Monitoring Report
FINAL VERSION
Horne Creek Tributaries Mitigation Project
Monitoring Year 3
Calendar Year of Data Collection: 2022

NCDEQ DMS Project Identification # 100026
NCDEQ DMS Contract # 7181
Yadkin River Basin (Cataloging Unit 03040101)
USACE Action ID Number: SAW-2017-01510
NCDEQ DWR Project # 2017-1156
Surry County, NC
Contracted Under RFP # 16-006993, Date of Issue: August 16, 2016
Data Collection Period: July - October 2022
Submission Date: November 2022

Prepared for:

North Carolina Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
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Prepared by:

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November 30th, 2022

NC Department of Environmental Quality
Division of Mitigation Services
Attn: Matthew Reid, Project Manager
2090 U.S. 70 Highway
Swannanoa, NC 28778

RE: WLS Responses to NCDEQ DMS Review Comments for Task 9 Submittal, Monitoring Year 3 Report for the Horne Creek Tributaries Mitigation Project, DMS Full-Delivery Project ID #100026, Contract #7181, Yadkin River Basin, Cataloging Unit 03040101, Surry County, NC

Dear Mr. Reid:

Water & Land Solutions, LLC (WLS) is pleased to present the Final Monitoring Year 3 Report for the Horne Creek Tributaries Mitigation Project to the North Carolina Department of Environmental Quality (NCDEQ) Division of Mitigation Services (DMS). Per the DMS review comments, WLS has updated the Monitoring Year 3 Report and associated deliverables accordingly. The electronic deliverables are organized under the following folder structure as required under the digital submission requirements:

1. Report PDF
2. Support Files
    1_ Background Tables
    2_Visual
    3_Veg Data
    4_Geomorphology
    5_Hydro
    6_Other Data

We are providing our written responses to DMS' review comments on the Draft Monitoring Year 3 Report below. Each of the DMS review comments is copied below in **bold** text, followed by the appropriate response from WLS in regular text:

- **Please ensure the Monitoring Phase Performance Bond has been updated and approved by Kristie Corson before invoicing for Task 9.** Response: WLS will ensure that the Monitoring Phase Performance Bond has been updated and approved prior to invoicing for Task 9.

- **In an effort to identify and resolve property issues early during the monitoring period, please verify that the conservation easement boundary has been walked, marking and signage is up to spec, fencing is intact, and no encroachments have been identified.** Response: The easement boundary has been walked, fencing is intact, and no encroachments have been identified. Easement signage is up to spec and WLS will continue to monitor for encroachments on a quarterly basis.

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- **Title Page: Please add (Date of Issue: August 16, 2016) following the RFP#.** Response: The title page is updated as requested.

- **Please include the CCPV overview sheet (figure 1 in previous reports) in final submittal.** Response: The CCPV overview sheet has been added to the final monitoring report.

- **Recommend downloading flow gauge 2 prior to credit release meeting and having data available for discussion.** Response: WLS will download flow gauge 2 and have data available for discussion prior to credit release meeting.

- **Table 6a: Please verify data for Plot number 7. No volunteers were indicated in Table 6 for this plot; however, Table 6a shows 121 volunteers/acre.** Response: Table 6a incorrectly showed 121 volunteers/acre. As indicated in Table 6, there were no volunteers in Plot 7 during MY3 and the typo has been corrected in the final monitoring report.

- **Section 1.1 and 3.3: Recommend including "when volunteer species are included" when discussing eight of ten vegetation plots meeting success criteria.** Response: WLS has updated the language in the final monitoring report to include "when volunteer species are included" when discussing vegetation plot success criteria.

- **Table 2: Please add "Invasive Species Treatment" and the dates it occurred to the table. Please also move the bottom two entries to their chronological position in the table.** Response: Invasive species treatment was added to Table 2. The stream survey and vegetation survey were moved to chronological order.

- **Thank you for including updated picture of SPA5. Please provide update and photos once the area is repaired in MY4 report.** Response: WLS will continue to provide updates and photos of SPA5 in the MY4 report

Electronic Deliverable:

- **Please submit digital file with stream gauge flow graphs.** Response: Hydrology graphs are provided in the Hydro folder.

- **Please submit vegetation height data.** Response: Average vegetation height by plot is provided in Table 6a.

Please contact me if you have any questions or comments.

Sincerely,

Water & Land Solutions, LLC

Emily Dunnigan
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LIST OF APPENDICES

1 Project Summary

1.1 Project Location and Description

The Horne Creek Tributaries Mitigation Project ("Project") is a North Carolina Department of Environmental Quality (NCDEQ), Division of Mitigation Services (DMS) full-delivery mitigation project contracted with Water & Land Solutions, LLC (WLS) in response to RFP 16-006993. The Project construction and planting was completed in April 2020. The Project was built as documented in the approved mitigation plan and record drawings. The Project provides warm stream mitigation credits in the Yadkin River Basin (Cataloging Unit 03040101). The Project is located in Surry County approximately seven miles southwest of the Town of Pilot Mountain (36.282582°, -80.509153°).

The Project restored, enhanced, and permanently protected seven stream reaches (R1, R2, R3, R4, R4a, R4b, and R5) and their riparian buffers, totaling approximately 5,428 linear feet of stream channel. The Project provides significant ecological improvements and functional uplift through stream and aquatic habitat restoration and through decreasing nutrient and sediment loads within the watershed. The mitigation plan provides a detailed project summary and Table 1 provides a summary of project assets.

Monitoring Year 3 (MY3) activities occurred from July thru October 2022. This report presents the data for MY3. The Project meets the MY3 success criteria for stream horizontal and vertical stability, streambed condition and stability. Flow gauges 1 and 3 (FG-1, FG-3) did meet the flow requirement, and Flow gauge 2 (FG-2) on R2 did not meet the 30-day flow requirement. Eight of the ten vegetation plots are meeting interim success criteria when volunteer species are included. Based on these results, the Project is on trajectory to meet interim and final success criteria. For more information on the chronology of the project history and activity, refer to Appendix A, Table 2. Relevant project contact information is presented in the appendices in Table 3 and project background information is presented in Table 4.

1.2 Project Goals and Objectives

The Project is on track to meet the goals and objectives described in the Horne Creek Tributaries Final Approved Mitigation Plan and will address general restoration goals and opportunities outlined in the North Carolina Division of Mitigation Services (DMS) Upper Yadkin River Basin Restoration Priority Plan (RBRP) (DEQ 2009). More specifically, watershed goals and management strategies described in the Upper Yadkin Local Watershed Plan (LWP) will be met by:

- Reducing sediment, soil erosion, turbidity, and nutrient inputs such as fecal coliform bacteria, nitrogen, and phosphorus to the Horne Creek Watershed.
- Restoring, enhancing, and protecting headwater streams, wetlands, riparian buffers, and aquatic habitat functions.
- Improving riparian corridor management and targeting restoration of impacted streams and riparian buffer areas.
- Promoting agronomic farm management techniques and implementing agricultural BMPs and water quality features such as livestock exclusion fencing, alternative watering systems, and nutrient management devices.

To accomplish these project-specific goals, the following objectives will be measured to document overall project success:

- Provide a floodplain connection to the incised Project stream reaches by lowering bank height ratios (BHRs) to less than 1.2, thereby promoting more natural or overbank flood flows,
- Improve bedform diversity by increasing scour pool spacing and depth variability,
- Increase native species riparian buffer and vegetation density/composition along streambank and floodplain areas that meet requirements of a minimum 30-foot-wide and 210 stems/acre after the monitoring period,
- Improve aquatic habitat and fish species diversity and migration through the addition of in-stream cover and native woody debris,
- Site protection through an 11.87-acre conservation easement in excess of 30 feet from the top of the restored streambanks, that will protect all streams, wetlands and aquatic resources in perpetuity.

1.3 Project Success Criteria

The success criteria for the Project follows the approved performance standards and monitoring protocols from the final approved mitigation plan; which was developed in compliance with the USACE October 2016 Guidance, USACE Stream Mitigation Guidelines (April 2003 and October 2005), and 2008 Compensatory Mitigation Final Rule. Cross-section and vegetation plot data will be collected in Years 0, 1, 2, 3, 5, and 7. Stream hydrology data and visual monitoring will be reported annually. Specific success criteria components and evaluation methods are described below.

1.3.1 Streams

***Stream Hydrology*:** Four separate bankfull or over bank events must be documented within the seven-year monitoring period and the stream hydrology monitoring will continue until four bankfull events have been documented in separate years. Stream hydrology monitoring will be accomplished with pressure transducers installed in pools and correlating sensor depth to top of bank elevation (Figure 4). Recorded water depth above the top of bank elevation will document a bankfull event.

Stream Profiles, Vertical Stability, and Floodplain Access: Stream profiles, as a measure of vertical stability and floodplain access will be evaluated by looking at Bank Height Ratios (BHR). In addition, observed bedforms should be consistent with those observed for channels of the design stream type(s). The BHR shall not exceed 1.2 along the restored Project stream reaches. This standard only applies to restored reaches of the channel where BHRs were corrected through design and construction. Vertical stability will be evaluated with visual assessment, cross-sections and, if directed by the IRT, longitudinal profile.

Stream Horizontal Stability: Cross-sections will be used to evaluate horizontal stream stability on restored streams. There should be little change expected from as-built restoration cross-sections. If measurable changes do occur, they should be evaluated to determine if the changes represent a movement toward a more unstable condition (e.g., downcutting, erosion) or a movement towards increased stability (e.g., settling, vegetation establishment, deposition along the streambanks, decrease in width/depth ratio). Cross-sections shall be classified using the Rosgen Stream Classification method and all monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type.

Streambed Material Condition and Stability: Pebble counts or streambed material samples will not be collected per the DMS Pebble Count Data Requirements memo sent on October 19, 2021. The IRT reserves the right to request pebble count data/particle distributions if deemed necessary during the monitoring period.

Jurisdictional Stream Flow: Monitoring of stream flow will be conducted to demonstrate that the restored stream systems classified as intermittent exhibit surface flow for a minimum of 30 consecutive days throughout some portion of the year during a year with normal or below normal rainfall conditions. Stream flow monitoring will be accomplished with pressure transducers installed in pools and correlating sensor depth to the downstream top of riffle elevation (diagram in Appendix E). If the pool water depth is at or above the top of riffle elevation, then the channel will be assumed to have surface flow.

1.3.2 Vegetation

Vegetation monitoring will occur in the fall each required monitoring year, typically prior to leaf drop. Plots will be monitored in years 1, 2, 3, 5, and 7. Vegetative success for the Project during the intermediate monitoring years will be based on the survival of at least 320, three-year-old trees per acre at the end of Year 3 of the monitoring period; and at least 260, five-year-old, trees per acre that must average six feet in height at the end of Year 5 of the monitoring period. The final vegetative restoration success criteria will be achieving a density of no less than 210, seven-year-old stems per acre that must average eight feet in height in Year 7 of monitoring. Volunteer species on the approved planting list that meet success criteria standards will be counted towards success criteria.

1.3.3 Visual Assessment

WLS will conduct visual assessments in support of mitigation performance monitoring. Visual assessments of all stream reaches will be conducted twice per monitoring year with at least five months in between each site visit for each of the seven years of monitoring. Photographs will be used to visually document system performance and any areas of concern related to streambank and bed stability, condition of in-stream structures, channel migration, active headcuts, live stake mortality, invasive plant species or animal browsing, easement boundary encroachments, cattle exclusion fence damage, and general streambed conditions. Permanent photo points will be located at cross-sections, culvert crossings, and Enhancement II reaches.

2 Project Mitigation Components

2.1 Project Components

The Project mitigation components include a combination of Stream Restoration and Enhancement activities, as summarized in the table below.

Table 1. Mitigation Plan Stream Mitigation Credits (SMCs)

Project Component	Existing Footage or Acreage	Proposed Reach Stationing	Restored Footage, Acreage, or SF	Creditable Footage, Acreage or SF	Restoration Level	Approach Priority Level	Mitigation Ratio (X:1)	Mitigation Credits
R1	1,397	10+00 – 23+40	1,320	1,320	R	PI/PII	1	1,320
R2	286	10+17 – 13+13	296	296	R	PII	1	296
R3	75	11+80 – 12+55	76	76	R	PII	1	76
R4	1,191	13+13 – 25+19	1,167	1,167	R	PI/PII	1	1,167
R4a	124	10+98 – 11+54	57	57	EII	-	2.5	23
R4a	-	11+55 – 12+65	111	111	R	PI	1	111
R4b	89	10+72 – 10+99	27	27	EII	-	2.5	11
R4b	-	10+99 – 12+24	125	125	R	PI	1	125
R5	2,519	25+19 – 48+12	2,249	2,249	R	PI	1	2,249
Totals	**5,681**		**5,428**	**5,428**				**5,378**
							Credit Loss in Required Buffer	-300
							Credit Gain for Additional Buffer	325
							Net Change in Credit from Buffers	+25
							Total Credits per Buffer Calculator	5,403
							Total Adjusted SMCs	**5,389**

3 Monitoring Year 3 Assessment and Results

The dates of Year 3 monitoring activities are detailed in Appendix A, Table 2. All Year 3 monitoring data is presented in this report and in the appendices. The Project is on track for meeting stream interim success criteria. The flow gauge located on upper R2 did not meet the 30-day flow requirement. Eight of the ten vegetation plots are meeting interim success criteria. All monitoring device locations are depicted on the CCPV (Figure 1).

3.1 Morphological Assessment

3.1.1 Stream Horizontal Pattern & Longitudinal Profile

Visual assessment and cross-section surveys were utilized for assessment of MY3 horizontal and vertical stream stability. The visual assessments for each stream reach concluded that the MY3 stream channel

pattern and longitudinal profiles, and in-stream structure location/function, still closely match the profile design parameters and MY0/baseline conditions (Appendix D). The MY3 planform geometry and dimensions fall within acceptable ranges of the design parameters for all restored reaches. Minor channel adjustments in riffle slopes, pool depths and pattern were observed based on natural sediment migration and stream bank vegetation establishment but did not present a stability concern or indicate a need for remedial action.

During the fall visual assessment for MY1, WLS staff noted seven potential problem areas outside the channel. One additional in-channel problem area was noted during MY2. Problem areas 1-4, 6, and 7 from MY2 have all been stabilized and are no longer considered problem areas. The remaining areas are noted on the CCPV (Figures 1a-1c) and photos can be found in Appendix B and the E-Data Submission included with this report. No additional problem areas were identified during MY3.

- **SPA5**- On R5, in the left floodplain area: minor deposition and erosion is occurring adjacent to station 32+60 as a result of erosion outside of the easement.
    - **MY2 Action**: During August 2021, WLS installed straw bales and coir logs outside of the easement to slow and spread the flow of water coming off the farm field, planted livestakes in the easement, and re-seeded. The installation of coir logs/straw bales in the farm field and increased vegetation cover reduced erosion in this area but did not permanently arrest the erosion. No deposition or erosion is impacting the R5 channel.
    - **MY3 Action**: No action was taken during MY3. During MY4, the area outside the easement will be repaired by grading the slope drainage feature, applying temporary and permanent seeding, and installing a permanent erosion control liner. All proposed work will take place outside the conservation easement.
- **SPA8**- On R4, just below two log vanes from approximate station 20+75 to 21+75, an area of the stream has dropped elevation and has some eroding banks. Coarse riffle substrate is still present, the log vanes directly upstream are stable and functional, and the culvert immediately downstream is holding grade. Supplemental cross-section data was collected from a riffle in this area and the data is located in Appendix D. No remedial action is required at this time, and this area will continue to be monitored closely in MY4.

3.1.2 Stream Horizontal Dimension

The MY3 channel dimensions generally match the design parameters and are within acceptable and stable ranges of tolerance. Data for the 16 cross-sections (eight riffle and eight pool) can be found in Appendix D. It is expected over time that some pools may accumulate fine sediment and organic matter, however, this is not an indicator of channel instability. Maximum riffle depths are also expected to fluctuate throughout the monitoring period as the channels adjust to the new flow regime. Of the eight riffle cross-sections, four experienced minor changes in bank height ratio (BHR) from MY0 to MY3. Two of the eight riffle cross-sections (XS-10 and XS-12) have decreased BHRs from MY2, but still have BHRs above 1.2. One riffle cross-section, XS-15 on R5, experienced minor aggradation due to sediment migration and thick herbaceous vegetation occurring during MY3. The cross-section is stable and shows minimal change from MY1. Three riffle cross sections, XS-10, XS-12, and XS-14 on R5, experienced degradation. XS-10 and XS-12 on R5, experienced degradation due to bed material entrainment from the riffles during MY2 storm events. Both riffles adjusted to be shorter and migrated slightly downstream, resulting in apparent degradation. R5 is stable above and below both cross-sections. XS-10 and XS-12 were re-surveyed in

Spring 2022 during visual assessments for MY3 and the cross-section data showed no major changes from MY2. XS-14 is stable and shows minimal changes from MY1. Visual surveys indicate the areas affected through aggradation and degradation are functioning and stable. WLS will closely monitor any changes to all stream reaches during MY4.

3.2 Stream Hydrology

3.2.1 Stream Flow

Two flow gauges (FG-1 and FG-3), installed in May 2020 on R1 and R4 respectively, documented that the stream exhibited surface flow for a minimum of 30 consecutive days throughout the monitoring year (Appendix E). One additional flow gauge (FG-2) was installed during MY1 further upstream on Reach R2 on September 18th, 2020, in response to IRT comments received during the September 15th, 2020, site visit. FG-2 did not meet the 30-day flow requirement, recording a maximum flow duration of 10 days. FG-2 data for the remainder of 2022 will be provided in the MY4 report Additionally, to determine if rainfall amounts are normal for the given year, precipitation data was obtained from Pilot Mountain Weather Station (CBTN7), approximately five miles north of the site. Rainfall was above normal for 2022 (Appendix E).

Flow Gauge Data

Flow Gauge Name	Flow Gauge Location	Longest Period of Consecutive Flow	Total Days of Cumulative Flow	Total Days of No Flow	Longest Period of Consecutive No Flow
FG-1	R1	279 days 1/1/2022 – 10/6/2022	279 days	0 days	0 days
FG-2	R2	10 days 2/23/2022 – 3/4/2022	72 days	207 days	36 days
FG-3	R4	141 days 5/19/2022 – 10/6/2022	273 days	6 days	2 days

3.2.2 Bankfull Events

During MY3, bankfull events were recorded on both pressure transducer and crest gauges. CG-1 (R1) recorded ten events with a maximum event of 1.00’ above bankfull. CG-2 (R5) recorded five events with a maximum event of 1.16’ above bankfull. Additionally, the cork crest gauge located adjacent to CG-1 on R1 recorded one bankfull event. The associated data and photographs are located in Appendix E.

3.3 Vegetation

Monitoring of the 10 permanent vegetation plots was completed during September and October 2022. Vegetation data can be found in Appendix C with the associated photos located in Appendix B. The MY3 average density is 417 stems per acre, which exceeds the interim measure of vegetative success of at least 320 stems per acre at the end of the third monitoring year. Two of the ten plots are below the interim success criteria due to prolonged saturation and thick herbaceous cover. Plot 6 is two stems below interim success criteria but is meeting the final success criteria. A random vegetation plot was surveyed adjacent to Plot 6 and met the interim success criteria with 324 stems/acre. Plot 9, located on R5, had 162 stems/acre. Many black willow stems (22) were found in Plot 9, only two were included in the total stem count. A random vegetation plot was surveyed adjacent to plot 9 and met the interim success criteria with 364 stems/acre. An area on R5 was noted during an IRT site visit to have low stem density. A random

vegetation plot was surveyed in this area and met interim success criteria with 405 stems/acre. No remedial action is proposed at this time. Random vegetation plots will be surveyed again in MY5. The permanent vegetation plots had 162 to 567 stems per acre, including appropriate volunteers. Volunteer persimmon (*Diospyros virginiana*), tulip poplar (*Liriodendron tulipifera*), and black willow (*Salix nigra*) were noted in MY3, and more are expected to establish in upcoming years. These volunteer species are on the approved mitigation plan planting list and are counted towards success criteria, with no one tree species being counted more than 50 percent. Plots 2, 5, and 10 did not meet interim success criteria with planted stems, but these plots do meet criteria with the addition of volunteer stems. Volunteer black willow is doing well in these areas. Plots 6 and 9 are in the old channel area and as a result have prolonged saturation and dense herbaceous vegetation.

Visual assessment of vegetation outside of the monitoring plots indicates that the herbaceous vegetation is becoming well established throughout the project.

A small cluster (below the mapping threshold) of princess tree (*Paulownia tomentosa*) is located on the right side slope of R4 and is actively being cut-stump treated with herbicide. No other areas of significant invasive plant species were observed during monitoring year 3. The site will be monitored closely, and any invasive plant species will be treated as needed. Small populations of narrow-leaved cattail (*Typha latifolia*) are present in some saturated floodplain areas; however, none were observed causing issues within the channels.

Invasive Species Treatment Table

Monitoring Year	Species	Date	Treatment
MY3	Princess Tree	4/6/2022	Rodeo cut-stump
	Princess Tree	11/23/2022	Rodeo cut-stump

3.4 Macrobenthic Sampling

Two macrobenthic sampling locations were surveyed prior to restoration activities on June 5th, 2018, on R1 and R5. R1 had a biotic index score of 6.53 and R5 had a score of 4.99. Two macrobenthic sampling locations were surveyed in MY3 on May 10th, 2022, on R1 and R5. R1 had a biotic index score of 8.24 and R5 had a score of 5.65. Benthic data and photographs are located in Appendix F.

4 Methods

Stream cross-section monitoring was conducted using a Topcon Total Station. Survey data was imported into Microsoft Excel® for data processing and analysis. The stage recorders include an automatic pressure transducer (HOBO Water Level (13 ft) Logger) set in PVC piping in the channel. The elevation of the bed and top of bank at each stage recorder location was recorded to be able to document presence of water in the channel and out of bank events. Visual observations (i.e. wrack or debris lines) and traditional cork crest gauges will also be used to document out of bank events.

Vegetation success is being monitored at a total of 10 permanent vegetation plots. Vegetation plot 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 and volunteer species. Data are processed using the CVS data entry tool. In the field, the four corners of each plot were permanently

marked with PVC at the origin and rebar at the other corners. Tree species and height will be recorded for each planted stem and photos of each plot are to be taken from the origin each monitoring year.

Benthic macroinvertebrate (BMI) sampling used methods and procedures defined by DWR's *Standard Operating Procedures for the Collection and Analysis of Benthic Macroinvertebrates* (NCDWR, 2016) to determine a Biotic Index (BI) value and a bioclassification rating. Sampling was conducted during MY3 and will be conducted again in MY7.

Appendix A:
Background Tables

Table 1. Horne Creek Tributaries (ID-100026) - Mitigation Assets and Components

Project Segment	Existing Footage or Acreage	Mitigation Plan Footage or Acreage	Mitigation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)	As-Built Footage or Acreage	Comments
R1	1,397	1,320	Warm	R	PI/PII	1.00000	1,342	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement
R2	286	296	Warm	R	PII	1.00000	289	Full Channel Restoration, Planted Buffer, Permanent Conservation Easement
R3	75	76	Warm	R	PII	1.00000	73	Full Channel Restoration, Planted Buffer, Permanent Conservation Easement
R4	1,191	1,167	Warm	R	PI/PII	1.00000	1,181	Full Channel Restoration, Planted Buffer, Permanent Conservation Easement
R4A	124	57	Warm	EII	PI	2.50000	57	Supplemental Planting of Buffer, Livestock Exclusion, Permananent Easement
R4A	-	111	Warm	R	PI	1.00000	105	Full Channel Restoration, Planted Buffer, Permanent Conservation Easement
R4B	89	27	Warm	EII	PI	2.50000	27	Supplemental Planting of Buffer, Livestock Exclusion, Permananent Easement
R4B	-	125	Warm	R	PI	1.00000	123	Full Channel Restoration, Planted Buffer, Permanent Conservation Easement
R5	2,519	2,249	Warm	R	PI	1.00000	2,270	Full Channel Restoration, Planted Buffer, Permanent Conservation Easement.

Project Credits

Restoration Level	Stream			Riparian Wetland		Non-Rip Wetland	Coastal Marsh
	Warm	Cool	Cold	Riverine	Non-Riv		
Restoration	5344.000						
Re-establishment							
Rehabilitation							
Enhancement							
Enhancement I							
Enhancement II	33.600						
Creation							
Preservation							
Totals	5377.600			0.000	0.000	0.000	

Overall Assets Summary	
Asset Category	**Overall Credits**
Stream	5,378
RP Wetland	NA
NR Wetland	NA
Buffer	NA
Buffer Loss SMC	-300
Buffer Gain SMC	325
Total SMU	5,403
Total Adjusted SMCs	5,389

Table 2. Project Activity and Reporting History Horne Creek Tributaries Mitigation Project #100026		
Elapsed Time Since grading complete:	**2 year 6 months**	
Elapsed Time Since planting complete:	**2 year 6 months**	
Number of reporting Years[1]:	**3**	
Activity or Deliverable	**Data Collection Complete**	**Completion or Delivery**
Institution Date	N/A	05/22/17
404 permit date	N/A	01/15/20
Mitigation Plan	N/A	07/29/19
Final Design – Construction Plans	N/A	07/29/19
Construction	N/A	04/30/20
Containerized, bare root and B&B plantings for reach/segments 1&2	N/A	04/30/20
As-built (Year 0 Monitoring – baseline)		
Vegetation Monitoring	5/6/2020	N/A
Stream Survey	5/8/2020	N/A
As-built (Year 0 Monitoring – baseline) Report	5/20/2020	7/1/2020
Year 1 Monitoring		
Stream Survey	11/5/2020	N/A
Vegetation Monitoring	11/10/2020	N/A
Year 1 Monitoring Report	11/10/2020	11/20/2020
Year 2 Monitoring		
Encroachment Planting	N/A	2/4/2021
Livestake Planting and Maintenance	N/A	February 2021
Vegetation Monitoring	10/27/2021	N/A
Stream Survey	10/27/2021	N/A
Year 2 Monitoring Report	10/27/2021	12/23/2021
Year 3 Monitoring		
Invasive Species Treatment	N/A	4/6/2022
Stream Survey	8/3/2022	N/A
Vegetation Monitoring	10/6/2022	N/A
Invasive Species Treatment	N/A	11/23/2022
Year 3 Monitoring Report	10/6/2022	11/30/2022
Year 4 Monitoring		
Vegetation Monitoring		
Stream Survey		
Year 4 Monitoring Report		
Year 5 Monitoring		
Vegetation Monitoring		
Stream Survey		
Year 5 Monitorig Report		
Year 6 Monitoring		
Vegetation Monitoring		
Stream Survey		
Year 6 Monitoring Report		
Year 7 Monitoring/ Close Out		
Vegetation Monitoring		
Stream Survey		
Year 7 Monitoring Report		

Table 3. Project Contacts Horne Creek Tributaries Mitigation Project #100026	
Designer	Water & Land Solutions, LLC
	7721 Six Forks Rd, Ste. 130, Raleigh, NC 27615
Primary project design POC	Christopher Tomsic - (828) 493-3287
Construction Contractor	North State Environmental, Inc.
	2889 Lowery Street, Winston-Salem, NC 27101
Construction contractor POC	Andrew Roten - (336) 406-9078
Survey Contractor	Ascension Land Surveying
	116 Williams Road, Mocksville, NC 27028
Survey contractor POC	Christopher Cole - (704) 579-7197
Planting Contractor	Ripple EcoSolutions, LLC
	215 Moonridge Rd, Chapel Hill, NC 27516
Planting contractor POC	George Morris - (919) 818-3984
Seeding Contractor	North State Environmental, Inc.
	2889 Lowery Street, Winston-Salem, NC 27101
Contractor point of contact	Andrew Roten - (336) 406-9078
Seed Mix Sources	Green Resource
	(336) 588-6363
Nursery Stock Suppliers (Bare Roots)	Native Forest Nursery
	(704) 483-3397
Nursery Stock Suppliers (Bare Roots/plugs)	Mellow Marsh Farm
	(919) 742-1200
Nursery Stock Suppliers (Live Stakes)	Foggy Mountain Nursery
	(336) 384-5323
Monitoring Performers	Water & Land Solutions, LLC
	7721 Six Forks Rd, Ste. 130, Raleigh, NC 27615
Stream Monitoring POC	Emily Dunnigan - (269) 908-6306
Vegetation Monitoring POC	Emily Dunnigan - (269) 908-6306
Wetland Monitoring POC	N/A; Emily Dunnigan - (269) 908-6306

Table 4. Project Background Information				
Project Name	Horne Creek Tributaries			
County	Surry			
Project Area (acres)	11.87			
Project Coordinates (latitude and longitude)	36.2851950º N, -80.5032100º W			
Planted Acreage (Acres of Woody Stems Planted)	10.2			
Project Watershed Summary Information				
Physiographic Province	Piedmont			
River Basin	Yadkin			
USGS Hydrologic Unit 8-digit	03040101	USGS Hydrologic Unit 14-digit	03040101110070	
DWR Sub-basin	03-07-02			
Project Drainage Area (Acres and Square Miles)	0.06 (R1) and 0.26 (R5)			
Project Drainage Area Percentage of Impervious Area	<1%			
CGIA Land Use Classification	2.01.03, 2.01.01, 3.02 (46% pasture/hay, 24% row crop, 16% mixed forest)			

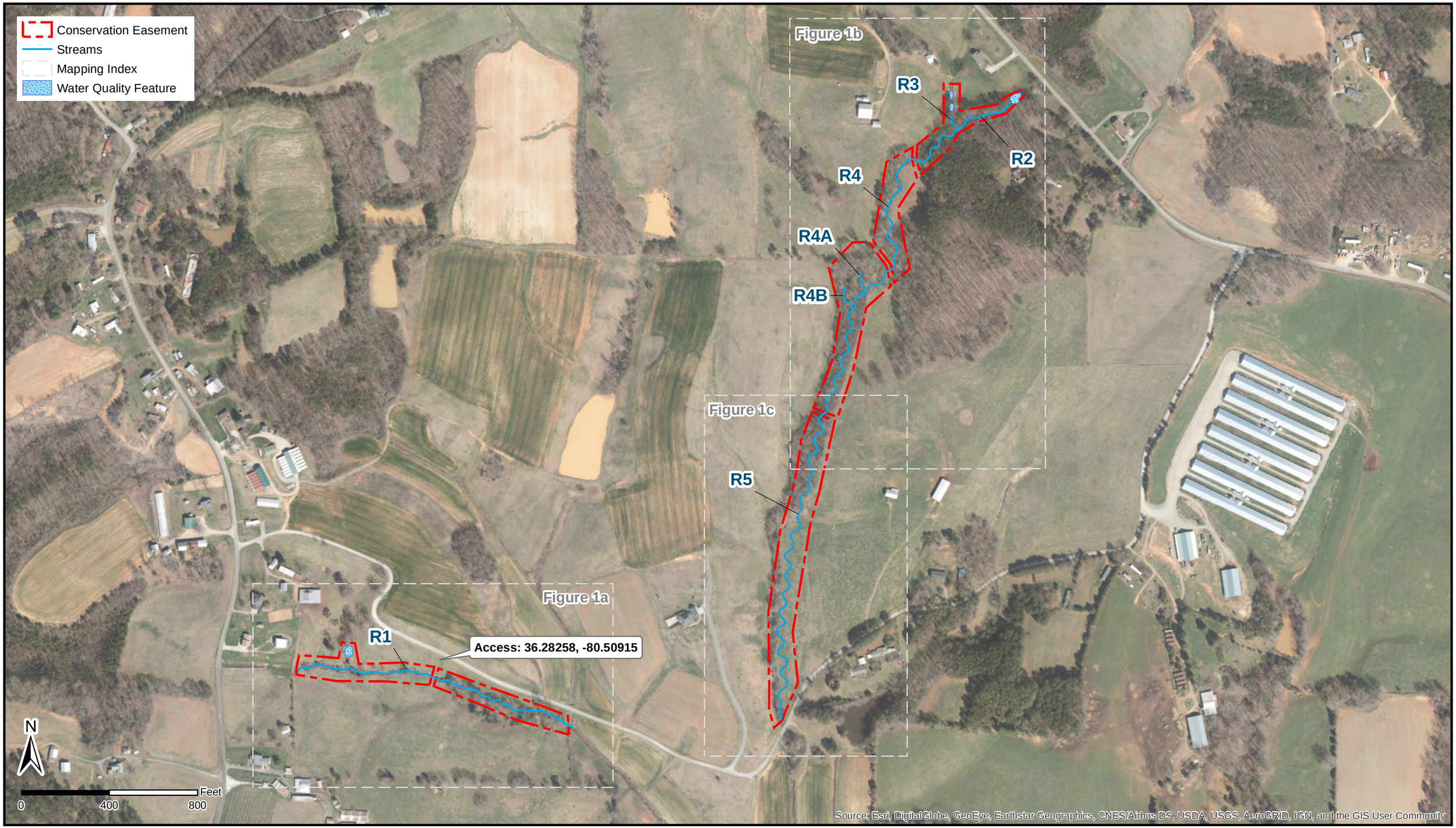
Reach Summary Information							
Parameters	**Reach 1**	**Reach 2**	**Reach 3**	**Reach 4**	**Reach 4A**	**Reach 4B**	**Reach 5**
Length of reach (linear feet)	1,320	296	76	1,167	168	152	2,249
Valley confinement (Confined, moderately confined, unconfined)	mod confined	mod confined	mod confined	unconfined	unconfined	unconfined	unconfined
Drainage area (Acres and Square Miles)	38 and 0.06	41 and 0.06	29 and 0.05	83 and 0.13	29 and 0.05	2 and 0.003	166 and 0.26
Perennial, Intermittent, Ephemeral	Perennial	Intermittent	Intermittent	Perennial	Perennial/Intermittent	Perennial/Intermittent	Perennial
NCDWR Water Quality Classification	C	C, WS-IV	C	C, WS-IV	C	C	C, WS-IV
Stream Classification (existing)	E5b/F5b (incised)	G4 (incised)	E6b (incised)	B4 (incised)	B4c (incised)	G5	B4c/G4c (incised)
Stream Classification (proposed)	B4	B4	B4a	B4/C4b	B4	B4	C4
Evolutionary trend (Simon)	III/IV	III	III	IV/V	I	I	IV/V
FEMA classification	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	Yes	PCN
Water of the United States - Section 401	Yes	Yes	PCN
Endangered Species Act	Yes	Yes	Categorical Exclusion
Historic Preservation Act	Yes	Yes	Categorical Exclusion
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	Categorical Exclusion

Appendix B:

Visual Assessment Data

Figure 1: Current Condition Plan View (CCPV)
Table 5a-g: Visual Stream Morphology Stability Assessment
Table 5h: Vegetation Condition Assessment
Stream Photo Points (Cross-Sections, Culvert Crossings, EII Reaches)
Vegetation Plot Photographs
Random Vegetation Plot Photographs
Potential Problem Area Photographs



WATER & LAND™ SOLUTIONS

Horne Creek Tributaries Mitigation Project
Surry County, North Carolina

USACE Action ID Number: SAW-2017-01510
DMS project number: 100026
November 2022
MY3

Current Conditions
Plan View
Monitoring Year 3

NAD 1983 2011 State Plane
North Carolina FIPS 3200 FT US

FIGURE
1

Conservation Easement
Fence
Top of Bank
Restoration
Pressure Gauge
Flow Gauge
Crest Gauge
Photo Station
Benthic Sampling
Cross Section
Water Quality Feature
Existing Wetland (No Credit)
Culvert

Vegetation Plots (Total Stems/Planted Stems)

Success Criteria Not Met
Success Criteria Met
Random 2m x 50m Vegetation Plot

Kiger Rd

Access: 36.282582, -80.509153

VP1 (364/324)
VP2 (526/283)
VP3 (526/526)
R1
PG-1
PS-1
PS-8
FG-1
XS-1
XS-2
XS-3
XS-4
CG-1
Culvert

10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
20+00
21+00
22+00
23+00
23+58

N

0 100 200 Feet

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

WATER & LAND™ SOLUTIONS

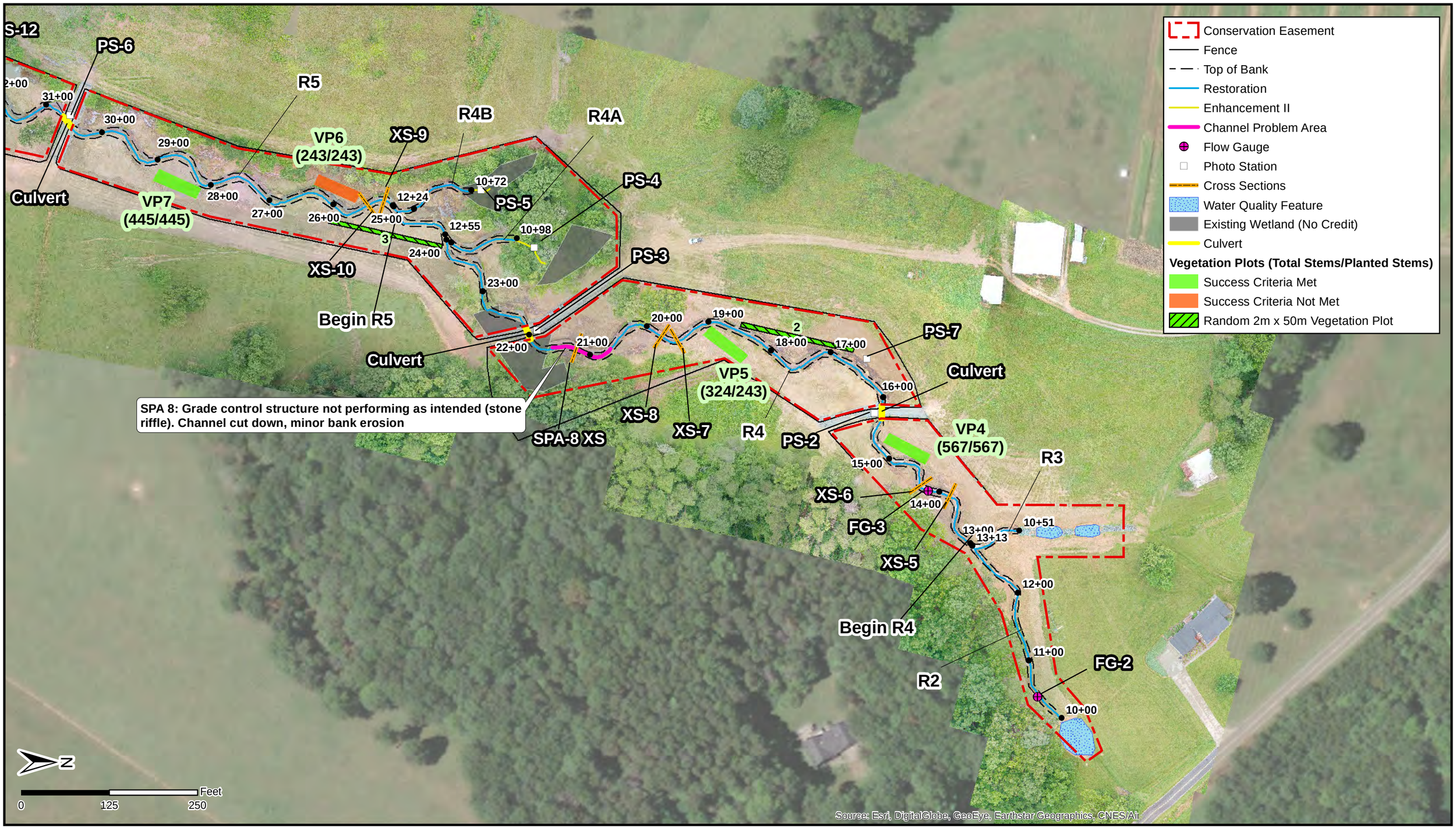
Horne Creek Tributaries Mitigation Project
Surry County, North Carolina

USACE Action ID Number: SAW-2017-01510
DMS project number: 100026
November 2022
MY3

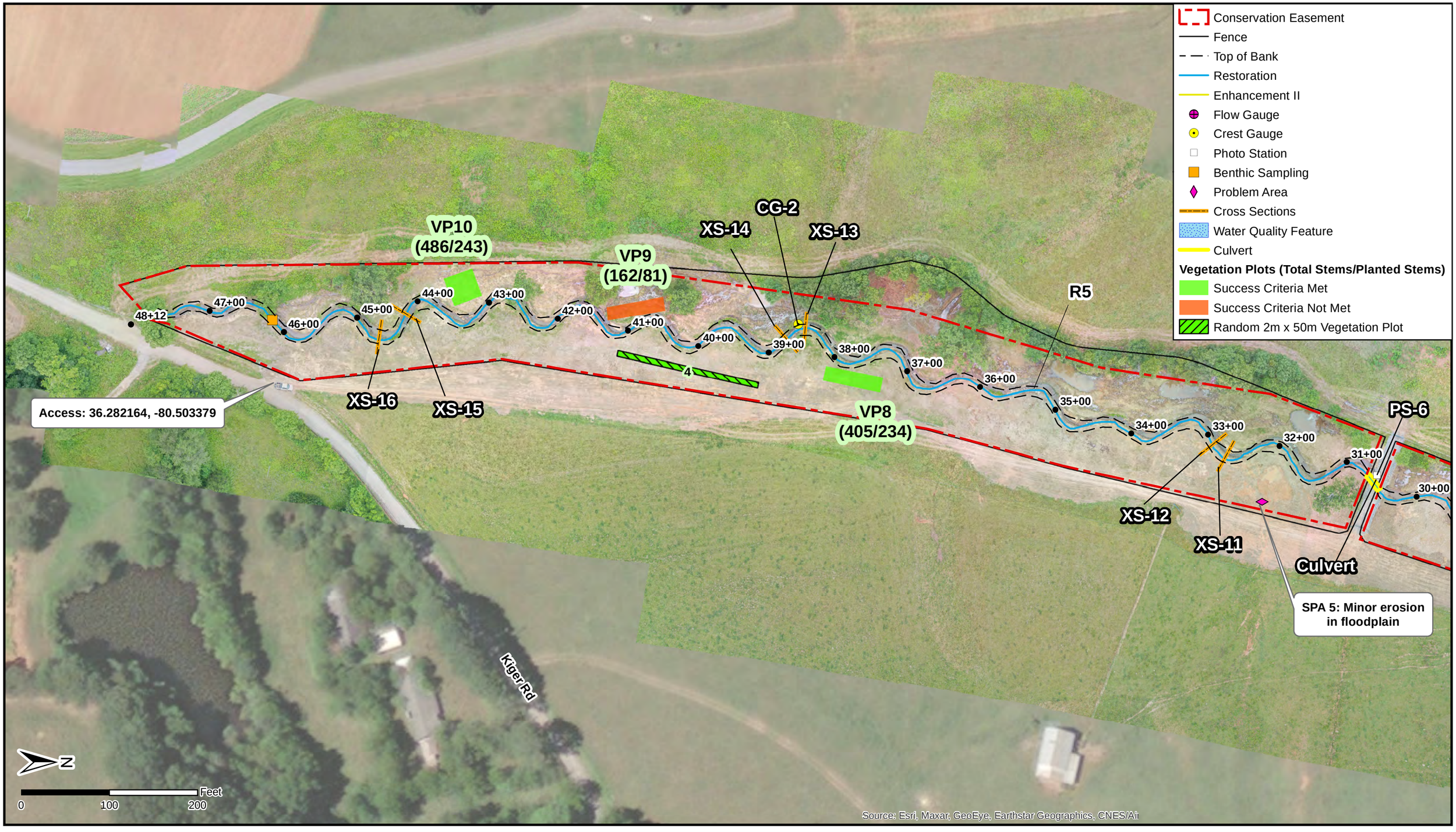
Current Conditions
Plan View
Monitoring Year 3

NAD 1983 2011 State Plane
North Carolina FIPS 3200 FT US

FIGURE
1a



WATER & LAND™ SOLUTIONS	**Horne Creek Tributaries Mitigation Project** **Surry County, North Carolina**	USACE Action ID Number: SAW-2017-01510 DMS project number: 100026 November 2022 MY3	Current Conditions Plan View Monitoring Year 3 NAD 1983 2011 State Plane North Carolina FIPS 3200 FT US	FIGURE 1b



WATER & LAND™ SOLUTIONS	**Horne Creek Tributaries Mitigation Project** **Surry County, North Carolina**	USACE Action ID Number: SAW-2017-01510 DMS project number: 100026 November 2022 MY3	Current Conditions Plan View Monitoring Year 3 NAD 1983 2011 State Plane North Carolina FIPS 3200 FT US	FIGURE 1c

Table 5a	Visual Stream Morphology Stability Assessment									
Project:	Horne Creek Tributaries Mitigation Project (DMS ID #100026)									
Reach ID:	R1									
Assessed Length:	1,342									
Date of Survey	4/6/2022 and 10/6/2022									
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 NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	79	79			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	39	39			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	39	39			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	2	2			100%			

Table 5b	Visual Stream Morphology Stability Assessment									
Project:	Horne Creek Tributaries Mitigation Project (DMS ID #100026)									
Reach ID:	R2									
Assessed Length:	289									
Date of Survey	4/6/2022 and 10/6/2022									
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 NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	22	22			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	12	12			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	12	12			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	0	0			#DIV/0!			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	0	0			#DIV/0!			

Table 5c	Visual Stream Morphology Stability Assessment									
Project:	Horne Creek Tributaries Mitigation Project (DMS ID #100026)									
Reach ID:	R3									
Assessed Length:	73									
Date of Survey	4/6/2022 and 10/6/2022									
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 NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	4			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	0	0			#DIV/0!			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	0	0			#DIV/0!			

Table 5d	Visual Stream Morphology Stability Assessment										
Project:	Horne Creek Tributaries Mitigation Project (DMS ID #100026)										
Reach ID:	R4										
Assessed Length:	1,181										
Date of Survey	4/6/2022 and 10/6/2022										
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	91	96%	0	0	96%
*	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	1	91	96%	0	0	96%
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	52	52			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	21	22			95%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	25	25			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	14	14			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	14	14			100%			

Table 5e	Visual Stream Morphology Stability Assessment									
Project:	Horne Creek Tributaries Mitigation Project (DMS ID #100026)									
Reach ID:	R4a									
Assessed Length:	162									
Date of Survey	4/6/2022 and 10/6/2022									
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 NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	5	5			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	1	1			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	0	0			#DIV/0!			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	0	0			#DIV/0!			

Table 5f	Visual Stream Morphology Stability Assessment									
Project:	Horne Creek Tributaries Mitigation Project (DMS ID #100026)									
Reach ID:	R4b									
Assessed Length:	150									
Date of Survey	4/6/2022 and 10/6/2022									
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 NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	10	10			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	4			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	0	0			#DIV/0!			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	0	0			#DIV/0!			

Table 5g	Visual Stream Morphology Stability Assessment									
Project:	Horne Creek Tributaries Mitigation Project (DMS ID #100026)									
Reach ID:	R5									
Assessed Length:	2,270									
Date of Survey	4/6/2022 and 10/6/2022									
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 NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	81	81			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	28	28			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	32	32			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	26	26			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	26	26			100%			

Table 5h	Vegetation Condition Assessment					
Project:	Horne Creek Tributaries Mitigation Project (DMS ID #100026)	Date of Survey: 4/6/2021 and 10/6/2022				
Planted Acreage[1]:	10.2					
Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	1 acre	Solid light blue	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	Transparent light green	0	0.00	0.0%
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	Pattern and Color	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%

Easement Acreage[2]:	11.9					
Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Areas or points (if too small to render as polygons at map scale).	1000 SF	orange hatched	0	0.00	0.0%
5. Easement Encroachment Areas[3]	Areas or points (if too small to render as polygons at map scale).	none	Green dotted line	0	0.00	0.0%

R1, XS1, Upstream, (MY-00)

R1, XS1, Upstream (MY-03)

R1, XS1, Downstream (MY-00)

R1, XS1, Downstream (MY-03)

R1, XS1, Left Bank (MY-00)

R1, XS1, Left Bank (MY-03)

R1, XS1, Right Bank (MY-00)

R1, XS1, Right Bank (MY-03)

R1, XS2, Upstream (MY-00)

R1, XS2, Upstream (MY-03)

R1, XS2, Downstream (MY-00)

R1, XS2, Downstream (MY-03)

R1, XS2, Left Bank (MY-00)

R1, XS2, Left Bank (MY-03)

R1, XS2, Right Bank (MY-00)

R1, XS2, Right Bank (MY-03)

R1, XS3, Upstream (MY-00)

R1, XS3, Upstream (MY-03)

R1, XS3, Downstream (MY-00)

R1, XS3, Downstream (MY-03)

R1, XS3, Left Bank (MY-00)

R1, XS3, Left Bank (MY-03)

R1, XS3, Right Bank (MY-00)

R1, XS3, Right Bank (MY-03)

R1, XS4, Upstream (MY-00)

R1, XS4, Upstream (MY-03)

R1, XS4, Downstream (MY-00)

R1, XS4, Downstream (MY-03)

R1, XS4, Left Bank (MY-00)

R1, XS4, Left Bank (MY-03)

R1, XS4, Right Bank (MY-00)

R1, XS4, Right Bank (MY-03)

R2, XS5, Upstream (MY-00)

R2, XS5, Upstream (MY-03)

R2, XS5, Downstream (MY-00)

R2, XS5, Downstream (MY-03)

R2, XS5, Left Bank (MY-00)

R2, XS5, Left Bank (MY-03)

R2, XS5, Right Bank (MY-00)

R2, XS5, Right Bank (MY-03)

R2, XS6, Upstream (MY-00)

R2, XS6, Upstream (MY-03)

R2, XS6, Downstream (MY-00)

R2, XS6, Downstream (MY-03)

R2, XS6, Left Bank (MY-00)

R2, XS6, Left Bank (MY-03)

R2, XS6, Right Bank (MY-00)

R2, XS6, Right Bank (MY-03)

R4, XS7, Upstream (MY-00)

R4, XS7, Upstream (MY-03)

R4, XS7, Downstream (MY-00)

R4, XS7, Downstream (MY-03)

R4, XS7, Left Bank (MY-00)

R4, XS7, Left Bank (MY-03)

R4, XS7, Right Bank (MY-00)

R4, XS7, Right Bank (MY-03)

R4, XS8, Upstream (MY-00)

R4, XS8, Upstream (MY-03)

R4, XS8, Downstream (MY-00)

R4, XS8, Downstream (MY-03)

R4, XS8, Left Bank (MY-00)

R4, XS8, Left Bank (MY-03)

R4, XS8, Right Bank (MY-00)

R4, XS8, Right Bank (MY-03)

R4, XS9, Upstream (MY-00)

R4, XS9, Upstream (MY-03)

R4, XS9, Downstream (MY-00)

R4, XS9, Downstream (MY-03)

R4, XS9, Left Bank (MY-00)

R4, XS9, Left Bank (MY-03)

R4, XS9, Right Bank (MY-00)

R4, XS9, Right Bank (MY-03)

R4, XS10, Upstream (MY-00)

R4, XS10, Upstream (MY-03)

R4, XS10, Downstream (MY-00)

R4, XS10, Downstream (MY-03)

R4, XS10, Left Bank (MY-00)

R4, XS10, Left Bank (MY-03)

R4, XS10, Right Bank (MY-00)

R4, XS10, Right Bank (MY-03)

R5, XS11, Upstream (MY-00)

R5, XS11, Upstream (MY-03)

R5, XS11, Downstream (MY-00)

R5, XS11, Downstream (MY-03)

R5, XS11, Left Bank (MY-00)

R5, XS11, Left Bank (MY-03)

R5, XS11, Right Bank (MY-00)

R5, XS11, Right Bank (MY-03)

R5, XS12, Upstream (MY-00)

R5, XS12, Upstream (MY-03)

R5, XS12, Downstream (MY-00)

R5, XS12, Downstream (MY-03)

R5, XS12, Left Bank (MY-00)

R5, XS12, Left Bank (MY-03)

R5, XS12, Right Bank (MY-00)

R5, XS12, Right Bank (MY-03)

R5, XS13, Upstream (MY-00)

R5, XS13, Upstream (MY-03)

R5, XS13, Downstream (MY-00)

R5, XS13, Downstream (MY-03)

R5, XS13, Left Bank (MY-00)

R5, XS13, Left Bank (MY-03)

R5, XS13, Right Bank (MY-00)

R5, XS13, Right Bank (MY-03)

R5, XS14, Upstream (MY-00)

R5, XS14, Upstream (MY-03)

R5, XS14, Downstream (MY-00)

R5, XS14, Downstream (MY-03)

R5, XS14, Left Bank (MY-00)

R5, XS14, Left Bank (MY-03)

R5, XS14, Right Bank (MY-00)

R5, XS14, Right Bank (MY-03)

R5, XS15, Upstream (MY-00)

R5, XS15, Upstream (MY-03)

R5, XS15, Downstream (MY-00)

R5, XS15, Downstream (MY-03)

R5, XS15, Left Bank (MY-00)

R5, XS15, Left Bank (MY-03)

R5, XS15, Right Bank (MY-00)

R5, XS15, Right Bank (MY-03)

R5, XS16, Upstream (MY-00)

R5, XS16, Upstream (MY-03)

R5, XS16, Downstream (MY-00)

R5, XS16, Downstream (MY-03)

R5, XS16, Left Bank (MY-00)

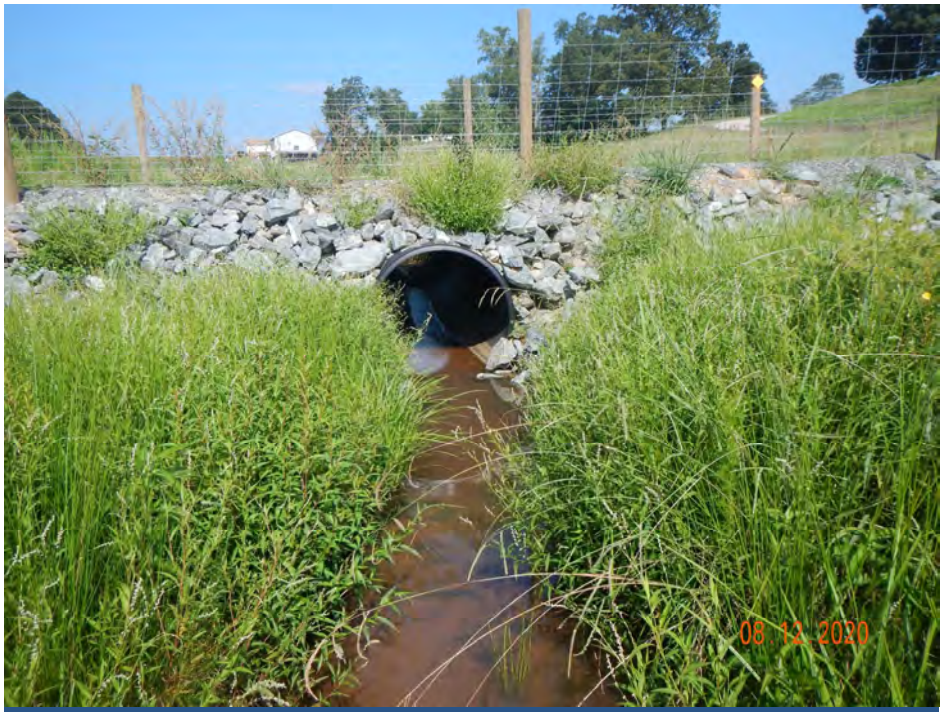
R5, XS16, Left Bank (MY-03)

R5, XS16, Right Bank (MY-00)

R5, XS16, Right Bank (MY-03)

PS-1, R1, Culvert Crossing, Downstream (MY-00)

PS-1, R1, Culvert Crossing, Downstream (MY-03)



PS-1, R1, Culvert Crossing, Upstream (MY-00)

PS-1 , R1, Culvert Crossing, Upstream (MY-03)

PS-2, R2, Culvert Crossing, Downstream (MY-00)

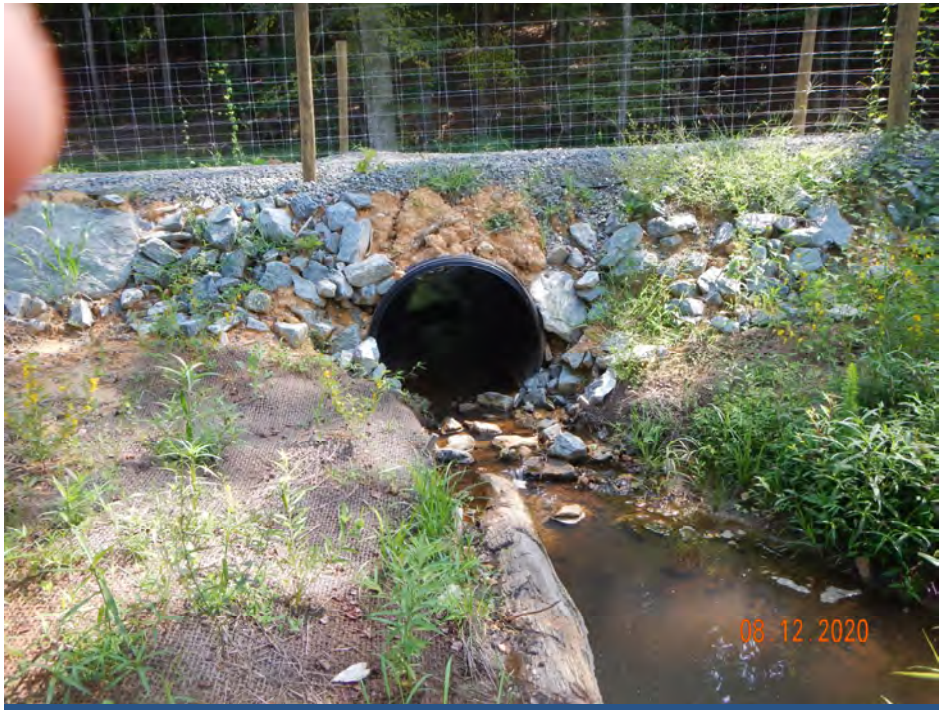
PS-2, R2, Culvert Crossing, Downstream (MY-03)

PS-2, R2 Culvert Crossing, Upstream (MY-00)

PS-2, R2, Culvert Crossing, Upstream (MY-03)

PS-3, R4, Culvert Crossing, Downstream (MY-00)

PS-3, R4, Culvert Crossing, Downstream (MY-03)



PS-3, R4, Culvert Crossing, Upstream (MY-00)

PS-3, R4, Culvert Crossing, Upstream (MY-03)

PS-4, R4A, Downstream (MY-00)

PS-4, R4A, Downstream (MY-03)

PS-4, R4A, Upstream (MY-00)

PS-4, R4A, Upstream (MY-03)

PS-5, R4B, Downstream (MY-00)

PS-5, R4B, Downstream (MY-03)

PS-5, R4B, Upstream (MY-00)

PS-5 , R4B, Upstream (MY-03)

PS-6, R5, Culvert Crossing, Downstream (MY-00)

PS-6, R5, Culvert Crossing, Downstream (MY-03)

PS-6, R5, Culvert Crossing, Upstream (MY-00)

PS-6, R5, Culvert Crossing, Upstream (MY-03)

PS-7, R4, Right Floodplain Slope (MY-01)

PS-7, R4, Right Floodplain Slope (MY-03)

PS-8, R1, Upstream (MY-03)

PS-8, R1, Downstream (MY-03)

Veg Plot 1 (MY-00)

Veg Plot 1 (MY-03)

Veg Plot 2 (MY-00)

Veg Plot 2 (MY-03)

Veg Plot 3 (MY-00)

Veg Plot 3 (MY-03)

Veg Plot 4 (MY-00)

Veg Plot 4 (MY-03)

Veg Plot 5 (MY-00)

Veg Plot 5 (MY-03)

Veg Plot 6 (MY-00)

Veg Plot 6 (MY-03)

Veg Plot 7 (MY-00)

Veg Plot 7 (MY-03)

Veg Plot 8 (MY-00)

Veg Plot 8 (MY-03)

Veg Plot 9 (MY-00)

Veg Plot 9 (MY-03)

Veg Plot 10 (MY-00)

Veg Plot 10 (MY-03)

Random Veg Plot 1, View East (MY-03)

Random Veg Plot 1, View West (MY-03)

Random Veg Plot 2, View North (MY-03)

Random Veg Plot 2, View South (MY-03)

Random Veg Plot 3, View North (MY-03)

Random Veg Plot 3, View South (MY-03)

Random Veg Plot 4, View North (MY-03)

Random Veg Plot 4, View South (MY-03)

SPA5, R5 Left Floodplain, R5 Side Slope, Minor deposition and erosion as a result of erosion outside of the easement (MY-01)

SPA5, R5 Side Slope, Minor deposition and erosion as a result of erosion outside of the easement (MY-03)

SPA5, R5 Left Floodplain, R5 Side Slope, Minor deposition and erosion as a result of erosion outside of the easement (MY-01)

SPA5, R5 Side Slope, Minor deposition and erosion as a result of erosion outside of the easement (MY-03)

SPA8, R4, STA 20+75, Channel Bed Erosion (MY-02)

SPA8, R4, STA 20+75, Channel Bed Erosion (MY-03)

SPA8, R4, STA 20+75, Channel Bed Erosion (MY-02)

SPA8, R4, STA 20+75, Channel Bed Erosion (MY-03)

Appendix C:
Vegetation Monitoring Plot Data

Table 6: Planted and Total Stem Counts
Table 6a: Vegetation Plot Mitigation Success Summary
Table 6b: Red-line Planting List
Table 6c: Random Vegetation Plot Data

Table 6: Planted and Total Stem Counts
Horne Creek

			Current Plot Data (MY3 2022)																											Annual Means								
			006-01-0001			006-01-0002			006-01-0003			006-01-0004			006-01-0005			006-01-0006			006-01-0007			006-01-0008			006-01-0009			006-01-0010			MY3 (2022)			MY2 (2021)			MY1 (2020)			MY0 (2020)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree			3																												3			2								
Alnus serrulata	hazel alder	Shrub	1	1	1				1	1	1	2	2	2				2	2	2	3	3	3	1	1	1	2	2	2	1	1	1	13	13	13	13	13	13	14	14	14	14	14	14
Asimina triloba	pawpaw	Tree							1	1	1				1	1	1	2	2	2										1	1	1	5	5	5	5	5	5	10	10	10	18	18	18
Betula nigra	river birch	Tree	2	2	2	1	1	1				4	4	4	3	3	3				2	2	2										12	12	12	12	12	12	15	15	15	4	4	4
Carpinus caroliniana	American hornbeam	Tree							1	1	1				1	1	1	1	1	1													3	3	3	7	7	7	10	10	10	13	13	13
Cercis canadensis	eastern redbud	Tree				1	1	1	2	2	2																			2	2	2	5	5	5	4	4	4	5	5	5	10	10	10
Corylus americana	American hazelnut	Shrub				2	2	2													1	1	1										3	3	3	3	3	3	4	4	4	12	12	12
Diospyros virginiana	common persimmon	Tree			1			4										1	1	1				2	2	2							3	3	8	3	3	6	9	9	12	12	12	12
Fraxinus pennsylvanica	green ash	Tree										1	1	1							1	1	1										2	2	2	2	2	2	2	2	3	4	4	4
Hamamelis virginiana	American witchhazel	Tree				1	1	1	1	1	1																						2	2	2	1	1	1	1	1	1	6	6	6
Lindera benzoin	northern spicebush	Shrub	1	1	1																			2	2	2							3	3	3	4	4	4	8	8	8	15	15	15
Liriodendron tulipifera	tuliptree	Tree	1	1	1	1	1	1	4	4	4	3	3	3			2																9	9	11	13	13	13	18	18	18	29	29	29
Nyssa sylvatica	blackgum	Tree										1	1	1							3	3	3	3	3	3							7	7	7	9	9	9	12	12	12	12	12	12
Platanus occidentalis	American sycamore	Tree				1	1	1	2	2	2	3	3	3	1	1	1													1	1	1	8	8	8	9	9	9	9	9	9	7	7	7
Quercus alba	white oak	Tree																																		2	2	2	4	4	4	4	4	4
Quercus rubra	northern red oak	Tree							1	1	1																						1	1	1	3	3	3	7	7	7	7	7	7
Salix nigra	black willow	Tree						2																		2			22			7			33			11						
Tilia americana	American basswood	Tree	3	3	3																1	1	1							1	1	1	5	5	5	5	5	5	10	10	10	5	5	5
		Stem count	8	8	12	7	7	13	13	13	13	14	14	14	6	6	8	6	6	6	11	11	11	8	8	10	2	2	24	6	6	13	81	81	124	95	95	111	138	138	142	172	172	172
		size (ares)	1			1			1			1			1			1			1			1			1			1			10			10			10			10		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.25			0.25			0.25			0.25		
		Species count	5	5	7	6	6	8	8	8	8	6	6	6	4	4	5	4	4	4	6	6	6	4	4	5	1	1	2	5	5	6	15	15	17	16	16	18	16	16	16	16	16	16
		Stems per ACRE	324	324	486	283	283	526	526	526	526	567	567	567	243	243	324	243	243	243	445	445	445	324	324	405	81	81	971	243	243	526	328	328	502	384	384	449	558	558	575	696	696	696

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 6a: Vegetation Plot Mitigation Success Summary Table Horne Creek Tributaries					
Plot #	Planted Stems/Acre	Volunteers/ Acre	Total Stems/Acre	Success Criteria Met	Average Stem Height (ft)
1	324	40	364	Yes	5.8
2	283	243	526	Yes	2.3
3	526	0	526	Yes	2.1
4	567	0	567	Yes	3.4
5	243	81	324	Yes	3.2
6	243	0	243	No	3.6
7	445	0	445	Yes	4.9
8	324	81	405	Yes	1.9
9	81	81	162	No	5.3
10	243	243	486	Yes	3.0
Project Average	328	76.9	405	Yes	3.6

*No one species accounts for more than 50% of the total species in a single plot.

** Plots 2, 5, and 10 meet interim success criteria when volunteer black willow, persimmon, and tulip poplar are included in plot data. These species are in approved mitigation plan species.

*** Total Stems/Acre only includes species from approved mitigation plan

Table 6b: Horne Creek Tributaries Red-line Planting List				
Common Name	Species	Stems	Percent Planted	Mitigation Plan Percent
Green ash	*Fraxinus pensylvanica*	250	3.4%	3.0%
River birch	*Betula nigra*	500	6.7%	7.0%
Basswood	*Tilia americana*	500	6.7%	7.0%
Black gum	*Nyssa sylvatica*	450	6.0%	6.0%
American sycamore	*Platanus occidentalis*	500	6.7%	7.0%
Tulip poplar	*Liriodendron tulipifera*	500	6.7%	7.0%
Northern red oak	*Quercus rubra*	250	3.4%	3.0%
White oak	*Quercus alba*	450	6.0%	6.0%
Persimmon	*Diospyros virginiana*	500	6.7%	7.0%
~~Common serviceberry~~	~~*Amelanchier arborea*~~	~~0~~	~~0.0%~~	~~5.0%~~
~~Umbrella magnolia~~	~~*Magnolia tripetala*~~	~~0~~	~~0.0%~~	~~6.0%~~
Redbud	*Cercis canadensis*	400	5.4%	0.0%
American hornbeam	*Carpinus caroliniana*	450	6.0%	6.0%
Witch hazel	*Hamamelis virginiana*	450	6.0%	6.0%
Pawpaw	*Asimina triloba*	900	12.1%	6.0%
Spicebush	*Lindera benzoin*	450	6.0%	6.0%
Tag alder	*Alnus serrulata*	450	6.0%	6.0%
Hazelnut	*Corylus americana*	450	6.0%	6.0%
	Total Planted	**7,450**	**100.0%**	

*changes from mitigation plan in red

Riparian Buffer Live Stake Plantings – Streambanks			
(Proposed 2'-3' Spacing @ Meander Bends and 6'-8' Spacing @ Riffle Sections)			
Sambucus canadensis	Elderberry	20%	FACW
Salix sericea	Silky Willow	30%	OBL
Salix nigra	Black Willow	10%	OBL
Cornus amomum	Silky Dogwood	40%	FACW

Table 6c: Random Vegetation Plot Data			
Random Veg Plot 1		**Random Veg Plot 3**	
Location	Upper R1, along left FP	Location	Lower R4, left FP
Species	Height (ft)	Species	Height (ft)
Sycamore	3.4	Redbud	2.4
Green Ash	5.4	Tulip Poplar	2.2
Sycamore	0.7	Tulip Poplar	0.7
Black Willow	3.9	Black Gum	1.3
Black Willow	5.4	Basswood	2.5
River Birch	5.6	Ironwood	2.2
River Birch	8.2	Tulip Poplar	2.5
Tag Alder	7.6	Witchhazel	1.2
Total Stems	8	Total Stems	8
Stems/Acre	324	Stems/Acre	324
Random Veg Plot 2		**Random Veg Plot 4**	
Location	Upper R4, near VP 5	Location	R5 left FP, near VP 9
Species	Height (ft)	Species	Height (ft)
Tulip Poplar	0.6	River Birch	3.7
Persimmon	1	Sycamore	2.9
Tag Alder	6.4	Green Ash	4
Tulip Poplar	0.9	Sycamore	4.1
Tag Alder	3	Persimmon	1.4
Black Willow	6.6	River Birch	3.2
Sycamore	2.1	Tag Alder	3.4
Tulip Poplar	1.3	Tag Alder	5.8
Black Gum	2.8	Tulip Poplar	2.9
White Oak	1	Total Stems	9
Total Stems	10	Stems/Acre	364
Stems/Acre	405		

Appendix D:

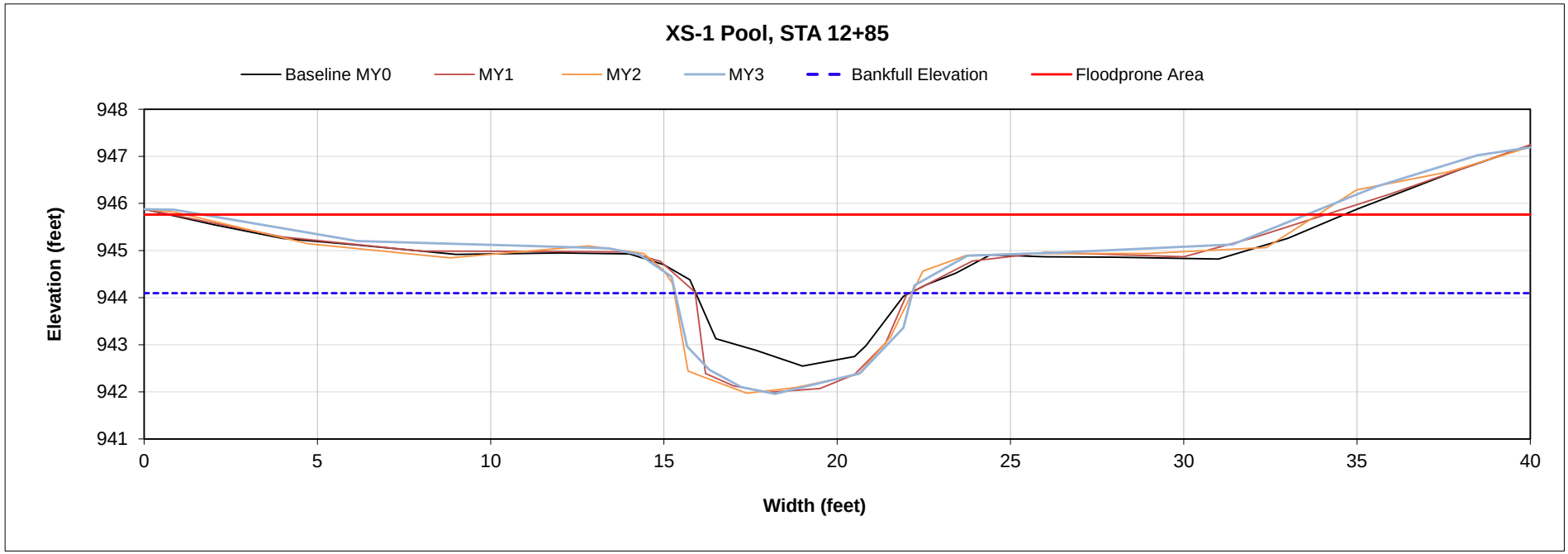
Stream Measurement and Geomorphology Data

Figure 2: MY3 Cross-Sections
Table 7a: Baseline Stream Data Summary
Table 7b: Cross-section Morphology Data
Table 7c: Stream Reach Morphology Data

Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R1
Cross Section ID	XS-1
Field Crew	E. Dunnigan, C. Durham

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	944.1
Low Bank Height Elevation (ft)	944.3
Bankfull Max Depth (ft)	2.1
Low Bank Height (ft)	2.3
Bank Height Ratio	1.08
Bankfull X-section Area (ft²)	11.1
% Change Bank Height Ratio	8.0%

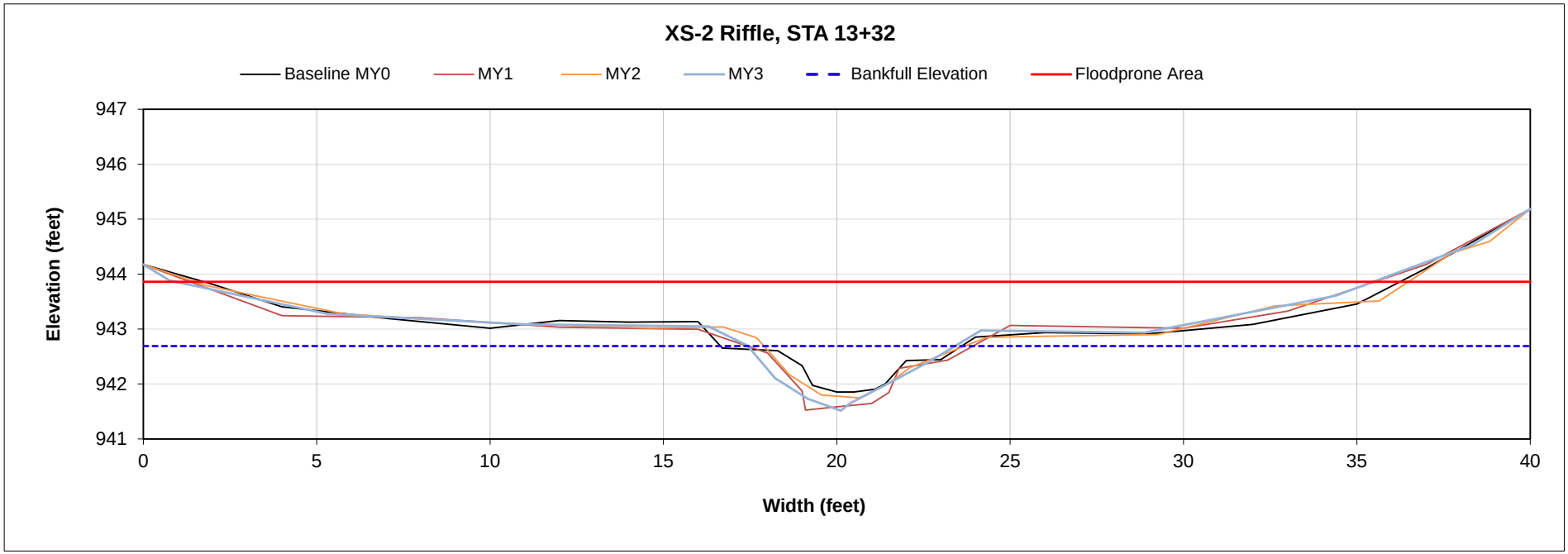
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R1
Cross Section ID	XS-2
Field Crew	K. Obermiller, C. Durham

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	942.7
Low Bank Height Elevation (ft)	942.7
Bankfull Max Depth (ft)	1.2
Low Bank Height (ft)	1.2
Bank Height Ratio	1.00
Bankfull X-section Area (ft²)	3.9
% Change Bank Height Ratio	0.0%

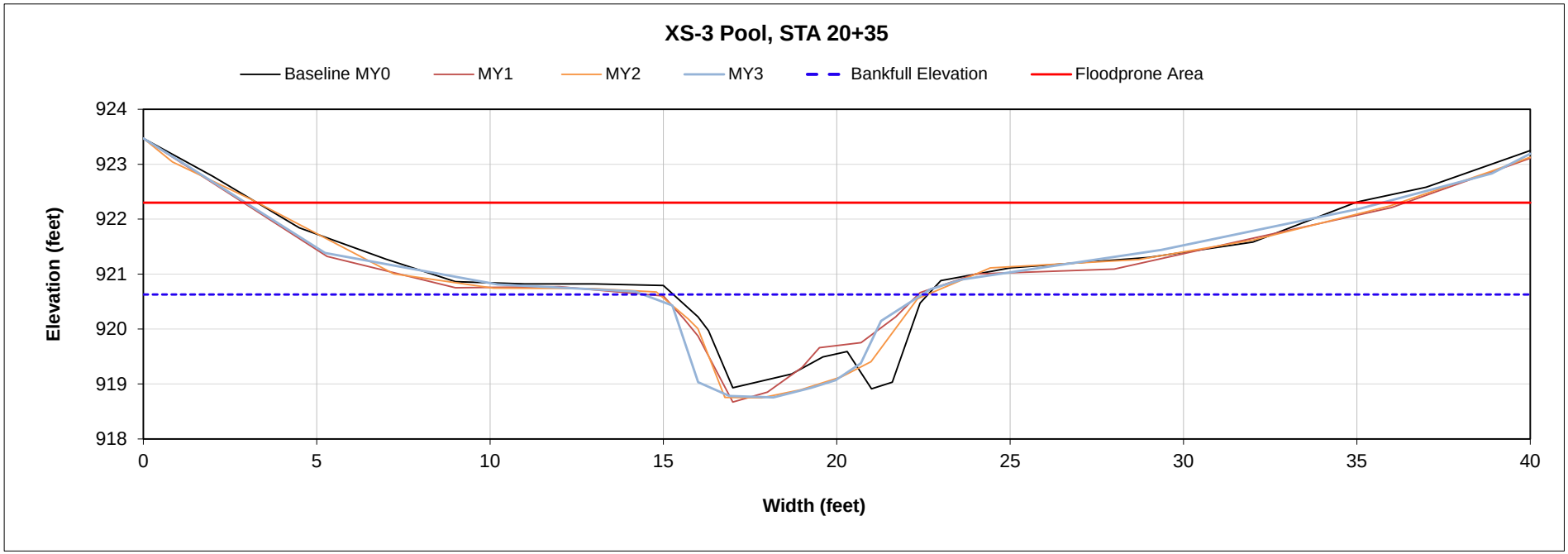
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R1
Cross Section ID	XS-3
Field Crew	E. Dunnigan, C. Durham

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	920.6
Low Bank Height Elevation (ft)	920.7
Bankfull Max Depth (ft)	1.9
Low Bank Height (ft)	1.9
Bank Height Ratio	1.03
Bankfull X-section Area (ft²)	9.6
% Change Bank Height Ratio	3.0%

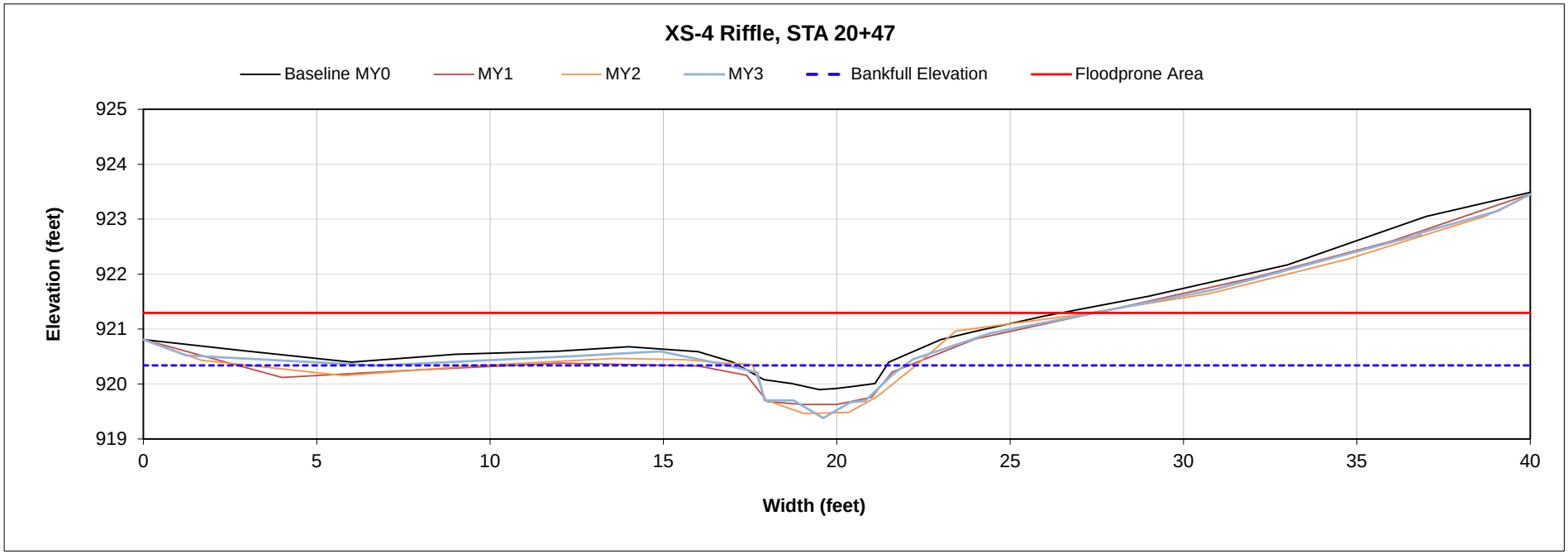
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R1
Cross Section ID	XS-4
Field Crew	K. Obermiller, C. Durham

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	920.3
Low Bank Height Elevation (ft)	920.4
Bankfull Max Depth (ft)	1.0
Low Bank Height (ft)	1.0
Bank Height Ratio	1.02
Bankfull X-section Area (ft²)	2.6
% Change Bank Height Ratio	2.0%

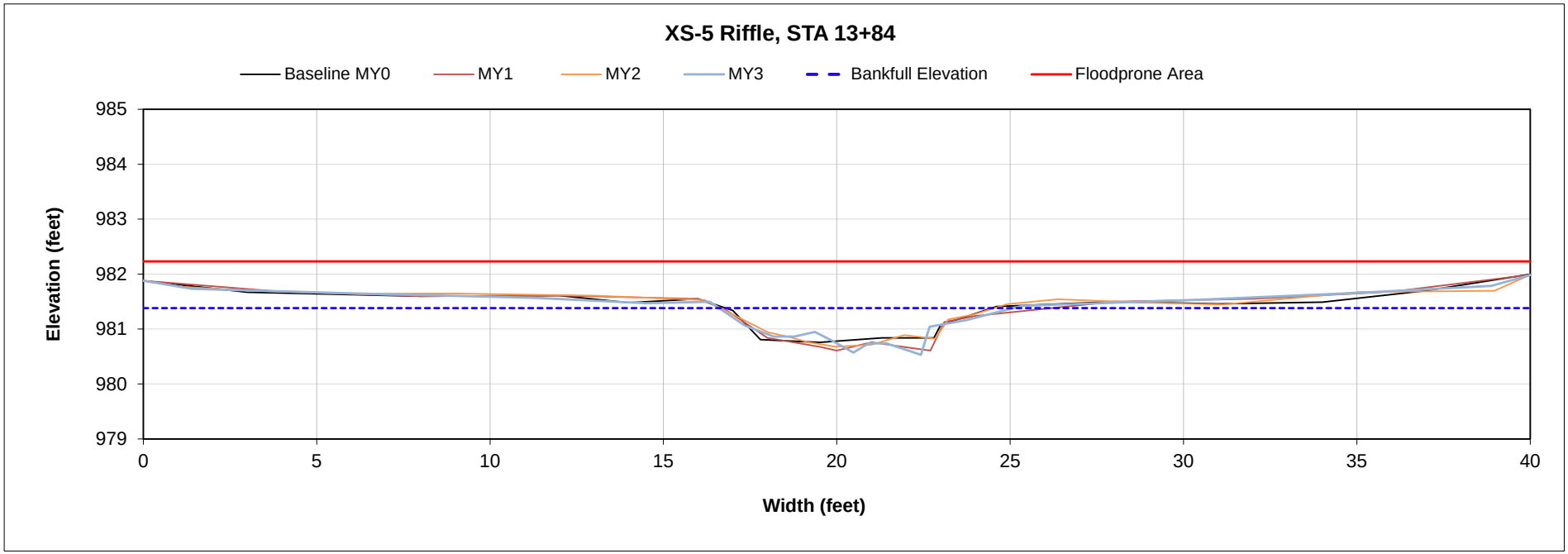
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R4
Cross Section ID	XS-5
Field Crew	K. Obermiller, E. Dunnigan

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	981.4
Low Bank Height Elevation (ft)	981.4
Bankfull Max Depth (ft)	0.9
Low Bank Height (ft)	0.9
Bank Height Ratio	1.05
Bankfull X-section Area (ft²)	3.7
% Change Bank Height Ratio	5.0%

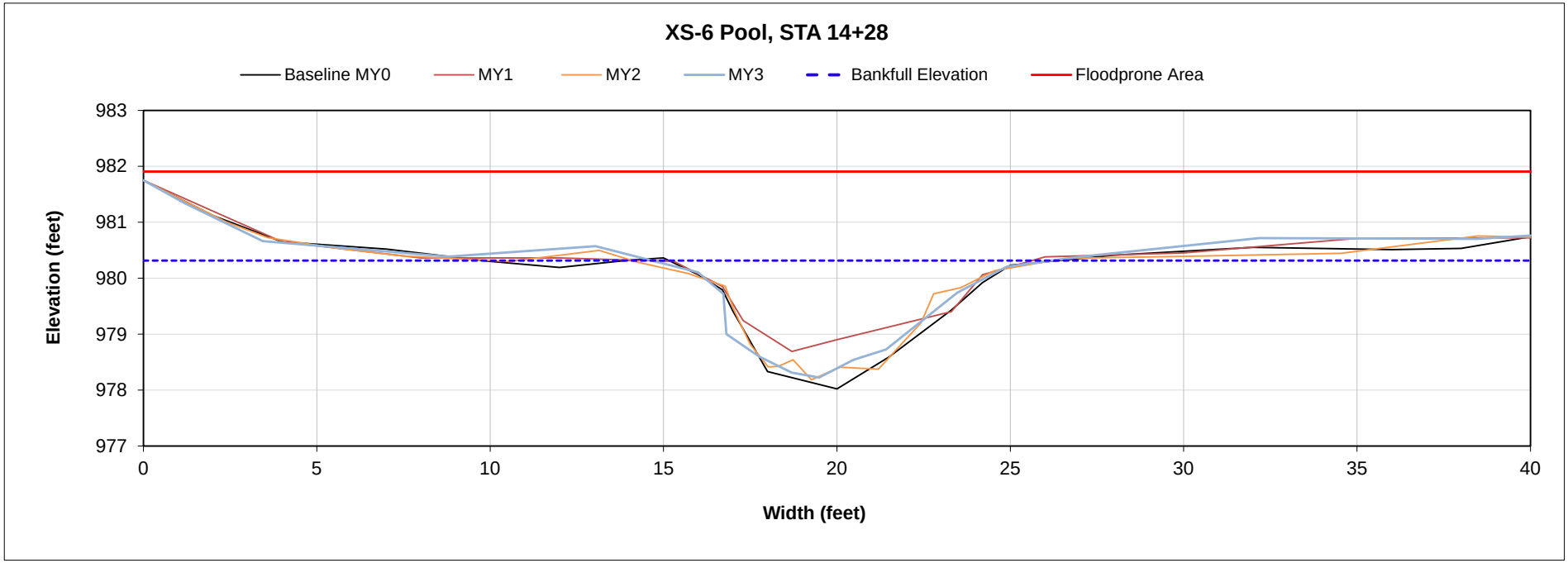
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R4
Cross Section ID	XS-6
Field Crew	K. Obermiller, C. Durham

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	980.3
Low Bank Height Elevation (ft)	980.1
Bankfull Max Depth (ft)	2.1
Low Bank Height (ft)	1.9
Bank Height Ratio	0.90
Bankfull X-section Area (ft²)	11.6
% Change Bank Height Ratio	10.0%

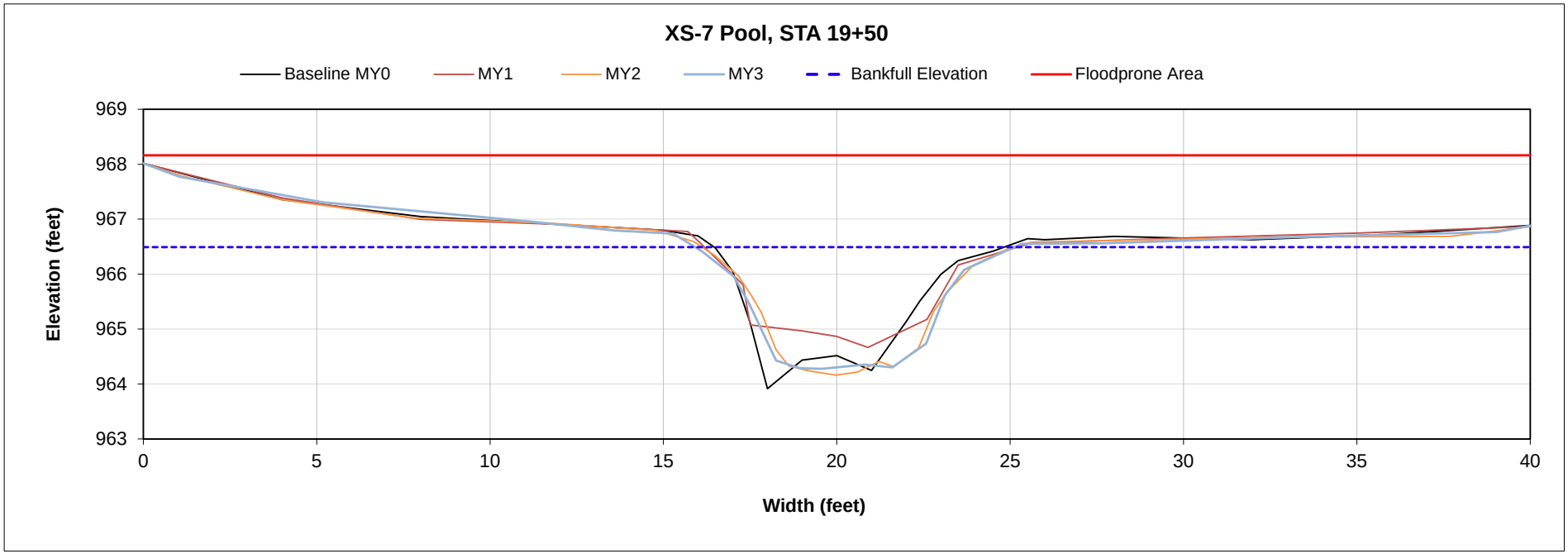
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R4
Cross Section ID	XS-7
Field Crew	K. Obermiller, E. Dunnigan

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	966.5
Low Bank Height Elevation (ft)	966.6
Bankfull Max Depth (ft)	2.2
Low Bank Height (ft)	2.3
Bank Height Ratio	1.03
Bankfull X-section Area (ft²)	12.4
% Change Bank Height Ratio	3.0%

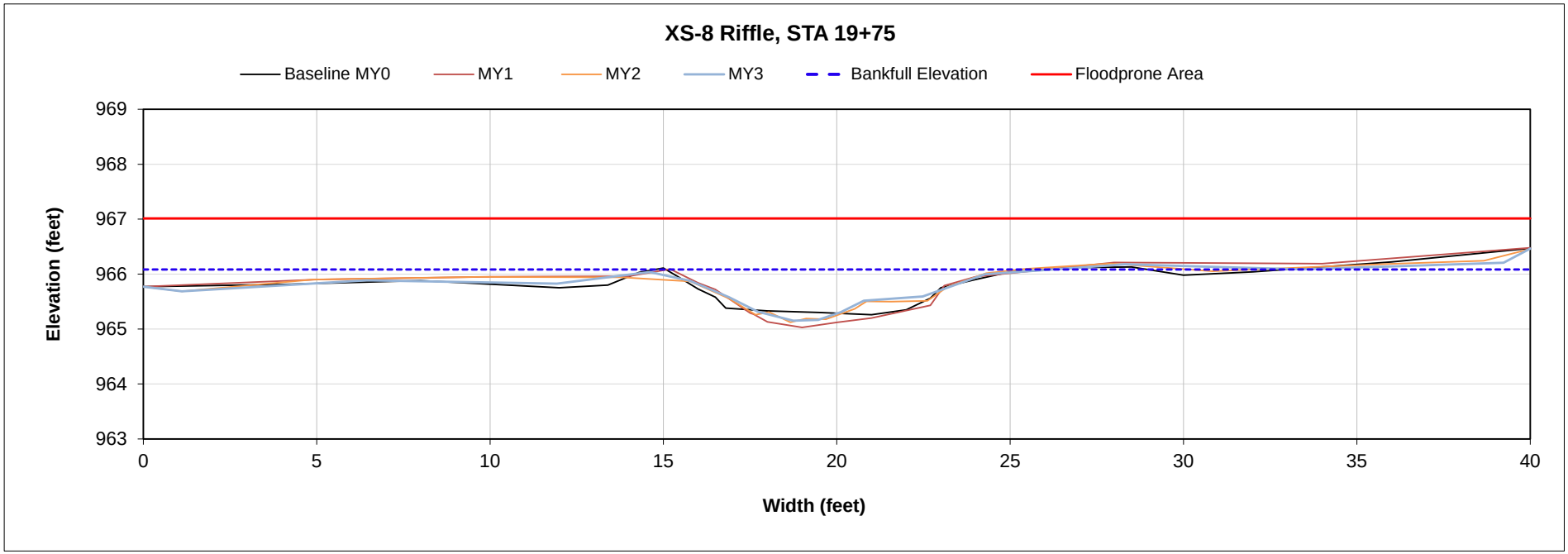
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R4
Cross Section ID	XS-8
Field Crew	K. Obermiller, E.Dunnigan

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	966.1
Low Bank Height Elevation (ft)	966.0
Bankfull Max Depth (ft)	0.9
Low Bank Height (ft)	0.8
Bank Height Ratio	0.91
Bankfull X-section Area (ft²)	5.1
% Change Bank Height Ratio	9.0%

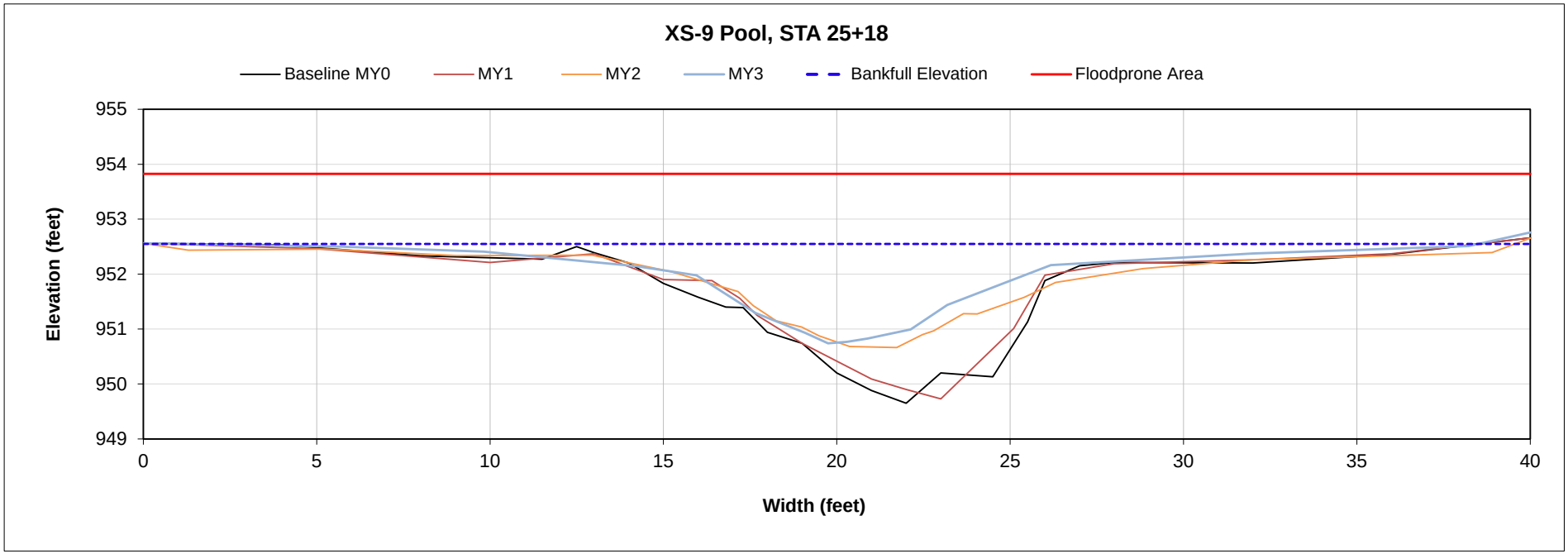
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R5
Cross Section ID	XS-9
Field Crew	K. Obermiller, E. Dunnigan

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	952.6
Low Bank Height Elevation (ft)	952.1
Bankfull Max Depth (ft)	1.8
Low Bank Height (ft)	1.4
Bank Height Ratio	0.81
Bankfull X-section Area (ft²)	16.8
% Change Bank Height Ratio	22.0%

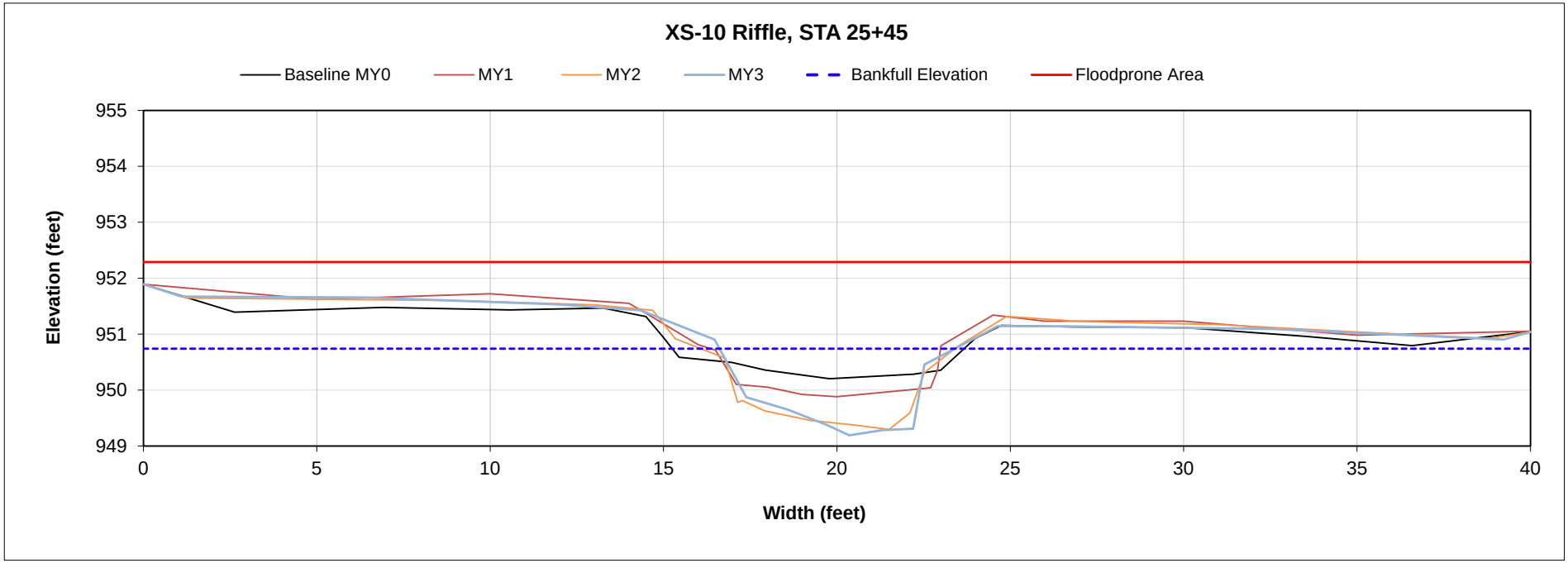
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R5
Cross Section ID	XS-10
Field Crew	K. Obermiller, E. Dunnigan

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	950.7
Low Bank Height Elevation (ft)	951.1
Bankfull Max Depth (ft)	1.5
Low Bank Height (ft)	2.0
Bank Height Ratio	1.26
Bankfull X-section Area (ft²)	6.9
% Change Bank Height Ratio	26.0%

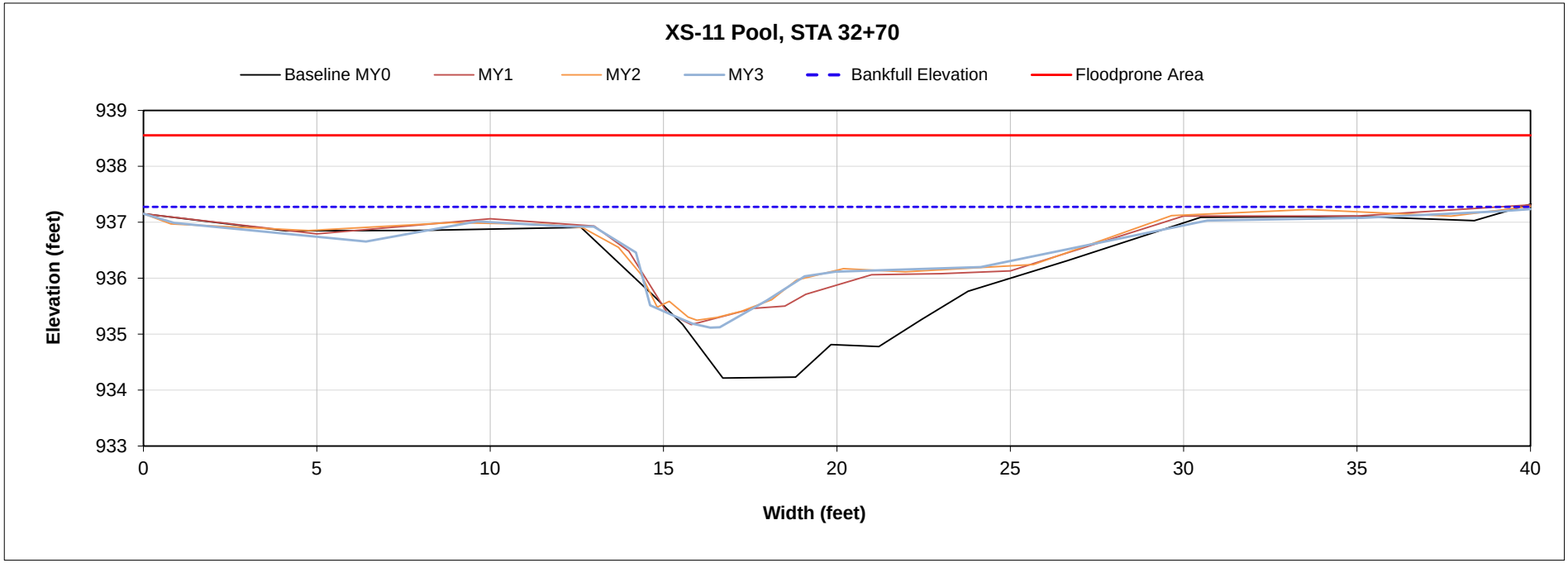
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R5
Cross Section ID	XS-11
Field Crew	E. Dunnigan, C. Durham

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	937.3
Low Bank Height Elevation (ft)	936.9
Bankfull Max Depth (ft)	2.2
Low Bank Height (ft)	1.8
Bank Height Ratio	0.84
Bankfull X-section Area (ft²)	23.6
% Change Bank Height Ratio	16.0%

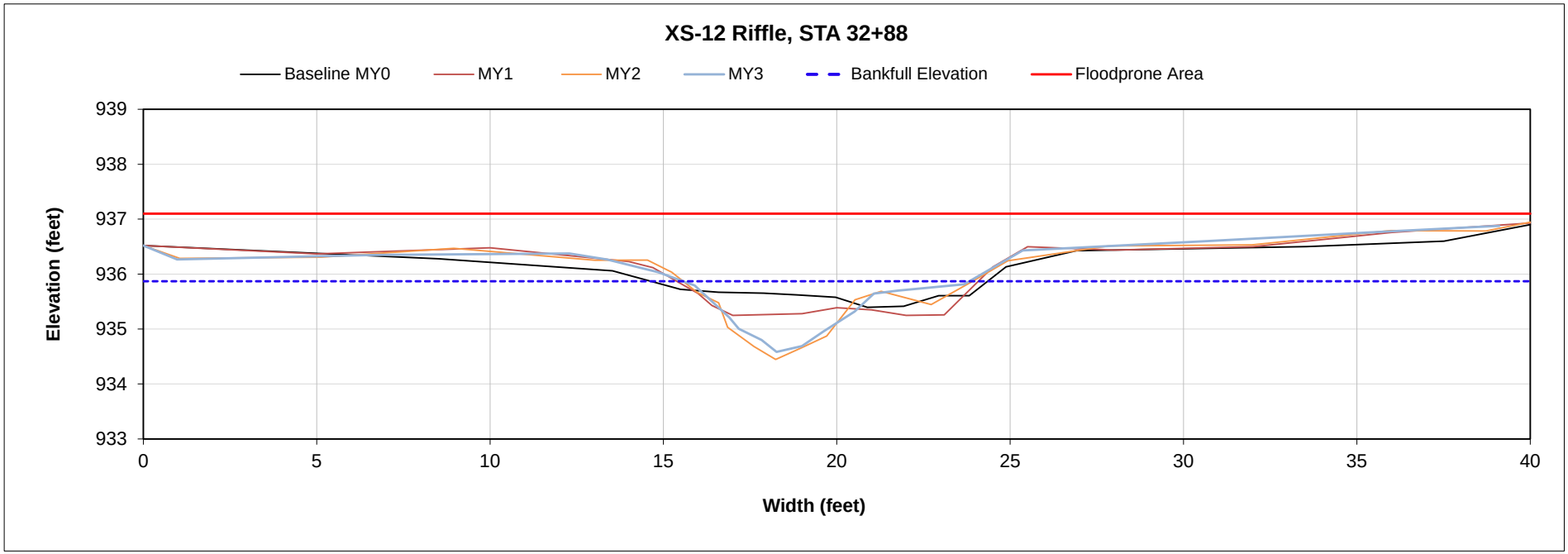
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R5
Cross Section ID	XS-12
Field Crew	K. Obermiller, C. Durham

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	935.9
Low Bank Height Elevation (ft)	936.3
Bankfull Max Depth (ft)	1.3
Low Bank Height (ft)	1.7
Bank Height Ratio	1.31
Bankfull X-section Area (ft²)	4.5
% Change Bank Height Ratio	31.0%

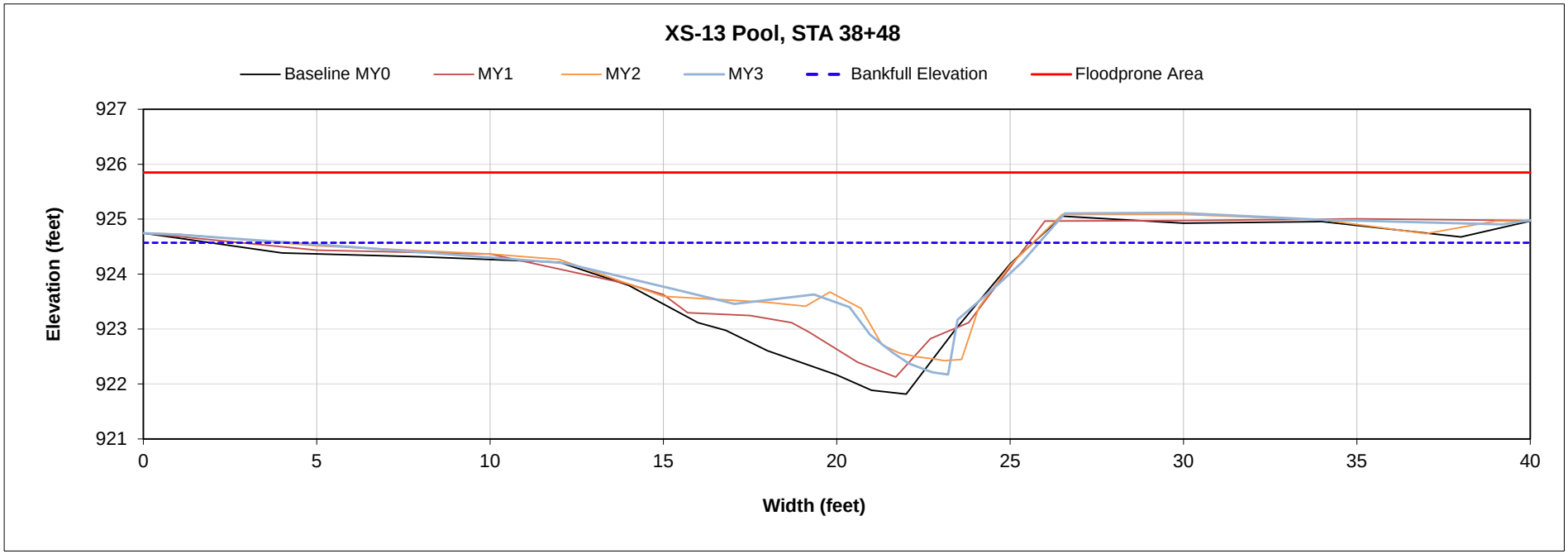
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R5
Cross Section ID	XS-13
Field Crew	E. Dunnigan, C. Durham

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	924.6
Low Bank Height Elevation (ft)	924.5
Bankfull Max Depth (ft)	2.4
Low Bank Height (ft)	2.3
Bank Height Ratio	0.97
***Bankfull X-section Area (ft²)**	16.4
% Change Bank Height Ratio	3.0%

Looking Downstream

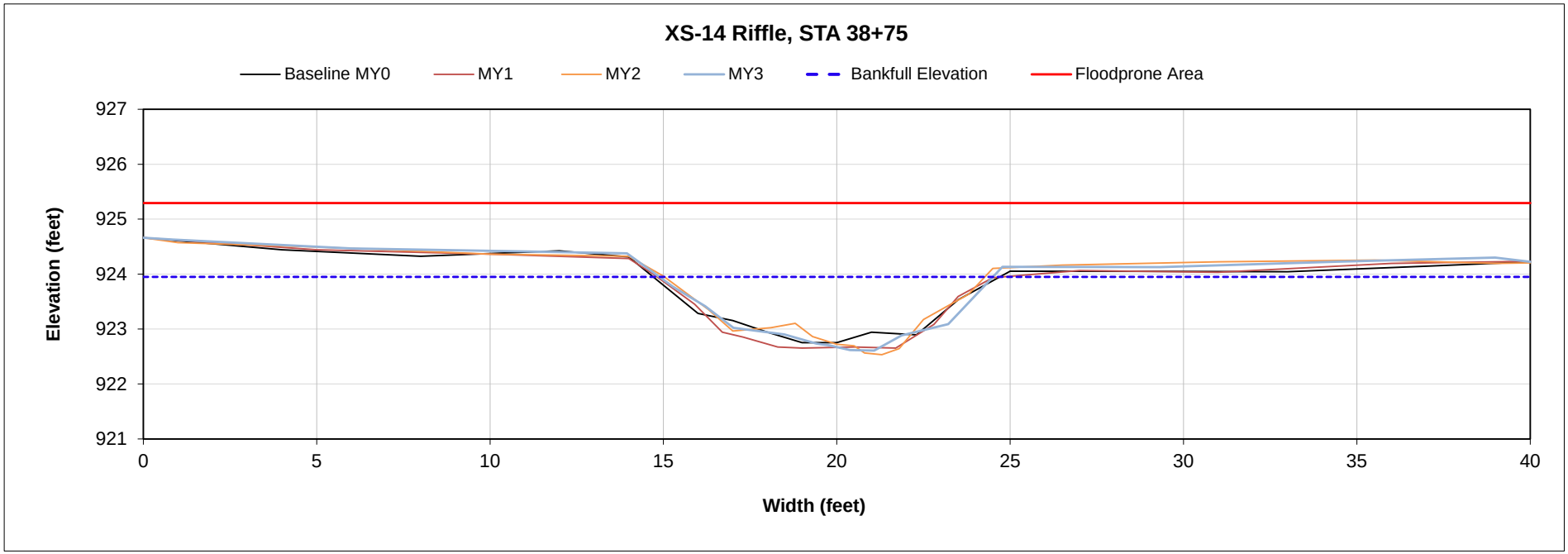


*Due to a calculation error MY0 bankfull was corrected from 19.9 to 16.4

Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R5
Cross Section ID	XS-14
Field Crew	E. Dunnigan, C. Durham

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	924.0
Low Bank Height Elevation (ft)	924.1
Bankfull Max Depth (ft)	1.3
Low Bank Height (ft)	1.5
Bank Height Ratio	1.14
Bankfull X-section Area (ft²)	8.4
% Change Bank Height Ratio	14.0%

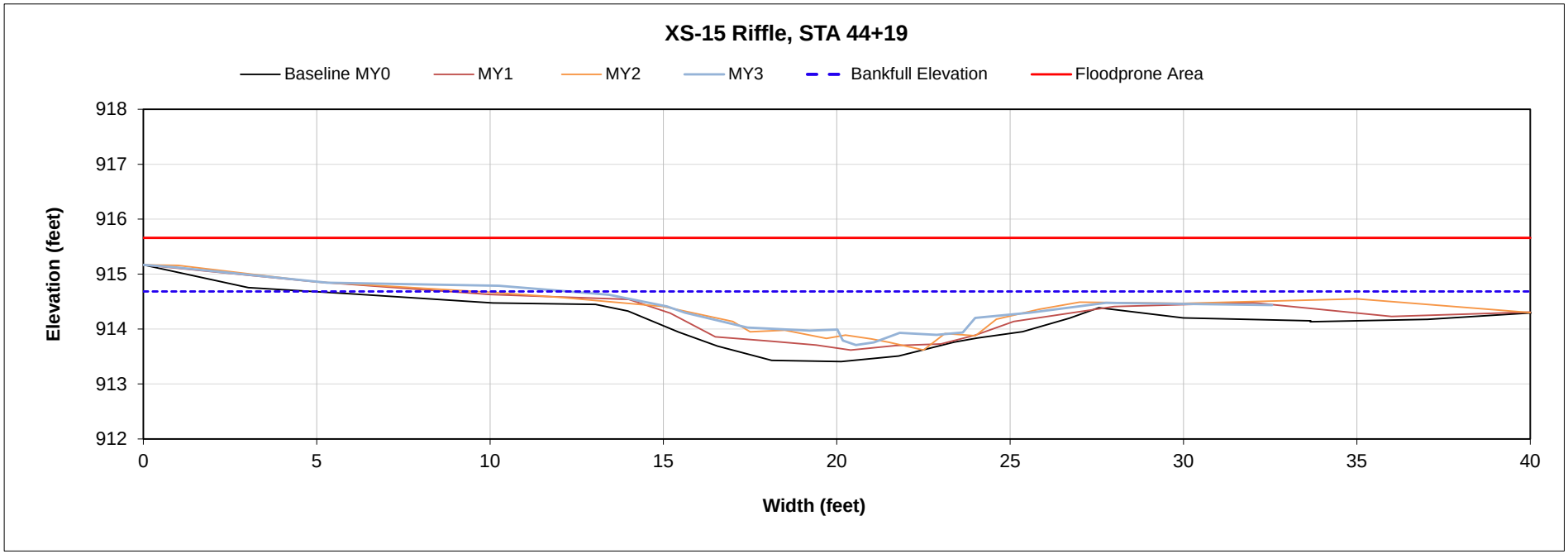
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R5
Cross Section ID	XS-15
Field Crew	E. Dunnigan, C. Durham

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	914.7
Low Bank Height Elevation (ft)	914.5
Bankfull Max Depth (ft)	1.0
Low Bank Height (ft)	0.8
Bank Height Ratio	0.79
Bankfull X-section Area (ft²)	7.7
% Change Bank Height Ratio	21.0%

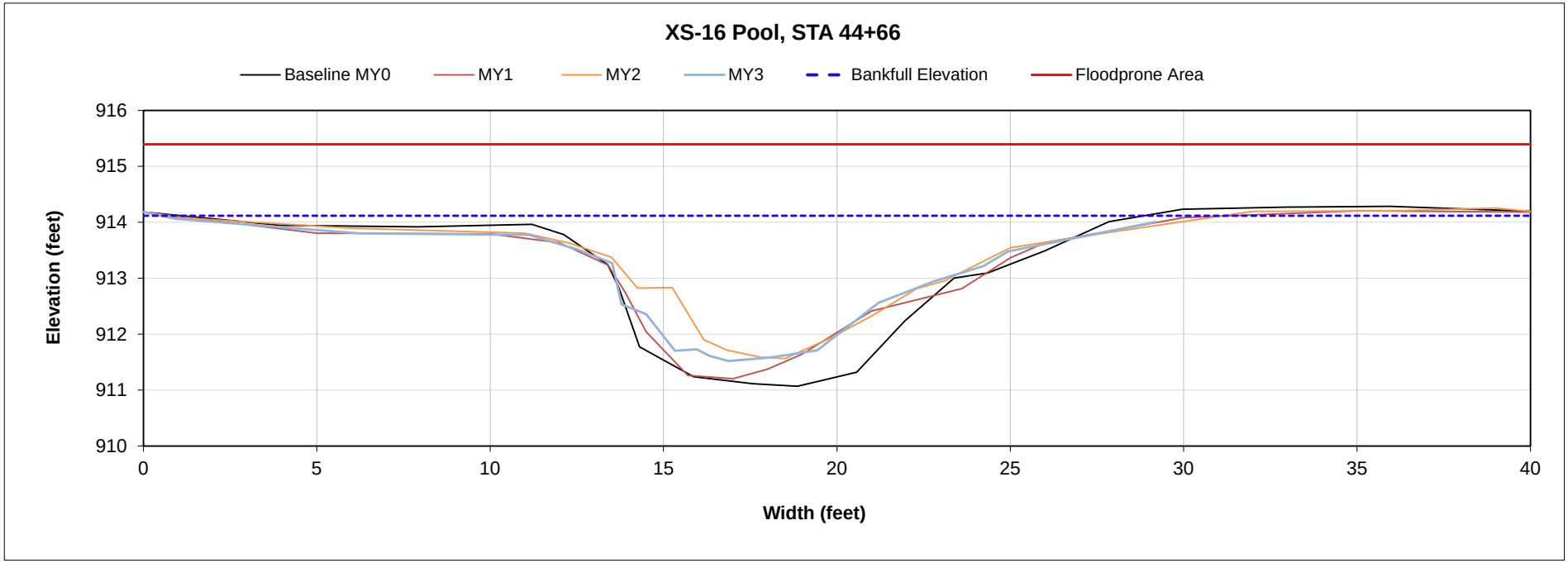
Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R5
Cross Section ID	XS-16
Field Crew	E. Dunnigan, C. Durham

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	914.1
Low Bank Height Elevation (ft)	913.8
Bankfull Max Depth (ft)	2.6
Low Bank Height (ft)	2.3
Bank Height Ratio	0.87
Bankfull X-section Area (ft²)	27.1
% Change Bank Height Ratio	13.0%

Looking Downstream



Project Name	Horne Creek Tributaries Mitigation Project
Project ID	100026
Reach ID	R4
Cross Section ID	SPA-8
Field Crew	K. Obermiller, E. Dunnigan

Dimension Data Summary: MY3 2022	
Bankfull Elevation (ft)	961.9
Low Bank Height Elevation (ft)	962.5
Bankfull Max Depth (ft)	1.4
Low Bank Height (ft)	2.1
Bank Height Ratio	1.45
Bankfull X-section Area (ft²)	*4.9

*SPA-8 Bankfull area was estimated off design parameters for constructed rock riffles on R4

Looking Downstream

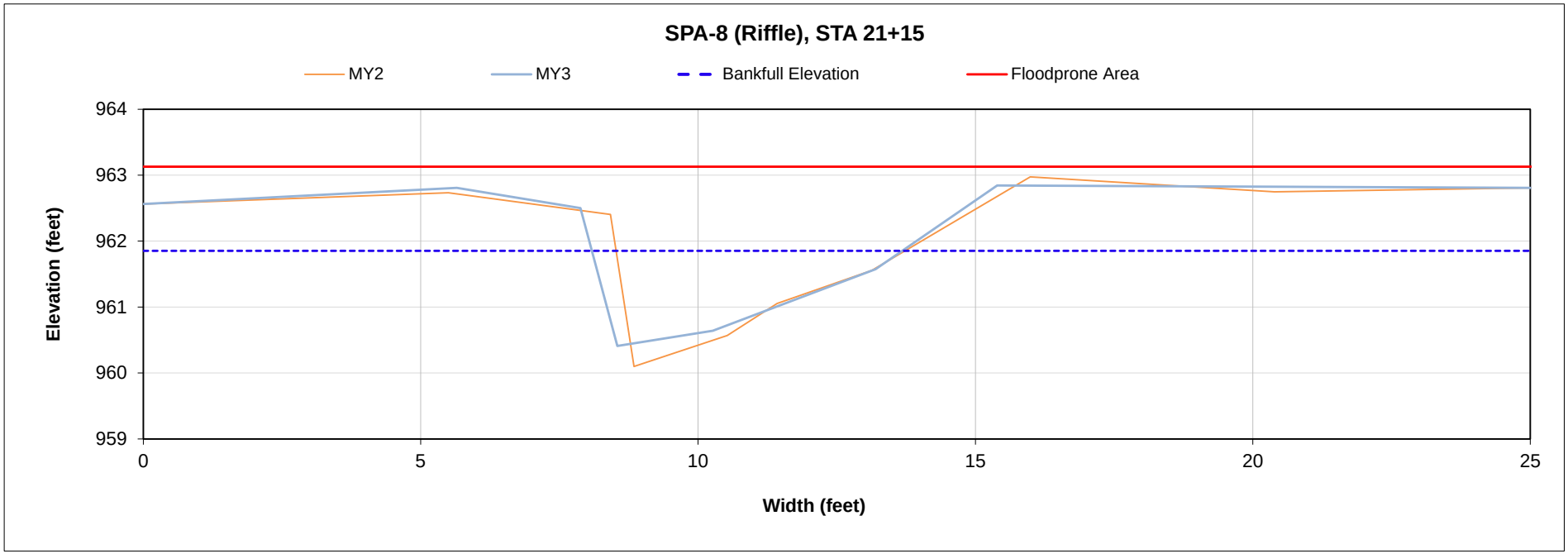


Table 7a. Baseline Stream Data Summary
Horne Creek Tributaries Mitigation Project

Parameter	Design		Baseline	
Reach ID: R1				
Dimension (Riffle)	Min	Max	Min	Max
Bankfull Width (ft)	-	7.0	6.2	7.6
Floodprone Width (ft)	28.0	65.0	23.9	34.5
Bankfull Mean Depth (ft)	-	0.4	0.4	0.5
Bankfull Max Depth (ft)	-	0.6	0.7	1.0
Bankfull Cross Sectional Area (ft^2)	-	2.9	2.6	3.9
Width/Depth Ratio	-	17.0	14.7	14.8
Entrenchment Ratio	4.0	9.3	3.9	4.5
Bank Height Ratio	-	1.0	1.0	1.0
Profile				
Riffle Length (ft)	10.0	20.0	10.7	26.1
Riffle Slope (ft/ft)	0.038	0.062	0.040	0.058
Pool Length (ft)	5.0	20.0	6.8	19.8
Pool Max Depth (ft)	0.8	1.4	0.9	1.9
Pool Spacing (ft)	10.5	35.0	10.8	35.5
Pattern				
Channel Beltwidth (ft)	24.5	56.0	12.4	24.3
Radius of Curvature (ft)	14.0	21.0	12.6	20.3
Rc:Bankfull Width (ft/ft)	2.0	3.0	2.0	2.7
Meander Wavelength (ft)	49.0	84.0	49.2	57.2
Meander Width Ratio	3.5	8.0	1.7	7.9
Transport Parameters				
Boundary Shear Stress (lb/ft^2)	0.79		0.84	
Max part size (mm) mobilized at bankfull	127.00		135.00	
Stream Power (W/m^2)	47.60		56.93	
Additional Reach Parameters				
Rosgen Classification	B4		B4	
Bankfull Velocity (fps)	4.2		4.6	
Bankfull Discharge (cfs)	12.0		12.0	
Sinuosity	1.07		1.12	
Water Surface Slope (Channel) (ft/ft)	0.037		0.037	
Bankfull Slope (ft/ft)	0.037		0.038	

Parameter	Design		Baseline	
Reach ID: R2				
Dimension (Riffle)	Min	Max	Min	Max
Bankfull Width (ft)	-	6.0	-	-
Floodprone Width (ft)	15.0	19.0	-	-
Bankfull Mean Depth (ft)	-	0.5	-	-
Bankfull Max Depth (ft)	-	0.6	-	-
Bankfull Cross Sectional Area (ft^2)	-	2.8	-	-
Width/Depth Ratio	-	13.1	-	-
Entrenchment Ratio	2.5	3.2	-	-
Bank Height Ratio	-	1.0	-	-
Profile				
Riffle Length (ft)	5.0	15.0	5.6	13.1
Riffle Slope (ft/ft)	0.033	0.054	0.047	0.073
Pool Length (ft)	5.0	15.0	8.6	15.3
Pool Max Depth (ft)	0.9	1.6	1.4	2.7
Pool Spacing (ft)	9.0	30.0	11.0	27.1
Pattern				
Channel Beltwidth (ft)	-	-	-	-
Radius of Curvature (ft)	-	-	-	-
Rc:Bankfull Width (ft/ft)	-	-	-	-
Meander Wavelength (ft)	-	-	-	-
Meander Width Ratio	-	-	-	-
Transport Parameters				
Boundary Shear Stress (lb/ft^2)	0.75		-	
Max part size (mm) mobilized at bankfull	123.00		-	
Stream Power (W/m^2)	43.31		-	
Additional Reach Parameters				
Rosgen Classification	B4		B4	
Bankfull Velocity (fps)	4.4		4.4	
Bankfull Discharge (cfs)	12.0		12.0	
Sinuosity	1.08		1.11	
Water Surface Slope (Channel) (ft/ft)	0.030		0.042	
Bankfull Slope (ft/ft)	0.030		0.046	

Table 7a. Baseline Stream Data Summary
Horne Creek Tributaries Mitigation Project

Parameter	Design		Baseline	
Reach ID: R4				
Dimension (Riffle)	Min	Max	Min	Max
Bankfull Width (ft)	-	9.0	7.9	9.6
Floodprone Width (ft)	38.0	79.0	59.0	70.0
Bankfull Mean Depth (ft)	-	0.6	0.5	0.5
Bankfull Max Depth (ft)	-	0.8	0.7	0.8
Bankfull Cross Sectional Area (ft^2)	-	5.2	3.7	5.1
Width/Depth Ratio	-	15.6	17.2	18.2
Entrenchment Ratio	4.2	8.8	4.2	5.0
Bank Height Ratio	-	1.0	1.0	1.0
Profile				
Riffle Length (ft)	10.0	30.0	11.5	33.2
Riffle Slope (ft/ft)	0.032	0.052	0.027	0.063
Pool Length (ft)	10.0	30.0	8.5	25.3
Pool Max Depth (ft)	1.2	2.0	1.4	2.6
Pool Spacing (ft)	13.5	45.0	20.6	57.9
Pattern				
Channel Beltwidth (ft)	31.5	72.0	31.7	48.2
Radius of Curvature (ft)	18.0	27.0	13.4	24.3
Rc:Bankfull Width (ft/ft)	2.0	3.0	1.7	2.5
Meander Wavelength (ft)	63.0	108.0	71.9	111.1
Meander Width Ratio	3.5	8.0	9.1	11.6
Transport Parameters				
Boundary Shear Stress ($lb/ft^{2)}$	0.93		0.75	
Max part size (mm) mobilized at bankfull	144.00		123.00	
Stream Power ($W/m^{2)}$	57.07		46.87	
Additional Reach Parameters				
Rosgen Classification	B4/C4b		B4/C4b	
Bankfull Velocity (fps)	4.2		4.3	
Bankfull Discharge (cfs)	22.0		22.0	
Sinuosity	1.31		1.32	
Water Surface Slope (Channel) (ft/ft)	0.029		0.025	
Bankfull Slope (ft/ft)	0.029		0.025	

Parameter	Design		Baseline	
Reach ID: R5				
Dimension (Riffle)	Min	Max	Min	Max
Bankfull Width (ft)	-	10.0	10.0	13.3
Floodprone Width (ft)	54.0	134.0	95.0	140.0
Bankfull Mean Depth (ft)	-	0.7	0.5	0.8
Bankfull Max Depth (ft)	-	0.9	0.7	1.2
Bankfull Cross Sectional Area (ft^2)	-	7.2	4.5	8.4
Width/Depth Ratio	-	13.9	14.5	27.7
Entrenchment Ratio	5.4	13.4	3.4	4.0
Bank Height Ratio	-	1.0	1.0	1.0
Profile				
Riffle Length (ft)	15.0	30.0	14.8	39.0
Riffle Slope (ft/ft)	0.030	0.040	0.015	0.043
Pool Length (ft)	15.0	35.0	16.1	41.9
Pool Max Depth (ft)	1.4	2.5	2.0	3.1
Pool Spacing (ft)	15.0	70.0	37.8	59.7
Pattern				
Channel Beltwidth (ft)	35.0	80.0	41.6	56.8
Radius of Curvature (ft)	20.0	30.0	19.3	29.9
Rc:Bankfull Width (ft/ft)	2.0	3.0	1.9	2.2
Meander Wavelength (ft)	70.0	120.0	81.8	107.6
Meander Width Ratio	3.5	8.0	7.6	10.5
Transport Parameters				
Boundary Shear Stress ($lb/ft^{2)}$	0.79		0.75	
Max part size (mm) mobilized at bankfull	128.00		123.00	
Stream Power ($W/m^{2)}$	43.10		42.77	
Additional Reach Parameters				
Rosgen Classification	C4		C4	
Bankfull Velocity (fps)	3.8		3.9	
Bankfull Discharge (cfs)	27.0		27.0	
Sinuosity	1.21		1.23	
Water Surface Slope (Channel) (ft/ft)	0.020		0.020	
Bankfull Slope (ft/ft)	0.020		0.020	

Table 7b. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Horne Creek Tributaries Mitigation Project #100026

	Cross Section 1 (Pool)							Cross Section 2 (Riffle)							Cross Section 3 (Pool)							Cross Section 4 (Riffle)						
Parameters	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**
Bankfull Width (ft)	8.9	6.7	6.8	6.8				7.6	6.5	6.4	6.0				7.9	11.2	8.0	8.1				6.2	6.0	4.5	5.1			
Floodprone Width (ft)	36.7	34.7	32.4	31.9				34.5	34.2	40.0	34.8				33.3	34.9	33.3	32.8				23.9	25.5	24.7	27.4			
Bankfull Mean Depth (ft)	1.2	1.7	1.6	1.6				0.5	0.6	0.6	0.7				1.2	0.9	1.2	1.2				0.4	0.4	0.6	0.5			
Bankfull Max Depth (ft)	2.1	2.2	2.1	2.1				1.0	1.2	1.1	1.2				1.9	2.2	1.9	1.9				0.7	0.7	0.8	1.0			
Bankfull Cross Sectional Area (ft^2)	11.1	11.1	11.1	11.1				3.9	3.9	3.9	3.9				9.6	9.6	9.6	9.6				2.6	2.6	2.6	2.6			
Bankfull Width/Depth Ratio	7.1	4.0	4.2	4.2				14.8	10.9	10.6	9.1				6.4	13.0	6.6	6.8				14.7	14.0	7.8	9.9			
Bankfull Entrenchment Ratio	4.1	5.2	4.7	4.7				4.5	5.2	6.2	5.8				4.2	3.1	4.2	4.1				3.9	4.2	5.5	5.4			
Bankfull Bank Height Ratio	N/A	N/A	N/A	N/A				1.0	0.9	1.04	1.0				N/A	N/A	N/A	N/A				1.0	0.9	1.10	1.0			
d50 (mm)	N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A			
	Cross Section 5 (Riffle)							**Cross Section 6 (Pool)**							**Cross Section 7 (Pool)**							**Cross Section 8 (Riffle)**						
Parameters	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**
Bankfull Width (ft)	7.9	8.7	8.2	8.5				9.6	22.0	12.3	11.6				9.4	14.0	9.3	9.2				9.6	8.5	10.5	11.6			
Floodprone Width (ft)	40.0	40.0	40.0	40.0				40.0	40.0	40.0	40.0				40.0	40.0	40.0	40.0				40.0	40.0	40.0	40.0			
Bankfull Mean Depth (ft)	0.5	0.4	0.5	0.4				1.2	0.5	0.9	1.0				1.3	0.9	1.3	1.3				0.5	0.6	0.5	0.4			
Bankfull Max Depth (ft)	0.7	0.7	0.7	0.9				2.2	1.8	2.1	2.1				2.7	2.1	2.4	2.2				0.8	1.0	0.9	0.9			
Bankfull Cross Sectional Area (ft^2)	3.7	3.7	3.7	3.7				11.6	11.6	11.6	11.6				12.4	12.4	12.4	12.4				5.1	5.1	5.1	5.1			
Bankfull Width/Depth Ratio	17.2	20.6	18.0	19.4				7.9	41.7	13.1	11.5				7.1	15.8	7.0	6.8				18.2	14.2	21.9	26.4			
Bankfull Entrenchment Ratio	5.0	4.6	4.9	4.7				4.2	1.8	3.2	3.5				4.3	2.9	4.3	4.3				4.2	4.7	3.8	3.4			
Bankfull Bank Height Ratio	1.0	0.9	1.16	1.1				N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A				1.0	1.0	0.89	0.9			
d50 (mm)	N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A			
	Cross Section 9 (Pool)							**Cross Section 10 (Riffle)**							**Cross Section 11 (Pool)**							**Cross Section 12 (Riffle)**						
Parameters	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**
Bankfull Width (ft)	12.9	14.6	32.9	28.4				10.0	8.3	7.2	6.8				17.0	37.9	35.2	33.6				11.2	8.8	8.0	8.2			
Floodprone Width (ft)	40.0	40.0	40.0	40.0				40.0	40.0	40.0	40.0				40.0	40.0	40.0	40.0				38.5	32.5	40.0	40.0			
Bankfull Mean Depth (ft)	1.3	1.2	0.5	0.6				0.7	0.8	1.0	1.0				1.4	0.6	0.7	0.7				0.5	0.5	0.6	0.5			
Bankfull Max Depth (ft)	2.5	2.5	1.8	1.8				1.0	1.2	1.4	1.5				2.7	2.1	2.0	2.2				0.7	0.6	1.3	1.3			
Bankfull Cross Sectional Area (ft^2)	16.8	16.8	16.8	16.8				6.9	6.9	6.9	6.9				23.6	23.6	23.6	23.6				4.5	4.5	4.5	4.5			
Bankfull Width/Depth Ratio	9.8	12.6	64.2	48.1				14.5	10.0	7.6	6.6				12.2	60.8	52.7	47.7				27.7	17.2	14.0	15.1			
Bankfull Entrenchment Ratio	3.1	2.7	1.2	1.4				4.0	4.8	5.5	5.9				2.4	1.1	1.1	1.2				3.4	3.7	5.0	4.8			
Bankfull Bank Height Ratio	N/A	N/A	N/A	N/A				1.0	1.3	1.40	1.3				N/A	N/A	N/A	N/A				1.0	1.4	1.34	1.3			
d50 (mm)	N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A			
	Cross Section 13 (Pool)							**Cross Section 14 (Riffle)**							**Cross Section 15 (Riffle)**							**Cross Section 16 (Pool)**						
Parameters	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY+**
Bankfull Width (ft)	13.0	15.4	20.7	20.0				10.2	9.5	9.5	9.6				13.3	17.8	23.0	14.3				16.6	28.0	32.0	34.3			
Floodprone Width (ft)	40.0	40.0	40.0	40.1				40.0	40.0	40.0	40.0				40.0	40.0	40.0	40.0				40.0	40.0	40.0	40.0			
Bankfull Mean Depth (ft)	1.3	1.1	0.8	0.8				0.8	0.9	0.9	0.9				0.6	0.4	0.3	0.5				1.6	1.0	0.8	0.8			
Bankfull Max Depth (ft)	2.4	2.3	2.1	2.4				1.2	1.3	1.5	1.3				0.9	0.9	1.0	1.0				2.9	2.9	2.6	2.6			
Bankfull Cross Sectional Area (ft^2)	*16.4	16.4	16.4	16.4				8.4	8.4	8.4	8.4				7.7	7.7	7.7	7.7				27.1	27.1	27.1	27.1			
Bankfull Width/Depth Ratio	10.3	14.4	26.1	24.3				2.4	10.7	10.7	11.0				22.9	41.2	69.1	26.6				10.2	29.0	37.8	43.4			
Bankfull Entrenchment Ratio	3.1	2.6	1.9	2.0				3.9	4.2	4.2	4.2				3.0	2.2	1.7	2.8				2.4	1.4	1.3	1.2			
Bankfull Bank Height Ratio	N/A	N/A	N/A	N/A				1.0	1.0	1.06	1.1				1.0	0.9	0.90	0.8				N/A	N/A	N/A	N/A			
d50 (mm)	N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A			

*Due to a calculation error MY0 bankfull was corrected from 19.9 to 16.4 (Cross Section 13 - Pool)

Table 7c. Monitoring Data - Stream Reach Summary
Horne Creek Tributaries Mitigation Project

Parameter	Baseline		MY1		MY2		MY3		MY4		MY5+	
Reach ID: R1												
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Profile												
Riffle Length (ft)	10.7	26.1										
Riffle Slope (ft/ft)	0.0395	0.0582										
Pool Length (ft)	6.8	19.8										
Pool Max depth (ft)	0.9	1.9										
Pool Spacing (ft)	10.8	35.5										
Pattern												
Channel Beltwidth (ft)	12.4	24.3										
Radius of Curvature (ft)	12.6	20.3										
Rc:Bankfull width (ft/ft)	2.0	2.7										
Meander Wavelength (ft)	49.2	57.2										
Meander Width Ratio	1.7	7.9										
Additional Reach Parameters												
Rosgen Classification	B4											
Sinuosity (ft)	1.12											
Water Surface Slope (Channel) (ft/ft)	0.0368											
BF slope (ft/ft)	0.038											
[3]Ri% / Ru% / P% / G% / S%												
[3]SC% / Sa% / G% / C% / B% / Be%												
[3]d16 / d35 / d50 / d84 / d95 /												
[2]% of Reach with Eroding Banks												
Channel Stability or Habitat Metric												
Biological or Other												

Pattern and Profile data will not typically be collected unless visual data, dimensional data or profile data indicate significant deviations from baseline conditions

Parameter	Baseline		MY1		MY2		MY3		MY4		MY5+	
Reach ID: R2												
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Profile												
Riffle Length (ft)	5.6	13.1										
Riffle Slope (ft/ft)	0.0473	0.0725										
Pool Length (ft)	8.6	15.3										
Pool Max depth (ft)	1.4	2.7										
Pool Spacing (ft)	11.0	27.1										
Pattern												
Channel Beltwidth (ft)	-	-										
Radius of Curvature (ft)	-	-										
Rc:Bankfull width (ft/ft)	-	-										
Meander Wavelength (ft)	-	-										
Meander Width Ratio	-	-										
Additional Reach Parameters												
Rosgen Classification	B4											
Sinuosity (ft)	1.11											
Water Surface Slope (Channel) (ft/ft)	0.04228											
BF slope (ft/ft)	0.04565											
[3]Ri% / Ru% / P% / G% / S%												
[3]SC% / Sa% / G% / C% / B% / Be%												
[3]d16 / d35 / d50 / d84 / d95 /												
[2]% of Reach with Eroding Banks												
Channel Stability or Habitat Metric												
Biological or Other												

Pattern and Profile data will not typically be collected unless visual data, dimensional data or profile data indicate significant deviations

Table 7c. Monitoring Data - Stream Reach Summary
Horne Creek Tributaries Mitigation Project

Parameter	Baseline		MY1		MY2		MY3		MY4		MY5+	
Reach ID: R4												
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Profile												
Riffle Length (ft)	11.5	33.2										
Riffle Slope (ft/ft)	0.02734	0.06283										
Pool Length (ft)	8.5	25.3										
Pool Max depth (ft)	1.4	2.6										
Pool Spacing (ft)	20.6	57.9										
Pattern												
Channel Beltwidth (ft)	31.7	48.2										
Radius of Curvature (ft)	13.4	24.3										
Rc:Bankfull width (ft/ft)	1.7	2.5										
Meander Wavelength (ft)	71.9	111.1										
Meander Width Ratio	9.1	11.6										
Additional Reach Parameters												
Rosgen Classification	B4/C4b											
Sinuosity (ft)	1.32											
Water Surface Slope (Channel) (ft/ft)	0.025											
BF slope (ft/ft)	0.02535											
[3]Ri% / Ru% / P% / G% / S%												
[3]SC% / Sa% / G% / C% / B% / Be%												
[3]d16 / d35 / d50 / d84 / d95 /												
[2]% of Reach with Eroding Banks												
Channel Stability or Habitat Metric												
Biological or Other												

Pattern and Profile data will not typically be collected unless visual data, dimensional data or profile data indicate significant deviations from

Parameter	Baseline		MY1		MY2		MY3		MY4		MY5+	
Reach ID: R5												
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Profile												
Riffle Length (ft)	14.8	39.0										
Riffle Slope (ft/ft)	0.0155	0.0434										
Pool Length (ft)	16.1	41.9										
Pool Max depth (ft)	2.0	3.1										
Pool Spacing (ft)	37.8	59.7										
Pattern												
Channel Beltwidth (ft)	41.6	56.8										
Radius of Curvature (ft)	19.3	29.9										
Rc:Bankfull width (ft/ft)	1.9	2.2										
Meander Wavelength (ft)	81.8	107.6										
Meander Width Ratio	7.6	10.5										
Additional Reach Parameters												
Rosgen Classification	C4											
Sinuosity (ft)	1.23											
Water Surface Slope (Channel) (ft/ft)	0.01984											
BF slope (ft/ft)	0.01984											
[3]Ri% / Ru% / P% / G% / S%												
[3]SC% / Sa% / G% / C% / B% / Be%												
[3]d16 / d35 / d50 / d84 / d95 /												
[2]% of Reach with Eroding Banks												
Channel Stability or Habitat Metric												
Biological or Other												

Pattern and Profile data will not typically be collected unless visual data, dimensional data or profile data indicate significant deviations

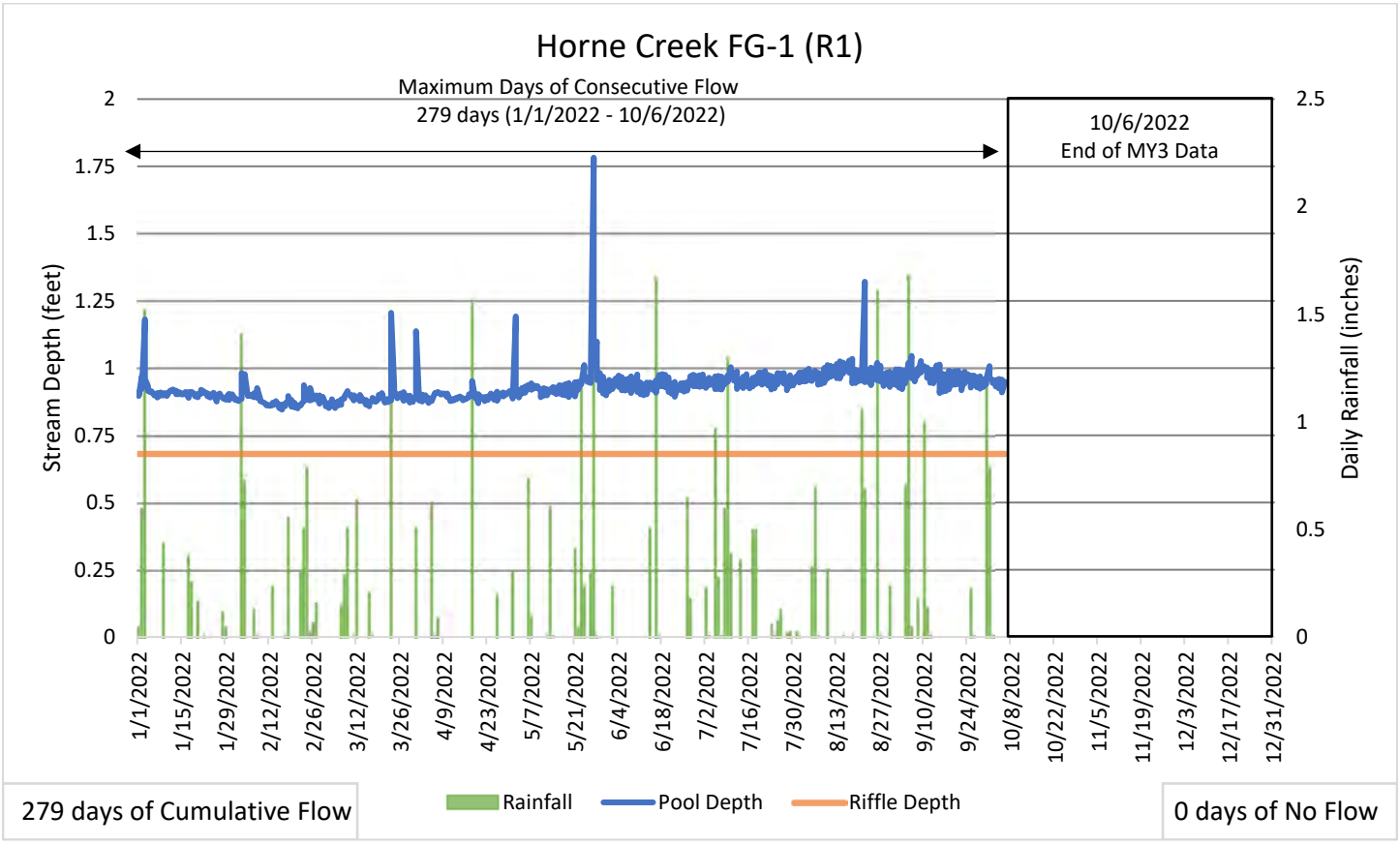
Appendix E: Hydrologic Data

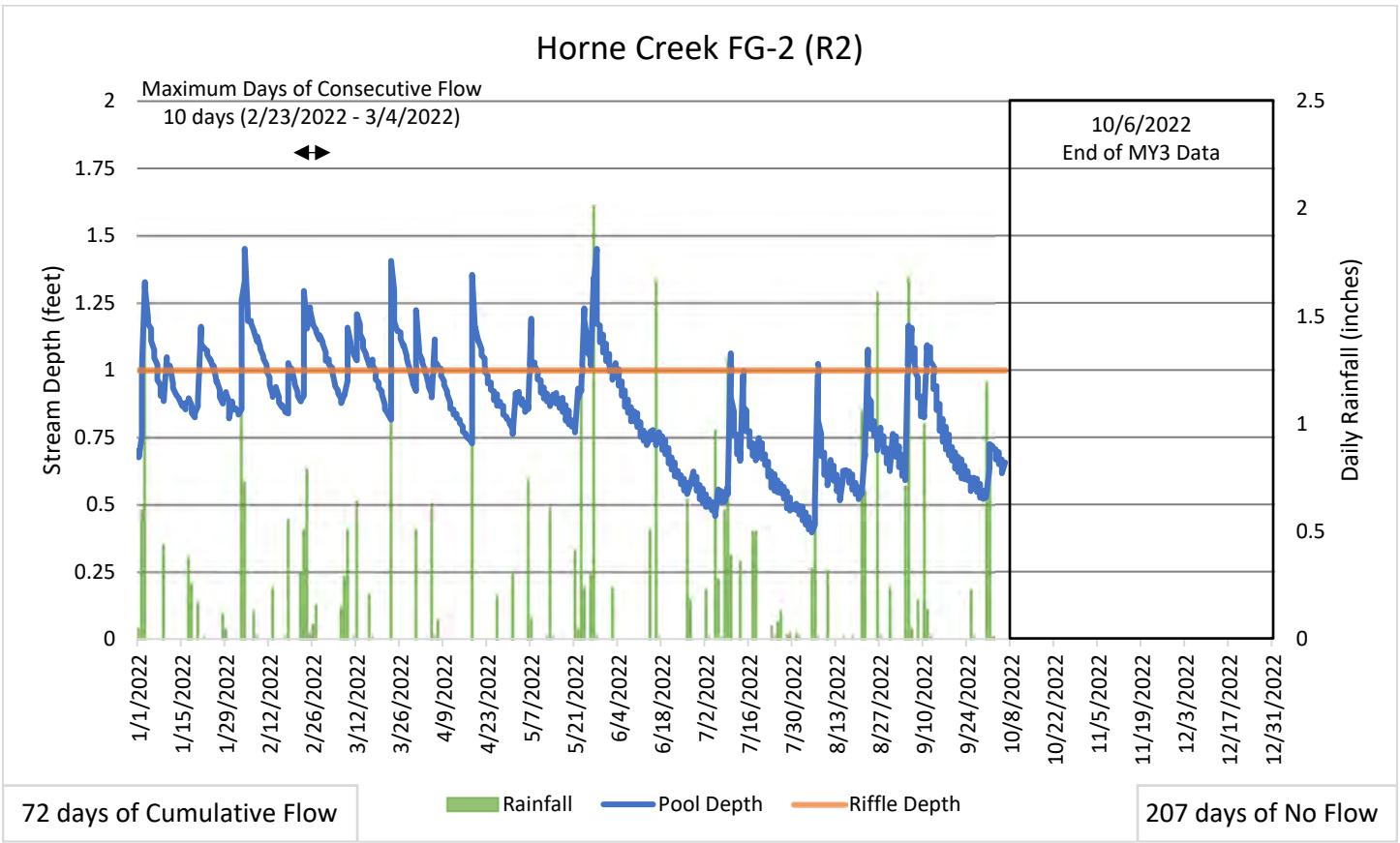
Table 8a and 8b: Verification of Bankfull Events
Figure 3: Surface Flow Events
Figure 4: Flow and Crest Gauge Installation Diagrams
Figure 5: Rainfall Data

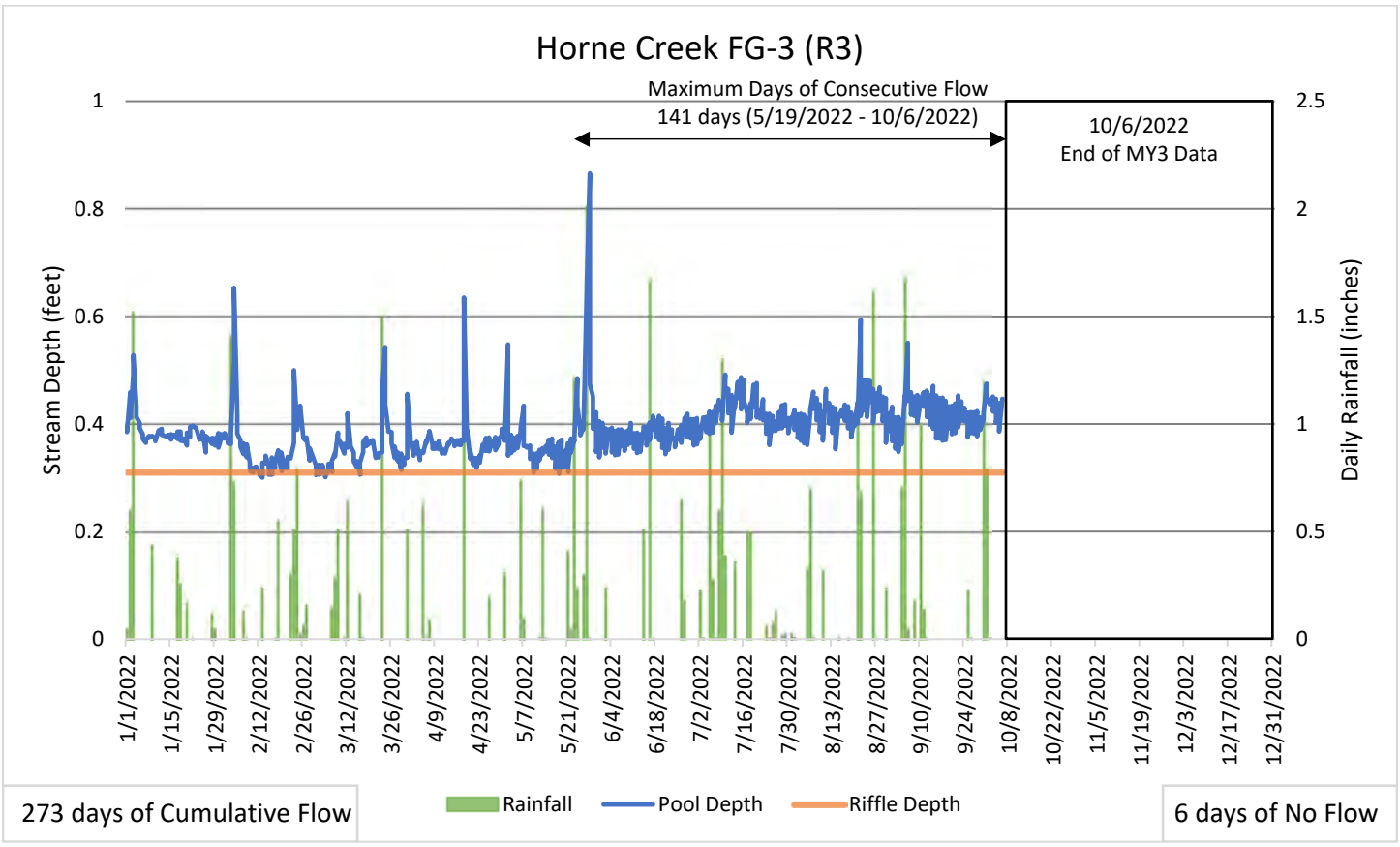
Table 8A: Verification of Bankfull Events - R1 Horne Creek Tributaries Mitigation Project					
Monitoring Year	Date of Collection	Date of Occurrence	Method	Photos	Measurement above bankfull (feet)
MY1	9/15/2020	8/21/2020	Pressure Transducer	No	0.18
	11/5/2020	9/17/2020	Pressure Transducer	No	0.18
	11/5/2020	10/11/2020	Pressure Transducer	No	0.28
	11/5/2020	10/29/2020	Pressure Transducer	No	0.11
	8/12/2020	Unknown	Cork Gauge	Yes	0.20
	11/5/2020	Unknown	Cork Gauge	Yes	0.35
MY2	10/26/2021	1/1/2021	Pressure Transducer	No	0.03
	10/26/2021	1/28/2021	Pressure Transducer	No	0.02
	10/26/2021	2/13/2021	Pressure Transducer	No	0.02
	10/26/2021	2/15/2021	Pressure Transducer	No	0.36
	10/26/2021	2/18/2021	Pressure Transducer	No	0.06
	10/26/2021	3/19/2021	Pressure Transducer	No	0.14
	10/26/2021	3/25/2021	Pressure Transducer	No	0.02
	10/26/2021	3/26/2021	Pressure Transducer	No	0.08
	4/30/2021	Unknown	Cork Gauge	Yes	0.35
	10/26/2021	7/2/2021	Pressure Transducer	No	0.71
	10/26/2021	8/7/2021	Pressure Transducer	No	0.51
	10/26/2021	8/16/2021	Pressure Transducer	No	0.009
	10/26/2021	Unknown	Cork Gauge	Yes	1.3
MY3	1/11/2022	1/3/2022	Pressure Transducer	No	0.06
	4/7/2022	2/24/2022	Pressure Transducer	No	0.059
	4/7/2022	3/23/2022	Pressure Transducer	No	0.45
	4/7/2022	4/6/2022	Cork Gauge	Yes	0.35
	8/3/2022	5/2/2022	Pressure Transducer	No	0.07
	8/3/2022	5/26/2022	Pressure Transducer	No	0.10
	8/3/2022	5/27/2022	Pressure Transducer	No	1.00
	8/3/2022	7/9/2022	Pressure Transducer	No	0.26
	10/6/2022	8/6/2022	Pressure Transducer	No	0.34
	10/6/2022	8/22/2022	Pressure Transducer	No	0.26
	10/6/2022	9/5/2022	Pressure Transducer	No	0.32

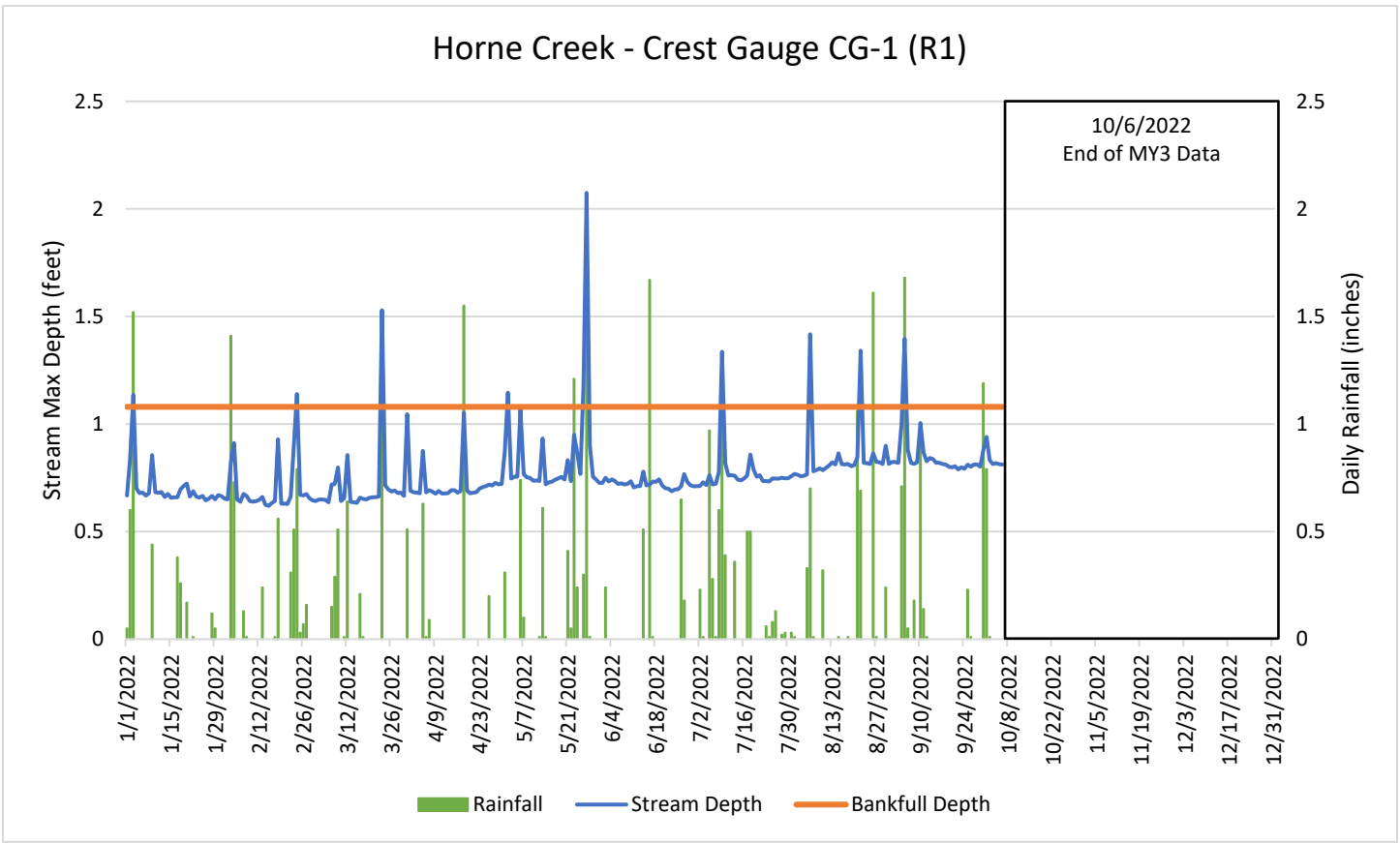
Table 8B: Verification of Bankfull Events - R5 Horne Creek Tributaries Mitigation Project					
Monitoring Year	Date of Collection	Date of Occurrence	Method	Photos	Measurement above bankfull (feet)
MY1	6/17/2020	5/20/2020	Pressure Transducer	No	0.10
	6/17/2020	5/24/2020	Pressure Transducer	No	0.96
MY2	10/26/2021	2/15/2021	Pressure Transducer	No	0.55
	10/26/2021	7/2/2021	Pressure Transducer	No	0.88
	10/26/2021	8/16/2021	Pressure Transducer	No	0.47
	10/26/2021	8/18/2021	Pressure Transducer	No	0.61
	9/2/2021	Unknown	Cork Gauge	Yes	1
	10/26/2021	9/21/2021	Pressure Transducer	No	1.67
	10/26/2021	9/22/2021	Pressure Transducer	No	0.16
	10/27/2021	Unknown	Crest Gauge	Yes	1.4
MY3	4/7/2022	3/23/2022	Pressure Transducer	No	0.233
	8/3/2022	5/27/2022	Pressure Transducer	No	1.16
	8/3/2022	7/9/2022	Pressure Transducer	No	0.269
	10/6/2022	8/22/2022	Pressure Transducer	No	0.1
	10/6/2022	9/5/2022	Pressure Transducer	No	0.203

Figure 3: Surface Flow Data
Horne Creek Tributaries Mitigation Project






Horne Creek FG-3 (R3)
Maximum Days of Consecutive Flow
141 days (5/19/2022 - 10/6/2022)
10/6/2022
End of MY3 Data
Stream Depth (feet)
Daily Rainfall (inches)
1
0.8
0.6
0.4
0.2
0
2.5
2
1.5
1
0.5
0
1/1/2022
1/15/2022
1/29/2022
2/12/2022
2/26/2022
3/12/2022
3/26/2022
4/9/2022
4/23/2022
5/7/2022
5/21/2022
6/4/2022
6/18/2022
7/2/2022
7/16/2022
7/30/2022
8/13/2022
8/27/2022
9/10/2022
9/24/2022
10/8/2022
10/22/2022
11/5/2022
11/19/2022
12/3/2022
12/17/2022
12/31/2022
Rainfall
Pool Depth
Riffle Depth
273 days of Cumulative Flow
6 days of No Flow


Horne Creek - Crest Gauge CG-1 (R1)
10/6/2022
End of MY3 Data
Stream Max Depth (feet)
Daily Rainfall (inches)
2.5
2
1.5
1
0.5
0
2.5
2
1.5
1
0.5
0
1/1/2022
1/15/2022
1/29/2022
2/12/2022
2/26/2022
3/12/2022
3/26/2022
4/9/2022
4/23/2022
5/7/2022
5/21/2022
6/4/2022
6/18/2022
7/2/2022
7/16/2022
7/30/2022
8/13/2022
8/27/2022
9/10/2022
9/24/2022
10/8/2022
10/22/2022
11/5/2022
11/19/2022
12/3/2022
12/17/2022
12/31/2022
Rainfall
Stream Depth
Bankfull Depth

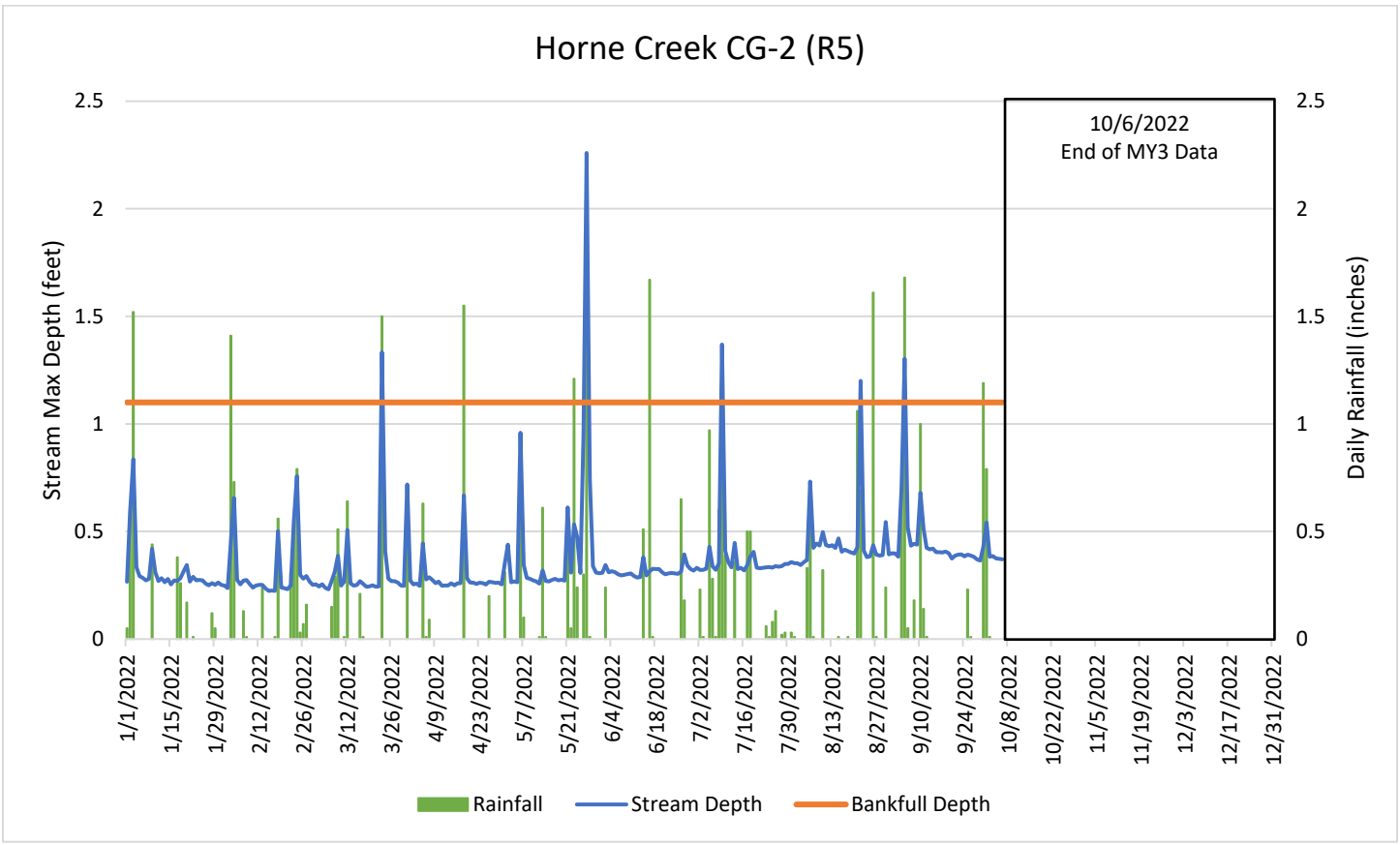
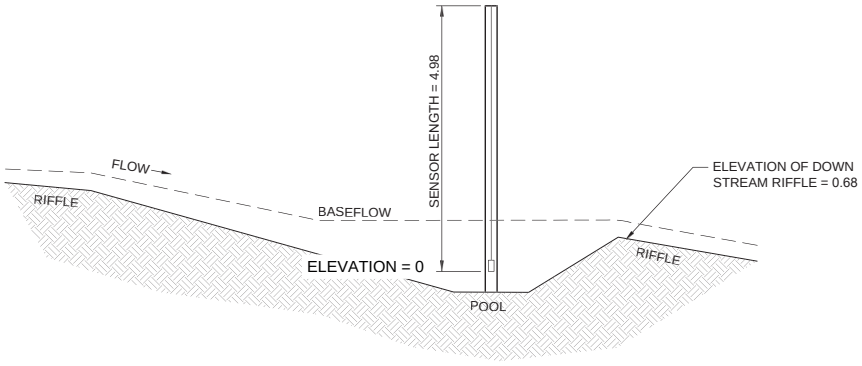

Horne Creek CG-2 (R5)
Stream Max Depth (feet)
Daily Rainfall (inches)
2.5
2
1.5
1
0.5
0
10/6/2022
End of MY3 Data
1/1/2022
1/15/2022
1/29/2022
2/12/2022
2/26/2022
3/12/2022
3/26/2022
4/9/2022
4/23/2022
5/7/2022
5/21/2022
6/4/2022
6/18/2022
7/2/2022
7/16/2022
7/30/2022
8/13/2022
8/27/2022
9/10/2022
9/24/2022
10/8/2022
10/22/2022
11/5/2022
11/19/2022
12/3/2022
12/17/2022
12/31/2022
Rainfall
Stream Depth
Bankfull Depth

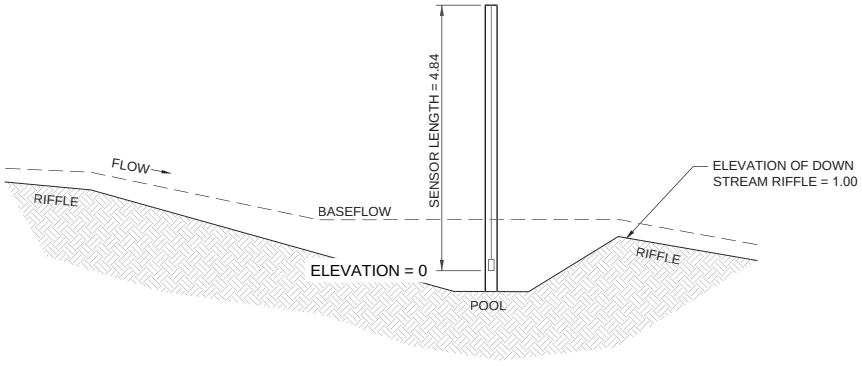
Figure 4: Flow Gauge Installation Diagrams



FLOW GAUGE FG-1 (R1)

Flow Depth = 0.68 Feet

*All elevations relative to sensor depth

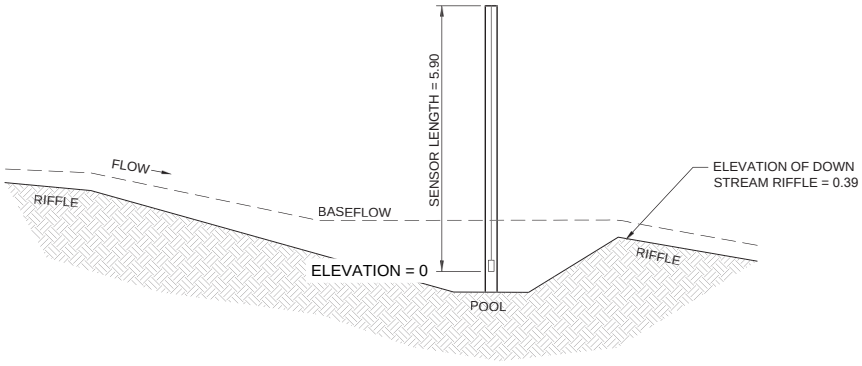


FLOW GAUGE FG-2 (R2)

Flow Depth = 1.00 Feet

*All elevations relative to sensor depth

Figure 4: Flow Gauge Installation Diagrams



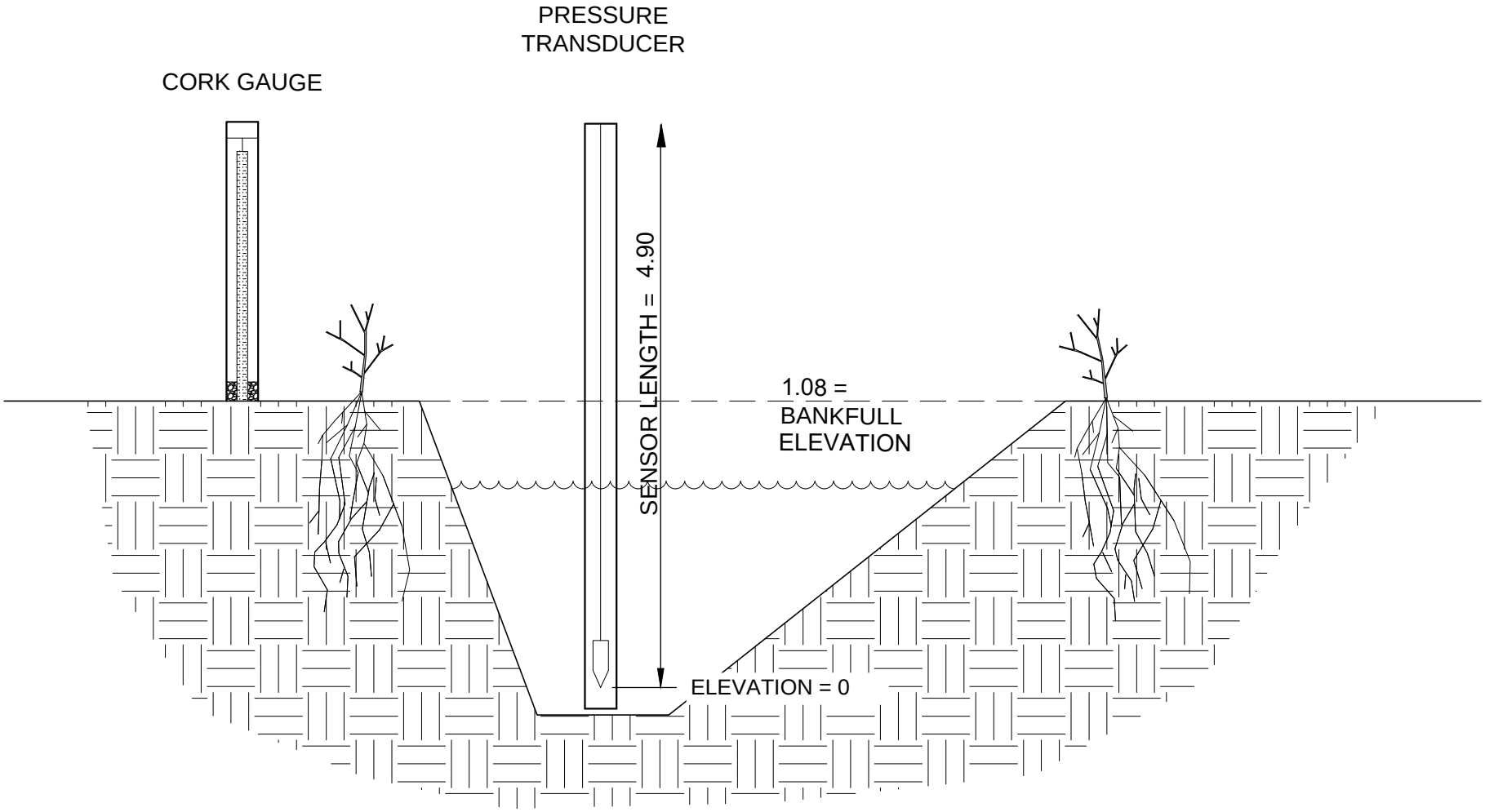
FLOW GAUGE FG-3 (R4)

Flow Depth = 0.39 Feet

*All elevations relative to sensor depth

Figure 4: Crest Gauge Installation Diagrams

CROSS SECTIONAL VIEW OF STREAM



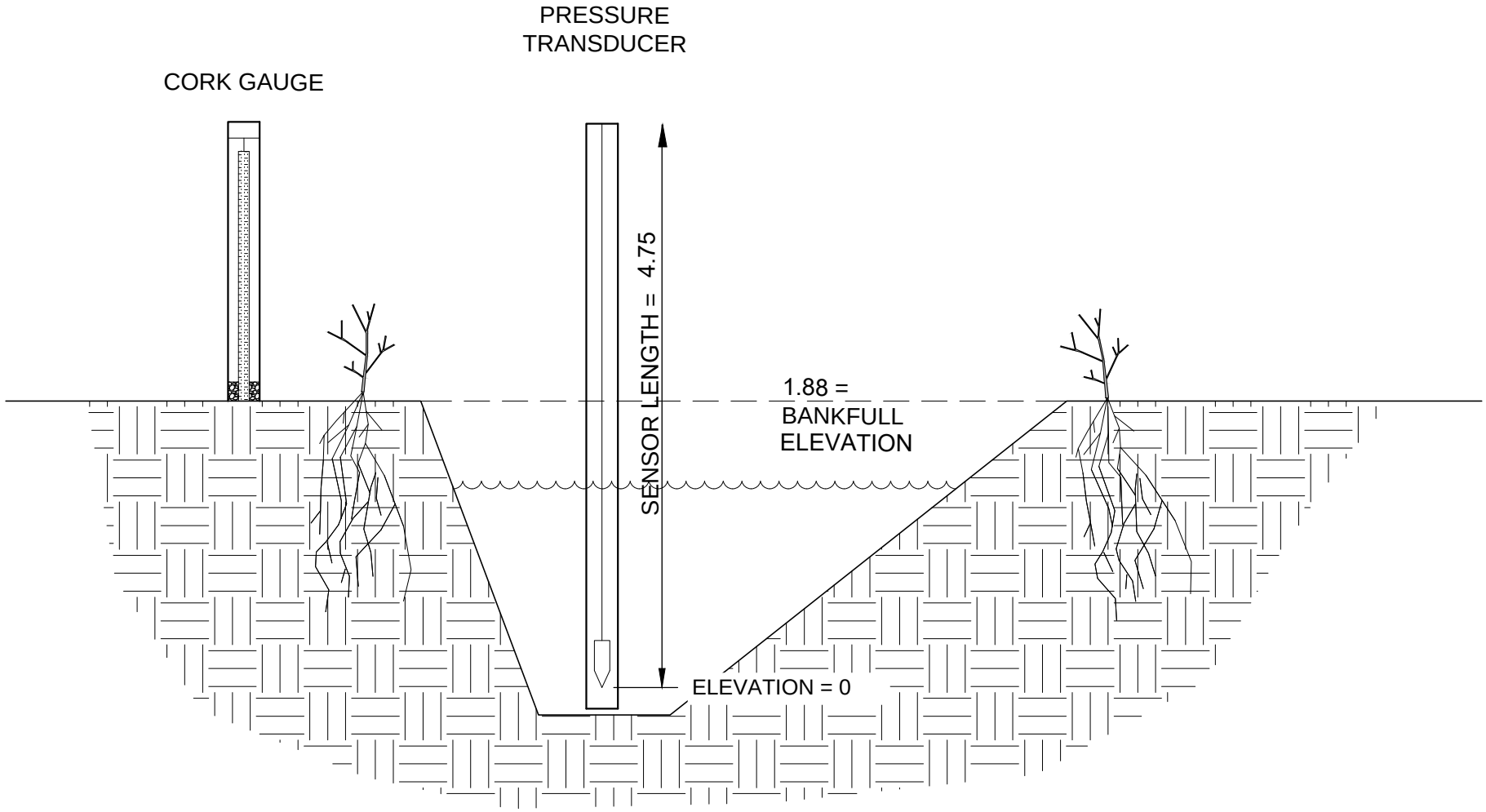
Crest Gauge CG-1 (R1)

Bankfull Event Depth = 1.08 feet

*All elevations relative to sensor depth

Figure 4: Crest Gauge Installation Diagrams

CROSS SECTIONAL VIEW OF STREAM

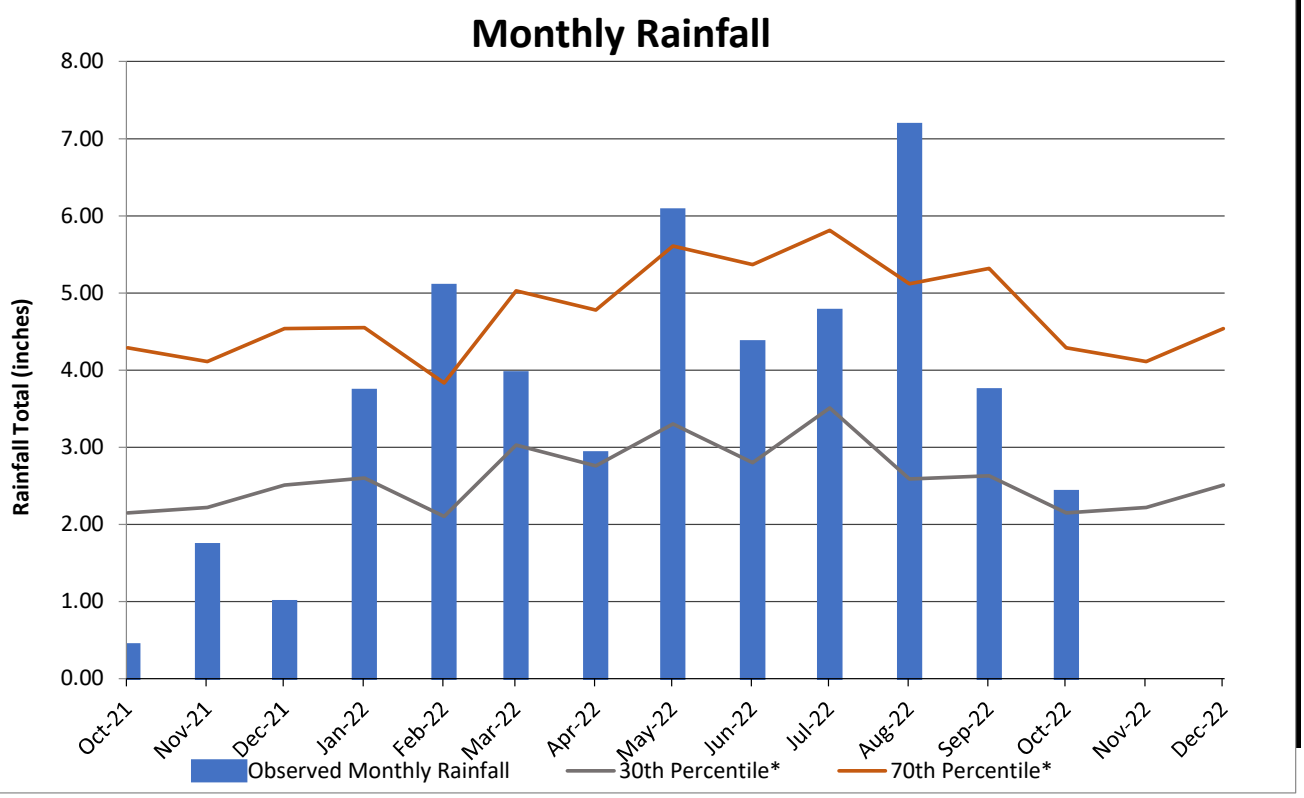


Crest Gauge CG-2 (R5)

Bankfull Event Depth = 1.88 feet

*All elevations relative to sensor depth

Figure 5: Monthly Rainfall Data
Horne Creek Tributaries Mitigation Project
MY3 2022



*30th and 70th percentile data collected from weather station Coop 315890 - Mount Airy, NC
**Incomplete Month

Month	30th Percentile*	70th Percentile*	Observed Monthly Rainfall
Oct-21	2.15	4.29	0.30
Nov-21	2.22	4.11	1.60
Dec-21	2.51	4.54	0.86
Jan-22	2.60	4.55	3.60
Feb-22	2.10	3.83	4.96
Mar-22	3.03	5.03	3.83
Apr-22	2.76	4.78	2.79
May-22	3.30	5.61	5.94
Jun-22	2.80	5.37	4.23
Jul-22	3.51	5.81	4.64
Aug-22	2.59	5.12	7.05
Sep-22	2.63	5.32	3.61
Oct-22	2.15	4.29	2.29
Nov-22	2.22	4.11	**
Dec-22	2.51	4.54	**

Appendix F: Macrobenthic Data

Table 9: Biotic Index Data and Scores
Benthic Field Data Sheets
Biotic Sampling Photographs

Table 9: Biotic Index Data and Scores

Pre-Construction 2018						MY3 2022		
Taxa / Biotic Index Value	R1	R5	Taxa / Biotic Index Value	R1	R5	Taxa / Biotic Index Value	R1	R5
EPHEMEROPTERA			Family Psephenidae			EPHEMEROPTERA		
Family Baetidae			Psephenus herricki (2.3)			Family Baetidae		
Baetis flavistriga (6.8)			Family Ptilodactylidae			Baetis intercalaris (5.0)		
Baetis pluto (3.4)		C	Anchytarsus bicolor (2.4)		A	Baetis pluto (3.4)		R
Diphetor hageni (1.1)		R	ODONATA			Family Ephemeridae		
Family Caenidae			Family Aeshnidae			Ephemera spp (2.0)		
Caenis spp (6.8)			Boyeria vinosa (5.6)		R	Family Heptageniidae		
Family Ephemerellidae			Family Calopterygidae			Maccaffertium modestum (5.7)		C
Telagonopsis deficiens (2.6)			Calopteryx spp (7.5)		R	Stenacron carolina (1.3)		
Family Heptageniidae			Family Cordulegasteridae			Family Leptophlebiidae		
Leucrocuta spp (2.0)			Cordulegaster spp (5.7)		R	Paraleptophlebia spp (1.2)		
Maccaffertium modestum (5.7)		A	Family Gomphidae			PLECOPTERA		
Family Leptophlebiidae			Gomphus spp (5.9)			Family Perlidae		
Habrophlebia vibrans (0.3)		R	Stylogomphus albistylus (5.0)			Amphinemoura (3.8)		
Habrophleboides spp		C	OLIGOCHAETA			Eccoptura xanthenes (4.7)		
Paraleptophlebia spp (1.2)		A	Family Lumbriculidae (7.0)		R	TRICHOPTERA		
PLECOPTERA			Family Naidae			Family Hydropsychidae		
Family Perlidae			Nais spp (8.7)		R	Cheumatopsyche spp (6.6)		
Agnetina flavescens (1.1)		R	Pristina spp (7.7)		R	Diplectrona modesta (2.3)		
Eccoptura xanthenes (4.7)		C	Slavina appendiculata (8.4)			Hydropsyche betteni (7.9)		C
Isoperla holochlora (1.2)			MEGALOPTERA			Family Limnephilidae		
TRICHOPTERA			Family Corydalidae			Neophylax atlanta (1.6)		
Family Glossosomatidae			Nigronia fasciatus (6.1)		R	Pycnopsyche spp (2.5)		
Glossoma spp (1.4)			CRUSTACEA			MISC DIPTERA		
Family Hydropsychidae			Family Asellidae			Family Ceratopogonidae		
Cheumatopsyche spp (6.6)		A	Caecidotea spp (8.4)			Atrichopogon spp		R
Diplectrona modesta (2.3)		C	MOLLUSCA			Family Simuliidae		
Hydropsyche betteni (7.9)	R	C	Family Ancylidae			Simulium spp (4.9)		R
Family Limnephilidae			Ferrissia spp (6.6)			DIPTERA; CHIRONOMIDAE		
Neophylax atlanta (1.6)		R	Family Pleuroceridae			Corynoneura spp (5.7)		
Family Odontoceridae			Elimia spp (2.7)		C	Cricotopus bicintus (C/O sp 1) (8.7)		R
Psilotreta spp (0.5)		R	OTHER TAXA			Orthocladius carlatus: C/O sp 54 (4.4)		
Family Philopotamidae			Family Planariidae			Parakieferiella spp (4.8)		R
Chimarra spp (3.3)		A	Dugesia tigrina (7.1)			Parametriocnemus spp (3.9)		R
Family Rhyacophilidae						Thienemaniella spp (6.4)		R
Rhyacophila carolina (0.4)		R	**Total Taxa Richness**	**15**	**38**	Thienemannimyia group (8.4)		
MISC DIPTERA			**EPT Taxa Richness**	**1**	**15**	Tribelos jacundum (5.7)		
Family Culicidae			**EPT Abundance**	**1**	**61**	COLEOPTERA		
Aedes spp	R		**Biotic Index**	**6.53**	**4.99**	Family Dryopidae		
Anopheles (8.6)	R		**Key**			Helichus spp (4.1)		
Culex spp	R		**R = Rare, C = Common, A = Abundant**			Family Dytiscidae		
Family Dixidae						Ilybius spp		
Dixa spp (2.5)	R	C				Neoporus spp (7.0)		
Family Simuliidae						Family Elmidae		
Simulium spp (4.9)	A	R				Macronychus glabratus (4.7)		
Family Tabanidae						Family Haliplidae		
Chrysops (6.7)						Peltodytes spp (8.4)		
Family Tipulidae						Family Hydrophilidae		
Dicranota spp (0)		R				Hydrochus spp		
Hexatoma spp (3.5)						Laccobius spp (6.5)		
Tipula spp (7.5)	R	A				Tropisternus blachleyi (9.3)	R	
DIPTERA; CHIRONOMIDAE						Tropisternus collaris (9.3)		
Chironomus spp (9.3)	A					Family Noteridae		
Corynoneura spp (5.7)						Hydrocanthus spp		
Cricotopus bicintus (C/O sp 1) (8.7)						Family Ptilodactylidae		
Eukieferiella claripennis (6.2)	R					Anchytarsus bicolor (2.4)		
Limnophyes spp		R				ODONATA		
Micropsectra polita (2.4)	C					Family Aeshnidae		
Microtendipes pedellus (3.9)						Boyeria vinosa (5.6)		
Nilotanypus fimbratus (4.9)						Family Calopterygidae		
Parametriocnemus lundbecki (3.7)						Calopteryx spp (7.5)	R	R
Phaenopscetra obediens gp (6.6)						Family Coenagrionidae		
Polypedilum aviceps (3.6)	R	R				Argia spp (8.3)	C	
Polypedilum fallax (6.5)						Enallagma sp (8.5)	R	
Polypedilum flavum (5.7)		R				Family Gomphidae		
Polypedilum illinoense (8.7)		R				Gomphus spp (5.9)		
Polypedilum tritum						Progomphus obscurus (8.2)		
Psectrotanypus dyari (10)						Family Libellulidae		
Rheocricotpus glabricolis (4.7)		R				Pachydiplax longipenis (9.6)		
Rheotanytarsus spp (6.5)		R				Family Macromiidae		
Stictochironomus devinctus (5.4)						Macromia spp (6.2)		
Tanytarsus acifer/buckleyi (6.6)		R				OLIGOCHAETA		
Thienemaniella spp (6.4)						Family Lumbriculidae (7.0)		
Thienemannimyia group (8.4)	R	C				Family Naidae		
Tvetenia bavarica gp (E sp 1) (3.6)						Pristinella spp (7.7)		
Zavrelimyia spp (6.1)	R					CRUSTACEA		
COLEOPTERA						Family Cambaridae		
Family Dryopidae						immature crayfish (7.5)	R	R
Helichus spp (4.1)		R				MOLLUSCA		
Family Dytiscidae						Family Pleuroceridae		
Neoporus spp (5.0)						Elimia spp (2.7)		R
Platambus spp						Family Corbiculidae		
Prodaticus spp	R					Corbicula fluminea (6.6)		
Family Elmidae						OTHER TAXA		
Stenelmis spp (5.6)		C				Family Corixidae		
Family Hydrophilidae						Sigara spp (8.7)		
Cymbiodyta spp	R					Family Hydrachnidae		
						Torrenticola spp (5.5)		
						Total Taxa Richness	**5**	**12**
						EPT Taxa Richness	**0**	**3**
						EPT Abundance	**0**	**7**
						Biotic Index	**8.24**	**5.65**

BENTHOS COLLECTION CARD

DATE 5-10-2022 COLLECT TIME 10:30 AM COLLECTORS KO, ED, CD CARD# 1
WATERBODY UT to Home Creek - R1
STAT. LOC. _____ RIVER BASIN Yadkin COUNTY Surry

CG-1

Substrate:			River:			Field Parameters:				
Boulder (10")	15	%	Mean depth	0.2'		Bank Erosion	N X	Mod ___	Sev ___	
Cobble (2 1/2-10")	20	%	Maxim. depth	0.9'		Canopy	% 0	Type ___		
Gravel (1/12-2 1/2")	35	%	Width	4.0'		Aufwuchs	N ___	Mod X	Abund. ___	
Sand (1/12")	20	%	Current	mod		Podostemum	N 0	Mod ___	Abund. ___	
Silt, fine Partic	10	%	Recent Rain?	no		Tribs Present?	NA			
Other	0	%	Photos	(#) ___						

Instream Habitat: (0,+,++)				Samples: (#)		Water Chemistry:	
Pools	++	Backwaters	0	Kicks	1	Temperature (°C)	—
Riffles	++	Detritus	0	Sweeps	3	Dissolved Oxygen (mg/L)	—
Snags	0	Aquatic Weeds	0	Leaf Packs	0	Conductivity (µmhos/cm)	—
Undercut Banks	+	Other	0	Rock-Log	0	pH	—
Root Mats	0			Sand	0		
				Visuals	2		
				Other	—		

Field Observations: Lots of iron and algae, canopy absent at this time, mix of stream mitigation. Most specimen found in bank undercuts, not riffles

BENTHOS COLLECTION CARD

DATE 5-10-2022 COLLECT TIME 11:15 AM COLLECTORS KA/ED/CO CARD# 1
WATERBODY R5- UT to Horne Creek
STAT. LOC. _____ RIVER BASIN Yadkin COUNTY Surry

Substrate:		River:		Field Parameters:	
Boulder (10")	10 %	Mean depth	0.3	Bank Erosion	N ✓ Mod ___ Sev ___
Cobble (2 1/2-10")	30 %	Maxim. depth	0.5	Canopy	% 0 Type absent
Gravel (1/12-2 1/2")	30 %	Width	10.0	Aufwuchs	N ___ Mod X Abund. ___
Sand (1/12")	20 %	Current	mod	Podostemum	N X Mod ___ Abund. ___
Silt, fine Partic.	10 %	Recent Rain ?	no	Tribs Present?	NO
Other	___ %	Photos	(#) 2		

Instream Habitat: (0,+,++)				Samples: (#)		Water Chemistry:	
Pools	++	Backwaters	0	Kicks	1	Temperature (°C)	___
Riffles	++	Detritus	0	Sweeps	3	Dissolved Oxygen (mg/L)	___
Snags	0	Aquatic Weeds	0	Leaf Packs	0	Conductivity (µmhos/cm)	___
Undercut Banks	+	Other	0	Rock-Log	0	pH	___
Root Mats	0			Sand	0		
				Visuals	2		
				Other			

Field Observations: Riffle at bottom of R5 and adjacent pools
8 + years post stream restoration

R1, Downstream (MY-03)

R1, Upstream (MY-03)

R1, Downstream (MY-03)

R5, Upstream (MY-03)