

Shadrick Creek Restoration Project

Annual Monitoring Report

Monitoring Year 3 of 5

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: March 2020 – November 2020

Date Submitted: February 2021



Submitted to:

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

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February 9, 2021

Matthew Reid
Western Project Manager
NCDENR – Division of Mitigation Services 5
Ravenscroft Dr., Suite 102
Asheville, NC 28801

Dear Mr. Reid,

On January 29, 2021, Equinox received comments on the Draft MY3 Monitoring Report for the Shadrick Creek Stream Restoration Project from DMS. The following are our replies to those comments (in Red).

- In order to be consistent with the official assets on the debit ledger, please update the WMU totals in the report to 0.265 WMUs. Section 1.1, 1.4 and Table 1 currently show 0.27 WMUs. **Updated Table 1 to report appropriate number of significant figures. Corrected text.**
- Section 1.5.1 Vegetation indicates n=15 invasive areas, but only 12 are shown on the CCPV and Table 5. Please review and revise as necessary. **Cross-checked digital files and updated textual reference regarding invasive polygons.**
- Please add a short discussion regarding the UT9 cattle encroachment and UT10 headcut and reference photos.
 - For UT9, please note in discussion that cattle encroachment on UT9 was identified in January 2019 and DMS implemented fence repairs in March 2019 to prevent further encroachment. DMS will investigate this new encroachment and employ new measures to ensure cattle no longer enter the easement on UT9. **Text and discussion of encroachment added.**
 - For UT10, please add discussion that DMS has contracted with an engineer to develop a repair plan for the UT10 headcut. This repair will occur in winter 2021. The repair will be documented in the MY4 report and photos. **Text and discussion of headcut added.**
- Please add location of cattle encroachment on UT9 and UT10 headcut to CCPV. **Cattle encroachment added as polygon and UT10 headcut added as mass wasting stream problem area.**

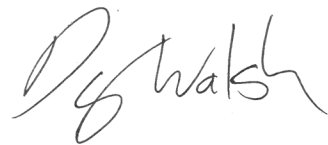
Digital File Review

- The number and lengths of scoured/eroding segments reported in Table 5 do not match the spatial data that was provided. For example, Shadrick Creek Reach 1 has 4 segments

totaling 102', compared to 2 segments and 49' reported in Table 5. Please revise and update as necessary. **Spatial data edited to match lengths reported in Table 5.**

- Please submit monitoring photos as JPEGs, naming the JPEGs based on photo point unique ID's. **Added additional file structure and photos.**
- Note that the Table 7 export from the CVS mdb produces a different PnoLs value for Plot 13 compared to what is included in the report (283.3 vs. 445.2). **Supplemental plantings (those not meeting 2yr survival) were erroneously tallied during MY3. Error corrected in table, text and CCPV.**
- Please review all cross-section calculations. The BHR for XS13 did not have the "omit Bkf" boxes checked, which produced a BHR of 0.7, but it should have been 0.5. **Reviewed/Edited XS data and revised tables and figures as appropriate.**
- Please include the spreadsheet used to produce the profile figures. **Included spreadsheets as separate excel files.**

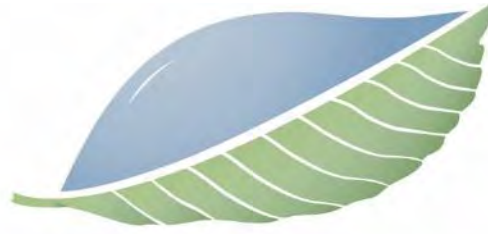
Regards,



Danvey Walsh,

Equinox Monitoring Manager

Prepared by:



EQUINOX

balance through proper planning

37 Haywood Street, Suite 100
Asheville, NC 28801

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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 (Catalog Unit (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 Unit 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 0.530 acre of wetlands were enhanced. The site generated a total of 6,662 SMU's, 0.265 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. Agricultural and/or forested lands border the project 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 structure of the buffers;
- Improve stream function and habitat by re-establishing stream-to-floodplain connections;
- Restore long-term stability through the restoration of 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 UTs 1, 5, 9, and 10;
- Preservation of 3,835 LF of UTs 2, 5, 6, 7, and 8;
- Enhancement of 0.530 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.

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.

1.5. Project Performance

Monitoring Year 3 (MY3) data was collected from March to November 2020. Monitoring activities included visual assessment of all reaches and the surrounding easement, collection of images at 31 permanent photo stations, inventory of 16 permanent vegetation monitoring plots, surveying of 18 cross-sections, conducting 5 pebble counts, and collection of longitudinal profile survey data for approximately 1,354 linear feet of stream channel.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly Restoration Plan) documents available on the NCDMS website (<http://portal.NCDEQ.org/web/eep>). All raw data supporting the tables and figures in the appendices is available from DMS upon request.

1.5.1. Vegetation

Visual assessment of vegetation outside of the monitoring plots (Appendix B – Table 6) indicates that the herbaceous vegetation is, generally, well established throughout the project. Shadrick Creek has some areas of bare, rocky ground, located along the bankfull bench. These areas are showing signs of improvement and will be monitored in future site visits.

Monitoring of the permanent vegetation plots (n = 16; VP) was completed in September 2020. Summary tables and photographs associated with MY3 vegetation monitoring are located in Appendix B and Appendix C. MY3 monitoring data indicates that all vegetation plots are on track to meet the MY3 interim success criteria of 320 planted stems per acre. Planted stem densities among plots ranged from 283 to 567 planted stems per acre with an annual mean of 450 planted stems per acre across all plots. A total of 8 species of planted trees and shrubs were documented within the plots. When volunteer stems are included, the mean annual total stems per acre rose to 1543 and ranged between 404 and 2,347 stems per acre, (Table 7, Appendix B).

Regarding invasive-exotic species, multiple areas (n=12, 0.10 acres) of invasive-exotic vegetation were treated in MY3 (Tables 2 and 6). The species documented at the Shadrick Creek Site include Japanese honeysuckle (*Lonicera japonica*), Privet spp. (*Ligustrum sinense*), and kudzu (*Pueraria montana*). All areas called out as “invasives present” in the MY3 initial site assessment were treated during MY3; invasive polygons will be removed from the CCPV as they are assessed as fully controlled. The timeframe and method of treatment can be found in Appendix F.

1.5.2. Stream Geomorphology

Visual assessment of the stream channel was performed to document signs of instability, such as eroding banks, structural instability, or excessive sedimentation. Two small areas of bank scour were noted on Shadrick Creek Reach 1, and one area of scour was noted on Shadrick Creek Reach 2 (Table 5, Figure 2 CCPV). The first area on Shadrick Creek Reach 1 is located at the top of the Project near STA 11+00. Here the left descending bank (LDB) has scoured out due to an uprooted tree. A large scour

pocket has formed where the tree had previously been rooted. This area has been monitored since baseline conditions and had not worsened during MY3 monitoring period. Further downstream on Shadrick Reach 1 at STA 37+50, the right descending bank (RDB) is scouring just downstream of the log sill structure. At high flows, the thalweg is directed directly at this portion of the bank and has scoured out approximately 20 feet of bank downstream from the structure. Photos of these areas can be found in Appendix B. A third area of bank erosion is noted on the LDB Shadrick Reach 2 just upstream of the crossing. These areas and the rest of the site will be monitored in future visits for any further signs of instability.

Geomorphic data for MY3 was collected during September and October 2020. Summary tables and cross-section data plots related to stream morphology are located in Appendix D. Cross-sectional dimensions have remained stable between baseline conditions and MY3 monitoring efforts. Slight adjustments have been observed in all cross-sections, none were indicative of a move toward instability (Appendix D, Table 11a). Riffle dimensions for each reach also remained relatively similar between baseline conditions and MY3 monitoring. (Appendix D, Table 11b).

Longitudinal profile data (Appendix B, Table 11b) indicated relatively little change in riffle and pool dimensions between baseline conditions and MY3 monitoring. Minor fluctuations in pool depths, lengths and spacing were noted but were overall stable. Riffle slopes and water surface slopes are similar since baseline. In Shadrick Reach 3 Mean riffle lengths have decreased and pool lengths have increased slightly from baseline to MY3. UT-9 Reach 2 dimensions have also indicated that mean riffle lengths have decreased slightly and mean pool length is decreasing. Longitudinal profile data will continue to be collected and analyzed in future monitoring years.

Substrate monitoring was performed during MY3. Pebble count D_{50} fell into the medium to very coarse gravel range for Shadrick Creek Reach 1 and very coarse gravel to small cobble for Shadrick Creek Reach 3. Particle sizes fell in the very fine sand range for UT 9. Indicating a shift toward slightly finer bed materials following the impacts from the beaver dam. The channel substrate will continue to be monitored in future years for shifts in particle size distributions.

The areas of beaver activity identified in July 2019 are revegetating and stabilizing. Some beaver activity was noted along the lower reaches of Shadrick Creek Reach 1. This was in the form of some chewed stems. No new dams were identified in MY3.

An initial incident of cattle encroachment on UT9 was identified in January 2019. DMS implemented fence repairs in March 2019 to prevent further encroachment. One area of easement encroachment by cattle was identified during April 2020. The lowest strand of barbed wire was broken along the downstream extent of UT9 Reach 1 above the crossing. This portion of wire was repaired in the field to provide temporary exclusion. DMS will investigate this area of encroachment and employ new measures to ensure cattle are excluded from the easement. No additional areas of encroachment were noted in subsequent site visits in MY3.

An approximately 10ft long headcut was documented as mass wasting at the farthest upstream extent of UT10 (Table 5, Figure 2 CPPV). This headcut is migrating towards the easement boundary. DMS has contracted with an engineer to develop a repair plan to be implemented in the Winter of 2021. This repair will be documented in the MY4 report and photos.

1.5.3. Stream Hydrology

Since project completion in late 2017, five bankfull events have been documented at the Shadrick Creek Site. Based on precipitation data, the suspected dates are January 12nd 2018, May 18th 2018, October 18th 2018, April, 17 2019, and February 4, 2020 (Table 12, Appendix E).

2.0 METHODS

The visual assessment of the project was performed at the beginning and end of each monitoring year. Permanent photo station photos were taken during the initial visual assessment when leaf-off conditions exist and during the morphological monitoring. Additional photos of vegetation or stream problem areas were taken as needed.

Geomorphic measurements were taken during low flow conditions using a Nikon[®] NPR 332 Total Station. Three-dimensional coordinates associated with cross-section and profile data were collected in the field and geo-referenced (NAD83 State Plane feet FIPS 3200). Morphological data were collected at 19 cross-sections. Survey data was imported into CAD, ArcGIS[®], and Microsoft Excel[®] for data processing and analysis. Channel substrate was characterized using a Wolman Pebble Count as outlined in Harrelson et al. (1994) and processed using Microsoft Excel.

Vegetation success is being monitored at 16 permanent monitoring plots. Vegetation monitoring follows the CVS-EEP Level 2 Protocol for Recording Vegetation, version 4.2 (Lee et al. 2008) and includes analysis of species composition and density of planted species. Data is processed using the CVS data entry tool. In the field, the four corners of each plot were permanently marked with metal t-posts and PVC pipe. Photos of each plot were taken from the plot origin each monitoring year.

Precipitation data was reported from the NCCRONOS station in Morganton, NC. Bankfull events were documented with two crest gauges, one located on Shadrick Creek Reach 1 and another on Shadrick Creek Reach 3. Crest gauges will be monitored semi-annually. The height of the corklines were recorded and cross-referenced with known bankfull elevations at each crest gauge.

3.0 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.
- Harrelson, Cheryl, C. Rawlins and J. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. Gen. Tech. Rep. RM-245. Rocky Mountain Forest and Range Experiment Station. USDA Forest Service. Fort Collins, Colorado.
- 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>)

Appendix A
Project Background Data and Maps

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Driving Directions: From Asheville drive east on I-40 and take exit 90. Turn right onto Harmony Grove Road, after 0.6 miles turn right to stay on Harmony Grove Road. After 2.2 miles continue onto State Road 1536. After 0.4 miles turn right on NC-126 E. Follow NC-126 E for approximately 2.5 miles then turn right onto a dirt road across from Lake James State Park. The Shadrick Creek Mitigation Site will be on the right after about 0.25 mile.

The subject project site in an environmental restoration site of the NCDMS and encompassed by a recorded conservation easement, but is bordered by land with private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access to the general public is not permitted. Access by authorized personnel of state and federal agencies or their designee/contractors involved in the development, oversight, and stewardship of the restoration site is permitted within the terms and timeframes of their defined role. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with NCDMS.

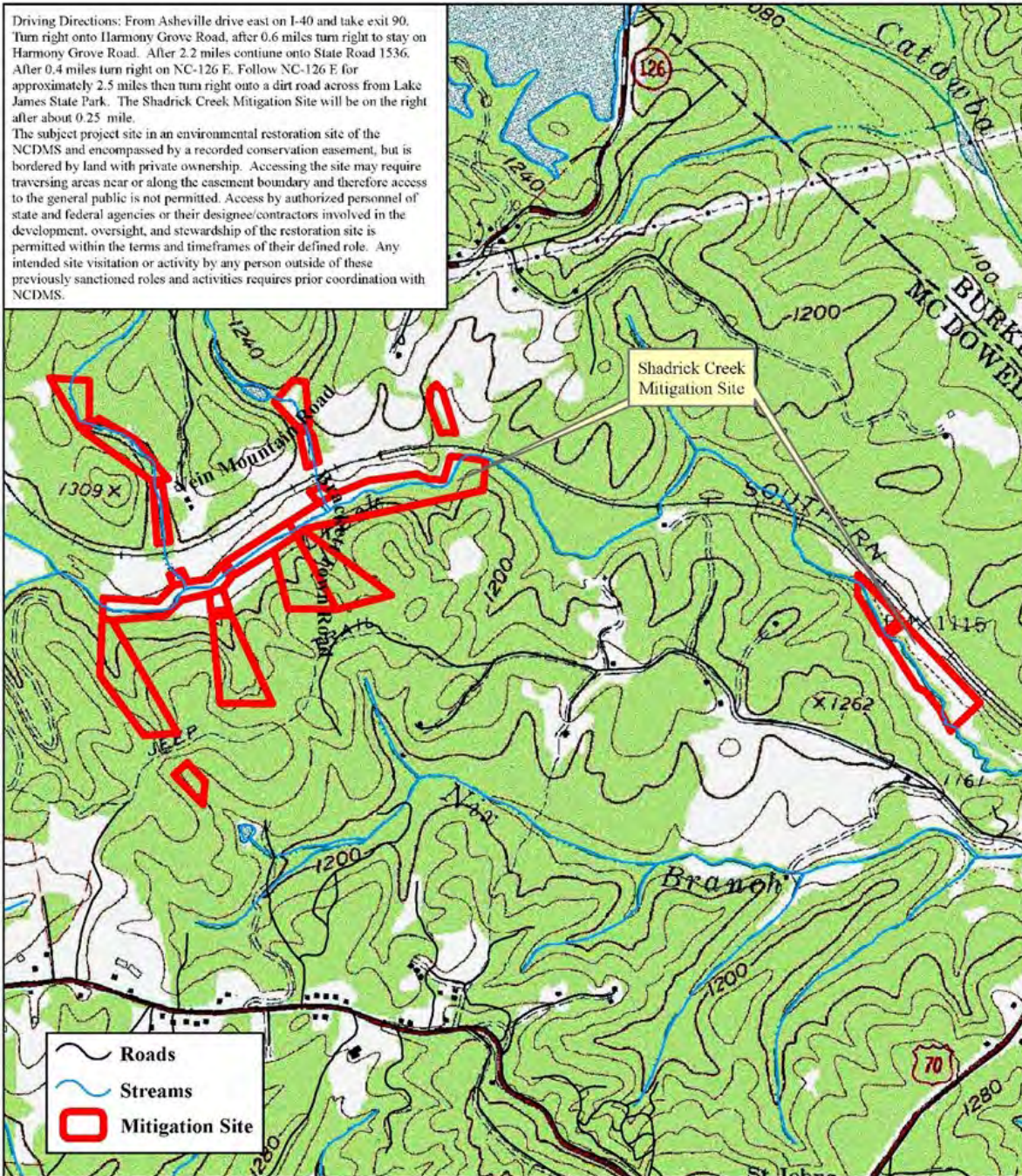


Figure 1
Shadrick Mitigation Site
Vicinity Map



EQUINOX

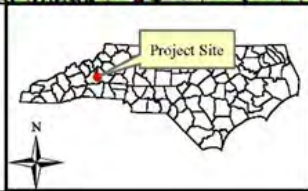
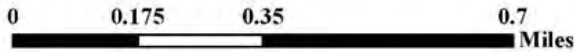


Table 1. Project Mitigation Components and Summation									
Shadrick Creek Stream Restoration Project									
Mitigation Credits*									
	Stream SMUs				Wetland WMUs	Buffer SF			
Type	R	EI	EII	P	E	527,000			
Totals	1,353	4,644	86	579	0.265				
Project Components									
Project Component -or- Reach ID	Stationing/Location	Existing Footage/Acreage	Restoration Footage or Acreage*	Restoration Footage/Acreage Discrepancy from Mitigation Plan	Restoration - or- Restoration Equivalent	Approach	Mitigation Ratio	Mitigation Credits*	Buffer SF
						(PI, PII etc.)			
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	UT1	0.440	0.440	0	E	Stab./Buffer	2:1	0.220	-
Wetland B	Shadrick Reach 1	0.090	0.090	0	E	Buffer	2:1	0.045	-
Component Summation									
Restoration Level	Stream	Riparian Wetland		Non-riparian Wetland	Buffer	Upland			
	(linear feet)	(acres)		(acres)	(square feet)	(acres)			
		Riverine	Non-Riverine	-	-	-			
Restoration	1,353	-	-	-	-	-			
Enhancement	-	0.530	-	-	-	-			
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	Oct 2018	Nov 2018
Invasive-Exotic Treatment	-	July 2018
Year 1 Vegetation Monitoring	Sept 2018	-
Year 1 Geomorphology Monitoring	Oct 2018	-
Year 2 Vegetation Monitoring	Oct 2019	-
Year 2 Geomorphology Monitoring	July 2019	-
Year 2 Beaver and Dam removal	-	August 2019
Year 2 Invasive vegetation management	-	March 2019
Year 2 Invasive vegetation management	-	June 2019
Year 2 Invasive vegetation management	-	July 2019
Year 2 Invasive vegetation management	-	October 2019
Year 3 Invasive vegetation management	-	August 2020
Year 3 Invasive vegetation management	-	Sept 2020
Year 3 Vegetation Monitoring	Sept 2020	-
Year 3 Geomorphology Monitoring	Oct 2020	-
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 (MY0-MY3)- 2017 - 2020	Equinox Environmental 37 Haywood St. Asheville, North Carolina 28801 Danvey Walsh (828) 253-6856

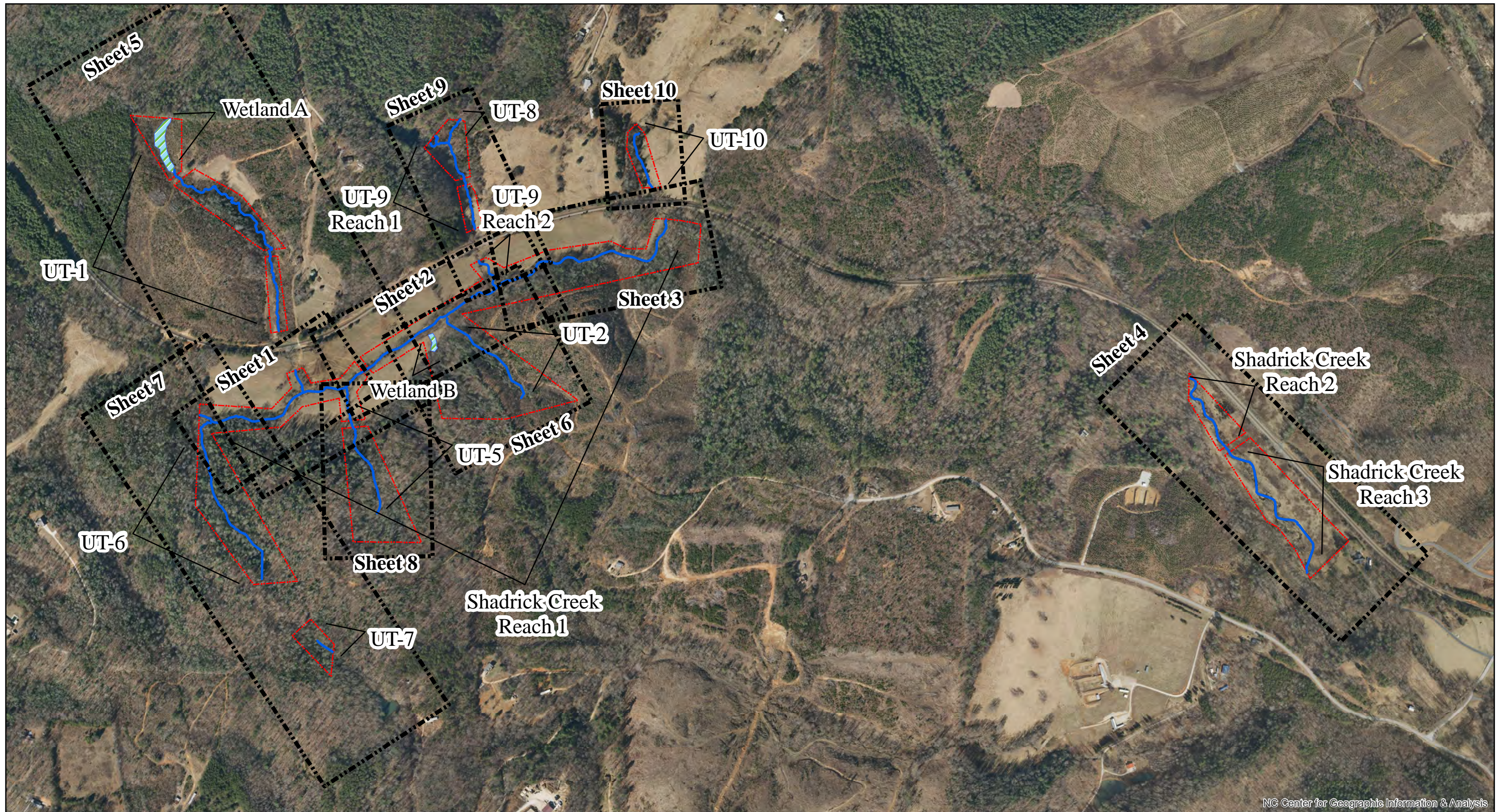
Table 4. Project Baseline Information and Attributes							
Project Information							
Project Name	Shadrick Creek						
County	McDowell						
Project Area (acres)	54.6						
Project Coordinates (latitude and longitude)	35.720410° N, -81.901405° W						
Project Watershed Summary Information							
Physiographic 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
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Perennial	Perennial	Perennial	Perennial
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

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Appendix B
Visual Assessment Data

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NC Center for Geographic Information & Analysis



Shadrick Creek Restoration Site
 McDowell County, NC NCDMS
 Contract No.: 00006783 NCDMS
 Project No.: 92916
 Overview Map

- Thalweg
- Wetland Enhancement
- Easement
- Sheet





Prepared for:



Shadrick Creek Restoration Site
 Monitoring Year 3
 McDowell County, NC
 NCDMS Contract No.: 00006783
 NCDMS Project No.: 92916
 December 2020
 Sheet 1 of 10

- ★ Photo Point
 - Log Vane
 - Boulder Structure
 - - - Easement
 - Top of Bank
 - Thalweg
- Vegetation Plot**
- Meeting >10%
- Stream Problem Areas**
- Bank Erosion
- Invasive-Exotic Species**
- Present

Notes:

1) Baseline Data Provided by Patton Land Surveying

Prepared by





Prepared for:



Shadrick Creek Restoration Site
 Monitoring Year 3
 McDowell County, NC
 NCDMS Contract No.: 00006783
 NCDMS Project No.: 92916
 December 2020
 Sheet 2 of 10

- ★ Photo Point
- Log Vane
- ⋯ Easement
- Top of Bank
- Cross-Section
- ⊙ Crest Gauge
- Thalweg
- Vegetation Plot**
- Meeting <10%
- Meeting >10%
- Wetland Enhancement

Invasive-Exotic Species

- Present

Notes:

1) Baseline Data Provided by Patton Land Surveying

Prepared by





NCCGIA, NC911 Board

Prepared for:



Shadrick Creek Restoration Site
 Monitoring Year 3
 McDowell County, NC
 NCDMS Contract No.: 00006783
 NCDMS Project No.: 92916
 December 2020
 Sheet 3 of 10

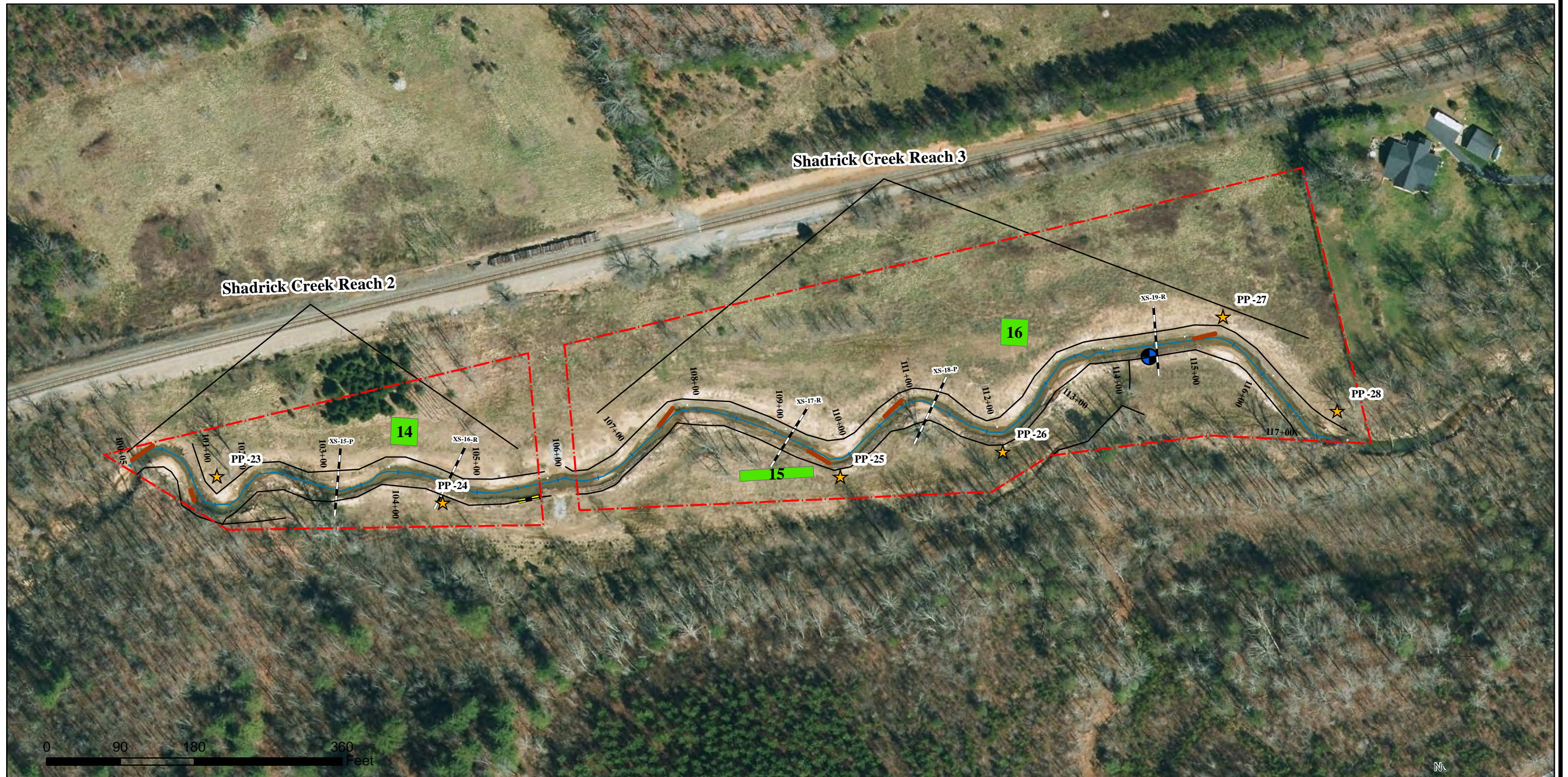
- ★ Photo Point
- Log Vane
- - - Easement
- Top of Bank
- - - Cross-Section
- Thalweg
- Vegetation Plot**
- Failing >10%
- Meeting >10%
- Stream Problem Areas**
- ▬ Bank Erosion

Notes:

1) Baseline Data Provided by Patton Land Surveying

Prepared by





Prepared for:



Shadrick Creek Restoration Site
 Monitoring Year 3
 McDowell County, NC
 NCDMS Contract No.: 00006783
 NCDMS Project No.: 92916
 December 2020
 Sheet 4 of 10

- ★ Photo Point
- Log Vane
- ⋯ Easement
- Top of Bank
- Cross-Section
- ⊕ Crest Gauge
- Thalweg
- Vegetation Plot**
- Meeting >10%
- Stream Problem Areas**
- Bank Erosion

Notes:

1) Baseline Data Provided by Patton Land Surveying

Prepared by





Prepared for:



Shadrick Creek Restoration Site
 Monitoring Year 3
 McDowell County, NC
 NCDMS Contract No.: 00006783
 NCDMS Project No.: 92916
 December 2020
 Sheet 5 of 10

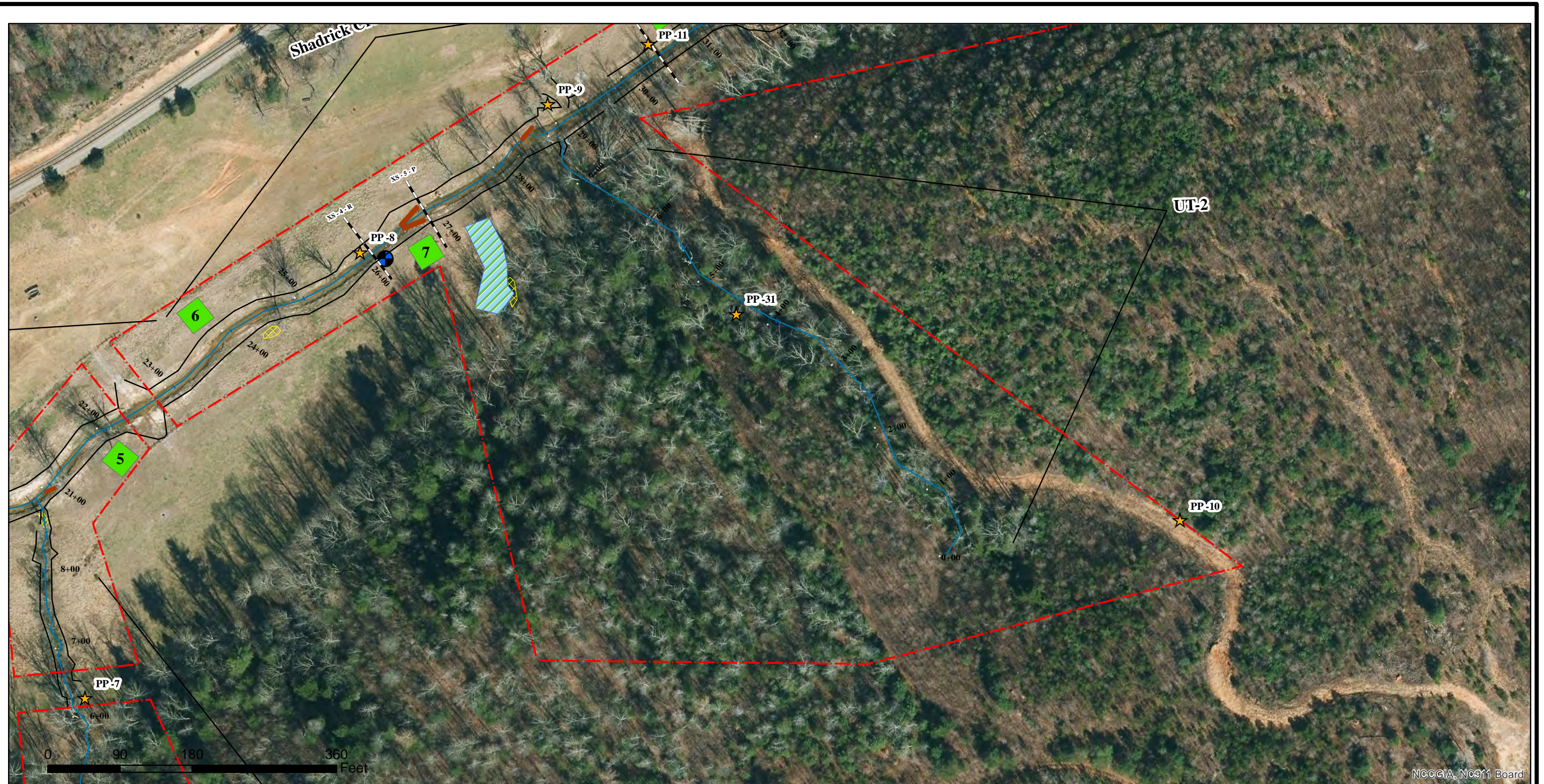
- | | | | |
|-------|-------------------|---|--------------------------------|
| ★ | Photo Point | — | Thalweg |
| — | Log Vane | ■ | Vegetation Plot |
| — | Boulder Structure | ■ | Meeting >10% |
| - - - | Easement | ■ | Wetland Enhancement |
| — | Top of Bank | ■ | Invasive-Exotic Species |
| — | Cross-Section | ■ | Present |

Notes:

1) Baseline Data Provided by Patton Land Surveying

Prepared by





Prepared for:



Shadrick Creek Restoration Site
 Monitoring Year 3
 McDowell County, NC
 NCDMS Contract No.: 00006783
 NCDMS Project No.: 92916
 December 2020
 Sheet 6 of 10

- ★ Photo Point
- Log Vane
- - - Easement
- Top of Bank
- - - Cross-Section
- ⊕ Crest Gauge
- Thalweg
- Vegetation Plot**
- Meeting >10%
- ▨ Wetland Enhancement
- Invasive-Exotic Species**
- ▨ Present

Notes:

1) Baseline Data Provided by Patton Land Surveying

Prepared by





Prepared for:



Shadrick Creek Restoration Site
 Monitoring Year 3
 McDowell County, NC
 NCDMS Contract No.: 00006783
 NCDMS Project No.: 92916
 December 2020
 Sheet 7 of 10

- | | | |
|-------|-------------|--------------------------------|
| ★ | Photo Point | Vegetation Plot |
| — | Log Vane | Meeting >10% |
| - - - | Easement | Stream Problem Areas |
| — | Top of Bank | Bank Erosion |
| — | Thalweg | Invasive-Exotic Species |
| | | Present |

Notes:

1) Baseline Data Provided by Patton Land Surveying

Prepared by










Prepared for:



Shadrick Creek Restoration Site
 Monitoring Year 3
 McDowell County, NC
 NCDMS Contract No.: 00006783
 NCDMS Project No.: 92916
 December 2020
 Sheet 8 of 10

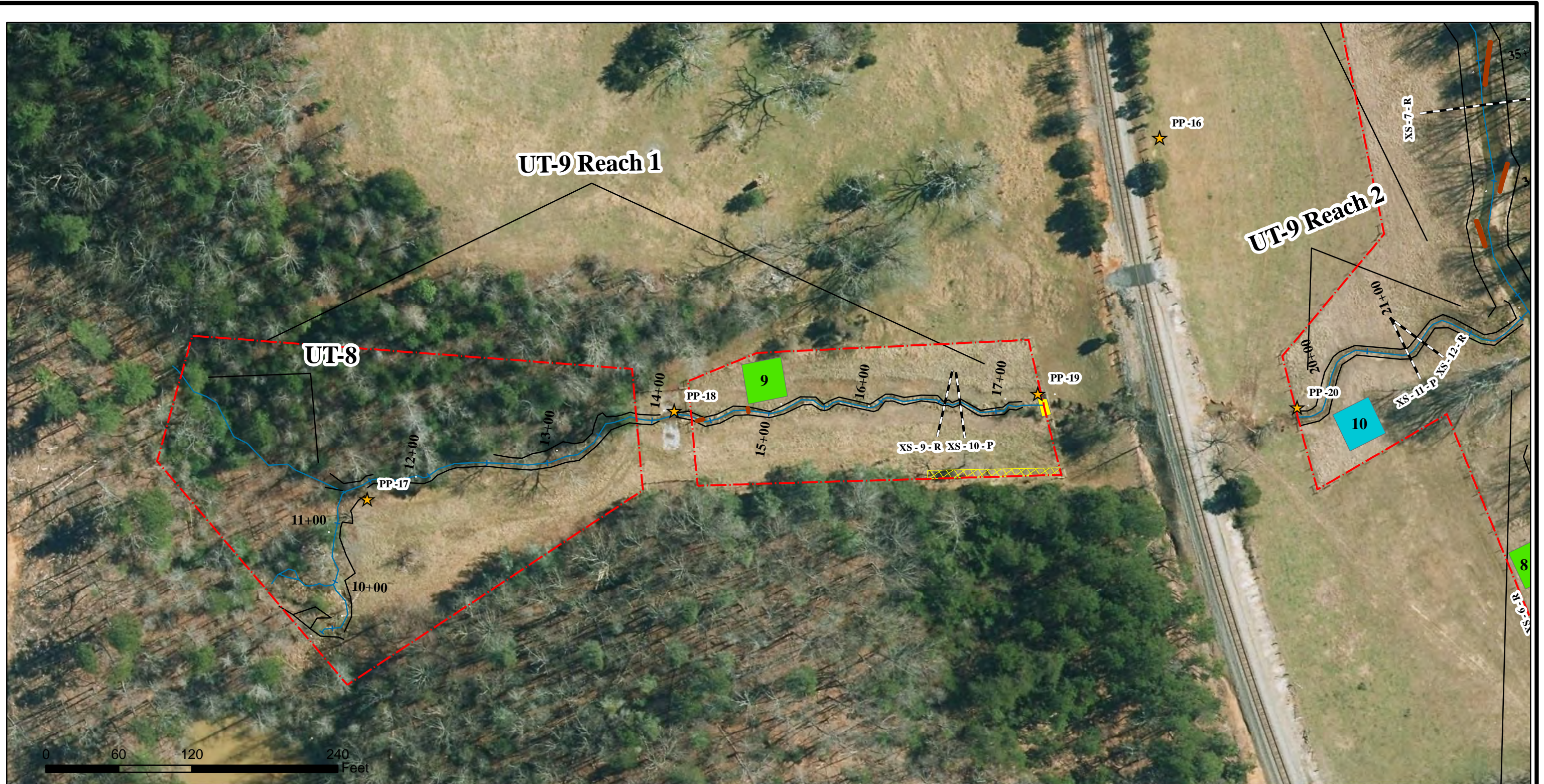
-  Photo Point
-  Easement
-  Top of Bank
-  Thalweg
- Invasive-Exotic Species**
-  Present

Notes:

1) Baseline Data Provided by Patton Land Surveying

Prepared by





Prepared for:



Shadrick Creek Restoration Site
 Monitoring Year 3
 McDowell County, NC
 NCDMS Contract No.: 00006783
 NCDMS Project No.: 92916
 December 2020
 Sheet 9 of 10

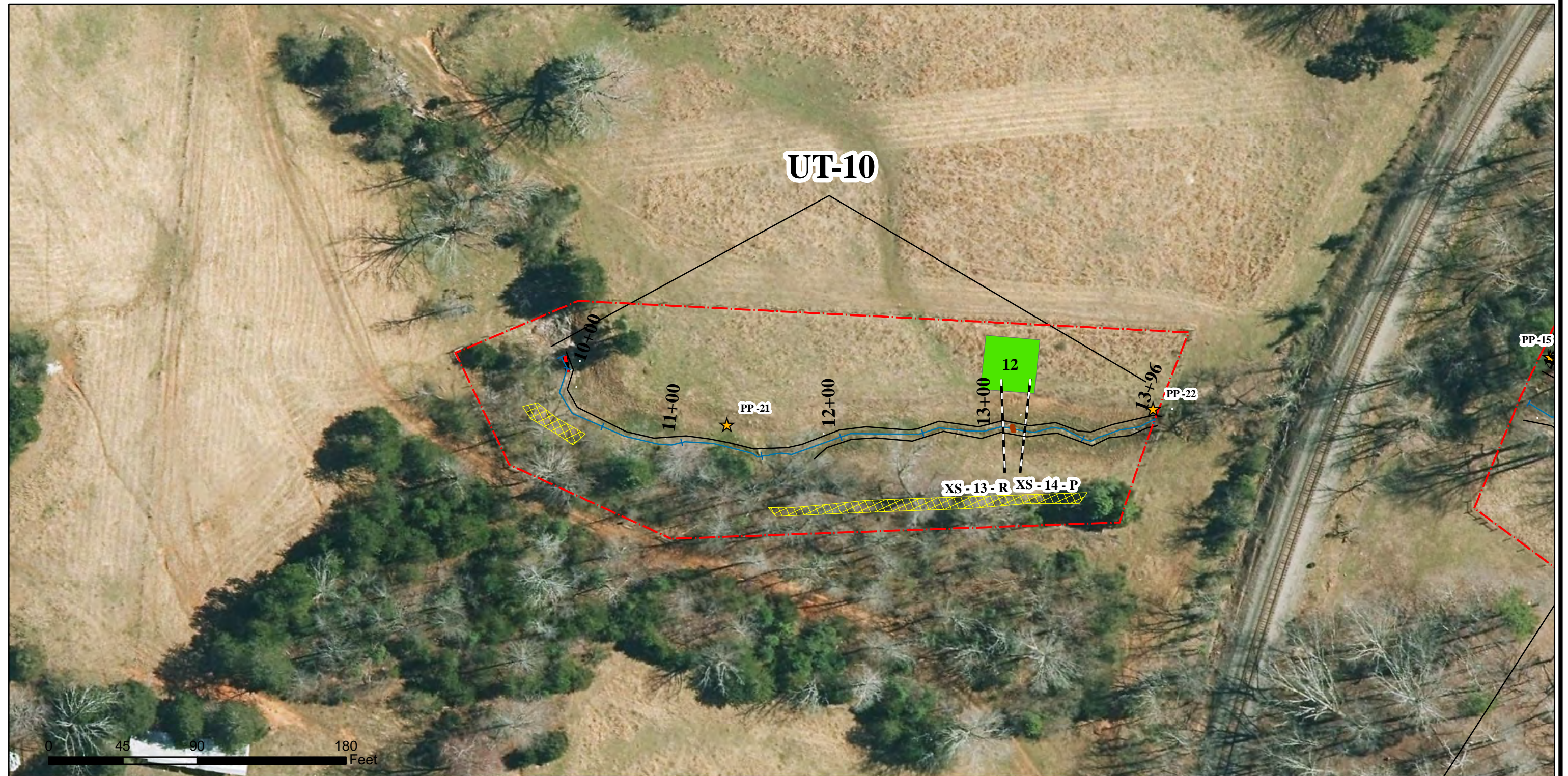
- | | | |
|-------|---------------|--------------------------------|
| ★ | Photo Point | Vegetation Plot |
| — | Log Vane | Meeting <10% |
| - - - | Easement | Meeting >10% |
| — | Top of Bank | Invasive-Exotic Species |
| — + — | Cross-Section | Present |
| — | Thalweg | Cattle Encroachment |

Notes:

1) Baseline Data Provided by Patton Land Surveying

Prepared by





Prepared for:



Shadrick Creek Restoration Site
 Monitoring Year 3
 McDowell County, NC
 NCDMS Contract No.: 00006783
 NCDMS Project No.: 92916
 December 2020
 Sheet 10 of 10

- ★ Photo Point
 - Log Vane
 - - - Easement
 - Top of Bank
 - - - Cross-Section
 - Thalweg
- Vegetation Plot**
- Meeting >10%
- Stream Problem Areas**
- ▬ Mass Wasting
- Invasive-Exotic Species**
- ▨ Present

Notes:

1) Baseline Data Provided by Patton Land Surveying

Prepared by



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**Table 5. Visual Stream Morphology Stability Assessment
Shadrick Creek Restoration Site - Shadrick Creek Reach 1 - Enhancement I
Assessed Length 3,631 feet**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			2	49	99%	0	0	99%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
Totals					2	49	99%	N/A	N/A	N/A
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	15	15			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	15	15			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	15	15			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	15	15			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio \geq 1.6. Rootwads/logs providing some cover at base-flow.	15	15			100%			

- Information Unavailable
N/A - Item does not apply.

**Table 5 cont'd. Visual Stream Morphology Stability Assessment
Shadrick Creek Restoration Site - Shadrick Creek Reach 2 - Enhancement I
Assessed Length 573 feet**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			1	27	98%	0	0	98%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
Totals					1	27	98%	N/A	N/A	N/A
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio \geq 1.6. Rootwads/logs providing some cover at base-flow.	2	2			100%			

N/A - Item does not apply.

**Table 5 cont'd. Visual Stream Morphology Stability Assessment
Shadrick Creek Restoration Site - Shadrick Creek Reach 3 - Restoration
Assessed Length 1,104 feet**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
Totals					0	0	100%	N/A	N/A	N/A
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	3	3			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	3	3			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	3	3			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	3	3			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio \geq 1.6. Rootwads/logs providing some cover at base-flow.	3	3			100%			

N/A - Item does not apply.

**Table 5 cont'd. Visual Stream Morphology Stability Assessment
Shadrick Creek Restoration Site - UT1 - Enhancement 1
Assessed Length 1,651 feet**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
Totals					0	0	100%	N/A	N/A	N/A
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	14	14			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	14	14			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	14	14			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	14	14			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio \geq 1.6. Rootwads/logs providing some cover at base-flow.	14	14			100%			

N/A - Item does not apply.

**Table 5 cont'd. Visual Stream Morphology Stability Assessment
Shadrick Creek Restoration Site - UT9 Reach 1 - Enhancement 1
Assessed Length 706 feet**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
Totals					0	0	100%	N/A	N/A	N/A
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio \geq 1.6. Rootwads/logs providing some cover at base-flow.	2	2			100%			

N/A - Item does not apply.

**Table 5 cont'd. Visual Stream Morphology Stability Assessment
Shadrick Creek Restoration Site - UT9 Reach 2 - Restoration
Assessed Length 238 feet**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
Totals					0	0	100%	N/A	N/A	N/A
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	1	1			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	1	1			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	1	1			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio \geq 1.6. Rootwads/logs providing some cover at base-flow.	1	1			100%			





N/A - Item does not apply.

**Table 5 cont'd. Visual Stream Morphology Stability Assessment
Shadrick Creek Restoration Site - UT10 - Enhancement I
Assessed Length 404 feet**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			1	10	99%	N/A	N/A	N/A
Totals					1	10	99%	N/A	N/A	N/A
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	1	1			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	1	1			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	1	1			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio \geq 1.6. Rootwads/logs providing some cover at base-flow.	1	1			100%			

N/A - Item does not apply.

**Table 6. Vegetation Condition Assessment
Shadrick Creek Restoration Site**

Planted Acreage : 8.68						
Vegetation Category	Definitions	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage	
1. Bare Areas	Very limited cover of both woody and herbaceous material.		0	0.00	0%	
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.		0	0.00	0%	
Totals			0	0.00	0%	
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	N/A	0	0.00	0%	
Cumulative Totals			0	0.00	0%	
Easement Acreage : 54.59						
Vegetation Category	Definitions		CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	Dense		0	0.00	0%
	Areas or points (if too small to render as polygons at map scale).	Present		12	0.10	0%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).		N/A	0	0.00	0%

N/A - Item does not apply.

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 Downstream 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 Downstream



UT-8 and UT 9– Permanent Photo Station 17
Looking Upstream



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



UT-7 – Permanent Photo Station 29
Looking Downstream



UT5 – Permanent Photo Station 30
Looking Upstream



UT-2 – Permanent Photo Station 31
Looking Downstream

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

Problem Area Photos



Shadrick Creek Reach 1 – Bank Erosion Station 11+00



Shadrick Creek Reach 1 – Bank Erosion Station 37+50



UT 9 – Evidence of cattle bypassing fenced crossing.



UT 10 – Headcut

Appendix C

Vegetation Plot Data

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Table 7. Current Plot Data (MY3) 2020
Shadrick Creek Restoration Project

			Current Plot Data (MY3 2020)																																
Scientific Name	Common Name	Species Type	92916-01-0001			92916-01-0002			92916-01-0003			92916-01-0004			92916-01-0005			92916-01-0006			92916-01-0007			92916-01-0008			92916-01-0009			92916-01-0010					
			Pno	LS	P-all	T	Pno	LS	P-all	T	Pno	LS	P-all	T	Pno	LS	P-all	T	Pno	LS	P-all	T	Pno	LS	P-all	T	Pno	LS	P-all	T	Pno	LS	P-all	T	Pno
Acer rubrum		Tree	2		2	2	3	3	3	1	1	1	2	2	2				4	4	4	1	1	1				1	1	1					
Acer rubrum var. rubrum	Eastern Red Maple	Tree			15																														
Alnus serrulata	Tag Alder, Smooth Al	Shrub Tree			5			15							3						39														
Betula nigra	River Birch, Red Birch	Tree							1	1	1			5			24	2	2	12	2	2	33	2	2	40				7	7	12			
Carpinus caroliniana																																			
Cercis canadensis		Shrub Tree							1	1	1													4	4	4	3	3	3						
Cornus amomum	Silky Dogwood	Shrub Tree																																	
Corylus cornuta		Shrub Tree																																	
Diospyros virginiana	American Persimmon	Tree						6					3															19			6				
Fraxinus pennsylvanica	Green Ash, Red Ash	Tree	12	12	12	5	5	5	7	7	7	1	1	1	3	3	3	3	3	3	4	4	4	7	7	7	4	4	4						
Hamamelis virginiana		Shrub Tree																																	
Ilex opaca	American Holly, Chris	Shrub Tree																																	
Juglans nigra	Black Walnut	Tree									3									2															
Liquidambar styraciflua	Sweet Gum, Red Gum	Tree			24																														
Liriodendron tulipifera		Tree																										34							
Nyssa sylvatica	Sour Gum, Black Gum	Tree																																	
Pinus virginiana	Virginia Pine, Scrub P	Tree											7																						
Platanus occidentalis	Sycamore, Plane-tree	Tree				3	3	3				5	5	6	1	1	1	2	2	2	3	3	20				9	9	59			3			
Populus deltoides		Tree				1	1	1				4	4	4	5	5	5	2	2	2										1	1	1			
Prunus serotina		Shrub Tree									6			6						2			4												
Quercus alba	White Oak	Tree																																	
Quercus nigra	Water Oak, Paddle O	Tree																																	
Quercus velutina	Black Oak	Tree																																	
Rhus copallinum		Shrub Tree																																	
Salix nigra	Black Willow	Tree																														2			
Stem count			14	14	58	12	12	33	10	10	19	12	12	34	9	9	36	13	13	27	10	10	101	13	13	51	17	17	120	8	8	24			
size (ares)			1			1			1			1			1			1			1			1			1			1					
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02					
Species count			2	2	5	4	4	6	4	4	6	4	4	8	3	3	5	5	5	7	4	4	6	3	3	3	4	4	6	2	2	5			
Stems per ACRE			566.6	566.6	2347	485.6	485.6	1335	404.7	404.7	768.9	485.6	485.6	1376	364.2	364.2	1457	526.1	526.1	1093	404.7	404.7	4087	526.1	526.1	2064	688	688	4856	323.7	323.7	971.2			

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%

Table 7. Current Plot Data (MY3) 2020
Shadrick Creek Restoration Project

		Current Plot Data (MY3 2020)																		Annual Means													
Scientific Name	Common Name	Species Type	92916-01-0011			92916-01-0012			92916-01-0013			92916-01-0014			92916-01-0015			92916-01-0016			MY3 (2020)			MY2 (2019)			MY1 (2018)			MY0 (2017)			
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	
Acer rubrum		Tree	2	2	2	2	2	2	1	1	1	1	1	1				2	2	2	22	22	22	24	24	40	24	24	26	25	25	25	
Acer rubrum var. rubrum	Eastern Red Maple	Tree																															
Alnus serrulata	Tag Alder, Smooth Al	Shrub Tree																															
Betula nigra	River Birch, Red Birch	Tree	1	1	1							1	1	1	1	1	6	2	2	4	19	19	139	22	22	99	21	21	30	24	24	24	
Carpinus caroliniana									1	1	1																						
Cercis canadensis		Shrub Tree	1	1	1	1	1	1													10	10	10	11	11	11	10	10	10	10	10	10	
Cornus amomum	Silky Dogwood	Shrub Tree																															
Corylus cornuta		Shrub Tree																															
Diospyros virginiana	American Persimmon	Tree												6		2																	
Fraxinus pennsylvanica	Green Ash, Red Ash	Tree	2	2	2	7	7	7	3	3	3	1	1	1	4	4	4	2	2	2	65	65	65	67	67	71	66	66	66	67	67	67	
Hamamelis virginiana		Shrub Tree							1	1	1				2	2	2	1	1	1	4	4	4	4	4	4	6	6	6	8	8	8	
Ilex opaca	American Holly, Chris	Shrub Tree																															
Juglans nigra	Black Walnut	Tree																															
Liquidambar styraciflua	Sweet Gum, Red Gum	Tree																															
Liriodendron tulipifera		Tree												5																			
Nyssa sylvatica	Sour Gum, Black Gum	Tree																															
Pinus virginiana	Virginia Pine, Scrub P	Tree														2																	
Platanus occidentalis	Sycamore, Plane-tree	Tree				2	2	2	1	1	1	3	3	8	1	1	11	2	2	11	32	32	127	35	35	61	33	33	46	36	36	36	
Populus deltoides		Tree	4	4	4							3	3	3	3	3	3	2	2	2	26	26	26	27	27	27	27	27	27	28	28	28	
Prunus serotina		Shrub Tree																															
Quercus alba	White Oak	Tree																															
Quercus nigra	Water Oak, Paddle O	Tree																															
Quercus velutina	Black Oak	Tree																															
Rhus copallinum		Shrub Tree																															
Salix nigra	Black Willow	Tree																															
Stem count			10	10	10	12	12	12	7	7	7	9	9	25	11	11	30	11	11	23	178	178	610	190	190	385	187	187	256	198	198	198	
size (ares)			1			1			1			1			1			1			16			3			3			3			
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.40			0.07			0.07			0.07			
Species count			5	5	5	4	4	4	5	5	5	5	5	7	5	5	7	6	6	7	7	7	16	7	7	20	7	7	12	7	7	7	
Stems per ACRE			404.7	404.7	404.7	485.6	485.6	485.6	283.3	283.3	283.3	364.2	364.2	1012	445.2	445.2	1214	445.2	445.2	930.8	450.2	450.2	1543	2563	2563	5193	2523	2523	3453	2671	2671	2671	

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%

**Table 8. Vegetation Plot Criteria Attainment
Shadrick Creek Restoration Project**

Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	94%
2	Yes	
3	Yes	
4	Yes	
5	Yes	
6	Yes	
7	Yes	
8	Yes	
9	Yes	
10	Yes	
11	Yes	
12	Yes	
13	No	
14	Yes	
15	Yes	
16	Yes	

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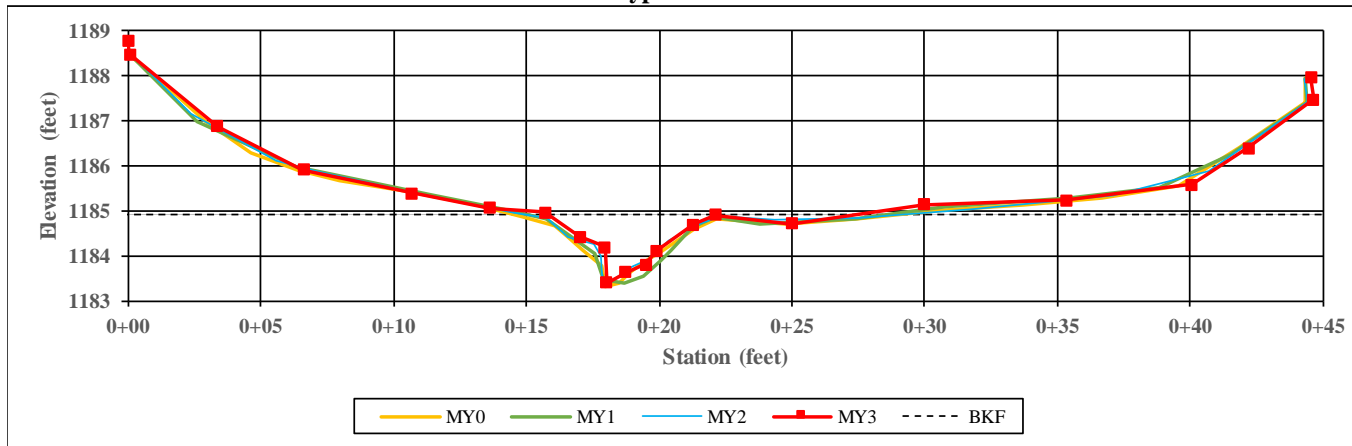
Appendix D
Stream Measurement and Geomorphology Data

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Project Name: Shadrick Creek
Reach Name: UT1

XS Number: 1
XS Type: Pool

Station: 16+05



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	7.1	6.1	7.4	11.3	-	-	-	-
Floodprone Width (ft)	24.0	24.0	24.0	24.0	-	-	-	-
Bankfull Mean Depth (ft)	0.6	0.7	0.6	0.4	-	-	-	-
Bankfull Max Depth (ft)	1.5	1.4	1.5	1.5	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	4.5	4.5	4.5	4.5	-	-	-	-
Width/Depth Ratio	11.1	8.3	12.2	28.5	-	-	-	-
Entrenchment Ratio	3.4	3.9	3.3	2.1	-	-	-	-
Bank Height Ratio	1.0	1.0	0.9	1.0	-	-	-	-
Low Top of Bank Depth (ft)	-	1.4	1.5	1.5	-	-	-	-



Left Descending Bank

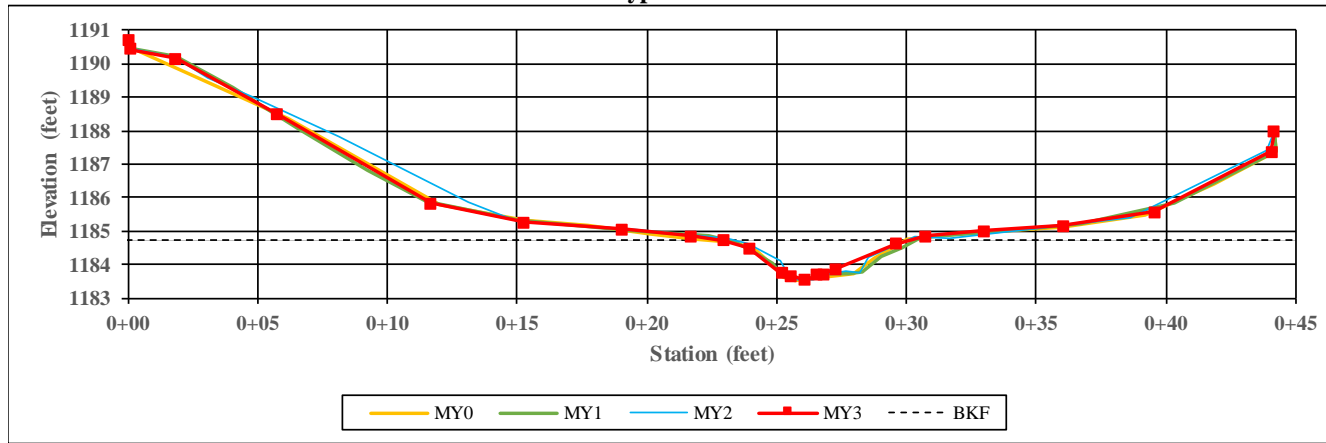


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: UT1

XS Number: 2
XS Type: Riffle

Station: 16+29



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	6.3	6.7	6.3	6.6	-	-	-	-
Floodprone Width (ft)	24.0	24.0	24.0	24.0	-	-	-	-
Bankfull Mean Depth (ft)	0.7	0.6	0.7	0.6	-	-	-	-
Bankfull Max Depth (ft)	1.1	1.1	1.2	1.2	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	4.3	4.3	4.3	4.3	-	-	-	-
Width/Depth Ratio	9.4	10.4	9.1	10.3	-	-	-	-
Entrenchment Ratio	3.8	3.6	3.8	3.6	-	-	-	-
Bank Height Ratio	1.0	1.0	0.9	1.1	-	-	-	-
Low Top of Bank Depth (ft)	-	1.1	1.1	1.3	-	-	-	-



Left Descending Bank

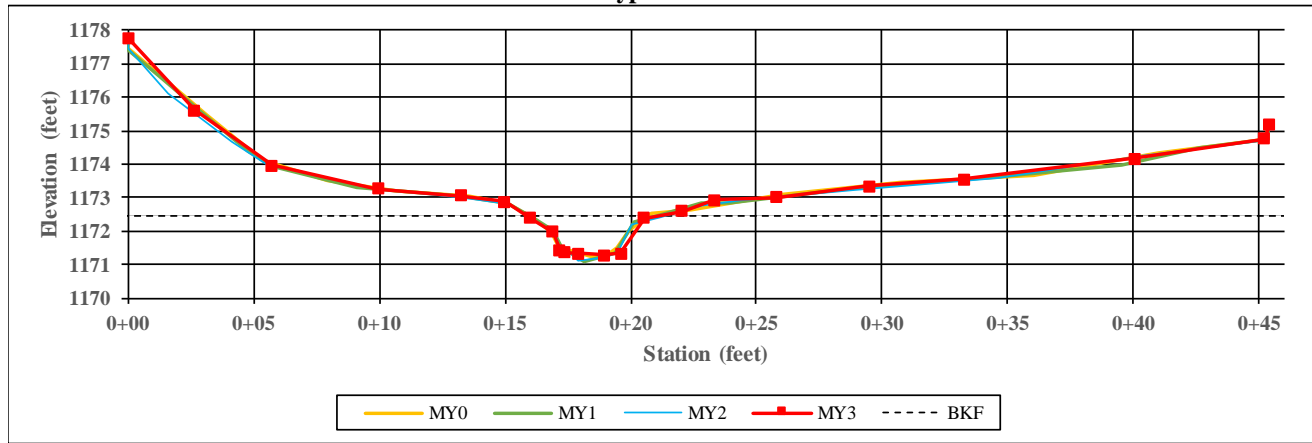


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: UT1

XS Number: 3
XS Type: Riffle

Station: 21+68



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	5.0	5.5	5.5	5.2	-	-	-	-
Floodprone Width (ft)	24.0	24.0	24.0	24.0	-	-	-	-
Bankfull Mean Depth (ft)	0.8	0.7	0.7	0.7	-	-	-	-
Bankfull Max Depth (ft)	1.3	1.4	1.3	1.2	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	3.9	3.9	3.9	3.9	-	-	-	-
Width/Depth Ratio	6.5	7.8	7.9	7.0	-	-	-	-
Entrenchment Ratio	4.8	4.4	4.3	4.6	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	1.1	-	-	-	-
Low Top of Bank Depth (ft)	-	1.4	1.3	1.3	-	-	-	-



Left Descending Bank

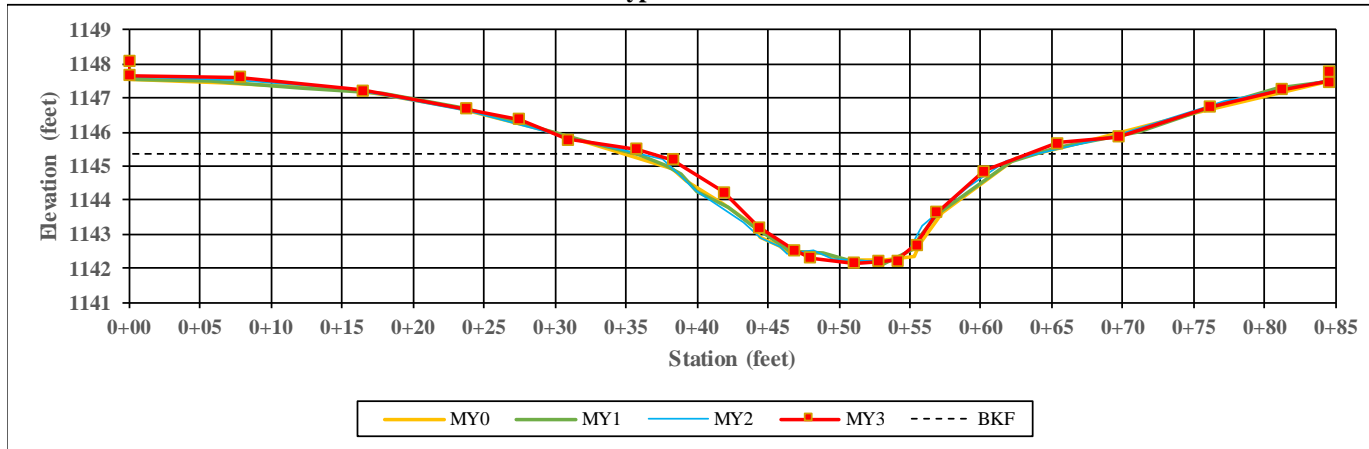


Right Descending Bank

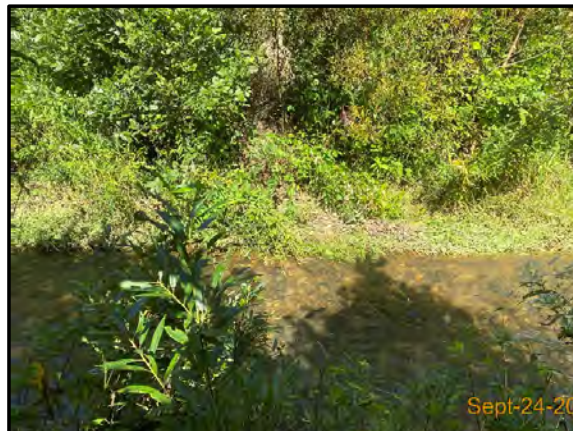
Project Name: Shadrick Creek
Reach Name: Shadrick Reach 1

XS Number: 4
XS Type: Riffle

Station: 26+02



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	26.6	25.9	24.1	26.6	-	-	-	-
Floodprone Width (ft)	100.0	100.0	100.0	100.0	-	-	-	-
Bankfull Mean Depth (ft)	1.8	1.8	1.9	1.8	-	-	-	-
Bankfull Max Depth (ft)	3.0	3.1	3.1	3.2	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	47.0	47.0	47.0	47.0	-	-	-	-
Width/Depth Ratio	15.0	14.2	12.4	15.0	-	-	-	-
Entrenchment Ratio	3.8	3.9	4.1	3.8	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	0.9	-	-	-	-
Low Top of Bank Depth (ft)	-	3.0	2.9	3.0	-	-	-	-



Left Descending Bank

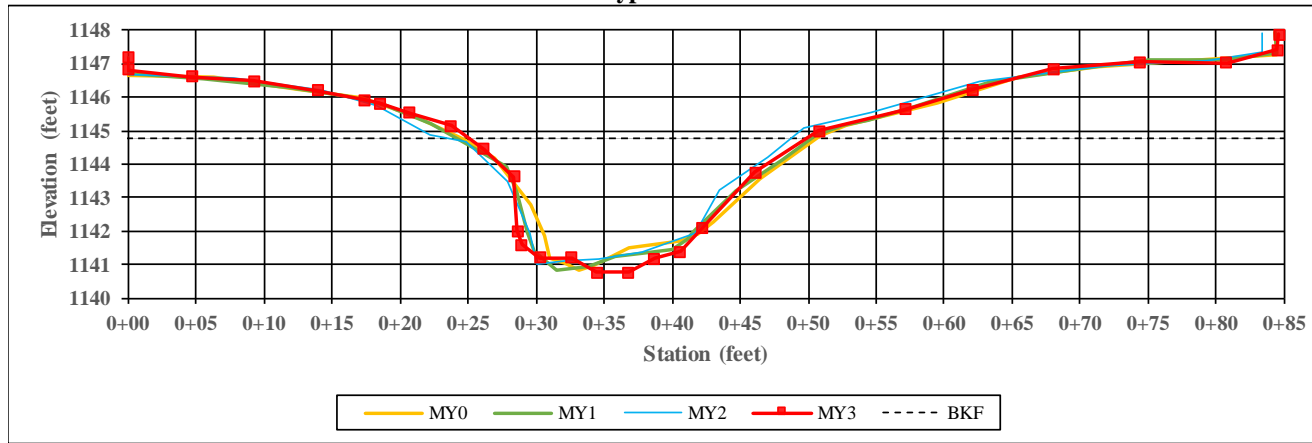


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: Shadrick Reach 1

XS Number: 5
XS Type: Pool

Station: 26+87



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	26.9	26.4	27.3	24.7	-	-	-	-
Floodprone Width (ft)	100.0	100.0	100.0	100.0	-	-	-	-
Bankfull Mean Depth (ft)	2.2	2.3	2.2	2.4	-	-	-	-
Bankfull Max Depth (ft)	4.0	4.0	3.9	4.0	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	59.5	59.5	59.5	59.5	-	-	-	-
Width/Depth Ratio	12.1	11.7	12.6	10.3	-	-	-	-
Entrenchment Ratio	3.7	3.8	3.7	4.0	-	-	-	-
Bank Height Ratio	1.0	1.1	1.0	1.1	-	-	-	-
Low Top of Bank Depth (ft)	-	4.3	4.1	4.3	-	-	-	-



Left Descending Bank

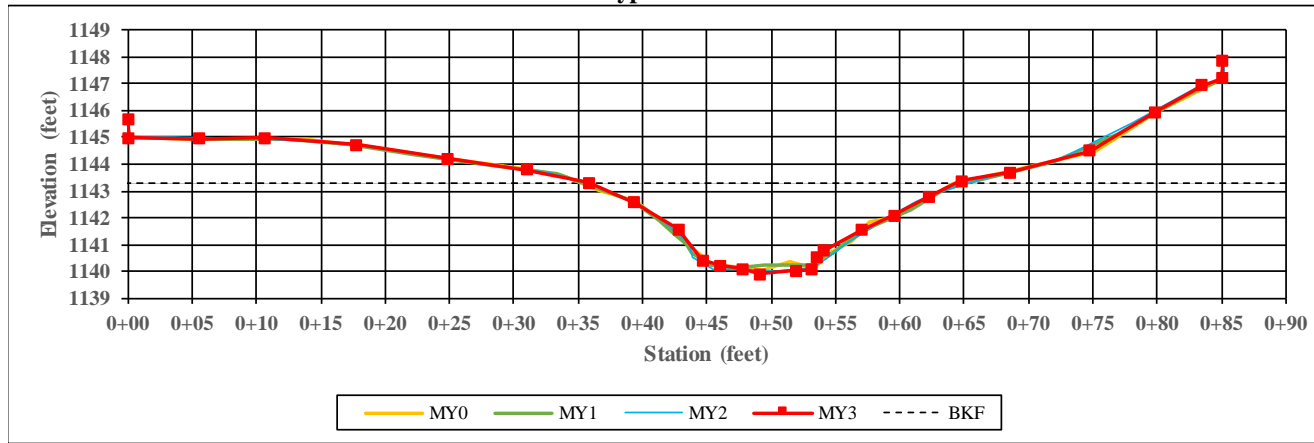


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: Shadrick Reach 1

XS Number: 6
XS Type: Riffle

Station: 30+44



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	28.7	29.1	28.8	28.4	-	-	-	-
Floodprone Width (ft)	100.0	100.0	100.0	100.0	-	-	-	-
Bankfull Mean Depth (ft)	1.8	1.8	1.8	1.8	-	-	-	-
Bankfull Max Depth (ft)	3.2	3.1	3.2	3.4	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	52.0	52.0	52.0	52.0	-	-	-	-
Width/Depth Ratio	15.8	16.3	15.9	15.5	-	-	-	-
Entrenchment Ratio	3.5	3.4	3.5	3.5	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	1.0	-	-	-	-
Low Top of Bank Depth (ft)	-	3.1	3.2	3.5	-	-	-	-



Left Descending Bank

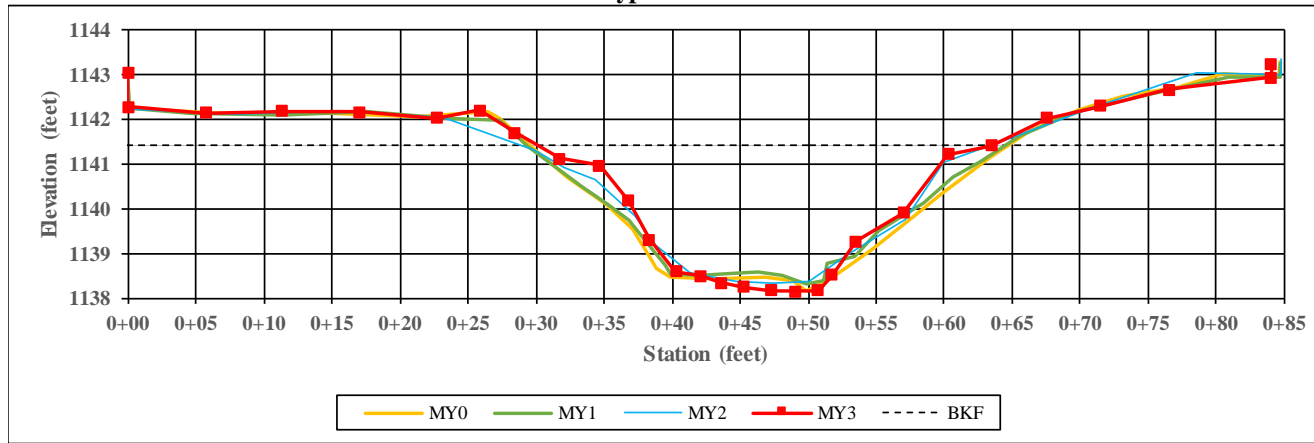


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: Shadrick Reach 1

XS Number: 7
XS Type: Riffle

Station: 34+64



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	32.7	33.6	33.5	28.6	-	-	-	-
Floodprone Width (ft)	100.0	100.0	100.0	100.0	-	-	-	-
Bankfull Mean Depth (ft)	1.8	1.8	1.8	2.1	-	-	-	-
Bankfull Max Depth (ft)	3.0	3.0	3.0	3.2	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	59.3	59.3	59.3	59.3	-	-	-	-
Width/Depth Ratio	18.0	19.0	18.9	13.8	-	-	-	-
Entrenchment Ratio	3.1	3.0	3.0	3.5	-	-	-	-
Bank Height Ratio	1.0	0.8	0.9	1.2	-	-	-	-
Low Top of Bank Depth (ft)	-	2.4	2.7	4.0	-	-	-	-



Left Descending Bank

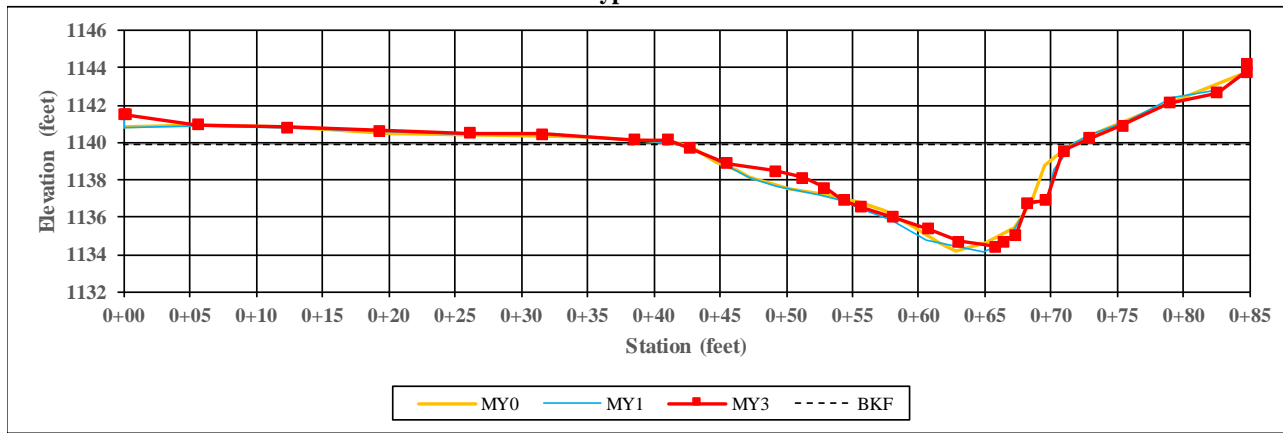


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: Shadrick Reach 1

XS Number: 8
XS Type: Pool

Station: 37+68



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	*MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	28.8	28.2	-	29.8	-	-	-	-
Floodprone Width (ft)	100.0	100.0	-	100.0	-	-	-	-
Bankfull Mean Depth (ft)	2.9	3.0	-	2.8	-	-	-	-
Bankfull Max Depth (ft)	5.6	5.5	-	5.4	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	84.3	84.3	-	84.3	-	-	-	-
Width/Depth Ratio	9.8	9.4	-	10.5	-	-	-	-
Entrenchment Ratio	3.5	3.5	-	3.4	-	-	-	-
Bank Height Ratio	1.0	1.1	-	1.0	-	-	-	-
Low Top of Bank Depth (ft)	-	5.9	-	5.7	-	-	-	-



Left Descending Bank



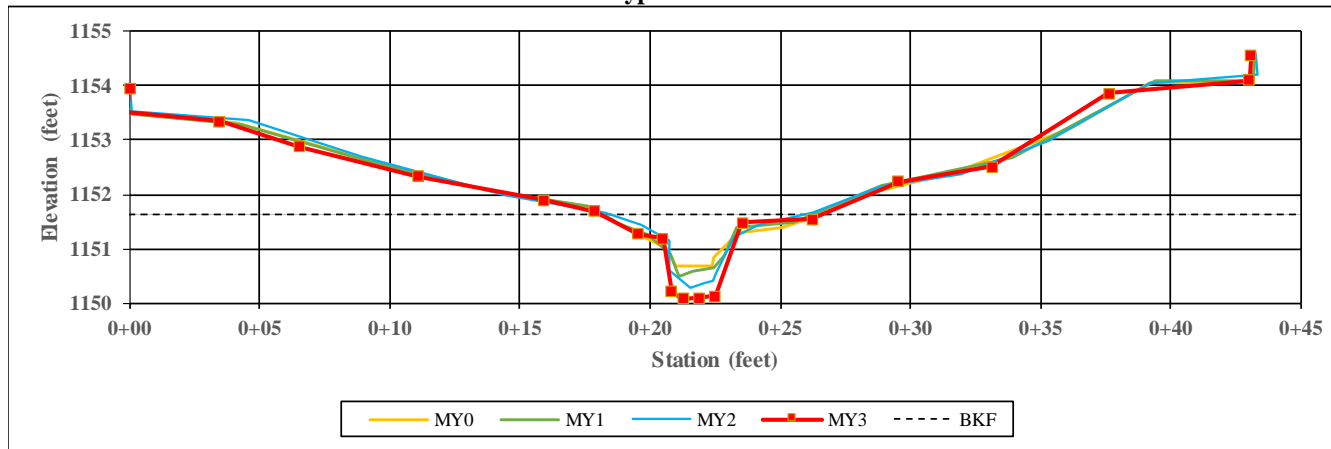
Right Descending Bank

*** Cross section not surveyed due to beaver impoundment**

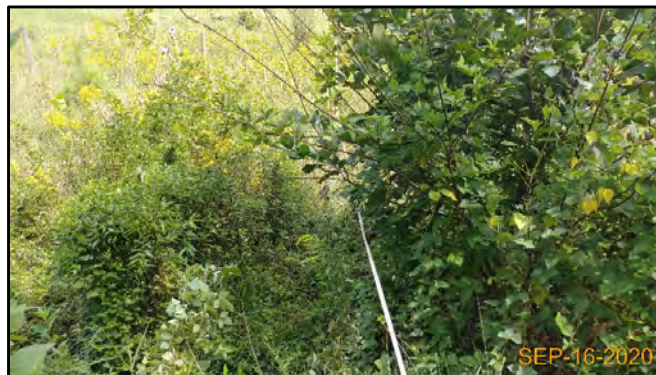
Project Name: Shadrick Creek
Reach Name: UT9 Reach 1

XS Number: 9
XS Type: Riffle

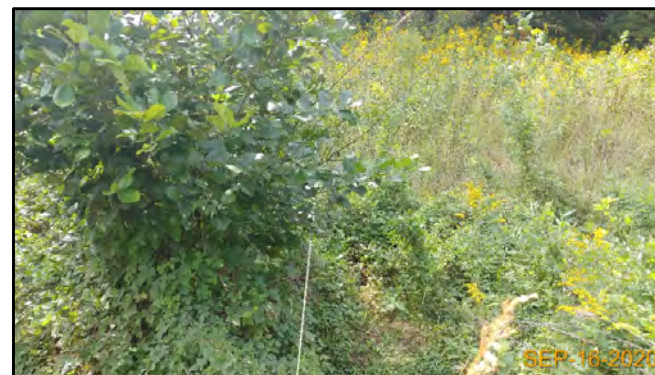
Station: 16+53



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	9.5	9.2	9.7	8.2	-	-	-	-
Floodprone Width (ft)	24.0	24.0	24.0	24.0	-	-	-	-
Bankfull Mean Depth (ft)	0.5	0.5	0.5	0.6	-	-	-	-
Bankfull Max Depth (ft)	1.1	1.3	1.5	1.6	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	4.8	4.8	4.8	4.8	-	-	-	-
Width/Depth Ratio	18.7	17.6	19.5	14.1	-	-	-	-
Entrenchment Ratio	2.5	2.6	2.5	2.9	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	0.9	-	-	-	-
Low Top of Bank Depth (ft)	-	1.3	1.5	1.4	-	-	-	-



Left Descending Bank

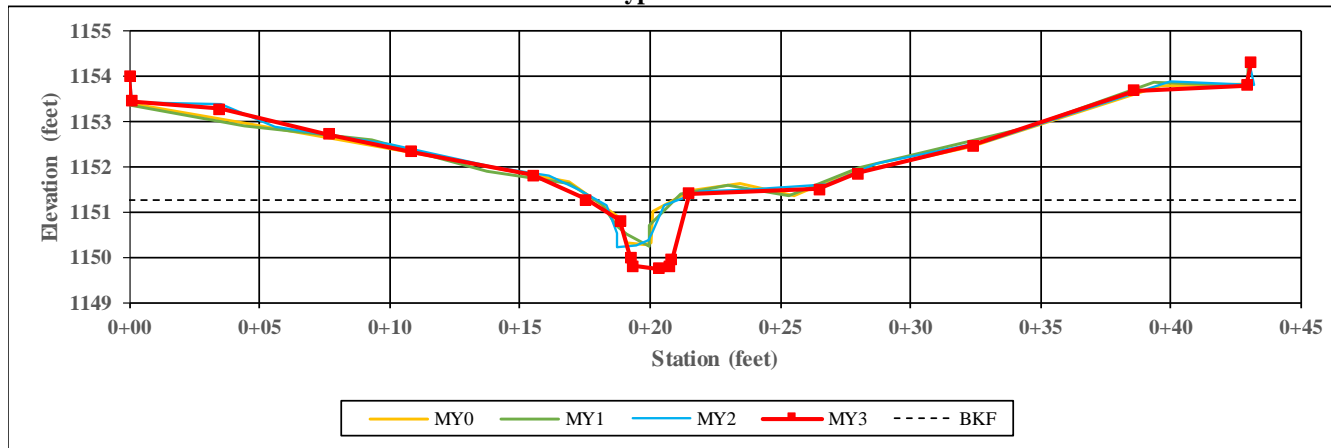


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: UT9 Reach 1

XS Number: 10
XS Type: Pool

Station: 16+68



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	6.5	6.0	5.0	3.3	-	-	-	-
Floodprone Width (ft)	24.0	24.0	24.0	24.0	-	-	-	-
Bankfull Mean Depth (ft)	0.5	0.5	0.6	0.9	-	-	-	-
Bankfull Max Depth (ft)	1.3	1.4	1.3	1.5	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	3.0	3.0	3.0	3.0	-	-	-	-
Width/Depth Ratio	14.3	12.2	8.2	3.6	-	-	-	-
Entrenchment Ratio	3.7	4.0	4.8	7.3	-	-	-	-
Bank Height Ratio	1.0	1.0	0.9	1.1	-	-	-	-
Low Top of Bank Depth (ft)	-	1.3	1.2	1.6	-	-	-	-



Left Descending Bank

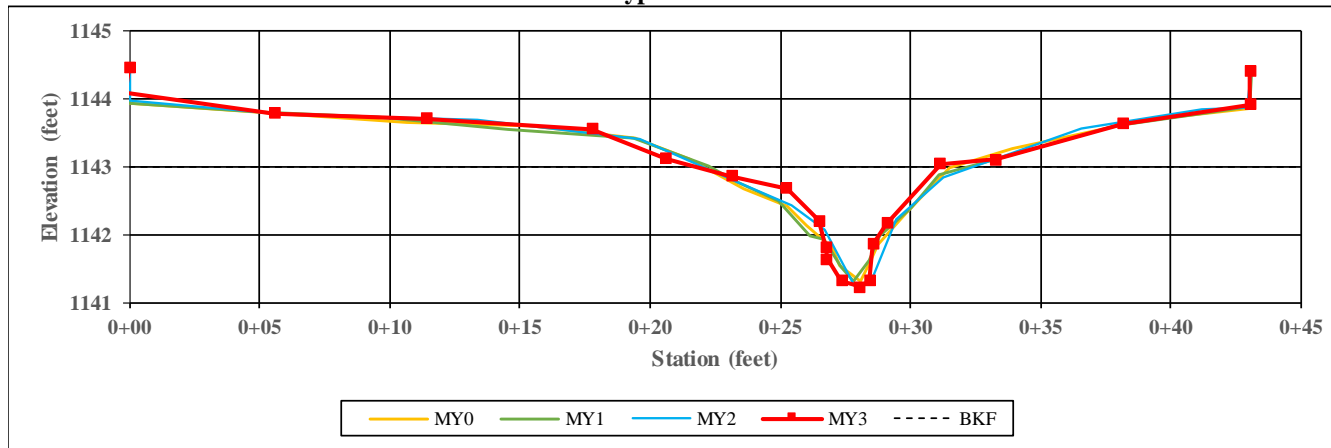


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: UT9 Reach 2

XS Number: 11
XS Type: Pool

Station: 21+34



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	8.8	8.6	9.1	7.9	-	-	-	-
Floodprone Width (ft)	24.0	24.0	24.0	24.0	-	-	-	-
Bankfull Mean Depth (ft)	0.7	0.7	0.6	0.7	-	-	-	-
Bankfull Max Depth (ft)	1.6	1.6	1.7	1.8	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	5.8	5.8	5.8	5.8	-	-	-	-
Width/Depth Ratio	13.2	12.8	14.4	10.9	-	-	-	-
Entrenchment Ratio	2.7	2.8	2.6	3.0	-	-	-	-
Bank Height Ratio	1.0	1.0	0.9	0.9	-	-	-	-
Low Top of Bank Depth (ft)	-	1.6	1.5	1.6	-	-	-	-



Left Descending Bank

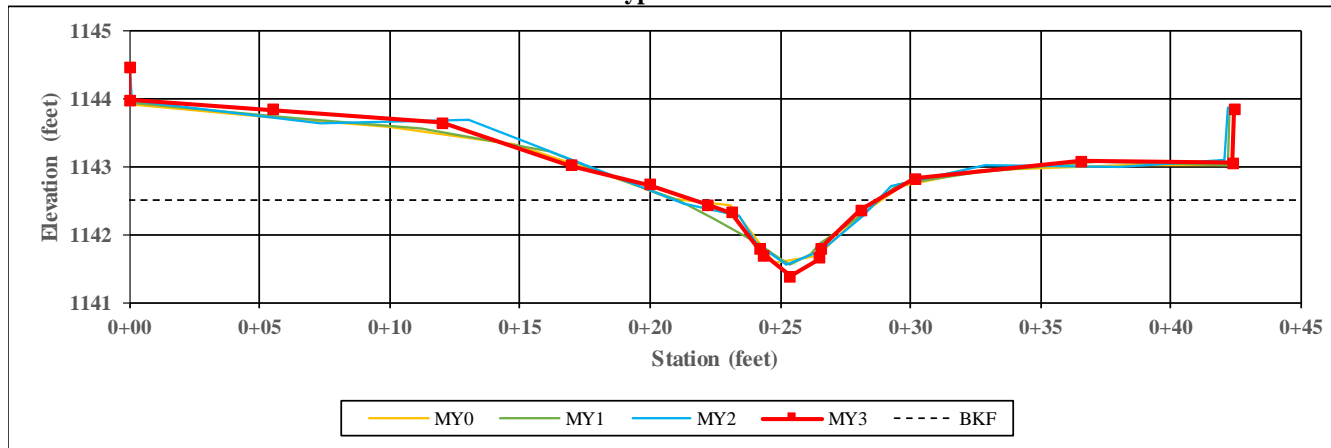


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: UT9 Reach 2

XS Number: 12
XS Type: Riffle

Station: 21+49



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	8.3	7.7	8.0	5.9	-	-	-	-
Floodprone Width (ft)	24.0	24.0	24.0	24.0	-	-	-	-
Bankfull Mean Depth (ft)	0.4	0.5	0.5	0.6	-	-	-	-
Bankfull Max Depth (ft)	1.0	1.0	1.0	1.1	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	3.6	3.6	3.6	3.6	-	-	-	-
Width/Depth Ratio	19.0	16.2	17.6	9.8	-	-	-	-
Entrenchment Ratio	2.9	3.1	3.0	4.1	-	-	-	-
Bank Height Ratio	1.0	1.0	0.9	0.8	-	-	-	-
Low Top of Bank Depth (ft)	-	1.0	0.9	0.9	-	-	-	-



Left Descending Bank

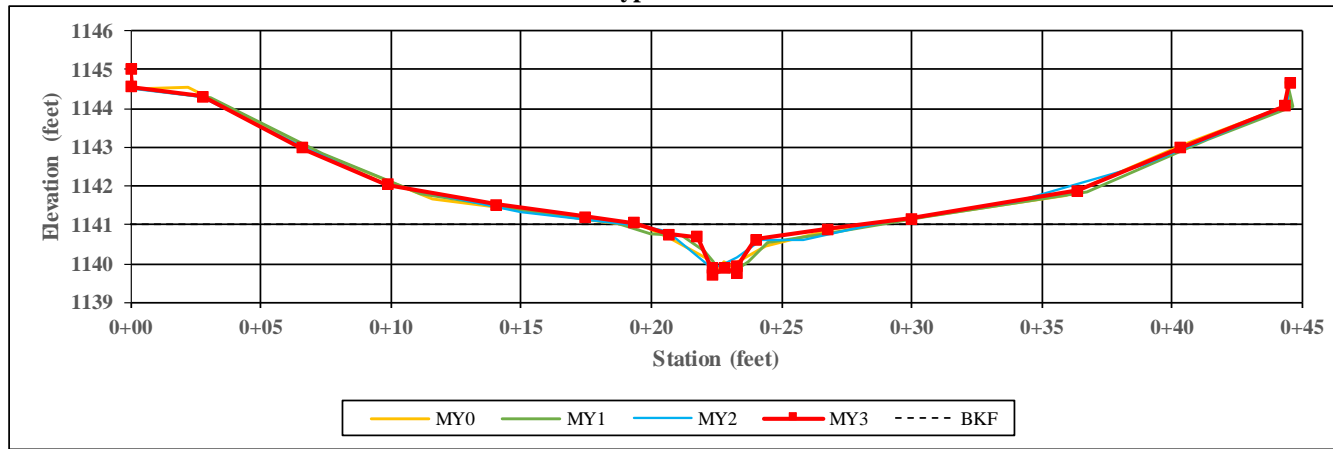


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: UT10

XS Number: 13
XS Type: Riffle

Station: 13+00



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	7.3	8.7	8.4	7.4	-	-	-	-
Floodprone Width (ft)	24.0	24.0	24.0	24.0	-	-	-	-
Bankfull Mean Depth (ft)	0.5	0.4	0.4	0.5	-	-	-	-
Bankfull Max Depth (ft)	1.1	1.1	1.0	1.3	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	3.4	3.4	3.4	3.4	-	-	-	-
Width/Depth Ratio	15.6	22.3	20.8	16.0	-	-	-	-
Entrenchment Ratio	3.3	2.8	2.9	3.3	-	-	-	-
Bank Height Ratio	1.0	0.9	1.0	0.7	-	-	-	-
Low Top of Bank Depth (ft)	-	1.0	1.0	0.9	-	-	-	-



Left Descending Bank

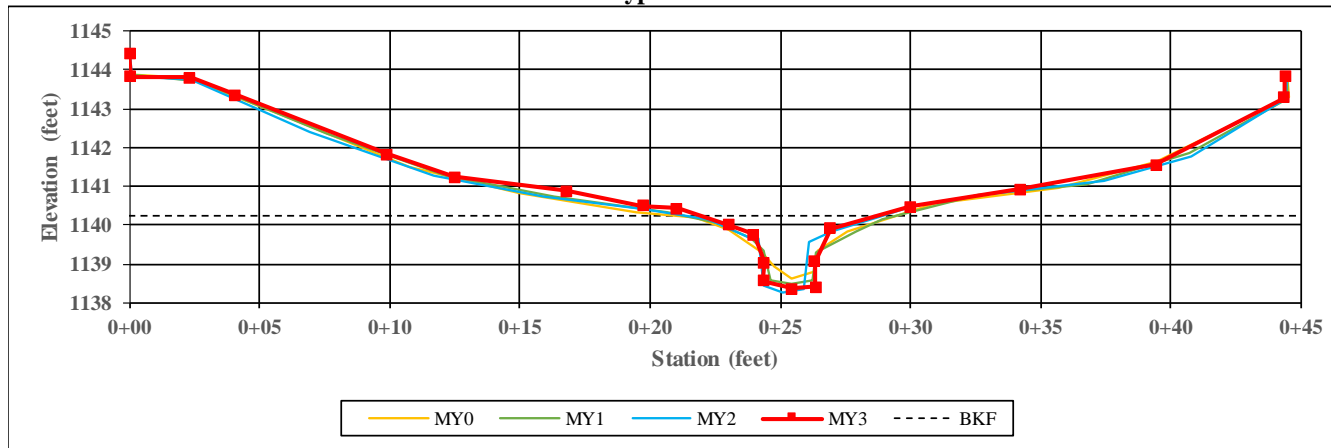


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: UT10

XS Number: 14
XS Type: Pool

Station: 13+13



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	7.5	6.9	7.1	3.9	-	-	-	-
Floodprone Width (ft)	24.0	24.0	24.0	24.0	-	-	-	-
Bankfull Mean Depth (ft)	0.6	0.7	0.7	1.2	-	-	-	-
Bankfull Max Depth (ft)	1.6	1.7	1.9	1.9	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	4.8	4.8	4.8	4.8	-	-	-	-
Width/Depth Ratio	11.6	9.9	10.5	3.2	-	-	-	-
Entrenchment Ratio	3.2	3.5	3.4	6.2	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	0.9	-	-	-	-
Low Top of Bank Depth (ft)	-	1.6	1.9	1.6	-	-	-	-



Left Descending Bank

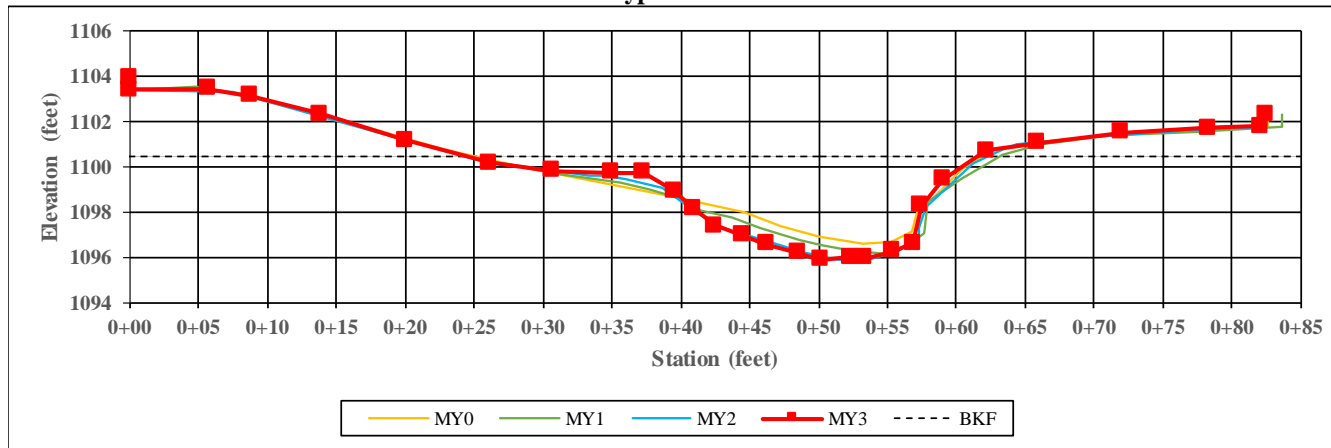


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: Shadrick Reach 2

XS Number: 15
XS Type: Pool

Station: 103+19



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	38.9	38.8	36.9	35.4	-	-	-	-
Floodprone Width (ft)	116.0	116.0	116.0	116.0	-	-	-	-
Bankfull Mean Depth (ft)	2.1	2.1	2.2	2.3	-	-	-	-
Bankfull Max Depth (ft)	4.1	4.3	4.5	4.6	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	80.4	80.4	80.4	80.4	-	-	-	-
Width/Depth Ratio	18.9	18.7	16.9	15.6	-	-	-	-
Entrenchment Ratio	3.0	3.0	3.1	3.3	-	-	-	-
Bank Height Ratio	1.0	1.0	0.8	0.8	-	-	-	-
Low Top of Bank Depth (ft)	-	4.4	3.8	3.8	-	-	-	-



Left Descending Bank

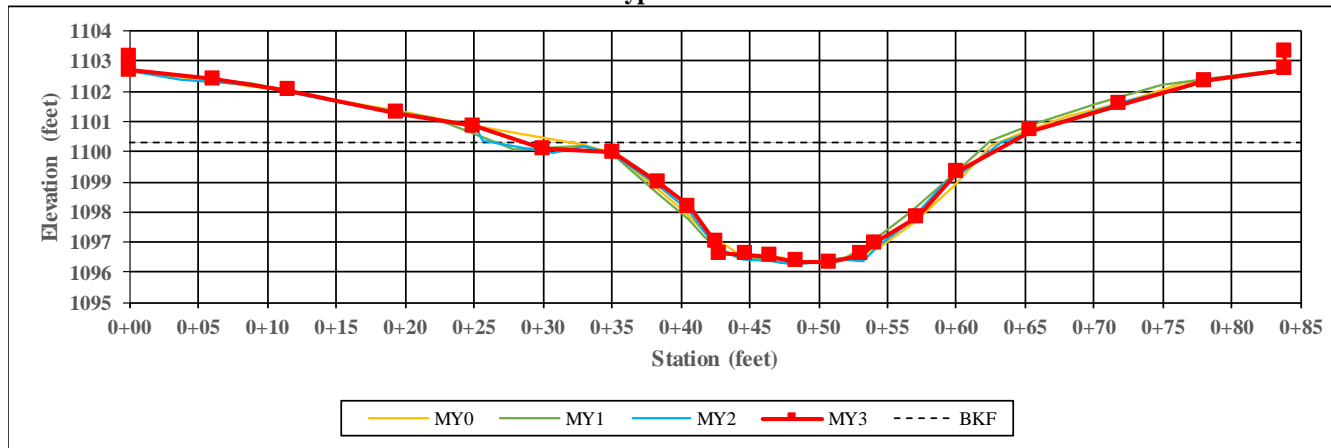


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: Shadrick Reach 2

XS Number: 16
XS Type: Riffle

Station: 104+67



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	29.9	27.1	33.3	30.1	-	-	-	-
Floodprone Width (ft)	116.0	116.0	116.0	116.0	-	-	-	-
Bankfull Mean Depth (ft)	2.4	2.6	2.2	2.4	-	-	-	-
Bankfull Max Depth (ft)	3.9	4.0	4.0	4.0	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	71.7	71.7	71.7	71.7	-	-	-	-
Width/Depth Ratio	12.5	10.2	15.5	12.6	-	-	-	-
Entrenchment Ratio	3.9	4.3	3.5	3.9	-	-	-	-
Bank Height Ratio	1.0	0.9	0.9	0.9	-	-	-	-
Low Top of Bank Depth (ft)	-	3.8	3.6	3.6	-	-	-	-



Left Descending Bank

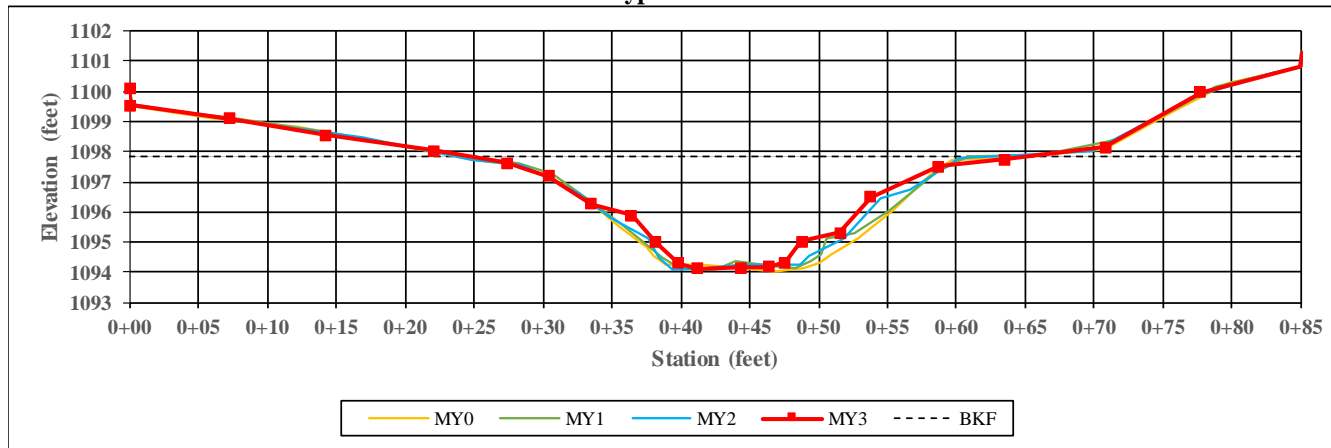


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: Shadrick Reach 3

XS Number: 17
XS Type: Riffle

Station: 109+18



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	31.1	32.7	34.4	36.2	-	-	-	-
Floodprone Width (ft)	116.0	116.0	116.0	116.0	-	-	-	-
Bankfull Mean Depth (ft)	2.2	2.1	2.0	1.9	-	-	-	-
Bankfull Max Depth (ft)	3.5	3.6	3.6	3.7	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	68.6	68.6	68.6	68.6	-	-	-	-
Width/Depth Ratio	14.1	15.6	17.2	19.1	-	-	-	-
Entrenchment Ratio	3.7	3.5	3.4	3.2	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	1.0	-	-	-	-
Low Top of Bank Depth (ft)	-	3.5	3.6	3.6	-	-	-	-



Left Descending Bank

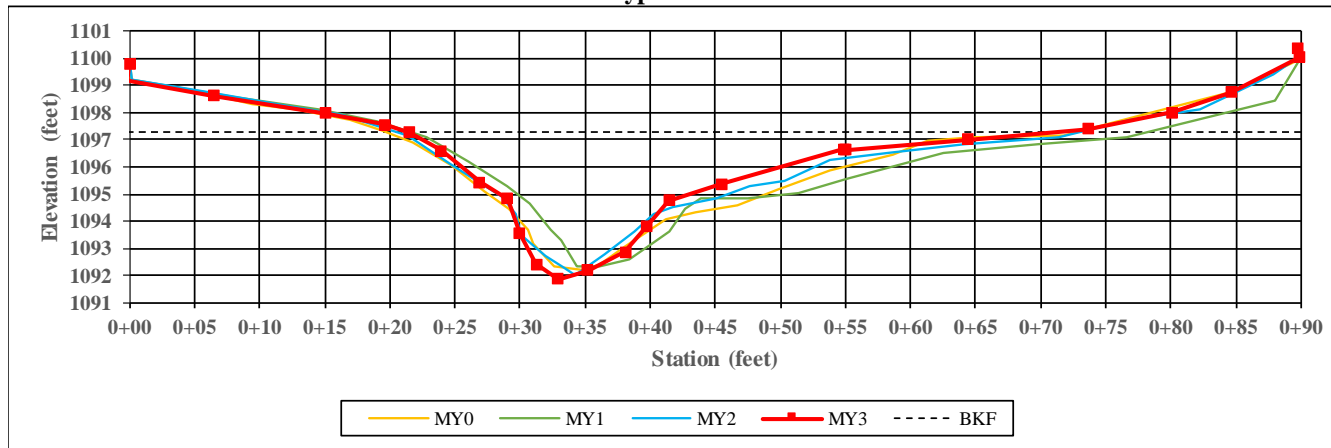


Right Descending Bank

Project Name: Shadrick Creek
Reach Name: Shadrick Reach 3

XS Number: 18
XS Type: Pool

Station: 111+27



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	40.0	46.4	32.5	42.9	-	-	-	-
Floodprone Width (ft)	116.0	116.0	116.0	116.0	-	-	-	-
Bankfull Mean Depth (ft)	2.2	1.9	2.7	2.1	-	-	-	-
Bankfull Max Depth (ft)	4.7	4.6	5.3	5.4	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	88.1	88.1	88.1	88.1	-	-	-	-
Width/Depth Ratio	18.2	24.4	12.0	20.9	-	-	-	-
Entrenchment Ratio	2.9	2.5	3.6	2.7	-	-	-	-
Bank Height Ratio	1.0	0.9	0.8	0.9	-	-	-	-
Low Top of Bank Depth (ft)	-	4.2	4.2	4.8	-	-	-	-



Downstream

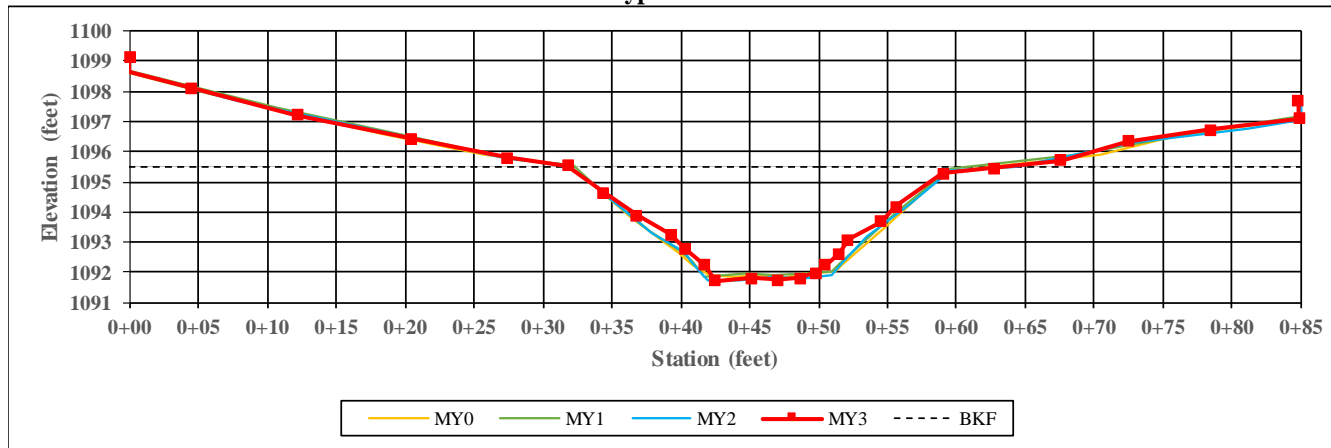


Upstream

Project Name: Shadrick Creek
Reach Name: Shadrick Reach 3

XS Number: 19
XS Type: Riffle

Station: 114+53



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	26.9	26.9	26.9	28.3	-	-	-	-
Floodprone Width (ft)	116.0	116.0	116.0	116.0	-	-	-	-
Bankfull Mean Depth (ft)	2.3	2.3	2.3	2.2	-	-	-	-
Bankfull Max Depth (ft)	3.5	3.5	3.6	3.8	-	-	-	-
Bankfull Cross-Sectional Area (ft ²)	61.0	61.0	61.0	61.0	-	-	-	-
Width/Depth Ratio	11.9	11.8	11.8	13.1	-	-	-	-
Entrenchment Ratio	4.3	4.3	4.3	4.1	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	0.9	-	-	-	-
Low Top of Bank Depth (ft)	-	3.6	3.7	3.6	-	-	-	-



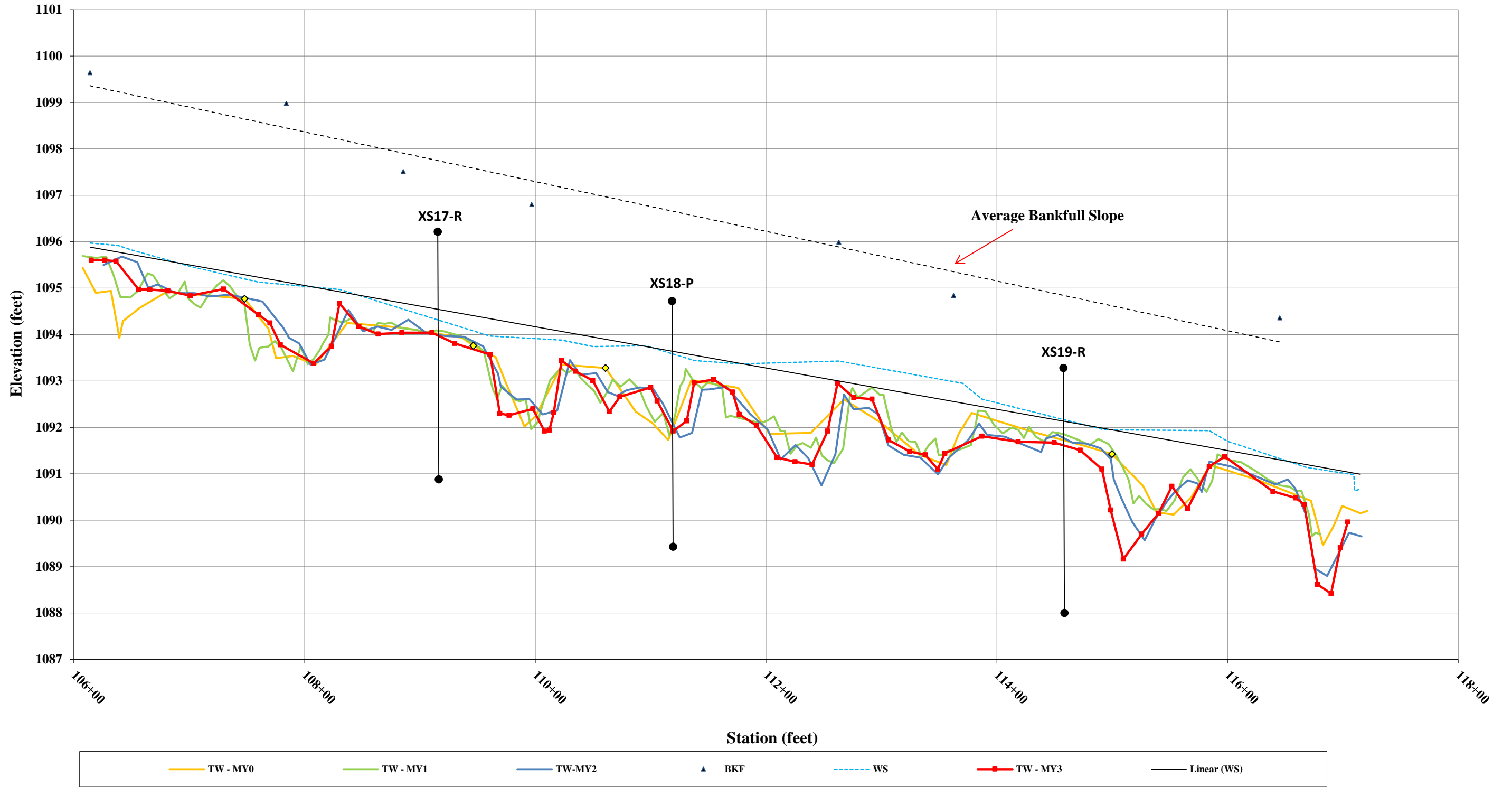
Left Descending Bank



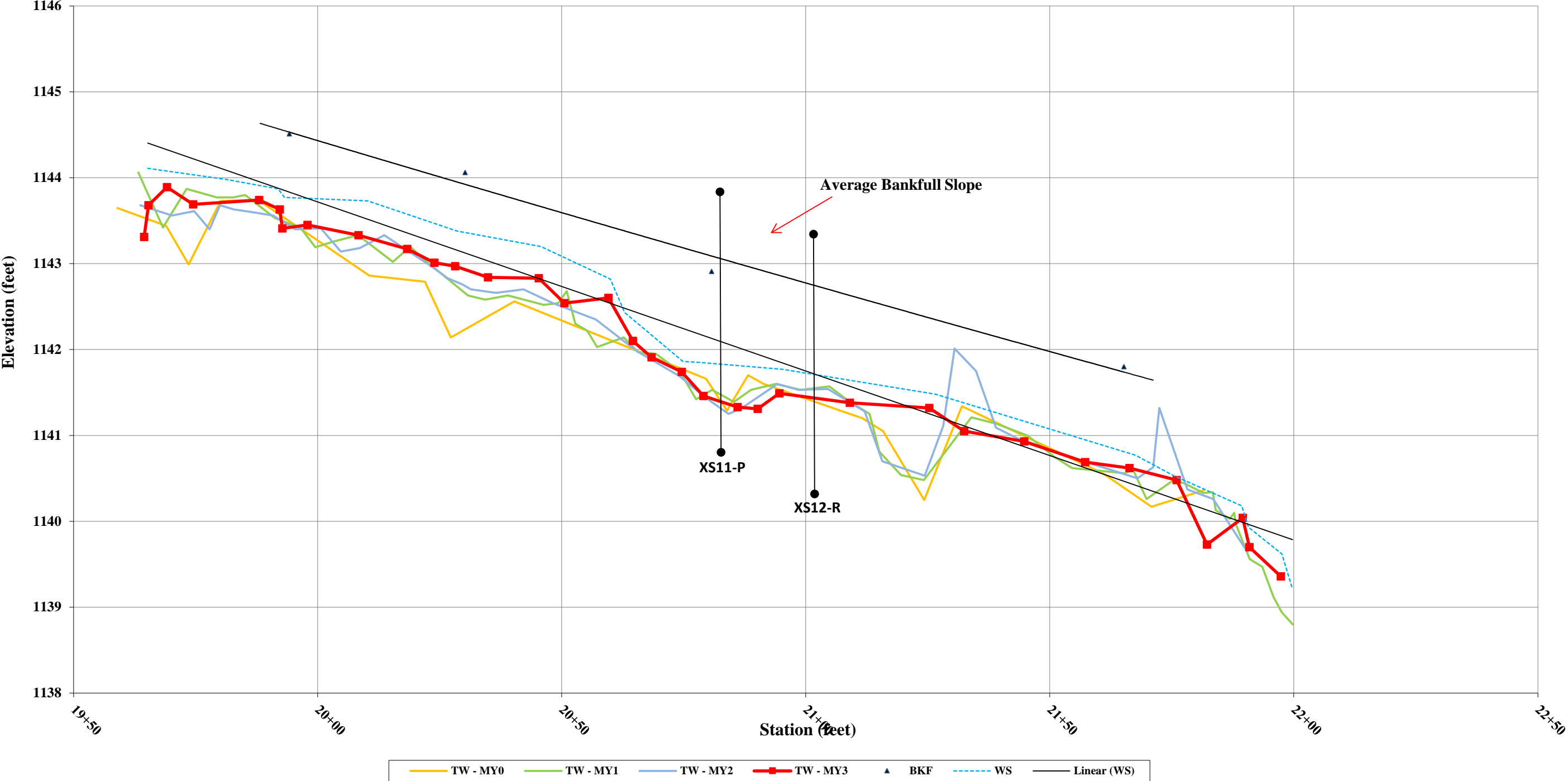
Right Descending Bank

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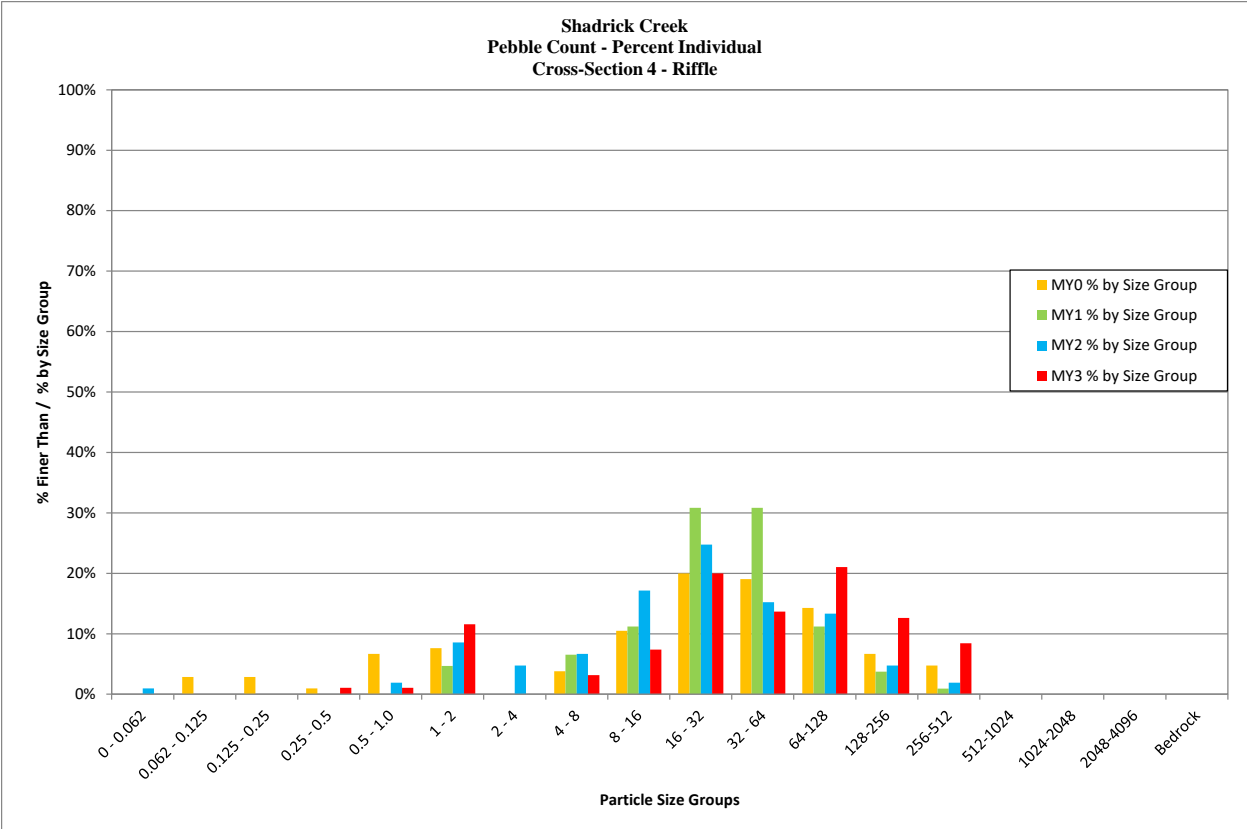
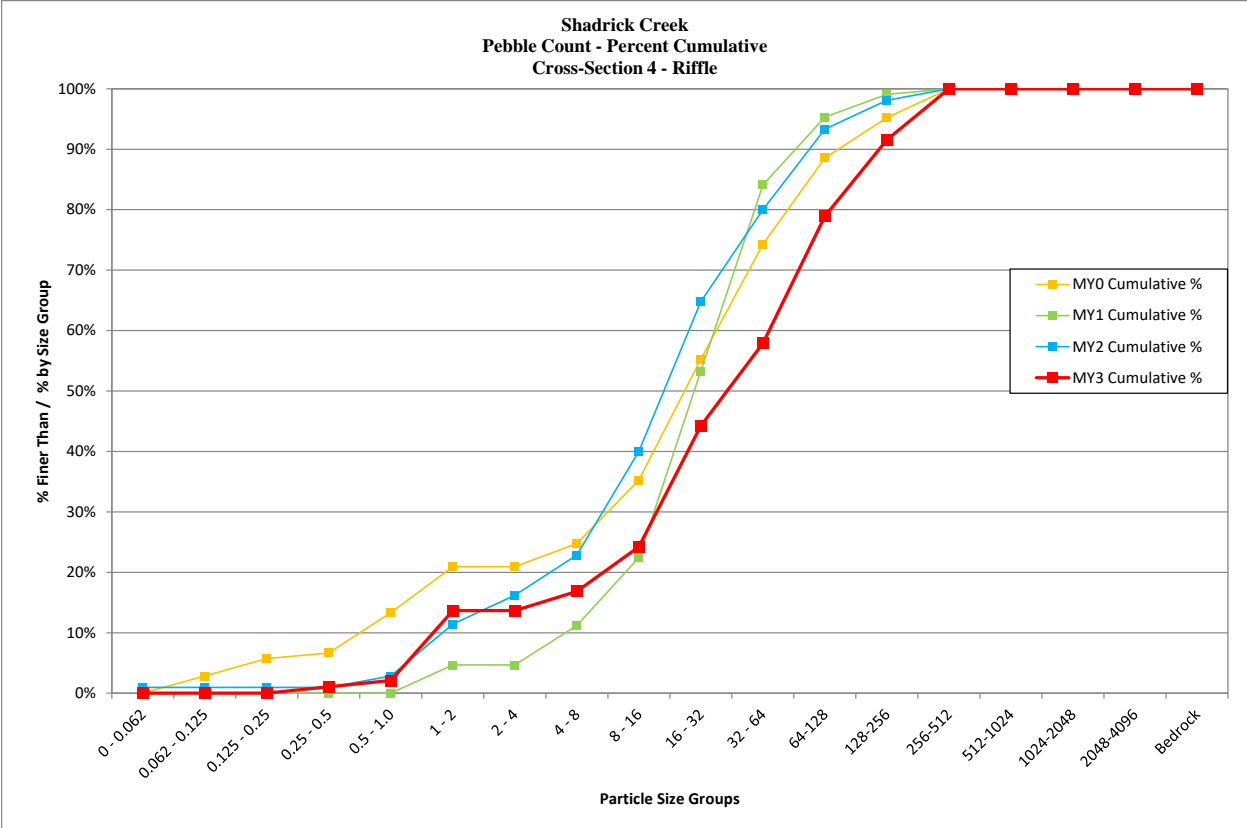
**Shadrick Creek - Shadrick Reach 3
Longitudinal Profile
Staioning 106+23 to 117+27**



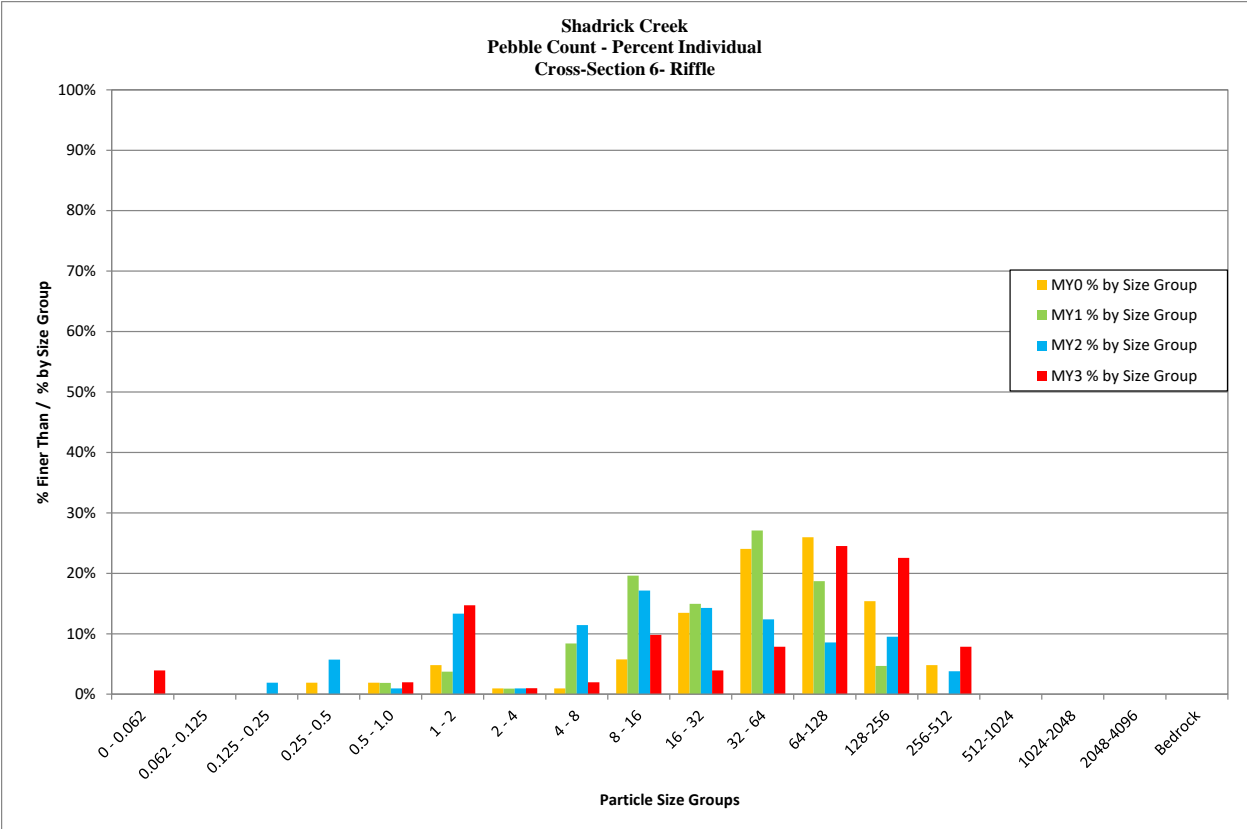
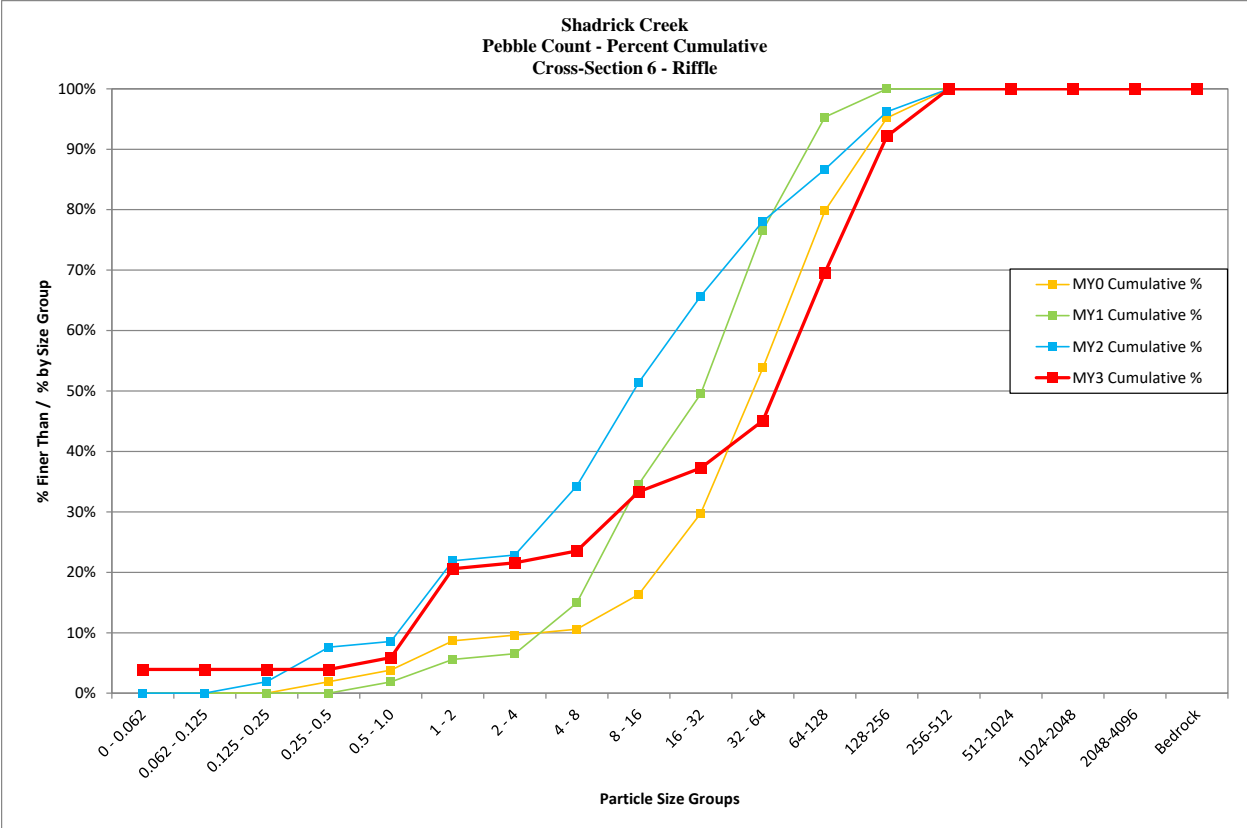
**Shadrick Creek - UT9
Longitudinal Profile
Stationing 19+59 to 22+08**



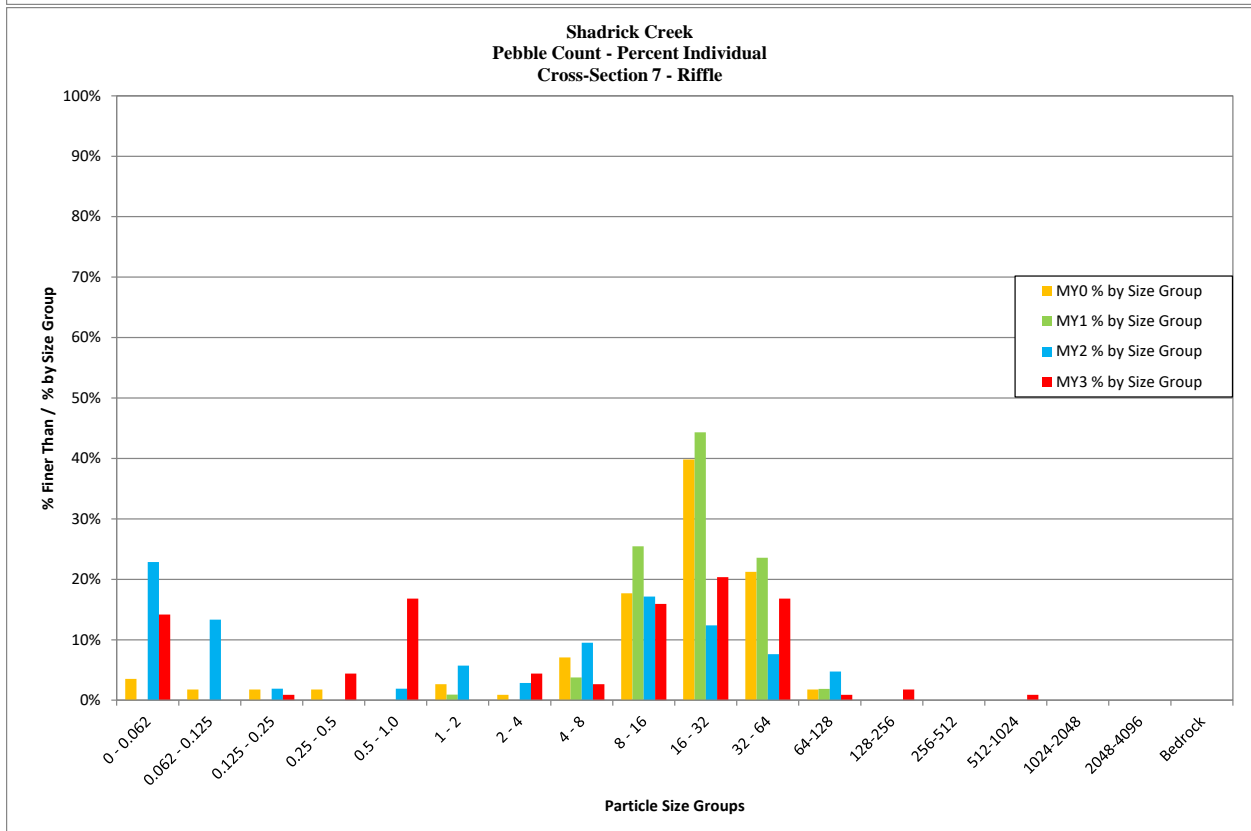
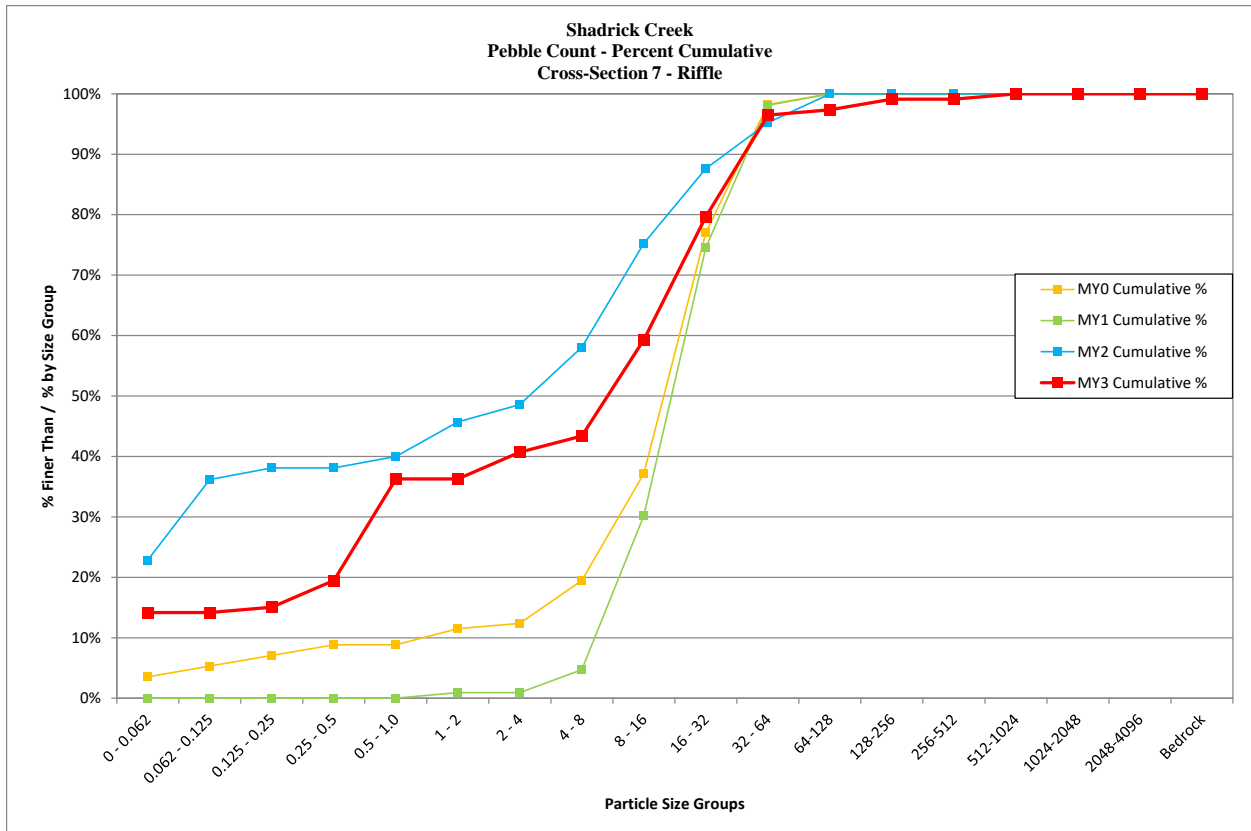
Shadrick Creek			
Cross Section 4 - Riffle			
Monitoring Year - 2020; MY3			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	0	0.0%	0%
0.062 - 0.125	0	0.0%	0%
0.125 - 0.25	0	0.0%	0%
0.25 - 0.5	1	1.1%	1%
0.5 - 1.0	1	1.1%	2%
1 - 2	11	11.6%	14%
2 - 4	0	0.0%	14%
4 - 8	3	3.2%	17%
8 - 16	7	7.4%	24%
16 - 32	19	20.0%	44%
32 - 64	13	13.7%	58%
64-128	20	21.1%	79%
128-256	12	12.6%	92%
256-512	8	8.4%	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	95	100%	100%
		Summary Data	
		D50	36
		D84	160
		D95	320



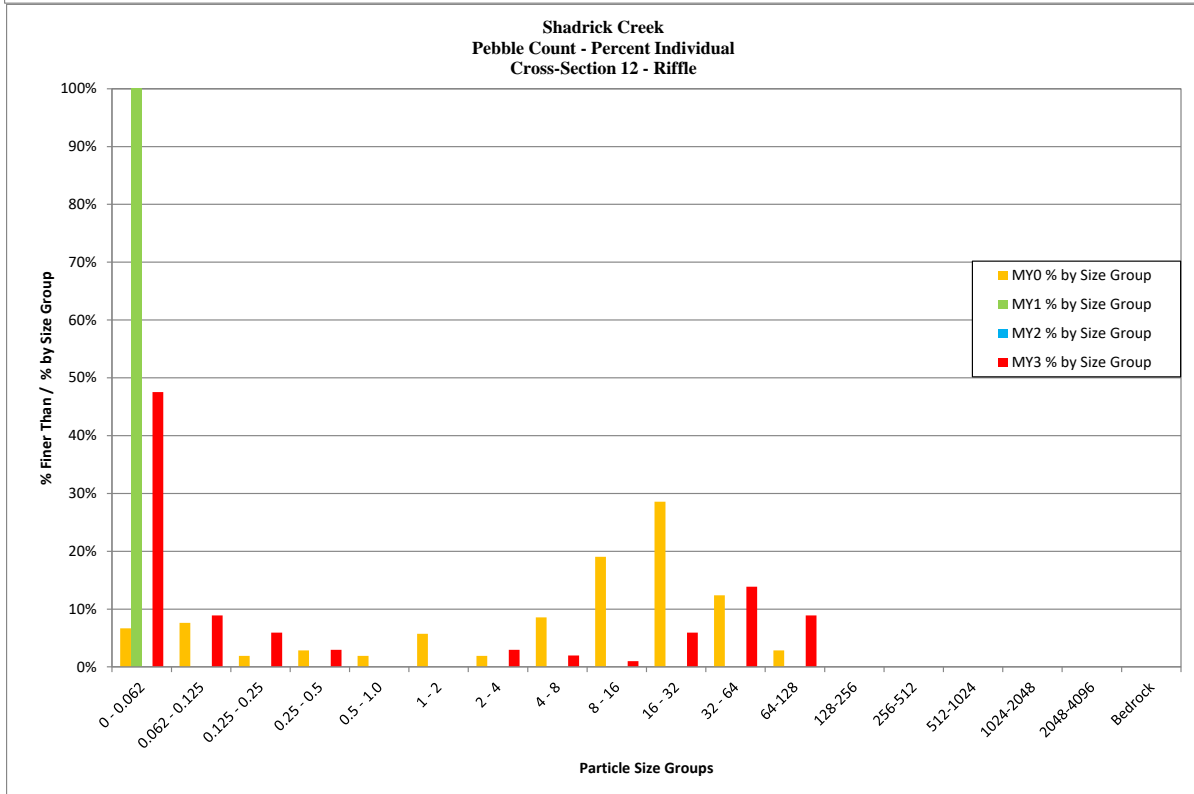
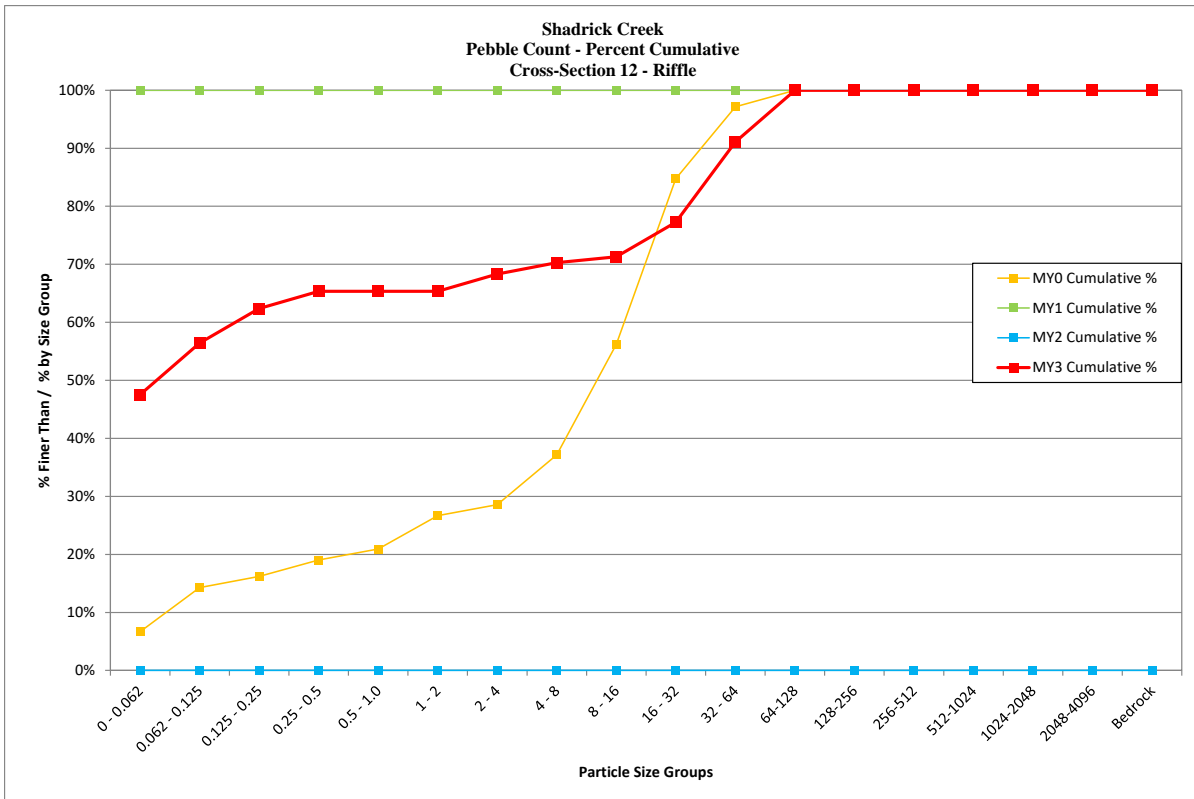
Shadrick Creek			
Cross Section 6 - Riffle			
Monitoring Year - 2020; MY3			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	4	3.9%	4%
0.062 - 0.125	0	0.0%	4%
0.125 - 0.25	0	0.0%	4%
0.25 - 0.5	0	0.0%	4%
0.5 - 1.0	2	2.0%	6%
1 - 2	15	14.7%	21%
2 - 4	1	1.0%	22%
4 - 8	2	2.0%	24%
8 - 16	10	9.8%	33%
16 - 32	4	3.9%	37%
32 - 64	8	7.8%	45%
64-128	25	24.5%	70%
128-256	23	22.5%	92%
256-512	8	7.8%	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	102	100%	100%
		Summary Data	
		D50	76
		D84	200
		D95	380



Shadrick Creek			
Cross Section 7 - Riffle			
Monitoring Year - 2020; MY3			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	16	14.2%	14%
0.062 - 0.125	0	0.0%	14%
0.125 - 0.25	1	0.9%	15%
0.25 - 0.5	5	4.4%	19%
0.5 - 1.0	19	16.8%	36%
1 - 2	0	0.0%	36%
2 - 4	5	4.4%	41%
4 - 8	3	2.7%	43%
8 - 16	18	15.9%	59%
16 - 32	23	20.4%	80%
32 - 64	19	16.8%	96%
64-128	1	0.9%	97%
128-256	2	1.8%	99%
256-512	0	0.0%	99%
512-1024	1	0.9%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	113	100%	100%
		Summary Data	
		D50	11
		D84	38
		D95	60

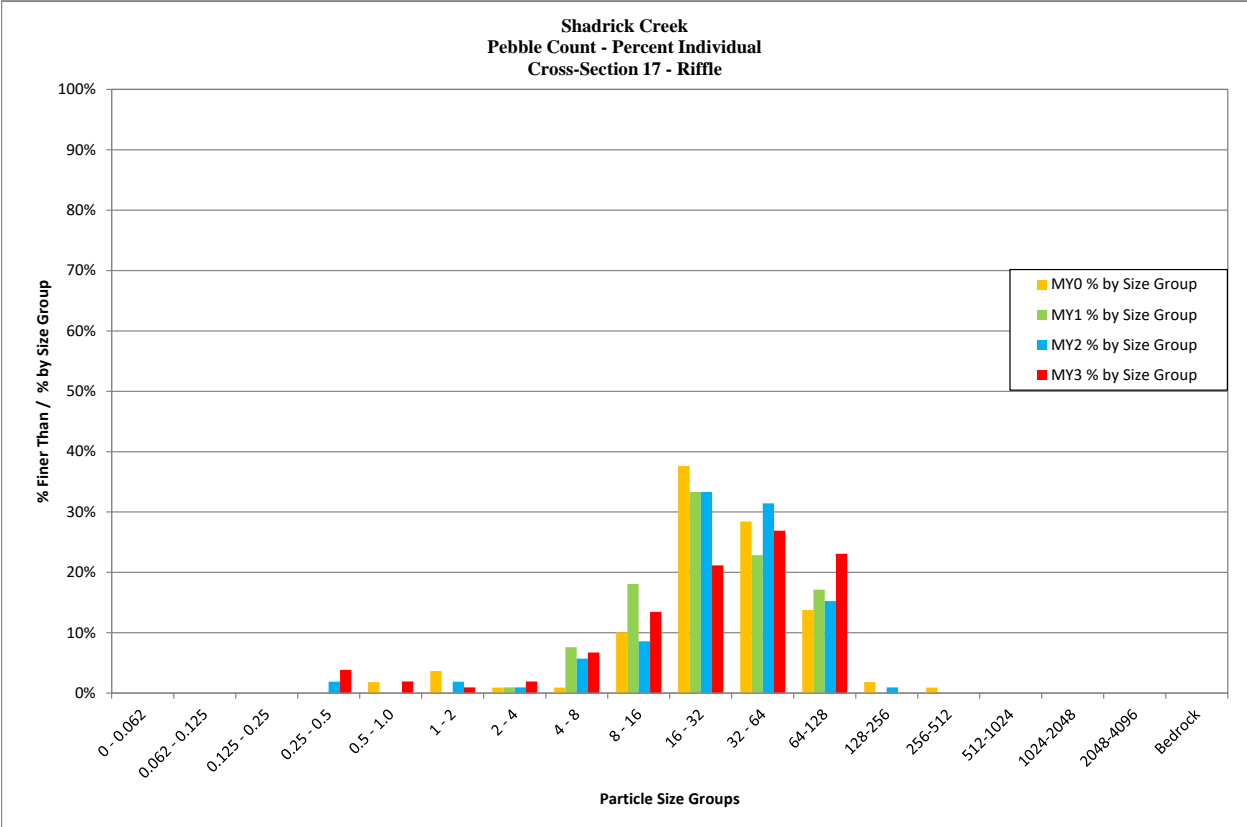
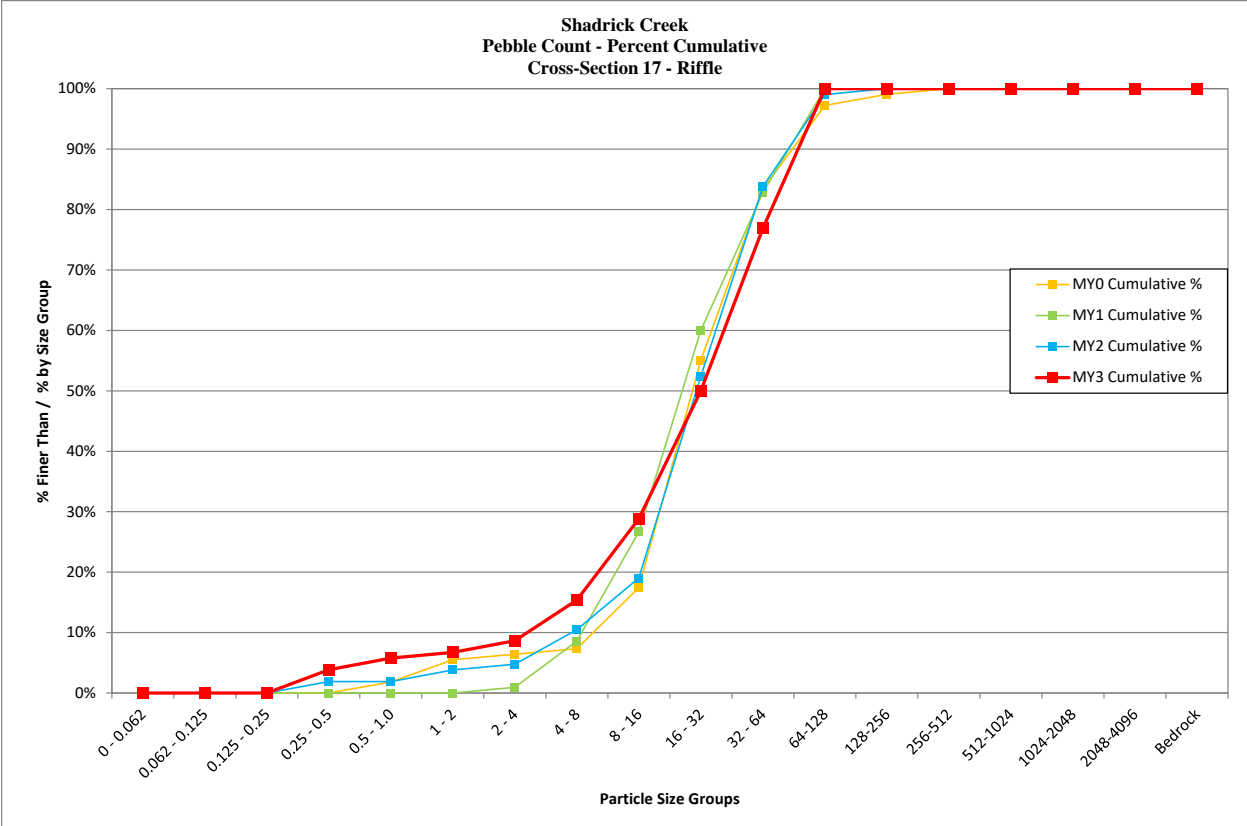


Shadrick Creek			
Cross Section 12 - Riffle			
Monitoring Year - 2020; MY3			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	48	47.5%	48%
0.062 - 0.125	9	8.9%	56%
0.125 - 0.25	6	5.9%	62%
0.25 - 0.5	3	3.0%	65%
0.5 - 1.0	0	0.0%	65%
1 - 2	0	0.0%	65%
2 - 4	3	3.0%	68%
4 - 8	2	2.0%	70%
8 - 16	1	1.0%	71%
16 - 32	6	5.9%	77%
32 - 64	14	13.9%	91%
64-128	9	8.9%	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	101	100%	100%
		Summary Data	
		D50	0.075
		D84	40
		D95	80



*Impacted by a beaver dam during MY2. No data was collected

Shadrick Creek			
Cross Section 17 - Riffle			
Monitoring Year - 2020; MY3			
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	4	3.8%	4%
0.5 - 1.0	2	1.9%	6%
1 - 2	1	1.0%	7%
2 - 4	2	1.9%	9%
4 - 8	7	6.7%	15%
8 - 16	14	13.5%	29%
16 - 32	22	21.2%	50%
32 - 64	28	26.9%	77%
64-128	24	23.1%	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	104	100%	100%
		Summary Data	
		D50	32
		D84	74
		D95	99



Shadrick Creek			
Cross Section 19 - Riffle			
Monitoring Year - 2020; MY3			
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	3	2.9%	3%
0.5 - 1.0	3	2.9%	6%
1 - 2	4	3.8%	10%
2 - 4	1	1.0%	11%
4 - 8	6	5.8%	16%
8 - 16	11	10.6%	27%
16 - 32	11	10.6%	38%
32 - 64	12	11.5%	49%
64-128	18	17.3%	66%
128-256	24	23.1%	89%
256-512	11	10.6%	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	67
		D84	210
		D95	310

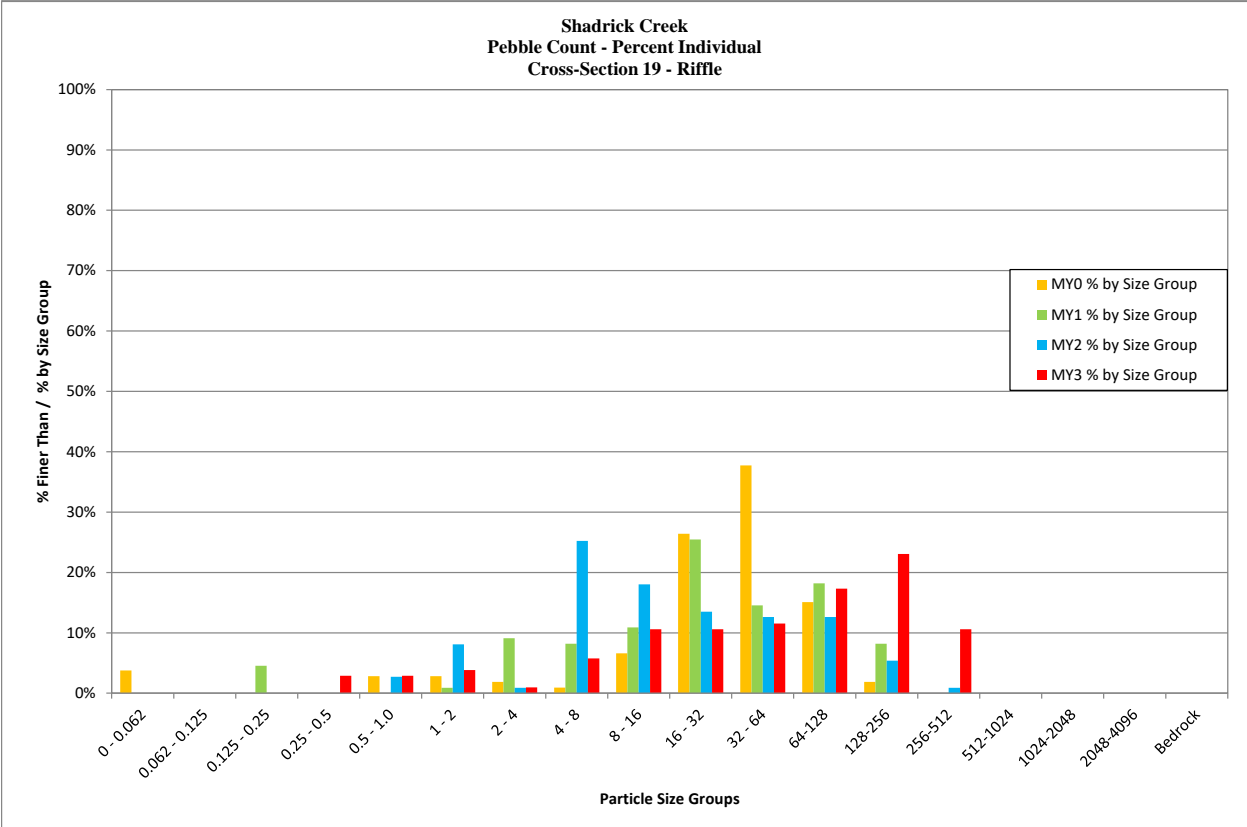
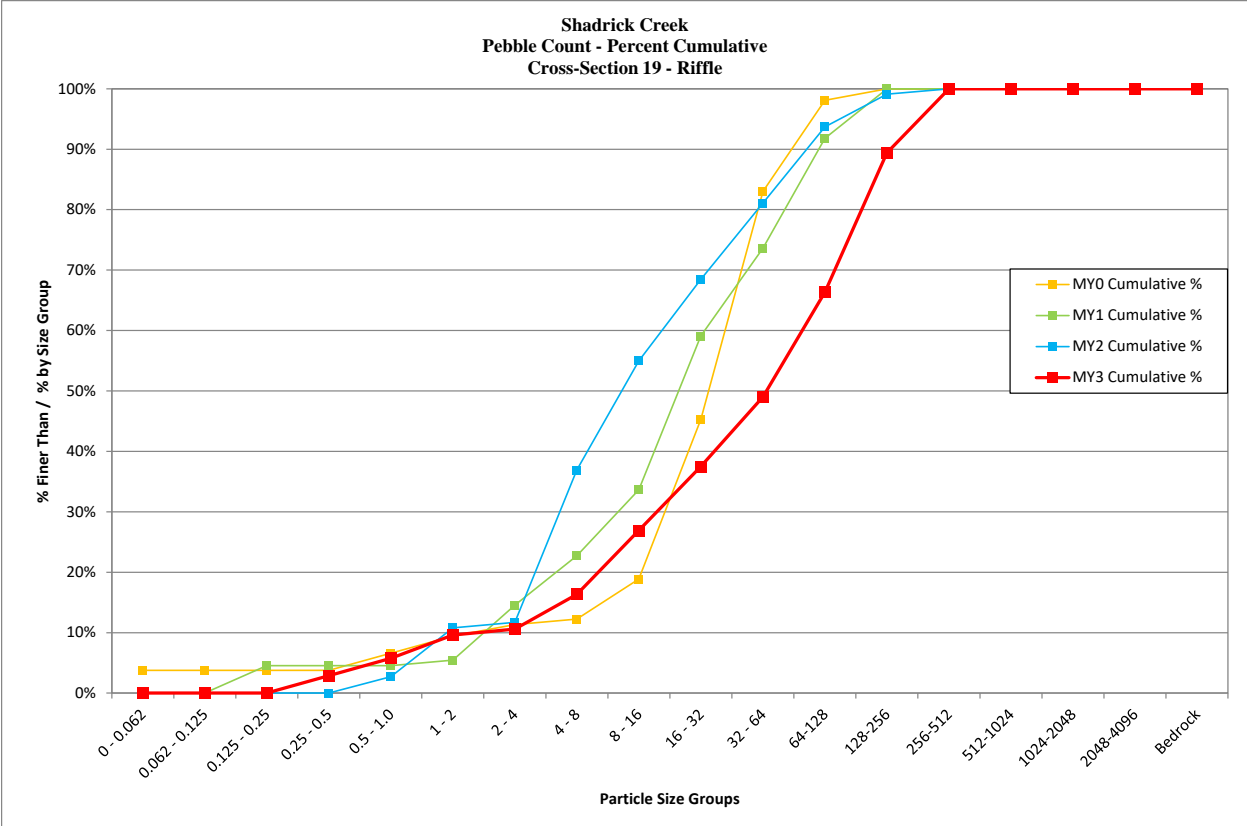


Table 10. Baseline Stream Data Summary																										
Shadrick Creek - Shadrick Creek Reach 1 (3,631 feet)																										
Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			As-Built / Baseline							
Dimension & Substrate - Riffle	LL	UL	Eq.	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 10 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	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	-	-	-	-	-	-	-	-	-	-	-
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)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	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 10 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 10 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 10 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	-	-	-	-	-	-	-	-	
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 10 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 10 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									
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									
Sinuosity						1.04					1.13					1.04									
Water Surface Slope (ft/ft)						0.0249					0.0230					0.0249									
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 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Shadrick Creek Restoration Project**

Dimension	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					
	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	1184.84	1184.80	1184.90	1184.91			1184.65	1184.65	1184.60	1184.74			1172.54	1172.52	1172.50	1172.48			1145.23	1145.26	1145.20	1145.37			1144.87	1144.82	1144.90	1144.75		
Low Bank Height Elevation (datum) Used	1184.84	1184.83	1184.90	1184.91			1184.65	1184.65	1184.60	1184.84			1172.54	1172.47	1172.50	1172.59			1145.23	1145.15	1145.20	1145.18			1144.87	1145.15	1145.10	1145.13		
Bankfull Width (ft)	7.1	6.1	7.4	11.3			6.3	6.7	6.3	6.6			5.0	5.6	5.5	5.2			26.6	25.9	24.1	26.6			26.9	26.4	27.3	24.7		
Floodprone Width (ft)	24.0	24.0	24.0	24.0			24.0	24.0	24.0	24.0			24.0	24.0	24.0	24.0			100.0	100.0	100.0	100.0			100.0	100.0	100.0	100.0		
Bankfull Mean Depth (ft)	0.6	0.7	0.6	0.4			0.7	0.6	0.7	0.6			0.8	0.7	0.7	0.7			1.8	1.8	1.9	1.8			2.2	2.3	2.2	2.4		
Bankfull Max Depth (ft)	1.5	1.4	1.5	1.5			1.1	1.1	1.2	1.2			1.3	1.4	1.3	1.2			3.0	3.1	3.1	3.2			4.0	4.0	3.9	4.0		
Bankfull Cross Sectional Area (ft ²)	4.5	4.5	4.5	4.5			4.3	4.3	4.3	4.3			3.9	3.9	3.9	3.9			47.0	47.0	47.0	47.0			59.5	59.5	59.5	59.5		
Bankfull Width/Depth Ratio	11.1	8.3	12.2	28.5			9.4	10.4	9.1	10.3			6.5	7.9	7.9	7.0			15.0	14.2	12.4	15.0			12.1	11.7	12.6	10.3		
Bankfull Entrenchment Ratio	3.4	3.9	3.3	2.1			3.8	3.6	3.8	3.6			4.8	4.3	4.3	4.6			3.8	3.9	4.1	3.8			3.7	3.8	3.7	4.0		
Bankfull Bank Height Ratio	1.0	1.0	0.9	1.0			1.0	1.0	0.9	1.1			1.0	1.0	1.0	1.1			1.0	1.0	1.0	0.9			1.0	1.1	1.0	1.1		
Low Top of Bank Depth (ft)	-	1.4	1.5	1.5			-	1.1	1.1	1.3			-	1.4	1.3	1.3			-	3.0	2.9	3.0			-	4.3	4.1	4.3		
Dimension	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					
	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	1143.26	1143.25	1143.20	1143.28			1141.15	1141.27	1141.20	1141.41			1139.81	1139.59	-	1139.88			1151.76	1151.77	1151.80	1151.64			1151.63	1151.63	1151.60	1151.28		
Low Bank Height Elevation (datum) Used	1143.26	1143.21	1143.20	1143.36			1141.15	1141.07	1141.20	1142.20			1139.81	1140.05	-	1140.14			1151.76	1151.76	1151.40	1151.47			1151.63	1151.64	1151.50	1151.40		
Bankfull Width (ft)	28.7	29.1	28.8	28.4			32.7	33.6	33.5	28.6			28.8	28.2	-	29.8			9.5	9.2	9.7	8.2			6.5	6.1	5.0	3.3		
Floodprone Width (ft)	100.0	100.0	100.0	100.0			100.0	100.0	100.0	100.0			100.0	100.0	-	100.0			24.0	24.0	24.0	24.0			24.0	24.0	24.0	24.0		
Bankfull Mean Depth (ft)	1.8	1.8	1.8	1.8			1.8	1.8	1.8	2.1			2.9	3.0	-	2.8			0.5	0.5	0.5	0.6			0.5	0.5	0.6	0.9		
Bankfull Max Depth (ft)	3.2	3.1	3.2	3.4			3.0	3.0	3.0	3.2			5.6	5.5	-	5.4			1.1	1.3	1.5	1.6			1.3	1.4	1.3	1.5		
Bankfull Cross Sectional Area (ft ²)	52.0	52.0	52.0	52.0			59.3	59.3	59.3	59.3			84.3	84.3	-	84.3			4.8	4.8	4.8	4.8			3.0	3.0	3.0	3.0		
Bankfull Width/Depth Ratio	15.8	16.3	15.9	15.5			18.0	19.0	18.9	13.8			9.8	9.4	-	10.5			18.7	17.6	19.5	14.1			14.3	12.1	8.2	3.6		
Bankfull Entrenchment Ratio	3.5	3.4	3.5	3.5			3.1	3.0	3.0	3.5			3.5	3.5	-	3.4			2.5	2.6	2.5	2.9			3.7	4.0	4.8	7.3		
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0			1.0	0.9	0.9	1.2			1.0	1.1	-	1.0			1.0	1.0	1.0	0.9			1.0	1.0	0.9	1.1		
Low Top of Bank Depth (ft)	-	3.1	3.2	3.5			-	2.8	2.7	4.0			-	5.9	-	5.7			-	1.3	1.2	1.4			-	1.3	1.2	1.6		

* Beginning in MY1 (2018), the bankfull elevation and channel cross-section dimensions have been calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (9/2018)
+ Cross section not surveyed due to beaver impoundment

**Table 11a cont. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Shadrick Creek Restoration Project**

	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	1142.90	1142.92	1142.90	1143.01			1142.55	1142.51	1142.50	1142.52			1140.92	1140.92	1140.90	1141.03			1140.19	1140.13	1140.20	1140.26			1100.70	1100.47	1100.37	1100.47		
Low Bank Height Elevation (datum) Used	1142.90	1142.89	1142.80	1142.86			1142.55	1142.52	1142.50	1142.33			1140.92	1140.77	1140.60	1140.63			1140.19	1140.05	1140.10	1140.00			1100.70	1100.52	1099.60	1099.73		
Bankfull Width (ft)	8.8	8.6	9.1	7.9			8.3	7.7	8.0	5.9			7.3	8.7	8.4	7.4			7.5	6.9	7.1	3.9			38.9	38.8	36.9	35.4		
Floodprone Width (ft)	24.0	24.0	24.0	24.0			24.0	24.0	24.0	24.0			24.0	24.0	24.0	24.0			24.0	24.0	24.0	24.0			116.0	116.0	116.0	116.0		
Bankfull Mean Depth (ft)	0.7	0.7	0.6	0.7			0.4	0.5	0.5	0.6			0.5	0.4	0.4	0.5			0.6	0.7	0.7	1.2			2.1	2.1	2.2	2.3		
Bankfull Max Depth (ft)	1.6	1.6	1.7	1.8			1.0	1.0	1.0	1.1			1.1	1.1	1.0	1.3			1.6	1.7	1.9	1.9			4.1	4.3	4.5	4.6		
Bankfull Cross Sectional Area (ft ²)	5.8	5.8	5.8	5.8			3.6	3.6	3.6	3.6			3.4	3.4	3.4	3.4			4.8	4.8	4.8	4.8			80.4	80.4	80.4	80.4		
Bankfull Width/Depth Ratio	13.2	12.8	14.4	10.9			19.0	16.2	17.6	9.8			15.6	22.3	20.8	16.0			11.6	9.9	10.5	3.2			18.9	18.7	16.9	15.6		
Bankfull Entrenchment Ratio	2.7	2.8	2.6	3.0			2.9	3.1	3.0	4.1			3.3	2.8	2.9	3.3			3.2	3.5	3.4	6.2			3.0	3.0	3.1	3.3		
Bankfull Bank Height Ratio	1.0	1.0	0.9	0.9			1.0	1.0	0.9	0.8			1.0	0.9	1.0	0.7			1.0	1.0	1.0	0.9			1.0	1.0	0.8	0.8		
Low Top of Bank Depth (ft)	-	1.6	1.5	1.6			-	1.0	0.9	0.9			-	1.0	0.7	0.9			-	1.6	1.9	1.6			-	4.4	3.8	3.8		
	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	1100.22	1100.25	1100.30	1100.33			1097.58	1097.67	1097.70	1097.85			1096.97	1097.03	1097.00	1097.26			1095.31	1095.37	1095.30	1095.50								
Low Bank Height Elevation (datum) Used	1100.22	1100.18	1099.30	1099.97			1097.58	1097.60	1097.71	1097.75			1096.97	1096.51	1097.00	1096.64			1095.31	1095.42	1095.30	1095.39								
Bankfull Width (ft)	29.9	29.5	33.3	30.1			31.1	32.7	34.4	36.2			40.0	43.7	32.5	42.9			26.9	26.9	26.9	28.3								
Floodprone Width (ft)	116.0	116.0	116.0	116.0			116.0	116.0	116.0	116.0			116.0	116.0	116.0	116.0			116.0	116.0	116.0	116.0								
Bankfull Mean Depth (ft)	2.4	2.4	2.2	2.4			2.2	2.1	2.0	1.9			2.2	2.0	2.7	2.1			2.3	2.3	2.3	2.2								
Bankfull Max Depth (ft)	3.9	4.0	4.0	4.0			3.5	3.6	3.6	3.7			4.7	4.7	5.3	5.4			3.5	3.5	3.6	3.8								
Bankfull Cross Sectional Area (ft ²)	71.7	71.7	71.7	71.7			68.6	68.6	68.6	68.6			88.1	88.1	88.2	88.1			61.0	61.0	61.0	61.0								
Bankfull Width/Depth Ratio	12.5	12.1	15.5	12.6			14.1	15.6	17.2	19.1			18.2	21.6	12.0	20.9			11.9	11.8	11.8	13.1								
Bankfull Entrenchment Ratio	3.9	3.9	3.5	3.9			3.7	3.5	3.4	3.2			2.9	2.7	3.6	2.7			4.3	4.3	4.3	4.1								
Bankfull Bank Height Ratio*	1.0	1.0	0.9	0.9			1.0	1.0	1.0	1.0			1.0	0.9	0.8	0.9			1.0	1.0	1.0	1.0								
Low Top of Bank Depth (ft)	-	3.8	3.6	3.6			-	3.5	2.4	3.6			-	4.2	4.2	4.8			-	3.6	3.7	3.7								

* Beginning in MY1 (2018), the bankfull elevation and channel cross-section dimensions have been calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (9/2018)

+ Cross section not surveyed due to beaver impoundment

**Table 11b. 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					
	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	25.9	29.5	29.1	33.6	3.9	3	24.1	28.8	28.8	33.5	4.7	3	26.6	27.9	28.4	28.6	1.1	3												
Floodprone Width (ft)	100.0	100.0	100.0	100.0	0.0	3	100.0	100.0	100.0	100.0	0.0	3	100.0	100.0	100.0	100.0	0.0	3	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	1.8	1.8	1.8	1.8	0.0	3	1.8	1.8	1.8	1.9	0.1	3	1.8	1.9	1.8	2.1	0.2	3												
Bankfull Max Depth (ft)	3.0	3.1	3.0	3.2	0.1	3	3.0	3.1	3.1	3.1	0.1	3	3.0	3.1	3.1	3.2	0.1	3	3.2	3.3	3.2	3.4	0.1	3												
Bankfull Cross-Sectional Area (ft ²)	47.0	52.8	52.0	59.3	6.2	3	47.0	52.8	52.0	59.3	6.2	3	47.0	52.8	52.0	59.3	6.2	3	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	14.2	16.5	16.3	19.0	2.4	3	12.4	15.7	15.9	18.9	3.3	3	13.8	14.8	15.0	15.5	0.9	3												
Entrenchment Ratio	3.1	3.4	3.5	3.8	0.4	3	3.0	3.4	3.4	3.9	0.4	3	3.0	3.5	3.5	4.1	0.6	3	3.5	3.6	3.5	3.8	0.1	3												
Bank Height Ratio	1.0	1.0	1.0	1.0	0.0	3	0.9	1.0	1.0	1.0	0.0	3	0.9	0.9	1.0	1.0	0.0	3	0.9	1.1	1.0	1.2	0.2	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 11b 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					
	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
Dimension & Substrate - Riffle																																				
Bankfull Width (ft)	-	29.9	-	-	-	1	-	29.5	-	-	-	1	-	33.3	-	-	-	1	-	30.1	-	-	-	1												
Floodprone Width (ft)	-	116.0	-	-	-	1	-	116.0	-	-	-	1	-	116	-	-	-	1	-	116.0	-	-	-	1												
Bankfull Mean Depth (ft)	-	2.4	-	-	-	1	-	2.4	-	-	-	1	-	2.2	-	-	-	1	-	2.4	-	-	-	1												
Bankfull Max Depth (ft)	-	3.9	-	-	-	1	-	4.0	-	-	-	1	-	4.0	-	-	-	1	-	4.0	-	-	-	1												
Bankfull Cross-Sectional Area (ft ²)	-	71.7	-	-	-	1	-	71.7	-	-	-	1	-	71.7	-	-	-	1	-	71.7	-	-	-	1												
Width/Depth Ratio	-	12.5	-	-	-	1	-	12.1	-	-	-	1	-	15.5	-	-	-	1	-	12.6	-	-	-	1												
Entrenchment Ratio	-	3.9	-	-	-	1	-	3.9	-	-	-	1	-	3.5	-	-	-	1	-	3.9	-	-	-	1												
Bank Height Ratio	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	0.9	-	-	-	1	-	0.9	-	-	-	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 11b 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					
	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
Dimension & Substrate - Riffle																																				
Bankfull Width (ft)	26.9	29.0	29.0	31.1	2.9	2	26.9	29.8	29.8	32.7	4.2	2	26.9	30.6	30.6	34.4	5.3	2	28.3	32.2	32.2	36.2	5.6	2												
Floodprone Width (ft)	116.0	116.0	116.0	116.0	0.0	2	116.0	116.0	116.0	116.0	0.0	2	116.0	116.0	116.0	116.0	0.0	2	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	2.1	2.2	2.2	2.3	0.1	2	2.0	2.1	2.1	2.3	0.2	2	1.9	2.0	2.0	2.2	0.2	2												
Bankfull Max Depth (ft)	3.5	3.5	3.5	3.5	0.0	2	3.5	3.6	3.6	3.6	0.1	2	3.6	3.6	3.6	3.6	0.0	2	3.7	3.7	3.7	3.8	0.1	2												
Bankfull Cross-Sectional Area (ft ²)	61.0	64.8	64.8	68.6	5.4	2	61.0	64.8	64.8	68.6	5.4	2	61.0	64.8	64.8	68.6	5.4	2	61.0	64.8	64.8	68.6	5.3	2												
Width/Depth Ratio	11.9	13.0	13.0	14.1	1.6	2	11.8	13.7	13.7	15.6	2.7	2	11.8	14.5	14.5	17.2	3.8	2	13.1	16.1	16.1	19.1	4.3	2												
Entrenchment Ratio	3.7	4.0	4.0	4.3	0.4	2	3.5	3.9	3.9	4.3	0.5	2	3.4	3.8	3.8	4.3	0.7	2	3.2	3.7	3.7	4.1	0.6	2												
Bank Height Ratio	1.0	1.0	1.0	1.0	0.0	2	1.0	1.0	1.0	1.0	0.0	2	1.0	1.0	1.0	1.0	0.0	2	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	22.7	62.4	62.7	113.2	36.5	7	28.4	73.4	72.3	105.2	29.3	7	28.2	64.6	57.5	126.7	37.5	7												
Riffle Slope (ft/ft)	0.004	0.007	0.008	0.011	0.002	7	0.004	0.008	0.007	0.013	0.004	7	0.003	0.007	0.006	0.012	0.003	7	0.005	0.007	0.008	0.010	0.002	7												
Pool Length (ft)	13.8	42.9	45.0	63.8	15.1	7	26.4	53.8	53.1	82.5	20.3	7	28.3	50.7	40.9	76.7	21.1	7	32.9	55.9	55.2	78.2	16.2	7												
Pool Max Depth (ft)	4.3	4.8	4.5	5.5	0.5	7	4.5	4.9	5.0	5.4	0.3	7	4.8	5.1	5.1	5.5	0.3	7	4.3	4.9	4.9	5.3	0.4	7												
Pool Spacing (ft)	87.4	145.2	141.1	196.3	40.1	6	76.2	147.5	134.5	212.3	53.0	6	101.3	147.3	141.0	202.0	39.1	6	57.1	147.3	167.6	200.4	52.8	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						C4						C4						C4																	
Channel Thalweg Length (ft)	1,104						1,093						1,153						1,154																	
Sinuosity (ft)	1.19						1.18						1.25						1.24																	
Water Surface Slope (Channel) (ft/ft)	0.0043						0.0045						0.0042						0.0044																	
Bankfull Slope (ft/ft)	0.0055						0.0043						0.0046						0.0054																	
Ri% / Ru% / P% / G% / S%	48%	12%	30%	11%	0%		42%	12%	37%	8%	0%		50%	12%	34%	4%	0%		42%	13%	37%	8%	0%													

- Information Unavailable

N/A - Information does not apply.

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

**Table 11b 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					
	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
Dimension & Substrate - Riffle																																				
Bankfull Width (ft)	5.0	5.7	5.7	6.3	0.9	2	5.6	6.1	6.1	6.7	0.8	2	5.5	5.9	5.9	6.3	0.5	2	5.2	5.9	5.9	6.6	1.0	2												
Floodprone Width (ft)	24.0	24.0	24.0	24.0	0.0	2	24.0	24.0	24.0	24.0	0.0	2	24.0	24.0	24.0	24.0	0.0	2	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	0.6	0.7	0.7	0.7	0.0	2	0.7	0.7	0.7	0.7	0.0	2	0.6	0.7	0.7	0.7	0.1	2												
Bankfull Max Depth (ft)	1.1	1.2	1.2	1.3	0.1	2	1.1	1.3	1.3	1.4	0.3	2	1.2	1.3	1.3	1.3	0.1	2	1.2	1.2	1.2	1.2	0.0	2												
Bankfull Cross-Sectional Area (ft ²)	3.9	4.1	4.1	4.3	0.3	2	3.9	4.1	4.1	4.3	0.3	2	3.9	4.1	4.1	4.3	0.3	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	7.9	9.1	9.1	10.4	1.8	2	7.9	8.5	8.5	9.1	0.8	2	7.0	8.6	8.6	10.3	2.3	2												
Entrenchment Ratio	3.8	4.3	4.3	4.8	0.7	2	3.6	3.9	3.9	4.3	0.5	2	3.8	4.1	4.1	4.3	0.4	2	3.6	4.1	4.1	4.6	0.7	2												
Bank Height Ratio	1.0	1.0	1.0	1.0	0.0	2	1.0	1.0	1.0	1.0	0.0	2	0.9	0.9	0.9	1.0	0.0	2	1.1	1.1	1.1	1.1	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 11b 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							
	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	-	9.2	-	-	-	1	-	9.7	-	-	-	1	-	8.2	-	-	-	1														
Floodprone Width (ft)	-	24.0	-	-	-	1	-	24.0	-	-	-	1	-	24	-	-	-	1	-	24.0	-	-	-	1														
Bankfull Mean Depth (ft)	-	0.5	-	-	-	1	-	0.5	-	-	-	1	-	0.5	-	-	-	1	-	0.6	-	-	-	1														
Bankfull Max Depth (ft)	-	1.1	-	-	-	1	-	1.3	-	-	-	1	-	1.5	-	-	-	1	-	1.6	-	-	-	1														
Bankfull Cross-Sectional Area (ft ²)	-	4.8	-	-	-	1	-	4.8	-	-	-	1	-	4.8	-	-	-	1	-	4.8	-	-	-	1														
Width/Depth Ratio	-	18.7	-	-	-	1	-	17.6	-	-	-	1	-	19.5	-	-	-	1	-	14.1	-	-	-	1														
Entrenchment Ratio	-	2.5	-	-	-	1	-	2.6	-	-	-	1	-	2.5	-	-	-	1	-	2.9	-	-	-	1														
Bank Height Ratio	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	0.8	-	-	-	1	-	0.9	-	-	-	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 11b 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					
	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
Dimension & Substrate - Riffle																																				
Bankfull Width (ft)	-	8.3	-	-	-	1	-	7.7	-	-	-	1	-	8.0	-	-	-	1	-	5.9	-	-	-	1												
Floodprone Width (ft)	-	24.0	-	-	-	1	-	24.0	-	-	-	1	-	24.0	-	-	-	1	-	24.0	-	-	-	1												
Bankfull Mean Depth (ft)	-	0.4	-	-	-	1	-	0.5	-	-	-	1	-	0.5	-	-	-	1	-	0.6	-	-	-	1												
Bankfull Max Depth (ft)	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	1.1	-	-	-	1												
Bankfull Cross-Sectional Area (ft ²)	-	3.6	-	-	-	1	-	3.6	-	-	-	1	-	3.6	-	-	-	1	-	3.6	-	-	-	1												
Width/Depth Ratio	-	19.0	-	-	-	1	-	16.2	-	-	-	1	-	17.6	-	-	-	1	-	9.8	-	-	-	1												
Entrenchment Ratio	-	2.9	-	-	-	1	-	3.1	-	-	-	1	-	3.0	-	-	-	1	-	4.1	-	-	-	1												
Bank Height Ratio	-	1.0	-	-	-	1	-	1.0	-	-	-	1	-	0.9	-	-	-	1	-	0.8	-	-	-	1												
Profile																																				
Riffle Length (ft)	23.3	29.0	27.3	38.4	6.7	4	18.8	24.6	24.3	31.0	5.0	4	21.1	25.6	26.7	33.4	5.7	4	7.5	24.3	19.1	47.2	16.3	7												
Riffle Slope (ft/ft)	0.016	0.022	0.020	0.033	0.008	4	0.014	0.022	0.021	0.030	0.007	4	0.015	0.022	0.020	0.032	0.007	4	0.006	0.026	0.012	0.058	0.022	7												
Pool Length (ft)	5.6	10.2	11.2	12.6	3.1	4	7.1	12.2	11.1	19.3	5.3	4	6.4	11.2	11.2	16.0	4.2	4	5.9	8.9	8.1	13.6	3.3	4												
Pool Max Depth (ft)	1.0	1.5	1.5	1.7	0.3	4	1.1	1.4	1.4	1.8	0.3	4	1.1	1.4	1.5	1.8	0.3	4	0.4	0.5	0.5	0.6	0.1	4												
Pool Spacing (ft)	40.4	47.7	46.4	56.4	8.1	3	38.7	44.9	45.3	50.6	6.0	3	39.5	46.3	45.8	53.5	7.0	3	38.7	62.8	57.7	92.1	27.1	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						C5						C5						C5																	
Channel Thalweg Length (ft)	238						240						239						230																	
Sinuosity (ft)	1.20						1.20						1.20						1.15																	
Water Surface Slope (Channel) (ft/ft)	0.0168						0.0171						0.0159						0.0193																	
Bankfull Slope (ft/ft)	0.0182						0.0166						0.0173						0.0164																	
Ri% / Ru% / P% / G% / S%	60%	13%	21%	6%	0%		51%	15%	25%	9%	0%		55%	14%	8%	0%			75%	6%	16%	3%	0%													

- Information Unavailable

N/A - Information does not apply.

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

**Table 11b 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					
	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
Dimension & Substrate - Riffle																																				
Bankfull Width (ft)	-	7.3	-	-	-	1	-	8.7	-	-	-	1	-	8.4	-	-	-	1	-	7.4	-	-	-	1												
Floodprone Width (ft)	-	24.0	-	-	-	1	-	24.0	-	-	-	1	-	24.0	-	-	-	1	-	24.0	-	-	-	1												
Bankfull Mean Depth (ft)	-	0.5	-	-	-	1	-	0.4	-	-	-	1	-	0.4	-	-	-	1	-	0.5	-	-	-	1												
Bankfull Max Depth (ft)	-	1.1	-	-	-	1	-	1.1	-	-	-	1	-	1.0	-	-	-	1	-	1.3	-	-	-	1												
Bankfull Cross-Sectional Area (ft ²)	-	3.4	-	-	-	1	-	3.4	-	-	-	1	-	3.4	-	-	-	1	-	3.4	-	-	-	1												
Width/Depth Ratio	-	15.6	-	-	-	1	-	22.3	-	-	-	1	-	20.8	-	-	-	1	-	16.0	-	-	-	1												
Entrenchment Ratio	-	3.3	-	-	-	1	-	2.8	-	-	-	1	-	2.9	-	-	-	1	-	3.3	-	-	-	1												
Bank Height Ratio	-	1.0	-	-	-	1	-	0.9	-	-	-	1	-	0.7	-	-	-	1	-	0.7	-	-	-	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

Hydrologic Data

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**Table 12. Verification of Bankfull Events
Shadrick Creek Restoration Project**

Shadrick Reach 1				
Date of Data Collection	Date of Occurrence	Method	Feet Above Bankfull Elevation	Photo # (if available)
6/5/2018	Unknown ²	Crest Gauge	0.05	n/a
11/8/2018	Unknown ³	Wrack Lines	Unknown	n/a
4/24/2019	Unknown ¹	Crest Gauge	0.4	n/a
4/24/2019	Unknown ¹	Wrack Lines	Unknown	n/a
4/22/2020	Unknown ⁵	Crest Gauge	1.1	1
4/22/2020	Unknown ⁵	Wrack Lines	Unknown	n/a
Shadrick Reach 3				
Date of Data Collection	Date of Occurrence	Method	Feet Above Bankfull Elevation	Photo # (if available)
2/5/2018	Unknown ⁴	Wrack Lines	Unknown	n/a
11/8/2018	Unknown ³	Crest Gauge	0.6	n/a
4/24/2019	Unknown ¹	Wrack Lines	Unknown	n/a
4/24/2019	Unknown ¹	Crest Gauge	0.4	n/a
4/22/2020	Unknown ⁵	Crest Gauge	0.6	2
4/22/2020	Unknown ⁵	Wrack Lines	Unknown	

¹ Suspected date is 4/17/2019 ³ Suspected date is 10/18/2018 ⁵ Suspected date is 2/4/2020

² Suspected date is 5/18/2018 ⁴ Suspected date is 1/12/2018

Photo Verification of Bankfull Events



Photo #1 – Shadrick Creek Reach 1 Crest Gauge at 2.26 feet (Recorded bankfull 1.2 feet)



Photo #2 – Shadrick Creek Reach 3 Crest Gauge at 2.22 feet (Recorded bankfull 1.6 feet)

Figure 3. Daily Precipitation Totals for the Shadrick Creek Restoration Site

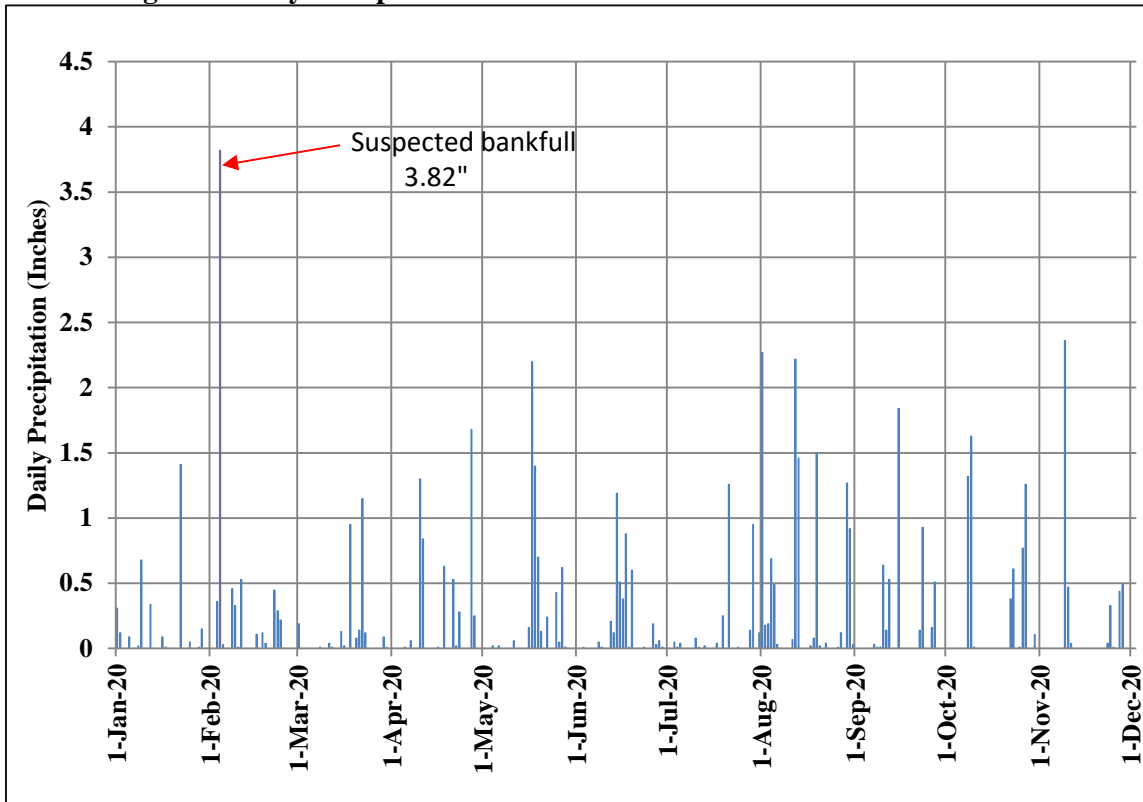
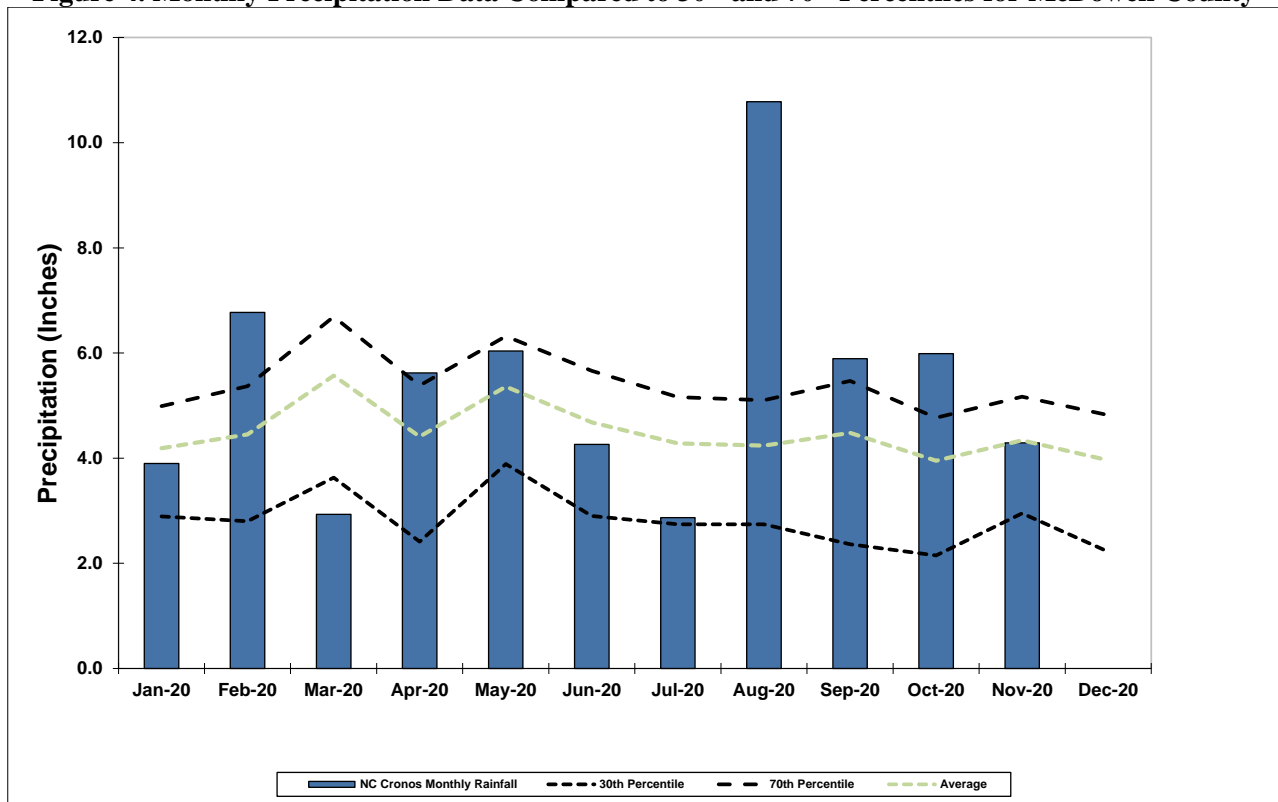


Figure 4. Monthly Precipitation Data Compared to 30th and 70th Percentiles for McDowell County



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Appendix F

Invasive vegetation management

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SHADRICK CREEK MITIGATION PROJECT - #D16020i - HERBICIDE LOG, INVOICE #2016-2021 #5

Date	Start / End Time	Certified Applicator	Areas	Target Species	Type	Herbicide	Solution (%)	Volume Herbicide Concentrate Used* (oz)	Volume Mixture Used (gal)	Weather	Temp (°F)	Wind Speed (mph)	Notes
8/4/2020	10:00-3:00pm	026-29539	Lower UT-2, Mainstem Reach 1, UT-9, UT-10	ROMU, LISI, LOJA, ELUM	Foliar	Glyphosate 5.4 in water plus CideKick adjuvant, blue dye	4	82	16	sunny, warm	83	1-3 mph	Retreatment of outlying stems within Reach 1 and all incoming tributaries except Upper UT-1 (wetland); incidental treatment of autumn olive seedlings;
			Lower UT-1, parts of mainstem; UT-5 up old road bed; lower UT-9	PUMO	Foliar	Clopyralid 3 in water plus CideKick adjuvant, blue dye	0.07	3	3				Cut/paint vines, spray ground infestations
			Lower UT-2, UT-3, Mainstem Reach 1 (targeted locations)	LISI, ROMU	Cut stump	Triclopyr 4 (ester) in Alligare BasOil Blue (basal diluent, soybean derived)	30	32	0.75				Cut stump treatment of large individual privet and incidental multiflora rose; several small patches eliminated;
10/1/2020	9:00-4:00pm	026-29539	Lower UT-2, Mainstem Reach 1, UT-9, UT-10	ROMU, LISI, LOJA, ELUM	Foliar	Triclopyr 3A (amine) in water plus CideKick adjuvant, blue dye	4	82	16	sunny, warm, dry	78	calm	Retreatment of outlying stems, spraying beyond CE boundary in certain areas to eliminate future issues; Follow up on UT 9 and 10; continued treatment required on UT-10 upper RDB;
			UT-1: Upper LDB above RR, at lower crossing; UT-2 along road;	PUMO	Foliar	Clopyralid 3 in water plus CideKick adjuvant, blue dye	0.07	3	3				Spray resprouts and any missed or new individuals; also sprayed outside of CE area to keep vines at bay;
			Reach 1 LDB; Lower UT-5 at wetland B; UT-9 Reach 2;	LISI, ROMU	Cut stump	Triclopyr 3A (amine) in water	50	32	0.5				Following up on heavy spray areas; cut stumping standing resprouting privet, rose, and occasional honeysuckle vine;

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