601 North II
Stream Restoration Site
NCDMS Project Number: 95025
Monitoring Contract Number: 003991
Monitoring Year 4
2016

Prepared for:
Resource Environmental Solutions

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601 North II
Stream Restoration Site
2016 Monitoring Report (MY 4)

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Appendices

1.0 Executive Summary/Project Abstract

The goals and objectives stated in the 601 North II Restoration Plan (EBX 2013) are as follows:

Project Goals

- Re-establish the capacity to store and transport watershed flows and sediment loads by restoring stable dimension, pattern, and profile
- Reduce sediment within on-site and downstream receiving waters through the stabilization of eroding stream banks, introduction of livestock exclusion fencing and responsible grazing techniques, and restoration of a forested riparian buffer
- Elevate the water table and introduce surface water flood hydrodynamics within the floodplain by re-establishing characteristic bankfull dimensions and flood frequency
- Remove non-point sources of pollution associated with pesticides, herbicides, fertilizer, and livestock waste by filtering sheet flow through a restored riparian buffer and installed Riparian Best Management Practice (RBMP) detention devices
- Improve aquatic habitat by reducing sedimentation, removing in-stream culverts, enhancing stream bed variability, and introducing shading, woody debris, and detritus from riparian planting
- Enhance terrestrial wildlife habitat by extending a terrestrial wildlife corridor and refuge to connect with the existing and adjacent 601 North Site, as well as to the downstream reaches of Wicker Branch and Lanes Creek
- Improve water quality for two populations of freshwater mussels documented to occur in Lanes Creek (Savannah Lilliput (*Toxolasma pullus*) and Carolina creekshell (*Villosa vaughniana*), both state listed and Federal Species of Concern
- Expand on and integrate the restoration and enhancement work with the adjacently positioned, companion 601 North Restoration Site

Project Objectives

- Restoration (Priority 1 and 2) of approximately 3,354 linear feet of perennial stream channel (3,169 linear feet of credited stream) to reconnect the floodplain and restore stable channel dimension, pattern, and profile
- Enhancement (Level I) of approximately 225 linear feet of perennial stream channel by stream bank grading, and slight adjustments to either stream pattern or dimension
- Enhancement (Level II) of approximately 615 linear feet of perennial stream channel by restoring a minimum 50 foot planted buffer
- Removal of an existing culvert on Wicker Branch
- Installation of Riparian Best Management Practice (RBMP) detention devices, and livestock exclusion fencing to prohibit grazing on the floodplain and hoof shear on stream banks
- Re-vegetating floodplains adjacent to streams
- Providing a permanent conservation easement on approximately 12.3 acres of riparian buffer along approximately 4,194 feet of restored and enhanced stream channels

The following presents the results from data collection performed during the Year 4 monitoring period (MY4). Data was collected between January and September of 2016.

Visual assessment of the easement indicates that herbaceous vegetation has become well established throughout the project. Areas of low stem densities (n = 3) and poor growth rates (n = 1) were noted during MY4 in Reaches 1, 2, and 4 (Figure 2). During MY4, a previously identified easement encroachment was observed on Reach 4, between station 0+00 and 1+50 on the LDB. This area consists of clearing a walking path along the fence line using mowing and the application of herbicides.). During MY4 only one continued encroachment occurred on the LDB of Reach from between STA 0+00 and 1+50, where the edge of the easement was sprayed and mowed to clear a walking path along the fence line. Vegetation within all areas of encroachment identified during previous monitoring years has begun to become re-established. Additional boundary marking and signage were installed in the vicinity of the original encroachment in April 2014. Areas of encroachment that have occurred since then will receive supplemental boundary markers in the vicinity of the encroachment and RES will continue efforts to coordinate with the adjacent landowners to avoid future encroachments. Supplemental planting of the easement occurred during January 2015 in areas that had experienced plant mortality. The replanted areas included areas of encroachment, poor growth rate, and low stem densities. Invasive exotic vegetation, consisting of Chinese Privet (*Lingustrum sinense*) and Japanese Honeysuckle (*Lonicera japonica*), was noted in seven locations totaling 0.39 acres, or 3% of the easement area (Figure 2 and Table 6).

The MY4 vegetation plot data was collected during June 2016. All monitoring plots met the year 5 success criteria of 260 stems per acre. Stem densities ranged from 283 to 647 stems per acre with an annual mean of 418 stems per acre, a 1% increase in stem density between MY3 and MY4 (Table 9). The increase occurred due to locating a stem reported as missing during MY3. A total of 10 plant species were documented within the vegetation monitoring plots. When volunteer stems are included, densities ranged from 405 to 1,012 stems per acre with a mean of 607 stems per acre across all plots.

Visual assessment of the entire project indicates that the stream is remaining stable with few problem areas noted. One small area of degradation on Reach 1 at approximately Station 3+30, first observed during MY2, is stabilizing. Another small area of degradation totaling 15 feet was noted on Reach 2 at Station 13+75. On Reach 2 bank erosion is occurring at the following locations: 26 feet beginning at STA 11+25, 10 feet near Station 12+50, 8 feet near Station 19+50, and 13 feet near Station 22+30 (Figure 2). Beaver dams were removed in early 2016, however remnants of the dams still exist at STA 10+25, STA 11+25, and STA 13+00. (Figure 2).

Field visits were conducted March 15th and 16th to collect stream morphological data. Stream longitudinal profiles, in general, have remained stable from MY3 to MY4 (Appendix D). There was a drop in the total number of pools in Reach 5 due to a compound pool scouring out at Station 5+25 and becoming one long pool. Water surface slopes at riffles on Reach 2 between Station 8+60 and Station 10+00 and between Station 12+70 and 12+75 on Reach 2 were flattened due to effects from the remnant beaver dams. However, bedform in these areas have remained mostly stable, with the exception of the pool 10+00, which has filled in slightly with fine sediment. Excluding these areas, no other significant areas of instability in the stream

channel were identified. MY4 cross-section data showed little change between MY3 and MY4 (Appendix D), with the exception of cross-sections 5 and 6 in Reach 1 and Reach 2 respectively. Scour along both banks led to an increased bankfull width at cross-section 5, while scour along the right descending bank led to an increased bankfull width at cross-section 6.

Bankfull events were documented on both Reach 2 and Reach 5 during site visits in January 2016 (Table 12). Another bankfull event was recorded on the Reach 2 crest gauge during a March site visit. These represent the seventh bankfull event recorded on Reach 2 and the sixth bankfull event recorded on Reach 5 since construction.

Summary information and data related to the occurrence of items such as easement 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 restoration plan on NCDMS's website. All raw data supporting tables and figures in the appendices are available from NCDMS upon request.

2.0 Methodology

Visual assessment of the stream was performed at the beginning and end of the monitoring year. Permanent photo station photos were collected during the initial visual assessment during leaf-off conditions to ensure visibility of in-channel structures and stream banks. Additional photos of vegetation or stream problem areas were documented with photographs throughout the project area.

Geomorphic measurements were taken using standard guidance (Rosgen 1996; USACE 2003) during low flow conditions using a Nikon NPR 332 Total Station. Three-dimensional coordinates associated with cross-section and profile data were collected in the field and geo-referenced (NAD83 State Plane feet FIPS 3200). Morphological data was limited to 10 cross-sections. Survey data was imported into CAD, ArcGIS, and Excel for data processing and analysis. Channel substrate was characterized using a Wolman Pebble Count outlined in the Harrelson et al. (1994) and processed using Microsoft Excel.

Vegetation success is being monitored using 12 permanent monitoring plots. Vegetation monitoring follows the CVS-EEP Level 1 Protocol for MY1 and will follow Level 2 Protocol for monitoring years 2-5 for Recording Vegetation, version 4.2 (Lee et al. 2008) and includes analysis of composition and density of planted species. Data is processed using the CVS data entry tool. In the field, the four corners of each plot were permanently marked with rebar and photos of each plot are taken from the origin each monitoring year.

Precipitation data was reported from the NCCRONOS station number 315771 two miles South East of Monroe, NC. Two crest gauges were installed—one on the mainstem Reach 2 at XS-10, and the other on Reach 5 at XS-3. During quarterly visits to the site, the height of the corkline was recorded and cross-referenced with known bankfull elevations at each crest gauge.

3.0 References

Harrelson, Cheryl, C. Rawlins and J. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. Gen. Tech. Rep. RM-245. Rocky Mountain Forest and Range Experiment Station. USDA Forest Service. Fort Collins, Colorado

Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2. The University of North Carolina at Chapel Hill, Department of Biology.

EBX (Environmental Banc and Exchange). 2013. 601 North II Restoration Site Baseline Monitoring Document and As-Build Baseline Report. NCEEP Project No. 95025/Contract No. 003991. Raleigh.

Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology Books, Pagosa Springs, Colorado.

USACE (U.S. Army Corps of Engineers). 2003. Stream Mitigation Guidelines. U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, North Carolina Wildlife Resources Commission, North Carolina Department of Environment and Natural Resources-Division of Water Quality. Wilmington District.

Appendix A
Project Vicinity Map and Background Tables

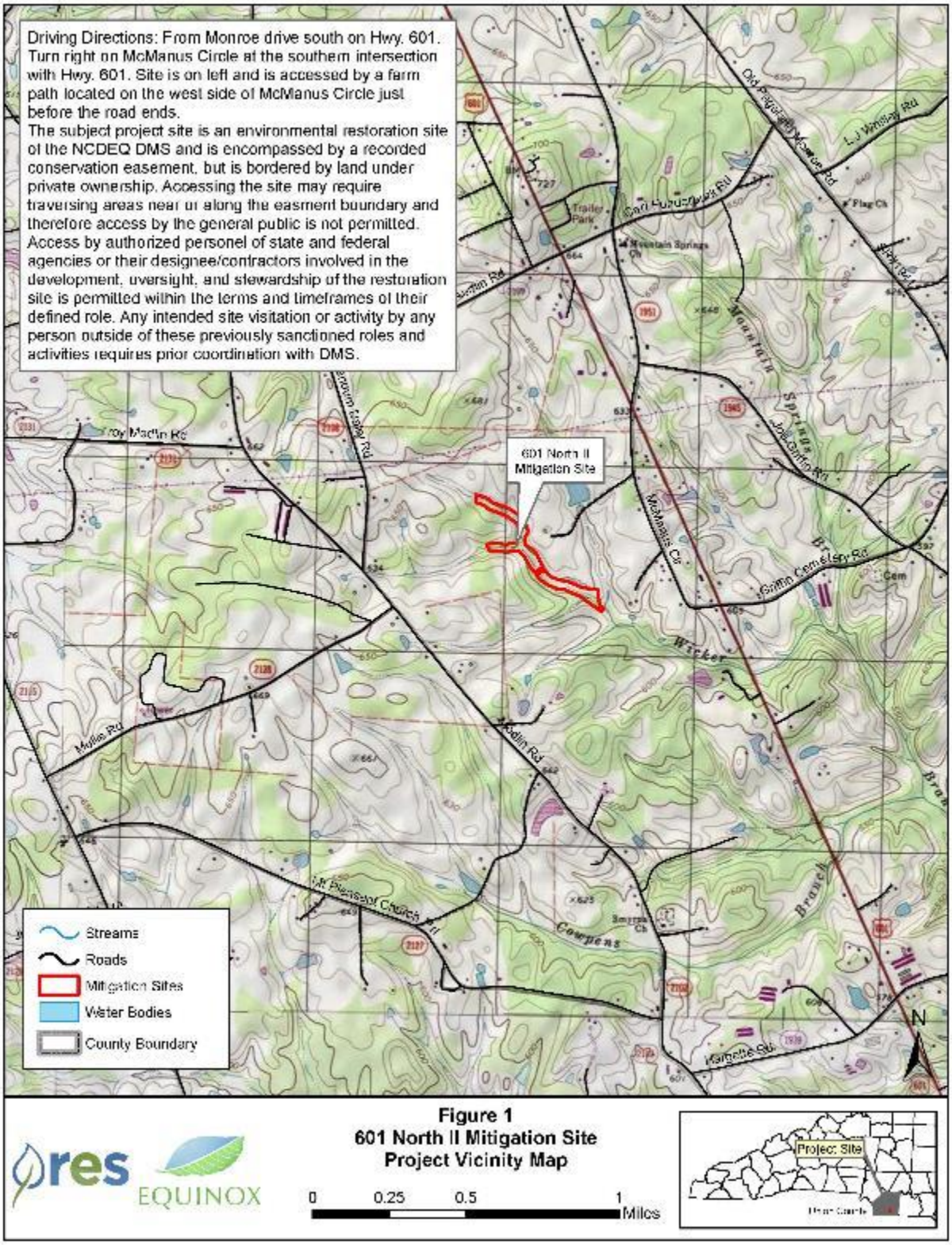
Driving Directions: From Monroe drive south on Hwy. 601. Turn right on McManus Circle at the southern intersection with Hwy. 601. Site is on left and is accessed by a farm path located on the west side of McManus Circle just before the road ends.
The subject project site is an environmental restoration site of the NCDEQ DMS 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 easment boundary and therefore access by the general public is not permitted. Access by authorized personel of state and federal agencies or their designee/contractors involved in the development, oversight, and stewardship of the restoration site is permitted within the terms and timeframes of their defined role. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with DMS.
601 North II Mitigation Site
Streams
Roads
Mitigation Sites
Water Bodies
County Boundary
N
0 0.25 0.5 1 Miles
Project Site
Figure 1
601 North II Mitigation Site
Project Vicinity Map

Table 1. Project Components and Mitigation Credits
601 North II Stream Restoration Site – Project No. 95025

Mitigation Credits

	Stream		Riparian Wetland	Non-riparian Wetland	Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE					
Totals	3,169	396					

Project Components

Project Component - or - Reach ID	Stationing /Location	Existing Footage	Approach	Restoration -or- Restoration Equivalent	Restoration Footage	Mitigation Ratio
Wicker Branch (Reach 1)	00+00-06+60	630[1]	P1	Restoration	660	1:01
Wicker Branch (Reach 2)	06+60-24+35	1,356	P1, P2	Restoration	1,713[2]	1:01
Wicker Branch (Reach 3)	24+35-27+08	414	P2	Restoration	150[3]	1:01
UT to Wicker Branch (Reach 4)	00+00-02+25	218	EI	Restoration Equivalent	225	01:01.5
	02+25-08+40	608	EII	Restoration Equivalent	615	01:02.5
UT to Wicker Branch (Reach 5)	08+40-14+86	534	P1	Restoration	646	1:01

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	3,169	--	--	--	--	12.3
Enhancement I	225	--	--	--	--	
Enhancement II	615	--	--	--	--	

BMP Elements

Element	Location	Purpose/Function	Notes
Vernal Pools (12)	See as-built plans	Treat on-site storm water from adjacent agricultural fields. Remove suspended solids, help infiltration of water and remove excess nutrients prior to entering stream. Will reduce livestock waste in on-site streams	Target at base of drainages coming from adjacent agricultural fields.
Farm Crossing Improvements	See as-built plans	Two off-site farm crossings located above the restored streams will be improved at their existing location and incorporated into the restoration design.	
Cattle Exclusion Fencing	Along the western site boundary	Will eliminate hoof shear on banks and livestock waste into on-site streams	To be installed in 2013

[1]Includes 169 feet of hydrologic connectivity through a linear wetland persisting in the location of the relic channel.

[2]Does not include the restored portion of Wicker Branch located outside of the conservation easement (Station 11+63-12+25).

[3]Does not include the restored portion of Wicker Branch located outside of the conservation easement (Station 25+85-27+08).

Table 2. Project Activity and Reporting History		
601 North II Stream Restoration Site – Project No. 95025		
Activity Report	**Data Collection Complete**	**Completion or Delivery**
Final Mitigation Plan	N/A	Oct-12
Final Design (90 percent)	N/A	Nov-12
Construction	N/A	Apr-13
Temporary S&E mix applied to entire project area	N/A	February-April 2013
Permanent seed mix applied to reach/segments	N/A	Apr-13
Bare Root Seedling Installation	N/A	Apr-13
Installation of permanent cross-sections and vegetation plots	N/A	May-13
Baseline Monitoring Report	Jun-13	Jun-13
Year 1 Vegetation Monitoring	Dec-13	Dec-13
Year 1 Stream Monitoring	Nov-13	Dec-13
Beaver Dam Removal	-	Mar-14
Additional Boundary Marking/Signage	-	Apr-14
Year 2 Vegetation Monitoring	Sep-14	Nov-14
Year 2 Stream Monitoring	Jun-14	Nov-14
Supplemental Planting	-	Jan-15
Year 3 Vegetation Monitoring	Sep-15	Nov-15
Year 3 Stream Monitoring	May-15	Nov-15
Beaver Dam Removal	-	Mar-16
Year 4 Vegetation Monitoring	Jun-16	Oct-16
Year 4 Stream Monitoring	Mar-16	Oct-16
Year 5 Vegetation Monitoring		
Year 5 Stream Monitoring		

*N/A- Activities and reporting history for these items are not applicable to this restoration project

Table 3. Project Contacts 601 North II Stream Restoration Site – Project No. 95025	
Prime Contractor	Resource Environmental Solutions 302 Jefferson Street, Suite 110 Raleigh NC 27605 Phone: (919) 209-1061 Contact: Brian Hockett
Designer	Atkins North America, Inc. 1616 East Millbrook Road, Suite 310 Raleigh, NC 27609 (919) 876-6888 Contact: Jens Geratz or Michael Gloden
Construction Contractor	Wright Contracting PO Box 545 Siler City, NC 27344 (919) 663-0810 Contact: Stephen James
Planting Contractor	KBS Earthworks 5616 Cable Church Road Julian, NC 27283 (336) 314-2935 Contact: Keneth Strader
As-built Surveys	Kee Mapping and Surveying PO Box 2566 Ashville, NC 28802 Contact: Phillip Kee
Seeding Mix Source	Evergreen Seed Fuquay Varina, NC (919) 567-1333 Contact: Wistar Taylor
Nursery Stock Suppliers	Arbor Gen Super Tree Nursery (800) 222-1290 Contact: Polly Creech
Monitoring Performers (MY0) - 2013	Atkins North America, Inc. 1616 East Millbrook Road, Suite 310 Raleigh, NC 27609 (919) 876-6888 Contact: Jim Cooper
Monitoring Performers (MY1-MY4) 2013-2016 Stream Monitoring POC Vegetation Monitoring POC	Equinox Environmental Consultation and Design, Inc. 37 Haywood Street, Suite 100 Asheville, NC Drew Alderman (828) 253-6856 Drew Alderman (828) 253-6856

Table 4. Project Baseline Information and Attributes
601 North II Stream Restoration Site – Project No. 95025

Project Information					
Project Name	601 North II Stream Restoration Site				
County	Union County				
Project Area (acres)	12.3				
Project Coordinates (latitude and longitude)	34.897274, -80.473416				
Project Watershed Summary Information					
Physiographic Province	Piedmont				
River Basin	Yadkin				
USGS Hydrologic Unit 8-digit	3040105				
USGS Hydrologic Unit 14-digit	3040105081010				
DWQ Sub-basin	3/7/2014				
Project Drainage Area (acres)	453				
Project Drainage Area Percent Impervious Area	<1%				
CGIA Land Use Classification	Cultivated, Managed Herbaceous Cover, Mixed Hardwood				
Reach Summary Information					
Parameters	**Wicker Branch (Reach 1)**	**Wicker Branch (Reach 2)**	**Wicker Branch (Reach 3)**	**UT to Wicker Branch (Reach 4)**	**UT to Wicker Branch (Reach 5)**
Length of reach (linear feet)	630	1,356	414	826	534
Valley classification	VIII	VIII	VIII	VIII	VIII
Drainage area (acres)	169	286	365	85	88
NCDWQ stream identification score	23.5	35	35	23	23
NCDWQ Water Quality Classification	WS-V	WS-V	WS-V	WS-V	WS-V
Morphological Description (stream type)	F6	E1/C1	G4	B4	B4
Evolutionary trend	E-G-F	E-G-C-E	E-G	E-G-B	E-G-B
Underlying mapped soils	Cid channery silt loam (CmB)	Cid channery silt loam (CmB)	Cid channery silt loam (CmB)	Badin channery silty clay loam (BdB2), Cid channery silt loam (CmB)	Badin channery silty clay loam (BdB2), Cid channery silt loam (CmB)
Drainage class	Moderately well drained	Moderately well drained	Moderately well drained	BdB2: Well drained, CmB: Moderately well drained	BdB2: Well drained, CmB: Moderately well drained
Soil Hydric status	Not hydric	Not hydric	Not hydric	Not hydric	Not hydric
Valley Slope	0.0095	0.0098	0.0165	0.013	0.0124
FEMA classification	Project streams are not located within a FEMA regulated area				
Native vegetation community	N/A (cultivated land)	N/A (cultivated land)	Mesic Mixed Hardwood Forest	N/A (cultivated land)	N/A (cultivated land)
Percent composition of exotic invasive vegetation	0%	0%	60% (Chinese privet)	0%	0%

Wetland Summary Information	
Parameters	**Wetland 1**
Size of Wetland (acres)	0.05
Wetland Type	Palustrine emergent
Mapped Soil Series	Cid channery silt loam (CmB)
Drainage class	Moderately well drained
Soil Hydric Status	Not hydric
Source of Hydrology	Groundwater
Hydrologic Impairment	NA
Native vegetation community	N/A (cultivated land)
Percent composition exotic invasive vegetation	0%

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Documentation**
Waters of the United States – Section 404	Yes	Yes	JD Notification / NWP27
Waters of the United States – Section 401	Yes	Yes	401 Water Quality Certification
Endangered Species Act	Yes	Yes	CE Documentation (Mitigation Plan, Appendix B)
Historic Preservation Act	No	NA	CE Documentation (Mitigation Plan, Appendix B)
Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	No	NA	NA
FEMA Floodplain Compliance	No	NA	FEMA Floodplain Checklist (Mitigation Plan, Appendix B)
Essential Fisheries Habitat	No	NA	NA

Appendix B
Visual Assessment Data

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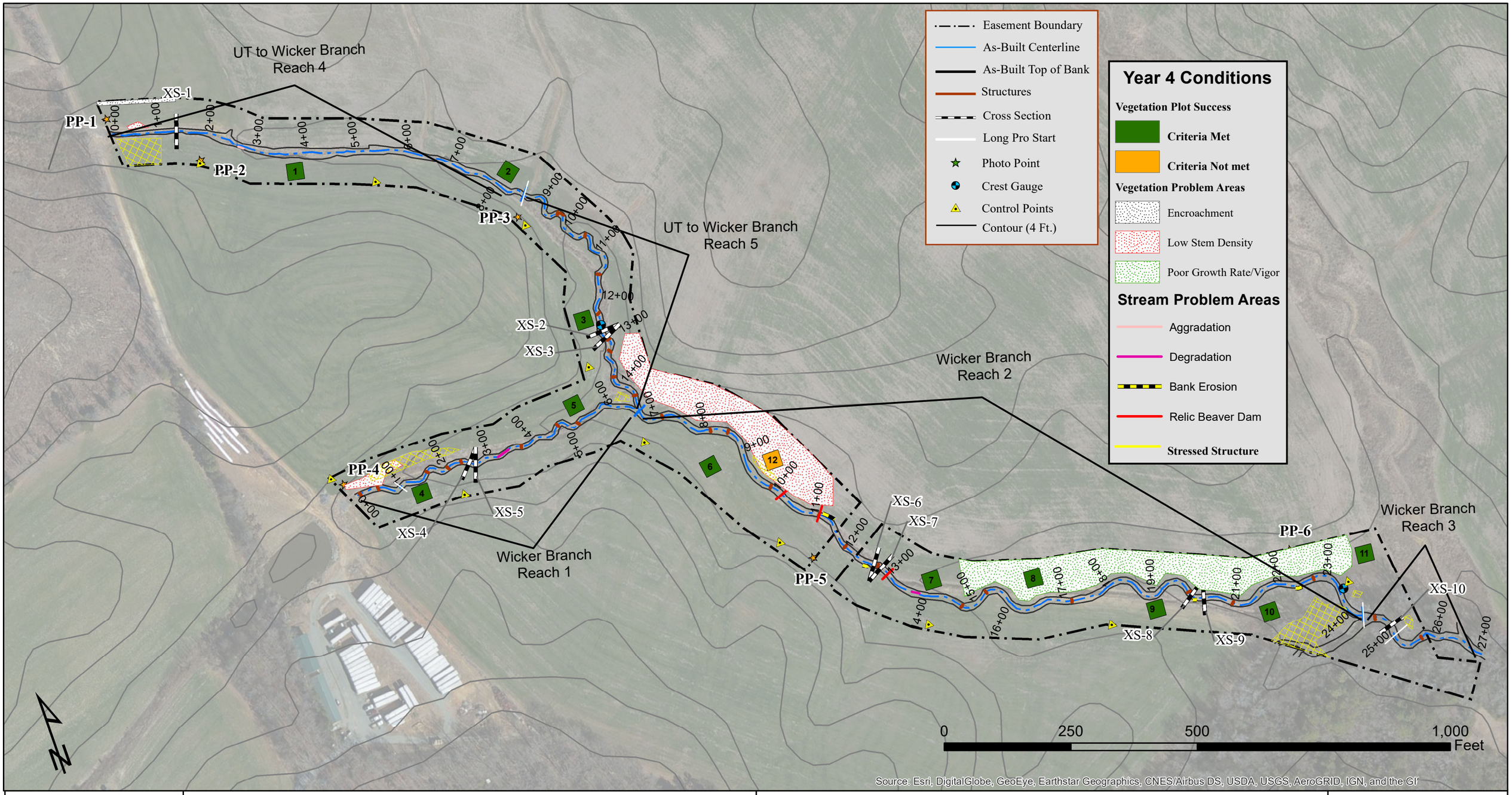
Figure 2. Integrated Current Condition Plan View



Prepared for	**Project:** 601 North II Current Condition Plan View Year 4 Monitoring Union County, North Carolina	Notes: 1) Base Map Data Provided by Akins North America, INC. 2) 2012 World Imagery Photo	Prepared by
	Sheet 1 of 1		
	Date	Project Number	
	September 2016	NCDMS # 95925	

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Table 5. Visual Stream Morphology Stability Assessment
601 North II / Project No. 95025 - Wicker Branch Reach 1
Assessed Length 660 feet

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.			1	25	96%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate.	22	22			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	19	19			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	19	19			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	21	21			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	21	21			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%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	8	8			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	8	8			100%			

N/A - Item does not apply.

Table 5 cont'd. Visual Stream Morphology Stability Assessment
601 North II / Project No. 95025 - Wicker Branch Reach 2
Assessed Length 1,775 feet

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.			1	15	99%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate.	33	33			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	32	33			97%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	33	33			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	33	33			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	33	33			100%			
2. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			4	58	97%	1	8	91%
	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%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	4	58	97%	N/A	N/A	N/A
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	13	13			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	13	13			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	13	13			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	13	13			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	13	13			100%			

N/A - Item does not apply.

Table 5 cont'd. Visual Stream Morphology Stability Assessment
601 North II / Project No. 95025 - Unnamed Tributary - Wicker Branch Reach 3
Assessed Length 273 feet

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.	5	5			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	5	5			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	5	5			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	5	5			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	5	5			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%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	2	2			100%			

N/A - Item does not apply.

Table 5 cont'd. Visual Stream Morphology Stability Assessment
601 North II / Project No. 95025 - Unnamed Tributary - Wicker Branch Reach 5
Assessed Length 646 feet

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.	18	18			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	19	19			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	19	19			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	19	19			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	19	19			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%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	9	9			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	9	9			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	9			89%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	9	9			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	9	9			100%			

N/A - Item does not apply.

Table 6. Vegetation Condition Assessment 601 North II / Project No. 95025 Planted Acreage 12.3					
Vegetation Category	**Definitions**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Planted Acreage**
1. Bare Areas	Very limited cover of both woody and herbaceous material.	N/A	0	0.00	0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	N/A	3	0.88	7%
		Totals	3	0.88	7%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	N/A	1	1.08	9%
		Cumulative Totals	4	1.96	16%
Easement Acreage 12.3					
Vegetation Category	**Definitions**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Easement Acreage**
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	Cross Hatch (Red - Dense/Yellow - Present)	7	0.39	3%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	N/A	1	0.03	0%

N/A - Item does not apply.

601 North II – Permanent Photo Station 1
Looking Downstream

601 North II – Permanent Photo Station 2
Looking Downstream

601 North II – Permanent Photo Station 2
Looking Upstream

601 North II – Permanent Photo Station 3
Looking Upstream

601 North II – Permanent Photo Station 4
Looking Downstream

601 North II – Permanent Photo Station 5
Looking Downstream

601 North II – Permanent Photo Station 5
Looking Upstream

601 North II – Permanent Photo Station 6
Looking Downstream

601 North II -Permanent Photo Station 6
Looking Upstream

Problem Area Photos

Project Reach 2 – Beaver Dam (removed) 10+25 Looking Upstream

Project Reach 2 – Beaver Dam (removed) 11+00 Looking Upstream

Project Reach 2 – Bank Erosion 11+25 Left Descending Bank

Project Reach 2 – Degradation 13+75 Right Descending Bank

Project Reach 2 – Bank Erosion 19+50 Right Descending Bank

Project Reach 2 – Bank Erosion 22+50 Right Descending Bank

Project Reach 4 – Encroachment 0+00 Left Descending Bank

Project Reach 5 – Stressed Structure 13+25 Looking Downstream

Appendix C
Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment		
601 North II / Project No. 95925		
Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	92%
2	Yes	
3	Yes	
4	Yes	
5	Yes	
6	Yes	
7	Yes	
8	Yes	
9	Yes	
10	Yes	
11	Yes	
12	No	

601 North II-Vegetation Monitoring Plot 1
June 14, 2016

601 North II-Vegetation Monitoring Plot 2
June 14, 2016

601 North II-Vegetation Monitoring Plot 3
June 14, 2016

601 North II-Vegetation Monitoring Plot 4
June 14, 2016

601 North II-Vegetation Monitoring Plot 5
June 14, 2016

601 North II-Vegetation Monitoring Plot 6
June 14, 2016

601 North II-Vegetation Monitoring Plot 7
June 14, 2016

601 North II-Vegetation Monitoring Plot 8
June 14, 2016

601 North II-Vegetation Monitoring Plot 9
June 14, 2016

601 North II-Vegetation Monitoring Plot 10
June 14, 2016

601 North II-Vegetation Monitoring Plot 11
June 14, 2016

601 North II-Vegetation Monitoring Plot 12
June 14, 2016

Table 8. CVS Vegetation Plot Metadata 601NII Stream Restoration Site	
Report Prepared By	Owen Carson
Date Prepared	6/16/2016 15:29
database name	601_N_II_MY4_2016.mdb
database location	Z:\ES\NRI&M\EBX Monitoring\601_N_II\601N-II-MY4-2016\Data\Veg
computer name	FIELD-PC
file size	46780416
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	95925
project Name	601 North II Stream Restoration Site
Description	Stream Restoration Site
River Basin	Yadkin-Pee Dee
length(ft)	4,248
stream-to-edge width (ft)	350
area (sq m)	47,348.22
Required Plots (calculated)	12
Sampled Plots	12

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Table 9. Planted Total Stem Counts (Species by Plot)
601NII Stream Restoration Site

			Current Plot Data (MY4 2016)																																				
			Plot 1			Plot 2			Plot 3			Plot 4			Plot 5			Plot 6			Plot 7			Plot 8			Plot 9			Plot 10			Plot 11			Plot 12		
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
Betula nigra	River Birch	Tree	1	1	1	3	3	3	2	2	3	1	1	1	4	4	4	4	4	4				2	2	2	3	3	3	3	3	4	4	4	5	2	2	2
Campsis radicans	Trumpet Creeper	Vine																																				
Celtis laevigata	Sugarberry	Tree																																				
Celtis occidentalis	Common Hackberry	Tree																								1												
Cercis canadensis	Eastern Redbud	Tree							1	1	1	2	2	2	2	2	2							1	1	1				1	1	1						
Diospyros virginiana	Common Persimmon	Tree																								5												
Fraxinus pennsylvanica	Green Ash	Tree	1	1	1			1	1	1	1							2	2	2	2	2	2	1	1	3	2	2	3						1	2	2	2
Liquidambar styraciflua	Sweetgum	Tree																					2			3			5			2			15			2
Nyssa sylvatica	Blackgum	Tree																																		1	1	1
Platanus occidentalis	American Sycamore	Tree	1	1	1	4	4	4	2	2	2				5	5	5				5	5	5				2	2	2							2	2	2
Platanus occidentalis var. occidentalis	Sycamore, Plane-tree	Tree	1	1	1				1	1	1			1														1										
Quercus michauxii	Swamp Chestnut Oak	Tree	3	3	3	1	1	1	3	3	4	6	6	6	4	4	4	4	4	4							1	1	1	1	1	1						
Quercus phellos	Wwillow Oak	Tree	1	1	1			1				2	2	2				5	5	5	2	2	2	2	2	2				2	2	2	4	4	4			
Quercus rubra	Northern Red Oak	Tree	1	1	1				1	1	1				1	1	1	1	1	1	4	4	4	2	2	2				1	1	1						
Quercus velutina	Black Oak	Tree	1	1	1																																	
Salix nigra	Black Willow	Tree																								3												5
Sambucus canadensis	Common Elderberry	Shrub																													1						
Stem count			10	10	10	8	8	10	11	11	13	11	11	12	16	16	16	16	16	16	13	13	15	8	8	13	8	8	24	8	8	12	8	8	25	7	7	14
size (ares)			1			1			1			1			1			1			1			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
Species count			8	8	8	3	3	5	7	7	7	4	4	5	5	5	5	5	5	5	4	4	5	5	5	6	4	4	9	5	5	7	2	2	4	4	4	6
Stems per ACRE			405	405	405	324	324	405	445	445	526	445	445	486	647	647	647	647	647	647	526	526	607	324	324	526	324	324	971	324	324	486	324	324	1,012	283	283	567

[1]PnoLS: No livestakes included in tally; P-all: All planted stems included in tally; T: Total stems including recruitment.

Table 9 Con't. Planted Total Stem Count (Annual Means)
601NII Stream Restoration Site

			Annual Means														
			MY4 (2016)			MY3 (2015)			MY2 (2014)			MY1 (2013)			MY0 (2013)		
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
Betula nigra	River Birch	Tree	29	29	32	28	28	28	29	29	29	31	31	31	51	51	51
Campsis radicans	Trumpet Creeper	Vine									1						
Celtis laevigata	Sugarberry	Tree															2
Celtis occidentalis	Common Hackberry	Tree			1												
Cercis canadensis	Eastern Redbud	Tree	7	7	7	8	8	8	7	7	7	11	11	11	19	19	19
Diospyros virginiana	Common Persimmon	Tree			5												
Fraxinus pennsylvanica	Green Ash	Tree	11	11	16	11	11	13	10	10	12	9	9	9	10	10	10
Liquidambar styraciflua	Sweetgum	Tree			29			1			8						
Nyssa sylvatica	Blackgum	Tree	1	1	1	1	1	1	1	1	1	3	3	3	7	7	7
Platanus occidentalis	American Sycamore	Tree	21	21	21	21	21	25	21	21	21	22	22	22	19	19	19
Platanus occidentalis var. occidentalis	Sycamore, Plane-tree	Tree	2	2	4	2	2	2	2	2	5						
Quercus michauxii	Swamp Chestnut Oak	Tree	23	23	24	23	23	23	23	23	23	31	31	31	44	44	44
Quercus phellos	Wwillow Oak	Tree	18	18	19	17	17	17	18	18	18	19	19	19	27	27	27
Quercus rubra	Northern Red Oak	Tree	11	11	11	11	11	11	9	9	9	13	13	13	14	14	14
Quercus velutina	Black Oak	Tree	1	1	1	1	1	1	1	1	1						
Salix nigra	Black Willow	Tree			8			2			2						
Sambucus canadensis	Common Elderberry	Shrub			1												
Stem count			124	124	180	123	123	132	121	121	137	139	139	139	191	191	193
size (ares)			12			12			12			12			12		
size (ACRES)			0.30			0.30			0.30			0.30			0.30		
Species count			10	10	15	10	10	12	10	10	13	8	8	8	8	8	9
Stems per ACRE			418	418	607	415	415	445	408	408	462	469	469	469	644	644	651

[1]PnoLS: No livestakes included in tally; P-all: All planted stems included in tally; T: Total stems including recruitment.

Color Key

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%
Recruit Stems

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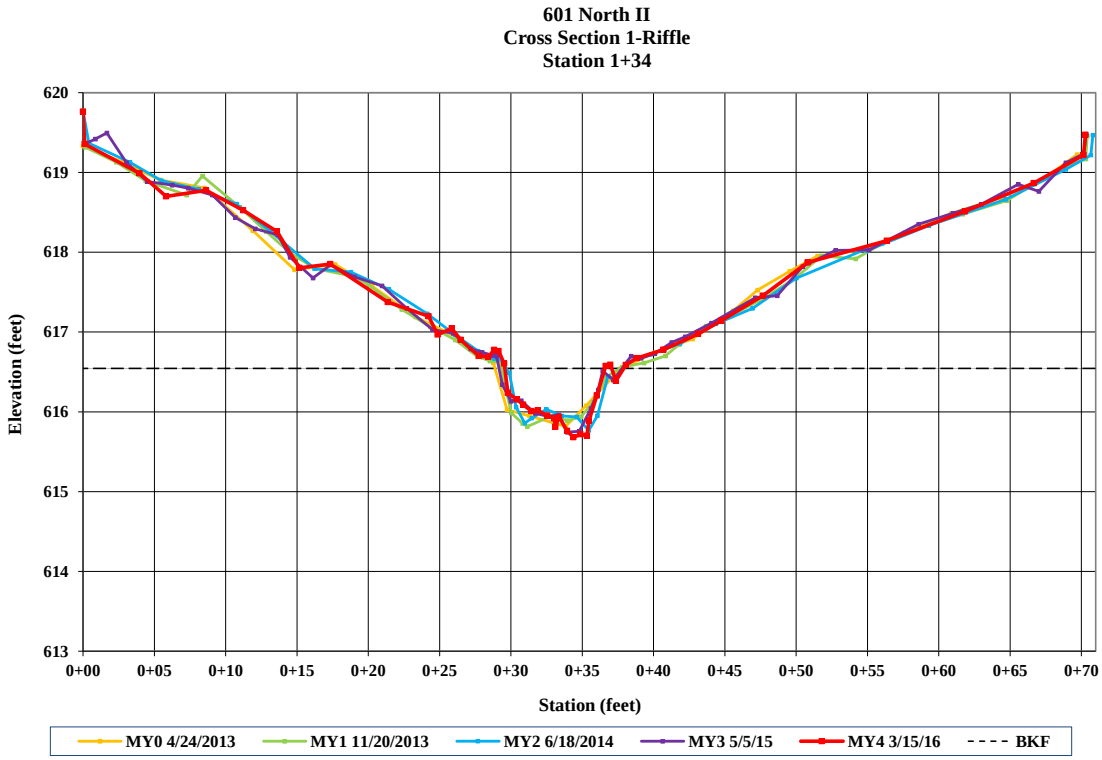
Appendix D
Stream Survey Data

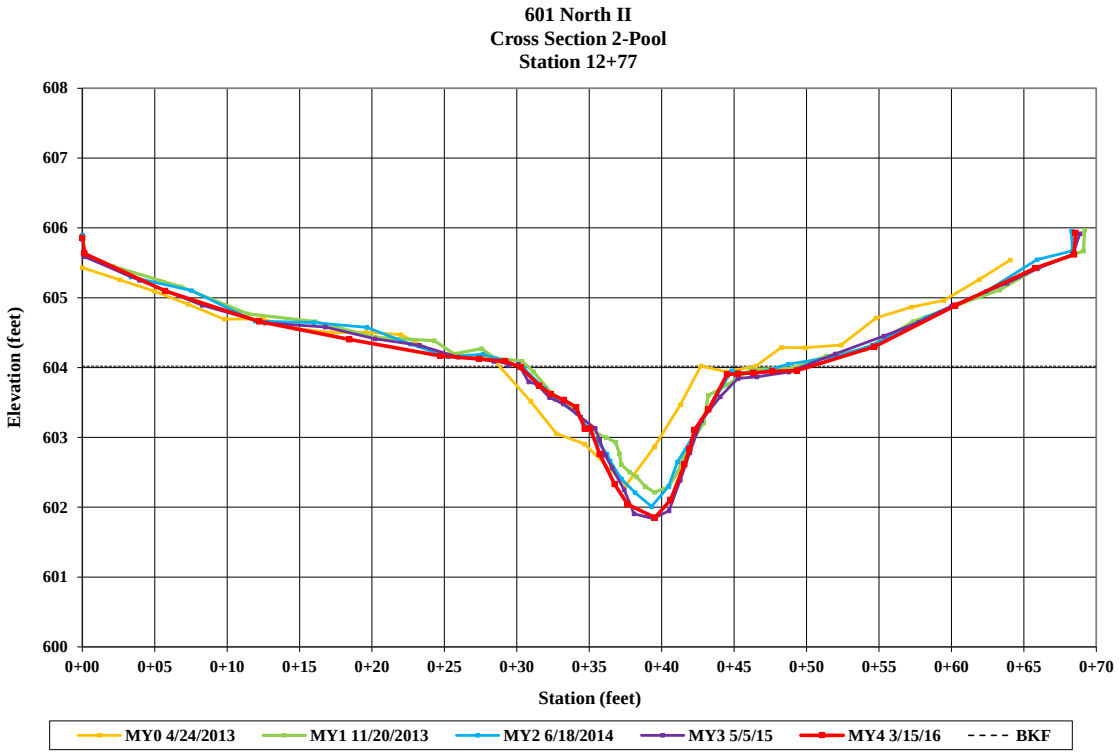


Left Descending Bank

Right Descending Bank

Upstream

Downstream

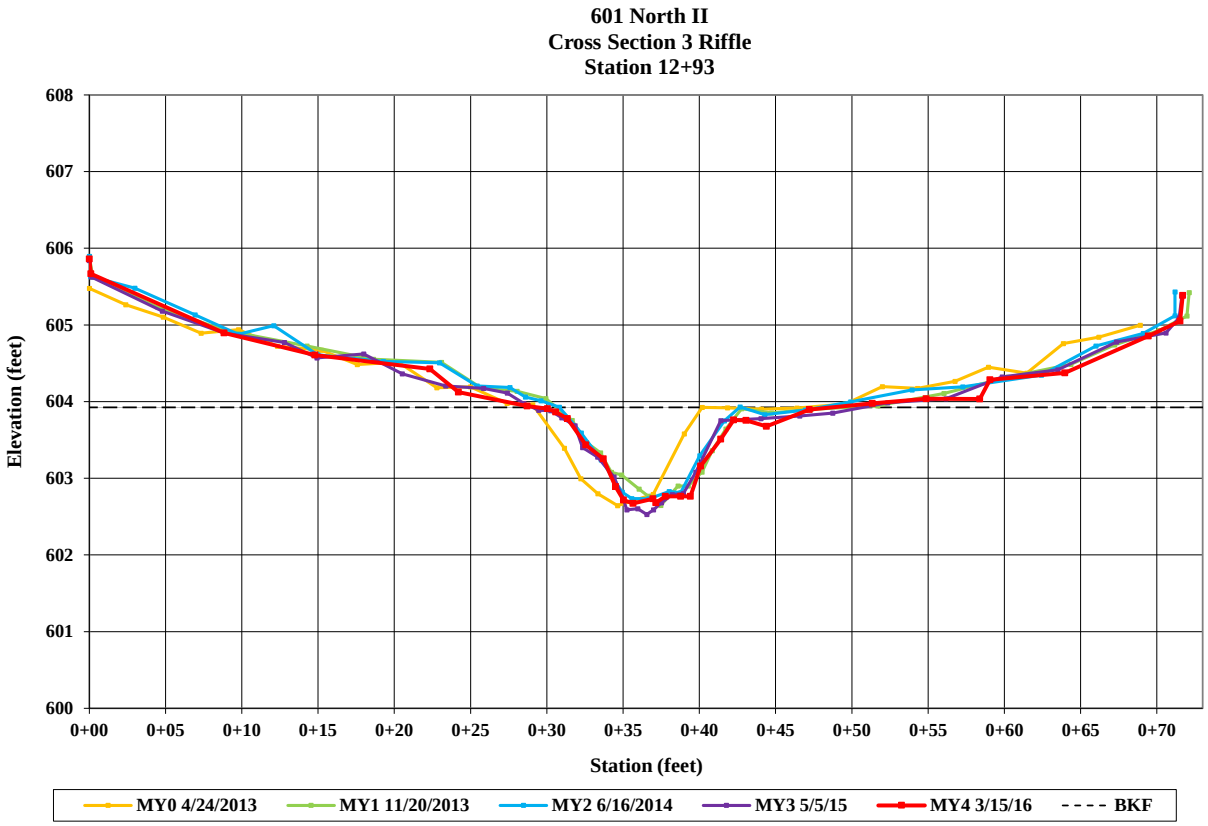


Left Descending Bank

Right Descending Bank

Upstream

Downstream

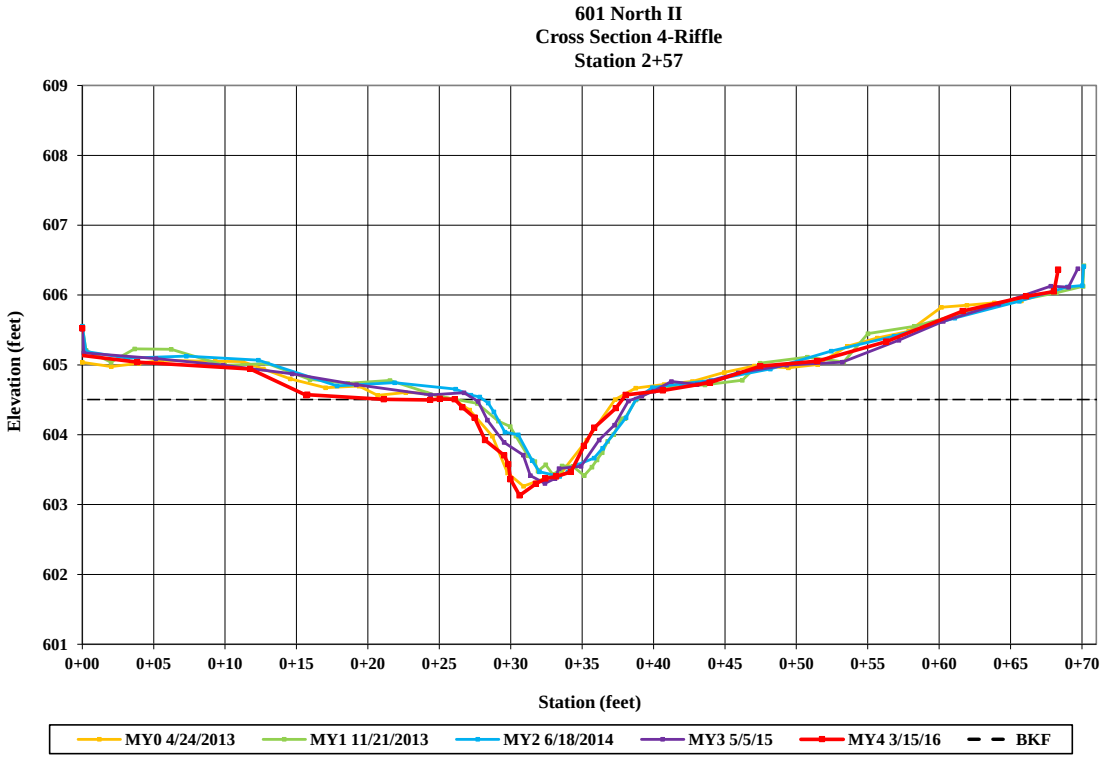


Left Descending Bank

Right Descending Bank

Upstream

Downstream

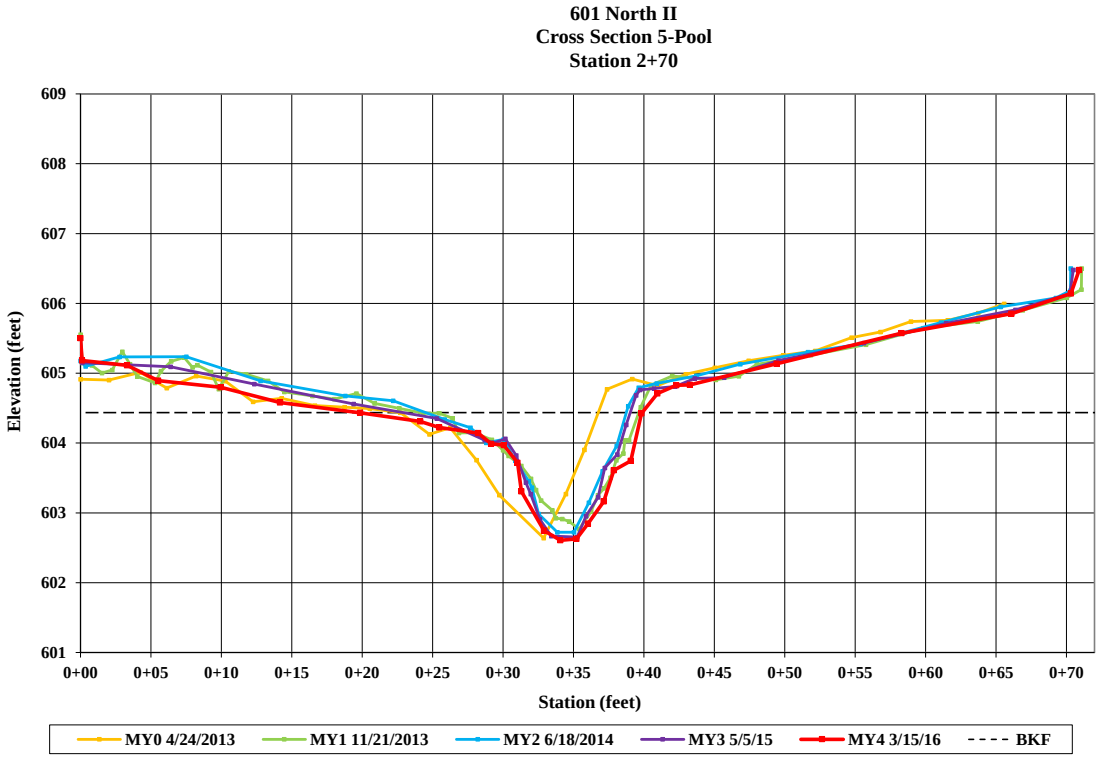


Left Descending Bank

Right Descending Bank

Upstream

Downstream

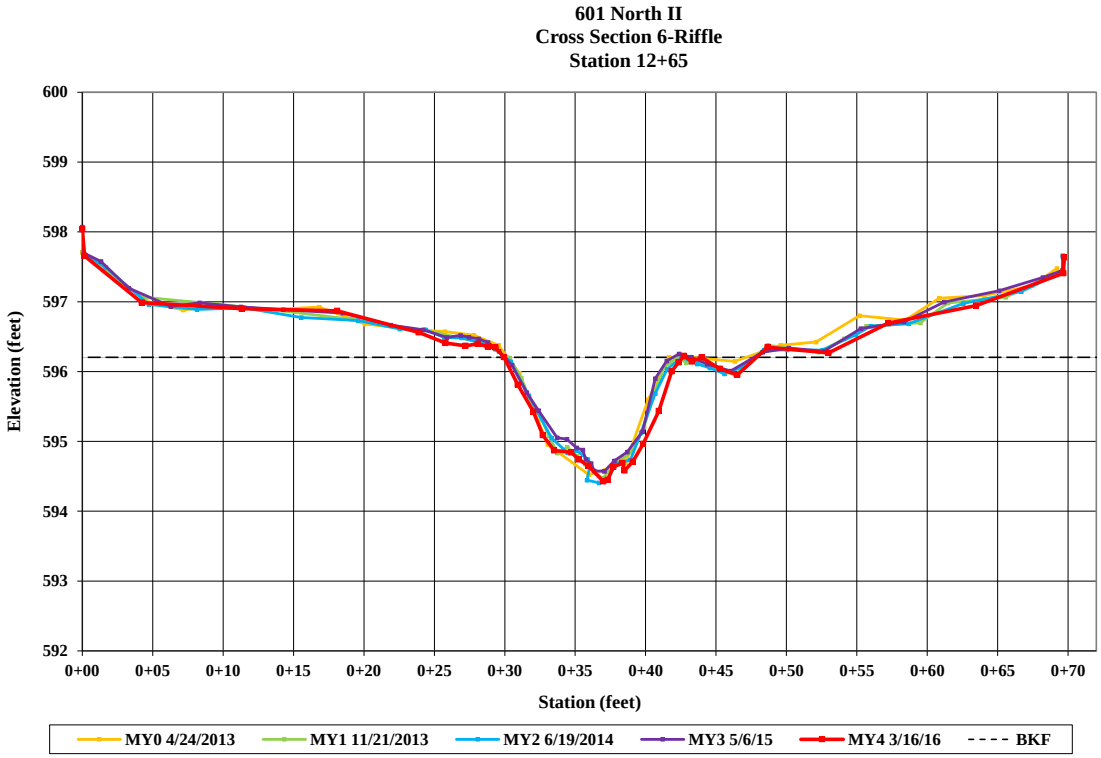


Left Descending Bank

Right Descending Bank

Upstream

Downstream

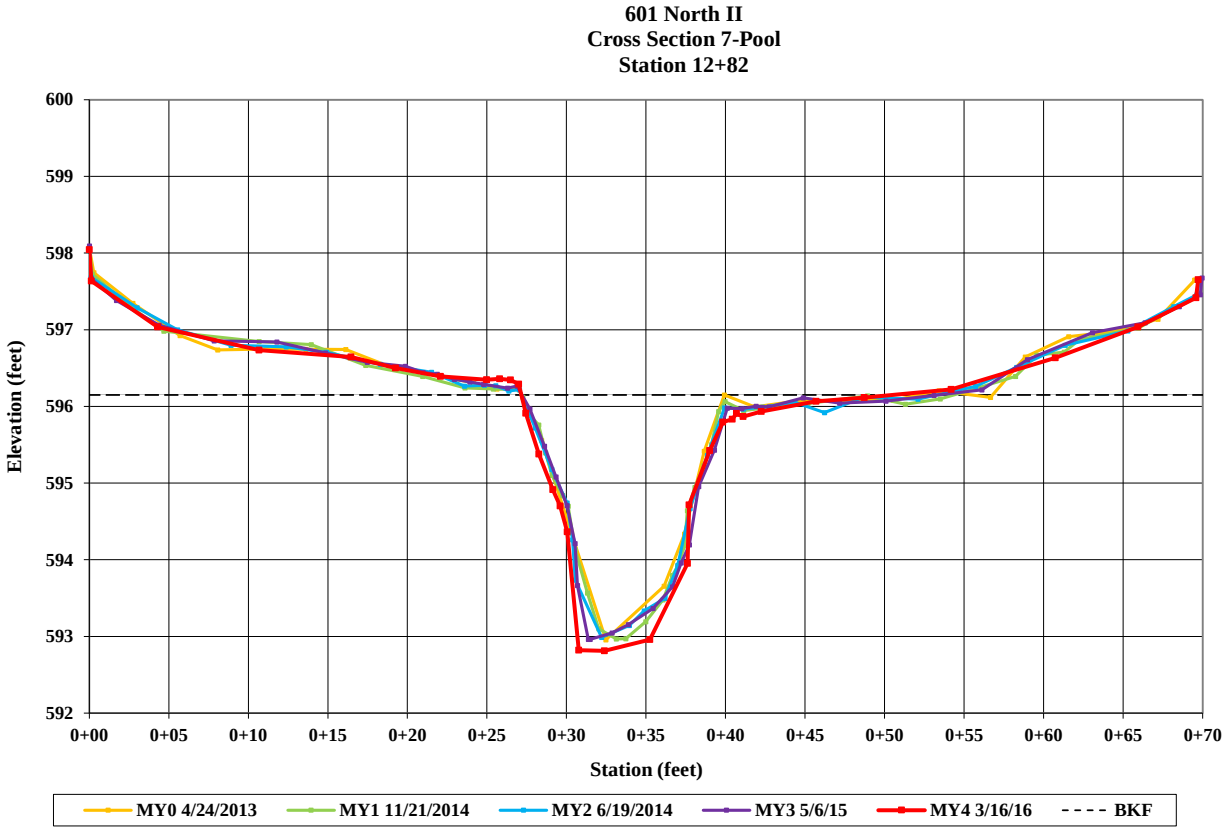


Left Descending Bank

Right Descending Bank

Upstream

Downstream

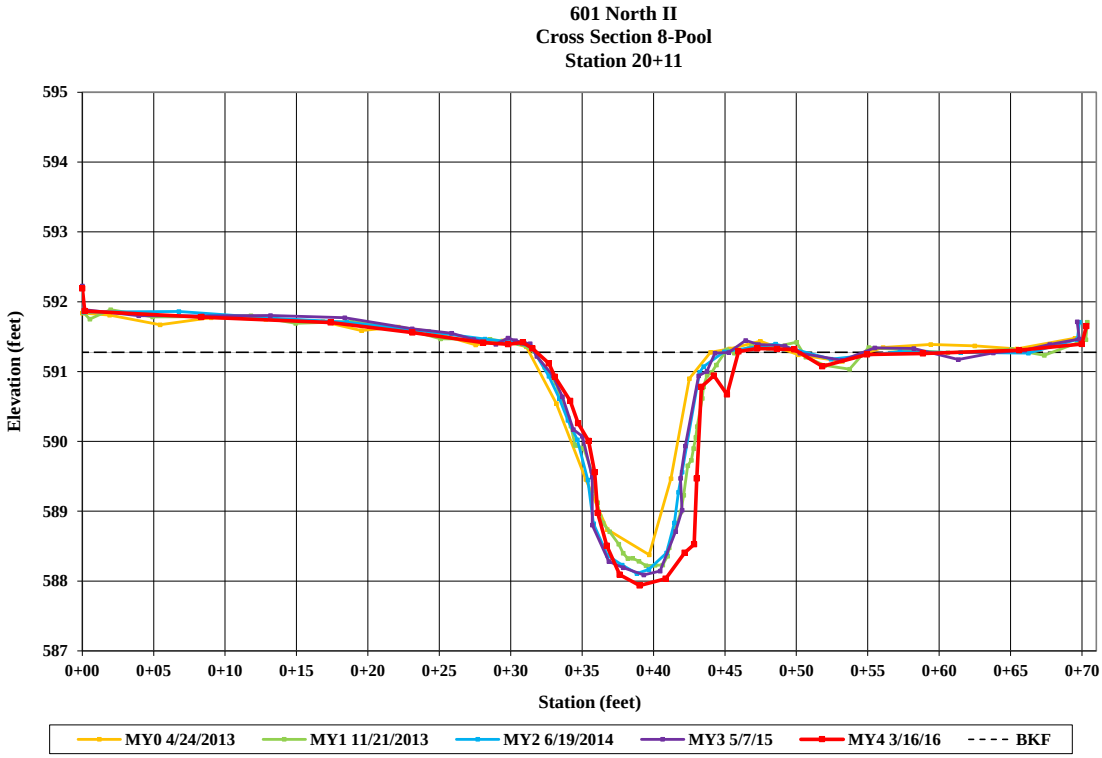


Left Descending Bank

Right Descending Bank

Upstream

Downstream

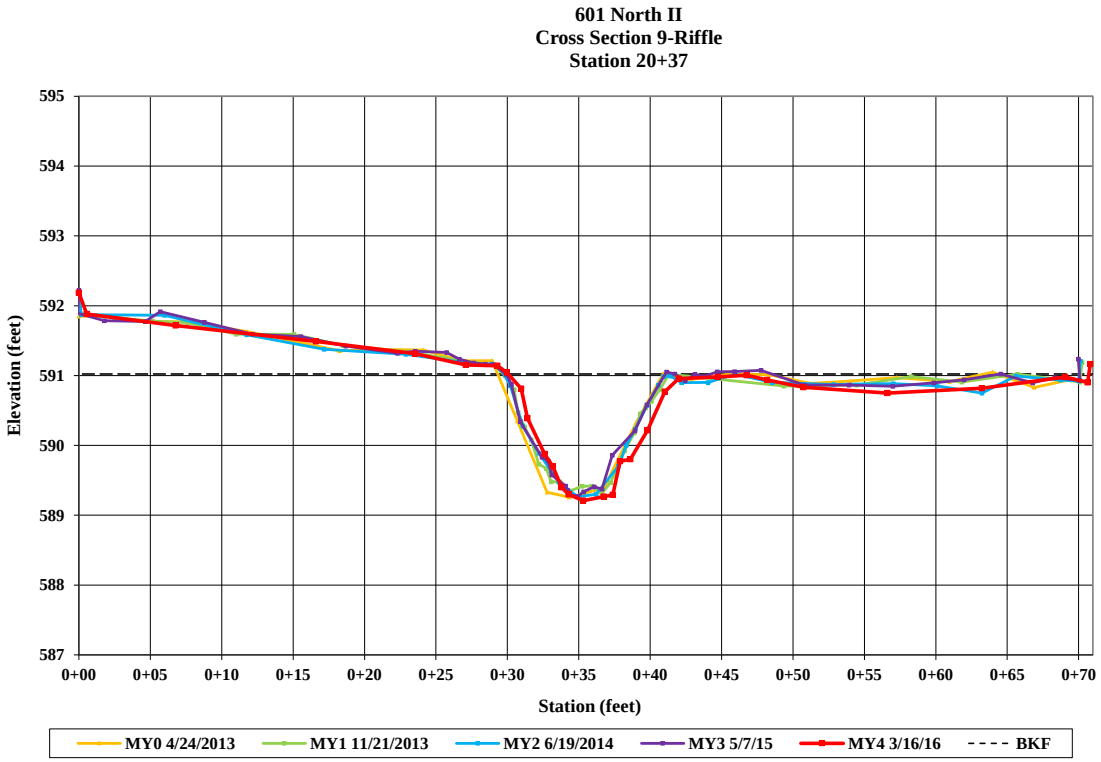


Left Descending Bank

Right Descending Bank

Upstream

Downstream

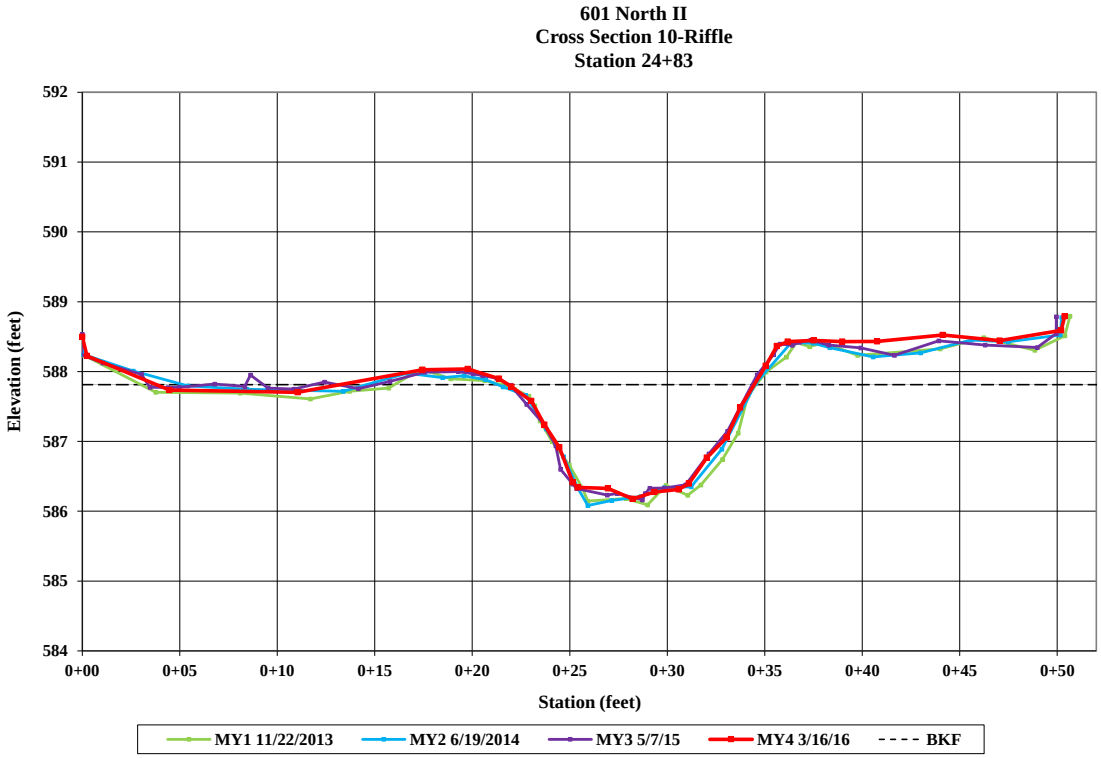


Left Descending Bank

Right Descending Bank

Upstream

Downstream



Left Descending Bank

Right Descending Bank

Upstream

Downstream

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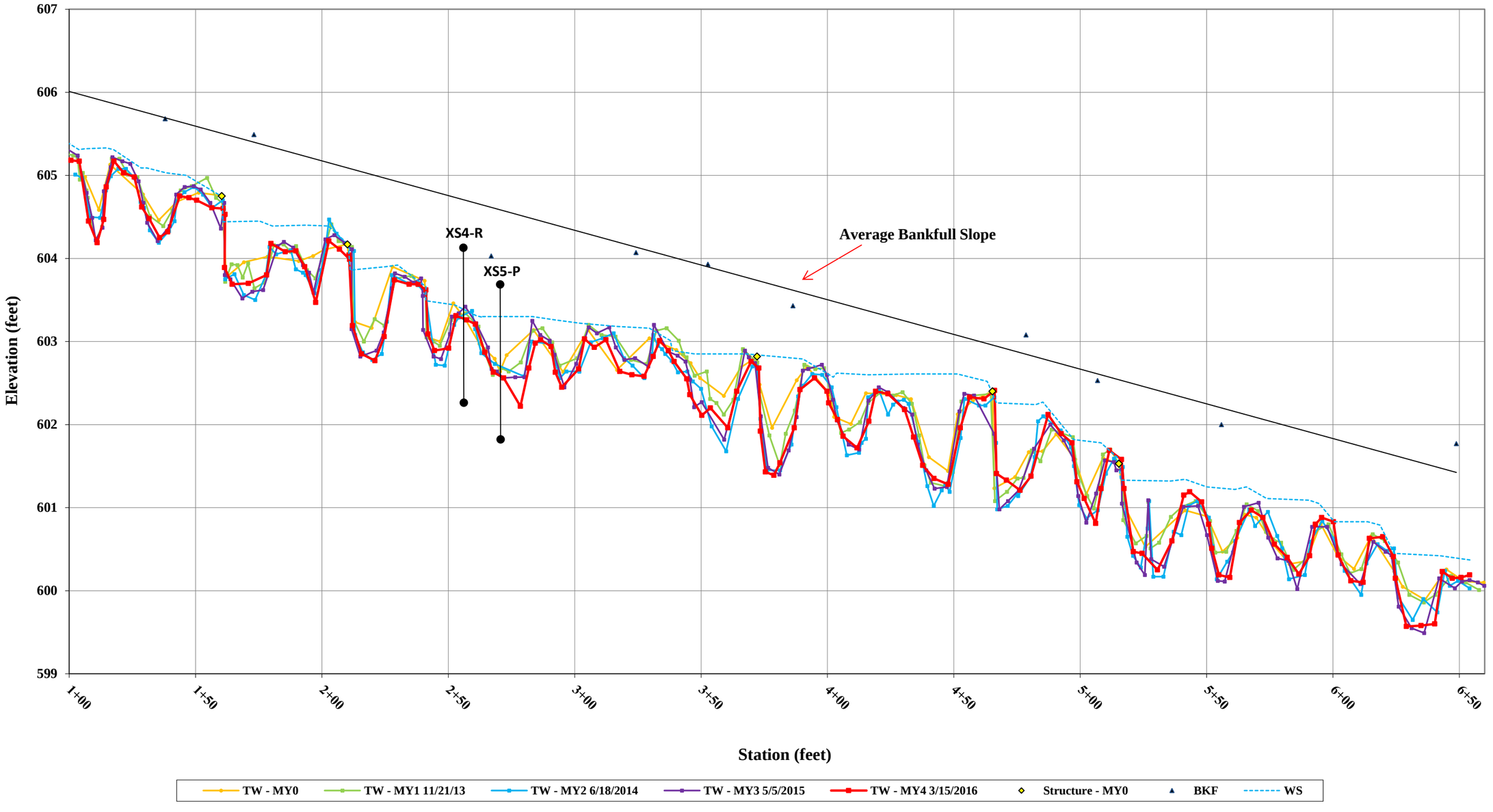
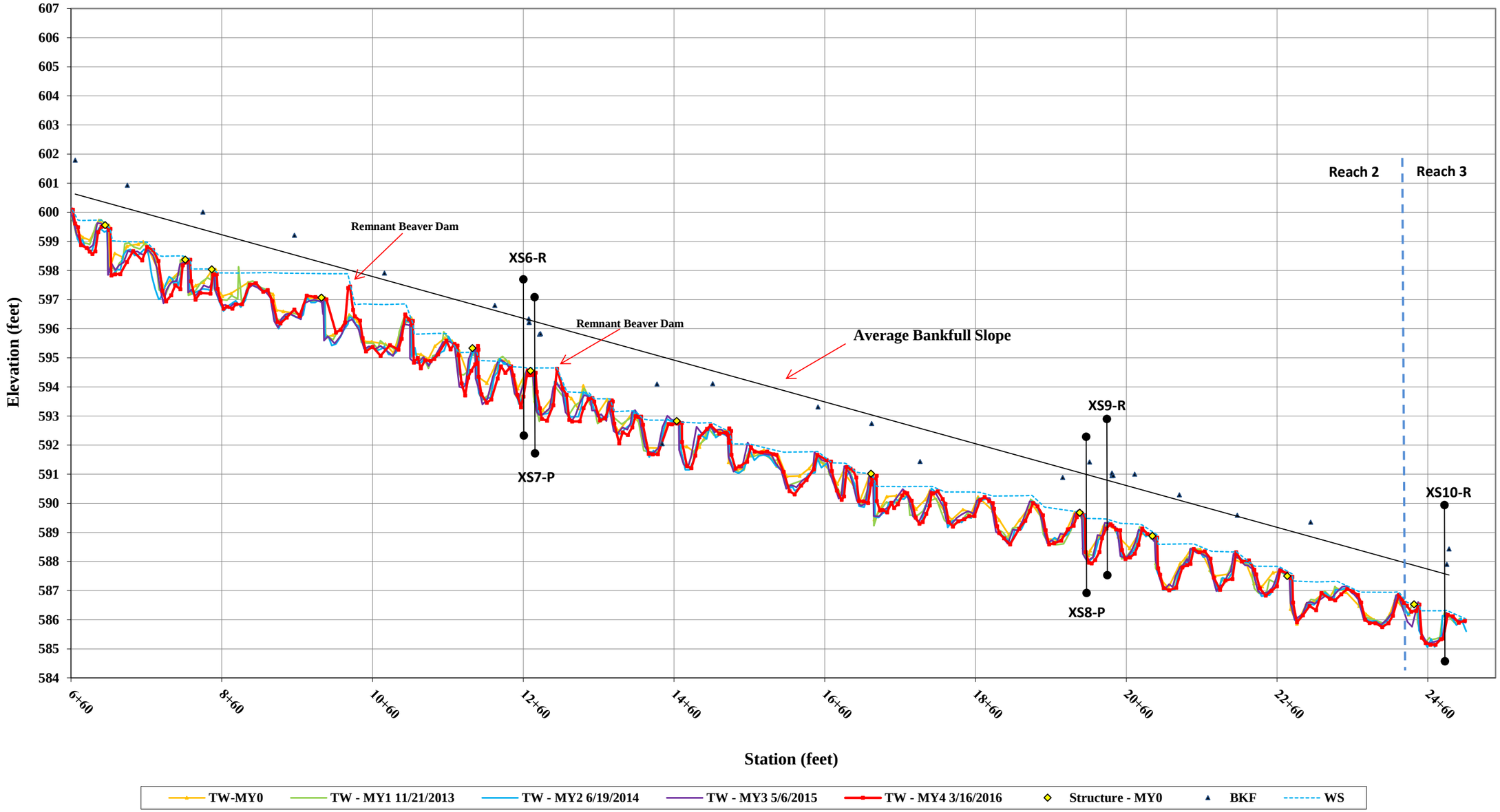
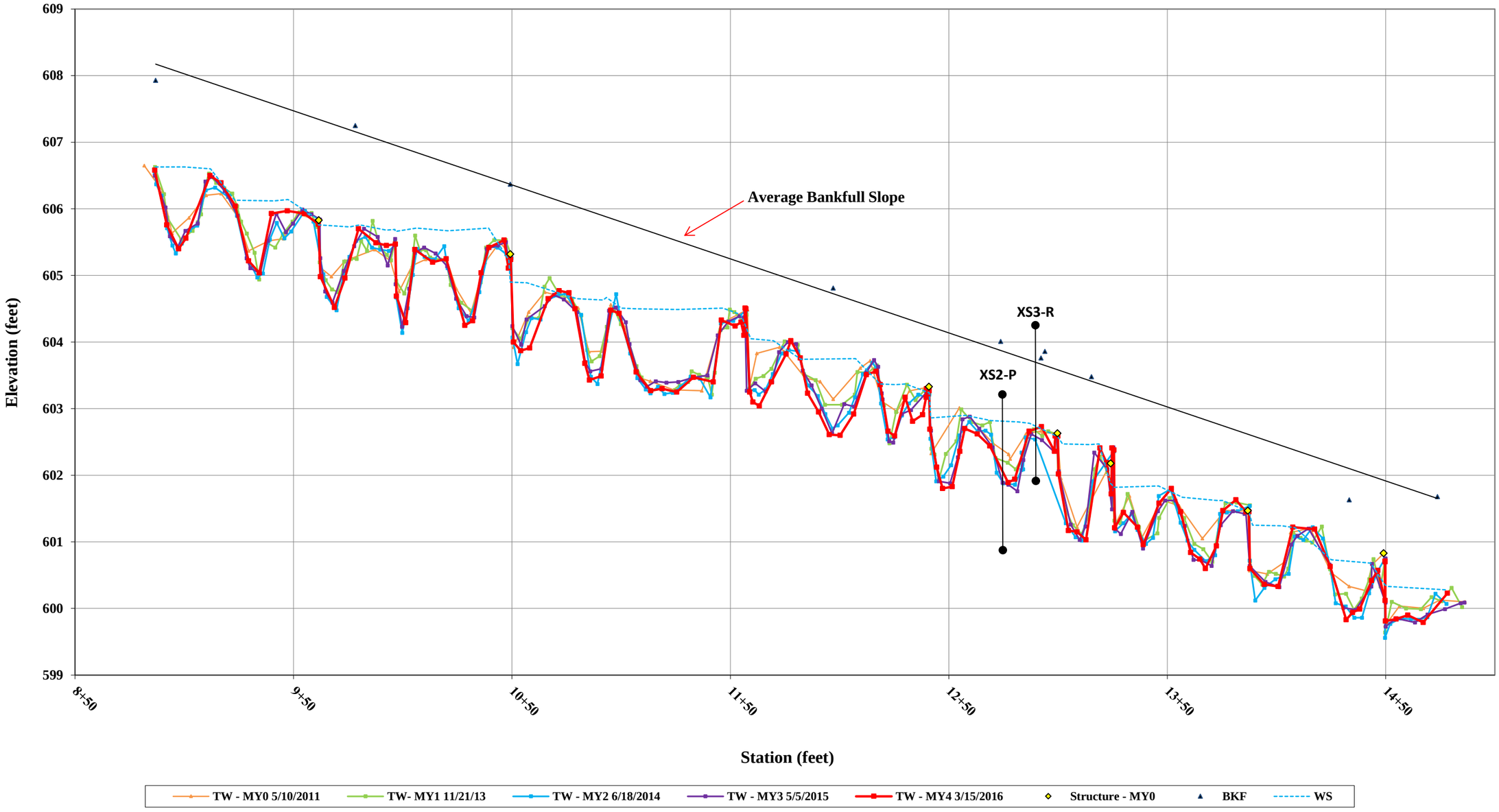
601 North II Wicker Branch
Reach 1
Longitudinal Profile
Staioning 1+00 to 6+60



601 North II Reach 2/3
Longitudinal Profile
Reach 2 - Stationing 6+60 to 24+35
Reach 3 - Stationing 24+35 to 25+08



601 North II UT-Wicker Branch
Reach 5
Longitudinal Profile
Stationing 8+86 to 14+84



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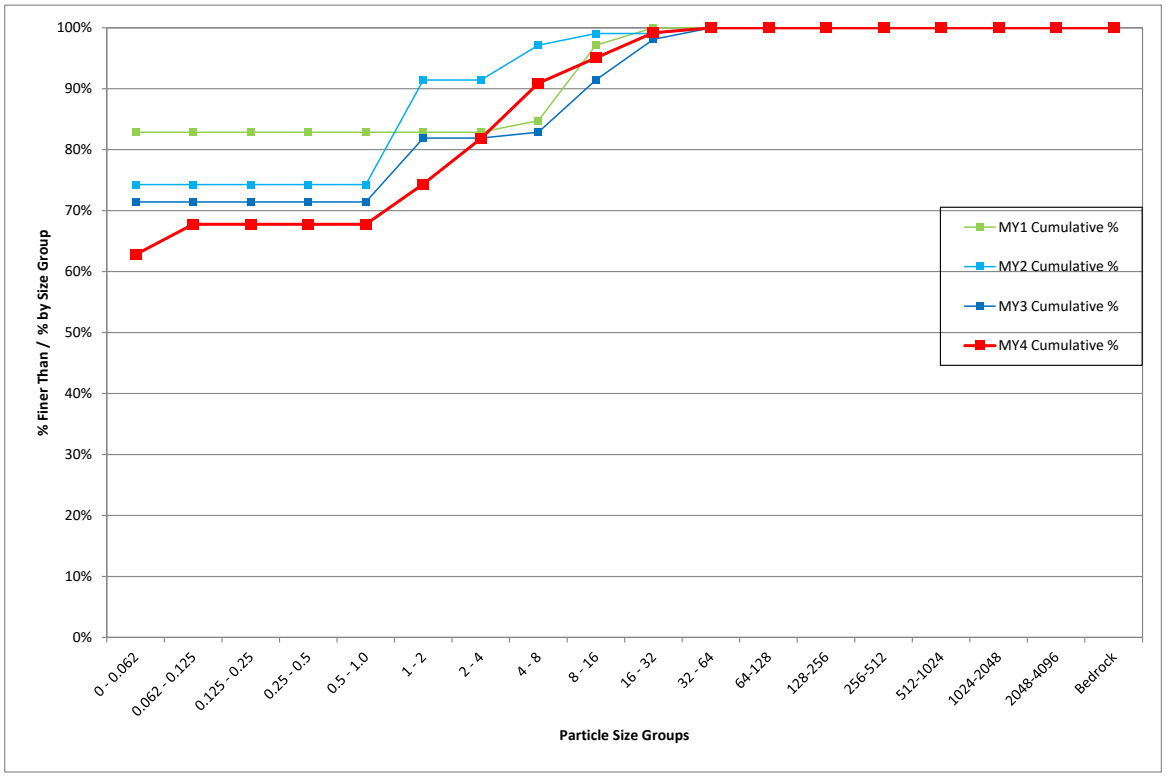
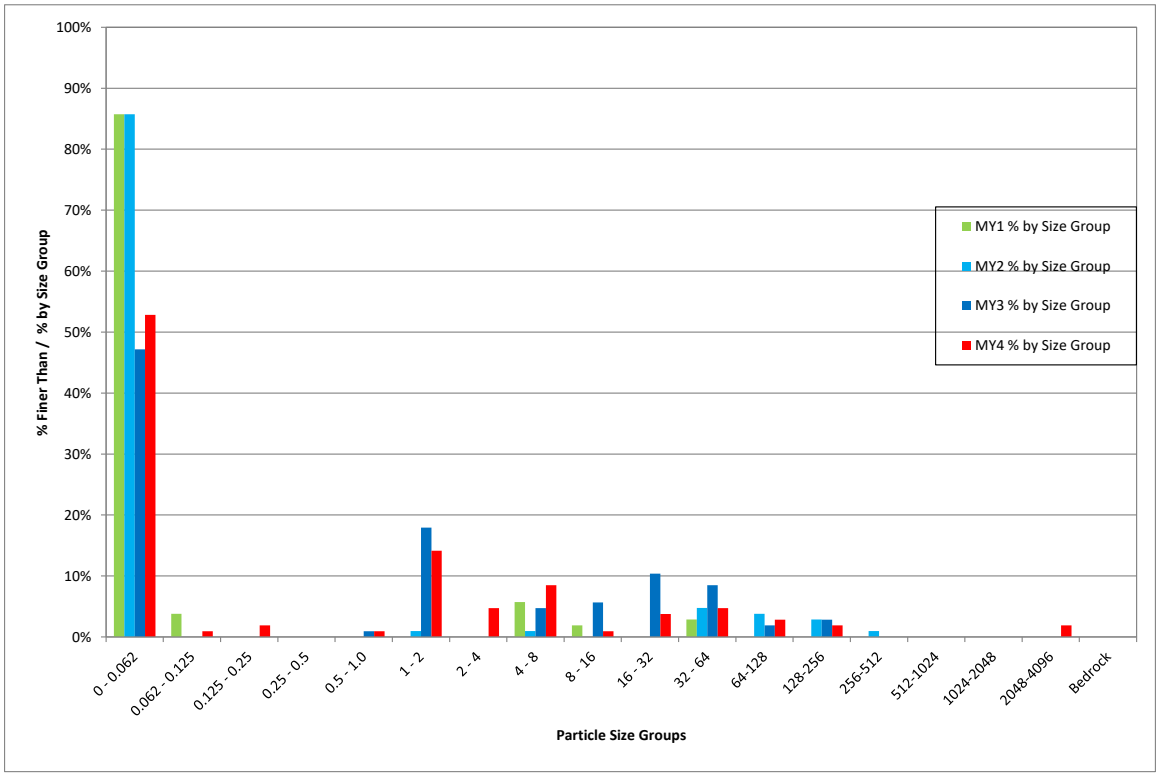
601N II			
Cross Section 1 - Riffle			
Monitoring Year - 2016; MY4			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	56	52.8%	53%
0.062 - 0.125	1	0.9%	54%
0.125 - 0.25	2	1.9%	56%
0.25 - 0.5	0	0.0%	56%
0.5 - 1.0	1	0.9%	57%
1 - 2	15	14.2%	71%
2 - 4	5	4.7%	75%
4 - 8	9	8.5%	84%
8 - 16	1	0.9%	85%
16 - 32	4	3.8%	89%
32 - 64	5	4.7%	93%
64-128	3	2.8%	96%
128-256	2	1.9%	98%
256-512	0	0.0%	98%
512-1024	0	0.0%	98%
1024-2048	0	0.0%	98%
2048-4096	2	1.9%	100%
Bedrock	0	0.0%	100%
Total	**106**	**100%**	**100%**
		Summary Data	
		D50	**0.062**
		D84	**8.1**
		D95	**78**

601NII Cross-Section 1 – Riffle
Pebble Count Percent Cumulative

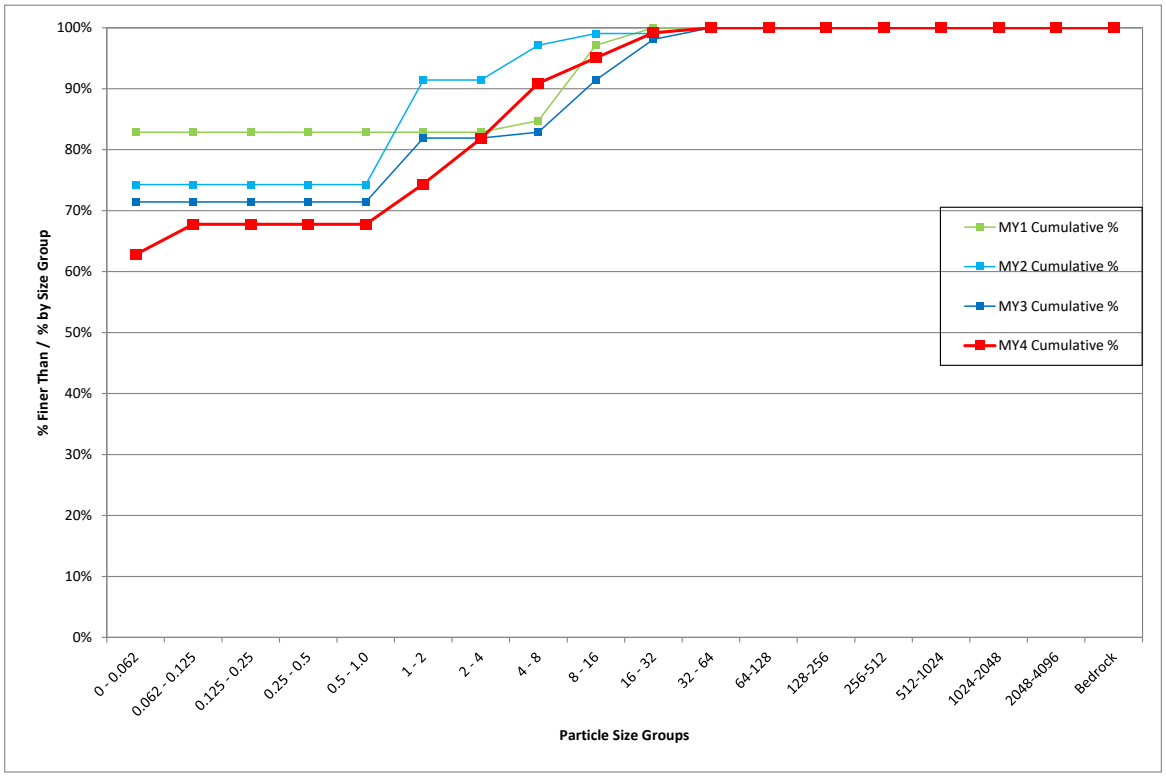


601NII Cross-Section 1 – Riffle
Pebble Count Percent Individual

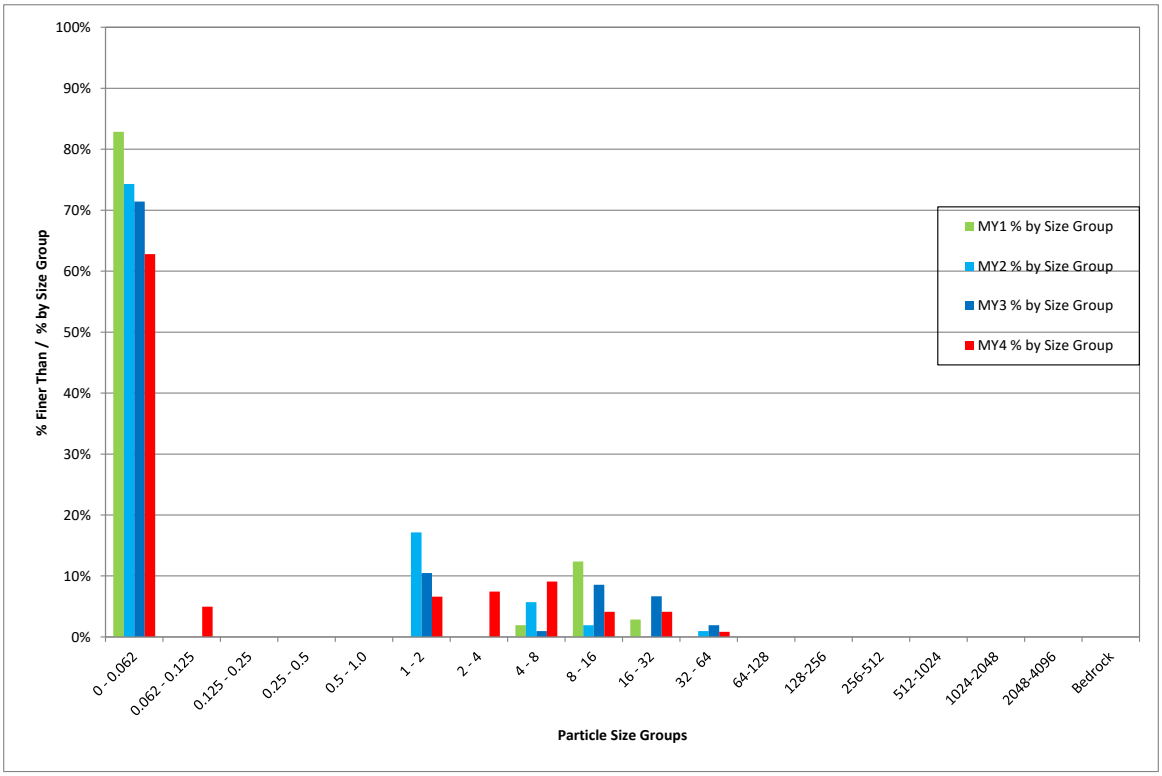


601N II			
Cross Section 2 - Pool			
Monitoring Year - 2016; MY4			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	76	62.8%	63%
0.062 - 0.125	6	5.0%	68%
0.125 - 0.25	0	0.0%	68%
0.25 - 0.5	0	0.0%	68%
0.5 - 1.0	0	0.0%	68%
1 - 2	8	6.6%	74%
2 - 4	9	7.4%	82%
4 - 8	11	9.1%	91%
8 - 16	5	4.1%	95%
16 - 32	5	4.1%	99%
32 - 64	1	0.8%	100%
64-128	0	0.0%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**121**	**100%**	**100%**
		Summary Data	
		D50	**0.062**
		D84	**5**
		D95	**16**

601NII Cross-Section 2 – Pool
Pebble Count Percent Cumulative

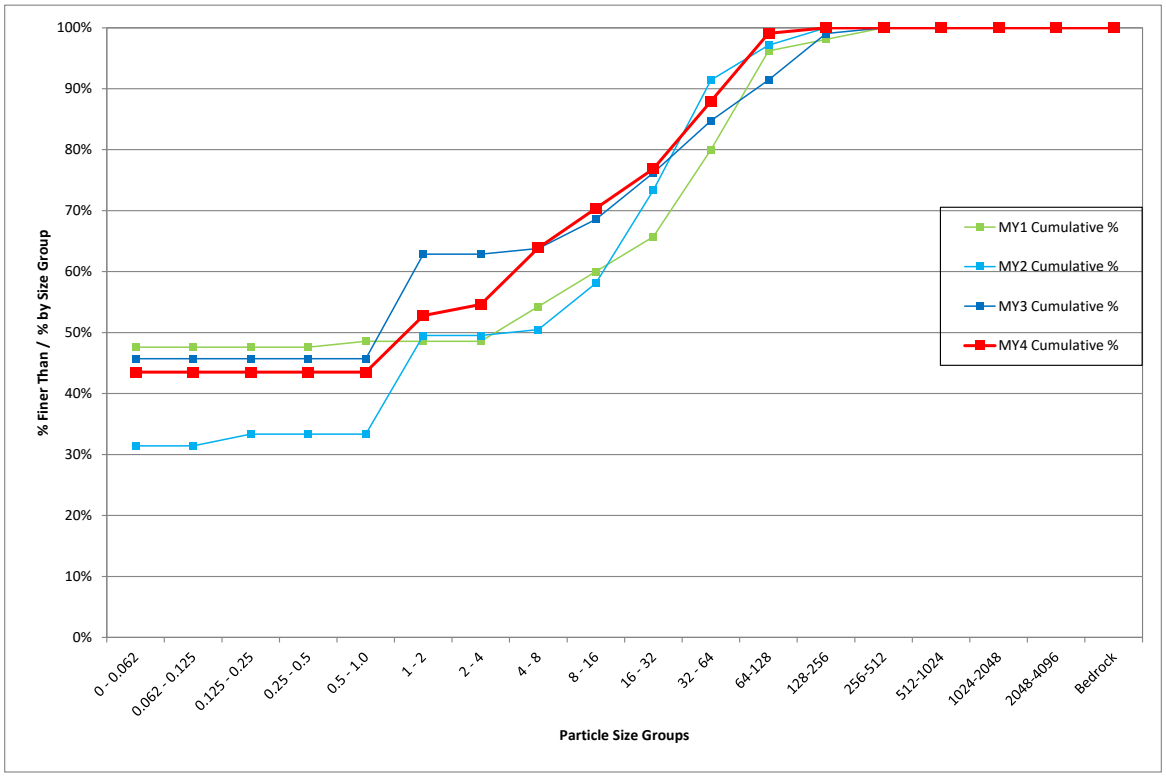


601NII Cross-Section 2 – Pool
Pebble Count Percent Individual

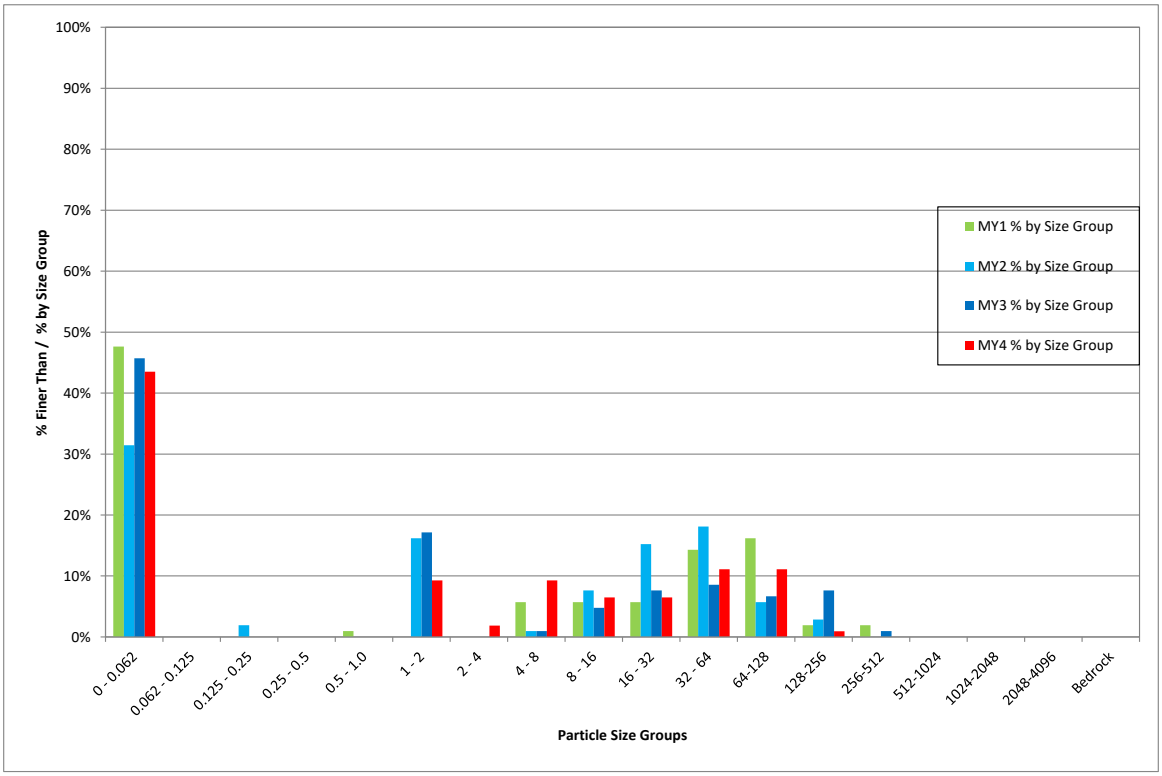


601N II			
Cross Section 3 - Riffle			
Monitoring Year - 2016; MY4			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	47	43.5%	44%
0.062 - 0.125	0	0.0%	44%
0.125 - 0.25	0	0.0%	44%
0.25 - 0.5	0	0.0%	44%
0.5 - 1.0	0	0.0%	44%
1 - 2	10	9.3%	53%
2 - 4	2	1.9%	55%
4 - 8	10	9.3%	64%
8 - 16	7	6.5%	70%
16 - 32	7	6.5%	77%
32 - 64	12	11.1%	88%
64-128	12	11.1%	99%
128-256	1	0.9%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**108**	**100%**	**100%**
		Summary Data	
		D50	**1.6**
		D84	**53**
		D95	**94**

601NII Cross-Section 3 – Riffle
Pebble Count Percent Cumulative

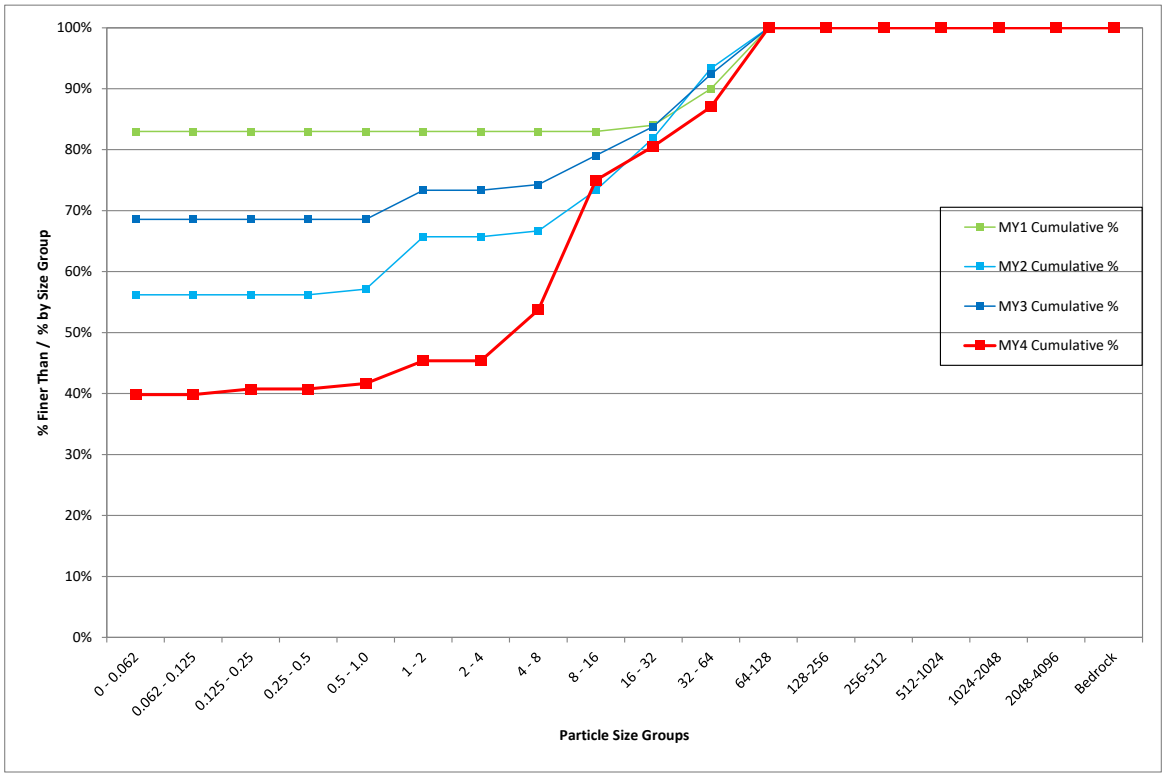


601NII Cross-Section 3 – Riffle
Pebble Count Percent Individual

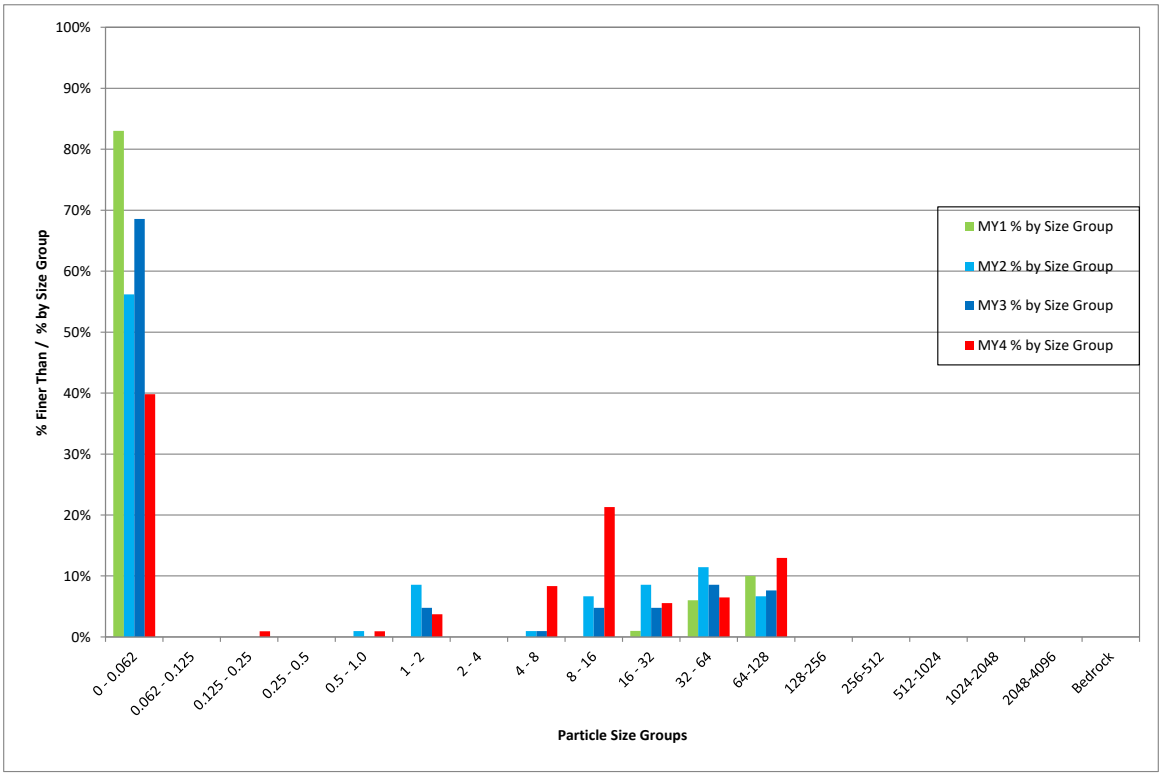


601N II			
Cross Section 4 - Riffle			
Monitoring Year - 2016; MY4			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	43	39.8%	40%
0.062 - 0.125	0	0.0%	40%
0.125 - 0.25	1	0.9%	41%
0.25 - 0.5	0	0.0%	41%
0.5 - 1.0	1	0.9%	42%
1 - 2	4	3.7%	45%
2 - 4	0	0.0%	45%
4 - 8	9	8.3%	54%
8 - 16	23	21.3%	75%
16 - 32	6	5.6%	81%
32 - 64	7	6.5%	87%
64-128	14	13.0%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**108**	**100%**	**100%**
		Summary Data	
		D50	**6.9**
		D84	**51**
		D95	**89**

601NII Cross-Section 4 – Riffle
Pebble Count Percent Cumulative

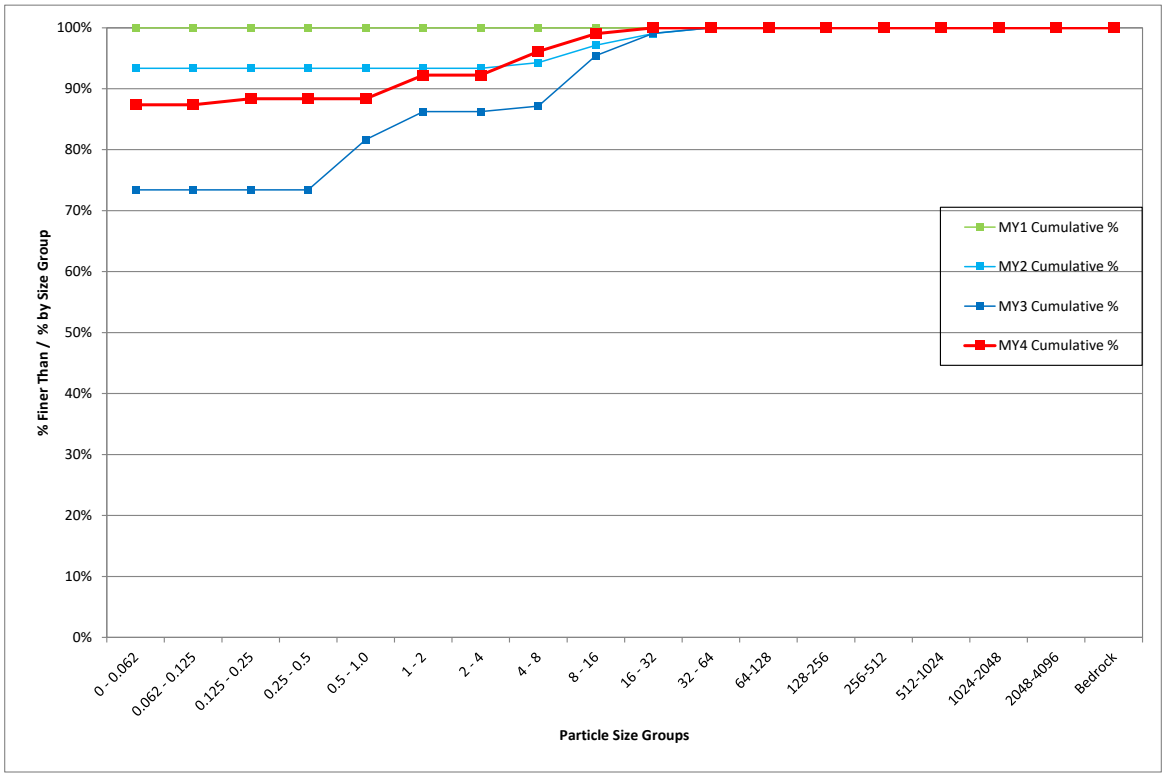


601NII Cross-Section 4 – Riffle
Pebble Count Percent Individual

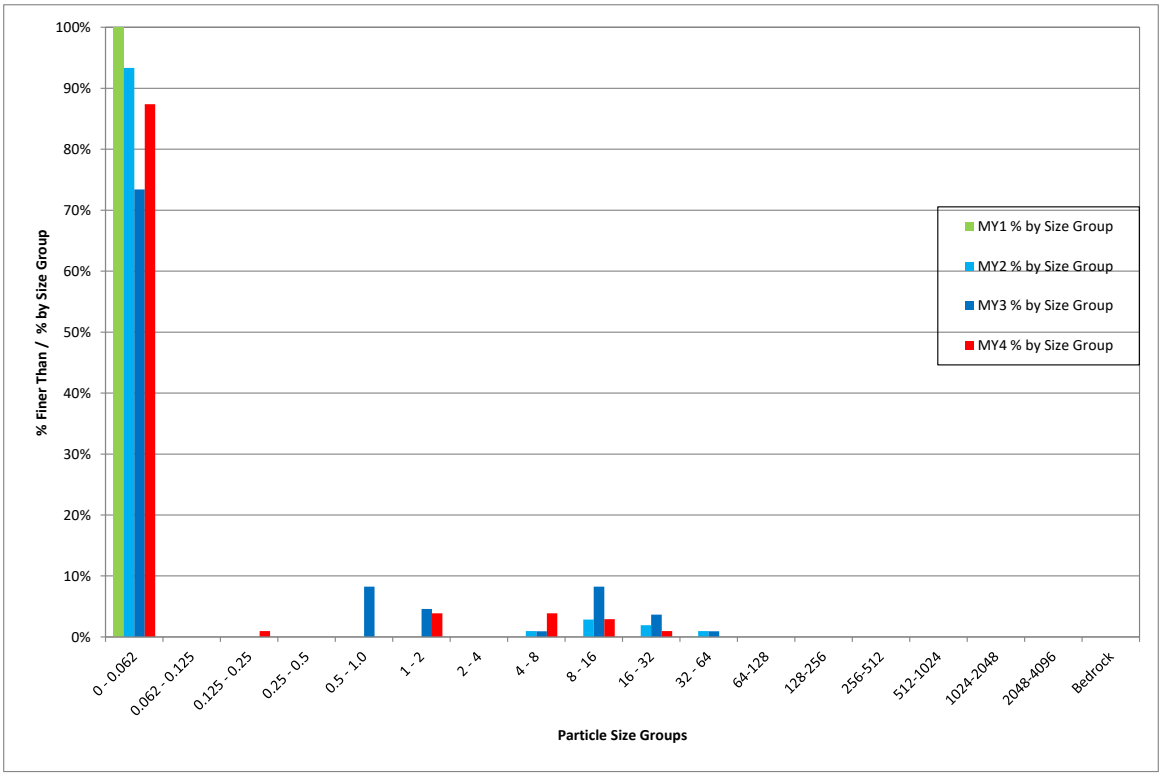


601N II			
Cross Section 5 - Pool			
Monitoring Year - 2016; MY4			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	90	87.4%	87%
0.062 - 0.125	0	0.0%	87%
0.125 - 0.25	1	1.0%	88%
0.25 - 0.5	0	0.0%	88%
0.5 - 1.0	0	0.0%	88%
1 - 2	4	3.9%	92%
2 - 4	0	0.0%	92%
4 - 8	4	3.9%	96%
8 - 16	3	2.9%	99%
16 - 32	1	1.0%	100%
32 - 64	0	0.0%	100%
64-128	0	0.0%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**103**	**100%**	**100%**
		Summary Data	
		D50	**0.062**
		D84	**0.062**
		D95	**7.2**

601NII Cross-Section 5 – Pool
Pebble Count Percent Cumulative

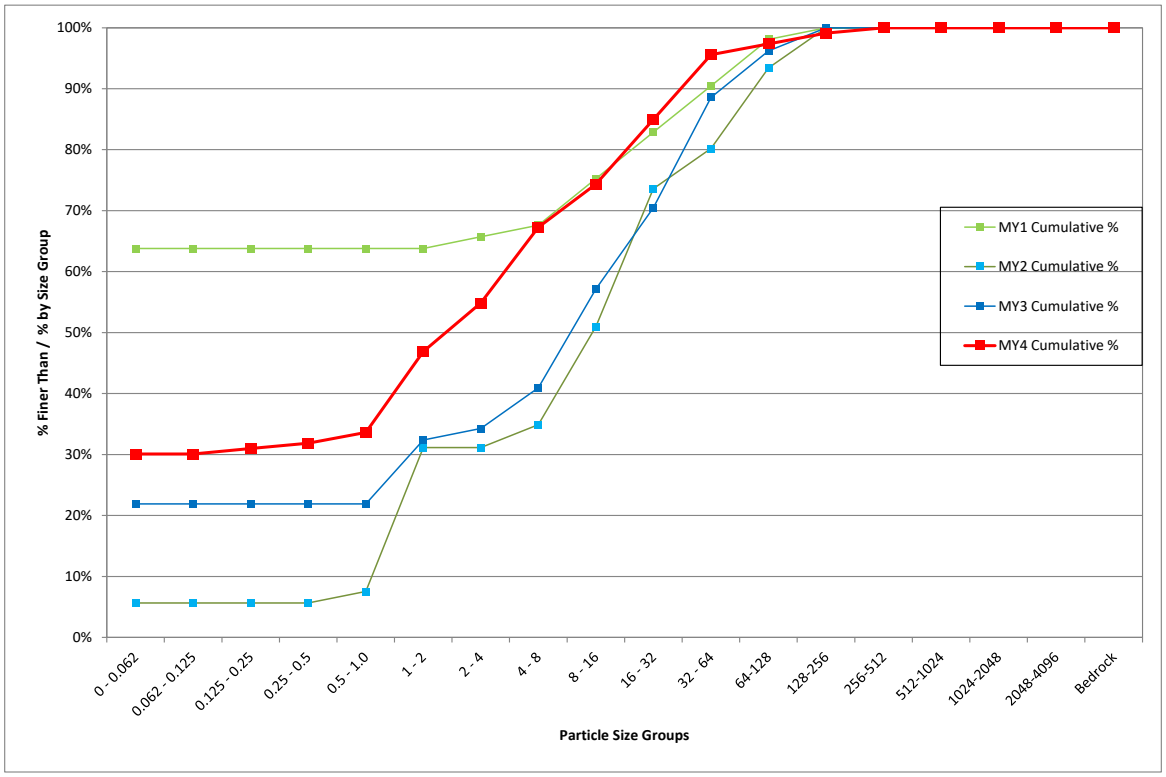


601NII Cross-Section 5 – Pool
Pebble Count Percent Individual

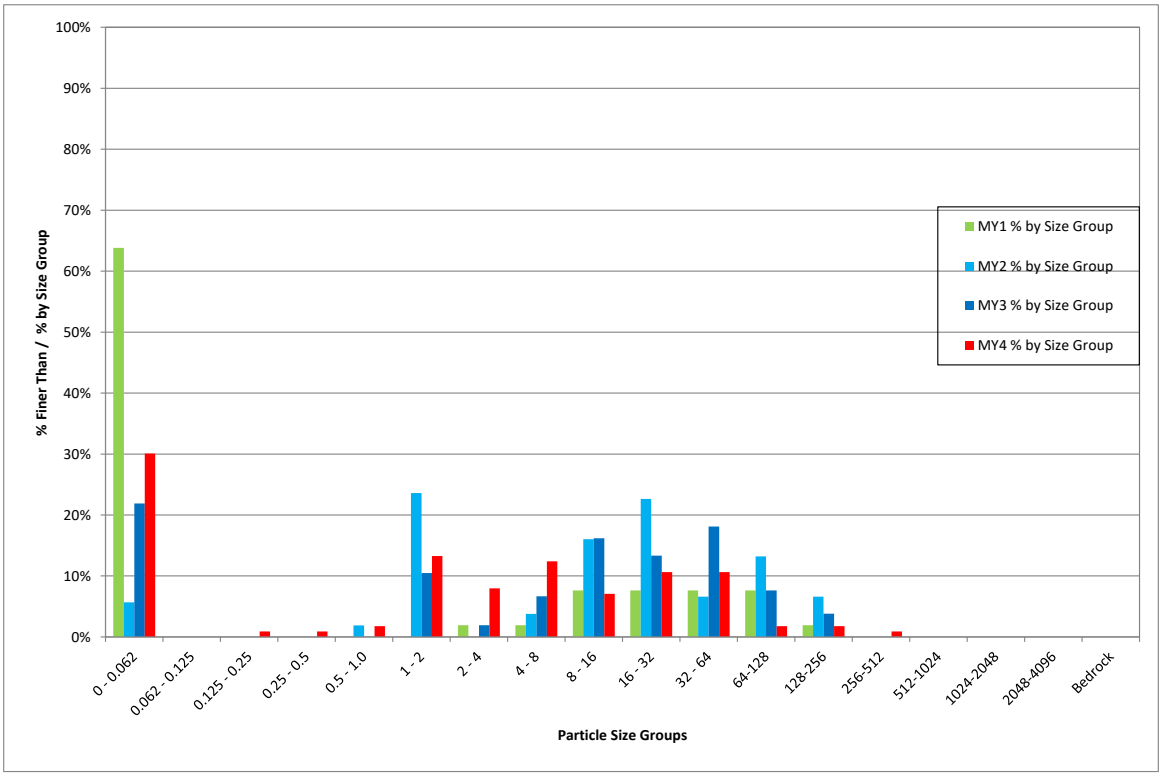


601N II			
Cross Section 6 - Riffle			
Monitoring Year - 2016; MY4			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	34	30.1%	30%
0.062 - 0.125	0	0.0%	30%
0.125 - 0.25	1	0.9%	31%
0.25 - 0.5	1	0.9%	32%
0.5 - 1.0	2	1.8%	34%
1 - 2	15	13.3%	47%
2 - 4	9	8.0%	55%
4 - 8	14	12.4%	67%
8 - 16	8	7.1%	74%
16 - 32	12	10.6%	85%
32 - 64	12	10.6%	96%
64-128	2	1.8%	97%
128-256	2	1.8%	99%
256-512	1	0.9%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**113**	**100%**	**100%**
		Summary Data	
		D50	**2.6**
		D84	**30**
		D95	**62**

601NII Cross-Section 6 – Riffle
Pebble Count Percent Cumulative

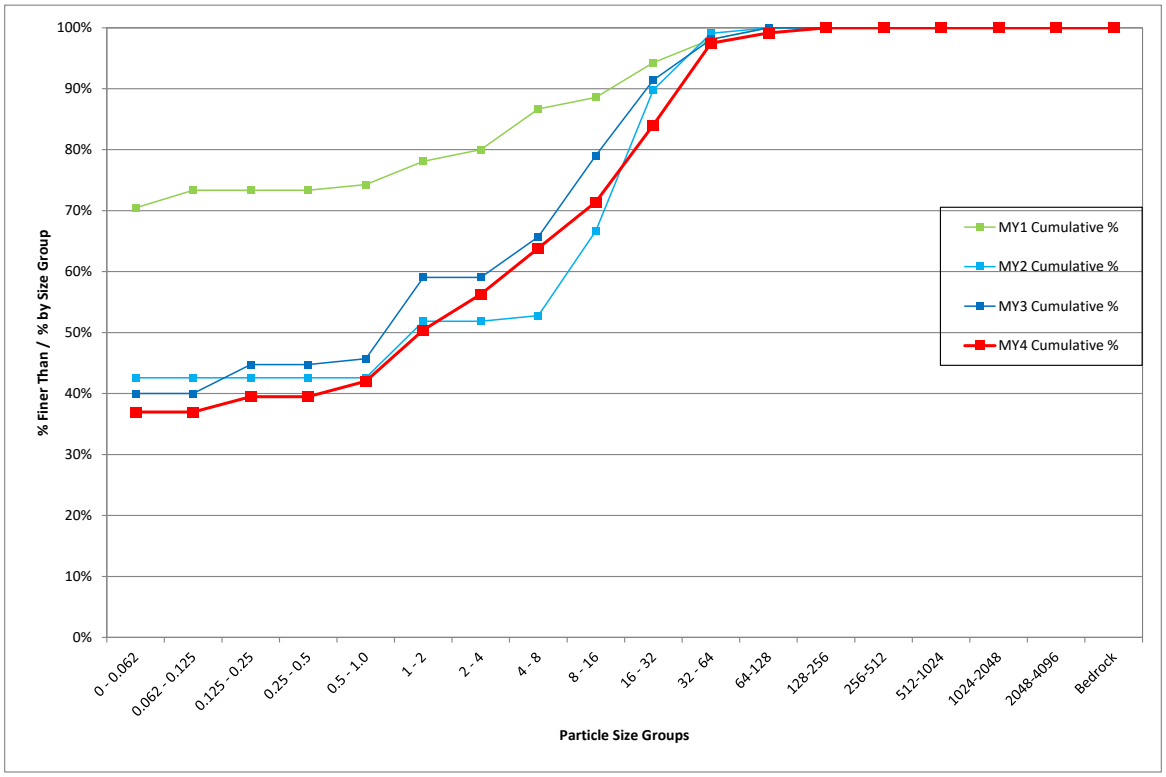


601NII Cross-Section 6 – Riffle
Pebble Count Percent Individual

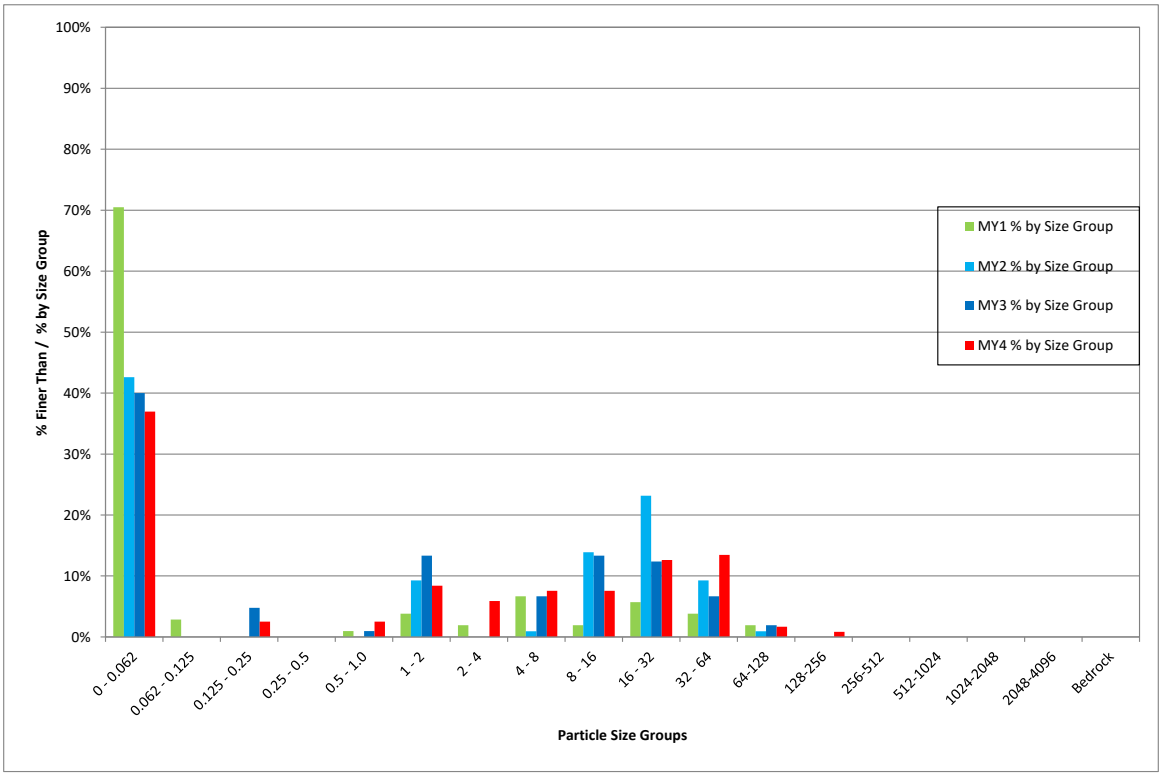


601N II			
Cross Section 7 - Pool			
Monitoring Year - 2016; MY4			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	44	37.0%	37%
0.062 - 0.125	0	0.0%	37%
0.125 - 0.25	3	2.5%	39%
0.25 - 0.5	0	0.0%	39%
0.5 - 1.0	3	2.5%	42%
1 - 2	10	8.4%	50%
2 - 4	7	5.9%	56%
4 - 8	9	7.6%	64%
8 - 16	9	7.6%	71%
16 - 32	15	12.6%	84%
32 - 64	16	13.4%	97%
64-128	2	1.7%	99%
128-256	1	0.8%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**119**	**100%**	**100%**
		Summary Data	
		D50	**1.9**
		D84	**32**
		D95	**55**

601NII Cross-Section 7 – Pool
Pebble Count Percent Cumulative

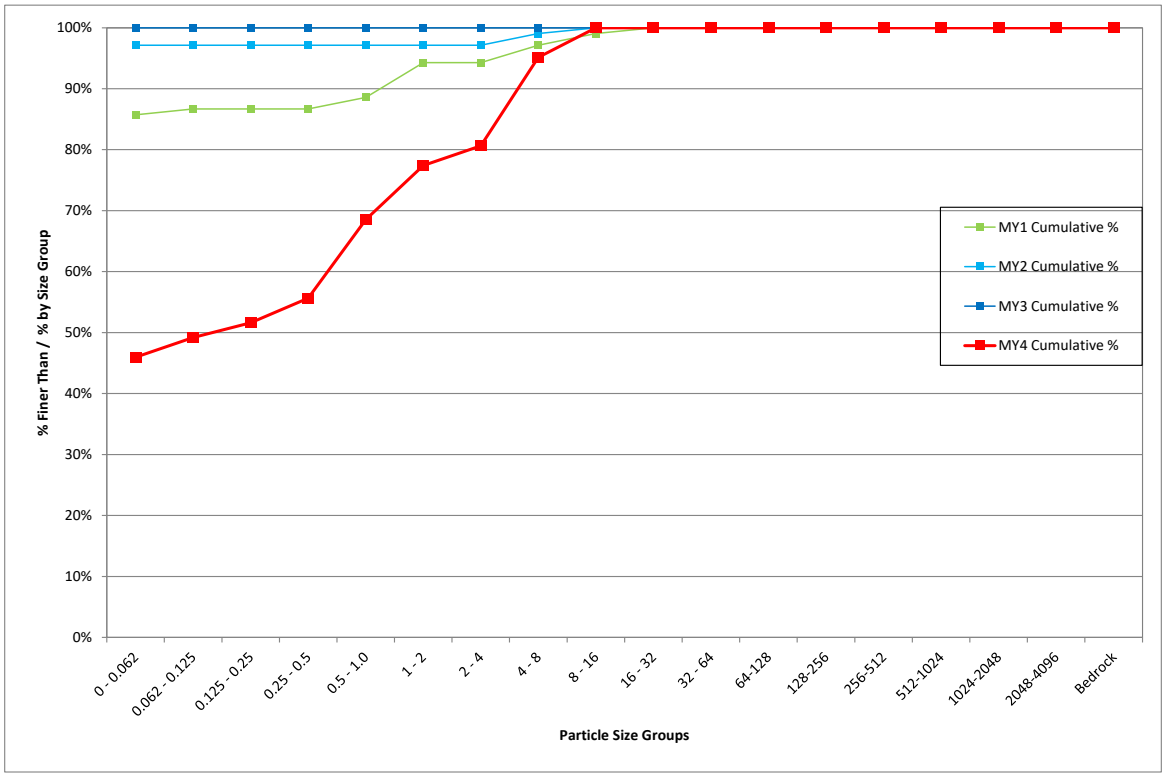


601NII Cross-Section 7 – Pool
Pebble Count Percent Individual

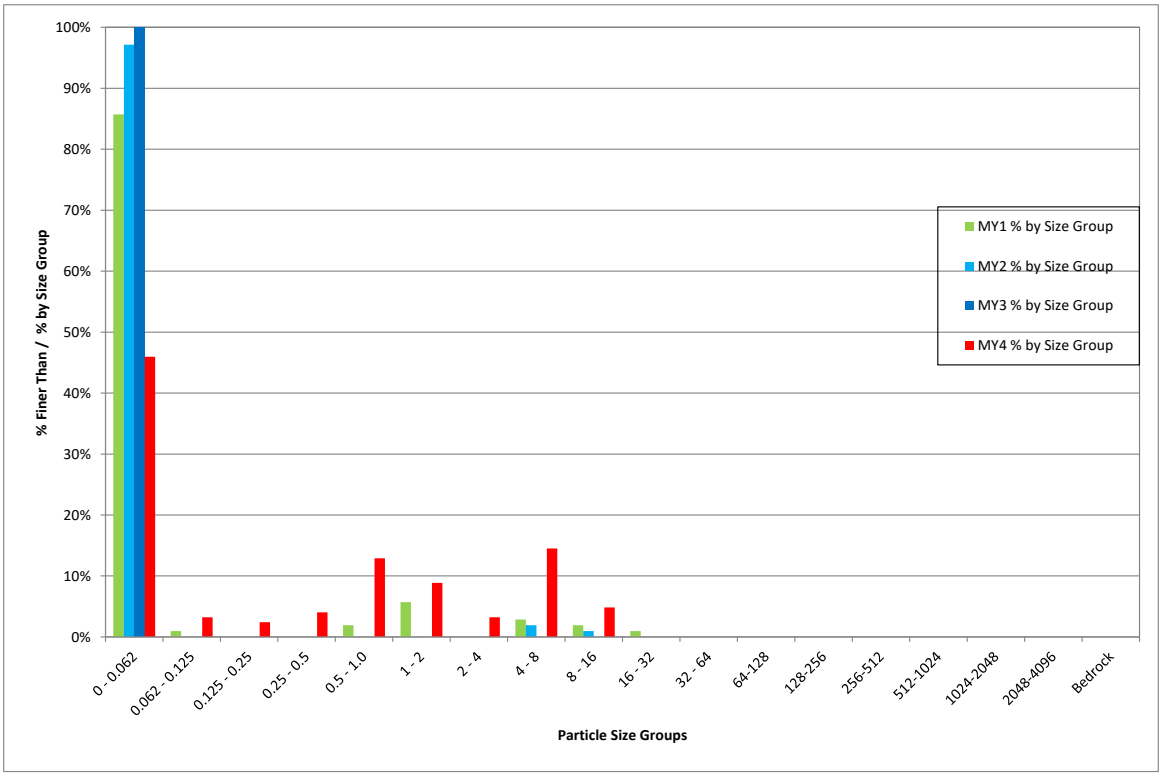


601N II			
Cross Section 8 - Pool			
Monitoring Year - 2016; MY4			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	57	46.0%	46%
0.062 - 0.125	4	3.2%	49%
0.125 - 0.25	3	2.4%	52%
0.25 - 0.5	5	4.0%	56%
0.5 - 1.0	16	12.9%	69%
1 - 2	11	8.9%	77%
2 - 4	4	3.2%	81%
4 - 8	18	14.5%	95%
8 - 16	6	4.8%	100%
16 - 32	0	0.0%	100%
32 - 64	0	0.0%	100%
64-128	0	0.0%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**124**	**100%**	**100%**
		Summary Data	
		D50	**0.16**
		D84	**4.7**
		D95	**7.9**

601NII Cross-Section 8 – Pool
Pebble Count Percent Cumulative

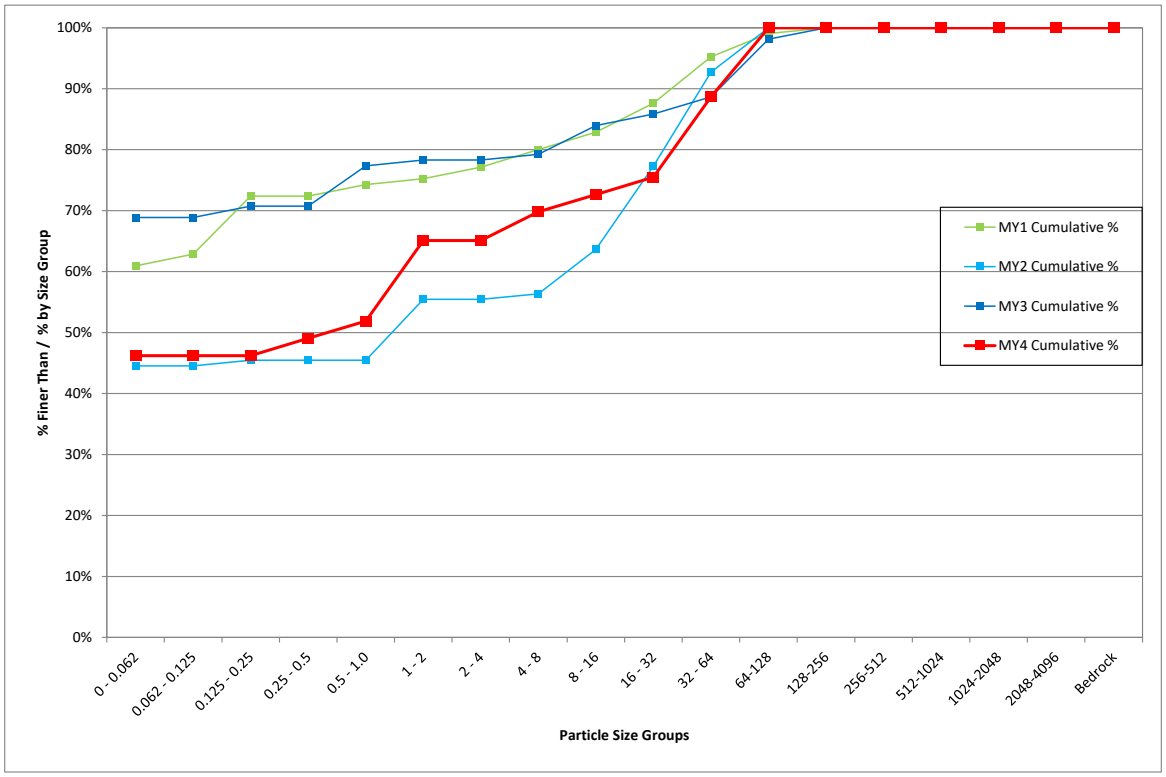


601NII Cross-Section 8 – Pool
Pebble Count Percent Individual

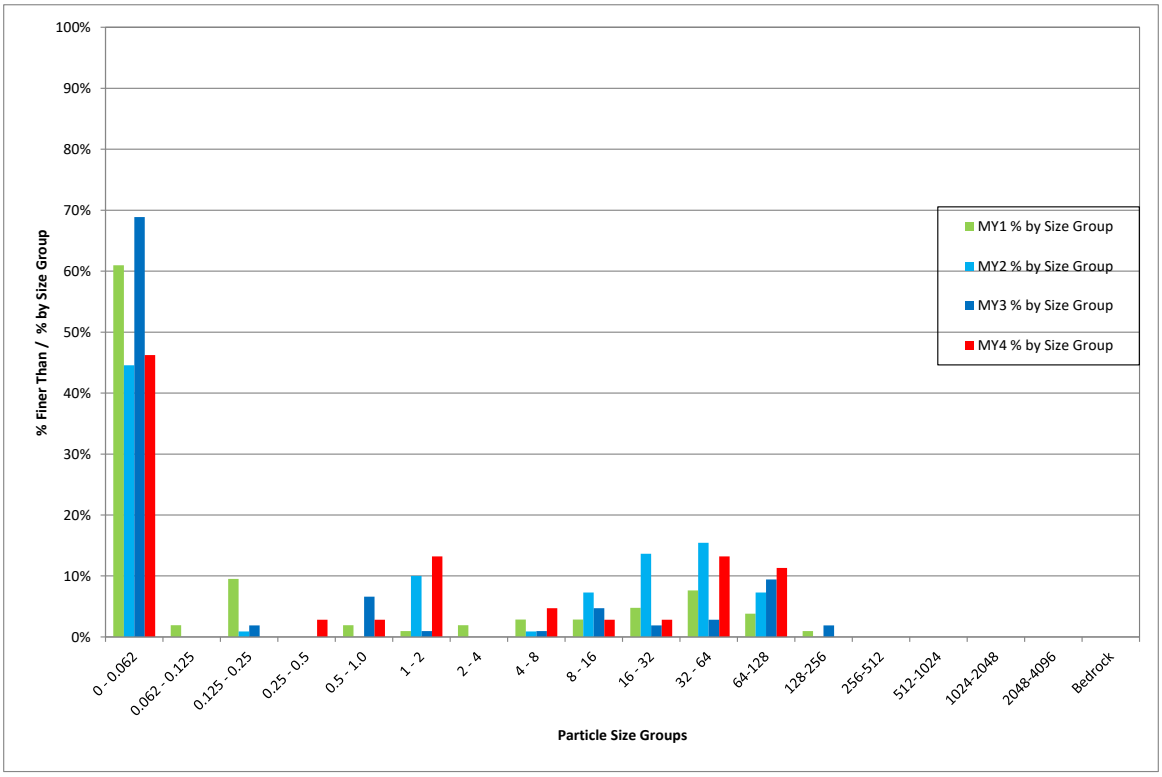


601N II			
Cross Section 9 - Riffle			
Monitoring Year - 2016; MY4			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	49	46.2%	46%
0.062 - 0.125	0	0.0%	46%
0.125 - 0.25	0	0.0%	46%
0.25 - 0.5	3	2.8%	49%
0.5 - 1.0	3	2.8%	52%
1 - 2	14	13.2%	65%
2 - 4	0	0.0%	65%
4 - 8	5	4.7%	70%
8 - 16	3	2.8%	73%
16 - 32	3	2.8%	75%
32 - 64	14	13.2%	89%
64-128	12	11.3%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**106**	**100%**	**100%**
		Summary Data	
		D50	**0.63**
		D84	**48**
		D95	**85**

601NII Cross-Section 9 – Riffle
Pebble Count Percent Cumulative

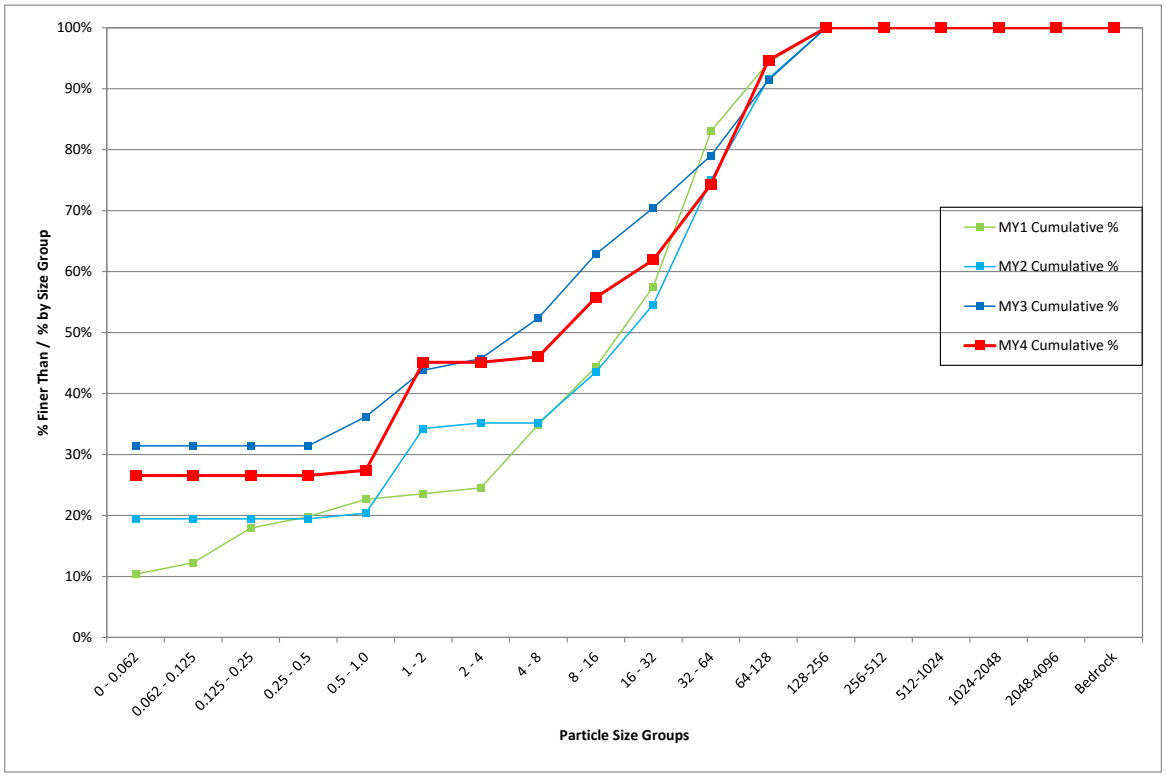


601NII Cross-Section 9 – Riffle
Pebble Count Percent Individual



601N II			
Cross Section 10 - Riffle			
Monitoring Year - 2016; MY4			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	30	26.5%	27%
0.062 - 0.125	0	0.0%	27%
0.125 - 0.25	0	0.0%	27%
0.25 - 0.5	0	0.0%	27%
0.5 - 1.0	1	0.9%	27%
1 - 2	20	17.7%	45%
2 - 4	0	0.0%	45%
4 - 8	1	0.9%	46%
8 - 16	11	9.7%	56%
16 - 32	7	6.2%	62%
32 - 64	14	12.4%	74%
64-128	23	20.4%	95%
128-256	6	5.3%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**113**	**100%**	**100%**
		Summary Data	
		D50	**11**
		D84	**83**
		D95	**130**

601NII Cross-Section 10 – Riffle
Pebble Count Percent Cumulative



601NII Cross-Section 10 – Riffle
Pebble Count Percent Individual

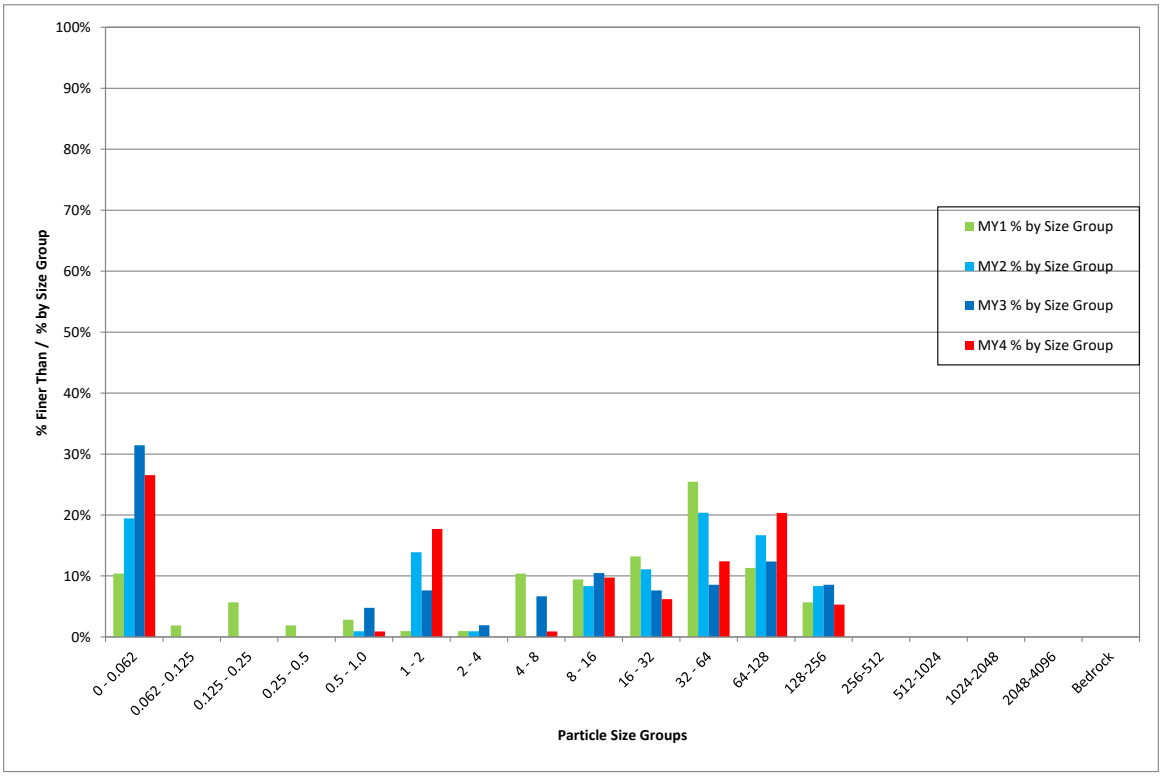


Table 10. Baseline Stream Data Summary
601 North II Stream Restoration Site – EEP Contract No. 003991- Segment/Reach: Wicker Branch Reach 1 (Sta 0+00 – 6+60)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data (UT to Rays Fork)						Design			Monitoring Baseline					
Dimension and Substrate - Riffle	LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	---	---	6.8	---	11.7	---	---	---	1	---	8.2	---	---	---	1	---	6.0	---	---	11.4	---	---	---	1
Floodprone Width (ft)				---	15.6	---	---	---	1	---	105.0	---	---	---	1	25	30	35	---	59.7	---	---	---	1
Bankfull Mean Depth (ft)	---	---	1.0	---	0.5	---	---	---	1	---	0.8	---	---	---	1	---	0.9	---	---	0.7	---	---	---	1
[1]Bankfull Max Depth (ft)				---	0.8	---	---	---	1	---	2.2	---	---	---	1	---	1.2	---	---	1.3	---	---	---	1
Bankfull Cross Sectional Area (ft^2)	---	---	8.8	---	5.5	---	---	---	1	---	6.3	---	---	---	1	---	5.5	---	---	7.9	---	---	---	1
Width/Depth Ratio				---	24.9	---	---	---	1	---	10.6	---	---	---	1	---	6.5	---	---	16.6	---	---	---	1
Entrenchment Ratio				---	1.3	---	---	---	1	---	12.8	---	---	---	1	4.2	5.0	5.8	---	5.2	---	---	---	1
[1]Bank Height Ratio				---	2.6	---	---	---	1	---	1.0	---	---	---	1	---	1.0	---	---	1.0	---	---	---	1
d50 (mm)				---	<2.0	---	---	---	1	---	6.5	---	---	---	1	16	24	32	---	28.7	---	---	---	1
Profile																								
Riffle Length (ft)				The existing stream channel did not display riffle-pool sequencing due to historic dredging and straightening.						3.3	7.5	---	15.5	---	---	5.0	8.0	15.0	4.2	12.3	11.5	33.3	6.0	22
Riffle Slope (ft/ft)										0.007	0.042	---	0.085	---	---	0.008	0.023	0.040	0.001	0.017	0.017	0.043	0.013	22
Pool Length (ft)										9.0	13.0	---	19.0	---	---	9.0	13.0	19.0	4.7	10.8	10.4	20.0	4.2	20
Pool Max depth (ft)										0.8	1.3	---	1.9	---	---	---	2.0	---	1.4	1.9	1.9	2.2	0.2	20
Pool Spacing (ft)										14.0	21.0	---	32.0	---	---	14.0	30.0	65.0	18.4	30.7	26.9	57.8	10.0	19
Pattern																								
Channel Beltwidth (ft)				The existing stream channel did not display plan form geometry due to historic dredging and straightening						12.0	19.0	---	23.0	---	---	12.0	19.0	26.0	13.4	20.1	20.2	29.7	4.0	21
Radius of Curvature (ft)										10.0	16.0	---	39.0	---	---	12.0	18.0	39.0	14.4	17.9	16.4	27.7	3.9	23
Rc:Bankfull width (ft/ft)										1.2	2.0	---	4.8	---	---	1.9	2.9	6.5	1.3	1.6	1.4	2.4	0.3	23
Meander Wavelength (ft)										31.4	45.3	---	61.4	---	---	36.0	53.0	73.0	13.7	51.5	51.8	87.9	15.3	21
Meander Width Ratio										1.5	2.3	---	2.8	---	---	2.0	3.1	4.4	1.2	4.5	4.5	7.7	1.3	21
Substrate, bed, and transport parameters																								
[4]d16 / d35 / d50 / d84 / d95 / dip / disp (mm)				<2	<2	<2	<2	<2	<2	<2	6.3	10.6	17.3	57.9	113.9	76.0	123.0							
Reach Shear Stress (competency) lb/f^2				---														0.5	0.4					
Max part size (mm) mobilized at bankfull				---														74.6	77.5					
Stream Power (transport capacity) W/m^2				---														1.6	1.0					
Additional Reach Parameters																								
Drainage Area (SM)				0.3						0.19														
Impervious Surface estimate (%)				<1						<1														
Rosgen Classification				F6						E4								E4	C4					
Bankfull Velocity (fps)	---	---	---	HEC-RAS: 2.8 (1.3-3.9)														HEC-RAS: 3.5 (3.3-4.1)	3.5					
Bankfull Discharge (cfs)	---	---	34.7	19.6																				
Valley length (ft)				610						240														
Channel Thalweg length (ft)				630						284								707	660					
Sinuosity (ft)				1.0						1.2								1.2	1.1					
BF slope (ft/ft)				0.009						0.016								0.008	0.009					
BEHI VL% / L% / M% / H% / VH% / E%				100	0	0	0	0	0	---	---	---	---	---	---									

Table 10 cont'd. Baseline Stream Data Summary
601 North II Stream Restoration Site – EEP Contract No. 003991- Segment/Reach: Wicker Branch Reach 2 (6+60-24+35)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data (UT to Rays Fork)						Design			Monitoring Baseline					
Dimension and Substrate - Riffle	LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	---	---	8.4	10.8	12.0	12.0	13.1	1.6	2	---	8.2	---	---	---	1	---	8.0	---	11.5	11.6	11.6	11.6	0.1	2
Floodprone Width (ft)				30.3	78.3	78.3	126.2	67.8	2	---	105.0	---	---	---	1	35.0	47.5	60.0	69.2	69.5	69.5	69.7	0.4	2
Bankfull Mean Depth (ft)	---	---	1.2	0.9	1.0	1.0	1.0	0.1	2	---	0.8	---	---	---	1	---	1.3	---	1.1	1.1	1.1	1.1	0.0	2
[1]Bankfull Max Depth (ft)				1.3	1.4	1.4	1.5	0.1	2	---	2.2	---	---	---	1	---	1.7	---	1.7	1.8	1.8	1.8	0.1	2
Bankfull Cross Sectional Area (ft^2)	---	---	12.5	10.5	11.1	11.1	11.7	0.8	2	---	6.3	---	---	---	1	---	10.5	---	12.1	12.6	12.6	13.0	0.6	2
Width/Depth Ratio				11.0	12.9	12.9	14.7	2.6	2	---	10.6	---	---	---	1	---	6.1	---	10.4	10.6	10.6	10.8	0.3	2
Entrenchment Ratio				2.3	7.0	7.0	11.7	6.6	2	---	12.8	---	---	---	1	4.3	5.9	7.5	6.0	6.0	6.0	6.0	0.0	2
[1]Bank Height Ratio				1.3	1.6	1.6	1.8	0.4	2	---	1.0	---	---	---	1	---	1.0	---	1.0	1.0	1.0	1.0	0.0	2
d50 (mm)					23.0				1	---	17.3	---	---	---	1	16.0	24.0	32.0	19.3	21.4	21.4	23.5	3.0	2
Profile																								
Riffle Length (ft)				The existing stream channel did not display riffle-pool sequencing due to historic dredging and straightening.						3.3	7.5	---	15.5	---	---	5.0	15.0	25.0	6.3	17.3	18.1	38.7	7.5	33
Riffle Slope (ft/ft)										0.0073	0.0422	---	0.085	---	---	0.005	0.016	0.03	0.001	0.017	0.013	0.062	0.013	33
Pool Length (ft)										9.0	13.0	---	19.0	---	---	5.0	22.0	40.0	6.1	24.2	23.7	62.0	11.9	33
Pool Max depth (ft)										0.8	1.3	---	1.9	---	---	---	2.8	---	1.7	2.9	2.8	3.8	0.4	33
Pool Spacing (ft)										14.0	21.0	---	32.0	---	---	30.0	52.0	80.0	25.5	53.6	53.2	103.3	19.5	32
Pattern																								
Channel Beltwidth (ft)				The existing stream channel did not display plan form geometry due to historic dredging and straightening						12.0	19.0	---	23.0	---	---	16.0	33.0	50.0	18.3	31.1	30.6	49.5	8.8	24
Radius of Curvature (ft)										10.0	16.0	---	39.0	---	---	21.0	38.0	67.0	28.3	40.2	37.8	61.8	10.1	28
Rc:Bankfull width (ft/ft)										1.2	2.0	---	4.8	---	---	2.6	4.8	8.4	2.4	3.5	3.3	5.3	0.9	28
Meander Wavelength (ft)										31.4	45.3	---	61.4	---	---	61.0	104.0	148.0	13.7	114.4	113.3	226.5	46.9	24
Meander Width Ratio										1.5	2.3	---	2.8	---	---	1.9	3.7	5.7	1.2	9.9	9.8	19.5	4.0	24
Substrate, bed, and transport parameters																								
[4]d16 / d35 / d50 / d84 / d95 / dip / disp (mm)				2.9	9.2	23.0	75.8	92.4	100.0	68.	6.3	10.6	17.3	57.9	113.	76.0	123.0							
Reach Shear Stress (competency) lb/f^2				0.5															0.7				0.5	
Max part size (mm) mobilized at bankfull				88.0															116.9				91.3	
Stream Power (transport capacity) W/m^2				2.3															3.2				1.8	
Additional Reach Parameters																								
Drainage Area (SM)				0.5						0.19														
Impervious Surface estimate (%)				<1						<1														
Rosgen Classification				E1/C1						E4									E4				E4	
Bankfull Velocity (fps)	---	---	---	HEC-RAS: 2.7 (1.2-5.2)															HEC-RAS: 4.3 (3.3-5.1)				4.0 (XS6) – 4.1 (XS9)	
Bankfull Discharge (cfs)	---	---	50.1	48.5																				
Valley length (ft)				1400						240													1550	
Channel Thalweg length (ft)				1356						284									1653				1775	
Sinuosity (ft)				1.0						1.2									1.2				1.2	
BF slope (ft/ft)				0.009						0.016									0.009				0.007	
BEHI VL% / L% / M% / H% / VH% / E%				7	0	0	48	10	35	---	---	---	---	---	---									

Table 10 cont'd. Baseline Stream Data Summary
601 North II Stream Restoration Site – EEP Contract No. 003991- Segment/Reach: Wicker Branch Reach 3 (24+35-27+08)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data (UT to Rays						Design			Monitoring Baseline					
Dimension and Substrate - Riffle	LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	---	---	9.3	---	10.0	---	---	---	1	---	8.2	---	---	---	1	---	10.0	---	---	---	---	---	---	---
Floodprone Width (ft)				---	11.9	---	---	---	1	---	105.0	---	---	---	1	40.0	55.0	70.0	---	---	---	---	---	---
Bankfull Mean Depth (ft)	---	---	1.3	---	1.4	---	---	---	1	---	0.8	---	---	---	1	---	1.4	---	---	---	---	---	---	---
[1]Bankfull Max Depth (ft)				---	1.9	---	---	---	1	---	2.2	---	---	---	1	---	1.8	---	---	---	---	---	---	---
Bankfull Cross Sectional Area (ft^2)	---	---	14.6	---	14.1	---	---	---	1	---	6.3	---	---	---	1	---	14.1	---	---	---	---	---	---	---
Width/Depth Ratio				---	7.0	---	---	---	1	---	10.6	---	---	---	1	---	7.1	---	---	---	---	---	---	---
Entrenchment Ratio				---	1.2	---	---	---	1	---	12.8	---	---	---	1	4.0	5.5	7.0	---	---	---	---	---	---
[1]Bank Height Ratio				---	2.0	---	---	---	1	---	1.0	---	---	---	1	---	1.0	---	---	---	---	---	---	---
d50 (mm)				---	8.0	---	---	---	1	---	17.3	---	---	---	1	16.0	24.0	32.0	---	---	---	---	---	---
Profile																								
Riffle Length (ft)				The existing stream channel did not display riffle-pool sequencing due to historic dredging and straightening.						3.3	7.5	---	15.5	---	---	10.0	20.0	30.0	---	---	---	---	---	---
Riffle Slope (ft/ft)										0.007	0.0422	---	0.0854	---	---	0.009	0.016	0.03	---	---	---	---	---	---
Pool Length (ft)										9.0	13.0	---	19.0	---	---	5.0	24.0	50.0	---	---	---	---	---	---
Pool Max depth (ft)										0.8	1.3	---	1.9	---	---	---	3.0	---	---	---	---	---	---	---
Pool Spacing (ft)										14.0	21.0	---	32.0	---	---	30.0	61.0	95.0	---	---	---	---	---	---
Pattern																								
Channel Beltwidth (ft)				The existing stream channel did not display plan form geometry due to historic dredging and straightening						12.0	19.0	---	23.0	---	---	23.0	41.0	57.0	---	---	---	---	---	---
Radius of Curvature (ft)										10.0	16.0	---	39.0	---	---	30.0	37.0	40.0	---	---	---	---	---	---
Rc:Bankfull width (ft/ft)										1.2	2.0	---	4.8	---	---	3.0	3.7	4.0	---	---	---	---	---	---
Meander Wavelength (ft)										31.4	45.3	---	61.4	---	---	112.0	127.0	142.0	---	---	---	---	---	---
Meander Width Ratio										1.5	2.3	---	2.8	---	---	2.3	4.1	5.7	---	---	---	---	---	---
Substrate, bed, and transport parameters																								
[4]d16 / d35 / d50 / d84 / d95 / dip / disp (mm)				2.0	5.2	8.0	20.3	29.7	34.0	45.0	6.3	10.6	17.3	57.9	113.9	76.0	123.0							
Reach Shear Stress (competency) lb/f^2				0.75														0.73	---					
Max part size (mm) mobilized at bankfull				123														120	---					
Stream Power (transport capacity) W/m^2				3.7														3.6	---					
Additional Reach Parameters																								
Drainage Area (SM)				0.6							0.19													
Impervious Surface estimate (%)				<1							<1													
Rosgen Classification				G4							E4							E4	---					
Bankfull Velocity (fps)	---	---	---	HEC-RAS: 3.6 (2.4-4.8)							---							HEC-RAS: 4.0 (3.2-4.7)	---					
Bankfull Discharge (cfs)	---	---	59.4	69.2																				
Valley length (ft)				360							240								235					
Channel Thalweg length (ft)				414							284							470	273					
Sinuosity (ft)				1.2							1.2							1.2	1.2					
BF slope (ft/ft)				0.009							0.016							0.008	---					
BEHI VL% / L% / M% / H% / VH% / E%				0	0	0	0	0	100		---	---	---	---	---	---	---							

Table 10 cont'd. Baseline Stream Data Summary
601 North II Stream Restoration Site – EEP Contract No. 003991- Segment/Reach: UT to Wicker Branch Reach 5 (8+40-14+86)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data (UT to Rays						Design			Monitoring Baseline					
Dimension and Substrate - Riffle	LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	---	---	5.1	---	8.6	---	---	---	1	---	8.2	---	---	---	---	---	6.0	---	---	11.0	---	---	---	1
Floodprone Width (ft)				---	12.4	---	---	---	1	---	105.0	---	---	---	---	20.0	25.0	30.0	---	65.5	---	---	---	1
Bankfull Mean Depth (ft)	---	---	0.8	---	0.6	---	---	---	1	---	0.8	---	---	---	---	---	0.9	---	---	0.8	---	---	---	1
[1]Bankfull Max Depth (ft)				---	0.9	---	---	---	1	---	2.2	---	---	---	---	---	1.2	---	---	1.3	---	---	---	1
Bankfull Cross Sectional Area (ft^2)	---	---	5.6	---	5.4	---	---	---	1	---	6.3	---	---	---	---	---	5.5	---	---	8.5	---	---	---	1
Width/Depth Ratio				---	13.7	---	---	---	1	---	10.6	---	---	---	---	---	6.5	---	---	14.1	---	---	---	1
Entrenchment Ratio				---	1.4	---	---	---	1	---	12.8	---	---	---	---	3.3	4.1	5.0	---	6.0	---	---	---	1
[1]Bank Height Ratio				---	2.3	---	---	---	1	---	1.0	---	---	---	---		1.0		---	1.0	---	---	---	1
d50 (mm)				---	49.4	---	---	---	1	---	17.3	---	---	---	---	16.0	24.0	32.0	---	25.7	---	---	---	1
Profile*																								
Riffle Length (ft)				The existing stream channel did not display riffle-pool sequencing due to historic dredging and straightening.						3.3	7.5	---	15.5	---	---	5.0	10.0	15.0	5.1	12.8	12.4	23.2	4.5	16
Riffle Slope (ft/ft)										0.0073	0.0422	---	0.0854	---	---	0.010	0.025	0.060	0.001	0.016	0.016	0.035	0.010	16
Pool Length (ft)										9.0	13.0	---	19.0	---	---	4.0	12.0	27.0	3.2	12.4	12.3	29.5	6.3	18
Pool Max depth (ft)										0.8	1.3	---	1.9	---	---	---	2.0	---	1.6	2.2	2.3	2.6	0.3	18
Pool Spacing (ft)										14.0	21.0	---	32.0	---	---	20.0	30.0	45.0	14.5	30.2	31.7	42.2	6.9	17
Pattern																								
Channel Beltwidth (ft)				The existing stream channel did not display plan form geometry due to historic dredging and straightening						12.0	19.0	---	23.0	---	---	13.0	20.0	28.0	15.7	24.3	25.6	29.8	4.7	18
Radius of Curvature (ft)										10.0	16.0	---	39.0	---	---	12.0	17.0	30.0	12.3	19.9	18.8	31.4	5.8	19
Rc:Bankfull width (ft/ft)										1.2	2.0	---	4.8	---	---	2.0	2.8	5.0	1.1	1.8	1.7	2.9	0.5	19
Meander Wavelength (ft)										31.4	45.3	---	61.4	---	---	46.0	55.0	81.0	23.3	54.3	52.3	88.5	15.6	18
Meander Width Ratio										1.5	2.3	---	2.8	---	---	2.1	3.3	4.6	2.1	4.9	4.8	8.0	1.4	18
Substrate, bed, and transport parameters																								
[4]d16 / d35 / d50 / d84 / d95 / dip / disp (mm)				10.6	23.6	49.4	75.3	82.7	86.0	78.0	6.3	10.	17.3	57.9	113.9	76.0	123.0							
Reach Shear Stress (competency) lb/f^2				0.50														0.6	0.6					
Max part size (mm) mobilized at bankfull				91.0														107.0	107.0					
Stream Power (transport capacity) W/m^2				2.1														2.6	1.4					
Additional Reach Parameters																								
Drainage Area (SM)				0.2							0.19													
Impervious Surface estimate (%)				<1							<1													
Rosgen Classification				B4							E4							E4	C4					
Bankfull Velocity (fps)	---	---	---	HEC-RAS: 3.0 (2.0-4.0)														HEC-RAS: 4.4 (3.8-5.1)	3.9					
Bankfull Discharge (cfs)	---	---	22.7	23.1																				
Valley length (ft)				530							240													
Channel Thalweg length (ft)				534							284							646	646					
Sinuosity (ft)				1.0							1.2							1.2	1.2					
BF slope (ft/ft)				0.012							0.016							0.011	0.011					
BEHI VL% / L% / M% / H% / VH% / E%				34	25	17	24	0	0	---	---	---	---	---	---									

Table 11a. Baseline Morphology & Hydraulic Monitoring Summary
601 North II / Project No. 95025

	Cross-Section 1 (Riffle) UT to Wicker (Reach 4)						Cross-Section 2 (Pool) UT to Wicker (Reach 5)						Cross-Section 3 (Riffle) UT to Wicker (Reach 5)						Cross-Section 4[1] (Riffle) Wicker (Reach 1)						Cross-Section 5[1] (Pool) Wicker (Reach 1)					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
Record Elevation (datum) Used	616.5	616.5	616.5	616.5	616.5		604.0	604.0	604.0	604.0	604.0		603.9	603.9	603.9	603.9	603.9		604.5	604.5	604.5	604.5	604.5		604.4	604.4	604.4	604.4	604.4	
Bankfull Width (ft)	8.9	8.3	8.0	8.6	7.9		17.6	15.4	17.1	18.6	17.6		11.0	10.8	10.8	11.9	11.7		11.4	12.5	12.3	11.0	11.2		14.2	15.4	15.5	16.1	20.0	
Floodprone Width (ft)	23.1	>23	>23	>23	>23		64.1	>100	>100	>100	>100		65.5	>100	>100	>100	>100		59.7	>100	>100	>100	>100		65.6	>100	>100	>100	>100	
Bankfull Mean Depth (ft)	0.5	0.5	0.5	0.5	0.5		0.7	0.9	1.0	0.9	0.9		0.8	0.9	0.9	0.8	0.8		0.7	0.6	0.8	0.7	0.7		0.8	0.8	0.8	0.7	0.7	
Bankfull Max Depth (ft)	0.7	0.7	0.8	0.8	0.9		1.7	1.8	2.1	2.2	2.2		1.3	1.3	1.3	1.4	1.3		1.3	1.1	1.2	1.2	1.4		1.8	1.7	1.8	1.8	1.8	
Bankfull Cross Sectional Area (ft^2)	4.2	4.1	3.9	3.9	4.0		12.8	13.6	16.4	16.7	16.0		8.5	8.5	9.5	9.1	8.6		7.9	7.2	8.2	7.5	8.4		11.5	6.1	9.4	11.8	14.1	
Bankfull Width/Depth Ratio	18.5	16.9	16.4	19.0	15.6		24.5	17.5	17.8	20.8	19.2		14.1	14.6	12.3	15.6	14.6		16.6	21.7	18.1	16.1	14.9		17.6	19.3	19.9	21.9	28.4	
Bankfull Entrenchment Ratio	2.6	>2.8	>2.9	>2.7	>2.9		3.6	>6.5	>5.9	>5.4	>5.7		6.0	>9	>9.2	>8.4	>8.6		5.2	>8	>8.1	>9.1	>8.9		4.6	>6.5	>6.5	>6.2	>5.0	
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	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
d50 (mm)	-	0.062	0.062	1.1	0.062		-	0.062	0.062	0.062	0.0621		-	4.9	6.9	40	1.6		-	0.06	0.062	0.062	6.9		-	0.062	0.062	0.062	0.062	

	Cross-Section 6 (Riffle) Wicker (Reach 2)						Cross-Section 7 (Pool) Wicker (Reach 2)						Cross-Section 8 (Pool) Wicker (Reach 2)						Cross-Section 9 (Riffle) Wicker (Reach 2)						Cross-Section 10 (Riffle) Wicker (Reach 3)					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3[2]**	**MY4**	**MY5**
Record Elevation (datum) Used	596.2	596.2	596.2	596.2	596.2		596.1	596.1	596.1	591.6	591.6		591.3	591.3	591.3	591.3	591.3		591.0	591.0	591.0	591.0	591.0		-	587.8	587.8	587.8	587.8	
Bankfull Width (ft)	11.5	11.9	11.8	11.9	12.7		12.8	12.8	12.9	12.9	12.7		12.7	13.3	13.4	13.6	14.1		11.6	11.5	11.3	11.1	11.6		-	12.0	11.8	12.4	12.6	
Floodprone Width (ft)	69.2	>90	>90	>90	>90		69.5	>125	>125	>125	>125		69.5	>200	>200	>200	>200		69.7	>200	>200	>200	>200		-	>200	>200	>200	>200	
Bankfull Mean Depth (ft)	1.1	1.0	1.1	0.9	1.1		1.8	1.9	2.0	2.0	2.2		1.6	1.7	1.8	1.7	1.8		1.1	1.1	1.1	1.1	1.1		-	1.2	1.2	1.1	1.1	
Bankfull Max Depth (ft)	1.7	1.7	1.9	1.6	1.8		3.2	3.2	3.2	3.2	3.3		2.9	3.1	3.2	3.2	3.3		1.8	1.7	1.8	1.7	1.8		-	1.7	1.7	1.6	1.6	
Bankfull Cross Sectional Area (ft^2)	12.1	12.0	12.9	11.2	13.6		23.2	24.2	25.5	25.2	27.6		19.9	22.9	23.5	22.9	25.7		13.0	12.3	12.4	11.7	12.5		-	14.4	14.0	13.5	13.3	
Bankfull Width/Depth Ratio	10.8	11.8	10.8	12.7	11.8		7.0	6.8	6.5	6.6	5.8		8.1	7.8	7.6	8.1	7.8		10.4	10.7	10.2	10.6	10.8		-	9.9	9.9	11.3	11.9	
Bankfull Entrenchment Ratio	6.0	>7.5	>7.6	>7.5	>7.1		5.4	>9.8	>9.7	>9.7	>9.9		5.5	>15	>14.9	>14.7	>14.2		6.0	>17.5	>17.8	>17.9	>17.2		-	>16.7	>17	>16.2	>15.9	
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	1.0	1.0	1.0	1.0		-	1.0	1.0	1.0	1.0	
d50 (mm)	-	0.062	15	11	2.6		-	0.062	1.7	1.2	1.9		-	0.062	0.062	0.062	0.16		-	0.06	1.4	0.062	0.63		-	24	24	6.7	11	

N/A - Item does not apply.

[1] MY1 data updated to show corrected bankfull width, W/D ratio, and entrenchment ratio calculations.

[2] Data updated to show corrected calculations.

Table 11b. Monitoring Data - Stream Reach Data Summary
601 North II - Wicker Branch Reach 1 (630 feet)

Parameter	Baseline						MY - 1[1, ^]						MY - 2[1]						MY - 3						MY - 4						MY - 5					
Dimension & Substrate - Riffle	**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**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	-	11.4	-	-	-	1	-	12.5	-	-	-	1	-	12.3	-	-	-	1	-	11.0	-	-	-	1	-	11.0	-	-	-	1						
Floodprone Width (ft)	-	59.7	-	-	-	1	-	>100	-	-	-	1	-	>100	-	-	-	1	-	>100	-	-	-	1	-	>100	-	-	-	1						
Bankfull Mean Depth (ft)	-	0.7	-	-	-	1	-	0.6	-	-	-	1	-	0.8	-	-	-	1	-	0.7	-	-	-	1	-	0.7	-	-	-	1						
Bankfull Max Depth (ft)	-	1.3	-	-	-	1	-	1.1	-	-	-	1	-	1.2	-	-	-	1	-	1.2	-	-	-	1	-	1.2	-	-	-	1						
Bankfull Cross-Sectional Area (ft^2)	-	7.9	-	-	-	1	-	7.2	-	-	-	1	-	8.2	-	-	-	1	-	7.5	-	-	-	1	-	7.5	-	-	-	1						
Width/Depth Ratio	-	16.6	-	-	-	1	-	21.7	-	-	-	1	-	18.1	-	-	-	1	-	16.1	-	-	-	1	-	16.1	-	-	-	1						
Entrenchment Ratio	-	5.2	-	-	-	1	-	>8	-	-	-	1	-	>8.1	-	-	-	1	-	>6.2	-	-	-	1	-	>9.1	-	-	-	1						
Bank Height Ratio	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	1.0	-	-	-	1						
Profile																																				
Riffle Length (ft)	4.2	12.3	11.5	33.3	6.0	22.0	3.3	6.9	6.3	11.0	2.1	18	1.9	7.8	7.3	12.9	3.3	19	4.8	8.5	7.6	15.5	3.1	19	4.7	8.7	8.8	17.4	3.2	19						
Riffle Slope (ft/ft)	0.001	0.017	0.017	0.043	0.0	22	-	-	-	-	-	-	-	-	-	-	-	-	0.000	0.016	0.015	0.035	0.010	19	0.000	0.019	0.016	0.059	0.015	19						
Pool Length (ft)	4.7	10.8	10.4	20.0	4.2	20	7.3	14.1	12.0	37.6	6.8	19	6.9	12.3	12.0	19.0	3.5	20	8.0	13.5	14.5	17.4	2.9	21	7.4	13.5	13.4	18.7	3.6	20						
Pool Max Depth (ft)	1.4	1.9	1.9	2.2	0.2	20	1.1	1.6	1.6	2.0	0.3	19	1.3	1.7	1.7	2.2	0.2	21	1.7	2.2	2.2	2.5	0.2	21	1.5	1.9	1.8	2.3	0.2	20						
Pool Spacing (ft)	13.4	30.7	26.9	57.8	10.0	19	16.4	27.7	26.9	41.8	7.0	19	8.9	26.0	25.8	38.0	7.2	20	7.7	26.2	25.4	34.3	6.1	20	16.6	27.3	28.6	36.3	5.8	19						
Pattern																																				
Channel Belt Width (ft)	13.4	20.1	20.2	29.7	4.00	21																														
Radius of Curvature (ft)	14.4	17.9	16.4	27.7	3.90	23																														
Rc: Bankfull Width (ft/ft)	1.30	1.60	1.40	2.40	0.3	23																														
Meander Wavelength (ft)	13.7	51.5	51.8	87.9	15.30	21																														
Meander Width Ratio	1.2	4.5	4.5	7.7	1.30	21																														
Additional Reach Parameters																																				
Rosgen Classification	C4						C4						C4						C4						C4											
Channel Thalweg Length (ft)	660						557						562						562						558											
Sinuosity (ft)	1.1						1.1						1.1						1.1						1.1											
Water Surface Slope (Channel) (ft/ft)	-						-						-						0.0090						0.0089											
Bankfull Slope (ft/ft)	0.0090						0.0094						0.0093						0.0083						0.0083											
Ri% / Ru% / P% / G% / S%	-	-	-	-	-		24%	10%	52%	14%	0%		28%	8%	46%	18%	1%		30%	7%	53%	9%	0%		31%	7%	51%	11%	0%							

N/A - Information does not apply.
Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step
*Percentages based on riffle and pool pebble counts.
[1]No water present at time of survey; MY1 and MY2 profile values based on bedform only.
^Mean bankfull width, W/D ratio, entrenchment ratio updated to reflect accurate calculations.

Table 11b. Monitoring Data - Stream Reach Data Summary
601 North II - Wicker Branch Reach 2 (1356 feet)

Parameter	Baseline						MY - 1[1]						MY - 2[1]						MY - 3						MY - 4						MY - 5					
Dimension & Substrate - Riffle	**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**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	11.5	11.6	11.6	11.6	0.1	2	11.5	11.7	11.7	11.9	0.28	2	11.3	11.6	11.6	11.8	0.4	2	11.1	11.5	11.5	11.9	0.6	2	11.6	12.2	12.2	12.7	0.8	2						
Floodprone Width (ft)	69.2	69.5	69.5	69.7	0.4	2	90	145	145	200	77.8	2	90	145	145	200	77.8	2	90.0	145.0	145.0	200.0	77.8	2	90.0	145.0	145.0	200.0	77.8	2						
Bankfull Mean Depth (ft)	1.1	1.1	1.1	1.1	0	2	1.0	1.0	1.0	1.1	0.04	2	1.1	1.1	1.1	1.1	0	2	0.9	1.0	1.0	1.1	0.1	2	1.1	1.1	1.1	1.1	0.0	2						
Bankfull Max Depth (ft)	1.7	1.8	1.8	1.8	0.1	2	1.7	1.7	1.7	1.7	0.02	2	1.8	1.9	1.9	1.9	0.07	2	1.6	1.7	1.7	1.7	0.1	2	1.8	1.8	1.8	1.8	0.0	2						
Bankfull Cross-Sectional Area (ft^2)	12.1	12.6	12.6	13.0	0.6	2	12.0	12.2	12.2	12.3	0.21	2	12.4	12.7	12.7	12.9	0.35	2	11.2	11.5	11.5	11.7	0.4	2	12.5	13.1	13.1	13.6	0.8	2						
Width/Depth Ratio	10.4	10.6	10.6	10.8	0.3	2	10.7	11.3	11.3	11.8	0.78	2	10.2	10.5	10.5	10.8	0.42	2	10.6	11.7	11.7	12.7	1.5	2	10.8	11.3	11.3	11.8	0.7	2						
Entrenchment Ratio	6.0	6.0	6.0	6.0	0	2	7.5	12.5	12.5	17.5	7.07	2	7.6	12.7	12.7	17.8	7.2	2	7.5	12.7	12.7	17.9	7.4	2	7.1	12.2	12.2	17.2	7.1	2						
Bank Height Ratio	19.3	21.4	21.4	23.5	3	2	1.0	1.0	1.0	1.0	0	2	1.0	1.0	1.0	1.0	0	2	1.0	1.0	1.0	1.0	0	2	1.0	1.0	1.0	1.0	0.0	2						
Profile																																				
Riffle Length (ft)	6.3	17.3	18.1	38.7	7.5	33	8.1	17.1	15.7	32.9	7.0	31	6.8	16.1	15.2	30.7	6.8	31	4.4	15.2	14.1	36.6	7.6	31	2.2	16.7	16.3	34.5	8.1	31						
Riffle Slope (ft/ft)	0.001	0.017	0.013	0.062	0.013	33	-	-	-	-	-	-	-	-	-	-	-	-	0.008	0.019	0.016	0.050	0.01	31	0.000	0.026	0.016	0.110	0.028	31						
Pool Length (ft)	6.1	24.2	23.7	62.0	11.9	33	12.6	29.2	26.2	57.3	11.3	33	13.7	29.4	25.4	65.0	11.7	33	17.5	32.7	29.1	66.2	11.2	33	15.4	27.3	24.1	55.5	9.6	34						
Pool Max Depth (ft)	1.7	2.9	2.8	3.8	0.4	33	1.4	2.8	2.8	3.8	0.5	33	1.7	3.0	3.0	3.7	0.4	33	2.1	3.2	3.3	3.9	0.4	33	1.9	2.9	3.0	3.5	0.4	34						
Pool Spacing (ft)	25.5	53.6	53.2	103.3	19.5	33	24.4	54.0	52.2	112.6	18.3	32	20.1	53.1	48.1	113.5	20.0	32	14.6	53.4	48.1	114.2	19.8	32	24.7	52.3	51.3	113.4	19.1	34						
Pattern																																				
Channel Belt Width (ft)	18.3	31.1	30.6	49.5	8.8	24																														
Radius of Curvature (ft)	28.3	40.2	37.8	61.8	10.1	28																														
Rc: Bankfull Width (ft/ft)	2.40	3.50	3.30	5.30	0.9	28																														
Meander Wavelength (ft)	13.7	114.4	113.3	226.5	46.9	24																														
Meander Width Ratio	1.2	9.9	9.8	19.5	4.0	24																														
Additional Reach Parameters																																				
Rosgen Classification	E4						E4						E4						E5						E5											
Channel Thalweg Length (ft)	1,775						1,777						1,779						1,775						1,774											
Sinuosity (ft)	1.2						1.2						1.2						1.2						1.2											
Water Surface Slope (Channel) (ft/ft)	-						-						-						0.0072						0.0067											
Bankfull Slope (ft/ft)	0.0070						0.0071						0.0070						0.0071						0.0071											
Ri% / Ru% / P% / G% / S%	-	-	-	-	-		31%	2%	57%	9%	0%		28%	3%	55%	13%	0%		27%	3%	61%	9%	1%		29%	5%	52%	12%	1%							

N/A - Information does not apply.

Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step

*Percentages based on riffle and pool pebble counts.

[1]No water present at time of survey; MY1 and MY2 profile values based on bedform only.

Table 11b. Monitoring Data - Stream Reach Data Summary
601 North II- Wicker Branch Reach 3 (414 feet)

Parameter	Baseline[2]						MY - 1[1]						MY - 2[1]						MY - 3[1,2]						MY - 4						MY - 5					
Dimension & Substrate - Riffle	**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**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	-	-	-	-	-	-	-	12.0	-	-	-	1	-	11.8	-	-	-	1	-	12.4	-	-	-	1	-	12.6	-	-	-	1						
Floodprone Width (ft)	-	-	-	-	-	-	-	>200	-	-	-	1	-	>200	-	-	-	1	-	>200	-	-	-	1	-	>200	-	-	-	1						
Bankfull Mean Depth (ft)	-	-	-	-	-	-	-	1.2	-	-	-	1	-	1.2	-	-	-	1	-	1.1	-	-	-	1	-	1.1	-	-	-	1						
Bankfull Max Depth (ft)	-	-	-	-	-	-	-	1.7	-	-	-	1	-	1.7	-	-	-	1	-	1.6	-	-	-	1	-	1.6	-	-	-	1						
Bankfull Cross-Sectional Area (ft^2)	-	-	-	-	-	-	-	14.4	-	-	-	1	-	14.0	-	-	-	1	-	13.5	-	-	-	1	-	13.3	-	-	-	1						
Width/Depth Ratio	-	-	-	-	-	-	-	9.9	-	-	-	1	-	9.9	-	-	-	1	-	11.3	-	-	-	1	-	11.9	-	-	-	1						
Entrenchment Ratio	-	-	-	-	-	-	-	>16.7	-	-	-	1	-	>17	-	-	-	1	-	>16.2	-	-	-	1	-	>15.9	-	-	-	1						
Bank Height Ratio	-	-	-	-	-	-	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	1.0	-	-	-	1						
Profile																																				
Riffle Length (ft)	-	-	-	-	-	-	-	27.6	-	-	-	1	-	31.7	-	-	-	1	-	25.6	-	-	-	1		24.9	-	-	-	1						
Riffle Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.011	-	-	-	1						
Pool Length (ft)	-	-	-	-	-	-	-	29.0	-	-	-	1	-	25.7	-	-	-	1	-	29.0	-	-	-	1	-	28.1	-	-	-	1						
Pool Max Depth (ft)	-	-	-	-	-	-	-	2.7	-	-	-	1	-	3.0	-	-	-	1	-	3.1	-	-	-	1	-	2.5	-	-	-	1						
Pool Spacing (ft)	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-						
Pattern																																				
Channel Belt Width (ft)	-	-	-	-	-	-																														
Radius of Curvature (ft)	-	-	-	-	-	-																														
Rc: Bankfull Width (ft/ft)	-	-	-	-	-	-																														
Meander Wavelength (ft)	-	-	-	-	-	-																														
Meander Width Ratio	-	-	-	-	-	-																														
Additional Reach Parameters																																				
Rosgen Classification	-						E4						E4						E4						E4											
Channel Thalweg Length (ft)	-						80						79						81						81											
Sinuosity (ft)	-						1.17						1.18						1.17						1.17											
Water Surface Slope (Channel) (ft/ft)	-						NA						N/A						N/A						0.0067											
Bankfull Slope (ft/ft)	-						0.0073						0.0070						0.0100						0.0071											
Ri% / Ru% / P% / G% / S%	-	-	-	-	-		44%	-	46%	10%	-		51%	-	41%	8%	-		42%	-	48%	9%	-		42%	-	47%	11%	-							

N/A - Information does not apply.

Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step

*Percentages based on riffle and pool pebble counts.

[1]No water present at time of survey; MY1, MY2, and MY3 profile values based on bedform only.

[2]Reach 3 cross-section was added during MY1; no data available for MY0

[3] Data updated to show corrected calculations.

Table 11b. Monitoring Data - Stream Reach Data Summary
601 North II - UT to Wicker Branch Reach 4 (826 feet)

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5					
Dimension & Substrate - Riffle	**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**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	-	8.9	-	-	-	1	-	8.3	-	-	-	1	-	8.0	-	-	-	1	-	8.6	-	-	-	1	-	7.9	-	-	-	1						
Floodprone Width (ft)	-	23.1	-	-	-	1	-	>23	-	-	-	1	-	>23	-	-	-	1	-	>23	-	-	-	1	-	>23	-	-	-	1						
Bankfull Mean Depth (ft)	-	0.5	-	-	-	1	-	0.5	-	-	-	1	-	0.5	-	-	-	1	-	0.5	-	-	-	1	-	0.5	-	-	-	1						
Bankfull Max Depth (ft)	-	0.7	-	-	-	1	-	0.7	-	-	-	1	-	0.8	-	-	-	1	-	0.8	-	-	-	1	-	0.9	-	-	-	1						
Bankfull Cross-Sectional Area (ft^2)	-	4.2	-	-	-	1	-	4.1	-	-	-	1	-	3.9	-	-	-	1	-	3.9	-	-	-	1	-	4.0	-	-	-	1						
Width/Depth Ratio	-	18.5	-	-	-	1	-	16.9	-	-	-	1	-	16.4	-	-	-	1	-	19.0	-	-	-	1	-	15.6	-	-	-	1						
Entrenchment Ratio	-	2.6	-	-	-	1	-	>2.8	-	-	-	1	-	>2.9	-	-	-	1	-	>2.7	-	-	-	1	-	>2.9	-	-	-	1						
Bank Height Ratio	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	1.0	-	-	-	1						
Profile																																				
Riffle Length (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Riffle Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Pool Length (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Pool Max Depth (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Pool Spacing (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Pattern																																				
Channel Belt Width (ft)	-	-	-	-	-	-																														
Radius of Curvature (ft)	-	-	-	-	-	-																														
Rc: Bankfull Width (ft/ft)	-	-	-	-	-	-																														
Meander Wavelength (ft)	-	-	-	-	-	-																														
Meander Width Ratio	-	-	-	-	-	-																														
Additional Reach Parameters																																				
Rosgen Classification	-						-						-						-						-											
Channel Thalweg Length (ft)	-						-						-						-						-											
Sinuosity (ft)	-						-						-						-						-											
Water Surface Slope (Channel) (ft/ft)	-						-						-						-						-											
Bankfull Slope (ft/ft)	-						-						-						-						-											
Ri% / Ru% / P% / G% / S%	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-							

N/A - Information does not apply.
Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step
*Percentages based on riffle and pool pebble counts.

Table 11b. Monitoring Data - Stream Reach Data Summary
601 North II -UT to Wicker Branch Reach 5 (534 feet)

Parameter	Baseline						MY - 1[1,^]						MY - 2[1]						MY - 3						MY - 4						MY - 5					
Dimension & Substrate - Riffle	**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**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	-	11.0	-	-	-	-	-	11.1	-	-	-	1	-	10.8	-	-	-	1	-	11.9	-	-	-	1	-	11.7	-	-	-	1						
Floodprone Width (ft)	-	65.5	-	-	-	-	-	>100	-	-	-	1	-	>100	-	-	-	1	-	>100	-	-	-	1	-	>100	-	-	-	1						
Bankfull Mean Depth (ft)	-	0.8	-	-	-	-	-	0.8	-	-	-	1	-	0.9	-	-	-	1	-	0.8	-	-	-	1	-	0.8	-	-	-	1						
Bankfull Max Depth (ft)	-	1.3	-	-	-	-	-	1.3	-	-	-	1	-	1.3	-	-	-	1	-	1.4	-	-	-	1	-	1.3	-	-	-	1						
Bankfull Cross-Sectional Area (ft^2)	-	8.5	-	-	-	-	-	8.5	-	-	-	1	-	9.5	-	-	-	1	-	9.1	-	-	-	1	-	8.6	-	-	-	1						
Width/Depth Ratio	-	14.1	-	-	-	-	-	14.6	-	-	-	1	-	12.3	-	-	-	1	-	15.6	-	-	-	1	-	14.6	-	-	-	1						
Entrenchment Ratio	-	6.0	-	-	-	-	-	>9	-	-	-	1	-	>9.2	-	-	-	1	-	>8.4	-	-	-	1	-	>8.6	-	-	-	1						
Bank Height Ratio	-	1.0	-	-	-	-	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	1.0	-	-	-	1						
Profile																																				
Riffle Length (ft)	5.1	12.8	12.4	23.2	4.5	16	3.1	9.7	9.3	18.5	3.9	17	3.2	7.7	6.9	14.5	3.5	17	2.2	9.0	8.3	14.8	3.1	17	4.9	10.1	10.9	16.9	4.0	17						
Riffle Slope (ft/ft)	0.001	0.016	0.016	0.035	0.010	16	-	-	-	-	-	-	-	-	-	-	-	-	0.001	0.018	0.014	0.053	0.013	17	0.003	0.021	0.016	0.057	0.014	17						
Pool Length (ft)	3.2	12.4	12.3	29.5	6.3	18	6.0	16.0	14.5	38.3	7.3	19	7.4	17.0	15.8	28.8	5.7	19	8.6	16.7	16.3	37.6	6.9	18	5.5	15.4	14.6	36.8	6.5	18						
Pool Max Depth (ft)	1.6	2.2	2.3	2.6	0.3	18	1.5	2.0	2.0	2.6	0.3	19	1.8	2.2	2.2	2.7	0.3	19	1.9	2.3	2.4	2.6	0.2	18	1.8	2.3	2.3	2.8	0.3	18						
Pool Spacing (ft)	14.5	30.2	31.7	42.2	6.9	17	10.8	28.7	30.8	42.0	8.8	19	10.5	29.1	30.4	48.7	9.9	19	13.9	30.7	30.8	54.3	7.9	18	21.7	31.7	32.3	39.8	5.1	18						
Pattern																																				
Channel Belt Width (ft)	15.7	24.3	25.6	29.8	4.7	18																														
Radius of Curvature (ft)	12.3	19.9	18.8	31.4	5.8	19																														
Rc: Bankfull Width (ft/ft)	1.10	1.80	1.70	2.90	0.5	19																														
Meander Wavelength (ft)	23.3	54.3	52.3	88.5	15.6	18																														
Meander Width Ratio	2.1	4.9	4.8	8.0	1.4	18																														
Additional Reach Parameters																																				
Rosgen Classification	C4						C4						C4						C4						C4											
Channel Thalweg Length (ft)	646						600						591						589						595											
Sinuosity (ft)	1.2						1.25						1.27						1.25						1.28											
Water Surface Slope (Channel) (ft/ft)	-						-						-						0.0103						0.0108											
Bankfull Slope (ft/ft)	0.0110						0.0114						0.0113						0.0102						0.0112											
Ri% / Ru% / P% / G% / S%	-	-	-	-	-		30%	5%	56%	8%	-		24%	5%	58%	14%	0%		28%	3%	56%	13%	0%		31%	5%	51%	11%	2%							

N/A - Information does not apply.
Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step
*Percentages based on riffle and pool pebble counts.

[1]No water present at time of survey; MY1 and MY2 profile values based on bedform only.

[^]MY1 data misreported, numbers updated to reflect accurate riffle length calculations

Appendix E
Hydrologic Data

Table 12. Verification of Bankfull Events- Reach 2 601 North II / Project No. 95025				
Date of Data Collection	**Date of Occurrence**	**Method**	**Feet Above Bankfull Elevation**	**Photo # (if available)**
November - 2013	Unknown	Wrack Lines		
September - 2014	Unknown[1]	Crest Gauge	1.5	
February - 2015	Unknown[2]	Crest Gauge	0.7	
May - 2015	Unknown[3]	Crest Gauge	0.4	
November - 2015	Unknown[4]	Crest Gauge	1.0	
January - 2016	Unknown	Crest Gauge	1.1	
March - 2016	Unknown	Crest Gauge	0.5	

[1] Based on precipitation data, suggested date is 7/22/2014

[2] Based on precipitation data, suggested date is 1/13/2015

[3] Based on precipitation data, suggested date is 4/16/2015

[4] Based on precipitation data, suggested date is 9/30/2015

Table 12. Verification of Bankfull Events - Reach 5 601 North II / Project No. 95925				
Date of Data Collection	**Date of Occurrence**	**Method**	**Feet Above Bankfull Evevation**	**Photo # (if available)**
Novemeber - 2013	Unknown	Wrack Lines		
September - 2014	Unknown[1]	Crest Gauge	1.2	
February - 2015	Unknown[2]	Crest Gauge	0.2	
May - 2015	Unknown[3]	Crest Gauge	0.1	
November - 2015	Unknown	Wrack Lines		
January - 2016	Unknown	Crest Gauge	0.1	

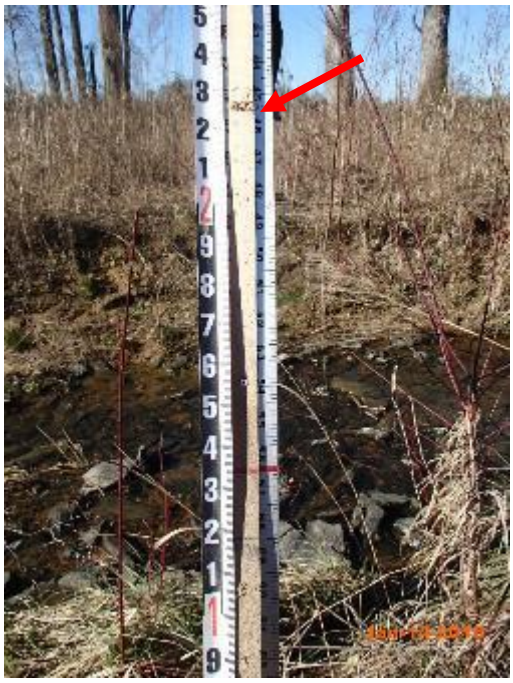
[1] Based on precipitation data, suggested date is 7/22/2014

[2] Based on precipitation data, suggested date is 1/13/2015

[3] Based on precipitation data, suggested date is 4/16/2015

Figure 3. Photo Verification of Bankfull Events

Bankfull Photo Verification



Reach 2 Crest Gauge

Bankfull Photo Verification

Reach 2 Crest Gauge

Bankfull Photo Verification

Reach 5 Crest Gauge

Figure 4. Daily Precipitation Totals for Monroe, North Carolina- NCCRONOS Station No. 315771

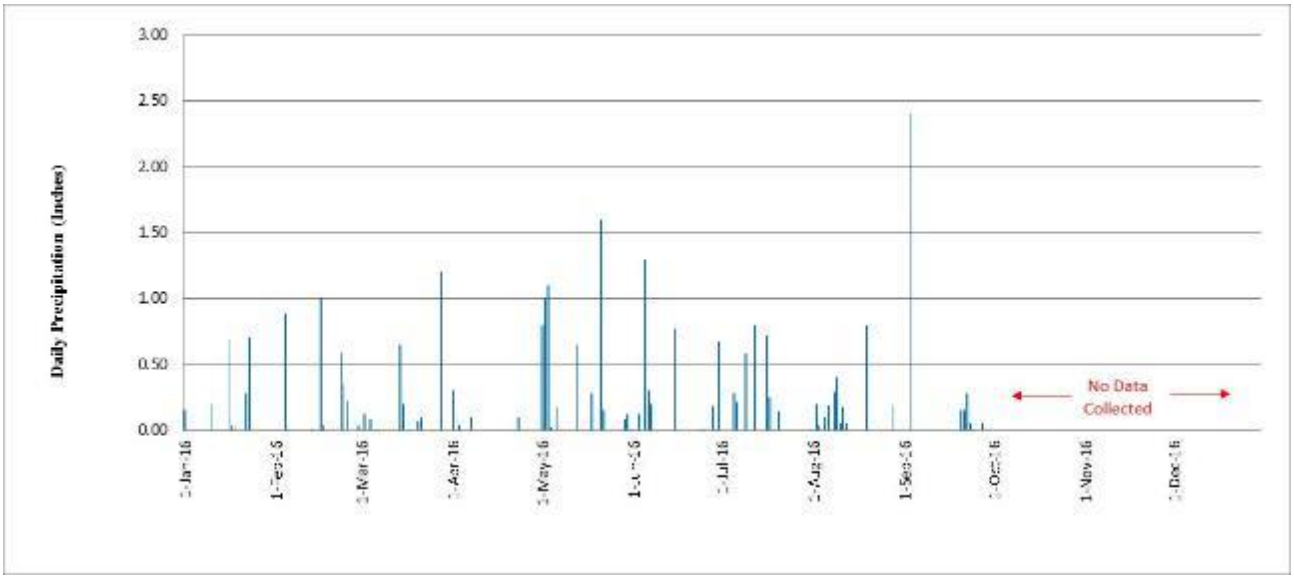


Figure 5. Monthly Precipitation Data Compared to 30th and 70th Percentiles for Union County