As-built Baseline Monitoring Report Draft
UT to Clarke Creek

EEP # 92500
DENR Contract # 005363
USACE Action ID # SAW-2010-00471
DWR Project # 11-0409
SCO # 09-07763-01
DLR (Land Quality) Project # MECK-2012-034

Mecklenburg County, North Carolina

Submitted to:

Ecosystem Enhancement Program

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Data Collection: Dec 2013 – Mar 2014
Report Submission: June 2014

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APPENDICES

EXECUTIVE SUMMARY

The UT Clarke Creek is located in Mecklenburg County, North Carolina near the Town of Huntersville. The property parcel is owned by Mecklenburg County and is referred to as Clark's Creek Nature Preserve. The project consisted of approximately 4,594 linear feet of existing streams on the site within the USGS cataloging unit Yadkin 03040105. The project site was assessed in the Upper Rocky River Local Watershed Plan (LWP) that was prepared for EEP by MACTEC in 2004. The LWP identified the major stressors in the watershed: stream bank erosion, lack of adequate forested buffer, stream channelization, agricultural impacts, land use changes, sedimentation, point source in-stream impacts, nutrients, and fecal coliform bacteria.

Restoration goals for this project include:

- Reduce sediment stressors caused by stream bank erosion and shear stress along the reach
- Improve stream bank stability and sediment transport efficiency
- Provide for uplift in water quality functions and nutrient filtration
- Provide for greater overall stream and wetland habitat complexity and quality
- Improve and maintain riparian buffer habitat

The project objectives include:

- Implement a sustainable, reference-based, rehabilitation of the project reaches' dimension to support sediment transport equilibrium.
- Provide a sustainable and functional bankfull floodplain feature and reslope banks at a more stable slope.
- Strategically install stream structures and plantings designed to maintain lateral stability and habitat to the stream channel.
- Install, augment, and maintain appropriate vegetative riparian buffer and riverine wetland community types with sufficient density and vigor to support native vegetation. The buffer should have a minimum width of 50 feet (ft) on each side of project streams and consist of a mix of native species representative of a bottomland hardwood forest.
- Restore and/or enhance the natural hydrology, vegetation, and soil composition in adjacent wetlands.

This report documents the completion of the restoration construction activities and presents as-built baseline monitoring data for the post-construction monitoring period. Table 1 (Appendix A) summarizes site conditions before and after restoration, as well as the conditions predicted in the previously approved Mitigation Plan.

1.0 PROJECT SUMMARY

1.1 Project Setting and Background

The UT Clarke Creek stream and wetland restoration project is located in Mecklenburg County, North Carolina, in the Yadkin-Pee Dee River Basin (USGS cataloging unit 03040105), DWR Subbasin 30711 (Figure 1). The project lies within Clark's Creek Nature Preserve, a 57.2 acre property owned by Mecklenburg County. The project restored 3,106 linear feet of stream and preserved 1,464 linear feet of stream and restored or preserved 1.549 acres of wetlands (Table 1). Prior to construction, the project site had problems with channelization, bank instability, and a limited riparian buffer zone. Areas of mass wasting, bank slumping, incision, and sediment deposition were evident in all reaches. Backwater effects from beaver dams also caused aggradation and habitat loss. The project aimed to reduce the major stressors identified in the Upper Rocky River Local Watershed Plan (LWP) which include stream bank erosion, lack of adequate forested buffer, stream channelization, and sedimentation.

1.2 Project Goals and Objectives

The goals and objectives of this project focus on improving water quality and restoring physical habitat. These goals and objectives are stated in the UT Clarke Creek Mitigation Plan (2011).

Goals:

1. Reduce sediment stressors caused by stream bank erosion and shear stress along the reach
2. Improve stream bank stability and sediment transport efficiency
3. Provide for uplift in water quality functions and nutrient filtration
4. Provide for greater overall stream and wetland habitat complexity and quality
5. Improve and maintain riparian buffer habitat

Objectives:

1. Implement a sustainable, reference-based, rehabilitation of the project reaches' dimension to support sediment transport equilibrium
2. Provide a sustainable and functional bankfull floodplain feature and reslope banks at a more stable slope
3. Strategically install stream structures and plantings designed to maintain lateral stability and habitat to the stream channel
4. Install, augment, and maintain appropriate vegetative riparian buffer and riverine wetland community types with sufficient density and vigor to support native vegetation. The buffer should have a minimum width of 50 feet on each side of project streams and consist of a mix of native species representative of a bottomland hardwood forest.
5. Restore and/or enhance the natural hydrology, vegetation, and soil composition in adjacent wetlands

1.3 Success Criteria

The following success criteria are provided from the NCEEP *Mitigation Plan Document Guidance* and the Army Corps of Engineers (ACOE) (2003).

1.3.1 Stream Morphology and Channel Stability

Restored or enhanced streams should demonstrate morphological stability to be considered successful. Any deviations will be evaluated to determine whether changes are indicative of instability. Stability will be based on permanent cross sections, longitudinal profile, substrate analysis, sediment transport, and evidence of bankful events.

1.3.2 Wetlands

Wetland hydrology attainment will be monitored in accordance to the ACOE (2003) standards. The target wetland hydrological success criterion is saturation or inundation for at least 12.5 percent of the growing season in the lower landscape (floodplain) positions. To achieve the hydrologic success criterion, groundwater levels must be within 12 inches of the ground surface for 29 consecutive days, which is 12.5 percent of the March 22 to November 11 (232 days) growing season. Eight Ecotone Water Level Loggers were established within the wetland restoration, creation, and preservation areas to monitor groundwater levels during the growing season. Wells 3, 5, 6, and 8 were placed within the wetland boundaries to provide hydrologic data for the restored and enhanced wetland areas. Wells 2, 4, and 7 were placed outside the wetland boundaries to confirm the upland boundaries of the same wetlands. Well 8 was placed within the wetland preservation to provide reference conditions for the restored and enhanced wetlands in the project.

1.3.3 Vegetation

Planted vegetation will be monitored for five years in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-NCEEP Level 2 Protocol (Lee et al., 2006). To achieve vegetative success criteria, the average number of planted stems per acre must exceed or meet 320 stems/acre after the third year of monitoring, 288 stems/acre after four years, and 260 stems/acre after the fifth year of project monitoring.

1.4 Project History, Contacts, and Attribute Data

The UT to Clarke Creek Stream and Wetland Restoration site was designed by JJG, North State Environmental constructed the site, and it will be monitored by SEPI Engineering & Construction. Tables 2, 3, and 4 in Appendix A provide detailed information regarding the Project Activity and Reporting History, Project Contacts, and Project Baseline Information and Attributes.

1.4.1 Construction Deviations

The as-built plan sheets/record drawings depict several engineered instream structures that were not located during baseline monitoring. It was determined the structures were not installed due to

constraints that arose during construction, and the record drawings were not updated with that information.

2.0 METHODOLOGY

The following methods were utilized during the as-built baseline monitoring for data collection and post-processing:

- Geomorphic topographic data collections were performed in the field using a survey grade GPS such that each survey point has three-dimensional coordinates, and is georeferenced (NAD83-State Plane Feet – FIPS3200).
- Longitudinal stationing was developed using the as-built survey thalweg as a baseline.
- The Modified-Wolman pebble count particle size distribution protocol was utilized.
- The CVS Level 2 methodology was utilized for the vegetation plot data collection.

3.0 REFERENCES

Jordan, Jones, and Goulding, Inc. Mitigation Plan: UT Clarke Creek Stream and Wetland Restoration, 2011.

Mactec Engineering and Consulting, Inc. November 30, 2004. *Watershed Management Plan and Recommendations, Lower Yadkin/Upper Rocky River Basin, Local Watershed Planning (Phase II), Cabarrus, Iredell, Rowan and Mecklenburg Counties, North Carolina*. Prepared for North Carolina Ecosystem Enhancement Program.

NCDWQ. 2008B. *Yadkin – Pee Dee River Basin Plan.* 553 pages.

NC Ecosystem Enhancement Program. As-built Baseline Monitoring Report Format, Data Requirements, and Content Guidance, 2014.

Radford, Albert. 1968. *Manual of Vascular Flora of the Carolinas.* The University of North Carolina Press, Chapel Hill. 596 p.

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

U. S. Army Corps of Engineers. 1987. *Wetland Delineation Manual* (Technical Report Y-87-1), Washington, DC.

U. S. Army Corps of Engineers. 2003. *Stream Mitigation Guidelines*. USACOE, USEPA, NCWRC, NCDENR-DWQ.

Appendix A
Background Tables

Table 1a. Project Components UT Clarke Creek/EEP Project #92500									
Project Component or Reach ID	**Existing Feet/Acres**	**Restoration Level**	**Approach**	**Footage or Acreage**	**Stationing**	**Mitigation Ratio**	**Mitigation Units**	**BMP Elements**	**Comment**
UT Clarke Creek	1507 lf	E1	P 2/3	1507 lf	00+00 – 15+87	1.5:1	1004.7		Creating bankfull bench, regrading bank slopes, installing structures, planting native vegetation
UT1	723 lf	E1	P 2/3	741 lf	00+00 – 07+48, 07+65 – 07+78	1.5:1	494.0		Creating bankfull bench, regrading bank slopes, installing structures, planting native vegetation
UT1	17 lf	E1	P 2/3	17 lf	07+48 – 07+65	3:1	5.7		Creating bankfull bench, regrading bank slopes, installing structures, planting native vegetation in sewer easement
UT2	308 lf	E2	P 4	308 lf	04+22 – 05+99, 07+16 – 08+47	2.5:1	123.2		Planting of native vegetation, removal of invasive species
UT3	100 lf	E1	P 2/3	84 lf	00+00 – 00+56, 00+72 – 01+03	1.5:1	56.0		Creating bankfull bench, regrading bank slopes, installing structures, planting native vegetation
UT3	16 lf	E1	P 2/3	16 lf	00+56 – 00+72	3:1	5.3		Creating bankfull bench, regrading bank slopes, installing structures, planting native vegetation in sewer easement
UT4	373 lf	E1	P 2/3	363 lf	01+92 – 05+65	1.5:1	242		Creating bankfull bench, regrading bank slopes, installing structures, planting native vegetation
UT5	119 lf	E1	P 2/3	119 lf	03+56 – 04+75	1.5:1	79.3		Creating bankfull bench, regrading bank slopes, installing structures, planting native vegetation
UT6	1464 lf	P	-	1464 lf	00+00 – 14+64	5:1	292.8		Designated as Preservation
Wetland A	0.085 ac	R		0.0*		0	0		Restoring aerial extent of riparian wetland adjacent to stream
Wetland B	0.134 ac	P		0.134 ac		5:1	0.03		Designated as Preservation
Weltand C	0.057 ac	E		0.057 ac		2.5:1	0.02		Includes improving hydrology and vegetation to enhance the riparian wetland adjacent to stream
Wetland D	0.070 ac	R		1.020 ac		1:1	1.02		Restoring aerial extent of riparian wetland adjacent to stream
Wetland E	0.109 ac	E		0.201 ac		2.5:1	0.08		Includes improving hydrology and vegetation to enhance the riparian wetland adjacent to stream

*One segment of WL A will be incorporated into the enhancement of UT2. The remainder of WL A will be incorporated into the restoration of WL D

Table 1b. Component Summations UT Clarke Creek/EEP Project #92500							
Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-Ripar (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration		1.02					
Enhancement		0.258					
Enhancement I	2,847						
Enhancement II	308						
Creation		0.137					
Preservation	1,464	0.134					
HQ Preservation							
		1.549	0				
Totals (Feet/Acres)	**4,619**	**1.549**					
MU Totals	**2,303**	**1.15**					

Non-Applicable

Table 2. Project Activity and Reporting History
UT Clarke Creek/EEP Project #92500

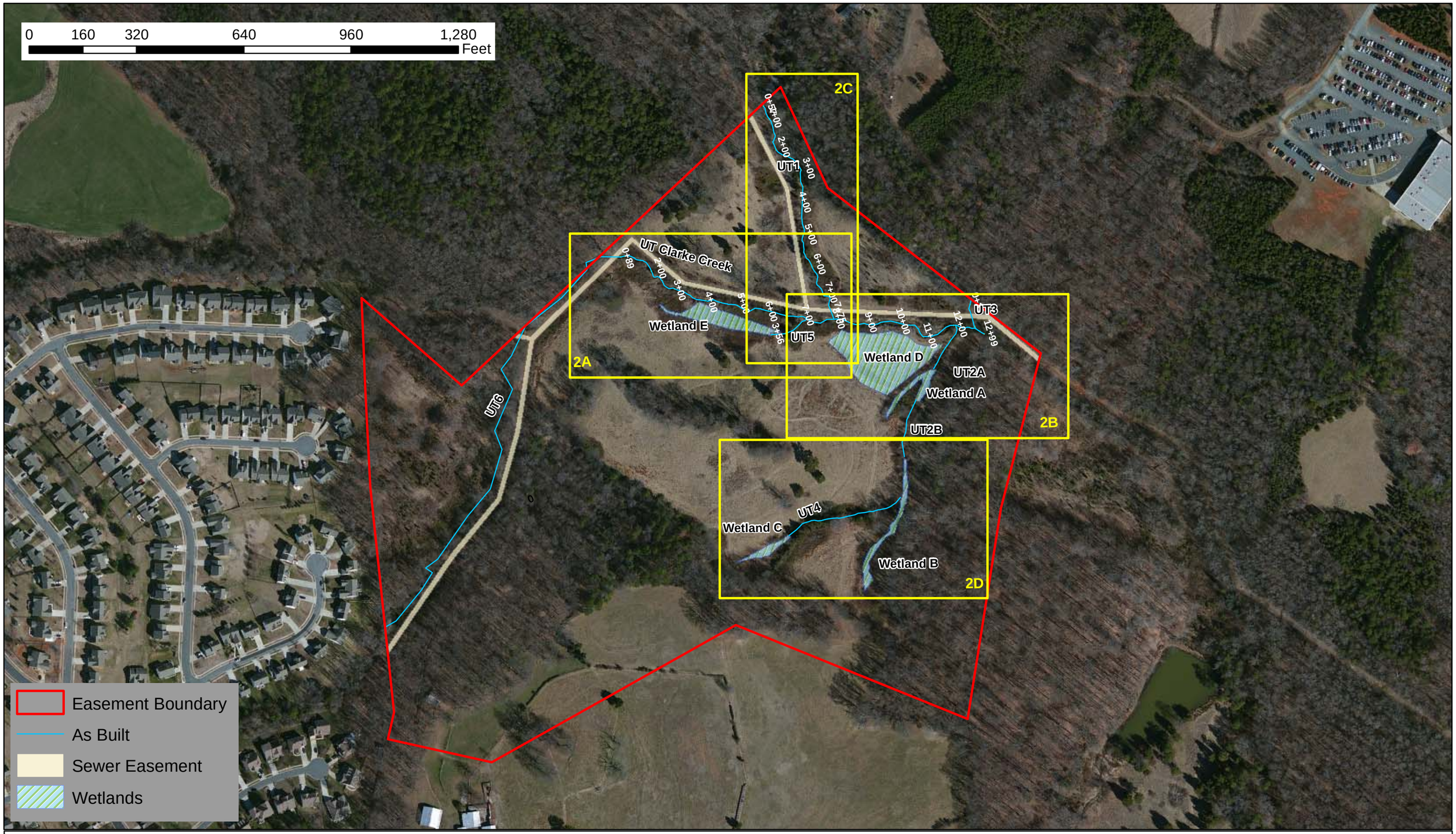
Elapsed Time Since grading complete:	**11 months**
Elapsed Time Since planting complete:	**4 months**
Number of reporting Years:	**0**

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Institution Date	NA	Sept-2008
404 permit date	NA	Jan-2012
Restoration Plan	Sept-2010	Feb-2011
Final Design – Construction Plans	NA	July-2012
Construction	NA	July-2013
Containerized, bare root and B&B plantings	NA	Feb-2014
Mitigation Plan / As-built (Year 0 Monitoring – baseline)	Mar-2014	June-2014
Year 1 Monitoring		
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		

Table 3. Project Contacts Table UT to Clarke Creek/ EEP Project #92500	
Designer Primary project design POC	Jordan, Jones, and Goulding, Inc. 309 E. Morehead Street, Suite 110, Charlotte, NC 28202 Matthew M. Clabaugh, PE
Construction Contractor Construction contractor POC	North State Environmental 2889 Lowery Street, Winston-Salem, NC 27101 Michael Anderson, (336) 245-1253
Survey Contractor Survey contractor POC	NorthState Environmental 2889 Lowery Street, Winston-Salem, NC 27101 David Keith Alley, PLS
Planting Contractor Planting contractor POC	Carolina Silvics 908 Indian Trail Road, Edenton, NC 27932
Seeding Contractor Contractor point of contact	Canady's Landscaping & Erosion 256 Fairview Acres Road, Lexington, NC 27295 Craig Canady, (336) 236-1182
Seed Mix Sources	
Nursery Stock Suppliers	
Monitoring Performers	SEPI Engineering & Construction 1025 Wade Avenue, Raleigh, NC 27605
Stream Monitoring POC	Philip Beach, PWS (919) 789-9977
Vegetation Monitoring POC	Kim Hamlin (919) 789-9977
Wetland Monitoring POC	Philip Beach, PWS (919) 789-9977

Table 4. Project Attribute Table UT to Clarke Creek/EEP Project #92500			
Project County	Mecklenburg		
Physiographic Region	Piedmont		
Ecoregion	Southern Outer Piedmont belt		
Project River Basin	Yadkin-Pee Dee		
USGS HUC for Project (14 digit)	03040105010040		
NCDWQ Sub-basin for Project	03-07-11		
Within extent of EEP Watershed Plan?	Upper Rocky River LWP		
WRC Hab Class (Warm, Cool, Cold)	Warm		
% of project easement fenced or demarcated	100%		
Beaver activity observed during design phase?	Yes		
Restoration Component Attribute Table			
	UT Clarke Creek	**UT1**	
Drainage area	1.08	0.46	
Stream order	2	1	
Restored length (feet)	1507	758	
Perennial or Intermittent	Perennial	Perennial	
Watershed type (Rural, Urban, Developing etc.)	Rural		
Watershed LULC Distribution (e.g.)			
Residential	94.60%		
Ag-Row Crop	-		
Ag-Livestock	-		
Forested	-		
Etc.	5.40%		
Watershed impervious cover (%)	16.50%		
NCDWQ AU/Index number	13-17-5-2		
NCDWQ classification	C		
303d listed?	No		
Upstream of a 303d listed segment?	Yes		
Reasons for 303d listing or stressor	5, Ecological/biological integrity		
Total acreage of easement	57.2		
Total vegetated acreage within the easement	57.2		
Total planted acreage as part of the restoration	57.2		
Rosgen classification of pre-existing	E4	B4c	B4c
Rosgen classification of As-built	N/A		
Valley type	VIII		
Valley slope	-		
Valley side slope range (e.g. 2-3.%)	-		
Valley toe slope range (e.g. 2-3.%)	-		
Cowardin classification	N/A		
Trout waters designation	No		
Species of concern, endangered etc.? (Y/N)	No		
Dominant soil series and characteristics	Mo, MeD, EnD		
Series	Monacan, Mecklenburg, Enon		
Depth	-		
Clay%	-		
K	-		
T	-		

Appendix B
Visual Assessment Data



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UT to Clarke Creek Baseline Monitoring

Current Conditions Plan View Index Map

June 2014 Project # 92500 Figure 2 Mecklenburg County, NC

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UT to Clarke Creek Baseline Monitoring

Current Conditions Plan View UT to Clarke Creek above Confluence

June 2014 Project # 92500 Figure 2A Mecklenburg County, NC

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UT to Clarke Creek Baseline Monitoring

Current Conditions Plan View UT to Clarke Creek below Confluence

June 2014 Project # 92500 Figure 2B Mecklenburg County, NC

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SEPI ENGINEERING & CONSTRUCTION

0 30 60 120 180 240 Feet

PLOT 7
PLOT 8
PLOT 9
PLOT 3
PLOT 4

0+57
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00

PPT 9 DS
PPT 9 US
PPT 10 DS
PPT 11 DS
PPT 10 US
PPT 12 DS
PPT 11 US
PPT 12 US
PPT 13 DS
PPT 13 US
PPT 5 US
PPT 6 DS
PPT 4 US
PPT 4 DS
PPT 2 NW

XS4 1+26
XS5 2+66
XS6 3+33
XS8 4+14
XS3 7+25
XS1a 5+58

UT1
UT Clarke Creek
UT5
7+75
6+00
3+56

Well 3
Well 4
Well 6

Photo Points
Well
Crest Gage
As Built
Cross Section
Boulder Sill
Bank Protection
Boulder Toe

Easement Boundary
Vegetation Plot

Sewer Easement
Wetlands

Structures
Brush Toe
Log Vane
Constructed Riffle
Rock Vane
Rootwad

Condition
Stable
Fair
Stressed
Failing
Not Assessed/Missing

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UT to Clarke Creek Baseline Monitoring

Current Conditions Plan View UT1

June 2014 Project # 92500 Figure 2C Mecklenburg County, NC

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UT to Clarke Creek Baseline Monitoring

Current Conditions Plan View UT4

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UT to Clarke Creek Baseline Monitoring

Components Map

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N W E S

Table 5a **Visual Stream Morphology Stability Assessment**
Reach ID **UT to Clarke Creek**
Assessed Length **1507**

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	10	10			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	10	10			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	10	10			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	10	10			100%			
		2. Thalweg centering at downstream of meander (Glide)	10	10			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	3	75	102%
	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%	2	60	102%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	5	135	104%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	7	7			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	1	1			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%. (See guidance for this table in EEP monitoring guidance document)	7	8			88%			
	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%			

Table 5b **Visual Stream Morphology Stability Assessment**
Reach ID **UT1**
Assessed Length **758**

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)	6	6			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	6	6			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	6	6			100%			
		2. Thalweg centering at downstream of meander (Glide)	6	6			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	3	75	105%
	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%	2	60	104%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	5	135	109%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	7	7			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	1	1			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%. (See guidance for this table in EEP monitoring guidance document)	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.	2	2			100%			

Table 6 Vegetation Condition Assessment

Planted Acreage[1] **13**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	Pattern and Color	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	Pattern and Color	0	0.00	0.0%
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	Pattern and Color	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%

Easement Acreage[2] **57.2**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Areas or points (if too small to render as polygons at map scale).	1000 SF	Pattern and Color	0	0.00	0.0%
5. Easement Encroachment Areas[3]	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

2 = The acreage within the easement boundaries.

3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1,2 or 3) as well as a parallel tally in item 5.

4 = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern spcies are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by EEP such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likley trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly ealry in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolzing invasives polygons, particulalry for situations where the conditon for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the

Photo Station 1 Downstream-XS9 (Baseline)

Photo Station 1 Upstream-XS 9 (Baseline)

Photo Station 2 Northeast-Wetland E (Baseline)

Photo Station 2 Southeast-Wetland E (Baseline)

Photo Station 3 Downstream-XS1 (Baseline)

Photo Station 3 Upstream-XS1 (Baseline)

Photo Station 4 Downstream-XS1A (Baseline)

Photo Station 4 Upstream-XS1A (Baseline)

Photo Station 5 Upstream-Confluence (Baseline)

Photo Station 6 Downstream-XS2 (Baseline)

Photo Station 6 Upstream-XS2 (Baseline)

Photo Station 7 Northwest- Wetland D (Baseline)

Photo Station 7 Southeast-Wetland D (Baseline)

Photo Station 8 Downstream-UT2 (Baseline)

Photo Station 8 South-Wetland A (Baseline)

Photo Station 9 Downstream-XS4 (Baseline)

Photo Station 9 Upstream-XS4 (Baseline)

Photo Station 10 Downstream-XS5 (Baseline)

Photo Station 10 Upstream-XS5 (Baseline)

Photo Station 11 Downstream-XS6 (Baseline)

Photo Station 11 Upstream-XS6 (Baseline)

Photo Station 12 Downstream-XS8 (Baseline)

Photo Station 12 Upstream-XS8 (Baseline)

Photo Station 13 Downstream-XS3 (Baseline)

Photo Station 13 Upstream-XS3 (Baseline)

Photo Station 14 North-Wetland B (Baseline)

Photo Station 14 South-Wetland B (Baseline)

Vegetation Plot 1 – 5m x 20m (18/FEB/2014 Year 0 of 5)

Vegetation Plot 2 – 10m x 10m (18/FEB/2014 Year 0 of 5)

Vegetation Plot 3 – 5m x 20m (16/APR/2014 Year 0 of 5)

Vegetation Plot 4 – 5m x 20m (19/FEB/2014 Year 0 of 5)

Vegetation Plot 5 – 5m x 20m (17/FEB/2014 Year 0 of 5)

Vegetation Plot 6 – 5m x 20m (19/FEB/2014 Year 0 of 5)

Vegetation Plot 7 – 10m x 10m (05/MAR/2014 Year 0 of 5)

Vegetation Plot 8 – 5m x 20m (05/MAR/2014 Year 0 of 5)

Vegetation Plot 9 – 5m x 20m (05/MAR/2014 Year 0 of 5)

Appendix C
Vegetation Plot Data

Table 7. Planted and Total Stem Counts (Stems and Species by Plot with Annual Means)

EEP Project Code 92500. Project Name: UT Clarke Creek

			Current Plot Data (MY0 2014)																									Annual Means		
			92500-01-0001			92500-01-0002			92500-01-0003			92500-01-0004			92500-01-0005			92500-01-0006			92500-01-0007			92500-01-0008			92500-01-0009			MY0 (2014)		
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
Alnus serrulata	hazel alder	Shrub									1																				1
Amelanchier arborea	common serviceberry	Tree										1	1	1															1	1	1
Betula nigra	river birch	Tree							2	2	2													2	2	2	4	4	4	8	8	8
Carpinus caroliniana	American hornbeam	Tree																									2	2	2	2	2	2
Carya glabra	pignut hickory	Tree										1	1	1																1	1	1
Cornus amomum	silky dogwood	Shrub								2	2																	4	4		6	6
Fraxinus pennsylvanica	green ash	Tree	1	1	1							3	3	3	1	1	1				8	8	8				2	2	2	15	15	15
Ilex verticillata	common winterberry	Shrub										1	1	1																1	1	1
Juglans	walnut	Tree									1																					1
Liquidambar styraciflua	sweetgum	Tree			2			1																		1						4
Liriodendron tulipifera	tuliptree	Tree	2	2	2				4	4	4													6	6	6				12	12	12
Platanus occidentalis	American sycamore	Tree	2	2	2	1	1	1	4	4	4																			7	7	7
Quercus falcata	southern red oak	Tree	3	3	3	7	7	7				5	5	5	8	8	8				1	1	1	1	1	1	1	1	1	26	26	26
Quercus nigra	water oak	Tree																8	8	8										8	8	8
Quercus rubra	northern red oak	Tree							1	1	1																			1	1	1
Salix nigra	black willow	Tree			72			4		5	5			3									4						10		5	98
		Stem count	8	8	82	8	8	13	11	18	20	11	11	14	9	9	9	8	8	8	9	9	13	9	9	10	9	13	23	82	93	192
		size (ares)	1			1			1			1			1			1			1			1			1			9		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.22		
		Species count	4	4	6	2	2	4	4	6	8	5	5	6	2	2	2	1	1	1	2	2	3	3	3	4	4	5	6	11	13	16
		Stems per ACRE	323.7	323.7	3318	323.7	323.7	526.1	445.2	728.4	809.4	445.2	445.2	566.6	364.2	364.2	364.2	323.7	323.7	323.7	364.2	364.2	526.1	364.2	364.2	404.7	364.2	526.1	930.8	368.7	418.2	863.3

Appendix D
Stream Survey Data

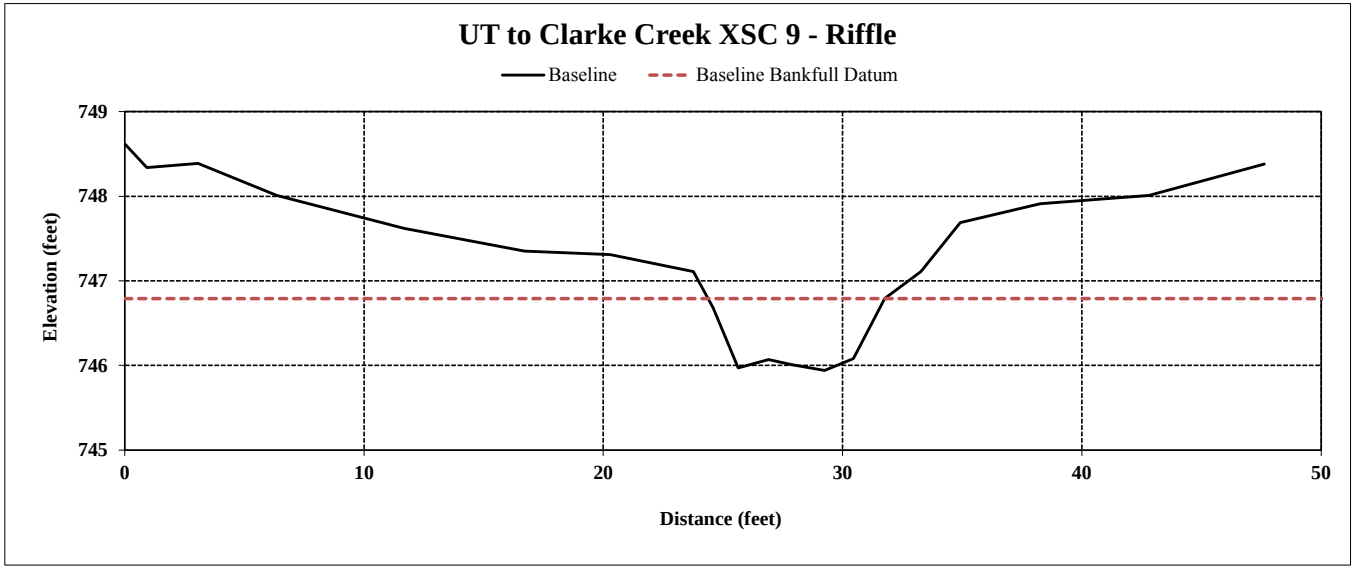
Station	Elevation
0.03	748.61
0.92	748.34
3.06	748.39
6.35	748.01
11.67	747.62
16.71	747.35
20.29	747.31
23.76	747.11
24.59	746.68
25.64	745.97
26.91	746.07
27.88	746.01
29.25	745.94
30.45	746.08
31.76	746.79
33.27	747.11
34.92	747.69
38.26	747.91
42.81	748.01
47.62	748.38

Reach	UT to Clarke Creek
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-9, Riffle, 2+02
Drainage Area (Sq Mi)	1.08
Date	3/4/2014
Observers	K. Hamlin, H. Anthony

SUMMARY DATA	
Baseline Bankfull Datum, ft	746.79
Bankfull Cross Sectional Area, ft^2	2.8
Bankfull Width, ft	7.17
Max Depth at Bankfull, ft	0.85
Mean Depth at Bankfull, ft	0.39
Width/Depth Ratio	18.36
Flood Prone Width, ft	18.7
Flood Prone Area Elevation	747.42
Entrenchment Ratio	2.61
Bank Height Ratio	0.87

Stream Type	E4

Sta. 2+02 Looking Downstream



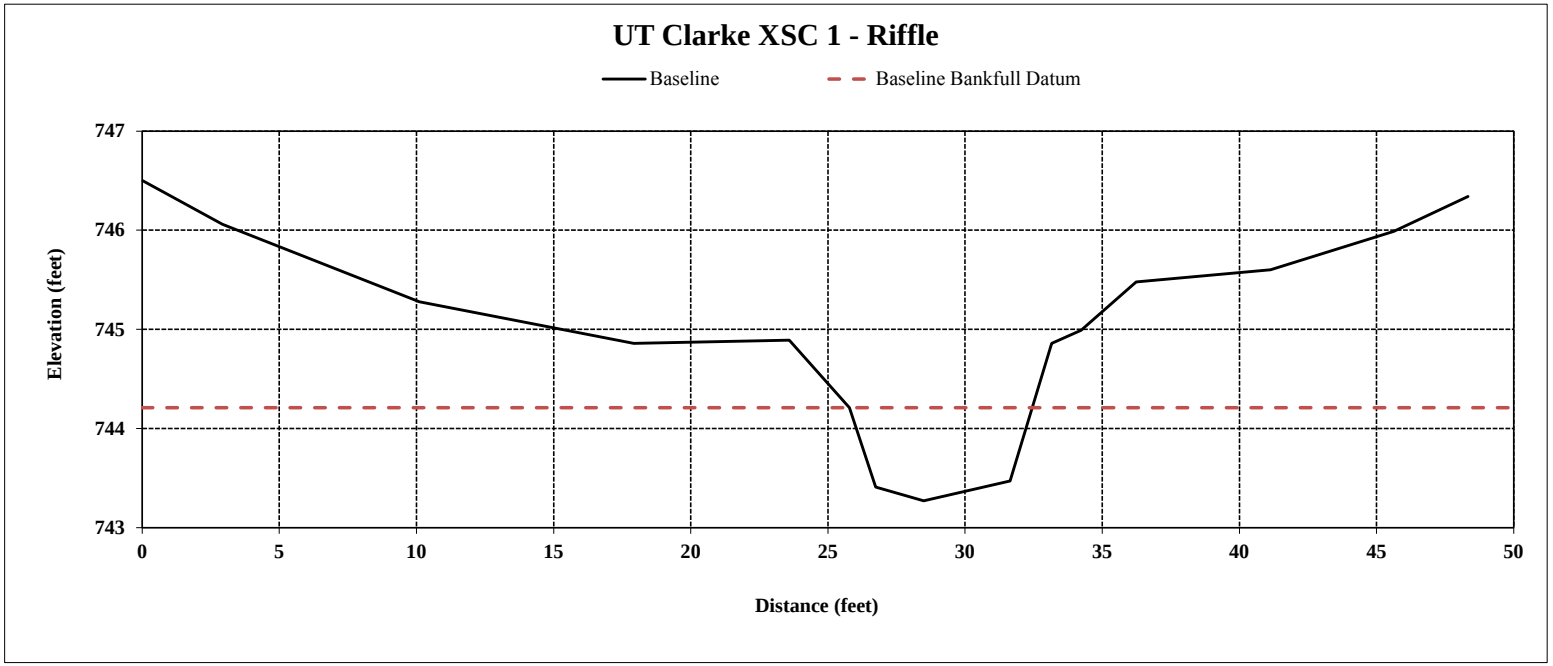
Station	Elevation
0.03	746.5
2.93	746.06
10.11	745.28
17.92	744.86
23.59	744.89
25.78	744.21
26.74	743.41
28.49	743.27
31.64	743.47
33.16	744.86
34.23	744.99
36.24	745.48
41.14	745.6
45.63	745.99
48.34	746.34

Reach	UT to Clarke Creek
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-1, Riffle, 4+52
Drainage Area (Sq Mi)	1.08
Date	3/4/2014
Observers	K. Hamlin, H. Anthony

SUMMARY DATA	
Baseline Bankfull Datum, ft	744.21
Bankfull Cross Sectional Area, ft^2	5.11
Bankfull Width, ft	6.72
Max Depth at Bankfull, ft	0.94
Mean Depth at Bankfull, ft	0.76
Width/Depth Ratio	8.84
Flood Prone Width, ft	22.40
Flood Prone Area Elevation	745.15
Entrenchment Ratio	3.33
Bank Height Ratio	1.00

Stream Type	E4

Sta. 4+52 Looking Downstream



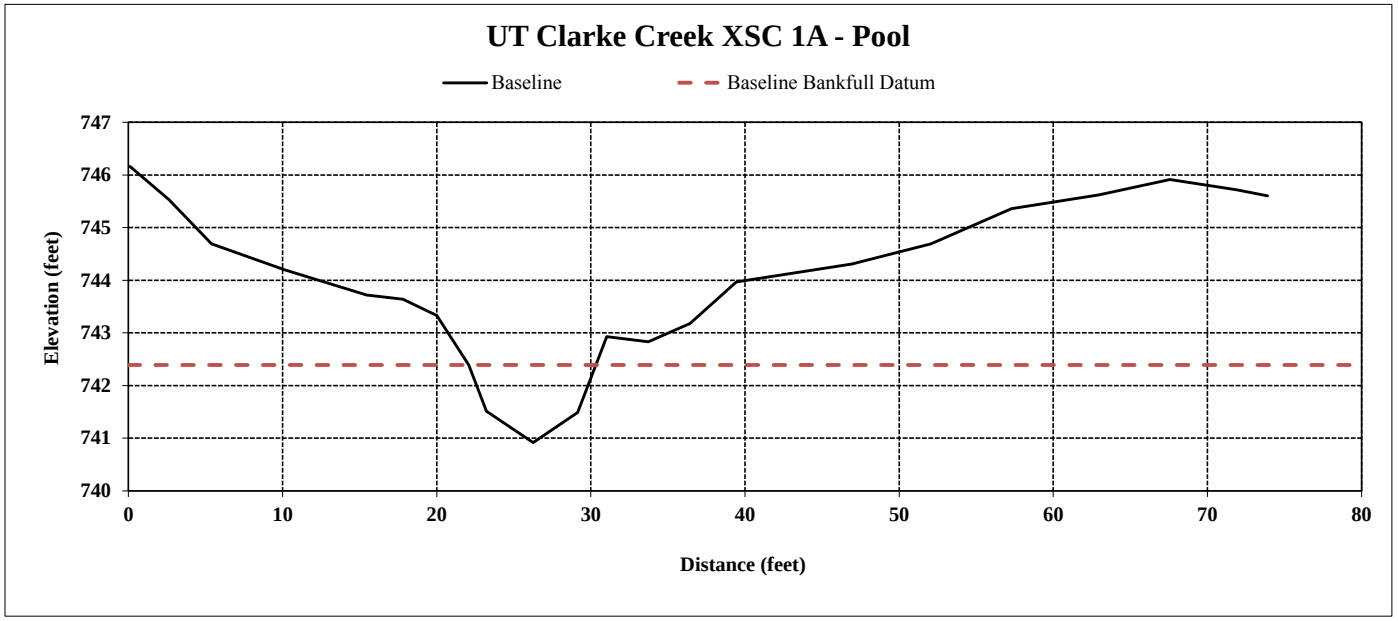
Station	Elevation
0.09	746.16
2.63	745.53
5.38	744.69
10.13	744.20
15.46	743.72
17.81	743.64
20	743.33
22.08	742.39
23.23	741.51
26.26	740.92
29.13	741.49
31.02	742.93
33.72	742.83
36.42	743.18
39.44	743.97
46.94	744.31
52.05	744.69
57.29	745.36
62.96	745.62
67.56	745.91
71.88	745.72
73.91	745.6

Reach	UT to Clarke Creek
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-1A, Pool, 5+58
Drainage Area (Sq Mi)	1.08
Date	3/4/2014
Observers	K. Hamlin, H. Anthony

SUMMARY DATA	
Baseline Bankfull Datum, ft	742.39
Bankfull Cross Sectional Area, ft^2	1.78
Bankfull Width, ft	9.02
Max Depth at Bankfull, ft	1.47
Mean Depth at Bankfull, ft	0.20
Width/Depth Ratio	45.71
Flood Prone Width, ft	25.60
Flood Prone Area Elevation	743.86
Entrenchment Ratio	2.84
Bank Height Ratio	1.00

Stream Type	E4

Sta. 5+58 Looking Downstream



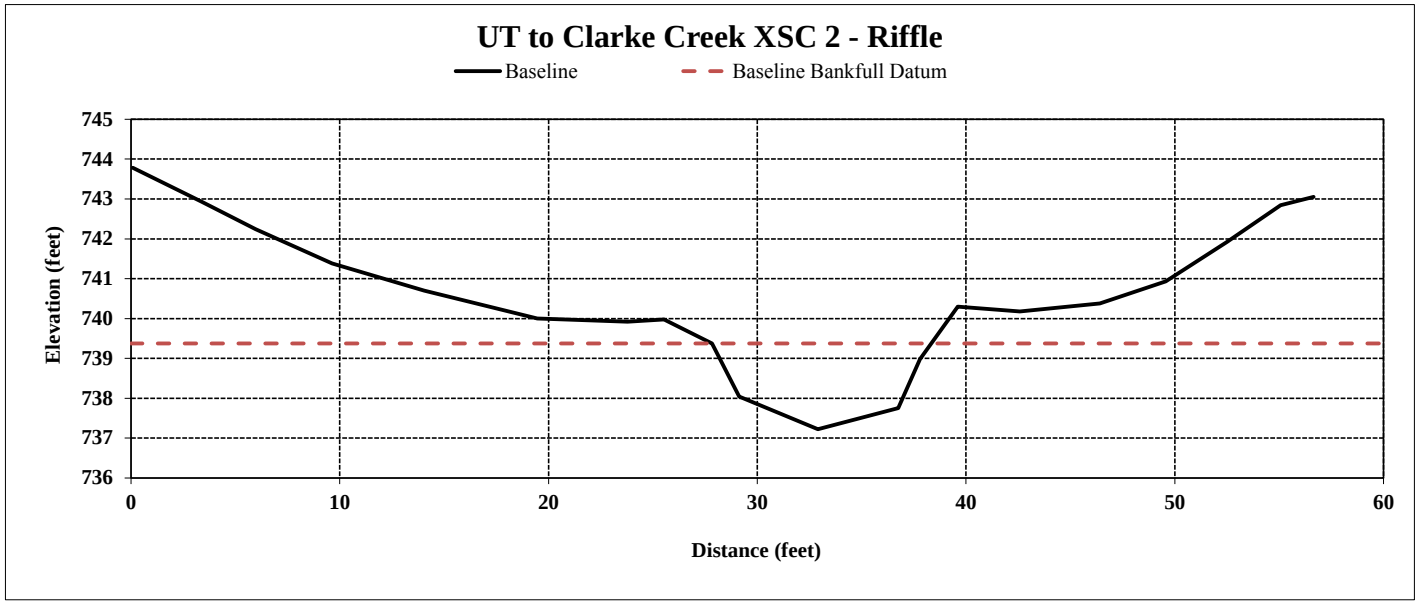
Station	Elevation
0.09	743.78
3.38	742.93
5.98	742.24
9.64	741.38
14.06	740.70
19.46	740.00
23.78	739.92
25.54	739.98
27.83	739.37
29.13	738.04
32.9	737.22
36.75	737.75
37.8	738.98
39.6	740.30
42.58	740.18
46.41	740.38
49.57	740.93
52.49	741.92
55.07	742.84
56.64	743.05

Reach	UT to Clarke Creek
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-2, Riffle, 9+33
Drainage Area (Sq Mi)	1.08
Date	3/4/2014
Observers	K. Hamlin, H. Anthony

SUMMARY DATA	
Baseline Bankfull Datum, ft	739.37
Bankfull Cross Sectional Area, ft^2	15.50
Bankfull Width, ft	9.97
Max Depth at Bankfull, ft	2.15
Mean Depth at Bankfull, ft	1.55
Width/Depth Ratio	6.41
Flood Prone Width, ft	34.60
Flood Prone Area Elevation	740.74
Entrenchment Ratio	3.47
Bank Height Ratio	0.82

Stream Type	E4

Sta. 9+33 Looking Downstream



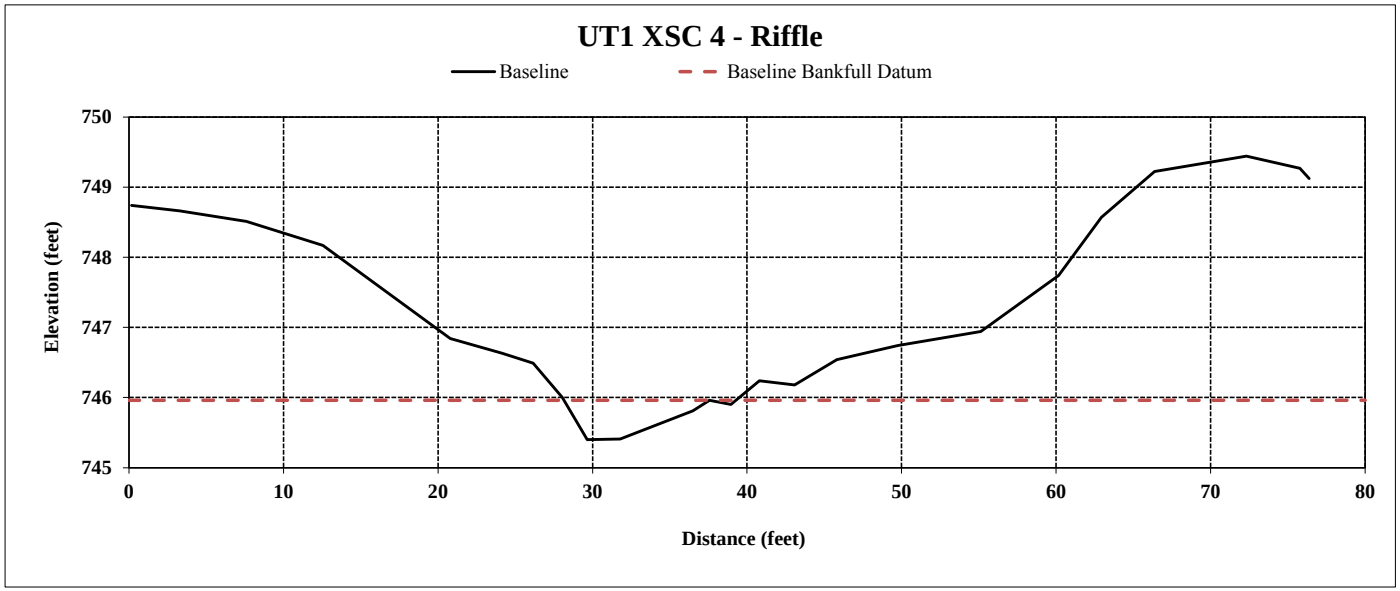
Station	Elevation
0.16	748.74
3.28	748.66
7.6	748.51
12.56	748.17
20.79	746.84
24.15	746.63
26.15	746.49
28.05	746.00
29.66	745.40
31.8	745.41
36.49	745.81
37.57	745.96
38.96	745.90
40.8	746.24
43.08	746.18
45.82	746.54
49.74	746.74
55.13	746.94
60.17	747.74
62.93	748.57
66.37	749.22
72.32	749.44
75.77	749.27
76.38	749.12

Reach	UT1
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-4, Riffle, 1+26
Drainage Area (Sq Mi)	0.46
Date	3/4/2014
Observers	K. Hamlin, H. Anthony

SUMMARY DATA	
Baseline Bankfull Datum, ft	745.96
Bankfull Cross Sectional Area, ft^2	3.14
Bankfull Width, ft	8.44
Max Depth at Bankfull, ft	0.56
Mean Depth at Bankfull, ft	0.37
Width/Depth Ratio	22.69
Flood Prone Width, ft	13.3
Flood Prone Area Elevation	746.52
Entrenchment Ratio	1.58
Bank Height Ratio	0.73

Stream Type	B4c

Sta. 1+26 Looking Downstream



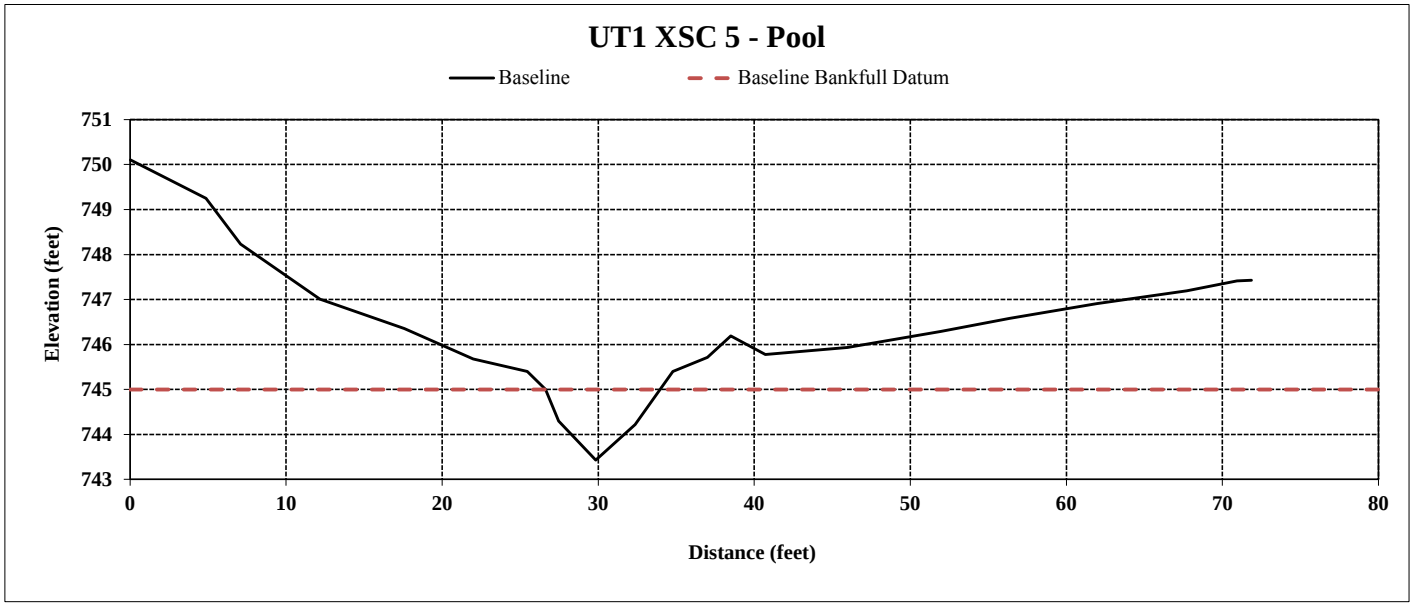
Station	Elevation
0.03	750.10
4.86	749.25
7.08	748.23
12.16	747.01
17.59	746.35
22	745.68
25.46	745.40
26.63	745.00
27.46	744.30
29.84	743.43
32.36	744.22
34.78	745.40
37	745.71
38.5	746.19
40.72	745.78
45.98	745.93
51.95	746.29
56.37	746.58
61.96	746.91
67.71	747.19
70.94	747.41
71.87	747.43

Reach	UT1
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-5, Pool, 2+66
Drainage Area (Sq Mi)	0.46
Date	3/4/2014
Observers	K. Hamlin, H. Anthony

SUMMARY DATA	
Baseline Bankfull Datum, ft	745.00
Bankfull Cross Sectional Area, ft^2	6.9
Bankfull Width, ft	8.18
Max Depth at Bankfull, ft	1.57
Mean Depth at Bankfull, ft	0.84
Width/Depth Ratio	9.70
Flood Prone Width, ft	40
Flood Prone Area Elevation	746.57
Entrenchment Ratio	4.89
Bank Height Ratio	1

Stream Type	B4c

Sta. 2+66 Looking Downstream



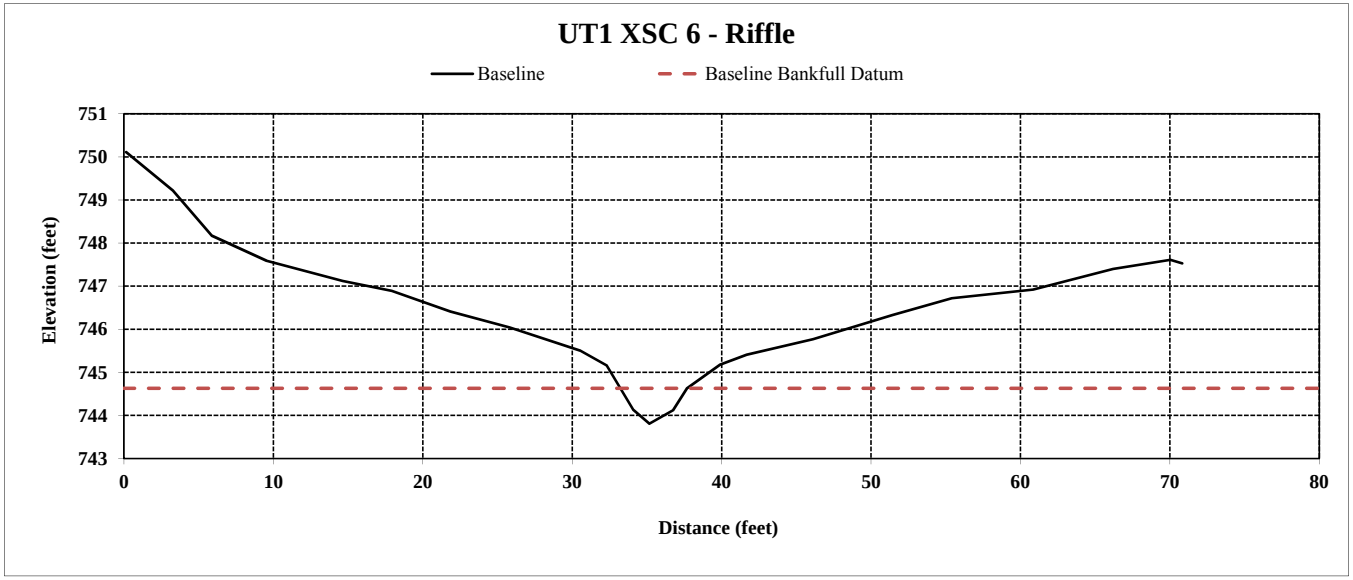
Station	Elevation
0.15	750.11
3.27	749.22
5.88	748.17
9.55	747.59
14.63	747.12
17.92	746.89
21.84	746.41
25.83	746.04
30.55	745.50
32.3	745.16
34.08	744.13
35.16	743.81
36.75	744.12
37.68	744.63
39.9	745.18
41.68	745.41
46.12	745.77
51.44	746.33
55.4	746.72
60.84	746.92
66.2	747.4
70.03	747.61
70.83	747.53

Reach	UT1
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-6, Riffle, 3+33
Drainage Area (Sq Mi)	0.46
Date	3/4/2014
Observers	K. Hamlin, H. Anthony

SUMMARY DATA	
Baseline Bankfull Datum, ft	744.63
Bankfull Cross Sectional Area, ft^2	4.59
Bankfull Width, ft	7.18
Max Depth at Bankfull, ft	0.82
Mean Depth at Bankfull, ft	0.64
Width/Depth Ratio	11.23
Flood Prone Width, ft	11.3
Flood Prone Area Elevation	745.45
Entrenchment Ratio	1.57
Bank Height Ratio	1

Stream Type	B4c

Sta. 3+33 Looking Downstream



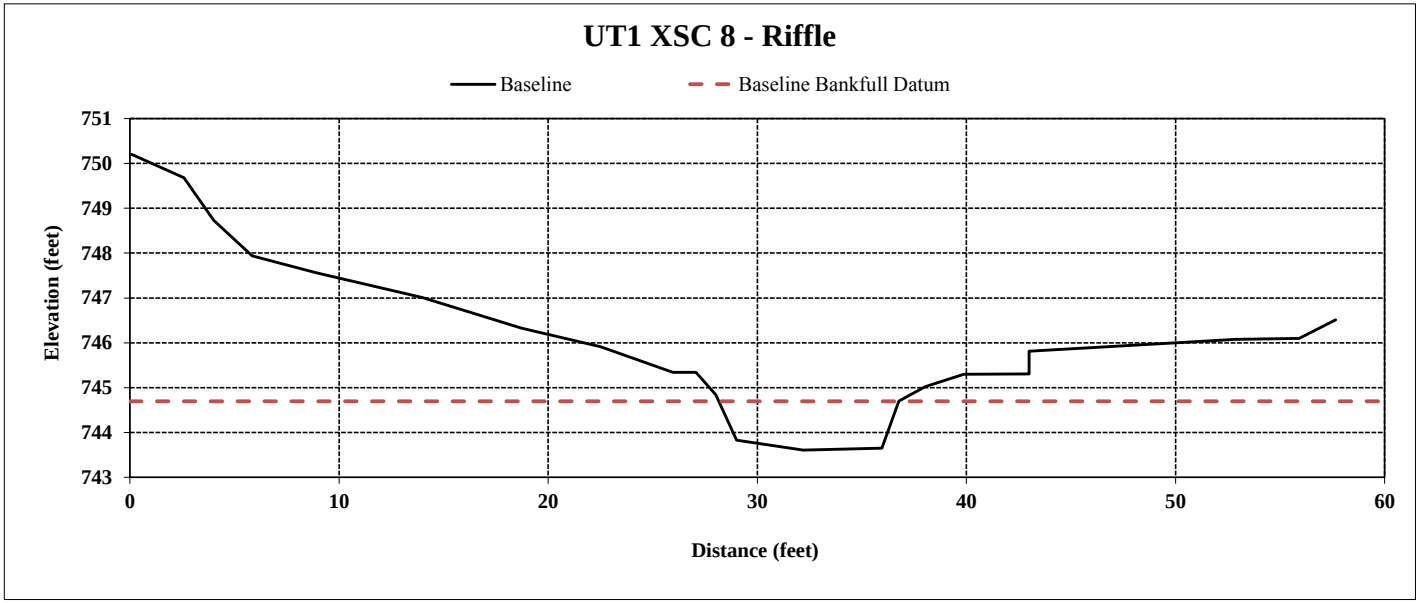
Station	Elevation
0.09	750.20
2.58	749.68
4	748.73
5.84	747.94
8.92	747.56
13.96	747.01
18.73	746.33
22.51	745.91
25.97	745.34
27.07	745.34
28.02	744.84
29.01	743.83
32.19	743.61
35.95	743.65
36.77	744.70
38.03	745.02
39.87	745.3
43	745.31
43	745.81
52.87	746.08
55.91	746.1
57.66	746.51

Reach	UT1
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-8, Riffle, 4+14
Drainage Area (Sq Mi)	0.46
Date	3/4/2014
Observers	H. Anthony, K. Hamlin

SUMMARY DATA	
Baseline Bankfull Datum, ft	744.70
Bankfull Cross Sectional Area, ft^2	9.09
Bankfull Width, ft	8.75
Max Depth at Bankfull, ft	1.09
Mean Depth at Bankfull, ft	1.04
Width/Depth Ratio	8.42
Flood Prone Width, ft	19.5
Flood Prone Area Elevation	745.79
Entrenchment Ratio	2.22
Bank Height Ratio	1

Stream Type	B4c

Sta. 4+14 Looking Downstream



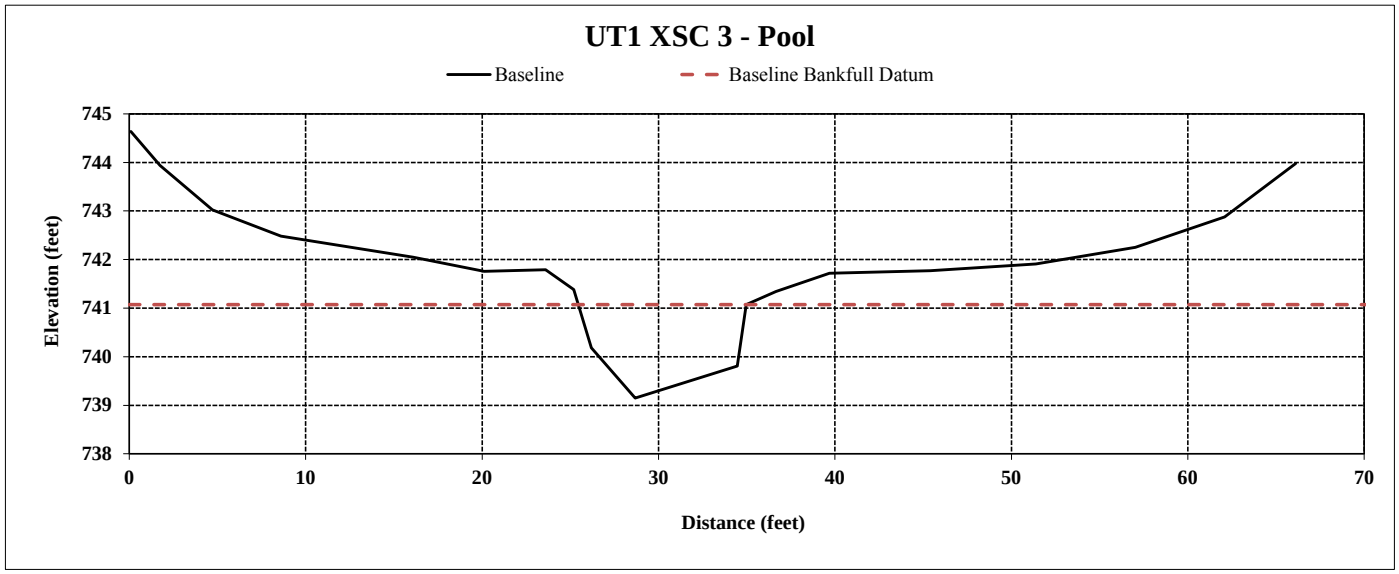
Station	Elevation
0.1	744.64
1.75	743.94
4.72	743.02
8.6	742.48
16.1	742.05
20.12	741.76
23.59	741.79
25.19	741.38
26.2	740.18
28.67	739.15
34.46	739.81
34.97	741.07
36.65	741.34
39.68	741.72
45.42	741.77
51.39	741.91
57.03	742.25
62.08	742.88
66.11	743.98

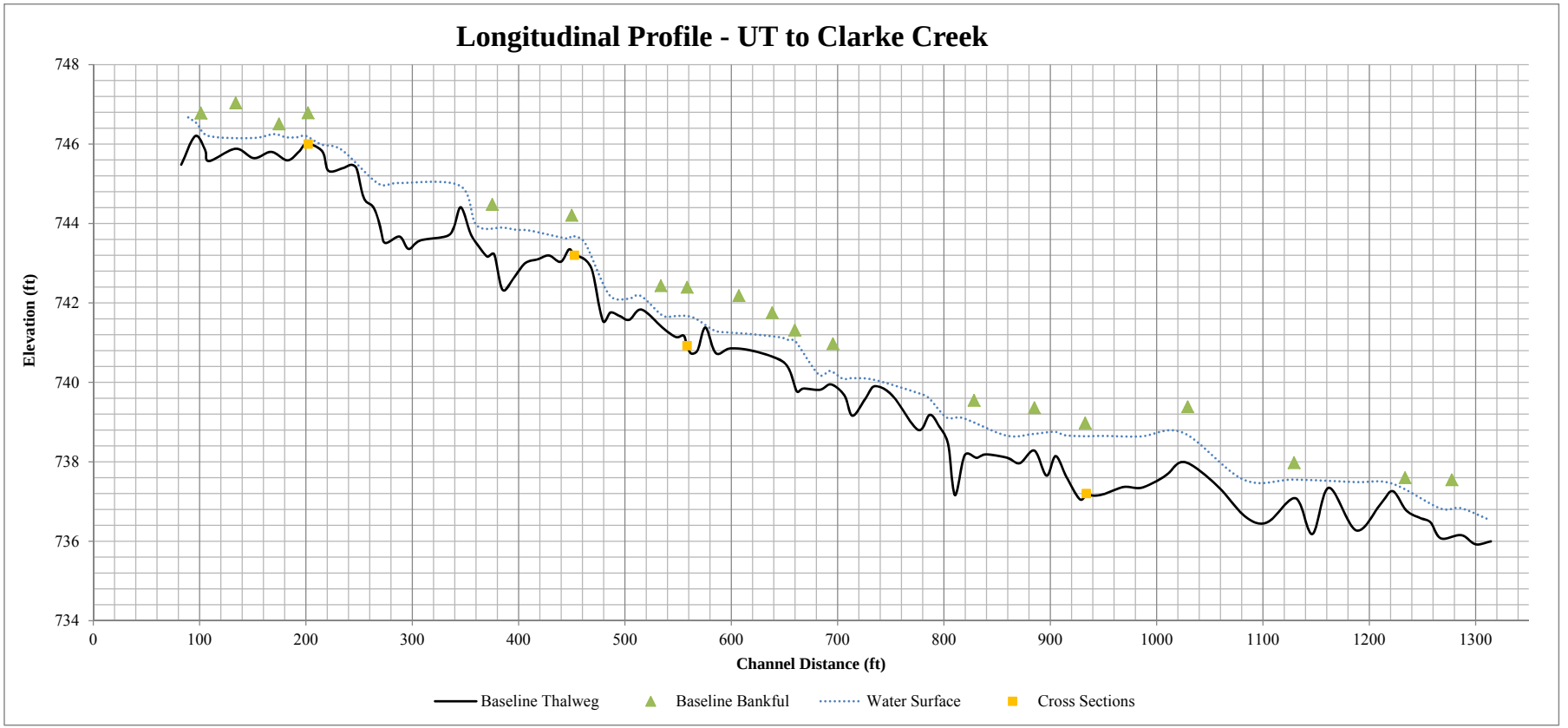
Reach	UT1
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-3, Pool, 7+25
Drainage Area (Sq Mi)	0.46
Date	3/4/2014
Observers	K. Hamlin, H. Anthony

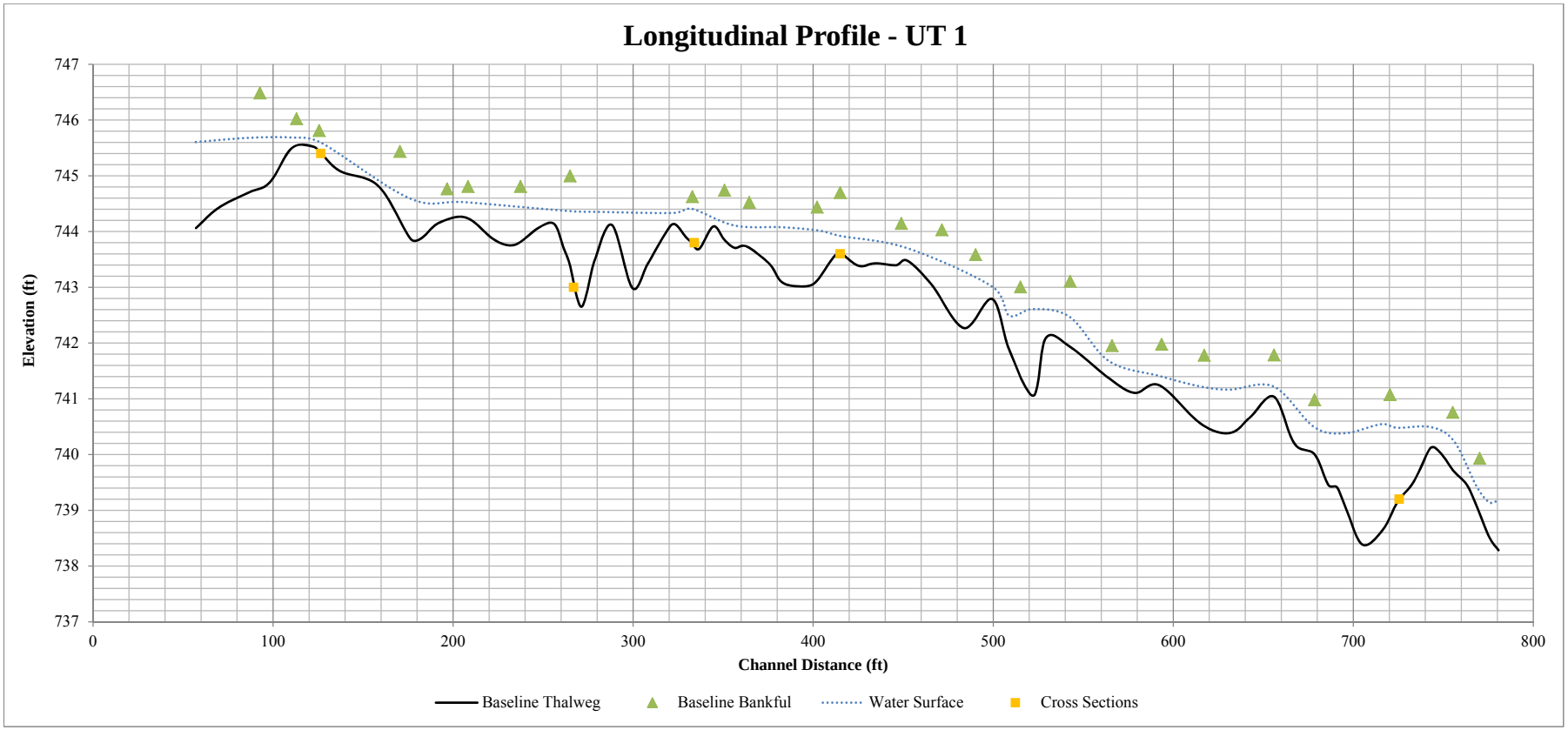
SUMMARY DATA	
Baseline Bankfull Datum, ft	741.07
Bankfull Cross Sectional Area, ft^2	16.24
Bankfull Width, ft	9.78
Max Depth at Bankfull, ft	1.92
Mean Depth at Bankfull, ft	1.66
Width/Depth Ratio	5.89
Flood Prone Width, ft	57.80
Flood Prone Area Elevation	742.99
Entrenchment Ratio	5.91
Bank Height Ratio	1.00

Stream Type	B4c

Sta. 7+25 Looking Downstream




Longitudinal Profile - UT to Clarke Creek
Elevation (ft)
748
746
744
742
740
738
736
734
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
Channel Distance (ft)
Baseline Thalweg
Baseline Bankful
Water Surface
Cross Sections

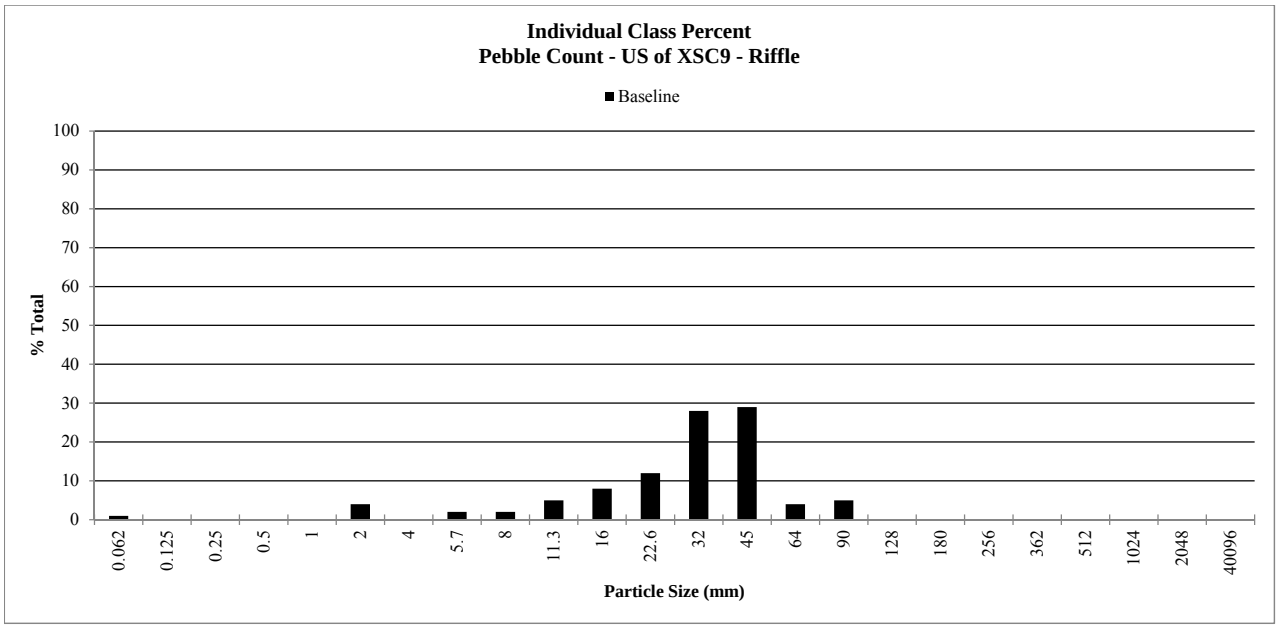

Longitudinal Profile - UT 1
Elevation (ft)
747
746
745
744
743
742
741
740
739
738
737
0
100
200
300
400
500
600
700
800
Channel Distance (ft)
Baseline Thalweg
Baseline Bankful
Water Surface
Cross Sections

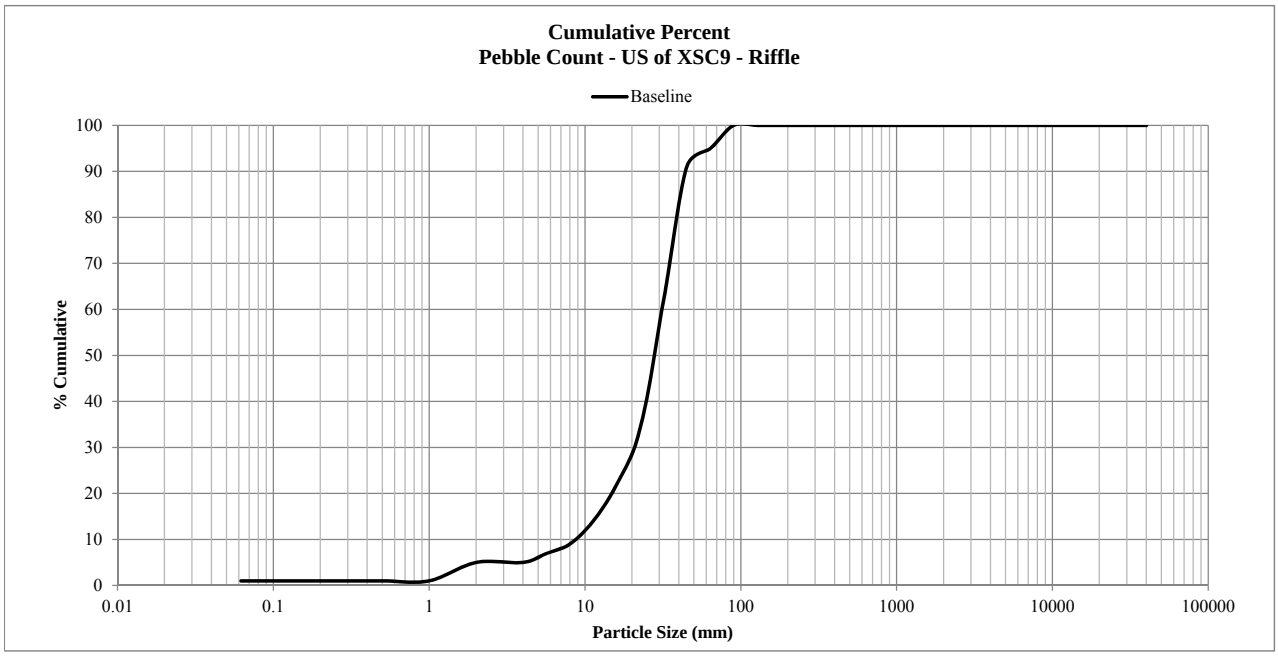
UT to Clarke Creek - US of XS9 - Riffle Pebble Count

Location: STA 2+02

Inches	Particle	Millimeters		Count	% Total	% Cum.
	Silt/Clay	<0.062		1	1	1
	Very Fine	0.062-0.125	S	0	0	1
	Fine	0.125-0.25	A	0	0	1
	Medium	0.25-0.50	N	0	0	1
	Coarse	0.50-1.0	D	0	0	1
0.04-0.08	Very Coarse	1.0-2		4	4	5
0.08-0.16	Very Fine	2-4		0	0	5
0.16-0.22	Fine	4-5.7		2	2	7
0.22-0.31	Fine	5.7-8	G	2	2	9
0.31-0.44	Medium	8-11.3	R	5	5	14
0.44-0.63	Medium	11.3-16	A	8	8	22
0.63-0.89	Coarse	16-22.6	V	12	12	34
0.89-1.26	Coarse	22.6-32	E	28	28	62
1.26-1.77	Very Coarse	32-45	L	29	29	91
1.77-2.5	Very Coarse	45-64		4	4	95
2.5-3.5	Small	64-90	C	5	5	100
3.5-5.0	Small	90-128	O	0	0	100
5.0-7.1	Medium	128-180	B	0	0	100
7.1-10.1	Large	180-256	B L E	0	0	100
10.1-14.3	Small	256-362	B	0	0	100
14.3-20	Small	362-512	O U L D E R	0	0	100
20-40	Medium	512-1024		0	0	100
40-80	Large	1024-2048		0	0	100
	Bedrock	Bedrock	Bedrock	0	0	100
			Total Counted	100		

Summary Data	
D50	28
D84	40
D95	65


Individual Class Percent
Pebble Count - US of XSC9 - Riffle
Baseline
100
90
80
70
60
50
40
30
20
10
0
% Total
0.062
0.125
0.25
0.5
1
2
4
5.7
8
11.3
16
22.6
32
45
64
90
128
180
256
362
512
1024
2048
40096
Particle Size (mm)

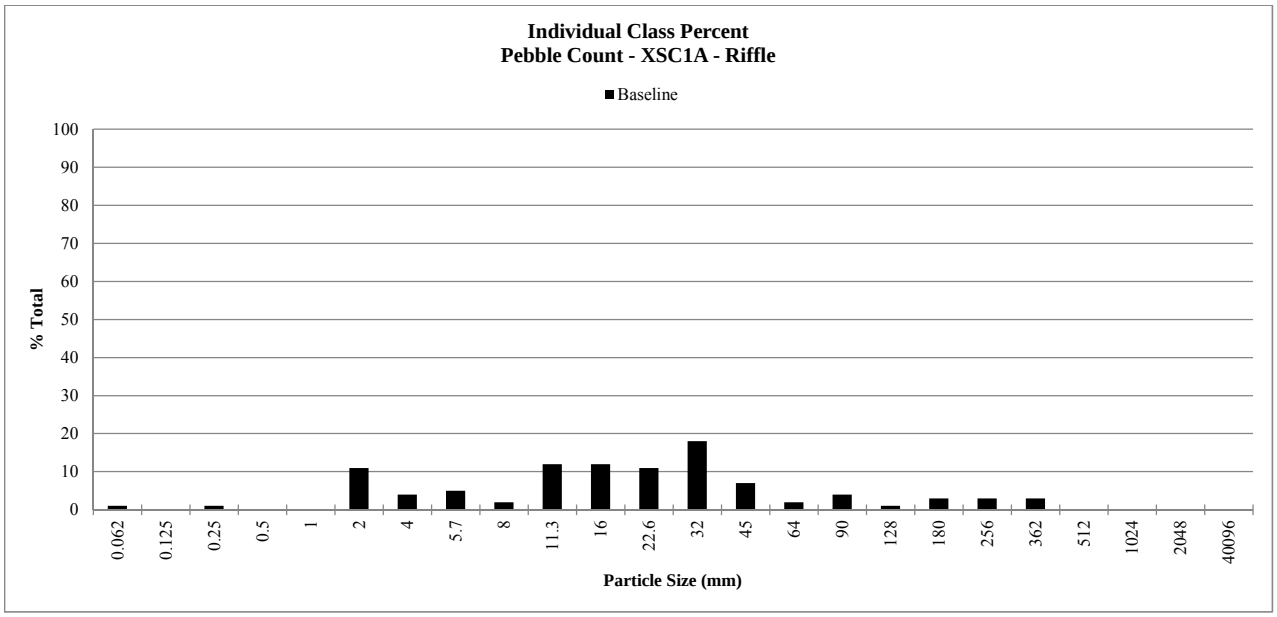

Cumulative Percent
Pebble Count - US of XSC9 - Riffle
Baseline
100
90
80
70
60
50
40
30
20
10
0
% Cumulative
0.01
0.1
1
10
100
1000
10000
100000
Particle Size (mm)

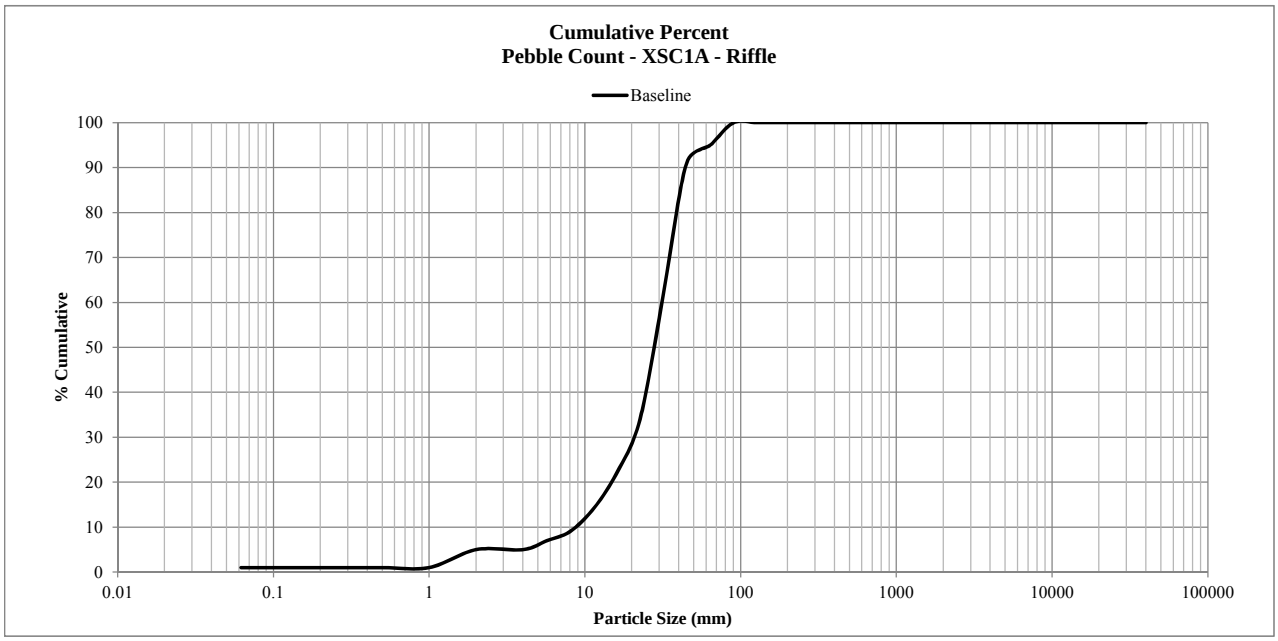
UT to Clarke Creek - XS1A - Riffle Pebble Count

Location: STA 5+58

Inches	Particle	Millimeters		Count	% Total	% Cum.
	Silt/Clay	<0.062		1	1	1
	Very Fine	0.062-0.125	S	0	0	1
	Fine	0.125-0.25	A	1	1	2
	Medium	0.25-0.50	N	0	0	2
	Coarse	0.50-1.0	D	0	0	2
0.04-0.08	Very Coarse	1.0-2		11	11	13
0.08-0.16	Very Fine	2-4		4	4	17
0.16-0.22	Fine	4-5.7		5	5	22
0.22-0.31	Fine	5.7-8	G	2	2	24
0.31-0.44	Medium	8-11.3	R	12	12	36
0.44-0.63	Medium	11.3-16	A	12	12	48
0.63-0.89	Coarse	16-22.6	V	11	11	59
0.89-1.26	Coarse	22.6-32	E	18	18	77
1.26-1.77	Very Coarse	32-45	L	7	7	84
1.77-2.5	Very Coarse	45-64		2	2	86
2.5-3.5	Small	64-90	C	4	4	90
3.5-5.0	Small	90-128	O	1	1	91
5.0-7.1	Medium	128-180	B	3	3	94
7.1-10.1	Large	180-256	B L E	3	3	97
10.1-14.3	Small	256-362	B	3	3	100
14.3-20	Small	362-512	O	0	0	100
20-40	Medium	512-1024	U L D E R	0	0	100
40-80	Large	1024-2048		0	0	100
	Bedrock	Bedrock	Bedrock	0	0	100
			Total Counted	100		

Summary Data	
D50	17
D84	45
D95	180


Individual Class Percent
Pebble Count - XSC1A - Riffle
Baseline
% Total
100
90
80
70
60
50
40
30
20
10
0
0.062
0.125
0.25
0.5
1
2
4
5.7
8
11.3
16
22.6
32
45
64
90
128
180
256
362
512
1024
2048
40096
Particle Size (mm)

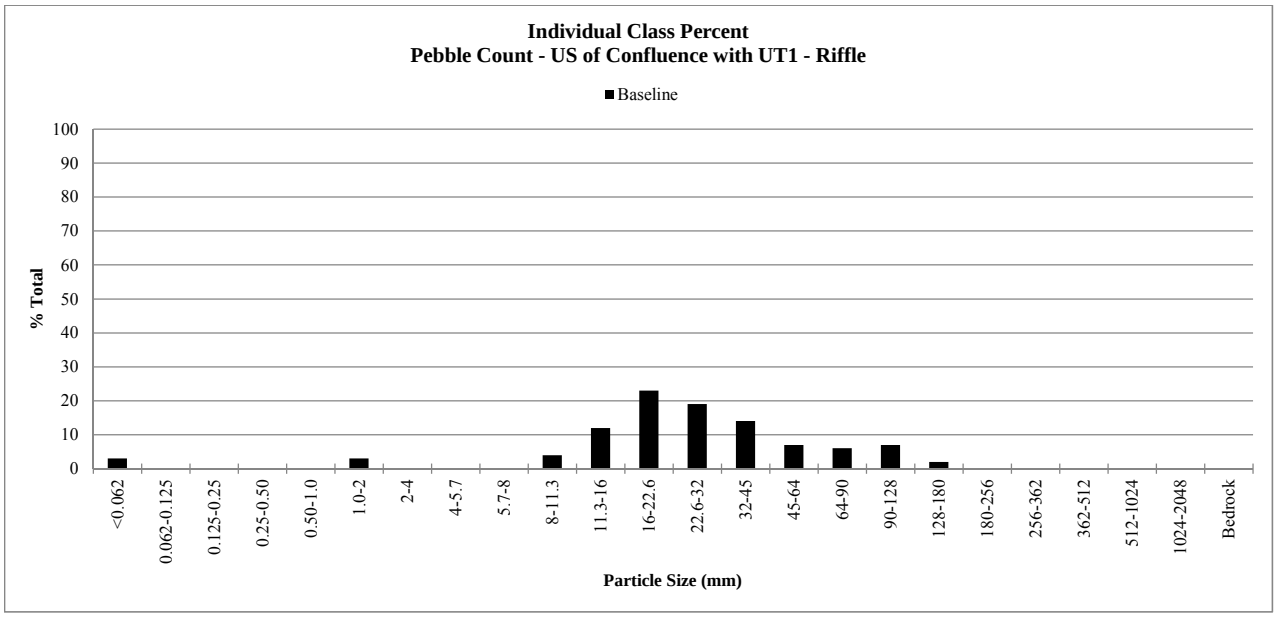

Cumulative Percent
Pebble Count - XSC1A - Riffle
Baseline
% Cumulative
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
100000
Particle Size (mm)

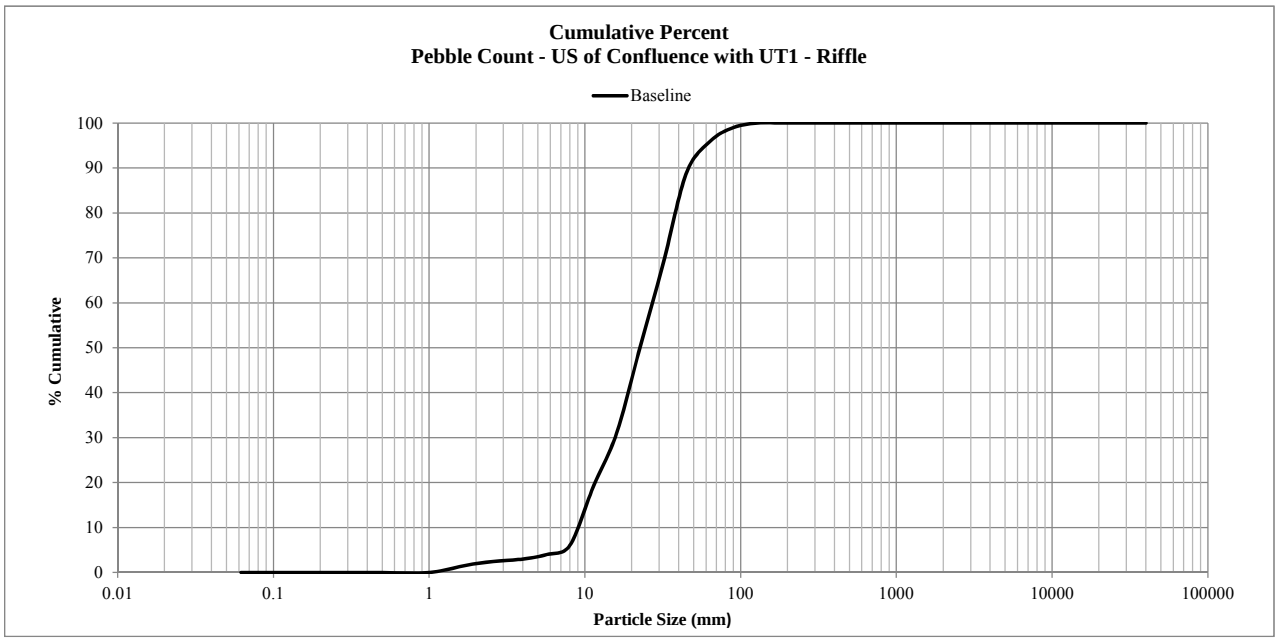
UT to Clarke Creek - US of Confluence with UT1 - Riffle Pebble Count

Location: STA 7+50

Inches	Particle	Millimeters		Count	% Total	% Cum.
	Silt/Clay	<0.062	SAND	0	0	0
	Very Fine	0.062-0.125		0	0	0
	Fine	0.125-0.25		0	0	0
	Medium	0.25-0.50		0	0	0
	Coarse	0.50-1.0		0	0	0
0.04-0.08	Very Coarse	1.0-2		2	2	2
0.08-0.16	Very Fine	2-4	GRAVEL	1	1	3
0.16-0.22	Fine	4-5.7		1	1	4
0.22-0.31	Fine	5.7-8		2	2	6
0.31-0.44	Medium	8-11.3		13	13	19
0.44-0.63	Medium	11.3-16		12	12	31
0.63-0.89	Coarse	16-22.6		19	19	50
0.89-1.26	Coarse	22.6-32		19	19	69
1.26-1.77	Very Coarse	32-45		20	20	89
1.77-2.5	Very Coarse	45-64		7	7	96
2.5-3.5	Small	64-90	COBBLE	3	3	99
3.5-5.0	Small	90-128		1	1	100
5.0-7.1	Medium	128-180		0	0	100
7.1-10.1	Large	180-256		0	0	100
10.1-14.3	Small	256-362	BOULDER	0	0	100
14.3-20	Small	362-512		0	0	100
20-40	Medium	512-1024		0	0	100
40-80	Large	1024-2048		0	0	100
	Bedrock	Bedrock	Bedrock	0	0	100
			Total Counted	100		

Summary Data	
D50	22
D84	40
D95	63


Individual Class Percent
Pebble Count - US of Confluence with UT1 - Riffle
Baseline
% Total
100
90
80
70
60
50
40
30
20
10
0
<0.062
0.062-0.125
0.125-0.25
0.25-0.50
0.50-1.0
1.0-2
2-4
4-5.7
5.7-8
8-11.3
11.3-16
16-22.6
22.6-32
32-45
45-64
64-90
90-128
128-180
180-256
256-362
362-512
512-1024
1024-2048
Bednock
Particle Size (mm)

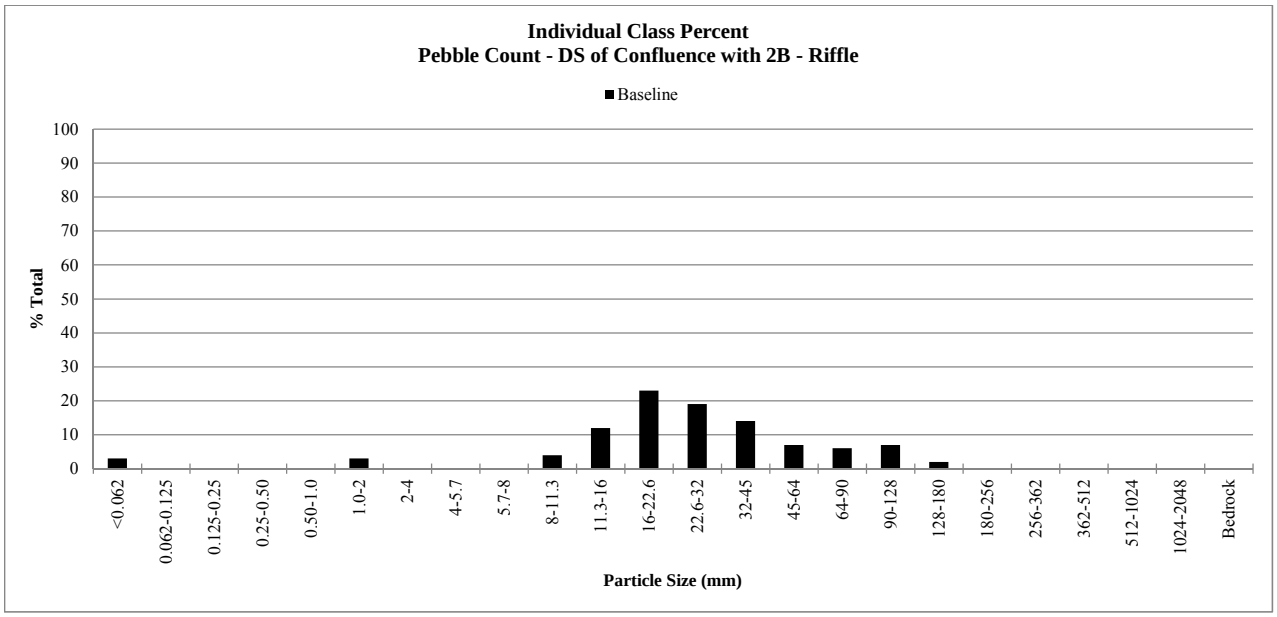

Cumulative Percent
Pebble Count - US of Confluence with UT1 - Riffle
Baseline
% Cumulative
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
100000
Particle Size (mm)

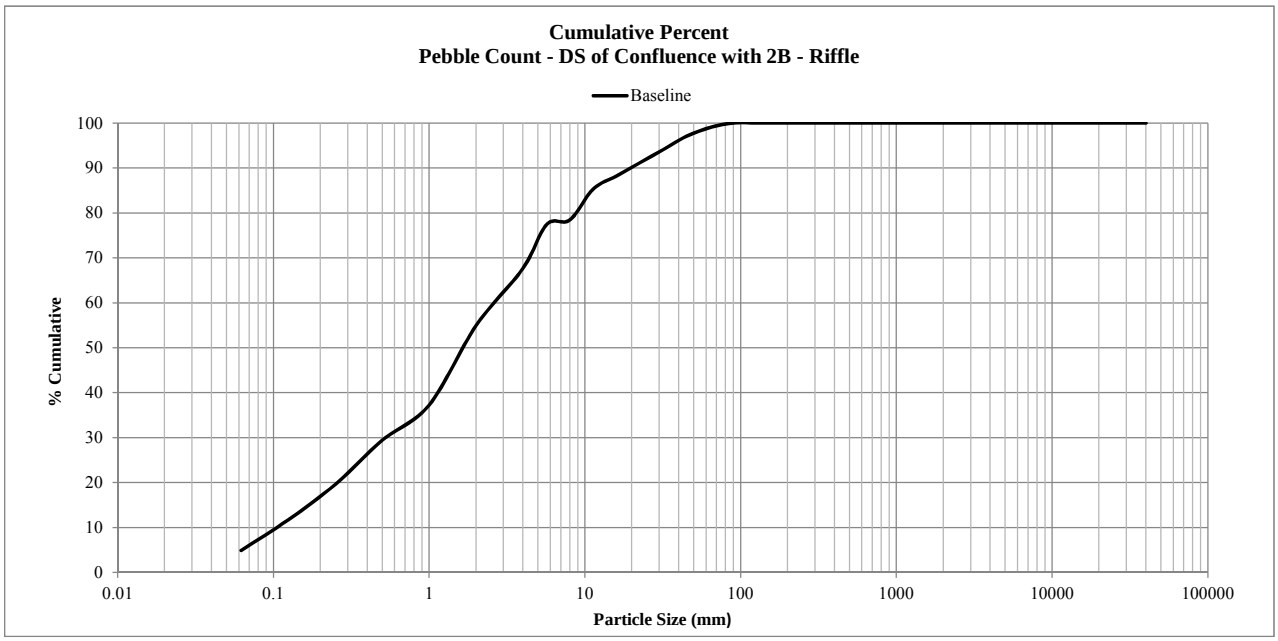
UT to Clarke Creek - DS of Confluence with 2B - Riffle Pebble Count

Location: STA 12+00

Inches	Particle	Millimeters		Count	% Total	% Cum.
	Silt/Clay	<0.062		0	0	0
	Very Fine	0.062-0.125	S	0	0	0
	Fine	0.125-0.25	A	0	0	0
	Medium	0.25-0.50	N	0	0	0
	Coarse	0.50-1.0	D	0	0	0
0.04-0.08	Very Coarse	1.0-2		1	1	1
0.08-0.16	Very Fine	2-4		0	0	1
0.16-0.22	Fine	4-5.7		1	1	2
0.22-0.31	Fine	5.7-8	G	1	1	3
0.31-0.44	Medium	8-11.3	R	1	1	4
0.44-0.63	Medium	11.3-16	A	6	6	10
0.63-0.89	Coarse	16-22.6	V	7	7	17
0.89-1.26	Coarse	22.6-32	E	10	10	27
1.26-1.77	Very Coarse	32-45	L	10	10	37
1.77-2.5	Very Coarse	45-64		10	10	47
2.5-3.5	Small	64-90	C	23	23	70
3.5-5.0	Small	90-128	O	21	21	91
5.0-7.1	Medium	128-180	B	4	4	95
7.1-10.1	Large	180-256	B L E	2	2	97
10.1-14.3	Small	256-362	B	1	1	98
14.3-20	Small	362-512	O	1	1	99
20-40	Medium	512-1024	U L D E R	1	1	100
40-80	Large	1024-2048		0	0	100
	Bedrock	Bedrock	Bedrock	0	0	100
			Total Counted	100		

Summary Data	
D50	1.75
D84	11
D95	33


Individual Class Percent
Pebble Count - DS of Confluence with 2B - Riffle
Baseline
% Total
100
90
80
70
60
50
40
30
20
10
0
<0.062
0.062-0.125
0.125-0.25
0.25-0.50
0.50-1.0
1.0-2
2-4
4-5.7
5.7-8
8-11.3
11.3-16
16-22.6
22.6-32
32-45
45-64
64-90
90-128
128-180
180-256
256-362
362-512
512-1024
1024-2048
Bednock
Particle Size (mm)

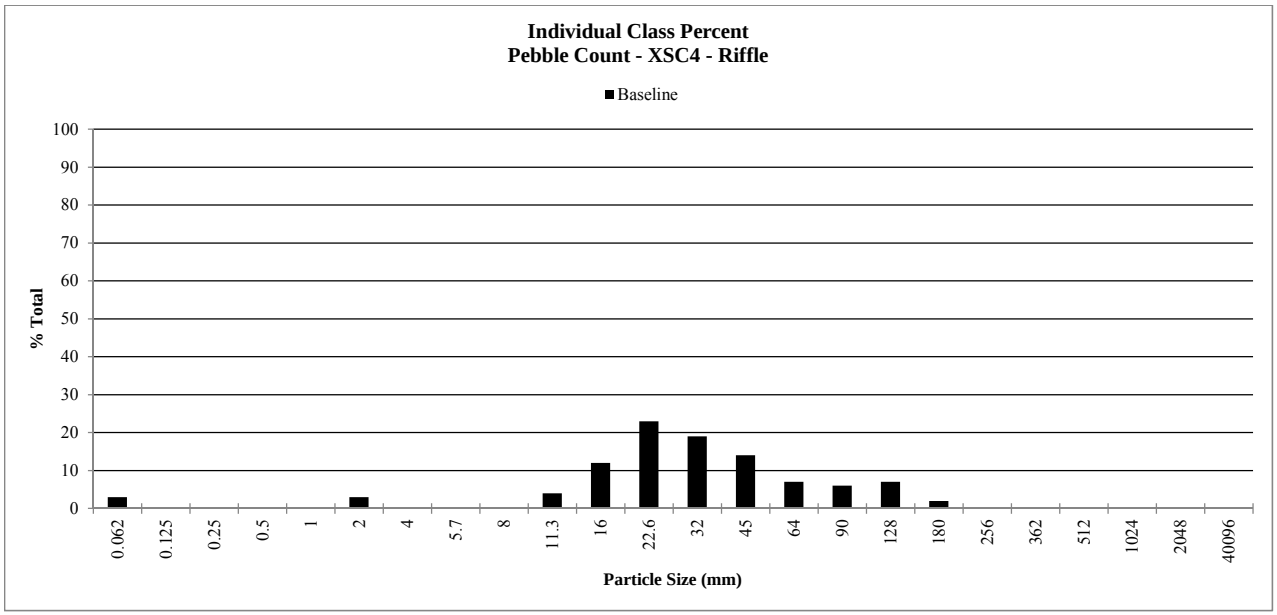

Cumulative Percent
Pebble Count - DS of Confluence with 2B - Riffle
Baseline
% Cumulative
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
100000
Particle Size (mm)

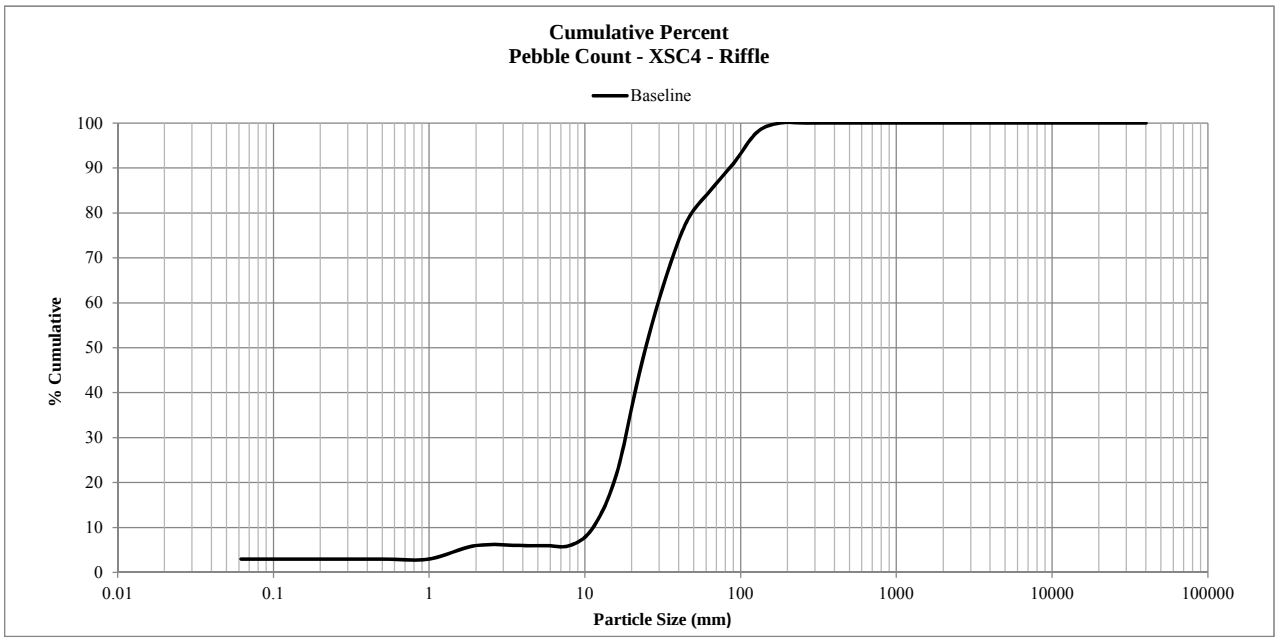
UT to Clarke Creek - Reach: UT1 - XS4 - Riffle Pebble Count

Location: STA 1+29

Inches	Particle	Millimeters		Count	% Total	% Cum.
	Silt/Clay	<0.062	SAND	3	3	3
	Very Fine	0.062-0.125		0	0	3
	Fine	0.125-0.25		0	0	3
	Medium	0.25-0.50		0	0	3
	Coarse	0.50-1.0		0	0	3
0.04-0.08	Very Coarse	1.0-2		3	3	6
0.08-0.16	Very Fine	2-4	GRAVEL	0	0	6
0.16-0.22	Fine	4-5.7		0	0	6
0.22-0.31	Fine	5.7-8		0	0	6
0.31-0.44	Medium	8-11.3		4	4	10
0.44-0.63	Medium	11.3-16		12	12	22
0.63-0.89	Coarse	16-22.6		23	23	45
0.89-1.26	Coarse	22.6-32		19	19	64
1.26-1.77	Very Coarse	32-45		14	14	78
1.77-2.5	Very Coarse	45-64		7	7	85
2.5-3.5	Small	64-90	COBBLE	6	6	91
3.5-5.0	Small	90-128		7	7	98
5.0-7.1	Medium	128-180		2	2	100
7.1-10.1	Large	180-256		0	0	100
10.1-14.3	Small	256-362	BOULDER	0	0	100
14.3-20	Small	362-512		0	0	100
20-40	Medium	512-1024		0	0	100
40-80	Large	1024-2048		0	0	100
	Bedrock	Bedrock	Bedrock	0	0	100
			Total Counted	100		

Summary Data	
D50	24
D84	60
D95	100


Individual Class Percent
Pebble Count - XSC4 - Riffle
Baseline
% Total
100
90
80
70
60
50
40
30
20
10
0
0.062
0.125
0.25
0.5
1
2
4
5.7
8
11.3
16
22.6
32
45
64
90
128
180
256
362
512
1024
2048
40096
Particle Size (mm)

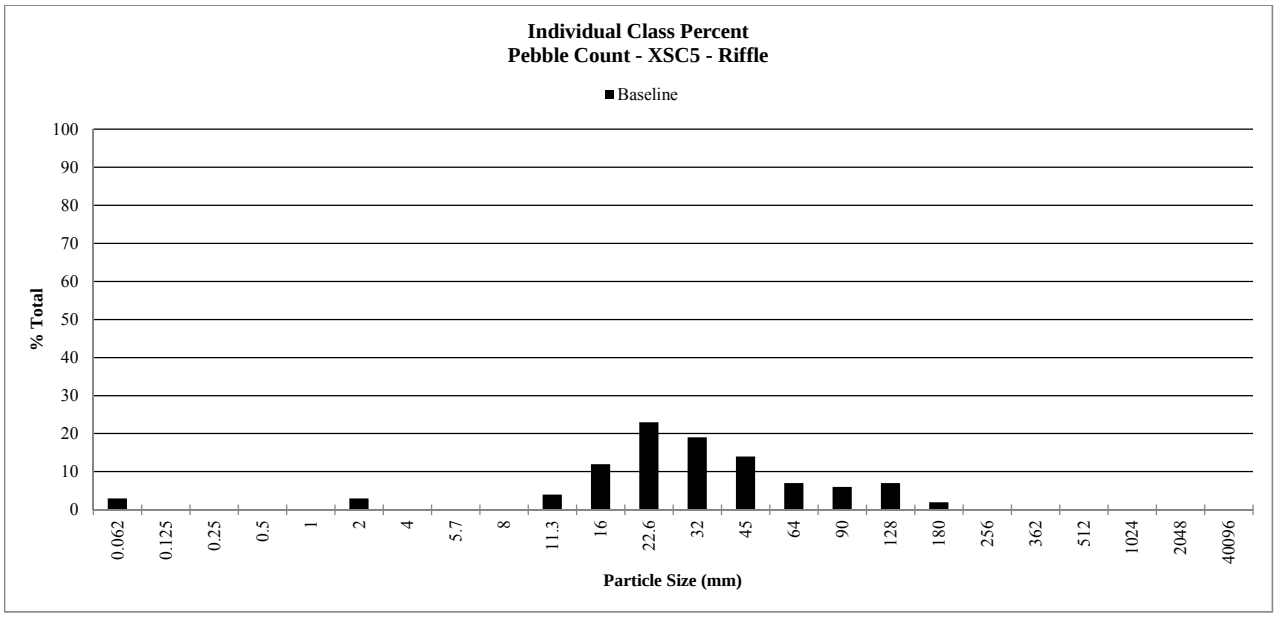

Cumulative Percent
Pebble Count - XSC4 - Riffle
Baseline
% Cumulative
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
100000
Particle Size (mm)

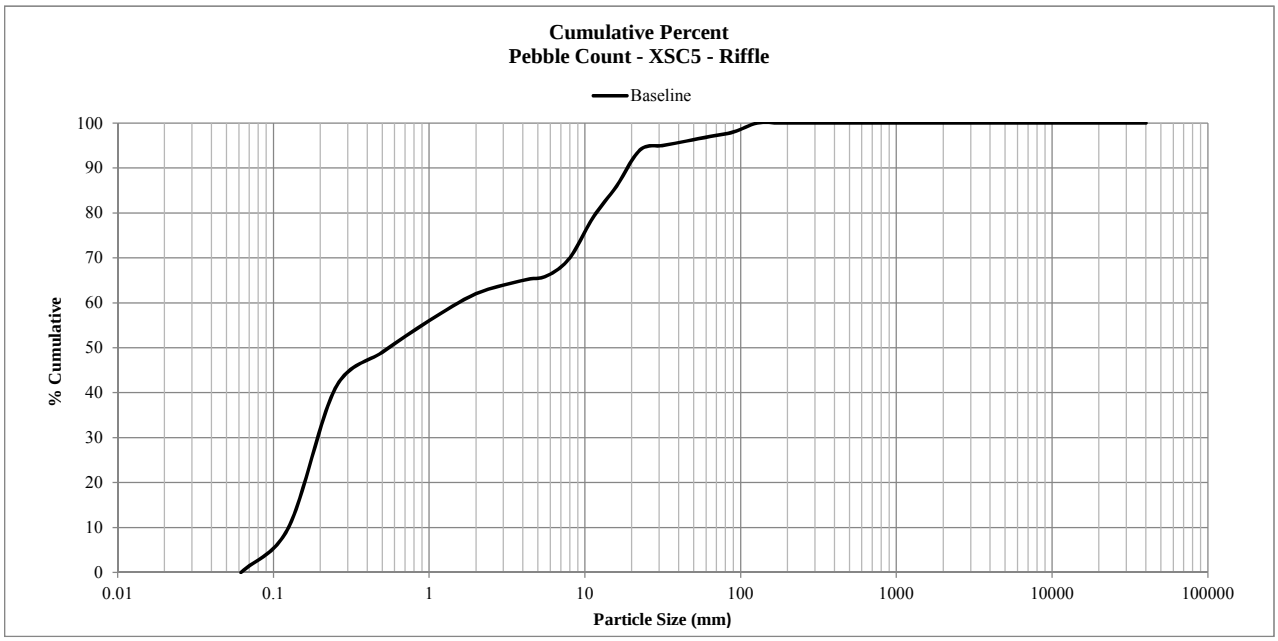
UT to Clarke Creek - Reach: UT1 - XS5 - Riffle Pebble Count

Location: STA 2+69

Inches	Particle	Millimeters		Count	% Total	% Cum.
	Silt/Clay	<0.062		0	0	0
	Very Fine	0.062-0.125	S	10	10	10
	Fine	0.125-0.25	A	31	31	41
	Medium	0.25-0.50	N	8	8	49
	Coarse	0.50-1.0	D	7	7	56
0.04-0.08	Very Coarse	1.0-2		6	6	62
0.08-0.16	Very Fine	2-4		3	3	65
0.16-0.22	Fine	4-5.7		1	1	66
0.22-0.31	Fine	5.7-8	G	4	4	70
0.31-0.44	Medium	8-11.3	R	9	9	79
0.44-0.63	Medium	11.3-16	A	7	7	86
0.63-0.89	Coarse	16-22.6	V	8	8	94
0.89-1.26	Coarse	22.6-32	E	1	1	95
1.26-1.77	Very Coarse	32-45	L	1	1	96
1.77-2.5	Very Coarse	45-64		1	1	97
2.5-3.5	Small	64-90	C	1	1	98
3.5-5.0	Small	90-128	O	2	2	100
5.0-7.1	Medium	128-180	B	0	0	100
7.1-10.1	Large	180-256	B L E	0	0	100
10.1-14.3	Small	256-362	B	0	0	100
14.3-20	Small	362-512	O	0	0	100
20-40	Medium	512-1024	U L D E R	0	0	100
40-80	Large	1024-2048		0	0	100
	Bedrock	Bedrock	Bedrock	0	0	100
			Total Counted	100		

Summary Data	
D50	0.5
D84	15
D95	23


Individual Class Percent
Pebble Count - XSC5 - Riffle
Baseline
% Total
100
90
80
70
60
50
40
30
20
10
0
0.062
0.125
0.25
0.5
1
2
4
5.7
8
11.3
16
22.6
32
45
64
90
128
180
256
362
512
1024
2048
40096
Particle Size (mm)

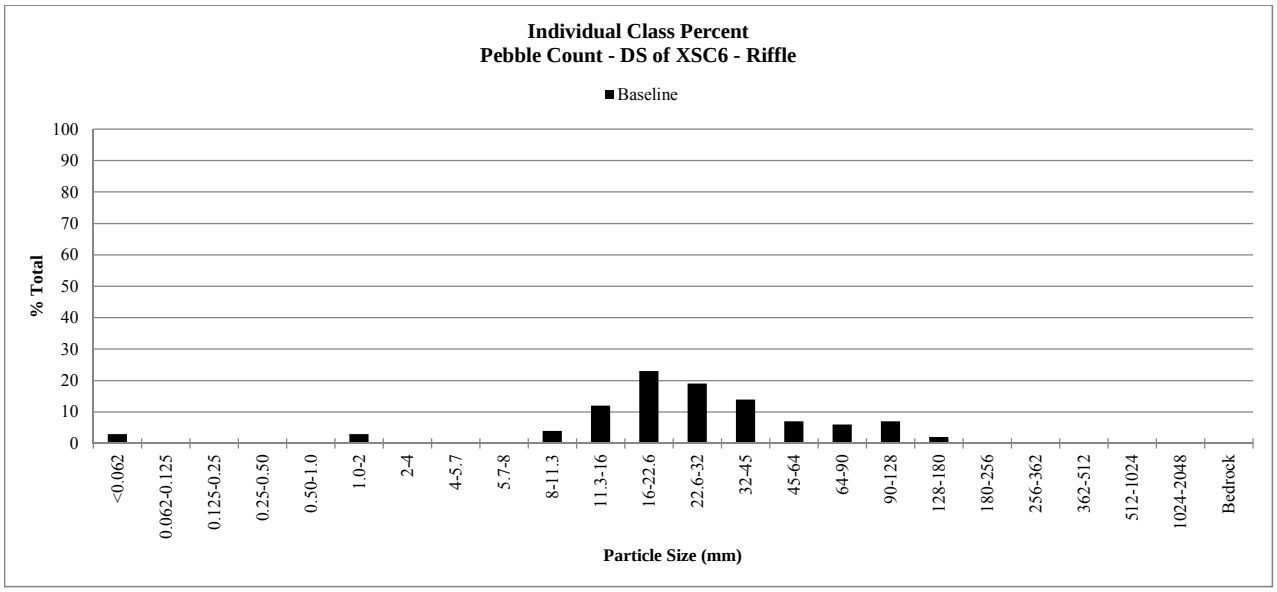

Cumulative Percent
Pebble Count - XSC5 - Riffle
Baseline
% Cumulative
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
100000
Particle Size (mm)

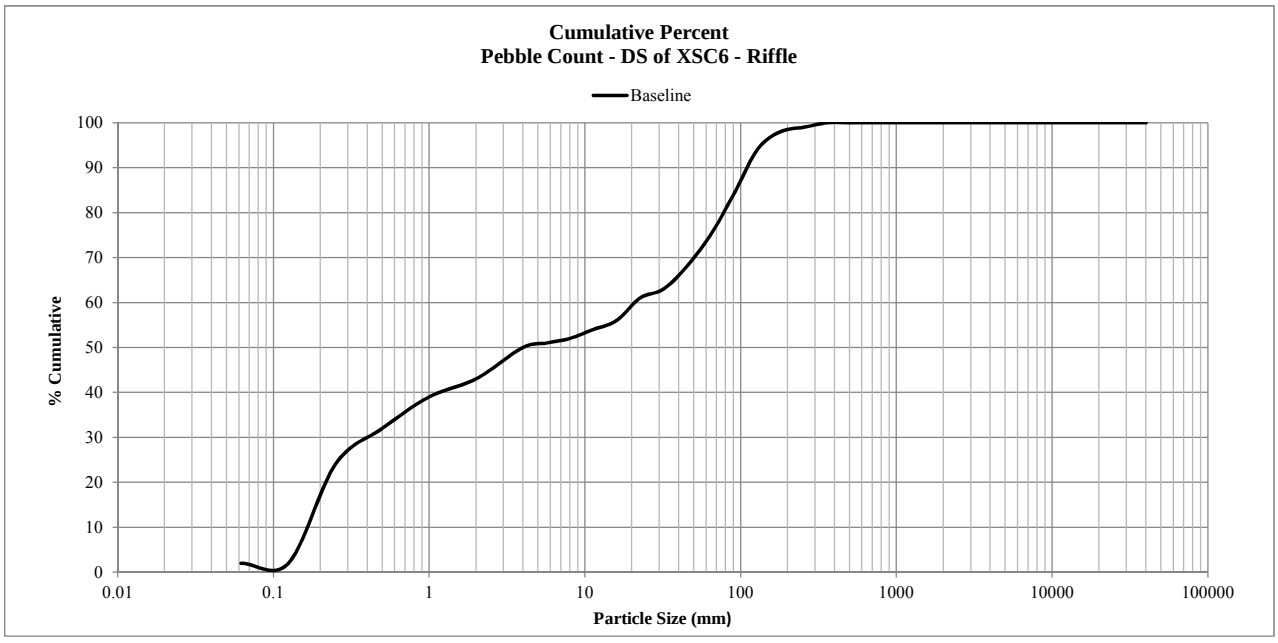
UT to Clarke Creek - Reach: UT1 - DS of XS6 - Riffle Pebble Count

Location: STA 3+34

Inches	Particle	Millimeters		Count	% Total	% Cum.
	Silt/Clay	<0.062	SAND	2	2	2
	Very Fine	0.062-0.125		0	0	2
	Fine	0.125-0.25		22	22	24
	Medium	0.25-0.50		8	8	32
	Coarse	0.50-1.0		7	7	39
0.04-0.08	Very Coarse	1.0-2		4	4	43
0.08-0.16	Very Fine	2-4	GRAVEL	7	7	50
0.16-0.22	Fine	4-5.7		1	1	51
0.22-0.31	Fine	5.7-8		1	1	52
0.31-0.44	Medium	8-11.3		2	2	54
0.44-0.63	Medium	11.3-16		2	2	56
0.63-0.89	Coarse	16-22.6		5	5	61
0.89-1.26	Coarse	22.6-32		2	2	63
1.26-1.77	Very Coarse	32-45		5	5	68
1.77-2.5	Very Coarse	45-64		7	7	75
2.5-3.5	Small	64-90	COBBLE	9	9	84
3.5-5.0	Small	90-128		10	10	94
5.0-7.1	Medium	128-180		4	4	98
7.1-10.1	Large	180-256		1	1	99
10.1-14.3	Small	256-362	BOULDER	1	1	100
14.3-20	Small	362-512		0	0	100
20-40	Medium	512-1024		0	0	100
40-80	Large	1024-2048		0	0	100
	Bedrock	Bedrock	Bedrock	0	0	100
			Total Counted	100		

Summary Data	
D50	4
D84	90
D95	128


Individual Class Percent
Pebble Count - DS of XSC6 - Riffle
Baseline
% Total
100
90
80
70
60
50
40
30
20
10
0
<0.062
0.062-0.125
0.125-0.25
0.25-0.50
0.50-1.0
1.0-2
2-4
4-5.7
5.7-8
8-11.3
11.3-16
16-22.6
22.6-32
32-45
45-64
64-90
90-128
128-180
180-256
256-362
362-512
512-1024
1024-2048
Bedrock
Particle Size (mm)

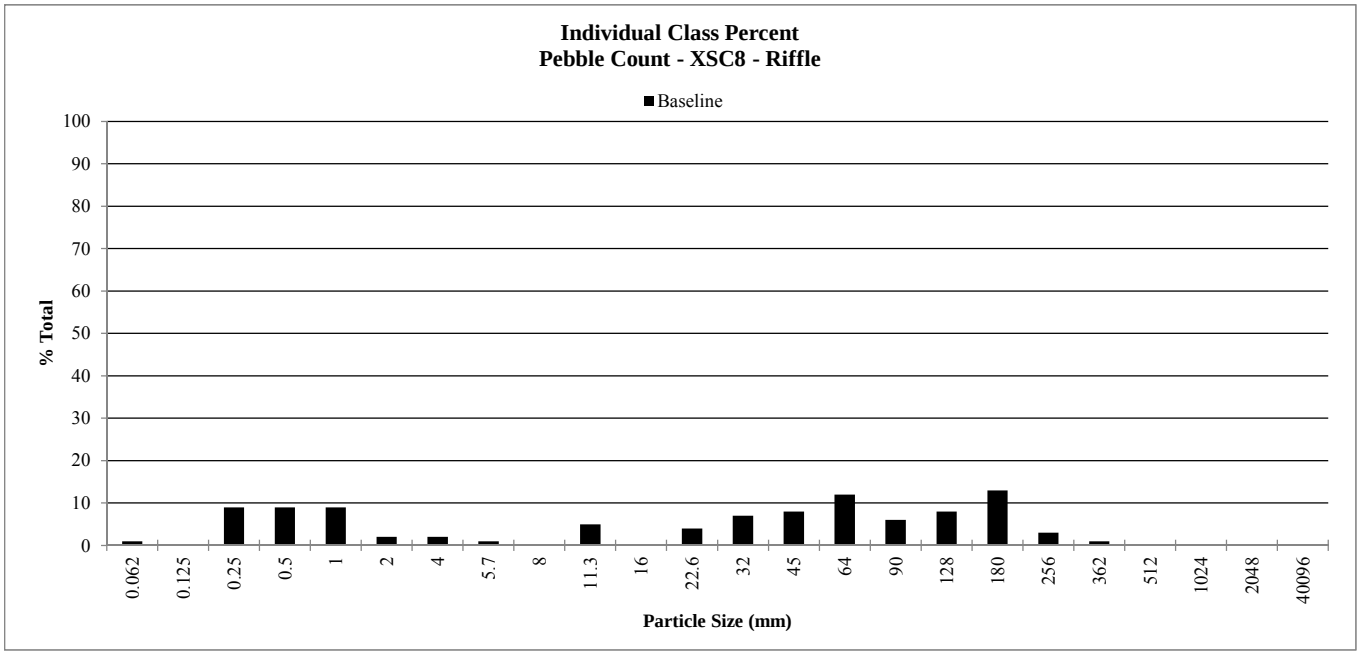

Cumulative Percent
Pebble Count - DS of XSC6 - Riffle
Baseline
% Cumulative
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
100000
Particle Size (mm)

UT to Clarke Creek - Reach: UT1 - XS8 - Riffle Pebble Count

Location: STA 4+14

Inches	Particle	Millimeters		Count	% Total	% Cum.
	Silt/Clay	<0.062	SAND	1	1	1
	Very Fine	0.062-0.125		0	0	1
	Fine	0.125-0.25		9	9	10
	Medium	0.25-0.50		9	9	19
	Coarse	0.50-1.0		9	9	28
0.04-0.08	Very Coarse	1.0-2		2	2	30
0.08-0.16	Very Fine	2-4	GRAVEL	2	2	32
0.16-0.22	Fine	4-5.7		1	1	33
0.22-0.31	Fine	5.7-8		0	0	33
0.31-0.44	Medium	8-11.3		5	5	38
0.44-0.63	Medium	11.3-16			0	38
0.63-0.89	Coarse	16-22.6		4	4	42
0.89-1.26	Coarse	22.6-32		7	7	49
1.26-1.77	Very Coarse	32-45		8	8	57
1.77-2.5	Very Coarse	45-64		12	12	69
2.5-3.5	Small	64-90	COBBLE	6	6	75
3.5-5.0	Small	90-128		8	8	83
5.0-7.1	Medium	128-180		13	13	96
7.1-10.1	Large	180-256		3	3	99
10.1-14.3	Small	256-362	BOULDER	1	1	100
14.3-20	Small	362-512		0	0	100
20-40	Medium	512-1024		0	0	100
40-80	Large	1024-2048		0	0	100
	Bedrock	Bedrock	Bedrock	0	0	100
			Total Counted	100		

Summary Data	
D50	34
D84	125
D95	175


Individual Class Percent
Pebble Count - XSC8 - Riffle
Baseline
% Total
100
90
80
70
60
50
40
30
20
10
0
0.062
0.125
0.25
0.5
1
2
4
5.7
8
11.3
16
22.6
32
45
64
90
128
180
256
362
512
1024
2048
40096
Particle Size (mm)

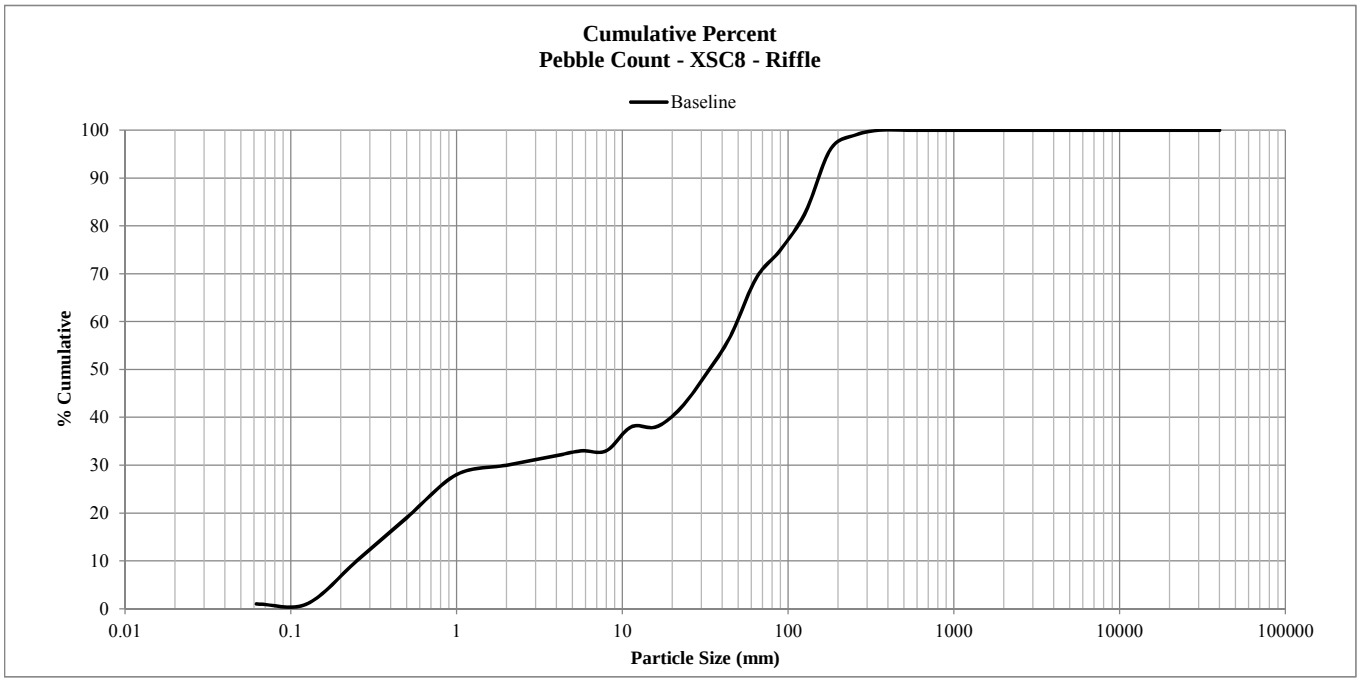

Cumulative Percent
Pebble Count - XSC8 - Riffle
Baseline
% Cumulative
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
100000
Particle Size (mm)

Table 8a. Baseline Stream Data Summary

UT to Clarke Creek/EEP #92500 - UT Clarke Creek (1507 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)		7	30	3	11.38			12.62			8.26			10.93			10.57		12.2	6.72	7.95	7.17	9.97	-	3
Floodprone Width (ft)					36.14			49.08			11.69			19.17			54.63		63.43	18.7	25.23	22.4	34.6	-	3
Bankfull Mean Depth (ft)		1	2.5	1.17	1.77			1.83			1.02			1.98			1.22		1.46	0.39	0.9	0.76	1.55	-	3
[1]Bankfull Max Depth (ft)											1.57			2.05			1.89		2.21	0.85	1.313	0.94	2.15	-	3
Bankfull Cross Sectional Area (ft^2)		5	40	8.47	20.88			22.29			8.42			17.17			12.89		17.86	2.8	7.803	5.11	15.5	-	3
Width/Depth Ratio					6.22			7.13			6.96			8.1			8.36		8.66	6.41	11.2	8.84	18.36	-	3
Entrenchment Ratio					2.86			4.31			1.41			1.86			5.17		5.2	2.61	3.137	3.33	3.47	-	3
[1]Bank Height Ratio					1.43			1.48			1.86			2.22			1		1	0.82	0.897	0.87	1	-	3
Profile																									
Riffle Length (ft)																				8.89	19.21	13.85	54.02	13.73	10
Riffle Slope (ft/ft)																				0.008	0.026	0.021	0.073	0.019	10
Pool Length (ft)																				14.37	42.2	34.77	84.52	26.2	10
Pool Max depth (ft)																				0.698	2.027	2.141	3.445	0.793	10
Pool Spacing (ft)																				34.82	82.81	83.19	151.6	36.88	9
Pattern																									
Channel Beltwidth (ft)																				14	14.8	14.5	15.9	-	3
Radius of Curvature (ft)																				10.4	16.17	16.9	21.2	-	3
Rc:Bankfull width (ft/ft)																				1.5	2	2	2.5	-	3
Meander Wavelength (ft)																				67.3	80.1	70	103	-	3
Meander Width Ratio																				1.9	4.6	2.0	9.8	-	3
Transport parameters																									
Reach Shear Stress (competency) lb/ft^2					0.74												0.74			-					
Max part size (mm) mobilized at bankfull					1												0.41			-					
Stream Power (transport capacity) W/m^2					-												-			-					
Additional Reach Parameters																									
Rosgen Classification					E4						B4c						E4			E4					
Bankfull Velocity (fps)		-	-	-	5.03												4.4-4.9			-					
Bankfull Discharge (cfs)		25	300	26.78	110.8						28						54.6-63.4								
Valley length (ft)					1612						200									1612					
Channel Thalweg length (ft)					1507						-						-			1507					
Sinuosity (ft)					1.07						-						-			1.07					
Water Surface Slope (Channel) (ft/ft)					0.0075						-						0.0083			0.0089					
BF slope (ft/ft)					0.0083						-						-			0.0092					
[3]Bankfull Floodplain Area (acres)					-						-						-			-					
[4]% of Reach with Eroding Banks					-						-														
Channel Stability or Habitat Metric					-						-														
Biological or Other					-						-														

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

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

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

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 8b. Baseline Stream Data Summary

UT to Clarke Creek/EEP #92500 - UT 1 (758 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)		6	11	2.07	9.08			11.26			7.09			11.96			10.6		10.77	7.18	8.44	8.60	9.40	0.93	4
Floodprone Width (ft)					19.5			20.02			13.18			39.46			49.4		93.72	11.30	25.48	16.40	57.80	21.83	4
Bankfull Mean Depth (ft)		6	11	0.89	1.51			1.7			0.78			1.33			1.1		1.28	0.37	0.87	0.84	1.43	0.46	4
[1]Bankfull Max Depth (ft)					1.83			2.45			1.11			1.82			1.6		2.14	0.56	1.10	0.96	1.92	0.59	4
Bankfull Cross Sectional Area (ft^2)		6	12	4.73	15.46			17.01			8.69			13.75			11.84		13.54	3.14	7.57	6.84	13.45	4.67	4
Width/Depth Ratio					5.34			7.46			5.81			15.33			8.28		9.79	6.57	12.23	9.83	22.69	7.23	4
Entrenchment Ratio					1.73			2.2			1.85			3.8			4.59		8.84	1.57	2.88	1.90	6.15	2.20	4
[1]Bank Height Ratio					1.34			1.56			1.53			1.6			1		1	0.73	0.93	1.00	1.00	0.14	4
Profile																									
Riffle Length (ft)																				4.82	9.83	8.81	18.46	5.27	5
Riffle Slope (ft/ft)																				0.008	0.023	0.025	0.036	0.011	5
Pool Length (ft)																				22.7	29.14	27.48	39.29	7.208	5
Pool Max depth (ft)																				0.944	1.956	1.857	3.012	0.777	5
Pool Spacing (ft)																				73.48	108.4	116.9	126.4	24.56	4
Pattern																									
Channel Beltwidth (ft)																				13.7	15.7	13.8	19.8	-	3
Radius of Curvature (ft)																				21.9	32.6	34.7	41.1	-	3
Rc:Bankfull width (ft/ft)																				2.5	3.9	3.6	5.6	-	3
Meander Wavelength (ft)																				41.5	64.1	46	105	-	3
Meander Width Ratio																				1.46	1.78	1.59	2.3	-	3
Transport parameters																									
Reach Shear Stress (competency) lb/ft^2					0.88												0.59			-					
Max part size (mm) mobilized at bankfull					0.75												4.27			-					
Stream Power (transport capacity) W/m^2					-												-			-					
Additional Reach Parameters																									
Rosgen Classification					B4c						B4c						E4			E4					
Bankfull Velocity (fps)		-	-	-	4.11												3.6-4.0			-					
Bankfull Discharge (cfs)		10	200	14.48	64												42.2-53.4								
Valley length (ft)					657						150									657					
Channel Thalweg length (ft)					723						-						-			758					
Sinuosity (ft)					1.1						-						-			1.15					
Water Surface Slope (Channel) (ft/ft)					0.009						-						0.0077			0.0089					
BF slope (ft/ft)					0.009						-						0.009			0.0083					
[3]Bankfull Floodplain Area (acres)					-						-						-			-					
[4]% of Reach with Eroding Banks					-						-														
Channel Stability or Habitat Metric					-						-														
Biological or Other					-						-														

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

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

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

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 9. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

UT to Clarke Creek/EEP #92500 Segment/Reach: UT to Clarke Creek (1507', XS1, 1A, 2, 9) and UT1 (758', XS 3, 4, 5, 6, 8)

	Cross Section 1 (Riffle)							Cross Section 1A (Pool)							Cross Section 2 (Riffle)							Cross Section 9 (Riffle)													
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	744.2							742.4							739							746.7													
Bankfull Width (ft)	6.7							9.02							9.97							7.17													
Floodprone Width (ft)	22.4							25.6							34.6							18.7													
Bankfull Mean Depth (ft)	0.76							0.2							1.55							0.39													
Bankfull Max Depth (ft)	0.94							1.47							2.15							0.85													
Bankfull Cross Sectional Area (ft^2)	5.11							1.78							15.5							2.8													
Bankfull Width/Depth Ratio	8.84							45.71							6.41							18.36													
Bankfull Entrenchment Ratio	3.33							2.84							3.47							2.61													
Bankfull Bank Height Ratio	1							1							0.82							0.87													
Cross Sectional Area between end pins (ft^2)	65.6							145.9							187.2							52.1													
d50 (mm)	-							17							-							28													
	Cross Section 3 (Pool)							**Cross Section 4 (Riffle)**							**Cross Section 5 (Pool)**							**Cross Section 6 (Pool)**							**Cross Section 8 (Riffle)**						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	741.1							745.8							745							744.6							744.7						
Bankfull Width (ft)	9.78							8.4							8.18							7.18							8.75						
Floodprone Width (ft)	57.8							13.3							40							11.3							19.5						
Bankfull Mean Depth (ft)	1.66							0.37							0.84							0.64							1.04						
Bankfull Max Depth (ft)	1.92							0.56							1.57							0.82							1.09						
Bankfull Cross Sectional Area (ft^2)	16.24							3.14							6.9							4.59							9.09						
Bankfull Width/Depth Ratio	5.89							22.69							9.7							11.23							8.42						
Bankfull Entrenchment Ratio	5.91							1.58							4.89							1.57							2.22						
Bankfull Bank Height Ratio	1							0.73							1							1							1						
Cross Sectional Area between end pins (ft^2)	170.9							100.5							258.1							247.5							231.5						
d50 (mm)	-							24							0.5							4							24						

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Exhibit Table 10a. Monitoring Data - Stream Reach Data Summary

UT to Clarke Creek/EEP #92500 - UT to Clarke Creek (1507 lf)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	6.72	7.953	7.17	9.97	-	3																														
Floodprone Width (ft)	18.7	25.23	22.4	34.6	-	3																														
Bankfull Mean Depth (ft)	0.39	0.9	0.76	1.55	-	3																														
[1]Bankfull Max Depth (ft)	0.85	1.313	0.94	2.15	-	3																														
Bankfull Cross Sectional Area (ft^2)	2.8	7.803	5.11	15.5	-	3																														
Width/Depth Ratio	6.41	11.2	8.84	18.36	-	3																														
Entrenchment Ratio	2.61	3.137	3.33	3.47	-	3																														
[1]Bank Height Ratio	0.82	0.897	0.87	1	-	3																														
Profile																																				
Riffle Length (ft)	4.82	9.826	8.81	18.46	5.272	5																														
Riffle Slope (ft/ft)	0.008	0.023	0.025	0.036	0.011	5																														
Pool Length (ft)	22.7	29.14	27.48	39.29	7.208	5																														
Pool Max depth (ft)	0.944	1.956	1.857	3.012	0.777	5																														
Pool Spacing (ft)	73.48	108.4	116.9	126.4	24.56	4																														
Pattern																																				
Channel Beltwidth (ft)	14	14.8	14.5	15.9	-	3																														
Radius of Curvature (ft)	10.4	16.17	16.9	21.2	-	3																														
Rc:Bankfull width (ft/ft)	1.5	2	2	2.5	-	3																														
Meander Wavelength (ft)	67.3	80.1	70	103	-	3																														
Meander Width Ratio	1.9	4.6	2.0	9.8	-	3																														
Additional Reach Parameters																																				
Rosgen Classification	E4																																			
Channel Thalweg length (ft)	1507																																			
Sinuosity (ft)	1.07																																			
Water Surface Slope (Channel) (ft/ft)	0.0089																																			
BF slope (ft/ft)	0.0092																																			
[3]Ri% / Ru% / P% / G% / S%	-	-	-	-	-																															
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	-																																			
Channel Stability or Habitat Metric	-																																			
Biological or Other	-																																			

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

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

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.

2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table

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

4. = Of value/needed only if the n exceeds 3

Exhibit Table 10b. Monitoring Data - Stream Reach Data Summary

UT to Clarke Creek/EEP #92500 - UT1 (758 lf)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	7.18	8.443	8.595	9.4	0.932	4																														
Floodprone Width (ft)	11.3	25.48	16.4	57.8	21.83	4																														
Bankfull Mean Depth (ft)	0.37	0.87	0.84	1.43	0.464	4																														
[1]Bankfull Max Depth (ft)	0.56	1.098	0.955	1.92	0.589	4																														
Bankfull Cross Sectional Area (ft^2)	3.14	7.568	6.84	13.45	4.669	4																														
Width/Depth Ratio	6.57	12.23	9.825	22.69	7.233	4																														
Entrenchment Ratio	1.57	2.88	1.9	6.15	2.201	4																														
[1]Bank Height Ratio	0.73	0.933	1	1	0.135	4																														
Profile																																				
Riffle Length (ft)	4.82	9.826	8.81	18.46	5.272	5																														
Riffle Slope (ft/ft)	0.008	0.023	0.025	0.036	0.011	5																														
Pool Length (ft)	22.7	29.14	27.48	39.29	7.208	5																														
Pool Max depth (ft)	0.944	1.956	1.857	3.012	0.777	5																														
Pool Spacing (ft)	73.48	108.4	116.9	126.4	24.56	4																														
Pattern																																				
Channel Beltwidth (ft)	13.7	15.7	13.8	19.8	-	3																														
Radius of Curvature (ft)	21.9	32.6	34.7	41.1	-	3																														
Rc:Bankfull width (ft/ft)	2.5	3.9	3.6	5.6	-	3																														
Meander Wavelength (ft)	41.5	64.1	46	105	-	3																														
Meander Width Ratio	1.46	1.78	1.59	2.3	-	3																														
Additional Reach Parameters																																				
Rosgen Classification	E4																																			
Channel Thalweg length (ft)	1507																																			
Sinuosity (ft)	1.07																																			
Water Surface Slope (Channel) (ft/ft)	0.0089																																			
BF slope (ft/ft)	0.0092																																			
[3]Ri% / Ru% / P% / G% / S%	-	-	-	-	-																															
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	-																																			
Channel Stability or Habitat Metric	-																																			
Biological or Other	-																																			

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

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

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.

2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table

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

4. = Of value/needed only if the n exceeds 3

Appendix E
Hydrologic Data

Table 11. Veriiatin of Bankful Events UT to Clarke Creek - EEP Project #92500			
Date of Data Collection	Date of Occurrence	Method	Photo
2/19/2014	2/19/2014	Visual observation of wrack lines	See photos below

UT to Clarke Creek Bankfull Event

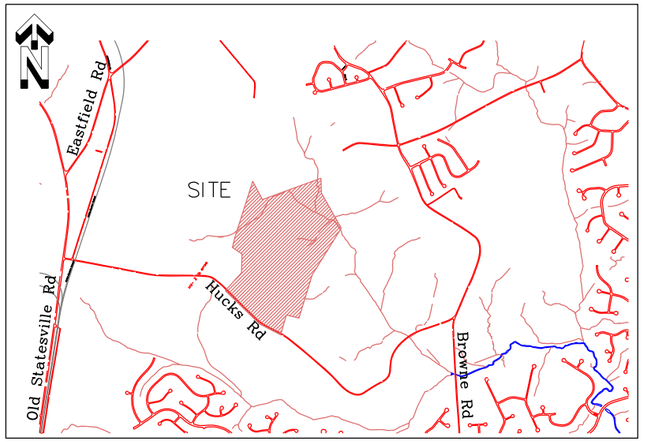
UT1 Bankfull Event

Appendix F
As-built Plans

STATE OF NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM

UT CLARKE CREEK STREAM AND WETLAND RESTORATION

LOCATION: 5542 HUCKS ROAD, CHARLOTTE, NC

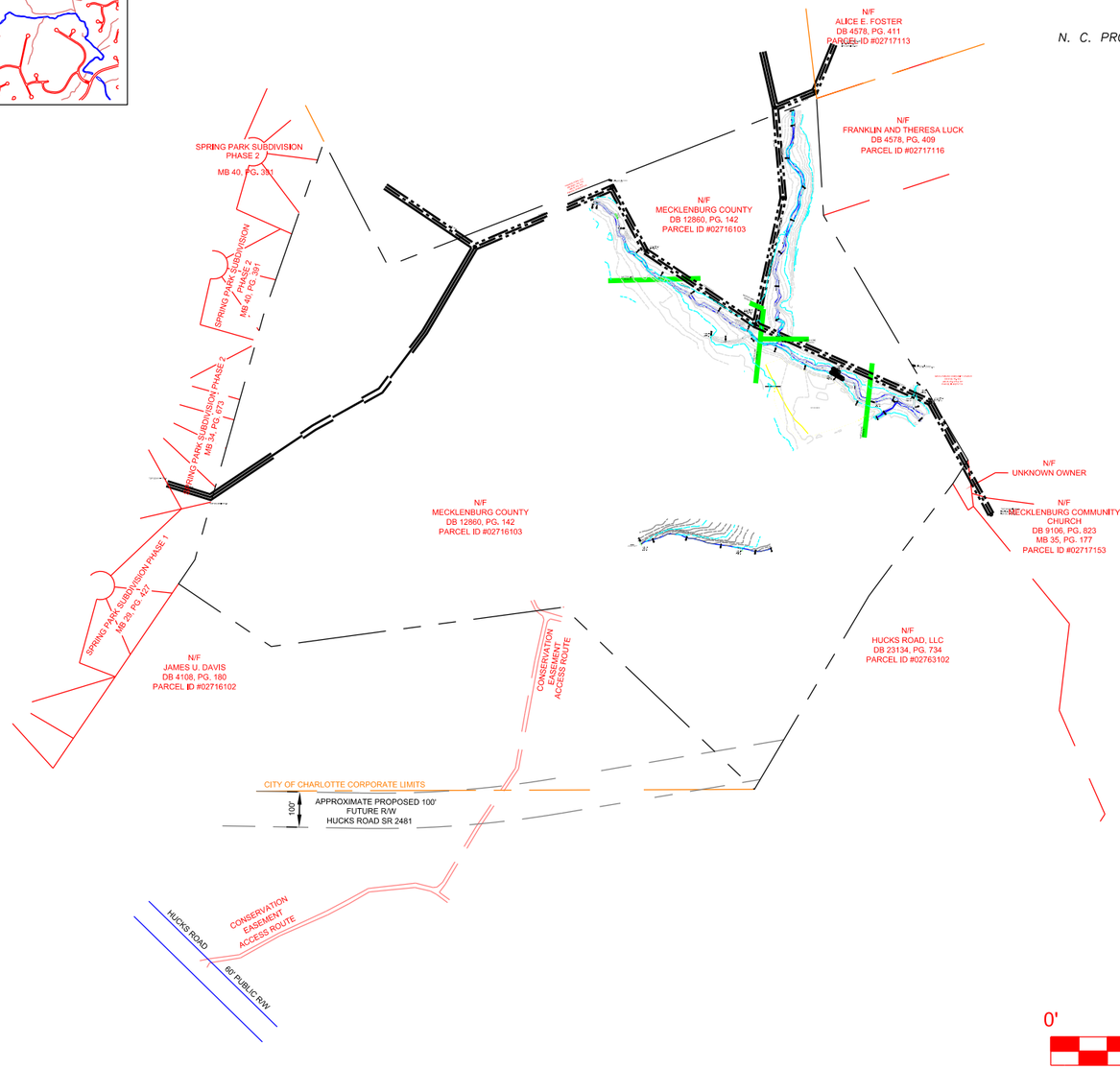


VICINITY MAP

LEGEND:

- BANKFULL
- THALWEG
- WATER SURFACE
- CONSTRUCTION LIMITS
- CONTOUR LINE
- CONTROL POINT

NOTE: ALL STUCTURES ARE NOTED ON EACH SHEET.



NOTES

1. *THE PURPOSE OF THIS SURVEY IS TO SHOW AS-BUILT FEATURES.*
2. *ALL COORDIANTES AND BEARINGS ARE BASED ON NORTH AMERICAN DATUM OF 1983(NSRS2011).*
3. *ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)*
4. *UNITS OF MEASURE ARE US SURVEY FOOT.*
5. *CONTOUR INTERVAL = 1 FOOT*
6. *THE ORIGINAL FIELD WORK WAS COMPLETED ON JUNE 12-14, 2013.*

I, DAVID K. ALLEY, CERTIFY THAT THE INFORMATION SHOWN ON THESE PLANS WERE DERIVED FROM AN ACTUAL FIELD SURVEY MADE UNDER MY SUPERVISION, THAT THE RATIO OF PERCISION AS CALCULATED IS 1:10000+. THE PURPOSE OF THIS SURVEY IS FOR TOPOGRAPHIC INFORMATION ONLY. NO BOUNDARY DETERMINATIONS WERE MADE AT THIS TIME.

THIS 12TH DAY OF JULY, 2013.

N. C. PROFESSIONAL LAND SURVEYOR L-4492

NC Grid Coordinates - NAD83 - NAVD88
Based on the North Carolina VRS Network
Control by GPS Methods using a Trimble SPS985
GPS Receiver running on the State of North Carolina VRS System.
All points shown were acquired as four separate positions at two different times of day to confirm accuracy.
A minimum of 15 epochs of data were collected for each occupation.

PNT	Easting	Northing	Elevation	
NSE1	1461796.10	589768.07	757.81	60D NAIL SET
NSE2	1461467.96	589961.21	763.81	60D NAIL SET
NSE3	1461256.05	589658.03	751.26	60D NAIL SET
NSE4	1461470.13	588951.72	769.44	60D NAIL SET
NSE5	1461530.32	589283.24	768.11	60D NAIL SET
90588	1458523.71	586168.99	789.19	PKSET
90589	1460492.85	586117.40	778.66	PKSET
90590	1462688.30	586295.88	775.75	PKSET
90611	1462622.11	592219.50	814.45	PKSET
90612	1460372.66	592149.73	842.00	PKSET
90613	1457959.69	592197.90	842.08	PKSET
COR-2	1459915.22	587996.38	814.16	EIP
COR-3	1460973.48	587135.21	801.88	EIP
COR-4	1461092.55	587523.42	788.48	EIP
COR-5	1461494.48	586750.15	789.14	EIP

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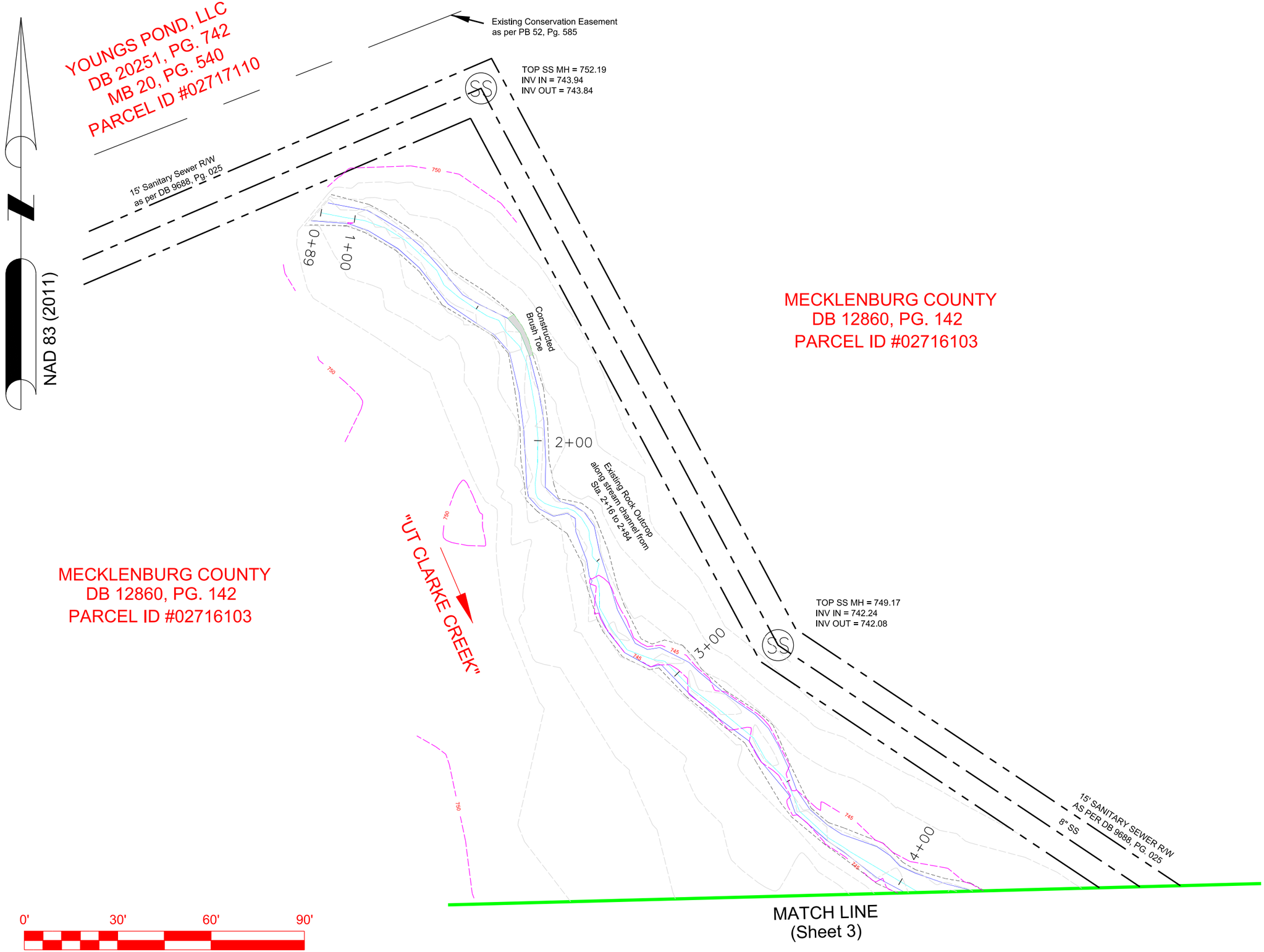
NORTH CAROLINA PROFESSIONAL SEAL L-4492 LAND SURVEYOR DAVID KEITH ALLEY

UT CLARKE STREAM AND WETLAND RESTORATION
Mecklenburg County, NC
SCO#09-07763-01

Date: June 28, 2013
Job Number: 513012
Project Surveyor: dka
Drawn by: dka
Scale: 1"= 100'
Revisions

OVERALL SITE

Sheet
1 of10



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NORTH CAROLINA PROFESSIONAL SEAL L-4492 LAND SURVEYOR DAVID KEITH ALLEY

UT CLARKE STREAM AND WETLAND RESTORATION

Mecklenburg County, NC

SCO#09-07763-01

Date: June 28, 2013
Job Number: 513012
Project Surveyor: dka
Drawn by: dka
Scale: 1"=30'

Revisions

AS-BUILT SURVEY

MATCH LINE
(Sheet 2)

NAD 83 (2011)

MECKLENBURG COUNTY
DB 12860, PG. 142
PARCEL ID #02716103

60d nail
N:589658.025
E:1461256.054
Z:751.26

XS1

Existing Rock Outcrop
along stream channel from
Sta. 4+70 to 4+80

15' SANITARY SEWER R/W
AS PER DB 9688, PG. 025

8" SS

5+00

6+00

"UT CLARKE CREEK"

TOP SS MH = 746.75
INV IN = 734.59
INV IN = 739.75-DROP
INV OUT = 734.45

MATCH LINE
(Sheet 6)

Existing Rock Outcrop
along stream channel from
Sta. 6+53 to 6+78

7+00

EXISTING
WETLAND AREA "E"

3+56

Boulder Sill
Sta. 3+56
Elev.: 745.4'

4+00

4+78

"UT-5"

MATCH LINE
(Sheet 4)

5/8" rebar
N:589481.760
E:1461600.329
Z:747.90

MECKLENBURG COUNTY
DB 12860, PG. 142
PARCEL ID #02716103

0' 30' 60' 90'

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NORTH CAROLINA PROFESSIONAL SEAL L-4492 LAND SURVEYOR DAVID KEITH ALLEN

UT CLARKE STREAM AND WETLAND RESTORATION
Mecklenburg County, NC
SCO#09-0763-01

Date: June 28, 2013
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Drawn by: dka
Scale: 1"=30'

Revisions

AS-BUILT SURVEY

NAD 83 (2011)

5/8" rebar
N:589481.760
E:1461600.329
Z:747.90

MECKLENBURG COUNTY
DB 12860, PG. 142
PARCEL ID #02716103

MATCH LINE
(Sheet 3)

MATCH LINE
(Sheet 6)

7+75

8+00

9+00

10+00

11+00

740

745

15' SANITARY SEWER R/W
AS PER DB 9688, PG. 025

8" SS

"UT CLARKE CREEK"

XS2

Boulder Toe
Sta. 9+80
Elev.: 739.0'

Boulder Toe
Sta. 9+80
Elev.: 739.4'

Existing Rock Outcrop
along stream channel from
Sta. 9+69 to 9+79

Log Vane
Sta. 10+88
Elev.: 737.8'

WETLAND AREA "D"

MATCH LINE
(Sheet 5)

MECKLENBURG COUNTY
DB 12860, PG. 142
PARCEL ID #02716103

0' 30' 60' 90'

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UT CLARKE STREAM AND WETLAND RESTORATION
Mecklenburg County, NC
SCO#09-07763-01

Date: June 28, 2013
Job Number: 513012
Project Surveyor: dka
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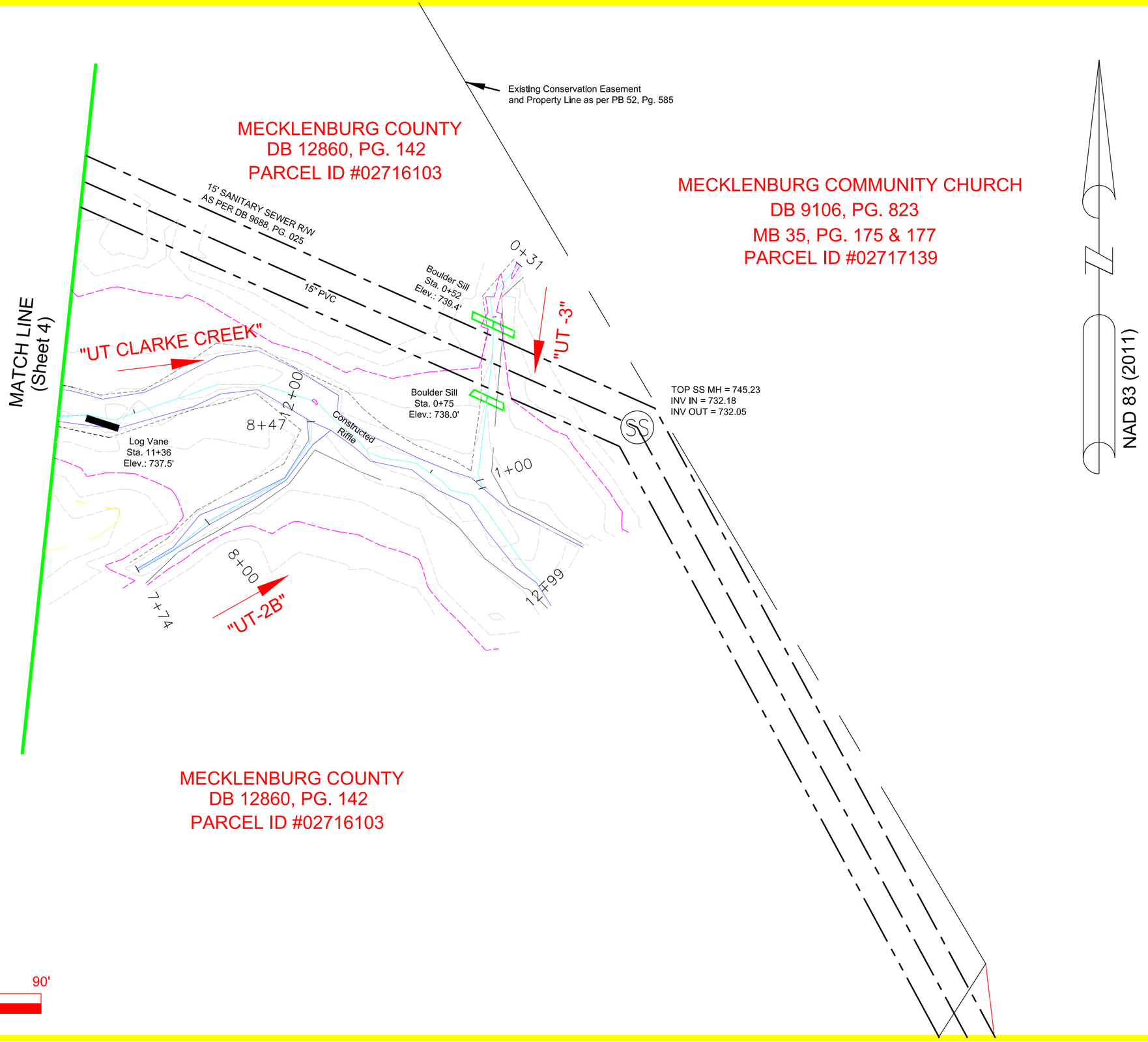
Scale: 1"=30'
Revisions

AS-BUILT SURVEY



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NORTH CAROLINA PROFESSIONAL SEAL L-4492 LAND SURVEYOR DAVID KEITH ALLEY

UT CLARKE STREAM AND WETLAND RESTORATION
Mecklenburg County, NC
SCO#09-0776-01

Date: June 28, 2013
Job Number: 513012
Project Surveyor: dka
Drawn by: dka
Scale: 1"=30'

Revisions

AS-BUILT SURVEY

FRANKLIN LUCK
THERESA LUCK
DB 4578, PG. 409
PARCEL ID #02717116

MECKLENBURG COMMUNITY CHURCH
DB 9106, PG. 823
MB 35, PG. 175 & 177
PARCEL ID #02717139

NAD 83 (2011)

MECKLENBURG COUNTY
DB 12860, PG. 142
PARCEL ID #02716103

60d nail
N:589768.074
E:1461796.095
Z:757.81

"UT-1"

XS8

XS3

MATCH LINE
(Sheet 4)

4+00
5+00
6+00
7+00

745
750
740

Log Vane/Root Wad
Sta. 7+20
Elev.: 740.7'

Constructed
Brush Toe

Existing Rock Outcrop
along stream channel from
Sta. 6+30 to 6+85

8" SS
15' SANITARY SEWER R/W
AS PER DB 9688, PG. 025

MATCH LINE
(Sheet 7)

Existing Rock Outcrop
along stream channel from
Sta. 3+50 to 3+75

MATCH LINE
(Sheet 3)

MATCH LINE
(Sheet 3)

Constructed
Brush Toe

MECKLENBURG COUNTY
DB 12860, PG. 142
PARCEL ID #02716103

Existing Rock Outcrop
along stream channel from
Sta. 4+40 to 5+56

0' 30' 60' 90'

Existing Rock Outcrop
along stream channel from
Sta. 7+45 to 7+65

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NORTH CAROLINA PROFESSIONAL SEAL L-4492 LAND SURVEYOR DAVID KEITH ALLEY

UT CLARKE STREAM AND WETLAND RESTORATION
Mecklenburg County, NC
SCO#09-0763-01

Date: June 28, 2013
Job Number: 513012
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Scale: 1"=30'
Revisions

AS-BUILT SURVEY

NAD 83 (2011)

ALICE E. FOSTER
DB 4578, PG. 411
PARCEL ID #02717113

FRANKLIN LUCK
THERESA LUCK
DB 4578, PG. 409
PARCEL ID #02717116

MECKLENBURG COMMUNITY CHURCH
DB 9106, PG. 823
MB 35, PG. 175 & 177
PARCEL ID #02717139

YOUNGS POND, LLC
DB 20251, PG. 742
MB 20, PG. 540
PARCEL ID #02717110

MECKLENBURG COUNTY
DB 12860, PG. 142
PARCEL ID #02716103

TOP SS MH = 754.77
INV IN = 742.77
INV OUT = 742.60

Existing Conservation Easement
and Property Line as per PB 52, Pg. 585

8" SS

15' R/W

Log Vane/Root Wad
Sta. 2+70
Elev.: 744.4'

3+00

750

745

Existing Rock Outcrop
at bankfull sta. 1+45

"UT-1"

Constructed
Riffle

0+57

1+00

2+00

Cross Vane
Sta. 0+65
Elev.: 745.2'

12 SS

15' SANITARY SEWER R/W
AS PER DB 9688, PG. 025

TOP SS MH = 752.00
INV IN = 741.12
INV OUT = 741.00

TOP SS MH = 748.32
INV IN = 737.52
INV OUT = 737.42

MATCH LINE
(Sheet 6)

0' 30' 60' 90'

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Revisions

AS-BUILT SURVEY

LEGEND

WATER SURFACE

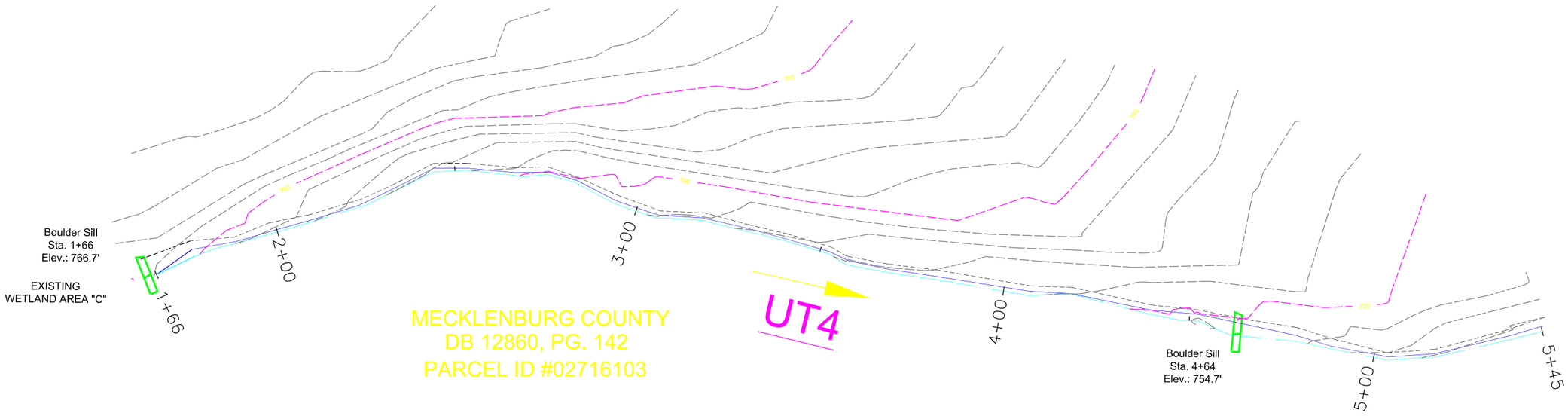
BANKFULL

THALWEG

0' 30' 60' 90'

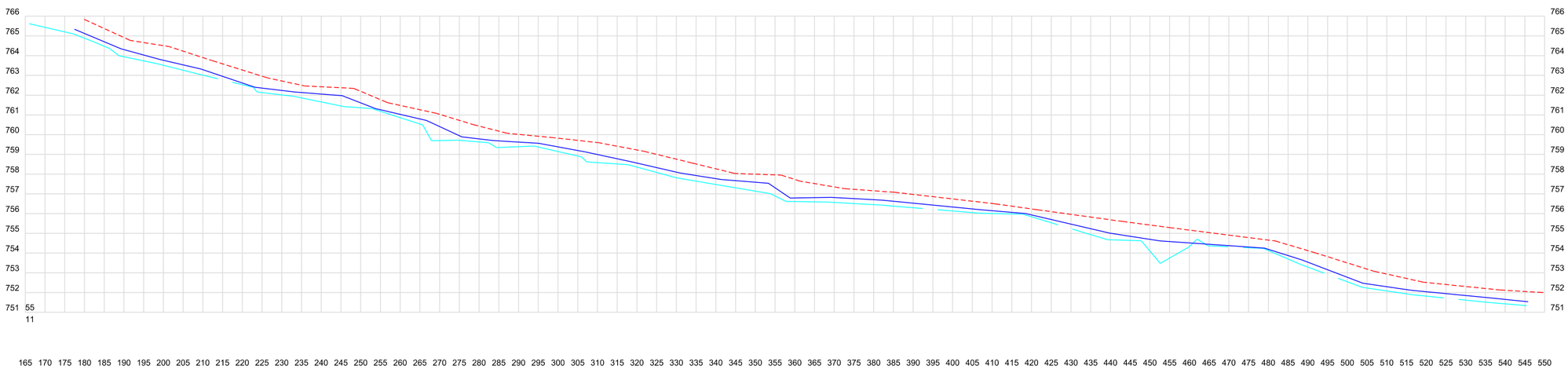
MECKLENBURG COUNTY
DB 12860, PG. 142
PARCEL ID #02716103

NAD 83 (2011)



MECKLENBURG COUNTY
DB 12860, PG. 142
PARCEL ID #02716103

NOTE: ONLY THE LEFT SIDE OF UT4 WAS GRADED DURING CONSTUCTION.
NO GRADING WAS PERFORMED ON THE RIGHT SIDE OF UT4.



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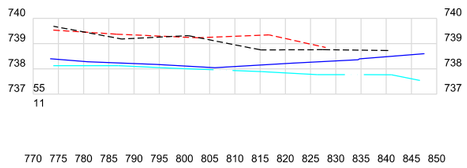
Revisions

AS-BUILT SURVEY

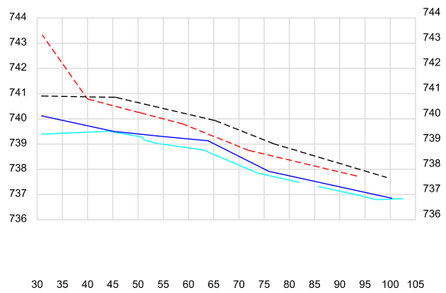
Sheet
8 of 10

PROFILES

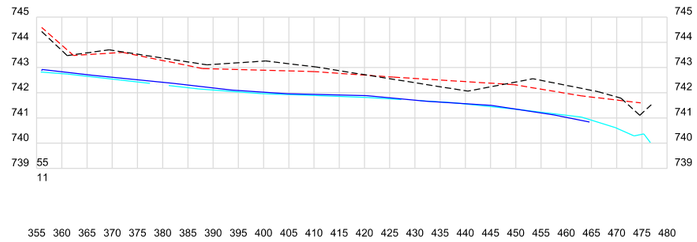
UT2A



UT3



UT5



LEGEND

WATER SURFACE

BANKFULL (RIGHT)

BANKFULL (LEFT)

THALWEG

◇ BANKFULL

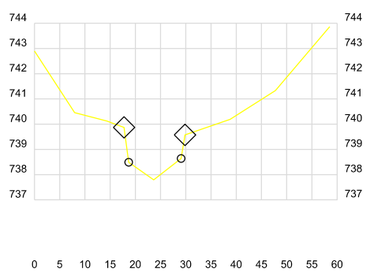
○ WATER SURFACE

CROSS SECTIONS

UT CLARKE

XS1

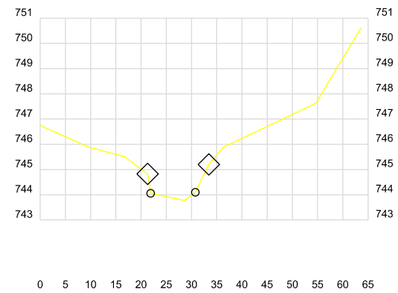
STA=4+52



XS2

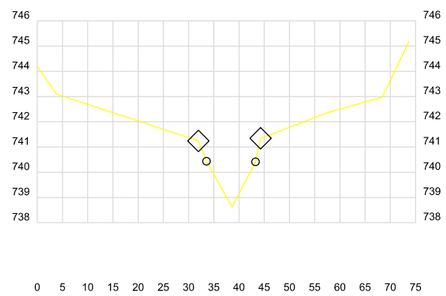
STA=9+34

UT1



XS8

STA=4+19



XS3

STA=7=26

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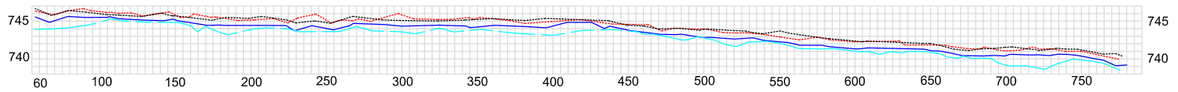
Revisions

AS-BUILT SURVEY

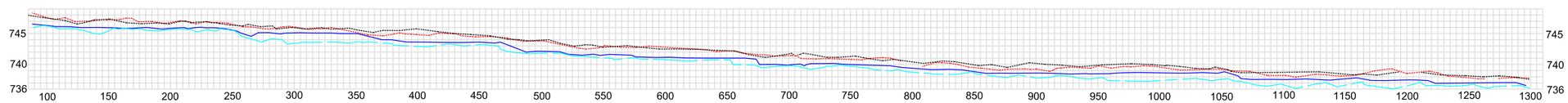
LEGEND

- WATER SURFACE
- BANKFULL (RIGHT)
- BANKFULL (LEFT)
- THALWEG

UT1



UT CLARKE



LEGEND

- WATER SURFACE
- BANKFULL (RIGHT)
- BANKFULL (LEFT)
- THALWEG

0' 100' 200' 300'

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AS-BUILT SURVEY