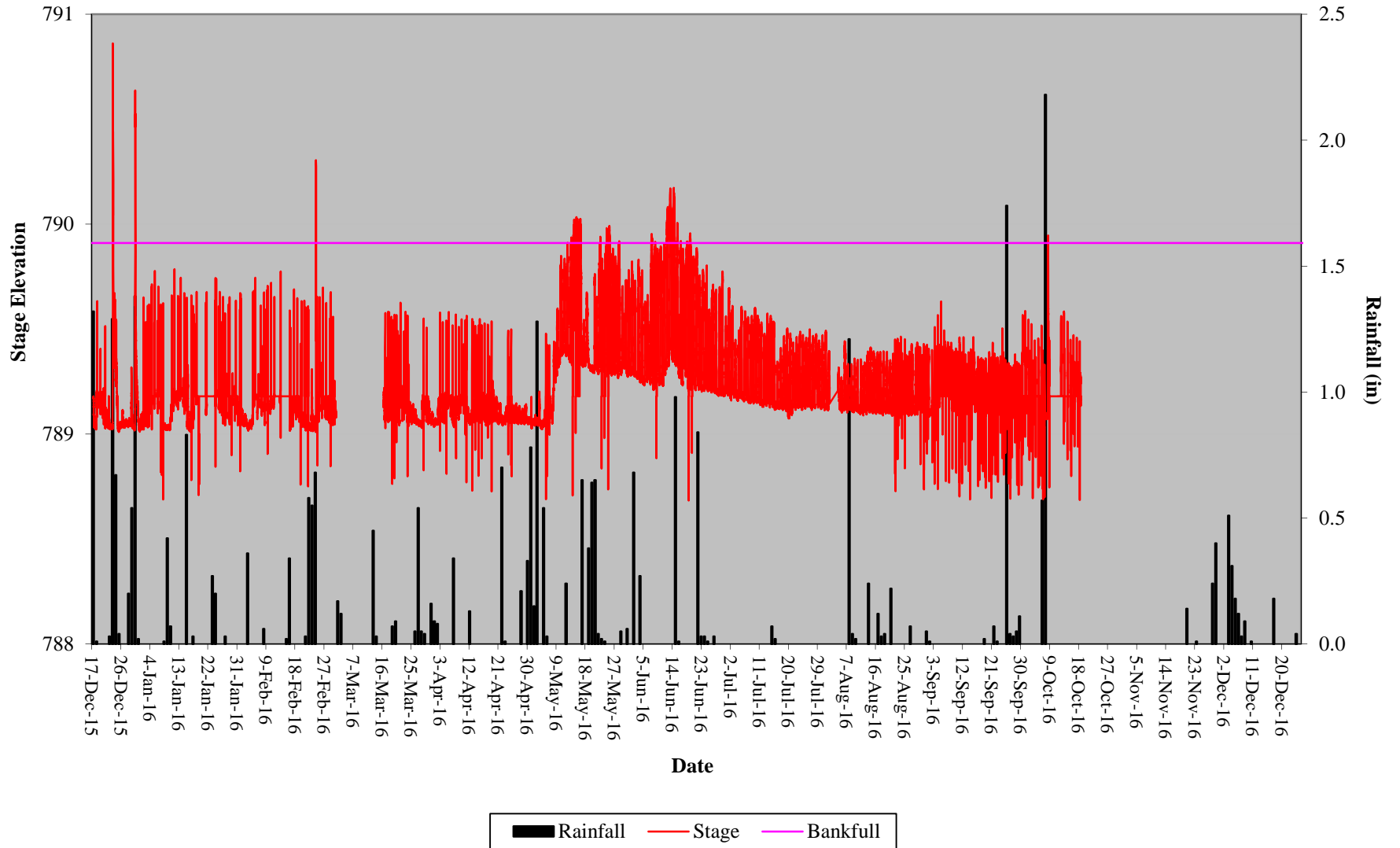


Photo 2. Bankfull indicators T2, 12/17/2015

Jacob's Landing Restoration Site  
Stage Hydrograph  
Stream Gauge 1



Jacob's Landing Restoration Site  
Stage Hydrograph  
Stream Gauge 2

