Monitoring Year 3 FINAL Monitoring Report

Stewarts Creek Tributaries Stream Restoration Project

Surry County, North Carolina

Yadkin River Basin, Hydrologic Unit Code (HUC) 03040101

Data Collection Period:
October 2022 – January 2023

Submission Date:
February 2023

NCDEQ Contract No. 7183
DMS ID No. 100023
RFP# 16-006993 (Issued 9/16/2016)
USACE Action ID No. SAW-2017-01508
DWR ID No. 20171043

Prepared For:

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Mr. Paul Wiesner
NCDEQ – Division of Mitigation Services
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801

February 22, 2023

RE: Response to Draft Monitoring Year 3 report for the Stewarts Creek Tributaries site Yadkin River Basin – CU# 03040101 – Surry County DMS Project ID No. 100023. Contract # 7183

Dear Mr. Wiesner,

Ecosystem Planning and Restoration (EPR) has reviewed the comments on the Draft MY3 Monitoring Report provided February 13, 2023. The comments have been addressed as described below and the Final MY3 Report and electronic deliverables have been revised in response to this review.

- *General: Please include the project's final 2022 Adaptive Management Plan (AMP) and IRT approval correspondence in an Appendix of the final MY3 (2022) report for reference.*
  - **Included.**

- *General: Please ensure that project monitoring equipment is checked prior to the start of the growing season and at least quarterly thereafter to confirm that it is functioning properly and collecting data through the full growing season/ monitoring year.*
  - **EPR will monitor equipment at the start of the growing season and at least quarterly going forward.**

- *Cover Page: Please include the issuance date of the RFP on the report cover (RFP# 16-006993 (Issued 9/16/2016).*
  - **Included.**

- *Section 1.2 Performance Criteria: Please review and update NCDED to NCDEQ.*
  - **Updated.**

- *Appendix D: Hydrologic Data - Year 3 (2022) Streamflow Data: Please provide a streamflow data summary table across all years of monitoring in the revised report. In the streamflow data graphs, please include call outs that identify the start and end dates of the most consecutive days of flow reported for each gauge. Several of the graphs report consecutive days of flow that do not appear to be accurate. As an*

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example, SCTSG3 reports 365 days for consecutive flow; however, there are several instances that show the water level dropping below the DS Riffle Elevation. Please explain in the response to DMS comments letter and update the graphs and final report as necessary.

- **Streamflow Summary Data added to Appendix D in Table 11. The consecutive flow days are accurate. The noise in the data was on every graph and is due to a few erroneous points in the barometric data. This noise does not last more than a few hours and has been removed to reduce confusion. Notes on the graphs have been added to each streamflow graphs for dates of consecutive days of flow and the removed inaccurate data. There is other noise on the graphs for the data that still appears less than the downstream riffle elevation, but these points last for only an hour and are in tolerance (0.1 foot) of the downstream riffle elevation.**

Project Property Action Items for MY4 (2023)

- *Due to the numerous mowing encroachments, the boundary marking should be upgraded sufficiently to prevent future mowing or crop planting within the easement. The landowner/operator should be notified of the easement locations and requirements for boundary integrity.*
  - **Noted and will be addressed in monitoring year 4. The landowner/operator will be notified, and a row of trees will be planted inside the easement boundary. Additional t-posts and horse tape will be used to mark the boundary more clearly.**

- *Supplemental marking and easement boundary protection should be provided in all encroachment areas and not limited to the example locations provided in the attached .kmz support file.*
  - **Noted and will be addressed in monitoring year 4. A row of trees will be planted inside the easement boundary. Additional t-posts and horse tape will be used to mark the boundary more clearly.**

- *Supplemental planting is recommended in the encroachment areas and re-planting should be conducted in accordance with the approved mitigation plan and IRT coordination.*
  - **Noted and will be addressed in monitoring year 4.**

- *Repair damaged signs and posts and install missing corner posts.*
  - **Noted and will be addressed in monitoring year 4.**

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- *Determine location of permanent deer stand relative to easement and move to a location outside the easement if encroaching.*
    - **Noted and will be addressed in monitoring year 4.**

- *DMS will discuss the approximately 300' long 5-strand barbed wire fence observed within the conservation easement with DEQ Stewardship to determine if the internal fencing should be removed from the site prior to project closeout. DMS will follow up with EPR on any required next steps.*
    - **Noted.**

Digital Support File Comments

- *The Flow Data Summary Table across all years of monitoring is missing from the submission. Please include it in the final digital submission.*
    - **Included in digital submission.**

- *EPR identified .1 acres of invasives which is the mapping threshold for spatial data. Please submit the spatial file for the area of invasives listed on the vegetation visual assessment table and show the area on the report's final CCPV map.*
    - **The 0.1 acres was the area of invasive kudzu that was treated in August 2022. It was included on the table to note that the area will be continually treated to prevent the kudzu from spreading as stated in Section 2.2.1. This area and note are included on the final CCPV map and digital support files.**

If you have any questions regarding the Final MY2 Monitoring Report, please contact me at 919-388-0787 or via email at ebennett@eprusa.net.

Sincerely,

Erin M Bennett

Erin M. Bennett, PE

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Final 2022 Adaptive Management Plan
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1.0 PROJECT SUMMARY

Ecosystem Planning and Restoration, PLLC (EPR) implemented the Stewarts Creek Tributaries Stream Restoration Project (Project; Site) for the North Carolina Department of Environmental Quality (NCDEQ) Division of Mitigation Services (DMS) to provide 10,649.2 stream mitigation credits (SMCs) in the Yadkin River Basin, Hydrologic Unit Code (HUC) 03040101. The Stewarts Creek Tributaries Stream Restoration Project was contracted via NCDEQ-DMS RFP #16-006993. As approved by the North Carolina Interagency Review Team (NCIRT), all projects contracted under the 16-006993 RFP have a cool or warm water thermal regime service type. Penalties will not be assessed for using these project mitigation credits to satisfy cool or warm water thermal regime requirements. The Project restored 9,498 linear feet and enhanced 1,573 linear feet of three Unnamed Tributaries (UTs) to Stewarts Creek and Moores Fork within a 30-acre conservation easement (Figures 1A-E). An adaptive management plan was approved in June 2022 (Appendix F) that modified the restored length of stream to 9,339.2 linear feet. Revised mitigation assets are listed in Table 1.

The Site is located in NCDEQ Division of Water Resources (DWR) Sub-basin 03-07-03 and DMS Targeted Local Watershed 03040101100010. The Site was historically utilized for agricultural and cattle practices. As such, wetlands and streams in the Project area were adversely impacted by direct cattle access, farming activities, and stream channelization. The Site is situated on historic pastureland in a WS-IV Watershed that is 49% agricultural land, 37% forest, 11% residential, and 1% impervious. Prior to construction activities, all Project streams were incised, the UTs were straightened and had adjacent row crops, and Moores Fork suffered from cattle damage. Pre-construction, or pre-existing, Site conditions are provided in Table 3 and the Summary Tables in Appendix C. Photos and a more detailed description of Site conditions before restoration are available in the Mitigation Plan (Final version submitted May 2019).

1.1 Goals and Objectives

The Project goals were established based on an assessment of Site conditions and restoration potential with careful consideration of the stressors identified in the Upper Yadkin Pee-Dee River Basin Restoration Priorities (RBRP) Report (NCEEP, 2009) and Yadkin Pee-Dee Basinwide Water Quality Plan (NCDWQ, 2008). These goals and objectives are presented in Table 2.

Site construction was completed in May 2020 and the as-built survey was completed in June 2020. Planting and baseline vegetation data collection occurred in May – June 2020. Adaptive Management Plan Construction was completed in January 2023. A detailed timeline of the Project activity and reporting history is provided in Appendix E.

1.2 Performance Criteria

Project success criteria were established in accordance with the *NCDEQ DMS Mitigation Plan Template* (ver. 06/2017), and *US Army Corps of Engineers – Wilmington District Public Notice: Notification of Issuance of Guidance for Compensatory Stream and Wetland Mitigation Conducted for Wilmington District* (October 24, 2016). The monitoring plan for the Site will

follow the same guidance as the *NCDEQ DMS Annual Monitoring Report Format, Data, and Content Requirement* (October 2020). Table 2 details the USACE success criteria that evaluate whether Project goals have been met throughout the monitoring period. For more detailed success criteria refer to the Final Mitigation Plan, the As-built Baseline Monitoring Report (Final version submitted October 2020), or the Adaptive Management Plan (Final version submitted June 2022 – Appendix F).

Table 1. Revised Project Mitigation Quantities and Credits

Project Component (reach ID, etc.)	Original Mitigation Plan and As-Built ft/ac	Proposed AMP ft/ac	Original Mitigation Thermal Regime Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Original Mitigation Credits	Revised Mitigation Credits
UT1	2,742	2,742	Cool	R	1.0	2,742	N/A
UT2	1,009	1,009	Cool	R	1.0	1,009	N/A
UT3 R1	944	944	Cool	R	1.0	944	N/A
UT3 R2	2,421	2,421	Cool	R	1.0	2,421	N/A
Moores Fork R1	1,573	1,573	Cool	E2	2.5	629.2*	N/A
Moores Fork R2	1,998	1,839.2	Cool	R	1.0	1,998	**1,839.2**
Moores Fork R3	384	384	Cool	R	1.0	384	384
Net Change In Credit From Buffers	-	-	-	-	-	522	**530.7**
					New Total Assets Summary:		**10,499.1 SMUs**

Length and Area Summations by Mitigation Category

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)
		Riverine	Non-Riverine	
Restoration	**9,339.2**			
Enhancement				
Enhancement I				
Enhancement II	1,573			
Rehabilitation				
Preservation				
High Quality Pres				

Overall Assets Summary

Asset Category	Overall Credits
Stream	**10,499.1**

*Moores Fork R1 mitigation credits were miscalculated due to a minor rounding error in the IRT approved Mitigation Plan. This has been updated in the baseline and subsequent monitoring reports.

Table 2. Summary: Goals, Performance, and Results

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Reduce sediment inputs and stream turbidity;	▪ Reduce the amount of land in active livestock pasture. ▪ Install fencing to exclude livestock from Project buffers and streams. ▪ Increase distance between active farming operations and receiving waters. ▪ Restore and protect riparian buffers to filter runoff. ▪ Stabilize eroding streambanks and concentrated runoff areas.	▪ Excluding livestock from all streams and buffers. The exclusion of livestock will remove a direct source of nutrients, fecal coliform, and sediment from the system. ▪ Restoring the Project streams to stable, functioning condition. Appropriate channel dimensions and in-stream log and wood structures will ensure channel stability and improve aquatic habitats. ▪ Restoring natural riparian vegetation. Restored riparian buffers will provide a source of woody debris and detritus for aquatic organisms, restore diverse aquatic and terrestrial habitats appropriate for the ecoregion and landscape setting, and provide shade, reduce water temperatures, and increase dissolved oxygen concentrations.	▪ Recordation and protection of a conservation easement meeting DMS guidelines ▪ Visual inspection of fence installed to exclude cattle from the stream and riparian buffer, demonstrating no encroachment. ▪ Vegetation success criteria of 320 native stems/ acre in Year 3, 260 native stems/acre in Year 5, and 210 native stems/acre in Year 7. Trees in each plot will average 7 feet in height at MY5 and 10 feet in height at MY7. ▪ Visual documentation of installed watering system and regular checks on its operation during annual monitoring. ▪ Visual inspection of BMP's to ensure proper function during monitoring period. ▪ Geomorphic cross sections indicate stable sections over the monitoring period. ▪ Bank height ratio (BHR) cannot exceed 1.2 for all	<u>Permanent Vegetation Plots</u> 11 permanent vegetation plots, 0.02 acre in size (minimum), surveyed during As-built, Years 1, 2, 3, 5, and 7 between July 1st and leaf drop. Data collection includes species, height, planted vs. volunteer, and age.	The 11 permanent vegetation plots survey during Monitoring Year 3 had an average stem density of 511 stems/acre which meets the success criteria of 320 native stems/acre in MY3. The 11 permanent vegetation plots surveyed during Monitoring Year 3 had an average tree height of 3.2 feet which does not meet the interim success criteria of 7 feet in MY5.
Reduce nutrient inputs	▪ Reduce the amount of land in active livestock pasture and row crop agriculture. ▪ Install fencing to exclude livestock from Project buffers and streams. ▪ Increase buffer widths between active farming operations and receiving waters. ▪ Restore and protect riparian buffers to filter runoff. ▪ Promote higher water table conditions, and thus denitrification, along restored headwaters.				
Reduce Fecal Coliform Inputs	▪ Reduce the amount of land in active livestock pasture. ▪ Exclude livestock from Project streams and buffers. ▪ Increase buffer width between active farming operations and receiving waters. ▪ Restore and protect riparian buffers to filter runoff.			<u>Annual Random Vegetation Plots</u> 11 randomly selected vegetation plots, 0.02 acre in size (minimum), surveyed during As-built, Years 1, 2, 3, 5, and 7 between July 1st and leaf drop. Data collection includes species and height.	The 11 randomly selected vegetation plots had an average stem density of 585 native stems/acre. which meets the success criteria of 320 native stems/acre in MY3. VPR-11 had 243 native stems/acre and didn't meet the interim success criteria. The 11 randomly selected vegetation plots had an average tree height of 3.6 feet which does not meet the interim

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
		▪ Conversion of row crops to forested buffer. ▪ Protecting all areas with conservation easement.	measured cross sections on a given reach. ▪ Entrenchment ratio (ER) must be 2.2 or above for all measured riffle cross sections for C/E stream types and 1.4 or above for B stream types. ▪ Documentation of hydrophytic vegetation within vegetation monitoring plots. ▪ Documentation of four bankfull events in different years throughout the monitoring period. ▪ Documentation of 30 days of consecutive stream flow in all reaches each monitoring year		success criteria of 7 feet in MY5.
Restore / Enhance Degraded Riparian Buffers	▪ Restore riparian buffer vegetation to filter runoff and provide organic matter and shade. ▪ Protect riparian buffers with permanent conservation easement.			<u>Stream Profile</u> Full longitudinal survey on all restored and enhanced stream channels. Data was collected during As-built survey only (unless otherwise required).	A full longitudinal survey of the Projects streams was conducted during As-built monitoring. Though repairs were conducted on the lower reaches of Moore's Fork, no longitudinal profile was shot during MY3.
Implement Agricultural BMPs in Agricultural Watersheds	▪ Construct agricultural conveyance system to filter and reduce agricultural runoff into restored stream systems. ▪ Construct a critical area restoration BMP by removing and decommissioning a heavily eroding forest road and cattle use area.			<u>Cross Sections</u> Cross sections are surveyed during Years 1,2,3,5, and 7. 26 total cross sections, 17 cross sections on the UTs and 9 cross sections on Moores Fork.	The Year 3 monitoring cross section surveys indicate that the Project streams are geomorphically stable and restored channel dimensions have not changed significantly during Monitoring Year 3. The lower reaches of Moores Fork cross sections were relocated after AMP construction.
Reduce Urban/ Suburban Stormwater Runoff	▪ Restore riparian buffers along headwater streams that drain suburban areas. ▪ Protect riparian buffers with permanent conservation easement.			<u>Visual Assessment</u> Conducted yearly on all restored stream channels and in-stream structures.	Visual assessment of streams indicate that restored channels and in-stream structures within the majority of Stewart's Creek are in good condition and functioning as intended.

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
				<u>Additional Cross Sections</u> Only surveyed if instability is documented during monitoring.	No additional cross sections were surveyed during MY3 but two cross sections on the lower reaches of Moores Fork were relocated.
Reduce Stream Channel and Streambank Instability	▪ Restore degraded stream channels by establishing appropriate dimension, pattern and profile. ▪ Install in-stream structures to provide stream channel and streambank stability. ▪ Restore and protect riparian buffer to provide bank protection and stability. ▪ Install fencing to exclude livestock from Project streams and buffers.			<u>Stream Hydrology Monitoring</u> 5 pressure transducers and a rain gauge will record precipitation and streamflow data continuously through the monitoring period. Photos of high water indicators will be taken yearly.	Flow gauge data from MY3 indicate that the UTs met the established success criteria of 30 days or more of consecutive flow throughout the year. In addition, 1 – 5 bankfull events were recorded for the UTs.

Table 3. Project Attribute Table

Project Background Information				
Project Name		Stewarts Creek Tributaries Stream Restoration Project		
County		Surry		
Project Area (acres)		30		
Project Coordinates (latitude and longitude)		latitude 36 deg 30' 55" N, longitude 80 deg 41' 41" W and latitude 36 deg 30' 37" N, longitude 80 deg 42' 01" W		
Planted Acreage (Acres of Woody Stems Planted)		30		
Project Watershed Summary Information				
Physiographic Province		Piedmont		
River Basin		Yadkin Pee-Dee		
USGS Hydrologic Unit 8-digit	03040101	USGS Hydrologic Unit 14-digit	3040101100010	
Project Drainage Area (Acres and Sq. Mi.)		3,001 acres/ 4.69 Sq.Mi. (Total)		
Project Stream Thermal Regime		Cool		
Project Drainage Area Percentage of Impervious Area		Average 1%		
CGIA Land Use Classification		Average 35% Agriculture 50% Forested/Scrubland 11% Residential		

Reach Summary Information				
Parameters	**Moores Fork**	**UT1**	**UT2**	**UT3**
Length of reach (linear feet)	3,796.2	2,742	1,009	3,365
Valley confinement (Confined, moderately confined, unconfined)	Unconfined	Unconfined	Unconfined	Unconfined
Drainage area (Acres and Square Miles)	4.4 Sq.Mi., 2816 Ac	0.11 Sq.Mi., 70 Ac	0.07 Sq.Mi., 45 Ac	0.11 Sq.Mi., 70 Ac
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Perennial
NCDWR Water Quality Classification	WS-IV	WS-IV	WS-IV	WS-IV
Stream Classification (existing)	F4	G4 -> F4	Channelized E4	F4
Stream Classification (proposed)	C4	C4	C4	C4
Evolutionary trend (Simon)	V	IV	IV	IV
FEMA classification	AE	AE	AE	AE

Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	Yes	SAW-2017-01508
Water of the United States - Section 401	Yes	Yes	DWR #17-1043
Division of Land Quality (Erosion and Sediment Control)	Yes	Yes	General Permit NCG010000 - ID # SURRY-2020-005
Endangered Species Act	No	Yes	Categorical Exclusion Document; Appendix 10 in Mitigation Plan
Historic Preservation Act	No	Yes	
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	CLOMR 19-04-3237R, Floodplain Development Permit PL201900063, LOMR case number 21-04-0390P, and planning approval on 09/22/22
Essential Fisheries Habitat	No	N/A	N/A

2.0 MONITORING DATA ASSESSMENT

This document reports the Monitoring Year 3 data and compares it to the baseline data to determine the success of the Stewarts Creek Stream Restoration Project based on the performance criteria stated above.

2.1 Stream Monitoring

Stream monitoring involved field collection to assess the hydrologic and geomorphic functions of UT1, UT2, UT3, and Moores Fork. Monitored parameters, methods, schedule/frequency, and extent are summarized in Table 2. These monitoring parameters follow USACE guidance, but will also allow for monitoring of other parameters to document Site performance related to the Project goals listed in Table 2. The locations of the established monitoring cross sections and are shown in Figures 1B-1E (Current Condition Plan View (CCPV)). Construction on the Adaptive Management Plan (Appendix F) was completed in January 2023 and shown in Figures 1B-1E.

2.1.1 Stream Profile

A full longitudinal profile was surveyed for the entire length of the restored streams in May - June 2020 to document as-built conditions. This survey was tied to a permanent benchmark and includes thalweg, water surface, right bank, and left bank features. Profile measurements were taken at the head of each feature (e.g. riffle, pool) and at the max depth of pools. The longitudinal profile will not be surveyed during annual monitoring unless vertical channel instability has been observed during monitoring and remedial actions or repairs are needed.

2.1.2 Stream Dimension

Permanent cross sections were installed across the Site to monitor stream stability through dimension change. Of the 26 permanent cross sections installed, 9 were located on Moores Fork and 17 on the UTs with 12 permanent cross sections installed in riffles and 14 in pools. Each cross section was monumented using t-posts on both streambanks. The location and elevation of each pin was located and recorded to facilitate data comparison from year to year. Cross sections were surveyed using a Topcon RL-H5A Self Leveling Laser Level. Reported data includes measurements of Bankfull Elevation (based on as-built bankfull area), Bank Height Ratio (BHR) (based on as-built bankfull area), Thalweg Elevation, Top of Bank Elevation, Top of Bank Max Depth, Top of Bank Cross Sectional Area, and Entrenchment Ratio (ER) (Appendix C). BHR measurements were made by holding the bankfull area recorded in the Baseline As-built report constant and adjusting the bankfull elevation. Reference photos were and will be taken of both streambanks every year to provide a visual assessment of any changes that may occur.

The Year 3 monitoring cross section surveys indicate that the majority of Project streams are geomorphically stable and have not changed significantly during Monitoring Year 3. Stream cross sections showed only minor fluctuations compared to the as-built condition and meet the success criteria for restored stream channels as established in the Mitigation Plan and shown in Table 2. Two cross sections (XS 4 & 5) located in Moores Fork Reach 2 were relocated due to

the adaptive management plan (Appendix F). The cross-section plots, photos, and data summary are included in Appendix C.

2.1.3 Channel Stability

Channel stability is assessed on an annual basis using photographs to visually document the condition of the restored Project streams. Photographs are taken from the same location in the same direction each year. 38 photo points were established during baseline monitoring and are shown in the CCPV (Figures 1B-1E). Visual assessments of channel stability were also made regularly throughout Monitoring Year 3.

Stream photo points and visual assessment indicate that a majority of restored channels and in-stream structures are in good condition and performing as intended. During Monitoring Year 3, the construction proposed in the Adaptive Management Plan (Appendix F) was completed. The location of the construction activities is shown in the CCPV (Figures 1B-1E). Photos of these areas are also included in the Monitoring Year 3 Photolog (Appendix A).

2.1.4 Stream Hydrology

Five pressure transducers were installed along the UTs to document stream flow and the occurrence of bankfull events within the monitoring period. The locations of these gauges are shown in the CCPV (Figures 1B–1E). All gauges were installed at the downstream end of pools. The constructed bankfull elevation at each gauge was located and recorded, as well as the elevation of the downstream controlling grade. These elevations will be compared with the gauge readings to determine and document whether the stream is flowing and if a bankfull event has occurred.

A tipping bucket rain gauge was also installed at a nearby EPR mitigation site to accurately document rainfall at the Site. The rainfall data can be compared to the flow gauge data to verify that high flows at the Site are correlated with rainfall events. The monitoring gauges were downloaded regularly throughout Monitoring Year 3 and rainfall data is presented in the flow gauge plots in Appendix D.

Flow gauge data from MY3 indicate that all three Project streams met the established success criteria of 30 days or more of consecutive flow throughout the year. According to the gauge for UT1 (SG-1), the stream had consistent flow throughout the year (365 consecutive days of flow) and the gauge documented 4 bankfull events. SG-2, located downstream on UT1 had corrupted data from 01/01/22 – 08/09/22, but even with the corrupted data there were 145 consecutive flow days in the 08/09/22 – 12/31/22 period and 1 bankfull event. SG-3, located on UT3 Reach 1, documented consistent flow throughout the year (365 consecutive days of flow) and 5 bankfull events. SG-4, located on UT3 Reach 2, had corrupted data from 01/01/22 – 08/09/22, but even with the corrupted data there was consistent flow throughout 08/09/22 – 12/31/22 period (145 days of consecutive flow) and 4 bankfull events. SG-5, located on UT2, documented consistent flow throughout the year (179 consecutive days of flow) and 3 bankfull events. Bankfull events were further verified by analysis of rain gauge data. The date and timing of

these bankfull events correlated with significant rainfall events recorded by the tipping bucket rain gauge.

In August 2022 the stream gauges SG-2 and SG-4 were serviced, inspected, replaced, and recalibrated due to the corrupt data. SG-2 was resurveyed in February 2023 due to the drifting in the data after the gauge was replaced. The numerous bankfull events in MY2 appear to normalize in MY3. The in-channel vegetation is decreasing over time as the woody vegetation along the banks matures and shades out the herbaceous vegetation in the stream channel.

2.2 Riparian Vegetation Monitoring

Riparian vegetation monitoring evaluates the growth and development of planted and volunteer vegetation across the Site. Monitored parameters, methods, schedule/frequency, and extent are summarized in Table 2. These monitoring parameters follow USACE guidance, but will also allow for monitoring of other parameters to document Site performance related to the Project goals listed in Table 2.

2.2.1 Vegetation Monitoring Data

Eleven (11) permanent vegetation monitoring plots were monitored across the Site. The corners of the permanent vegetation plots were marked using steel t-posts and the location of each plot was surveyed during the as-built survey. The individual trees within each permanent plot were flagged and identified to facilitate repeat monitoring each year. In addition to the 11 permanent plots, 11 randomly placed vegetation plots are established each year and the location of these plots is recorded using GPS. All vegetation plots for MY3 are shown in the CCPV (Figures 1B – 1E). Annual vegetation data is compiled and summarized using the DMS Vegetation Data Entry Tool.

Year 3 vegetation monitoring occurred in October 2022 and January 2023. Planted stem counts for each plot ranged from 6-17 trees per plot (243 - 688 trees per acre). The average density of planted stems from all 22 vegetation plots (permanent and random) was 14 trees per plot (567 trees per acre). Therefore, the vegetation plot data indicates that planted trees on the Site are meeting the interim success criteria for Monitoring Year 3 except for VPR-11. Monitoring Year 3 had an average planted stem height of 3.2 feet for permanent vegetation plots and 3.6 feet for randomly placed vegetation plots which doesn't meet the interim success criteria of 7 feet in MY5. Interim success criteria for stem height is for MY5 so 2 additional years of tree growth will occur prior to determining if the site is meeting the interim success criteria. Stem height will be monitored in MY4 to determine whether the site appears to be on track to meet the interim success criteria in MY5.

Only minor vegetation problem areas were noted in MY3 vegetation plots. Riparian herbaceous vegetation that was established after construction and the supplemental planting appears to be flourishing throughout the Site. The reestablished VPF-3 was planted with approved species and similar density as the other surrounding vegetation plots. Approximately 0.1 acres of invasive kudzu was treated in August 2022 on the left floodplain within the conservation

easement on Moores Fork Reach 3 shown in the CCPV (Figures 1B – 1E). EPR will continue to treat the kudzu to prevent it from spreading.

3.0 REFERENCES

North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS). DMS Vegetation Data Entry Tool, October 2020. https://ncdms.shinyapps.io/Veg_Table_Tool/

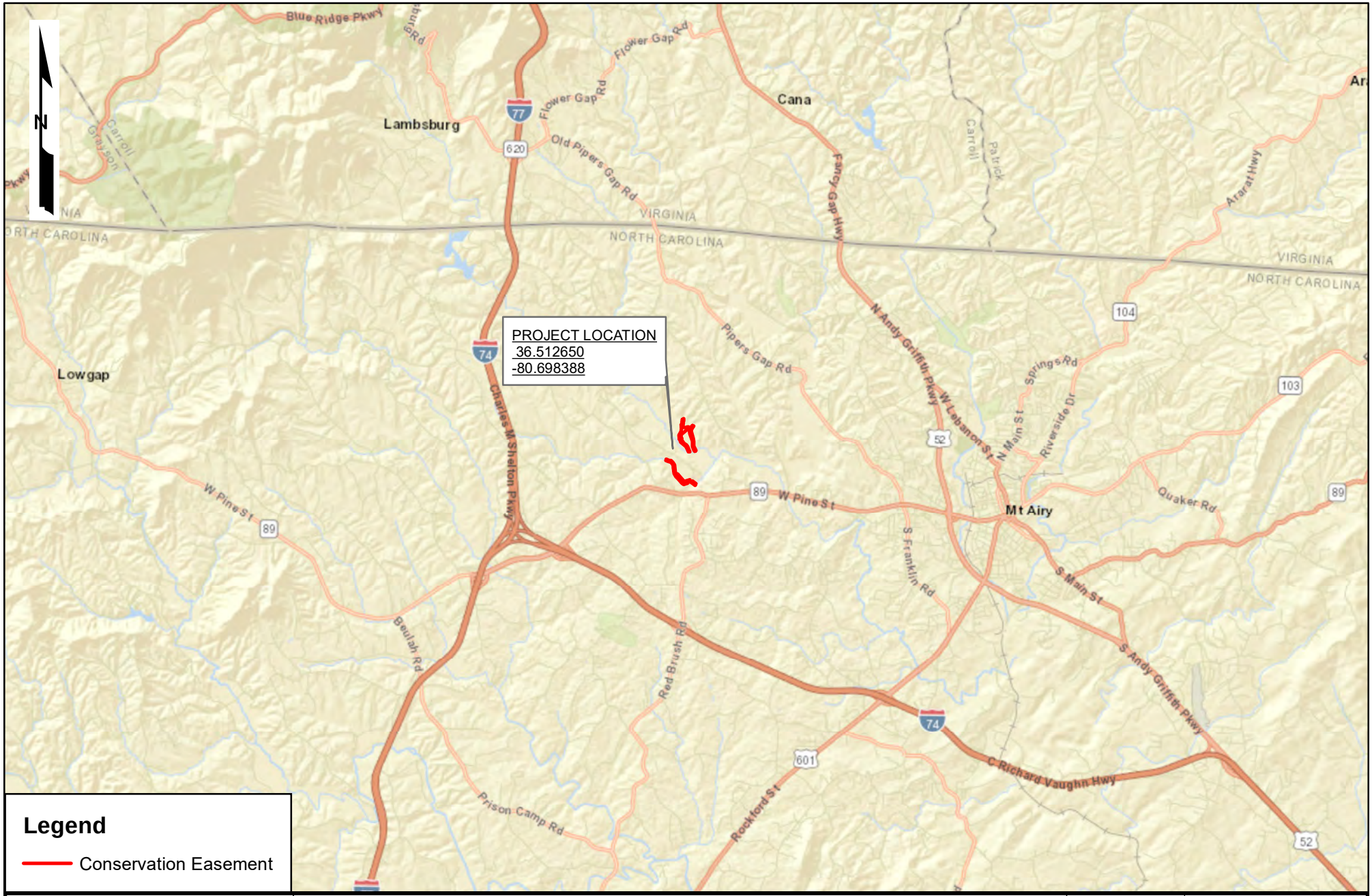
North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS). DMS Cross Section Tool V.1.0 2020. https://ncdms.shinyapps.io/XS_APP/

North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS). Annual Monitoring Report Format, Data, and Content Requirements, October 2020.

North Carolina Ecosystem Enhancement Program. 2009. Upper Yadkin Pee-Dee River Basin Restoration Priorities.

North Carolina Division of Water Quality. 2008. Yadkin Pee-Dee Basinwide Water Quality Plan.

U.S. Army Corps of Engineers. 2016. Wilmington District Public Notice: Notification of Issuance of Guidance for Compensatory Stream and Wetland Mitigation Conducted for Wilmington District.



STEWARTS CREEK TRIBUTARIES STREAM RESTORATION PROJECT

VICINITY MAP

DMS PROJECT ID# 100023

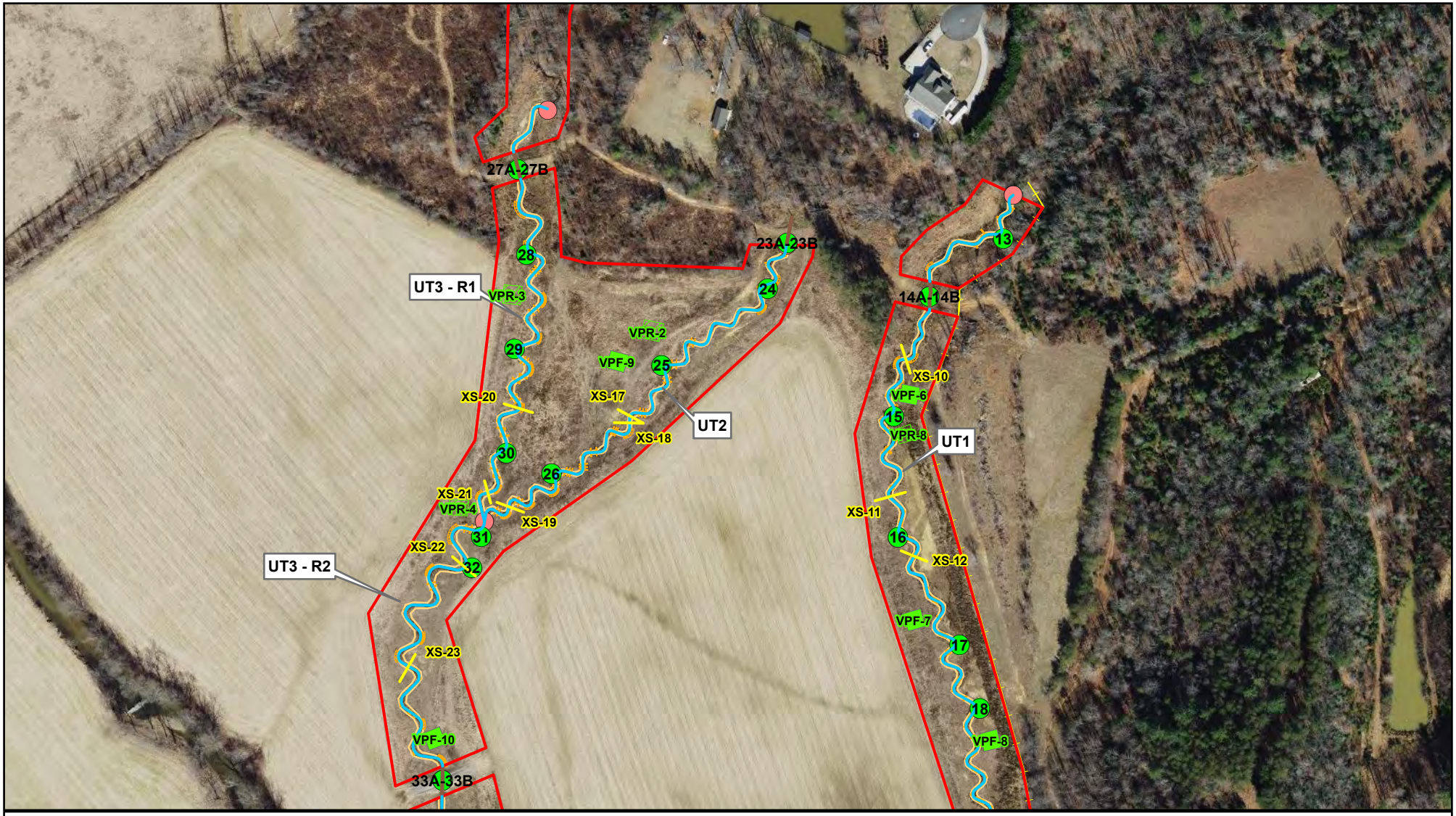
FEBRUARY 2023

FIGURE 1A

SURRY COUNTY, NC

NC Mitigation Services ENVIRONMENTAL QUALITY

EPR ECOSYSTEM PLANNING & RESTORATION



Streams - Enhancement
Streams - Restoration
No Credit
Conservation Easement

Fixed Vegetation Plot
Successful
Unsuccessful
Relocated

Random Vegetation Plot
Successful
Unsuccessful
Structures

Top of Bank
Photo Points
Cross Sections
Relocated Cross Sections

Reach Breaks
Fence

NC OneMap Orthoimagery (2018)

0 120 240 Feet
1:3,000

N

STEWARTS CREEK TRIBUTARIES STREAM RESTORATION PROJECT

Current Condition Plan View: Asset Map
MY3: 2022

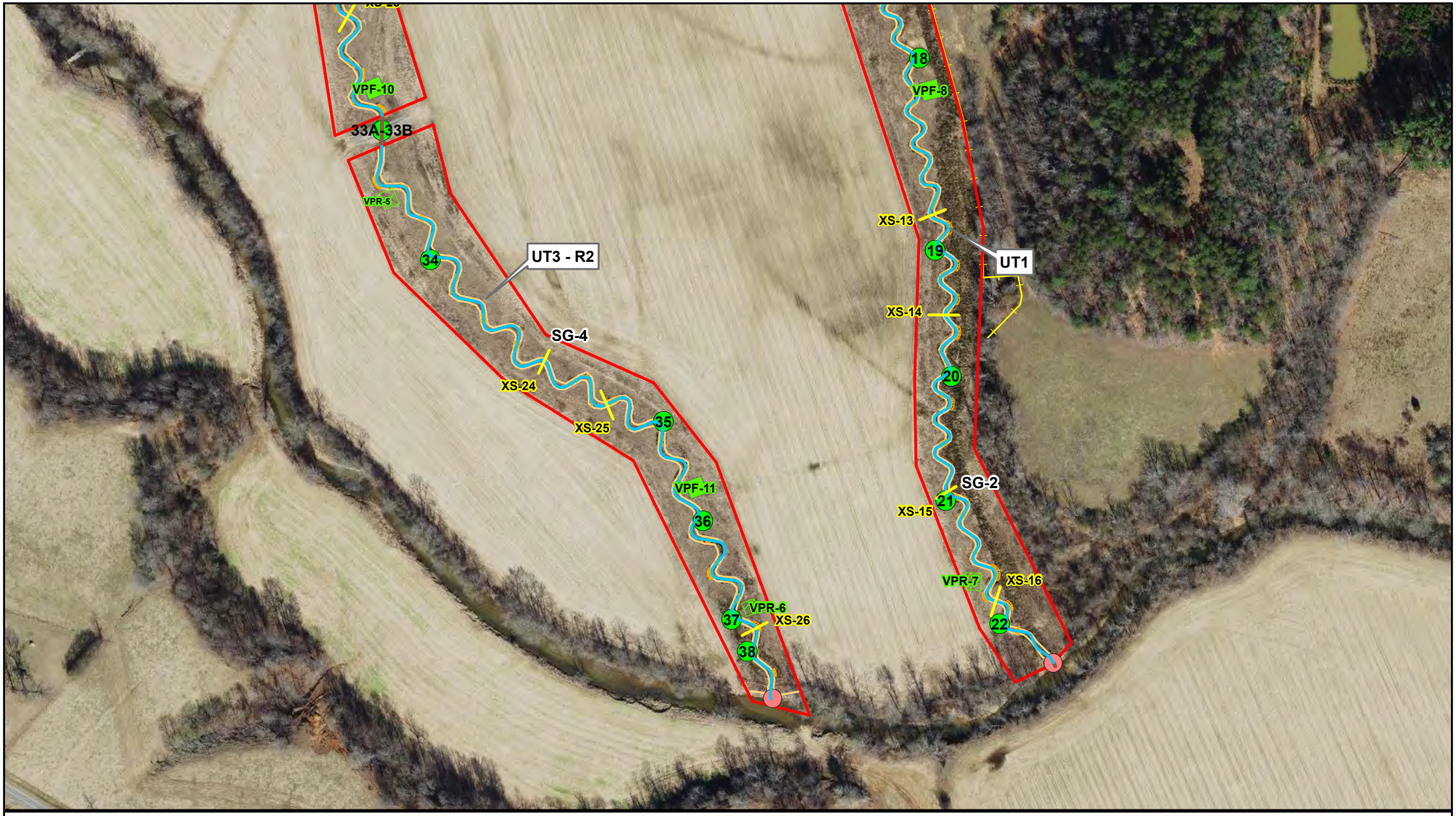
Surry County, NC

DMS Project
ID# 100023
FEBRUARY 2023

FIGURE 1B

Mitigation Services
Environmental Quality

Ecosystem Planning & Restoration



Streams - Enhancement
Streams - Restoration
No Credit
Conservation Easement

Fixed Vegetation Plot
Successful
Unsuccessful
Relocated

Random Vegetation Plot
Successful
Unsuccessful
Structures

Top of Bank
Photo Points
Cross Sections
Relocated Cross Sections

Reach Breaks
Fence

NC OneMap Orthoimagery (2018)

0 120 240 Feet
1:3,000

N

STEWARTS CREEK TRIBUTARIES STREAM RESTORATION PROJECT

Current Condition Plan View: Asset Map
MY3: 2022

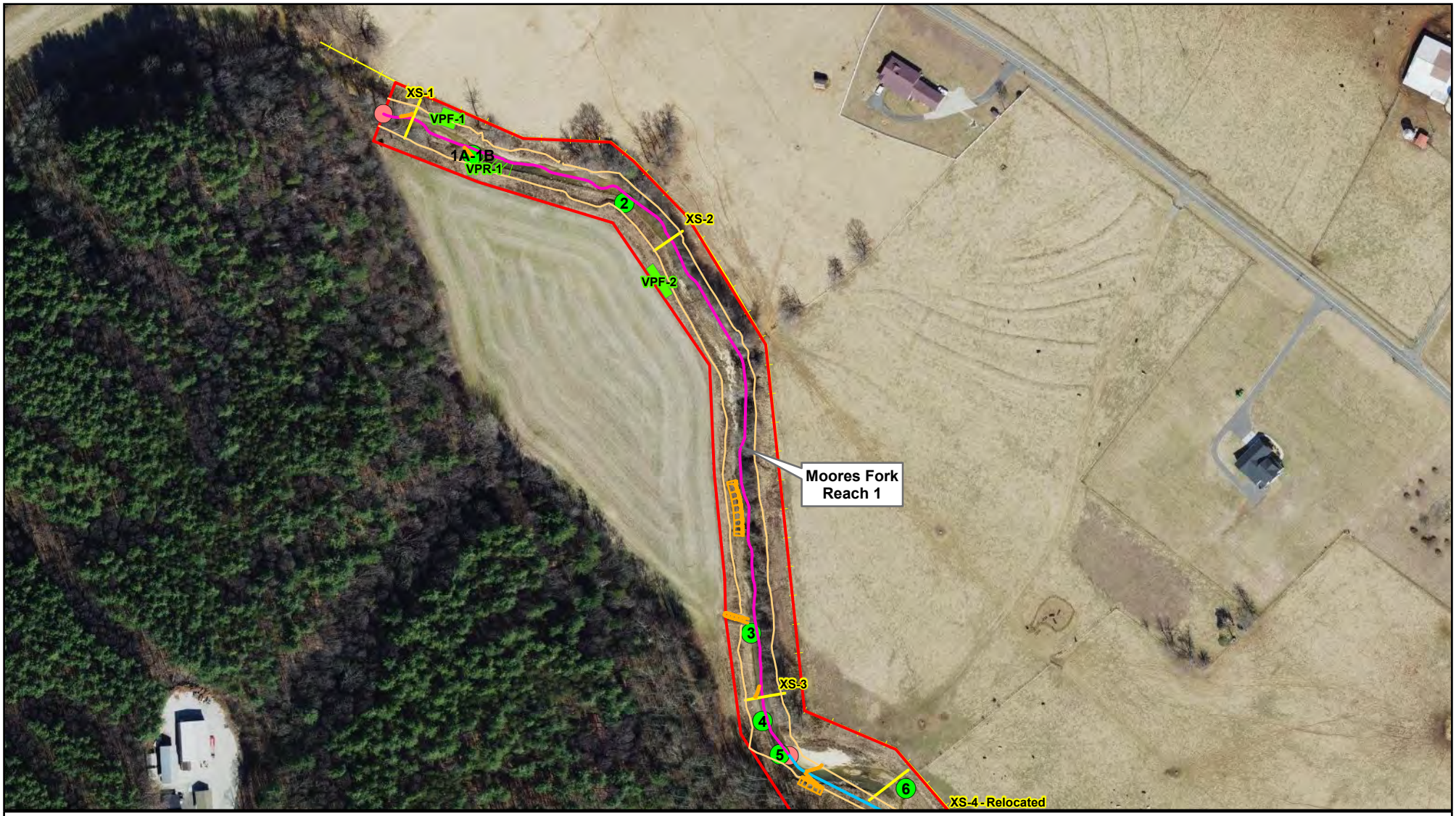
DMS Project ID# 100023
February 2023

FIGURE 1C

Surry County, NC

Mitigation Services Environmental Quality

Ecosystem Planning & Restoration



Streams - Enhancement
Streams - Restoration
No Credit
Conservation Easement

Fixed Vegetation Plot
Successful
Unsuccessful
Relocated

Random Vegetation Plot
Successful
Unsuccessful
Structures

Top of Bank
Photo Points
Cross Sections
Relocated Cross Sections

Reach Breaks
Fence

NC OneMap Orthoimagery (2018)

0 120 240 Feet
1:3,000

N

STEWARTS CREEK TRIBUTARIES STREAM RESTORATION PROJECT

Current Condition Plan View: Asset Map
MY3: 2022

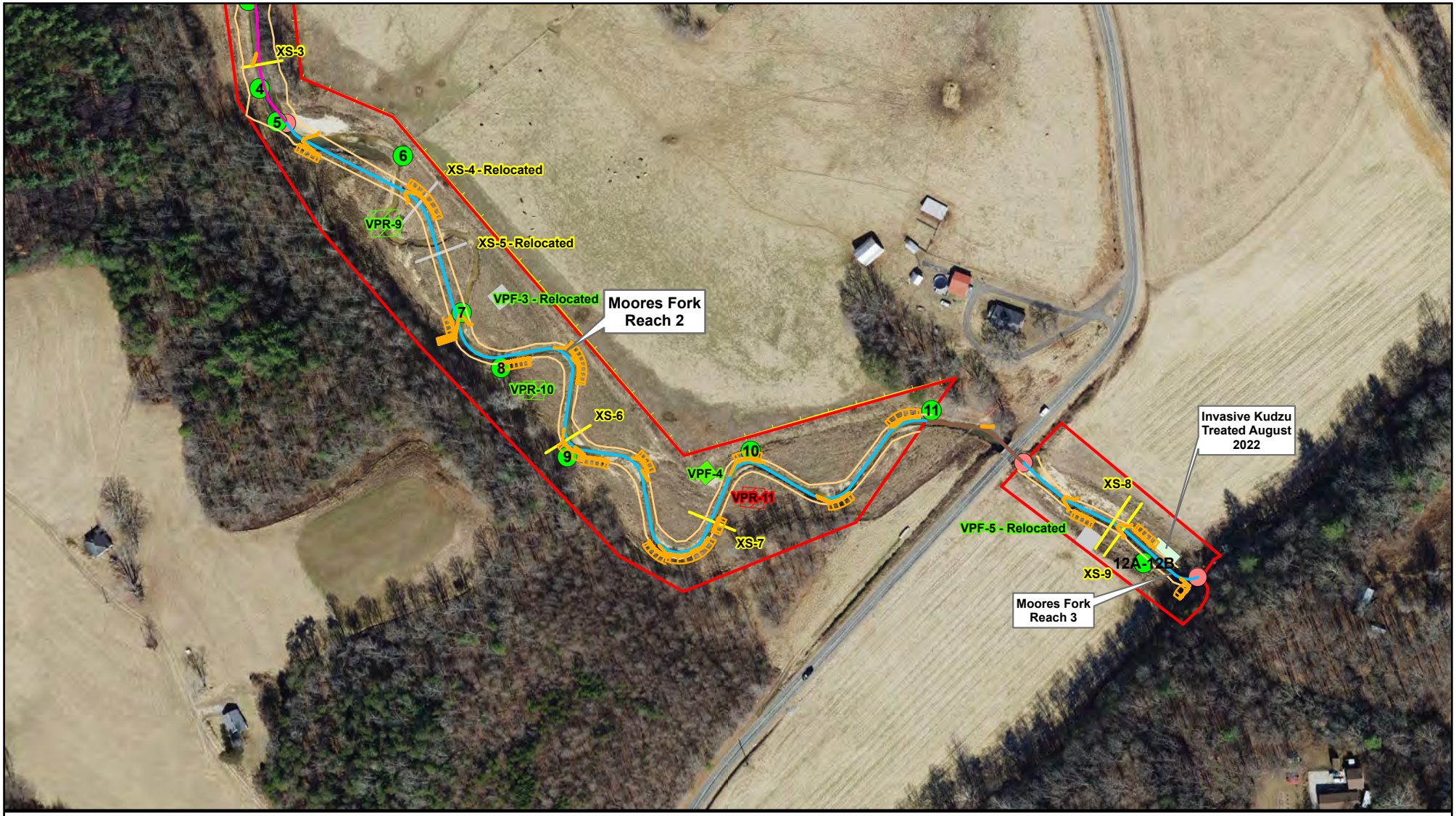
DMS Project ID# 100023
February 2023

FIGURE 1D

Surry County, NC

Mitigation Services
Environmental Quality

Ecosystem Planning & Restoration



Streams - Enhancement
Streams - Restoration
No Credit
Conservation Easement

Fixed Vegetation Plot
Successful
Unsuccessful
Relocated

Random Vegetation Plot
Successful
Unsuccessful
Structures

Top of Bank
Photo Points
Cross Sections
Relocated Cross Sections

Reach Breaks
Fence
SCT_Stream_Gauges
MY2 Kudzu

NC OneMap Orthoimagery (2018)

0 120 240 Feet

1:3,000

N

STEWARTS CREEK TRIBUTARIES STREAM RESTORATION PROJECT

CURRENT CONDITION PLAN VIEW: ASSET MAP MY3: 2022

SURRY COUNTY, NC

DMS PROJECT ID# 100023

FEBRUARY 2023

FIGURE 1E

NC Mitigation Services

EPR Ecosystem Planning & Restoration

3.0 REFERENCES

North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS). DMS Vegetation Data Entry Tool, October 2020. https://ncdms.shinyapps.io/Veg_Table_Tool/

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North Carolina Ecosystem Enhancement Program. 2009. Upper Yadkin Pee-Dee River Basin Restoration Priorities.

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U.S. Army Corps of Engineers. 2016. Wilmington District Public Notice: Notification of Issuance of Guidance for Compensatory Stream and Wetland Mitigation Conducted for Wilmington District.

Appendix A: Visual Assessment Data

Table 4. Visual Stream Morphology Stability Assessment Table

Table 5. Vegetation Condition Assessment Table

Monitoring Year 3 Photo Log

Monitoring Year 3 Vegetation Photo Log

Table 4a. Visual Stream Morphology Stability Assessment Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Reach ID	**UT1**
Dates Visually Assessed	**10/17/22 and 10/18/22**
Assessed Stream Length (ft)	**2800**
Assessed Bank Length (ft)	**5600**

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	55	55		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	61	61		100%

Table 4b. Visual Stream Morphology Stability Assessment Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Reach ID	**UT2**
Dates Visually Assessed	**10/17/22 and 10/18/22**
Assessed Stream Length (ft)	**1060**
Assessed Bank Length (ft)	**2120**

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	22	22		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	25	25		100%

Table 4c. Visual Stream Morphology Stability Assessment Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Reach ID	**UT3 - Reach 1**
Dates Visually Assessed	**10/17/22 and 10/18/22**
Assessed Stream Length (ft)	**994**
Assessed Bank Length (ft)	**1988**

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	19	19		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	20	20		100%

Table 4d. Visual Stream Morphology Stability Assessment Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Reach ID	**UT3 - Reach 2**
Dates Visually Assessed	**10/17/22 and 10/18/22**
Assessed Stream Length (ft)	**2486**
Assessed Bank Length (ft)	**4972**

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	25	25		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	31	31		100%

Table 4e. Visual Stream Morphology Stability Assessment Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Reach ID	**Moores Fork - Reach 1**
Dates Visually Assessed	**10/17/2022**
Assessed Stream Length (ft)	**1572.5**
Assessed Bank Length (ft)	**3145**

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	3	3		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	3	3		100%

Table 4f. Visual Stream Morphology Stability Assessment Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Reach ID	**Moores Fork - Reach 2**
Dates Visually Assessed	**1/18/2023**
Assessed Stream Length (ft)	**2194.5**
Assessed Bank Length (ft)	**4389**

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	7	7		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	32	32		100%

Table 4g. Visual Stream Morphology Stability Assessment Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Reach ID	**Moores Fork - Reach 3**
Dates Visually Assessed	**1/18/2023**
Assessed Stream Length (ft)	**386**
Assessed Bank Length (ft)	**772**

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	6	6		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	2	2		100%

Table 5. Vegetation Condition Assessment Table
Stewarts Creek Tributaries Mitigation Project (DMS No.100023)

Dates Visually Assessed **10/17-18/22 and 01/26/23**

Planted Acreage **24.2**

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.1 acres	0.00	0.0%
		Total	0.00	0.0%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.25 acres	0.00	0.0%
		Cumulative Total	0.00	0.0%

Easement Acreage **30**

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Species included in summation above should be identified in report summary.	0.1 acres	0.10	0.3%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	None	0.0	0.0%

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 3 - Photo Log

Photo Point 1A – Moores Fork Reach 1, Sta. 11+81
Facing Upstream (10/17/2022)

Photo Point 1B – Moores Fork Reach 1, Sta. 11+81
Facing Downstream (10/17/2022)

Photo Point 2 – Moores Fork Reach 1, Sta. 14+79
Facing Downstream (10/17/2022)

Photo Point 3 – Moores Fork Reach 1, Sta. 23+37
Facing Downstream (10/17/2022)

Photo Point 4 – Moores Fork Reach 1, Sta. 24+96
Facing Upstream (10/17/2022)

Photo Point 5 – Moores Fork Reach 2, Sta. 25+61
Facing Downstream (1/18/2023)

ECOSYSTEM PLANNING & RESTORATION

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 3 - Photo Log

Photo Point 6 – Moores Fork Reach 2, Sta. 27+97
Facing Downstream (1/18/2023)

Photo Point 7 – Moores Fork Reach 2, Sta. 32+21
Facing Upstream (1/18/2023)

Photo Point 8 – Moores Fork Reach 2, Sta. 33+48
Facing Upstream (1/18/2023)

Photo Point 9 – Moores Fork Reach 2, Sta. 36+47
Facing Upstream (1/18/2023)

Photo Point 10 – Moores Fork Reach 2, Sta. 41+77
Facing Upstream (1/18/2023)

Photo Point 11A – Moores Fork Reach 2, Sta. 45+79
Facing Upstream (1/18/2023)

ECOSYSTEM PLANNING & RESTORATION

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 3 - Photo Log

Photo Point 11B – Moores Fork Reach 2, Sta. 45+79
Facing Downstream (1/18/2023)

Photo Point 12A – Moores Fork Reach 3, Sta. 50+54
Facing Upstream (1/18/2023)

Photo Point 12B – Moores Fork Reach 3, Sta. 50+54
Facing Downstream (1/18/2023)

Photo Point 13 – UT1, Sta. 10+84
Facing Upstream (10/17/2022)

Photo Point 14A – UT1, Sta. 12+91
Facing Upstream (10/17/2022)

Photo Point 14B – UT1, Sta. 12+91
Facing Downstream (10/17/2022)

ECOSYSTEM PLANNING & RESTORATION

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 3 - Photo Log

Photo Point 14C – UT1, Sta. 12+91
Upstream Invert (10/17/2022)

Photo Point 14D – UT1, Sta. 12+91
Downstream Invert (10/17/2022)

Photo Point 15 – UT1, Sta. 15+52
Facing Upstream (10/17/2022)

Photo Point 16 – UT1, Sta. 18+34
Facing Upstream (10/17/2022)

Photo Point 17 – UT1, Sta. 21+12
Facing Upstream (10/17/2022)

Photo Point 18 – UT1, Sta. 22+81
Facing Upstream (10/17/2022)

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 3 - Photo Log

Photo Point 19 – UT1, Sta. 27+39
Facing Upstream (2/1/2023)

Photo Point 20 – UT1, Sta. 30+35
Facing Upstream (2/1/2023)

Photo Point 21 – UT1, Sta. 33+42
Facing Upstream (2/1/2023)

Photo Point 22 – UT1, Sta. 36+73
Facing Downstream (2/1/2023)

Photo Point 23A – UT2, Sta. 10+47
Facing Upstream (10/18/2022)

Photo Point 23B – UT2, Sta. 10+47
Facing Downstream (10/18/2022)

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 3 - Photo Log

Photo Point 23C – UT2, Sta. 10+47
Upstream Invert (10/18/2022)

Photo Point 23D – UT2, Sta. 10+47
Downstream Invert (10/18/2022)

Photo Point 24 – UT2, Sta. 11+57
Facing Upstream (2/1/2023)

Photo Point 25 – UT2, Sta. 14+65
Facing Upstream (2/1/2023)

Photo Point 26 – UT2, Sta. 18+32
Facing Upstream (2/1/2023)

Photo Point 27A – UT3 Reach 1, Sta. 11+51
Facing Upstream (10/18/2022)

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 3 - Photo Log

Photo Point 27B – UT3 Reach 1, Sta. 11+51
Facing Downstream (10/18/2022)

Photo Point 27C – UT3 Reach 1, Sta. 11+51
Upstream Invert (10/18/2022)

Photo Point 27D – UT3 Reach 1, Sta. 11+51
Downstream Invert (10/18/2022)

Photo Point 28 – UT3 Reach 1, Sta. 13+35
Facing Upstream (2/1/2023)

Photo Point 29 – UT3 Reach 1, Sta. 15+88
Facing Upstream (2/1/2023)

Photo Point 30 – UT3 Reach 1, Sta. 18+28
Facing Upstream (2/1/2023)

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 3 - Photo Log

Photo Point 31 – UT3 Reach 2, Sta. 20+10
Facing Upstream (2/1/2023)

Photo Point 32 – UT3 Reach 2, Sta. 21+27
Facing Upstream (2/1/2023)

Photo Point 33A – UT3 Reach 2, Sta. 27+44
Facing Upstream (10/18/2022)

Photo Point 33B – UT3 Reach 2, Sta. 27+44
Facing Downstream (10/18/2022)

Photo Point 33C – UT3 Reach 2, Sta. 27+44
Upstream Invert (10/18/2022)

Photo Point 33D – UT3 Reach 2, Sta. 27+44
Downstream Invert (10/18/2022)

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 3 - Photo Log

Photo Point 34 – UT3 Reach 2, Sta. 30+47
Facing Upstream (2/1/2023)

Photo Point 35 – UT3 Reach 2, Sta. 37+79
Facing Upstream (2/1/2023)

Photo Point 36 – UT3 Reach 2, Sta. 40+06
Facing Upstream (2/1/2023)

Photo Point 37 – UT3 Reach 2, Sta. 42+81
Facing Upstream (2/1/2023)

Photo Point 38 – UT3 Reach 2, Sta. 27+44
Facing Upstream (2/1/2023)

Site Overview – Moore's Fork (1/26/23)

Site Overview – UT1, UT2, UT3 (1/26/23)

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 3 - Vegetation Photo Log

Veg Plot 1 – E Corner (10/17/2022)

Veg Plot 2 – NW Corner (10/17/2022)

Veg Plot 3 – N Corner (1/26/2023)

Veg Plot 4 – S Corner (1/26/2023)

Veg Plot 5 – S Corner (1/26/2023)

Veg Plot 6 –SE Corner (10/18/2022)

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 3 - Vegetation Photo Log

Veg Plot 7 – SE Corner (10/18/2022)

Veg Plot 8 – SW Corner (10/18/2022)

Veg Plot 9 – SE Corner (10/17/2022)

Veg Plot 10 – N Corner (10/18/2022)

Veg Plot 11 – SW Corner (10/18/2022)

Random Veg Plot 1 – (10/17/2022)

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 3 - Vegetation Photo Log

Random Veg Plot 2 – (10/17/2022)

Random Veg Plot 3 – (10/17/2022)

Random Veg Plot 4 – (10/17/2022)

Random Veg Plot 5 – (10/18/2022)

Random Veg Plot 6 – (10/18/2022)

Random Veg Plot 7 – (10/18/2022)

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 3 - Vegetation Photo Log

Random Veg Plot 8 – (10/18/2022)

Random Veg Plot 9 – (1/26/2023)

Random Veg Plot 10 – (1/26/2023)

Random Veg Plot 11 – (1/26/2023)

Appendix B: Vegetation Plot Data

Table 6. Vegetation Plot Data

Table 7. Vegetation Performance Standards Summary Table

Table 6a. Vegetation Performance Standards Summary Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Planted Acreage	24.2
Date of Initial Plant	2020-03-31
Date(s) of Supplemental Plant(s)	2020-11-03
Date(s) Mowing	#N/A
Date of Current Survey	10/17/2022 and 01/26/23
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	VPF-1		VPF-2		VPF-3		VPF-4		VPF-5	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Alnus serrulata	hazel alder	Tree	FACW										
	Betula nigra	river birch	Tree	FACW	2	2	2	2	1	1	6	6	2	2
	Carya glabra	pignut hickory	Tree	FACU										
	Carya tomentosa	mockernut hickory	Tree											
	Cornus amomum	silky dogwood	Shrub	FACW					1	1			1	1
	Diospyros virginiana	common persimmon	Tree	FAC	1	1					1	1		
	Fraxinus pennsylvanica	green ash	Tree	FACW			1	1						
	Liriodendron tulipifera	tuliptree	Tree	FACU					3	3				
	Ostrya virginiana	hophornbeam	Tree	FACU										
	other				1	1								
	Platanus occidentalis	American sycamore	Tree	FACW			5	5	1	1	2	2	1	1
	Populus deltoides	eastern cottonwood	Tree	FAC										
	Quercus alba	white oak	Tree	FACU	1	1								
	Quercus nigra	water oak	Tree	FAC	1	1			1	1	1	1		
	Quercus phellos	willow oak	Tree	FACW	1	1	3	3	1	1	1	1	3	3
	Quercus rubra	northern red oak	Tree	FACU	1	1	1	1						
	Salix nigra	black willow	Tree	OBL	1	1	1	1	3	3	2	2	3	3
	Ulmus americana	American elm	Tree	FAC	1	1					4	4	1	1
Sum	Performance Standard				10	10	13	13	11	11	17	17	11	11
Mitigation Plan Performance Standard	Current Year Stem Count					10		13		11		17		11
	Stems/Acre					405		526		445		688		445
	Species Count					9		6		7		7		6
	Dominant Species Composition (%)					20		38		27		35		27
	Average Plot Height					6		3		4		4		5
	% Invasives					0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					10		13		11		17		11
	Stems/Acre					405		526		445		688		445
	Species Count					9		6		7		7		6
	Dominant Species Composition (%)					20		38		27		35		27
	Average Plot Height					6		3		4		4		5
	% Invasives					0		0		0		0		0

Meets Interim Performance Criteria | **Does Not Meet Interim Performance Criteria**

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 6b. Vegetation Performance Standards Summary Table (continued)
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Planted Acreage	24.2
Date of Initial Plant	2020-03-31
Date(s) of Supplemental Plant(s)	2020-11-03
Date(s) Mowing	#N/A
Date of Current Survey	10/17/2022 and 01/26/23
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	VPF-6		VPF-7		VPF-8		VPF-9		VPF-10	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Alnus serrulata	hazel alder	Tree	OBL										
	Betula nigra	river birch	Tree	FACW	1	1	3	3	4	4	2	2	2	2
	Carya glabra	pignut hickory	Tree	FACU							1	1		
	Carya tomentosa	mockernut hickory	Tree											
	Cornus amomum	silky dogwood	Shrub	FACW	3	3	1	1						
	Diospyros virginiana	common persimmon	Tree	FAC							1	1		
	Fraxinus pennsylvanica	green ash	Tree	FACW	1	1								
	Liriodendron tulipifera	tuliptree	Tree	FACU										
	other													
	Platanus occidentalis	American sycamore	Tree	FACW	1	1	1	1	5	5	2	2	2	2
	Quercus alba	white oak	Tree	FACU										
	Quercus nigra	water oak	Tree	FAC	3	3	2	2						
	Quercus phellos	willow oak	Tree	FAC	1	1	3	3	1	1	3	3	3	3
	Quercus rubra	northern red oak	Tree	FACU	1	1								
	Salix nigra	black willow	Tree	OBL									1	1
	Ulmus americana	American elm	Tree	FACW					3	3	4	4	5	5
Sum	Performance Standard				11	11	10	10	13	13	13	13	13	13
Mitigation Plan Performance Standard	Current Year Stem Count					11		10		13		13		13
	Stems/Acre					445		405		526		526		526
	Species Count					7		5		4		6		5
	Dominant Species Composition (%)					27		30		38		31		38
	Average Plot Height					3		3		2		2		3
	% Invasives					0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					11		10		13		13		13
	Stems/Acre					445		405		526		526		526
	Species Count					7		5		4		6		5
	Dominant Species Composition (%)					27		30		38		31		38
	Average Plot Height					3		3		2		2		3
	% Invasives					0		0		0		0		0

Meets Interim Performance Criteria | **Does Not Meet Interim Performance Criteria**

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 6c. Vegetation Performance Standards Summary Table (continued)
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Planted Acreage	24.2
Date of Initial Plant	2020-03-31
Date(s) of Supplemental Plant(s)	2020-11-03
Date(s) Mowing	#N/A
Date of Current Survey	10/17/2022 and 01/26/23
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	VPF-11		VPR-1	VPR-2	VPR-3	VPR-4	VPR-5	VPR-6	VPR-7	VPR-8	VPR-9	VPR-10	VPR-11
					Planted	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
Species Included in Approved Mitigation Plan	Alnus serrulata	hazel alder	Tree	OBL								1		2			
	Betula nigra	river birch	Tree	FACW	3	3	1	3	3		3	3	4	1	9	3	1
	Carya glabra	pignut hickory	Tree	FACU													
	Carya tomentosa	mockernut hickory	Tree		1	1											
	Cornus amomum	silky dogwood	Shrub	FACW													
	Diospyros virginiana	common persimmon	Tree	FAC					2	2	2		1	2	4	4	
	Fraxinus pennsylvanica	green ash	Tree	FACW	3	3	1	3	2	1	1		3	1	1		
	Liriodendron tulipifera	tuliptree	Tree	FACU	2	2											
							1				1						
	other								1	4	2	1		2			
	Platanus occidentalis	American sycamore	Tree	FACW	4	4	3	6	5	3	1	4	3	3	3	1	3
												1					
	Quercus alba	white oak	Tree	FACU													
	Quercus nigra	water oak	Tree	FAC	1	1					1		1	1	3	1	
	Quercus phellos	willow oak	Tree	FAC			1	4			3	2	1	1		1	
	Quercus rubra	northern red oak	Tree	FACU	1	1			1								
	Salix nigra	black willow	Tree	OBL	1	1	5			1		3	1	2			2
	Ulmus americana	American elm	Tree	FACW	1	1							1		5	6	
Sum	Performance Standard				17	17	12	16	14	11	14	15	15	15	25	16	6
Mitigation Plan Performance Standard	Current Year Stem Count					17	12	16	14	11	14	15	15	15	25	16	6
	Stems/Acre					688	486	648	567	445	567	607	607	607	1012	648	243
	Species Count					9	6	4	6	5	8	7	8	9	6	6	3
	Dominant Species Composition (%)					24	42	38	36	36	21	27	27	20	36	38	50
	Average Plot Height					3	7	3	3	3	3	3	4	5	2	1	7
	% Invasives					0	0	0	0	0	0	0	0	0	0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count					17	12	16	14	11	14	15	15	15	25	16	6
	Stems/Acre					688	486	648	567	445	567	607	607	607	1012	648	243
	Species Count					9	6	4	6	5	8	7	8	9	6	6	3
	Dominant Species Composition (%)					24	42	38	36	36	21	27	27	20	36	38	50
	Average Plot Height					3	7	3	3	3	3	3	4	5	2	1	7
	% Invasives					0	0	0	0	0	0	0	0	0	0	0	0

Meets Interim Performance Criteria | **Does Not Meet Interim Performance Criteria**

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 7a. Vegetation Performance Standards Summary Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Vegetation Performance Standards Summary Table												
	VPF-1				VPF-2				VPF-3			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	405	6	9	0	526	3	6	0	445	4	7	0
Monitoring Year 2	405	3	9	0	688	2	6	0	364	3	6	0
Monitoring Year 1	607	2	9	0	243	1	4	0	162	2	3	0
Monitoring Year 0	688	2	9	0	567	1	6	0	324	2	5	0
	VPF-4				VPF-5				VPF-6			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	688	4	7	0	445	5	6	0	445	3	7	0
Monitoring Year 2	567	2	7	0	445	3	6	0	364	2	6	0
Monitoring Year 1	607	2	7	0	243	2	5	0	445	1	8	0
Monitoring Year 0	648	2	9	0	445	2	6	0	567	2	7	0
	VPF-7				VPF-8				VPF-9			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	405	3	5	0	526	2	4	0	526	3	6	0
Monitoring Year 2	445	2	6	0	486	2	4	0	445	2	5	0
Monitoring Year 1	324	2	5	0	486	1	4	0	364	2	4	0
Monitoring Year 0	648	2	7	0	405	1	5	0	567	2	6	0
	VPF-10				VPF-11				VPR-1			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	526	3	5	0	688	3	9	0	486	7	6	0
Monitoring Year 2	607	2	5	0	688	2	9	0	364	1	7	0
Monitoring Year 1	283	1	4	0	607	2	9	0	405	2	6	0
Monitoring Year 0	526	2	6	0	567	2	8	0				
	Meets Interim Performance Criteria				Does Not Meet Interim Performance Criteria							

*Each monitoring year represents a different plot for the random vegetation plot "groups". Random plots are denoted with an R, and fixed plots with an F.

Table 7b. Vegetation Performance Standards Summary Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Vegetation Performance Standards Summary Table												
	VPR-2				VPR-3				VPR-4			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	648	3	4	0	567	3	6	0	445	3	5	0
Monitoring Year 2	324	1	5	0	445	2	4	0	283	2	5	0
Monitoring Year 1	445	2	5	0	283	2	4	0	324	2	4	0
Monitoring Year 0												
	VPR-5				VPR-6				VPR-7			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	567	3	8	0	607	3	7	0	607	4	8	0
Monitoring Year 2	121	1	2	0	567	2	6	0	283	2	5	0
Monitoring Year 1	486	2	5	0	162	1	3	0	364	2	5	0
Monitoring Year 0												
	VPR-8				VPR-9				VPR-10			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	607	5	9	0	1012	2	6	0	648	1	6	0
Monitoring Year 2	405	2	5	0	405	2	6	0	283	2	4	0
Monitoring Year 1	202	1	5	0	324	2	4	0	486	2	6	0
Monitoring Year 0												
	VPR-11											
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives								
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	243	7	3	0								
Monitoring Year 2	486	2	5	0								
Monitoring Year 1	243	2	4	0								
Monitoring Year 0												

Meets Interim Performance Criteria | **Does Not Meet Interim Performance Criteria**

*Each monitoring year represents a different plot for the random vegetation plot "groups". Random plots are denoted with an R, and fixed plots with an F.

Appendix C: Stream Geomorphology Data

Cross Sections with Annual Overlays

Table 8. Baseline Stream Data Summary

Table 9. Cross Section Morphology Monitoring Summary

Cross Section Plot - MY3 - October 2022

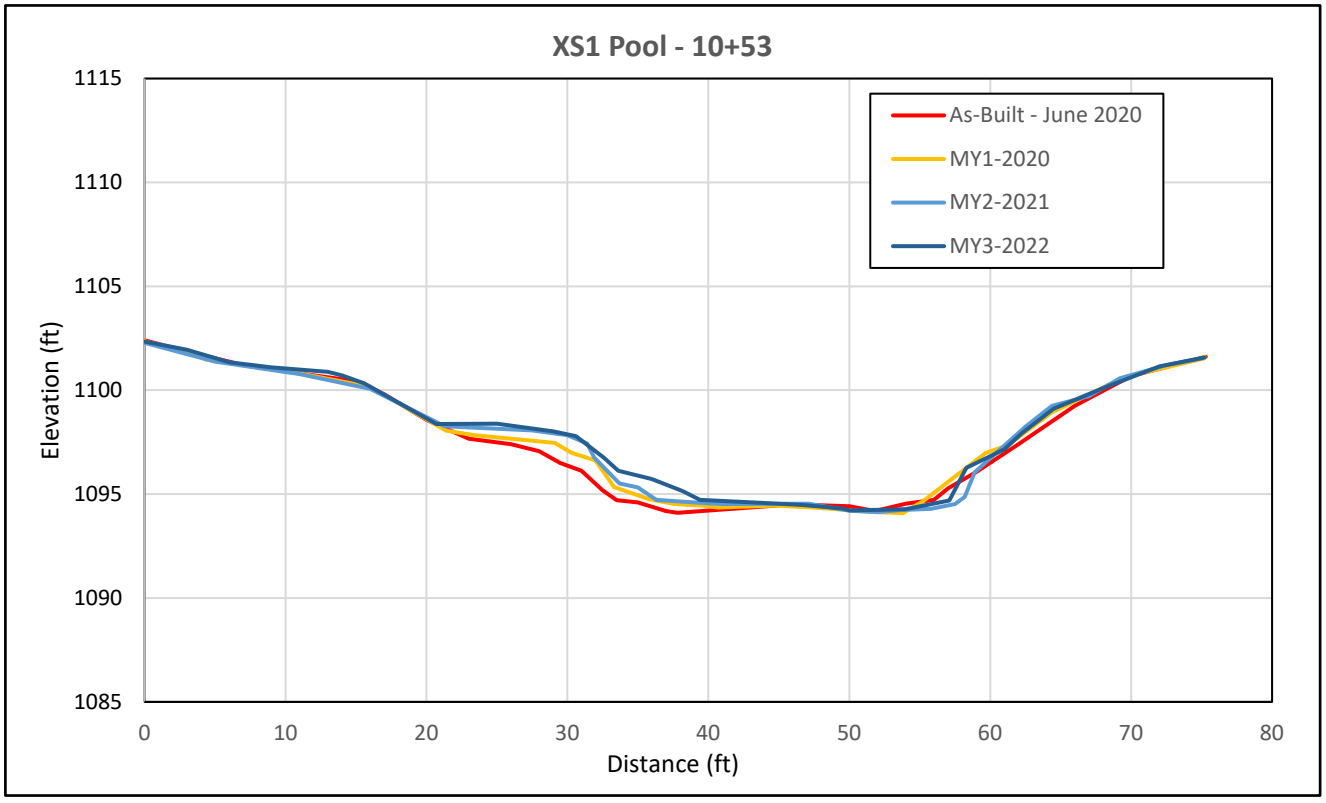
XS1 - Moores Fork Reach 1

Station 10+53 - Pool

XS1 looking upstream

XS1 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1097.06	1097.29	1097.27	1097.51			
Bank Height Ratio - Based on AB-Bankfull Area	1.20	1.05	1.06	1.09			
Thalweg Elevation	1094.10	1094.08	1094.13	1094.22			
LTOB Elevation	1097.67	1097.46	1097.44	1097.44			
LTOB Max Depth	3.57	3.38	3.31	3.57			
LTOB Cross Sectional Area	93.76	77.33	76.98	80.46			
Entrenchment Ratio	N/A	N/A	N/A	N/A			



Cross Section Plot - MY3 - October 2022

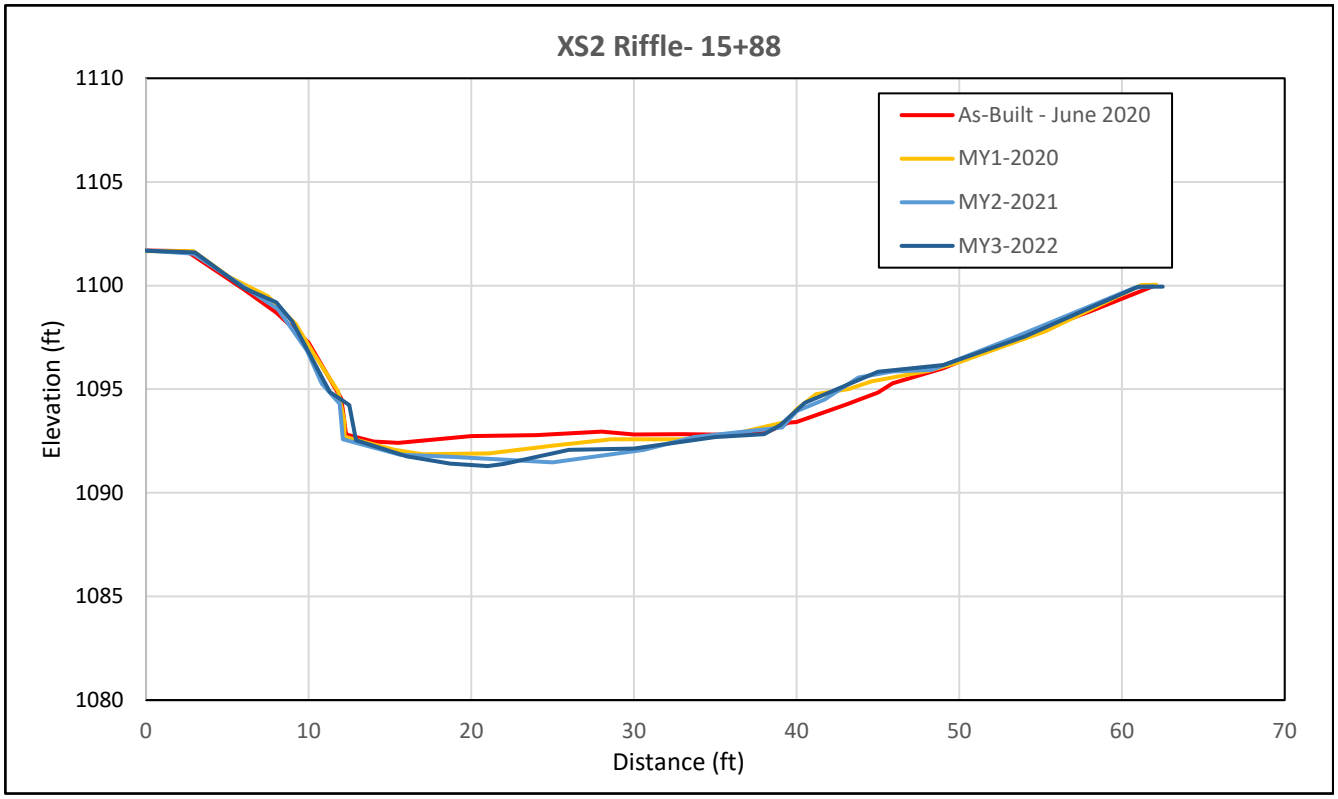
XS2 - Moores Fork Reach 1

Station 15+88 - Riffle

XS2 looking upstream

XS2 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1094.84	1094.64	1094.32	1094.87			
Bank Height Ratio - Based on AB-Bankfull Area	1.18	1.04	1.44	1.27			
Thalweg Elevation	1092.41	1091.86	1091.47	1091.29			
LTOB Elevation	1095.28	1094.76	1095.57	1095.84			
LTOB Max Depth	2.87	2.90	4.1	4.55			
LTOB Cross Sectional Area	75.98	65.20	100.49	107.47			
Entrenchment Ratio	1.29	1.54	1.49	1.56			



Cross Section Plot - MY3 - October 2022

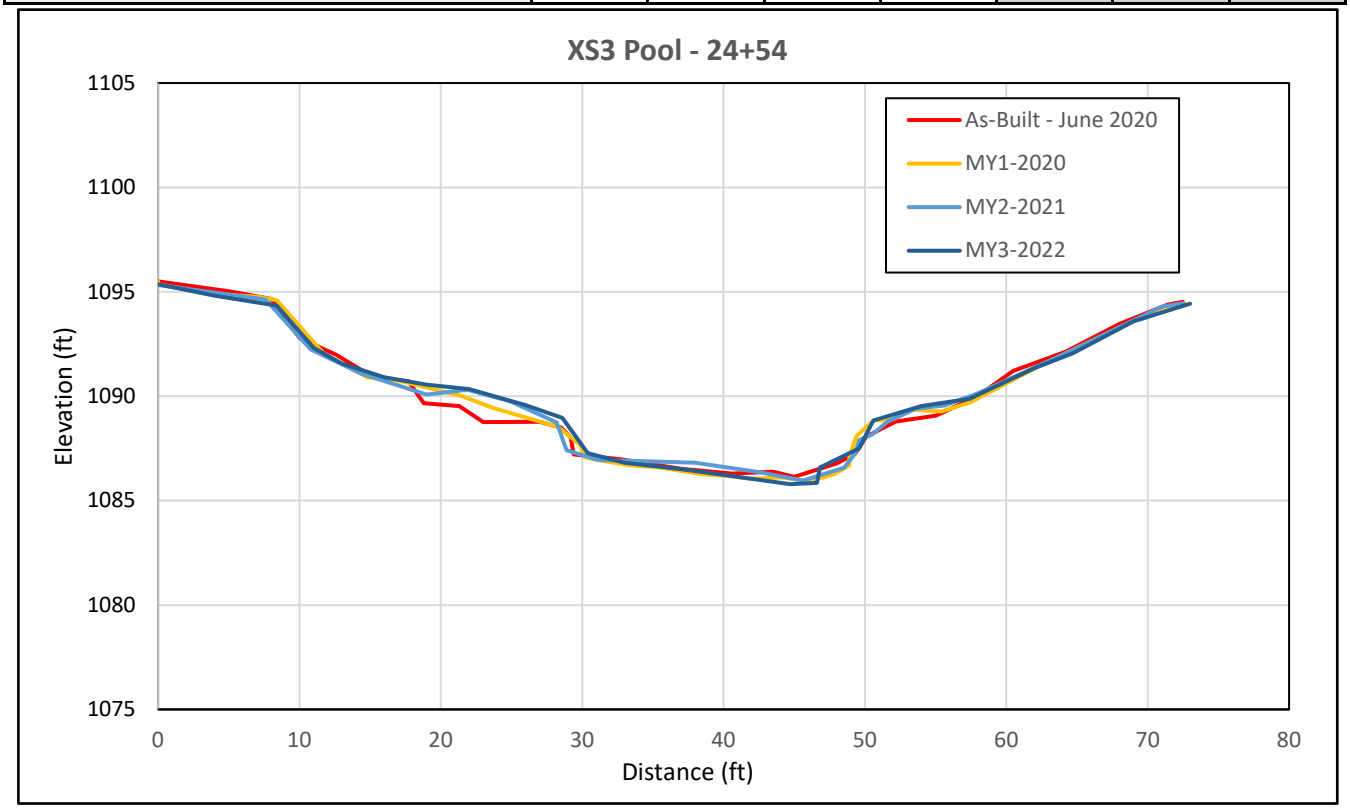
XS3 - Moores Fork Reach 1

Station 24+54 - Pool

XS3 looking upstream

XS3 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1088.77	1088.67	1088.77	1088.74			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.06	1.01	1.03			
Thalweg Elevation	1086.14	1085.92	1085.96	1085.79			
LTOB Elevation	1088.77	1088.82	1088.79	1088.84			
LTOB Max Depth	2.63	2.90	2.83	3.05			
LTOB Cross Sectional Area	45.04	48.74	45.43	47.29			
Entrenchment Ratio	N/A	N/A	N/A	N/A			



Cross Section Plot - MY3 - January 2023

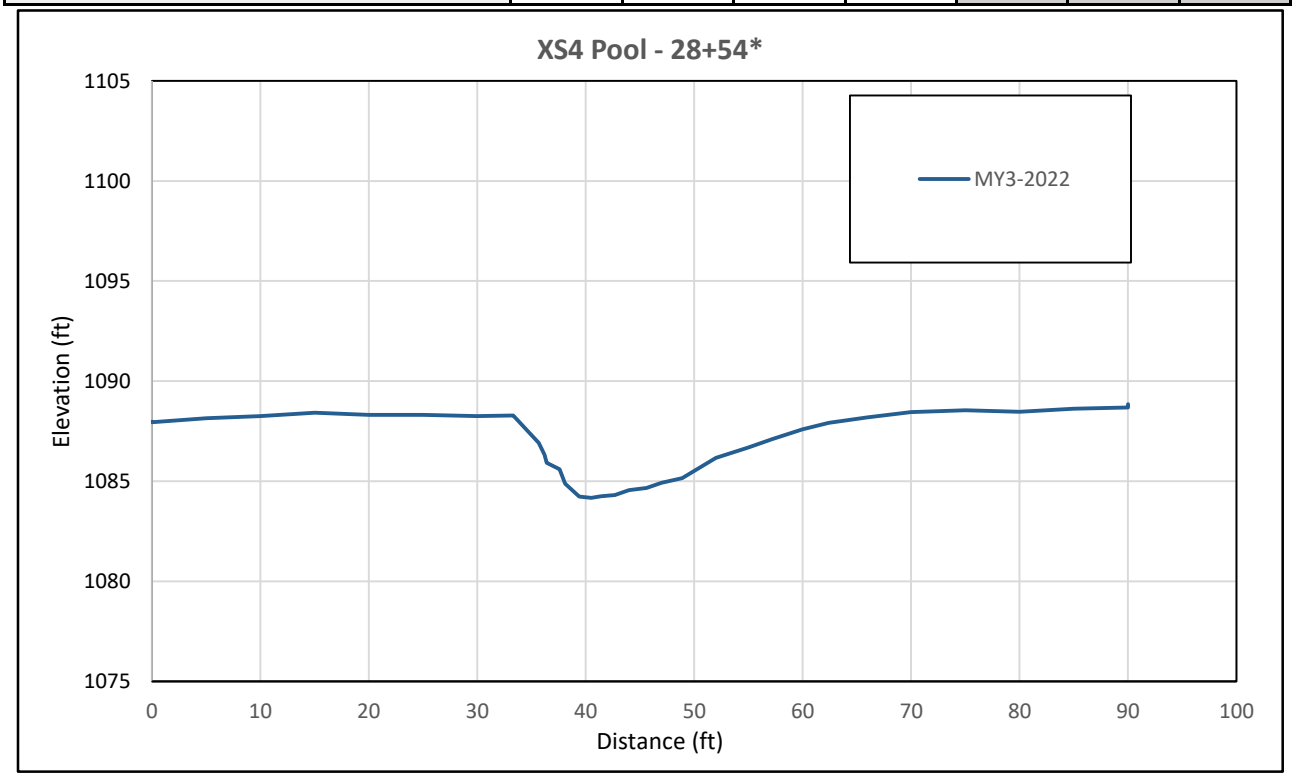
XS4 - Moores Fork Reach 2

Station 28+54 - Pool

XS4 looking upstream

XS4 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	-	-	-	1088.20			
Bank Height Ratio - Based on AB-Bankfull Area	-	-	-	1.00			
Thalweg Elevation	-	-	-	1084.17			
LTOB Elevation	-	-	-	1088.20			
LTOB Max Depth	-	-	-	4.03			
LTOB Cross Sectional Area	-	-	-	66.40			
Entrenchment Ratio	-	-	-	N/A			



* Stationing from AMP. The cross section location was relocated and stationing has been updated. MY0 through MY2 data not applicable due to the cross section being relocated.

Cross Section Plot - MY3 - January 2023

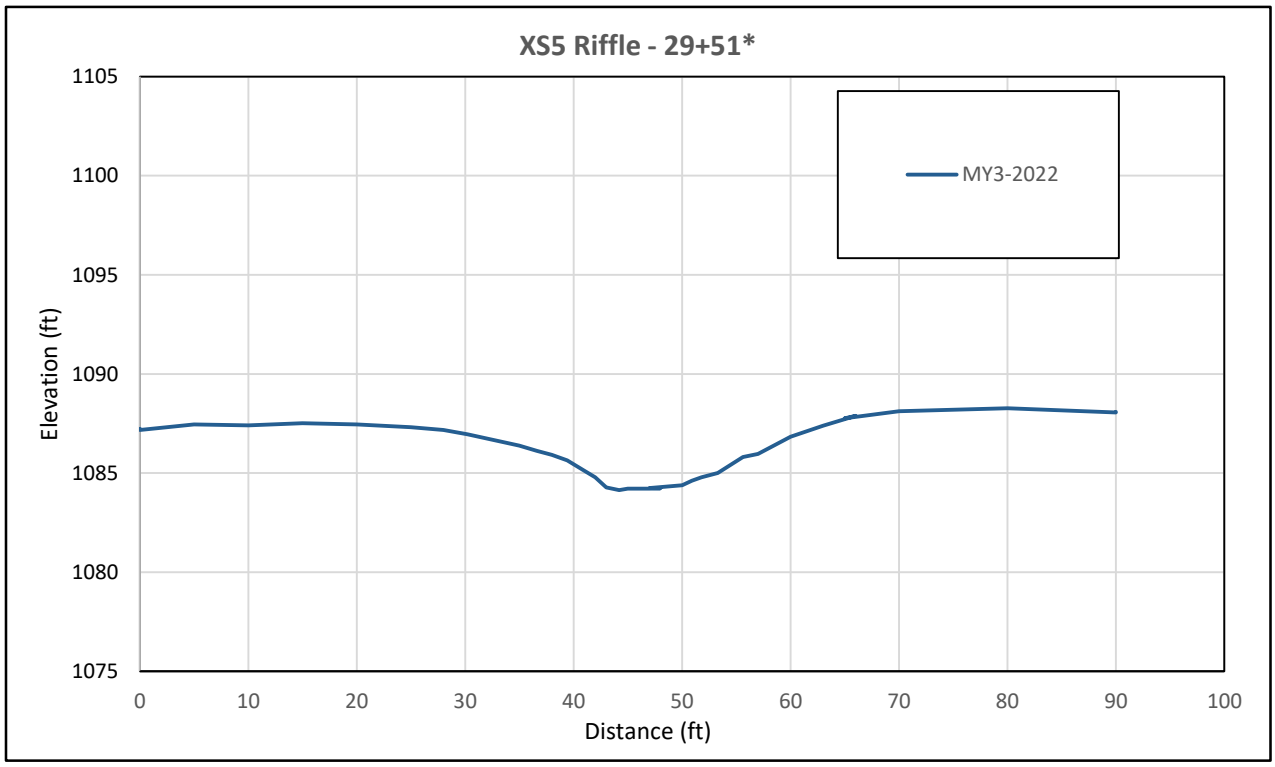
XS5 - Moores Fork Reach 2

Station 29+51 - Riffle

XS5 looking upstream

XS5 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	-	-	-	1087.17			
Bank Height Ratio - Based on AB-Bankfull Area	-	-	-	1.00			
Thalweg Elevation	-	-	-	1084.14			
LTOB Elevation	-	-	-	1087.17			
LTOB Max Depth	-	-	-	3.03			
LTOB Cross Sectional Area	-	-	-	52.43			
Entrenchment Ratio	-	-	-	>3.15			



* Stationing from AMP. The cross section location was relocated and stationing has been updated. MY0 through MY2 data not applicable due to the cross section being relocated.

Cross Section Plot - MY3 - January 2023

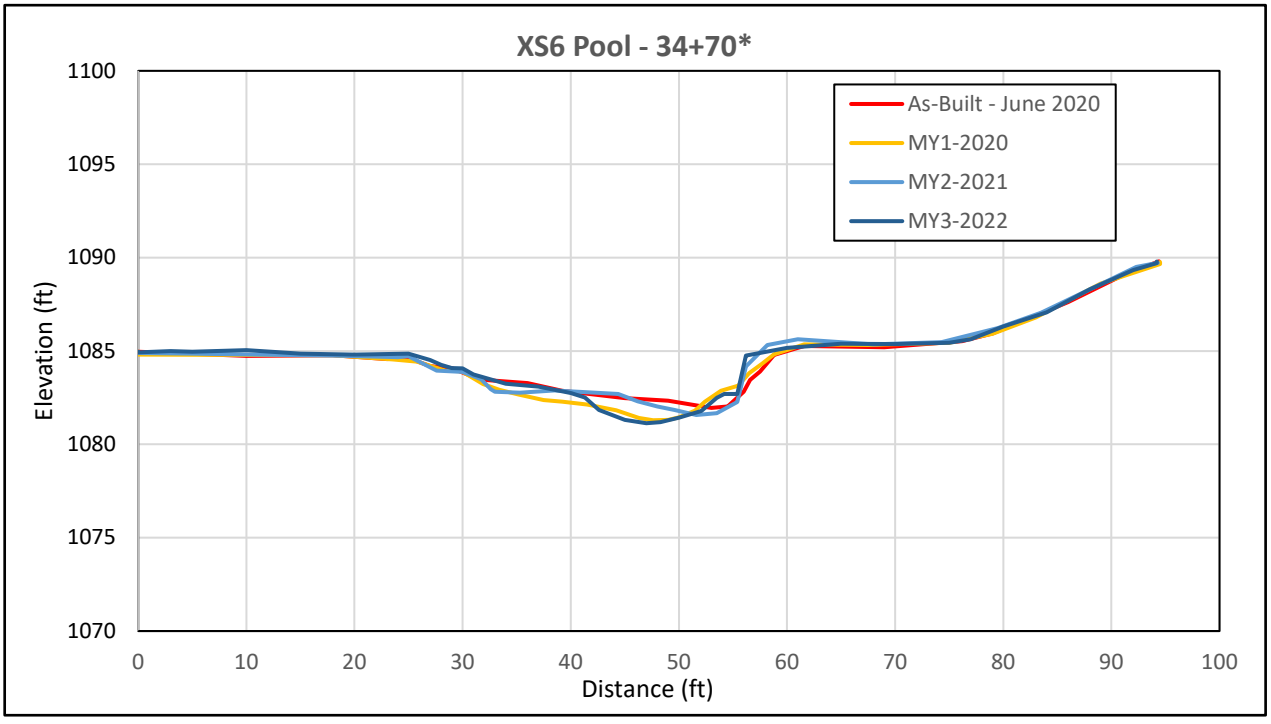
XS6 - Moores Fork Reach 2

Station 34+70 - Pool

XS6 looking upstream

XS6 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1084.62	1084.29	1084.51	1084.44			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.08	1.07	1.07			
Thalweg Elevation	1081.95	1081.29	1081.57	1081.13			
LTOB Elevation	1084.62	1084.54	1084.72	1084.68			
LTOB Max Depth	2.67	3.25	3.15	3.55			
LTOB Cross Sectional Area	53.58	61.60	60.33	60.90			
Entrenchment Ratio	N/A	N/A	N/A	N/A			



* Stationing from AMP. The stationing has been updated.

Cross Section Plot - MY3 - January 2023

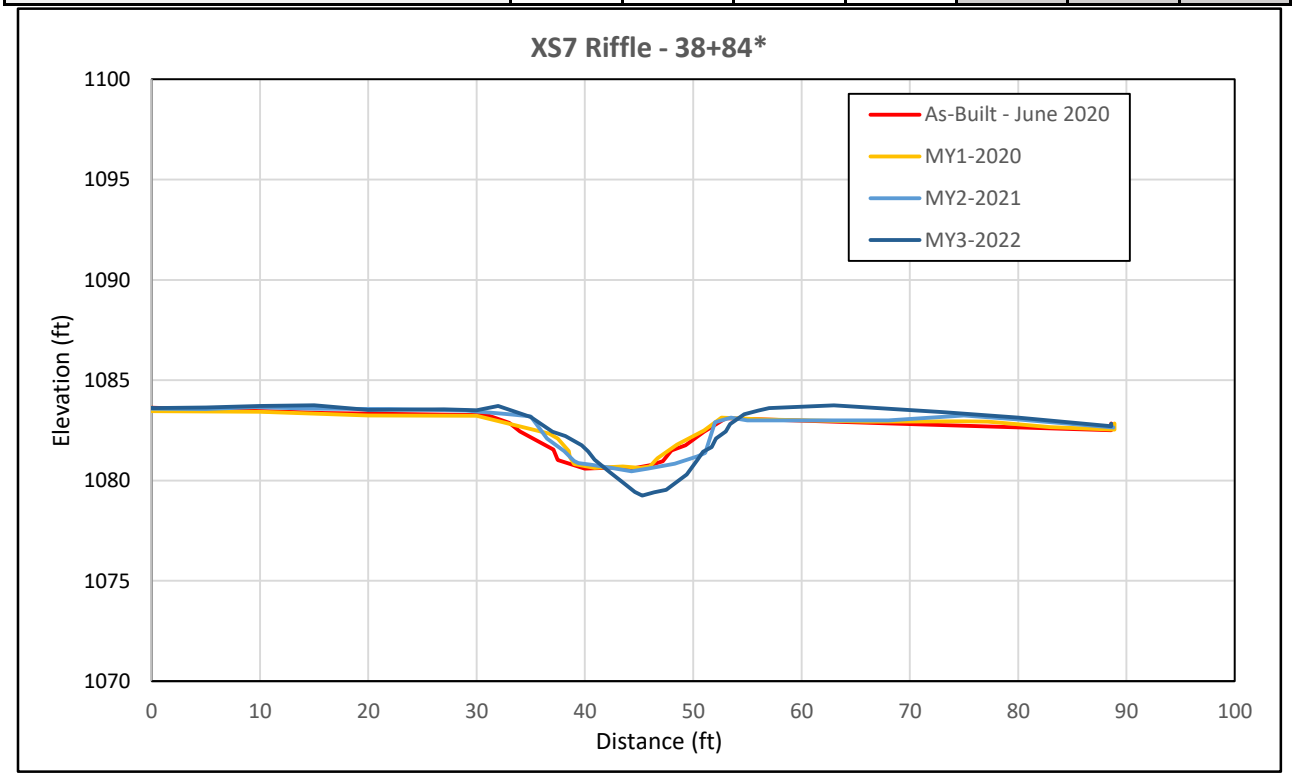
XS7 - Moores Fork Reach 2

Station 38+84 - Riffle

XS7 looking upstream

XS7 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1083.10	1083.29	1083.10	1082.82			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.94	1.01	1.09			
Thalweg Elevation	1080.56	1080.63	1080.46	1079.25			
LTOB Elevation	1083.10	1083.13	1083.13	1083.16			
LTOB Max Depth	2.54	2.50	2.67	3.91			
LTOB Cross Sectional Area	33.72	30.17	34.27	39.95			
Entrenchment Ratio	>4.14	>4.07	>4.88	>5.17			



* Stationing from AMP. The stationing has been updated. This cross section was impacted by AMP construction and the right bank was rebuilt with additional toewood.

Cross Section Plot - MY3 - January 2023

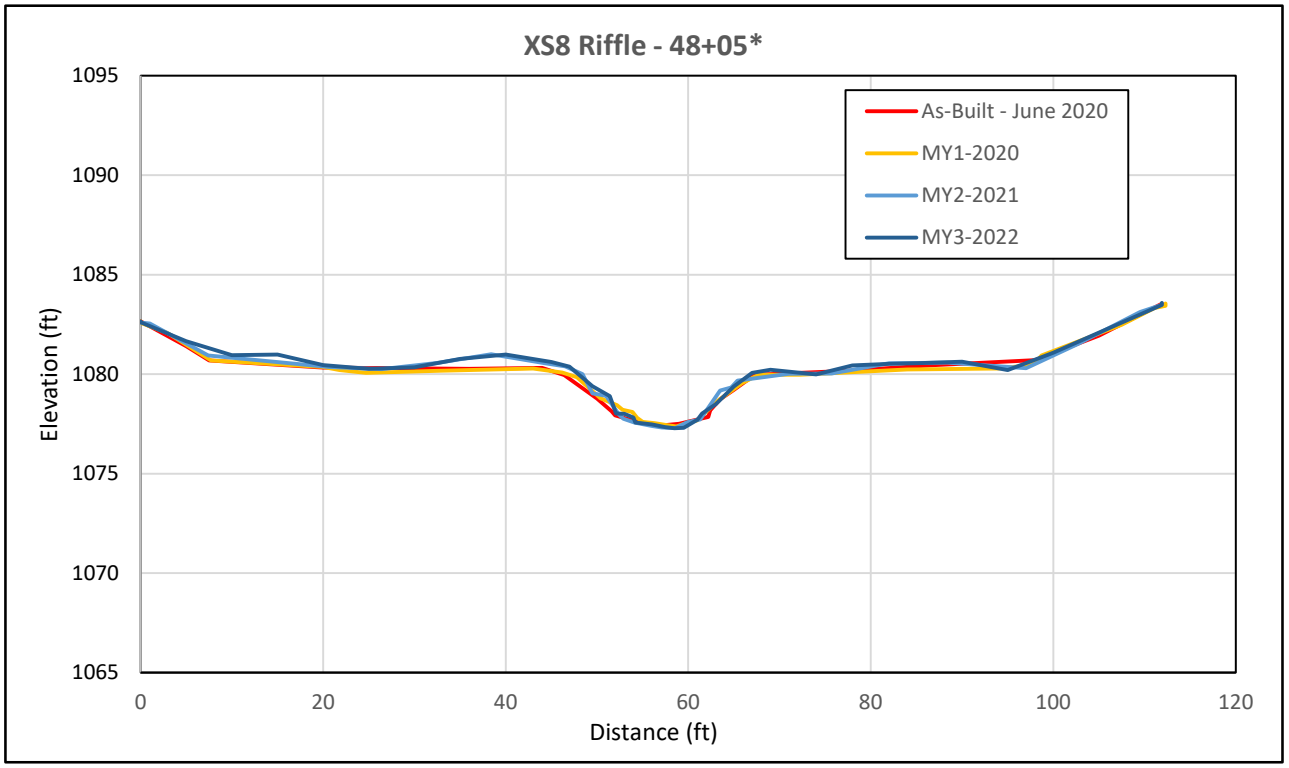
XS8 - Moores Fork Reach 3

Station 48+05 - Riffle

XS8 looking upstream

XS8 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1079.97	1080.11	1080.17	1080.13			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.95	0.83	0.98			
Thalweg Elevation	1077.41	1077.37	1077.29	1077.28			
LTOB Elevation	1079.97	1079.97	1079.68	1080.06			
LTOB Max Depth	2.56	2.60	2.39	2.78			
LTOB Cross Sectional Area	33.89	31.07	25.77	32.55			
Entrenchment Ratio	5.12	5.20	6.42	5.46			



* Stationing from AMP. The stationing has been updated.

Cross Section Plot - MY3 - January 2023

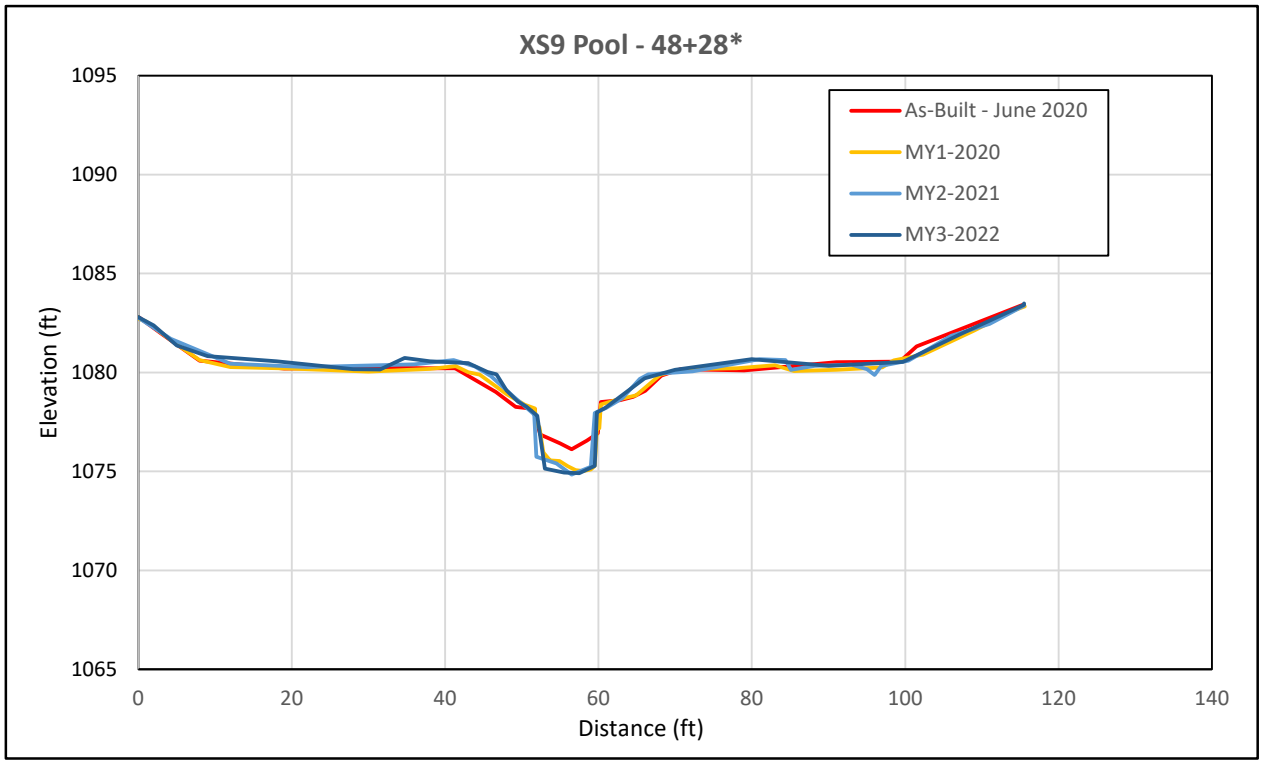
XS9 - Moores Fork Reach 3

Station 48+28 - Pool

XS9 looking upstream

XS9 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1080.16	1079.98	1080.07	1080.04			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.04	0.97	1.00			
Thalweg Elevation	1076.12	1075.02	1074.84	1074.91			
LTOB Elevation	1080.16	1080.16	1079.90	1080.03			
LTOB Max Depth	4.04	5.14	5.06	5.12			
LTOB Cross Sectional Area	52.58	57.57	49.07	52.42			
Entrenchment Ratio	N/A	N/A	N/A	N/A			



* Stationing from AMP. The stationing has been updated.

Cross Section Plot - MY3 - October 2022

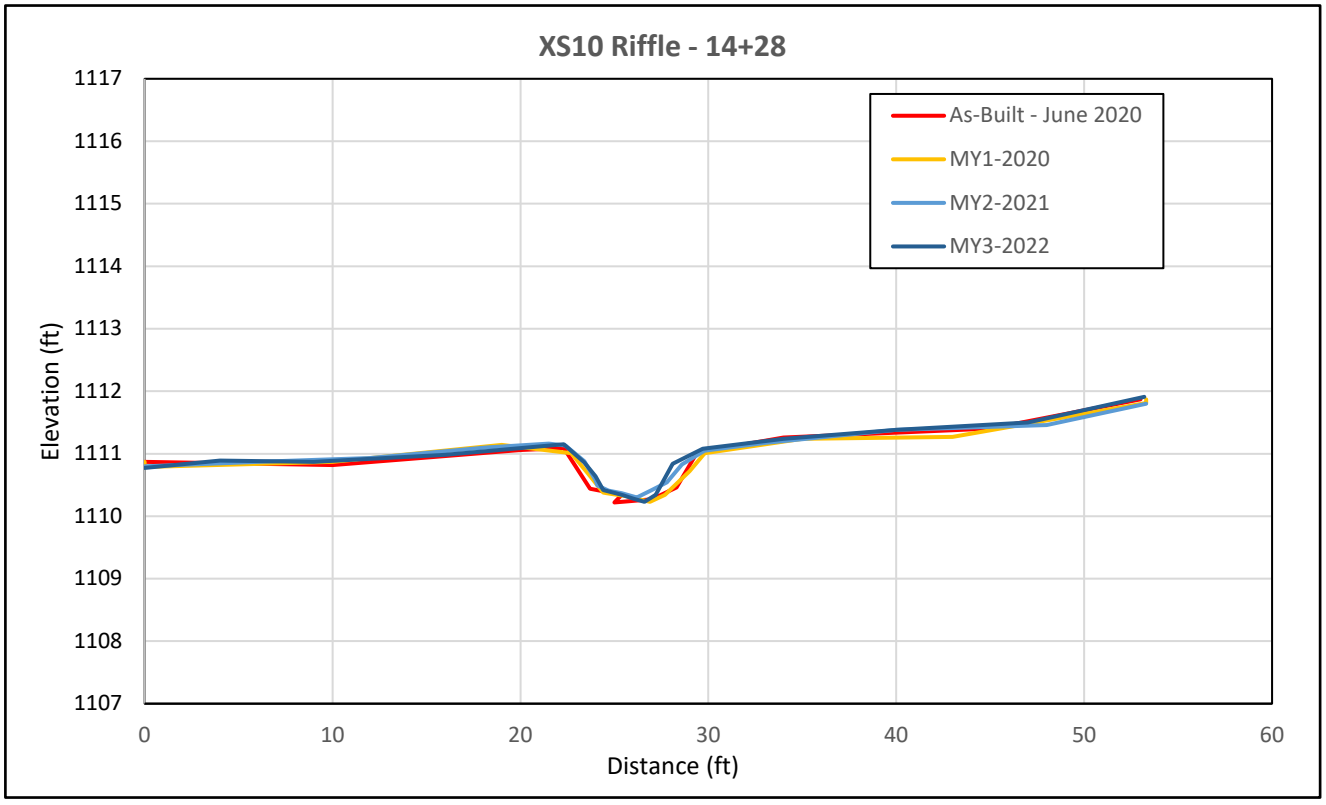
XS10 - UT1

Station 14+28 - Riffle

XS10 looking upstream

XS10 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1111.02	1111.05	1111.14	1111.24			
Bank Height Ratio - Based on AB-Bankfull Area	1.08	0.95	0.99	0.84			
Thalweg Elevation	1110.22	1110.23	1110.30	1110.23			
LTOB Elevation	1111.09	1111.01	1111.13	111.08			
LTOB Max Depth	0.87	0.78	0.83	0.85			
LTOB Cross Sectional Area	4.40	3.60	3.79	3.28			
Entrenchment Ratio	>7.5	>7.45	>7.53	>7.49			



Cross Section Plot - MY3 - October 2022

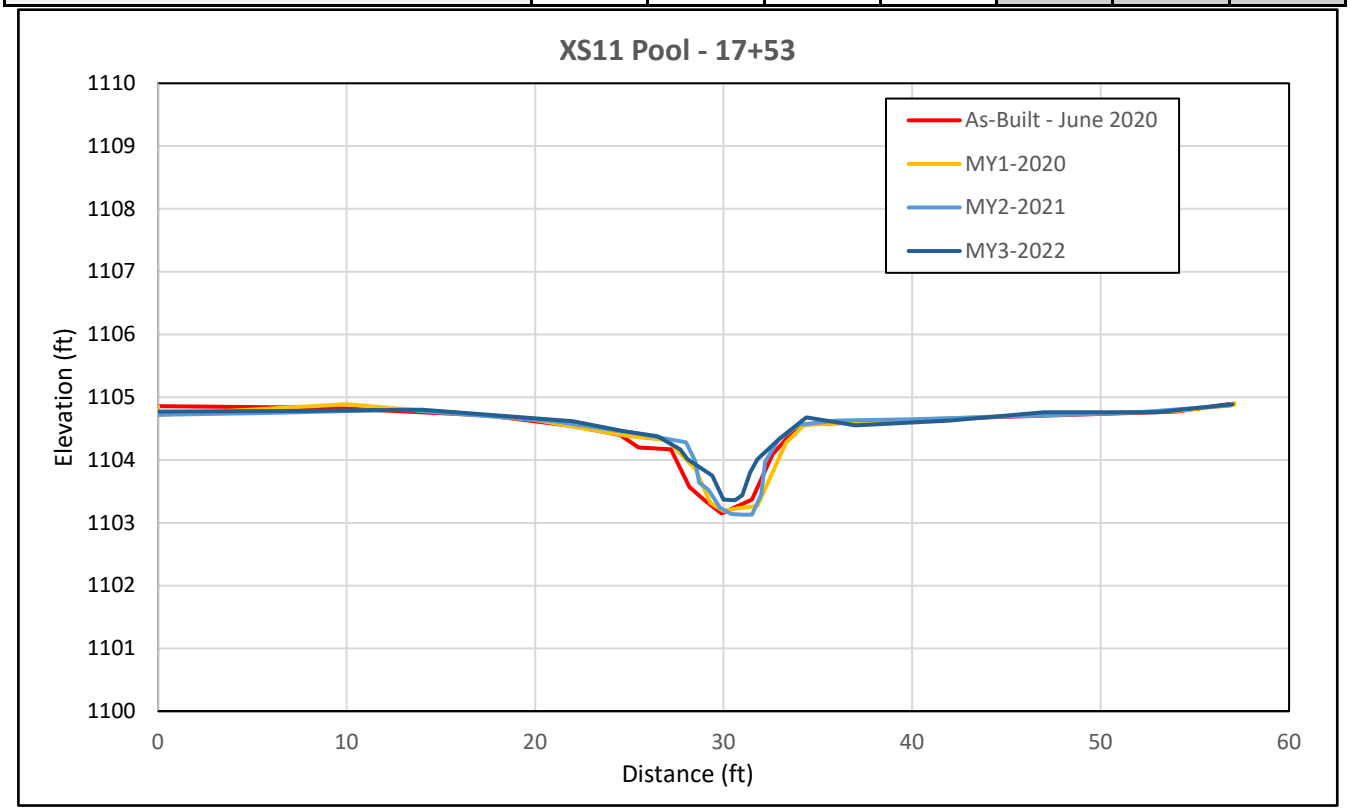
XS11 - UT1

Station 17+53 - Pool

XS11 looking upstream

XS11 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1104.40	1104.45	1104.65	1104.74			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.95	0.75	0.74			
Thalweg Elevation	1103.15	1103.19	1103.13	1103.36			
LTOB Elevation	1104.40	1104.38	1104.28	1104.38			
LTOB Max Depth	1.25	1.19	1.15	1.02			
LTOB Cross Sectional Area	5.48	4.92	3.67	3.12			
Entrenchment Ratio	N/A	N/A	N/A	N/A			



Cross Section Plot - MY3 - October 2022

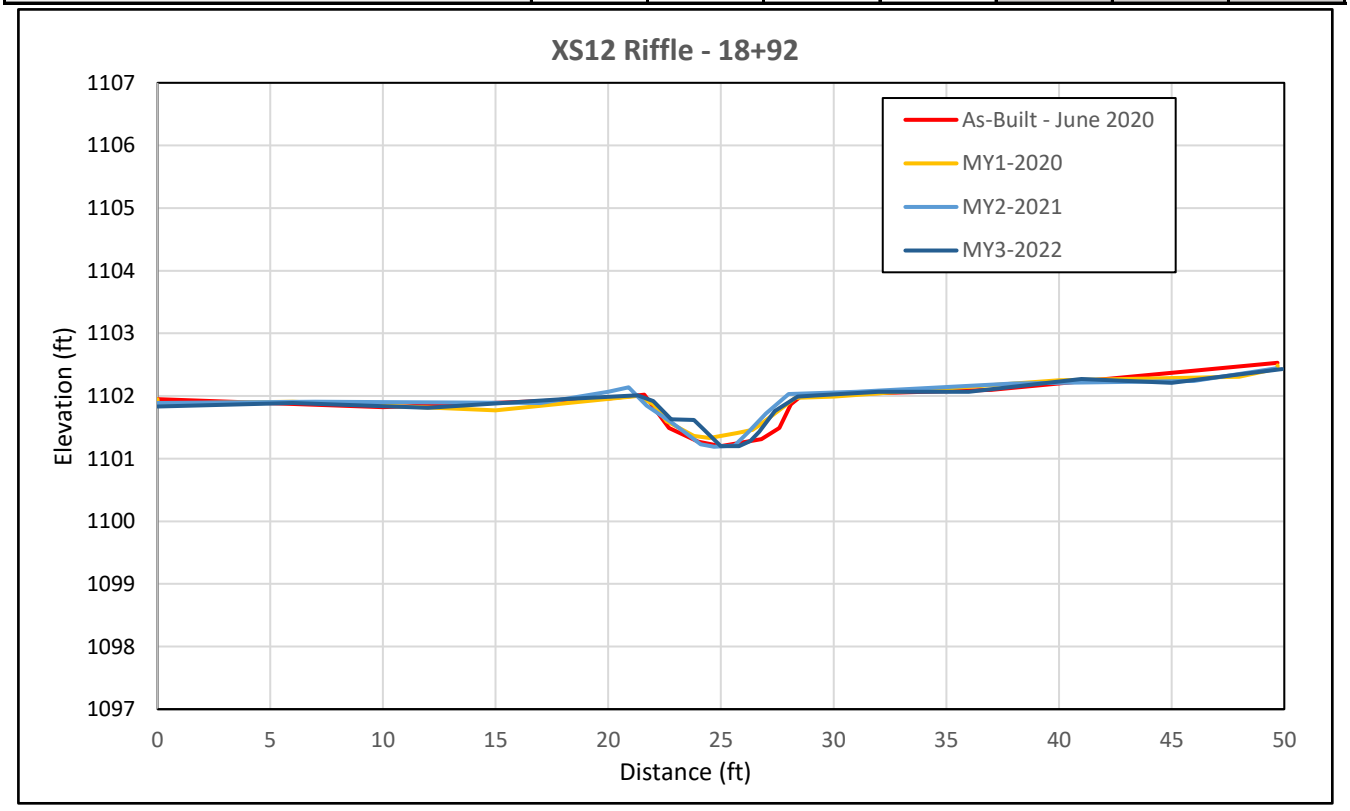
XS12 - UT1

Station 18+92 - Riffle

XS12 looking upstream

XS12 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1102.01	1102.14	1102.11	1102.16			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.79	0.92	0.75			
Thalweg Elevation	1101.20	1101.33	1101.19	1101.20			
LTOB Elevation	1102.01	1101.97	1102.03	1101.92			
LTOB Max Depth	0.81	0.64	0.84	0.72			
LTOB Cross Sectional Area	3.92	2.78	3.39	2.45			
Entrenchment Ratio	>7.12	>7.27	>7.30	>7.57			



Cross Section Plot - MY3 - October 2022

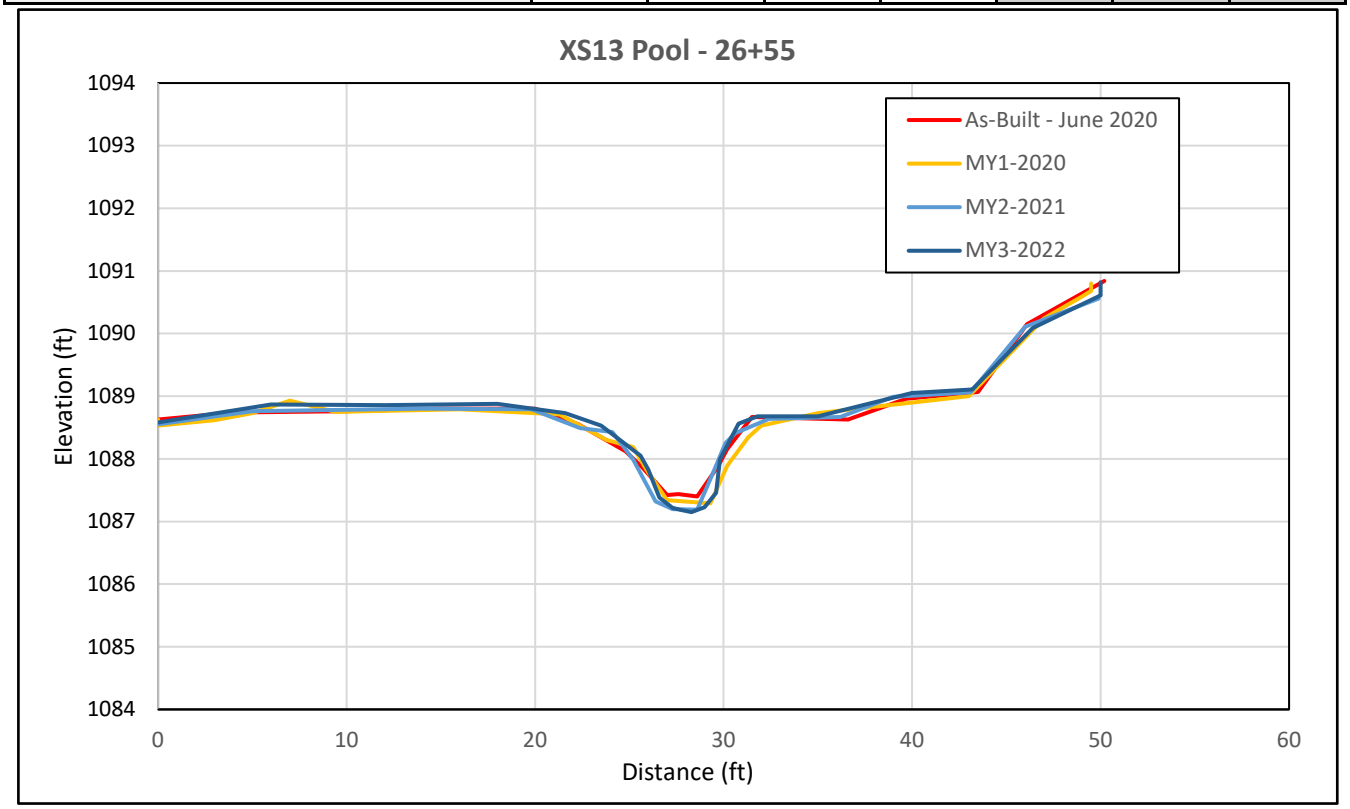
XS13 - UT1

Station 26+55 - Pool

XS13 looking upstream

XS13 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1088.55	1088.46	1088.51	1088.66			
Bank Height Ratio - Based on AB-Bankfull Area	1.10	1.23	0.94	1.01			
Thalweg Elevation	1087.40	1087.29	1087.19	1087.15			
LTOB Elevation	1088.67	1088.73	1088.43	1088.68			
LTOB Max Depth	1.27	1.44	1.24	1.53			
LTOB Cross Sectional Area	6.64	8.60	4.95	6.83			
Entrenchment Ratio	N/A	N/A	N/A	N/A			



Cross Section Plot - MY3 - October 2022

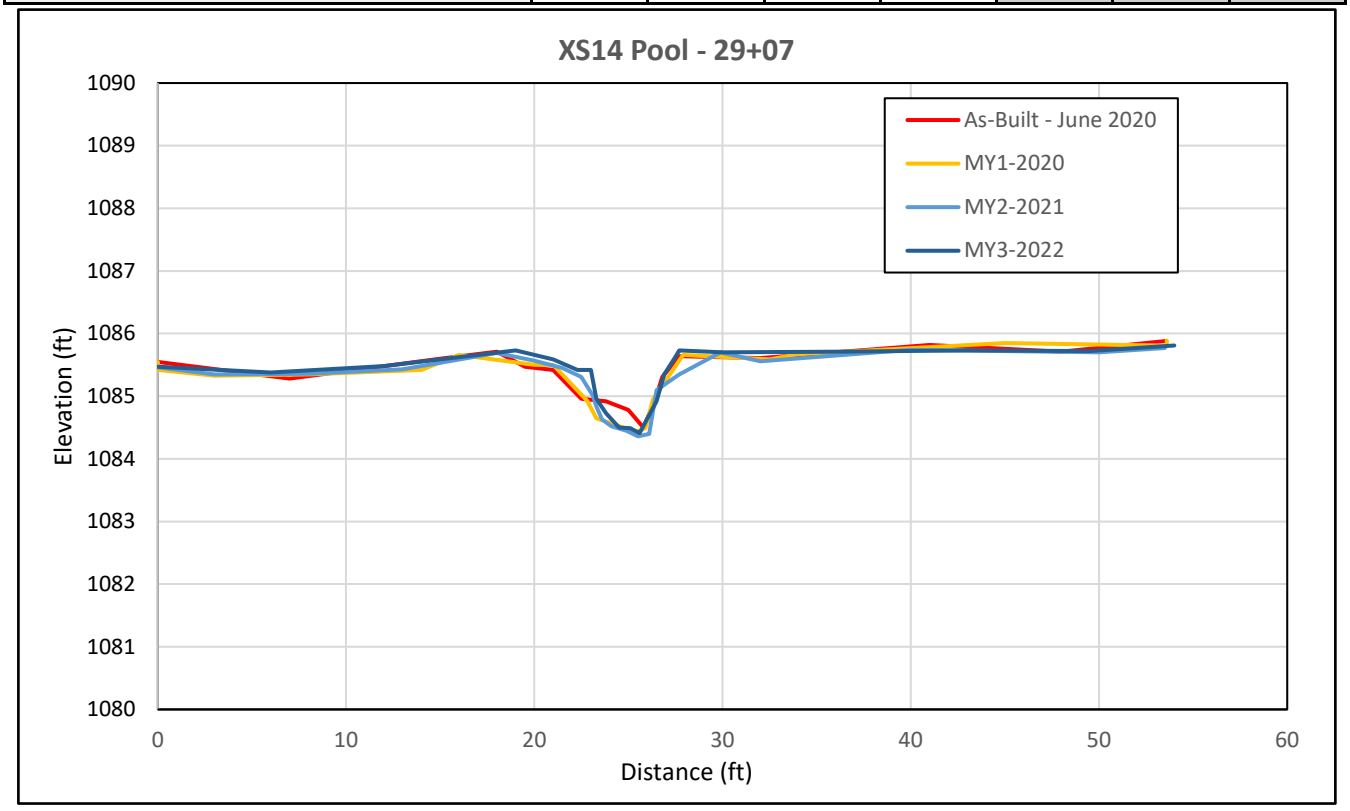
XS14 - UT1

Station 29+07 - Pool

XS14 looking upstream

XS14 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1085.64	1085.57	1085.58	1085.71			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.08	1.09	1.01			
Thalweg Elevation	1084.50	1084.43	1084.36	1084.41			
LTOB Elevation	1085.64	1085.66	1085.69	1085.73			
LTOB Max Depth	1.14	1.23	1.33	1.32			
LTOB Cross Sectional Area	4.63	5.61	5.83	4.77			
Entrenchment Ratio	N/A	N/A	N/A	N/A			



Cross Section Plot - MY3 - October 2022

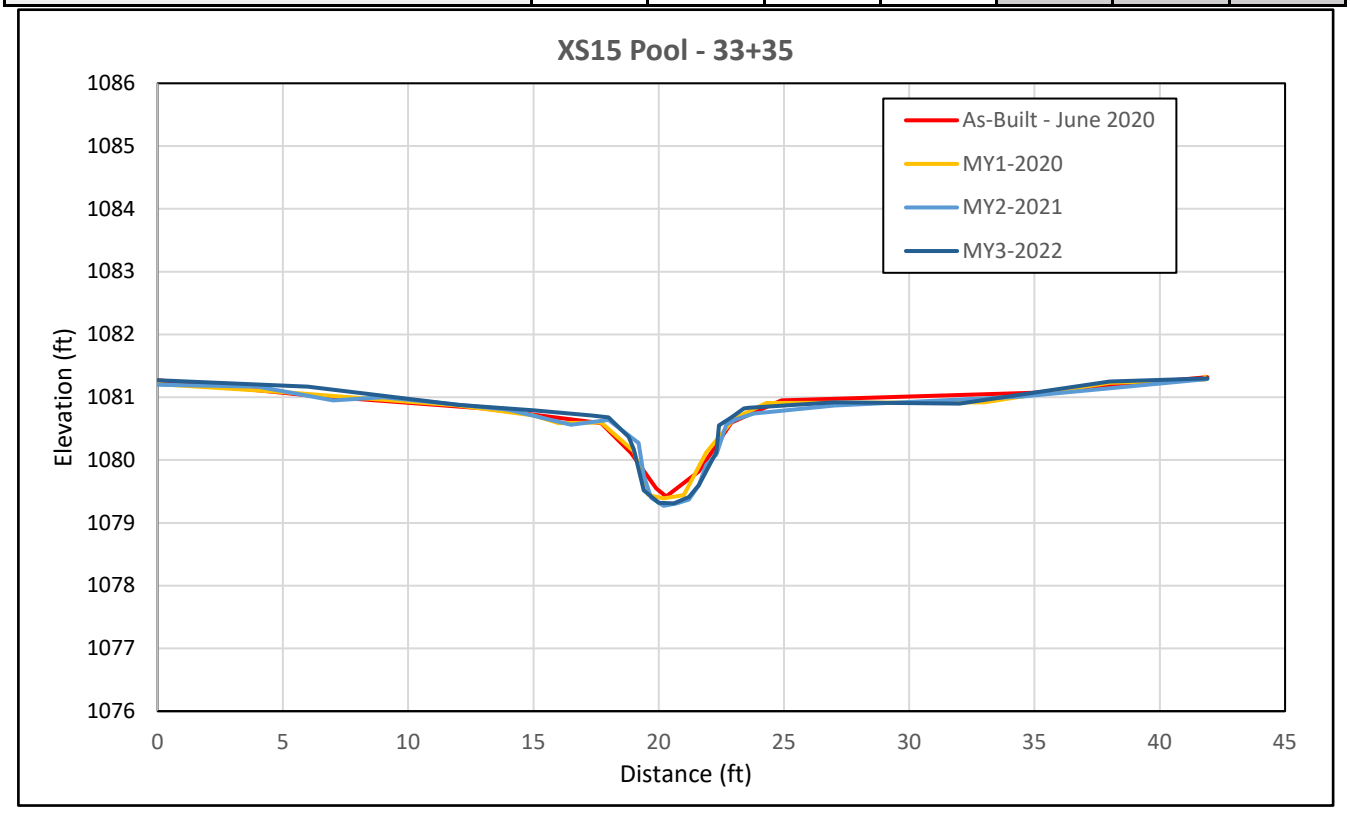
XS15 - UT1

Station 33+35 - Pool

XS15 looking upstream

XS15 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1080.95	1080.95	1081.26	1081.27			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.98	0.69	0.70			
Thalweg Elevation	1079.42	1079.39	1079.27	1079.31			
LTOB Elevation	1080.95	1080.91	1080.64	1080.68			
LTOB Max Depth	1.53	1.52	1.37	1.37			
LTOB Cross Sectional Area	6.90	6.40	3.76	4.01			
Entrenchment Ratio	N/A	N/A	N/A	N/A			



Cross Section Plot - MY3 - October 2022

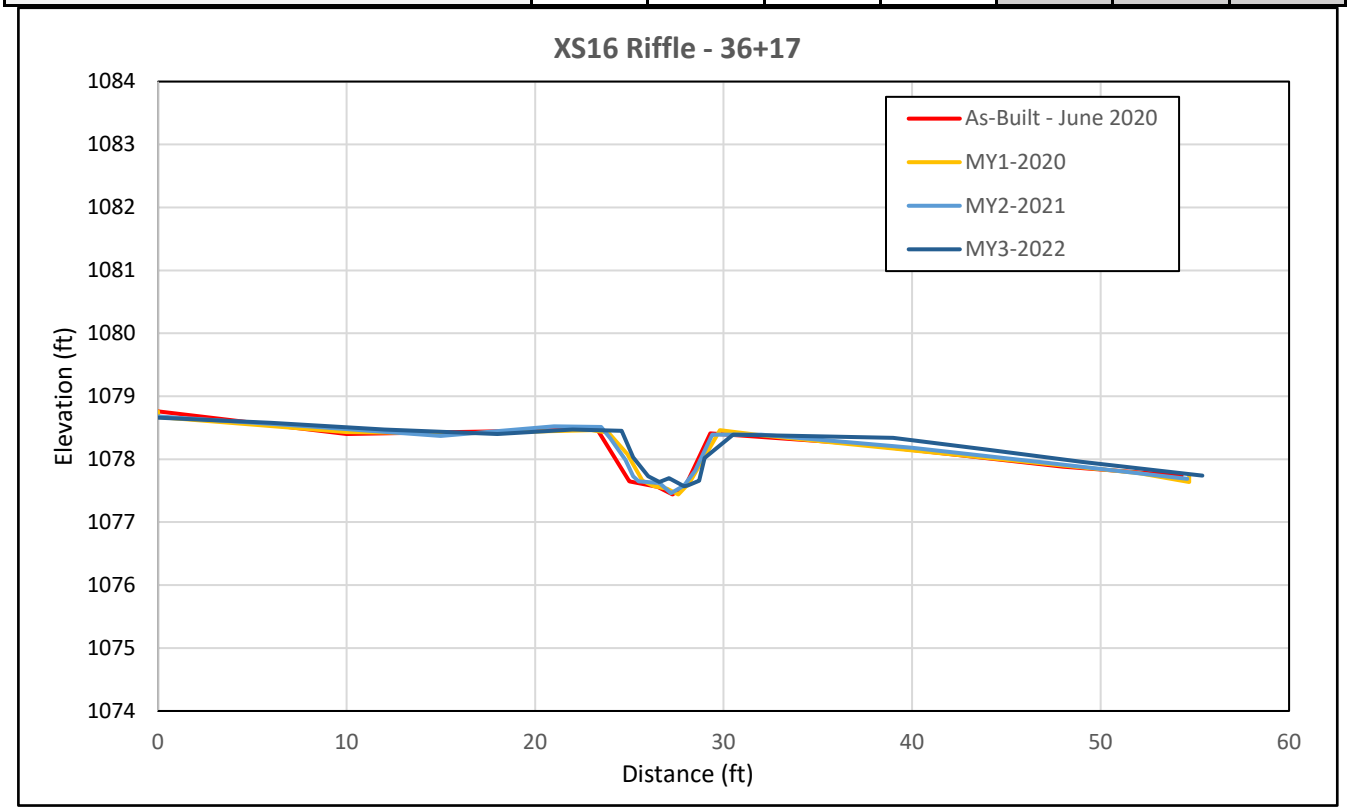
XS16 - UT1

Station 36+17 - Riffle

XS16 looking upstream

XS16 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1078.41	1078.47	1078.47	1078.52			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.99	0.92	0.87			
Thalweg Elevation	1077.44	1077.44	1077.46	1077.57			
LTOB Elevation	1078.41	1078.46	1078.39	1078.39			
LTOB Max Depth	0.97	1.02	0.93	0.82			
LTOB Cross Sectional Area	3.69	3.65	3.23	2.95			
Entrenchment Ratio	>9.12	>9.27	>9.81	>9.17			



Cross Section Plot - MY3 - October 2022

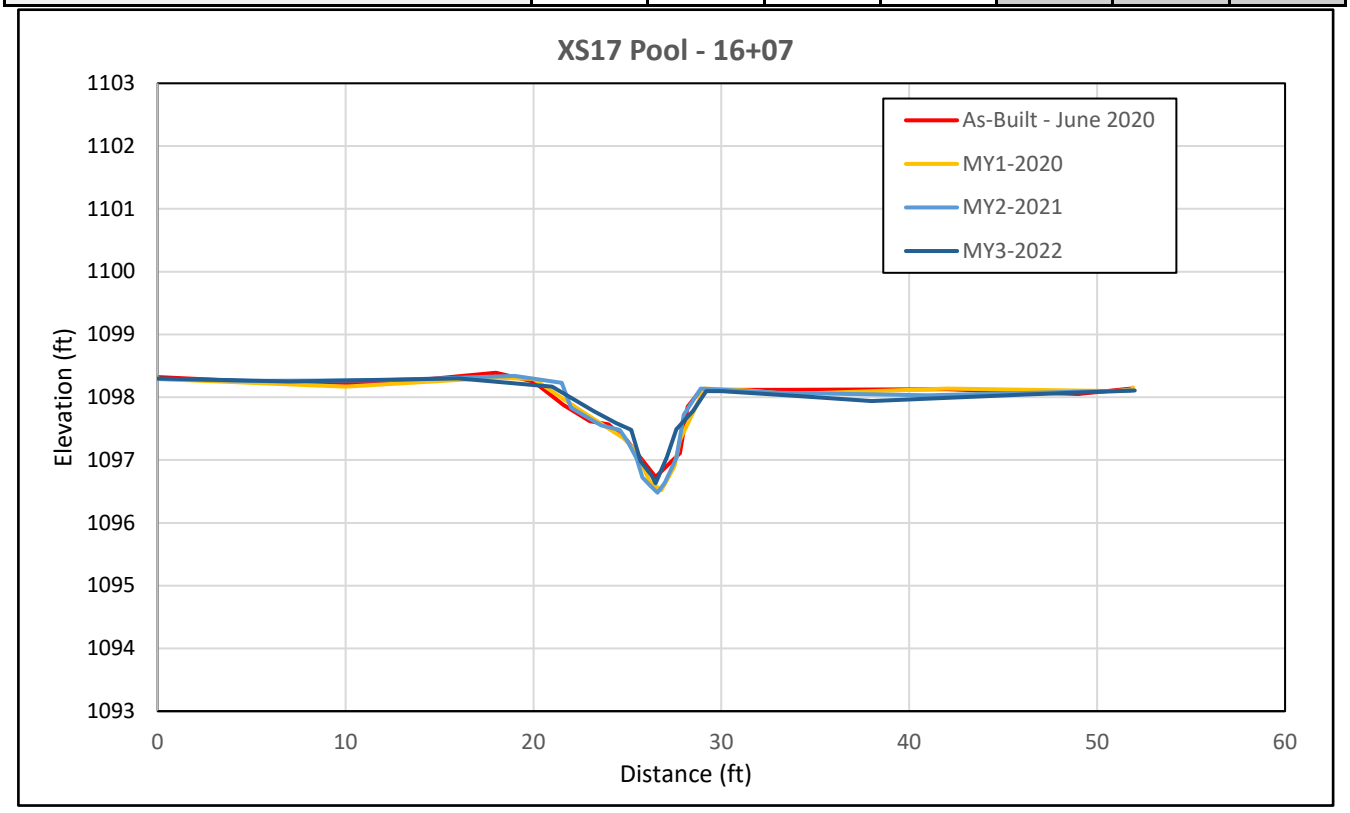
XS17 - UT2

Station 16+07 - Pool

XS17 looking upstream

XS17 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1098.12	1098.08	1098.10	1098.23			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.04	1.03	0.92			
Thalweg Elevation	1096.73	1096.52	1096.48	1096.63			
LTOB Elevation	1098.12	1098.14	1098.14	1098.10			
LTOB Max Depth	1.39	1.62	1.66	1.47			
LTOB Cross Sectional Area	5.42	5.90	5.72	4.40			
Entrenchment Ratio	N/A	N/A	N/A	N/A			



Cross Section Plot - MY3 - October 2022

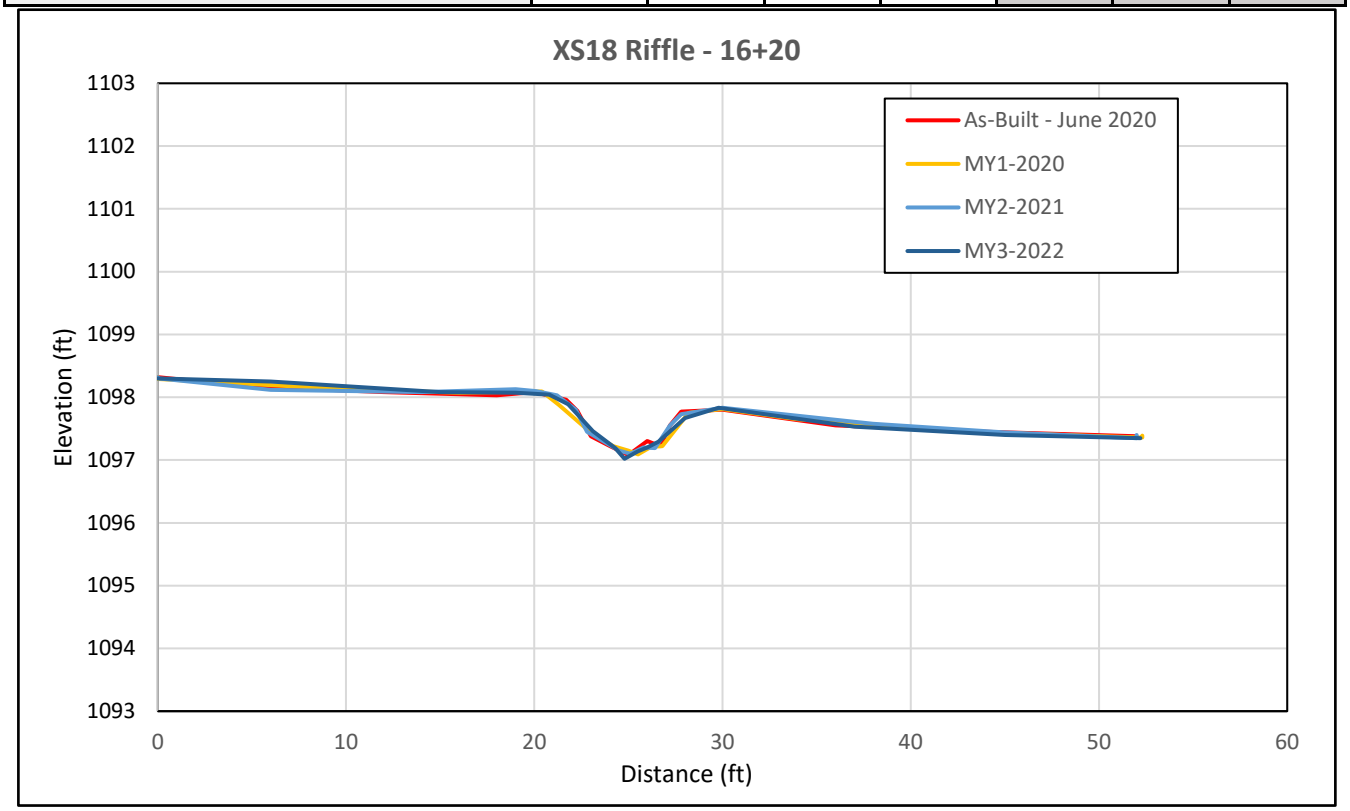
XS18 - UT2

Station 16+20 - Riffle

XS18 looking upstream

XS18 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1097.77	1097.72	1097.76	1097.78			
Bank Height Ratio - Based on AB-Bankfull Area	1.04	1.13	1.10	1.07			
Thalweg Elevation	1097.08	1097.09	1097.10	1097.10			
LTOB Elevation	1097.80	1097.81	1097.83	1097.87			
LTOB Max Depth	0.72	0.72	0.73	0.73			
LTOB Cross Sectional Area	2.61	3.02	2.90	2.90			
Entrenchment Ratio	>9.48	>8.17	>9.3	>9.17			



Cross Section Plot - MY3 - October 2022

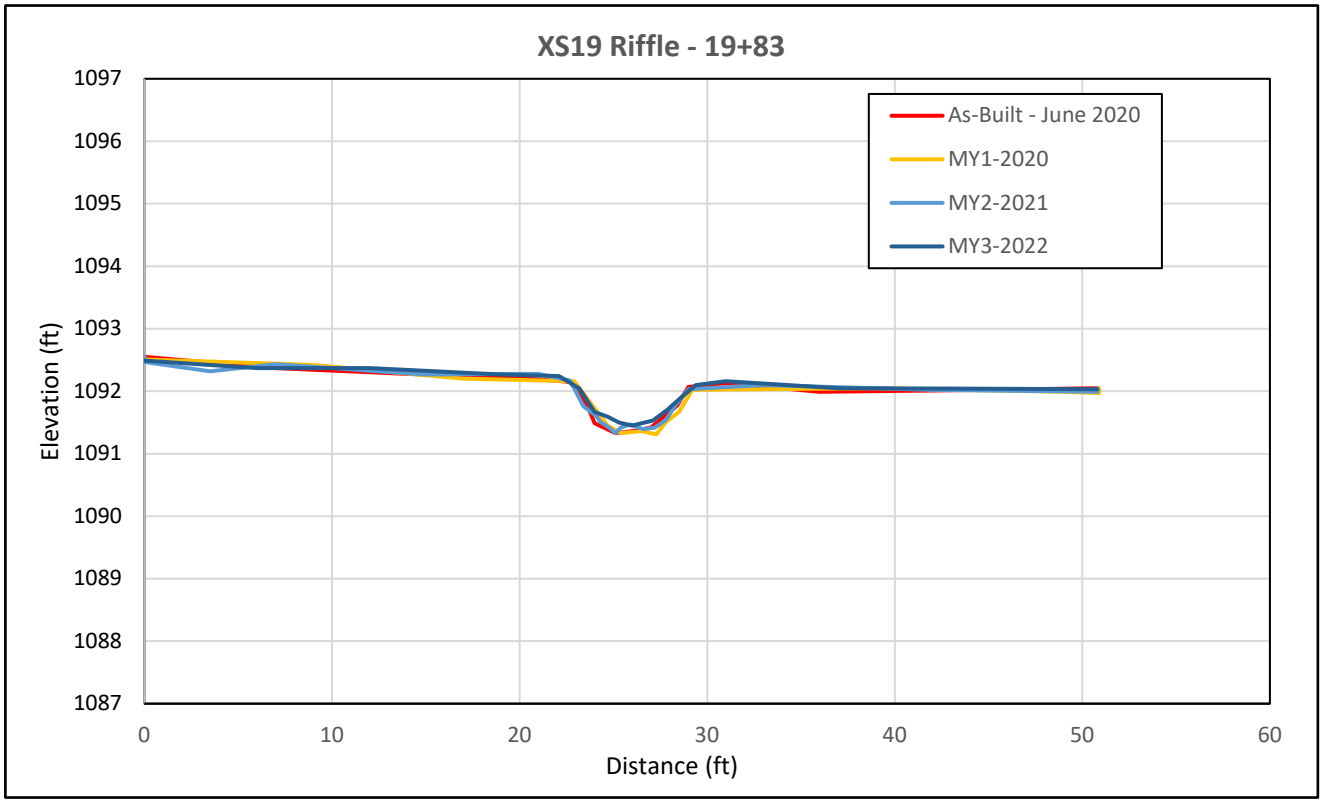
XS19 - UT2

Station 19+83 - Riffle

XS19 looking upstream

XS19 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1092.07	1092.04	1092.07	1092.23			
Bank Height Ratio - Based on AB-Bankfull Area	1.08	1.01	1.04	0.83			
Thalweg Elevation	1091.33	1091.31	1091.33	1091.33			
LTOB Elevation	1092.13	1092.05	1092.10	1092.10			
LTOB Max Depth	0.80	0.74	0.77	0.77			
LTOB Cross Sectional Area	3.52	3.20	3.35	3.35			
Entrenchment Ratio	>8.32	>8.56	>8.32	>8.19			



Cross Section Plot - MY3 - October 2022

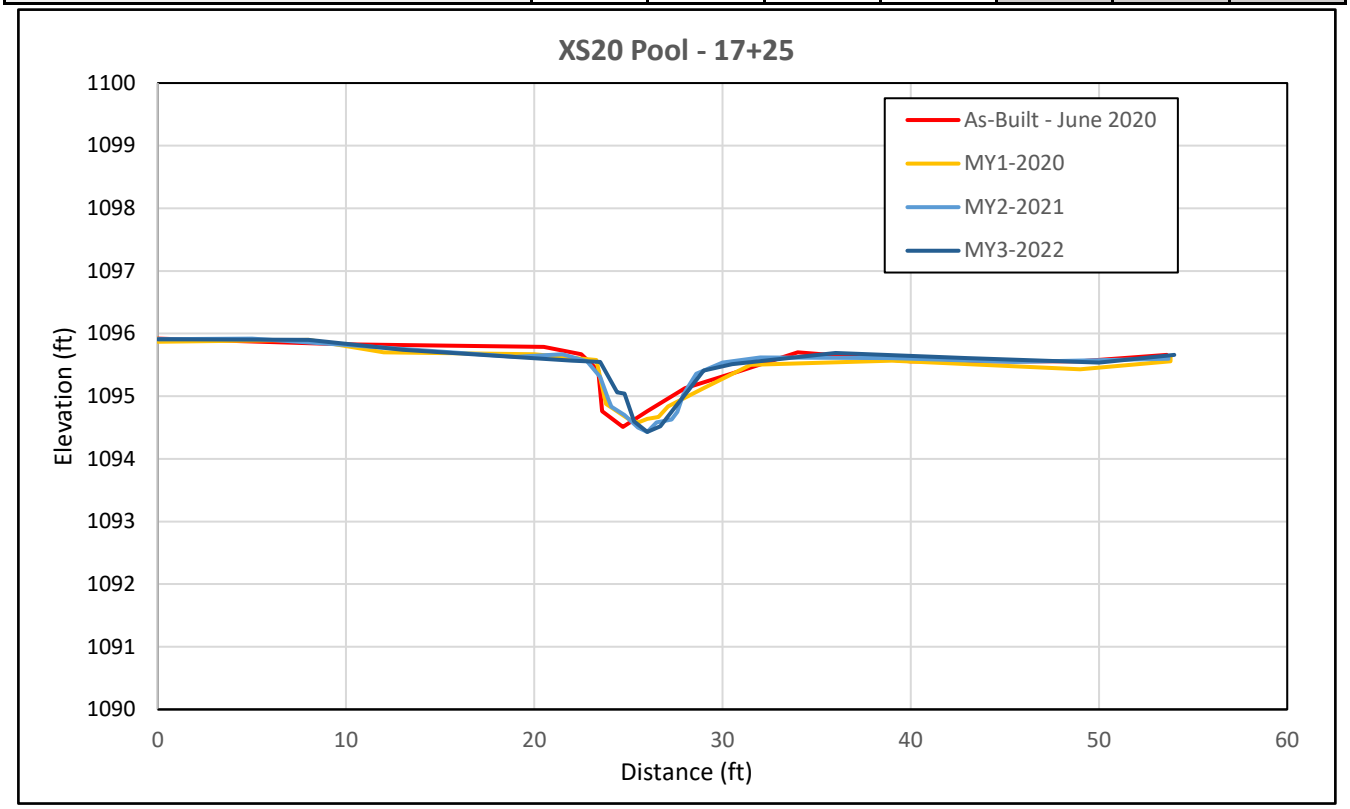
XS20 - UT3 Reach 1

Station 17+25 - Pool

XS20 looking upstream

XS20 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1095.67	1095.56	1095.64	1095.96			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.11	1.03	0.64			
Thalweg Elevation	1094.51	1094.58	1094.43	1094.43			
LTOB Elevation	1095.67	1095.67	1095.67	1095.41			
LTOB Max Depth	1.16	1.09	1.24	0.98			
LTOB Cross Sectional Area	5.72	9.02	6.71	2.86			
Entrenchment Ratio	N/A	N/A	N/A	N/A			



Cross Section Plot - MY3 - October 2022

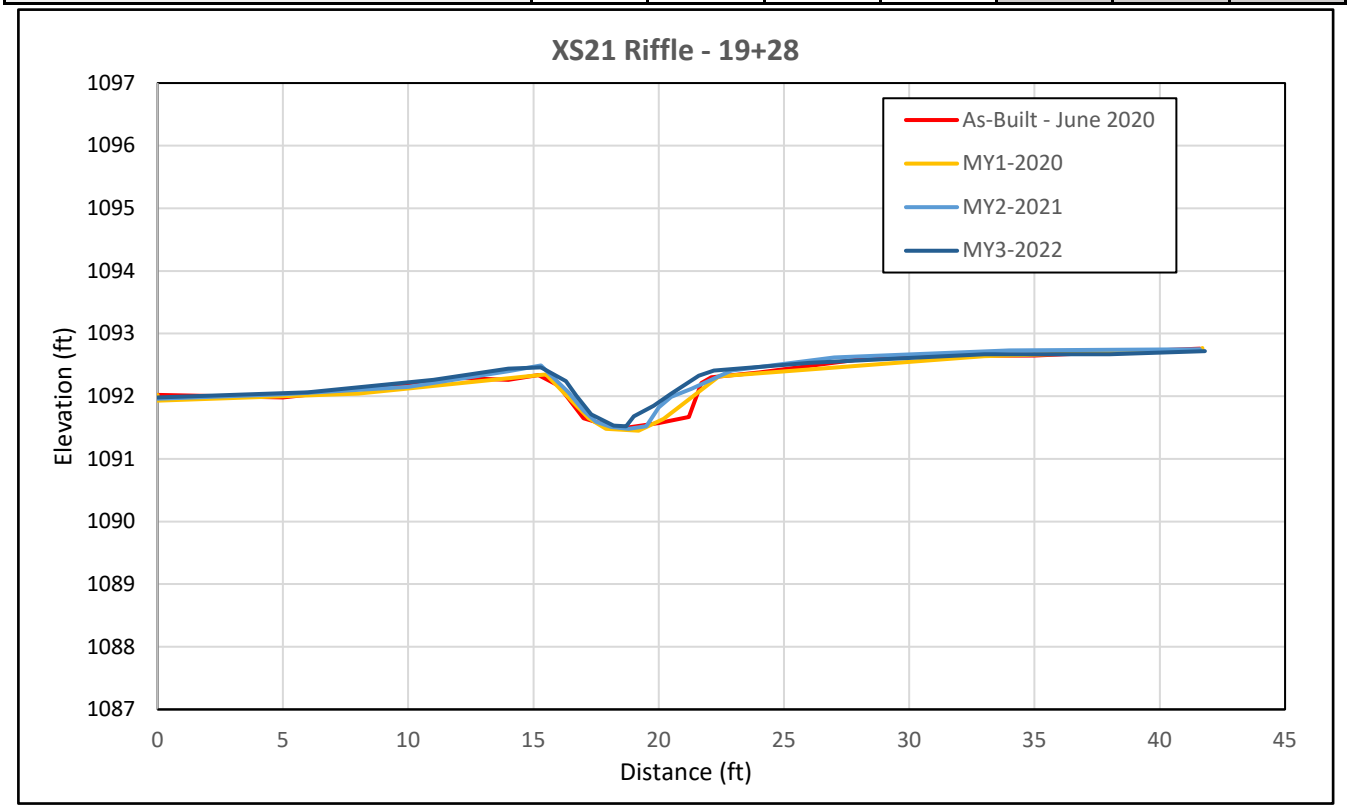
XS21 - UT3 Reach 1

Station 19+28 - Riffle

XS21 looking upstream

XS21 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1092.21	1092.24	1092.32	1092.51			
Bank Height Ratio - Based on AB-Bankfull Area	1.12	1.11	1.10	0.90			
Thalweg Elevation	1091.48	1091.45	1091.48	1091.52			
LTOB Elevation	1092.30	1092.32	1092.41	1092.41			
LTOB Max Depth	0.82	0.87	0.93	0.89			
LTOB Cross Sectional Area	3.71	3.71	3.75	3.02			
Entrenchment Ratio	>7.06	>6.11	>7.1	>6.17			



Cross Section Plot - MY3 - October 2022

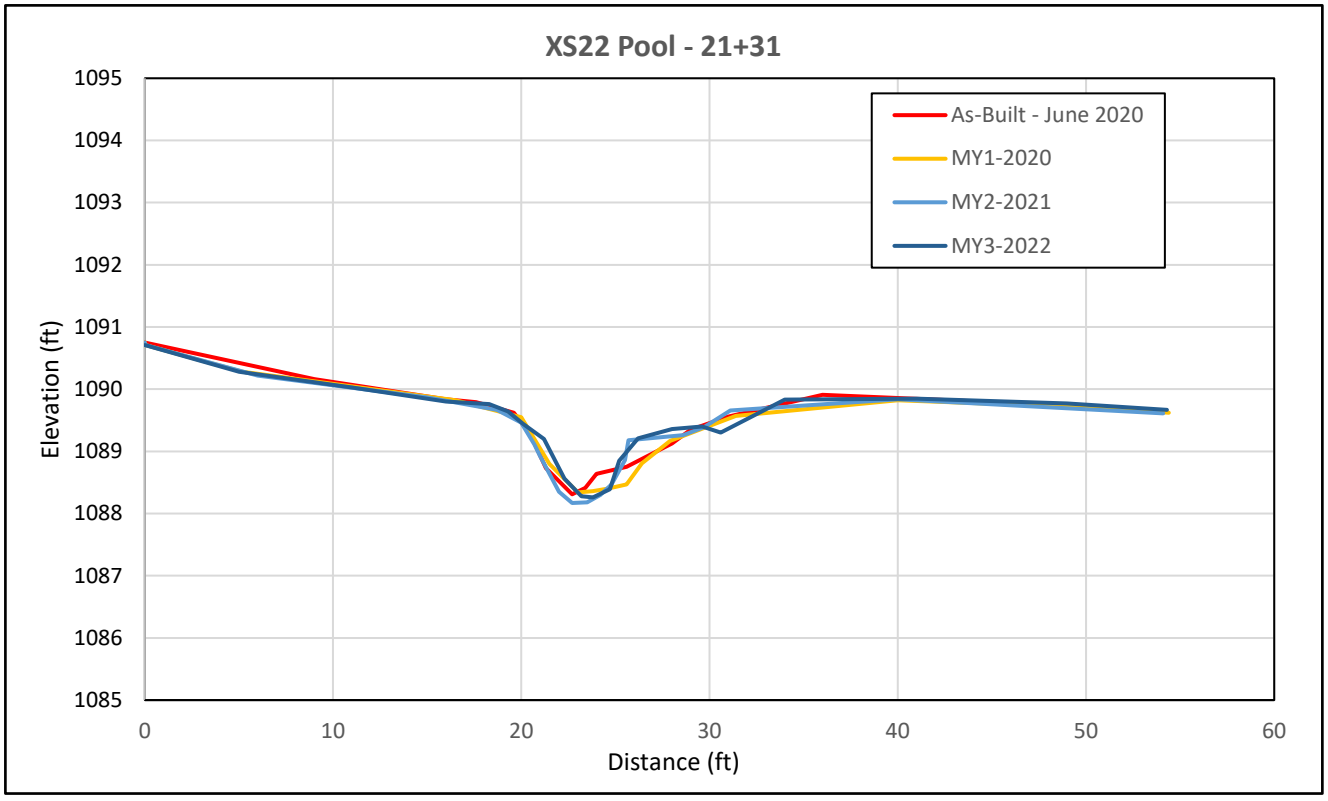
XS22 - UT3 Reach 2

Station 21+31 - Pool

XS22 looking upstream

XS22 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1089.56	1089.52	1089.55	1089.62			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.04	1.08	1.02			
Thalweg Elevation	1088.31	1088.34	1088.17	1088.26			
LTOB Elevation	1089.56	1089.57	1089.66	1089.64			
LTOB Max Depth	1.25	1.23	1.49	1.38			
LTOB Cross Sectional Area	6.88	7.47	8.19	7.21			
Entrenchment Ratio	N/A	N/A	N/A	N/A			



Cross Section Plot - MY3 - October 2022

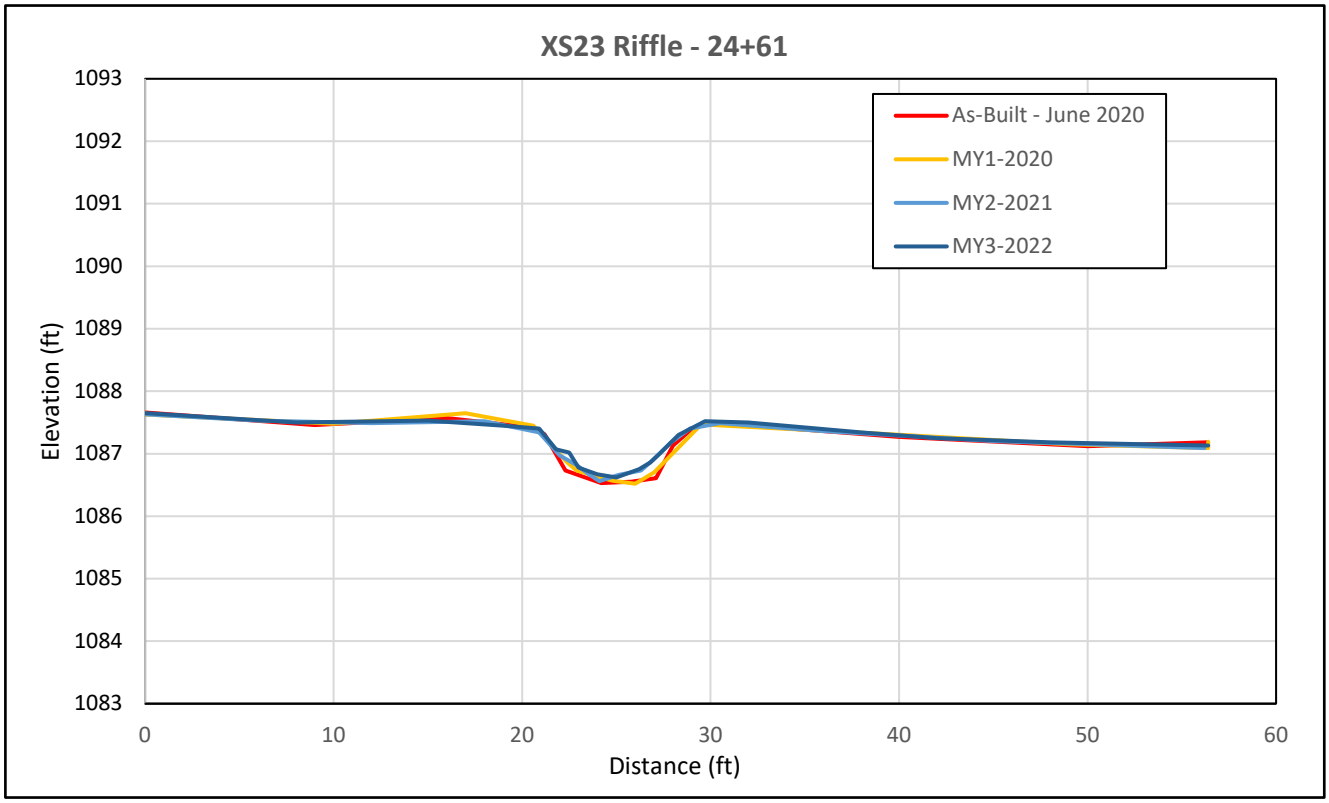
XS23- UT3 Reach 2

Station 24+61 - Riffle

XS23 looking upstream

XS23 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1087.39	1087.41	1087.48	1087.67			
Bank Height Ratio - Based on AB-Bankfull Area	1.13	1.06	1.01	0.74			
Thalweg Elevation	1086.53	1086.52	1086.56	1086.62			
LTOB Elevation	1087.50	1087.47	1087.49	1087.40			
LTOB Max Depth	0.97	0.95	0.93	0.78			
LTOB Cross Sectional Area	5.95	5.40	5.03	3.81			
Entrenchment Ratio	>6.85	>6.34	>6.42	>6.22			



Cross Section Plot - MY3 - October 2022

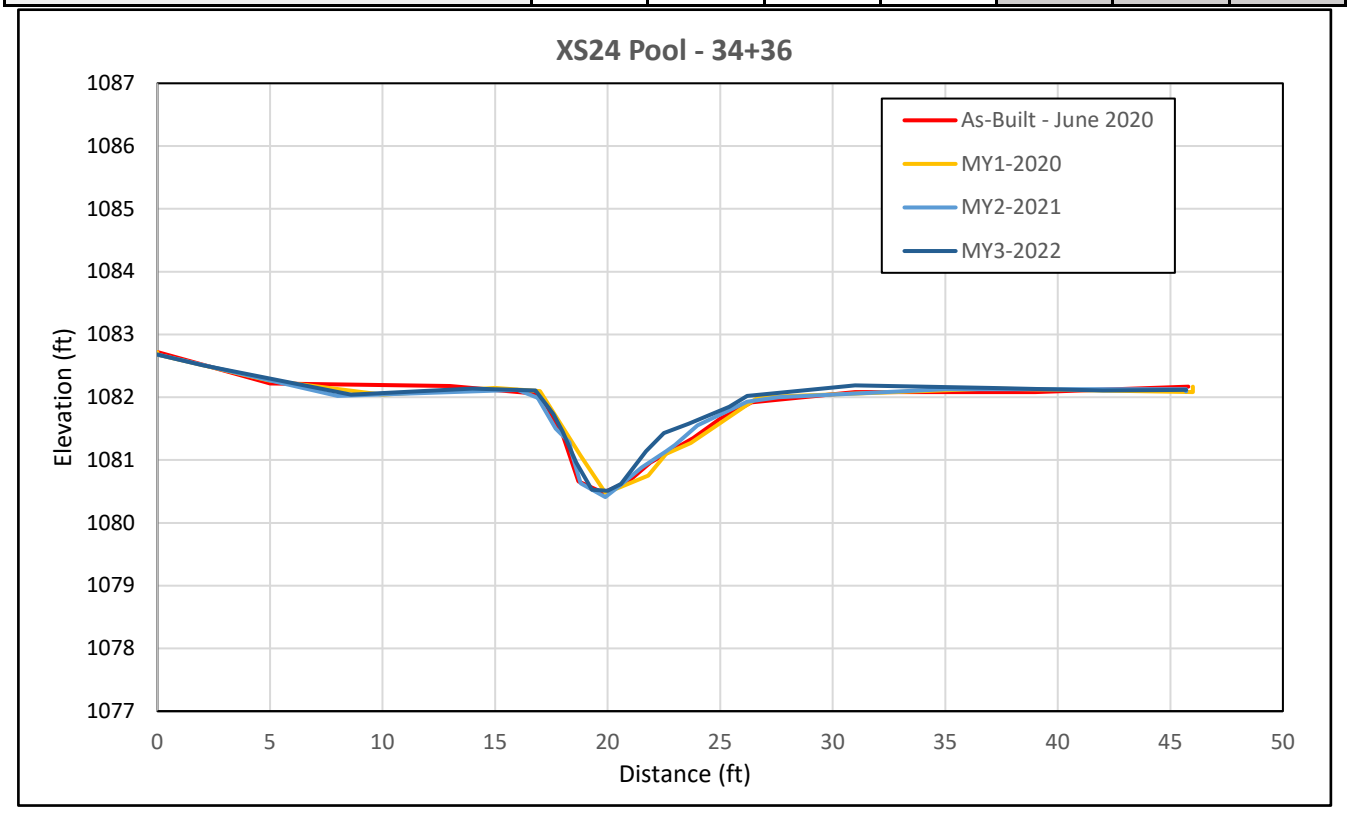
XS24 - UT3 Reach 2

Station 34+36 - Pool

XS24 looking upstream

XS24 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1081.92	1081.94	1081.95	1082.27			
Bank Height Ratio - Based on AB-Bankfull Area	1.11	1.04	1.03	0.86			
Thalweg Elevation	1080.48	1080.48	1080.41	1080.51			
LTOB Elevation	1082.08	1082.00	1082.00	1082.00			
LTOB Max Depth	1.60	1.52	1.59	1.51			
LTOB Cross Sectional Area	8.93	7.59	7.54	6.59			
Entrenchment Ratio	N/A	N/A	N/A	N/A			



Cross Section Plot - MY3 - October 2022

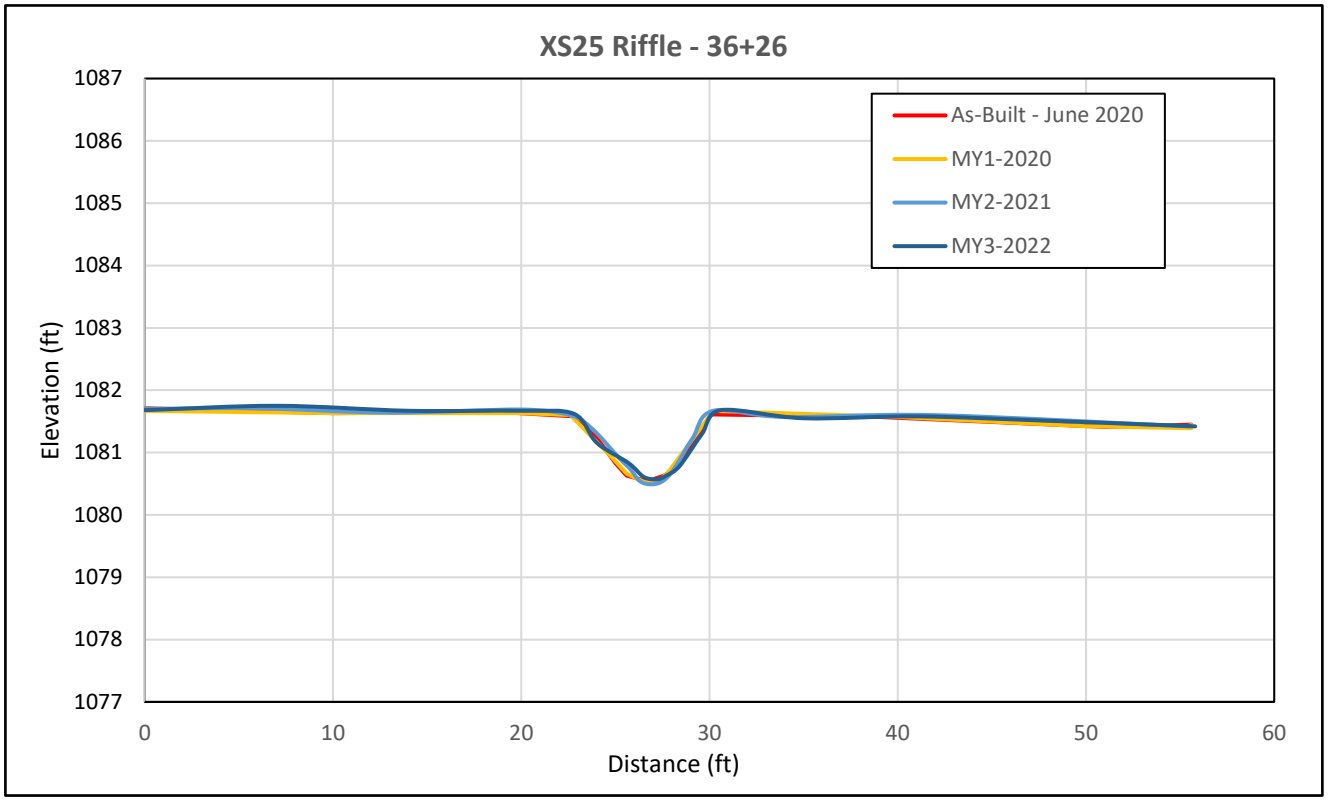
XS25 - UT3 Reach 2

Station 36+26 - Riffle

XS25 looking upstream

XS25 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1081.58	1081.59	1081.62	1081.59			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.01	0.98	1.03			
Thalweg Elevation	1080.54	1080.52	1080.49	1080.57			
LTOB Elevation	1081.58	1081.60	1081.60	1081.62			
LTOB Max Depth	1.04	1.08	1.11	1.05			
LTOB Cross Sectional Area	4.54	4.65	4.41	4.76			
Entrenchment Ratio	>7.7	>7.48	>7.63	>7.57			



Cross Section Plot - MY3 - October 2022

XS26 - UT3 Reach 2

Station 43+26 - Pool

XS26 looking upstream

XS26 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1077.31	1077.29	1077.20	1077.33			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.01	1.10	0.99			
Thalweg Elevation	1075.90	1075.60	1075.84	1075.79			
LTOB Elevation	1077.31	1077.31	1077.34	1077.31			
LTOB Max Depth	1.41	1.71	1.5	1.52			
LTOB Cross Sectional Area	7.58	7.84	9.12	7.41			
Entrenchment Ratio	N/A	N/A	N/A	N/A			

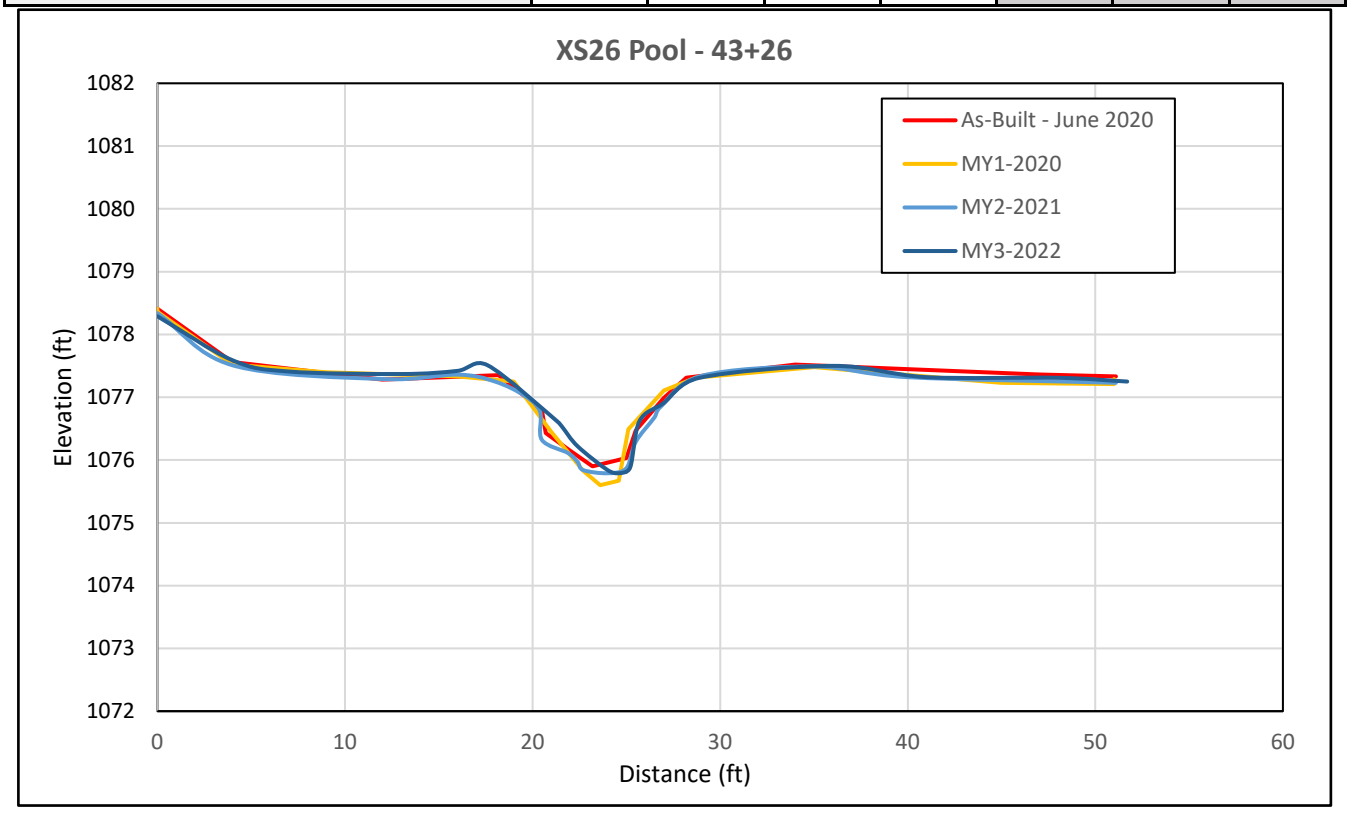


Table 8a. Baseline Stream Data Summary
Stewarts Creek Tributaries Stream Restoration Project (DMS No. 100023) - UT 1 (2742 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only	LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	4	7	4.6	4.3	5.0	5.1	5.7	0.6	4	5.6	6.1	-	6.6	-	-	5.6	6.1	6.6	6.0	6.6	7.0	7.0	-	3
Floodprone Width (ft)				5.7	7.3	7.0	9.7	1.9	4	13.4	18.9	-	24.4	-	-	13.4	18.9	24.4	49.7	52.1	52.2	54.3	-	3
Bankfull Mean Depth (ft)	0.5	0.8	0.7	0.5	0.5	0.5	0.6	0.1	4	0.4	0.6	-	0.7	-	-	0.4	0.5	0.7	0.6	0.6	0.6	0.6	-	3
[1]Bankfull Max Depth (ft)				0.7	0.7	0.7	0.8	0.1	4	1.2	1.3	-	1.4	-	-	0.6	0.7	0.8	0.8	0.9	0.8	1.0	-	3
Bankfull Cross Sectional Area (ft^2)	3.1	4.8	3.1	2.0	2.6	2.7	3.1	0.5	4	2.2	3.4	-	4.6	-	-	3.2	3.2	3.2	3.7	3.8	3.9	3.9	-	3
Width/Depth Ratio				8.5	10.0	9.7	12.0	1.5	4	10.0	12.0	-	14	-	-	10.0	12.0	14.0	9.6	11.6	12.5	12.6	-	3
Entrenchment Ratio				1.2	1.5	1.4	1.9	0.3	4	2.2	3.1	-	4.0	-	-	2.2	3.1	4.0	7.1	7.9	7.5	9.1	-	3
[1]Bank Height Ratio				5.6	8.4	7.7	12.5	3.1	4	1.0	1.0	-	1	-	-	1.0	1.05	1.1	1.0	1.0	1.0	1.1	-	3
Profile																								
Riffle Length (ft)				5.0	26.2	20.7	94.4	23.0	13	Total riffle length 60-70% of reach length						5.0	29.0	41.0	5.3	15.1	14.3	39.1	6.2	56
Riffle Slope (ft/ft)				0.012	0.044	0.038	0.084	0.025	13	-	-	-	-	-	-	0.009	0.024	0.075	0.008	0.037	0.034	0.086	0.019	56
Pool Length (ft)				5.8	11.3	9.5	22.0	4.6	13	Total pool length 30-40% of reach length						3.0	11.0	16.0	7.4	21.2	20.9	39.1	8.0	56
Pool Max depth (ft)				0.8	1.0	1.0	1.4	0.1	4	0.8	1.6	-	2.5	-	-	1.1	1.2	1.9	1.0	1.5	1.4	2.2	0.3	57
Pool Spacing (ft)				9.6	24.00	20.3	59.9	12.7	25	18	33.5	-	49	-	-	18.0	33.5	49.0	19.0	38.4	40.0	71.3	8.8	72
Pattern																								
Channel Beltwidth (ft)				6.2	16.9	16.5	34.1	7.5	18	18.3	27.5	-	36.6	-	-	18.3	27.5	36.6	12.7	28.4	30.4	37.0	6.5	67
Radius of Curvature (ft)				5.3	11.1	12.3	18.3	3.6	20	12.2	16.8	-	21.4	-	-	12.2	16.8	21.4	9.3	14.8	14.3	21.3	2.1	69
Rc:Bankfull width (ft/ft)				1.1	2.2	2.4	3.6	0.7	20	2.0	2.8	-	3.5	-	-	2.0	2.8	3.5	1.4	2.2	2.2	3.2	0.4	69
Meander Wavelength (ft)				24.3	45.7	41.8	79.0	14.2	18	42.7	58.0	-	73.2	-	-	30.5	51.9	73.2	35.7	60.0	61.4	73.4	8.9	71
Meander Width Ratio				4.8	9.1	8.3	15.7	14.2	18	3.0	4.5	-	6.0	-	-	3.0	4.5	6.0	1.9	4.3	4.6	5.6	1.5	67
Transport parameters																								
Reach Shear Stress (competency) lb/f^2				0.66												0.56			0.65					
Max part size (mm) mobilized at bankfull				72												72			111					
Stream Power (transport capacity) lb/s				10												9			9					
Additional Reach Parameters																								
Rosgen Classification				G4->F4						C4						Cb4			C4					
Bankfull Velocity (fps)	1.0	10.8	5.8	3.2												2.5			2.1					
Bankfull Discharge (cfs)	4	40	18.1	8 to 16												8								
Valley length (ft)				1840						-						2158								
Channel Thalweg length (ft)				2373						-						2805			2805					
Sinuosity (ft)				1.29						1.2-1.4						1.3			1.3					
Water Surface Slope (Channel) (ft/ft)				0.021						-						0.018			0.018					
BF slope (ft/ft)				0.021						-						0.018			0.018					
[3]Bankfull Floodplain Area (acres)				0.310						-						0.9			0.9					
[4]% of Reach with Eroding Banks				80%						-														
Channel Stability or Habitat Metric				0.58						-														
Biological or Other				-						-														

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 8b. Baseline Stream Data Summary
Stewarts Creek Tributaries Stream Restoration Project (DMS No. 100023) - UT 2 (1009 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only	LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	4	7	3.8	2.5	3.5	3.5	4.5	-	2	4.7	5.1	-	5.5	-	-	4.7	5.1	5.5	5.5	5.8	5.8	6.1	-	2
Floodprone Width (ft)				6.5	9.3	9.3	12.0	-	2	11.2	15.8	-	20.4	-	-	11.2	15.8	20.4	50.8	51.4	51.4	52.0	-	2
Bankfull Mean Depth (ft)	0.5	0.8	0.6	0.5	0.7	0.7	0.9	-	2	0.3	0.5	-	0.6	-	-	0.3	0.4	0.6	0.4	0.5	0.5	0.5	-	2
[1]Bankfull Max Depth (ft)				0.7	0.9	0.9	1.0	-	2	1.1	1.8	-	2.4	-	-	0.5	0.6	0.7	0.7	0.7	0.7	0.7	-	2
Bankfull Cross Sectional Area (ft^2)	2	3	2.2	2.1	2.2	2.2	2.3	-	2	1.4	2.4	-	3.3	-	-	11.2	15.8	20.4	2.4	2.8	2.8	3.1	-	2
Width/Depth Ratio				2.8	6.2	6.2	9.5	-	2	10.0	12.0	-	14	-	-	10.0	12.0	14.0	12.0	12.2	12.2	12.5	-	2
Entrenchment Ratio				1.5	3.2	3.2	4.8	-	2	2.2	3.1	-	4.0	-	-	2.2	3.1	4.0	8.3	8.9	8.9	9.5	-	2
[1]Bank Height Ratio				4.0	7.5	7.5	10.9	-	2	1.0	1.0	-	1.0	-	-	1.0	1.0	1.1	1.0	1.1	1.1	1.1	-	2
Profile																								
Riffle Length (ft)				6.6	19.3	14.0	35.9	11.8	7	Total riffle length 60-70% of reach length						22.0	25.0	32.0	5.0	16.4	18.0	27.1	6.0	25
Riffle Slope (ft/ft)				0.015	0.027	0.023	0.047	0.011	7	-	-	-	-	-	-	0.011	0.027	0.045	0.02	0.045	0.043	0.083	0.017	25
Pool Length (ft)				7.1	10.6	8.5	20.3	4.7	8	Total pool length 30-40% of reach length						6.0	10.0	21.0	5.1	14.5	14.3	21.9	4.2	26
Pool Max depth (ft)				0.7	0.8	0.8	1.5	0.3	2	0.6	1.4	-	2.1	-	-	0.9	1.0	1.6	0.8	1.2	1.1	1.8	0.2	26
Pool Spacing (ft)				13.3	23.6	18.9	44.8	10.3	15	20.4	28.1	-	35.7	-	-	15.3	28.1	40.8	24.9	36.0	35.0	42.0	2.8	27
Pattern																								
Channel Beltwidth (ft)				4.8	7.9	7.3	12.3	2.2	15	15.3	23.0	-	30.6	-	-	15.3	23.0	30.6	23.2	27.2	27.5	32.6	2.5	27
Radius of Curvature (ft)				4.8	8.0	7.8	13.8	2.1	16	10.2	14.0	-	17.9	-	-	10.2	14.1	17.9	10.6	12.7	12.4	15.9	1.7	28
Rc:Bankfull width (ft/ft)				1.4	2.3	2.2	3.9	0.6	16	2.0	2.8	-	3.5	-	-	2.0	2.8	3.5	1.8	2.2	2.1	2.7	0.3	28
Meander Wavelength (ft)				13.6	37.4	37.0	68.3	18.7	15	35.7	48.5	-	61.2	-	-	25.5	43.4	61.2	40.4	54.4	52.9	92.0	9.2	28
Meander Width Ratio				3.9	10.7	10.6	19.5	18.7	15	3.0	4.5	-	6.0	-	-	3.0	4.5	6.0	4.0	4.7	4.7	5.6	1.5	27
Transport parameters																								
Reach Shear Stress (competency) lb/f^2				1.1												0.5			0.62					
Max part size (mm) mobilized at bankfull				67												67			107					
Stream Power (transport capacity) lb/s				13												10			10					
Additional Reach Parameters																								
Rosgen Classification				Channelized E4						Cb						Cb4			Cb4					
Bankfull Velocity (fps)	1.0	10.8	5.9	3.7												3.6			2.9					
Bankfull Discharge (cfs)	4	40	13.0	8												8								
Valley length (ft)				374						-						1358								
Channel Thalweg length (ft)				397						-						1060			1060					
Sinuosity (ft)				1.06						1.2 to 1.4						1.34			1.3					
Water Surface Slope (Channel) (ft/ft)				0.026						-						0.022			0.0208					
BF slope (ft/ft)				0.026						-						0.022			0.0208					
[3]Bankfull Floodplain Area (acres)				0.1						-						0.5			0.5					
[4]% of Reach with Eroding Banks				70%						-														
Channel Stability or Habitat Metric				0.24						-														
Biological or Other				-						-														

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 8c. Baseline Stream Data Summary
Stewarts Creek Tributaries Stream Restoration Project (DMS No. 100023) - UT 3 R1 (994 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only	LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	4	7	4.6	4.1	4.9	4.9	5.8	-	3	4.7	5.1	-	5.5	-	-	5.6	6.1	6.6	5.9	5.9	5.9	5.9	-	1
Floodprone Width (ft)				5.8	11.4	7.6	20.7	-	3	11.2	15.8	-	20.4	-	-	13.4	18.9	24.4	41.6	41.6	41.6	41.6	-	1
Bankfull Mean Depth (ft)	0.5	0.8	0.7	0.4	0.6	0.7	0.7	-	3	0.3	0.5	-	0.6	-	-	0.4	0.5	0.7	0.5	0.5	0.5	0.5	-	1
[1]Bankfull Max Depth (ft)				0.6	1.0	1.0	1.4	-	3	1.1	1.8	-	2.4	-	-	0.6	0.7	0.8	0.7	0.7	0.7	0.7	-	1
Bankfull Cross Sectional Area (ft^2)	3.1	4.8	3.1	2.3	3.0	2.9	3.7	-	3	1.4	2.4	-	3.3	-	-	3.2	3.2	3.2	3.2	3.2	3.2	3.2	-	1
Width/Depth Ratio				5.9	9.0	6.6	14.4	-	3	10.0	12.0	-	14	-	-	10.0	12.0	14.0	11.1	11.1	11.1	11.1	-	1
Entrenchment Ratio				1.0	2.5	1.6	5.0	-	3	2.2	3.1	-	4.0	-	-	2.2	3.1	4.0	7.1	7.1	7.1	7.1	-	1
[1]Bank Height Ratio				2.7	4.2	4.0	5.8	-	3	1.0	1.0	-	1	-	-	1.0	1.05	1.1	1.1	1.1	1.1	1.1	-	1
Profile																								
Riffle Length (ft)				9.1	34.4	32.4	89.8	25.6	10	Total riffle length 60-70% of reach length						11.0	31.0	46.0	6.4	16.6	14.7	32.3	8.1	22
Riffle Slope (ft/ft)				0.001	0.029	0.030	0.051	0.015	10	-	-	-	-	-	-	0.016	0.027	0.064	0.020	0.047	0.044	0.089	0.018	22
Pool Length (ft)				7.7	17.9	16.3	29.8	7.5	10	Total pool length 30-40% of reach length						7.0	11.0	18.0	5.0	13.6	13.1	25.6	5.3	23
Pool Max depth (ft)				0.9	1.0	1.0	1.0	0.2	3	0.6	1.4	-	2.1	-	-	1.1	1.2	1.9	0.8	1.3	1.3	1.7	0.3	23
Pool Spacing (ft)				14.5	27.2	22.8	55.6	12.2	23	20.4	28.1	-	35.7	-	-	18.0	33.5	49.0	33.0	45.1	44.0	56.0	6.1	18
Pattern																								
Channel Beltwidth (ft)				6.0	12.8	8.7	37.0	8.6	21	15.3	23.0	-	30.6	-	-	18.3	27.5	36.6	16.4	31.0	32.4	39.3	5.5	20
Radius of Curvature (ft)				5.7	11.0	11.7	22.7	4.1	27	10.2	14.0	-	17.9	-	-	12.2	16.8	21.4	12.4	15.0	14.9	20.9	2.2	21
Rc:Bankfull width (ft/ft)				1.2	2.2	2.4	4.6	0.8	27	2.0	2.8	-	3.5	-	-	2.0	2.8	3.5	2.1	2.6	2.5	3.6	0.4	21
Meander Wavelength (ft)				16.7	34.9	31.7	68.3	14.7	23	35.7	48.5	-	61.2	-	-	30.5	51.9	73.2	57.6	73.3	70.0	117.0	14.3	20
Meander Width Ratio				3.4	7.1	6.4	13.8	14.7	23	3.0	4.5	-	6.0	-	-	3.0	4.5	6.0	2.8	5.3	5.5	6.7	2.3	20
Transport parameters																								
Reach Shear Stress (competency) lb/f^2				0.58												0.62			0.69					
Max part size (mm) mobilized at bankfull				62												62			116					
Stream Power (transport capacity) lb/s				9												11			12					
Additional Reach Parameters																								
Rosgen Classification				F4						Cb						Cb4			Cb4					
Bankfull Velocity (fps)	1.0	10.8	4.2	3												2.8			2.9					
Bankfull Discharge (cfs)	4	40	13.0	9												9								
Valley length (ft)				1385						-						802								
Channel Thalweg length (ft)				1814						-						994			994					
Sinuosity (ft)				1.31						1.2 to 1.4						1.24			1.2					
Water Surface Slope (Channel) (ft/ft)				0.016						-						0.02			0.0209					
BF slope (ft/ft)				0.016						-						0.02			0.0209					
[3]Bankfull Floodplain Area (acres)				0.4						-						0.3			0.3					
[4]% of Reach with Eroding Banks				60%						-														
Channel Stability or Habitat Metric				0.55						-														
Biological or Other				-						-														

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 8d. Baseline Stream Data Summary
Stewarts Creek Tributaries Stream Restoration Project (DMS No. 100023) - UT 3 R2 (2421 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only	LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	5	9	5.7							4.7	5.1	-	5.5	-	-	6.8	7.3	7.8	7.2	7.7	7.7	8.2	-	2
Floodprone Width (ft)										11.2	15.8	-	20.4	-	-	16.1	22.6	29.2	55.6	56.0	56.0	56.3	-	2
Bankfull Mean Depth (ft)	0.8	1.2	0.9							0.3	0.5	-	0.6	-	-	0.5	0.6	0.8	0.6	0.6	0.6	0.6	-	2
[1]Bankfull Max Depth (ft)										1.1	1.8	-	2.4	-	-	0.7	0.8	0.9	0.9	1.0	1.0	1.0	-	2
Bankfull Cross Sectional Area (ft^2)	4	5	4.4							1.4	2.4	-	3.3	-	-	4.4	4.4	4.4	4.5	4.7	4.7	4.9	-	2
Width/Depth Ratio										10.0	12.0	-	14	-	-	10.0	12.0	14.0	11.5	12.7	12.7	13.9	-	2
Entrenchment Ratio										2.2	3.1	-	4.0	-	-	2.2	3.1	4.0	6.9	7.3	7.3	7.7	-	2
[1]Bank Height Ratio										1.0	1.0	-	1	-	-	1.0	1.05	1.1	1.0	1.1	1.1	1.1	-	2
Profile																								
Riffle Length (ft)										Total riffle length 60-70% of reach length						12.0	41.0	57.0	5.0	18.1	16.2	39.3	9.8	40
Riffle Slope (ft/ft)										-	-	-	-	-	-	0.004	0.01	0.018	0.004	0.022	0.018	0.063	0.016	40
Pool Length (ft)										Total pool length 30-40% of reach length						8.0	15.0	22.0	7.9	17.4	16.2	38.3	6.4	41
Pool Max depth (ft)										0.6	1.4	-	2.1	-	-	1.3	1.4	2.2	1.2	1.6	1.6	2.5	0.2	41
Pool Spacing (ft)										20.4	28.1	-	35.7	-	-	29.2	86.0	58.4	43.0	55.6	56.0	70.0	6.0	43
Pattern																								
Channel Beltwidth (ft)										15.3	23.0	-	30.6	-	-	25.6	42	58.4	26.5	42.1	42.1	56.6	6.9	43
Radius of Curvature (ft)										10.2	14.0	-	17.9	-	-	14.6	20.1	25.6	15.7	18.6	19.0	23.0	1.7	45
Rc:Bankfull width (ft/ft)										2.0	2.8	-	3.5	-	-	2.0	2.8	3.5	2.0	2.4	2.5	3.0	0.3	45
Meander Wavelength (ft)										35.7	48.5	-	61.2	-	-	51.1	69.4	87.6	66.9	81.9	81.2	130.3	10.9	44
Meander Width Ratio										3.0	4.5	-	6.0	-	-	3.5	5.8	8.0	3.4	5.4	5.5	7.3	1.8	43
Transport parameters																								
Reach Shear Stress (competency) lb/f^2																0.25			0.24					
Max part size (mm) mobilized at bankfull																62			54					
Stream Power (transport capacity) lb/s																7			7					
Additional Reach Parameters																								
Rosgen Classification										C4						C4			C4					
Bankfull Velocity (fps)	2.3	22.5	5.9													3.9			3.6					
Bankfull Discharge (cfs)	9	90	25.8													17								
Valley length (ft)										-						1802								
Channel Thalweg length (ft)										-						2523			2523					
Sinuosity (ft)										1.2 to 1.4						1.4			1.4					
Water Surface Slope (Channel) (ft/ft)										-						0.0067			0.0063					
BF slope (ft/ft)										-						0.0067			0.0063					
[3]Bankfull Floodplain Area (acres)										-						0.9			0.9					
[4]% of Reach with Eroding Banks										-														
Channel Stability or Habitat Metric										-														
Biological or Other										-														

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 8e. Baseline Stream Data Summary
Stewarts Creek Tributaries Stream Restoration Project (DMS No. 100023) - Moores Fork R1 (1573 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only	LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	20	30	22.5	30.7	30.7	30.7	30.7	-	1	21.9	23.9	-	25.9	-	-	21.9	23.9	25.9	33.2	33.2	33.2	33.2	-	1
Floodprone Width (ft)				35.0	35.0	35.0	35.0	-	1	52.6	74.1	-	95.6	-	-	52.6	74.1	95.6	43.0	43.0	43.0	43.0	-	1
Bankfull Mean Depth (ft)	1.8	3	2.4	1.7	1.7	1.7	1.7	-	1	1.6	2.1	-	2.6	-	-	1.6	2.1	2.6	1.8	1.8	1.8	1.8	-	1
[1]Bankfull Max Depth (ft)				2.7	2.7	2.7	2.7	-	1	1.2	1.3	-	1.4	-	-	2.3	3.0	3.8	2.4	2.4	2.4	2.4	-	1
Bankfull Cross Sectional Area (ft^2)	40	50	47.8	51.6	51.6	51.6	51.6	-	1	35.0	51.2	-	67.3	-	-	47.7	47.7	47.7	61.1	61.1	61.1	61.1	-	1
Width/Depth Ratio				18.2	18.2	18.2	18.2	-	1	10.0	12.0	-	14	-	-	10.0	12.0	14.0	18.1	18.1	18.1	18.1	-	1
Entrenchment Ratio				1.1	1.1	1.1	1.1	-	1	2.2	3.1	-	4.0	-	-	2.2	3.1	4.0	1.3	1.3	1.3	1.3	-	1
[1]Bank Height Ratio				3.2	3.2	3.2	3.2	-	1	1.0	1.0	-	1	-	-	1.0	1.05	1.1	1.2	1.2	1.2	1.2	-	1
Profile																								
Riffle Length (ft)				20.3	48.1	32.0	126.8	36.5	8	Total riffle length 60-70% of reach length						20.3	32.0	126.8	79	108.3	89	190	38.77	7
Riffle Slope (ft/ft)				0.002	0.013	0.013	0.025	0.007	8	-	-	-	-	-	-	0.002	0.013	0.025	0.002	0.005	0.004	0.009	0.002	7
Pool Length (ft)				30.9	61.8	55.4	98.0	20.8	8	Total pool length 30-40% of reach length						30.9	55.4	98.0	40	94.57	97	150	30.77	7
Pool Max depth (ft)				0.8	3.4	3.4	1.4	-	1	3.2	6.2	-	9.1	-	-	0.8	3.4	1.4	5.11	6.14	6.17	7.28	0.792	7
Pool Spacing (ft)				16.3	76.5	64.6	199.2	41.0	21	95.6	131.5	-	167.3	-	-	16.3	64.6	199.2	111	206.1	187.2	330.6	71.09	6
Pattern																								
Channel Beltwidth (ft)				31.2	37.9	35.5	85.1	8.1	44	83.7	137.4	-	191.2	-	-	31.2	35.5	85.1	31.2	37.9	35.5	85.1	8.1	44
Radius of Curvature (ft)				18.1	32.0	26.6	85.1	15.9	47	47.8	65.7	-	83.7	-	-	18.1	26.6	85.1	18.1	32.0	26.6	85.1	15.9	47
Rc:Bankfull width (ft/ft)				0.6	1.0	0.9	2.8	0.5	47	2.0	2.8	-	3.5	-	-	0.6	0.9	2.8	0.6	0.96	0.9	2.8	0.5	47
Meander Wavelength (ft)				14.8	76.4	52.6	281.1	66.0	45	167.3	227.1	-	286.8	-	-	14.8	52.6	281.1	14.8	76.4	52.6	281.1	66.0	45
Meander Width Ratio				0.5	2.5	1.7	9.2	2.1	45	3.5	5.8	-	8.0	-	-	0.5	1.7	9.2	0.5	2.3	1.7	9.2	2.0	45
Transport parameters																								
Reach Shear Stress (competency) lb/f^2				0.4												0.46			0.26					
Max part size (mm) mobilized at bankfull				90												90			56					
Stream Power (transport capacity) lb/s				37												35			22					
Additional Reach Parameters																								
Rosgen Classification				F4						C4						C4			B4					
Bankfull Velocity (fps)	2.5	20.0	5.4	3.1												3.1			2.5					
Bankfull Discharge (cfs)	100	800	259.8	150												150								
Valley length (ft)				1470						-						1470								
Channel Thalweg length (ft)				1573						-						1573			1573					
Sinuosity (ft)				1.07						1.2 to 1.4						1.07			1.07					
Water Surface Slope (Channel) (ft/ft)				0.003						-						0.003			0.0023					
BF slope (ft/ft)				0.003						-						0.003			0.0023					
[3]Bankfull Floodplain Area (acres)				1.2						-						2.5			2.5					
[4]% of Reach with Eroding Banks				33%						-														
Channel Stability or Habitat Metric				0.20						-														
Biological or Other				-						-														

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 8f. Baseline Stream Data Summary
Stewarts Creek Tributaries Stream Restoration Project (DMS No. 100023) - Moores Fork R2 (2035.7 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only	LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	20	30	22.5	28.5	30.8	30.8	33.0	-	2	21.9	23.9	-	25.9	-	-	21.9	23.9	25.9	20.2	20.7	20.7	21.3	-	2
Floodprone Width (ft)				45.0	45.5	45.5	46.0	-	2	52.6	74.1	-	95.6	-	-	52.6	74.1	95.6	81.2	>88.6	>88.6	>88.6	-	2
Bankfull Mean Depth (ft)	1.8	3	2.4	1.4	1.6	1.6	1.7	-	2	1.6	2.1	-	2.6	-	-	1.6	2.1	2.6	1.6	1.6	1.6	1.7	-	2
[1]Bankfull Max Depth (ft)				2.1	2.3	2.3	2.5	-	2	1.2	1.3	-	1.4	-	-	2.3	3.0	3.8	2.4	2.5	2.5	2.5	-	2
Bankfull Cross Sectional Area (ft^2)	40	50	47.8	47.0	47.9	47.9	48.8	-	2	35.0	51.2	-	67.3	-	-	47.7	47.7	47.7	33.7	33.9	33.9	34.1	-	2
Width/Depth Ratio				16.6	19.9	19.9	23.2	-	2	10.0	12.0	-	14	-	-	10.0	12.0	14.0	12.0	12.7	12.7	13.4	-	2
Entrenchment Ratio				1.4	1.5	1.5	1.6	-	2	2.2	3.1	-	4.0	-	-	2.2	3.1	4.0	4.0	>4.14	>4.14	>4.14	-	2
[1]Bank Height Ratio				2.7	2.9	2.9	3.0	-	2	1.0	1.0	-	1	-	-	1.0	1.05	1.1	1.0	1.1	1.1	1.1	-	2
Profile																								
Riffle Length (ft)				15.3	66.6	53.7	179.0	50.1	9	Total riffle length 60-70% of reach length						29.0	121.0	167.0	73.6	113.0	118.1	169.4	28.7	13
Riffle Slope (ft/ft)				0.006	0.011	0.007	0.024	0.007	9	-	-	-	-	-	-	0.004	0.005	0.007	0.004	0.005	0.006	0.007	7.7E-04	13
Pool Length (ft)				15.3	71.2	71.6	147.0	38.6	9	Total pool length 30-40% of reach length						26.0	45.0	67.0	38.0	57.5	59.0	67.0	7.1	13
Pool Max depth (ft)				0.8	3.1	3.1	1.4	0.2	2	3.2	6.2	-	9.1	-	-	4.2	4.6	7.3	2.7	3.3	3.4	3.8	0.3	13
Pool Spacing (ft)				54.0	122.7	89.1	287.6	70.2	13	95.6	131.5	-	167.3	-	-	96.0	143.5	191.0	134.0	178.7	173.0	271.0	36.6	12
Pattern																								
Channel Beltwidth (ft)				47.4	85.9	75.3	174.1	40.2	9	83.7	137.4	-	191.2	-	-	83.7	137.5	191.2	83.7	126.2	126.7	176.7	24.8	10
Radius of Curvature (ft)				33.7	86.3	88.7	159.1	37.1	9	47.8	65.7	-	83.7	-	-	47.8	65.8	83.7	46.4	60.8	60.4	81.4	12.0	13
Rc:Bankfull width (ft/ft)				1.1	2.8	2.9	5.2	1.2	9	2.0	2.8	-	3.5	-	-	2.0	2.8	3.5	2.2	2.9	2.9	3.9	0.6	13
Meander Wavelength (ft)				214.5	296.9	303.9	414.1	75.2	9	167.3	227.1	-	286.8	-	-	167.3	138.1	286.8	188.0	246.7	243.5	304.0	33.2	10
Meander Width Ratio				7.0	9.7	9.9	13.5	2.4	9	3.5	5.8	-	8.0	-	-	3.5	5.8	8.0	4.0	6.1	6.1	8.5	1.6	10
Transport parameters																								
Reach Shear Stress (competency) lb/ft^2				0.4												0.46			0.39					
Max part size (mm) mobilized at bankfull				90												90			76					
Stream Power (transport capacity) lb/s				37												35			37					
Additional Reach Parameters																								
Rosgen Classification				F4						C4						C4			C4					
Bankfull Velocity (fps)	2.5	20.0	5.4	3.1												3.1			3.1					
Bankfull Discharge (cfs)	100	800	259.8	150												150								
Valley length (ft)				1808						-						1700								
Channel Thalweg length (ft)				2007						-						2017.3			2176					
Sinuosity (ft)				1.11						1.2 to 1.4						1.19			1.19					
Water Surface Slope (Channel) (ft/ft)				0.004						-						0.004			0.004					
BF slope (ft/ft)				0.004						-						0.004			0.004					
[3]Bankfull Floodplain Area (acres)				1.9						-						2.9			2.9					
[4]% of Reach with Eroding Banks				30%						-														
Channel Stability or Habitat Metric				0.26						-														
Biological or Other				-						-														

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 8g. Baseline Stream Data Summary
Stewarts Creek Tributaries Stream Restoration Project (DMS No. 100023) - Moores Fork R3 (384 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only	LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	20	30	22.5	22.8	22.8	22.8	22.8	-	1	21.9	23.9	-	25.9	-	-	21.9	23.9	25.9	20.9	20.9	20.9	20.9	-	1
Floodprone Width (ft)				144.4	144.4	144.4	144.4	-	1	52.6	74.1	-	95.6	-	-	52.6	74.1	95.6	106.9	106.9	106.9	106.9	-	1
Bankfull Mean Depth (ft)	1.8	3	2.4	2.3	2.3	2.3	2.3	-	1	1.6	2.1	-	2.6	-	-	1.6	2.1	2.6	1.6	1.6	1.6	1.6	-	1
[1]Bankfull Max Depth (ft)				3.2	3.2	3.2	3.2	-	1	1.2	1.3	-	1.4	-	-	2.3	3.0	3.8	2.6	2.6	2.6	2.6	-	1
Bankfull Cross Sectional Area (ft^2)	40	50	47.8	52.4	52.4	52.4	52.4	-	1	35.0	51.2	-	67.3	-	-	47.7	47.7	47.7	33.7	33.7	33.7	33.7	-	1
Width/Depth Ratio				9.9	9.9	9.9	9.9	-	1	10.0	12.0	-	14	-	-	10.0	12.0	14.0	13.0	13.0	13.0	13.0	-	1
Entrenchment Ratio				6.3	6.3	6.3	6.3	-	1	2.2	3.1	-	4.0	-	-	2.2	3.1	4.0	5.0	5.0	5.0	5.0	-	1
[1]Bank Height Ratio				1.4	1.4	1.4	1.4	-	1	1.0	1.0	-	1	-	-	1.0	1.05	1.1	1.0	1.0	1.0	1.0	-	1
Profile																								
Riffle Length (ft)				24.5	45.0	44.1	67.2	21.3	4	Total riffle length 60-70% of reach length						29.0	121.0	167.0	20.0	63.7	54.2	126.7	41.7	4
Riffle Slope (ft/ft)				0.003	0.009	0.008	0.016	0.006	4	-	-	-	-	-	-	0.004	0.005	0.007	0.004	0.006	0.005	0.011	0.003	4
Pool Length (ft)				16.4	41.4	33.6	92.0	30.0	5	Total pool length 30-40% of reach length						26.0	45.0	67.0	30	40	40	50	8.6	4
Pool Max depth (ft)				0.8	4.6	4.6	1.4	-	1	3.2	6.2	-	9.1	-	-	4.2	4.6	7.3	2.1	3.2	3.4	4.0	0.7	4
Pool Spacing (ft)				21.6	67.1	70.2	101.5	30.6	8	95.6	131.5	-	167.3	-	-	96.0	143.5	191.0	77.0	107.5	100.0	153.0	28.5	4
Pattern																								
Channel Beltwidth (ft)				23.2	30.8	28.1	53.7	8.9	10	83.7	137.4	-	191.2	-	-	83.7	137.5	191.2	63.9	63.9	63.9	63.9	-	1
Radius of Curvature (ft)				17.0	26.5	26.5	47.1	7.5	13	47.8	65.7	-	83.7	-	-	47.8	65.8	83.7	50.5	63.8	70.5	70.5	-	3
Rc:Bankfull width (ft/ft)				0.7	1.2	1.2	2.1	0.3	13	2.0	2.8	-	3.5	-	-	2.0	2.8	3.5	2.4	3.1	3.4	3.4	-	3
Meander Wavelength (ft)				18.0	82.0	84.2	139.5	36.6	12	167.3	227.1	-	286.8	-	-	167.3	138.1	286.8	241.0	241.0	241.0	241.0	-	1
Meander Width Ratio				0.8	3.6	3.7	6.1	1.6	12	3.5	5.8	-	8.0	-	-	3.5	5.8	8.0	3.1	3.1	3.1	3.1	-	1
Transport parameters																								
Reach Shear Stress (competency) lb/f^2				0.4												0.46			0.27					
Max part size (mm) mobilized at bankfull				90												90			58					
Stream Power (transport capacity) lb/s				37												35			25					
Additional Reach Parameters																								
Rosgen Classification				F4						C4						C4			C4					
Bankfull Velocity (fps)	2.5	20.0	5.4	3.1												3.1			4.5					
Bankfull Discharge (cfs)	100	800	259.8	150												150								
Valley length (ft)				373						-						373								
Channel Thalweg length (ft)				380						-						384			384					
Sinuosity (ft)				1.02						1.2 to 1.4						1.03			1.03					
Water Surface Slope (Channel) (ft/ft)				0.0076						-						0.0037			0.0027					
BF slope (ft/ft)				0.0076						-						0.0037			0.0027					
[3]Bankfull Floodplain Area (acres)				1.2						-						0.6			0.6					
[4]% of Reach with Eroding Banks				25%						-														
Channel Stability or Habitat Metric				0.14						-														
Biological or Other				-						-														

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 9. Monitoring Data - Cross-Section Morphology Data Table
Stewarts Creek Mitigation Project (DMS No. 100023)

	Moores Fork Reach 1																				Moores Fork Reach 2						
	Cross Section 1 (Pool)							Cross Section 2 (Riffle)							Cross Section 3 (Pool)							Cross Section 4 (Pool)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	1097.06	1097.29	1097.29	1097.51				1094.84	1094.64	1094.32	1094.87				1088.77	1088.67	1088.77	1088.74							1088.20			
Bank Height Ratio_Based on AB Bankfull[1] Area	1.20	1.05	1.06	1.09				1.18	1.04	1.44	1.27				1.00	1.06	1.01	1.03							1.00			
Thalweg Elevation	1094.10	1094.08	1094.13	1094.22				1092.41	1091.86	1091.47	1091.29				1086.14	1085.92	1085.96	1085.79							1084.17			
LTOB[2] Elevation	1097.67	1097.46	1097.44	1097.44				1095.28	1094.76	1095.57	1095.84				1088.77	1088.82	1088.79	1088.84							1088.20			
LTOB[2] Max Depth (ft)	3.57	3.38	3.31	3.57				2.87	2.90	4.10	4.55				2.63	2.90	2.83	3.05							4.03			
LTOB[2] Cross Sectional Area (ft^2)	93.76	77.33	76.98	80.46				75.98	65.20	100.49	107.47				45.04	48.74	45.43	47.29							66.40			

	Moores Fork Reach 3																											
	Cross Section 5 (Riffle)							Cross Section 6 (Pool)							Cross Section 7 (Riffle)							Cross Section 8 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area				1087.17				1084.62	1084.29	1084.51	1084.44				1083.10	1083.29	1083.10	1082.82				1079.97	1080.11	1080.17	1080.13			
Bank Height Ratio_Based on AB Bankfull[1] Area				1.00				1.00	1.08	1.07	1.07				1.00	0.94	1.01	1.09				1.00	0.95	0.83	0.98			
Thalweg Elevation				1084.14				1081.95	1081.29	1081.57	1081.13				1080.56	1080.63	1080.46	1079.25				1077.41	1077.37	1077.29	1077.28			
LTOB[2] Elevation				1087.17				1084.62	1084.54	1084.72	1084.68				1083.10	1083.13	1083.13	1083.16				1079.97	1079.97	1079.68	1080.06			
LTOB[2] Max Depth (ft)				3.03				2.67	3.25	3.15	3.55				2.54	2.50	2.67	3.91				2.56	2.60	2.39	2.78			
LTOB[2] Cross Sectional Area (ft^2)				52.43				53.58	61.60	60.33	60.90				33.72	30.17	34.27	39.95				33.89	31.07	25.77	32.55			

	Moores Fork Reach 3							UT1																				
	Cross Section 9 (Pool)							Cross Section 10 (Riffle)							Cross Section 11 (Pool)							Cross Section 12 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	1080.16	1079.98	1080.07	1080.04				1111.02	1111.05	1111.14	1111.24				1104.40	1104.45	1104.65	1104.74				1102.01	1102.14	1102.11	1102.16			
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	1.04	0.97	1.00				1.08	0.95	0.99	0.84				1.00	0.95	0.75	0.74				1.00	0.79	0.92	0.75			
Thalweg Elevation	1076.12	1075.02	104.84	1074.91				1110.22	1110.23	1110.30	1110.23				1103.15	1103.19	1103.13	1103.36				1101.20	1101.33	1101.19	1101.2			
LTOB[2] Elevation	1080.16	1080.16	1079.90	1080.03				1111.09	1111.01	0.83	111.08				1104.40	1104.38	1104.28	1104.38				1102.01	1101.97	1102.03	1101.92			
LTOB[2] Max Depth (ft)	4.04	5.14	5.06	5.12				0.87	0.78	3.79	0.85				1.25	1.19	1.15	1.02				0.81	0.64	0.84	0.72			
LTOB[2] Cross Sectional Area (ft^2)	52.58	57.57	49.07	52.42				4.40	3.60	7.53	3.28				5.48	4.92	3.67	3.12				3.92	2.78	3.39	2.45			

	UT1																											
	Cross Section 13 (Pool)							Cross Section 14 (Pool)							Cross Section 15 (Pool)							Cross Section 16 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	1088.55	1088.46	1088.51	1088.66				1085.64	1085.57	1085.58	1085.71				1080.95	1080.95	1081.26	1081.27				1078.41	1078.47	1078.47	1078.52			
Bank Height Ratio_Based on AB Bankfull[1] Area	1.10	1.23	0.94	1.01				1.00	1.08	1.09	1.01				1.00	0.98	0.69	0.7				1.00	0.99	0.92	0.87			
Thalweg Elevation	1087.40	1087.29	1087.19	1087.15				1084.50	1084.43	1084.36	1084.41				1079.42	1079.39	1079.27	1079.31				1077.44	1077.44	1077.46	1077.57			
LTOB[2] Elevation	1088.67	1088.73	1088.43	1088.68				1085.64	1085.66	1085.69	1085.73				1080.95	1080.91	1080.64	1080.68				1078.41	1078.46	1078.39	1078.39			
LTOB[2] Max Depth (ft)	1.27	1.44	1.24	1.53				1.14	1.23	1.33	1.32				1.53	1.52	1.37	1.37				0.97	1.02	0.93	0.82			
LTOB[2] Cross Sectional Area (ft^2)	6.64	8.60	4.95	6.83				4.63	5.61	5.83	4.77				6.90	6.40	3.76	4.01				3.69	3.65	3.23	2.95			

The above morphology parameters reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT and industry mitigation providers/practitioners. The outcome resulted in the focus on three primary morphological parameters of interest for the purposes of tracking channel change moving forward. They are the bank height ratio using a constant As-built bankfull area and the cross sectional area and max depth based on each years low top of bank. These are calculated as follows:

1 - Bank Height Ratio (BHR) takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation. For example if the As-built bankfull area was 10 ft2, then the MY1 bankfull elevation would be adjusted until the calculated bankfull area within the MY1 cross section survey = 10 ft2. The BHR would then be calculated with the difference between the low top of bank (LTOB) elevation for MY1 and the thalweg elevation for MY1 in the numerator with the difference between the MY1 bankfull elevation and the MY1 thalweg elevation in the denominator. This same process is then carried out in each successive year.
2 - LTOB Area and Max depth - These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recroded and tracked above as LTOB max depth.

Note: The smaller the channel the closer the survey measurements are to their limit of reliable detection, therefore inter-annual variation in morphological measurement (as a percentage) is by default magnified as channel size decereases. Some of the variability above is the result of this factor and some is due to the large amount of depositional sediments observed.

Table 9. Monitoring Data - Cross-Section Morphology Data Table
Stewarts Creek Mitigation Project (DMS No. 100023)

	UT2																				UT3 Reach 1						
	Cross Section 17 (Pool)							Cross Section 18 (Riffle)							Cross Section 19 (Riffle)							Cross Section 20 (Pool)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	1098.12	1098.08	1098.10	1098.23				1097.77	1097.72	1097.76	1097.78				1092.07	1092.04	1092.07	1092.23				1095.67	1095.56	1095.64	1095.96			
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	1.04	1.03	0.92				1.04	1.13	1.10	1.07				1.08	1.01	1.04	0.83				1.00	1.11	1.03	0.64			
Thalweg Elevation	1096.73	1096.52	1096.48	1096.63				1097.08	1097.09	1097.10	1097.1				1091.33	1091.31	1091.33	1091.33				1094.51	1094.58	1094.43	1094.43			
LTOB[2] Elevation	1098.12	1098.14	1098.14	1098.1				1097.80	1097.81	1097.83	1097.873				1092.13	1092.05	1092.10	1092.1				1095.67	1095.67	1095.67	1095.41			
LTOB[2] Max Depth (ft)	1.39	1.62	1.66	1.47				0.72	0.72	0.73	0.73				0.80	0.74	0.77	0.77				1.16	1.09	1.24	0.98			
LTOB[2] Cross Sectional Area (ft^2)	5.42	5.90	5.72	4.4				2.61	3.02	2.90	2.9				3.52	3.20	3.35	3.35				5.72	9.02	6.71	2.86			

	UT3 Reach 1							UT3 Reach 2																			
	Cross Section 21 (Riffle)							Cross Section 22 (Pool)							Cross Section 23 (Riffle)							Cross Section 24 (Pool)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	1092.21	1092.24	1092.32	1092.51				1089.56	1089.52	1089.55	1089.62				1087.39	1087.41	1087.48	1087.67				1081.92	1081.94	1081.95	1082.27			
Bank Height Ratio_Based on AB Bankfull[1] Area	1.12	1.11	1.10	0.9				1.00	1.04	1.08	1.02				1.13	1.06	1.01	0.74				1.11	1.04	1.03	0.86			
Thalweg Elevation	1091.48	1091.45	1091.48	1091.52				1088.31	1088.34	1088.17	1088.26				1086.53	1086.52	1086.56	1086.62				1080.48	1080.48	1080.41	1080.51			
LTOB[2] Elevation	1092.3	1092.32	1092.41	1092.41				1089.56	1089.57	1089.66	1089.64				1087.50	1087.47	1087.49	1087.4				1082.08	1082.00	1082	1082			
LTOB[2] Max Depth (ft)	0.82	0.87	0.93	0.89				1.25	1.23	1.49	1.38				0.97	0.95	0.93	0.78				1.60	1.52	1.59	1.51			
LTOB[2] Cross Sectional Area (ft^2)	3.71	3.71	3.75	3.02				6.88	7.47	8.19	7.21				5.95	5.40	5.03	3.81				8.93	7.59	7.54	6.59			

	UT3 Reach 2													
	Cross Section 25 (Riffle)							Cross Section 26 (Pool)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	1081.58	1081.59	1081.62	1081.59				1077.31	1077.29	1077.20	1077.33			
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	1.01	0.98	1.03				1.00	1.01	1.10	0.99			
Thalweg Elevation	1080.54	1080.52	1080.49	1080.57				1075.90	1075.60	1075.84	1075.79			
LTOB[2] Elevation	1081.58	1081.60	1081.60	1081.62				1077.31	1077.31	1077.34	1077.31			
LTOB[2] Max Depth (ft)	1.04	1.08	1.11	1.05				1.41	1.71	1.50	1.52			
LTOB[2] Cross Sectional Area (ft^2)	4.54	4.65	4.41	4.76				7.58	7.84	9.12	7.41			

The above morphology parameters reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT and industry mitigation providers/practitioners. The outcome resulted in the focus on three primary morphological parameters of interest for the purposes of tracking channel change moving forward. They are the bank height ratio using a constant As-built bankfull area and the cross sectional area and max depth based on each years low top of bank. These are calculated as follows:

1 - Bank Height Ratio (BHR) takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation. For example if the As-built bankfull area was 10 ft2, then the MY1 bankfull elevation would be adjusted until the calculated bankfull area within the MY1 cross section survey = 10 ft2. The BHR would then be calculated with the difference between the low top of bank (LTOB) elevation for MY1 and the thalweg elevation for MY1 in the numerator with the difference between the MY1 bankfull elevation and the MY1 thalweg elevation in the denominator. This same process is then carried out in each successive year.
2 - LTOB Area and Max depth - These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recroded and tracked above as LTOB max depth.

Note: The smaller the channel the closer the survey measurements are to their limit of reliable detection, therefore inter-annual variation in morphological measurement (as a percentage) is by default magnified as channel size decereases. Some of the variability above is the result of this factor and some is due to the large amount of depositional sediments observed.

Appendix D: Hydrologic Data

Table 10. Verification of Bankfull Events

Figure 2. Monthly Rainfall Summary

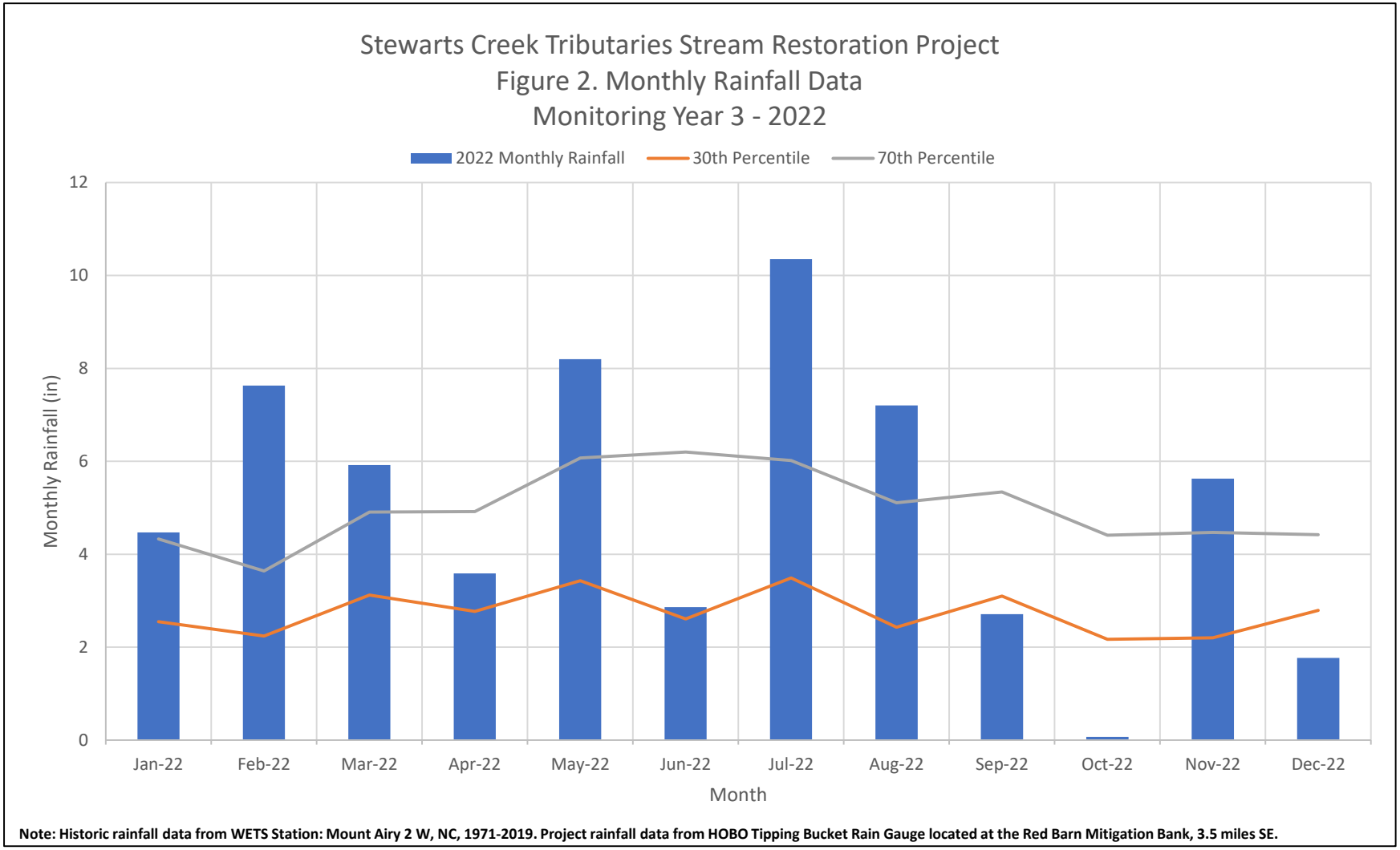
Precipitation and Water Level Hydrographs

Table 11. Streamflow Summary Data

Table 10. Bankfull Event Verification
Stewarts Creek Tributaries Stream Restoration Project (DMS No. 100023)

Overbank Events							
Gage ID	**MY1 (2020)**	**MY2 (2021)**	**MY3 (2022)**	**MY4 (2023)**	**MY5 (2025)**	**MY6 (2026)**	**MY7 (2027)**
UT1 - SCTSG1	5 separate events: 4/30/2020 5/27/2020-5/28/2020 8/15/2020 10/11/2020 10/29/2020	1 event 8/18/2021	4 separate events: 1/3/2022 5/26/2022 7/8/2022 8/22/2022	-	-	-	-
UT1 - *SCTSG2	2 separate events: 4/30/2020 10/29/2020	8 separate events 3/19/2021 4/10/2021 5/28/2021 6/12/2021 7/2/2021 7/17/2021 8/18/2021 9/22/2021	1 event: 8/22/2022	-	-	-	-
UT3 Reach 1 - SCTSG3	4 separate events: 7/29/2020-8/1/2020 8/5/2020-8/6/2020 10/13/2020-10/15/2020 10/29/2020	3 separate events 3/19/2021 6/12/2021 8/18/2021	5 separate events: 1/3/2022 3/24/2022 5/26/2022 7/13/2022 8/22/2022	-	-	-	-
UT3 Reach 2 - *SCTSG4	11 separate events: 4/30/2020 5/23/2020 5/27/2020-5/28/2020 7/10/2020 8/3/2020 8/5/2020 8/15/2020 9/11/2020 9/29/2020 10/11/2020 10/29/2020	6 separate events 3/19/2021 4/10/2021 6/12/2021 7/18/2021 8/18/2021 9/22/2021	4 separate events: 8/22/2022 9/8/2022 11/11/2022 12/15/2022	-	-	-	-
UT2 - SCTSG5	No bankfull events	1 event 8/18/2021	3 separate events: 1/3/2022 11/6/2022 11/11/2022	-	-	-	-

***Note:** Both SCTSG2 and SCTSG5 suffered gauge malfuntions from 1/1/2022 - 8/9/2022. Corrupted data was not included in stream gauge plots.

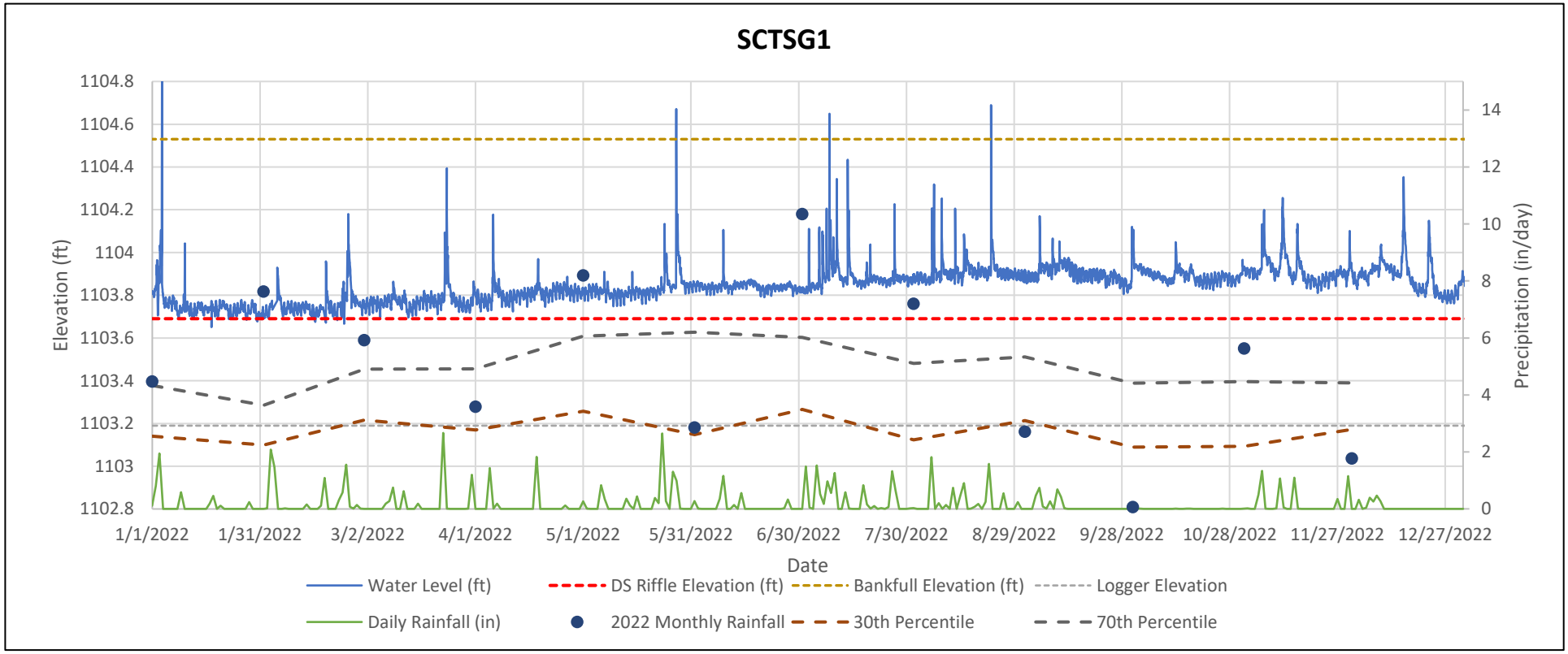


Note: Historic rainfall data from WETS Station: Mount Airy 2 W, NC, 1971-2019. Project rainfall data from HOBO Tipping Bucket Rain Gauge located at the Red Barn Mitigation Bank, 3.5 miles SE.

Rainfall Summary							
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Annual Precip Total	67.90	49.25	60.4	-	-	-	-
WETS 30th Percentile	43.95	43.95	43.95	-	-	-	-
WETS 70th Percentile	52.86	52.86	52.86	-	-	-	-
Normal	Y	Y	-	-	-	-	-

*Note: 2022 rainfall data does not include data from part of December because the gauge was last downloaded in 12/13/2022 during MY3 monitoring.

Stewarts Creek Tributaries Stream Restoration Project
Year 3 (2022) Streamflow Data



Site Info	
Stream	Stewarts Creek Tributaries Stream Restoration Project
Reach	UT1
Date Installed	4/21/2020
Serial Number	20727103
Reach Type	Perennial

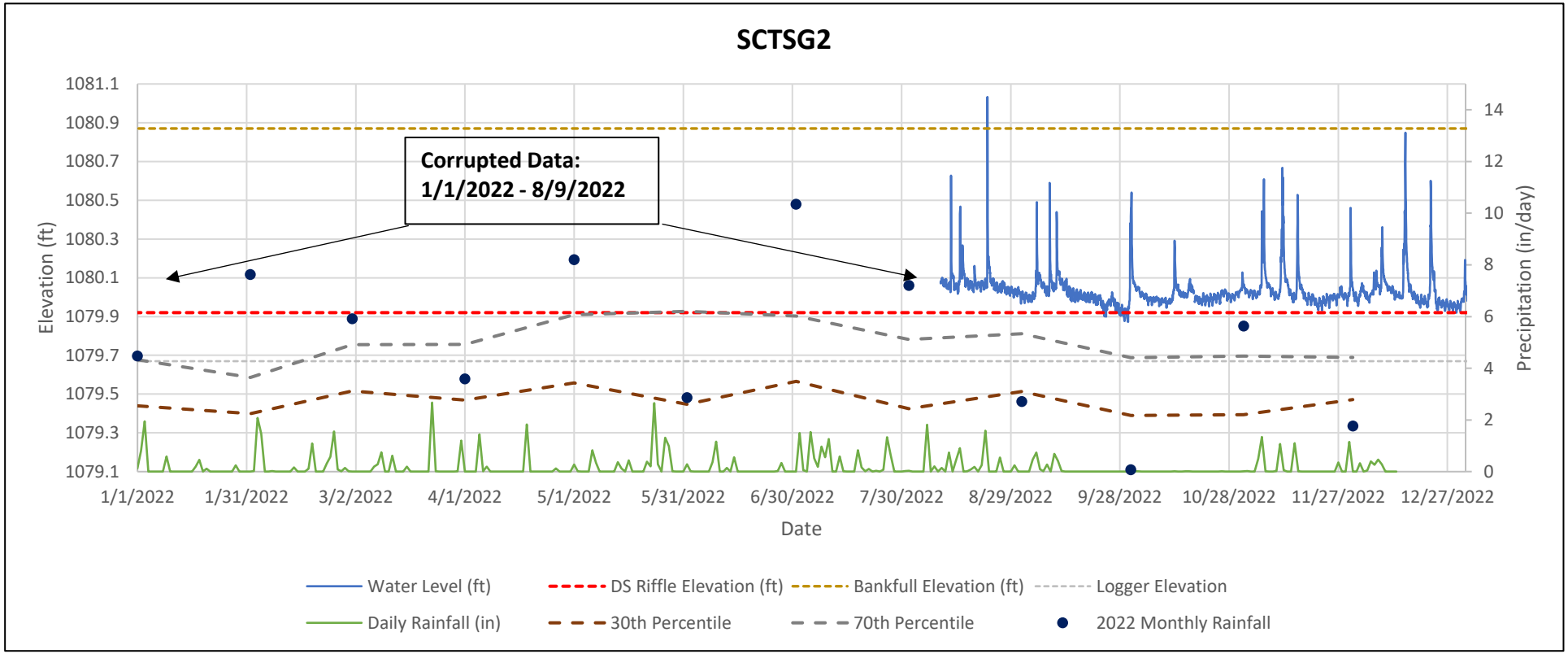
*Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Red Barn Mitigation Site, 0.75 miles SE.

Most Consecutive Days of Flow: 1/1/2022 - 12/31/2022

Note: Barometric Erroneous Data 1/23/2022 (1100-1400), 2/3/2022 (1100-2400), 2/4/2022 (0000-1800), 2/17/2022 (1500-2400), 2/18/2022 (0000-0700), 2/22/2022 (1400-1900), 2/23/2022 (1100-1400), 2/25/2022 (1200-

Year 3 (2022) Streamflow Data	
Gauge ID	SCTSG1
Start Date	1/1/2022
End Date	12/31/2022
Flow Criteria (Days)	30
Recordings Per Day	24
Logger Elevation (ft)	1103.19
Controlling Grade Elevation (ft)	1103.69
Bankfull Elevation (ft)	1104.53
Most Consecutive Days of Flow	365
Total Days of Flow	365
Max High Water Level Above Bankfull (ft)	0.39
Bankfull Events	4
Meets Success Criteria	Yes

Stewarts Creek Tributaries Stream Restoration Project
Year 3 (2022) Streamflow Data



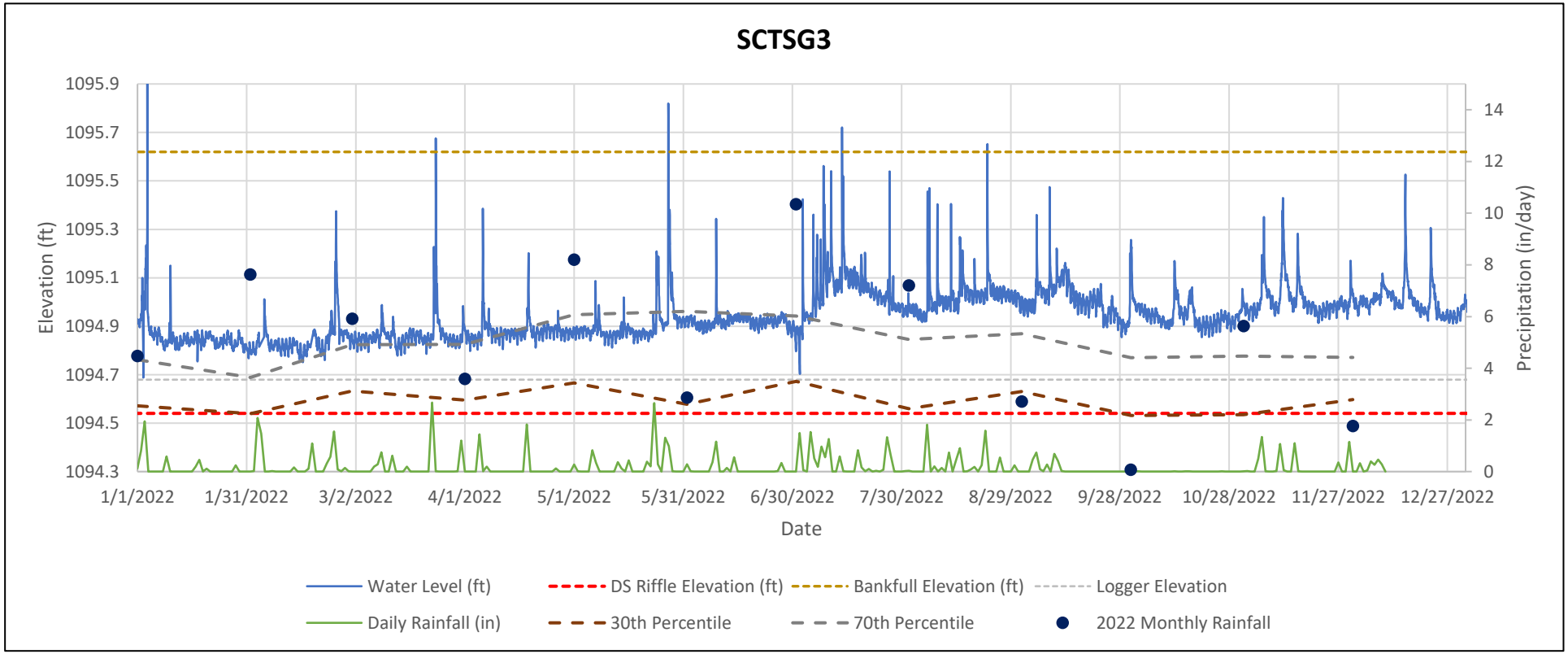
Site Info	
Stream	Stewarts Creek Tributaries Stream Restoration Project
Reach	UT1
Date Installed	4/21/2020
Serial Number	20234981
Reach Type	Perennial

*Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Red Barn Mitigation Bank, 3.5 miles SE.

Most Consecutive Days of Flow: 8/10/22 - 12/31/22
Note: SCTSG2 was resurveyed 2/1/2023

Year 3 (2022) Streamflow Data	
Gauge ID	SCTSG2
Start Date	1/1/2022
End Date	12/31/2022
Flow Criteria (Days)	30
Recordings Per Day	24
Logger Elevation (ft)	1079.67
Controlling Grade Elevation (ft)	1079.92
Bankfull Elevation (ft)	1080.87
Most Consecutive Days of Flow	145
Total Days of Flow	145
Max High Water Level Above Bankfull (ft)	0.16
Bankfull Events	1
Meets Success Criteria	Yes

Stewarts Creek Tributaries Stream Restoration Project
Year 3 (2022) Streamflow Data



Site Info	
Stream	Stewarts Creek Tributaries Stream Restoration Project
Reach	UT3 Reach 1
Date Installed	4/21/2020
Serial Number	20234982
Reach Type	Perennial

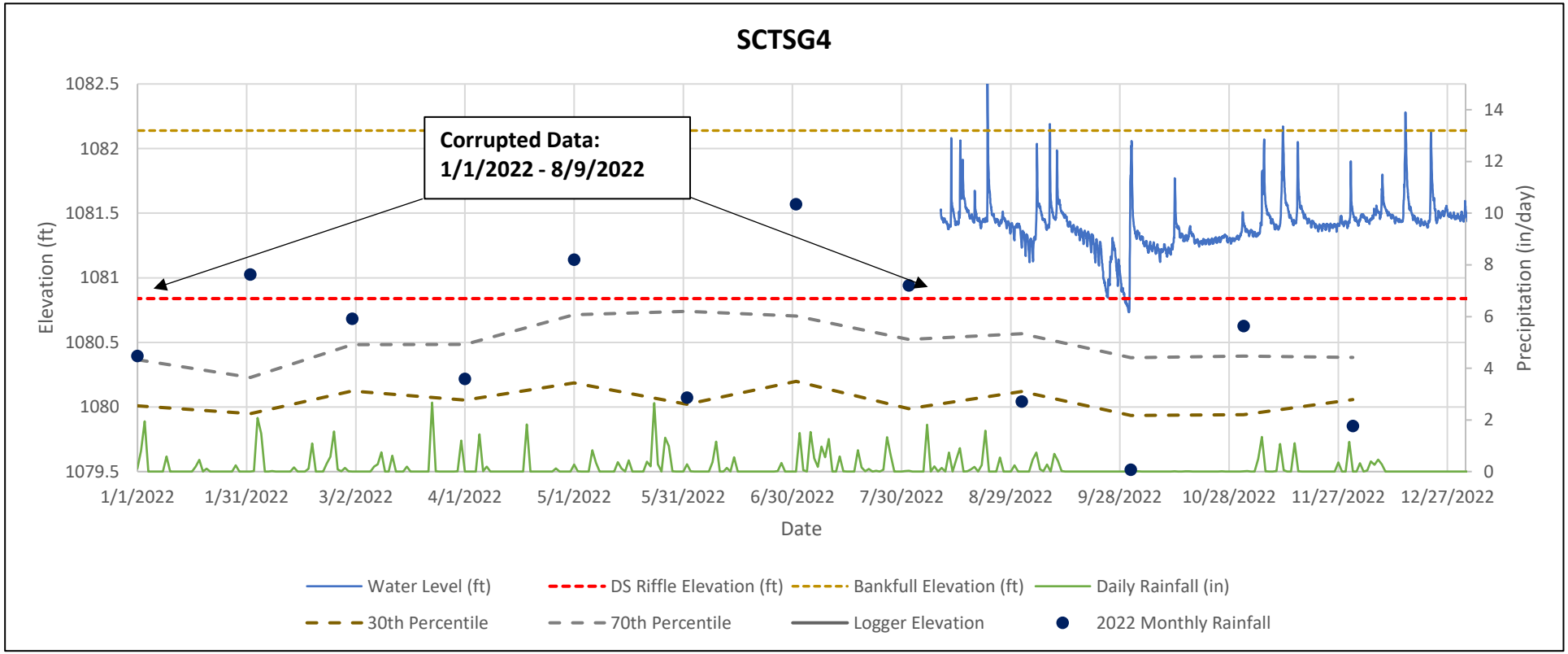
*Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Red Barn Mitigation Bank, 3.5 miles SE.

Most Consecutive Days of Flow: 1/1/2022 - 12/31/2022

Note: Barometric Erroneous Data 1/23/2022 (1100-1400), 2/3/2022 (1100-2400), 2/4/2022 (0000-1800), 2/17/2022 (1500-2400), 2/18/2022 (0000-1000), 2/22/2022 (1400-2000), 2/23/2022 (1000-1400), 2/25/2022 (1200-

Year 3 (2022) Streamflow Data	
Gauge ID	SCTSG3
Start Date	1/1/2022
End Date	12/31/2022
Flow Criteria (Days)	30
Recordings Per Day	24
Logger Elevation (ft)	1094.55
Controlling Grade Elevation (ft)	1094.54
Bankfull Elevation (ft)	1095.62
Most Consecutive Days of Flow	365
Total Days of Flow	365
Max High Water Level Above Bankfull (ft)	0.42
Bankfull Events	5
Meets Success Criteria	Yes

Stewarts Creek Tributaries Stream Restoration Project
Year 3 (2022) Streamflow Data



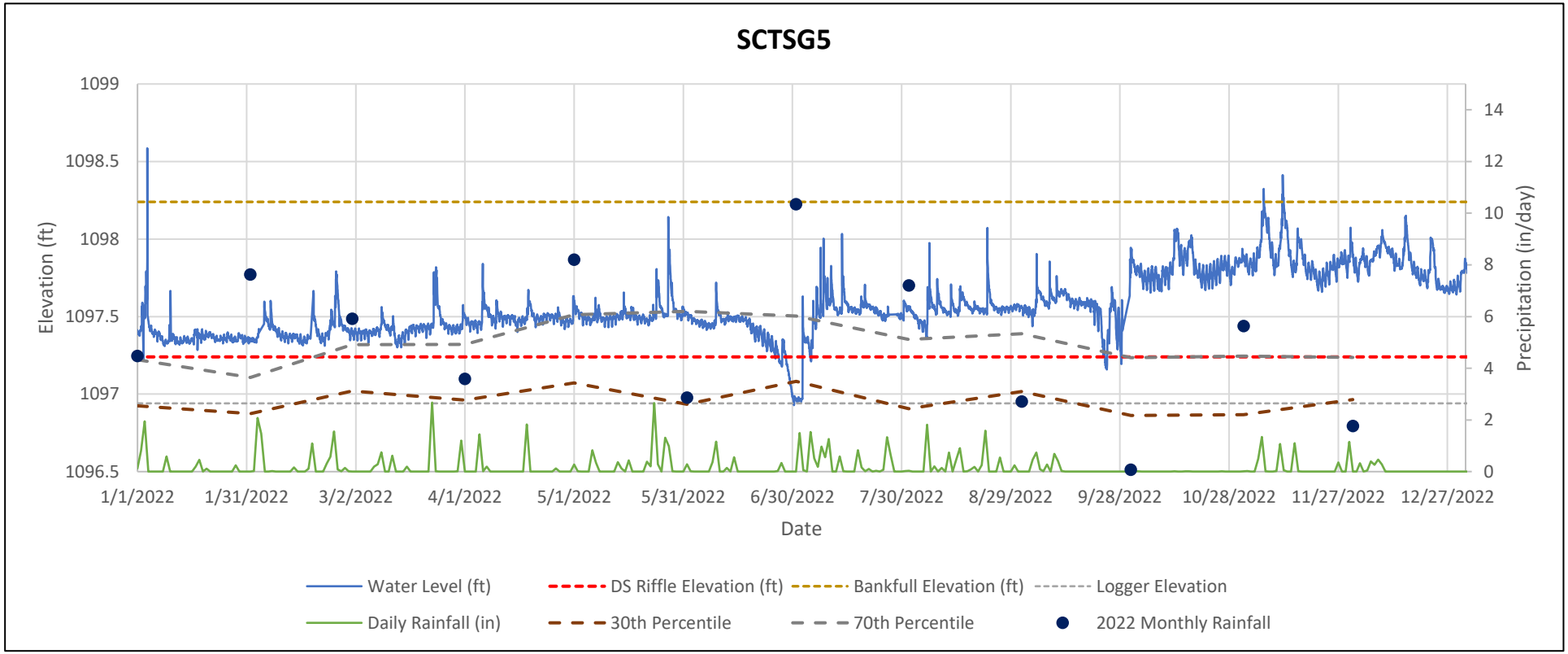
Site Info	
Stream	Stewarts Creek Tributaries Stream Restoration Project
Reach	UT3 Reach 2
Date Installed	4/21/2020
Serial Number	20234980
Reach Type	Perennial

*Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Red Barn Mitigation Bank, 3.5 miles SE.

Most Consecutive Days of Flow: 10/1/2022 - 12/31/2022

Year 3 (2022) Streamflow Data	
Gauge ID	SCTSG4
Start Date	1/1/2022
End Date	12/31/2022
Flow Criteria (Days)	30
Recordings Per Day	24
Logger Elevation (ft)	1080.62
Controlling Grade Elevation (ft)	1080.84
Bankfull Elevation (ft)	1082.14
Most Consecutive Days of Flow	91
Total Days of Flow	144
Max High Water Level Above Bankfull (ft)	0.48
Bankfull Events	4
Meets Success Criteria	Yes

Stewarts Creek Tributaries Stream Restoration Project
Year 3 (2022) Streamflow Data



Site Info	
Stream	Stewarts Creek Tributaries Stream Restoration Project
Reach	UT2
Date Installed	4/21/2020
Serial Number	20727118
Reach Type	Perennial

*Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Red Barn Mitigation Bank, 3.5 miles SE.

Most Consecutive Days of Flow: 1/1/2022 - 6/28/2022

Note: Barometric Erroneous Data: 1/23/2022 (1100-1400), 2/3/2022 (1100-2400), 2/4/2022 (0000-1800), 2/17/2022 (1500-2400), 2/18/2022 (0000-0800), 2/22/2022 (1400-2000), 2/23/2022 (1000-1400), 2/25/2022 (1200-1300), 3/24/2022 (1000-1200), 10/18 (1300-1400), 9/28/2022 (1800-2400), 9/29 (0000-2400), 9/30 (0000-1500)

Year 3 (2022) Streamflow Data	
Gauge ID	SCTSG5
Start Date	1/1/2022
End Date	12/31/2022
Flow Criteria (Days)	30
Recordings Per Day	24
Logger Elevation (ft)	1096.94
Controlling Grade Elevation (ft)	1097.24
Bankfull Elevation (ft)	1098.24
Most Consecutive Days of Flow	179
Total Days of Flow	360
Max High Water Level Above Bankfull (ft)	0.35
Bankfull Events	3
Meets Success Criteria	Yes

Table 11. Streamflow Summary Data
Stewarts Creek Tributaries Stream Restoration Project (DMS No. 100023)

Most Consecutive Days of Flow							
Gage ID	**MY1 (2020)**	**MY2 (2021)**	**MY3 (2022)**	**MY4 (2023)**	**MY5 (2025)**	**MY6 (2026)**	**MY7 (2027)**
UT1 - SCTSG1	167	308	365	-	-	-	-
UT1 - *SCTSG2	167	308	145	-	-	-	-
UT3 Reach 1 - SCTSG3	167	290	365	-	-	-	-
UT3 Reach 2 - *SCTSG4	167	308	91	-	-	-	-
UT2 - SCTSG5	167	217	179	-	-	-	-

***Note:** Both SCTSG2 and SCTSG5 suffered gauge malfunctions from 1/1/2022 - 8/9/2022 in MY3. Corrupted data was not included in stream gauge plots.

Appendix E: Project Timeline and Contact Information

Table 12. Project Activity and Reporting History

Table 13. Project Contacts Table

Table 12. Project Activity and Reporting History
Stewarts Creek Tributaries Stream Restoration Project (NCDMS Project No. 100023)

Elapsed Time Since grading complete: **2 yrs 7 months**
Elapsed Time Since planting complete: **2 yrs 2 months**
Number of reporting Years: **3**

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Institution Date	NA	May-17
404 permit date	NA	Jul-19
Final Mitigation Plan	2017 to 2019	May-19
Final Design – Construction Plans	2017 to 2019	Sep-19
Site Earthwork	NA	May-20
As-Built Survey Performed	May - June 2020	Jun-20
Bare root plantings	NA	Mar-20
As-built monitoring report (Year 0 Monitoring – baseline)	Jun-20	Oct-20
Year 1 Monitoring	2020	Nov-20
Year 1 Monitoring Moores Fork Repairs	NA	Aug-20
Year 2 Monitoring	2021	Dec-21
Year 2 Monitoring Supplemental Planting	NA	Apr-21
Adaptive Management Plan (AMP)	Nov 2020 - April 2022	Jun-22
AMP Site Earthwork	NA	Jan-22
Year 3 Monitoring	2022 - 2023	Feb-23
Year 4 Monitoring	2023	--
Year 5 Monitoring	2024	--
Year 6 Monitoring	2025	--
Year 7 Monitoring	2026	--

Table 13. Project Contacts Table
Stewarts Creek Tributaries Stream Restoration Project (NCDMS Project No. 100023)

Designer Primary project design POC	Ecosystem Planning and Restoration, PLLC 1150 SE Maynard Road, Suite 140 Cary, NC 27511 Kevin Tweedy, PE (919) 388-0787
Construction Contractor Original Construction contractor POC	Resource Environmental Solutions, LLC (Formally Carolina Environmental Contracting, Inc.) 150 Pine Ridge Rd, Mt Airy, NC 27030 Wayne Taylor
Construction Contractor AMP Construction contractor POC	Yadkin Valley Construction, Inc. 2961 Old 60 Hwy Ronda, NC 28670 Brad Benton
Survey Contractor Original Survey contractor POC	Turner Land Surveying, PLLC PO Box 148, Swannanoa, NC 28778 Lissa Turner (919) 827-0745
Planting Contractor Original Planting contractor POC	Bruton Natural Systems, Inc. Charlie Bruton
Planting Contractor AMP Planting contractor POC	Foggy Mountain Nursery 797 Helton Creek Road Lansing, NC 28643
Seeding Contractor Original Contractor point of contact	Resource Environmental Solutions, LLC (Formally Carolina Environmental Contracting, Inc.) 150 Pine Ridge Rd, Mt Airy, NC 27030 Wayne Taylor
Seeding Contractor AMP Contractor point of contact	Yadkin Valley Construction, Inc. 2961 Old 60 Hwy Ronda, NC 28670 Brad Benton
Seed Mix Sources Original	Green Resources
Seed Mix Sources AMP	Green Resources
Nursery Stock Suppliers Original	Dykes & Son Nursery (931) 668-8833
Nursery Stock Suppliers AMP	Foggy Mountain Nursery 797 Helton Creek Road Lansing, NC 28643
Monitoring Performers	Ecosystem Planning and Restoration, PLLC
Stream Monitoring POC	Erin Bennett, EPR (919) 388-0787
Vegetation Monitoring POC	Tom Barrett, EPR (919) 388-0787

Appendix F: Final 2022 Adaptive Management Plan

Final 2022 Adaptive Management Plan

Adaptive Management Plan Approval and Response to Comments

Adaptive Management Plan

Stewarts Creek Tributaries Stream Restoration Project

Surry County, North Carolina

Yadkin River Basin, Hydrologic Unit Code (HUC) 03040101

Submission Date: June 2022

NCDEQ Contract No. 7183
DMS ID No. 100023
RFP#16-006993
USACE Action ID No. SAW-2017-01508
DWR ID No. 20171043

Prepared For:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

Prepared By:

Ecosystem Planning and Restoration
1150 SE Maynard Road, Suite 140
Cary, NC 27511

Ecosystem Planning and Restoration, LLC
1150 SE Maynard Road, Suite 140
Cary, NC 27511

Phone: (919) 388-0787
www.eprusa.net

Mr. Paul Wiesner
NCDEQ – Division of Mitigation Services
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801

June 1, 2022

RE: Response to Draft Adaptive Management Plan Comments dated May 26, 2022
Stewarts Creek Tributaries Stream Restoration Project
Yadkin River Basin –HUC 03040101 – Surry County, North Carolina
NCDMS Project # 100023, Contract # 7183

Dear Mr. Wiesner,

Ecosystem Planning and Restoration (EPR) has reviewed the comments on the Draft Adaptive Management Plan provided May 26, 2022. The comments have been addressed as described below and the Final Adaptive Management Plan and electronic deliverables have been revised in response to this review.

- *Please add a section to discuss the current encroachment issues on the site and the proposed resolution/s. Any additional landowner discussions, signage, fencing or marking should also be considered and implemented in the AMP. Encroachment has been a point of contention with the IRT and needs to be fully addressed in MY3 (2022) and during the AMP work.*
  - **Current encroachment issues have been discussed in Section 3.3.**

- *While the MY2 (2021) vegetation data looks good and is meeting the success criteria, it looked sparce based on my April 6th, 2022 site visit. Consider looking at everything before the AMP planting effort to make sure that the site is sufficiently supplementally planted moving into MY4 (2023).*
  - **Planting is discussed in Section 3.2.**

- *The IRT is going to request that several of the random vegetation plots or additional vegetation transects be located in the supplementally planted areas associated with the AMP work in MY4 (2023). Please discuss and address this in the revised AMP document.*
  - **Random vegetation plots are discussed in Section 3.2.**

- *Please consider adding additional information in an Appendix that can confirm the updated assets associated with the "Net Change in Credit from Buffers". The riparian buffer zone map is included but the IRT will likely want more information to confirm the results/*

Ecosystem Planning and Restoration, LLC
1150 SE Maynard Road, Suite 140
Cary, NC 27511

Phone: (919) 388-0787
www.eprusa.net

additional credits. It is also fine to submit an additional electronic file/s or output that substantiate the revised additional credits.

- **Report and support files included in the submission.**

- *Table 10 notes that the AMP site earthwork will be completed in December 2022. The completed AMP work should be fully documented in the MY3 (2022) report. Please indicate this in the revised AMP document. If the draft MY3 (2022) report will not be available in December as specified in the DEQ contract, please notify me via email with a revised draft delivery date. Not a problem; we just need to get a revised draft delivery date established.*
  - **Currently we do not need to request a revised draft delivery date. Repairs should be completed in the Fall 2022 (Table 10 updated), and we will be able to complete draft MY3 report by December. If an extension is needed, we will contact you quickly.**

If you have any questions regarding the Final Adaptive Manage Plan, please contact me at 919-388-0787 or via email at ebennett@eprusa.net.

Sincerely,

Erin M Bennett

Erin M. Bennett, PE

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1.0 INTRODUCTION

1.1 Project Summary

Ecosystem Planning and Restoration, PLLC (EPR) implemented the Stewarts Creek Tributaries Stream Restoration Project (Project; Site) for the North Carolina Department of Environmental Quality (NCDEQ) Division of Mitigation Services (DMS) to provide 10,649.2 stream mitigation credits (SMCs) in the Yadkin River Basin, Hydrologic Unit Code (HUC) 03040101. The Stewarts Creek Tributaries Stream Restoration Project was contracted via NCDEQ-DMS RFP #16-006993. As approved by the North Carolina Interagency Review Team (NCIRT), all projects contracted under the 16-006993 RFP have a cool or warm water thermal regime service type. Penalties will not be assessed for using these project mitigation credits to satisfy cool or warm water thermal regime requirements. The Project restored 9,498 linear feet and enhanced 1,573 linear feet of three Unnamed Tributaries (UTs) to Stewarts Creek and Moores Fork within a 30-acre conservation easement. Mitigation assets are listed in Table 1.

The Project is located in Surry County (36.51028° N, 80.70028° W), approximately 5 miles west of Mount Airy, north of NC 89, and along Rack Track Road and is part of NCDEQ Division of Water Resources (DWR) Sub-basin 03-07-03 and DMS Targeted Local Watershed 03040101100010. The Site was historically utilized for agricultural and cattle production. As such, wetlands and streams in the Project area were adversely impacted by direct cattle access, farming activities, and stream channelization. The Site is situated on historic pastureland in a WS-IV Watershed that is 49% agricultural land, 37% forest, 11% residential, and 1% impervious. Prior to construction activities, all Project streams were incised, the UTs were straightened and had adjacent row crops, and Moores Fork suffered from cattle damage.

The Final Mitigation Plan for the Project was submitted May 2019 and site construction was completed in May 2020. Planting and baseline vegetation data collection occurred in May – June 2020 and the as-built survey was completed in June 2020. A detailed timeline of the Project activity and reporting history is provided in Appendix E. The Project is currently in monitoring year 3.

Table 1. Project Mitigation Quantities and Credits

Project Component (reach ID, etc.)	Original Mitigation Plan ft/ac	As-built ft/ac	Original Mitigation Thermal Regime Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Mitigation Credits	Notes/Comments
UT1	2,742	2,742	Cool	R	1.0	2,742	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, and Permanent Conservation Easement.
UT2	1,009	1,009	Cool	R	1.0	1,009	
UT3 R1	944	944	Cool	R	1.0	944	
UT3 R2	2,421	2,421	Cool	R	1.0	2,421	
Moores Fork R1	1,573	1,573	Cool	E2	2.5	629.2*	Habitat Structures, Benching, Planted Buffer, Exclusion of Livestock, and Permanent Conservation Easement.
Moores Fork R2	1,998	1,998	Cool	R	1.0	1,998	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, and Permanent Conservation Easement.
Moores Fork R3	384	384	Cool	R	1.0	384	
Net Change In Credit From Buffers	-	-	-	-	-	522	Wilmington District Stream Buffer Credit Calculator (Updated 1/19/2018)
					Total Assets Summary:		**10,649.2 SMUs**

Length and Area Summations by Mitigation Category

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)
		Riverine	Non-Riverine	
Restoration	9,498			
Enhancement				
Enhancement I				
Enhancement II	1,573			
Rehabilitation				
Preservation				
High Quality Pres				

Overall Assets Summary

Asset Category	Overall Credits
Stream	**10,649.2**

*Moores Fork R1 mitigation credits were miscalculated due to a minor rounding error in the IRT approved Mitigation Plan. This has been updated in the baseline and subsequent monitoring reports.

1.2 Performance Summary

As of monitoring year 2 (September 2020 – November 2021), the three Unnamed Tributaries (UTs) to Stewarts Creek are 100% successfully performing as intended and the majority of Moores Fork is performing successfully. Approximately 48% of Moores Fork Reach 2 and 28% of Moores Fork Reach 3 were identified as not meeting mitigation success criteria and needing repair. Assessments indicated 2,122 feet of unstable banks in Moores Fork Reach 2. These changes have been attributed to Hurricane Zeta that caused multiple meander cutoffs in the reach from Station 25+48 - 34+46 in as-built plan set (Figure 1B). 223 feet of unstable bank are located on Moores Fork Reach 3. Problem areas are shown in Figure 1B (Current Condition Plan View (CCPV)).

Success criteria the Project is currently not meeting in Moores Fork Reaches 2 and 3 as outlined in the approved Final Mitigation Plan are:

- Geomorphic cross sections indicate stable sections over the monitoring period.

These project success criteria were established in accordance with the *NCDEQ DMS Mitigation Plan Template* (ver. 06/2017), and *US Army Corps of Engineers – Wilmington District Public Notice: Notification of Issuance of Guidance for Compensatory Stream and Wetland Mitigation Conducted for Wilmington District* (October 24, 2016).

2.0 CURRENT MONITORING YEAR DATA ASSESSMENT

Moores Fork Reaches 2 and 3 are currently not meeting success criteria associated with stream monitoring parameters including stream dimension and channel stability. Monitoring year 2 assessment results for these parameters are compared with those assessed at baseline and during MY1 to report the effects of bank instability in the identified portions of each reach.

2.1 Stream Monitoring

Stream monitoring involved field data collection to assess the hydrologic and geomorphic functions of Moores Fork. The locations of established monitoring cross sections and channel instability areas are shown in Figure 1B (Current Condition Plan View (CCPV)).

2.1.1 Stream Profile

A full longitudinal profile was surveyed for the entire length of the restored streams in May - June 2020 to document as-built conditions. This survey was tied to a permanent benchmark and includes thalweg, water surface, right bank, and left bank features. Profile measurements were taken at the head of each feature (e.g. riffle, pool) and at the max depth of pools. The longitudinal profile will be surveyed in areas of corrective actions in the as-built record drawings. The longitudinal profile will not be surveyed during annual monitoring unless vertical channel instability has been observed during monitoring and other remedial actions or repairs are needed.

2.1.2 Stream Dimension

Two cross sections (XS 4 & 5) located in Moores Fork Reach 2 are displaying notable changes in channel dimensions between MY1 and MY2. Cross sectional surveys indicate that significant bank erosion has occurred in these areas leading to change in channel geometry and alignment. The cross-section plots, photos, and data summary are included in Appendices B and D.

2.1.3 Channel Stability

Channel stability is assessed on an annual basis using photographs to visually document the condition of the restored Project streams. Photographs were taken from the same location in the same direction each year. Stream photo points and visual assessments completed in MY2 indicated bank instability in Moores Fork Reach 2 Restoration and in Moores Fork Reach 3 Restoration. Location of the photo points and streambank damage is displayed in Figure 1B and Appendix B. Photos of areas exhibiting bank instability in Monitoring year 2 are provided in addition to MY1 and as built photos for comparison purposes in Appendix B. Visual stream morphology stability assessment tables for both reaches can be found in Appendix B.

2.2 Riparian Vegetation Monitoring

Riparian vegetation monitoring evaluates the growth and development of planted and volunteer vegetation across the Site. Monitored parameters, methods, schedule/frequency, and extent are summarized in Table 2. These monitoring parameters follow USACE guidance but will also allow for monitoring of other parameters to document Site performance related to the Project goals listed in Table 2.

2.2.1 Vegetation Monitoring Data

Three (3) permanent vegetation monitoring plots were monitored on Moores Fork Reaches 2 and 3, and five (5) randomly placed vegetation plots were monitored in monitoring year 2 for these reaches. All vegetation plots for MY2 are shown in the CCPV (Figure 1B). Annual vegetation data is compiled and summarized using the DMS Vegetation Data Entry Tool.

Year 2 vegetation monitoring occurred in September 2021, before leaf drop. Planted stem counts for each plot on Moores Fork Reaches 2 and 3 ranged from 8-17 trees per plot (324 - 688 trees per acre). Therefore, the vegetation plot data for Moores Fork Reaches 2 and 3 indicate that planted trees on the Site are meeting the interim success criteria for Monitoring Year 3. Monitoring Year 2 had an average planted stem height of 2.3 feet for permanent vegetation plots and 1.8 feet for randomly placed vegetation plots. Stem height will be monitored in MY3 and MY5 to determine whether the site appears to be on track to meet the interim success criteria in MY5.

Only minor vegetation problem areas were noted in MY2 vegetation plots. Riparian herbaceous vegetation appears to be flourishing throughout the Site. The supplementally planted areas are shown in the CCPV (Figure 1B). Additionally, approximately 0.1 acres of invasive kudzu was noted on the left floodplain within the conservation easement on Moores Fork Reach 3 shown in the CCPV (Figure 1B). The kudzu had not spread significantly as of Spring 2022 and will be chemically treated after repairs.

3.0 PROPOSED CORRECTIVE MEASURES

3.1 Design Approach

The upstream extent of Moores Fork Reach 2 will re-aligned to provide a more gentle transition between the straighter upstream enhancement section (Moores Fork Reach 1) and the downstream meandering section. Bankfull cross sectional geometry will be established along the new alignment and in-stream structures will be installed to provide grade control, improve habitat and protect stream banks. Additional sloping and geolift with rock toe structures will be placed on banks for areas of high stress or areas with current bank erosion. Moores Fork Reach 3 will have additional structures and bank sloping added for areas with currently eroding banks. Appendix A provides the adaptative management plan sheets that include work stated above. Table 2 provides a summary of the regional curve, monitoring year 0 data, proposed stream morphological information and design criteria for the reaches. Detailed morphological tables are provided for the reaches in Appendix D.

Table 2. Morphology Table for Moores Fork Reach 2 and 3

Parameter	Regional Curve	MY0	Design Criteria – Repair (Typical)	Proposed - Repair
Contributing Drainage Area (sq. mi.)	4.40			
Channel Thalweg Length (ft)	-	2581.1	-	2422.3
Valley Width (feet)	>53			
Channel/Reach Classification	-	*C4*	C4	C4
Bankfull Width (feet)	20 – 30	*20.2 –21.3*	21.9 - 25.9	21.9 - 25.9
Bankfull Mean Depth (feet)	1.8 – 3.0	*1.6 – 1.7*	1.6 – 2.6	1.6 – 2.6
Bankfull Area (ft^2)	40– 50	*33.7 – 34.1*	-	47.8
Bank Height Ratio	-	*1.0 – 1.1*	1.0 - 1.1	1.0
Entrenchment Ratio	-	*>4.0*	> 2.2	2.2 – 4.0
Bankfull Shear Stress (lb/ft^2)	-	*0.39*	-	0.46
Average Bankfull Velocity (fps)	2.5 – 20.0	*4.4*	< 4	3.1
Bankfull Discharge (cfs)	100 – 800	*150*	-	150
Water Surface Slope (ft/ft)	-	*0.0027 - 0.0039*	-	0.004

Sinuosity*	-	*1.28*	1.2-1.4	1.19
D16 / 35 / 50 / 84 / 95/ di_pavement/ di_subpavement (mm)*	-	13.1 / 21.9 / 30.5 / 75.3 / 142.0 / 61 / 90		

3.2 Vegetation and Planting Plan

Species selection for re-vegetation of stream buffer areas will generally follow those suggested by Schafale and Weakley (1990) for Piedmont/Low Mountain Alluvial Forest and Schafale (2012) for Piedmont Alluvial Forest, as well as wetness tolerances cited in *WRP Technical Note VN-RS-4.1* (WRP 1997). The native species selected for establishment at the Site represent a range of growth rates and varying tolerances to shade and moisture. This range of characteristics were selected to ensure that the appropriate vegetation cover develops over the life of the project.

The proposed species list, site preparation, planting density, planting methods, and materials are provided in the construction drawings included in Appendix A. The proposed species list has not changed from the approved mitigation plan species list. Vegetation will be planted during the dormant season (November 15 – March 15) following the handling and installation procedures outlined on the plan sheets to achieve the vegetative success criteria. Areas disturbed during the repair work will be re-planted. Vegetation Plot 3 will be relocated due to the alignment change. Additionally, two random vegetation plots along Moores Fork Reach 2 will be placed in any area that will be re-planted as part of the AMP work. The gentle transition on Moores Fork Reach 2 allows for more riparian buffer width within the conservation easement (Figure 2).

3.3 Encroachment

Mowing and ATV encroachment was observed along Moores Fork. The encroachment was happening at an unrestricted location off Race Track Road due to a car running off the road and damaging the existing gate and fencing. In May 2022 Foothills Fencing installed fencing and a new gate in that location. EPR will walk the boundary regularly and communicate with the landowner to determine if all encroachment issues have been resolved due to the fencing installation. Additional posts and rope will be installed to further demarcate the easement boundary along Moores Fork Reach 3 where some minor encroachment from agricultural activities has occurred.

4.0 EXPECTED CHANGES IN MITIGATION ASSETS

The adaptive management plan proposes a reduction in length from the as-built conditions on Moores Fork Reach 2 and an increase in buffer width. The revisions in mitigation assets are listed in Table 3.

Table 3. Revised Project Mitigation Quantities and Credits

Project Component (reach ID, etc.)	Original Mitigation Plan and As-Built ft/ac	Proposed AMP ft/ac	Original Mitigation Thermal Regime Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Original Mitigation Credits	Revised Mitigation Credits
UT1	2,742	2,742	Cool	R	1.0	2,742	N/A
UT2	1,009	1,009	Cool	R	1.0	1,009	N/A
UT3 R1	944	944	Cool	R	1.0	944	N/A
UT3 R2	2,421	2,421	Cool	R	1.0	2,421	N/A
Moores Fork R1	1,573	1,573	Cool	E2	2.5	629.2*	N/A
Moores Fork R2	1,998	1,839.2	Cool	R	1.0	1,998	**1,839.2**
Moores Fork R3	384	384	Cool	R	1.0	384	384
Net Change In Credit From Buffers	-	-	-	-	-	522	**530.7**
					New Total Assets Summary:		**10,499.1 SMUs**

Length and Area Summations by Mitigation Category

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)
		Riverine	Non-Riverine	
Restoration	**9,339.2**			
Enhancement				
Enhancement I				
Enhancement II	1,573			
Rehabilitation				
Preservation				
High Quality Pres				

Overall Assets Summary

Asset Category	Overall Credits
Stream	**10,499.1**

*Moores Fork R1 mitigation credits were miscalculated due to a minor rounding error in the IRT approved Mitigation Plan. This has been updated in the baseline and subsequent monitoring reports.

5.0 PROPOSED MONITORING REVISION

As well as a revision in mitigation assets due to the realignment of the stream (Table 3), there will be some stream and riparian vegetation monitoring location revisions on Moores Fork Reaches 2 and 3 due to the realignment of the stream channel.

5.1 Stream Monitoring

The stream profile in the repair area will be taken during the as-built survey. Current monitoring cross sections 4 and 5 will be relocated to the new alignment. Proposed locations of these relocated cross sections are shown in Figure 1B. Cross section 7 geometry will be affected by the grading for additional toewood but will remain in place.

5.2 Riparian Vegetation Monitoring

Permanent vegetation plot 3 will be relocated due to the new repair alignment intersecting the plot. The proposed location of the permanent vegetation plot 3 are shown in Figure 1B. Permanent vegetation plot 5 will be adjusted due to the installation of toewood. This adjustment will be very minor.

REFERENCES

North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS). DMS Vegetation Data Entry Tool, October 2020. https://ncdms.shinyapps.io/Veg_Table_Tool/

North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS). DMS Cross Section Tool V.1.0 2020. https://ncdms.shinyapps.io/XS_APP/

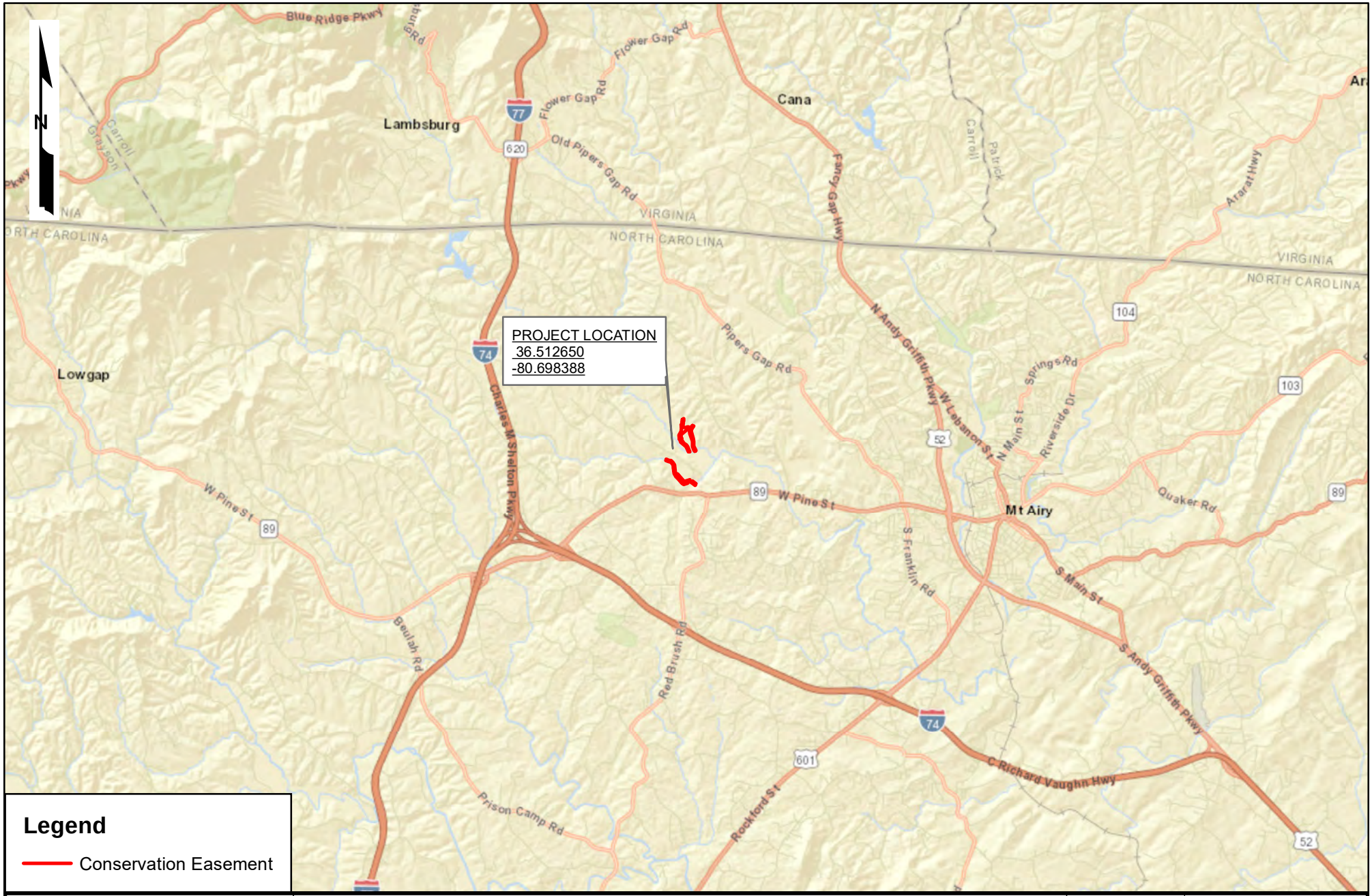
North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS). Annual Monitoring Report Format, Data, and Content Requirements, October 2020.

North Carolina Ecosystem Enhancement Program. 2009. Upper Yadkin Pee-Dee River Basin Restoration Priorities.

North Carolina Division of Water Quality. 2008. Yadkin Pee-Dee Basinwide Water Quality Plan.

U.S. Army Corps of Engineers. 2016. Wilmington District Public Notice: Notification of Issuance of Guidance for Compensatory Stream and Wetland Mitigation Conducted for Wilmington District.

U.S. Army Corps of Engineers – Wilmington District. 2021. Draft Mitigation Site Adaptive Management Plan Guidance.



STEWARTS CREEK TRIBUTARIES STREAM RESTORATION PROJECT

VICINITY MAP

DMS PROJECT ID# 100023

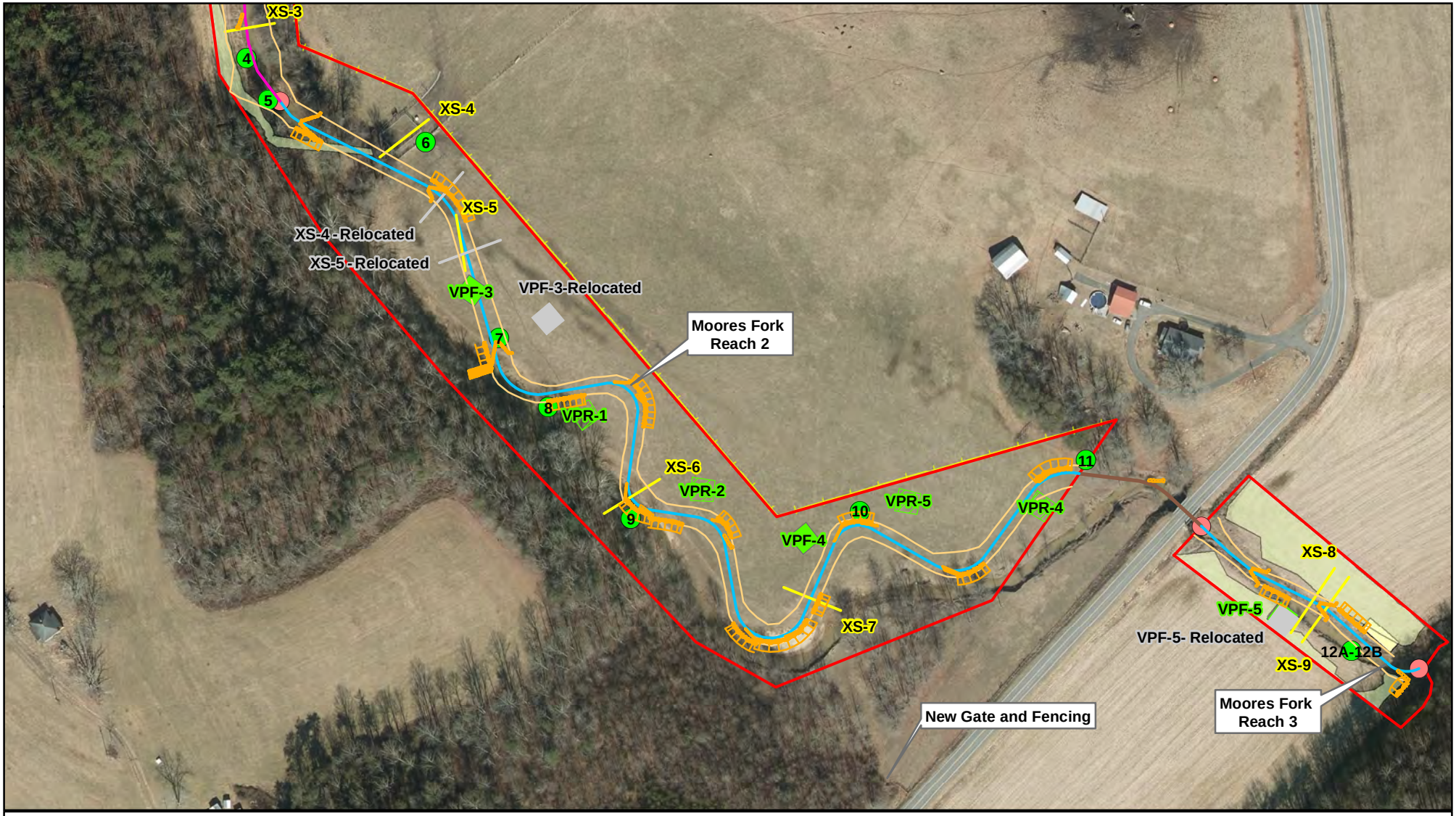
JUNE 2022

FIGURE 1A

SURRY COUNTY, NC

NC Mitigation Services ENVIRONMENTAL QUALITY

EPR ECOSYSTEM PLANNING & RESTORATION



Streams - Enhancement
Streams - Restoration
No Credit
Conservation Easement

Fixed Vegetation Plot
Relocated
Successful
Unsuccessful

Random Vegetation Plot
Successful
Unsuccessful
Structures

Top of Bank
Photo Points
Cross Sections
Relocated Cross Sections

Reach Breaks
Fence
2021 Supplemental Planting
Kudzu

NC OneMap Orthoimagery (2018)

0 100 200 Feet
1 inch = 200 feet

N

STEWARTS CREEK TRIBUTARIES STREAM RESTORATION PROJECT

Current Condition Plan View: Asset Map
AMP: 2022

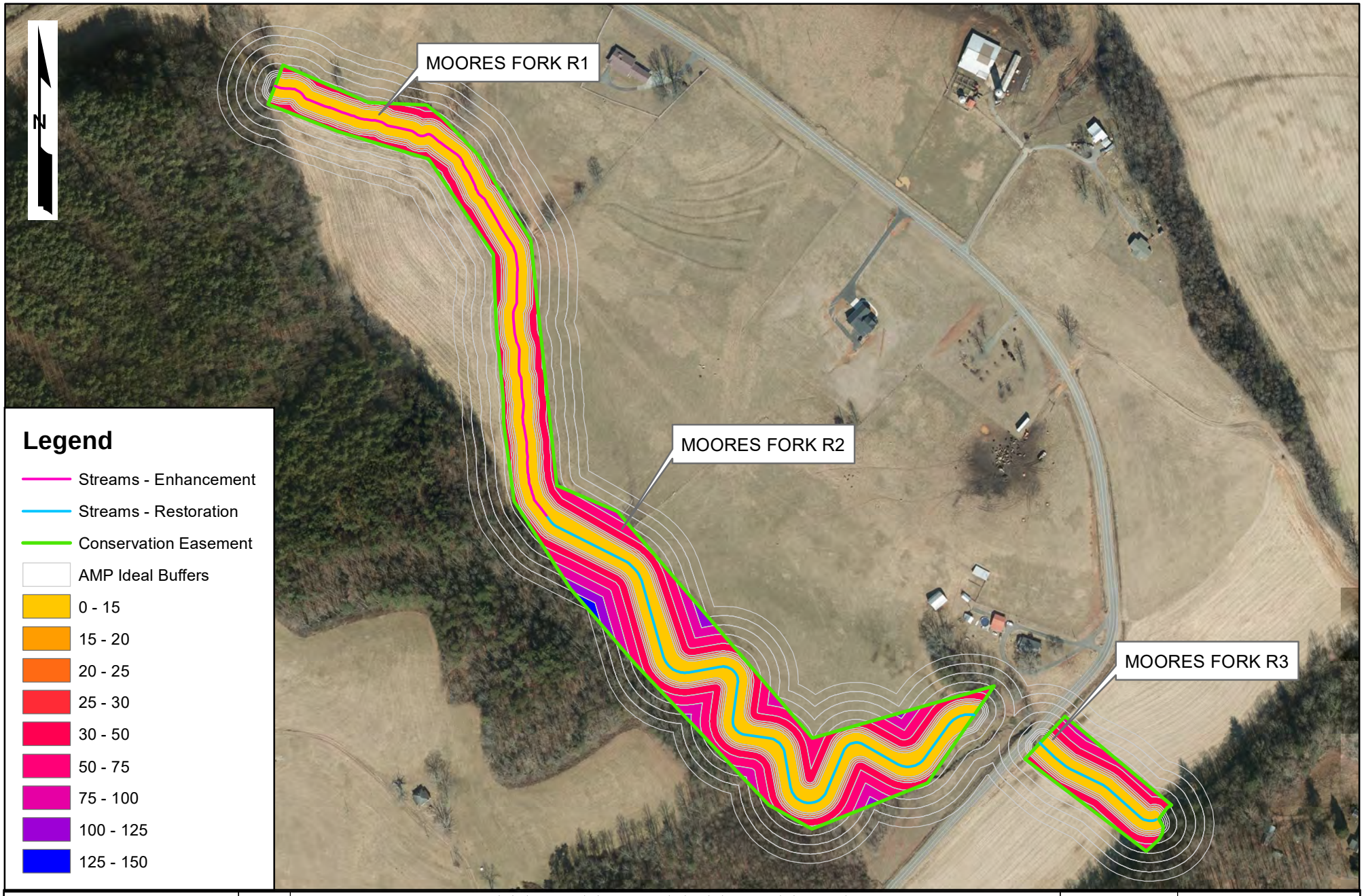
DMS Project
ID# 100023
June 2022

FIGURE 1B

Surry County, NC

Mitigation Services
Environmental Quality

Ecosystem Planning & Restoration



0 175 350 Feet

1 inch = 350 feet

N

STEWARTS CREEK TRIBUTARIES STREAM RESTORATION PROJECT

Riparian Buffer Zones Map
AMP: 2022

Surry County, NC

DMS Project ID# 100023

June 2022

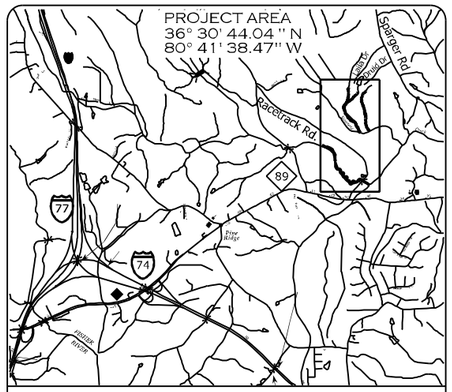
FIGURE 2

Mitigation Services Environmental Quality

Ecosystem Planning & Restoration

Appendix A: Adaptive Management Plan Sheets

PROJECT: STEWARTS CREEK TRIBUTARIES



VICINITY MAP

INDEX OF SHEETS

NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES

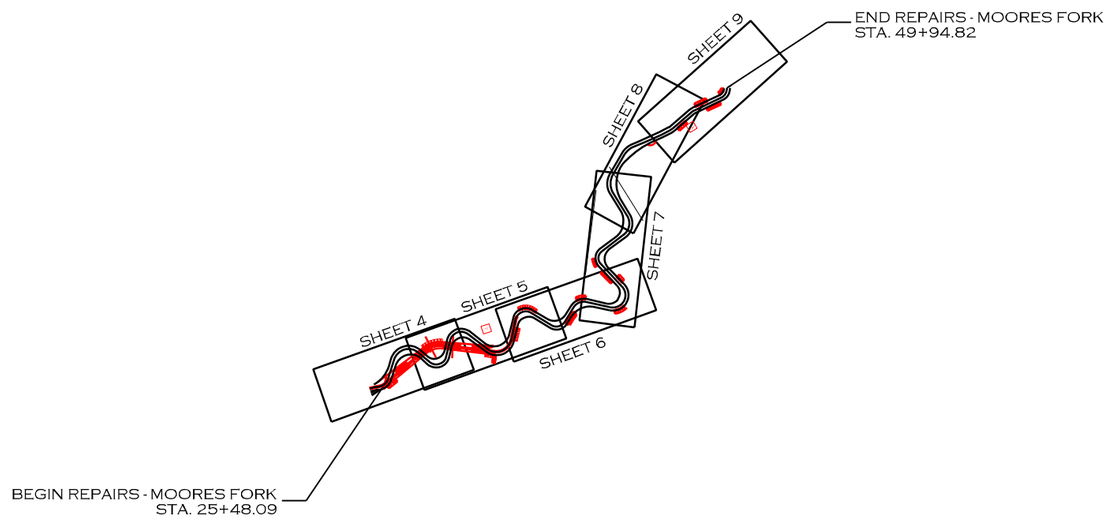
SURRY COUNTY

LOCATION: SURRY COUNTY, NC

TYPE OF WORK: STEWARTS CREEK TRIBUTARIES
ADAPTIVE MANAGEMENT PLAN

STATE	PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
NC	083	1	17

MOORES FORK EXISTING STREAM LENGTH = 3,955 FT.
MOORES FORK PROPOSED STREAM LENGTH = 3,796 FT.



GRAPHIC SCALES

20 10 0 20 40
PLANS

20 10 0 20 40
PROFILE (HORIZONTAL)

5 2.5 0 5 10
PROFILE (VERTICAL)

REVISIONS

NO.	DESCRIPTION	ENGR.	APPROV.	DATE
1	ADAPTIVE MANAGEMENT PLAN	EB	KLT	5/4/22

PREPARED FOR:
Mitigation Services
ENVIRONMENTAL QUALITY
NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NC 27699-1652

PAUL WIESNER
PROJECT MANAGER

PREPARED IN THE OFFICE OF:
ECOSYSTEM PLANNING & RESTORATION
1150 SE MAYNARD RD
SUITE 140
CARY, NC 27511
LICENSE # P-1182

FALL 2022
LETTING DATE:

ERIN BENNETT, PE
PROJECT ENGINEER

PROJECT ENGINEER

PROGRESS DRAWING
FOR REVIEW PURPOSES ONLY
DO NOT USE FOR CONSTRUCTION

SIGNATURE: P.E.

STREAM CONVENTIONAL SYMBOLS

- ROCK J-HOOK (JH)
- ROCK VANE (RV)
- OFFSET ROCK CROSS VANE (OV)
- ROCK CROSS VANE (XV)
- TEMPORARY SILT CHECK
- ROOT WAD (RW)
- GRADE CONTROL LOG J-HOOK (LJH)
- LOG VANE (LV)
- LOG STEP (LS)
- ROCK STEP (RS)
- LOG CROSS VANE (XV)
- CONSTRUCTED CASCADE (CC)
- CONSTRUCTED RIFFLE (CR)
- BOULDER CLUSTER
- LOG ROLLER (LR)
- GRADE CONTROL WOODY RIFFLE (WR)
- TOEWOOD WITH GEOLIFT (TW)
- SOD MAT (SM)
- DEBRIS JAM (DJ-T#)
- SINGLE WING DEFLECTOR (SW)
- DOUBLE WING DEFLECTOR (DW)
- FLOODPLAIN SILLS

- SF — SAFETY FENCE
- TP — TAPE FENCE
- SILT FENCE
- CE — CONSERVATION EASEMENT
- 20 — EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- LIMITS OF DISTURBANCE
- BANKFULL BENCH (GRADE)
- PROPERTY LINE
- ACCESS ROAD
- 10+00 STREAM THALWEG
- STREAM TOP OF BANKS
- FOOT BRIDGE
- TEMPORARY STREAM CROSSING
- PERMANENT FORD STREAM CROSSING (PFC)
- TRANSPLANTED VEGETATION
- TREE REMOVAL
- TREE PROTECTION
- GEOLIFT
- CHANNEL FILL / DITCH PLUG
- GRADE BANK 2:1 OR FLATTER
- EXISTING WETLANDS
- EXISTING BEDROCK
- OUTLET PROTECTION (OP)
- IMPERVIOUS DIKE
- FENCING
- WITNESS POST
- EXISTING FENCE REMOVAL

**NOTE: ALL ITEMS ABOVE MAY NOT BE USED ON THIS PROJECT

GENERAL NOTES

1. THE CONTRACTOR IS REQUIRED TO INSTALL INSTREAM STRUCTURES USING A TRACK HOE WITH A HYDRAULIC THUMB OF SUFFICIENT SIZE TO PLACE BOULDERS, AND STRUCTURES.
2. WORK IS BEING PERFORMED AS AN ENVIRONMENTAL RESTORATION PLAN. THE CONTRACTOR SHOULD MAKE ALL REASONABLE EFFORTS TO REDUCE SEDIMENT LOSS AND MINIMIZE DISTURBANCE OF THE SITE WHILE PERFORMING THE CONSTRUCTION WORK.
3. CONSTRUCTION IS SCHEDULED TO BEGIN FALL 2022.

PROJECT # 083

SHEET NO. 1A

SYMBOLOGY / NOTES

REVISIONS

NO.	DESCRIPTION	ENGR.	APPROV	DATE
1	ADAPTIVE MANAGEMENT PLAN	EB	KLT	5/4/22

PREPARED FOR:

NC Mitigation Services (Environmental Quality)

NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NC 27699-1652

STEWARTS CREEK TRIBUTARIES PROJECT
SURRY COUNTY, NC

PREPARED IN THE OFFICE OF:

EPR ECOSYSTEM PLANNING & RESTORATION
1150 SE MAYNARD RD, SUITE 140
CARY, NC 27511
LICENSE # P-1182

PROJECT ENGINEER

PROGRESS DRAWING
FOR REVIEW PURPOSES ONLY
DO NOT USE FOR CONSTRUCTION

5/4/2022
R:\PROJECTS\RDU0083_NCDEQ_STEWARTS CREEK_FD\CADD\PLANS\REPAIRS\MF_PSH_1A.DGN
BRYERS

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION A: SELF-INSPECTION

Self-inspections are required during normal business hours in accordance with the table below. When adverse weather or site conditions would cause the safety of the inspection personnel to be in jeopardy, the inspection may be delayed until the next business day on which it is safe to perform the inspection. In addition, when a storm event of equal to or greater than 1.0 inch occurs outside of normal business hours, the self-inspection shall be performed upon the commencement of the next business day. Any time when inspections were delayed shall be noted in the Inspection Record.

Inspect	Frequency (during normal business hours)	Inspection records must include:
(1) Rain gauge maintained in good working order	Daily	Daily rainfall amounts. If no daily rain gauge observations are made during weekend or holiday periods, and no individual-day rainfall information is available, record the cumulative rain measurement for those un-attended days (and this will determine if a site inspection is needed). Days on which no rainfall occurred shall be recorded as "zero." The permittee may use another rain-monitoring device approved by the Division.
(2) E&SC Measures	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	1. Identification of the measures inspected, 2. Date and time of the inspection, 3. Name of the person performing the inspection, 4. Indication of whether the measures were operating properly, 5. Description of maintenance needs for the measure, 6. Description, evidence, and date of corrective actions taken.
(3) Stormwater discharge outfalls (SDOs)	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	1. Identification of the discharge outfalls inspected, 2. Date and time of the inspection, 3. Name of the person performing the inspection, 4. Evidence of indicators of stormwater pollution such as oil sheen, floating or suspended solids or discoloration, 5. Indication of visible sediment leaving the site, 6. Description, evidence, and date of corrective actions taken.
(4) Perimeter of site	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	If visible sedimentation is found outside site limits, then a record of the following shall be made: 1. Actions taken to clean up or stabilize the sediment that has left the site limits, 2. Description, evidence, and date of corrective actions taken, and 3. An explanation as to the actions taken to control future releases.
(5) Streams or wetlands onsite or offsite (where accessible)	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	If the stream or wetland has increased visible sedimentation or a stream has visible increased turbidity from the construction activity, then a record of the following shall be made: 1. Description, evidence and date of corrective actions taken, and 2. Records of the required reports to the appropriate Division Regional Office per Part III, Section C, Item (2)(a) of this permit.
(6) Ground stabilization measures	After each phase of grading	1. The phase of grading (installation of perimeter E&SC measures, clearing and grubbing, installation of storm drainage facilities, completion of all land-disturbing activity, construction or redevelopment, permanent ground cover). 2. Documentation that the required ground stabilization measures have been provided within the required timeframe or an assurance that they will be provided as soon as possible.

NOTE: The rain inspection resets the required 7 calendar day inspection requirement.

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION B: RECORDKEEPING

1. E&SC Plan Documentation

The approved E&SC plan as well as any approved deviation shall be kept on the site. The approved E&SC plan must be kept up-to-date throughout the coverage under this permit. The following items pertaining to the E&SC plan shall be kept on site and available for inspection at all times during normal business hours.

Item to Document	Documentation Requirements
(a) Each E&SC measure has been installed and does not significantly deviate from the locations, dimensions and relative elevations shown on the approved E&SC plan.	Initial and date each E&SC measure on a copy of the approved E&SC plan or complete, date and sign an inspection report that lists each E&SC measure shown on the approved E&SC plan. This documentation is required upon the initial installation of the E&SC measures or if the E&SC measures are modified after initial installation.
(b) A phase of grading has been completed.	Initial and date a copy of the approved E&SC plan or complete, date and sign an inspection report to indicate completion of the construction phase.
(c) Ground cover is located and installed in accordance with the approved E&SC plan.	Initial and date a copy of the approved E&SC plan or complete, date and sign an inspection report to indicate compliance with approved ground cover specifications.
(d) The maintenance and repair requirements for all E&SC measures have been performed.	Complete, date and sign an inspection report.
(e) Corrective actions have been taken to E&SC measures.	Initial and date a copy of the approved E&SC plan or complete, date and sign an inspection report to indicate the completion of the corrective action.

2. Additional Documentation to be Kept on Site

In addition to the E&SC plan documents above, the following items shall be kept on the site and available for inspectors at all times during normal business hours, unless the Division provides a site-specific exemption based on unique site conditions that make this requirement not practical:

(a) This General Permit as well as the Certificate of Coverage, after it is received.

(b) Records of inspections made during the previous twelve months. The permittee shall record the required observations on the Inspection Record Form provided by the Division or a similar inspection form that includes all the required elements. Use of electronically-available records in lieu of the required paper copies will be allowed if shown to provide equal access and utility as the hard-copy records.

3. Documentation to be Retained for Three Years

All data used to complete the e-NOI and all inspection records shall be maintained for a period of three years after project completion and made available upon request. [40 CFR 122.41]

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION C: REPORTING

1. Occurrences that Must be Reported

Permittees shall report the following occurrences:

(a) Visible sediment deposition in a stream or wetland.

(b) Oil spills if:
- They are 25 gallons or more,
- They are less than 25 gallons but cannot be cleaned up within 24 hours,
- They cause sheen on surface waters (regardless of volume), or
- They are within 100 feet of surface waters (regardless of volume).

(c) Releases of hazardous substances in excess of reportable quantities under Section 311 of the Clean Water Act (Ref: 40 CFR 110.3 and 40 CFR 117.3) or Section 102 of CERCLA (Ref: 40 CFR 302.4) or G.S. 143-215.85.

(d) Anticipated bypasses and unanticipated bypasses.

(e) Noncompliance with the conditions of this permit that may endanger health or the environment.

2. Reporting Timeframes and Other Requirements

After a permittee becomes aware of an occurrence that must be reported, he shall contact the appropriate Division regional office within the timeframes and in accordance with the other requirements listed below. Occurrences outside normal business hours may also be reported to the Department's Environmental Emergency Center personnel at (800) 858-0368.

Occurrence	Reporting Timeframes (After Discovery) and Other Requirements
(a) Visible sediment deposition in a stream or wetland	• ***Within 24 hours***, an oral or electronic notification. • ***Within 7 calendar days***, a report that contains a description of the sediment and actions taken to address the cause of the deposition. Division staff may waive the requirement for a written report on a case-by-case basis. • If the stream is named on the NC 303(d) list as impaired for sediment-related causes, the permittee may be required to perform additional monitoring, inspections or apply more stringent practices if staff determine that additional requirements are needed to assure compliance with the federal or state impaired-waters conditions.
(b) Oil spills and release of hazardous substances per Item 1(b)-(c) above	• ***Within 24 hours***, an oral or electronic notification. The notification shall include information about the date, time, nature, volume and location of the spill or release.
(c) Anticipated bypasses [40 CFR 122.41(m)(3)]	• ***A report at least ten days before the date of the bypass, if possible***. The report shall include an evaluation of the anticipated quality and effect of the bypass.
(d) Unanticipated bypasses [40 CFR 122.41(m)(3)]	• ***Within 24 hours***, an oral or electronic notification. • ***Within 7 calendar days,*** a report that includes an evaluation of the quality and effect of the bypass.
(e) Noncompliance with the conditions of this permit that may endanger health or the environment[40 CFR 122.41(l)(7)]	• ***Within 24 hours***, an oral or electronic notification. • ***Within 7 calendar days***, a report that contains a description of the noncompliance, and its causes; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time noncompliance is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. [40 CFR 122.41(l)(6). • Division staff may waive the requirement for a written report on a case-by-case basis.

PART II, SECTION G, ITEM (4)
DRAW DOWN OF SEDIMENT BASINS FOR MAINTENANCE OR CLOSE OUT

Sediment basins and traps that receive runoff from drainage areas of one acre or more shall use outlet structures that withdraw water from the surface when these devices need to be drawn down for maintenance or close out unless this is infeasible. The circumstances in which it is not feasible to withdraw water from the surface shall be rare (for example, times with extended cold weather). Non-surface withdrawals from sediment basins shall be allowed only when all of the following criteria have been met:

(a) The E&SC plan authority has been provided with documentation of the non-surface withdrawal and the specific time periods or conditions in which it will occur. The non-surface withdrawal shall not commence until the E&SC plan authority has approved these items,

(b) The non-surface withdrawal has been reported as an anticipated bypass in accordance with Part III, Section C, Item (2)(c) and (d) of this permit,

(c) Dewatering discharges are treated with controls to minimize discharges of pollutants from stormwater that is removed from the sediment basin. Examples of appropriate controls include properly sited, designed and maintained dewatering tanks, weir tanks, and filtration systems,

(d) Vegetated, upland areas of the sites or a properly designed stone pad is used to the extent feasible at the outlet of the dewatering treatment devices described in Item (c) above,

(e) Velocity dissipation devices such as check dams, sediment traps, and riprap are provided at the discharge points of all dewatering devices, and

(f) Sediment removed from the dewatering treatment devices described in Item (c) above is disposed of in a manner that does not cause deposition of sediment into waters of the United States.

NORTH CAROLINA Environmental Quality

NCG01 SELF-INSPECTION, RECORDKEEPING AND REPORTING

EFFECTIVE: 04/01/19

REVISIONS				
NO.	DESCRIPTION	ENGR.	APPROV	DATE
1	ADAPTIVE MANAGEMENT PLAN	EB	KLT	5/4/22

PREPARED FOR:
NC Mitigation Services
NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NC 27699-1652

STEWARTS CREEK TRIBUTARIES PROJECT
SURRY COUNTY, NC

PREPARED IN THE OFFICE OF:
EPR ECOSYSTEM PLANNING & RESTORATION
1150 SE MAYNARD RD, SUITE 140
CARY, NC 27511
LICENSE # P-1182

PROJECT ENGINEER

PROGRESS DRAWING
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GROUND STABILIZATION AND MATERIALS HANDLING PRACTICES FOR COMPLIANCE WITH THE NCG01 CONSTRUCTION GENERAL PERMIT

Implementing the details and specifications on this plan sheet will result in the construction activity being considered compliant with the Ground Stabilization and Materials Handling sections of the NCG01 Construction General Permit (Sections E and F, respectively). The permittee shall comply with the Erosion and Sediment Control plan approved by the delegated authority having jurisdiction. All details and specifications shown on this sheet may not apply depending on site conditions and the delegated authority having jurisdiction.

SECTION E: GROUND STABILIZATION

Required Ground Stabilization Timeframes

Site Area Description	Stabilize within this many calendar days after ceasing land disturbance	Timeframe variations
(a) Perimeter dikes, swales, ditches, and perimeter slopes	7	None
(b) High Quality Water (HQW) Zones	7	None
(c) Slopes steeper than 3:1	7	If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed
(d) Slopes 3:1 to 4:1	14	-7 days for slopes greater than 50' in length and with slopes steeper than 4:1 -7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed
(e) Areas with slopes flatter than 4:1	14	-7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed unless there is zero slope

Note: After the permanent cessation of construction activities, any areas with temporary ground stabilization shall be converted to permanent ground stabilization as soon as practicable but in no case longer than 90 calendar days after the last land disturbing activity. Temporary ground stabilization shall be maintained in a manner to render the surface stable against accelerated erosion until permanent ground stabilization is achieved.

GROUND STABILIZATION SPECIFICATION

Stabilize the ground sufficiently so that rain will not dislodge the soil. Use one of the techniques in the table below:

Temporary Stabilization	Permanent Stabilization
• Temporary grass seed covered with straw or other mulches and tackifiers • Hydroseeding • Rolled erosion control products with or without temporary grass seed • Appropriately applied straw or other mulch • Plastic sheeting	• Permanent grass seed covered with straw or other mulches and tackifiers • Geotextile fabrics such as permanent soil reinforcement matting • Hydroseeding • Shrubs or other permanent plantings covered with mulch • Uniform and evenly distributed ground cover sufficient to restrain erosion • Structural methods such as concrete, asphalt or retaining walls • Rolled erosion control products with grass seed

POLYACRYLAMIDES (PAMS) AND FLOCCULANTS

1. Select flocculants that are appropriate for the soils being exposed during construction, selecting from the *NC DWR List of Approved PAMS/Flocculants*.
2. Apply flocculants at or before the inlets to Erosion and Sediment Control Measures.
3. Apply flocculants at the concentrations specified in the *NC DWR List of Approved PAMS/Flocculants* and in accordance with the manufacturer's instructions.
4. Provide ponding area for containment of treated Stormwater before discharging offsite.
5. Store flocculants in leak-proof containers that are kept under storm-resistant cover or surrounded by secondary containment structures.

EQUIPMENT AND VEHICLE MAINTENANCE

1. Maintain vehicles and equipment to prevent discharge of fluids.
2. Provide drip pans under any stored equipment.
3. Identify leaks and repair as soon as feasible, or remove leaking equipment from the project.
4. Collect all spent fluids, store in separate containers and properly dispose as hazardous waste (recycle when possible).
5. Remove leaking vehicles and construction equipment from service until the problem has been corrected.
6. Bring used fuels, lubricants, coolants, hydraulic fluids and other petroleum products to a recycling or disposal center that handles these materials.

LITTER, BUILDING MATERIAL AND LAND CLEARING WASTE

1. Never bury or burn waste. Place litter and debris in approved waste containers.
2. Provide a sufficient number and size of waste containers (e.g dumpster, trash receptacle) on site to contain construction and domestic wastes.
3. Locate waste containers at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
4. Locate waste containers on areas that do not receive substantial amounts of runoff from upland areas and does not drain directly to a storm drain, stream or wetland.
5. Cover waste containers at the end of each workday and before storm events or provide secondary containment. Repair or replace damaged waste containers.
6. Anchor all lightweight items in waste containers during times of high winds.
7. Empty waste containers as needed to prevent overflow. Clean up immediately if containers overflow.
8. Dispose waste off-site at an approved disposal facility.
9. On business days, clean up and dispose of waste in designated waste containers.

PAINT AND OTHER LIQUID WASTE

1. Do not dump paint and other liquid waste into storm drains, streams or wetlands.
2. Locate paint washouts at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
3. Contain liquid wastes in a controlled area.
4. Containment must be labeled, sized and placed appropriately for the needs of site.
5. Prevent the discharge of soaps, solvents, detergents and other liquid wastes from construction sites.

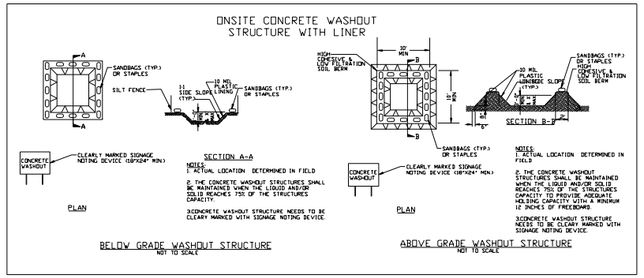
PORTABLE TOILETS

1. Install portable toilets on level ground, at least 50 feet away from storm drains, streams or wetlands unless there is no alternative reasonably available. If 50 foot offset is not attainable, provide relocation of portable toilet behind silt fence or place on a gravel pad and surround with sand bags.
2. Provide staking or anchoring of portable toilets during periods of high winds or in high foot traffic areas.
3. Monitor portable toilets for leaking and properly dispose of any leaked material. Utilize a licensed sanitary waste hauler to remove leaking portable toilets and replace with properly operating unit.

EARTHEN STOCKPILE MANAGEMENT

1. Show stockpile locations on plans. Locate earthen-material stockpile areas at least 50 feet away from storm drain inlets, sediment basins, perimeter sediment controls and surface waters unless it can be shown no other alternatives are reasonably available.
2. Protect stockpile with silt fence installed along toe of slope with a minimum offset of five feet from the toe of stockpile.
3. Provide stable stone access point when feasible.
4. Stabilize stockpile within the timeframes provided on this sheet and in accordance with the approved plan and any additional requirements. Soil stabilization is defined as vegetative, physical or chemical coverage techniques that will restrain accelerated erosion on disturbed soils for temporary or permanent control needs.

NORTH CAROLINA Environmental Quality



CONCRETE WASHOUTS

1. Do not discharge concrete or cement slurry from the site.
2. Dispose of, or recycle settled, hardened concrete residue in accordance with local and state solid waste regulations and at an approved facility.
3. Manage washout from mortar mixers in accordance with the above item and in addition place the mixer and associated materials on impervious barrier and within lot perimeter silt fence.
4. Install temporary concrete washouts per local requirements, where applicable. If an alternate method or product is to be used, contact your approval authority for review and approval. If local standard details are not available, use one of the two types of temporary concrete washouts provided on this detail.
5. Do not use concrete washouts for dewatering or storing defective curb or sidewalk sections. Stormwater accumulated within the washout may not be pumped into or discharged to the storm drain system or receiving surface waters. Liquid waste must be pumped out and removed from project.
6. Locate washouts at least 50 feet from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available. At a minimum, install protection of storm drain inlet(s) closest to the washout which could receive spills or overflow.
7. Locate washouts in an easily accessible area, on level ground and install a stone entrance pad in front of the washout. Additional controls may be required by the approving authority.
8. Install at least one sign directing concrete trucks to the washout within the project limits. Post signage on the washout itself to identify this location.
9. Remove leavings from the washout when at approximately 75% capacity to limit overflow events. Replace the tarp, sand bags or other temporary structural components when no longer functional. When utilizing alternative or proprietary products, follow manufacturer's instructions.
10. At the completion of the concrete work, remove remaining leavings and dispose of in an approved disposal facility. Fill pit, if applicable, and stabilize any disturbance caused by removal of washout.

HERBICIDES, PESTICIDES AND RODENTICIDES

1. Store and apply herbicides, pesticides and rodenticides in accordance with label restrictions.
2. Store herbicides, pesticides and rodenticides in their original containers with the label, which lists directions for use, ingredients and first aid steps in case of accidental poisoning.
3. Do not store herbicides, pesticides and rodenticides in areas where flooding is possible or where they may spill or leak into wells, stormwater drains, ground water or surface water. If a spill occurs, clean area immediately.
4. Do not stockpile these materials onsite.

HAZARDOUS AND TOXIC WASTE

1. Create designated hazardous waste collection areas on-site.
2. Place hazardous waste containers under cover or in secondary containment.
3. Do not store hazardous chemicals, drums or bagged materials directly on the ground.

NCG01 GROUND STABILIZATION AND MATERIALS HANDLING

EFFECTIVE: 04/01/19

REVISIONS				
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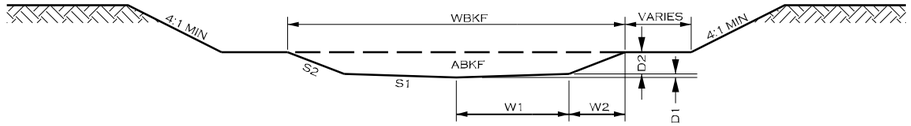
REVISED

TYPICAL SECTIONS

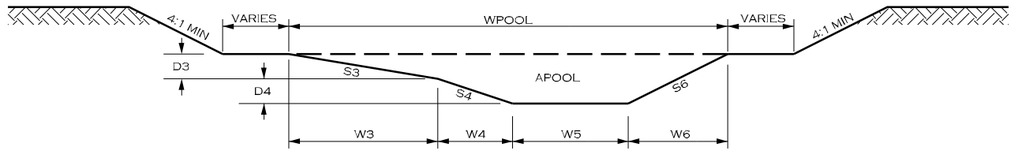
PROJECT # 083 | SHEET NO. 2

DETAILS

"C" TYPE CHANNELS
MOORES FORK STA. 25+48 - 32+87



TYPICAL RIFFLE CROSS SECTION



TYPICAL POOL RIGHT CROSS SECTION

C STREAM TYPE TYPICAL CROSS SECTION DIMENSIONS

		RIFFLES								POOLS										
Stream	Station	ABKF	WBKF	W1	W2	D1	D2	S1	S2	APool	WPool	W3	W4	W5	W6	D3	D4	S3	S4	S6
Moores Fork	25+48.09 - 32+87.48	47.7	23.9	5.30	6.65	0.34	2.66	15.6:1	2.5:1	88.4	35.9	13.80	6.90	6.00	9.20	2.30	2.30	6:1	3:1	2:1

REVISIONS

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PROJECT # 083 | SHEET NO. 2A

DETAILS

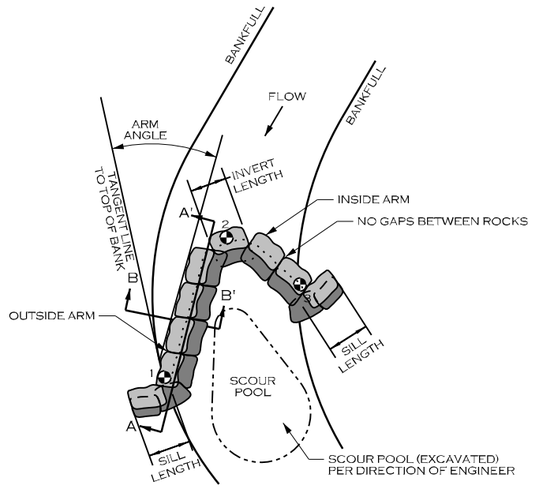
OFFSET ROCK CROSS VANE (OV)

OFFSET ROCK CROSS VANE SPECIFICATIONS

MATERIALS:	SPECIFICATIONS:	
BOULDER	TYPE: SIZE: NUMBER OF HEADER ROWS: NUMBER OF FOOTER ROWS:	GRANITE OR COMPARABLE MF - 4 FT X 3 FT X 3 FT 1 1
FILTER FABRIC	TYPE: WIDTH UPSTREAM:	TYPE 2 NON-WOVEN 6 FT MINIMUM
STONE BACKFILL	WELL GRADED MIX OF CLASS A, CLASS B AND ON-SITE ALLUVIUM	

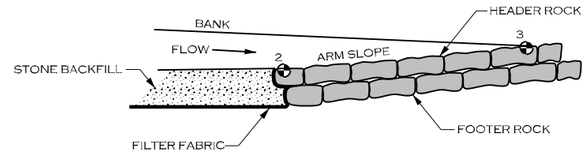
NOTES FOR OFFSET ROCK CROSS VANE :

1. STRUCTURE DIMENSIONS AND MEASUREMENTS ARE SHOWN ON THE STRUCTURES TABLE SHEET.
2. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS AND PLACE FILL ON UPSTREAM SIDE OF VANE ARM, BETWEEN THE ARM AND STREAMBANK.
3. PLACE FOOTER ROCKS AND THEN HEADER ROCKS TO ACHIEVE DESIGN DIMENSIONS AND ELEVATIONS.
4. USE HAND PLACED STONE TO FILL GAPS ON UPSTREAM SIDE OF HEADER AND FOOTER ROCKS.
5. PLACE FILTER FABRIC BEGINNING AT THE TOP OF THE HEADER ROCKS AND EXTENDING DOWN TO THE DEPTH OF THE FOOTER ROCKS, THEN OUTWARD THE DISTANCE SPECIFIED IN THE STRUCTURES TABLE SHEET.
6. INSTALL STONE BACKFILL AS SHOWN, TO THE DIMENSIONS INDICATED IN THE STRUCTURES TABLE SHEET.
7. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH ONSITE ALLUVIUM TO THE ELEVATION OF THE TOP OF HEADER ROCK.

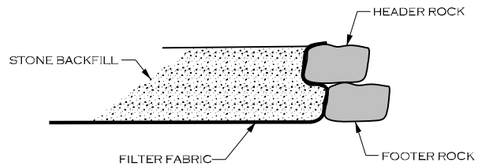


PLAN VIEW

⊕ - ELEVATION POINT (SEE STRUCTURE TABLES)



PROFILE VIEW A - A'
VANE OUTSIDE ARM



SECTION B - B'
VANE ARM CROSS SECTION

ROCK CROSS VANE (XV)

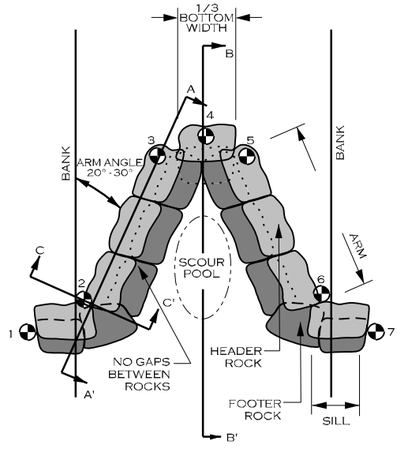
ROCK CROSS VANE SPECIFICATIONS

MATERIALS:	SPECIFICATIONS:	
BOULDER	TYPE: SIZE: NUMBER OF HEADER ROWS: NUMBER OF FOOTER ROWS:	GRANITE OR COMPARABLE MF - 4 FT X 3 FT X 3 FT 1 1
FILTER FABRIC	TYPE: WIDTH UPSTREAM:	TYPE 2 NON-WOVEN 6 FT MINIMUM

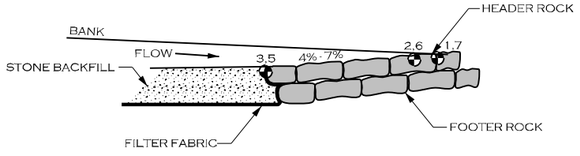
NOTES FOR ROCK CROSS VANE STRUCTURES:

1. DIG A TRENCH BELOW THE STREAM BED FOR FOOTER AND HEADER ROCKS, FILTER FABRIC AND STONE BACKFILL.
2. PLACE FOOTER ROCKS AND THEN HEADER ROCKS TO ACHIEVE DESIGN DIMENSIONS AND ELEVATIONS.
3. USE HAND PLACED STONE TO FILL GAPS AND VOIDS ON UPSTREAM SIDE OF THE HEADER AND FOOTER ROCKS.
4. PLACE FILTER FABRIC BEGINNING AT THE TOP OF THE HEADER ROCKS AND EXTENDING DOWN TO THE DEPTH OF THE FOOTER ROCKS, THEN OUTWARD THE DISTANCE SPECIFIED IN THE STRUCTURES TABLE SHEET.
5. INSTALL STONE BACKFILL AND ONSITE ALLUVIUM AS SHOWN, TO THE DIMENSIONS INDICATED IN THE STRUCTURES TABLE SHEET.
6. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH ONSITE ALLUVIUM TO THE ELEVATION OF THE TOP OF THE HEADER ROCK.

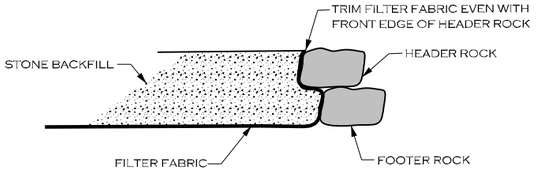
⊕ - ELEVATION POINT (SEE STRUCTURES TABLE)



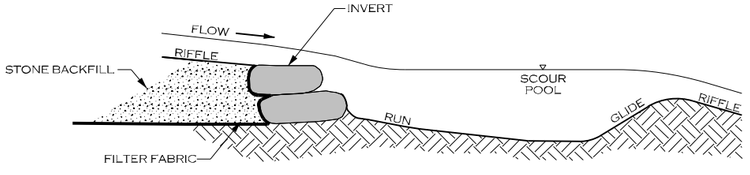
PLAN VIEW



PROFILE VIEW A - A'
VANE ARM



SECTION C - C'
INVERT AND POOL



PROFILE VIEW B - B'
INVERT

REVISIONS				
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1	ADAPTIVE MANAGEMENT PLAN	EB	KLT	5/4/22

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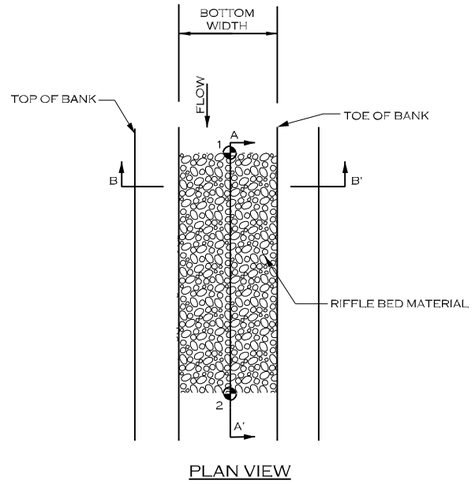
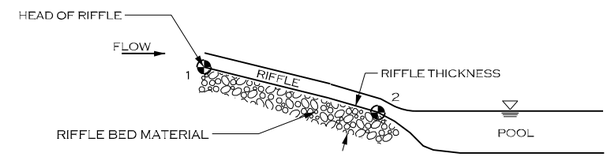
PROJECT # 083 | SHEET NO. 2B

DETAILS

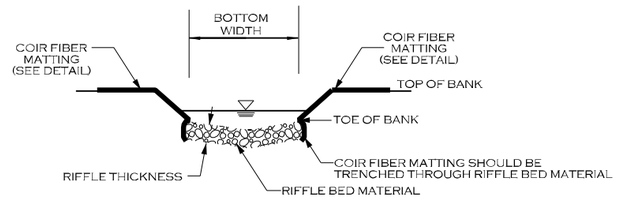
CONSTRUCTED RIFFLE (CR)



PLAN VIEW



PROFILE A - A'



SECTION B - B'

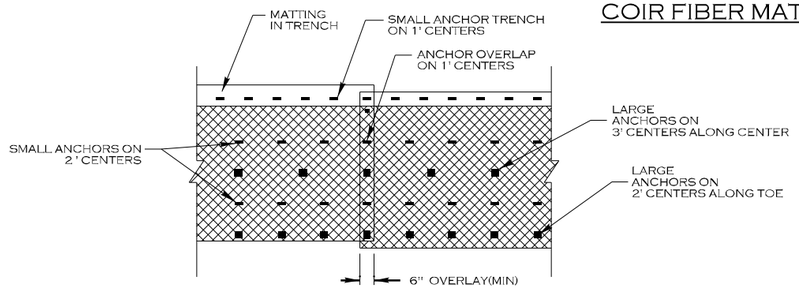
- ELEVATION POINT (SEE STRUCTURE TABLES)

CONSTRUCTED RIFFLE SPECIFICATIONS	
MATERIALS:	SPECIFICATIONS:
RIFFLE BED MATERIAL	SIZE: MF: CLASS 2, CLASS A, CLASS B AND 57 STONE (25/25/25/25 MIX) THICKNESS: 18 INCHES MIN.
COIR FIBER MATTING	SEE DETAIL

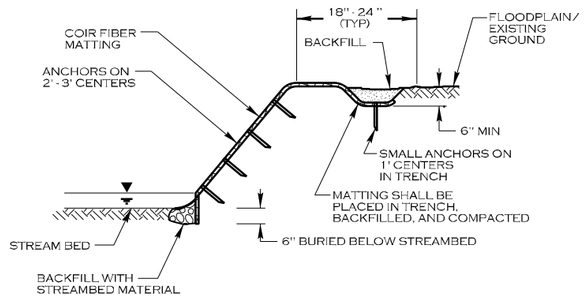
NOTES FOR CONSTRUCTED RIFFLE STRUCTURES:

1. GRADE STREAMBED AND BANKS TO PROPOSED DIMENSIONS PER TYPICAL CROSS-SECTION AND PROFILE.
2. EXCAVATE TRENCH BELOW PROPOSED STREAMBED ELEVATION EQUAL TO OR GREATER THAN RIFFLE THICKNESS.
3. INSTALL COIR FIBER MATTING ALONG STREAMBANKS ENSURING MATTING IS SUFFICIENTLY TRENCHED ALONG TOE OF BANK.
4. FILL TRENCH WITH RIFFLE BED MATERIAL TO FINAL DESIGN STREAM GRADE.

COIR FIBER MATTING



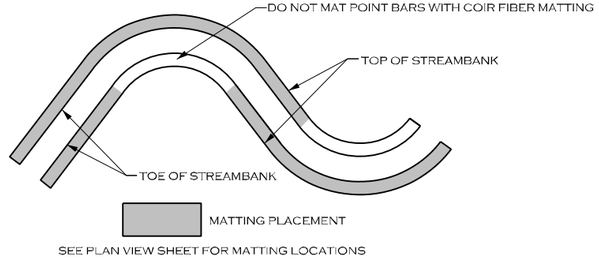
PLAN VIEW



TYPICAL CROSS SECTION

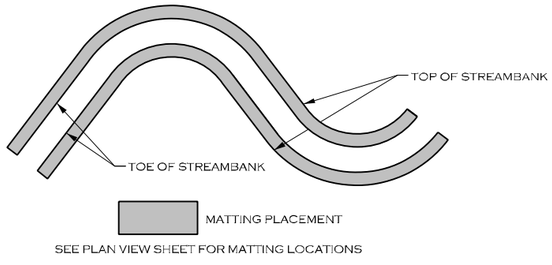
NOTES:

1. IN AREAS TO BE MATTED, ALL SEEDING, SOIL AMENDMENTS, AND SOIL PREPARATION MUST BE COMPLETED PRIOR TO PLACEMENT OF COIR FIBER MATTING.
2. WOODEN STAKES ARE PREFERRED. USE OF STAPLES AS SMALL ANCHORS MUST BE PRE-APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.



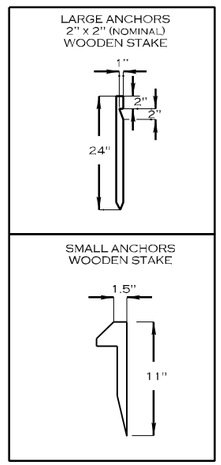
SEE PLAN VIEW SHEET FOR MATTING LOCATIONS

TYPICAL MATTING PLAN VIEW (MEANDERING CHANNELS)



SEE PLAN VIEW SHEET FOR MATTING LOCATIONS

TYPICAL MATTING PLAN VIEW



ANCHOR OPTIONS

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1	ADAPTIVE MANAGEMENT PLAN	EB	KLT	5/4/22

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STEWARTS CREEK TRIBUTARIES PROJECT
SURRY COUNTY, NC

PREPARED IN THE OFFICE OF:

EPR Ecosystem Planning & Restoration

1150 SE MAYNARD RD, SUITE 140
CARY, NC 27511
LICENSE # P-1182

PROJECT ENGINEER

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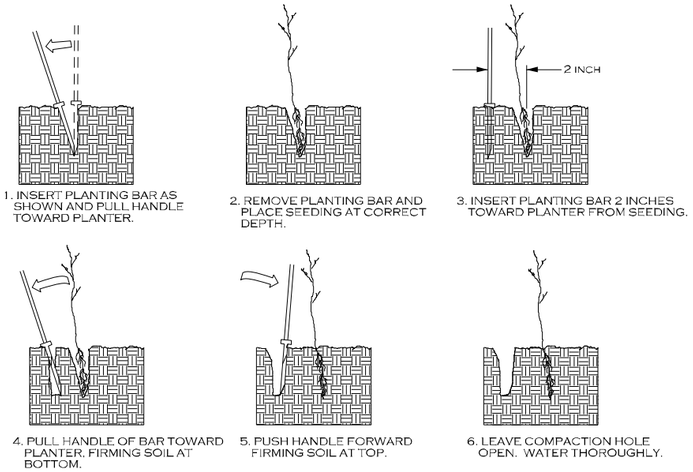
BAKERS

PROJECT # 083 | SHEET NO. 2C

DETAILS

DIBBLE PLANTING METHOD
USING THE KBC PLANTING BAR



1. INSERT PLANTING BAR AS SHOWN AND PULL HANDLE TOWARD PLANTER.
2. REMOVE PLANTING BAR AND PLACE SEEDING AT CORRECT DEPTH.
3. INSERT PLANTING BAR 2 INCHES TOWARD PLANTER FROM SEEDING.
4. PULL HANDLE OF BAR TOWARD PLANTER, FIRMING SOIL AT BOTTOM.
5. PUSH HANDLE FORWARD FIRMING SOIL AT TOP.
6. LEAVE COMPACTION HOLE OPEN. WATER THOROUGHLY.

PLANTING NOTES:

PLANTING BAG

DURING PLANTING, SEEDLINGS SHALL BE KEPT IN A MOIST CANVAS BAG OR SIMILAR CONTAINER TO PREVENT THE ROOT SYSTEMS FROM DRYING.

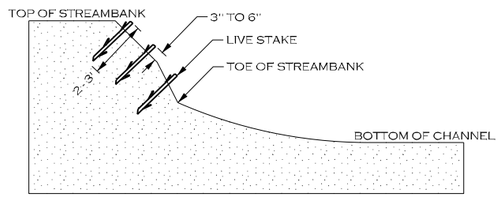
KBC PLANTING BAR

PLANTING BAR SHALL HAVE A BLADE WITH A TRIANGULAR CROSS SECTION, AND SHALL BE 12 INCHES LONG, 4 INCHES WIDE AND 1 INCH THICK AT CENTER.

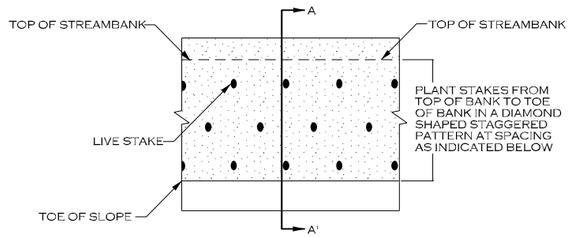
ROOT PRUNING

ALL SEEDLINGS SHALL BE ROOT PRUNED, IF NECESSARY, SO THAT NO ROOTS EXTEND MORE THAN 10 INCHES BELOW THE ROOT COLLAR.

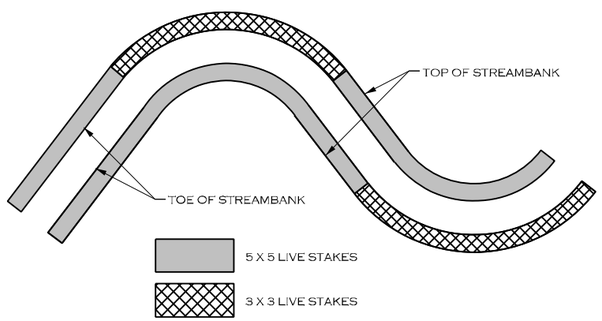
LIVE STAKING



SECTION A - A'

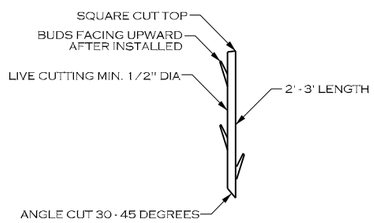


PLAN VIEW



SEE PLAN VIEW SHEET FOR LIVE STAKING LOCATIONS

TYPICAL LIVE STAKING AREA PLAN VIEW



LIVE STAKE DETAIL

NOTES:
1. ENHANCEMENT AREAS HAVE 5 X 5 SPACING ONLY.
2. IF STAKES ARE BEING HARVESTED NEAR THE SITE, STAKES SHOULD BE CUT AND INSTALLED ON THE SAME DAY.
3. KEEP STAKES COOL AND MOIST WHILE ON THE JOB SITE AND PRIOR TO INSTALLATION.
4. DO NOT INSTALL STAKES THAT HAVE BEEN SPLIT.
5. STAKES MUST BE INSTALLED WITH BUDS POINTING UPWARDS.
6. STAKES SHALL BE INSTALLED PERPENDICULAR TO BANK.
7. STAKES SHALL BE 1/2 TO 2 INCHES IN DIAMETER AND 2 TO 3 FT LONG.
8. STAKES SHALL BE INSTALLED LEAVING 1/5 OF STAKE ABOVE GROUND.

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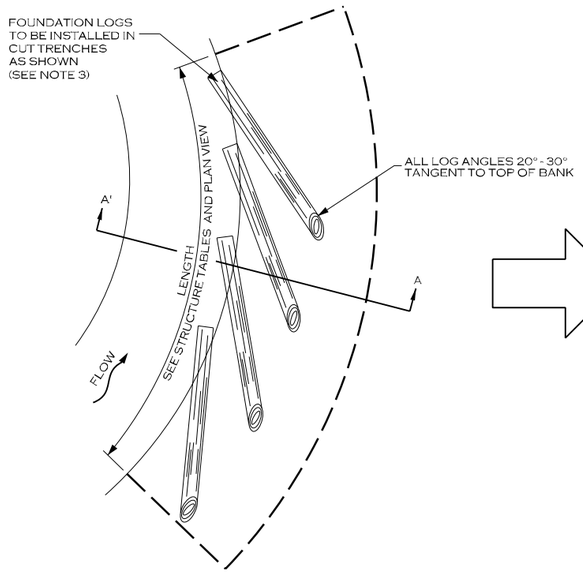
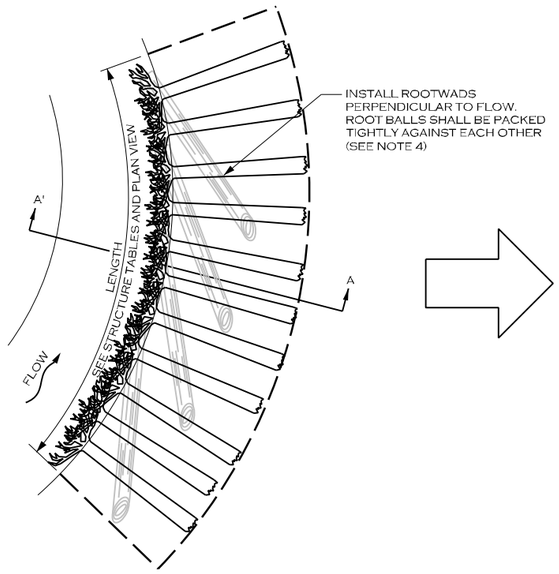
PROJECT # 083 | SHEET NO. 2D

DETAILS

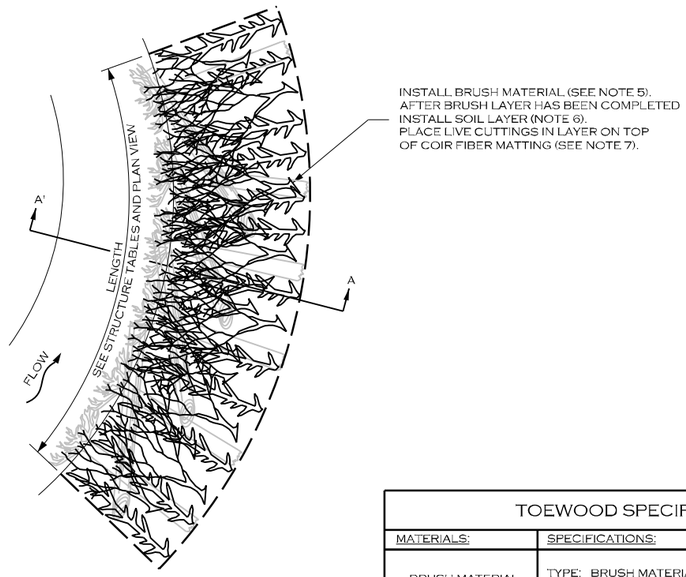
TOEWOOD WITH GEOLIFT (TW)



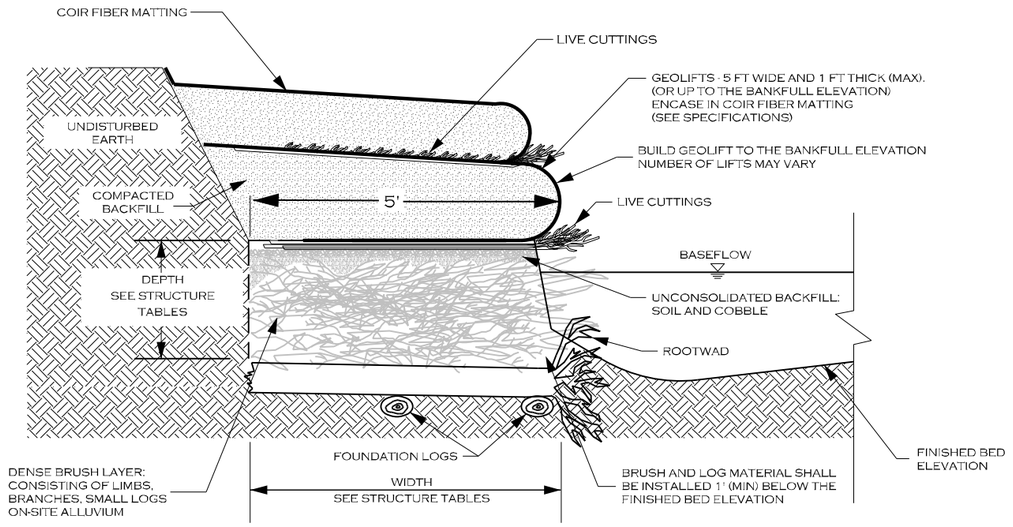
PLAN VIEW - 1
TRENCH EXCAVATION



PLAN VIEW - 2
ROOTWAD INSTALLATION



PLAN VIEW - 3
BRUSH LAYER INSTALLATION



SECTION VIEW

TOEWOOD SPECIFICATIONS

MATERIALS:	SPECIFICATIONS:
BRUSH MATERIAL	TYPE: BRUSH MATERIAL SIZE: MIN. 5 FT LONG, 1 INCH DIAMETER
ROOTWAD MATERIAL	TYPE: HARDWOOD SIZE: MIN. 6 FT LONG MIN. 12 INCH DIAMETER
FOUNDATION LOGS	TYPE: HARDWOOD SIZE: MIN. 6 FT LONG MIN. 12 INCH DIAMETER
COIR FIBER MATTING	SEE DETAIL

NOTES FOR TOEWOOD STRUCTURES:

1. STRUCTURE DIMENSIONS AND MEASUREMENTS ARE SHOWN ON THE STRUCTURE TABLES SHEET.
2. DIG A TRENCH ALONG BANK WHERE TOEWOOD IS TO BE INSTALLED TO THE DEPTH AND WIDTH SPECIFIED IN THE DETAILS AND STRUCTURE TABLES. IF TOEWOOD IS BEING PLACED IN A LOCATION WHERE THERE IS NOT EXISTING GROUND, PLACE FILL MATERIAL AND COMPACT TO FORM THE TRENCH FOR THE TOEWOOD MATERIALS.
3. FOUNDATION LOGS SHALL MEET THE MINIMUM DIAMETER LISTED ABOVE, AND BE STRAIGHT, HARDWOOD, AND NOT ROTTEN. EXCAVATE TRENCH BELOW TOEWOOD GRADE FOR FOUNDATION LOG INSTALLATION. PLACE FOUNDATION LOGS AS SHOWN IN THE PLAN VIEW 1 TO FORM A FOUNDATION FOR THE TOE WOOD MATERIALS TO LAY UPON. THE ANGLE BETWEEN THE TANGENT LINE OF THE BANK AND THE UPSTREAM FACE OF THE FOUNDATION LOG SHALL BE BETWEEN 20 TO 30 DEGREES.
4. INSTALL ROOTWADS PERPENDICULAR TO THE FLOW AS SHOWN IN PLAN VIEW 2.
5. INSTALL BRUSH MATERIAL INCLUDING BRANCHES, LOGS, AND BRUSH, OF AT LEAST 1"IN DIAMETER. LARGE AND SMALL MATERIALS SHALL BE MIXED, PLACED IN LAYERS NO MORE THAN 1 FOOT DEEP, COVERED IN A THIN LAYER OF ONSITE ALLUVIUM, AND COMPACTED BEFORE PLACING THE NEXT LAYER OF TOEWOOD MATERIAL. CONTINUE PLACING MATERIALS TO FORM A DENSE LAYER OF WOODY MATERIALS AND ONSITE ALLUVIUM TO THE DEPTH AND ELEVATIONS SPECIFIED (PLAN VIEW 3).
6. PLACE AN UNCONSOLIDATED LAYER OF SOIL AND COBBLE ON TOP OF BRUSH LAYER.
7. INSTALL LIVE CUTTINGS AT LEAST 5 FEET IN LENGTH.
8. CONSTRUCT GEOLIFTS OR PLACE TRANSPLANTS AS SPECIFIED OR DIRECTED BY THE ENGINEER) TO REBUILD THE STREAMBANK ABOVE THE TOEWOOD LAYER.
9. ROOTWADS CAN BE REPLACED WITH LARGER LOGS TO FORM THE BRUSH FOUNDATION PER THE DIRECTION OF THE ENGINEER.
10. BRUSH FOUNDATION SHALL BE APPROXIMATELY 0.5' ABOVE THE BASEFLOW LEVEL.
11. GEOLIFT THICKNESS CAN BE ADJUSTED AS NEEDED TO ENSURE LIFTS ARE CONSTRUCTED EVENLY UP TO THE BANKFULL ELEVATION.
12. TOEWOOD CAN BE REPLACED WITH A STONE FOUNDATION AND GEOLIFTS WITH PERMISSION FROM THE ENGINEER BASED ON THE AVAILABILITY OF WOOD MATERIAL. THE STONE FOUNDATION SHALL BE PLACED TO THE SAME DEPTHS, GRADES, AND EXTENTS AS THE TOE WOOD AND SHALL BE COMPOSED OF CLASS II STONE.

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STRUCTURE TABLES

TABLES

Rock Cross Vane Structures - Moores Fork

Structure #	Arm			Sill	Invert	Station (ft)	Elevation (ft)						
	Length (ft)	Angle (deg)	Slope (%)	Length (ft)	Length (ft)	At Pt 4	Pt 1	Pt 2	Pt 3	Pt 4	Pt 5	Pt 6	Pt 7
XV-1	23.2	20	6.0%	8.0	8.0	26+17.83	1087.72	1087.52	1086.12	1085.92	1086.12	1087.52	1087.72

Offset Rock Vane - Moores Fork

Structure #	Sill Length (ft)	Outside Arm			Invert Length (ft)	Inside Arm			Station (ft)	Elevation (ft)		
		Length (ft)	Angle (deg)	Slope (%)		Length (ft)	Angle (deg)	Slope (%)	At Pt 2	Pt 1	Pt 2	Pt 3
OV-1	8.0	30.6	18.0	4.6%	8.0	21.2	18.0	1.0%	28+24.88	1086.33	1084.93	1085.14
OV-2	8.0	30.6	18.0	4.6%	8.0	21.2	18.0	1.0%	30+71.26	1085.18	1083.78	1083.99

Toe-Wood With Geolift - Moores Fork

Structure #	Toe Wood Dimensions					
	Begin Station (ft)	End Station (ft)	STA Length (ft)	Bank Length (ft)	Width (ft)	Toe Wood Depth (ft)
TW-1	26+12.42	26+56.67	44.3	44.4	5.0	3.5
TW-2	28+19.35	28+92.11	72.8	81.4	5.0	3.5
TW-3	30+64.05	31+05.15	41.1	44.4	5.0	3.5
TW-4	31+89.61	32+42.25	52.6	52.4	5.0	3.5
TW-5	33+06.87	33+66.41	59.5	72.9	5.0	3.5
TW-6	35+05.44	35+54.30	48.9	49.1	5.0	3.5
TW-7	35+97.81	36+27.42	29.6	36.7	5.0	3.5
TW-8	37+43.75	37+80.13	36.4	45.1	5.0	3.5
TW-9	38+66.69	38+96.68	30.0	30.0	5.0	3.5
TW-10	47+32.90	47+74.64	41.7	41.6	5.0	3.5
TW-11	48+41.91	48+91.69	49.8	49.8	5.0	3.5

Constructed Riffle Structures - Moores Fork

Structure #	Point 1		Point 2		Bottom Width	Length	Slope
	Station	Elevation	Station	Elevation			
CR-1	26+75.00	1085.69	27+34.00	1085.29	14.9	59.0	0.68%
CR-2	27+71.00	1085.29	28+24.88	1084.95	14.9	53.9	0.63%
CR-3	28+94.77	1084.68	29+66.06	1084.20	14.9	71.3	0.67%
CR-4	30+09.86	1084.20	30+71.26	1083.78	14.9	61.4	0.69%

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RIVERS

VEGETATION SELECTION

PROJECT # 083 | SHEET NO. 3A

VEGETATION SELECTION

Temporary Seeding

Temporary herbaceous seed mixtures for the restoration site shall be planted in all disturbed areas. Temporary seed shall be applied according to the construction specifications and the information specified below.

Scientific Name	Common Name	Rate	Dates
Secale cereale	Cereal Rye Grain	130 lbs/acre	September to March (Cool Season)
Urochloa ramosa	Browntop Millet	30 lbs/acre	April to August (Warm Season)

Riparian Buffer (Permanent Seeding)

This permanent seed mixture shall be planted in all disturbed areas within the conservation easement. This permanent seed mixture shall be applied with temporary seed, as defined in the construction specifications. This permanent seed shall be applied at a rate of **25 lbs/acre**.

Scientific Name	Common Name	% by Species	Wetland Indicator Status
Elymus virginicus	Virginia wildrye	20%	FACW
Agrostis perennans	Autumn bentgrass	15%	FACU
Panicum virgatum	Switchgrass	15%	FAC
Rudbeckia hirta	Black-Eyed Susan	10%	FACU
Coreopsis lanceolata	Lance-Leaved Tick Seed	10%	FACU
Andropogon gerardii	Big Blue Stem	10%	FAC
Juncus effusus	Soft Rush	5%	FACW
Schizachyrium scoparium	Little Blue Stem	5%	FACU
Sorghastrum nutans	Yellow Indian Grass	5%	FACU
Tripsacum dactyloides	Eastern Gamma Grass	5%	FACW
	Total	**100%**	

Areas Outside of Easement (Permanent Seeding)

This permanent seed mixture shall be planted in all disturbed areas outside the conservation easement. This permanent seed mixture shall be applied with temporary seed, as defined in the construction specifications. Permanent seed shall be applied at the rate shown below.

Scientific Name	Common Name	Rate	Dates
Poa pratensis	Kentucky Bluegrass	1 lb/1,000 sq.ft.	August - September (Cool Season)
Schedonorus arundinaceus	Tall Fescue	5 lb/1,000 sq.ft.	
	Total	6 lbs/1,000 sq.ft	

Live Staking (Stream Banks)

Live stakes will be installed along all stabilized bank areas, as indicated on the planting plan sheets, details, and according to the construction specifications. Live stake all disturbed banks with 2 rows at a **5' x 5' spacing, or 3'x3' spacing).** Not all of the species listed may be planted. Commercial availability may dictate which species are actually planted.

Scientific Name	Common Name	% by Species	Status
Cornus amomum	Silky dogwood	40%	FACW
Salix sericea	Silky willow	30%	OBL
Salix nigra	Black willow	20%	OBL
Sambucus canadensis	Elderberry	10%	FAC
	Total	**100%**	

Riparian Vegetation

Riparian vegetation species (bare-roots) shall be planted in the areas designated on the plans using the species mixture and percentages listed below. Riparian species shall be planted at an overall density of **680 stems per acre (8' x 8' spacing)**. All species will be planted according to the plans, details, and construction specifications. Not all of the species listed may be planted. Commercial availability may dictate which species are actually planted.

Scientific Name	Common Name	% by Species	Indicator Status
Betula nigra	River Birch	15%	FACW
Carpinus caroliniana	Ironwood	10%	FAC
Celtis laevigata	Sugarberry	5%	FACW
Diospryos virginiana	Persimmon	10%	FAC
Fraxinus pennsylvanica	Green Ash	5%	FACW
Platanus occidentalis	Sycamore	20%	FACW
Quercus nigra	Water Oak	10%	FAC
Quercus phellos	Willow Oak	15%	FAC
Ulmus americana	American Elm	10%	FACW
	Total	**100%**	

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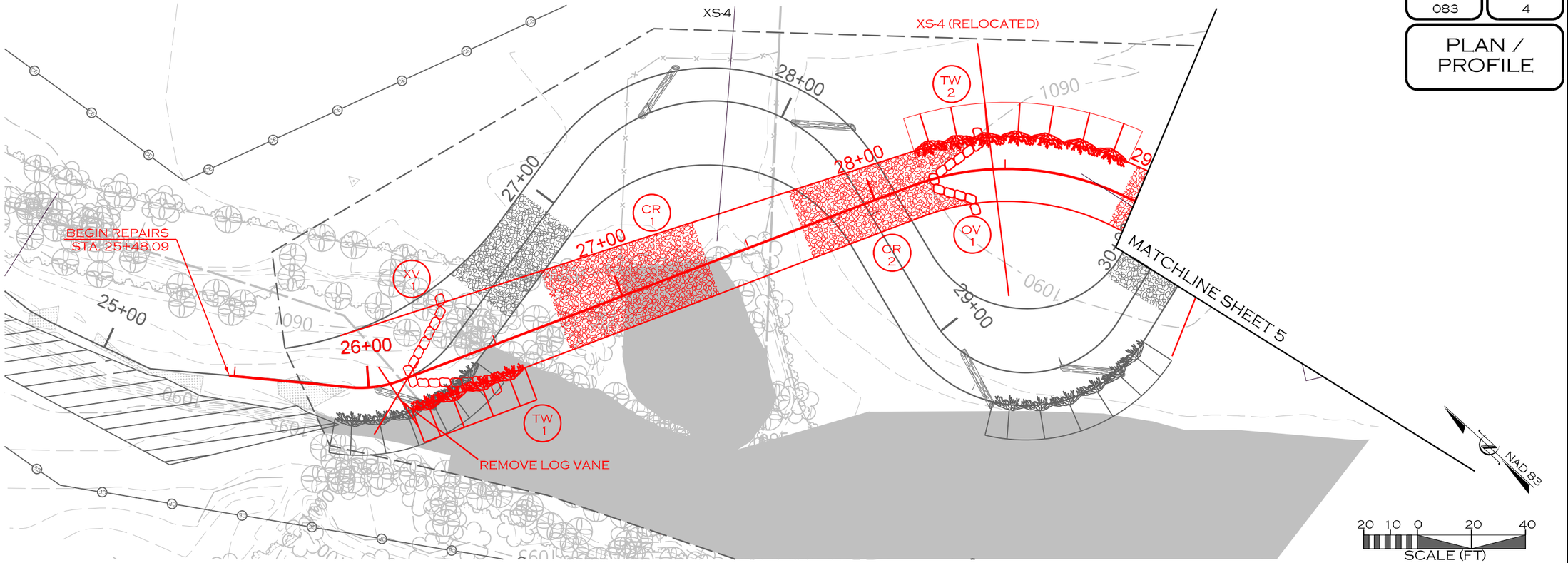

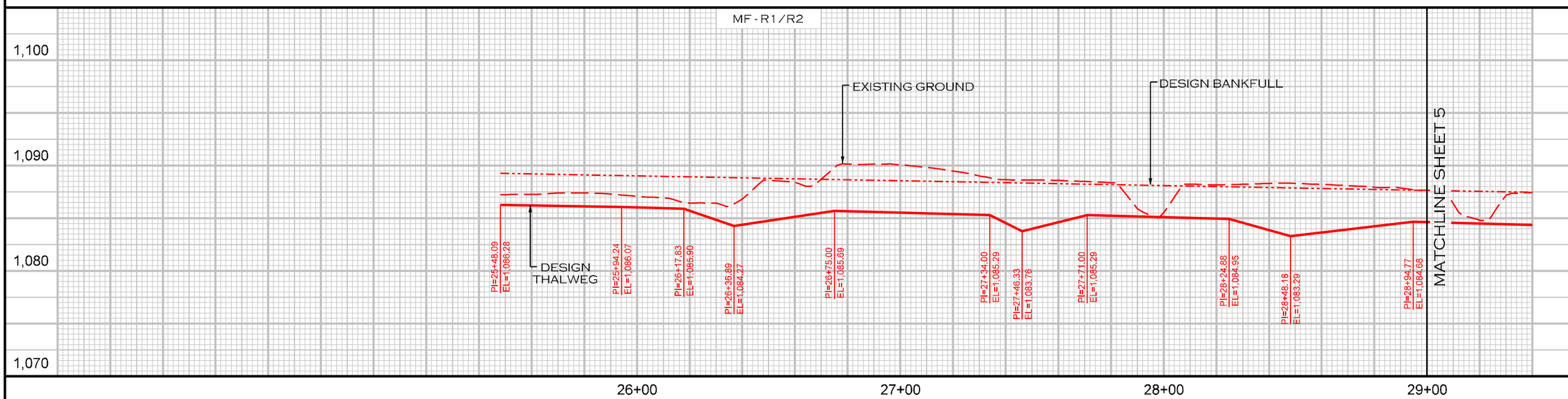

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PROJECT #	SHEET NO.
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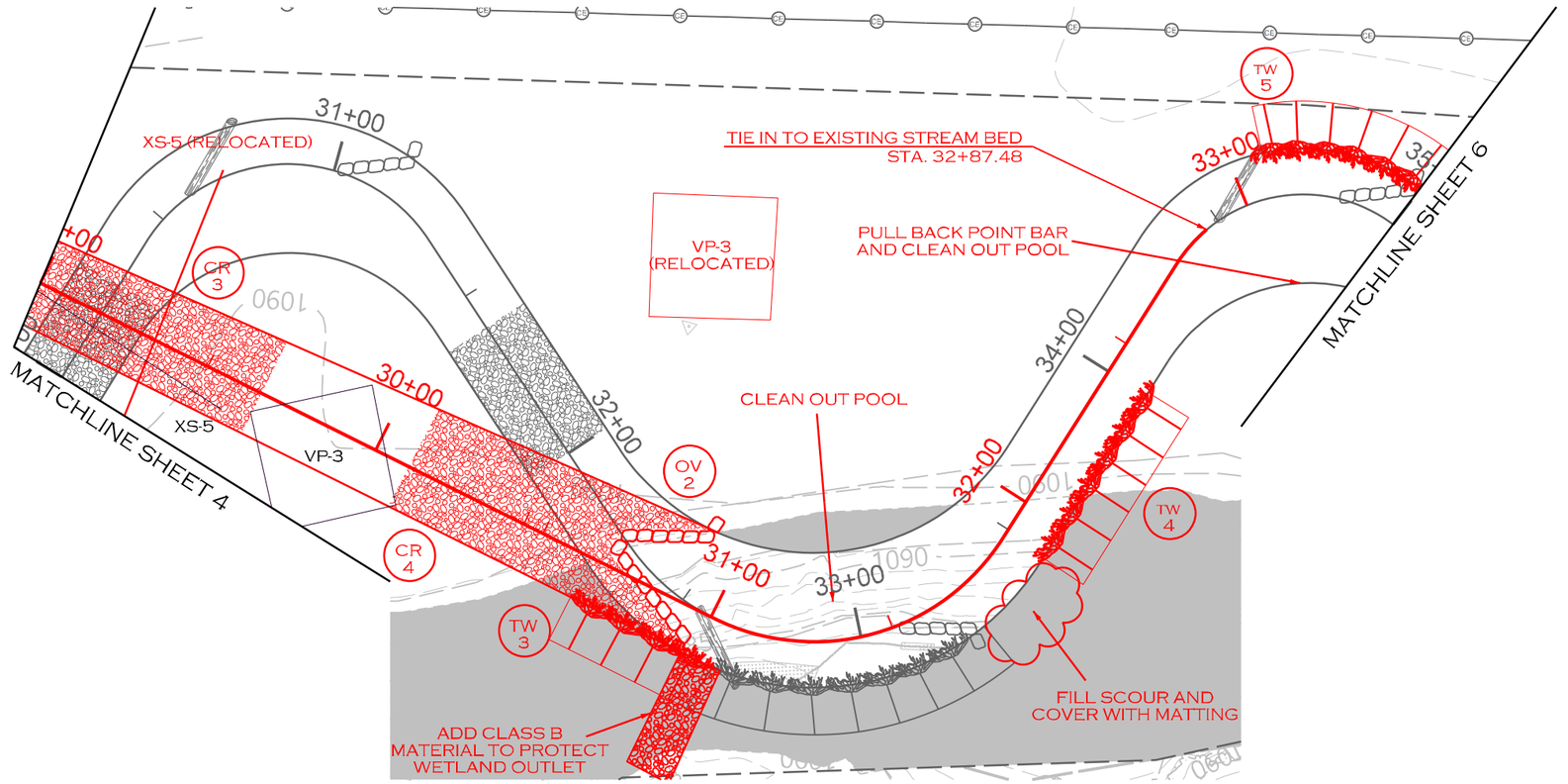

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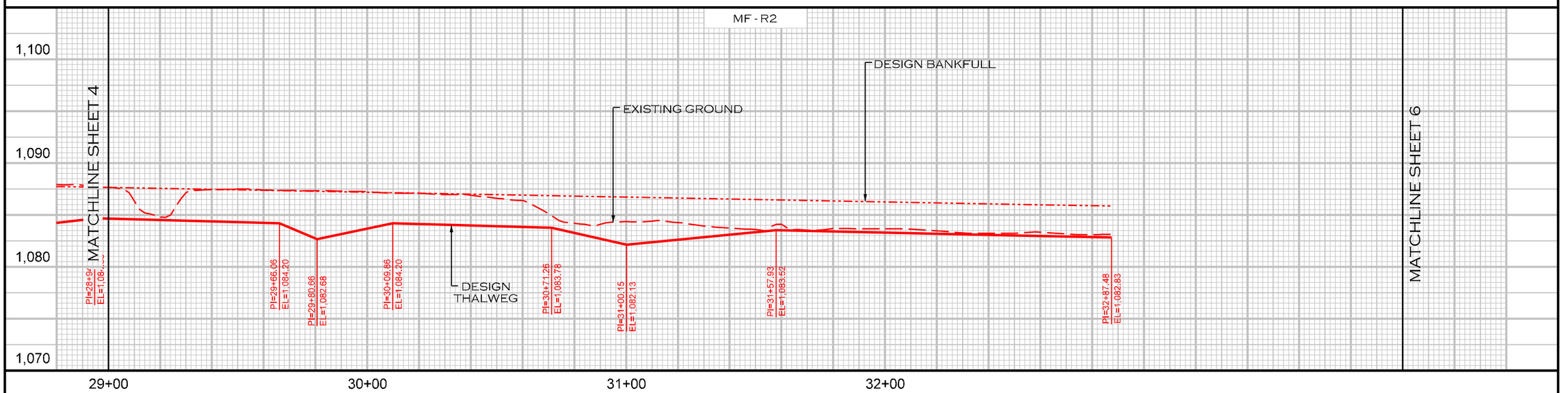

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NO.	DESCRIPTION	ENGR.	APPROV.	DATE
1	ADAPTIVE MANAGEMENT PLAN	EB	KLT	5/4/22

PREPARED FOR:
NC Mitigation Services
NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NC 27699-1652

STEWARTS CREEK TRIBUTARIES PROJECT
SURRY COUNTY, NC

PREPARED IN THE OFFICE OF:
EPR ECOSYSTEM PLANNING & RESTORATION
1150 SE MAYNARD RD, SUITE 140
CARY, NC 27511
LICENSE # P-1182

PROJECT ENGINEER

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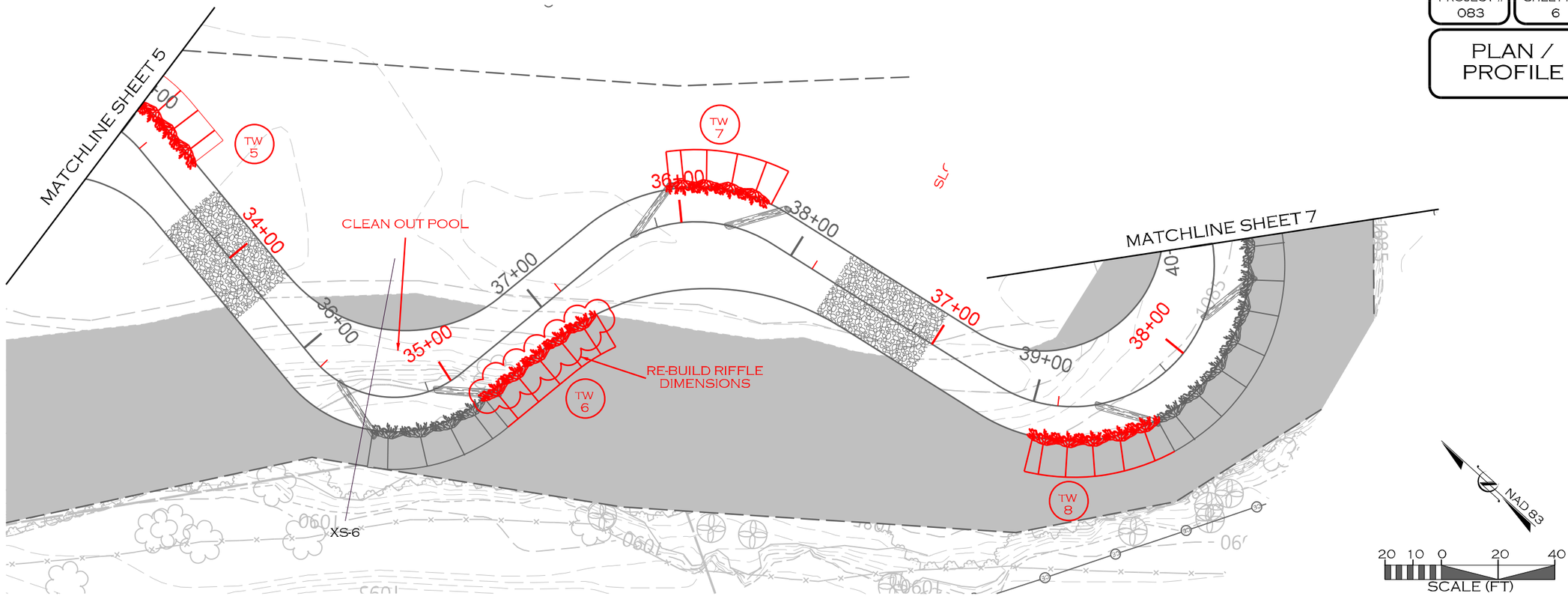
PROJECT # 083 | SHEET NO. 6

PLAN / PROFILE



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REVISIONS				
NO.	DESCRIPTION	ENGR.	APPROV.	DATE
1	ADAPTIVE MANAGEMENT PLAN	EB	KLT	5/4/22

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DIVISION OF MITIGATION SERVICES
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RALEIGH, NC 27699-1652

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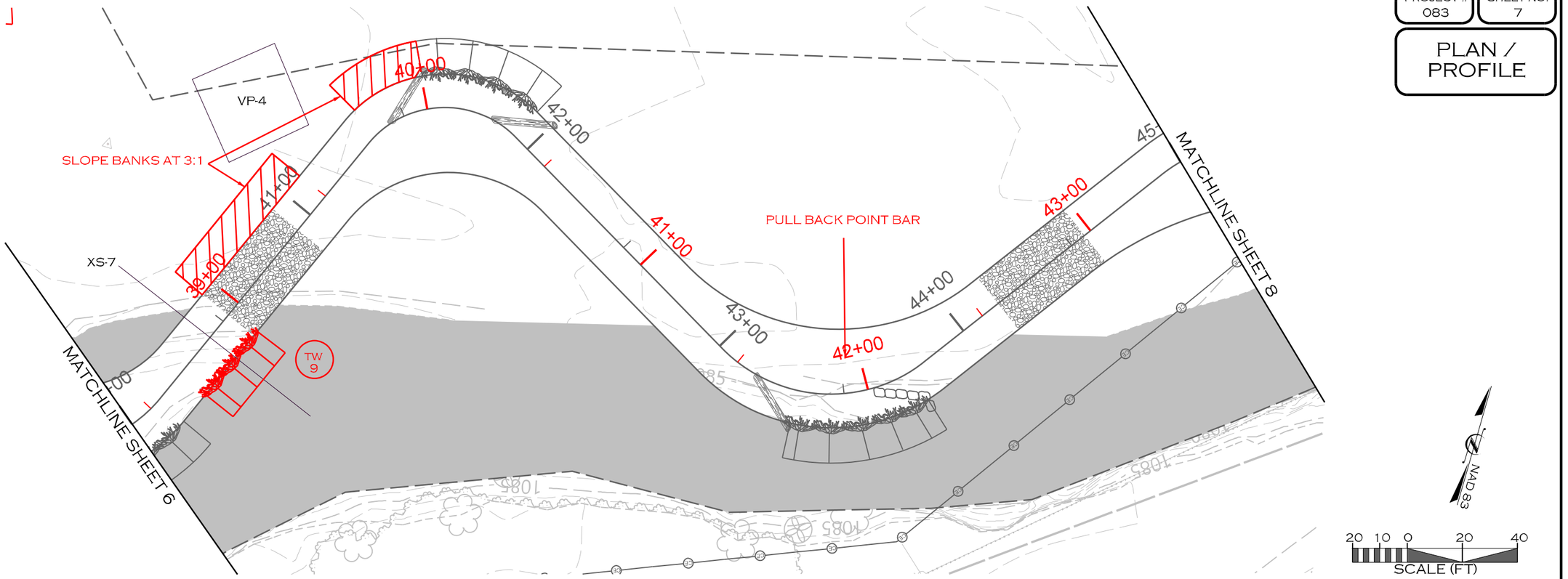
PROJECT # 083 | SHEET NO. 7

PLAN / PROFILE



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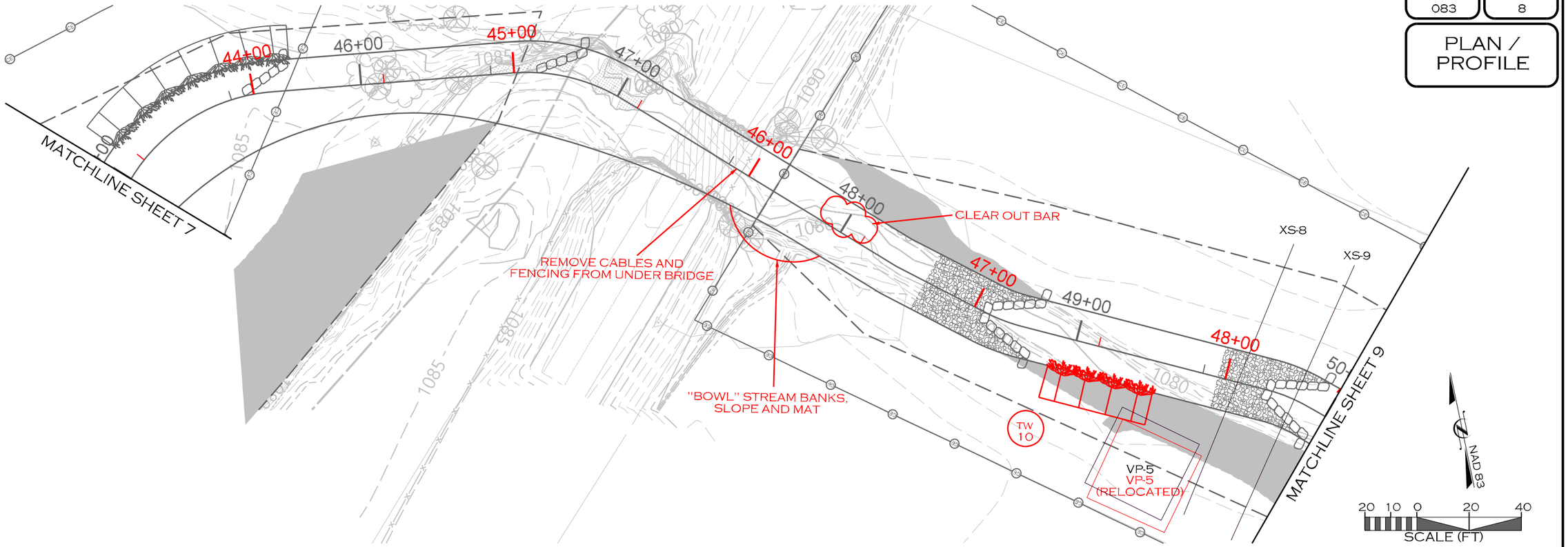
BWATERS

PROJECT # 083 | SHEET NO. 8

PLAN / PROFILE



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NO.	DESCRIPTION	ENGR.	APPROV.	DATE
1	ADAPTIVE MANAGEMENT PLAN	EB	KLT	5/4/22

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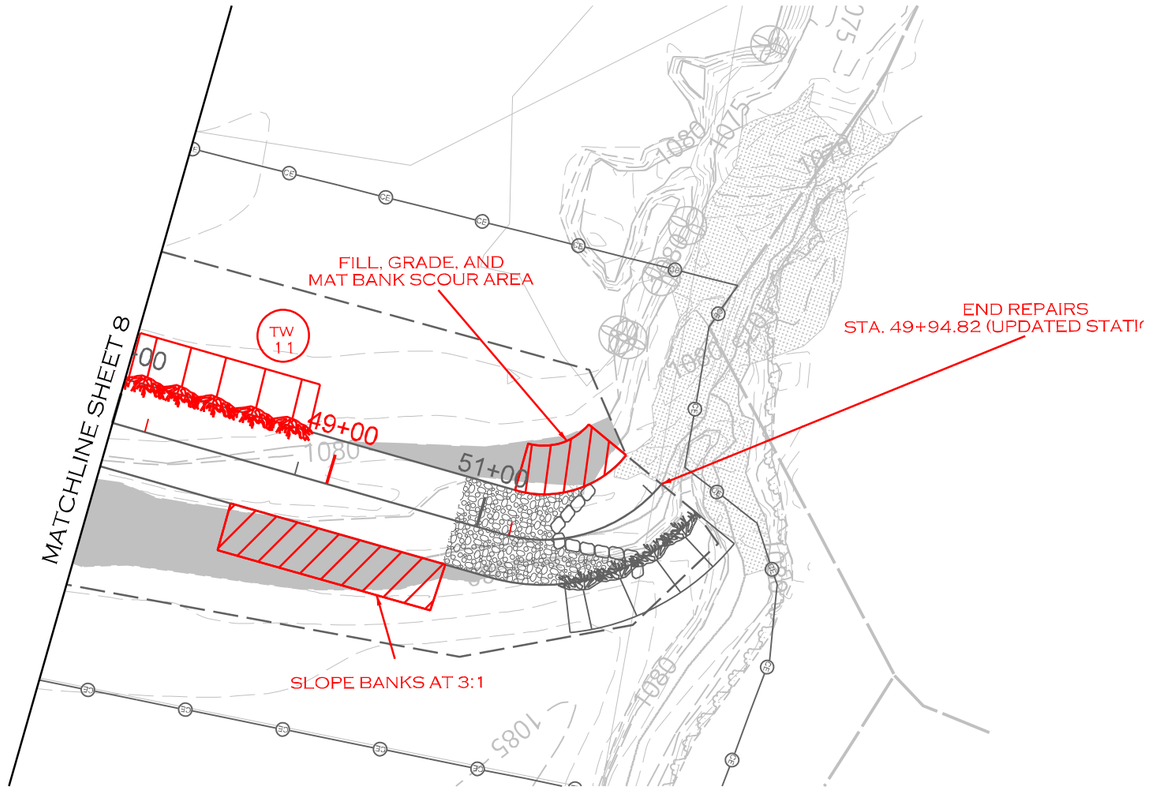
BWATERS

PROJECT # 083 | SHEET NO. 9

PLAN / PROFILE



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NO.	DESCRIPTION	ENGR.	APPROV.	DATE
1	ADAPTIVE MANAGEMENT PLAN	EB	KLT	5/4/22

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BWATERS

Appendix B: Visual Assessment Data

Table 4. Monitoring Year 2 Visual Stream Morphology Stability Assessment Table

Table 5. Monitoring Year 2 Vegetation Condition Assessment Table

Areas of Corrective Action Photo Log

Monitoring Year 2 Vegetation Photo Log

Table 4a. Visual Stream Morphology Stability Assessment Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Reach ID	**Moores Fork - Reach 2**
Dates Visually Assessed	**11/04/21 and 11/16/21**
Assessed Stream Length (ft)	**2194.5**
Assessed Bank Length (ft)	**4389**

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			1310	70%
				Totals	1310	70%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	7	7		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	30	33		91%

Table 4b. Visual Stream Morphology Stability Assessment Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Reach ID	**Moores Fork - Reach 3**
Dates Visually Assessed	**11/04/21 and 11/16/21**
Assessed Stream Length (ft)	**386**
Assessed Bank Length (ft)	**772**

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			33	96%
				Totals	33	96%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	6	6		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	2	2		100%

Table 5. Vegetation Condition Assessment Table
Stewarts Creek Tributaries Mitigation Project (DMS No.100023)

Dates Visually Assessed **09/15/21 and 09/24/21**

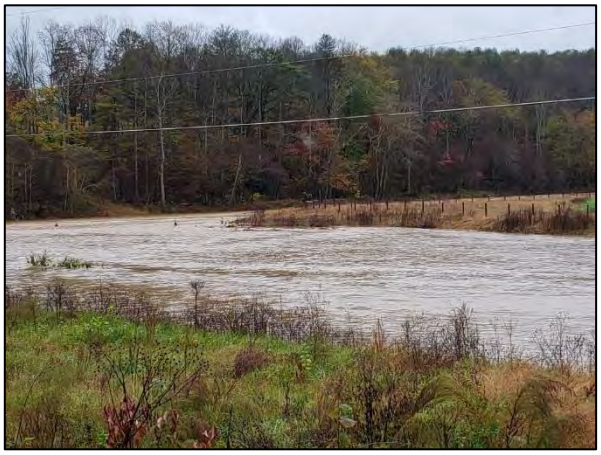
Planted Acreage **24.2**

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.1 acres	0.00	0.0%
		Total	0.00	0.0%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.25 acres	0.00	0.0%
		Cumulative Total	0.00	0.0%

Easement Acreage **30**

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Species included in summation above should be identified in report summary.	0.1 acres	0.10	0.3%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	None	0.0	0.0%

Stewarts Creek Tributaries Stream Restoration Project
Adaptive Management Plan - Photo Log*



Moores Fork Reach 2 - Hurricane Zeta Flooding - MY1 (10/30/2020)

Drone Photo – Moores Fork Reach 2 (4/20/2021)

Photo Point 5 – Moores Fork Reach 2, Sta. 25+61
Facing Downstream - MY0 (6/11/2020)

Photo Point 5 – Moores Fork Reach 2, Sta. 25+61
Facing Downstream -MY1 (11/3/2020)

Photo Point 5 – Moores Fork Reach 2, Sta. 25+61
Facing Downstream – MY2 (11/16/2021)

Photo Point 6 – Moores Fork Reach 2, Sta. 27+97
Facing Downstream – MY0 (06/11/2020)

Stewarts Creek Tributaries Stream Restoration Project
Adaptive Management Plan - Photo Log

Photo Point 6 – Moores Fork Reach 2, Sta. 27+97
Facing Downstream – MY1 (11/3/2020)

Photo Point 6 – Moores Fork Reach 2, Sta. 27+97
Facing Downstream – MY2 (11/16/2021)

Cross Section 4 – Moores Fork Reach 2, Sta. 27+79
Facing Downstream – MY0 (6/11/2020)

Cross Section 4 – Moores Fork Reach 2, Sta. 27+79
Facing Downstream – MY1 (10/15/2020)

Cross Section 4 – Moores Fork Reach 2, Sta. 27+79
Facing Downstream – MY2 (11/16/2021)

Cross Section 5 – Moores Fork Reach 2, Sta. 30+16
Facing Downstream – MY0 (6/11/2020)

Stewarts Creek Tributaries Stream Restoration Project
Adaptive Management Plan - Photo Log

Cross Section 5 – Moores Fork Reach 2, Sta. 30+16
Facing Downstream – MY1 (10/15/2020)

Cross Section 5 – Moores Fork Reach 2, Sta. 30+16
Facing Downstream – MY2 (11/16/2021)

Moores Fork Reach 2 - Additional Flooding – MY2
(6/14/2021)

Moores Fork Additional Fencing Off Race Track Road
MY3 (5/20/2022)

Moores Fork Reach 3, Sta. 49+00
RB Erosion – MY3 (4/13/2022)

Moores Fork Reach 3, Sta. 51+25
LB Erosion – MY2 (11/4/2021)

Site Overview – Moore's Fork Reach 2 (11/16/2021)

Site Overview – Moore's Fork Reach 3 (2/12/2022)

* All station references in the photo log refer to MY2 stationing. The stationing has been updated in the AMP.

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 2 - Vegetation Photo Log

Veg Plot 3 – N Corner (9/15/2021)

Veg Plot 4 – S Corner (9/15/2021)

Veg Plot 5 – S Corner (9/15/2021)

Random Veg Plot 1 – (9/15/2021)

Random Veg Plot 2 – (9/15/2021)

Random Veg Plot 3 – (9/15/2021)

Stewarts Creek Tributaries Stream Restoration Project
Monitoring Year 2 - Vegetation Photo Log

Random Veg Plot 4 – (9/15/2021)

Random Veg Plot 5 – (9/15/2021)

Appendix D: Vegetation Plot Data

Table 6. Monitoring Year 2 Vegetation Plot Data

Table 7. Monitoring Year 2 Vegetation Performance Standards Summary Table

Table 6a. Vegetation Performance Standards Summary Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Planted Acreage	24.2
Date of Initial Plant	2020-03-31
Date(s) of Supplemental Plant(s)	2020-11-03
Date(s) Mowing	#N/A
Date of Current Survey	2021-09-24
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	VPF-3		VPF-4		VPF-5	
					Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Alnus serrulata	hazel alder	Tree	OBL						
	Betula nigra	river birch	Tree	FACW	2	2	6	6	2	2
	Carya glabra	pignut hickory	Tree	FACU	1	1				
	Carya tomentosa	mockernut hickory	Tree							
	Cornus amomum	silky dogwood	Shrub	FACW					1	1
	Diospyros virginiana	common persimmon	Tree	FAC			1	1	1	1
	Fraxinus pennsylvanica	green ash	Tree	FACW						
	Liriodendron tulipifera	tuliptree	Tree	FACU						
	other									
	Platanus occidentalis	American sycamore	Tree	FACW	3	3	2	2	1	1
	Quercus alba	white oak	Tree	FACU						
	Quercus nigra	water oak	Tree	FAC	1	1	1	1	2	2
	Quercus phellos	willow oak	Tree	FAC	1	1	2	2		
	Quercus rubra	northern red oak	Tree	FACU						
	Salix nigra	black willow	Tree	OBL			1	1	5	5
	Ulmus americana	American elm	Tree	FACW	1	1	4	4		
Sum	Performance Standard				9	9	17	17	12	12
Mitigation Plan Performance Standard	Current Year Stem Count					9		17		12
	Stems/Acre					364		688		486
	Species Count					6		7		6
	Dominant Species Composition (%)					33		35		42
	Average Plot Height					3		2		3
	% Invasives					0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					9		17		12
	Stems/Acre					364		688		486
	Species Count					6		7		6
	Dominant Species Composition (%)					33		35		42
	Average Plot Height					3		2		3
	% Invasives					0		0		0

Meets Interim Performance Criteria | **Does Not Meet Interim Performance Criteria**

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 6b. Vegetation Performance Standards Summary Table (continued)
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Planted Acreage	24.2
Date of Initial Plant	2020-03-31
Date(s) of Supplemental Plant(s)	2020-11-03
Date(s) Mowing	#N/A
Date of Current Survey	2021-09-24
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	VPR-1 Total	VPR-2 Total	VPR-3 Total	VPR-4 Total	VPR-5 Total
Species Included in Approved Mitigation Plan	Alnus serrulata	hazel alder	Tree	OBL	1				
	Betula nigra	river birch	Tree	FACW	4	2	3	3	5
	Carya glabra	pignut hickory	Tree	FACU					
	Carya tomentosa	mockernut hickory	Tree						
	Cornus amomum	silky dogwood	Shrub	FACW	1	2			
	Diospyros virginiana	common persimmon	Tree	FAC		1		1	
	Fraxinus pennsylvanica	green ash	Tree	FACW	1			1	
	Liriodendron tulipifera	tuliptree	Tree	FACU					
	other				1		1		
	Platanus occidentalis	American sycamore	Tree	FACW	1	4	4	4	
	Quercus alba	white oak	Tree	FACU					
	Quercus nigra	water oak	Tree	FAC		2	2		1
	Quercus phellos	willow oak	Tree	FAC		1		1	1
	Quercus rubra	northern red oak	Tree	FACU					
	Salix nigra	black willow	Tree	OBL	1				
	Ulmus americana	American elm	Tree	FACW	2	1	3	1	1
Sum	Performance Standard				12	13	13	11	8
Mitigation Plan Performance Standard	Current Year Stem Count				12	13	13	11	8
	Stems/Acre				486	526	526	445	324
	Species Count				8	7	5	6	4
	Dominant Species Composition (%)				33	31	31	36	62
	Average Plot Height				1	1	2	2	1
	% Invasives				0	0	0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count				12	13	13	11	8
	Stems/Acre				486	526	526	445	324
	Species Count				8	7	5	6	4
	Dominant Species Composition (%)				33	31	31	36	62
	Average Plot Height				1	1	2	2	1
	% Invasives				0	0	0	0	0

Meets Interim Performance Criteria | **Does Not Meet Interim Performance Criteria**

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan

Table 7. Vegetation Performance Standards Summary Table
Stewarts Creek Tributaries Stream Restoration Project (DMS No.100023)

Vegetation Performance Standards Summary Table												
	VPF-3				VPF-4				VPF-5			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	364	3	6	0	688	2	7	0	486	3	6	0
Monitoring Year 1	202	2	4	0	648	2	8	0	567	2	8	0
Monitoring Year 0	364	2	5	0	688	2	9	0	486	2	7	0
	VPR-1				VPR-2				VPR-3			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	486	1	8	0	526	1	7	0	526	2	5	0
Monitoring Year 1	405	2	6	0	526	2	5	0	364	2	4	0
Monitoring Year 0												
	VPR-4				VPR-5							
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives				
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	445	2	6	0	324	1	4	0				
Monitoring Year 1	364	2	4	0	486	2	5	0				
Monitoring Year 0												

Appendix C: Stream Geomorphology Data

Cross Sections with Annual Overlays

Table 8. Baseline Stream Data Summary

Table 9. Cross Section Morphology Monitoring Summary

Cross Section Plot - MY2 - November 2021

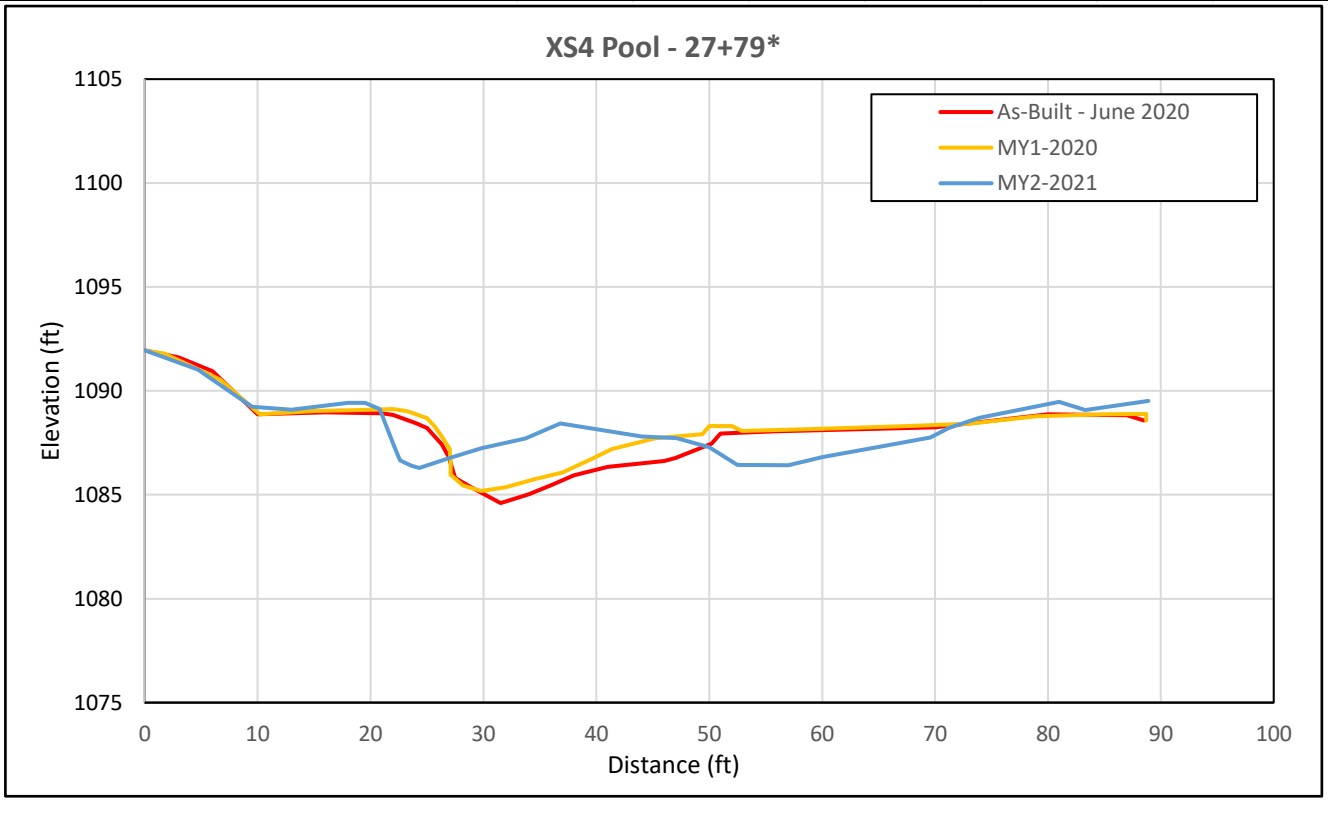
XS4 - Moores Fork Reach 2

Station 27+79 - Pool*

XS4 looking upstream

XS4 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1087.94	1088.59	1088.26				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.80	1.61				
Thalweg Elevation	1084.60	1085.18	1086.29				
LTOB Elevation	1087.94	1087.91	1089.47				
LTOB Max Depth	3.34	2.73	3.18				
LTOB Cross Sectional Area	47.12	31.39	115.69				
Entrenchment Ratio	N/A	N/A	N/A				



* Stationing from MY2. The cross section location and stationing has been updated in the AMP.

Cross Section Plot - MY2 - November 2021

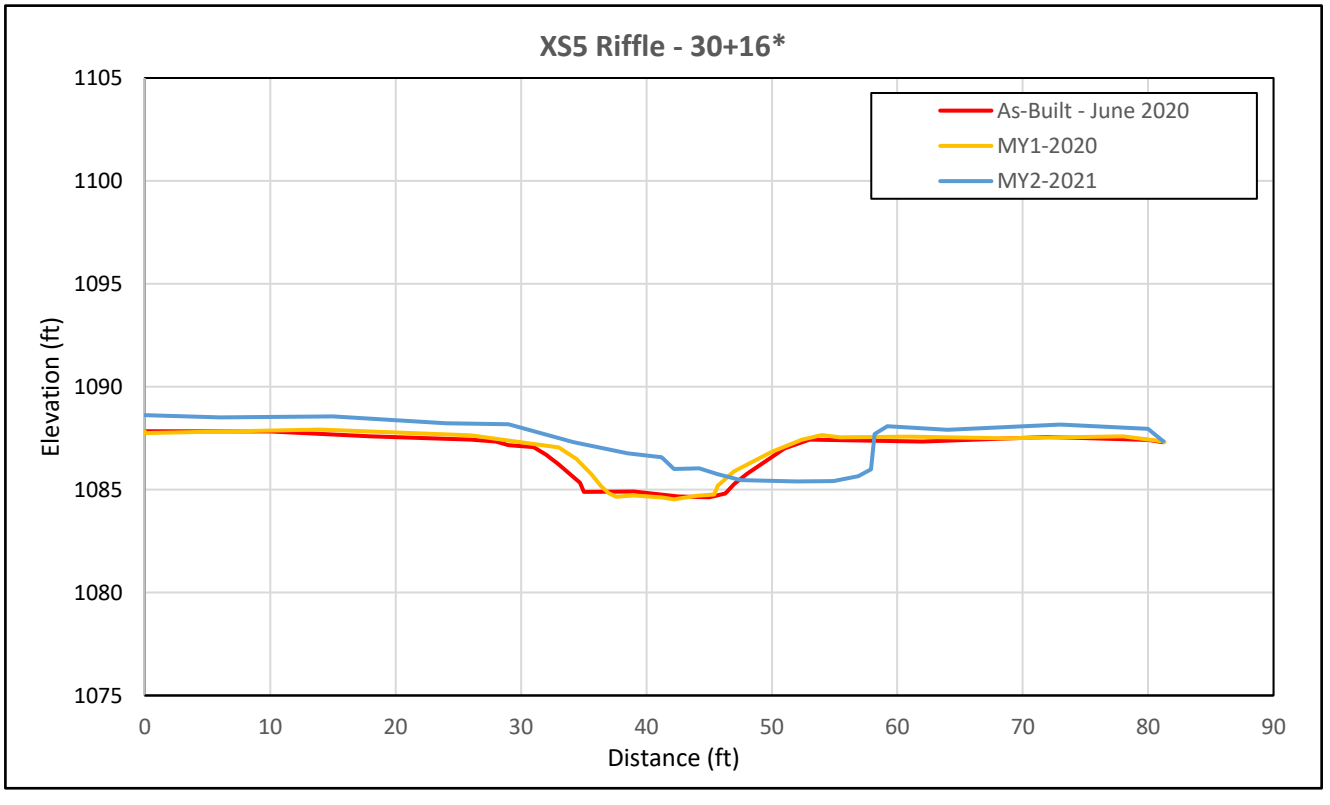
XS5 - Moores Fork Reach 2

Station 30+16 - Riffle*

XS5 looking upstream

XS5 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1087.06	1087.32	1087.50				
Bank Height Ratio - Based on AB-Bankfull Area	1.11	1.04	1.10				
Thalweg Elevation	1084.63	1084.53	1085.47				
LTOB Elevation	1087.34	1087.43	1087.70				
LTOB Max Depth	2.71	2.90	2.23				
LTOB Cross Sectional Area	40.53	36.65	39.54				
Entrenchment Ratio	>4.01	>4.55	>3.69				



* Stationing from MY2. The cross section location and stationing has been updated in the AMP.

Cross Section Plot - MY2 - November 2021

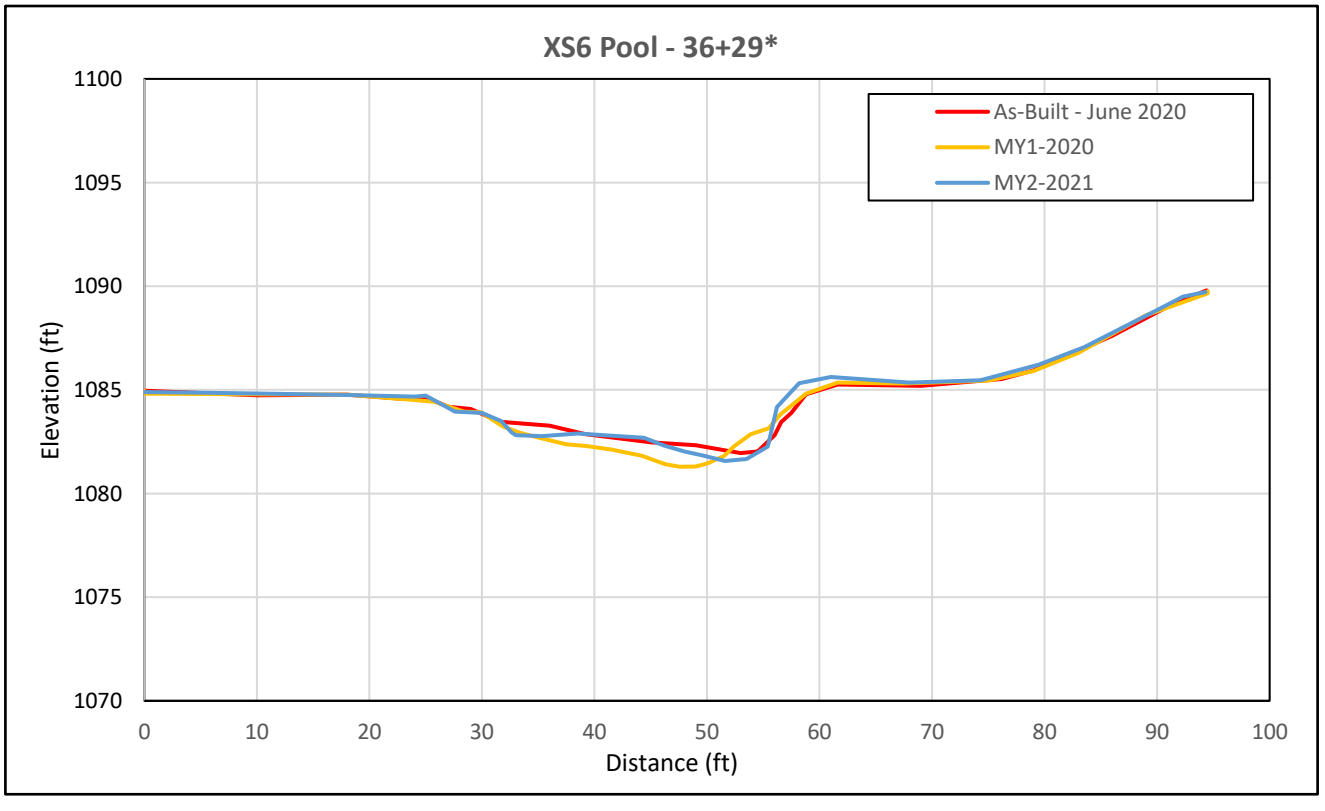
XS6 - Moores Fork Reach 2

Station 36+29 - Pool*

XS6 looking upstream

XS6 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1084.62	1084.29	1084.51				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.08	1.07				
Thalweg Elevation	1081.95	1081.29	1081.57				
LTOB Elevation	1084.62	1084.54	1084.72				
LTOB Max Depth	2.67	3.25	3.15				
LTOB Cross Sectional Area	53.58	61.60	60.33				
Entrenchment Ratio	N/A	N/A	N/A				



* Stationing from MY2. The stationing has been updated in the AMP.

Cross Section Plot - MY2 - November 2021

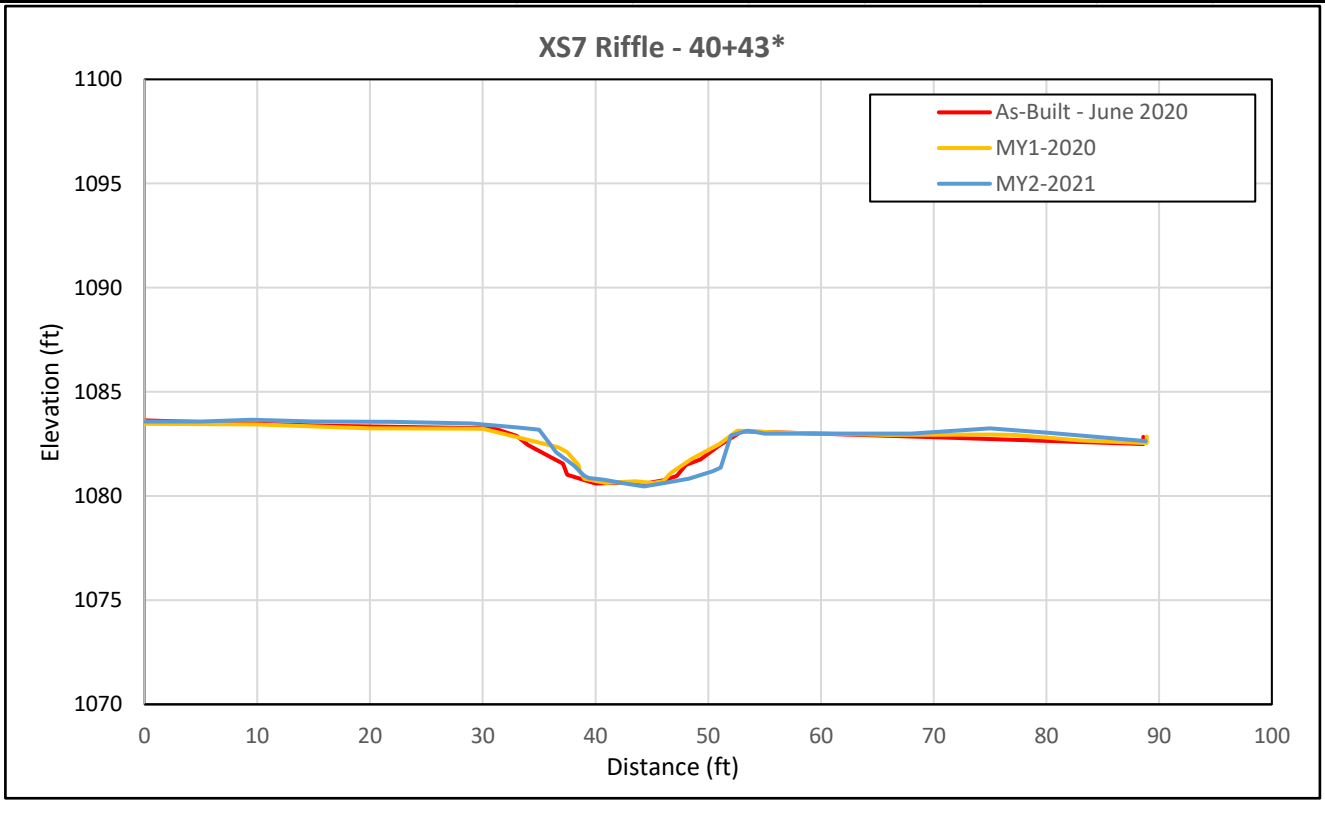
XS7 - Moores Fork Reach 2

Station 40+43 - Riffle*

XS7 looking upstream

XS7 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1083.10	1083.29	1083.10				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.94	1.01				
Thalweg Elevation	1080.56	1080.63	1080.46				
LTOB Elevation	1083.10	1083.13	1083.13				
LTOB Max Depth	2.54	2.50	2.67				
LTOB Cross Sectional Area	33.72	30.17	34.27				
Entrenchment Ratio	>4.14	>4.07	>4.88				



* Stationing from MY2. The stationing has been updated in the AMP.

Cross Section Plot - MY2 - November 2021

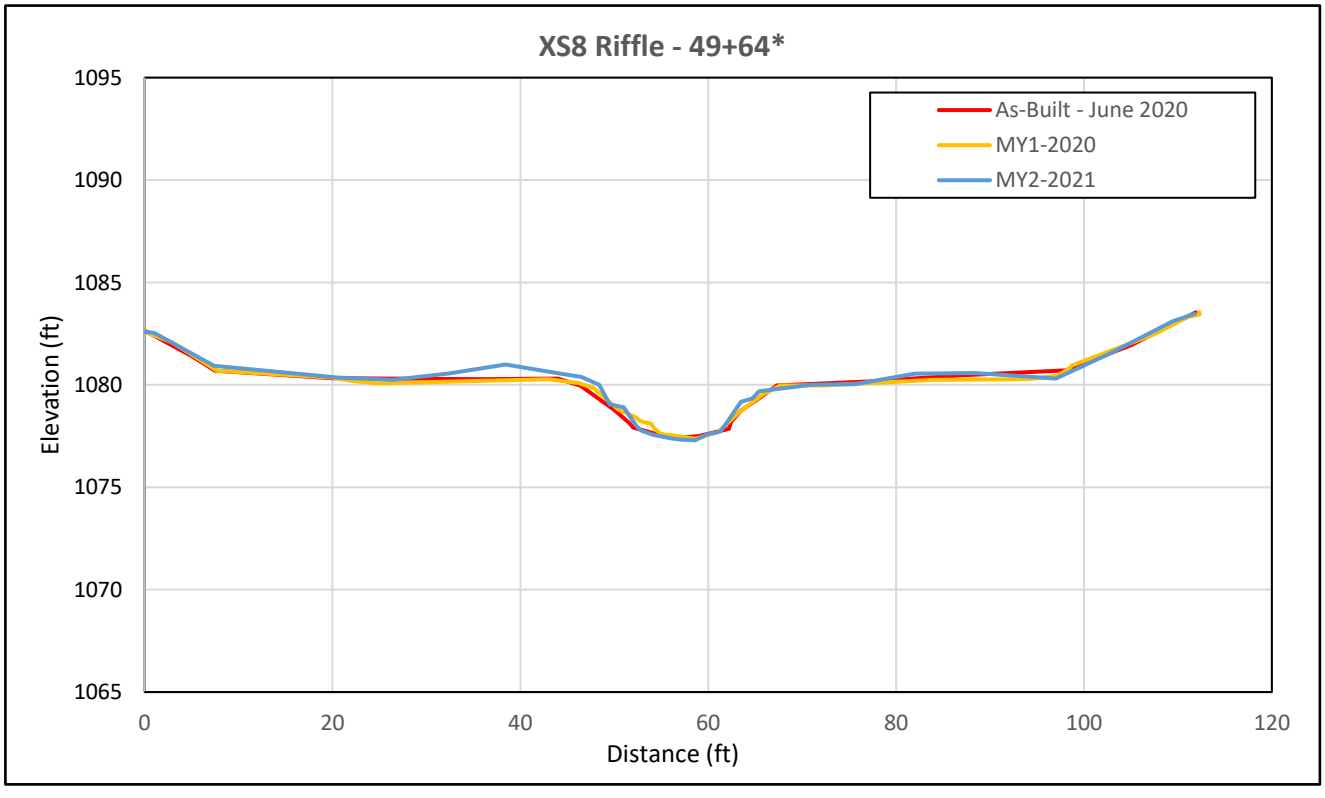
XS8 - Moores Fork Reach 3

Station 49+64 - Riffle*

XS8 looking upstream

XS8 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1079.97	1080.11	1080.17				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.95	0.83				
Thalweg Elevation	1077.41	1077.37	1077.29				
LTOB Elevation	1079.97	1079.97	1079.68				
LTOB Max Depth	2.56	2.60	2.39				
LTOB Cross Sectional Area	33.89	31.07	25.77				
Entrenchment Ratio	5.12	5.20	6.42				



* Stationing from MY2. The stationing has been updated in the AMP.

Cross Section Plot - MY2 - November 2021

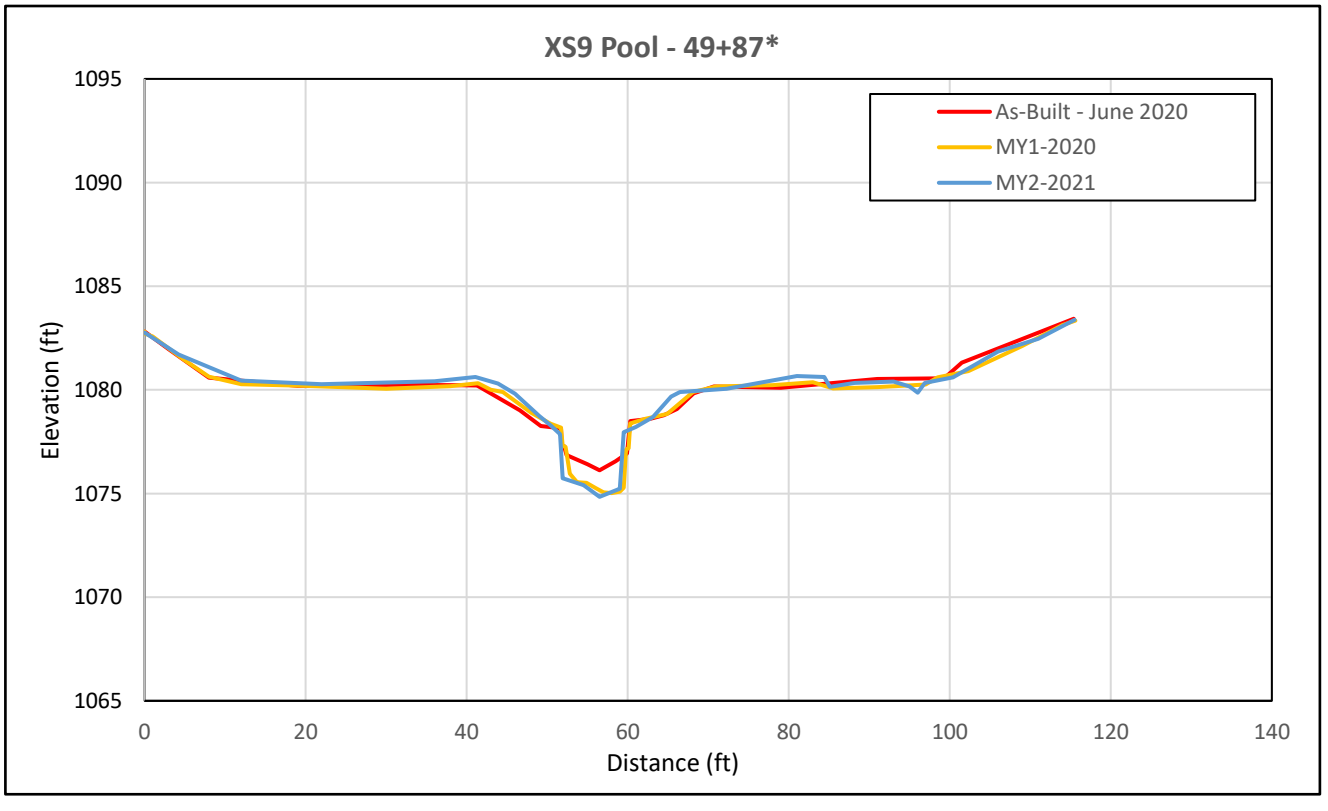
XS9 - Moores Fork Reach 3

Station 49+87 - Pool*

XS9 looking upstream

XS9 looking downstream

	MY0	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Elevation - Based on AB Bankfull Area	1080.16	1079.98	1080.07				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.04	0.97				
Thalweg Elevation	1076.12	1075.02	1074.84				
LTOB Elevation	1080.16	1080.16	1079.90				
LTOB Max Depth	4.04	5.14	5.06				
LTOB Cross Sectional Area	52.58	57.57	49.07				
Entrenchment Ratio	N/A	N/A	N/A				



* Stationing from MY2. The stationing has been updated in the AMP.

Table 8a. Baseline Stream Data Summary
Stewarts Creek Tributaries Stream Restoration Project (DMS No. 100023) - Moores Fork R2 (2035.7 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only	LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	20	30	22.5	28.5	30.8	30.8	33.0	-	2	21.9	23.9	-	25.9	-	-	21.9	23.9	25.9	20.2	20.7	20.7	21.3	-	2
Floodprone Width (ft)				45.0	45.5	45.5	46.0	-	2	52.6	74.1	-	95.6	-	-	52.6	74.1	95.6	81.2	>88.6	>88.6	>88.6	-	2
Bankfull Mean Depth (ft)	1.8	3	2.4	1.4	1.6	1.6	1.7	-	2	1.6	2.1	-	2.6	-	-	1.6	2.1	2.6	1.6	1.6	1.6	1.7	-	2
[1]Bankfull Max Depth (ft)				2.1	2.3	2.3	2.5	-	2	1.2	1.3	-	1.4	-	-	2.3	3.0	3.8	2.4	2.5	2.5	2.5	-	2
Bankfull Cross Sectional Area (ft^2)	40	50	47.8	47.0	47.9	47.9	48.8	-	2	35.0	51.2	-	67.3	-	-	47.7	47.7	47.7	33.7	33.9	33.9	34.1	-	2
Width/Depth Ratio				16.6	19.9	19.9	23.2	-	2	10.0	12.0	-	14	-	-	10.0	12.0	14.0	12.0	12.7	12.7	13.4	-	2
Entrenchment Ratio				1.4	1.5	1.5	1.6	-	2	2.2	3.1	-	4.0	-	-	2.2	3.1	4.0	4.0	>4.14	>4.14	>4.14	-	2
[1]Bank Height Ratio				2.7	2.9	2.9	3.0	-	2	1.0	1.0	-	1	-	-	1.0	1.05	1.1	1.0	1.1	1.1	1.1	-	2
Profile																								
Riffle Length (ft)				15.3	66.6	53.7	179.0	50.1	9	Total riffle length 60-70% of reach length						29.0	121.0	167.0	73.6	113.0	118.1	169.4	28.7	13
Riffle Slope (ft/ft)				0.006	0.011	0.007	0.024	0.007	9	-	-	-	-	-	-	0.004	0.005	0.007	0.004	0.005	0.006	0.007	7.7E-04	13
Pool Length (ft)				15.3	71.2	71.6	147.0	38.6	9	Total pool length 30-40% of reach length						26.0	45.0	67.0	38.0	57.5	59.0	67.0	7.1	13
Pool Max depth (ft)				0.8	3.1	3.1	1.4	0.2	2	3.2	6.2	-	9.1	-	-	4.2	4.6	7.3	2.7	3.3	3.4	3.8	0.3	13
Pool Spacing (ft)				54.0	122.7	89.1	287.6	70.2	13	95.6	131.5	-	167.3	-	-	96.0	143.5	191.0	134.0	178.7	173.0	271.0	36.6	12
Pattern																								
Channel Beltwidth (ft)				47.4	85.9	75.3	174.1	40.2	9	83.7	137.4	-	191.2	-	-	83.7	137.5	191.2	83.7	126.2	126.7	176.7	24.8	10
Radius of Curvature (ft)				33.7	86.3	88.7	159.1	37.1	9	47.8	65.7	-	83.7	-	-	47.8	65.8	83.7	46.4	60.8	60.4	81.4	12.0	13
Rc:Bankfull width (ft/ft)				1.1	2.8	2.9	5.2	1.2	9	2.0	2.8	-	3.5	-	-	2.0	2.8	3.5	2.2	2.9	2.9	3.9	0.6	13
Meander Wavelength (ft)				214.5	296.9	303.9	414.1	75.2	9	167.3	227.1	-	286.8	-	-	167.3	138.1	286.8	188.0	246.7	243.5	304.0	33.2	10
Meander Width Ratio				7.0	9.7	9.9	13.5	2.4	9	3.5	5.8	-	8.0	-	-	3.5	5.8	8.0	4.0	6.1	6.1	8.5	1.6	10
Transport parameters																								
Reach Shear Stress (competency) lb/f^2				0.4												0.46			0.39					
Max part size (mm) mobilized at bankfull				90												90			76					
Stream Power (transport capacity) lb/s				37												35			37					
Additional Reach Parameters																								
Rosgen Classification				F4						C4						C4			C4					
Bankfull Velocity (fps)	2.5	20.0	5.4	3.1												3.1			3.1					
Bankfull Discharge (cfs)	100	800	259.8	150												150								
Valley length (ft)				1808						-						1700								
Channel Thalweg length (ft)				2007						-						2017.3			2017.3					
Sinuosity (ft)				1.11						1.2 to 1.4						1.19			1.19					
Water Surface Slope (Channel) (ft/ft)				0.004						-						0.004			0.004					
BF slope (ft/ft)				0.004						-						0.004			0.004					
[3]Bankfull Floodplain Area (acres)				1.9						-						2.9			2.9					
[4]% of Reach with Eroding Banks				30%						-														
Channel Stability or Habitat Metric				0.26						-														
Biological or Other				-						-														

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 8b. Baseline Stream Data Summary
Stewarts Creek Tributaries Stream Restoration Project (DMS No. 100023) - Moores Fork R3 (384 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only	LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	20	30	22.5	22.8	22.8	22.8	22.8	-	1	21.9	23.9	-	25.9	-	-	21.9	23.9	25.9	20.9	20.9	20.9	20.9	-	1
Floodprone Width (ft)				144.4	144.4	144.4	144.4	-	1	52.6	74.1	-	95.6	-	-	52.6	74.1	95.6	106.9	106.9	106.9	106.9	-	1
Bankfull Mean Depth (ft)	1.8	3	2.4	2.3	2.3	2.3	2.3	-	1	1.6	2.1	-	2.6	-	-	1.6	2.1	2.6	1.6	1.6	1.6	1.6	-	1
[1]Bankfull Max Depth (ft)				3.2	3.2	3.2	3.2	-	1	1.2	1.3	-	1.4	-	-	2.3	3.0	3.8	2.6	2.6	2.6	2.6	-	1
Bankfull Cross Sectional Area (ft^2)	40	50	47.8	52.4	52.4	52.4	52.4	-	1	35.0	51.2	-	67.3	-	-	47.7	47.7	47.7	33.7	33.7	33.7	33.7	-	1
Width/Depth Ratio				9.9	9.9	9.9	9.9	-	1	10.0	12.0	-	14	-	-	10.0	12.0	14.0	13.0	13.0	13.0	13.0	-	1
Entrenchment Ratio				6.3	6.3	6.3	6.3	-	1	2.2	3.1	-	4.0	-	-	2.2	3.1	4.0	5.0	5.0	5.0	5.0	-	1
[1]Bank Height Ratio				1.4	1.4	1.4	1.4	-	1	1.0	1.0	-	1	-	-	1.0	1.05	1.1	1.0	1.0	1.0	1.0	-	1
Profile																								
Riffle Length (ft)				24.5	45.0	44.1	67.2	21.3	4	Total riffle length 60-70% of reach length						29.0	121.0	167.0	20.0	63.7	54.2	126.7	41.7	4
Riffle Slope (ft/ft)				0.003	0.009	0.008	0.016	0.006	4	-	-	-	-	-	-	0.004	0.005	0.007	0.004	0.006	0.005	0.011	0.003	4
Pool Length (ft)				16.4	41.4	33.6	92.0	30.0	5	Total pool length 30-40% of reach length						26.0	45.0	67.0	30	40	40	50	8.6	4
Pool Max depth (ft)				0.8	4.6	4.6	1.4	-	1	3.2	6.2	-	9.1	-	-	4.2	4.6	7.3	2.1	3.2	3.4	4.0	0.7	4
Pool Spacing (ft)				21.6	67.1	70.2	101.5	30.6	8	95.6	131.5	-	167.3	-	-	96.0	143.5	191.0	77.0	107.5	100.0	153.0	28.5	4
Pattern																								
Channel Beltwidth (ft)				23.2	30.8	28.1	53.7	8.9	10	83.7	137.4	-	191.2	-	-	83.7	137.5	191.2	63.9	63.9	63.9	63.9	-	1
Radius of Curvature (ft)				17.0	26.5	26.5	47.1	7.5	13	47.8	65.7	-	83.7	-	-	47.8	65.8	83.7	50.5	63.8	70.5	70.5	-	3
Rc:Bankfull width (ft/ft)				0.7	1.2	1.2	2.1	0.3	13	2.0	2.8	-	3.5	-	-	2.0	2.8	3.5	2.4	3.1	3.4	3.4	-	3
Meander Wavelength (ft)				18.0	82.0	84.2	139.5	36.6	12	167.3	227.1	-	286.8	-	-	167.3	138.1	286.8	241.0	241.0	241.0	241.0	-	1
Meander Width Ratio				0.8	3.6	3.7	6.1	1.6	12	3.5	5.8	-	8.0	-	-	3.5	5.8	8.0	3.1	3.1	3.1	3.1	-	1
Transport parameters																								
Reach Shear Stress (competency) lb/f^2				0.4												0.46			0.27					
Max part size (mm) mobilized at bankfull				90												90			58					
Stream Power (transport capacity) lb/s				37												35			25					
Additional Reach Parameters																								
Rosgen Classification				F4						C4						C4			C4					
Bankfull Velocity (fps)	2.5	20.0	5.4	3.1												3.1			4.5					
Bankfull Discharge (cfs)	100	800	259.8	150												150								
Valley length (ft)				373						-						373								
Channel Thalweg length (ft)				380						-						384			384					
Sinuosity (ft)				1.02						1.2 to 1.4						1.03			1.03					
Water Surface Slope (Channel) (ft/ft)				0.0076						-						0.0037			0.0027					
BF slope (ft/ft)				0.0076						-						0.0037			0.0027					
[3]Bankfull Floodplain Area (acres)				1.2						-						0.6			0.6					
[4]% of Reach with Eroding Banks				25%						-														
Channel Stability or Habitat Metric				0.14						-														
Biological or Other				-						-														

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 9. Monitoring Data - Cross-Section Morphology Data Table
Stewarts Creek Mitigation Project (DMS No. 100023)

	Moores Fork Reach 2																										
	Cross Section 4 (Pool)							Cross Section 5 (Riffle)							Cross Section 6 (Pool)							Cross Section 7 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	1087.94	1088.59	1088.26					1087.06	1087.32	1087.50					1084.62	1084.29	1084.51					1083.10	1083.29	1083.10				
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	0.80	1.61					1.11	1.04	1.10					1.00	1.08	1.07					1.00	0.94	1.01				
Thalweg Elevation	1084.60	1085.18	1089.29					1084.63	1084.53	1085.47					1081.95	1081.29	1081.57					1080.56	1080.63	1080.46				
LTOB[2] Elevation	1087.94	1087.91	1089.47					1087.34	1087.43	1087.70					1084.62	1084.54	1084.72					1083.10	1083.13	1083.13				
LTOB[2] Max Depth (ft)	3.34	2.73	3.18					2.71	2.9	2.23					2.67	3.25	3.15					2.54	2.50	2.67				
LTOB[2] Cross Sectional Area (ft^2)	47.12	31.39	115.69					40.53	36.65	39.54					53.58	61.60	60.33					33.72	30.17	34.27				

	Moores Fork Reach 3													
	Cross Section 8 (Riffle)							Cross Section 9 (Pool)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	1079.97	1080.11	1080.17					1080.16	1079.98	1080.07				
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	0.95	0.83					1.00	1.04	0.97				
Thalweg Elevation	1077.41	1077.37	1077.29					1076.12	1075.02	104.84				
LTOB[2] Elevation	1079.97	1079.97	1079.68					1080.16	1080.16	1079.90				
LTOB[2] Max Depth (ft)	2.56	2.60	2.39					4.04	5.14	5.06				
LTOB[2] Cross Sectional Area (ft^2)	33.89	31.07	25.77					52.58	57.57	49.07				

The above morphology parameters reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT and industry mitigation providers/practitioners. The outcome resulted in the focus on three primary morphological parameters of interest for the purposes of tracking channel change moving forward. They are the bank height ratio using a constant As-built bankfull area and the cross sectional area and max depth based on each years low top of bank. These are calculated as follows:

1 - Bank Height Ratio (BHR) takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation. For example if the As-built bankfull area was 10 ft2, then the MY1 bankfull elevation would be adjusted until the calculated bankfull area within the MY1 cross section survey = 10 ft2. The BHR would then be calculated with the difference between the low top of bank (LTOB) elevation for MY1 and the thalweg elevation for MY1 in the numerator with the difference between the MY1 bankfull elevation and the MY1 thalweg elevation in the denominator. This same process is then carried out in each successive year.
2 - LTOB Area and Max depth - These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recroded and tracked above as LTOB max depth.

Note: The smaller the channel the closer the survey measurements are to their limit of reliable detection, therefore inter-annual variation in morphological measurement (as a percentage) is by default magnified as channel size decereases. Some of the variability above is the result of this factor and some is due to the large amount of depositional sediments observed.

Appendix E: Project Timeline and Contact Information

Table 10. Project Activity and Reporting History

Table 11. Project Contacts Table

Table 10. Project Activity and Reporting History
Stewarts Creek Tributaries Stream Restoration Project (NCDMS Project No. 100023)

Elapsed Time Since grading complete:	**2 yrs**
Elapsed Time Since planting complete:	**2 yrs**
Number of reporting Years:	**2**

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Institution Date	NA	May-17
404 permit date	NA	Jul-19
Final Mitigation Plan	2017 to 2019	May-19
Final Design – Construction Plans	2017 to 2019	Sep-19
Site Earthwork	NA	May-20
As-Built Survey Performed	May - June 2020	Jun-20
Bare root plantings	NA	Mar-20
As-built monitoring report (Year 0 Monitoring – baseline)	Jun-20	Oct-20
Year 1 Monitoring	2020	Nov-20
Year 1 Monitoring Moores Fork Repairs	NA	Aug-20
Year 2 Monitoring	2021	Dec-21
Year 2 Monitoring Supplemental Planting	NA	Apr-21
Adaptive Management Plan (AMP)	Nov 2020 - April 2022	Jun-22
AMP Site Earthwork	NA	Nov-22
Year 3 Monitoring	2022	Dec-22
Year 4 Monitoring	2023	Dec-23
Year 5 Monitoring	2024	Dec-24
Year 6 Monitoring	2025	Dec-25
Year 7 Monitoring	2026	Dec-26

Table 11. Project Contacts Table
Stewarts Creek Tributaries Stream Restoration Project (NCDMS Project No. 100023)

Designer Primary project design POC	Ecosystem Planning and Restoration, PLLC 1150 SE Maynard Road, Suite 140 Cary, NC 27511 Kevin Tweedy, PE (919) 388-0787
Construction Contractor Construction contractor POC	Resource Environmental Solutions, LLC (Formally Carolina Environmental Contracting, Inc.) 150 Pine Ridge Rd, Mt Airy, NC 27030 Wayne Taylor
Survey Contractor Survey contractor POC	Turner Land Surveying, PLLC PO Box 148, Swannanoa, NC 28778 Lissa Turner (919) 827-0745
Planting Contractor Planting contractor POC	Bruton Natural Systems, Inc. Charlie Bruton
Seeding Contractor Contractor point of contact	Resource Environmental Solutions, LLC (Formally Carolina Environmental Contracting, Inc.) 150 Pine Ridge Rd, Mt Airy, NC 27030 Wayne Taylor
Seed Mix Sources	Green Resource
Nursery Stock Suppliers	Dykes & Son Nursery (931) 668-8833
Monitoring Performers	Ecosystem Planning and Restoration, PLLC
Stream Monitoring POC	Erin Bennett, EPR (919) 388-0787
Vegetation Monitoring POC	Tom Barrett, EPR (919) 388-0787

From:	Erin Bennett
To:	Browning, Kimberly D CIV USARMY CESAW (USA); Wiesner, Paul; Jake Byers
Cc:	Kevin Tweedy; Russell Myers; Tugwell, Todd J CIV USARMY CESAW (USA); Davis, Erin B; Bowers, Todd; Wilson, Travis W.; Leslie, Andrea J; Fennel, Tommy E CIV USARMY CESAW (USA); Haywood, Casey M CIV MVP; Crumbley, Tyler A CIV USARMY CESAW (USA)
Subject:	RE: Adaptive Management Plan Approval / NCDMS Stewart Creek Tributaries Mitigation Site/ SAW-2017-01508 / Surry County
Date:	Monday, July 25, 2022 3:51:00 PM
Attachments:	image001.jpg image002.png image003.png image004.png image005.png image006.png

Kim,

Happy Monday! Thank you for all this. EPR's response to comments are below in purple. Let us know if you all need a more formal response to comments in another form and/or in the MY3 report.

Erin

EPR Color JPG - small

Erin Bennett Pennell, PE
Water Resources Engineer

Ecosystem Planning and Restoration
1150 SE Maynard Road
Suite 140
Cary, NC 27511

(O): 919-388-0787
(F): 919-388-0789
(M): 828-735-1083
www.eprusa.net

From: Browning, Kimberly D CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>
Sent: Friday, July 15, 2022 2:19 PM
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Subject: Adaptive Management Plan Approval / NCDMS Stewart Creek Tributaries Mitigation Site/ SAW-2017-01508 / Surry County

Good afternoon,

The IRT has reviewed and approved the attached NCDMS Stewart Creek Tributaries Adaptive Management Plan. Per Section 332.8(g)(2) of the 2008 Mitigation Rule, this review followed the streamlined review process. Please provide photo documentation of the repairs in next year's monitoring report. Individual IRT comments on the adaptive management plan are incorporated in the email below.

Todd Bowers, USEPA:
Thank you for the opportunity to review and provide feedback on the Stewarts Creek Tributaries Mitigation Site (NCDMS) Adaptive Management Plan dated June 2022. As of monitoring year 2 (September 2020 – November 2021), the three Unnamed Tributaries (UTs) to Stewarts Creek are 100% successfully performing as intended and the majority of Moores Fork is performing successfully. Due to severe storm damage, approximately 48% of Moores Fork Reach 2 and 28% of Moores Fork Reach 3 were identified as not meeting mitigation success criteria and needing repair. Assessments indicated 2,122 feet of unstable banks in Moores Fork Reach 2. Minor areas of encroachment due to mowing and ATV use were observed along Moores Fork Reach 3.

Ecosystems Planning and Restoration (EPR) is proposing the following corrective measures to address the deficiencies noted above. The upstream extent of Moores Fork Reach 2 will be re-aligned to provide a more gentle transition between the straighter upstream enhancement section (Moores Fork Reach 1) and the downstream meandering section. Bankfull cross sectional geometry will be established along the new alignment and in-stream structures will be installed to provide grade control, improve habitat and protect stream banks. Additional sloping and geolift with rock toe structures will be placed on banks for areas of high stress or areas with current bank erosion. Moores Fork Reach 3 will have additional structures and bank sloping added for areas with currently eroding banks. Areas disturbed during the repair work will be re-planted. Vegetation Plot 3 will be relocated due to the alignment change. Additionally, two random vegetation plots along Moores Fork Reach 2 will be placed in any area that will be re-planted as part of the AMP work. To address minor areas of encroachment, additional posts and rope will be installed to further demarcate the easement boundary along Moores Fork Reach 3 where some minor encroachment from agricultural activities has occurred.

I concur with the Adaptive Management Plan and corrective actions proposed by EPR. Stream repairs, site earthwork and supplemental planting is proposed to be completed by November 2022 and I encourage the sponsor to meet this time frame in order to complete MY3 monitoring on-time. I would like to see a detailed discussion of the completed corrective actions, updated planting lists (if needed) and an outcome of encroachment resolution in the next Monitoring Year report.

Noted.

Erin Davis, NCDWR:

1. Since 5% of the site has already been planted with green ash, DWR requests that an alternate species be installed as part of the proposed AMP planting due to concerns with the emerald ash borer.

EPR will remove green ash from the vegetation tables in the design plans and add 5% more Sugarberry.

2. It appears that the Reach 3 kudzu cover area falls within the AMP footprint. DWR is very concerned that kudzu may spread if not treated prior to construction activities.

EPR will be observing if the kudzu has spread and will spray soon. We will inform you all when this occurs and in the MY3 report.

3. Please confirm that the current channel areas to be abandoned will be plugged and/or backfilled to meet surrounding grade. If floodplain pools or depressions will remain, please delineate these areas and show on the repair completion/as-built drawing.

The current channel areas that will be abandoned will be plugged and backfilled to meet the floodplain grade.

4. Design educational inquiry – How will the proposed rock cross vanes be anchored in the middle of the toewood with geolift bank treatment areas?

When the bank grading is completed, the cross vanes will be installed first. After the installation of the cross vanes, the toewood will be installed around the structure.

5. DWR requests that stream cross-sections and veg plot surveys be conducted in MY4 for Moores Fork Reach 2 and Reach 3 (i.e., XS-3 – XS-9 and VPF-3 – VPF-5 & 2 VPRs).

EPR will monitor all cross-sections, fixed vegetation plots, and 2 random vegetation plots in MY4 for Moores Fork Reach 2 and 3.

6. DWR requests supplemental photos of the AMP repairs and resolved encroachment area(s) be included in the MY3 report.

These supplemental photos will be included in the MY3 report.

7. Please confirm that future CCPVs will show the updated channel alignment.

All future CCPVs will show the update channel alignment.

Kim Isenhour, USACE:

1. Please add random veg plots and/or transects near Moores Fork Reaches 2 &3 for MY4. If data suggests that the vegetative performance is not on a trajectory for success, an additional year of monitoring may be required.

One random vegetation plot will be near Moores Fork Reaches 2 and the other random vegetation plot will be near Moores Fork Reach 3 in MY4.

2. In next year's monitoring report, please confirm that kudzu was treated on Moores Fork Reach 3.

EPR will confirm the kudzu was treated in MY3 report.

3. Table 3: Are you proposing to reduce the number of credits by 158.8 SMUs? That's a significant change from the approved mitigation plan that would typically require a change in mitigation credits, particularly since the original stream design was modified to a less sinuous channel.

The credit loss will be 150.1 SMUs. We have been in contact with Paul Wiesner about this change in mitigation credits.

4. Will the existing channel that was abandoned be plugged and planted?

The current channel areas that will be abandoned will be plugged, backfilled, and planted.

Respectfully,
Kim

Kim (Browning) Isenhour
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