As-Built Baseline Monitoring Report Final
Hogan Creek Stream Mitigation Project

DENR Contract Number: 6496
USACE Action ID: SAW-2011-02268
DWR Project Number: 20120182
SCO# 09-08566-01

Surry County, North Carolina
Data Collected: May 27-June 9, 2015
Data Submitted: August 2015

Submitted to:

NCDENR - Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

Prepared by:

ClearWater
32 Clayton Street
Asheville, NC 28801

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806

Table of Contents

1.0 PROJECT SUMMARY

The NCDENR Division of Mitigation Services (DMS) restored, enhanced, and preserved a total of 9,923 linear feet (LF) of stream channel at the Hogan Creek Stream Mitigation Site (Site) in Surry County, North Carolina generating 5,089 Stream Mitigation Units (SMUs). The restoration project was developed to fulfill stream mitigation requirements accepted by DMS for the Upper Yadkin River Basin Hydrologic Unit Code (HUC) 03040101. This report documents the results of the As-Built Baseline monitoring efforts (MY0).

The project goals identified in the Mitigation Plan (Confluence, 2012) include:

- Improve water quality in Hogan Creek and the UTs through reductions in sediment and nutrient inputs from local sources;
- Create conditions for dynamic equilibrium of water and sediment movement between the supply reaches and project reaches;
- Promote floodwater attenuation and secondary functions associated with more frequent and extensive floodwater contact times;
- Improve in-stream habitat by increasing the diversity of bedform features;
- Enhance and protect native riparian vegetation communities; and
- Reduce fecal, nutrient, and sediment loads to project streams by promoting and implementing livestock best management practices.

The performance of the project will be evaluated in accordance with the geomorphic, visual, hydrology, and vegetation components outlined in the Stream Mitigation Guidelines (USACE 2003). The following are specific performance standards.

Performance Standards	
Proposed Ecological Service Enhancements	**Metrics/Success Criteria**
Flood attenuation	a. Evidence of at least two out-of-bank flows (wrack lines, crest gage data) by year 5 b. BHR < 1.2 each year
Fine sediment storage	a. Evidence of fine sediment on floodplain at least twice by year 5
Maintenance of stable channel bed and banks	a. Annual changes in riffle cross sectional area generally modest (e.g. <20%) and exhibit a stabilizing trend b. Annual width-depth ratio changes generally modest (e.g. <20%) and exhibit a stabilizing trend
Equilibrium sediment transport	a. No trends in widespread development of robust (e.g. comprised of coarse material and/or vegetated actively diverting flow) mid-channel bar features b. Majority of riffle pebble counts indicate maintenance or coarsening of substrate distributions

Maintenance of in-stream riffle and pool habitats	a. Overall number and distributions of riffle and pool features are generally maintained b. Pool depths may vary from year to year, but the majority maintain depths sufficient to be observed as distinct features in the profile c. Majority of riffle pebble counts indicate maintenance or coarsening of substrate distributions
Filtration of runoff	a. Evidence of floating debris or fine sediment on buffer vegetation at least twice by year 5
Riparian buffer habitat density and diversity	a. Density of 320 live, planted stems/ac at year 3; 260 live, planted stems/acre at year 5 b. Four dominant species at year 5 shall be native c. <20% non-native species at year 5, based on measurements of aerial extent
Protection of water quality from nutrient and pathogen inputs	a. Observations of intact livestock fencing and absence of evidence of livestock access to streams each year
Protection of banks from livestock trampling	a. Observations of intact livestock fencing and absence of evidence of livestock impacts each year
Re-vegetation of areas treated for non-native species	a. Bare soil areas shall comprise no more than 10 percent of the total treated area, based on measurements of aerial extent

The Site is located in the Piedmont physiographic province (NCGS 2004). The Piedmont is characterized by gently rolling, well rounded hills and long low ridges. Hogan Creek is a main tributary to the Yadkin River in the Upper Yadkin River Basin (HUC 03040101). The site is located approximately 2 miles south of NC 268 on Miller Gap Road, which bisects the project site at the bridge over Hogan Creek. The project site is bordered to the north by Trajan Trail, to the south by Anderson Road, and to the west by Siloam Road. Latitude and longitude for the site are 36.321609 N and 80.602389 W, respectively. A site location map is included in Appendix A as Figure 1.

Agriculture is the primary land use in the watershed (41% agriculture land cover). Non-forested buffers and livestock operations were identified as major stressors to water quality within the watershed. The site assessment phase of the project identified other stressors as well, including bank erosion, sediment deposition, disconnection of the streams and floodplains, and exotic plant species. The majority of the project area was utilized as a cattle operation for over fifty years. Cattle accessed Hogan Creek and the downstream reach of UT2 exacerbating bank erosion and allowing direct nutrient and fecal inputs to the streams. Deforested riparian buffers and levee construction along Hogan Creek and unnamed tributaries also contributed to channel degradation.

Stream restoration was accomplished using a natural channel design approach to restore appropriate channel dimension, pattern, and profile (Table 1; Figure 2). These improved conditions will promote water and sediment transport equilibrium between the stream and its watershed, reconnect the stream to its floodplain and promote healthy in-stream and riparian habitats. The project goals were addressed through the following project objectives:

- Restoration of the dimension, pattern, profile of 761 LF of Hogan Creek Reach 1, 992 LF of Hogan Creek Reach 2, 650 LF of UT2, and 275 LF of UT3.
- Restoration of the dimension and profile (Enhancement I) of 1,200 LF of Hogan Creek;
- Limited channel work coupled with livestock exclusion and/or invasive species control (Enhancement II) on 66 LF of UT1 and 280 LF of UT2.
- Livestock exclusion fencing and alternative water source installations;
- Invasive plant species control measures across the entire project wherever necessary; and
- Preservation of approximately 5,699 LF relatively un-impacted forested streams in a permanent conservation easement.

The target stream type for Hogan Creek was a moderately sinuous, moderate width-depth ratio C4, which was appropriate for the relatively flat and wide alluvial valley. Reach 1 was constructed largely within the existing channel with in-stream structures incorporated to promote sediment transport equilibrium, riffle and pool formation, and enhanced bank stability. Reach 2 of Hogan Creek was constructed mainly off-line to position the channel in the low point of the valley and provide much improved floodplain access on both banks.

The target stream type of each of the UTs was a B4, with a moderate width-depth ratio and moderate sinuosity which is suited to the somewhat steeper and more confined tributary valleys. Bankfull benches cut on 10:1 slopes were provided on both banks. The off-line channel segments were designed to promote the formation of riffle and pool sequences while also affording the ability during construction to maintain clean flow separate in the original channel.

The final design was completed in November of 2012. Construction activities and as-built surveys were completed in December of 2014. Planting of the Site took place in March of 2015. The baseline monitoring efforts began in May of 2015 and monitoring year one efforts are scheduled for the end of October 2015. More detailed information related to the project activity, history, and contacts can be found in Appendix A Tables 1 and 2.

Monitoring will consist of collecting morphological, vegetative, and hydrological data to assess the project success based on the restoration goals and objectives on an annual basis for five years or until the success criteria is met. The success of the project will be assessed using measurements of the stream channel's dimension, substrate composition permanent photographs, vegetation, surface water hydrology, and visual assessments. Monitoring requirements include:

Monitoring Requirements							
Parameter	Monitoring Feature	Quantity Length By Reach (ft)					
		Hogan R1	Hogan R2	UT1	UT2	UT3	Frequency
Dimension	Riffle XS	2	2		2		Annual
	Pool XS	1	1		1		Annual
Pattern/Profile	Longitudinal Profile	1,500	1,000		675		Annual
Substrate	100 Pebble Count	2	2				Annual
Hydrology	Crest Gauge		1		1		Semi-Annual
Vegetation	Vegetation Plots	3	2		1		Annual
Visual Assessment	Project Site	Y	Y	Y	Y	Y	Semi-Annual
Reference Photos	Permanent Photo Points	18	6	1	6	1	Annual

The baseline data showed little deviation from the design; however, riffle cross-sections 5 and 6 in Reach 2 of Hogan Creek exhibited a larger cross-sectional area than was designed. It appears that this is due to scour of constructed riffles and measures to correct this issue are scheduled for the Fall of 2015. The project as a whole shows no other significant deviations between the construction plans and the as-built surveys.

The MY0 vegetation plot data indicate that the project is on track to meet the interim criterion for survival and growth of 320 stems per acre at the end of the year three monitoring period. The average stem density for planted stems is 473 stems per acre; however, Vegetation Plot 3, with a density of 280 stems per acre, did not meet the interim success criteria of 320 stems per acre. Planted and volunteer stem densities were between 280 and 1,400 stems per acre with an average of 680 stems per acre for the entire restoration site. The site includes a diverse assemblage of 10 species of native trees and shrubs. Herbicide treatments of exotic invasive plants were conducted during the construction phase and in July 2015. Observations indicate that the extent of invasive plants has been greatly reduced. A supplemental planting is scheduled for the entire site during the Fall of 2015.

MY0 data indicate that the streams are generally stable and performing well. Repairs to constructed riffles on the main stem of Hogan Creek will be conducted in late 2015 to correct dimension issues, but no significant bank erosion/scour was observed. No bankfull events were recorded during the monitoring period but based on wrack line observations, a near-bankfull event did occur at the site on April 20, 2015 (NCCRONOS, 2015).

Summary data 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 can be found in the mitigation plan document. All raw data, supporting tables, and figures in the appendices are available from DMS upon request.

2.0 METHODOLOGY

The stream monitoring methodologies utilized in 2015 are based on standard guidance and procedures documents (Rosgen 1996 and USACE 2003).

- Stream longitudinal profile and cross-section data were collected throughout three reaches using a total station survey. Approximately 3,175 linear feet of stream and 9 cross-sections were surveyed. Cross-sections and longitudinal profile start and stop locations were permanently marked with capped rebar and PVC conduit.
- 32 permanent photo points were established throughout the project to visually monitor stream stability and vegetation. Permanent photo points were marked with labeled wooden stakes.
- Wolman pebble counts were conducted at four representative riffle cross-sections to evaluate particle size distribution over time. A minimum of 100 particles were selected at random and measured (Harrelson 1994).
- Vegetation monitoring included documenting species composition and survival of planted and volunteer species within six randomly located vegetation plots. Each 0.025 acre vegetation plot was permanently marked with rebar and PVC conduit at all four corners.
- Two crest gauges were installed and will be checked during semi-annual visits to determine if a bankfull event has occurred. The crest gauges were installed and surveyed at riffles on Hogan Creek Reach 2 and UT2.
- Visual assessments will be performed on all stream and buffer restoration areas on a semi-annual basis. Problem areas will be noted such as channel instability (lateral and/or vertical instability, structure failure/instability and/or piping, headcuts), vegetation health (low stem density, vegetation mortality, invasive species or encroachment), beaver activity, and livestock access. Areas of concern will be mapped, photographed, and described in future monitoring reports.

3.0 REFERENCES

Confluence Engineering, PC. 2012. Hogan Creek Stream Mitigation Plan. NCEEP, Raleigh, NC.

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.

NCCRONOS (North Carolina Climate Retrieval and Observations Network of the Southeast Database). 2015. State Climate Office of North Carolina. Version 2.7.2. Pilot Mountain 0.7 NW Station ID No. NC-SR-9. Accessed July 2015.

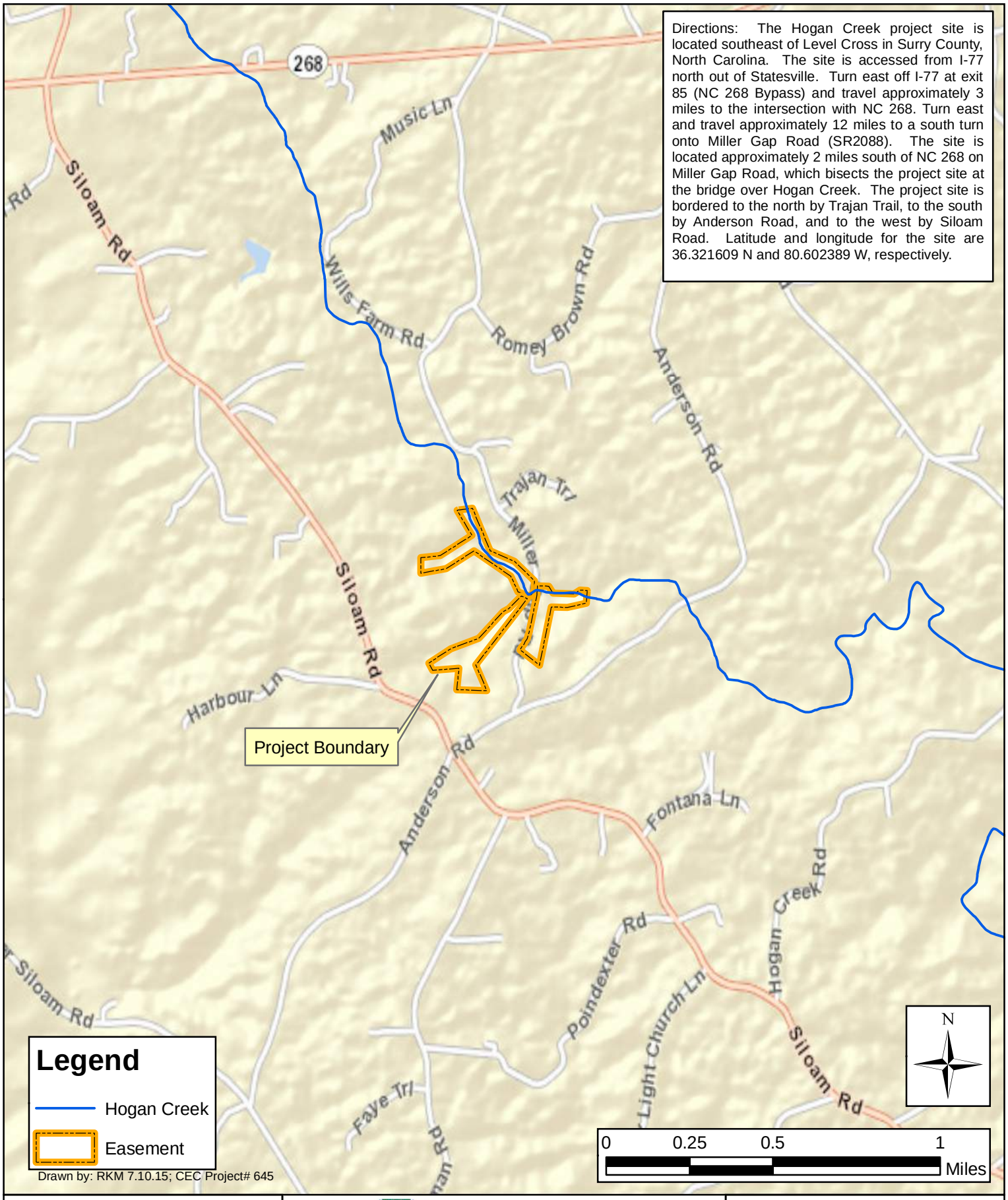
NCGS (North Carolina Geological Survey). 2004. Physiography of North Carolina. Map compiled by the Division of Land Resources. Raleigh.

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

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

Appendix A
Figures and Background Tables

Hogan Creek Stream Mitigation/Project No. 94708



Surry County,
North Carolina

NCDENR - Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

ClearWater
32 Clayton Street
Asheville, North Carolina 28801

Vicinity Map

Figure 1

Table 1. Project Components and Mitigation Credits
Hogan Creek Stream Mitigation/ DMS Project No. 94708

Mitigation Credit Summaries

	Stream	Riparian Wetland	Non-Riparian Wetland	Buffer	Nitrogen Nutrient Offset		Phosphorous Nutrient Offset
Overall Credit	5,089	N/A	N/A	N/A	N/A	N/A	N/A

Project Components

Project Component or Reach ID	Stationing	Pre-project Footage or Acreage	Restoration Footage or Acreage	Restoration Level	Restoration or Rest Equiv.	Mitigation Ratio	Mitigation Credits	Notes
Hogan Reach 1	10+00 - 22+00	1,331	1,200	P2	EI	1:1	1,200	-
Hogan Reach 1	22+00 - 29+61	797	761	P2	R	1:1	743	Crossing was removed from total
Hogan Reach 2	30+11 - 40+03	876	992	P2	R	1:1	992	-
UT1,1A, 1B	Upstream of 10+32	1,517	1,517	Preservation	P	5:1	303	-
UT1	10+32 - 10+98	66	66	P3	EII	2.5:1	26	-
UT2, 2A, 2B,2C	Upstream of 6+50	3,230	3,230	Preservation	P	5:1	646	-
UT2	6+50 - 9+30	280	280	P3	EII	2.5:1	112	-
UT2	9+30 - 15+80	633	650	P2	R	1:1	602	Crossing was removed from total
UT3	Ustream of 9+30	952	952	Preservation	P	5:1	190	-
UT3	9+30 - 12+05	260	275	P2	R	1:1	275	-

Length and Area Summations

Restoration Level	Stream (Linear Feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (Square feet)		Upland (acres)	
		Riverine	Non-Riverine					
		-						
Restoration	2,678	-	-	-	-	-	-	-
Enhancement		-	-	-	-	-	-	-
Enhancement I	1,200							
Enhancement II	346							
Creation		-	-	-			-	-
Preservation	5,699	-	-	-			-	-
High Quality Preservation	-	-	-	-			-	-
	-	-	-	-			-	-

BMP Element

Element	Location	Purpose/Function		Notes				
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-

Table 2. Project Activity and Reporting History Hogan Creek Stream Mitigation/ DMS Project No. 94708		
Activity or Deliverable	**Data Collection Complete**	**Completion or Delivery**
Mitigation Plan	Oct-11	Feb-12
Final Design – Construction Plans	Oct-11	Nov-12
Construction	N/A	Dec-14
Temporary S&E Mix Applied	N/A	Dec-14
Permanent Seed Mix Applied	N/A	Dec-14
Containerized, bare root and B&B plantings for reach/segments	N/A	Mar-15
Baseline Monitoring Document (Year 0 Monitoring - Baseline)	Jun-15	Aug-15
Year 1 Monitoring		
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

N/A - Not Applicable

Table 3. Project Contacts Table Hogan Creek Stream Mitigation/ DMS Project No. 94708	
Designer	Wildlands Engineering, Inc. 167-B Haywood Road Asheville, NC 28806
Primary project design POC	Andrew Bick 828-606-0306
Construction Contractor	Carolina Environmental Contracting, Inc. 150 Pine Ridge Road Mount Airy, NC 27030
Construction contractor POC	Wayne Taylor 336-341-6489
Survey Contractor	Turner Land Surveying, PLLC PO Box 41023 Raleigh, NC 27629
Survey Contractor POC	David Turner 919-623-5095
Planting Contractor	Keller Environmental, LLC 7921 Haymarket Lane Raleigh, NC 27615
Planting Contractor POC	Jay Keller 919-749-8259
Seeding Contractor	Carolina Environmental Contracting, Inc. 150 Pine Ridge Road Mount Airy, NC 27030
Seeding Contractor POC	Wayne Taylor 336-341-6489
Seed Mix Sources	Green Resources 336-855-6363
Nursery Stock Suppliers	Foggy Mountain Nursery 336-384-5323
Monitoring Performers	Wildlands Engineering, Inc. 167-B Haywood Road Asheville, NC 28806 ClearWater Environmental Consultants 32 Clayton Street Asheville, NC 28801
Stream Monitoring POC	Andrew Bick 828-606-0306
Vegetation Monitoring POC	Andrew Bick 828-606-0306

Table 4. Project Baseline Information and Attributes	
Hogan Creek Stream Mitigation/ DMS Project No. 94708	
County	Surry
Project Area (acres)	36
Project Coordinates (latitude and longitude)	36.321609 N, 80.602389 W
Project Watershed Summary Information	
Physiographic Province	Piedmont
River Basin	Yadkin
USGS Hydrologic Unit 8-digit	3040101
USGS Hydrologic Unit 14-digit	3040101110060
DWR Sub-basin	Pee Dee River Subbasin 03-07-02
Project Drainage Area (acres)	1,514 ac (2.37 mi^2)
Project Drainage Area Percentage of Impervious Area	0.40%
CGIA Land Use Classification	Managed Herbaceous Cover, Broadleaf Deciduous Forest Land

Reach Summary Information

Parameters	Reach 1 Hogan Creek	Reach 2 Hogan Creek	Main Stem UT1	Main Stem UT2	UT3
Length of Reach Post Construction (LF)	1,961	992	1,442	2,869	1,227
Valley classification (Rosgen)	VIII	VIII	VI	VI	VI
Drainage area (acres)	1,479	1,514	60	81	18
NCDWQ stream identification score	40	37	31	31.5	32.5
NCDWQ Water Quality Classification	C	C	C	C	C
Morphological Description (Rosgen stream type)	C4	C4	E4b	E4b	G4
Evolutionary trend	C-F	C-F	Eb-G	Eb-G	Eb-G
Underlying mapped soils	CsA	CsA	CsA, FsE	FsE	FsE
Drainage class	well drained	well drained	well drained	well drained	well drained
Soil Hydric status	not hydric	not hydric	not hydric	not hydric	not hydric
Slope	0.007	0.005	0.031	0.021	0.030
FEMA classification	AE	AE	Not in SFHA	Not in SFHA	Not in SFHA
Native vegetation community	Felsic Mesic Forest	Felsic Mesic Forest	Felsic Mesic Forest	Felsic Mesic Forest	Felsic Mesic Forest
Percent composition of exotic invasive vegetation	0	0	0	0	0

Wetland Summary Information

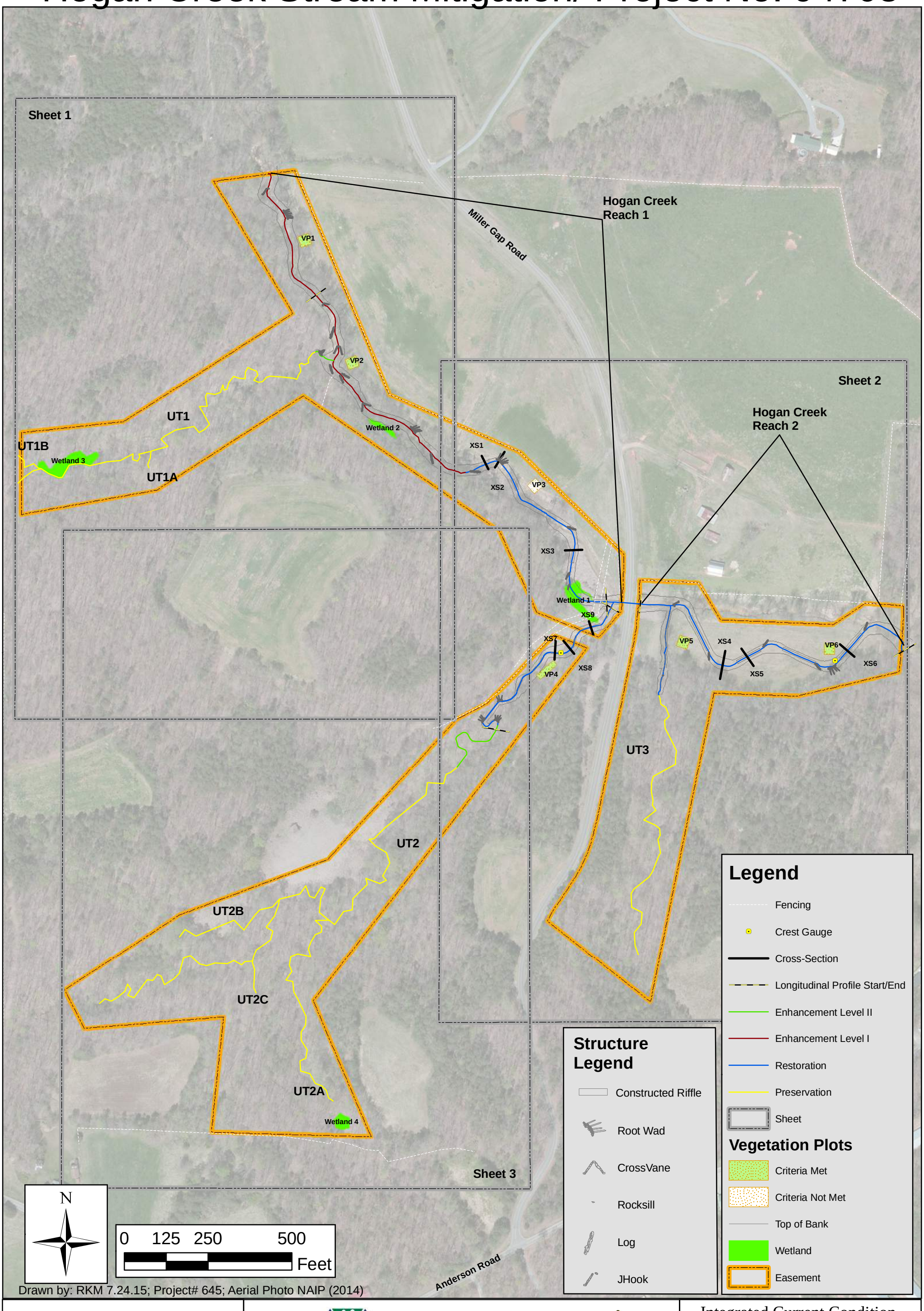
Parameters	Wetland 1	Wetland 2	Wetland 3	Wetland 4
Size of Wetland (acres)	0.09	0.02	0.13	0.10
Wetland Type	riparian non-riverine	riparian non-riverine	riparian non-riverine	riparian non-riverine
Mapped Soil Series	CsA	CsA and FsE	CsA and FsE	CsA and FsE
Drainage class	well drained	well drained	well drained	well drained
Soil Hydric Status	not hydric	not hydric	not hydric	not hydric
Source of Hydrology	Creek (oxbow)	Toe seep	Toe seep	Impoundment
Hydrologic Impairment	none	none	none	none
Native vegetation community	Dist. Small Stream/ Narrow FP Forest	Dist. Small Stream/ Narrow FP Forest	Dist. Small Stream/ Narrow FP Forest	Herbaceous
Percent composition of exotic invasive vegetation	0	0	0	0

Regulatory Considerations

Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States – Section 404	Y	Y	02268
Waters of the United States – Section 401	Y	Y	NCDWR # 20120182
Endangered Species Act	Y	Y	CE Approved 9/30/11
Historic Preservation Act	N	N/A	-
Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	N	N/A	-
FEMA Floodplain Compliance	Y	Y	LOMR Submitted 5/2015
Essential Fisheries Habitat	N	N/A	-

Appendix B
Visual Assessment Data

Hogan Creek Stream Mitigation/ Project No. 94708



Surry County,
North Carolina

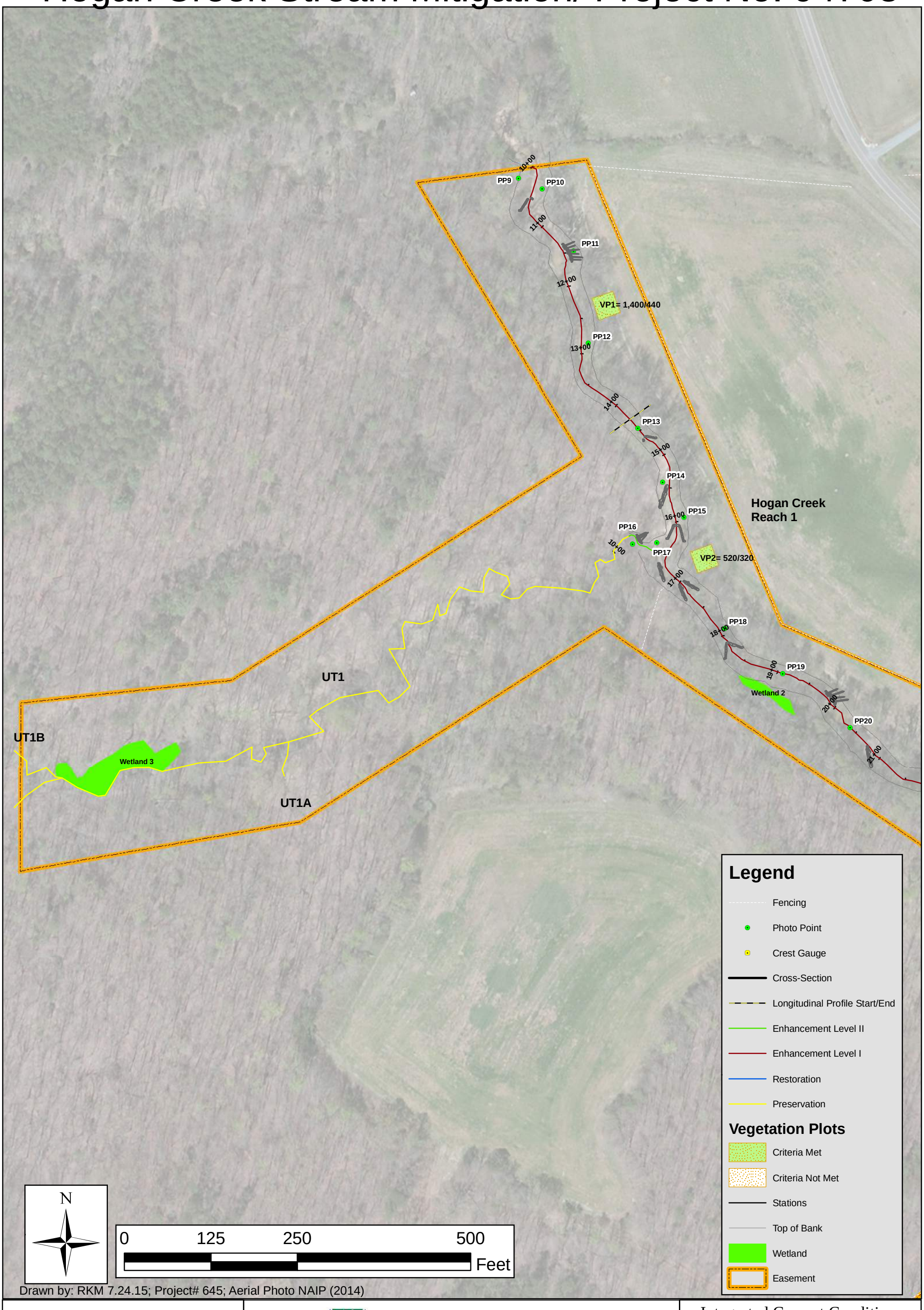
NCDENR - Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

ClearWater
32 Clayton Street
Asheville, North Carolina 28801

Integrated Current Condition
Plan View
DMS Project # 94708

Figure 2

Hogan Creek Stream Mitigation/ Project No. 94708



Drawn by: RKM 7.24.15; Project# 645; Aerial Photo NAIP (2014)

Surry County,
North Carolina

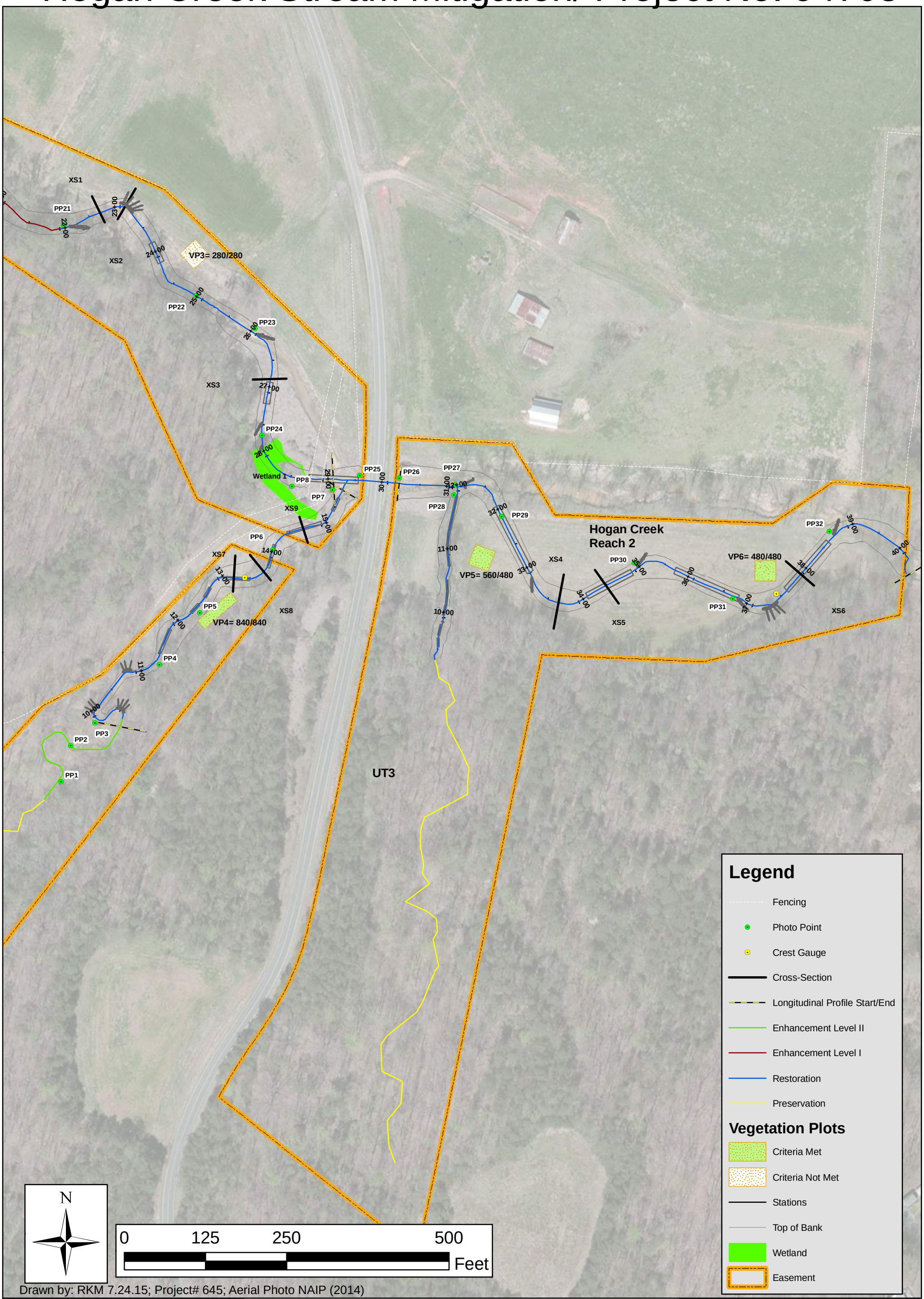
NCDENR - Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

ClearWater
32 Clayton Street
Asheville, North Carolina 28801

Integrated Current Condition
Plan View
DMS Project # 94708

Figure 2 Sheet 1

Hogan Creek Stream Mitigation/ Project No. 94708



Drawn by: RKM 7.24.15; Project# 645; Aerial Photo NAIP (2014)

Surry County,
North Carolina

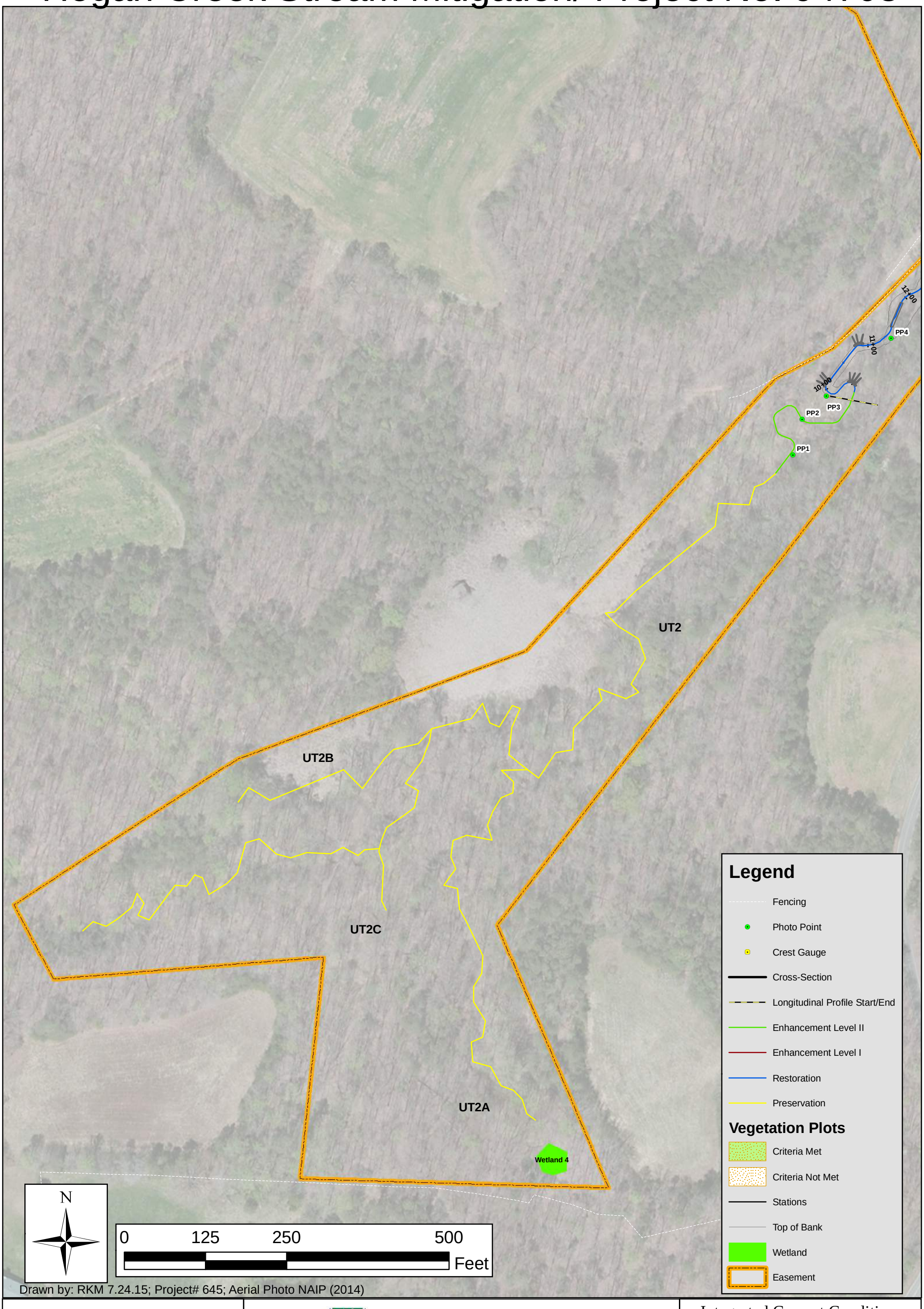
NCDENR - Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

32 Clayton Street
Asheville, North Carolina 28801

Integrated Current Condition
Plan View
DMS Project # 94708

Figure 2 Sheet 2

Hogan Creek Stream Mitigation/ Project No. 94708



Drawn by: RKM 7.24.15; Project# 645; Aerial Photo NAIP (2014)

Surry County,
North Carolina

NCDENR - Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

ClearWater
32 Clayton Street
Asheville, North Carolina 28801

Integrated Current Condition
Plan View
DMS Project # 94708

Figure 2 Sheet 3

Photo Point 1 - Downstream

Photo Point 2 - Downstream

Photo Point 3 - Upstream

Photo Point 4 - Upstream

Photo Point 5 – Downstream

Photo Point 6 - Downstream

Photo Point 7 – Downstream

Photo Point 8 – Upstream

Photo Point 9 – Downstream

Photo Point 10 – Downstream

Photo Point 11 – Downstream

Photo Point 12 – Downstream

Photo Point 13 – Downstream

Photo Point 14 – Downstream

Photo Point 15 – Downstream

Photo Point 16 – Downstream

Photo Point 17 – Downstream

Photo Point 18 – Downstream

Photo Point 19 – Downstream

Photo Point 20 – Downstream

Photo Point 21 – Downstream

Photo Point 22 – Downstream

Photo Point 23 – Downstream

Photo Point 24 – Downstream

Photo Point 25 – Upstream

Photo Point 26 – Downstream

Photo Point 27 – Downstream

Photo Point 28 – Upstream

Photo Point 29 – Downstream

Photo Point 30 – Downstream

Photo Point 31 – Downstream

Photo Point 32 – Downstream

Appendix C
Vegetation Plot Data

Table 5. Vegetation Plot Results (All Stems)			Current Data (MY0 2015)												Annual Means		
	Common		Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		MY0 (2015)		
	Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	
Acer rubrum	Red maple	Tree	0	0	0	1	0	0	0	0	0	0	0	0	0	1	
Betula nigra	River birch	Tree	3	3	0	0	1	1	6	6	0	0	0	0	10	10	
Fraxinus pennsylvanica	Green ash	Tree	5	5	3	3	3	3	5	5	1	1	0	0	17	17	
Juglans nigra	Black walnut	Tree	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
Nyssa sylvatica	Black gum	Tree	0	0	0	0	0	0	0	0	5	5	7	7	12	12	
Platanus occidentalis	American sycamore	Tree	2	2	3	3	1	1	7	7	0	0	0	0	13	13	
Prunus serotina	Black cherry	Tree	0	22	0	4	0	0	0	0	0	1	0	0	0	27	
Quercus phellos	Willow oak	Tree	1	1	1	1	0	0	0	0	3	3	1	1	6	6	
Quercus rubra	Northern red oak	Tree	0	2	0	0	0	0	0	0	0	0	0	0	0	2	
Quercus lyrata	Overcup oak	Tree	0	0	1	1	2	2	3	3	3	3	4	4	13	13	
	Plot area (acres)		0.025		0.025		0.025		0.025		0.025		0.025		0.15		
	Species count		4	6	4	6	4	4	4	4	4	6	3	3	6	10	
	Stem Count		11	35	8	13	7	7	21	21	12	14	12	12	71	102	
	Stems per Acre		440	1400	320	520	280	280	840	840	480	560	480	480	473	680	

Meets Success Criteria

Fails to Meet Interim Success Criteria

Type = Tree, Shrub, Livestake

P = Planted

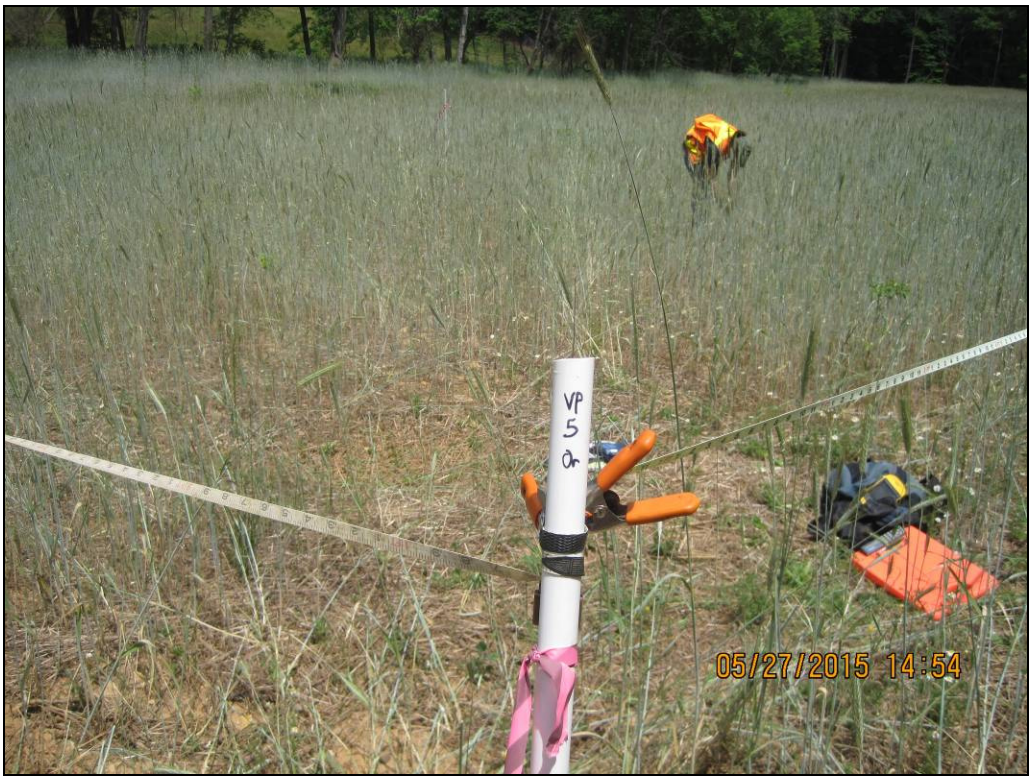
T = Total

Vegetation Monitoring Plot 1
Monitoring Year 0 – May 27, 2015

Vegetation Monitoring Plot 2
Monitoring Year 0 – May 27, 2015

Vegetation Monitoring Plot 3
Monitoring Year 0 – May 27, 2015

Vegetation Monitoring Plot 4
Monitoring Year 0 – May 27, 2015



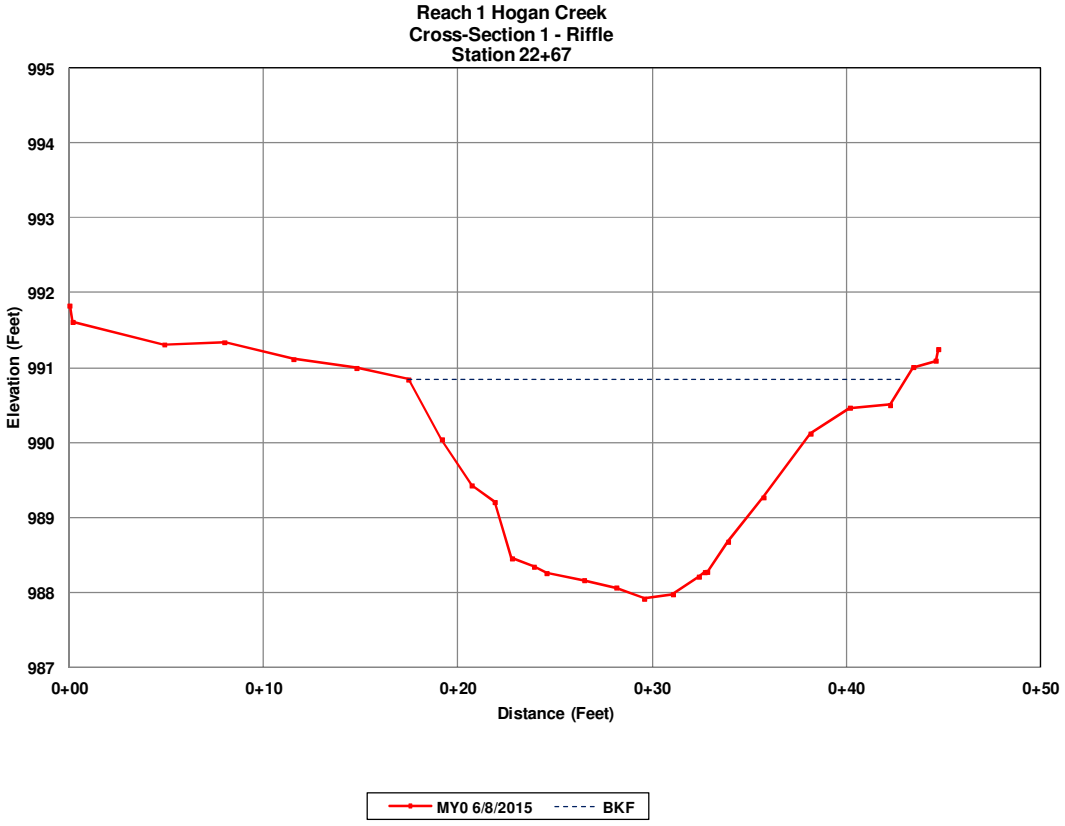
Vegetation Monitoring Plot 5
Monitoring Year 0 – May 27, 2015

Vegetation Monitoring Plot 6
Monitoring Year 0 – May 27, 2015

Appendix D
Stream Survey Data

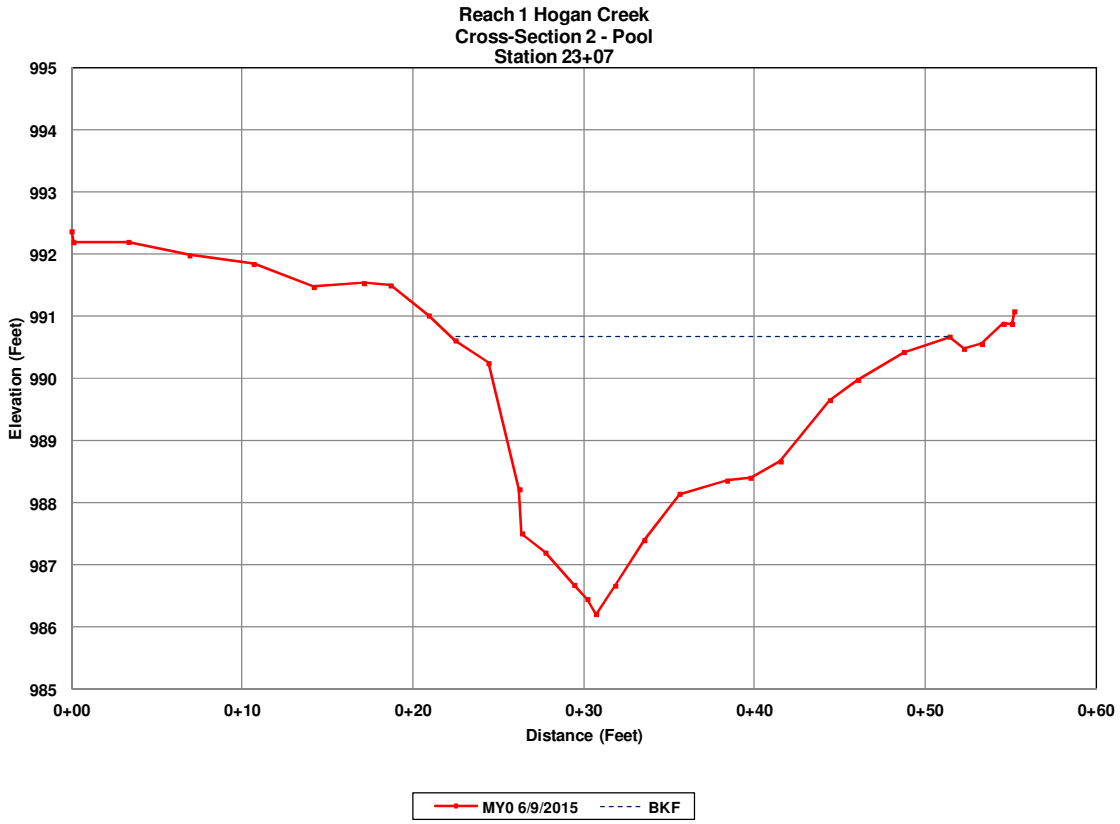
Cross-Section 1 – Riffle Looking Downstream

Cross-Section 1 – Riffle Looking Upstream



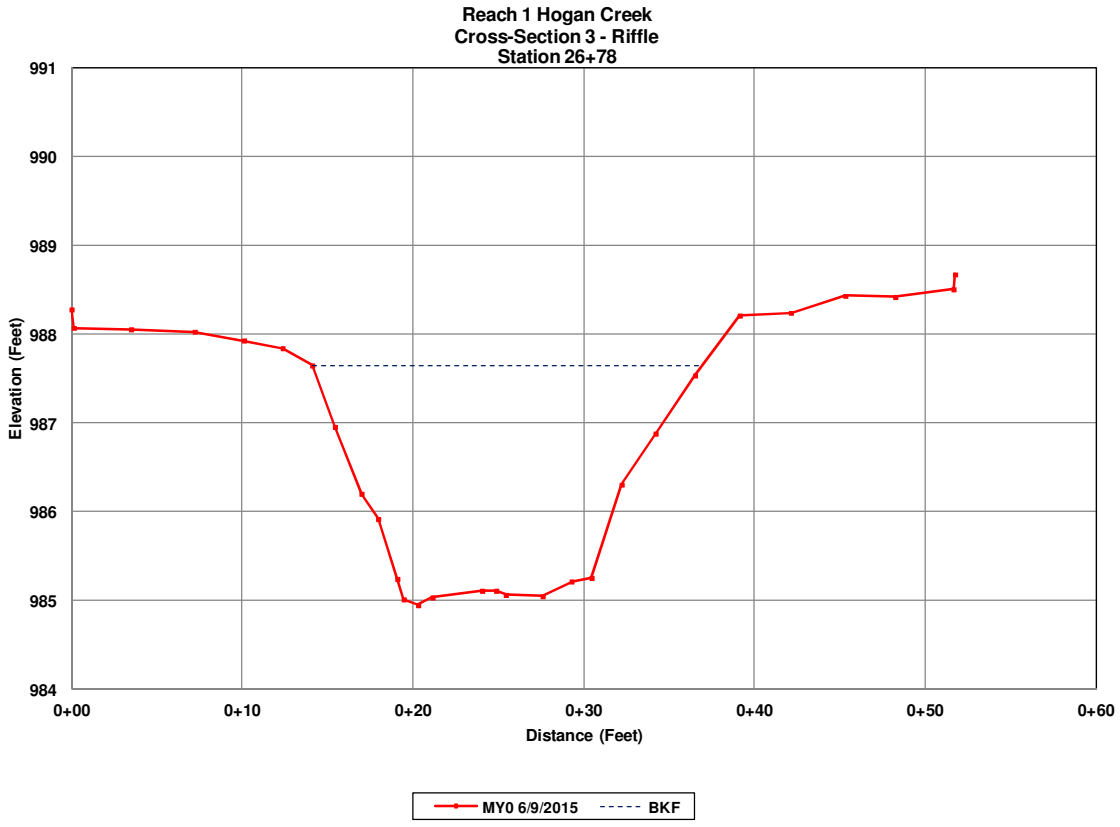
Cross-Section 2 – Pool Looking Downstream

Cross-Section 2 – Pool Looking Upstream



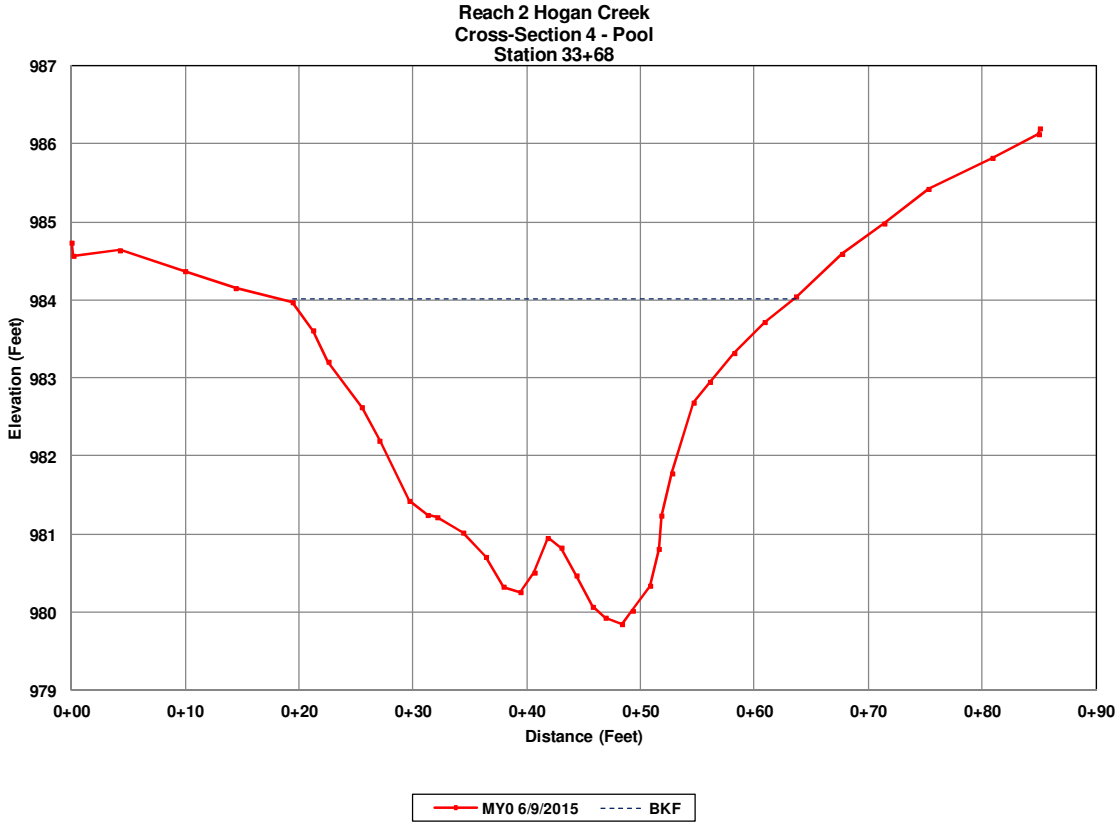
Cross-Section 3 – Riffle Looking Downstream

Cross-Section 3 – Riffle Looking Upstream



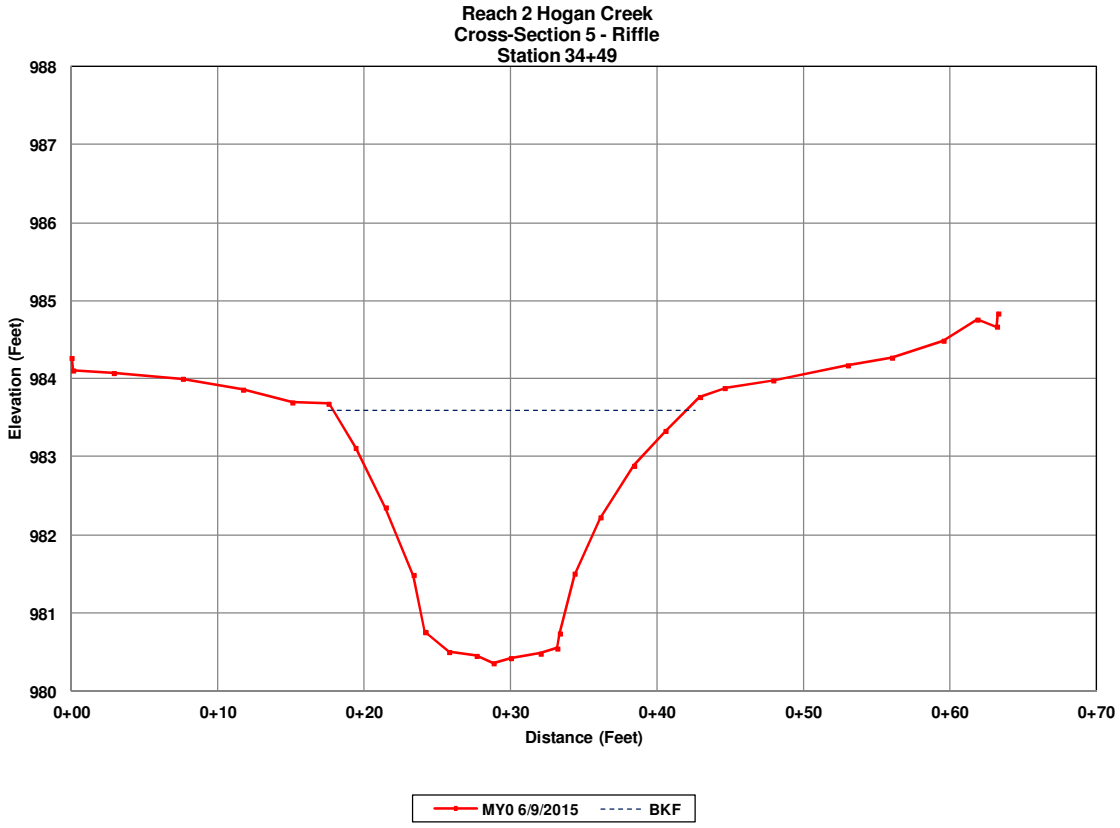
Cross-Section 4 – Pool Looking Downstream

Cross-Section 4 – Pool Looking Upstream



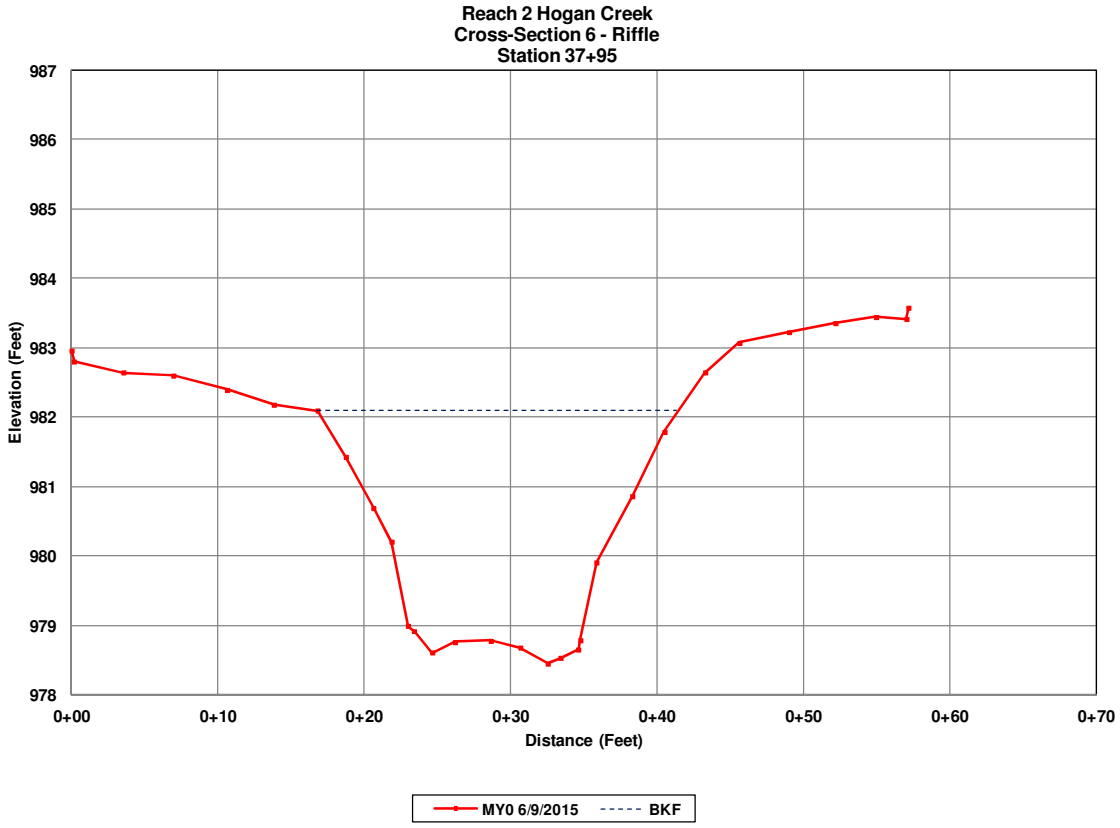
Cross-Section 5 – Riffle Looking Downstream

Cross-Section 5 – Riffle Looking Upstream



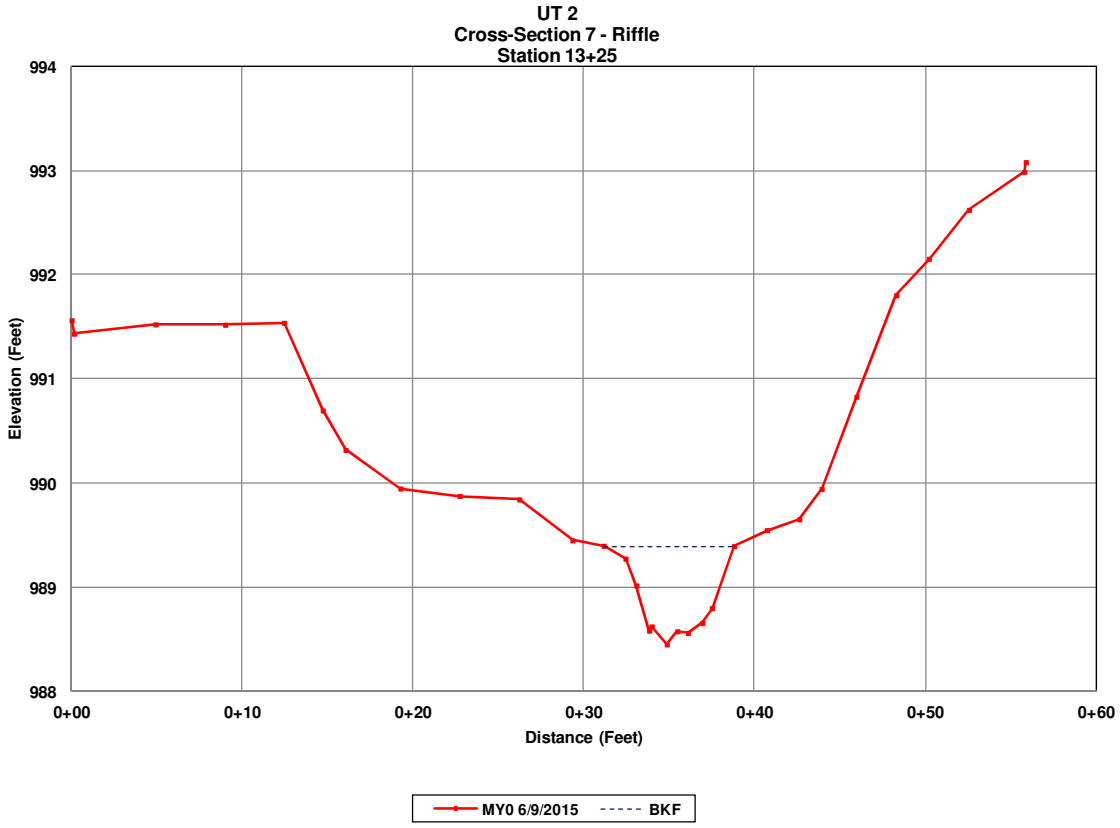
Cross-Section 6 – Riffle Looking Downstream

Cross-Section 6 – Riffle Looking Upstream



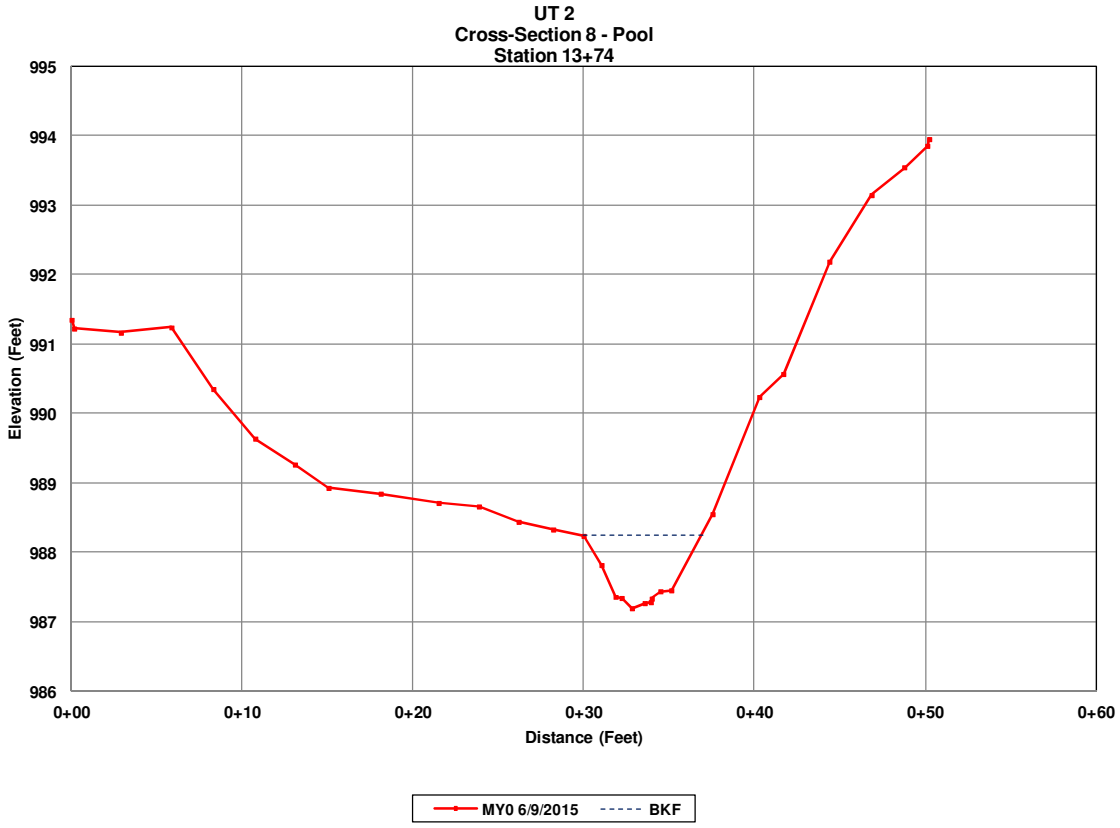
Cross-Section 7 – Riffle Looking Downstream

Cross-Section 7 – Riffle Looking Upstream



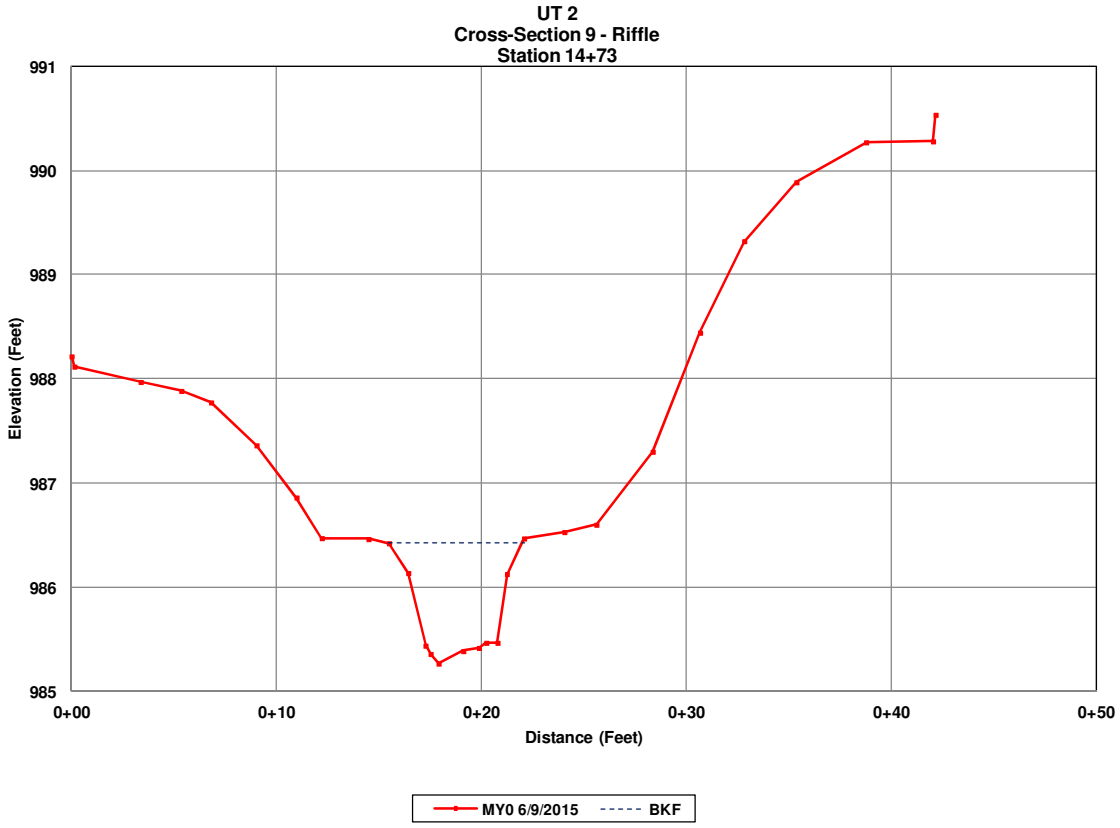
Cross-Section 8 – Pool Looking Downstream

Cross-Section 8 – Pool Looking Upstream

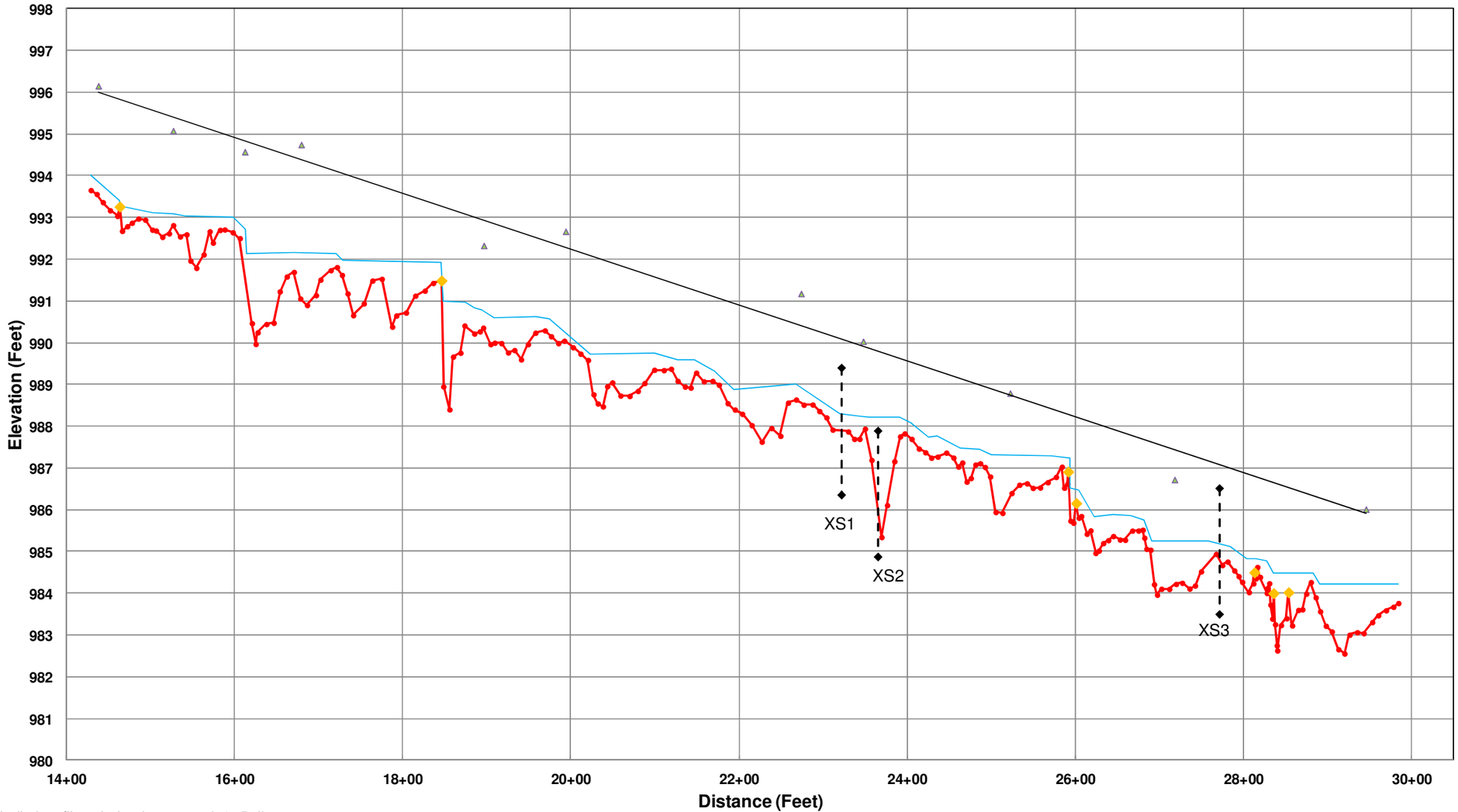


Cross-Section 9 – Riffle Looking Downstream

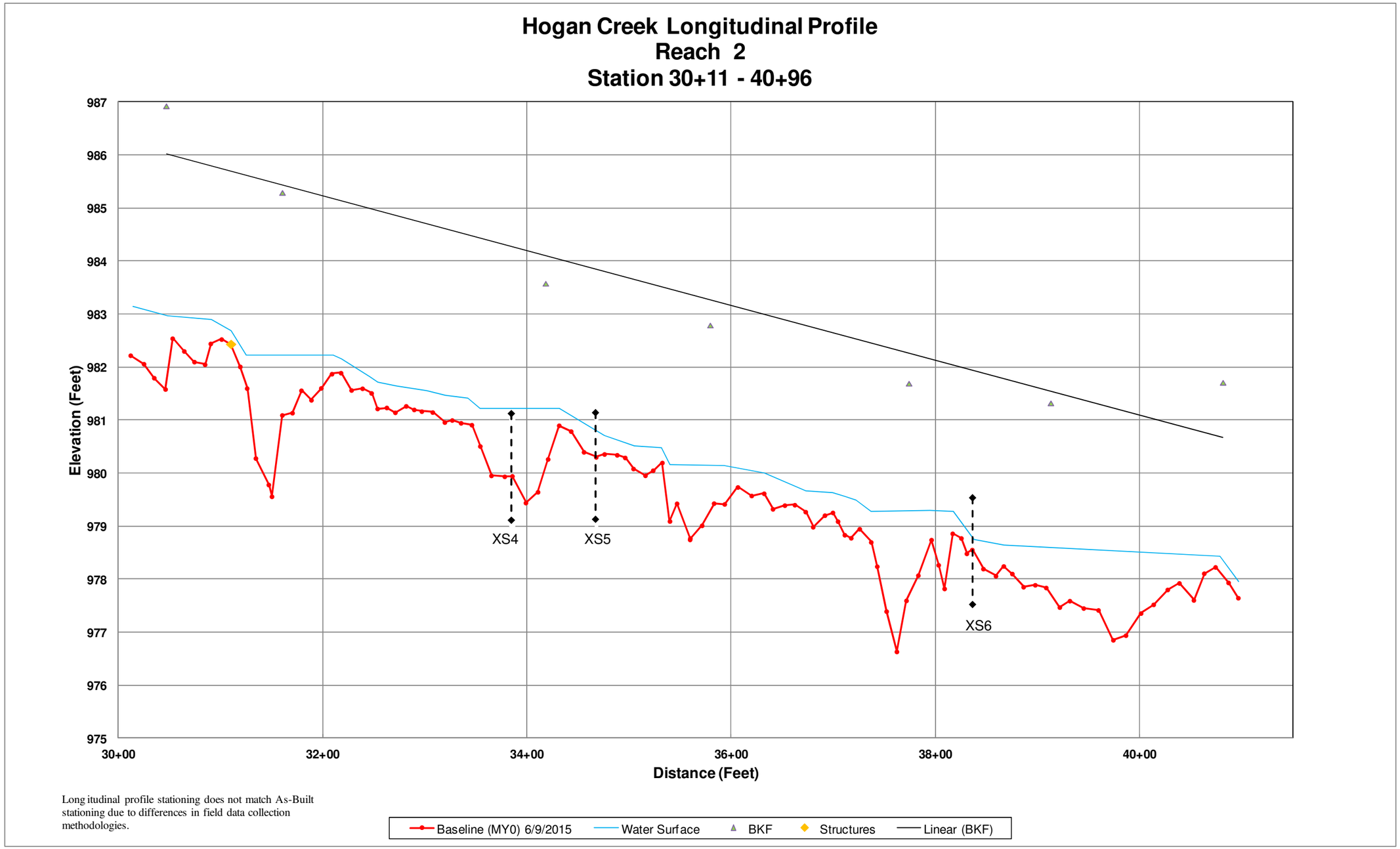
Cross-Section 9 – Riffle Looking Upstream



Hogan Creek Longitudinal Profile
Reach 1
Station 14+29 - 29+61

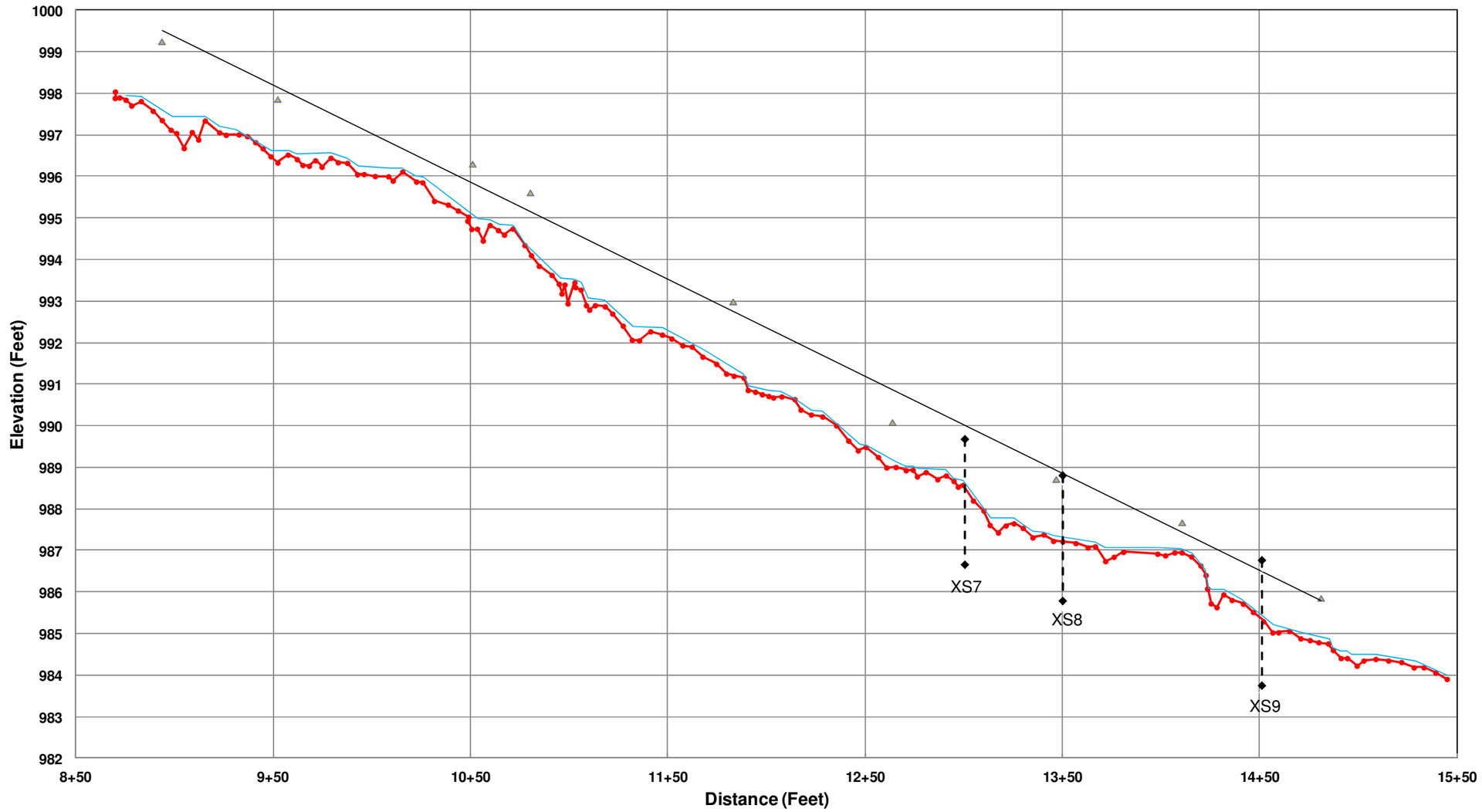


Longitudinal profile stationing does not match As-Built stationing due to differences in field data collection methodologies.



Long itudinal profile stationing does not match As-Built stationing due to differences in field data collection methodologies.

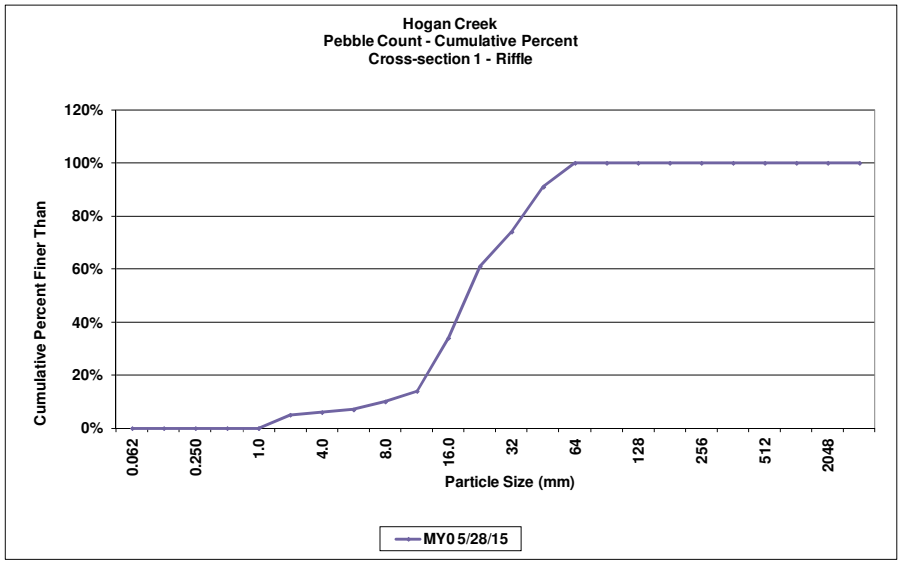
UT2 Longitudinal Profile
Station 8+70 - 15+45

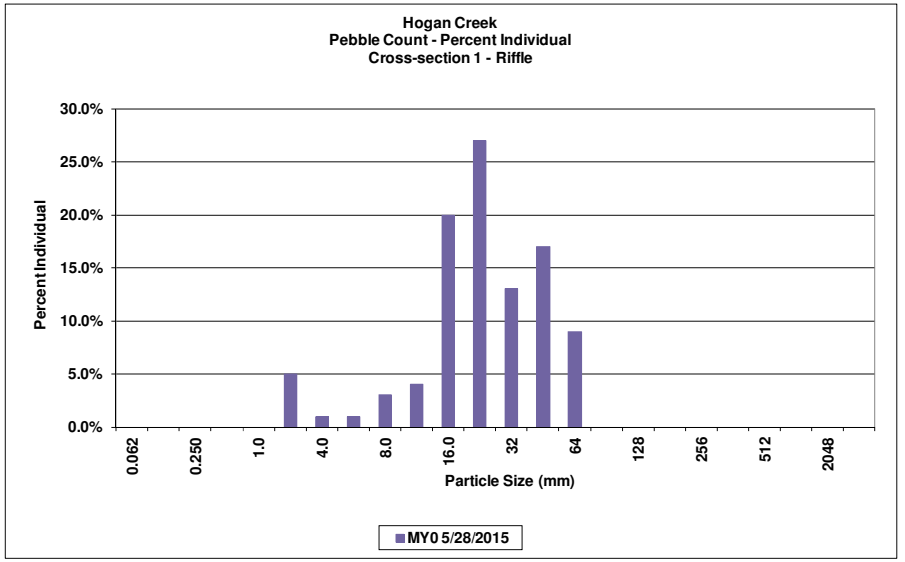


Long itudinal profile stationing does not match As-Built stationing due to differences in field data collection methodologies.

Hogan Creek Stream Mitigation / 94708 Cross Section 1 - Riffle Reach 1				
Material	Particle Size Class (mm)	Total	% Individual	% Cumulative
silt/clay	0.062		0.0%	0%
very fine sand	0.125		0.0%	0%
fine sand	0.250		0.0%	0%
medium sand	0.50		0.0%	0%
coarse sand	1.0		0.0%	0%
very course sand	2.0	5	5.0%	5%
very fine gravel	4.0	1	1.0%	6%
fine gravel	5.7	1	1.0%	7%
fine gravel	8.0	3	3.0%	10%
medium gravel	11.3	4	4.0%	14%
medium gravel	16.0	20	20.0%	34%
course gravel	22.3	27	27.0%	61%
course gravel	32	13	13.0%	74%
very course gravel	45	17	17.0%	91%
very course gravel	64	9	9.0%	100%
small cobble	90		0.0%	100%
medium cobble	128		0.0%	100%
large cobble	180		0.0%	100%
very large cobble	256		0.0%	100%
small boulder	362		0.0%	100%
small boulder	512		0.0%	100%
medium boulder	1024		0.0%	100%
large boulder	2048		0.0%	100%
bedrock	4096		0.0%	100%
Total		**100**	**100.0%**	**100%**

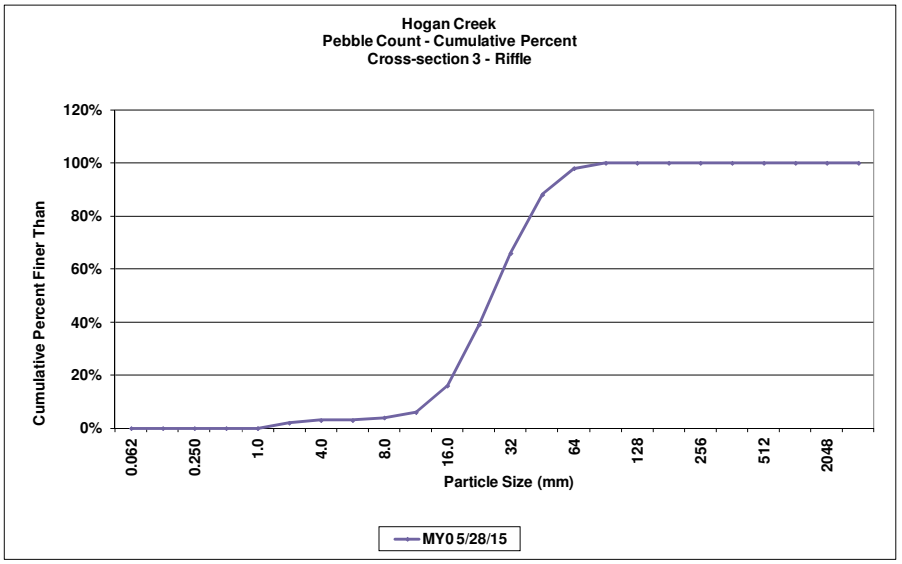
Summary Data	
D50	**19**
D84	**39**
D95	**53**

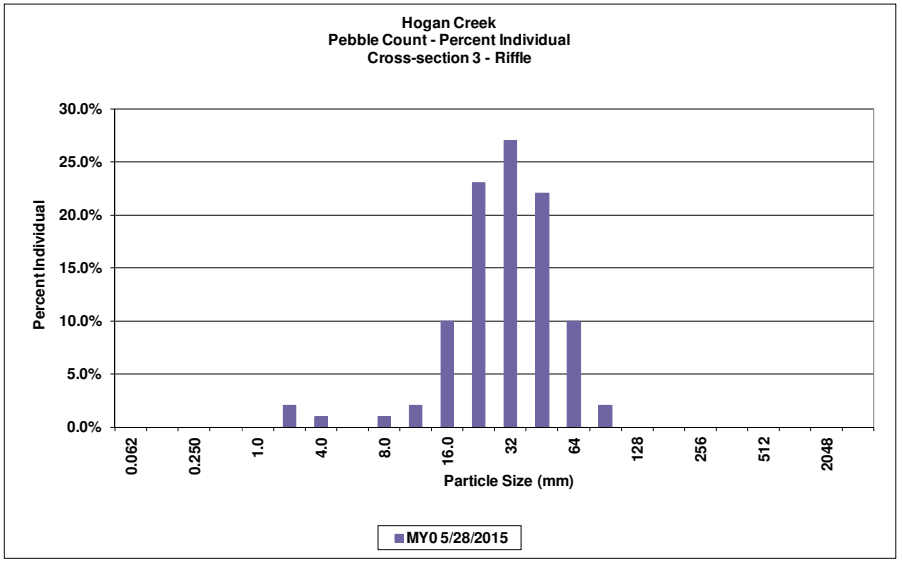




Hogan Creek Stream Mitigation / 94708 Cross Section 3 - Riffle Reach 1				
Material	Particle Size Class (mm)	Total	% Individual	% Cumulative
silt/clay	0.062		0.0%	0%
very fine sand	0.125		0.0%	0%
fine sand	0.250		0.0%	0%
medium sand	0.50		0.0%	0%
coarse sand	1.0		0.0%	0%
very course sand	2.0	2	2.0%	2%
very fine gravel	4.0	1	1.0%	3%
fine gravel	5.7		0.0%	3%
fine gravel	8.0	1	1.0%	4%
medium gravel	11.3	2	2.0%	6%
medium gravel	16.0	10	10.0%	16%
course gravel	22.3	23	23.0%	39%
course gravel	32	27	27.0%	66%
very course gravel	45	22	22.0%	88%
very course gravel	64	10	10.0%	98%
small cobble	90	2	2.0%	100%
medium cobble	128		0.0%	100%
large cobble	180		0.0%	100%
very large cobble	256		0.0%	100%
small boulder	362		0.0%	100%
small boulder	512		0.0%	100%
medium boulder	1024		0.0%	100%
large boulder	2048		0.0%	100%
bedrock	4096		0.0%	100%
Total		**100**	**100.0%**	**100%**

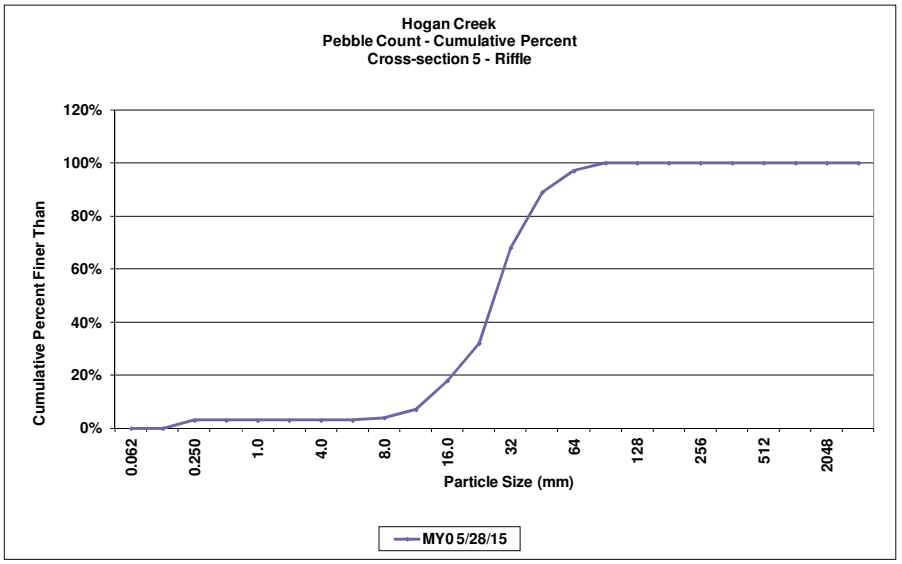
Summary Data	
D50	**26**
D84	**42**
D95	**58**

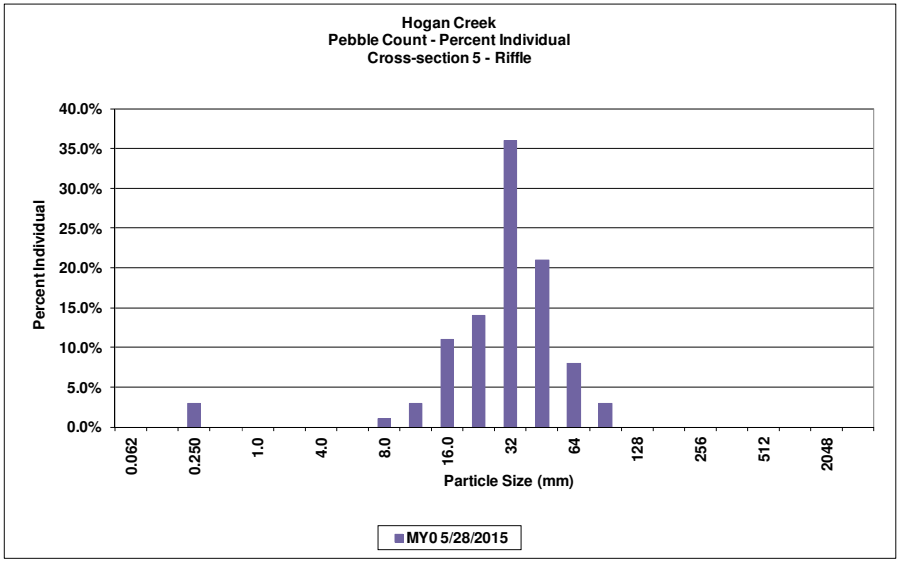




Hogan Creek Stream Mitigation / 94708 Cross Section 5 - Riffle Reach 2				
Material	Particle Size Class (mm)	Total	% Individual	% Cumulative
silt/clay	0.062		0.0%	0%
very fine sand	0.125		0.0%	0%
fine sand	0.250	3	3.0%	3%
medium sand	0.50		0.0%	3%
coarse sand	1.0		0.0%	3%
very course sand	2.0		0.0%	3%
very fine gravel	4.0		0.0%	3%
fine gravel	5.7		0.0%	3%
fine gravel	8.0	1	1.0%	4%
medium gravel	11.3	3	3.0%	7%
medium gravel	16.0	11	11.0%	18%
course gravel	22.3	14	14.0%	32%
course gravel	32	36	36.0%	68%
very course gravel	45	21	21.0%	89%
very course gravel	64	8	8.0%	97%
small cobble	90	3	3.0%	100%
medium cobble	128		0.0%	100%
large cobble	180		0.0%	100%
very large cobble	256		0.0%	100%
small boulder	362		0.0%	100%
small boulder	512		0.0%	100%
medium boulder	1024		0.0%	100%
large boulder	2048		0.0%	100%
bedrock	4096		0.0%	100%
Total		**100**	**100.0%**	**100%**

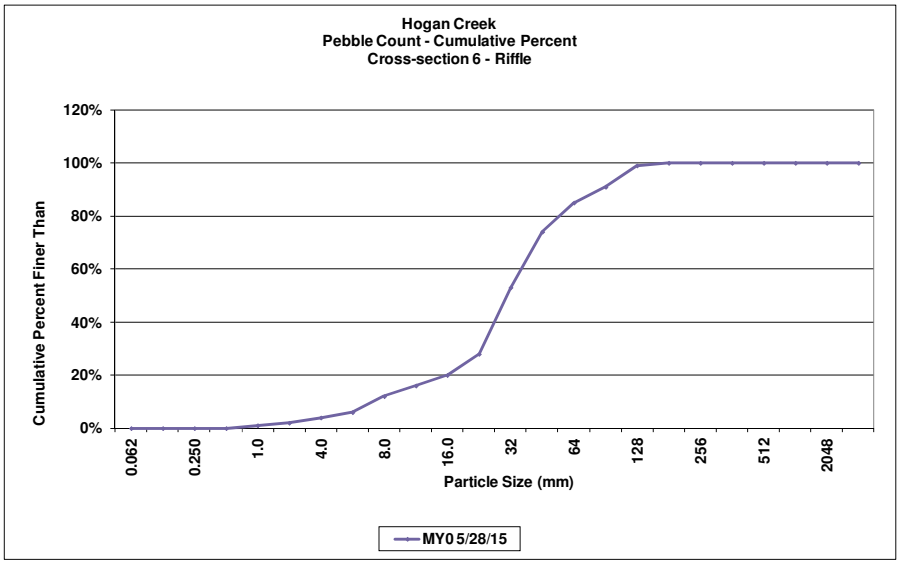
Summary Data	
D50	**27**
D84	**41**
D95	**59**





Hogan Creek Stream Mitigation / 94708 Cross Section 6 - Riffle Reach 2				
Material	Particle Size Class (mm)	Total	% Individual	% Cumulative
silt/clay	0.062		0.0%	0%
very fine sand	0.125		0.0%	0%
fine sand	0.250		0.0%	0%
medium sand	0.50		0.0%	0%
coarse sand	1.0	1	1.0%	1%
very course sand	2.0	1	1.0%	2%
very fine gravel	4.0	2	2.0%	4%
fine gravel	5.7	2	2.0%	6%
fine gravel	8.0	6	6.0%	12%
medium gravel	11.3	4	4.0%	16%
medium gravel	16.0	4	4.0%	20%
course gravel	22.3	8	8.0%	28%
course gravel	32	25	25.0%	53%
very course gravel	45	21	21.0%	74%
very course gravel	64	11	11.0%	85%
small cobble	90	6	6.0%	91%
medium cobble	128	8	8.0%	99%
large cobble	180	1	1.0%	100%
very large cobble	256		0.0%	100%
small boulder	362		0.0%	100%
small boulder	512		0.0%	100%
medium boulder	1024		0.0%	100%
large boulder	2048		0.0%	100%
bedrock	4096		0.0%	100%
Total		**100**	**100.0%**	**100%**

Summary Data	
D50	**31**
D84	**62**
D95	**110**



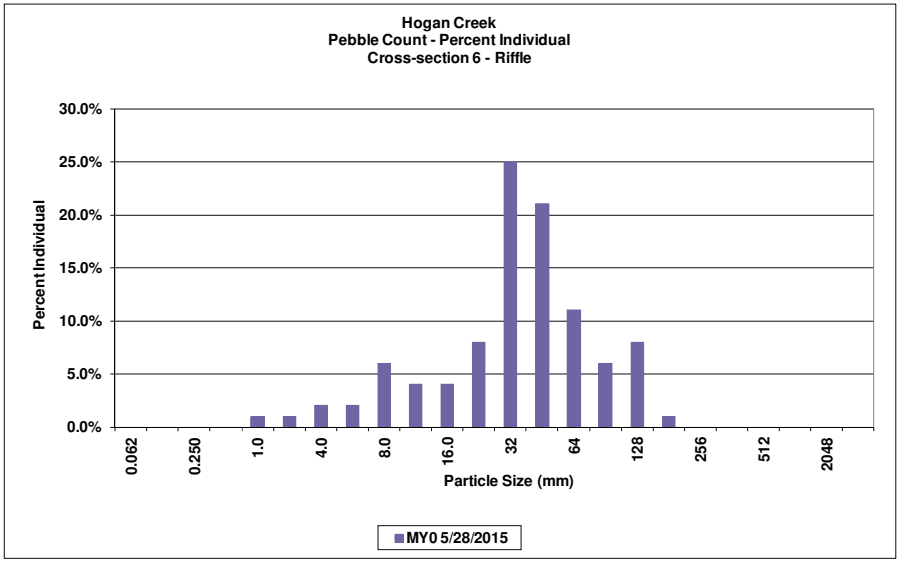


Table 6a. Baseline Stream Data Summary

Hogan Creek/94708 - Reach 1 (1,532 feet)

Parameter	Gauge	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	-	-	-	-	21.5	-	25.7	29.7	-	-	27.2	-	30.4	33.6	-	-	22.5	23.3	24.0	22.8	24.2	24.2	25.6	N/A	2
Floodprone Width (ft)					178.0	-	220.0	246.0	-	-	72.1	-	72.3	72.5	-	-	100.0	150.0	200.0	>100	>100	>100	>100	N/A	2
Bankfull Mean Depth (ft)	-	-	-	-	2.0	-	1.9	2.1	-	-	1.9	-	2.0	2.2	-	-	1.8	1.9	2.2	1.7	1.8	1.8	1.8	N/A	2
Bankfull Max Depth (ft)	-				2.5	-	2.7	3.2	-	-	2.4	-	2.5	2.7	-	-	2.5	2.6	2.8	2.7	2.8	2.8	2.9	N/A	2
Bankfull Cross Sectional Area (ft^2)	-	-	-	-	45.1	-	48.6	59.3	-	-	50.8	-	61.6	72.4	-	-	40.6	44.1	47.6	41.4	42.7	42.7	43.9	N/A	2
Width/Depth Ratio	-				10.3	-	13.6	14.9	-	-	14.5	-	15.0	15.6	-	-	12.5	12.3	12.1	12.6	13.8	13.8	14.9	N/A	2
Entrenchment Ratio	-				8.3	-	8.6	8.3	-	-	2.7	-	2.7	2.7	-	-	4.4	6.5	8.3	>3.9	>4.2	>4.2	>4.4	N/A	2
Bank Height Ratio	-				1.3	-	1.3	1.4	-	-	1.0	-	1.0	1.1	-	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	N/A	2
Profile																									
Riffle Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37.17	58.9	-	98.4	-	8
Riffle Slope (ft/ft)					0.010	-	0.024	0.055	-	-	0.019	-	0.020	0.021	-	-	0.007	0.010	0.013	0.002	0.010	-	0.018	-	8
Pool Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	73.3	121	-	200.1	-	13
Pool Max depth (ft)					4.0	-	4.3	4.7	-	-	3.4	-	3.5	3.5	-	-	4.0	4.0	4.0	2.5	3.2	-	4.1	-	13
Pool Spacing (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	73.3	120.9	-	200.1	-	12
Pattern																									
Channel Beltwidth (ft)					44.0	-	65.0	117.0	-	-	86.0	-	86.0	86.0	-	-	48.0	88.0	126.0	63.0	96.5	101.0	121.0	24.9	4
Radius of Curvature (ft)					20.0	-	29.0	52.0	-	-	19.6	-	22.7	25.8	-	-	67.0	73.0	101.0	70.0	76.5	75.0	86.0	6.8	4
Rc:Bankfull width (ft/ft)					0.9	-	1.1	1.8	-	-	0.7	-	0.8	0.9	-	-	3.0	3.1	4.2	2.9	3.2	3.1	3.6	N/A	N/A
Meander Wavelength (ft)					133.0	-	297.0	479.0	-	-	81.0	-	81.0	81.0	-	-	133.0	311.0	325.0	165.0	263.7	306.0	320.0	85.7	3
Meander Width Ratio					2.0	-	2.5	3.9	-	-	3.2	-	3.2	3.2	-	-	2.1	3.8	5.3	2.6	4.0	4.2	5.0	N/A	N/A
Substrate, Bed, and Transport parameters																									
Ri% / Ru% / P% / G% / S%					-												-			-					
SC% / Sa% / G% / C% / B% / Be%					-												-			0%,3.5%,96%,0.5%,0%,0%					
d16 / d35 / d50 / d84 / d95 (mm)					-												-			14, 19, 23, 41, 56					
Reach Shear Stress (competency) lb/f^2					-												-			-					
Max part size (mm) mobilized at bankfull					-												-			-					
Stream Power (transport capacity) W/m^2					-												-			-					
Additional Reach Parameters																									
Rosgen Classification	-				C4						C4						C4			C4					
Bankfull Velocity (fps)	-	-	-	-	-												-			-					
Bankfull Discharge (cfs)	-	-	-	-	-																				
Valley length (ft)					2,525						4,730									1,294					
Channel Thalweg length (ft)					2,762						327						2,897			1,532					
Sinuosity (ft)					1.12						1.26						1.15			1.18					
Water Surface Slope (Channel) (ft/ft)	-				0.0064						0.0127						0.0071			0.0063					
BF slope (ft/ft)	-				0.0071						0.0101						0.0062			0.0067					
Bankfull Floodplain Area (acres)					-						-						-			-					
% of Reach with Eroding Banks					-						-														
Channel Stability or Habitat Metric					-						-														
Biological or Other					-						-														

N/A - Not Applicable

- Information Unavailable

Table 6b. Baseline Stream Data Summary

Hogan Creek/94708 - Reach 2 (1,085feet)

Parameter	Gauge	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	-	-	-	-	21.5	-	25.7	29.7	-	-	27.2	-	30.4	33.6	-	-	22.5	23.3	24.0	24.2	24.5	24.5	24.7	N/A	2
Floodprone Width (ft)					178.0	-	220.0	246.0	-	-	72.1	-	72.3	72.5	-	-	100.0	150.0	200.0	>100	>100	>100	>100	N/A	2
Bankfull Mean Depth (ft)	-	-	-	-	2.0	-	1.9	2.1	-	-	1.9	-	2.0	2.2	-	-	1.8	1.9	2.2	1.9	2.1	2.1	2.3	N/A	2
Bankfull Max Depth (ft)	-				2.5	-	2.7	3.2	-	-	2.4	-	2.5	2.7	-	-	2.5	2.6	2.8	3.2	3.4	3.4	3.6	N/A	2
Bankfull Cross Sectional Area (ft^2)	-	-	-	-	45.1	-	48.6	59.3	-	-	50.8	-	61.6	72.4	-	-	40.6	44.1	47.6	45.2	50.9	50.9	56.6	N/A	2
Width/Depth Ratio	-				10.3	-	13.6	14.9	-	-	14.5	-	15.0	15.6	-	-	12.5	12.3	12.1	10.8	11.9	11.9	13.0	N/A	2
Entrenchment Ratio	-				8.3	-	8.6	8.3	-	-	2.7	-	2.7	2.7	-	-	4.4	6.5	8.3	>4.0	>4.1	>4.1	>4.1	N/A	2
Bank Height Ratio	-				1.3	-	1.3	1.4	-	-	1.0	-	1.0	1.1	-	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	N/A	2
Profile																									
Riffle Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	95.63	111.6	-	130.3	-	5
Riffle Slope (ft/ft)					0.010	-	0.024	0.055	-	-	0.019	-	0.020	0.021	-	-	0.007	0.010	0.013	0.004	0.005	-	0.007	-	5
Pool Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43.7	68.8	-	117.1	-	5
Pool Max depth (ft)					4.0	-	4.3	4.7	-	-	3.4	-	3.5	3.5	-	-	4.0	4.0	4.0	3.80	4.73	-	5.8	-	5
Pool Spacing (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	164.1	208.4	-	253.1	-	4
Pattern																									
Channel Beltwidth (ft)					44.0	-	65.0	117.0	-	-	86.0	-	86.0	86.0	-	-	48.0	88.0	126.0	84.0	114.0	117.0	141.0	28.6	3
Radius of Curvature (ft)					20.0	-	29.0	52.0	-	-	19.6	-	22.7	25.8	-	-	67.0	73.0	101.0	69.0	73.3	74.0	75.0	2.8	5
Rc:Bankfull width (ft/ft)					0.9	-	1.1	1.8	-	-	0.7	-	0.8	0.9	-	-	3.0	3.1	4.2	2.8	3.0	3.0	3.1	N/A	N/A
Meander Wavelength (ft)					133.0	-	297.0	479.0	-	-	81.0	-	81.0	81.0	-	-	133.0	311.0	325.0	292.0	307.0	301.0	328.0	18.7	3
Meander Width Ratio					2.0	-	2.5	3.9	-	-	3.2	-	3.2	3.2	-	-	2.1	3.8	5.3	3.4	4.7	4.8	5.8	N/A	N/A
Substrate, Bed, and Transport parameters																									
Ri% / Ru% / P% / G% / S%					-												-			-					
SC% / Sa% / G% / C% / B% / Be%					-												-			0%,3%,9%,89%, 0%, 0%					
d16 / d35 / d50 / d84 / d95 (mm)					-												-			13, 24, 22, 35, 49					
Reach Shear Stress (competency) lb/f^2					-												-			-					
Max part size (mm) mobilized at bankfull					-												-			-					
Stream Power (transport capacity) W/m^2					-												-			-					
Additional Reach Parameters																									
Rosgen Classification	-				C4						C4						C4			C4					
Bankfull Velocity (fps)	-	-	-	-	-												-			-					
Bankfull Discharge (cfs)	-	-	-	-	-																				
Valley length (ft)					2,525						4,730									794					
Channel Thalweg length (ft)					2,762						327						2,897			1,085					
Sinuosity (ft)					1.12						1.26						1.15			1.37					
Water Surface Slope (Channel) (ft/ft)	-				0.0064						0.0127						0.0071			0.0050					
BF slope (ft/ft)	-				0.0071						0.0101						0.0062			0.0053					
Bankfull Floodplain Area (acres)					-						-						-			-					
% of Reach with Eroding Banks					-						-														
Channel Stability or Habitat Metric					-						-														
Biological or Other					-						-														

N/A - Not Applicable

- Information Unavailable

Table 6c. Baseline Stream Data Summary

Hogan Creek/94708 - UT2 (675 feet)

Parameter	Gauge	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	-	-	-	-	-	-	8.2	-	-	-	-	-	7.1	-	-	-	-	9.0	-	6.5	7.1	7.1	7.6	N/A	2
Floodprone Width (ft)					-	-	66.0	-	-	-	-	-	15.0	-	-	-	-	30.0	-	21	24.9	24.9	28.8	N/A	2
Bankfull Mean Depth (ft)	-	-	-	-	-	-	1.5	-	-	-	-	-	0.9	-	-	-	-	0.7	-	0.5	0.6	0.6	0.7	N/A	2
Bankfull Max Depth (ft)	-				-	-	2.1	-	-	-	-	-	1.2	-	-	-	-	1.0	-	0.9	1.1	1.1	1.2	N/A	2
Bankfull Cross Sectional Area (ft^2)	-	-	-	-	-	-	12.1	-	-	-	-	-	6.6	-	-	-	-	6.5	-	4.0	4.4	4.4	4.7	N/A	2
Width/Depth Ratio	-				-	-	5.6	-	-	-	-	-	7.6	-	-	-	-	12.5	-	8.9	11.6	11.6	14.2	N/A	2
Entrenchment Ratio	-				-	-	8.0	-	-	-	-	-	2.1	-	-	-	-	3.3	-	3.2	3.5	3.5	3.8	N/A	2
Bank Height Ratio	-				-	-	1.6	-	-	-	-	-	1.0	-	-	-	-	1.0	-	1.0	1.0	1.0	1.0	N/A	2
Profile																									
Riffle Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.3	34.4	-	67.3	-	11
Riffle Slope (ft/ft)					0.030	-	0.033	0.056	-	-	0.023	-	0.033	0.036	-	-	0.027	0.032	0.038	0.014	0.028	-	0.052	-	11
Pool Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.2	11.0	-	27.1	-	12
Pool Max depth (ft)					-	-	2.7	-	-	-	-	-	1.5	-	-	-	-	1.6	-	1.2	2.0	-	3.2	-	12
Pool Spacing (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.1	54.8	-	151.0	-	11
Pattern																									
Channel Beltwidth (ft)					28.0	-	42.0	56.0	-	-	62.0	-	67.5	73.0	-	-	17.0	26.0	49.0	26.0	38.0	39.0	54.0	2.7	5
Radius of Curvature (ft)					16.0	-	18.5	21.0	-	-	7.0	-	16.0	25.0	-	-	22.0	27.0	30.0	19.0	21.6	22.0	26.0	2.4	6
Rc:Bankfull width (ft/ft)					2.0	-	2.3	2.6	-	-	1.0	-	2.3	3.5	-	-	2.4	3.0	3.3	2.7	3.0	3.1	3.7	N/A	N/A
Meander Wavelength (ft)					128.0	-	159.0	190.0	-	-	53.0	-	58.5	64.0	-	-	73.0	103.0	130.0	101.0	112.3	109.5	132.0	2.7	6
Meander Width Ratio					3.4	-	5.1	6.8	-	-	8.7	-	9.5	10.3	-	-	1.9	2.9	5.5	3.7	5.4	5.5	7.6	N/A	N/A
Substrate, Bed, and Transport parameters																									
Ri% / Ru% / P% / G% / S%					-												-			-					
SC% / Sa% / G% / C% / B% / Be%					-												-			N/A					
d16 / d35 / d50 / d84 / d95 (mm)					-												-			N/A					
Reach Shear Stress (competency) lb/f^2					-												-			-					
Max part size (mm) mobilized at bankfull					-												-			-					
Stream Power (transport capacity) W/m^2					-												-			-					
Additional Reach Parameters																									
Rosgen Classification	-				E4b						E4b						B4			B4					
Bankfull Velocity (fps)	-	-	-	-	-												-			-					
Bankfull Discharge (cfs)	-	-	-	-	-																				
Valley length (ft)					641						1,350									544					
Channel Thalweg length (ft)					568						1,980						555			675					
Sinuosity (ft)					1.33						1.47						1.4			1.24					
Water Surface Slope (Channel) (ft/ft)	-				0.0235						0.0263						0.0223			0.0218					
BF slope (ft/ft)	-				0.0312						0.0356						0.0312			0.0229					
Bankfull Floodplain Area (acres)					-						-						-			-					
% of Reach with Eroding Banks					-						-														
Channel Stability or Habitat Metric					-						-														
Biological or Other					-						-														

N/A - Not Applicable

- Information Unavailable

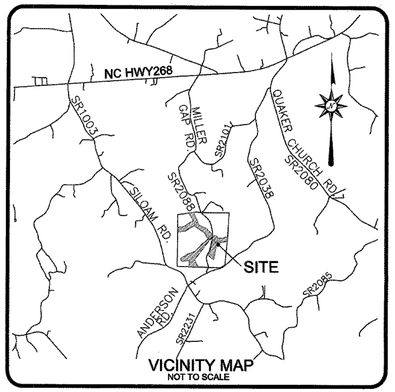
Table 7. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)																		
Hogan Creek /94708 Segment/Reach: Hogan Reach 1 (1,532 feet)																		
	Cross Section 1 (Riffle)						**Cross Section 2 (Pool)**						**Cross Section 3 (Riffle)**					
Based on fixed baseline bankfull elevation	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record elevation (datum) used	990.8						990.7						987.6					
Bankfull Width (ft)	25.6						29.1						22.8					
Floodprone Width (ft)	>100						N/A						>100					
Bankfull Mean Depth (ft)	1.7						2.0						1.8					
Bankfull Max Depth (ft)	2.9						4.5						2.7					
Bankfull Cross Sectional Area (ft^2)	43.9						57.6						41.4					
Bankfull Width/Depth Ratio	14.9						14.7						12.6					
Bankfull Entrenchment Ratio	>3.9						N/A						>4.4					
Bankfull Bank Height Ratio	1.0						1.0						1.0					
d50 (mm)	19						N/A						26					
Hogan Creek /94708 Segment/Reach: Hogan Reach 2 (1,085 feet)																		
	Cross Section 4 (Pool)						**Cross Section 5 (Riffle)**						**Cross Section 6 (Riffle)**					
Based on fixed baseline bankfull elevation	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record elevation (datum) used	984.0						983.6						982.1					
Bankfull Width (ft)	44.6						24.2						24.7					
Floodprone Width (ft)	N/A						>100						>100					
Bankfull Mean Depth (ft)	2.2						1.9						2.3					
Bankfull Max Depth (ft)	4.2						3.2						3.6					
Bankfull Cross Sectional Area (ft^2)	98.9						45.2						56.6					
Bankfull Width/Depth Ratio	20.1						13						10.8					
Bankfull Entrenchment Ratio	N/A						>4.1						>8.1					
Bankfull Bank Height Ratio	1.0						1.0						1.0					
d50 (mm)	N/A						27						31					
Hogan Creek /94708 Segment/Reach: UT2 (675 feet)																		
	Cross Section 7 (Riffle)						**Cross Section 8 (Pool)**						**Cross Section 9 (Riffle)**					
Based on fixed baseline bankfull elevation	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record elevation (datum) used	989.4						988.2						986.4					
Bankfull Width (ft)	7.6						6.9						6.5					
Floodprone Width (ft)	28.8						N/A						21.0					
Bankfull Mean Depth (ft)	0.5						0.6						0.7					
Bankfull Max Depth (ft)	0.9						1						1.2					
Bankfull Cross Sectional Area (ft^2)	4.0						4.4						4.7					
Bankfull Width/Depth Ratio	14.2						10.7						8.9					
Bankfull Entrenchment Ratio	3.8						N/A						3.2					
Bankfull Bank Height Ratio	1.0						1						1.0					
d50 (mm)	N/A						N/A						N/A					

N/A - Not Applicable

Appendix E

As-Built Plan Sheet

AS-BUILT SURVEY OF
HOGAN CREEK RESTORATION PROJECT
SURRY COUNTY, NC
SCO PROJECT #090856601
EEP PROJECT ID #94708



VICINITY MAP
NOT TO SCALE

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 28th DAY OF JANUARY, 2015.

David S. Turner

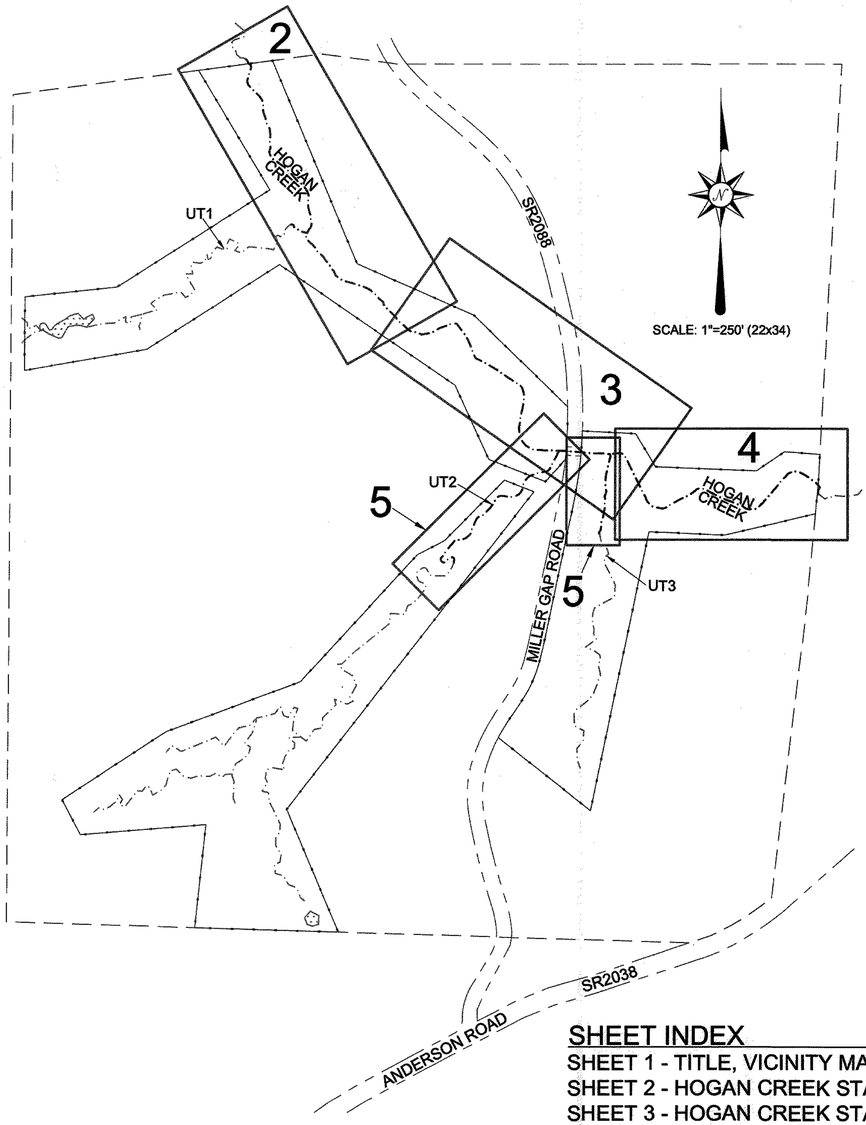
DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

GENERAL NOTES:
1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. THE VERTICAL DATUM IS NAVD88.
3. THE BASIS OF BEARINGS IS NCGS STATE PLANE GRID COORDINATES NAD83 DATUM.
4. CONTROL IS BASED ON EXISTING CONTROL DATA AS SHOWN ON SHEET P8 OF 30 IN THE DESIGN PLANS AND RECOVERED DURING THE CONSTRUCTION & AS-BUILT SURVEYS. ADDITIONAL CONTROL WAS ESTABLISHED USING TOTAL STATION & GPS/RTK METHODS AND CONFIRMED DURING AS-BUILT SURVEY. AS-BUILT CONTROL POINTS ARE LISTED ON SHEET 1.
5. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
6. THE SOLE PURPOSE OF THIS SURVEY IS TO SHOW THE CONSTRUCTED STREAM AND GRADING RELATED TO THE HOGAN CREEK STREAM RESTORATION PROJECT.
7. INFORMATION SHOWN OUTSIDE THE LIMITS OF AS-BUILT SURVEY WAS TAKEN FROM THE EXISTING CONDITIONS & DESIGN DATA PROVIDED BY THE DESIGNER AND WAS NOT VERIFIED BY TURNER LAND SURVEYING, PLLC.
8. REFER TO NCEEP HOGAN CREEK STREAM MITIGATION DOCUMENTS AND PLANS FOR BOUNDARY & OWNER INFORMATION.

AS-BUILT SURVEY CONTROL POINTS:

PT#	Northing(Y)	Easting(X)	Elev(Z)	Description
4	941264.42	1527067.66	998.41	EX. CONTROL#4 NAIL
11	940165.20	1527985.18	994.83	EX. CONTROL#11 PK NAIL
17	940075.78	1528150.46	985.34	EX. CONTROL#17 NAIL
24	941025.46	1527131.51	996.11	TLS#24 NAIL
25	940896.91	1527175.55	995.76	TLS#25 NAIL
26	940679.88	1527421.09	993.54	TLS#26 NAIL
27	940428.02	1527814.04	989.49	TLS#27 NAIL
29	940188.82	1527982.11	993.96	TLS#29 NAIL
30	940421.42	1527884.16	989.31	TLS#30 REBAR W/CAP
32	939853.05	1527609.65	998.41	TLS#32 NAIL



REFERENCES:

OWNER:
NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM
217 WEST JONES ST., SUITE 3000A
RALEIGH, NC 27803
(919)707-8976
EEP PROJ. MANAGER: JULIE CAHILL

CONTRACTOR:
CAROLINA ENVIRONMENTAL CONTRACTING, INC.
MOUNT AIRY, NC
(336)320-3849

DESIGNER:
CONFLUENCE ENGINEERING, PC
ASHEVILLE, NC
(828)255-5530

SHEET INDEX

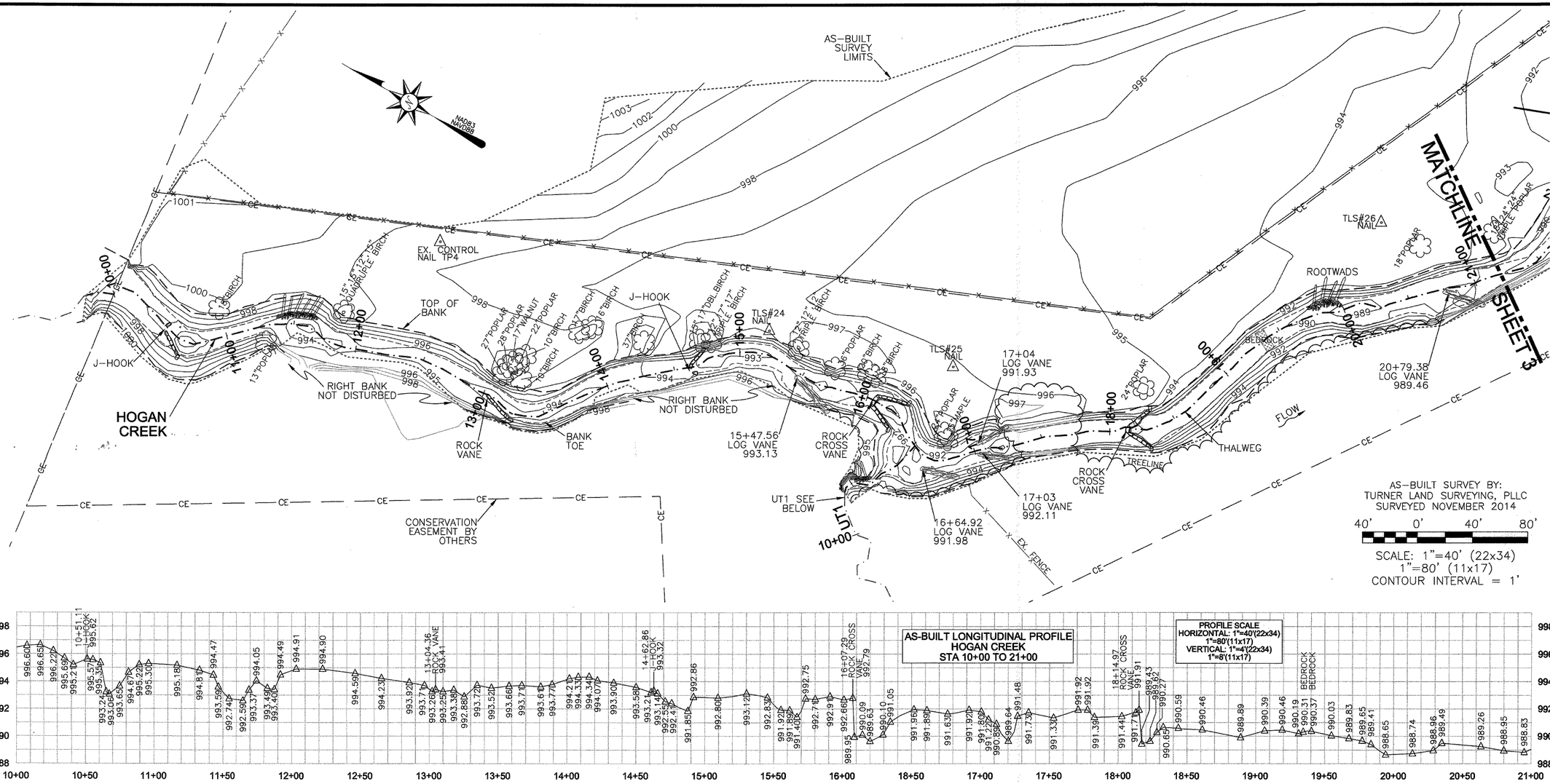
REVISIONS, DATE AND INITIAL:

TURNER LAND SURVEYING, PLLC
3719 Benson Drive, Raleigh, NC 27609 – (919)827-0745
P-0702 – info@turnerlandsurveying.com
www.TURNERLANDSURVEYING.com

TITLE, VICINITY MAP, & SHEET INDEX

HOGAN CREEK RESTORATION PROJECT
SCO PROJECT #090856601
EEP PROJECT ID #94708
SILOAM — SURRY COUNTY — NORTH CAROLINA

DATE: 12/15/2014
SURVEYED BY: DST
DRAWN BY: DST/EGT
REVIEWED BY: DST/EGT
PROJECT: TLS-14-018
FILE: HOGAN CREEK_94708_AB_TLS_F.dwg
SCALE: AS SHOWN



I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 28th DAY OF JANUARY, 2015.

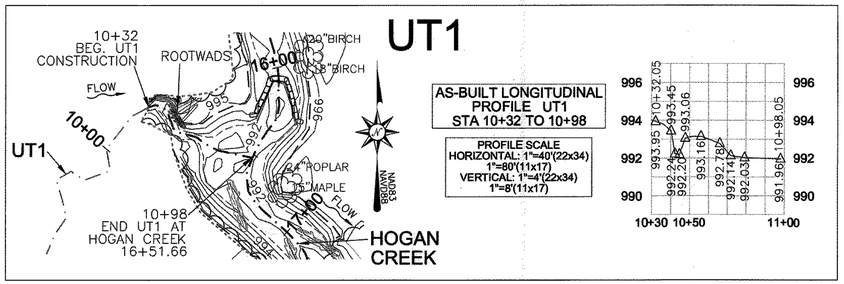
David S. Turner

DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER 01-28-15

GENERAL NOTES:

1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. THE VERTICAL DATUM IS NAVD88.
3. THE BASIS OF BEARINGS IS NCGS STATE PLANE GRID COORDINATES NAD83 DATUM.
4. CONTROL IS BASED ON EXISTING CONTROL DATA AS SHOWN ON SHEET P8 OF 30 IN THE DESIGN PLANS AND RECOVERED DURING THE CONSTRUCTION & AS-BUILT SURVEYS. ADDITIONAL CONTROL WAS ESTABLISHED USING TOTAL STATION & GPS/RTK METHODS AND CONFIRMED DURING AS-BUILT SURVEY. AS-BUILT CONTROL POINTS ARE LISTED ON SHEET 1.
5. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
6. THE SOLE PURPOSE OF THIS SURVEY IS TO SHOW THE CONSTRUCTED STREAM AND GRADING RELATED TO THE HOGAN CREEK STREAM RESTORATION PROJECT.
7. INFORMATION SHOWN OUTSIDE THE LIMITS OF AS-BUILT SURVEY WAS TAKEN FROM THE EXISTING CONDITIONS & DESIGN DATA PROVIDED BY THE DESIGNER AND WAS NOT VERIFIED BY TURNER LAND SURVEYING, PLLC.
8. REFER TO NCEEP HOGAN CREEK STREAM MITIGATION DOCUMENTS AND PLANS FOR BOUNDARY & OWNER INFORMATION.



LEGEND:

- THALWEG
- TOP OF BANK
- BANK TOE
- CE — CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- FENCE
- EX. FENCE
- GEOLIFT
- BRUSH MATTRESS
- CONSTRUCTED RIFFLE
- BEDROCK
- RIP RAP
- ROOTWAD CLUSTER
- CONTROL POINT
- ROCK STEP STRUCTURE
- ROCK J-HOOK
- ROCK VANE
- ROCK CROSS VANE
- LOG VANE OR SILL

REVISIONS, DATE AND INITIAL:

TURNER LAND SURVEYING, PLLC
3719 Benson Drive, Raleigh, NC 27609 – (919)827-0745
P-0702 – info@turnerlandsurveying.com
www.TURNERLANDSURVEYING.com

HOGAN CREEK STA. 10+00 TO 21+00 AND UT1

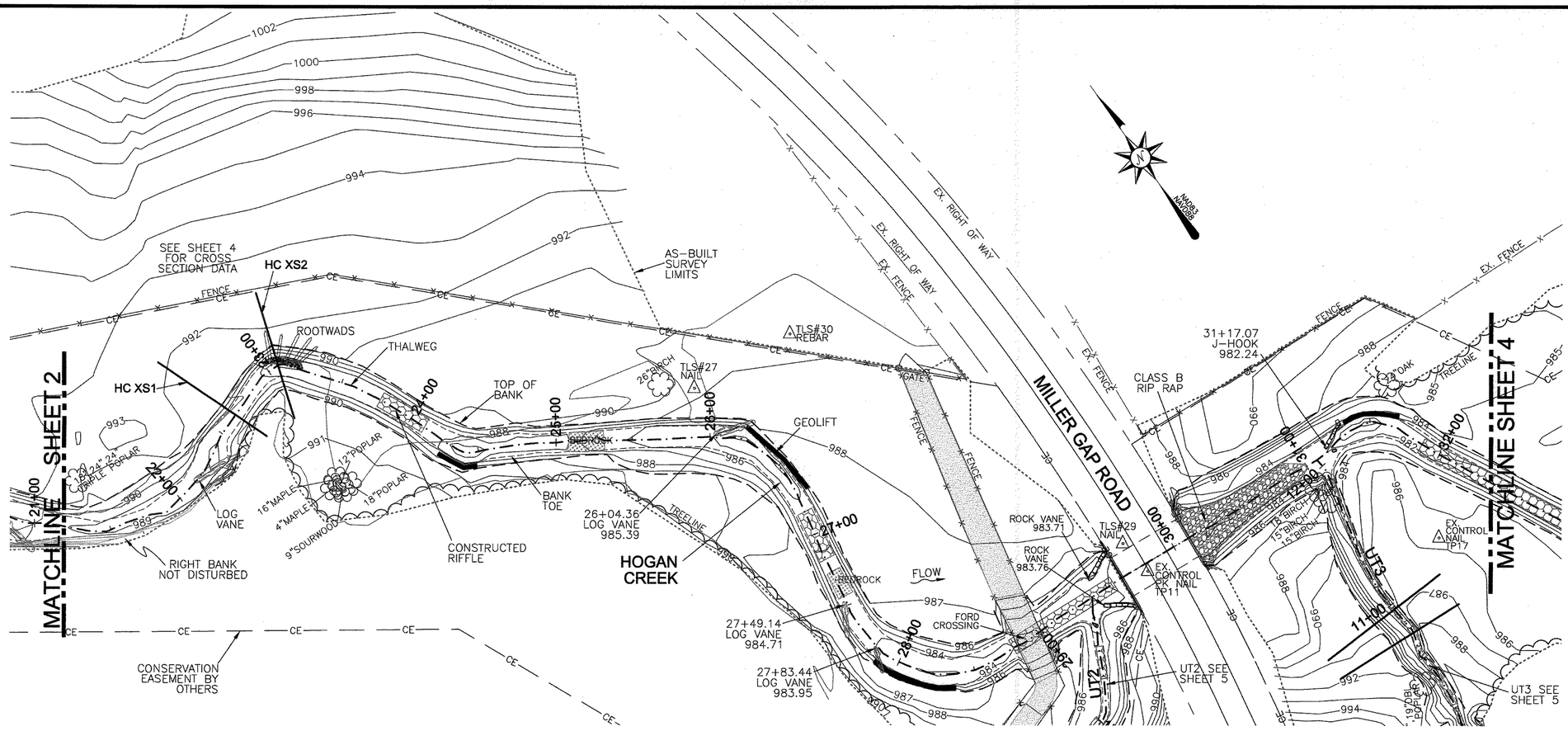
HOGAN CREEK RESTORATION PROJECT

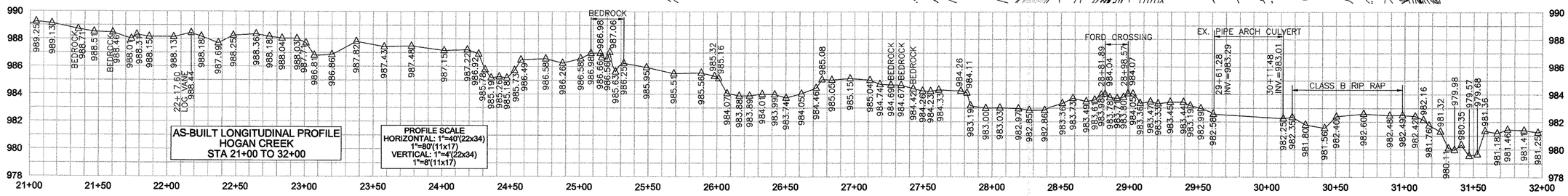
SCO PROJECT #09085660 1
EEP PROJECT ID #94708

NORTH CAROLINA
SURRY COUNTY
SILOAM

DATE: 12/15/2014
SURVEYED BY: DST
DRAWN BY: DST/EGT
REVIEWED BY: DST/EGT
PROJECT: TLS-14-018
FILE: HOGAN CREEK_94708_AB_TLS_F.dwg
SCALE: AS SHOWN

SHEET 2 of 7





I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 28th DAY OF JANUARY, 2015.

David S. Turner

DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL 01-28-15 SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

GENERAL NOTES:

1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. THE VERTICAL DATUM IS NAVD88.
3. THE BASIS OF BEARINGS IS NCGS STATE PLANE GRID COORDINATES NAD83 DATUM.
4. CONTROL IS BASED ON EXISTING CONTROL DATA AS SHOWN ON SHEET P8 OF 30 IN THE DESIGN PLANS AND RECOVERED DURING THE CONSTRUCTION & AS-BUILT SURVEYS. ADDITIONAL CONTROL WAS ESTABLISHED USING TOTAL STATION & GPS/RTK METHODS AND CONFIRMED DURING AS-BUILT SURVEY. AS-BUILT CONTROL POINTS ARE LISTED ON SHEET 1.
5. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
6. THE SOLE PURPOSE OF THIS SURVEY IS TO SHOW THE CONSTRUCTED STREAM AND GRADING RELATED TO THE HOGAN CREEK STREAM RESTORATION PROJECT.
7. INFORMATION SHOWN OUTSIDE THE LIMITS OF AS-BUILT SURVEY WAS TAKEN FROM THE EXISTING CONDITIONS & DESIGN DATA PROVIDED BY THE DESIGNER AND WAS NOT VERIFIED BY TURNER LAND SURVEYING, PLLC.
8. REFER TO NCEEP HOGAN CREEK STREAM MITIGATION DOCUMENTS AND PLANS FOR BOUNDARY & OWNER INFORMATION.

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED NOVEMBER 2014

40' 0' 40' 80'

SCALE: 1"=40' (22x34)
1"=80' (11x17)
CONTOUR INTERVAL = 1'

LEGEND:
- THALWEG
- TOP OF BANK
- BANK TOE
- CE — CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- FENCE
- EX. FENCE
- GEOLIFT
- BRUSH MATTRESS
- CONSTRUCTED RIFFLE
- BEDROCK
- RIP RAP
- ROOTWAD CLUSTER
- ROCK STEP STRUCTURE
- ROCK J-HOOK
- ROCK VANE
- ROCK CROSS VANE
- LOG VANE OR SILL
- CONTROL POINT

TURNER LAND SURVEYING, PLLC
3719 Benson Drive, Raleigh, NC 27609 – (919)827-0745
P-0702 – info@turnerlandsurveying.com
www.TURNERLANDSURVEYING.com

REVISIONS, DATE AND INITIAL:

HOGAN CREEK STATION 21+00 TO 32+00
HOGAN CREEK RESTORATION PROJECT

SCO PROJECT #09085660I
EEP PROJECT ID #94708

SURRY COUNTY NORTH CAROLINA

SILOAM

DATE:	12/15/2014
SURVEYED BY:	DST
DRAWN BY:	DST/EGT
REVIEWED BY:	DST/EGT
PROJECT:	TLS-14-018
FILE:	HOGAN CREEK_94708_AB_TLS_F.dwg
SCALE:	AS SHOWN
SHEET	3 of 7

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 28th DAY OF JANUARY, 2015.

David S. Turner

DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

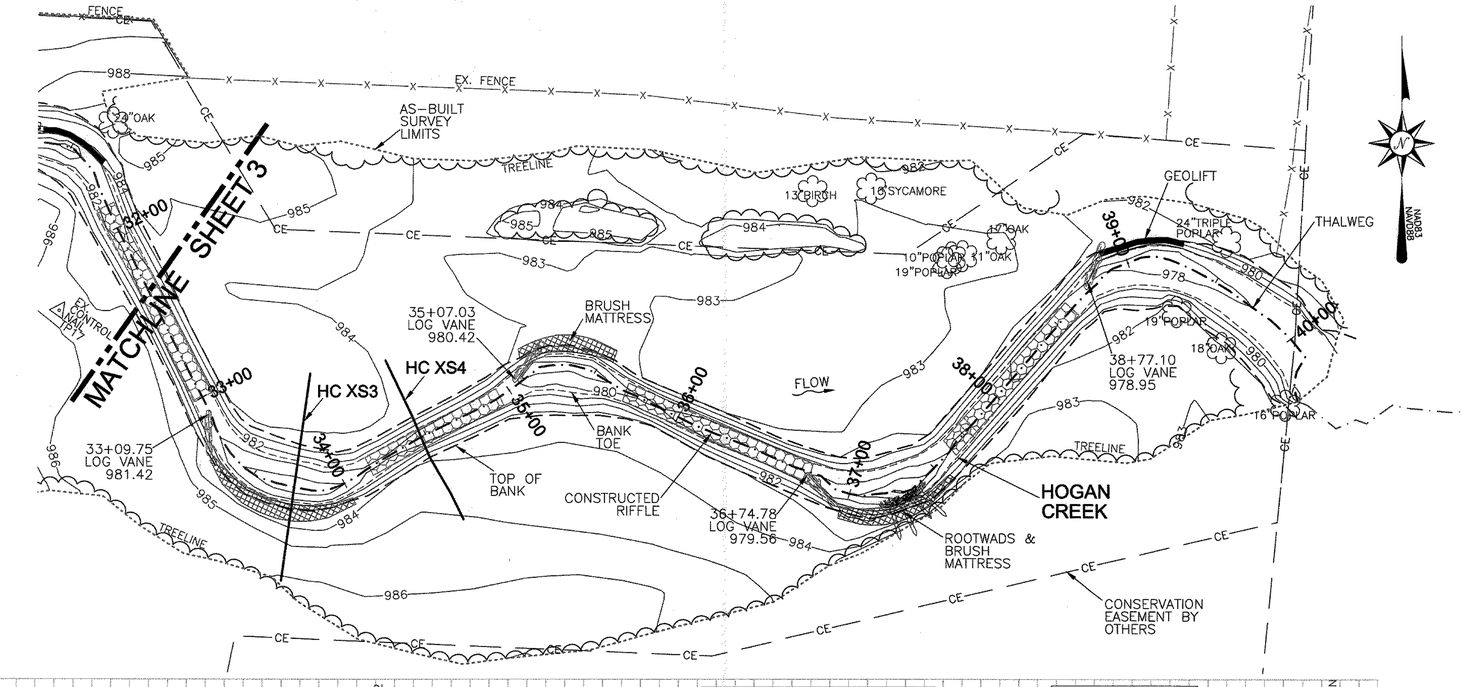
GENERAL NOTES:
1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. THE VERTICAL DATUM IS NAVD88.
3. THE BASIS OF BEARINGS IS NCGS STATE PLANE GRID COORDINATES NAD83 DATUM.
4. CONTROL IS BASED ON EXISTING CONTROL DATA AS SHOWN ON SHEET P8 OF 30 IN THE DESIGN PLANS AND RECOVERED DURING THE CONSTRUCTION & AS-BUILT SURVEYS. ADDITIONAL CONTROL WAS ESTABLISHED USING TOTAL STATION & GPS/RTK METHODS AND CONFIRMED DURING AS-BUILT SURVEY. AS-BUILT CONTROL POINTS ARE LISTED ON SHEET 1.
5. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
6. THE SOLE PURPOSE OF THIS SURVEY IS TO SHOW THE CONSTRUCTED STREAM AND GRADING RELATED TO THE HOGAN CREEK STREAM RESTORATION PROJECT.
7. INFORMATION SHOWN OUTSIDE THE LIMITS OF AS-BUILT SURVEY WAS TAKEN FROM THE EXISTING CONDITIONS & DESIGN DATA PROVIDED BY THE DESIGNER AND WAS NOT VERIFIED BY TURNER LAND SURVEYING, PLLC.
8. REFER TO NCEEP HOGAN CREEK STREAM MITIGATION DOCUMENTS AND PLANS FOR BOUNDARY & OWNER INFORMATION.

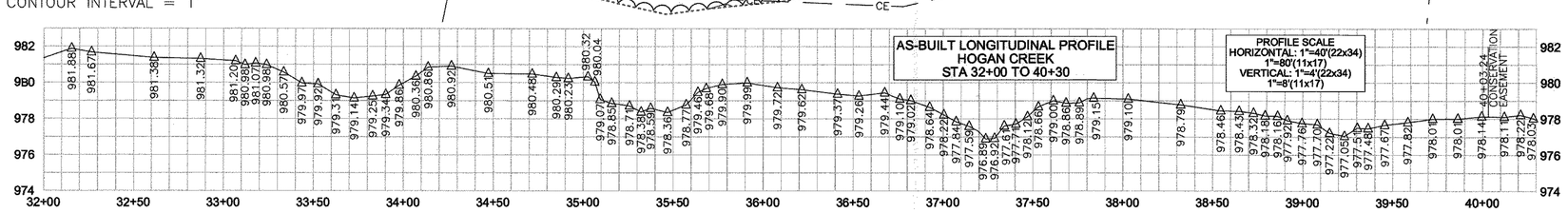
LEGEND:
- THALWEG
- TOP OF BANK
- BANK TOE
- CE — CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- FENCE
- EX. FENCE
- GEOLIFT
- BRUSH MATTRESS
- CONSTRUCTED RIFFLE
- BEDROCK
- RIP RAP
- ROOTWAD CLUSTER
- ROCK STEP STRUCTURE
- ROCK J-HOOK
- ROCK VANE
- ROCK CROSS VANE
- LOG VANE OR SILL
- CONTROL POINT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED NOVEMBER 2014

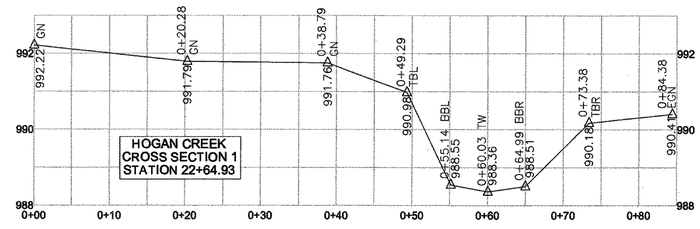
40' 0' 40' 80'

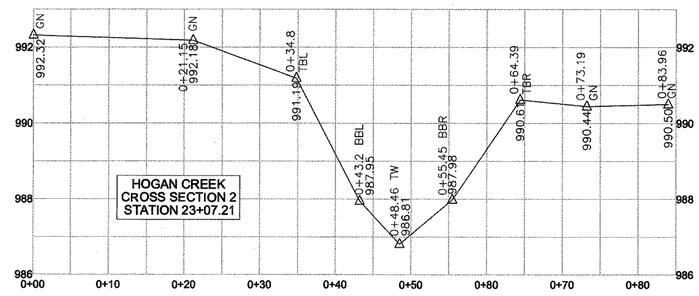
SCALE: 1"=40' (22x34)
1"=80' (11x17)
CONTOUR INTERVAL = 1'

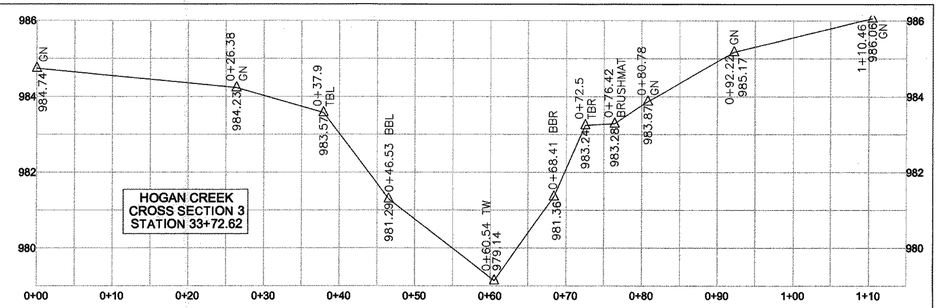


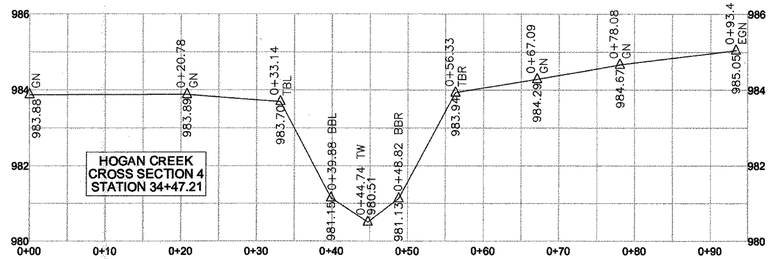


CROSS SECTION SCALE
HORIZONTAL: 1"=10'(22x34)
1"=20'(11x17)
VERTICAL: 1"=2'(22x34)
1"=4'(11x17)
TBL–LEFT TOP OF BANK
TBR–RIGHT TOP OF BANK
BBL–LEFT BANK TOE
BBR–RIGHT BANK TOE
TW–THALWEG
GN–GROUND
EGN–EXISTING GROUND









REVISIONS, DATE AND INITIAL:

TURNER LAND SURVEYING, PLLC
3719 Benson Drive, Raleigh, NC 27609 – (919)827-0745
P-0702 – info@turnerlandsurveying.com
www.TURNERLANDSURVEYING.com

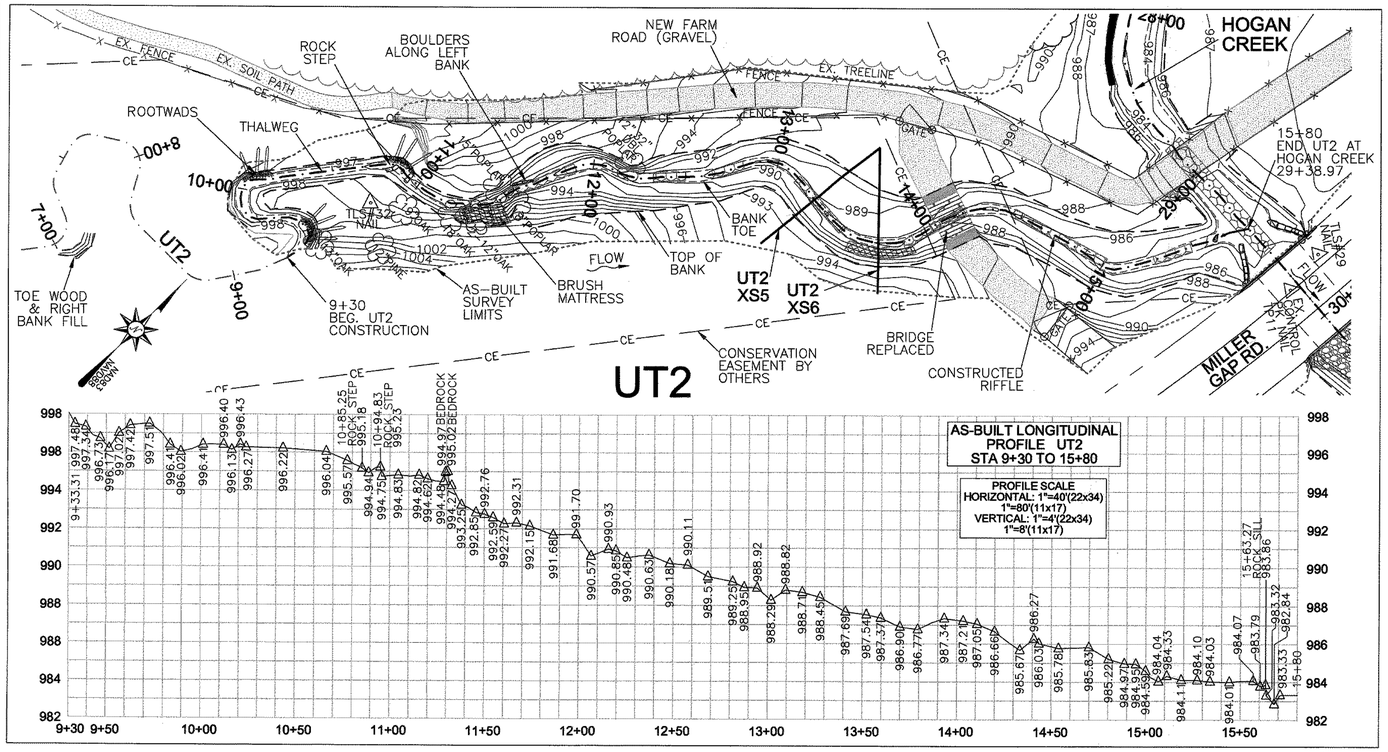
HOGAN CREEK STA. 32+00 TO 40+30 & CROSS SECTIONS 1-4

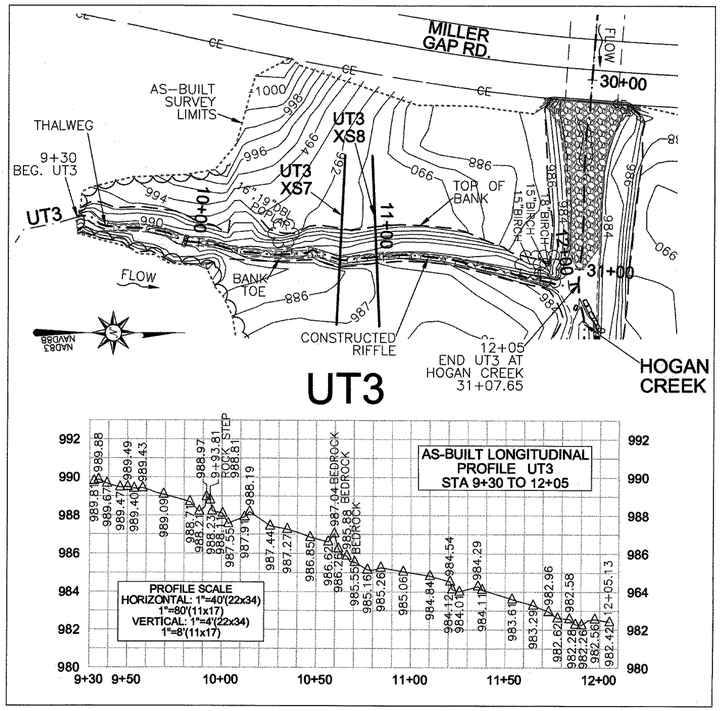
HOGAN CREEK RESTORATION PROJECT

SCO PROJECT #09085601
EEP PROJECT ID #94708

NORTH CAROLINA
SURRY COUNTY
SILOAM

DATE: 12/15/2014
SURVEYED BY: DST
DRAWN BY: DST/EGT
REVIEWED BY: DST/EGT
PROJECT: TLS-14-018
FILE: HOGAN CREEK_94708_AB_TLS_F.dwg
SCALE: AS SHOWN





AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED NOVEMBER 2014

40' 0' 40' 80'

SCALE: 1"=40' (22x34)
1"=80' (11x17)
CONTOUR INTERVAL = 1'

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 28th DAY OF JANUARY, 2015.

DAVID S. TURNER, P.L.S. #L-4551

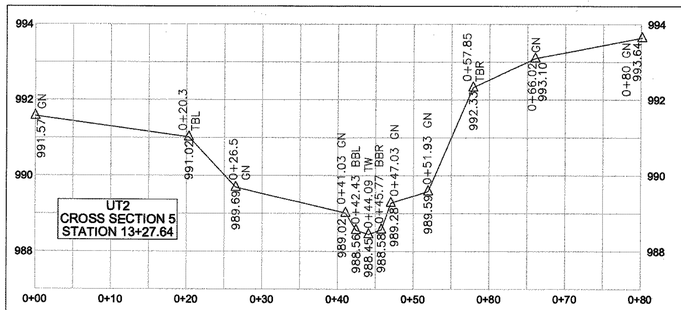
NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

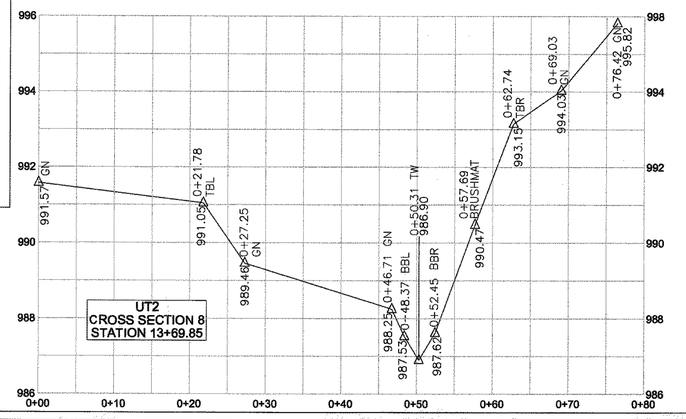
LEGEND:
- THALWEG
- TOP OF BANK
- BANK TOE
- CE — CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- FENCE
- EX. FENCE
- BRUSH MATTRESS
- ROCK STEP STRUCTURE
- CONSTRUCTED RIFFLE
- BEDROCK
- RIP RAP
- ROOTWAD CLUSTER
- CONTROL POINT

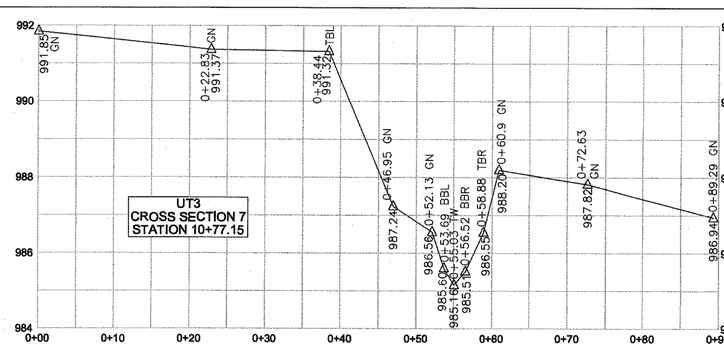
GENERAL NOTES:
1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. THE VERTICAL DATUM IS NAVD88.
3. THE BASIS OF BEARINGS IS NCGS STATE PLANE GRID COORDINATES NAD83 DATUM.
4. CONTROL IS BASED ON EXISTING CONTROL DATA AS SHOWN ON SHEET P8 OF 30 IN THE DESIGN PLANS AND RECOVERED DURING THE CONSTRUCTION & AS-BUILT SURVEYS. ADDITIONAL CONTROL WAS ESTABLISHED USING TOTAL STATION & GPS/RTK METHODS AND CONFIRMED DURING AS-BUILT SURVEY. AS-BUILT CONTROL POINTS ARE LISTED ON SHEET 1.
5. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
6. THE SOLE PURPOSE OF THIS SURVEY IS TO SHOW THE CONSTRUCTED STREAM AND GRADING RELATED TO THE HOGAN CREEK STREAM RESTORATION PROJECT.
7. INFORMATION SHOWN OUTSIDE THE LIMITS OF AS-BUILT SURVEY WAS TAKEN FROM THE EXISTING CONDITIONS & DESIGN DATA PROVIDED BY THE DESIGNER AND WAS NOT VERIFIED BY TURNER LAND SURVEYING, PLLC.
8. REFER TO NCEEP HOGAN CREEK STREAM MITIGATION DOCUMENTS AND PLANS FOR BOUNDARY & OWNER INFORMATION.

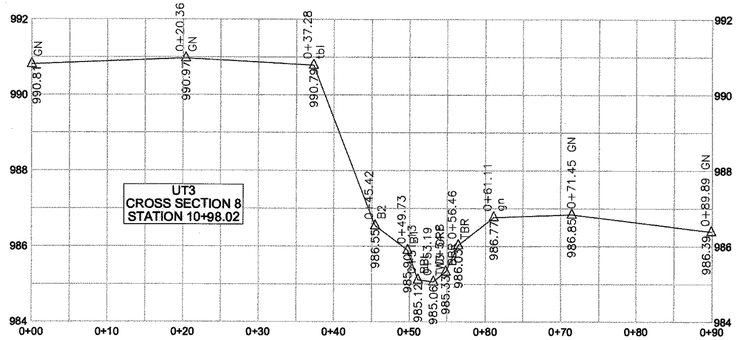
CROSS SECTION SCALE
HORIZONTAL: 1"=10'(22x34) 1"=20'(11x17)
VERTICAL: 1"=2'(22x34) 1"=4'(11x17)

TBL–LEFT TOP OF BANK
TBR–RIGHT TOP OF BANK
BBL–LEFT BANK TOE
BBR–RIGHT BANK TOE
TW–THALWEG
GN–GROUND
EGN–EXISTING GROUND









REVISIONS, DATE AND INITIAL:

TURNER LAND SURVEYING, PLLC
3719 Benson Drive, Raleigh, NC 27609 – (919)827-0745
P-0702 – info@turnerlandsurveying.com
www.TURNERLANDSURVEYING.com

UT2, UT3, AND CROSS SECTIONS 5-8
HOGAN CREEK RESTORATION PROJECT
SCO PROJECT #090856601
EEP PROJECT ID #94708
SURRY COUNTY NORTH CAROLINA
SILOAM

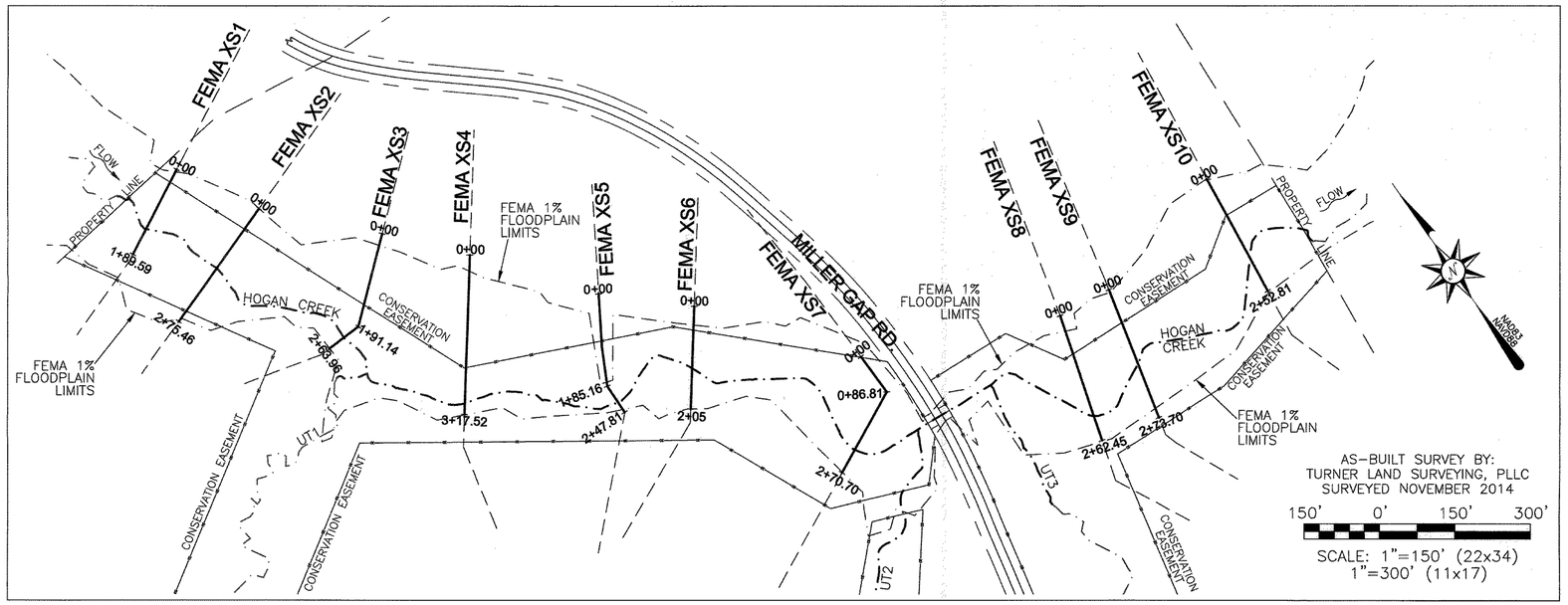
DATE: 12/15/2014
SURVEYED BY: DST
DRAWN BY: DST/EGT
REVIEWED BY: DST/EGT
PROJECT: TLS-14-018
FILE: HOGAN CREEK 94708_AB_TLS_F.dwg
SCALE: AS SHOWN

SHEET 5 of 7

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 28th DAY OF JANUARY, 2015.

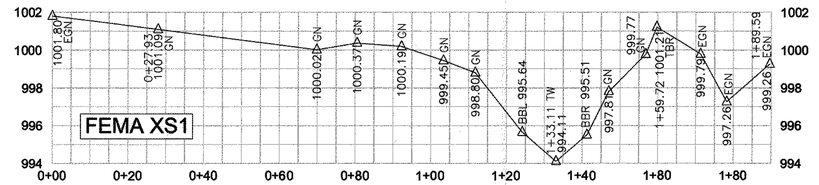
DAVID S. TURNER, P.L.S. #L-4551

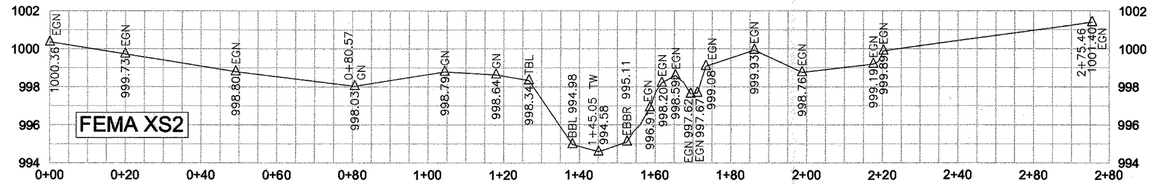
NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

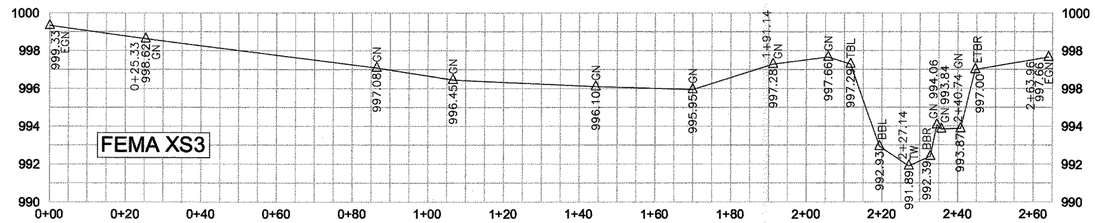


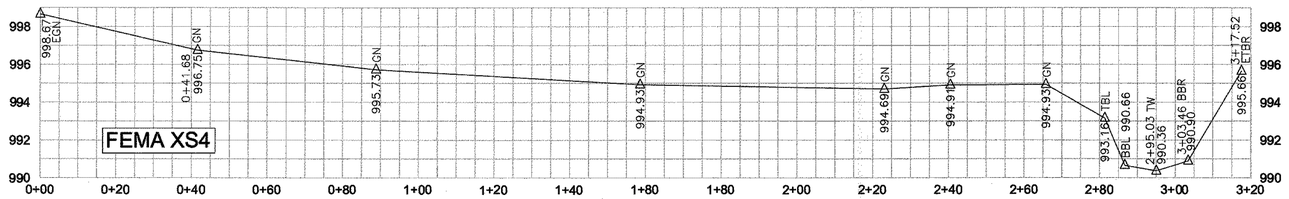
FEMA CROSS SECTION SCALE
HORIZONTAL: 1"=20'(22x34)
1"=40'(11x17)
VERTICAL: 1"=4'(22x34)
1"=8'(11x17)

TBL–LEFT TOP OF BANK
TBR–RIGHT TOP OF BANK
BBL–LEFT BANK TOE
BBR–RIGHT BANK TOE
TW–THALWEG
GN–GROUND
E–EXISTING (SEE NOTE*)









*FEMA CROSS SECTION NOTE:
NOTE - SOME "EXISTING" ELEVATIONS WERE TAKEN FROM THE EXISTING CONDITIONS SURVEY AND WERE NOT VERIFIED BY TURNER LAND SURVEYING.

GENERAL NOTES:
1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. THE VERTICAL DATUM IS NAVD88.
3. THE BASIS OF BEARINGS IS NCGS STATE PLANE GRID COORDINATES NAD83 DATUM.
4. CONTROL IS BASED ON EXISTING CONTROL DATA AS SHOWN ON SHEET P8 OF 30 IN THE DESIGN PLANS AND RECOVERED DURING THE CONSTRUCTION & AS-BUILT SURVEYS. ADDITIONAL CONTROL WAS ESTABLISHEO USING TOTAL STATION & GPS/RTK METHODS AND CONFIRMED DURING AS-BUILT SURVEY. AS-BUILT CONTROL POINTS ARE LISTED ON SHEET 1.
5. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
6. THE SOLE PURPOSE OF THIS SURVEY IS TO SHOW THE CONSTRUCTED STREAM AND GRADING RELATED TO THE HOGAN CREEK STREAM RESTORATION PROJECT.
7. INFORMATION SHOWN OUTSIDE THE LIMITS OF AS-BUILT SURVEY WAS TAKEN FROM THE EXISTING CONDITIONS & DESIGN DATA PROVIDED BY THE DESIGNER AND WAS NOT VERIFIED BY TURNER LAND SURVEYING, PLLC.
8. REFER TO NCEEP HOGAN CREEK STREAM MITIGATION DOCUMENTS AND PLANS FOR BOUNDARY & OWNER INFORMATION.

REVISIONS, DATE AND INITIAL:

TURNER LAND SURVEYING, PLLC
3719 Benson Drive, Raleigh, NC 27609 – (919)827-0745
P-0702 – info@turnerlandsurveying.com
www.TURNERLANDSURVEYING.com

FEMA CROSS SECTION PLAN VIEW & FXS1-FXS4

HOGAN CREEK RESTORATION PROJECT

SCO PROJECT #090856601
EEP PROJECT ID #94708

SILOAM — SURRY COUNTY — NORTH CAROLINA

DATE: 12/15/2014
SURVEYED BY: DST
DRAWN BY: DST/EGT
REVIEWED BY: DST/EGT
PROJECT: TLS-14-018
FILE: HOGAN CREEK_94708_AB_TLS_F.dwg
SCALE: AS SHOWN

SHEET 6 of 7

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 28th DAY OF JANUARY, 2015.

DAVID S. TURNER, P.L.S. #L-4551

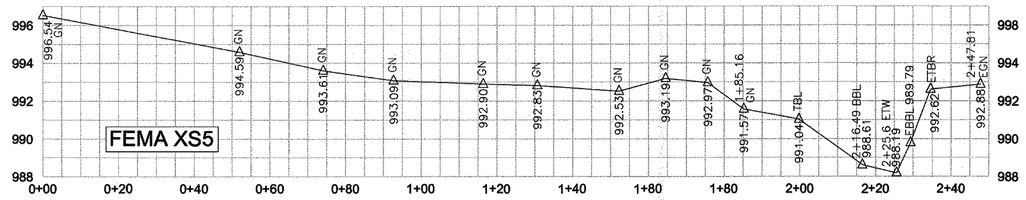
NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

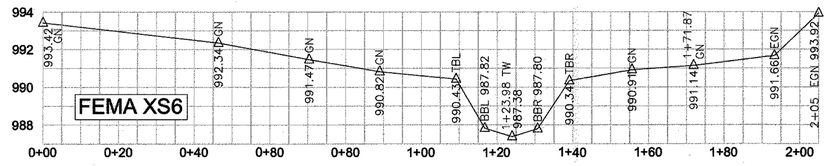
FEMA CROSS SECTION SCALE
HORIZONTAL: 1"=20'(22x34)
1"=40'(11x17)
VERTICAL: 1"=4'(22x34)
1"=8'(11x17)

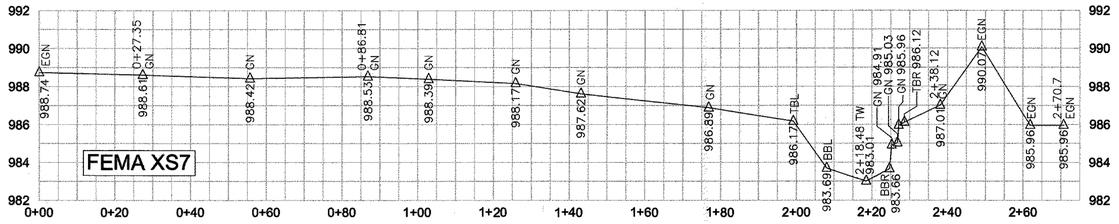
TBL–LEFT TOP OF BANK
TBR–RIGHT TOP OF BANK
BBL–LEFT BANK TOE
BBR–RIGHT BANK TOE
TW–THALWEG
GN–GROUND
E–EXISTING (SEE NOTE*)

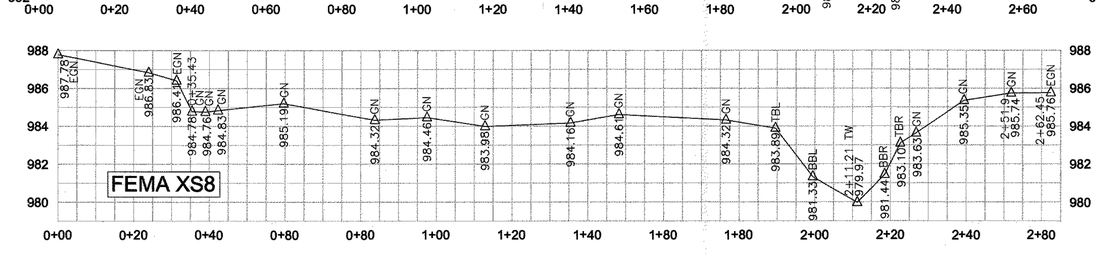
*FEMA CROSS SECTION NOTE:
NOTE - SOME "EXISTING" ELEVATIONS WERE TAKEN FROM THE EXISTING CONDITIONS SURVEY AND WERE NOT VERIFIED BY TURNER LAND SURVEYING.

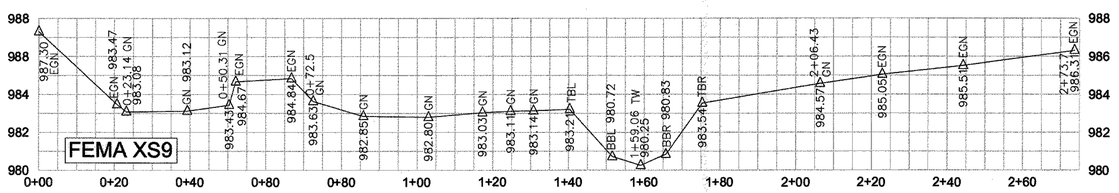
GENERAL NOTES:
1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. THE VERTICAL DATUM IS NAVD88.
3. THE BASIS OF BEARINGS IS NCGS STATE PLANE GRID COORDINATES NAD83 DATUM.
4. CONTROL IS BASED ON EXISTING CONTROL DATA AS SHOWN ON SHEET P8 OF 30 IN THE DESIGN PLANS AND RECOVERED DURING THE CONSTRUCTION & AS-BUILT SURVEYS. ADDITIONAL CONTROL WAS ESTABLISHEO USING TOTAL STATION & GPS/RTK METHODS AND CONFIRMED DURING AS-BUILT SURVEY. AS-BUILT CONTROL POINTS ARE LISTED ON SHEET 1.
5. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
6. THE SOLE PURPOSE OF THIS SURVEY IS TO SHOW THE CONSTRUCTED STREAM AND GRADING RELATED TO THE HOGAN CREEK STREAM RESTORATION PROJECT.
7. INFORMATION SHOWN OUTSIDE THE LIMITS OF AS-BUILT SURVEY WAS TAKEN FROM THE EXISTING CONDITIONS & DESIGN DATA PROVIDED BY THE DESIGNER AND WAS NOT VERIFIED BY TURNER LAND SURVEYING, PLLC.
8. REFER TO NCEEP HOGAN CREEK STREAM MITIGATION DOCUMENTS AND PLANS FOR BOUNDARY & OWNER INFORMATION.

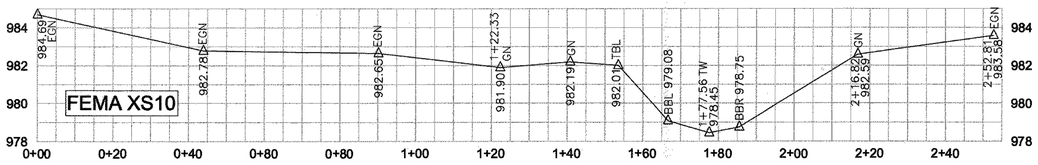












TURNER LAND SURVEYING, PLLC
3719 Benson Drive, Raleigh, NC 27609 -- (919)827-0745
P-0702 -- info@turnerlandsurveying.com
www.TURNERLANDSURVEYING.com

REVISIONS, DATE AND INITIAL:

FEMA CROSS SECTIONS FXS5-FXS10

HOGAN CREEK RESTORATION PROJECT

SCO PROJECT #09085660
EEP PROJECT ID #94708

SURRY COUNTY
NORTH CAROLINA
SILOAM

DATE: 12/15/2014
SURVEYED BY: DST
DRAWN BY: DST/EGT
REVIEWED BY: DST/EGT
PROJECT: TLS-14-018
FILE: HOGAN CREEK_94708_AB_TLS_F.dwg
SCALE: AS SHOWN

SHEET 7 of 7