Annual Monitoring Report Final
Monitoring Year 2 of 5
Hogan Creek Stream Mitigation Project

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

Surry County, North Carolina
Data Collected: April 12-October 13, 2016
Data Submitted: November 29, 2016
Revised: December 15, 2016

Submitted to:

NCDEQ - Division of Mitigation Services
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Table of Contents

1.0 PROJECT SUMMARY

The NCDEQ 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 Monitoring Year 2 monitoring efforts (MY2).

1.1 Project Goals

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.

1.2 Project Performance Standards

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

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 are 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	3	10	4	Annual

1.3 Project Setting and Background

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 triple box culvert 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 vicinity 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.

1.4 Project Components and Approach

Stream restoration was accomplished using a natural channel design approach to restore appropriate channel dimension, pattern, and profile (Appendix A Table 1; Appendix B 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 Reach 1;
- 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 in order to position the channel in the low point of the valley and improve floodplain access on both banks.

The target stream type for UT2 and UT3 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 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 1 efforts began in October of 2015. Monitoring year 2 efforts began in April of 2016. More detailed information related to the project activity, history, and contacts can be found in Appendix A, Tables 1, 2 and 3.

1.5 Project Performance

MY2 data indicate that bank erosion and bed aggradation are issues on portions of Hogan Creek, while UT2 and UT3 are stable and performing well. Eight areas of bank erosion were observed in Hogan Creek Reach 1, and two were observed in Hogan Creek Reach 2. These areas, which are indicated on the CCPV, total about 13 percent of the total reach length. Six of these ten areas were noted and documented during MY1 monitoring efforts while the other four are new areas. The initial six areas appear to be related to sediment deposition and bank retreat following flooding that occurred at the site in October 2015. The four new areas are likely related to flood events documented in 2016. Five of the erosional areas have stabilizing woody vegetation nearby, while the other five do not. The latter five areas appear to be trending toward less stable conditions and likely warrant adaptive management in MY3.

Cross-section data indicate modest changes between MY1 and MY2. Hogan Creek riffle cross section 3 exhibited the greatest change, with a reduction in width-depth ratio and an increase in bankfull maximum depth, continuing a trend observed between MY0 and MY1 at this same location. Cross section 3 is located downstream of a riffle-run-pool sequence between stations 25+00 and 26+50 that has scoured through a thin layer of bed sediment down to bedrock. This scouring appears to be resulting in high stress on the riffle at which cross section 3 is located, but the presence of bedrock suggests that future reach-wide down-cutting is unlikely. Hogan Creek pool cross sections indicate maintenance of pool maximum depths and stable function. Hogan Creek pool cross section 4 data show a reduction in cross sectional area, which observations indicate is due to expansion of the point bar. MY2 data from UT2 indicate moderate increases in width-depth ratio at the two riffles and a modest reduction in maximum depth at the pool cross

section. Visual observations of UT2 indicate overall stability. Similarly, UT1 and UT3 appear stable and functioning as intended.

Three sets of profile data between MY0 and MY2 indicate that the Hogan Creek bed has been dynamic over the past 18 months. Facet lengths and slopes have shifted noticeably, particularly in Reach 1 where the largest volume of coarse sediment was deposited following the flood event that occurred shortly after construction. The profile adjustments may be indicative of this coarse sediment progressing downstream during lessor flooding events. UT2 profile data indicate a relatively stable bed. The most significant UT2 profile change from MY1 to MY2 is located near station 14+00 where a bridge was constructed through a gap in the conservation easement. No bed scour was observed at this location, so the differences may be attributable to a lateral shift in thalweg measurement.

Sediment sampling indicates a significant fining of riffle bed material distributions. The D_{50} and D_{84} values decreased for all four pebble counts conducted in Hogan Creek compared with MY1 values. This increase in fines percentage may be indicative of excess fine sediment inputs from the watershed, movement of coarse sediments that were deposited during the large events of 2015, or a combination of the two.

Vegetation monitoring was conducted on October 13, 2016. The MY2 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. Vegetation plot data and photographs are included in Appendix C. The average stem density for planted stems is 467 stems per acre. The site includes a diverse assemblage of 15 species of native trees and shrubs. Planted and volunteer stem densities were between 320 and 6,720 stems per acre with an average of 2,226 stems per acre for the entire restoration site. Vegetation Plot 1 had a total density of 6,720 stems per acre. The high density of volunteers in this plot may have skewed the results for the entire site. Densities are expected to decrease in Vegetation Plot 1 during future monitoring years as herbaceous vegetation becomes more established. Herbicide treatments of exotic invasive plants were originally conducted during the construction phase and again in July 2015. Subsequent exotic invasive treatments were conducted on May 24, 2016 and September 8, 2016. Observations indicate that the extent of invasive plants on site has increased from 5.6% to 11.6% from MY1 to MY2. Additional treatments are required, particularly along the upstream reaches of UT2, the downstream portion of Hogan Creek Reach 1, and the upstream section of Hogan Creek Reach 2.

Bankfull events were documented in April of 2016 based on the visual observation of wrack lines and sediment deposition throughout the floodplain. Readings from the crest gauge located on UT2 also indicate a bankfull flow occurred in August of 2016. The crest gauge located on Hogan Creek Reach 2 had been damaged in a previous flood event, and was replaced in August of 2016. A nearby gauging station recorded approximately 30 inches of rain from April-August 2016 (NCCRONOS, 2016). Monthly rainfall data indicate significantly higher than normal rainfall occurred during May and August of 2016.

Livestock fencing has been taken down, apparently by the landowner, in the areas adjacent to the ford on Hogan Creek Reach 1. Currently there is no livestock in the pasture on the north side of Hogan Creek Reach 1 and no livestock impacts were observed in the buffer.

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.
- Forty-one permanent photo points were established throughout the project to visually monitor stream stability and vegetation. Permanent photo points were marked with labeled wooden or PVC 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). 2016. State Climate Office of North Carolina. Version 2.7.2. NC-SR-2 - Dobson 2.3 SE Station ID No. Dobson 2.3 SE. Accessed November 29, 2016.

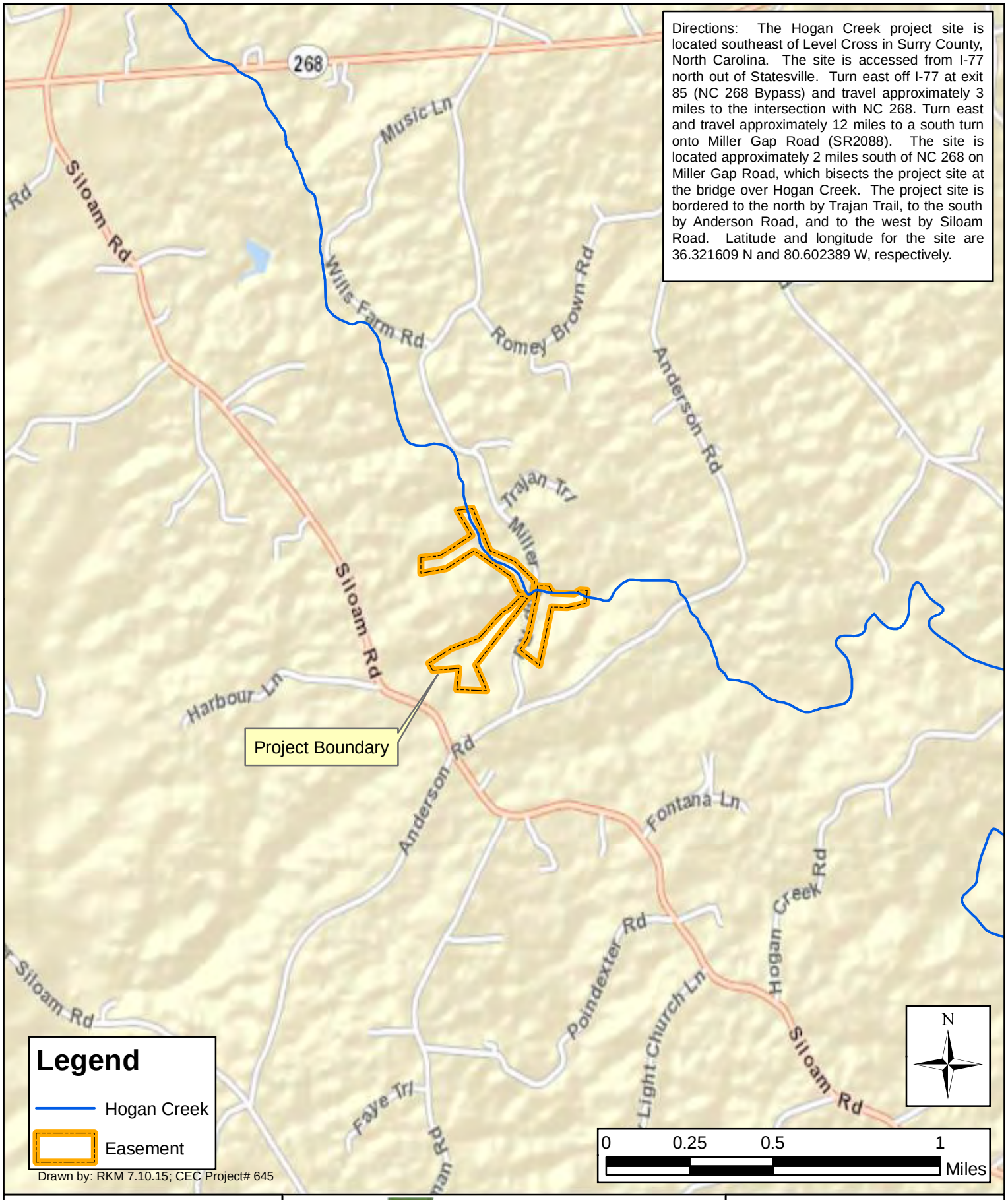
NCGS (North Carolina Geological Survey). 2004. Physiography of North Carolina. Map compiled by the Division of Land Resources. Raleigh.

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



Drawn by: RKM 7.10.15; CEC Project# 645

Surry County, North Carolina	NCDEQ - 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
Stream Repair/Maintenance	N/A	Dec-15
Year 1 Monitoring	Dec-15	Jan-16
Invasive Species Treatment	May-16	May-16
Supplemental Planting	N/A	Jan-16
Invasive Species Treatment	Sep-16	Sep-16
Year 2 Monitoring	Oct-16	Nov-16
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	03040101
USGS Hydrologic Unit 14-digit	03040101110060
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

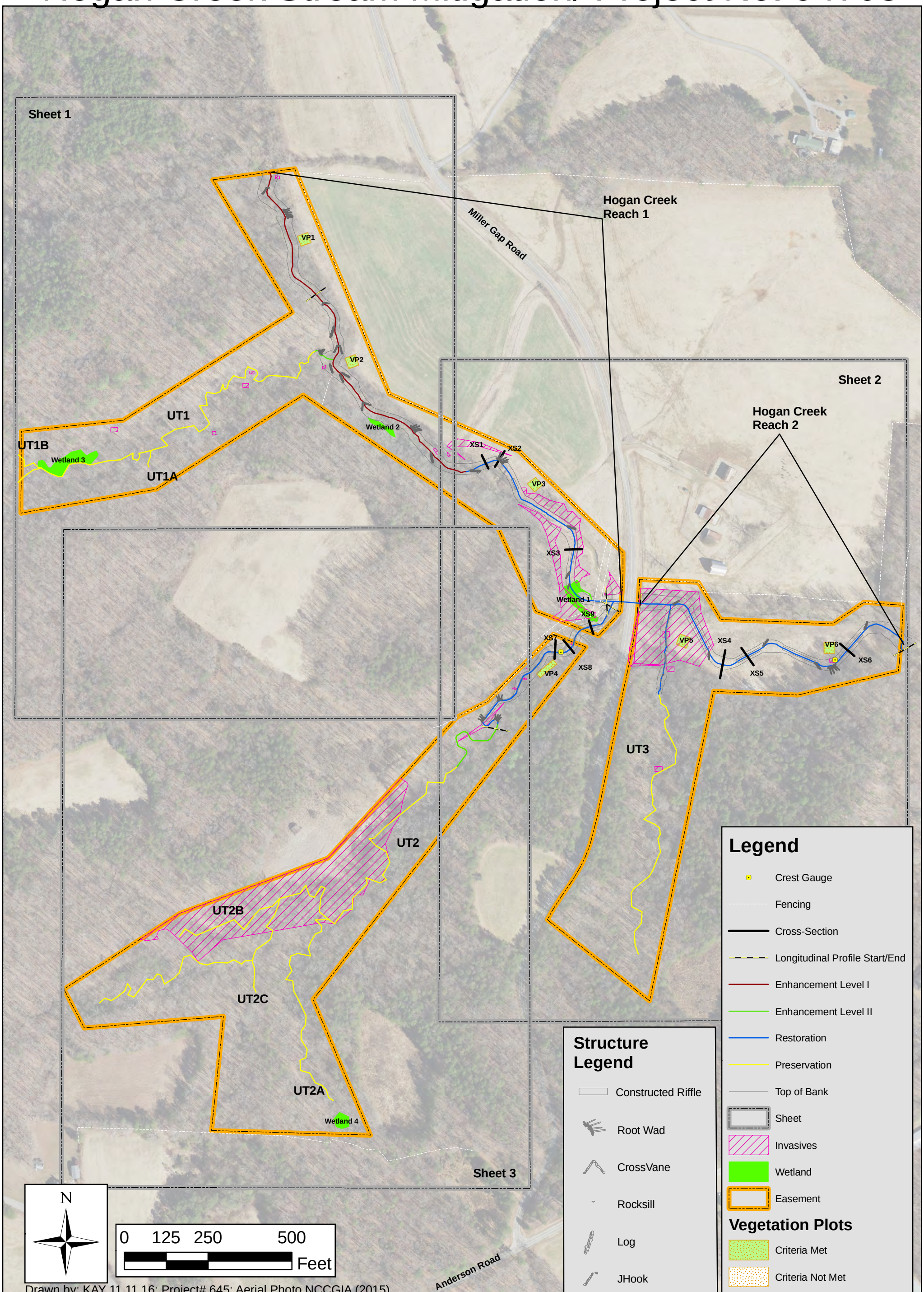
Regulatory Considerations

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	-

N/A Not-applicable

Appendix B
Visual Assessment Data

Hogan Creek Stream Mitigation/ Project No. 94708



Drawn by: KAY 11.11.16; Project# 645; Aerial Photo NCCGIA (2015)

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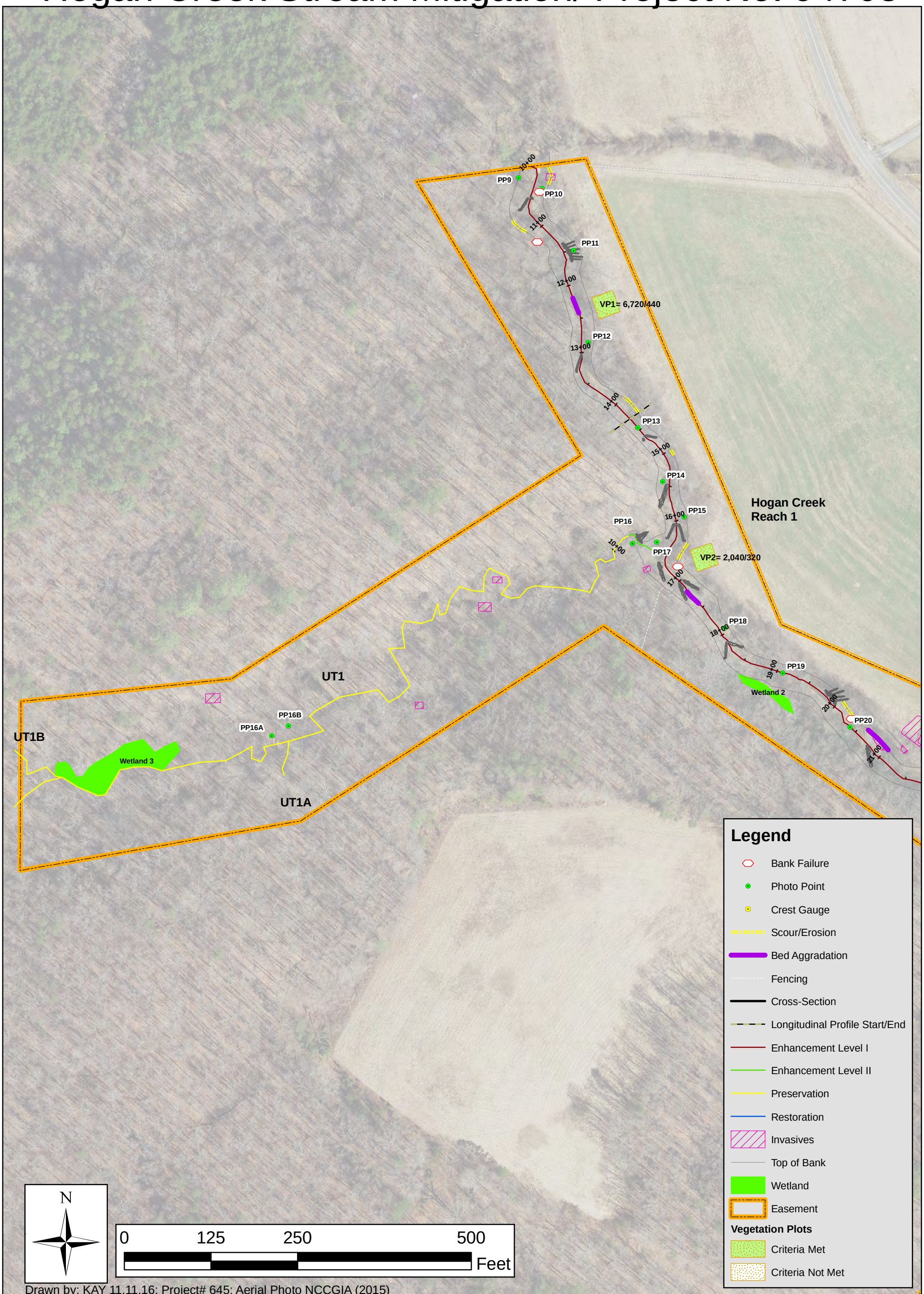
Integrated Current Condition
Plan View
DMS Project # 94708

Figure 2

Hogan Creek Stream Mitigation/ Project No. 94708



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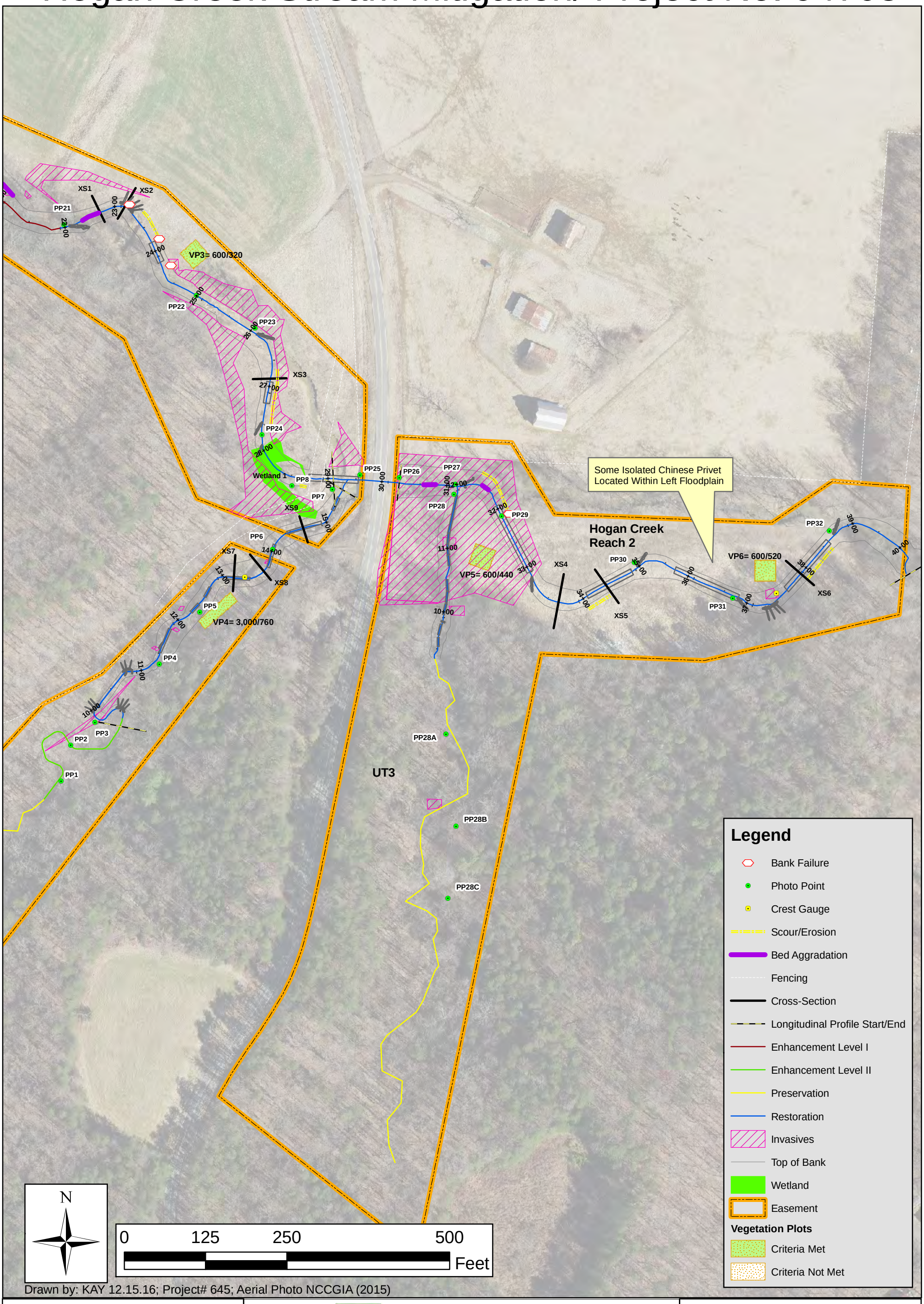
Integrated Current Condition
Plan View
DMS Project # 94708

Figure 2 Sheet 1

Hogan Creek Stream Mitigation/ Project No. 94708



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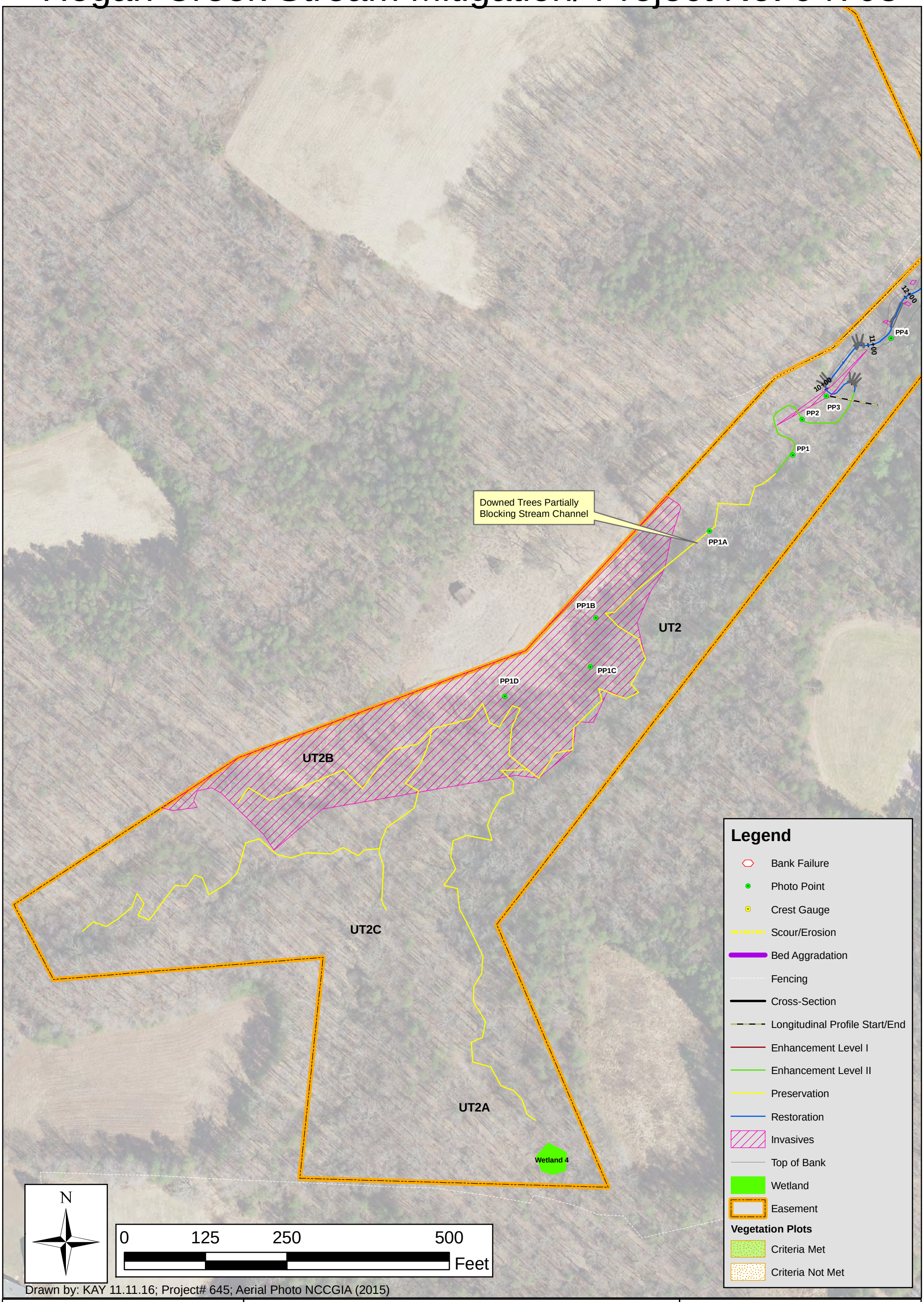
Integrated Current Condition
Plan View
DMS Project # 94708

Figure 2 Sheet 2

Hogan Creek Stream Mitigation/ Project No. 94708



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Integrated Current Condition
Plan View
DMS Project # 94708

Figure 2 Sheet 3

Table 5a. Visual Stream Morphology Stability Assessment
Hogan Creek Reach 1
Assessed Length : 1,961 feet

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			4	90	95%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	14	14			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	13	13			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	13	13			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	13	13			100%			
		2. Thalweg centering at downstream of meander (Glide)	13	13			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			8	270	86%	5	175	91%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	8	270	86%	0	0	91%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	15	15			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	12	12			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)	14	15			93%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	14	15			93%			

Table 5b. Visual Stream Morphology Stability Assessment
Hogan Creek Reach 2
Assessed Length : 992 feet

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			2	20	98%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	4	6			67%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	4	5			80%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	4	5			80%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	4	5			80%			
		2. Thalweg centering at downstream of meander (Glide)	4	5			80%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			3	160	84%	0	0	87%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	3	160	87%	0	0	87%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	6	6			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	1	1			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	5	5			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)	6	6			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	6	6			100%			

Table 5c. Visual Stream Morphology Stability Assessment
UT2
Assessed Length : 930 feet

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	14	14			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	13	13			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	13	13			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	13	13			100%			
		2. Thalweg centering at downstream of meander (Glide)	13	13			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	6	6			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	4			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)	6	6			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	6	6			100%			

Table 5d. Visual Stream Morphology Stability Assessment
UT3
Assessed Length : 275 feet

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	4	4			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	4	4			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	4	4			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	4	4			100%			
		2. Thalweg centering at downstream of meander (Glide)	4	4			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	1	1			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.	1	1			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)	1	1			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	1	1			100%			

Table 6. Vegetation Condition Assessment Hogan Creek/94708 Planted Acreage 6.7						
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	**36**					
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Easement Acreage**
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000 SF	Cross Hatch Pink	6	4.16	11.6%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

Photo Point 1 – View Downstream, Main Stem UT2

Photo Point 1A – View Upstream, Main Stem UT2

Photo Point 1B – View Downstream, Main Stem UT2

Photo Point 1C– View Upstream, Main Stem UT2

Photo Point 1D– View Upstream, Main Stem UT2

Photo Point 2 – View Downstream, Main Stem UT2

Photo Point 3 – View Upstream, Main Stem UT2

Photo Point 4 – View Upstream, Main Stem UT2

Photo Point 5 – View Downstream, Main Stem UT2

Photo Point 6 – View Downstream, Main Stem UT2

Photo Point 7 – View Downstream, Main Stem UT2

Photo Point 8 – View Upstream, Reach 1 Hogan Creek

Photo Point 9 – View Downstream, Reach 1 Hogan Creek

Photo Point 10 – View Downstream, Reach 1 Hogan Creek

Photo Point 11 – View Downstream, Reach 1 Hogan Creek

Photo Point 12 – View Downstream, Reach 1 Hogan Creek

Photo Point 13 – View Downstream, Reach 1 Hogan Creek

Photo Point 14 – View Downstream, Reach 1 Hogan Creek

Photo Point 15 – View Downstream, Reach 1 Hogan Creek

Photo Point 16 – View Downstream, Main Stem UT1

Photo Point 16A – View Upstream, Main Stem UT1

Photo 16B – View Downstream, Main Stem UT1

Photo 17 – View Downstream, Reach 1 Hogan Creek

Photo Point 18 – View Downstream, Reach 1 Hogan Creek

Photo Point 19 – View Downstream, Reach 1 Hogan Creek

Photo Point 20 – View Downstream, Reach 1 Hogan Creek

Photo Point 21 – View Downstream, Reach 1 Hogan Creek

Photo Point 22 – View Downstream, Reach 1 Hogan Creek

Photo Point 23 – View Downstream, Reach 1 Hogan Creek

Photo Point 24 – View Downstream, Reach 1 Hogan Creek

Photo Point 25 – View Upstream, Reach 2 Hogan Creek

Photo Point 26 – View Downstream, Reach 2 Hogan Creek

Photo Point 27 – View Downstream, Reach 2 Hogan Creek

Photo Point 28 – View Upstream, UT3

Photo Point 28A – View Upstream, UT3

Photo Point 28B – View Downstream, UT3

Photo Point 28C – View Upstream, UT3

Photo Point 29 – View Downstream, Reach 2 Hogan Creek

Photo Point 30 – View Downstream, Reach 2 Hogan Creek

Photo Point 31 – View Downstream, Reach 2 Hogan Creek

Photo Point 32 – View Downstream, Reach 2 Hogan Creek

Appendix C
Vegetation Plot Data

Table 7. Vegetation Plot Results (All Stems)			Current Data (MY2 2016)												Annual Means		Annual Means		Annual Means	
	Common		Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		MY0 (2015)		MY1 (2015)		MY2 (2016)	
	Name	Type	P	T	P	T	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	0	7	0	1
Betula nigra	River birch	Tree	3	118	0	36	1	5	6	8	0	2	0	0	10	10	10	149	10	169
Cornus amomum	Silky dogwood	Tree	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Diospyros virginiana	Persimmon	Tree	0	0	0	0	0	0	0	0	5	5	6	6	0	0	0	0	11	11
Fraxinus pennsylvanica	Green ash	Tree	5	5	3	3	2	2	4	4	1	1	0	0	17	17	14	14	15	15
Juglans nigra	Black walnut	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Liriodendron tulipifera	Tulip poplar	Tree	0	9	0	3	0	0	0	50	0	0	0	0	0	0	0	70	0	62
Nyssa sylvatica	Black gum	Tree	0	0	0	0	0	0	0	0	0	0	2	2	12	12	12	12	2	2
Pinus taeda	Loblolly pine	Tree	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3
Platanus occidentalis	American sycamore	Tree	2	2	3	6	1	1	8	8	0	1	0	2	13	13	14	17	14	20
Prunus serotina	Black cherry	Tree	0	30	0	0	0	3	0	0	0	0	0	0	0	27	0	41	0	33
Quercus alba	White oak	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Quercus phellos	Willow oak	Tree	0	0	0	0	0	0	0	1	1	1	0	0	6	6	4	4	1	2
Quercus rubra	Northern red oak	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Quercus lyrata	Overcup oak	Tree	1	1	2	2	4	4	1	4	4	4	5	5	13	13	15	15	17	20
	Plot area (acres)		0.025		0.025		0.025		0.025		0.025		0.025		0.15		0.15		0.15	
	Species count		4	8	3	6	4	5	4	5	4	7	3	4	6	10	6	10	7	12
	Stem Count		11	168	8	51	8	15	19	75	11	15	13	15	71	102	69	330	70	339
	Stems per Acre		440	6,720	320	2,040	320	600	760	3,000	440	600	520	600	473	680	460	2,200	467	2,260

Meets Success Criteria

Fails to Meet Interim Success Criteria

Type = Tree, Shrub, Livestake

P = Planted

T = Total

The "Stems per Acre" totals listed for MY0 and MY1 Annual Means in Table 7 deviate from the data previously submitted with the Hogan Creek MY1 report. A mathematical error was discovered during the MY2 report compilation. "Stems per Acre" listed in Table 7 reflect corrected data for MY0, MY1, and current data for MY2. These totals will be referenced for future monitoring reports.

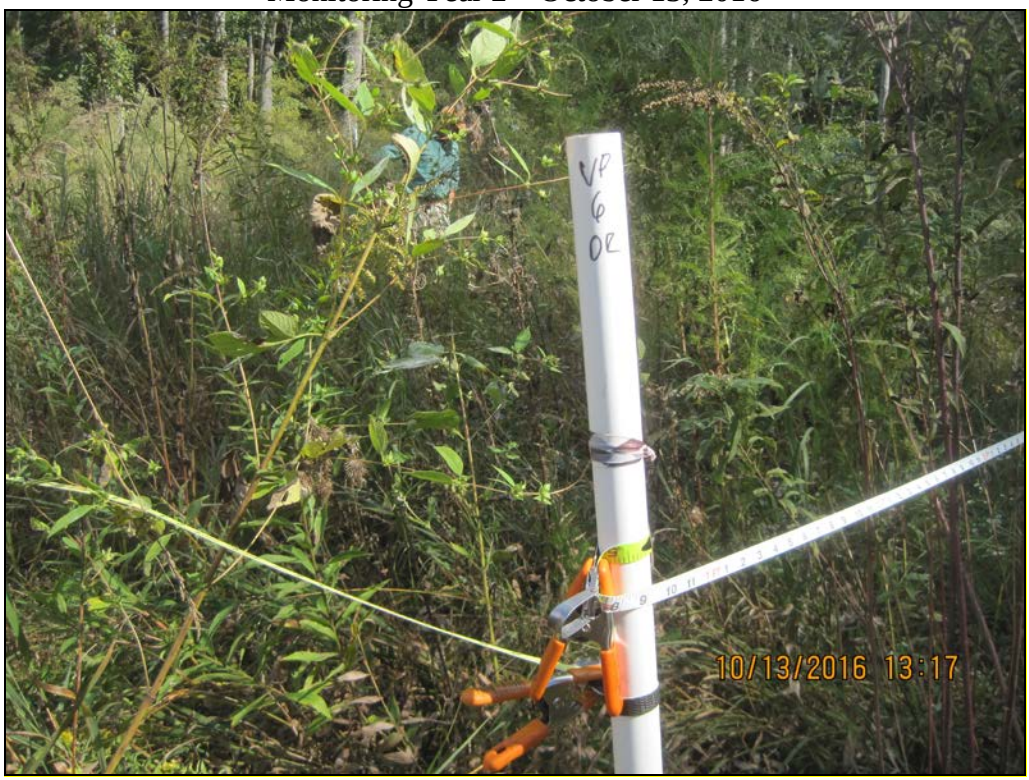
Vegetation Monitoring Plot 1
Monitoring Year 2 – October 13, 2016

Vegetation Monitoring Plot 2
Monitoring Year 2 – October 13, 2016

Vegetation Monitoring Plot 3
Monitoring Year 2 – October 13, 2016

Vegetation Monitoring Plot 4
Monitoring Year 2 – October 13, 2016

Vegetation Monitoring Plot 5
Monitoring Year 2 – October 13, 2016

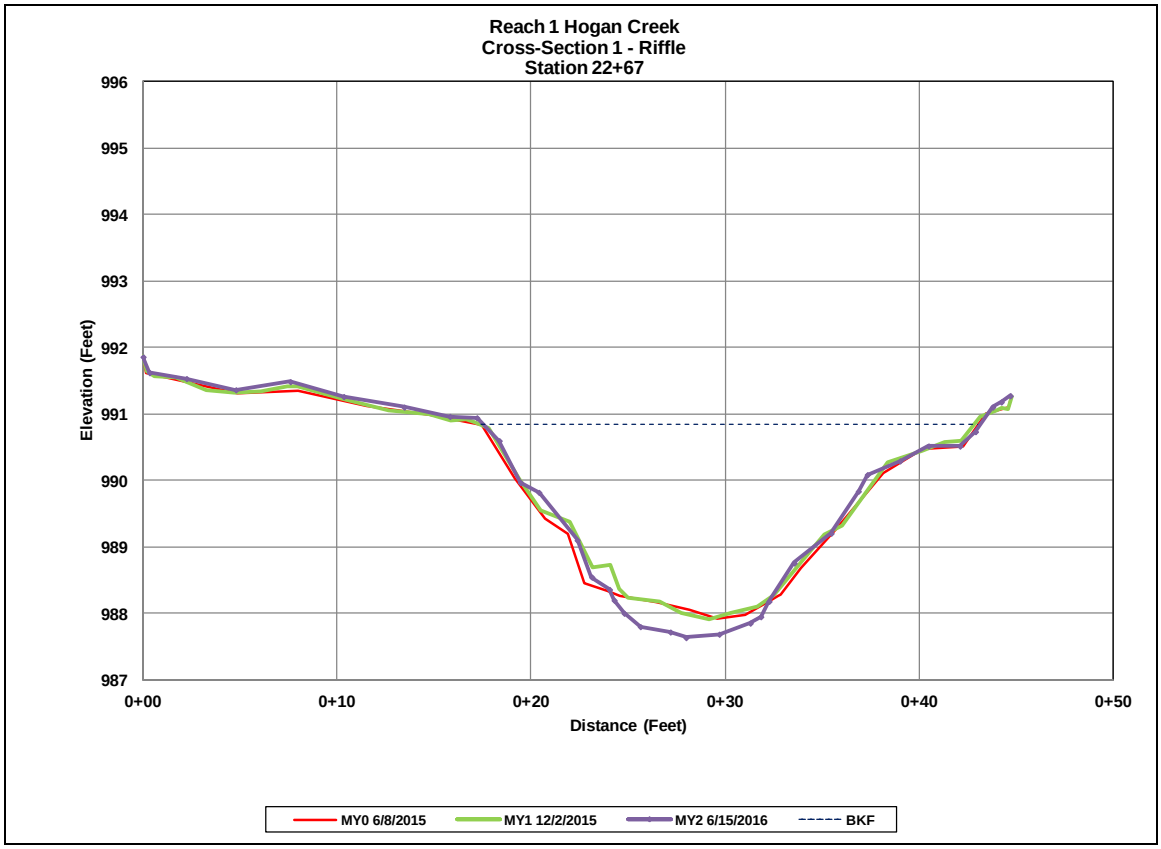


Vegetation Monitoring Plot 6
Monitoring Year 2 – October 13, 2016

Appendix D
Stream Survey Data

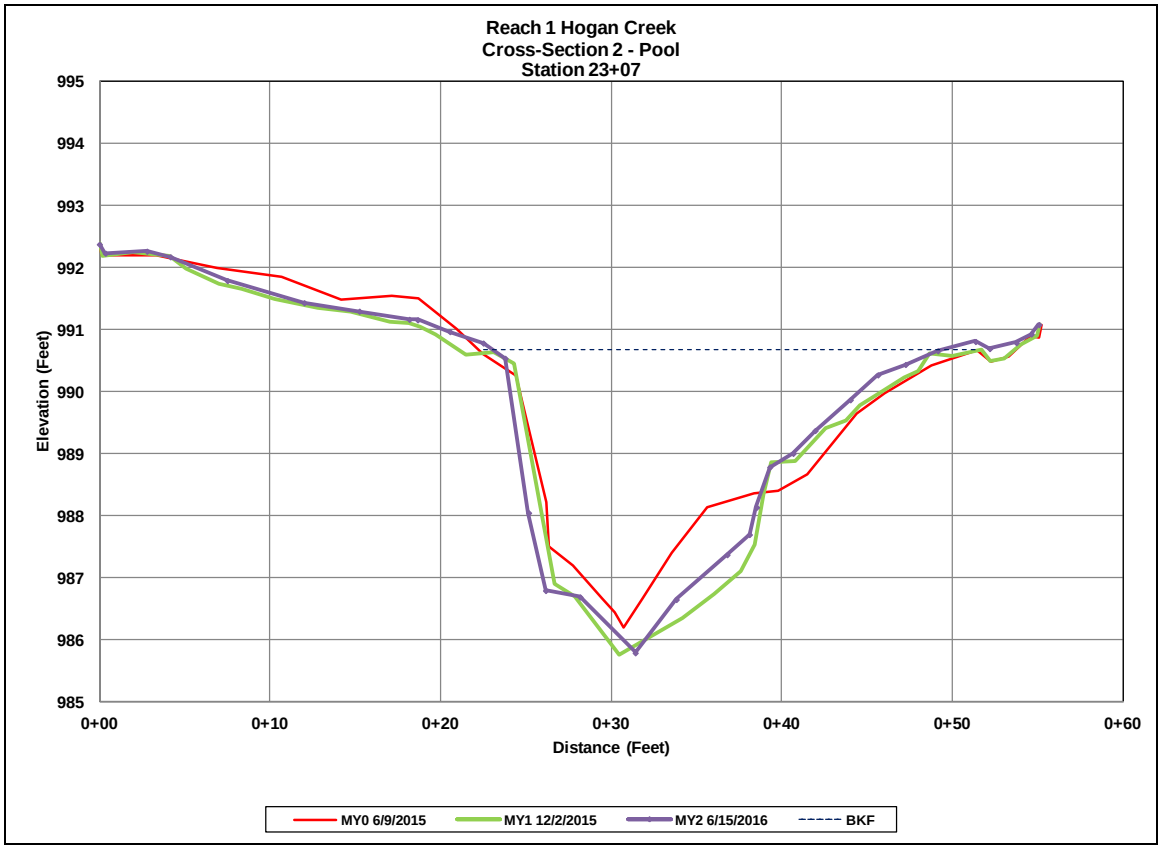
Cross-Section 1 – Upstream

Cross-Section 1 – Downstream



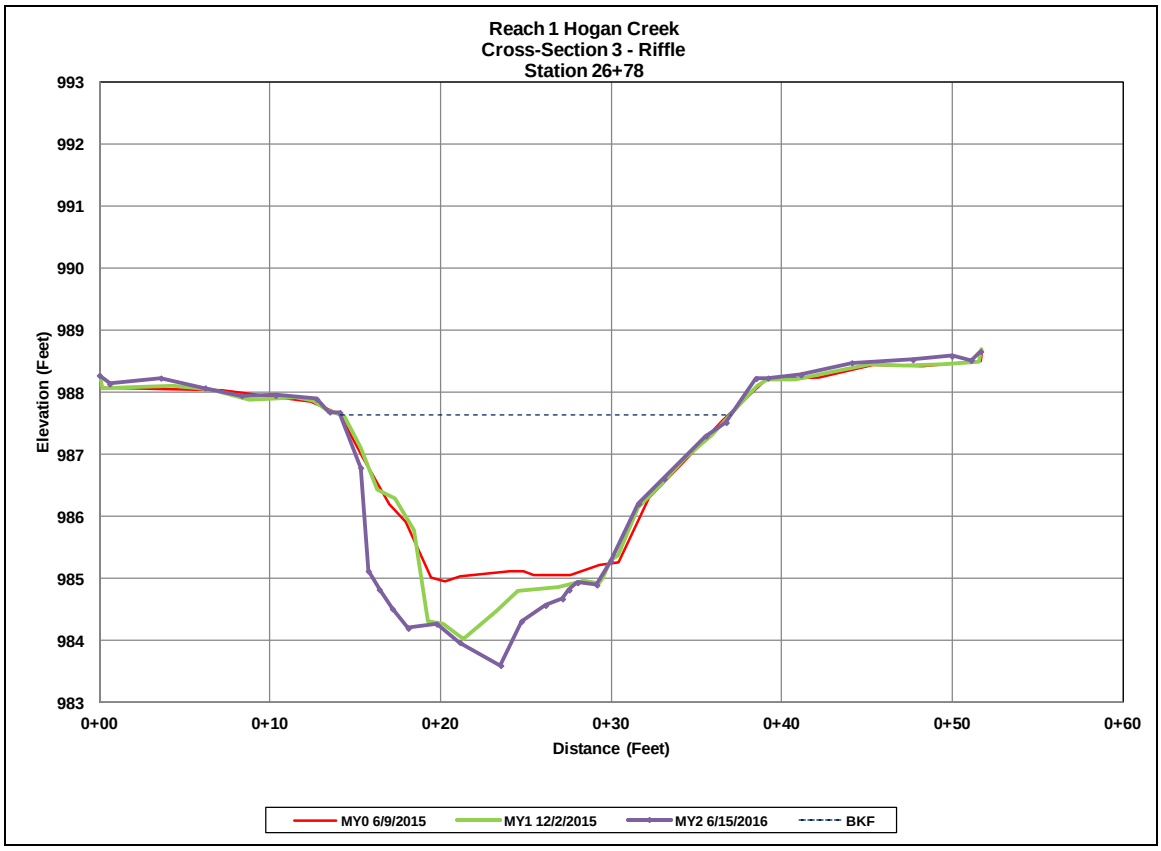
Cross-Section 2 – Upstream

Cross-Section 2 – Downstream



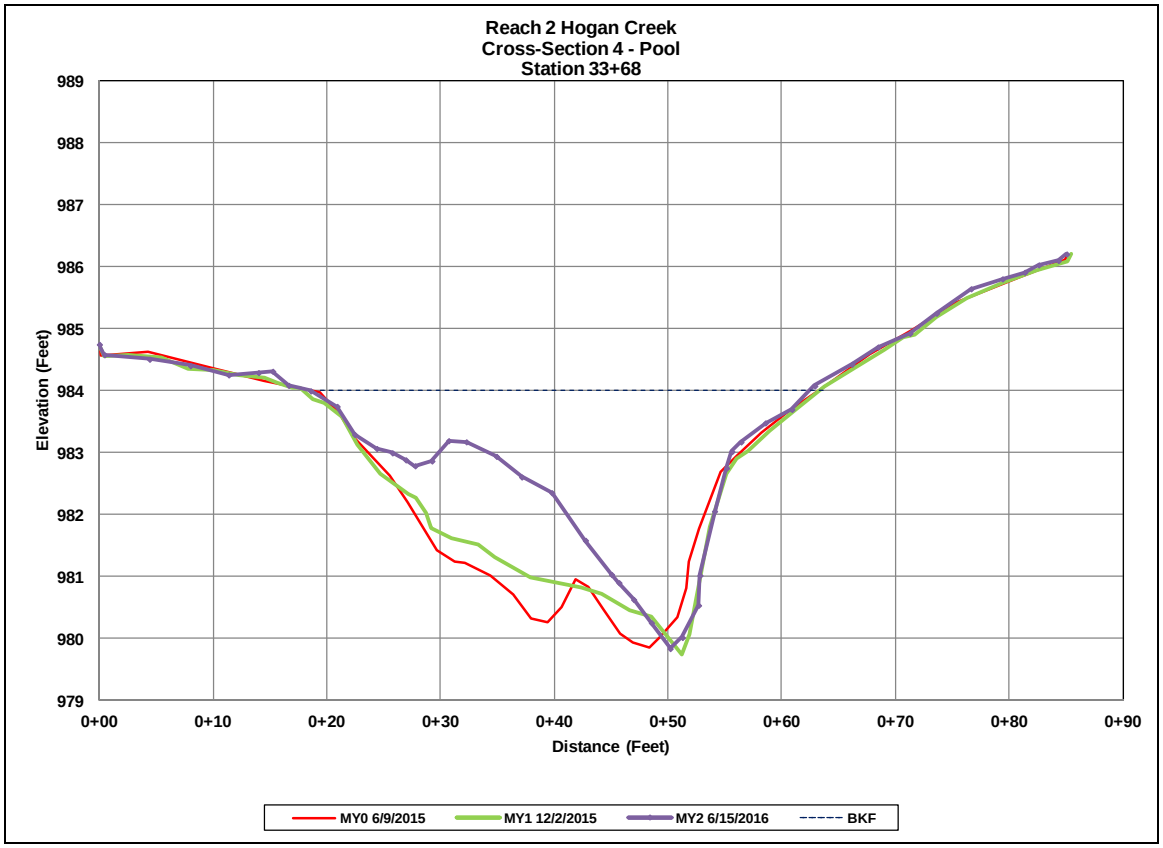
Cross-Section 3 – Upstream

Cross-Section 3 – Downstream



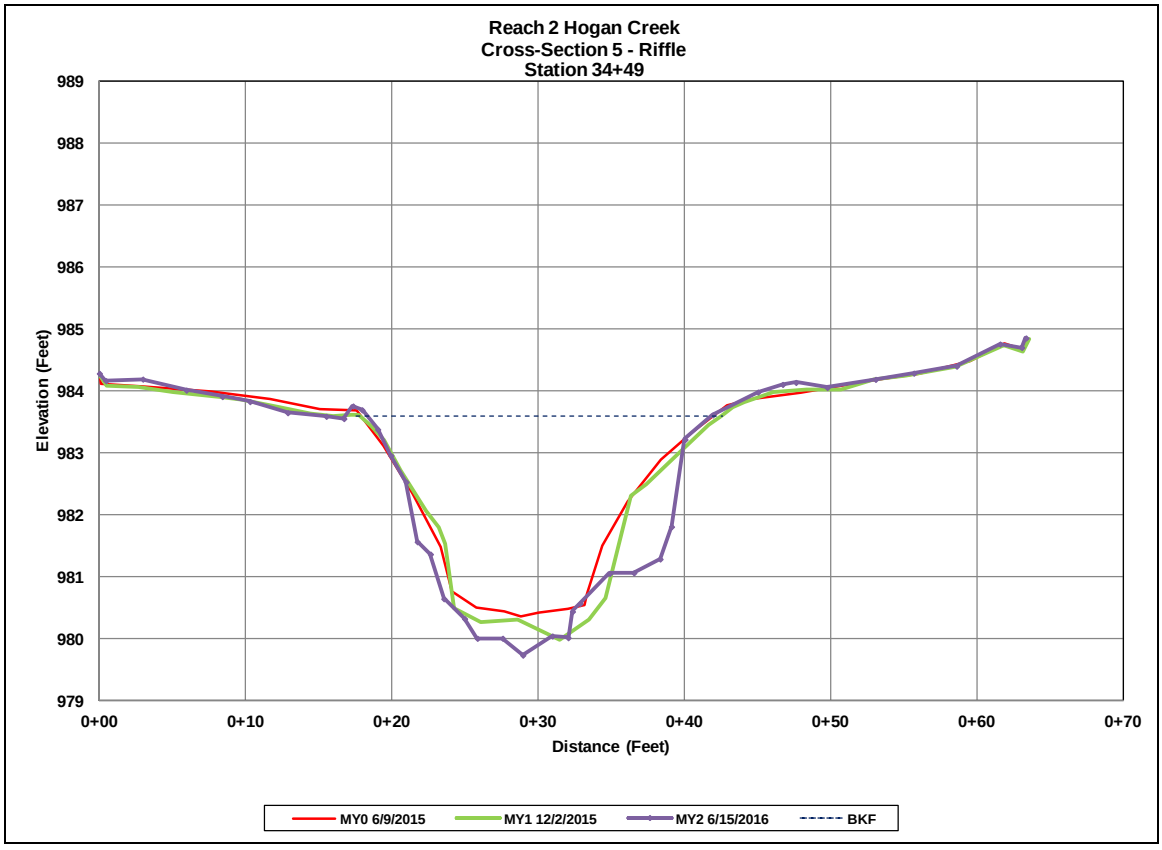
Cross-Section 4 – Upstream

Cross-Section 4 – Downstream



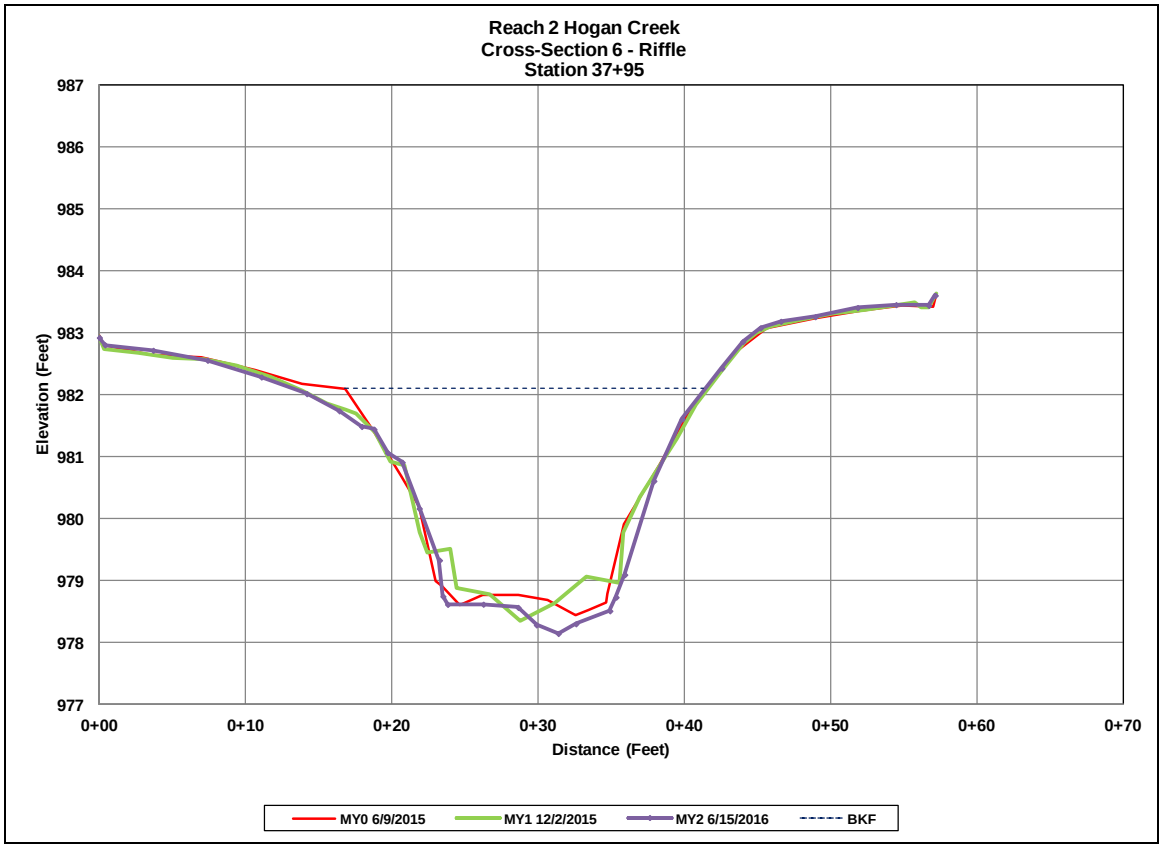
Cross-Section 5 – Upstream

Cross-Section 5 – Downstream



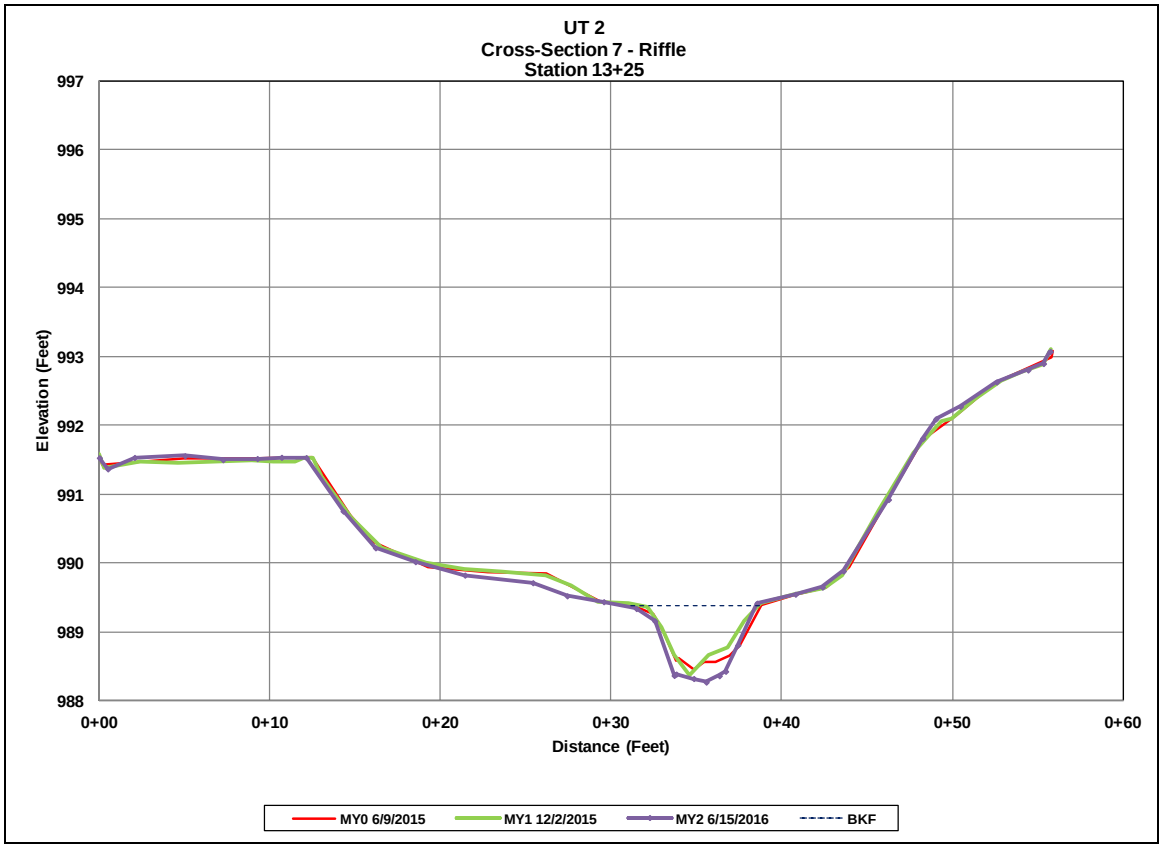
Cross-Section 6 – Upstream

Cross-Section 6 – Downstream



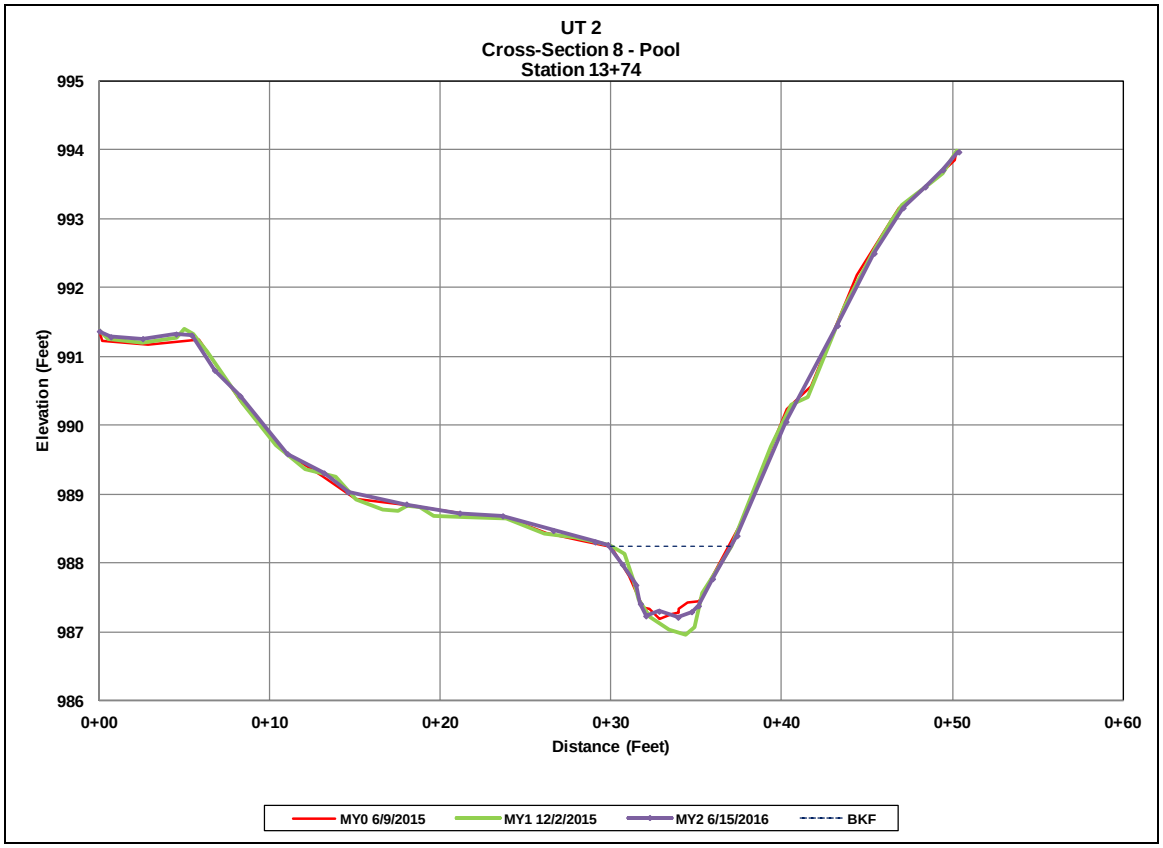
Cross-Section 7 – Upstream

Cross-Section 7 – Downstream



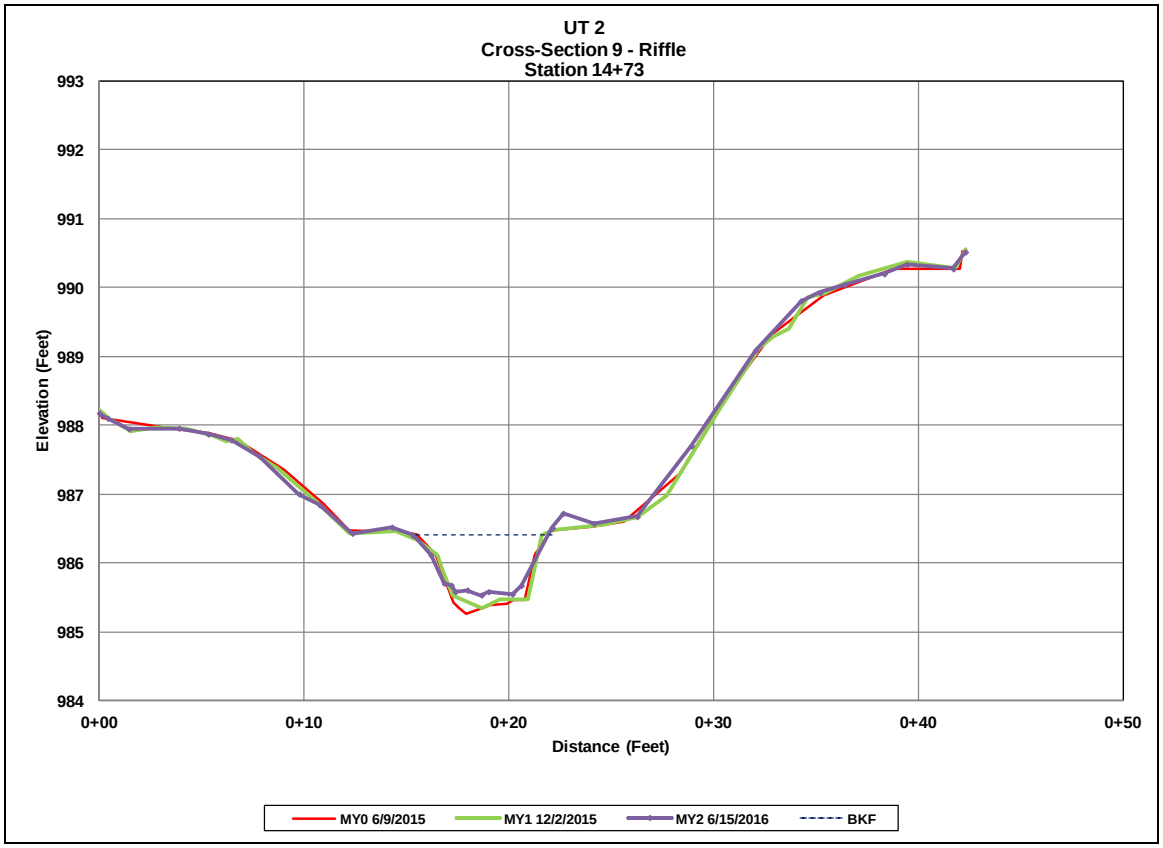
Cross-Section 8 – Upstream

Cross-Section 8 – Right Top of Bank



Cross-Section 9 – Upstream

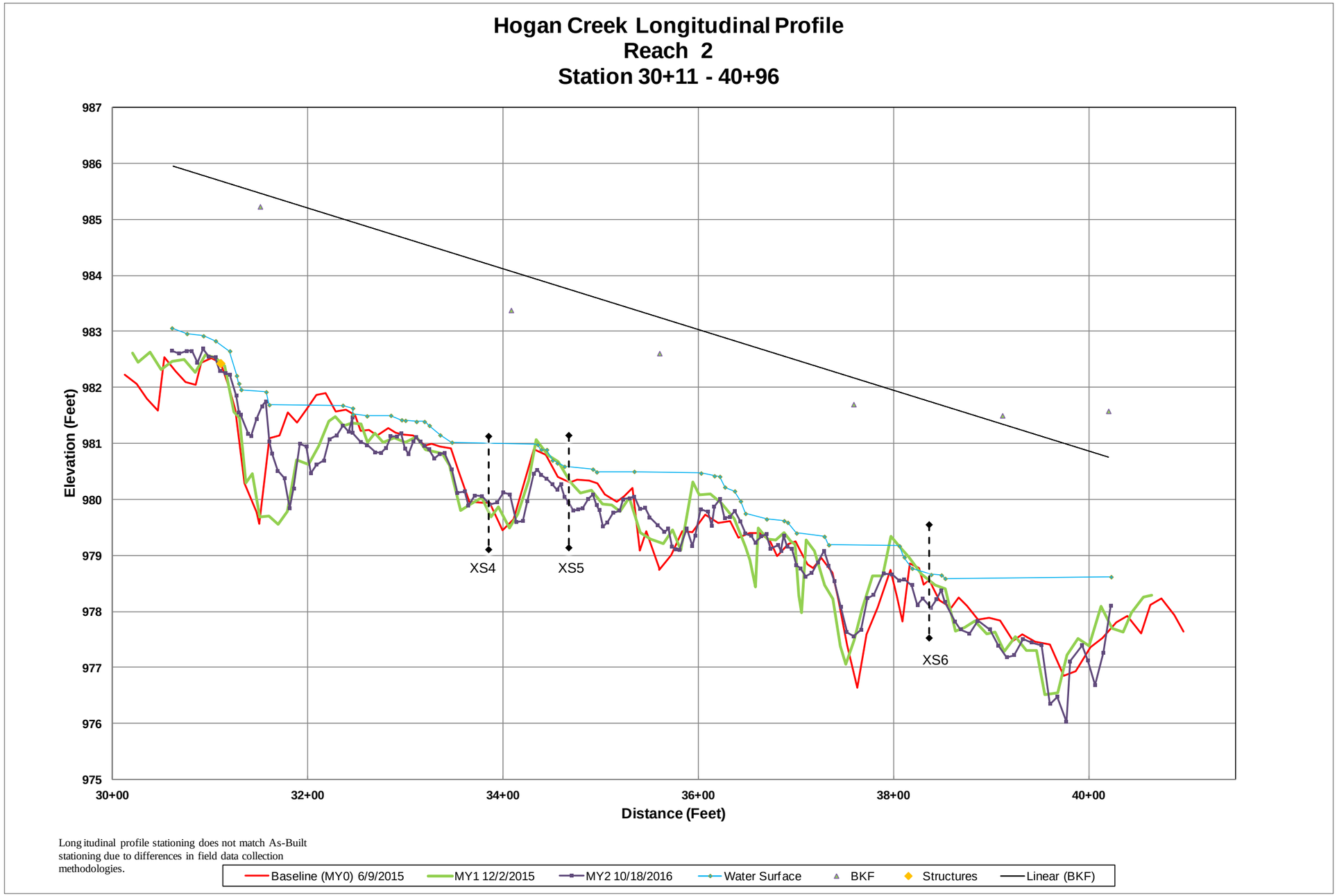
Cross-Section 9 – Downstream



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

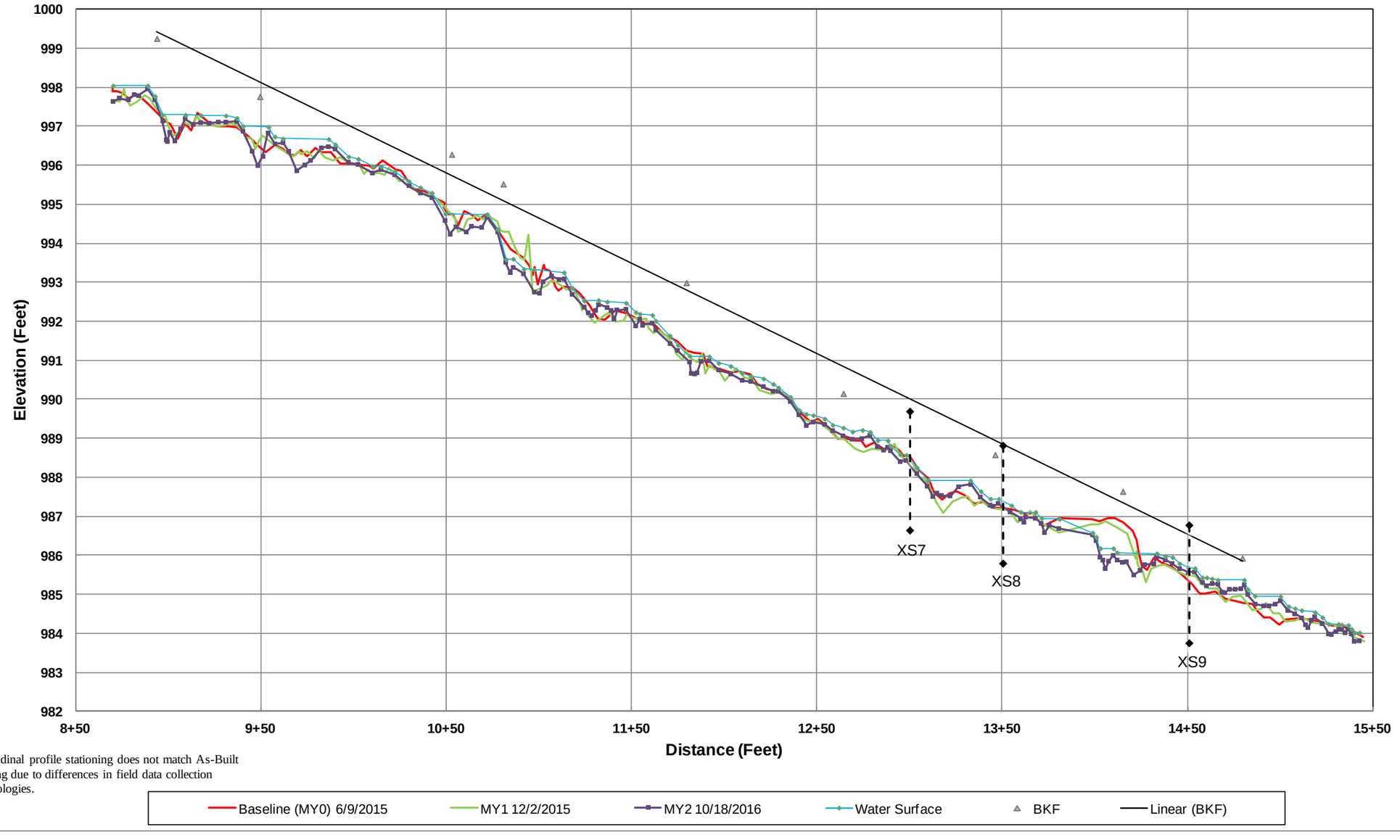
Longitudinal profile stationing does not match As-Built stationing due to differences in field data collection methodologies.

Baseline (MY0) 6/9/2015 | MY1 12/2/2015 | MY2 10/18/2016 | Water Surface | BKF | Structures | Linear (BKF)



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

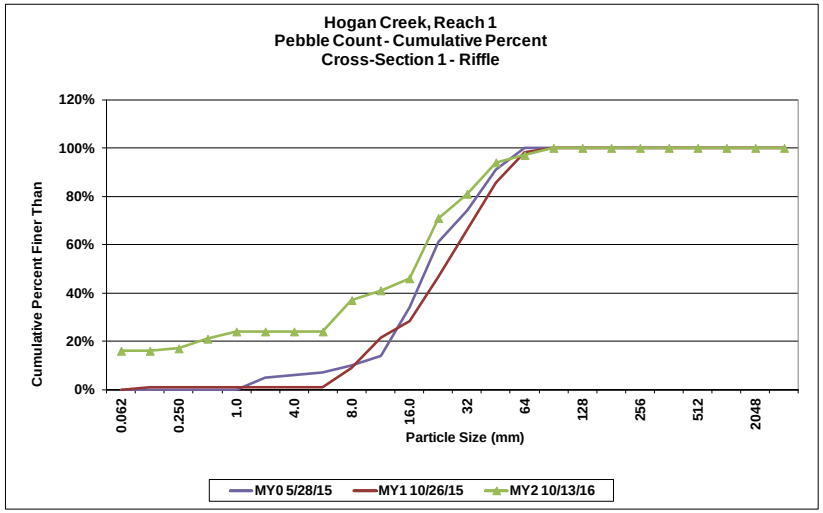
UT2 Longitudinal Profile
Station 8+70 - 15+45

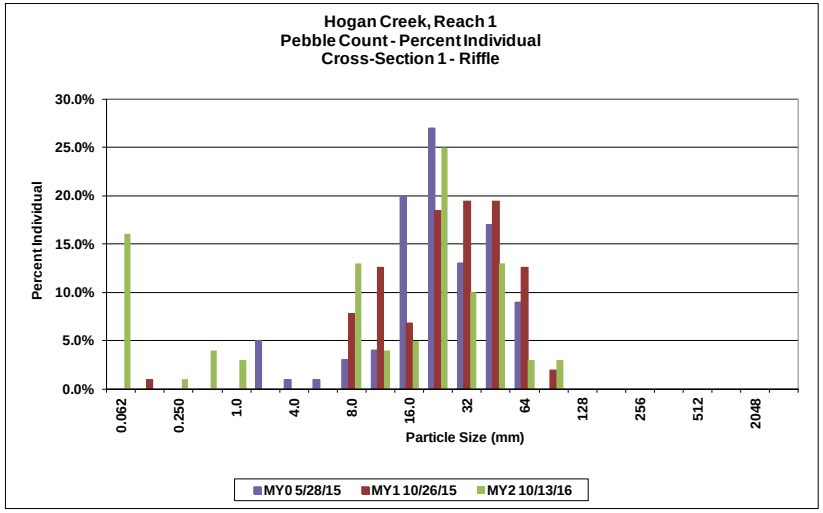


Longitudinal profile stationing does not match As-Built stationing due to differences in field data collection methodologies.

Hogan Creek Stream Mitigation / 94708 Cross Section 1 - Riffle Reach 1				
			MY2	
Material	Particle Size Class (mm)	Total	% Individual	% Cumulative
silt/clay	0.062	16	16.0%	16%
very fine sand	0.125		0.0%	16%
fine sand	0.250	1	1.0%	17%
medium sand	0.50	4	4.0%	21%
coarse sand	1.0	3	3.0%	24%
very coarse sand	2.0		0.0%	24%
very fine gravel	4.0		0.0%	24%
fine gravel	5.7		0.0%	24%
fine gravel	8.0	13	13.0%	37%
medium gravel	11.3	4	4.0%	41%
medium gravel	16.0	5	5.0%	46%
coarse gravel	22.3	25	25.0%	71%
coarse gravel	32	10	10.0%	81%
very coarse gravel	45	13	13.0%	94%
very coarse gravel	64	3	3.0%	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%**

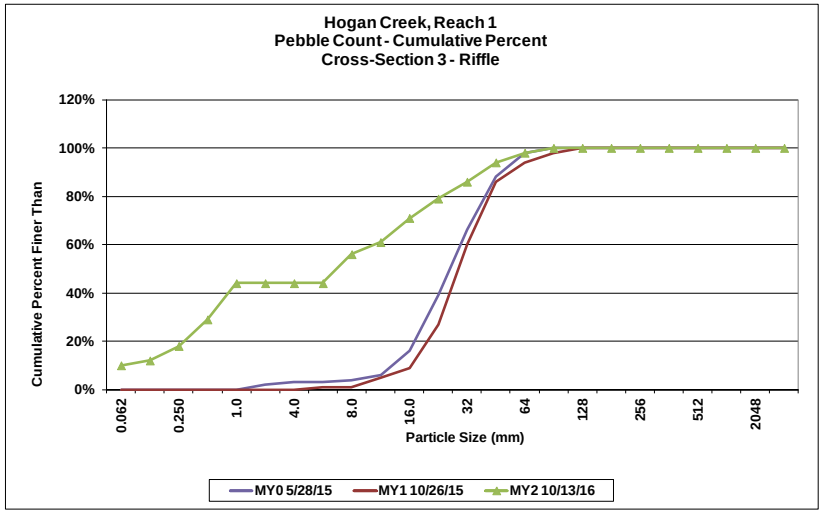
Summary Data	
D50	**17**
D84	**35**
D95	**51**

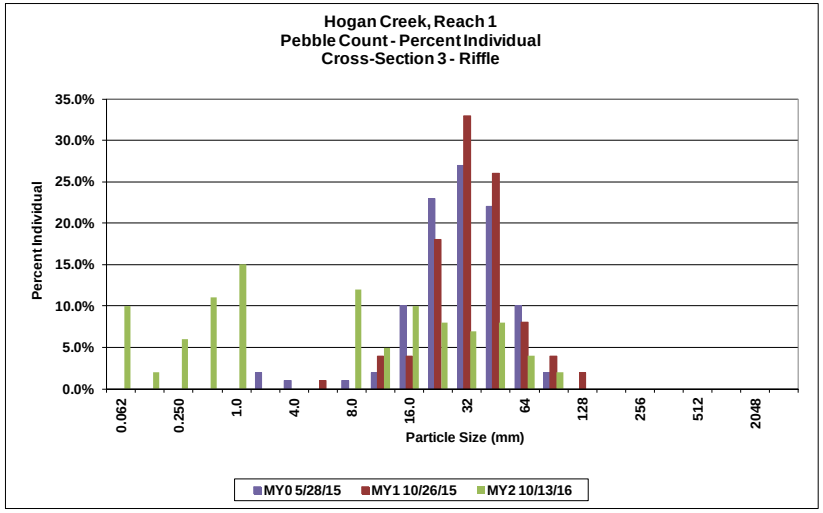




Hogan Creek Stream Mitigation / 94708 Cross Section 3 - Riffle Reach 1				
			MY2	
Material	Particle Size Class (mm)	Total	% Individual	% Cumulative
silt/clay	0.062	10	10.0%	10%
very fine sand	0.125	2	2.0%	12%
fine sand	0.250	6	6.0%	18%
medium sand	0.50	11	11.0%	29%
coarse sand	1.0	15	15.0%	44%
very coarse sand	2.0		0.0%	44%
very fine gravel	4.0		0.0%	44%
fine gravel	5.7		0.0%	44%
fine gravel	8.0	12	12.0%	56%
medium gravel	11.3	5	5.0%	61%
medium gravel	16.0	10	10.0%	71%
coarse gravel	22.3	8	8.0%	79%
coarse gravel	32	7	7.0%	86%
very coarse gravel	45	8	8.0%	94%
very coarse gravel	64	4	4.0%	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%**

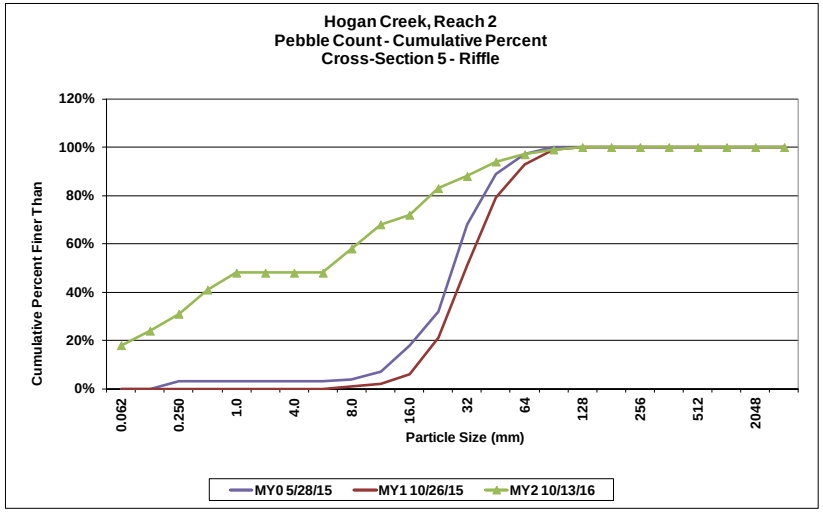
Summary Data	
D50	**6.9**
D84	**29**
D95	**49**

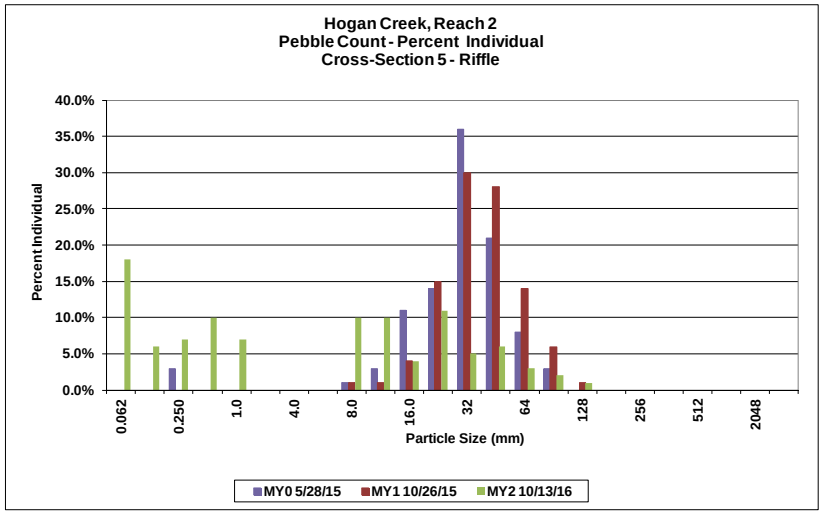




Hogan Creek Stream Mitigation / 94708 Cross Section 5 - Riffle Reach 2				
			MY2	
Material	Particle Size Class (mm)	Total	% Individual	% Cumulative
silt/clay	0.062	18	18.0%	18%
very fine sand	0.125	6	6.0%	24%
fine sand	0.250	7	7.0%	31%
medium sand	0.50	10	10.0%	41%
coarse sand	1.0	7	7.0%	48%
very coarse sand	2.0		0.0%	48%
very fine gravel	4.0		0.0%	48%
fine gravel	5.7		0.0%	48%
fine gravel	8.0	10	10.0%	58%
medium gravel	11.3	10	10.0%	68%
medium gravel	16.0	4	4.0%	72%
coarse gravel	22.3	11	11.0%	83%
coarse gravel	32	5	5.0%	88%
very coarse gravel	45	6	6.0%	94%
very coarse gravel	64	3	3.0%	97%
small cobble	90	2	2.0%	99%
medium cobble	128	1	1.0%	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%**

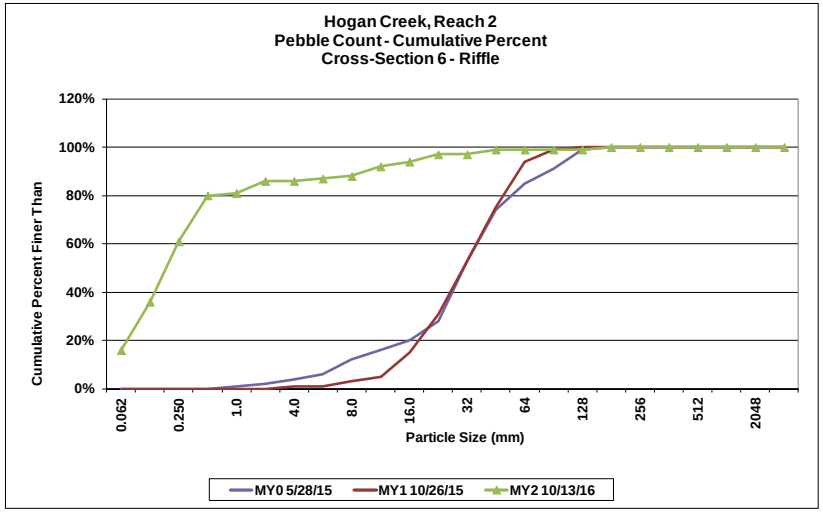
Summary Data	
D50	**6.4**
D84	**24**
D95	**51**





Hogan Creek Stream Mitigation / 94708 Cross Section 6 - Riffle Reach 2				
			MY2	
Material	Particle Size Class (mm)	Total	% Individual	% Cumulative
silt/clay	0.062	16	16.0%	16%
very fine sand	0.125	20	20.0%	36%
fine sand	0.250	25	25.0%	61%
medium sand	0.50	19	19.0%	80%
coarse sand	1.0	1	1.0%	81%
very coarse sand	2.0	5	5.0%	86%
very fine gravel	4.0		0.0%	86%
fine gravel	5.7	1	1.0%	87%
fine gravel	8.0	1	1.0%	88%
medium gravel	11.3	4	4.0%	92%
medium gravel	16.0	2	2.0%	94%
coarse gravel	22.3	3	3.0%	97%
coarse gravel	32		0.0%	97%
very coarse gravel	45	2	2.0%	99%
very coarse gravel	64		0.0%	99%
small cobble	90		0.0%	99%
medium cobble	128		0.0%	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	**0.18**
D84	**1.5**
D95	**18**



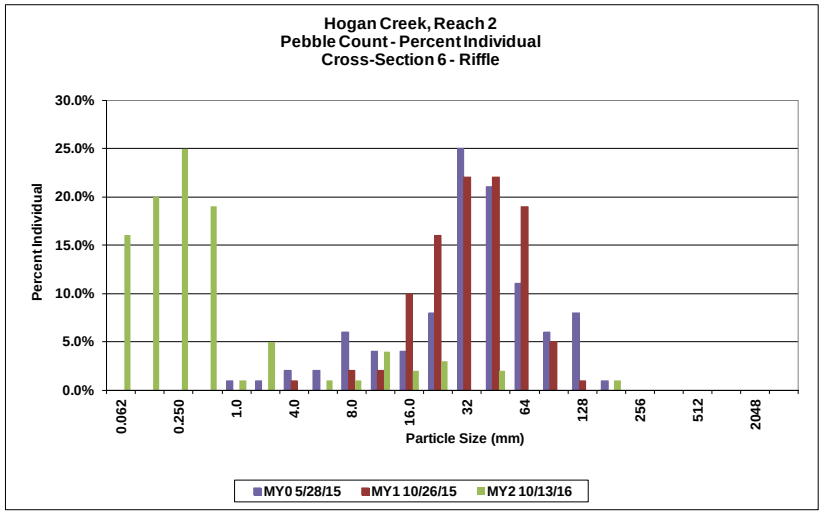


Table 8a. Baseline Stream Data Summary

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)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25.0	62.6	-	88.0	-	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/ft^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 8b. 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 8c. 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 9. 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	990.8	990.8				990.7	990.7	990.7				987.6	987.6	987.6			
Bankfull Width (ft)	25.6	25.4	25.6				29.1	30.6	26.2				22.8	22.9	22.9			
Floodprone Width (ft)	>100	>100	>100				N/A	N/A	N/A				>100	>100	>100			
Bankfull Mean Depth (ft)	1.7	1.6	1.7				2.0	2.2	2.0				1.8	2.0	2.4			
Bankfull Max Depth (ft)	2.9	2.9	3.2				4.5	4.9	4.9				2.7	3.6	4.0			
Bankfull Cross Sectional Area (ft^2)	43.9	41.8	44.2				57.6	66.7	64.2				41.4	45.9	54.6			
Bankfull Width/Depth Ratio	14.9	15.4	14.8				14.7	14.1	10.7				12.6	11.4	9.6			
Bankfull Entrenchment Ratio	>3.9	>3.9	>3.8				N/A	N/A	N/A				>4.4	>4.4	>4.4			
Bankfull Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0				1.0	1.0	1.0			
d50 (mm)	19	23	17				N/A	N/A	N/A				26	29	6.9			
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	984.0	984				983.6	983.6	983.6				982.1	982.1	982.1			
Bankfull Width (ft)	44.6	45.5	44				24.2	24.8	25.3				24.7	28.1	28.2			
Floodprone Width (ft)	N/A	N/A	N/A				>100	>100	>100				>100	>100	>100			
Bankfull Mean Depth (ft)	2.2	2.1	1.6				1.9	2.0	2.2				2.3	2.0	2.2			
Bankfull Max Depth (ft)	4.2	4.3	4.2				3.2	3.6	3.9				3.6	3.8	3.9			
Bankfull Cross Sectional Area (ft^2)	98.9	95.4	69.1				45.2	49.2	56.7				56.6	56.5	61.1			
Bankfull Width/Depth Ratio	20.1	21.7	28.1				13.0	12.5	11.3				10.8	14.0	13			
Bankfull Entrenchment Ratio	N/A	N/A	N/A				>4.1	>4.0	>4				>4.0	>3.6	>3.5			
Bankfull Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0				1.0	1.0	1.0			
d50 (mm)	N/A	N/A	N/A				27	32	6.4				31	30	0.18			
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	989.4	989.4				988.2	988.2	988.2				986.4	986.4	986.4			
Bankfull Width (ft)	7.6	6.9	8.2				6.9	7.1	7.1				6.5	6.8	6.8			
Floodprone Width (ft)	28.8	29.0	26.1				N/A	N/A	N/A				21.0	20.6	19.2			
Bankfull Mean Depth (ft)	0.5	0.5	0.5				0.6	0.7	0.7				0.7	0.7	0.6			
Bankfull Max Depth (ft)	0.9	1.0	1.0				1.0	1.3	1.0				1.2	1.1	0.9			
Bankfull Cross Sectional Area (ft^2)	4.0	3.5	4.2				4.4	5.1	4.7				4.7	4.6	4.1			
Bankfull Width/Depth Ratio	14.2	13.6	16				10.7	9.8	10.8				8.9	10.3	11.3			
Bankfull Entrenchment Ratio	3.8	4.2	3.2				N/A	N/A	N/A				3.2	3.0	2.8			
Bankfull Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0				1.0	1.0	1.0			
d50 (mm)	N/A	N/A	N/A				N/A	N/A	N/A				N/A	N/A	N/A			

N/A - Not Applicable

Table 10a. Monitoring Data - Stream Reach Data Summary
Hogan Creek/94708 - Hogan Creek/Reach 1 (1,532 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	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)	22.8	24.2	24.2	25.6	N/A	2	22.9	24.2	24.2	25.4	N/A	2	22.9	24.25	24.3	25.6	N/A	2																		
Floodprone Width (ft)	>100	>100	>100	>100	N/A	2	>100	>100	>100	>100	N/A	2	>100	>100	>100	>100	N/A	2																		
Bankfull Mean Depth (ft)	1.7	1.8	1.8	1.8	N/A	2	1.6	1.8	1.8	2.0	N/A	2	1.7	2.1	2.1	2.4	N/A	2																		
Bankfull Max Depth (ft)	2.7	2.8	2.8	2.9	N/A	2	2.9	3.3	3.3	3.6	N/A	2	3.2	3.6	3.6	4	N/A	2																		
Bankfull Cross Sectional Area (ft^2)	41.4	42.7	42.7	43.9	N/A	2	41.8	43.9	43.9	45.9	N/A	2	44.2	49.4	49.4	54.6	N/A	2																		
Width/Depth Ratio	12.6	13.8	13.8	14.9	N/A	2	11.4	13.4	13.4	15.4	N/A	2	9.6	12.2	12.2	14.8	N/A	2																		
Entrenchment Ratio	>3.9	>4.2	>4.2	>4.4	N/A	2	>3.9	>4.2	>4.2	>4.4	N/A	2	>3.8	>4.1	>4.1	>4.4	N/A	2																		
Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2																		
Profile																																				
Riffle Length (ft)	37.2	58.9	-	98.4	-	8	15.0	62.1	73.5	98.0	-	8	11.7	23.2	23.6	38	-	1																		
Riffle Slope (ft/ft)	0.002	0.010	-	0.018	-	8	0.006	0.013	0.011	0.020	-	8	0.01	0.05	0.02	0.06	-	10																		
Pool Length (ft)	25.0	62.6	-	88.0	-	13	20.0	67.1	76.0	105.0	-	13	30.9	85.3	89.5	141	-	13																		
Pool Max depth (ft)	2.5	3.2	-	4.1	-	13	2.8	3.7	3.4	4.8	-	13	2.3	3.7	3.6	5.1	-	13																		
Pool Spacing (ft)	73.3	120.9	-	200.1	-	12	52.0	112.8	111.0	148.0	-	12	57	110.1	103	204.0	-	12																		
Pattern																																				
Channel Beltwidth (ft)	63.0	96.5	101.0	121.0	24.9	4																														
Radius of Curvature (ft)	70.0	76.5	75.0	86.0	6.8	4																														
Rc:Bankfull width (ft/ft)	2.9	3.2	3.1	3.6	N/A	N/A																														
Meander Wavelength (ft)	165.0	263.7	306.0	320.0	85.7	3																														
Meander Width Ratio	2.6	4.0	4.2	5.0	N/A	N/A																														
Additional Reach Parameters																																				
Rosgen Classification	C4						C4						C4																							
Channel Thalweg length (ft)	1,532						1,530						1,532																							
Sinuosity (ft)	1.18						1.18						1.18																							
Water Surface Slope (Channel) (ft/ft)	0.0063						0.0064						0.007																							
BF slope (ft/ft)	0.0067						0.0069						0.0069																							
Ri% / Ru% / P% / G% / S%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																		
SC% / Sa% / G% / C% / B% / Be%	0%	3.5%	96%	0.5%	0%	0%	0%	0.5%	98%	1.5%	0%	0%	13%	21.0%	64%	3.0%	0%	0%																		
d16 / d35 / d50 / d84 / d95 /	14	19	23	41	56		13	21	27	44	62		0.19	6.1	10	33	50																		
% of Reach with Eroding Banks	0%						7%						9%																							
Channel Stability or Habitat Metric																																				
Biological or Other																																				

N/A - Not Applicable
- Information Unavailable

Table 10b. Monitoring Data - Stream Reach Data Summary
Hogan Creek/94708 - Hogan Creek/Reach 2 (1,085 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	24.2	24.5	24.5	24.7	N/A	2	24.8	26.5	26.5	28.1	N/A	2	25.3	26.75	26.8	28.2	N/A	2																		
Floodprone Width (ft)	>100	>100	>100	>100	N/A	2	>100	>100	>100	>100	N/A	2	>100	>100	>100	>100	N/A	2																		
Bankfull Mean Depth (ft)	1.9	2.1	2.1	2.3	N/A	2	2.0	2.0	2.0	2.0	N/A	2	2.2	2.2	2.2	2.2	N/A	2																		
Bankfull Max Depth (ft)	3.2	3.4	3.4	3.6	N/A	2	3.6	3.7	3.7	3.8	N/A	2	3.9	3.9	3.9	3.9	N/A	2																		
Bankfull Cross Sectional Area (ft^2)	45.2	50.9	50.9	56.6	N/A	2	49.2	52.9	52.9	56.5	N/A	2	56.7	58.9	58.9	61.1	N/A	2																		
Width/Depth Ratio	10.8	11.9	11.9	13.0	N/A	2	12.5	13.3	13.3	14.0	N/A	2	11.3	12.2	12.2	13.0	N/A	2																		
Entrenchment Ratio	>4.0	>4.1	>4.1	>4.1	N/A	2	>3.6	>3.8	>3.8	>4.0	N/A	2	>3.5	>3.75	>3.75	>4.0	N/A	2																		
Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2																		
Profile																																				
Riffle Length (ft)	95.6	111.6	-	130.3	-	5	56.0	91.0	101.0	125.0	-	5	24.7	51.8	46.9	97.6	-	5																		
Riffle Slope (ft/ft)	0.004	0.005	-	0.007	-	5	0.004	0.009	0.007	0.018	-	5	0.01	0.012	0.01	0.02	-	5																		
Pool Length (ft)	43.7	68.8	-	117.1	-	5	60.0	87.3	64.0	135.0	-	5	29.9	74.4	75.4	107.0	-	5																		
Pool Max depth (ft)	3.8	4.7	-	5.8	-	5	4.0	4.8	4.6	5.7	-	5	3.77	4.4	4.4	5.4	-	5																		
Pool Spacing (ft)	164.1	208.4	-	253.1	-	4	169.0	196.5	189.5	238.0	-	4	93.7	134.2	129	201.0	-	4																		
Pattern																																				
Channel Beltwidth (ft)	84.0	114.0	117.0	141.0	28.6	3																														
Radius of Curvature (ft)	69.0	73.3	74.0	75.0	2.8	5																														
Rc:Bankfull width (ft/ft)	2.8	3.0	3.0	3.1	N/A	N/A																														
Meander Wavelength (ft)	292.0	307.0	301.0	328.0	18.7	3																														
Meander Width Ratio	3.4	4.7	4.8	5.8	N/A	N/A																														
Additional Reach Parameters																																				
Rosgen Classification	C4						C4						C4																							
Channel Thalweg length (ft)	1,085						1,085						1,085																							
Sinuosity (ft)	1.37						1.37						1.37																							
Water Surface Slope (Channel) (ft/ft)	0.0050						0.0045						0.005																							
BF slope (ft/ft)	0.0053						0.0053						0.0053																							
Ri% / Ru% / P% / G% / S%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																		
SC% / Sa% / G% / C% / B% / Be%	0%	3%	9%	89%	0%	0%	0%	0%	99%	1%	0%	0%	17%	50.0%	31%	2.0%	0%	0%																		
d16 / d35 / d50 / d84 / d95 /	13	24	22	35	49		18	25	31	52	70		0.06	0.16	0.3	17	40																		
% of Reach with Eroding Banks	0%						2%						13%																							
Channel Stability or Habitat Metric																																				
Biological or Other																																				

N/A - Not Applicable
- Information Unavailable

Table 10c. Monitoring Data - Stream Reach Data Summary
Hogan Creek/94708 - UT2 (675 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	6.5	7.1	7.1	7.6	N/A	2	6.8	6.9	6.9	6.9	N/A	2	6.8	7.5	7.5	8.2	N/A	2																		
Floodprone Width (ft)	21	24.9	24.9	28.8	N/A	2	20.6	24.8	24.8	29.0	N/A	2	19.2	22.65	22.7	26.1	N/A	2																		
Bankfull Mean Depth (ft)	0.5	0.6	0.6	0.7	N/A	2	0.5	0.6	0.6	0.7	N/A	2	0.5	0.55	0.55	0.6	N/A	2																		
Bankfull Max Depth (ft)	0.9	1.1	1.1	1.2	N/A	2	1.0	1.1	1.1	1.1	N/A	2	0.9	0.95	0.95	1.0	N/A	2																		
Bankfull Cross Sectional Area (ft^2)	4.0	4.4	4.4	4.7	N/A	2	3.5	4.1	4.1	4.6	N/A	2	4.1	4.15	4.15	4.2	N/A	2																		
Width/Depth Ratio	8.9	11.6	11.6	14.2	N/A	2	10.3	12.0	12.0	13.6	N/A	2	11.3	13.65	13.7	16.0	N/A	2																		
Entrenchment Ratio	3.2	3.5	3.5	3.8	N/A	2	3.0	3.6	3.6	4.2	N/A	2	2.8	3	3	3.2	N/A	2																		
Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2																		
Profile																																				
Riffle Length (ft)	14.3	34.4	-	67.3	-	11	12.0	28.9	29.0	62.0	-	11	7.88	29.3	25.6	69.8	-	11																		
Riffle Slope (ft/ft)	0.014	0.028	-	0.052	-	11	0.014	0.026	0.024	0.050	-	11	0.01	0.041	0.030	0.1	-	11																		
Pool Length (ft)	4.2	11.0	-	27.1	-	12	7.0	13.3	12.0	28.0	-	13	7.07	17.2	13.7	50.4	-	13																		
Pool Max depth (ft)	1.2	2.0	-	3.2	-	12	1.1	1.7	1.7	2.4	-	13	1.14	1.7	1.7	2.3	-	13																		
Pool Spacing (ft)	13.1	54.8	-	151.0	-	11	8.0	50.4	43.5	145.0	-	12	11.9	47.8	35.9	138	-	12																		
Pattern																																				
Channel Beltwidth (ft)	26.0	38.0	39.0	54.0	2.7	5																														
Radius of Curvature (ft)	19.0	21.6	22.0	26.0	2.4	6																														
Rc:Bankfull width (ft/ft)	2.7	3.0	3.1	3.7	N/A	N/A																														
Meander Wavelength (ft)	101.0	112.3	109.5	132.0	2.7	6																														
Meander Width Ratio	3.7	5.4	5.5	7.6	N/A	N/A																														
Additional Reach Parameters																																				
Rosgen Classification	B4						B4						B4																							
Channel Thalweg length (ft)	675						670						675																							
Sinuosity (ft)	1.24						1.24						1.24																							
Water Surface Slope (Channel) (ft/ft)	0.0218						0.0208						0.0215																							
BF slope (ft/ft)	0.0229						0.0226						0.0224																							
Ri% / Ru% / P% / G% / S%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																		
SC% / Sa% / G% / C% / B% / Be%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																			
d16 / d35 / d50 / d84 / d95 /		-	-	-	-			-	-	-	-		-	-	-	-	-																			
% of Reach with Eroding Banks	0%						0%						0%																							
Channel Stability or Habitat Metric																																				
Biological or Other																																				

N/A - Not Applicable
- Information Unavailable

Appendix E

Hydrologic Data

Table 11. Verification of Bankfull Events Hogan Creek Stream Mitigation / 94708					
Reach	**Date of Data Collection**	**Date of Occurrence**	**Method**	**Measurement (ft)**	**Photo (If Available)**
Hogan Creek Reach 2	10/26/2015	10/2/2015-10/3/2015	Crest Gauge	*4.0	-
UT2	10/26/2015	10/2/2015-10/3/2015	Crest Gauge	0.9	-
UT2 & Hogan Creek Reach 3	4/12/2016	4/1/2016-4/12/2016	Wrack Lines/Sediment Deposition	-	Photos 1-3
UT2	8/2/2016	~ 6/16/2016	Crest Gauge	0.79	Photo 4

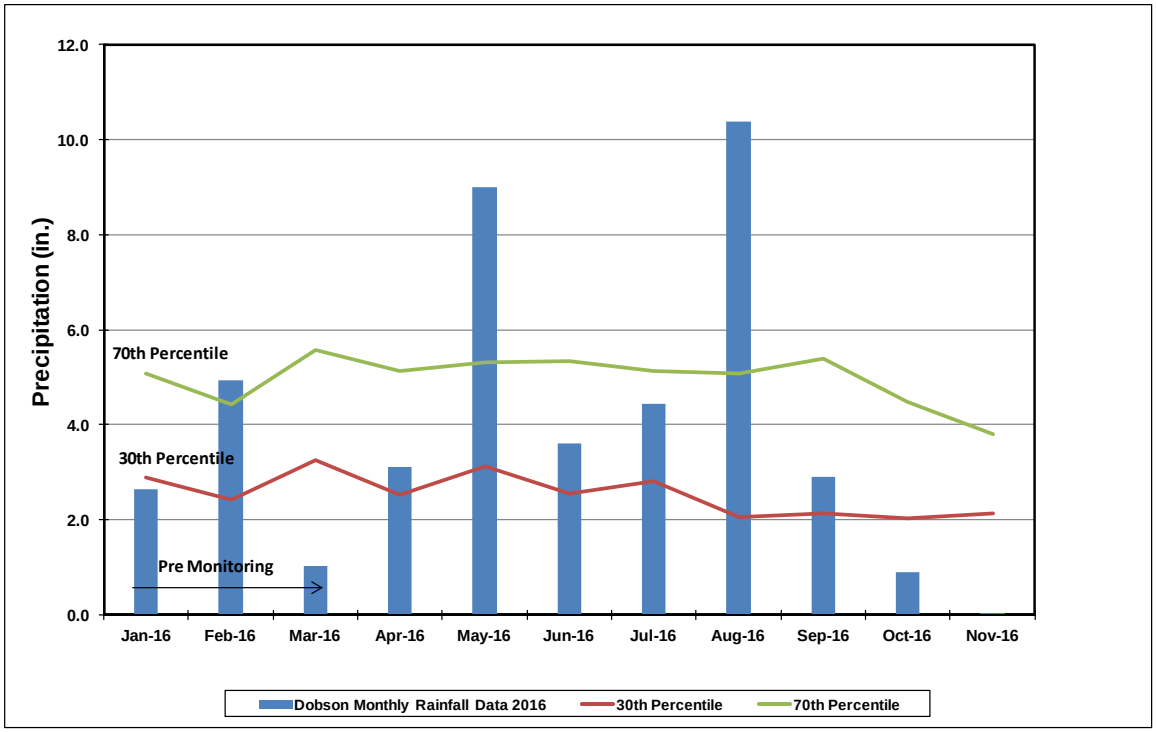
*Crest Gauge was damaged from bankfull event

Photo 1. Wrack lines on UT2 Station 13+25, April 12, 2016

Photo 2. Wrack lines on Hogan Creek Reach 3 Station 36+00, April 12, 2016

Photo 3. Wrack lines and sediment deposition on Hogan Creek Reach 3 Station 37+00, April 12, 2016

Photo 4. UT2 Crest Guage, Station 13+25, 0.79 Ft., August 2, 2016


12.0
10.0
8.0
6.0
4.0
2.0
0.0
Precipitation (in.)
70th Percentile
30th Percentile
Pre Monitoring
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dobson Monthly Rainfall Data 2016
30th Percentile
70th Percentile