

FINAL MONITORING REPORT
2021 (Year 3)

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, North Carolina

DMS Project ID No. 100014
Full Delivery Contract No. 7192
USACE Action ID No. SAW-2017-01471
DWR No. 17-0290
RFP No. 16-006990

Cape Fear River Basin
Cataloging Unit 03030002

Data Collection: January 2021 – October 2021
Submission: December 2021



Prepared for:

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

December 2021



Response to Monitoring Year 2 (2022) DMS Comments

Heron Stream and Wetland Mitigation Site (DMS #100014)
Cape Fear River Basin 03030002, Alamance County
Contract No. 7192

Comments Received (Black Text) & Responses (Blue Text)

1. Wetland Summary, page 8. The Mitigation Plan for this project shows a 3/1-10/22 growing season documented with soil temperature was accepted by IRT. However, there are multiple growing seasons showing for each year of this project and the footnotes on the wetland summary table contains conflicting information. Review, revise, and update this section and the associated growing season dates to match mitigation plan.

The growing season for Year 3 was changed to March 1-October 22. The footnotes on the table were updated to clarify the reasoning for different growing season start dates for each monitoring year. Gauge graphs and groundwater hydrology summary tables were also updated to reflect the approved growing season.
2. Vegetation Summary, page 8. Per your Mitigation Plan: 'Planted and volunteer stems are counted, provided they are included in the approved planting list for the site.' Please consider this when documenting success for each vegetation plot. Use the planted species list to show which volunteers are on the planting plan and update narrative, CCPV, Table 8, and Table 10 to show success based on this. The volunteers counted for success should only come from planted species table.

The wording in the vegetation summary section was revised to indicate that although Plot 2 has a stem density of 445 stems/acre when including natural recruits, hickory (*Carya* sp.) was not included on the approved planting list, and therefore, Plot 2 does not meet MY3 success criteria. Table 8 indicates planted and total stem density, and Table 10 indicates "approved" stem density.
3. Table 1. Overall assets. Please update final numbers to show out 3 significant digits (5,293.334 and 0.655 WMU) to match the credit ledger on file.

The overall assets were updated to show 3 significant digits.
4. Table 2. Show supplemental plant and invasive treatment dates on this table.

Supplemental planting and invasive treatment dates were added to Table 2.
5. Table 13f. Check the W/D ratio on 33 riffle.

An error in processing was corrected on cross-section 33 riffle.
6. Cross section 9 (pool) shows BHR at 1.29 but there don't appear to be signs of degradation (it looks like aggradation between baseline and MY1). Check that number and revise if necessary and/or explain this in the response.

This cross-section aggraded between MY0 and MY1 but appears to have stabilized since. There was an error in processing (the wrong TOB elevation was used). This has been corrected, resulting in a BHR of <1.

7. XS-26 and XS-27 footnote states that riffle degradation and pool deposition is natural, but DMS does not agree. Some aggradation is expected from construction on riffles, and degradation in pools as a general statement. It would be better to explain what RS thinks occurred here and/or why.

The degradation in XS-26 is likely a result of upstream land-use causing more direct, flashy flows during heavy rain events prior to the streambed fully settling post-construction. The majority of the degradation occurred between MY0 and MY1, and MY2 and MY3 data are virtually the same. This indicates stability, although RS will continue to monitor this reach for additional degradation through the remainder of the monitoring period. XS-27 aggradation occurred shortly after construction, likely from fines being flushed out of riffle bed material upstream and settling in this lower energy reach of stream. Virtually no additional aggradation has occurred since MY1, and the pool appears to have stabilized. The notes on these cross-sections were revised for clarity.

8. GW gage 1 is missing the label that includes # continuous days and % hydroperiod like the other graphs.

The label was added to the graph.

9. Provide benthic score data as compared to pre-condition benthics in a table if possible.

A benthic summary table was added in the Stream Summary section on page 8.

10. Provide soil temperature dates to show when the temperature reached 41 degrees in each monitoring year.

The documented soil temperatures and dates were added to the footnotes on the "Summary of Monitoring Period/Hydrology Success Criteria by Year" table.

Digital Review-

- Please include the veg transect data used to create Table 9.
This excel sheet was added to the digital submittal.
- The figure for GWG 1 does not include the percentage growing season callout.
The label was added to the graph.
- Please include a figure displaying the 30-70th percentiles and observed precipitation and include these data in the digital submittal.
This figure is included in Appendix E and the digital submittal.

Heron Year 3, 2021 Executive Summary

General Notes

- No encroachment was identified in Year 3
- No evidence of nuisance animal activity (i.e., beaver, heavy deer browsing, etc.) was observed.

Site Maintenance Report (2021)

Invasive Species Work	Maintenance work
9/07/2021, 09/10/2021, 10/07/2021 Johnson Grass, Privet, Tree-of-Heaven, Multi-flora Rose, Japanese Knotweed, Cattail and Fescue	04/08/2021 Planted Bareroot Hardwoods within the proposed area on the monitoring report

Streams

- All streams are functioning as designed, and no stream areas of concern were observed during Year 3 (2021) monitoring. Stream morphology data is available in Appendix D.
- In accordance with the monitoring schedule, Year 3 (2021) benthic macroinvertebrate sampling occurred on May 11, 2021. See the table below for a summary of benthic macroinvertebrate results. Year 3 (2021) results and habitat forms are in Appendix F.

Summary of Benthic Macroinvertebrate Data by Year

Sampling Station	Preconstruction		Year 3 (2021)		Year 5 (2023)		Year 7 (2025)	
	# EPT Taxa	Biotic Index	# EPT Taxa	Biotic Index	# EPT Taxa	Biotic Index	# EPT Taxa	Biotic Index
UT-1	0	7.94	2	8.11				
UT-5	0	7.40	0	8.85				

Wetlands

- Six of six groundwater gauges met success for the Year 3 (2021) monitoring period. Wetland hydrology data is in Appendix E.

Summary of Monitoring Period/Hydrology Success Criteria by Year

Year	Soil Temperatures/Date Bud Burst Documented	Monitoring Period Used for Determining Success	10 Percent of Monitoring Period
2019 (Year 1)	March 28, 2019*	March 28-October 22 (209 days)	21 days
2020 (Year 2)	March 2, 2020 [#]	March 2-October 22 (234 days)	23 days
2021 (Year 3)	March 1, 2021 [^]	March 1-October 22 (236 days)	24 days

*Based on documented bud burst and soil temperature of 50.06°F on March 28, 2019.

[#]Based on bud burst documented March 2, 2020 and soil temperature of 46.82°F on March 1, 2020.

[^]Based on bud burst documented on March 1, 2021. The soil temperature logger was damaged and stopped recording February 16, 2021, however at the time of the failure, the soil temperature had dropped below 41°F just twice in 2021 (January 5th and 31st) and exceeded thereafter.

Groundwater Hydrology Data

Gauge	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)	Year 6 (2024)	Year 7 (2025)
1	Yes/33 days (15.8%)	Yes/23 days (9.8%)	Yes /46 days (19.5%)				
2	Yes/26 days (12.4%)	Yes/27 days (11.5%)	Yes/47 days (19.9%)				
3	Yes/35 days (16.7%)	Yes/28 days (12.0%)	Yes/36 days (15.2%)				
4	Yes/69 days (33.0%)	Yes/51 days (21.8%)	Yes/60 days (25.4%)				
5	Yes/52 days (24.9%)	Yes/45 days (19.2%)	Yes/50 days (21.2%)				
6	Yes/54 days (25.8%)	Yes/46 days (19.7%)	Yes/52 days (22.0%)				

Vegetation Summary

Measurements of the 14 permanent vegetation plots resulted in an average of 411 approved stems/acre excluding livestock. All plots met success criteria except permanent plots 2, 10, and 14 which were each one stem short of meeting target goals. Additionally, all six temporary transects met success criteria resulting in an average of 445 stems/acre, including natural recruits. The sitewide average for all 20 plots, including natural recruits for temporary transects, was 421 stems/acre. Year 3 (2021) vegetation data is included in Tables 8-10 (Appendix C).

Site Permitting/Monitoring Activity and Reporting History

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Technical Proposal (RFP No. 16-006990)	January 11, 2017	January 11, 2017
Institution Date (NCDMS Contract No. 100014)	--	May 22, 2017
404 Permit	--	October 10, 2018
Mitigation Plan	--	July 2018
Construction Plans	--	July 17, 2018
Site Construction	--	November 27, 2018- February 11, 2019
Planting	--	February 21, 2019
As-built Baseline Stream Data Collection	February 25-26, 2019	--
As-built Baseline Vegetation Data Collection	February 25, 2019	--
As-built Baseline Monitoring (MY0)	February-March 2019	May 2019
Monitoring Year 1 (2019) Stream Data Collection	August 13-14, 2019	--
Monitoring Year 1 (2019) Vegetation Data Collection	September 30, 2019	--
Monitoring Year 1 (MY1)	March-October 2019	November 2019
Monitoring Year 2 (2020) Stream Data Collection	May 16-24, 2020	--
Monitoring Year 2 (2020) Vegetation Data Collection	July 1-6, 2020	--
Monitoring Year 2 (MY2)	March-October 2020	January 2021
Monitoring Year 3 (2021) Stream Data Collection	February 16, 2021	--
Monitoring Year 3 (2021) Vegetation Data Collection	July - October, 2021	--
Monitoring Year 3 (MY3)	January - October 2021	December 2021

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December 2021

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1.0 PROJECT SUMMARY

Restoration Systems, LLC has established the North Carolina Division of Mitigation Services (NCDMS) Heron Stream and Wetland Restoration Site (Site).

1.1 Project Goals & Objectives

Project goals were based on the *Cape Fear River Basin Restoration Priorities* (RBRP) report (NCEEP 2009) and on-site preconstruction data collection of channel morphology and function observed during field investigations. The Site is located within Targeted Local Watershed (TLW) 03030002050050. The RBRP report documents benthic ratings vary between “Fair” and “Good-Fair” possibly due to cattle, dairy, and poultry operations. The project is not located in a Regional or Local Watershed Planning Area; however, RBRP goals addressed by project activities are as follows with Site specific information following the RBRP goals in parenthesis.

1. Reduce and control sediment inputs (sediment input reduction of 67.3 tons/year);
2. Reduce and manage nutrient inputs (livestock removed from streams, elimination of fertilizer application, installation of marsh treatment areas; and a direct reduction of 893.2 pounds of nitrogen and 47.0 pounds of phosphorus per year);

Site specific mitigation goals and objectives were developed through the use of North Carolina Stream Assessment Method (NC SAM) and North Carolina Wetland Assessment Method (NC WAM) analyses of preconstruction and reference stream systems at the Site (NC SFAT 2015 and NC WFAT 2010) (see Table 1).

Table 1. Stream/Wetland Targeted Functions, Goals, and Objectives

Targeted Functions	Goals	Objectives	Compatibility of Success Criteria
(1) HYDROLOGY			
(2) Flood Flow (Floodplain Access)	<ul style="list-style-type: none"> Attenuate flood flow across the Site. Minimize downstream flooding to the maximum extent possible. Connect streams to functioning wetland systems. 	<ul style="list-style-type: none"> Construct new channel at historic floodplain elevation to restore overbank flows and restore jurisdictional wetlands Plant woody riparian buffer Remove livestock Deep rip floodplain soils to reduce compaction and increase soil surface roughness Protect riparian buffers with a perpetual conservation easement 	<ul style="list-style-type: none"> BHR not to exceed 1.2 Document four overbank events in separate monitoring years Livestock excluded from the easement Attain Wetland Hydrology Success Criteria Attain Vegetation Success Criteria Conservation Easement recorded
(3) Streamside Area Attenuation			
(4) Floodplain Access			
(4) Wooded Riparian Buffer			
(4) Microtopography	<ul style="list-style-type: none"> Increase stream stability within the Site so that channels are neither aggrading nor degrading. 	<ul style="list-style-type: none"> Construct channels with proper pattern, dimension, and longitudinal profile Remove livestock Construct stable channels with cobble/gravel substrate Plant woody riparian buffer 	<ul style="list-style-type: none"> Cross-section measurements indicate a stable channel with cobble/gravel substrate Visual documentation of stable channels and structures BHR not to exceed 1.2 ER of 1.4 or greater < 10% change in BHR and ER in any given year Livestock excluded from the easement Attain Vegetation Success Criteria
(3) Stream Stability			
(4) Channel Stability			
(4) Sediment Transport			
(1) WATER QUALITY			
(2) Streamside Area Vegetation	<ul style="list-style-type: none"> Remove direct nutrient and pollutant inputs from the Site and reduce contributions to downstream waters. 	<ul style="list-style-type: none"> Remove livestock and reduce agricultural land/inputs Install marsh treatment areas Plant woody riparian buffer Restore/enhance jurisdictional wetlands adjacent to Site streams Provide surface roughness through deep ripping/plowing Restore overbank flooding by establishing proper channel dynamics Cessation of municipal land application 	<ul style="list-style-type: none"> Livestock excluded from the easement Attain Wetland Hydrology Success Criteria Attain Vegetation Success Criteria
(3) Upland Pollutant Filtration			
(3) Thermoregulation			
(2) Indicators of Stressors			
Wetland Particulate Change			
Wetland Physical Change			
(1) HABITAT			
(2) In-stream Habitat	<ul style="list-style-type: none"> Improve instream and stream-side habitat. 	<ul style="list-style-type: none"> Construct stable channels with cobble/gravel substrate Plant woody riparian buffer to provide organic matter and shade Construct new channel at historic floodplain elevation to restore overbank flows and plant woody riparian buffer Protect riparian buffers with a perpetual conservation easement Restore/enhance jurisdictional wetlands adjacent to Site streams 	<ul style="list-style-type: none"> Cross-section measurement indicate a stable channel with cobble/gravel substrate Visual documentation of stable channels and in-stream structures. Attain Wetland Hydrology Success Criteria Attain Vegetation Success Criteria Conservation Easement recorded
(3) Substrate			
(3) Stream Stability			
(3) In-Stream Habitat			
(2) Stream-side Habitat			
(3) Stream-side Habitat			
(3) Thermoregulation			
Wetland Landscape Patch Structure			
Wetland Vegetation Composition			

1.2 Project Background

The Heron Stream and Wetland Mitigation Site (hereafter referred to as the “Site”) encompasses a 17.64-acre easement along warm water, unnamed tributaries to Pine Hill Branch and unnamed tributaries to South Fork Cane Creek. The Site is located approximately 4 miles southeast of Snow Camp and 4.5 miles north of Silk Hope in southern Alamance County near the Chatham County line (Figure 1, Appendix A).

Prior to construction, Site land use consisted of disturbed forest and agricultural land used for livestock grazing and hay production. Livestock had unrestricted access to Site streams, which had been cleared, dredged of cobble substrate, straightened, trampled by livestock, eroded vertically and laterally, and received extensive sediment and nutrient inputs from stream banks and adjacent pastures. Approximately 62 percent of the stream channel had been degraded contributing to sediment export from the Site resulting from mechanical processes such as livestock hoof shear. In addition, streamside wetlands were cleared and drained by channel downcutting and land uses. Preconstruction Site conditions resulted in degraded water quality, a loss of aquatic habitat, reduced nutrient and sediment retention, and unstable channel characteristics (loss of horizontal flow vectors that maintain pools and an increase in erosive forces to channel bed and banks). Site restoration activities restored riffle-pool morphology, aided in energy dissipation, increased aquatic habitat, stabilized channel banks, and greatly reduced sediment loss from channel banks.

1.3 Project Components and Structure

Proposed Site restoration activities generated 5293 Stream Mitigation Units (SMUs) and 0.66 Wetland Mitigation Units (WMUs) as the result of the following.

- 4068 linear feet of Priority I stream restoration
- 1184 linear feet of stream enhancement (Level I)
- 1090 linear feet of stream enhancement (Level II)
- 0.35 acre of riparian wetland restoration
- 0.61 acre of riparian wetland enhancement

Additional activities that occurred at the Site included the following.

- Installation of six marsh treatment areas throughout the Site.
- Fencing the entire conservation easement by leaving some pre-existing fencing, removing fencing, and installing additional fencing.
- Planting 12.05 acres of the Site with 15,625 stems (planted species and densities by zone are included in Table 7 [Appendix C]).

Deviations from the construction plans included realignment of UT 1B (adding 20 linear feet to the alignment) due to conflicts with a gas line crossing. The realignment resulted in the reduction of a log vane and alterations to pipe configurations within the crossing. Gas line realignment also affected the length of UT 2 in its lower reaches (shortening the Restoration reach). UT 2 also has minor deviations in the enhancement II reach due to profile elevation alterations to tie to the invert of UT 1B. These profile alterations were included in construction plans, but not included in table updates of the detailed plan. Profile alterations resulted in the Enhancement (level II)/Restoration initiation point migrating upstream, and thus the length of the Enhancement (Level II) reach (UT 2A) decreased by 39 feet, and the length of the restoration reach (UT 2B) increased by 17 feet.

Minor easement deviations after construction plan development resulted in some stationing changes, most notable at the upper reaches of UT 1A (adding 5 linear feet to the alignment) and UT 8A & UT 8B

(reducing the alignments by a total of 4 linear feet). The easement variations also affected channel lengths across gas lines, which do not generate mitigation credit. Eight log cross-vanes were not constructed due to contact with bed rock, or conflicts with the gas line. In addition, a marsh treatment area was added to the right bank of UT 6 at a draw that was concentrating surface drainage and scouring the valley walls. No other deviations of significance occurred between construction plans and the as-built condition. In addition, no issues have arisen since construction occurred.

Site design was completed in July 2018. Construction started on November 27, 2018 and ended within a final walkthrough on February 11, 2019. The Site was planted on February 21, 2019. Completed project activities, reporting history, completion dates, project contacts, and background information are summarized in Tables 1-4 (Appendix A).

1.4 Success Criteria

Project success criteria have been established per the October 24, 2016 NC Interagency Review Team *Wilmington District Stream and Wetland Compensatory Mitigation Update*. Monitoring and success criteria relate to project goals and objectives. From a mitigation perspective, several of the goals and objectives are assumed to be functionally elevated by restoration activities without direct measurement. Other goals and objectives will be considered successful upon achieving success criteria. The following table summarizes Site success criteria.

Success Criteria

Streams
<ul style="list-style-type: none"> • All streams must maintain an Ordinary High-Water Mark (OHWM), per RGL 05-05. • Continuous surface flow must be documented each year for at least 30 consecutive days. Surface water monitoring gauges will be installed in the upper third of all intermittent channels, unless otherwise requested by the IRT. • Bank height ratio (BHR) cannot exceed 1.2 at any measured cross-section. • Entrenchment ratio (ER) must be no less than 2.2 for E- and C-type channels at any measured riffle cross-section. Note: B-type channels may have an ER less than 1.4. • BHR and ER at any measure riffle cross-section should not change by more than 10% from baseline condition during any given monitoring period. • The stream project shall remain stable and all other performance standards shall be met through four separate bankfull events, occurring in separate years, during the monitoring years 1-7.
Wetland Hydrology
<ul style="list-style-type: none"> • Saturation or inundation within the upper 12 inches of the soil surface for, at a minimum, 10 percent of the growing season, during average climatic conditions. Note: Soil temperature for growing season establishment will be measured daily utilizing a continuous monitoring soil probe. Soil temperature will be measured from mid-February through the end of April (at a minimum).
Vegetation
<ul style="list-style-type: none"> • Within planted portions of the site, a minimum of 320 stems per acre must be present at year 3; a minimum of 260 stems per acre must be present at year 5; and a minimum of 210 stems per acre must be present at year 7. • Trees must average 7 feet in height at year 5, and 10 feet in height at year 7 in each plot. • Planted and volunteer stems are counted, provided they are included in the approved planting list for the site; natural recruits not on the planting list may be considered by the IRT on a case-by-case basis.

2.0 METHODS

Monitoring requirements and success criteria outlined in this plan follow the October 24, 2016 NC Interagency Review Team *Wilmington District Stream and Wetland Compensatory Mitigation Update*. Monitoring will be conducted by Axiom Environmental, Inc. Annual monitoring reports of the data collected will be submitted to the NCDMS by Restoration Systems no later than December 31 of each monitoring year data is collected. The monitoring schedule is summarized in the following table.

Monitoring Schedule

Resource	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Streams	X	X	X		X		X
Wetlands	X	X	X	X	X	X	X
Vegetation	X	X	X		X		X
Macroinvertebrates			X		X		X
Visual Assessment	X	X	X	X	X	X	X
Report Submittal	X	X	X	X	X	X	X

2.1 Monitoring

The monitoring parameters are summarized in the following table.

Monitoring Summary

Stream Parameters				
Parameter	Method	Schedule/Frequency	Number/Extent	Data Collected/Reported
Stream Profile	Full longitudinal survey	As-built (unless otherwise required)	All restored stream channels	Graphic and tabular data.
Stream Dimension	Cross-sections	Years 1, 2, 3, 5, and 7	Total of 37 cross-sections on restored channels	Graphic and tabular data.
Channel Stability	Visual Assessments	Yearly	All restored stream channels	Areas of concern to be depicted on a plan view figure with a written assessment and photograph of the area included in the report.
	Additional Cross-sections	Yearly	Only if instability is documented during monitoring	Graphic and tabular data.
Stream Hydrology	Continuous monitoring surface water gauges and/or trail camera	Continuous recording through monitoring period	Total of 10 surface water gauges	Surface water data for each monitoring period as depicted in Figures 10A-10D.
Bankfull Events	Continuous monitoring surface water gauges and/or trail camera	Continuous recording through monitoring period	Total of 10 surface water gauges: One gauge on UT1, 2, 3, 6 and 8. Two gauges on UT 5. Three gauges on UT 7	Surface water data for each monitoring period
	Visual/Physical Evidence	Continuous through monitoring period	All restored stream channels	Visual evidence, photo documentation, and/or rain data.
Benthic Macroinvertebrates	"Qual 4" method described in <i>Standard Operating Procedures for Collection and Analysis of Benthic Macroinvertebrates, Version 5.0</i> (NCDWR 2016)	Pre-construction, Years 3, 5, and 7 during the "index period" referenced in <i>Small Streams Biocriteria Development</i> (NCDWQ 2009)	2 stations (one at the lower end of UT1 and one at the lower end of UT5)	Results* will be presented on a site-by-site basis and to include a list of taxa collected, an enumeration of <i>Ephemeroptera</i> , <i>Plecoptera</i> , and <i>Tricoptera</i> taxa as well as Biotic Index.
Wetland Parameters				
Parameter	Method	Schedule/Frequency	Number/Extent	Data Collected/Reported
Wetland Restoration	Groundwater gauges	As-built, Years 1, 2, 3, 4, 5, 6, and 7 throughout the year with the growing season defined as March 1-October 22	6 gauges spread throughout restored wetlands	Soil temperature at the beginning of each monitoring period to verify the start of the growing season, groundwater and rain data for each monitoring period
Vegetation Parameters				
Parameter	Method	Schedule/Frequency	Number/Extent	Data Collected/Reported
Vegetation establishment and vigor	Permanent vegetation plots 0.0247 acre (100 square meters) in size; <i>CVS-EEP Protocol for Recording Vegetation, Version 4.2</i> (Lee et al. 2008)	As-built, Years 1, 2, 3, 5, and 7	14 plots spread across the Site	Species, height, planted vs. volunteer, stems/acre
	Annual random vegetation plots, 0.0247 acre (100 square meters) in size	As-built, Years 1, 2, 3, 5, and 7	4 plots randomly selected each year	Species and height

*Benthic Macroinvertebrate sampling data will not be tied to success criteria; however, the data may be used as a tool to observe positive gains to in-stream habitat

Stream Summary

All streams are functioning as designed, and no stream areas of concern were observed during year 3 (2021) monitoring. Stream morphology data is available in Appendix D.

In accordance with the monitoring schedule, year 3 (2021) benthic macroinvertebrate sampling occurred on May 11, 2021. See the table below for a summary of benthic macroinvertebrate results. Year 3 (2021) results and habitat forms are in Appendix F.

Summary of Benthic Macroinvertebrate Data by Year

Sampling Station	Preconstruction		Year 3 (2021)		Year 5 (2023)		Year 7 (2025)	
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#Based on bud burst documented March 2, 2020 and soil temperature of 46.82°F on March 1, 2020.

^Based on bud burst documented on March 1, 2021. The soil temperature logger was damaged and stopped recording February 16, 2021, however at the time of the failure, the soil temperature had dropped below 41°F just twice in 2021 (January 5th and 31st) and exceeded thereafter.

All six groundwater gauges met success criteria for the year 3 (2021) monitoring period (Appendix E).

Vegetation Summary

During quantitative vegetation sampling, 14 sample plots (10-meter by 10-meter) were installed within the Site as per guidelines established in *CVS-EEP Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008). Year 3 (2021) measurements also included six random sample plots (50-meter by 2-meter). Measurements of all 20 plots resulted in an average of 421 approved stems/acre excluding lifestakes. Additionally, all plots met success criteria except permanent plots 2, 10, and 14 which were each one stem short of meeting target goals (Tables 8-10, Appendix C). Plot 2 stem density was 445 stems/acre when considering natural recruits, however, hickory (*Carya sp.*) was not included on the approved planting plan, so therefore, Plot 2 did not meet success criteria.

Supplemental planting of 3.87 acres was conducted in 2021 in previously identified areas of poor growth rates or vigor using 1,290 plants to improve the Site's overall stem density. These areas are identified on

Figures 2A, 2B, and 2C (Appendix B) and are outside vegetation plots. Planting occurred at a rate of approximately 330 bare root stems per acre of the following species: river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), tulip poplar (*Liriodendron tulipifera*), red bud (*Cercis canadensis*), sycamore (*Platanus occidentalis*), white oak (*Quercus alba*), water oak (*Quercus nigra*), willow oak (*Quercus phellos*), and red oak (*Quercus rubra*).

3.0 REFERENCES

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Appendix A

Background Tables

Table 1. Project Components and Mitigation Units

Table 2. Project Activity and Reporting History

Table 3. Project Contacts Table

Table 4. Project Attributes Table

Table 1. Project Components and Mitigation Credits: Heron Site

Reach ID	Stream Stationing/ Wetland Type	Existing Footage/ Acreage	Mitigation Plan Footage/ Acreage	Restoration Footage/ Acreage	Restoration Level	Restoration or Restoration Equivalent	Mitigation Ratio	Mitigation Credits	Comment
UT 1A	(-)0+05 to 04+70	475	470	475	Enhancement (Level I)	475	1.5:1	317	
UT 1B	04+70 to 13+26	753	836	856	Restoration	856-57= 799	1:1	799	57 lf of UT1 is located outside of the conservation easement and therefore is not generating credit
UT 2A	00+00 to 03+04	304	343	304	Enhancement (Level II)	304	2.5:1	122	
UT 2B	03+04 to 03+67	19	46	63	Restoration	63	1:1	63	
UT 3	00+00 to 02+79	269	279	279	Restoration	279	1:1	279	
UT 4	00+00 to 04+50	485	450	450	Restoration	450	1:1	450	
UT 5A	00+00 to 09+52	422	952	952	Restoration	952-52= 900	1:1	900	52 lf of UT5 is located outside of the conservation easement and therefore is not generating credit
UT 5B	09+52 to 14+90	538	538	538	Enhancement (Level II)	538	2.5:1	215	
UT 6	00+00 to 07+81	683	781	781	Restoration	781	1:1	781	
UT 7A	00+00 to 02+32	0	232	232	Restoration	232-41= 191	1:1	191	41 lf of the UT7 restoration reach is located outside of the conservation easement and therefore is not generating credit
UT 7B	02+32 to 09+96	764	764	764	Enhancement (Level I)	764-55= 709	1.5:1	473	55 lf of the UT7 enhancement reach is located outside of the conservation easement and therefore is not generating credit
UT8A	00+04 to 06+09	549	607	605	Restoration	605	1:1	605	
UT 8B	06+09 to 08+57	248	250	248	Enhancement (Level II)	248	2.5:1	99	
Wetland R	Riparian Riverine	--	0.35	0.35	Restoration	0.35	1:1	0.35	Wetland Restoration
Wetland E	Riparian Riverine	0.61	0.61	0.61	Enhancement	0.61	2:1	0.31	Wetland Enhancement

Table 1. Project Components and Mitigation Credits: Heron Site (continued)

Length & Area Summations by Mitigation Category		
Restoration Level	Stream (linear footage)	Riparian Wetland (acreage)
Restoration	4068*	0.35
Enhancement (Level I)	1184**	--
Enhancement (Level II)	1090	--
Enhancement	--	0.61

*An additional 150 linear feet of stream restoration is located outside of the conservation easement and is therefore not included in this total or in mitigation credit calculations.

**An additional 55 linear feet of stream enhancement (level I) is located outside of the conservation easement and is therefore not included in this total or in mitigation credit calculations.

Overall Assets Summary	
Asset Category	Overall Credits
Stream	5293.334
Riparian Riverine Wetland	0.655

Table 2. Project Activity and Reporting History: Heron Site

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Technical Proposal (RFP No. 16-006990)	January 11, 2017	January 11, 2017
Institution Date (NCDMS Contract No. 100014)	--	May 22, 2017
404 Permit	--	October 10, 2018
Mitigation Plan	--	July 2018
Construction Plans	--	July 17, 2018
Site Construction	--	November 27, 2018-February 11, 2019
Planting	--	February 21, 2019
As-built Baseline Stream Data Collection	February 25-26, 2019	--
As-built Baseline Vegetation Data Collection	February 25, 2019	--
As-built Baseline Monitoring (MY0)	February-March 2019	May 2019
Monitoring Year 1 (2019) Stream Data Collection	August 13-14, 2019	--
Monitoring Year 1 (2019) Vegetation Data Collection	September 30, 2019	--
Monitoring Year 1 (MY1)	March-October 2019	November 2019
Monitoring Year 2 (2020) Stream Data Collection	May 16-24, 2020	--
Monitoring Year 2 (2020) Vegetation Data Collection	July 1-6, 2020	--
Monitoring Year 2 (MY2)	March-October 2020	November 2020
Monitoring Year 3 (2021) Stream Data Collection	February 16, 2021	--
Supplemental Planting	--	April 8, 2021
Invasive Species Treatment	--	September 7 – October 7, 2021
Monitoring Year 3 (2021) Vegetation Data Collection	July - October, 2021	--
Monitoring Year 3 (MY3)	January - October 2021	December 2021

Table 3. Project Contacts Table: Heron Site

Full Delivery Provider Restoration Systems 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604 Worth Creech 919-755-9490	Construction Contractor Land Mechanic Designs 780 Landmark Road Willow Spring, NC 27592 Lloyd Glover 919-639-6132
Designer Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693	Planting Contractor Carolina Silvics, Inc. 908 Indian Trail Road Edenton, NC 27932 Mary-Margaret McKinney 252-482-8491
Construction Plans and Sediment and Erosion Control Plans Sungate Design Group, PA 915 Jones Franklin Road Raleigh, NC 27606 Joshua G. Dalton, PE 919-859-2243	As-built Surveyor K2 Design Group 5688 US Highway 70 East Goldsboro, NC 27534 John Rudolph 919-751-0075
	Baseline & Monitoring Data Collection Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693

Table 4. Project Attribute Table: Heron Site

Project Information	
Project Name	Heron Stream and Wetland Mitigation Site
Project County	Alamance County, North Carolina
Project Area (acres)	17.64
Project Coordinates (latitude & longitude)	35.853955°N, -79.363458°W
Planted Area (acres)	12.05
Project Watershed Summary Information	
Physiographic Province	Piedmont
Project River Basin	Cape Fear
USGS HUC for Project (14-digit)	03030002050050
NCDWR Sub-basin for Project	03-06-04
Project Drainage Area (acres)	14 to 96
Percentage of Project Drainage Area that is Impervious	<2%
CGIA Land Use Classification	Managed Herbaceous Cover & Mixed Upland Hardwoods

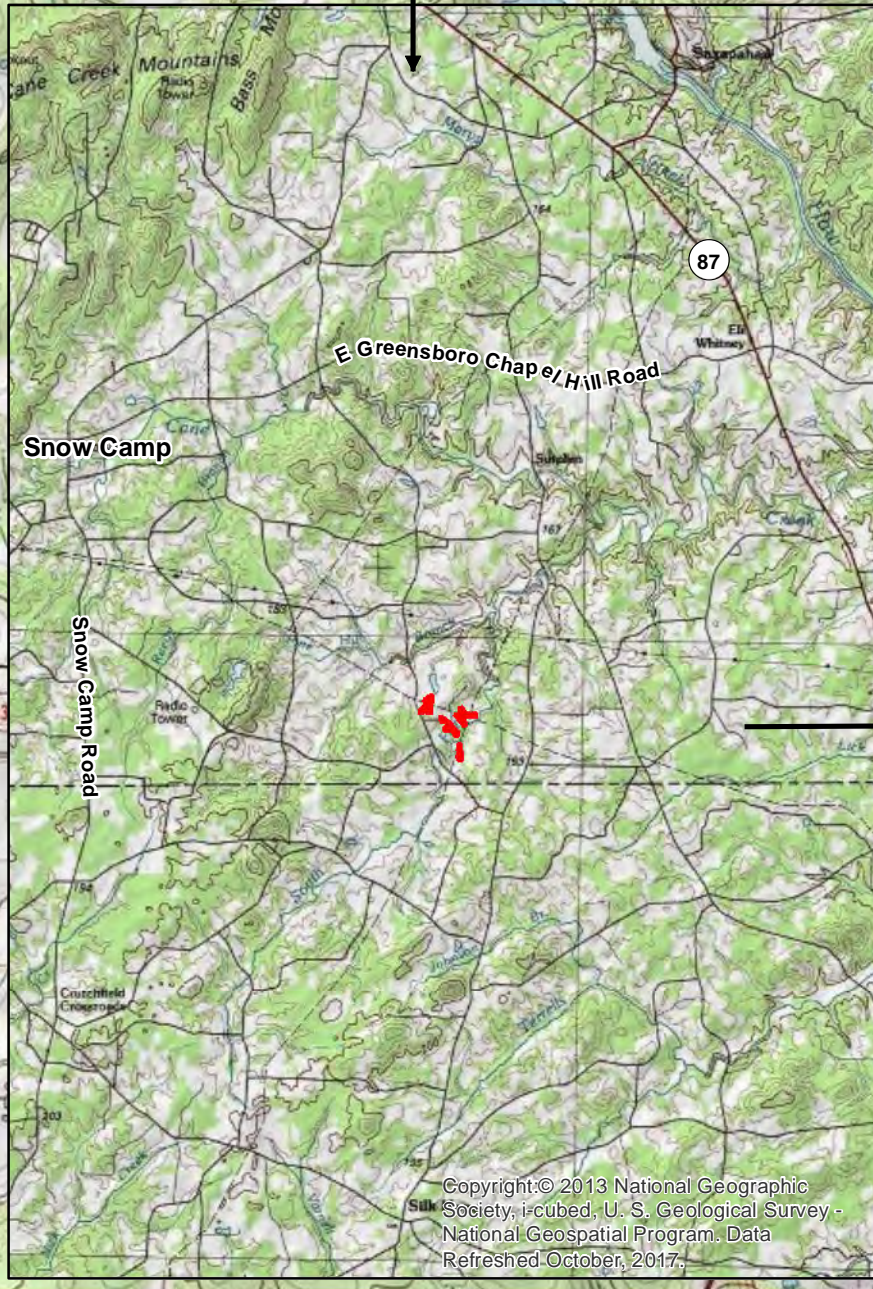
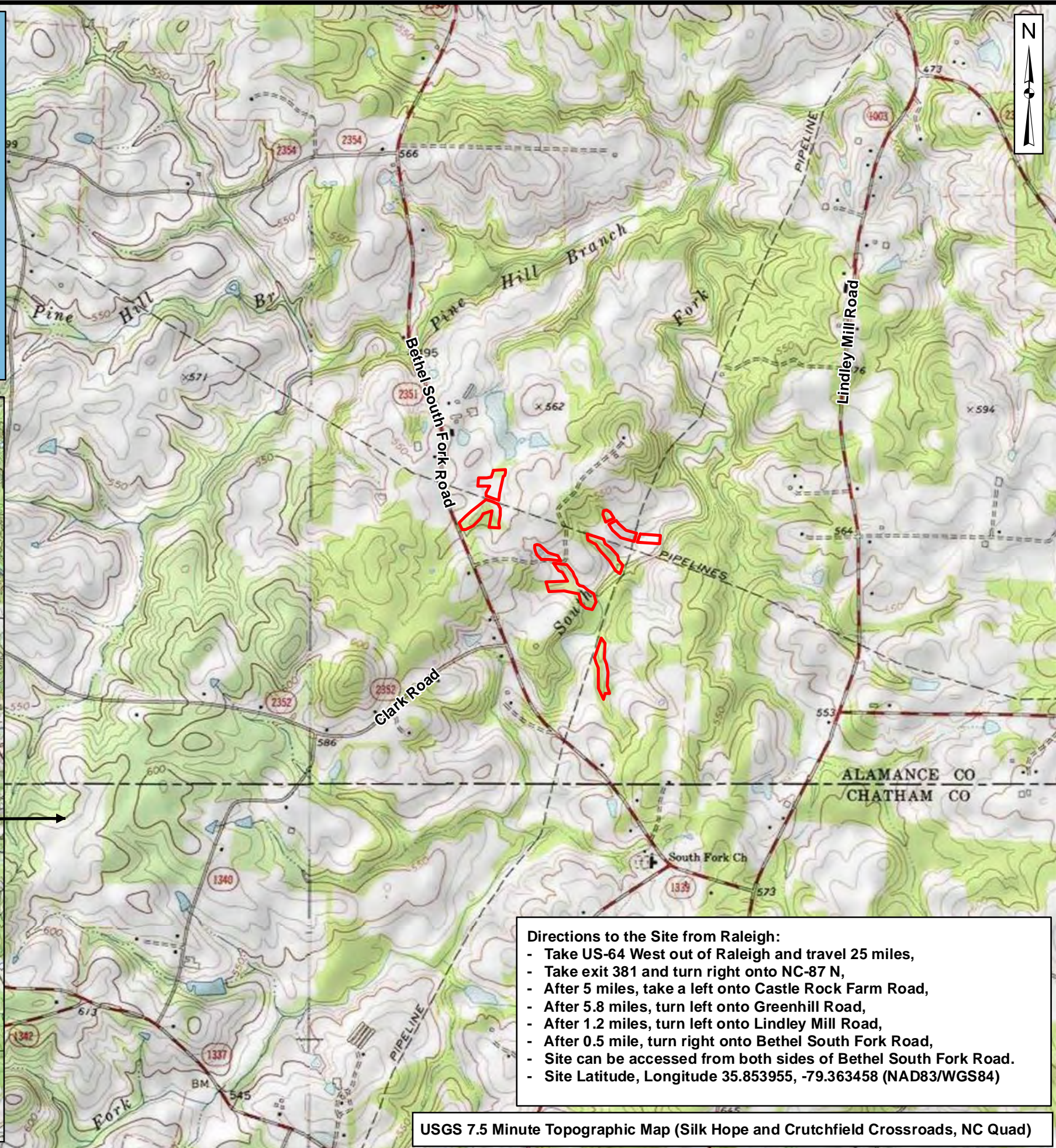
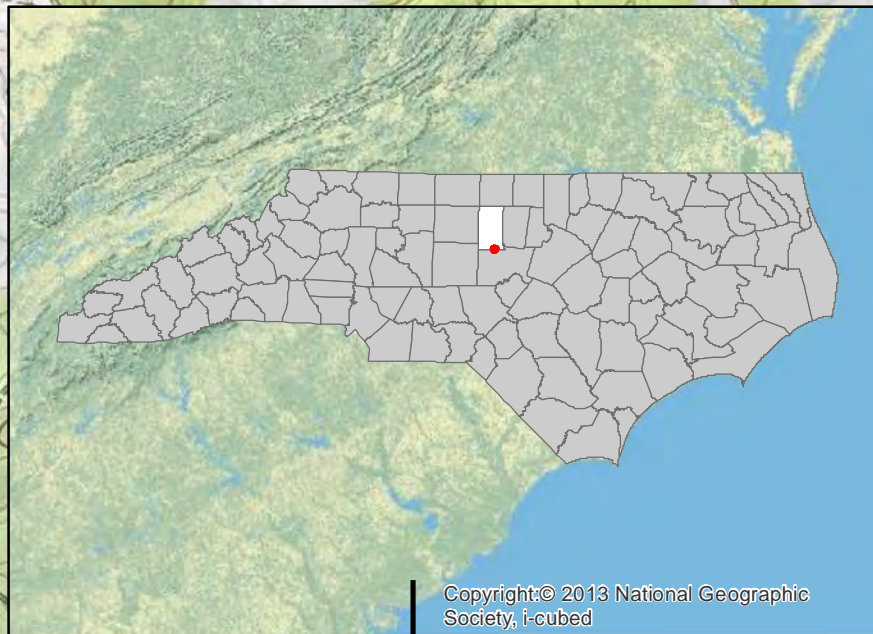
Table 4. Project Attribute Table: Heron Site (Continued)

Reach Summary Information								
Parameters	UT1	UT2	UT 3	UT4	UT 5	UT6	UT 7	UT 8
Length of reach (linear feet)	1155	363	269	485	907	683	202	1221
Valley Classification & Confinement	Alluvial, confined							
Drainage Area (acres)	96.4	7.1	11.7	17.2	38.1	14.1	20.9	30.8
NCDWR Stream ID Score	30.5	22.5	28.5	33.5	27.5	23.5	24.5	27.5
Perennial, Intermittent, Ephemeral	Perennial	Intermittent	Perennial/ Intermittent	Perennial	Perennial/ Intermittent	Perennial/ Intermittent	Intermittent	Perennial
NCDWR Water Quality Classification	WS-V, NSW							
Existing Morphological Description (Rosgen 1996)	Cg5	Gf5	Cg5	Eg5	Eg5	Cg5	Cg5	Eg5
Proposed Stream Classification (Rosgen 1996)	C/E 4	Gf 5	C/E 4	C/E 4	C/E 4	C/E 4	Eb4	C/E 4
Existing Evolutionary Stage (Simon and Hupp 1986)	III/IV	I/III/IV	III/IV	II/III	II/III	III/IV	III/IV	II/III
Underlying Mapped Soils	Alamance silt loam, Georgeville silt loam, Goldston slaty silt loam, Herndon silt loam, Orange silt loam, Worsham sandy loam, Local Alluvial Land,							
Drainage Class	Well-drained, well-drained, well-drained, well-drained, well drained, poorly-drained, poorly-drained							
Hydric Soil Status	Nonhydric, nonhydric, nonhydric, nonhydric, nonhydric, hydric, hydric, respectively							
Valley Slope	0.0074	0.0270	0.0222	0.0244	0.0358	0.0300	0.0255	0.0218
FEMA Classification	NA							
Native Vegetation Community	Piedmont Alluvial Forest/Dry-Mesic Oak-Hickory Forest							
Watershed Land Use/Land Cover (Site)	43% forest,55% agricultural land, <2% low density residential/impervious surface							
Watershed Land Use/Land Cover (Cedarock Reference Channel)	65% forest, 30% agricultural land, <5% low density residential/impervious surface							
Percent Composition of Exotic Invasive Vegetation	<5%							

Appendix B

Visual Assessment Data

Figure 1. Project Location
Figure 2, 2A-D. Current Conditions Plan View
Tables 5A-5H. Visual Stream Morphology Stability Assessment
Table 6. Vegetation Condition Assessment
Vegetation Plot Photographs



Project:
HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:
PROJECT LOCATION

Drawn by: KRJ

Date: DEC 2017

Scale: 1:20000

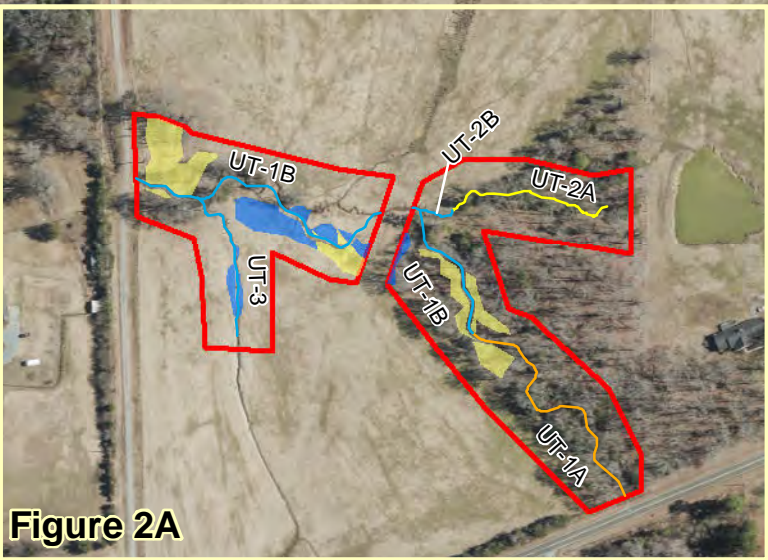
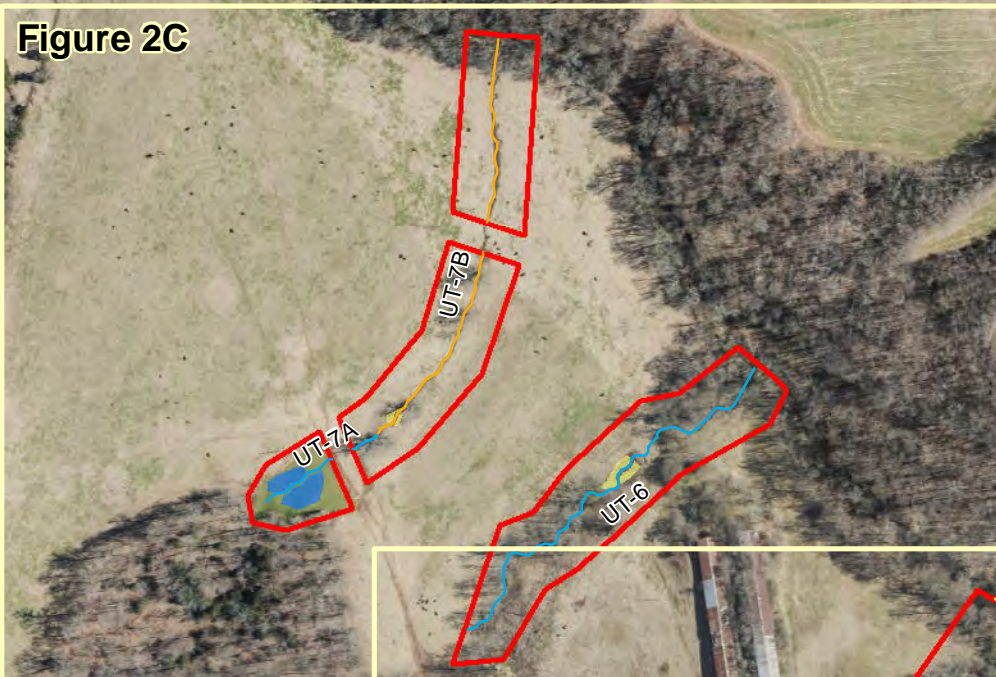
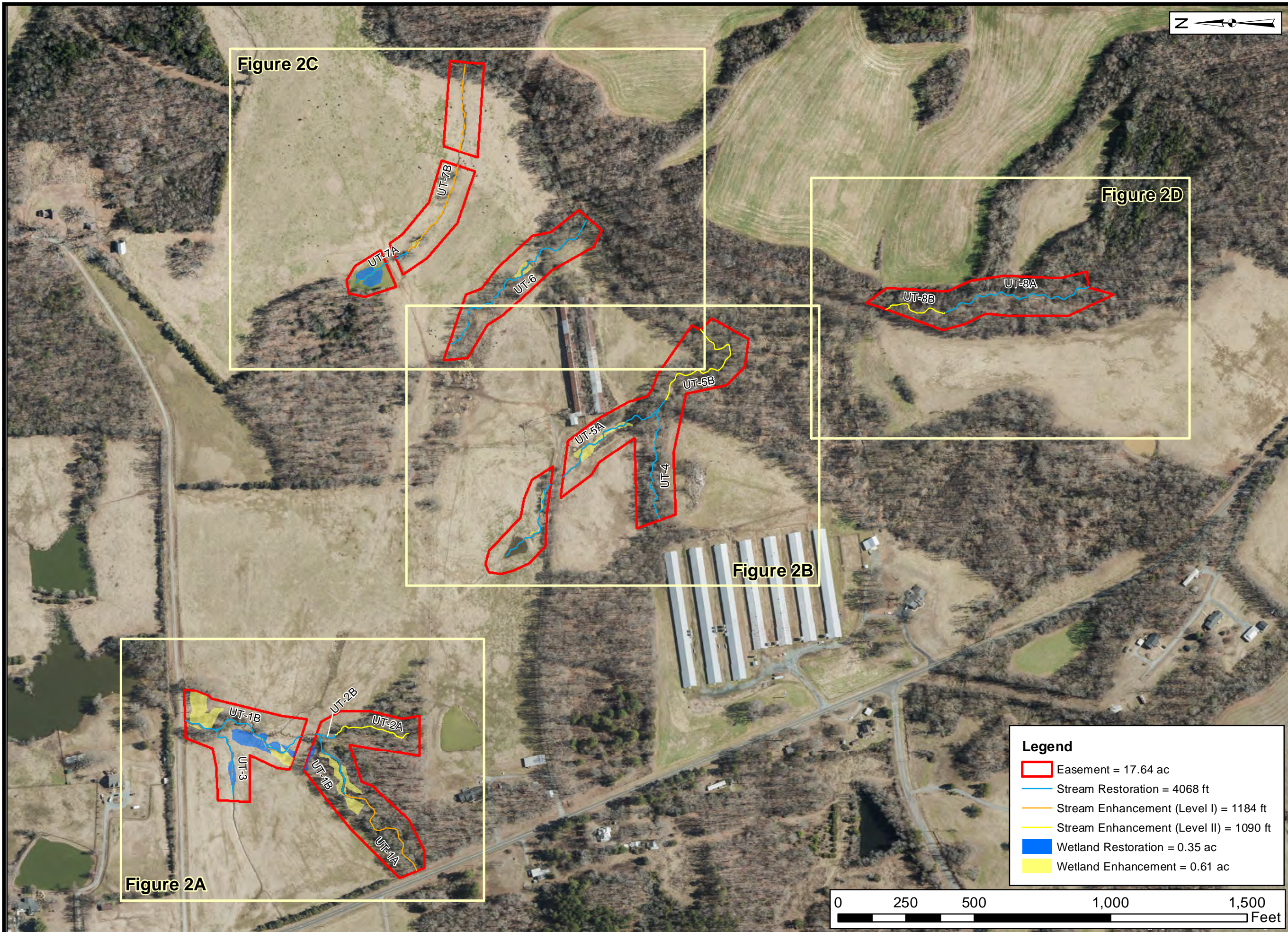
Project No.: 17-008

Directions to the Site from Raleigh:

- Take US-64 West out of Raleigh and travel 25 miles,
- Take exit 381 and turn right onto NC-87 N,
- After 5 miles, take a left onto Castle Rock Farm Road,
- After 5.8 miles, turn left onto Greenhill Road,
- After 1.2 miles, turn left onto Lindley Mill Road,
- After 0.5 mile, turn right onto Bethel South Fork Road,
- Site can be accessed from both sides of Bethel South Fork Road.
- Site Latitude, Longitude 35.853955, -79.363458 (NAD83/WGS84)

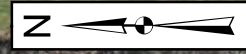
USGS 7.5 Minute Topographic Map (Silk Hope and Crutchfield Crossroads, NC Quad)

FIGURE
1



Legend

- Easement = 17.64 ac
- Stream Restoration = 4068 ft
- Stream Enhancement (Level I) = 1184 ft
- Stream Enhancement (Level II) = 1090 ft
- Wetland Restoration = 0.35 ac
- Wetland Enhancement = 0.61 ac



Project:
HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:
CURRENT CONDITIONS PLAN VIEW

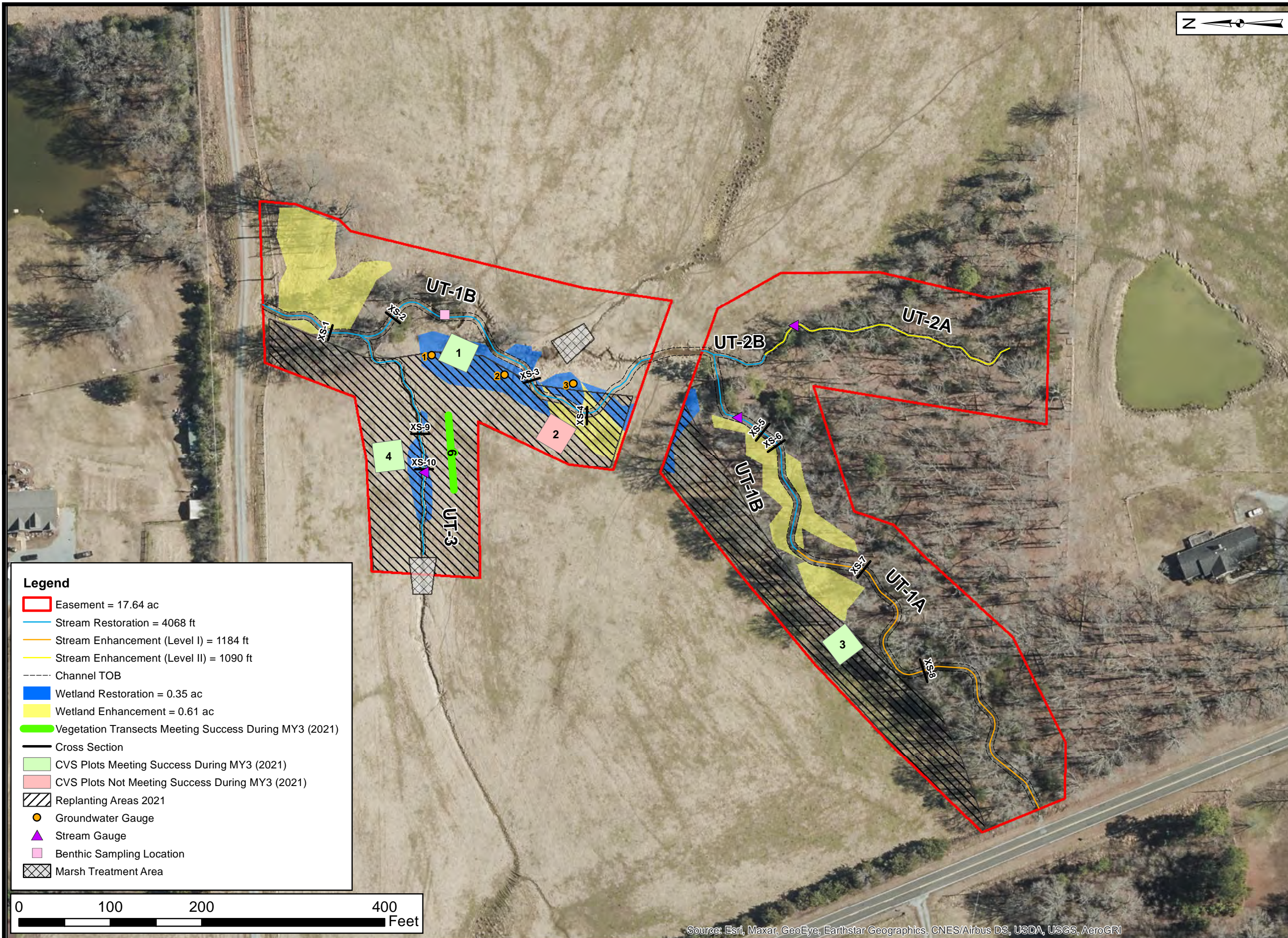
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Date: JAN 2021

Scale: 1:4000

Project No.: 17-008

FIGURE
2



Axiom Environmental, Inc.

Prepared for:



Project:

**HERON STREAM
AND WETLAND
MITIGATION SITE**

Alamance County, NC

Title:

**CURRENT
CONDITIONS
PLAN VIEW**

Drawn by:

JMH

Date:

NOV 2021

Scale:

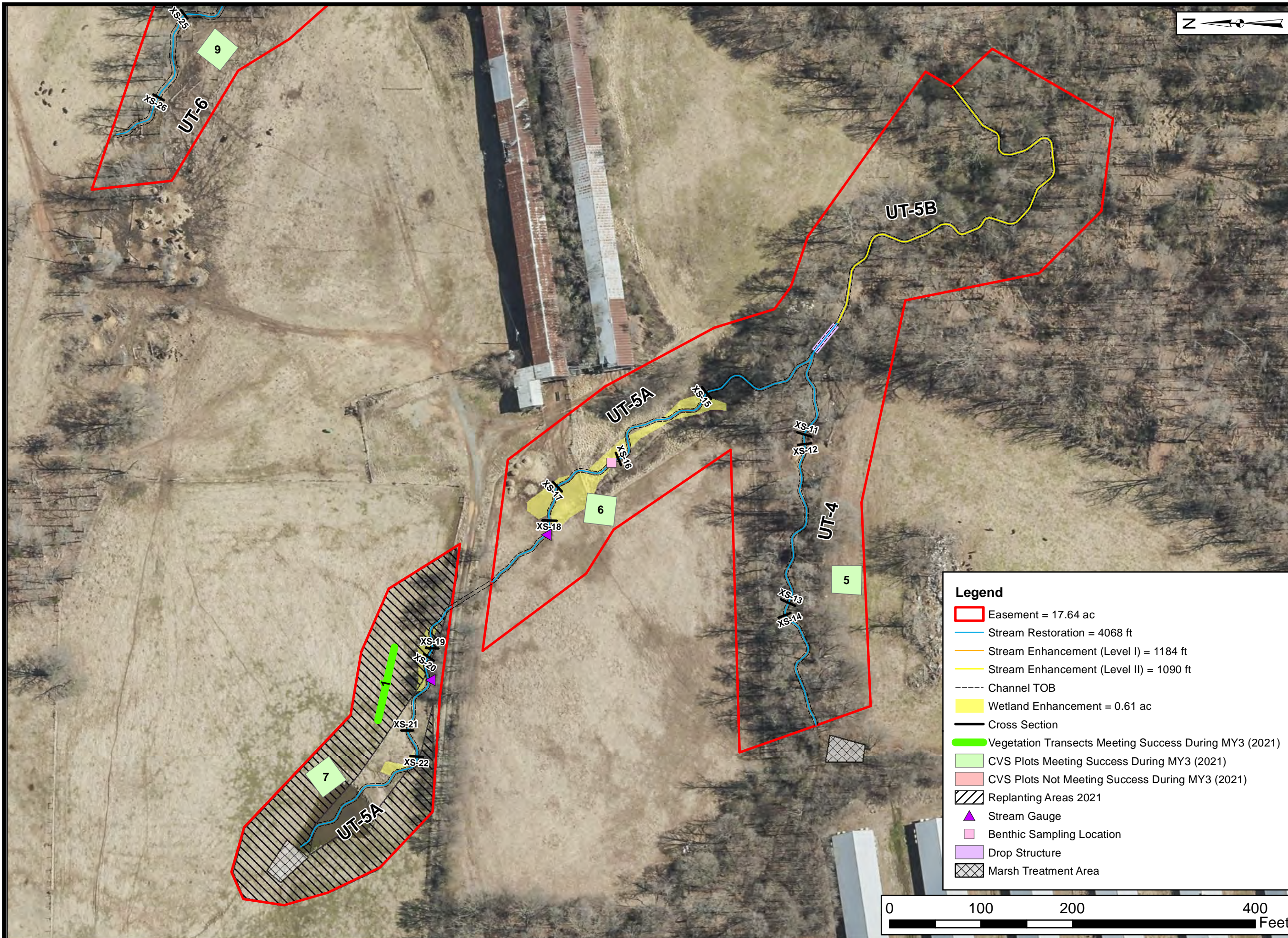
1:1200

Project No.:

17-008

FIGURE

2A



Project:
HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:
CURRENT CONDITIONS PLAN VIEW

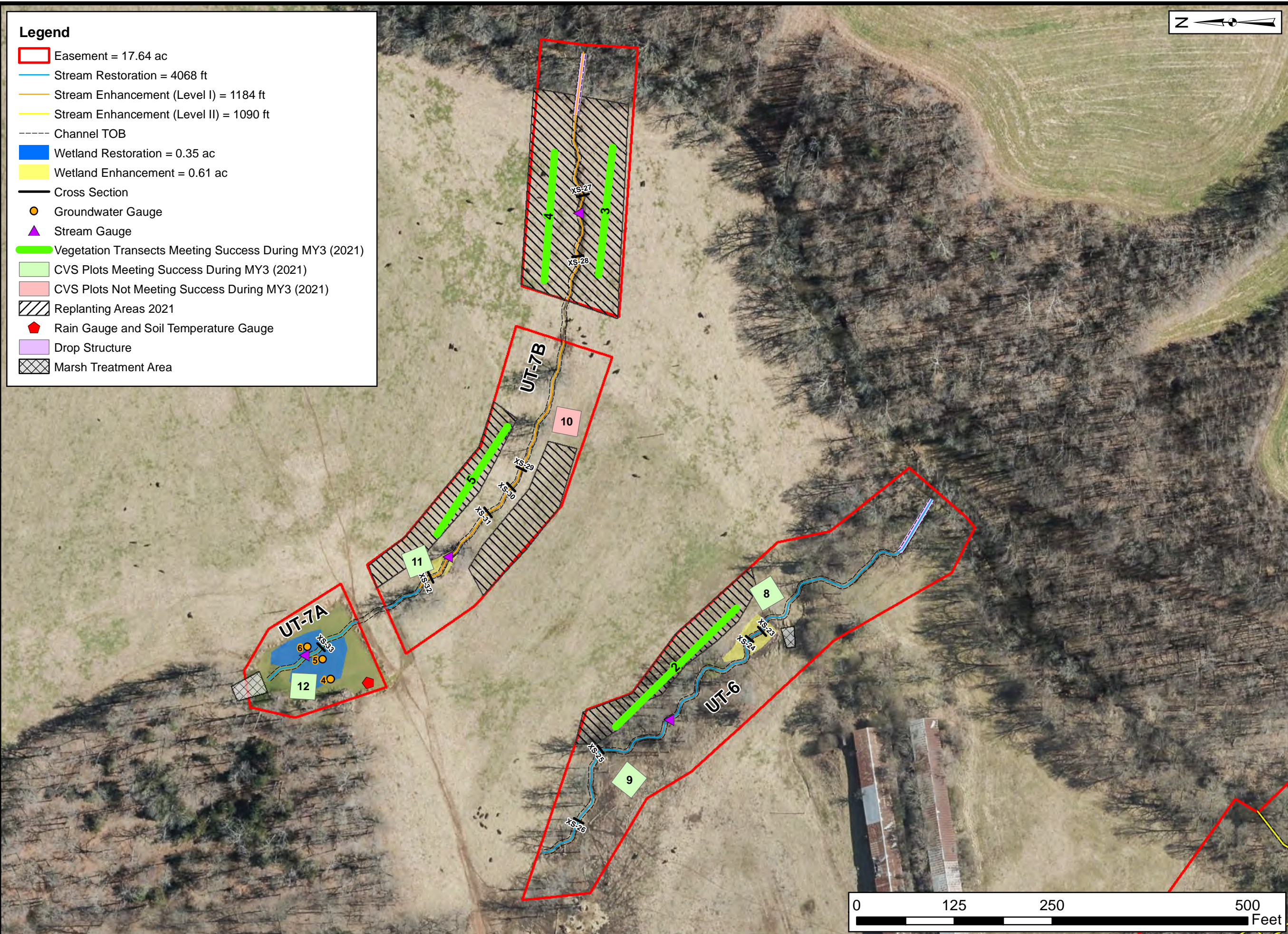
Drawn by:
 JMH

Date:
 NOV 2021

Scale:
 1:1200

Project No.:
 17-008

FIGURE
2B



Legend

- Easement = 17.64 ac
- Stream Restoration = 4068 ft
- Stream Enhancement (Level I) = 1184 ft
- Stream Enhancement (Level II) = 1090 ft
- Channel TOB
- Wetland Restoration = 0.35 ac
- Wetland Enhancement = 0.61 ac
- Cross Section
- Groundwater Gauge
- Stream Gauge
- Vegetation Transects Meeting Success During MY3 (2021)
- CVS Plots Meeting Success During MY3 (2021)
- CVS Plots Not Meeting Success During MY3 (2021)
- Replanting Areas 2021
- Rain Gauge and Soil Temperature Gauge
- Drop Structure
- Marsh Treatment Area



Prepared for:



Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by:

JMH

Date:

NOV 2021

Scale:

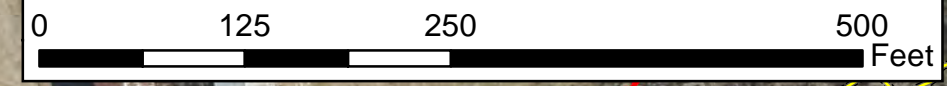
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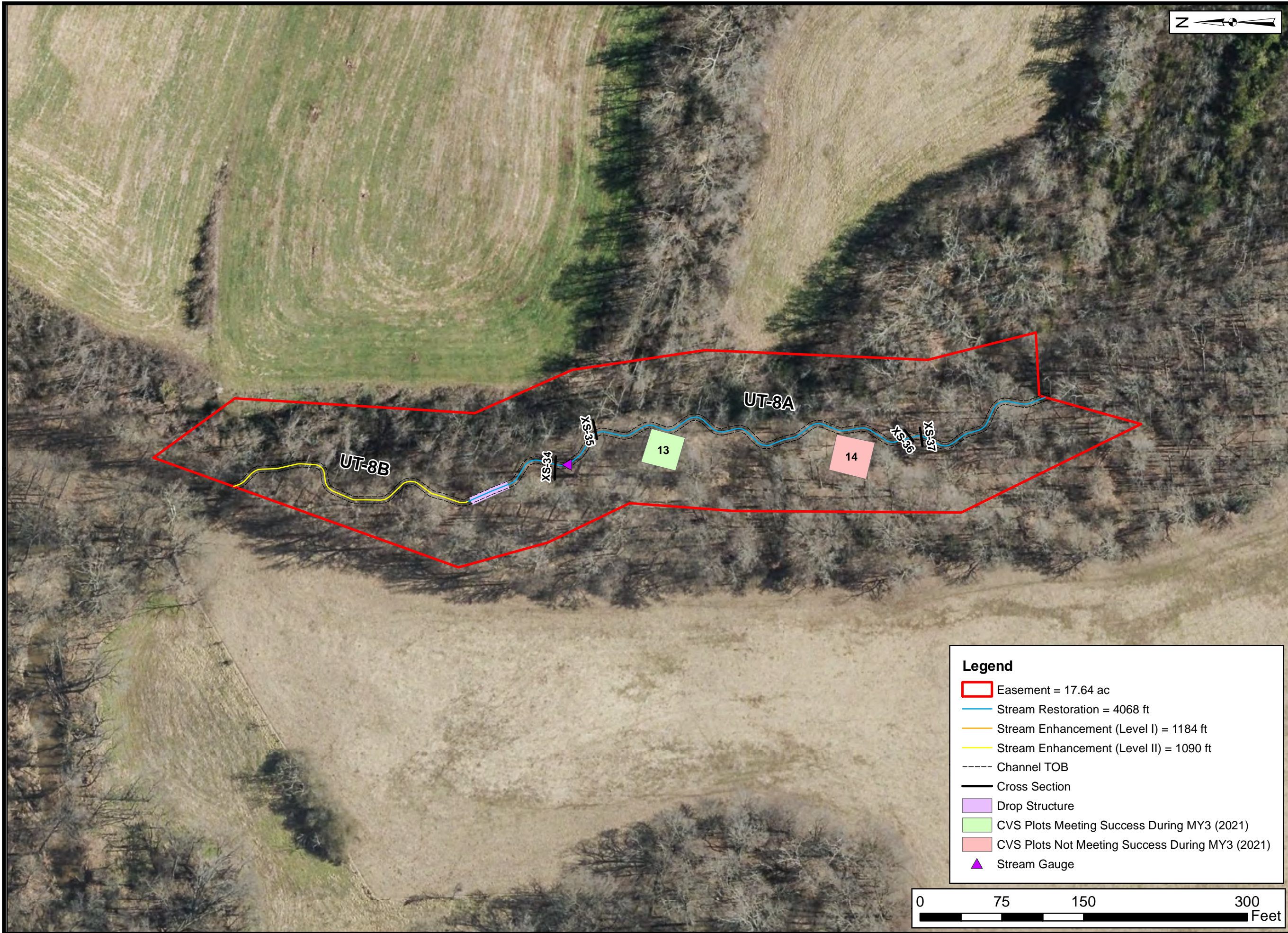
Project No.:

17-008

FIGURE

2C





Prepared for:



Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by:

JMH

Date:

NOV 2021

Scale:

1:1000

Project No.:

17-008

FIGURE

2D

Legend

- Easement = 17.64 ac
- Stream Restoration = 4068 ft
- Stream Enhancement (Level I) = 1184 ft
- Stream Enhancement (Level II) = 1090 ft
- Channel TOB
- Cross Section
- Drop Structure
- CVS Plots Meeting Success During MY3 (2021)
- CVS Plots Not Meeting Success During MY3 (2021)
- ▲ Stream Gauge

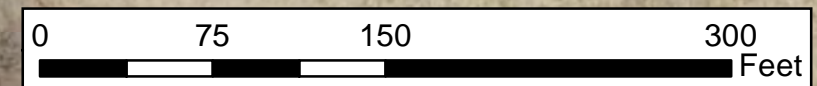


Table 5A
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 Heron UT-1
 1331

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	35	35			100%			
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	34	34			100%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	34	34			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	34	34			100%			
		2. Thalweg centering at downstream of meander (Glide)	34	34			100%			
Totals										
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
Totals										
					0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	15	15			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	15	15			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	15	15			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	15	15			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	15	15			100%			

Table 5B
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 Heron UT-2
 63

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	3	3			100%			
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	3	3			100%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	3	3			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	3	3			100%			
		2. Thalweg centering at downstream of meander (Glide)	3	3			100%			
	Totals									
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
Totals										
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	0	0			NA			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	0	0			NA			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	0	0			NA			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	0	0			NA			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	0	0			NA			

Table 5C
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 Heron UT-3
 279

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	14	14			100%			
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	13	13			100%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	13	13			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	13	13			100%			
		2. Thalweg centering at downstream of meander (Glide)	13	13			100%			
	Totals									
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
Totals										
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	5	5			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	5	5			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	5	5			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	5	5			100%			

Table 5D
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 Heron UT-4
 450

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	22	22			100%			
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	21	21			100%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	21	21			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	21	21			100%			
2. Thalweg centering at downstream of meander (Glide)		21	21			100%				
Totals										
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
Totals										
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	10	10			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	10	10			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	10	10			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	10	10			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	10	10			100%			

Table 5E
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 Heron UT-5
 952

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	44	44			100%			
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	43	43			100%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	43	43			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	43	43			100%			
		2. Thalweg centering at downstream of meander (Glide)	43	43			100%			
Totals										
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
Totals										
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	25	25			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	25	25			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	25	25			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	25	25			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	25	25			100%			

Table 5F
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 Heron UT-6
 781

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	34	34			100%			
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	33	33			100%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	33	33			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	33	33			100%			
2. Thalweg centering at downstream of meander (Glide)		33	33			100%				
Totals										
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
Totals										
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	8	8			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	8	8			100%			

Table 5G
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 Heron UT-7
 996

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	44	44			100%			
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	44	44			100%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	44	44			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	44	44			100%			
2. Thalweg centering at downstream of meander (Glide)		44	44			100%				
Totals										
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
Totals										
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	19	19			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	19	19			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	19	19			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	19	19			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	19	19			100%			

Table 5H
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 Heron UT-8
 605

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	24	24			100%			
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	23	23			100%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	23	23			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	23	23			100%			
		2. Thalweg centering at downstream of meander (Glide)	23	23			100%			
Totals										
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
Totals										
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	9	9			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	9	9			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	9	9			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	9	9			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	9	9			100%			

Table 6

Vegetation Condition Assessment

Heron

Planted Acreage¹

12.05

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	None	0.1 acres	none	0	0.00	0.0%
2. Low Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
2B. Low Planted Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
Total				0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor		0 acres	none	0	0.00	0.0%
Cumulative Total				0	0.00	0.0%

Easement Acreage²

17.64

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern ⁴	None	1000 SF	none	0	0.00	0.0%
5. Easement Encroachment Areas ³	None	none	none	0	0.00	0.0%

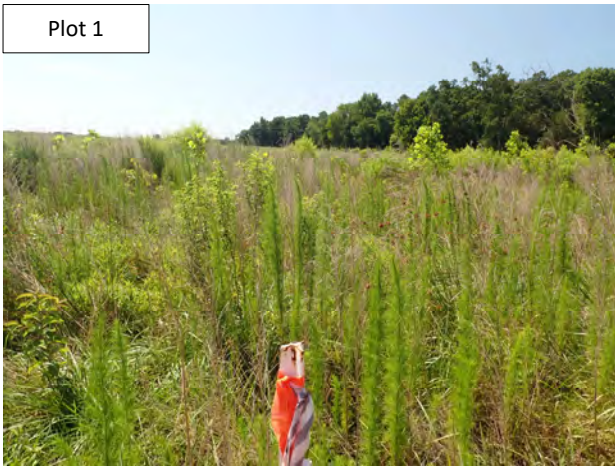
¹ = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

² = The acreage within the easement boundaries.

³ = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1,2 or 3) as well as a parallel tally in item 5.

⁴ = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern species are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by DMS such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likely trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly early in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolizing invasives polygons, particularly for situations where the condition for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

Heron
MY-03 (2021) Vegetation Monitoring Photographs
Taken July 2021



Heron
MY-03 (2021) Vegetation Monitoring Photographs
Taken July 2021



Heron
MY-03 (2021) Vegetation Monitoring Photographs
Taken July 2021



Appendix C Vegetation Data

Table 7. Planted Bare Root Woody Vegetation

Table 8. Total Stems by Plot and Species

Table 9. Temporary Vegetation Plot Data

Table 10. Approved Vegetation Totals

Table 7. Planted Bare Root Woody Vegetation: Heron Site

Species	Total*
Acres	12.05
<i>Alnus serrulata</i>	500
<i>Asimina triloba</i>	100
<i>Betula nigra</i>	400
<i>Carpinus caroliniana</i>	800
<i>Cephalanthus occidentalis</i>	25
<i>Cercis canadensis</i>	500
<i>Cornus amomum</i>	2500
<i>Diospyros virginiana</i>	350
<i>Fraxinus americana</i>	100
<i>Fraxinus pennsylvanica</i>	2500
<i>Liriodendron tulipifera</i>	125
<i>Nyssa sylvatica</i>	500
<i>Platanus occidentalis</i>	2400
<i>Quercus lyrata</i>	900
<i>Quercus nigra</i>	2000
<i>Quercus phellos</i>	1900
<i>Sambucus canadensis</i>	25
TOTALS	15,625*
Average Stems/Acre	1297

*Live stakes of *Salix nigra* were planted, but are not included in this table.

Table 8. Total Stems by Plot and Species
 Project Code 17.008. Project Name: Heron Stream and Wetland

			Current Plot Data (MY3 2021)																													
Scientific Name	Common Name	Species Type	17.008-01-0001			17.008-01-0002			17.008-01-0003			17.008-01-0004			17.008-01-0005			17.008-01-0006			17.008-01-0007			17.008-01-0008			17.008-01-0009			17.008-01-0010		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T			
Acer rubrum	red maple	Tree																														
Alnus serrulata	hazel alder	Shrub																														
Asimina triloba	pawpaw	Tree																			1	1	1				1	1	1			
Betula nigra	river birch	Tree																									1	1	1			
Carpinus caroliniana	American hornbeam	Tree	1	1	1	1	1	1				5	5	5																		
Carya	hickory	Tree						4																								
Celtis occidentalis	common hackberry	Tree												3																		
Cephalanthus occidentalis	common buttonbush	Shrub																														
Cercis canadensis	eastern redbud	Tree	1	1	1	3	3	3												2	2	2	2	2	2							
Cornus amomum	silky dogwood	Shrub																			1	1	1									
Diospyros virginiana	common persimmon	Tree	7	7	9						2			1	1	3	2	2	2	1	1	1				2	2	2				
Fraxinus americana	white ash	Tree																								3	3	3				
Fraxinus pennsylvanica	green ash	Tree												1	1	1	5	5	5							1	1	1				
Liquidambar styraciflua	sweetgum	Tree																				2						3				
Liriodendron tulipifera	tuliptree	Tree				1	1	1																								
Nyssa sylvatica	blackgum	Tree	1	1	1				1	1	1									1	1	1				1	1	1				
Platanus occidentalis	American sycamore	Tree	1	1	1				3	3	3				5	5	5							2	2	5			2	2	2	
Populus deltoides	eastern cottonwood	Tree																														
Quercus	oak	Tree							3	3	3												1	1	1	3	3	3				
Quercus lyrata	overcup oak	Tree							1	1	1															1	1	1				
Quercus nigra	water oak	Tree				2	2	2				1	1	1	1	1	1				1	1	1	2	2	2	1	1	1			
Quercus pagoda	cherrybark oak	Tree							1	1	1																					
Quercus phellos	willow oak	Tree	1	1	1							4	4	4				1	1	1	2	2	2					3	3	3		
Quercus rubra	northern red oak	Tree																			1	1	1				1	1	1			
Salix nigra	black willow	Tree																					1									
Sambucus canadensis	Common Elderberry	Shrub																														
Ulmus americana	American elm	Tree																				3										
Ulmus rubra	slippery elm	Tree																														
Unknown		Shrub or Tree																														
	Stem count		12	12	14	7	7	11	9	9	11	10	10	10	8	8	13	8	8	11	8	8	11	9	9	12	13	13	16	7	7	7
	size (ares)		1			1			1			1			1			1			1			1			1			1		
	size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
	Species count		6	6	6	4	4	5	5	5	6	3	3	3	4	4	5	3	3	4	6	6	8	6	6	6	8	8	9	4	4	4
	Stems per ACRE		485.6	485.6	566.6	283.3	283.3	445.2	364.2	364.2	445.2	404.7	404.7	404.7	323.7	323.7	526.1	323.7	323.7	445.2	323.7	323.7	445.2	364.2	364.2	485.6	526.1	526.1	647.5	283.3	283.3	283.3

Color for Density
 Exceeds requirements by 10%
 Exceeds requirements, but by less than 10%
 Fails to meet requirements, by less than 10%
 Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes
 P-all = Planting including livestakes
 T = All planted and natural recruits including livestakes
 T includes natural recruits

Table 8. Total Stems by Plot and Species (continued)
 Project Code 17.008. Project Name: Heron Stream and Wetland

Scientific Name	Common Name	Species Type	Current Plot Data (MY3 2021)												Annual Means																	
			17.008-01-0011			17.008-01-0012			17.008-01-0013			17.008-01-0014			MY3 (2021)			MY2 (2020)			MY1 (2019)			MY0 (2019)								
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T						
Acer rubrum	red maple	Tree																7			4											
Alnus serrulata	hazel alder	Shrub	1	1	1									1	1	1	1	1	1	1	1	1	1	1	4	4	4					
Asimina triloba	pawpaw	Tree												2	2	2	2	2	2	14	14	14	21	21	21							
Betula nigra	river birch	Tree											2	2	2				3	3	3	4	4	4	4	4	4					
Carpinus caroliniana	American hornbeam	Tree																7	7	7	8	8	8	7	7	7	13	13	13			
Carya	hickory	Tree																														
Celtis occidentalis	common hackberry	Tree																														
Cephalanthus occidentalis	common buttonbush	Shrub																														
Cercis canadensis	eastern redbud	Tree										1	1	1	9	9	9	9	9	9	10	10	10	10	10	10	10	10	10			
Cornus amomum	silky dogwood	Shrub	2	2	2	2	2	2						1	5	5	6	6	6	6	5	5	5	6	6	6	6	6	6			
Diospyros virginiana	common persimmon	Tree											1	1	1	14	14	20	14	14	17	13	13	15	19	19	19	19	19			
Fraxinus americana	white ash	Tree	1	1	1									4	4	4	5	5	5	3	3	3	5	5	5	5	5	5	5			
Fraxinus pennsylvanica	green ash	Tree	2	2	3	4	4	4						13	13	14	12	12	12	13	13	13	15	15	15	15	15	15	15			
Liquidambar styraciflua	sweetgum	Tree																														
Liriodendron tulipifera	tuliptree	Tree																														
Nyssa sylvatica	blackgum	Tree	1	1	1									3	3	3				1	1	1	2	2	2	2	2	2	2			
Platanus occidentalis	American sycamore	Tree	3	3	3	1	1	1	2	2	6																					
Populus deltoides	eastern cottonwood	Tree																														
Quercus	oak	Tree				1	1	1																								
Quercus lyrata	overcup oak	Tree																														
Quercus nigra	water oak	Tree												1	1	1	1	1	1	10	10	10	13	13	13	18	18	18	19	19	19	
Quercus pagoda	cherrybark oak	Tree																														
Quercus phellos	willow oak	Tree																														
Quercus rubra	northern red oak	Tree																														
Salix nigra	black willow	Tree																														
Sambucus canadensis	Common Elderberry	Shrub																														
Ulmus americana	American elm	Tree																														
Ulmus rubra	slippery elm	Tree																														
Unknown		Shrub or Tree																														
Stem count			10	10	11	8	8	8	8	8	23	7	7	7	124	124	165	131	131	159	152	152	176	196	196	196	196	196	196	196		
size (ares)			1			1			1			1			14			14			14			14			14			14		
size (ACRES)			0.02			0.02			0.02			0.02			0.35			0.35			0.35			0.35			0.35			0.35		
Species count			6	6	6	4	4	4	4	4	8	4	4	4	18	18	24	18	18	21	19	19	23	20	20	20	20	20	20	20		
Stems per ACRE			404.7	404.7	445.2	323.7	323.7	323.7	323.7	323.7	930.8	283.3	283.3	283.3	358.4	358.4	477	378.7	378.7	459.6	439.4	439.4	508.7	567	567	567	567	567	567	567		

Color for Density
 Exceeds requirements by 10%
 Exceeds requirements, but by less than 10%
 Fails to meet requirements, by less than 10%
 Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes
 P-all = Planting including livestakes
 T = All planted and natural recruits including livestakes
 T includes natural recruits

Table 9. Temporary Vegetation Plot Data: Heron Site

Species	50m x 2m Temporary Plot (Bearing)					
	T-1 (130°)	T-2 (319°)	T-3 (319°)	T-4 (285°)	T-5 (10°)	T-6 (344°)
<i>Betula nigra</i>				1		
<i>Carpinus caroliniana</i>	3					
<i>Cercis canadensis</i>	8		1	1	1	1
<i>Cornus ammomum</i>			2	2	2	
<i>Diospyros virginiana</i>		1	3	3		1
<i>Fraxinus pennsylvanica</i>		4	2	2	4	
<i>Liriodendron tulipifera</i>		1				
<i>Nyssa sylvatica</i>	1					
<i>Platanus occidentalis</i>	1	2			2	2
<i>Quercus lyrata</i>	2	8				
<i>Quercus phellos</i>		1				1
<i>Quercus alba</i>						3
Total Stems	15	17	8	9	9	8
Total Stems/Acre	607	688	324	364	364	324

MY-03 HEIGHT DATA: Stems ranged in height from 40 cm to 240 cm.

Table 10. Approved Vegetation Totals: Heron Site

Plot #	MY3 Approved Stems/Acre	Success Criteria Met?
1	567	Yes
2	283	No
3	445	Yes
4	405	Yes
5	405	Yes
6	324	Yes
7	324	Yes
8	486	Yes
9	526	Yes
10	283	No
11	445	Yes
12	324	Yes
13	647	Yes
14	283	No
T-1	607	Yes
T-2	688	Yes
T-3	324	Yes
T-4	364	Yes
T-5	364	Yes
T-6	324	Yes
Average Approved Stems/Acre	421	Yes

Appendix D

Stream Geomorphology Data

Tables 11A-G. Baseline Stream Data Summary

Tables 12A-G. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment
Parameter Distributions)

Tables 13A-G. Monitoring Data-Dimensional Morphology Summary (Dimensional Parameters-Cross-
sections)

Tables 14A-G. Monitoring Data-Stream Reach Data Summary
Cross-Section Plots

Table 11a. Baseline Stream Data Summary
 Project Name/Number (Heron/100014) - Segment/Reach: UT 1 (856 feet)

Parameter	Gauge ²	Regional Curve			Pre-Existing Condition						Cedarrock Park Ref			Causey Ref			Design			Monitoring Baseline											
		LL	UL	Eq.	Min	Mean	Med	Max	SD ⁵	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD ⁵	n						
Dimension and Substrate - Riffle Only																															
Bankfull Width (ft)					4.7	8.5		11.1			8	8.1	12.1	10.7	11	11.3	7.8	8.4	9	8.3	11		13		4						
Floodprone Width (ft)					13	20		30			15	18	25	122	131	140	10	75	100	25	100		100		4						
Bankfull Mean Depth (ft)					0.5	0.7		1.1			0.8	0.8	1	1.3	1.4	1.4	0.6	0.6	0.7	0.4	0.5		0.6		4						
¹ Bankfull Max Depth (ft)					0.8	1.1		2			1.1	1.4	1.4	1.9	2	2	0.7	0.8	1	0.6	0.8		1.1		4						
Bankfull Cross Sectional Area (ft ²)						5.1						8			14.7		5.1	5.1	5.1	3.7	5.4		7.2		4						
Width/Depth Ratio					4.3	14.6		22			8	10.1	15.1	8	9	9	12	14	16	17.4	18.7		36.7		4						
Entrenchment Ratio					1.6	2.5		4.3			1.9	2.1	2.2	11	12	13	5.1	8.9	11.1	3	8.3		9.3		4						
¹ Bank Height Ratio					1.4	1.9		2.5			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		4						
Profile																															
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																2.7	19	16	53	11	31					
Riffle Slope (ft/ft)																0.01	0.0316	0.0576	0.002	0.01	0.012	0.007	0.009	0.01	0	0.013	0.012	0.048	0.01	31	
Pool Length (ft)																										6	23	20	80	12.9	34
Pool Max depth (ft)																1.5	1.8	2.1		2.7		0.8	1.1	1.3	1.5	1.6		2.1		4	
Pool Spacing (ft)																25	37	69	22	44	81	25	34	68	25	34		68		34	
Pattern																															
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	25	34	68	25	34		68								
Radius of Curvature (ft)																11	16	27	9	31	113	17	25	85	17	25		85			
Rc:Bankfull width (ft/ft)																1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10			
Meander Wavelength (ft)																44	68	116	10	63	91	51	72	101	51	72		101			
Meander Width Ratio																2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6			
Transport parameters																															
Reach Shear Stress (competency) lb/ft ²					0.61												0.19			0.24											
Max part size (mm) mobilized at bankfull																															
Stream Power (transport capacity) W/m ²																															
Additional Reach Parameters																															
Rosgen Classification					Cg 5						Eb 4			E5			E/C 4			C 4											
Bankfull Velocity (fps)					3.8												3.8			3.6											
Bankfull Discharge (cfs)					19.3																										
Valley length (ft)					1067																										
Channel Thalweg length (ft)					1433												856			856											
Sinuosity (ft)					1.3						1.2			1.46			1.3			1.3											
Water Surface Slope (Channel) (ft/ft)					0.0057						0.0258			0.0053			0.0057			0.0087											
BF slope (ft/ft)																															
³ Bankfull Floodplain Area (acres)																															
⁴ % of Reach with Eroding Banks					61						0			0																	
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 11b. Baseline Stream Data Summary
 Project Name/Number (Heron/100014) - Segment/Reach: UT 3 (279 feet)

Parameter	Gauge ²	Regional Curve			Pre-Existing Condition						Cedarrock Park Ref			Causey Ref			Design			Monitoring Baseline											
		LL	UL	Eq.	Min	Mean	Med	Max	SD ⁵	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD ⁵	n						
Dimension and Substrate - Riffle Only																															
Bankfull Width (ft)					3.2	4.5		5.9			8	8.1	12.1	10.7	11	11.3	4.1	4.4	4.7	7.7	7.7		7.7		1						
Floodprone Width (ft)					9	14		21			15	18	25	122	131	140	20	40	60	18	18		18		1						
Bankfull Mean Depth (ft)					0.2	0.3		0.4			0.8	0.8	1	1.3	1.4	1.4	0.3	0.3	0.3	0.6	0.6		0.6		1						
¹ Bankfull Max Depth (ft)					0.5	0.6		0.7			1.1	1.4	1.4	1.9	2	2	0.4	0.4	0.5	1	1		1		1						
Bankfull Cross Sectional Area (ft ²)						1.4						8			14.7		1.4	1.4	1.4	4.5	4.5		4.5		1						
Width/Depth Ratio					8	17.4		29.5			8	10.1	15.1	8	9	9	12	14	16	13.2	13.2		13.2		1						
Entrenchment Ratio					1.4	2.2		3.8			1.9	2.1	2.2	11	12	13	4.9	9	12.7	2.3	2.3		2.3		1						
¹ Bank Height Ratio					1.7	2.2		2.4			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		1						
Profile																															
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																	4	11	10	19	4.3	14				
Riffle Slope (ft/ft)																0.01	0.0316	0.0576	0.002	0.01	0.012	0.023	0.031	0.035	0.011	0.029	0.027	0.736	0.017	14	
Pool Length (ft)																										4	9	8	21	4.9	13
Pool Max depth (ft)																1.5	1.8	2.1		2.7		0.4	0.6	0.7	1	1	1	1	0	1	
Pool Spacing (ft)																25	37	69	22	44	81	13	18	35	13	18		35		14	
Pattern																															
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	13	18	27	13	18		27								
Radius of Curvature (ft)																11	16	27	9	31	113	9	13	44	9	13		44			
Rc:Bankfull width (ft/ft)																1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10			
Meander Wavelength (ft)																44	68	116	10	63	91	26	37	53	26	37		53			
Meander Width Ratio																2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6			
Transport parameters																															
Reach Shear Stress (competency) lb/ft ²					1.42												0.34			0.56											
Max part size (mm) mobilized at bankfull																															
Stream Power (transport capacity) W/m ²																															
Additional Reach Parameters																															
Rosgen Classification					Cg 5						Eb 4			E5			E/C 4			C 4											
Bankfull Velocity (fps)					3.6												3.6			1.1											
Bankfull Discharge (cfs)					5																										
Valley length (ft)					229																										
Channel Thalweg length (ft)					247												279			279											
Sinuosity (ft)					1.07						1.2			1.46			1.15			1.15											
Water Surface Slope (Channel) (ft/ft)					0.0207						0.0258			0.0053			0.0193			0.0176											
BF slope (ft/ft)																															
³ Bankfull Floodplain Area (acres)																															
⁴ % of Reach with Eroding Banks					100						0			0																	
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 11c. Baseline Stream Data Summary
 Project Name/Number (Heron/100014) - Segment/Reach: UT 4 (450 feet)

Parameter	Gauge ²	Regional Curve			Pre-Existing Condition						Cedarrock Park Ref			Causey Ref			Design			Monitoring Baseline										
		LL	UL	Eq.	Min	Mean	Med	Max	SD ⁵	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD ⁵	n					
Dimension and Substrate - Riffle Only																														
Bankfull Width (ft)					3.1	3.8		4.9			8	8.1	12.1	10.7	11	11.3	4.6	5	5.4	6.5	7.3		8		2					
Floodprone Width (ft)					6	15		30			15	18	25	122	131	140	25	50	75	40	40		40		2					
Bankfull Mean Depth (ft)					0.4	0.5		0.6			0.8	0.8	1	1.3	1.4	1.4	0.3	0.4	0.4	0.3	0.4		0.5		2					
¹ Bankfull Max Depth (ft)					0.7	0.8		0.9			1.1	1.4	1.4	1.9	2	2	0.4	0.5	0.6	0.5	0.7		0.8		2					
Bankfull Cross Sectional Area (ft ²)						2						8			14.7		1.8	1.8	1.8	2.2	3		3.7		2					
Width/Depth Ratio					5.2	7.7		12.3			8	10.1	15.1	8	9	9	12	14	16	17.3	18.3		19.2		2					
Entrenchment Ratio					1.3	3.9		6.1			1.9	2.1	2.2	11	12	13	5.4	10	14	5	5.6		6.2		2					
¹ Bank Height Ratio					1.3	2.3		4.0			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		2					
Profile																														
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																4	9	9	20	3.5	23				
Riffle Slope (ft/ft)																0.01	0.0316	0.0576	0.002	0.01	0.012	0.037	0.05	0.056	0	0.021	0.017	0.061	0.014	23
Pool Length (ft)																									4	10	10	18	3.5	22
Pool Max depth (ft)																1.5	1.8	2.1		2.7		0.5	0.7	0.8	1.1	1.3		1.4		2
Pool Spacing (ft)																25	37	69	22	44	81	15	20	40	15	20		40		22
Pattern																														
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	15	20	30	15	20		30							
Radius of Curvature (ft)																11	16	27	9	31	113	10	15	50	10	15		50		
Rc:Bankfull width (ft/ft)																1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)																44	68	116	10	63	91	30	43	60	30	43		60		
Meander Width Ratio																2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																														
Reach Shear Stress (competency) lb/ft ²					2.79												0.6			0.59										
Max part size (mm) mobilized at bankfull																														
Stream Power (transport capacity) W/m ²																														
Additional Reach Parameters																														
Rosgen Classification					Eg 5						Eb 4			E5			E/C 4			C 4										
Bankfull Velocity (fps)					3.7												4			2.4										
Bankfull Discharge (cfs)					7.3																									
Valley length (ft)					391																									
Channel Thalweg length (ft)					428												450			450										
Sinuosity (ft)					1.09						1.2			1.46			1.15			1.15										
Water Surface Slope (Channel) (ft/ft)					0.0283						0.0258			0.0053			0.3111			0.0254										
BF slope (ft/ft)																														
³ Bankfull Floodplain Area (acres)																														
⁴ % of Reach with Eroding Banks					56						0			0																
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 11d. Baseline Stream Data Summary
 Project Name/Number (Heron/100014) - Segment/Reach: UT 5 (952 feet)

Parameter	Gauge ²	Regional Curve			Pre-Existing Condition						Cedarrock Park Ref			Causey Ref			Design			Monitoring Baseline											
		LL	UL	Eq.	Min	Mean	Med	Max	SD ⁵	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD ⁵	n						
Dimension and Substrate - Riffle Only																															
Bankfull Width (ft)					2.5	3.7		6			8	8.1	12.1	10.7	11	11.3	4.6	5	5.4	4.9	6.9		8.1		4						
Floodprone Width (ft)					4	12		30			15	18	25	122	131	140	25	50	75	40	40		40		4						
Bankfull Mean Depth (ft)					0.3	0.5		0.6			0.8	0.8	1	1.3	1.4	1.4	0.3	0.4	0.4	0.3	0.4		0.5		4						
¹ Bankfull Max Depth (ft)					0.5	0.8		0.9			1.1	1.4	1.4	1.9	2	2	0.4	0.5	0.6	0.5	0.7		0.8		4						
Bankfull Cross Sectional Area (ft ²)						1.6						8			14.7		1.8	1.8	1.8	1.9	2.4		3.7		4						
Width/Depth Ratio					3.6	8.8		20			8	10.1	15.1	8	9	9	12	14	16	12.6	18.3		20.9		4						
Entrenchment Ratio					1.4	3.1		7.3			1.9	2.1	2.2	11	12	13	5.4	10	14	4.9	5.9		8.2		4						
¹ Bank Height Ratio					1.3	1.5		2.0			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		4						
Profile																															
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																	3	11	9	49	8.4	41				
Riffle Slope (ft/ft)																0.01	0.0316	0.0576	0.002	0.01	0.012	0.037	0.05	0.056	0.004	0.028	0.027	0.051	0.01	41	
Pool Length (ft)																										4	12	10	59	8.5	41
Pool Max depth (ft)																1.5	1.8	2.1		2.7		0.5	0.7	0.8	0.8	1		1.1		4	
Pool Spacing (ft)																25	37	69	22	44	81	15	20	40	15	20		40		41	
Pattern																															
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	15	20	30	15	20		30								
Radius of Curvature (ft)																11	16	27	9	31	113	10	15	50	10	15		50			
Rc:Bankfull width (ft/ft)																1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10			
Meander Wavelength (ft)																44	68	116	10	63	91	30	43	60	30	43		60			
Meander Width Ratio																2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6			
Transport parameters																															
Reach Shear Stress (competency) lb/ft ²					2.79												0.6			0.5											
Max part size (mm) mobilized at bankfull																															
Stream Power (transport capacity) W/m ²																															
Additional Reach Parameters																															
Rosgen Classification					Eg 5						Eb 4			E5			E/C 4			E/C 4											
Bankfull Velocity (fps)					3.9												4			2.3											
Bankfull Discharge (cfs)					5.5																										
Valley length (ft)					579																										
Channel Thalweg length (ft)					605												952			952											
Sinuosity (ft)					1.04						1.2			1.46			1.15			1.15											
Water Surface Slope (Channel) (ft/ft)					0.0372						0.0258			0.0053			0.3111			0.0256											
BF slope (ft/ft)																															
³ Bankfull Floodplain Area (acres)																															
⁴ % of Reach with Eroding Banks					50						0			0																	
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 11e. Baseline Stream Data Summary
 Project Name/Number (Heron/100014) - Segment/Reach: UT 6 (781 feet)

Parameter	Gauge ²	Regional Curve			Pre-Existing Condition						Cedarrock Park Ref			Causey Ref			Design			Monitoring Baseline											
		LL	UL	Eq.	Min	Mean	Med	Max	SD ⁵	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD ⁵	n						
Dimension and Substrate - Riffle Only																															
Bankfull Width (ft)					4.6	6.4		9.6			8	8.1	12.1	10.7	11	11.3	4.2	4.6	4.9	6.1	6.5		6.8		2						
Floodprone Width (ft)					7	16		46			15	18	25	122	131	140	25	50	75	40	40		40		2						
Bankfull Mean Depth (ft)					0.2	0.3		0.3			0.8	0.8	1	1.3	1.4	1.4	0.3	0.3	0.4	0.4	0.4		0.5		2						
¹ Bankfull Max Depth (ft)					0.4	0.5		0.8			1.1	1.4	1.4	1.9	2	2	0.4	0.5	0.5	0.6	0.8		0.9		2						
Bankfull Cross Sectional Area (ft ²)						1.5						8			14.7		1.5	1.5	1.5	2.2	2.9		3.5		2						
Width/Depth Ratio					15.3	26.7		48			8	10.1	15.1	8	9	9	12	14	16	13.2	15.1		16.9		2						
Entrenchment Ratio					1.1	2.4		4.8			1.9	2.1	2.2	11	12	13	5.9	10.9	15.3	5.9	6.2		6.6		2						
¹ Bank Height Ratio					3.7	5.0		7.5			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		2						
Profile																															
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																	2	10	7	47	8.8	33				
Riffle Slope (ft/ft)																0.01	0.0316	0.0576	0.002	0.01	0.012	0.031	0.042	0.047	0.001	0.028	0.024	0.126	0.021	33	
Pool Length (ft)																										4	12	12	18	3.7	33
Pool Max depth (ft)																1.5	1.8	2.1		2.7		0.4	0.6	0.7	1	1.2		1.3		2	
Pool Spacing (ft)																25	37	69	22	44	81	13.7	18.3	36.7	14	18		37		33	
Pattern																															
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	13.7	18.3	36.7	14	18		37								
Radius of Curvature (ft)																11	16	27	9	31	113	9	14	46	9	14		46			
Rc:Bankfull width (ft/ft)																1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10			
Meander Wavelength (ft)																44	68	116	10	63	91	27	39	55	27	39		55			
Meander Width Ratio																2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6			
Transport parameters																															
Reach Shear Stress (competency) lb/ft ²					14.18												0.47			0.56											
Max part size (mm) mobilized at bankfull																															
Stream Power (transport capacity) W/m ²																															
Additional Reach Parameters																															
Rosgen Classification					Cg 5						Eb 4			E5			E/C 4			C 4											
Bankfull Velocity (fps)					3.5												3.5			1.8											
Bankfull Discharge (cfs)					5.2																										
Valley length (ft)					486																										
Channel Thalweg length (ft)					522												781			781											
Sinuosity (ft)					1.07						1.2			1.46			1.15			1.15											
Water Surface Slope (Channel) (ft/ft)					0.028						0.0258			0.0053			0.0261			0.0225											
BF slope (ft/ft)																															
³ Bankfull Floodplain Area (acres)																															
⁴ % of Reach with Eroding Banks					68						0			0																	
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 11f. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 7 (232 feet)

Parameter	Gauge ²	Regional Curve			Pre-Existing Condition						Cedarrock Park Ref			Causey Ref			Design			Monitoring Baseline											
		LL	UL	Eq.	Min	Mean	Med	Max	SD ⁵	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD ⁵	n						
Dimension and Substrate - Riffle Only																															
Bankfull Width (ft)					4.1	5.3		6.7			8	8.1	12.1	10.7	11	11.3	4.9	5.3	5.7	6.2	6.6		7.8		4						
Floodprone Width (ft)					7	13		29			15	18	25	122	131	140	25	50	75	10	20		20		4						
Bankfull Mean Depth (ft)					0.3	0.4		0.5			0.8	0.8	1	1.3	1.4	1.4	0.4	0.4	0.4	0.3	0.4		0.5		4						
¹ Bankfull Max Depth (ft)					0.4	0.6		0.8			1.1	1.4	1.4	1.9	2	2	0.5	0.5	0.6	0.5	0.6		0.7		4						
Bankfull Cross Sectional Area (ft ²)						2						8			14.7		2	2	2	1.8	2.7		3.3		4						
Width/Depth Ratio					8.2	14.5		22.3			8	10.1	15.1	8	9	9	12	14	16	12.8	18.5		24.2		4						
Entrenchment Ratio					1.7	2.4		5.2			1.9	2.1	2.2	11	12	13	5	9	13	1.6	2.8		3.1		4						
¹ Bank Height Ratio					1.8	2.5		4.1			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		4						
Profile																															
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																	3	13	10	75	13	42				
Riffle Slope (ft/ft)																0.01	0.0316	0.0576	0.002	0.01	0.012	0.027	0.036	0.04	0.006	0.029	0.029	0.056	0.011	42	
Pool Length (ft)																										3	9	9	14	2.6	41
Pool Max depth (ft)																1.5	1.8	2.1		2.7		1.3	1.9	2.1	1	1.1		1.5		3	
Pool Spacing (ft)																25	37	69	22	44	81	16	21	42	16	21		42		42	
Pattern																															
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	16	21	32	16	21			32							
Radius of Curvature (ft)																11	16	27	9	31	113	10	16	53	10	16		53			
Rc:Bankfull width (ft/ft)																1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10			
Meander Wavelength (ft)																44	68	116	10	63	91	31	45	64	31	45		64			
Meander Width Ratio																2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6			
Transport parameters																															
Reach Shear Stress (competency) lb/ft ²					2.36												0.45			0.61											
Max part size (mm) mobilized at bankfull																															
Stream Power (transport capacity) W/m ²																															
Additional Reach Parameters																															
Rosgen Classification					Cg 5						Eb 4			E5			Eb 4			Cb 4											
Bankfull Velocity (fps)					3.5												3.5			2.6											
Bankfull Discharge (cfs)					7																										
Valley length (ft)					755																										
Channel Thalweg length (ft)					778												232			232											
Sinuosity (ft)					1.03						1.2			1.46			1.15			1.15											
Water Surface Slope (Channel) (ft/ft)					0.0248						0.0258			0.0053			0.0222			0.0268											
BF slope (ft/ft)																															
³ Bankfull Floodplain Area (acres)																															
⁴ % of Reach with Eroding Banks					76						0			0																	
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 11g. Baseline Stream Data Summary
 Project Name/Number (Heron/100014) - Segment/Reach: UT 8 (605 feet)

Parameter	Gauge ²	Regional Curve			Pre-Existing Condition						Cedarrock Park Ref			Causey Ref			Design			Monitoring Baseline										
		LL	UL	Eq.	Min	Mean	Med	Max	SD ⁵	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD ⁵	n					
Dimension and Substrate - Riffle Only																														
Bankfull Width (ft)					4.2	5.1		6.1			8	8.1	12.1	10.7	11	11.3	5.5	5.9	6.3	6.5	7.9		9.3		2					
Floodprone Width (ft)					5	15		30			15	18	25	122	131	140	25	50	75	20	30		40		2					
Bankfull Mean Depth (ft)					0.4	0.5		0.6			0.8	0.8	1	1.3	1.4	1.4	0.4	0.4	0.5	0.4	0.4		0.4		2					
¹ Bankfull Max Depth (ft)					0.6	0.8		1			1.1	1.4	1.4	1.9	2	2	0.5	0.6	0.7	0.7	0.7		0.7		2					
Bankfull Cross Sectional Area (ft ²)						2.5						8			14.7		2.5	2.5	2.5	2.6	3.2		3.7		2					
Width/Depth Ratio					7	11.3		15.3			8	10.1	15.1	8	9	9	12	14	16	16.3	19.8		23.4		2					
Entrenchment Ratio					1.1	2.7		4.9			1.9	2.1	2.2	11	12	13	4.6	8.5	11.9	2.2	4.2		6.2		2					
¹ Bank Height Ratio					1.4	2.3		3.7			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		2					
Profile																														
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																5	11	11	19	3.4	23				
Riffle Slope (ft/ft)																0.01	0.0316	0.0576	0.002	0.01	0.012	0.023	0.03	0.034	0.007	0.02	0.017	0.041	0.009	23
Pool Length (ft)																									6	15	15	24	4.8	23
Pool Max depth (ft)																1.5	1.8	2.1		2.7		0.5	0.8	0.9	0.9	1.3		1.6		2
Pool Spacing (ft)																25	37	69	22	44	81	17	24	47	17	24		47		23
Pattern																														
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	17	24	36	17	24		36							
Radius of Curvature (ft)																11	16	27	9	31	113	11	18	59	11	18		59		
Rc:Bankfull width (ft/ft)																1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)																44	68	116	10	63	91	35	50	71	35	50		71		
Meander Width Ratio																2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																														
Reach Shear Stress (competency) lb/ft ²					1.85												0.44			0.32										
Max part size (mm) mobilized at bankfull																														
Stream Power (transport capacity) W/m ²																														
Additional Reach Parameters																														
Rosgen Classification					Eg 5						Eb 4			E5			E/C 4			C 4										
Bankfull Velocity (fps)					3.6												3.6			2.8										
Bankfull Discharge (cfs)					9.1																									
Valley length (ft)					520																									
Channel Thalweg length (ft)					543												605			605										
Sinuosity (ft)					1.04						1.2			1.46			1.15			1.15										
Water Surface Slope (Channel) (ft/ft)					0.0218						0.0258			0.0053			0.019			0.0138										
BF slope (ft/ft)																														
³ Bankfull Floodplain Area (acres)																														
⁴ % of Reach with Eroding Banks					80						0			0																
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 12a. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 1 (856 feet)

Parameter	Pre-Existing Condition					Cedarrock Reference Reach Data					Causey Reference Reach Data					Design					As-built/Baseline							
¹ Ri% / Ru% / P% / G% / S%																60	13	14	13			43	19	19	19			
¹ SC% / Sa% / G% / C% / B% / Be%						9	22	39	18	11	4	54	28	11	1	2												
¹ d16 / d35 / d50 / d84 / d95 / di ^p / di ^{sp} (mm)						0.116	4.1	9.8	161	2568	0.318	0.5	0.9	24	116													
² Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10		29	71							66				50	50									25	75			
³ Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0		14	43	43		66		33				100										100						

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosely built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construction distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 12b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 3 (279 feet)

Parameter	Pre-Existing Condition					Cedarrock Reference Reach Data					Causey Reference Reach Data					Design					As-built/Baseline							
¹ Ri% / Ru% / P% / G% / S%																74	8	9	8			55	15	15	15			
¹ SC% / Sa% / G% / C% / B% / Be%						9	22	39	18	11	4	54	28	11	1	2												
¹ d16 / d35 / d50 / d84 / d95 / di ^p / di ^{sp} (mm)						0.116	4.1	9.8	161	2568	0.318	0.5	0.9	24	116													
² Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	33	33	33							66				50	50									100				
³ Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0			33	66		66		33				100										100						

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosely built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construction distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 12c. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 4 (450 feet)

Parameter	Pre-Existing Condition					Cedarrock Reference Reach Data					Causey Reference Reach Data					Design					As-built/Baseline							
¹ Ri% / Ru% / P% / G% / S%																63	12	13	12			48	17	18	17			
¹ SC% / Sa% / G% / C% / B% / Be%						9	22	39	18	11	4	54	28	11	1	2												
¹ d16 / d35 / d50 / d84 / d95 / di ^p / di ^{sp} (mm)						0.116	4.1	9.8	161	2568	0.318	0.5	0.9	24	116													
² Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10		25	25	50						66				50	50									100				
³ Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0		25	25	50		66		33				100										100						

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosely built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construction distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 12d. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 5 (952 feet)

Parameter	Pre-Existing Condition					Cedarrock Reference Reach Data					Causey Reference Reach Data					Design					As-built/Baseline											
¹ Ri% / Ru% / P% / G% / S%																58	14	14	14					50	17	17	16					
¹ SC% / Sa% / G% / C% / B% / Be%						9	22	39	18	11	4	54	28	11	1	2																
¹ d16 / d35 / d50 / d84 / d95 / di ^p / di ^{sp} (mm)						0.116	4.1	9.8	161	2568	0.318	0.5	0.9	24	116																	
² Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	20	20	40	20																								100				
³ Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0		20	20	60		66		33			100													100								

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosely built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construction distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 12e. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 6 (781 feet)

Parameter	Pre-Existing Condition					Cedarrock Reference Reach Data					Causey Reference Reach Data					Design					As-built/Baseline											
¹ Ri% / Ru% / P% / G% / S%																64	12	12	12					46	18	18	18					
¹ SC% / Sa% / G% / C% / B% / Be%						9	22	39	18	11	4	54	28	11	1	2																
¹ d16 / d35 / d50 / d84 / d95 / di ^p / di ^{sp} (mm)						0.116	4.1	9.8	161	2568	0.318	0.5	0.9	24	116																	
² Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	40	20	20	20																								100				
³ Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0				100		66		33			100													100								

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosely built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construction distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 12f. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 7 (232 feet)

Parameter	Pre-Existing Condition					Cedarrock Reference Reach Data					Causey Reference Reach Data					Design					As-built/Baseline											
¹ Ri% / Ru% / P% / G% / S%																76	7	8	7					60	13	14	13					
¹ SC% / Sa% / G% / C% / B% / Be%						9	22	39	18	11	4	54	28	11	1	2																
¹ d16 / d35 / d50 / d84 / d95 / di ^p / di ^{sp} (mm)						0.116	4.1	9.8	161	2568	0.318	0.5	0.9	24	116																	
² Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10		57	29	14																					25	75						
³ Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0			29	71		66		33			100													100								

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosely built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construction distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 12g. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 8 (605 feet)

Parameter	Pre-Existing Condition					Cedarock Reference Reach Data					Causey Reference Reach Data					Design					As-built/Baseline											
¹ Ri% / Ru% / P% / G% / S%																60	13	14	13					41	20	20	19					
¹ SC% / Sa% / G% / C% / B% / Be%						9	22	39	18	11	4	54	28	11	1	2																
¹ d16 / d35 / d50 / d84 / d95 / di ^p / di ^{sp} (mm)						0.116	4.1	9.8	161	2568	0.318	0.5	0.9	24	116																	
² Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	25	25	50				33			66				50	50											50	50					
³ Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0		50		50		66		33				100												100								

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

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosely built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construction distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 13a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)																																							
Project Name/Number (Heron/100014) Segment/Reach: UT 1 (856 feet)																																							
		Cross Section 1 (Pool)							Cross Section 2 (Riffle)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)									
Based on fixed baseline bankfull elevation ¹	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+				
Record elevation (datum) used																																							
Bankfull Width (ft)	9.2	8.5	8.5	11.5				10.7	14.7	15.3	16.0				13.0	14.4	17.7	13.0				8.9	9.7	9.1	10.0				8.3	9.0	10.7	12.4							
Floodprone Width (ft)	NA	NA	NA	NA				100	100	100	100				100	100	100	100				NA	NA	NA	NA				25	25	25	25							
Bankfull Mean Depth (ft)	1.1	1.2	1.2	0.9				0.6	0.4	0.4	0.4				0.4	0.3	0.3	0.4				0.8	0.7	0.7	0.7				0.4	0.4	0.3	0.3							
Bankfull Max Depth (ft)	2.1	2.2	2.2	2.3				0.9	0.8	0.9	1.0				0.7	0.7	0.7	0.6				1.6	1.6	1.5	1.6				0.6	0.6	0.7	0.6							
Bankfull Cross Sectional Area (ft ²)	10.5	10.5	10.5	10.5				6.1	6.1	6.1	6.1				4.6	4.6	4.6	4.6				6.8	6.8	6.8	6.8				3.7	3.7	3.7	3.7							
Bankfull Width/Depth Ratio	NA	NA	NA	NA				18.8	35.4	38.4	40.0				36.7	45.1	68.1	36.8				NA	NA	NA	NA				18.6	21.9	30.9	41.9							
Bankfull Entrenchment Ratio	NA	NA	NA	NA				9.3	6.8	6.5	6.3				7.7	6.9	5.6	7.7				NA	NA	NA	NA				3.0	2.8	2.3	2.0							
Low Bank Height (ft)	2.1	2.2	2.1	2.2				0.9	0.7	0.9	1.0				0.7	0.7	0.7	0.6				1.6	1.6	1.5	1.6				0.6	0.6	0.7	0.6							
Bankfull Bank Height Ratio*	1.00	1.00	0.95	0.96				1.00	0.88	1.00	1.00				1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.00				1.00	1.00	1.00	0.96							
Cross Sectional Area between end pins (ft ²)																																							
d50 (mm)																																							
		Cross Section 6 (Pool)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)																							
Based on fixed baseline bankfull elevation ¹	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+																		
Record elevation (datum) used																																							
Bankfull Width (ft)	12.8	13.2	15.7	13.1				9.6	10.4	10.5	15.4				11.2	12.0	11.4	13.8																					
Floodprone Width (ft)	NA	NA	NA	NA				NA	NA	NA	NA				100	100	100	100																					
Bankfull Mean Depth (ft)	0.7	0.7	0.6	0.7				0.8	0.8	0.8	0.5				0.6	0.6	0.6	0.5																					
Bankfull Max Depth (ft)	1.6	1.7	1.6	1.7				1.5	1.7	1.5	1.6				1.1	1.0	1.1	1																					
Bankfull Cross Sectional Area (ft ²)	9.4	9.4	9.4	9.4				8.0	8.0	8.0	8				7.2	7.2	7.2	7.2																					
Bankfull Width/Depth Ratio	NA	NA	NA	NA				NA	NA	NA	NA				17.4	20.0	18.1	26.45																					
Bankfull Entrenchment Ratio	NA	NA	NA	NA				NA	NA	NA	NA				8.9	8.3	8.8	7.25																					
Low Bank Height (ft)	1.6	1.7	1.6	1.7				1.5	1.7	1.5	1.6				1.1	1.0	1.1	1.1																					
Bankfull Bank Height Ratio*	1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.10																					
Cross Sectional Area between end pins (ft ²)																																							
d50 (mm)																																							

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 13b. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)																																							
Project Name/Number (Heron/100014) Segment/Reach: UT 3 (279 feet)																																							
		Cross Section 9 (Pool)							Cross Section 10 (Riffle)																														
Based on fixed baseline bankfull elevation ¹	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+																									
Record elevation (datum) used																																							
Bankfull Width (ft)	4.2	5.6	5.8	5.8				7.7	7.0	7.0	7.4																												
Floodprone Width (ft)	NA	NA	NA	NA				18	18	18	18																												
Bankfull Mean Depth (ft)	0.7	0.5	0.5	0.5				0.6	0.6	0.6	0.6																												
Bankfull Max Depth (ft)	1.0	0.8	0.8	0.7				1.0	1.1	1.0	1.0																												
Bankfull Cross Sectional Area (ft ²)	2.9	2.9	2.9	2.9				4.5	4.5	4.5	4.5																												
Bankfull Width/Depth Ratio	NA	NA	NA	NA				13.2	10.9	10.9	12.3																												
Bankfull Entrenchment Ratio	NA	NA	NA	NA				2.3	2.6	2.6	2.4																												
Low Bank Height (ft)	1.0	0.3	0.8	0.5				1.0	1.1	1.0	1.1																												
Bankfull Bank Height Ratio*	1.00	0.38	1.00	0.79				1.00	1.00	1.00	1.10																												
Cross Sectional Area between end pins (ft ²)																																							
d50 (mm)																																							
Based on fixed baseline bankfull elevation ¹																																							
Record elevation (datum) used																																							
Bankfull Width (ft)																																							
Floodprone Width (ft)																																							
Bankfull Mean Depth (ft)																																							
Bankfull Max Depth (ft)																																							
Bankfull Cross Sectional Area (ft ²)																																							
Bankfull Width/Depth Ratio																																							
Bankfull Entrenchment Ratio																																							
Low Bank Height (ft)																																							
Bankfull Bank Height Ratio*																																							
Cross Sectional Area between end pins (ft ²)																																							
d50 (mm)																																							

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 13c. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 4 (450 feet)

	Cross Section 11 (Pool)							Cross Section 12 (Riffle)							Cross Section 13 (Riffle)							Cross Section 14 (Pool)						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation¹																												
Record elevation (datum) used																												
Bankfull Width (ft)	6.0	7.9	9.4	9.6				6.5	7.4	10.6	11.2				8.0	7.9	11.3	7.8				9.1	11.0	10.9	11.3			
Floodprone Width (ft)	NA	NA	NA	NA				40	40	40	40				40	40	40	40				NA	NA	NA	NA			
Bankfull Mean Depth (ft)	0.8	0.6	0.5	0.5				0.3	0.3	0.2	0.2				0.5	0.4	0.3	0.4				0.7	0.6	0.6	0.6			
Bankfull Max Depth (ft)	1.1	1.1	1.3	1.2				0.5	0.6	0.5	0.5				0.8	0.8	0.8	0.8				1.4	1.4	1.4	1.4			
Bankfull Cross Sectional Area (ft ²)	4.8	4.8	4.8	4.8				2.2	2.2	2.2	2.2				3.7	3.5	3.5	3.5				6.8	6.8	6.8	6.8			
Bankfull Width/Depth Ratio	NA	NA	NA	NA				19.2	24.9	51.1	55.8				17.3	17.8	36.5	17.7				NA	NA	NA	NA			
Bankfull Entrenchment Ratio	NA	NA	NA	NA				6.2	5.4	3.8	3.6				5.0	5.1	3.5	5.1				NA	NA	NA	NA			
Low Bank Height (ft)	1.1	0.9	1.3	1.2				0.5	0.5	0.5	0.5				0.8	0.8	0.8	0.7				1.4	1.4	1.4	1.4			
Bankfull Bank Height Ratio*	1.00	0.82	1.00	1.00				1.00	0.83	1.00	1.00				1.00	1.00	1.00	0.88				1.00	1.00	1.00	1.00			
Cross Sectional Area between end pins (ft ²)																												
d50 (mm)																												
Based on fixed baseline bankfull elevation¹																												
Record elevation (datum) used																												
Bankfull Width (ft)																												
Floodprone Width (ft)																												
Bankfull Mean Depth (ft)																												
Bankfull Max Depth (ft)																												
Bankfull Cross Sectional Area (ft ²)																												
Bankfull Width/Depth Ratio																												
Bankfull Entrenchment Ratio																												
Low Bank Height (ft)																												
Bankfull Bank Height Ratio*																												
Cross Sectional Area between end pins (ft ²)																												
d50 (mm)																												

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 13d. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 5 (952 feet)

	Cross Section 15 (Pool)							Cross Section 16 (Riffle)							Cross Section 17 (Pool)							Cross Section 18 (Riffle)							Cross Section 19 (Pool)						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation¹																																			
Record elevation (datum) used																																			
Bankfull Width (ft)	4.7	9.4	8.7	10.4				6.3	5.7	9.4	11.0				5.4	5.7	5.9	5.9				8.1	9.2	12.2	12.7				7.8	8.7	11.4	14.2			
Floodprone Width (ft)	NA	NA	NA	NA				40	40	40	40				NA	NA	NA	NA				40	40	40	40				NA	NA	NA	NA			
Bankfull Mean Depth (ft)	0.5	0.3	0.3	0.2				0.3	0.3	0.2	0.2				0.6	0.6	0.6	0.6				0.5	0.4	0.3	0.3				0.4	0.4	0.3	0.2			
Bankfull Max Depth (ft)	0.8	0.5	0.6	0.7				0.5	0.6	0.6	0.6				1.1	1.2	1.3	1.3				0.8	0.7	0.8	0.8				0.9	0.8	0.7	0.7			
Bankfull Cross Sectional Area (ft ²)	2.4	2.4	2.4	2.4				1.9	1.9	1.9	1.9				3.4	3.4	3.4	3.4				3.7	3.7	3.7	3.7				3.3	3.3	3.3	3.3			
Bankfull Width/Depth Ratio	NA	NA	NA	NA				20.9	17.1	46.5	64.7				NA	NA	NA	NA				17.7	22.9	40.2	43.2				NA	NA	NA	NA			
Bankfull Entrenchment Ratio	NA	NA	NA	NA				6.3	7.0	4.3	3.7				NA	NA	NA	NA				4.9	4.3	3.3	3.2				NA	NA	NA	NA			
Low Bank Height (ft)	0.8	0.5	0.6	0.6				0.5	0.6	0.6	0.6				1.1	1.2	1.3	1.4				0.8	0.6	0.8	0.7				0.9	0.8	0.7	0.7			
Bankfull Bank Height Ratio*	1.00	1.00	1.00	0.86				1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.07				1.00	0.86	1.00	0.88				1.00	1.00	1.00	1.00			
Cross Sectional Area between end pins (ft ²)																																			
d50 (mm)																																			
Based on fixed baseline bankfull elevation¹																																			
Record elevation (datum) used																																			
Bankfull Width (ft)	4.9	6.2	5.3	5.9				5.0	5.8	5.8	5.3				7.4	7.2	8.5	7.7																	
Floodprone Width (ft)	40	40	40	40				NA	NA	NA	NA				40	40	40	40																	
Bankfull Mean Depth (ft)	0.4	0.3	0.4	0.3				0.6	0.5	0.5	0.6				0.4	0.4	0.3	0.4																	
Bankfull Max Depth (ft)	0.6	0.6	0.6	0.6				1.1	1.0	1.1	1.1				0.7	0.8	0.7	0.8																	
Bankfull Cross Sectional Area (ft ²)	1.9	1.9	1.9	1.9				3.1	3.1	3.1	3.1				2.9	2.9	2.9	2.9																	
Bankfull Width/Depth Ratio	12.6	20.2	14.8	18.5				NA	NA	NA	NA				18.9	17.9	24.9	20.7																	
Bankfull Entrenchment Ratio	8.2	6.5	7.5	6.8				NA	NA	NA	NA				5.4	5.6	4.7	5.2																	
Low Bank Height (ft)	0.6	0.6	0.6	0.6				1.1	1.0	1.1	1.2				0.7	0.8	0.7	0.7																	
Bankfull Bank Height Ratio*	1.00	1.00	1.00	1.11				1.00	1.00	1.00	1.09				1.00	1.00	1.00	0.88																	
Cross Sectional Area between end pins (ft ²)																																			
d50 (mm)																																			

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

**Table 13e. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 6 (781 feet)**

Based on fixed baseline bankfull elevation ¹	Cross Section 23 (Pool)							Cross Section 24 (Riffle)							Cross Section 25 (Pool)							Cross Section 26 (Riffle)						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																												
Bankfull Width (ft)	5.6	5.7	6.4	8.8				6.1	5.8	5.7	5.4			5.2	10.0	10.3	10.8			6.8	4.7	4.8	4.3					
Floodprone Width (ft)	NA	NA	NA	NA				40	40	40	40			NA	NA	NA	NA			40	40	40	40					
Bankfull Mean Depth (ft)	0.6	0.6	0.6	0.4				0.4	0.4	0.4	0.4			0.6	0.3	0.3	0.3			0.5	0.7	0.7	0.8					
Bankfull Max Depth (ft)	1.0	0.9	1.0	1.0				0.6	0.5	0.6	0.6			1.3	0.8	0.8	0.7			0.9	1.0	1.2	1.2					
Bankfull Cross Sectional Area (ft ²)	3.6	3.6	3.6	3.6				2.2	2.2	2.2	2.2			3.2	3.2	3.2	3.2			3.5	3.5	3.5	3.5					
Bankfull Width/Depth Ratio	NA	NA	NA	NA				16.9	15.3	14.8	13.4			NA	NA	NA	NA			13.2	6.3	6.6	5.3					
Bankfull Entrenchment Ratio	NA	NA	NA	NA				6.6	6.9	7.0	7.5			NA	NA	NA	NA			5.9	8.5	8.3	9.3					
Low Bank Height (ft)	1.0	0.9	1.0	1.1				0.6	0.7	0.6	0.6			1.3	0.6	0.7	0.6			0.9	1.4	1.5	1.2					
Bankfull Bank Height Ratio*	1.00	1.00	1.00	1.10				1.00	1.40	1.00	1.07			1.00	0.75	0.88	0.86			1.00	1.40	1.25	1.02					
Cross Sectional Area between end pins (ft ²)																												
d50 (mm)																												

Based on fixed baseline bankfull elevation ¹	Cross Section 27 (Pool)							Cross Section 28 (Riffle)							Cross Section 29 (Pool)							Cross Section 30 (Riffle)							Cross Section 31 (Pool)						
Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	
Record elevation (datum) used																																			
Bankfull Width (ft)	7.1	11.4	12.4	12.5				7.8	6.9	7.5	7.0			4.1	4.1	4.1	4.1			6.2	5.6	6.3	6.2			5.3	6.1	5.8	5.8						
Floodprone Width (ft)	NA	NA	NA	NA				20	20	20	20			NA	NA	NA	NA			10	11	11	11			NA	NA	NA	NA						
Bankfull Mean Depth (ft)	0.9	0.6	0.5	0.5				0.4	0.4	0.4	0.4			0.8	0.8	0.8	0.8			0.4	0.4	0.4	0.4			0.6	0.5	0.5	0.5						
Bankfull Max Depth (ft)	1.5	1.1	0.9	1.0				0.6	1.1	0.9	1.1			1.1	1.3	1.2	1.2			0.5	0.5	0.5	0.6			1.0	0.7	0.7	0.7						
Bankfull Cross Sectional Area (ft ²)	6.3	6.3	6.3	6.3				3.0	3.0	3.0	3.0			3.4	3.4	3.4	3.4			2.3	2.3	2.3	2.3			3.0	3.0	3.0	3.0						
Bankfull Width/Depth Ratio	NA	NA	NA	NA				20.3	15.9	18.8	16.3			NA	NA	NA	NA			16.7	13.6	17.3	16.7			NA	NA	NA	NA						
Bankfull Entrenchment Ratio	NA	NA	NA	NA				2.6	2.9	2.7	2.9			NA	NA	NA	NA			1.6	2.0	1.7	1.8			NA	NA	NA	NA						
Low Bank Height (ft)	1.5	0.8	0.8	0.9				0.6	1.1	0.9	1.1			1.1	1.2	1.2	1.3			0.5	0.5	0.5	0.6			1.0	0.6	0.8	0.8						
Bankfull Bank Height Ratio*	1.00	0.73	0.89	0.90				1.00	1.00	1.00	1.00			1.00	0.92	1.00	1.08			1.00	1.00	1.00	1.04			1.00	0.86	1.14	1.01						
Cross Sectional Area between end pins (ft ²)																																			
d50 (mm)																																			

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

**Table 13f. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 7 (232 feet)**

Based on fixed baseline bankfull elevation ¹	Cross Section 27 (Pool)							Cross Section 28 (Riffle)							Cross Section 29 (Pool)							Cross Section 30 (Riffle)							Cross Section 31 (Pool)						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																			
Bankfull Width (ft)	6.5	7.6	7.9	8.1				6.6	5.8	6.2	7.4																								
Floodprone Width (ft)	20	20	20	20				20	20	20	20																								
Bankfull Mean Depth (ft)	0.5	0.4	0.4	0.4				0.3	0.3	0.3	0.2																								
Bankfull Max Depth (ft)	0.7	0.8	0.8	0.9				0.5	0.6	0.6	0.6																								
Bankfull Cross Sectional Area (ft ²)	3.3	3.3	3.3	3.3				1.8	1.8	1.8	1.8																								
Bankfull Width/Depth Ratio	12.8	17.5	18.9	19.8				24.2	18.7	21.4	30.7																								
Bankfull Entrenchment Ratio	3.1	2.6	2.5	2.5				3.0	3.4	3.2	2.7																								
Low Bank Height (ft)	0.7	0.8	0.8	0.9				0.5	0.5	0.7	0.5																								
Bankfull Bank Height Ratio*	1.00	1.00	1.00	1.00				1.00	0.83	1.17	0.90																								
Cross Sectional Area between end pins (ft ²)																																			
d50 (mm)																																			

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 13g. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 8 (605 feet)

	Cross Section 34 (Riffle)							Cross Section 35 (Pool)							Cross Section 36 (Riffle)							Cross Section 37 (Pool)						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation¹																												
Record elevation (datum) used																												
Bankfull Width (ft)	6.5	5.2	4.8	5.3				7.5	6.9	7.1	6.4				9.3	9.0	9.3	9.7				9.5	8.7	10.5	8.6			
Floodprone Width (ft)	40	40	40	40				NA	NA	NA	NA				20	20	20	20				NA	NA	NA	NA			
Bankfull Mean Depth (ft)	0.4	0.5	0.5	0.5				0.5	0.6	0.6	0.6				0.4	0.4	0.4	0.4				0.8	0.8	0.7	0.8			
Bankfull Max Depth (ft)	0.7	0.7	0.8	0.7				0.9	1.0	0.9	0.9				0.7	0.7	0.8	0.8				1.6	1.6	1.6	1.6			
Bankfull Cross Sectional Area (ft ²)	2.6	2.6	2.6	2.6				4.1	4.1	4.1	4.1				3.7	3.7	3.7	3.7				7.2	7.2	7.2	7.2			
Bankfull Width/Depth Ratio	16.3	10.4	8.9	10.7				NA	NA	NA	NA				23.4	21.9	23.4	25.5				NA	NA	NA	NA			
Bankfull Entrenchment Ratio	6.2	7.7	8.3	7.6				NA	NA	NA	NA				2.2	2.2	2.2	2.1				NA	NA	NA	NA			
Low Bank Height (ft)	0.7	0.8	0.8	0.8				0.9	1.0	0.9	0.9				0.7	0.7	0.8	0.8				1.6	1.6	1.6	1.5			
Bankfull Bank Height Ratio*	1.00	1.14	1.00	1.14				1.00	1.00	1.00	1.01				1.00	1.00	1.00	1.07				1.00	1.00	1.00	0.94			
Cross Sectional Area between end pins (ft ²)																												
d50 (mm)																												
Based on fixed baseline bankfull elevation¹																												
Record elevation (datum) used																												
Bankfull Width (ft)																												
Floodprone Width (ft)																												
Bankfull Mean Depth (ft)																												
Bankfull Max Depth (ft)																												
Bankfull Cross Sectional Area (ft ²)																												
Bankfull Width/Depth Ratio																												
Bankfull Entrenchment Ratio																												
Low Bank Height (ft)																												
Bankfull Bank Height Ratio*																												
Cross Sectional Area between end pins (ft ²)																												
d50 (mm)																												

¹ = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Exhibit Table 14a. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 1 (856 feet)

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n
Dimension and Substrate - Riffle only																																				
Bankfull Width (ft)	8.3	11		13		4	9	13.2		14.7		4	10.7	13.4		17.7		4	12.4		13.4	16		4												
Floodprone Width (ft)	25	100		100		4	25	100		100		4	25	100		100		4	25		100	100		4												
Bankfull Mean Depth (ft)	0.4	0.5		0.6		4	0.3	0.4		0.6		4	0.26	0.37		0.63		4	0.30		0.41	0.52		4												
¹ Bankfull Max Depth (ft)	0.6	0.8		1.1		4	0.6	0.8		1		4	0.7	0.8		1.1		4	0.62		0.82	1.04		4												
Bankfull Cross Sectional Area (ft ²)	3.7	5.4		7.2		4	3.7	5.4		7.2		4	3.7	5.4		7.2		4	3.7		5.4	7.2		4												
Width/Depth Ratio	17.4	18.7		36.7		4	20	28.7		45.1		4	18.1	34.7		68.1		4	26.7		39.3	41.9		4												
Entrenchment Ratio	3	8.3		9.3		4	2.8	6.9		8.3		4	2.34	6.09		8.77		4	2.01		6.74	7.68		4												
Low Bank Height (ft)	0.6	0.8		1.1		4	0.6	0.7		1		4	0.7	0.8		1.1		4	0.62		0.82	1.04		4												
¹ Bank Height Ratio	1.0	1.0		1.0		4	0.9	1		1		4	1.0	1.0		1.0		4	0.9		0.9	1.0		4												
Profile																																				
Riffle Length (ft)	2.7	19	16	53	11	31																														
Riffle Slope (ft/ft)	0	0.01	0.01	0.05	0.01	31																														
Pool Length (ft)	6	23	20	80	12.9	34																														
Pool Max depth (ft)	1.5	1.6		2.1		4																														
Pool Spacing (ft)	25	34		68		34																														
Pattern																																				
Channel Beltwidth (ft)	25	34		68																																
Radius of Curvature (ft)	17	25		85																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	51	72		101																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification				C 4																																
Channel Thalweg length (ft)				856																																
Sinuosity (ft)				1.3																																
Water Surface Slope (Channel) (ft/ft)				0.0087																																
BF slope (ft/ft)																																				
³ Ri% / Ru% / P% / G% / S%	43	19	19	19																																
³ SC% / Sa% / G% / C% / B% / Be%																																				
³ d16 / d35 / d50 / d84 / d95 /																																				
² % of Reach with Eroding Banks				0																																
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

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 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
 3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
 4. = Of value/needed only if the n exceeds 3

Exhibit Table 14b. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 3 (279 feet)

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n
Dimension and Substrate - Riffle only																																				
Bankfull Width (ft)	7.7	7.7		7.7		1	7	7		7		1	7	7		7		1	7.4	7.4		7.4		1	7.4	7.4		7.4		1						
Floodprone Width (ft)	18	18		18		1	18	18		18		1	18	18		18		1	18	18		18		1												
Bankfull Mean Depth (ft)	0.6	0.6		0.6		1	0.6	0.6		0.6		1	0.6	0.6		0.6		1	0.6	0.6		0.6		1												
¹ Bankfull Max Depth (ft)	1	1		1		1	1.1	1.1		1.1		1	1	1		1		1	1.1	1.1		1.1		1												
Bankfull Cross Sectional Area (ft ²)	4.5	4.5		4.5		1	4.5	4.5		4.5		1	4.5	4.5		4.5		1	4.5	4.5		4.5		1												
Width/Depth Ratio	13.2	13.2		13.2		1	10.9	10.9		10.9		1	10.9	10.9		10.9		1	12.3	12.3		12.3		1												
Entrenchment Ratio	2.3	2.3		2.3		1	2.6	2.6		2.6		1	2.6	2.6		2.6		1	2.4	2.4		2.4		1												
Low Bank Height (ft)	1	1		1		1	1.1	1.1		1.1		1	1	1		1		1	1.1	1.1		1.1		1												
¹ Bank Height Ratio	1.0	1.0		1.0		1	1	1.0		1.0		1	1	1.0		1.0		1	1.1	1.1		1.1		1												
Profile																																				
Riffle Length (ft)	4	11	10	19	4.3	14																														
Riffle Slope (ft/ft)	0.01	0.03	0.03	0.74	0.02	14																														
Pool Length (ft)	4	9	8	21	4.9	13																														
Pool Max depth (ft)	1	1	1	0	1																															
Pool Spacing (ft)	13	18		35		14																														
Pattern																																				
Channel Beltwidth (ft)	13	18		27																																
Radius of Curvature (ft)	9	13		44																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	26	37		53																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	279																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0176																																			
BF slope (ft/ft)																																				
³ Ri% / Ru% / P% / G% / S%	55	15	15	15																																
³ SC% / Sa% / G% / C% / B% / Be%																																				
³ d16 / d35 / d50 / d84 / d95 /																																				
² % of Reach with Eroding Banks	0																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

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 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
 3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
 4. = Of value/needed only if the n exceeds 3

Exhibit Table 14c. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 4 (450 feet)

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n
Dimension and Substrate - Riffle only																																				
Bankfull Width (ft)	6.5	7.3		8		2	7.4	7.7		7.9		2	10.6	11		11.3		2	7.8		7.9	7.9														
Floodprone Width (ft)	40	40		40		2	40	40		40		2	40	40		40		2	40		40	40														
Bankfull Mean Depth (ft)	0.3	0.4		0.5		2	0.3	0.4		0.4		2	0.2	0.3		0.3		2	0.3		0.4	0.4														
¹ Bankfull Max Depth (ft)	0.5	0.7		0.8		2	0.6	0.7		0.8		2	0.5	0.7		0.8		2	0.5		0.7	0.8														
Bankfull Cross Sectional Area (ft ²)	2.2	3		3.7		2	2.2	2.9		3.5		2	2.2	2.9		3.5		2	2.2		2.9	3.5														
Width/Depth Ratio	17.3	18.3		19.2		2	17.8	21.4		24.9		2	36.5	43.8		51.1		2	17.7		23.2	28.7														
Entrenchment Ratio	5	5.6		6.2		2	5.1	5.2		5.4		2	3.5	3.7		3.8		2	5		5.1	5.1														
Low Bank Height (ft)	0.5	0.7		0.8		2	0.5	0.7		0.8		2	0.5	0.7		0.8		2	0.5		0.6	0.7														
¹ Bank Height Ratio	1.0	1.0		1.0		2	0.8	0.9		1		2	1.0	1.0		1.0		2	0.9		0.9	1														
Profile																																				
Riffle Length (ft)	4	9	9	20	3.5	23																														
Riffle Slope (ft/ft)	0	0.02	0.02	0.06	0.01	23																														
Pool Length (ft)	4	10	10	18	3.5	22																														
Pool Max depth (ft)	1.1	1.3		1.4		2																														
Pool Spacing (ft)	15	20		40		22																														
Pattern																																				
Channel Beltwidth (ft)	15	20		30																																
Radius of Curvature (ft)	10	15		50																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	30	43		60																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	450																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0195																																			
BF slope (ft/ft)																																				
³ Ri% / Ru% / P% / G% / S%	48	17	18	17																																
³ SC% / Sa% / G% / C% / B% / Be%																																				
³ d16 / d35 / d50 / d84 / d95 /																																				
² % of Reach with Eroding Banks	0																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

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 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
 3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
 4. = Of value/needed only if the n exceeds 3

Exhibit Table 14d. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 5 (952 feet)

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n
Dimension and Substrate - Riffle only																																				
Bankfull Width (ft)	4.9	6.9		8.1		4	5.7	6.7		9.2		4	5.3	9		12.2		4	5.9		7.5	12.7														
Floodprone Width (ft)	40	40		40		4	40	40		40		4	40	40		40		4	40		40	40														
Bankfull Mean Depth (ft)	0.3	0.4		0.5		4	0.3	0.4		0.4		4	0.2	0.3		0.4		4	0.3		0.3	0.4														
¹ Bankfull Max Depth (ft)	0.5	0.7		0.8		4	0.6	0.7		0.8		4	0.6	0.7		0.8		4	0.6		0.7	0.8														
Bankfull Cross Sectional Area (ft ²)	1.9	2.4		3.7		4	1.9	2.4		3.7		4	1.9	2.4		3.7		4	1.9		2.4	3.7														
Width/Depth Ratio	12.6	18.3		20.9		4	17.1	19.1		22.9		4	14.8	32.6		46.5		4	18.5		24.6	43.2														
Entrenchment Ratio	4.9	5.9		8.2		4	4.3	6.0		7.0		4	3.3	4.5		7.5		4	3.2		5.4	6.8														
Low Bank Height (ft)	0.5	0.7		0.8		4	0.6	0.6		0.8		4	0.6	0.6		0.7		4	0.6		0.7	0.7														
¹ Bank Height Ratio	1.0	1.0		1.0		4	0.9	1.0		1.0		4	1	0.8		1		4	1		1	1.2														
Profile																																				
Riffle Length (ft)	3	11	9	49	8.4	41																														
Riffle Slope (ft/ft)	0	0.03	0.03	0.05	0.01	41																														
Pool Length (ft)	4	12	10	59	8.5	41																														
Pool Max depth (ft)	0.8	1		1.1		4																														
Pool Spacing (ft)	15	20		40		41																														
Pattern																																				
Channel Beltwidth (ft)	15	20		30																																
Radius of Curvature (ft)	10	15		50																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	30	43		60																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	E/C 4																																			
Channel Thalweg length (ft)	952																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0256																																			
BF slope (ft/ft)																																				
³ Ri% / Ru% / P% / G% / S%	50	17	17	16																																
³ SC% / Sa% / G% / C% / B% / Be%																																				
³ d16 / d35 / d50 / d84 / d95 /																																				
² % of Reach with Eroding Banks	0																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.
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 2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
 3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
 4. = Of value/needed only if the n exceeds 3

Exhibit Table 14e. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 6 (781 feet)

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n
Dimension and Substrate - Riffle only																																				
Bankfull Width (ft)	6.1	6.5		6.8		2	4.7	5.3		5.8		2	4.8	5.3		5.7		2	4.3		4.8	5.4														
Floodprone Width (ft)	40	40		40		2	40	40		40		2	40	40		40		2	40		40	40														
Bankfull Mean Depth (ft)	0.4	0.4		0.5		2	0.4	0.6		0.7		2	0.4	0.6		0.7		2	0.4		0.6	0.8														
¹ Bankfull Max Depth (ft)	0.6	0.8		0.9		2	0.5	0.8		1		2	0.6	0.9		1.2		2	0.6		0.9	1.2														
Bankfull Cross Sectional Area (ft ²)	2.2	2.9		3.5		2	2.2	2.9		3.5		2	2.2	2.9		3.5		2	2.2		2.9	3.5														
Width/Depth Ratio	13.2	15.1		16.9		2	6.3	10.8		15.3		2	6.6	10.7		14.8		2	5.3		9.4	13.4														
Entrenchment Ratio	5.9	6.2		6.6		2	6.9	7.7		8.5		2	7	7.7		8.3		2	7.4		8.4	9.3														
Low Bank Height (ft)	0.6	0.8		0.9		2	0.7	1.1		1.4		2	0.7	1.1		1.5		2	0.6		0.9	1.2														
¹ Bank Height Ratio	1.0	1.0		1.0		2	1.4	1.4		1.4		2	1.1	1.2		1.3		2	1.0		1.0	1.1														
Profile																																				
Riffle Length (ft)	2	10	7	47	8.8	33																														
Riffle Slope (ft/ft)	0	0.03	0.02	0.13	0.02	33																														
Pool Length (ft)	4	12	12	18	3.7	33																														
Pool Max depth (ft)	1	1.2		1.3		2																														
Pool Spacing (ft)	14	18		37		33																														
Pattern																																				
Channel Beltwidth (ft)	14	18		37																																
Radius of Curvature (ft)	9	14		46																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	27	39		55																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	781																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0225																																			
BF slope (ft/ft)																																				
³ Ri% / Ru% / P% / G% / S%	46	18	18	18																																
³ SC% / Sa% / G% / C% / B% / Be%																																				
³ d16 / d35 / d50 / d84 / d95 /																																				
² % of Reach with Eroding Banks	0																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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Shaded cells indicate that these will typically not be filled in.
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 4. = Of value/needed only if the n exceeds 3

Exhibit Table 14f. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 7 (232 feet)

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5											
	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n						
Dimension and Substrate - Riffle only																																										
Bankfull Width (ft)	6.2	6.6		7.8		4	5.6	6.4		7.6		4	6.2	6.9		7.9		4	6.2	Mean	Med	Max	SD ⁴	n	6.2	Mean	Med	Max	SD ⁴	n	6.2	Mean	Med	Max	SD ⁴	n	6.2	Mean	Med	Max	SD ⁴	n
Floodprone Width (ft)	10	20		20		4	11	20		20		4	11	20		20		4	11	20		20		4	11	20		20		4	11	20		20		4	11	20		20		4
Bankfull Mean Depth (ft)	0.3	0.4		0.5		4	0.3	0.4		0.4		4	0.3	0.4		0.4		4	0.2	0.4	0.4				0.2	0.4	0.4				0.2	0.4	0.4				0.2	0.4	0.4			
¹ Bankfull Max Depth (ft)	0.5	0.6		0.7		4	0.5	0.7		1.1		4	0.5	0.7		0.9		4	0.6	0.8	1.1				0.6	0.8	1.1				0.6	0.8	1.1				0.6	0.8	1.1			
Bankfull Cross Sectional Area (ft ²)	1.8	2.7		3.3		4	1.8	2.7		3.3		4	1.8	2.7		3.3		4	1.8	2.7	3.3				1.8	2.7	3.3				1.8	2.7	3.3				1.8	2.7	3.3			
Width/Depth Ratio	12.8	18.5		24.2		4	13.6	16.7		18.7		4	17.3	18.8		21.4		4	16.3	18.3	46.4				16.3	18.3	46.4				16.3	18.3	46.4				16.3	18.3	46.4			
Entrenchment Ratio	1.6	2.8		3.1		4	2	2.8		3.4		4	1.7	2.6		3.2		4	1.8	2.3	2.9				1.8	2.3	2.9				1.8	2.3	2.9				1.8	2.3	2.9			
Low Bank Height (ft)	0.5	0.6		0.7		4	0.5	0.7		1.1		4	0.5	0.7		0.9		4	0.5	0.8	1.1				0.5	0.8	1.1				0.5	0.8	1.1				0.5	0.8	1.1			
¹ Bank Height Ratio	1.0	1.0		1.0		4	0.8	1		1		4	1.0	1.0		1.0		4	0.9	1	1.1				0.9	1	1.1				0.9	1	1.1				0.9	1	1.1			
Profile																																										
Riffle Length (ft)	3	13	10	75	13	42																																				
Riffle Slope (ft/ft)	0.01	0.03	0.03	0.06	0.01	42																																				
Pool Length (ft)	3	9	9	14	2.6	41																																				
Pool Max depth (ft)	1	1.1		1.5		3																																				
Pool Spacing (ft)	16	21		42		42																																				
Pattern																																										
Channel Beltwidth (ft)	16	21		32																																						
Radius of Curvature (ft)	10	16		53																																						
Rc:Bankfull width (ft/ft)	2	3		10																																						
Meander Wavelength (ft)	31	45		64																																						
Meander Width Ratio	3	4		6																																						
Additional Reach Parameters																																										
Rosgen Classification	Cb 4																																									
Channel Thalweg length (ft)	232																																									
Sinuosity (ft)	1.15																																									
Water Surface Slope (Channel) (ft/ft)	0.0268																																									
BF slope (ft/ft)																																										
³ Ri% / Ru% / P% / G% / S%	60	13	14	13																																						
³ SC% / Sa% / G% / C% / B% / Be%																																										
³ d16 / d35 / d50 / d84 / d95 /																																										
² % of Reach with Eroding Banks	0																																									
Channel Stability or Habitat Metric																																										
Biological or Other																																										

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 4. = Of value/needed only if the n exceeds 3

Exhibit Table 14g. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 8 (605 feet)

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n
Dimension and Substrate - Riffle only																																				
Bankfull Width (ft)	6.5	7.9		9.3		2	5.2	7.1		9		2	4.8	7.1		9.3		2	5.3		7.5	9.7														
Floodprone Width (ft)	20	30		40		2	20	30		40		2	20	30		40		2	20		30	40														
Bankfull Mean Depth (ft)	0.4	0.4		0.4		2	0.4	0.5		0.5		2	0.4	0.5		0.5		2	0.4		0.4	0.5														
¹ Bankfull Max Depth (ft)	0.7	0.7		0.7		2	0.7	0.7		0.7		2	0.8	0.8		0.8		2	0.7		0.7	0.8														
Bankfull Cross Sectional Area (ft ²)	2.6	3.2		3.7		2	2.6	3.2		3.7		2	2.6	3.2		3.7		2	2.6		3.2	3.7														
Width/Depth Ratio	16.3	19.8		23.4		2	10.4	16.1		21.9		2	8.9	16.1		23.4		2	10.7		18.1	25.5														
Entrenchment Ratio	2.2	4.2		6.2		2	2.2	5		7.7		2	2.2	5.2		8.3		2	2.1		4.8	7.5														
Low Bank Height (ft)	0.7	0.7		0.7		2	0.7	0.8		0.8		2	0.8	0.8		0.8		2	0.8		0.8	0.8														
¹ Bank Height Ratio	1.0	1.0		1.0		2	1	1.1		1.1		2	1.0	1.0		1.0		2	1.1		1.1	1.1														
Profile																																				
Riffle Length (ft)	5	11	11	19	3.4	23																														
Riffle Slope (ft/ft)	0.01	0.02	0.02	0.04	0.01	23																														
Pool Length (ft)	6	15	15	24	4.8	23																														
Pool Max depth (ft)	0.9	1.3		1.6		2																														
Pool Spacing (ft)	17	24		47		23																														
Pattern																																				
Channel Beltwidth (ft)	17	24		36																																
Radius of Curvature (ft)	11	18		59																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	35	50		71																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	605																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0138																																			
BF slope (ft/ft)																																				
³ Ri% / Ru% / P% / G% / S%	41	20	20	19																																
³ SC% / Sa% / G% / C% / B% / Be%																																				
³ d16 / d35 / d50 / d84 / d95 /																																				
² % of Reach with Eroding Banks	0																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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 3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
 4. = Of value/needed only if the n exceeds 3

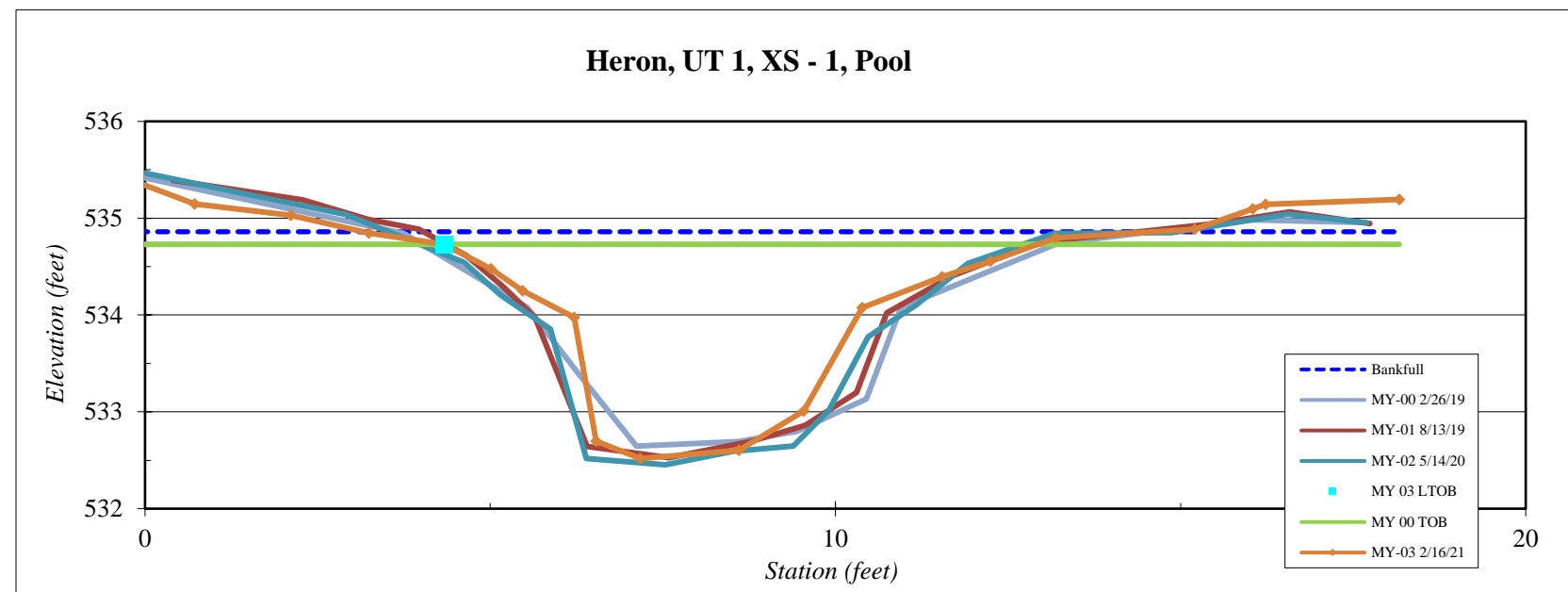
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 1, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
-0.4	535.5
0.7	535.1
2.1	535.0
3.2	534.8
4.3	534.7
5.0	534.5
5.5	534.3
6.2	534.0
6.5	532.7
7.2	532.5
8.6	532.6
9.5	533.0
10.4	534.1
11.5	534.4
12.2	534.6
13.2	534.8
15.2	534.9
16.0	535.1
16.2	535.1
18.2	535.2

SUMMARY DATA	
Bankfull Elevation:	534.9
LTOB Elevation:	534.7
Bankfull Cross-Sectional Area:	10.5
Bankfull Width:	11.5
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.3
Low Bank Height:	2.2
Mean Depth at Bankfull:	0.9
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.94



Stream Type	C/E
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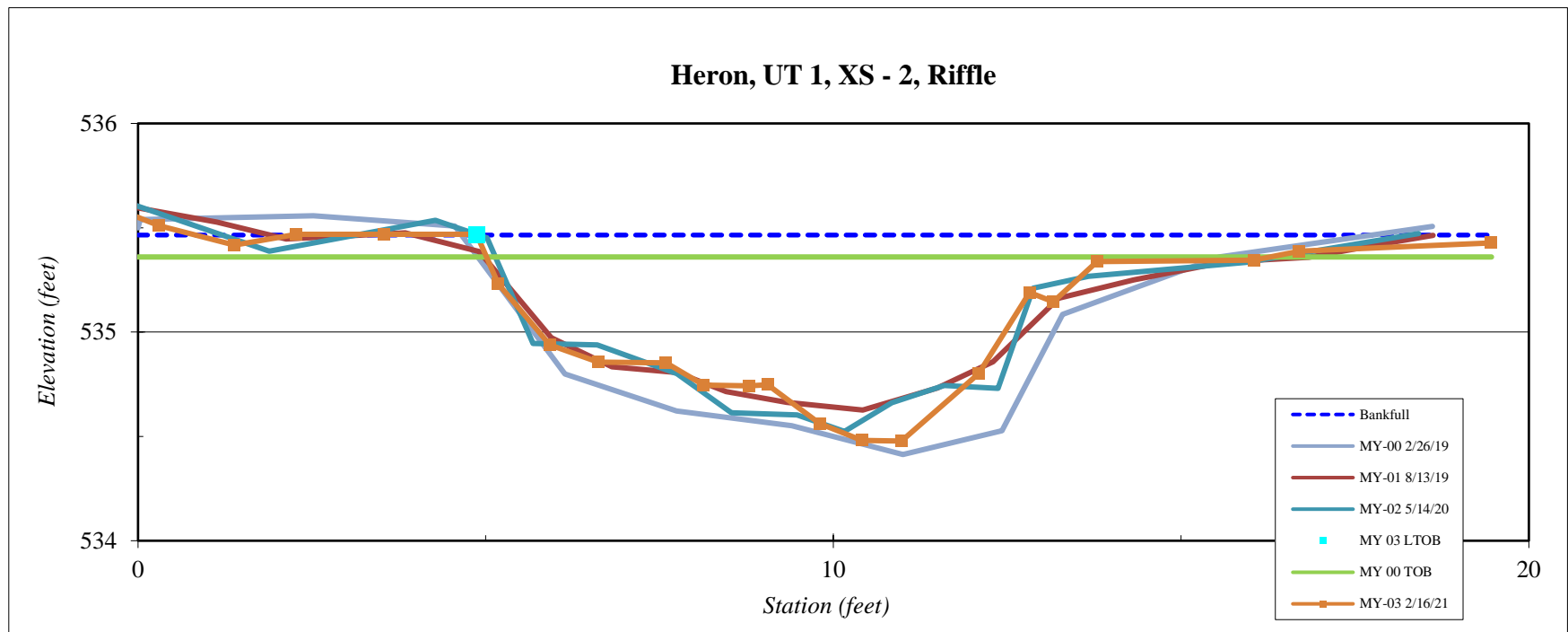
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 2, Riffle
Feature	Riffle
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris



Station	Elevation
-0.2	535.58
0.3	535.51
1.4	535.42
2.3	535.47
3.5	535.47
4.9	535.47
5.2	535.23
5.9	534.94
6.6	534.86
7.6	534.85
8.1	534.75
8.8	534.74
9.1	534.75
9.8	534.56
10.4	534.48
11.0	534.48
12.1	534.80
12.8	535.19
13.2	535.15
13.8	535.34
16.0	535.34
16.7	535.4
19.5	535.4

SUMMARY DATA	
Bankfull Elevation:	535.5
LTOB Elevation:	535.5
Bankfull Cross-Sectional Area:	6.1
Bankfull Width:	16.0
Flood Prone Area Elevation:	536.5
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.0
Low Bank Height:	1.0
Mean Depth at Bankfull:	0.4
W / D Ratio:	41.7
Entrenchment Ratio:	6.3
Bank Height Ratio:	1.00

Stream Type	C/E
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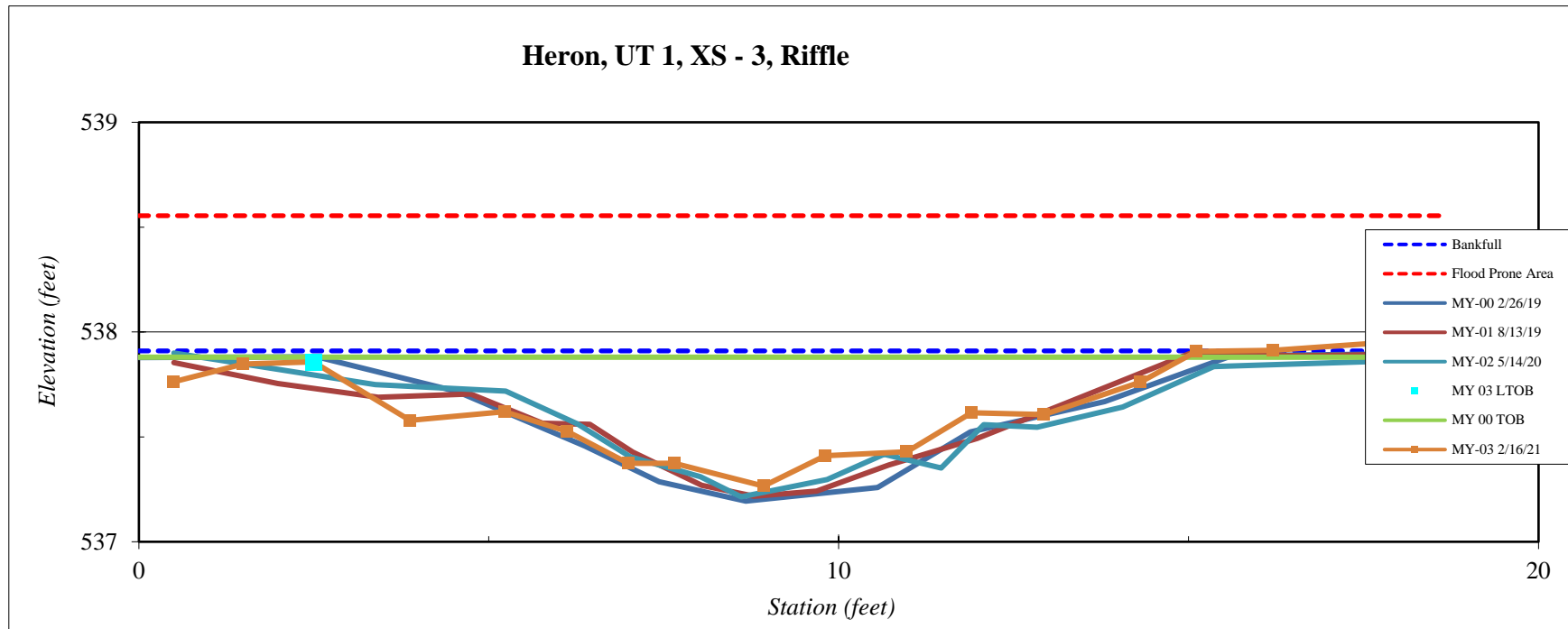
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 3, Riffle
Feature	Riffle
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris



Station	Elevation
0.5	537.26
1.5	537.35
2.5	537.36
3.9	537.08
5.2	537.12
6.1	537.03
7.0	536.87
7.7	536.87
8.9	536.77
9.8	536.91
11.0	536.93
11.9	537.12
12.9	537.11
14.3	537.26
15.1	537.41
16.2	537.41
18.7	537.47

SUMMARY DATA	
Bankfull Elevation:	537.4
LTOB Elevation:	537.4
Bankfull Cross-Sectional Area:	4.6
Bankfull Width:	13.0
Flood Prone Area Elevation:	538.1
Flood Prone Width:	100.0
Max Depth at Bankfull:	0.6
Low Bank Height:	0.6
Mean Depth at Bankfull:	0.4
W / D Ratio:	36.8
Entrenchment Ratio:	7.7
Bank Height Ratio:	0.92

Stream Type	C/E
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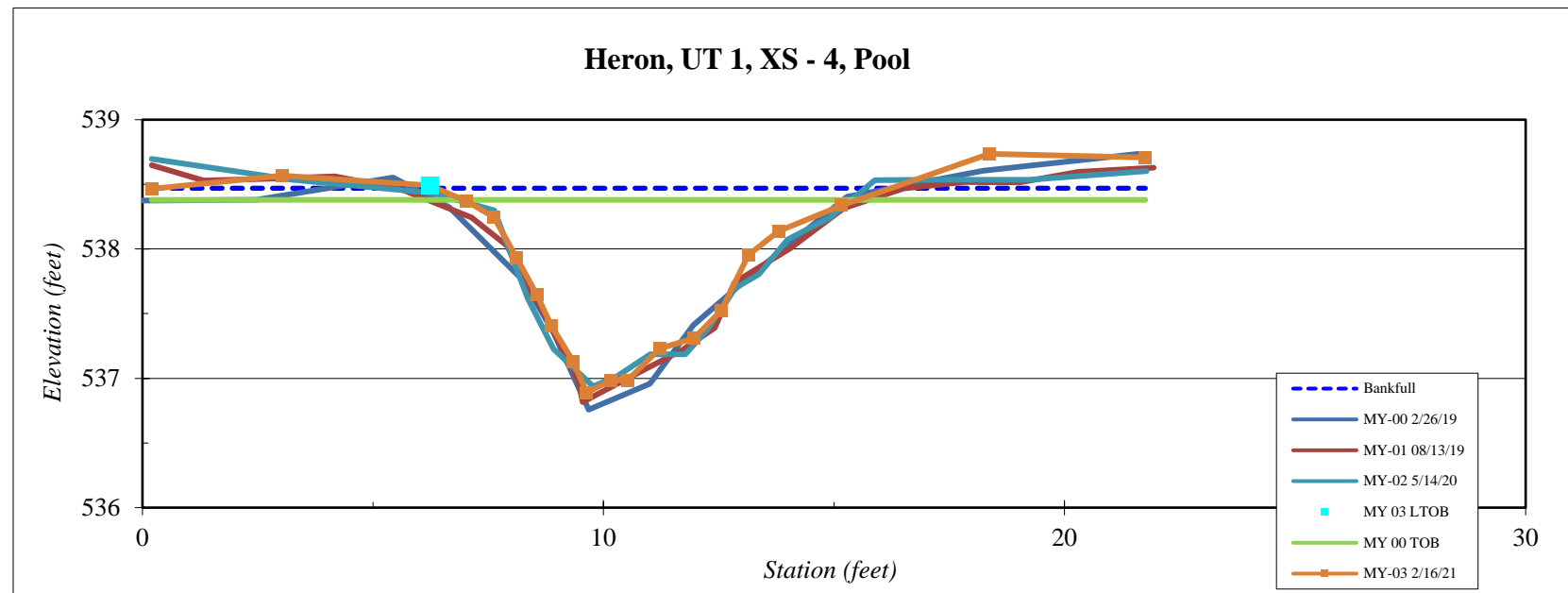
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 4, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris



Station	Elevation
0.2	538.5
3.0	538.6
6.2	538.5
7.0	538.4
7.6	538.2
8.1	537.9
8.6	537.6
8.9	537.4
9.3	537.1
9.6	536.9
10.2	537.0
10.5	537.0
11.2	537.2
12.0	537.3
12.6	537.5
13.1	538.0
13.8	538.1
15.2	538.3
18.4	538.7
21.8	538.7

SUMMARY DATA	
Bankfull Elevation:	538.5
LTOB Elevation:	538.5
Bankfull Cross-Sectional Area:	6.8
Bankfull Width:	10.0
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.6
Low Bank Height:	1.6
Mean Depth at Bankfull:	0.7
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.01

Stream Type	C/E
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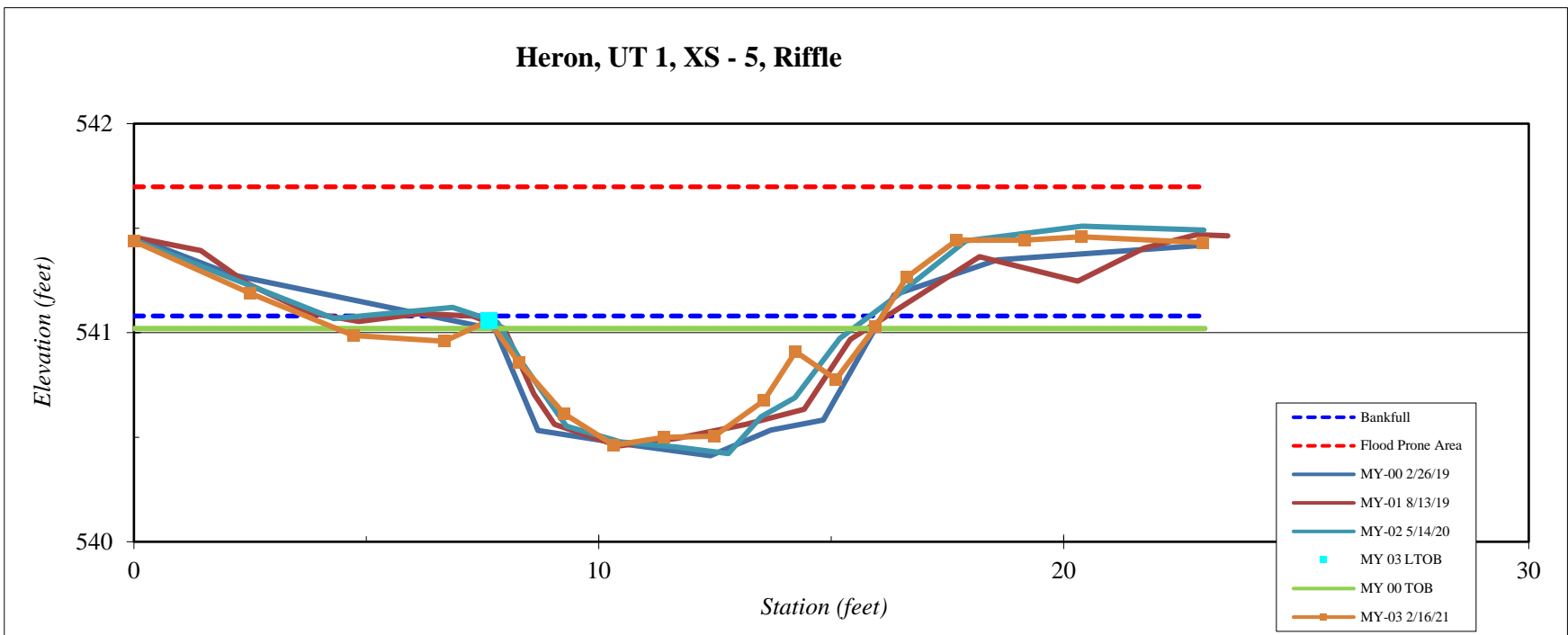
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 5, Riffle
Feature	Riffle
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris



Station	Elevation
0.0	541.44
2.5	541.19
4.7	540.99
6.7	540.96
7.6	541.06
8.3	540.86
9.2	540.61
10.3	540.46
11.4	540.50
12.5	540.51
13.6	540.68
14.2	540.91
15.1	540.78
16.0	541.03
16.6	541.27
17.7	541.44
19.2	541.44
20.4	541.46
23.0	541.43

SUMMARY DATA	
Bankfull Elevation:	541.1
LTOB Elevation:	541.1
Bankfull Cross-Sectional Area:	3.7
Bankfull Width:	12.4
Flood Prone Area Elevation:	541.7
Flood Prone Width:	25.0
Max Depth at Bankfull:	0.6
Low Bank Height:	0.6
Mean Depth at Bankfull:	0.3
W / D Ratio:	41.9
Entrenchment Ratio:	2.0
Bank Height Ratio:	0.96

Stream Type	C/E
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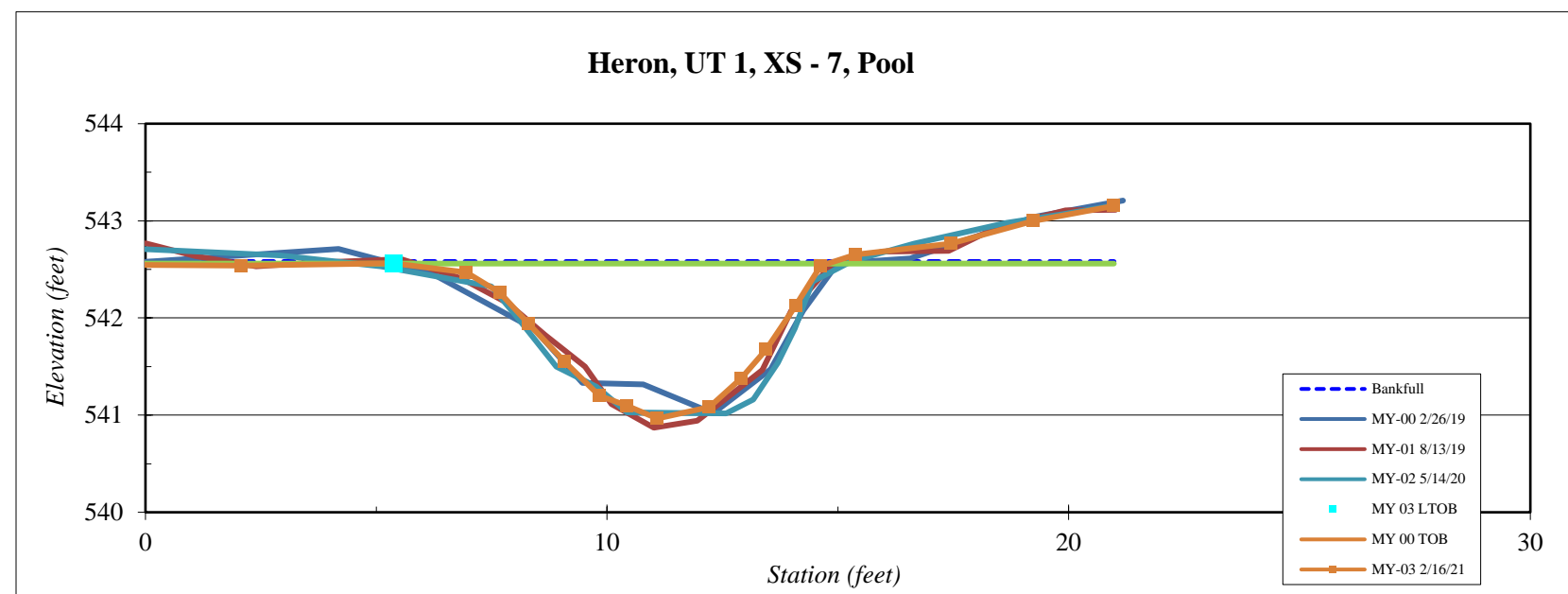
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 7, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
-0.5	542.5
2.1	542.5
5.4	542.6
6.9	542.5
7.7	542.3
8.3	541.9
9.1	541.5
9.8	541.2
10.4	541.1
11.1	541.0
12.2	541.1
12.9	541.4
13.4	541.7
14.1	542.1
14.6	542.5
15.4	542.7
17.4	542.8
19.2	543.0
21.0	543.2

SUMMARY DATA	
Bankfull Elevation:	542.6
LTOB Elevation:	542.6
Bankfull Cross-Sectional Area:	8.0
Bankfull Width:	15.4
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.6
Low Bank Height:	1.6
Mean Depth at Bankfull:	0.5
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.99



Stream Type	C/E
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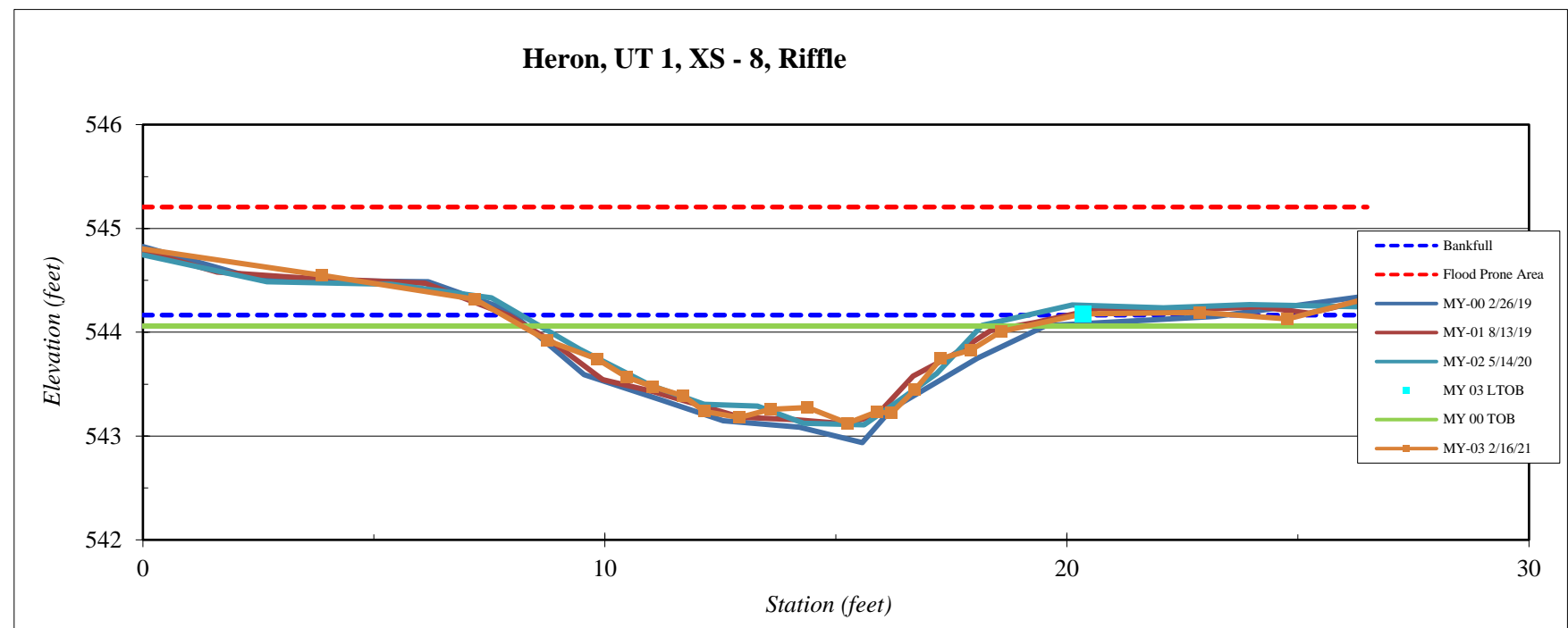
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 8, Riffle
Feature	Riffle
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris



Station	Elevation
-0.2	544.82
3.9	544.55
7.2	544.32
8.8	543.92
9.8	543.74
10.5	543.57
11.0	543.48
11.7	543.39
12.2	543.24
12.9	543.18
13.6	543.26
14.4	543.27
15.3	543.12
15.9	543.24
16.2	543.22
16.7	543.44
17.3	543.75
17.9	543.83
18.6	544.01
20.3	544.18
22.9	544.19
24.8	544.1
26.5	544.3

SUMMARY DATA	
Bankfull Elevation:	544.2
LTOB Elevation:	544.2
Bankfull Cross-Sectional Area:	7.2
Bankfull Width:	13.8
Flood Prone Area Elevation:	545.2
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.0
Low Bank Height:	1.1
Mean Depth at Bankfull:	0.5
W / D Ratio:	26.6
Entrenchment Ratio:	7.2
Bank Height Ratio:	1.01

Stream Type C/E



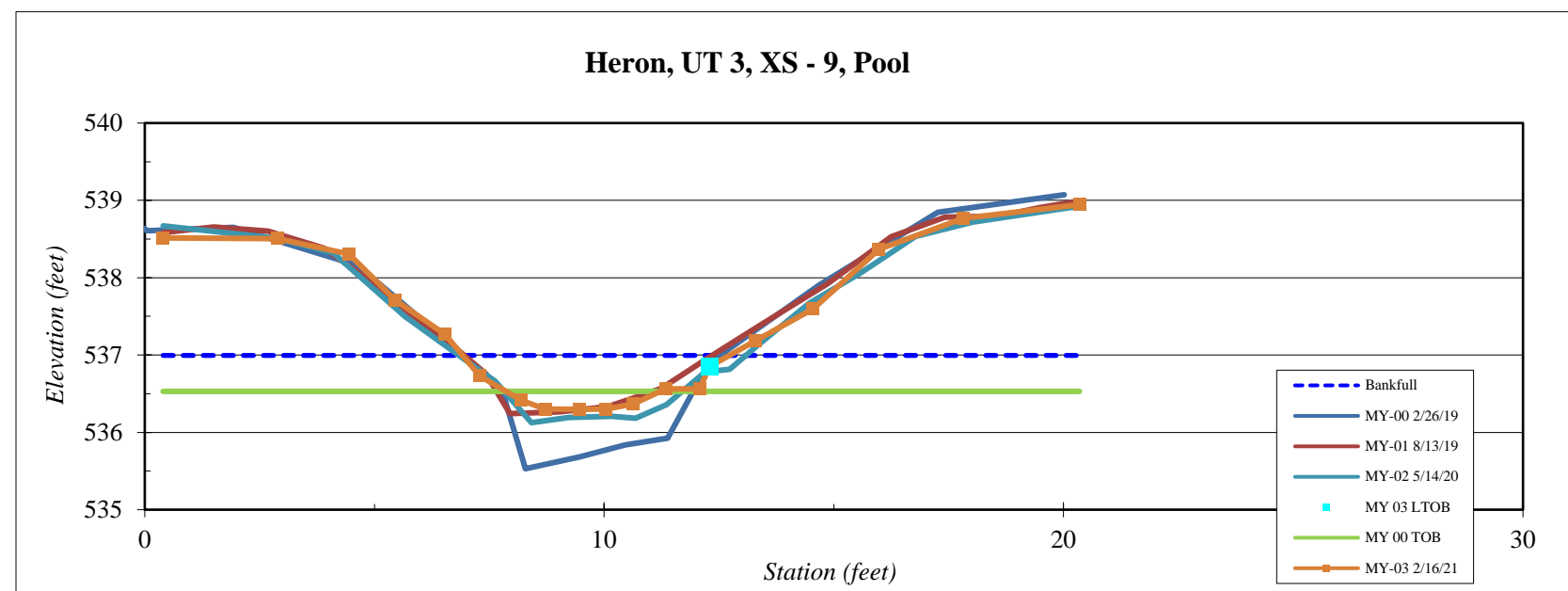
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 3, XS - 9, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris



Station	Elevation
0.4	538.5
2.9	538.5
4.4	538.3
5.5	537.7
6.5	537.3
7.3	536.7
8.2	536.4
8.7	536.3
9.5	536.3
10.0	536.3
10.6	536.4
11.3	536.6
12.1	536.6
12.3	536.8
13.3	537.2
14.5	537.6
16.0	538.4
17.8	538.8
20.3	538.9

SUMMARY DATA	
Bankfull Elevation:	537.0
LTOB Elevation:	538.3
Bankfull Cross-Sectional Area:	2.9
Bankfull Width:	5.8
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	0.7
Low Bank Height:	0.5
Mean Depth at Bankfull:	0.5
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.79

Stream Type	C/E
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*Last year's error for bank height ratio was corrected on Table 13B

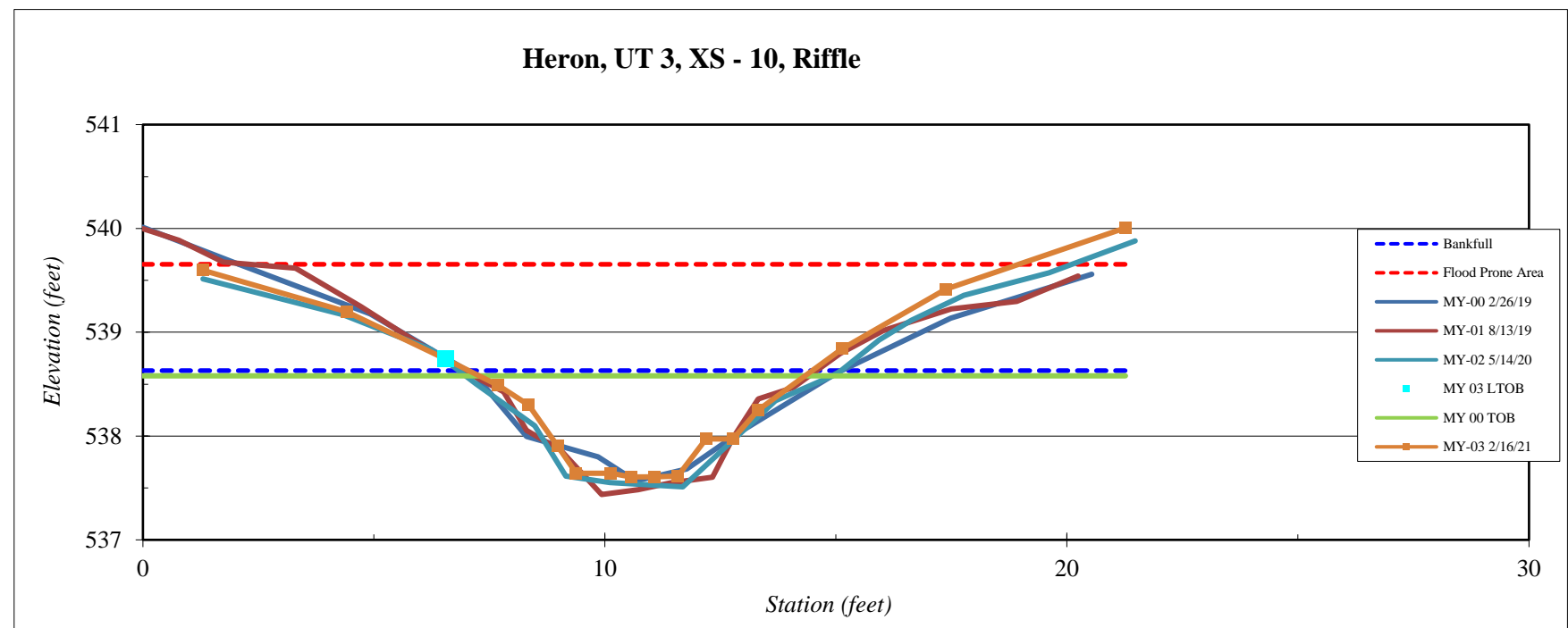
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 3, XS - 10, Riffle
Feature	Riffle
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris



Station	Elevation
1.3	539.60
4.4	539.20
6.5	538.74
7.7	538.49
8.4	538.30
9.0	537.90
9.4	537.64
10.1	537.64
10.6	537.61
11.1	537.61
11.6	537.61
12.2	537.97
12.8	537.97
13.3	538.25
15.1	538.84
17.4	539.41
21.3	540.00

SUMMARY DATA	
Bankfull Elevation:	538.6
LTOB Elevation:	538.7
Bankfull Cross-Sectional Area:	4.5
Bankfull Width:	7.4
Flood Prone Area Elevation:	539.7
Flood Prone Width:	18.0
Max Depth at Bankfull:	1.0
Low Bank Height:	1.1
Mean Depth at Bankfull:	0.6
W / D Ratio:	12.2
Entrenchment Ratio:	2.4
Bank Height Ratio:	1.11

Stream Type C/E



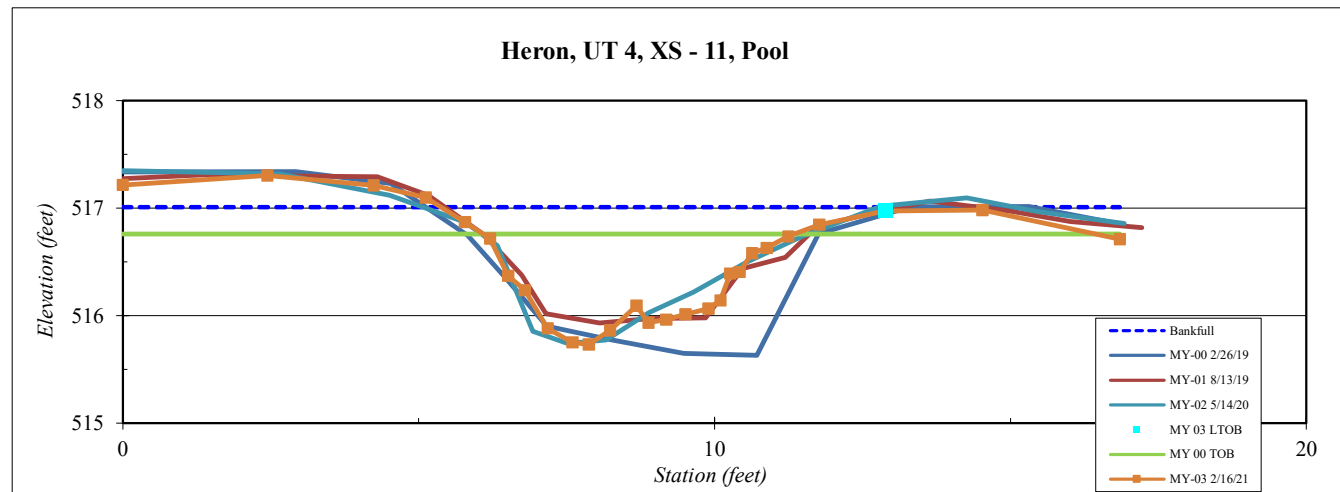
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 4, XS - 11, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
0.0	517.2
2.4	517.3
4.2	517.2
5.1	517.1
5.8	516.9
6.2	516.7
6.5	516.4
6.8	516.2
7.2	515.9
7.6	515.8
7.9	515.7
8.2	515.9
8.7	516.1
8.9	515.9
9.2	516.0
9.5	516.0
9.9	516.1
10.1	516.1
10.3	516.4
10.4	516.4
10.6	516.6
10.9	516.6
11.2	516.7
11.8	516.8
12.9	517.0
14.5	517.0
16.8	516.7

SUMMARY DATA	
Bankfull Elevation:	517.0
LTOB Elevation:	517.0
Bankfull Cross-Sectional Area:	4.8
Bankfull Width:	9.6
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.2
Low Bank Height:	1.2
Mean Depth at Bankfull:	0.5
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.00



Stream Type	C/E
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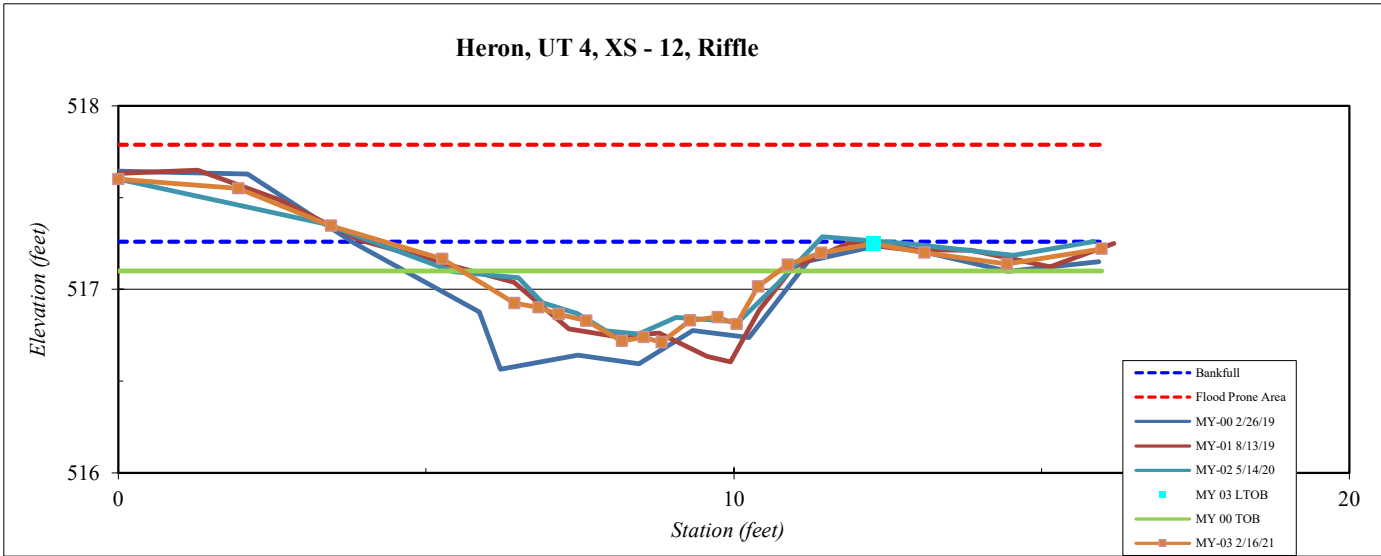
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 4, XS - 12, Riffle
Feature	Riffle
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
0.0	517.60
1.9	517.55
3.5	517.35
5.3	517.17
6.4	516.93
6.8	516.90
7.2	516.87
7.6	516.83
8.2	516.72
8.5	516.74
8.8	516.71
9.3	516.83
9.7	516.85
10.0	516.81
10.4	517.02
10.9	517.13
11.4	517.20
12.3	517.25
12.3	517.25
13.1	517.20
14.4	517.14
16.0	517.2

SUMMARY DATA	
Bankfull Elevation:	517.3
LTOB Elevation:	517.2
Bankfull Cross-Sectional Area:	2.2
Bankfull Width:	11.2
Flood Prone Area Elevation:	517.8
Flood Prone Width:	40.0
Max Depth at Bankfull:	0.5
Low Bank Height:	0.5
Mean Depth at Bankfull:	0.2
W / D Ratio:	55.8
Entrenchment Ratio:	3.6
Bank Height Ratio:	1.01



Stream Type	C/E
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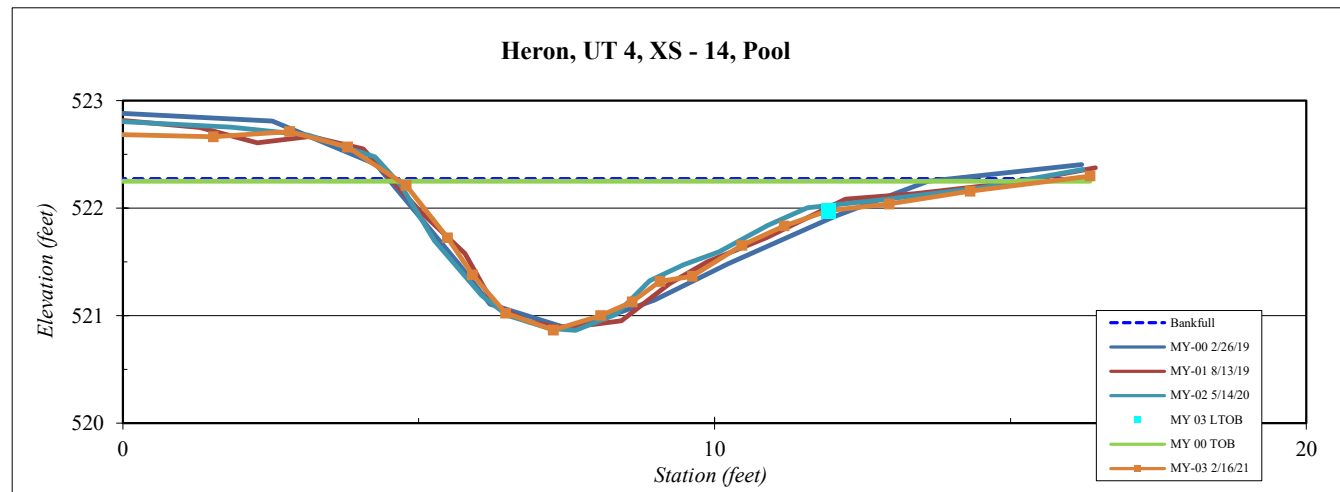
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 4, XS - 14, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
-0.1	522.7
1.5	522.7
2.8	522.7
3.8	522.6
4.8	522.2
5.5	521.7
5.9	521.4
6.5	521.0
7.3	520.9
8.1	521.0
8.6	521.1
9.1	521.3
9.6	521.4
10.5	521.7
11.2	521.8
11.9	522.0
12.9	522.0
14.3	522.2
16.3	522.3

SUMMARY DATA	
Bankfull Elevation:	522.3
LTOB Elevation:	522.3
Bankfull Cross-Sectional Area:	6.8
Bankfull Width:	11.3
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.4
Low Bank Height:	1.4
Mean Depth at Bankfull:	0.6
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.02



Stream Type	C/E
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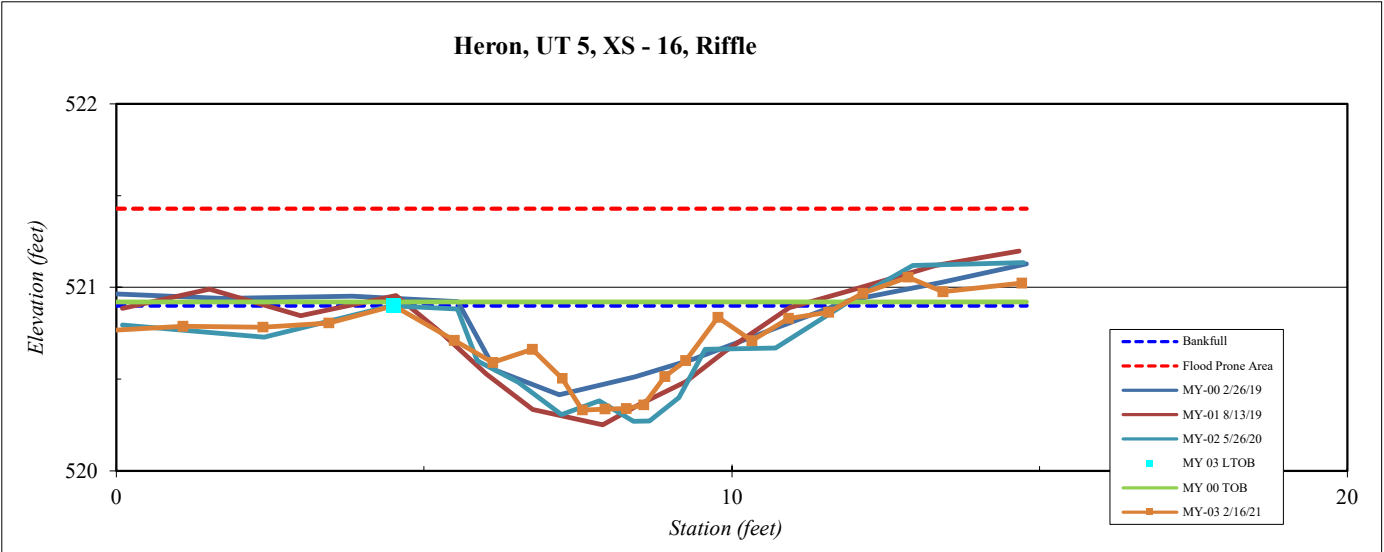
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 5, XS - 16, Riffle
Feature	Riffle
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
-0.1	520.76
1.1	520.79
2.4	520.78
3.5	520.81
4.5	520.90
5.5	520.71
6.1	520.59
6.8	520.66
7.2	520.50
7.6	520.33
7.9	520.34
8.3	520.34
8.6	520.36
8.9	520.51
9.2	520.60
9.8	520.84
10.3	520.71
10.9	520.83
11.6	520.86
12.1	520.97
12.9	521.06
13.4	521.0
14.7	521.0

SUMMARY DATA	
Bankfull Elevation:	520.9
LTOB Elevation:	520.9
Bankfull Cross-Sectional Area:	1.9
Bankfull Width:	11.0
Flood Prone Area Elevation:	521.4
Flood Prone Width:	40.0
Max Depth at Bankfull:	0.5
Low Bank Height:	0.6
Mean Depth at Bankfull:	0.2
W / D Ratio:	64.7
Entrenchment Ratio:	3.7
Bank Height Ratio:	1.07



Stream Type	C/E
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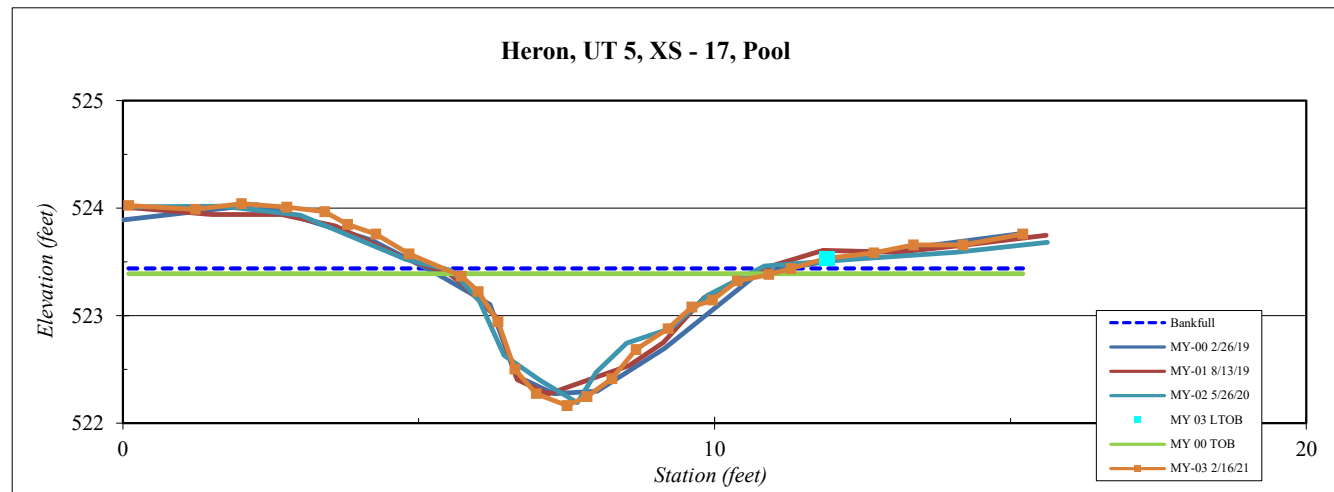
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 5, XS - 17, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
0.1	524.0
1.2	524.0
2.0	524.0
2.8	524.0
3.4	524.0
3.8	523.8
4.3	523.8
4.8	523.6
5.7	523.4
6.0	523.2
6.3	522.9
6.6	522.5
7.0	522.3
7.5	522.2
7.8	522.2
8.3	522.4
8.7	522.7
9.2	522.9
9.6	523.1
10.0	523.1
10.4	523.3
10.9	523.38
11.3	523.4
11.9	523.5
12.7	523.6
13.4	523.7
14.2	523.7
15.2	523.8

SUMMARY DATA	
Bankfull Elevation:	523.4
LTOB Elevation:	523.7
Bankfull Cross-Sectional Area:	3.4
Bankfull Width:	5.9
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.3
Low Bank Height:	1.4
Mean Depth at Bankfull:	0.6
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.07



Stream Type	C/E
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Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 5, XS - 18, Riffle
Feature	Riffle
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

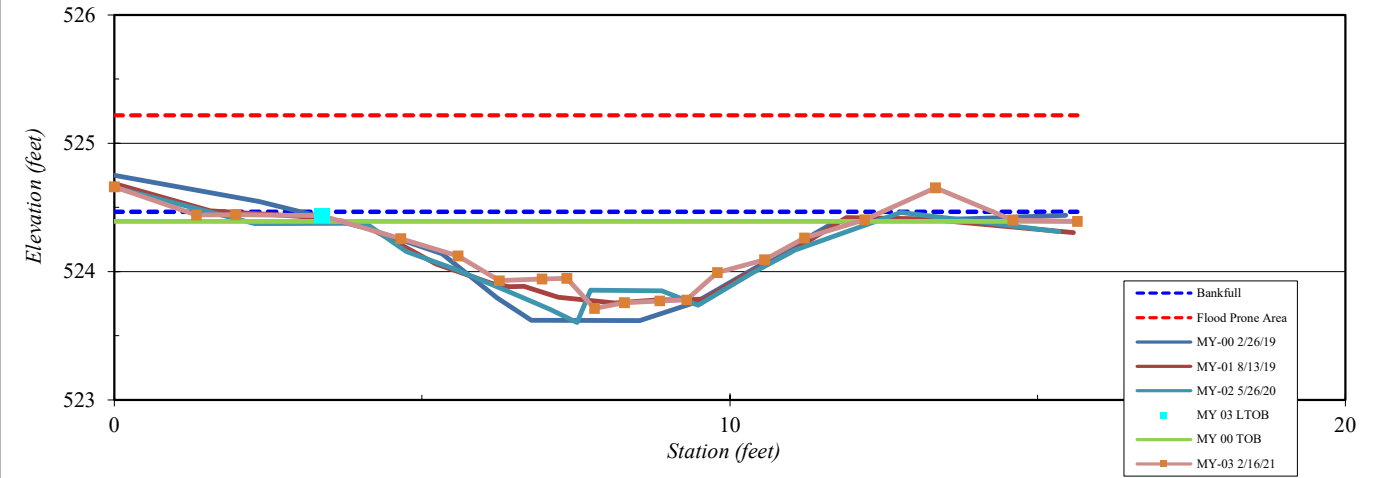


Stream Type	C/E
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Station	Elevation
0.0	524.66
1.3	524.44
2.0	524.44
3.4	524.43
4.7	524.26
5.6	524.12
6.3	523.93
6.9	523.94
7.4	523.95
7.8	523.71
8.3	523.76
8.9	523.77
9.3	523.78
9.8	523.99
10.6	524.09
11.2	524.26
12.2	524.40
13.3	524.65
14.6	524.40
15.6	524.39

SUMMARY DATA	
Bankfull Elevation:	524.5
LTOB Elevation:	524.4
Bankfull Cross-Sectional Area:	3.7
Bankfull Width:	12.7
Flood Prone Area Elevation:	525.2
Flood Prone Width:	40.0
Max Depth at Bankfull:	0.8
Low Bank Height:	0.7
Mean Depth at Bankfull:	0.3
W / D Ratio:	43.2
Entrenchment Ratio:	3.2
Bank Height Ratio:	0.96

Heron, UT 5, XS - 18, Riffle



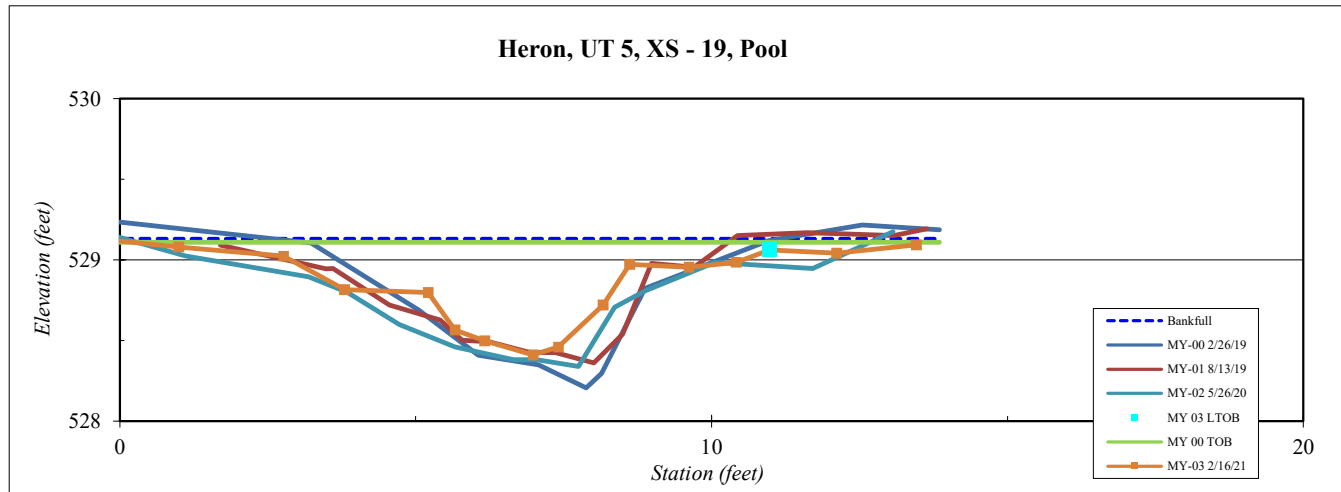
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 5, XS - 19, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
-0.8	529.1
-0.2	529.1
1.0	529.1
2.8	529.0
3.8	528.8
5.2	528.8
5.7	528.6
6.2	528.5
7.0	528.4
7.4	528.5
8.2	528.7
8.6	529.0
9.6	529.0
10.4	529.0
11.0	529.1
12.1	529.0
13.5	529.1

SUMMARY DATA	
Bankfull Elevation:	529.1
LTOB Elevation:	529.1
Bankfull Cross-Sectional Area:	3.3
Bankfull Width:	14.2
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	0.7
Low Bank Height:	0.7
Mean Depth at Bankfull:	0.2
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.91



Stream Type	C/E
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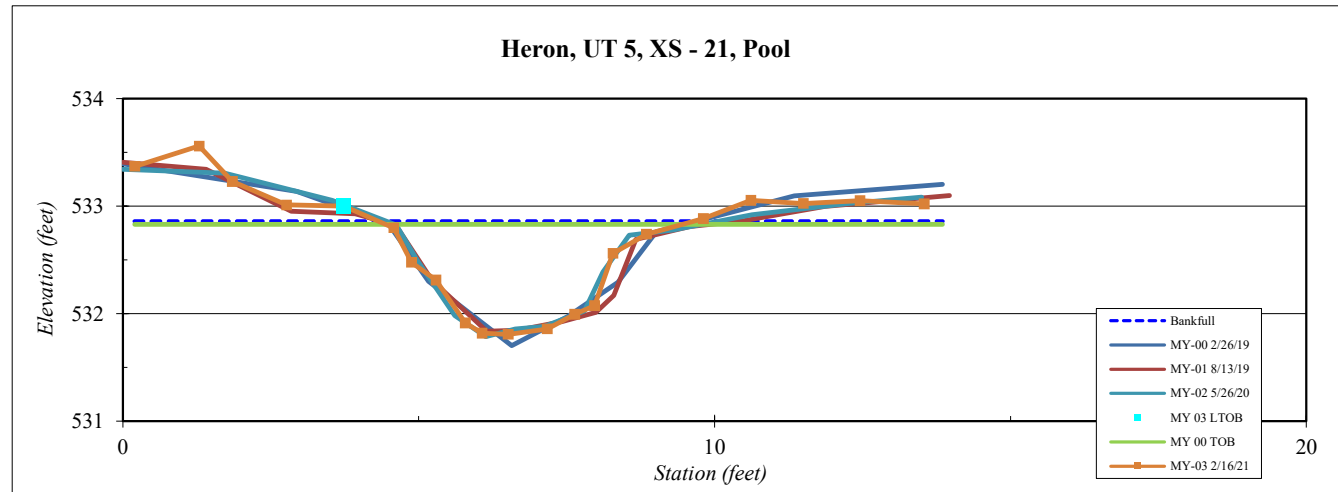
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 5, XS - 21, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
0.2	533.4
1.3	533.6
1.8	533.2
2.8	533.0
3.7	533.0
4.6	532.8
4.9	532.5
5.3	532.3
5.8	531.9
6.1	531.8
6.5	531.8
7.2	531.9
7.6	532.0
8.0	532.1
8.3	532.6
8.8	532.7
9.8	532.9
10.6	533.1
11.5	533.0
12.5	533.1
13.5	533.0

SUMMARY DATA	
Bankfull Elevation:	532.9
LTOB Elevation:	533.0
Bankfull Cross-Sectional Area:	3.1
Bankfull Width:	5.3
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.1
Low Bank Height:	1.2
Mean Depth at Bankfull:	0.6
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.14



Stream Type	C/E
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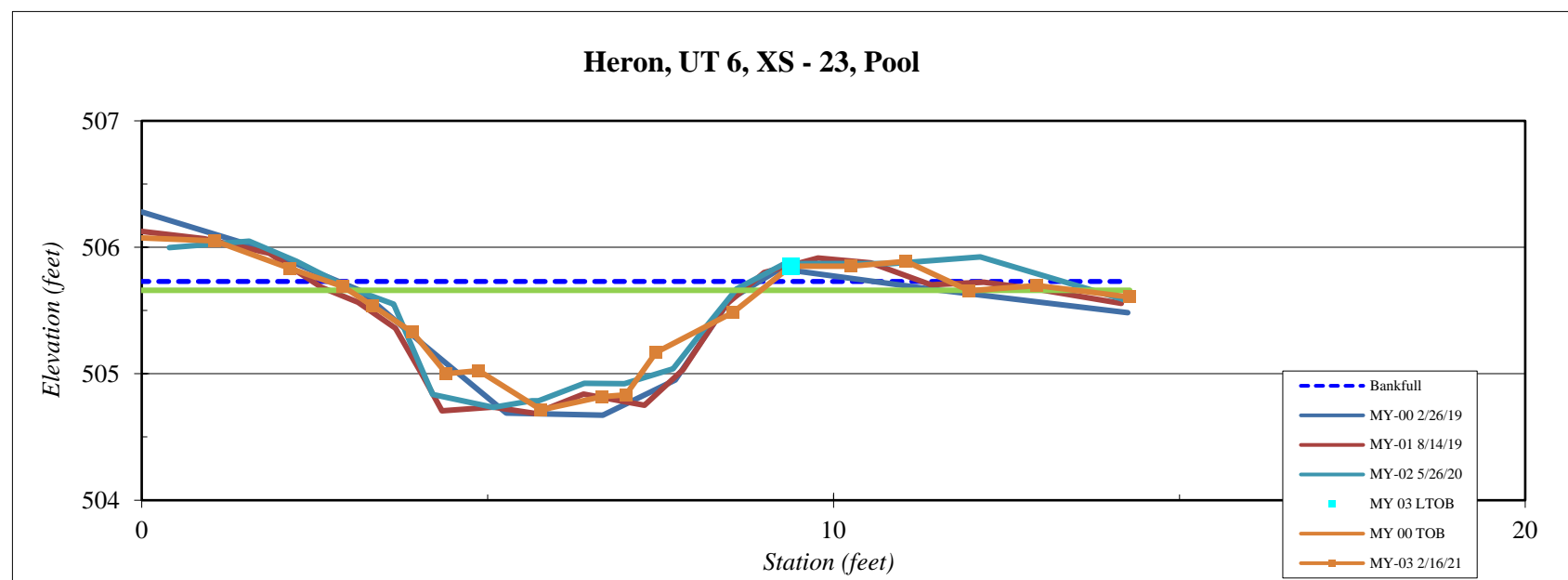
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 6, XS - 23, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris



Station	Elevation
-0.9	505.9
-0.3	506.1
1.1	506.1
2.1	505.8
2.9	505.7
3.3	505.5
3.9	505.3
4.4	505.0
4.9	505.0
5.8	504.7
6.7	504.8
7.0	504.8
7.4	505.2
8.6	505.5
9.4	505.9
10.3	505.9
11.1	505.9
12.0	505.7
12.9	505.7
14.3	505.6

SUMMARY DATA	
Bankfull Elevation:	505.7
LTOB Elevation:	505.9
Bankfull Cross-Sectional Area:	3.6
Bankfull Width:	8.8
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.0
Low Bank Height:	1.1
Mean Depth at Bankfull:	0.4
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.14

Stream Type	C/E
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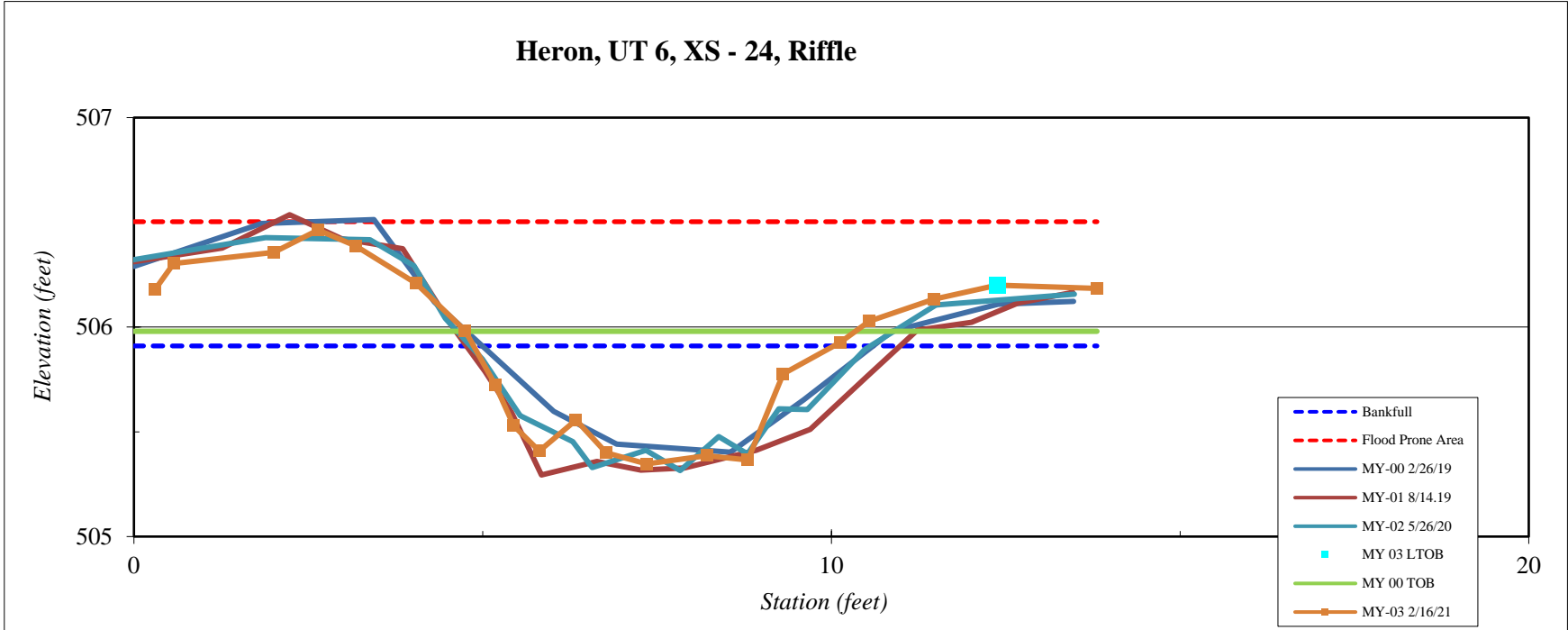
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 6, XS - 24, Riffle
Feature	Riffle
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris



Station	Elevation
0.3	506.18
0.6	506.30
2.0	506.36
2.6	506.46
3.2	506.39
4.0	506.21
4.7	505.98
5.2	505.72
5.4	505.53
5.8	505.41
6.3	505.56
6.8	505.40
7.4	505.35
8.2	505.39
8.8	505.37
9.3	505.78
10.1	505.93
10.5	506.03
11.5	506.13
12.4	506.20
13.8	506.19

SUMMARY DATA	
Bankfull Elevation:	505.9
LTOB Elevation:	506.2
Bankfull Cross-Sectional Area:	2.2
Bankfull Width:	5.4
Flood Prone Area Elevation:	506.5
Flood Prone Width:	40.0
Max Depth at Bankfull:	0.6
Low Bank Height:	0.6
Mean Depth at Bankfull:	0.4
W / D Ratio:	13.4
Entrenchment Ratio:	7.5
Bank Height Ratio:	1.07

Stream Type	C/E
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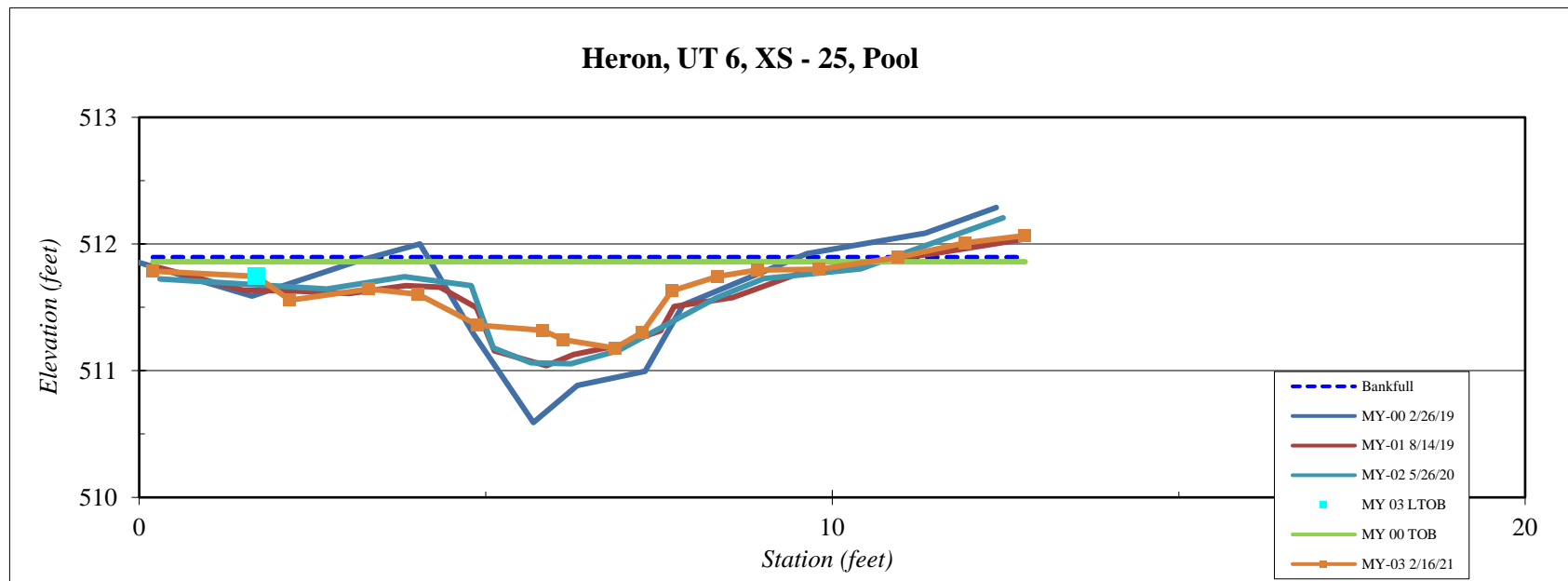
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 6, XS - 25, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris



Station	Elevation
0.2	511.8
1.7	511.7
2.2	511.6
3.3	511.6
4.0	511.6
4.9	511.4
5.8	511.3
6.1	511.2
6.9	511.2
7.3	511.3
7.7	511.6
8.4	511.7
8.9	511.8
9.8	511.8
10.9	511.9
11.9	512.0
12.8	512.1

SUMMARY DATA	
Bankfull Elevation:	511.9
LTOB Elevation:	511.7
Bankfull Cross-Sectional Area:	3.2
Bankfull Width:	10.8
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	0.7
Low Bank Height:	0.6
Mean Depth at Bankfull:	0.3
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.79

Stream Type	C/E
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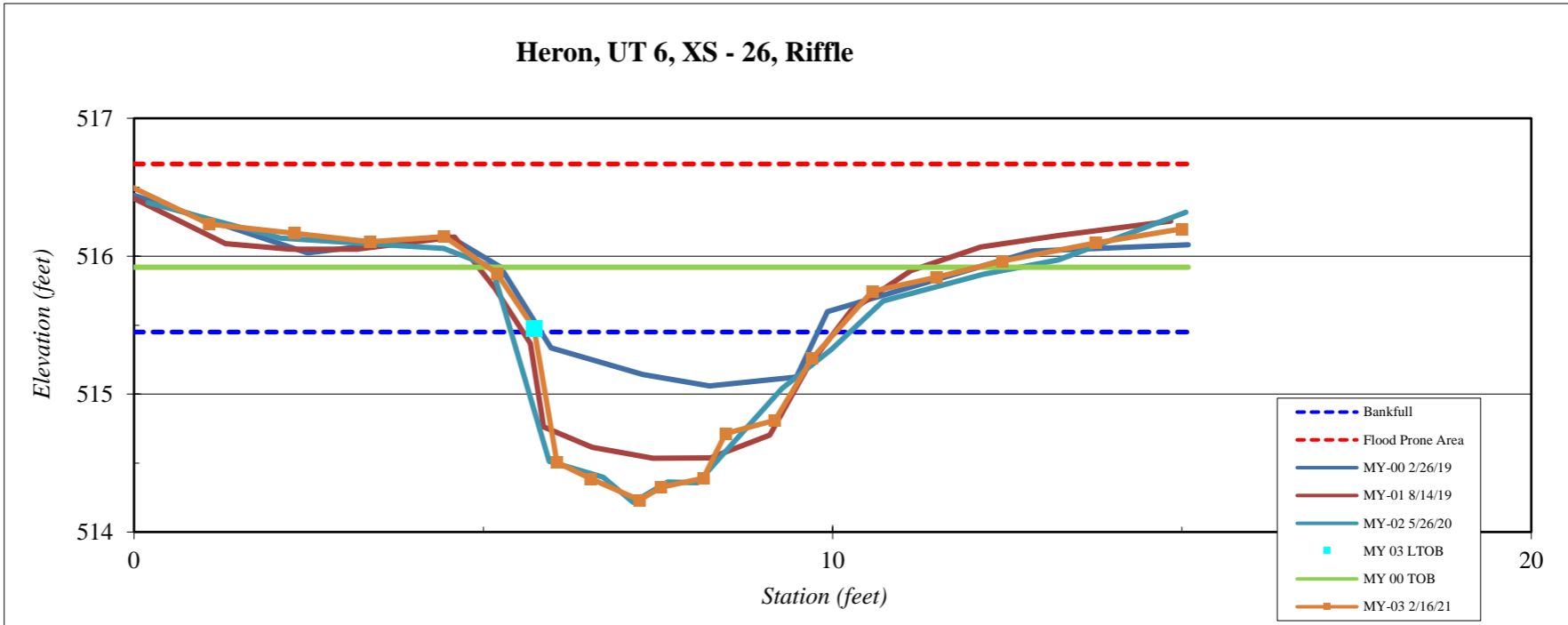
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 6, XS - 26, Riffle
Feature	Riffle
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
-0.1	516.52
1.1	516.23
2.3	516.17
3.4	516.11
4.4	516.14
5.2	515.87
5.7	515.48
6.1	514.50
6.5	514.39
7.2	514.23
7.5	514.32
8.1	514.39
8.5	514.71
9.2	514.81
9.7	515.26
10.6	515.74
11.5	515.85
12.4	515.96
13.8	516.10
15.0	516.20

SUMMARY DATA	
Bankfull Elevation:	515.5
LTOB Elevation:	516.1
Bankfull Cross-Sectional Area:	3.5
Bankfull Width:	4.3
Flood Prone Area Elevation:	516.7
Flood Prone Width:	40.0
Max Depth at Bankfull:	1.2
Low Bank Height:	1.2
Mean Depth at Bankfull:	0.8
W / D Ratio:	5.3
Entrenchment Ratio:	9.3
Bank Height Ratio:	1.02



Stream Type	C/E
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Note: Riffle degradation is likely a result of direct, flashy flows from upstream land-use just after construction. It appears to have stabilized during years 2-3.

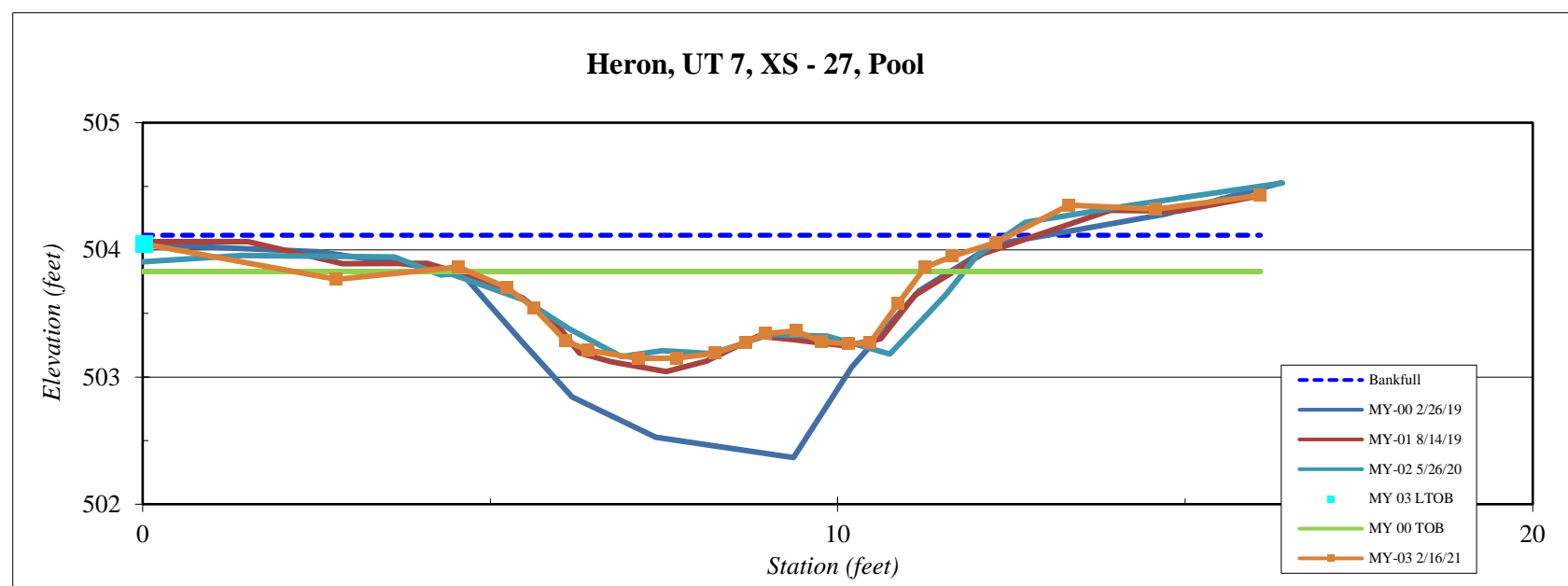
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 7, XS - 27, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
0.0	504.0
0.0	504.0
2.8	503.8
4.5	503.9
5.2	503.7
5.6	503.5
6.1	503.3
6.4	503.2
7.1	503.1
7.7	503.2
8.2	503.2
8.7	503.3
9.0	503.3
9.4	503.4
9.8	503.3
10.2	503.3
10.5	503.3
10.9	503.6
11.3	503.9
11.7	503.9
12.3	504.1
13.3	504.4
14.6	504.3
16.1	504.4

SUMMARY DATA	
Bankfull Elevation:	504.1
LTOB Elevation:	503.9
Bankfull Cross-Sectional Area:	6.3
Bankfull Width:	12.5
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.0
Low Bank Height:	0.9
Mean Depth at Bankfull:	0.5
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.93



Stream Type	C/E
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Note: The sediment deposition in this pool occurred shortly after construction and has stabilized during Years 1-3. It is not expected to lead to further instability.

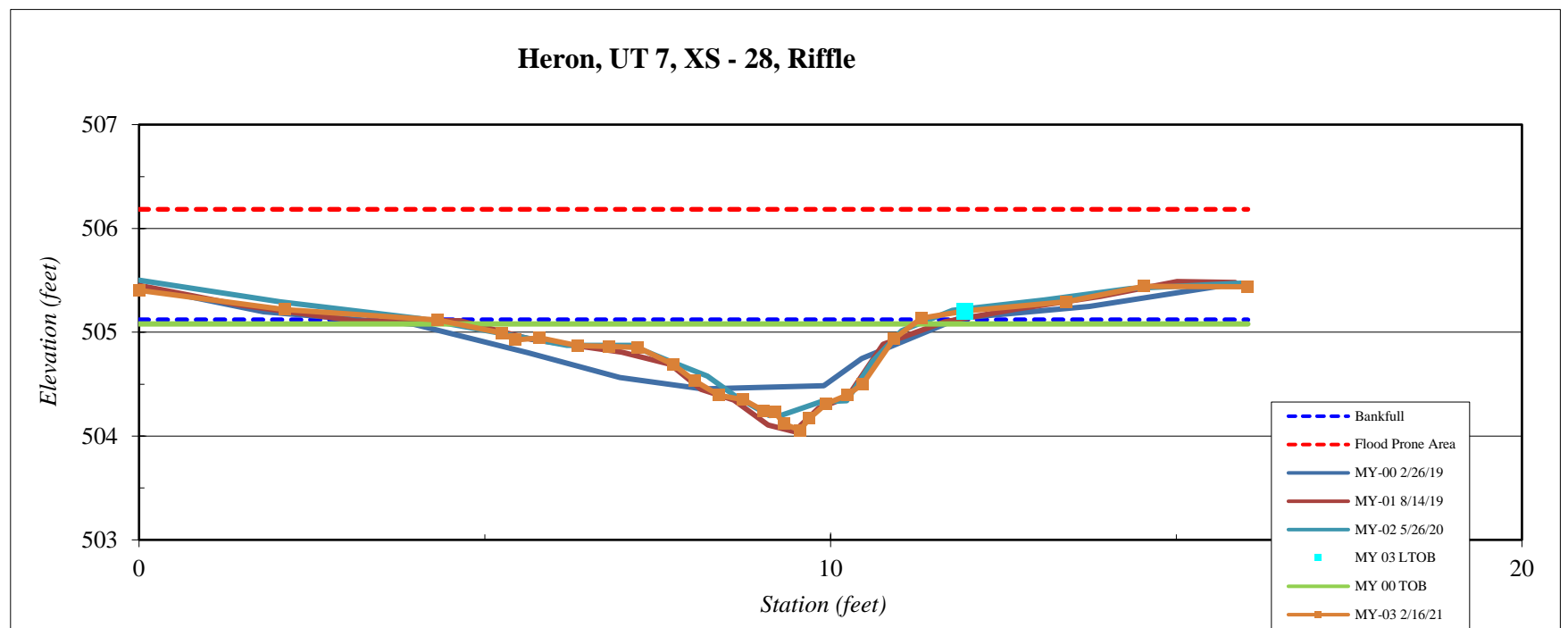
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 7, XS - 28, Riffle
Feature	Riffle
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
0.0	505.40
2.1	505.22
4.3	505.12
5.3	504.99
5.4	504.93
5.8	504.95
6.3	504.87
6.8	504.86
7.2	504.85
7.7	504.69
8.0	504.53
8.4	504.39
8.7	504.35
9.0	504.24
9.2	504.23
9.3	504.12
9.6	504.06
9.7	504.17
9.9	504.31
10.2	504.40
10.5	504.50
10.9	504.9
11.3	505.1
11.9	505.2
13.4	505.3
14.5	505.4
16.0	505.4

SUMMARY DATA	
Bankfull Elevation:	505.1
LTOB Elevation:	505.2
Bankfull Cross-Sectional Area:	3.0
Bankfull Width:	7.0
Flood Prone Area Elevation:	506.2
Flood Prone Width:	20.0
Max Depth at Bankfull:	1.1
Low Bank Height:	1.1
Mean Depth at Bankfull:	0.4
W / D Ratio:	16.3
Entrenchment Ratio:	2.9
Bank Height Ratio:	1.08



Stream Type	C/E
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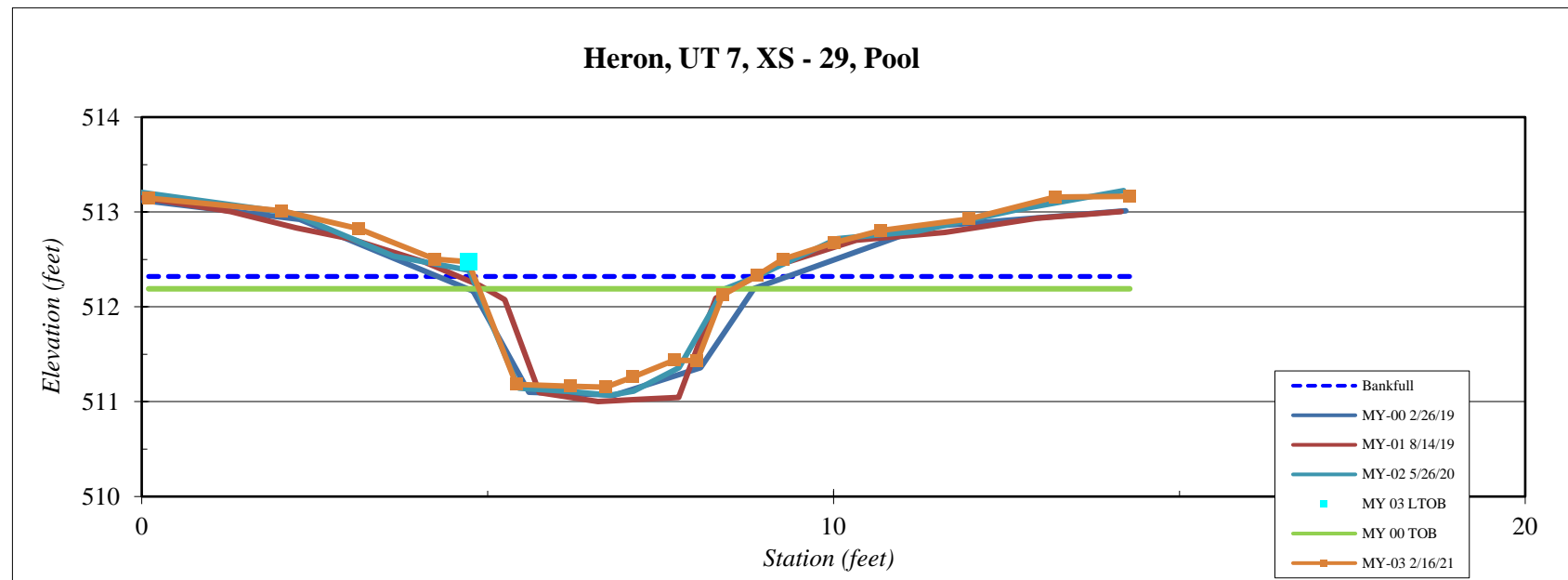
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 7, XS - 29, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris



Station	Elevation
0.1	513.1
2.0	513.0
3.1	512.8
4.2	512.5
4.7	512.5
5.4	511.2
6.2	511.2
6.7	511.2
7.1	511.3
7.7	511.4
8.0	511.4
8.4	512.1
8.9	512.3
9.3	512.5
10.0	512.7
10.7	512.8
12.0	512.9
13.2	513.2
14.3	513.2

SUMMARY DATA	
Bankfull Elevation:	512.3
LTOB Elevation:	512.5
Bankfull Cross-Sectional Area:	3.4
Bankfull Width:	4.1
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.2
Low Bank Height:	1.3
Mean Depth at Bankfull:	0.8
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.13

Stream Type	C/E
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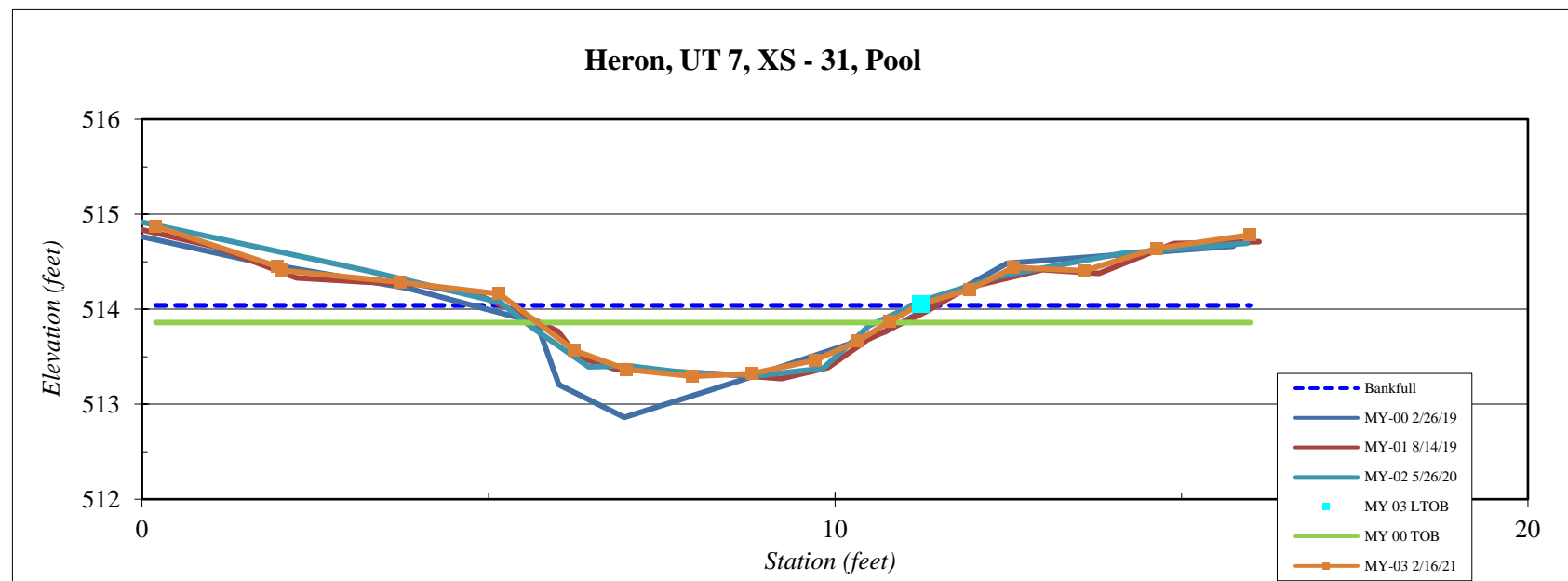
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 7, XS - 31, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
0.2	514.9
2.0	514.4
2.0	514.4
3.7	514.3
5.2	514.2
6.2	513.6
7.0	513.4
7.9	513.3
8.8	513.3
9.7	513.5
10.3	513.7
10.8	513.9
11.2	514.1
11.9	514.2
12.6	514.4
13.6	514.4
14.6	514.6
16.0	514.8

SUMMARY DATA	
Bankfull Elevation:	514.0
LTOB Elevation:	514.2
Bankfull Cross-Sectional Area:	3.0
Bankfull Width:	5.8
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	0.7
Low Bank Height:	0.8
Mean Depth at Bankfull:	0.5
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.01



Stream Type	C/E
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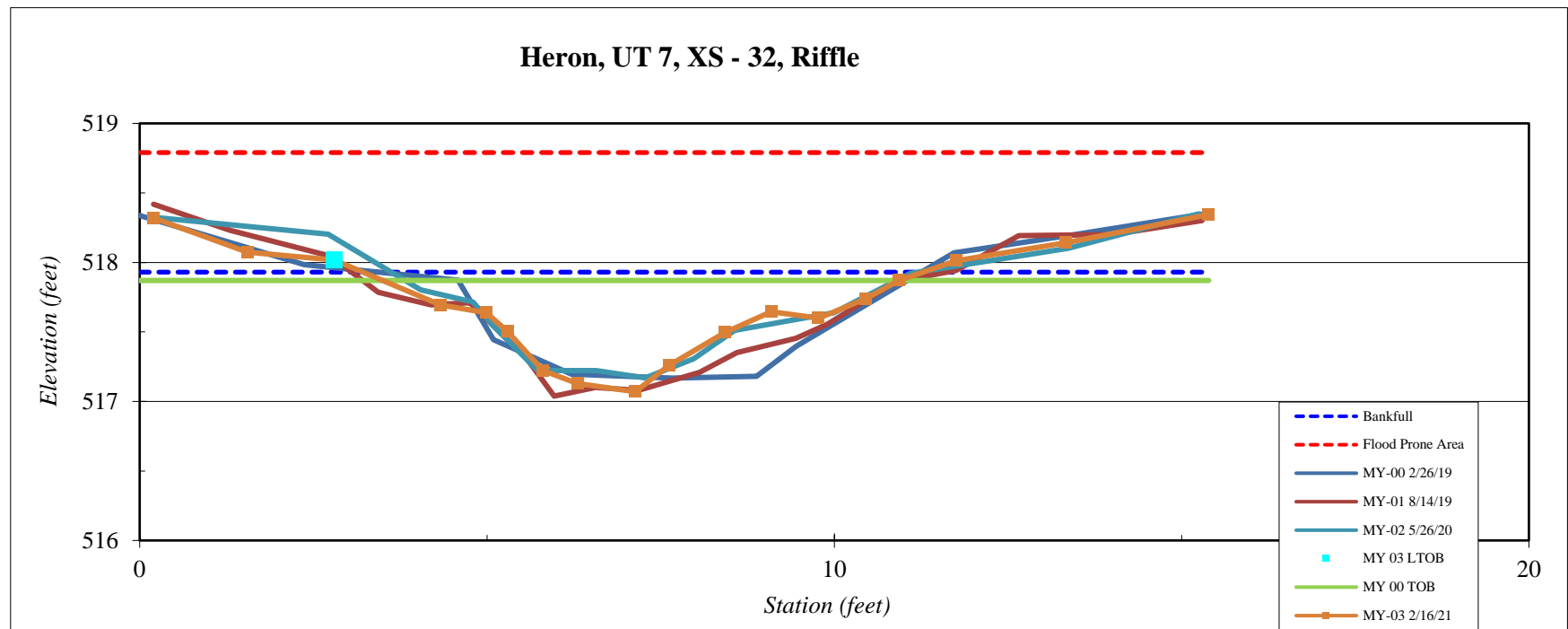
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 7, XS - 32, Riffle
Feature	Riffle
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris



Station	Elevation
0.2	518.32
1.5	518.07
2.8	518.02
4.3	517.69
5.0	517.64
5.3	517.50
5.8	517.22
6.3	517.13
7.1	517.07
7.6	517.26
8.4	517.50
9.1	517.65
9.8	517.60
10.5	517.74
10.9	517.87
11.8	518.01
13.3	518.14
15.4	518.34

SUMMARY DATA	
Bankfull Elevation:	517.9
LTOB Elevation:	518.0
Bankfull Cross-Sectional Area:	3.3
Bankfull Width:	8.1
Flood Prone Area Elevation:	518.8
Flood Prone Width:	20.0
Max Depth at Bankfull:	0.9
Low Bank Height:	0.9
Mean Depth at Bankfull:	0.4
W / D Ratio:	19.8
Entrenchment Ratio:	2.5
Bank Height Ratio:	1.10

Stream Type C/E



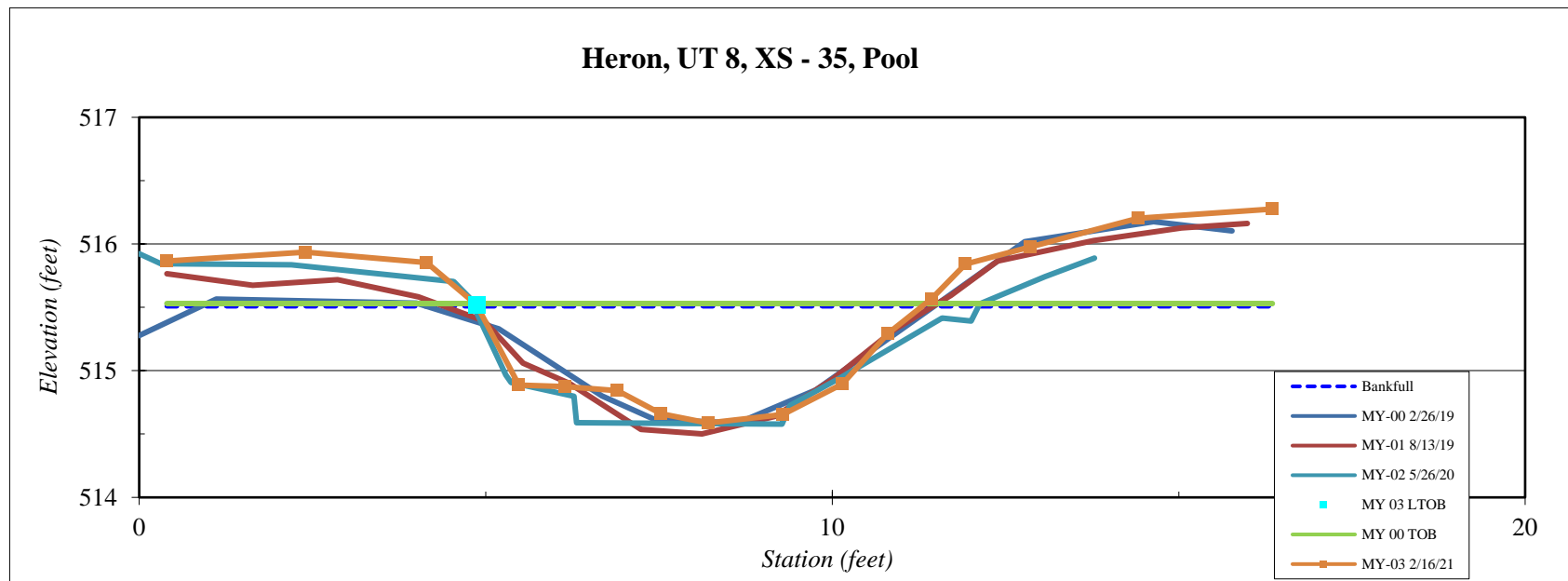
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 8, XS - 35, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris



Station	Elevation
0.4	515.9
2.4	515.9
4.1	515.9
4.9	515.5
5.5	514.9
6.1	514.9
6.9	514.8
7.5	514.7
8.2	514.6
9.3	514.7
10.1	514.9
10.8	515.3
11.4	515.6
11.9	515.8
12.9	516.0
14.4	516.2
16.4	516.3

SUMMARY DATA	
Bankfull Elevation:	515.5
LTOB Elevation:	515.9
Bankfull Cross-Sectional Area:	4.1
Bankfull Width:	6.4
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	0.9
Low Bank Height:	0.9
Mean Depth at Bankfull:	0.6
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.01

Stream Type	C/E
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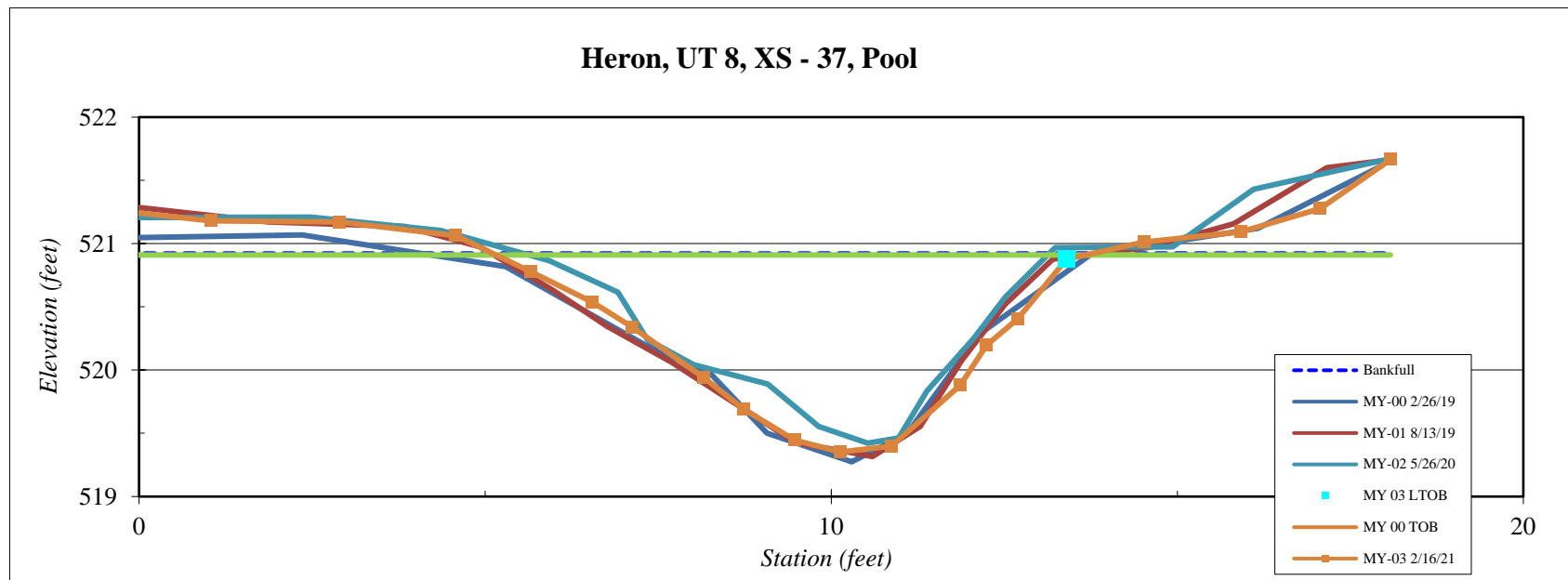
Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 8, XS - 37, Pool
Feature	Pool
Date:	2/16/2021
Field Crew:	Perkinson, Adams, Lawson, Harris

Station	Elevation
-0.2	521.3
1.0	521.2
2.9	521.2
4.6	521.1
5.7	520.8
6.6	520.5
7.1	520.3
8.2	519.9
8.7	519.7
9.5	519.4
10.1	519.4
10.9	519.4
11.9	519.9
12.2	520.2
12.7	520.4
13.4	520.9
14.5	521.0
15.9	521.1
17.1	521.3
18.1	521.7

SUMMARY DATA	
Bankfull Elevation:	520.9
LTOB Elevation:	520.9
Bankfull Cross-Sectional Area:	7.2
Bankfull Width:	8.6
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.6
Low Bank Height:	1.5
Mean Depth at Bankfull:	0.8
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.97



Stream Type	C/E
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Appendix E. Hydrology Data

Table 15A.-15J. Channel Evidence
Stream Gauge Graphs
Table 16. Verification of Bankfull Events
Table 17. Groundwater Hydrology Data
Groundwater Gauge Graphs
Figure E-1. 30-70 Percentile Graph for Rainfall

Table 15A. UT1 Channel Evidence

UT1 Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)
Max consecutive days channel flow	103	162	289
Presence of litter and debris (wracking)	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No
Other:			

Table 15B. UT2 Channel Evidence

UT2 Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)
Max consecutive days channel flow	85	126	116
Presence of litter and debris (wracking)	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No
Other:			

Table 15C. UT3 Channel Evidence

UT3 Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)
Max consecutive days channel flow	142	166	120
Presence of litter and debris (wracking)	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No
Other:			

Table 15D. UT5 Downstream Channel Evidence

UT5 Downstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)
Max consecutive days channel flow	134	152	135
Presence of litter and debris (wracking)	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No
Other:			

Table 15E. UT5 Upstream Channel Evidence

UT5 Upstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)
Max consecutive days channel flow	167	158	60
Presence of litter and debris (wracking)	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No
Other:			

Table 15F. UT6 Channel Evidence

UT6 Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)
Max consecutive days channel flow	131	187	288
Presence of litter and debris (wracking)	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No
Other:			

Table 15G. UT7 Downstream Channel Evidence

UT7 Downstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)
Max consecutive days channel flow	237	68	144
Presence of litter and debris (wracking)	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No
Other:			

Table 15H. UT7 Middle Channel Evidence

UT7 Middle Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)
Max consecutive days channel flow	151	106	157
Presence of litter and debris (wracking)	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No
Other:			

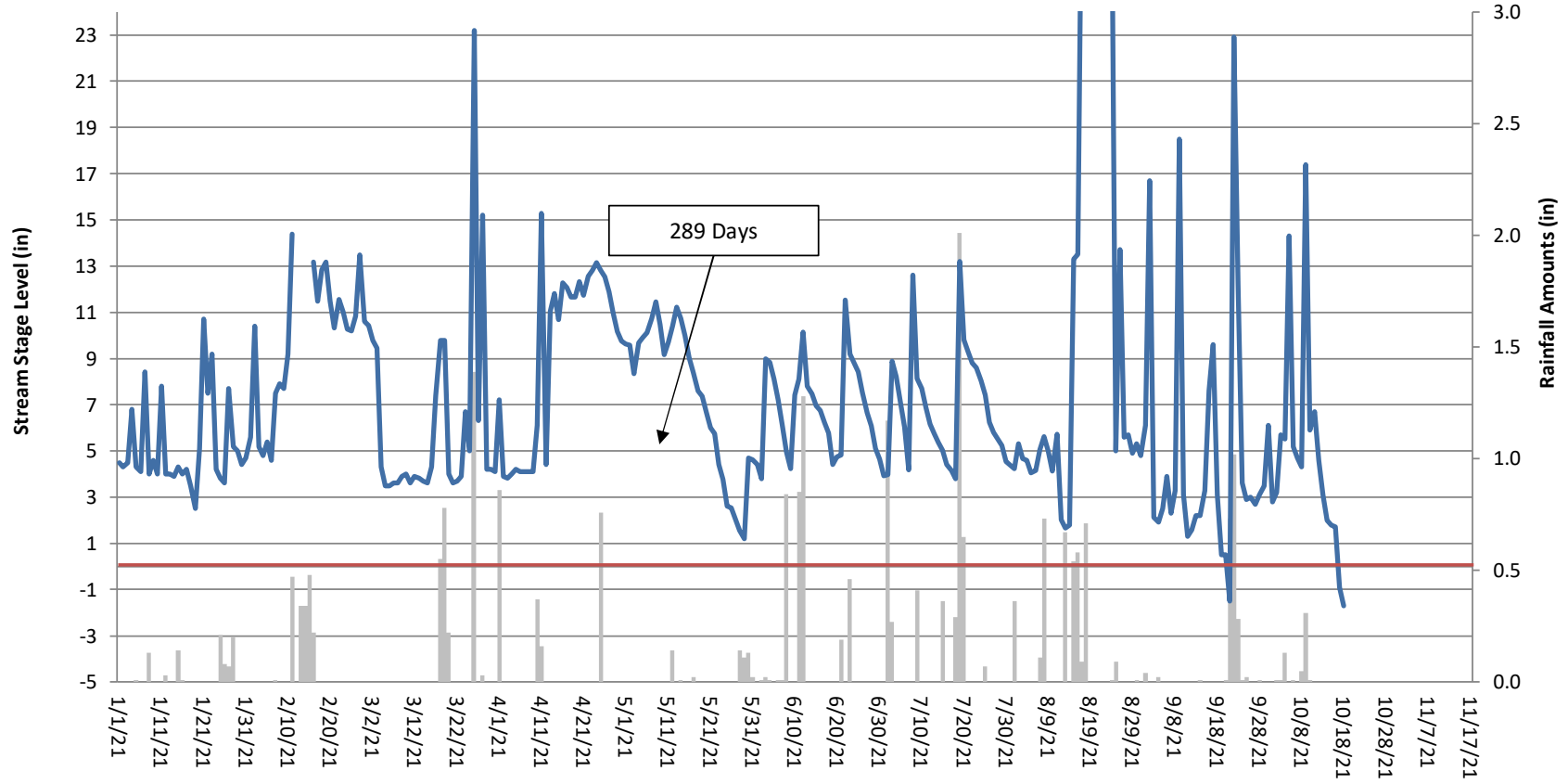
Table 15I. UT7 Upstream Channel Evidence

UT7 Upstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)
Max consecutive days channel flow	237	248	107
Presence of litter and debris (wracking)	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No
Other:			

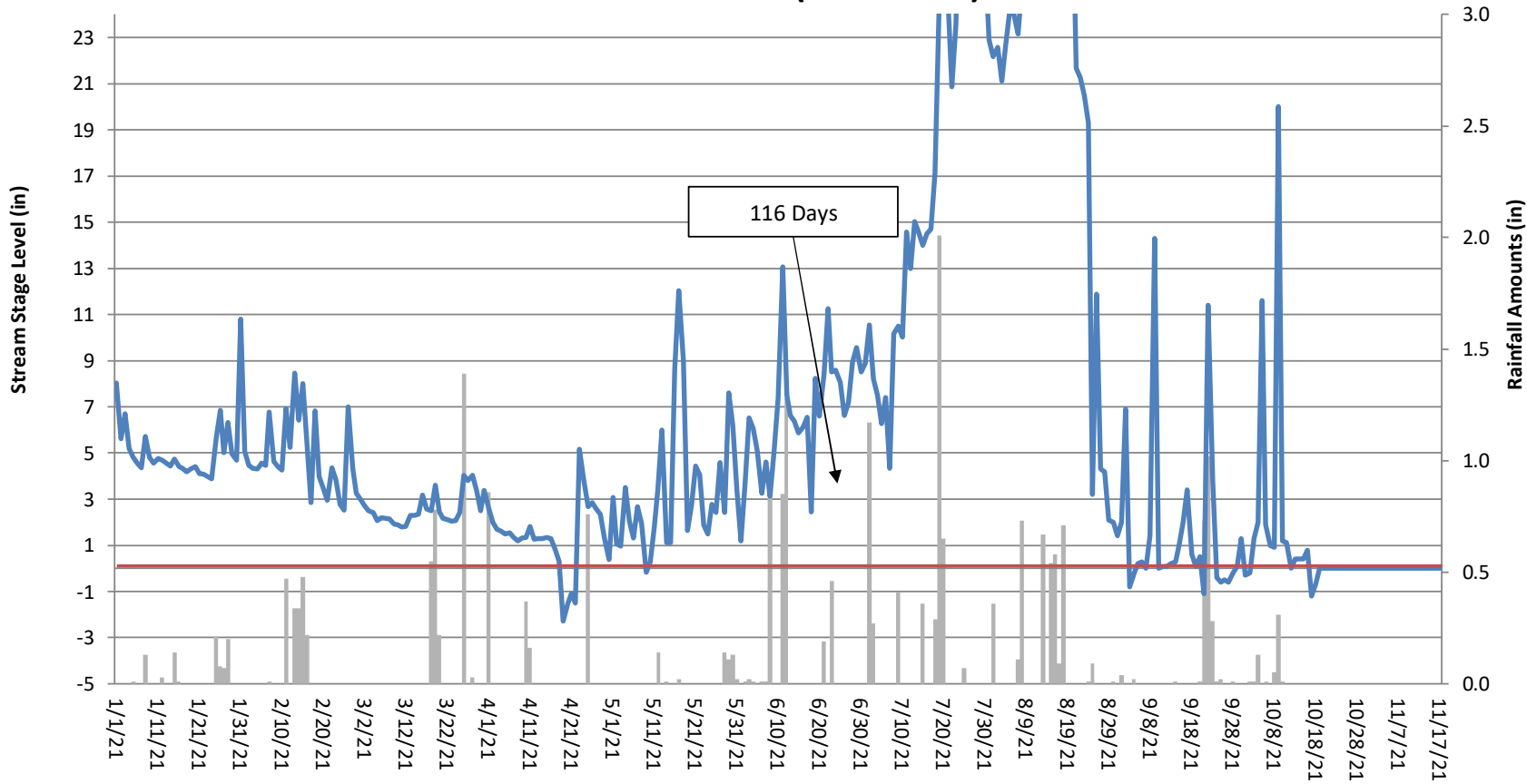
Table 15J. UT8 Channel Evidence

UT8 Downstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)
Max consecutive days channel flow	49	89	69
Presence of litter and debris (wracking)	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No
Other:			

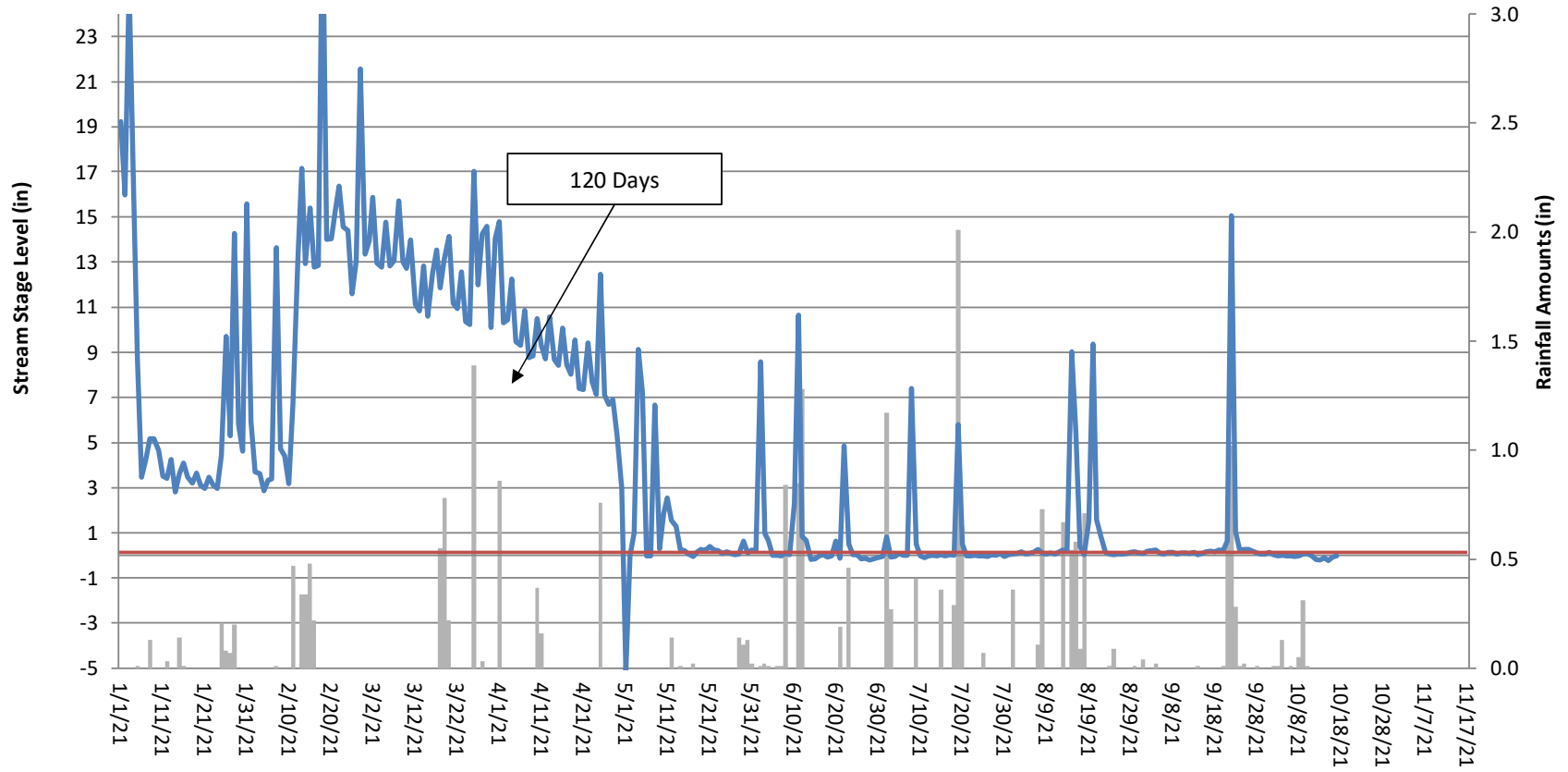
Heron Stream Flow Gauge UT1 Year 3 (2021 Data)



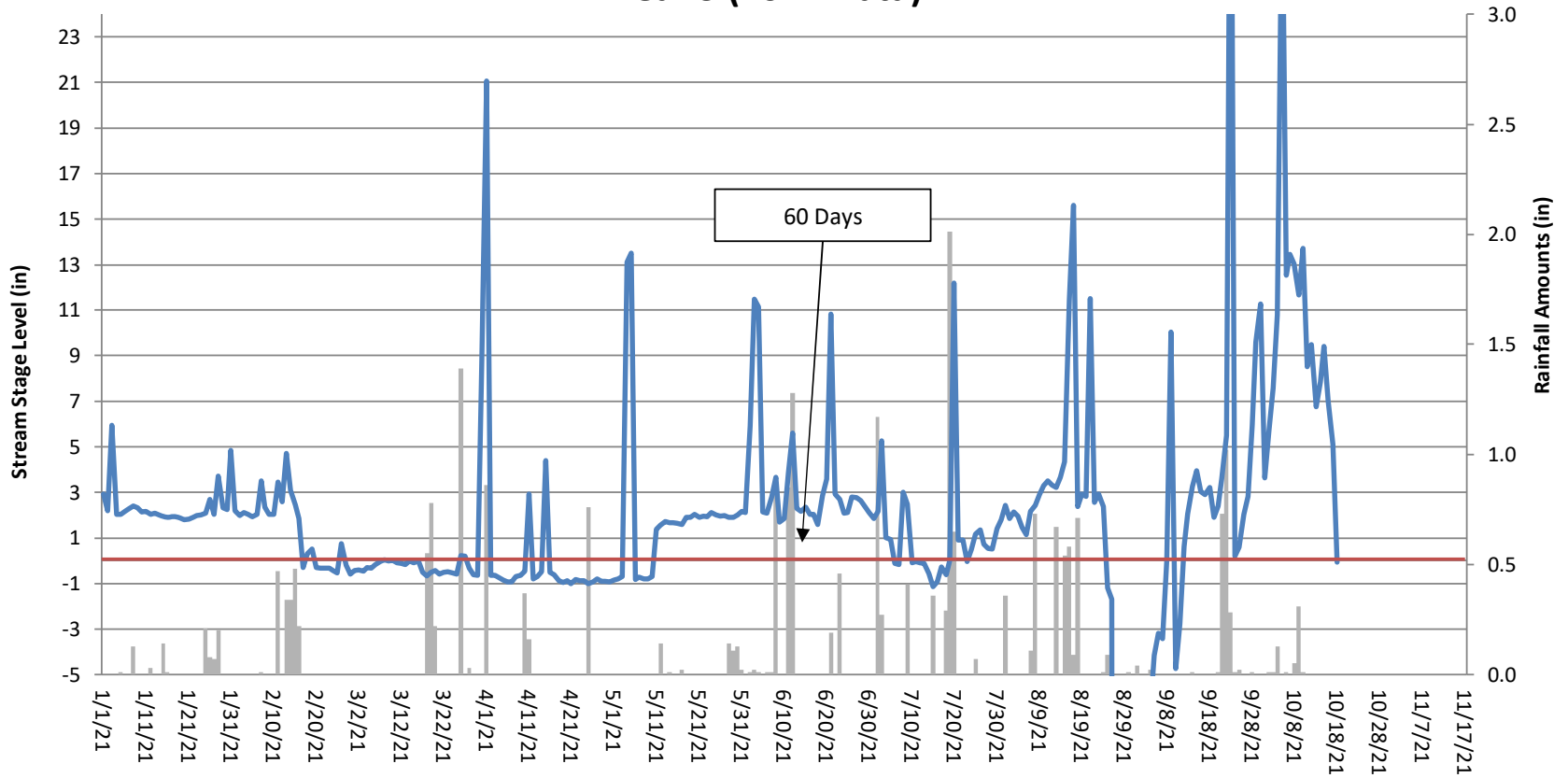
Heron Stream Flow Gauge UT2 Year 3 (2021 Data)



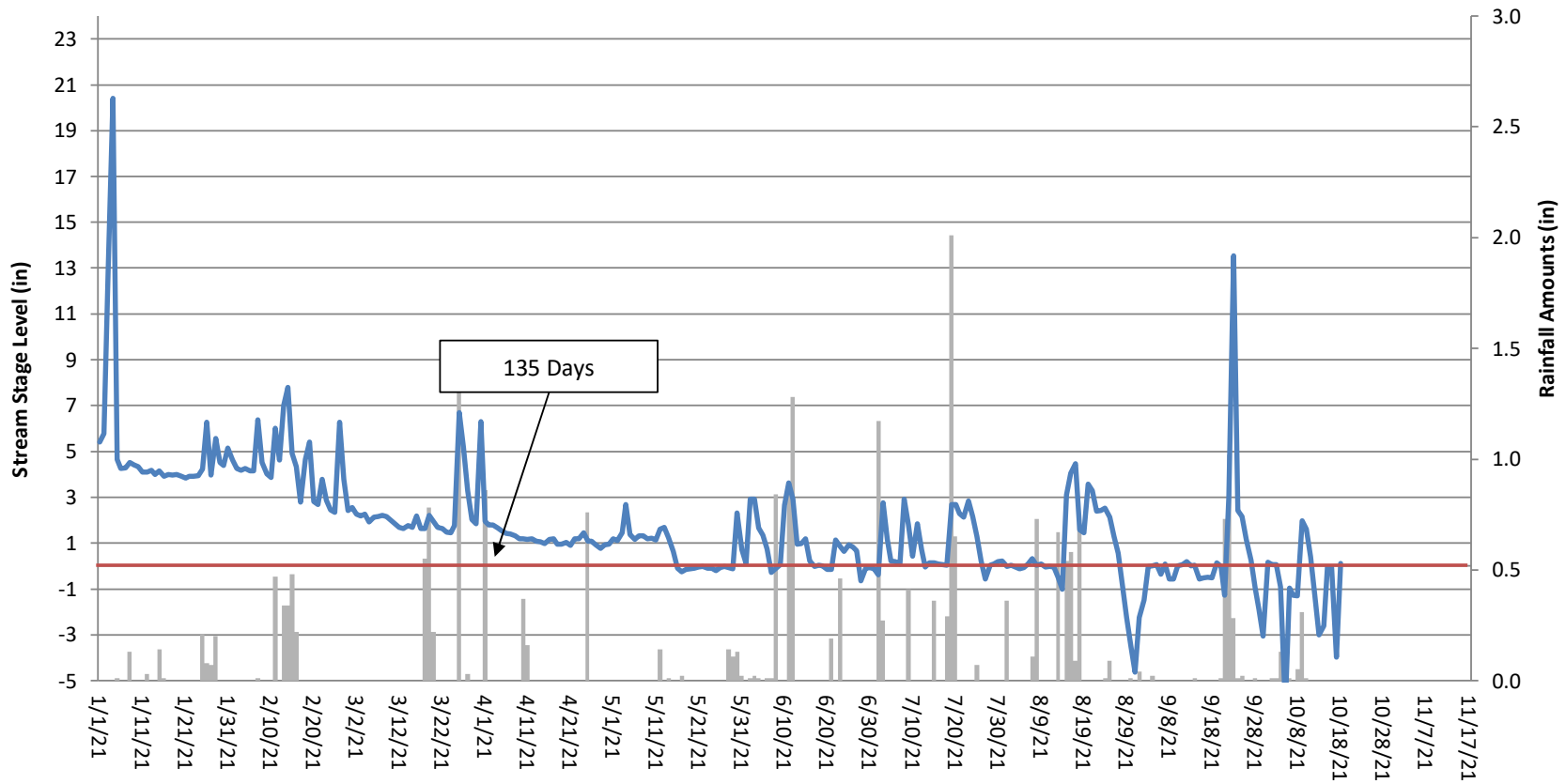
Heron Stream Flow Gauge UT3 Year 3 (2021 Data)



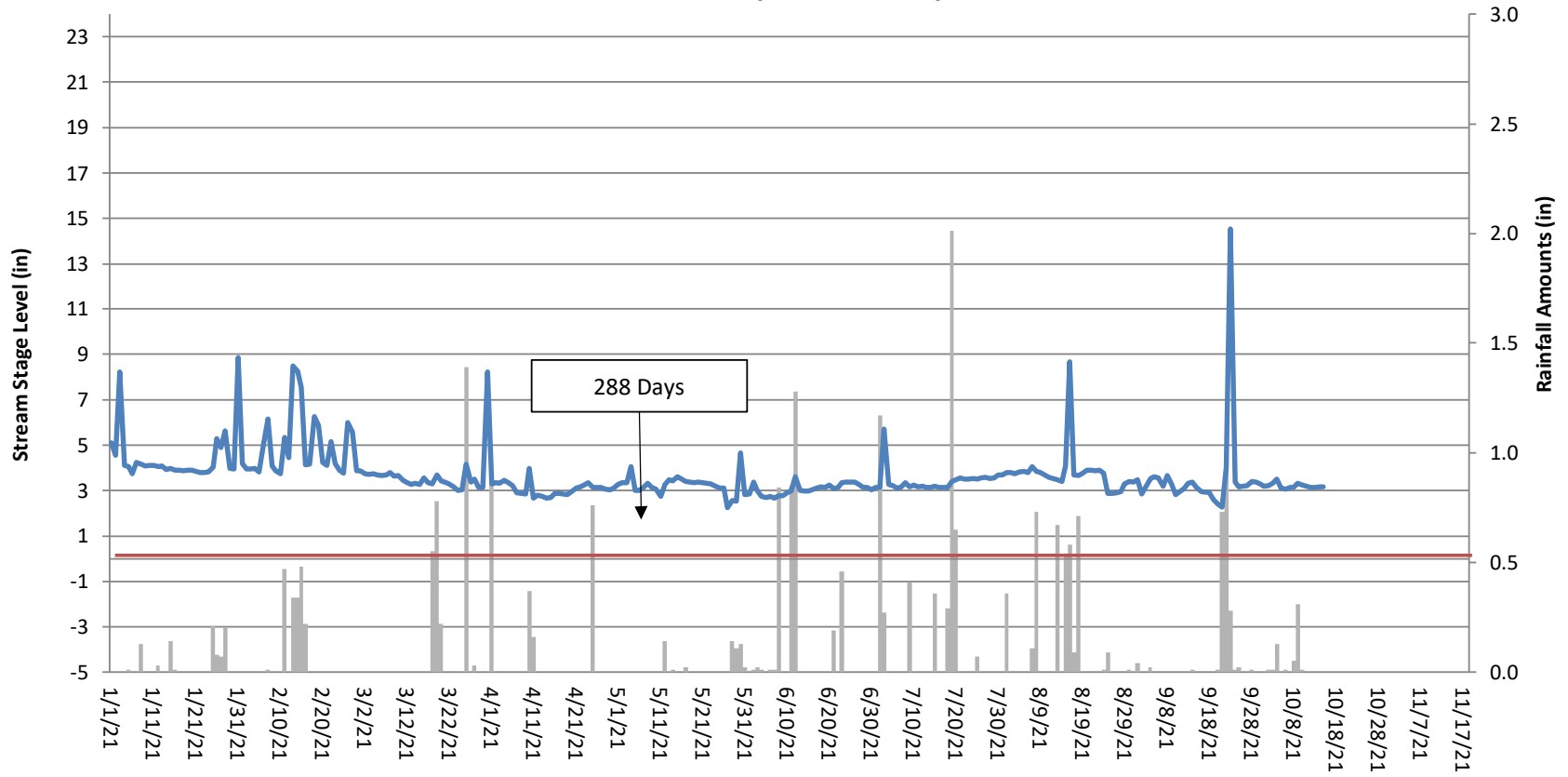
Heron Stream Flow Gauge UT5 Upstream Year 3 (2021 Data)



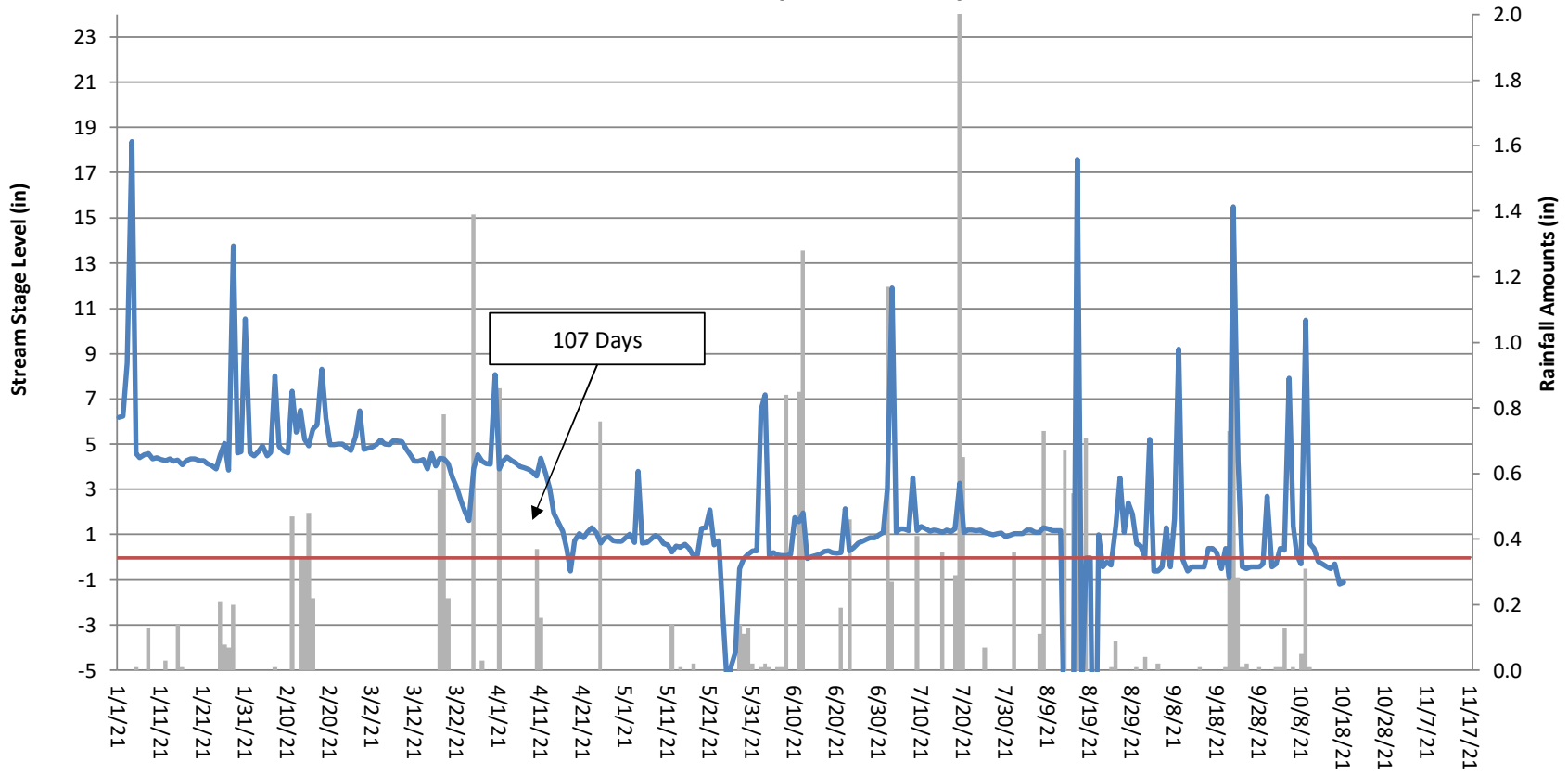
Heron Stream Flow Gauge UT5 Downstream Year 3 (2021 Data)



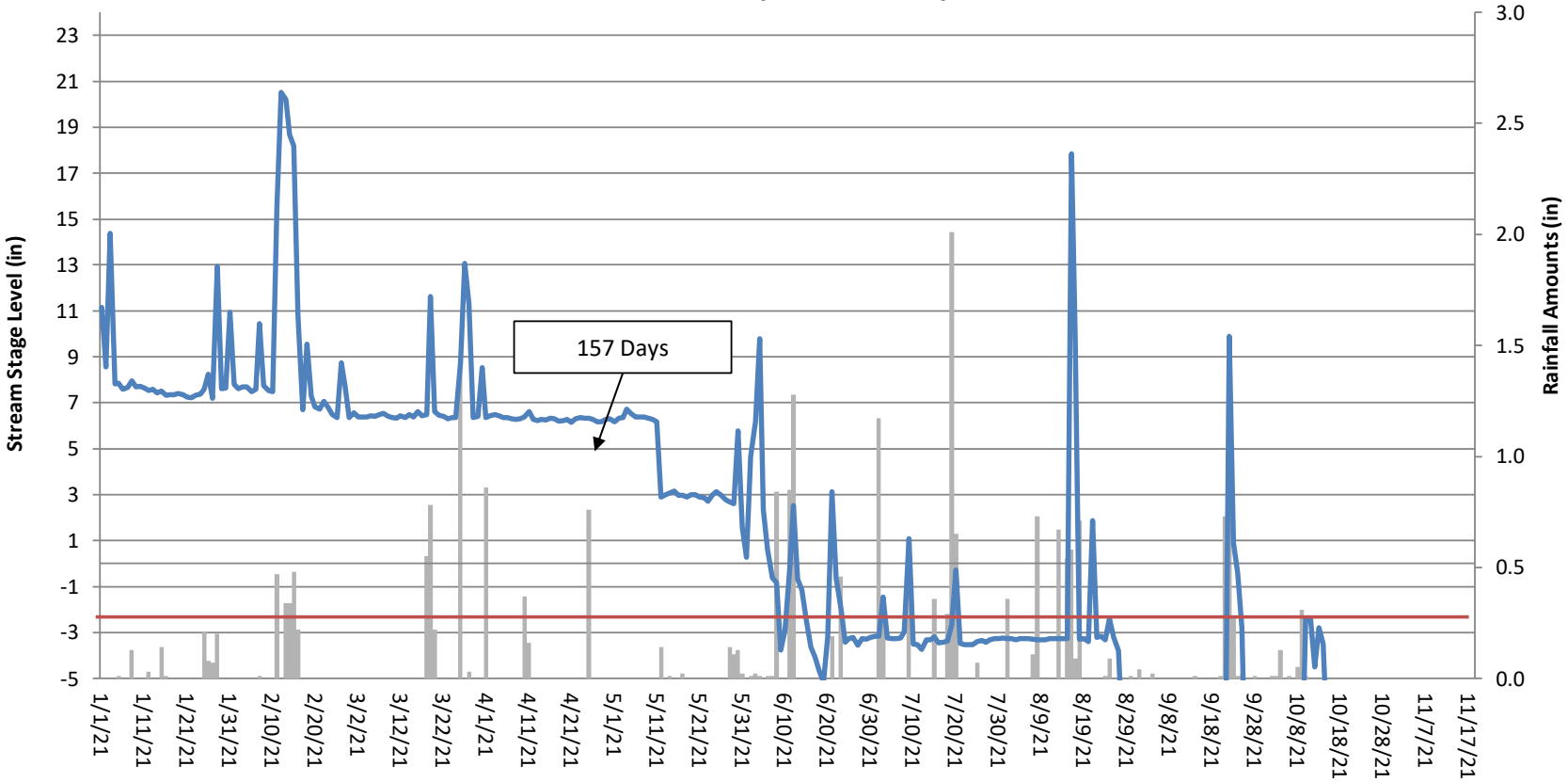
Heron Stream Flow Gauge UT6 Year 3 (2021 Data)



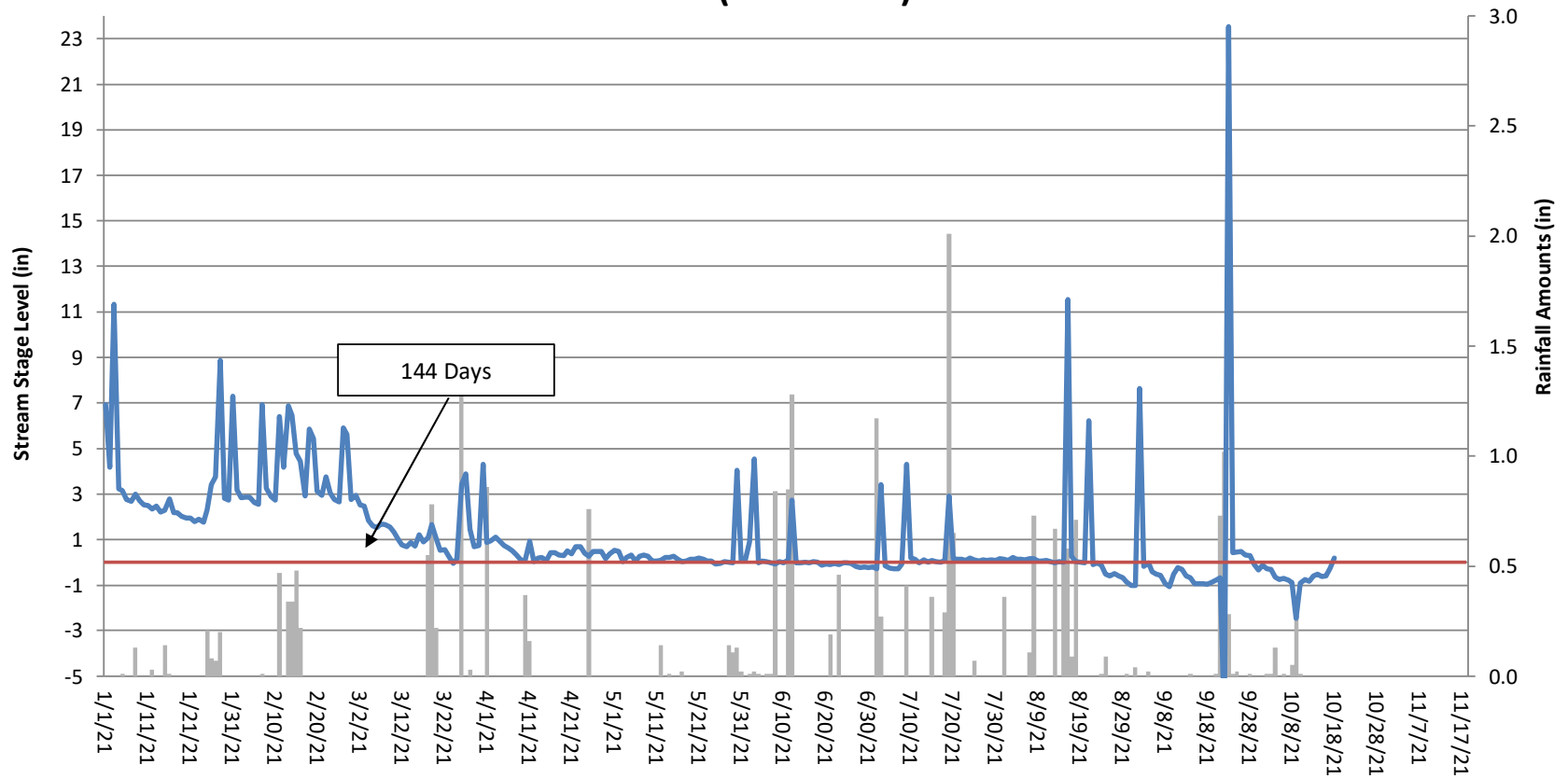
Heron Stream Flow Gauge UT7 Upstream Year 3 (2021 Data)



Heron Stream Flow Gauge UT7 Middle Year 3 (2021 Data)



Heron Stream Flow Gauge UT7 Downstream Year 3 (2021 Data)



Heron Stream Flow Gauge UT8 Year 3 (2021 Data)

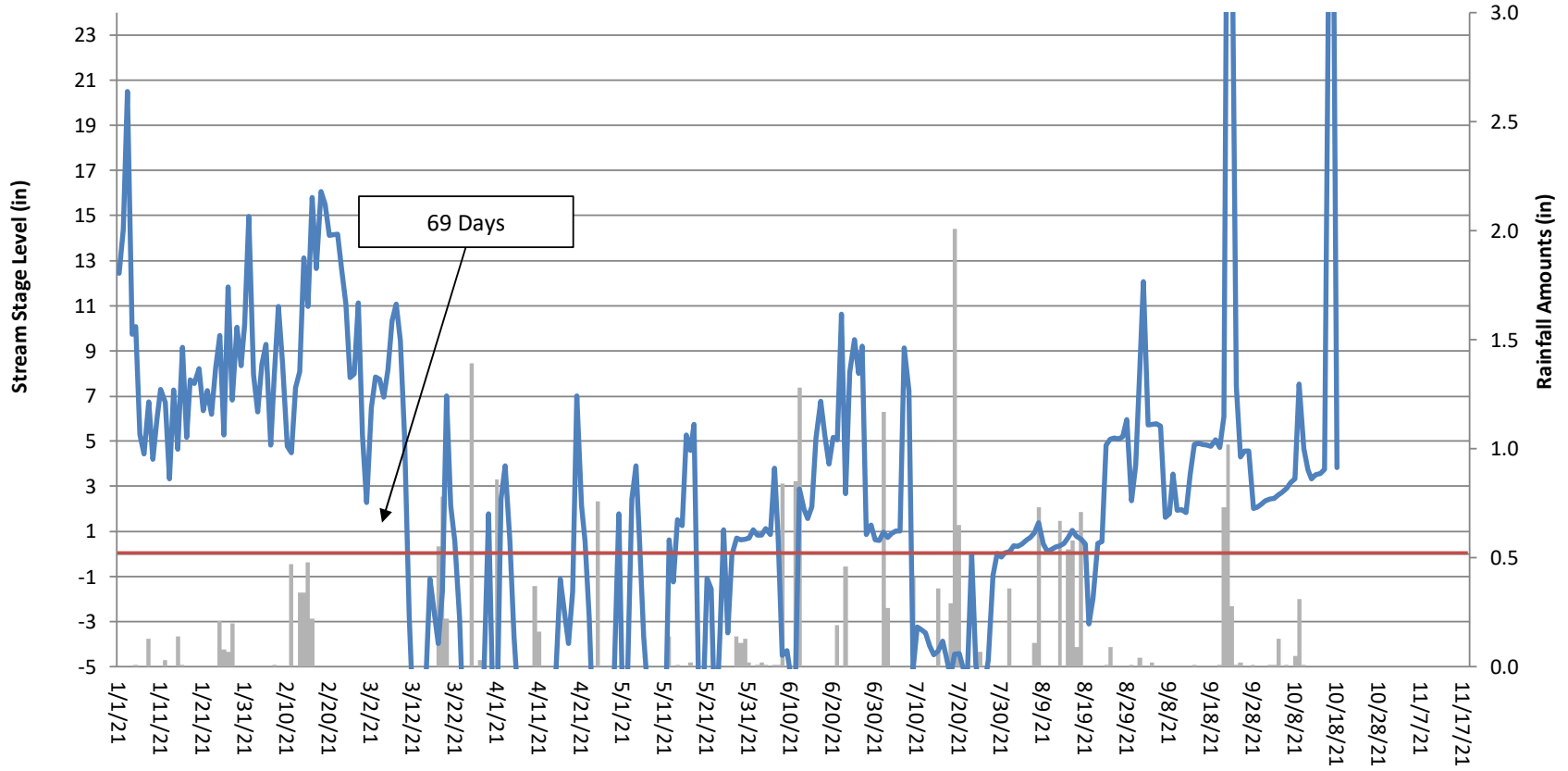


Table 16. Verification of Bankfull Events

Date of Data Collection	Date of Occurrence	Method	Photo (if available)
August 26, 2019	July 7, 2019	Stream gauge data indicates a bankfull event occurred after 4.06 inches of rain was documented on July 7, 2019 at an onsite rain gauge	--
August 26, 2019	August 22, 2019	A bankfull event likely occurred after 7.16 inches of rain was documented between August 20-22, 2019 at an onsite rain gauge	--
July 1, 2020	May 21, 2020	Wrack and laid-back vegetation were observed on the TOB of UT4 after 3.03 inches of rain was documented between May 19 and 21, 2020 at an onsite rain gauge.	1
November 16, 2020	November 12, 2020	Wrack and laid-back vegetation were observed on the TOB of UT1 after 3.13 inches of rain was documented between November 11 and 12, 2020 at an onsite rain gauge.	2
December 14, 2020	December 14, 2020	A bankfull event was documented on UT8 by trail camera and stream gauge evidence after 0.82 inches of rain were captured at an onsite rain gauge.	3
January 31, 2021	January 31, 2021	A bankfull was documented on UT3 by trail camera and stream gauge evidence after 0.56 inches of rain were captured by an onsite rain gauge between January 25-28.	4
February 16, 2021	February 13-16, 2021	A bankfull event was documented on UT1B during a site visit after 1.38 inches of rain were captured by an onsite rain gauge between February 13-16, 2021.	5

Photo 1: Wrack and laid-back vegetation along the TOB of UT4 after a bankfull event.



Photo 2: Wrack and laid-back vegetation along the TOB of UT1 after a bankfull event.



Photo 3: UT8 bankfull event documented on December 14, 2020 after 0.82 inches of rain.



Photo 4: UT3 bankfull event documented on January 31, 2020 after 0.56 inches of rain.



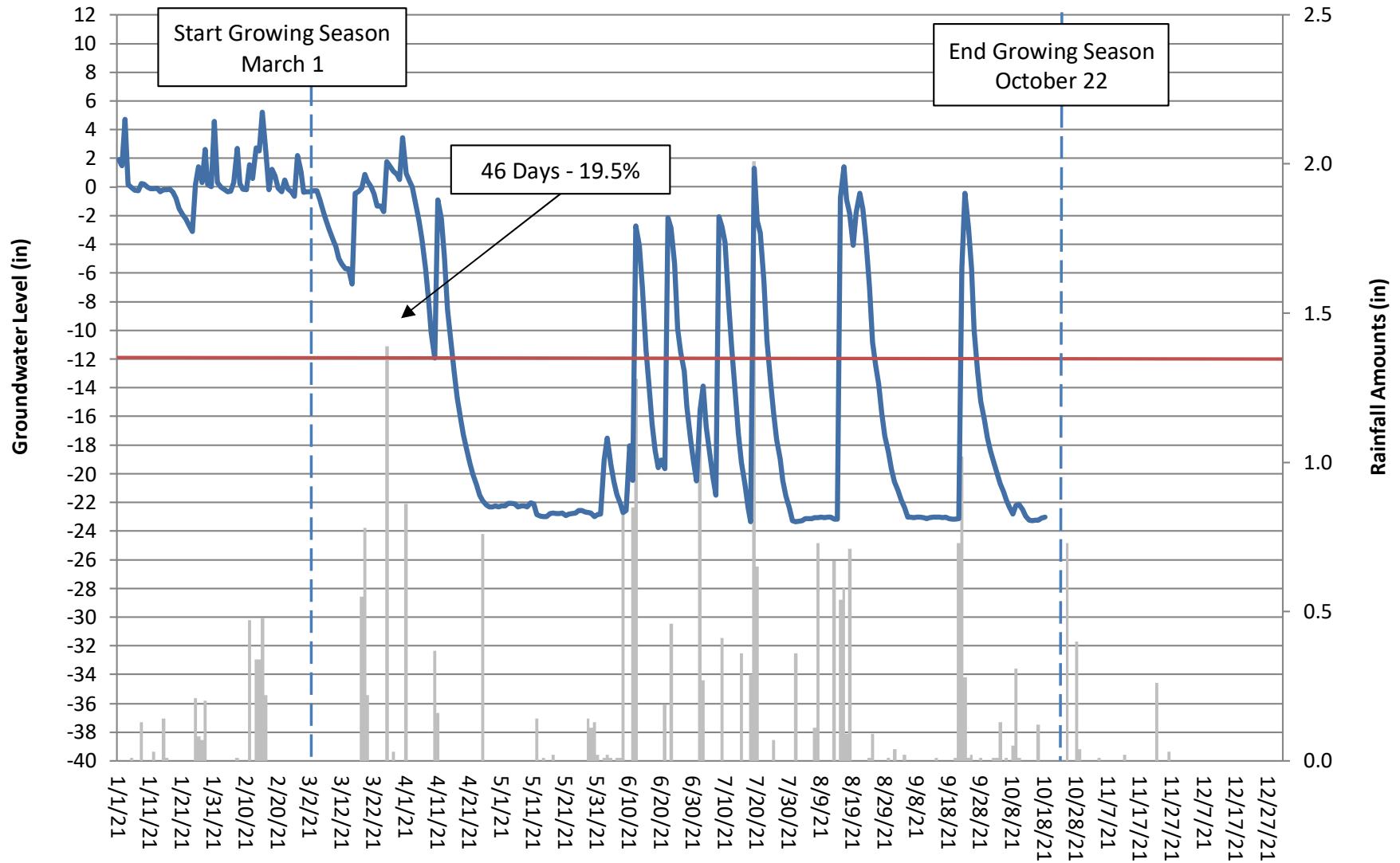
Photo 5: Bankfull event on UT1B on February 16 after 1.38 inches fell between February 13 – 16, 2021.



Table 17. Groundwater Hydrology Data

Gauge	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)	Year 6 (2024)	Year 7 (2025)
1	Yes/33 days (15.8%)	Yes/23 days (9.8%)	Yes /46 days (19.5%)				
2	Yes/26 days (12.4%)	Yes/27 days (11.5%)	Yes/47 days (19.9%)				
3	Yes/35 days (16.7%)	Yes/28 days (12.0%)	Yes/36 days (15.2%)				
4	Yes/69 days (33.0%)	Yes/51 days (21.8%)	Yes/60 days (25.4%)				
5	Yes/52 days (24.9%)	Yes/45 days (19.2%)	Yes/50 days (21.2%)				
6	Yes/54 days (25.8%)	Yes/46 days (19.7%)	Yes/52 days (22.0%)				

Heron Groundwater Gauge 1 Year 3 (2021 Data)

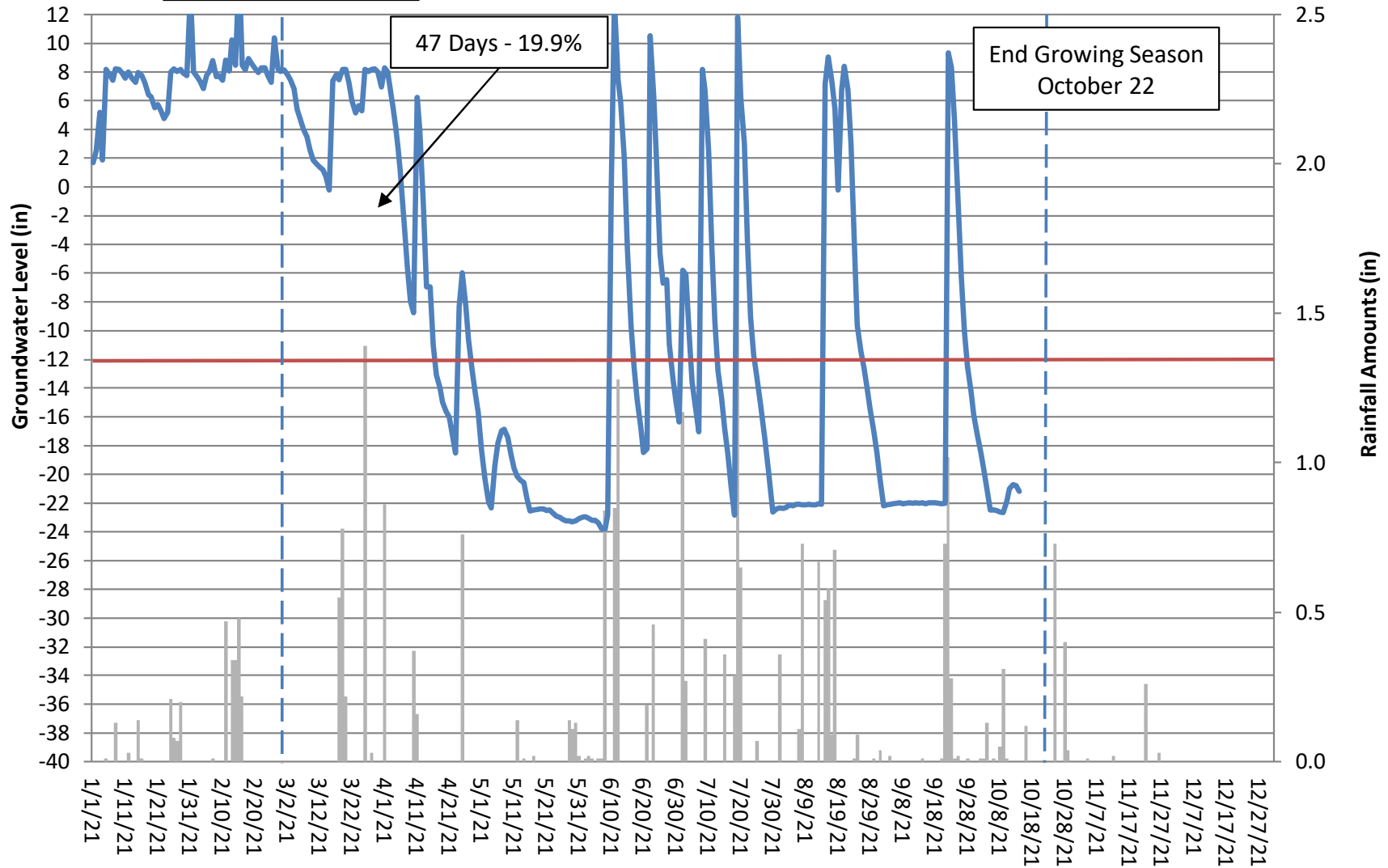


Heron Groundwater Gauge 2 Year 3 (2021 Data)

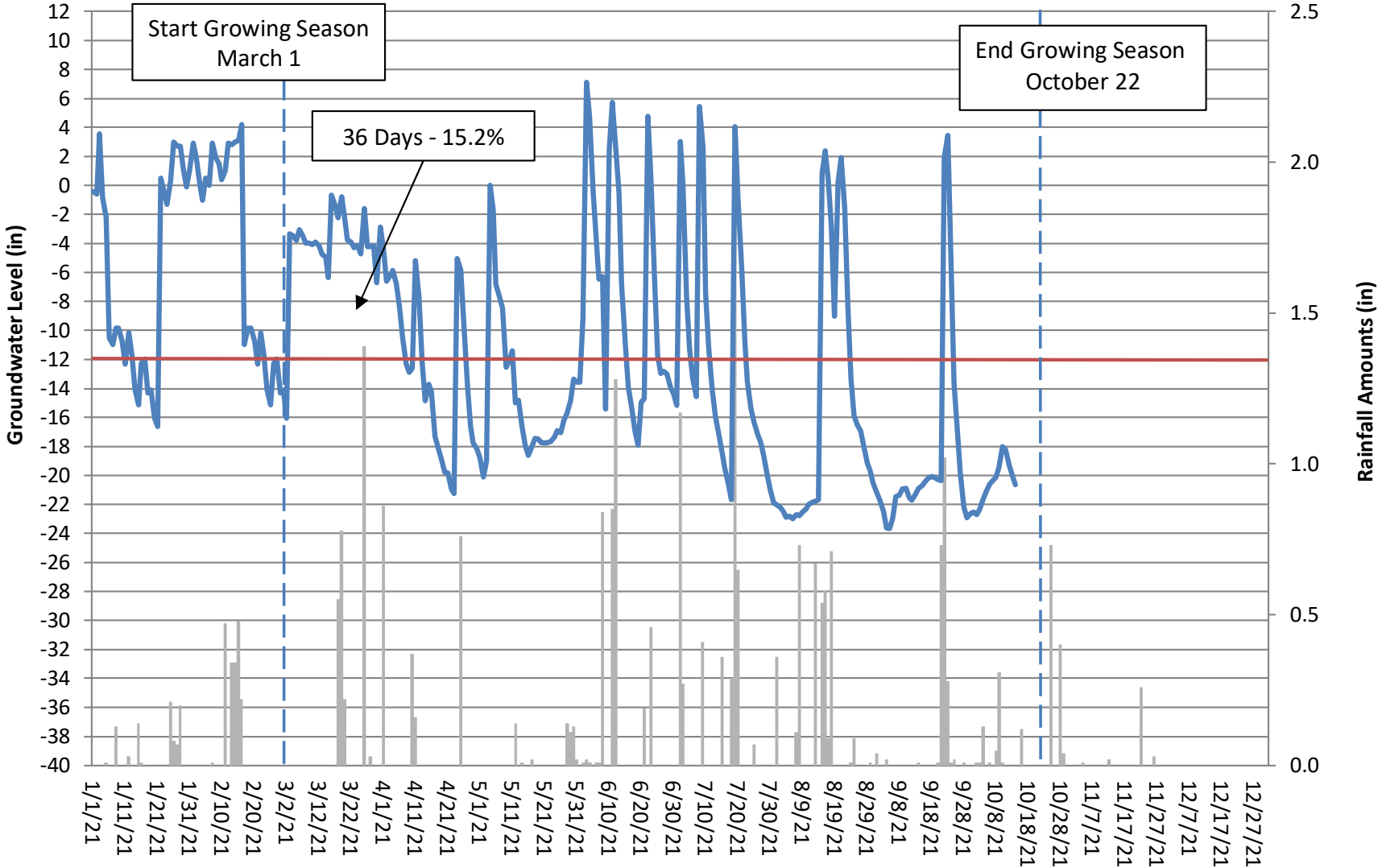
Start Growing Season
March 1

End Growing Season
October 22

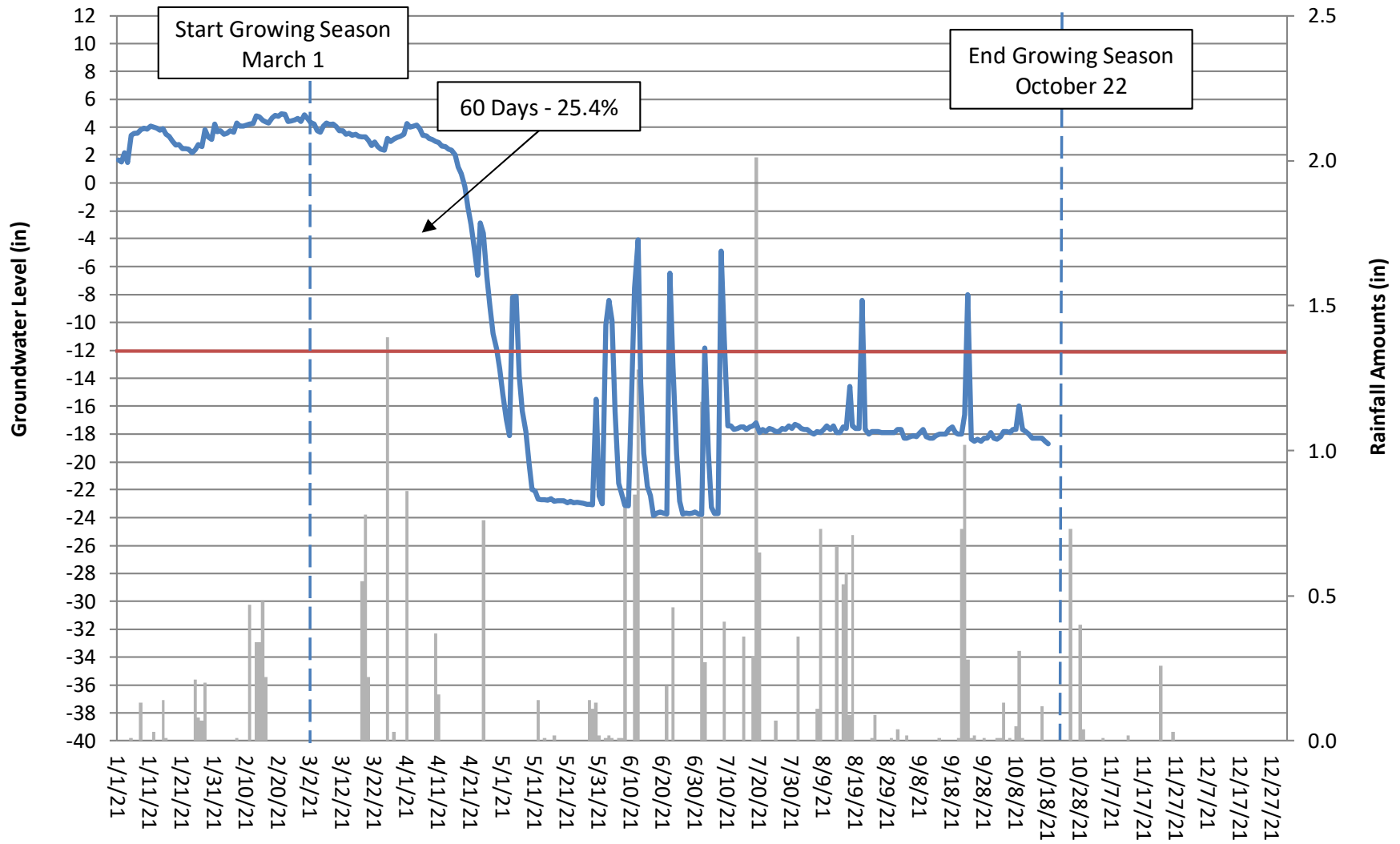
47 Days - 19.9%



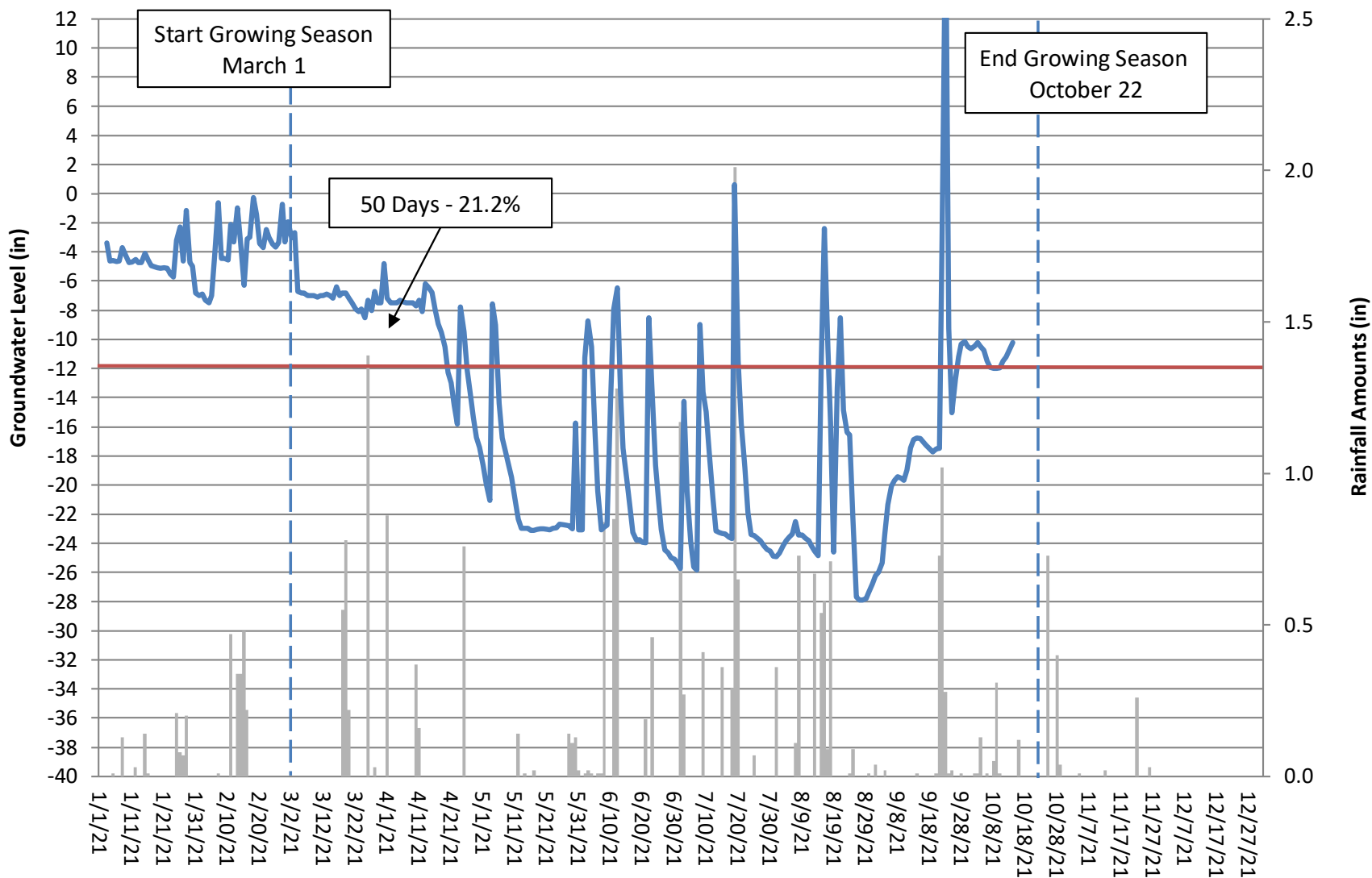
Heron Groundwater Gauge 3 Year 3 (2021 Data)



Heron Groundwater Gauge 4 Year 3 (2021 Data)



Heron Groundwater Gauge 5 Year 3 (2021 Data)



Heron Groundwater Gauge 6 Year 3 (2021 Data)

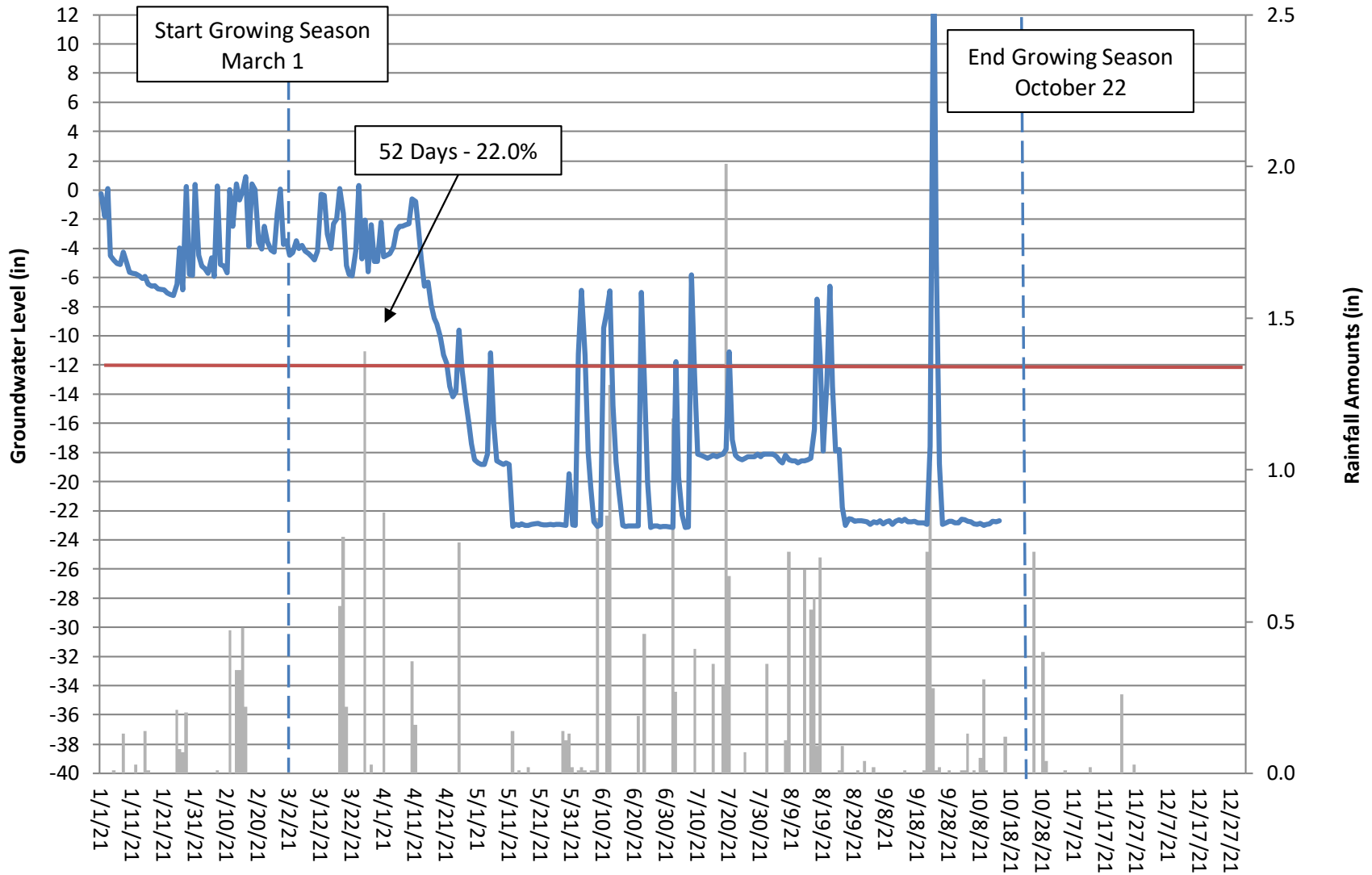
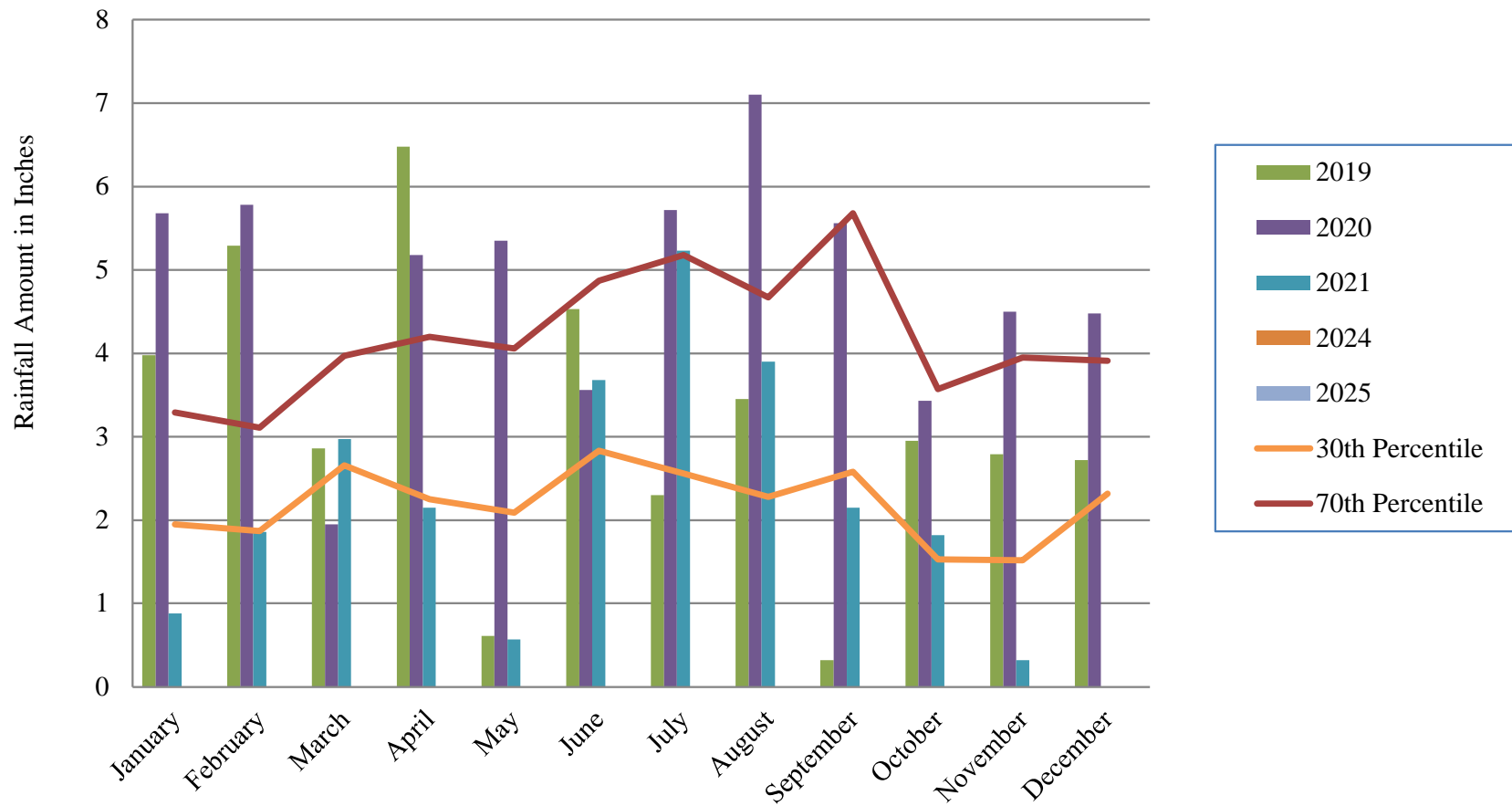


Figure E1: Heron 30-70 Percentile Graph for Rainfall

Current year data from onsite rain gauge
30-70th percentile data from WETS Station: Burlington Alamance Regional Airport, NC



Appendix F. Benthic Data

Benthic Results
Habitat Dataforms

PAI ID NO			54830	54831
STATION			Heron UT-1	Heron UT-5
DATE			5/11/2021	5/11/2021
SPECIES	Tolerance Value	Functional Feeding Group		
PLATYHELMINTHES				
Turbellaria		P		
Tricladida		P		
Planariidae		O		
<i>Phagocata sp.</i>				
MOLLUSCA				
Bivalvia				
Veneroida				
Sphaeriidae		FC		
<i>Pisidium sp.</i>	6.6	FC		
Gastropoda				
Basommatophora				
Lymnaeidae		SC		
<i>Pseudosuccinea columella</i>	7.7	CG		2
Physidae				
<i>Physella sp.</i>	8.7	CG		7
ANNELIDA				
Oligochaeta		CG		
Tubificida				
Naididae		CG		
Naidinae		CG	1	
<i>Dero sp.</i>	9.8	CG		
Tubificinae w.h.c.		CG		
Tubificinae w.o.h.c.		CG		
Lumbriculida				
Lumbriculidae		CG		1
<i>Lumbriculus sp.</i>		CG	2	
Hirudinea		8		
Arhynchobdellida				
Erpobdellidae				
ARTHROPODA				
Crustacea				
Ostracoda				2
Isopoda				
Asellidae		SH		
<i>Caecidotea sp.</i>	8.4	CG	7	5
Amphipoda		CG		
Crangonyctidae				
<i>Crangonyx sp.</i>	7.2	CG	30	6

Insecta				
Ephemeroptera				
Baetidae		CG		
<i>Baetis intercalaris</i>	5	CG		
<i>Baetis pluto</i>	3.4			
<i>Baetis tricaudatus</i>	1.5	CG		
<i>Callibaetis fluctuans</i>	9.2	CG	2	
<i>Callibaetis sp.</i>	9.2	CG		
<i>Dipheter hageni</i>	1.1	CG		
<i>Labiobaetis frondalis</i>	4.6			
<i>Labiobaetis propinquus</i>	5.8			
Baetiscidae		CG		
<i>Baetisca carolina</i>	4.2			
Ephemerellidae		SC		
<i>Dannella provonshai</i>		SC		
<i>Ephemerella invaria gp.</i>	2.6	CG		
Heptageniidae		SC		
<i>Epeorus dispar</i>	1	CG		
<i>Maccaffertium carlsoni</i>	2.1	SC		
<i>Maccaffertium modestum</i>	5.7	SC		
<i>Maccaffertium sp.</i>		SC		
<i>Stenacron interpunctatum</i>	6.4	SC		
Isonychiidae		FC		
<i>Isonychia sp.</i>	3.6	FC		
Leptophlebiidae		CG		
<i>Habrophlebiodes brunneipennis</i>				
<i>Habrophlebiodes sp.</i>				
Odonata				
Aeshnidae		P		
<i>Boyeria vinosa</i>	5.8	P		
Calopterygidae		P		
<i>Calopteryx sp.</i>	7.5	P		
Coenagrionidae		P		
<i>Argia sp.</i>	8.3	P		
<i>Ischnura sp.</i>	9.5		3	2
Cordulegastridae		P		
<i>Cordulegaster maculata</i>	5.7			
Gomphidae		P		
<i>Lanthus sp.</i>	1.6	P		
<i>Ophiogomphus sp.</i>	5.9	P		
<i>Stylogomphus albistylus</i>	5	P		
Libellulidae		P		
<i>Libellula sp.</i>	9.4	P	1	
<i>Pachydiplax longipennis</i>	9.6			
Plecoptera				
Leuctridae		SH		
<i>Leuctra sp.</i>	1.5	SH		

<i>Paraleuctra sara</i>				
Nemouridae		SH		
<i>Amphinemura nigritta</i>	3.8	SH		
Perlidae		P		
<i>Acroneuria cf filicis</i>		P		
<i>Eccopectura xanthenes</i>	4.7	P		
<i>Perlesta frisoni</i>	2.9	P		
<i>Perlesta sp.</i>	2.9	P	1	
Perlodidae		P		
<i>Isoperla holochlora</i>	0.7	P		
<i>Remensus bilobatus</i>	0.9	-		
Hemiptera				
Belostomatidae				
<i>Belostoma sp.</i>	9.5	P	3	
Corixidae		PI		5
Veliidae		P		
<i>Microvelia sp.</i>		P		1
Megaloptera				
Sialidae		P		
<i>Sialis sp.</i>	7	P		
Trichoptera				
Hydropsychidae		FC		
<i>Cheumatopsyche sp.</i>	6.6	FC		
<i>Diplectrona modesta</i>	2.3	FC		
<i>Hydropsyche depravata gp.</i>	7.9	FC		
Philopotamidae		FC		
<i>Chimarra sp.</i>	3.3	FC		
<i>Dolophilodes distinctus</i>	1	FC		
Coleoptera				
Dryopidae				
<i>Helichus basalis</i>	0.5	SC		
<i>Helichus fastigiatus</i>	4.1	SC		
Dytiscidae		P		
<i>Laccophilus sp.</i>	9.8	P		4
<i>Neoporus sp.</i>	5		2	
Elmidae		CG		
<i>Stenelmis sp.</i>	5.6	SC		
Haliplidae				
<i>Peltodytes muticus</i>	8.4	SH	1	
Hydrophilidae		P		1
<i>Helophorus lineatus</i>				2
<i>Tropisternus sp.</i>	9.3	P	8	
Psephenidae		SC		
<i>Psephenus herricki</i>	2.3	SC		
Staphylinidae		P		1
Diptera				
Chironomidae				1

<i>Chironomus sp.</i>	9.3	CG	1	1
<i>Conchapelopia sp.</i>	8.4	P	1	
<i>Cricotopus sp.</i>				
<i>Cryptochironomus sp.</i>	6.4	P		
<i>Dicrotendipes neomodestus</i>	7.9	CG		
<i>Microtendipes pedellus gp.</i>	3.9	CG		
<i>Odontomesa fulva</i>	4.9			
<i>Paracladopelma undine</i>	4.5			
<i>Parametrioconemus sp.</i>	3.9	CG		
<i>Paratendipes albimanus/duplicatus</i>	5.6			
<i>Polypedilum aviceps</i>	3.6	SH		
<i>Polypedilum illinoense gp.</i>	8.7	SH		1
<i>Procladius sp.</i>	8.8	P	1	
<i>Psectrocladius dyari</i>	10			15
<i>Rheotanytarsus exiguus gp.</i>	6.5	FC	1	
<i>Stictochironomus devinctus</i>	5.4	CG		
<i>Tanytarsus sp.</i>	6.6	FC		4
<i>Zavrelia sp.</i>	6.1	CG		
Culicidae		FC	1	
<i>Anopheles sp.</i>	8.6	FC	3	5
<i>Culex sp.</i>		FC	2	10
Dixidae		CG		
<i>Dixa sp.</i>	2.5	CG		
<i>Dixella sp.</i>	4.9	CG		
Ephydriidae		PI		1
Psychodidae		CG		
<i>Pericoma sp.</i>		CG		1
Sciomyzidae			1	
Sciaridae				
Tipulidae		SH		
<i>Dicranota sp.</i>	0	P		
<i>Limnophila sp.</i>		P		
<i>Pseudolimnophila sp.</i>	6.2	P		
<i>Tipula sp.</i>	7.5	SH		
TOTAL NO. OF ORGANISMS			72	78
TOTAL NO. OF TAXA			20	22
EPT TAXA			2	0
BIOTIC INDEX ASSIGNED VALUES			8.11	8.85

How UT-1

Habitat Assessment Field Data Sheet
Mountain/ Piedmont Streams

TOTAL SCORE 77

Biological Assessment Unit, DWQ

Directions for use: The observer is to survey a minimum of 100 meters with 200 meters preferred of stream, preferably in an upstream direction starting above the bridge pool and the road right-of-way. The segment which is assessed should represent average stream conditions. To perform a proper habitat evaluation the observer needs to get into the stream. To complete the form, select the description which best fits the observed habitats and then circle the score. If the observed habitat falls in between two descriptions, select an intermediate score. A final habitat score is determined by adding the results from the different metrics.

Stream How UT-1 Location/road: Snow Camp (Road Name State Route) County Alamance

Date 2/05 CC# 03030002 Basin Cone Fee Subbasin 03-06-04

Observer(s) MA-PP Type of Study: Fish Benthos Basinwide Special Study (Describe) _____

Latitude 35.856180 Longitude 79.365480 Ecoregion: MT P Slate Belt Triassic Basin

Water Quality: Temperature _____ °C DO _____ mg/l Conductivity (corr.) _____ μS/cm pH _____

Physical Characterization: Visible land use refers to immediate area that you can see from sampling location - include what you estimate driving thru the watershed in watershed land use.

Visible Land Use: 20 %Forest 5 %Residential 70 %Active Pasture _____ % Active Crops
5 %Fallow Fields _____ % Commercial _____ %Industrial _____ %Other - Describe: _____

Watershed land use: Forest Agriculture Urban Animal operations upstream

Width: (meters) Stream 1.5 Channel (at top of bank) 2-3 Stream Depth: (m) Avg .2 Max .5
 Width variable Large river >25m wide

Bank Height (from deepest part of riffle to top of bank-first flat surface you stand on): (m) .5

Bank Angle: 120 ° or NA (Vertical is 90°, horizontal is 0°. Angles > 90° indicate slope is towards mid-channel, < 90° indicate slope is away from channel. NA if bank is too low for bank angle to matter.)

- Channelized Ditch
 - Deeply incised-steep, straight banks Both banks undercut at bend Channel filled in with sediment
 - Recent overbank deposits Bar development Buried structures Exposed bedrock
 - Excessive periphyton growth Heavy filamentous algae growth Green tinge Sewage smell
- Manmade Stabilization: N Y: Rip-rap, cement, gabions Sediment/grade-control structure Berm/levee

Flow conditions: High Normal Low
Turbidity: Clear Slightly Turbid Turbid Tannic Milky Colored (from dyes)
Good potential for Wetlands Restoration Project?? YES NO Details - rip-rap stream

- Channel Flow Status
- Useful especially under abnormal or low flow conditions.
- A. Water reaches base of both lower banks, minimal channel substrate exposed
 - B. Water fills >75% of available channel, or <25% of channel substrate is exposed.....
 - C. Water fills 25-75% of available channel, many logs/snags exposed.....
 - D. Root mats out of water.....
 - E. Very little water in channel, mostly present as standing pools.....

Weather Conditions: cool - showers 48h Photos: N Y Digital 35mm

Remarks: 3 yr old stream restoration - larval salamanders abundant
44 well 45 tadpoles and crayfish

None

I. Channel Modification

- A. channel natural, frequent bends..... 5
- B. channel natural, infrequent bends (channelization could be old)..... 4
- C. some channelization present..... 3
- D. more extensive channelization, >40% of stream disrupted..... 2
- E. no bends, completely channelized or rip rapped or gabioned, etc..... 0

Evidence of dredging Evidence of desnagging=no large woody debris in stream Banks of uniform shape/height

Remarks regional channel Subtotal 5

II. Instream Habitat: Consider the percentage of the reach that is favorable for benthos colonization or fish cover. If >70% of the reach is rocks, 1 type is present, circle the score of 17. Definition: leafpacks consist of older leaves that are packed together and have begun to decay (not piles of leaves in pool areas). Mark as Rare, Common, or Abundant.

1 Rocks 1 Macrophytes 1 Sticks and leafpacks 0 Snags and logs 0 Undercut banks or root mats

AMOUNT OF REACH FAVORABLE FOR COLONIZATION OR COVER

	>70%	40-70%	20-40%	<20%
	Score	Score	Score	Score
4 or 5 types present.....	20	16	12	8
3 types present.....	19	15	11	7
2 types present.....	18	14	10	6
1 type present.....	17	13	9	5
No types present.....	0			

No woody vegetation in riparian zone Remarks _____ Subtotal 15

III. Bottom Substrate (silt, sand, detritus, gravel, cobble, boulder) Look at entire reach for substrate scoring, but only look at riffle for embeddedness, and use rocks from all parts of riffle-look for "mud line" or difficulty extracting rocks.

- A. substrate with good mix of gravel, cobble and boulders
 - 1. embeddedness <20% (very little sand, usually only behind large boulders)..... 15
 - 2. embeddedness 20-40%..... 12
 - 3. embeddedness 40-80%..... 8
 - 4. embeddedness >80%..... 3
- B. substrate gravel and cobble
 - 1. embeddedness <20%..... 14
 - 2. embeddedness 20-40%..... 11
 - 3. embeddedness 40-80%..... 6
 - 4. embeddedness >80%..... 2
- C. substrate mostly gravel
 - 1. embeddedness <50%..... 8
 - 2. embeddedness >50%..... 4
- D. substrate homogeneous
 - 1. substrate nearly all bedrock..... 3
 - 2. substrate nearly all sand..... 3
 - 3. substrate nearly all detritus..... 2
 - 4. substrate nearly all silt/ clay..... 1

Remarks _____ Subtotal 6

IV. Pool Variety Pools are areas of deeper than average maximum depths with little or no surface turbulence. Water velocities associated with pools are always slow. Pools may take the form of "pocket water", small pools behind boulders or obstructions, in large high gradient streams, or side eddies.

- A. Pools present
 - 1. Pools Frequent (>30% of 200m area surveyed)
 - a. variety of pool sizes..... 10
 - b. pools about the same size (indicates pools filling in)..... 8
 - 2. Pools Infrequent (<30% of the 200m area surveyed)
 - a. variety of pool sizes..... 6
 - b. pools about the same size..... 4
- B. Pools absent..... 0

Subtotal 10

Pool bottom boulder-cobble=hard Bottom sandy-sink as you walk Silt bottom Some pools over wader depth

Remarks _____ Page Total 36

Head UT-1

V. Riffle Habitats

Definition: Riffle is area of reaeration-can be debris dam, or narrow channel area. Riffles Frequent Riffles Infrequent

	Score	Score
A. well defined riffle and run, riffle as wide as stream and extends 2X width of stream....	16	12
B. riffle as wide as stream but riffle length is not 2X stream width	14	7
C. riffle not as wide as stream and riffle length is not 2X stream width	10	3
D. riffles absent.....	0	

Channel Slope: Typical for area Steep=fast flow Low=like a coastal stream

Subtotal 12

VI. Bank Stability and Vegetation

FACE UPSTREAM

A. Banks stable

1. little evidence of erosion or bank failure(except outside of bends), little potential for erosion.. 7 7

B. Erosion areas present

1. diverse trees, shrubs, grass; plants healthy with good root systems.....	6	6
2. few trees or small trees and shrubs; vegetation appears generally healthy.....	5	5
3. sparse mixed vegetation; plant types and conditions suggest poorer soil binding.....	3	3
4. mostly grasses, few if any trees and shrubs, high erosion and failure potential at high flow..	2	2
5. little or no bank vegetation, mass erosion and bank failure evident.....	0	0

Total 12

Remarks

VII. Light Penetration Canopy is defined as tree or vegetative cover directly above the stream's surface. Canopy would block out sunlight when the sun is directly overhead. Note shading from mountains, but not use to score this metric.

	Score
A. Stream with good canopy with some breaks for light penetration	10
B. Stream with full canopy - breaks for light penetration absent.....	8
C. Stream with partial canopy - sunlight and shading are essentially equal.....	7
D. Stream with minimal canopy - full sun in all but a few areas.....	2
E. No canopy and no shading.....	0

Remarks

Subtotal 7

VIII. Riparian Vegetative Zone Width

Definition: Riparian zone for this form is area of natural vegetation adjacent to stream (can go beyond floodplain). Definition: A break in the riparian zone is any place on the stream banks which allows sediment or pollutants to directly enter the stream, such as paths down to stream, storm drains, uprooted trees, otter slides, etc.

FACE UPSTREAM

Dominant vegetation: Trees Shrubs Grasses Weeds/old field Exotics (kudzu, etc)

A. Riparian zone intact (no breaks)

	Lft. Bank Score	Rt. Bank Score
1. width > 18 meters.....	5	5
2. width 12-18 meters.....	4	4
3. width 6-12 meters.....	3	3
4. width < 6 meters.....	2	2

B. Riparian zone not intact (breaks)

1. breaks rare		
a. width > 18 meters.....	4	4
b. width 12-18 meters.....	3	3
c. width 6-12 meters.....	2	2
d. width < 6 meters.....	1	1
2. breaks common		
a. width > 18 meters.....	3	3
b. width 12-18 meters.....	2	2
c. width 6-12 meters.....	1	1
d. width < 6 meters.....	0	0

Remarks

Total 10

Disclaimer-form filled out, but score doesn't match subjective opinion-atypical stream.

Page Total 41
TOTAL SCORE 71

How 4T-5

Habitat Assessment Field Data Sheet
Mountain/ Piedmont Streams

TOTAL SCORE 76

Biological Assessment Unit, DWQ

Directions for use: The observer is to survey a minimum of 100 meters with 200 meters preferred of stream, preferably in an upstream direction starting above the bridge pool and the road right-of-way. The segment which is assessed should represent average stream conditions. To perform a proper habitat evaluation the observer needs to get into the stream. To complete the form, select the description which best fits the observed habitats and then circle the score. If the observed habitat falls in between two descriptions, select an intermediate score. A final habitat score is determined by adding the results from the different metrics.

Stream How 4T-5 Location/road: Snow Camp (Road Name How 4T-5) County Alamance

Date 2/10/11 CC# 03030002 Basin Cane Run Subbasin 03-06-04

Observer(s) MAPO Type of Study: Fish Benthos Basinwide Special Study (Describe) _____

Latitude 35.952576 Longitude 79.361977 Ecoregion: MT P Slate Belt Triassic Basin

Water Quality: Temperature _____ °C DO _____ mg/l Conductivity (corr.) _____ μS/cm pH _____

Physical Characterization: Visible land use refers to immediate area that you can see from sampling location - include what you estimate driving thru the watershed in watershed land use.

Visible Land Use: 10 %Forest _____ %Residential 80 %Active Pasture _____ % Active Crops
10 %Fallow Fields _____ % Commercial _____ %Industrial _____ %Other - Describe: _____

Watershed land use : Forest Agriculture Urban Animal operations upstream

Width: (meters) Stream 1 Channel (at top of bank) .2 Stream Depth: (m) Avg .1 Max .5
 Width variable Large river >25m wide

Bank Height (from deepest part of riffle to top of bank-first flat surface you stand on): (m) .2

Bank Angle: 120 ° or NA (Vertical is 90°, horizontal is 0°. Angles > 90° indicate slope is towards mid-channel, < 90° indicate slope is away from channel. NA if bank is too low for bank angle to matter.)

Channelized Ditch
 Deeply incised-steep, straight banks Both banks undercut at bend Channel filled in with sediment
 Recent overbank deposits Bar development Buried structures Exposed bedrock
 Excessive periphyton growth Heavy filamentous algae growth Green tinge Sewage smell
Manmade Stabilization: N Y: Rip-rap, cement, gabions Sediment/grade-control structure Berm/levee

Flow conditions : High Normal Low
Turbidity: Clear Slightly Turbid Turbid Tannic Milky Colored (from dyes)

Good potential for Wetlands Restoration Project?? YES NO Details _____

Channel Flow Status
Useful especially under abnormal or low flow conditions.
A. Water reaches base of both lower banks, minimal channel substrate exposed
B. Water fills >75% of available channel, or <25% of channel substrate is exposed.....
C. Water fills 25-75% of available channel, many logs/snags exposed.....
D. Root mats out of water.....
E. Very little water in channel, mostly present as standing pools.....

Weather Conditions: cloudy cool Photos: N Y Digital 35mm

Remarks: - 5400 ft high - post 48 years but has been cut
now 40 years - 2 year old stream restoration

reach 4/8

I. Channel Modification

- A. channel natural, frequent bends..... **Score** 5
- B. channel natural, infrequent bends (channelization could be old)..... 4
- C. some channelization present..... 3
- D. more extensive channelization, >40% of stream disrupted..... 2
- E. no bends, completely channelized or rip rapped or gabioned, etc..... 0

Evidence of dredging Evidence of desnagging=no large woody debris in stream Banks of uniform shape/height

Remarks Restored stream channel Subtotal 5

II. Instream Habitat: Consider the percentage of the reach that is favorable for benthos colonization or fish cover. If >70% of the reach is rocks, 1 type is present, circle the score of 17. Definition: leafpacks consist of older leaves that are packed together and have begun to decay (not piles of leaves in pool areas). Mark as Rare, Common, or Abundant.

Rocks Macrophytes Sticks and leafpacks Snags and logs Undercut banks or root mats

AMOUNT OF REACH FAVORABLE FOR COLONIZATION OR COVER

	>70%	40-70%	20-40%	<20%
	Score	Score	Score	Score
4 or 5 types present.....	20	16	12	8
3 types present.....	19	<u>13</u>	11	7
2 types present.....	18	14	10	6
1 type present.....	17	13	9	5
No types present.....	0			

No woody vegetation in riparian zone Remarks _____ Subtotal 5

III. Bottom Substrate (silt, sand, detritus, gravel, cobble, boulder) Look at entire reach for substrate scoring, but only look at riffle for embeddedness, and use rocks from all parts of riffle-look for "mud line" or difficulty extracting rocks.

- A. substrate with good mix of gravel, cobble and boulders** **Score**
 - 1. embeddedness <20% (very little sand, usually only behind large boulders)..... 15
 - 2. embeddedness 20-40%..... 12
 - 3. embeddedness 40-80%..... 8
 - 4. embeddedness >80%..... 3
- B. substrate gravel and cobble**
 - 1. embeddedness <20%..... 14
 - 2. embeddedness 20-40%..... 11
 - 3. embeddedness 40-80%..... 6
 - 4. embeddedness >80%..... 2
- C. substrate mostly gravel**
 - 1. embeddedness <50%..... 8
 - 2. embeddedness >50%..... 4
- D. substrate homogeneous**
 - 1. substrate nearly all bedrock..... 3
 - 2. substrate nearly all sand..... 3
 - 3. substrate nearly all detritus..... 2
 - 4. substrate nearly all silt/ clay..... 1

Remarks _____ Subtotal 6

IV. Pool Variety Pools are areas of deeper than average maximum depths with little or no surface turbulence. Water velocities associated with pools are always slow. Pools may take the form of "pocket water", small pools behind boulders or obstructions, in large high gradient streams, or side eddies.

- A. Pools present** **Score**
 - 1. Pools Frequent (>30% of 200m area surveyed)
 - a. variety of pool sizes..... 10
 - b. pools about the same size (indicates pools filling in)..... 8
 - 2. Pools Infrequent (<30% of the 200m area surveyed)
 - a. variety of pool sizes..... 6
 - b. pools about the same size..... 4
- B. Pools absent..... 0**

Subtotal 8

Pool bottom boulder-cobble=hard Bottom sandy-sink as you walk Silt bottom Some pools over wader depth

Remarks _____

Page Total 34

Handwritten: H-ow 475

V. Riffle Habitats

Definition: Riffle is area of reaceration-can be debris dam, or narrow channel area. Riffles Frequent Riffles Infrequent

Table with 2 columns: Riffles Frequent Score, Riffles Infrequent Score. Rows: A. well defined riffle and run, riffle as wide as stream and extends 2X width of stream... (16), B. riffle as wide as stream but riffle length is not 2X stream width (14), C. riffle not as wide as stream and riffle length is not 2X stream width (10), D. riffles absent (0)

Channel Slope: [X] Typical for area [] Steep=fast flow [] Low=like a coastal stream Subtotal 16

VI. Bank Stability and Vegetation

FACE UPSTREAM

A. Banks stable

1. little evidence of erosion or bank failure(except outside of bends), little potential for erosion. (7) (7)

B. Erosion areas present

Table with 3 columns: Description, Left Bank Score, Rt. Bank Score. Rows: 1. diverse trees, shrubs, grass; plants healthy with good root systems... (6, 6), 2. few trees or small trees and shrubs; vegetation appears generally healthy... (5, 5), 3. sparse mixed vegetation; plant types and conditions suggest poorer soil binding... (3, 3), 4. mostly grasses, few if any trees and shrubs, high erosion and failure potential at high flow.. (2, 2), 5. little or no bank vegetation, mass erosion and bank failure evident... (0, 0)

Total 14

Remarks

VII. Light Penetration Canopy is defined as tree or vegetative cover directly above the stream's surface. Canopy would block out sunlight when the sun is directly overhead. Note shading from mountains, but not use to score this metric.

Table with 2 columns: Description, Score. Rows: A. Stream with good canopy with some breaks for light penetration (10), B. Stream with full canopy - breaks for light penetration absent (8), C. Stream with partial canopy - sunlight and shading are essentially equal (7), D. Stream with minimal canopy - full sun in all but a few areas (2), E. No canopy and no shading (0)

Subtotal 2

Remarks

VIII. Riparian Vegetative Zone Width

Definition: Riparian zone for this form is area of natural vegetation adjacent to stream (can go beyond floodplain). Definition: A break in the riparian zone is any place on the stream banks which allows sediment or pollutants to directly enter the stream, such as paths down to stream, storm drains, uprooted trees, otter slides, etc.

FACE UPSTREAM

Dominant vegetation: [X] Trees [X] Shrubs [X] Grasses [] Weeds/old field [] Exotics (kudzu, etc) Lft. Bank Score Rt. Bank Score

A. Riparian zone intact (no breaks)

Table with 3 columns: Description, Lft. Bank Score, Rt. Bank Score. Rows: 1. width > 18 meters... (5, 5), 2. width 12-18 meters... (4, 4), 3. width 6-12 meters... (3, 3), 4. width < 6 meters... (2, 2)

B. Riparian zone not intact (breaks)

Table with 3 columns: Description, Lft. Bank Score, Rt. Bank Score. Rows: 1. breaks rare: a. width > 18 meters... (4, 4), b. width 12-18 meters... (3, 3), c. width 6-12 meters... (2, 2), d. width < 6 meters... (1, 1); 2. breaks common: a. width > 18 meters... (3, 3), b. width 12-18 meters... (2, 2), c. width 6-12 meters... (1, 1), d. width < 6 meters... (0, 0)

Total 10

Remarks

Page Total 42

TOTAL SCORE 76

[] Disclaimer-form filled out, but score doesn't match subjective opinion-atypical stream.