



MONITORING YEAR 2 ANNUAL REPORT FINAL

January 2023

PERRY HILL MITIGATION SITE

Orange County, NC
Neuse River Basin
HUC 03020201

DMS Project No. 100093
DMS Contract No. 7744
DMS RFP No. 16-007576
USACE Action ID No. 2019-00125
DWR Project No. 2019-0157

Data Collection Dates: January-October 2022

PREPARED FOR:



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



January 4, 2023

Jeremiah Dow

NC DEQ Division of Mitigation Services
217 West Jones Street
Raleigh, NC 27603

Subject: DMS Comments on Perry Hill Mitigation Site Monitoring Year 2 Report
DMS Project Number 100093, DMS Contract 7744

Dear Mr. Dow,

We have reviewed the comments on the MY2 Report for the above referenced project dated December 22, 2022. Below are responses to each of the comments. For your convenience, the comments are reprinted with responses in italics.

1. In the stream report Table 1: Project Quantities and Credits, please break down the lost stream credits in the footnote or incorporate into the Table. 20 SMUs on Perry Branch Reach 4 and 5.17 SMUs on Perry Branch Reach 2.

A footnote has been added to Stream report Table 1 to break down the credit reduction by stream reach.

2. In the buffer report, please do the same on Table 1 as requested above for the stream report. Show in the footnote the actual square footage and amount of buffer credit lost by reach due to the water line.

The original square footage and buffer credits have been added back into Table 1 to show credit reductions. A footnote has been added to break down the credit reduction by mitigation activity to match the way credits are broken out in Table 1.

3. If UT1 does not meet minimum flow requirements in MY3, we recommend that Wildlands determine the linear extent of the channel that should be considered at-risk and include in the MY3 report.

Wildlands has taken note of this comment for MY3.

4. There is a typo in the flow plot summary table in appendix D digital submission, please fix this in next year's submission; one gauge was omitted due to another being reported twice. This typo was not present in the report version of the summary table.

The original flow gauge on UT1 is labeled "UT1 Reach 1 – In-Stream Flow Gauge". The flow gauge that was installed upstream on UT1 months later to provide supplemental information is labeled "UT1 Reach 1 – In-Stream Flow Gauge B". The names are very



similar, but they are separate gauges. An updated copy of the excel workbook is included in the digital files again.

If you have any questions, please contact me by phone (919) 851-9986, or by email (jlorch@wildlandseng.com).

Sincerely,

A handwritten signature in black ink, appearing to read "Jason Lorch".

Jason Lorch, *Monitoring Coordinator*

PREPARED BY:



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PERRY HILL MITIGATION SITE
Monitoring Year 2 Annual Report

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Section 1: PROJECT OVERVIEW

The Perry Hill Mitigation Site (Site) is located in Orange County, approximately three miles northwest of Hillsborough, NC. The Site drains to Corporation Lake on the Eno River, which then flows to Falls Lake. Corporation Lake is a water supply reservoir on the Eno River, which is classified as Water Supply Waters (WS-II) and Nutrient Sensitive Waters (NSW). Falls Lake is classified as Water Supply Waters (WS-IV), as well as Nutrient Sensitive Waters (NSW). Table 3 presents information related to the project attributes.

1.1 Project Quantities and Credits

The Site is located on one parcel and a conservation easement was recorded on 26.88 acres. Mitigation work within the Site included restoration and enhancement I and II of perennial and intermittent stream channels (Figures 1-1b).

In October 2021, waterlines were installed by the tenant farmer within the conservation easement, parallel to the internal crossings. This work was done without consulting Wildlands. In an effort to find the most reasonable and least disruptive solution, it was decided that the area containing the waterlines would be marked as a maintenance area and credits reduced accordingly. This will allow for maintenance in the future and avoid any further easement encroachments.

Approximately 20 feet (or a total of 0.19 acres) was added alongside both internal crossings as a maintenance area. No credit is claimed in the maintenance area and project credits were reduced accordingly. Table 1 below shows updated stream credits by reach and the total amount of stream credits expected at closeout. Wildlands is working with a surveyor to mark the area.

Table 1: Project Quantities and Credits

PROJECT MITIGATION QUANTITIES							
Project Segment	Mitigation Plan Footage	As-Built Footage	Mitigation Category	Restoration Level	Mitigation Ratio (X:1)	Credits	Comments
Stream							
Perry Branch Reach 1	321	323	Warm	R	1.0	321.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
Perry Branch Reach 2	344	342	Warm	EII	3.5	98.286	Grade Control Structures, Invasive Control, Planted Buffer, Livestock Exclusion
	20	20	N/A	N/A	0.0	N/A	Maintenance Area
	60	60	N/A	N/A	0.0	N/A	Culvert Crossing
Perry Branch Reach 3	691	694	Warm	R	1.0	691.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion



PROJECT MITIGATION QUANTITIES							
Project Segment	Mitigation Plan Footage	As-Built Footage	Mitigation Category	Restoration Level	Mitigation Ratio (X:1)	Credits	Comments
Stream							
Perry Branch Reach 4	634	642	Warm	R	1.0	634.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
	20	20	N/A	N/A	0.0	N/A	Maintenance Area
	60	60	N/A	N/A	0.0	N/A	Culvert Crossing
	1,284	1,297	Warm	R	1.0	1,284.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
UT1 Reach 1	285	285	Warm	R	1.5	190.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
UT1 Reach 2	291	293	Warm	R	1.5	194.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
UT2 Reach 1	221	223	Warm	EII	2.5	88.400	Bank Stabilization, Planted Buffer, Livestock Exclusion
UT2 Reach 2	947	941	Warm	EI	2.5	378.800	Grade Control Structures, Bank Stabilization, Planted Buffer, Livestock Exclusion
UT3	343	319	Warm	EII	2.5	137.200	Grade Control Structures, Bank Stabilization, Planted Buffer, Livestock Exclusion
Total:						4,016.686	

*Credits updated in Monitoring Year 2 to reflect the addition of the maintenance areas and resulting reduction in credits. Twenty LF of stream fall within each of the maintenance areas, reducing credits on Perry Branch Reach 2 by 5.714 credits and Perry Branch Reach 4 by 20 credits.

Restoration Level	Stream		
	Warm	Cool	Cold
Restoration	3,314.000		
Enhancement I	378.800		
Enhancement II	323.886		
Preservation	--		
Totals	4,016.686		
Total Stream Credit	4,016.686		

1.2 Project Goals and Objectives

The project is intended to provide numerous ecological benefits. Table 2 below describes the project goals and objectives along with the expected outcomes to water quality and ecological processes. Additionally, performance criteria for project objectives and a summary of the related monitoring data results for Monitoring Year 2 (MY2) are included.

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Exclude livestock (i.e. cattle) from project streams and adjacent riparian areas.	Exclude livestock from streams and riparian areas by installing fencing around project area and/or removing livestock from the Site.	Reduce and control sediment inputs; reduce and manage nutrient inputs; contribute to protection of or improvement to a Water Supply Waterbody.	Exclusion fencing is installed and maintained. Livestock remain excluded from the project area.	Visually inspect the perimeter, as well as interior, of the Site to ensure there are no signs of livestock entering the Site.	Cattle are excluded from project streams.
Improve the stability of stream channels.	Construct and enhance stream channels that will maintain a stable pattern and profile considering the hydrologic and sediment inputs to the system, the landscape setting, and the watershed conditions.	Reduce sediment inputs; contribute to protection of or improvement to a Water Supply Waterbody.	Entrenchment ratio over 2.2 and bank height ratios below 1.2 with visual assessments showing stability.	Cross-section monitoring will be assessed during MY1, MY2, MY3, MY5, and MY7 and visual inspections will be assessed annually.	Minor deviations from design.
Improve instream habitat.	Install habitat features such as constructed riffles, cover logs, and brush toes on restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Improve aquatic communities in project streams.	There is no performance standard for this metric.	N/A	N/A
Reconnect channels with floodplains.	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the existing floodplain.	Reduce and control sediment inputs; reduce and manage nutrient inputs; contribute to protection of or improvement to a Water Supply Waterbody.	Four bankfull events in separate years within monitoring period. 30-days of continuous surface water flow will be documented annually along intermittent restoration or enhancement reaches.	Pressure transducers recording flow elevations.	Bankfull events were documented on UT1, UT2, and Perry Branch. Greater than 30 days of consecutive flow was recorded on UT2 but not UT1.



Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Restore and enhance native floodplain vegetation.	Convert active livestock pasture to forested riparian buffers along all Site streams. Protect and enhance existing forested riparian buffers. Treat invasive species during monitoring period to permit establishment of native plantings.	Reduce sediment inputs; provide a canopy to shade streams and reduce thermal loadings; contribute to protection of or improvement to a Water Supply Waterbody.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7. Vegetation plots will average 7-ft in height in MY5 and 10-ft in height in MY7.	One hundred square meter vegetation plots are placed on 2% of the planted area of the Site and monitored annually.	All 14 vegetation plots have a planted stem density greater than 320 stems per acre.
Permanently protect the Site from harmful uses.	Establish a conservation easement on the Site.	Ensure that development and agricultural uses that would damage the Site or reduce the benefits of the project are prevented.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	No easement encroachments have occurred in MY2. The areas affected by the waterline installation in October 2021 will be marked as a maintenance area.

1.3 Project Attributes

The project includes one parcel that has been managed as pasture and/or crop production, as indicated by aerial photographs from 1938 to 2017. Portions of the upper watershed historically have been forested. The stream crossings which existed prior to construction on Perry Branch were installed before 1938. Forested areas within the headwaters of UT2 and UT3 were cleared between 1938 and 1950. The high-voltage utility transmission line that crosses the downstream extent of Perry Branch was constructed between 1938 and 1950. Between 1950 and 1955, two ponds were constructed on the project parcel, including one within the headwaters of Perry Branch Reach 1 and the other an offline pond adjacent to Perry Branch Reach 4 within the lower portion of the watershed. Table 3 below and Table 8 in Appendix C present additional information on pre-restoration conditions. Project Activity and Reporting History, as well as the Project Contact Table are included in Appendix E.



Table 3: Project Attributes

PROJECT INFORMATION									
Project Name	Perry Hill Mitigation Site	County	Orange County						
Project Area (acres)	26.88	Project Coordinates	36° 06' 25.81" N, 79° 07' 46.66" W						
PROJECT WATERSHED SUMMARY INFORMATION									
Physiographic Province	Carolina Slate Belt of the Piedmont	River Basin	Neuse River						
USGS HUC 8-digit	03020201	USGS HUC 14-digit	03020201030020						
DWR Sub-basin	03-04-01	Land Use Classification	68% managed herbaceous cover/pasture; 22% forested; 5% shrub; 3% grassland/herbaceous; 2% residential area; <1% impervious						
Project Drainage Area (acres)	174	Percentage of Impervious Area	<1%						
RESTORATION TRIBUTARY SUMMARY INFORMATION									
Parameters	Perry Branch				UT1		UT2		UT3
	Reach 1	Reach 2	Reach 3	Reach 4	Reach 1	Reach 2	Reach 1	Reach 2	
Pre-project length (feet)	326	417	732	2,061	388	213	266	974	357
Post-project length (feet)*	323	422	694	2,166	285	293	223	941	319
Valley confinement (Confined, moderately confined, unconfined)	Unconfined		Moderately Confined		Confined to Moderately Confined	Moderately Confined	Confined	Moderately Confined	Unconfined
Drainage area (acres)	58	66	117	175	9	10	15	23	20
Perennial, Intermittent, Ephemeral	Perennial				Intermittent				
DWR Water Quality Classification	WS-II/HQW/NSW								
Dominant Stream Classification (existing)	G4c	C4	G4c	F4	E6b	F4b	C6	E4	C4

*Includes No Credit Project Stream lengths in internal crossings, the maintenance area, and the downstream end of Perry Branch Reach 4.

RESTORATION TRIBUTARY SUMMARY INFORMATION									
Parameters	Perry Branch				UT1		UT2		UT3
	Reach 1	Reach 2	Reach 3	Reach 4	Reach 1	Reach 2	Reach 1	Reach 2	
Dominant Stream Classification (proposed)	C4	C4	C4	C4	B4	C4b	C6	C4	C4
Dominant Evolutionary class (Simon) if applicable	III	V	IV	III/IV	III/IV	III/IV	V	III/IV	III/IV
REGULATORY CONSIDERATIONS									
Parameters	Applicable?	Resolved?	Supporting Documentation						
Water of the United States - Section 404	Yes	Yes	USACE Nationwide Permit No. 27 and DWQ 401 Water Quality Certification No. 4134.						
Water of the United States - Section 401	Yes	Yes							
Endangered Species Act	Yes	Yes	Categorical Exclusion in Mitigation Plan (Wildlands, 2020)						
Historic Preservation Act	Yes	Yes							
Coastal Zone Management Act (CZMA or CAMA)	N/A	N/A	N/A						
Essential Fisheries Habitat	N/A	N/A	N/A						

Section 2: Monitoring Year 2 Data Assessment

Annual monitoring and site visits were conducted during MY2 to assess the condition of the project. The vegetation and stream success criteria for the Site follow the approved performance standards presented in the Mitigation Plan (Wildlands Engineering, 2020). Performance criteria for vegetation, stream, and hydrologic assessment are located above in Section 1.2 Table 3: Goals, Performance Criteria, and Functional Improvements. Methodology for annual monitoring is described in the MY0 As-Built Baseline Report (Wildlands, 2021).

2.1 Vegetative Assessment

The MY2 vegetative survey was completed in September 2022. Vegetation monitoring resulted in an average stem density of 479 planted stems per acre across all vegetation plots, which is well above the interim success criteria of 320 stems per acre required at MY3. All fourteen vegetation plots individually met the interim success criteria and stem densities for each plot range from 324 to 729 planted stems per acre. Herbaceous vegetation is growing well and desirable volunteer tree species such as common hackberry (*Celtis occidentalis*) and green ash (*Fraxinus pennsylvanica*) are establishing themselves. Refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix B for Vegetation Plot Data and Vegetation Performance Standards Summary Table.

2.2 Vegetation Areas of Concern

As was discussed above, an additional 20 feet (a total of 0.19 acres) was added alongside both internal crossings as a maintenance area due to the installation of waterlines in October 2021. The affected area was seeded, and herbaceous vegetation has grown over the disturbance. The soil is stabilized, and Wildlands does not anticipate any future problems in these areas. Recent photographs showing vegetation cover are included in Vegetation Areas of Concern Updated Photographs in Appendix A.

While planted trees are growing well, pasture grasses are still thick. To ensure planted trees remain competitive, herbicide ring sprays were applied around the base of trees where necessary in April 2022.

Additionally, follow up treatments were done on the intermittent Tree-of Heaven (*Ailanthus altissima*) stems via cut stump application of triclopyr in August 2022. Occasional resprouts of Chinese privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera japonica*) were also treated in March 2022 in the wooded areas along UT2, UT3, and Perry Branch.

While waiting for the live stakes to grow and shade the stream channels, in-stream vegetation was treated with a foliar spray of glyphosate in August 2022 on UT1, UT2 and sections of Perry Branch.

2.3 Stream Assessment

Morphological surveys for MY2 were conducted in April 2022. All streams within the Site are stable and functioning as designed. Cross-sections show minimal change in max depth and bankfull cross-sectional area. Bank height ratios are less than 1.2 and entrenchment ratios are over 2.2. Cross-sections show slight deviations from as-built due to sediment deposition and establishment of vegetation. Some sediment deposition in pools is natural and expected. Pebble count data is no longer required per the September 29, 2021 Technical Work Group Meeting and is not included in this report. The IRT reserves the right to request pebble count data/particle distributions if deemed necessary during the monitoring period. Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table, Current Condition Plan View maps, Stream Photographs, and Culvert Crossing Photographs. Refer to Appendix C for the morphological data and cross-section plots.



2.4 Stream Areas of Concern

Wildlands continued to observe the lack of flow in the short stretch of UT1 Reach 1 through the winter and spring of 2022. When gauge data and observations did not show an increase in flow throughout the wettest part of the year (see Section 2.5 Hydrology Assessment Section below), it was decided that repairs were necessary. In September 2022, a rock sill was repaired by reinstalling filter fabric and backfill material on the upstream face. The original fabric and backfill material are believed to have failed to seal this structure, resulting in stream flow going subsurface. The repair was completed to return the structure to the original design condition. This does not leave much to see on the surface, however pictures with a red arrow pointing to the area of disturbance in the channel are included in Appendix A – Stream Area of Concern Repair Photographs. Approximately five linear feet of channel were impacted (see Figure 1b for location). Wildlands will continue to monitor flow in MY3.

2.5 Hydrology Assessment

By the end of MY7, four bankfull events must have occurred in separate years within the restoration and enhancement I reaches. Bankfull events were recorded on Perry Branch and UT2 on May 24th, and UT1 on May 23rd, 2022. Bankfull was recorded on Perry Branch on a gauge installed in January 2022 (Perry Branch Reach 4 crest gauge B in Figure 1b) to gather more information on the stream. All streams on the Site recorded a bankfull event during MY2.

In addition, the presence of baseflow must be documented on restored or enhanced intermittent reaches (UT1 Reach 1 and UT2 Reach 2) for a minimum of 30 consecutive days during a normal precipitation year. UT2 Reach 2 exceeded baseflow criterion with 164 days of consecutive baseflow and 183 total days of flow. UT1 Reach 1 did not meet baseflow criteria this year. As in MY1, the original UT1 Reach 1 flow gauge recorded one day of flow. As mentioned in the previous section, repairs were completed on this small section of UT1 in response to continued low flow through the winter months. This area will continue to be monitored for the presence of baseflow in MY3.

UT1 Reach 1 flow gauge B (Figure 1b) was installed upstream of the original flow gauge (in cross-section 8 in Figure 1b) in December 2021 to learn the extent of the low flow stretch on UT1 Reach 1. Twenty consecutive days and 92 total days of flow were recorded in MY2. While this is below the 30 consecutive day minimum, all gauges are taking a measurement every 30 minutes. If one reading during a 24-hour period falls below thalweg, the entire day does not count toward the consecutive days of flow. The UT1 Reach 1 flow gauge B flow events plot shows that most of the readings in January and half of February are above the thalweg (see the Recorded In-stream Flow Events Plots in Appendix D). Refer to Appendix D for Hydrology Summary Data.

According to the National Integrated Drought Information System, Orange County was abnormally dry November 2021 through January 2022, a significant portion of the county was abnormally dry through March 2022, and again mid-June through mid-August, and all of September 2022 (NOAA, 2022). This likely had some effect on low baseflow of intermittent streams.

2.6 Adaptive Management Plan

Wildlands plans to re-apply herbicide in rings around planted trees in areas of thick herbaceous competition and treat aggressive blackberry growth as needed in spring of 2023. Additionally, native permanent seed will be spread as a cover crop in areas where agricultural weeds are still dominant. Wildlands will continue to monitor for resprouts of invasive species, and additional treatments will be applied as necessary.

Wildlands will continue to monitor flow on UT1 Reach 1 through flow gauges and visual observation. Data through MY3 will inform additional management actions if deemed necessary.



2.7 Monitoring Year 2 Summary

Vegetation across the Site is exceeding performance standards and is on track to achieve the MY3 interim requirement of 320 planted stems per acre. Monitoring Year 2 data shows an average density of 479 planted stems per acre across vegetation plots. Resprouts of sporadic invasive vegetation were treated in MY2 and follow up treatments will be scheduled as necessary. Additional ring sprays will be applied around the base of trees in areas of high competition with herbaceous vegetation in spring 2023. Wildlands is working with a surveyor to mark the maintenance area. Project streams are stable and functioning. Cross-sections show limited deviations from as-built due to sediment deposition and vegetation establishment. Bankfull events were documented on UT1, UT2, and Perry Branch. UT2 achieved more than 30 consecutive days of baseflow, while UT1 did not. A short section of the UT1 Reach 1 channel was resealed in September 2022 to address the low flow. Wildlands will continue to observe this stretch of channel.

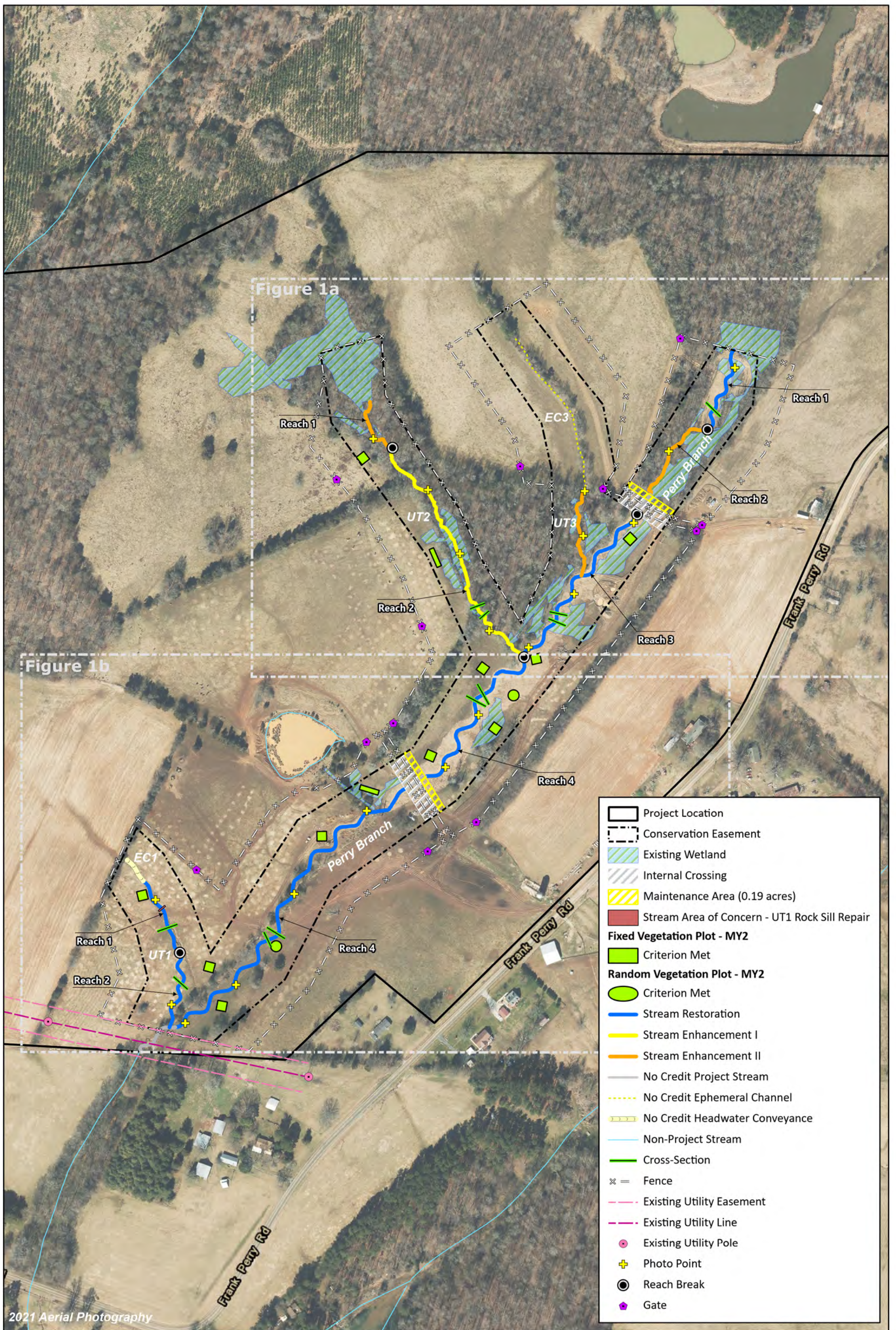
Summary information and data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. All raw data supporting the tables and figures in the appendices are available from DMS upon request.



Section 3: REFERENCES

- Breeding, R. 2010. Neuse River Basin Restoration Priorities. North Carolina Ecosystem Enhancement Program. Accessed at:
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2021 Aerial Photography



0 300 600 Feet

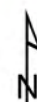
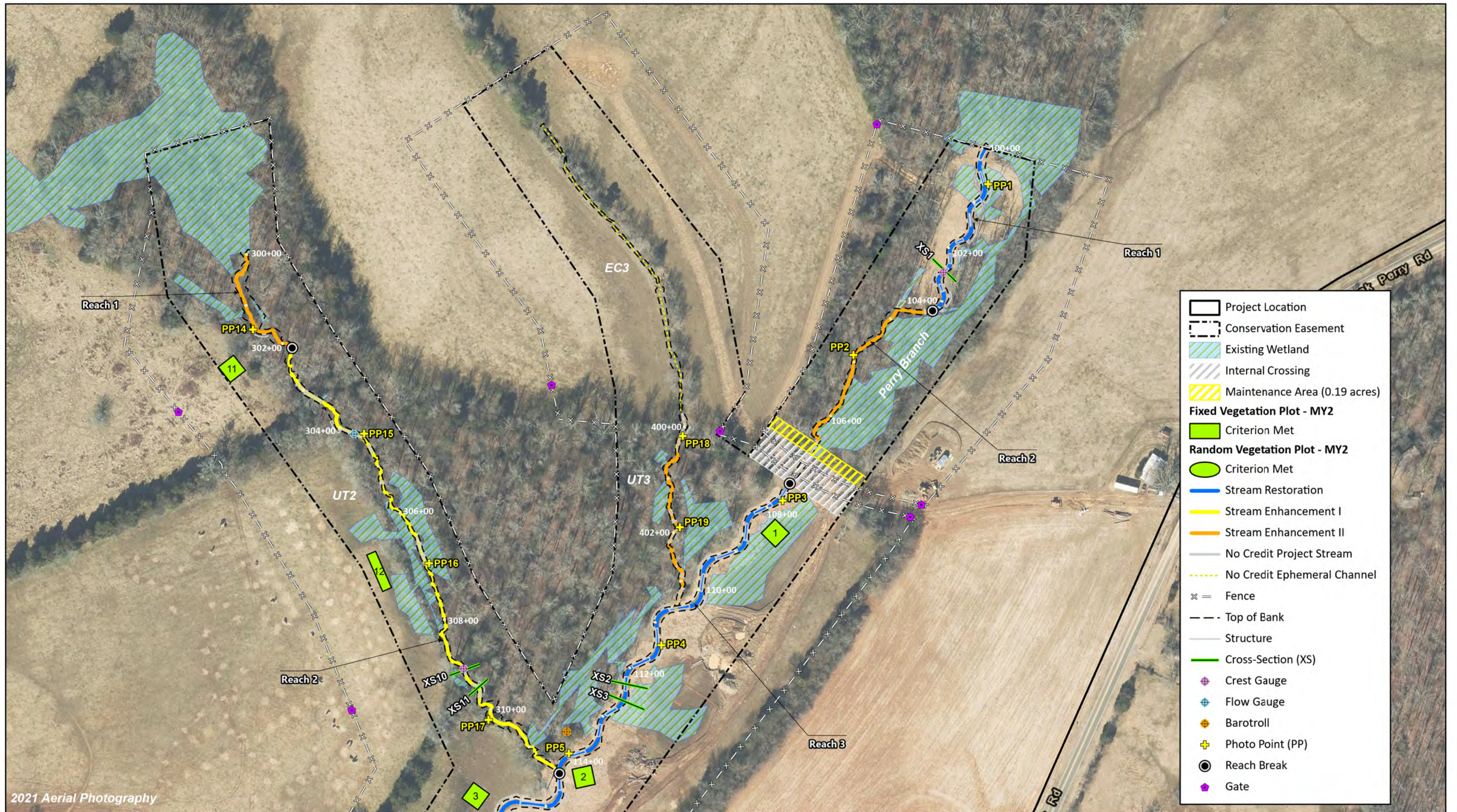
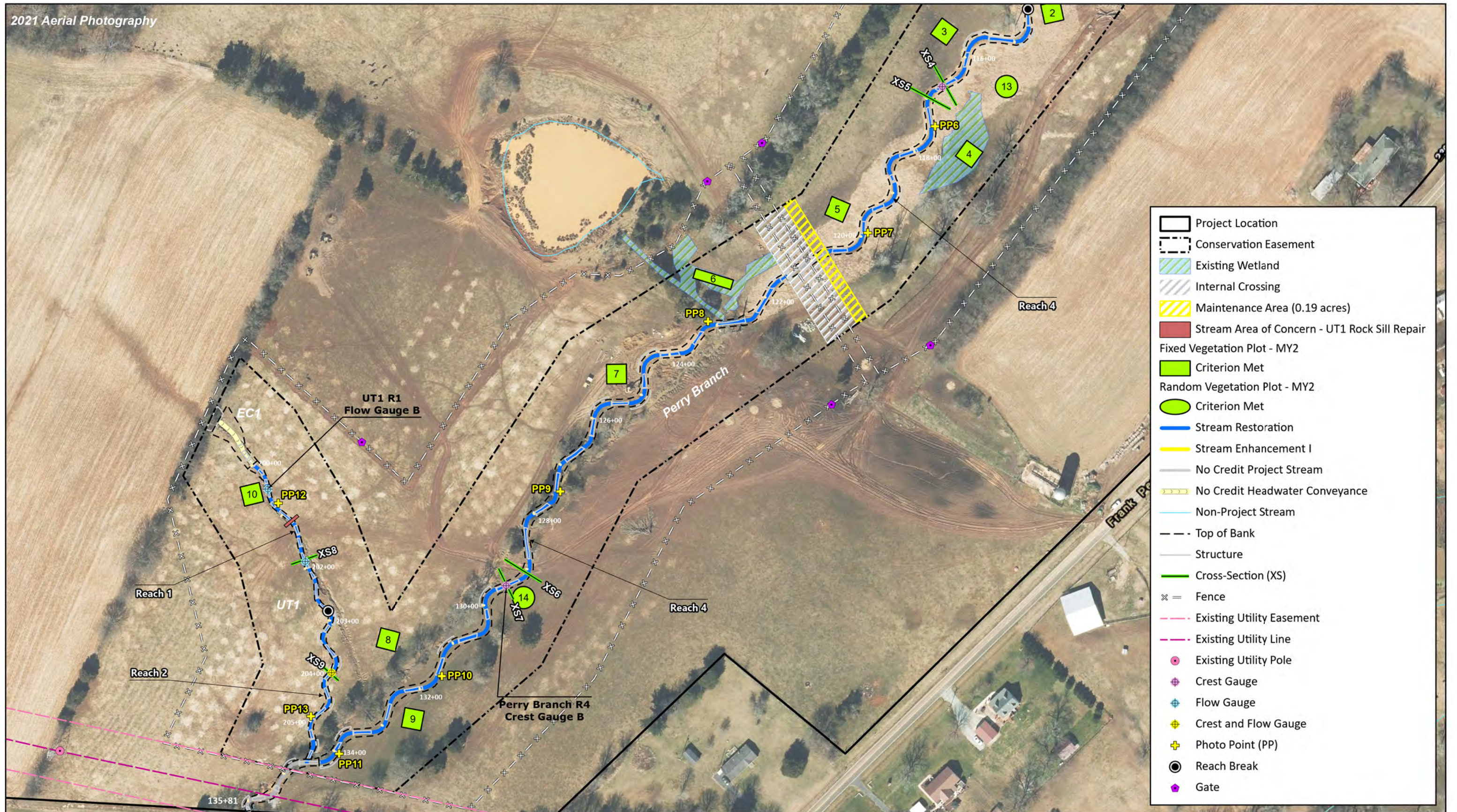


Figure 1. Current Condition Plan View
 Perry Hill Mitigation Site
 DMS Project No. 100093
 Monitoring Year 2 - 2022





- Project Location
- Conservation Easement
- Existing Wetland
- Internal Crossing
- Maintenance Area (0.19 acres)
- Stream Area of Concern - UT1 Rock Sill Repair
- Fixed Vegetation Plot - MY2
- Criterion Met
- Random Vegetation Plot - MY2
- Criterion Met
- Stream Restoration
- Stream Enhancement I
- No Credit Project Stream
- No Credit Headwater Conveyance
- Non-Project Stream
- Top of Bank
- Structure
- Cross-Section (XS)
- Fence
- Existing Utility Easement
- Existing Utility Line
- Existing Utility Pole
- Crest Gauge
- Flow Gauge
- Crest and Flow Gauge
- Photo Point (PP)
- Reach Break
- Gate

APPENDIX A. VISUAL ASSESSMENT DATA

Table 4. Visual Stream Morphology Stability Assessment Table

Perry Hill Mitigation Site
 DMS Project No. 100093
 Monitoring Year 2 - 2022

Perry Branch Reach 1

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	323
					Assessed Bank Length	646
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
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	2	2		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	4	4		100%

Visual assessment was completed October 19, 2022.

Perry Branch Reach 3 and Reach 4

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	2,653
					Assessed Bank Length	5,306
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
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	18	18		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	17	17		100%

Visual assessment was completed October 19, 2022.

Table 4. Visual Stream Morphology Stability Assessment Table

Perry Hill Mitigation Site
 DMS Project No. 100093
 Monitoring Year 2 - 2022

UT1 Reach 1 and Reach 2

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	578
					Assessed Bank Length	1,156
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.	18	18		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	7	7		100%

Visual assessment was completed October 19, 2022.

UT2 Reach 2

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	941
					Assessed Bank Length	1,882
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.	8	8		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	2	2		100%

Visual assessment was completed October 19, 2022.

Table 5. Vegetation Condition Assessment Table

Perry Hill Mitigation Site
 DMS Project No. 100093
 Monitoring Year 2 - 2022

Planted Acreage 20.53

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10	0	0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10	0	0%
Total			0	0%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10	0	0%
Cumulative Total			0.0	0%

Visual assessment was completed October 19, 2022.

Easement Acreage 26.88

Vegetation Category	Definitions	Mapping Threshold (ac)	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. Invasive species included in summation above should be identified in report summary.	0.10	0	0%
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 Encroachments Noted / 0 ac	

Visual assessment was completed October 19, 2022.

STREAM PHOTOGRAPHS



PHOTO POINT 1 Perry Branch R1 – upstream (04/14/2022)



PHOTO POINT 1 Perry Branch R1 – downstream (04/14/2022)



PHOTO POINT 2 Perry Branch R2 – upstream (04/14/2022)



PHOTO POINT 2 Perry Branch R2 – downstream (04/14/2022)



PHOTO POINT 3 Perry Branch R3 – upstream (04/14/2022)



PHOTO POINT 3 Perry Branch R3 – downstream (04/14/2022)





PHOTO POINT 4 Perry Branch R3 – upstream (04/14/2022)



PHOTO POINT 4 Perry Branch R3 – downstream (04/14/2022)



PHOTO POINT 5 Perry Branch R3 – upstream (04/14/2022)



PHOTO POINT 5 Perry Branch R3 – downstream (04/14/2022)



PHOTO POINT 6 Perry Branch R4 – upstream (04/14/2022)



PHOTO POINT 6 Perry Branch R4 – downstream (04/14/2022)





PHOTO POINT 7 Perry Branch R4 – upstream (04/14/2022)



PHOTO POINT 7 Perry Branch R4 – downstream (04/14/2022)



PHOTO POINT 8 Perry Branch R4 – upstream (04/14/2022)



PHOTO POINT 8 Perry Branch R4 – downstream (04/14/2022)



PHOTO POINT 9 Perry Branch R4 – upstream (04/14/2022)



PHOTO POINT 9 Perry Branch R4 – downstream (04/14/2022)





PHOTO POINT 10 Perry Branch R4 – upstream (04/14/2022)



PHOTO POINT 10 Perry Branch R4 – downstream (04/14/2022)



PHOTO POINT 11 Perry Branch R4 – upstream (04/14/2022)



PHOTO POINT 11 Perry Branch R4 – downstream (04/14/2022)



PHOTO POINT 12 UT1 R1 – upstream (04/14/2022)



PHOTO POINT 12 UT1 R1 – downstream (04/14/2022)





PHOTO POINT 13 UT1 R2 – upstream (04/14/2022)



PHOTO POINT 13 UT1 R2 – downstream (04/14/2022)



PHOTO POINT 14 UT2 R1 – upstream (04/14/2022)



PHOTO POINT 14 UT2 R1 – downstream (04/14/2022)



PHOTO POINT 15 UT2 R2 – upstream (04/14/2022)



PHOTO POINT 15 UT2 R2 – downstream (04/14/2022)





PHOTO POINT 16 UT2 R2 – upstream (04/14/2022)



PHOTO POINT 16 UT2 R2 – downstream (04/14/2022)



PHOTO POINT 17 UT2 R2 – upstream (04/14/2022)



PHOTO POINT 17 UT2 R2 – downstream (04/14/2022)



PHOTO POINT 18 UT3 – upstream (04/14/2022)



PHOTO POINT 18 UT3 – downstream (04/14/2022)





PHOTO POINT 19 UT3 – upstream (04/14/2022)



PHOTO POINT 19 UT3 – downstream (04/14/2022)



CULVERT CROSSING PHOTOGRAPHS



Perry Branch R2 – Looking Upstream (04/14/2022)



Perry Branch R2 – Looking Downstream (04/14/2022)



Perry Branch R4 – Looking Upstream (04/14/2022)



Perry Branch R4 – Looking Downstream (04/14/2022)



VEGETATION PLOT PHOTOGRAPHS



FIXED VEG PLOT 1 (9/27/2022)



FIXED VEG PLOT 2 (9/27/2022)



FIXED VEG PLOT 3 (9/27/2022)



FIXED VEG PLOT 4 (9/27/2022)



FIXED VEG PLOT 5 (9/27/2022)



FIXED VEG PLOT 6 (9/27/2022)





FIXED VEG PLOT 7 (9/27/2022)



FIXED VEG PLOT 8 (9/27/2022)



FIXED VEG PLOT 9 (9/27/2022)



FIXED VEG PLOT 10 (9/27/2022)



FIXED VEG PLOT 11 (9/27/2022)



FIXED VEG PLOT 12 (9/27/2022)





RANDOM VEG PLOT 13 (9/27/2022)



RANDOM VEG PLOT 14 (9/27/2022)



STREAM AREA OF CONCERN REPAIR PHOTOGRAPHS
UT1 Rock Sill Repair



UT1 R1 US – Repair just above rock sill in foreground (9/27/2022)



UT1 R1 DS – Repair at end of riffle above rock sill (9/27/2022)



VEGETATION AREAS OF CONCERN UPDATED PHOTOGRAPHS
Conservation Easement Encroachment

Perry Branch R2 – CE Encroachment Seeded and Stabilized (10/19/2022)



Perry Branch R4 – CE Encroachment Seeded and Stabilized (10/19/2022)



APPENDIX B. VEGETATION PLOT DATA

Table 6. Vegetation Plot Data

Perry Hill Mitigation Site
 DMS Project No. 100093
Monitoring Year 2 - 2022

Planted Acreage	20.53
Date of Initial Plant	2021-04-04
Date of Current Survey	2022-09-27
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 5 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	<i>Acer negundo</i>	boxelder	Tree	FAC	1	1	1	1	1	1				
	<i>Asimina triloba</i>	pawpaw	Tree	FAC										
	<i>Betula nigra</i>	river birch	Tree	FACW	3	3	2	2	1	1	4	4	2	2
	<i>Cornus amomum</i>	silky dogwood	Shrub	FACW	1	1								
	<i>Diospyros virginiana</i>	common persimmon	Tree	FAC					2	2			1	1
	<i>Nyssa sylvatica</i>	blackgum	Tree	FAC										
	<i>Oxydendrum arboreum</i>	sourwood	Shrub	UPL										
	<i>Platanus occidentalis</i>	American sycamore	Tree	FACW	2	2	4	4	1	1	3	3	2	2
	<i>Populus deltoides</i>	eastern cottonwood	Tree	FAC			2	2	1	1			1	1
	<i>Quercus alba</i>	white oak	Tree	FACU										
	<i>Quercus falcata</i>	southern red oak	Tree	FACU										
	<i>Quercus lyrata</i>	overcup oak	Tree	OBL	1	1					1	1		
	<i>Quercus pagoda</i>	cherrybark oak	Tree	FACW	1	1			1	1	1	1	2	2
	<i>Quercus phellos</i>	willow oak	Tree	FAC									1	1
	<i>Quercus rubra</i>	northern red oak	Tree	FACU			2	2						
<i>Ulmus alata</i>	winged elm	Tree	FACU											
<i>Ulmus americana</i>	American elm	Tree	FACW					2	2			1	1	
<i>Viburnum prunifolium</i>	blackhaw	Tree	FACU									1	1	
Sum	Performance Standard				9	9	11	11	9	9	9	9	11	11
Mitigation Plan Performance Standard	Current Year Stem Count					9		11		9		9		11
	Stems/Acre					364		445		364		364		445
	Species Count					6		5		7		4		8
	Dominant Species Composition (%)					33		36		22		44		18
	Average Plot Height (ft.)					5		6		4		4		4
Post Mitigation Plan Performance Standard	Current Year Stem Count					9		11		9		9		11
	Stems/Acre					364		445		364		364		445
	Species Count					6		5		7		4		8
	Dominant Species Composition (%)					33		36		22		44		18
	Average Plot Height (ft.)					5		6		4		4		4
% Invasives					0		0		0		0		0	

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 6. Vegetation Plot Data

Perry Hill Mitigation Site
 DMS Project No. 100093
Monitoring Year 2 - 2022

Planted Acreage	20.53
Date of Initial Plant	2021-04-04
Date of Current Survey	2022-09-27
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F		Veg Plot 9 F		Veg Plot 10 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	<i>Acer negundo</i>	boxelder	Tree	FAC	1	1	1	1	1	1	3	3	1	1
	<i>Asimina triloba</i>	pawpaw	Tree	FAC					1	1				
	<i>Betula nigra</i>	river birch	Tree	FACW	3	3	1	1	3	3	2	2		
	<i>Cornus amomum</i>	silky dogwood	Shrub	FACW										
	<i>Diospyros virginiana</i>	common persimmon	Tree	FAC			1	1	3	3	1	1	1	1
	<i>Nyssa sylvatica</i>	blackgum	Tree	FAC										
	<i>Oxydendrum arboreum</i>	sourwood	Shrub	UPL										
	<i>Platanus occidentalis</i>	American sycamore	Tree	FACW	6	6	2	2	2	2	3	3	2	2
	<i>Populus deltoides</i>	eastern cottonwood	Tree	FAC			1	1	2	2	1	1	1	1
	<i>Quercus alba</i>	white oak	Tree	FACU										
	<i>Quercus falcata</i>	southern red oak	Tree	FACU										
	<i>Quercus lyrata</i>	overcup oak	Tree	OBL	3	3								
	<i>Quercus pagoda</i>	cherrybark oak	Tree	FACW	1	1	1	1	2	2	1	1	2	2
	<i>Quercus phellos</i>	willow oak	Tree	FAC			1	1					1	1
	<i>Quercus rubra</i>	northern red oak	Tree	FACU			2	2						
<i>Ulmus alata</i>	winged elm	Tree	FACU											
<i>Ulmus americana</i>	American elm	Tree	FACW	2	2			4	4	1	1			
<i>Viburnum prunifolium</i>	blackhaw	Tree	FACU			1	1			1	1			
Sum	Performance Standard				16	16	11	11	18	18	13	13	8	8
Mitigation Plan Performance Standard	Current Year Stem Count					16		11		18		13		8
	Stems/Acre					648		445		729		526		324
	Species Count					6		9		8		8		6
	Dominant Species Composition (%)					38		18		22		23		25
	Average Plot Height (ft.)					6		3		5		4		4
Post Mitigation Plan Performance Standard	Current Year Stem Count					16		11		18		13		8
	Stems/Acre					648		445		729		526		324
	Species Count					6		9		8		8		6
	Dominant Species Composition (%)					38		18		22		23		25
	Average Plot Height (ft.)					6		3		5		4		4
% Invasives					0		0		0		0		0	

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 6. Vegetation Plot Data

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 2 - 2022

Planted Acreage	20.53
Date of Initial Plant	2021-04-04
Date of Current Survey	2022-09-27
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 11 F		Veg Plot 12 F		Veg Plot 13 R	Veg Plot 14 R
					Planted	Total	Planted	Total	Total	Total
Species Included in Approved Mitigation Plan	<i>Acer negundo</i>	boxelder	Tree	FAC			1	1	1	
	<i>Asimina triloba</i>	pawpaw	Tree	FAC			1	1		
	<i>Betula nigra</i>	river birch	Tree	FACW	2	2	2	2	2	1
	<i>Cornus amomum</i>	silky dogwood	Shrub	FACW						
	<i>Diospyros virginiana</i>	common persimmon	Tree	FAC	4	4	2	2		
	<i>Nyssa sylvatica</i>	blackgum	Tree	FAC	1	1				
	<i>Oxydendrum arboreum</i>	sourwood	Shrub	UPL					1	
	<i>Platanus occidentalis</i>	American sycamore	Tree	FACW	4	4	4	4	3	7
	<i>Populus deltoides</i>	eastern cottonwood	Tree	FAC			1	1		1
	<i>Quercus alba</i>	white oak	Tree	FACU	1	1				
	<i>Quercus falcata</i>	southern red oak	Tree	FACU						2
	<i>Quercus lyrata</i>	overcup oak	Tree	OBL						
	<i>Quercus pagoda</i>	cherrybark oak	Tree	FACW			1	1		
	<i>Quercus phellos</i>	willow oak	Tree	FAC						
	<i>Quercus rubra</i>	northern red oak	Tree	FACU	1	1	1	1	2	2
<i>Ulmus alata</i>	winged elm	Tree	FACU	1	1				1	
<i>Ulmus americana</i>	American elm	Tree	FACW					1		
<i>Viburnum prunifolium</i>	blackhaw	Tree	FACU							
Sum	Performance Standard				14	14	13	13	10	14
Mitigation Plan Performance Standard	Current Year Stem Count					14		13	10	14
	Stems/Acre					567		526	405	567
	Species Count					7		8	6	6
	Dominant Species Composition (%)					29		31	30	50
	Average Plot Height (ft.)					4		5	4	7
Post Mitigation Plan Performance Standard	Current Year Stem Count					14		13	10	14
	Stems/Acre					567		526	405	567
	Species Count					7		8	6	6
	Dominant Species Composition (%)					29		31	30	50
	Average Plot Height (ft.)					4		5	4	7
% Invasives					0		0	0	0	

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 7. Vegetation Performance Standards Summary Table

Perry Hill Mitigation Site

DMS Project No. 100093

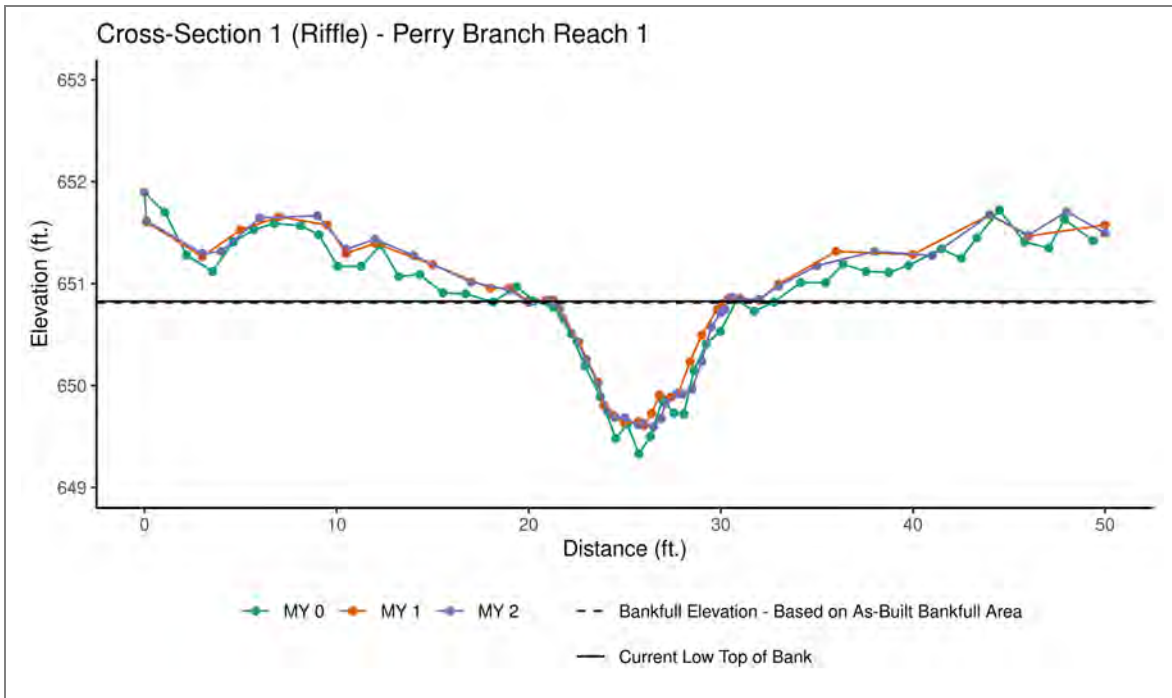
Monitoring Year 2 - 2022

	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	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	5	6	0	445	6	5	0	364	4	7	0
Monitoring Year 1	607	2	6	0	486	3	6	0	405	3	7	0
Monitoring Year 0	607	2	6	0	486	2	6	0	486	2	8	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	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	4	4	0	445	4	8	0	648	6	6	0
Monitoring Year 1	567	2	6	0	445	3	8	0	648	4	6	0
Monitoring Year 0	607	2	6	0	486	2	9	0	688	2	6	0
	Veg Plot 7 F				Veg Plot 8 F				Veg Plot 9 F			
	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	445	3	9	0	729	5	8	0	526	4	8	0
Monitoring Year 1	486	2	9	0	729	3	8	0	526	3	8	0
Monitoring Year 0	486	2	9	0	729	2	8	0	526	2	8	0
	Veg Plot 10 F				Veg Plot 11 F				Veg Plot 12 F			
	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	324	4	6	0	567	4	7	0	526	5	8	0
Monitoring Year 1	567	2	8	0	567	3	7	0	607	3	8	0
Monitoring Year 0	648	2	8	0	607	2	7	0	607	2	8	0
	Veg Plot Group 13 R				Veg Plot Group 14 R							
	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	405	4	6	0	567	7	6	0				
Monitoring Year 1	364	3	4	0	445	3	6	0				
Monitoring Year 0	567	2	7	0	445	2	8	0				

*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-Section Plots

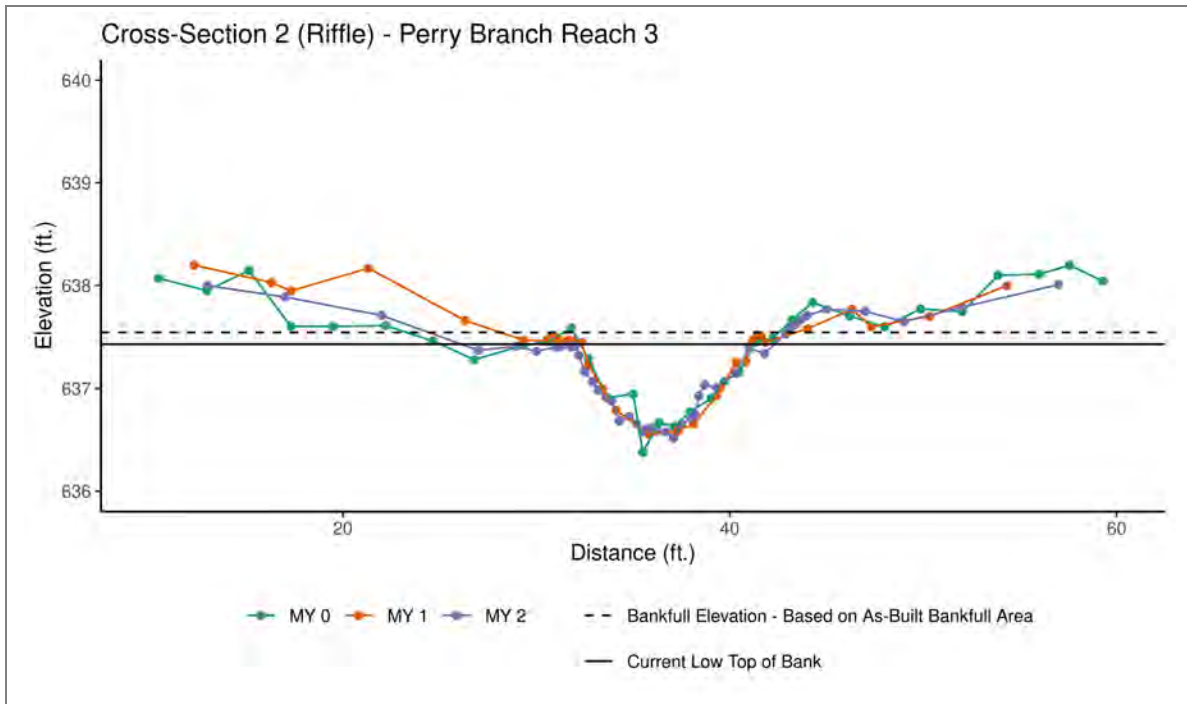


	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	650.73	650.88	650.81			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.96	1.01			
Thalweg Elevation	649.33	649.61	649.60			
LTOB Elevation	650.73	650.83	650.83			
LTOB Max Depth	1.44	1.22	1.23			
LTOB Cross-Sectional Area	6.71	6.24	6.83			



Downstream (4/14/2022)



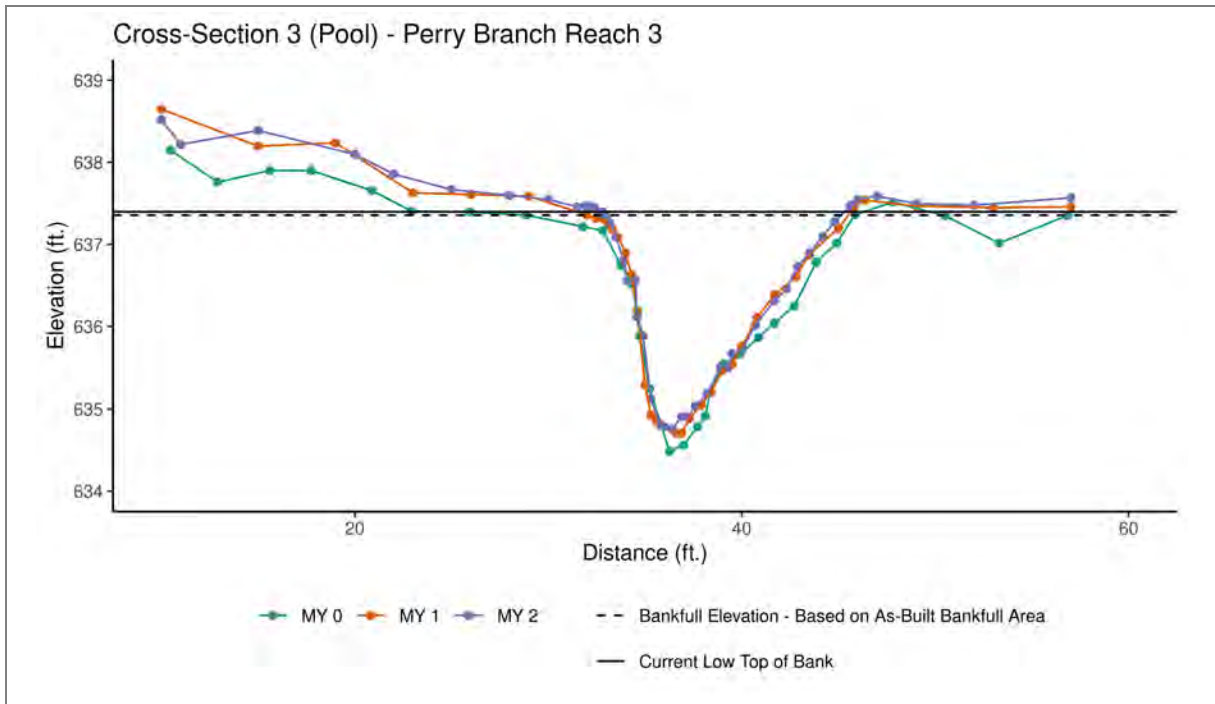


	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	637.59	637.57	637.54			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.88	0.89			
Thalweg Elevation	636.38	636.56	636.52			
LTOB Elevation	637.59	637.45	637.43			
LTOB Max Depth	1.21	0.89	0.91			
LTOB Cross-Sectional Area	6.27	5.22	5.06			



Downstream (4/14/2022)



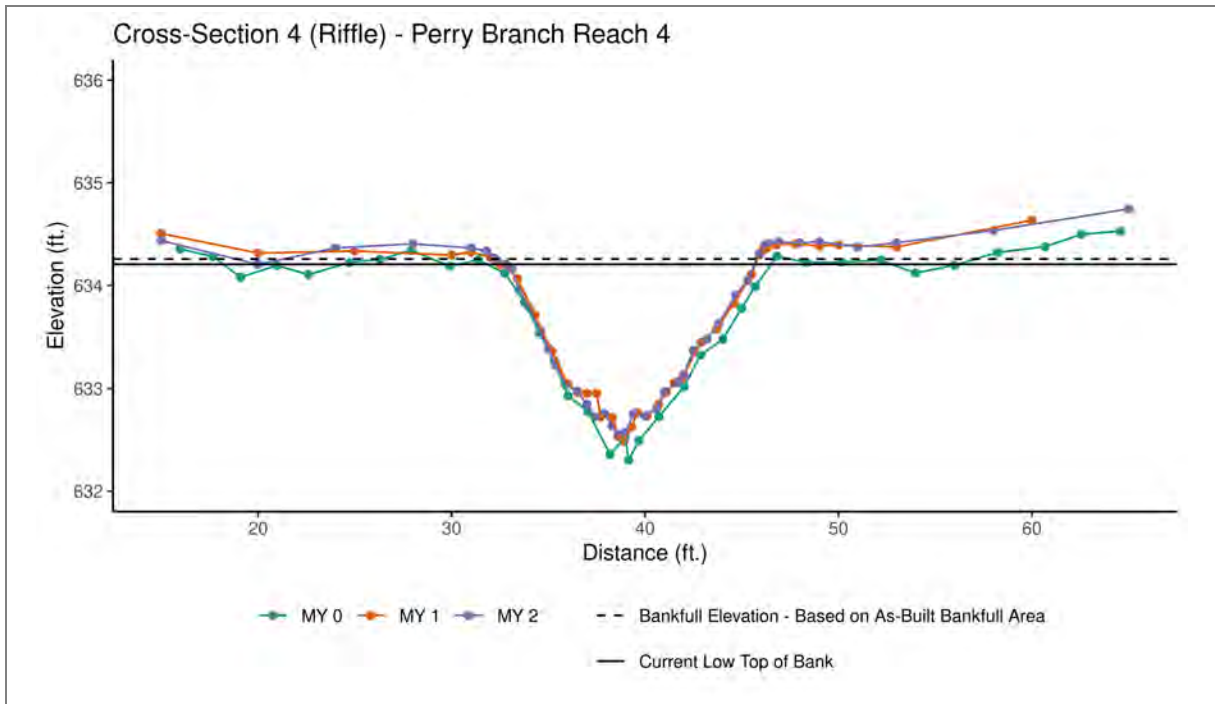


	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A	N/A			
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A	N/A			
Thalweg Elevation	634.49	634.71	634.76			
LTOB Elevation	637.17	637.32	637.40			
LTOB Max Depth	2.68	2.61	2.64			
LTOB Cross-Sectional Area	16.26	16.24	16.79			



Downstream (4/14/2022)



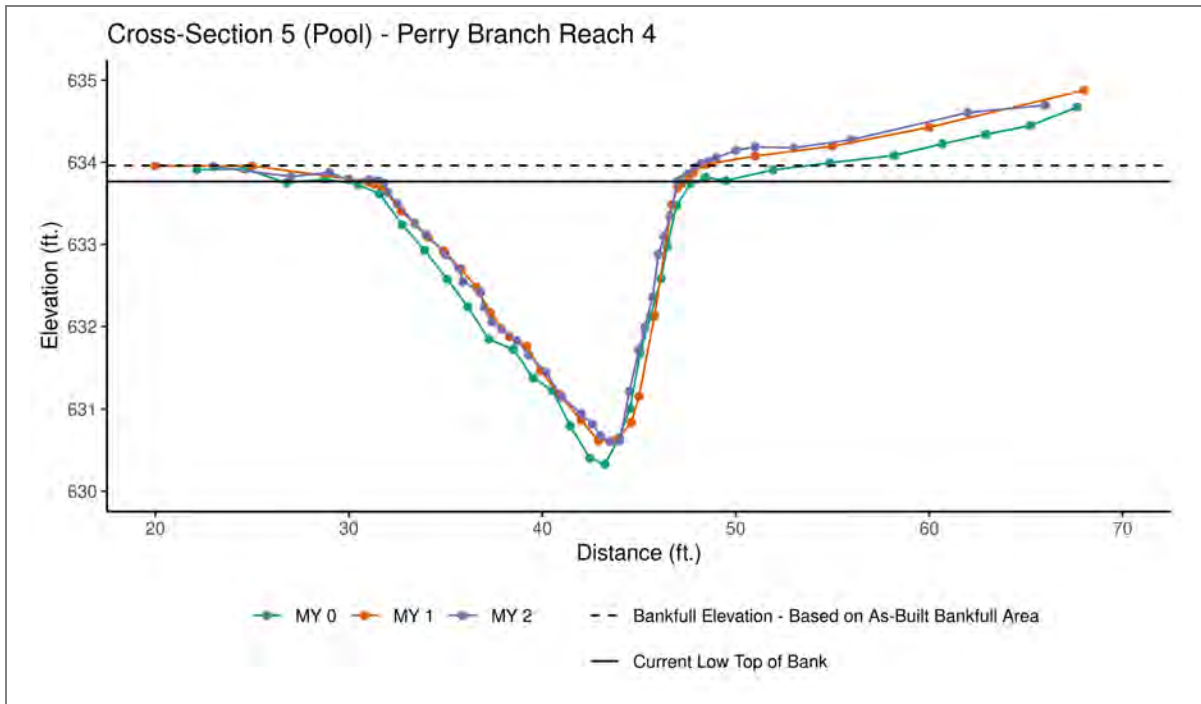


	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	634.12	634.27	634.26			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.96	0.97			
Thalweg Elevation	632.30	632.49	632.56			
LTOB Elevation	634.12	634.20	634.21			
LTOB Max Depth	1.81	1.71	1.65			
LTOB Cross-Sectional Area	12.85	11.91	12.18			



Downstream (4/14/2022)



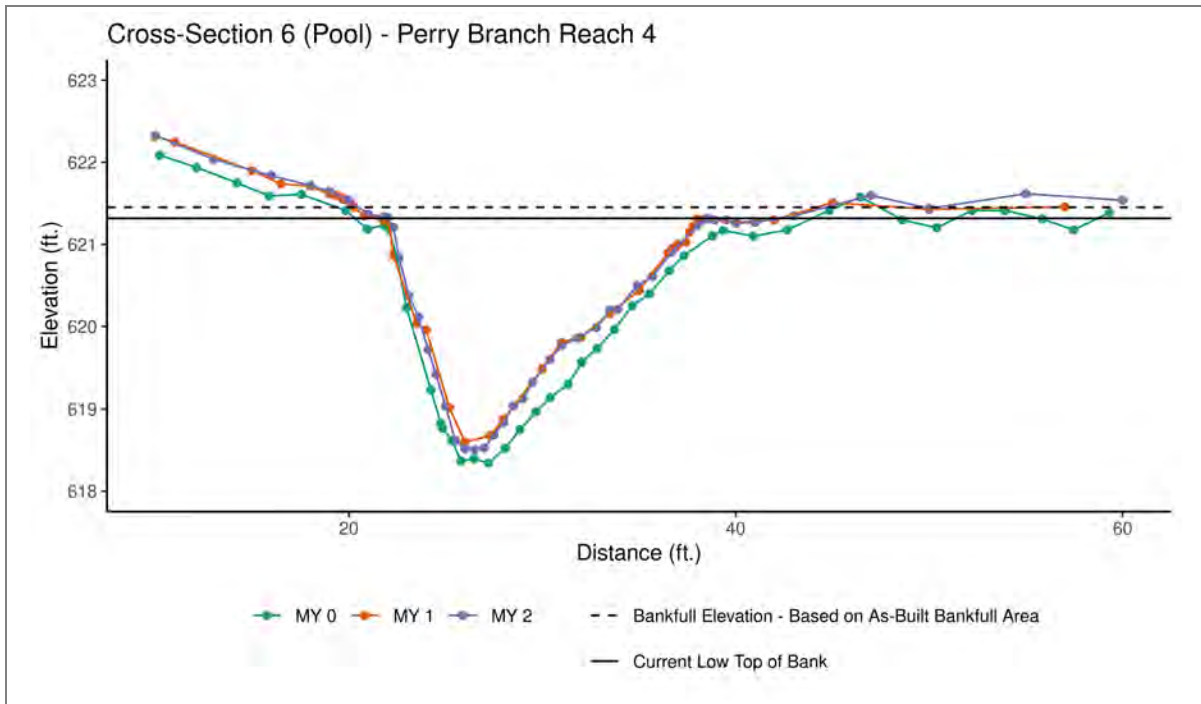


	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A	N/A			
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A	N/A			
Thalweg Elevation	630.33	630.62	630.61			
LTOB Elevation	633.73	633.76	633.77			
LTOB Max Depth	3.40	3.14	3.16			
LTOB Cross-Sectional Area	28.55	26.42	25.56			



Downstream (4/14/2022)



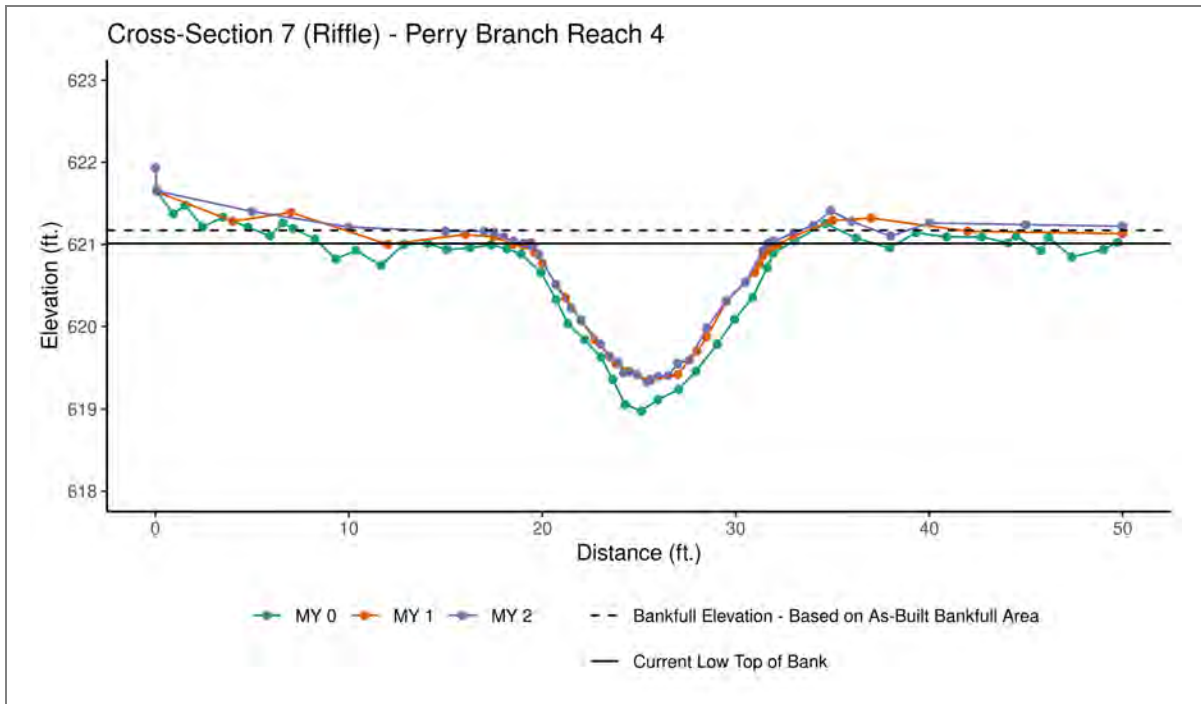


	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A	N/A			
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A	N/A			
Thalweg Elevation	618.34	618.60	618.51			
LTOB Elevation	621.17	621.28	621.32			
LTOB Max Depth	2.83	2.68	2.81			
LTOB Cross-Sectional Area	26.08	22.86	23.88			



Downstream (4/14/2022)



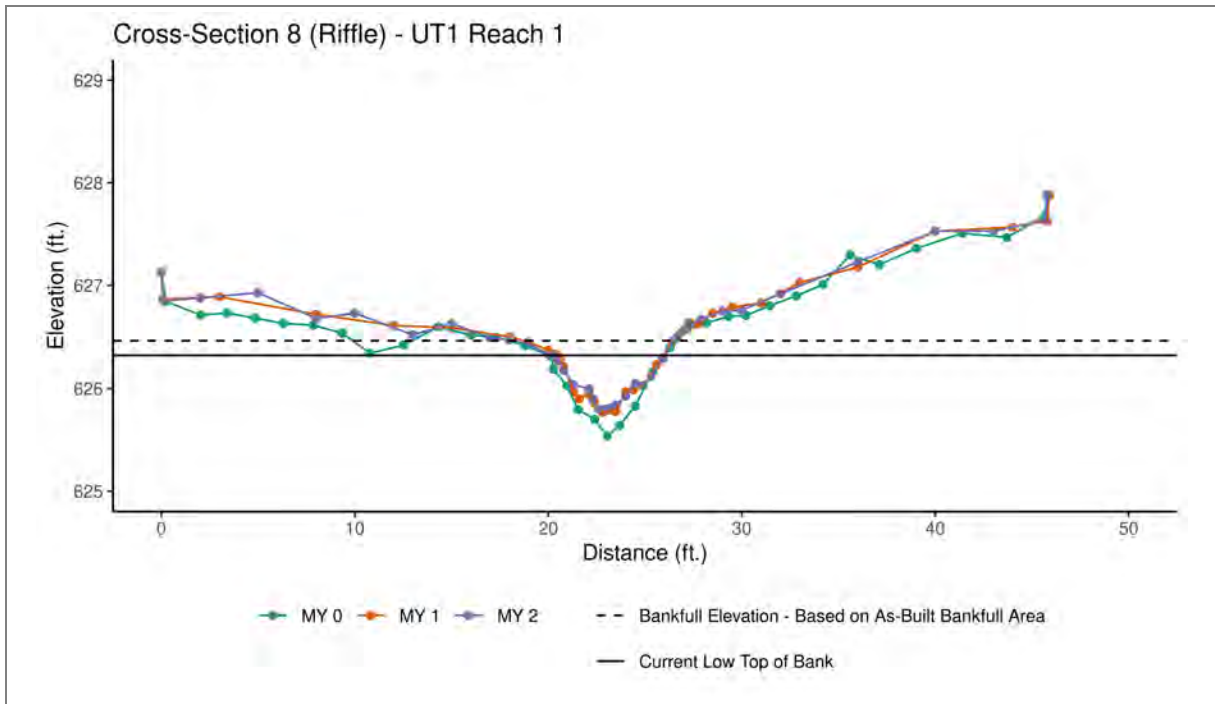


	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	620.89	621.15	621.17			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.87	0.91			
Thalweg Elevation	618.98	619.35	619.33			
LTOB Elevation	620.89	620.92	621.01			
LTOB Max Depth	1.91	1.57	1.68			
LTOB Cross-Sectional Area	14.13	11.34	12.15			



Downstream (4/14/2022)



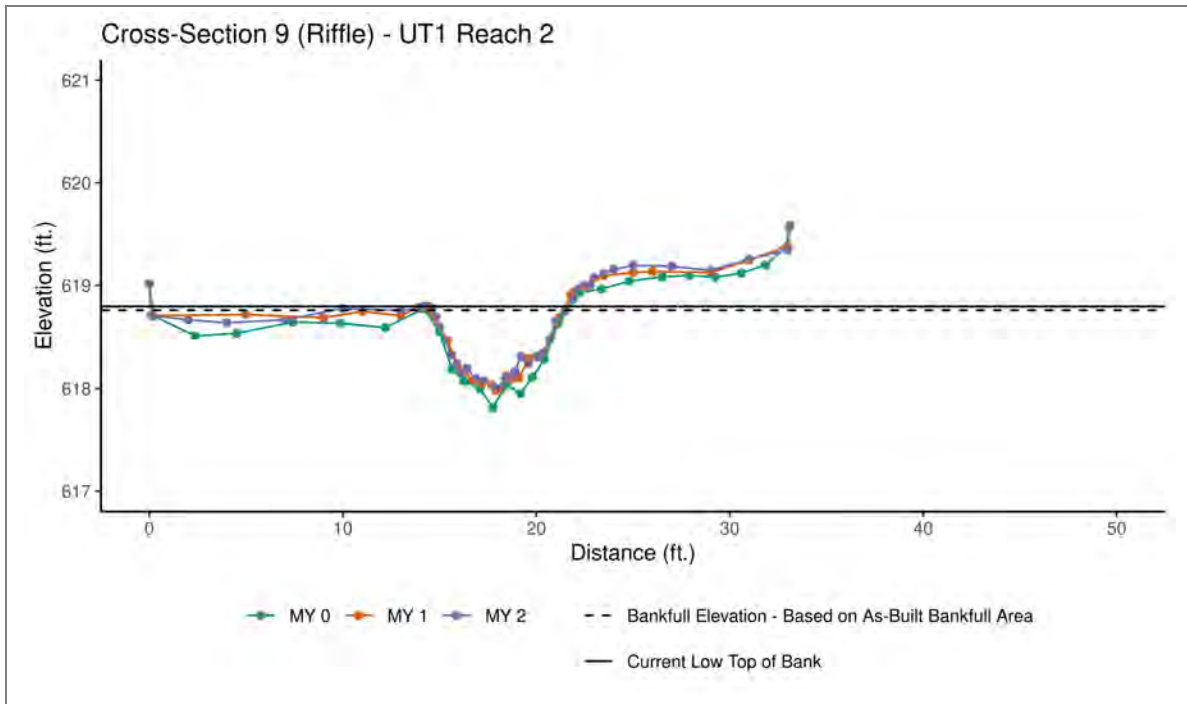


	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	626.30	626.45	626.46			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.82	0.79			
Thalweg Elevation	625.54	625.77	625.80			
LTOB Elevation	626.30	626.33	626.32			
LTOB Max Depth	0.77	0.56	0.52			
LTOB Cross-Sectional Area	2.52	1.86	1.72			



Downstream (4/14/2022)



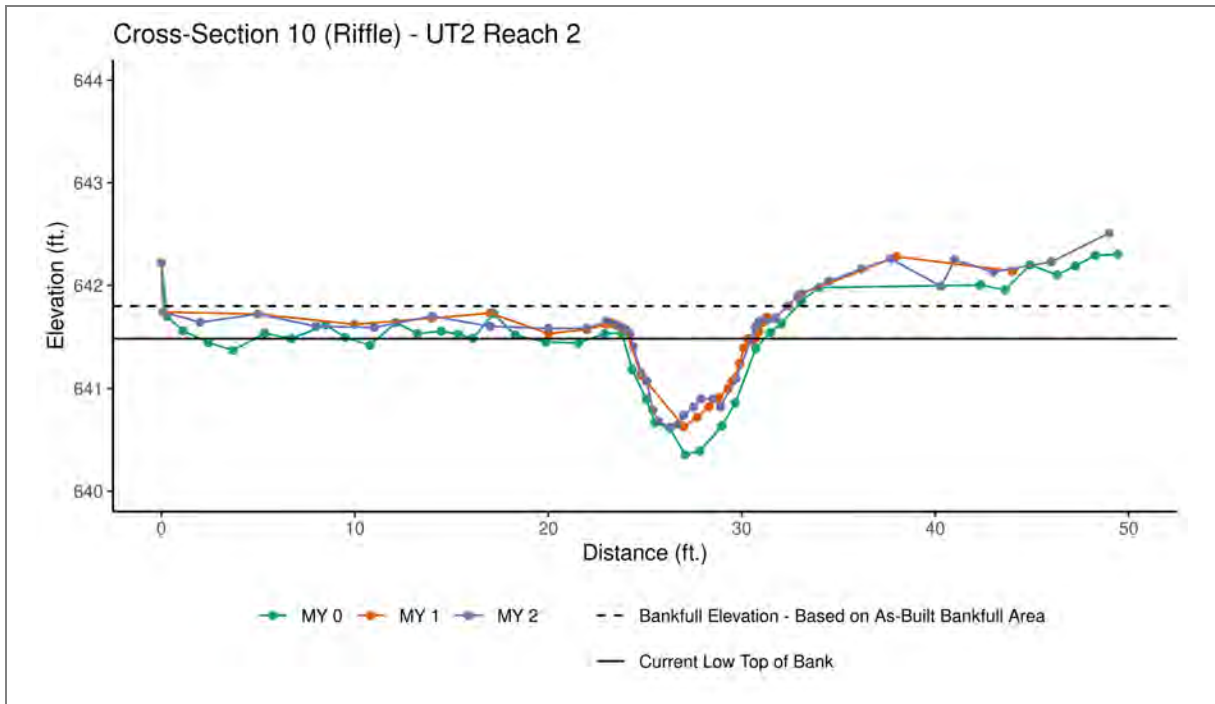


	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	618.63	618.74	618.76			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.02	1.05			
Thalweg Elevation	617.81	617.99	618.01			
LTOB Elevation	618.63	618.76	618.80			
LTOB Max Depth	0.82	0.77	0.79			
LTOB Cross-Sectional Area	3.23	3.32	3.49			



Downstream (4/14/2022)



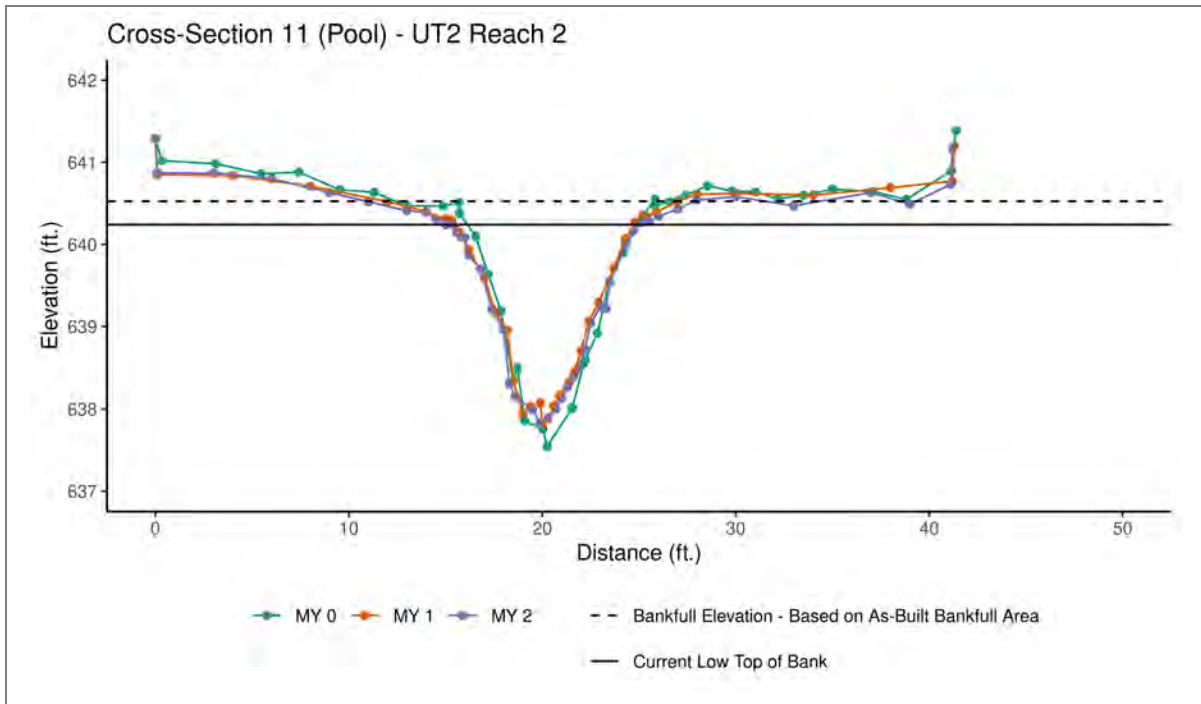


	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	641.54	641.78	641.80			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.82	0.73			
Thalweg Elevation	640.35	640.63	640.62			
LTOB Elevation	641.54	641.58	641.48			
LTOB Max Depth	1.18	0.95	0.86			
LTOB Cross-Sectional Area	5.39	3.93	3.42			



Downstream (4/14/2022)





	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A	N/A			
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A	N/A			
Thalweg Elevation	637.54	637.81	637.83			
LTOB Elevation	640.51	640.30	640.24			
LTOB Max Depth	2.97	2.49	2.41			
LTOB Cross-Sectional Area	14.86	12.04	12.15			



Downstream (4/14/2022)



Table 8. Baseline Stream Data Summary

Perry Hill Mitigation Site
 DMS Project No. 100093
 Monitoring Year 2 - 2022

Parameter	PRE-EXISTING CONDITIONS					DESIGN		MONITORING BASELINE (MYO)		
	Min	Mean	Med	Max	n	Min	Max	Max	Min	n
Perry Branch Reach 1										
Riffle Only										
Bankfull Width (ft)	2.7	2.9	2.9	3.1	2	8.0		9.2		1
Floodprone Width (ft)	4	4	4	4	2	61		80		1
Bankfull Mean Depth	0.4	0.5	0.5	0.6	2	0.6		0.7		1
Bankfull Max Depth	0.6	0.7	0.7	0.8	2	1.0		1.4		1
Bankfull Cross Sectional Area (ft ²)	1.1	1.6	1.6	2.0	2	5.0		6.8		1
Width/Depth Ratio	5.2	6.0	6.0	6.8	2	12.8		12.6		1
Entrenchment Ratio	1.3	1.4	1.4	1.4	2	7.6		8.7		1
Bank Height Ratio	2.1	2.4	2.4	2.7	2	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	29					36		39		
Rosgen Classification	G4c					C4		C4		
Bankfull Discharge (cfs)	2.8	4.4	4.4	5.9	2	14.9		22.0		1
Sinuosity	1.10					1.16		1.13		
Water Surface Slope (ft/ft)	0.0129					0.0127		0.0128		
Other	---					---		---		
Perry Branch Reach 3										
Riffle Only										
Bankfull Width (ft)	5.3	5.7	5.7	6.1	2	9.6		11.0		1
Floodprone Width (ft)	11.0	12.5	12.5	14.0	2	156		100		1
Bankfull Mean Depth	0.6	0.7	0.7	0.7	2	0.8		0.6		1
Bankfull Max Depth	0.7	0.8	0.8	0.8	2	1.2		1.2		1
Bankfull Cross Sectional Area (ft ²)	3.4	3.5	3.5	3.6	2	7.2		6.3		1
Width/Depth Ratio	8.7	8.8	8.8	8.8	2	12.8		19.2		1
Entrenchment Ratio	2.1	2.2	2.2	2.2	2	16.3		9.1		1
Bank Height Ratio	1.9	2.1	2.1	2.3	2	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	35					46		32		
Rosgen Classification	G4c					C4		C4		
Bankfull Discharge (cfs)	9.1	9.7	9.7	10.2	2	25.1		17.9		1
Sinuosity	1.15					1.12		1.12		
Water Surface Slope (ft/ft)	0.0155					0.0135		0.0130		
Other	---					---		---		
Perry Branch Reach 4										
Riffle Only										
Bankfull Width (ft)	5.7	6.7	6.0	9.3	4	11.4		13.0	13.1	2
Floodprone Width (ft)	9	12	12	17	4	123		125	175	2
Bankfull Mean Depth	0.6	0.8	0.8	1.0	4	0.9		1.0	1.1	2
Bankfull Max Depth	0.9	1.2	1.2	1.4	4	1.4		1.8	1.9	2
Bankfull Cross Sectional Area (ft ²)	4.0	5.1	5.2	5.9	4	10.1		12.8	14.1	2
Width/Depth Ratio	6.3	9.2	7.9	14.6	4	12.9		12.1	13.1	2
Entrenchment Ratio	1.4	1.9	1.8	2.7	4	10.8		9.6	13.5	1
Bank Height Ratio	1.2	2.2	2.3	3.0	4	1.0	1.1	1.0		2
Max part size (mm) mobilized at bankfull	33					46		48		
Rosgen Classification	F4					C4		C4		
Bankfull Discharge (cfs)	10.8	15.1	14.4	20.7	4	35.5		48.3	56.4	2
Sinuosity	1.11					1.14		1.15		
Water Surface Slope (ft/ft)	0.0109					0.0111		0.0110		
Other	---					---		---		

Table 8. Baseline Stream Data Summary

Perry Hill Mitigation Site
 DMS Project No. 100093
 Monitoring Year 2 - 2022

Parameter	PRE-EXISTING CONDITIONS					DESIGN		MONITORING BASELINE (MY0)		
	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
UT1 Reach 1										
Riffle Only										
Bankfull Width (ft)	1.7		1.7	1.7	1	6.0		5.8		1
Floodprone Width (ft)	6		6.0	6.0	1	11		50		1
Bankfull Mean Depth	0.8		0.8	0.8	1	0.4		0.4		1
Bankfull Max Depth	1.1		1.1	1.1	1	0.6		0.8		1
Bankfull Cross Sectional Area (ft ²)	1.4		1.4	1.4	1	2.5		2.5		1
Width/Depth Ratio	2.1		2.1	2.1	1	14.3		13.2		1
Entrenchment Ratio	3.3		3.3	3.3	1	1.8		8.7		1
Bank Height Ratio	1.9		1.9	1.9	1	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	22					111		94		
Rosgen Classification	E6b					B4		B4		
Bankfull Discharge (cfs)	7.5		7.5	7.5	1	9.4		11.7		1
Sinuosity	1.04					1.06		1.04		
Water Surface Slope (ft/ft)	0.0473					0.0522		0.0508		
Other	---					---		---		
UT1 Reach 2										
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Max	Min	n
Bankfull Width (ft)	3.7	4.6	4.6	5.4	2	6.0		6.4		1
Floodprone Width (ft)	7	8	8	9	2	113		175		1
Bankfull Mean Depth	0.3	0.4	0.4	0.4	2	0.5		0.5		1
Bankfull Max Depth	0.6	0.7	0.7	0.7	2	0.8		0.8		1
Bankfull Cross Sectional Area (ft ²)	1.4	1.5	1.5	1.6	2	2.9		3.2		1
Width/Depth Ratio	9.3	14.0	14.0	18.7	2	12.5		13.0		1
Entrenchment Ratio	1.6	1.8	1.8	2.0	2	18.8		27.2		1
Bank Height Ratio	2.6	2.8	2.8	3.0	2	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	22					51		48		
Rosgen Classification	F4b					C4b		C4b		
Bankfull Discharge (cfs)	3.2	3.5	3.5	3.7	2	7.6		11.0		
Sinuosity	1.14					1.15		1.14		
Water Surface Slope (ft/ft)	0.0204					0.0221		0.0233		
Other	---					---		---		
UT2 Reach 2										
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	3.2	3.8	4.0	4.0	3	6.0		7.7		1
Floodprone Width (ft)	20	44	42	69	3	44		100		1
Bankfull Mean Depth	0.6	0.7	0.7	0.8	3	0.5		0.7		1
Bankfull Max Depth	1.0	1.1	1.0	1.2	3	0.7		1.2		1
Bankfull Cross Sectional Area (ft ²)	2.0	2.7	2.7	3.0	3	2.7		5.4		1
Width/Depth Ratio	5.0	5.4	5.2	5.9	3	13.2		10.8		1
Entrenchment Ratio	6.2	11.3	10.3	17.3	3	7.3		13.0		1
Bank Height Ratio	1.2	1.4	1.3	1.6	3	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	52					37		51		
Rosgen Classification	E4					C4		C4		
Bankfull Discharge (cfs)	6.2	8.7	9.0	10.9	3	8.2		20.7		1
Sinuosity	1.13					1.11		1.11		
Water Surface Slope (ft/ft)	0.0187					0.0177		0.0179		
Other	---					---		---		

Table 9. Cross-Section Morphology Monitoring Summary

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 2 - 2022

	Perry Branch Reach 1						Perry Branch Reach 3																	
	Cross-Section 1 (Riffle)						Cross-Section 2 (Riffle)						Cross-Section 3 (Pool)											
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7						
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	650.73	650.88	650.81				637.59	637.57	637.54				N/A	N/A	N/A									
Bank Height Ratio - Based on AB Bankfull ¹ Area	1.00	0.96	1.01				1.00	0.88	0.89				N/A	N/A	N/A									
Thalweg Elevation	649.33	649.61	649.60				636.38	636.56	636.52				634.49	634.71	634.76									
LTOB ² Elevation	650.73	650.83	650.83				637.59	637.45	637.43				637.17	637.32	637.40									
LTOB ² Max Depth (ft)	1.44	1.22	1.23				1.21	0.89	0.91				2.68	2.61	2.64									
LTOB ² Cross-Sectional Area (ft ²)	6.71	6.24	6.83				6.27	5.22	5.06				16.26	16.24	16.79									
	Perry Branch Reach 4																							
	Cross-Section 4 (Riffle)						Cross-Section 5 (Pool)						Cross-Section 6 (Pool)						Cross-Section 7 (Riffle)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	634.12	634.27	634.26				N/A	N/A	N/A				N/A	N/A	N/A				620.89	621.15	621.17			
Bank Height Ratio - Based on AB Bankfull ¹ Area	1.00	0.96	0.97				N/A	N/A	N/A				N/A	N/A	N/A				1.00	0.87	0.91			
Thalweg Elevation	632.30	632.49	632.56				630.33	630.62	630.61				618.34	618.60	618.51				618.98	619.35	619.33			
LTOB ² Elevation	634.12	634.20	634.21				633.73	633.76	633.77				621.17	621.28	621.32				620.89	620.92	621.01			
LTOB ² Max Depth (ft)	1.81	1.71	1.65				3.40	3.14	3.16				2.83	2.68	2.81				1.91	1.57	1.68			
LTOB ² Cross-Sectional Area (ft ²)	12.85	11.91	12.18				28.55	26.42	25.56				26.08	22.86	23.88				14.13	11.34	12.15			
	UT1 Reach 1						UT1 Reach 2						UT2 Reach 2											
	Cross-Section 8 (Riffle)						Cross-Section 9 (Riffle)						Cross-Section 10 (Riffle)						Cross-Section 11 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	626.30	626.45	626.46				618.63	618.74	618.76				641.54	641.78	641.80				N/A	N/A	N/A			
Bank Height Ratio - Based on AB Bankfull ¹ Area	1.00	0.82	0.79				1.00	1.02	1.05				1.00	0.82	0.73				N/A	N/A	N/A			
Thalweg Elevation	625.54	625.77	625.80				617.81	617.99	618.01				640.35	640.63	640.62				637.54	637.81	637.83			
LTOB ² Elevation	626.30	626.33	626.32				618.63	618.76	618.80				641.54	641.58	641.48				640.51	640.30	640.24			
LTOB ² Max Depth (ft)	0.77	0.56	0.52				0.82	0.77	0.79				1.18	0.95	0.86				2.97	2.49	2.41			
LTOB ² Cross-Sectional Area (ft ²)	2.52	1.86	1.72				3.23	3.32	3.49				5.39	3.93	3.42				14.86	12.04	12.15			

¹Bank Height Ratio (BHR) takes the As-Built bankfull area as the basis for adjusting each subsequent years bankfull elevation.

²LTOB Cross-Sectional Area and Max depth 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 recorded and tracked above as LTOB max depth.

APPENDIX D. HYDROLOGY DATA

Table 10. Bankfull Events

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 2 - 2022

Reach	MY1 (2021) ¹	MY2 (2022) ²	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
Perry Branch Reach 1	N/A	N/A					
Perry Branch Reach 4	N/A	N/A					
Perry Branch Reach 4 (Gauge B)	Installed January 2022	5/24/2022					
UT1 Reach 2	7/19/2021	5/23/2022					
UT2 Reach 2	7/19/2021	3/9/2022 5/23-24/2022					

¹Gauges were installed mid-March 2021.

²Data was collected 1/1/2022 to 10/18/2022. Data from the remainder of MY2 will be updated in MY3.

Table 11. Rainfall Summary

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 2 - 2022

	MY1 (2021)	MY2 (2022)	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
Annual Precipitation Total	40.10 [^]	39.88 [*]					
30 Year Average Precip WETS 30th Percentile	43.75	43.52					
30 Year Average Precip WETS 70th Percentile	51.13	51.01					
Annual Precipitation Compared to Normal	Low	*					

Annual Precipitation Source: **Durham 11 W** Station, Orange County, NC, State Climate Office

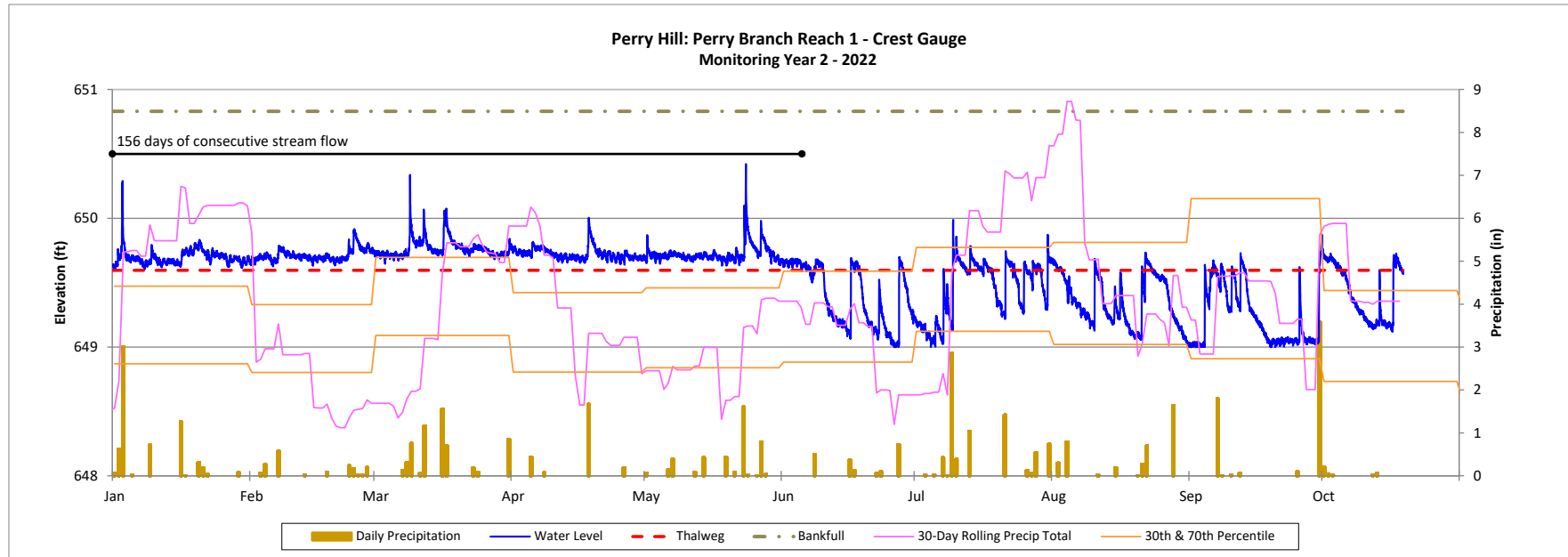
30 Year Average Precipitation Source: **Chapel Hill 2 W** Station, Orange County, NC, AgACIS

[^]MY1 Report calculation erroneously included December 2020 daily rainfall data.

^{*}Annual precipitation total includes data from 1/1/2022 to 10/18/2022. Data from the remainder of MY2 will be updated in MY3.

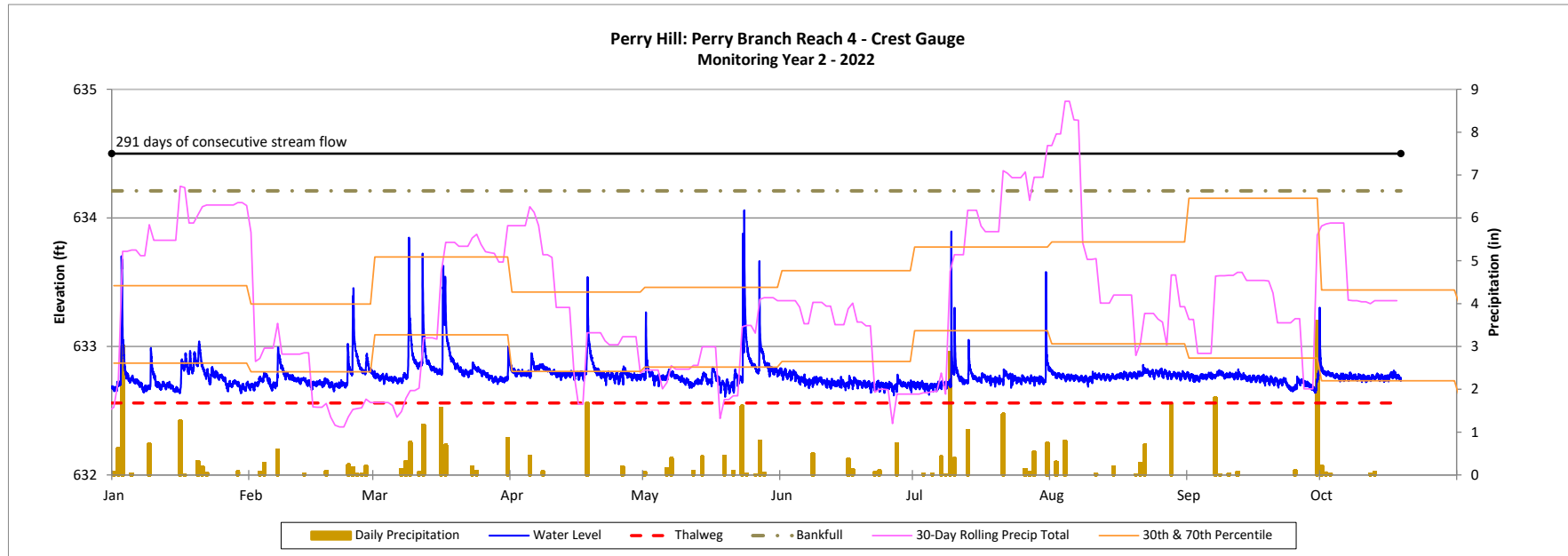
Recorded Bankfull Events Plot

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 2 - 2022



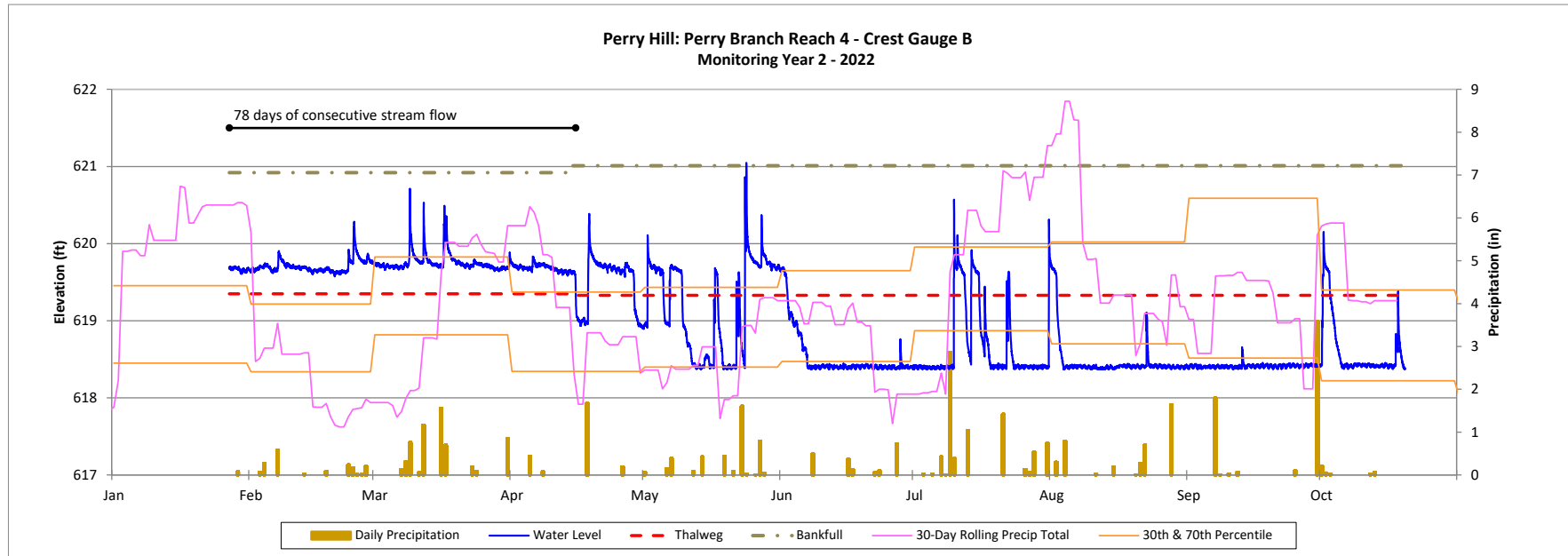
Recorded Bankfull Events Plot

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 2 - 2022



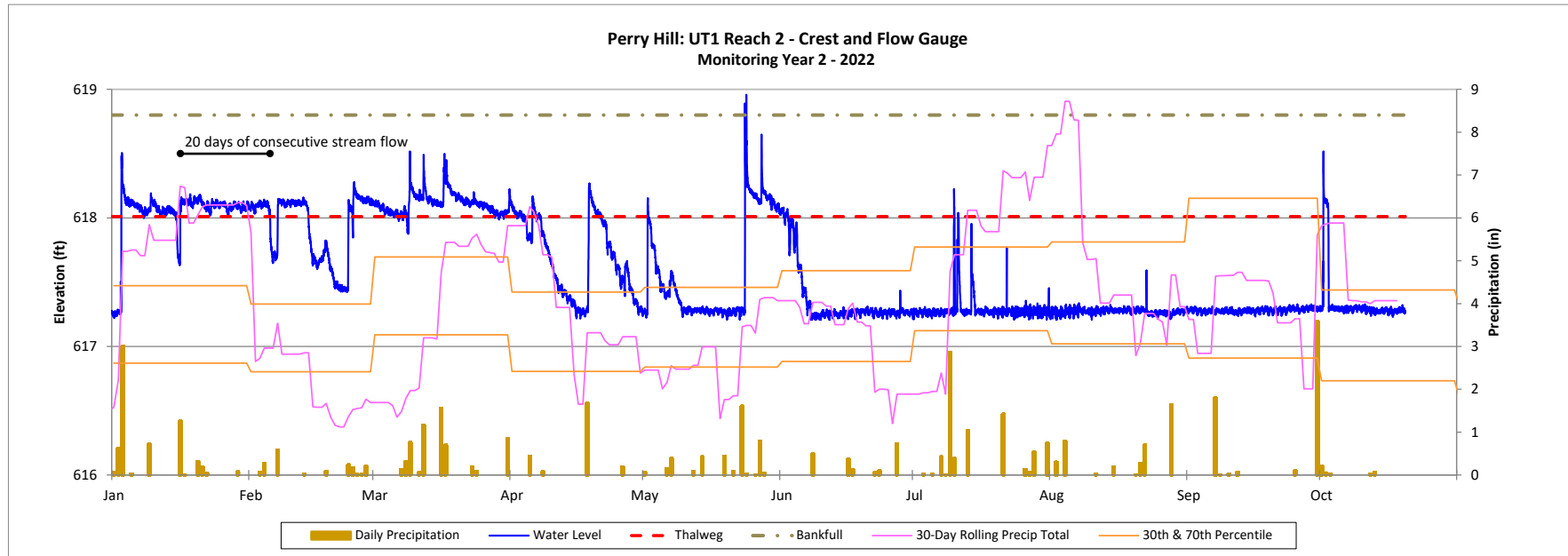
Recorded Bankfull Events Plot

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 2 - 2022



Recorded Bankfull Events Plot

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 2 - 2022



Recorded Bankfull Events Plot

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 2 - 2022

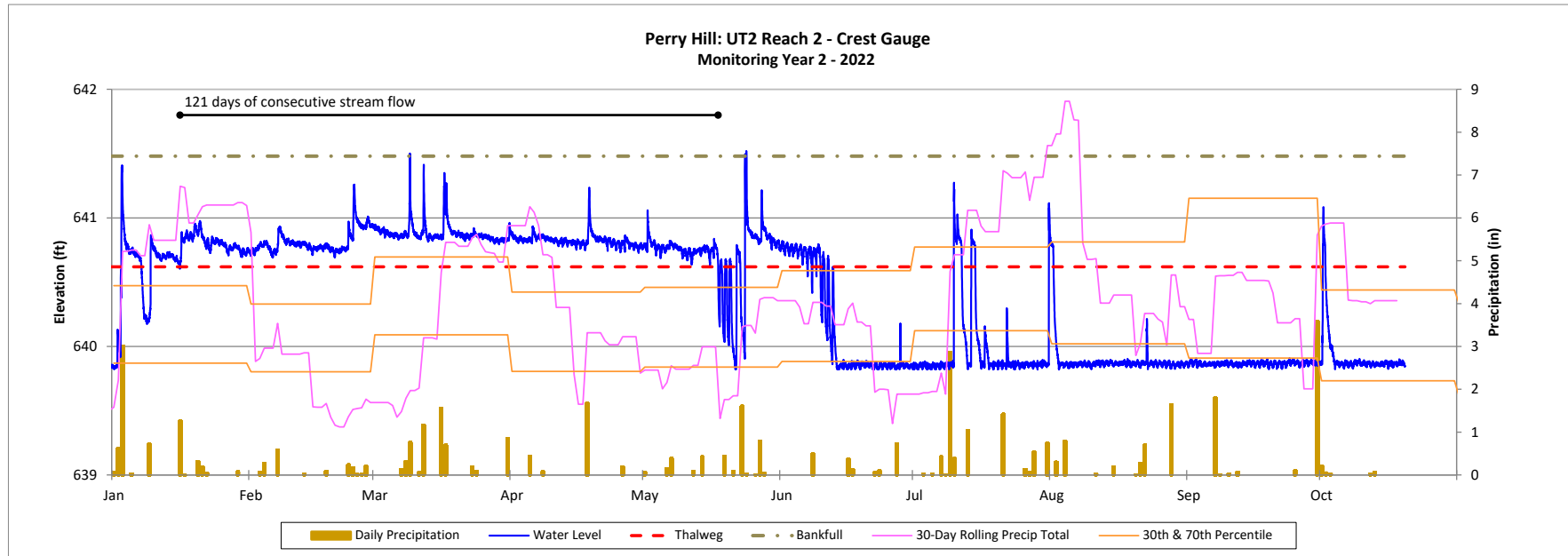


Table 12. Recorded In-Stream Flow Events Summary

Perry Hill Mitigation Site
 DMS Project No. 100093
Monitoring Year 2 - 2022

Reach	Max Consecutive Days/Total Days of Baseflow*						
	MY1 (2021) ¹	MY2 (2022) ²	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
UT1 Reach 1	1 Day/ 1 Day	1 Day/ 1 Day					
UT1 Reach 1 (Gauge B)	Not Installed until December 2021	20 Days/ 92 Days					
UT2 Reach 2	98 Days/ 154 Days	164 Days/ 183 Days					

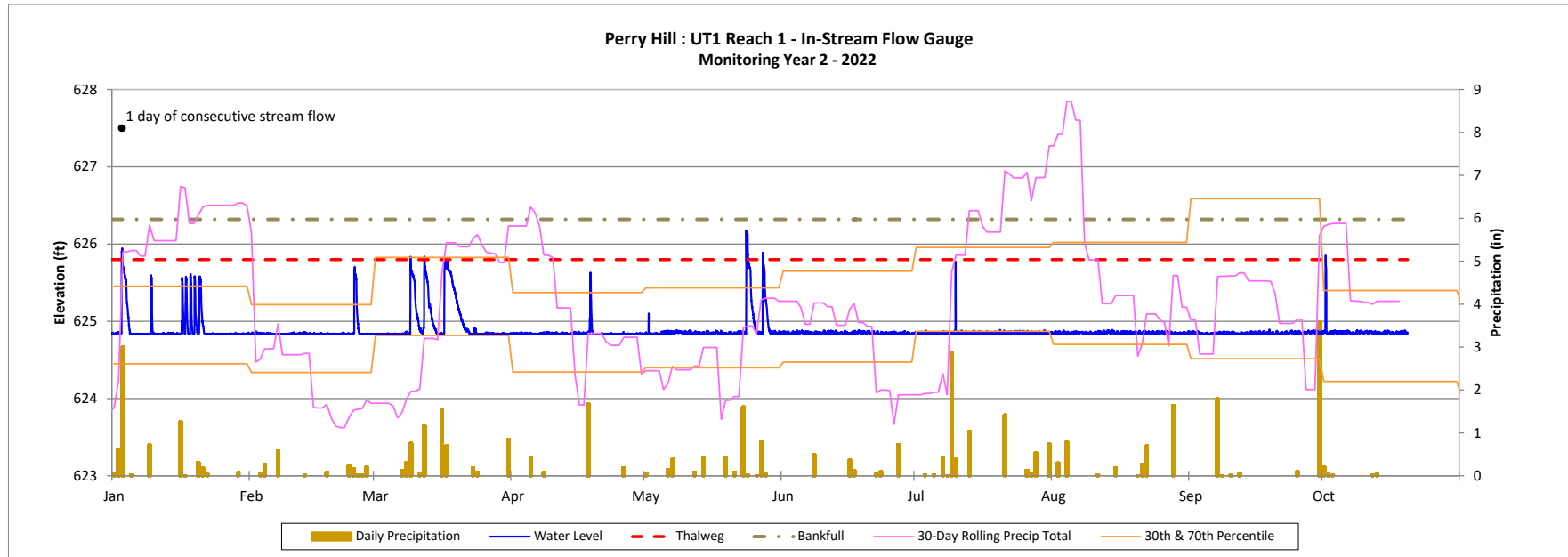
*Success criterion is presence of baseflow for a minimum of 30 consecutive days.

¹Gauges were installed mid-March 2021.

²Data was collected 1/1/2022 to 10/18/2022. Data from the remainder of MY2 will be updated in MY3.

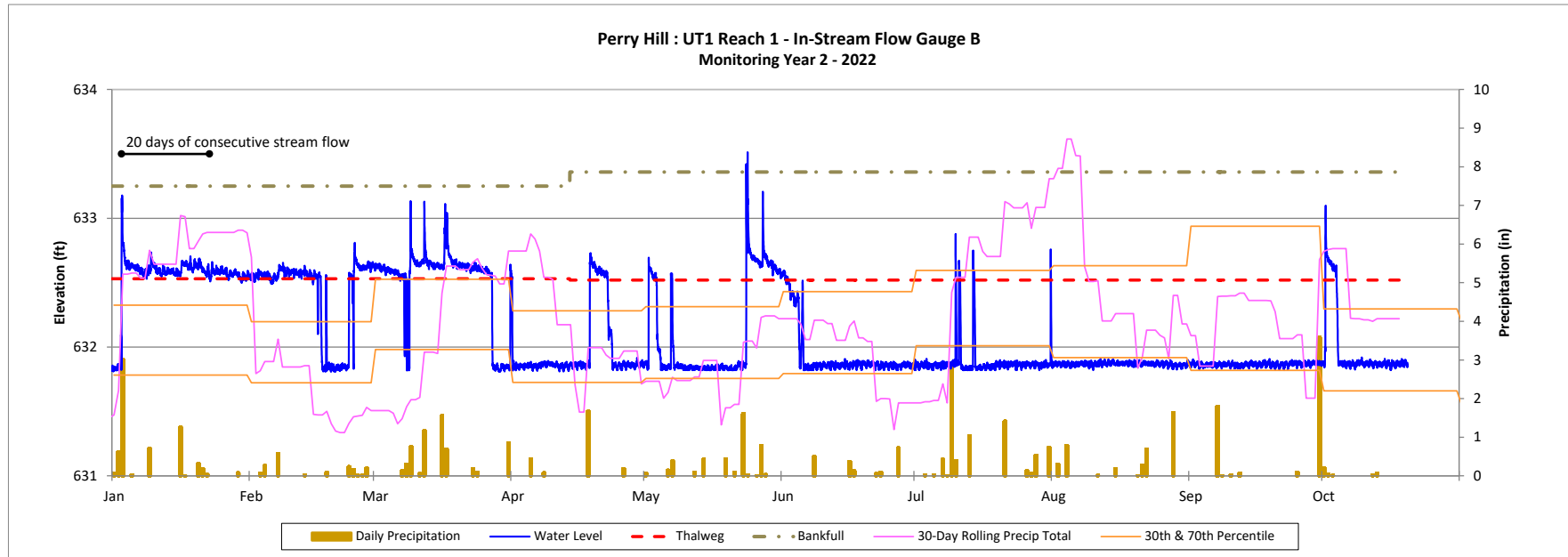
Recorded In-stream Flow Events Plot

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 2 - 2022



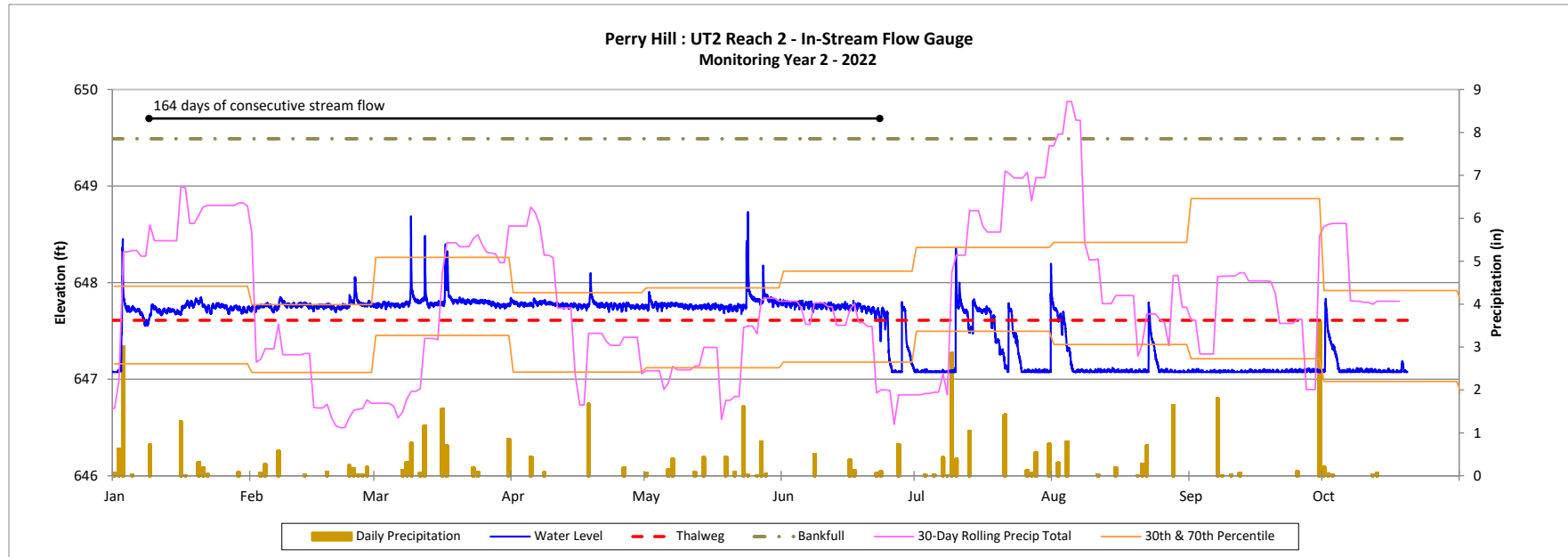
Recorded In-stream Flow Events Plot

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 2 - 2022



Recorded In-stream Flow Events Plot

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 2 - 2022



APPENDIX E. PROJECT TIMELINE AND CONTACT INFO

Table 13. Project Activity and Reporting History

Perry Hill Mitigation Site
 DMS Project No. 100093
Monitoring Year 2 - 2022

Activity or Report	Data Collection Complete	Completion or Scheduled Delivery
Project Instituted	NA	December 2018
Mitigation Plan Approved	July 2020	July 2020
Invasive Vegetation Treatment		November 2020
Construction (Grading) Completed	NA	March 2021
As-Built Survey Completed	April 2021	April 2021
Competitive Vegetation Treatment ¹		April 2021
Baseline Monitoring Document (Year 0)	Stream Survey	March 2021
	Vegetation Survey	April 2021
Invasive Vegetation Treatment		October 2021
Easement Encroachment		October 2021
Year 1 Monitoring	Stream Survey	October 2021
	Vegetation Survey	October 2021
Competitive Vegetation Treatment ¹		April 2022
Invasive Vegetation Treatment		March and August 2022
In-Stream Vegetation Treatment		August 2022
UT1 Channel Repair		September 2022
Maintenance Area Marked		TBD
Year 2 Monitoring	Stream Survey	April 2022
	Vegetation Survey	September 2022
Year 3 Monitoring	Stream Survey	2023
	Vegetation Survey	2023
Year 4 Monitoring		2024
Year 5 Monitoring	Stream Survey	2025
	Vegetation Survey	2025
Year 6 Monitoring		2026
Year 7 Monitoring	Stream Survey	2027
	Vegetation Survey	2027

¹Herbicide ring sprays around the base of planted stems.

Table 14. Project Contact Table

Perry Hill Mitigation Site
 DMS Project No. 100093
Monitoring Year 2 - 2022

Designer Geoff Smith, PE	Wildlands Engineering, Inc. 497 Bramson Ct, Suite 104 Mt. Pleasant, SC 29464 843.277.6221
Construction Contractor	Main Stream Earthwork, Inc. 631 Camp Dan Valley Rd Reidsville, NC 27320
Monitoring Performers Monitoring, POC	Wildlands Engineering, Inc. Jason Lorch 919.851.9986