MONITORING YEAR 2 ANNUAL REPORT
FINAL

January 2023

SANDY BRANCH MITIGATION SITE
Chatham County, NC
Cape Fear River Basin
HUC 03030003

DMS Project No. 100060
NCDEQ Contract No. 7527
USACE Action ID No. SAW-2018-01167
NCDWR Project No. 2018-0786

Data Collection Period: January-November 2022

DMS RFP No. 16-007331

PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
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SANDY BRANCH MITIGATION SITE

Monitoring Year 2 Annual Report

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

Section 1: PROJECT OVERVIEW

The Sandy Branch Mitigation Site (Site) is located in Chatham County, approximately seven miles southeast of Siler City, NC in the Cape Fear River Basin 8-Digit Hydrologic Unit Code (HUC) 03030003. The Site involves re-establishing a stream and wetland complex utilizing stream restoration, wetland re-establishment, and wetland rehabilitation approaches. The Site is located within the DMS Targeted Local Watershed (TLW) for the Cape Fear River Basin HUC 03030003070050 (Bear Creek TLW) and the NC DWR Subbasin 03-06-12. The Sandy Branch Mitigation Site is one of the projects identified in the Upper Rocky River Local Watershed Plan as a priority for stream and wetland restoration.

1.1 Project Quantities and Credits

A conservation easement was recorded on 18.10 acres and was fenced prior to construction (Figure 1). Mitigation work within the Site included 3,286 linear feet of perennial stream channel restoration and 8.540 acres of wetland re-establishment and rehabilitation. The project is expected to provide 3,286.000 stream credits and 7.267 wetland credits at closeout.

Table 1. Project Mitigation Quantities and Credits

Project Components							
Project Segment	**Mitigation Plan Footage/ Acreage**	**As-Built Footage/ Acreage**	**Mitigation Category**	**Restoration Level**	**Mitigation Ratio (X:1)**	**Credits**	**Comments**
Stream							
Sandy Branch R1	861	849	Warm	R	1	861.000	Full Channel Restoration, Planted Buffer, Fencing Out Livestock
	40	40	Warm	N/A	N/A	N/A	External Crossing, Culvert
	110	104	Warm	R	1	110.000	Full Channel Restoration, Planted Buffer, Fencing Out Livestock
Sandy Branch R2	1,929	1,919	Warm	R	1	1,929.000	
UT1	131	125	Warm	R	1	131.000	
UT2	255	254	Warm	R	1	255.000	
					Total:	**3,286.000**	
Wetland							
Re-establishment	N/A	4.721	Riparian	R	1.000	4.721	
Rehabilitation	3.819	3.819	Riparian	RE	1.500	2.546	
					Total:	**7.267**	

Project Credits		
Restoration Level	**Stream - Warm**	**Riparian Wetland - Riverine**
Restoration	3,286.000	
Re-establishment		4.721
Rehabilitation		2.546
Totals	**3,286.000**	**7.267**

1.2 Project Goals and Objectives

The project is intended to provide numerous ecological benefits within the Cape Fear River Basin. While benefits such as habitat improvement and geomorphic stability are limited to the Site, reduced nutrient and sediment loading have farther reaching effects. Table 2 below describes expected outcomes to water quality and ecological processes associated with the project goals and objectives. These goals were established and completed with careful consideration of goals and objectives described in the River Basin Restoration Priorities and to meet the DMS mitigation needs while maximizing the ecological and water quality uplift within the watershed.

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Monitoring Results
Improve the stability of stream channels	Reconstruct stream channels that will maintain stable pattern and profile considering hydrologic and sediment inputs to the system, landscape setting, and the watershed conditions.	Reduce sediment inputs from bank erosion. Contribute to protection of, or improvement to, a Nutrient-Sensitive Water.	Entrenchment ratios remaining above 2.2 and bank height ratios remaining below 1.2, coarser material in riffles and finer material in pools, and progression towards stability shown in visual inspections.	Cross-section monitoring will be assessed during MY1, MY2, MY3, MY5, and MY7 and visual inspections will be assessed annually.	No deviations from design.
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 channels, hydrate adjacent wetland areas, and filter pollutants from overbank flows.	Four bankfull events in separate years within monitoring period.	Crest gauges and/or pressure transducers recording flow elevations.	Two bankfull events were recorded during MY2.
Improve instream habitat	Install habitat features such as constructed riffles, lunker logs, and brush toe into restored streams. Add woody material to channel beds. Construct pools of varying depths.	Improve aquatic communities in project streams.	There is no required performance standard for this metric.	N/A	N/A

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Monitoring Results
Restore wetland hydrology, soils, and plant communities	Re-establish and rehabilitate riparian wetlands by raising stream beds and planting native wetland species.	Improve terrestrial habitat. Contribute to protection of, or improvement to, a Nutrient-Sensitive Water.	Free groundwater surface within 12 inches of the ground surface for 10% (27 days) of the growing season under normal precipitation conditions.	12 groundwater gauges equipped with pressure transducers are located in representative wetland areas and monitored annually. Two additional gauges were installed during MY2 per IRT request.	11 out of 12 groundwater gauges had groundwater within 12 inches of the ground surface for 10.0% (27 days) of the growing season consecutively. Two additional gauges were added per an IRT request.
Restore and enhance native floodplain vegetation	Plant native tree species in riparian zones where currently insufficient.	Reduce/control sediment inputs, reduce/manage nutrient inputs, provide canopy to shade streams and reduce thermal loadings, contribute to protection of, or improvement to, a Nutrient-Sensitive Water.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7. Planted stems must average at least seven feet in height in each plot at the end of MY5 and 10 feet in height in each plot by the end of MY7.	One hundred square meter vegetation plots are placed on 2% of the planted area of the Site and monitored during MY1, MY2, MY3, MY5, and MY7.	All 13 vegetation plots have a planted stem density greater than 320 stems per acre.
Permanently protect the project site from harmful uses	Establish conservation easements and fence the Site.	Prevent development and agricultural uses that would damage the Site or reduce the benefits of the project.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	No easement encroachments.

1.3 Project Attributes

The Site is located on a single parcel bounded by Elmer Moore Road on the northern edge and other agricultural parcels to the east, south, and west. Prior to restoration, the Site was an active livestock operation characterized by extensively grazed pasture, minimal riparian vegetation, and project streams functioning as the primary water source for livestock. The streams and riparian buffers onsite were in the same approximate configurations since before 1965, according to aerial photographs. In general, the area maintained its rural, agricultural character for more than 50 years with only minor changes in land use and land cover. Table 3 below and Table 8 in Appendix C present additional information on pre-restoration conditions.

Table 3. Project Attributes

Project Information				
Project Name	Sandy Branch Mitigation Site			
County	Chatham			
Project Area (acres)	18.10			
Project Coordinates (latitude and longitude decimal)	35°38’35"N 79°23'14"W			
Project Watershed Summary Information				
Physiographic Province	Piedmont			
River Basin	Cape Fear			
USGS Hydrologic Unit 8-digit	03030003			
DWR Sub-basin	03-06-12			
Project Drainage Area (acres)	463			
Project Drainage Area Percentage of Impervious Area	2%			
Land Use Classification	49% Cultivated Crops/Hay, 36% Forested, 13% Developed, 2% Other			
Reach Summary Information				
Parameters	**Sandy Branch R1**	**Sandy Branch R2**	**UT1**	**UT2**
Pre-project length (feet)	964	1,931	102	257
Post-project length (feet)	953	1,919	125	254
Valley confinement	Unconfined			
Drainage area (acres)	323	388-463	35	73
Perennial, Intermittent, Ephemeral	Perennial			
NCDWR Water Quality Classification	C, NSW			
Dominant Stream Classification (existing)	E4/F4	F4	E4/F4	F4
Dominant Stream Classification (proposed)	C4			
Dominant Evolutionary Classification (Simon) if applicable	Stage III: Degradation			
Wetland Summary Information				
Parameters	**Re-establishment**		**Rehabilitation**	
Pre-project area (acres)	N/A		3.819	
Post-project area (acres)	4.721		3.819	
Wetland Type (non-riparian, riparian)	Riparian		Riparian	
Mapped Soil Series	CmB - Cid-Lignum complex, 2-6% slopes			
Soil Hydric Status	Predominantly Non-Hydric			
Regulatory Considerations				
Regulation	**Applicable?**	**Resolved?**	**Supporting Docs?**	
Waters of the United States - Section 404	Yes	Yes	USACE Nationwide Permit No. 27 and DWQ 401 Water Quality Certification No. 4134.	
Waters of the United States - Section 401	Yes	Yes		
Endangered Species Act	Yes	Yes	Categorical Exclusion in Mitigation Plan (Wildlands, 2019)	
Historic Preservation Act	Yes	Yes		
Coastal Zone Management Act (CZMA or CAMA)	N/A			
Essential Fisheries Habitat	N/A			

Section 2: MONITORING YEAR 2 DATA ASSESSMENT

Annual monitoring and site visits were conducted during MY2 to assess the condition of the project. The vegetation and stream success criteria for the Site follow the approved success criteria presented in the Mitigation Plan (Wildlands, 2019). Performance criteria for vegetation, stream, and hydrologic assessment are located in Section 1.2 Table 2: Goals, Performance Criteria, and Functional Improvements. Methodology for annual monitoring is presented in the MY0 Annual Report (Wildlands, 2021).

2.1 Vegetative Assessment

The MY2 vegetative survey was completed in August 2022. Vegetation monitoring resulted in an average planted stem density of 486 stems per acre, with individual plots ranging from 364 to 567 planted stems per acre. All 13 plots are well above the interim requirement of 320 stems per acre required at MY3 and are on track to meet the final success criteria required for MY7. Herbaceous vegetation growth is flourishing across the Site and is providing effective ground coverage to filter incoming runoff and nutrients. Refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix B for Vegetation Plot Data.

2.2 Vegetation Areas of Concern and Management

High density fescue was treated with 4 ft. ring sprays around planted stems and as needed sitewide in April 2022 to help promote tree growth. Additional ring sprays and overseeding are planned for especially dense areas along the western side of Sandy Branch Reach 2 for spring 2023. Wildlands will continue to monitor and assess further treatment needs.

2.3 Stream Assessment

Morphological surveys for MY2 were conducted in March 2022. All streams within the Site are stable and functioning as designed. All 8 cross-sections at the Site show little to no change in the bankfull areas and width-to-depth ratios, and bank height ratios are less than 1.2. Pebble count data is no longer required per the September 29, 2021, IRT Technical Work Group Meeting. The IRT reserves the right to request pebble count data and particle distributions if deemed necessary during the monitoring period. Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table and Stream Photographs. Refer to Appendix C for Stream Geomorphology Data.

2.4 Stream Areas of Concern and Management

No stream areas of concern were identified during MY2.

2.5 Hydrology Assessment

At the end of MY7, four or more bankfull events must have occurred in separate years within the restoration reaches of Sandy Branch. Multiple bankfull events were recorded on Sandy Branch Reach 2 during MY1 and MY2, resulting in partial attainment of the final stream hydrology assessment success criteria. Refer to Appendix D for hydrologic data.

2.6 Wetland Assessment

The performance criteria for wetland hydrology is groundwater within 12 inches of the ground surface for 10.0% (27 days) of the growing season consecutively. The estimated growing season is March 1st-November 17th. These dates were determined using the NRCS WETS tables, soil temperature data from the on-site soil temperature probe, and bud burst observations of *Acer rubrum* on February 22, 2022. Of the twelve groundwater gauges on the Site, eleven met the success criteria during MY2. The eleven gauges that met were all well above the success criteria of 27 days, all meeting with 29-94 days

consecutively. Groundwater gauge 2 narrowly missed with a hydroperiod of 9.5% (25 days). Annual precipitation was lower than normal throughout MY2, especially in February to mid-March, which likely contributed to not meeting success criteria. Additionally, after construction of the stream channel, it is anticipated that the groundwater table will take some time to recharge. Two gauges that failed in the previous monitoring year have since recharged post-construction and successfully meet performance criteria. It is expected that groundwater gauge 2 will also meet performance criteria in future monitoring years. Per the IRT's request, two additional groundwater gauges were installed in wetland re-establishment areas on April 28, 2022. Groundwater gauges 13 and 14 missed with a hydroperiod of 8.4% (22 days) and 3.8% (10 days) respectively. However, these gauges were installed in late April after the critical portion of the growing season was past, and groundwater levels began to drop as summer approached. Given a complete year of observation, both gauges are expected to reach success criteria. Refer to Figure 1 for the groundwater gauge locations and Appendix D for groundwater hydrology data and plots.

2.7 Monitoring Year 2 Summary

All vegetation plots are on track to exceed the MY3 interim requirement of 320 planted stems per acre. Vegetative cover has become well established and planted tree species are showing positive trends in both density and vigor. Herbaceous growth is flourishing across the Site and is providing effective ground coverage to filter incoming runoff and nutrients. All project streams are stable and functioning as designed. Eleven of the twelve groundwater gauges met success criteria in low a precipitation year. Groundwater gauge 2 missed success criteria by a narrow margin. Overall, data for the Site reflects a positive trend in groundwater and is expected to successfully recharge in subsequent years. Per IRT request, two additional groundwater gauges were installed in wetland re-establishment areas on April 28, 2022. Although the additional gauges missed criteria, they were installed after the critical part of the growing season had passed and groundwater levels began to drop. Groundwater gauges 13 and 14 will continue to be monitored and are expected to successfully meet performance criteria in subsequent monitoring years. Sandy Branch Reach 2 had multiple bankfull events in MY1 and MY2 resulting in partial attainment of the final stream hydrology assessment success criteria.

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

Section 3: REFERENCES

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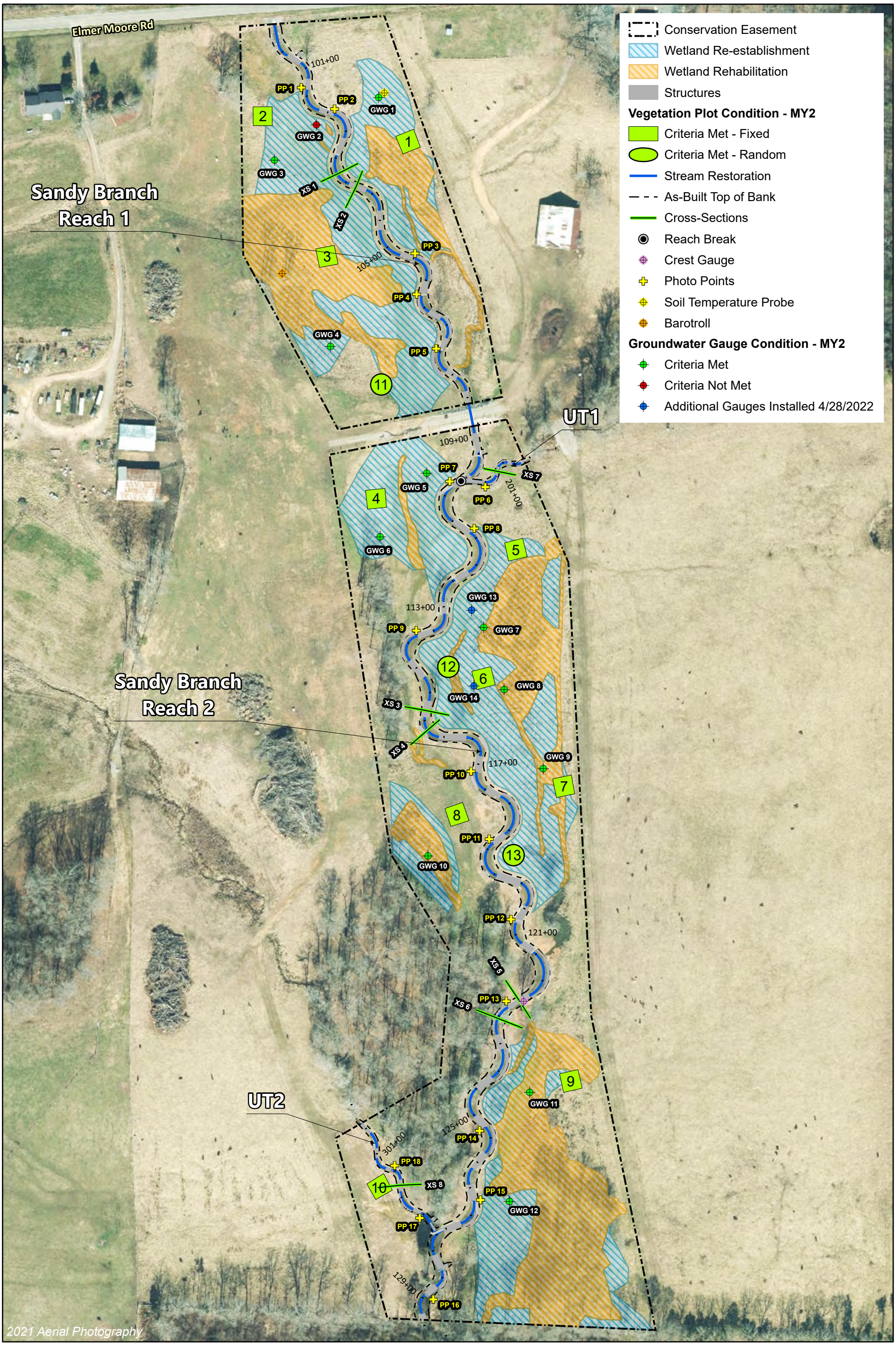


WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 1 - Current Condition Plan View
Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022
Chatham County, NC

APPENDIX A: Visual Assessment Data

Table 4. Visual Stream Morphology Stability Assessment Table

Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022

Sandy Branch Reach 1

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	953
					Assessed Bank Length	1,906
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.	13	13		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	8	8		0%

Sandy Branch Reach 2

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	1,919
					Assessed Bank Length	3,838
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.	24	24		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	14	14		100%

Table 4. Visual Stream Morphology Stability Assessment Table

Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022

UT1

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	125
					Assessed Bank Length	250
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%.	2	2		100%

UT2

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	254
					Assessed Bank Length	508
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.	6	6		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	1	1		100%

Table 5. Vegetation Condition Assessment Table
Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022

Planted Acreage **15.87**

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

Easement Acreage **18.10**

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

STREAM PHOTOGRAPHS

	
PHOTO POINT 1 Sandy Branch R1 – upstream *(03/08/2022)*	**PHOTO POINT 1 Sandy Branch R1** – downstream *(03/08/2022)*
	
PHOTO POINT 2 Sandy Branch R1 – upstream *(03/08/2022)*	**PHOTO POINT 2 Sandy Branch R1** – downstream *(03/08/2022)*
	
PHOTO POINT 3 Sandy Branch R1 – upstream *(03/08/2022)*	**PHOTO POINT 3 Sandy Branch R1** – downstream *(03/08/2022)*

PHOTO POINT 4 Sandy Branch R1 – upstream *(03/08/2022)*

PHOTO POINT 4 Sandy Branch R1 – downstream *(03/08/2022)*

PHOTO POINT 5 Sandy Branch R1 – upstream *(03/08/2022)*

PHOTO POINT 5 Sandy Branch R1 – downstream *(03/08/2022)*

PHOTO POINT 6 UT1 – upstream *(03/08/2022)*

PHOTO POINT 6 UT1 – downstream *(03/08/2022)*

PHOTO POINT 7 Sandy Branch R2 – upstream *(03/08/2022)*

PHOTO POINT 7 Sandy Branch R2 – downstream *(03/08/2022)*

PHOTO POINT 8 Sandy Branch R2 – upstream *(03/08/2022)*

PHOTO POINT 8 Sandy Branch R2 – downstream *(03/08/2022)*

PHOTO POINT 9 Sandy Branch R2 – upstream *(03/08/2022)*

PHOTO POINT 9 Sandy Branch R2 – downstream *(03/08/2022)*

PHOTO POINT 10 Sandy Branch R2 – upstream *(03/08/2022)*

PHOTO POINT 10 Sandy Branch R2 – downstream *(03/08/2022)*

PHOTO POINT 11 Sandy Branch R2 – upstream *(03/08/2022)*

PHOTO POINT 11 Sandy Branch R2 – downstream *(03/08/2022)*

PHOTO POINT 12 Sandy Branch R2 – upstream *(03/08/2022)*

PHOTO POINT 12 Sandy Branch R2 – downstream *(03/08/2022)*

PHOTO POINT 13 Sandy Branch R2 – upstream *(03/08/2022)*

PHOTO POINT 13 Sandy Branch R2 – downstream *(03/08/2022)*

PHOTO POINT 14 Sandy Branch R2 – upstream *(03/08/2022)*

PHOTO POINT 14 Sandy Branch R2 – downstream *(03/08/2022)*

PHOTO POINT 15 Sandy Branch R2 – upstream *(03/08/2022)*

PHOTO POINT 15 Sandy Branch R2 – downstream *(03/08/2022)*

	
PHOTO POINT 16 Sandy Branch R2 – upstream *(03/08/2022)*	**PHOTO POINT 16 Sandy Branch R2** – downstream *(03/08/2022)*
	
PHOTO POINT 17 UT2 – upstream *(03/08/2022)*	**PHOTO POINT 17 UT2** – downstream *(03/08/2022)*
	
PHOTO POINT 18 UT2 – upstream *(03/08/2022)*	**PHOTO POINT 18 UT2** – downstream *(03/08/2022)*

CULVERT CROSSING PHOTOGRAPHS

	
Sandy Branch R1 – Looking Upstream *(03/08/2022)*	**Sandy Branch R1 – Looking Downstream** *(03/08/2022)*

VEGETATION PLOT PHOTOGRAPHS

FIXED VEG PLOT 1 *(08/02/2022)*

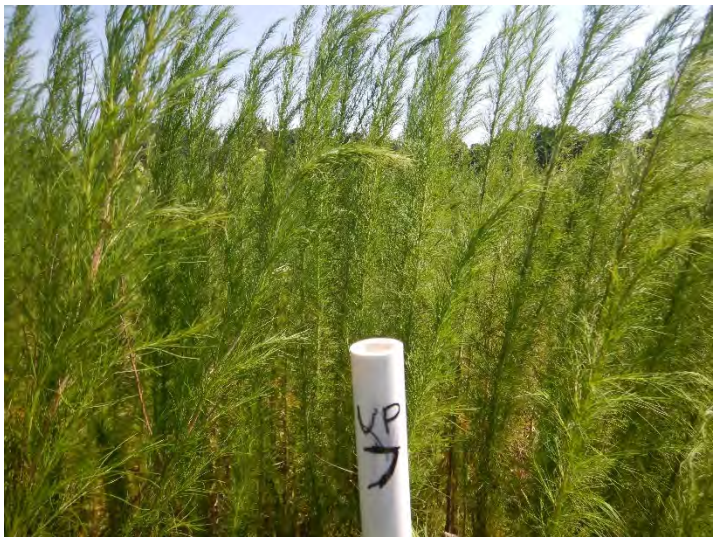
FIXED VEG PLOT 2 *(08/02/2022)*

FIXED VEG PLOT 3 *(08/02/2022)*

FIXED VEG PLOT 4 *(08/02/2022)*

FIXED VEG PLOT 5 *(08/02/2022)*

FIXED VEG PLOT 6 *(08/02/2022)*



FIXED VEG PLOT 7 *(08/02/2022)*

FIXED VEG PLOT 8 *(08/02/2022)*

FIXED VEG PLOT 9 *(08/02/2022)*

FIXED VEG PLOT 10 *(08/02/2022)*

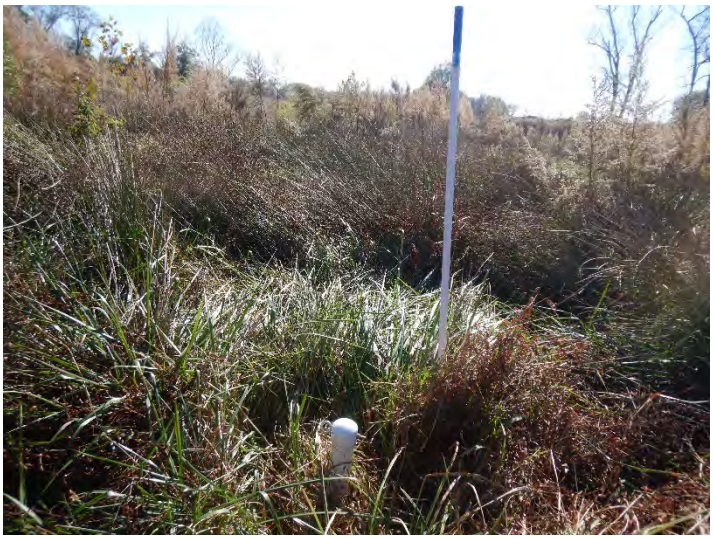
RANDOM VEG PLOT 11 *(08/02/2022)*

RANDOM VEG PLOT 12 *(08/02/2022)*

RANDOM VEG PLOT 13 *(08/02/2022)*

GROUNDWATER GAUGE PHOTOGRAPHS

GROUNDWATER GAUGE 1 ***(11/18/2022)***



GROUNDWATER GAUGE 2 ***(11/18/2022)***

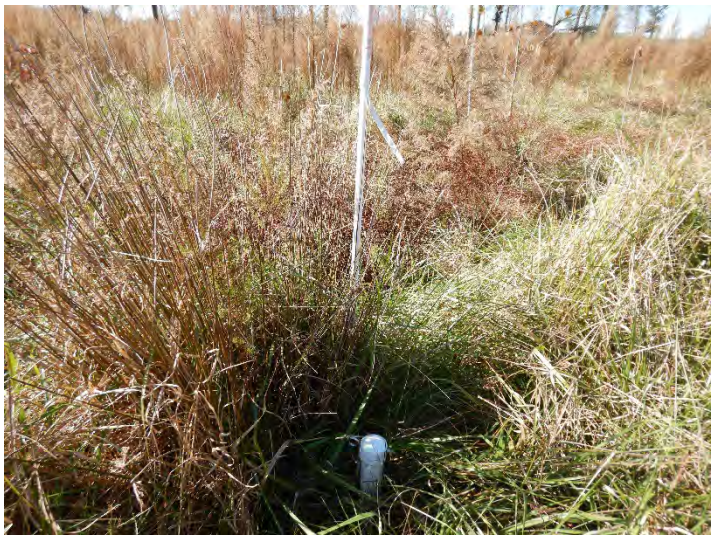
GROUNDWATER GAUGE 3 ***(11/18/2022)***

GROUNDWATER GAUGE 4 ***(11/18/2022)***

GROUNDWATER GAUGE 5 ***(11/18/2022)***

GROUNDWATER GAUGE 6 ***(11/18/2022)***

GROUNDWATER GAUGE 7 *(11/18/2022)*



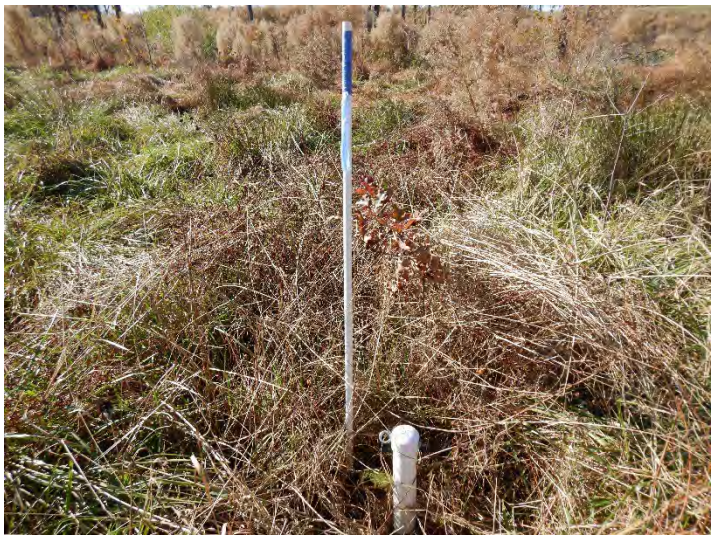
GROUNDWATER GAUGE 8 *(11/18/2022)*

GROUNDWATER GAUGE 9 *(11/18/2022)*

GROUNDWATER GAUGE 10 *(11/18/2022)*

GROUNDWATER GAUGE 11 *(11/18/2022)*

GROUNDWATER GAUGE 12 *(11/18/2022)*

	
GROUNDWATER GAUGE 13 ***(11/18/2022)***	**GROUNDWATER GAUGE 14** ***(11/18/2022)***

APPENDIX B: Vegetation Plot Data

Table 6. Vegetation Plot Data
Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022

Planted Acreage	15.87
Date of Initial Plant	2020-03-01
Date of Current Survey	2022-08-02
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	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	1	1			1	1		
	Betula nigra	river birch	Tree	FACW	2	2	2	2	2	2	2	2
	Diospyros virginiana	common persimmon	Tree	FAC	1	1					2	2
	Platanus occidentalis	American sycamore	Tree	FACW	2	2	4	4	1	1	3	3
	Quercus michauxii	swamp chestnut oak	Tree	FACW	1	1	3	3	3	3		
	Quercus nigra	water oak	Tree	FAC			1	1				
	Quercus pagoda	cherrybark oak	Tree	FACW	2	2			1	1		
	Quercus phellos	willow oak	Tree	FACW	1	1	3	3	1	1		
	Quercus shumardii	Shumard's oak	Tree	FAC								
	Salix nigra	black willow	Tree	OBL	1	1			1	1	1	1
	Ulmus rubra	slippery elm	Tree	FAC			1	1			2	2
Sum	Performance Standard				11	11	14	14	10	10	10	10
Post Mitigation Plan Species	***Fraxinus pennsylvanica***	***green ash***	***Tree***	***FACW***								
	Robinia pseudoacacia	***black locust***	***Tree***	***UPL***								
Sum	Proposed Standard				11	11	14	14	10	10	10	10
Mitigation Plan Performance Standard	Current Year Stem Count					11		14		10		10
	Stems/Acre					445		567		405		405
	Species Count					8		6		7		5
	Dominant Species Composition (%)					18		29		30		30
	Average Plot Height (ft.)					3		4		3		2
	% Invasives					0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					11		14		10		10
	Stems/Acre					445		567		405		405
	Species Count					8		6		7		5
	Dominant Species Composition (%)					18		29		30		30
	Average Plot Height (ft.)					3		4		3		2
	% Invasives					0		0		0		0

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

Table 6. Vegetation Plot Data
Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022

Planted Acreage	15.87
Date of Initial Plant	2020-03-01
Date of Current Survey	2022-08-02
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 5 F		Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	1	1	1	1			1	1
	Betula nigra	river birch	Tree	FACW	1	1	4	4	2	2	3	3
	Diospyros virginiana	common persimmon	Tree	FAC			1	1				
	Platanus occidentalis	American sycamore	Tree	FACW	2	2	3	3	2	2	2	2
	Quercus michauxii	swamp chestnut oak	Tree	FACW	4	4	3	3	1	1	1	1
	Quercus nigra	water oak	Tree	FAC	1	1	2	2	2	2	1	1
	Quercus pagoda	cherrybark oak	Tree	FACW	1	1			1	1		
	Quercus phellos	willow oak	Tree	FACW	4	4			3	3	2	2
	Quercus shumardii	Shumard's oak	Tree	FAC								
	Salix nigra	black willow	Tree	OBL								
	Ulmus rubra	slippery elm	Tree	FAC					1	1	3	3
Sum	Performance Standard				14	14	14	14	12	12	13	13
Post Mitigation Plan Species	***Fraxinus pennsylvanica***	***green ash***	***Tree***	***FACW***								
	Robinia pseudoacacia	***black locust***	***Tree***	***UPL***								
Sum	Proposed Standard				14	14	14	14	12	12	13	13
Mitigation Plan Performance Standard				Current Year Stem Count		14		14		12		13
				Stems/Acre		567		567		486		526
				Species Count		7		6		7		7
				Dominant Species Composition (%)		29		29		25		23
				Average Plot Height (ft.)		3		3		3		3
				% Invasives		0		0		0		0
Post Mitigation Plan Performance Standard				Current Year Stem Count		14		14		12		13
				Stems/Acre		567		567		486		526
				Species Count		7		6		7		7
				Dominant Species Composition (%)		29		29		25		23
				Average Plot Height (ft.)		3		3		3		3
				% Invasives		0		0		0		0

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

Table 6. Vegetation Plot Data
Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022

Planted Acreage	15.87
Date of Initial Plant	2020-03-01
Date of Current Survey	2022-08-02
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 9 F		Veg Plot 10 F		Veg Plot 11 R	Veg Plot 12 R	Veg Plot 13 R
					Planted	Total	Planted	Total	Total	Total	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	1	1	1	1	2	2	
	Betula nigra	river birch	Tree	FACW	3	3	2	2	1		1
	Diospyros virginiana	common persimmon	Tree	FAC	2	2					1
	Platanus occidentalis	American sycamore	Tree	FACW	3	3	2	2	2	3	3
	Quercus michauxii	swamp chestnut oak	Tree	FACW	1	1	1	1	1	2	1
	Quercus nigra	water oak	Tree	FAC						1	
	Quercus pagoda	cherrybark oak	Tree	FACW	2	2				1	3
	Quercus phellos	willow oak	Tree	FACW			4	4	1	2	2
	Quercus shumardii	Shumard's oak	Tree	FAC			1	1			
	Salix nigra	black willow	Tree	OBL					2		
	Ulmus rubra	slippery elm	Tree	FAC	1	1	2	2			1
Sum	Performance Standard				13	13	13	13	9	11	12
Post Mitigation Plan Species	***Fraxinus pennsylvanica***	***green ash***	***Tree***	***FACW***						***1***	
	Robinia pseudoacacia	***black locust***	***Tree***	***UPL***						***1***	
Sum	Proposed Standard				13	13	13	13	9	13	12
Mitigation Plan Performance Standard	Current Year Stem Count					13		13	9	11	12
	Stems/Acre					526		526	364	445	486
	Species Count					7		7	6	6	7
	Dominant Species Composition (%)					23		31	22	23	25
	Average Plot Height (ft.)					3		2	3	3	4
	% Invasives					0		0	0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count					13		13	9	13	12
	Stems/Acre					526		526	364	526	486
	Species Count					7		7	6	8	7
	Dominant Species Composition (%)					23		31	22	23	25
	Average Plot Height (ft.)					3		2	3	3	4
	% Invasives					0		0	0	0	0

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

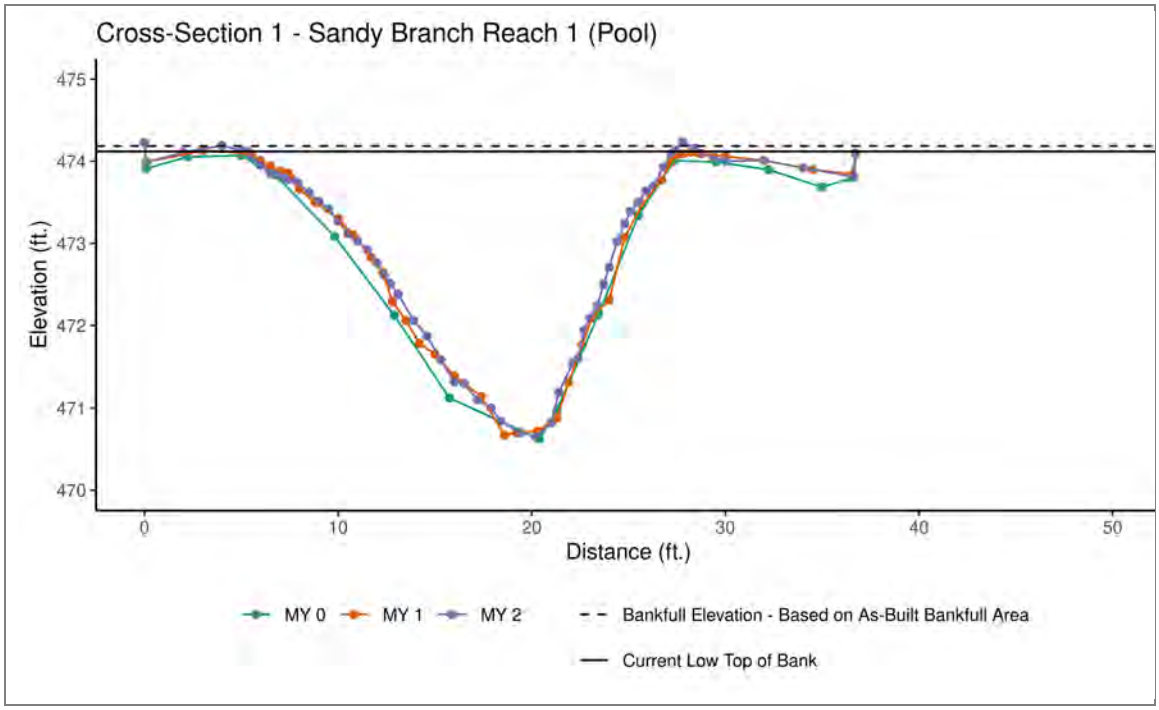
Table 7. Vegetation Performance Standards Summary Table
Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022

	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	445	3	8	0	567	4	6	0	405	3	7	0
Monitoring Year 1	567	2	9	0	607	2	6	0	486	2	7	0
Monitoring Year 0	567	3	9	0	607	3	6	0	567	3	8	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	405	2	5	0	567	3	7	0	567	3	6	0
Monitoring Year 1	445	2	6	0	648	2	8	0	607	3	7	0
Monitoring Year 0	486	3	7	0	648	3	8	0	607	3	7	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	486	3	7	0	526	3	7	0	526	3	7	0
Monitoring Year 1	567	3	8	0	567	2	7	0	607	2	8	0
Monitoring Year 0	567	3	8	0	607	3	8	0	607	3	8	0
	Veg Plot 10 F				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	526	2	7	0	364	3	6	0	445	3	6	0
Monitoring Year 1	607	2	7	0	688	3	6	0	567	3	4	0
Monitoring Year 0	648	3	7	0	567	3	6	0	364	3	4	0
	Veg Plot Group 13 R											
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives								
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	486	4	7	0								
Monitoring Year 1	688	2	7	0								
Monitoring Year 0	607	3	6	0								

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

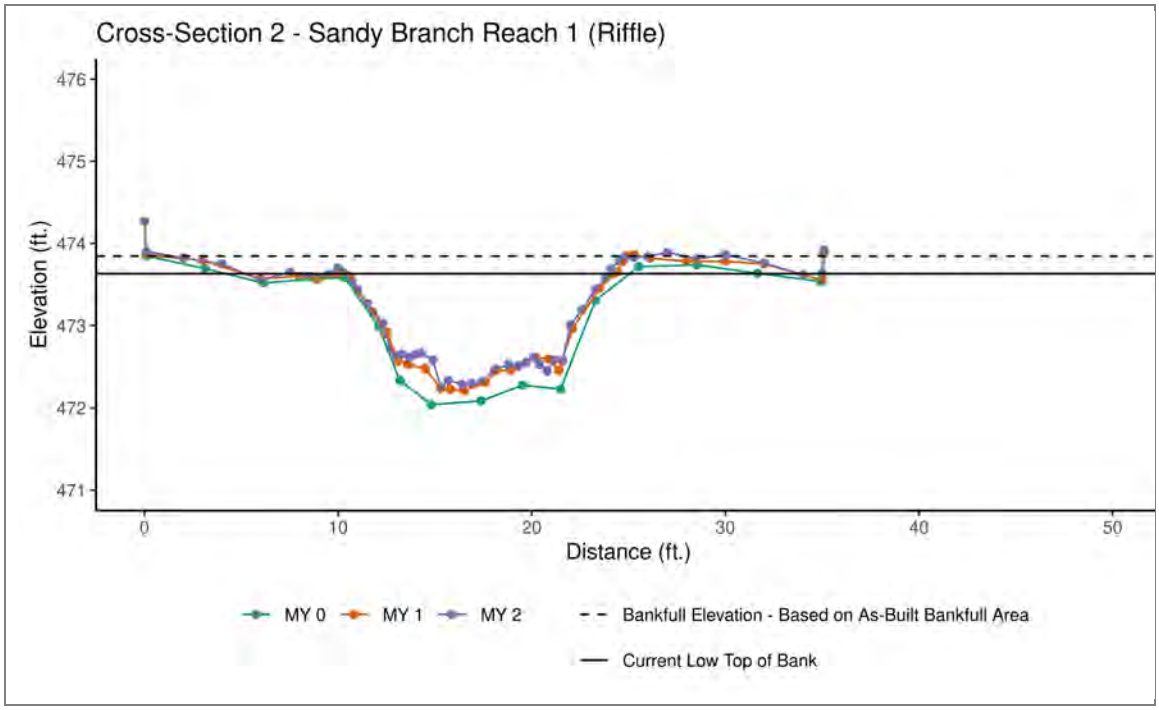
APPENDIX C: Stream Geomorphology Data

Cross-Section Plots



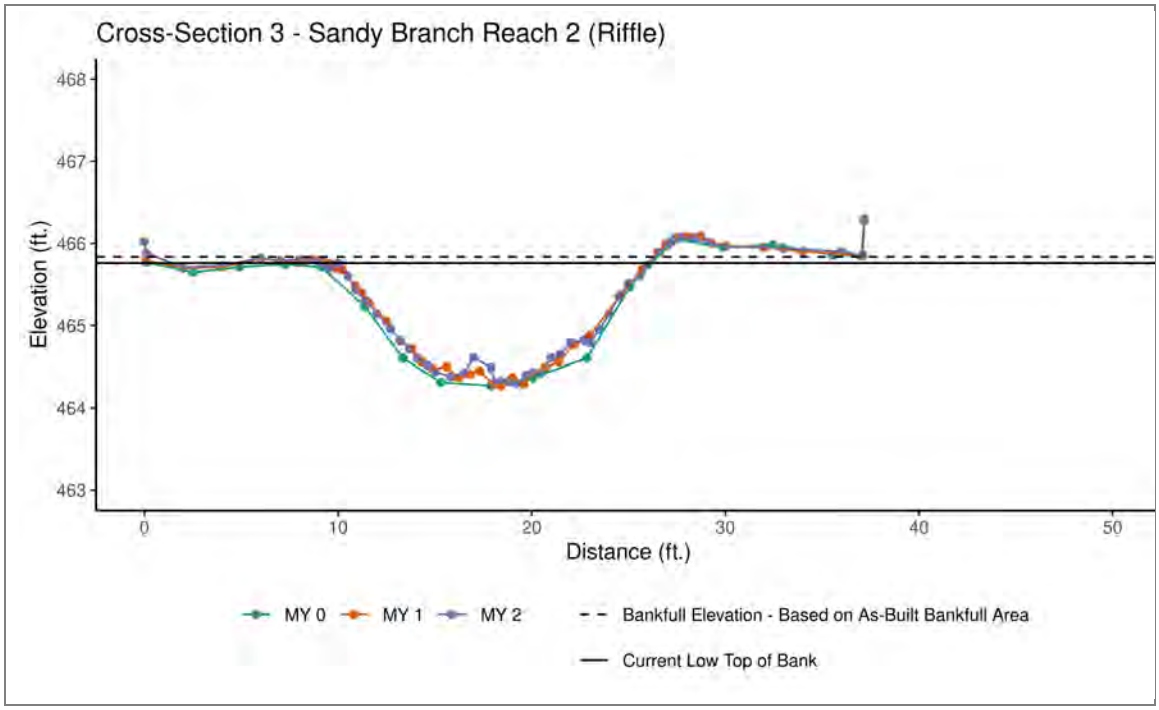
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A	N/A			
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A	N/A			
Thalweg Elevation	470.62	470.67	470.65			
LTOB Elevation	474.01	474.09	474.12			
LTOB Max Depth	3.39	3.42	3.47			
LTOB Cross-Sectional Area	38.87	38.01	37.42			

Downstream *(3/7/2022)*



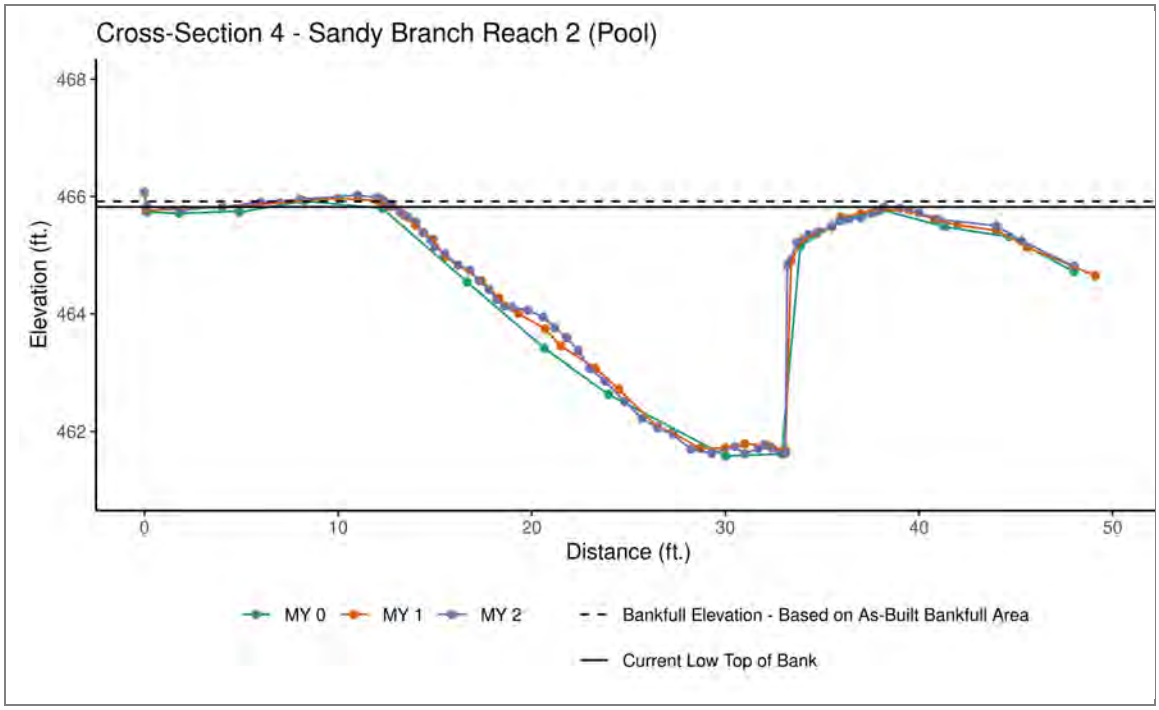
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	473.58	473.79	473.84			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.91	0.86			
Thalweg Elevation	472.04	472.21	472.26			
LTOB Elevation	473.58	473.65	473.63			
LTOB Max Depth	1.54	1.44	1.37			
LTOB Cross-Sectional Area	14.96	12.88	12.00			

Downstream *(3/7/2022)*



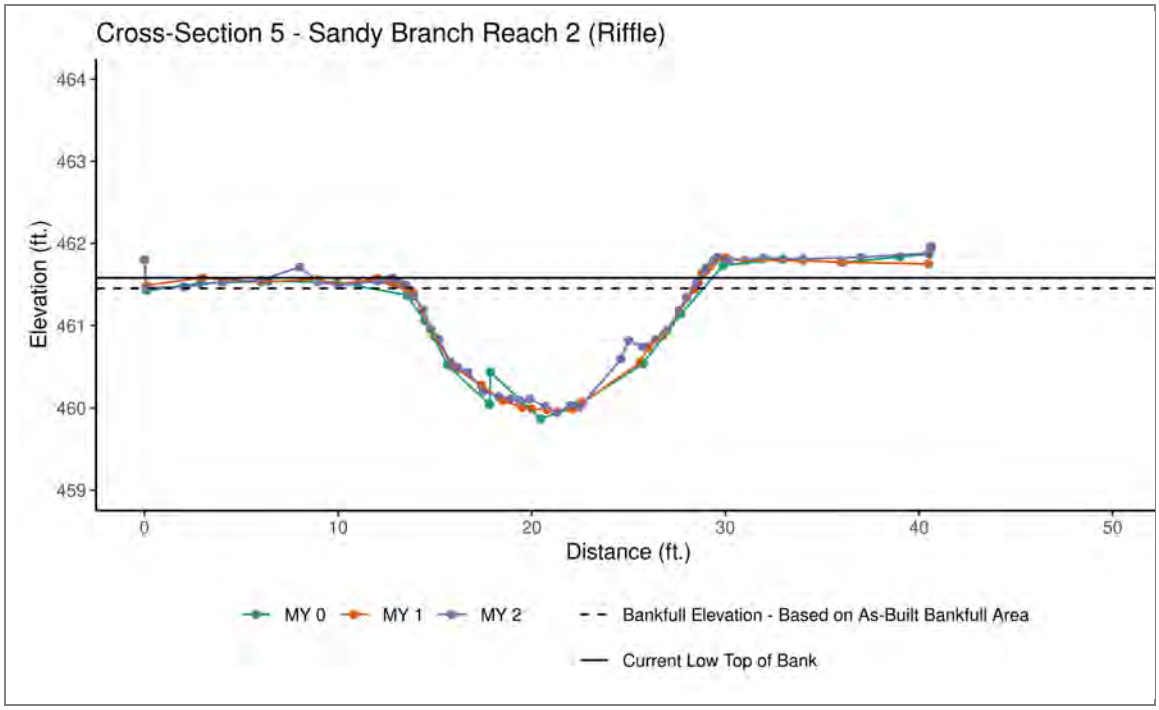
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	465.71	465.83	465.83			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.96	0.95			
Thalweg Elevation	464.27	464.27	464.30			
LTOB Elevation	465.71	465.77	465.76			
LTOB Max Depth	1.44	1.50	1.46			
LTOB Cross-Sectional Area	16.25	15.33	15.06			

Downstream *(3/7/2022)*



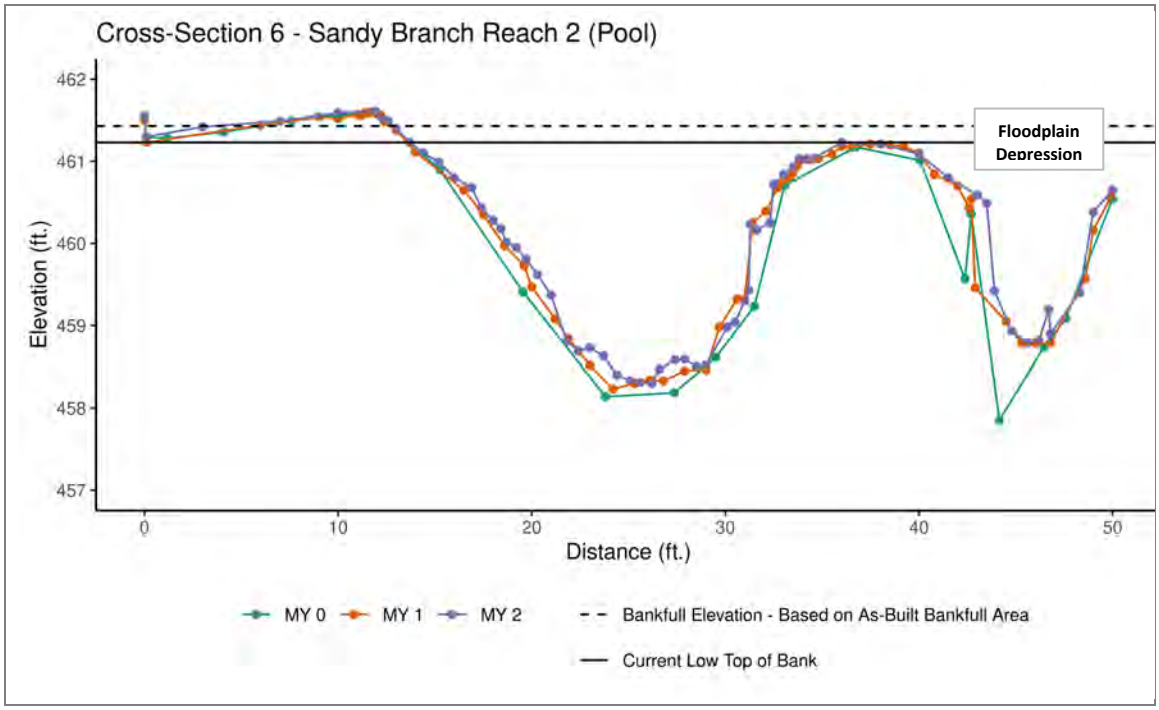
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A	N/A			
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A	N/A			
Thalweg Elevation	461.58	461.68	461.62			
LTOB Elevation	465.78	465.77	465.82			
LTOB Max Depth	4.19	4.09	4.20			
LTOB Cross-Sectional Area	56.56	52.87	54.15			

Downstream *(3/7/2022)*



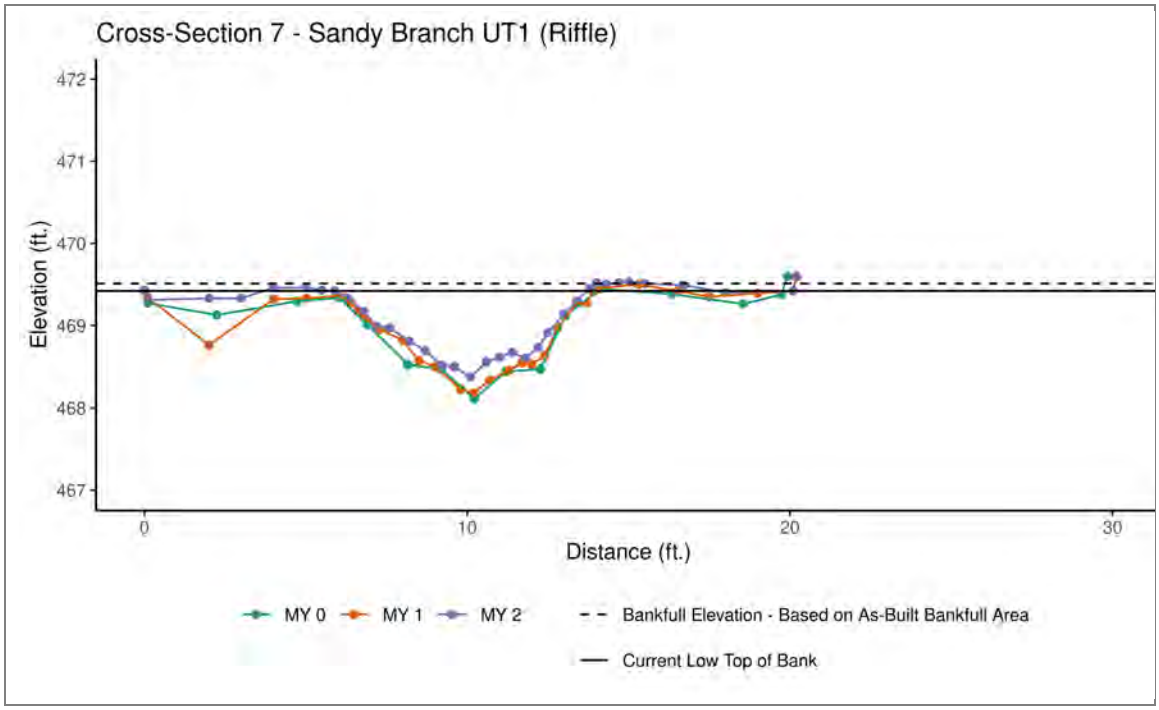
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	461.37	461.40	461.45			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.08	1.09			
Thalweg Elevation	459.87	459.98	459.95			
LTOB Elevation	461.37	461.51	461.58			
LTOB Max Depth	1.50	1.53	1.63			
LTOB Cross-Sectional Area	13.91	15.57	15.87			

Downstream *(3/7/2022)*



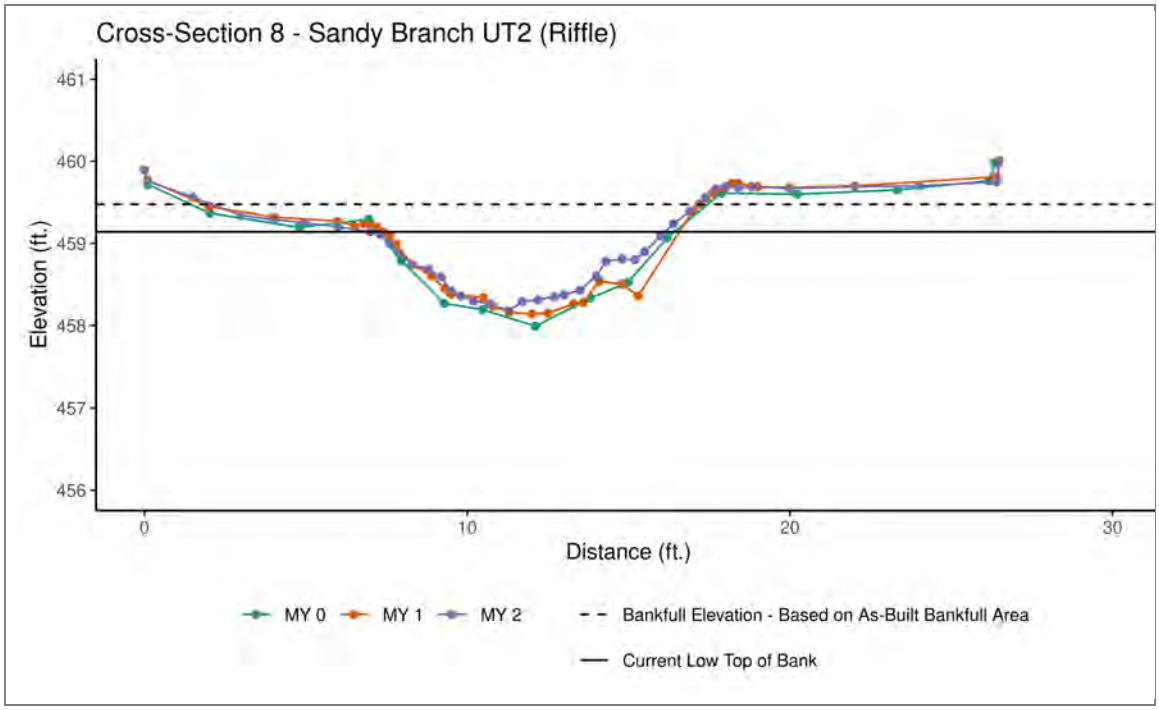
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A	N/A			
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A	N/A			
Thalweg Elevation	458.14	458.23	458.30			
LTOB Elevation	461.17	461.18	461.23			
LTOB Max Depth	3.04	2.95	2.93			
LTOB Cross-Sectional Area	38.67	34.55	34.22			

Downstream *(3/7/2022)*



	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	469.34	469.39	469.51			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.96	0.92			
Thalweg Elevation	468.11	468.18	468.38			
LTOB Elevation	469.34	469.34	469.42			
LTOB Max Depth	1.22	1.16	1.04			
LTOB Cross-Sectional Area	5.25	4.86	4.54			

Downstream *(3/7/2022)*



	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	459.29	459.34	459.47			
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.92	0.74			
Thalweg Elevation	457.99	458.14	458.18			
LTOB Elevation	459.29	459.24	459.14			
LTOB Max Depth	1.30	1.10	0.96			
LTOB Cross-Sectional Area	8.12	7.14	5.07			

Downstream *(3/7/2022)*

Table 8. Baseline Stream Data Summary

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**Sandy Branch R1**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	6.6		1	14.0		14.4		1
Floodprone Width (ft)	>60.0		1	>30.8		100.0		1
Bankfull Mean Depth (ft)	1.0		1	0.9		1.0		1
Bankfull Max Depth (ft)	1.6		1	1.3		1.5		1
Bankfull Cross Sectional Area (ft^2)	6.6		1	13.2		14.9		1
Width/Depth Ratio	6.5		1	14.8		13.9		1
Entrenchment Ratio	>9.1		1	>2.2		>6.9		1
Bank Height Ratio	1.0		1	1.0	1.2	1.0		1
Max part size (mm) mobilized at bankfull	87.0			88.0		82.7		
Rosgen Classification	E4/F4			C4		C4		
Bankfull Discharge (cfs)	22.0			44.0		50.9		
Sinuosity	1.10			1.16		1.16		
Water Surface Slope ($ft/ft)^2$	0.0100	0.0140	---	0.0017	0.0108	0.0074		
Other	---			---		---		
Parameter	**Sandy Branch R2**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	7.3	11.0	3	16.0		15.0	16.9	2
Floodprone Width (ft)	11.0	40.0	3	>35.2		70.0	80.0	2
Bankfull Mean Depth (fr)	1.2	1.6	3	1.1		0.9	1.0	2
Bankfull Max Depth (ft)	1.7	2.1	3	1.5		1.4	1.5	2
Bankfull Cross Sectional Area (ft^2)	9.1	14.0	3	17.5		14.0	16.3	2
Width/Depth Ratio	4.7	8.4	3	14.6		16.2	17.5	2
Entrenchment Ratio	1.5	3.7	3	>2.20		4.1	5.3	2
Bank Height Ratio	1.8	2.4	3	1.0	1.2	1.0	1.0	2
Max particle size (mm) mobilized at bankfull	---			---		68.3		
Rosgen Classification	F4			C4		C4		
Bankfull Discharge (cfs)	29.0	39.0	---	51.0	58.0	53.2	57.4	2
Sinuosity	1.20			1.27		1.27		
Water Surface Slope ($ft/ft)^2$	0.0041	0.0090	---	0.0044	0.0241	0.0060		
Other	---			---		---		

Table 8. Baseline Stream Data Summary

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**UT1**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	3.3		1	7.0		7.7		1
Floodprone Width (ft)	12.0		1	>15.4		55.0		1
Bankfull Mean Depth (ft)	0.63		1	0.57		0.70		1
Bankfull Max Depth (ft)	1.2		1	0.8		1.2		1
Bankfull Cross Sectional Area (ft^2)	2.1		1	4.0		5.3		1
Width/Depth Ratio	5.2		1	12.3		11.3		1
Entrenchment Ratio	3.7		1	>2.2		7.1		1
Bank Height Ratio	2.9		1	1.0	1.2	1.0		
Max part size (mm) mobilized at bankfull	---			---		62.6		
Rosgen Classification	E4/F4			C4		C4		
Bankfull Discharge (cfs)	7.7			9.0		13.2		
Sinuosity	1.10			1.14		1.14		
Water Surface Slope ($ft/ft)^2$	0.0270		---	0.0032	0.0198	0.0082		
Other	---			---		---		
Parameter	**UT2**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	2.9		1	9.0		9.9		1
Floodprone Width (ft)	6.3		1	>19.8		80.0		1
Bankfull Mean Depth (ft)	1.4		1	0.7		0.8		1
Bankfull Max Depth (ft)	1.7		1	1.0		1.3		1
Bankfull Cross Sectional Area (ft^2)	4.1		1	6.5		8.1		1
Width/Depth Ratio	2.1		1	12.5		12.2		1
Entrenchment Ratio	2.2		1	>2.2		8.1		1
Bank Height Ratio	2.5		1	1.0	1.2	1.0		
Max particle size (mm) mobilized at bankfull	---			---		77.4		
Rosgen Classification	F4			C4		C4		
Bankfull Discharge (cfs)	15			16		27		
Sinuosity	1.10			1.09		1.09		
Water Surface Slope ($ft/ft)^2$	0.0084	0.0140	---	0.0036	0.0251	0.0081		
Other	---			---		---		

Table 9. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022

	Sandy Branch Reach 1												Sandy Branch Reach 2											
	Cross-Section 1 (Pool)						Cross-Section 2 (Riffle)						Cross-Section 3 (Riffle)						Cross-Section 4 (Pool)					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	N/A	N/A	N/A				473.58	473.79	473.84				465.71	465.83	465.83				N/A	N/A	N/A			
Bank Height Ratio - Based on AB Bankfull[1] Area	N/A	N/A	N/A				1.00	0.91	0.86				1.00	0.96	0.95				N/A	N/A	N/A			
Thalweg Elevation	470.62	470.67	470.65				472.04	472.21	472.26				464.27	464.27	464.30				461.58	461.68	461.62			
LTOB[2] Elevation	474.01	474.09	474.12				473.58	473.65	473.63				465.71	465.77	465.76				465.78	465.77	465.82			
LTOB[2] Max Depth (ft)	3.39	3.42	3.47				1.54	1.44	1.37				1.44	1.50	1.46				4.19	4.09	4.20			
LTOB[2] Cross Sectional Area (ft^2)	38.87	38.01	37.42				14.96	12.88	12.00				16.25	15.33	15.06				56.56	52.87	54.15			
	Sandy Branch Reach 2												UT1						UT2					
	Cross-Section 5 (Riffle)						Cross-Section 6 (Pool)						Cross-Section 7 (Riffle)						Cross-Section 8 (Riffle)					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	461.37	461.40	461.45				N/A	N/A	N/A				469.34	469.39	469.51				459.29	459.34	459.47			
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00	1.08	1.09				N/A	N/A	N/A				1.00	0.96	0.92				1.00	0.92	0.74			
Thalweg Elevation	459.87	459.98	459.95				458.14	458.23	458.30				468.11	468.18	468.38				457.99	458.14	458.18			
LTOB[2] Elevation	461.37	461.51	461.58				461.17	461.18	461.23				469.34	469.34	469.42				459.29	459.24	459.14			
LTOB[2] Max Depth (ft)	1.50	1.53	1.63				3.04	2.95	2.93				1.22	1.16	1.04				1.30	1.10	0.96			
LTOB[2] Cross Sectional Area (ft^2)	13.91	15.57	15.87				38.67	34.55	34.22				5.25	4.86	4.54				8.12	7.14	5.07			

[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.

APPENDIX D: Hydrology Data

Table 10. Bankfull Events

Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022

Reach	MY1 (2021)	MY2 (2022)	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
Sandy Branch Reach 2	2/4/2021 10/9/2021	1/3/2022 3/16/2022					

Table 11. Rainfall Summary

Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022

	MY1 (2021)	MY2 (2022)	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
Annual Precip Total	47.37	38.44*					
WETS 30th Percentile	29.58	29.57					
WETS 70th Percentile	54.08	53.74					
Normal	Y	*					

*Annual precipitation total was collected up until 11/18/2022. Data will be updated in MY3.

Table 12. Groundwater Gauge Summary

Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022

Gauge	Max. Consecutive Hydroperiod (Percentage)						
	MY1 (2021)	MY2 (2022)	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
1	50 days (19.1%)	80 Days (30.5%)					
2	20 days (7.6%)	25 Days (9.5%)					
3	19 days (7.3%)	29 Days (11.1%)					
4	51 days (19.5%)	82 Days (31.3%)					
5	55 days (21%)	48 Days (18.3%)					
6	20 days (7.6%)	31 Days (11.8%)					
7	61 days (23.3%)	94 Days (35.9%)					
8	62 days (23.7%)	82 Days (31.3%)					
9	51 days (19.5%)	80 Days (30.5%)					
10	37 days (14.1%)	43 Days (16.4%)					
11	40 days (15.3%)	81 Days (30.9%)					
12	51 days (19.5%)	56 Days (21.4%)					
13	*	22 Days* (8.4%)					
14	*	10 Days* (3.8%)					

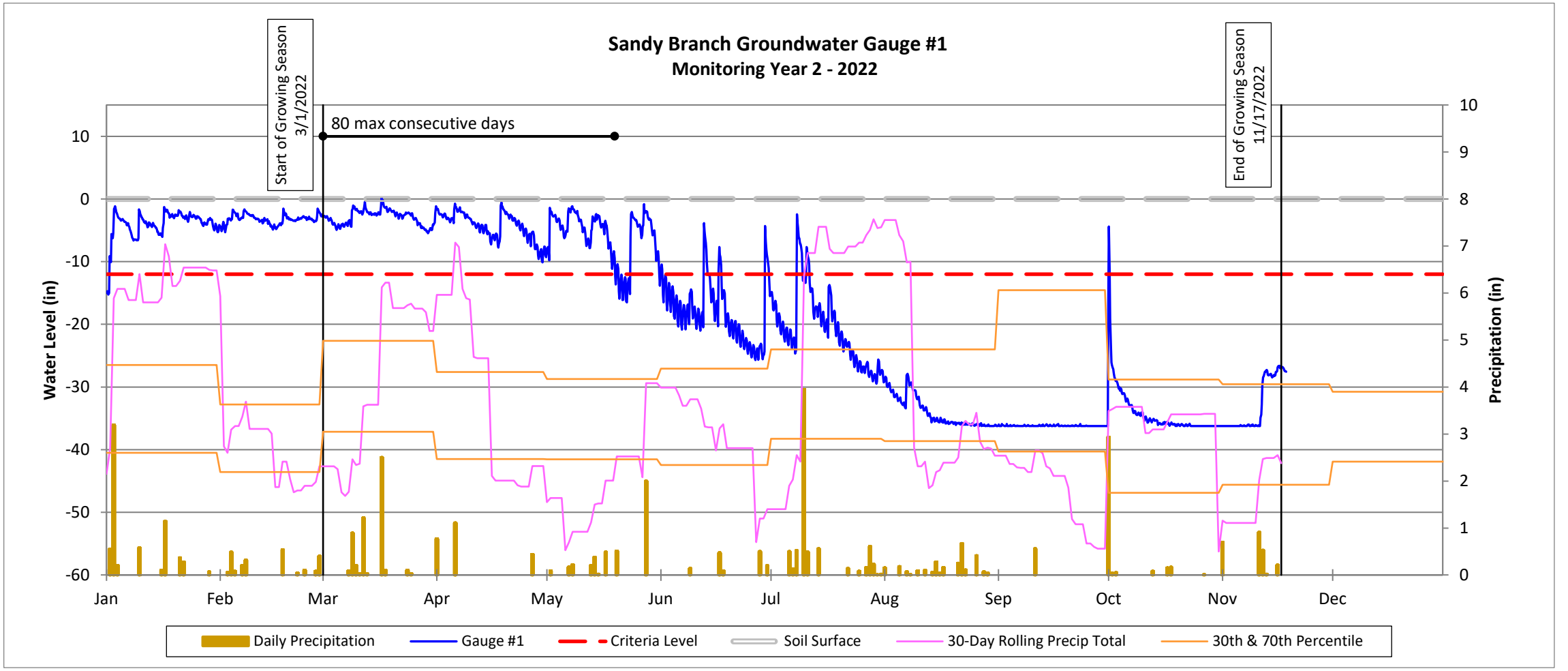
Performance Standard: **27 Days (10%)**
WETS Station (Daily Rainfall): **Goldston 3.8 N**
WETS Station (30th & 70th Percentile): **Siler City 2 N, NC**
Growing Season: **3/1/2022 to 11/17/2022 (261 Days)**
*GWG 13 and 14 were installed on April 28, 2022 per IRT request.

Groundwater Gauge Plot

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

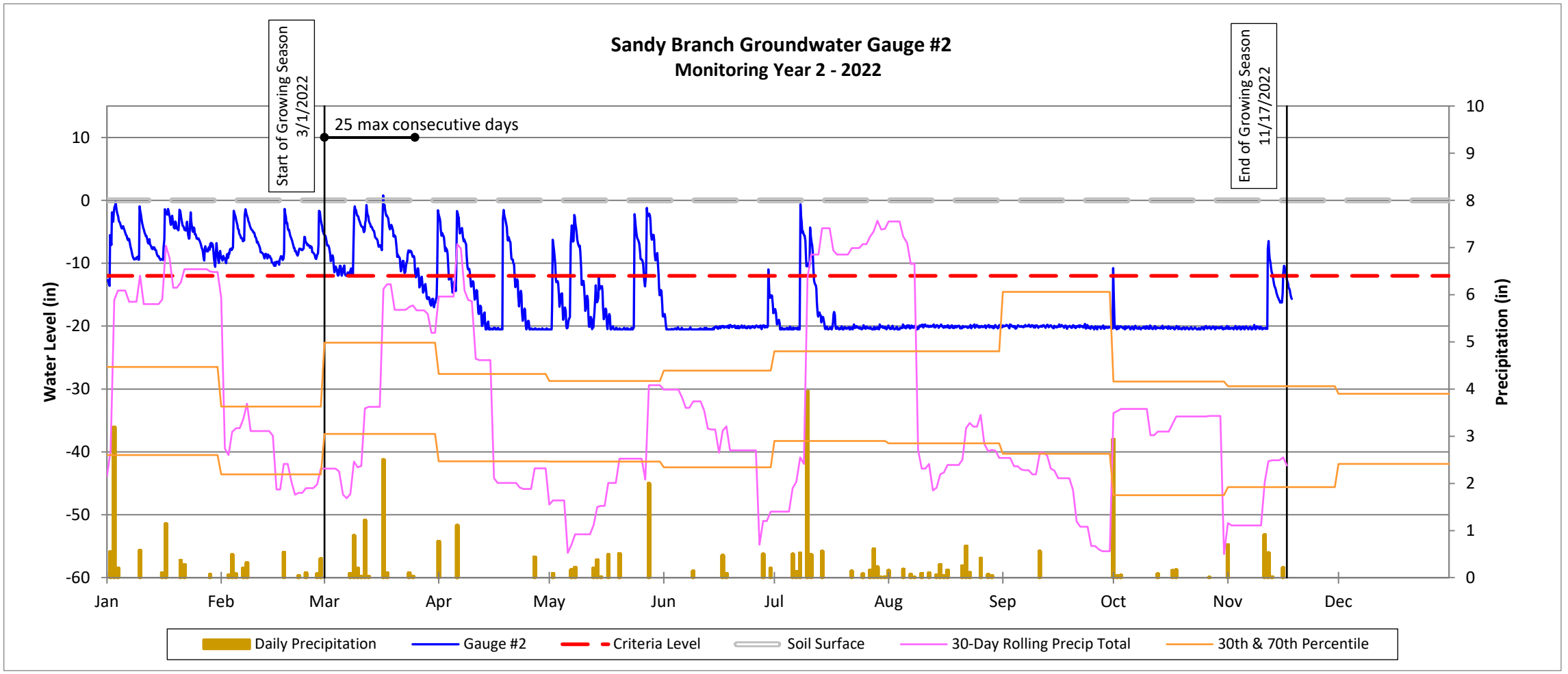


Groundwater Gauge Plot

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

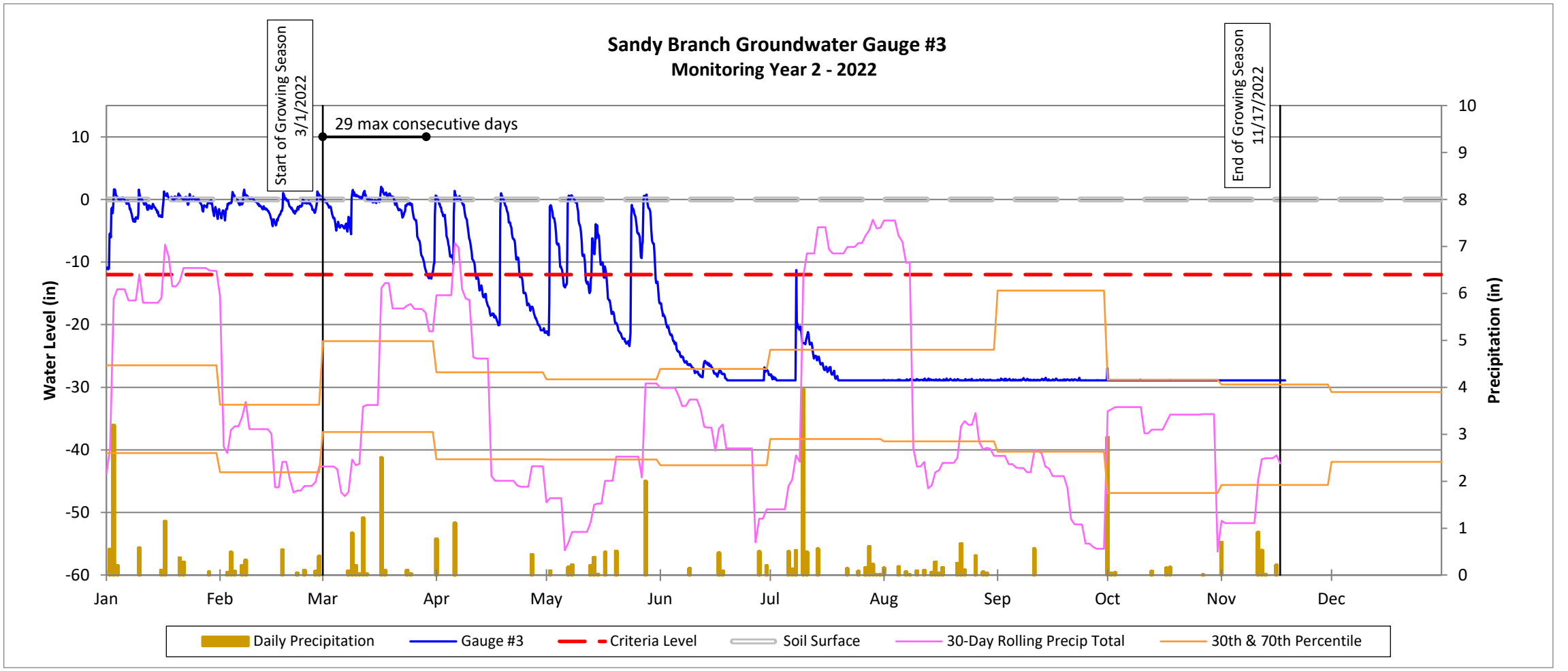


Groundwater Gauge Plot

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

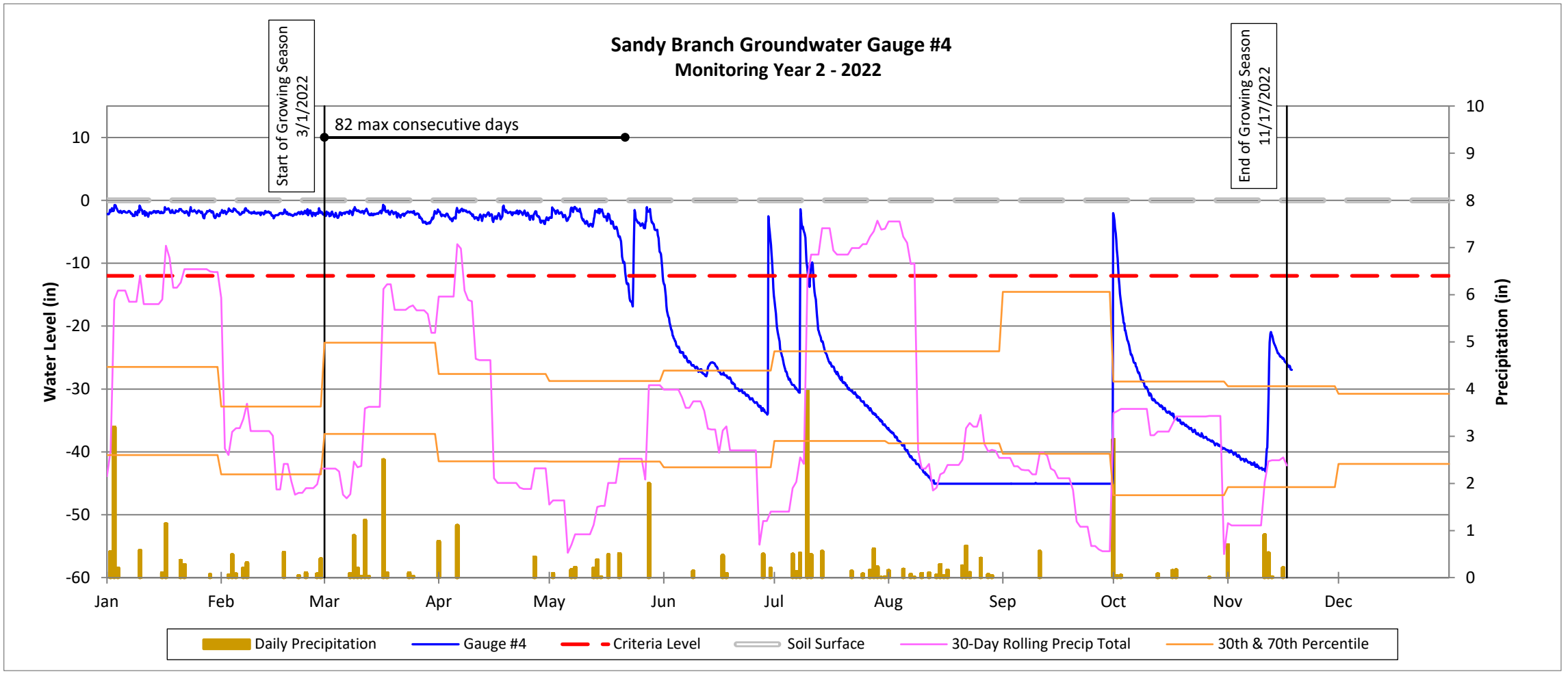


Groundwater Gauge Plot

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

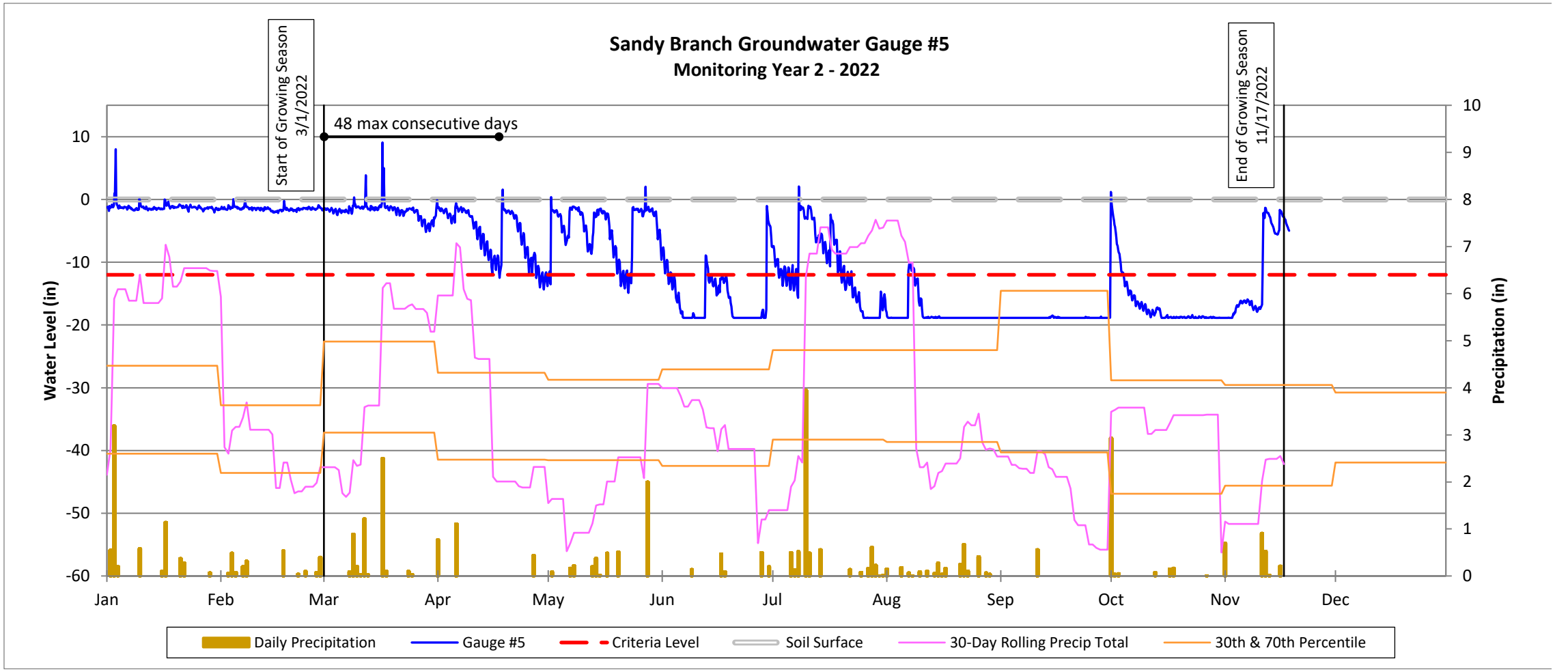


Groundwater Gauge Plot

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

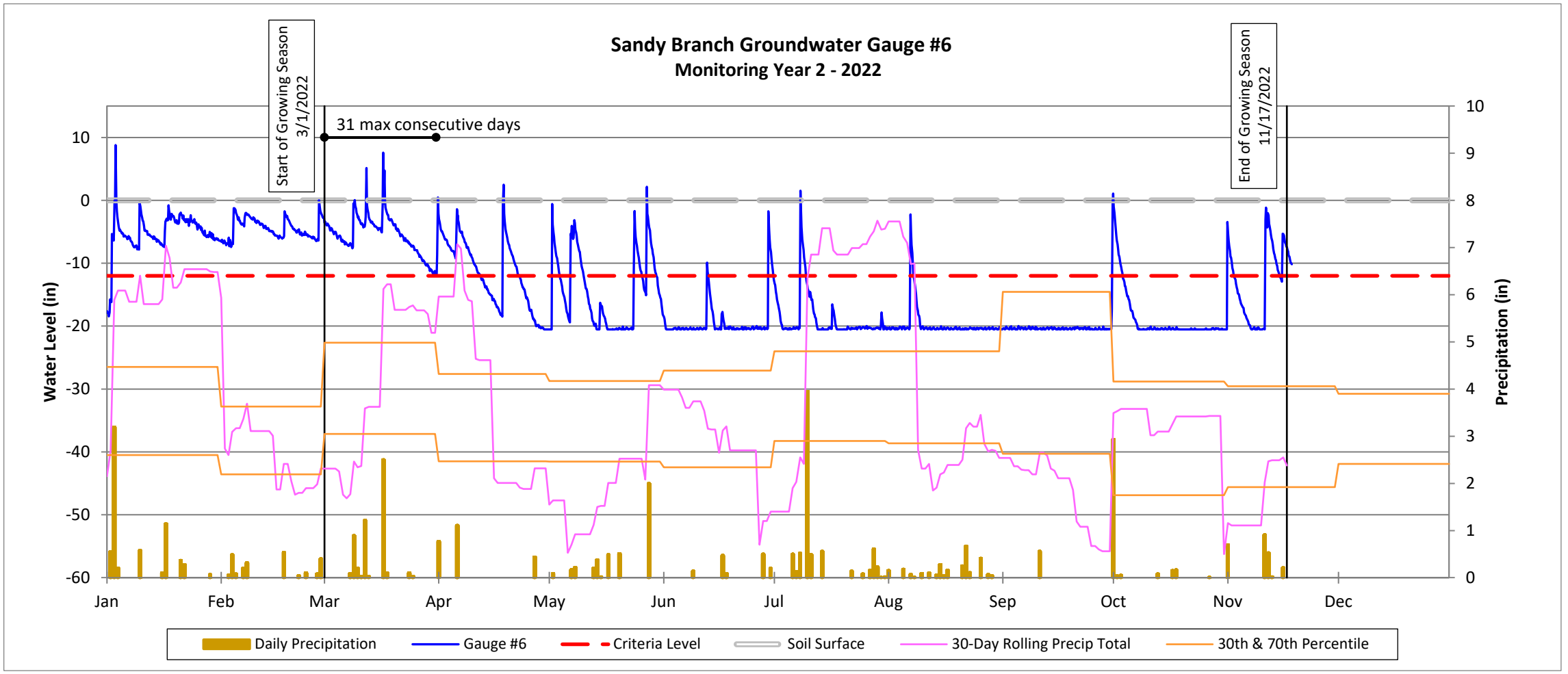


Groundwater Gauge Plot

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

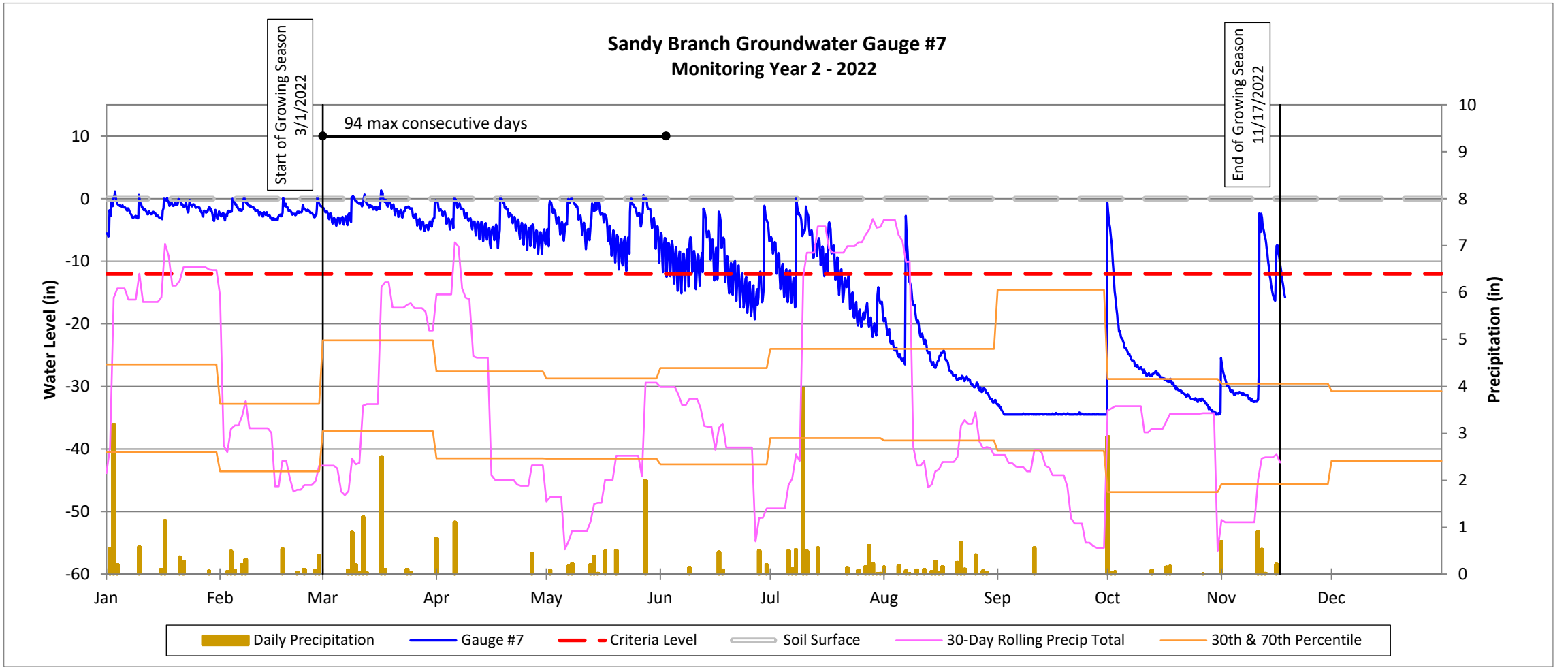


Groundwater Gauge Plot

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

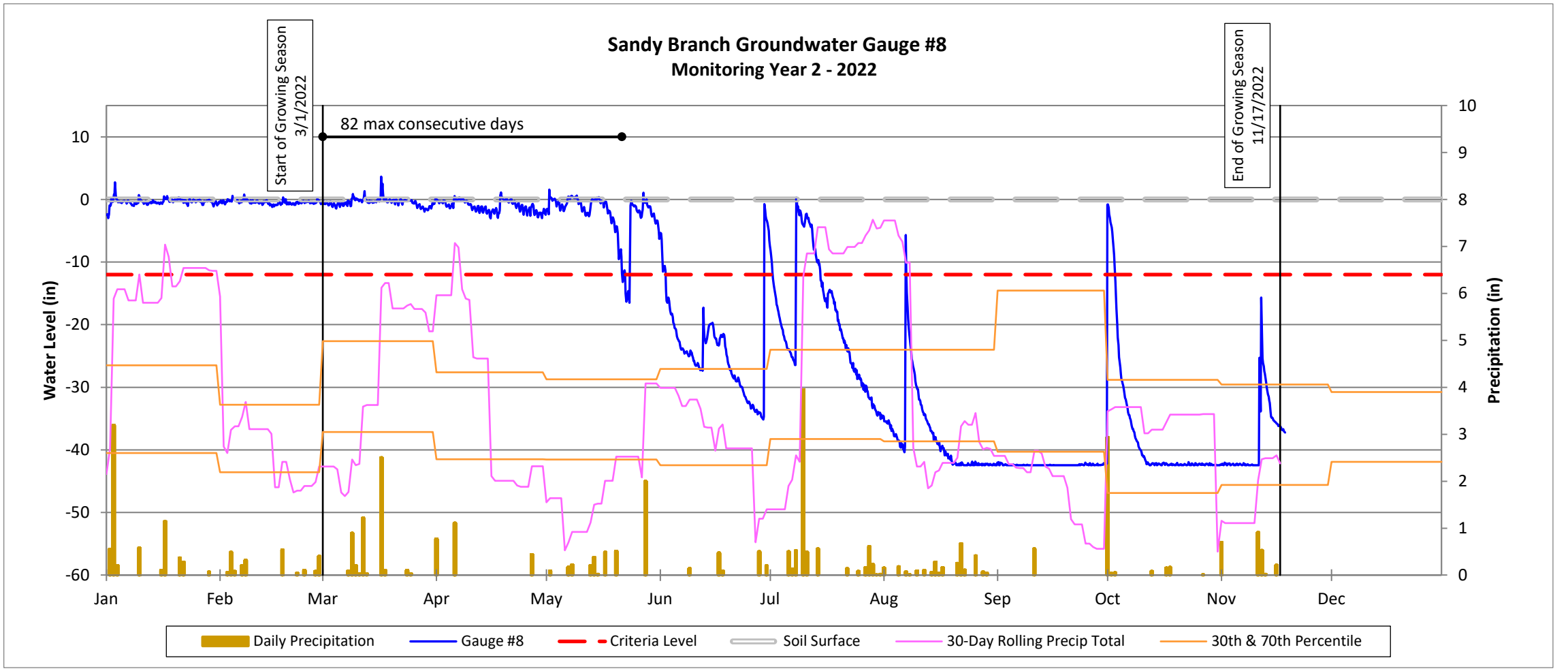


Groundwater Gauge Plot

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

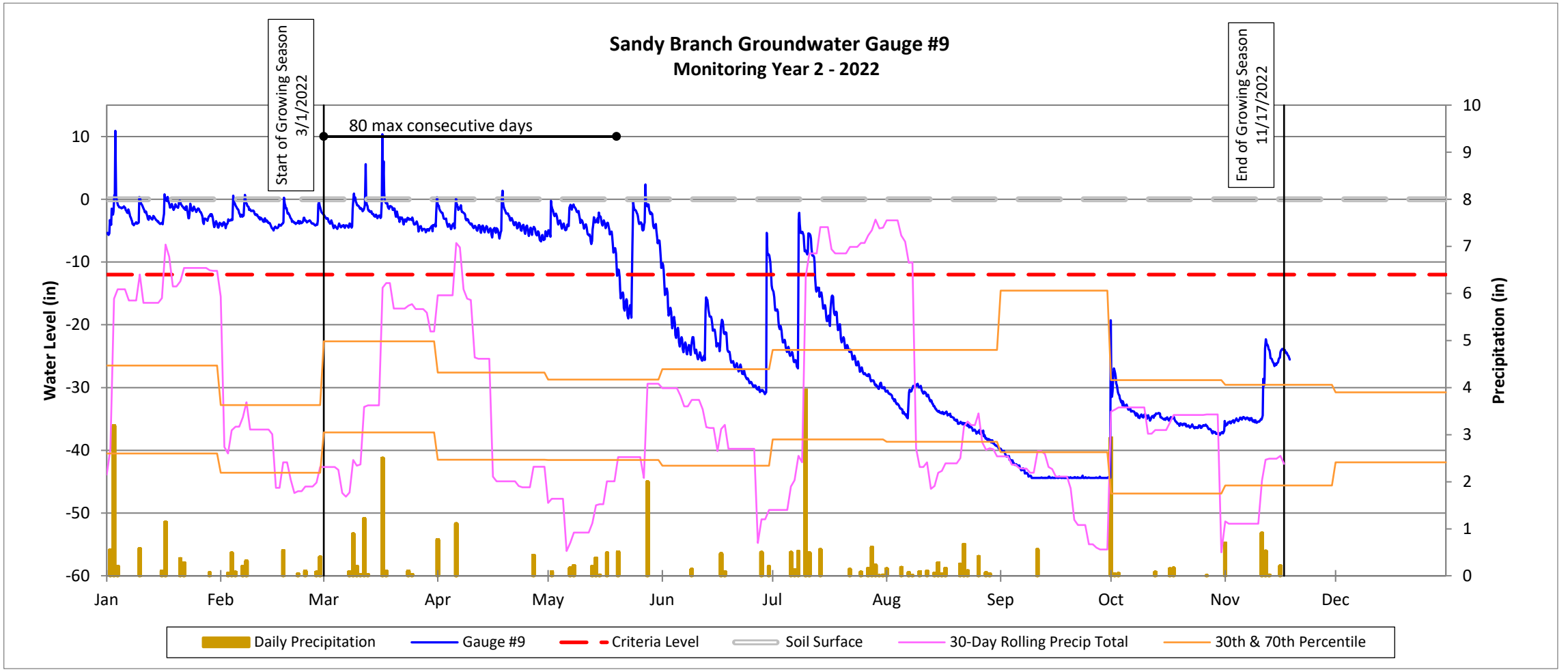


Groundwater Gauge Plot

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

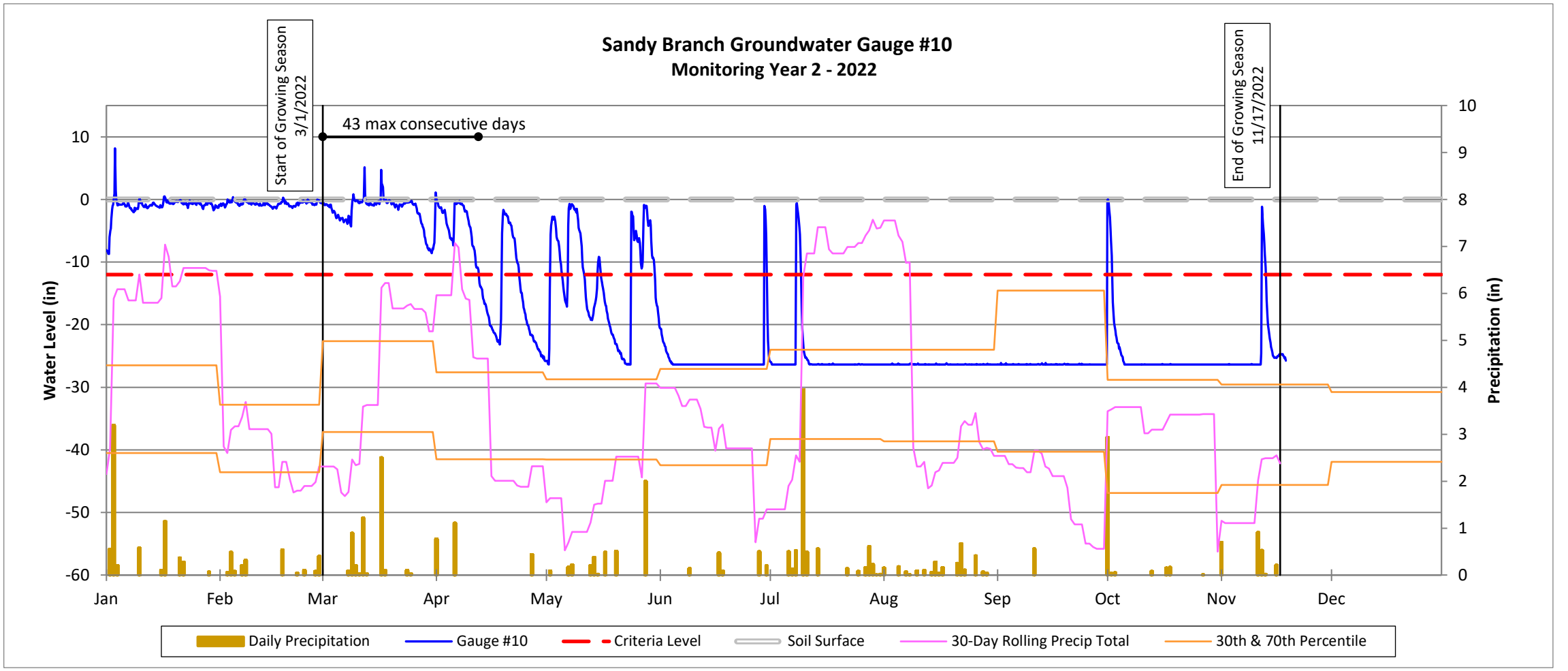


Groundwater Gauge Plot

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

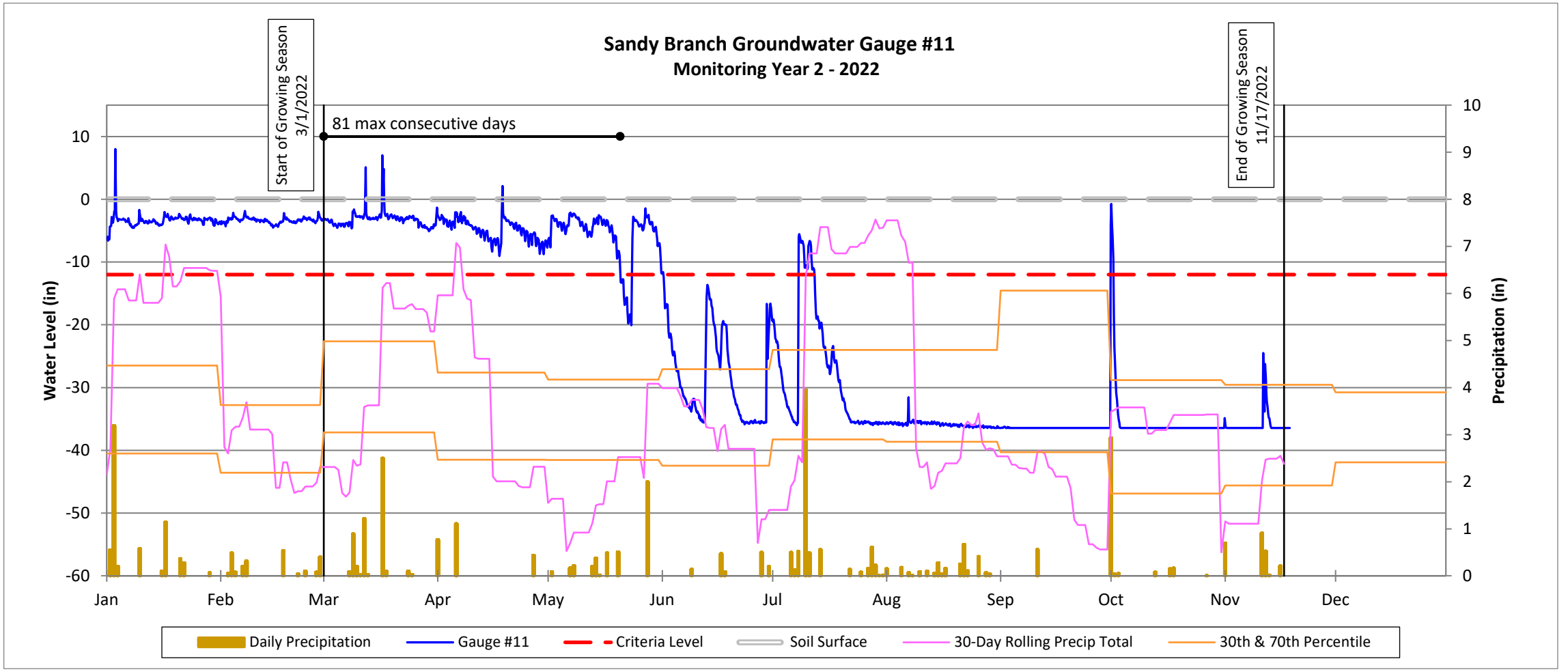


Groundwater Gauge Plot

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

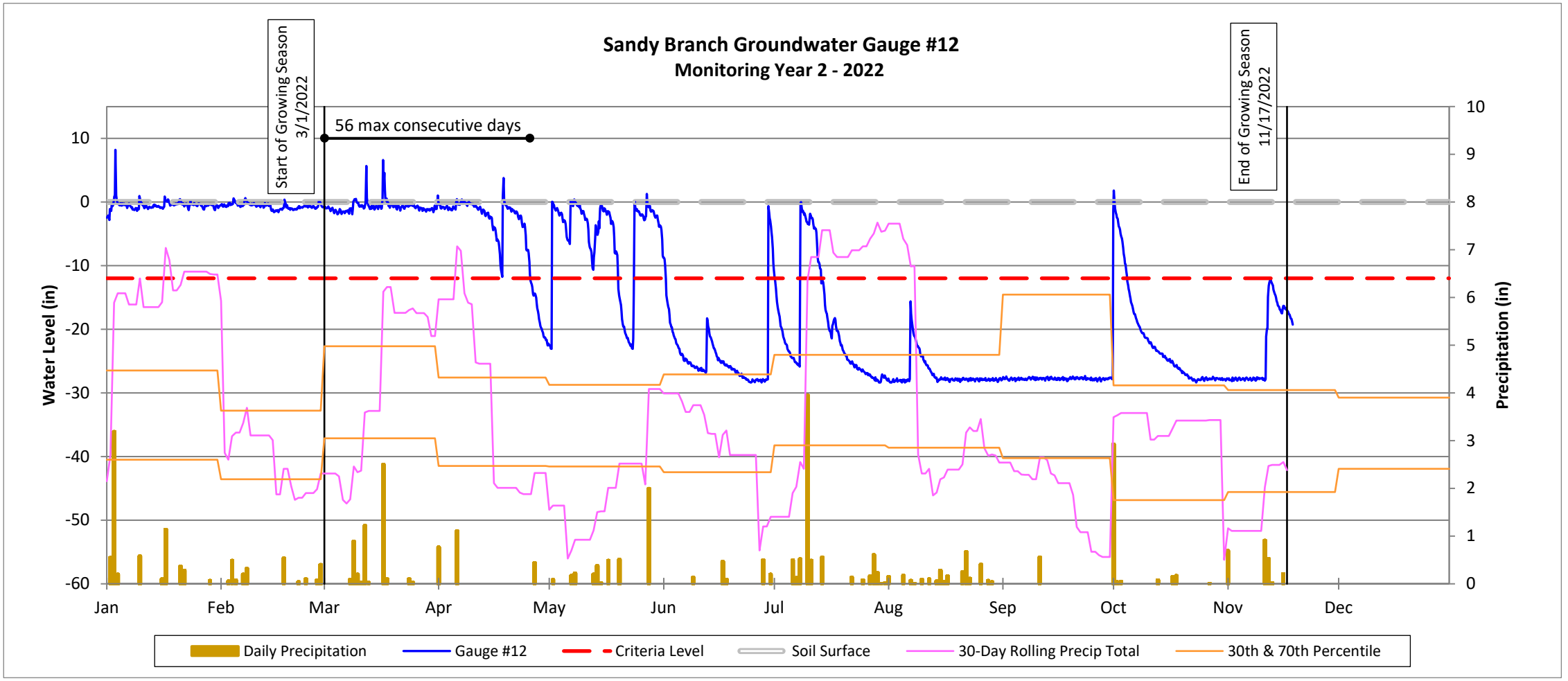


Groundwater Gauge Plot

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

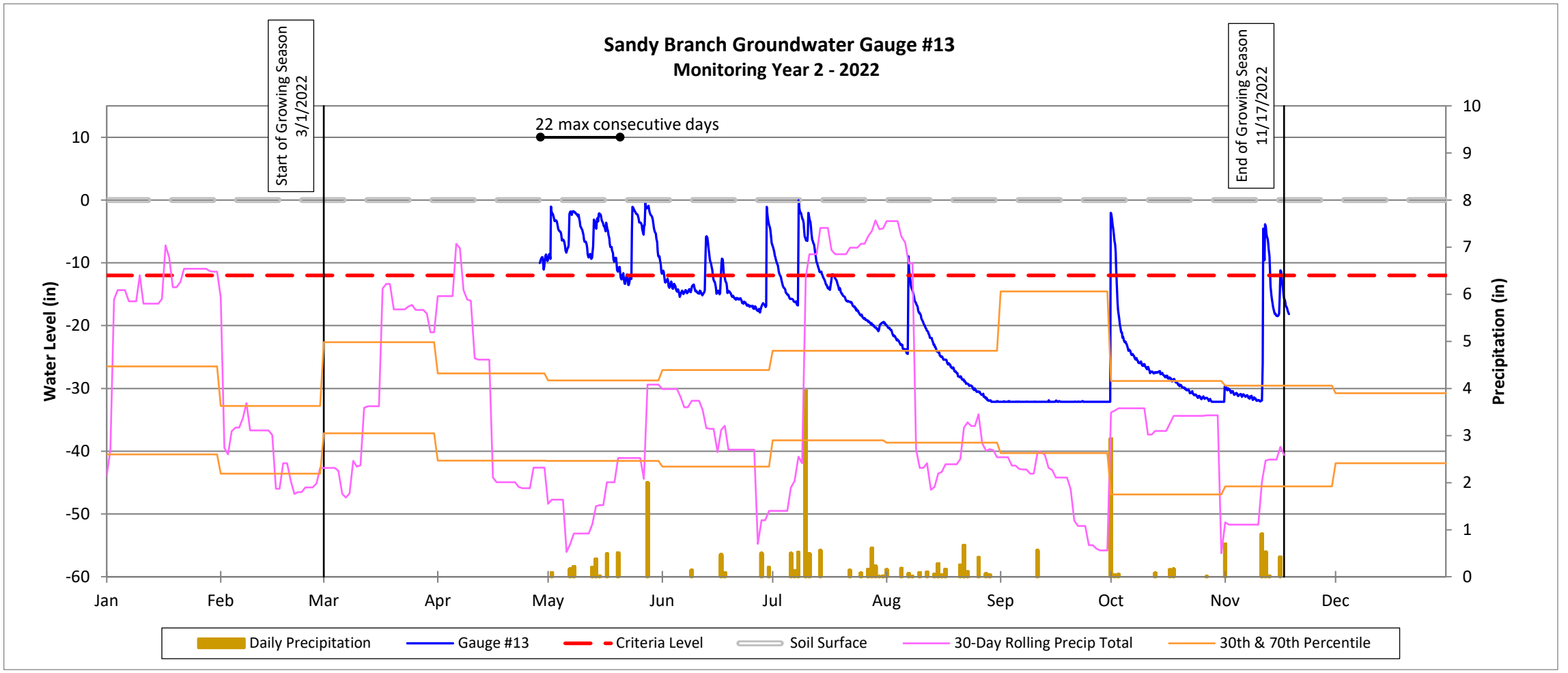


Groundwater Gauge Plot

Sandy Branch Mitigation Site

DMS Project No. 100060

Monitoring Year 2 - 2022

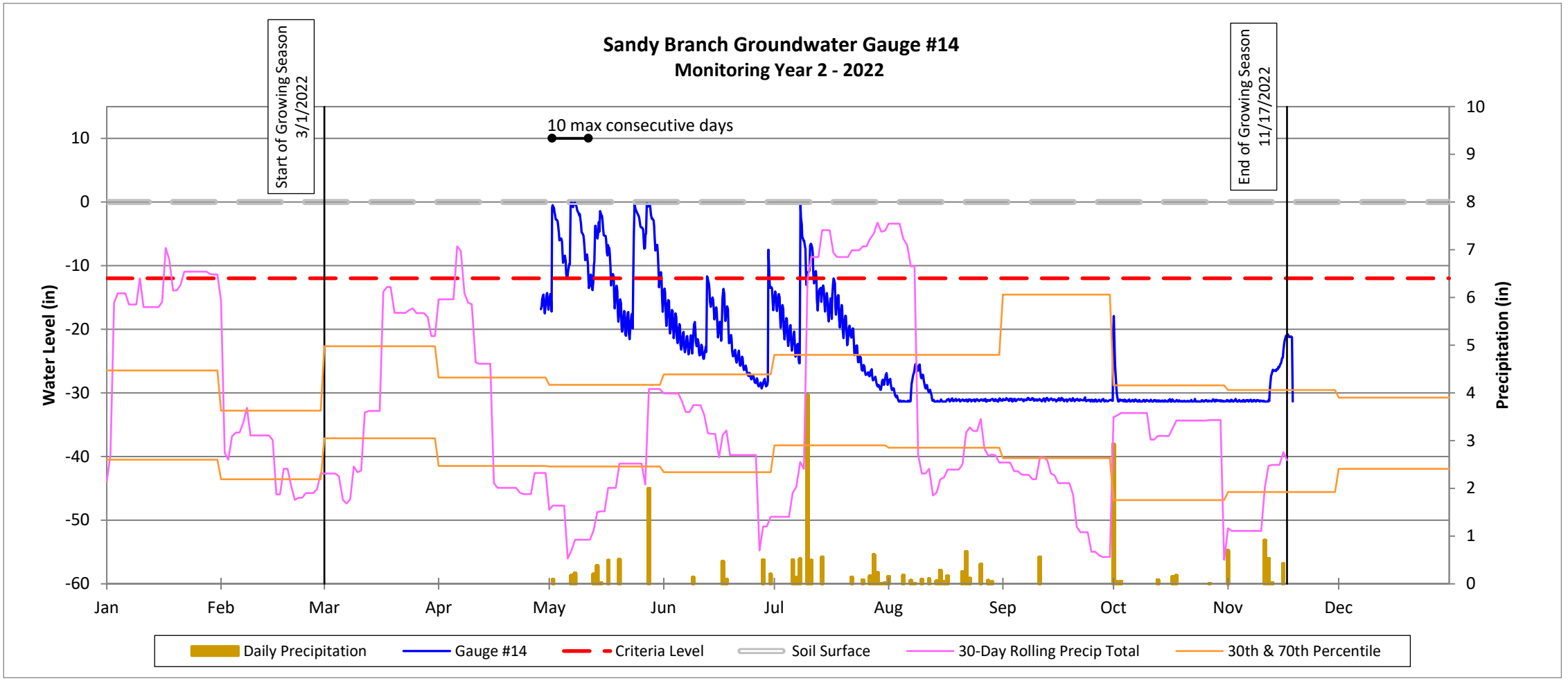


Groundwater Gauge Plot

Sandy Branch Mitigation Site

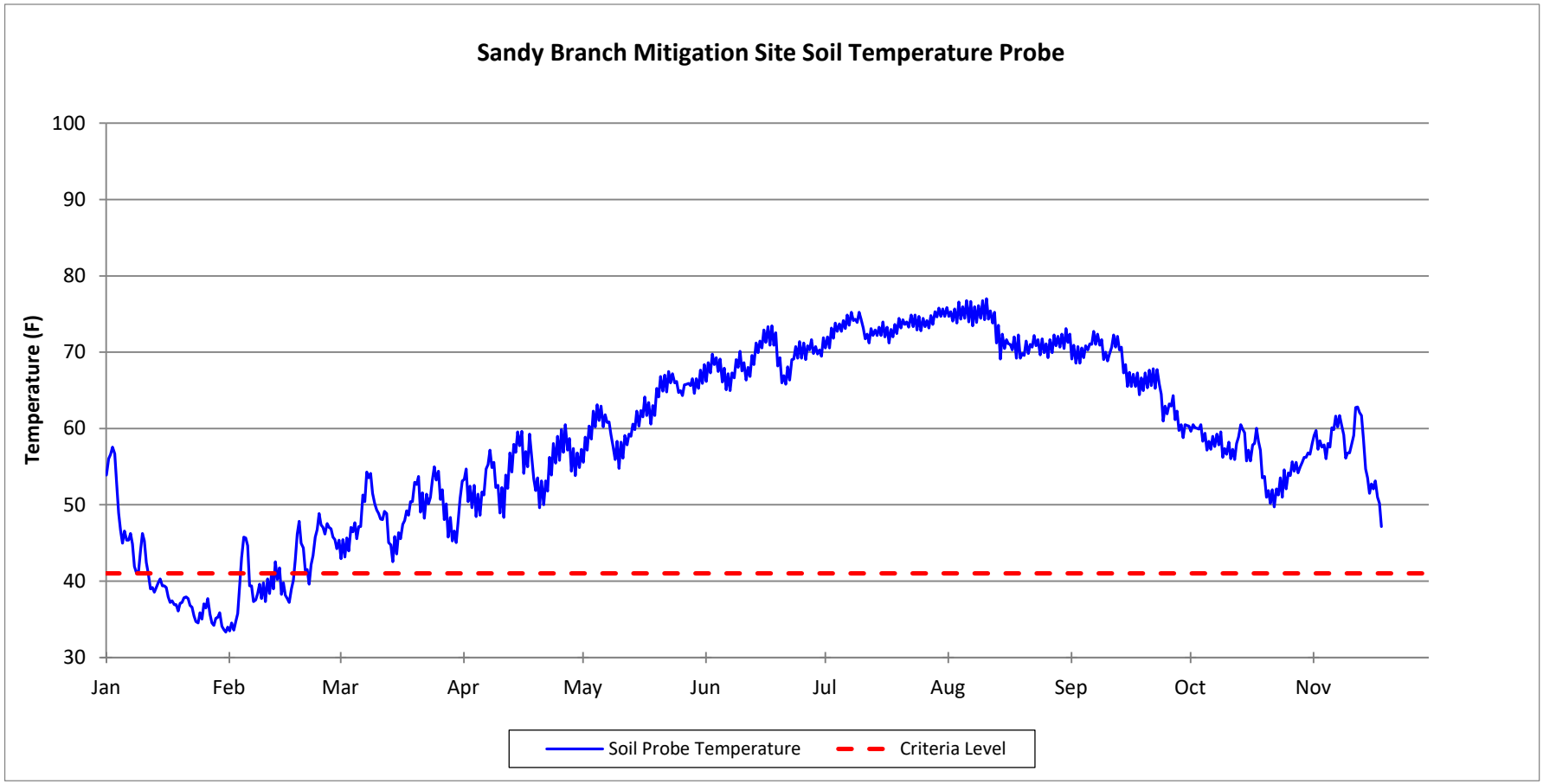
DMS Project No. 100060

Monitoring Year 2 - 2022



Soil Temperature Probe Plot

Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022



APPENDIX E: Project Timeline and Contact Info

Table 13. Project Activity and Reporting History

Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022

Activity or Deliverable		Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted		September 2017	September 2017
Mitigation Plan Approved		December 2019	December 2019
Construction (Grading) Completed		September 2020	September 2020
Planting Completed		January 2021	January 2021
As-Built Survey Completed		September 2020	September 2020
Baseline Monitoring Document (Year 0)	Stream Survey	September 2020	April 2021
	Vegetation Survey	January 2021	
Year 1 Monitoring	Stream Survey	May 2021	December 2021
	Vegetation Survey	August 2021	
Year 2 Monitoring	Stream Survey	March 2022	December 2022
	Fescue Reduction	April 2022	
	Vegetation Survey	August 2022	
Year 3 Monitoring	Stream Survey	2023	December 2023
	Vegetation Survey	2023	
Year 4 Monitoring			December 2024
Year 5 Monitoring	Stream Survey	2025	December 2025
	Vegetation Survey	2025	
Year 6 Monitoring			December 2026
Year 7 Monitoring	Stream Survey	2027	December 2027
	Vegetation Survey	2027	

Table 14. Project Contact Table

Sandy Branch Mitigation Site
DMS Project No. 100060
Monitoring Year 2 - 2022

Designer Greg Turner, PE	**Wildlands Engineering, Inc.** 312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986
Construction Contractor	**Main Stream Earthwork, Inc.** 631 Camp Dan Valley Rd. Reidsville, NC 27320
Monitoring Performers Monitoring, POC	**Wildlands Engineering, Inc.** Jason Lorch 919.851.9986