Shadrick Creek Restoration Project

As-Built Baseline Monitoring Report

FINAL

Shadrick Creek Stream Restoration Project
NCDMS Contract No. 7343
NCDMS Project No. 92916
DWR# 10-04065
USACE Action ID: 2010-00764
McDowell County, North Carolina
Data Collected: September 29th, 2017 – December 14th, 2017
Date Submitted: February 11th, 2018

Submitted to:

NCDEQ-Division of Mitigation Services
1652 Mail Service Center Raleigh N C 27699-1652

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EQUINOX
balance through proper planning

February 16, 2018

Matthew Reid
Project Manager
DENR Division of Mitigation Services
5 Ravenscroft Dr., #102
Asheville, NC 28801

Subject: Revisions to Shadrick Creek As-Built Baseline Monitoring Report; NCDMS Project #92916

Dear Mr. Reid,

The North Carolina Division of Mitigation Services contracted the services of Equinox to compile and report on the baseline conditions of the Shadrick Creek Restoration Project. Comments provided by NCDMS on February 16th, 2018 are listed below with red text indicating how each was addressed:

Title Page/ Cover:

• Please use "Shadrick Creek Restoration Project" as the name of the project. "Shadrick Creek Restoration Project" has been updated throughout the report.

• Add the following information below the NCDMS Project Number:

- DWR# 10-0465
- USACE Action ID: 2010-00764

The information above has been added below the NCDMS Project number on the title page.

1.4 Mitigation Components:

• Please revise the second paragraph in the section to reflect the changes in length/ assets for UT9 Reach 2 as shown in Table 1. The second paragraph in in this section have been updated to reflect the changes in assets for UT9 Reach 2.

Table 1:

• UT9 Reach 2 currently shows 238 feet in the Restoration Footage column. Asbuilt stationing is 19+59-22+08. That would be 249 feet. Please revise the table and the report as necessary to reflect this change. Table 1 and the report have been updated to reflect the change in assets for UT9 Reach 2.

Table 2:

• Please use the attached Table 2 in the final and future submittals. The IRT has requested that the dates for vegetation and stream data be included in the monitoring reports. The provided Table 2 has been added to the report and will be included in future monitoring reports.

Table 3:

• Please update the designer information to the following:

Wildlands Engineering, Inc.; 167B Haywood Road; Asheville, NC 28806; Andrew Bick (828) 774-5547. Table 3 has been updated to show the information listed above.

Permanent Photo Stations:

• Permanent photo stations are needed on Preservation Reaches (UT2, UT5, UT6, UT7, and UT8). Beginning in MY1, please establish photo stations on those reaches and add to CCPV. Equinox will work with DMS to best capture the Preservations Reaches not yet depicted with a Permanent Photo Station in MY1.

Cross-Sections:

• Cross-section order (1-19) is correct in the pdf, but the hard copy order was 19-1. Please ensure final deliverable hard copies are in the correct order. Final deliverable hard copies are in the correct order.

General Cross-section/ Table 8 comment:

• The IRT has expressed concern over BHR having a measurement of 1 throughout the monitoring period. For future monitoring reports, please update the calculations to reflect changes observed I the overlay and explain in detail as a table footnote how calculations were made. Please update the reports as necessary to justify whether or not any changes observed in a cross section represent an issue. For future monitoring reports, attention will be paid to the BHR and changes will be made as necessary.

General Comment:

• As Equinox has done in the past, please include a response to the comment letter and how/ where comments were addressed. Please insert this letter directly behind the cover page in the final deliverables (printed and electronic). The IRT has requested that we include this letter with the final deliverables. The response letter will need to be included with all future monitoring deliverables. This letter will be included behind the cover page of the final hard copies and the electronic deliverable.

The Equinox project manager for this project is Mr. Drew Alderman. His contact is as follows:

Natural Resource Specialist
Equinox
37 Haywood Street
Asheville, NC 28801
Office: 828-253-6856 ext. 213
Fax: 828-253-8256

Sincerely,

Drew Alderman

Prepared by:

37 Haywood Street, Suite 100
Asheville, NC 28801

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Table of Contents

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1.0 PROJECT SUMMARY

1.1. Project Setting and Background

The Shadrick Creek Restoration Project (Shadrick) is located in the Catawba River Basin (CU 03050101). The Shadrick Creek site is also located within the Muddy Creek (Upper Catawba) Local Watershed (LWP) area. The Shadrick Creek site watershed also includes the Hydrologic Code (HUC) 0305010103006, which is identified as a Targeted Local Watershed (TLW) in the Ecosystem Enhancement Program's (EEP) 2009 Upper Catawba River Basin Restoration Priority (RBRP) Plan. Project work at the Shadrick site was completed in April 2017, and included construction, planting, invasive treatment, and fence installation. Through the project work, a total of 1,353 linear feet were restored, 6,966 linear feet were enhanced through Enhancement I, 215 linear feet were enhanced through Enhancement II, 2,895 linear feet were preserved, and 0.54 acre of wetlands were enhanced. The site generated a total of 6,662 SMU's, 0.27 WMU, and 527,000 SF of Buffer. Refer to Table 1 for the project components and mitigation credit information and Figure 2 for the project asset map.

The Shadrick site has a history of unrestricted livestock access, leading to bank erosion, compaction, and discontinuity between the stream and its associated floodplain. Historic agricultural practices, including recent tree farming, and removal of the vegetative buffer have caused loss of plant diversity, stream incision, and failing banks. The completed project will reduce sediment inputs from the failing banks, reduce nutrients and bacteria entering the stream from livestock, and will enhance the forested corridor along the stream floodplain.

This project is protected by a 54.6 acre conservation easement and is located approximately 5.5 miles east of Nebo, NC in McDowell County at 35.720410° N, 81.901405° W. The Shadrick Creek site is bounded to the north by the Norfolk Southern Railroad and agricultural and forest land to the south, east, and west.

1.2. Project Goals and Objectives

The project goals address stressors identified in the TLW and priority subwatershed, as outline in the Final Mitigation Plan, and include:

- Improve water quality by repairing eroding stream banks, establishing riparian buffers and implementing agricultural best management practices;
- Improve the community structures of the buffers;
- Improve stream function and habitat by re-establishing stream-to-flood connections;
- Restore long-term stability through the restoration on channel dimensions, pattern, and profile;
- Improve in-stream habitat using in-stream structures; and
- Remove exotic invasive plant species.

The following objectives are proposed for accomplishing the above listed goals as outlined in the Final Mitigation Plan:

- Restoration and enhancement of approximately 5,276 LF of Shadrick Creek;
- Restoration and enhancement of 3,179 LF of UT's 1, 5, 9, and 10;
- Preservation of 3,835 LF of UT's 2, 5, 6, 7, and 8;
- Enhancement of 0.53 acre of wetland by improving hydrologic connections and vegetation communities;

- Installing over 8,000 LF of livestock fence, three wells and six watering tanks; and
- Establishment of riparian buffers by removing exotic invasive plants and installing a variety of native vegetation.

1.3. Project Success Criteria

The stream restoration success criterial for the project will follow accepted and approved criteria based on the Mitigation Plan for Shadrick Creek Stream Restoration (2010). The Shadrick Creek Mitigation Plan references the Stream Mitigation Guidelines issued in April 2003 by the USACE and NCDWQ.

Specific success criteria are presented below.

1.3.1. Streams

The stream geometry will be considered successful if the cross section geometry, profile, and sinuosity are stable or reach a dynamic equilibrium. It is expected that there will be changes in the designed cross sections, profile, and/or substrate composition. Any changes that occur during the monitoring period will be evaluated to determine whether they represent a trend toward a less stable condition (e.g., down cutting, erosion, etc.) or simply an increase in stability (e.g., settling, vegetative changes, coarsening of bed material, etc.) or move toward quasi-equilibrium.

An initial, though not exclusive, indicator of success will be the stream's adherence to design or reference ratios of stream geometry found in the morphological table in Appendix D or in a comparable, stable reference system. The channel may not adhere to design or reference ratios of stream geometry, but can be considered stable if the following key indicators are present:

- Stream Type: Maintenance of the design stream type or progression toward/conversion to a stable stream type such as C or E will indicate stability.
- Bank Height Ratio: Bank height ratio between 1.0 and 1.2 will indicate that flood flows have access to the active floodplain and that higher flows do not apply excessive stresses to stream banks.

Determination of true bankfull may be difficult to determine until the stream has experienced adequate flooding events to create strong bankfull indicators. Stream bank erosion upstream of the project site will persistently contribute sediment to the project reaches due to unstable upstream banks. Excess sediment will be routed through the project area or deposited in target areas such as point bars and the floodplain. Minor sedimentation of pools and glides may occur. The pools are designed to be over-dug to account for some sedimentation in pools and glides. If a large storm event occurs before the woody vegetation has established, isolated bank erosion may occur in sections where the flood-prone area has been restricted by topography or easements. Areas of bank erosion will be repaired as necessary.

1.3.2. Vegetation

The success of riparian vegetation planting will be gauged by stem counts of planted species. Stem counts of more than 320 trees per acre after three years, and 260 trees per acre after five years will be considered successful. Photos taken at established photo points should indicate maturation of riparian vegetation.

1.4. Mitigation Components

The Shadrick Creek Restoration Project generated 6,662 SMUs, 0.27 WMU, and 527,000 Square Feet. Buffer Credits. Refer to Figure 2 for the project component/ asset map for a visual description of the project assets and Table 1 for project components and mitigation credit information for the Shadrick Creek Restoration Project. These credits are based on stream lengths surveyed during the as-built baseline survey and account for the breaks in the easement.

The total number of SMU's generated from the Shadrick Creek Restoration Project are 164 SMUs lower than what was outlined in the Shadrick Creek Restoration Project Mitigation Plan Addendum (2015). This discrepancy is due mostly to the Mitigation Plan Addendum calculating the total linear feet of stream preservation as 3,835 while the as-built report total indicates that the total linear feet of preservation equals 2,895 (difference of 940 LF). It is believed that this discrepancy is attributed to UT3 and UT4 being determined as non-jurisdictional streams. Other deviations from the Mitigation Plan exist based on data taken from the centerline survey for the As-Built survey. Please refer to Table 1 for these numbers.

1.4.1. Restoration Type and Approach

The as-built and baseline surveys found that the stream was constructed as designed and all structures were installed as planned. Stream work includes the installation of geolifts and brush mattresses to increase stability at sloped banks and log vanes to direct flow toward the center of the channel and away from banks. Constructed riffles were installed to set the grade within the profile and direct cascading flow to the center of the stream and the downstream plunge pools and root wad clusters were also installed to enhance bank stability and establish near-bank cover and pool habitat.

Shadrick Creek Reach 3 and UT9 Reach 2, which were previously impacted due to historic agricultural practices and livestock access, received Priority 2 Restoration. Uplift was gained by sloping the banks, floodplain benching, on-line/ off-line channel construction, bioengineering, in-stream structures, and planted buffers. Buffers were planted with native trees.

Shadrick Creek Reach 1 and 2, UT1, UT9 Reach 1, and UT10, which were previously impacted by livestock access, agricultural practices, and vegetative buffer removal causing widespread bank instability and erosion, received Priority 3 Enhancement I. Uplift was gained by a combination of on-line/ off0line bank sloping, floodplain benching, bioengineering, and in-stream structures. Buffers were planted with native trees and shrubs. Existing wetlands were protected during construction and planted with native plant species.

UT5, which was previously impacted by livestock access, buffer vegetation removal, and infestation of invasive exotic species, received Enhancement II. Uplift was gained by removing exotic invasive species and by establishing a wider more diverse buffer.

The two wetland areas totaling 0.53 acre, which were previously impacted by logging activities, agricultural practices, and cattle grazing, will be enhanced through cattle exclusion fencing, invasive species removal, and native tree planting.

1.5. Vicinity Map

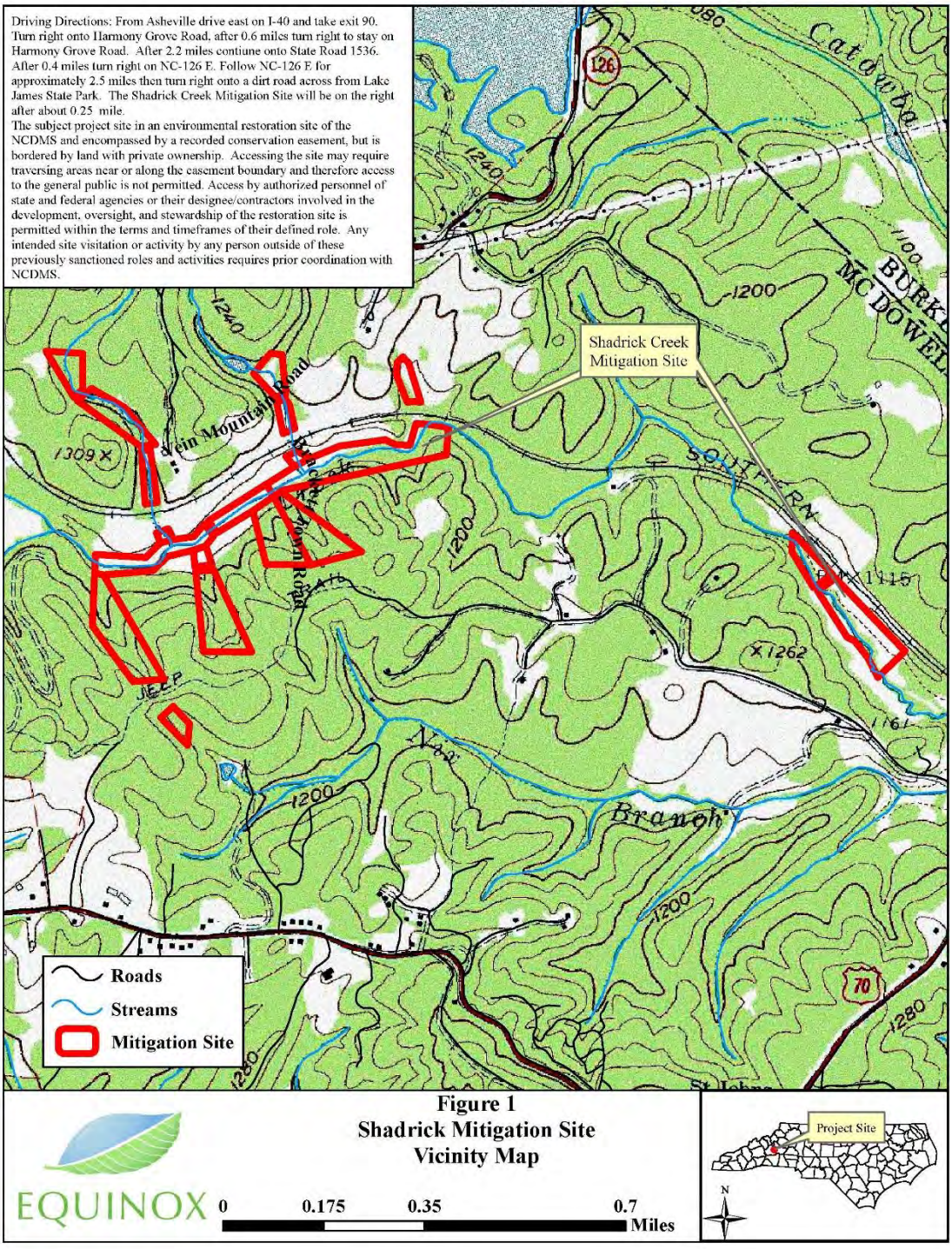

Figure 1
Shadrick Mitigation Site
Vicinity Map

2.0 REFERENCES

Ben Patton Land Surveying. 2017. As-Built Survey of Shadrick Creek Restoration Project. Prepared for N.C. Division of Mitigation Services.

Confluence Engineering. 2015. Mitigation Plan Addendum – Final, Shadrick Creek Restoration Project. . Prepared for North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Mitigation Plan Addendum – Final, Shadrick Creek Restoration Project. EEP Project No. 92916.

Kimley-Horn and Associates, Inc. 2010. Mitigation Plan for Shadrick Creek Stream Restoration. Prepared for North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Final Mitigation Plan, Shadrick Creek Stream Restoration, McDowell County. EEP Project No: 92916.

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

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Appendix A
Background Tables

Table 1. Project Mitigation Components and Summation

Shadrick Creek Stream Restoration Project

Mitigation Credits*

	Stream SMUs				Wetland WMUs	Buffer SF
Type	R	EI	EII	**P**	**E**	**527,000**
Totals	**1,353**	**4,644**	**86**	**579**	**0.27**	

Project Components

Project Component -or- Reach ID	Stationing/Location	Existing Footage/Acreage	Restoration Footage or Acreage*	Restoration Footage/Acreage Discrepancy from Mitigation Plan	Restoration -or- Restoration Equivalent	Approach (PI, PII etc.)	Mitigation Ratio	Mitigation Credits*	Buffer SF
Shadrick Reach 1	10+06 - 46+84	3,686	3,632	-6	EI	P3	1.5:1	2,421	199,000
Shadrick Reach 2	100+04 - 105+77	595	573	-2	EI	P3	1.5:1	382	226,000
Shadrick Reach 3	105+77 - 117+26	1,168	1,104	-4	R	P2	1:1	1,104	
UT-1	10+00 - 30+57	1,637	1,651	14	EI	P3	1.5:1	1,101	46,000
UT-5	6+64 - 8+79	228	215	-13	EII	Buffer	2.5:1	86	Incl. in Shadrick R1
UT's 2, 5, 6, 7 & 8	-	3,835	2,895	-940	P	Preservation	5:1	579	-
UT-9 Reach 1	9+90 - 17+42	678	706	28	EI	P3	1.5:1	471	34,000
UT-9 Reach 2	19+59 - 22+08	237	249	3	R	P2	1:1	249	
UT-10	9+92 - 13+96	391	404	13	EI	P3	1.5:1	269	24,000
Wetland A	UT 1	0.44	0.44	0	E	Stab./Buffer	2:1	0.22	-
Wetland B	Shadrick Reach 1	0.09	0.09	0	E	Buffer	2:1	0.05	-

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine	-	-	-
Restoration	1,353	-	-	-	-	-
Enhancement	-	0.53	-	-	-	-
Enhancement I	6,966	-	-	-	-	-
Enhancement II	215	-	-	-	-	-
Preservation	2,895	-	-	-	527,000 SF	-
High Quality Preservation	-	-	-	-	-	-

BMP Elements

Element	Location	Purpose/Function	Notes
FB	Entire Site	Protect Stream Channel	

BMP Elements

BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer

* Mitigation credits and stream lengths account for breaks in conservation easements

Table 2. Project Activity and Reporting History Shadrick Creek Restoration Project		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Mitigation Plan	-	May 2010
Mitigation Plan Addendum	-	Feb 2015
Final Design - Construction Plans	-	Feb 2015
Construction	Oct 2016 - Jun 2017	Jun 2017
Temporary S&E Mix Applied	Oct 2016 - Jun 2017	Jun 2017
Permanent Seed Mix Applied	Oct 2016 - Jun 2017	Jun 2017
Bare Root and Live Stake Plantings	Dec 2016 - Apr 2017	Apr 2017
Baseline Monitoring Document (Year 0 Monitoring - Baseline)	Sep 2017 - Dec 2017	Feb 2018
Stream Assessment	Dec 2017	Feb 2018
Vegetation Assessment	Sep 2017	
Year 1 Monitoring		
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

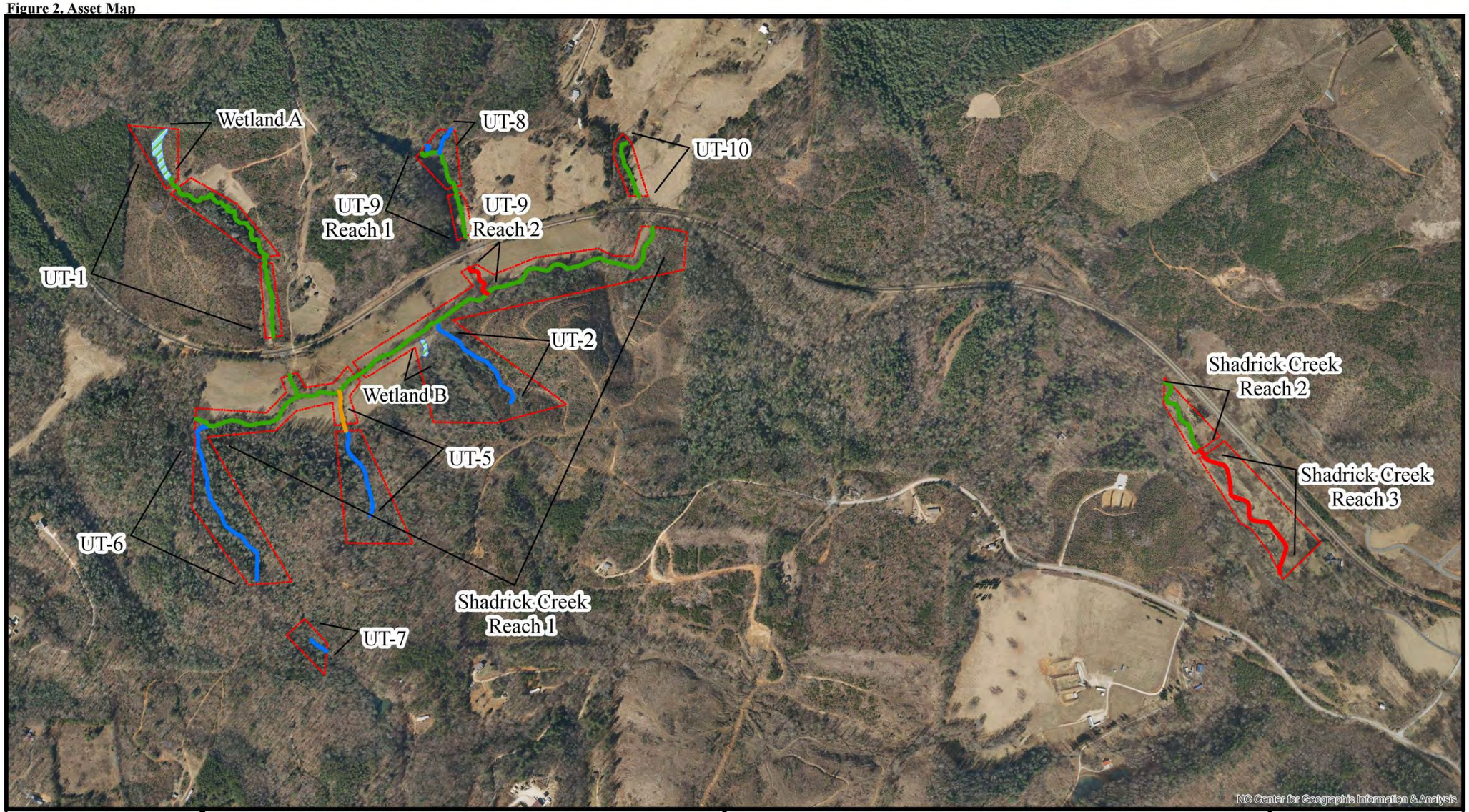
Table 3. Project Contacts	
Shadrick Creek Restoration Project	
Prime Contractor	North Carolina Division of Mitigation Services 217 W Jones Street Suite 3000a Raleigh, North Carolina 27603 Matthew Reid (828) 231-7812
Designer	Wildlands Engineering 167B Haywood Road Asheville, North Carolina 28806 Andrew Bick (828) 774-5547
Construction Contractor	Baker Construction 1000 Bat Cave Road Old Fort, NC 28762 Charles Baker (828) 668-5060
Seeding Contractor	Baker Construction 1000 Bat Cave Road Old Fort, NC 28762 Charles Baker (828) 668-5060
Planting Contractor	Equinox 37 Haywood St. Asheville, North Carolina 28801 Owen Carson (828) 253-6856
As-built Surveys	Ben Patton Land Surveying 259 Daves Farm Dr. Marion, NC 28752 Ben Patton (828) 768-1625
Seeding Mix Source	Green Resource 5204 Highgreen Court Colfax, North Carolina 27235 (336) 855-6363
Live Stakes	Foggy Mountain Nursery 797 Helton Creek Road Lansing, North Carolina (336) 384-5323
Monitoring Performers (Y0)-2017	Equinox Environmental 37 Haywood St. Asheville, North Carolina 28801 Drew Alderman (828) 253-6856

Table 4. Project Baseline Information and Attributes							
Project Information							
Project Name	Shadrick Creek						
County	McDowell						
Project Area (acres)	54.6						
Project Coordinates (latitude and longitude)	35.720410° N, -81.901405° W						
Project Watershed Summary Information							
Physiographic Province	Blue Ridge						
River Basin	Catawba River						
USGS Hydrologic Unit 8-digit	3050101	USGS Hydrologic Unit 14-digit	0305010103006				
DWR Sub-basin	03-08-30						
Project Drainage Area (acres)	2,093						
Project Drainage Area Percentage of Impervious Area	> 1%						
CGIA Land Use Classification	Agricultural						
Reach Summary Information							
Parameters	**Shadrick Creek Reach 1**	**Shadrick Creek Reach 2**	**Shadrick Creek Reach 3**	**UT-1**	**UT-9 Reach 1**	**UT-9 Reach 2**	**UT-10**
Length of reach (linear feet)*	3,632	573	1,104	1,651	706	249	404
Valley Confinement (Rosgen)	VIII	VIII	VIII	II	II	VIII	II
Drainage area (miles^2)	2.80	3.30	3.30	0.10	0.10	0.10	0.05
Perrenial, Intermittent, Ephemeral	Perrenial	Perrenial	Perrenial	Perrenial	Perrenial	Perrenial	Perrenial
NCDWR Water Quality Classification	C	C	C	C	C	C	C
Stream Classification (existing)	E4	E4	E4	G4	B4, G4	B4, G4	F4
Stream Classification (proposed)	C4	C4	C4	B4	B4	E4	B4
Evolutionary Trend (Rosgen)	V	V	V	V	VI	VI	VI
FEMA classification	-	-	-	-	-	-	-
Wetland Summary Information							
Parameters	**Wetland A**			**Wetland B**			
Size of Wetland (acres)	0.44			0.09			
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Riparian			Riparian			
Mapped Soil Series	HeD			EwE			
Drainage class	well-drained			well-drained			
Soil Hydric Status	Hydric			Hydric			
Source of Hydrology	Spring			Spring			
Hydrologic Impairment	Logging			Stream Incision, Cattle Grazing			
Native vegetation community	Piedmont/ Low Mountain Alluvial Forest			Piedmont/ Low Mountain Alluvial Forest			
Percent composition of exotic invasive vegetation	0%			0%			
Regulatory Considerations							
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**				
Waters of the United States – Section 404	Yes	Yes	Jurisdictional Determination				
Waters of the United States – Section 401	Yes	Yes	Jurisdictional Determination				
Endangered Species Act	No	N/A	ERTR				
Historic Preservation Act	No	N/A	ERTR				
Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A					
FEMA Floodplain Compliance	Yes	Yes	Yes				
Essential Fisheries Habitat	No	N/A	-				

*Accounts for breaks in conservation easements

Appendix B
Visual Assessment Data

Figure 2. Asset Map



Natural and Cultural Resources

Stream Asset Type

- Restoration
- Enhancement I
- Enhancement II
- Preservation
- Wetland Enhancement
- Easement

Figure 2. Asset Map
Shadrick Creek Stream Restoration Site
Project No. 92916
McDowell County, NC

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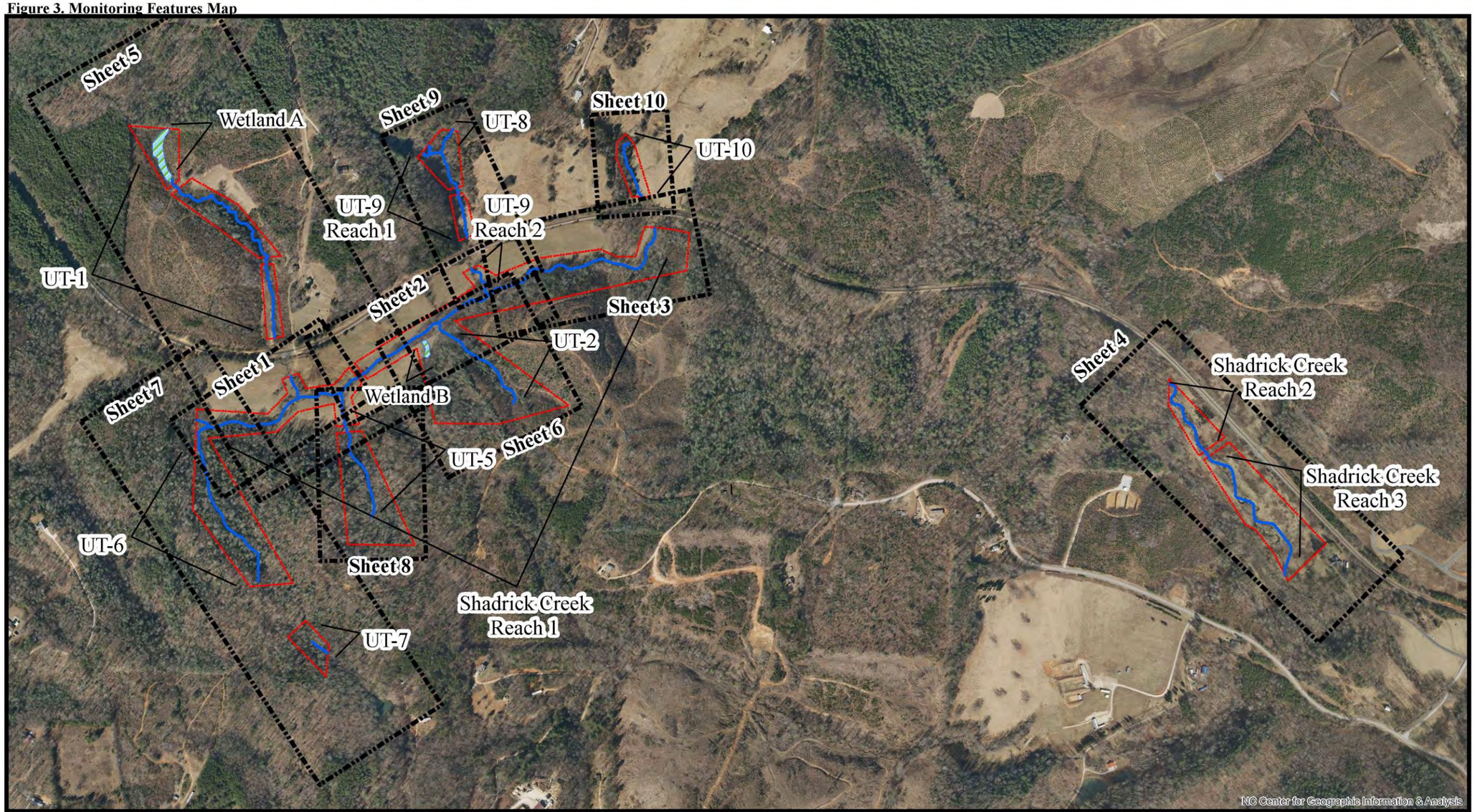
Figure 3. Monitoring Features Map



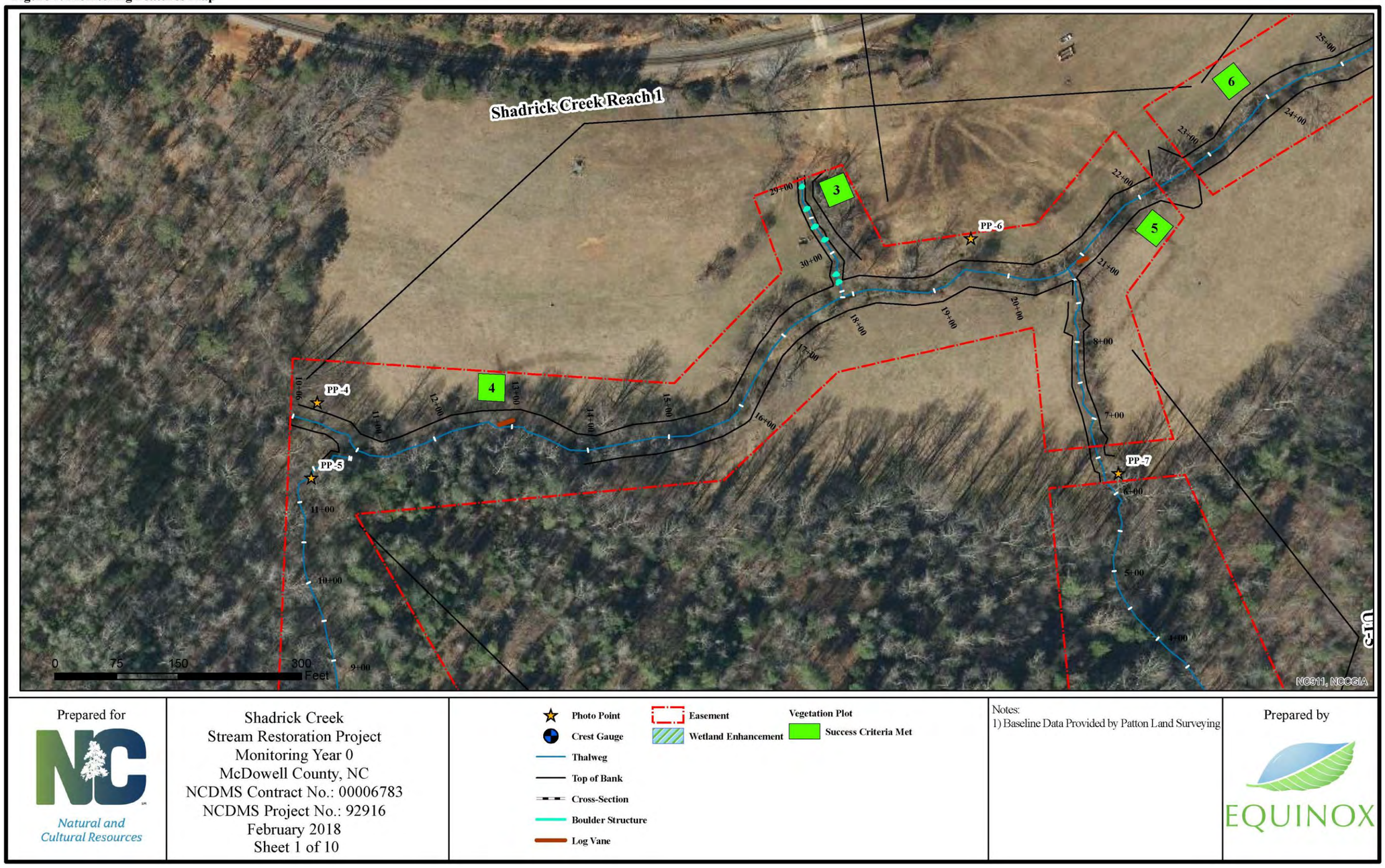
Natural and Cultural Resources

Shadrick Creek Stream Restoration Site
Monitoring Year 0
McDowell County, NC
NCDMS Contract No.: 00006783
NCDMS Project No.: 92916
February 2018
Overview Map

Thalweg
Wetland Enhancement
Easement
Sheet

EQUINOX

Figure 3. Monitoring Features Map



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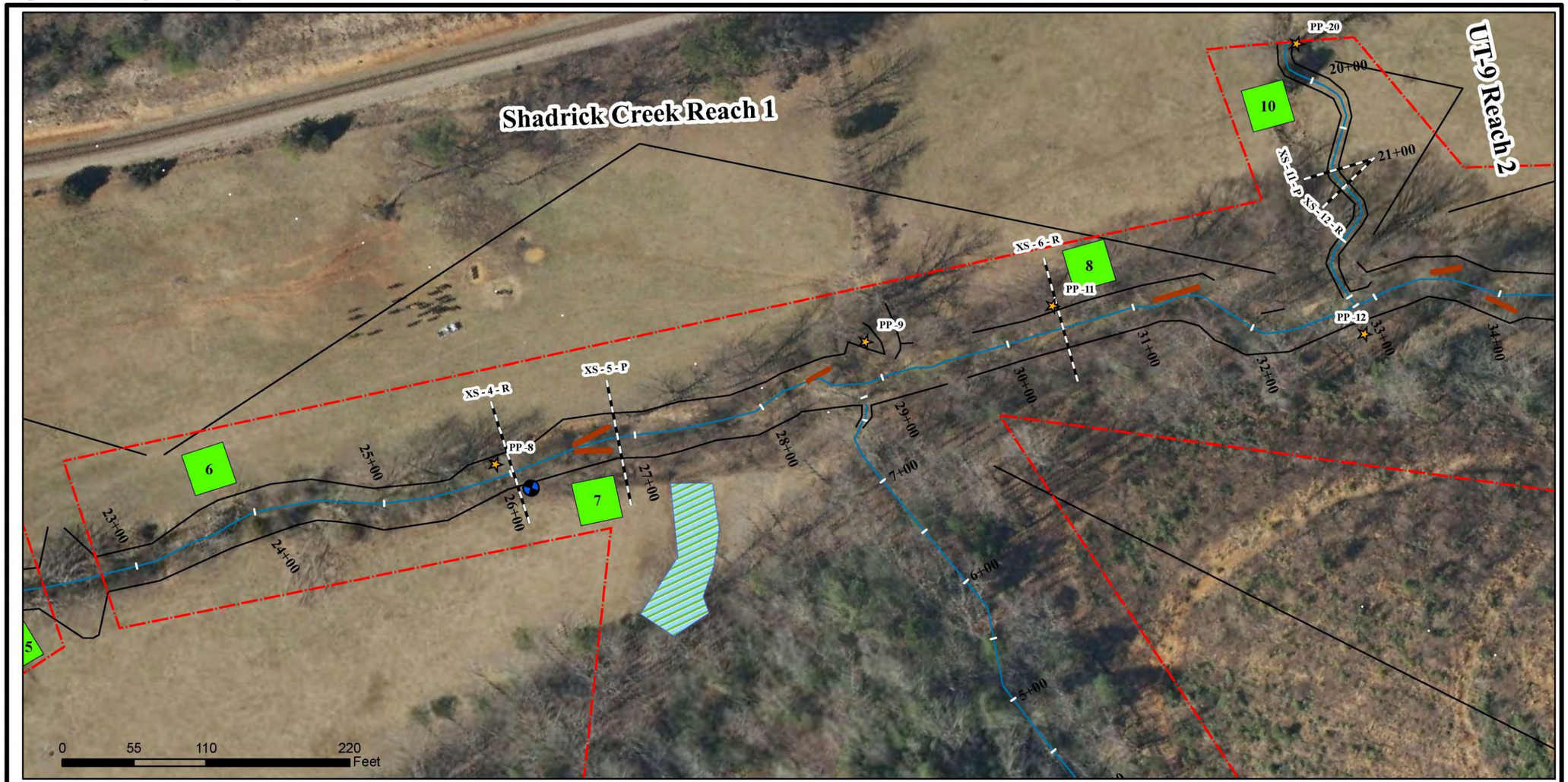
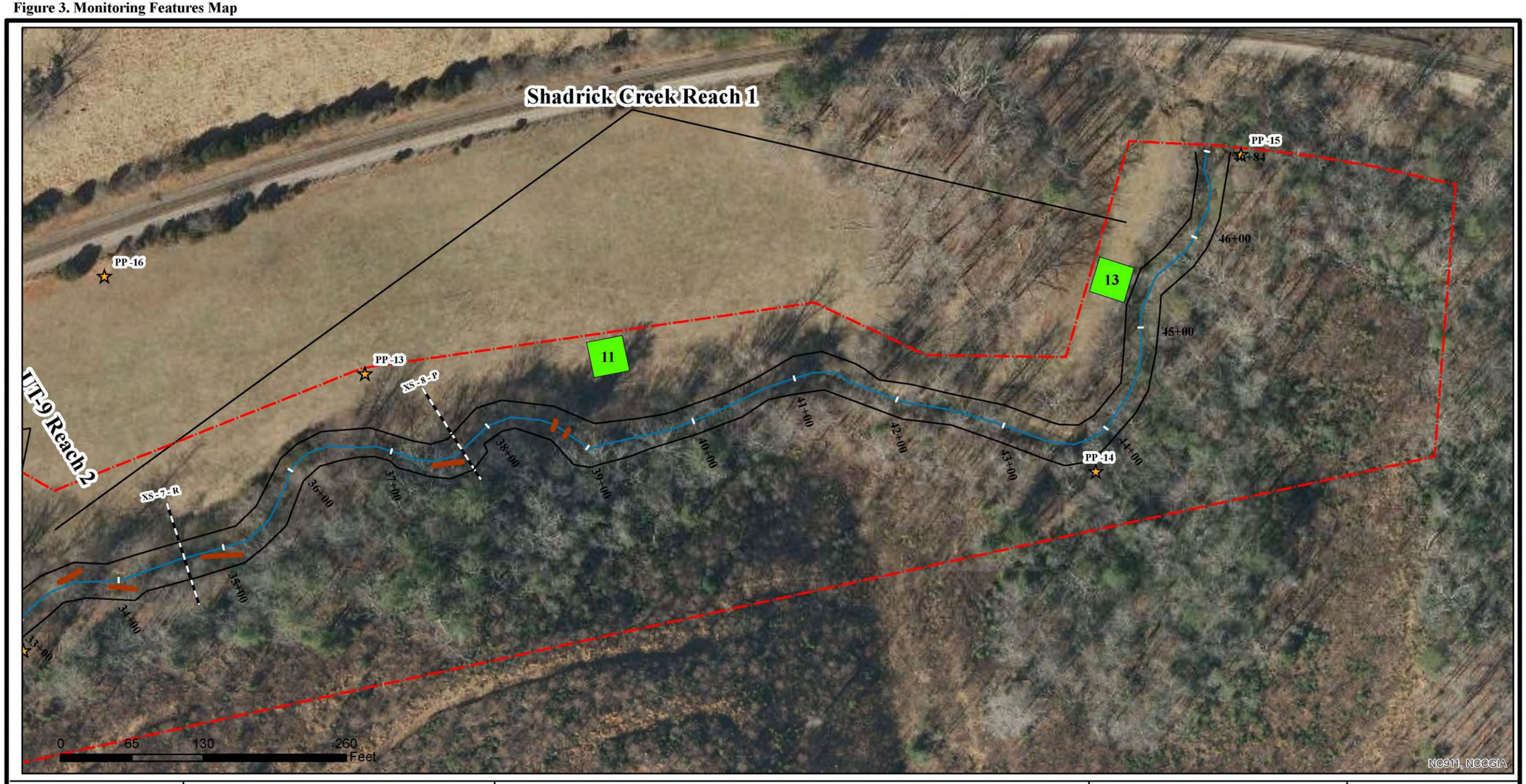


Prepared for NC Natural and Cultural Resources	Shadrick Creek Stream Restoration Project Monitoring Year 0 McDowell County, NC NCDMS Contract No.: 00006783 NCDMS Project No.: 92916 February 2018 Sheet 2 of 10	Photo Point Crest Gauge Thalweg Top of Bank Cross-Section Boulder Structure Log Vane Easement Wetland Enhancement Vegetation Plot Success Criteria Met	Notes: 1) Baseline Data Provided by Patton Land Surveying	Prepared by EQUINOX

Figure 3. Monitoring Features Map



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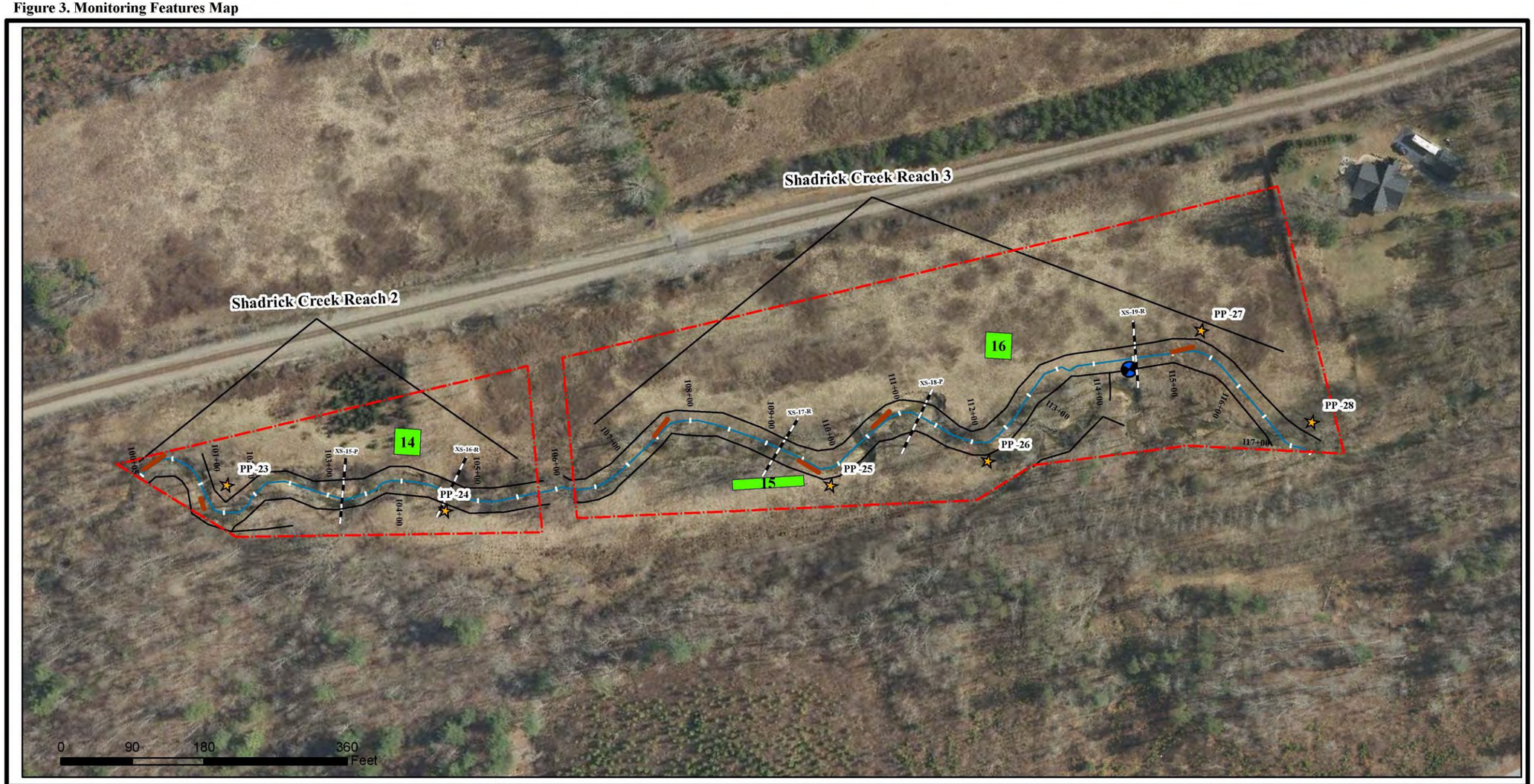

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Figure 3. Monitoring Features Map

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Natural and Cultural Resources

Shadrick Creek
Stream Restoration Project
Monitoring Year 0
McDowell County, NC
NCDMS Contract No.: 00006783
NCDMS Project No.: 92916
February 2018
Sheet 5 of 10

- Photo Point
- Crest Gauge
- Thalweg
- Top of Bank
- Cross-Section
- Boulder Structure
- Log Vane
- Easement
- Wetland Enhancement
- Vegetation Plot
- Success Criteria Met

Notes:
1) Baseline Data Provided by Patton Land Surveying

Prepared by

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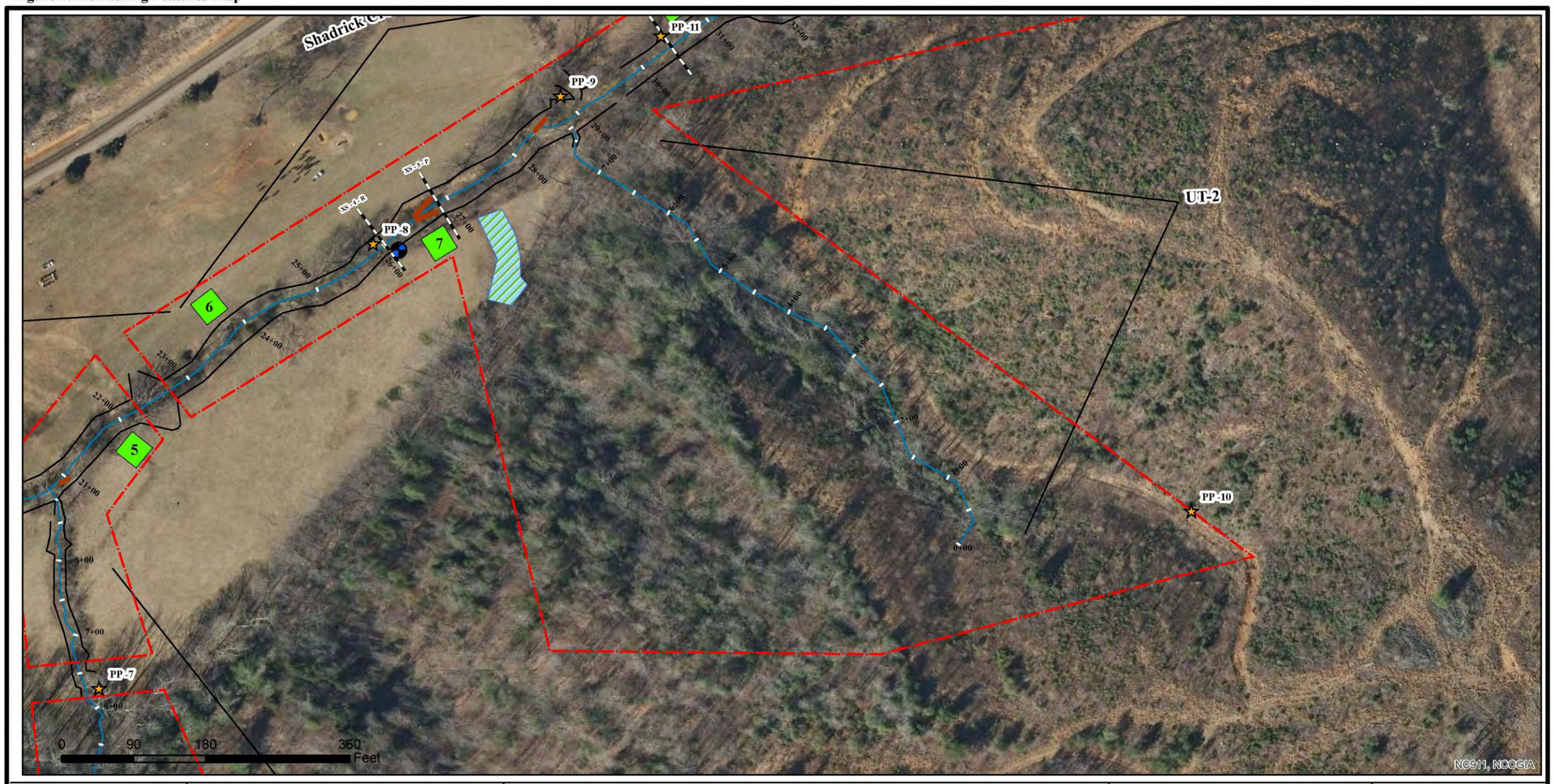
Figure 3. Monitoring Features Map



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Natural and Cultural Resources

Shadrick Creek
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Monitoring Year 0
McDowell County, NC
NCDMS Contract No.: 00006783
NCDMS Project No.: 92916
February 2018
Sheet 6 of 10

- Photo Point
- Crest Gauge
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- Success Criteria Met

Notes:
1) Baseline Data Provided by Patton Land Surveying

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Figure 3. Monitoring Features Map

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Natural and Cultural Resources

Shadrick Creek
Stream Restoration Project
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McDowell County, NC
NCDMS Contract No.: 00006783
NCDMS Project No.: 92916
February 2018
Sheet 7 of 10

Photo Point
Crest Gauge
Thalweg
Top of Bank
Cross-Section
Boulder Structure
Log Vane
Easement
Wetland Enhancement
Vegetation Plot
Success Criteria Met

Notes:
1) Baseline Data Provided by Patton Land Surveying

Prepared by
EQUINOX

Figure 3. Monitoring Features Map

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NCDMS Contract No.: 00006783
NCDMS Project No.: 92916
February 2018
Sheet 9 of 10

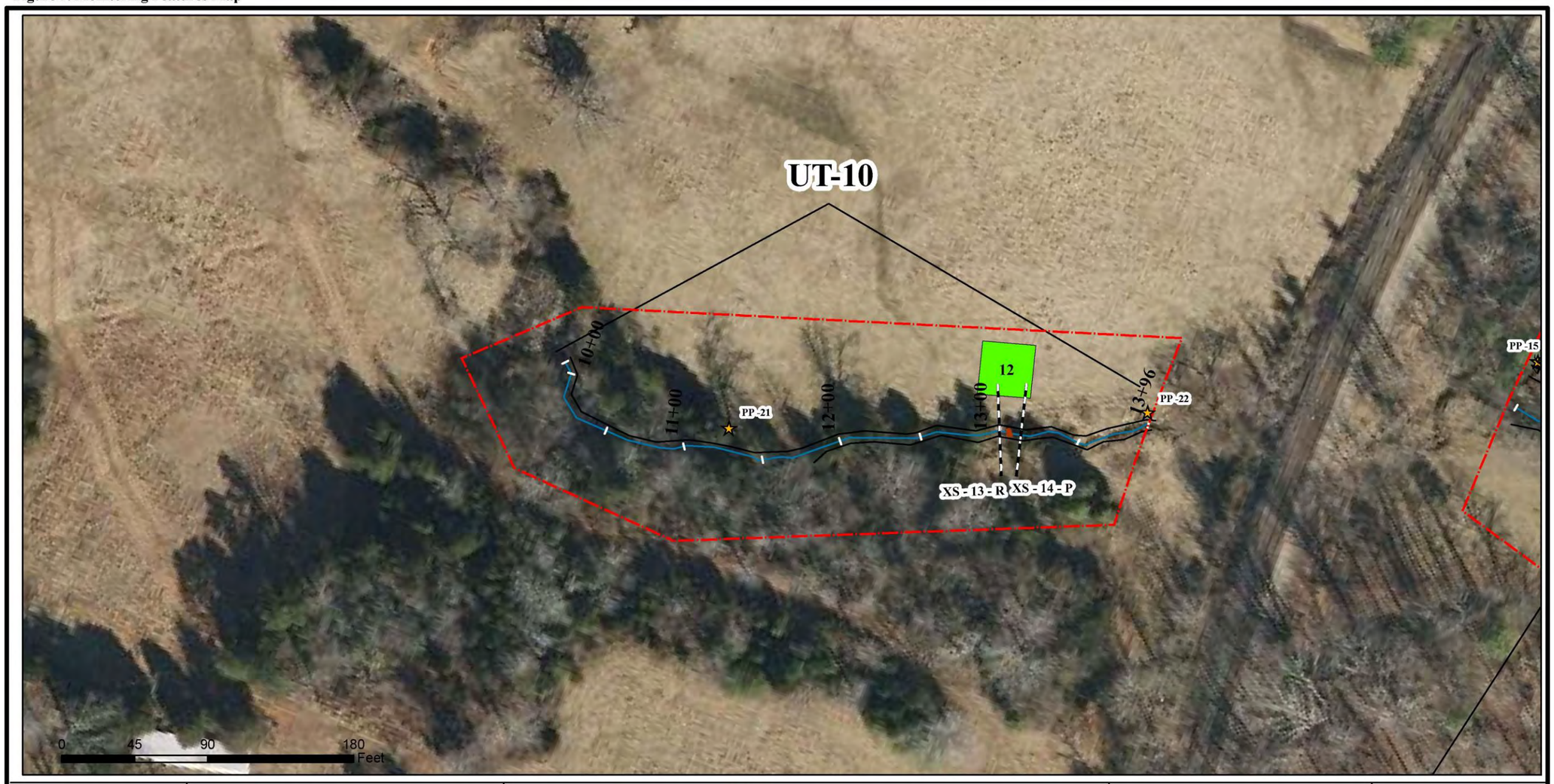
Photo Point
Crest Gauge
Thalweg
Top of Bank
Cross-Section
Boulder Structure
Log Vane
Easement
Wetland Enhancement
Vegetation Plot
Success Criteria Met

Notes:
1) Baseline Data Provided by Patton Land Surveying

Prepared by

EQUINOX

Figure 3. Monitoring Features Map



Prepared for

Natural and Cultural Resources

Shadrick Creek
Stream Restoration Project
Monitoring Year 0
McDowell County, NC
NCDMS Contract No.: 00006783
NCDMS Project No.: 92916
February 2018
Sheet 10 of 10

Photo Point
Crest Gauge
Thalweg
Top of Bank
Cross-Section
Boulder Structure
Log Vane
Easement
Wetland Enhancement
Vegetation Plot
Success Criteria Met

Notes:
1) Baseline Data Provided by Patton Land Surveying

Prepared by

EQUINOX

Vegetation Plot Photos

Vegetation Monitoring Plot 1

Vegetation Monitoring Plot 2

Vegetation Monitoring Plot 3

Vegetation Monitoring Plot 4

Vegetation Monitoring Plot 5

Vegetation Monitoring Plot 6

Vegetation Monitoring Plot 7

Vegetation Monitoring Plot 8

Vegetation Monitoring Plot 9

Vegetation Monitoring Plot 10

Vegetation Monitoring Plot 11

Vegetation Monitoring Plot 12

Vegetation Monitoring Plot 13

Vegetation Monitoring Plot 14

Vegetation Monitoring Plot 15

Vegetation Monitoring Plot 16

Permanent Photo Stations

UT-1 – Permanent Photo Station 1
Looking Upstream

UT-1 – Permanent Photo Station 1
Looking Downstream

UT-1 – Permanent Photo Station 2
Looking Upstream

UT-1 – Permanent Photo Station 2
Looking Downstream

UT-1 – Permanent Photo Station 3
Looking Upstream

Shadrick Creek Reach 1 – Permanent Photo Station 4
Looking Downstream

UT-6 – Permanent Photo Station 5
Looking Upstream

Shadrick Creek Reach 1 – Permanent Photo Station 6
Looking Upstream

Shadrick Creek Reach 1 – Permanent Photo Station 6
Looking Downstream

UT-7 – Permanent Photo Station 7
Looking Upstream from Crossing

UT-7 – Permanent Photo Station 7
Looking Downstream from Crossing

Shadrick Creek Reach 1 – Permanent Photo Station 8
Looking Upstream from Cross-Section 4

Shadrick Creek Reach 1 – Permanent Photo Station 8
Looking Downstream from Cross-Section 4

Shadrick Creek Reach 1 – Permanent Photo Station 9
Looking Upstream at UT-2

UT-2 - Permanent Photo Station 10
Looking Downsteam at Easement

Shadrick Creek Reach 1 – Permanent Photo Station 11
Looking Upstream from Cross-Section 6

Shadrick Creek Reach 1 – Permanent Photo Station 11
Looking Downstream from Cross-Section 6

Shadrick Creek Reach 1 – Permanent Photo Station 12
Looking Upstream Shadrick Creek from confluence of UT-9 Reach 2

Shadrick Creek Reach 1 – Permanent Photo Station 12
Looking Downstream Shadrick Creek from confluence of UT-9 Reach 2

Shadrick Creek Reach 1 – Permanent Photo Station 12
Looking Upstream UT-9 Reach 2 from the confluence with Shadrick Creek

Shadrick Creek Reach 1 – Permanent Photo Station 13
Looking Upstream

Shadrick Creek Reach 1 – Permanent Photo Station 13
Looking Downstream

Shadrick Creek Reach 1 – Permanent Photo Station 14
Looking Upstream

Shadrick Creek Reach 1 – Permanent Photo Station 14
Looking Downstream

Shadrick Creek Reach 1 – Permanent Photo Station 15
Looking Upstream

Shadrick Creek Reach 1 – Permanent Photo Station 16
Looking Upstream

Shadrick Creek Reach 1 – Permanent Photo Station 16
Looking Downstream

UT-9 Reach 1 – Permanent Photo Station 17
Looking Upstream

UT-9 Reach 1 – Permanent Photo Station 17
Looking Downstream

UT-9 Reach 1 – Permanent Photo Station 18
Looking Downstream

UT-9 Reach 1 – Permanent Photo Station 19
Looking Upstream

UT-9 Reach 2 – Permanent Photo Station 20
Looking Downstream

UT-10 – Permanent Photo Station 21
Looking Downstream

UT-10 – Permanent Photo Station 22
Looking Upstream

Shadrick Creek Reach 2 – Permanent Photo Station 23
Looking Upstream

Shadrick Creek Reach 2 – Permanent Photo Station 23
Looking Downstream

Shadrick Creek Reach 2 – Permanent Photo Station 24
Looking Upstream

Shadrick Creek Reach 2 – Permanent Photo Station 24
Looking Downstream

Shadrick Creek Reach 3 – Permanent Photo Station 25
Looking Upstream

Shadrick Creek Reach 3 – Permanent Photo Station 25
Looking Downstream

Shadrick Creek Reach 3 – Permanent Photo Station 26
Looking Upstream

Shadrick Creek Reach 3 – Permanent Photo Station 26
Looking Downstream

Shadrick Creek Reach 3 – Permanent Photo Station 27
Looking Upstream

Shadrick Creek Reach 3 – Permanent Photo Station 28
Looking Upstream

Appendix C
Vegetation Plot Data

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Table 5. Current Plot Data (MY0) 2017
Shadrick Creek Restoration Project

			Current Plot Data (MY0 2017)																								
			Plot 1			Plot 2			Plot 3			Plot 4			Plot 5			Plot 6			Plot 7			Plot 8			Plot 9		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	Red Maple	Tree	2	2	2	3	3	3	1	1	1	2	2	2				4	4	4	1	1	1				1	1	1
Betula nigra	River Birch	Tree							1	1	1							2	2	2	3	3	3	2	2	2			
Cercis canadensis	Redbud	Shrub Tree							1	1	1													5	5	5	2	2	2
Fraxinus pennsylvanica	Green Ash	Tree	13	13	13	5	5	5	7	7	7	1	1	1	3	3	3	3	3	3	4	4	4	8	8	8	4	4	4
Hamamelis virginiana	Witch-hazel	Shrub Tree																											
Platanus occidentalis	Sycamore	Tree				4	4	4				5	5	5	1	1	1	2	2	2	3	3	3				9	9	9
Populus deltoides	Cottonwood	Tree				1	1	1				4	4	4	5	5	5	2	2	2									
Stem count			15	15	15	13	13	13	10	10	10	12	12	12	9	9	9	13	13	13	11	11	11	15	15	15	16	16	16
size (ares)			1			1			1			1			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
Species count			2	2	2	4	4	4	4	4	4	4	4	4	3	3	3	5	5	5	4	4	4	3	3	3	4	4	4
Stems per ACRE			607	607	607	526	526	526	405	405	405	486	486	486	364	364	364	526	526	526	445	445	445	607	607	607	647	647	647

Table 5. Current Plot Data (MY0) 2017
Shadrick Creek Restoration Project

			Current Plot Data (MY0 2017)																					Annual Means		
			Plot 10			Plot 11			Plot 12			Plot 13			Plot 14			Plot 15			Plot 16			MY0 (2017)		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	Red Maple	Tree				2	2	2	2	2	2	3	3	3	2	2	2				2	2	2	25	25	25
Betula nigra	River Birch	Tree	7	7	7	2	2	2				2	2	2	1	1	1	1	1	1	3	3	3	24	24	24
Cercis canadensis	Redbud	Shrub Tree				1	1	1	1	1	1													10	10	10
Fraxinus pennsylvanica	Green Ash	Tree				2	2	2	7	7	7	3	3	3	1	1	1	4	4	4	2	2	2	67	67	67
Hamamelis virginiana	Witch-hazel	Shrub Tree	1	1	1							1	1	1	2	2	2	3	3	3	1	1	1	8	8	8
Platanus occidentalis	Sycamore	Tree							3	3	3	3	3	3	3	3	3	1	1	1	2	2	2	36	36	36
Populus deltoides	Cottonwood	Tree	1	1	1	4	4	4				2	2	2	4	4	4	3	3	3	2	2	2	28	28	28
Stem count			9	9	9	11	11	11	13	13	13	14	14	14	13	13	13	12	12	12	12	12	12	198	198	198
size (ares)			1			1			1			1			1			1			1			16		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.32		
Species count			3	3	3	5	5	5	4	4	4	6	6	6	6	6	6	5	5	5	6	6	6	7	7	7
Stems per ACRE			364	364	364	445	445	445	526	526	526	567	567	567	526	526	526	486	486	486	486	486	486	619	619	619

P=Planted, T=Planted & Volunteer

Color for Density

- Exceeds requirements by 10%
- Exceeds requirements, but by less than 10%
- Fails to meet requirements, by less than 10%
- Fails to meet requirements by more than 10%

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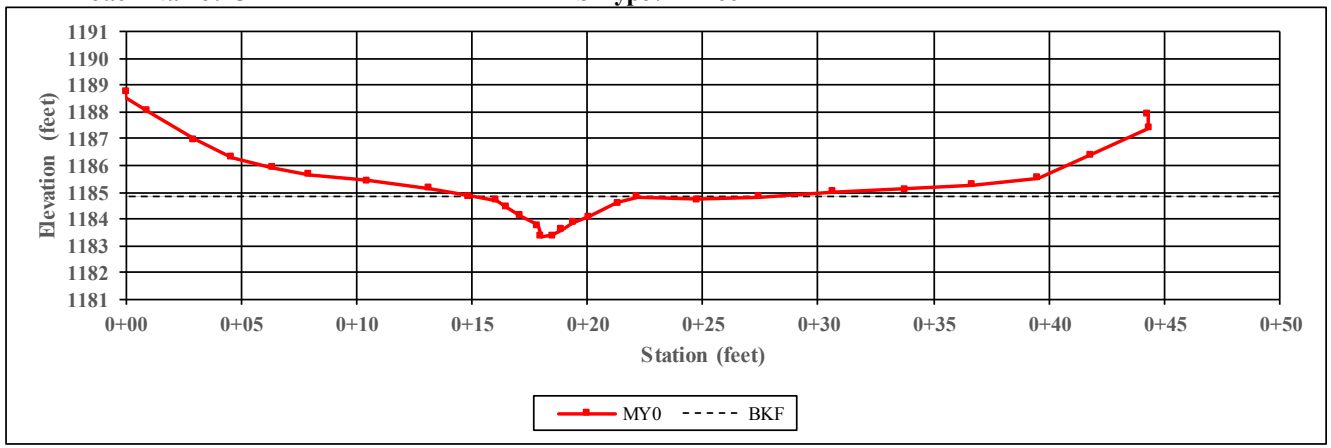
Table 6. Vegetation Plot Criteria Attainment Shadrick Creek Restoration Project		
Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	100%
2	Yes	
3	Yes	
4	Yes	
5	Yes	
6	Yes	
7	Yes	
8	Yes	
9	Yes	
10	Yes	
11	Yes	
12	Yes	
13	Yes	
14	Yes	
15	Yes	
16	Yes	

Appendix D
Stream Measurement and Geomorphology Data

Project Name: Shadrick Creek **XS Number:** 1 **Station:** 16+05

Reach Name: UT1 **XS Type:** Pool



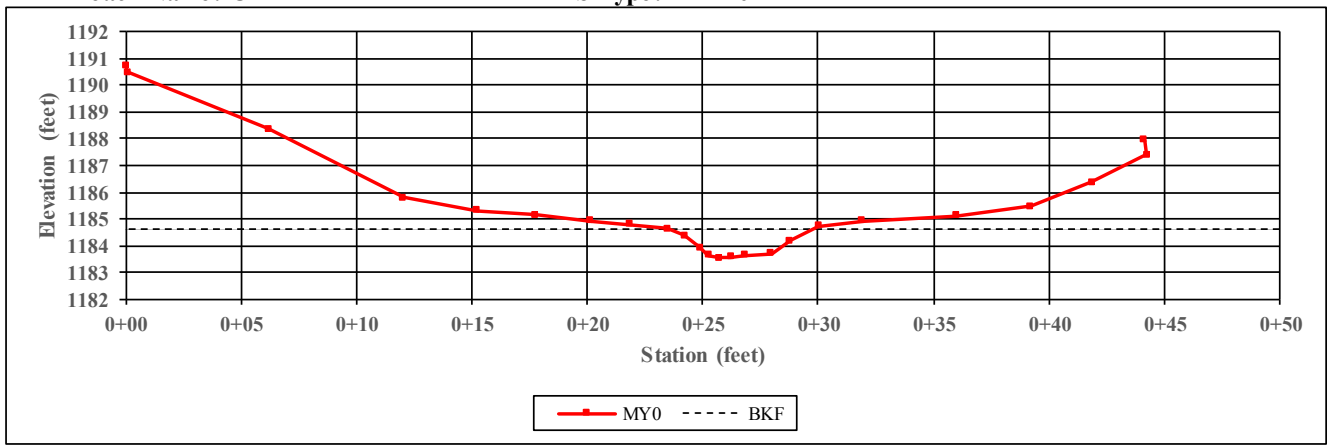
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	7.1	-	-	-	-	-	-	-
Floodprone Width (ft)	24.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.6	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.5	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	4.5	-	-	-	-	-	-	-
Width/Depth Ratio	11.1	-	-	-	-	-	-	-
Entrenchment Ratio	3.4	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

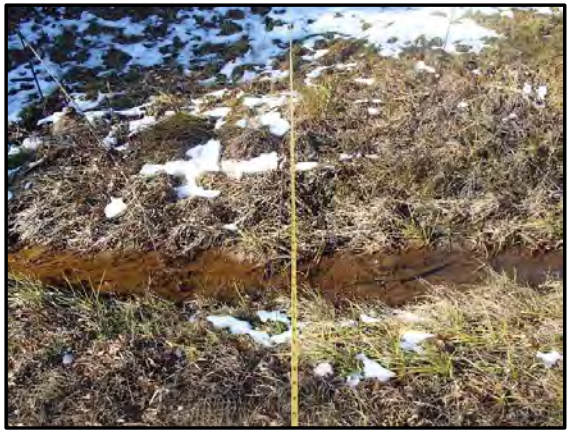
Project Name: Shadrick Creek **XS Number:** 2 **Station:** 16+29

Reach Name: UT1 **XS Type:** Riffle



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	6.3	-	-	-	-	-	-	-
Floodprone Width (ft)	24.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.7	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.1	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	4.3	-	-	-	-	-	-	-
Width/Depth Ratio	9.4	-	-	-	-	-	-	-
Entrenchment Ratio	3.8	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

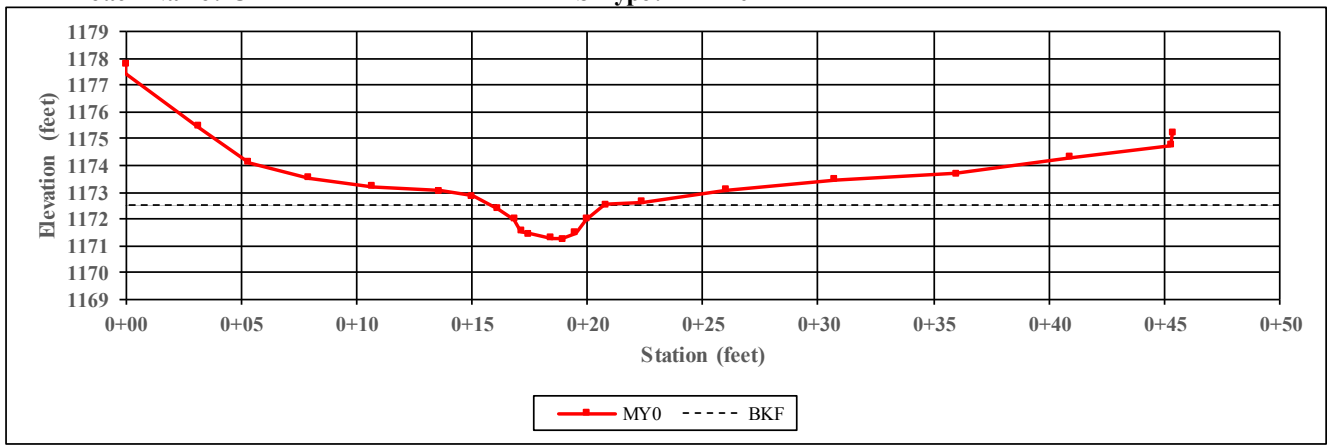
Left Descending Bank



Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 3 **Station:** 21+68

Reach Name: UT1 **XS Type:** Riffle



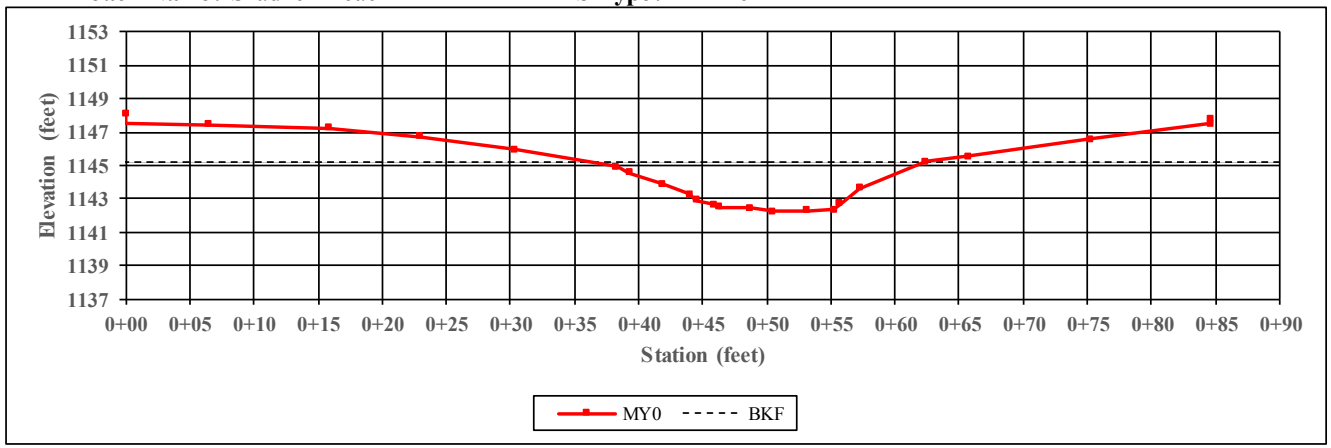
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	5.0	-	-	-	-	-	-	-
Floodprone Width (ft)	24.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.8	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.3	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	3.9	-	-	-	-	-	-	-
Width/Depth Ratio	6.5	-	-	-	-	-	-	-
Entrenchment Ratio	4.8	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

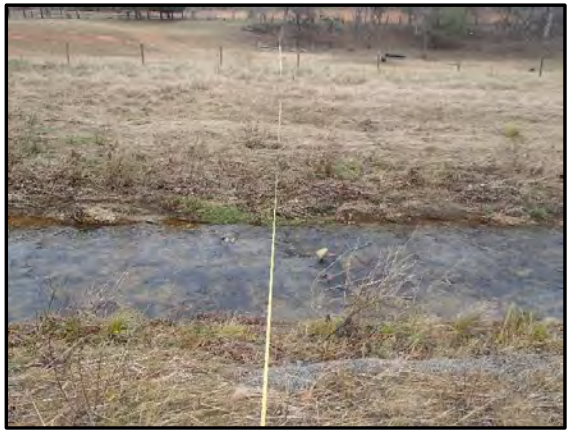
Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 4 **Station:** 26+02

Reach Name: Shadrick Reach 1 **XS Type:** Riffle



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	26.6	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.8	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	3.0	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	47.0	-	-	-	-	-	-	-
Width/Depth Ratio	15.0	-	-	-	-	-	-	-
Entrenchment Ratio	3.8	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

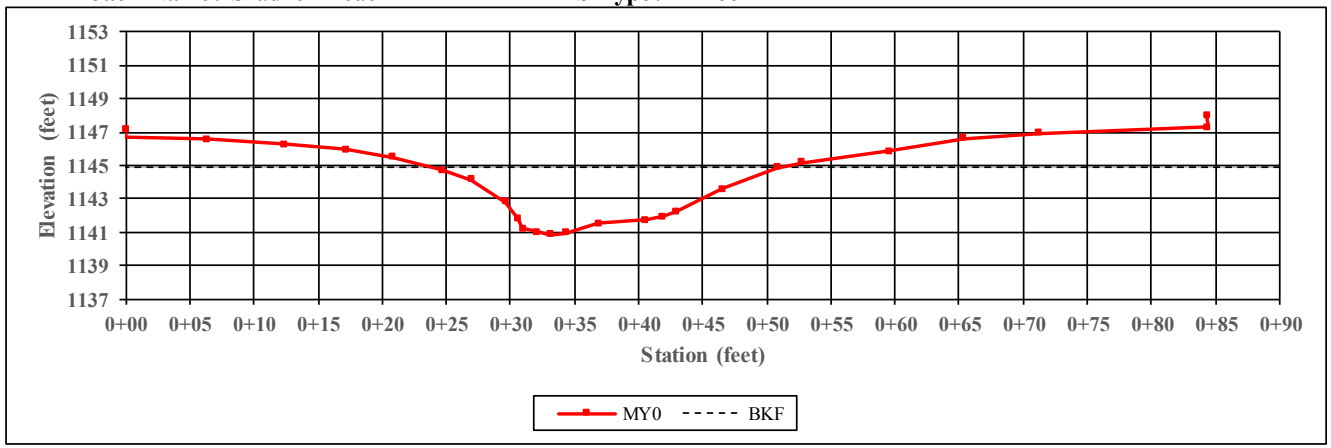


Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 5 **Station:** 26+87

Reach Name: Shadrick Reach 1 **XS Type:** Pool



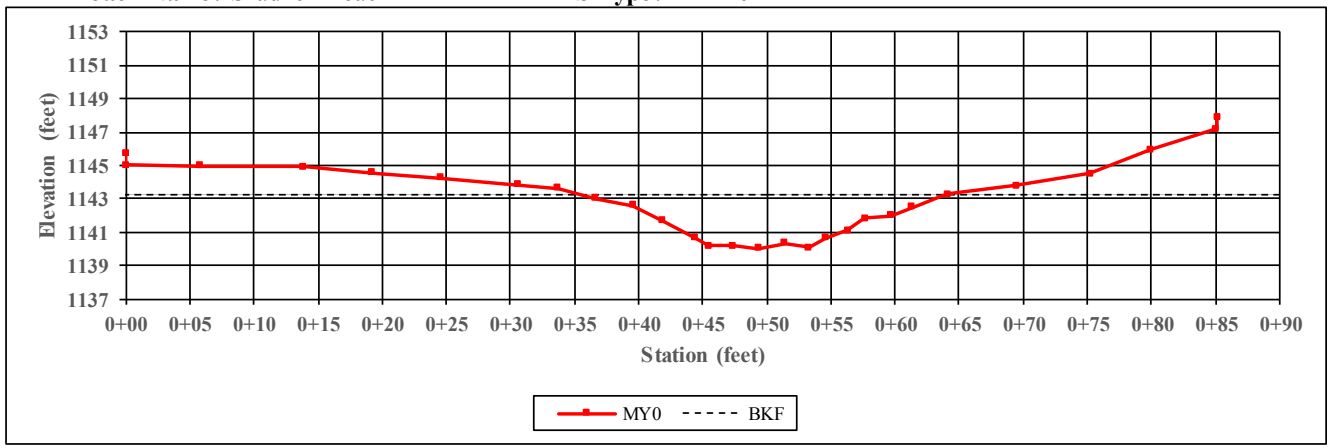
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	26.9	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	2.2	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	4.0	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	59.5	-	-	-	-	-	-	-
Width/Depth Ratio	12.1	-	-	-	-	-	-	-
Entrenchment Ratio	3.7	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 6 **Station:** 30+44

Reach Name: Shadrick Reach 1 **XS Type:** Riffle



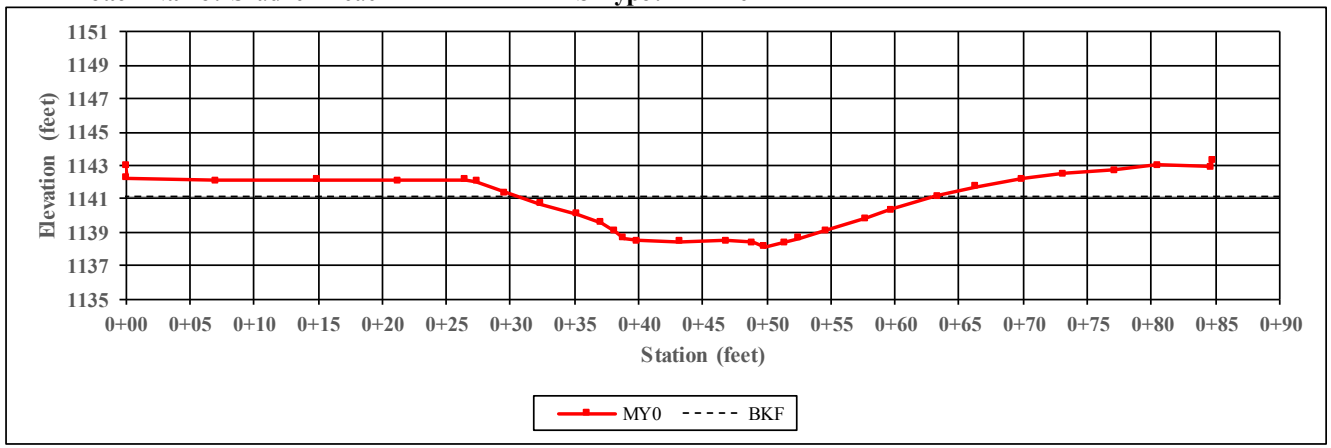
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	28.7	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.8	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	3.2	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	52.0	-	-	-	-	-	-	-
Width/Depth Ratio	15.8	-	-	-	-	-	-	-
Entrenchment Ratio	3.5	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 7 **Station:** 34+64

Reach Name: Shadrick Reach 1 **XS Type:** Riffle



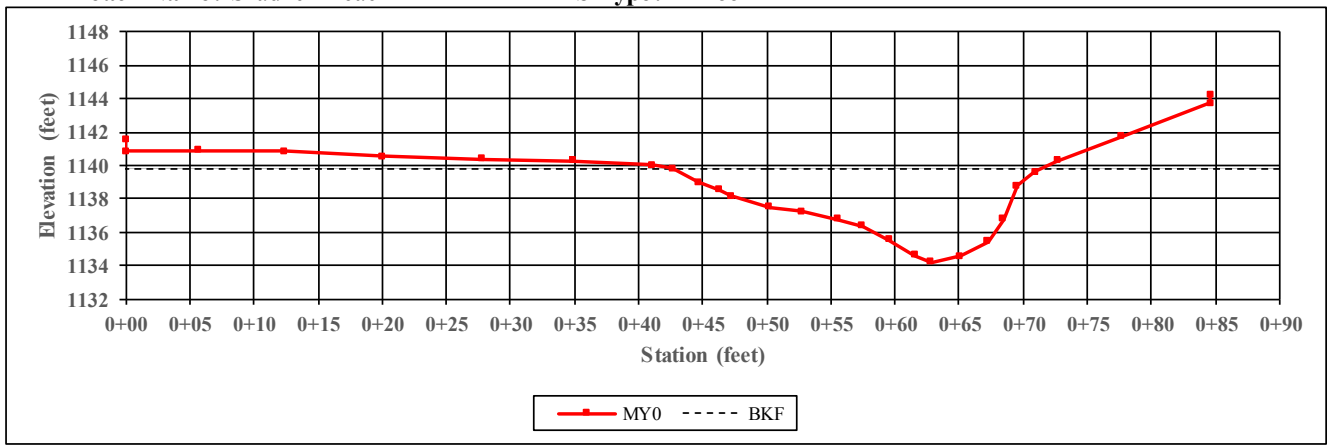
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	32.7	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	1.8	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	3.0	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	59.3	-	-	-	-	-	-	-
Width/Depth Ratio	18.0	-	-	-	-	-	-	-
Entrenchment Ratio	3.1	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 8 **Station:** 37+68

Reach Name: Shadrick Reach 1 **XS Type:** Pool



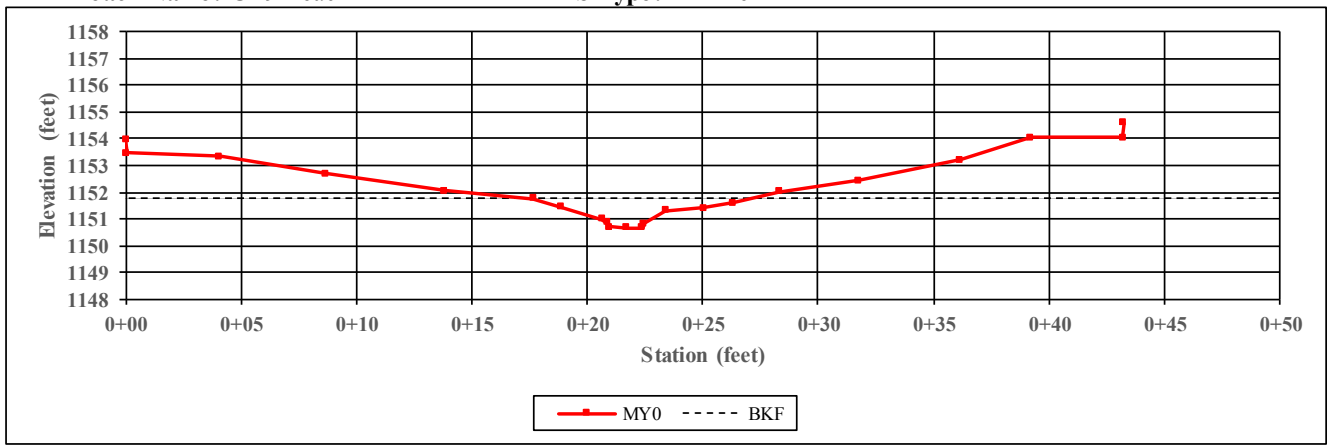
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	28.8	-	-	-	-	-	-	-
Floodprone Width (ft)	100.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	2.9	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	5.6	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	84.3	-	-	-	-	-	-	-
Width/Depth Ratio	9.8	-	-	-	-	-	-	-
Entrenchment Ratio	3.5	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 9 **Station:** 16+53

Reach Name: UT9 Reach 1 **XS Type:** Riffle



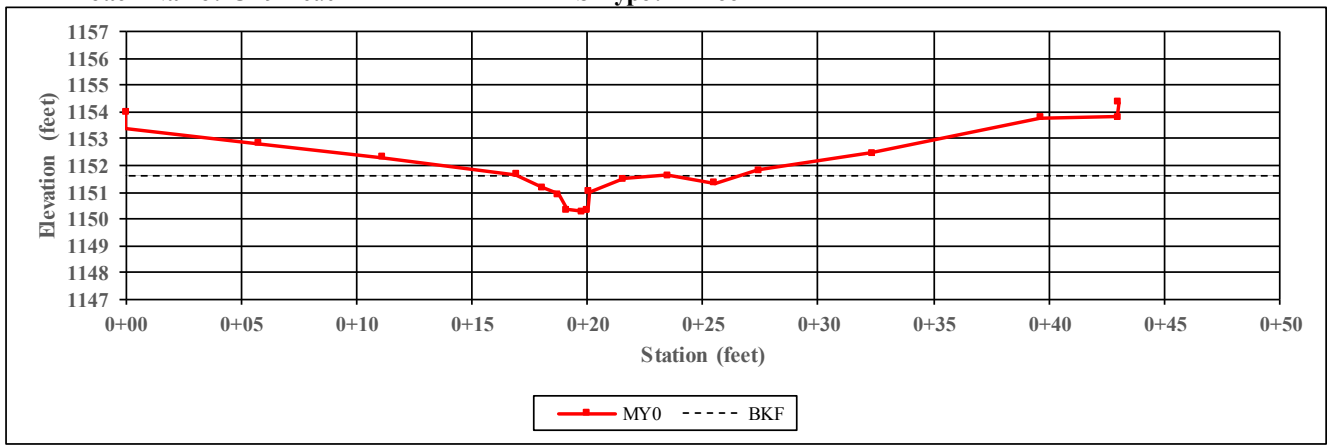
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	9.5	-	-	-	-	-	-	-
Floodprone Width (ft)	24.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.5	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.1	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	4.8	-	-	-	-	-	-	-
Width/Depth Ratio	18.7	-	-	-	-	-	-	-
Entrenchment Ratio	2.5	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 10 **Station:** 16+68

Reach Name: UT9 Reach 1 **XS Type:** Pool



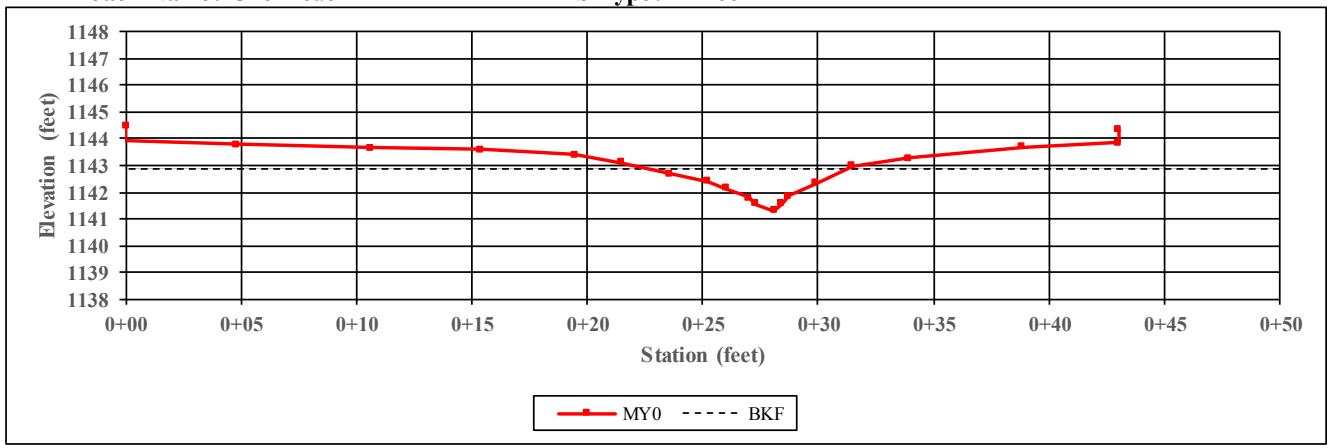
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	6.5	-	-	-	-	-	-	-
Floodprone Width (ft)	24.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.5	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.3	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	3.0	-	-	-	-	-	-	-
Width/Depth Ratio	14.3	-	-	-	-	-	-	-
Entrenchment Ratio	3.7	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 11 **Station:** 20+84

Reach Name: UT9 Reach 2 **XS Type:** Pool



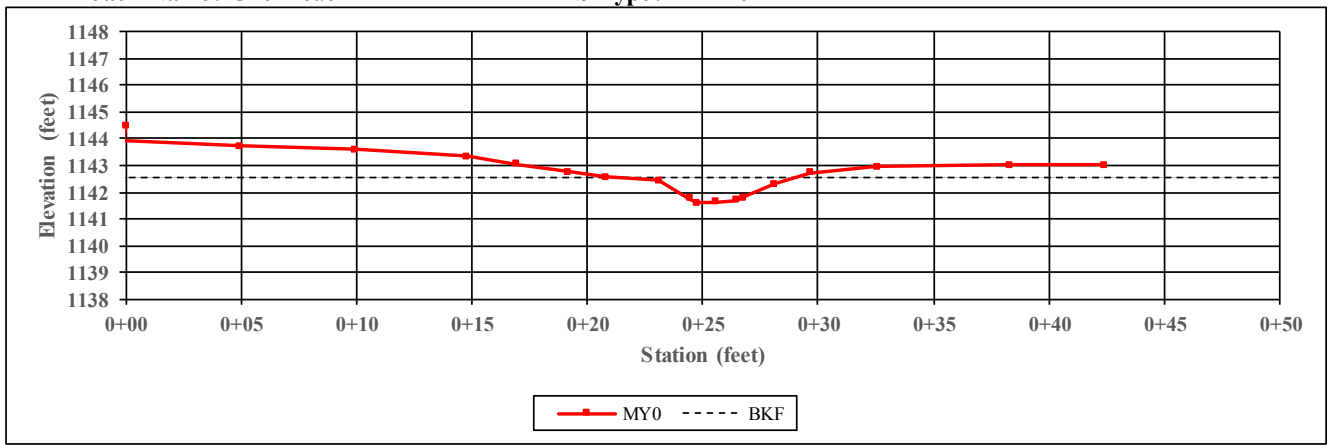
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	8.8	-	-	-	-	-	-	-
Floodprone Width (ft)	24.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.7	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.6	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	5.8	-	-	-	-	-	-	-
Width/Depth Ratio	13.2	-	-	-	-	-	-	-
Entrenchment Ratio	2.7	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 12 **Station:** 20+99

Reach Name: UT9 Reach 2 **XS Type:** Riffle



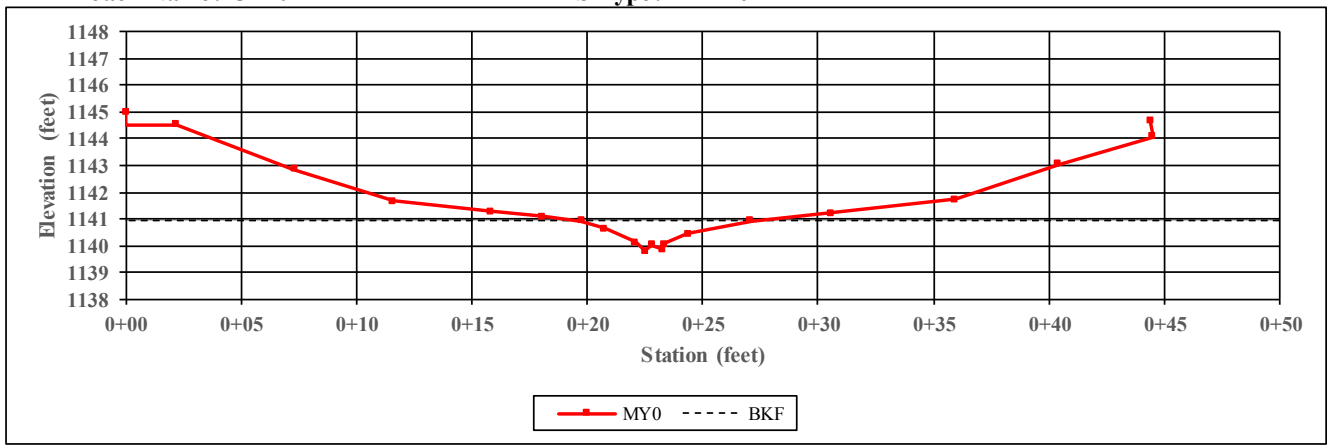
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	8.3	-	-	-	-	-	-	-
Floodprone Width (ft)	24.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.4	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.0	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	3.6	-	-	-	-	-	-	-
Width/Depth Ratio	19.0	-	-	-	-	-	-	-
Entrenchment Ratio	2.9	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 13 **Station:** 13+00

Reach Name: UT10 **XS Type:** Riffle



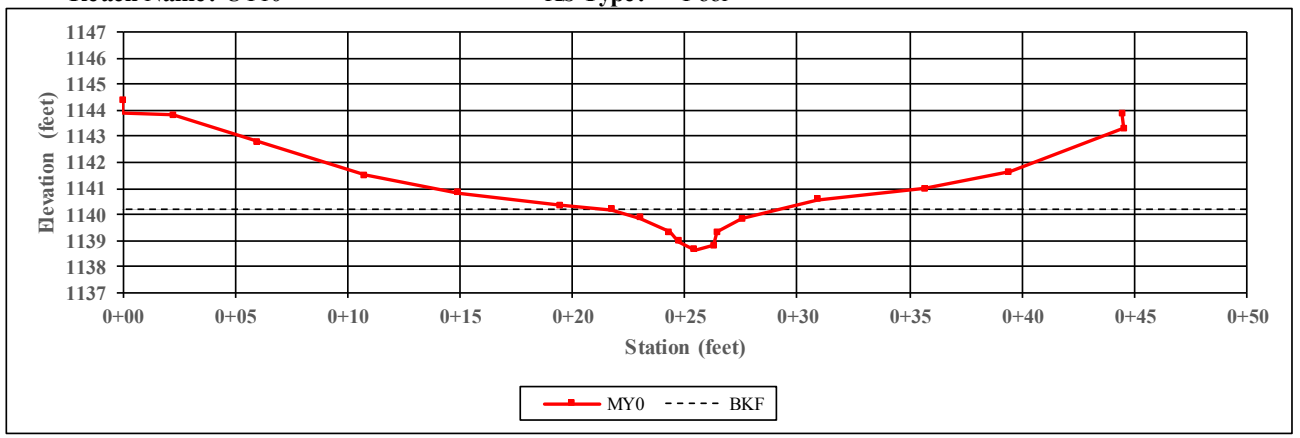
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	7.3	-	-	-	-	-	-	-
Floodprone Width (ft)	24.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.5	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.1	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	3.4	-	-	-	-	-	-	-
Width/Depth Ratio	15.6	-	-	-	-	-	-	-
Entrenchment Ratio	3.3	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 14 **Station:** 13+13

Reach Name: UT10 **XS Type:** Pool



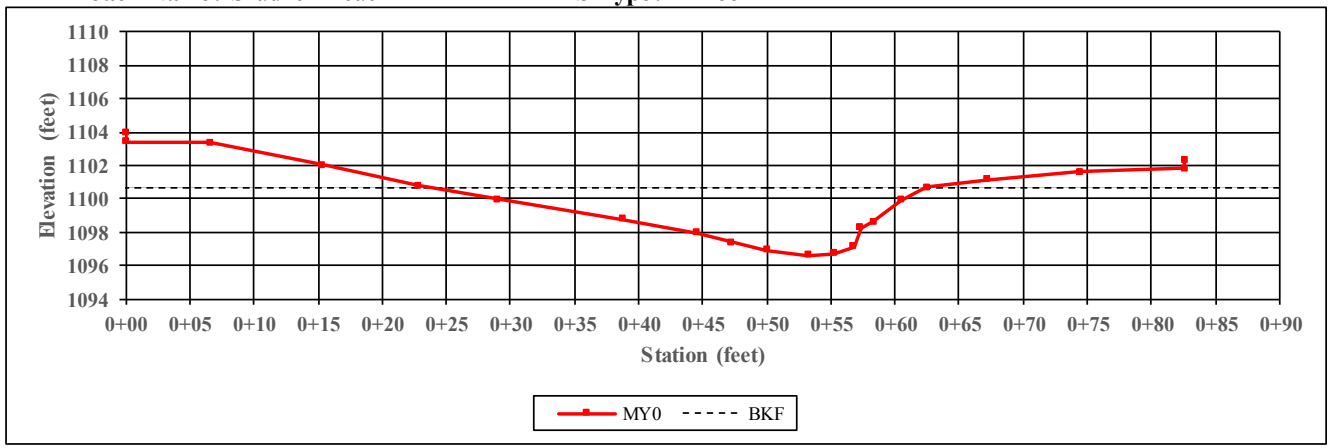
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	7.5	-	-	-	-	-	-	-
Floodprone Width (ft)	24.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	0.6	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	1.6	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	4.8	-	-	-	-	-	-	-
Width/Depth Ratio	11.6	-	-	-	-	-	-	-
Entrenchment Ratio	3.2	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 15 **Station:** 103+19

Reach Name: Shadrick Reach 2 **XS Type:** Pool



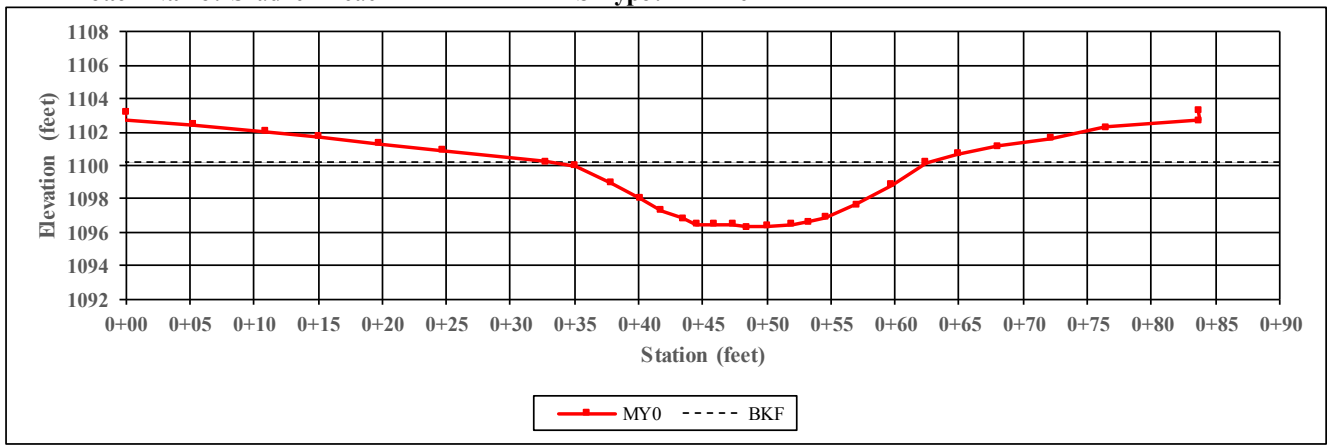
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	38.9	-	-	-	-	-	-	-
Floodprone Width (ft)	116.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	2.1	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	4.1	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	80.4	-	-	-	-	-	-	-
Width/Depth Ratio	18.9	-	-	-	-	-	-	-
Entrenchment Ratio	3.0	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 16 **Station:** 104+67

Reach Name: Shadrick Reach 2 **XS Type:** Riffle



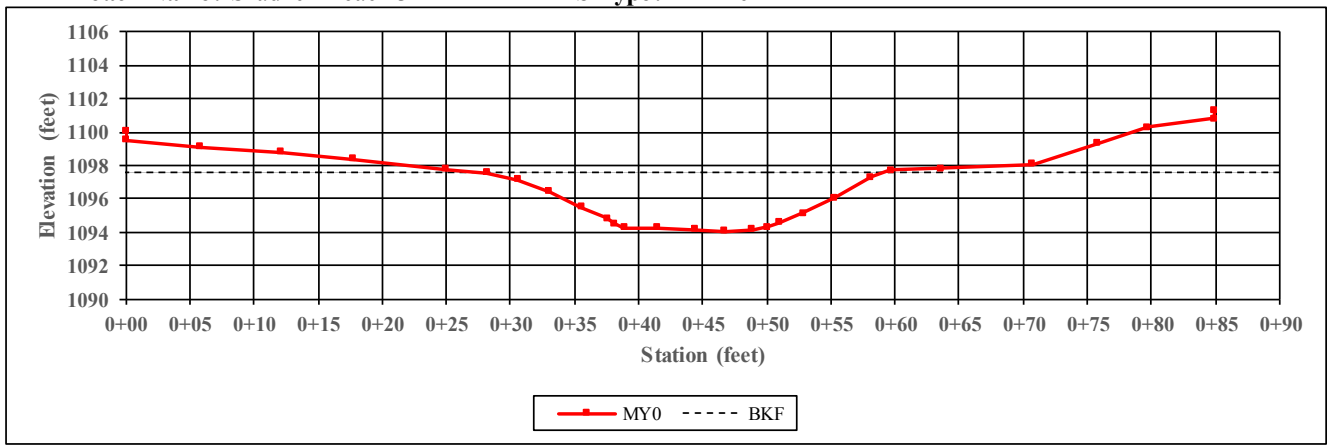
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	29.9	-	-	-	-	-	-	-
Floodprone Width (ft)	116.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	2.4	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	3.9	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	71.7	-	-	-	-	-	-	-
Width/Depth Ratio	12.5	-	-	-	-	-	-	-
Entrenchment Ratio	3.9	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 17 **Station:** 109+18

Reach Name: Shadrick Reach 3 **XS Type:** Riffle



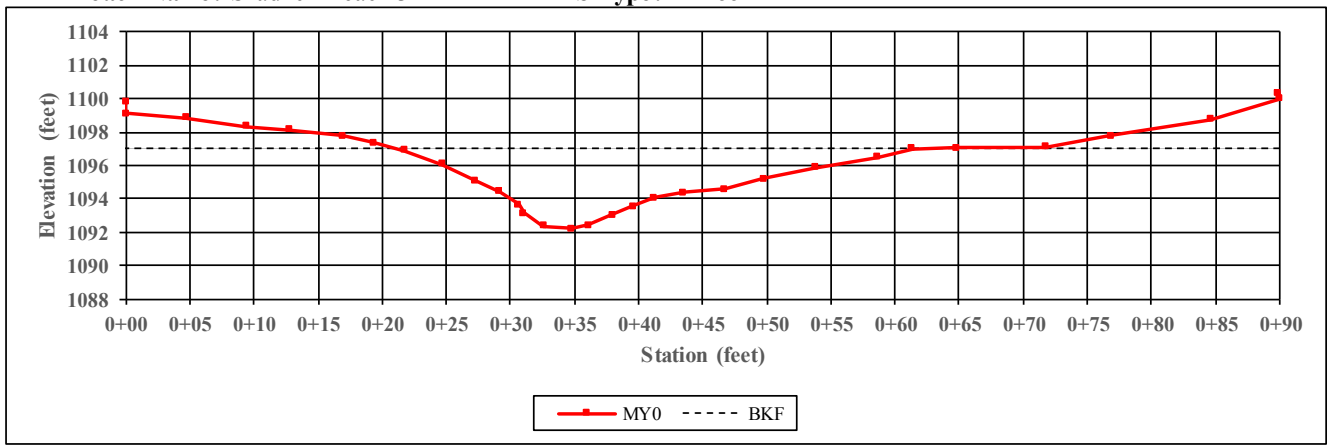
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	31.1	-	-	-	-	-	-	-
Floodprone Width (ft)	116.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	2.2	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	3.5	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	68.6	-	-	-	-	-	-	-
Width/Depth Ratio	14.1	-	-	-	-	-	-	-
Entrenchment Ratio	3.7	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 18 **Station:** 111+27

Reach Name: Shadrick Reach 3 **XS Type:** Pool



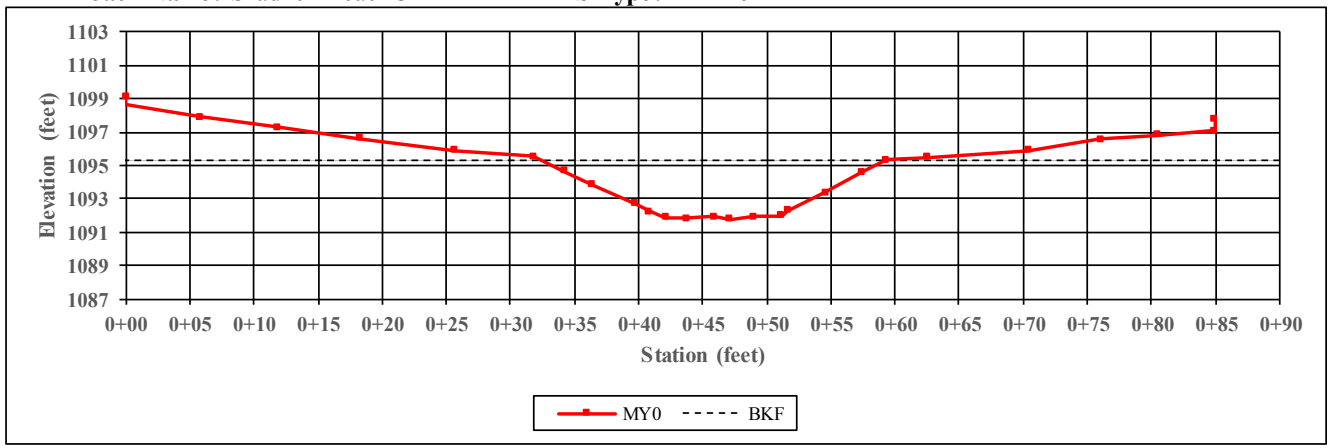
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	40.0	-	-	-	-	-	-	-
Floodprone Width (ft)	116.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	2.2	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	4.7	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	88.1	-	-	-	-	-	-	-
Width/Depth Ratio	18.2	-	-	-	-	-	-	-
Entrenchment Ratio	2.9	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Shadrick Creek **XS Number:** 19 **Station:** 114+53

Reach Name: Shadrick Reach 3 **XS Type:** Riffle



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	26.9	-	-	-	-	-	-	-
Floodprone Width (ft)	116.0	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	2.3	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	3.5	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	61.0	-	-	-	-	-	-	-
Width/Depth Ratio	11.9	-	-	-	-	-	-	-
Entrenchment Ratio	4.3	-	-	-	-	-	-	-
Bank Height Ratio	1.0	-	-	-	-	-	-	-

Left Descending Bank

Right Descending Bank

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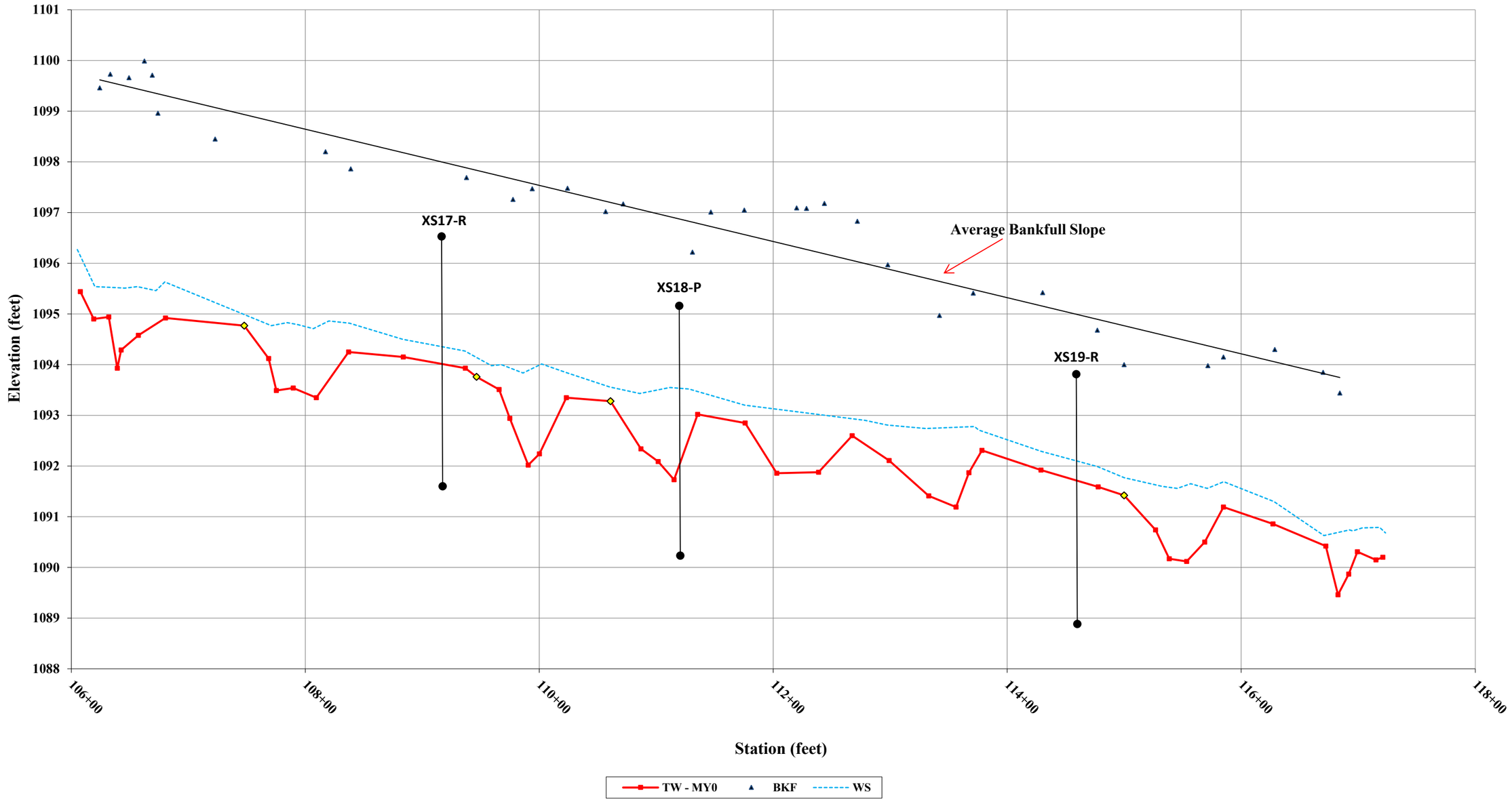
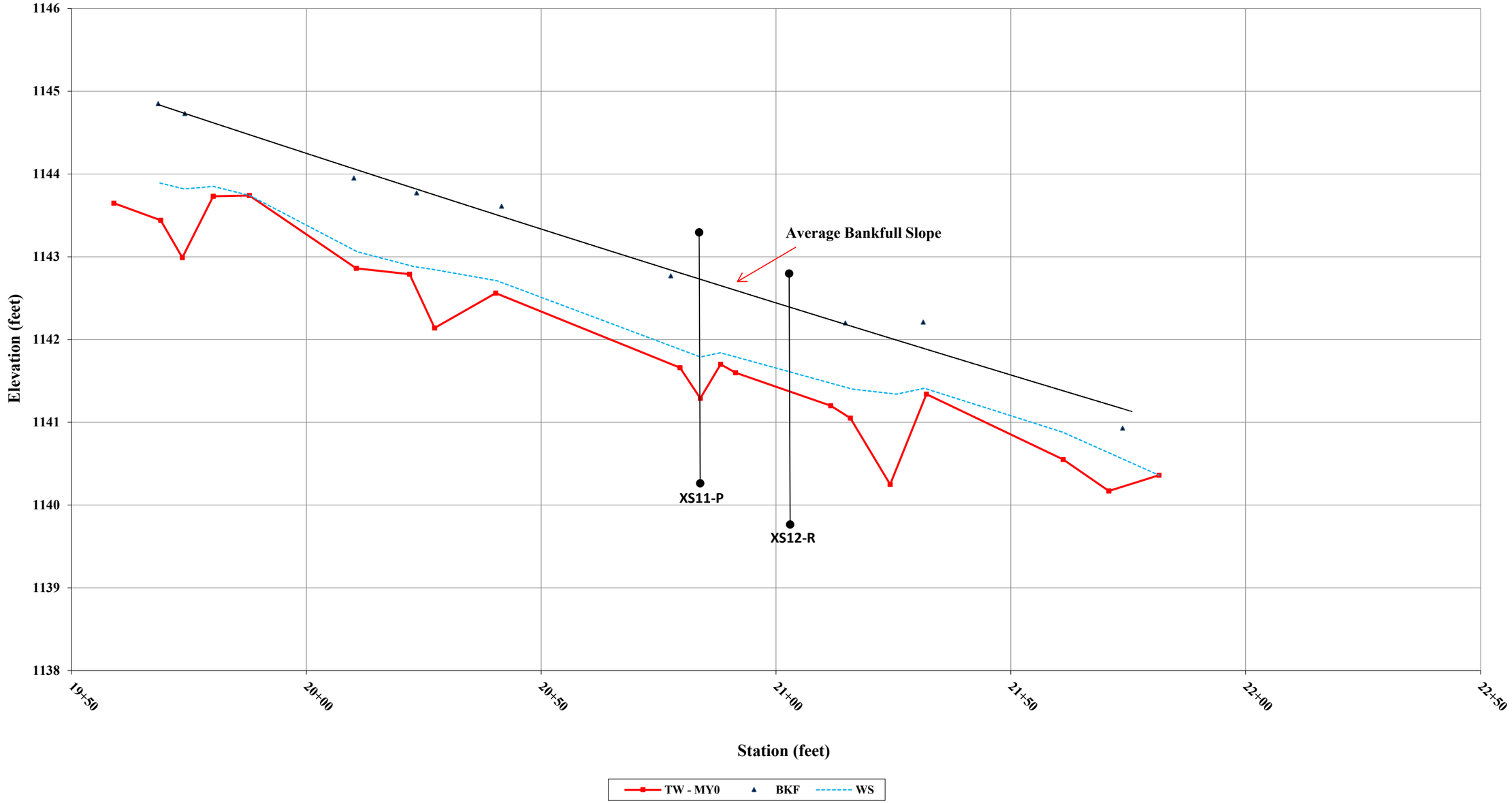
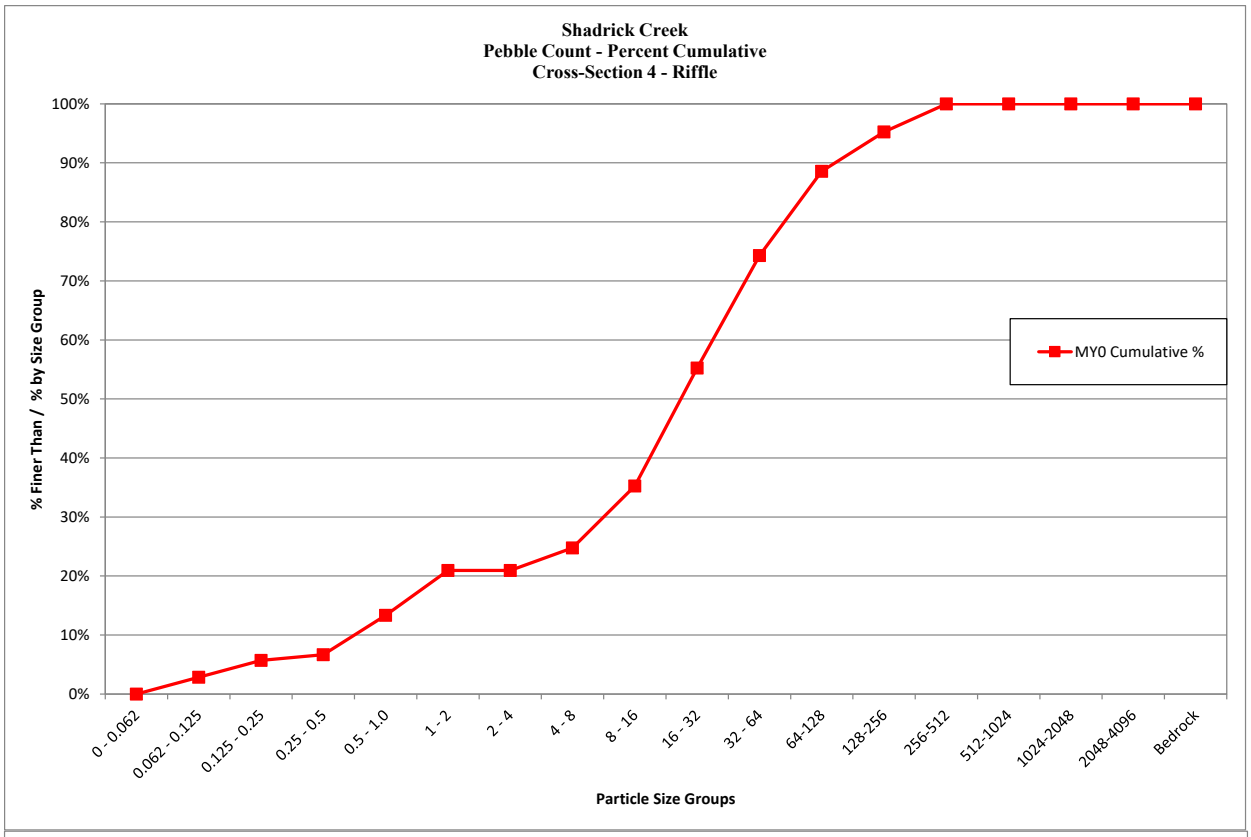
Shadrick Creek - Shadrick Reach 3
Longitudinal Profile
Staioning 106+23 to 117+27

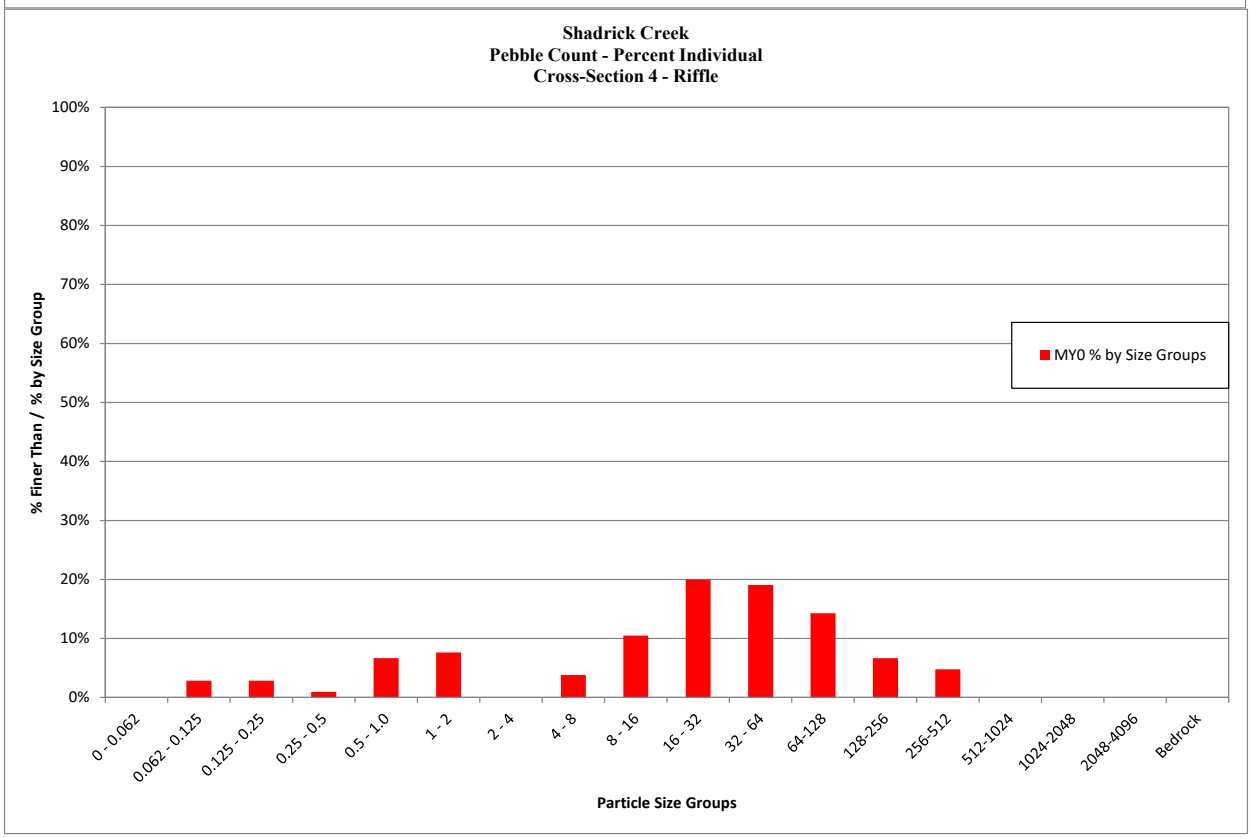


Shadrick Creek - UT9
Longitudinal Profile
Staioning 19+59 to 22+08

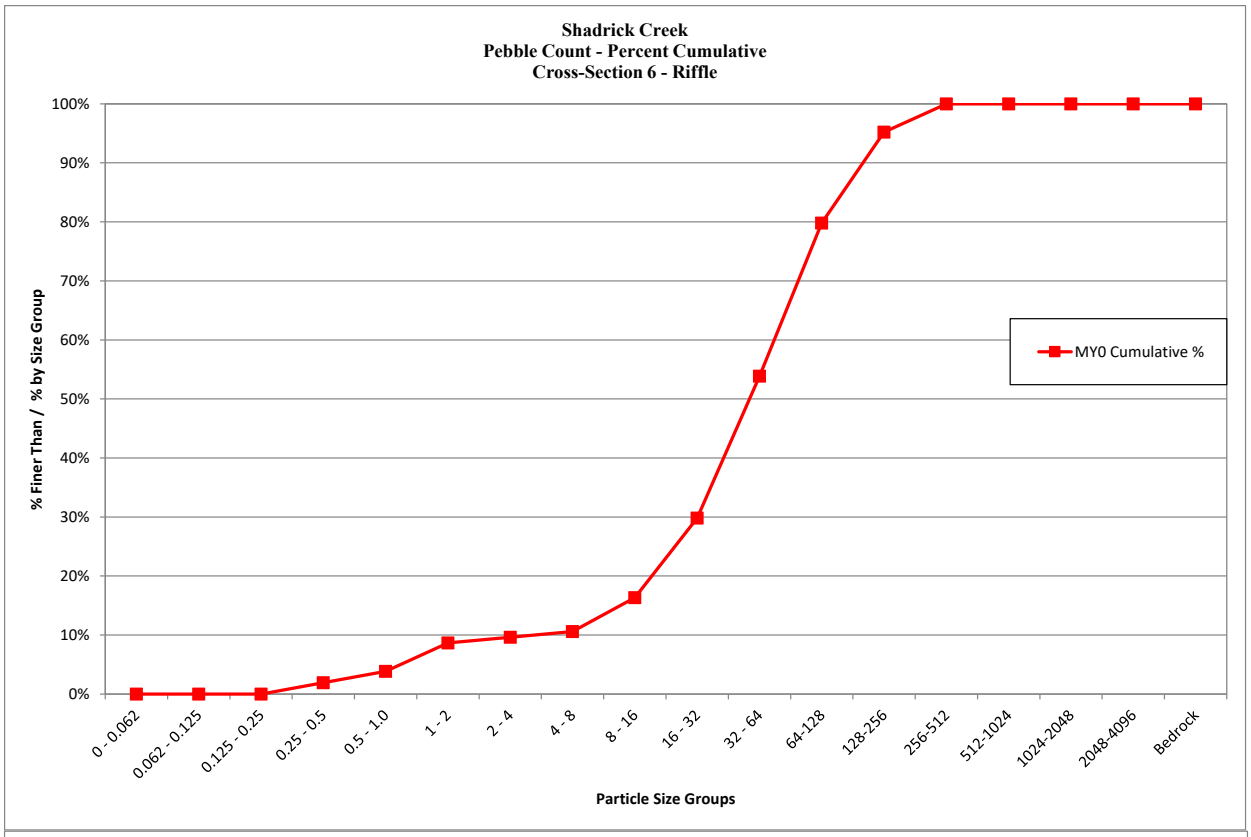


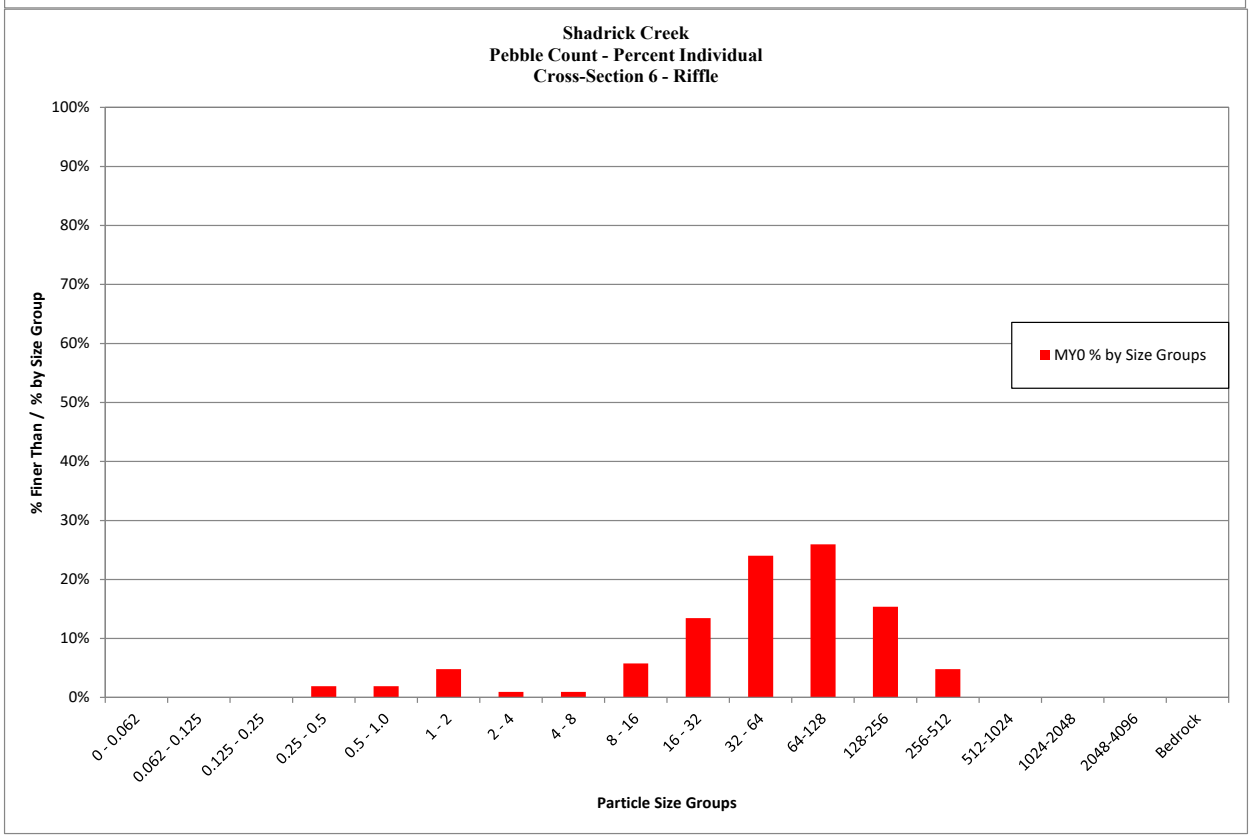
Shadrick Creek Reach 1			
Cross Section 4 - Riffle			
Monitoring Year - 2017; MY0			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	0	0.0%	0%
0.062 - 0.125	3	2.9%	3%
0.125 - 0.25	3	2.9%	6%
0.25 - 0.5	1	1.0%	7%
0.5 - 1.0	7	6.7%	13%
1 - 2	8	7.6%	21%
2 - 4	0	0.0%	21%
4 - 8	4	3.8%	25%
8 - 16	11	10.5%	35%
16 - 32	21	20.0%	55%
32 - 64	20	19.0%	74%
64-128	15	14.3%	89%
128-256	7	6.7%	95%
256-512	5	4.8%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**105**	**100%**	**100%**
		Summary Data	
		D50	**28**
		D84	**97**
		D95	**250**


Shadrick Creek
Pebble Count - Percent Cumulative
Cross-Section 4 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY0 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

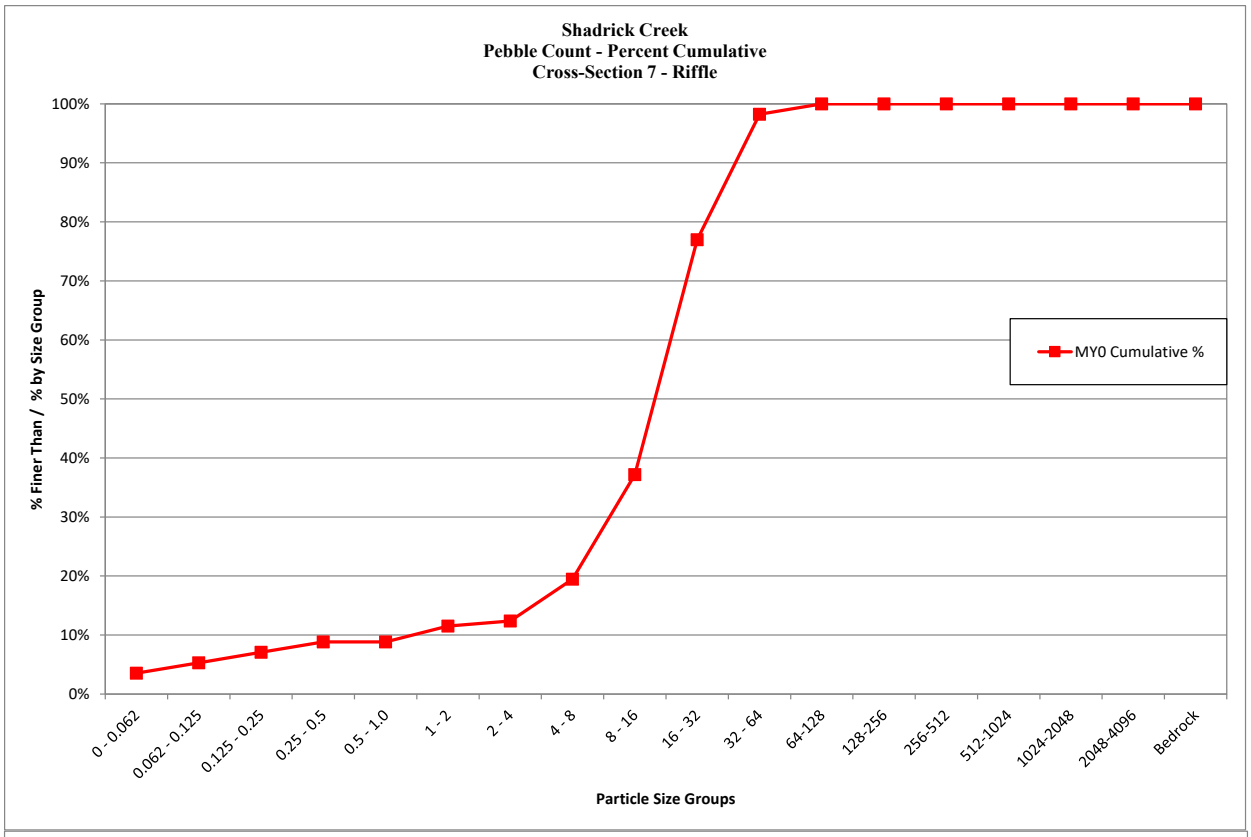

Shadrick Creek
Pebble Count - Percent Individual
Cross-Section 4 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY0 % by Size Groups
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

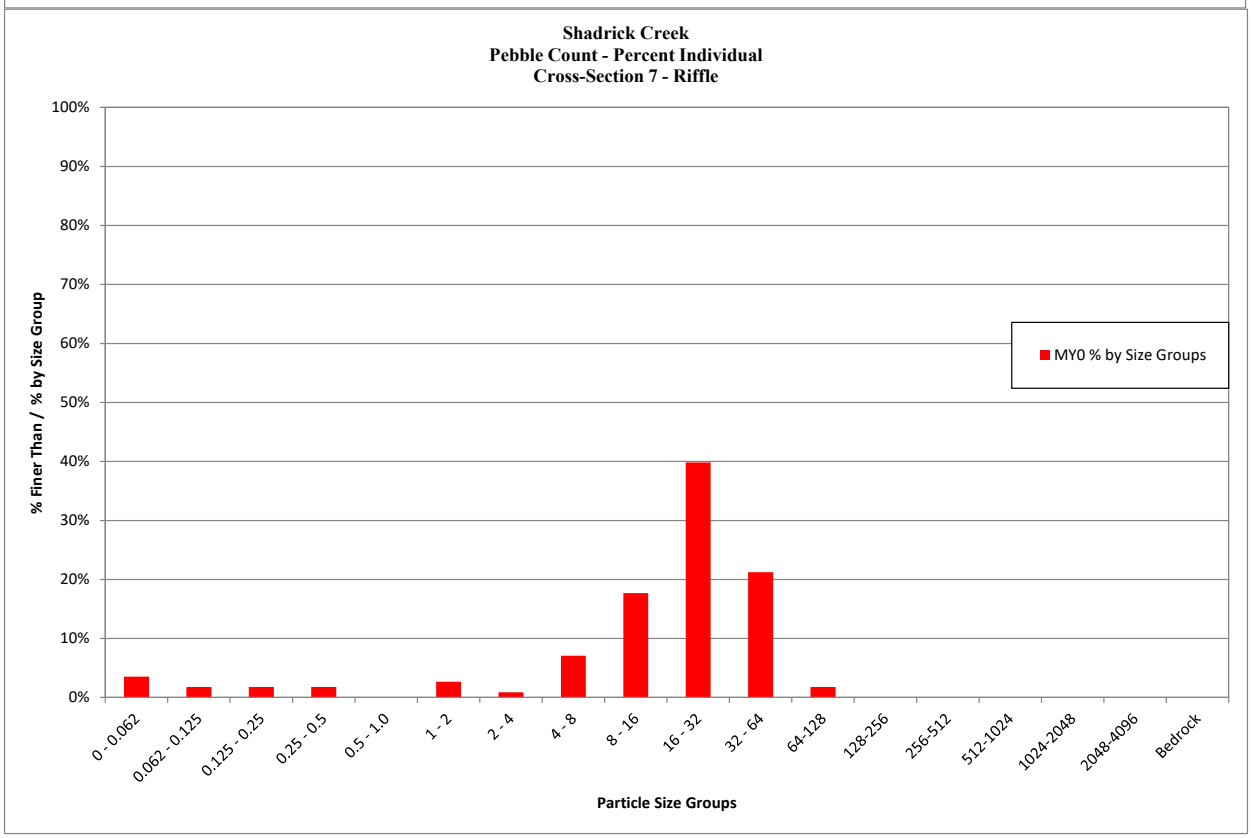
Shadrick Creek Reach 1			
Cross Section 6 - Riffle			
Monitoring Year - 2017; MY0			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	0	0.0%	0%
0.062 - 0.125	0	0.0%	0%
0.125 - 0.25	0	0.0%	0%
0.25 - 0.5	2	1.9%	2%
0.5 - 1.0	2	1.9%	4%
1 - 2	5	4.8%	9%
2 - 4	1	1.0%	10%
4 - 8	1	1.0%	11%
8 - 16	6	5.8%	16%
16 - 32	14	13.5%	30%
32 - 64	25	24.0%	54%
64-128	27	26.0%	80%
128-256	16	15.4%	95%
256-512	5	4.8%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**104**	**100%**	**100%**
		Summary Data	
		D50	**56**
		D84	**150**
		D95	**250**


Shadrick Creek
Pebble Count - Percent Cumulative
Cross-Section 6 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY0 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

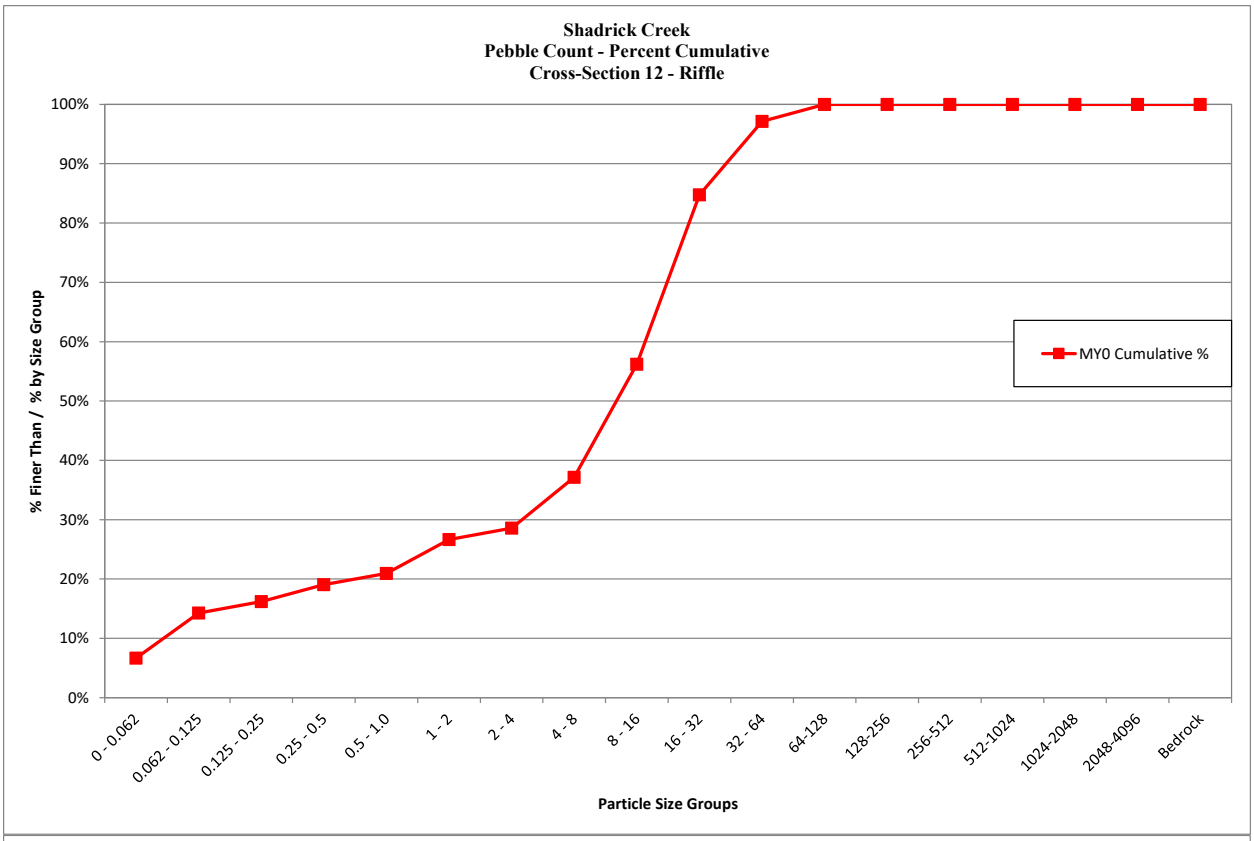

Shadrick Creek
Pebble Count - Percent Individual
Cross-Section 6 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY0 % by Size Groups
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

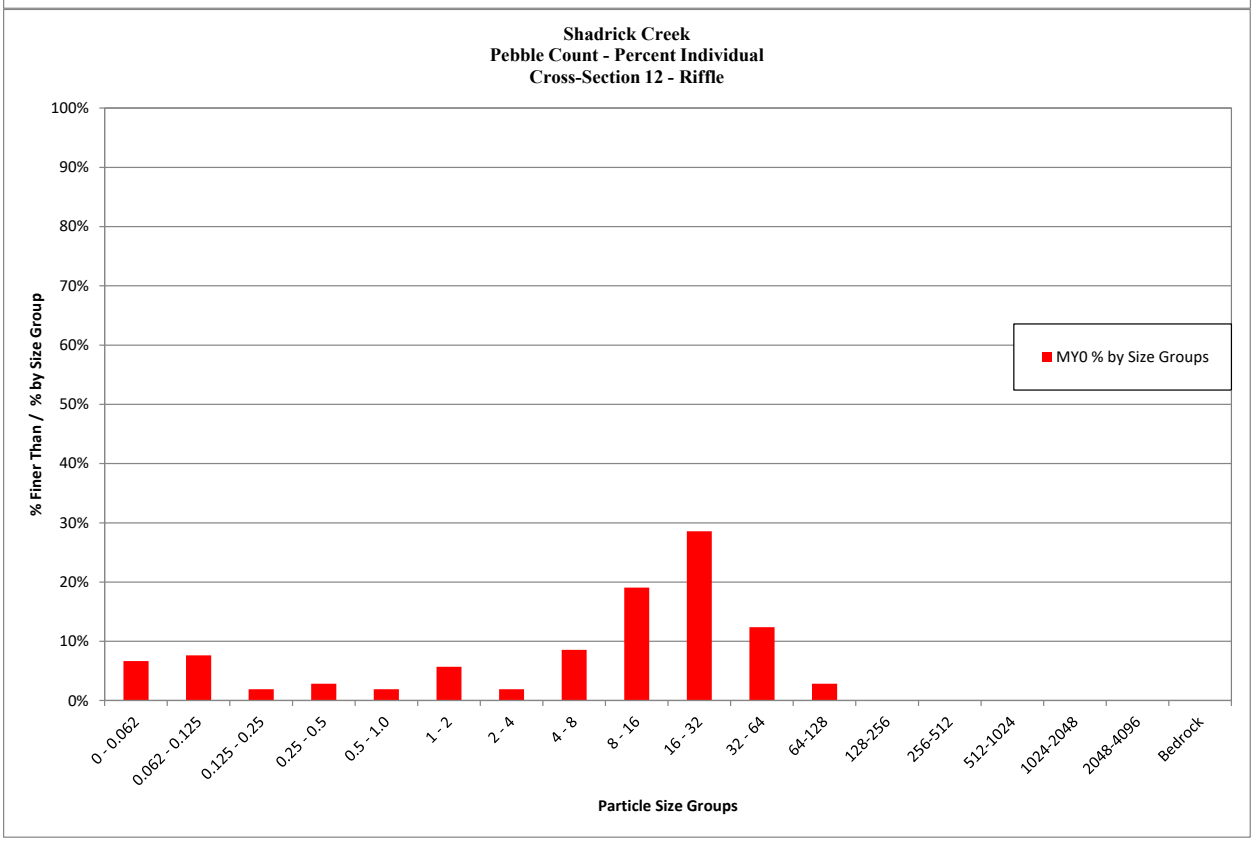
Shadrick Creek Reach 1			
Cross Section 7 - Riffle			
Monitoring Year - 2017; MY0			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	4	3.5%	4%
0.062 - 0.125	2	1.8%	5%
0.125 - 0.25	2	1.8%	7%
0.25 - 0.5	2	1.8%	9%
0.5 - 1.0	0	0.0%	9%
1 - 2	3	2.7%	12%
2 - 4	1	0.9%	12%
4 - 8	8	7.1%	19%
8 - 16	20	17.7%	37%
16 - 32	45	39.8%	77%
32 - 64	24	21.2%	98%
64-128	2	1.8%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**113**	**100%**	**100%**
		Summary Data	
		D50	**21**
		D84	**38**
		D95	**55**


Shadrick Creek
Pebble Count - Percent Cumulative
Cross-Section 7 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY0 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

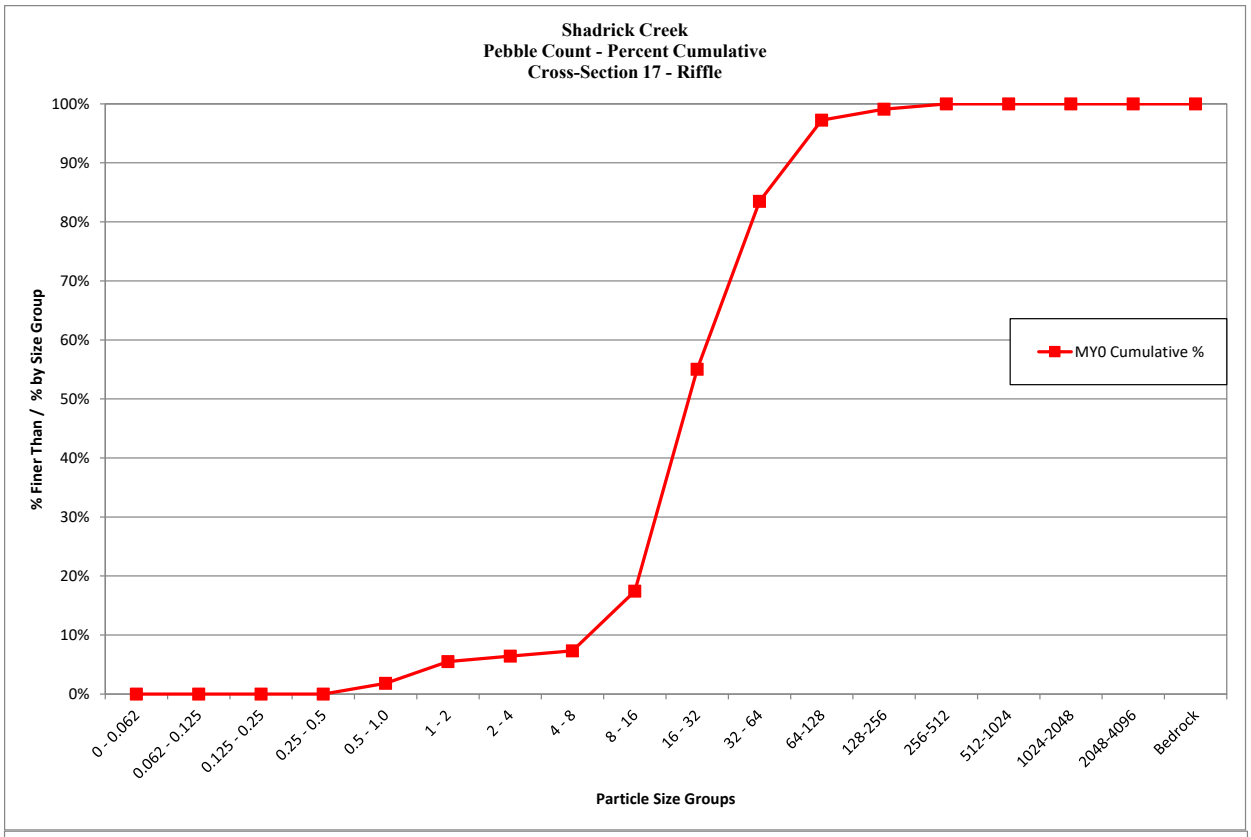

Shadrick Creek
Pebble Count - Percent Individual
Cross-Section 7 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY0 % by Size Groups
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

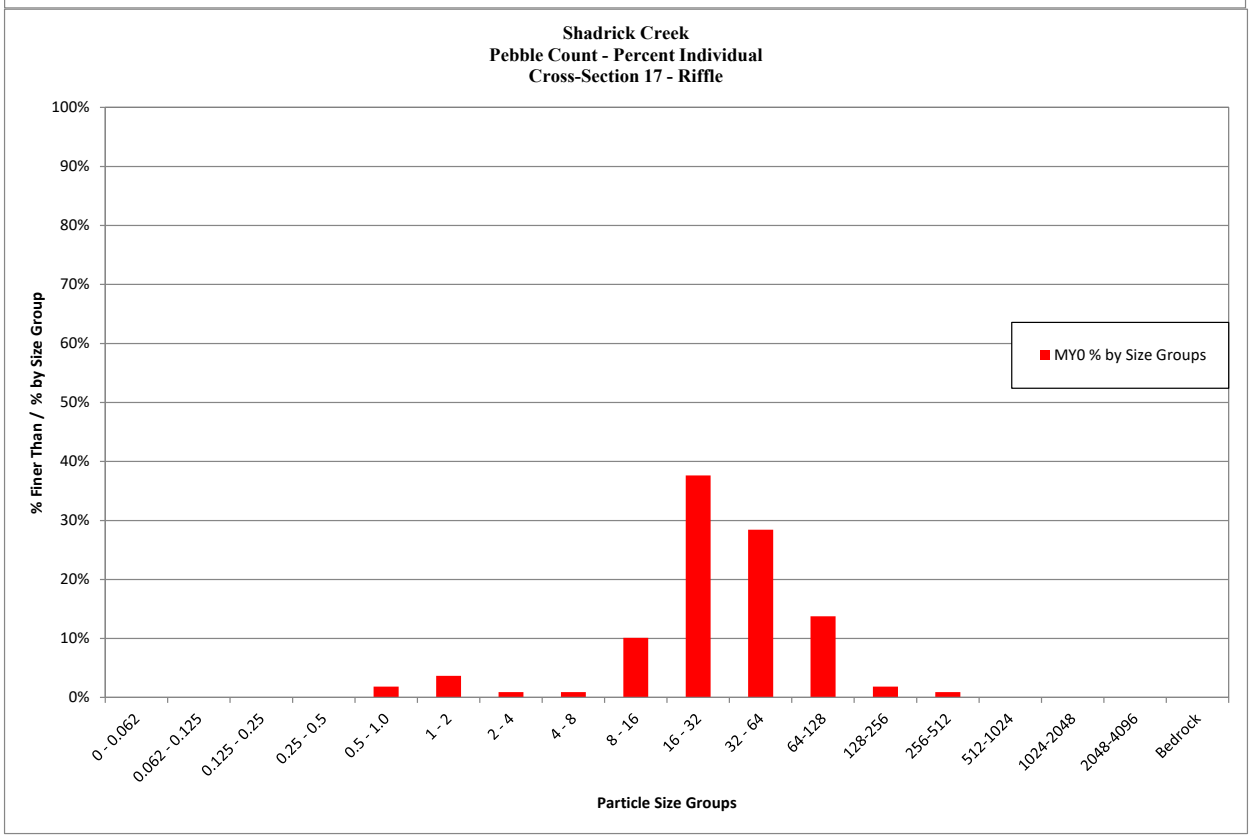
Shadrick Creek UT - 9			
Cross Section 12 - Riffle			
Monitoring Year - 2017; MY0			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	7	6.7%	7%
0.062 - 0.125	8	7.6%	14%
0.125 - 0.25	2	1.9%	16%
0.25 - 0.5	3	2.9%	19%
0.5 - 1.0	2	1.9%	21%
1 - 2	6	5.7%	27%
2 - 4	2	1.9%	29%
4 - 8	9	8.6%	37%
8 - 16	20	19.0%	56%
16 - 32	30	28.6%	85%
32 - 64	13	12.4%	97%
64-128	3	2.9%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**105**	**100%**	**100%**
		Summary Data	
		D50	**13**
		D84	**31**
		D95	**55**


Shadrick Creek
Pebble Count - Percent Cumulative
Cross-Section 12 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY0 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

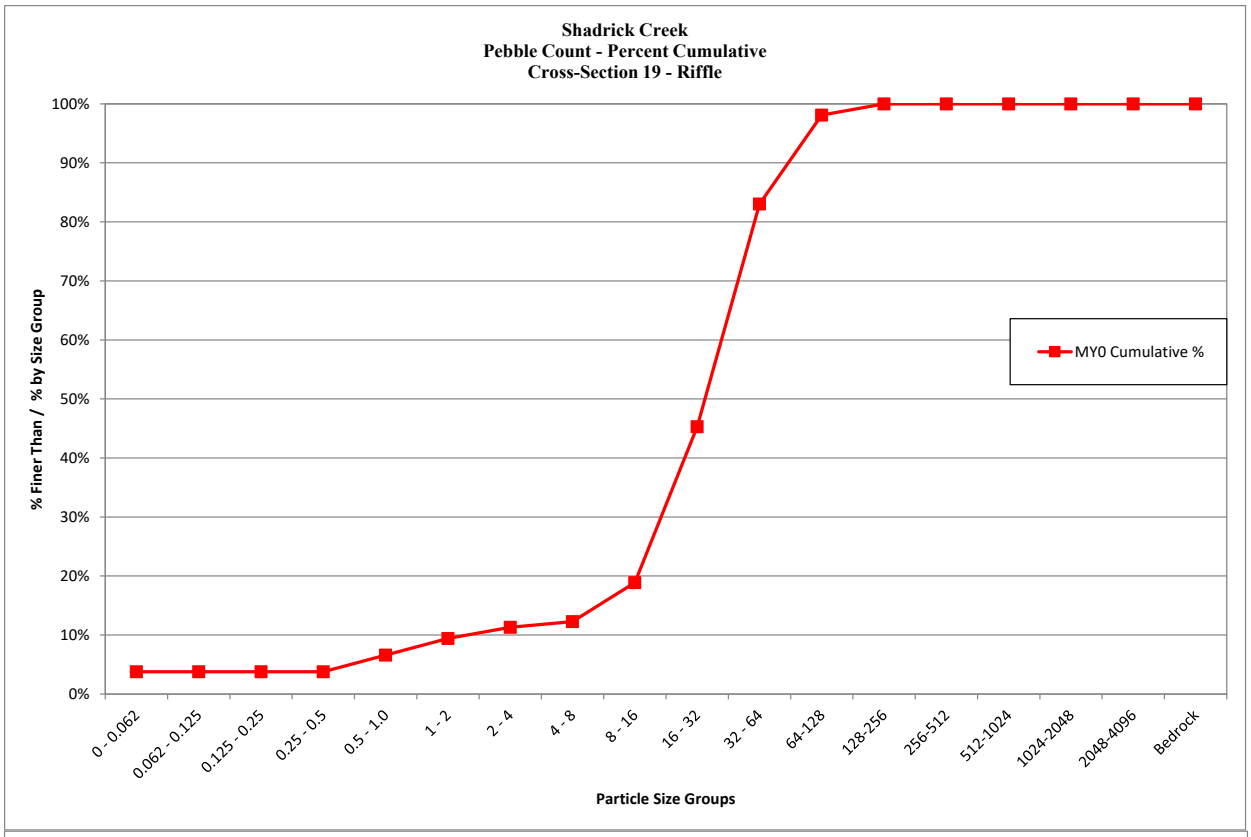

Shadrick Creek
Pebble Count - Percent Individual
Cross-Section 12 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY0 % by Size Groups
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

Shadrick Creek Reach 3			
Cross Section 17 - Riffle			
Monitoring Year - 2017; MY0			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	0	0.0%	0%
0.062 - 0.125	0	0.0%	0%
0.125 - 0.25	0	0.0%	0%
0.25 - 0.5	0	0.0%	0%
0.5 - 1.0	2	1.8%	2%
1 - 2	4	3.7%	6%
2 - 4	1	0.9%	6%
4 - 8	1	0.9%	7%
8 - 16	11	10.1%	17%
16 - 32	41	37.6%	55%
32 - 64	31	28.4%	83%
64-128	15	13.8%	97%
128-256	2	1.8%	99%
256-512	1	0.9%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**109**	**100%**	**100%**
		Summary Data	
		D50	**29**
		D84	**66**
		D95	**110**


Shadrick Creek
Pebble Count - Percent Cumulative
Cross-Section 17 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY0 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups


Shadrick Creek
Pebble Count - Percent Individual
Cross-Section 17 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY0 % by Size Groups
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

Shadrick Creek Reach 3			
Cross Section 19 - Riffle			
Monitoring Year - 2017; MY0			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	4	3.8%	4%
0.062 - 0.125	0	0.0%	4%
0.125 - 0.25	0	0.0%	4%
0.25 - 0.5	0	0.0%	4%
0.5 - 1.0	3	2.8%	7%
1 - 2	3	2.8%	9%
2 - 4	2	1.9%	11%
4 - 8	1	0.9%	12%
8 - 16	7	6.6%	19%
16 - 32	28	26.4%	45%
32 - 64	40	37.7%	83%
64-128	16	15.1%	98%
128-256	2	1.9%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**106**	**100%**	**100%**
		Summary Data	
		D50	**35**
		D84	**66**
		D95	**110**


Shadrick Creek
Pebble Count - Percent Cumulative
Cross-Section 19 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY0 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

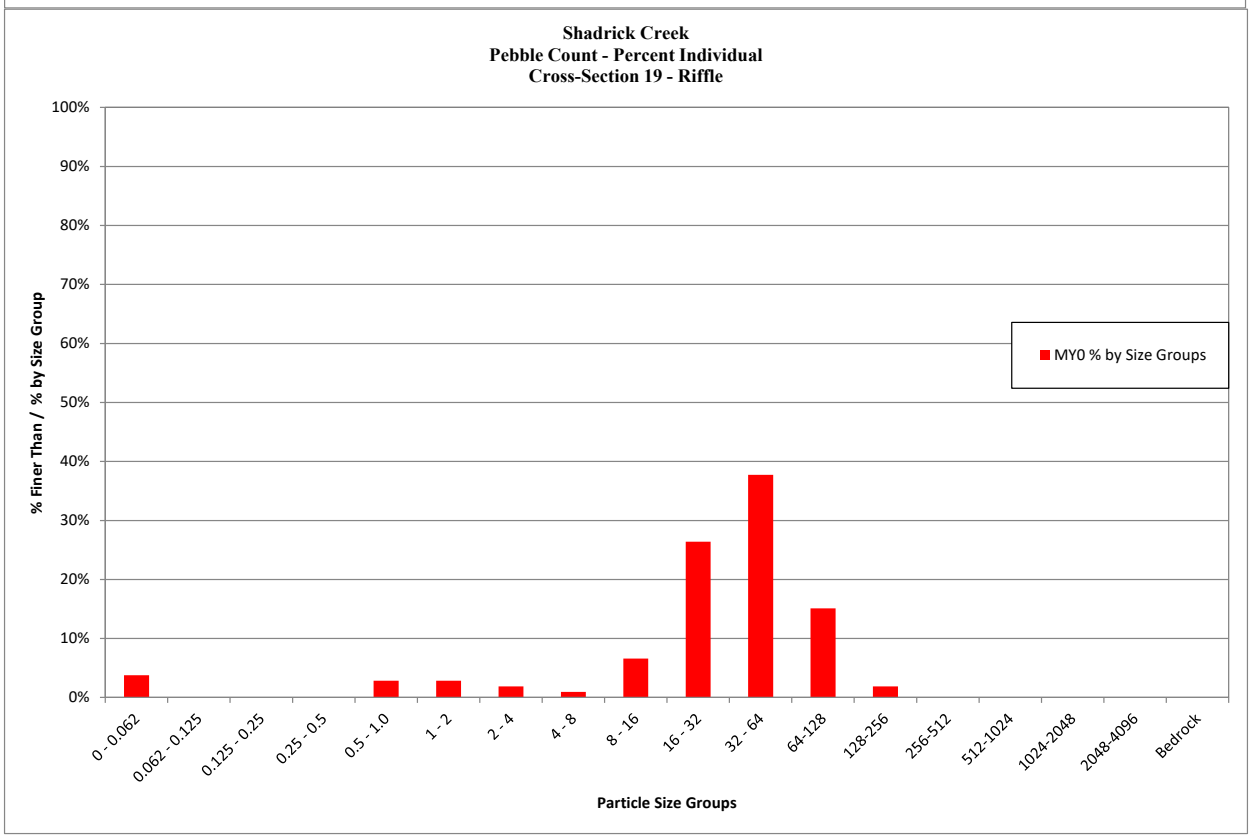

Shadrick Creek
Pebble Count - Percent Individual
Cross-Section 19 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY0 % by Size Groups
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

Table 7. Baseline Stream Data Summary
Shadrick Creek - Shadrick Creek Reach 1 (3,631 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			As-Built / Baseline					
Dimension & Substrate - Riffle	**LL**	**UL**	**Eq.**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**
Bankfull Width (ft)	-	-	-	21.0	-	22.0	23.0	-	-	-	-	19	-	-	-	-	27.0	-	26.6	29.3	28.7	32.7	3.1	3
Floodprone Width (ft)				68.0	-	74.0	80.0	-	-	-	-	32.0	-	-	-	-	100.0	-	100.0	100.0	100.0	100.0	0.0	3
Bankfull Mean Depth (ft)				2.4	-	2.6	2.8	-	-	-	-	1.8	-	-	-	-	2.2	-	1.8	1.8	1.8	1.8	0.0	3
Bankfull Max Depth (ft)				3.6	-	3.6	3.7	-	-	-	-	2.1	-	-	-	-	3.0	-	3.0	3.1	3.0	3.2	0.1	3
Bankfull Cross Sectional Area (ft^2)		-		51.4	-	57.5	63.5	-	-	-	-	34.5	-	-	-	-	58.4	-	47.0	52.8	52.0	59.3	6.2	3
Width/Depth Ratio				6.9	-	8.6	10.3	-	-	-	-	10.4	-	-	-	-	12.4	-	15.0	16.3	15.8	18.0	1.5	3
Entrenchment Ratio				3.0	-	3.4	3.8	-	-	-	-	1.7	-	-	-	-	3.7	-	3.1	3.4	3.5	3.8	0.4	3
Bank Height Ratio				1.3	-	1.3	1.4	-	-	-	-	-	-	-	-	-	-	-	1.0	1.0	1.0	1.0	0.0	3
d50 (mm)				23.0	-	25.0	40.0	-	-	-	-	40.0	-	-	-	23.0	25.0	40.0	21.0	35.0	28.0	56.0	18.5	3
Profile																								
Riffle Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Riffle Slope (ft/ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pool Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pool Max Depth (ft)				3.9	-	4.4	4.8	-	-	-	-	3.9	-	-	-	-	5.0	-	-	-	-	-	-	-
Pool Spacing (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pattern																								
Channel Belt Width (ft)				66.0	-	70.0	162.0	-	-	-	-	65.0	-	-	-	66.0	70.0	162.0	-	-	-	-	-	-
Radius of Curvature (ft)				34.0	-	61.0	149.0	-	-	-	-	60.0	-	-	-	34.0	61.0	149.0	-	-	-	-	-	-
Rc: Bankfull Width (ft/ft)				1.6	-	2.8	6.5	-	-	-	-	3.2	-	-	-	1.6	2.8	6.5	-	-	-	-	-	-
Meander Wavelength (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Meander Width Ratio				3.1	-	3.2	7.0	-	-	-	-	3.4	-	-	-	3.1	3.2	7.0	-	-	-	-	-	-
Substrate, Bed and Transport Parameters																								
Reach Shear Stress (Competency) lb/ft^2				0.75						-						-			-					
Max Part Size (mm) Mobilized at Bankfull				120.0						-						-			-					
Stream Power (Transport Capacity) W/m^2				-												-			-					
Additional Reach Parameters																								
Drainage Area (mi^2)				2.8						2.5						2.8								
Rosgen Classification				E4						E4						C4			C4					
Bankfull Velocity (fps)		-		4.8						3.7						3.9								
Bankfull Discharge (cfs)		-		273.0						127.0						230.0								
Valley Length (ft)				-						-						-			3,268					
Channel Thalweg Length (ft)				-						-						3,641			3,631					
Sinuosity				1.32						1.80						1.32			1.13					
Water Surface Slope (ft/ft)				0.0053						0.0089						0.0053			-					
Bankfull Slope (ft/ft)				-						-						-			-					
Bankfull Floodplain Area (acres)				-						-														
% of Reach with Eroding Banks				-						-														
Channel Stability or Habitat Metric				-						-														
Biological or Other				-						-														

- Information unavailable.

Non-Applicable.

Table 7 Cont'd. Baseline Stream Data Summary Shadrick Creek - Shadrick Creek Reach 2 (573 feet)																								
Parameter	**Regional Curve**			**Pre-Existing Condition**						**Reference Reach Data**						**Design**			**As-Built / Baseline**					
Dimension & Substrate - Riffle	**LL**	**UL**	**Eq.**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**
Bankfull Width (ft)	-	-	-	19.9	-	20.6	21.3	-	-	-	-	19.7	-	-	-	-	29.0	-	-	29.9	-	-	-	1
Floodprone Width (ft)				68.0	-	74.0	80.0	-	-	-	-	32.0	-	-	-	-	100.0	-	-	116.0	-	-	-	1
Bankfull Mean Depth (ft)	-	-	-	2.3	-	2.4	2.5	-	-	-	-	2.1	-	-	-	-	2.4	-	-	2.4	-	-	-	1
Bankfull Max Depth (ft)				3.4	-	3.7	4.0	-	-	-	-	3.2	-	-	-	-	3.4	-	-	3.9	-	-	-	1
Bankfull Cross Sectional Area (ft^2)		-		46.4	-	49.4	52.3	-	-	-	-	41.0	-	-	-	-	69.7	-	-	71.7	-	-	-	1
Width/Depth Ratio				8.5	-	8.6	8.6	-	-	-	-	9.5	-	-	-	-	12.1	-	-	12.5	-	-	-	1
Entrenchment Ratio				2.2	-	2.8	3.3	-	-	3.0	-	4.0	5.0	-	-	-	1.7	-	-	3.9	-	-	-	1
Bank Height Ratio				1.6	-	1.7	1.7	-	-	-	-	1.9	-	-	-	-	1.0	-	-	1.0	-	-	-	1
d50 (mm)				10.0	-	12.0	32.0	-	-	10.0	-	12.0	32.0	-	-	10.0	12.0	32.0						
Profile																								
Riffle Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Riffle Slope (ft/ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pool Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pool Max Depth (ft)				-	-	5.1	-	-	-	-	-	-	-	-	-	-	5.5	-	-	-	-	-	-	-
Pool Spacing (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pattern																								
Channel Belt Width (ft)				60.0	-	80.0	100.0	-	-	60.0	-	80.0	100.0	-	-	90.0	116.0	160.0	-	-	-	-	-	-
Radius of Curvature (ft)				20.0	-	43.0	118.0	-	-	30.0	-	40.0	50.0	-	-	30.0	60.0	75.0	-	-	-	-	-	-
Rc: Bankfull Width (ft/ft)				1.00	-	21.00	5.50	-	-	1.50		2.00	2.50	-	-	1.10	2.10	2.60	-	-	-	-	-	-
Meander Wavelength (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Meander Width Ratio				3.0	-	3.9	4.7	-	-	3.1	-	4.1	5.1	-	-	3.1	4.0	5.5	-	-	-	-	-	-
Substrate, Bed and Transport Parameters																								
Reach Shear Stress (Competency) lb/ft^2				0.84						-						-			-					
Max Part Size (mm) Mobilized at Bankfull				130.0						-						-			-					
Stream Power (Transport Capacity) W/m^2				-						-						-								
Additional Reach Parameters																								
Drainage Area (mi^2)				3.3						3.2						3.3								
Rosgen Classification				E4						E4						C4			C4					
Bankfull Velocity (fps)		-		4.5						5.3						4.0								
Bankfull Discharge (cfs)		-		225.0						217.0						280.0								
Valley Length (ft)				-						-						-			499					
Channel Thalweg Length (ft)				-						-						575			573					
Sinuosity				1.26						1.26						1.31			1.15					
Water Surface Slope (ft/ft)				0.0050						0.0050						0.0048			-					
Bankfull Slope (ft/ft)				-						-						-			-					
Bankfull Floodplain Area (acres)				-						-														
% of Reach with Eroding Banks				-						-														
Channel Stability or Habitat Metric				-						-														
Biological or Other				-						-														

- Information unavailable.

Non-Applicable.

Table 7 Cont'd. Baseline Stream Data Summary
Shadrick Creek - Shadrick Creek Reach 3 (1,104 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			As-Built / Baseline					
Dimension & Substrate - Riffle	**LL**	**UL**	**Eq.**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**
Bankfull Width (ft)	-	-	-	19.9	-	20.6	21.3	-	-	-	-	19.7	-	-	-	-	29.0	-	26.9	29.0	29.0	31.1	2.9	2
Floodprone Width (ft)				68.0	-	74.0	80.0	-	-	-	-	32.0	-	-	-	-	100.0	-	116.0	116.0	116.0	116.0	0.0	2
Bankfull Mean Depth (ft)	-	-	-	2.3	-	2.4	2.5	-	-	-	-	2.1	-	-	-	-	2.4	-	2.2	2.2	2.2	2.3	0.0	2
Bankfull Max Depth (ft)				3.4	-	3.7	4.0	-	-	-	-	3.2	-	-	-	-	3.4	-	3.5	3.5	3.5	3.5	0.0	2
Bankfull Cross Sectional Area (ft^2)		-		46.4	-	49.4	52.3	-	-	-	-	41.0	-	-	-	-	69.7	-	61.0	64.8	64.8	68.6	5.4	2
Width/Depth Ratio				8.5	-	8.6	8.6	-	-	-	-	9.5	-	-	-	-	12.1	-	11.9	13.0	13.0	14.1	1.6	2
Entrenchment Ratio				2.2	-	2.8	3.3	-	-	3.0	-	4.0	5.0	-	-	-	1.7	-	3.7	4.0	4.0	4.3	0.4	2
Bank Height Ratio				1.6	-	1.7	1.7	-	-	-	-	1.9	-	-	-	-	1.0	-	1.0	1.0	1.0	1.0	0.0	2
d50 (mm)				10.0	-	12.0	32.0	-	-	10.0	-	12.0	32.0	-	-	10.0	12.0	32.0	29.0	32.0	32.0	35.0	4.2	2
Profile																								
Riffle Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32.0	69.7	67.8	121.6	34.8	7
Riffle Slope (ft/ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.004	0.007	0.008	0.011	0.002	7
Pool Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.8	42.9	45.0	63.8	15.1	7
Pool Max Depth (ft)				-	-	5.1	-	-	-	-	-	-	-	-	-	-	5.5	-	4.3	4.8	4.5	5.5	0.5	7
Pool Spacing (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	87.4	145.2	141.1	196.3	40.1	6
Pattern																								
Channel Belt Width (ft)				60.0	-	80.0	100.0	-	-	60.0	-	80.0	100.0	-	-	90.0	116.0	160.0	84.7	94.5	95.0	103.5	7.7	4
Radius of Curvature (ft)				20.0	-	43.0	118.0	-	-	30.0	-	40.0	50.0	-	-	30.0	60.0	75.0	61.6	67.0	66.8	72.9	4.8	4
Rc: Bankfull Width (ft/ft)				1.00	-	21.00	5.50	-	-	1.50	-	2.00	2.50	-	-	1.10	2.10	2.60	2.12	2.31	2.30	2.51	0.17	3
Meander Wavelength (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	202.5	250.1	248.2	301.6	51.7	4
Meander Width Ratio				3.0	-	3.9	4.7	-	-	3.1	-	4.1	5.1	-	-	3.1	4.0	5.5	2.1	2.3	2.3	2.5	0.16	4
Substrate, Bed and Transport Parameters																								
Reach Shear Stress (Competency) lb/ft^2				0.84						-						-			-					
Max Part Size (mm) Mobilized at Bankfull				130.0						-						-			-					
Stream Power (Transport Capacity) W/m^2				-						-						-								
Additional Reach Parameters																								
Drainage Area (mi^2)				3.3						3.2						3.3								
Rosgen Classification				E4						E4						C4			C4					
Bankfull Velocity (fps)		-		4.5						5.3						4.0								
Bankfull Discharge (cfs)		-		225.0						217.0						280.0								
Valley Length (ft)				-						-						1,108			1,104					
Channel Thalweg Length (ft)				-						-						-			927					
Sinuosity				1.26						1.26						1.31			1.19					
Water Surface Slope (ft/ft)				0.0050						0.0050						0.0048			0.0043					
Bankfull Slope (ft/ft)				-						-						-			0.0055					
Bankfull Floodplain Area (acres)				-						-														
% of Reach with Eroding Banks				-						-														
Channel Stability or Habitat Metric				-						-														
Biological or Other				-						-														

- Information unavailable.

Non-Applicable.

Table 7 Cont'd. Baseline Stream Data Summary
Shadrick Creek - UT1 (1,651 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			As-Built / Baseline					
Dimension & Substrate - Riffle	**LL**	**UL**	**Eq.**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**
Bankfull Width (ft)	-	-	-	3.3	-	3.9	5.3	-	-	5.4	-	6.7	8.0	-	-	-	8.0	-	5.02	5.68	5.68	6.34	0.93	2
Floodprone Width (ft)				4.5	-	13.0	21.0	-	-	13.0	-	16.5	20.0	-	-	-	24.0	-	24	24	24	24	0	2
Bankfull Mean Depth (ft)	-	-	-	0.3	-	0.7	1.0	-	-	0.6	-	0.6	0.7	-	-	-	0.7	-	0.68	0.73	0.73	0.77	0.07	2
Bankfull Max Depth (ft)				0.5	-	0.9	1.2	-	-	1.1	-	1.1	1.2	-	-	-	1.0	-	1.1	1.19	1.19	1.28	0.12	2
Bankfull Cross Sectional Area (ft^2)		-		1.2	-	2.8	4.6	-	-	3.1	-	4.3	5.5	-	-	-	5.5	-	3.88	4.09	4.09	4.3	0.3	2
Width/Depth Ratio				4.2	-	6.1	12.6	-	-	9.4	-	10.5	11.6	-	-	-	11.6	-	6.5	7.93	7.93	9.35	2.02	2
Entrenchment Ratio				1.1	-	2.8	5.2	-	-	-	-	2.5	-	-	-	-	3.0	-	3.78	4.28	4.28	4.78	0.7	2
Bank Height Ratio				1.0	-	1.5	3.0	-	-	-	-	1.0	-	-	-	-	1.0	-	1.0	1.0	1.0	1.0	0.0	2
d50 (mm)				3.0	-	6.0	9.0	-	-	3.0	-	6.0	9.0	-	-	3.0	6.0	9.0						
Profile																								
Riffle Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Riffle Slope (ft/ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pool Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pool Max Depth (ft)				0.9	-	1.3	1.9	-	-	-	-	1.2	-	-	-	-	1.6	-	-	-	-	-	-	-
Pool Spacing (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pattern																								
Channel Belt Width (ft)				16.0	-	35.0	50.0	-	-	-	-	40.0	-	-	-	16.0	35.0	50.0	-	-	-	-	-	-
Radius of Curvature (ft)				7.0	-	20.0	70.0	-	-	21.0	-	22.0	23.0	-	-	7.0	20.0	70.0	-	-	-	-	-	-
Rc: Bankfull Width (ft/ft)				2.1	-	5.1	13.2	-	-	3.1	-	3.3	3.4	-	-	2.1	5.1	13.2	-	-	-	-	-	-
Meander Wavelength (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Meander Width Ratio				4.8	-	8.9	9.5	-	-	-	-	6.0	-	-	-	4.8	8.9	9.5	-	-	-	-	-	-
Substrate, Bed and Transport Parameters																								
Reach Shear Stress (Competency) lb/ft^2				0.95						-						-			-					
Max Part Size (mm) Mobilized at Bankfull				145.0						-						-			-					
Stream Power (Transport Capacity) W/m^2				-						-						-								
Additional Reach Parameters																								
Drainage Area (mi^2)				0.10						0.10						0.10								
Rosgen Classification				G4						B4						B4			C4					
Bankfull Velocity (fps)		-		5.5						7.0						4.5								
Bankfull Discharge (cfs)		-		24.0						30.0						25.0								
Valley Length (ft)				-						-						-								
Channel Thalweg Length (ft)				-						-						1,637			1,651					
Sinuosity				1.13						1.13						1.13			1.14					
Water Surface Slope (ft/ft)				0.0230						0.0230						0.0230			-					
Bankfull Slope (ft/ft)				-						-						-			-					
Bankfull Floodplain Area (acres)				-						-														
% of Reach with Eroding Banks				-						-														
Channel Stability or Habitat Metric				-						-														
Biological or Other				-						-														

- Information unavailable.

Non-Applicable.

Table 7 Cont'd. Baseline Stream Data Summary Shadrick Creek - UT9 Reach 1 (706 feet)																								
Parameter	**Regional Curve**			**Pre-Existing Condition**						**Reference Reach Data**						**Design**			**As-Built / Baseline**					
Dimension & Substrate - Riffle	**LL**	**UL**	**Eq.**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**
Bankfull Width (ft)	-	-	-	4.2	-	5.7	6.0	-	-	5.4	-	6.7	8.0	-	-	-	8.0	-	-	9.5	-	-	-	1
Floodprone Width (ft)				8.0	-	10.0	11.0	-	-	13.0	-	17.00	20.0	-	-	-	24.0	-	-	24.0	-	-	-	1
Bankfull Mean Depth (ft)	-	-	-	0.5	-	0.7	1.1	-	-	0.6	-	0.6	0.7	-	-	-	0.7	-	-	0.5	-	-	-	1
Bankfull Max Depth (ft)				0.6	-	0.9	1.5	-	-	1.1	-	1.1	1.2	-	-	-	1.0	-	-	1.1	-	-	-	1
Bankfull Cross Sectional Area (ft^2)		-		2.6	-	2.7	6.3	-	-	3.1	-	4.3	5.5	-	-	-	5.5	-	-	4.8	-	-	-	1
Width/Depth Ratio				5.7	-	6.3	12.7	-	-	9.4	-	10.5	11.6	-	-	-	11.6	-	-	18.7	-	-	-	1
Entrenchment Ratio				1.4	-	1.7	2.7	-	-	-	-	2.5	-	-	-	-	3.0	-	-	2.5	-	-	-	1
Bank Height Ratio				2.3	-	2.7	4.4	-	-	-	-	1.0	-	-	-	-	1.0	-	-	1.0	-	-	-	1
d50 (mm)				-	-	0.3	-	-	-	3.0	-	6.0	9.0	-	-	-	0.3	-						
Profile																								
Riffle Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Riffle Slope (ft/ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pool Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pool Max Depth (ft)				1.0	-	1.2	1.4	-	-	-	-	1.2	-	-	-	-	1.6	-	-	-	-	-	-	-
Pool Spacing (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pattern																								
Channel Belt Width (ft)				20.0	-	26.0	31.0	-	-	-	-	40.0	-	-	-	20.0	26.0	31.0	-	-	-	-	-	-
Radius of Curvature (ft)				36.0	-	47.0	62.0	-	-	21.0	-	22.0	23.0	-	-	36.0	47.0	62.0	-	-	-	-	-	-
Rc: Bankfull Width (ft/ft)				6.0	-	8.2	14.9	-	-	3.1	-	3.3	3.4	-	-	6.0	8.2	14.9	-	-	-	-	-	-
Meander Wavelength (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Meander Width Ratio				4.5	-	4.8	5.1	-	-	-	-	6.0	-	-	-	4.5	4.8	5.1	-	-	-	-	-	-
Substrate, Bed and Transport Parameters																								
Reach Shear Stress (Competency) lb/ft^2				1.44						-						-			-					
Max Part Size (mm) Mobilized at Bankfull				200.0						-						-			-					
Stream Power (Transport Capacity) W/m^2				-						-						-								
Additional Reach Parameters																								
Drainage Area (mi^2)				0.1						0.1						0.1								
Rosgen Classification				B4, G4						B4						B4			B4					
Bankfull Velocity (fps)		-		10.1						7.0						4.5								
Bankfull Discharge (cfs)		-		48.0						30.0						25.0								
Valley Length (ft)				-						-						-			696					
Channel Thalweg Length (ft)				-						-						678			706					
Sinuosity				1.03						1.13						1.03			1.08					
Water Surface Slope (ft/ft)				0.0350						0.0230						0.0350			-					
Bankfull Slope (ft/ft)				-						-						-			-					
Bankfull Floodplain Area (acres)				-						-														
% of Reach with Eroding Banks				-						-														
Channel Stability or Habitat Metric				-						-														
Biological or Other				-						-														

- Information unavailable.

Non-Applicable.

Table 7 Cont'd. Baseline Stream Data Summary Shadrick Creek - UT9 Reach 2 (238 feet)																								
Parameter	**Regional Curve**			**Pre-Existing Condition**						**Reference Reach Data**						**Design**			**As-Built / Baseline**					
Dimension & Substrate - Riffle	**LL**	**UL**	**Eq.**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**
Bankfull Width (ft)	-	-	-	4.2	-	5.7	6.0	-	-	5.4	-	6.7	8.0	-	-	-	8.0	-	-	8.3	-	-	-	1
Floodprone Width (ft)				8.0	-	10.0	11.0	-	-	13.0	-	17	20.0	-	-	-	24.0	-	-	24.0	-	-	-	1
Bankfull Mean Depth (ft)	-	-	-	0.5	-	0.7	1.1	-	-	0.6	-	0.6	0.7	-	-	-	0.7	-	-	0.4	-	-	-	1
Bankfull Max Depth (ft)				0.6	-	0.9	1.5	-	-	1.1	-	1.1	1.2	-	-	-	1.0	-	-	1.0	-	-	-	1
Bankfull Cross Sectional Area (ft^2)		-		2.6	-	2.7	6.3	-	-	3.1	-	4.3	5.5	-	-	-	5.5	-	-	3.6	-	-	-	1
Width/Depth Ratio				5.7	-	6.3	12.7	-	-	9.4	-	10.5	11.6	-	-	-	11.6	-	-	19.0	-	-	-	1
Entrenchment Ratio				1.4	-	1.7	2.7	-	-	-	-	2.5	-	-	-	-	3.0	-	-	2.9	-	-	-	1
Bank Height Ratio				2.3	-	2.7	4.4	-	-	-	-	1.0	-	-	-	-	1.0	-	-	1.0	-	-	-	1
d50 (mm)				-	-	0.3	-	-	-	3.0	-	6.0	9.0	-	-	-	0.3	-	-	13.0	-	-	-	1
Profile																								
Riffle Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23.3	29.0	27.3	38.4	6.7	4
Riffle Slope (ft/ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.016	0.022	0.020	0.033	0.008	4
Pool Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.6	10.2	11.2	12.6	3.1	4
Pool Max Depth (ft)				1.0	-	1.2	1.4	-	-	-	-	1.2	-	-	-	-	1.8	-	1.0	1.5	1.5	1.7	0.3	4
Pool Spacing (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40.4	47.7	46.4	56.4	8.1	3
Pattern																								
Channel Belt Width (ft)				20.0	-	26.0	31.0	-	-	-	-	40.0	-	-	-	-	42.0	-	24.5	30.0	29.0	36.6	6.1	3
Radius of Curvature (ft)				36.0	-	47.0	62.0	-	-	21.0	-	22	23.0	-	-	-	15.0	-	13.3	15.2	15.4	16.9	1.8	3
Rc: Bankfull Width (ft/ft)				6.0	-	8.2	14.9	-	-	3.1	-	3.3	3.4	-	-	-	1.9		2.12	2.31	2.30	2.51	0.17	3
Meander Wavelength (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63.7	78.5	79.3	92.5	14.4	3
Meander Width Ratio				4.5	-	4.8	5.1	-	-	-	-	6.0	-	-	-	-	5.3	-	3.1	3.8	3.6	4.6	0.8	3
Substrate, Bed and Transport Parameters																								
Reach Shear Stress (Competency) lb/ft^2						0.58						-				-				-				
Max Part Size (mm) Mobilized at Bankfull						100.0						-				-				-				
Stream Power (Transport Capacity) W/m^2						-						-				-								
Additional Reach Parameters																								
Drainage Area (mi^2)						0.10						0.1				0.1								
Rosgen Classification						B4, G4						B4				E4				C5				
Bankfull Velocity (fps)		-				10.10						7.0				3.3								
Bankfull Discharge (cfs)		-				48.00						30.0				18.0								
Valley Length (ft)						-						-				-				198				
Channel Thalweg Length (ft)						-						-				245				238				
Sinuosity						1.03						1.13				1.71				1.20				
Water Surface Slope (ft/ft)						0.04						0.0230				0.0140				0.0168				
Bankfull Slope (ft/ft)						-						-				-				0.0182				
Bankfull Floodplain Area (acres)						-						-												
% of Reach with Eroding Banks						-						-												
Channel Stability or Habitat Metric						-						-												
Biological or Other						-						-												

- Information unavailable.

Non-Applicable.

Table 7 Cont'd. Baseline Stream Data Summary
Shadrick Creek - UT10 (404 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			As-Built / Baseline					
Dimension & Substrate - Riffle	**LL**	**UL**	**Eq.**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**
Bankfull Width (ft)	-	-	-	-	-	7.0	-	-	-	5.4	-	6.7	8.0	-	-	-	7.0	-	-	7.3	-	-	-	1
Floodprone Width (ft)				-	-	9.0	-	-	-	13.0	-	17	20.0	-	-	-	24.0	-	-	24.0	-	-	-	1
Bankfull Mean Depth (ft)	-	-	-	-	-	0.5	-	-	-	0.6	-	0.6	0.7	-	-	-	0.6	-	-	0.5	-	-	-	1
Bankfull Max Depth (ft)				-	-	0.8	-	-	-	1.1	-	1.1	1.2	-	-	-	0.8	-	-	1.1	-	-	-	1
Bankfull Cross Sectional Area (ft^2)		-		-	-	3.8	-	-	-	3.1	-	4.3	5.5	-	-	-	4.0	-	-	3.4	-	-	-	1
Width/Depth Ratio				-	-	13.0	-	-	-	9.4	-	10.5	11.6	-	-	-	12.3	-	-	15.6	-	-	-	1
Entrenchment Ratio				-	-	1.3	-	-	-	-	-	2.5	-	-	-	-	3.4	-	-	3.3	-	-	-	1
Bank Height Ratio				-	-	2.5	-	-	-	-	-	1.0	-	-	-	-	1.0	-	-	1.0	-	-	-	1
d50 (mm)				-	-	0.3	-	-	-	3.0	-	6.0	9.0	-	-	-	0.3	-						
Profile																								
Riffle Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Riffle Slope (ft/ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pool Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pool Max Depth (ft)				-	-	-	-	-	-	-	-	1.2	-	-	-	-	1.3	-	-	-	-	-	-	-
Pool Spacing (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pattern																								
Channel Belt Width (ft)				-	-	30.0	-	-	-	-	-	40	-	-	-	-	30.0	-	-	-	-	-	-	-
Radius of Curvature (ft)				36.0	-	66.0	67.0	-	-	21.0	-	22	23.0	-	-	-	66.0	-	-	-	-	-	-	-
Rc: Bankfull Width (ft/ft)				5.1	-	9.4	9.6	-	-	3.1	-	3.3	3.4	-	-	-	3.3	-	-	-	-	-	-	-
Meander Wavelength (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Meander Width Ratio				-	-	4.3	-	-	-	-	-	6.0	-	-	-	-	4.3	-	-	-	-	-	-	-
Substrate, Bed and Transport Parameters																								
Reach Shear Stress (Competency) lb/ft^2						0.86						-				-				-				
Max Part Size (mm) Mobilized at Bankfull						135.0						-				-				-				
Stream Power (Transport Capacity) W/m^2						-						-				-								
Additional Reach Parameters																								
Drainage Area (mi^2)						0.03						0.1				0.03								
Rosgen Classification						F4						B4				B4				B4				
Bankfull Velocity (fps)		-				1.9						7				7.0								
Bankfull Discharge (cfs)		-				7.0						30.0				30.0								
Valley Length (ft)						-						-				-				390				
Channel Thalweg Length (ft)						-						-				391				404				
Sinuosity						1.04						1.13				1.04				1.03				
Water Surface Slope (ft/ft)						0.0249						0.0230				0.0249				0.0168				
Bankfull Slope (ft/ft)						-						-				-				0.0182				
Bankfull Floodplain Area (acres)						-						-												
% of Reach with Eroding Banks						-						-												
Channel Stability or Habitat Metric						-						-												
Biological or Other						-						-												

- Information unavailable.

Non-Applicable.

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Table 8. - Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Shadrick Creek Restoration Project

	Cross Section 1 (Pool) UT-1						Cross Section 2 (Riffle) UT-1						Cross Section 3 (Riffle) UT-1						Cross Section 4 (Riffle) Shadrick Reach 1						Cross Section 5 (Pool) Shadrick Reach 1					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
Record elevation (datum) used	1184.8						1184.6						1172.5						1145.2						1144.9					
Bankfull Width (ft)	7.1						6.3						5.0						26.6						26.9					
Floodprone Width (ft)	24.0						24.0						24.0						100.0						100.0					
Bankfull Mean Depth (ft)	0.6						0.7						0.8						1.8						2.2					
Bankfull Max Depth (ft)	1.5						1.1						1.3						3.0						4.0					
Bankfull Cross Sectional Area (ft^2)	4.5						4.3						3.9						47.0						59.5					
Bankfull Width/Depth Ratio	11.1						9.4						6.5						15.0						12.1					
Bankfull Entrenchment Ratio	3.4						3.8						4.8						3.8						3.7					
Bankfull Bank Height Ratio	1.0						1.0						1.0						1.0						1.0					

	Cross Section 6 (Riffle) Shadrick Reach 1						Cross Section 7 (Riffle) Shadrick Reach 1						Cross Section 8 (Pool) Shadrick Reach 1						Cross Section 9 (Riffle) UT-9 Reach 1						Cross Section 10 (Pool) UT-9 Reach 1					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
Record elevation (datum) used	1143.3						1141.2						1139.8						1151.8						1151.6					
Bankfull Width (ft)	28.7						32.7						28.8						9.5						6.5					
Floodprone Width (ft)	100.0						100.0						100.0						24.0						24.0					
Bankfull Mean Depth (ft)	1.8						1.8						2.9						0.5						0.5					
Bankfull Max Depth (ft)	3.2						3.0						5.6						1.1						1.3					
Bankfull Cross Sectional Area (ft^2)	52.0						59.3						84.3						4.8						3.0					
Bankfull Width/Depth Ratio	15.8						18.0						9.8						18.7						14.3					
Bankfull Entrenchment Ratio	3.5						3.1						3.5						2.5						3.7					
Bankfull Bank Height Ratio	1.0						1.0						1.0						1.0						1.0					

	Cross Section 11 (Pool) UT-9 Reach 2						Cross Section 12 (Riffle) UT-9 Reach 2						Cross Section 13 (Riffle) UT-10						Cross Section 14 (Pool) UT-10						Cross Section 15 (Pool) Shadrick Reach 2					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
Record elevation (datum) used	1142.9						1142.5						1140.9						1140.2						1100.7					
Bankfull Width (ft)	8.8						8.3						7.3						7.5						38.9					
Floodprone Width (ft)	24.0						24.0						24.0						24.0						116.0					
Bankfull Mean Depth (ft)	0.7						0.4						0.5						0.6						2.1					
Bankfull Max Depth (ft)	1.6						1.0						1.1						1.6						4.1					
Bankfull Cross Sectional Area (ft^2)	5.8						3.6						3.4						4.8						80.4					
Bankfull Width/Depth Ratio	13.2						19.0						15.6						11.6						18.9					
Bankfull Entrenchment Ratio	2.7						2.9						3.3						3.2						3.0					
Bankfull Bank Height Ratio	1.0						1.0						1.0						1.0						1.0					

	Cross Section 16 (Riffle) Shadrick Reach 2						Cross Section 17 (Riffle) Shadrick Reach 3						Cross Section 18 (Pool) Shadrick Reach 3						Cross Section 19 (Riffle) Shadrick Reach 3					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
Record elevation (datum) used	1100.2						1097.6						1097.0						1095.3					
Bankfull Width (ft)	29.9						31.1						40.0						26.9					
Floodprone Width (ft)	116.0						116.0						116.0						116.0					
Bankfull Mean Depth (ft)	2.4						2.2						2.2						2.3					
Bankfull Max Depth (ft)	3.9						3.5						4.7						3.5					
Bankfull Cross Sectional Area (ft^2)	71.7						68.6						88.1						61.0					
Bankfull Width/Depth Ratio	12.5						14.1						18.2						11.9					
Bankfull Entrenchment Ratio	3.9						3.7						2.9						4.3					
Bankfull Bank Height Ratio	1.0						1.0						1.0						1.0					

Table 9. Monitoring Data - Stream Reach Data Summary
Shadrick Creek - Shadrick Creek Reach 1 (3,631 feet)

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5					
Dimension & Substrate - Riffle	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	26.6	29.3	28.7	32.7	3.1	3																														
Floodprone Width (ft)	100.0	100.0	100.0	100.0	0.0	3																														
Bankfull Mean Depth (ft)	1.8	1.8	1.8	1.8	0.0	3																														
Bankfull Max Depth (ft)	3.0	3.1	3.0	3.2	0.1	3																														
Bankfull Cross-Sectional Area (ft^2)	47.0	52.8	52.0	59.3	6.2	3																														
Width/Depth Ratio	15.0	16.3	15.8	18.0	1.5	3																														
Entrenchment Ratio	3.1	3.4	3.5	3.8	0.4	3																														
Bank Height Ratio	1.0	1.0	1.0	1.0	0.0	3																														
Profile																																				
Riffle Length (ft)																																				
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max Depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Belt Width (ft)																																				
Radius of Curvature (ft)																																				
Rc: Bankfull Width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	C4																																			
Channel Thalweg Length (ft)	3,631																																			
Sinuosity (ft)	1.13																																			
Water Surface Slope (Channel) (ft/ft)	.																																			
Bankfull Slope (ft/ft)																																				
Ri% / Ru% / P% / G% / S%																																				

- Information Unavailable

N/A - Information does not apply.

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

Table 9 Cont'd. Monitoring Data - Stream Reach Data Summary
Shadrick Creek - Shadrick Creek Reach 2 (573 feet)

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5					
Dimension & Substrate - Riffle	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	-	29.9	-	-	-	1																														
Floodprone Width (ft)	-	116.0	-	-	-	1																														
Bankfull Mean Depth (ft)	-	2.4	-	-	-	1																														
Bankfull Max Depth (ft)	-	3.9	-	-	-	1																														
Bankfull Cross-Sectional Area (ft^2)	-	71.7	-	-	-	1																														
Width/Depth Ratio	-	12.5	-	-	-	1																														
Entrenchment Ratio	-	3.9	-	-	-	1																														
Bank Height Ratio	-	1.0	-	-	-	1																														
Profile																																				
Riffle Length (ft)																																				
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max Depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Belt Width (ft)																																				
Radius of Curvature (ft)																																				
Rc: Bankfull Width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	C4																																			
Channel Thalweg Length (ft)	573																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)																																				
Bankfull Slope (ft/ft)																																				
Ri% / Ru% / P% / G% / S%																																				

- Information Unavailable

N/A - Information does not apply.

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

Table 9 Cont'd. Monitoring Data - Stream Reach Data Summary
Shadrick Creek - Shadrick Creek Reach 3 (1,104 feet)

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5					
Dimension & Substrate - Riffle	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	26.9	29.0	29.0	31.1	2.9	2																														
Floodprone Width (ft)	116.0	116.0	116.0	116.0	0.0	2																														
Bankfull Mean Depth (ft)	2.2	2.2	2.2	2.3	0.0	2																														
Bankfull Max Depth (ft)	3.5	3.5	3.5	3.5	0.0	2																														
Bankfull Cross-Sectional Area (ft^2)	61.0	64.8	64.8	68.6	5.4	2																														
Width/Depth Ratio	11.9	13.0	13.0	14.1	1.6	2																														
Entrenchment Ratio	3.7	4.0	4.0	4.3	0.4	2																														
Bank Height Ratio	1.0	1.0	1.0	1.0	0.0	2																														
Profile																																				
Riffle Length (ft)	32.0	69.7	67.8	121.6	34.8	7																														
Riffle Slope (ft/ft)	0.004	0.007	0.008	0.011	0.002	7																														
Pool Length (ft)	13.8	42.9	45.0	63.8	15.1	7																														
Pool Max Depth (ft)	4.3	4.8	4.5	5.5	0.5	7																														
Pool Spacing (ft)	87.4	145.2	141.1	196.3	40.1	6																														
Pattern																																				
Channel Belt Width (ft)	84.7	94.5	95.0	103.5	7.7	4																														
Radius of Curvature (ft)	61.6	67.0	66.8	72.9	4.8	4																														
Rc: Bankfull Width (ft/ft)	2.1	2.3	2.3	2.5	0.2	3																														
Meander Wavelength (ft)	202.5	250.1	248.2	301.6	51.7	4																														
Meander Width Ratio	2.1	2.3	2.3	2.5	0.2	4																														
Additional Reach Parameters																																				
Rosgen Classification	C4																																			
Channel Thalweg Length (ft)	1,104																																			
Sinuosity (ft)	1.19																																			
Water Surface Slope (Channel) (ft/ft)	0.0043																																			
Bankfull Slope (ft/ft)	0.0055																																			
Ri% / Ru% / P% / G% / S%	48%	12%	30%	11%	0%																															

- Information Unavailable

N/A - Information does not apply.

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

Table 9 Cont'd. Monitoring Data - Stream Reach Data Summary
Shadrick Creek - UT1 (1,651 feet)

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5					
Dimension & Substrate - Riffle	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	5.0	5.7	5.7	6.3	0.9	2																														
Floodprone Width (ft)	24.0	24.0	24.0	24.0	0.0	2																														
Bankfull Mean Depth (ft)	0.7	0.7	0.7	0.8	0.1	2																														
Bankfull Max Depth (ft)	1.1	1.2	1.2	1.3	0.1	2																														
Bankfull Cross-Sectional Area (ft^2)	3.9	4.1	4.1	4.3	0.3	2																														
Width/Depth Ratio	6.5	7.9	7.9	9.4	2.0	2																														
Entrenchment Ratio	3.8	4.3	4.3	4.8	0.7	2																														
Bank Height Ratio	1.0	1.0	1.0	1.0	0.0	2																														
Profile																																				
Riffle Length (ft)																																				
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max Depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Belt Width (ft)																																				
Radius of Curvature (ft)																																				
Rc: Bankfull Width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	C4																																			
Channel Thalweg Length (ft)	1,651																																			
Sinuosity (ft)	1.14																																			
Water Surface Slope (Channel) (ft/ft)																																				
Bankfull Slope (ft/ft)																																				
Ri% / Ru% / P% / G% / S%																																				

- Information Unavailable

N/A - Information does not apply.

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

Table 9 Cont'd. Monitoring Data - Stream Reach Data Summary
Shadrick Creek - UT9 Reach 1 (706 feet)

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5					
Dimension & Substrate - Riffle	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	-	9.5	-	-	-	1																														
Floodprone Width (ft)	-	24.0	-	-	-	1																														
Bankfull Mean Depth (ft)	-	0.5	-	-	-	1																														
Bankfull Max Depth (ft)	-	1.1	-	-	-	1																														
Bankfull Cross-Sectional Area (ft^2)	-	4.8	-	-	-	1																														
Width/Depth Ratio	-	18.7	-	-	-	1																														
Entrenchment Ratio	-	2.5	-	-	-	1																														
Bank Height Ratio	-	1.0	-	-	-	1																														
Profile																																				
Riffle Length (ft)																																				
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max Depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Belt Width (ft)																																				
Radius of Curvature (ft)																																				
Rc: Bankfull Width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	B4																																			
Channel Thalweg Length (ft)	706																																			
Sinuosity (ft)	1.08																																			
Water Surface Slope (Channel) (ft/ft)																																				
Bankfull Slope (ft/ft)																																				
Ri% / Ru% / P% / G% / S%																																				

- Information Unavailable

N/A - Information does not apply.

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

Table 9 Cont'd. Monitoring Data - Stream Reach Data Summary
Shadrick Creek - UT9 Reach 2 (238 feet)

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5					
Dimension & Substrate - Riffle	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	-	8.3	-	-	-	1																														
Floodprone Width (ft)	-	24.0	-	-	-	1																														
Bankfull Mean Depth (ft)	-	0.4	-	-	-	1																														
Bankfull Max Depth (ft)	-	1.0	-	-	-	1																														
Bankfull Cross-Sectional Area (ft^2)	-	3.6	-	-	-	1																														
Width/Depth Ratio	-	19.0	-	-	-	1																														
Entrenchment Ratio	-	2.9	-	-	-	1																														
Bank Height Ratio	-	1.0	-	-	-	1																														
Profile																																				
Riffle Length (ft)	23.3	29.0	27.3	38.4	6.7	4																														
Riffle Slope (ft/ft)	0.016	0.022	0.020	0.033	0.008	4																														
Pool Length (ft)	5.6	10.2	11.2	12.6	3.1	4																														
Pool Max Depth (ft)	1.0	1.5	1.5	1.7	0.3	4																														
Pool Spacing (ft)	40.4	47.7	46.4	56.4	8.1	3																														
Pattern																																				
Channel Belt Width (ft)	24.5	30.0	29.0	36.6	6.1	3																														
Radius of Curvature (ft)	13.3	15.2	15.4	16.9	1.8	3																														
Rc: Bankfull Width (ft/ft)	2.1	2.3	2.3	2.5	0.2	3																														
Meander Wavelength (ft)	63.7	78.5	79.3	92.5	14.4	3																														
Meander Width Ratio	3.1	3.8	3.6	4.6	0.8	3																														
Additional Reach Parameters																																				
Rosgen Classification	C5																																			
Channel Thalweg Length (ft)	238																																			
Sinuosity (ft)	1.20																																			
Water Surface Slope (Channel) (ft/ft)	0.0168																																			
Bankfull Slope (ft/ft)	0.0182																																			
Ri% / Ru% / P% / G% / S%	60%	13%	21%	6%	0%																															

- Information Unavailable

N/A - Information does not apply.

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

Table 9 Cont'd. Monitoring Data - Stream Reach Data Summary
Shadrick Creek - UT10 (404 feet)

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5					
Dimension & Substrate - Riffle	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	-	7.3	-	-	-	1																														
Floodprone Width (ft)	-	24.0	-	-	-	1																														
Bankfull Mean Depth (ft)	-	0.5	-	-	-	1																														
Bankfull Max Depth (ft)	-	1.1	-	-	-	1																														
Bankfull Cross-Sectional Area (ft^2)	-	3.4	-	-	-	1																														
Width/Depth Ratio	-	15.6	-	-	-	1																														
Entrenchment Ratio	-	3.3	-	-	-	1																														
Bank Height Ratio	-	1.0	-	-	-	1																														
Profile																																				
Riffle Length (ft)																																				
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max Depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Belt Width (ft)																																				
Radius of Curvature (ft)																																				
Rc: Bankfull Width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	B4																																			
Channel Thalweg Length (ft)	404																																			
Sinuosity (ft)	1.03																																			
Water Surface Slope (Channel) (ft/ft)																																				
Bankfull Slope (ft/ft)																																				
Ri% / Ru% / P% / G% / S%																																				

- Information Unavailable

N/A - Information does not apply.

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

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Appendix E
As-Built Plan Sheets

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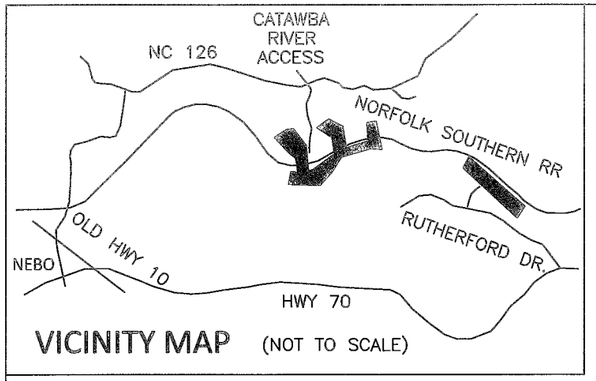


VICINITY MAP (NOT TO SCALE)

AS-BUILT SURVEY OF:

SHADRICK CREEK RESTORATION PROJECT

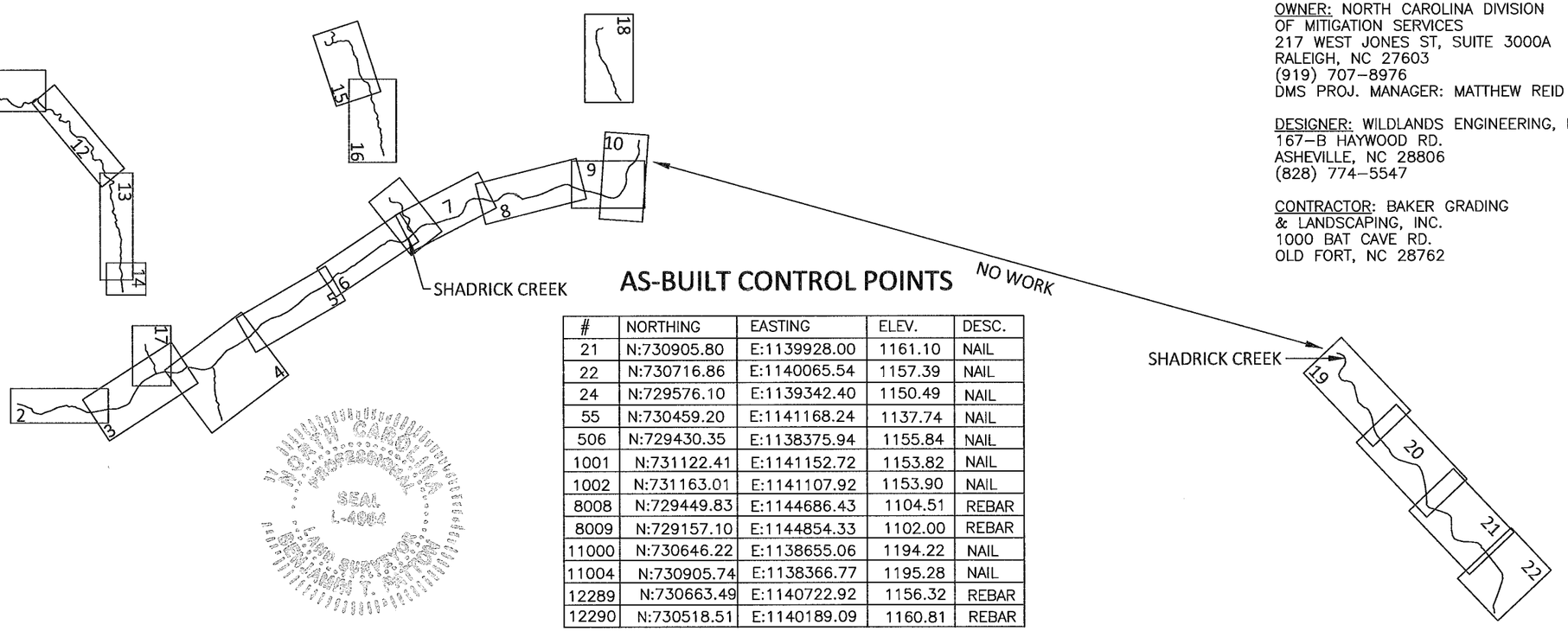
McDOWELL COUNTY, NC
SCO PROJECT 15-11633-01
DMS PROJECT 92916

REFERENCES:

OWNER: NORTH CAROLINA DIVISION
OF MITIGATION SERVICES
217 WEST JONES ST, SUITE 3000A
RALEIGH, NC 27603
(919) 707–8976
DMS PROJ. MANAGER: MATTHEW REID

DESIGNER: WILDLANDS ENGINEERING, INC.
167–B HAYWOOD RD.
ASHEVILLE, NC 28806
(828) 774–5547

CONTRACTOR: BAKER GRADING
& LANDSCAPING, INC.
1000 BAT CAVE RD.
OLD FORT, NC 28762



AS-BUILT CONTROL POINTS

#	NORTHING	EASTING	ELEV.	DESC.
21	N:730905.80	E:1139928.00	1161.10	NAIL
22	N:730716.86	E:1140065.54	1157.39	NAIL
24	N:729576.10	E:1139342.40	1150.49	NAIL
55	N:730459.20	E:1141168.24	1137.74	NAIL
506	N:729430.35	E:1138375.94	1155.84	NAIL
1001	N:731122.41	E:1141152.72	1153.82	NAIL
1002	N:731163.01	E:1141107.92	1153.90	NAIL
8008	N:729449.83	E:1144686.43	1104.51	REBAR
8009	N:729157.10	E:1144854.33	1102.00	REBAR
11000	N:730646.22	E:1138655.06	1194.22	NAIL
11004	N:730905.74	E:1138366.77	1195.28	NAIL
12289	N:730663.49	E:1140722.92	1156.32	REBAR
12290	N:730518.51	E:1140189.09	1160.81	REBAR

NOTES

1. DISTANCES ARE HORIZONTAL GROUND MEASURED IN US SURVEY FEET
2. HORIZONTAL DATUM: NAD 83 (2011) / VERTICAL DATUM: NAVD 88
3. AS–BUILT SURVEY BASED ON EXISTING CONTROL FROM DESIGNER AND GPS VERIFICATION BY BEN PATTON LAND SURVEYING, PLLC.
4. THIS MAP DOES NOT CONFORM TO NCGS 47–30, AND THEREFORE IS NOT FOR RECORDATION.
5. THE PURPOSE OF THIS SURVEY IS TO SHOW THE AS–BUILT CONDITIONS OF THE CREEK/TRIBUTARY RESTORATION AND MAY NOT SHOW ALL EXISTING UTILITIES, STRUCTURES, BOUNDARIES, OR EASEMENTS.
6. A BOUNDARY SURVEY WAS NOT PERFORMED. SEE PB 19 PG 30–32 FOR CONSERVATION EASEMENT.

I, BENJAMIN T. PATTON, PLS CERTIFY THAT THIS AS–BUILT MAP WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY OF THE POST–CONSTRUCTION CONDITIONS PERFORMED UNDER MY SUPERVISION. DIMENSIONS AND ELEVATIONS SHOWN ARE POST–CONTRUCTION CONDITIONS UNLESS NOTED OTHERWISE. WITNESS MY HAND AND SEAL THIS 31st DAY OF MAY, 2017.

5-31-17

BENJAMIN T. PATTON, PLS # 4904 DATE

REVISIONS:

BPLS
BEN PATTON LAND SURVEYING, PLLC
SERVING NC, SC, & TN
PHONE: (828) 768–1625
931 N. MAIN ST. SUITE 5 MARION, NC 28752
BEN@BPSURVEYING.COM FIRM NO: P–0907

TITLE, VICINITY MAP, & SHEET INDEX

SHADRICK CREEK RESTORATION PROJECT
DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

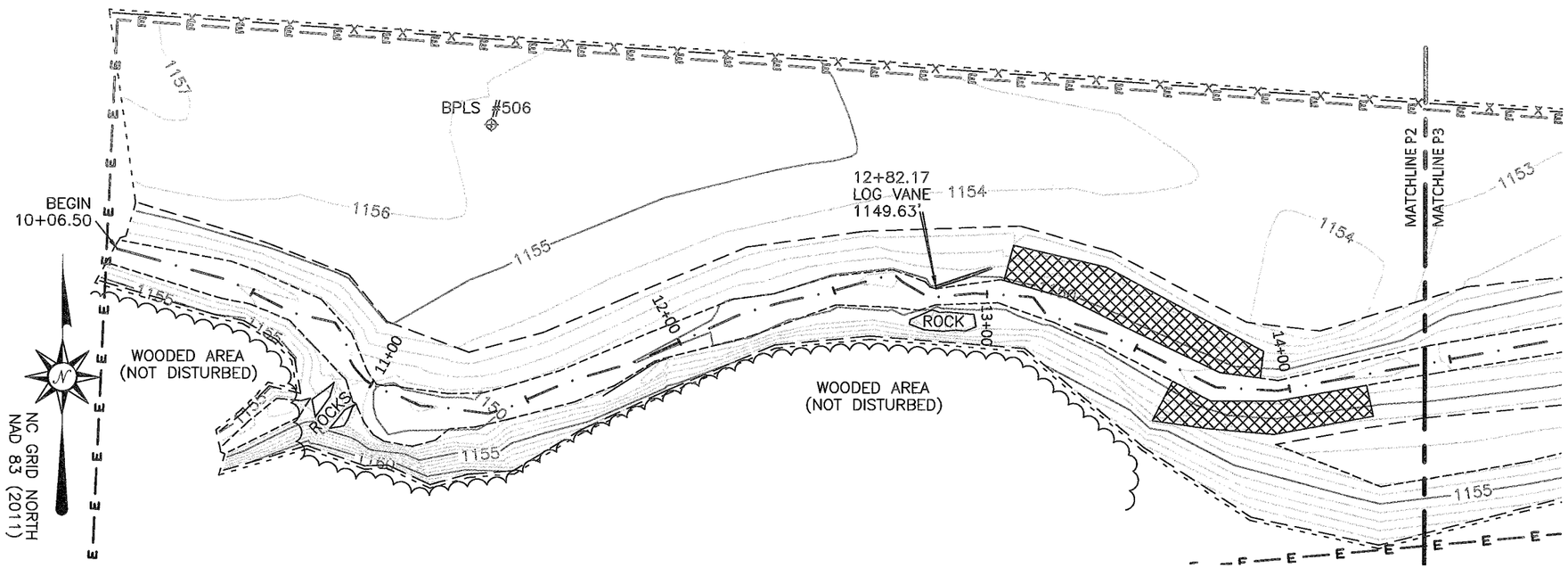
DRAWN: JSM, BTP

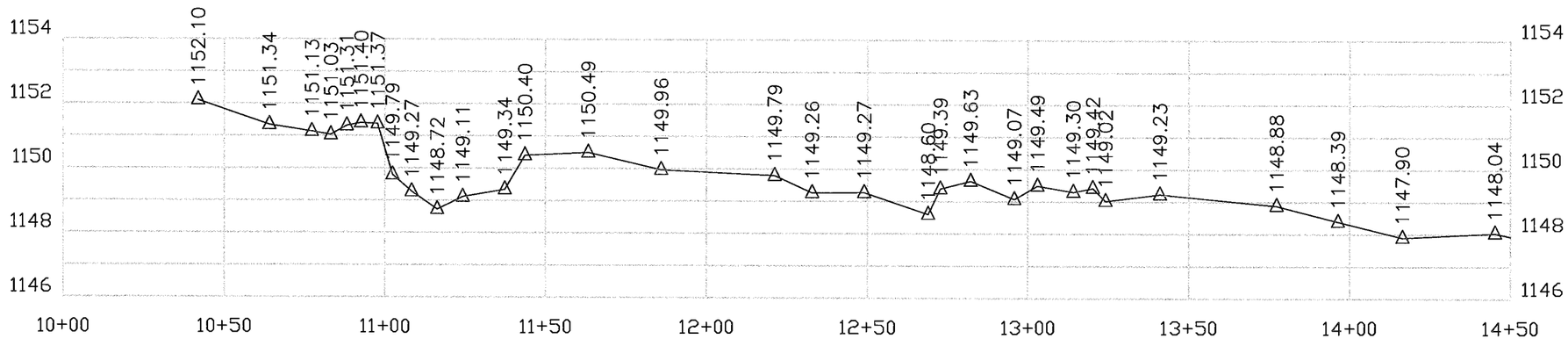
REVIEWED: BTP

BPLS PRO. # 16075

SCALE: NONE

SHEET:
1 of 23





PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'

LEGEND/LINETYPES

- E — E — CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- x — x — x — BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE

STONE
CONSTRUCTED RIFFLE
BRUSH MATTRESS

- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS
- LOG VANE
- GEOLIFT

NORTH CAROLINA PROFESSIONAL SEAL L-4864 LAND SURVEYOR BENJAMIN T. PATTON
5-31-17

SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'

REVISIONS:

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BEN PATTON LAND SURVEYING, PLLC
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PHONE: (828) 768-1625
931 N. MAIN ST. SUITE 5 MARION, NC 28752
BEN@BPSURVEYING.COM FIRM NO: P-0907

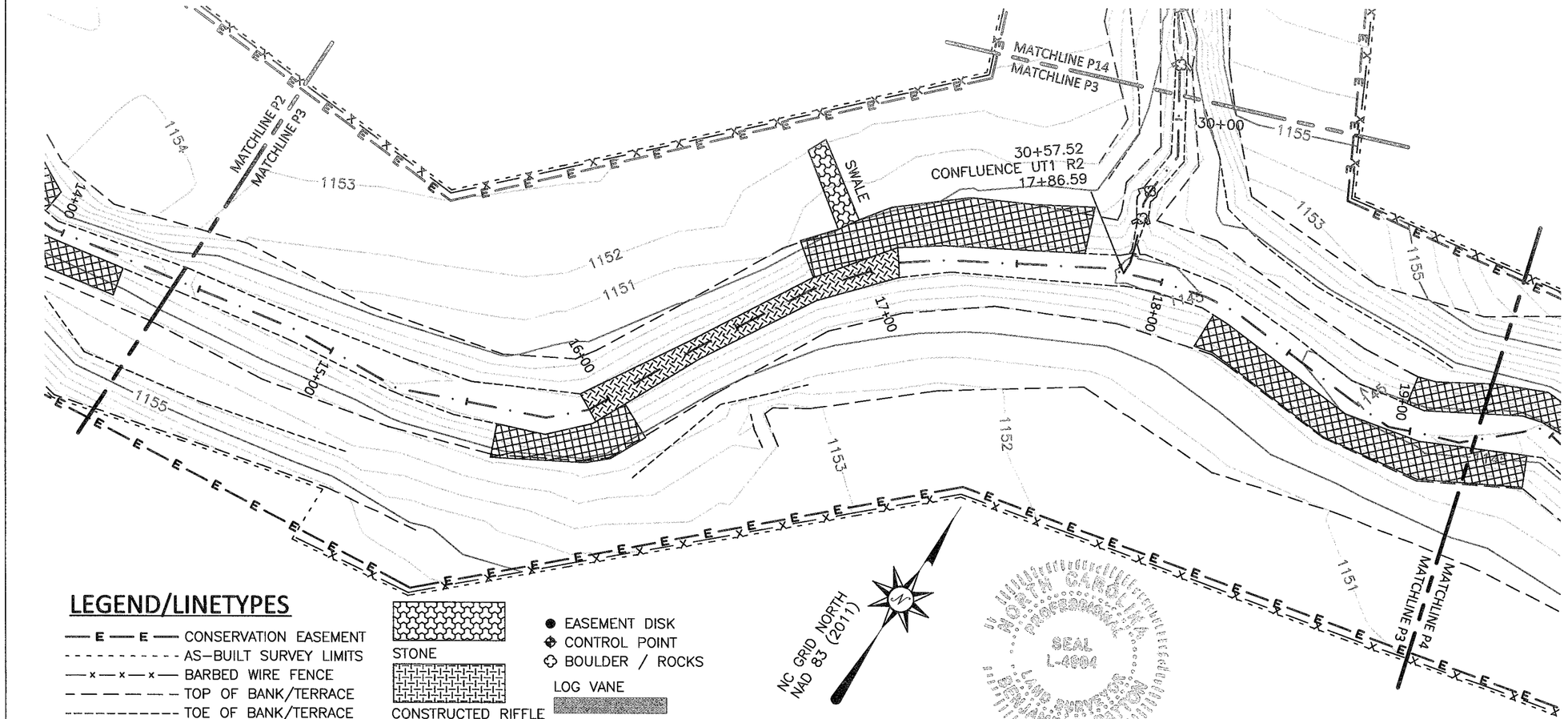
REACH 1 STA. 10+06.50 TO 14+50

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17
FIELD: JSM, BTP
DRAWN: JSM, BTP
REVIEWED: BTP
BPLS PRO. # 16075
SCALE: 1"=40'

SHEET:
2 of 23



LEGEND/LINETYPES

- CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE

STONE

CONSTRUCTED RIFFLE

BRUSH MATTRESS

- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS

LOG VANE

GEOLIFT

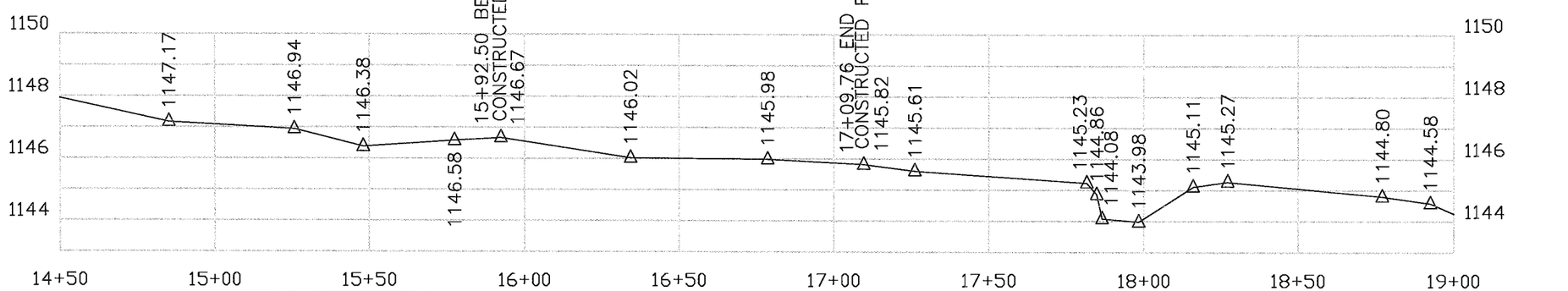
PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'

SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'



REVISIONS:

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BEN@BPSURVEYING.COM FIRM NO: P-0907

REACH 1 STA. 14+50 TO 19+00

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

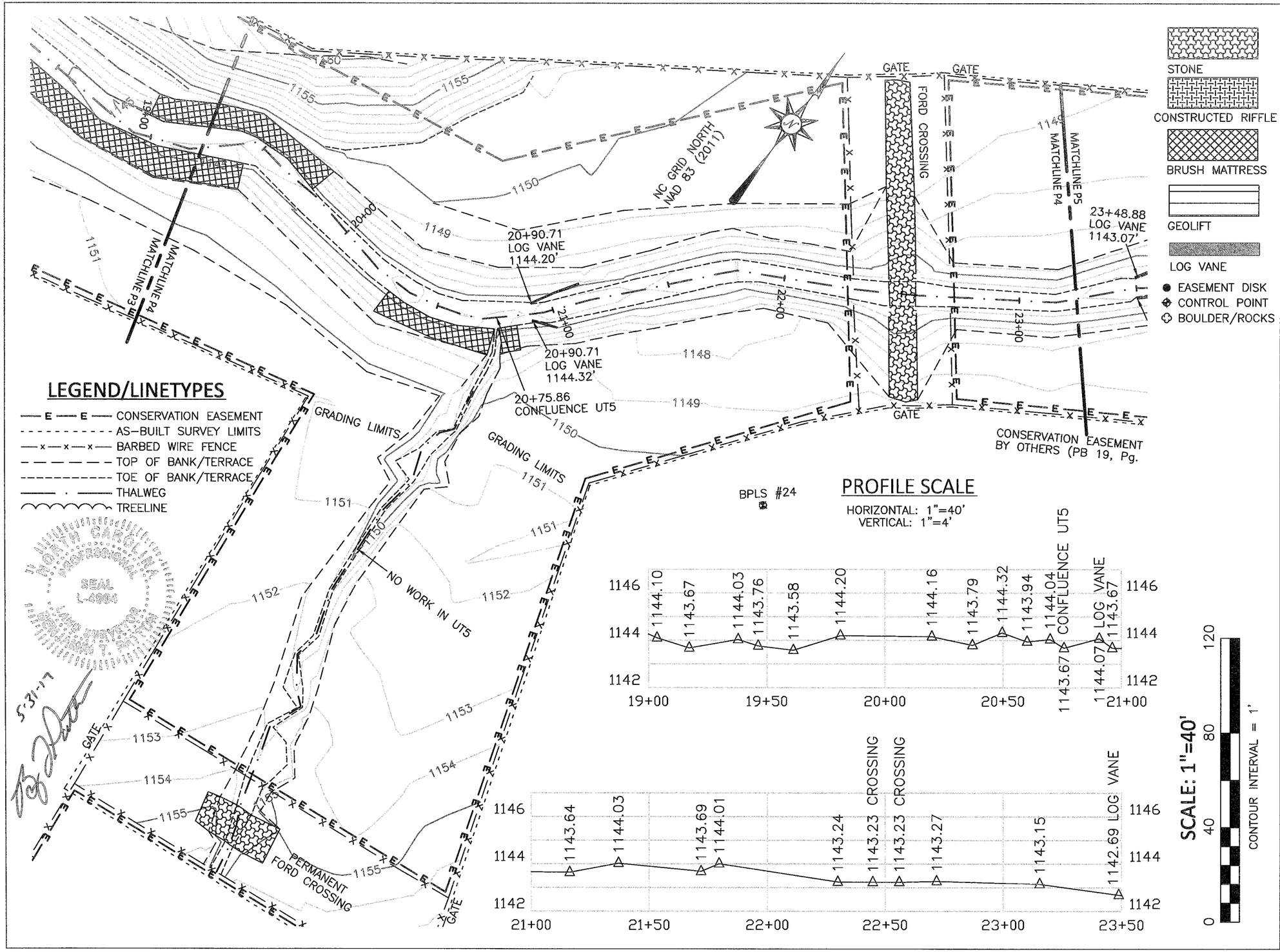
DRAWN: JSM, BTP

REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
3 of 23



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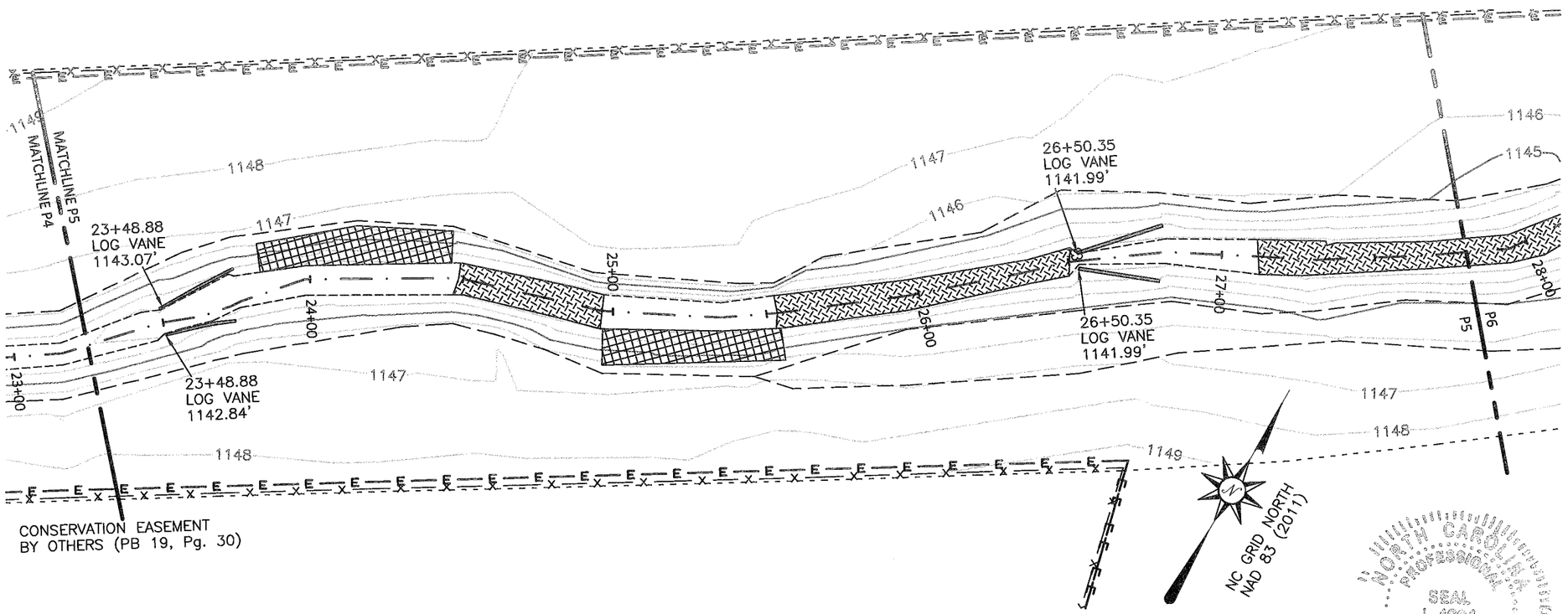
BEN@BPSURVEYING.COM FIRM NO: P-0907

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

REACH 1 STA. 19+00 TO 23+50

DATE: 5/31/17
FIELD: JSM, BTP
DRAWN: JSM, BTP
REVIEWED: BTP
BPLS PRO. # 16075
SCALE: 1"=40'
SHEET: 4 of 23



LEGEND/LINETYPES

- E E CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- x x x BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE

STONE

CONSTRUCTED RIFFLE

BRUSH MATTRESS

- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS

LOG VANE

GEOLIFT

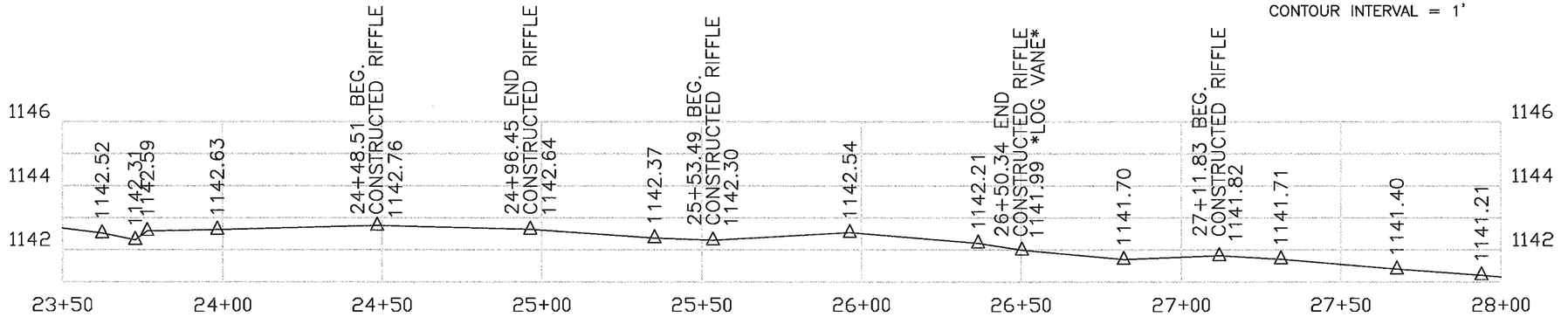
PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'

SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'



NORTH CAROLINA PROFESSIONAL SEAL L-4904 LAND SURVEYOR

5-31-17

REVISIONS:

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SERVING NC, SC, & TN
PHONE: (828) 768-1625
931 N. MAIN ST. SUITE 5 MARION, NC 28752
BEN@BPSURVEYING.COM FIRM NO: P-0907

REACH 1 STA 23+50 TO 28+00

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

DRAWN: JSM, BTP

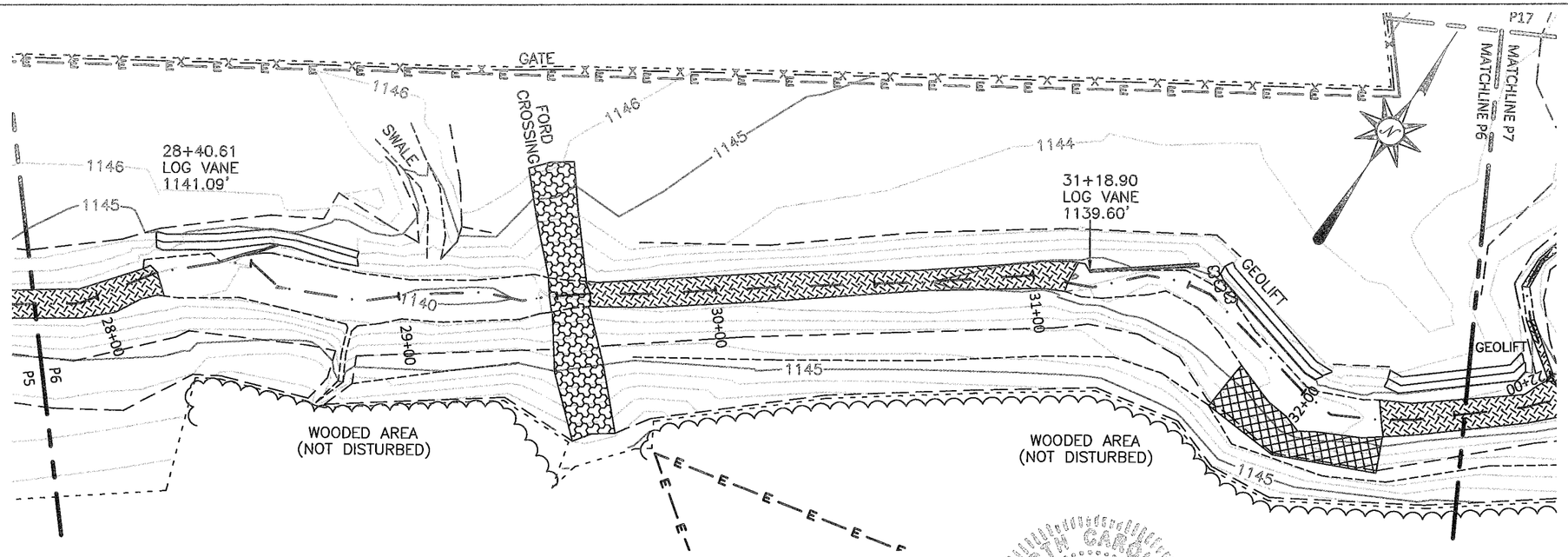
REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
5 of 23

28+00



LEGEND/LINETYPES

- CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE

STONE

CONSTRUCTED RIFFLE

BRUSH MATTRESS

- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS

LOG VANE

GEOLIFT

PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'

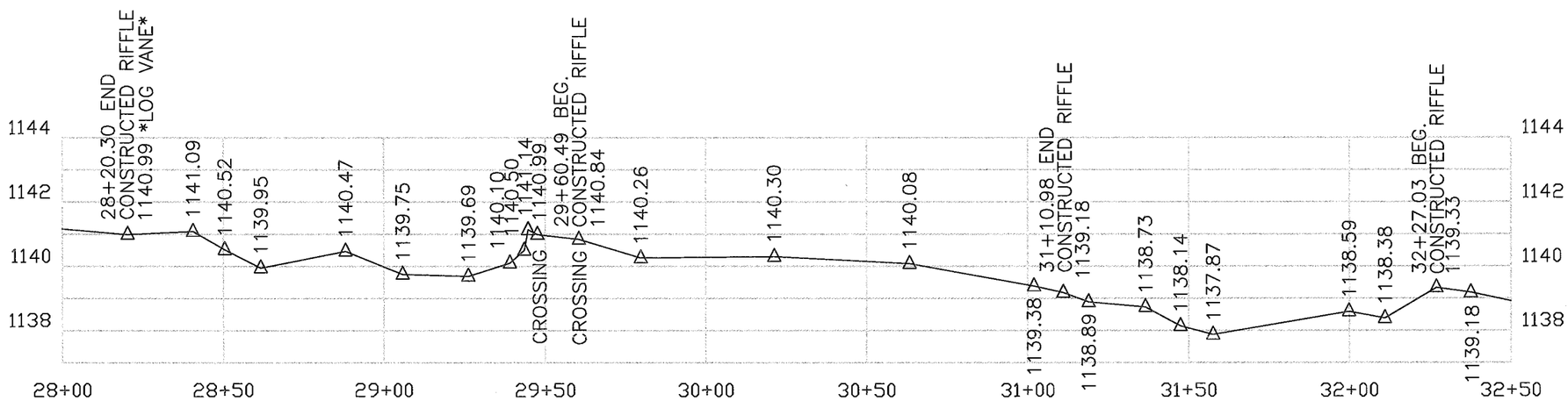
NORTH CAROLINA PROFESSIONAL SEAL L-4864 LAND SURVEYOR BENJAMIN T. PATTON

5-31-17

SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'



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BEN@BPSURVEYING.COM FIRM NO: P-0907

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

REACH 1 28+00 TO 32+50

DATE: 5/31/17

FIELD: JSM, BTP

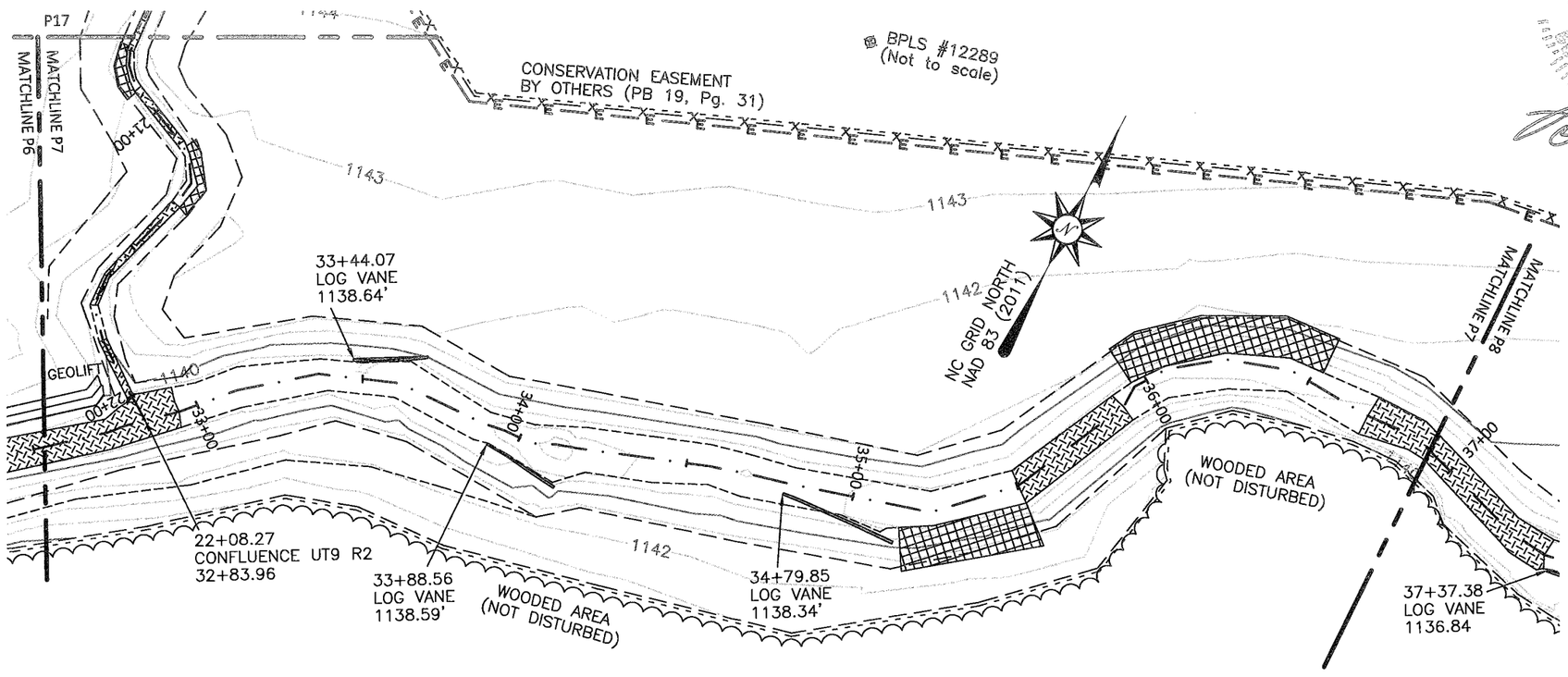
DRAWN: JSM, BTP

REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
6 of 23



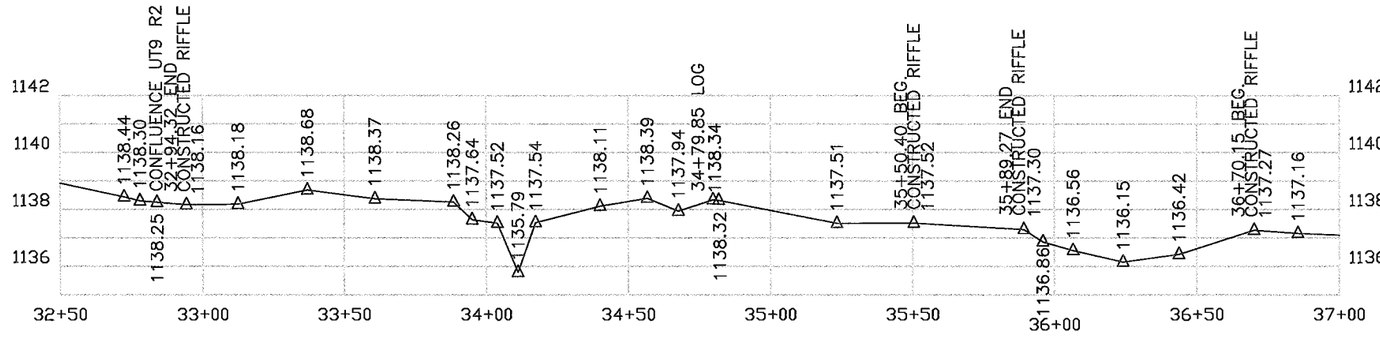
SCALE: 1"=40'

PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'

0 40 80 120

CONTOUR INTERVAL = 1'



LEGEND/LINETYPES

- E — E — CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- x — x — x — BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE
- STONE
- CONSTRUCTED RIFFLE
- BRUSH MATTRESS
- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS
- LOG VANE
- GEOLIFT

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-4000

5-31-17

REVISIONS:

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PHONE: (828) 768-1625
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BEN@BPSURVEYING.COM FIRM NO: P-0907

REACH 1 STA 32+50 TO 37+00

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

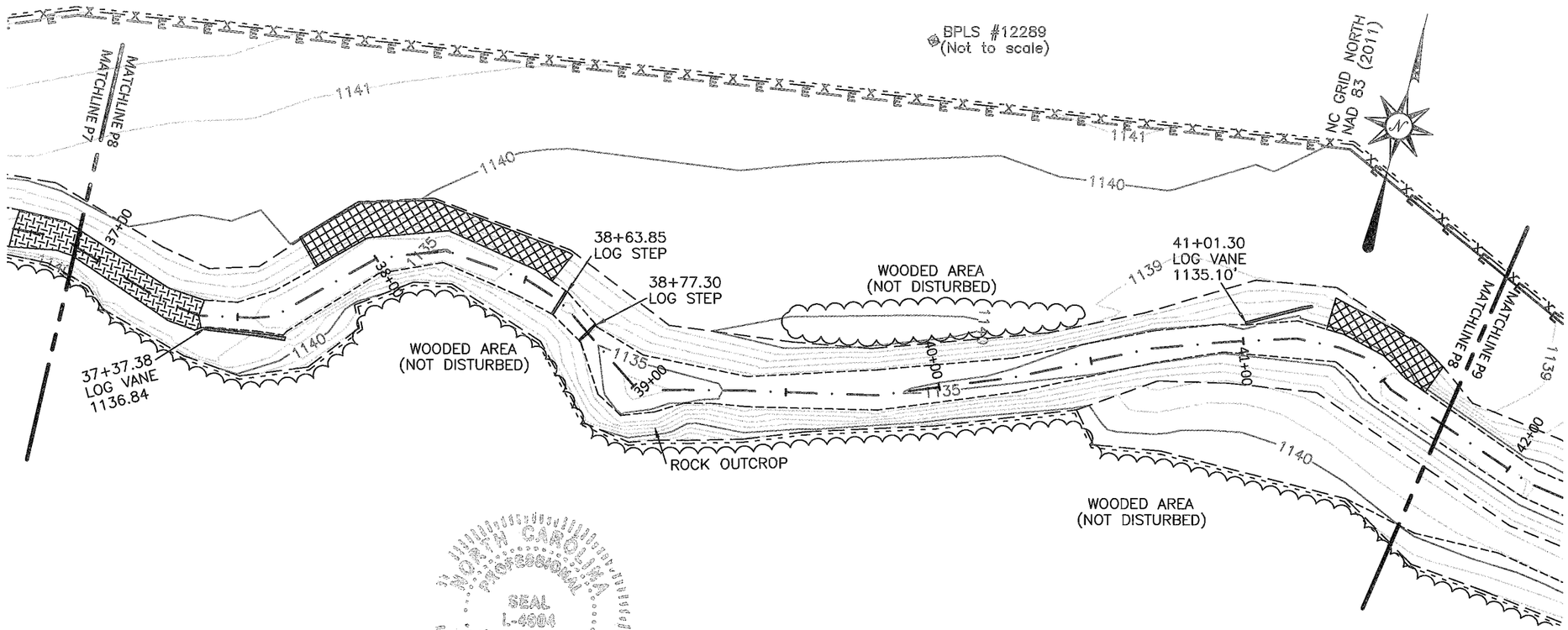
DRAWN: JSM, BTP

REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
7 of 23



SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'

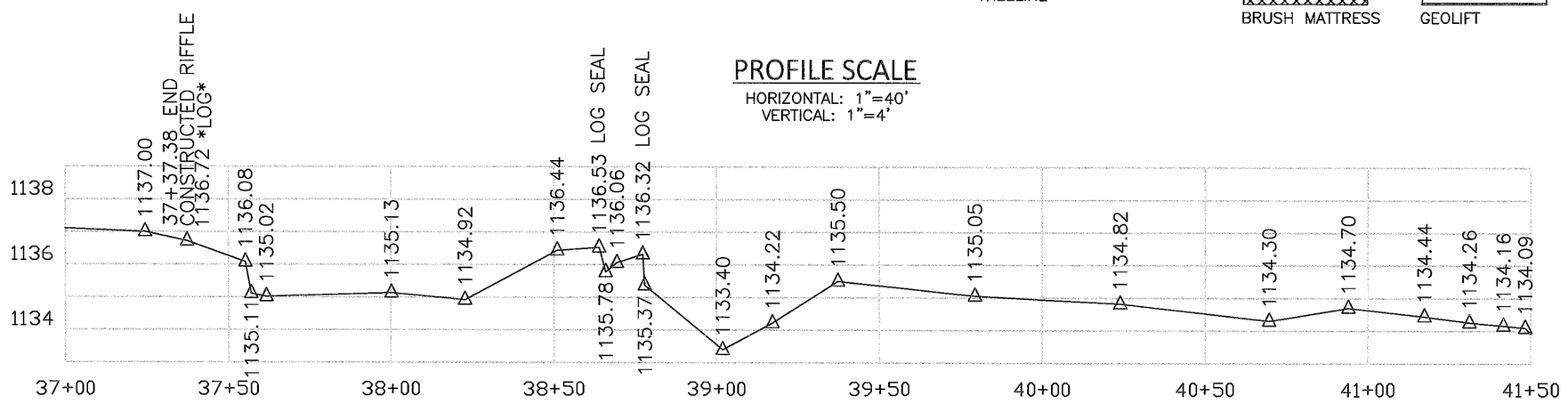
LEGEND/LINETYPES

- E — E — CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- x — x — x — BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE

- STONE
- CONSTRUCTED RIFFLE
- BRUSH MATTRESS
- GEOLIFT
- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS
- LOG VANE

PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'



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BEN@BPSURVEYING.COM FIRM NO: P-0907

REACH 1 STA 37+00 TO 41+50

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

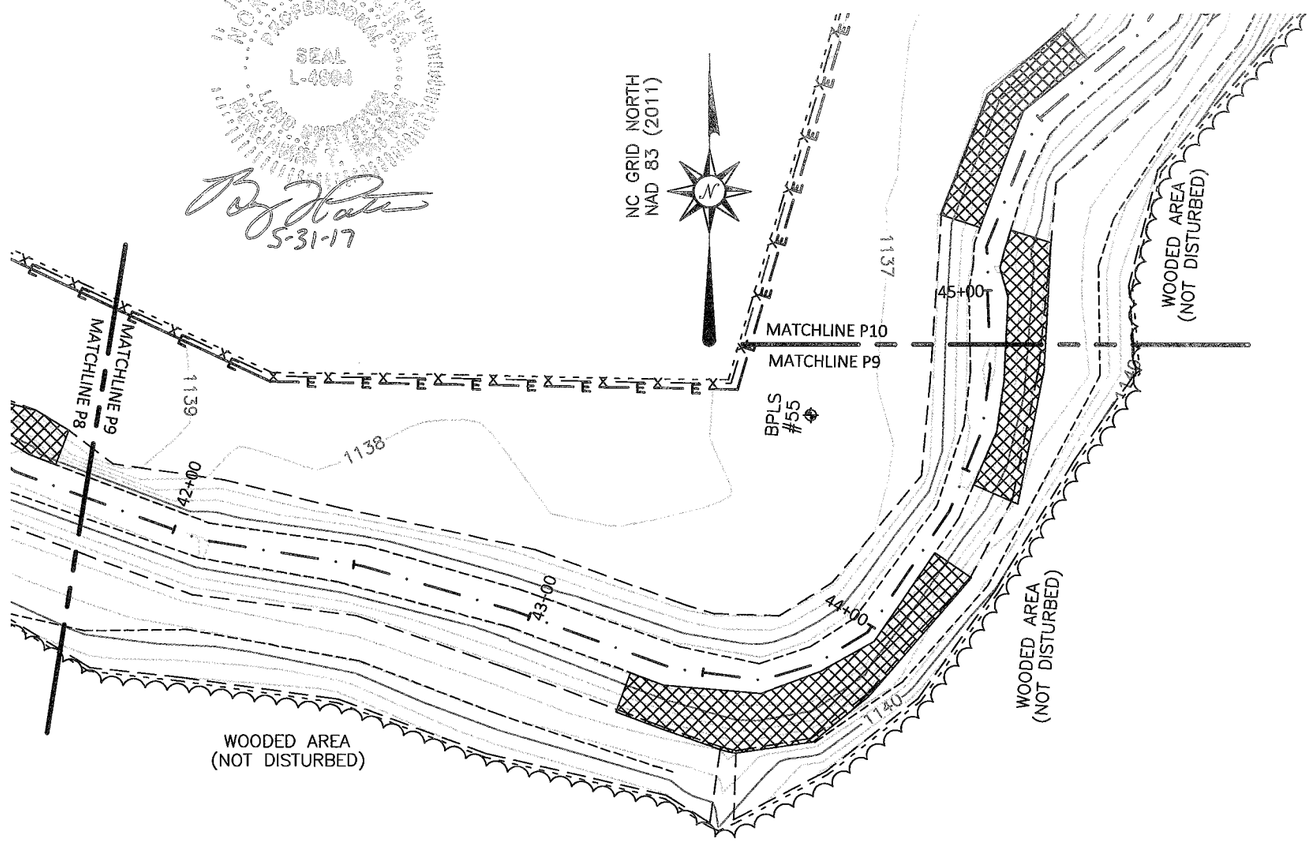
DRAWN: JSM, BTP

REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
8 of 23

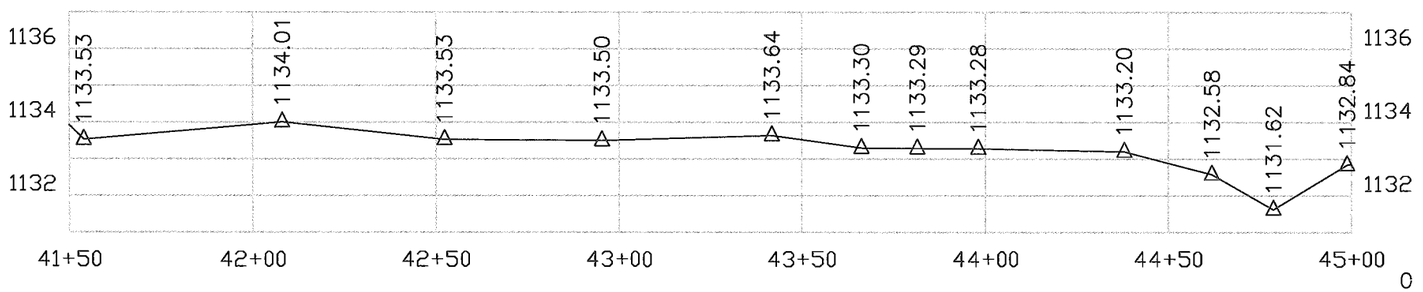


LEGEND/LINETYPES

- E E CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- x x x BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE
- STONE
- CONSTRUCTED RIFFLE
- BRUSH MATTRESS
- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS
- LOG VANE
- GEOLIFT

PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'



SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'

REVISIONS:

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BEN@BPSURVEYING.COM FIRM NO: P-0907

REACH 1 STA 41+50 TO 45+00

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

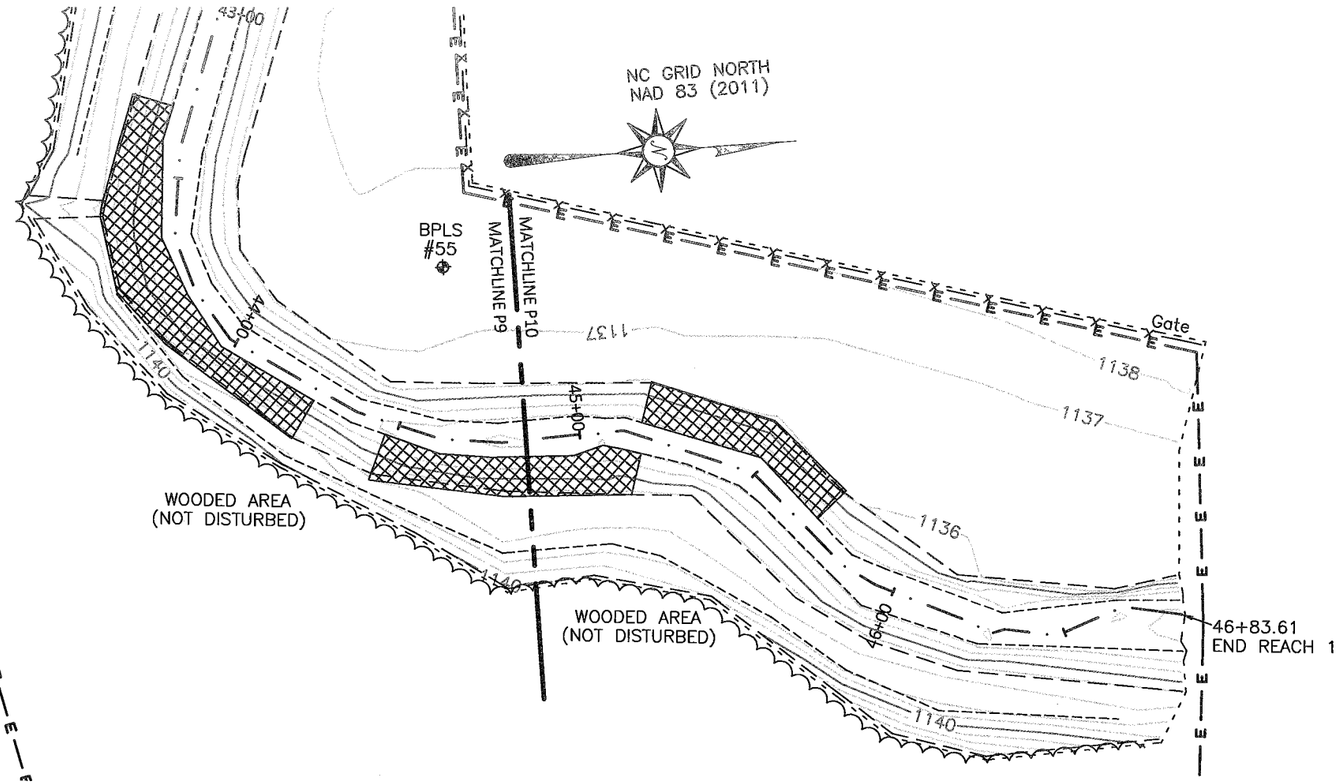
FIELD: JSM, BTP

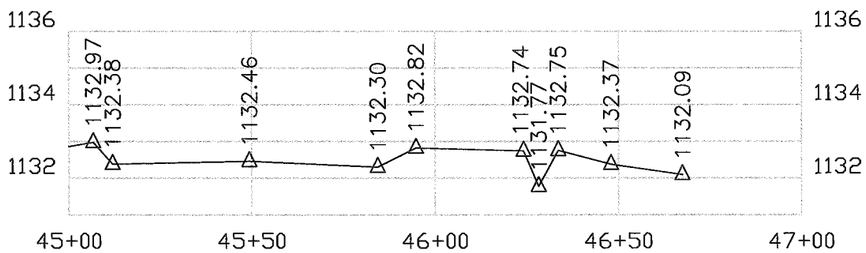
DRAWN: JSM, BTP

REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'





PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'

LEGEND/LINETYPES

- E E CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE

STONE

CONSTRUCTED RIFFLE

BRUSH MATTRESS

- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS

LOG VANE

GEOLIFT

NORTH CAROLINA PROFESSIONAL SEAL L-4064 LAND SURVEYOR

5-31-17

SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'

REVISIONS:

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REACH 1 45+00 TO 46+83.61

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

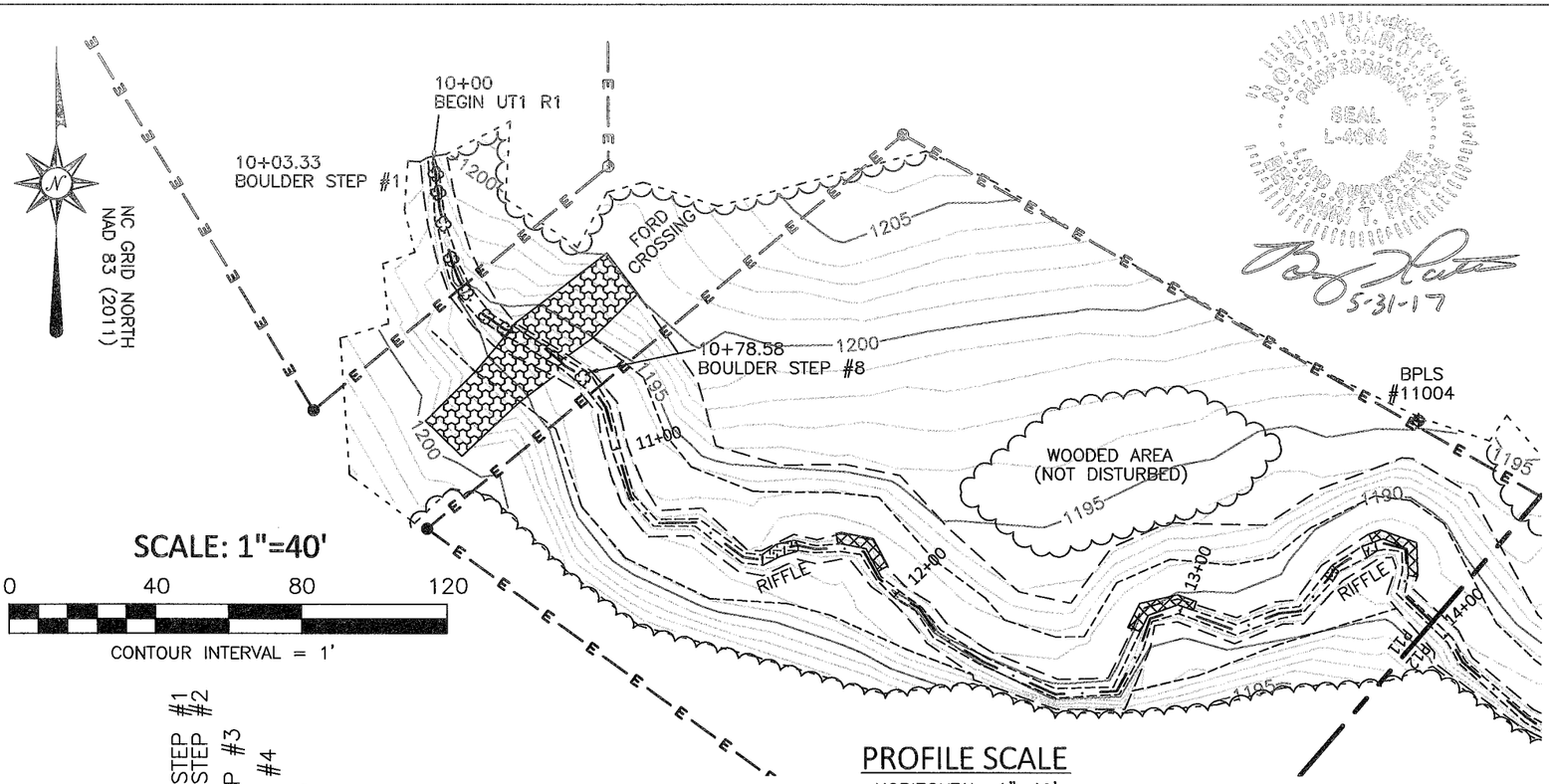
FIELD: JSM, BTP

DRAWN: JSM, BTP

REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'



LEGEND/LINETYPES

- CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE

10+03.33 BOULDER STEP #1 TOP=1197.85 BOTTOM=1197.58 — LOG VANE

10+08.54 BOULDER STEP #2 TOP=1198.03 BOTTOM=1196.92 — GEOLIFT

10+17.24 BOULDER STEP #3 TOP=1197.00 BOTTOM=1196.34 — STONE

CONSTRUCTED RIFFLE

10+27.25 BOULDER STEP #4 TOP=1196.35 BOTTOM=1195.04 — BRUSH MATTRESS

10+36.52 BOULDER STEP #5 TOP=1195.43 BOTTOM=1194.45 — EASEMENT DISK, CONTROL POINT, BOULDER / ROCKS

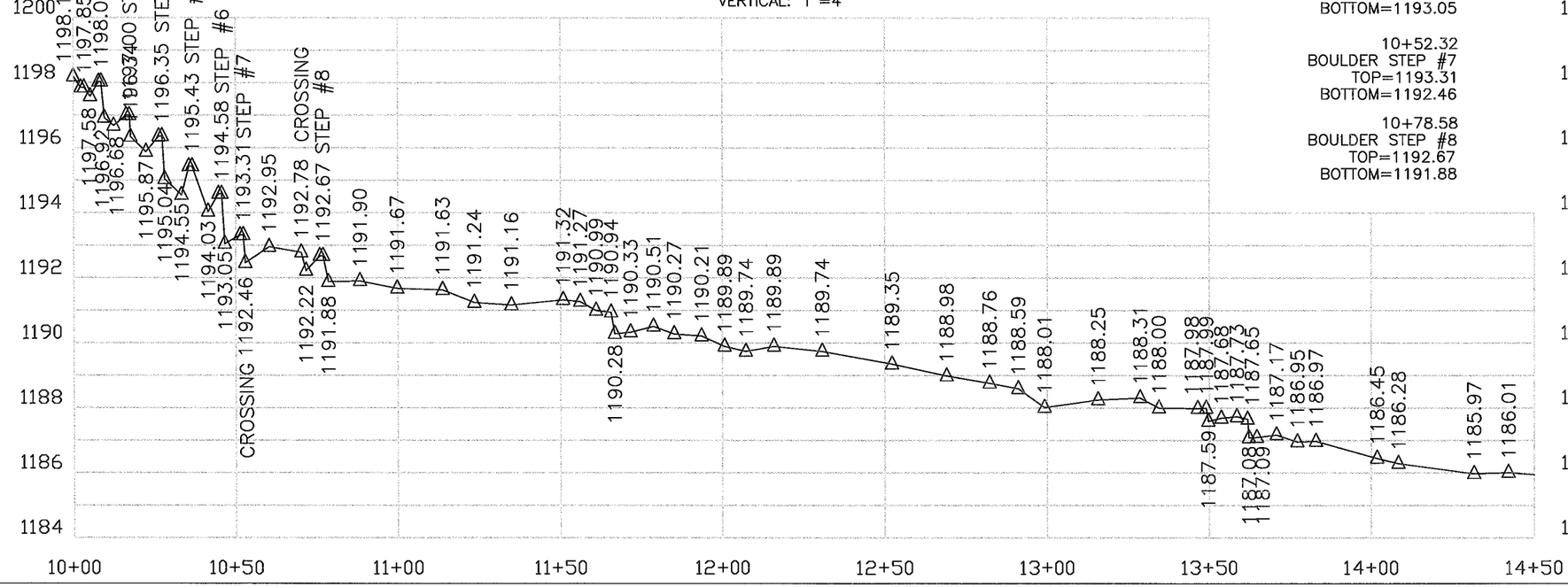
10+45.70 BOULDER STEP #6 TOP=1194.58 BOTTOM=1193.05

10+52.32 BOULDER STEP #7 TOP=1193.31 BOTTOM=1192.46

10+78.58 BOULDER STEP #8 TOP=1192.67 BOTTOM=1191.88

PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'



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UT1 STA 10+00 TO 14+50

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

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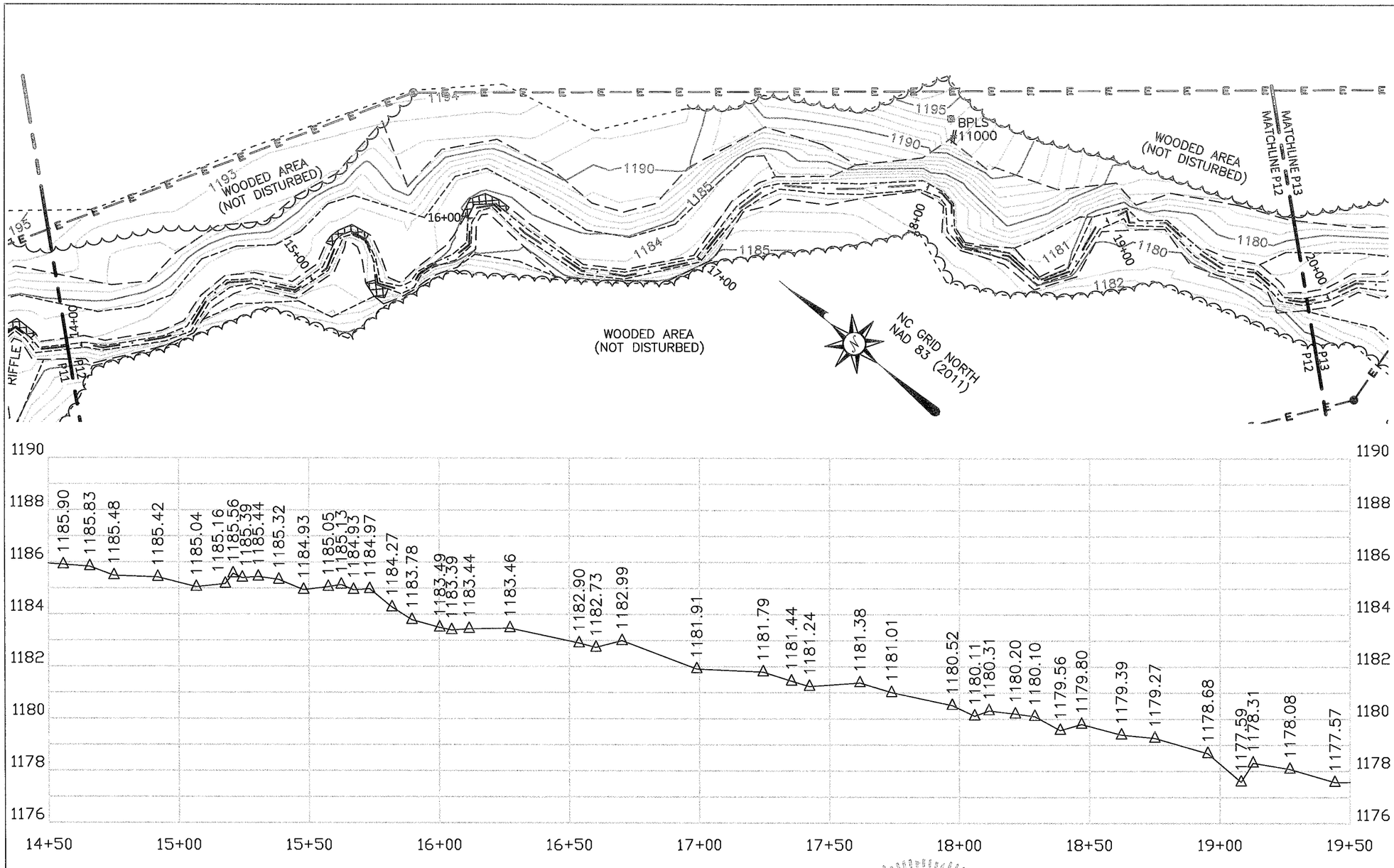
REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
11 of 23



LEGEND/LINETYPES

- E E CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- x x x BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE

STONE

CONSTRUCTED RIFFLE

BRUSH MATTRESS

- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS

LOG VANE

GEOLIFT

PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'

NORTH CAROLINA PROFESSIONAL SEAL L-4964 LAND SURVEYOR BENJAMIN T. PATTON

5-31-17

SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'

REVISIONS:

BPLS

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931 N. MAIN ST. SUITE 5 MARION, NC 28752
BEN@BPSURVEYING.COM FIRM NO: P-0907

UT 1 STA. 14+50 TO 19+50

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

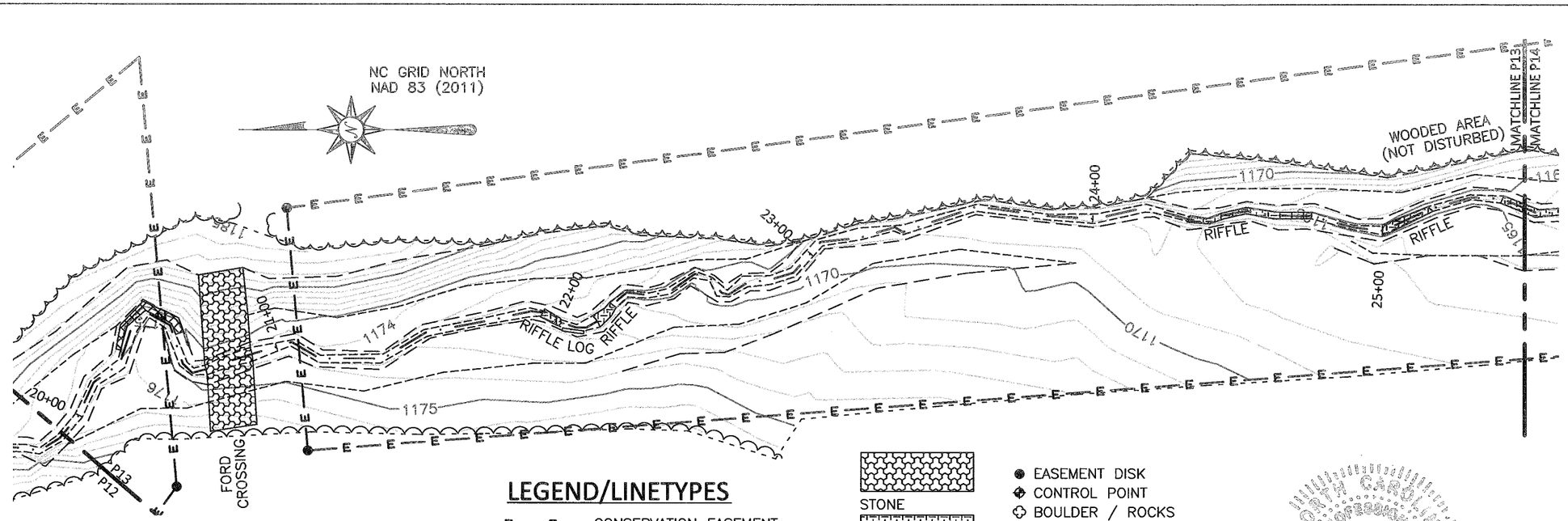
DRAWN: JSM, BTP

REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
12 of 23



SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'

LEGEND/LINETYPES

- E E CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- x x x BARBED WIRE FENCE
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STONE

CONSTRUCTED RIFFLE

BRUSH MATTRESS

- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS

LOG VANE

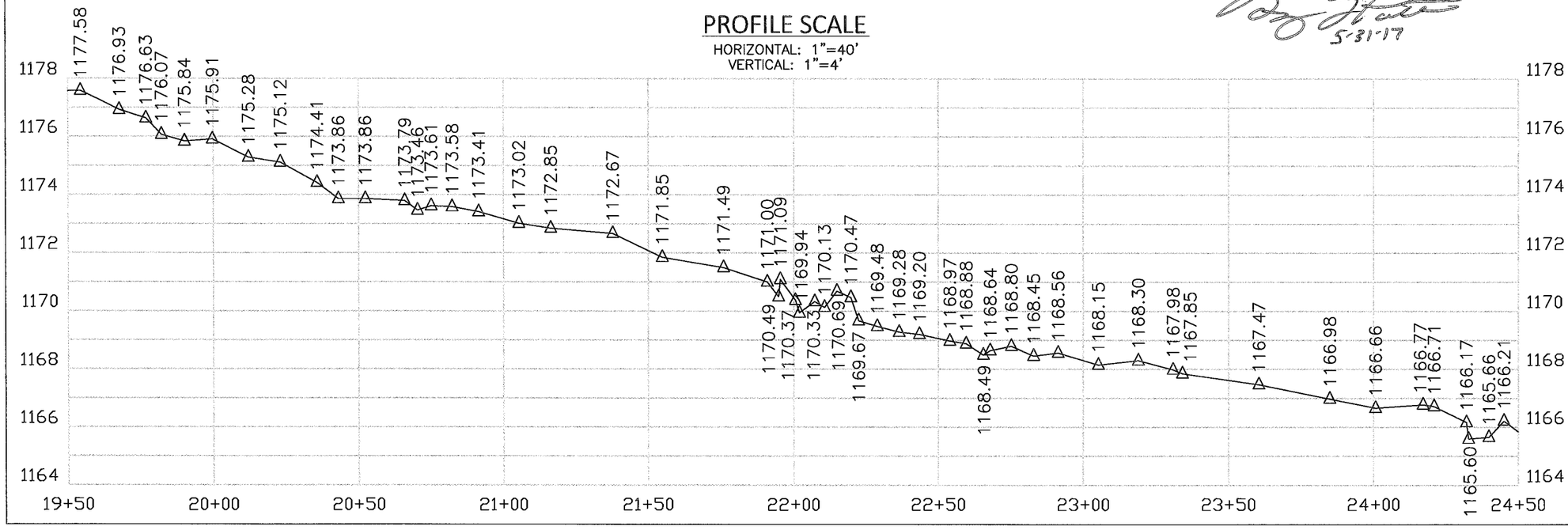
GEOLIFT

NORTH CAROLINA PROFESSIONAL SEAL L-4864 LAND SURVEYOR BENJAMIN P. PATTON

5-31-17

PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'



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BEN@BPSURVEYING.COM FIRM NO: P-0907

REVISIONS:

UT 1 STA 19+50 TO 24+50

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

DRAWN: JSM, BTP

REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
13 of 23

SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'

NORTH CAROLINA PROFESSIONAL SEAL L-4064 LAND SURVEYOR BENJAMIN T. PATTON

5-31-17

NC GRID NORTH
NAD 83 (2011)

NC GRID NORTH
NAD 83 (2011)

STONE

CONSTRUCTED RIFFLE

BRUSH MATTRESS

EASEMENT DISK
CONTROL POINT
BOULDER / ROCKS

LOG VANE

GEOLIFT

LEGEND/LINETYPES

- CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE

29+08.45
BOULDER STEP #9
TOP=1152.83
BOTTOM=1151.84

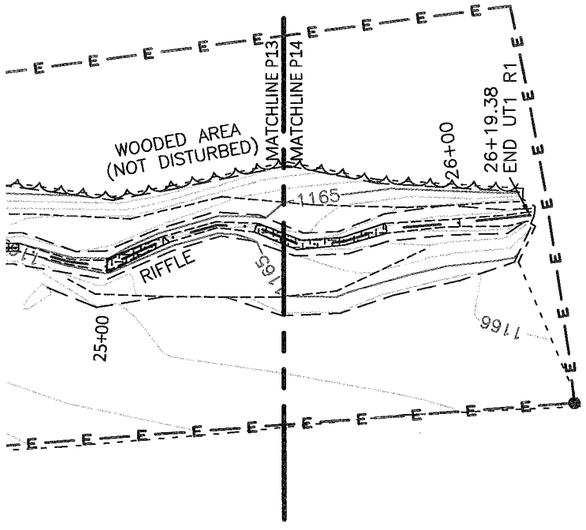
29+37.08
BOULDER STEP #10
TOP=1150.84
BOTTOM=1149.59

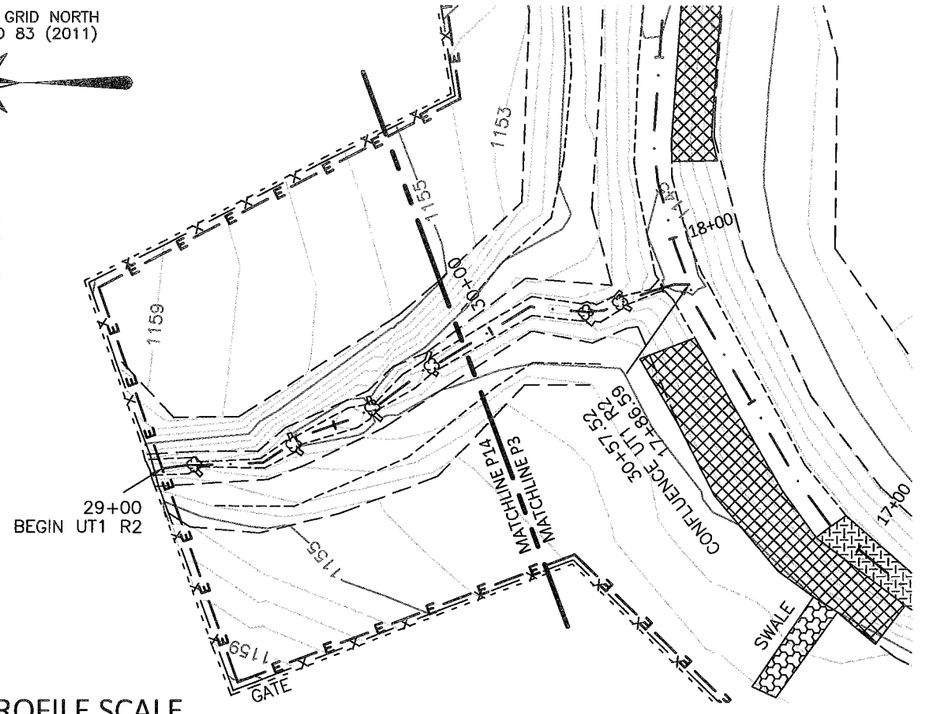
29+61.00
BOULDER STEP #11
TOP=1149.99
BOTTOM=1148.68

29+80.85
BOULDER STEP #12
TOP=1148.93
BOTTOM=1147.81

30+27.25
BOULDER STEP #13
TOP=1147.80
BOTTOM=1146.92

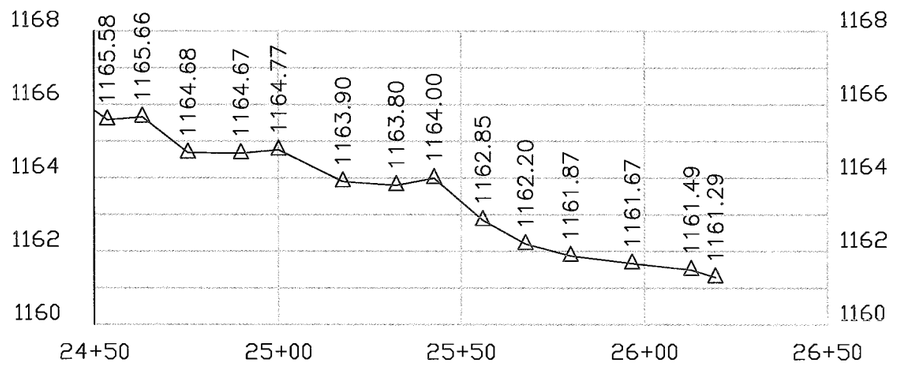
30+37.48
BOULDER STEP #14
TOP=1147.12
BOTTOM=1146.24

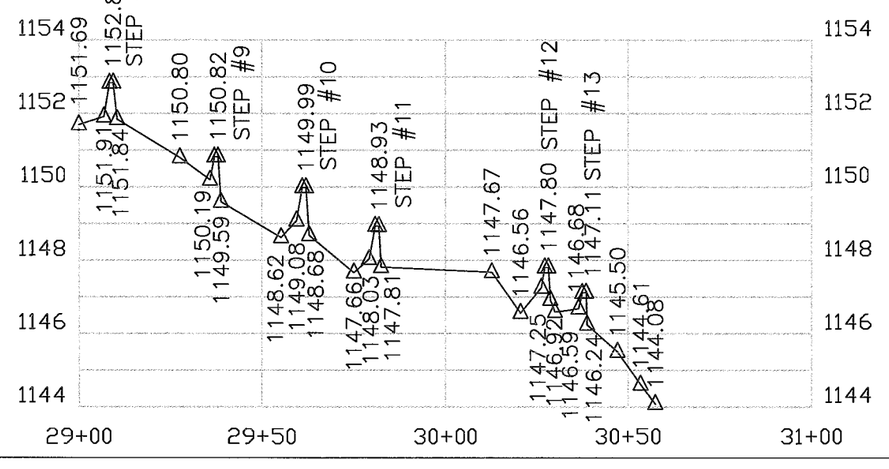




PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'





MATCHLINE P14

REVISIONS:

BPLS

BEN PATTON LAND SURVEYING, PLLC
SERVING NC, SC, & TN
PHONE: (828) 768-1625
931 N. MAIN ST. SUITE 5 MARION, NC 28752
BEN@BPSURVEYING.COM FIRM NO: P-0907

UT 1 STA. 24+50 TO 26+19.38
UT 1 STA. 29+00 TO 30+57.62

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

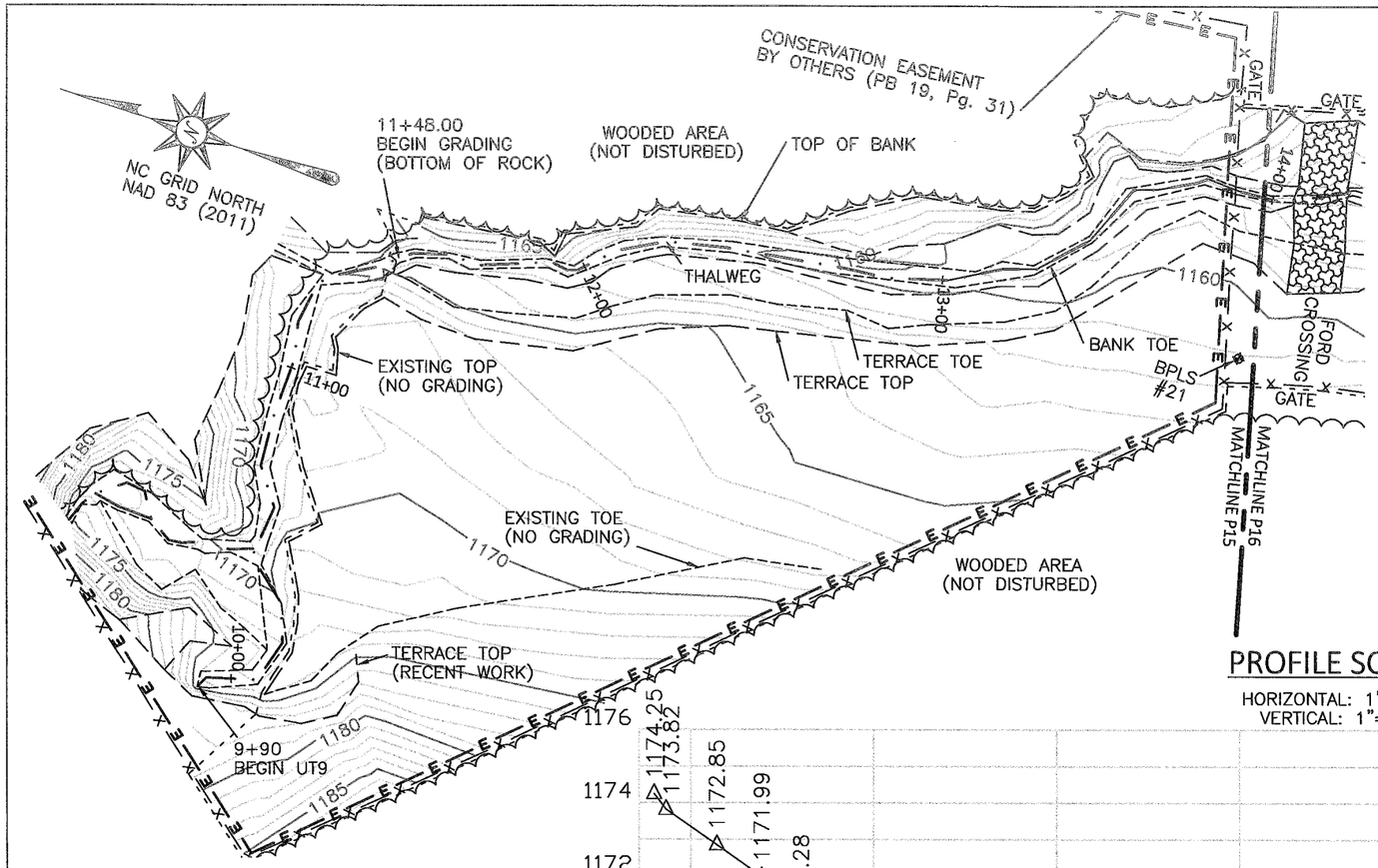
DRAWN: JSM, BTP

REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
14 of 23



LEGEND/LINETYPES

- CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE

STONE

CONSTRUCTED RIFFLE

BRUSH MATTRESS

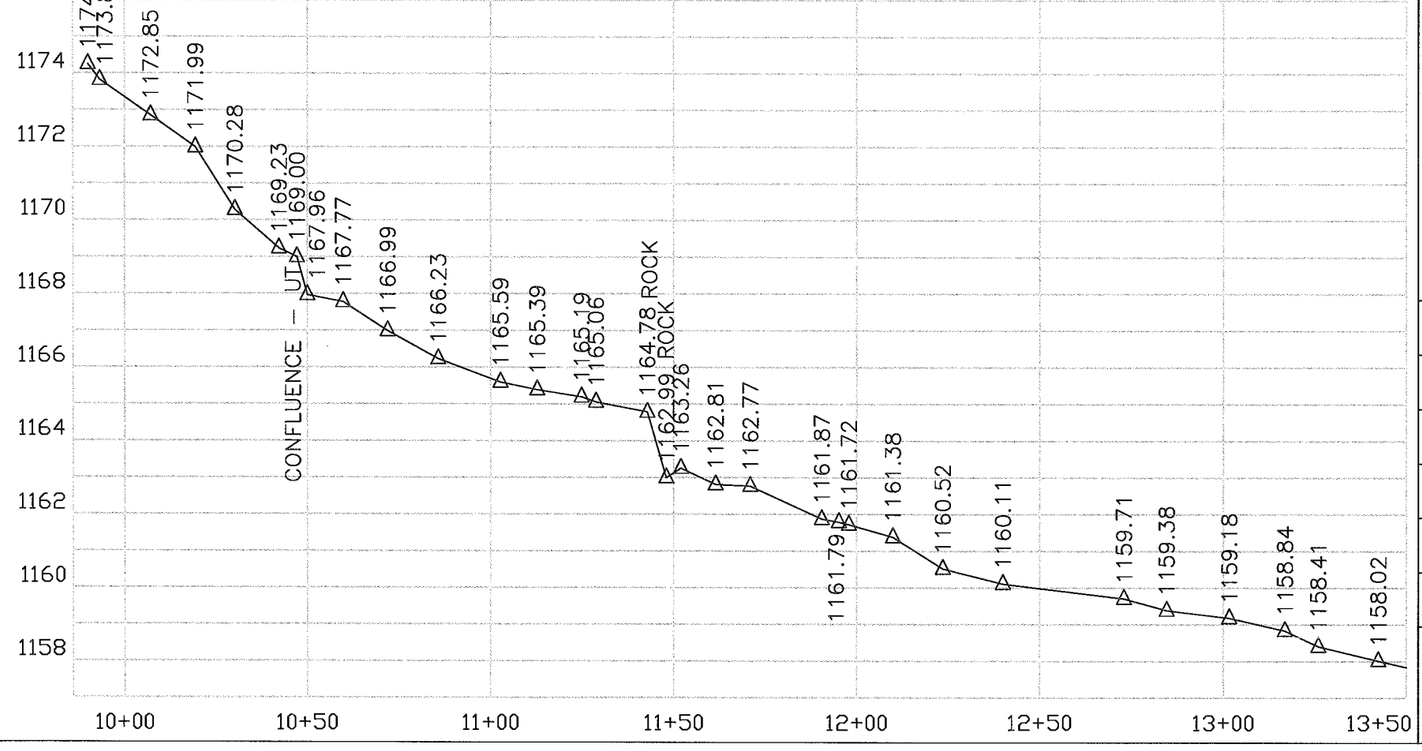
- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS

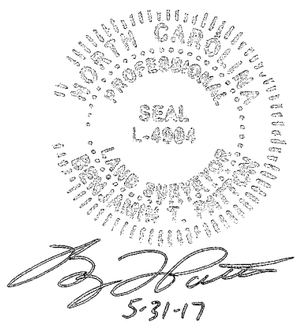
LOG VANE

GEOLIFT

PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'





SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'

REVISIONS:

BPLS
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PHONE: (828) 768-1625
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UT 9 STA. 9+90 TO 13+50

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

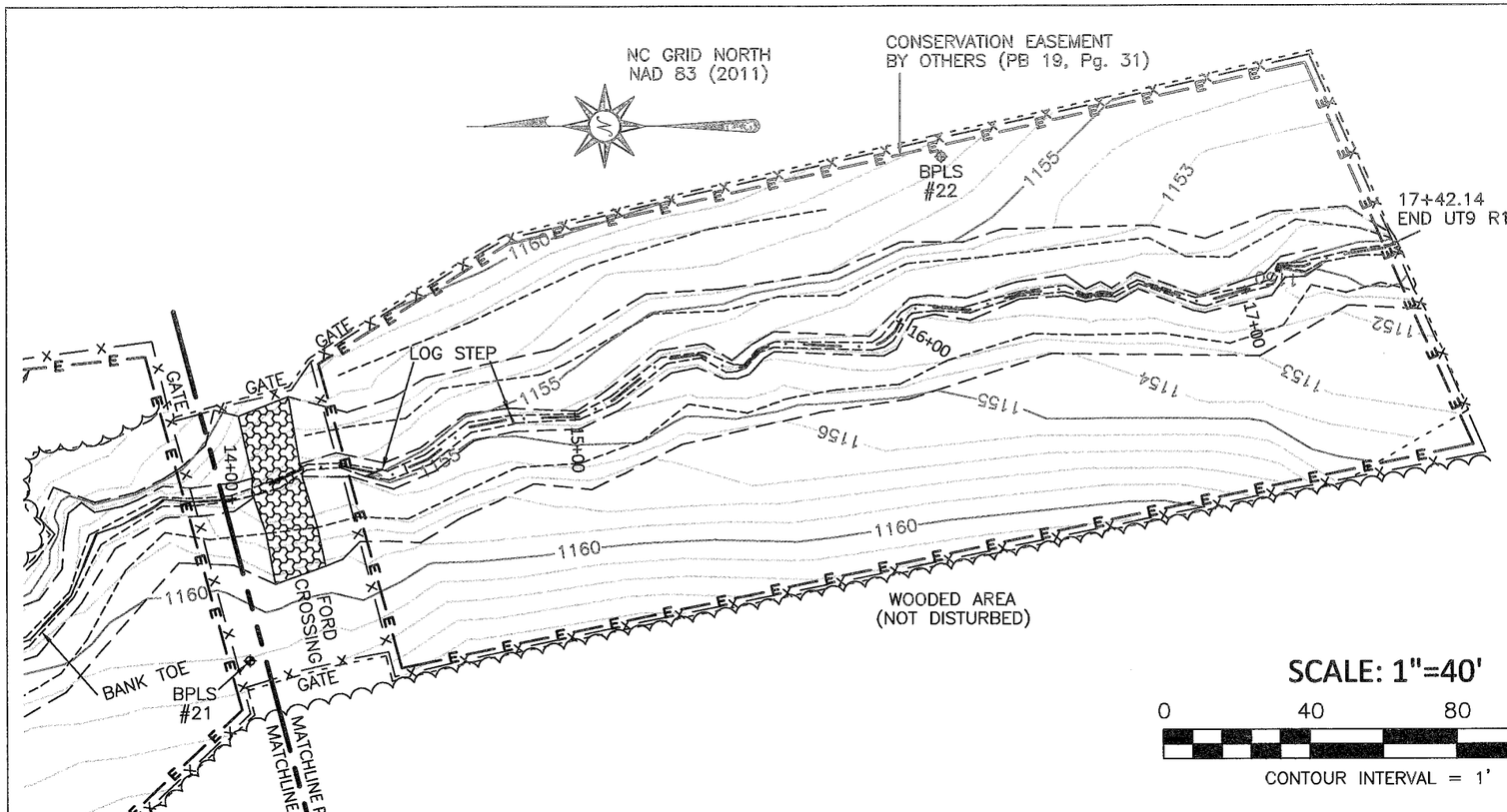
DRAWN: JSM, BTP

REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
15 of 23



LEGEND/LINETYPES

- CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE

STONE

CONSTRUCTED RIFFLE

BRUSH MATTRESS

- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS

LOG VANE

GEOLIFT

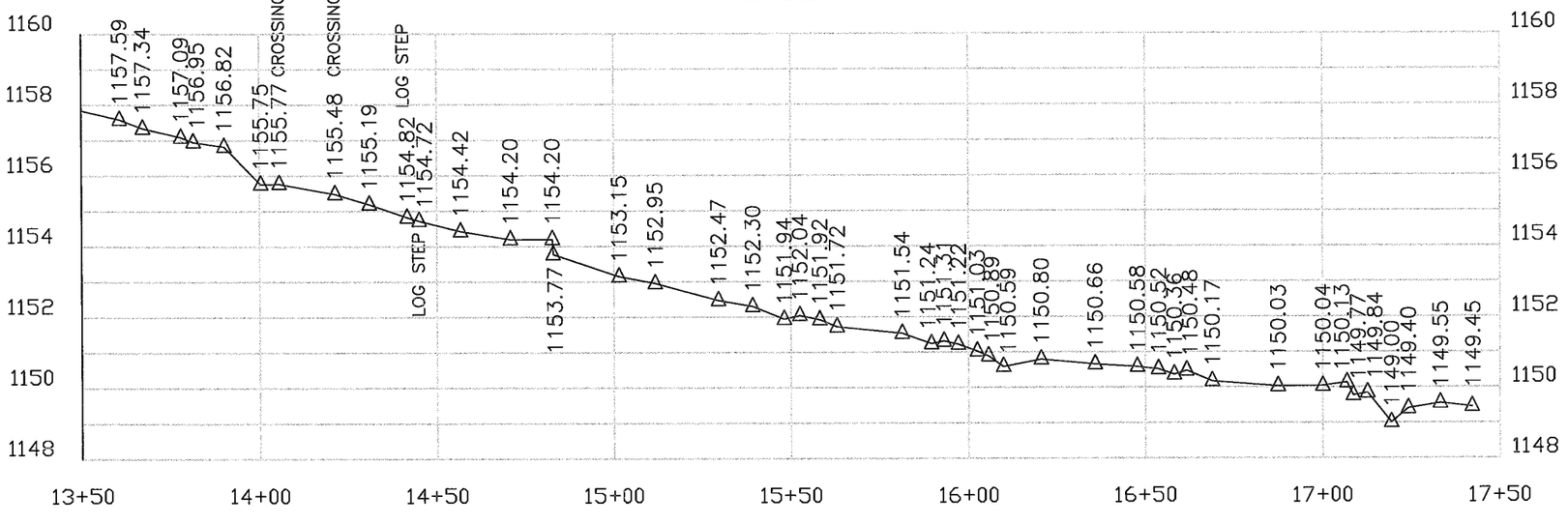
SCALE: 1"=40'

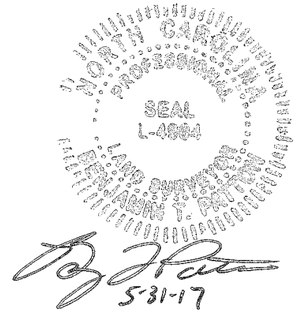
0 40 80 120

CONTOUR INTERVAL = 1'

PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'





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UT 9 STA 13+50 TO 17+50

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

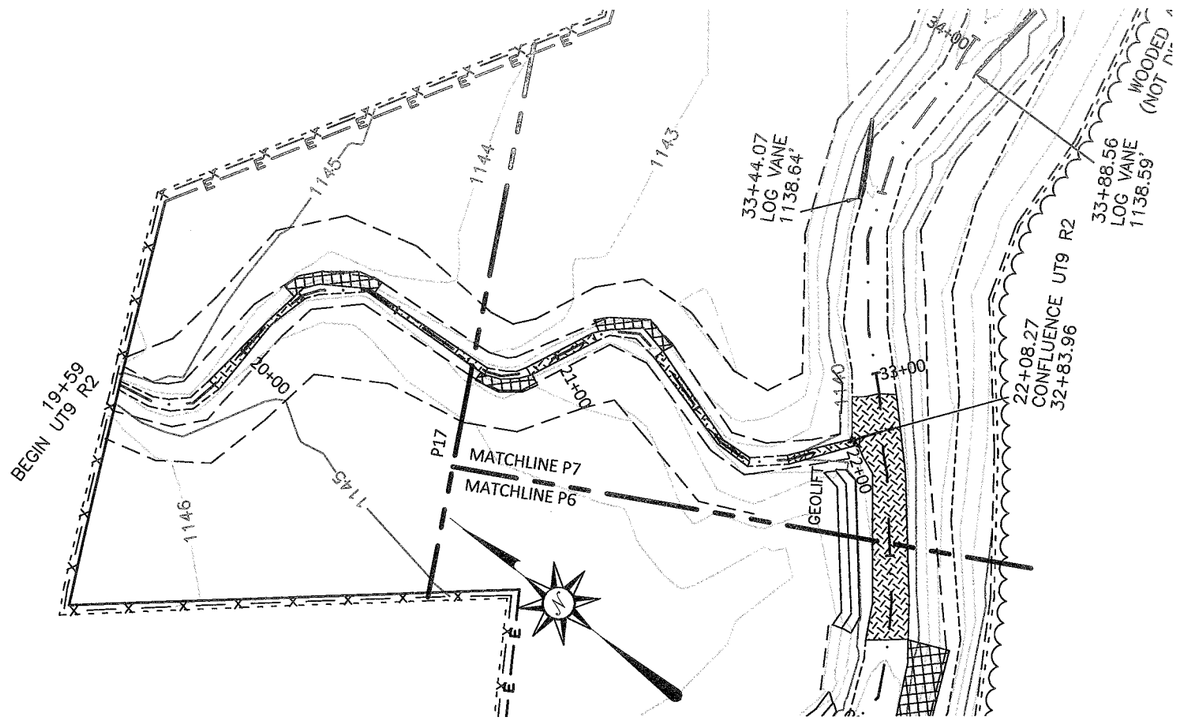
DRAWN: JSM, BTP

REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
16 of 23



LEGEND/LINETYPES

- CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE

STONE

CONSTRUCTED RIFFLE

BRUSH MATTRESS

EASEMENT DISK

CONTROL POINT

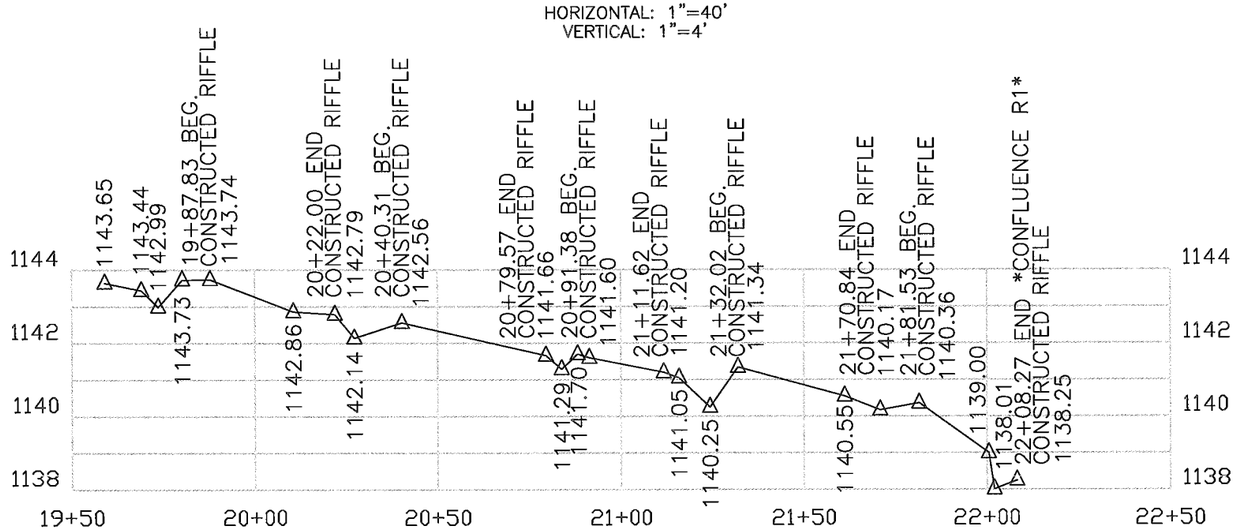
BOULDER / ROCKS

LOG VANE

GEOLIFT

PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'



SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'

NORTH CAROLINA PROFESSIONAL SEAL L-4804 LAND SURVEYOR

5-31-17

REVISIONS:

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BEN@BPSURVEYING.COM FIRM NO: P-0907

UT 9 STA 19+59 TO 22+08.27

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

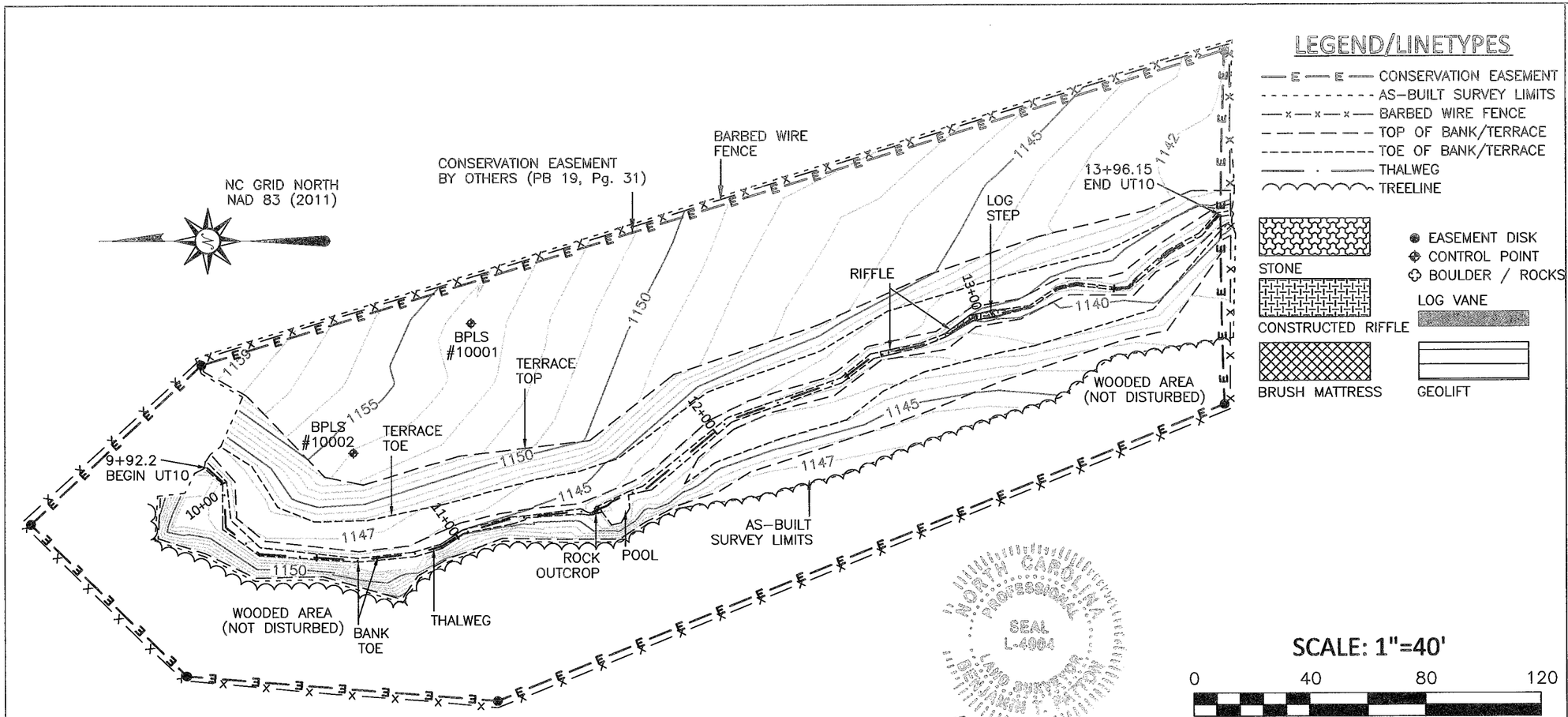
DRAWN: JSM, BTP

REVIEWED: BTP

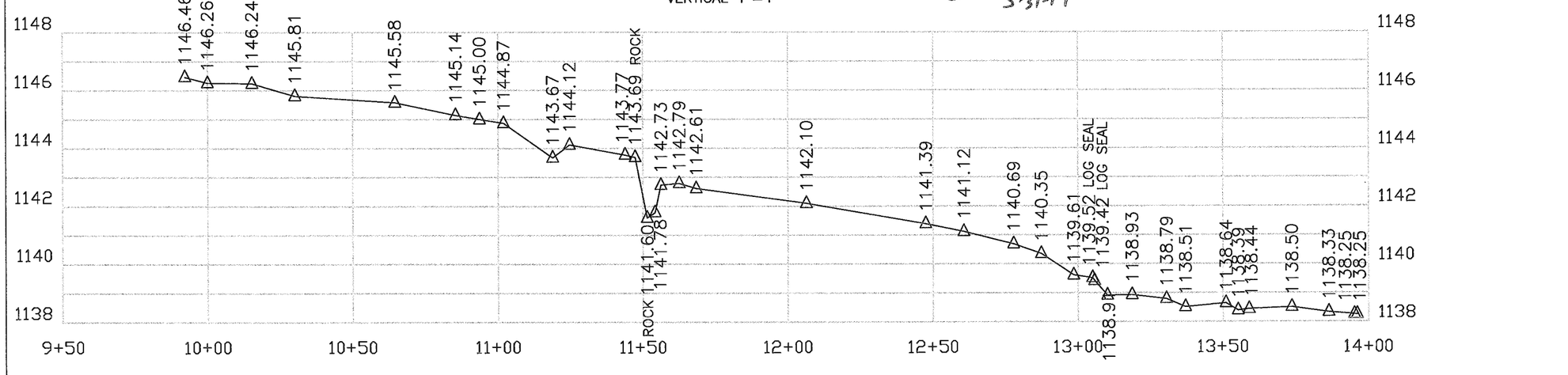
BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
17 of 23



PROFILE SCALE
HORIZONTAL 1"=40'
VERTICAL 1"=4'



REVISIONS:

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BEN@BPSURVEYING.COM FIRM NO: P-0907

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

UT 10 STA. 9+92.20 TO 13+96.15

DATE: 5/31/17

FIELD: JSM, BTP

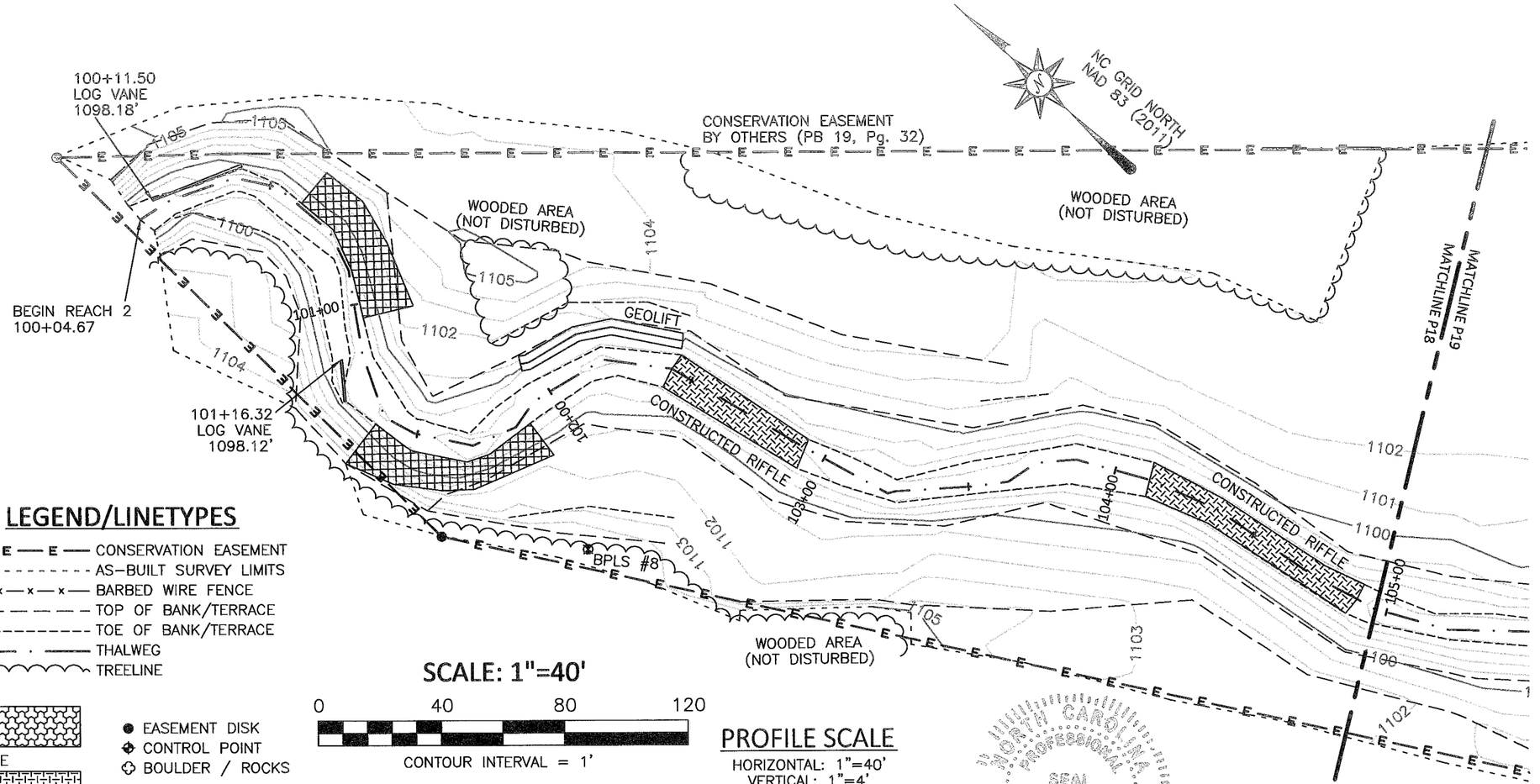
DRAWN: JSM, BTP

REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
18 of 23



LEGEND/LINETYPES

- E — E — CONSERVATION EASEMENT
- - - - - - - - - - AS-BUILT SURVEY LIMITS
- x — x — x — BARBED WIRE FENCE
- — — — — — TOP OF BANK/TERRACE
- ---------- TOE OF BANK/TERRACE
- ——— · ——— THALWEG
- TREELINE

STONE

CONSTRUCTED RIFFLE

BRUSH MATTRESS

- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS

LOG VANE

GEOLIFT

SCALE: 1"=40'

0 40 80 120

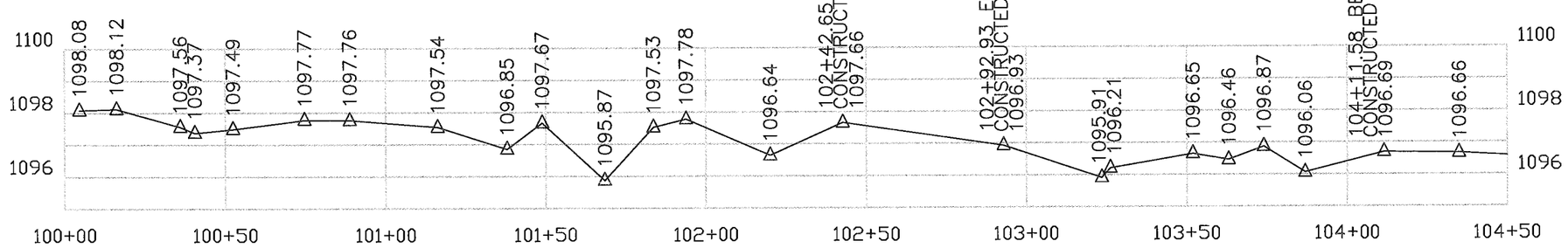
CONTOUR INTERVAL = 1'

PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'

NORTH CAROLINA PROFESSIONAL SEAL L-4964 LAND SURVEYOR BEN PATTON

5-31-17



REVISIONS:

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PHONE: (828) 768-1625
931 N. MAIN ST. SUITE 5 MARION, NC 28752
BEN@BPSURVEYING.COM FIRM NO: P-0907

REACH 2 STA 100+04.67 TO 104+50

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

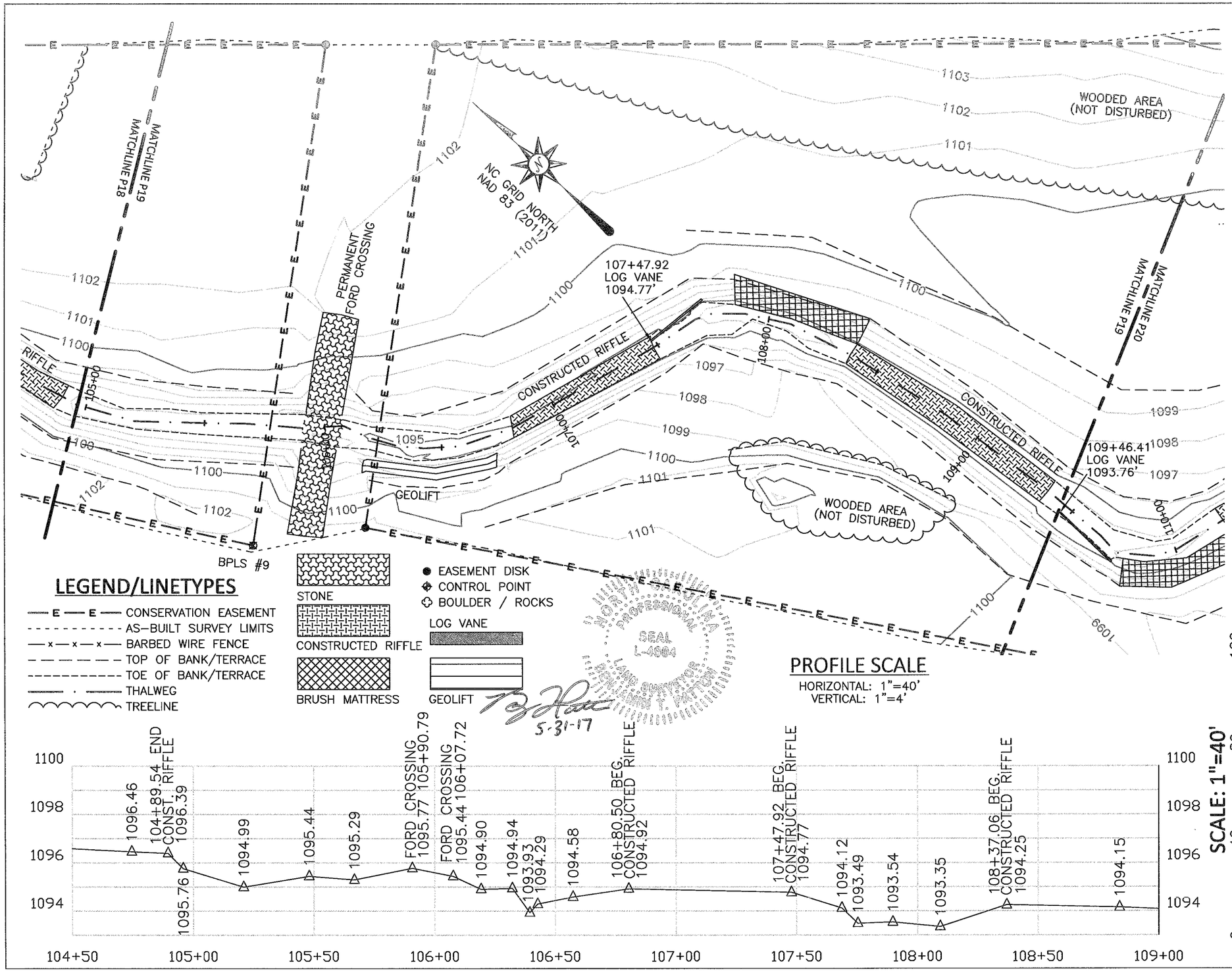
DRAWN: JSM, BTP

REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
19 of 23



REVISIONS:

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931 N. MAIN ST. SUITE 5 MARION, NC 28752
BEN@BPSURVEYING.COM FIRM NO: P-0907

REACH 2 STA. 104+50 TO 109+00

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17

FIELD: JSM, BTP

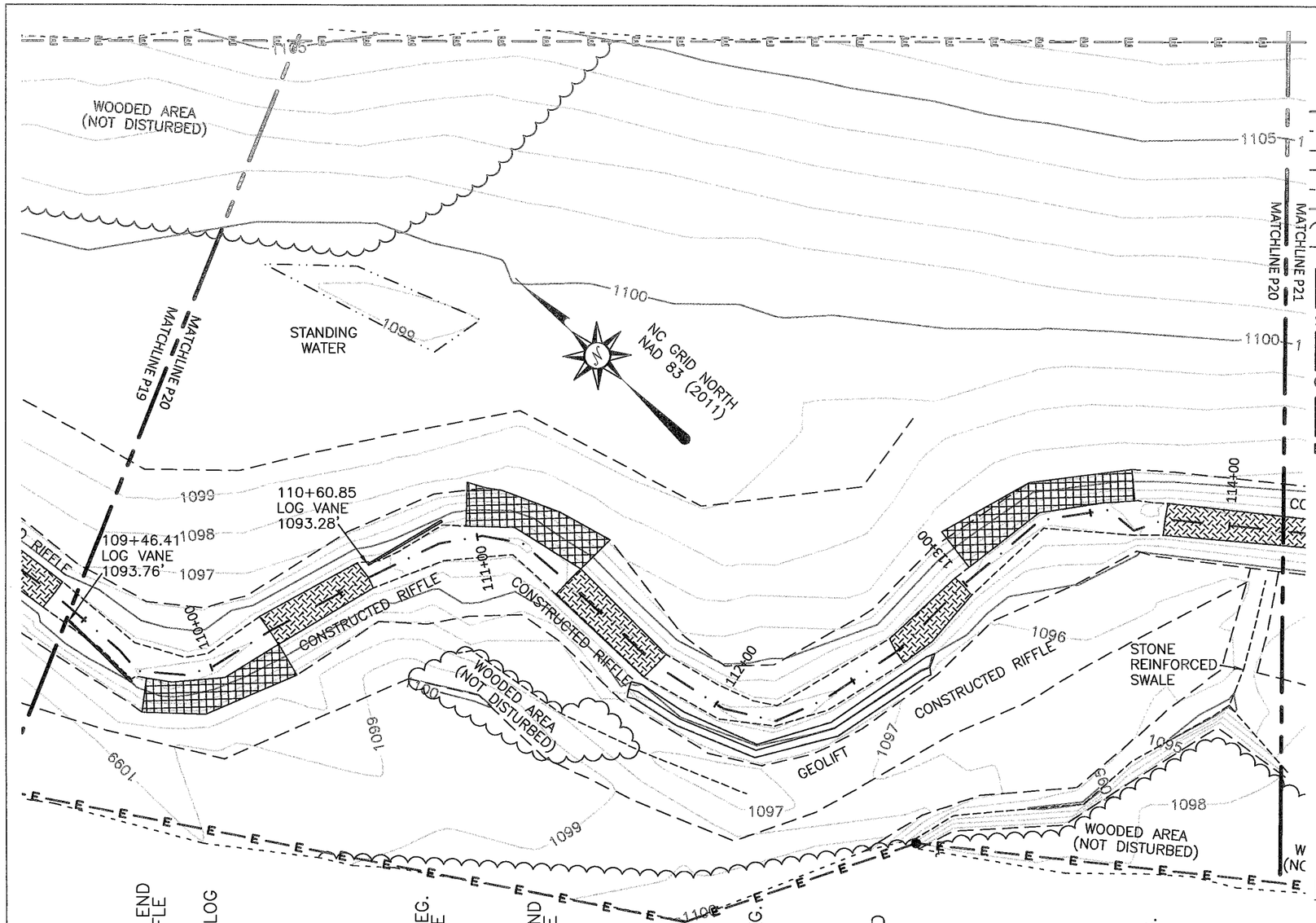
DRAWN: JSM, BTP

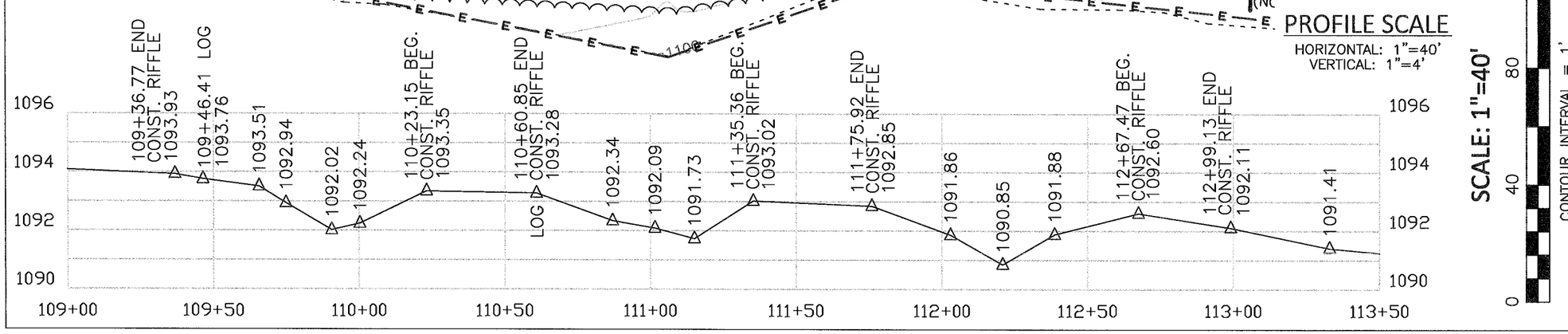
REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
20 of 23





SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'

REVISIONS:

BPLS
BEN PATTON LAND SURVEYING, PLLC
SERVING NC, SC, & TN
PHONE: (828) 768-1625
931 N. MAIN ST. SUITE 5 MARION, NC 28752
BEN@BPSURVEYING.COM FIRM NO: P-0907

REACH 2 109+00 TO 113+50

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

NORTH CAROLINA PROFESSIONAL SEAL L-4964 LAND SURVEYOR BENJAMIN T. PATTON

5-31-17

DATE: 5/31/17

FIELD: JSM, BTP

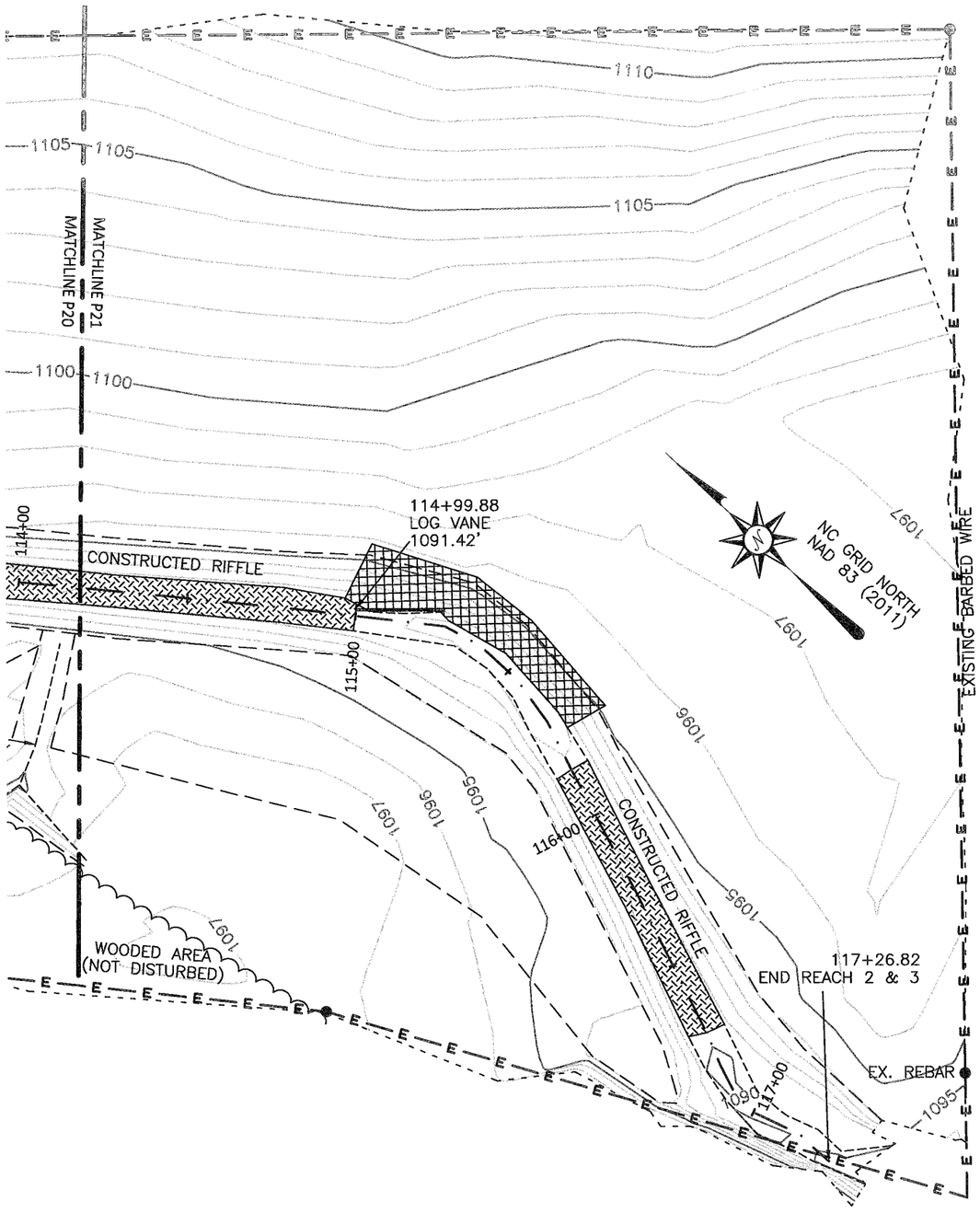
DRAWN: JSM, BTP

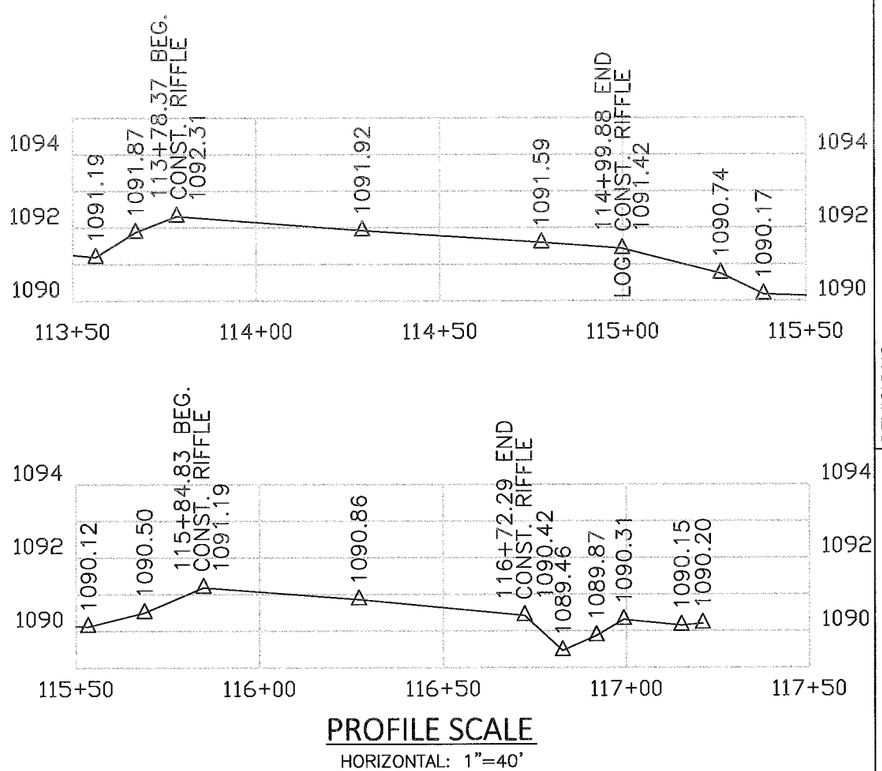
REVIEWED: BTP

BPLS PRO. # 16075

SCALE: 1"=40'

SHEET:
21 of 23





PROFILE SCALE

HORIZONTAL: 1"=40'
VERTICAL: 1"=4'

LEGEND/LINETYPES

- CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- BARBED WIRE FENCE
- TOP OF BANK/TERRACE
- TOE OF BANK/TERRACE
- THALWEG
- TREELINE

STONE
CONSTRUCTED RIFFLE
BRUSH MATTRESS

- EASEMENT DISK
- CONTROL POINT
- BOULDER / ROCKS

LOG VANE
GEOLIFT

NORTH CAROLINA PROFESSIONAL SEAL L-4964 LAND SURVEYOR BEN T. PATTON
5-31-17

SCALE: 1"=40'

0 40 80 120

CONTOUR INTERVAL = 1'

REVISIONS:

BPLS

BEN PATTON LAND SURVEYING, PLLC
SERVING NC, SC, & TN
PHONE: (828) 768-1625
931 N. MAIN ST. SUITE 5 MARION, NC 28752
BEN@BPSURVEYING.COM FIRM NO: P-0907

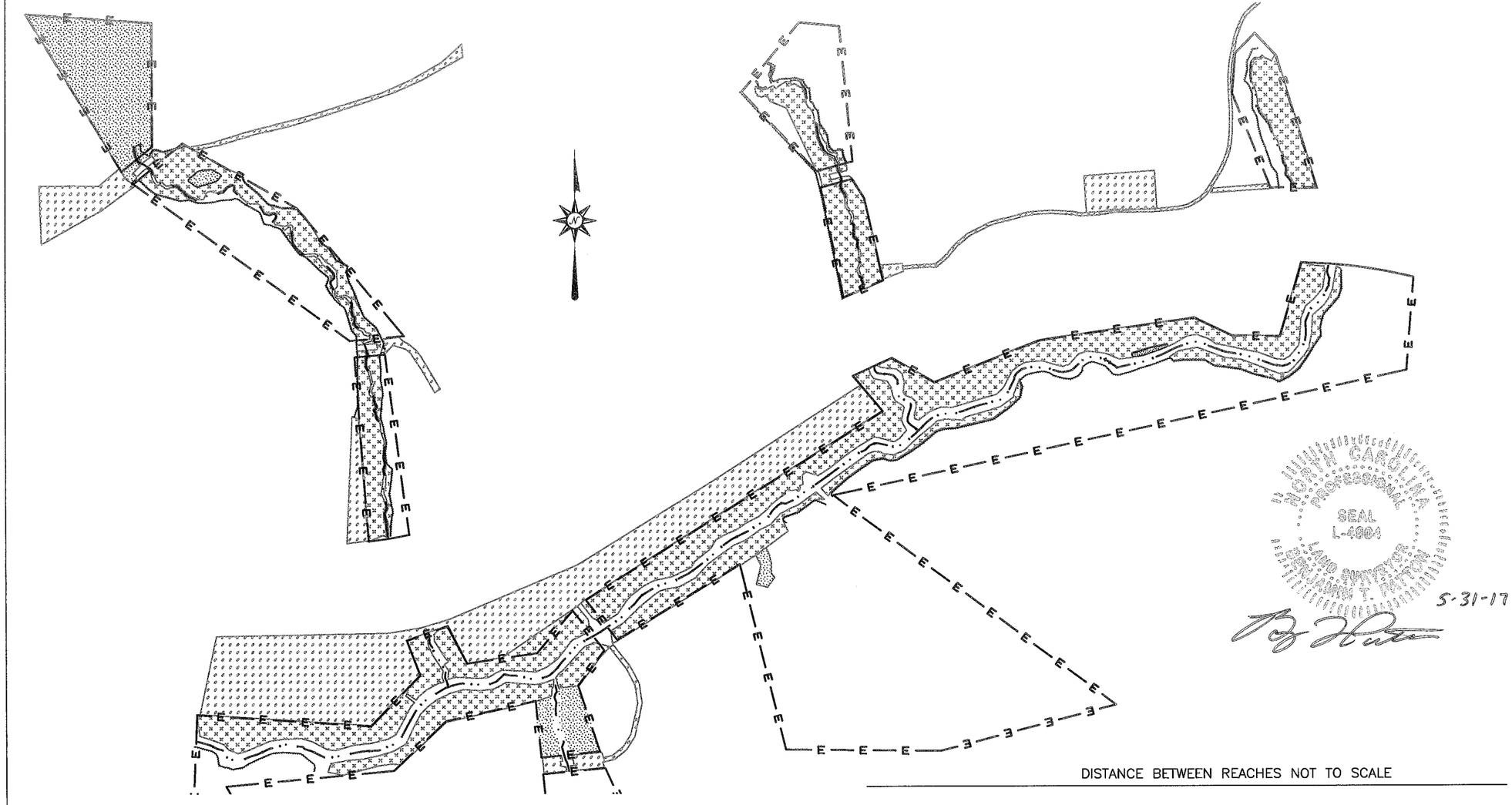
REACH 2 STA 113+50 TO 117+26.82

SHADRICK CREEK RESTORATION PROJECT

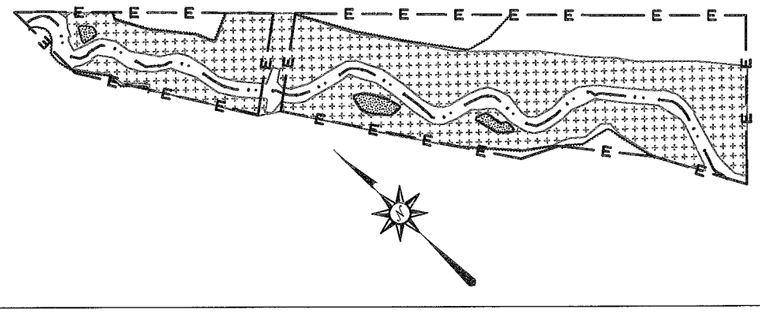
DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17
FIELD: JSM, BTP
DRAWN: JSM, BTP
REVIEWED: BTP
BPLS PRO. # 16075
SCALE: 1"=40'

SHEET:
22 of 23



DISTANCE BETWEEN REACHES NOT TO SCALE



LEGEND/LINETYPES

— E — E — CONSERVATION EASEMENT
— · — THALWEG
TREELINE

STABILIZATION SEED
BARE ROOT TREES
RIPARIAN SEED & BARE ROOT TREES

SCALE: 1"=300'

0 300 600 900

NORTH CAROLINA PROFESSIONAL SEAL L-4904 LAND SURVEYOR BENJAMIN T. PATTON

5-31-17

REVISIONS:

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931 N. MAIN ST. SUITE 5 MARION, NC 28752
BEN@BPSURVEYING.COM FIRM NO: P-0907

FLOODPLAIN PLANTING

SHADRICK CREEK RESTORATION PROJECT

DMS PROJECT 92916
McDOWELL COUNTY, NC

DATE: 5/31/17
FIELD: JSM, BTP
DRAWN: JSM, BTP
REVIEWED: BTP
BPLS PRO. # 16075
SCALE: 1"=300'

SHEET:
23 of 23