MY3 FINAL MONITORING REPORT

Odell's House Mitigation Project

Johnston County

Neuse River Basin

CU 03020201

DMS Project # 100041
DMS Contract # 7420
Contracted RFP # 16-007279
USACE Action ID Number: SAW-2018-00431
DWR Project # 2018-0200
Calendar Year of Data Collection: 2023

Prepared for:
North Carolina Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

WATER & LAND SOLUTIONS
7721 SIX FORKS ROAD, SUITE 130, RALEIGH, NC 27615
(919) 614 - 5111 | waterlandsolutions.com

December 29, 2023

NC Department of Environmental Quality
Division of Mitigation Services
Attn: Emily Dunnigan, Project Manager
217 W. Jones Street, Suite 3000
Raleigh, NC 27609

RE: WLS Responses to NCDEQ DMS Review Comments for Task 9 Submittal, Draft Monitoring Year 3 Report for the Odell's House Mitigation Project, DMS Full-Delivery Project ID #100041, Contract #7420, Neuse River Basin, Cataloging Unit 03020201, Johnston County, NC

Dear Ms. Dunnigan:

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

1. Report PDF
2. Support Files
    - 1_ Tables
    - 2_CCPV
    - 3_Veg
    - 4_Geomorph
    - 5_Hydro
    - 6_Photos

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

General:

1. **Figure 1b: Add date to replanted area in legend (1/2022).** WLS Response: The date has been added to the replanted area in the Figure 1b legend.
2. **Figure 1b: Is the low stem density area the same as it was in MY2? Indicate if this is true by adding MY3 in legend.** WLS Response: The low stem density area is the same as it was in MY2 and the legend on Figure 1b and c have been updated accordingly.
3. **Appendix A, Vegetation Condition Assessment Table: Update low stem acreage to 0.33 acres.** WLS Response: The low stem acreage has been updated to the correct acreage in the Appendix A, Vegetation Condition Assessment Table.

4. **Appendix A, Cross-Section Photos: XS-8 MY0 right bank photo glitched; please update.** WLS Response: The photo has been updated in the PDF report.
5. **Appendix C, Headwater Photos: It's great that R5 appears to have 8/9 channel forming indicators, but only photos were provided for 1 of the indicators. Please update with additional photos and/or provide photographs for each indicator in future reports.** WLS Response: WLS will take photos of additional channel forming indicators and provide them in the MY4 report.
6. **Appendix C, R1 Drone Photo: Please make the labels on the aerial more legible.** WLS Response: The labels on the R1 aerial photo have been updated to be easier to read.
7. **Appendix D: DMS encourages WLS to include gauge data for the entirety of the growing season in the final submission.** WLS Response: WLS has included all gauge data that has been collected in the final report (ending 9/26/23). For future monitoring reports, efforts will be made to include data as close to the end of the growing season as feasibly possible with monitoring schedules.
8. **Appendix D, Rainfall Data Table: Based on the data for October 2023 rainfall was not normal; please update the table/graph. Please update with rainfall through November if possible.** WLS Response: WLS updated all months' rainfall overall designation and added the rainfall total for November 2023 in the table and graph.

Riparian Buffer:

1. **Pg. 7, Section 3.2, last paragraph: Provide a breakdown of credits/sqft at risk by buffer credit type (0-100 vs 101-200).** WLS Response: A breakdown of credits/sq. ft. at risk by buffer credit type has been added to the At-Risk Credit Table in the report narrative.
2. **See AMP comment #1 above. Please remove the AMP and add these details to the report narrative.** WLS Response: WLS has removed the AMP and added all details into the report narrative as requested.
3. **DWR has requested raw vegetation data (individual tree heights and species by plot) so they can get a better idea of tree conditions. The veg plot input tables used in the Shiny App easily fulfill this need. This should be included in an Appendix.** WLS Response: The Shiny App vegetation plot input tables have been added to the report in Appendix B.

Adaptive Management Plan:

1. An adaptive management plan is not necessary for this project as no remedial action is being proposed to fix the subsurface flow of R1. Please remove the AMP and add details of the subsurface flow, at-risk credits, and summary to the report narrative. Update the CCPV with the features called out in the AMP Figure 1 (and/or rename the AMP figure and include with the other CCPVs). Please do not include credit values at risk in the final report. WLS Response: WLS has removed the AMP and added all details into the report narrative as requested. The credit values at risk column in the At-Risk Credit Table has been removed in the final report.
2. Pg. 3, Section 3: Is WLS intending to continue vegetation monitoring in the at-risk areas? Please explain in narrative. WLS Response: WLS will continue vegetation monitoring in the at-risk area as well as stream flow and wetland hydrology.

Electronic Comments:

1. The report indicates the low stem density identified on reach 5 as MY 2 in the CCPV, this same shapefile has been submitted in MY 3 as low stem density and this is not depicted on the CCPV. Please verify the current state of low stem density and ensure the correct file has been submitted. WLS Response: The low stem density labels have been updated to MY3 on the CCPV to reflect that the current low stem density shapefile is correct.

Boundary Inspection:

1. At corner #27 ensure the aluminum cap is affixed to the rebar and is stamped with corner number. WLS Response: WLS will ensure the aluminum cap is affixed to the rebar and is stamped with the corner number at the beginning of MY4.
2. Add signs where needed at witness posts. Ref KML for example locations. WLS Response: WLS will add signs at all witness posts indicated in the reference KML at the beginning of MY4.
3. Add signs online to ensure at least one sign every 200 feet. Ref. KML for example locations. WLS Response: WLS will add additional signs at locations indicated in the reference KML at the beginning of MY4.
4. Straighten or replace bent t-posts where encountered. Ref. KML for example locations. WLS Response: WLS will straighten or replace all bent t-posts identified in the reference KML at the beginning of MY4.
5. Remove tree from fence and repair. WLS Response: WLS will remove the tree from the fence and repair.
6. In multiple locations the fence extends well outside of the conservation easement. This is acceptable if the landowner agrees with this practice. Confirm the location of these signs with the landowner and if acceptable document the conversation. If not, please remove. WLS Response: The fence location was coordinated with and approved by all landowners during project construction.
7. Where the fence was broken and recent sign of livestock in the easement area was noted, fix the broken fence. Communicate this observation to the landowner and encourage them to speak with their neighbor to try and avoid future impacts to the easement area. WLS Response: WLS monitoring staff repaired the broken section of fence on 11/28/23. Photos of the repair have been included in the final report (see Appendix A). WLS has communicated to all landowners that if they notice any fence issues, they should call WLS to have field staff repair the issue as soon as possible.
8. Wooden post fasteners should be upgraded to an ACQ appropriate fastener with an appropriate length of 2.5-3" to ensure fastening strength over time. WLS Response: WLS will replace any easement signs and fasteners that are damaged/failing as needed.

Please contact me if you have any questions or comments.

Sincerely,

Alyssa Davis

Water & Land Solutions, LLC
Alyssa Davis
Water & Land Solutions, LLC
7721 Six Forks Road, Suite 130
Raleigh, NC 27615
Office Phone: (919) 614-5111
Email: alyssa@waterlandsolutions.com

Table of Contents

LIST OF APPENDICES

1 Project Summary

1.1 Project Location and Description

The Odell's House Mitigation Project ("Project") is a North Carolina Department of Environmental Quality (NCDEQ), Division of Mitigation Services (DMS) full-delivery stream and wetland mitigation project contracted with Water & Land Solutions, LLC (WLS) in response to RFP 16-007279. The Project provides stream and wetland mitigation credits in the Neuse River Basin (Cataloging Unit 03020201). The project site is in Johnston County, North Carolina between the Town of Wendell and the Community of Archer Lodge. The Project is in the Lower Buffalo Creek Priority Sub-watershed 030202011504, study area for the Neuse 01 Regional Watershed Plan Phase II, Final Report (RWP), and in the Targeted Local Watershed 03020201180050 of the Neuse River Basin.

The Project involved the restoration, enhancement, preservation, and permanent protection of eight stream reaches (R1, R2, R3, R4, R5, R6, R7 upper, and R7 lower), six wetland areas (W1, W2, W3, W4, W5, and W6), and their riparian buffers, totaling approximately 4,313 linear feet of designed streams and 453,057.200 square feet of riparian buffers. Stream restoration is within the conservation easement and the existing powerline right-of-way. The Project also includes riparian wetland restoration (re-establishment and rehabilitation), enhancement, and the preservation of 3.890 acres (based on design). The Project will provide significant ecological improvements and functional uplift through stream and wetland restoration and will decrease nutrient and sediment loads within the watershed. The mitigation plan provides a detailed project summary and Table 1 provides a summary of project assets. Figure 1a-c illustrates the project mitigation components.

Prior to construction, landowners historically manipulated streams and ditched riparian wetland systems to provide areas for crop production and cattle grazing. Cattle had complete access to streams and wetlands except for R7 and W5/W6, resulting in eroded banks, habitat destruction, and poor water quality. Two man-made ponds existed where reaches R1 and R5 are now located.

Monitoring Year 3 (MY3) activities occurred during March and September 2023. This report presents the data for MY3. The Project meets the MY3 success criteria for stream horizontal and vertical stability and streambed condition and stability. Stream hydrology is meeting success criteria for flow on R5, but not meeting flow requirements on R1. Ten of the twelve vegetation plots met interim success criteria. The site is meeting wetland hydrology requirements at all locations except GW-1 and GW-6. For more information on the chronology of the project history and activity, refer to Appendix E. Relevant project contact information is presented in Appendix E, and project background information is presented in Table 3.

1.2 Project Quantities and Credits

The Project mitigation components include a combination of Stream Restoration, Enhancement, and Preservation activities, as well as Riparian Wetland Restoration (Re-establishment & Rehabilitation), Enhancement, and Preservation, as summarized in Table 1 below.

Table 1. Odell's House (ID-100041) Project Mitigation Quantities and Credits							
Project Segment	Original Mitigation Plan Ft/Ac	As-Built Ft/Ac	Original Mitigation Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Credits	Comments
Stream							
R1	437	533	Warm	R (PI/HW)	1.00000	437.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement
R2	526	518	Warm	EII	2.50000	210.400	Livestock Exclusion, Invasive Control, Supplemental Planting, Habitat Structures, Permanent Conservation Easement
R3	1,091	1,103	Warm	R (PI)	1.00000	1,091.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement
R4	190	199	Warm	EII	3.00000	63.333	Livestock Exclusion, Invasive Control, Supplemental Planting, Habitat Structures, Permanent Conservation Easement
R5	340	392	Warm	R (PI/HW)	1.00000	340.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement
R6	432	422	Warm	R (PI)	1.00000	432.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement
R7 (upper)	625	674	Warm	EI	1.50000	416.667	Dimension, Pattern and Profile modified, Livestock Exclusion, Supplemental Planting, Permanent Conservation Easement
R7 (lower)	412	461	Warm	P	10.00000	41.200	Permanent Conservation Easement
					Total:	**3,031.600**	
Wetland							
W1	0.476	0.477	R	REE	1.00000	0.476	Livestock Exclusion, Pond drainage, Limited soil manipulation, and Planting
W2	0.416	0.413	R	REE	1.00000	0.416	Livestock Exclusion, Pond drainage, Limited soil manipulation, and Planting
W3	0.666	0.645	R	RH	1.50000	0.444	Limited soil manipulation and Planting
W4	0.234	0.227	R	REE	1.00000	0.234	Limited soil manipulation, Restored groundwater hydrology and Planting
W5	1.654	1.636	R	E	2.50000	0.662	Restored hydrology and Planting
W6	0.444	0.440	R	P	10.00000	0.044	Permanent Conservation Easement
					Total:	**2.276**	

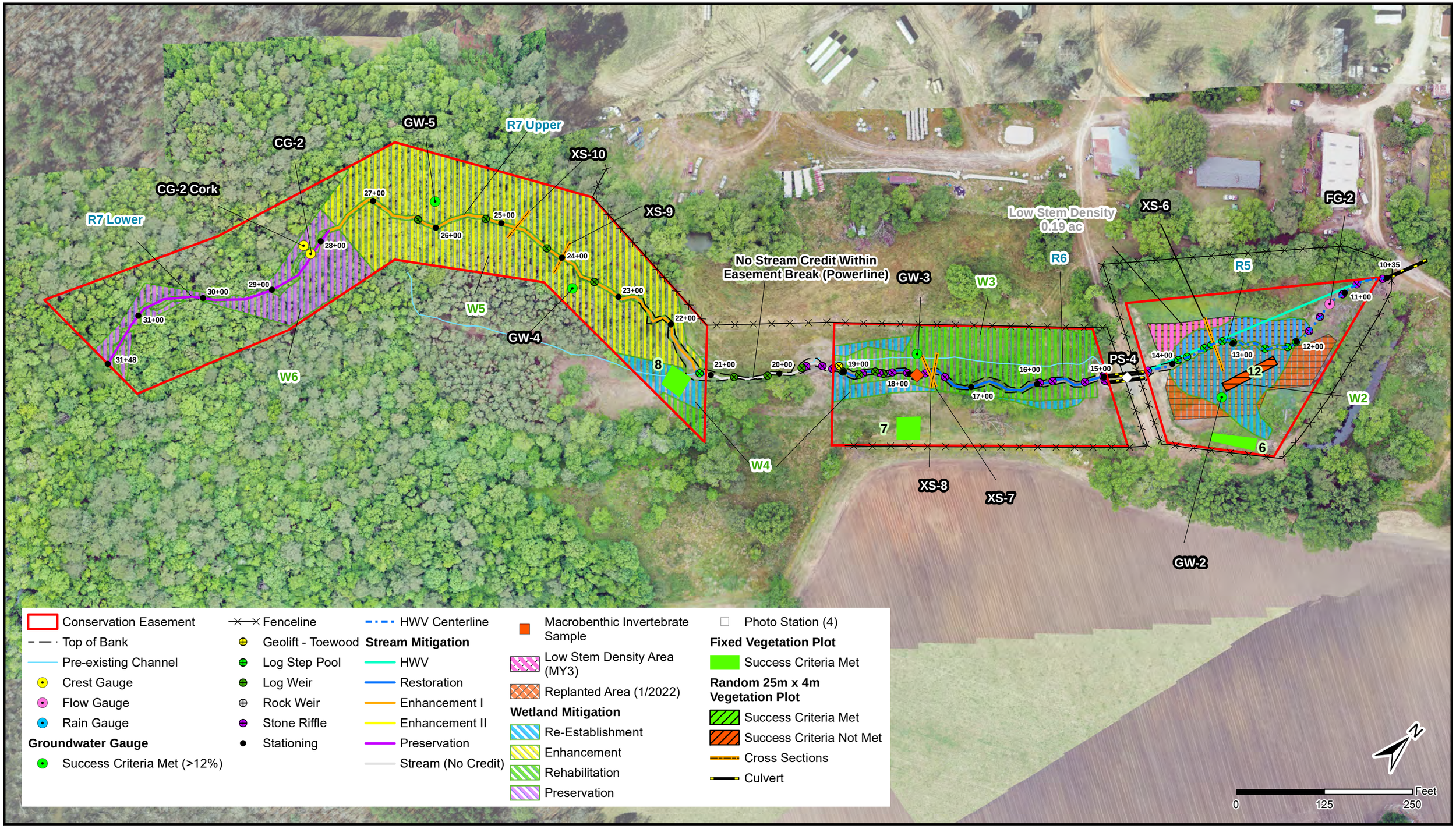
Project Credits						
	Stream			Riparian	Non-Rip	Coastal
Restoration Level	Warm	Cool	Cold	Wetland	Wetland	Marsh
Restoration	2,300.000					
Re-establishment				1.126		
Rehabilitation				0.444		
Enhancement				0.662		
Enhancement I	416.667					
Enhancement II	273.733					
Creation						
Preservation	41.200			0.044		
Totals	**3,031.600**			**2.276**		

Total Stream Credit	**3,031.600**
Total Wetland Credit	**2.276**

1.3 Current Condition Plan View

The following pages present the Current Condition Plan View (CCPV).

WATER & LAND™ SOLUTIONS	NC Mitigation Services ENVIRONMENTAL QUALITY	**Odells House Mitigation Project** **Johnston County, North Carolina**	USACE Action ID Number: SAW-2018-00431 October 2023 MY3	USACE Current Conditions Plan View Monitoring Year 3 NAD 1983 2011 State Plane North Carolina FIPS 3200 FT US	FIGURE 1a



WATER & LAND™ SOLUTIONS

NC Mitigation Services ENVIRONMENTAL QUALITY

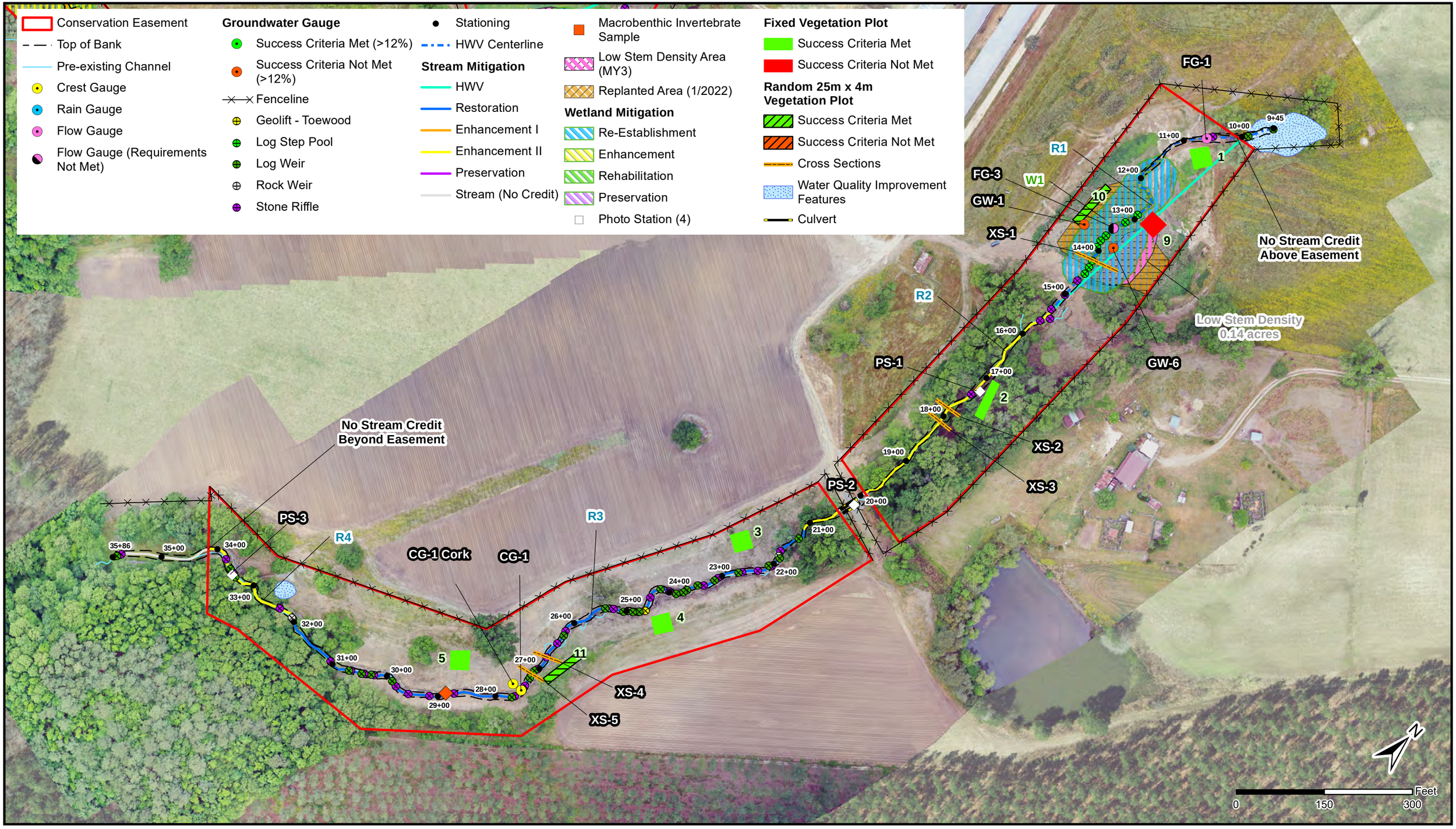
Odells House Mitigation Project
Johnston County, North Carolina

USACE Action ID Number:
SAW-2018-00431
October 2023
MY3

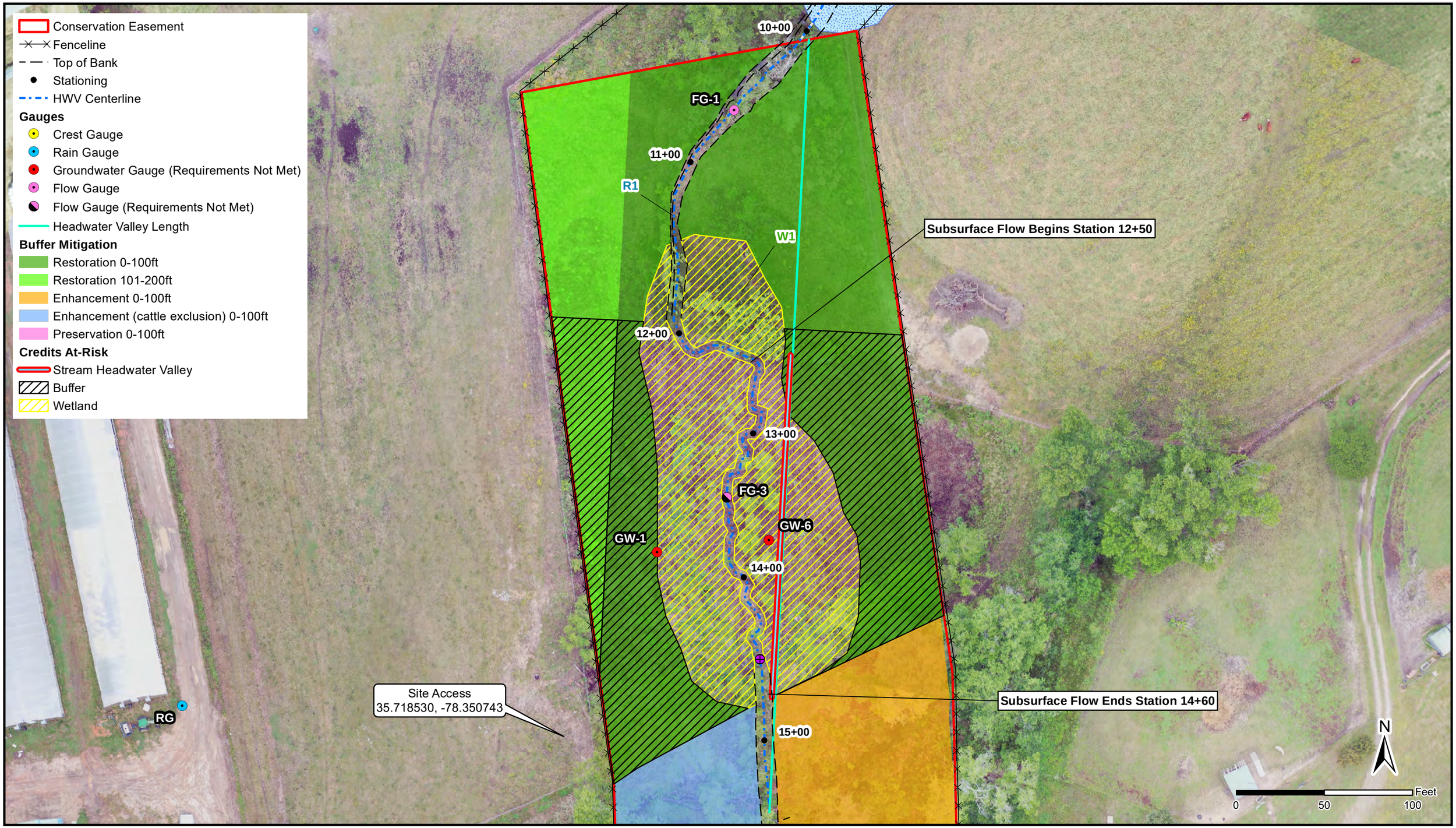
USACE
Current Conditions Plan View
Monitoring Year 3

NAD 1983 2011 State Plane
North Carolina FIPS 3200 FT US

FIGURE
1b



WATER & LAND™ SOLUTIONS	NC Mitigation Services ENVIRONMENTAL QUALITY	**Odells House Mitigation Project** **Johnston County, North Carolina**	USACE Action ID Number: SAW-2018-00431 October 2023 MY3	USACE Current Conditions Plan View Monitoring Year 3 NAD 1983 2011 State Plane North Carolina FIPS 3200 FT US	FIGURE 1c



WATER & LAND™ SOLUTIONS	NC Mitigation Services ENVIRONMENTAL QUALITY	**Odells House Mitigation Project** **Johnston County, North Carolina**	USACE Action ID Number: SAW-2018-00431 October 2023 MY3	USACE Current Conditions Plan View Monitoring Year 3 NAD 1983 2011 State Plane North Carolina FIPS 3200 FT US	FIGURE 1d

2 Goals, Performance Criteria, and Functional Improvements

2.1 Project Goals and Objectives

The Project will meet the goals and objectives described in the Odell's House Final Approved Mitigation Plan and address the general restoration goals and opportunities outlined in the DMS Neuse River Basin Watershed Restoration Priorities (RBRP). More specifically, three out of the four functional goals and objectives outlined in the Wake-Johnston Collaborative Local Watershed Plan (LWP) as well as the Neuse 01 RWP will be met by:

- Reducing sediment and nutrient inputs to the Buffalo Creek Watershed.
- Restoring, preserving, and protecting wetlands, streams, riparian buffers, and aquatic habitat.
- Implementing agricultural BMPs and stream restoration in rural catchments together as "project clusters".

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

- Restore stream and floodplain interaction and geomorphically stable conditions by reconnecting historic flow paths and promoting more natural flood processes;
- Improve and protect water quality by reducing streambank erosion, nutrient, and sediment inputs;
- Restore and protect riparian buffer functions and habitat connectivity in perpetuity by recording a permanent conservation easement;
- Incorporate water quality improvement features to reduce nonpoint source inputs to receiving waters

Table 2: Summary: Goals, Performance and Results					
Goal	**Objective/Treatment**	**Likely Functional Uplift**	**Performance Criteria**	**Measurement**	**Cumulative Monitoring Results**
Improve Stream Base Flow Duration	Improve and/or remove existing stream crossings and restore a more natural flow regime and aquatic passage.	Create a more natural and higher functioning headwater flow regime and provide aquatic passage; re-establish appropriate wetland hydroperiods and provide hydrologic storage	Maintain seasonal flow on intermittent stream for a minimum of 30 consecutive days during normal annual rainfall	3 Flow gauges (R1 & R5)	2/3 flow gauges met critiera
Reconnect channels with floodplains and riparian wetlands to allow a natural flooding regime.	Design BHRs to not exceed 1.2 and increase ERs no less than 2.2 for Rosgen 'C' and 'E' stream types and 1.4 for 'B' stream types.	Provide temporary water storage and reduce erosive forces (shear stress) in channel during larger flow events.	Minimum of four bankfull events in separate years. Wetland hydrology for 12% of growing season.	2 Crest Gauges/pressure transducers (R3 & R7 Lower) and 6 wetland groundwater gauges (W1, W2, W3, & W5)	2/2 crest gauges met critiera and 4/6 wetland groundwater gauges met 12% criteria.
Improve stabilty of stream channels	Construct stream channels that will maintain stable cross- sections, patterns, and profiles over time.	Reduction in sediment inputs from bank erosion, reduction of shear stress, and improved overall hydraulic function.	Bank height ratios remain below 1.2 over the monitoring period. Visual assessments showing progression towards stability.	10 Cross section surveys	10/10 cross sections BHR<1.2
Establish Riparian Buffer Vegetation	Plant native species vegetation a minimum 50' wide from the top of the streambanks with a composition/density comparable to downstream reference condition.	Increase woody and herbaceous vegetation will provide channel stability and reduce streambank erosion, runoff rates and exotic species vegetation.	Within planted portions of the site, a minimum of 320 stems per acre must be present at year three; a minimum of 260 stems per acre must be present at year five and average height of seven feet; and a minimum of 210 stems per acre and average ten foot tree heights must be present at year seven.	Tree data for 12 Veg Plots (species & height), visual assessment	10/12 veg plots met - 2023

2.2 Project Success Criteria

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

2.2.1 Streams

***Stream Hydrology*:** Four separate bankfull or over bank events must be documented within the seven-year monitoring period, and the stream hydrology monitoring will continue until four bankfull events have been documented in separate years. Stream hydrology monitoring will be accomplished with pressure transducers installed in pools and correlating sensor depth to top of bank elevation (see appendix D for installation diagrams). Recorded water depth above the top of bank elevation will document a bankfull event. The devices will record water depth hourly and will be inspected quarterly. In addition to the pressure transducers, traditional cork gauges will be installed at bankfull elevation and will be used to document bankfull events with photographs.

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

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

Stream cross-section monitoring will be conducted using a Topcon Total Station. Three-dimensional coordinates associated with cross-section data will be collected in the field (NAD83 State Plane feet FIPS 3200). Morphological data will be collected at ten cross-sections. Survey data will be imported into Microsoft Excel® and the DMS Shiny App for data processing and analysis.

Reference photo transects will be taken at each permanent cross-section. Lateral photos should not indicate excessive erosion or continuing degradation of the streambanks. Photographs will be taken of both streambanks at each cross-section. A survey tape stretched between the permanent cross-section monuments/pins will be centered in each of the streambank photographs. The water elevation will be shown in the lower edge of the frame, and as much of the streambank as possible will be included in each photo. Photographers will attempt to consistently maintain the same area in each photo over time.

Jurisdictional Stream Flow: Monitoring of stream flow will be conducted to demonstrate that the restored stream systems classified as intermittent exhibit surface flow for a minimum of 30 consecutive days throughout some portion of the year during years with normal rainfall conditions. Stream flow monitoring will be accomplished with pressure transducers installed in pools and correlating sensor depth to the downstream top of riffle elevation (see appendix D for installation diagrams). If the pool water depth is at or above the top of riffle elevation, then the channel will be assumed to have surface flow. The devices will record water elevation twice per day and will be inspected quarterly to document surface hydrology and provide a basis for evaluating flow response to rainfall events.

The stage recorders include an automatic pressure transducer (HOBO Water Level (13 ft) Logger) set in PVC piping in the channel. The elevation of the bed and top of bank at each stage recorder location will be recorded to be able to document presence of water in the channel and out of bank events. Visual observations (i.e. wrack or debris lines) and traditional cork crest gauges will also be used to document out of bank events.

Channel Formation: During monitoring years 1 through 4, the preponderance of evidence must demonstrate a concentration of flow indicative of headwater stream channel formation within the topographic low-point of the valley or crenulation as documented by the following indicators for reaches R1 and R5:

- Scour (indicating sediment transport by flowing water)
- Sediment deposition (accumulations of sediment and/or formation of ripples)
- Sediment sorting (sediment sorting indicated by grain-size distribution with the primary path of flow)
- Multiple observed flow events (must be documented by gauge data and/or photographs)
- Destruction of terrestrial vegetation
- Presence of litter and debris
- Wracking (deposits of drift material indicating surface water flow)
- Vegetation matted down, bent, or absent (herbaceous or otherwise)
- Leaf litter disturbed or washed away

During monitoring years 5 through 7, the stream must successfully meet the requirements above and the preponderance of evidence must demonstrate the development of stream bed and banks as documented by the following indicators:

- Bed and banks (may include the formation of stream bed and banks, development of channel pattern such as meander bends and/or braiding at natural topographic breaks, woody debris, or plant root systems)
- Natural line impressed on the bank (visible high-water mark)
- Shelving (shelving of sediment depositions indicating transport)
- Water staining (staining of rooted vegetation)
- Change in plant community (transition to species adapted for flow or inundation for a long duration, including hydrophytes)
- Changes in character of soil (texture and/or chroma changes when compared to the soils abutting the primary path of flow)

2.2.2 Wetlands

Wetland Hydrology: The performance standard for wetland hydrology will be 12 percent based on the suggested wetland saturation thresholds for soils' taxonomic subgroups. The proposed success criteria for wetland hydrology will be when the soils are saturated within 12 inches of the soil surface for 12 percent (27 days) of the 227-day growing season (March 21st through November 3rd) based on the WETS data table for Johnston County, NC. The saturated conditions should occur during a period when antecedent precipitation has been normal or drier than normal for a minimum frequency of 5 years in 10 (USACE, 2005 and 2010b). Precipitation data will be obtained from an on-site rain gauge and the Clayton (CLAY) Research Weather Station, approximately nine miles southeast of the Project site. If a normal year of precipitation does not occur during the first seven years of monitoring, WLS will continue to monitor the Project hydrology until the Project site has been saturated for the appropriate hydroperiod. If rainfall amounts for any given year during the monitoring period are abnormally low, reference wetland hydrology data will be compared to determine if there is a correlation with the weather conditions and site variability.

2.2.3 Vegetation

Vegetation monitoring will occur in the fall each required monitoring year, prior to leaf drop. Plots will be monitored in years 1, 2, 3, 5, and 7. Vegetative success for the Project during the intermediate monitoring years will be based on the survival of at least 320, three-year-old trees per acre at the end of Year 3 of the

monitoring period; and at least 260, five-year-old, trees per acre that must average seven feet in height at the end of Year 5 of the monitoring period. The final vegetative restoration success criteria will be achieving a density of no less than 210, seven-year-old stems per acre that must average ten feet in height in Year 7 of monitoring. Volunteer species on the approved planting list that meet success criteria standards will be counted towards success criteria.

Vegetation success will be monitored at a total of nine permanent vegetation plots (10m x 10m) and 3 random vegetation transects (50m x 2m). Vegetation plot monitoring follows the CVS-EEP Level 2 Protocol for Recording Vegetation, version 4.2 (Lee et al. 2008) and includes analysis of species composition and density of planted species. Data will be processed using the DMS Shiny App. In the field, the four corners of each plot will be permanently marked with PVC at the origin and rebar at the other corners. Tree species and height will be recorded for each planted stem, and photos of each plot are to be taken from the origin each monitoring year.

2.2.4 Visual Assessment

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

3 Project Attributes

3.1 Design Approach

The Project stream design approach included a combination of Stream Restoration, Enhancement, and Preservation activities (see Table 1). Priority Level I restoration approaches were incorporated with the design of both single-thread meandering channels and headwater stream valleys. All non-vegetated areas within the conservation easement were planted with native species vegetation, and any areas of invasive species were removed and/or treated.

3.2 Project Attributes

See Table 3 below for Project Attributes.

Table 3. Project Attribute Table								
Project Name	Odell's House Mitigation Project							
County	Johnston							
Project Area (acres)	15.092							
Project Coordinates (latitude and longitude decimal degrees)	35.71589, -78.35345							
Project Watershed Summary Information								
Physiographic Province	Piedmont							
River Basin	Neuse							
USGS Hydrologic Unit 8-digit	3020201							
DWR Sub-basin	03-04-06							
Project Drainage Area (acres)	41.8 (R7 lower) and 95.4 (R4)							
Project Drainage Area Percentage of Impervious Area	<1%							
Land Use Classification	2.01.03, 2.01.01, 3.02 (69% cultivated crops/hay, 2% grass/herbaceous, 25% mixed forest, 4% pond)							
Reach Summary Information								
Parameters	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**	**R7 (upper)**	**R7 (lower)**
Pre-project length (feet)	N/A (pond)	632	1169	392	N/A (pond)	610	468	412
Post-project (feet)	533	518	1103	199	392	422	674	461
Valley confinement (Confined, moderately confined, unconfined)	N/A	moderately confined	moderately confined	unconfined	N/A	unconfined	unconfined	unconfined
Drainage area (acres)	42.9	64	83.2	95.4	19.4	30.7	39.7	41.8
Perennial, Intermittent, Ephemeral	N/A	Perennial	Intermittent	Intermittent	N/A	Intermittent	Intermittent	Intermittent
NCDWR Water Quality Classification	C, NSW	C, NSW	C, NSW	C, NSW	C, NSW	C, NSW	C, NSW	C, NSW
Dominant Stream Classification (existing)	N/A (pond)	C5	G5	E5	N/A (pond)	E5	G5	E5/DA
Dominant Stream Classification (proposed)	DA/E5	C5	B5	E5	DA/E5	B5c	B5c	E5
Dominant Evolutionary class (Simon) if applicable	N/A	IV/V	III	IV/V	N/A	III	I	I
Wetland Summary Information								
Parameters	**W1**	**W2**	**W3**	**W4**	**W5**	**W6**		
Pre-project (acres)	0.476	0.416	0.666	0.234	1.654	0.444		
Post-project (acres)	0.477	0.413	0.645	0.227	1.636	0.44		
Wetland Type (non-riparian, riparian)	Riparian Riverine	Riparian Riverine	Riparian Riverine	Riparian Riverine	Riparian Riverine	Riparian Riverine		
Mapped Soil Series	Water, Cowarts loamy sand	Water	Leaf silt loam, Cowarts loamy sand	Leaf silt loam, Cowarts loamy sand	Leaf silt loam, Bonneau sand, Wedowee sandy loam	Bonneau sand, Leaf silt loam		
Soil Hydric Status	N/A, non hydric	N/A	Hydric, non hydric	Hydric, non hydric	Hydric, non hydric	non-hydric, Hydric		
Regulatory Considerations								
Parameters	**Applicable?**			**Resolved?**		**Supporting Docs?**		
Water of the United States - Section 404	Yes			Yes		PCN/404 permit		
Water of the United States - Section 401	Yes			Yes		PCN/401 permit		
Endangered Species Act	Yes			Yes		Categorical Exclusion		
Historic Preservation Act	Yes			Yes		Categorical Exclusion		
Coastal Zone Management Act (CZMA or CAMA)	No			N/A		N/A		
Essential Fisheries Habitat	No			N/A		N/A		

4 Monitoring Year 3 Assessment and Results

4.1 Morphological Assessment

Morphological data for MY3 was collected in March of 2023. Refer to Appendices A and C for summary data tables, morphological plots, and stream photographs.

4.1.1 Stream Horizontal Pattern & Longitudinal Profile

The MY3 visual observations of stream channel pattern and longitudinal profiles closely match the as-built parameters and did not show any significant deviation from as-built conditions with the exception of R1. The minor channel adjustments in riffle slopes, pool depths and pattern do not present a stability concern or indicate a need for remedial action and will be assessed visually during the annual assessments.

R1 has experienced continued subsurface flow through a portion of the old pond bottom. This length is not functioning as intended and is not meeting stream criteria. R1 will continue to be monitored in MY4 as flow is present above and below the old pond bottom. More information can be found in Section 4.6.

4.1.2 Stream Horizontal Dimension

The MY3 channel dimensions generally match the design parameters and are within acceptable and stable ranges of tolerance. Ten cross-sections are located on restoration and enhancement I and II reaches on the project. Two cross-sections are in headwater reaches, four are in riffles, and four are in pools. All ten cross-sections show little change in bankfull area, and all bank-height ratios are below 1.2. It is expected that over time some pools may accumulate fine sediment and organic matter, however, this is not an indicator of channel instability. Maximum riffle depths are also expected to fluctuate slightly throughout the monitoring period as the channels adjust to the new flow regime.

4.2 Stream Hydrology

4.2.1 Stream Flow

Two pressure transducers (flow gauges), installed in March 2021 at the top of R1 and R5, documented that the stream exhibited surface flow for a minimum of 30 consecutive days throughout the monitoring year (Appendix D). An additional flow gauge (FG-3) was installed on December 16th, 2021, on R1 near the center of the old pond bed. FG-3 exhibited flow for a maximum of one consecutive day and failed to meet the 30-day criteria. Stream flow is present above the old pond and below the dam. Flow through the old pond section of R1 is subsurface until the old dam location. Additionally, to determine if rainfall amounts are normal for the given year, precipitation data was obtained from an onsite rain gauge, and data is presented in Appendix D. Rainfall was normal for MY3 data collection.

Flow Gauge Data

Flow Gauge Name	Flow Gauge Location	Longest Period of Consecutive Flow	Total Days of Cumulative Flow	Total Days of Cumulative No Flow	Longest Period of Consecutive No Flow
FG-1	R1	163 days 1/1/2023 – 6/12/2023	233 days	37 days	13 days
FG-2	R5	104 days 2/25/2023 – 6/8/2023	182 days	88 days	58 days
FG-3	R1	1 days 5/17/2023	2 days	267 days	136 days

4.2.1.1 Bankfull Events

Two crest gauges were installed in March 2021 to document bankfull events. WLS installed a conventional cork crest gauge, along with a pressure transducer, to validate flood status on R3 and R7-lower. During MY3, bankfull events were recorded on both pressure transducer crest gauges. CG-1 recorded 14 events with a maximum of 1.285' above bankfull on July 14, 2023. CG-2 recorded 11 events with a maximum of 0.56' above bankfull on April 30, 2023. Associated data are in Appendix D.

4.2.2 Headwater Stream Channel Formation

During MY3, R5 exhibited evidence indicative of channel formation within the topographic low-point of the valley (see table and photos in Appendix C). R1 has channel formation above the old pond bed with surface level flow. As the reach enters the old pond bottom, the flow is subsurface until the old dam area at the start of R2. WLS will continue to monitor R1 in MY4.

4.3 Wetlands

Five groundwater wells were installed in March 2021 to monitor wetland hydrology within wetland re-establishment and enhancement areas. Groundwater well locations are shown on the CCPV. An additional groundwater well was installed in W1 on the left floodplain prior to MY3. Of the six wetland groundwater wells, four met the twelve percent hydrology criteria for MY3. GW-1 located in the west portion of W1 did not meet hydrology criteria with only one day of consecutive hydrology or 0.44 percent of the growing season. GW-6 located in the east portion of W1 did not meet hydrology criteria with only two days of consecutive hydrology or 0.88% of the growing season. Subsurface flow of the channel and poor soil conditions within the old pond are the cause of criteria not being met. Associated data is in Appendix D.

4.4 Vegetation

Monitoring of the nine permanent vegetation plots and three random plots/transects was completed during September 2023. Vegetation data and photos can be found in Appendix B. Two of the random transects were done within wetland crediting areas. At the request of the IRT, one random transect was completed on the Priority II cut along R3. The MY3 average planted density is 418 stems per acre, which exceeds the interim measure of vegetative success of at least 320 planted stems per acre at the end of the third monitoring year. Eight fixed vegetation plots and two of the random transects met the interim measure requirement and the site ranged from 121- 607 stems per acre overall. Vegetation plot 9 (W1) did not meet the density criteria with four measured stems totaling 121 stems per acre. This area is within the old pond bottom of W1 and has dense herbaceous vegetation as well as soil cracking causing roots to dry out and die. Random transect 12 (W2) did not meet density criteria by one stem, with 283 stems per acre. WLS will continue to monitor random transects in W2 in Year 5. Low stem densities in this area are due to difficult to locate trees in dense herbaceous vegetation.

Two areas located in W1 and W2, totaling approximately 1.07 acres, were identified in MY1 as having low stem density. Both areas were replanted on January 6th, 2022, with wet-tolerant species from the approved mitigation plan (see planting list below). Due to this year's data, the low-stem density area was reduced to the left floodplain of R1 within W1 (0.14 acres) and the right floodplain of R5 (0.19 acres) for a total of 0.33 acres.

Visual assessment of vegetation outside of the monitoring plots indicates that the herbaceous vegetation is becoming well established throughout the project. One area of encroachment was noted in MY1 along R3 left bank slope (~0.12 acres). An active farm field along the easement has led to farm equipment encroachment. Remedial action taken in MY2 added extra signage and horse tape to the easement line. This area did not have any further encroachment in MY3.

A section of conservation easement fence, southeast of the old pond bed, was identified to be compromised during the DMS boundary inspection on November 22, 2023. The neighboring landowner's horses had access to the easement during this time, though no damage was observed within the easement. WLS monitoring staff repaired the fence on November 28, 2023. Before and after photos of the repair area have been included in Appendix A.

A large population of golden bamboo (*Phyllostachys aurea*) existed along the left floodplain of R2 prior to construction. Construction activities included bamboo removal in this area by ripping the roots/rhizomes, cut stump herbicide treatments, and foliar spray of small shoots. Herbicide treatments used 50 percent glyphosate (Rodeo) for cut/stump and 20 percent for foliar spray. During MY3, foliar spray treatments of bamboo continued (see table below). Current percent cover is less than five percent. This area will continue to be monitored closely and any treatments will be documented in future monitoring reports.

Herbicide Treatment Table

Monitoring Year	Invasive Targeted	Invasive Treatment	Date Treatment Conducted	Herbicide Used
1	Golden Bamboo	Foliar	7/1/2021	Rodeo (5%)
	Golden Bamboo	Foliar	8/17/2021	Rodeo (20%)
2	Golden Bamboo & Cattail	Foliar	4/20/2022	Rodeo (5% and 20%)
3	Golden Bamboo & Cattail	Foliar	6/8/2023	Rodeo (5%)
	Golden Bamboo	Foliar	8/30/2023	Rodeo (5%)

4.5 Macrobenthic Sampling

Two macrobenthic sampling locations were surveyed prior to restoration activities on R3 and R6. Neither reach produced any benthic samples due to the intermittent nature of the channels. These reaches were re-surveyed in MY3 on March 29, 2023. R3 scored "Poor" and had a biotic index value of 8.32, and R6 scored "Poor" with a biotic index value of 7.87. Benthic data and photographs are located in Appendix F.

4.6 R1 Subsurface Flow

During MY2 site visits, it was noted that stream flow through the lower portion of R1 from station 12+50 – 14+60 (based off the as-built surveyed stream) was flowing subsurface during drier portions of the year. WLS installed a flow gauge within this area (FG-3) prior to MY2. During MY3, FG-3 did not record any consecutive days of flow greater than 1 day. FG-1, located above the old pond bed, recorded 163 consecutive days of flow. WLS noted flow resurfacing at station 14+60 which is located at a rock riffle at the old pond dam. Flow is visible below this point within the channel from R2 down to the exit of the project area on R4. Poor soil conditions at the time of construction did not allow for sufficient excavation of pond silt and structure placement. This has caused the subsurface flow conditions that are affecting stream flow and wetland hydrology within W1.

WLS is not requesting a release on the credits within the affected area. A summary of the credits affected can be found in Table 4 below.

Table 4. At-Risk Credit Table

Project Reach Designation	Credit Type	Credits At-Risk	*Contracted Credit At-Risk
W1	Wetland Mitigation Credit	0.476	0.1
R1	Stream Mitigation Credit	182.00	N/A
R1 Buffer (0-100)	Buffer Credit	18,016.00	18,016.00
R1 Buffer (101-200)	Buffer Credit	1,253.00	1,253.00

**Contracted Credit At-Risk is the difference between the credits at risk and the approved Mitigation Plan Credits. WLS had additional Stream and Wetland length/area above the contract value with DMS.*

WLS understands these credits are at risk within the old pond bed portion of R1, all of W1, and the associated headwater Buffer credits. Stream function and buffer function above the affected reach of R1 remains functional and creditable. Stream flow is present and documented with FG-1 until station 12+50. R1 stream credit is calculated based off headwater valley length, and the associated at-risk credits are calculated within the valley crediting parameters.

WLS is not proposing any remedial action on R1 in the old pond bed. WLS will continue to monitor the area for stream flow, wetland hydrology, and vegetation.

Appendix A:
Visual Assessment Data

Visual Stream Morphology Stability Assessment Table
Vegetation Condition Assessment Table
Photos: Cross-Section Photos
Photos: Stream Photo Points (Culvert Crossings and EII Reaches)
Fence Repair Photos

Table 4: Visual Stream Stability Assessment						
Reach		R1				
Assessed Stream Length		533				
Assessed Bank Length		1,066				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	16	16		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	9	9		100%

Table 4: Visual Stream Stability Assessment						
Reach		R2				
Assessed Stream Length		518				
Assessed Bank Length		1,036				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	2	2		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	0	0		N/A

Table 4: Visual Stream Stability Assessment						
Reach		R3				
Assessed Stream Length		1,103				
Assessed Bank Length		2,206				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	44	44		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	23	23		100%

Table 4: Visual Stream Stability Assessment						
Reach		R4				
Assessed Stream Length		199				
Assessed Bank Length		398				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	5	5		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	2	2		100%

Table 4: Visual Stream Stability Assessment						
Reach		R5				
Assessed Stream Length		392				
Assessed Bank Length		784				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	18	18		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	9	9		100%

Table 4: Visual Stream Stability Assessment						
Reach		R6				
Assessed Stream Length		422				
Assessed Bank Length		844				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	17	17		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	5	5		100%

Table 4: Visual Stream Stability Assessment						
Reach		R7				
Assessed Stream Length		1,135				
Assessed Bank Length		2,270				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	5	5		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	5	5		100%

Visual Vegetation Assessment				
Planted acreage	**11.17**			
Vegetation Category	**Definitions**	**Mapping Threshold**	**Combined Acreage**	**% of Planted Acreage**
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10acres	0.33	3.0%
		Total	0.33	3.0%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10 acres	0.00	0.0%
		Cumulative Total	0.33	3.0%
Easement Acreage	**15.1**			
Vegetation Category	**Definitions**	**Mapping Threshold**	**Combined Acreage**	**% of Easement Acreage**
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Species included in summation above should be identified in report summary.	0.10 acres	0.00	0.0%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	Black and White stripes	0.00	

R1, XS-1, Upstream (MY-00)

R1, XS-1, Upstream (MY-03)

R1, XS-1, Downstream (MY-00)

R1, XS-1, Downstream (MY-03)

R1, XS-1, Left Bank (MY-00)

R1, XS-1, Left Bank (MY-03)

R1, XS-1, Right Bank (MY-00)

R1, XS-1, Right Bank (MY-03)

R2, XS-2, Upstream (MY-00)

R2, XS-2, Upstream (MY-03)

R2, XS-2, Downstream (MY-00)

R2, XS-2, Downstream (MY-03)

R2, XS-2, Left Bank (MY-00)

R2, XS-2, Left Bank (MY-03)

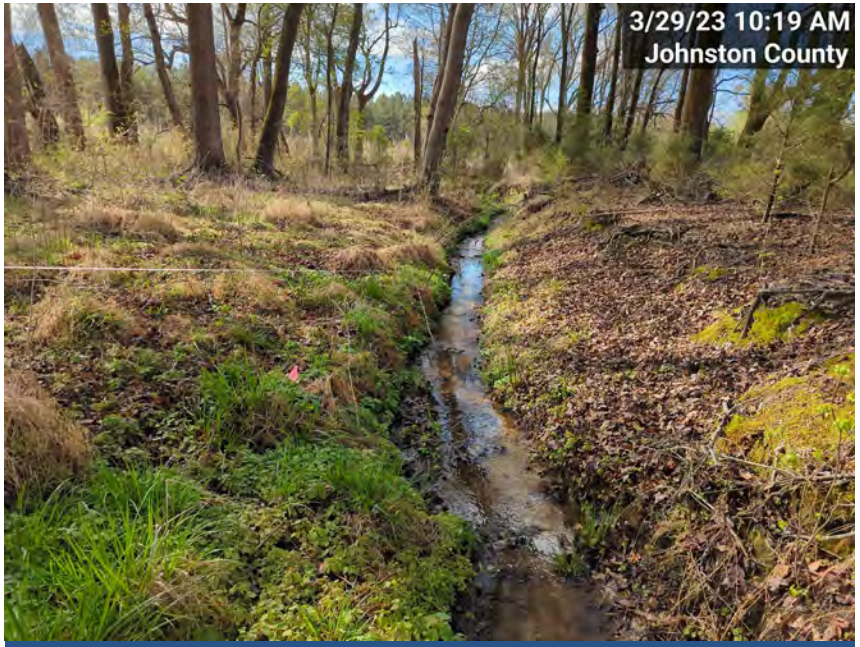
R2, XS-2, Right Bank (MY-00)

R2, XS-2, Right Bank (MY-03)

R2, XS-3, Upstream (MY-00)

R2, XS-3, Upstream (MY-03)

R2, XS-3, Downstream (MY-00)



R2, XS-3, Downstream (MY-03)

R2, XS-3, Left Bank (MY-00)

R2, XS-3, Left Bank (MY-03)

R2, XS-3, Right Bank (MY-00)

R2, XS-3, Right Bank (MY-03)

R3, XS-4, Upstream (MY-00)

R3, XS-4, Upstream (MY-03)

R3, XS-4, Downstream (MY-00)

R3, XS-4, Downstream (MY-03)

R3, XS-4, Left Bank (MY-00)

R3, XS-4, Left Bank (MY-03)

R3, XS-4, Right Bank (MY-00)

R3, XS-4, Right Bank (MY-03)

R3, XS-5, Upstream (MY-00)

R3, XS-5, Upstream (MY-03)

R3, XS-5, Downstream (MY-00)

R3, XS-5, Downstream (MY-03)

R3, XS-5, Left Bank (MY-00)

R3, XS-5, Left Bank (MY-03)

R3, XS-5, Right Bank (MY-00)

R3, XS-5, Right Bank (MY-03)

R5, XS-6, Upstream (MY-00)

R5, XS-6, Upstream (MY-03)

R5, XS-6, Downstream (MY-00)

R5, XS-6, Downstream (MY-03)

R5, XS-6, Left Bank (MY-00)

R5, XS-6, Left Bank (MY-03)

R5, XS-6, Right Bank (MY-00)

R5, XS-6, Right Bank (MY-03)

R6, XS-7, Upstream (MY-00)

R6, XS-7, Upstream (MY-03)

R6, XS-7, Downstream (MY-00)

R6, XS-7, Downstream (MY-03)

R6, XS-7, Left Bank (MY-00)

R6, XS-7, Left Bank (MY-03)

R6, XS-7, Right Bank (MY-00)

R6, XS-7, Right Bank (MY-03)

R6, XS-8, Upstream (MY-00)

R6, XS-8, Upstream (MY-03)

R6, XS-8, Downstream (MY-00)

R6, XS-8, Downstream (MY-03)

R6, XS-8, Left Bank (MY-00)

R6, XS-8, Left Bank (MY-03)

R6, XS-8, Right Bank (MY-00)

R6, XS-8, Right Bank (MY-03)

R7 (upper), XS-9, Upstream (MY-00)

R7 (upper), XS-9, Upstream (MY-03)

R7 (upper), XS-9, Downstream (MY-00)

R7 (upper), XS-9, Downstream (MY-03)

R7 (upper), XS-9, Left Bank (MY-00)

R7 (upper), XS-9, Left Bank (MY-03)

R7 (upper), XS-9, Right Bank (MY-00)

R7 (upper), XS-9, Right Bank (MY-03)

R7 (upper), XS-10, Upstream (MY-00)

R7 (upper), XS-10, Upstream (MY-03)

R7 (upper), XS-10, Downstream (MY-00)

R7 (upper), XS-10, Downstream (MY-03)

R7 (upper), XS-10, Left Bank (MY-00)

R7 (upper), XS-10, Left Bank (MY-03)

R7 (upper), XS-10, Right Bank (MY-00)

R7 (upper), XS-10, Right Bank (MY-03)

PS-1 – R2, EII, Upstream (MY-00)

PS-1 – R2, EII, Upstream (MY-03)

PS-1 – R2, EII, Downstream (MY-00)

PS-1 – R2, EII, Downstream (MY-03)

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

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

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

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

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

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

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

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

PS-3 – R4, EII, Upstream (MY-00)

PS-3 – R4, EII, Upstream (MY-03)

PS-3 – R4, EII, Downstream (MY-00)

PS-3 – R4, EII, Downstream (MY-03)

PS-4 – R5 Culvert Crossing, Upstream (MY-00)

PS-4 – R5 Culvert Crossing, Upstream (MY-03)

PS-4 – R5 Culvert Crossing, Downstream (MY-00)

PS-4 – R5 Culvert Crossing, Downstream (MY-03)

PS-4 – R5 Culvert Crossing, Upstream (MY-00)

PS-4 – R5 Culvert Crossing, Upstream Lateral (MY-03)

PS-4 – R5 Culvert Crossing, Downstream (MY-00)

PS-4 – R5 Culvert Crossing, Downstream Lateral (MY-03)

Broken Fence Section, Before Repair (MY-03)

Broken Fence Section, After Repair (MY-03)

Broken Fence Section, Before Repair (MY-03)

Broken Fence Section, After Repair (MY-03)

Appendix B:
Vegetation Plot Data

Red-line Plant List
Vegetation Performance Standards Summary Table
Vegetation Plot Counts and Densities Table
Photos: Vegetation Plot Photos

Odell's House Mitigation Project Red-line Planting List				
Species	**Common Name**	**Stems**	**% Planted**	**Mitigation Plan %**
Fraxinus pennsylvanica	Green Ash	228	3.00%	3%
Betula nigra	River birch	608	8.00%	12%
Quercus michauxii	Swamp chestnut oak	608	8.00%	10%
Quercus pagoda	Cherrybark oak	532	7.00%	10%
Platanus occidentalis	American sycamore	684	9.00%	12%
Quercus nigra	Water Oak	532	7.00%	10%
Liriodendron tulipifera	Tulip Poplar	684	9.00%	12%
Quercus phellos	Willow Oak	532	7.00%	10%
Diospyros virginiana	Persimmon	456	6.00%	4%
Carpinus caroliniana	Ironwood	456	6.00%	3%
Hamamelis virginiana	Witch Hazel	456	6.00%	3%
Asimina triloba	Pawpaw	456	6.00%	4%
Lindera benzoin	Spicebush	456	6.00%	4%
Alnus serulatta	Tag Alder	456	6.00%	0%
Corylus americana	Hazelnut	456	6.00%	3%
Total		**7,600**	**100%**	

* changes from mitigation plan in red

*Tag Alder was not planted within potential Nutrient Buffer Areas

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

Note: *Final species selection may change due to refinement or availability at the time of planting. Species substitutions will be coordinated between WLS and planting contractor prior to the procurement of plant stock and documented in the as-built report.*

Vegetation Performance Standards Summary Table												
	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	405	5	7	0	405	4	7	0	405	3	8	0
Monitoring Year 2	445	3	8	0	526	3	8	0	486	2	8	0
Monitoring Year 1	567	2	11	0	607	2	9	0	567	2	8	0
Monitoring Year 0	688	2	12	0	648	2	9	0	607	2	8	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	486	3	7	0	324	3	5	0	607	5	5	0
Monitoring Year 2	445	2	6	0	405	2	6	0	769	3	6	0
Monitoring Year 1	607	2	8	0	486	2	7	0	1174	2	7	0
Monitoring Year 0	769	2	9	0	607	2	8	0	1214	2	8	0
	Veg Plot 7 F				Veg Plot 8 F				Veg Plot 9 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	567	4	7	0	445	4	4	0	121	5	2	0
Monitoring Year 2	486	3	7	0	729	3	6	0	324	2	4	0
Monitoring Year 1	526	2	7	0	729	2	6	0	243	2	4	0
Monitoring Year 0	850	2	10	0	769	2	6	0	688	2	9	0
	Veg Plot Group 10 R				Veg Plot Group 11 R				Veg Plot Group 12 R			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	405	4	4	0	567	5	6	0	283	8	4	0
Monitoring Year 2	648	1	4	0	202	3	3	0	445	4	7	0
Monitoring Year 1					162	4	2	0	324	3	5	0
Monitoring Year 0	648	2	7	0	688	2	10	0	810	2	10	0

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

Table 6	
Planted Acreage	11.17
Date of Initial Plant	2021-03-03
Date(s) of Supplemental Plant(s)	2022-01-05
Date(s) Mowing	NA
Date of Current Survey	2023-09-26
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 5 F		Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F		Veg Plot 9 F		Veg Plot 10 R	Veg Plot 11 R	Veg Plot 12 R
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total	Total	Total
Species Included in Approved Mitigation Plan	Asimina triloba	pawpaw	Tree	FAC			1	1			2	2	1	1											
	Betula nigra	river birch	Tree	FACW	1	1	1	1	1	1					3	3	1	1					2	5	2
	Carpinus caroliniana	American hornbeam	Tree	FAC							1	1							2	2					
	Corylus americana	American hazelnut	Shrub	FACU			1	1									1	1							
	Diospyros virginiana	common persimmon	Tree	FAC	2	2			2	2	2	2					3	3						1	
	Fraxinus pennsylvanica	green ash	Tree	FACW	1	1									4	4			5	5				2	1
	Hamamelis virginiana	American witchhazel	Tree	FACU	1	1	1	1	1	1	1	1													
	Lindera benzoin	northern spicebush	Tree	FACW	1	1																			
	Liriodendron tulipifera	tuliptree	Tree	FACU					1	1	1	1	2	3										3	
	Platanus occidentalis	American sycamore	Tree	FACW	3	3	2	2	2	2			2	2	4	4	3	3	3	3	1	1	4		3
	Quercus alba	white oak	Tree	FACU																				1	
	Quercus michauxii	swamp chestnut oak	Tree	FACW			2	2							3	3	1	1			3	3	3		1
	Quercus nigra	water oak	Tree	FAC					1	1			1	1											
	Quercus pagoda	cherrybark oak	Tree	FACW	1	1	2	2	1	1	2	2	1	1			2	2							
	Quercus phellos	willow oak	Tree	FACW					1	1	3	3			1	1	1	3	1	1			1	2	
Sum	Performance Standard				10	10	10	10	10	10	12	12	7	8	15	15	12	14	11	11	4	4	10	14	7
Post Mitigation Plan Species	*Liquidambar styraciflua*	*sweetgum*	*Tree*	*FAC*														*3*							
	Salix nigra	*black willow*	*Tree*	*OBL*												*5*									
Sum	Proposed Standard				10	10	10	10	10	10	12	12	7	8	15	15	12	14	11	11	4	4	10	14	7
Mitigation Plan Performance Standard	Current Year Stem Count				10		10		10		12		8		15		14		11		4		10	14	7
	Stems/Acre				405		405		405		486		324		607		567		445		121		405	567	283
	Species Count				7		7		8		7		5		5		7		4		2		4	6	4
	Dominant Species Composition (%)				30		20		20		25		38		25		18		45		75		40	36	43
	Average Plot Height (ft.)				5		4		3		3		3		5		4		4		5		4	5	8
	% Invasives				0		0		0		0		0		0		0		0		0		0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count				10		10		10		12		8		15		14		11		4		10	14	7
	Stems/Acre				405		405		405		486		324		607		567		445		121		405	567	283
	Species Count				7		7		8		7		5		5		7		4		2		4	6	4
	Dominant Species Composition (%)				30		20		20		25		38		25		18		45		75		40	36	43
	Average Plot Height (ft.)				5		4		3		3		3		5		4		4		5		4	5	8
	% Invasives				0		0		0		0		0		0		0		0		0		0	0	0

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

Fixed Veg Plot 1 (MY-00)

Fixed Veg Plot 1 (MY-03)

Fixed Veg Plot 2 (MY-00)

Fixed Veg Plot 2 (MY-03)

Fixed Veg Plot 3 (MY-00)

Fixed Veg Plot 3 (MY-03)

Fixed Veg Plot 4 (MY-00)

Fixed Veg Plot 4 (MY-03)

Fixed Veg Plot 5 (MY-00)

Fixed Veg Plot 5 (MY-03)

Fixed Veg Plot 6 (MY-00)

Fixed Veg Plot 6 (MY-03)

Fixed Veg Plot 7 (MY-00)

Fixed Veg Plot 7 (MY-03)

Fixed Veg Plot 8 (MY-00)

Fixed Veg Plot 8 (MY-03)

Fixed Veg Plot 9 (MY-00)

Fixed Veg Plot 9 (MY-03)

Random Veg Plot 10 (View North) (MY-03)

Random Veg Plot 10 (View South) (MY-03)

Random Veg Plot 11 (View North) (MY-03)

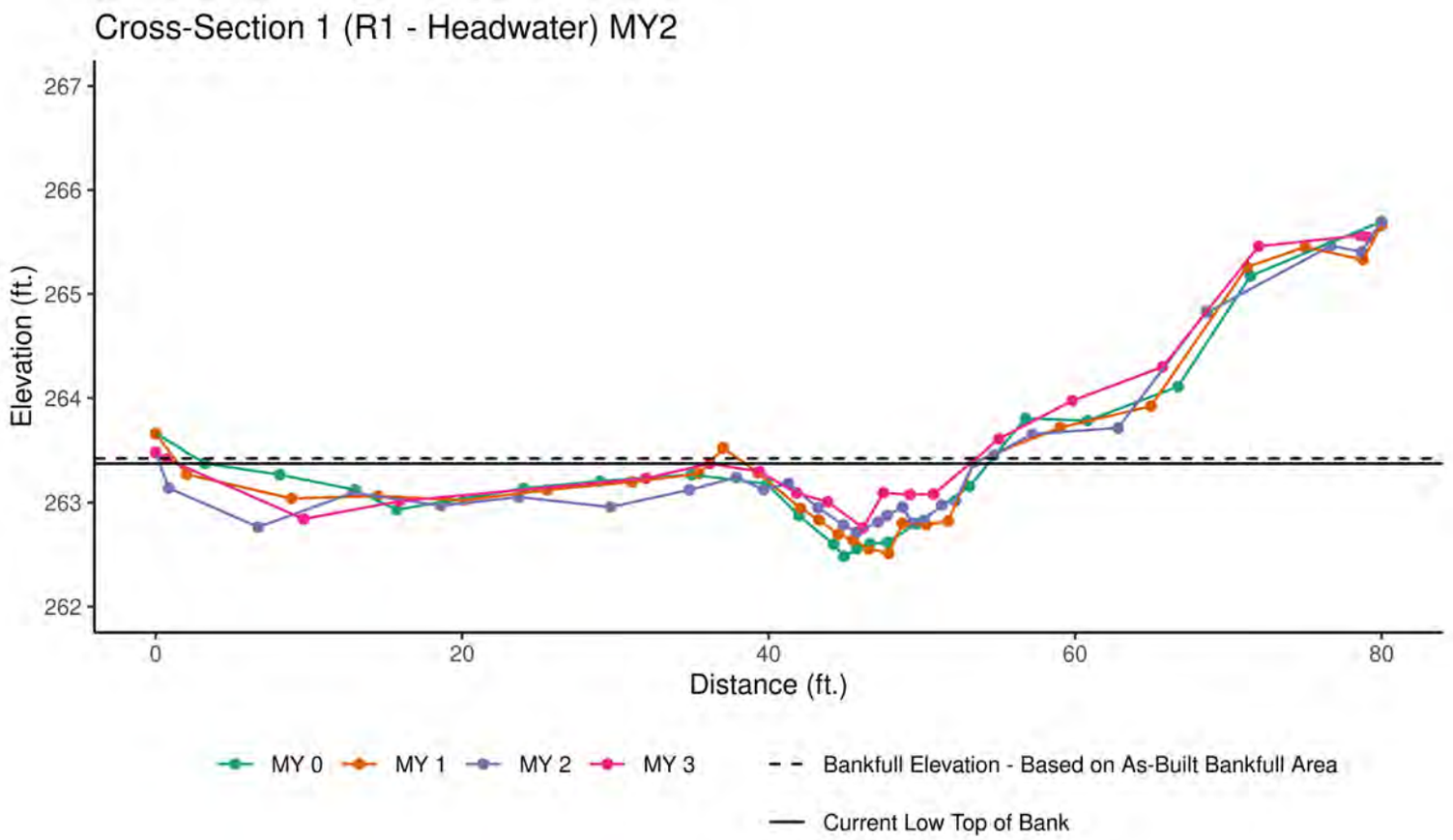
Random Veg Plot 11 (View South) (MY-03)

Random Veg Plot 12 (View Northeast) (MY-03)

Random Veg Plot 12 (View Southwest) (MY-03)

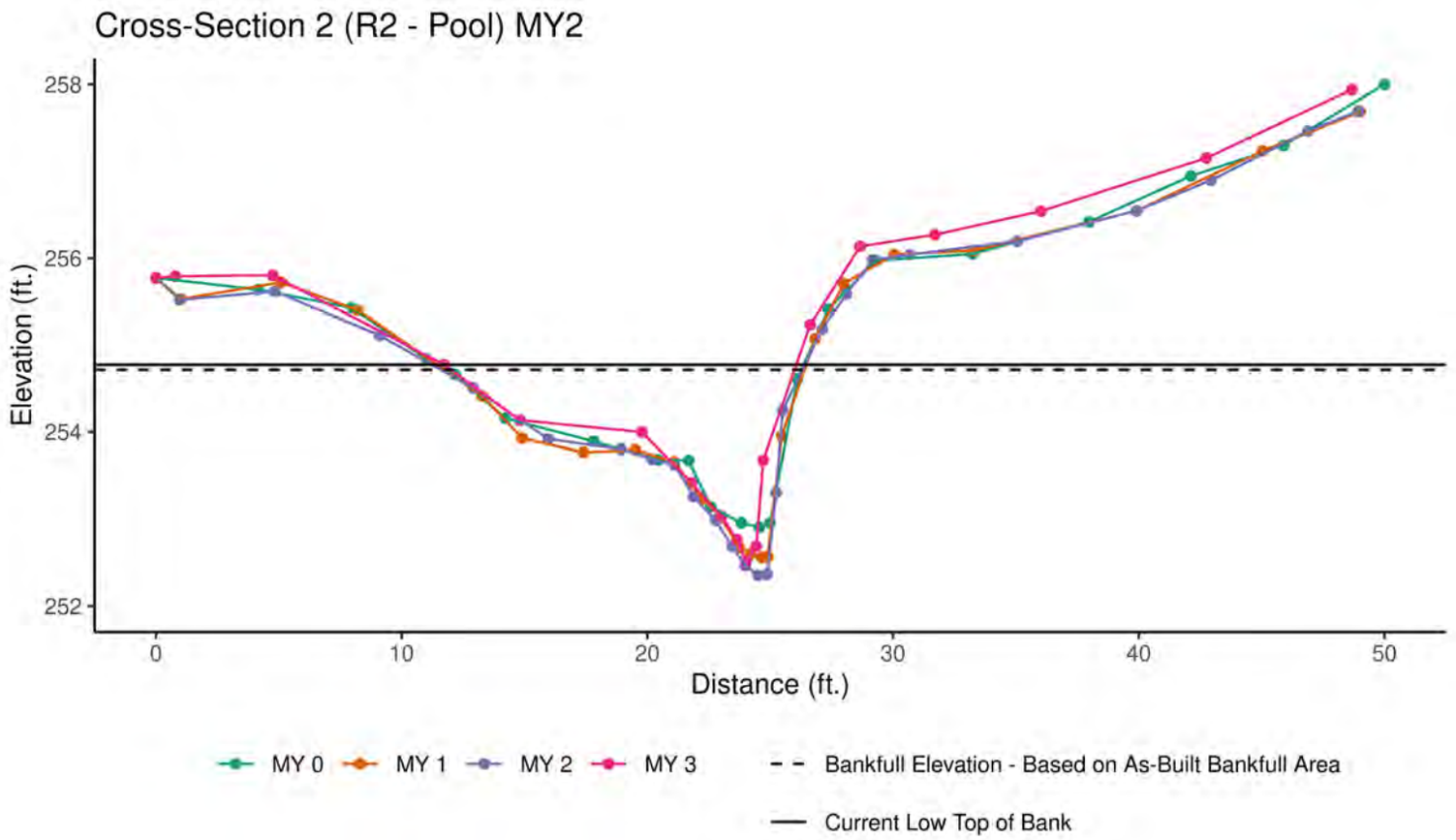
Appendix C:
Stream Geomorphology Data

MY3 Cross-Sections with Annual Overlays
Baseline Stream Data Summary Tables
Cross-Section Morphology Data
Headwater Channel Formation Table
Photos: Evidence of Headwater Channel Formation



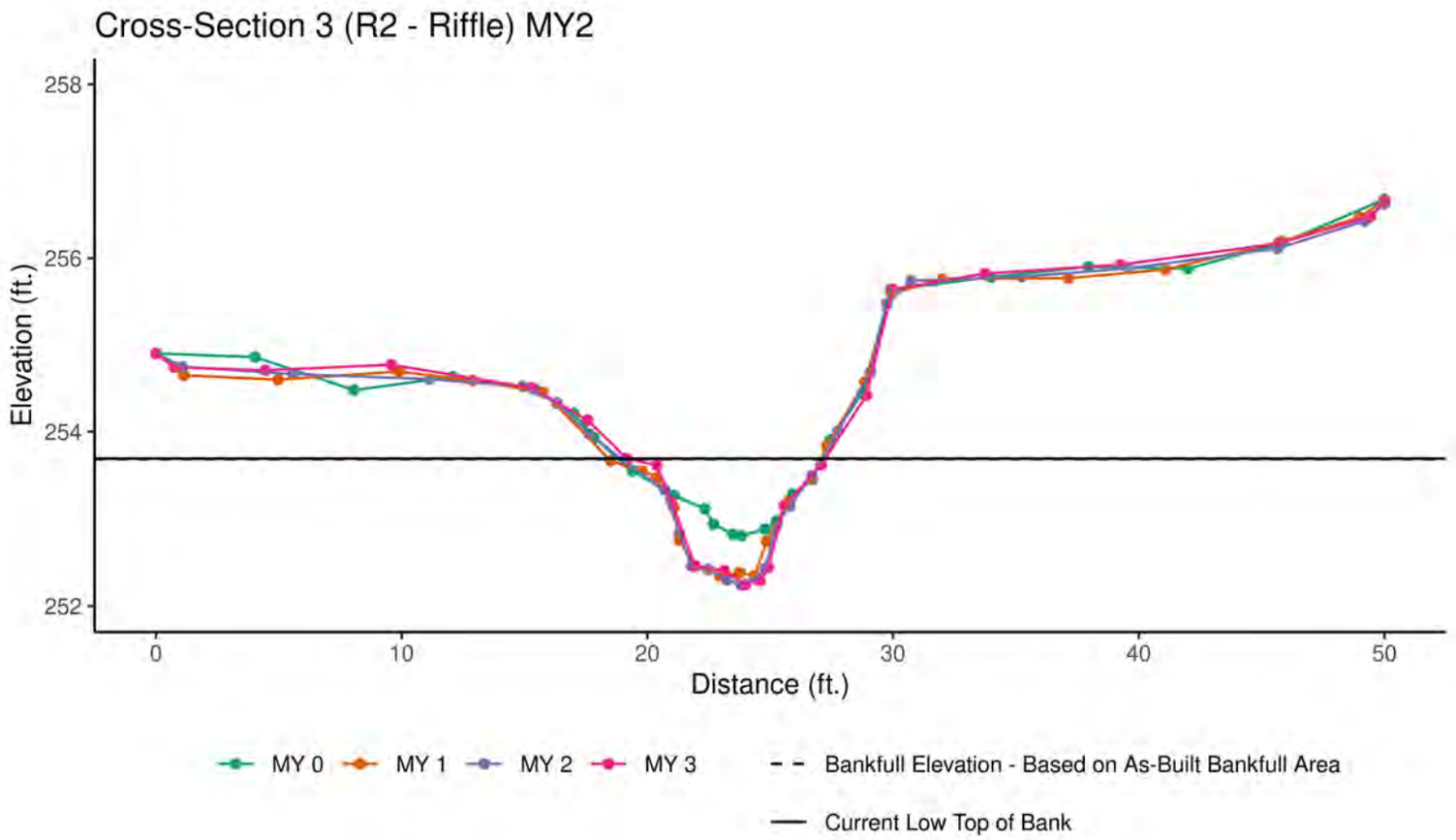
Distance	Elevation	Features
0	263.48	TLP
0.72444185	263.419	
9.64832473	262.842	
15.918205	263.014	
31.9898922	263.233	
36.1594993	263.375	TLB, BKF
39.3974112	263.298	
41.8373338	263.092	
43.8510239	263.007	
46.1753313	262.758	THW
47.4900815	263.094	
49.2263549	263.077	
50.7683641	263.081	
55.0234238	263.607	TRB
59.8044686	263.973	
65.705616	264.299	
71.9766972	265.459	
78.5920661	265.564	
79.106013	265.546	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	263.18	263.20	263.31	263.42				
Bank Height Ratio - Based on As-Built Bankfull Area	0.96	1.13	0.89	0.93				
Thalweg Elevation	262.48	262.51	262.72	262.76				
LTOB Elevation	263.16	263.29	263.24	263.38				
LTOB Max Depth	0.674	0.778	0.527	0.617				
LTOB Cross Sectional Area	4.77	6.27	4.11	4.26				



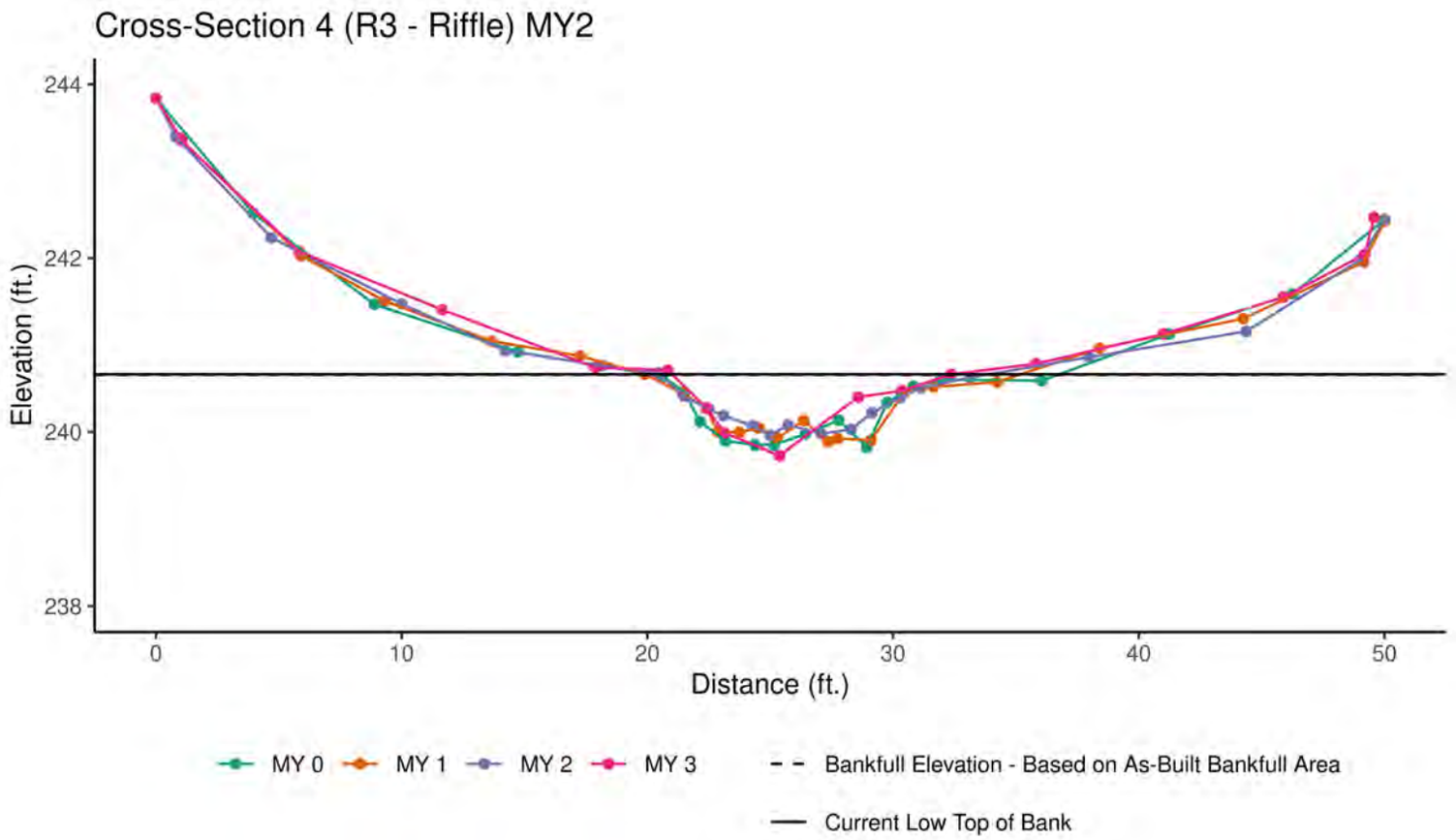
Distance	Elevation	Features
0	255.772	TLP
0.79130904	255.79	
4.75376914	255.801	
11.7285515	254.771	TLB, BKF
14.8030728	254.134	
19.7781214	253.996	
21.7950568	253.42	
23.0135292	253.032	
23.6487346	252.763	
24.0145885	252.513	THW
24.4329852	252.688	
24.7198552	253.677	
26.627383	255.231	TRB
28.6594599	256.134	
31.7006377	256.269	
36.024175	256.54	
42.7553594	257.152	
48.671003	257.939	
50	258.063	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	254.61	254.52	254.53	254.71				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.94	0.99	1.03				
Thalweg Elevation	252.91	252.56	252.35	252.51				
LTOB Elevation	254.61	254.41	254.51	254.77				
LTOB Max Depth	1.704	1.852	2.155	2.258				
LTOB Cross Sectional Area	11.76	10.33	11.53	12.59				



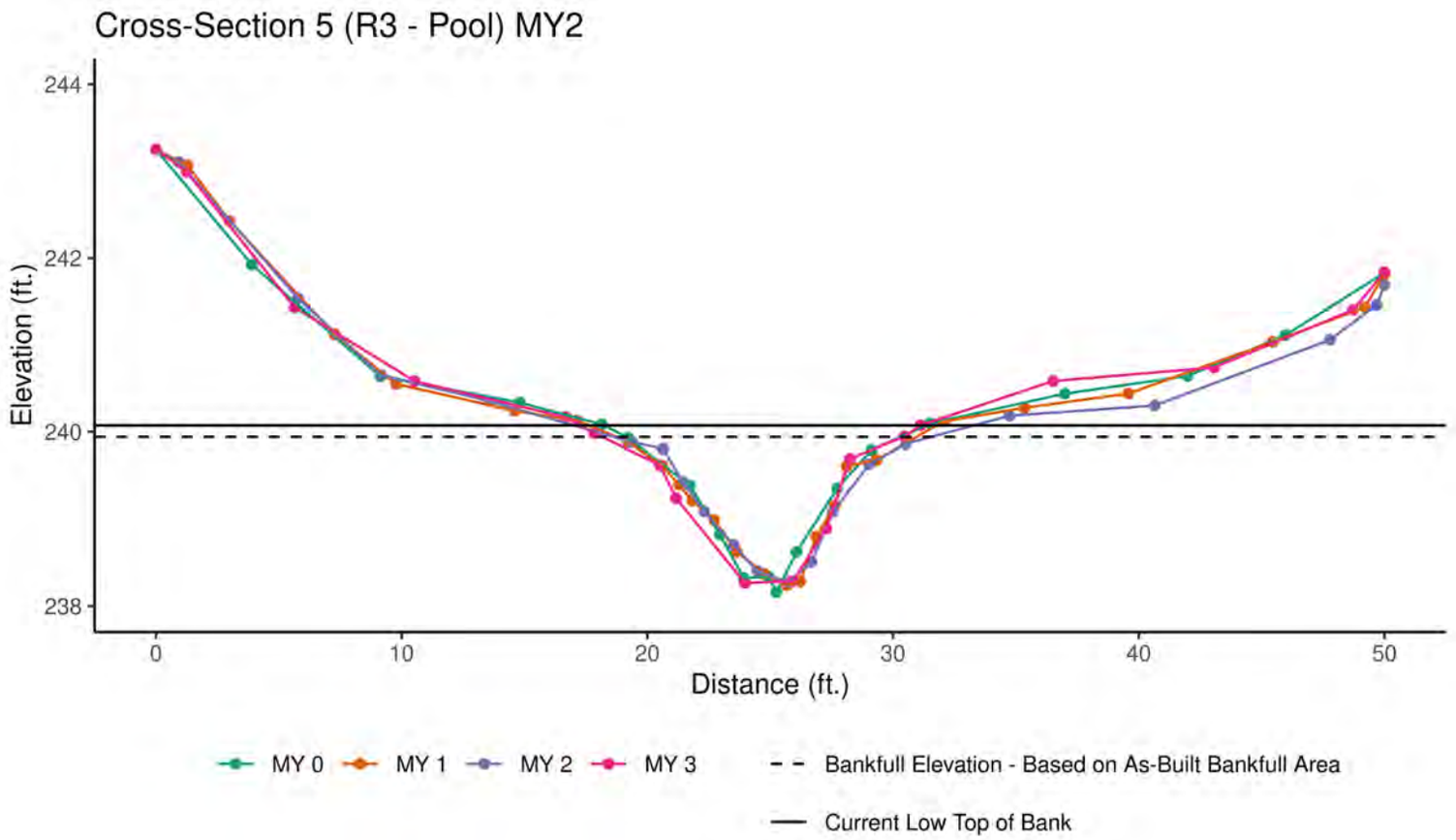
Distance	Elevation	Features
0	254.901	TLP
0.75384083	254.742	
4.45767652	254.707	
9.5722512	254.771	
15.3166271	254.504	
17.5676813	254.132	
19.153345	253.698	TLB, BKF
20.3824107	253.621	
20.9684661	253.219	
21.9374636	252.465	
23.1280111	252.408	
23.9879839	252.245	THW
24.5807984	252.29	
24.9328433	252.449	
25.5708383	253.155	
27.0799285	253.626	
28.9213502	254.421	
29.986496	255.642	TRB
33.7391837	255.821	
39.2622685	255.924	
45.690251	256.168	
49.433397	256.48	
50	256.661	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	253.90	253.70	253.65	253.69				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.89	1.01	1.00				
Thalweg Elevation	252.81	252.35	252.24	252.25				
LTOB Elevation	253.90	253.55	253.65	253.70				
LTOB Max Depth	1.095	1.205	1.412	1.453				
LTOB Cross Sectional Area	6.03	5.00	6.10	6.08				



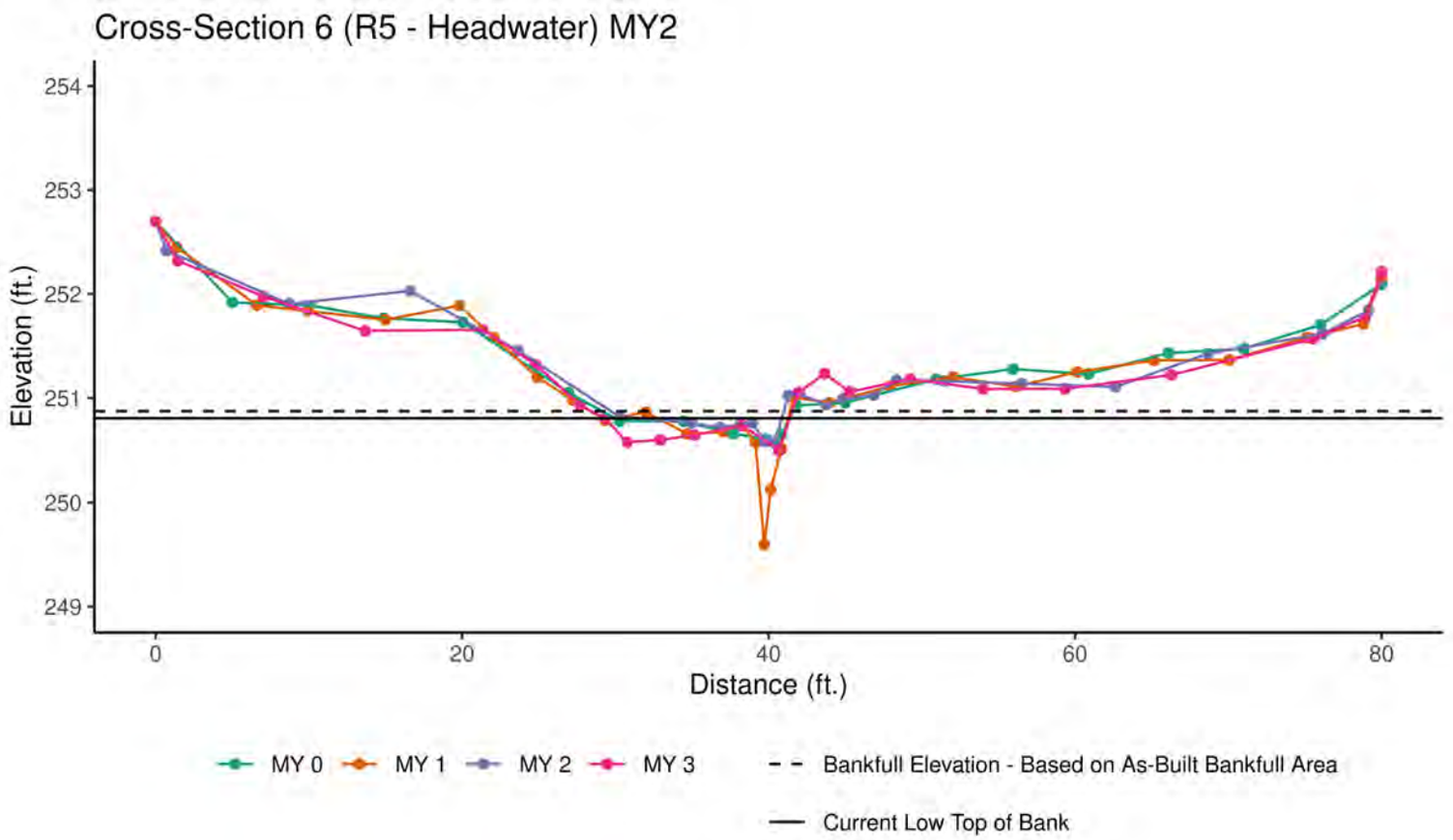
Distance	Elevation	Features
0	243.839	TLP
1.03821241	243.371	
1.05661772	243.349	
5.82070236	242.076	
11.6508919	241.405	
17.8835907	240.74	
20.8389349	240.707	TLB
22.4208166	240.273	
23.1298391	239.987	
25.3845555	239.73	THW
28.5930619	240.4	
30.3590684	240.471	
32.3709797	240.661	TRB, BKF
35.8099531	240.782	
40.9953122	241.124	
45.8844101	241.549	
49.1953914	242.041	
49.576534	242.468	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	240.60	240.58	240.64	240.66				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.90	0.98	1.01				
Thalweg Elevation	239.85	239.89	239.96	239.73				
LTOB Elevation	240.60	240.52	240.63	240.66				
LTOB Max Depth	0.752	0.629	0.665	0.931				
LTOB Cross Sectional Area	4.90	4.18	4.73	4.96				



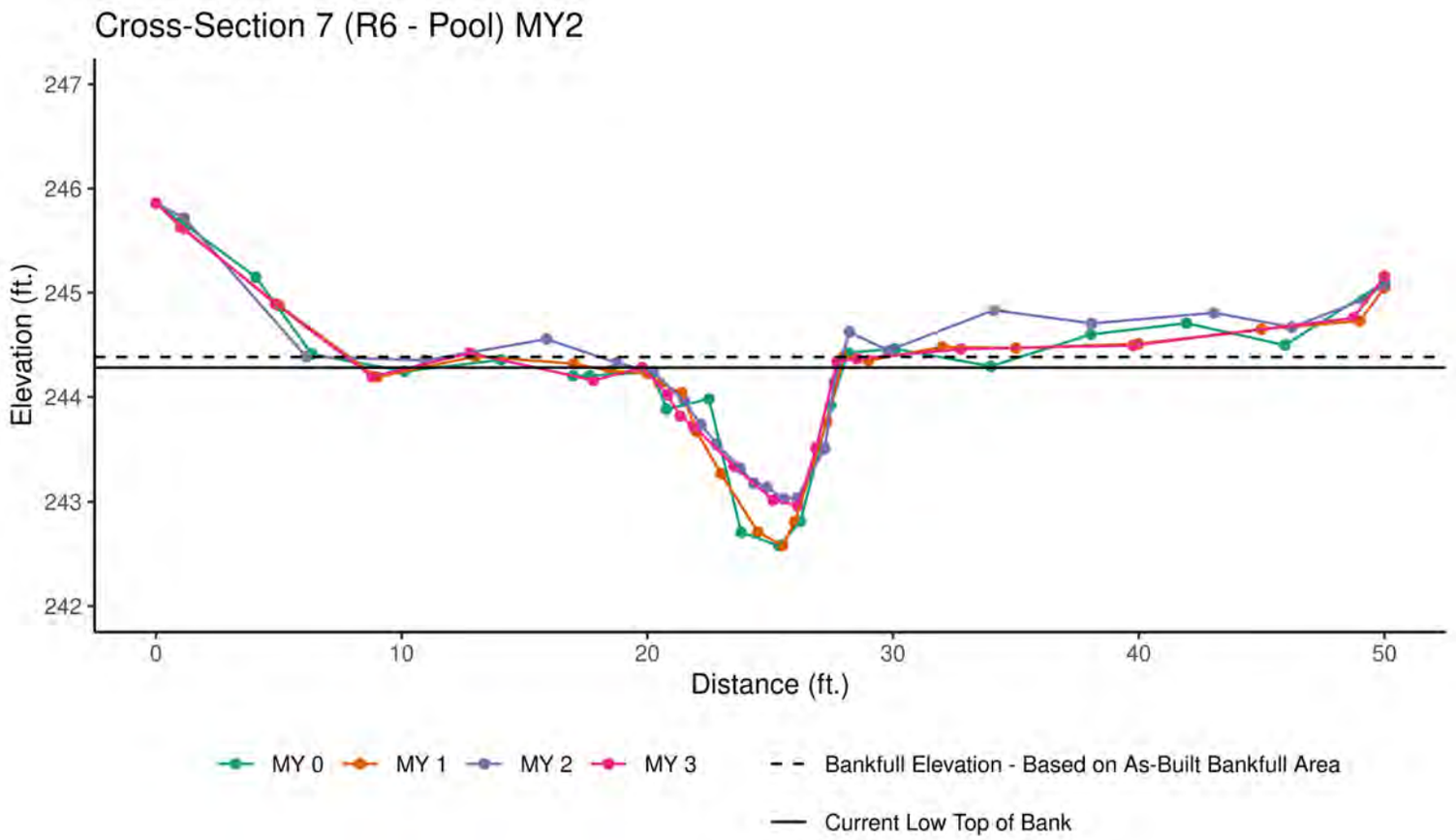
Distance	Elevation	Features
0	243.251	TLP
1.24373832	242.996	
5.64442211	241.431	
10.5241278	240.583	
16.6808259	240.167	TLB
17.83892	239.984	
20.5069711	239.624	
21.1675953	239.242	
23.9700489	238.266	THW
25.9279233	238.287	
27.2872285	238.893	
28.24956	239.695	
30.46123	239.945	
31.1189434	240.073	TRB, BKF
36.5179454	240.584	
43.0752371	240.74	
48.726566	241.403	
50	241.837	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	240.09	240.00	240.02	239.94				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.07	0.91	1.08				
Thalweg Elevation	238.34	238.24	238.27	238.27				
LTOB Elevation	240.09	240.13	239.86	240.07				
LTOB Max Depth	1.749	1.892	1.591	1.807				
LTOB Cross Sectional Area	10.02	11.78	8.32	11.75				



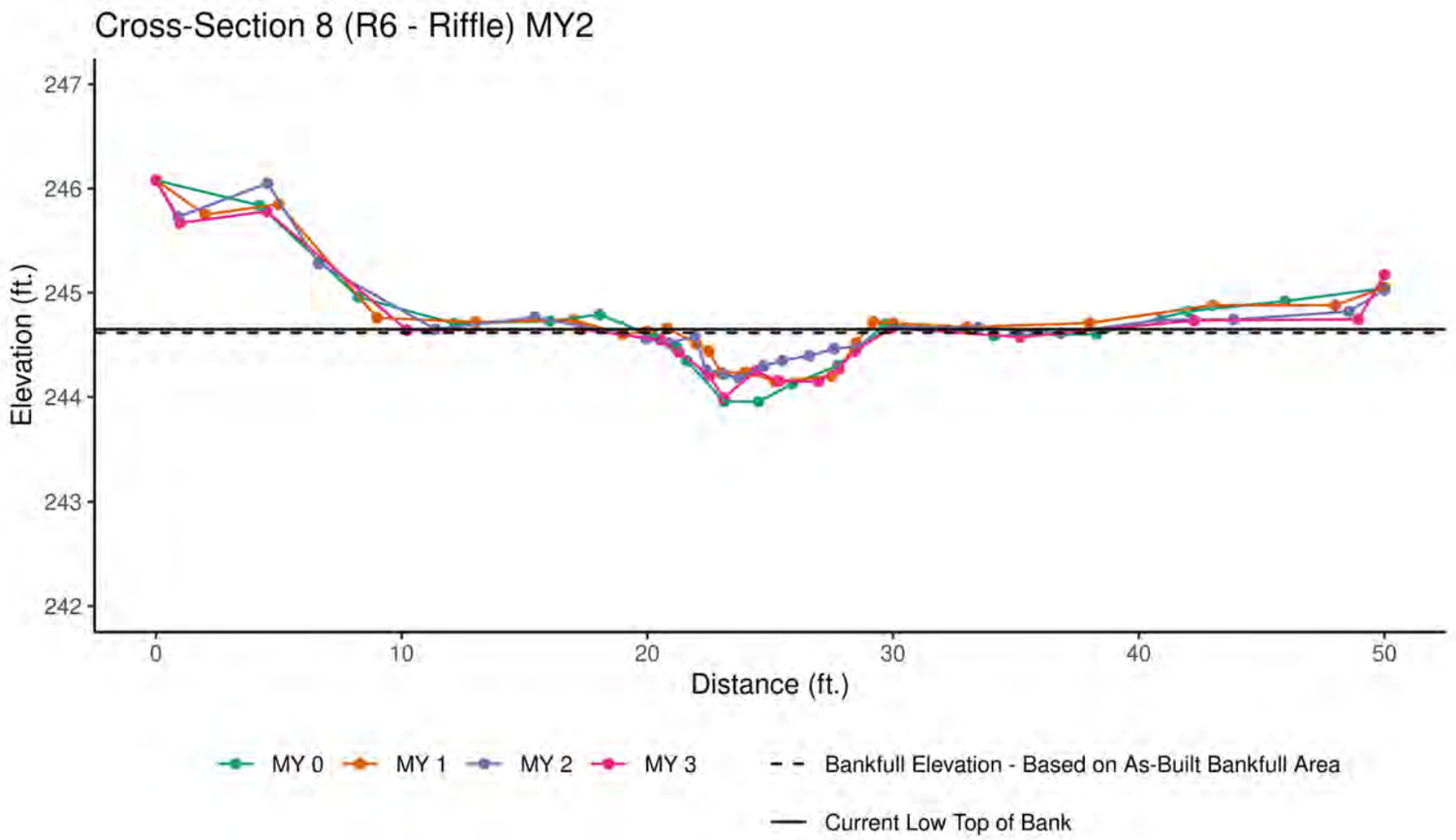
Distance	Elevation	Features
0	252.697	TLP
1.44600035	252.321	
7.03087683	251.977	
13.6868598	251.645	
21.3454367	251.658	
24.8392021	251.317	
27.7089434	250.93	
29.3124758	250.805	TLB, BKF
30.7647843	250.576	
32.9240211	250.596	
35.1581291	250.644	
38.2883579	250.734	
40.6771602	250.501	THW
41.9462651	251.053	TRB
43.6621702	251.235	
45.2875085	251.059	
49.2357049	251.184	
53.9998189	251.087	
59.3392927	251.089	
66.2934019	251.222	
75.530635	251.57	
78.922401	251.779	
80	252.211	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	250.93	250.88	250.97	250.87				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.99	1.05	0.82				
Thalweg Elevation	250.57	249.60	250.58	250.50				
LTOB Elevation	250.93	250.87	250.99	250.81				
LTOB Max Depth	0.359	1.267	0.409	0.304				
LTOB Cross Sectional Area	2.55	2.46	2.78	1.98				



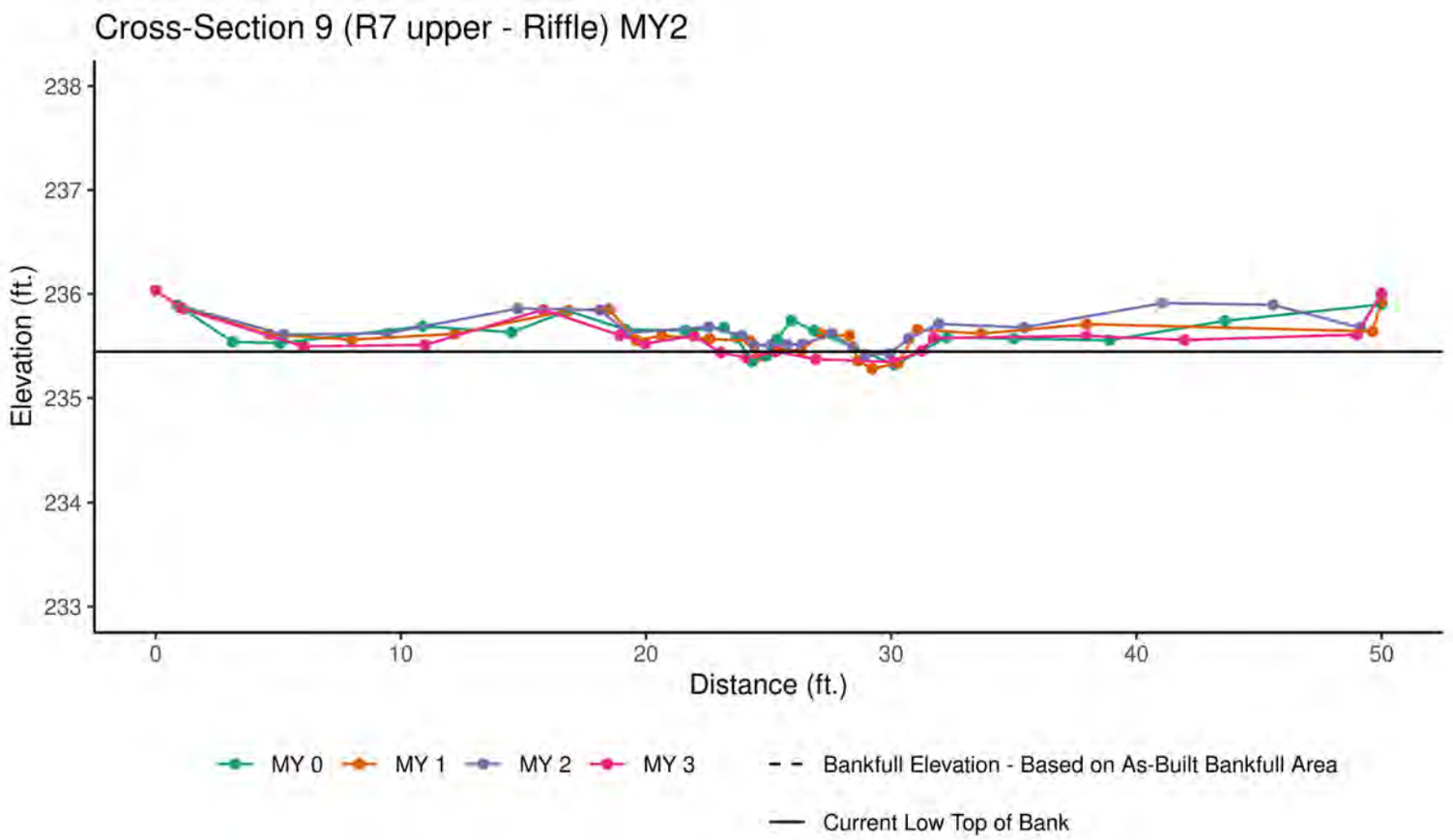
Distance	Elevation	Features
0	245.859	TLP
1.12651409	245.618	
4.86371052	244.894	
8.80123383	244.195	
12.7804771	244.421	
17.8048449	244.159	
19.7891245	244.282	TLB, BKF
20.8277955	244.021	
21.3369776	243.816	
21.8679516	243.722	
23.5258711	243.343	
25.1086958	243.017	
26.1237962	242.961	THW
26.8723162	243.513	
27.721503	244.34	
28.5329277	244.367	TRB
32.7616762	244.46	
39.7744561	244.495	
48.7442835	244.759	
50	245.158	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	244.24	244.24	244.42	244.38				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.99	0.87	0.93				
Thalweg Elevation	242.58	242.58	243.03	242.96				
LTOB Elevation	244.24	244.23	244.24	244.28				
LTOB Max Depth	1.663	1.65	1.212	1.321				
LTOB Cross Sectional Area	6.78	6.70	5.43	5.98				



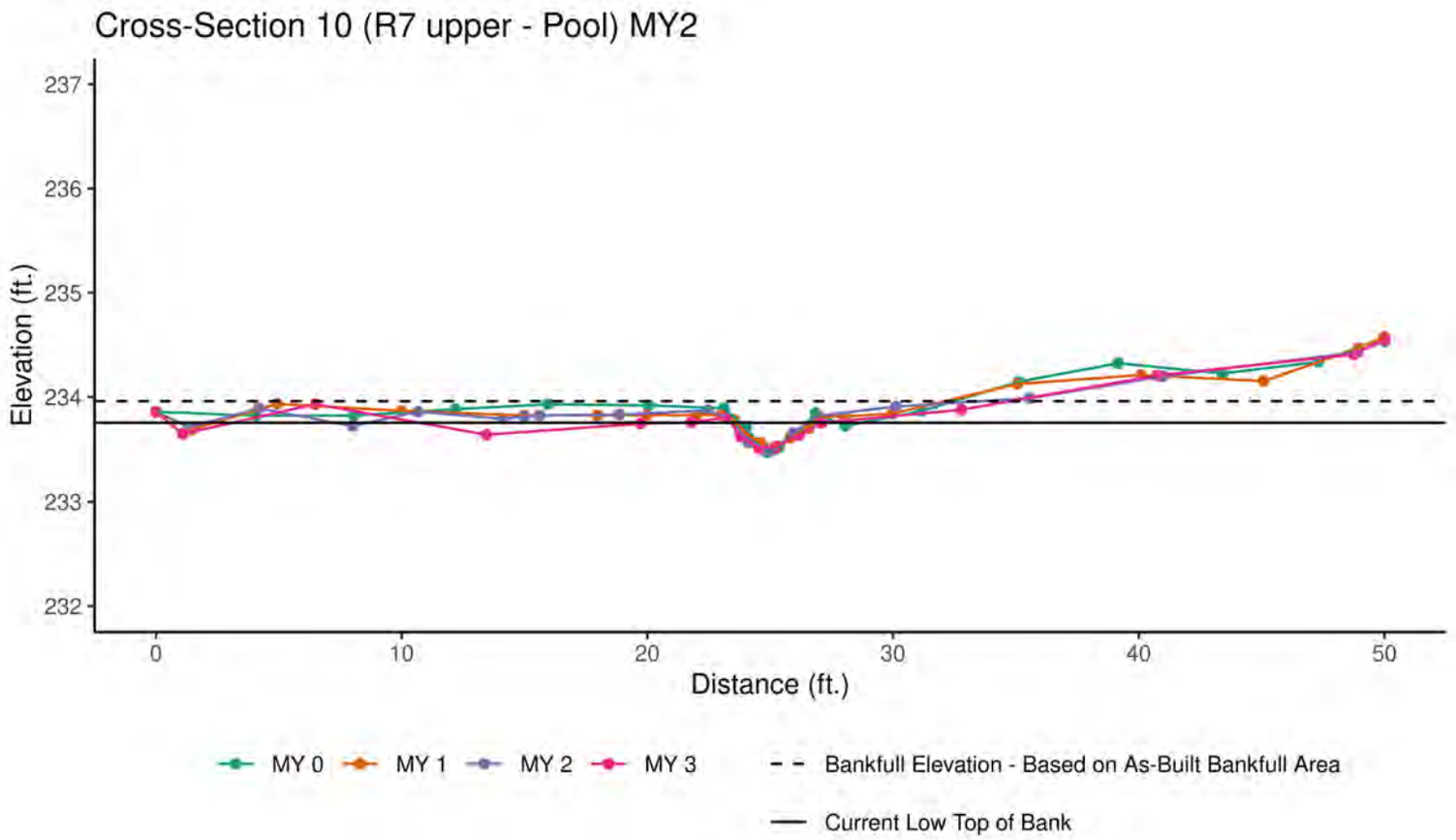
Distance	Elevation	Features
0	246.08	TLP
0.9729666	245.67	
4.50649531	245.781	
10.2164933	244.64	
17.3231123	244.65	TLB, BKF
20.5411193	244.547	
21.2694058	244.432	
22.5292946	244.207	
23.1027502	243.99	THW
24.4018609	244.247	
25.3599015	244.152	
26.962911	244.149	
27.7899925	244.278	
28.4539224	244.441	
29.9280514	244.662	TRB
35.1770985	244.574	
42.2444946	244.734	
48.9391995	244.745	
50	245.173	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	244.59	244.71	244.72	244.62				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.90	0.92	1.05				
Thalweg Elevation	243.96	244.15	244.19	243.99				
LTOB Elevation	244.59	244.66	244.67	244.65				
LTOB Max Depth	0.632	0.51	0.487	0.66				
LTOB Cross Sectional Area	3.23	2.79	2.72	3.64				



Distance	Elevation	Features
0	236.034	TLP
1.09010458	235.86	
6.01310901	235.497	
10.9853004	235.51	
15.8071083	235.849	
18.9345723	235.604	
19.9555888	235.523	
21.9580016	235.597	
23.0517304	235.437	
24.090211	235.389	
25.2900425	235.447	TLB, BKF
26.924456	235.373	
30.0883206	235.346	THW
31.25	235.453	TRB
31.726841	235.577	
37.9720754	235.597	
41.9791745	235.558	
49.0005715	235.61	
50	236.004	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	235.65	235.59	235.64	235.45				
Bank Height Ratio - Based on As-Built Bankfull Area	0.97	1.05	0.86	1.01				
Thalweg Elevation	235.35	235.40	235.51	235.35				
LTOB Elevation	235.65	235.60	235.62	235.45				
LTOB Max Depth	0.299	0.197	0.113	0.101				
LTOB Cross Sectional Area	0.39	0.45	0.31	0.39				



Distance	Elevation	Features
0	233.858	TLP
1.08678655	233.646	
6.4892176	233.932	
13.4462568	233.638	
19.7199418	233.744	
21.7815647	233.755	
23.2418394	233.805	TLB
23.8047344	233.62	
24.5491554	233.514	THW
25.2387403	233.523	
26.1882879	233.637	
27.1010739	233.753	TRB, BKF
32.7808419	233.877	
40.7458601	234.206	
48.7557712	234.408	
50	234.549	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	233.89	233.99	234.01	233.96				
Bank Height Ratio - Based on As-Built Bankfull Area	0.68	0.64	0.57	0.54				
Thalweg Elevation	233.47	233.50	233.57	233.51				
LTOB Elevation	233.85	233.81	233.82	233.75				
LTOB Max Depth	0.371	0.316	0.25	0.239				
LTOB Cross Sectional Area	0.70	0.63	0.57	0.54				

Baseline Stream Data Summary Odell's House, R1											Odell's House, R2										Odell's House, R3									
Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)			Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)			Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)		N/A			0		6.0		13.2	1.0		11.0			1.0		8.0		9.5	1.0		5.7			1.0		8.0		11.1	1.0
Floodprone Width (ft)		N/A			0	31.3	115.0		62.6	1.0		27.0			1.0	25.0	50.0		29.3	1.0		11.5			1.0	25.0	30.0		34.3	1.0
Bankfull Mean Depth (ft)		N/A			0		0.5		0.4	1.0		0.3			1.0		0.5		0.6	1.0		1.0			1.0		0.6		0.5	1.0
Bankfull Max Depth (ft)		N/A			0		0.7		0.7	1.0		0.7			1.0		0.7		1.1	1.0		1.4			1.0		0.8		0.8	1.0
Bankfull Cross Sectional Area (ft^2)		N/A			0		3.2		5.1	1.0		3.7			1.0		4.2		6.0	1.0		5.6			1.0		4.8		5.4	1.0
Width/Depth Ratio		N/A			0		11.4		34.3	1.0		33.0			1.0		15.2		15.0	1.0		5.8			1.0		13.3		23.2	1.0
Entrenchment Ratio		N/A			0	5.2	19.2		4.7	1.0		2.5			1.0	3.1	6.3		3.1	1.0		2.0			1.0	3.1	3.8		3.1	1.0
Bank Height Ratio		N/A			0		1.0		1.0	1.0		1.0			1.0		1.0		1.0	1.0		1.4			1.0		1.0		1.0	1.0
Max part size (mm) mobilized at bankfull	N/A					19.0		17.0			25.0					37.0		42.0			46.0					35.0		32.0		
Rosgen Classification	Pond					DA/E5		DA			C5					C5		C5			G5					B5		B5c		
Bankfull Discharge (cfs)	11.0					11.0		11.0			14.5					14.5		14.5			20.0					20.0		20.0		
Sinuosity (ft)	N/A					1.08		1.16			1.07					1.07		1.04			1.20					1.12		1.10		
Water Surface Slope (Channel) (ft/ft)	N/A					0.0089		0.0107			0.0168					0.0168		0.0195			0.0133					0.0142		0.0152		
Other																														

Baseline Stream Data Summary Odell's House, R5											Odell's House, R6										Odell's House, R7 upper									
Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)			Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)			Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)		N/A			0		5.5		13.4	1.0		4.1			1.0		6.0		8.9	1.0					1.0		6.0		2.2	1.0
Floodprone Width (ft)		N/A			0	49.0	103.0		38.1	1.0		53.3			1.0	22.0	40.0		44.0	1.0					1.0	126.0	145.0		49.6	1.0
Bankfull Mean Depth (ft)		N/A			0		0.3		0.2	1.0		0.6			1.0		0.4		0.4	1.0					1.0		0.4		0.2	1.0
Bankfull Max Depth (ft)		N/A			0		0.4		0.4	1.0		1.1			1.0		0.5		0.6	1.0					1.0		0.5		0.3	1.0
Bankfull Cross Sectional Area (ft^2)		N/A			0		1.8		2.6	1.0		2.5			1.0		2.4		3.3	1.0					1.0		2.4		0.4	1.0
Width/Depth Ratio		N/A			0		16.8		68.9	1.0		6.8			1.0		15.2		24.0	1.0		4.2			1.0		15.2		14.0	1.0
Entrenchment Ratio		N/A			0	8.9	18.7		2.8	1.0		12.9			1.0	3.7	6.7		4.9	1.0		1.5			1.0	21.0	24.2		22.2	1.0
Bank Height Ratio		N/A			0		1.0		1.0	1.0		2.3			1.0		1.0		1.0	1.0		1.3			1.0		1.0		1.0	1.0
Max part size (mm) mobilized at bankfull	N/A					10.0		7.0			32.0					22.0		20.0								20.0		11.0		
Rosgen Classification	Pond					DA/E5		DA			E5					B5c		B5c			G5 / Channelized					B5c		B5c		
Bankfull Discharge (cfs)	10.0					10.0		10.0			10.0					10.0		10.0			10.0					10.0		10.0		
Sinuosity (ft)	N/A					1.08		1.09			1.05					1.12		1.09			1.03					1.07		1.09		
Water Surface Slope (Channel) (ft/ft)	N/A					0.0077		0.0083			0.0145					0.0135		0.0129			0.0153					0.0123		0.0131		
Other																														

Cross-Section Morphology Data

Odell's House Mitigation Project: DMS #100041 (Data Collected 8/4/2022)

	Cross-Section 1 (Headwater - R1)							Cross-Section 2 (Pool - R2)							Cross-Section 3 (Riffle - R2)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	263.18	263.20	263.31	263.42				254.61	254.52	254.53	254.71				253.90	253.70	253.65	253.69			
Bank Height Ratio_Based on AB Bankfull[1] Area	0.96	1.13	0.89	0.93				N/A	N/A	N/A	N/A				1.00	0.89	1.01	1.00			
Thalweg Elevation	262.48	262.51	262.72	262.76				252.91	252.56	252.35	252.51				252.81	252.35	252.24	252.25			
LTOB[2] Elevation	263.16	263.29	263.24	263.38				254.61	254.41	254.51	254.77				253.90	253.55	253.65	253.70			
LTOB[2] Max Depth (ft)	0.67	0.78	0.53	0.62				1.70	1.85	2.16	2.26				1.10	1.21	1.41	1.45			
LTOB[2] Cross Sectional Area (ft^2)	4.77	6.27	4.11	4.26				11.76	10.33	11.53	12.59				6.03	5.00	6.10	6.08			
Entrenchment Ratio	4.70	5.30	4.40	3.50				1.70	1.60	1.60	1.50				3.10	3.40	3.80	2.20			
	Cross Section-4 (Riffle - R3)							Cross-Section 5 (Pool - R3)							Cross-Section 6 (Headwater - R5)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	240.60	240.58	240.64	240.66				240.09	240.00	240.02	239.94				250.93	250.88	250.97	250.87			
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	0.90	0.98	1.01				N/A	N/A	N/A	N/A				1.00	0.99	1.05	0.82			
Thalweg Elevation	239.85	239.89	239.96	239.73				238.34	238.24	238.27	238.27				250.57	249.60	250.58	250.50			
LTOB[2] Elevation	240.60	240.52	240.63	240.66				240.09	240.13	239.86	240.07				250.93	250.87	250.99	250.81			
LTOB[2] Max Depth (ft)	0.75	0.63	0.67	0.93				1.75	1.89	1.59	1.81				0.36	1.27	0.41	0.30			
LTOB[2] Cross Sectional Area (ft^2)	4.90	4.18	4.73	4.96				10.02	11.78	8.32	11.75				2.55	2.46	2.78	1.98			
Entrenchment Ratio	3.10	2.90	2.60	3.30				3.50	2.80	3.30	2.80				2.80	8.10	8.00	4.20			
	Cross-Section 7 (Pool - R6)							Cross-Section 8 (Riffle - R6)							Cross-Section 9 (Riffle - R7 upper)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	244.24	244.24	244.42	244.38				244.59	244.71	244.72	244.62				235.65	235.59	235.64	235.45			
Bank Height Ratio_Based on AB Bankfull[1] Area	N/A	N/A	N/A	N/A				1.00	0.90	0.92	1.05				0.97	1.05	0.86	1.01			
Thalweg Elevation	242.58	242.58	243.03	242.96				243.96	244.15	244.19	243.99				235.35	235.40	235.51	235.35			
LTOB[2] Elevation	244.24	244.23	244.24	244.28				244.59	244.66	244.67	244.65				235.65	235.60	235.62	235.45			
LTOB[2] Max Depth (ft)	1.66	1.65	1.21	1.32				0.63	0.51	0.49	0.66				0.30	0.20	0.11	0.10			
LTOB[2] Cross Sectional Area (ft^2)	6.78	6.70	5.43	5.98				3.23	2.79	2.72	3.64				0.39	0.45	0.31	0.39			
Entrenchment Ratio	6.00	6.30	6.40	5.90				4.90	2.50	2.40	3.90				22.20	7.70	7.70	7.80			
	Cross-Section 10 (Pool - R7 upper)																				
	MY0	MY1	MY2	MY3	MY5	MY7	MY+														
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	233.89	233.99	234.01	233.96																	
Bank Height Ratio_Based on AB Bankfull[1] Area	N/A	N/A	N/A	N/A																	
Thalweg Elevation	233.47	233.50	233.57	233.51																	
LTOB[2] Elevation	233.85	233.81	233.82	233.75																	
LTOB[2] Max Depth (ft)	0.37	0.32	0.25	0.24																	
LTOB[2] Cross Sectional Area (ft^2)	0.70	0.63	0.57	0.54																	
Entrenchment Ratio	13.40	9.90	11.10	13.00																	

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

1 - **Bank Height Ratio (BHR)** takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation. For example if the As-built bankfull area was 10 ft2, then the MY1 bankfull elevation would be adjusted until the calculated bankfull area within the MY1 cross section survey = 10 ft2. The BHR would then be calculated with the difference between the low top of bank (LTOB) elevation for MY1 and the thalweg elevation for MY1 in the numerator with the difference between the MY1 bankfull elevation and the MY1 thalweg elevation in the denominator. This same process is then carried out in each successive year.

2 - **LTOB Area and Max depth -** These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recroded and tracked above as LTOB max depth.

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

Headwater Stream Channel Formation Table Odells House Mitigaiton Project				
Channel Forming Indicators - R1	**MY1**	**MY2**	**MY3**	**MY4**
Scour (indicating sediment transport by flowing water)	No	No	No	
Sediment deposition (accumulations of sediment and/or formation of ripples)	No	No	No	
Sediment sorting (sediment sorting indicated by grain-size distribution within primary flow path)	No	No	No	
Multiple observed flow events (must be documented by gauge data and/or photographs)	Yes	Yes	No	
Destruction of terrestrial vegetation	No	No	No	
Presence of litter and debris	No	No	No	
Wracking (deposits of drift material indicating surface water flow)	No	No	No	
Vegetation matted down, bent, or absent (herbaceous or otherwise)	No	Yes	No	
Leaf litter disturbed or washed away	No	No	No	
Channel Forming Indicators - R5	**MY1**	**MY2**	**MY3**	**MY4**
Scour (indicating sediment transport by flowing water)	Yes	No	Yes	
Sediment deposition (accumulations of sediment and/or formation of ripples)	No	No	No	
Sediment sorting (sediment sorting indicated by grain-size distribution within primary flow path)	No	No	Yes	
Multiple observed flow events (must be documented by gauge data and/or photographs)	Yes	Yes	Yes	
Destruction of terrestrial vegetation	Yes	Yes	Yes	
Presence of litter and debris	No	No	Yes	
Wracking (deposits of drift material indicating surface water flow)	No	No	Yes	
Vegetation matted down, bent, or absent (herbaceous or otherwise)	Yes	Yes	Yes	
Leaf litter disturbed or washed away	No	No	Yes	

R1 Documentation – XS-1 Upstream View (MY-03)

R1 Looking Downstream at FG-3 04/27/2023 (MY-03)

R5 Flow Documentation (MY-03)

R5 Looking Downstream at FG-2 (MY-03)

R1 Drone Aerial View – 4/29/2023

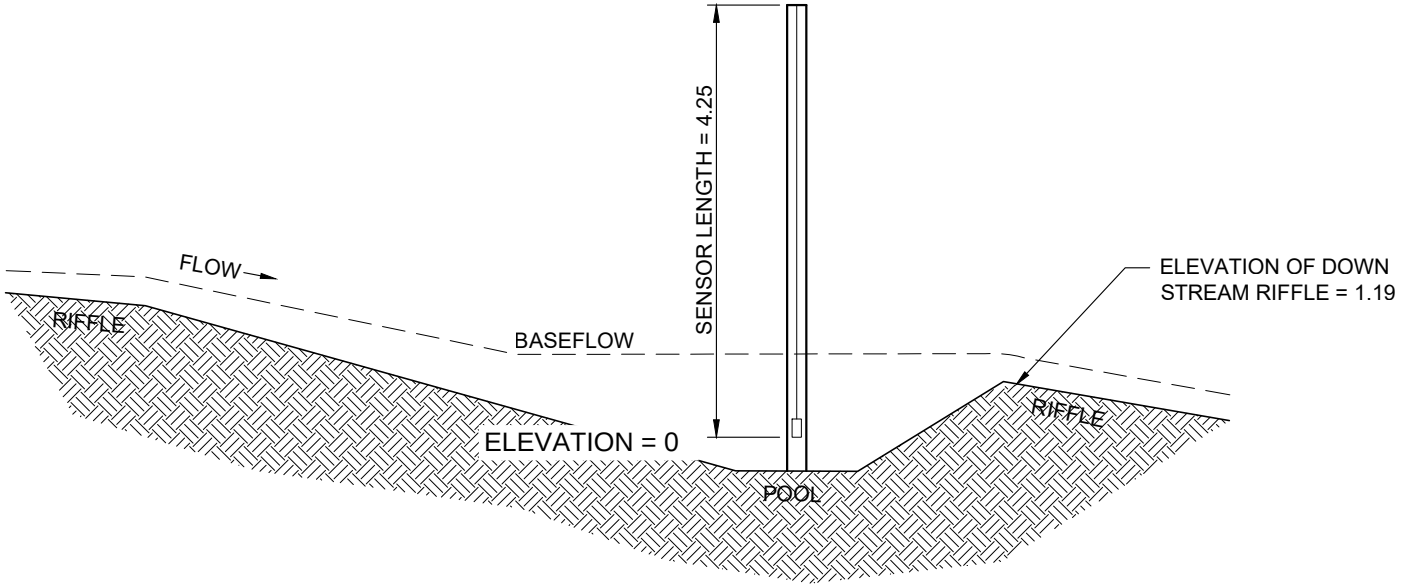
R5 Drone Aerial View – 4/29/2023

Appendix D:
Hydrologic Data

Verification of Bankfull Events
Flow Gauge and Crest Gauge Installation Diagrams
Flow Gauge and Crest Gauge Graphs
Wetland Hydrology Criteria and Hydrographs
Rainfall Data Table

Verification of Bankfull Events: CG-1 (R3) Odells House Mitigation Project					
Monitoring Year	Date of Collection	Date of Occurrence	Method	Photos	Measurement above bankfull (feet)
MY1	7/13/2021	3/28/2021	Pressure Transducer	No	0.130
	7/13/2021	4/11/2021	Pressure Transducer	No	0.100
	7/13/2021	6/10/2021	Pressure Transducer	No	0.437
MY2	4/8/2022	1/3/2022	Pressure Transducer	No	0.316
	4/8/2022	1/16/2022	Pressure Transducer	No	0.137
	4/8/2022	3/24/2022	Pressure Transducer	No	0.203
	8/4/2022	7/9/2022	Pressure Transducer	No	0.157
	8/18/2022	8/12/2022	Pressure Transducer	No	0.715
	9/14/2022	Unknown	Cork	Yes	0.575
	9/14/2022	8/30/2022	Pressure Transducer	No	0.448
MY3	3/28/2023	2/12/2023	Pressure Transducer	No	0.062
	6/9/2023	4/6/2023	Pressure Transducer	No	0.028
	6/9/2023	4/14/2023	Pressure Transducer	No	0.505
	6/9/2023	4/22/2023	Pressure Transducer	No	0.393
	6/9/2023	4/30/2023	Pressure Transducer	No	0.853
	6/9/2023	5/11/2023 - 5/13/2023	Pressure Transducer	No	0.093
	6/9/2023	5/17/2023	Pressure Transducer	No	0.533
	9/26/2023	6/22/2023	Pressure Transducer	No	0.544
	9/26/2023	7/14/2023	Pressure Transducer	No	1.285
	9/26/2023	7/18/2023 - 7/19/2023	Pressure Transducer	No	0.039
	9/26/2023	8/15/2023	Pressure Transducer	No	0.835
	9/26/2023	8/28/2023	Pressure Transducer	No	0.144
	9/26/2023	9/2/2023 - 9/4/2023	Pressure Transducer	No	0.571
	9/26/2023	9/23/2023	Pressure Transducer	No	0.887

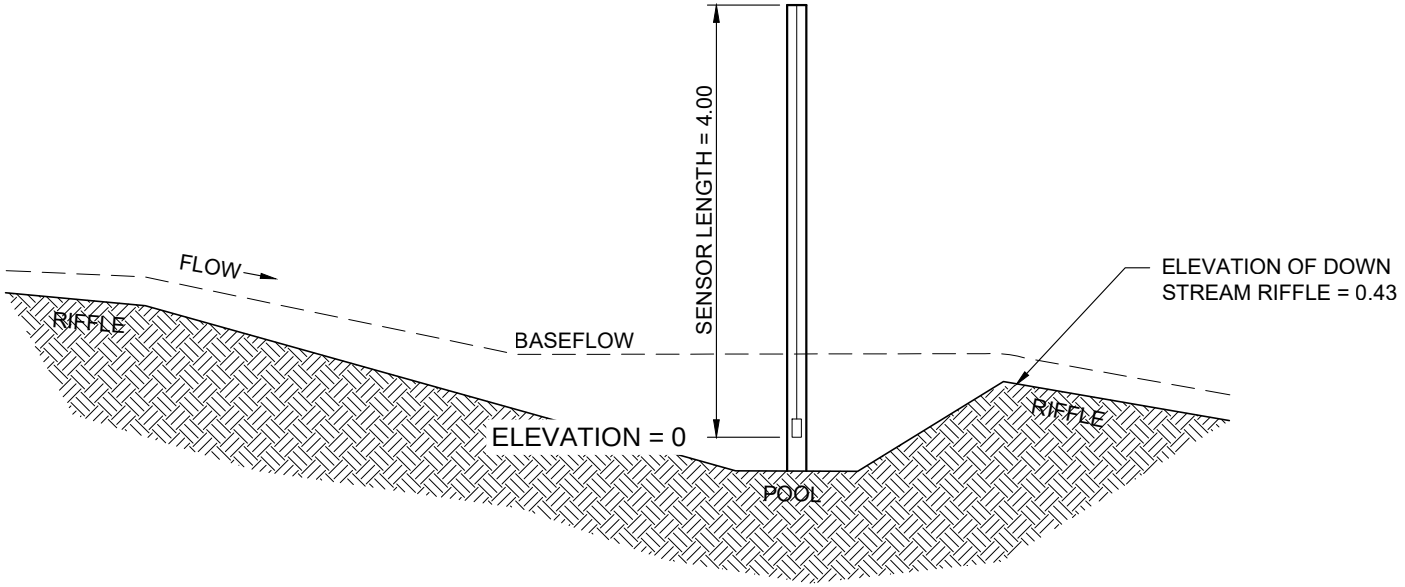
Verification of Bankfull Events: CG-2 (R7-lower) Odells House Mitigation Project					
Monitoring Year	Date of Collection	Date of Occurrence	Method	Photos	Measurement above bankfull (feet)
MY1	7/13/2021	3/16/2021	Pressure Transducer	No	0.11
	7/13/2021	3/19/2021	Pressure Transducer	No	0.10
	7/13/2021	3/28/2021	Pressure Transducer	No	0.33
	7/13/2021	3/31/2021	Pressure Transducer	No	0.14
	7/13/2021	4/11/2021	Pressure Transducer	No	0.33
	7/13/2021	6/10/2021	Pressure Transducer	No	0.46
	7/13/2021	7/8/2021	Pressure Transducer	No	0.28
	7/13/2021	7/11/2021	Pressure Transducer	No	0.17
	11/9/2021	7/27/2021	Pressure Transducer	No	0.43
	11/9/2021	10/26/2021	Pressure Transducer	No	0.24
	11/9/2021	10/29/2021	Pressure Transducer	No	0.20
MY2	4/8/2022	1/2/2022 - 1/10/2022	Pressure Transducer	No	0.54
	4/8/2022	1/16/2022 - 1/18/2022	Pressure Transducer	No	0.42
	4/8/2022	1/20/2022 - 1/23/2022	Pressure Transducer	No	0.13
	4/8/2022	2/7/2022 - 2/9/2022	Pressure Transducer	No	0.17
	4/8/2022	3/12/2022	Pressure Transducer	No	0.31
	4/8/2022	3/24/2022	Pressure Transducer	No	0.44
	4/8/2022	4/7/2022	Pressure Transducer	No	0.22
	4/8/2022	Unknown	Wrack lines	Yes	N/A
	6/9/2022	4/18/2022	Pressure Transducer	No	0.16
	6/9/2022	5/24/2022	Pressure Transducer	No	0.07
	8/18/2022	8/12/2022	Pressure Transducer	No	0.28
MY3	3/28/2023	1/4/2023	Pressure Transducer	No	0.10
	3/28/2023	1/22/2023	Pressure Transducer	No	0.10
	3/28/2023	2/1/2023 - 2/3/2023	Pressure Transducer	No	0.17
	3/28/2023	2/12/2023	Pressure Transducer	No	0.19
	6/9/2023	4/8/2023 - 4/9/2023	Pressure Transducer	No	0.31
	6/9/2023	4/14/2023	Pressure Transducer	No	0.27
	6/9/2023	4/22/2023	Pressure Transducer	No	0.20
	6/9/2023	4/28/2023 - 5/1/2023	Pressure Transducer	No	0.56
	6/9/2023	5/17/2023	Pressure Transducer	No	0.21
	9/26/2023	7/14/2023	Pressure Transducer	No	0.30
	9/26/2023	9/23/2023	Pressure Transducer	No	0.17



FLOW GAUGE #1 - R1

Flow Depth = 1.19 feet

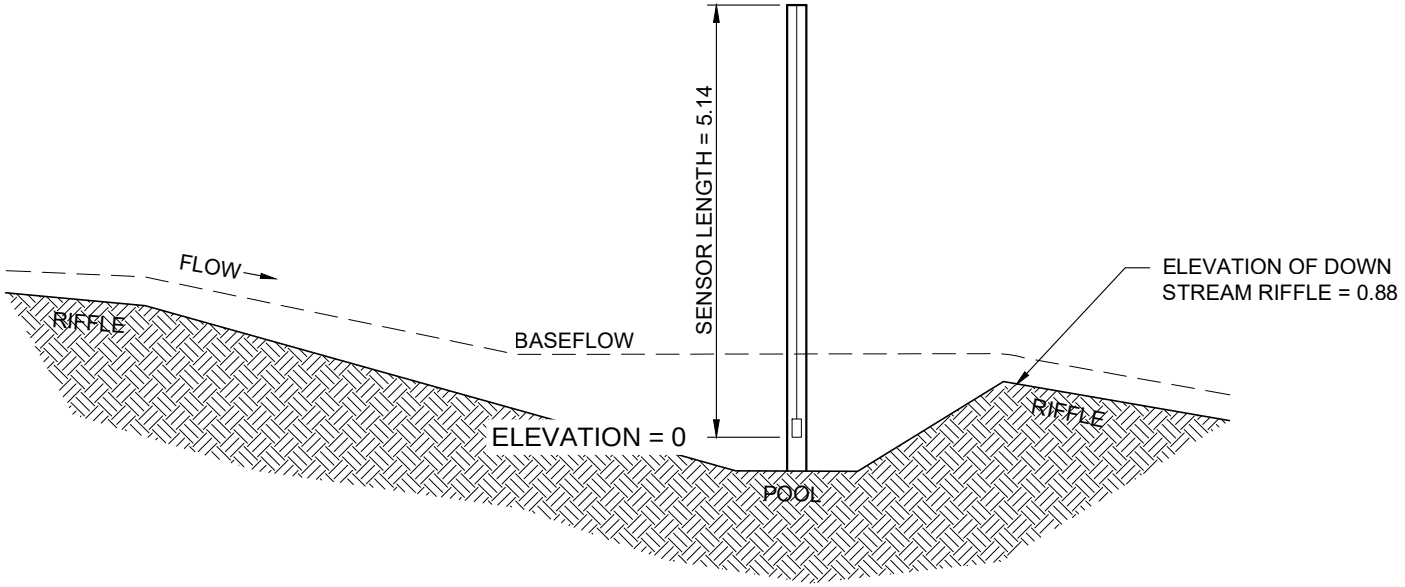
*All elevations relative to sensor depth



FLOW GAUGE #2 - R5

Flow Depth = 0.43 feet

*All elevations relative to sensor depth

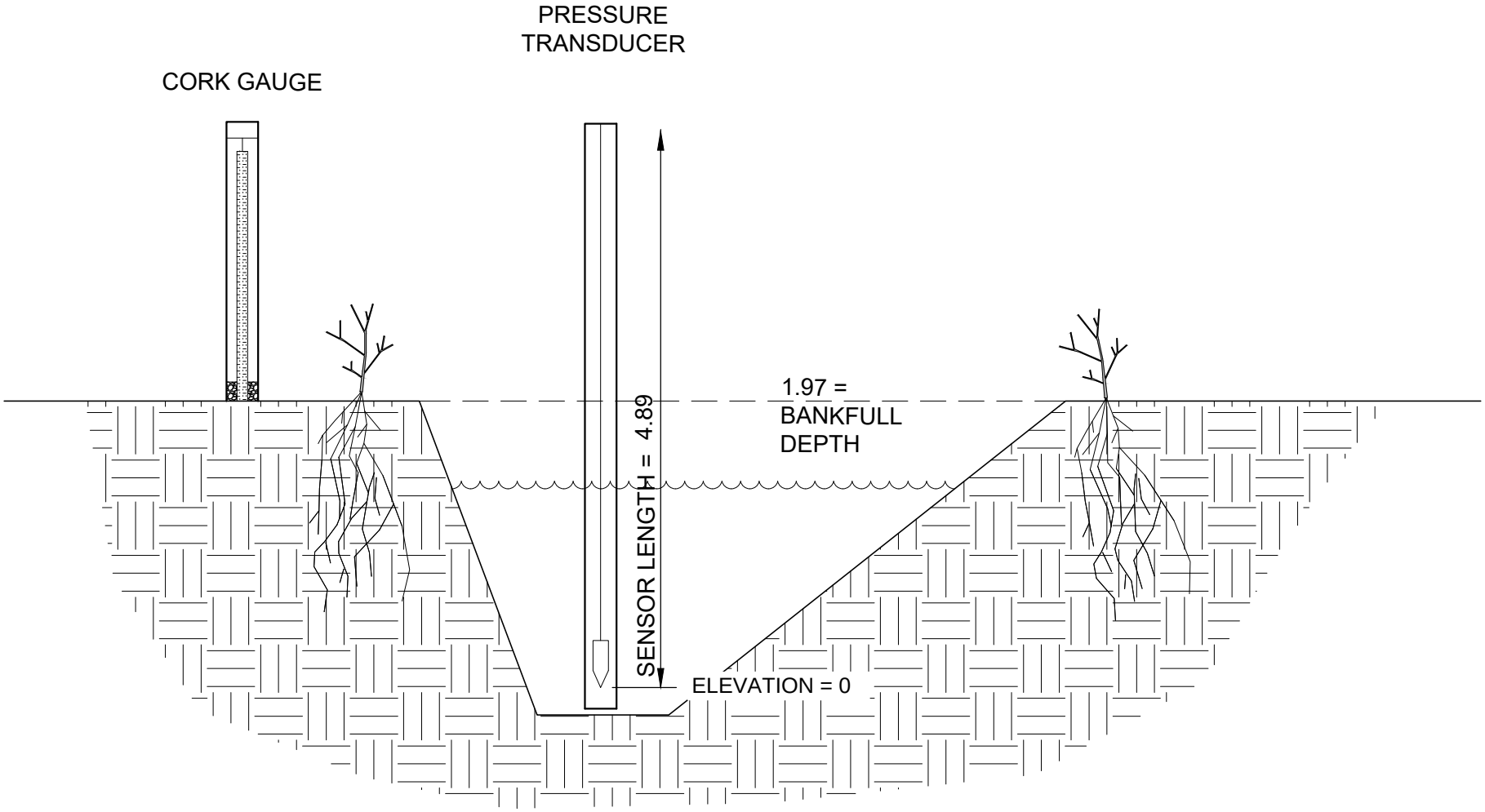


FLOW GAUGE #3 - R1

Flow Depth = 0.88 feet

*All elevations relative to sensor depth

CROSS SECTIONAL VIEW OF STREAM

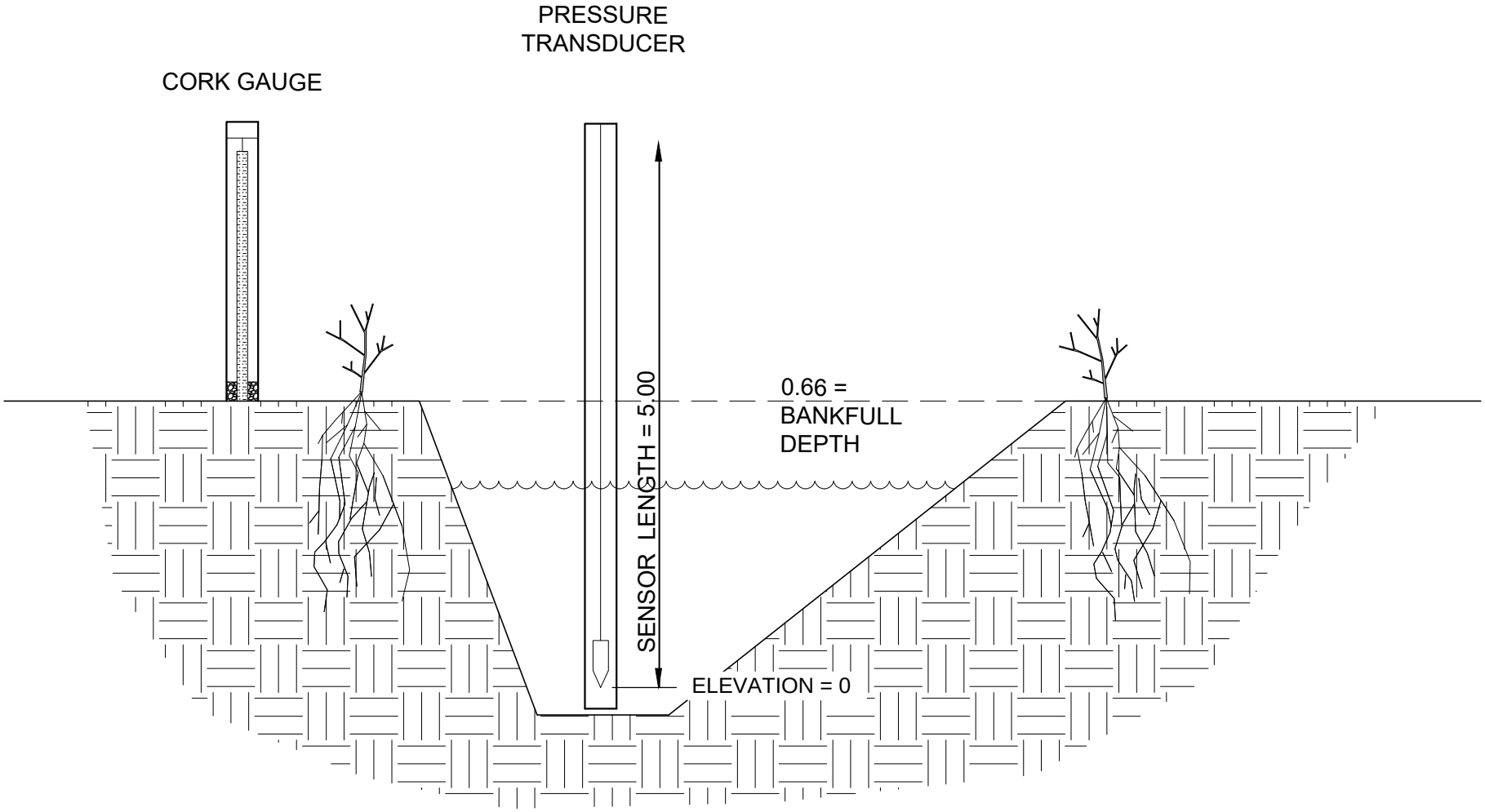


Crest Gauge CG-1 (R3)

Bankfull Event Depth = 1.81 feet

*All elevations relative to sensor depth

CROSS SECTIONAL VIEW OF STREAM

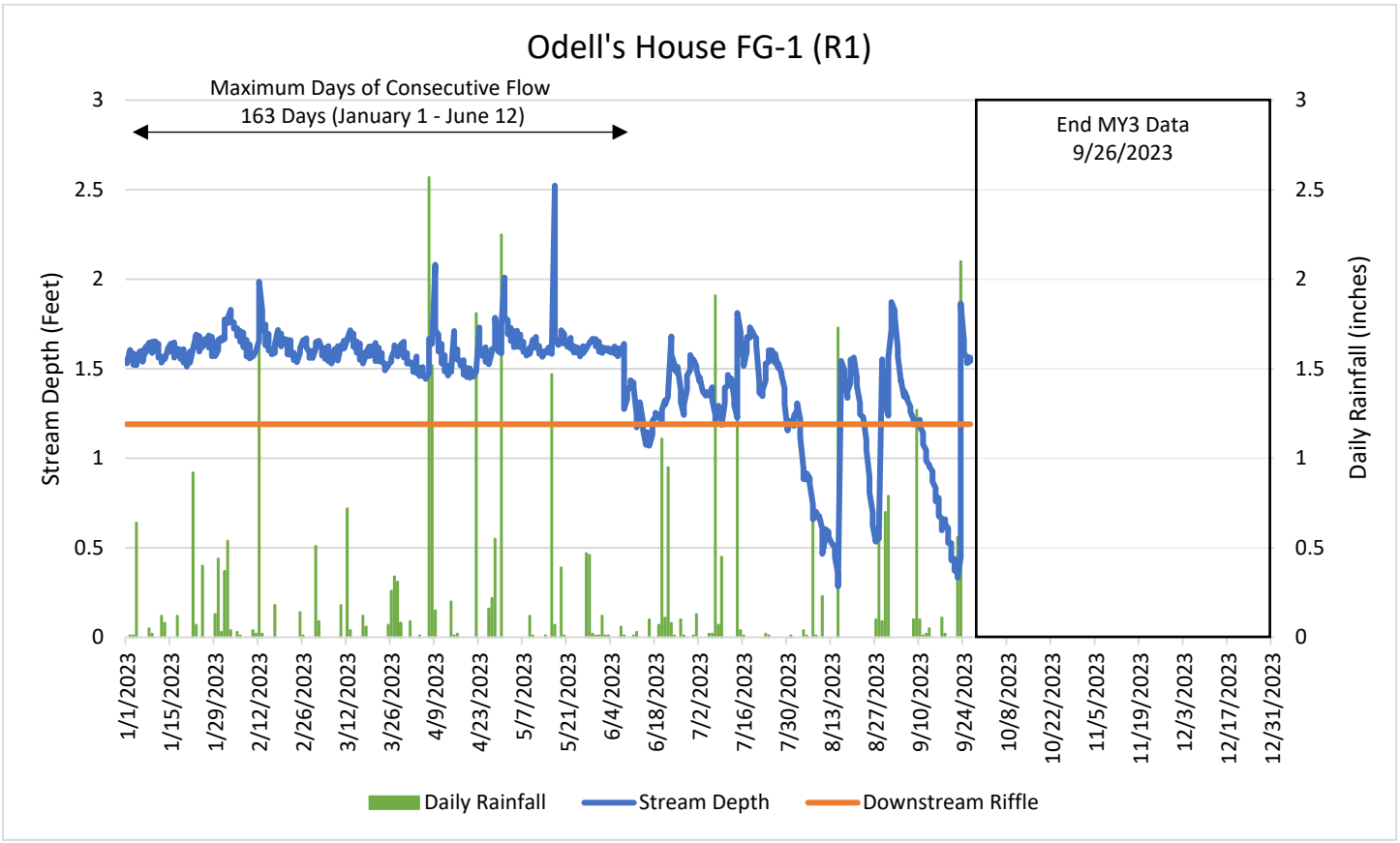


Crest Gauge CG-2 (R7 lower)

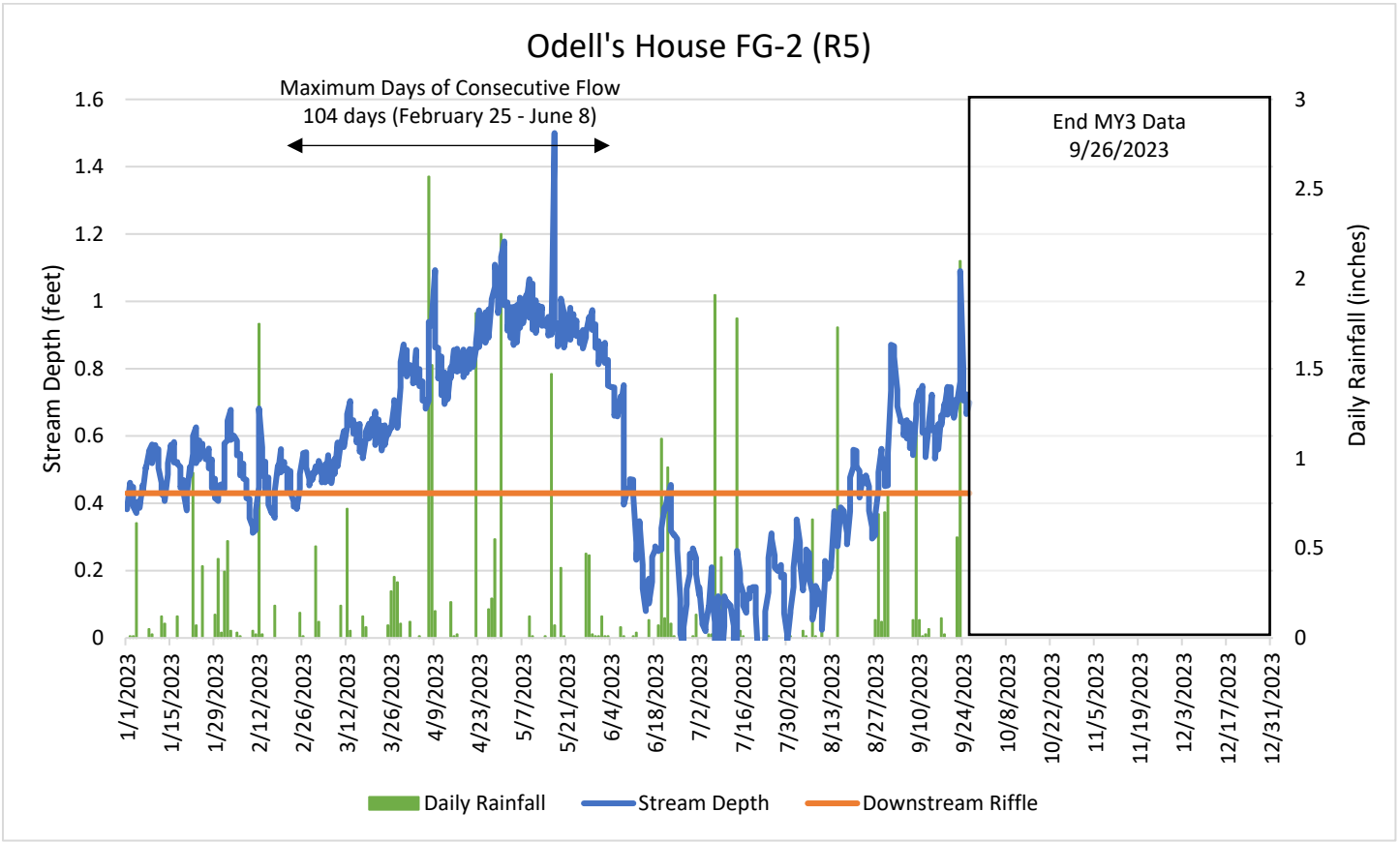
Bankfull Event Depth = 0.61 feet

*All elevations relative to sensor depth

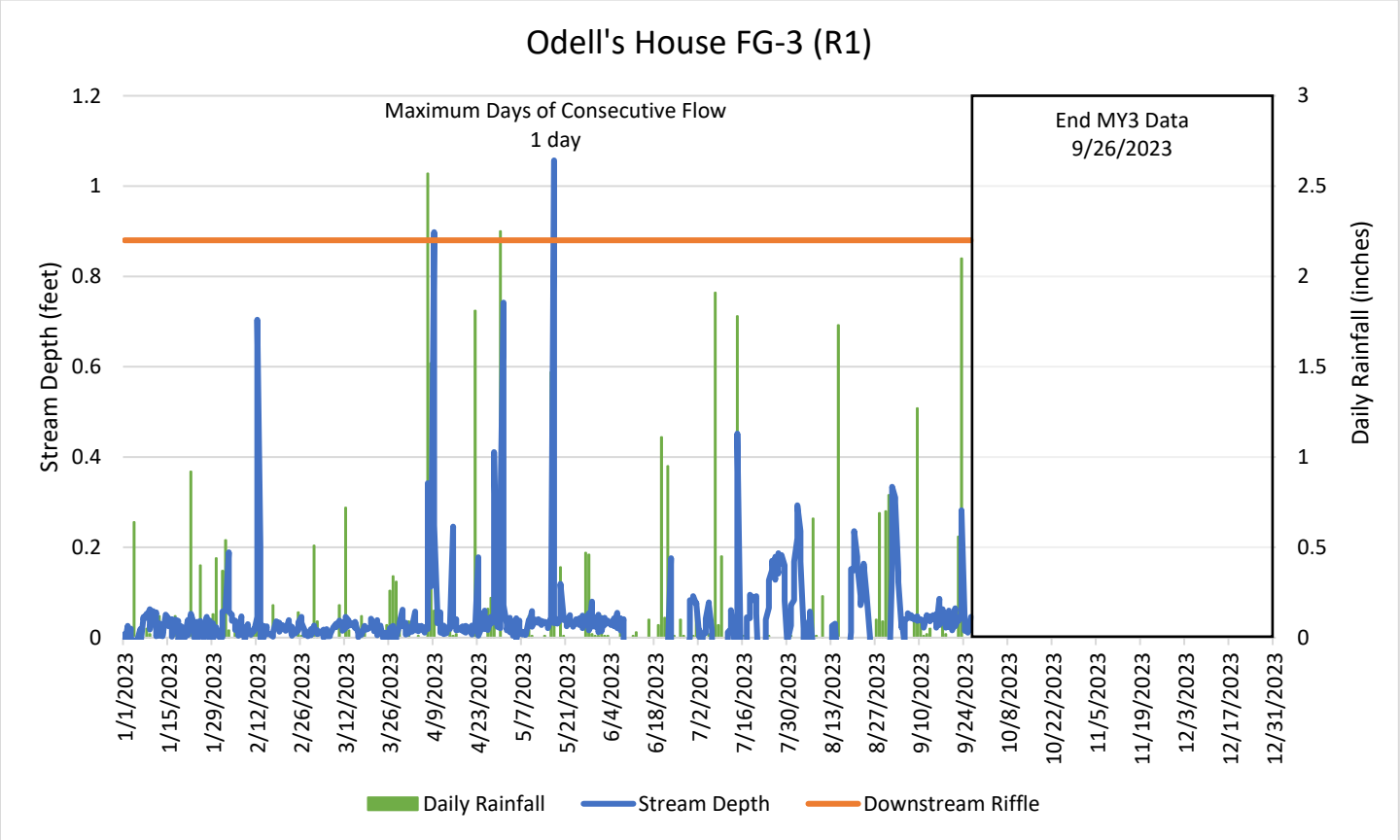
Flow Gauge Graphs



***FG-1:** 233 days total of Cumulative Flow, 37 days of no flow.

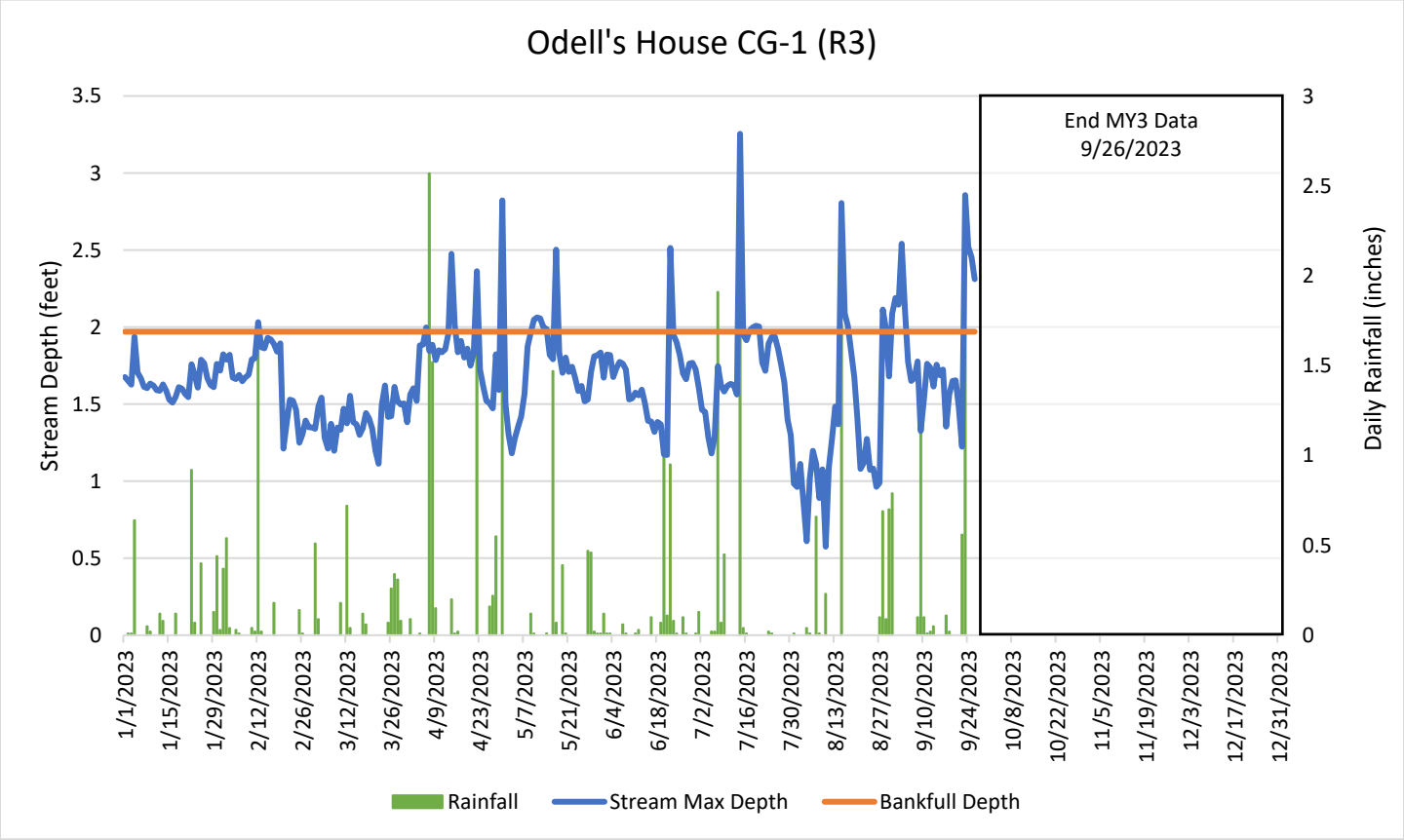


***FG-2:** 182 days of Cumulative Flow, 88 days of no flow.

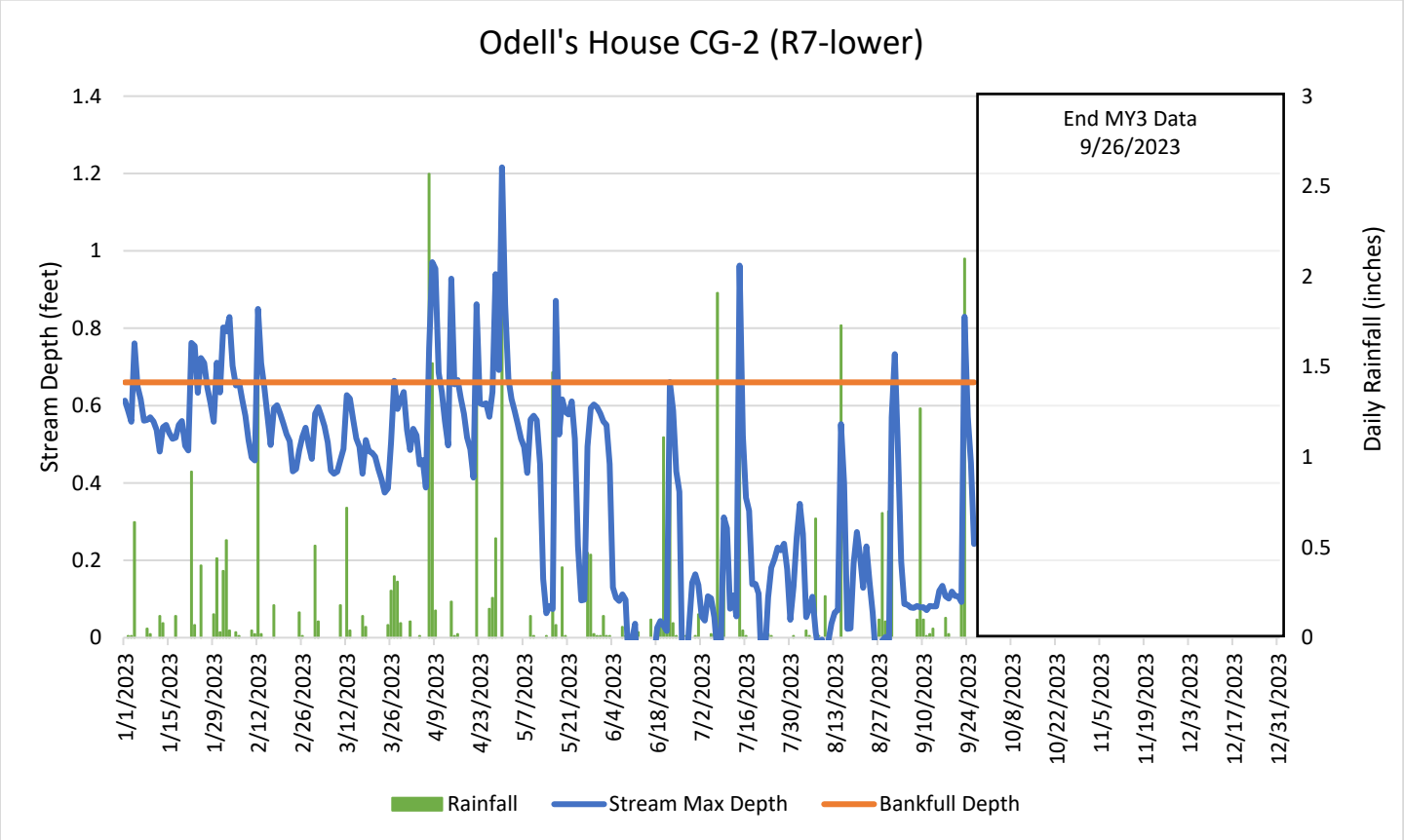


***FG-3:** 2 days of Cumulative Flow, 267 days of no flow.

Crest Gauge Graphs



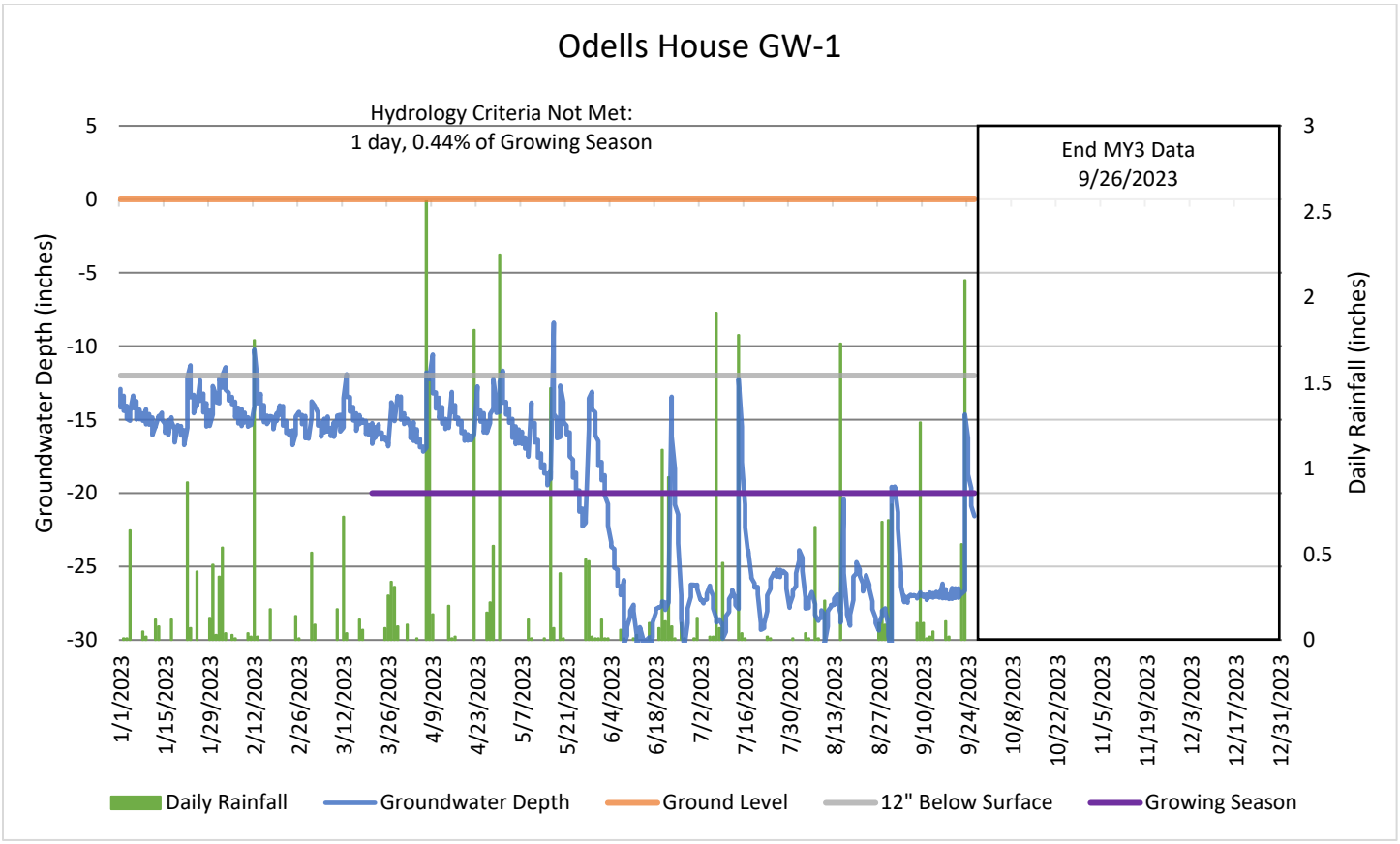
***CG-1:** 14 bankfull events with a maximum 1.285' above bankfull on July 14th

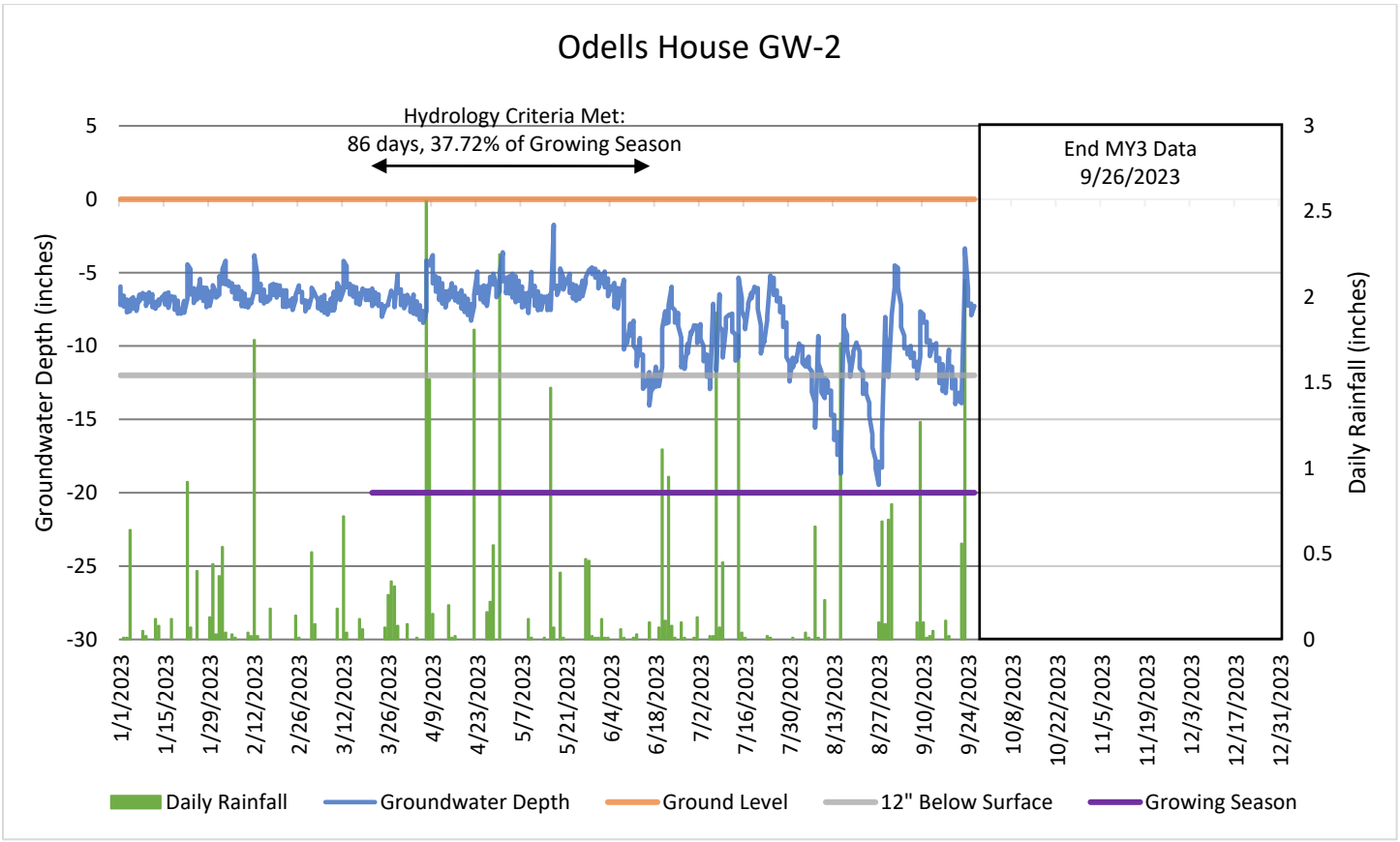


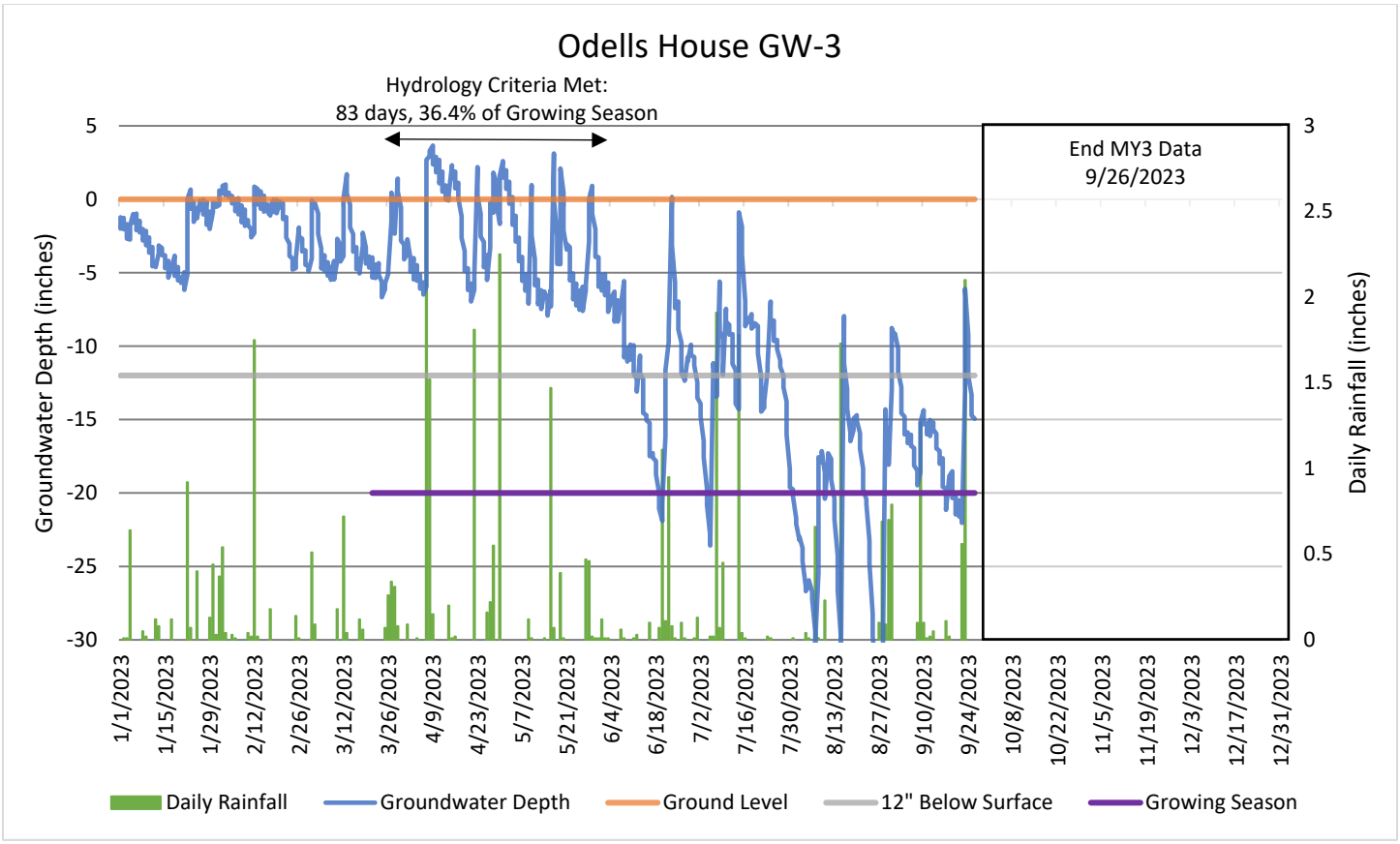
***CG-2:** 11 bankfull events with a maximum 0.56' above bankfull on April 30th

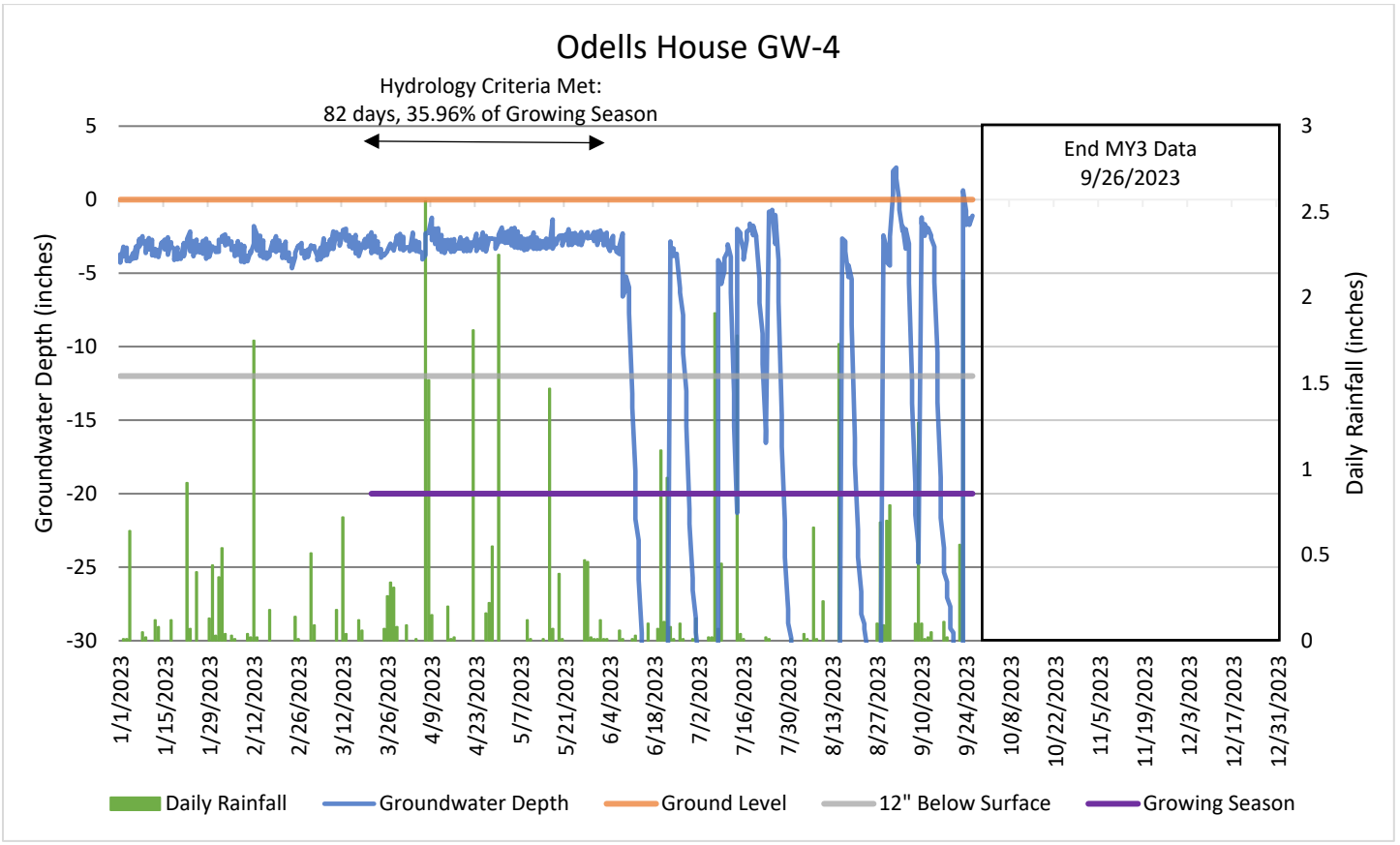
Max Consecutive Hydroperiod Saturation within 12 Inches of Soil Surface (Percent of Growing Season 3/21-11/3) CRONOS Station:Clayton (CLAY)								
Monitoring Gauge Name	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**Mean**
Groundwater Gauge 1 (W1)	**14.54%**	**2.20%**	**0.44%**					**5.73%**
Groundwater Gauge 2 (W2)	**24.23%**	**42.73%**	**37.72%**					**34.89%**
Groundwater Gauge 3 (W3)	**17.18%**	**27.31%**	**36.40%**					**26.96%**
Groundwater Gauge 4 (W5)	**17.18%**	**32.16%**	**35.96%**					**28.43%**
Groundwater Gauge 5 (W5)	**25.11%**	**22.47%**	**23.68%**					**23.75%**
Groundwater Gauge 6 (W1)*	**N/A**	**N/A**	**0.88%**					**0.88%**
*Groundwater Gauge 6 was installed prior to MY3								

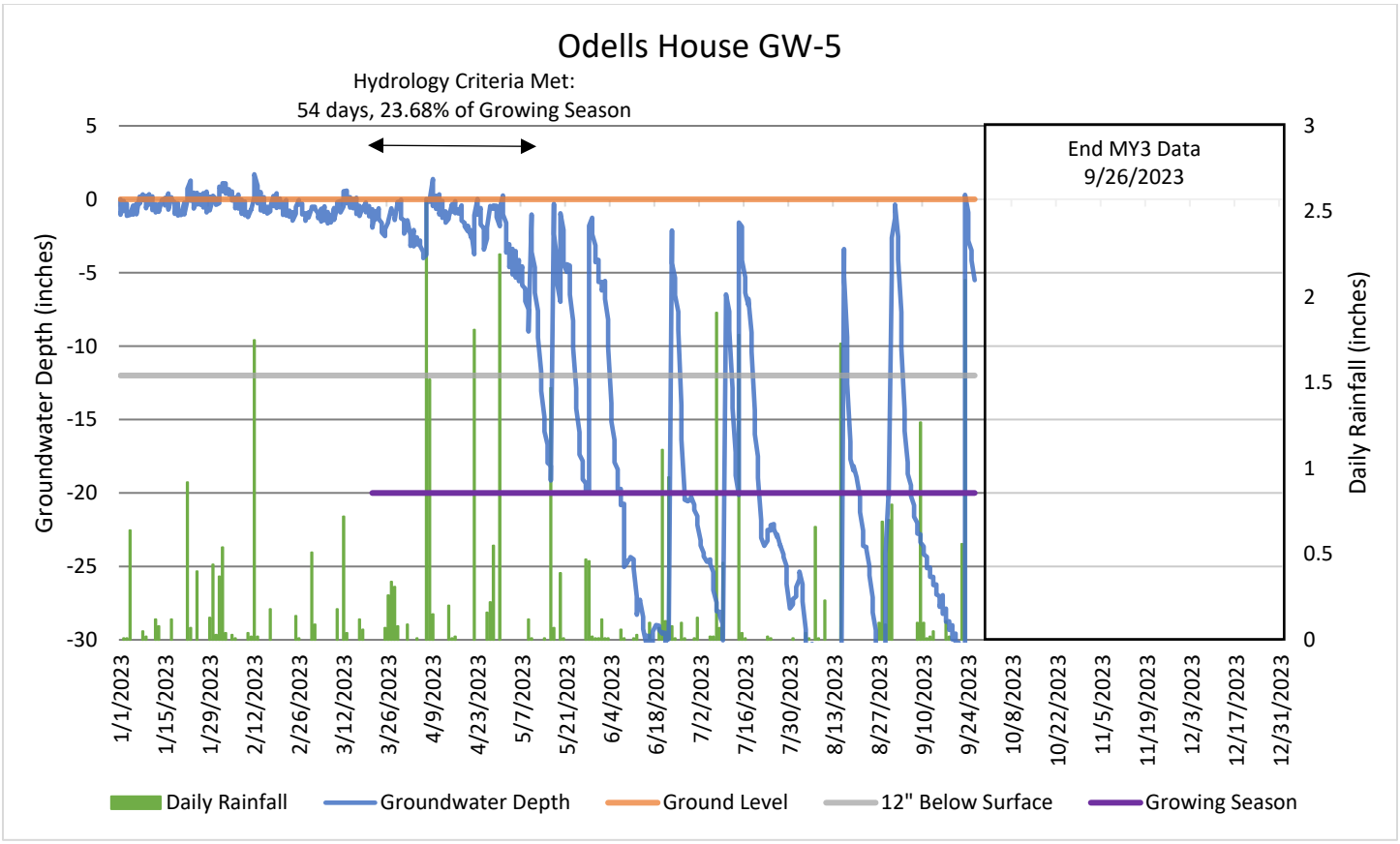
Groundwater Gauge Graphs

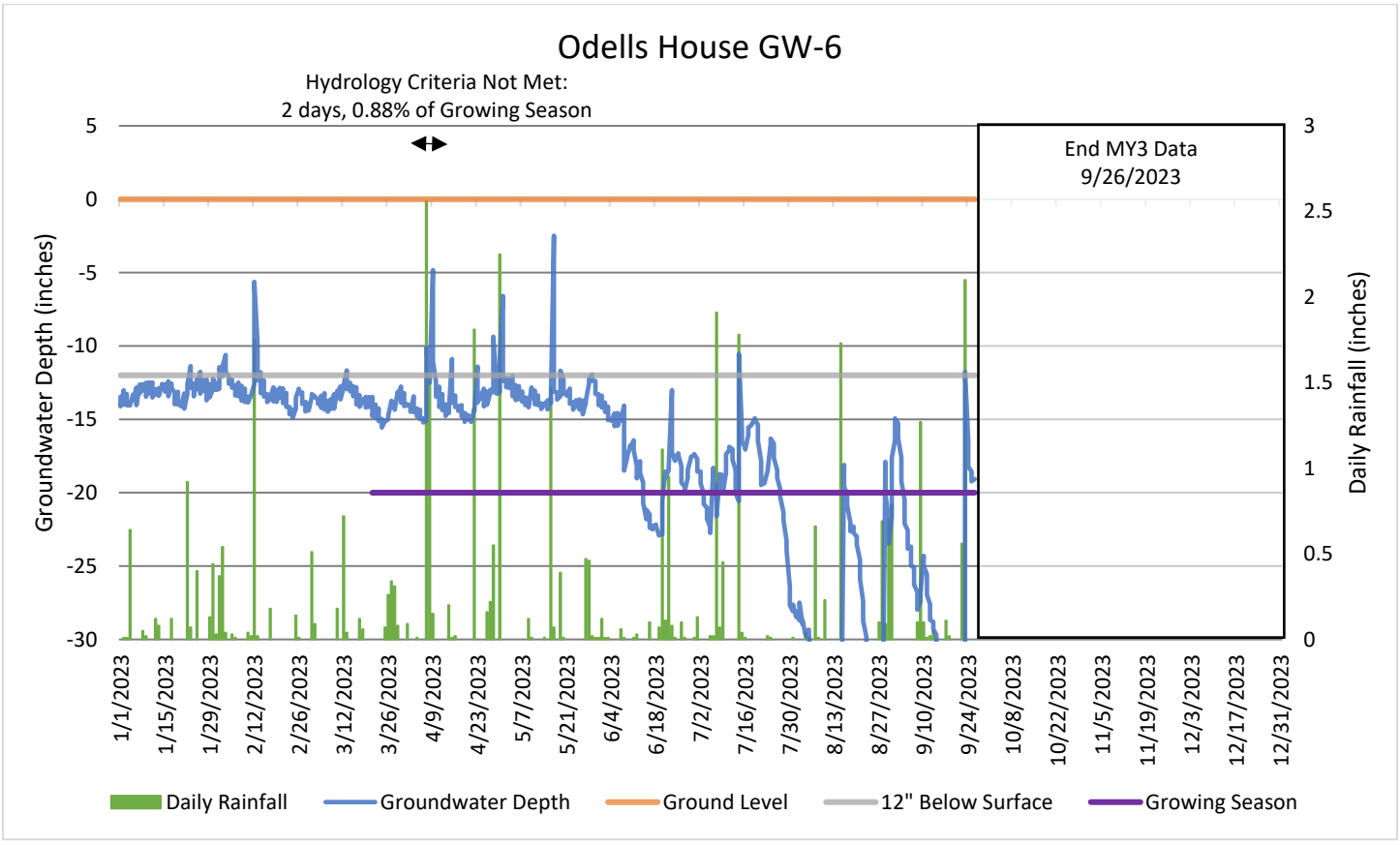


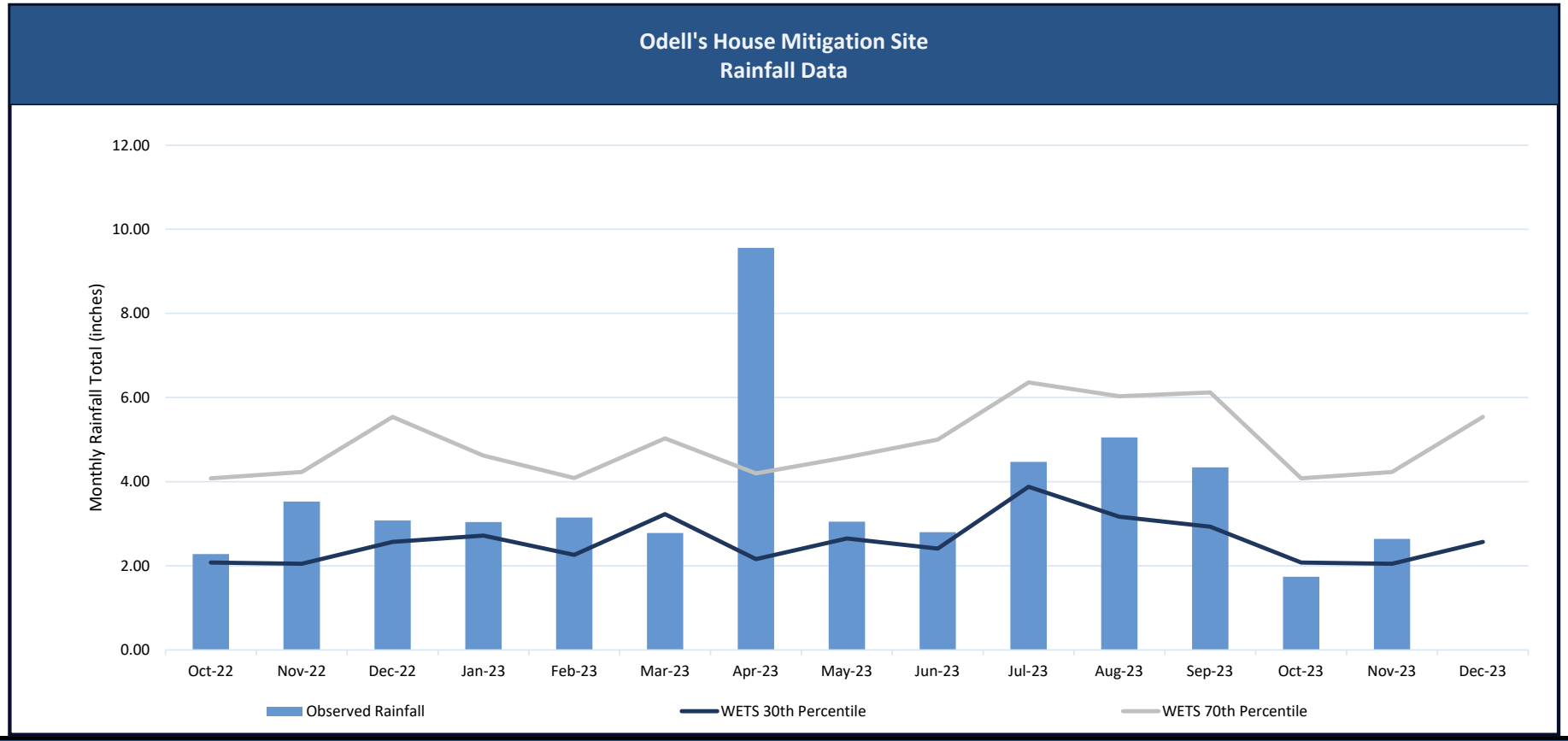



Odells House GW-3
Hydrology Criteria Met:
83 days, 36.4% of Growing Season
End MY3 Data
9/26/2023
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3
2.5
2
1.5
1
0.5
0
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Daily Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Odells House GW-4
Hydrology Criteria Met:
82 days, 35.96% of Growing Season
End MY3 Data
9/26/2023
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3
2.5
2
1.5
1
0.5
0
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Daily Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Odells House GW-5
Hydrology Criteria Met:
54 days, 23.68% of Growing Season
End MY3 Data
9/26/2023
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3
2.5
2
1.5
1
0.5
0
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Daily Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Odells House GW-6
Hydrology Criteria Not Met:
2 days, 0.88% of Growing Season
End MY3 Data
9/26/2023
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3
2.5
2
1.5
1
0.5
0
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Daily Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season



Rainfall Summary Table															
	Oct-2022	Nov-2022	Dec-2022	Jan-2023	Feb-2023	Mar-2023	Apr-2023	May-2023	Jun-2023	Jul-2023	Aug-2023	Sep-2023	Oct-2023	Nov-2023	Dec-2023
Observed Rainfall	2.28	3.53	3.08	3.04	3.15	2.78	9.56	3.05	2.80	4.47	5.05	4.34	1.74	2.64	**
WETS 30th Percentile	2.08	2.05	2.57	2.72	2.26	3.23	2.16	2.65	2.41	3.88	3.17	2.93	2.08	2.05	2.57
WETS 70th Percentile	4.08	4.23	5.54	4.62	4.09	5.03	4.2	4.58	5	6.36	6.03	6.12	4.08	4.23	5.54
Normal	N	N	N	N	N	L	H	N	N	N	N	N	L	N	**

*30th and 70th Percentile data collected from WETS Station : Johnston County

**Incomplete month of data

Appendix E:

Project Timeline and Contact Info

Project Timeline and Contacts Table		
Activity or Deliverable	**Data Collection Complete**	**Task Completion or Deliverable Submission**
Project Instituted	N/A	1/2/2018
Mitigation Plan Approved	N/A	8/26/2020
Construction (Grading) Completed	N/A	3/25/2021
Planting Completed	N/A	4/1/2021
As-built Survey Completed	N/A	6/11/2021
MY-0 Baseline Report	5/6/2021	6/15/2021
MY1 Monitoring Reports	11/23/2021	12/23/2021
Encroachment	N/A	5/26/2021
Wetland Planting	N/A	1/6/2022
MY2 Monitoring Reports	9/14/2022	11/30/2022
Invasive Treatment	N/A	6/8/2023
Invasive Treatment	N/A	8/30/2023
MY3 Monitoring Reports	9/26/2023	12/29/2023

Odell's House DMS Project # 100041	
Provider	7721 Six Forks Road Suite 130
Water & Land Solutions, LLC	Raleigh, NC 27615
Mitigation Provider POC: Leah Farr	(919) 971 - 4575
Designer	7721 Six Forks Road Suite 130
Water & Land Solutions, LLC	Raleigh, NC 27615
Primary project design POC: Chris Tomsic, WLS	(828) 492-3287
Construction Contractor	2889 Lowery Street
North State Environmental, Inc.	Winston-Salem, NC 27101
Primary contractor POC: Andrew Roten	(336) 406-9078

Appendix F:
Benthic Data

Macrobenthic Sampling Data

R3 - Odell's House Mitigation Site			
Monitoring Year	MY0	MY3	
Biotic Index Score	NA*	8.32	
Water Quality Level	NA*	Poor	

**No benthics were collected during sampling*

View Upstream

View Downstream

Macrobenthic Sampling Data

R6 - Odell's House Mitigation Site			
Monitoring Year	MY0	MY3	
Biotic Index Score	NA*	7.87	
Water Quality Level	NA*	Poor	

**Sampling reach adjusted*

View Upstream

View Downstream

Biotic Index Data and Scores		
MY3 2023		
Taxa / Biotic Index Value	**R3**	**R6**
ODONATA		
Family Coenagrionidae		
Enallagma spp (8.5)	R	
Cordulegaster spp (5.7)	R	
COLEOPTERA		
Family Dytiscidae		
Laccophilus spp (9.8)		R
DIPTERA; CHIRONOMIDAE		
no genus specified (7.2)	R	R
DIPTERA		
Family Culicidae		
Anopholes spp (8.6)	R	
Family Tipulidae		
Tipula spp (7.5)	R	
Family Ptychopteridae		
Bittacomorpha spp (--)		R
HEMIPTERA		
Family Belostomatidae		
Belostoma spp (9.5)	C	
GASTROPODA		
Family Physidae		
Physa spp (8.7)	R	
HIRUDINEA		
Family Glossiphoniidae	C	
BIVALVIA		
Family Cyrenidae		
Corbicula fluminea (6.6)		R
Total Taxa Richness	**8**	**4**
EPT Taxa Richness	**0**	**0**
EPT Abundance	**0**	**0**
Biotic Index	**8.32**	**7.87**
Key		
R = Rare, C = Common, A = Abundant		

*no benthics were found at pre-construction sampling (MY0)