MONITORING YEAR 1 ANNUAL REPORT
Final

BANNER FARM MITIGATION SITE
Henderson County, NC
French Broad River Basin
HUC 06010105

DMS Project No. 100062
DEQ Contract No. 7530
DMS RFP No. 16-007334
Date of Issue: September 8, 2017
USACE Action ID No. SAW-2018-01153
DWR Project No. 20181032

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PREPARED FOR:

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January 17, 2023

Mr. Matthew Reid
Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211

RE: **Banner Farm Draft MY1 Report Review**
French Broad River Basin – CU# 06010105
Henderson County
DMS Project ID No. 100062
Contract # 7530

Dear Mr. Reid:

Wildlands Engineering, Inc. (WEI) has reviewed the Division of Mitigation Services (DMS) comments from the Draft MY1 Monitoring report for the Banner Farm Mitigation Site provided in bold type below and offers the following responses in italics.

Table of Contents: Please revise Table 8a-c to Table 8a-d.

Wildlands Response: The table of contents has been revised.

The IRT commented during the MY0/Asbuilt review that Silver Maple should not have been included in the approved planting list based on IRT Mitigation Plan comments. WEI responded that an error in communication occurred with planting staff at the time of planting. This species is currently being counted towards success in fixed plots 2 and 3 and random plot 8. Please update tables to remove this species from calculations.

Wildlands Response: The vegetation plot tables 6a-e and 7a-c have been updated to not count Silver Maple stems towards success criteria. The Silver Maple species has been changed to "Not Approved – Not Invasive or Exotic" under the Performance Standard Approval column in the dataset. All digital support files have been updated.

Please include a Groundwater Gage Plot for the reference gage with the final document.

Wildlands Response: A standalone groundwater gage plot has been included for the reference gage in Appendix D.

Areas of low stem density will be replanted, and live stakes will be added to formally inundated areas in winter 2022/2023. Please include replant information (species, quantities, etc.) in MY2 report.

Wildlands Response: Replant information will be included in the MY2 report.

XS12 and Table 9b: Please include a note on graph and table indicating cross-section is located in area of repair and was not rebuilt to the original design or asbuilt condition.

Wildlands Response: A note has been added to the XS12 plot and Table 9b.

Easement Encroachments: Discussion on easement encroachments is unclear. Two encroachments are discussed in section 2.5.1 Vegetation, and additional encroachments are discussed in section 2.5.3 Conservation Easement. The CCPV shows two encroachments. The first is on Banner Creek R2 (Fig 1a) and a second encroachment near the beginning of UT2 (Fig 1e). The two encroachments mentioned in 2.5.1 are not shown on the CCPV as encroachments, but they are shown as low stem density. Recommend showing all encroachments on CCPV and discussing in more detail in section 2.5.3 regarding location and description of each encroachment. A table or list would be helpful.

Wildlands Response: Discussion of the specific easement encroachment locations along with a summary table have been added to section 2.5.3. The resolved and unresolved encroachments that are discussed in the report have been added to the CCPV figures.

2.5.3 Conservation Easement: If possible, please include photos of rectified easement encroachments and photos of on-going encroachments in final submittal. Please provide update to encroachments in MY2 report.

Wildlands Response: A photo log of the unresolved encroachments has been included in the final report in Appendix A. An update about the encroachments first identified in MY1 will be provided in the MY2 report.

Wetland Hydrology: Only 4 of 18 gages met or exceeded the wetland hydrology success criteria for MY1. Two of the four gages meeting success criteria are in the rehabilitation area. The site is early in the monitoring process; however, such a low number of gages meeting success criteria is concerning. Several gages missed by only a few days, others by much more. Is site compaction, deep ripping, or gage placement an issue on the site? Does WEI have any thoughts or concerns with the wetland hydrology as the site moves into MY2?

Wildlands Response: WEI evaluated MY1 groundwater data comparing inundation periods on site to reference data, evaluating the percent increase in max consecutive days of inundation within 12-inches of the soil surface between pre-construction and MY1 conditions, and looking at overall average groundwater levels across the site. Additionally, annual, and seasonal precipitation patterns were reviewed to fully understand MY1 site conditions. While only 4 of the 18 groundwater gages met or exceeded the specific hydrology success criteria, average groundwater across the site increased dramatically and maximum consecutive days of inundation increased by an average of 124%. The baseline groundwater increased even though annual rainfall was approximately 10.7-inches less when comparing pre-construction to MY1 data. Groundwater gage plots show infiltration rates higher than the reference gage for the early spring period of the growing season (March to May), which coincides with April rainfall below the 30% average. Higher infiltration rates could also be associated with lack of vegetation at the early onset of the monitoring period. Infiltration rates slow to reference conditions later in the summer as vegetation established and rainfall returns to more typical annual amounts. Based on current evaluations, WEI believes groundwater levels and inundation periods at the site will increase as the built environment continues to establish. WEI will continue to evaluate groundwater conditions on site and will identify any areas of potential asset risk within future monitoring reports. Site compaction, deep ripping, and gage placement are not considered to be an issue at the Site.

As a reminder, the IRT requested a mobile plot in the wetland rehabilitation area north of UT1 at least once during MY2 or MY3 in their MY0/Asbuilt comments. Please consider this request when conducting future monitoring.

Wildlands Response: Thank you for the reminder. WEI will locate a mobile plot in the wetland rehabilitation area north of UT1 at least once during the MY2 or MY3 vegetation monitoring.

Please include the IRT MY0 comment responses (email dated July 29, 2022) in the appendix.

Wildlands Response: The IRT MY0 comment response email correspondence has been added to Appendix E.

Digital Deliverable Comments:

The Monitoring Year 1 GIS files folder does not contain the required GIS files (location for random vegetation plots, all problem areas identified in the visual assessment tables, and location of identified encroachment). Please submit the missing files.

Wildlands Response: The random or mobile vegetation plots are included in the feature class layer named "Banner_VegPlot_Mobile". The problem areas identified in the visual assessment tables are contained in the MY1.gdb within the features classes named "Banner_StreamAOC_MY1" and "Banner_VegAOC_MY1" which includes the encroachment polygons. This data has been included with the final electronic support files.

Enclosed please find two hard copies of the Final MY1 Monitoring Report and an electronic copy of the report and support files. Please contact me at (865) 207-8835 if you have any questions.

Sincerely,

Eric Neuhaus, PE
Project Manager
eneuhaus@wildlandseng.com

BANNER FARM MITIGATION SITE

Monitoring Year 1 Annual Report

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Section 1: PROJECT OVERVIEW

The Banner Farm Mitigation Site (Site) is located in Henderson County, approximately five miles west of Hendersonville near Horse Shoe. The Site is positioned in the Blue Ridge Physiographic Province and project streams include Banner Creek and two associated tributaries which drain to the French Broad River. At the confluence with Banner Creek, the French Broad River is defined in the 2016 North Carolina Integrated Report as Class WS-IV waters. This classification of waters is protected for drinking, culinary, food processing, aquatic life, secondary recreation, and freshwater purposes.

1.1 Project Quantities and Credits

The site is located on 7 parcels under 4 different landowners and a conservation easement was recorded on 46.6 acres. Mitigation work within the Site included restoration of perennial stream channels and creation, re-establishment, and rehabilitation of wetland areas. Table 1 below shows stream and wetland credits and the total amount of credits expected at closeout.

Table 1: Project Quantities and Credits

Project Components							
Project Segment	**Original Mitigation Plan Ft/Ac**	**As-Built Ft/Ac**	**Mitigation Category**	**Original Restoration Level**	**Original Mitigation Ratio (X:1)**	**Credits**	**Comments**
Stream							
Banner Creek Reach 1	797	827	Cool	R	1.000	797.000	Restoring dimension, pattern, and profile, reconnecting channels with floodplains and wetlands, replanting buffers, protecting with conservation easement
Banner Creek Reach 2	866	836	Cool	R	1.000	866.000	
Banner Creek Reach 3	467	467	Cool	R	1.000	467.000	
Banner Creek Reach 4a	794	780	Cool	R	1.000	794.000	
Banner Creek Reach 4b	420	434	Cool	R	1.000	420.000	
UT1	1,071	1,071	Cool	R	1.000	1,071.000	
UT2	1,879	1,879	Cool	R	1.000	1,879.000	
					Total:	**6,294.000**	
Wetland							
Wetland Re-Establishment	31.820	31.671	RR	REE	1.000	31.820	Re-establish hydrology via the plugging/filling of drainage features, stream grading, wetland planting, invasive species treatment, permanent conservation easement

Project Components							
Project Segment	**Original Mitigation Plan Ft/Ac**	**As-Built Ft/Ac**	**Mitigation Category**	**Original Restoration Level**	**Original Mitigation Ratio (X:1)**	**Credits**	**Comments**
Wetland Rehabilitation	2.760	2.746	RR	RH	2.000	1.380	Improve hydrology via the plugging/filling of drainage features, wetland planting, stream grading, invasive species treatment, permanent conservation easement
Wetland Creation	1.140	1.094	RR	C	3.000	0.380	Priority 2 stream grading, plugging/filling of drainage features, wetland planting, invasive species treatment, permanent conservation easement
					Total:	**33.580**	

Project Credits							
Restoration Level	**Stream**			**Riparian Wetland**		**Non-Riparian Wetland**	**Coastal Marsh**
	Warm	**Cool**	**Cold**	**Riverine**	**Non-Riv**		
Restoration		6,294.000					
Re-establishment				31.820			
Rehabilitation				1.380			
Enhancement							
Enhancement I							
Enhancement II							
Creation				0.380			
Preservation							
Totals		**6,294.000**		**33.580**			

1.2 Project Goals and Objectives

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

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Stabilize eroding stream banks.	Reconstruct stream channels slated for restoration with stable dimensions. Add bank revetments and in-stream structures to protect restored streams.	Reduce erosion and sediment inputs.	Cross-sections should be stable and show little change in bankfull area and width-to-depth ratio.	Cross-section monitoring and visual inspections.	Most cross-section dimensions closely match baseline monitoring.
Improve the stability of stream channels.	Construct stream channels that will maintain a stable pattern and profile considering the hydrologic and sediment inputs to the system, landscape setting, and watershed conditions.	Reduce erosion and sediment inputs; maintain appropriate bedforms and sediment size distribution.	Entrenchment ratio (ER) stays over 2.2 and bank height ratio (BHR) below 1.2 with visual assessments showing progress toward stability.	Cross-section monitoring and visual inspections.	Most cross-sections show streams are stable and functioning as designed. All show ERs are over 2.2 and 9/11 riffle XS BHRs are below 1.2.
Improve instream habitat.	Install habitat features including constructed riffles, cover logs, and brush toes into restored streams. Add woody materials to channel beds. Construct pools of varying depth.	Support biological communities and processes; provide aquatic habitat for diverse populations of aquatic organisms.	There is no required performance standard for this metric.	N/A	N/A

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Reconnect channels with floodplains and riparian wetlands.	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the existing floodplain.	Reduce shear stress on channel, hydrate adjacent wetland areas, filter pollutants out of overbank flows, provide surface storage of water on floodplain, increase groundwater recharge while reducing outflow of stormwater, support water quality, and habitat goals.	Four bankfull events in separate years within the 7-year monitoring period.	Crest gages with transducers recording stage elevations.	All project streams experienced multiple bankfull events in MY1.
Restore wetland hydrology, soils, and plant communities.	Restore and enhance riparian wetlands by raising stream beds, plug existing ditches, removing berm material over relic hydric soils, and planting native wetland species.	Increase water storage, increase groundwater recharge, water quality treatment through retention, and increase habitat for aquatic and terrestrial species.	Free groundwater surface within 12 inches of the ground surface for 12% of the growing season (26 consecutive days).	Groundwater gages installed in wetland re-establishment, creation, and rehabilitation areas and monitored annually.	6/20 GWGs met or exceeded hydrologic success criteria in MY1.
Restore and enhance native floodplain vegetation.	Plant native tree species in riparian zone where they are currently insufficient.	Provide a canopy to shade streams and reduce thermal loading. Stabilize stream banks and floodplain. Support water quality habitat goals.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7. Average height of 6 feet in each plot at MY5 and 8 feet in each plot at MY7 for planted stems.	Vegetation plots measuring 100 square meters established in 2% of the open planted area and monitored annually.	In MY0, all plots met MY3 density criteria. In MY1, 23/24 permanent and 9/12 mobile vegetation plots are meeting MY3 density criteria.
Permanently protect the Site from harmful uses.	Establish conservation easements on the Site.	Protect and enhance aquatic habitat, reduce sediments inputs, and protect any rare natural communities.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	2 minor encroachments unresolved in MY1. Remaining areas have been resolved.

1.3 Project Attributes

The Site and adjoining properties have sustained predominantly rural characteristics for approximately 60 years. Portions of Site parcels were extensively ditched to drain and maintain adjacent agricultural fields for row crop production from 1964 to the commencement of project construction. Large segments of the ditches were determined to be modified streams including Banner Creek, UT1, and UT2. Throughout the watershed, agricultural land use declined slightly from 1964 to 1994 as residential areas were established and fields were abandoned and allowed to reforest. The watershed has since remained relatively stable with only minor changes in land use. Table 3 below presents additional information on pre-restoration conditions.

Table 3: Project Attributes

Project Information					
Project Name	Banner Farm Mitigation Site				
County	Henderson				
Project Area (acres)	46.6				
Project Coordinates (latitude and longitude decimal)	35° 21' 7"N, 82° 33' 13" W				
Project Watershed Summary Information					
Physiographic Province	Blue Ridge				
River Basin	French Broad				
USGS Hydrologic Unit 8-digit	06010105				
DWR Sub-basin	04-03-02				
Project Drainage Area (acres)	722				
Project Drainage Area Percentage of Impervious Area	1.5%				
Land Use Classification	44% cultivated crops and hay, 27% forest, 2.5% shrub/grassland/herbaceous, 0.5% wetlands, 26% residential				
Reach Summary Information					
Parameters	**Banner Creek**				
	R1	**R2**	**R3**	**R4a**	**R4b**
Pre-project length (feet)	705	945	357	607	802
Post-project length (feet)	827	836	467	780	434
Valley confinement (Confined, moderately confined, unconfined)	Unconfined				
Drainage area (acres)	390	422	429	634	722
Perennial, Intermittent, Ephemeral	P				
NCDWR Water Quality Classification	WS-IV (WSW)				
Dominant Stream Classification (existing)	C4	C4	C4	C5/4	C5/4
Dominant Stream Classification (proposed)	C4	C4	C4	C5/4	C5/4
Dominant Evolutionary Classification (Simon) if applicable	V	IV	III	IV	IV
Parameters	**UT1**			**UT2**	
Pre-project length (feet)	620			2042	
Post-project length (feet)	1,071			1,879	
Valley confinement (Confined, moderately confined, unconfined)	Unconfined				
Drainage area (acres)	83			192	
Perennial, Intermittent, Ephemeral	P				
NCDWR Water Quality Classification	WS-IV (WSW)				
Dominant Stream Classification (existing)	E/C5			E/C5	
Dominant Stream Classification (proposed)	E5			C4	
Dominant Evolutionary Classification (Simon) if applicable	IV				

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Docs?**
USACE Public Notice - Section 404	Yes	Yes	SAW-2018-01153[1]
Water of the United States - Section 404	Yes	Yes	PCN[2]
Water of the United States - Section 401	Yes	Yes	PCN[2]
Endangered Species Act	Yes	Yes	Final Mitigation Plan
Historic Preservation Act	Yes	Yes	Final Mitigation Plan
Coastal Zone Management Act	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	No Rise Certification
Essential Fisheries Habitat	No	N/A	N/A

[1] Public Notice was issued on August 28, 2018.
[2]PCN was submitted to DMS with Final Mitigation Plan for IRT submittal.

Wetland Summary Information						
Parameters	**Wetland Rehabilitation Areas**					
	A	**D**	**E**	**F**	**H**	**I**
Post-project area (acres)	0.46	0.12	<0.01	0.03	0.06	<0.01
Wetland Type (non-riparian, riparian)	Riparian					
Classification	Bottomland Hardwood Forest					
Mapped Soil Series	Toxaway/ Rosman	Toxaway/ Codorus	Toxaway	Toxaway	Codorus/ Delanco	Codorus
Soil Hydric Status	Yes/No		Yes		No	
Restoration or enhancement method	Rehabilitation (Vegetative, hydrology)					
Parameters	**Wetland Rehabilitation Areas**					
	J	**K**	**L**	**R**	**S**	**W**
Post-project area (acres)	0.05	0.11	<0.01	1.65		0.28
Wetland Type (non-riparian, riparian)	Riparian					
Classification	Bottomland Hardwood Forest					
Mapped Soil Series	Codorus/ Delanco	Codorus/ Bradson	Codorus	Codorus/ Delanco	Codorus/ Bradson	Toxaway
Soil Hydric Status	No					
Restoration or enhancement method	Rehabilitation (Vegetative, hydrology)					
Parameters	**Wetland Re-establishment Areas**					
Post-project area (acres)	31.67					
Wetland Type (non-riparian, riparian)	Riparian					
Mapped Soil Series	Codorus/Delanco/Bradson/Toxaway/Rosman					
Soil Hydric Status	No					
Restoration or enhancement method	Re-establishment (Vegetative, hydrology)					
Parameters	**Wetland Creation Areas**					
Post-project area (acres)	1.094					
Wetland Type (non-riparian, riparian)	Riparian					
Mapped Soil Series	Rosman					
Soil Hydric Status	No					
Restoration or enhancement method	Creation (Vegetative, hydrology)					

Section 2: Monitoring Year 1 Data Assessment

The MY1 data collection was conducted between September and November 2022 to assess the condition of the project. Performance criteria for vegetation, stream, and hydrologic assessments are located in Section 1.2 Table 2: Goals, Performance Criteria, and Functional Improvements. The Site will be monitored for a total of seven years with the final monitoring activities scheduled for 2028.

2.1 Vegetative Assessment

The MY1 vegetative survey was completed in September 2022. The average stem density across all vegetation plots is 443 stems per acre. In MY1, 23 out of 24 permanent vegetation plots (VP) and 9 out of 12 mobile vegetation plots (MP) are on track to meet the MY3 interim density requirement of 320 stems per acre. 4 vegetation plots (VP 5, MP 3, MP 5, and MP 7) are not meeting criteria but based on visual assessments do not appear to be indicative of larger areas of low stem density. See Section 2.5.1 for further discussion on areas of low stem density. Within the permanent plots, there was approximately a 79% planted stem survival rate. The planted tree/shrub species with the lowest survival rates include witch hazel (*Hamamelis virginiana*), spicebush (*Lindera Benzoin*), tulip poplar (*Liriodendron tulipifera*), and black cherry (*Prunus serotina*). Herbaceous vegetation is becoming well established throughout the Site. There are also a variety of hydrophytic species within the wetland areas beginning to flourish. Refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix B for Vegetation Plot Data.

2.2 Stream Assessment

Morphological surveys for MY1 were completed in October 2022. Most cross-sections show dimensions within an acceptable range of the design parameters indicating that the streams are stable and functioning as designed. The max depth and bank height ratios of two riffle cross-sections (XS4 and XS12) increased since MY0. See section 2.5.2 for further discussion about stream areas of concern.

Based on a DMS Technical Workgroup memo from 10/19/21 and concurrence received on 10/27/2021 from the DMS project manager for the Site, pebble counts will not be conducted during the remaining monitoring years unless requested by the IRT or deemed necessary by best professional judgement. Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table and Stream Photographs. Refer to Appendix C for Stream Geomorphology Data. Refer to Appendix E for the DMS Technical Workgroup memo and the email confirmation from the DMS project manager (Reid, 2021).

2.3 Stream Hydrology Assessment

In total, 3 automated crest gages (CG) were installed along Banner Creek Reach 2, UT1, and UT2 to monitor bankfull events. In MY1, multiple bankfull events were documented on all project streams. Therefore, the hydrologic success criteria of four bankfull events in separate years has been partially met. Refer to Appendix D for Hydrology Data.

2.4 Wetland Hydrology Assessment

Eighteen groundwater gages (GWGs) and one soil temperature probe were installed during MY0 across the wetland re-establishment, rehabilitation, and creation areas. All monitoring gages are downloaded on a quarterly basis and maintained as needed. Calibrations were checked by manually measuring water levels on all gages which validated the recorded data from the pressure transducers.

Of the eighteen GWGs, four met or exceeded the wetland hydrology success criteria for MY1 with the percentage of consecutive days of the growing season ranging from 25.2% to 100%. The remaining fourteen GWGs did not meet the success criteria with the percentage of consecutive days of the growing season ranging from 1.9% to 11.7%. A groundwater gage was established in a reference

wetland located on the Sierra Nevada property and is located 5.5 aerial miles from the Site. The reference gage met the success criteria with the percentage of consecutive days of the growing season equal to 12.1%. When compared to reference data, all gages except GWGs 5, 6, and 7 generally follow the hydrologic trends of the reference, with many of the site GWGs having higher baseline water levels in the summer/fall than the reference. Gage data will continue to be compared to reference data in subsequent monitoring reports to analyze trends in hydrology.

Daily rainfall data was obtained from the Asheville Airport station (Station ID 310300) and is approximately 5 miles from the Site. The precipitation data indicates lower than normal rainfall in April, June, and October. These periods of low rainfall correspond with large groundwater draw downs at both the reference wetland and at the project site. Refer to Appendix A for Groundwater Gage and Wetland Photographs, and Appendix D for Hydrology Data.

2.5 Areas of Concern and Adaptive Management Activities

2.5.1 Vegetation

MY1 visual assessments reveal that over 99% of the conservation easement is unaffected by invasive species. When present, these species include Chinese privet (*Ligustrum sinense*), Callery pear (*Pyrus calleryana*), multiflora rose (Rosa multiflora), Asian bittersweet (*Celastrus orbiculatus*), and European grey willow (*Salix cinerea*). The European grey willow was discovered as small saplings scattered at a low density within much of the wetland re-establishment areas. In October 2022, a contractor systematically worked across these large areas of the Site to treat the invasive willow. Other invasive species populations found within the Site were treated in May and September 2022. Additional treatments will continue as needed to help manage and eliminate remaining invasive species populations.

Native woody and herbaceous vegetation are becoming well established on over 99% of the planted acreage. Additionally, the mature river birch trees that were protected during construction along Banner Creek Reach 1 are surviving and continue to appear healthy in MY1. As discussed in section 2.1, the vegetation plots not meeting the interim density requirement are not indicative of larger areas around the plots and are not currently mapped as an area of concern. Two areas mapped for low stem density are due to some mowing overreach observed along the boundary north of Banner Creek Reach 3 and Reach 4a. See Section 2.5.3 for discussion on the status of encroachments. A third area of low density corresponds to the area of disturbance associated with the stream repairs that occurred along Banner Creek Reach 4b in October 2022. The areas of low stem density total approximately 0.32 acres (0.7% of the planted acreage) and will be replanted in winter of 2022/2023 with approved species from the project's Final Mitigation Plan (Wildlands, 2020). Low herbaceous cover exists within the southernmost part of the Site along the former ditch location where standing water was observed during the early spring. Throughout the remainder of MY1, the standing water was observed to recede significantly (see wetland photo points 20 – 22 in Appendix A). In September 2022, wetland plugs were planted in the formally inundated area to improve herbaceous coverage. Wildlands plans to add live stakes to this area in the winter of 2022/2023.

2.5.2 Stream

Numerous large storm events occurred in the summer of 2022, with several exhibiting single day rainfall totals greater than 1.5 inches (Asheville Airport Station ID 310300). The Site was largely resilient to these large storm events. In August 2022, some storm damage was first observed along Banner Creek Reach 4b which included instances of bank scour, structure piping, and degradation/aggradation from the French Broad River. Sediment cycling from the French Broad River was anticipated in the project's Final Mitigation (Wildlands, 2020): "Banner Creek Reach 4b is proposed for more of a Priority 2 restoration

approach as the stream channel flows out of the proposed wetland restoration zones and ties down to the bed elevation of the French Broad River. Wildlands expects to see some backwater conditions and potential aggradation and degradation cycling in lower stream reaches following large flow events." In October 2022, a repair plan was implemented along Banner Creek Reach 4b which included regrading vulnerable banks, resetting log structures, and adding riffle material. Repairs prioritized stability in the streambed of this reach such that aggradation and degradation processes can still occur, but sudden, large changes to the overall profile would be unlikely. Cross-section 12 is located at a riffle that initially degraded and was surveyed after the repair work was complete. The increased max depth at cross-section 12 is not an area of concern because the riffle was not rebuilt to match the as-built profile. All disturbed areas were reseeded, and transplants were used along the banks where possible. Live stakes and bare roots will be planted in the winter of 2022/2023 in the repair areas. Please refer to Appendix F for repair plan sheets and photographs.

In MY1, one riffle experienced some bed scour along Banner Creek Reach 1 at station 5+60, as indicated by the increase in max depth at cross-section 4. Assessments revealed that the log structure located at the end of this riffle is maintaining grade and should inhibit additional degradation. This area of concern is considered minor but will continue to be monitored for signs of instability.

2.5.3 Conservation Easement

A few easement encroachments were originally noted in MY0 along the dirt farm road that exists along the eastern edge of the easement boundary. In May 2022, these issues were resolved by adding posts, signs, extenders, and horse tape to delineate the boundary along the dirt road. To reconcile the constructed farm entrance encroachment originally noted in MY0, Wildlands is currently in the process of modifying the recorded conservation easement to release the farm entrance from the project area. The partial release of easement document and the preliminary plat for the area to be released have been drafted by Wildlands and reviewed and approved by the State Property Office. The plat has been approved for signatures by the landowners and subsequent review and recordation by Henderson County. After the plat is signed, approved, and recorded, the partial release document will be executed, and state property will record the document.

In MY1, minor encroachments including small sections of mowing overreach and row crop intrusion were observed. Wildlands has successfully notified the landowner of the error and installed additional posts and horse tape to clarify the boundary to resolve the encroachment issues along Banner Creek Reach 3. As discussed above in section 2.5.1, the two small areas of mowing overreach along Banner Creek Reach 3 do warrant replanting, which will be completed in the winter of 2022/2023. Furthermore, additional boundary markings will be added in MY2 to the two unresolved easement encroachment areas along Banner Creek Reach 2 and UT2 that are shown on CCPV Figures 1a and 1e. The table below summarizes the easement encroachments and associated adaptive management activities.

Easement Encroachment List – MY1				
Encroachment Location	**MY1 Status**	**Description**	**Follow Up Adaptive Management**	**Area (Acres)**
Banner Creek Reach 2 STA 15+00 – Left Floodplain	Unresolved	Slight crop overreach from small garden behind trailer.	Install additional posts/ horse tape.	0.0012
Banner Creek Reach 3 STA 23+00 – Left Floodplain	Resolved	Area of mowing overreach. Horse tape installed in MY1.	Replant with bare roots.	0.0557
Banner Creek Reach 3 STA 27+00 – Left Floodplain	Resolved	Area of mowing overreach. Horse tape installed in MY1.	Replant with bare roots.	0.0489
UT2 STA 201+00 – Right Floodplain	Unresolved	Slight mowing scalloping.	Install additional posts/ horse tape.	0.0058

Site maintenance and adaptive measurement implementation will continue to follow those outlined in the project's Final Mitigation Plan (Wildlands, 2020). No adaptive management plans are needed at this time.

2.6 Monitoring Year 1 Summary

Overall, the Site is on track to meet most of the required stream, vegetation, and hydrology success criteria for MY1. The average planted stem density for the Site is 443 stems per acres and is on track to meet the MY3 requirement of 320 stems per acre. Geomorphic surveys indicate that cross-section bankfull dimensions closely match the baseline monitoring, with some minor adjustments, and streams are functioning as intended. At least one bankfull event was documented on all project reaches in MY1. Four of the eighteen groundwater gages on the Site met or exceeded the hydrology success criteria. Stream repairs were completed in October 2022 along Banner Creek Reach 4b. The MY1 visual assessment identified a few areas of concern including pockets of invasive species, small areas of low stem density, and an isolated area of bed scour. Wildlands will continue to monitor these areas and adaptive management actions will be implemented as necessary throughout the seven-year monitoring period to maintain the ecological health of the Site.

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

Section 3: METHODOLOGY

Annual monitoring will consist of collecting morphologic, vegetative, and hydrologic data to assess The project's success based on the goals outlined in the Site's Mitigation Plan (Wildlands, 2020). Monitoring requirements will follow guidelines outlined in the NC IRT Stream and Wetland Mitigation Guidance Update (2016). Installed monitoring devices and plot locations closely mimic the locations of those proposed in the Site's Mitigation Plan. Deviations from these locations were made when professional judgement deemed them necessary to better represent as-built field conditions or when installation of the device in the proposed location was not physically feasible.

Geomorphic data was collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All Integrated Current Condition Mapping was collected by either a professional licensed surveyor or an Arrow 100® Submeter GNSS Receiver and processed using ArcPro. Crest gages, using automated pressure transducers, were installed in riffle cross-sections to monitor stream hydrology throughout the year. Groundwater gages were installed using guidance from the USACE's *Technical Standard for Water-Table Monitoring of Potential Wetland Sites* (2005). Stream hydrology and vegetation monitoring protocols followed the Wilmington District Stream and Wetland Compensatory Mitigation Update (NCIRT, 2016). Vegetation installation data collection follow the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008); however, vegetation data processing follows the NC DMS Vegetation Data Entry Tool and Vegetation Plot Data Table (NCDMS, 2020).

Section 4: REFERENCES

Doll, B.A., Grabow, G.L., Hall, K.A., Halley, J., Harman, W.A., Jennings, G.D., and Wise, D.E. 2003. Stream Restoration A Natural Channel Design Handbook.

Harrelson, C.C., Rawlins, C.L., Potyondy, J.P. 1994. *Stream Channel Reference Sites: An Illustrated Guide to Field Technique.* Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

Lee, Michael T., Peet, Robert K., Steven D., Wentworth, Thomas R. 2008. CVS-EEP Protocol for Recording Vegetation Version 4.2. Retrieved: http://cvs.bio.unc.edu/protocol/cvs-eep-protocol-v4.2-lev1-5.pdf.

National Oceanic and Atmospheric Administration (NOAA) Applied Climate Information System (ACIS). 2022. Coop Station ID 310300, Asheville Airport. Accessed November 2022.

North Carolina Division of Mitigation Services. 2009 (NC DMS). French Broad River Basin Restoration Priorities (RBRP). Raleigh, NC.

NC DMS. 2020. Vegetation Data Entry Tool and Vegetation Plot Data Table. Raleigh, NC. https://ncdms.shinyapps.io/Veg_Table_Tool/

NC DMS and Interagency Review Team (IRT) Technical Workgroup. 2018. Standard Measurement of the BHR Monitoring Parameter. Raleigh, NC.

NC DMS and IRT Technical Workgroup. 2021. Pebble Count Data Requirements. Raleigh, NC. October 19, 2021.

North Carolina Division of Water Quality. 2016. Surface Water Classifications. http://portal.ncdenr.org/web/wq/ps/csu/classifications

North Carolina Geological Survey (NCGS), 1985, Geologic Map of North Carolina: Raleigh, North Carolina Department of Natural Resources and Community Development, Geological Survey Section, scale 1:500,00, in color.

North Carolina Interagency Review Team (NCIRT). 2016. Wilmington District Stream and Wetland Compensatory Mitigation Update. Accessed at: https://saw-reg.usace.army.mil/PN/2016/Wilmington-District-Mitigation-Update.pdf

Reid, M. 2021. Email Correspondence, Pebble Count Data Requirements. October 28, 2021.

Rosgen, D. L. 1994. A classification of natural rivers. *Catena* 22:169-199.

Rosgen, D.L. 1996. Applied River Morphology. Pagosa Springs, CO: Wildland Hydrology Books.

Simon, A. 1989. A model of channel response in disturbed alluvial channels. Earth Surface Processes and Landforms 14(1):11-26.

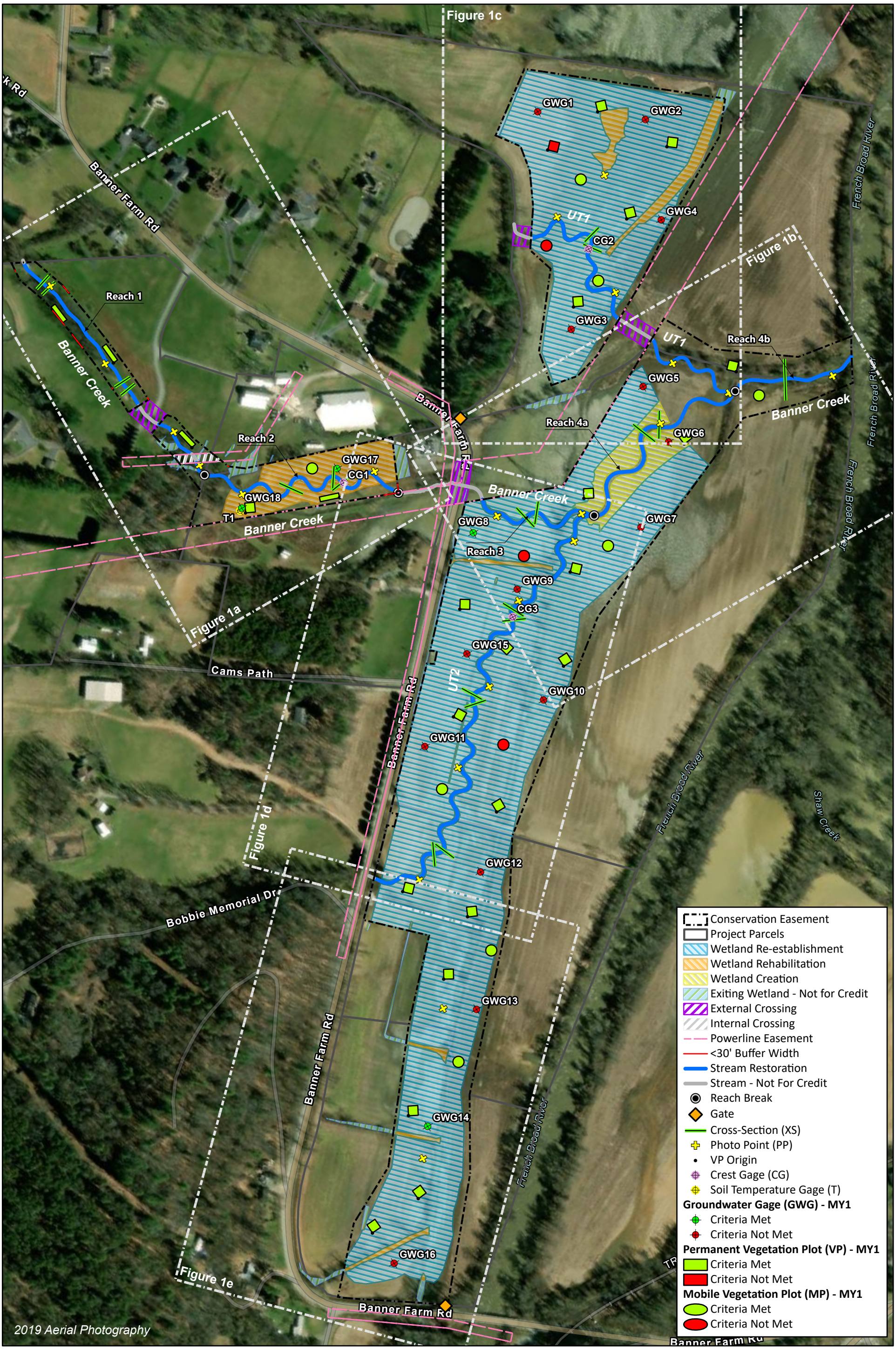
US Army Corps of Engineers (USACE). 2005. *Technical Standard for Water-Table Monitoring of Potential Wetland Sites*. ERDC TN-WRAP-05-2.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. 2019. http://websoilsurvey.sc.egov.usda.gov/. Accessed August 2019.

Wildlands Engineering, Inc. (2020). Banner Farm Mitigation Site Final Mitigation Plan. DMS, Raleigh, NC.

Wildlands Engineering, Inc. (2022). Banner Farm Year 0 Annual Report. DMS, Raleigh, NC.

Figures



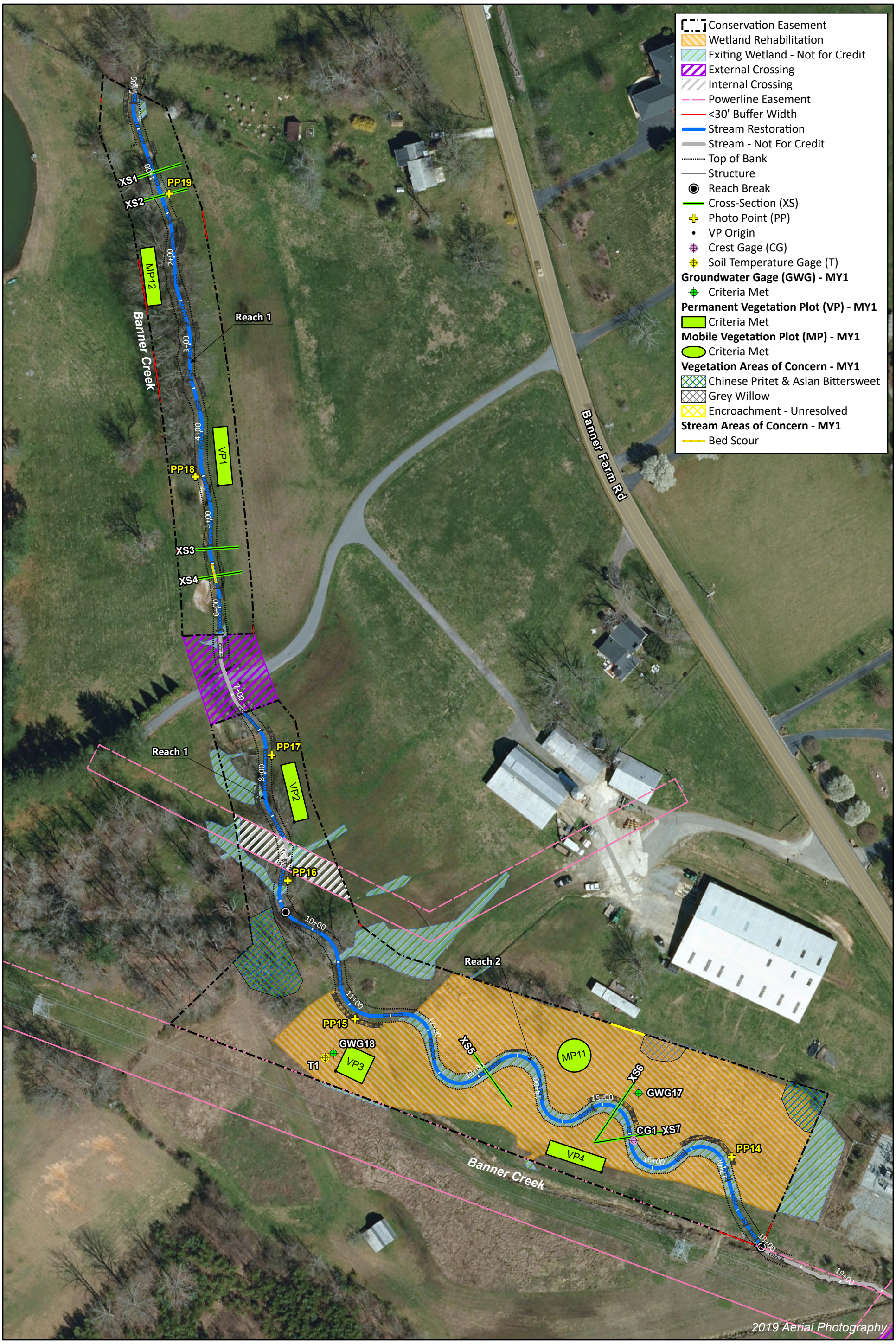
WILDLANDS ENGINEERING

Environmental Quality

0 300 600 Feet

Figure 1 Current Condition Plan View Map (Key)
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Henderson County, NC



WILDLANDS ENGINEERING

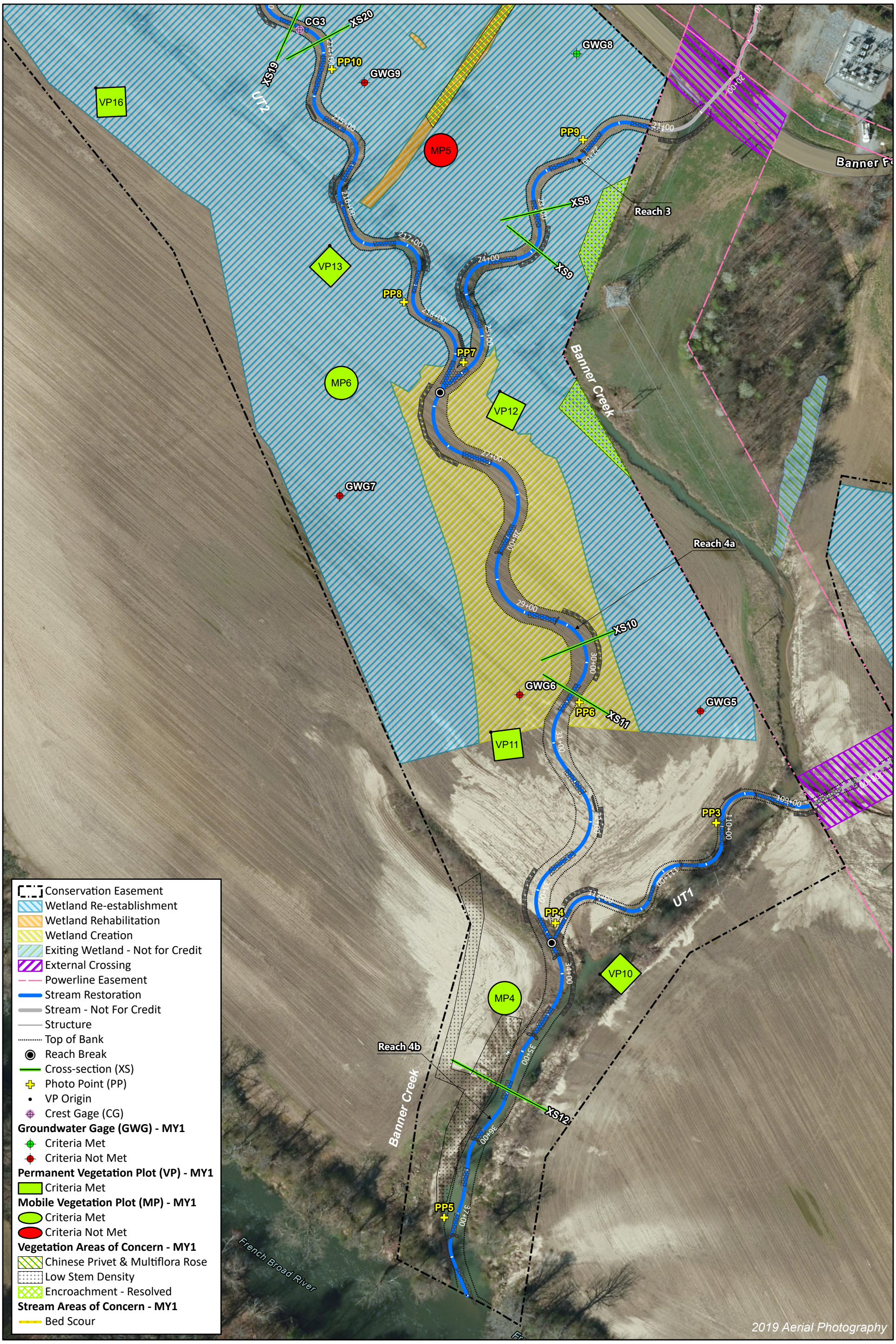
Environmental Quality

0 100 200 Feet

N

Figure 1a Current Condition Plan View Map
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Henderson County, NC



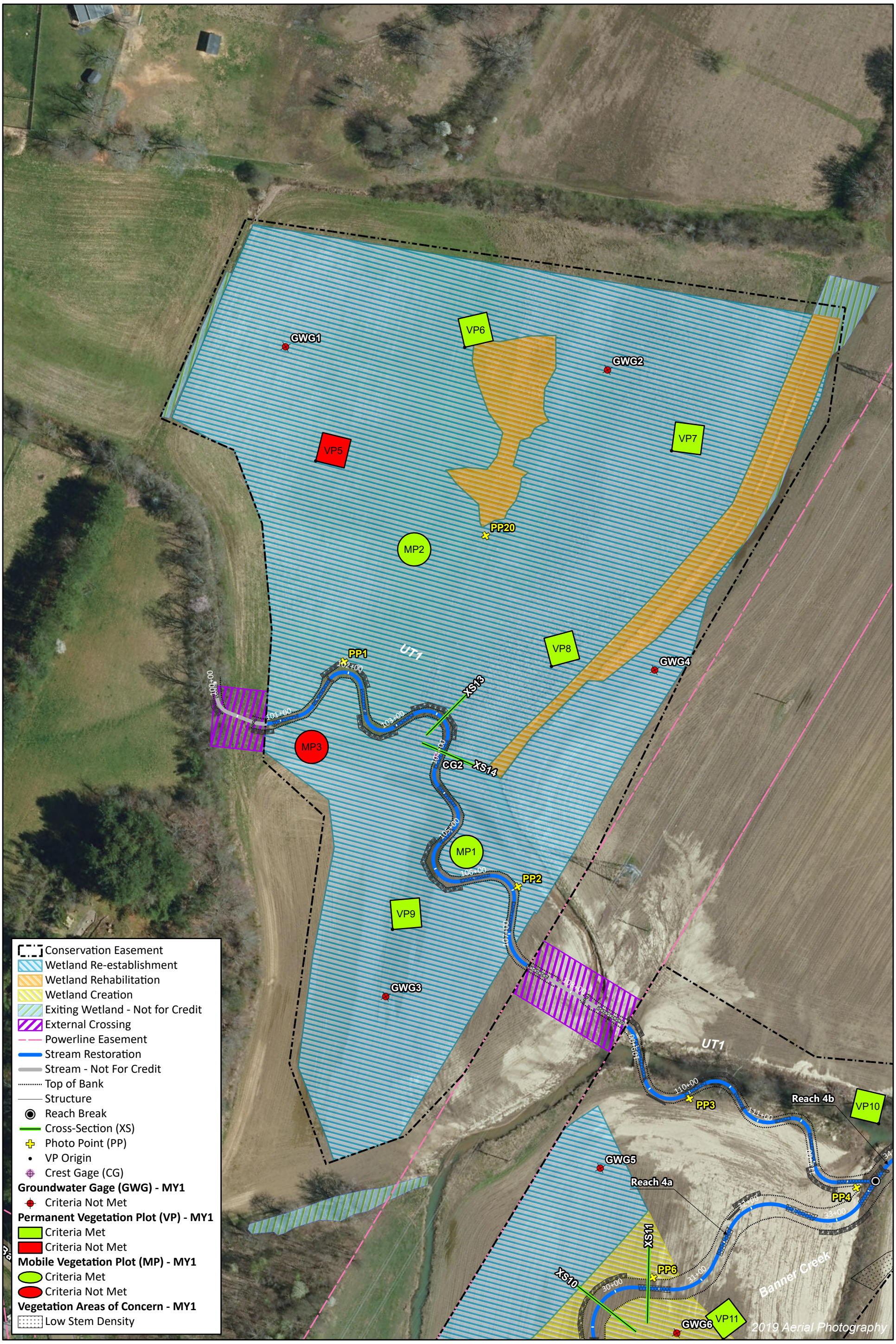
WILDLANDS ENGINEERING

Environmental Quality

0 100 200 Feet

Figure 1b Current Condition Plan View Map
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Henderson County, NC



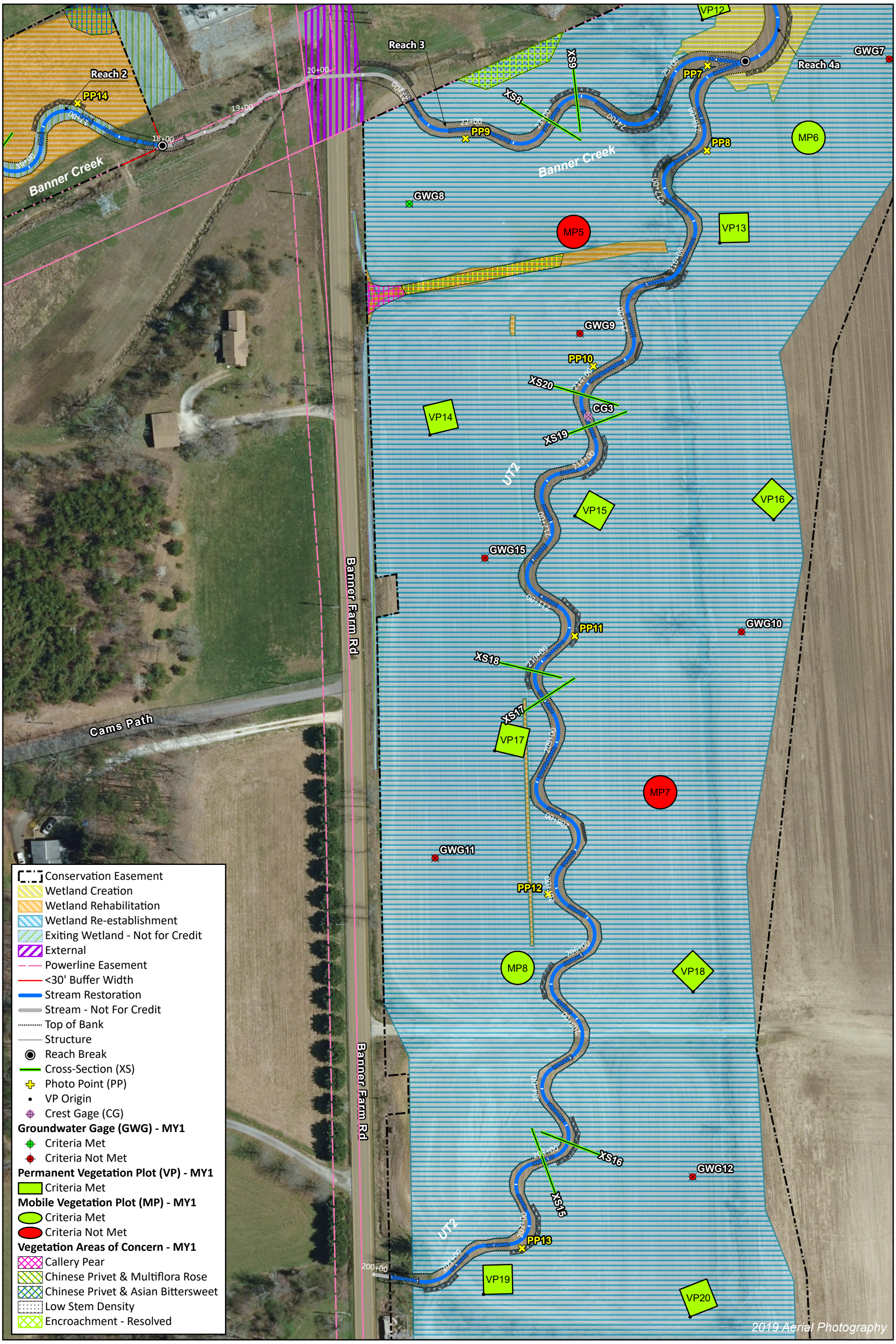
WILDLANDS ENGINEERING

Environmental Quality

0 100 200 Feet

Figure 1c Current Condition Plan View Map
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Henderson County, NC



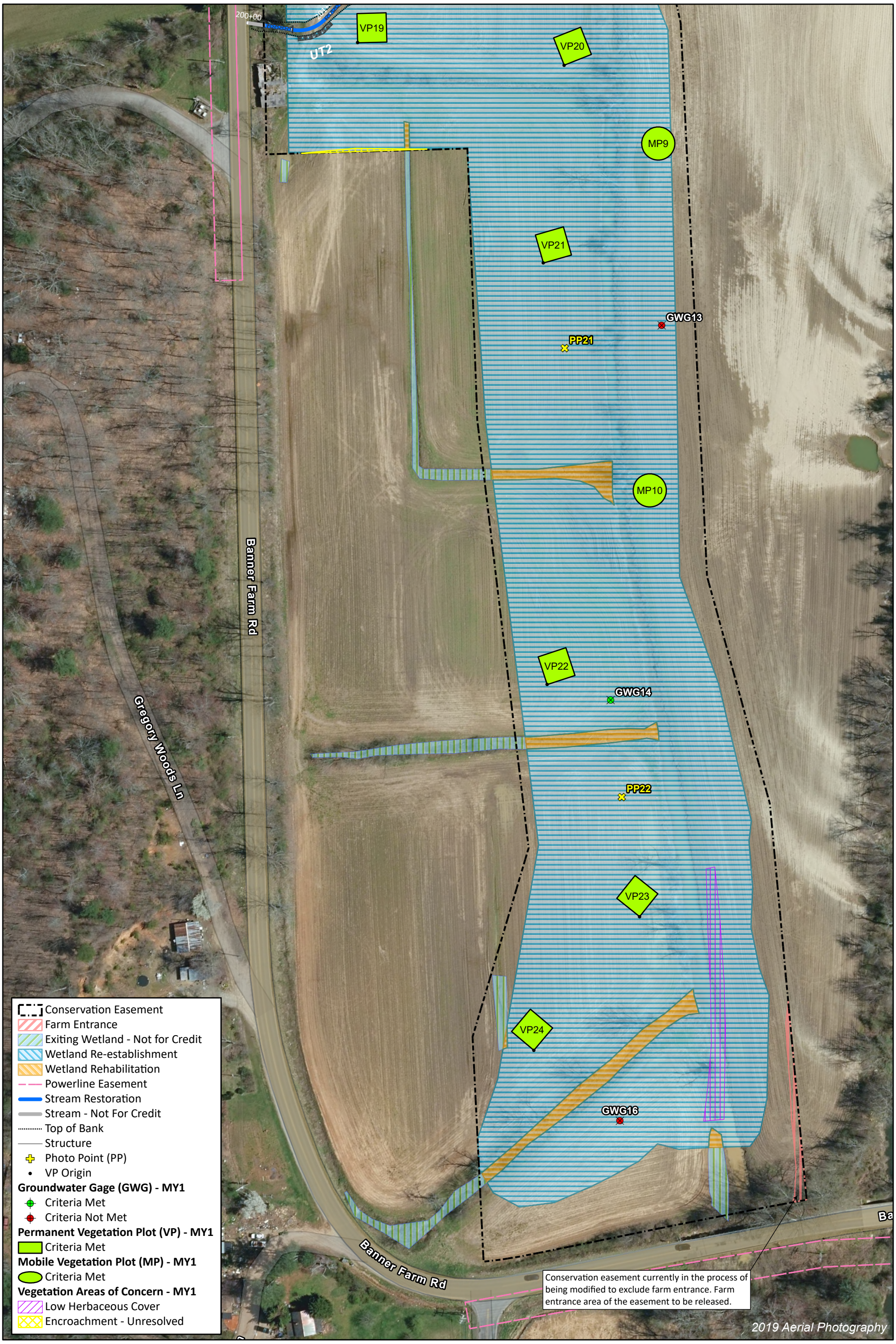
WILDLANDS ENGINEERING

Environmental Quality

0 100 200 Feet

Figure 1d Current Condition Plan View Map
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Henderson County, NC



WILDLANDS ENGINEERING

Environmental Quality

0 100 200 Feet

Figure 1e Current Condition Plan View Map
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Henderson County, NC

APPENDIX A. Visual Assessment Data

Table 4a-b. Visual Stream Morphology Stability Assessment Table

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Table 4a: Banner Creek Reach 1 Date Last Assessed: 11/03/2022

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	827
					Assessed Bank Length	1,654
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.	9	9		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	12	12		100%

Table 4b: Banner Creek Reach 2 Date Last Assessed: 11/03/2022

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	836
					Assessed Bank Length	1,672
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%.	4	4		100%

Table 4c-d. Visual Stream Morphology Stability Assessment Table

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Table 4c: Banner Creek Reach 3 Date Last Assessed: 11/03/2022

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		467
				Assessed Bank Length		934
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.	1	1		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2		100%

Table 4d: Banner Creek Reach 4a Date Last Assessed: 11/03/2022

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		780
				Assessed Bank Length		1,560
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%.	5	5		100%

Table 4e-f. Visual Stream Morphology Stability Assessment Table

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Table 4e: Banner Creek Reach 4b Date Last Assessed: 11/03/2022

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	434
					Assessed Bank Length	868
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	3	3		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2		100%

Table 4f: UT1 Date Last Assessed: 11/03/2022

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	1,071
					Assessed Bank Length	2,142
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 not exceed 15%.	8	8		100%

Table 4g. Visual Stream Morphology Stability Assessment Table

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Table 4g: UT2 Date Last Assessed: 11/03/2022

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		1,879
				Assessed Bank Length		3,758
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.	1	1		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	12	12		100%

Table 5. Vegetation Condition Assessment Table

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Planted Acreage **45.00** Date Last Assessed: 11/03/2022

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10	0.10	0.2%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10	0.32	0.7%
		Total	**0.43**	**0.9%**
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10	0.00	0.0%
		Cumulative Total	**0.43**	**0.9%**

Easement Acreage **46.60** Date Last Assessed: 11/03/2022

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Invasive species included in summation above should be identified in report summary.	0.10	0.24	0.5%
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	2 Encroachments Noted / 0.007 ac	

Stream Photographs
MY1

	
Photo Point 1 – UT1, view upstream *(09/20/2022)*	**Photo Point 1** – UT1, view downstream *(09/20/2022)*
	
Photo Point 2 – UT1, view upstream *(09/20/2022)*	**Photo Point 2** – UT1, view downstream *(09/20/2022)*
	
Photo Point 3 – UT1, view upstream *(09/20/2022)*	**Photo Point 3** – UT1, view downstream *(09/20/2022)*

Photo Point 4 – UT1, view upstream *(09/20/2022)*

Photo Point 4 – Banner Creek R4a, view upstream *(09/20/2022)*

Photo Point 4 – Banner Creek R4b, view downstream *(09/20/2022)*

Photo Point 5 – Banner Creek R4b, view upstream *(09/20/2022)*

Photo Point 5 – Banner Creek R4b, view downstream *(09/20/2022)*

Photo Point 6 – Banner Creek R4a, view upstream *(09/20/2022)*

Photo Point 6 – Banner Creek R4a, view downstream *(09/20/2022)*

Photo Point 7 – UT2, view upstream *(09/20/2022)*

Photo Point 7 – Banner Creek R3, view upstream *(09/20/2022)*

Photo Point 7 – Banner Creek R4a, view downstream *(09/20/2022)*

	
Photo Point 8 – UT2, view upstream *(09/20/2022)*	**Photo Point 8** – UT2, view downstream *(09/20/2022)*
	
Photo Point 9 – Banner Creek R3, view upstream *(09/20/2022)*	**Photo Point 9** – Banner Creek R3, view downstream *(09/20/2022)*
	
Photo Point 10 – UT2, view upstream *(09/20/2022)*	**Photo Point 10** – UT2, view downstream *(09/20/2022)*

	
Photo Point 11 – UT2, view upstream *(09/20/2022)*	**Photo Point 11** – UT2, view downstream *(09/20/2022)*
	
Photo Point 12 – UT2, view upstream *(09/20/2022)*	**Photo Point 12** – UT2, view downstream *(09/20/2022)*
	
Photo Point 13 – UT2, view upstream *(09/20/2022)*	**Photo Point 13** – UT2, view downstream *(09/20/2022)*

	
Photo Point 14 – Banner Creek R2, view upstream *(09/20/2022)*	**Photo Point 14** – Banner Creek R2, view downstream *(09/20/2022)*
	
Photo Point 15 – Banner Creek R2, view upstream *(09/20/2022)*	**Photo Point 15** – Banner Creek R2, view downstream *(09/20/2022)*
	
Photo Point 16 – Banner Creek R1, view upstream *(09/20/2022)*	**Photo Point 16** – Banner Creek R1, view downstream *(09/20/2022)*

	
Photo Point 17 – Banner Creek R1, view upstream *(09/20/2022)*	**Photo Point 17** – Banner Creek R1, view downstream *(09/20/2022)*
	
Photo Point 18 – Banner Creek R1, view upstream *(09/20/2022)*	**Photo Point 18** – Banner Creek R1, view downstream *(09/20/2022)*
	
Photo Point 19 – Banner Creek R1, view upstream *(09/20/2022)*	**Photo Point 19** – Banner Creek R1, view downstream *(09/20/2022)*

Wetland Photographs
MY1

	
Photo Point 20 – wetland rehabilitation/re-establishment area, view north *(09/22/2022)*	**Photo Point 20** – wetland rehabilitation/re-establishment area, view east *(09/22/2022)*
	
Photo Point 20 – wetland re-establishment area, view south *(09/22/2022)*	**Photo Point 20** – wetland re-establishment area, view west *(09/22/2022)*

	
Photo Point 21 – wetland re-establishment area, view north *(09/22/2022)*	**Photo Point 21** – wetland re-establishment area, view east *(09/22/2022)*
	
Photo Point 21 – wetland re-establishment area, view south *(09/22/2022)*	**Photo Point 21** – wetland re-establishment area, view west *(09/22/2022)*

Photo Point 22 –
wetland re-establishment area, view north *(09/22/2022)*

Photo Point 22 –
wetland re-establishment area, view east *(09/22/2022)*

Photo Point 22 –
wetland re-establishment area, view south *(09/22/2022)*

Photo Point 22 –
wetland re-establishment area, view west *(09/22/2022)*

Groundwater Gage Photographs
MY1

GWG 1 – *(09/22/2022)*

GWG 2 – *(09/22/2022)*

GWG 3 – *(09/22/2022)*

GWG 4 – *(09/22/2022)*

GWG 5 – *(09/22/2022)*

GWG 6 – *(09/22/2022)*

GWG 7 – *(09/22/2022)*

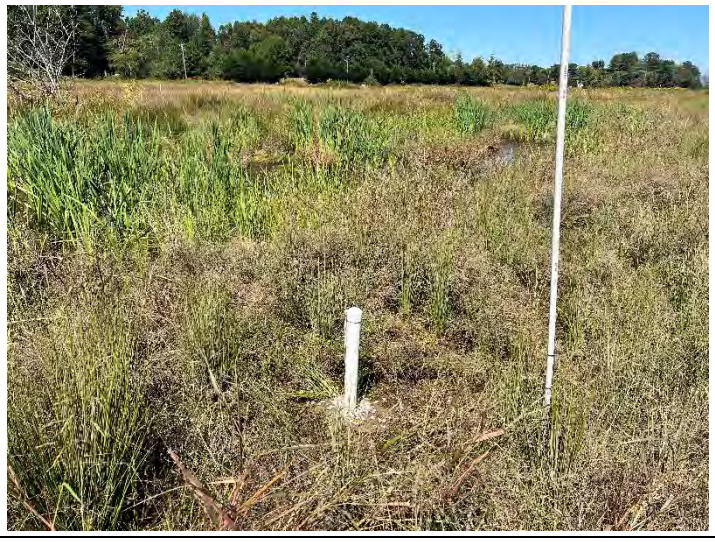
GWG 8 – *(09/22/2022)*

GWG 9 – *(09/22/2022)*

GWG 10 – *(09/22/2022)*

GWG 11 – *(09/22/2022)*

GWG 12 – *(09/22/2022)*

	
GWG 13 – *(09/22/2022)*	**GWG 14** – *(09/22/2022)*
	
GWG 15 – *(09/22/2022)*	**GWG 16** – *(09/22/2022)*
	
GWG 17 – *(09/22/2022)*	**GWG 18** – *(09/22/2022)*

Reference GWG - *(11/22/2022)*

Culvert Crossing Photographs
MY1

Culvert Crossing – Upper UT1, view upstream *(09/20/2022)*

Culvert Crossing – Upper UT1, view downstream *(09/20/2022)*

Culvert Crossing – Lower UT1, view upstream *(09/20/2022)*

Culvert Crossing – Lower UT1, view downstream *(09/20/2022)*

Culvert Crossing – Banner Creek R1, view upstream *(09/20/2022)*

Culvert Crossing – Banner Creek R1, view downstream *(09/20/2022)*

Vegetation Photographs

MY1

Permanent Vegetation Plot 1 *(09/23/2022)*

Permanent Vegetation Plot 2 *(09/23/2022)*

Permanent Vegetation Plot 3 *(09/23/2022)*

Permanent Vegetation Plot 4 *(09/23/2022)*

Permanent Vegetation Plot 5 *(09/23/2022)*

Permanent Vegetation Plot 6 *(09/23/2022)*

Permanent Vegetation Plot 7 *(09/23/2022)*

Permanent Vegetation Plot 8 *(09/23/2022)*

Permanent Vegetation Plot 9 *(09/23/2022)*

Permanent Vegetation Plot 10 *(09/23/2022)*

Permanent Vegetation Plot 11 *(09/23/2022)*

Permanent Vegetation Plot 12 *(09/23/2022)*

Permanent Vegetation Plot 13 *(09/23/2022)*

Permanent Vegetation Plot 14 *(09/23/2022)*

Permanent Vegetation Plot 15 *(09/23/2022)*

Permanent Vegetation Plot 16 *(09/23/2022)*

Permanent Vegetation Plot 17 *(09/23/2022)*

Permanent Vegetation Plot 18 *(09/23/2022)*

Permanent Vegetation Plot 19 *(09/23/2022)*

Permanent Vegetation Plot 20 *(09/23/2022)*

Permanent Vegetation Plot 21 *(09/23/2022)*

Permanent Vegetation Plot 22 *(09/23/2022)*

Permanent Vegetation Plot 23 *(09/23/2022)*

Permanent Vegetation Plot 24 *(09/23/2022)*

Mobile Vegetation Plot 1 *(09/23/2022)*

Mobile Vegetation Plot 2 *(09/23/2022)*

Mobile Vegetation Plot 3 *(09/23/2022)*

Mobile Vegetation Plot 4 *(09/23/2022)*

Mobile Vegetation Plot 5 *(09/23/2022)*

Mobile Vegetation Plot 6 *(09/23/2022)*

Mobile Vegetation Plot 7 *(09/23/2022)*

Mobile Vegetation Plot 8 *(09/23/2022)*

Mobile Vegetation Plot 9 *(09/23/2022)*

Mobile Vegetation Plot 10 *(09/23/2022)*

Mobile Vegetation Plot 11 *(09/23/2022)*

Mobile Vegetation Plot 12 *(09/23/2022)*

Encroachment Photographs
MY1

Easement Encroachment - Unresolved: Banner Creek Reach 2 STA 15+00, Left floodplain boundary, Garden row crop overreach *(07/14/2022)*

Easement Encroachment - Unresolved: UT2 STA 201+00, Right floodplain boundary, Slight mowing scalloping *(11/03/2022)*

APPENDIX B. Vegetation Plot Data

Table 6a. Vegetation Plot Data
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Planted Acreage	45
Date of Initial Plant	2022-02-13
Date of Current Survey	2022-09-22
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	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	*boxelder*	Tree	FAC							1	1	1	1	2	2
	Alnus serrulata	*hazel alder*	Tree	OBL												
	Amelanchier arborea	*common serviceberry*	Tree	FAC	1	1			1	1						
	Asimina triloba	*pawpaw*	Tree	FAC											1	1
	Betula nigra	*river birch*	Tree	FACW	2	2	3	3	2	2	3	3	1	1		
	Carpinus caroliniana	*American hornbeam*	Tree	FAC												
	Cornus florida	*flowering dogwood*	Tree	FACU												
	Diospyros virginiana	*common persimmon*	Tree	FAC	1	1	1	1	1	1						
	Fagus grandifolia	*American beech*	Tree	FACU			1	1	1	1						
	Fraxinus pennsylvanica	*green ash*	Tree	FACW	1	1	2	2								
	Hamamelis virginiana	*American witchhazel*	Tree	FACU												
	Ilex opaca	*American holly*	Tree	FACU												
	Liriodendron tulipifera	*tuliptree*	Tree	FACU			1	1								
	Nyssa sylvatica	*blackgum*	Tree	FAC							1	1			1	1
	Platanus occidentalis	*American sycamore*	Tree	FACW	1	1	2	2	2	2	1	1			2	2
	Quercus falcata	*southern red oak*	Tree	FACU	2	2	2	2	2	2						
	Quercus rubra	*northern red oak*	Tree	FACU	2	2										
	Salix nigra	*black willow*	Tree	OBL							3	3	3	3	3	3
	Sambucus canadensis	*American black elderberry*	Tree								1	1				
	Ulmus americana	*American elm*	Tree	FACW							1	1			1	1
Sum	Performance Standard				10	10	12	12	9	9	11	11	5	5	10	10
Post Mitigation Plan Species	*Acer saccharinum*	*silver maple*	*Tree*	*FACW*			*1*	*1*	*1*	*1*						
Sum	Proposed Standard				10	10	12	12	9	9	11	11	5	5	10	10
Invasives	*Salix cinerea*	*large gray willow*	*Tree*	*FACW*												
Mitigation Plan Performance Standard	Current Year Stem Count					10		12		9		11		5		10
	Stems/Acre					405		486		364		445		162		405
	Species Count					7		7		6		7		3		6
	Dominant Species Composition (%)					20		23		20		27		60		30
	Average Plot Height (ft.)					2		2		2		2		3		3
	% Invasives					0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					10		12		9		11		5		10
	Stems/Acre					405		486		364		445		162		405
	Species Count					7		7		6		7		3		6
	Dominant Species Composition (%)					20		23		20		27		60		30
	Average Plot Height (ft.)					2		2		2		2		3		3
	% Invasives					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.

Table 6b. Vegetation Plot Data
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Planted Acreage	45
Date of Initial Plant	2022-02-13
Date of Current Survey	2022-09-22
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 7 F		Veg Plot 8 F		Veg Plot 9 F		Veg Plot 10 F		Veg Plot 11 F		Veg Plot 12 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	*boxelder*	Tree	FAC	2	2	1	1	1	1			2	2	1	1
	Alnus serrulata	*hazel alder*	Tree	OBL									2	2	1	1
	Amelanchier arborea	*common serviceberry*	Tree	FAC												
	Asimina triloba	*pawpaw*	Tree	FAC			1	1								
	Betula nigra	*river birch*	Tree	FACW	2	2	2	2	2	2	1	1	2	2	1	1
	Carpinus caroliniana	*American hornbeam*	Tree	FAC									1	1	1	1
	Cornus florida	*flowering dogwood*	Tree	FACU												
	Diospyros virginiana	*common persimmon*	Tree	FAC							1	1				
	Fagus grandifolia	*American beech*	Tree	FACU												
	Fraxinus pennsylvanica	*green ash*	Tree	FACW												
	Hamamelis virginiana	*American witchhazel*	Tree	FACU							1	1				
	Ilex opaca	*American holly*	Tree	FACU									1	1	1	1
	Liriodendron tulipifera	*tuliptree*	Tree	FACU												
	Nyssa sylvatica	*blackgum*	Tree	FAC	1	1			1	1						
	Platanus occidentalis	*American sycamore*	Tree	FACW	3	3	3	3	3	3	2	2	2	2	4	4
	Quercus falcata	*southern red oak*	Tree	FACU							1	1				
	Quercus rubra	*northern red oak*	Tree	FACU							3	3				
	Salix nigra	*black willow*	Tree	OBL	2	2	2	2	1	1			3	3	3	3
	Sambucus canadensis	*American black elderberry*	Tree												1	1
	Ulmus americana	*American elm*	Tree	FACW	2	2			3	3			1	1	2	2
Sum	Performance Standard				12	12	9	9	11	11	9	9	14	14	15	15
Post Mitigation Plan Species	*Acer saccharinum*	*silver maple*	*Tree*	*FACW*												
Sum	Proposed Standard				12	12	9	9	11	11	9	9	14	14	15	15
Invasives	*Salix cinerea*	*large gray willow*	*Tree*	*FACW*												
Mitigation Plan Performance Standard	Current Year Stem Count					12		9		11		9		14		15
	Stems/Acre					486		364		445		364		567		607
	Species Count					6		5		6		6		8		9
	Dominant Species Composition (%)					25		33		27		33		21		27
	Average Plot Height (ft.)					2		2		3		2		3		3
	% Invasives					0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					12		9		11		9		14		15
	Stems/Acre					486		364		445		364		567		607
	Species Count					6		5		6		6		8		9
	Dominant Species Composition (%)					25		33		27		33		21		27
	Average Plot Height (ft.)					2		2		3		2		3		3
	% Invasives					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.

Table 6c. Vegetation Plot Data
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Planted Acreage	45
Date of Initial Plant	2022-02-13
Date of Current Survey	2022-09-22
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 13 F		Veg Plot 14 F		Veg Plot 15 F		Veg Plot 16 F		Veg Plot 17 F		Veg Plot 18 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	*boxelder*	Tree	FAC	5	5	2	2	2	2	3	3	3	3	2	2
	Alnus serrulata	*hazel alder*	Tree	OBL			1	1								
	Amelanchier arborea	*common serviceberry*	Tree	FAC												
	Asimina triloba	*pawpaw*	Tree	FAC												
	Betula nigra	*river birch*	Tree	FACW	1	1	2	2	4	4	3	3	2	2	3	3
	Carpinus caroliniana	*American hornbeam*	Tree	FAC												
	Cornus florida	*flowering dogwood*	Tree	FACU												
	Diospyros virginiana	*common persimmon*	Tree	FAC												
	Fagus grandifolia	*American beech*	Tree	FACU												
	Fraxinus pennsylvanica	*green ash*	Tree	FACW												
	Hamamelis virginiana	*American witchhazel*	Tree	FACU												
	Ilex opaca	*American holly*	Tree	FACU			1	1								
	Liriodendron tulipifera	*tuliptree*	Tree	FACU					1	1	1	1				
	Nyssa sylvatica	*blackgum*	Tree	FAC	1	1					1	1	2	2	1	1
	Platanus occidentalis	*American sycamore*	Tree	FACW	3	3	1	1	4	4	5	5	2	2	4	4
	Quercus falcata	*southern red oak*	Tree	FACU												
	Quercus rubra	*northern red oak*	Tree	FACU												
	Salix nigra	*black willow*	Tree	OBL	1	1	4	4	1	1	1	1	2	2	5	5
	Sambucus canadensis	*American black elderberry*	Tree													
	Ulmus americana	*American elm*	Tree	FACW	2	2	1	1	2	2	1	1	1	1	1	1
Sum	Performance Standard				13	13	12	12	14	14	15	15	12	12	16	16
Post Mitigation Plan Species	*Acer saccharinum*	*silver maple*	*Tree*	*FACW*												
Sum	Proposed Standard				13	13	12	12	14	14	15	15	12	12	16	16
Invasives	*Salix cinerea*	*large gray willow*	*Tree*	*FACW*												
Mitigation Plan Performance Standard	Current Year Stem Count					13		12		14		15		12		16
	Stems/Acre					526		486		567		607		486		648
	Species Count					6		7		6		7		6		6
	Dominant Species Composition (%)					38		33		29		33		25		31
	Average Plot Height (ft.)					3		3		2		3		3		3
	% Invasives					0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					13		12		14		15		12		16
	Stems/Acre					526		486		567		607		486		648
	Species Count					6		7		6		7		6		6
	Dominant Species Composition (%)					38		33		29		33		25		31
	Average Plot Height (ft.)					3		3		2		3		3		3
	% Invasives					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.

Table 6d. Vegetation Plot Data
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Planted Acreage	45
Date of Initial Plant	2022-02-13
Date of Current Survey	2022-09-22
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 19 F		Veg Plot 20 F		Veg Plot 21 F		Veg Plot 22 F		Veg Plot 23 F		Veg Plot 24 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	*boxelder*	Tree	FAC	1	1			1	1	2	2	1	1	1	1
	Alnus serrulata	*hazel alder*	Tree	OBL	1	1							2	2	1	1
	Amelanchier arborea	*common serviceberry*	Tree	FAC												
	Asimina triloba	*pawpaw*	Tree	FAC												
	Betula nigra	*river birch*	Tree	FACW	2	2	1	1	2	2	2	2	4	4	3	3
	Carpinus caroliniana	*American hornbeam*	Tree	FAC	1	1										
	Cornus florida	*flowering dogwood*	Tree	FACU												
	Diospyros virginiana	*common persimmon*	Tree	FAC												
	Fagus grandifolia	*American beech*	Tree	FACU												
	Fraxinus pennsylvanica	*green ash*	Tree	FACW												
	Hamamelis virginiana	*American witchhazel*	Tree	FACU												
	Ilex opaca	*American holly*	Tree	FACU												
	Liriodendron tulipifera	*tuliptree*	Tree	FACU					1	1					1	1
	Nyssa sylvatica	*blackgum*	Tree	FAC	1	1	1	1	2	2	3	3	2	2	1	1
	Platanus occidentalis	*American sycamore*	Tree	FACW	1	1	3	3	2	2			2	2	3	3
	Quercus falcata	*southern red oak*	Tree	FACU												
	Quercus rubra	*northern red oak*	Tree	FACU												
	Salix nigra	*black willow*	Tree	OBL	4	4	3	3	2	2	5	5			2	2
	Sambucus canadensis	*American black elderberry*	Tree													
	Ulmus americana	*American elm*	Tree	FACW			2	2	1	1	2	2			1	1
Sum	Performance Standard				11	11	10	10	11	11	14	14	11	11	13	13
Post Mitigation Plan Species	*Acer saccharinum*	*silver maple*	*Tree*	*FACW*												
Sum	Proposed Standard				11	11	10	10	11	11	14	14	11	11	13	13
Invasives	*Salix cinerea*	*large gray willow*	*Tree*	*FACW*												
Mitigation Plan Performance Standard	Current Year Stem Count					11		10		11		14		11		13
	Stems/Acre					445		405		445		567		445		526
	Species Count					7		5		7		5		5		8
	Dominant Species Composition (%)					36		30		18		36		36		23
	Average Plot Height (ft.)					2		3		3		3		2		2
	% Invasives					0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					11		10		11		14		11		13
	Stems/Acre					445		405		445		567		445		526
	Species Count					7		5		7		5		5		8
	Dominant Species Composition (%)					36		30		18		36		36		23
	Average Plot Height (ft.)					2		3		3		3		2		2
	% Invasives					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.

Table 6e. Vegetation Plot Data
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Planted Acreage	45
Date of Initial Plant	2022-02-13
Date of Current Survey	2022-09-22
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 1 R Total	Veg Plot 2 R Total	Veg Plot 3 R Total	Veg Plot 4 R Total	Veg Plot 5 R Total	Veg Plot 6 R Total	Veg Plot 7 R Total	Veg Plot 8 R Total	Veg Plot 9 R Total	Veg Plot 10 R Total	Veg Plot 11 R Total	Veg Plot 12 R Total
Species Included in Approved Mitigation Plan	Acer negundo	*boxelder*	Tree	FAC				1		4	1	1	1	2	2	
	Alnus serrulata	*hazel alder*	Tree	OBL		1					1	2	1			
	Amelanchier arborea	*common serviceberry*	Tree	FAC												
	Asimina triloba	*pawpaw*	Tree	FAC												
	Betula nigra	*river birch*	Tree	FACW	1	1	1	5	2	1	1		2	1		2
	Carpinus caroliniana	*American hornbeam*	Tree	FAC												1
	Cornus florida	*flowering dogwood*	Tree	FACU	1		2								2	
	Diospyros virginiana	*common persimmon*	Tree	FAC											1	
	Fagus grandifolia	*American beech*	Tree	FACU												
	Fraxinus pennsylvanica	*green ash*	Tree	FACW												4
	Hamamelis virginiana	*American witchhazel*	Tree	FACU				1								
	Ilex opaca	*American holly*	Tree	FACU												
	Liriodendron tulipifera	*tuliptree*	Tree	FACU											1	1
	Nyssa sylvatica	*blackgum*	Tree	FAC									1		2	
	Platanus occidentalis	*American sycamore*	Tree	FACW	11	4		2	1	3	1	5	1	1	1	1
	Quercus falcata	*southern red oak*	Tree	FACU				2								2
	Quercus rubra	*northern red oak*	Tree	FACU												
	Salix nigra	*black willow*	Tree	OBL	2	2	5					3	3	4	3	
	Sambucus canadensis	*American black elderberry*	Tree		1											
	Ulmus americana	*American elm*	Tree	FACW						1	1			2	2	
Sum	Performance Standard				16	8	8	11	3	9	5	11	9	10	14	11
Post Mitigation Plan Species	*Acer saccharinum*	*silver maple*	*Tree*	*FACW*								*1*				
Sum	Proposed Standard				16	8	8	11	3	9	5	11	9	10	14	11
Invasives	*Salix cinerea*	*large gray willow*	*Tree*	*FACW*								*1*				
Mitigation Plan Performance Standard	Current Year Stem Count				16	8	8	11	3	9	5	11	9	10	14	11
	Stems/Acre				526	324	283	445	81	364	202	445	364	405	567	445
	Species Count				5	4	3	5	2	4	5	4	6	5	8	6
	Dominant Species Composition (%)				69	50	62	45	67	44	20	38	33	40	21	36
	Average Plot Height (ft.)				4	3	4	2	3	3	2	3	2	3	1	2
	% Invasives				0	0	0	0	0	0	0	8	0	0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count				16	8	8	11	3	9	5	11	9	10	14	11
	Stems/Acre				526	324	283	445	81	364	202	445	364	405	567	445
	Species Count				5	4	3	5	2	4	5	4	6	5	8	6
	Dominant Species Composition (%)				69	50	62	45	67	44	20	38	33	40	21	36
	Average Plot Height (ft.)				4	3	4	2	3	3	2	3	2	3	1	2
	% Invasives				0	0	0	0	0	0	0	8	0	0	0	0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.

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

3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 7a. Vegetation Performance Standards Summary Table

Banner Farm Mitigation Site

DMS Project No. 100062

Monitoring Year 1 - 2022

	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	405	2	7	0	486	2	7	0	364	2	6	0
Monitoring Year 0	648	2	10	0	567	2	8	0	526	2	9	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	445	2	7	0	162	3	3	0	405	3	6	0
Monitoring Year 0	567	3	8	0	567	3	8	0	607	3	9	0
	Veg Plot 7 F				Veg Plot 8 F				Veg Plot 9 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	486	2	6	0	364	2	5	0	445	3	6	0
Monitoring Year 0	648	3	8	0	607	3	9	0	567	2	7	0
	Veg Plot 10 F				Veg Plot 11 F				Veg Plot 12 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	364	2	6	0	567	3	8	0	607	3	9	0
Monitoring Year 0	607	2	10	0	607	2	9	0	607	3	9	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 7b. Vegetation Performance Standards Summary Table

Banner Farm Mitigation Site

DMS Project No. 100062

Monitoring Year 1 - 2022

	Veg Plot 13 F				Veg Plot 14 F				Veg Plot 15 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	526	3	6	0	486	3	7	0	567	2	6	0
Monitoring Year 0	567	2	6	0	567	3	9	0	607	2	6	0
	Veg Plot 16 F				Veg Plot 17 F				Veg Plot 18 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	607	3	7	0	486	3	6	0	648	3	6	0
Monitoring Year 0	648	2	7	0	567	3	7	0	648	3	6	0
	Veg Plot 19 F				Veg Plot 20 F				Veg Plot 21 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	445	2	7	0	405	3	5	0	445	3	7	0
Monitoring Year 0	486	3	7	0	648	2	6	0	648	3	7	0
	Veg Plot 22 F				Veg Plot 23 F				Veg Plot 24 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	567	3	5	0	445	2	5	0	526	2	8	0
Monitoring Year 0	607	3	5	0	648	2	7	0	567	2	8	0

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

Table 7c. Vegetation Performance Standards Summary Table

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

	Veg Plot Group 1 R				Veg Plot Group 2 R				Veg Plot Group 3 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												
Monitoring Year 2												
Monitoring Year 1	526	4	5	0	324	3	4	0	283	4	3	0
Monitoring Year 0	405	3	6	0	486	2	7	0	405	3	6	0
	Veg Plot Group 4 R				Veg Plot Group 5 R				Veg Plot Group 6 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												
Monitoring Year 2												
Monitoring Year 1	445	2	5	0	81	3	2	0	364	3	4	0
Monitoring Year 0	486	2	8	0	445	2	5	0	526	2	6	0
	Veg Plot Group 7 R				Veg Plot Group 8 R				Veg Plot Group 9 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												
Monitoring Year 2												
Monitoring Year 1	202	2	5	0	445	3	4	8	364	2	6	0
Monitoring Year 0	445	2	6	0	405	2	7	0	405	2	5	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												
Monitoring Year 2												
Monitoring Year 1	405	3	5	0	567	1	8	0	445	2	6	0
Monitoring Year 0	486	2	9	0	526	2	7	0	850	2	12	0

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

APPENDIX C. Stream Geomorphology Data

Table 8a. Baseline Stream Data Summary

Banner Farm Mitigation Site

DMS Project No. 100062

Monitoring Year 1 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**Banner Creek R1**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	9.8		1	13.5		12.8	14.0	2
Floodprone Width (ft)	25		1	30	68	61	62	2
Bankfull Mean Depth	1.2		1	1.0		1.1	1.2	2
Bankfull Max Depth	1.7		1	1.7		1.8	2.0	2
Bankfull Cross Sectional Area (ft^2)	12.0		1	14.0		15.9	15.9	2
Width/Depth Ratio	8.2		1	13.0		10.2	12.3	2
Entrenchment Ratio	2.5		1	2.2	5.0	4.4	4.7	2
Bank Height Ratio	2.2		1	1.0	1.1	1.0	1.0	2
Max part size (mm) mobilized at bankfull	-			33		-		
Rosgen Classification	C4			C4		C4		
Bankfull Discharge (cfs)	40.5		1	40.0	43.0	52.3	55.2	2
Sinuosity	1.08			1.20		1.20		
Water Surface/Channel Slope $(ft/ft)^2$	0.006			0.002		0.005		
Other	-			-		-		
Parameter	**Banner Creek R2**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	10.4		1	13.5		10.2	13.3	2
Floodprone Width (ft)	58		1	30	68	81	86	2
Bankfull Mean Depth	1.1		1	1.0		0.9	1.1	2
Bankfull Max Depth	2.3		1	1.2	1.7	1.4	1.9	2
Bankfull Cross Sectional Area (ft^2)	11.6		1	14.0		9.6	14.6	2
Width/Depth Ratio	9.3		1	13.0		10.9	12.0	2
Entrenchment Ratio	14.4		1	2.2	5.0	6.5	7.9	2
Bank Height Ratio	1.4		1	1.0	1.1	1.0	1.0	2
Max part size (mm) mobilized at bankfull	-			33		-		
Rosgen Classification	C5/4			C4		C4		
Bankfull Discharge (cfs)	45.7		1	40.0	43.0	18.7	32.1	2
Sinuosity	1.01			1.20		1.20		
Water Surface/Channel Slope $(ft/ft)^2$	0.007			0.002		0.003		
Other	-			-		-		

Table 8b. Baseline Stream Data Summary

Banner Farm Mitigation Site

DMS Project No. 100062

Monitoring Year 1 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**Banner Creek R3**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	7.4		1	14.8		14.9		1
Floodprone Width (ft)	31		1	33	74	88		1
Bankfull Mean Depth	1.6		1	1.0		1.4		1
Bankfull Max Depth	2.1		1	1.7		2.2		1
Bankfull Cross Sectional Area (ft^2)	11.9		1	17.3		20.6		1
Width/Depth Ratio	4.6		1	13.0		10.7		1
Entrenchment Ratio	4.2		1	2.2	5.0	5.9		1
Bank Height Ratio	1.7		1	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	-			33		-		
Rosgen Classification	C4			C4		C4		
Bankfull Discharge (cfs)	42.5		1	44.0		44.2		1
Sinuosity	1.00			1.30		1.30		
Water Surface/Channel Slope $(ft/ft)^2$	0.009			0.002		0.002		
Other	-			-		-		
Parameter	**Banner Creek R4a**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	19.4		1	19.8		20.0		1
Floodprone Width (ft)	23		1	44	99	94		1
Bankfull Mean Depth	1.7		1	1.5		1.4		1
Bankfull Max Depth	2.6		1	2.5		2.5		1
Bankfull Cross Sectional Area (ft^2)	32.4		1	30.3		28.2		1
Width/Depth Ratio	11.4		1	13.0		14.2		1
Entrenchment Ratio	1.2		1	2.2	5.0	4.7		1
Bank Height Ratio	2.1		1	1.0		1.0		1
Max part size (mm) mobilized at bankfull	-			44		-		
Rosgen Classification	C4			C5/4		C5/4		
Bankfull Discharge (cfs)	57.5		1	60.0		60.1		1
Sinuosity	1.02			1.20		1.20		
Water Surface/Channel Slope $(ft/ft)^2$	0.001			0.001		0.002		
Other	-			-		-		

Table 8c. Baseline Stream Data Summary

Banner Farm Mitigation Site

DMS Project No. 100062

Monitoring Year 1 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**Banner Creek Reach 4b**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	19.4		1	20.8		22.4		1
Floodprone Width (ft)	23		1	46	104	114		1
Bankfull Mean Depth	1.7		1	1.6		1.6		1
Bankfull Max Depth	2.6		1	1.9	2.7	2.7		1
Bankfull Cross Sectional Area (ft^2)	32.4		1	32.7		35.5		1
Width/Depth Ratio	11.4		1	13.0		14.2		1
Entrenchment Ratio	1.2		1	2.2	5.0	5.1		1
Bank Height Ratio	2.1		1	1.0		1.0		1
Max part size (mm) mobilized at bankfull	-			45		-		
Rosgen Classification	C4			C5/4		C5/4		
Bankfull Discharge (cfs)	57.5		1	70.0		145.3		1
Sinuosity	1.02			1.20		1.20		
Water Surface/Channel Slope $(ft/ft)^2$	0.001			0.002		0.005		
Other	-			-		-		
Parameter	**UT1**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	5.2	10.0	1	9.0		9.2		1
Floodprone Width (ft)	15	24	1	20	72	66		1
Bankfull Mean Depth	0.7	0.8	1	0.9		1.0		1
Bankfull Max Depth	1.4	1.7	1	1.5		1.6		1
Bankfull Cross Sectional Area (ft^2)	3.6	7.8	1	8.4		9.6		1
Width/Depth Ratio	7.5	12.9	1	10.0		8.9		1
Entrenchment Ratio	2.4	2.9	1	2.2	8.0	7.2		1
Bank Height Ratio	2.0	2.1	1	1.0		1.0		1
Max part size (mm) mobilized at bankfull	-			30		-		
Rosgen Classification	E/C5			E5		E5		
Bankfull Discharge (cfs)	5.0	8.0	1	14.0		23.5		1
Sinuosity	1.10			1.30		1.30		
Water Surface/Channel Slope $(ft/ft)^2$	0.003			0.002		0.004		
Other	-			-		-		

Table 8d. Baseline Stream Data Summary

Banner Farm Mitigation Site

DMS Project No. 100062

Monitoring Year 1 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**UT2**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	4.6		1	12.0		11.0	12.0	3
Floodprone Width (ft)	16		1	26	60	75	82	3
Bankfull Mean Depth	0.9		1	1.1		1.1	1.4	3
Bankfull Max Depth	1.2		1	1.7		1.6	2.0	3
Bankfull Cross Sectional Area (ft^2)	4.1		1	12.8		11.9	15.4	3
Width/Depth Ratio	5.1		1	11.0		7.8	10.5	3
Entrenchment Ratio	3.5		1	2.2	5.0	6.2	7.5	3
Bank Height Ratio	1.4		1	1.0		1.0	1.0	3
Max part size (mm) mobilized at bankfull	-			33		-		
Rosgen Classification	E/C5			C4		C4		
Bankfull Discharge (cfs)	10.0	13.0	1	25.0		14.8	22.5	3
Sinuosity	1.28			1.30		1.30		
Water Surface/Channel Slope ($ft/ft)^2$	0.005			0.002		0.001		
Other	-			-		-		

Table 9a. Cross-Section Morphology Monitoring Summary

Banner Farm Mitigation Site

DMS Project No. 100062

Monitoring Year 1 - 2022

	Banner Creek Reach 1						Banner Creek Reach 1						Banner Creek Reach 1					
	Cross-Section 1 (Riffle)						Cross-Section 2 (Pool)						Cross-Section 3 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	2063.92	2064.05					-	-					-	-				
Bank Height Ratio - Based on AB Bankfull[1] Area	1.0	0.9					-	-					-	-				
Thalweg Elevation	2062.09	2062.15					2060.14	2060.37					2059.01	2058.02				
LTOB[2] Elevation	2063.92	2063.92					2063.62	2063.68					2062.56	2062.53				
LTOB[2] Max Depth (ft)	1.8	1.8					3.5	3.3					3.5	4.5				
LTOB[2] Cross Sectional Area (ft^2)	15.9	14.1					31.0	29.0					26.6	38.7				
	Banner Creek Reach 1						Banner Creek Reach 2						Banner Creek Reach 2					
	Cross-Section 4 (Riffle)						Cross-Section 5 (Riffle)						Cross-Section 6 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	2062.07	2061.52					2058.64	2058.82					-	-				
Bank Height Ratio - Based on AB Bankfull[1] Area	1.0	1.2					1.0	0.9					-	-				
Thalweg Elevation	2060.08	2058.45					2056.76	2056.89					2054.66	2054.87				
LTOB[2] Elevation	2062.07	2062.01					2058.64	2058.64					2057.76	2057.99				
LTOB[2] Max Depth (ft)	2.0	3.6					1.9	1.8					3.1	3.1				
LTOB[2] Cross Sectional Area (ft^2)	15.9	21.6					14.6	12.4					26.5	25.7				
	Banner Creek Reach 2						Banner Creek Reach 3						Banner Creek Reach 3					
	Cross-Section 7 (Riffle)						Cross-Section 8 (Riffle)						Cross-Section 9 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	2057.92	2058.00					2055.76	2055.85					-	-				
Bank Height Ratio - Based on AB Bankfull[1] Area	1.0	1.0					1.0	1.0					-	-				
Thalweg Elevation	2056.49	2056.57					2053.52	2053.57					2052.03	2052.21				
LTOB[2] Elevation	2057.92	2058.02					2055.76	2055.83					2055.55	2055.66				
LTOB[2] Max Depth (ft)	1.4	1.5					2.2	2.3					3.5	3.5				
LTOB[2] Cross Sectional Area (ft^2)	9.6	9.8					20.6	20.2					26.2	25.0				

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

[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.

Table 9b. Cross-Section Morphology Monitoring Summary

Banner Farm Mitigation Site

DMS Project No. 100062

Monitoring Year 1 - 2022

	Banner Creek Reach 4a						Banner Creek Reach 4a						Banner Creek Reach 4b					
	Cross-Section 10 (Pool)						Cross-Section 11 (Riffle)						Cross-Section 12 (Riffle)[3]					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	-	-					2054.69	2054.76					2053.69	2052.03				
Bank Height Ratio - Based on AB Bankfull[1] Area	-	-					1.0	1.0					1.0	1.4				
Thalweg Elevation	2050.36	2051.66					2052.14	2052.05					2050.95	2048.69				
LTOB[2] Elevation	2054.68	2054.74					2054.69	2054.65					2053.69	2053.48				
LTOB[2] Max Depth (ft)	4.3	3.1					2.5	2.6					2.7	4.8				
LTOB[2] Cross Sectional Area (ft^2)	68.4	51.2					28.2	26.0					35.5	59.4				
	UT1						UT1						UT2					
	Cross-Section 13 (Pool)						Cross-Section 14 (Riffle)						Cross-Section 15 (Riffle)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	-	-					2056.54	2056.63					2057.14	2057.29				
Bank Height Ratio - Based on AB Bankfull[1] Area	-	-					1.0	0.9					1.0	1.0				
Thalweg Elevation	2053.81	2053.23					2054.96	2055.14					2055.16	2055.28				
LTOB[2] Elevation	2056.51	2056.50					2056.54	2056.54					2057.14	2057.20				
LTOB[2] Max Depth (ft)	2.7	3.3					1.6	1.4					2.0	1.9				
LTOB[2] Cross Sectional Area (ft^2)	16.8	17.5					9.6	8.7					15.4	14.3				
	UT2						UT2						UT2					
	Cross-Section 16 (Pool)						Cross-Section 17 (Riffle)						Cross-Section 18 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	-	-					2056.27	2056.32					-	-				
Bank Height Ratio - Based on AB Bankfull[1] Area	-	-					1.0	1.0					-	-				
Thalweg Elevation	2053.10	2053.38					2054.31	2054.45					2052.20	2052.45				
LTOB[2] Elevation	2056.67	2056.70					2056.27	2056.29					2055.93	2056.00				
LTOB[2] Max Depth (ft)	3.6	3.3					2.0	1.8					3.7	3.6				
LTOB[2] Cross Sectional Area (ft^2)	28.4	24.0					14.1	13.7					24.5	25.7				

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

[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.

[3]Cross-section 12 is located in the MY1 repair area and was not rebuilt to the original design or as-built condition.

Table 9c. Cross-Section Morphology Monitoring Summary

Banner Farm Mitigation Site

DMS Project No. 100062

Monitoring Year 1 - 2022

	UT2						UT2					
	Cross-Section 19 (Riffle)						Cross-Section 20 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	2055.87	2055.94					-	-				
Bank Height Ratio - Based on AB Bankfull[1] Area	1.0	1.0					-	-				
Thalweg Elevation	2054.24	2054.32					2052.10	2052.25				
LTOB[2] Elevation	2055.87	2055.90					2055.80	2055.80				
LTOB[2] Max Depth (ft)	1.6	1.6					3.7	3.6				
LTOB[2] Cross Sectional Area (ft^2)	11.9	11.4					33.3	32.4				

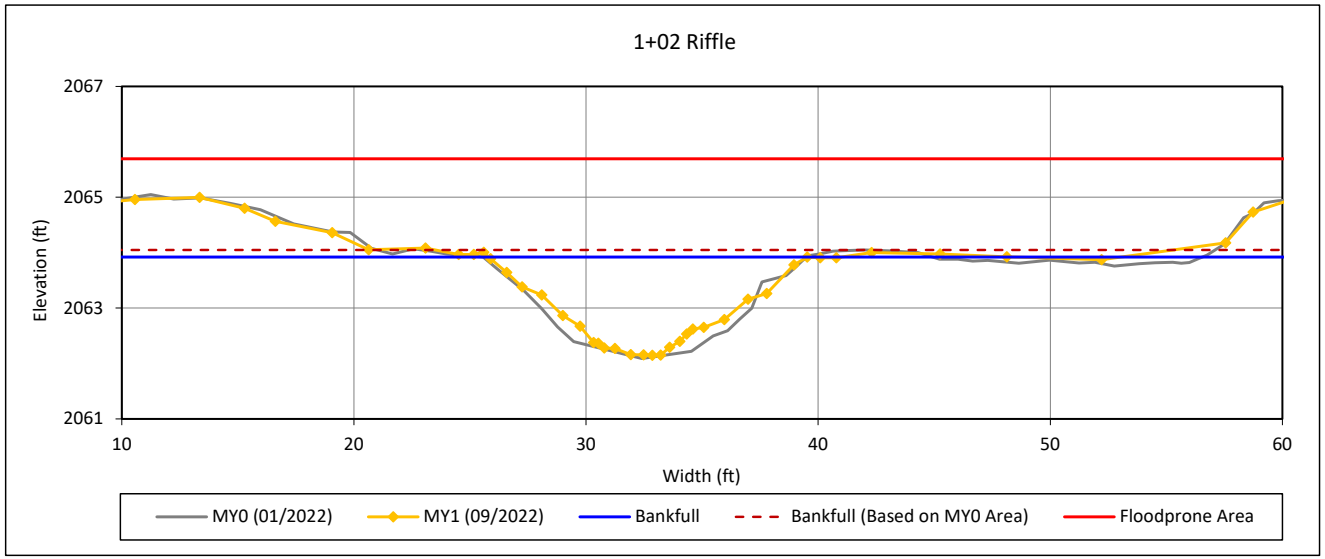
[1]Bank Height Ratio (BHR) takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation.

[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.

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 1-Banner Creek Reach 1



Bankfull Dimensions	
14.1	x-section area (ft.sq.)
13.7	width (ft)
1.0	mean depth (ft)
1.8	max depth (ft)
14.3	wetted perimeter (ft)
1.0	hydraulic radius (ft)
13.3	width-depth ratio
61.7	W flood prone area (ft)
4.5	entrenchment ratio
< 1.0	low bank height ratio

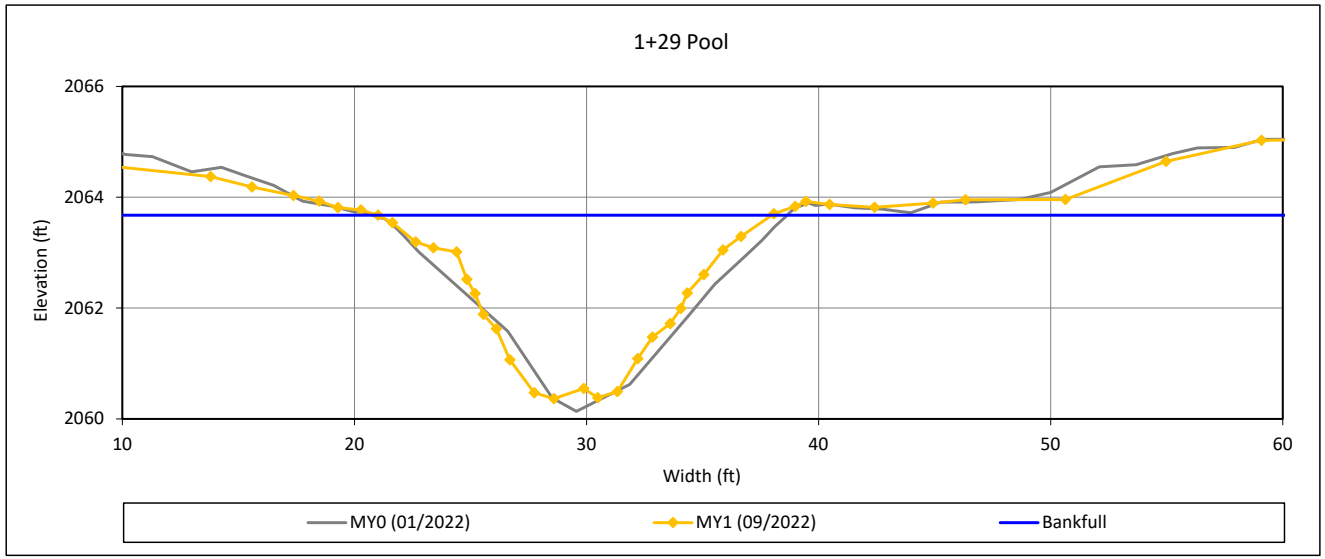
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 2-Banner Creek Reach 1



Bankfull Dimensions	
29.0	x-section area (ft.sq.)
17.0	width (ft)
1.7	mean depth (ft)
3.3	max depth (ft)
18.8	wetted perimeter (ft)
1.5	hydraulic radius (ft)
9.9	width-depth ratio

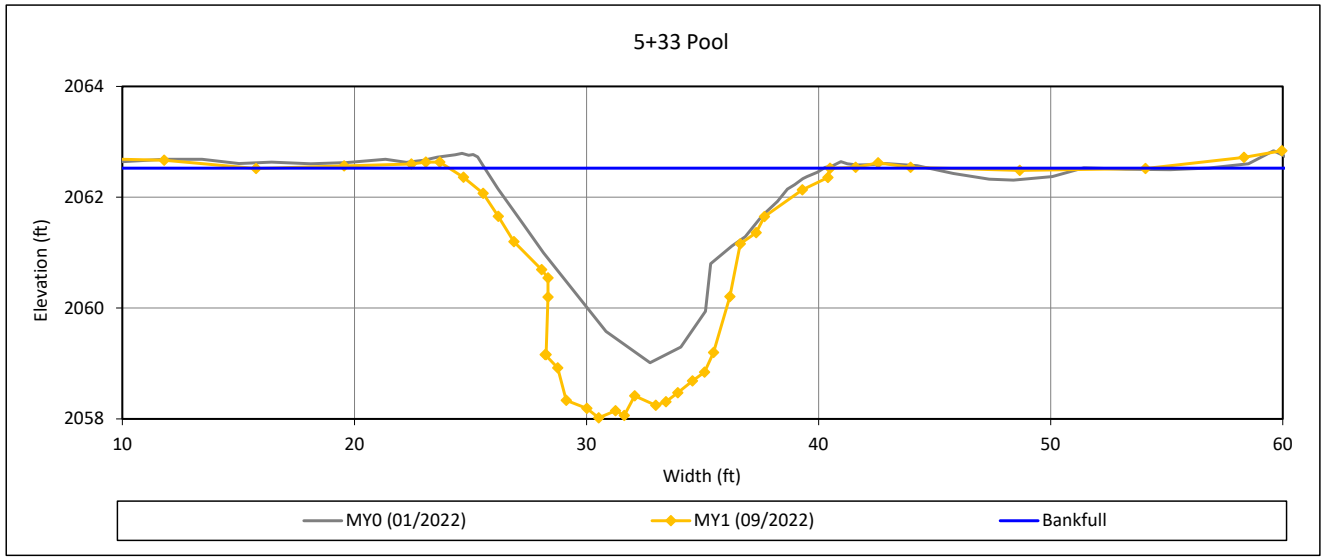
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 3-Banner Creek Reach 1



Bankfull Dimensions	
38.7	x-section area (ft.sq.)
16.4	width (ft)
2.4	mean depth (ft)
4.5	max depth (ft)
20.7	wetted perimeter (ft)
1.9	hydraulic radius (ft)
7.0	width-depth ratio

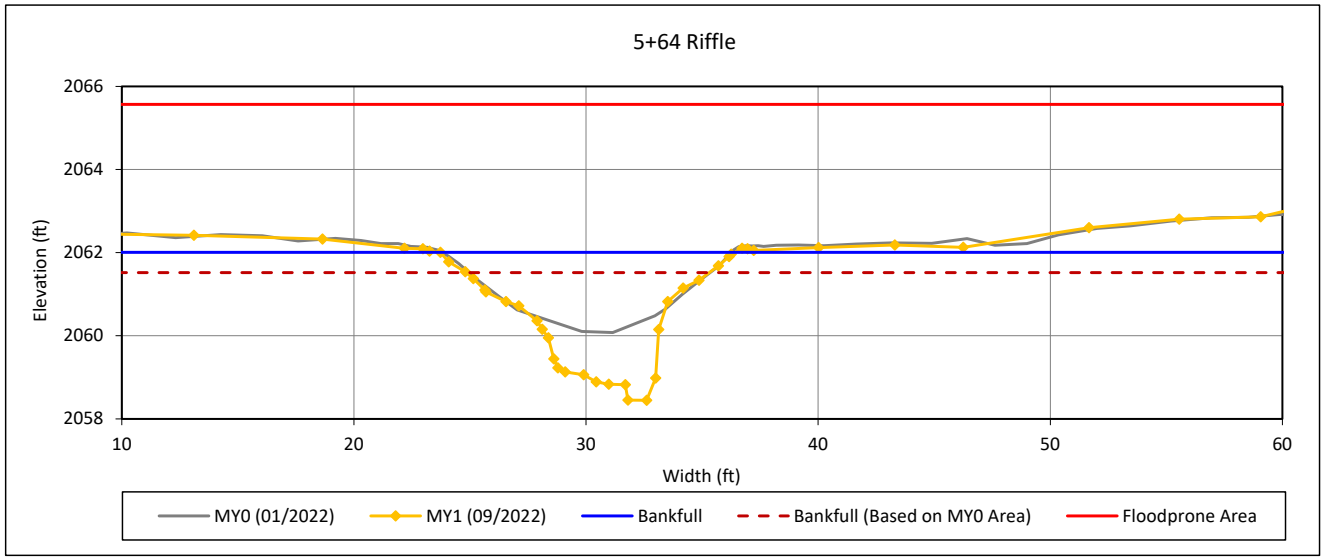
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 4-Banner Creek Reach 1



Bankfull Dimensions	
21.6	x-section area (ft.sq.)
12.7	width (ft)
1.7	mean depth (ft)
3.6	max depth (ft)
15.9	wetted perimeter (ft)
1.4	hydraulic radius (ft)
7.5	width-depth ratio
60.4	W flood prone area (ft)
4.8	entrenchment ratio
1.2	low bank height ratio

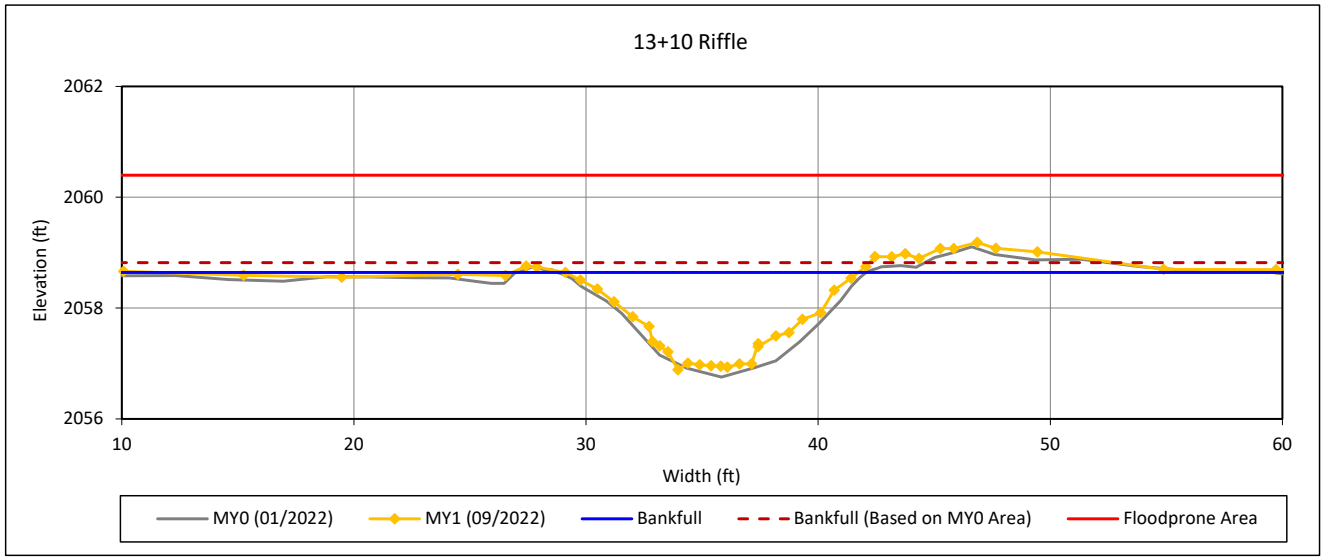
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 5-Banner Creek Reach 2



Bankfull Dimensions	
12.4	x-section area (ft.sq.)
12.6	width (ft)
1.0	mean depth (ft)
1.8	max depth (ft)
13.5	wetted perimeter (ft)
0.9	hydraulic radius (ft)
12.9	width-depth ratio
85.7	W flood prone area (ft)
6.8	entrenchment ratio
< 1.0	low bank height ratio

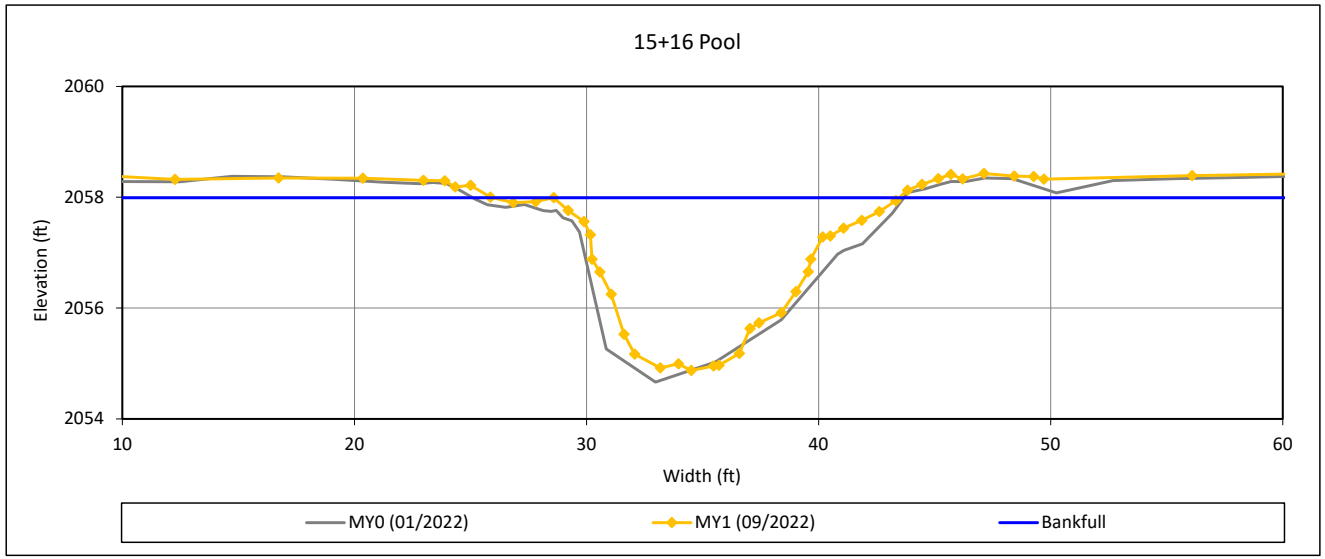
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 6-Banner Creek Reach 2



Bankfull Dimensions	
25.7	x-section area (ft.sq.)
14.9	width (ft)
1.7	mean depth (ft)
3.1	max depth (ft)
17.0	wetted perimeter (ft)
1.5	hydraulic radius (ft)
8.6	width-depth ratio

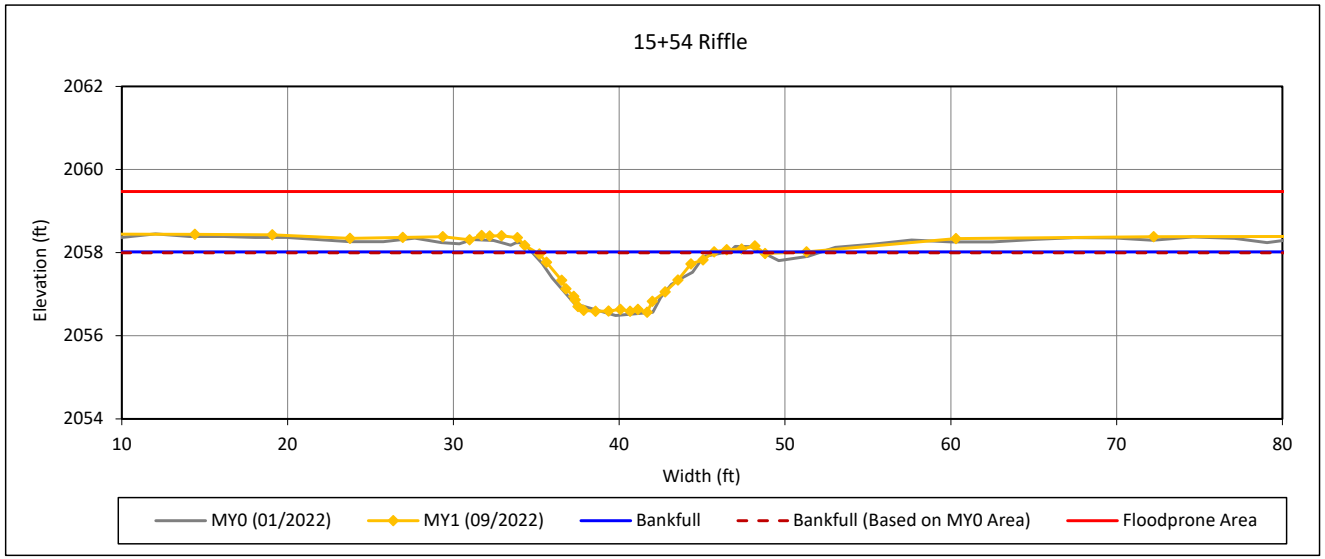
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 7-Banner Creek Reach 2



Bankfull Dimensions	
9.8	x-section area (ft.sq.)
10.8	width (ft)
0.9	mean depth (ft)
1.5	max depth (ft)
11.4	wetted perimeter (ft)
0.9	hydraulic radius (ft)
11.8	width-depth ratio
80.8	W flood prone area (ft)
7.5	entrenchment ratio
1.0	low bank height ratio

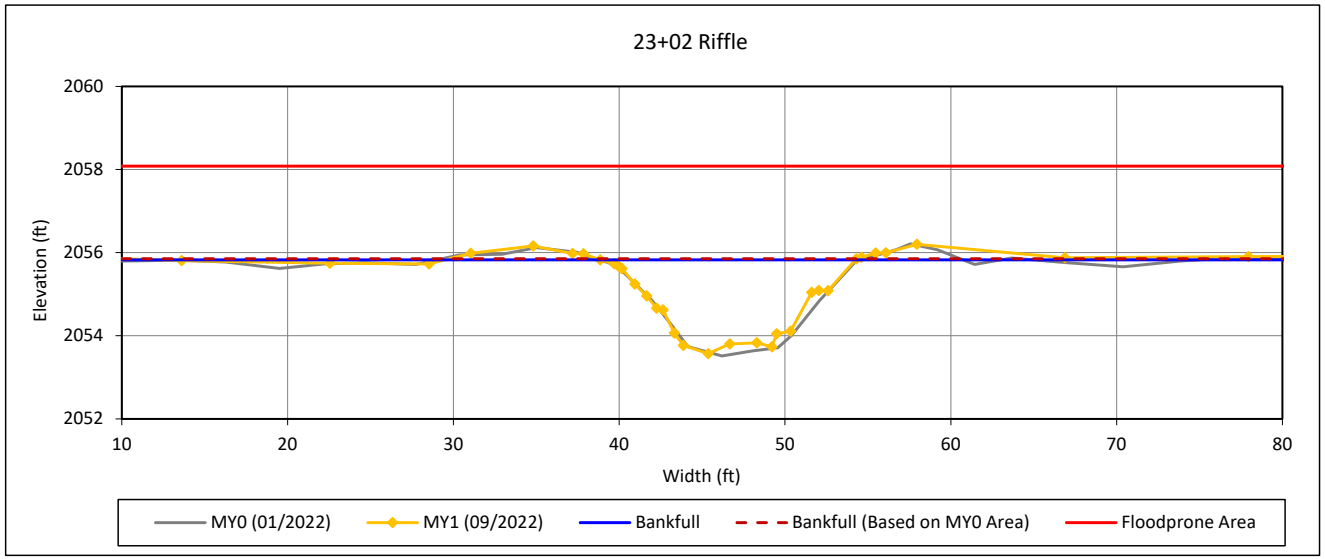
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 8-Banner Creek Reach 3



Bankfull Dimensions	
20.2	x-section area (ft.sq.)
15.4	width (ft)
1.3	mean depth (ft)
2.3	max depth (ft)
16.5	wetted perimeter (ft)
1.2	hydraulic radius (ft)
11.7	width-depth ratio
87.5	W flood prone area (ft)
5.7	entrenchment ratio
1.0	low bank height ratio

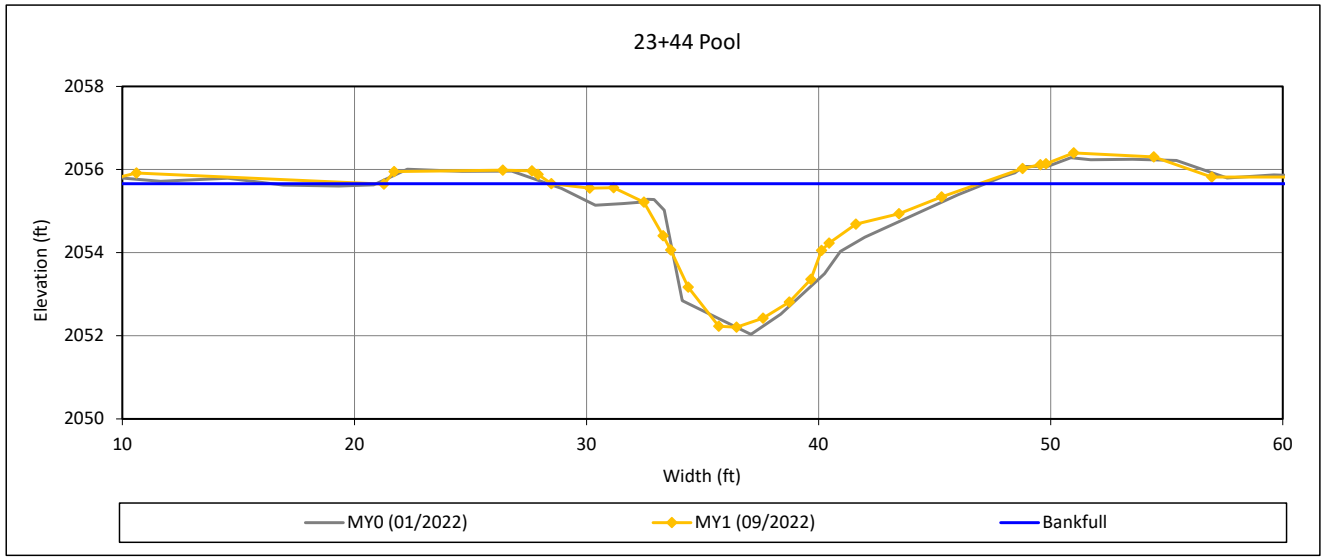
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 9-Banner Creek Reach 3



Bankfull Dimensions	
25.0	x-section area (ft.sq.)
18.4	width (ft)
1.4	mean depth (ft)
3.5	max depth (ft)
20.5	wetted perimeter (ft)
1.2	hydraulic radius (ft)
13.6	width-depth ratio

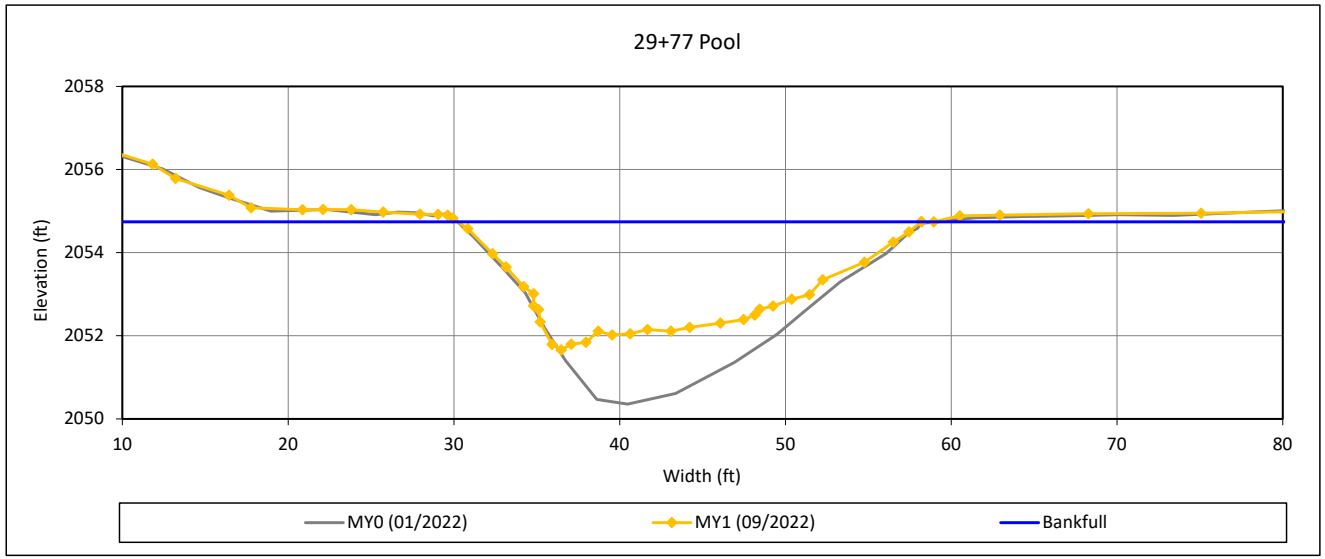
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 10-Banner Creek Reach 4a



Bankfull Dimensions	
51.2	x-section area (ft.sq.)
27.9	width (ft)
1.8	mean depth (ft)
3.1	max depth (ft)
29.4	wetted perimeter (ft)
1.7	hydraulic radius (ft)
15.2	width-depth ratio

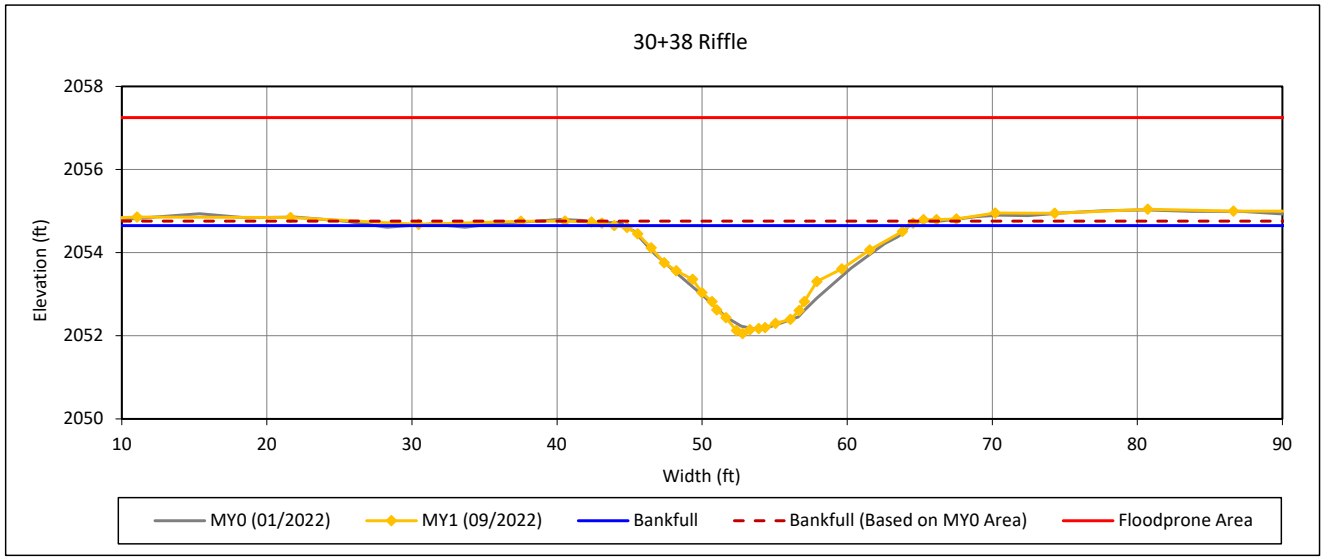
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 11-Banner Creek Reach 4a



Bankfull Dimensions	
26.0	x-section area (ft.sq.)
20.4	width (ft)
1.3	mean depth (ft)
2.6	max depth (ft)
21.2	wetted perimeter (ft)
1.2	hydraulic radius (ft)
16.0	width-depth ratio
93.4	W flood prone area (ft)
4.6	entrenchment ratio
1.0	low bank height ratio

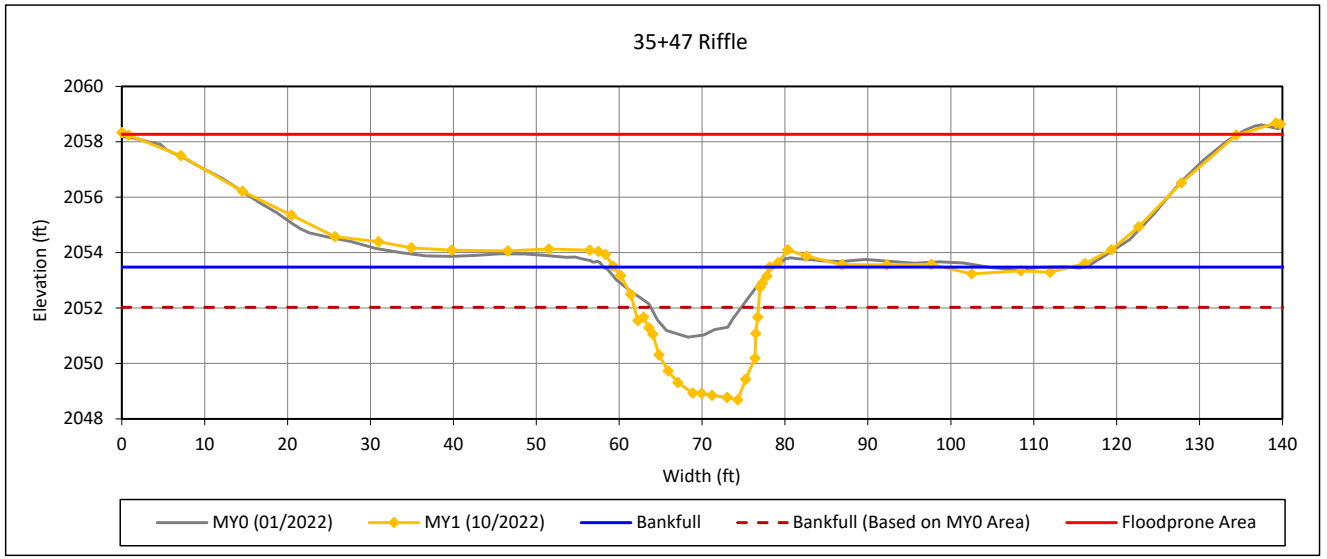
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 12-Banner Creek Reach 4b



Bankfull Dimensions	
59.4	x-section area (ft.sq.)
18.8	width (ft)
3.2	mean depth (ft)
4.8	max depth (ft)
22.9	wetted perimeter (ft)
2.6	hydraulic radius (ft)
6.0	width-depth ratio
139.7	W flood prone area (ft)
7.4	entrenchment ratio
1.4	low bank height ratio

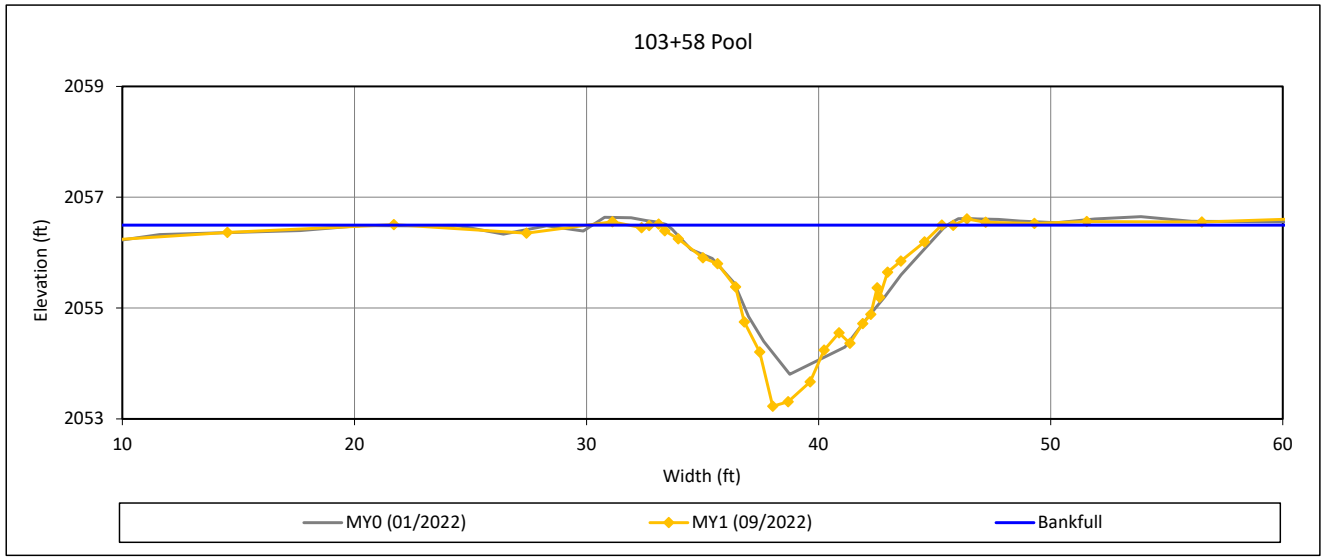
Survey Date: 10/2022
Field Crew: Wildlands Engineering
Note: XS12 is in the MY1 repair area and not rebuilt to the original design or as-built condition

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 13-UT1



Bankfull Dimensions	
17.5	x-section area (ft.sq.)
12.2	width (ft)
1.4	mean depth (ft)
3.3	max depth (ft)
14.8	wetted perimeter (ft)
1.2	hydraulic radius (ft)
8.5	width-depth ratio

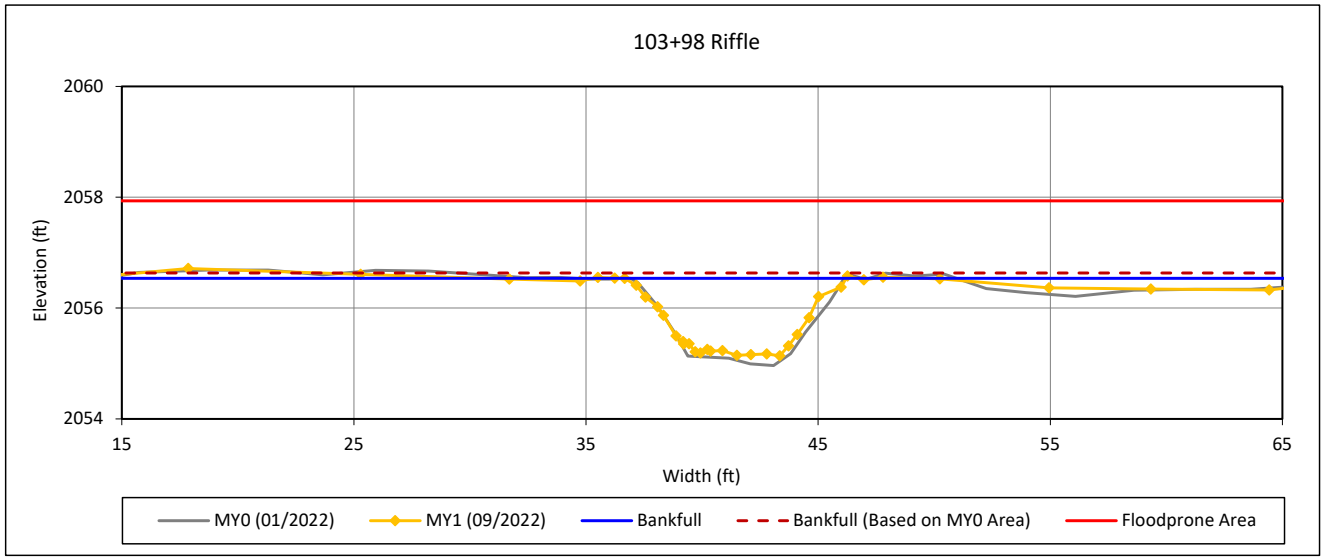
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 14-UT1



Bankfull Dimensions	
8.7	x-section area (ft.sq.)
9.5	width (ft)
0.9	mean depth (ft)
1.4	max depth (ft)
10.3	wetted perimeter (ft)
0.8	hydraulic radius (ft)
10.5	width-depth ratio
66.4	W flood prone area (ft)
7.0	entrenchment ratio
< 1.0	low bank height ratio

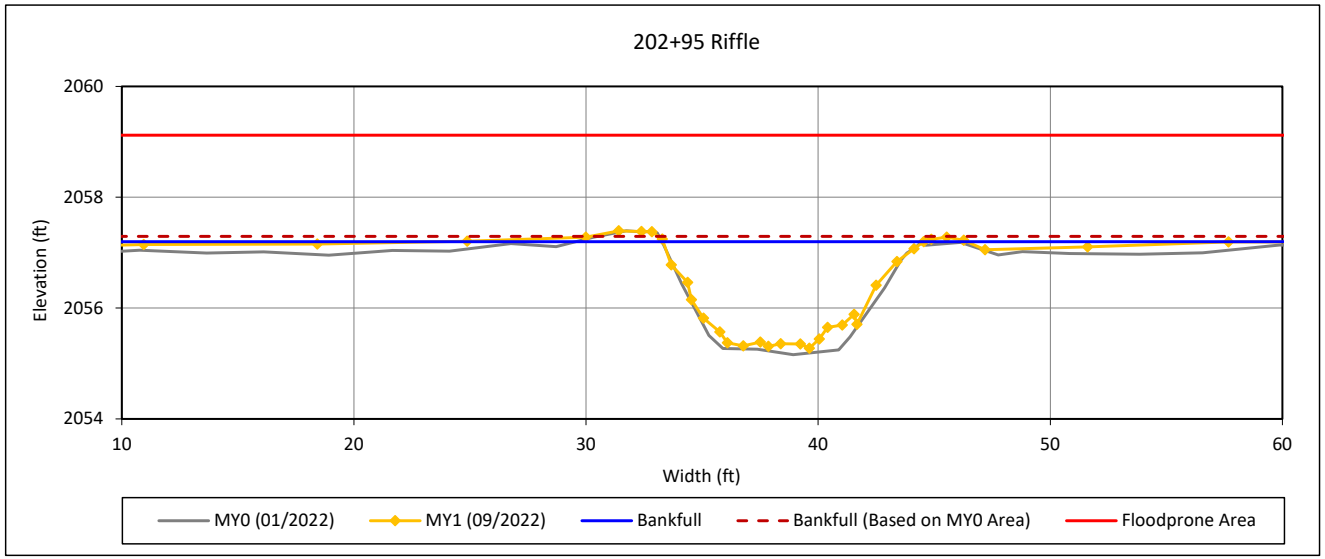
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 15-UT2



Bankfull Dimensions	
14.3	x-section area (ft.sq.)
11.2	width (ft)
1.3	mean depth (ft)
1.9	max depth (ft)
12.5	wetted perimeter (ft)
1.1	hydraulic radius (ft)
8.8	width-depth ratio
81.9	W flood prone area (ft)
7.3	entrenchment ratio
1.0	low bank height ratio

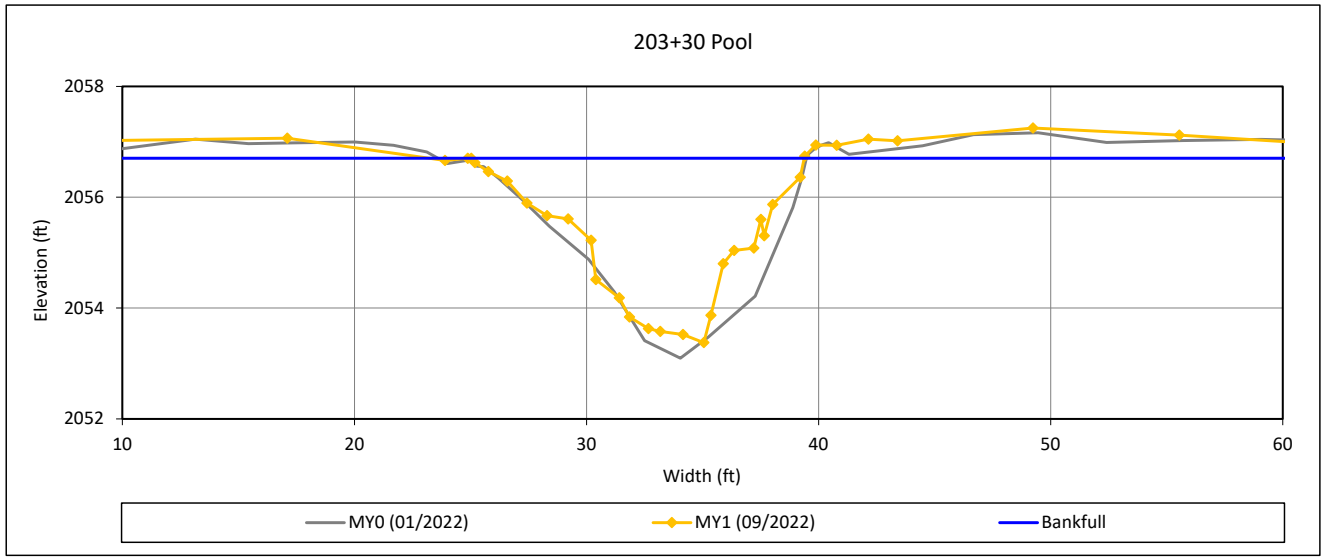
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 16-UT2



Bankfull Dimensions	
24.0	x-section area (ft.sq.)
14.4	width (ft)
1.7	mean depth (ft)
3.3	max depth (ft)
17.3	wetted perimeter (ft)
1.4	hydraulic radius (ft)
8.6	width-depth ratio

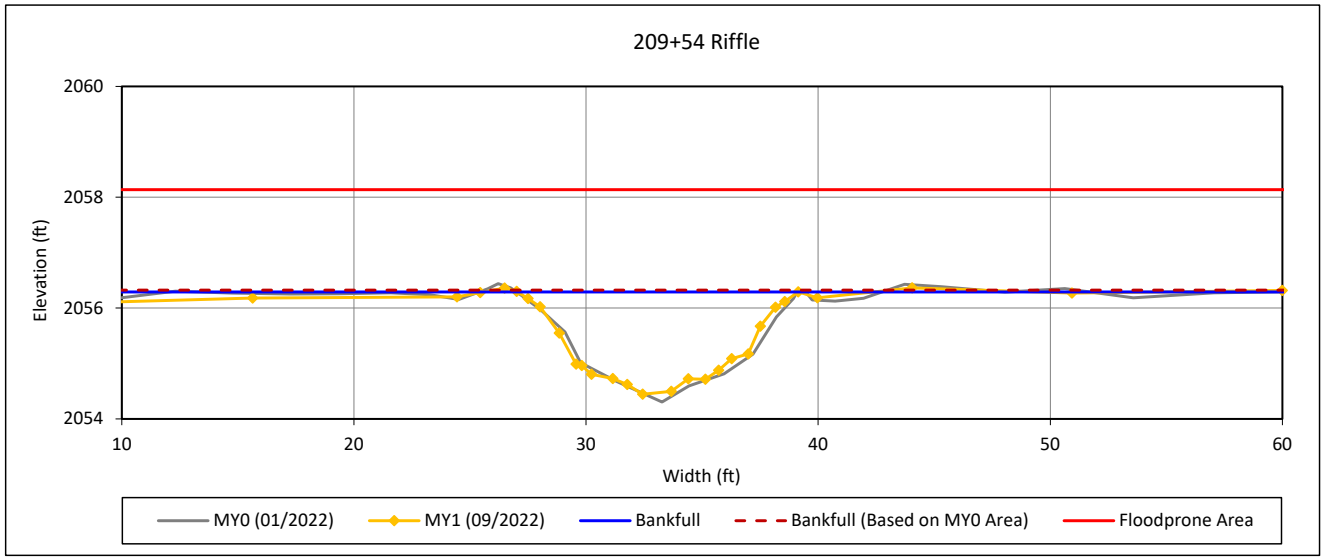
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 17-UT2



Bankfull Dimensions	
13.7	x-section area (ft.sq.)
12.1	width (ft)
1.1	mean depth (ft)
1.8	max depth (ft)
12.9	wetted perimeter (ft)
1.1	hydraulic radius (ft)
10.7	width-depth ratio
74.8	W flood prone area (ft)
6.2	entrenchment ratio
1.0	low bank height ratio

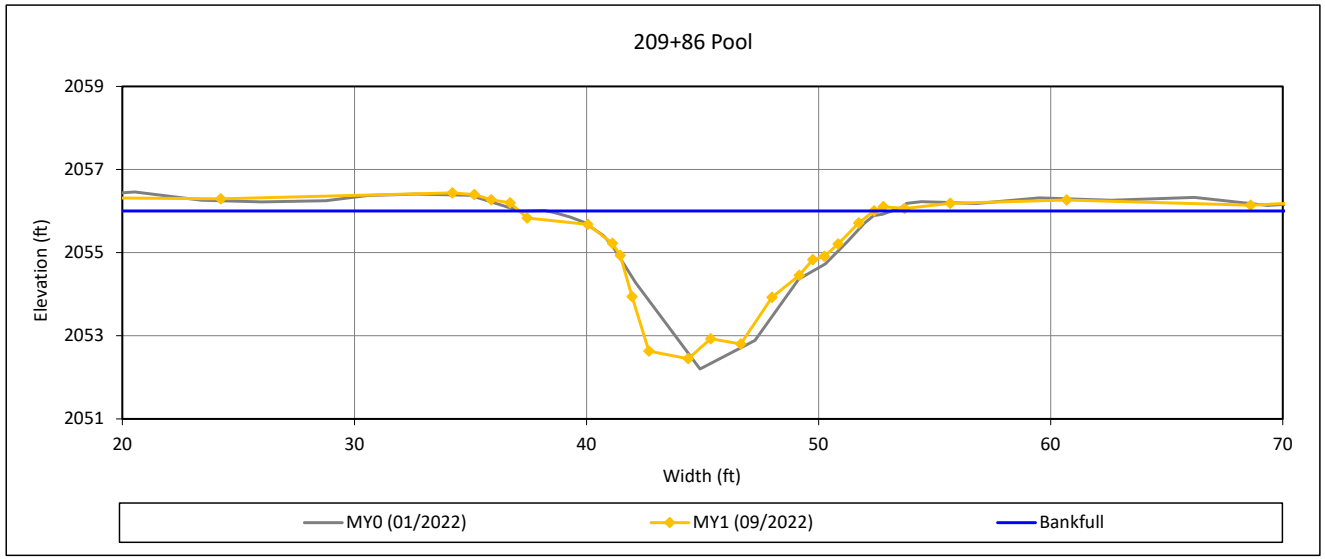
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 18-UT2



Bankfull Dimensions	
25.7	x-section area (ft.sq.)
15.3	width (ft)
1.7	mean depth (ft)
3.6	max depth (ft)
17.9	wetted perimeter (ft)
1.4	hydraulic radius (ft)
9.1	width-depth ratio

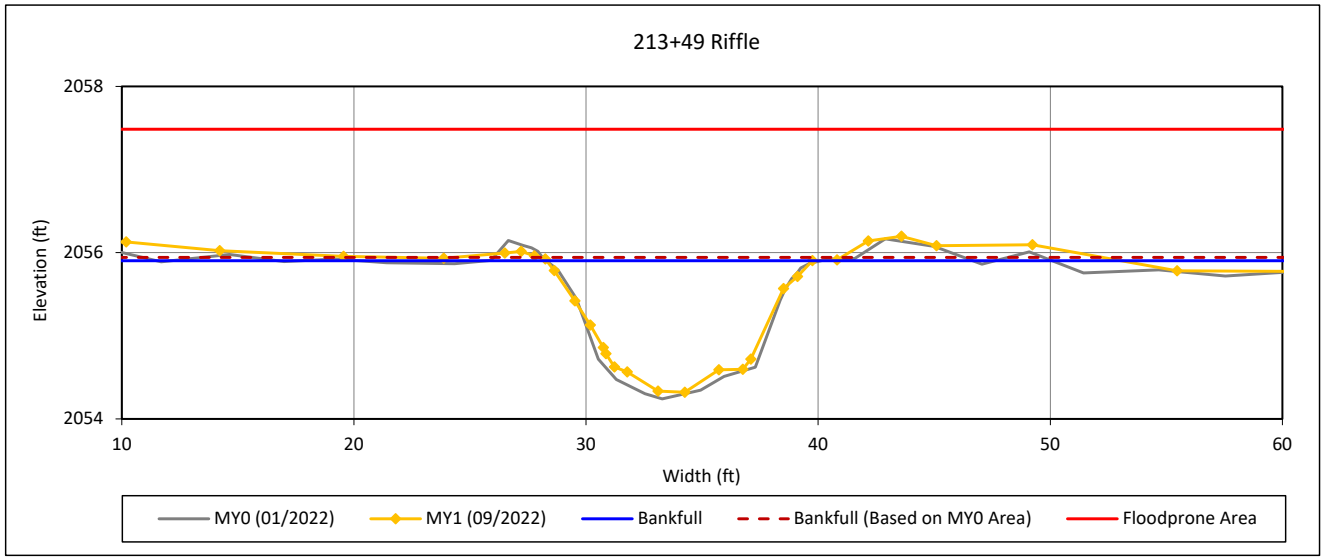
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 19-UT2



Bankfull Dimensions	
11.4	x-section area (ft.sq.)
11.5	width (ft)
1.0	mean depth (ft)
1.6	max depth (ft)
12.1	wetted perimeter (ft)
0.9	hydraulic radius (ft)
11.5	width-depth ratio
79.0	W flood prone area (ft)
6.9	entrenchment ratio
1.0	low bank height ratio

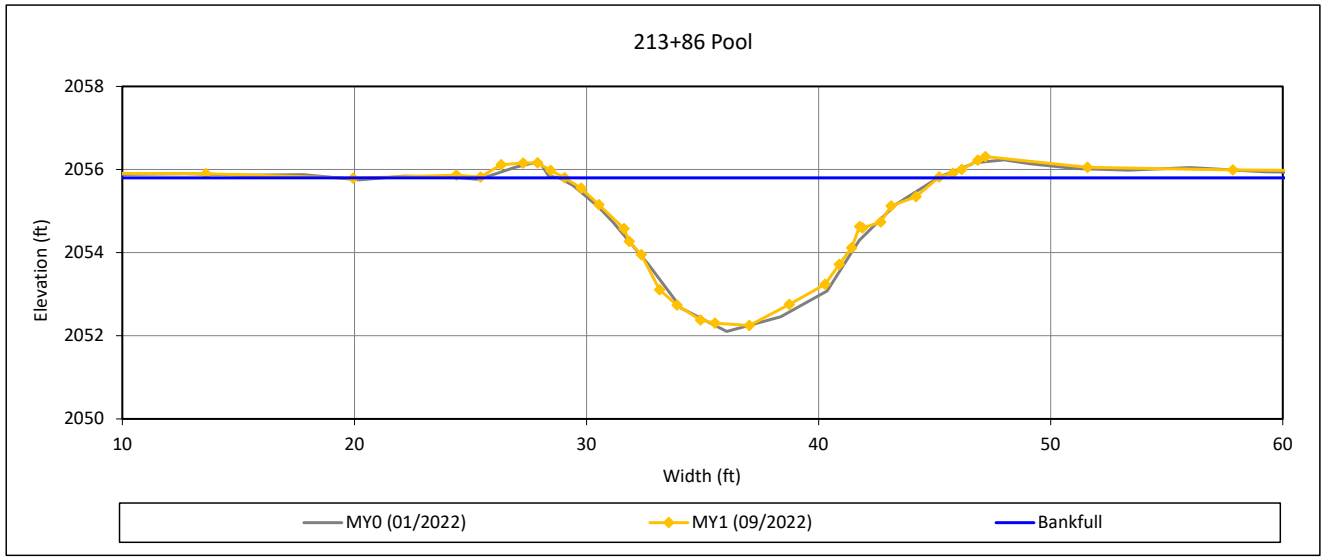
Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Cross-Section 20-UT2



Bankfull Dimensions	
32.4	x-section area (ft.sq.)
16.1	width (ft)
2.0	mean depth (ft)
3.6	max depth (ft)
18.2	wetted perimeter (ft)
1.8	hydraulic radius (ft)
8.0	width-depth ratio

Survey Date: 09/2022
Field Crew: Wildlands Engineering

View Downstream

APPENDIX D. Hydrology Data

Table 10. Bankfull Events Summary
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Reach	MY1 (2021)	MY2 (2022)	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
Banner Farm Reach 2 - CG1	2/4/2022 - 2/8/2022 3/24/2022 - 3/26/2022 5/28/2022 - 5/30/2022 7/28/2022 7/30/2022 9/6/2022 - 9/8/2022						
UT1 - CG2	2/4/2022 - 2/7/2022 3/24/2022 - 3/28/2022 5/28/2022 - 5/30/2022 7/28/2022 7/31/2022 9/5/2022 - 9/8/2022						
UT2 - CG3	2/4/2022 - 2/7/2022 3/24/2022 - 3/28/2022 5/27/2022 - 5/30/2022 7/28/2022 7/31/2022 9/5/2022 - 9/8/2022						

Table 11. Rainfall Summary
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

	MY1 (2021)	MY2 (2022)	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
Annual Precip Total	39.87*						
WETS 30th Percentile	30.82						
WETS 70th Percentile	58.69						
Normal	*						

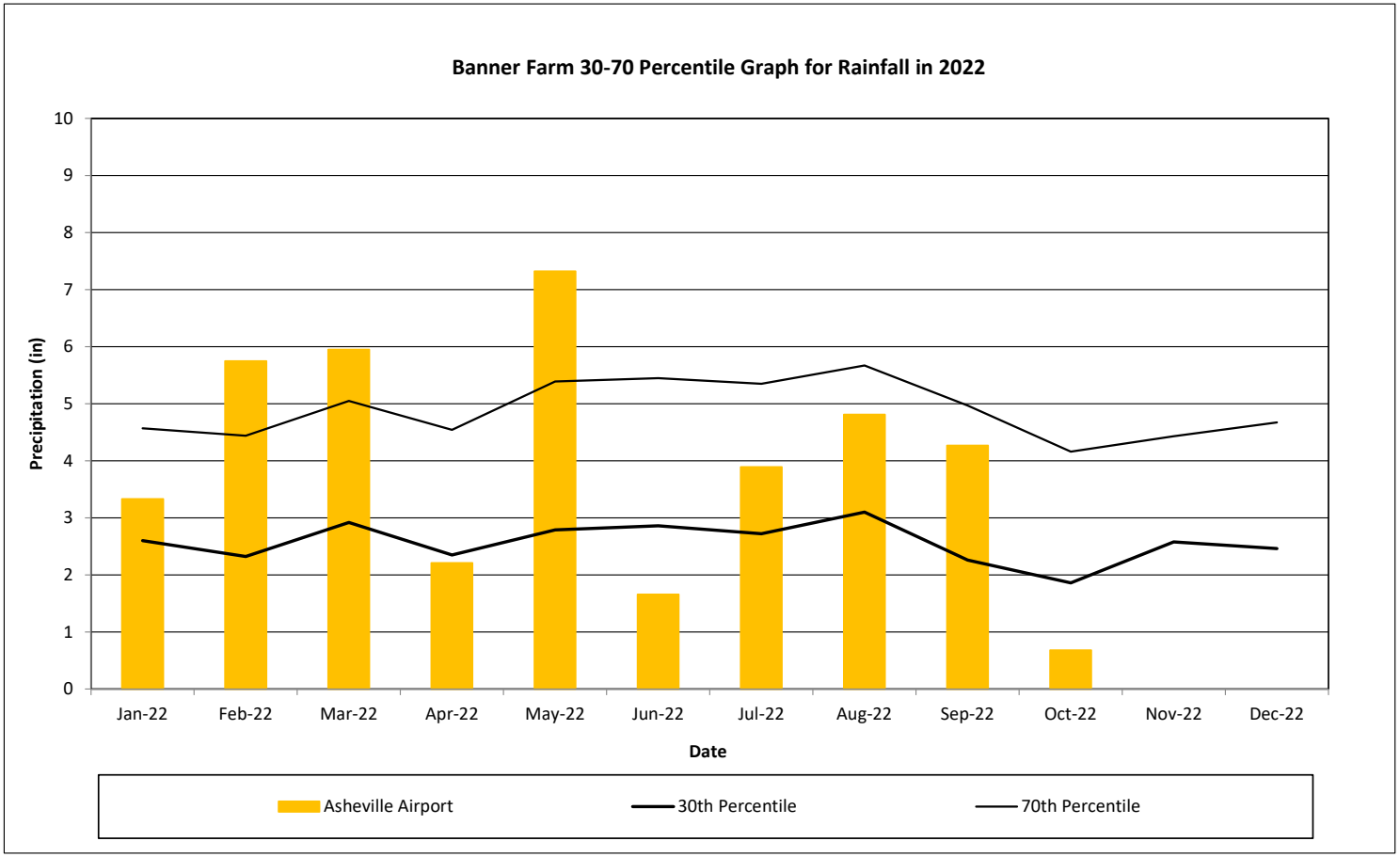
*Annual precipitation total was collected up until 11/1/2022. Data will be updated in MY2.

Monthly Rainfall Data

Baner Farm Mitigation Site

DMS Project No. 100062

Monitoring Year 1 - 2022



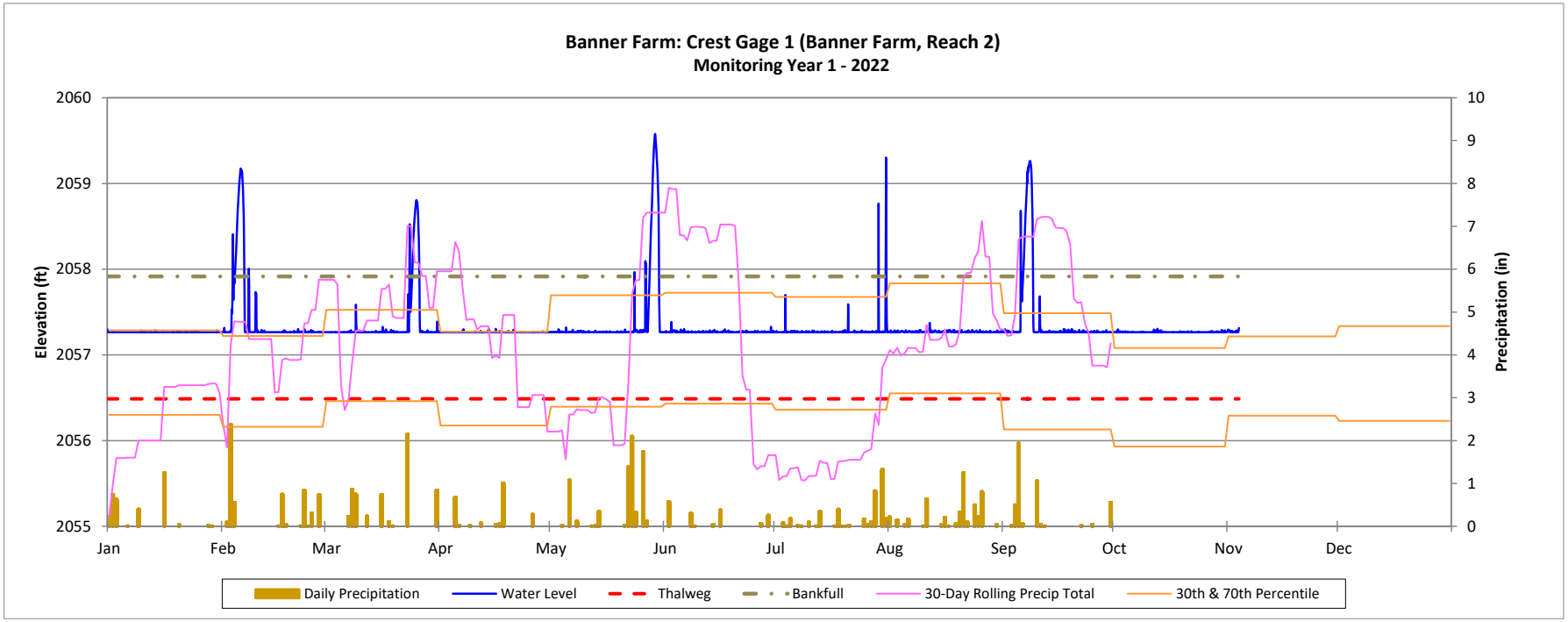
2022 rainfall collected by NC CRONOS Station Asheville Airport, NC

30th and 70th percentile rainfall data collected from WETS station Asheville Airport, NC

Data collected up through November 1, 2022.

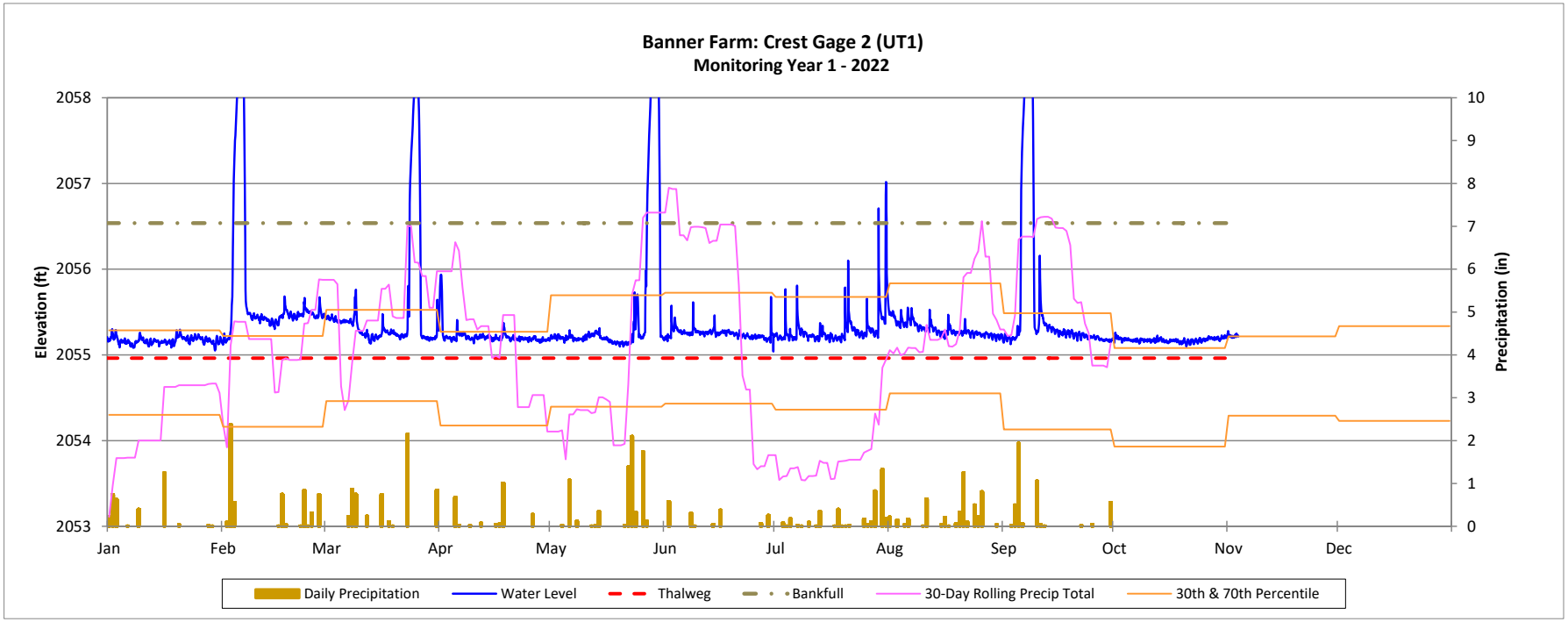
Crest Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022



Crest Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022



Crest Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

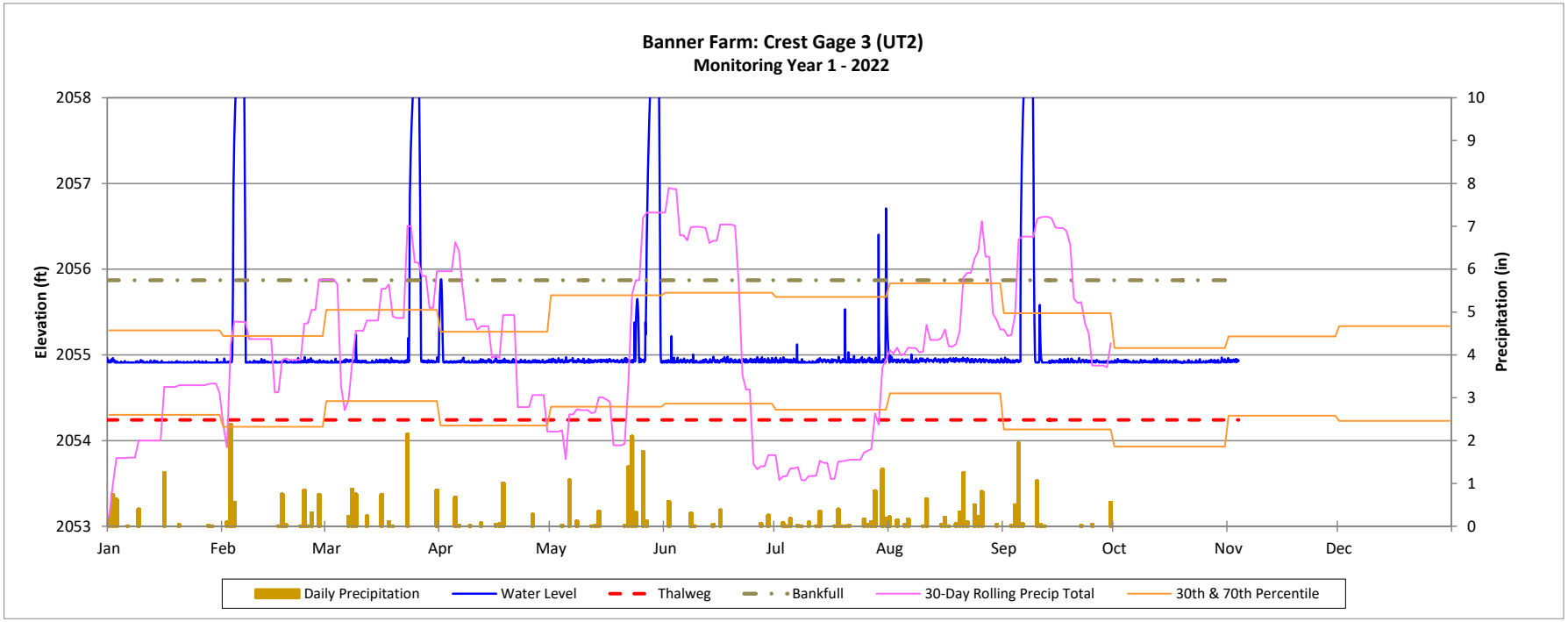


Table 12. Wetland Gage Summary

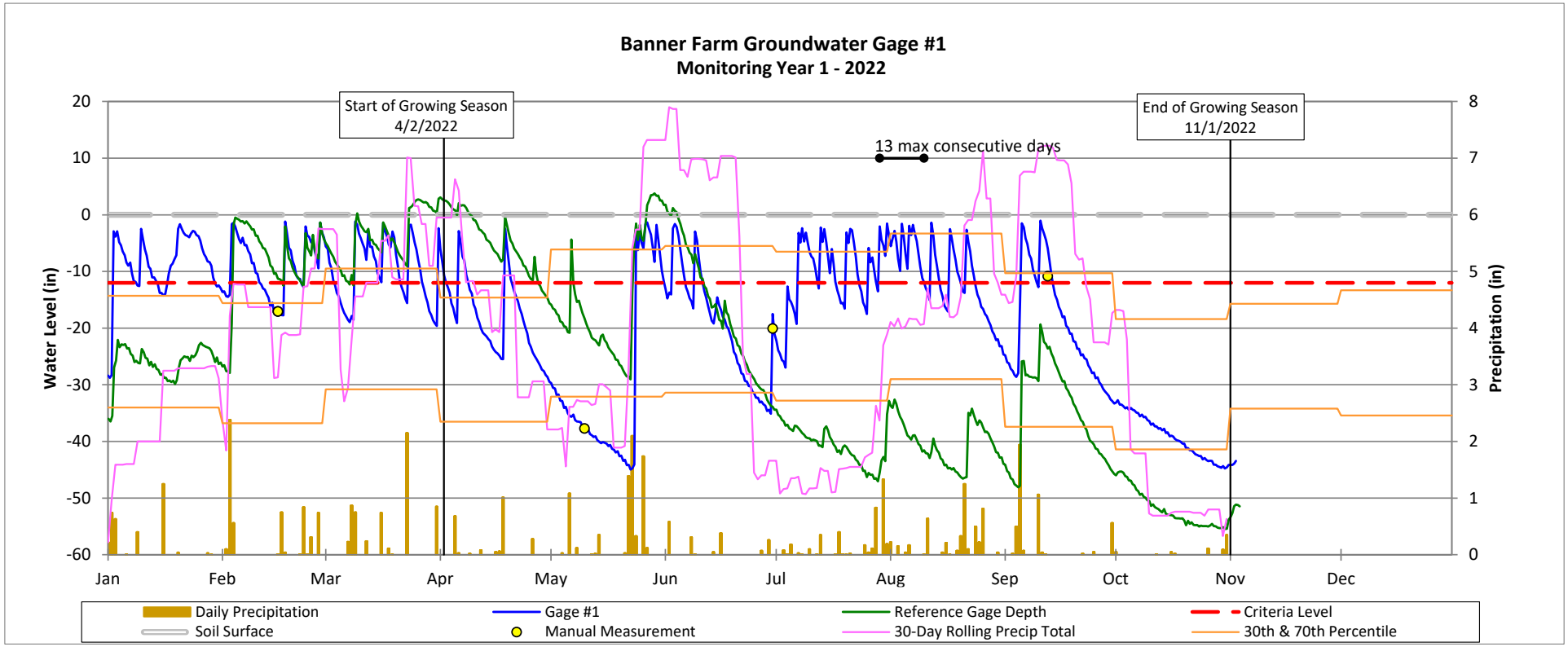
Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Gage	Max. Consecutive Hydroperiod (Percentage)						
	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
Reference	26 Days (12.1%)						
1	13 Days (6.1%)						
2	25 Days (11.7%)						
3	16 Days (7.5%)						
4	13 Days (6.1%)						
5	4 Days (1.9%)						
6	6 Days (2.8%)						
7	4 Days (1.9%)						
8	55 Days (25.7%)						
9	15 Days (7.0%)						
10	13 Days (6.1%)						
11	20 Days (9.3%)						
12	24 Days (11.2%)						
13	17 Days (7.9%)						
14	54 Days (25.2%)						
15	14 Days (6.5%)						
16	23 Days (10.7%)						
17	214 Days (100.0%)						
18	125 Days (58.4%)						

Performance Standard: **12% of the growing season (26 consecutive days)**
WETS Station: **ASHEVILLE AIRPORT, NC**
Growing Season: **4/2/2022 to 11/1/2022 (214 days)**

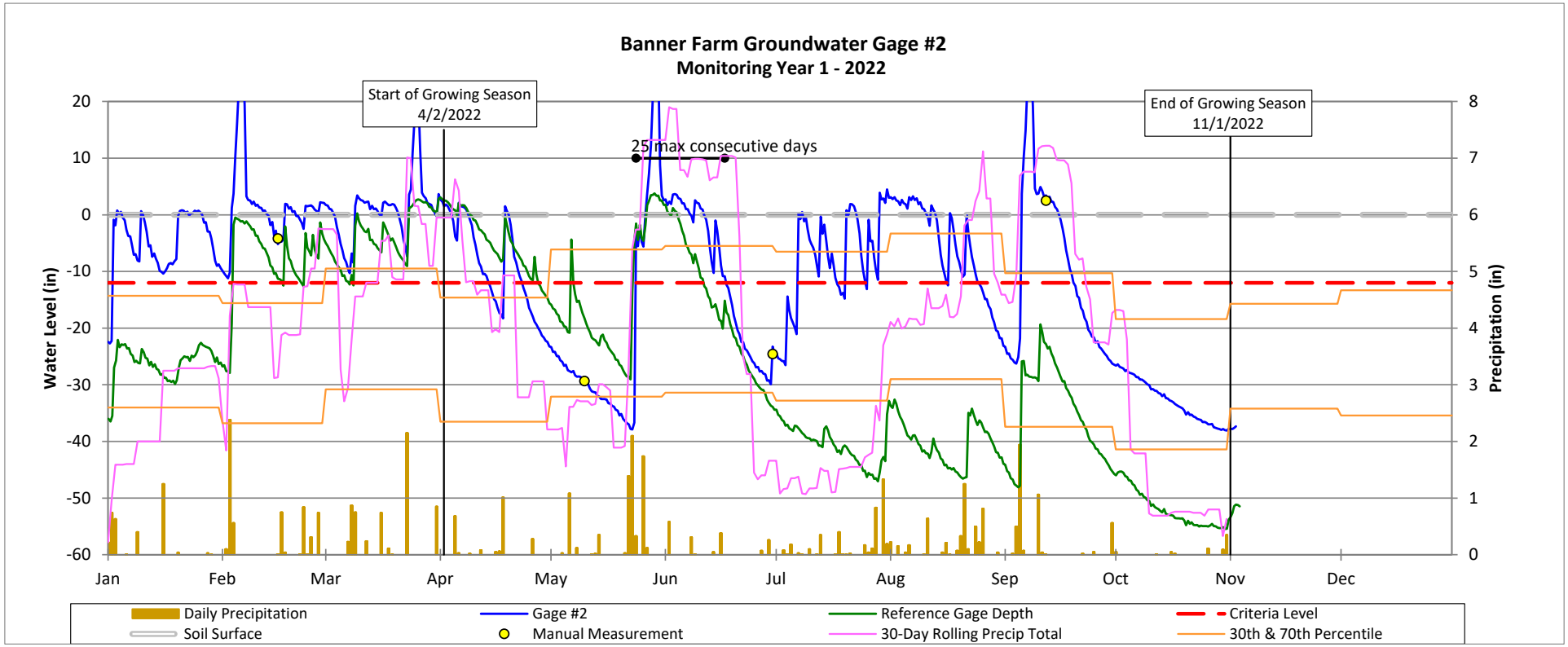
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



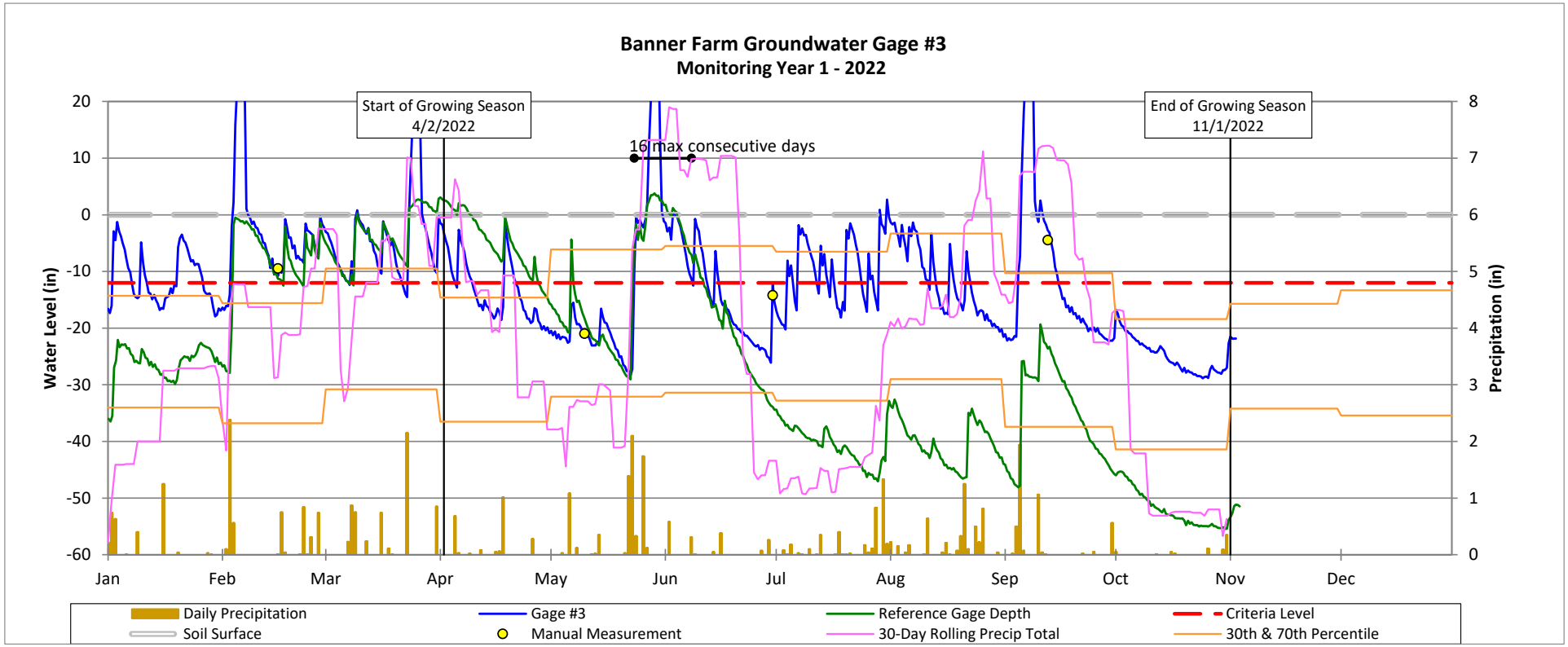
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



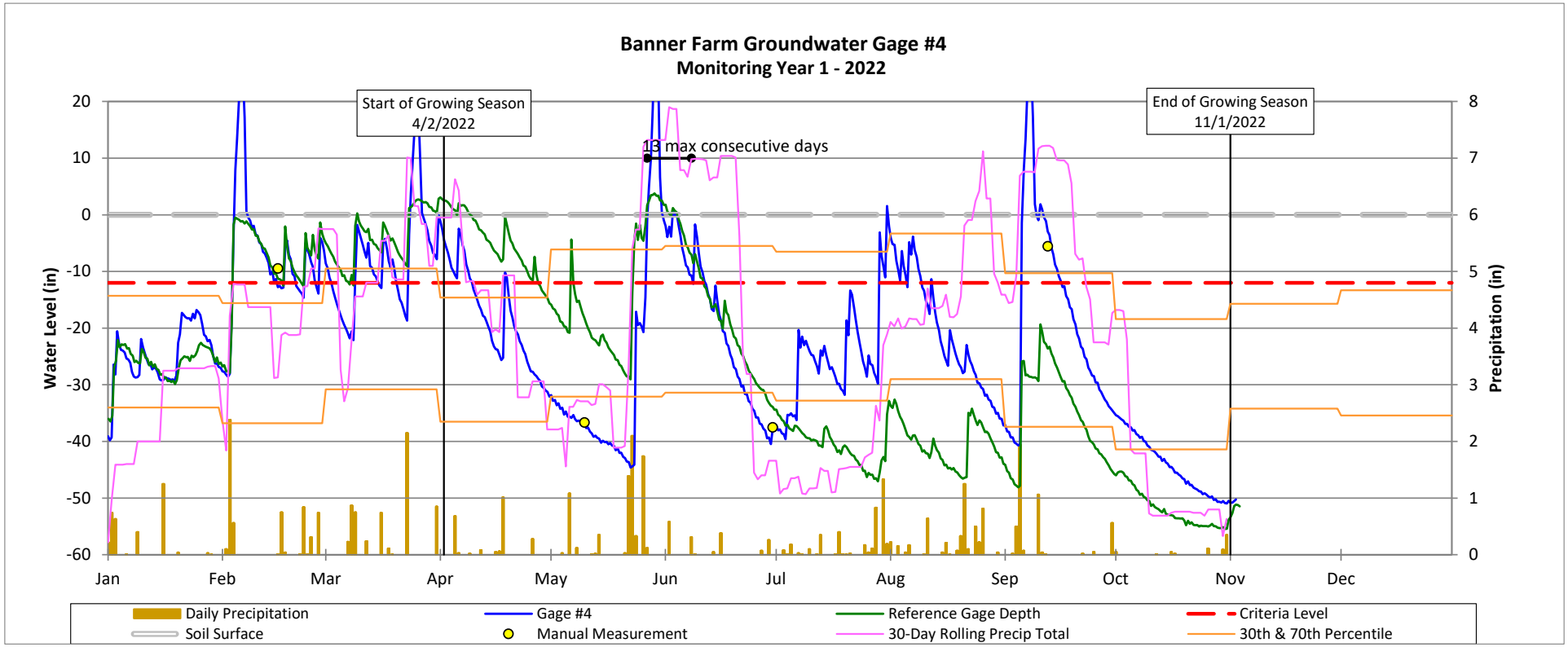
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



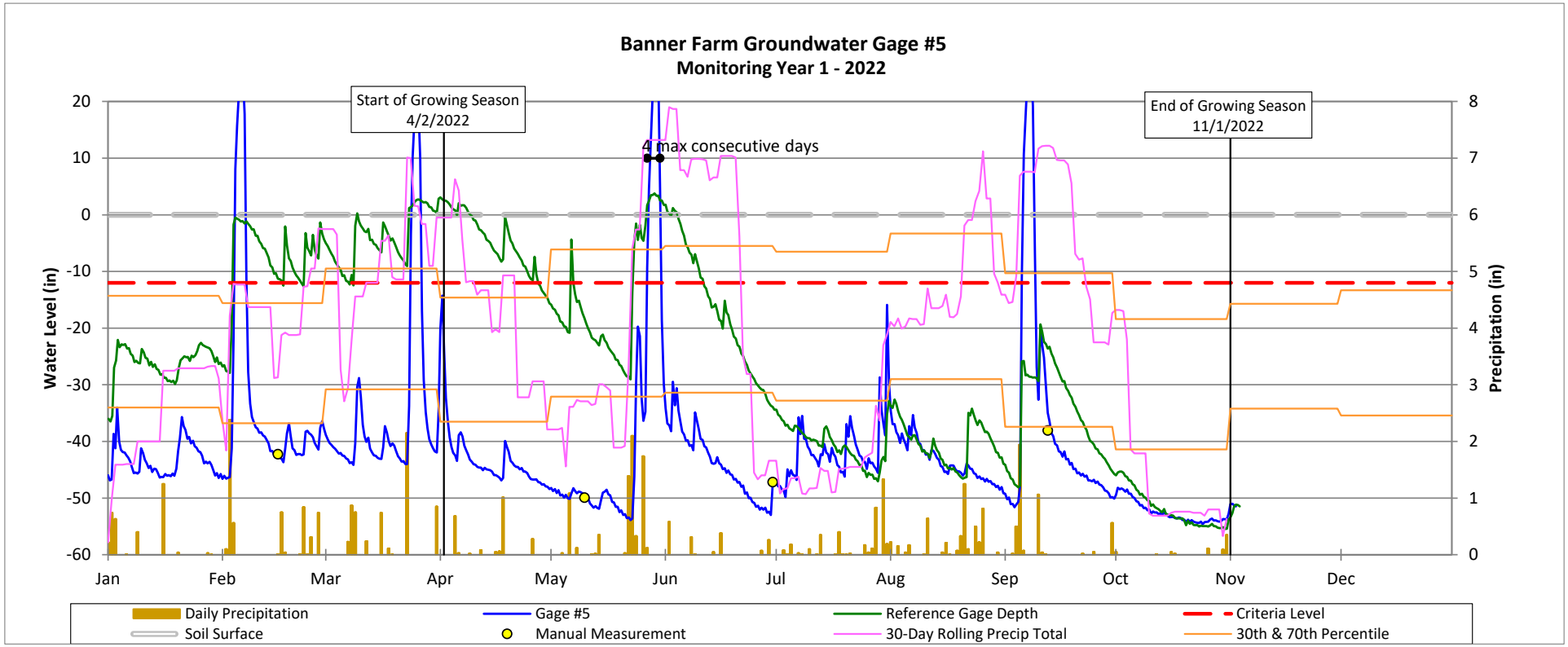
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



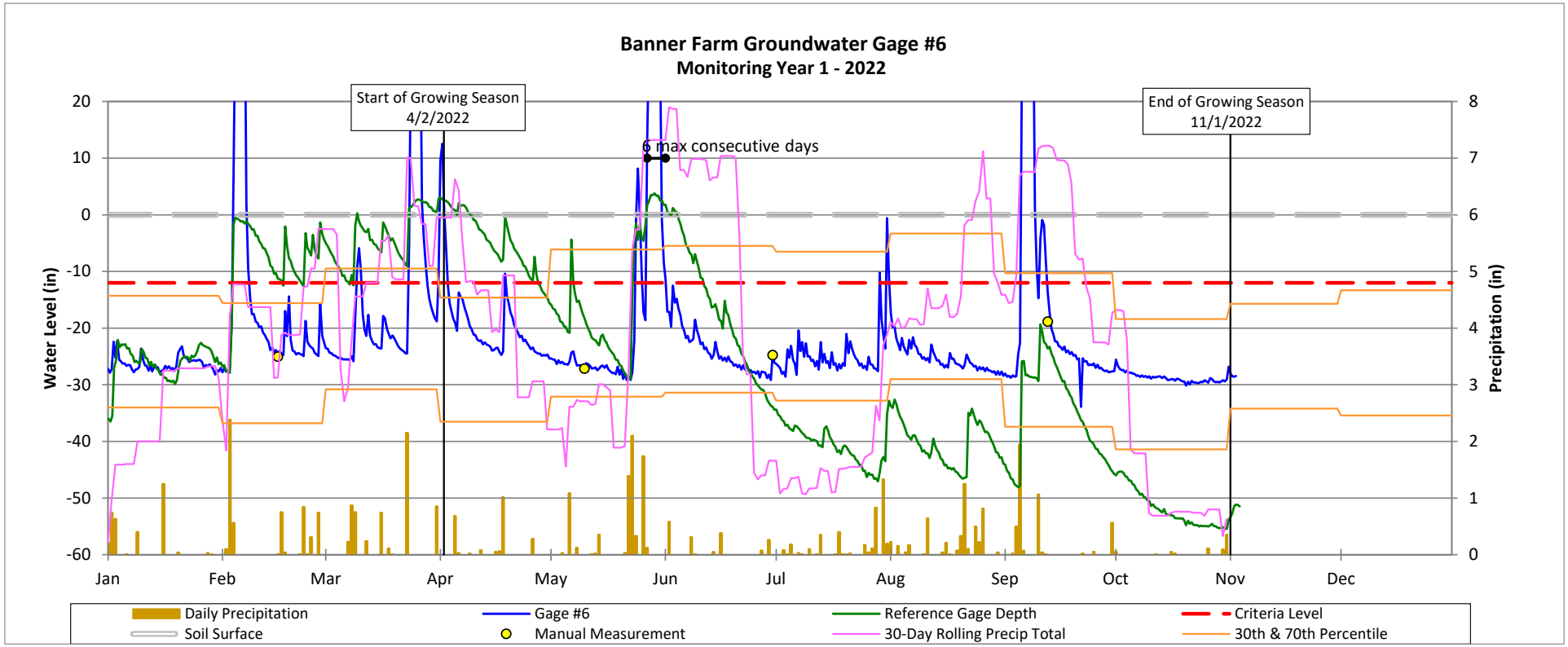
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



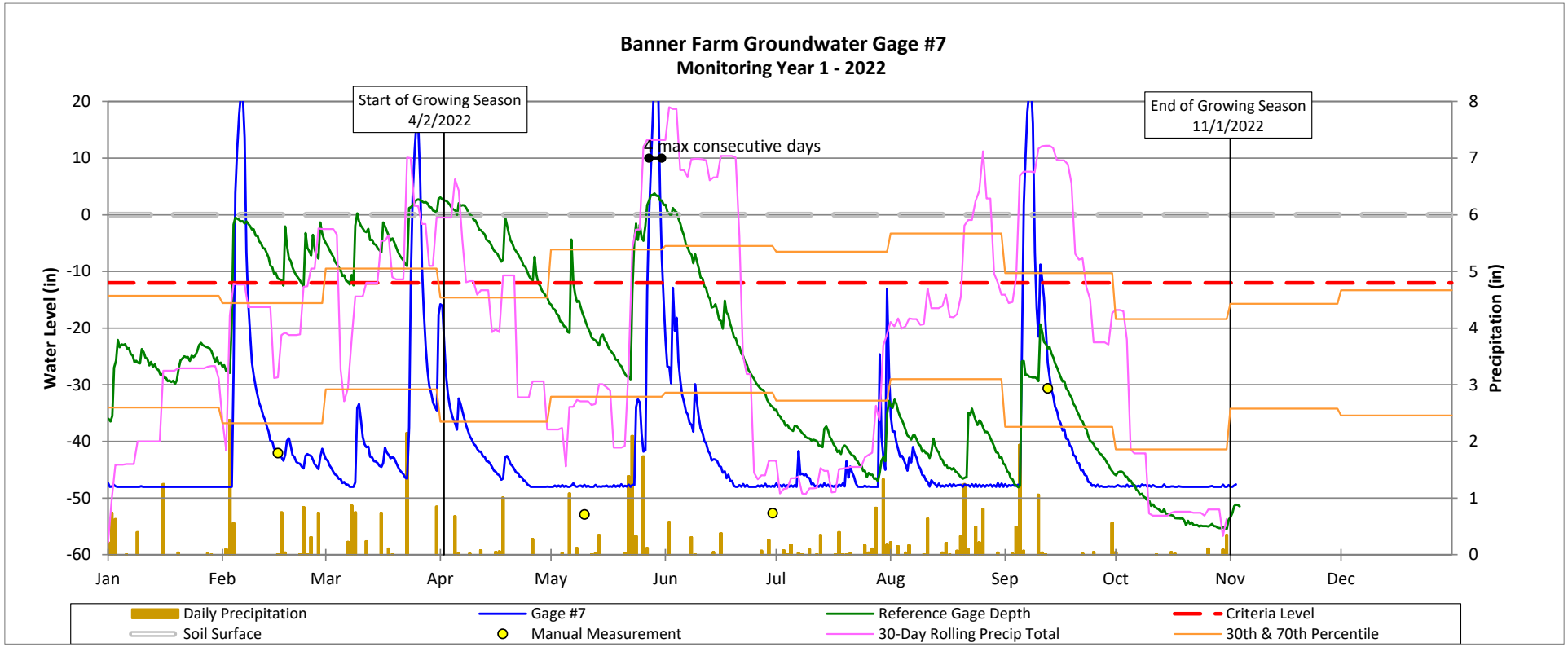
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Creation



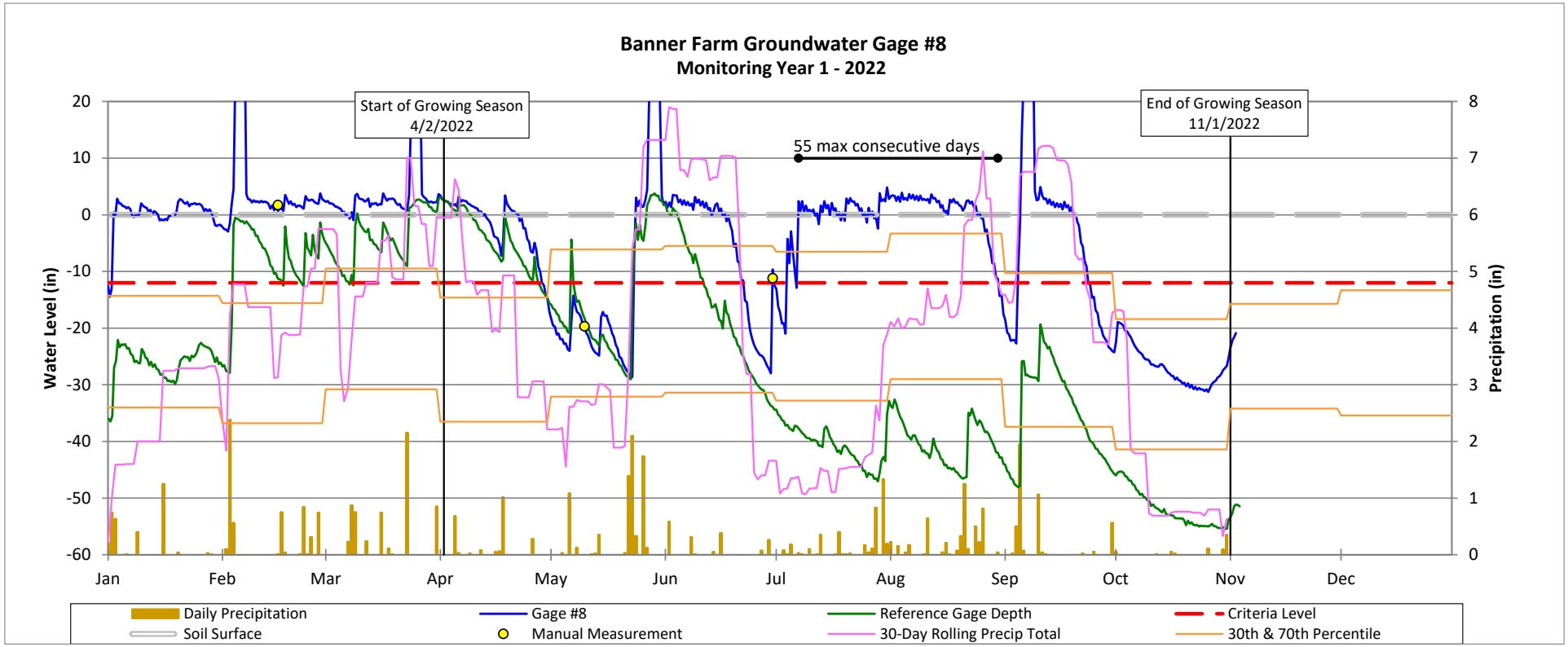
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



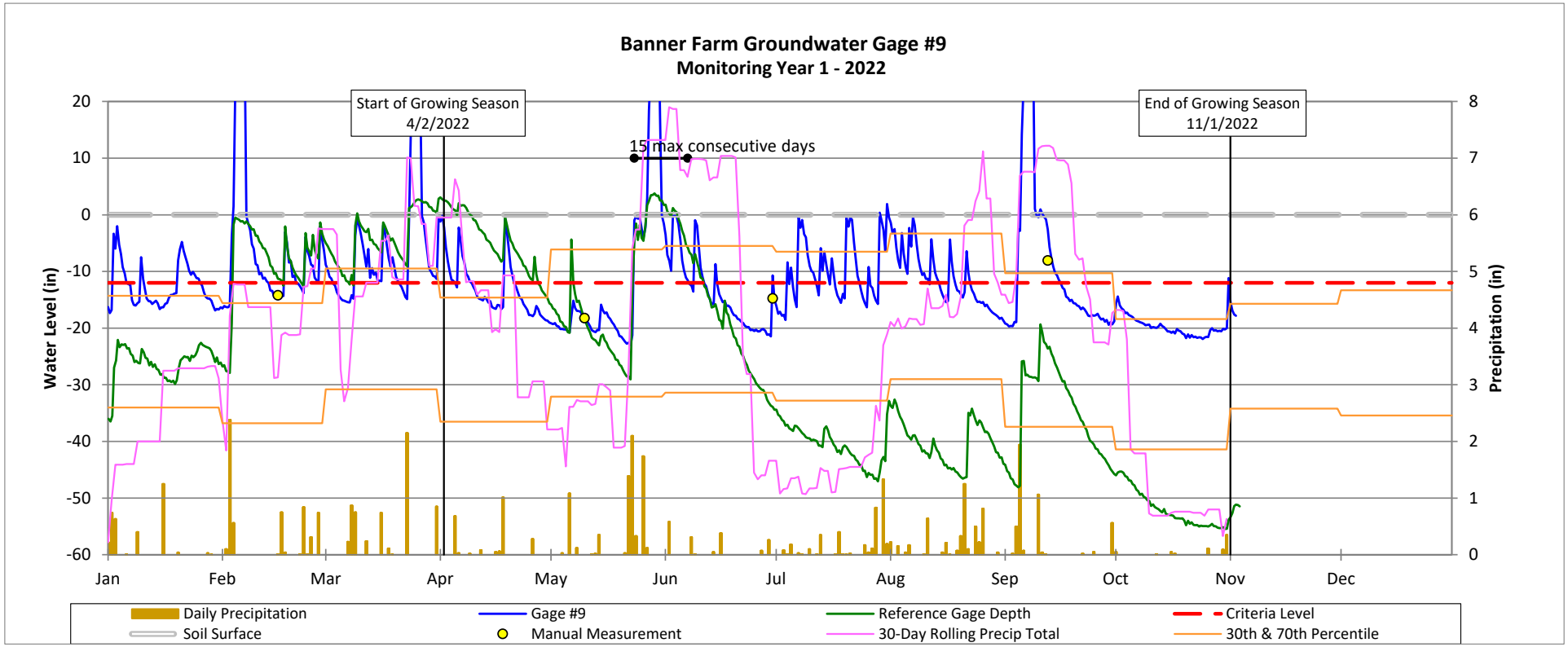
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



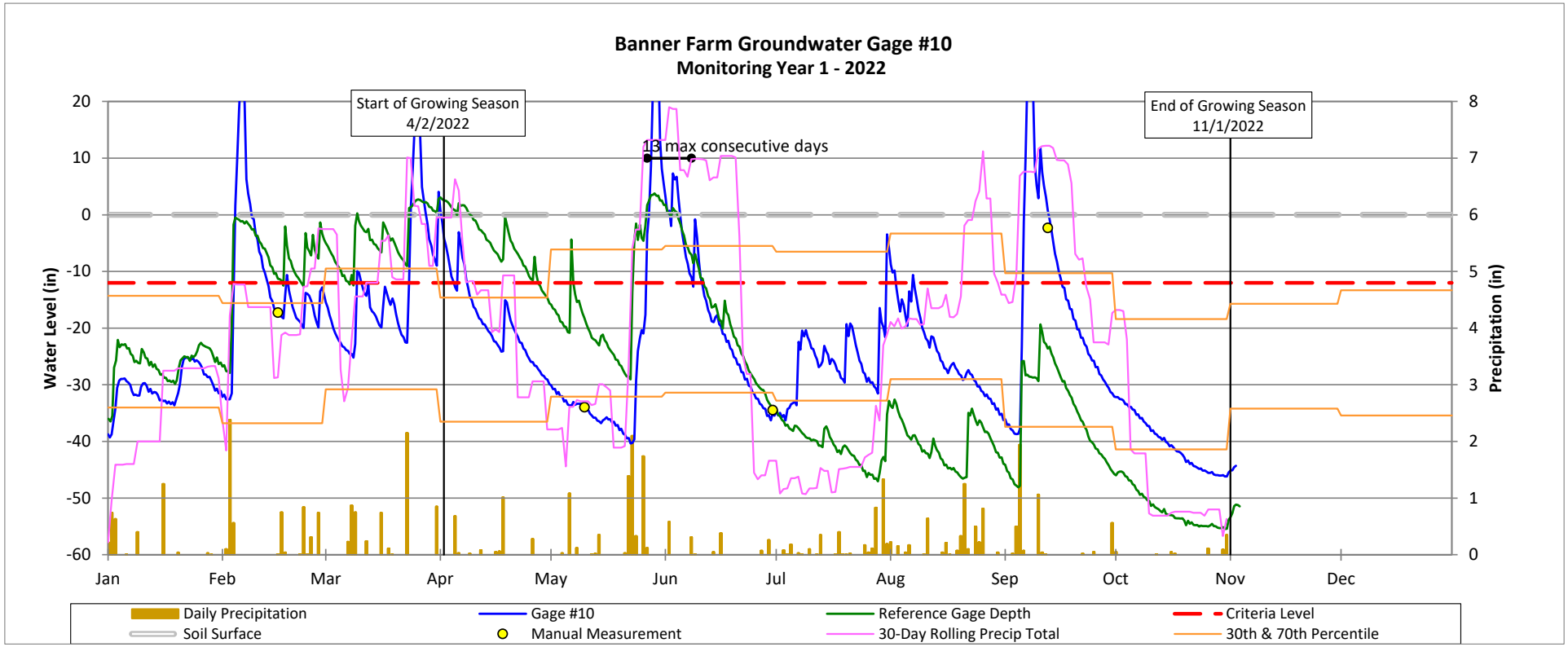
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



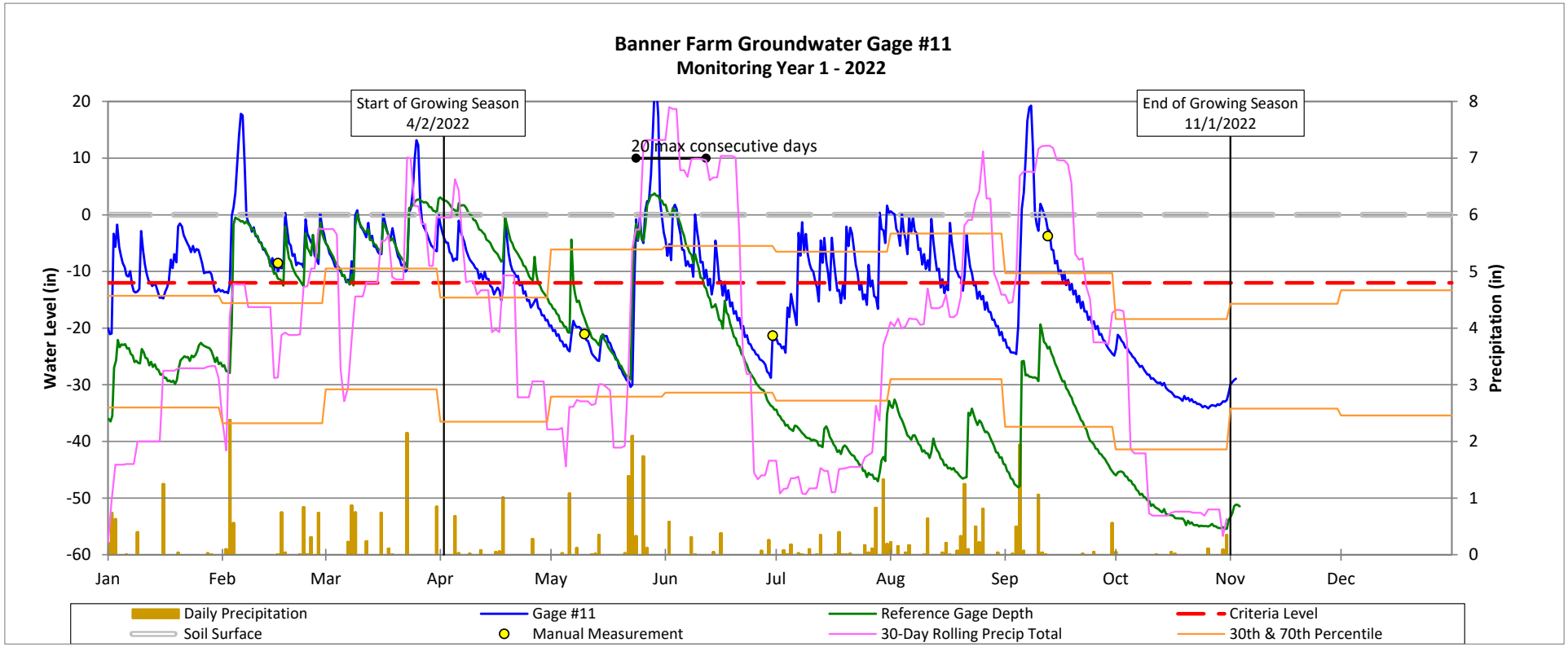
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



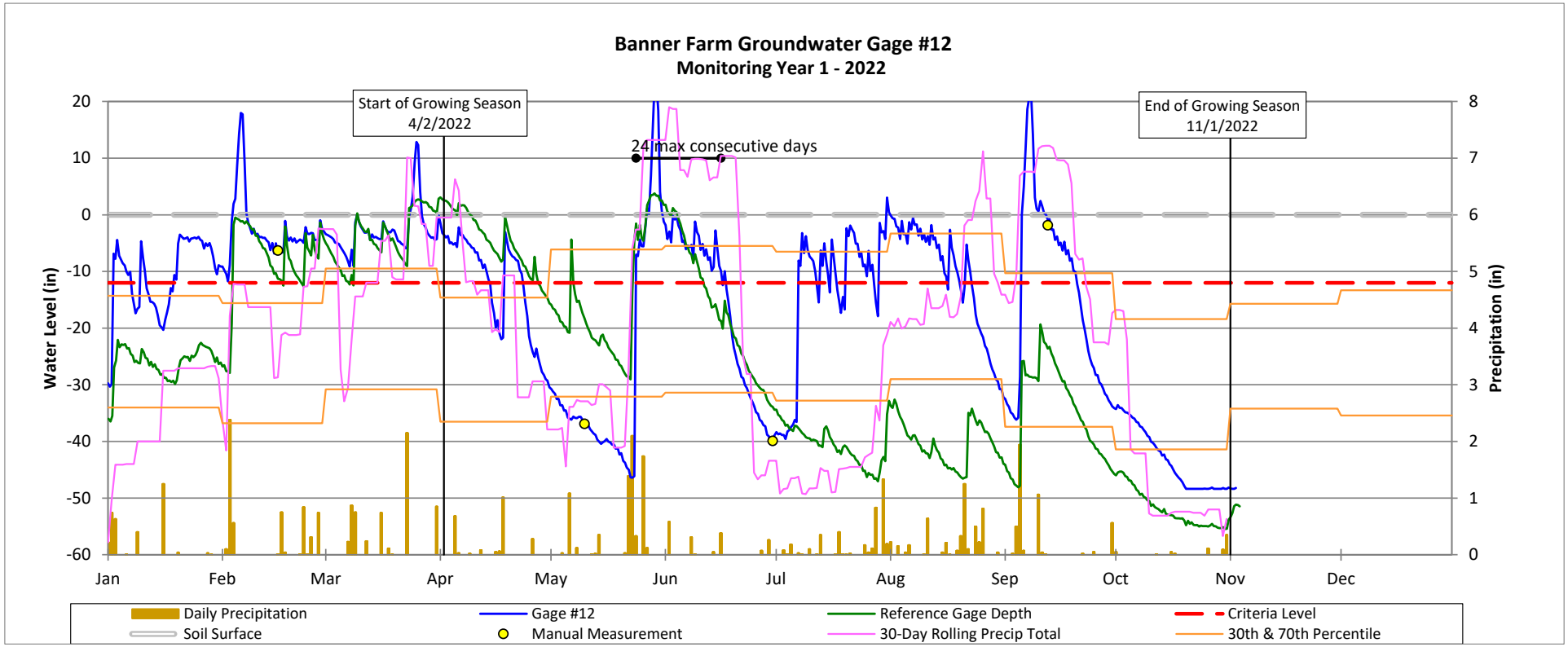
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



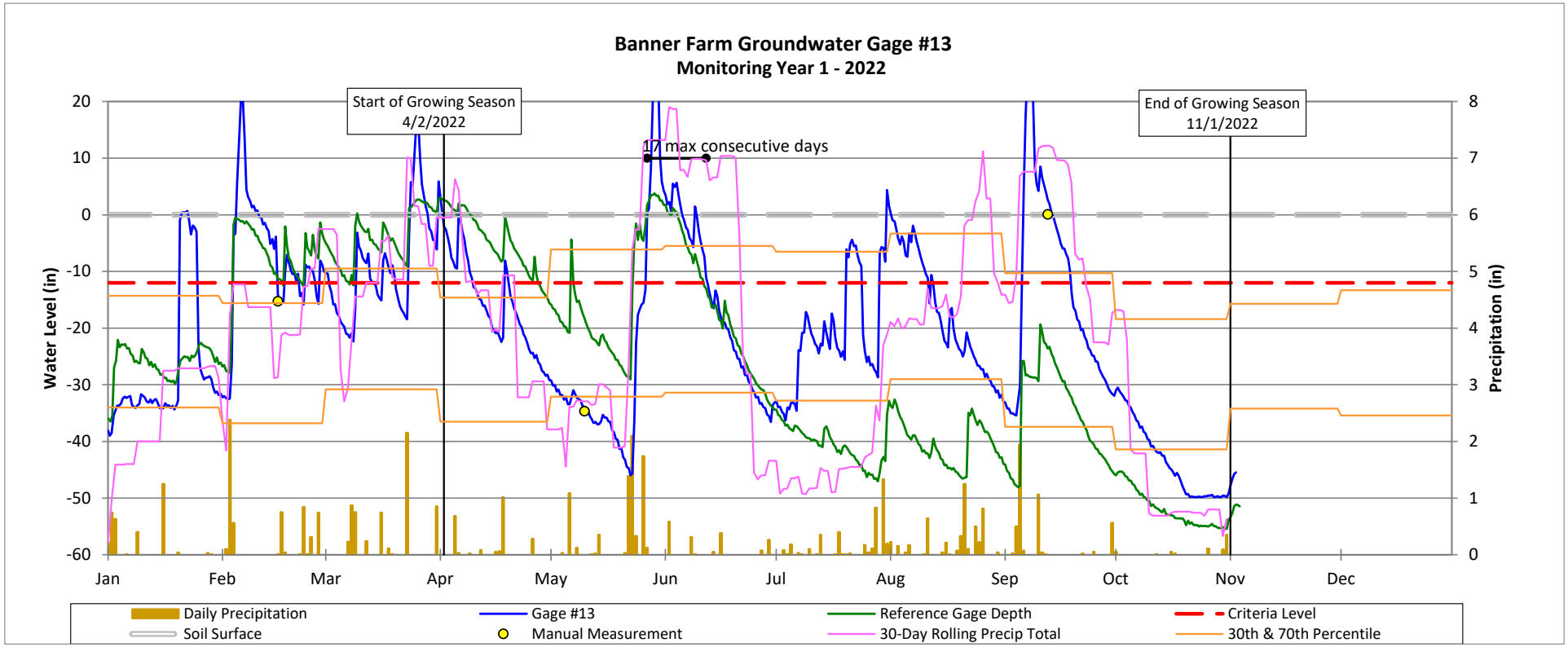
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



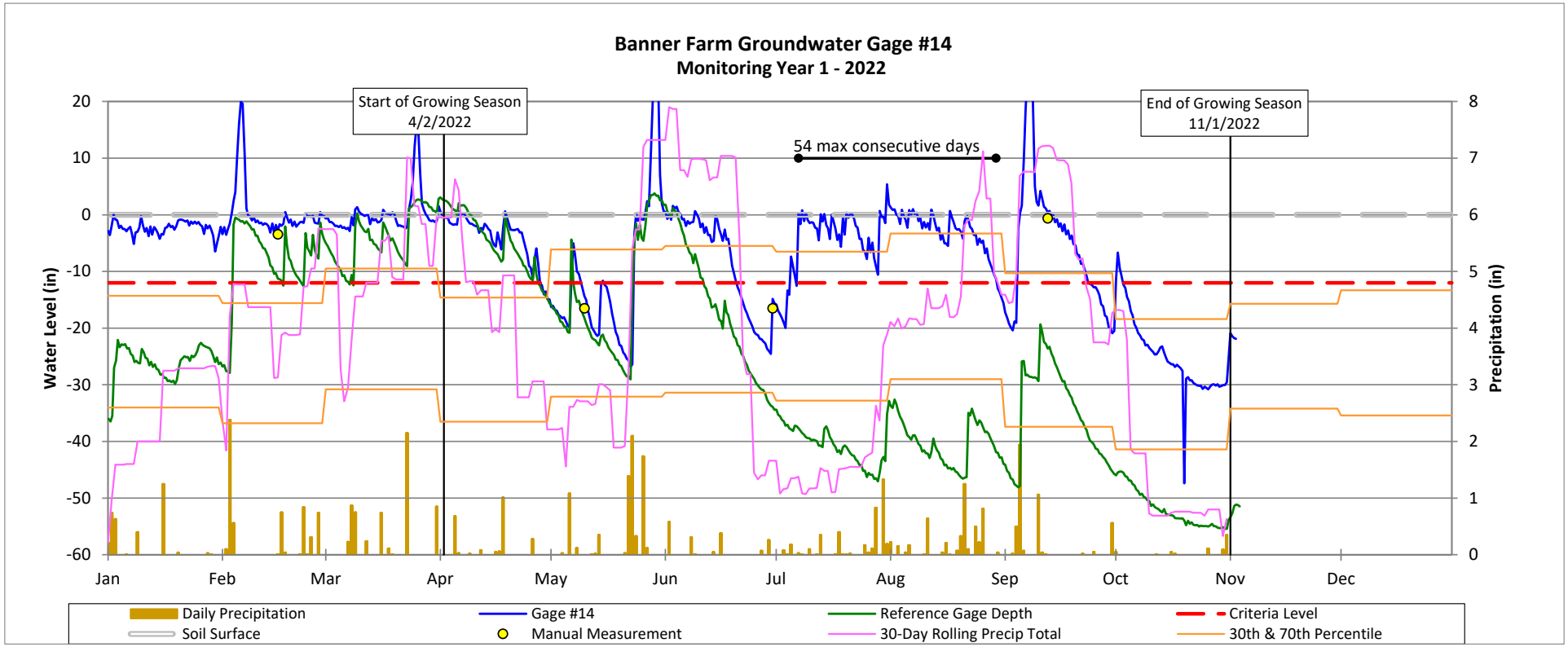
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



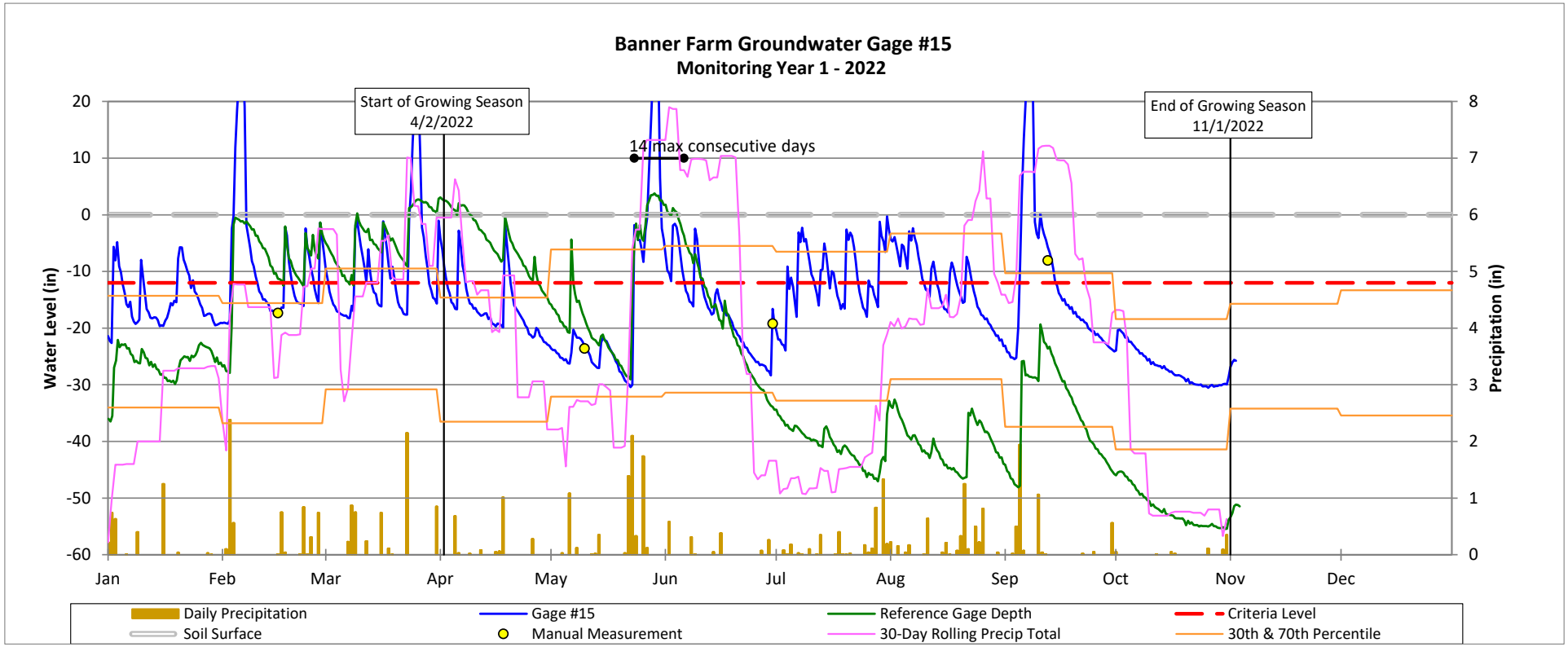
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



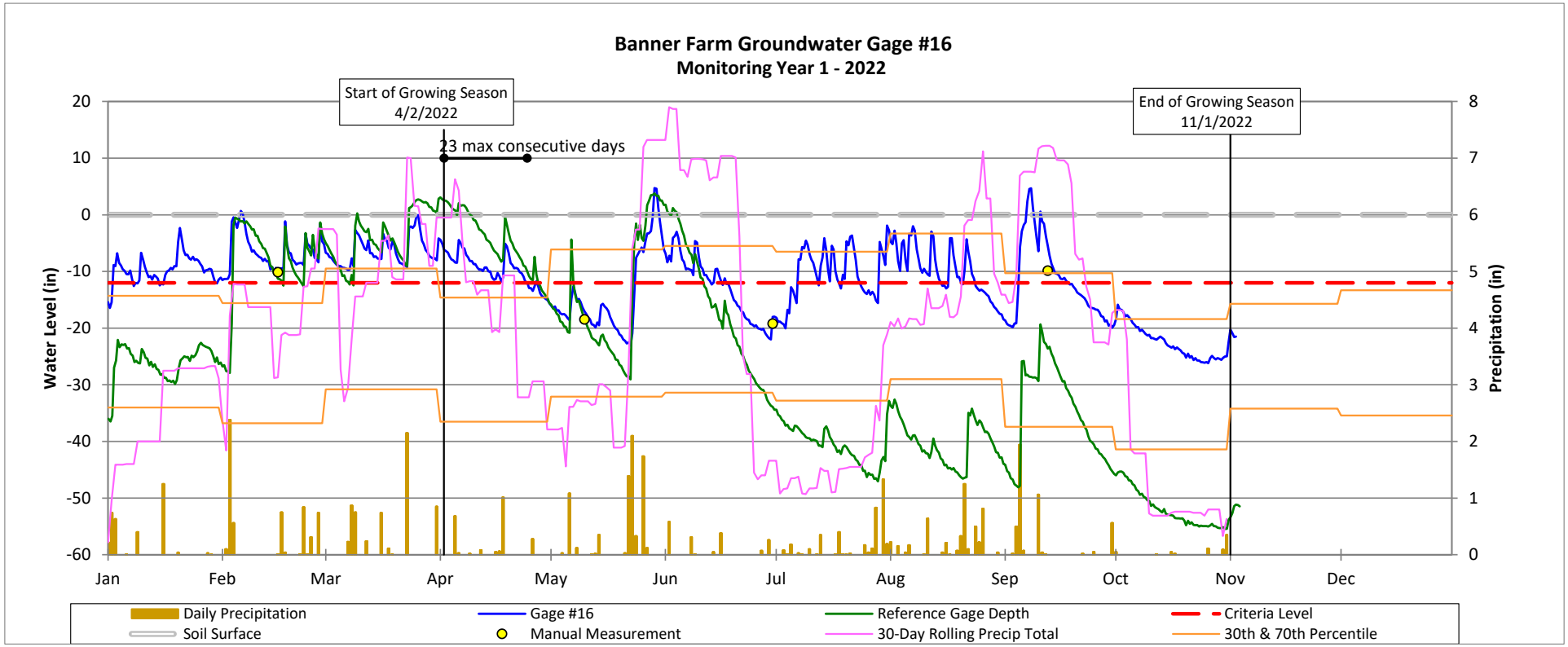
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



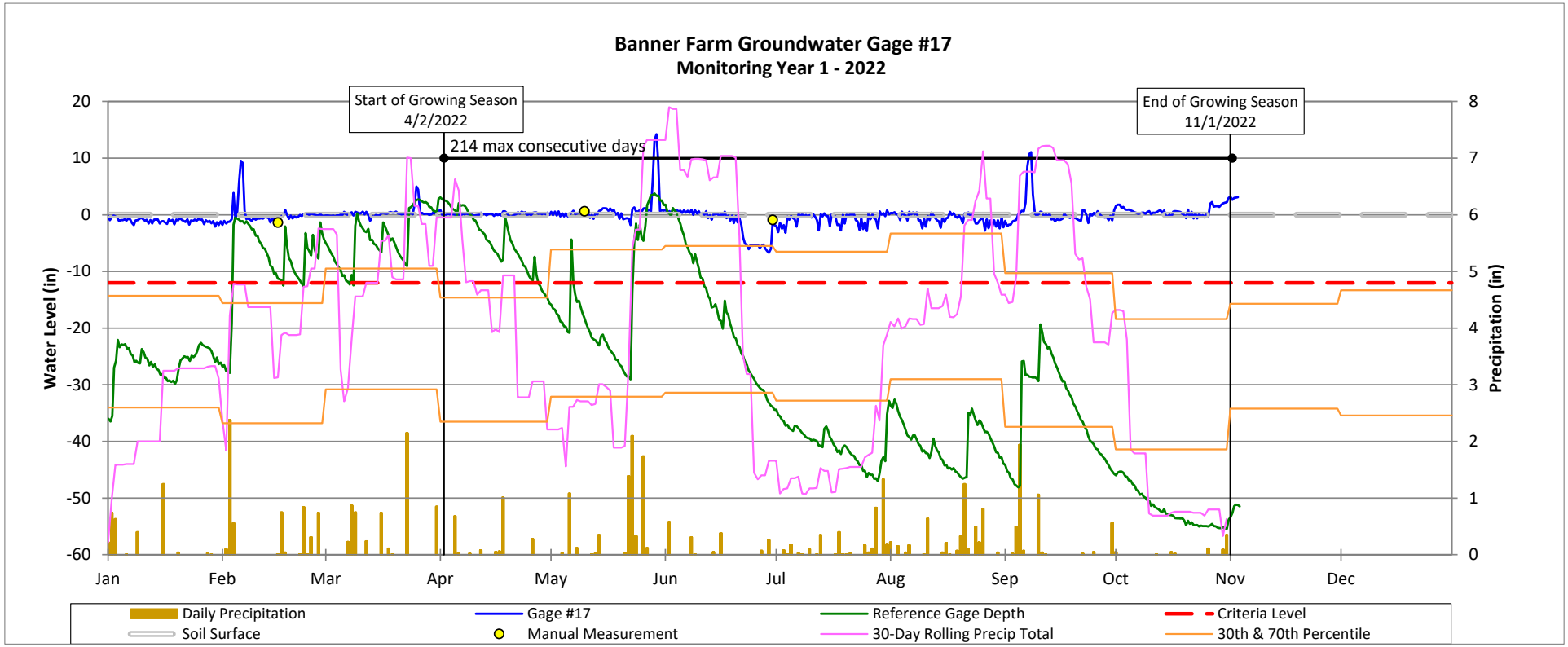
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Re-establishment



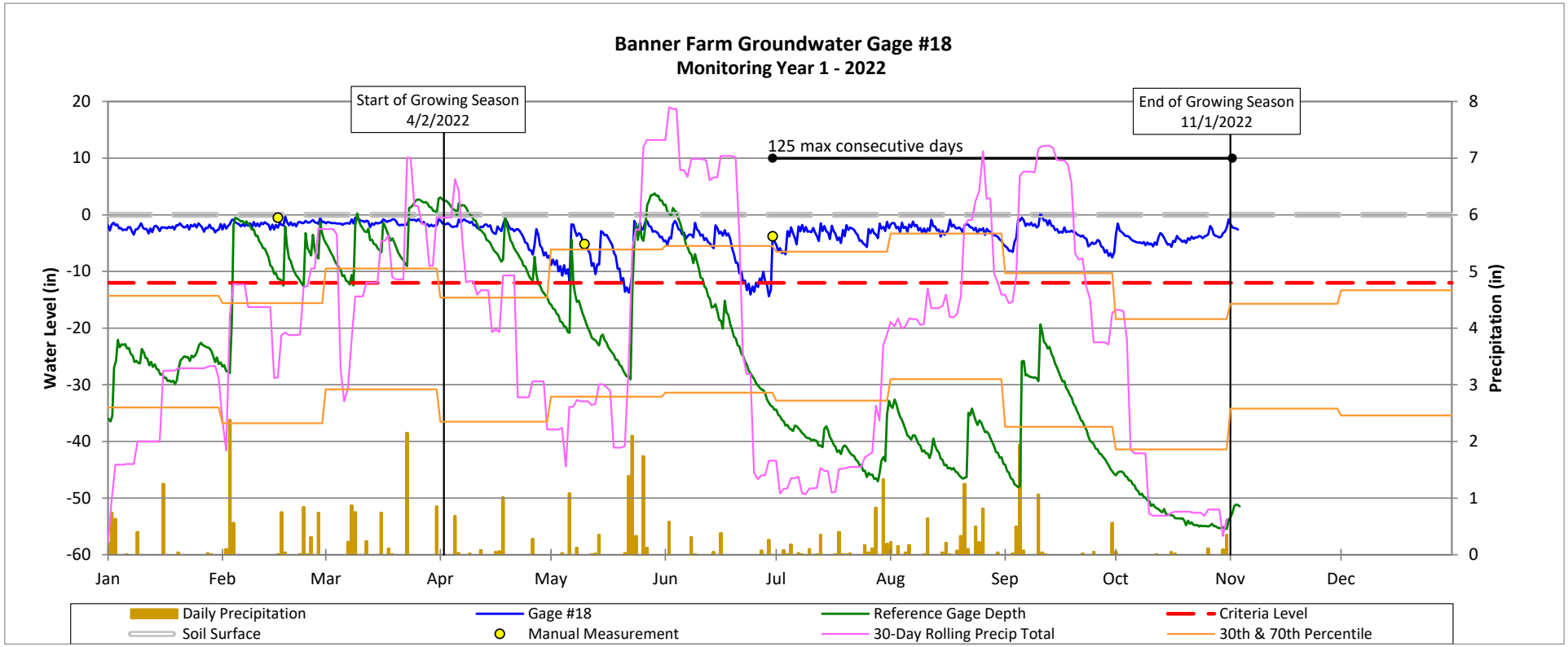
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Rehabilitation



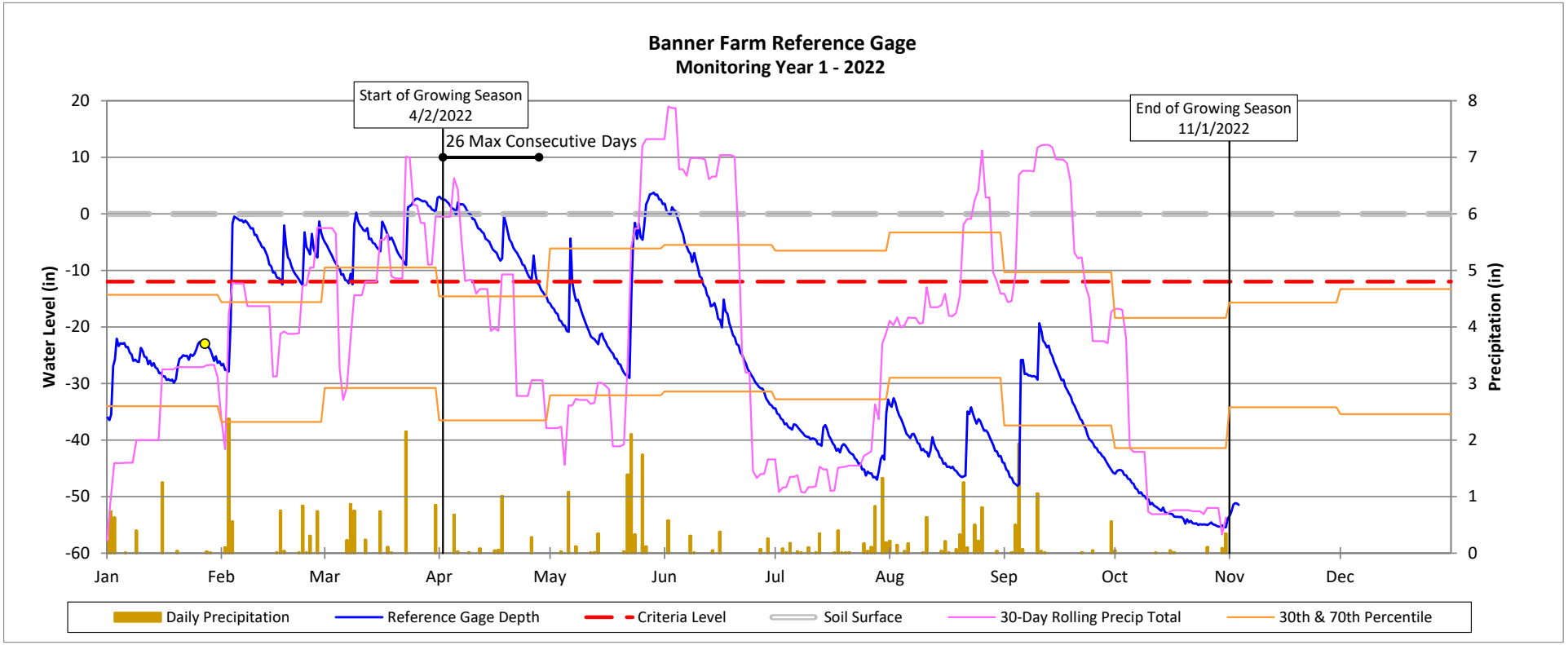
Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Wetland Rehabilitation



Groundwater Gage Plot

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022
Reference Wetland



APPENDIX E. Project Timeline and Contact Information

Table 13. Project Activity and Reporting History

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Activity or Deliverable		Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted		N/A	April 2018
Mitigation Plan Approved		June 2020	June 2020
Construction (Grading) Completed		N/A	November 2021
Planting Completed		N/A	February 2022
As-Built Survey Completed		February 2022	February 2022
Baseline Monitoring Document (Year 0)	Stream Survey	February - March 2022	April 2022
	Vegetation Survey	February 2022	
Invasive species treatments		May, September, October 2022	November 2022
Stream Repair		October 2022	October 2022
Supplemental herbaceous plug planting		September 2022	September 2022
Conservation easement boundary maintenance		May, September, November 2022	November 2022
Year 1 Monitoring	Stream Survey	October 2022	November 2022
	Vegetation Survey	September 2022	
Year 2 Monitoring	Stream Survey		
	Vegetation Survey		
Year 3 Monitoring	Stream Survey		
	Vegetation Survey		
Year 4 Monitoring			
Year 5 Monitoring	Stream Survey		
	Vegetation Survey		
Year 6 Monitoring			
Year 7 Monitoring	Stream Survey		
	Vegetation Survey		

Table 14. Project Contact Table

Banner Farm Mitigation Site
DMS Project No. 100062
Monitoring Year 1 - 2022

Designer Eric Neuhaus, PE	**Wildlands Engineering, Inc.** 167-B Haywood Rd. Asheville, NC 28806 828-774-5547
Construction Contractor	**Main Stream Earthwork, Inc.** 631 Camp Dan Valley Rd Reidsville, NC 27320
Monitoring Performers Monitoring, POC	**Wildlands Engineering, Inc.** Kristi Suggs 704-332-7754 x 110

To: DMS Technical Workgroup, DMS operations staff

From: Periann Russell, Division of Mitigation Services (DMS)

RE: Pebble count data requirements

Date: October 19, 2021

The DMS Technical Work Group met September 29, 2021 to discuss Interagency Review Team (IRT) and DMS requirements for collecting pebble count data as part of monitoring (MY0-MYx). Agreement was reached between all attending parties that pebble count data will not be required during the monitoring period for all future projects.

Sediment data and particle distribution will still be required for the mitigation plan as part of the proposed design explanation and justification.

Pebble counts and/or particle distributions currently being conducted by providers for annual monitoring may be discontinued at the discretion of the DMS project manager. If particle distribution was listed as a performance standard in the project mitigation plan, the provider is required to communicate the intent to cease data collection with the DMS project manager. The absence of pebble count data in future monitoring reports where pebble count data was listed as part of monitoring in the mitigation plan must be documented in the monitoring report. The September 29, 2021 Technical Work Group meeting may be cited as the source of the new policy.

The IRT reserves the right to request pebble count data/particle distributions if deemed necessary during the monitoring period.

Kristi Suggs

From: Reid, Matthew <matthew.reid@ncdenr.gov>
Sent: Wednesday, October 27, 2021 1:26 PM
To: Kristi Suggs
Cc: Mimi Caddell
Subject: RE: [External] FW: Pebble Count Data Requirements

I am absolutely OK with not doing pebble counts anymore!

As stated in the memo, please add a statement in the monitoring reports citing the policy.

Thanks!

Matthew Reid
Project Manager – Western Region
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-231-7912 Mobile
matthew.reid@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Dr
Suite 102
Asheville, NC 28801

From: Kristi Suggs [mailto:ksuggs@wildlandseng.com]
Sent: Wednesday, October 27, 2021 1:24 PM
To: Reid, Matthew <matthew.reid@ncdenr.gov>
Cc: Mimi Caddell <mcaddell@wildlandseng.com>
Subject: [External] FW: Pebble Count Data Requirements

Matthew,

Jason Lorch in our Raleigh Office forwarded this meeting memo to me. It says that conducting pebble counts for DMS monitoring (MY0 – MY7) projects is no longer needed as long as it has been okayed by the DMS PM. Moving forward, are you going to allow us to stop doing them on your projects? If so, will DBB projects be treated the same? Please let me know. Thank you!

Kristi

Kristi Suggs | *Senior Environmental Scientist*
O: 704.332.7754 x110 **M**: 704.579.4828

Wildlands Engineering, Inc.
1430 S. Mint St, Suite 104
Charlotte, NC 28203

From: Jason Lorch <jlorch@wildlandseng.com>
Sent: Monday, October 25, 2021 9:05 AM
To: Kristi Suggs <ksuggs@wildlandseng.com>
Subject: FW: Pebble Count Data Requirements

FYI!

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

From: Russell, Periann <periann.russell@ncdenr.gov>
Sent: Thursday, October 21, 2021 10:05 AM
To: King, Scott <Scott.King@mbakerintl.com>; Catherine Manner <catherine@waterlandsolutions.com>; Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>; adam.spiller@kci.com; Brad Breslow <bbreslow@res.us>; Davis, Erin B <erin.davis@ncdenr.gov>; gginn@wolfcreekeng.com; grant lewis <glewis@axiomenvironmental.org>; Jeff Keaton <jkeaton@wildlandseng.com>; katie mckeithan <Katie.McKeithan@mbakerintl.com>; Kayne Van Stell <kayne@waterlandsolutions.com>; Kevin Tweedy <ktweedy@eprusa.net>; Reid, Matthew <matthew.reid@ncdenr.gov>; Ryan Smith <rsmith@lmgroup.net>; Melia, Gregory <gregory.melia@ncdenr.gov>; Allen, Melonie <melonie.allen@ncdenr.gov>; Famularo, Joseph T <Joseph.Famularo@ncdenr.gov>; Rich@mogmit.com; Bryan Dick <Bryan.Dick@freese.com>; Ryan Medric <rmedric@res.us>; Kim Browning <Kimberly.D.Browning@usace.army.mil>; Kayne Van Stell <kayne@waterlandsolutions.com>; Worth Creech <worth@restorationsystems.com>; Jason Lorch <jlorch@wildlandseng.com>
Cc: Crocker, Lindsay <Lindsay.Crocker@ncdenr.gov>; Wiesner, Paul <paul.wiesner@ncdenr.gov>; Tsomides, Harry <harry.tsomides@ncdenr.gov>; Reid, Matthew <matthew.reid@ncdenr.gov>; Dow, Jeremiah J <jeremiah.dow@ncdenr.gov>; Horton, Jeffrey <jeffrey.horton@ncdenr.gov>; Ullman, Kirsten J <Kirsten.Ullman@NCDENR.gov>; Ackerman, Anjie <anjie.ackerman@ncdenr.gov>; Blackwell, Jamie D <james.blackwell@ncdenr.gov>; Xu, Lin <lin.xu@ncdenr.gov>; Mir, Danielle <Danielle.Mir@ncdenr.gov>; Corson, Kristie <kristie.corson@ncdenr.gov>; Russell, Periann <periann.russell@ncdenr.gov>; Sparks, Kimberly L <Kim.sparks@ncdenr.gov>
Subject: Pebble Count Data Requirements

Please review the attached memo documenting the agreed upon policy for pebble count data requirements.
Please reply (me only) to this email if accept that this memo represents (or misrepresents) our discussion on Sept 29.
Thank you.

Periann Russell
Geomorphologist
Division of Mitigation Services, Science and Analysis
NC Department of Environmental Quality

919 707 8306 office
919 208 1426 mobile
periann.russell@ncdenr.gov

Mailing: 1652 Mail Service Center Raleigh, NC 27699-1652
Physical: 217 West Jones Street Raleigh, NC 27603

From:	Eric Neuhaus
To:	Browning, Kimberly D CIV USARMY CESAW (USA); Wiesner, Paul
Cc:	Reid, Matthew; Allen, Melonie; jim.stanfill@ncdenr.gov; Beth.Harmon@ncdenr.gov; Tugwell, Todd J CIV USARMY CESAW (USA); Haywood, Casey M CIV MVP; Davis, Erin B; Wilson, Travis W.; Leslie, Andrea J; Bowers, Todd; Crumbley, Tyler A CIV USARMY CESAW (USA); Fennel, Tommy E CIV USARMY CESAW (USA); Mimi Caddell; Joe Lovenshimer
Subject:	RE: Notice of Initial Credit Release/ NCDMS Banner Farm Mitigation Site/ SAW-2018-01153/ Henderson County
Date:	Friday, July 29, 2022 10:44:39 AM
Attachments:	image001.png

Kim,

Please see WEI's responses in blue to the As-Built/MY0 review comments of the Banner Farm Mitigation Site (SAW-2018-01153). Comments and the below responses will be included with the MY1 submittal within the Appendices. If there are questions, please advise.

Thanks,

Eric Neuhaus, PE | *Water Resources Engineer*
O: 828.774.5547 x105 **M**: 865.207.8835

Note: IRT is not requesting a site visit at this time but has requested to schedule a site visit early in MY2.

USACE Comments, Kim Isenhour:

1. It appears like numerous changes were made to the profile and riffles to protect existing trees. Throughout monitoring, please make visual observations on the viability of those trees that were protected during construction. I'm just curious of the effects of heavy construction equipment on the tree roots.
    - Wildlands will visually observe and note the health/viability of the trees along Banner Creek Reach 1 in the MY1 Report.
2. Wetland grading sheets 2.3 & 2.4: I agree with DWR's comment #3 below and would add that in addition to horse tape, I would suggest a more long-term solution, such as additional sign posts or fencing, considering it's adjacent to a road.
    - Additional marking, including T-posts along with large PVC extensions and signage have been installed on the road to prevent encroachment. The horse tape installed along the road further delineates the boundary and should prevent encroachment. Additionally, there is generally a buffer of a few feet between the road path and the easement boundary.
3. In the open area planting zone, you replaced sweet birch with silver maple. IRT comments in the mitigation plan suggested that this species should not be on the planting list because it's known to be invasive.
    - Silver Maple was removed from the planting plan but was included in the alternate planting list so it could be counted as a volunteer during monitoring. Planting staff were told if species were not available at the time of planting, they could substitute with approved species on the alternate list. It should have been communicated that they could use all alternatives except the Silver Maple. Wildlands will continue to observe the site an ensure Silver Maples that were planted do not begin to become invasive at

the Site.

4. Please try to capture some of the wetland rehabilitation area north of UT1 in a mobile plot at least once during MY2 or MY3.
    - Wildlands will make note capture some of the planted wetland rehabilitation area north of UT1 with a mobile plot during MY2 or MY3.
5. Since the site photos were taken in mid-February, when the site it likely wet, it's unclear how long is there standing water. Will these areas be herbaceous-dominated, and do you plan to plant them?
    - There is one isolated area of standing water at the site (unplanted area shown on Sheet 3.2). It is anticipated that this area will have mostly herbaceous cover, however Wildlands is planning to plant woody species, largely shrubs and subcanopy species, and wetland plugs in this area as the inundation level recedes and conditions allow. An update will be provided in the MY1 report.

-

-

NCDWR Comments, Erin Davis:

1. Sheet 1.1.3 shows the Sta. 11+78 stabilization outlet in the middle of the floodplain. Please confirm this location.
    - The location shown is correct. There is a small ditch feature that outlets from the adjacent property through the floodplain and into the conservation easement. The outlet protection was placed where the bench transitions down to the active floodplain. This is the steepest portion of the drainage and is most at risk for erosion based on site evaluation during construction. An outlet was added to prevent any potential head-cutting up the floodplain feature.
2. Was the standing water area seeded with the wetland seed mix during construction? DWR requests that this area be planted prior to MY3 if it is still proposed for wetland credit. If bareroot trees are not appropriate based on the inundation duration and depth.
    - The standing water area was seeded with the wetland seed mix when conditions allowed. Wildlands is planning to plant woody and herbaceous species within this area as the inundation level recedes and conditions allow. Woody species will largely be shrubs and subcanopy trees. This planting will be informed by the floodplain pool community type (Schafale, 2022). An update will be provided in the MY1 report.
3. DWR recommends considering flood- tolerant shrub species, live whips (4-6'+ long), and/or herbaceous wetland plugs. Also, please track the general perimeter of open water area(s) during monitoring.
    - It is anticipated that this area will have mostly herbaceous cover, however Wildlands is planning to plant woody species within this area as the inundation level recedes and conditions allow. An update will be provided in the MY1 report.
4. On paper, the constructed road bordering the conservation easement is concerning from a long-term management and future encroachment risk perspective. It appears that the easement signs would be located on the road edge. Is Stewardship comfortable with the easement and road sharing a boundary without any offset? From a crediting perspective, DWR is particularly concerned where wetland credit and the constructed road both abut the easement line. Was a credit area offset from the easement line considered to mitigate the risk to wetland assets?

Additional marking, including T-posts along with large PVC extensions and signage have been installed on the road to prevent encroachment. The horse tape installed along the road further delineates the boundary and should prevent encroachment. Additionally, there is generally a buffer of a few feet between the road path and the easement boundary. A credit offset from the easement line was implemented along most credited wetland areas. Areas where credit and easement are closest will be observed during monitoring and additional marking will be added in these areas as necessary.

5. DWR appreciates the species diversity shown within and across the veg plots. It's also helpful that alternate species included in the approved plant list were able to be used as substitutions during construction (a good practice for future projects).
6. DWR appreciated the descriptions provided for the construction changes. Also, the number and range of the photos provided were helpful for this review, including the crossings, soils, and wetland area pictures.
7. We were glad to read that the bamboo and reed canary grass invasive were treated prior to construction.

NCWRC Comments, Andrea Leslie:

Ensure that particularly wet areas (e.g., those with standing water in the photos) are planted with species that will survive that hydrologic regime. Note any changes to the planting plan for those areas – e.g., areas dominated by shrubs/herbaceous plugs or herbaceous plugs – and note those areas on maps.

- It is anticipated that this area will have mostly herbaceous cover, however Wildlands is planning to plant this area with woody and herbaceous species as the inundation level recedes and conditions allow. Woody species will largely be shrubs and subcanopy trees. The planted species will be informed by the floodplain pool community type (Schafale, 2022). An update, including any changes to the planting will be provided in the MY1 report and noted on the maps.

USEPA Comments, Todd Bowers:

According to Wildlands, site construction was completed in November 2021. The as-built and MY0 data collection was conducted between December 2021 and March 2022. The Site's construction planting was completed on 02/15/22. Monitoring device installation and vegetative and substrate data collection were completed by 02/17/2022. River cane planting was completed on 03/02/2022. Overall, use of instream structures at the site was increased during final design and construction based on site conditions and material availability. An additional 13 rock sills, 17 brush toes, 4 cover logs and 6 log sills were installed at the site. The MY0 vegetative survey was completed in February 2022. Three areas of encroachment will be corrected during MY1 maintenance activities. Changes within the planted riparian buffer were minimal and consisted of three species changes and planting density adjustments within the Wetland and Streambank Planting Zones. Overall, the Site appears to be performing as intended, and is on course for meeting success criteria.

The following items or highlights from the As-Build Condition Assessment were noted:

- The average stem density across vegetation plots is 565 planted stems per acre. All 24 permanent and 12 mobile vegetation plots exceeded the interim success criteria individually

and are on track to meet the final success criteria required for MY7

- Morphological surveys conducted throughout the Site show all streams as stable and functioning as designed; no areas of concern.
- 3 automated crest gages were installed along Banner Creek Reach 2, UT1, and UT2 to monitor bankfull events. Hydrologic data will be collected and reported during MY1. 18 groundwater gages and one soil temperature probe were installed across re-establishment, rehabilitation, creation wetland areas. Groundwater gage data will be collected and reported during MY1.
- No adaptive management plan needed at this time.
- There are currently no vegetation areas of concern; no significant presence of invasive species.
- ***** I am not clear on the **credit calculations for Wetland Credits**. The total of wetland credit present during the as-built (Table 1) is only 33.399 WMU based on as-built acreage and credit ratios. Recommend taking another look at this and correcting as needed. Stream totals, while also seemingly miscalculated, end up with the same SMU in the end (as-built feet equals the mitigation plan feet). Stream and wetland crediting is calculated and approved during the mitigation plan phase of the project. Typically, if no major changes are made during construction, the mitigation plan assets are used for as-built crediting in lieu of a mitigation plan addendum.

Overall, I am very satisfied with the report and the work that Wildlands has completed at the site. Having not been able to visit this location, I really appreciated the detailed ground-level stream and veg plot photos to illustrate the amount of work implemented. **I recommend the appropriate credit release (Milestone 2) for cool stream and riparian wetland mitigation units** for this monitoring milestone. I have no other substantial comments at this time.

Please reach out with any questions.
Thanks,
Kim

Kim (Browning) Isenhour
Mitigation Project Manager, Regulatory Division I U.S. Army Corps of Engineers I 919.946.5107

From: Browning, Kimberly D CIV USARMY CESAW (USA)
Sent: Tuesday, June 21, 2022 1:39 PM
To: Tugwell, Todd J CIV USARMY CESAW (USA) <Todd.J.Tugwell@usace.army.mil>; Haywood, Casey M CIV USARMY CESAW (USA); erin.davis@ncdenr.gov; travis.wilson@ncwildlife.org; andrea.leslie@ncwildlife.org; Youngman, Holland J <holland_youngman@fws.gov>; bowers.todd@epa.gov; Brown, David W CIV USARMY CESAW (USA) <David.W.Brown@usace.army.mil>
Cc: Eric Neuhaus <eneuhaus@wildlandseng.com>; Wiesner, Paul <paul.wiesner@ncdenr.gov>; Reid, Matthew <matthew.reid@ncdenr.gov>; Fennel, Tommy E CIV USARMY CESAW (USA) <Tommy.E.Fennel@usace.army.mil>; Crumbley, Tyler A CIV USARMY CESAW (USA) <Tyler.A.Crumbley2@usace.army.mil>; Allen, Melonie <melonie.allen@ncdenr.gov>; Shawn Wilkerson <swilkerson@wildlandseng.com>

Subject: Notice of As-Built Review/ NCDMS Banner Farm Mitigation Site/ SAW-2018-01153/ Henderson County

Hello IRT,

The below referenced FINAL Record Drawing (As-Built) Report review has been requested by NCDMS. Per Section 332.8(o)(9) of the 2008 Mitigation Rule, this review follows the streamlined review process, which requires an IRT review period of 15 calendar days from this email notification. Please provide any comments by 5 PM on the 15-day comment deadline shown below. When providing comments please indicate if your concerns are great enough that you recommend not issuing the credit release. Comments provided after the 15-day comment deadline (shown below) may not be considered.

At the conclusion of this comment period, a copy of all comments will be provided to NCDMS and the NCIRT along with District Engineer's intent to approve or disapprove this Final Record Drawing and initial credit release.

15-Day Comment Start Date: June 22, 2022
15-Day Comment Deadline: July 6, 2022
45-Day Credit Release Approval Deadline: August 5, 2022

2022 is Monitoring Year 1 for this project.

Project information and location of the FINAL As-Built Baseline Monitoring Report (MY0):
Banner Farm Mitigation Site
DMS Project # 100062
RFP# 16-007334 – Issued 9/8/2017
Institution Date: 4/20/2018 – Full Delivery
SAW-2018-01153
DWR# 2018-1032v1
French Broad River Basin
Cataloging Unit 06010105
Henderson County, North Carolina

Mitigation Plan Project Credits:
6,294.000 SMUs (Cool)
33.580 WMUs (Riparian)

As-Built-MY0 Project Credits:
6,294.000 SMUs (Cool)
33.580 WMUs (Riparian)

Mitigation Plan Lengths/ Acreages:
6,294 ft
35.720 ac

As-Built-MY0 Lengths/ Acreages:
6,294 ft
35.511 ac

Please Note: Additional structures were added during construction/final design based on site conditions and material availability. These changes are shown as redlines and are discussed in Section 2.1 of the report. Other than the additional structures, there were no alignment deviations and the project was constructed as designed. There is an ongoing easement issue regarding a constructed farm entrance that is encroaching into the easement in a non-creditable area. This issue is discussed in Section 2.1.8 and is shown clearly on the as-built/redline drawings. WEI is currently working to modify the recorded conservation easement with the State Property Office (SPO). DMS and Stewardship have been involved with the solution process. This property issue should be resolved during MY1.

FD Provider: Wildlands Engineering, Inc. – Contact: Eric Neuhaus, eneuhaus@wildlandseng.com, (865) 207-8835

NCDEQ - DMS PM: Matthew Reid, matthew.reid@ncdenr.gov, (828)-231-7912

FINAL As-Built Baseline Monitoring Report and Record Drawings can be accessed directly on the DMS SharePoint site here:

IRT-DMS SharePoint Page (Updated):
https://ncconnect.sharepoint.com/sites/IRT-DMS/SitePages/Home.aspx

BannerFarm_100062_MY0_2022.pdf
BannerFarm_100062_MY0_2022.pdf

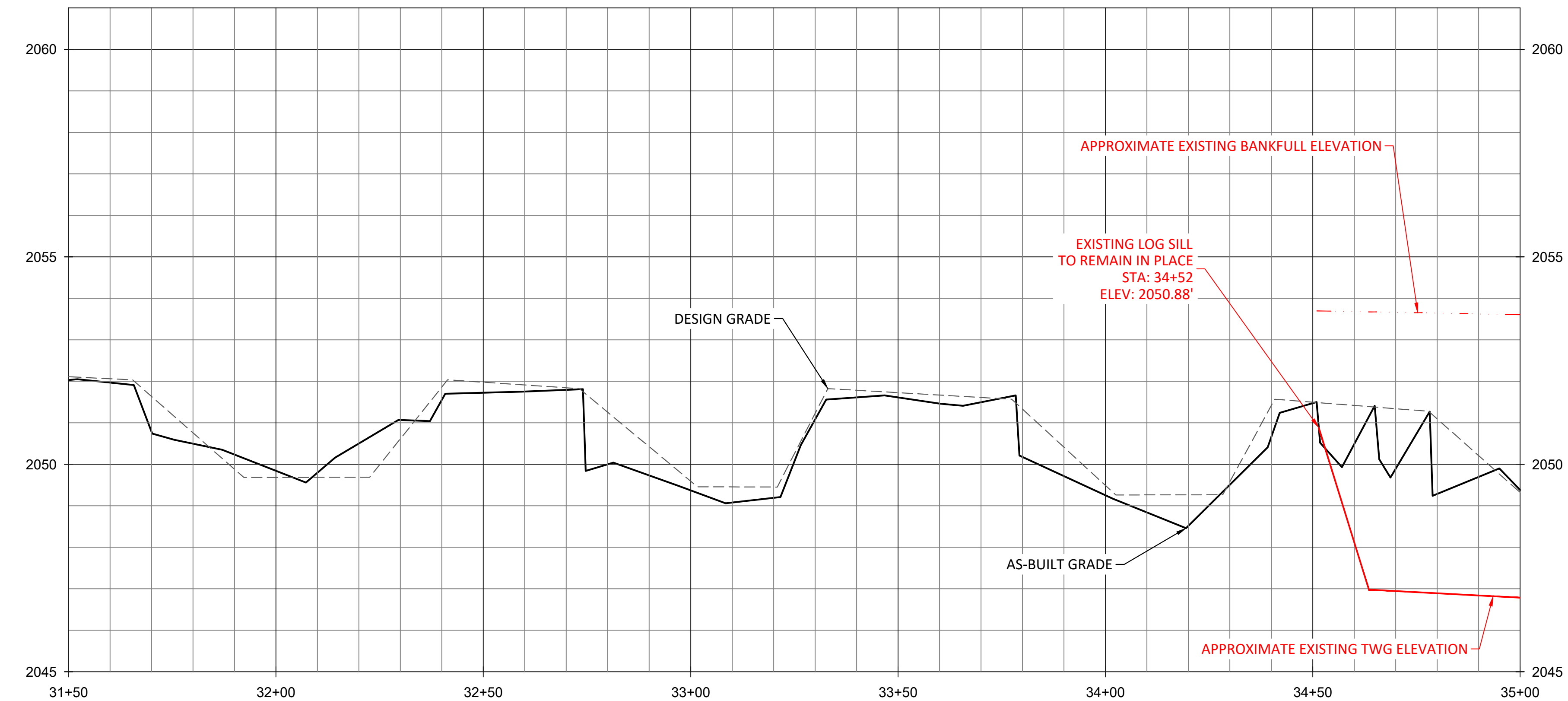
BannerFarm_100062_AB_2022.pdf
BannerFarm_100062_AB_2022.pdf

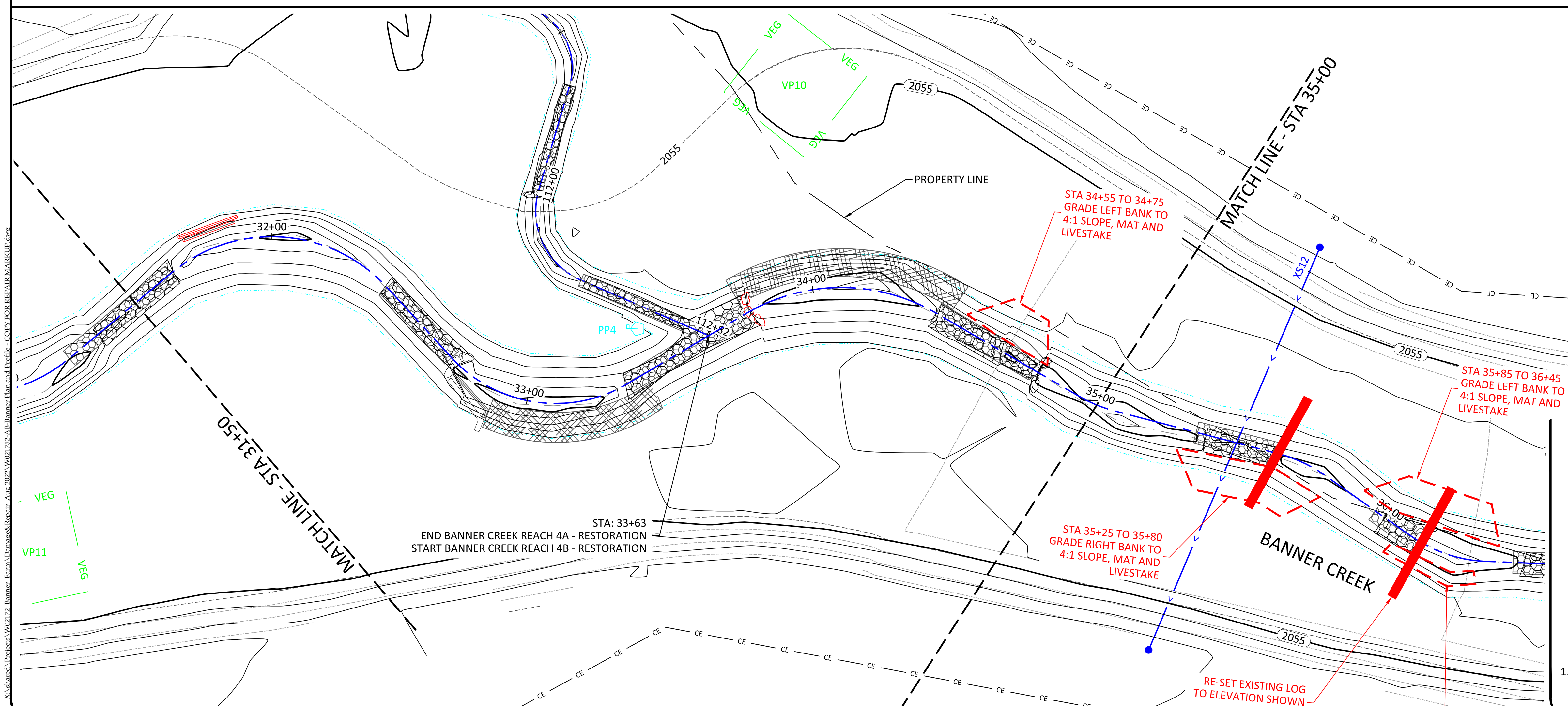
RIBITS:
https://ribits.ops.usace.army.mil/ords/f?p=107:278:16516139017721:::RP,278:P278_BANK_ID:5110

Kim (Browning) Isenhour
Mitigation Project Manager, Regulatory Division I U.S. Army Corps of Engineers I 919.946.5107

APPENDIX F. Other Data

Repair Plans – MY1





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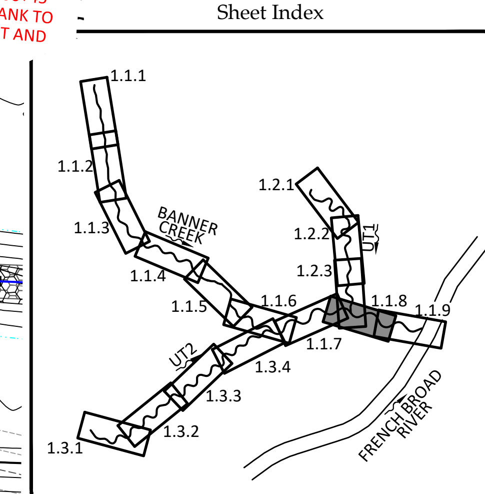

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DRAFT

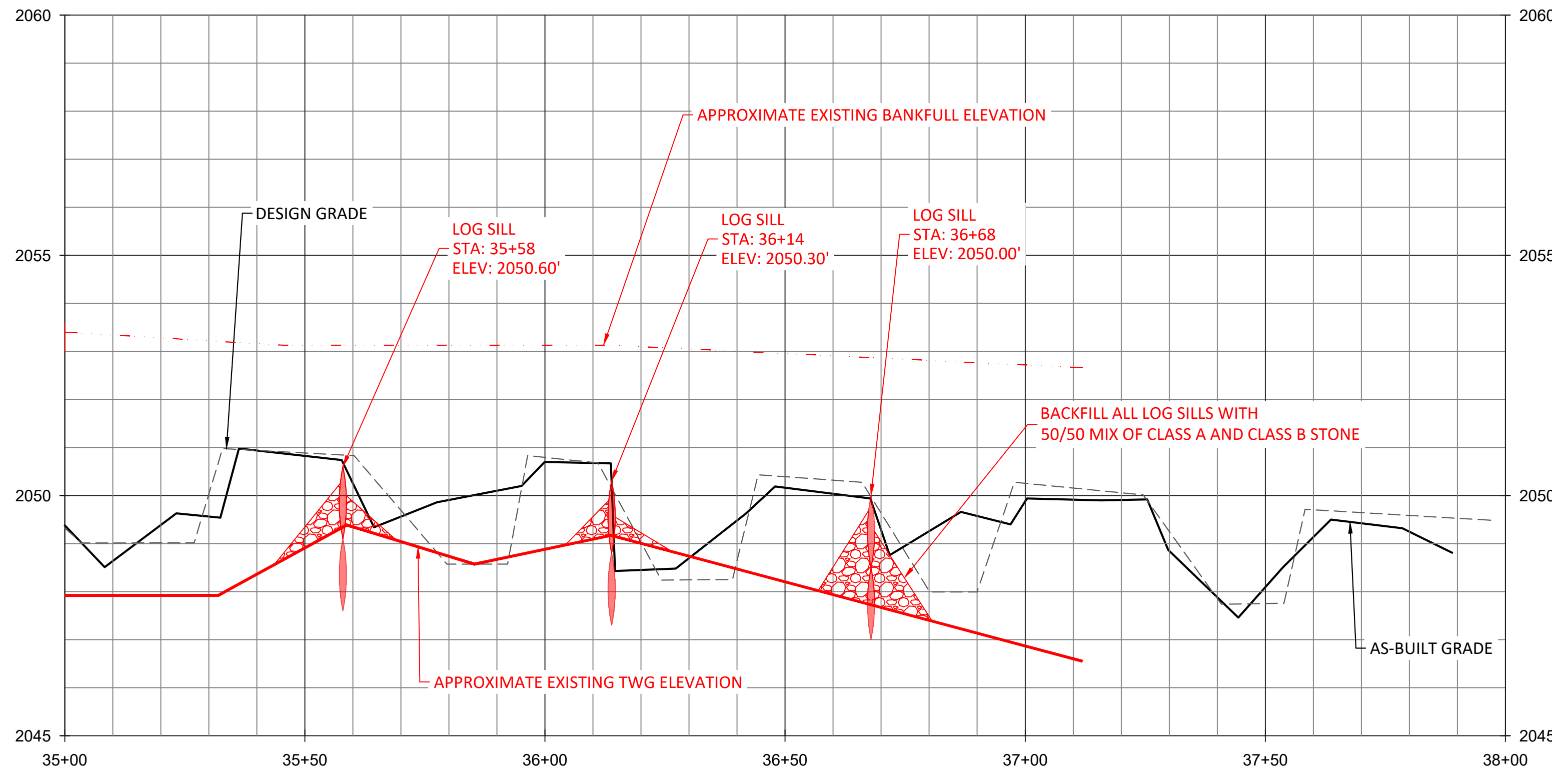
Banner Farm Mitigation Site Record Drawings
Henderson County, North Carolina

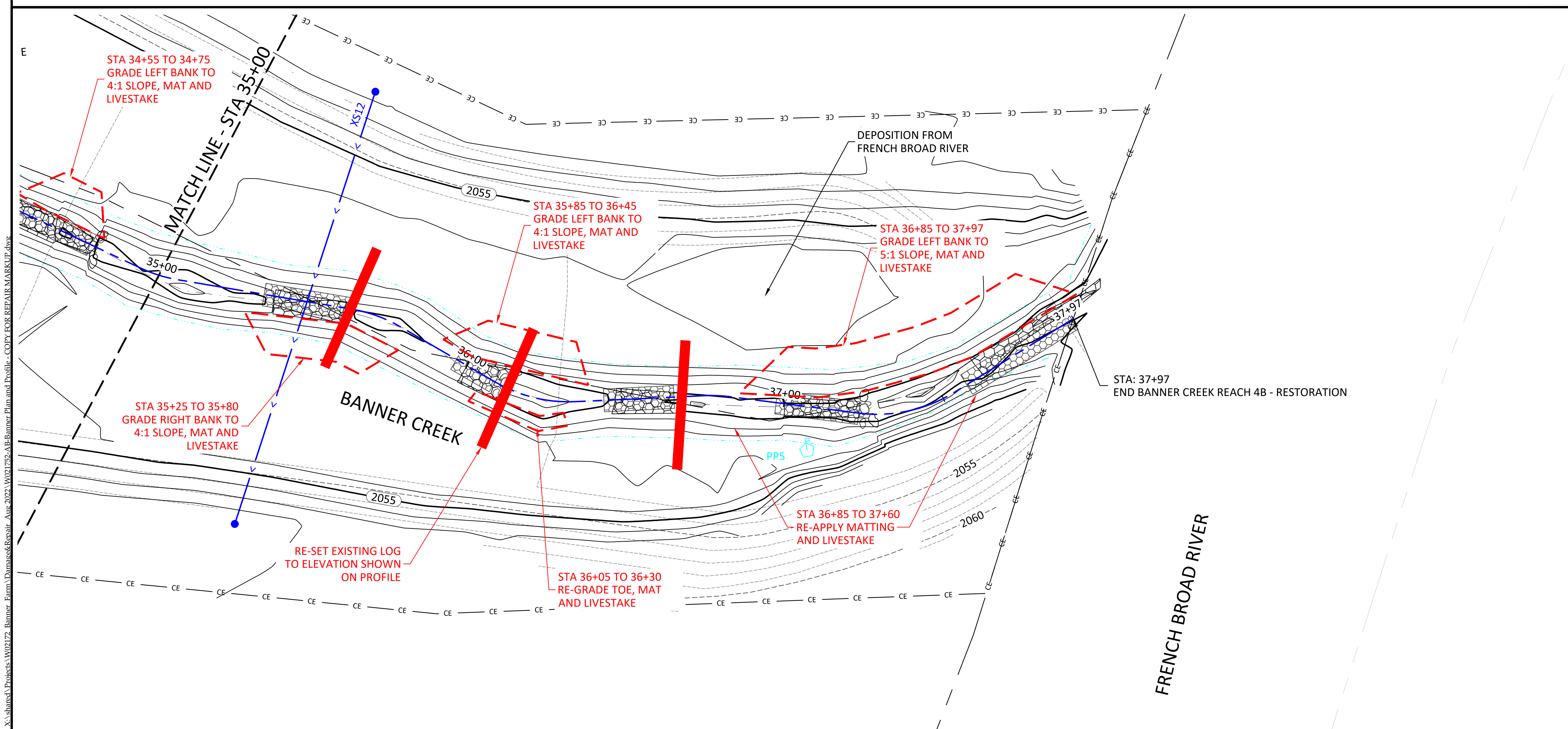
Stream Plan and Profile
Banner Creek

Revisions:

Date:	04-18-22
Job Number:	W021752
Project Engineer:	EN
Drawn By:	JH
Checked By:	JK

Sheet 1.1.8





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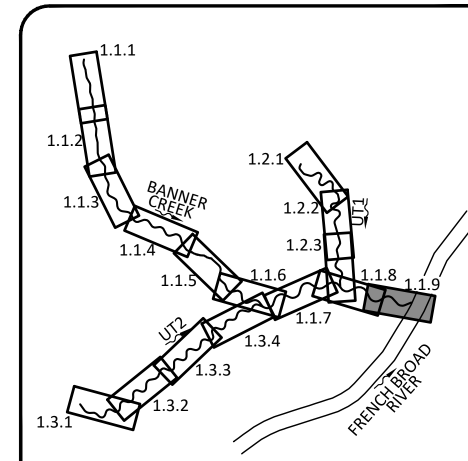

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Sheet 1.1.9

August 30, 2022

Repair Photographs – Banner Creek Reach 4b
MY1

	
Pre-repair: BC R4b, STA 34+55, left bank erosion *(09/22/2022)*	**Post-repair:** BC R4b, STA 34+55, left bank repair *(10/19/2022)*
	
Pre-repair: BC R4b, STA 35+25, bank erosion and bed scour *(09/22/2022)*	**Post-repair:** BC R4b, STA 35+25, structure & bank repair *(10/19/2022)*
	
Pre-repair: BC R4b, STA 35+85, bank scour & structure issue *(09/22/2022)*	**Post-repair:** BC R4b, STA 35+85, structure & bank repair *(10/19/2022)*

	
Pre-repair: BC R4b, STA 37+00, riffle & bank scour *(09/22/2022)*	**Post-repair:** BC R4b, STA 37+00, riffle & bank repair *(10/19/2022)*