



**MONITORING YEAR 4
ANNUAL REPORT**
Final

January 2023

BUCKWATER MITIGATION SITE

Orange County, NC
Neuse River Basin
HUC 03020201

DMS Project No. 97084
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DWR Project No. 2016-0406 v2

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BUCKWATER MITIGATION SITE
Monitoring Year 4 Annual Report

TABLE OF CONTENTS

Section 1: PROJECT OVERVIEW 1-1

 1.1 Project Quantities and Credits 1-1

 1.2 Project Goals and Objectives 1-3

 1.3 Project Attributes..... 1-4

Section 2: Monitoring Year 4 Data Assessment 2-1

 2.1 Vegetative Assessment 2-1

 2.2 Vegetation Areas of Concern and Management 2-1

 2.3 Stream Assessment..... 2-1

 2.4 Stream Areas of Concern and Management..... 2-1

 2.5 Hydrology Assessment 2-1

 2.6 Wetland Assessment..... 2-2

 2.7 Monitoring Year 4 Summary 2-3

Section 3: REFERENCES 3-1

TABLES

Table 1: Project Quantities and Credits 1-1

Table 2: Goals, Performance Criteria, and Functional Improvements 1-3

Table 3: Project Attributes 1-5

FIGURES

Figure 1a-e Integrated Current Condition Plan View

APPENDICES

Appendix A Visual Assessment Data

Table 4 Visual Stream Morphology Stability Assessment Table

Table 5 Vegetation Condition Assessment Table

 Stream Photographs

 Vegetation Plot Photographs

Appendix B Vegetation Plot Data*

Table 6 Vegetation Plot Data

Table 7 Vegetation Performance Standards Summary Table

Appendix C Stream Geomorphology Data*

 Cross-Section Plots

Table 8 Baseline Stream Data Summary

Table 9 Cross-Section Morphology Monitoring Summary

Appendix D Hydrology Data

Table 10 Bankfull Events

Table 11 Rainfall Summary

 Bankfull Events Visual Observations

Table 12 Recorded In-Stream Flow Events Summary

 Recorded In-Stream Flow Events Plot

Table 13 Groundwater Gauge Summary
Groundwater Gauge Plot
Figure 2a-e MY4 Follow-Up Wetland Delineation Map
MY4 Follow-Up Wetland Delineation Photographs

Appendix E Project Timeline and Contact Info
Table 14 Project Activity and Reporting History
Table 15 Project Contact Table

Appendix F Additional Documentation
IRT Correspondence – Supplemental Planting

*Content omitted from Monitoring Year 4 Report



Section 1: PROJECT OVERVIEW

The Buckwater Mitigation Site (Site) is located in central Orange County, approximately 4.5 miles northeast of Hillsborough, NC. The Site lies in the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998). Table 3 presents information related to the project attributes.

1.1 Project Quantities and Credits

The Site is located on eleven parcels under nine different landowners and a conservation easement was recorded on 51.84 acres. Mitigation work within the Site included restoration, enhancement I, and enhancement II of perennial and intermittent stream channels. Table 1 below shows stream credits by reach and the total amount of stream credits expected at closeout.

Table 1: Project Quantities and Credits

PROJECT MITIGATION QUANTITIES						
Reach ID	Mitigation Plan Footage	As-Built Footage	Mitigation Category	Restoration Level	Mitigation Ratio (X:1)	Comments
STREAMS						
Buckwater Reach 1	445	433	Warm	EII	2.5	Grade Control Structures, Bank Repair, Conservation Easement
Buckwater Reach 2	160	162	Warm	EI	1.5	Grade Control Structures, Bank Repair, Planted Buffer
Buckwater Reach 3	232	232	Warm	EI	1.5	Grade Control Structures, Bank Repair, Planted Buffer
Buckwater Reach 4	2,067	2,071	Warm	R	1.0	Full Channel Restoration, Planted Buffer, Invasive Control
	30	29	N/A	N/A	0.0	Utility Crossing
	206	209	Warm	R	1.0	Full Channel Restoration, Planted Buffer
	72	70	N/A	N/A	0.0	Road Crossing
	194	198	Warm	R	1.0	Full Channel Restoration, Planted Buffer
Buckwater Reach 5	486	485	Warm	R	1.0	Full Channel Restoration, Planted Buffer, Invasive Control
Buckwater Reach 6	379	363	Warm	R	1.0	Full Channel Restoration, Planted Buffer, Invasive Control
	118	30	N/A	N/A	0.0	Utility Crossing
Buckwater Reach 7	43	132	N/A	N/A	0.0	Utility Crossing
	891	885	Warm	EII	2.5	Grade Control Structures, Bank Repair, Enhancement Work Completed Beyond Limits of Conservation Easement
Buckwater Reach 8	188	185	Warm	EII	2.5	Bank Repair, Conservation Easement
T1 Reach 1	366	375	Warm	EI	1.5	Grade Control Structures, Planted Buffer
	119	0	N/A	N/A	0.0	Road Crossing
T1 Reach 2	123	244	N/A	N/A	0.0	Utility Crossing
	485	477	Warm	R	1.0	Full Channel Restoration, Planted Buffer
	25	43	N/A	N/A	0.0	Utility Crossing
T2	587	592	Warm	R	1.0	Full Channel Restoration, Planted Buffer

T3 Reach 1	1,101	1,107	Warm	EII	2.5	Livestock Exclusion, Grade Control Structures, Planted Buffer
	30	29	N/A	N/A	0.0	Road Crossing
	166	167	Warm	EII	2.5	Livestock Exclusion, Grade Control Structures, Planted Buffer
T3 Reach 2	658	665	Warm	R	1.0	Full Channel Restoration, Planted Buffer, Livestock Exclusion
	63	93	N/A	N/A	0.0	Road Crossing
	193	197	Warm	R	1.0	Full Channel Restoration, Planted Buffer, Livestock Exclusion
T4	961	956	Warm	R	1.0	Full Channel Restoration, Planted Buffer
T4A Reach 1	311	327	Warm	R	1.0	Farm Pond Drained, Full Channel Restoration, Planted Buffer
T4A Reach 2	175	155	Warm	EII	2.5	Livestock Exclusion, Grade Control Structures, Conservation Easement
	72	75	N/A	N/A	0.0	Road Crossing
T4A Reach 3	201	208	Warm	R	1.0	Full Channel Restoration, Planted Buffer
	64	66	N/A	N/A	0.0	Road Crossing
T4B Reach 1	345	346	Warm	R	1.0	Full Channel Restoration, Livestock Exclusion
T5	548	554	Warm	R	1.0	Full Channel Restoration, Planted Buffer, Invasive Control
	167	0	N/A	N/A	0.0	Road Crossing
	711	722	Warm	R	1.0	Full Channel Restoration, Planted Buffer, Farm Pond Drained
T6 Reach 1	695	697	Warm	EII	2.5	Invasive Control, Bank Repair, Conservation Easement
T6 Reach 2	458	458	Warm	EII	2.5	Invasive Control, Bank Repair, Conservation Easement
	30	30	N/A	N/A	0.0	Road Crossing
T6 Reach 3	620	623	Warm	EI	1.5	Grade Control Structures, Planted Buffer, Invasive Control
T6A	311	313	Warm	EII	2.5	Grade Control Structures, Bank Repair, Conservation Easement
T6B	136	136	Warm	EII	2.5	Grade Control Structures, Bank Repair, Conservation Easement
T7 Reach 1	322	320	Warm	EI	1.5	Grade Control Structures, Planted Buffer
T7 Reach 2	363	367	Warm	R	1.0	Full Channel Restoration, Planted Buffer
T7 Reach 3	356	357	Warm	R	1.0	Full Channel Restoration, Planted Buffer
T7A	242	240	Warm	EI	1.5	Grade Control Structures, Planted Buffer
T8	631	621	Warm	EI	1.5	Grade Control Structures, Planted Buffer
T9	73	73	Warm	EII	2.5	Grade Control Structures, Conservation Easement



Restoration Level	Stream		
	Warm	Cool	Cold
Restoration	9,051.000		
Enhancement I	1,715.334		
Enhancement II	1,855.600		
Preservation			
Totals	12,621.934		
Total Stream Credit	12,621.934		

1.2 Project Goals and Objectives

The project is intended to provide numerous ecological benefits. Table 2 below describes expected outcomes to water quality and ecological processes and provides project goals and objectives.

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Improve the stability of stream channels.	Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time.	Significantly reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary.	ER stays over 2.2 and BHR below 1.2 with visual assessments showing progression towards stability.	Cross-section monitoring and visual inspections.	Cross-section data not required for MY4. Beaver dams were removed along Buckwater Creek Reach 4. Visual observations indicate channel is performing as intended.
Improve instream habitat.	Install habitat features such as constructed riffles, cover/lunker logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Increase and diversify available habitats for macroinvertebrates, fish, and amphibians leading to colonization and increase in biodiversity over time. Add complexity including LWD to streams.	There is no required performance standard for this metric.	N/A	N/A
Reconnect channels with floodplains and riparian wetlands to allow a natural flooding regime.	Reconstruct stream channels for bankfull dimensions and depth relative to the existing floodplain.	Raise water table and hydrate riparian wetlands. Allow more frequent flood flows to disperse on the floodplain.	Two or more bankfull events in separate years and two geomorphically significant events throughout the monitoring period. 30 consecutive days of flow for intermittent channels.	Crest gauges and/or pressure transducers recording flow elevations.	Bankfull or geomorphically significant events were recorded on all streams with crest gauges. T4A, T4B, T6, T7 Reach 2, T7A, and T8 exceeded 30 days of consecutive flow during MY4.

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Exclude cattle from project streams.	Install fencing around conservation easements adjacent to cattle pastures.	Reduce and control sediment inputs; reduce and manage nutrient inputs; reduce and manage fecal coliform inputs. Contribute to protection of or improvement to a Water Supply Waterbody. Support Falls Lake recovery plan.	Prevent cattle from accessing the stream.	Visually inspect the Site to ensure no cattle encroachment is occurring.	No cattle encroachments.
Restore and enhance native floodplain and streambank vegetation.	Plant native tree and understory species in riparian zone and plant appropriate species on streambank.	Reduce sediment inputs from bank erosion and runoff. Increase nutrient cycling and storage in floodplain. Provide riparian habitat. Add a source of LWD and organic material to stream.	Survival rate of 320 stems per acre at MY3, 260 stems per acre at MY5, and 210 stems per acre at MY7. Height requirement is 7 feet at MY5 and 10 feet at MY7.	One hundred square meter vegetation plots are placed on 2% of the planted area of the Site and monitored annually.	Vegetation plot data not required for MY4. Based on visual observations a healthy early successional canopy is starting to form. November 2022 supplemental planting occurred along 4.3 acres.
Permanently protect the project Site from harmful uses.	Establish conservation easements on the Site.	Protect Site from encroachment on the riparian corridor and direct impact to streams and wetlands.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	No easement encroachments.

1.3 Project Attributes

Prior to construction activities, the primary causes of Site degradation were stream channelization and livestock grazing, both of which originated prior to 1938. Agricultural activity remained intensive through the 1990s with several thousand beef cattle and three hog houses. Currently, approximately 100 cows graze on two properties and non-forested land is used for cultivating hay. Several ponds along Buckwater Creek, T3, and T5 were built between 1938 and 1955. According to 1955 aerial photography, the top 1,000 feet of Buckwater Creek on the Site were channelized. Landowners maintained lower Buckwater Creek below Walnut Hill Drive as a straightened channel until the 1990s. Table 3 below and Table 8 in Appendix C present additional information on pre-restoration conditions.

Table 3: Project Attributes

PROJECT INFORMATION				
Project Name	Buckwater Mitigation Site	County		Orange County
Project Area (acres)	51.84	Project Coordinates		36.62349 N, 79.12911 W
PROJECT WATERSHED SUMMARY INFORMATION				
Physiographic Province	Piedmont	River Basin		Neuse
USGS HUC 8-digit	03020201	USGS HUC 14-digit		03020201030030
DWR Sub-basin	03-04-01	Land Use Classification		63.9% Forested, 32.1% Cultivated, 3.9% Impervious
Project Drainage Area (acres)	2,259	Percentage of Impervious Area		3.9%
RESTORATION TRIBUTARY SUMMARY INFORMATION				
Parameters	Buckwater Creek	T1	T2 & T3	T4, T4A, & T4B
Pre-project length (feet)	5,557	1,073	2,728	2,216
Post-project (feet)	5,223	852	2,728	1,992
Valley confinement	Moderately Confined to Unconfined	Unconfined	Unconfined to Confined	Moderately Confined to Unconfined
Drainage area (acres)	2,259	1,216	218	77
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Intermittent
DWR Water Quality Classification	WS-IV			
Dominant Stream Classification (existing)	E4/G4c	E4/B4c	E4/G4c	G4
Dominant Stream Classification (proposed)	C4/E4	E4	B4/C4	B4
Dominant Evolutionary class (Simon) if applicable	Stage V		Stage IV	
Parameters	T5 & T6	T7 & T7A		T8
Pre-project length (feet)	3,184	1,235		620
Post-project (feet)	3,054	1,284		621
Valley confinement	Moderately Confined	Moderately Confined to Confined		Moderately Confined
Drainage area (acres)	109	28		21
Perennial, Intermittent, Ephemeral	Intermittent	Intermittent		Intermittent
DWR Water Quality Classification	WS-IV			
Dominant Stream Classification (existing)	E4/C4	E4/G4		E4
Dominant Stream Classification (proposed)	B4/C4	B4/C4		
Dominant Evolutionary class (Simon) if applicable	Stage IV			
REGULATORY CONSIDERATIONS				
Parameters	Applicable?	Resolved?	Supporting Documentation	
Water of the United States - Section 404	Yes	Yes	USACE Nationwide Permit No. 27 and DWQ 401 Water Quality Certification No. 4134. Categorical Exclusion in Mitigation Plan (Wildlands, 2017)	
Water of the United States - Section 401	Yes	Yes		
Endangered Species Act	Yes	Yes		
Historic Preservation Act	Yes	Yes		
Coastal Zone Management Act (CZMA or CAMA)	N/A	N/A	N/A	
Essential Fisheries Habitat	N/A	N/A	N/A	



Section 2: Monitoring Year 4 Data Assessment

Annual monitoring and site visits were conducted during MY4 to assess the condition of the project. The vegetation and stream success criteria for the Site follow the approved success criteria presented in the Mitigation Plan (Wildlands, 2020). Performance criteria for vegetation, stream, and hydrologic assessment are located in Section 1.2, Table 2. Methodology for annual monitoring is presented in the MY0 Annual Report (Wildlands, 2019).

2.1 Vegetative Assessment

Detailed vegetation inventory and analysis is not required during MY4. Visual assessment during MY4 indicated that vegetation is healthy and performing adequately to attain interim success criteria of 260 planted stems per acre and the end of MY5 and terminal success criteria of 210 planted stems per acre and averaging ten feet in height. Many volunteer tree species have become established adding to the diversity of the overall Site. Along with a successful early successional canopy starting to develop, the herbaceous vegetation is dense and providing appropriate streambank stabilization and wildlife habitat.

2.2 Vegetation Areas of Concern and Management

Based on visual observations, Wildlands was concerned about lack of species diversity along portions of T3 and T7. With this in mind, Wildlands received approval from the IRT to supplementally plant 4.3 acres across the Site (Appendix F). The supplemental planting occurred on November 7, 2022.

Several small areas totaling 1.72 acres of Chinese privet (*Ligustrum sinense*) growth were noted along Buckwater Creek Reach 7 and T4. An invasive removal of these areas will be scheduled in 2023.

2.3 Stream Assessment

Detailed dimensional survey and analysis is not required for MY4. Visual monitoring indicated that the stream channels are performing as desired. No deposition or erosion exceeding approximate natural levels was observed. See Appendix A for stream photographs and visual assessment data.

2.4 Stream Areas of Concern and Management

Several beaver dams were removed along Buckwater Creek Reach 4 (Figure 1b) in August 2022 by APHIS. Beaver have not returned since the dams were removed. The two areas where beaver dams occurred experienced some vegetation loss and sediment deposition. The vegetation is expected to grow back in over the next year. The sediment deposition occurred on the point bars and is not a concern.

2.5 Hydrology Assessment

Bankfull or geomorphically significant events were recorded on Buckwater Creek Reach 6, T1 Reach 2, T2, T4, T5 (upstream and downstream of St. Mary's Road), and T7 Reach 3. All channels have met the hydrologic success criteria of two or more bankfull events in separate years and two geomorphically significant events throughout the monitoring period except T2 and T5 (upstream of St. Mary's Road). T2 and T5 (upstream of St. Mary's Road) only require one additional bankfull event to meet final success criteria.

In addition, the presence of baseflow must be documented on intermittent reaches (T4A, T4B, T6, T7 Reach 2, T7A, and T8) for a minimum of 30 consecutive days during a normal precipitation year. Intermittent reaches maintained baseflow from 41 to 221 consecutive days. Since baseflow has been documented and proven on the intermittent reaches for more than half the required 7-year monitoring period, Wildlands is requesting removal of all flow gauges. Refer to Appendix D for hydrologic data.



2.6 Wetland Assessment

Three groundwater gauges were installed and monitored within the existing wetlands zones. All gauges were installed at locations requested by NCDWR and were downloaded and maintained quarterly. The purpose of these gauges is to assess potential effects to wetland hydrology from the construction of restored stream channels through these areas. The results of this monitoring are not tied to any success criteria. The measured hydroperiod ranged from 2.3% to 39.6% of the growing season consecutively. Refer to Appendix D for wetland data.

Per the Mitigation Plan (Wildlands, 2017) wetlands were delineated during MY4. The outcome of the follow-up delineation is below.

In 2016, a jurisdictional Waters of the U.S. (WOTUS) delineation was completed for the Site as a component of the Mitigation Plan and a Preliminary Jurisdictional Determination (SAW-2016-00873) was issued by the U.S. Army Corps of Engineers (USACE) on February 16, 2017. During this field investigation, 70 jurisdictional wetlands totaling approximately 6.68 acres were identified within and immediately surrounding the project easement area. As a condition of the Mitigation Plan, on October 6, 18, 20, and 26, 2022, four years after construction, Wildlands staff conducted a follow-up wetland delineation focusing only on the area within the conservation easement to assess wetland gains and losses. Because wetland areas previously delineated outside of the project easement were not reassessed in the follow-up delineation, and wetland areas within the as-built bankfull were considered part of the constructed stream channel, only 4.22 acres of wetlands identified in 2016 were included in the assessment. Jurisdictional areas were delineated using methods outlined in the 1987 U.S. Army Corps of Engineers (USACE) Wetlands Delineation Manual and subsequent Eastern Mountains and Piedmont Regional Supplement.

The results of the onsite field investigation indicate that overall, total wetland area increased within the easement when compared to the delineation results from 2016 (Figures 2a-2e). During the MY4 delineation, a total of 40 additional wetland areas, both as standalone features and features adjoining existing wetlands, totaling approximately 5.29 acres were identified. The majority of these features occur along the floodplains of onsite stream channels and exhibited saturation within 12-inches of the soil surface, high water table, pockets of shallow inundation, and oxidized rhizospheres on living roots with low-chroma matrix soils. Saturation and inundation were also commonly observed on aerial imagery in these areas.

An additional 0.47 acres was identified as potentially transitioning to wetland where wetlands were not reported in the 2016 delineation. These areas commonly occur between existing wetland features and along the old stream channel within the floodplain of the restored stream. Wetland hydrology typically observed in these areas included oxidized rhizospheres on living roots, saturation within 12-inches of the soil surface, high water table, shallow aquitard, and microtopographic relief. Soils observed within these areas commonly exhibited chroma 3 matrices with active redoximorphic features within 12-inches of the soil surface, with some having depleted matrices within 18-inches, indicating a shift from upland to hydric soils even though they do not meet the requirements of a hydric soil indicator. The presence of hydrologic indicators and redoximorphic features within the soils suggest these areas are regularly experiencing a wetland hydrologic regime but have not been established long enough yet to fully meet the hydric soil matrix color requirements.

Of the wetland area delineated within the project easement in 2016, only 0.36 acres were observed to be turning into upland areas. These areas exhibited little to no indicators of wetland hydrology, relict hydric soils with low chroma matrices and relict redoximorphic features, and were commonly dominated by dog fennel (*Eupatorium capillifolium*) and wingstem (*Verbesina alternifolia*).



Overall, the wetland area within the Site, not including the 0.47 acres transitioning to wetlands or the 0.36 acres from wetlands, was found to now be 9.61 acres, a net gain of 4.93 acres. With this positive information, Wildlands is requesting removal of all wetland groundwater gauges.

2.7 Monitoring Year 4 Summary

Visual assessment indicated that all stream reaches within the Site are geomorphically stable and functioning as designed. Beaver dams were removed in August 2022. The streams are stable and vegetation is expected to fill back in over time. Vegetation has become well established along the streambanks providing shade, stability, and a source of organic material. An approved supplemental planting occurred on November 7, 2022. An invasive vegetation treatment will be scheduled for 2023 to address scattered populations of Chinese privet. All channels have met the hydrologic success criteria except T2 and T5 (upstream of St. Mary's Road). The channels not currently meeting only require one additional bankfull event. Greater than 30 days of consecutive flow were recorded on all intermittent reaches with flow gauges. Wildlands is requesting removal of all flow gauges. MY4 follow-up wetland delineation was performed and documented an overall net gain of 4.93 acres of wetlands. Therefore, Wildlands is requesting removal of all groundwater gauges.

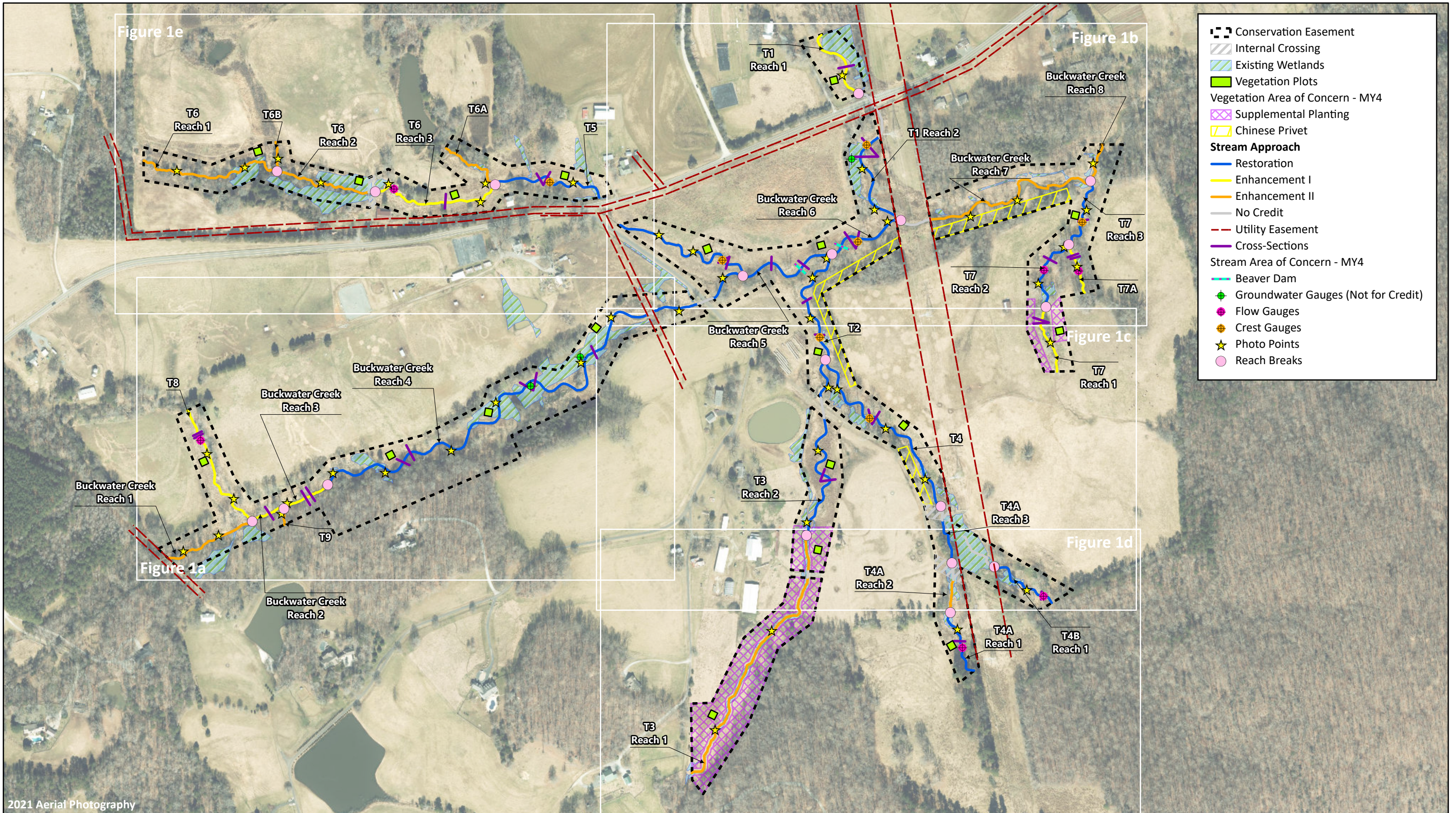
Summary information and data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

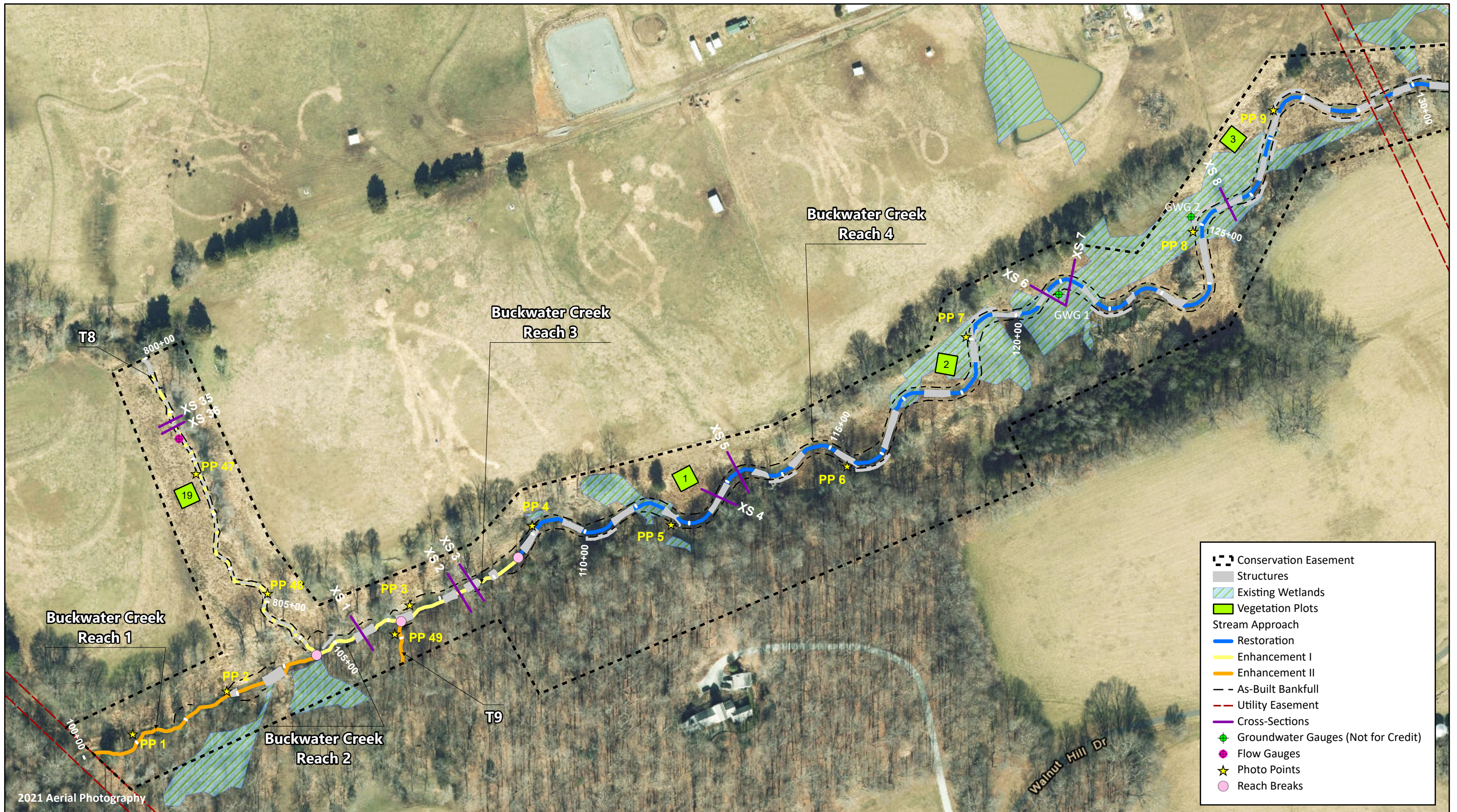


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2021 Aerial Photography

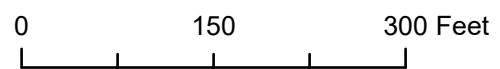


Figure 1a. Integrated Current Condition Plan View
 Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022

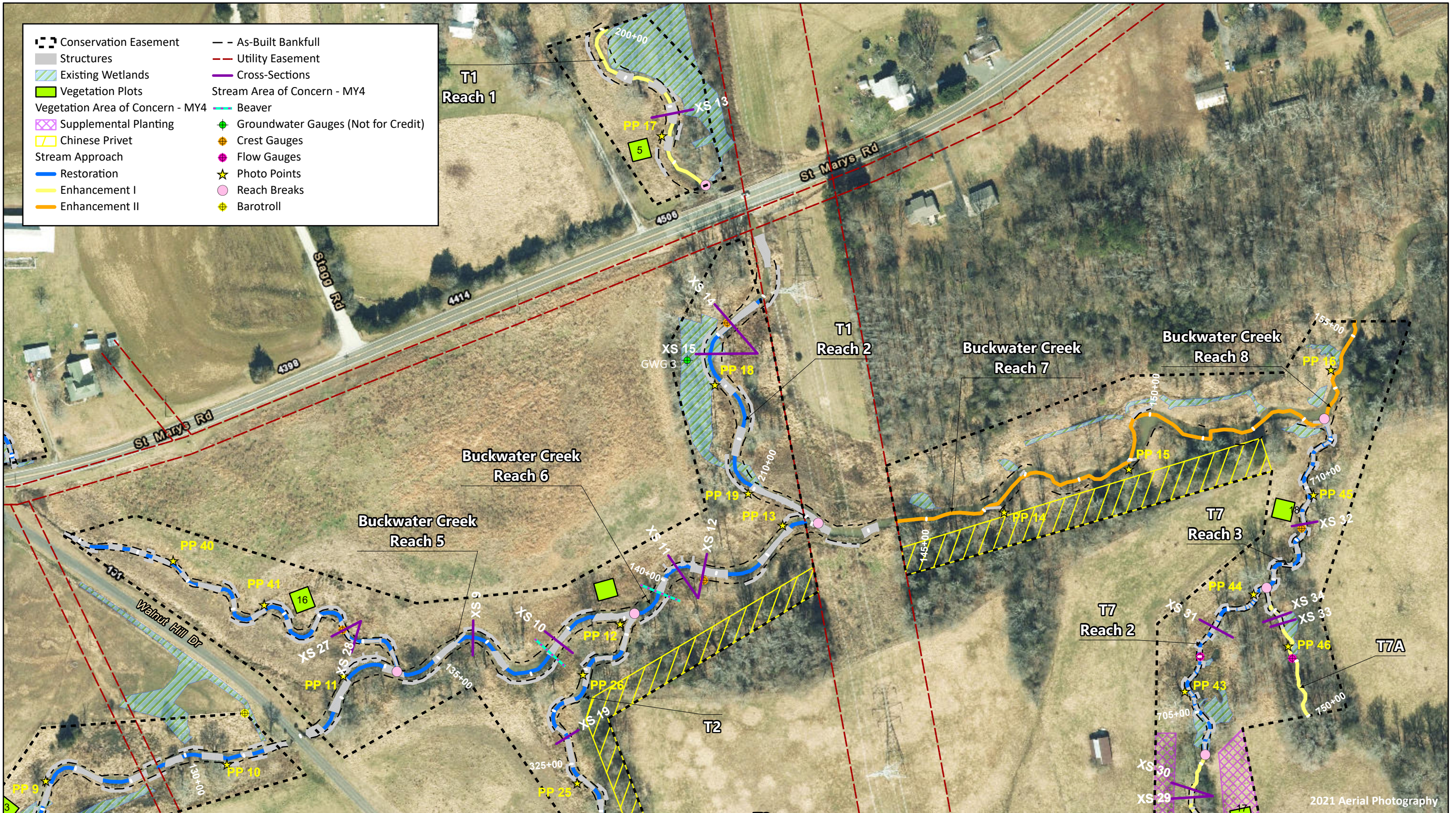




Figure 1c. Integrated Current Condition Plan View
 Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022

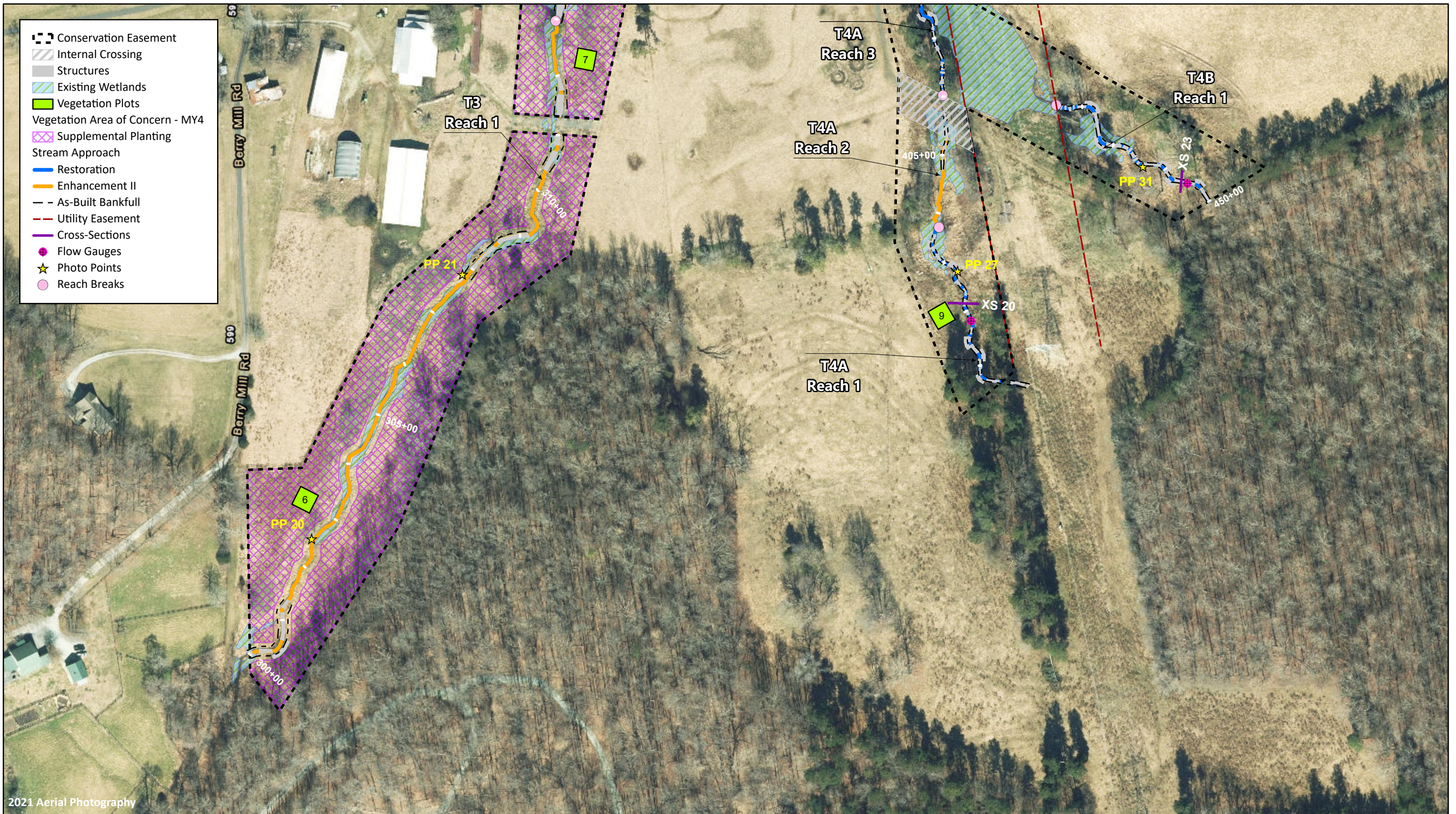


Figure 1d. Integrated Current Condition Plan View
 Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022



- Conservation Easement
- As-Built Bankfull
- Internal Crossing
- Utility Easement
- Structures
- Cross-Sections
- Existing Wetlands
- Vegetation Plots
- Stream Approach
- Restoration
- Enhancement I
- Enhancement II
- Crest Gauges
- Flow Gauges
- Photo Points
- Reach Breaks

Figure 1e. Integrated Current Condition Plan View
 Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022

APPENDIX A. Visual Assessment Data

Table 4. Visual Stream Morphology Stability Assessment Table

Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022

Buckwater Creek Reach 2/3

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	394
					Assessed Bank Length	788
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
Totals:					0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	25	25		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	58	58		100%

Buckwater Reach 4

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	2,478
					Assessed Bank Length	4,956
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.	15	15		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	4	4		100%

Table 4. Visual Stream Morphology Stability Assessment Table

Bug Headwaters Mitigation Site

DMS Project No. 100084

Monitoring Year 4 - 2022

Buckwater Creek Reach 5/6

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	848
					Assessed Bank Length	1,696
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
Totals:					0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	22	22		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	30	30		100%

T1

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	1,444
					Assessed Bank Length	2,888
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.	14	14		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	7	7		100%

Table 4. Visual Stream Morphology Stability Assessment Table

Bug Headwaters Mitigation Site
 DMS Project No. 100084
 Monitoring Year 4 - 2022

T2/T3

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	2,136
					Assessed Bank Length	4,272
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.	4	4		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	0	0		N/A

T4/T4A

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	1,646
					Assessed Bank Length	3,292
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.	0	0		N/A
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	23	23		100%

Table 4. Visual Stream Morphology Stability Assessment Table

Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022

T4B

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	346
					Assessed Bank Length	692
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 <u>NOT</u> 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.	0	0		N/A
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	0	0		N/A

T5/T6

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	3,503
					Assessed Bank Length	7,006
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 <u>NOT</u> 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.	0	0		N/A
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	0	0		N/A

Table 4. Visual Stream Morphology Stability Assessment Table

Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022

T7

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	1,044
					Assessed Bank Length	2,088
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 <u>NOT</u> 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.	0	0		N/A
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	0	0		N/A

T7A

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	240
					Assessed Bank Length	480
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 <u>NOT</u> 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.	4	4		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	0	0		N/A

Table 4. Visual Stream Morphology Stability Assessment Table

Bug Headwaters Mitigation Site

DMS Project No. 100084

Monitoring Year 4 - 2022

T8

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	621
					Assessed Bank Length	1,242
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 <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
					Totals:	0
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	0	0		N/A
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	23	23		100%

Table 5. Vegetation Condition Assessment Table

Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022

Planted Acreage 23.60

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10	0	0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10	4.30*	18%
Total			4.30	18%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.25	0	0%
Cumulative Total			4.30	18%

*An approved supplemental planting occurred on November 7, 2022 to increase species diversity.

Easement Acreage 51.84

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Invasive species included in summation above should be identified in report summary.	0.10	1.72	3%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	none	0 Encroachments Noted / 0 ac	

STREAM PHOTOGRAPHS



PHOTO POINT 1 Buckwater R1 – upstream (4/12/2022)



PHOTO POINT 1 Buckwater R1 – downstream (4/12/2022)



PHOTO POINT 2 Buckwater R1 – upstream (4/12/2022)



PHOTO POINT 2 Buckwater R1 – downstream (4/12/2022)



PHOTO POINT 3 Buckwater R3 – upstream (4/12/2022)



PHOTO POINT 3 Buckwater R3 – downstream (4/12/2022)





PHOTO POINT 4 Buckwater R4 – upstream (4/12/2022)



PHOTO POINT 4 Buckwater R4 – downstream (4/12/2022)



PHOTO POINT 5 Buckwater R4 – upstream (4/12/2022)



PHOTO POINT 5 Buckwater R4 – downstream (4/12/2022)



PHOTO POINT 6 Buckwater R4 – upstream (4/12/2022)



PHOTO POINT 6 Buckwater R4 – downstream (4/12/2022)



Buckwater Mitigation Site

Appendix A: Visual Assessment Data – Stream Photographs



PHOTO POINT 7 Buckwater R4 – upstream (4/12/2022)



PHOTO POINT 7 Buckwater R4 – downstream (4/12/2022)



PHOTO POINT 8 Buckwater R4 – upstream (4/12/2022)



PHOTO POINT 8 Buckwater R4 – downstream (4/12/2022)



PHOTO POINT 9 Buckwater R4 – upstream (4/12/2022)



PHOTO POINT 9 Buckwater R4 – downstream (4/12/2022)





PHOTO POINT 10 Buckwater R4 – upstream (4/12/2022)



PHOTO POINT 10 Buckwater R4 – downstream (4/12/2022)



PHOTO POINT 11 Buckwater R4 – upstream (4/12/2022)



PHOTO POINT 11 Buckwater R4 – downstream (4/12/2022)



PHOTO POINT 12 Buckwater R5 – upstream (4/12/2022)



PHOTO POINT 12 Buckwater R5 – downstream (4/12/2022)





PHOTO POINT 13 Buckwater R6 – upstream (4/12/2022)



PHOTO POINT 13 Buckwater R6 – downstream (4/12/2022)



PHOTO POINT 14 Buckwater R7 – upstream (4/12/2022)



PHOTO POINT 14 Buckwater R7 – downstream (4/12/2022)



PHOTO POINT 15 Buckwater R7 – upstream (4/12/2022)



PHOTO POINT 15 Buckwater R7 – downstream (4/12/2022)





PHOTO POINT 16 Buckwater R8 – upstream (4/12/2022)



PHOTO POINT 16 Buckwater R8 – downstream (4/12/2022)



PHOTO POINT 17 T1 Reach 1 – upstream (4/12/2022)



PHOTO POINT 17 T1 Reach 1 – downstream (4/12/2022)



PHOTO POINT 18 T1 Reach 2 – upstream (4/12/2022)



PHOTO POINT 18 T1 Reach 2 – downstream (4/12/2022)





PHOTO POINT 19 T1 Reach 2 – upstream (4/12/2022)



PHOTO POINT 19 T1 Reach 2 – downstream (4/12/2022)



PHOTO POINT 20 T3 Reach 1 – upstream (4/12/2022)



PHOTO POINT 20 T3 Reach 1 – downstream (4/12/2022)



PHOTO POINT 21 T3 Reach 1 – upstream (4/12/2022)



PHOTO POINT 21 T3 Reach 1 – downstream (4/12/2022)





PHOTO POINT 22 T3 Reach 2 – upstream (4/12/2022)



PHOTO POINT 22 T3 Reach 2 – downstream (4/12/2022)



PHOTO POINT 23 T3 Reach 2 – upstream (4/12/2022)



PHOTO POINT 23 T3 Reach 2 – downstream (4/12/2022)



PHOTO POINT 24 T3 – upstream (4/12/2022)



PHOTO POINT 24 T3 – downstream (4/12/2022)





PHOTO POINT 25 T2 – upstream (4/12/2022)



PHOTO POINT 25 T2 – downstream (4/12/2022)



PHOTO POINT 26 T2 – upstream (4/12/2022)



PHOTO POINT 26 T2 – downstream (4/12/2022)



PHOTO POINT 27 T4A Reach 1 – upstream (4/12/2022)



PHOTO POINT 27 T4A Reach 1 – downstream (4/12/2022)





PHOTO POINT 28 T4 – upstream (4/12/2022)



PHOTO POINT 28 T4 – downstream (4/12/2022)



PHOTO POINT 29 T4 – upstream (4/12/2022)



PHOTO POINT 29 T4 – downstream (4/12/2022)



PHOTO POINT 30 T4 – upstream (4/12/2022)



PHOTO POINT 30 T4 – downstream (4/12/2022)





PHOTO POINT 31 T4B Reach 1 – upstream (4/12/2022)



PHOTO POINT 31 T4B Reach 1 – downstream (4/12/2022)



PHOTO POINT 32 T6 Reach 1 – upstream (4/12/2022)



PHOTO POINT 32 T6 Reach 1 – downstream (4/12/2022)



PHOTO POINT 33 T6 Reach 1 – upstream (4/12/2022)



PHOTO POINT 33 T6 Reach 1 – downstream (4/12/2022)





PHOTO POINT 34 T6 Reach 2 – upstream (4/12/2022)



PHOTO POINT 34 T6 Reach 2 – downstream (4/12/2022)



PHOTO POINT 35 T6 Reach 3 – upstream (4/12/2022)



PHOTO POINT 35 T6 Reach 3 – downstream (4/12/2022)



PHOTO POINT 36 T6 Reach 3 – upstream (4/12/2022)



PHOTO POINT 36 T6 Reach 3 – downstream (4/12/2022)





PHOTO POINT 37 T6B – upstream (4/12/2022)



PHOTO POINT 37 T6B – downstream (4/12/2022)



PHOTO POINT 38 T6A – upstream (4/12/2022)



PHOTO POINT 38 T6A – downstream (4/12/2022)



PHOTO POINT 39 T5 – upstream (4/12/2022)



PHOTO POINT 39 T5 – downstream (4/12/2022)





PHOTO POINT 40 T5 – upstream (4/12/2022)



PHOTO POINT 40 T5 – downstream (4/12/2022)



PHOTO POINT 41 T5 – upstream (4/12/2022)



PHOTO POINT 41 T5 – downstream (4/12/2022)



PHOTO POINT 42 T7 Reach 1 – upstream (4/12/2022)



PHOTO POINT 42 T7 Reach 1 – downstream (4/12/2022)



Buckwater Mitigation Site

Appendix A: Visual Assessment Data – Stream Photographs



PHOTO POINT 43 T7 Reach 2 – upstream (4/12/2022)



PHOTO POINT 43 T7 Reach 2 – downstream (4/12/2022)



PHOTO POINT 44 T7 Reach 2 – upstream (4/12/2022)



PHOTO POINT 44 T7 Reach 2 – downstream (4/12/2022)



PHOTO POINT 45 T7 Reach 3 – upstream (4/12/2022)



PHOTO POINT 45 T7 Reach 3 – downstream (4/12/2022)





PHOTO POINT 46 T7A – upstream (4/12/2022)



PHOTO POINT 46 T7A – downstream (4/12/2022)



PHOTO POINT 47 T8 – upstream (4/12/2022)



PHOTO POINT 47 T8 – downstream (4/12/2022)



PHOTO POINT 48 T8 – upstream (4/12/2022)



PHOTO POINT 48 T8 – downstream (4/12/2022)





PHOTO POINT 49 T9 – upstream (4/12/2022)



PHOTO POINT 49 T9 – downstream (4/12/2022)



VEGETATION PLOT PHOTOGRAPHS



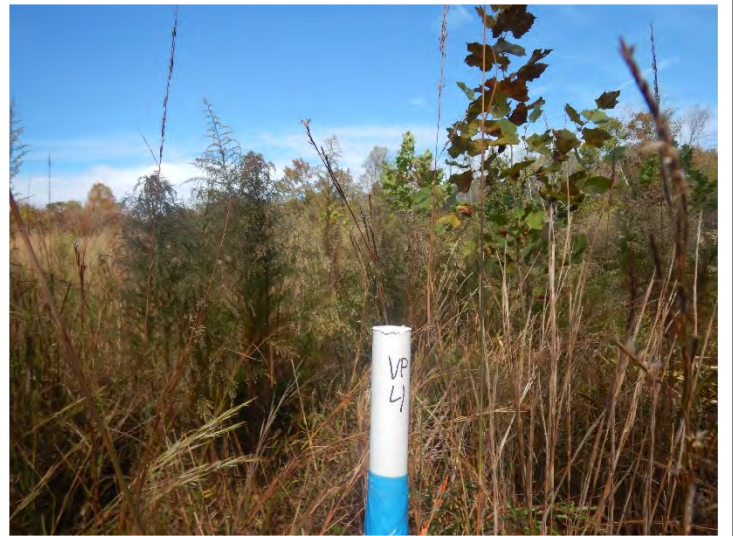
VEG PLOT 1 (9/20/2022)



VEG PLOT 2 (9/20/2022)



VEG PLOT 3 (9/20/2022)



VEG PLOT 4 (10/11/2022)



VEG PLOT 5 (10/11/2022)



VEG PLOT 6 (10/11/2022)





VEG PLOT 7 (10/11/2022)



VEG PLOT 8 (10/11/2022)



VEG PLOT 9 (10/11/2022)



VEG PLOT 10 (9/20/2022)



VEG PLOT 11 (10/11/2022)



VEG PLOT 12 (10/18/2022)

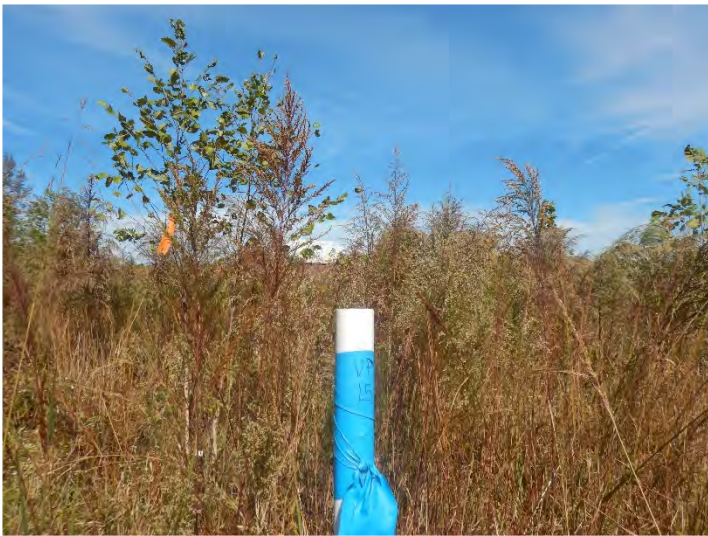




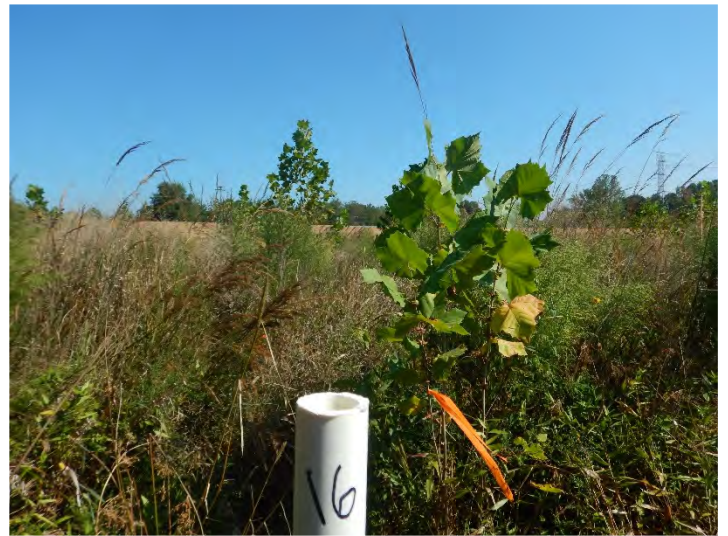
VEG PLOT 13 (10/18/2022)



VEG PLOT 14 (10/11/2022)



VEG PLOT 15 (10/11/2022)



VEG PLOT 16 (9/20/2022)



VEG PLOT 17 (10/11/2022)



VEG PLOT 18 (10/11/2022)





VEG PLOT 19 (10/18/2022)



APPENDIX B. Vegetation Plot Data

Vegetation inventory and analysis not required during MY4

APPENDIX C. Stream Geomorphology Data

Geomorphological survey and analysis not required during MY4

APPENDIX D. Hydrology Data

Table 10. Bankfull Events

Buckwater Mitigation Site
DMS Project No. 97084
Monitoring Year 4 - 2022

Reach	MY1 (2019)	MY2 (2020)	MY3 (2021)	MY4 (2022)	MY5 (2023)	MY6 (2024)	MY7 (2025)
Buckwater Creek Reach 6	6/18/2019	2/6/2020* 5/21/2020	1/3/2021* 4/9/2021*	4/6/2022 ²			
T1 Reach 2	4/13/2019	2/6/2020* 5/21/2020*	**	3/17/2022 5/23/2022*			
T2	6/18/2019*	2/6/2020* 5/21/2020*	**	3/12/2022 3/17/2022*			
T4	4/14/2019* 6/18/2019	2/6/2020 5/21/2020	1/3/2021 3/31/2021*	3/12/2022*			
T5: US of St. Mary's Rd	N/A	2/6/2020 5/21/2020	1/3/2021* 4/9/2021*	1/3/2022*			
T5: DS of St. Mary's Rd	4/13/2019 6/18/2019	2/6/2020 5/21/2020	1/3/2021* 4/9/2021*	1/3/2022			
T7 Reach 3	6/18/2019*	2/6/2020	1/3/2021 ¹ 4/9/2021*	1/3/2022 3/12/2022 ¹			

*Only a geomorphically significant event. Not a bankfull event.

**No bankfull or geomorphically significant events discernible due to gauge freezing.

1. T7 Reach 3 recorded bankfull events on the flow gauge on T7 Reach 2.

2. Bankfull event recorded based on visual observations.

Table 11. Rainfall Summary

Buckwater Mitigation Site
DMS Project No. 97084
Monitoring Year 4 - 2022

	MY1 (2019)	MY2 (2020)	MY3 (2021)	MY4 (2022)	MY5 (2023)	MY6 (2024)	MY7 (2025)
Annual Precip Total	43.35	61.38	47.80	39.62*			
WETS 30th Percentile	43.75	43.73	43.79	43.52			
WETS 70th Percentile	51.13	50.88	51.30	51.01			
Normal	Y	Y	Y	*			

*Annual precipitation total was collected up until 10/18/2022. Data will be updated in MY5.

**BANKFULL EVENTS
VISUAL OBSERVATIONS**



Buckwater Creek Reach 4 (4/6/2022)



Buckwater Creek Reach 4 (4/6/2022)



Table 12. Recorded In-Stream Flow Events Summary

Buckwater Mitigation Site

DMS Project No. 97084

Monitoring Year 4 - 2022

Reach	Max Consecutive Days/ Total Days Meeting Success Criteria*						
	MY1 (2019)	MY2 (2020)	MY3 (2021)	MY4 (2022)	MY5 (2023)	MY6 (2024)	MY7 (2025)
T4A	96 Days/ 120 Days	70 Days/ 216 Days	52 Days/ 155 Days	63 Days/ 154 Days			
T4B	63 Days/ 91 Days	208 Days/ 290 Days	188 Days/ 263 Days	166 Days/ 176 Days			
T6	73 Days/ 103 Days	294 Days/ 294 Days	238 Days/ 280 Days	161 Days/ 237 Days			
T7 Reach 2	Not Installed	194 Days/ 234 Days	146 Days/ 171 Days	137 Days/ 161 Days			
T7A	169 Days/ 233 Days	133 Days/ 281 Days	250 Days/ 338 Days	221 Days/ 227 Days			
T8	19 Days/ 21 Days**	207 Days/ 272 Days	101 Days/ 196 Days	57 Days/ 110 Days			

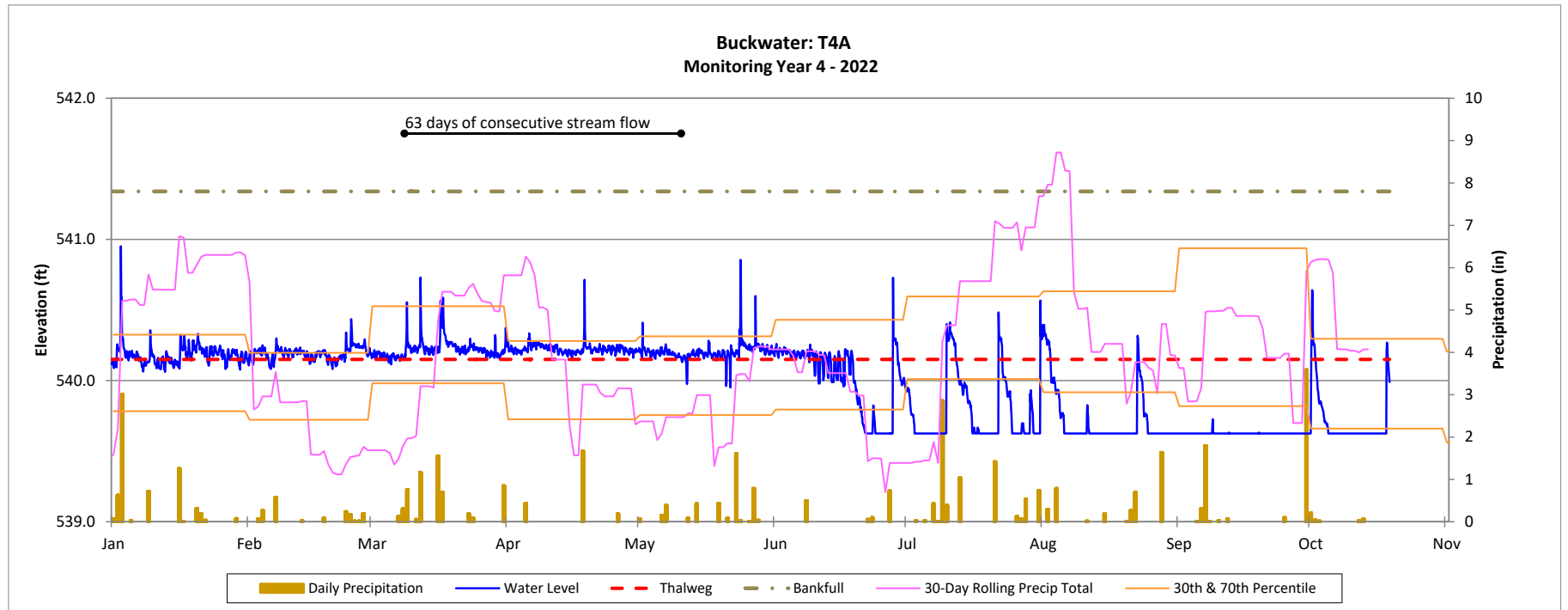
*Success criteria is 30 consecutive days of flow.

Recorded In-Stream Flow Events Plot

Buckwater Mitigation Site

DMS Project No. 97084

Monitoring Year 4 - 2022

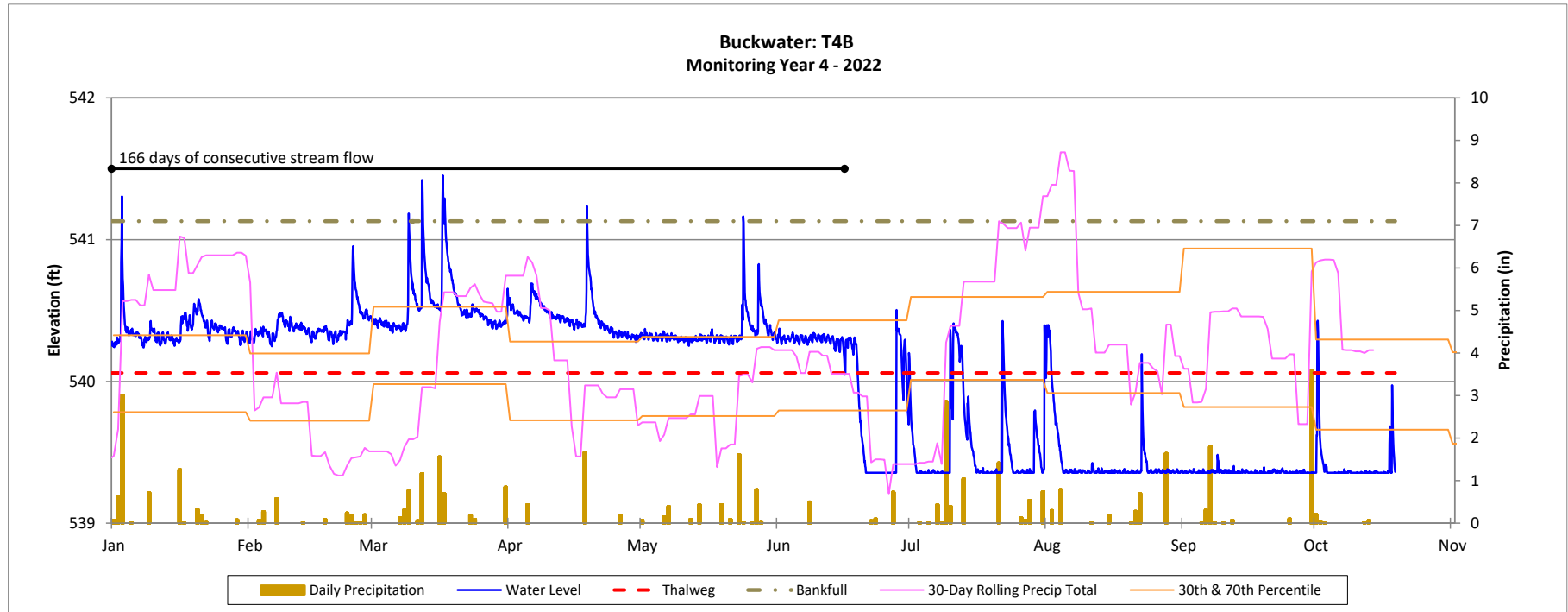


Recorded In-Stream Flow Events Plot

Buckwater Mitigation Site

DMS Project No. 97084

Monitoring Year 4 - 2022

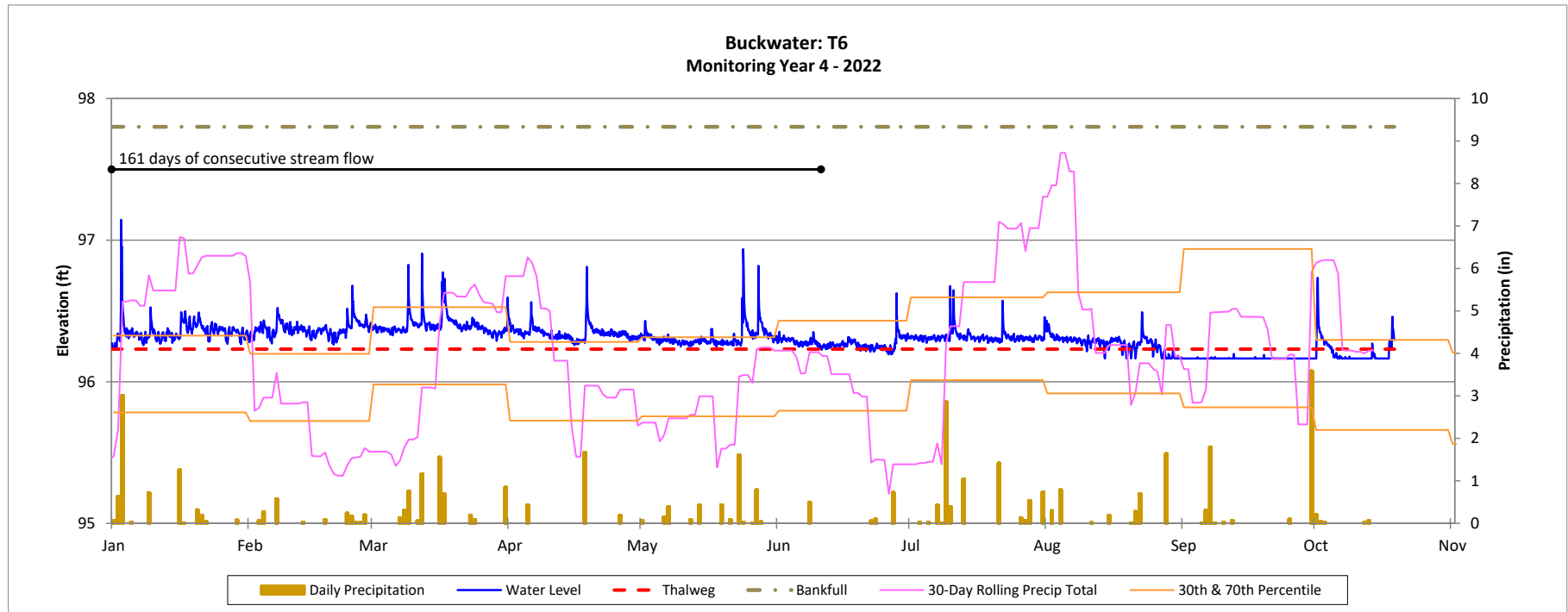


Recorded In-Stream Flow Events Plot

Buckwater Mitigation Site

DMS Project No. 97084

Monitoring Year 4 - 2022

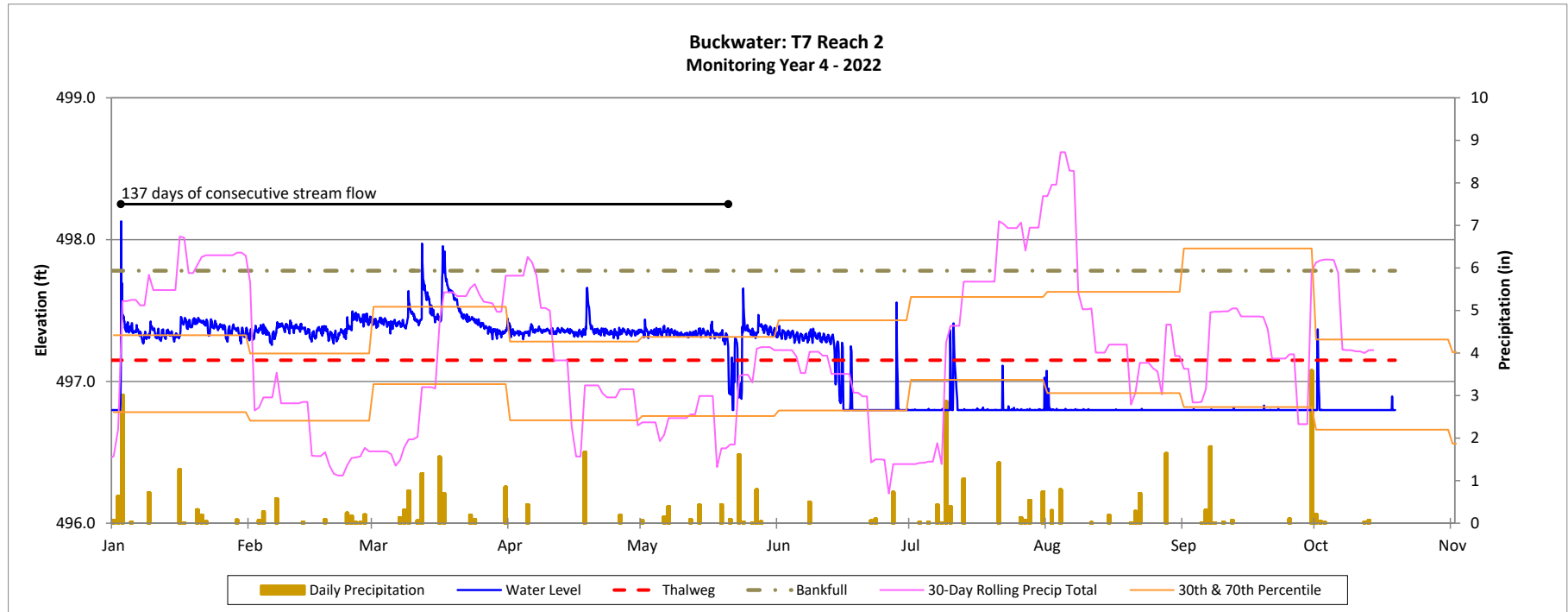


Recorded In-Stream Flow Events Plot

Buckwater Mitigation Site

DMS Project No. 97084

Monitoring Year 4 - 2022

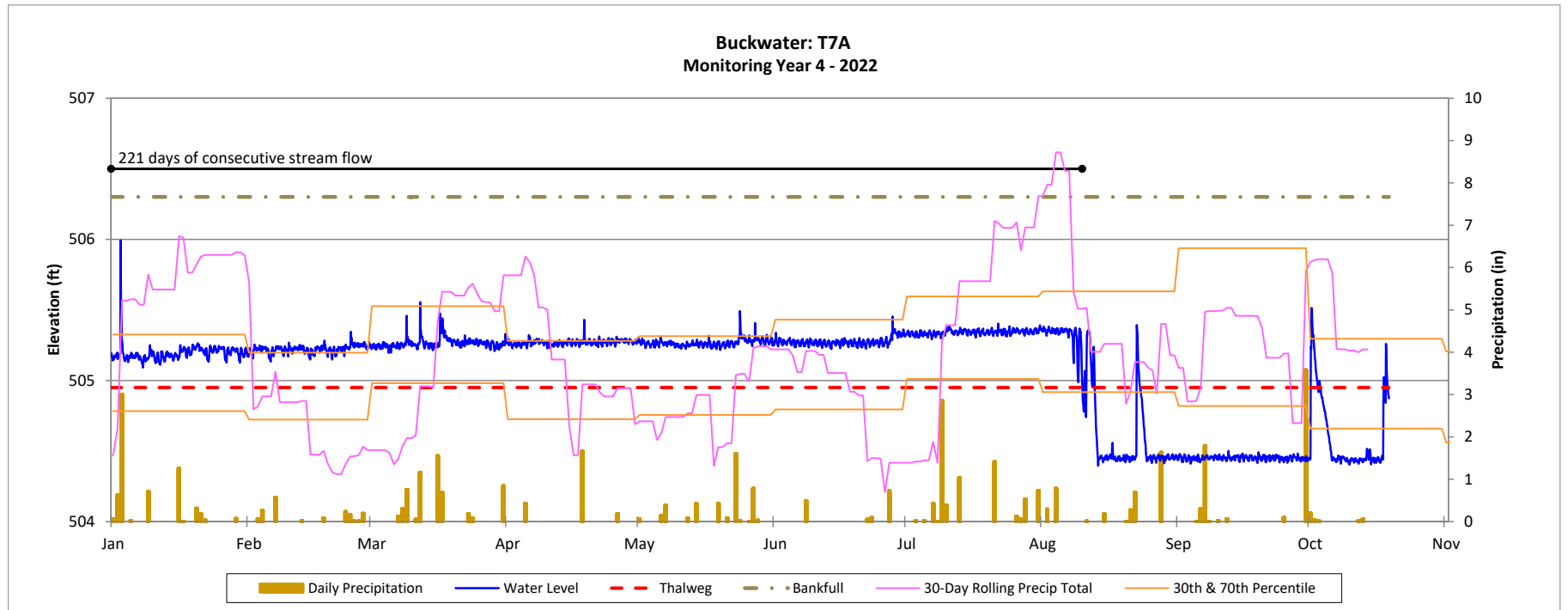


Recorded In-Stream Flow Events Plot

Buckwater Mitigation Site

DMS Project No. 97084

Monitoring Year 4 - 2022



Recorded In-Stream Flow Events Plot

Buckwater Mitigation Site

DMS Project No. 97084

Monitoring Year 4 - 2022

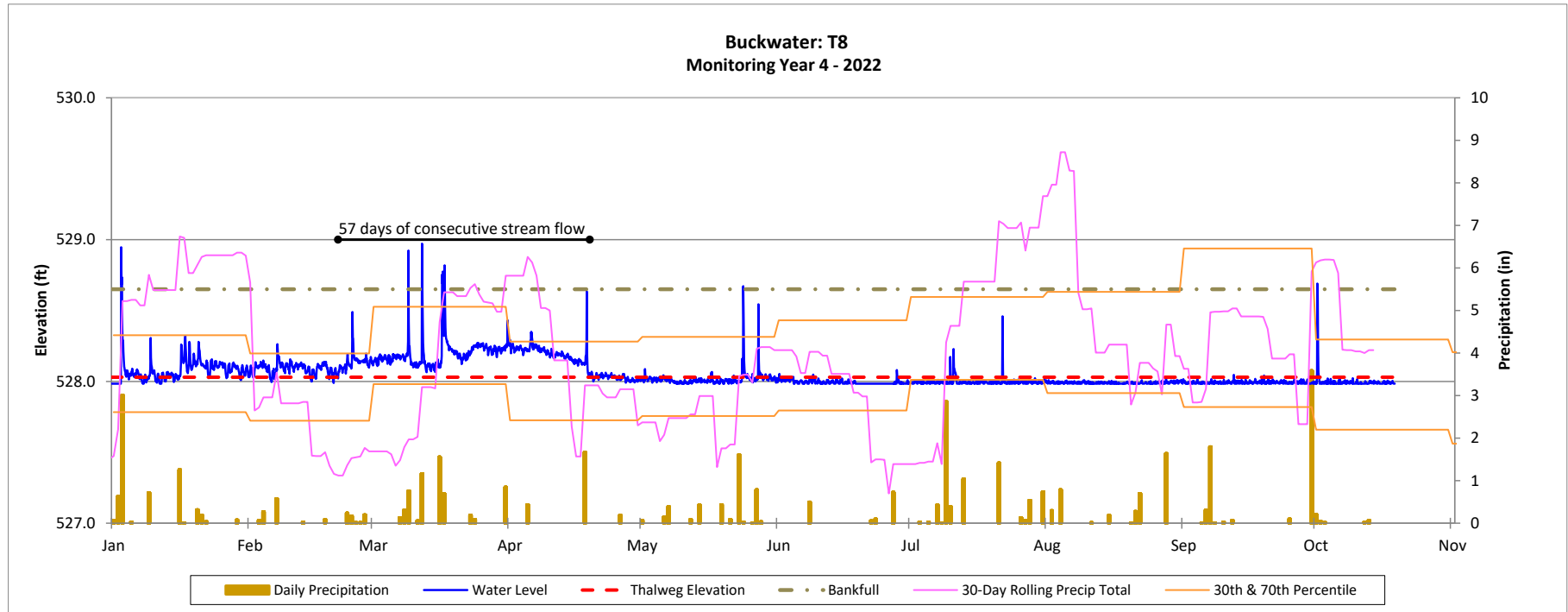


Table 13. Groundwater Gauge Summary

Buckwater Mitigation Site

DMS Project No. 97084

Monitoring Year 4 - 2022

Summary of Groundwater Gauge Results for Monitoring Years 1 through 7							
Gauge	Max Consecutive Days During Growing Season (Percentage)						
	MY1 (2019)	MY2 (2020)	MY3 (2021)	MY4 (2022)	MY5 (2023)	MY6 (2024)	MY7 (2025)
1	55 Days (20.7%)	34 Days (12.8%)	24 Days (9.4%)	28 Days (10.6%)			
2	13 Days (4.9%)	6 Days (2.3%)	8 Days (3.1%)	6 Days (2.3%)			
3	58 Days (21.8%)	135 Days (50.4%)	110 Days (43.0%)	105 Days (39.6%)			

Performance Standard: **None**

WETS Station (Daily Rainfall): **Durham 6.8 NNW, NC**

WETS Station (30th & 70th Percentile): **Chapel Hill 2 W, NC**

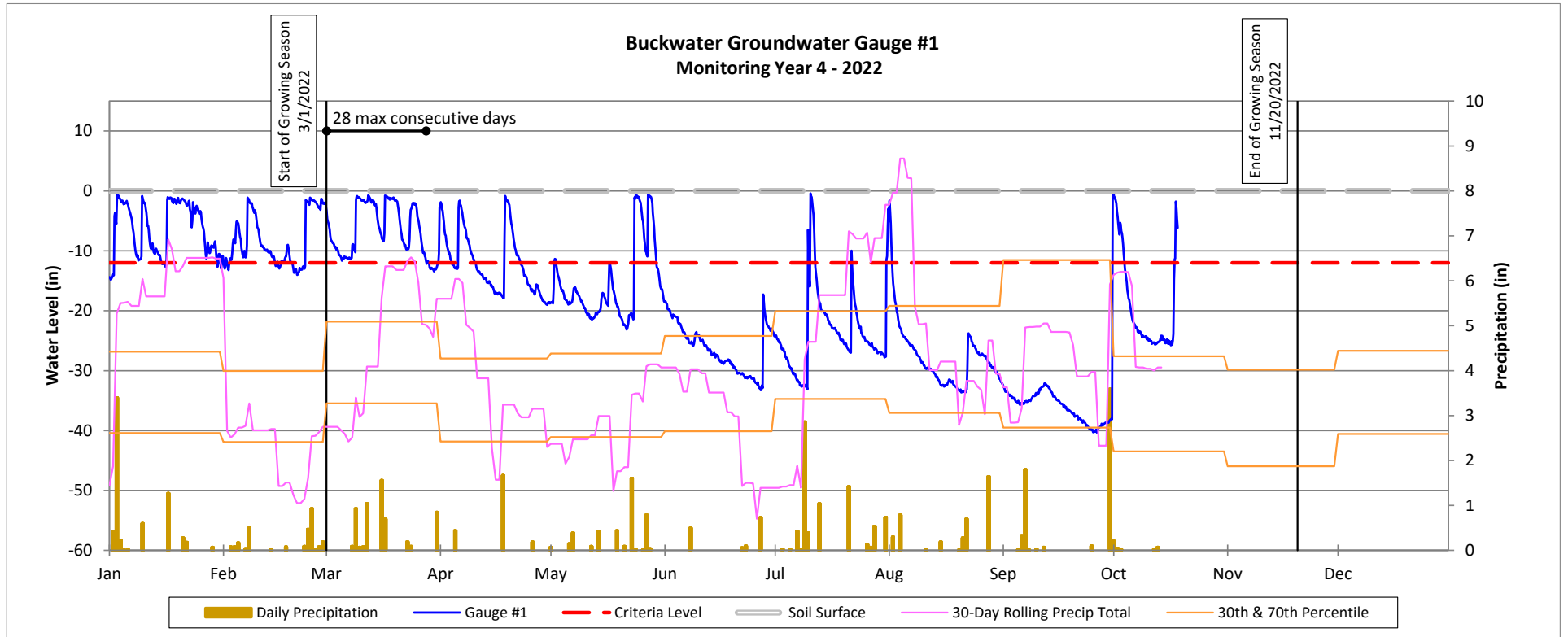
Growing Season: **3/1/2021 to 11/11/2021 (255 Days)**

Groundwater Gauge Plot

Buckwater Mitigation Site

DMS Project No. 97084

Monitoring Year 4 - 2022

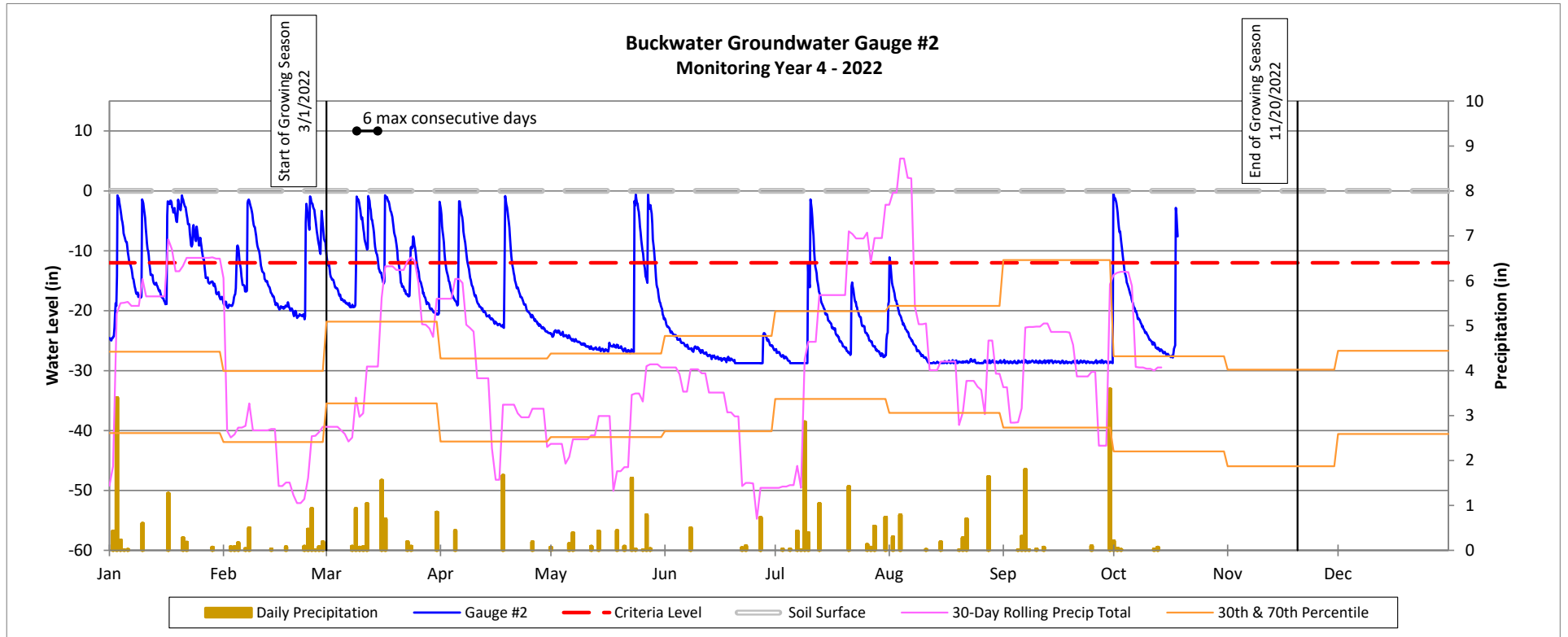


Groundwater Gauge Plot

Buckwater Mitigation Site

DMS Project No. 97084

Monitoring Year 4 - 2022

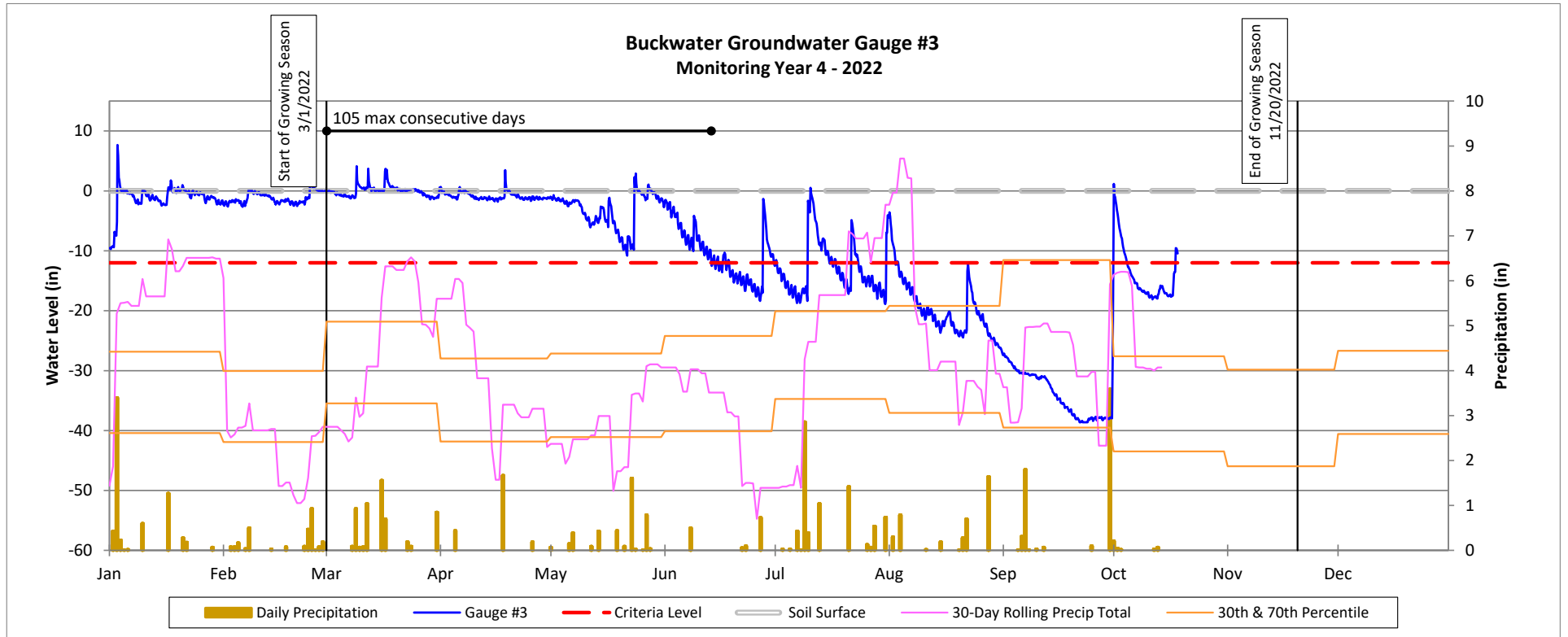


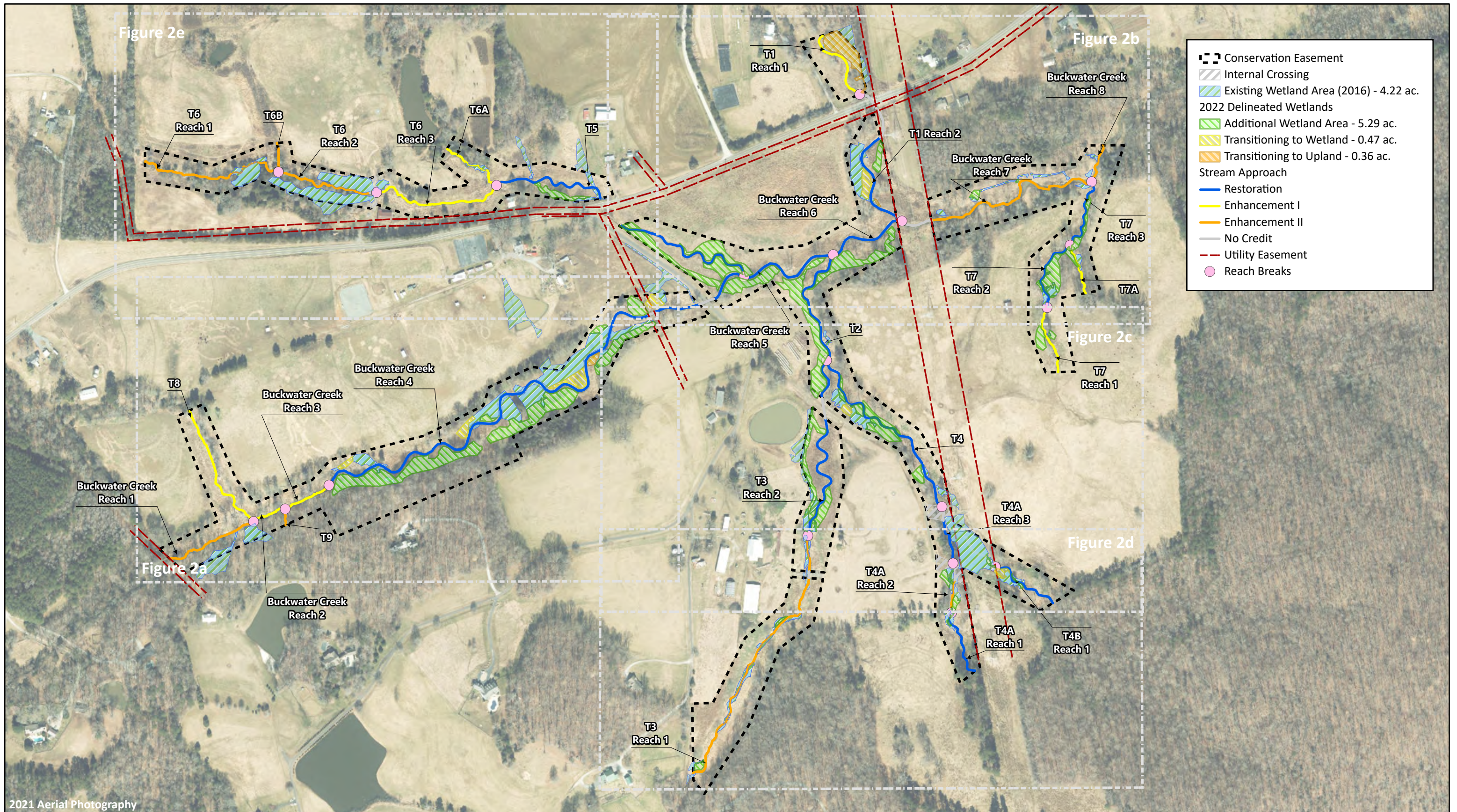
Groundwater Gauge Plot

Buckwater Mitigation Site

DMS Project No. 97084

Monitoring Year 4 - 2022





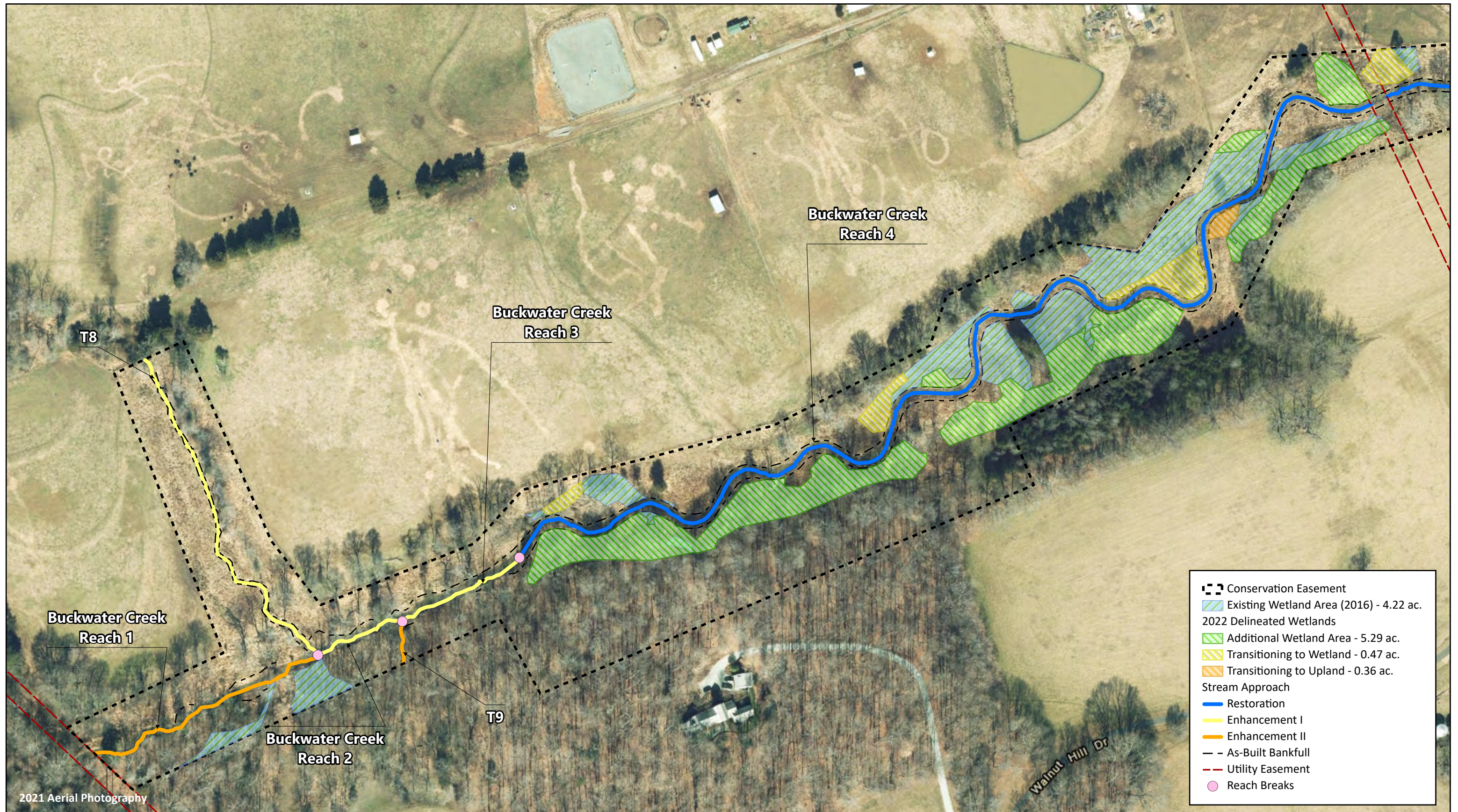
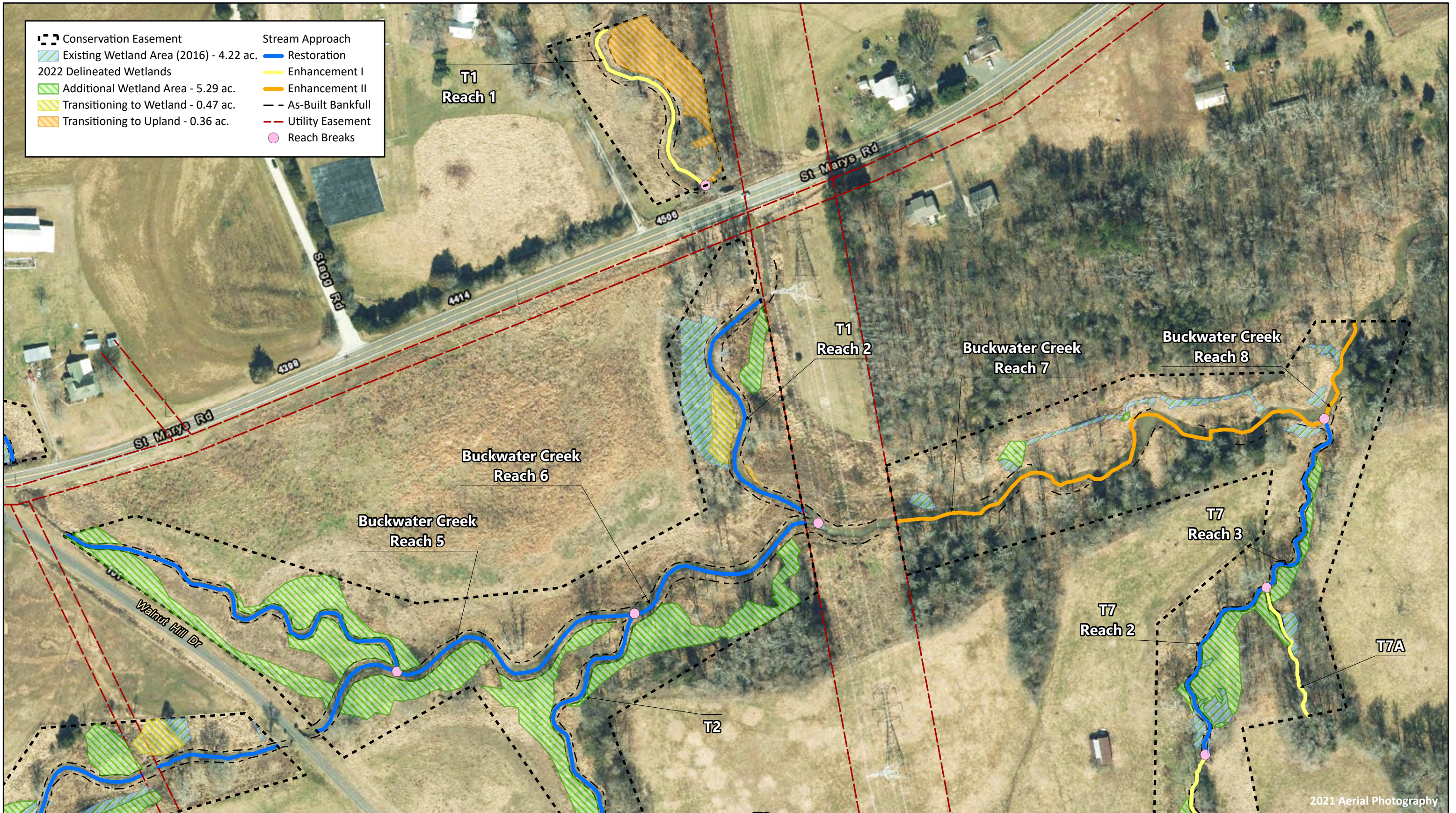
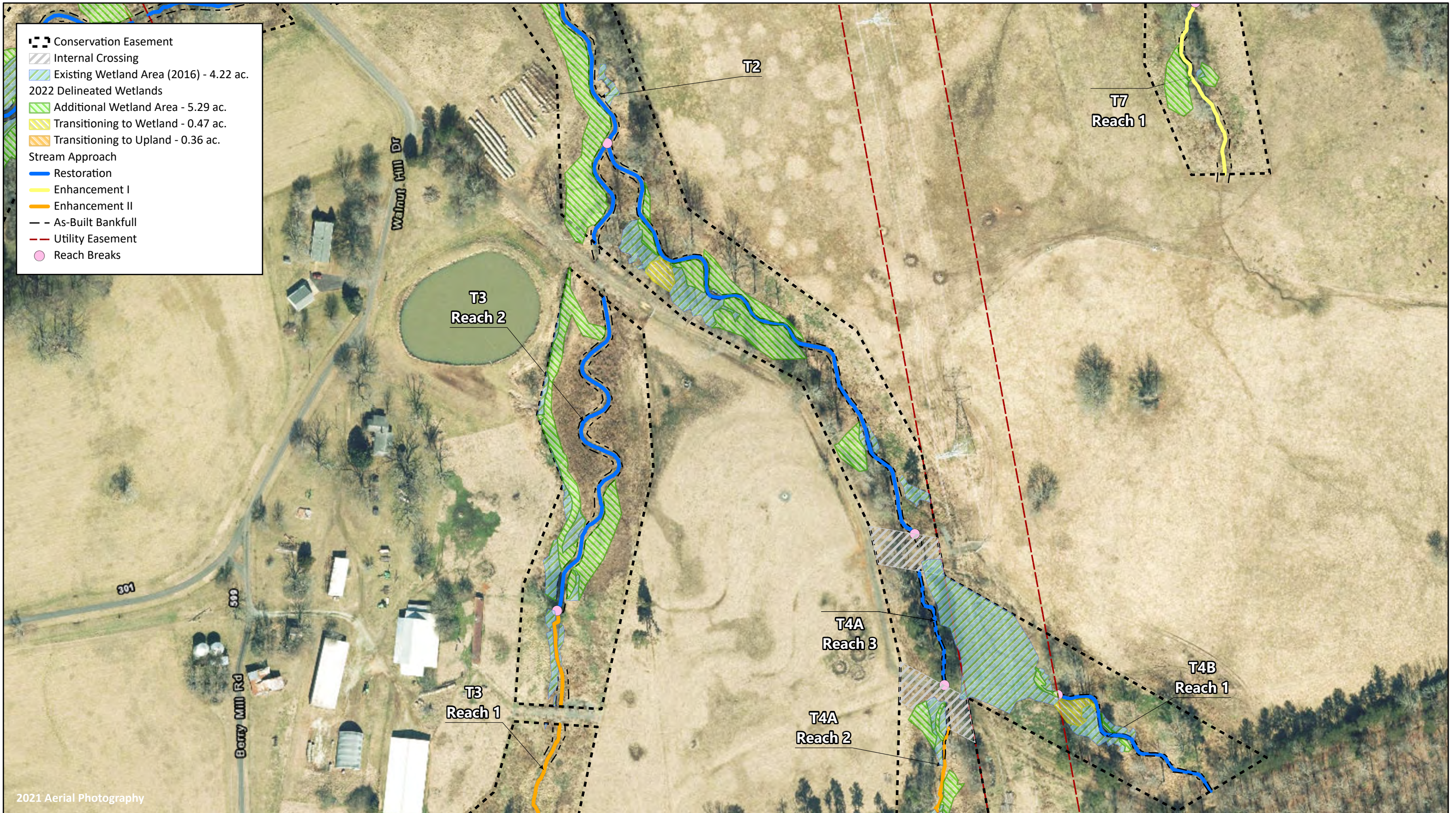


Figure 2a. MY4 Follow-Up Wetland Delineation Map
 Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022





2021 Aerial Photography

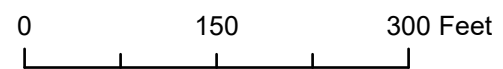
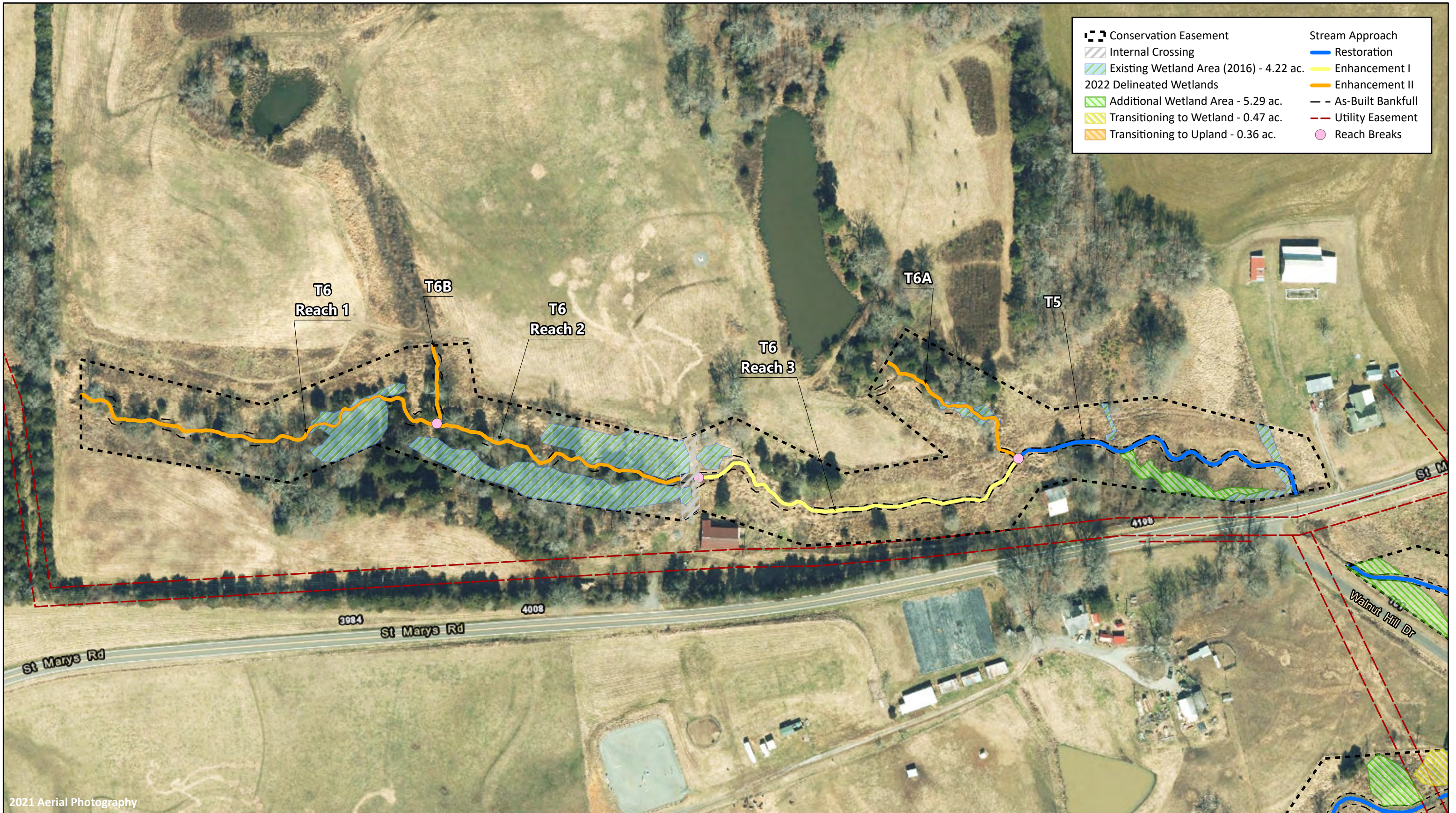


Figure 2c. MY4 Follow-Up Wetland Delineation Map
 Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022



Figure 2d. MY4 Follow-Up Wetland Delineation Map
 Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022



**MY4 FOLLOW-UP WETLAND
DELINEATION PHOTOGRAPHS**



Buckwater Reach 4 – Additional wetland area. (10/6/2022)



Buckwater Reach 4 – Area transitioning to wetland (10/6/2022)



Buckwater Reaches 5 and 6 – Additional wetland areas (10/6/2022)



T5 – Additional wetland area (10/6/2022)



Buckwater Reach 7 – Existing and additional wetland areas (10/26/2022)



T1 Reach 1 – Area transitioned to upland (10/26/2022)



T1 Reach 1 – Representative soil profile of area transitioning to upland (10/26/2022)



T1 Reach 2 – Existing wetland and area transitioning to wetland (10/26/2022)



T3 Reach 2 – Additional wetland area (10/20/2022)



T4 Reach 1 – Additional and existing wetland areas (10/20/2022)



T4 Reach 2 – Additional and existing wetland areas (10/20/2022)



T2 – Additional wetland area (10/20/2022)



T5 – Existing wetland area (10/26/2022)



T7 Reach 2 and T7A – Additional and existing wetland areas (10/26/2022)



T2 – Soil ped observed within 0-12 inches of the soil surface in additional wetland areas (10/20/2022)



T1 Reach 2 – Soil profile observed within 0-12 inches of the soil surface in existing wetland areas onsite (10/26/2022)

APPENDIX E. Project Timeline and Contact Info

Table 14. Project Activity and Reporting History

Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022

Activity or Deliverable		Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted		NA	March 2016
Mitigation Plan Approved		December 2017	December 2017
Construction (Grading) Completed		April 2018-April 2019	April 2019
Planting Completed		April 2018-April 2019	April 2019
As-Built Survey Completed		May 2021	May 2021
Baseline Monitoring Document (Year 0)	Stream Survey	April 2019	July 2019
	Vegetation Survey	April 2019	
Year 1 Monitoring	Stream Survey	October 2019	December 2019
	Vegetation Survey	October 2019	
	In-stream repairs	August 2019	
	Invasive Treatment	October 2019	
Year 2 Monitoring	Stream Survey	April 2020	December 2020
	Vegetation Survey	September 2020	
	Stream Bank Repairs	April 2020	
	Soil Amendments	August 2020	
Year 3 Monitoring	In-stream Vegetation Treatment	August 2020	December 2021
	Stream Survey	May 2021	
	Vegetation Survey	October 2021	
	Replanting & Soil Amendments	February 2021	
Year 4 Monitoring	Ring Sprays	March 2021	December 2022
	Follow-Up Delineation	October 2022	
	Supplemental Planting	November 2022	
Year 5 Monitoring	Stream Survey	2023	December 2023
	Vegetation Survey	2023	
Year 6 Monitoring			December 2024
Year 7 Monitoring	Stream Survey	2025	December 2025
	Vegetation Survey	2025	

Table 15. Project Contact Table

Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022

Designer Nicole Macaluso Millns, PE	Wildlands Engineering, Inc. 312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986
Construction Contractor	Ecotone, Inc. 2120 High Point Rd Forest Hill, MD 21050
Monitoring Performers Monitoring, POC	Wildlands Engineering, Inc. Jason Lorch 919.851.9986

APPENDIX F. Additional Documentation

Carolyn Lanza

From: Jason Lorch
Sent: Monday, October 24, 2022 1:19 PM
To: Chris Roessler; Carolyn Lanza; Andrew Radecki
Subject: FW: Buckwater Mitigation Site / Orange County
Attachments: Supplemental Planting MY4.pdf

See the IRTs response below. They are fine with our species, but would like additional transects, and MY6 vegetation data. Let me know if you have any questions. Thanks!

Jason Lorch, GISP | Senior Environmental Scientist
O: 919.851.9986 x107 M: 919.413.1214

Wildlands Engineering, Inc.
312 West Millbrook Road, Suite 225
Raleigh, NC 27609

-----Original Message-----

From: Isenhour, Kimberly T CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>
Sent: Monday, October 24, 2022 1:13 PM
To: Jason Lorch <jlorch@wildlandseng.com>
Cc: Tugwell, Todd J CIV USARMY CESAW (USA) <Todd.J.Tugwell@usace.army.mil>; Davis, Erin B <erin.davis@ncdenr.gov>; Haywood, Casey M CIV USARMY CEMVP (USA) <Casey.M.Haywood@usace.army.mil>; Crumbley, Tyler A CIV USARMY CESAW (USA) <Tyler.A.Crumbley2@usace.army.mil>; Bowers, Todd <bowers.todd@epa.gov>; Wilson, Travis W. <travis.wilson@ncwildlife.org>; Munzer, Olivia <olivia.munzer@ncwildlife.org>; Matthews, Kathryn (kathryn_matthews@fws.gov) <kathryn_matthews@fws.gov>; Merritt, Katie <katie.merritt@ncdenr.gov>; Dow, Jeremiah J <jeremiah.dow@ncdenr.gov>; Melonie Allen <melonie.allen@ncdenr.gov>; Crocker, Lindsay <Lindsay.Crocker@ncdenr.gov>
Subject: RE: Buckwater Mitigation Site / Orange County

Hi Jason,

Thanks for the information. The IRT doesn't have any issues with the newly proposed species. Since this is the second supplemental planting effort, we'd request that Wildlands perform an additional year of vegetation monitoring during monitoring year 6. Please also provide random veg transects in the supplemental planting areas to demonstrate survival and adequate site cover. Please include this correspondence in next year's monitoring report.

Please reach out with any questions.

Thanks,
Kim

Kim Isenhour
Mitigation Project Manager, Regulatory Division | U.S. Army Corps of Engineers | 919.946.5107

-----Original Message-----

From: Jason Lorch <jlorch@wildlandseng.com>
Sent: Friday, October 14, 2022 2:10 PM
To: Isenhour, Kimberly T CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>
Subject: [URL Verdict: Neutral][Non-DoD Source] Buckwater Mitigation Site

Hey Kim,

Wildlands is purposing to do a supplemental planting at Buckwater to add plant diversity and supplement stem density in a few areas. We are purposing to plant 4.3 acres along UT3 and UT7 (Figure 1). This falls under the 20% threshold, so no adaptive management plan should be needed. There are a few new species we are proposing that were not in the original planting plan. We are planning to plant in the fall to allow the roots to establish over the winter and be more drought tolerant come spring. Bone meal and Terrasorb (water retention beads) will be added to the hole before the trees are planted to help establishment. Further amendments and management actions such as ring sprays in the supplementally planted areas are planned for the upcoming year. All these actions should improve stem survivability. Let me know if you have any comments or questions about the proposed plan. Have a good weekend. Thanks!

Jason Lorch, GISP | Senior Environmental Scientist
O: 919.851.9986 x107 M: 919.413.1214

Wildlands Engineering, Inc. <Blocked<http://www.wildlandseng.com/>>
312 West Millbrook Road, Suite 225
Raleigh, NC 27609

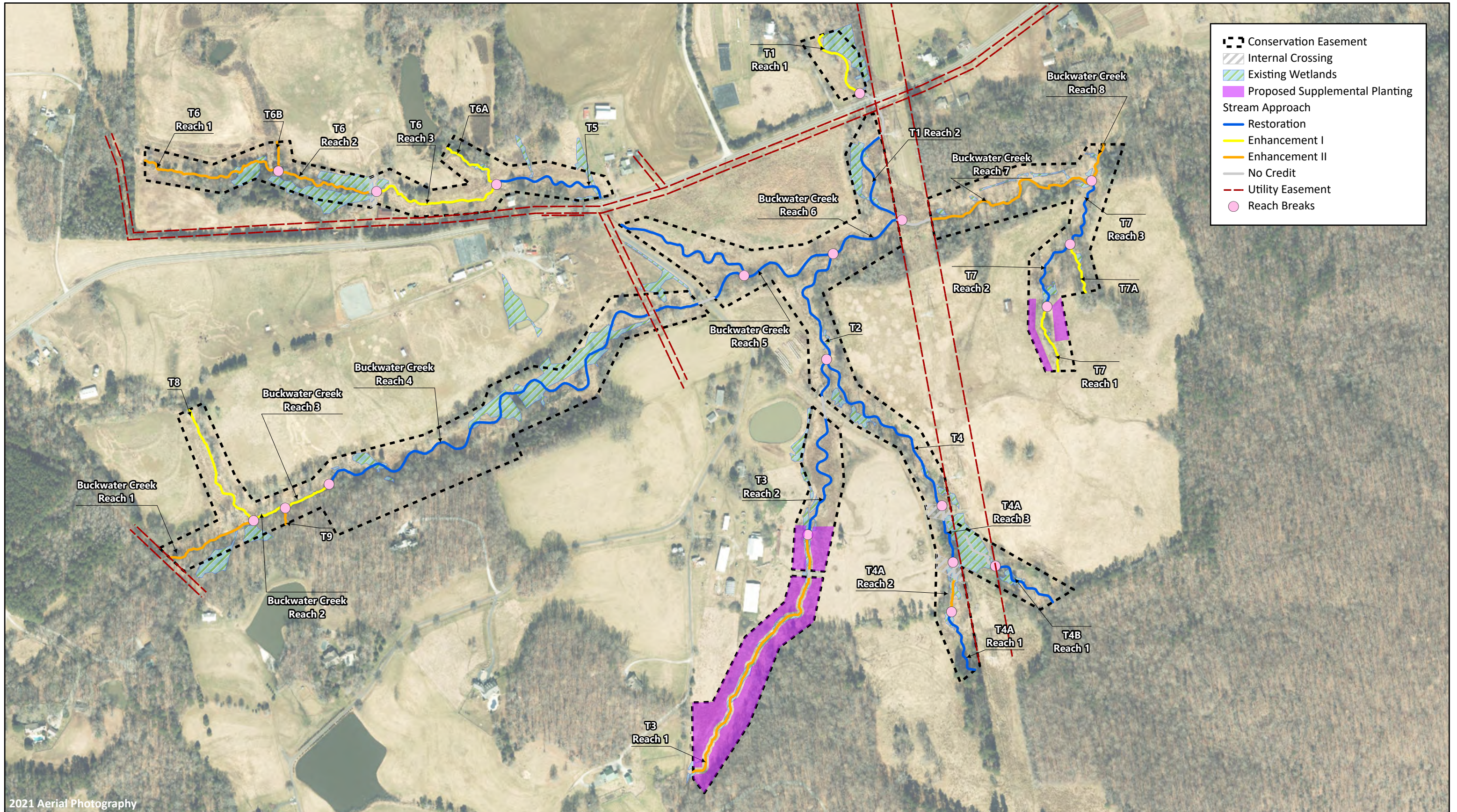


Figure 1. Supplemental Planting Along UT3 and UT7
 Buckwater Mitigation Site
 DMS Project No. 97084
 Monitoring Year 4 - 2022

Table 1. Supplemental Planting Along UT3 and UT7

Buckwater Mitigation Site

DMS Project No. 97084

Monitoring Year 4 - 2022

Scientific Name	Common Name	Stratum	Wetland Indicator Status	Container Type	Percentage of Stems	Number of Stems
<i>Acer negundo</i>	Box elder	Canopy	FAC	Gallon	5%	30
<i>Betula nigra</i>	River Birch	Canopy	FACW	Gallon	8%	50
<i>Carya ovata</i>	Shagbark Hickory	Canopy	FACU	Gallon	3%	20
<i>Diospyros virginiana</i>	Persimmon	Understory	FAC	Gallon	3%	20
<i>Liriodendron tulipifera</i>	Tulip poplar	Canopy	FACU	Gallon	8%	50
<i>Nyssa sylvatica</i>	Black gum	Canopy	FAC	Gallon	8%	50
<i>Quercus alba</i>	White Oak	Canopy	FACU	Gallon	8%	50
<i>Quercus alba</i>	White Oak	Canopy	FACU	Tubling	10%	60
<i>Quercus michauxii</i>	Swamp chestnut oak	Canopy	FACW	Gallon	8%	50
<i>Quercus phellos</i>	Willow Oak	Canopy	FAC	Gallon	8%	50
<i>Quercus rubra</i>	Northern red oak	Canopy	FACU	Gallon	10%	60
<i>Quercus shumardii</i>	Shumard Oak	Canopy	FAC	Gallon	8%	50
<i>Ulmus americanus</i>	American elm	Canopy	FACW	Gallon	10%	60
Total					100%	600

Original Planted Acreage = 23.6

Supplemental Planted Acreage = 4.3 (18%)