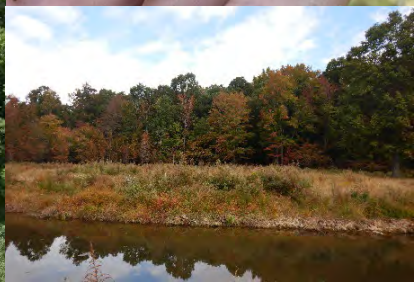

MONITORING YEAR 0 ANNUAL REPORT

FINAL

February 2023

Liberty Rock Mitigation Site

Randolph County, NC
Cape Fear River Basin
HUC 03030003

DMS Project No. 100135
NCDEQ Contract No. 7877-01
DMS RFP No. 16-007877
NCDWR Project No. 2020-0035 v1
USACE Action ID Number 2020-00047

Data Collection Period: October 2022 - January 2023

PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

February 28, 2023

Jeremiah Dow
NC DEQ Division of Mitigation Services
217 West Jones Street
Raleigh, NC 27603

Subject: DMS Comments on Liberty Rock Mitigation Site Monitoring Year 0 Report
DMS Project Number 100135
Randolph County, North Carolina
Contract No. 7877-01

Dear Mr. Dow,

We have reviewed the comments on the MY0 Report for the above referenced project dated February 20, 2023. Below are responses to each of the comments. For your convenience, the comments are reprinted with responses in italics.

1. Table 2, last row says "Trees in each plot must average 7 ft at MY5 and 10 ft at MY7 (excluding shrub and canopy species)." Please remove or replace word "canopy" with correct terminology.

   The typo has been corrected and now reads "sub-canopy."

2. Section 3.5 – says an additional crest gauge will be installed in MY0. During the site visit this had not been done, so please say it will be installed in MY1.

   The report has been updated to reflect that the additional crest gauge was installed on February 21, 2023 in MY1.

3. Should Water Surface (WSF) be shown on the Rocky River Reach 1 longitudinal profile?

   No water was present in the stream channel at the time of the as-built survey; therefore, no water surface is shown on the profile. This has been denoted on the Rocky River Reach 1 profile plots.

4. Sheet 1.13 – A log sill is shown near PP14 that is not shown in the approved mitigation plan drawings, and is not colored red to indicate a construction adjustment. Please correct.

   The structure shown is included in an existing angled log riffle shown and approved in the mitigation plan drawings; the additional symbology has been removed to maintain consistency.

5. Sheet 1.15 – Similar to comment above. A log sill is shown on the first riffle (~506+50) that is not shown on the mit plan drawings, and is not colored red.

   The structure shown is included in an existing angled log riffle shown and approved in the mitigation plan drawings; the additional symbology has been removed to maintain consistency.

6. Sheet 1.15 & 1.16 – It appears that the brush toe installed at 508+09 due to the channel alignment deviation should be colored red.

   The brush toe installed at 508+09 due to channel alignment deviation has been noted and colored red.

7. If any other inconsistencies in the AB drawings are present, please correct, and ensure that Section 2 of the report is updated.

   No other inconsistencies have been found upon comparison of the as-built and mitigation plan drawings; section 2 of the report has been updated to include the addition of brush toe at 508+08 due to alignment deviation.

If you have any questions, please contact me by phone (919) 851-9986, or by email (jlorch@wildlandseng.com).

Sincerely,

Jason Lorch, *Monitoring Coordinator*

PREPARED BY:

312 West Millbrook Road, Suite 225
Raleigh, NC 27609

Jason Lorch
jlorch@wildlandseng.com
Phone: 919.851.9986

LIBERTY ROCK MITIGATION SITE
Monitoring Year 0 Annual Report

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Section 1: PROJECT OVERVIEW

The Liberty Rock Mitigation Site (Site) is located in Randolph County two miles south of the Town of Liberty and nine miles northwest of Siler City. The Site is located within the Rocky River Headwaters targeted local watershed (TLW) Hydrologic Unit Code (HUC) 03030003070010 and the NC Division of Water Resources (DWR) Subbasin 03-06-12. The Site will provide stream and wetland credits to the Cape Fear River Basin Cataloging Unit (CU) 03030003 through restoration, enhancement, and preservation of the Rocky River and four unnamed tributaries to the Rocky River (referred to as Schist Creek, Gypsum Creek, Dolomite Creek, and Mica Creek for the project) and riparian wetland re-establishment, rehabilitation, and enhancement. The Site is located on 2 parcels owned by one landowner and a conservation easement was recorded on 41.12 acres.

1.1 Project Quantities and Credits

The Wilmington District Stream Buffer Credit Calculator (updated (1/19/2018) was used to determine final crediting for the "Additional Credit from Extended Buffers" shown in Table 1 below.

Table 1: Project Quantities and Credits

PROJECT MITIGATION QUANTITIES							
Project Segment	**Mitigation Plan Footage**	**As-Built Footage**	**Mitigation Category**	**Restoration Level**	**Mitigation Ratio (X:1)**	**Credits**	**Comments**
Stream							
Rocky River Reach 1	1,989	2,023	Warm	R	1.0	1,989.000	Full Channel Restoration, Planted Buffer, Extended Buffers
Rocky River Reach 2	580	585	Warm	EI	1.0	580.000	Bank Stabilization, Extended Buffers
Rocky River Reach 3	479	482	Warm	R	1.0	479.000	Full Channel Restoration, Planted Buffer, Extended Buffers
Schist Creek	420	476	Warm	R	1.0	420.000	
Gypsum Creek Reach 1	152	152	Warm	P	10.0	15.200	Conservation Easement
Gypsum Creek Reach 2	208	218	Warm	R	1.0	208.000	Full Channel Restoration, Planted Buffer, Extended Buffers
Dolomite Creek Reach 1	188	188	Warm	P	10.0	18.800	Conservation Easement
Dolomite Creek Reach 2	36	31	Warm	EII	5.0	7.200	Minor Bank Grading, Planted Buffer
Mica Creek	1,151	1,182	Warm	R	1.0	1,151.000	Full Channel Restoration, Planted Buffer, Extended Buffers
					Total:	**4,868.200**	

Wetland							
Re-establishment	N/A	12.868	Riverine	R	1	12.868	Restored Hydrology, Planted
Rehabilitation	3.308	3.308	Riverine	RE	1.5	2.205	Enhanced Hydrology, Planted
Enhancement	0.893	0.893	Riverine	RE	5	0.179	Conservation Easement
					Total:	**15.252**	

Restoration Level	Stream			Riparian Wetland	
	Warm	Cool	Cold	Riverine	Non-Riverine
Restoration	4,247.000				
Enhancement I	580.000				
Enhancement II	7.200				
Preservation	34.000				
Additional Credits from Extended Buffers	274.150				
Re-establishment				12.868	
Rehabilitation				2.205	
Enhancement				0.179	
TOTALS	**5,142.350**			**15.252**	

1.2 Project Goals and Objectives

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

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Improve the stability of stream channels.	Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time.	Reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary.	Entrenchment ratio over 2.2 for C/E restoration reaches and bank height ratio below 1.2 with visual assessments showing progression towards stability.	Cross-section monitoring will be assessed during MY1, MY2, MY3, MY5, and MY7 and visual inspections will be performed annually.	Cross-section data meets performance criteria; all Entrenchment Ratios are >2.2 and BHR is <1.2.
Exclude livestock from streams.	Exclude livestock through removal of livestock from the project parcel.	N/A	N/A	Livestock have been removed from project parcel.	N/A

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Improve instream habitat.	Install habitat features such as constructed riffles, lunker logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Increase and diversify available habitats for macroinvertebrates, fish, mussels, and amphibians leading to colonization and increase in biodiversity over time. Add complexity including LWD to the streams.	There is no performance criteria for this metric. However, mussel survey reports are required deliverables to the IRT.	Mussel surveys will take place in restoration and/or relocation reaches in MY1, MY2, MY3, MY5, and MY7.	Pre-construction mussel surveys completed.
Improve wetland hydrology.	Remove livestock to allow soil profiles to stabilize. Remove drain effect of channelized stream and floodplain swales.	Increased surface water residence time will provide contact treatment and groundwater recharge potential.	Free groundwater surface within 12 inches of the ground surface for 12% of the growing season under normal precipitation conditions.	11 groundwater gauges equipped with pressure transducers are located in representative wetland areas and monitored annually.	Data will be collected throughout the year and reported in MY1.
Reconnect channels with floodplains.	Reconstruct stream channels with designed bankfull dimensions and depth relative to the existing floodplain.	Allow more frequent flood flows to disperse on the floodplain. Support geomorphology and higher-level functions. Improve wetland hydrology in the Rocky River floodplain.	Four bankfull events in separate years within the monitoring period. Thirty days of continuous flow each year on intermittent streams during years of normal precipitation.	Crest and flow gauges (pressure transducers) recording flow elevations.	Data will be collected throughout the year and reported in MY1.
Restore and enhance native floodplain and streambank vegetation.	Plant native tree and understory species in riparian zones and plant native shrub and herbaceous species on streambanks. Treat invasive species within project area.	Reduce sediment inputs from bank erosion and runoff. Increase nutrient cycling and storage in floodplain. Provide riparian habitat. Add a source of LWD and organic material to stream. Support all stream functions.	Survival rate of 210 planted stems per acre at MY7. Interim survival rate of 320 planted stems per acre at MY3 and 260 at MY5. Trees in each plot must average 7 ft at MY5 and 10 ft at MY7 (excluding shrub and sub-canopy species).	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 and assessed visually in MY4 and MY6.	All 19 vegetation plots have a planted stem density greater than 320 stems per acre.

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Permanently protect the Site from harmful uses.	Establish a conservation easement on the Site. Preserve high quality stream reaches through the placement of a conservation easement on site.	Protect Site from encroachment on the riparian corridor and direct impact to streams and wetlands. Support all stream functions.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	No easement encroachments.

1.3 Project Attributes

Five jurisdictional stream channels are located on Site: Rocky River, Schist Creek, Gypsum Creek, Dolomite Creek, and Mica Creek. As referenced in the Liberty Rock Mitigation Site Final Mitigation Plan, historic aerials indicate that on-site streams have existed in their same approximate location for over 75 years, with some changes to the agricultural management of the land. Aerials show that the riparian buffers for Dolomite, Gypsum, and Schist Creeks have remained undisturbed since prior to 1943. The riparian buffer of Mica Creek was timbered and converted to agricultural use in the 1960's and the riparian buffer and floodplain of Rocky River was timbered and converted to agricultural use in the 1980's. The Rocky River was straightened and moved to the south valley edge during that time. Land use and buffer extents have remained consistent since then. A review of historic imagery for the greater Rocky River Watershed draining to the Site shows little land use change since 1993 as well. Nearly 4% of the watershed area is planted pine trees for future harvesting. According to aerial photography, the most recent logging event occurred between 2006 and 2008 when approximately 75 acres of pines in the upper watershed were timbered.

Table 3: Project Attributes

PROJECT INFORMATION			
Project Name	Liberty Rock Mitigation Site	County	Randolph County
Project Area (acres)	41.12	Project Coordinates	35°49'12.34" N 79°33'43.89" W
PROJECT WATERSHED SUMMARY INFORMATION			
Physiographic Province	Piedmont	River Basin	Cape Fear River
USGS HUC 8-digit	03030003	USGS HUC 14-digit	03030003070010
DWR Sub-basin	03-06-12	Land Use Classification	42% Cultivated Crops, 24% Developed, 24% Forest, 5% Shrubland, 3% Grassland/Herbaceous, 1% Open Water, 1% Wetlands
Project Drainage Area (acres)	2,600	Percentage of Impervious Area	6.70%

RESTORATION TRIBUTARY SUMMARY INFORMATION					
Parameters	**Rocky River**	**Schist Creek**	**Gypsum Creek**	**Dolomite Creek**	**Mica Creek**
Pre-project length (feet)	2,652	211	113	44	952
Post-project (feet)	3,090	476	218	31	1,182
Valley confinement	Unconfined				Moderately confined
Drainage area (acres)	2,600	219	2	7	92
Perennial, Intermittent, Ephemeral	P	P	I	I	P
DWR Water Quality Classification	Water Supply III				
Dominant Stream Classification (existing)	C4	C4/E4	N/A[1]	N/A[1]	C4/E4
Dominant Stream Classification (proposed)	C4	C4	C4	N/A[2]	C4
Dominant Evolutionary class (Simon) if applicable	N/A	N/A	N/A	N/A	N/A

REGULATORY CONSIDERATIONS			
Parameters	**Applicable?**	**Resolved?**	**Supporting Documentation**
Water of the United States - Section 404	Yes	Yes	USACE Nationwide Permit No. 27 and DWQ 401 Water Quality Certification No. 4134.
Water of the United States - Section 401	Yes	Yes	
Endangered Species Act	Yes	Yes	Categorical Exclusion in Mitigation Plan (Wildlands, 2020)
Historic Preservation Act	Yes	Yes	
Coastal Zone Management Act	N/A	N/A	N/A
Essential Fisheries Habitat	N/A	N/A	N/A

1. Gypsum Creek Reach 2 and Dolomite Creek Reach 2 were severely degraded and eroded due to cattle trampling. Cross-section surveys could not be performed.

2. Source: Rosgen, D. L. 1994. A classification of natural rivers. Catena 22:169-199. Reaches not slated for restoration or enhancement I were not classified (NC).

Section 2: As-Built Condition (Baseline)

The Site construction and as-built surveys were completed in August 2022 and October 2022 respectively. The survey included developing an as-built topographic surface; as well as surveying the as-built channel centerlines, top of banks, structures, and cross-sections.

2.1 As-Built/Record Drawings

A sealed half-size set of record drawings are in Appendix E which includes the post-construction survey, alignments, structures, and monitoring features. A slight adjustment falling within 2 feet of design was made on Mica Creek due to the presence of bedrock. No other significant field adjustments were made during construction, the adjustments made during construction were minimal, made only where needed, and were based on field evaluations. They are listed below.

2.1.1 Rocky River Reach 1

- STA 101+48 – STA 101+86 – Added rock to existing riffle.
- STA 102+05 – STA 102+69 – Vegetative soil lift replaced with brushtoe for increased channel stability.
- STA 112+41 – STA 113+31 – Vegetative soil lift replaced with brushtoe for increased channel stability.

2.1.2 Rocky River Reach 2

- STA 123+26 – STA 123+64 – Streambank stability was achieved by grading instead of installing vegetative soil lift.

2.1.3 Rocky River Reach 3

- STA 126+95 – STA 127+36 – Vegetative soil lift replaced with brushtoe for increased channel stability.

2.1.4 Schist Creek

- No significant changes made.

2.1.5 Gypsum Creek Reach 2

- No significant changes made.

2.1.6 Dolomite Creek Reach 2

- STA 401+88 – STA 402+33 – Realigned during construction due to slight change in Rocky River from initial survey.

2.1.7 Mica Creek

- STA 508+09 – STA 509+04 – Alignment changed due to bedrock.
- STA 508+09 – STA 509+04 – Brushtoe added for stabilization.
- STA 509+08 – STA 509+29 – Brushtoe added for stabilization.
- STA 510+69 – STA 511+00 – Brushtoe added for stabilization.
- STA 511+27 – STA 511+45 – Brushtoe added for stabilization.

Section 3: Monitoring Year 0 Data Assessment

The vegetation and stream success criteria for the Site follow the approved success criteria presented in the Mitigation Plan (Wildlands, 2021). Performance criteria for vegetation, stream, and hydrologic assessment are located in Section 1.2 Table 2: Goals, Performance Criteria, and Functional Improvements.

3.1 Vegetative Assessment

The MY0 vegetative survey was completed in January 2023. Vegetation monitoring resulted in a stem density range of 526 to 688 planted stems per acre which is well above the interim requirement of 320 stems per acre required at MY3. Average stem density across all vegetation plots was 594 planted stems per acre. All 19 vegetation plots met the interim success criteria and are on track to meet the final success criteria required for MY7. Herbaceous groundcover has become established across the site. Refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix B for Vegetation Plot Data.

3.2 Vegetation Areas of Concern

Vegetation management and herbicide treatments were applied prior to construction in sporadic areas of existing forested areas to prevent the spread of invasive species that could potentially compete with planted native species. Throughout March-June 2021, multiflora rose (*Rosa multiflora*), Chinese privet (*Ligustrum sinense*), and parrot feather (*Myriophyllum aquaticum*) were treated physically and chemically. Scattered populations of blackberry (*Rubus spp.*) were also present on the site and treated prior to construction. Wildlands recognizes that multiple treatments are typically needed for effective invasive plant control. Supplemental treatments were applied monthly post-construction throughout August-December 2022. Additional physical and chemical removal is planned for spring 2023. These areas will be monitored and retreated as necessary.

3.3 Stream Assessment

Morphological surveys for MY0 were conducted in October 2022. All streams on Site are stable and functioning as designed. Streams show only minor deviations from design and visual assessments show streams remain stable. Cross-sections show entrenchment and width-to-depth ratios within an acceptable range of the design parameters, and bank height ratios are less than 1.2. Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table and Stream Photographs. Refer to Appendix C for Stream Geomorphology Data.

3.4 Stream Areas of Concern

No stream areas of concern were identified, all streams are stable and functioning as intended.

3.5 Hydrology Assessment

Two crest gauges were installed, one on Rocky River Reach 2 (Enhancement I) and another on Mica Creek. An additional crest gauge was installed on Rocky River Reach 1 in MY1 to better reflect the interaction of flow conditions within the restored portion of the site. One flow gauge was installed on Gypsum Creek. Stream gauge data will be collected quarterly, and hydrologic data will be reported during MY1.

3.6 Wetland Assessment

Eleven groundwater gauges were installed in wetlands across the Site. These gauges will be monitored quarterly to observe wetland hydrology and determine if they meet success criteria. Groundwater gauge

data will be collected and reported during MY1. Soil profile data has been recorded near each groundwater well and included in Appendix F.

3.7 Monitoring Year 0 Summary

Overall, the Site looks great, is performing as intended, and is on course to meet success criteria. Vegetation plot data shows an average density of 594 planted stems per acre across plots. All vegetation plots are on track to exceed the MY3 interim requirement of 320 planted stems per acre. All project streams are stable, functioning as intended, and meeting project goals. Stream and wetland hydrology data will be included in the MY1 annual report. Invasive species were treated prior to construction and again after construction. Invasive species will continue to be assessed and treated as necessary in future monitoring years.

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 4: METHODOLOGY

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 recorded using an EOS Arrow handheld GPS with sub-meter accuracy and processed using ArcPro. Pressure transducers were installed in riffle cross-sections and monitored throughout the year. Hydrologic monitoring instrument installation and monitoring methods are in accordance with the United States Army Corps of Engineers standards (USACE, 2003) and the North Carolina Interagency Review Team Stream and Wetland Compensatory Mitigation Update (NCIRT, 2016). Vegetation monitoring protocols followed the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).

Section 5: 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, John 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.

Lee, M.T., Peet, R.K., Roberts, S.D., & Wentworth, T.R. 2008. CVS-EEP Protocol for Recording Vegetation Version 4.2.

North Carolina Interagency Review Team (NCIRT). 2016. Wilmington District Stream and Wetland Compensatory Mitigation Update.

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

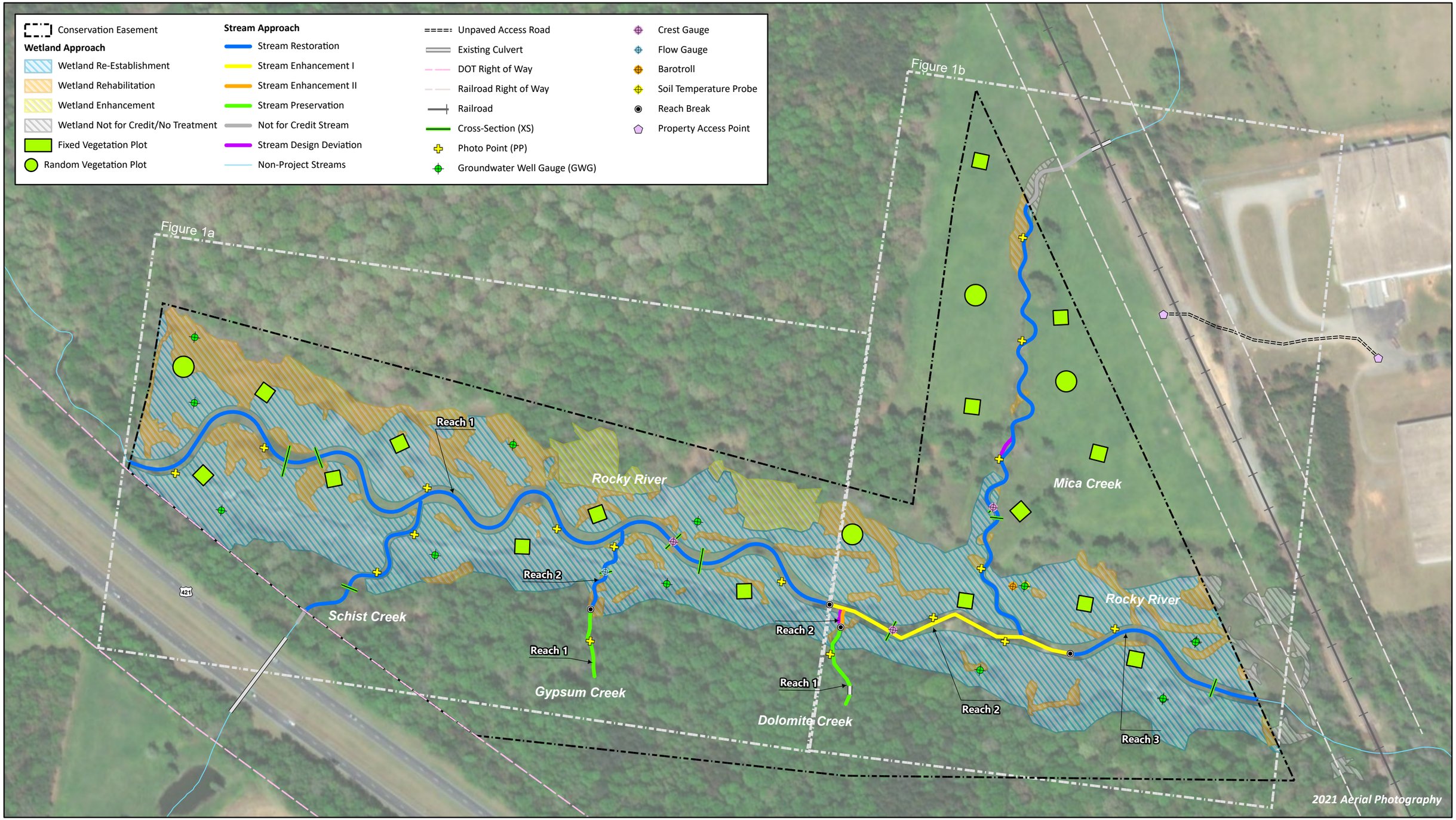
Rosgen, D.L. 1996. Applied River Morphology. Pagosa Springs, CO: Wildland Hydrology Books.

Rosgen, D.L. 1997. A Geomorphological Approach to Restoration of Incised Rivers. Proceedings of the Conference on Management of Landscapes Disturbed by Channel Incision. Center For Computational Hydroscience and Bioengineering, Oxford Campus, University of Mississippi, Pages 12-22.

United States Army Corps of Engineers. 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

United States Geological Survey. 1998. North Carolina Geology.

Wildlands Engineering, Inc. 2021. Liberty Rock Mitigation Site - Final Mitigation Plan. DMS, Raleigh, NC.



WILDLANDS ENGINEERING

0 200 400 Feet

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Figure 1. Current Condition Plan View Key
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Randolph County, NC

Conservation Easement

Wetland Approach
- Wetland Re-Establishment
- Wetland Rehabilitation
- Wetland Enhancement
- Wetland Not for Credit/No Treatment
- Fixed Vegetation Plot
- Random Vegetation Plot

Stream Approach
- Stream Restoration
- Stream Enhancement I
- Stream Preservation
- Not for Credit Stream
- Non-Project Streams
- Structure
- Top of Bank

- Existing Culvert
- DOT Right of Way
- Cross-Section (XS)
- Photo Point (PP)
- Groundwater Well Gauge (GWG)
- Flow Gauge
- Reach Break

Rocky River
Schist Creek
Gypsum Creek
Reach 1
Reach 2
GWG 1
GWG 2
GWG 3
GWG 4
GWG 5
GWG 6
GWG 7
PP1
PP2
PP3
PP4
PP5
PP9
PP10
PP11
PP12
XS 1
XS 2
XS 3
XS 4
XS 7
XS 8
102+00
104+00
106+00
108+00
110+00
112+00
114+00
116+00
118+00
120+00
202+00
204+00
302+00
421
1
2
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16
2021 Aerial Photography

WILDLANDS ENGINEERING

0 100 200 Feet

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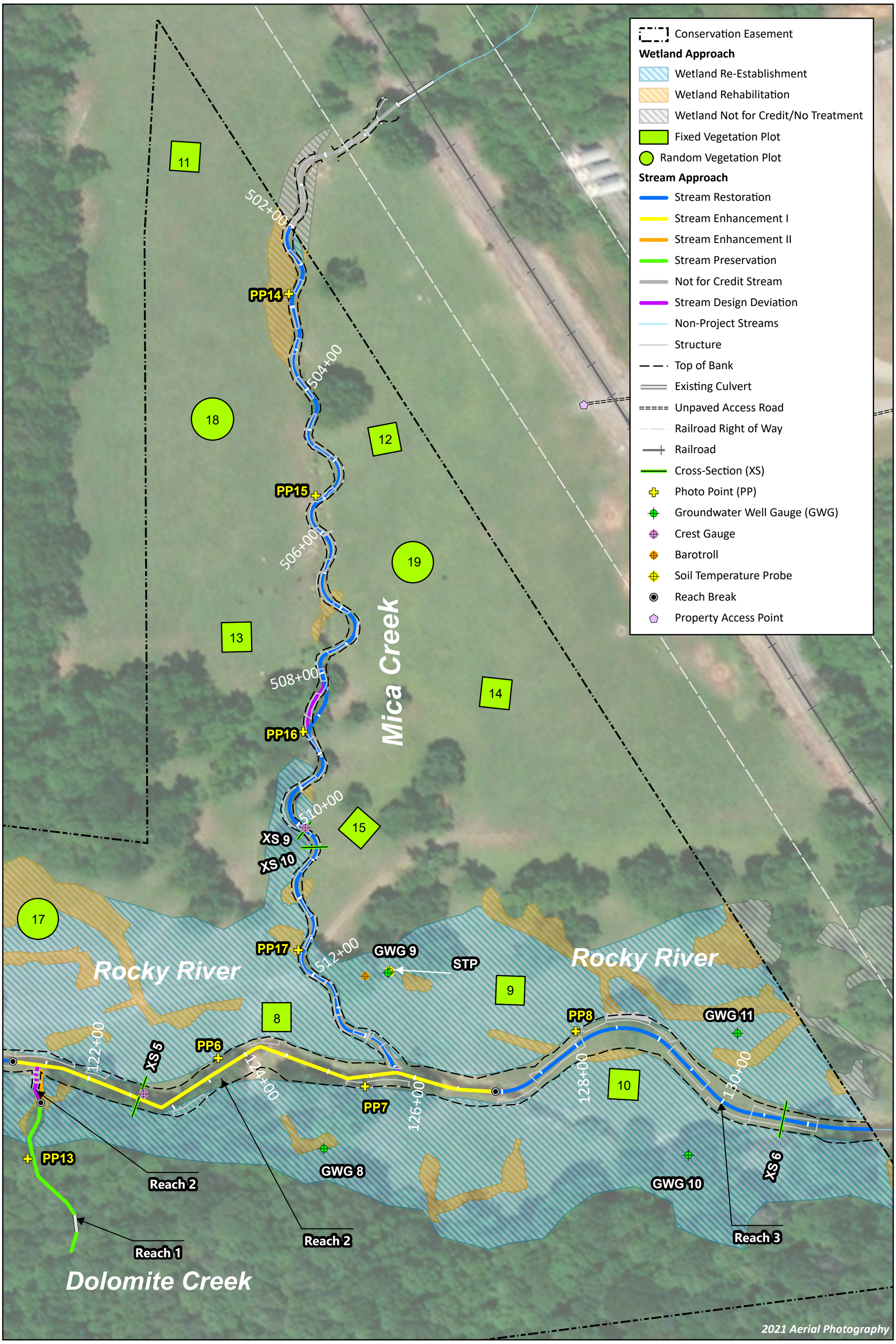
Figure 1a. Current Condition Plan View
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Randolph County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 1b. Current Condition Plan View
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Randolph County, NC

APPENDIX A. Visual Assessment Data

Table 4. Visual Stream Morphology Stability Assessment Table

Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Rocky River Reaches 1-3

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	3,090
					Assessed Bank Length	6,180
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%.	21	21		100%

Schist Creek

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	476
					Assessed Bank Length	952
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.	N/A	N/A		N/A
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	6	6		100%

Table 4. Visual Stream Morphology Stability Assessment Table

Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Gypsum Creek 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	218
					Assessed Bank Length	436
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%.	7	7		100%

Mica Creek

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	1,182
					Assessed Bank Length	2,364
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%.	19	19		100%

Table 5. Vegetation Condition Assessment Table
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Planted Acreage **23.70**

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10	0.00	0.00
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10	0.00	0.00
		Total	**0.0**	**0%**
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10	0.00	0.00
		Cumulative Total	**0.0**	**0%**

Easement Acreage **41.12**

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	0.00	0.00
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 Rocky River R1 – upstream *(8/22/2022)*

PHOTO POINT 1 Rocky River R1 – downstream *(8/22/2022)*

PHOTO POINT 2 Rocky River R1 – upstream *(8/22/2022)*

PHOTO POINT 2 Rocky River R1 – downstream *(8/22/2022)*

PHOTO POINT 3 Rocky River R1 – upstream *(8/22/2022)*

PHOTO POINT 3 Rocky River R1 – downstream *(8/22/2022)*

PHOTO POINT 4 Rocky River R1 – upstream *(8/22/2022)*

PHOTO POINT 4 Rocky River R1 – downstream *(8/22/2022)*

PHOTO POINT 5 Rocky River R1 – upstream *(8/22/2022)*

PHOTO POINT 5 Rocky River R1 – downstream *(8/22/2022)*

PHOTO POINT 6 Rocky River R2 – upstream *(8/22/2022)*

PHOTO POINT 6 Rocky River R2 – downstream *(8/22/2022)*

	
PHOTO POINT 7 Rocky River R2 – upstream *(8/22/2022)*	**PHOTO POINT 7 Rocky River R2 – downstream *(8/22/2022)***
	
PHOTO POINT 8 Rocky River R3 – upstream *(8/22/2022)*	**PHOTO POINT 8 Rocky River R3 – downstream *(8/22/2022)***
	
PHOTO POINT 9 Schist Creek – upstream *(8/22/2022)*	**PHOTO POINT 9 Schist Creek – downstream *(8/22/2022)***

PHOTO POINT 10 Schist Creek – upstream *(8/22/2022)*

PHOTO POINT 10 Schist Creek – downstream *(8/22/2022)*

PHOTO POINT 11 Gypsum Creek R1 – upstream *(8/22/2022)*

PHOTO POINT 11 Gypsum Creek R1 – downstream *(8/22/2022)*

PHOTO POINT 12 Gypsum Creek R2 – upstream *(8/22/2022)*

PHOTO POINT 12 Gypsum Creek R2 – downstream *(8/22/2022)*

PHOTO POINT 13 Dolomite Creek R1 – upstream *(8/22/2022)*

PHOTO POINT 13 Dolomite Creek R1 – downstream *(8/22/2022)*

PHOTO POINT 14 Mica Creek – upstream *(8/22/2022)*

PHOTO POINT 14 Mica Creek – downstream *(8/22/2022)*

PHOTO POINT 15 Mica Creek – upstream *(8/22/2022)*

PHOTO POINT 15 Mica Creek – downstream *(8/22/2022)*

PHOTO POINT 16 Mica Creek – upstream *(8/22/2022)*

PHOTO POINT 16 Mica Creek – downstream *(8/22/2022)*

PHOTO POINT 17 Mica Creek – upstream *(8/22/2022)*

PHOTO POINT 17 Mica Creek – downstream *(8/22/2022)*

Lunker Box Installation *(8/04/2022)*

VEGETATION PLOT PHOTOGRAPHS

FIXED VEG PLOT 1 *(01/12/2023)*

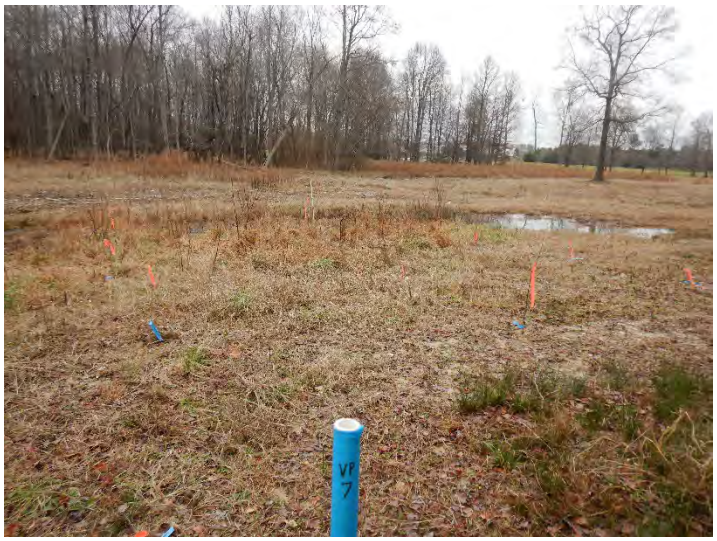
FIXED VEG PLOT 2 *(01/12/2023)*

FIXED VEG PLOT 3 *(01/12/2023)*

FIXED VEG PLOT 4 *(01/12/2023)*

FIXED VEG PLOT 5 *(01/12/2023)*

FIXED VEG PLOT 6 *(01/12/2023)*



FIXED VEG PLOT 7 *(01/12/2023)*

FIXED VEG PLOT 8 *(01/12/2023)*

FIXED VEG PLOT 9 *(01/12/2023)*

FIXED VEG PLOT 10 *(01/12/2023)*

FIXED VEG PLOT 11 *(01/12/2023)*

FIXED VEG PLOT 12 *(01/12/2023)*

FIXED VEG PLOT 13 *(01/12/2023)*

FIXED VEG PLOT 14 *(01/12/2023)*

FIXED VEG PLOT 15 *(01/12/2023)*

RANDOM VEG PLOT 16 *(01/12/2023)*

RANDOM VEG PLOT 17 *(01/12/2023)*

RANDOM VEG PLOT 18 (*01/12/2023*)

RANDOM VEG PLOT 19 (*01/12/2023*)

APPENDIX B. Vegetation Plot Data

Table 6. Vegetation Plot Data
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Planted Acreage	26.50
Date of Initial Plant	2023-01-06
Date of Current Survey	2023-01-12
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	
					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	1	1	1	1	1	1
	Alnus serrulata	hazel alder	Tree	FACW	1	1			1	1	1	1		
	Asimina triloba*	pawpaw	Tree	FAC										
	Betula nigra	river birch	Tree	FACW	1	1	2	2			3	3	5	5
	Celtis laevigata	sugarberry	Tree	FACW										
	Cephalanthus occidentalis*	buttonbush	Shrub	OBL	2	2	2	2					1	1
	Cornus amomum*	silky dogwood	Shrub	FACW										
	Diospyros virginiana	common persimmon	Tree	FAC										
	Euonymus americanus*	strawberry bush	Shrub	FAC										
	Platanus occidentalis	American sycamore	Tree	FACW	3	3	2	2	2	2	2	2	2	2
	Quercus lyrata	overcup oak	Tree	OBL	2	2	1	1	2	2	4	4		
	Quercus michauxii	swamp chestnut oak	Tree	FACW			1	1	2	2			1	1
	Quercus phellos	willow oak	Tree	FACW	1	1	1	1	1	1	2	2	1	1
	Quercus rubra	northern red oak	Tree	FACU										
	Salix nigra*	black willow	Tree	OBL	2	2	2	2	2	2	1	1	2	2
	Sambucus canadensis*	American black elderberry	Tree	FACW	1	1	1	1						
	Ulmus americana	American elm	Tree	FAC	1	1	3	3	3	3			1	1
Sum			Performance Standard		15	15	16	16	14	14	14	14	14	14
Mitigation Plan Performance Standard			Current Year Stem Count			15		16		14		14		14
			Stems/Acre			607		648		567		567		567
			Species Count			10		10		8		7		8
			Dominant Species Composition (%)			20		19		21		29		36
			Average Plot Height (ft.)			2		2		2		3		2
			% Invasives			0		0		0		0		0
Post Mitigation Plan Performance Standard			Current Year Stem Count			15		16		14		14		14
			Stems/Acre			607		648		597		567		567
			Species Count			10		10		8		7		8
			Dominant Species Composition (%)			20		19		21		29		36
			Average Plot Height (ft.)			2		2		2		3		2
			% Invasives			0		0		0		0		0

*Species not subject to monitoring height requirement due to species growth habit.
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
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Planted Acreage	26.50
Date of Initial Plant	2023-01-06
Date of Current Survey	2023-01-12
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F		Veg Plot 9 F		Veg Plot 10 F	
					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	1	1	2	2	1	1
	Alnus serrulata	hazel alder	Tree	FACW	2	2					1	1	2	2
	Asimina triloba*	pawpaw	Tree	FAC										
	Betula nigra	river birch	Tree	FACW			3	3	3	3	2	2	1	1
	Celtis laevigata	sugarberry	Tree	FACW										
	Cephalanthus occidentalis*	buttonbush	Shrub	OBL	2	2	1	1			1	1	2	2
	Cornus amomum*	silky dogwood	Shrub	FACW										
	Diospyros virginiana	common persimmon	Tree	FAC										
	Euonymus americanus*	strawberry bush	Shrub	FAC										
	Platanus occidentalis	American sycamore	Tree	FACW	3	3	3	3	1	1	2	2	1	1
	Quercus lyrata	overcup oak	Tree	OBL			1	1	3	3			2	2
	Quercus michauxii	swamp chestnut oak	Tree	FACW	3	3	1	1	2	2				
	Quercus phellos	willow oak	Tree	FACW			1	1	1	1	2	2	2	2
	Quercus rubra	northern red oak	Tree	FACU										
	Salix nigra*	black willow	Tree	OBL	2	2	1	1	2	2	2	2	2	2
	Sambucus canadensis*	American black elderberry	Tree	FACW			1	1	1	1	1	1	1	1
	Ulmus americana	American elm	Tree	FAC	2	2	1	1	1	1	2	2	2	2
Sum				Performance Standard	15	15	14	14	15	15	15	15	16	16
Mitigation Plan Performance Standard				Current Year Stem Count		15		14		15		15		16
				Stems/Acre		607		567		607		607		648
				Species Count		7		10		9		9		10
				Dominant Species Composition (%)		20		21		20		13		12
				Average Plot Height (ft.)		2		2		3		3		3
				% Invasives		0		0		0		0		0
Post Mitigation Plan Performance Standard				Current Year Stem Count		15		14		15		15		16
				Stems/Acre		607		567		607		607		648
				Species Count		7		10		9		9		10
				Dominant Species Composition (%)		20		21		20		13		12
				Average Plot Height (ft.)		2		2		3		3		3
				% Invasives		0		0		0		0		0

*Species not subject to monitoring height requirement due to species growth habit.
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
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Planted Acreage	26.50
Date of Initial Plant	2023-01-06
Date of Current Survey	2023-01-12
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 11 F		Veg Plot 12 F		Veg Plot 13 F		Veg Plot 14 F		Veg Plot 15 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	1	1	2	2	3	3	2	2	1	1
	Alnus serrulata	hazel alder	Tree	FACW										
	Asimina triloba*	pawpaw	Tree	FAC	1	1							1	1
	Betula nigra	river birch	Tree	FACW	2	2	3	3	1	1	2	2	3	3
	Celtis laevigata	sugarberry	Tree	FACW	1	1								
	Cephalanthus occidentalis*	buttonbush	Shrub	OBL										
	Cornus amomum*	silky dogwood	Shrub	FACW										
	Diospyros virginiana	common persimmon	Tree	FAC	2	2	2	2	3	3	2	2	2	2
	Euonymus americanus*	strawberry bush	Shrub	FAC	1	1	1	1	2	2	1	1	1	1
	Platanus occidentalis	American sycamore	Tree	FACW	2	2	3	3	2	2	3	3	2	2
	Quercus lyrata	overcup oak	Tree	OBL										
	Quercus michauxii	swamp chestnut oak	Tree	FACW	2	2	2	2	2	2	1	1	2	2
	Quercus phellos	willow oak	Tree	FACW	2	2	1	1	2	2	2	2		
	Quercus rubra	northern red oak	Tree	FACU							1	1		
	Salix nigra*	black willow	Tree	OBL										
	Sambucus canadensis*	American black elderberry	Tree	FACW										
	Ulmus americana	American elm	Tree	FAC	1	1	1	1	2	2	1	1	1	1
Sum			Performance Standard		15	15	15	15	17	17	15	15	13	13
Mitigation Plan Performance Standard			Current Year Stem Count			15		15		17		15		13
			Stems/Acre			607		607		688		607		526
			Species Count			10		8		8		9		8
			Dominant Species Composition (%)			13		20		18		20		23
			Average Plot Height (ft.)			2		2		2		2		2
			% Invasives			0		0		0		0		0
Post Mitigation Plan Performance Standard			Current Year Stem Count			15		15		17		15		13
			Stems/Acre			607		607		688		607		526
			Species Count			10		8		8		9		8
			Dominant Species Composition (%)			13		20		18		20		23
			Average Plot Height (ft.)			2		2		2		2		2
			% Invasives			0		0		0		0		0

*Species not subject to monitoring height requirement due to species growth habit.
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
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Planted Acreage	26.50
Date of Initial Plant	2023-01-06
Date of Current Survey	2023-01-12
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 16 R Total	Veg Plot 17 R Total	Veg Plot 18 R Total	Veg Plot 19 R Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	1	1	2	1
	Alnus serrulata	hazel alder	Tree	FACW				
	Asimina triloba*	pawpaw	Tree	FAC			1	1
	Betula nigra	river birch	Tree	FACW	4	4	3	2
	Celtis laevigata	sugarberry	Tree	FACW				
	Cephalanthus occidentalis*	buttonbush	Shrub	OBL				
	Cornus amomum*	silky dogwood	Shrub	FACW	1			
	Diospyros virginiana	common persimmon	Tree	FAC				1
	Euonymus americanus*	strawberry bush	Shrub	FAC			1	1
	Platanus occidentalis	American sycamore	Tree	FACW	3	2	2	2
	Quercus lyrata	overcup oak	Tree	OBL	2	2		
	Quercus michauxii	swamp chestnut oak	Tree	FACW	1		1	2
	Quercus phellos	willow oak	Tree	FACW	1	1		1
	Quercus rubra	northern red oak	Tree	FACU			2	1
	Salix nigra*	black willow	Tree	OBL	1	2		
	Sambucus canadensis*	American black elderberry	Tree	FACW	1	1		
	Ulmus americana	American elm	Tree	FAC		2	1	1
Sum				Performance Standard	15	15	13	13
Mitigation Plan Performance Standard				Current Year Stem Count	15	15	13	13
				Stems/Acre	607	607	526	526
				Species Count	9	8	8	10
				Dominant Species Composition (%)	27	27	23	15
				Average Plot Height (ft.)	2	3	2	2
				% Invasives	0	0	0	0
Post Mitigation Plan Performance Standard				Current Year Stem Count	15	15	13	13
				Stems/Acre	607	607	526	526
				Species Count	9	8	8	10
				Dominant Species Composition (%)	27	27	23	15
				Average Plot Height (ft.)	2	3	2	2
				% Invasives	0	0	0	0

*Species not subject to monitoring height requirement due to species growth habit.
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
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

	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												
Monitoring Year 0	607	2	10	0	648	2	10	0	567	2	8	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)**	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)**	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)**	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1												
Monitoring Year 0	567	3	8	0	567	2	8	0	607	2	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												
Monitoring Year 1												
Monitoring Year 0	567	2	10	0	607	3	9	0	607	3	9	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												
Monitoring Year 0	648	3	10	0	607	2	10	0	607	2	8	0
	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												
Monitoring Year 0	688	2	8	0	607	2	9	0	526	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.
**Species not subject to monitoring height requirement due to species growth habit are not included in height calculations.

Table 7. Vegetation Performance Standards Summary Table
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

	Veg Plot 16 R				Veg Plot 17 R				Veg Plot 18 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												
Monitoring Year 0	607	2	9	0	607	3	8	0	526	2	8	0

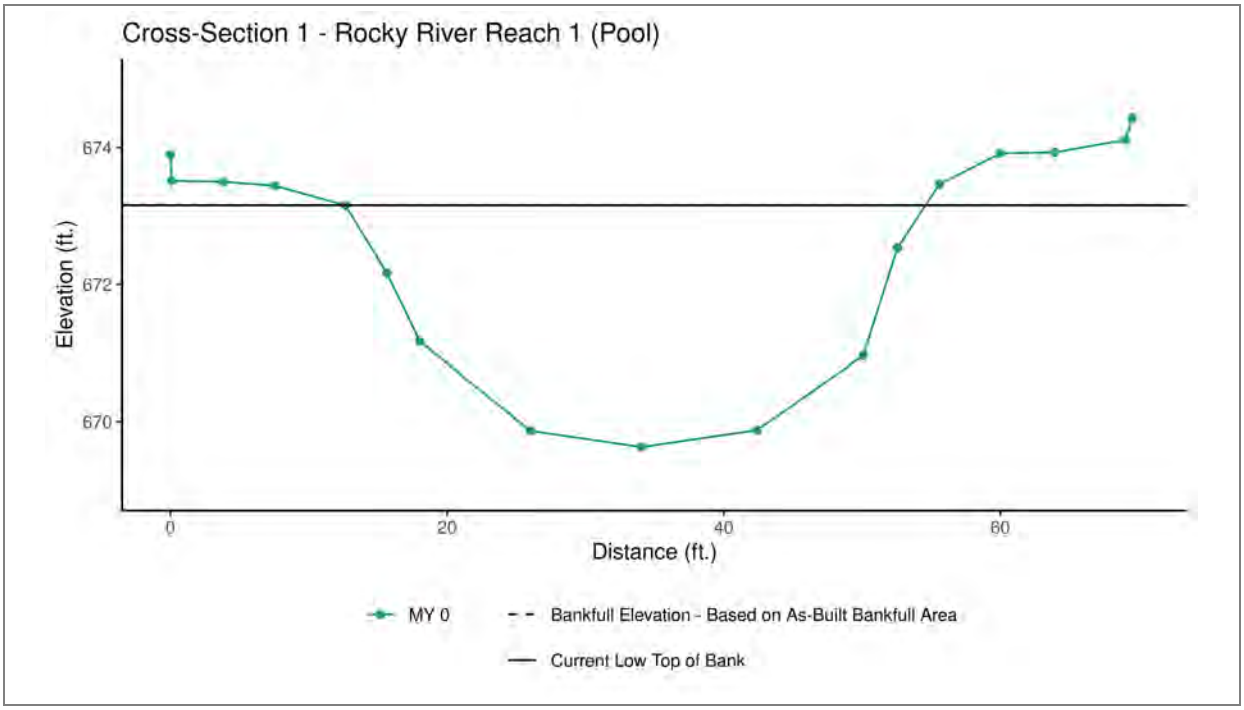
	Veg Plot 19 R			
	Stems/Ac.	Av. Ht. (ft)**	# Species	% Invasives
Monitoring Year 7				
Monitoring Year 5				
Monitoring Year 3				
Monitoring Year 2				
Monitoring Year 1				
Monitoring Year 0	526	2	10	0

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

**Species not subject to monitoring height requirement due to species growth habit are not included in height calculations.

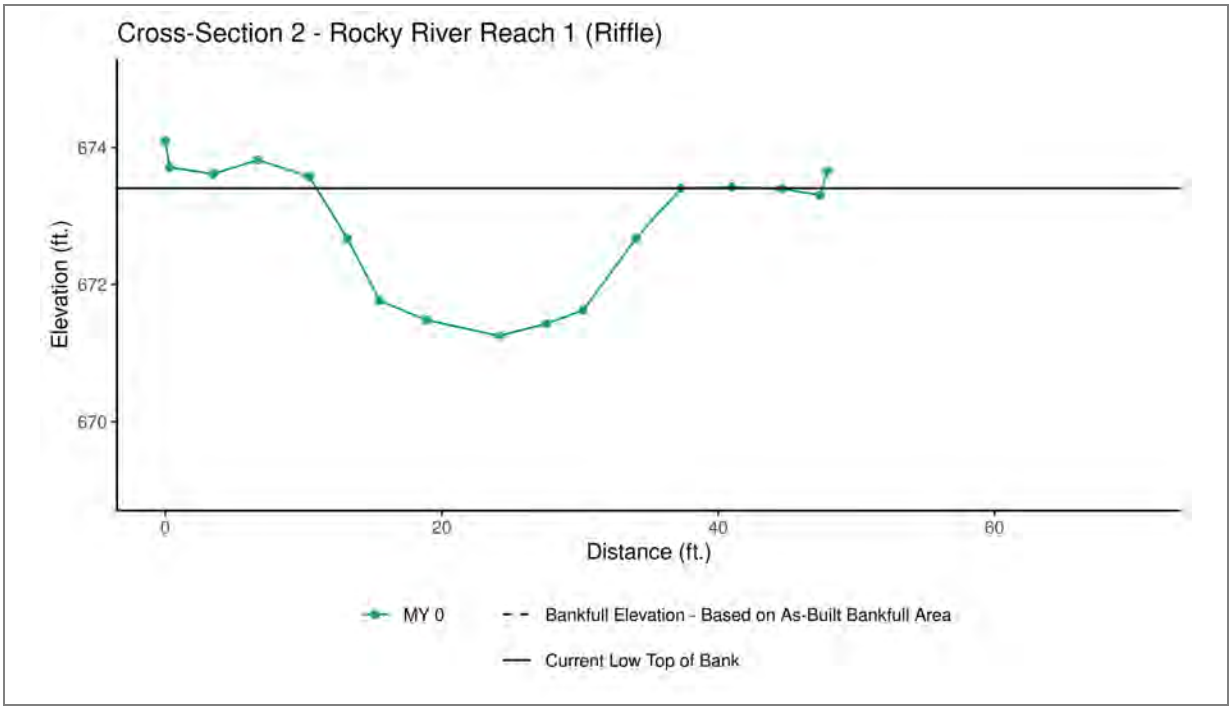
APPENDIX C. Stream Geomorphology Data

Cross-Section Plots



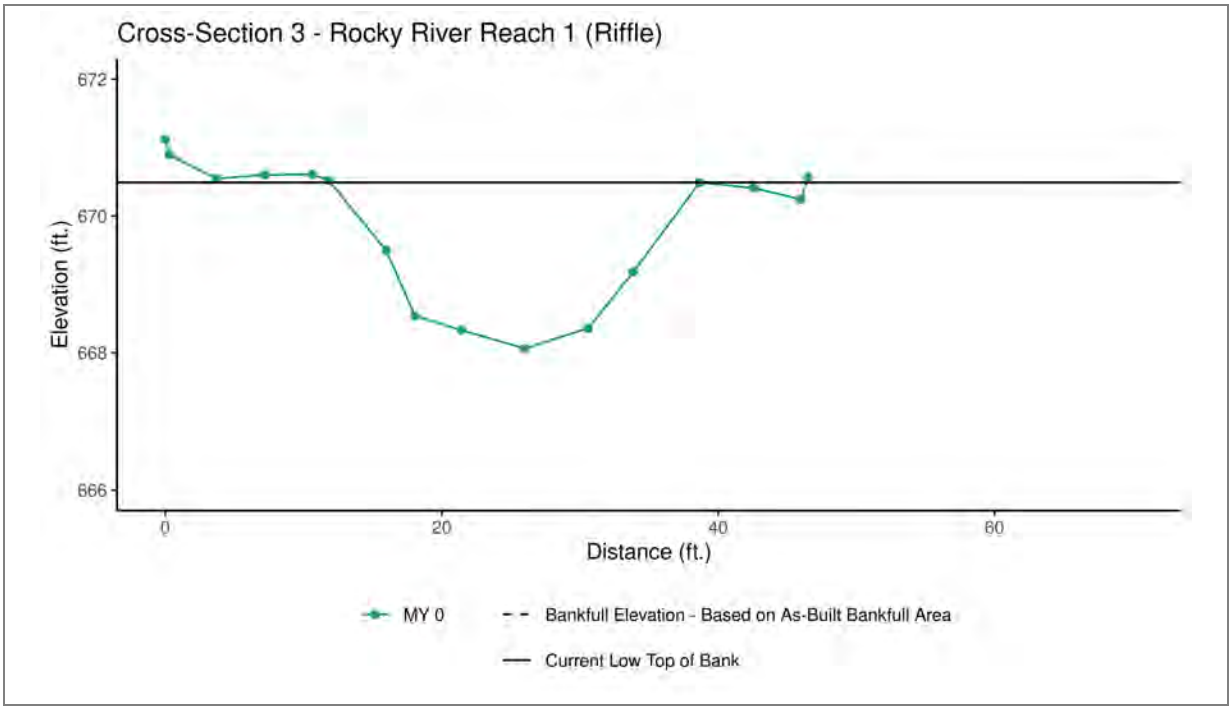
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A					
Bank Height Ratio - Based on AB-Bankfull Area	N/A					
Thalweg Elevation	669.63					
LTOB Elevation	673.16					
LTOB Max Depth	3.53					
LTOB Cross Sectional Area	107.09					

Downstream *(08/19/2022)*



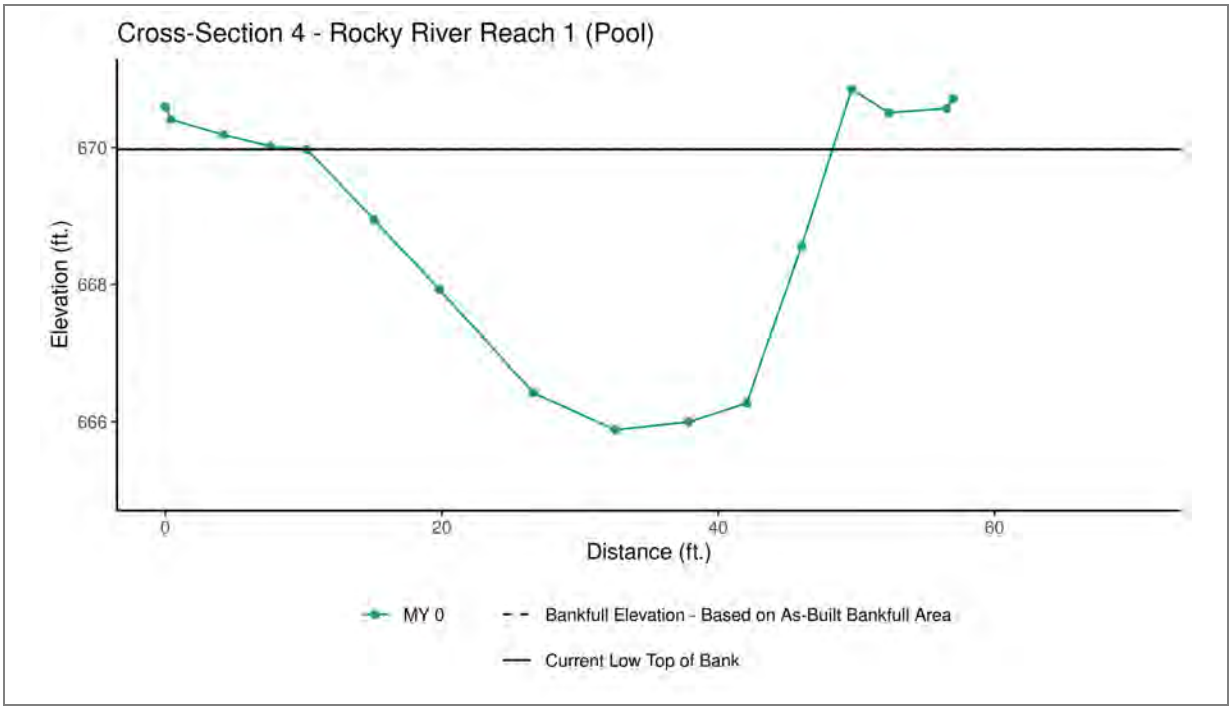
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	673.41					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	671.25					
LTOB Elevation	673.41					
LTOB Max Depth	2.16					
LTOB Cross Sectional Area	38.51					

Downstream *(08/19/2022)*



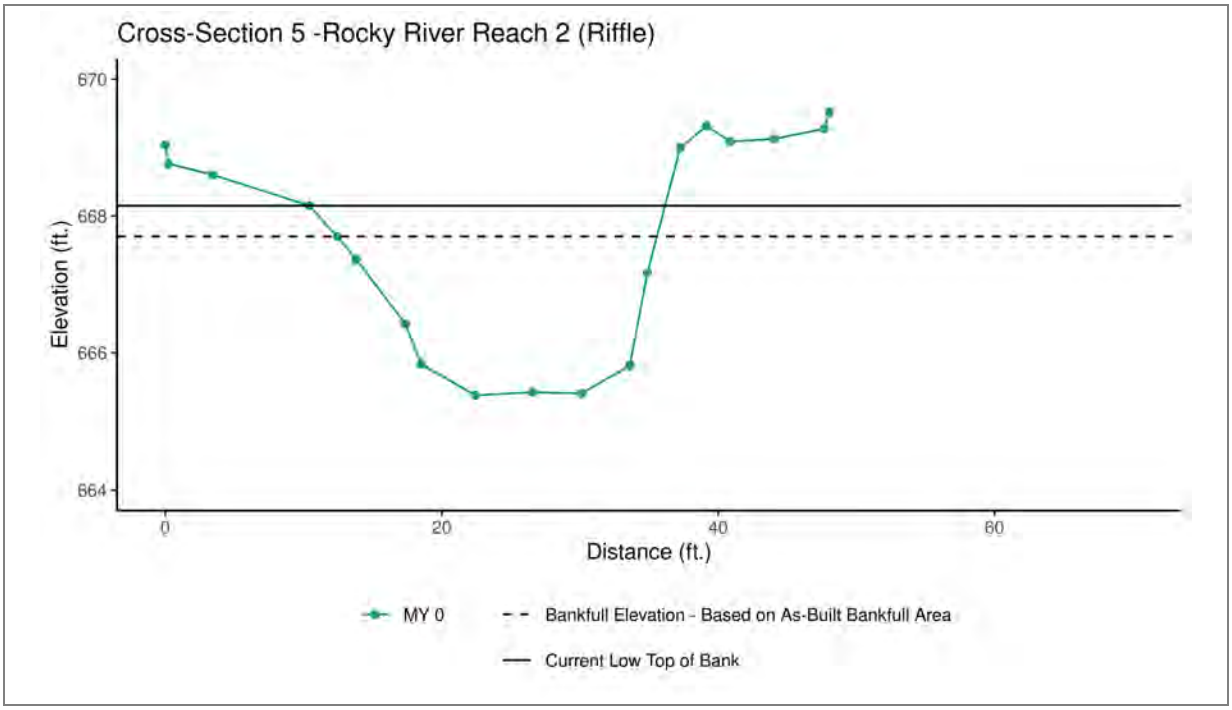
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	670.49					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	668.06					
LTOB Elevation	670.49					
LTOB Max Depth	2.43					
LTOB Cross Sectional Area	41.72					

Downstream *(08/19/2022)*



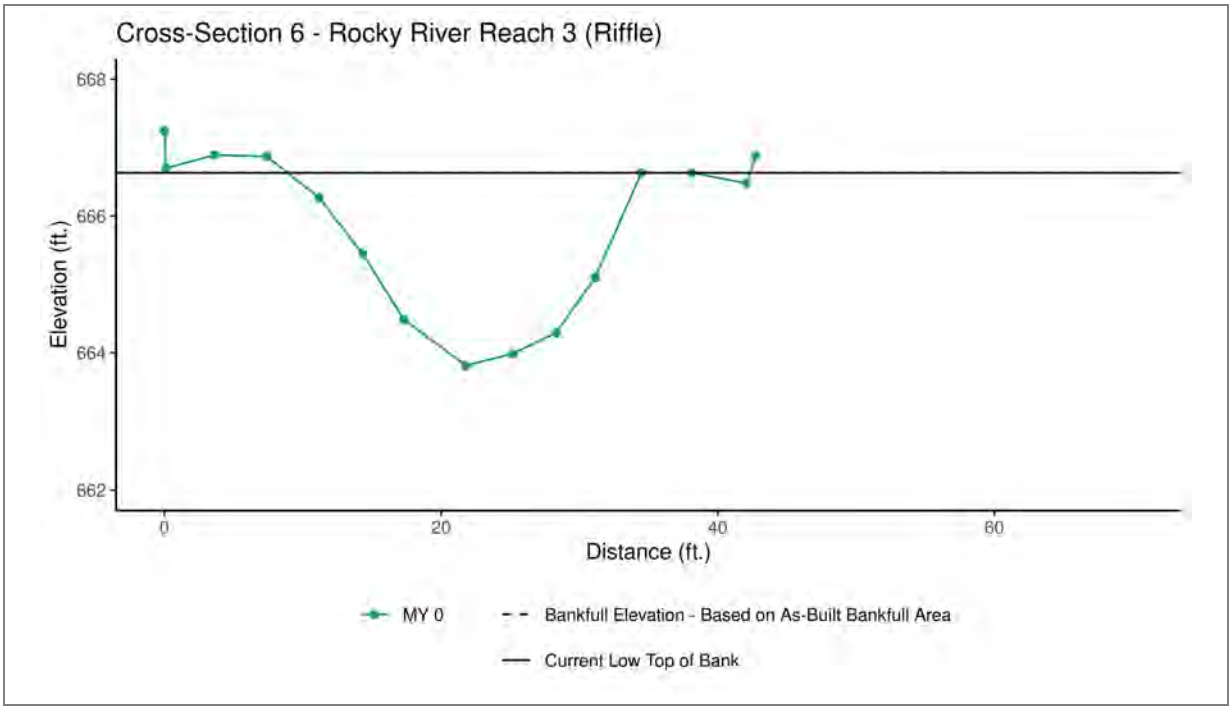
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A					
Bank Height Ratio - Based on AB-Bankfull Area	N/A					
Thalweg Elevation	665.88					
LTOB Elevation	669.97					
LTOB Max Depth	4.09					
LTOB Cross Sectional Area	100.78					

Downstream *(08/19/2022)*



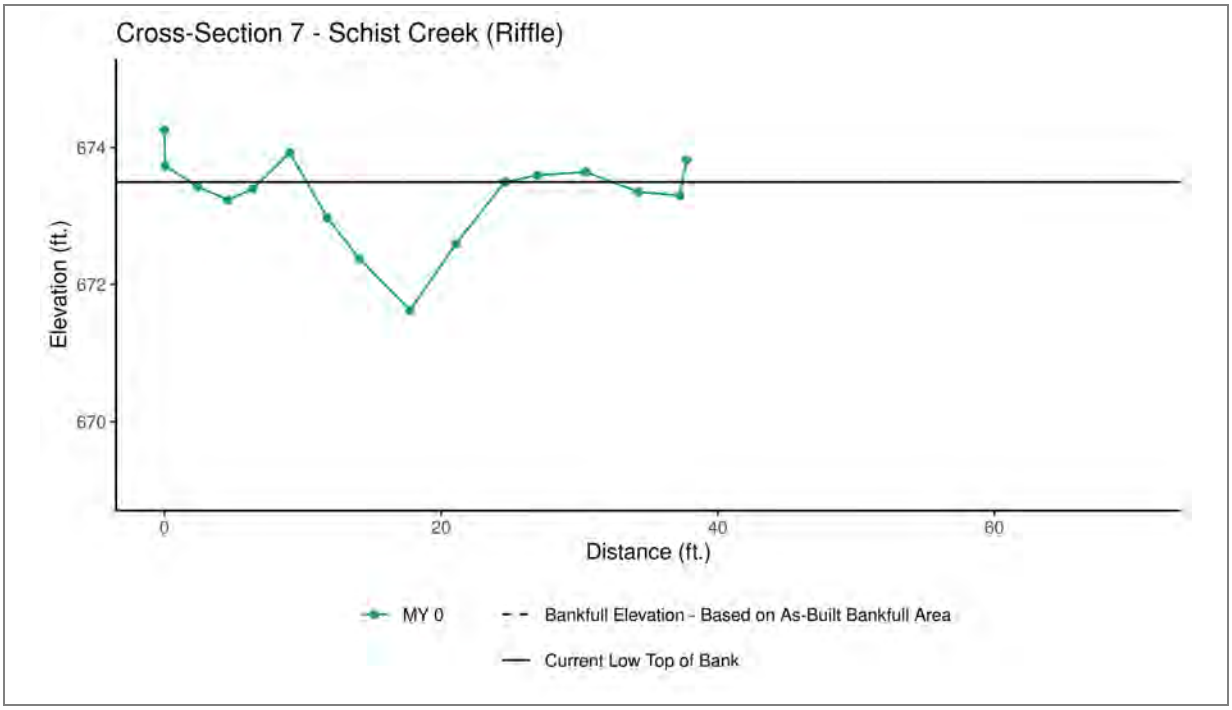
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	667.70					
Bank Height Ratio - Based on AB-Bankfull Area	1.19					
Thalweg Elevation	665.39					
LTOB Elevation	668.15					
LTOB Max Depth	2.76					
LTOB Cross Sectional Area	50.63					

Downstream *(08/19/2022)*



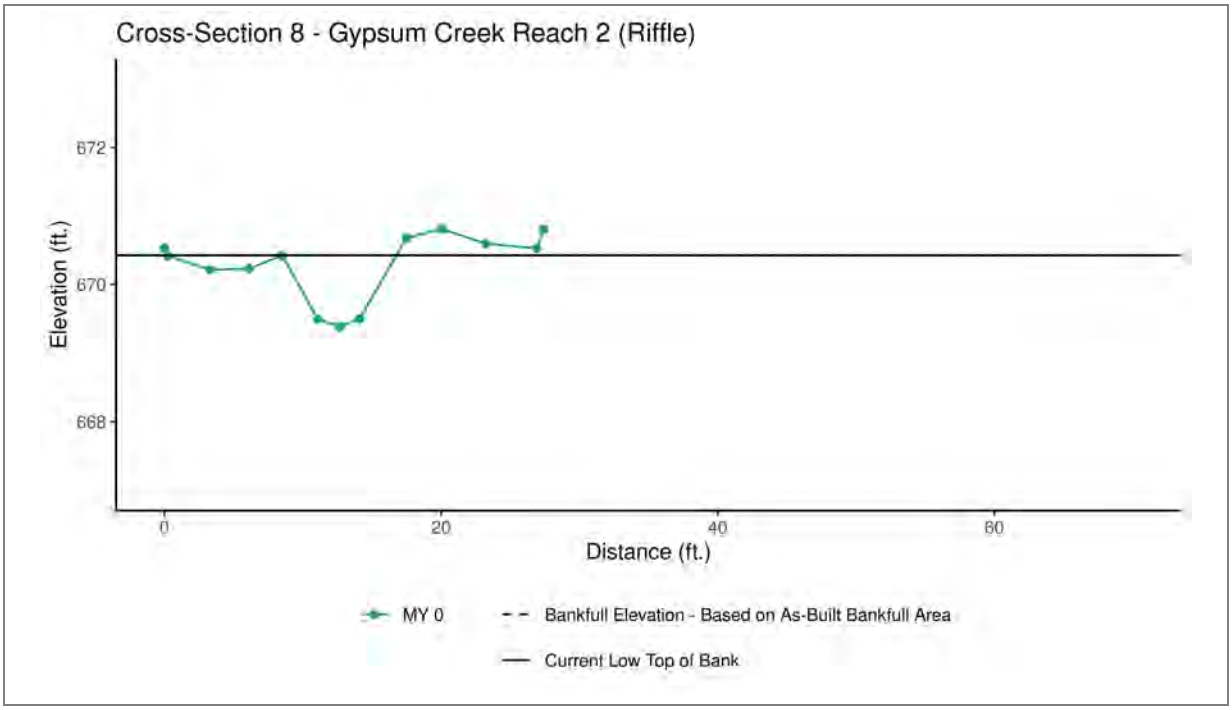
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	666.63					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	663.81					
LTOB Elevation	666.63					
LTOB Max Depth	2.82					
LTOB Cross Sectional Area	44.03					

Downstream *(08/19/2022)*



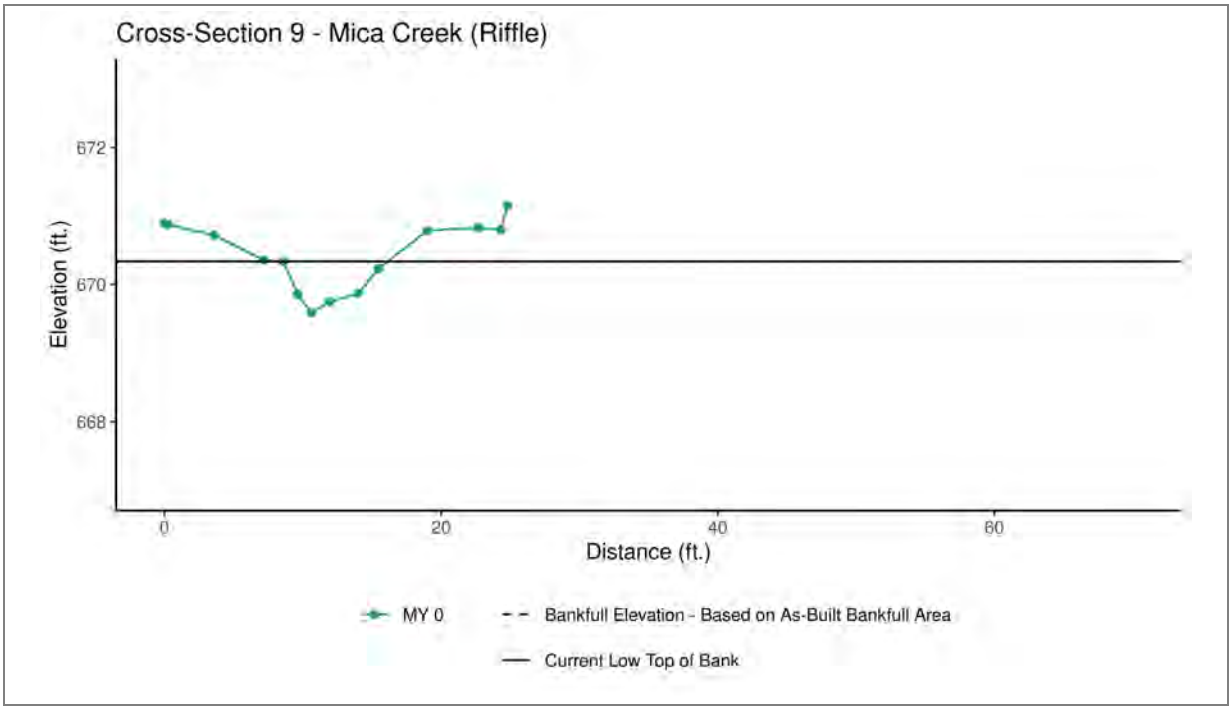
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	673.50					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	671.62					
LTOB Elevation	673.50					
LTOB Max Depth	1.88					
LTOB Cross Sectional Area	14.01					

Downstream *(08/19/2022)*



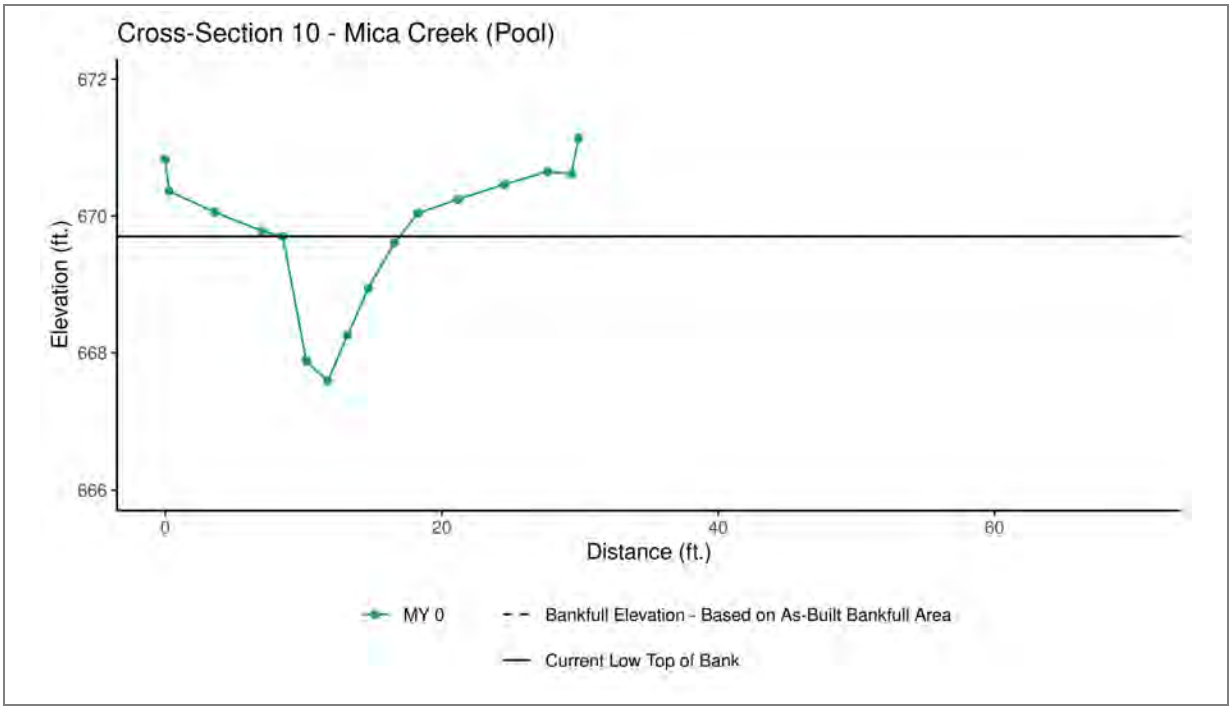
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	670.42					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	669.38					
LTOB Elevation	670.42					
LTOB Max Depth	1.04					
LTOB Cross Sectional Area	5.42					

Downstream *(08/19/2022)*



	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	670.34					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	669.58					
LTOB Elevation	670.34					
LTOB Max Depth	0.75					
LTOB Cross Sectional Area	3.29					

Downstream *(08/22/2022)*



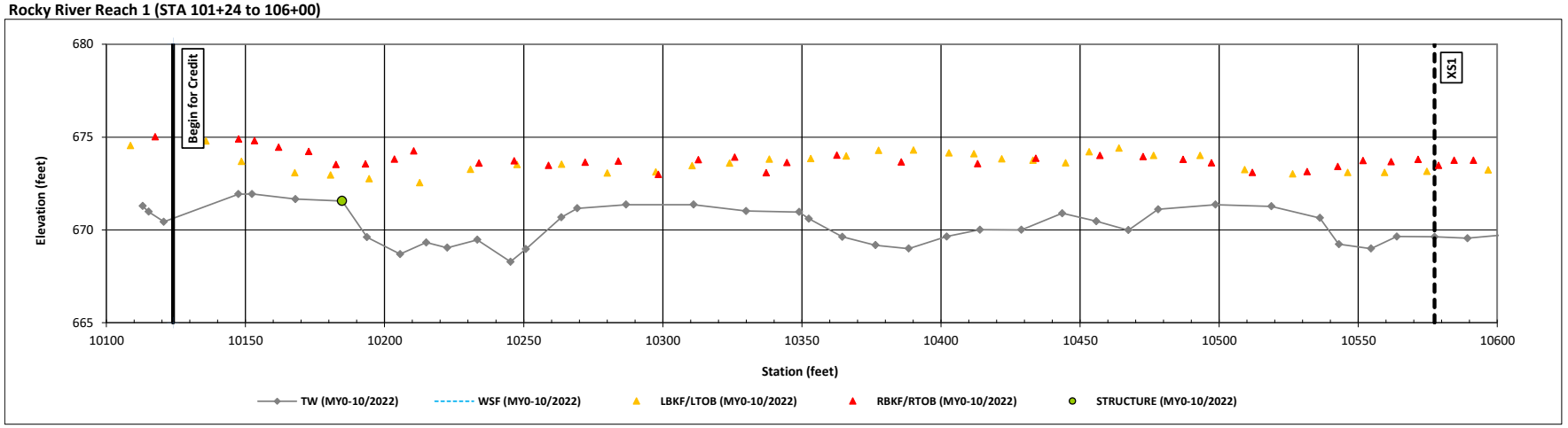
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A					
Bank Height Ratio - Based on AB-Bankfull Area	N/A					
Thalweg Elevation	667.60					
LTOB Elevation	669.70					
LTOB Max Depth	2.11					
LTOB Cross Sectional Area	9.62					

Downstream *(08/22/2022)*

Longitudinal Profile Plots

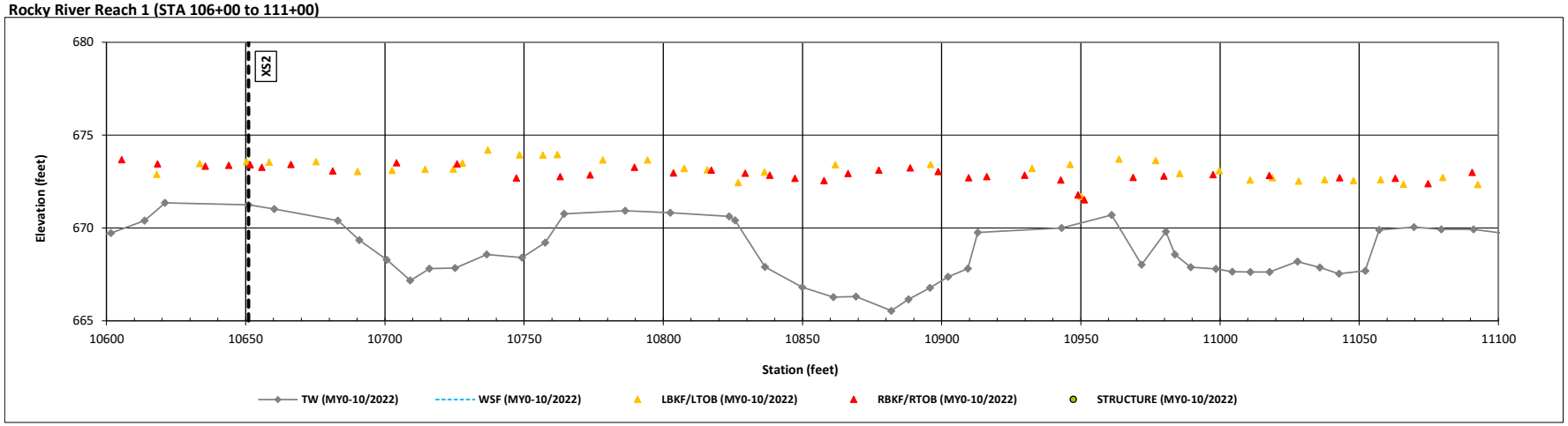
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Rocky River Reach 1 (STA 101+24 to 106+00)



*No water present in channel at the time of survey, water surface not shown.

Rocky River Reach 1 (STA 106+00 to 111+00)



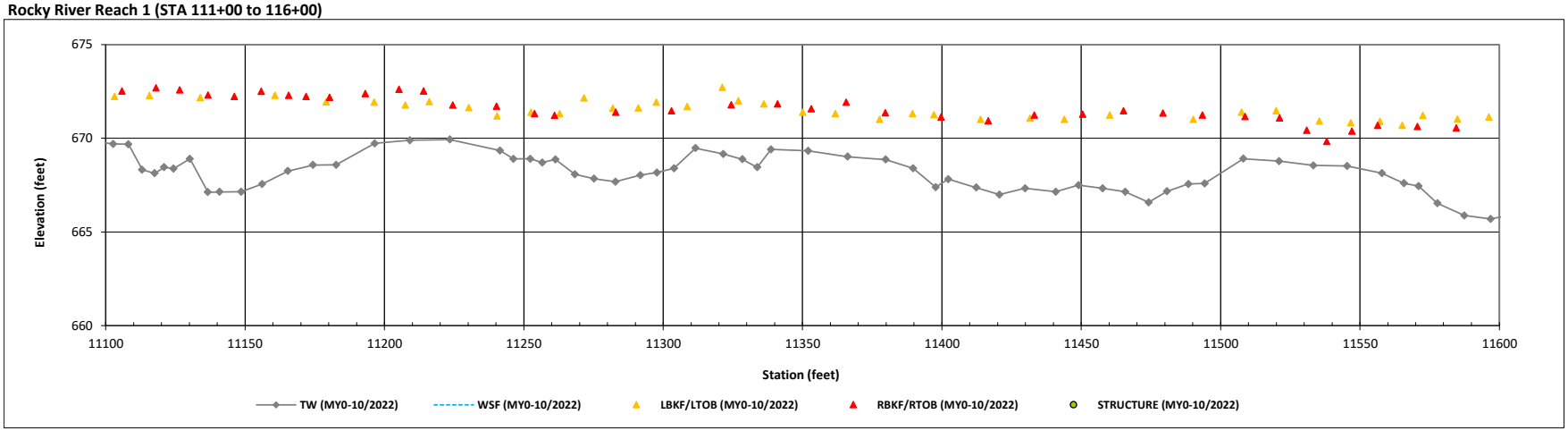
*No water present in channel at the time of survey, water surface not shown.

**No structures present in As-Built design.

Longitudinal Profile Plots

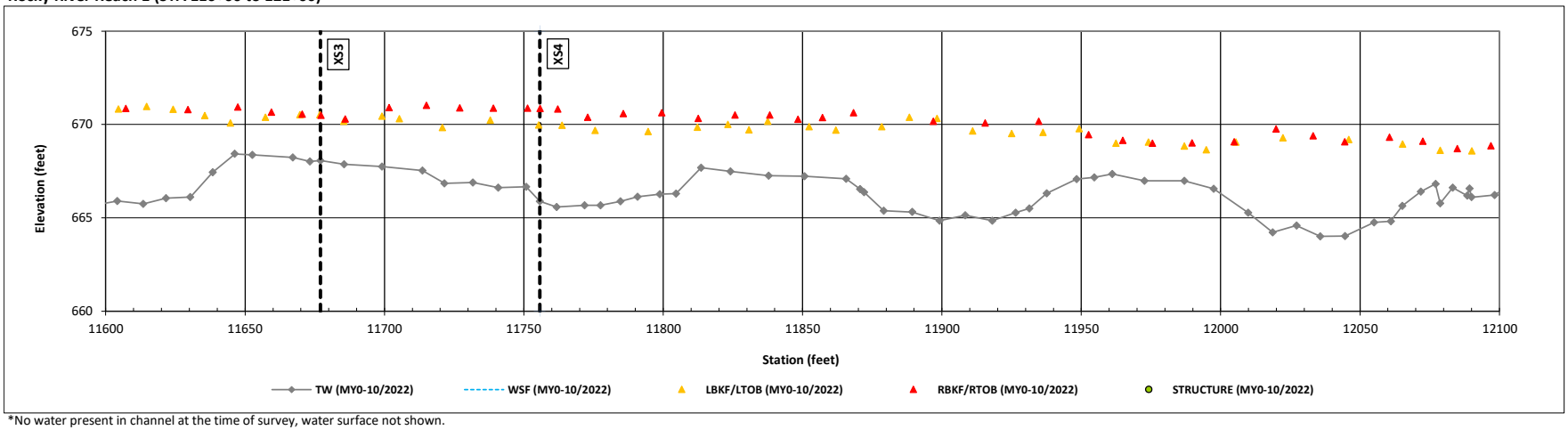
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Rocky River Reach 1 (STA 111+00 to 116+00)



*No water present in channel at the time of survey, water surface not shown.
**No structures present in As-Built design.

Rocky River Reach 1 (STA 116+00 to 121+00)

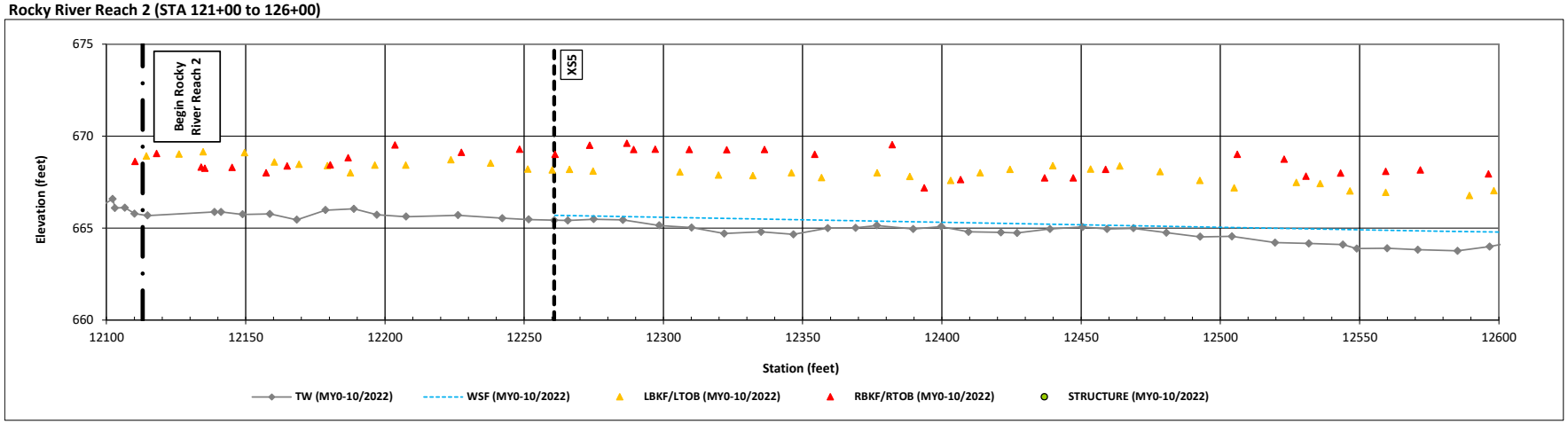


*No water present in channel at the time of survey, water surface not shown.
**No structures present in As-Built design.

Longitudinal Profile Plots

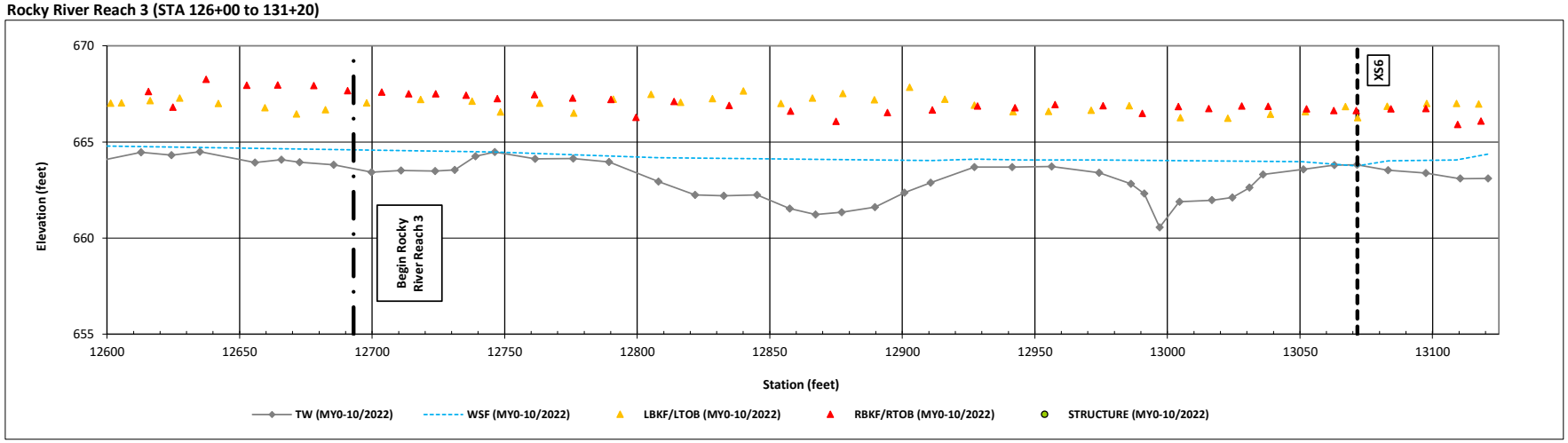
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Rocky River Reach 2 (STA 121+00 to 126+00)



**No structures present in As-Built design.

Rocky River Reach 3 (STA 126+00 to 131+20)

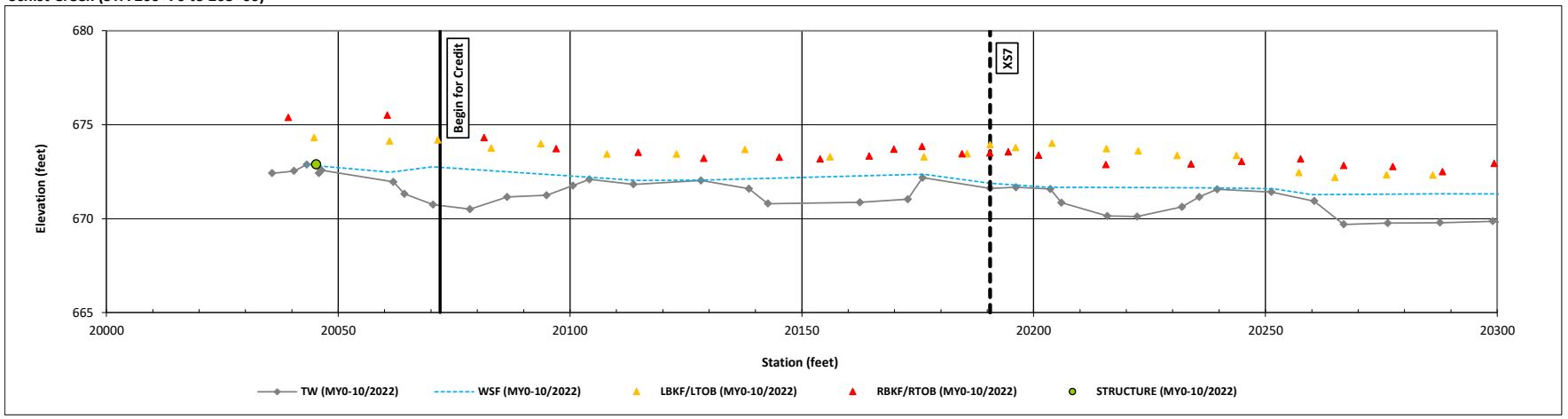


**No structures present in As-Built design.

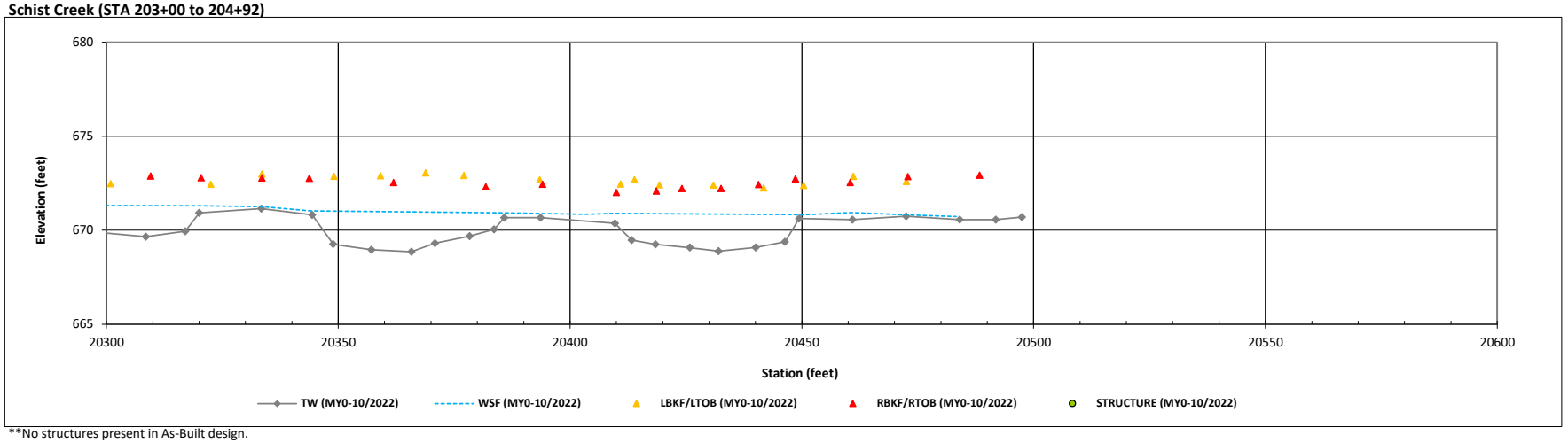
Longitudinal Profile Plots

Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Schist Creek (STA 200+70 to 203+00)



Schist Creek (STA 203+00 to 204+92)

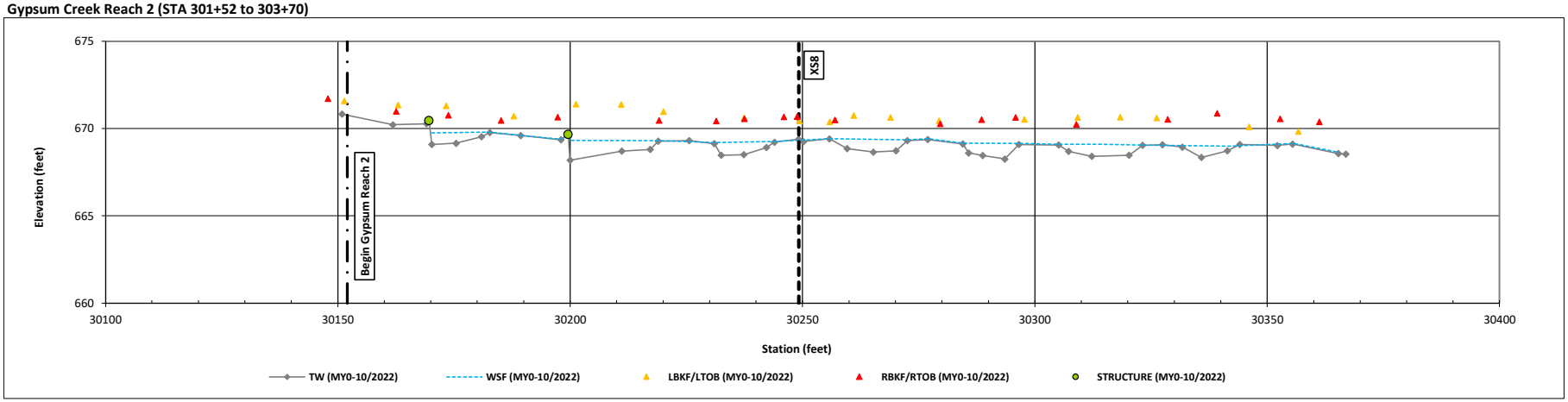


**No structures present in As-Built design.

Longitudinal Profile Plots

Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

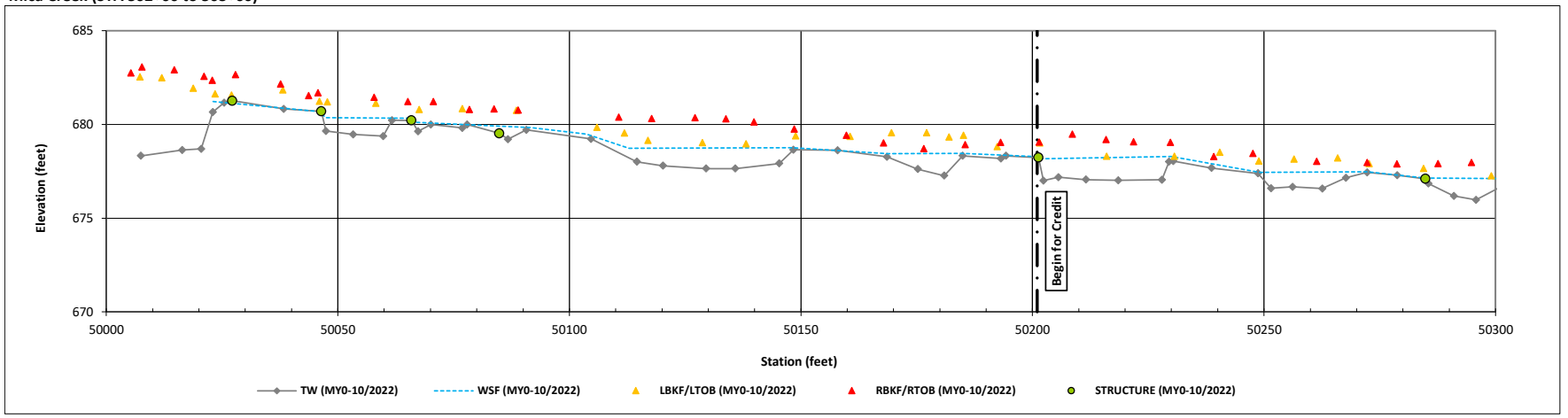
Gypsum Creek Reach 2 (STA 301+52 to 303+70)



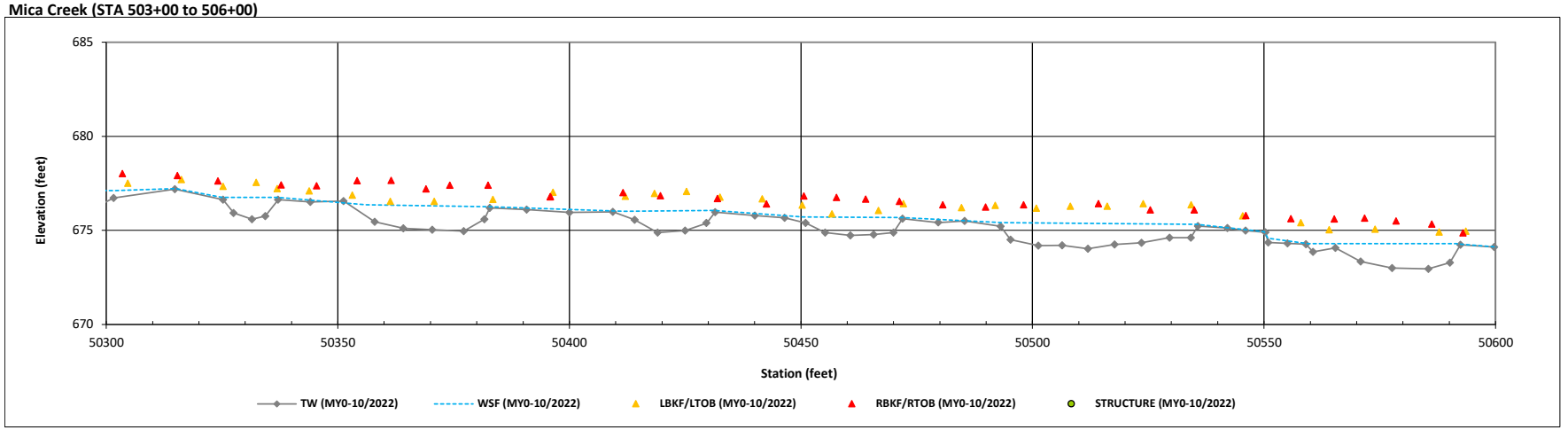
Longitudinal Profile Plots

Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Mica Creek (STA 502+00 to 503+00)



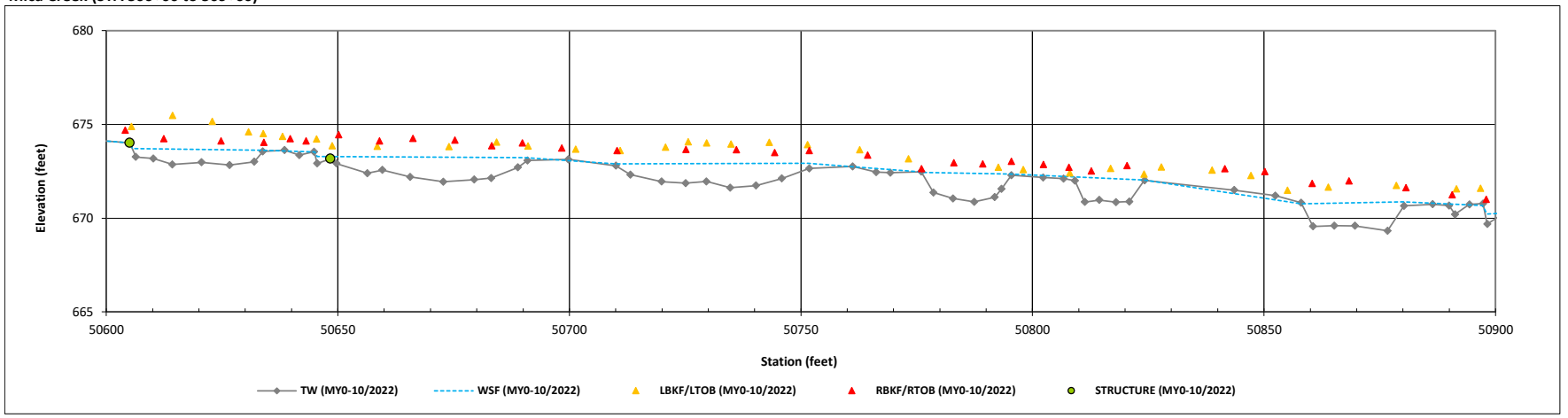
Mica Creek (STA 503+00 to 506+00)



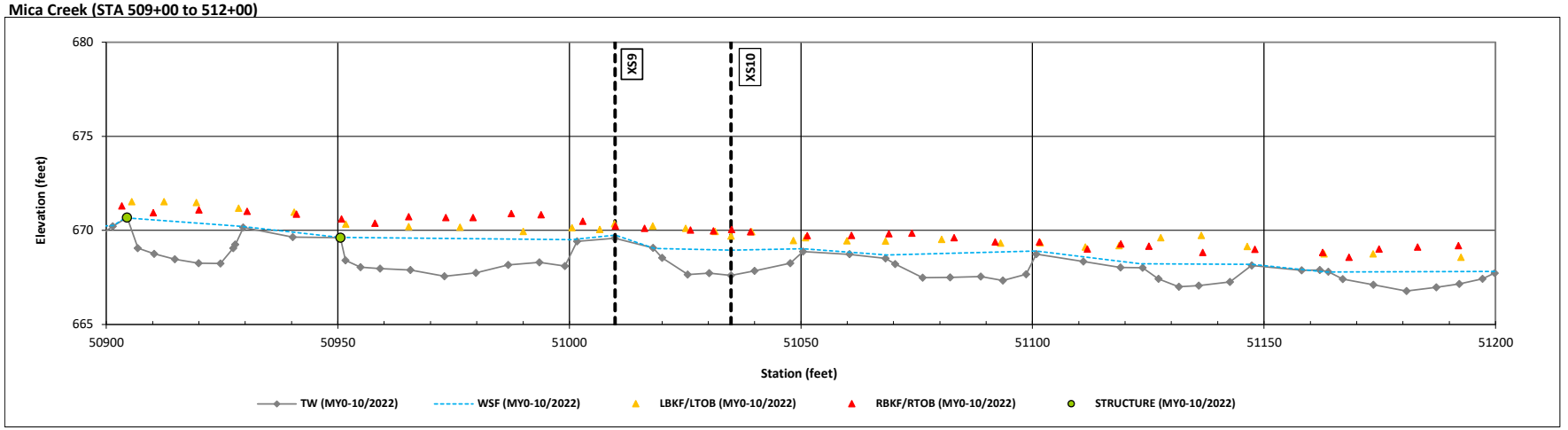
Longitudinal Profile Plots

Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Mica Creek (STA 506+00 to 509+00)



Mica Creek (STA 509+00 to 512+00)



Longitudinal Profile Plots

Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Mica Creek (STA 512+00 to 513+53)

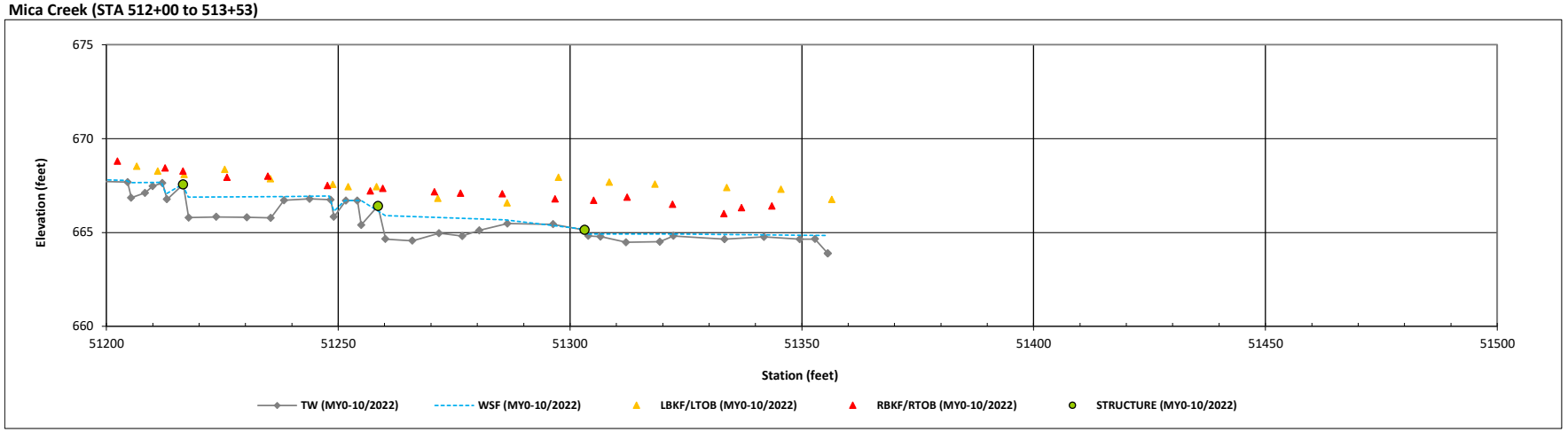


Table 8. Baseline Stream Data Summary

Liberty Rock Mitigation Site

DMS Project No. 100135

Monitoring Year 0 - 2023

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**Rocky River Reach 1**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	21.6		2	28.0		30.6	30.7	2
Floodprone Width (ft)	200.0		2	>100.0		200.0		2
Bankfull Mean Depth (ft)	1.7		2	1.6		1.3	1.4	2
Bankfull Max Depth (ft)	2.8		2	2.5		2.2	2.4	2
Bankfull Cross Sectional Area (ft^2)	35.7		2	45.5		38.5	41.7	2
Width/Depth Ratio	12.7		2	17.2		22.4	24.2	2
Entrenchment Ratio	>2.2		2	>2.2		6.5		2
Bank Height Ratio	1.0		2	1.0		1.0		2
Max particle size (mm) mobilized at bankfull	19.0			60.0		12.0	13.0	2
Rosgen Classification	C4			C4		C4		
Bankfull Discharge (cfs)	110.0	121.0	2	110.0		94.1	107.2	2
Sinuosity	1.10		2	1.26		1.26		
Water Surface Slope (ft/ft)[2]	0.0010	0.0090	2	0.0010	0.0050	---[2]		
Other	---			---		---		
Parameter	**Rocky River Reach 2[1]**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	22.8		1	N/A		22.4		1
Floodprone Width (ft)	200.0		1	>20.0		200.0		1
Bankfull Mean Depth (ft)	2.1		1	N/A		1.8		1
Bankfull Max Depth (ft)	3.0		1	N/A		2.3		1
Bankfull Cross Sectional Area (ft^2)	48.1		1	N/A		50.7		1
Width/Depth Ratio	12.6		1	N/A		12.8		1
Entrenchment Ratio	>2.2		1	N/A		8.9		1
Bank Height Ratio	1.0		1	N/A		1.2		1
Max particle size (mm) mobilized at bankfull	11.0			N/A		8.0		
Rosgen Classification	C4			N/A		C4		
Bankfull Discharge (cfs)	110.0	121.0	1	N/A		83.3		
Sinuosity	1.00		1	N/A		1.09		
Water Surface Slope (ft/ft)[2]	0.0010	0.0090	1	N/A		0.0027		
Other	---			---		---		

[1]Restoration activities along Rocky River Reach 2 were limited to bank grading and stabilization. No work was done on the channel bed per agreement with USFWS and WRC on potential impact to on-site mussels. Design parameters were not used on this reach.

[2]Water Surface not recorded, no water present in channel at time of as-built survey.

Table 8. Baseline Stream Data Summary
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**Rocky River Reach 3**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	18.1		1	26.0		22.5		1
Floodprone Width (ft)	200.0		1	>100.0		200.0		1
Bankfull Mean Depth (ft)	2.3		1	1.9		1.6		1
Bankfull Max Depth (ft)	2.9		1	3.0		2.5		1
Bankfull Cross Sectional Area (ft^2)	41.4		1	49.0		44.0		1
Width/Depth Ratio	7.9		1	13.8		14.4		1
Entrenchment Ratio	>2.2		1	>2.2		8.9		1
Bank Height Ratio	1.0		1	1.0		1.0		1
Max particle size (mm) mobilized at bankfull	12.0			55.0		17.0		
Rosgen Classification	C4			C4		C4		
Bankfull Discharge (cfs)	110.0	121.0	1	128.0		105.7		
Sinuosity	1.00	1.10	1	1.10		1.10		
Water Surface Slope ($ft/ft)^2$	0.0010	0.0090	1	0.0020		0.0002		
Other	---			---		---		
Parameter	**Schist Creek**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	11.2		1	12.8		24.4		1
Floodprone Width (ft)	75.0		1	>75.0		75.0		1
Bankfull Mean Depth (ft)	0.9		1	1.0		0.6		1
Bankfull Max Depth (ft)	1.8		1	1.5		1.9		1
Bankfull Cross Sectional Area (ft^2)	10.4		1	12.5		14.0		1
Width/Depth Ratio	12.4		1	13.0		38.7		1
Entrenchment Ratio	>2.2		1	>2.2		3.1		1
Bank Height Ratio	1.2		1	1.0		1.0		1
Max particle size (mm) mobilized at bankfull	7.0			62.0		3.0		
Rosgen Classification	C4/E4			C4		C4		
Bankfull Discharge (cfs)	20.9		1	31.0		17.2		
Sinuosity	1.00		1	1.17		1.17		
Water Surface Slope ($ft/ft)^2$	0.0000	0.0010	1	0.0060	0.0170	0.0038		
Other	---			---		---		

Table 8. Baseline Stream Data Summary

Liberty Rock Mitigation Site

DMS Project No. 100135

Monitoring Year 0 - 2023

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**Gypsum Creek Reach 2[3]**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	---		---	8.7		8.3		1
Floodprone Width (ft)	---		---	>100.0		100.0		1
Bankfull Mean Depth (ft)	---		---	0.5		0.7		1
Bankfull Max Depth (ft)	---		---	0.8		1.0		1
Bankfull Cross Sectional Area (ft^2)	---		---	2.9		5.4		1
Width/Depth Ratio	---		---	13.0		12.7		1
Entrenchment Ratio	---		---	>2.2		12.1		1
Bank Height Ratio	---		---	1.0		1.0		1
Max particle size (mm) mobilized at bankfull	---			31.0		12.0		
Rosgen Classification	---			C4		C4		
Bankfull Discharge (cfs)	---			4.0		11.7		
Sinuosity	1.00			1.15		1.15		
Water Surface Slope (ft/ft)[2]	0.0001	0.0100	1	0.0096		0.0057		
Other	---			---		---		
Parameter	**Mica Creek**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	6.6		1	8.7		7.5		1
Floodprone Width (ft)	50.0		1	>50.0		50.0		1
Bankfull Mean Depth (ft)	0.7		1	0.7		0.4		1
Bankfull Max Depth (ft)	1.5		1	1.0		0.8		1
Bankfull Cross Sectional Area (ft^2)	4.9		1	5.7		3.3		1
Width/Depth Ratio	9.4		1	13.0		17.3		1
Entrenchment Ratio	>2.2		1	>2.2		6.6		1
Bank Height Ratio	1.7		1	1.0		1.0		1
Max particle size (mm) mobilized at bankfull	25.0			79.0		24.0		
Rosgen Classification	C4/E4			C4		C4		
Bankfull Discharge (cfs)	20.1			16.0		9.5		
Sinuosity	1.00			1.12		1.18		
Water Surface Slope (ft/ft)[2]	0.0090	0.0150	1	0.0140		0.0138		
Other	---			---		---		

[3]Gypsum Creek Pre-Exisiting Conditions data not recorded.

Table 9. Cross-Section Morphology Monitoring Summary
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

	Rocky River Reach 1																					
	Cross-Section 1 (Pool)						Cross-Section 2 (Riffle)						Cross-Section 3 (Riffle)						Cross-Section 4 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	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	N/A						673.41						670.49						N/A					
Bank Height Ratio - Based on AB Bankfull[1] Area	N/A						1.00						1.00						N/A					
Thalweg Elevation	669.63						671.25						668.06						665.88					
LTOB[2] Elevation	673.16						673.41						670.49						669.97					
LTOB[2] Max Depth (ft)	3.53						2.16						2.43						4.09					
LTOB[2] Cross Sectional Area (ft^2)	107.09						38.51						41.72						100.78					
	Rocky River Reach 2						Rocky River Reach 3						Schist Creek						Gypsum Creek					
	Cross-Section 5 (Riffle)						Cross-Section 6 (Riffle)						Cross-Section 7 (Riffle)						Cross-Section 8 (Riffle)					
	MY0	MY1	MY2	MY3	MY5	MY7	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	667.70						666.63						673.50						670.42					
Bank Height Ratio - Based on AB Bankfull[1] Area	1.19						1.00						1.00						1.00					
Thalweg Elevation	665.39						663.81						671.62						669.38					
LTOB[2] Elevation	668.15						666.63						673.50						670.42					
LTOB[2] Max Depth (ft)	2.76						2.82						1.88						1.04					
LTOB[2] Cross Sectional Area (ft^2)	50.63						44.03						14.01						5.42					
	Mica Creek																							
	Cross-Section 9 (Riffle)						Cross-Section 10 (Pool)																	
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7												
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	670.34						N/A																	
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00						N/A																	
Thalweg Elevation	669.58						667.60																	
LTOB[2] Elevation	670.34						669.70																	
LTOB[2] Max Depth (ft)	0.75						2.11																	
LTOB[2] Cross Sectional Area (ft^2)	3.29						9.62																	

[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.

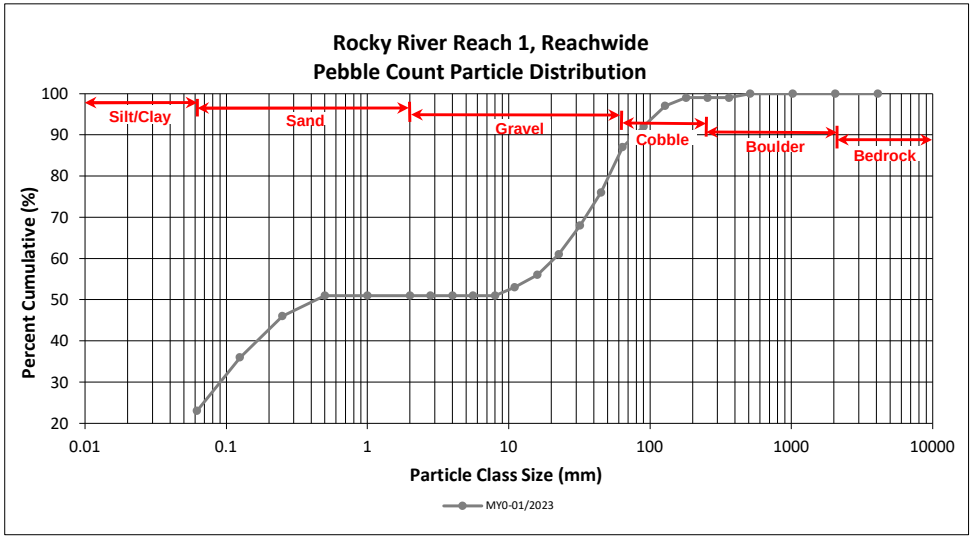
Reachwide and Cross-Section Pebble Count Plots

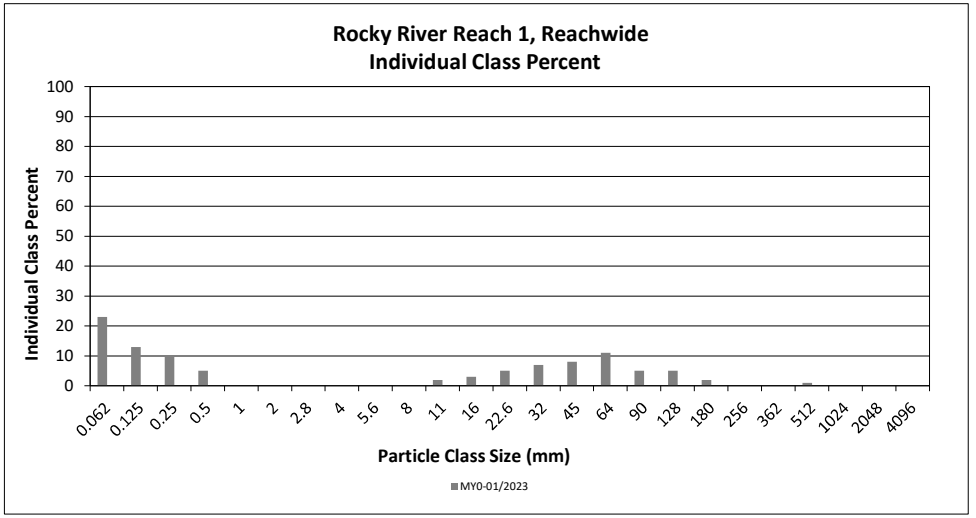
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Rocky River Reach 1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	3	20	23	23	23
SAND	Very fine	0.062	0.125		13	13	13	36
	Fine	0.125	0.250	1	9	10	10	46
	Medium	0.25	0.50	1	4	5	5	51
	Coarse	0.5	1.0					51
	Very Coarse	1.0	2.0					51
GRAVEL	Very Fine	2.0	2.8					51
	Very Fine	2.8	4.0					51
	Fine	4.0	5.6					51
	Fine	5.6	8.0					51
	Medium	8.0	11.0	1	1	2	2	53
	Medium	11.0	16.0	1	2	3	3	56
	Coarse	16.0	22.6	5		5	5	61
	Coarse	22.6	32	7		7	7	68
	Very Coarse	32	45	8		8	8	76
	Very Coarse	45	64	10	1	11	11	87
COBBLE	Small	64	90	5		5	5	92
	Small	90	128	5		5	5	97
	Large	128	180	2		2	2	99
	Large	180	256					99
BOULDER	Small	256	362					99
	Small	362	512	1		1	1	100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	50	50	100	100	100

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.12
D_{50} =	0.4
D_{84} =	58.1
D_{95} =	111.2
D_{100} =	512.0





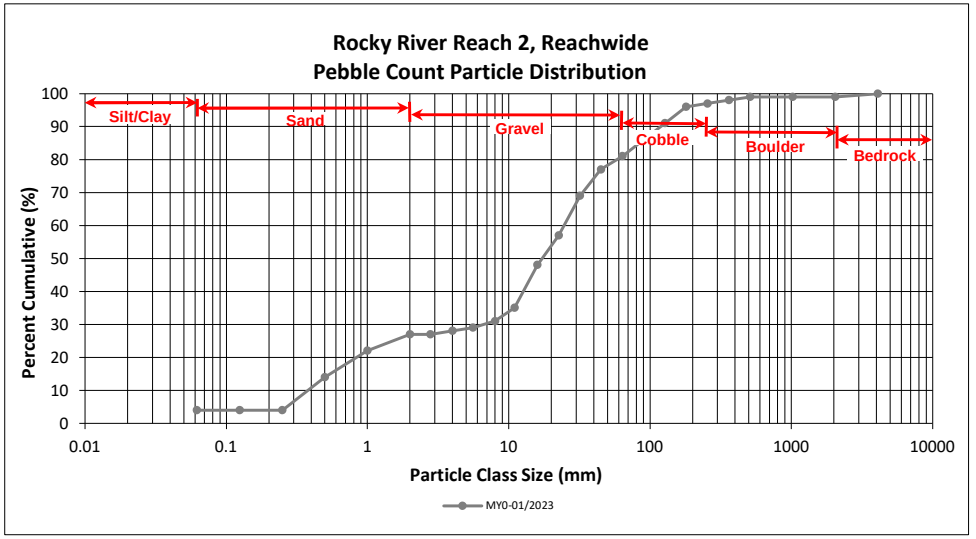
Reachwide and Cross-Section Pebble Count Plots

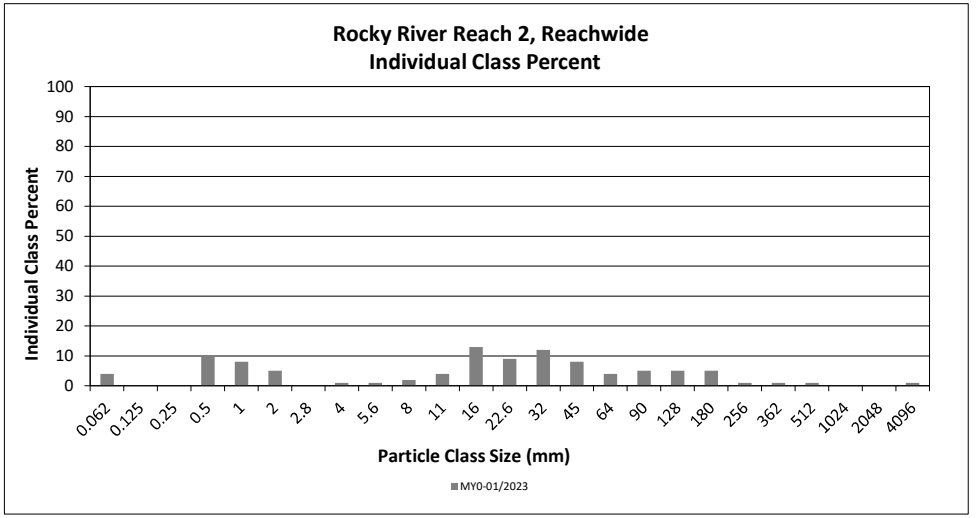
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Rocky River Reach 2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		4	4	4	4
SAND	Very fine	0.062	0.125					4
	Fine	0.125	0.250					4
	Medium	0.25	0.50	2	8	10	10	14
	Coarse	0.5	1.0	4	4	8	8	22
	Very Coarse	1.0	2.0	3	2	5	5	27
GRAVEL	Very Fine	2.0	2.8					27
	Very Fine	2.8	4.0	1		1	1	28
	Fine	4.0	5.6	1		1	1	29
	Fine	5.6	8.0	1	1	2	2	31
	Medium	8.0	11.0	2	2	4	4	35
	Medium	11.0	16.0	8	5	13	13	48
	Coarse	16.0	22.6	3	6	9	9	57
	Coarse	22.6	32	5	7	12	12	69
	Very Coarse	32	45	6	2	8	8	77
	Very Coarse	45	64	4		4	4	81
COBBLE	Small	64	90	1	4	5	5	86
	Small	90	128	5		5	5	91
	Large	128	180	2	3	5	5	96
	Large	180	256	1		1	1	97
BOULDER	Small	256	362	1		1	1	98
	Small	362	512		1	1	1	99
	Medium	512	1024					99
	Large/Very Large	1024	2048					99
BEDROCK	Bedrock	2048	>2048		1	1	1	100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.59
D_{35} =	11.00
D_{50} =	17.3
D_{84} =	78.5
D_{95} =	168.1
D_{100} =	>2048





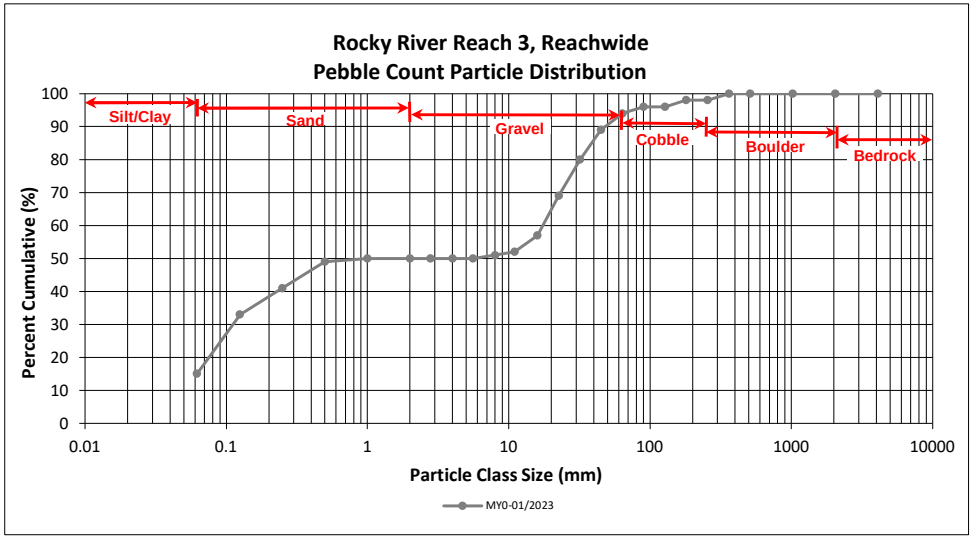
Reachwide and Cross-Section Pebble Count Plots

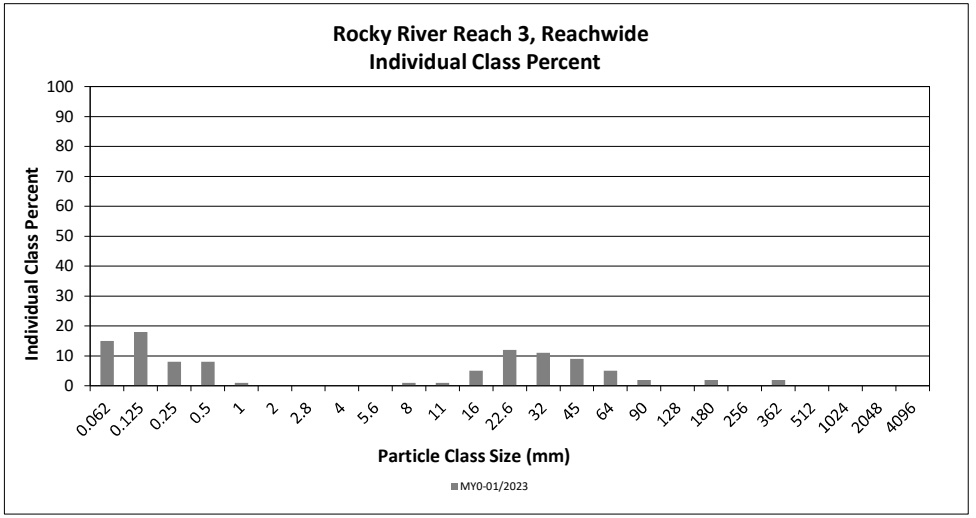
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Rocky River Reach 3, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		15	15	15	15
SAND	Very fine	0.062	0.125		18	18	18	33
	Fine	0.125	0.250		8	8	8	41
	Medium	0.25	0.50		8	8	8	49
	Coarse	0.5	1.0		1	1	1	50
	Very Coarse	1.0	2.0					50
GRAVEL	Very Fine	2.0	2.8					50
	Very Fine	2.8	4.0					50
	Fine	4.0	5.6					50
	Fine	5.6	8.0	1		1	1	51
	Medium	8.0	11.0	1		1	1	52
	Medium	11.0	16.0	5		5	5	57
	Coarse	16.0	22.6	12		12	12	69
	Coarse	22.6	32	11		11	11	80
	Very Coarse	32	45	9		9	9	89
	Very Coarse	45	64	5		5	5	94
COBBLE	Small	64	90	2		2	2	96
	Small	90	128					96
	Large	128	180	2		2	2	98
	Large	180	256					98
BOULDER	Small	256	362	2		2	2	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.06
D_{35} =	0.15
D_{50} =	1.0
D_{84} =	37.2
D_{95} =	75.9
D_{100} =	362.0





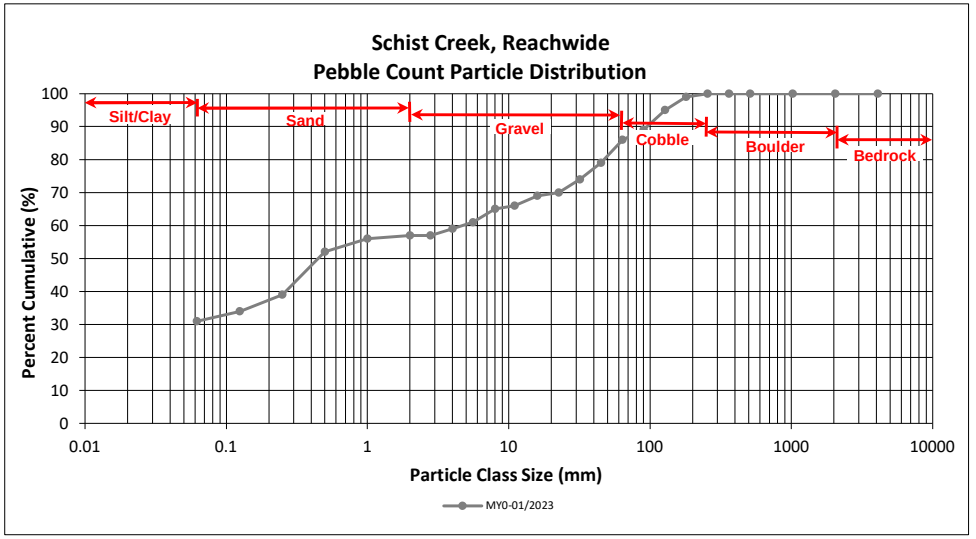
Reachwide and Cross-Section Pebble Count Plots

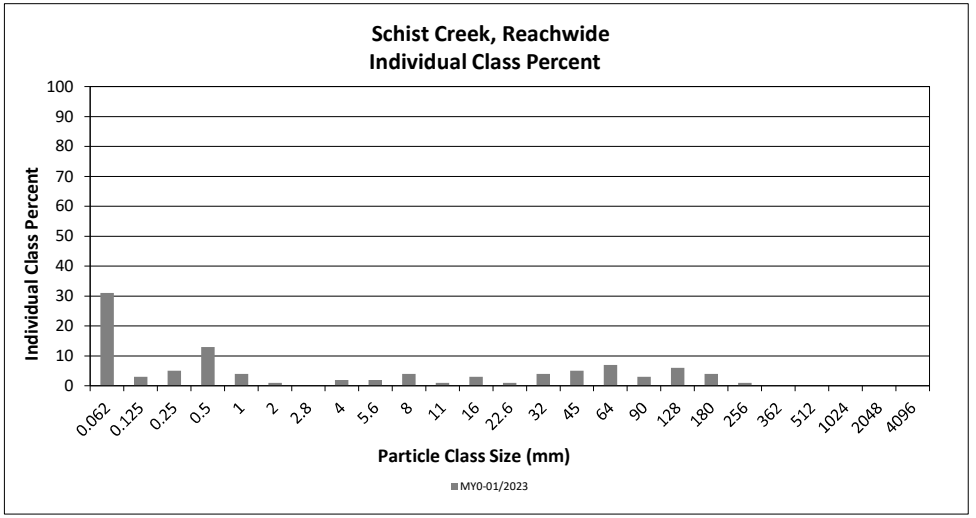
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Schist Creek, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	7	24	31	31	31
SAND	Very fine	0.062	0.125		3	3	3	34
	Fine	0.125	0.250	1	4	5	5	39
	Medium	0.25	0.50	2	11	13	13	52
	Coarse	0.5	1.0	4		4	4	56
	Very Coarse	1.0	2.0	1		1	1	57
GRAVEL	Very Fine	2.0	2.8					57
	Very Fine	2.8	4.0	1	1	2	2	59
	Fine	4.0	5.6	1	1	2	2	61
	Fine	5.6	8.0	2	2	4	4	65
	Medium	8.0	11.0	1		1	1	66
	Medium	11.0	16.0	1	2	3	3	69
	Coarse	16.0	22.6	1		1	1	70
	Coarse	22.6	32	3	1	4	4	74
	Very Coarse	32	45	4	1	5	5	79
	Very Coarse	45	64	7		7	7	86
COBBLE	Small	64	90	3		3	3	89
	Small	90	128	6		6	6	95
	Large	128	180	4		4	4	99
	Large	180	256	1		1	1	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.14
D_{50} =	0.4
D_{84} =	57.9
D_{95} =	128.0
D_{100} =	256.0





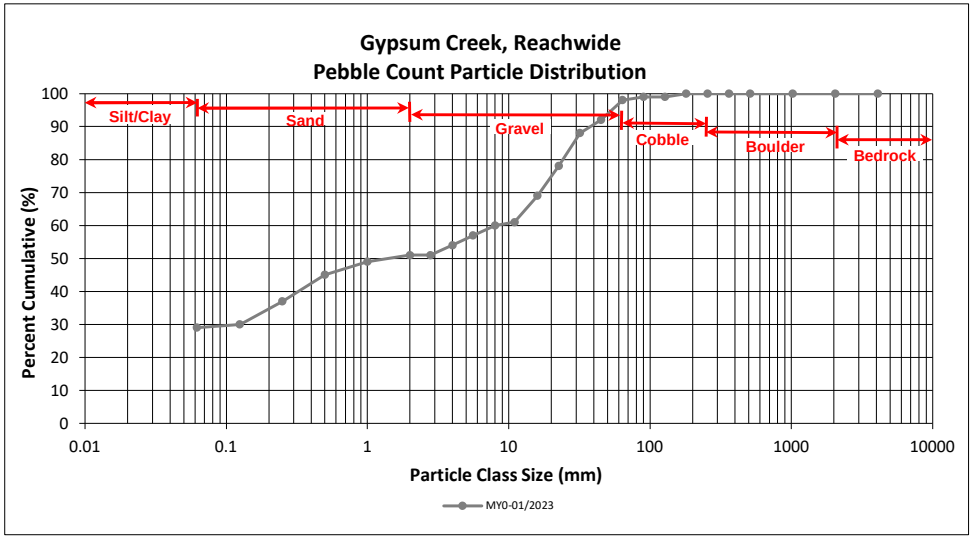
Reachwide and Cross-Section Pebble Count Plots

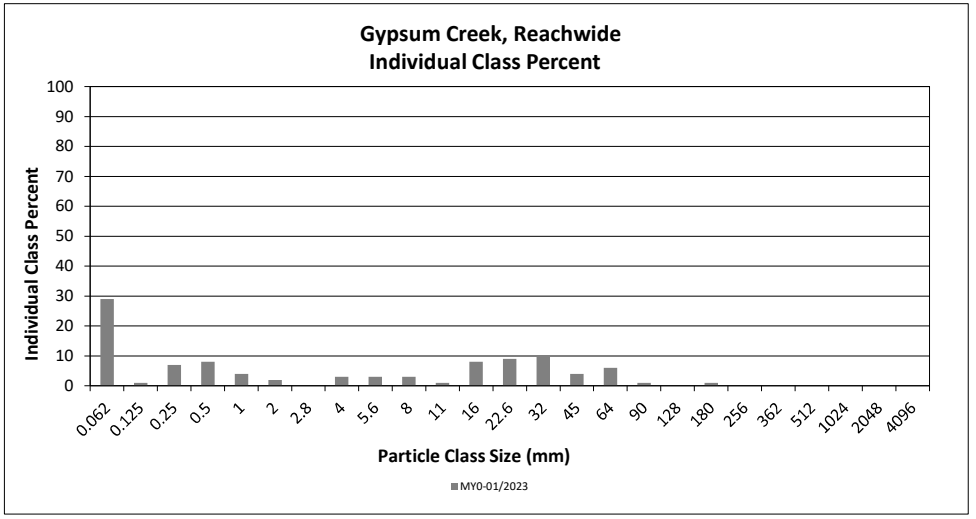
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Gypsum Creek, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	27	29	29	29
SAND	Very fine	0.062	0.125		1	1	1	30
	Fine	0.125	0.250		7	7	7	37
	Medium	0.25	0.50	1	7	8	8	45
	Coarse	0.5	1.0	2	2	4	4	49
	Very Coarse	1.0	2.0	1	1	2	2	51
GRAVEL	Very Fine	2.0	2.8					51
	Very Fine	2.8	4.0	1	2	3	3	54
	Fine	4.0	5.6	2	1	3	3	57
	Fine	5.6	8.0	2	1	3	3	60
	Medium	8.0	11.0	1		1	1	61
	Medium	11.0	16.0	7	1	8	8	69
	Coarse	16.0	22.6	9		9	9	78
	Coarse	22.6	32	10		10	10	88
	Very Coarse	32	45	4		4	4	92
	Very Coarse	45	64	6		6	6	98
COBBLE	Small	64	90	1		1	1	99
	Small	90	128					99
	Large	128	180	1		1	1	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.21
D_{50} =	1.4
D_{84} =	27.8
D_{95} =	53.7
D_{100} =	180.0





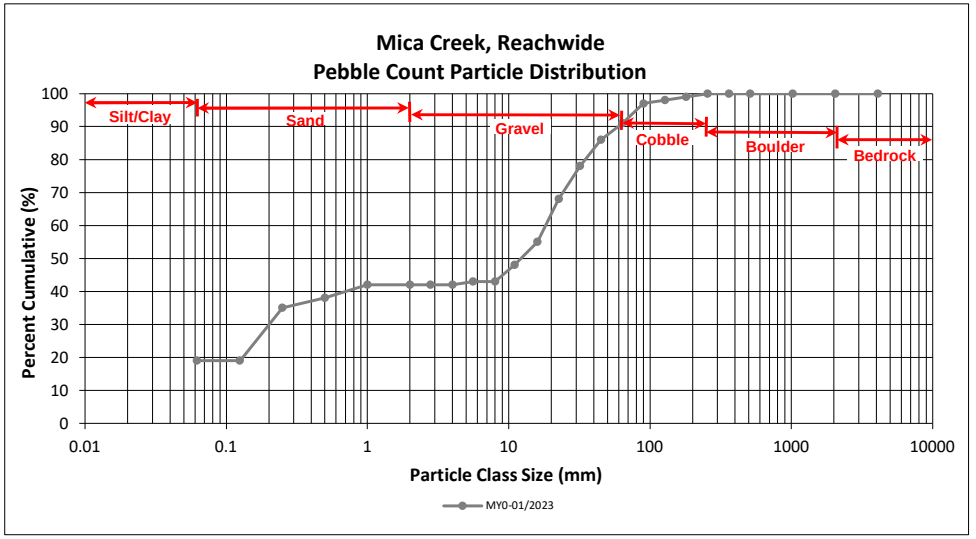
Reachwide and Cross-Section Pebble Count Plots

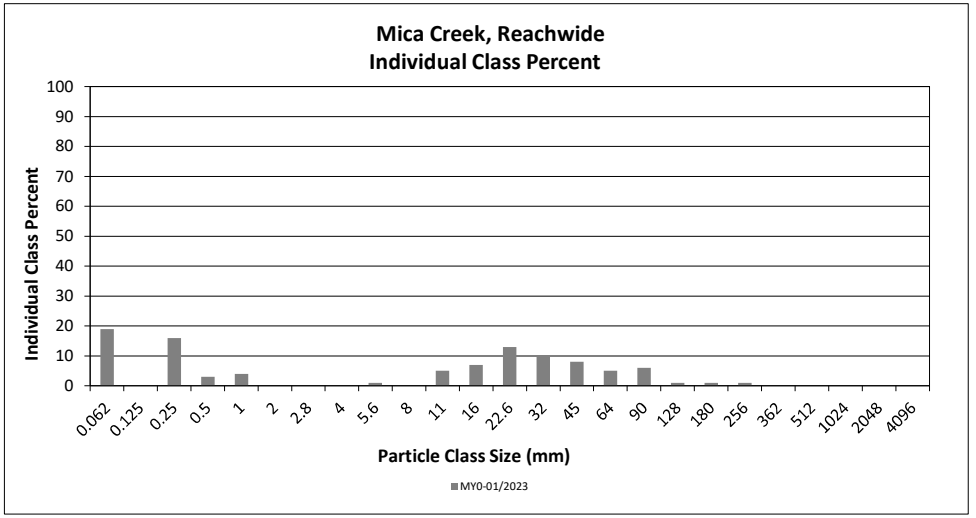
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Mica Creek, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		19	19	19	19
SAND	Very fine	0.062	0.125					19
	Fine	0.125	0.250		16	16	16	35
	Medium	0.25	0.50	2	1	3	3	38
	Coarse	0.5	1.0	1	3	4	4	42
	Very Coarse	1.0	2.0					42
GRAVEL	Very Fine	2.0	2.8					42
	Very Fine	2.8	4.0					42
	Fine	4.0	5.6		1	1	1	43
	Fine	5.6	8.0					43
	Medium	8.0	11.0	2	3	5	5	48
	Medium	11.0	16.0	3	4	7	7	55
	Coarse	16.0	22.6	11	2	13	13	68
	Coarse	22.6	32	10		10	10	78
	Very Coarse	32	45	7	1	8	8	86
	Very Coarse	45	64	5		5	5	91
COBBLE	Small	64	90	6		6	6	97
	Small	90	128	1		1	1	98
	Large	128	180	1		1	1	99
	Large	180	256	1		1	1	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.25
D_{50} =	12.2
D_{84} =	41.3
D_{95} =	80.3
D_{100} =	256.0





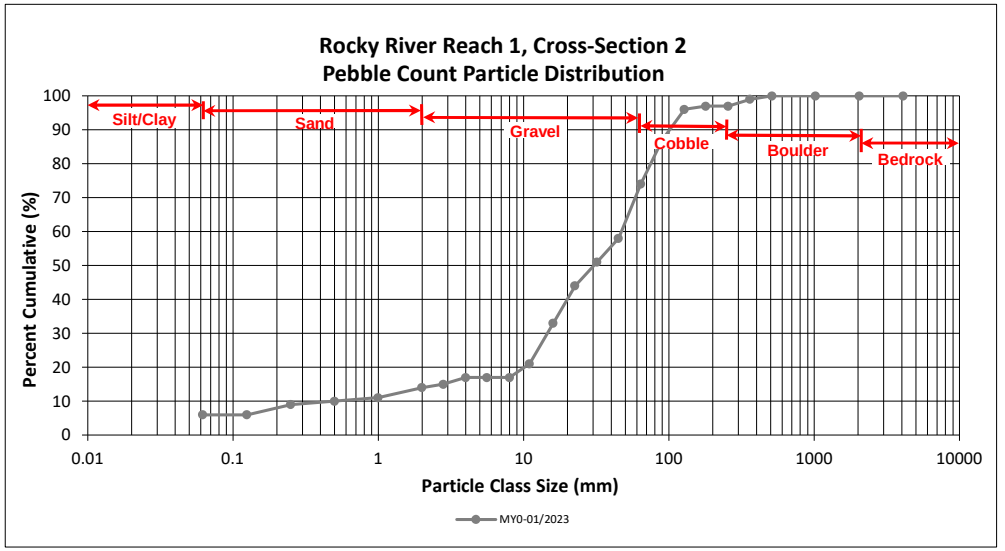
Reachwide and Cross-Section Pebble Count Plots

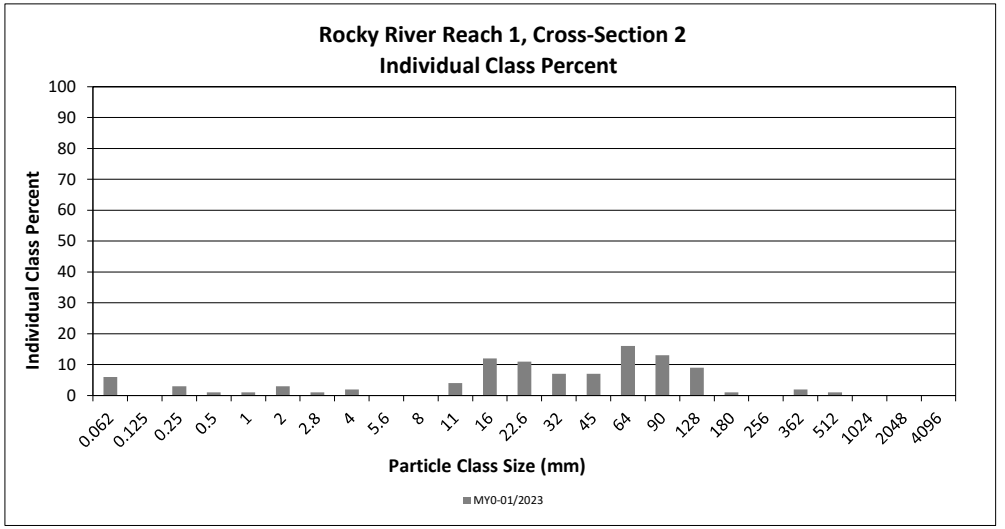
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Rocky River Reach 1, Cross-Section 2

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	6	6	6
SAND	Very fine	0.062	0.125			6
	Fine	0.125	0.250	3	3	9
	Medium	0.25	0.50	1	1	10
	Coarse	0.5	1.0	1	1	11
	Very Coarse	1.0	2.0	3	3	14
GRAVEL	Very Fine	2.0	2.8	1	1	15
	Very Fine	2.8	4.0	2	2	17
	Fine	4.0	5.6			17
	Fine	5.6	8.0			17
	Medium	8.0	11.0	4	4	21
	Medium	11.0	16.0	12	12	33
	Coarse	16.0	22.6	11	11	44
	Coarse	22.6	32	7	7	51
	Very Coarse	32	45	7	7	58
	Very Coarse	45	64	16	16	74
COBBLE	Small	64	90	13	13	87
	Small	90	128	9	9	96
	Large	128	180	1	1	97
	Large	180	256			97
BOULDER	Small	256	362	2	2	99
	Small	362	512	1	1	100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 2	
Channel materials (mm)	
D_{16} =	3.35
D_{35} =	17.04
D_{50} =	30.4
D_{84} =	83.2
D_{95} =	123.1
D_{100} =	512.0





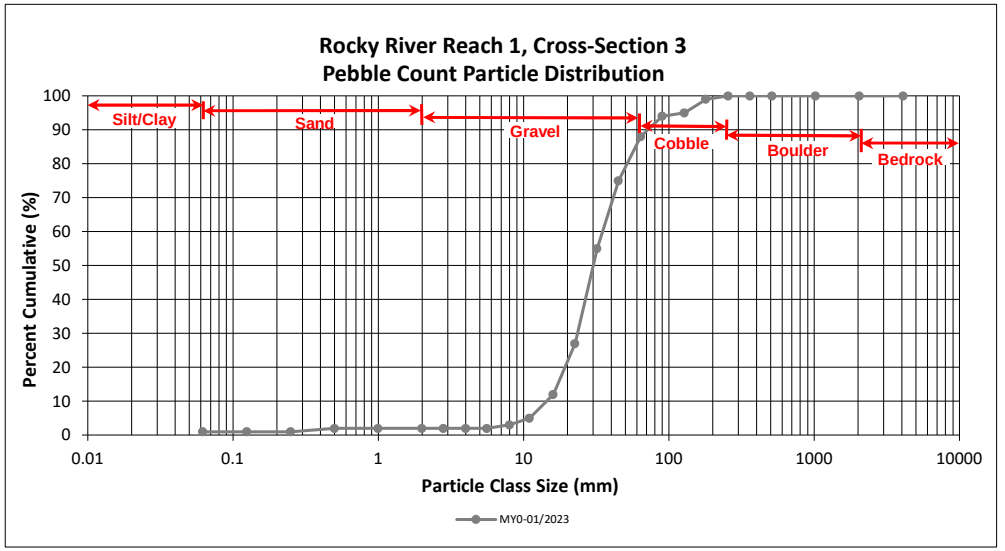
Reachwide and Cross-Section Pebble Count Plots

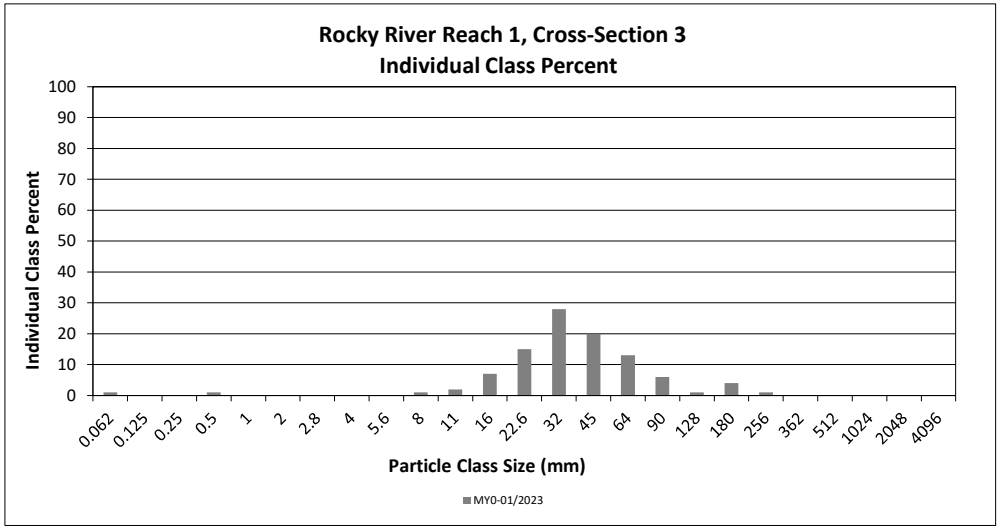
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Rocky River Reach 1, Cross-Section 3

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	1	1
SAND	Very fine	0.062	0.125			1
	Fine	0.125	0.250			1
	Medium	0.25	0.50	1	1	2
	Coarse	0.5	1.0			2
	Very Coarse	1.0	2.0			2
GRAVEL	Very Fine	2.0	2.8			2
	Very Fine	2.8	4.0			2
	Fine	4.0	5.6			2
	Fine	5.6	8.0	1	1	3
	Medium	8.0	11.0	2	2	5
	Medium	11.0	16.0	7	7	12
	Coarse	16.0	22.6	15	15	27
	Coarse	22.6	32	28	28	55
	Very Coarse	32	45	20	20	75
	Very Coarse	45	64	13	13	88
COBBLE	Small	64	90	6	6	94
	Small	90	128	1	1	95
	Large	128	180	4	4	99
	Large	180	256	1	1	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 3	
Channel materials (mm)	
D_{16} =	17.54
D_{35} =	24.96
D_{50} =	30.1
D_{84} =	57.4
D_{95} =	128.0
D_{100} =	256.0





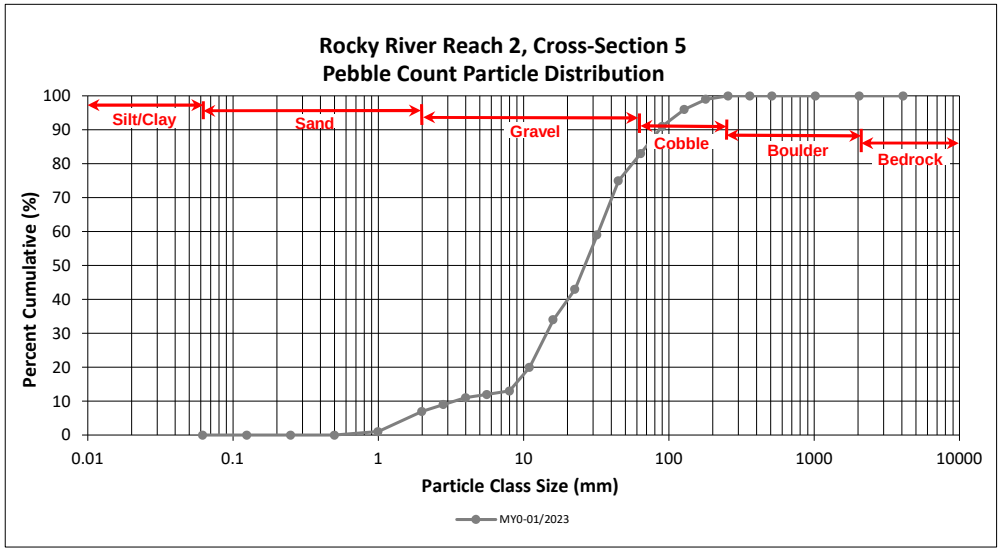
Reachwide and Cross-Section Pebble Count Plots

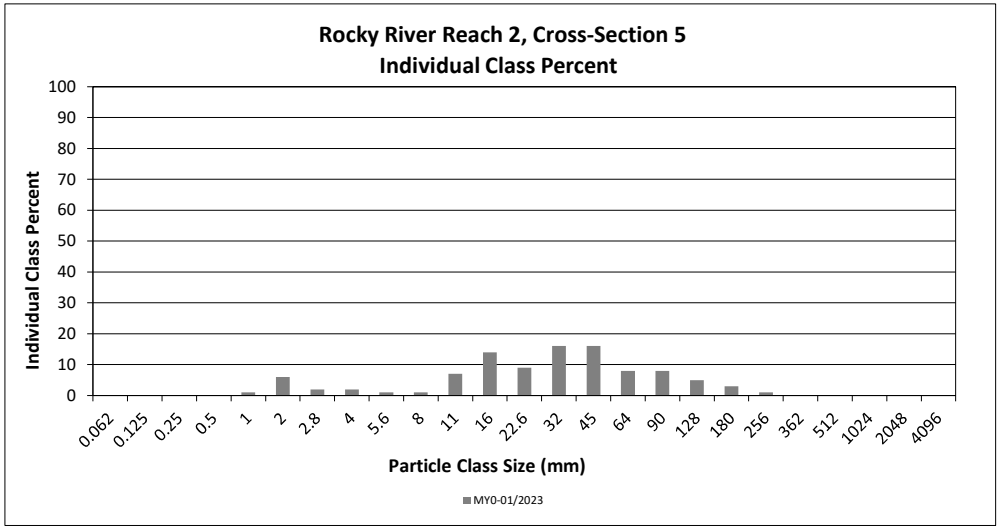
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Rocky River Reach 2, Cross-Section 5

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0	1	1	1
	Very Coarse	1.0	2.0	6	6	7
GRAVEL	Very Fine	2.0	2.8	2	2	9
	Very Fine	2.8	4.0	2	2	11
	Fine	4.0	5.6	1	1	12
	Fine	5.6	8.0	1	1	13
	Medium	8.0	11.0	7	7	20
	Medium	11.0	16.0	14	14	34
	Coarse	16.0	22.6	9	9	43
	Coarse	22.6	32	16	16	59
	Very Coarse	32	45	16	16	75
	Very Coarse	45	64	8	8	83
COBBLE	Small	64	90	8	8	91
	Small	90	128	5	5	96
	Large	128	180	3	3	99
	Large	180	256	1	1	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 5	
Channel materials (mm)	
D_{16} =	9.17
D_{35} =	16.63
D_{50} =	26.3
D_{84} =	66.8
D_{95} =	119.3
D_{100} =	256.0





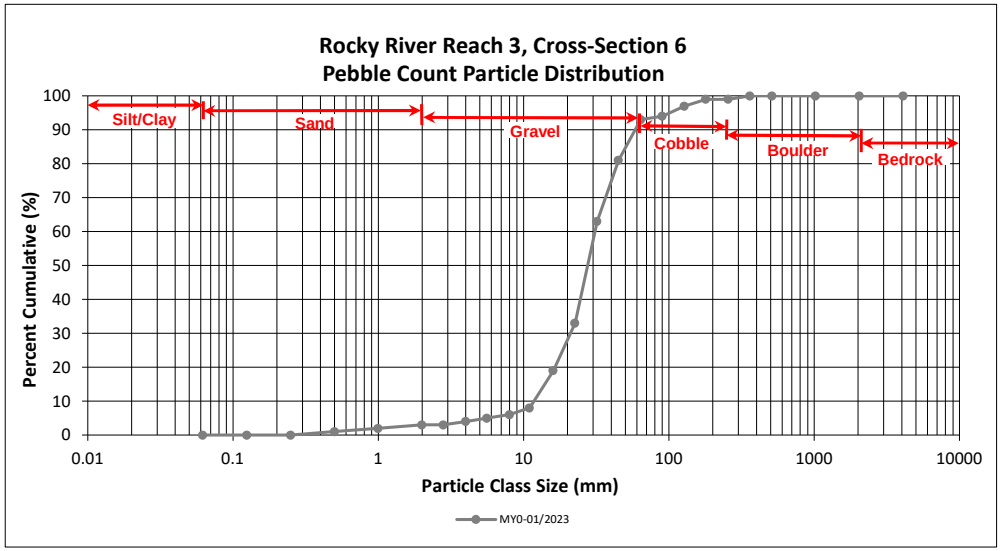
Reachwide and Cross-Section Pebble Count Plots

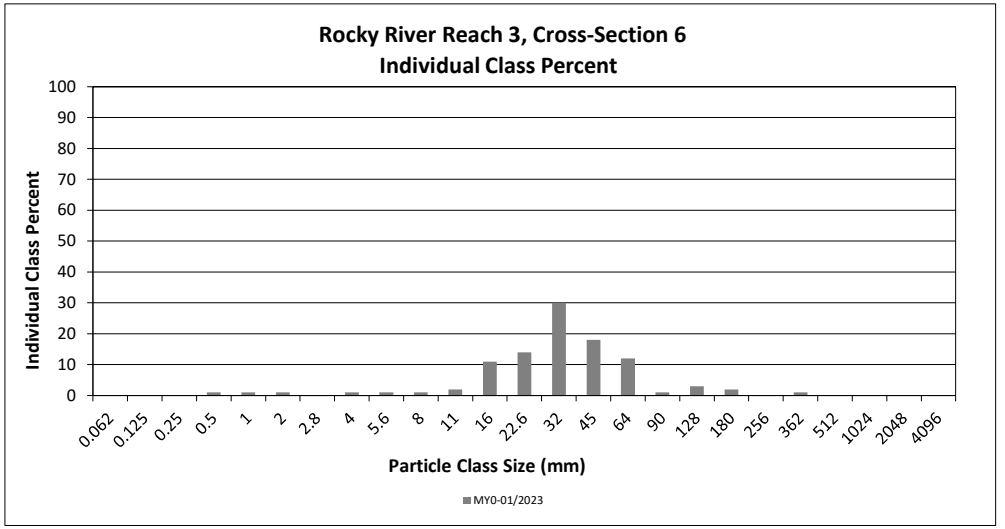
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Rocky River Reach 3, Cross-Section 6

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	1	1	1
	Coarse	0.5	1.0	1	1	2
	Very Coarse	1.0	2.0	1	1	3
GRAVEL	Very Fine	2.0	2.8			3
	Very Fine	2.8	4.0	1	1	4
	Fine	4.0	5.6	1	1	5
	Fine	5.6	8.0	1	1	6
	Medium	8.0	11.0	2	2	8
	Medium	11.0	16.0	11	11	19
	Coarse	16.0	22.6	14	14	33
	Coarse	22.6	32	30	30	63
	Very Coarse	32	45	18	18	81
	Very Coarse	45	64	12	12	93
COBBLE	Small	64	90	1	1	94
	Small	90	128	3	3	97
	Large	128	180	2	2	99
	Large	180	256			99
BOULDER	Small	256	362	1	1	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 6	
Channel materials (mm)	
D_{16} =	14.45
D_{35} =	23.13
D_{50} =	27.5
D_{84} =	49.1
D_{95} =	101.2
D_{100} =	362.0





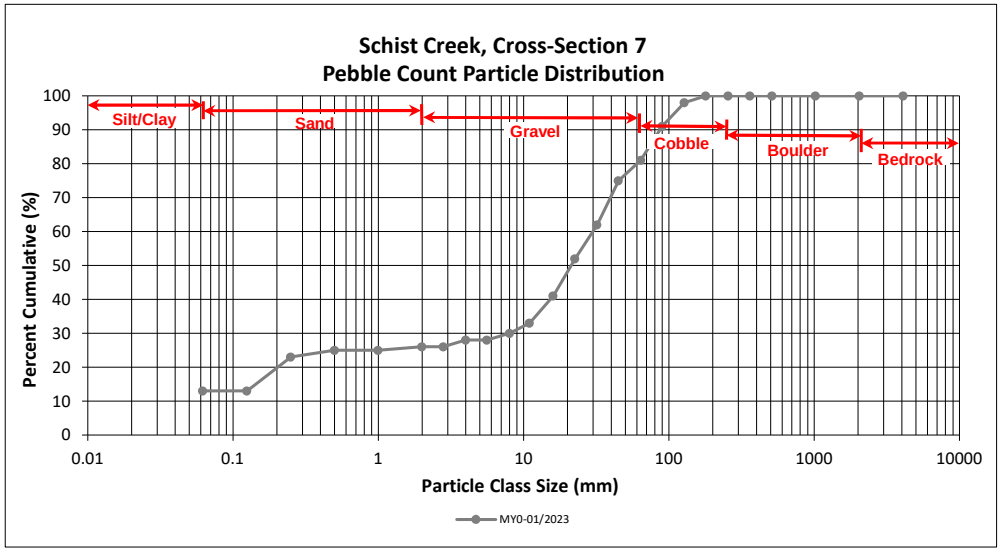
Reachwide and Cross-Section Pebble Count Plots

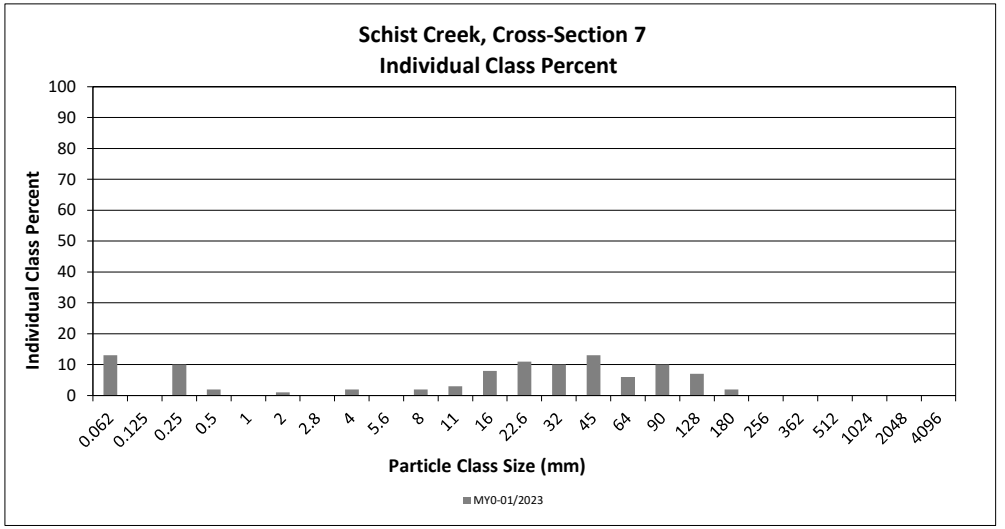
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Schist Creek, Cross-Section 7

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	13	13	13
SAND	Very fine	0.062	0.125			13
	Fine	0.125	0.250	10	10	23
	Medium	0.25	0.50	2	2	25
	Coarse	0.5	1.0			25
	Very Coarse	1.0	2.0	1	1	26
GRAVEL	Very Fine	2.0	2.8			26
	Very Fine	2.8	4.0	2	2	28
	Fine	4.0	5.6			28
	Fine	5.6	8.0	2	2	30
	Medium	8.0	11.0	3	3	33
	Medium	11.0	16.0	8	8	41
	Coarse	16.0	22.6	11	11	52
	Coarse	22.6	32	10	10	62
	Very Coarse	32	45	13	13	75
	Very Coarse	45	64	6	6	81
COBBLE	Small	64	90	10	10	91
	Small	90	128	7	7	98
	Large	128	180	2	2	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 7	
Channel materials (mm)	
D_{16} =	0.15
D_{35} =	12.08
D_{50} =	21.2
D_{84} =	70.9
D_{95} =	110.1
D_{100} =	180.0





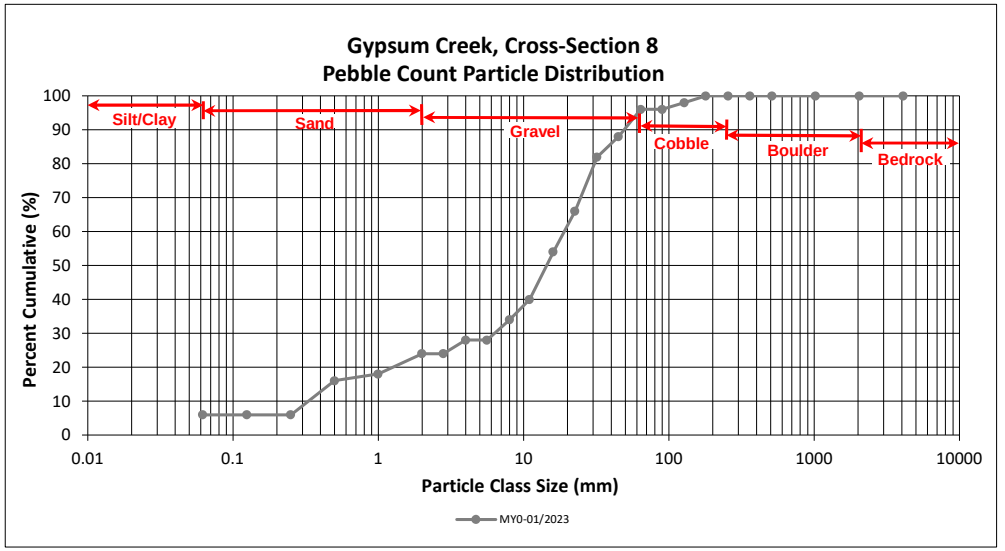
Reachwide and Cross-Section Pebble Count Plots

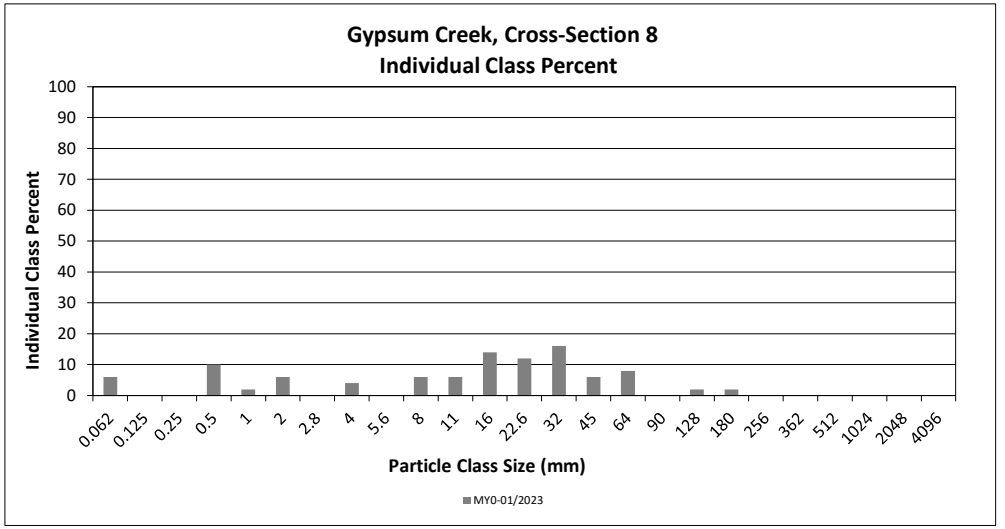
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Gypsum Creek, Cross-Section 8

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	6	6	6
SAND	Very fine	0.062	0.125			6
	Fine	0.125	0.250			6
	Medium	0.25	0.50	10	10	16
	Coarse	0.5	1.0	2	2	18
	Very Coarse	1.0	2.0	6	6	24
GRAVEL	Very Fine	2.0	2.8			24
	Very Fine	2.8	4.0	4	4	28
	Fine	4.0	5.6			28
	Fine	5.6	8.0	6	6	34
	Medium	8.0	11.0	6	6	40
	Medium	11.0	16.0	14	14	54
	Coarse	16.0	22.6	12	12	66
	Coarse	22.6	32	16	16	82
	Very Coarse	32	45	6	6	88
	Very Coarse	45	64	8	8	96
COBBLE	Small	64	90			96
	Small	90	128	2	2	98
	Large	128	180	2	2	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 8	
Channel materials (mm)	
D_{16} =	0.50
D_{35} =	8.44
D_{50} =	14.4
D_{84} =	35.9
D_{95} =	61.2
D_{100} =	180.0





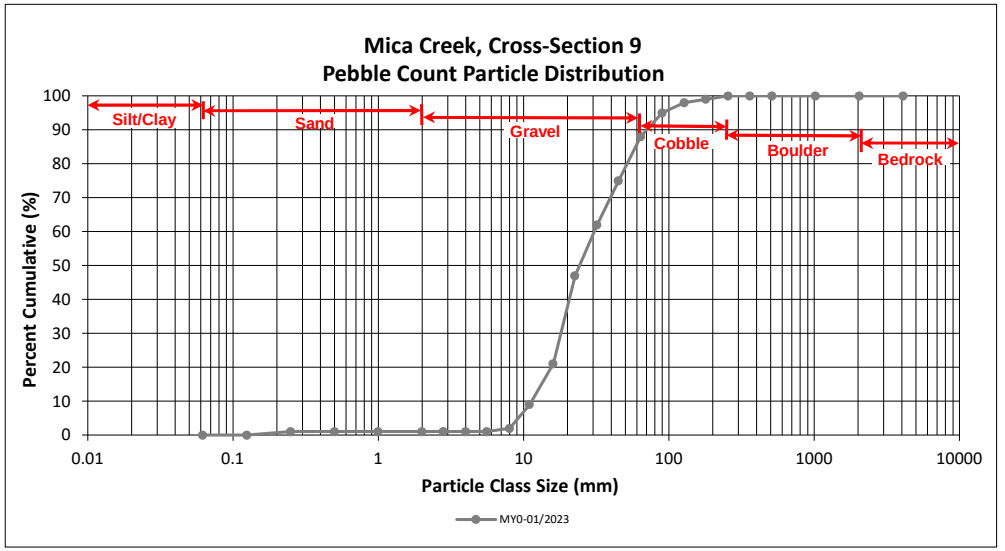
Reachwide and Cross-Section Pebble Count Plots

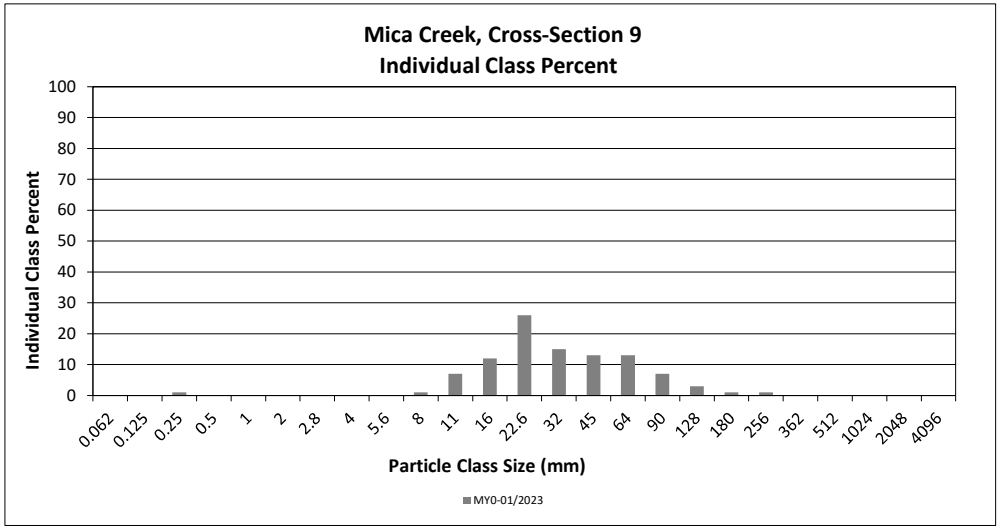
Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Mica Creek, Cross-Section 9

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	1	1	1
	Medium	0.25	0.50			1
	Coarse	0.5	1.0			1
	Very Coarse	1.0	2.0			1
GRAVEL	Very Fine	2.0	2.8			1
	Very Fine	2.8	4.0			1
	Fine	4.0	5.6			1
	Fine	5.6	8.0	1	1	2
	Medium	8.0	11.0	7	7	9
	Medium	11.0	16.0	12	12	21
	Coarse	16.0	22.6	26	26	47
	Coarse	22.6	32	15	15	62
	Very Coarse	32	45	13	13	75
	Very Coarse	45	64	13	13	88
COBBLE	Small	64	90	7	7	95
	Small	90	128	3	3	98
	Large	128	180	1	1	99
	Large	180	256	1	1	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 9	
Channel materials (mm)	
D_{16} =	13.69
D_{35} =	19.27
D_{50} =	24.2
D_{84} =	57.4
D_{95} =	90.0
D_{100} =	256.0





APPENDIX D. Project Timeline and Contact Info

Table 10. Project Activity and Reporting History
Liberty Rock Mitigation Site
DMS ID No. 100135
Monitoring Year 0 - 2023

Activity or Report		Data Collection Complete	Completion or Scheduled Delivery
Project Instituted		N/A	November 2019
Mitigation Plan Approved		N/A	October 2021
Invasive Vegetation Treatment			March-June 2021
Construction (Grading) Completed		N/A	August 2022
Invasive Vegetation Treatment			August-December 2022
As-Built Survey Completed		October 2022	October 2022
Planting Completed		N/A	January 2023
Baseline Monitoring Document (Year 0)	Stream Survey	October 2022	January 2023
	Vegetation Survey	January 2023	
Year 1 Monitoring	Stream Survey	2024	December 2024
	Vegetation Survey	2024	
Year 2 Monitoring	Stream Survey	2025	2025
	Vegetation Survey	2025	
Year 3 Monitoring	Stream Survey	2026	2026
	Vegetation Survey	2026	
Year 4 Monitoring		2027	2027
Year 5 Monitoring	Stream Survey	2028	2028
	Vegetation Survey	2028	
Year 6 Monitoring		2029	2029
Year 7 Monitoring	Stream Survey	2030	2030
	Vegetation Survey	2030	

Table 11. Project Contact Table
Liberty Rock Mitigation Site
DMS ID No. 100135
Monitoring Year 0 - 2023

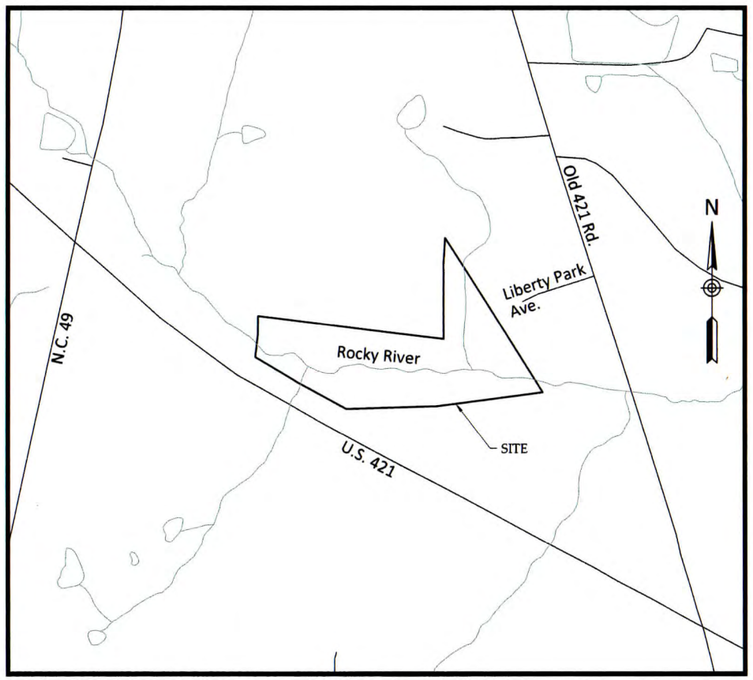
Designer **Abigail Vieira, PE**	**Wildlands Engineering, Inc.** 312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986
Construction Contractor	**Wildlands Construction** 312 West Millbrook Road, Suite 225 Raleigh, NC 27609
Monitoring Performers Monitoring, POC	**Wildlands Engineering, Inc.** Jason Lorch 919.851.9986

APPENDIX E. Record Drawings

February 28, 2023

Liberty Rock Mitigation Site

Randolph County, North Carolina
for
NCDEQ
Division of Mitigation Services



Vicinity Map
Not to Scale

I, DAVID S. TURNER, CERTIFY THAT THE SURVEY TO COLLECT AS-BUILT DATA WAS COMPLETED UNDER MY DIRECT AND RESPONSIBLE CHARGE FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; THAT THE TOPOGRAPHIC SURVEY WAS PERFORMED AT THE 95 PERCENT CONFIDENCE LEVEL TO MEET FEDERAL GEOGRAPHIC DATA COMMITTEE STANDARDS; THAT THIS SURVEY WAS PERFORMED TO MEET THE REQUIREMENTS FOR A TOPOGRAPHIC SURVEY TO THE HORIZONTAL ACCURACY OF CLASS A AND THE VERTICAL ACCURACY WHEN APPLICABLE TO CLASS C STANDARD, AND THAT THE ORIGINAL DATA WAS OBTAINED IN SEP-OCT 2022; THAT THE SURVEY WAS COMPLETED ON 17 OCTOBER 2022; AND ALL COORDINATES ARE BASED ON NAD83 (2011) AND ALL ELEVATIONS ARE BASED ON NAVD88. WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER, AND SEAL THIS 28th DAY OF FEBRUARY, 2023.

David S. Turner
DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

AS-BUILT AND
RECORD DRAWINGS
ISSUE DATE: FEBRUARY 28, 2023

Project Location

35°49'12.34" N, 79° 33'43.89" W

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 28th DAY OF FEBRUARY, 2023.

David S. Turner
DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

Sheet Index

Project Directory

Engineering:
Wildlands Engineering, Inc
License No. F-0831
312 W. Millbrook Rd, Suite 225
Raleigh, NC 27609
Angela Allen, PE, Project Manager
Abigail Vieira, PE, Project Engineer
919-851-9986

Surveying:
Turner Land Surveying
P.O. Box 148
Swannanoa, NC 28778
David S. Turner, PLS
919-827-0745

Owner:
NCDEQ DMS
1652 Mail Service Center
Raleigh, NC 27699-1652
Attention: Jeremiah Dow
919-791-4248

NCDEQ Contract No. 7877-01
DMS ID No. 100135
USACE Action ID No. 2020-00047
DWR No. 20200035

WILDLANDS ENGINEERING
312 W. Millbrook Rd, Suite 225
Raleigh, NC 27609
Tel: 919.851.9986
License No. F-0831

Liberty Rock Mitigation Site
Randolph County, North Carolina

Title Sheet

Revisions:
Rev 1 - Addressed Comments

Date: 02-28-23
Job Number: 005-02185
Project Engineer: ANA
Drawn By: CW
Checked By: GAT

Sheet 0.1

X:\Shared\Projects\005-02185_Liberty_Rock\Monitoring\Baseline Monitoring\Plans\As-Built Set\Plans\02185-AB Cover.dwg

February 28, 2023

N/F
CLYDE OLIVER FULK, JR.
D.B. 1912, PG. 197
P.B. NA, PG. NA
PID: 78447
PIN: 8735-15-4919

N/F
LYN S. RICHARDSON
D.B. 2629, PG. 732
P.B. NA, PG. NA
PID: 78500
PIN: 8735-35-5209

N/F
LYN VILLA SMITH RICHARDSON
D.B. 2629, PG. 726
P.B. NA, PG. NA
PID: 78502
PIN: 8735-35-9444

N/F
SUMMITNORTH LIBERTY HOLDINGS I LLC
D.B.2219 , PG. 750
P.B. 61, PG. 94
PID: 78529
PIN: 8735-44-1640

N/F
LYN VILLA SMITH RICHARDSON
D.B. 2629, PG. 714
P.B. 32, PG. 85
PID: 78487
PIN: 8735-23-4859

N/F
TOWN OF SILER CITY
D.B. 1887, PG. 2132
P.B. 95, PG. 93
PID: 78409
PIN: 8735-15-4919

N/F
SUMMITNORTH LIBERTY HOLDINGS I LLC
D.B. 2228, PG. 765
P.B. 61, PG. 94
PID: 78530
PIN: 8735-44-4200

N/F
LYN VILLA SMITH RICHARDSON
D.B. 2629, PG. 726
P.B. 13, PG. 47
PID: 78499
PIN: 8735-33-8516

N/F
LYN VILLA SMITH RICHARDSON
D.B. 2629, PG. 726
P.B. 20, PG. 27
PID: 78499
PIN: 8735-33-8516

N/F
HAMPTON J. PIKE
TRUSTEE
D.B. 1713, PG. 720
P.B. 39, PG. 26
PID: 78526
PIN: 8735-42-1852

NORFOLK & SOUTHERN RAILWAY

LIBERTY PARK AVE.

OLD 421 RD.
S.R. 1006

U.S. HWY. 421

MICA CREEK

ROCKY RIVER

SCHIST CREEK

GYPSUM CREEK

DOLOMITE CREEK

FEMA 100 YR FLOODPLAIN

BEGIN MICA CREEK
(RESTORATION)
STA. 502+01

END SCHIST CREEK
(RESTORATION)
STA. 205+01

END GYPSUM CREEK
REACH 2 (RESTORATION)
STA. 303+68

END ROCKY RIVER
REACH 1 (RESTORATION)
BEGIN ROCKY RIVER
REACH 2 (ENHANCEMENT I)
STA. 121+13

END MICA CREEK
(RESTORATION)
STA. 513+57

END ROCKY RIVER
REACH 3 (RESTORATION)
STA. 131+72

BEGIN ROCKY RIVER
REACH 1 (RESTROATION)
STA. 101+24

BEGIN SCHIST CREEK
(RESTORATION)
STA. 200+72

END GYPSUM CREEK
REACH 1 (PRESERVATION)
BEGIN GYPSUM CREEK
REACH 2 (RESTORATION)
STA. 301+52

END DOLOMITE CREEK
REACH 2 (ENHANCEMENT II)
STA. 402+30

END DOLOMITE CREEK
REACH 1 (PRESERVATION)
BEGIN DOLOMITE CREEK
REACH 2 (ENHANCEMENT II)
STA. 401+88

END ROCKY RIVER
REACH 2 (ENHANCEMENT I)
BEGIN ROCKY RIVER
REACH 3 (RESTORATION)
STA. 126+93

BEGIN GYPSUM CREEK
REACH 1 (PRESERVATION)
STA. 300+00

BEGIN DOLOMITE CREEK
REACH 1 (PRESERVATION)
STA. 400+00

1.01 1.02 1.03 1.04 1.05 1.06 1.07 1.08 1.09 1.10 1.11 1.12 1.13 1.14 1.15 1.16 1.17 1.18

CE R/W

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.

N

0' 150' 300' 450'
(HORIZONTAL)

X:\Shared\Projects\WI2165_Liberty_Rock\Monitoring\Baseline Monitoring\Plans\As-Built-Set\Plans\02165-AB Project Overview.dwg

WILDLANDS ENGINEERING
312 W. Millbrook Rd, Suite 225
Raleigh, NC 27609
Tel: 919.851.9986
License No. F-0831

Liberty Rock Mitigation Site
Randolph County, North Carolina

Project Overview

Revisions:

Date: 02-28-23
Job Number: 005-02165
Project Engineer: ANA
Drawn By: CW
Checked By: GAT

Sheet 0.2

February 29, 2023

Existing Features

- EXISTING TOP OF BANK (TB)
- EXISTING THALWEG
- EXISTING FENCE (X)
- EXISTING STORM PIPE
- EXISTING RIGHT-OF-WAY (R/W)
- EXISTING PROPERTY LINE
- EXISTING CONSERVATION EASEMENT (CE)
- EXISTING RAILROAD TRACKS
- EXISTING TREE LINE
- EXISTING BEDROCK
- EXISTING CONCRETE
- EXISTING WETLAND
- EXISTING RIGHT-OF-WAY MONUMENT
- EXISTING FIBER OPTIC MARKER (FO)
- EXISTING TREE

Designed Features

- NOT FOR CREDIT (10+00)
- DESIGNED PRESERVATION REACH (10+00)
- DESIGNED ENHANCEMENT I REACH (10+00)
- DESIGNED ENHANCEMENT II REACH (10+00)
- DESIGNED RESTORATION REACH (10+00)
- DESIGNED BANKFULL
- DESIGNED MAJOR CONTOUR (100)
- DESIGNED MINOR CONTOUR (101)
- DESIGNED LOG SILL
- DESIGNED BOULDER STEP
- DESIGNED COVER LOG
- DESIGNED LOG STEP
- DESIGNED BOULDER SILL
- DESIGNED LUNKER STRUCTURE
- DESIGNED LOG J-HOOK
- DESIGNED BRUSHTOE
- DESIGNED VEGETATED SOIL LIFT
- DESIGNED RIFFLE
- DESIGNED ROCK PIPE OUTLET
- DESIGNED WETLAND PLUG
- DESIGNED PERMANENT FORD CROSSING

As-Built Features

- THALWEG
- BANKFULL
- LIMITS OF DISTURBANCE (LOD)
- AS-BUILT 5' MAJOR CONTOUR (540)
- AS-BUILT 1' MINOR CONTOUR
- CROSS SECTION (XS#)
- PHOTO POINT (PP ##)
- GROUND WATER GAUGE (GWG ##)
- CREST GAUGE (CG)
- VEGETATION PLOT (VP ##, VEG)
- AS-BUILT LOG SILL
- AS-BUILT BOULDER STEP
- AS-BUILT COVER LOG
- AS-BUILT LOG STEP
- AS-BUILT BOULDER SILL
- AS-BUILT LUNKER STRUCTURE
- AS-BUILT LOG J-HOOK
- AS-BUILT BRUSHTOE
- AS-BUILT RIFFLE
- AS-BUILT ROCK PIPE OUTLET
- AS-BUILT PERMANENT FORD CROSSING

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.

WILDLANDS ENGINEERING
312 W. Millbrook Rd, Suite 225
Raleigh, NC 27609
Tel: 919.851.9986
License No. F-0831

Liberty Rock Mitigation Site
Randolph County, North Carolina

General Notes and Symbols

Revisions:

Date: 02-28-23
Job Number: 005-02185
Project Engineer: ANA
Drawn By: CW
Checked By: GAT

Sheet 0.3

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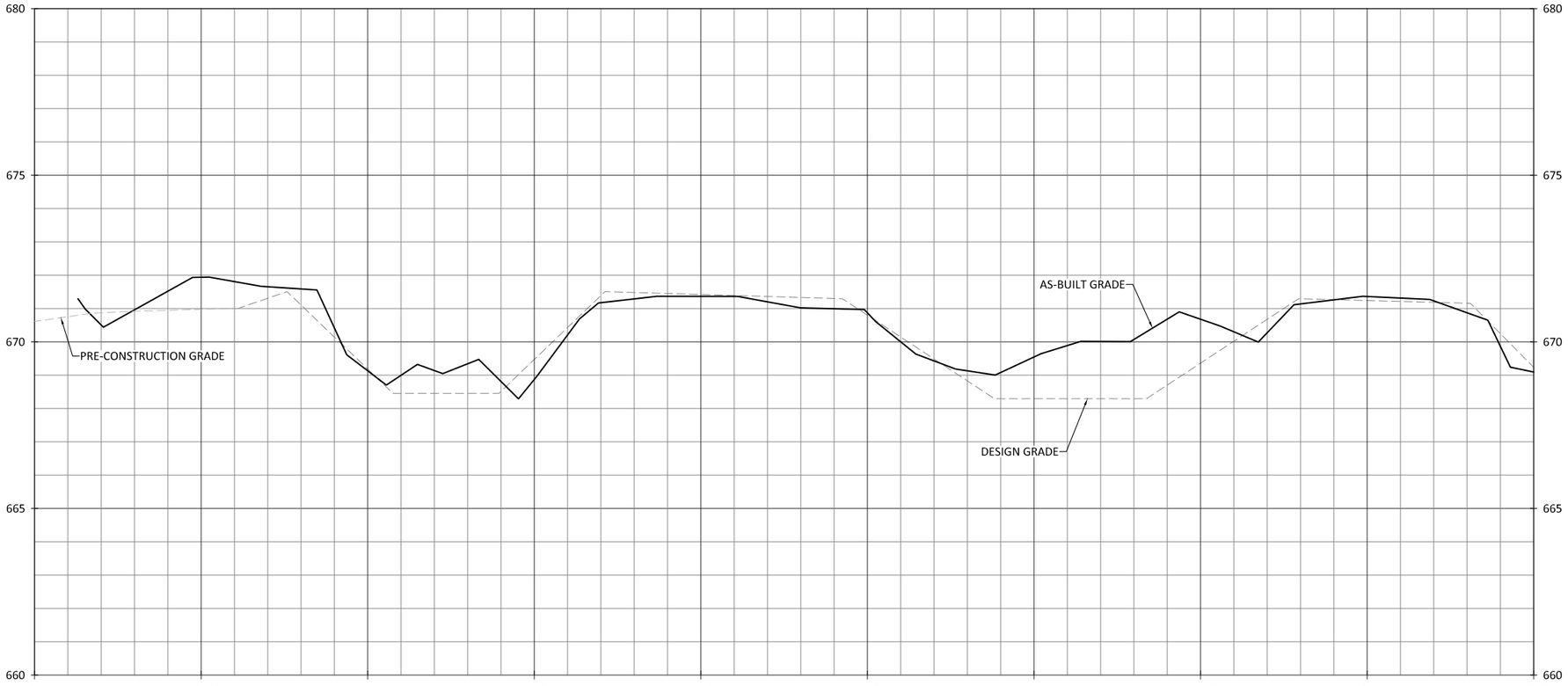
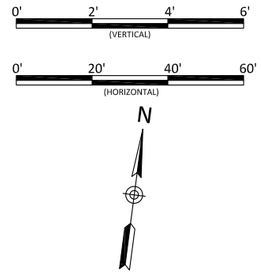
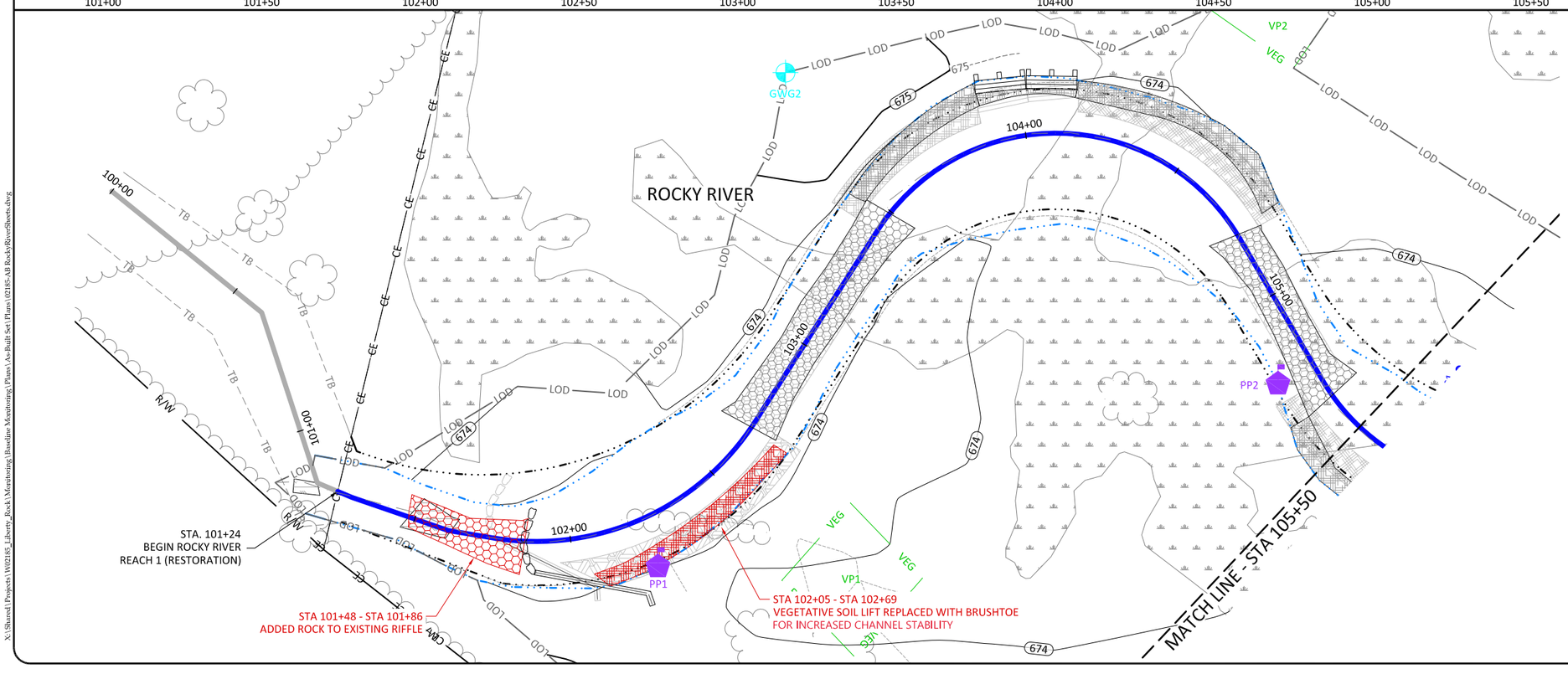
February 29, 2023







NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.

WILDLANDS ENGINEERING
312 W. Millbrook Rd, Suite 225
Raleigh, NC 27609
Tel: 919.851.9986
License No. F-0831

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040286 ANGELA M. ALLEN 2-23-23

Liberty Rock Mitigation Site
Randolph County, North Carolina

Rocky River
Stream Plan and Profile

Revisions:

Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

Sheet 1.01

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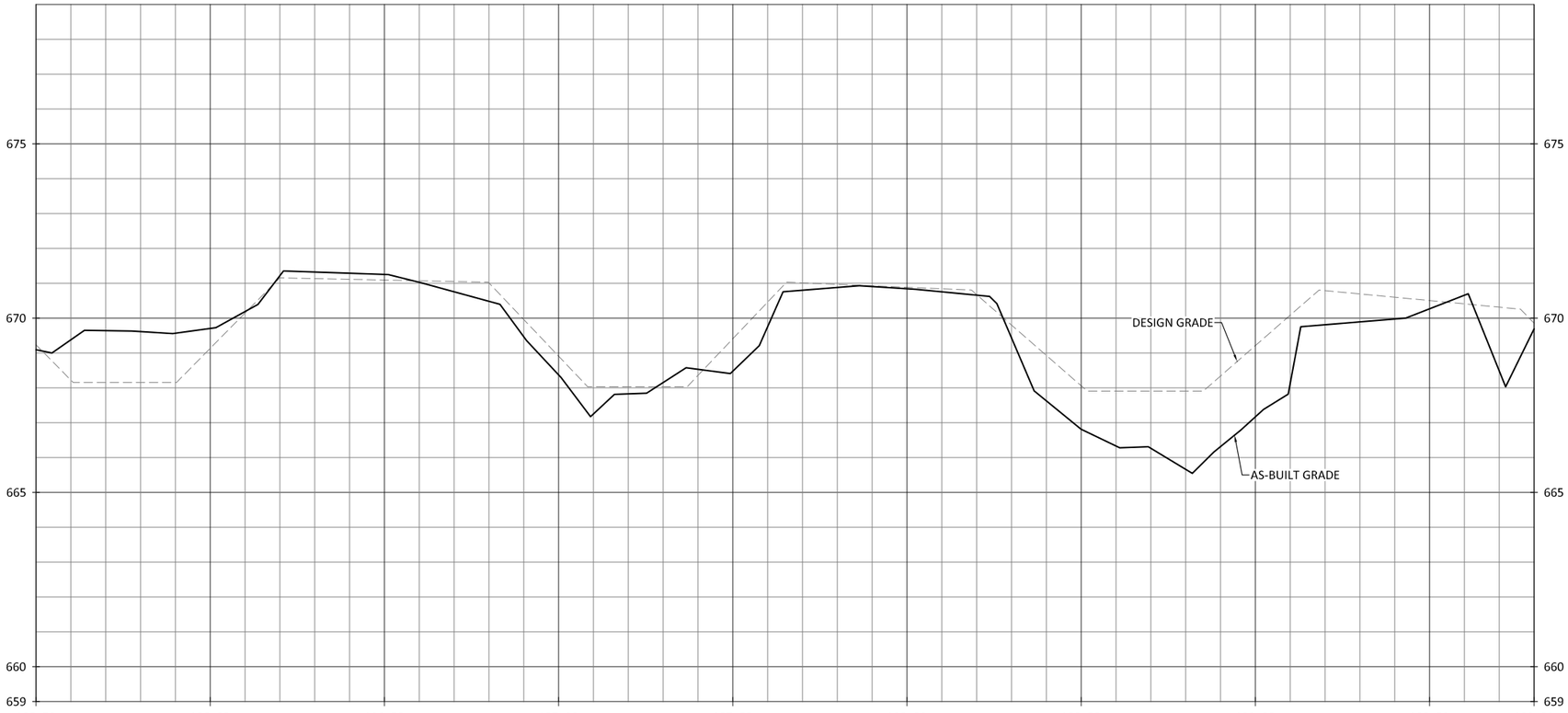
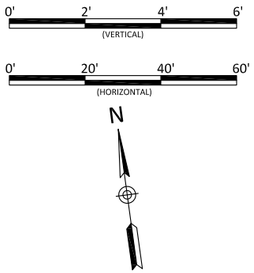
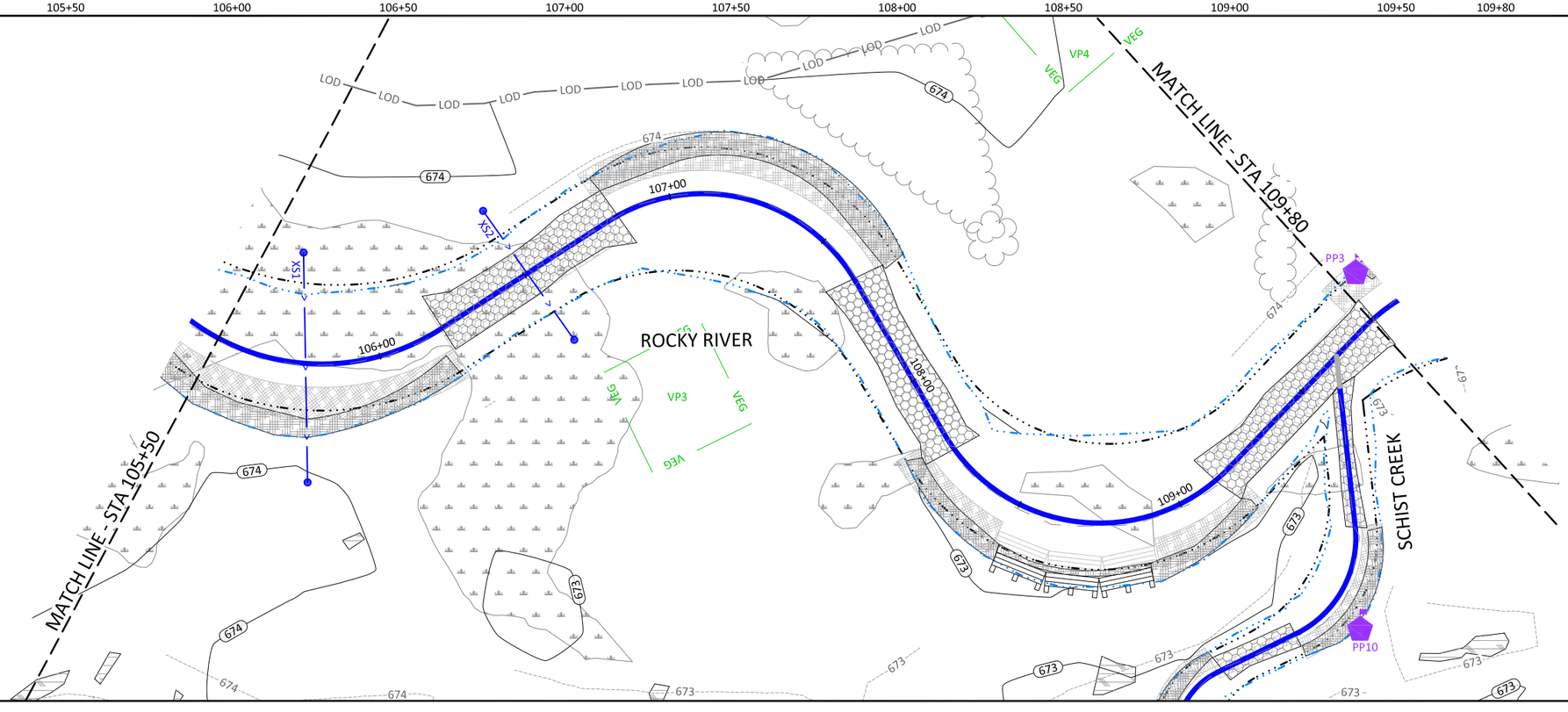
February 29, 2023







NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR SCHIST CREEK IS ADDRESSED ON SHEETS 1.08 THROUGH 1.09.

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040288 ANGELA M. ALLEN 2-22-23

Liberty Rock Mitigation Site
Randolph County, North Carolina

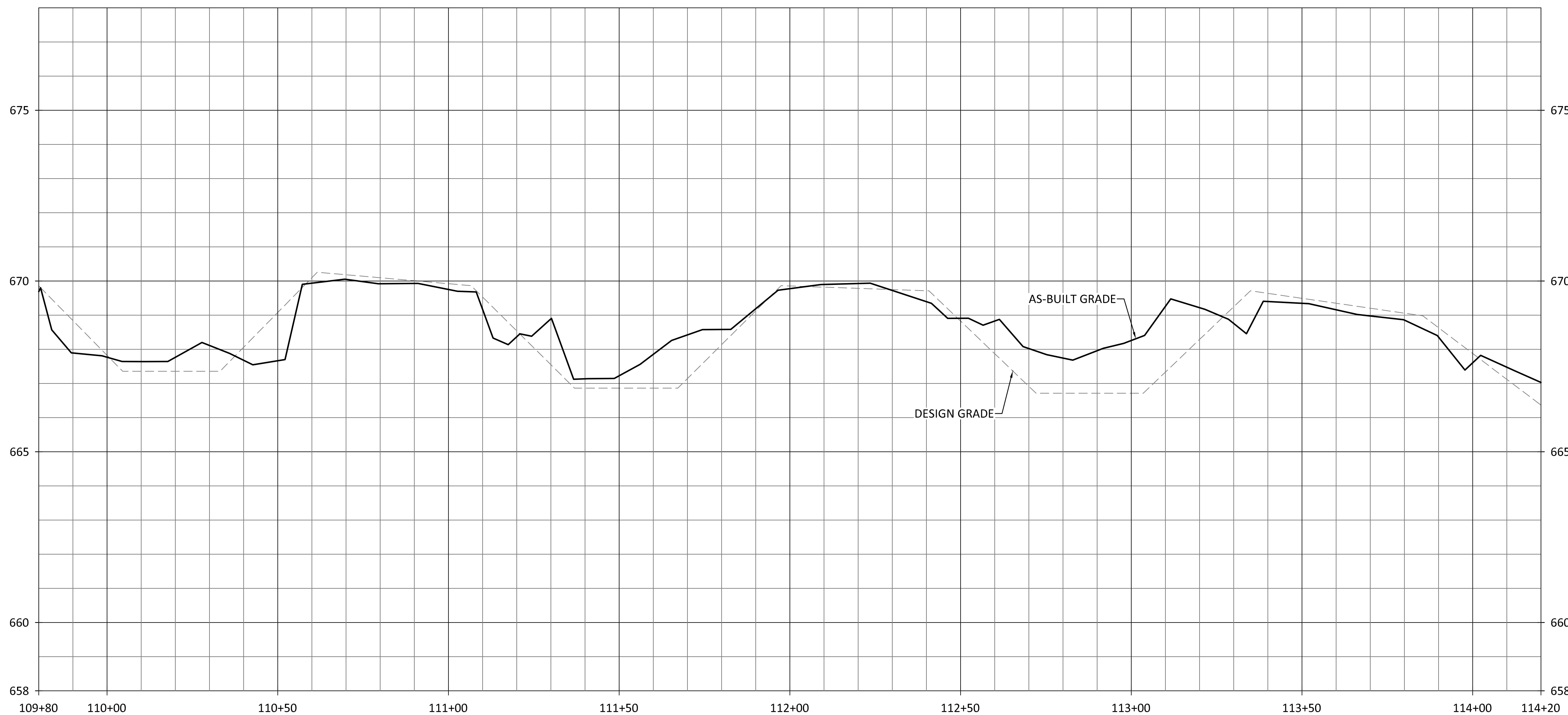
Rocky River
Stream Plan and Profile

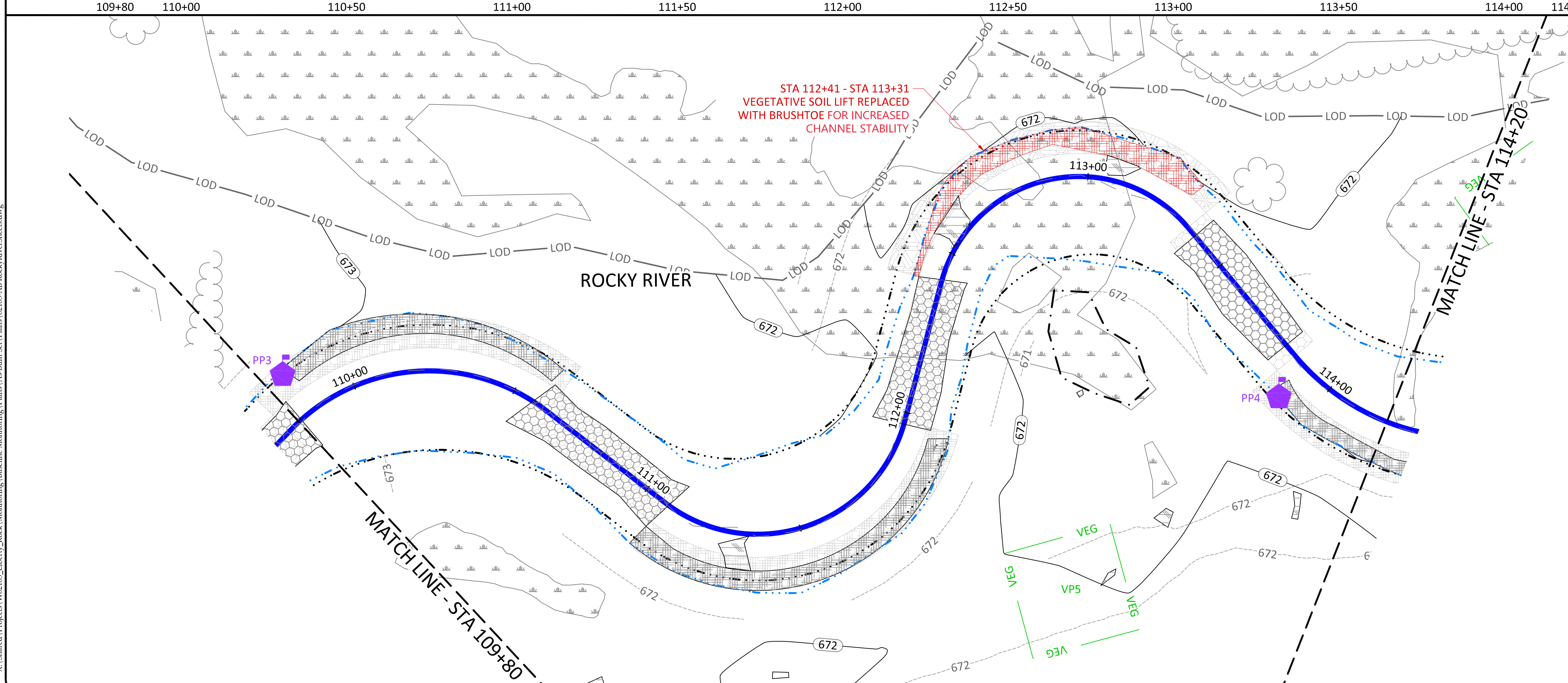
Revisions:

Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

Sheet 1.02

X:\Shared\Projects\WI02185_Liberty_Rock\Monitoring\Baseline Monitoring\Plans\As-Built-Set\Plans\02185-AB RockyRiverSheets.dwg





0' 2' 4' 6'
(VERTICAL)

0' 20' 40' 60'
(HORIZONTAL)

N

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.

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Liberty Rock Mitigation Site
Randolph County, North Carolina

Rocky River
Stream Plan and Profile

Revisions:

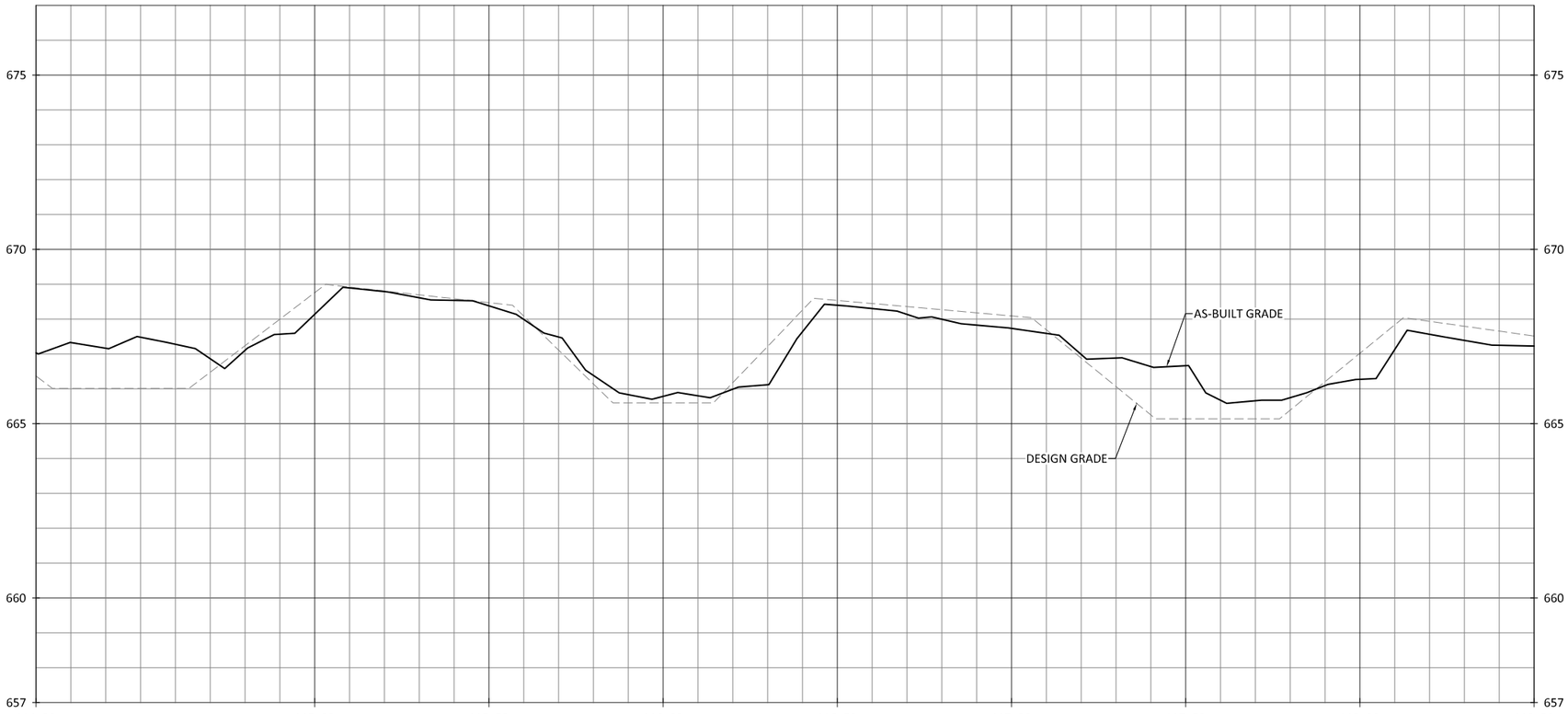
Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

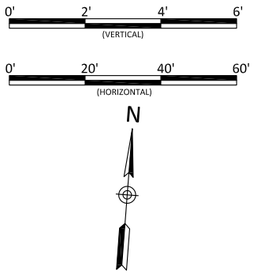
Sheet 1.03

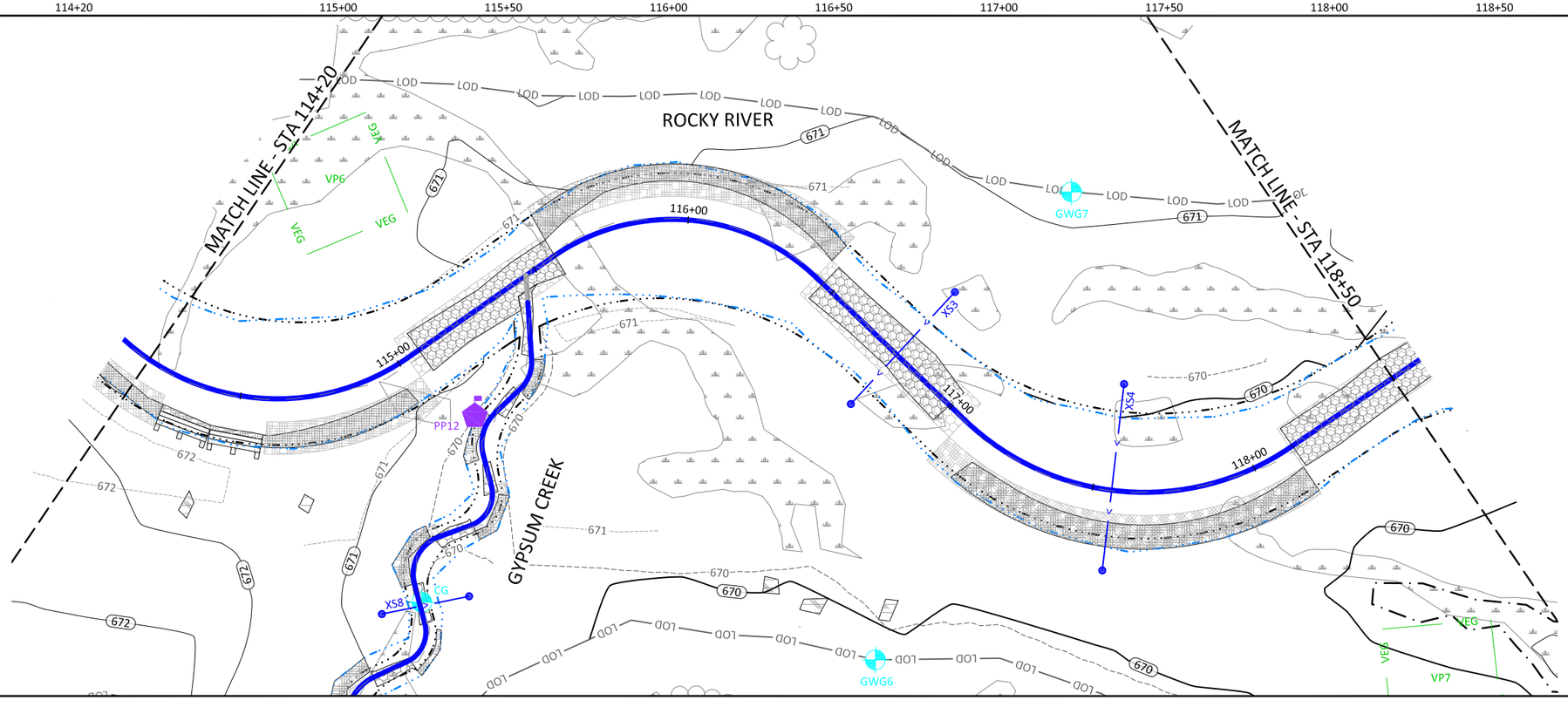
February 28, 2023

X:\Shared\Projects\W02185_Liberty_Rock\Monitoring\Baseline Monitoring\Plans\As-Built Set\Plans\02185-AB RockyRiverSheets.dwg

February 29, 2023







NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR GYPSUM CREEK IS ADDRESSED ON SHEET 1.10.

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Liberty Rock Mitigation Site
Randolph County, North Carolina

Rocky River
Stream Plan and Profile

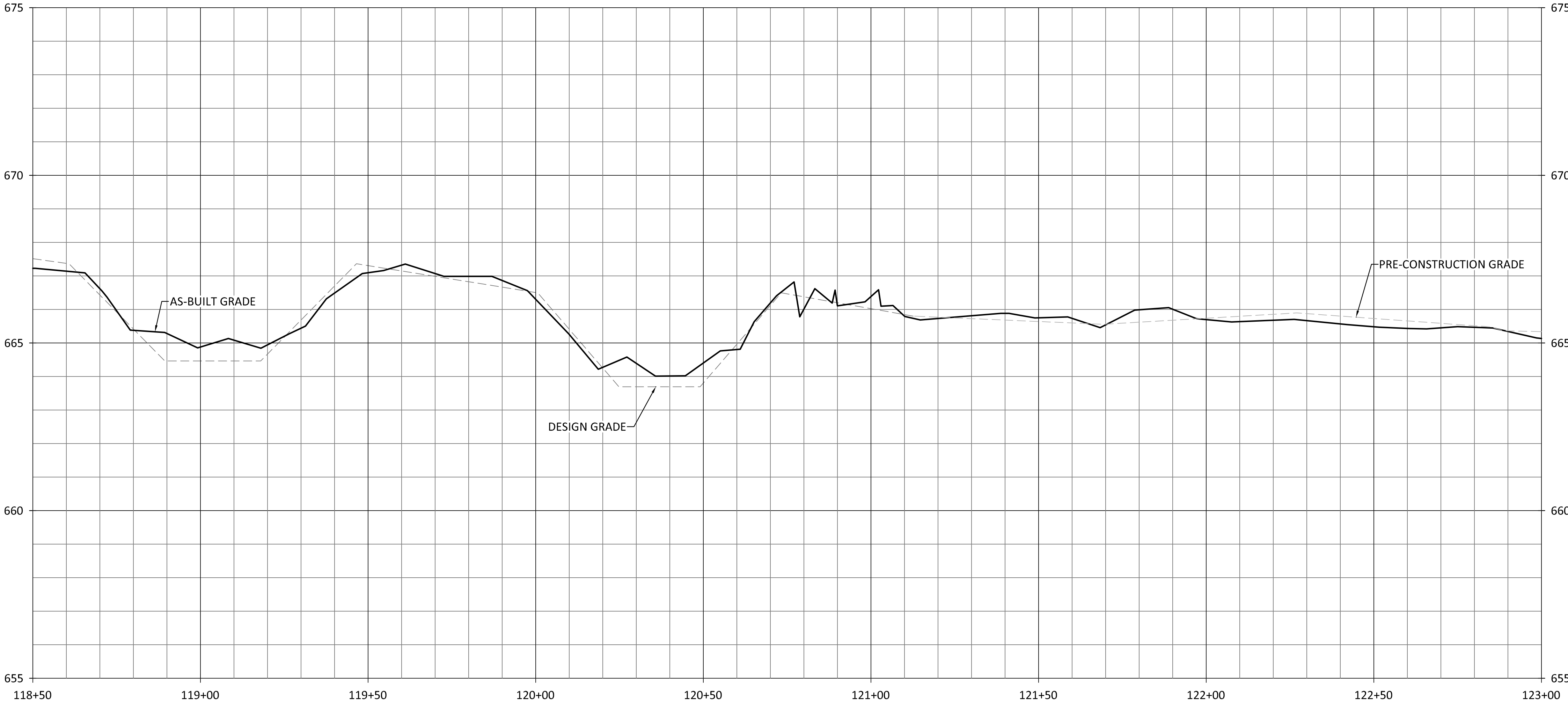
Revisions:

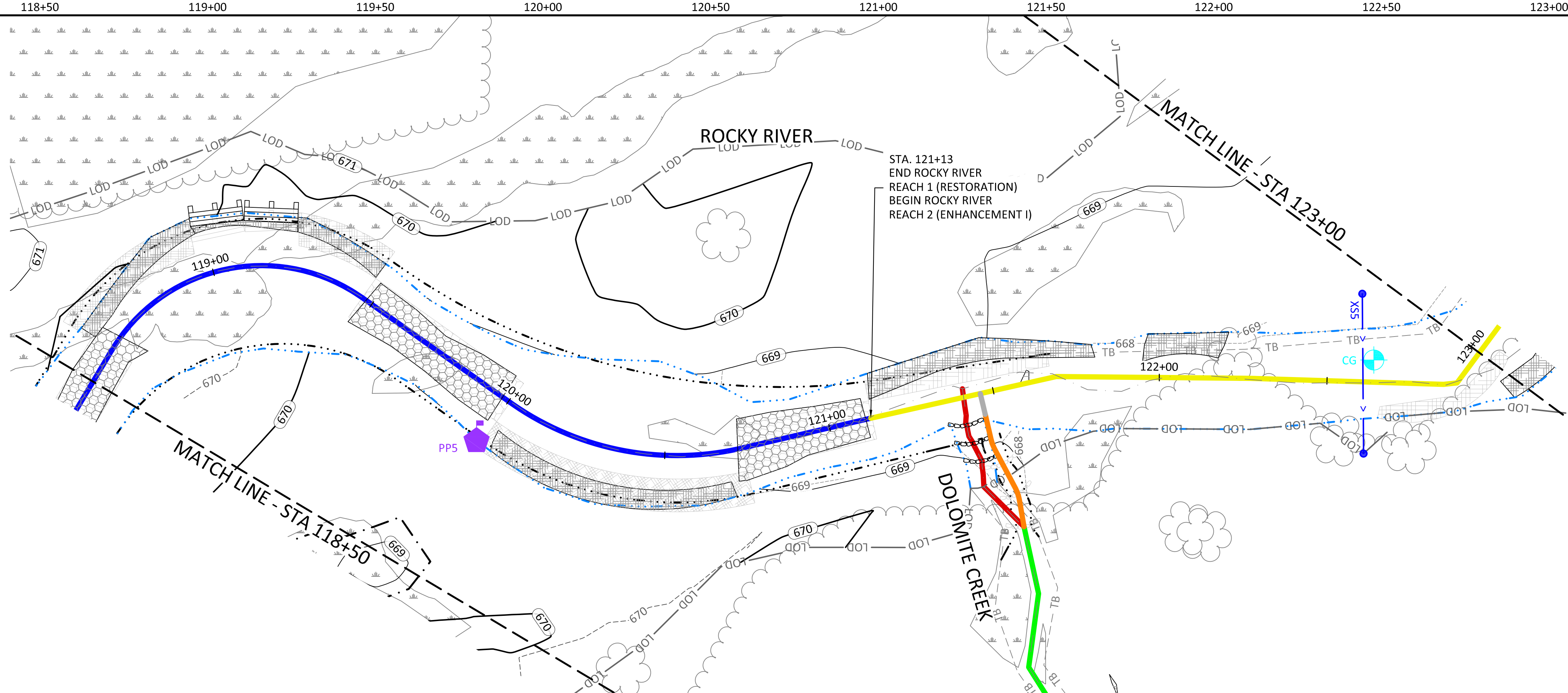
Date: 02-28-23
Job Number: 005-02185
Project Engineer: ANA
Drawn By: CW
Checked By: GAT

Sheet 1.04

X:\Shared\Projects\WI02185_Liberty_Rock\Monitoring\Baseline Monitoring\Plans\As-Built-Set\Plans\02185-AB RockyRiverSheets.dwg

February 28, 2023





NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR DOLOMITE CREEK IS ADDRESSED ON SHEET 1.11.

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Liberty Rock Mitigation Site
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Rocky River
Stream Plan and Profile

Revisions:

Date: 02-28-23
Job Number: 005-02185
Project Engineer: ANA
Drawn By: CW
Checked By: GAT

Sheet 1.05

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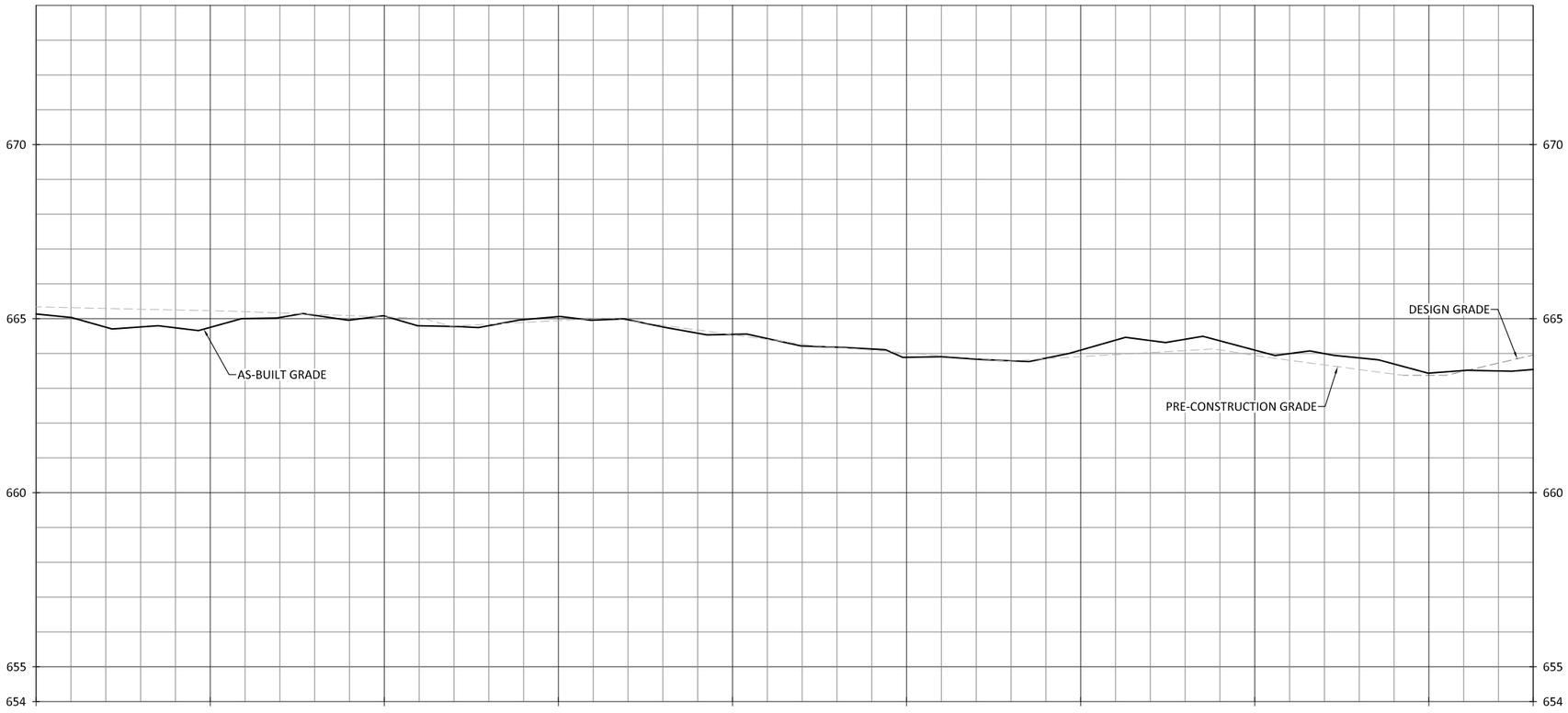
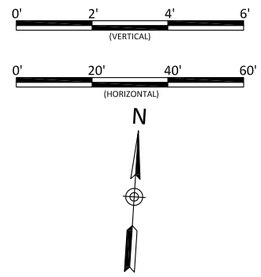
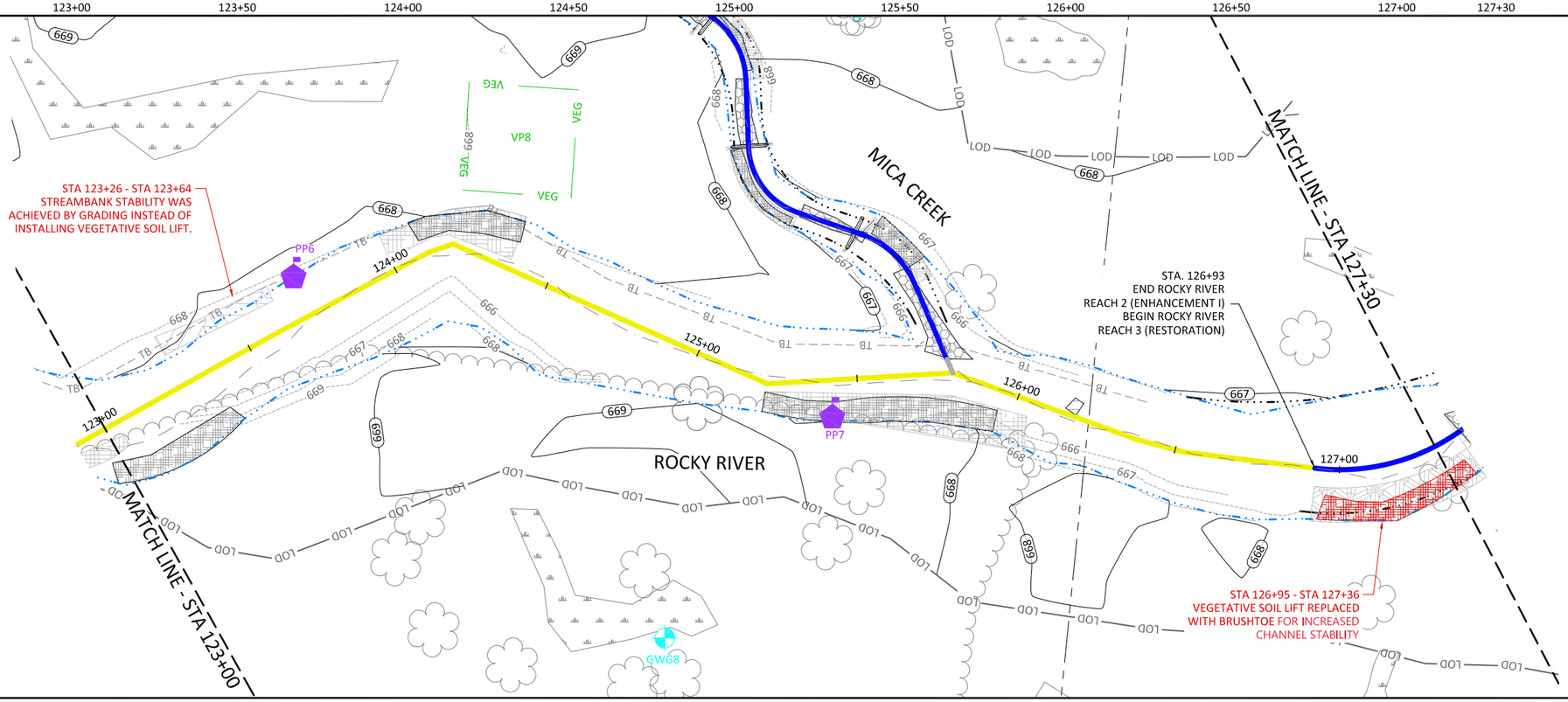
February 29, 2023







NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR MICA CREEK IS ADDRESSED ON SHEETS 1.12 THROUGH 1.18.

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Liberty Rock Mitigation Site
Randolph County, North Carolina

Rocky River
Stream Plan and Profile

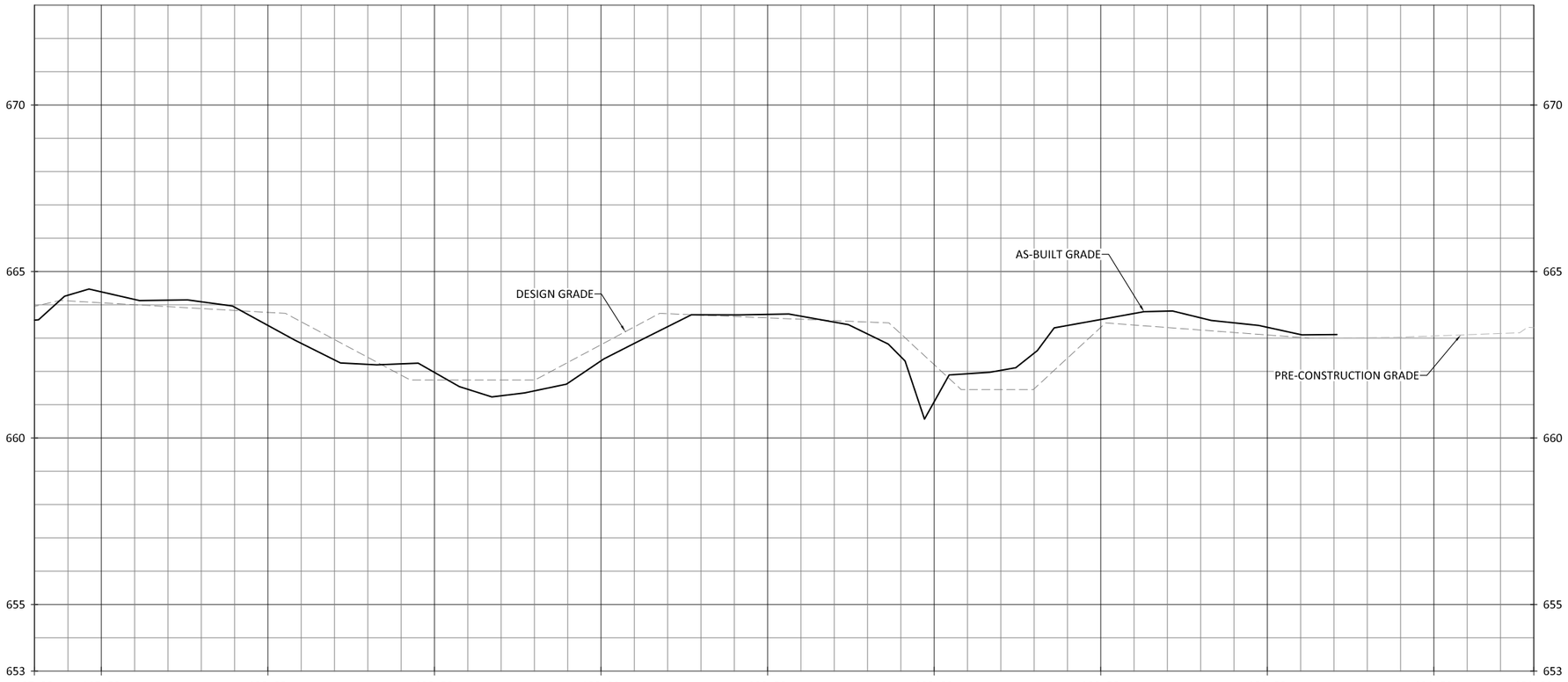
Revisions:

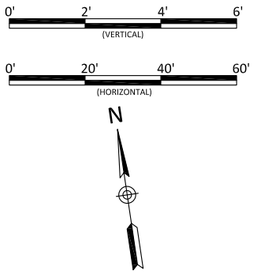
Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

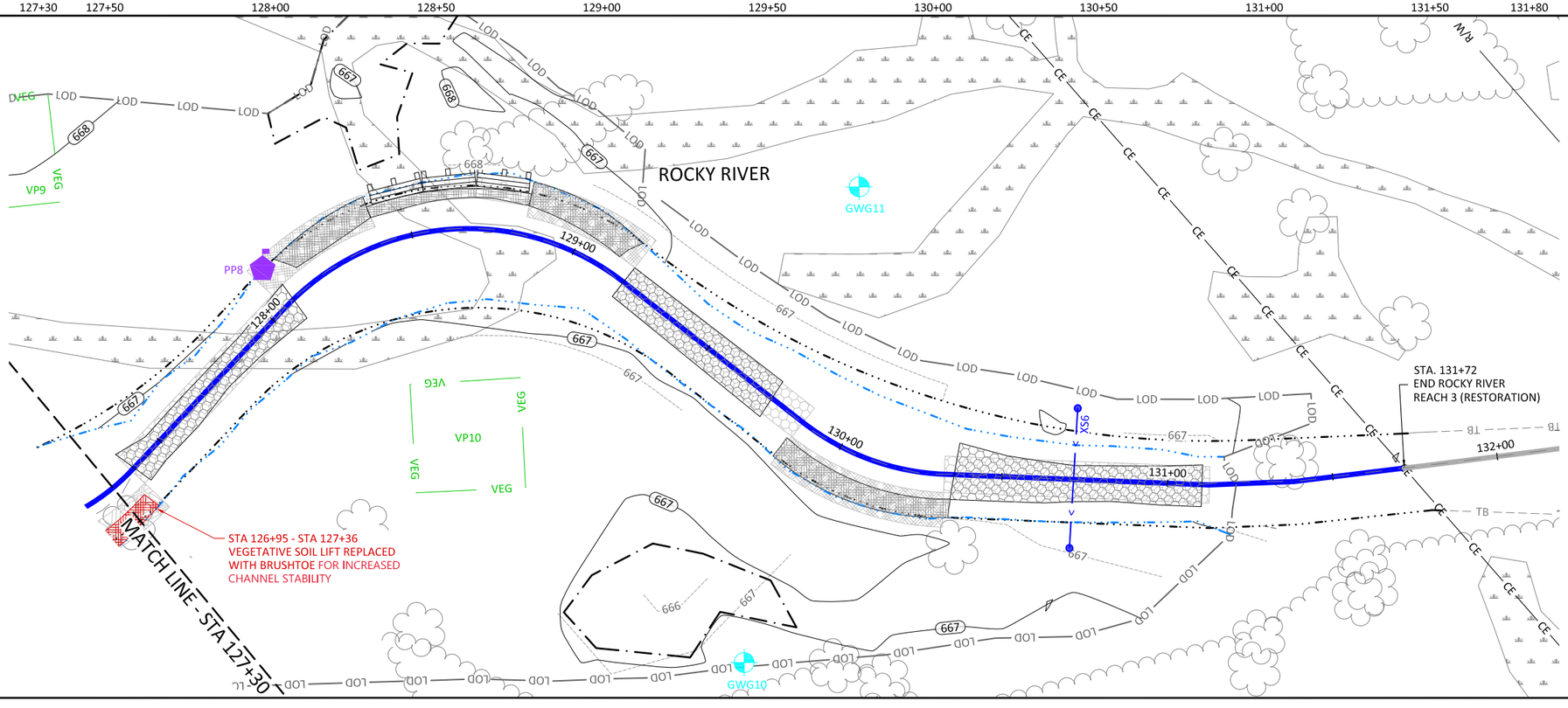
Sheet 1.06

X:\Shared\Projects\WI02185_Liberty_Rock\Monitoring\Baseline Monitoring\Plans\As-Built Set\Plans\02185-AB RockyRiverSheets.dwg

February 28, 2023







NOTES:
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Liberty Rock Mitigation Site
Randolph County, North Carolina

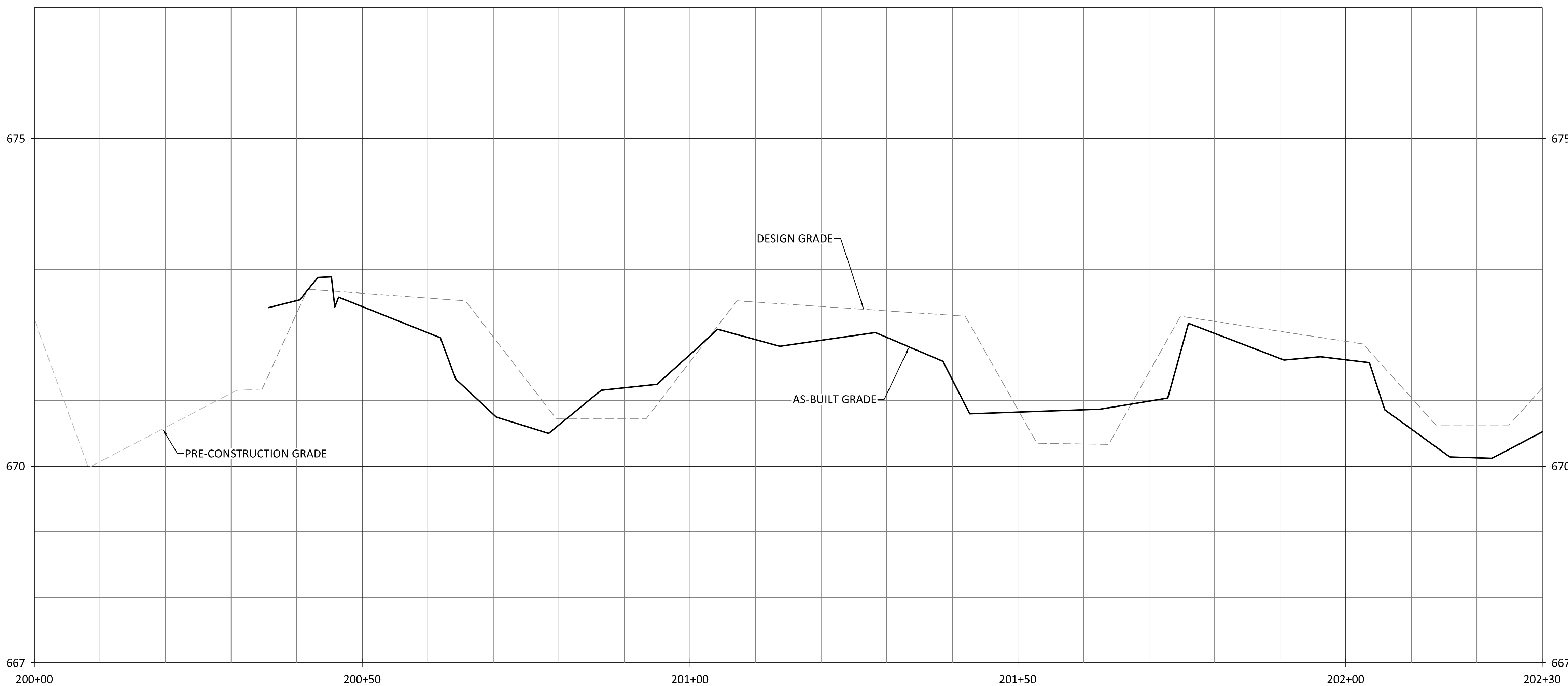
Rocky River
Stream Plan and Profile

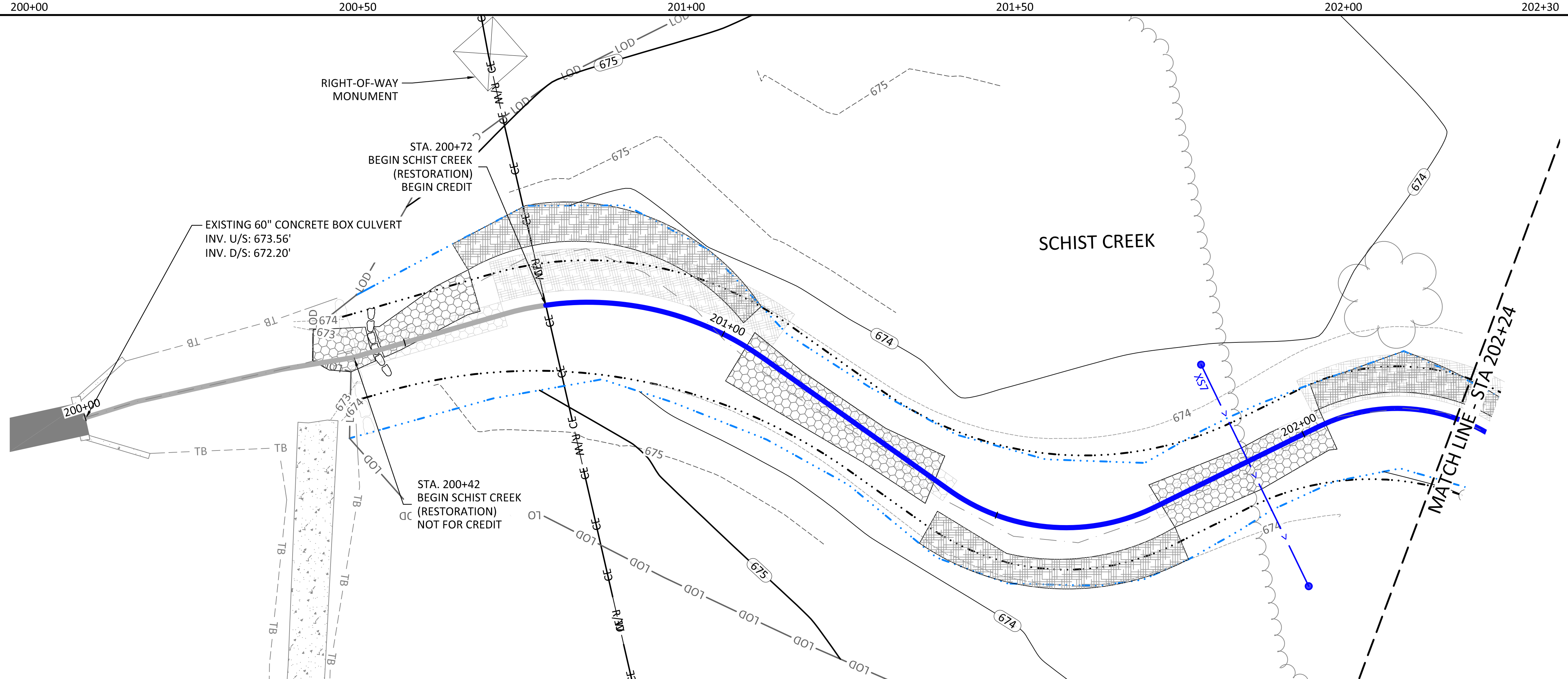
Revisions:

Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

Sheet 1.07

X:\Shared\Projects\WI02185_Liberty_Rock\Monitoring\Baseline Monitoring\Plans\As-Built-Set\Plans\02185-AB RockyRiverSheets.dwg





NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.

Liberty Rock Mitigation Site
Randolph County, North Carolina

Schist Creek
Stream Plan and Profile

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NORTH CAROLINA PROFESSIONAL SEAL 040280 ENGINEER ANGELA N. ALLEN 2-27-23

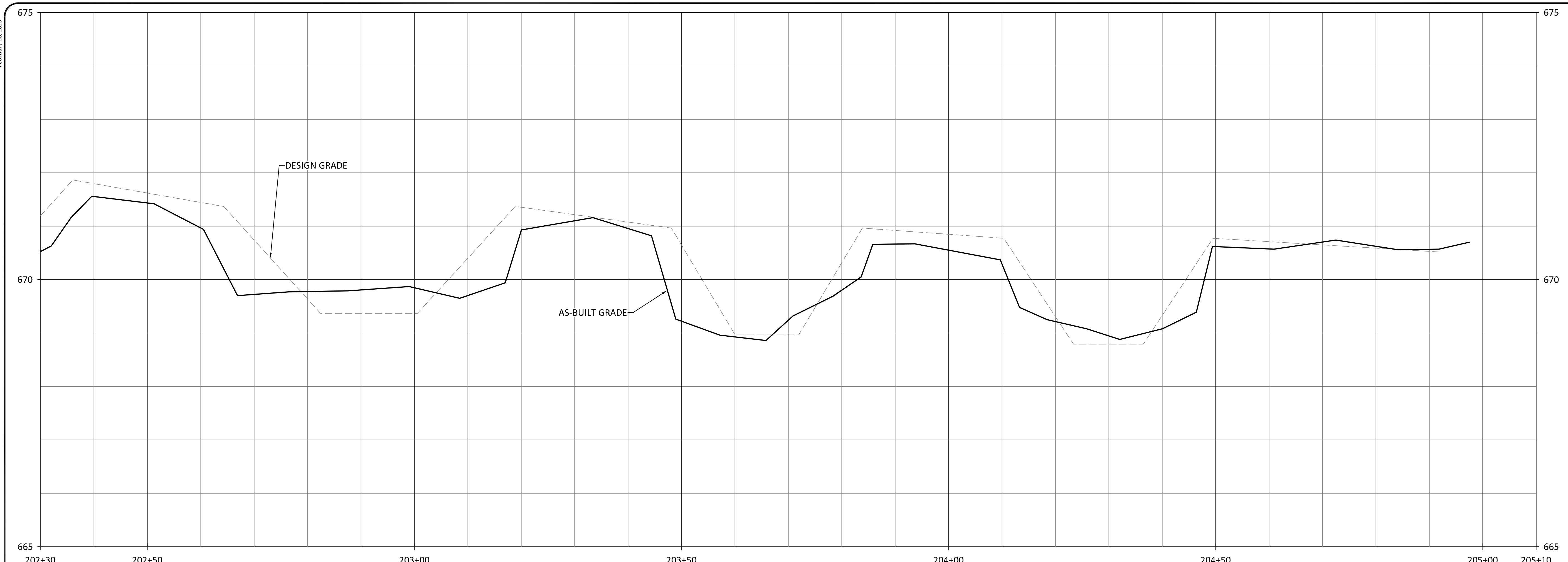
Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

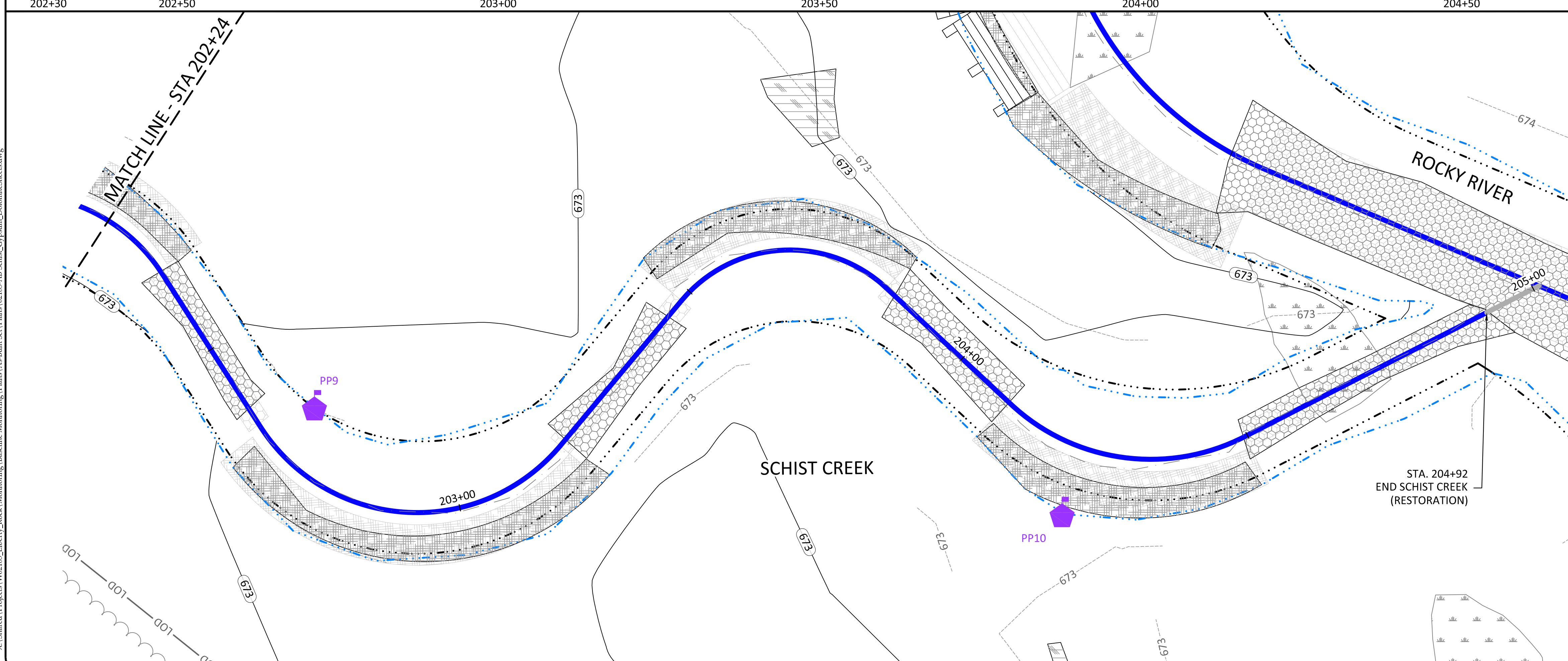
Revisions:

Sheet 1.08

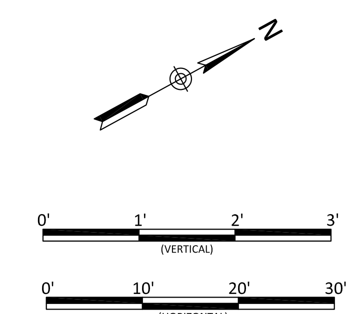
February 28, 2023

X:\Shared\Projects\W02185_Liberty_Rock\Monitoring\Baseline Monitoring\Plans\As-Built Set\Plans\02185-AB Schist_Gypsum_DolomiteSheets.dwg





NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR ROCKY RIVER IS ADDRESSED ON SHEETS 1.01 THROUGH 1.07.



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Liberty Rock Mitigation Site
Randolph County, North Carolina

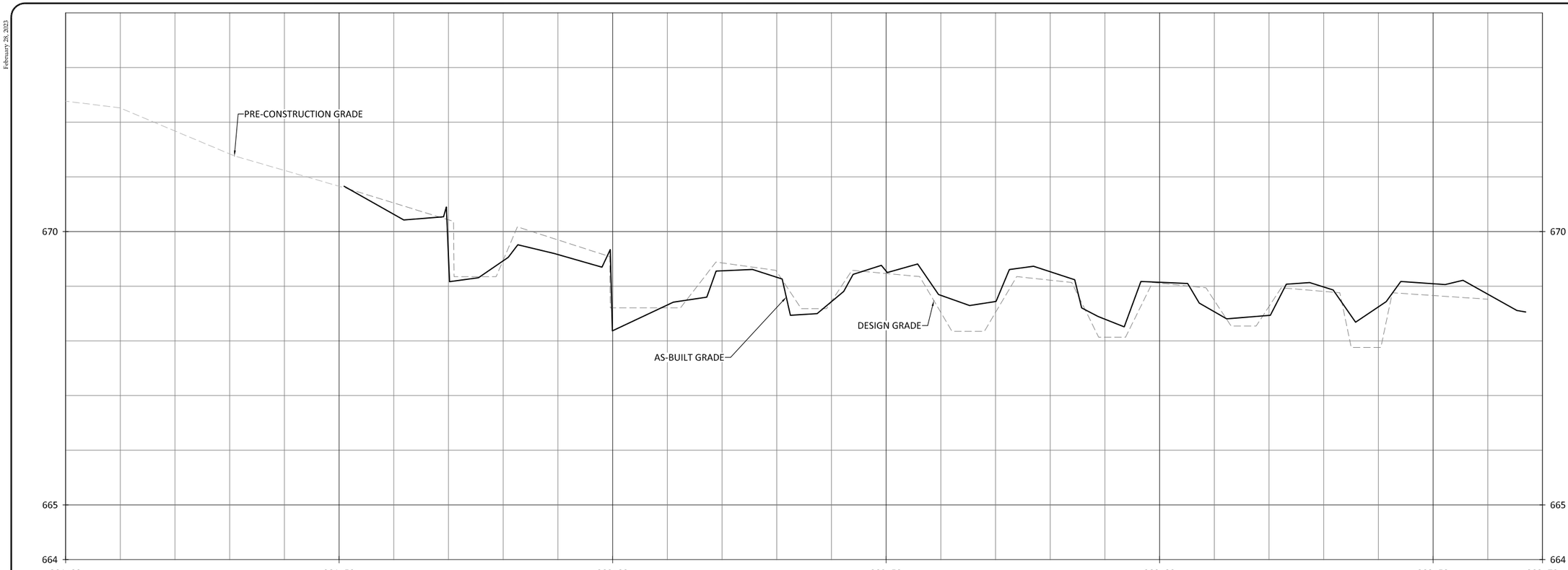
Schist Creek
Stream Plan and Profile

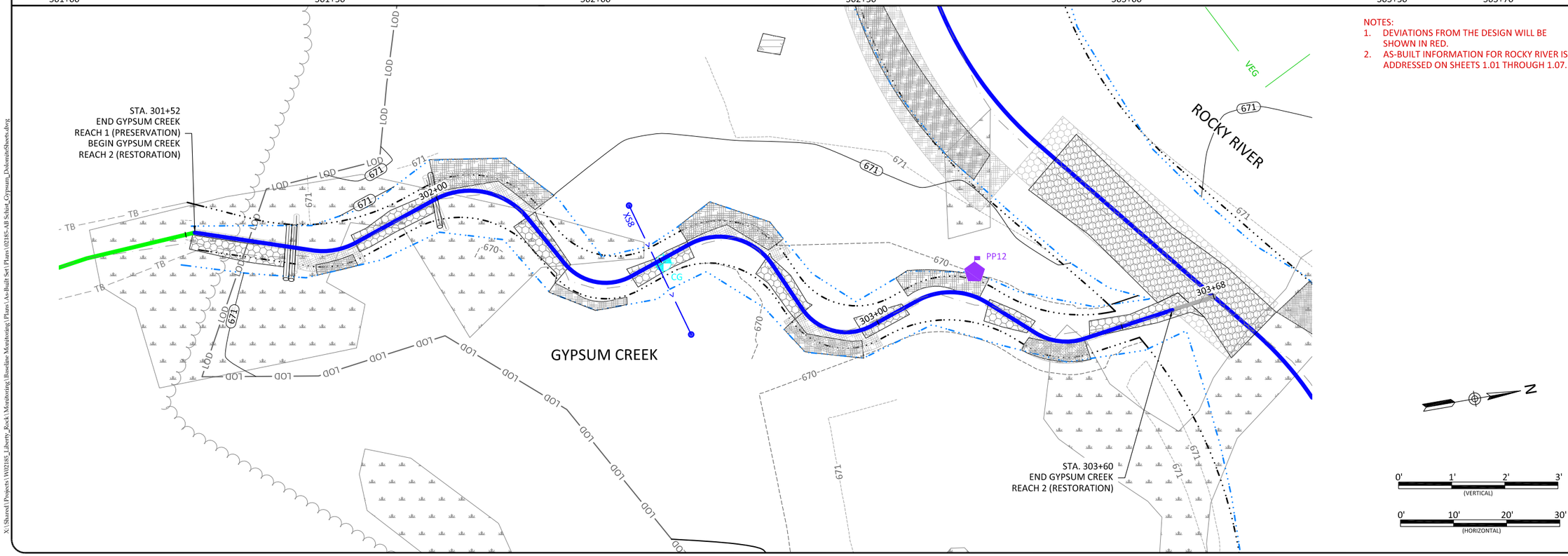
Revisions:

Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

Sheet 1.09

February 29, 2023





NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR ROCKY RIVER IS ADDRESSED ON SHEETS 1.01 THROUGH 1.07.

N

0' 1' 2' 3' (VERTICAL)

0' 10' 20' 30' (HORIZONTAL)

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Liberty Rock Mitigation Site
Randolph County, North Carolina

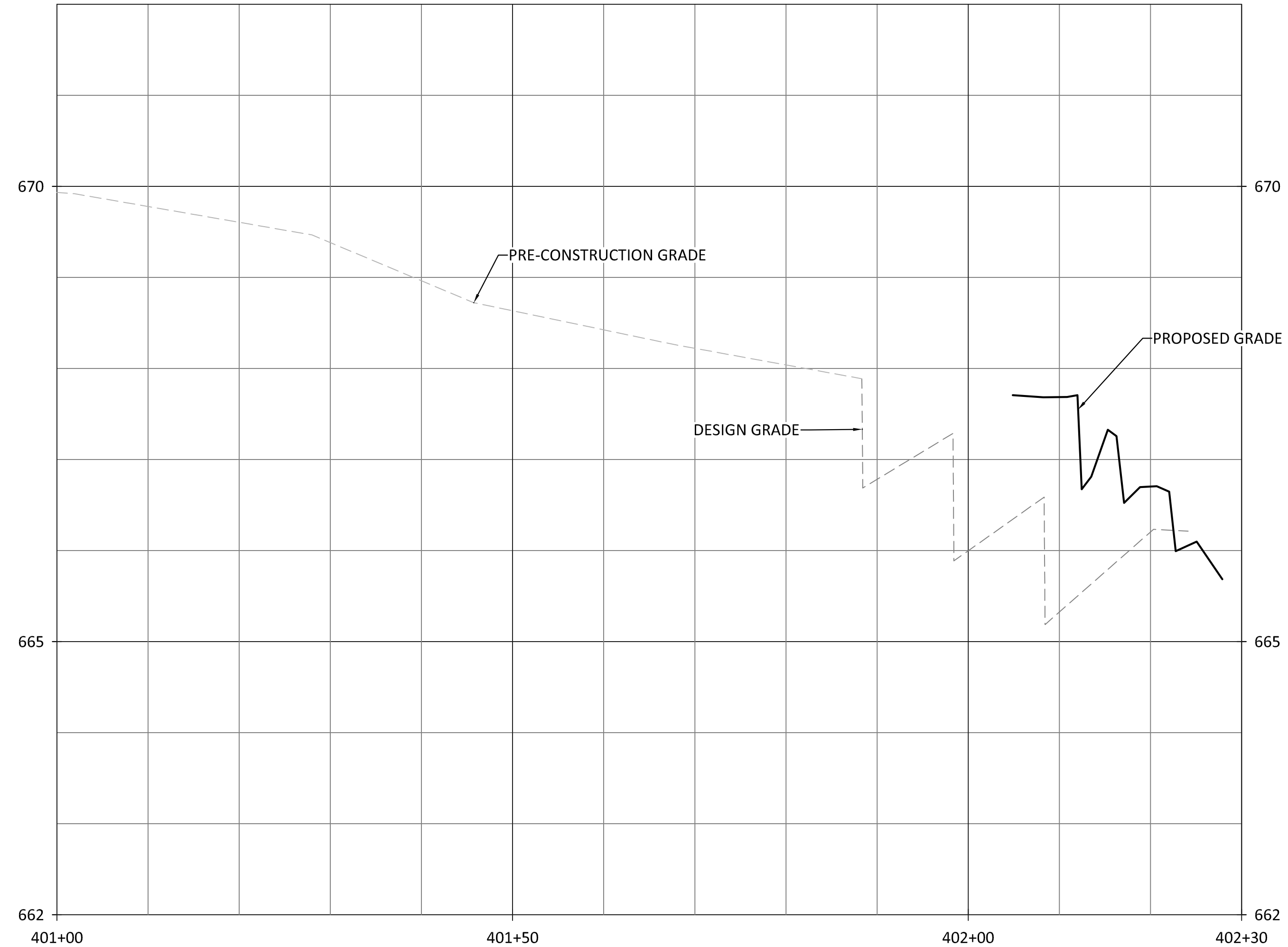
Gypsum Creek Reach 2
Stream Plan and Profile

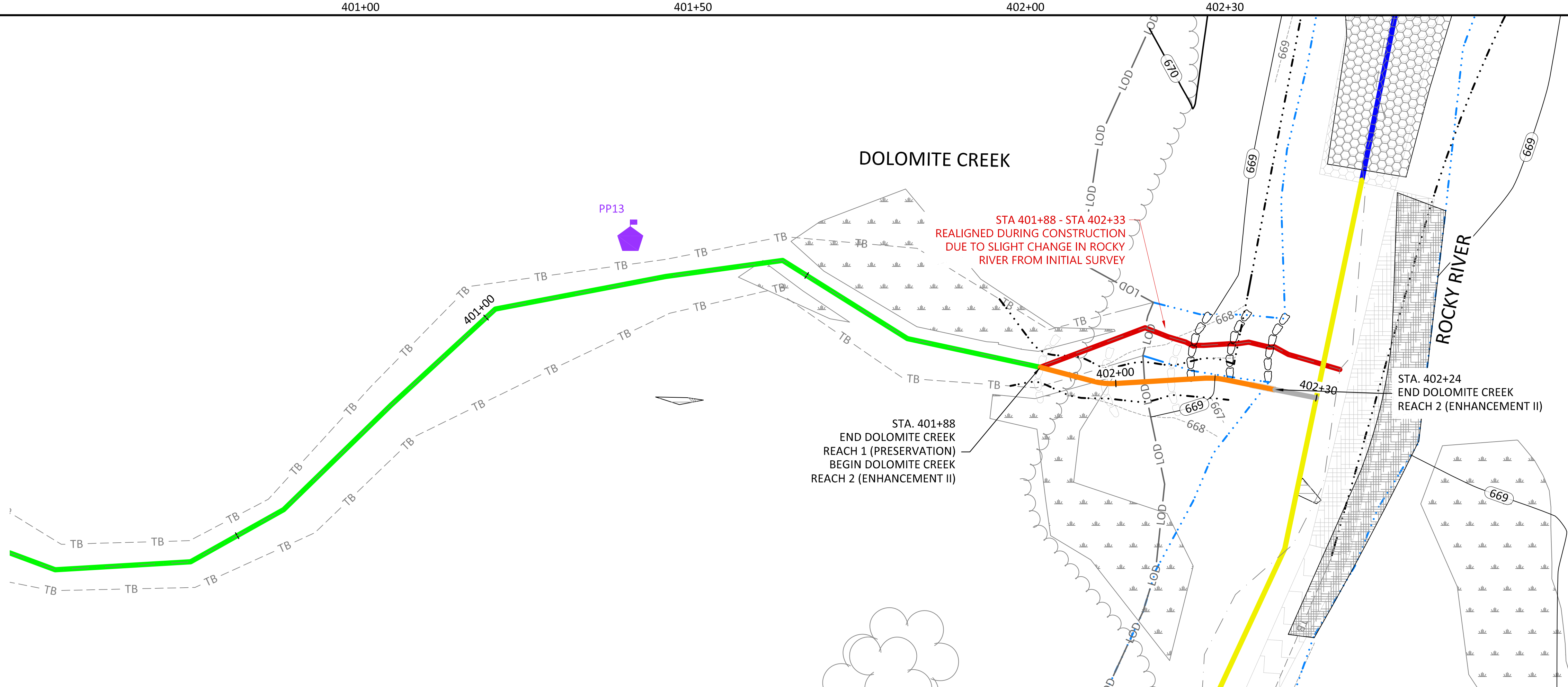
Revisions:

Date: 02-29-23
Job Number: 005-02185
Project Engineer: ANA
Drawn By: CW
Checked By: GAT

Sheet 1.10

X:\Shared\Projects\WI02185_Liberty_Rock\Monitoring\Baseline Monitoring\Plans\As-Built Set\Plans\02185-AB Sht04_Gypsum_DolomiteSheets.dwg





NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR ROCKY RIVER IS ADDRESSED ON SHEETS 1.01 THROUGH 1.07.

0' 1' 2' 3' (VERTICAL)

0' 10' 20' 30' (HORIZONTAL)

N

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Liberty Rock Mitigation Site
Randolph County, North Carolina

Dolomite Creek Reach 2
Stream Plan and Profile

Revisions:

Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

Sheet 1.11

February 28, 2023

X:\Shared\Projects\W02185_Liberty_Rock\Monitoring\Baseline Monitoring\Plans\As-Built Set\Plans\02185-AB Schist_Gypsum_DolomiteSheets.dwg

Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

1.12
Sheet

Revisions:

Liberty Rock Mitigation Site
Randolph County, North Carolina

Mica Creek
Stream Plan and Profile

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040280 7-27-23 ANGELA N. ALLEN

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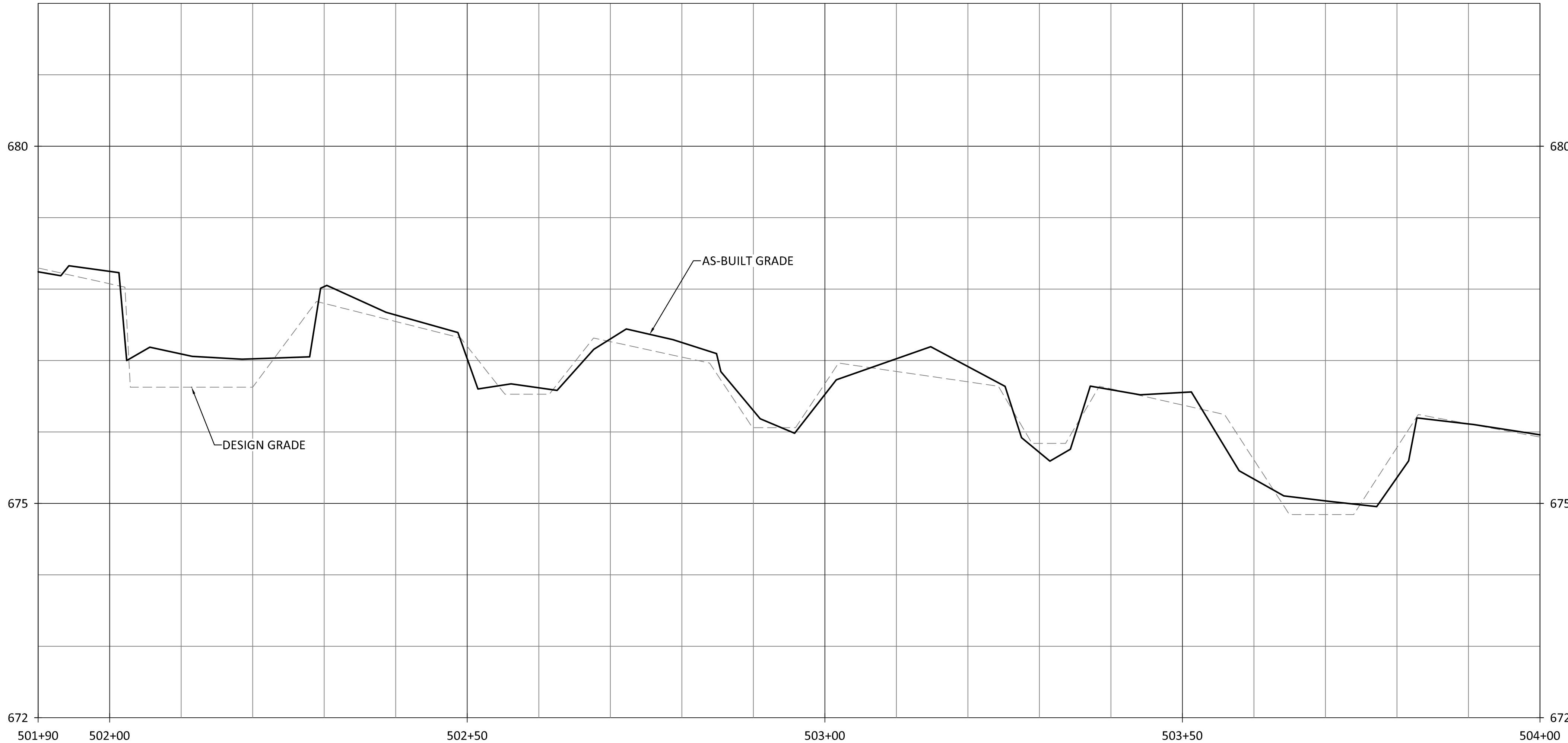
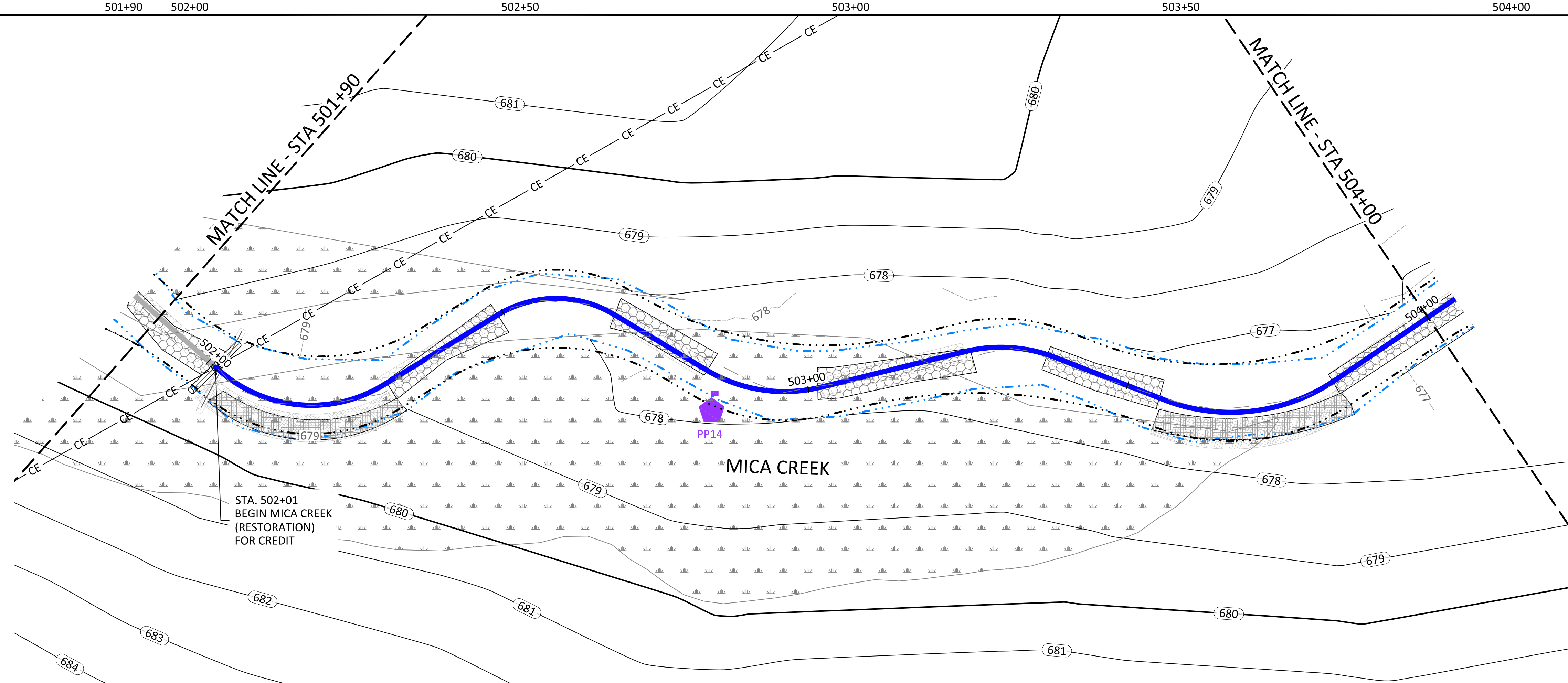
February 28, 2023





NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.

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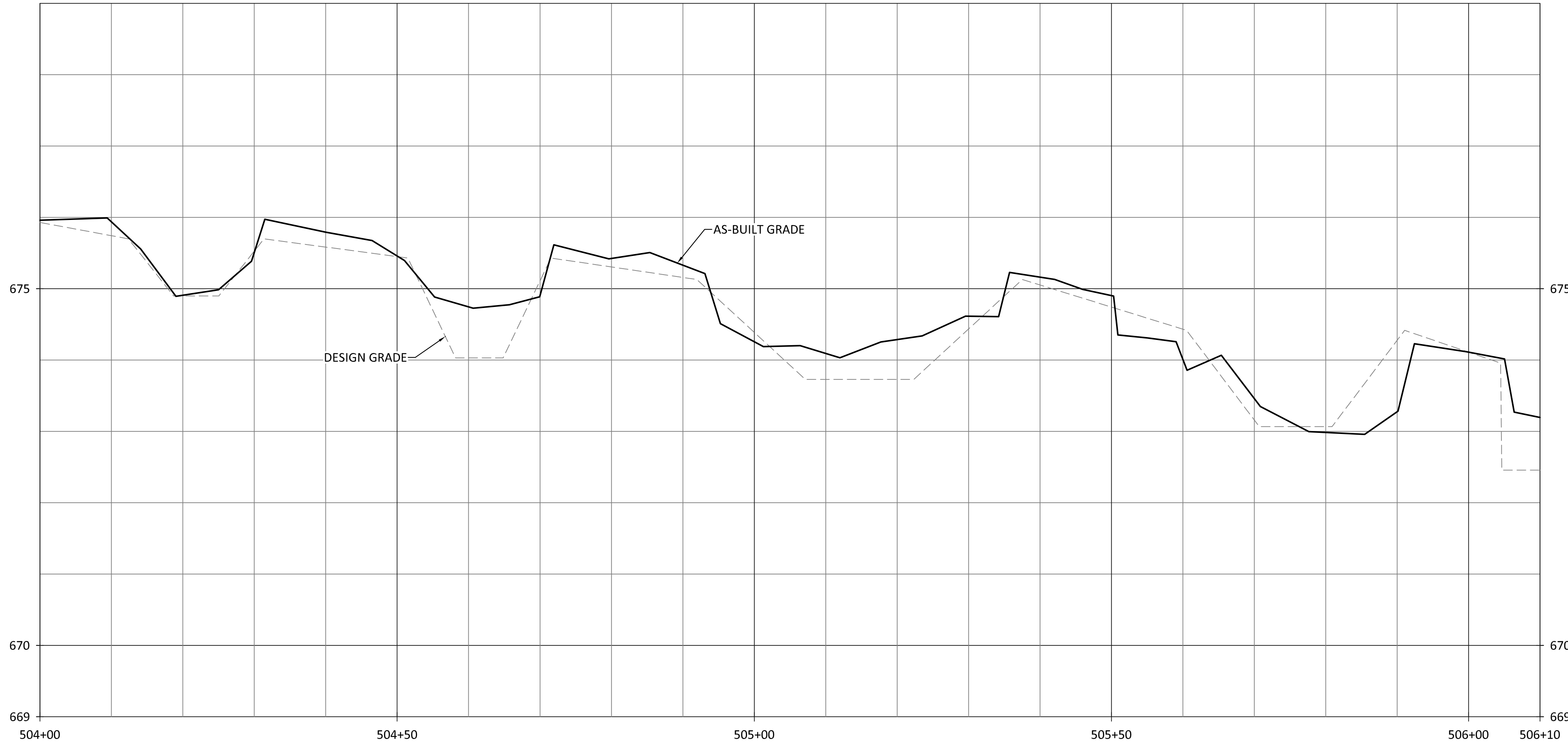
Liberty Rock Mitigation Site
Randolph County, North Carolina

Mica Creek
Stream Plan and Profile

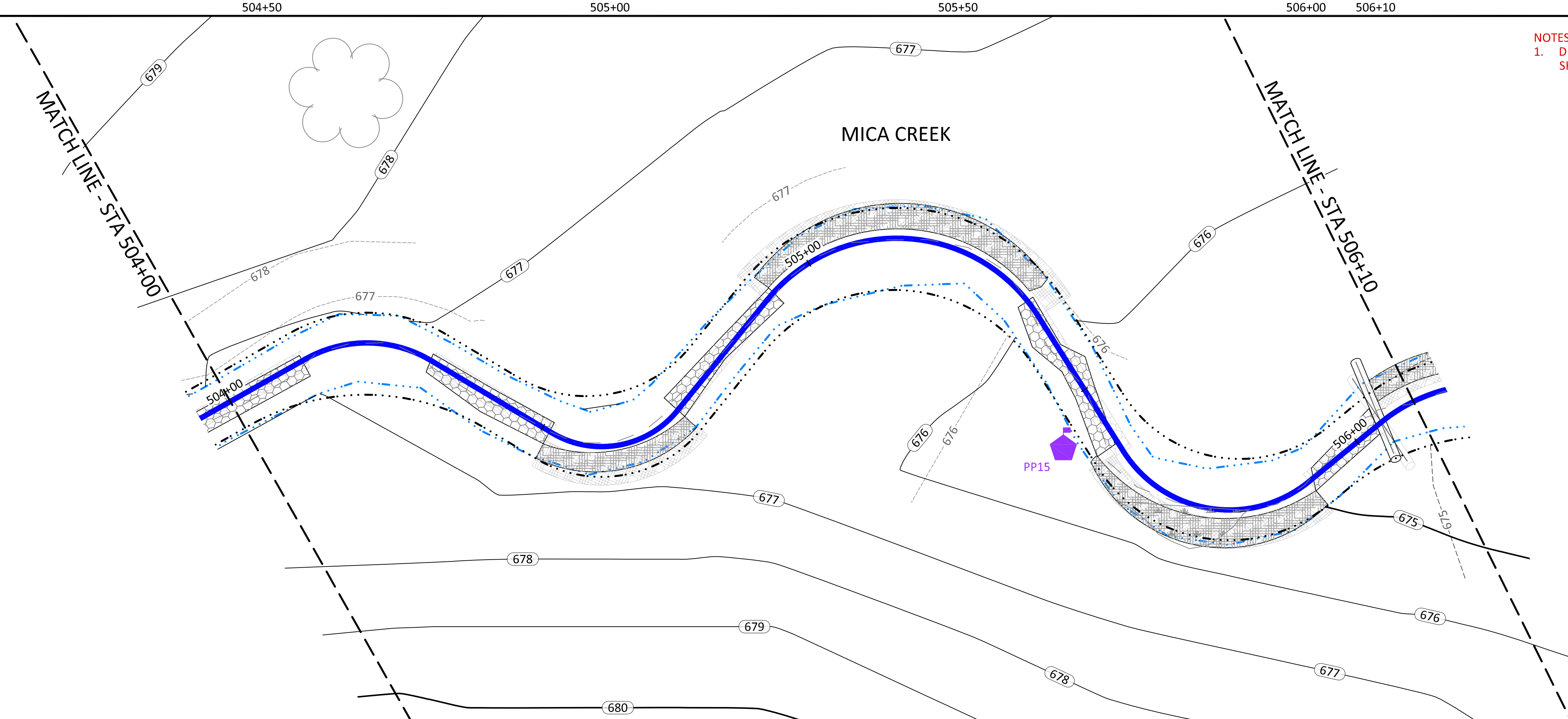
Revisions:
Rev 1 - Addressed Comments

Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

Sheet 1.13



0' 1' 2' 3'
(VERTICAL)
0' 10' 20' 30'
(HORIZONTAL)



NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.

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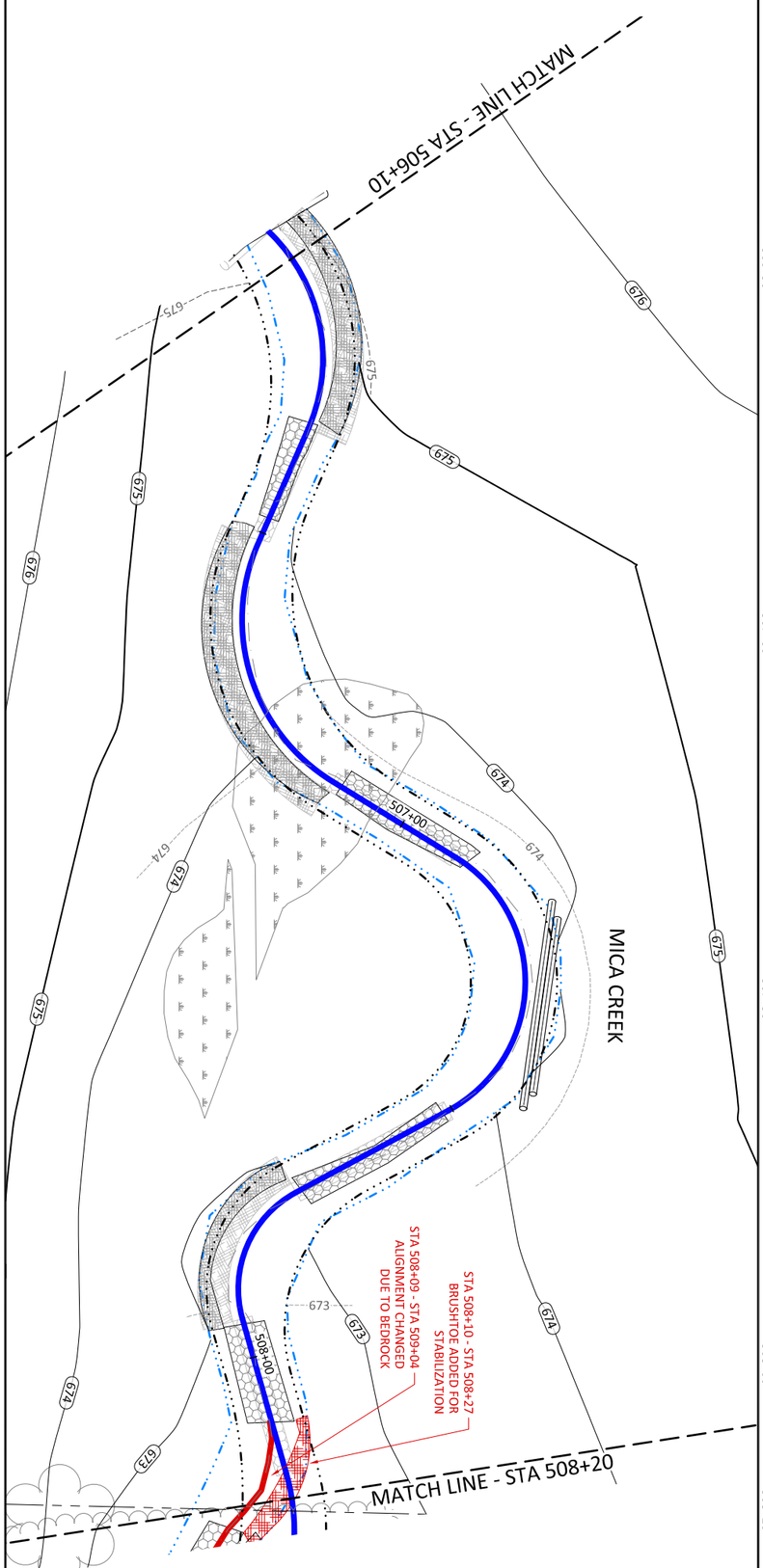
Liberty Rock Mitigation Site
Randolph County, North Carolina

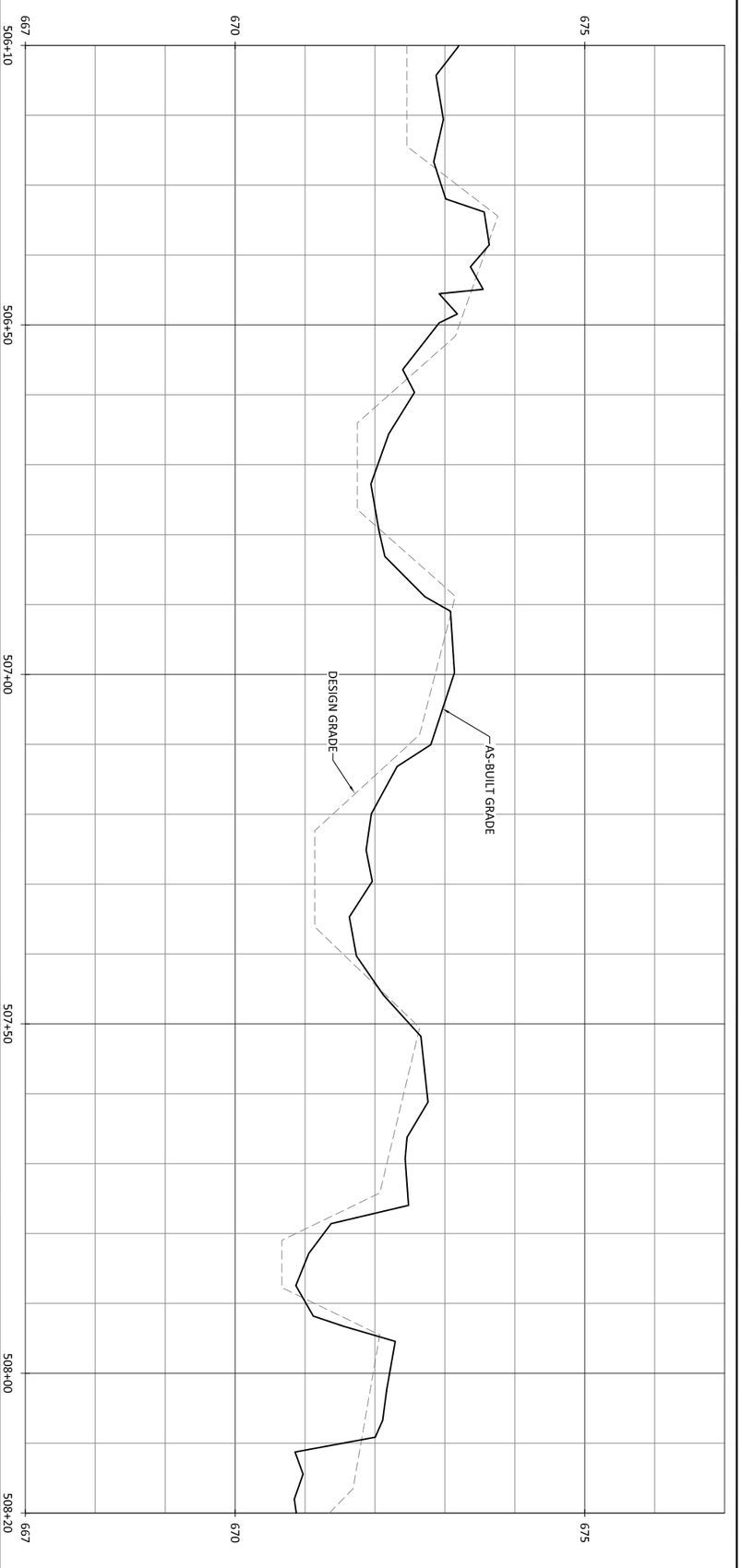
Mica Creek
Stream Plan and Profile

Revisions:

Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

Sheet 1.14





NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.

N

0' 10' 20' 30' (HORIZONTAL)

0' 1' 2' 3' (VERTICAL)

Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

1.15
Sheet

Revisions:
Rev 1 - Addressed Comments

Liberty Rock Mitigation Site
Randolph County, North Carolina

Mica Creek
Stream Plan and Profile

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040280 2-23-23 ANGELA N. ALLEN

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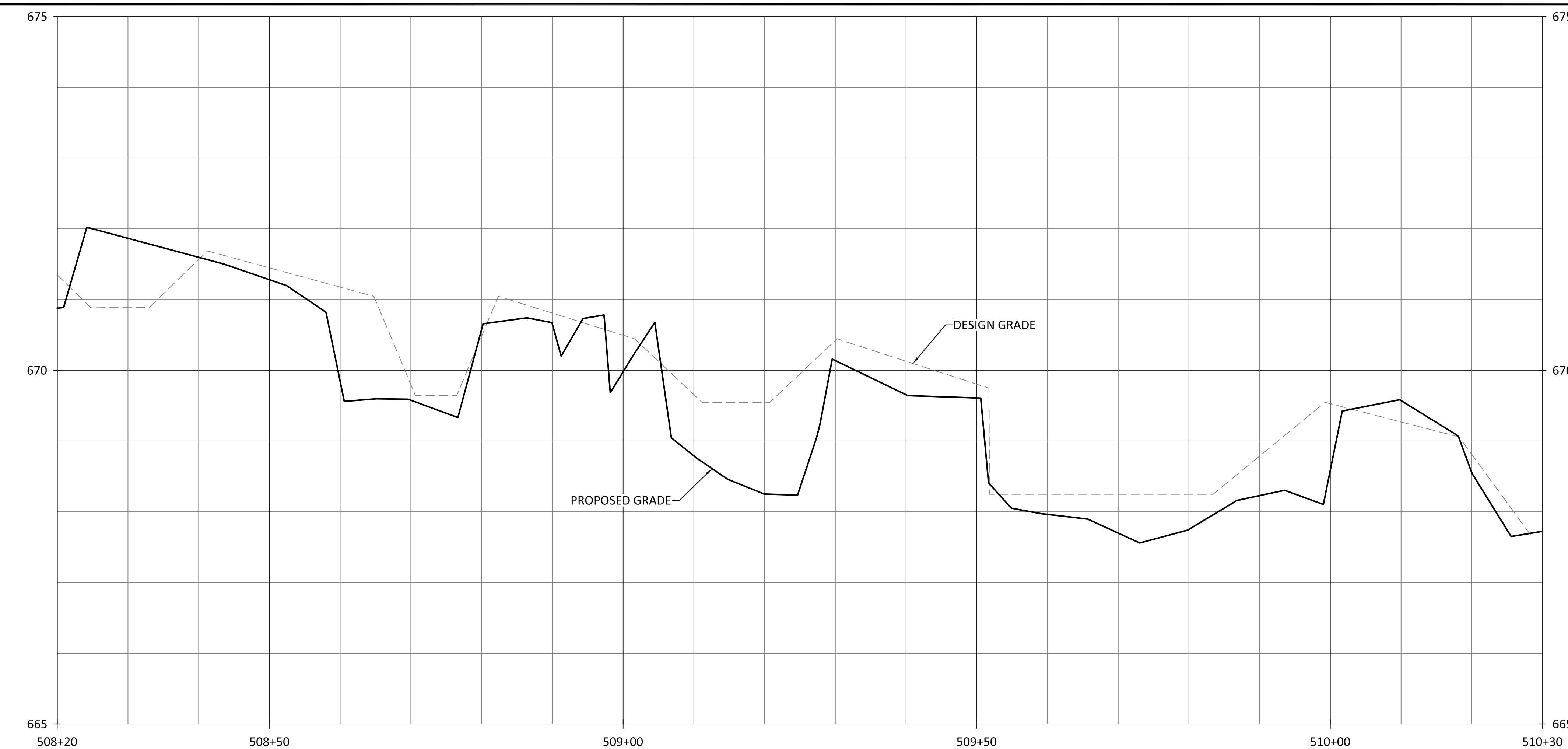

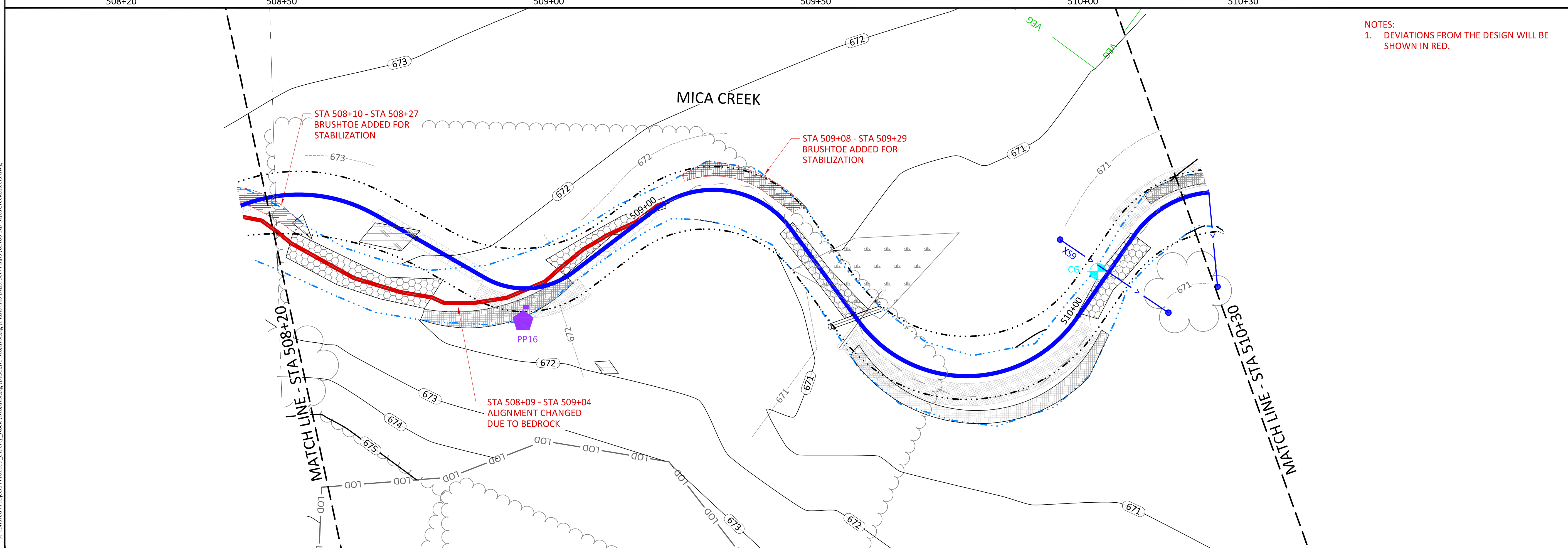

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.

0' 1' 2' 3' (VERTICAL)
0' 10' 20' 30' (HORIZONTAL)

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Liberty Rock Mitigation Site
Randolph County, North Carolina

Mica Creek
Stream Plan and Profile

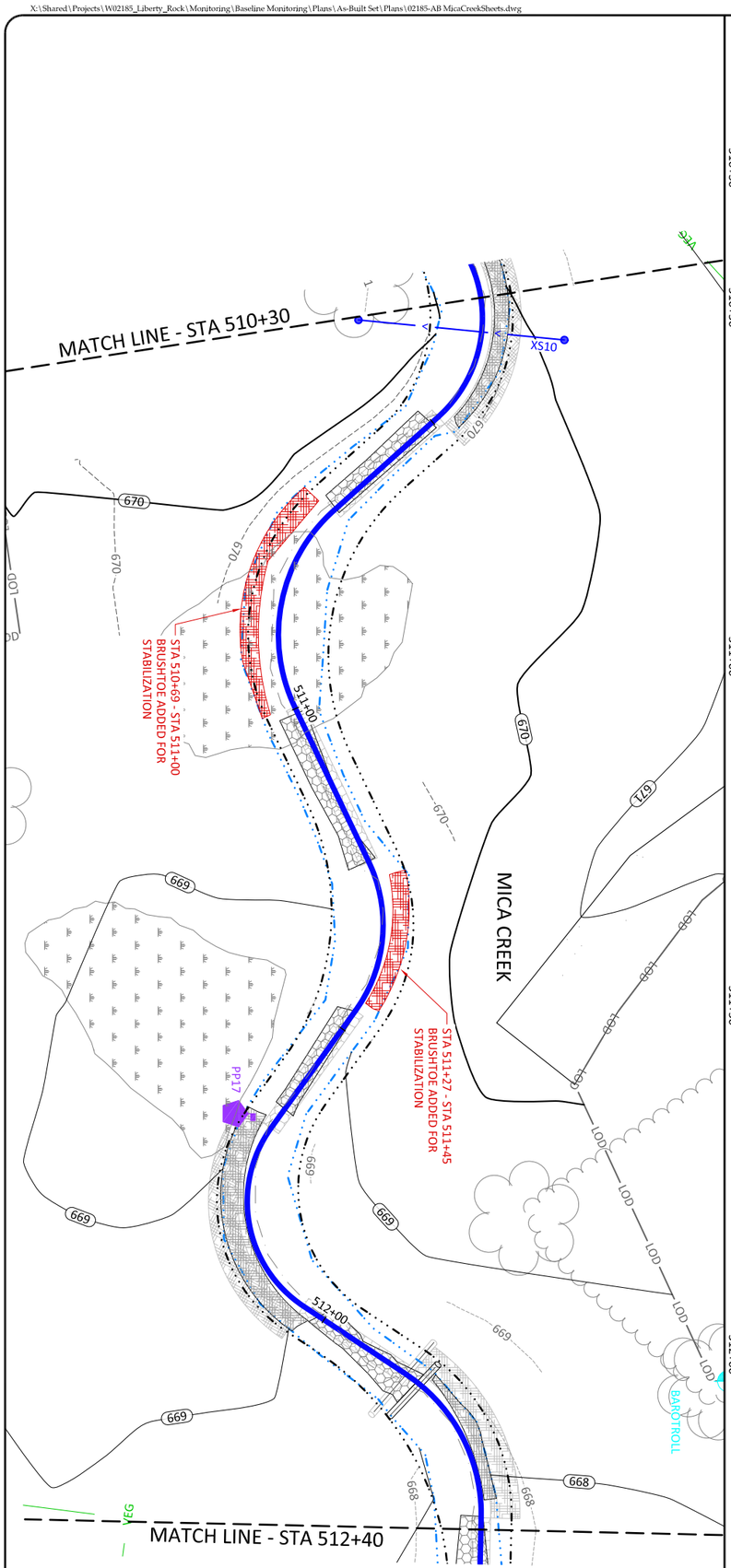
Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

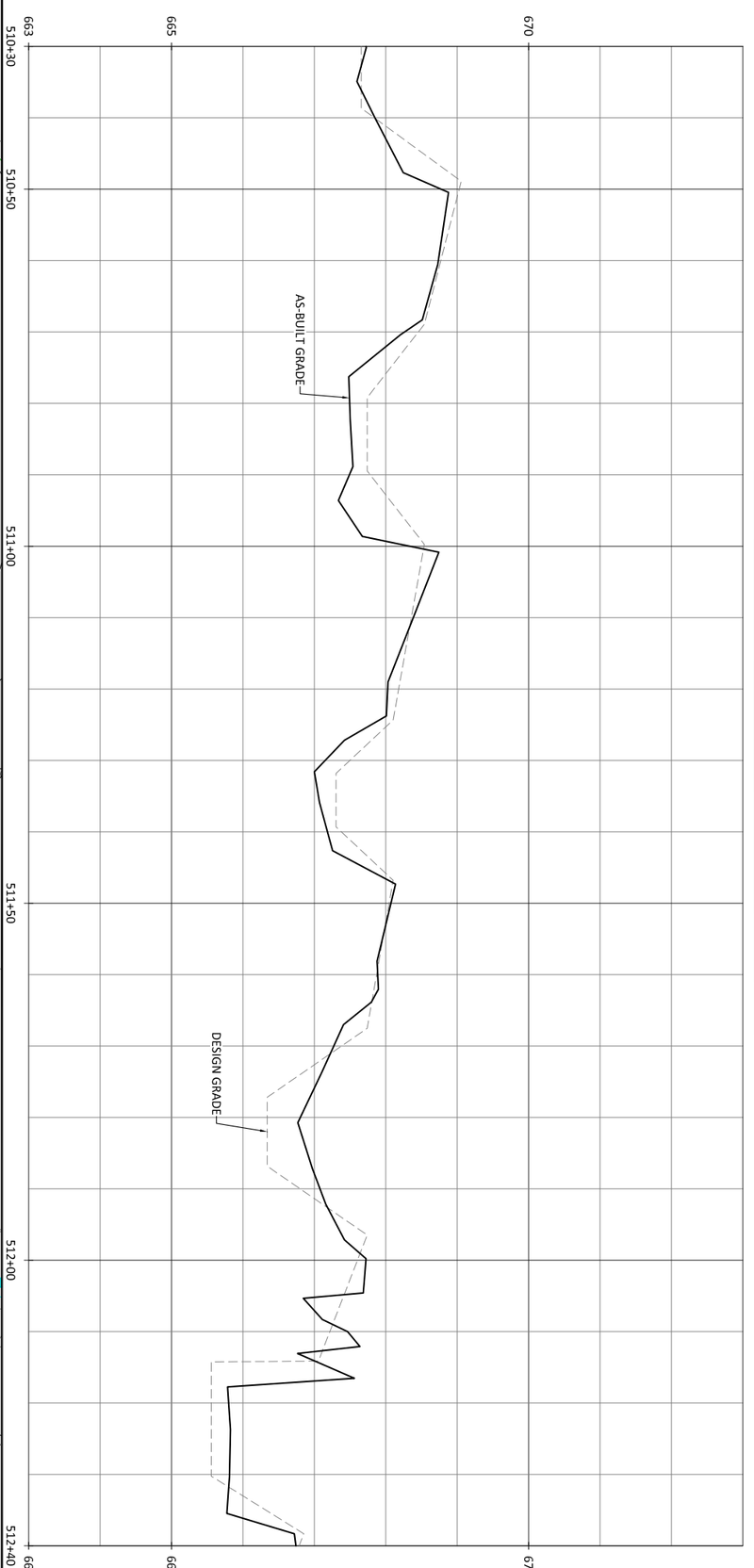
Revisions:
Rev 1 - Addressed Comments

Sheet 1.16

February 28, 2023

X:\Shared\Projects\W02185_Liberty_Rock\Monitoring\Baseline Monitoring\Plans\As-Built Set\Plans\02185-AB MicaCreekSheets.dwg





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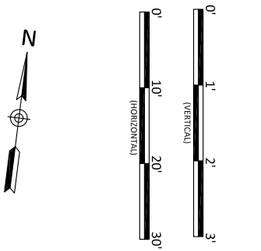

Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

Revisions:

1.17
Sheet

Liberty Rock Mitigation Site
Randolph County, North Carolina

Mica Creek
Stream Plan and Profile

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040280 2-23-23 ANGELA T. ALLEN

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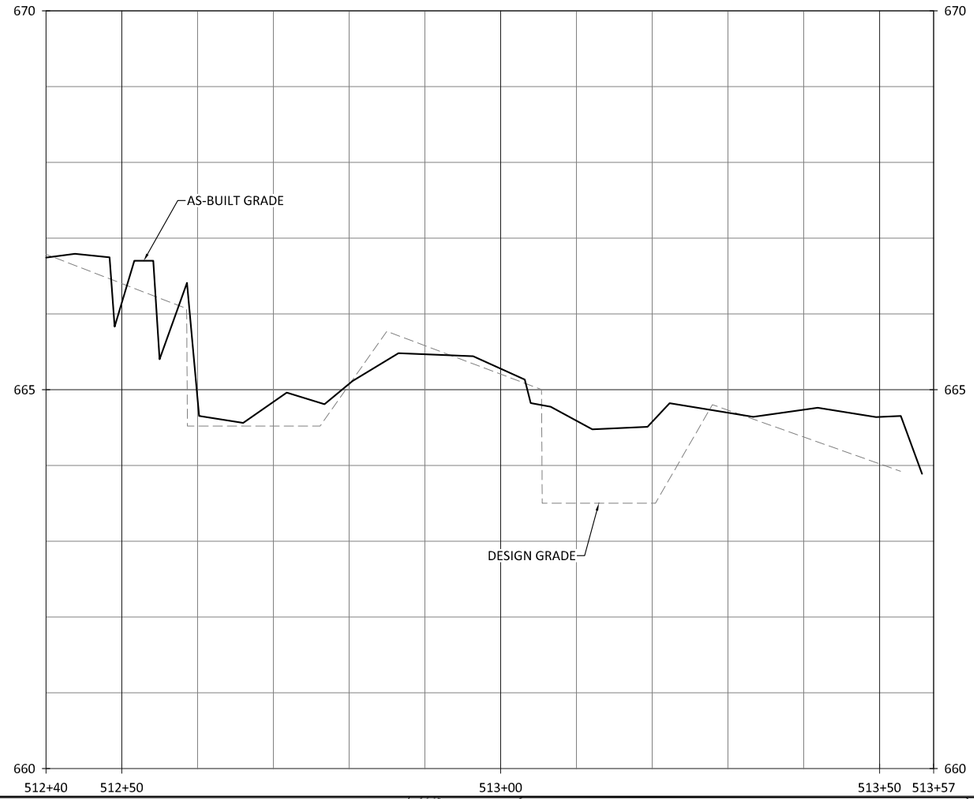
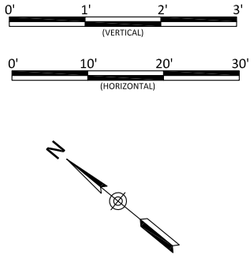
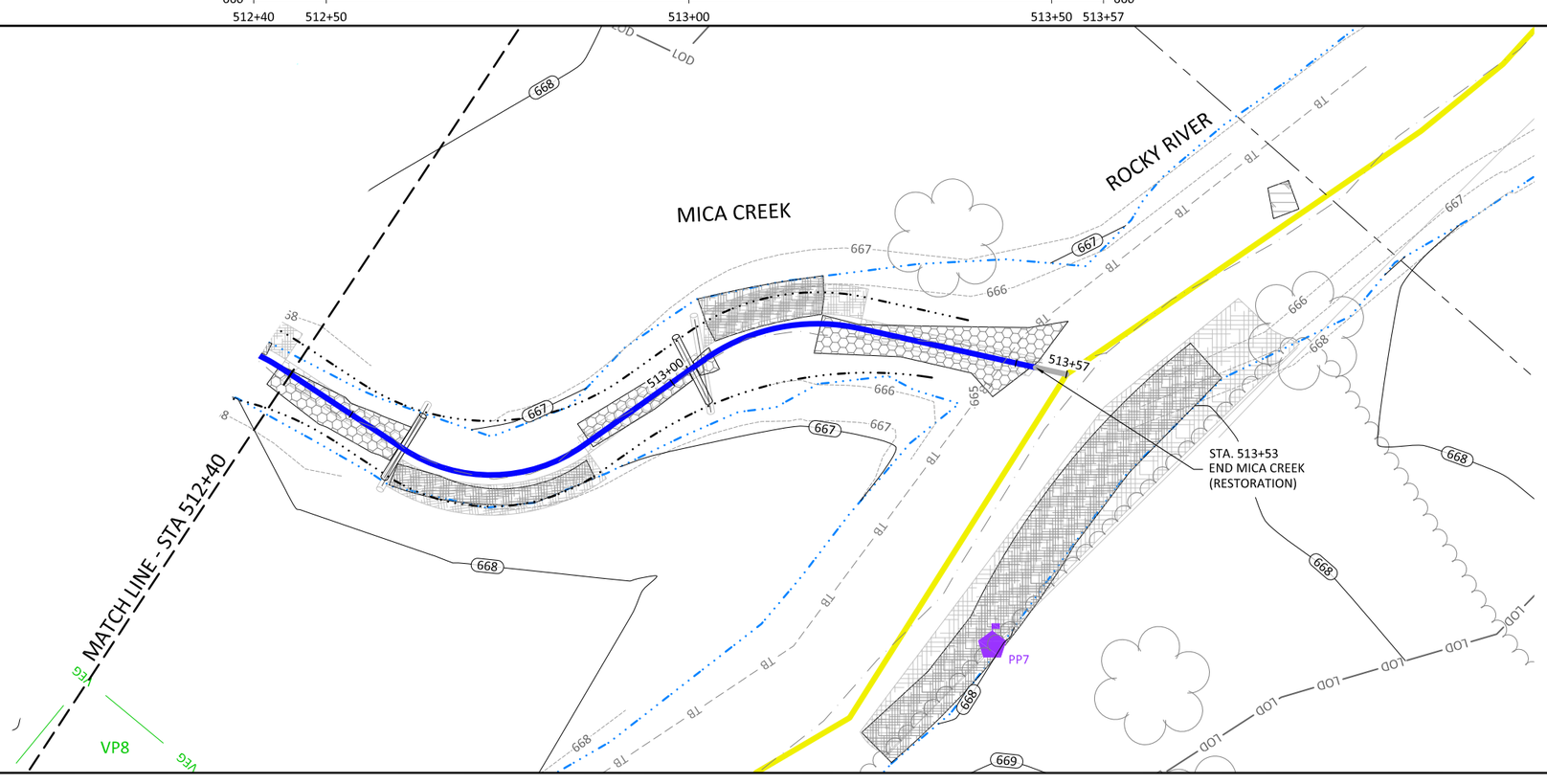
February 29, 2023







NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR ROCKY RIVER IS ADDRESSED ON SHEETS 1.01 THROUGH 1.07.

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040288 ANGELA T. WILLEY 2-22-23

Liberty Rock Mitigation Site
Randolph County, North Carolina

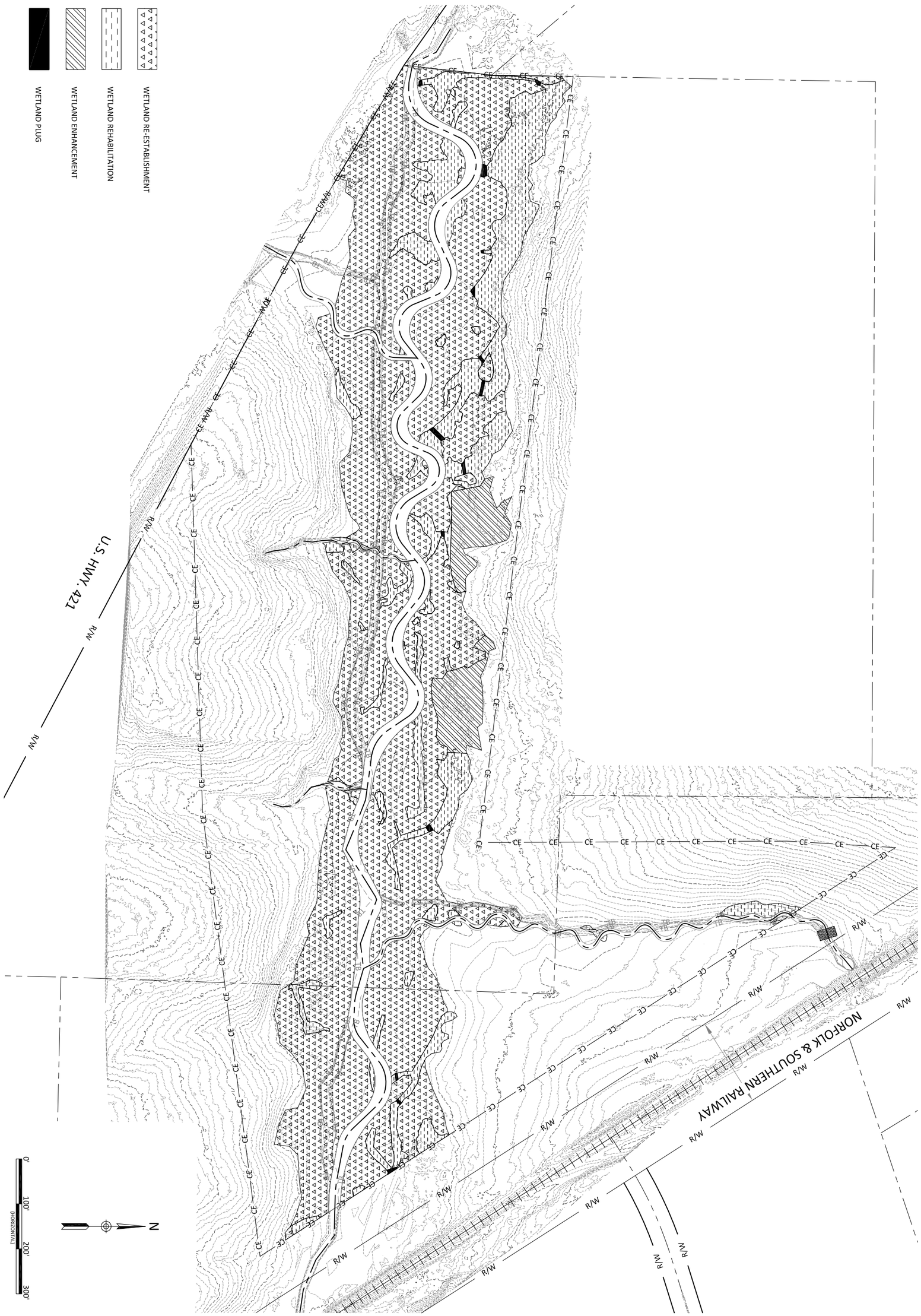
Mica Creek
Stream Plan and Profile

Revisions:

Date: 02-28-23
Job Number: 005-02185
Project Engineer: ANA
Drawn By: CW
Checked By: GAT

Sheet 1.18

X:\Shared Projects\WI02185_Liberty_Rock\Monitoring\Baseline Monitoring\Plans\As-Built Set Plans\02185-AB MicaCreekSheets.dwg



Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

Revisions:

2.0
Sheet

Liberty Rock Mitigation Site
Randolph County, North Carolina

Wetland Overview

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040280 2-23-23 ENGINEER ANGELA N. ALLEN

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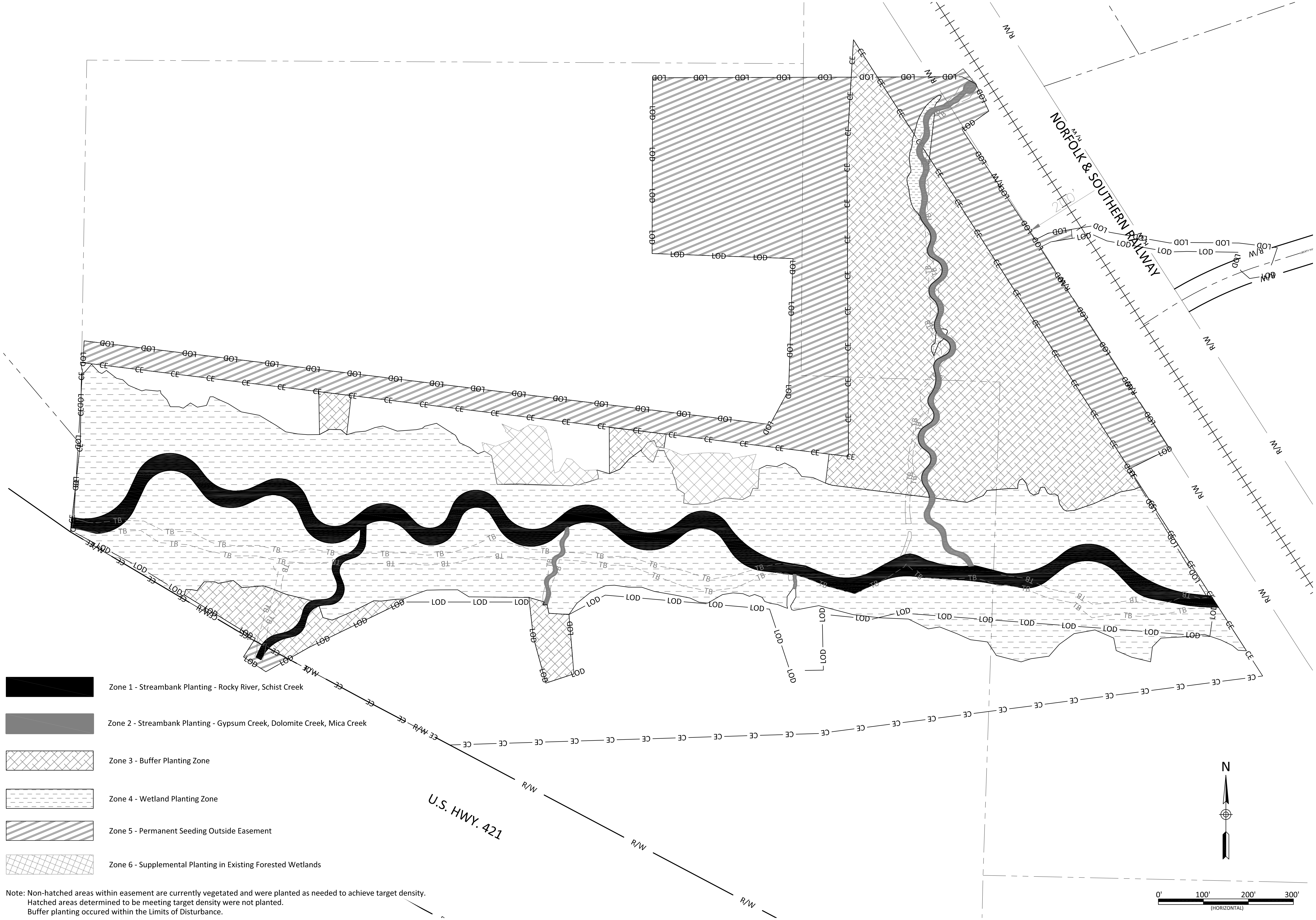

Zone 1 - Streambank Planting - Rocky River, Schist Creek

Zone 2 - Streambank Planting - Gypsum Creek, Dolomite Creek, Mica Creek

Zone 3 - Buffer Planting Zone

Zone 4 - Wetland Planting Zone

Zone 5 - Permanent Seeding Outside Easement

Zone 6 - Supplemental Planting in Existing Forested Wetlands

Note: Non-hatched areas within easement are currently vegetated and were planted as needed to achieve target density.
Hatched areas determined to be meeting target density were not planted.
Buffer planting occured within the Limits of Disturbance.

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Liberty Rock Mitigation Site
Randolph County, North Carolina

Planting Overview

Revisions:

Date:	02-28-23
Job Number:	005-02185
Project Engineer:	ANA
Drawn By:	CW
Checked By:	GAT

Sheet 3.0

February 28, 2023

Streambank Planting Zone 1 (2.3 acres)

Species	Common Name	Indiv. Spacing	Size	Stratum	Wetland Indicator Status	% of Stems
Live Stakes						
Salix nigra	Black Willow	3-6 ft.	0.5"-1.5" cal.	Canopy	OBL	50%
Salix sericea	Silky Willow	3-6 ft.	0.5"-1.5" cal.	Subcanopy	OBL	25%
Cornus amomum	Silky Dogwood	3-6 ft.	0.5"-1.5" cal.	Subcanopy	FACW	15%
Cephalanthus occidentalis	Buttonbush	3-6 ft.	0.5"-1.5" cal.	Shrub	OBL	10%
						100%
Herbaceous Plugs						
Juncus Effusus	Soft Rush	4 ft.	1.0"- 2.0" plug	Herb	FACW	50%
Carex lurida	Lurid Sedge	4 ft.	1.0"- 2.0" plug	Herb	OBL	15%
Carex crinita	Fringed Sedge	4 ft.	1.0"- 2.0" plug	Herb	OBL	10%
Scirpus cyperinus	Woolgrass	4 ft.	1.0"- 2.0" plug	Herb	OBL	15%
Lobelia cardinalis	Cardinal flower	5 ft.	1.0"- 2.0" plug	Herb	FACW	5%
Hibiscus moschuetos	Crimsoneyed Marshmallow	6 ft.	1.0"- 2.0" plug	Shrub	OBL	5%
						100%

Streambank Planting Zone 2 (0.3 acres)

Species	Common Name	Indiv. Spacing	Size	Stratum	Wetland Indicator Status	% of Stems
Live Stakes						
Salix sericea	Silky Willow	3-6 ft.	0.5"-1.5" cal.	Subcanopy	OBL	50%
Cornus amomum	Silky Dogwood	3-6 ft.	0.5"-1.5" cal.	Subcanopy	FACW	25%
Cephalanthus occidentalis	Buttonbush	3-6 ft.	0.5"-1.5" cal.	Shrub	OBL	15%
Sambucus canadensis	Elderberry	3-6 ft.	0.5"-1.5" cal.	Subcanopy	FACW	10%
						100%
Herbaceous Plugs						
Juncus Effusus	Soft Rush	4 ft.	1.0"- 2.0" plug	Herb	FACW	50%
Carex lurida	Lurid Sedge	4 ft.	1.0"- 2.0" plug	Herb	OBL	15%
Carex crinita	Fringed Sedge	4 ft.	1.0"- 2.0" plug	Herb	OBL	10%
Scirpus cyperinus	Woolgrass	4 ft.	1.0"- 2.0" plug	Herb	OBL	15%
Helianthus angustifolius	Swamp Sunflower	5 ft.	1.0"- 2.0" plug	Herb	FACW	5%
Hibiscus moschuetos	Crimsoneyed Marshmallow	6 ft.	1.0"- 2.0" plug	Shrub	OBL	5%
						100%

Buffer Planting Zone (8.9 acres)

Bare Root

Species	Common Name	Indiv. Spacing	Caliper Size	Stratum	Wetland Indicator Status	% of Stems
Platanus occidentalis	Sycamore	6-12 ft.	0.25"-1.0"	Canopy	FACW	15%
Betula nigra	River Birch	6-12 ft.	0.25"-1.0"	Canopy	FACW	15%
Acer negundo	Boxelder	6-12 ft.	0.25"-1.0"	Canopy	FAC	10%
Diospyros virginiana	Persimmon	6-12 ft.	0.25"-1.0"	Canopy	FAC	10%
Ulmus americana	American Elm	6-12 ft.	0.25"-1.0"	Canopy	FACW	7%
Quercus michauxii	Swamp Chestnut Oak	6-12 ft.	0.25"-1.0"	Canopy	FACW	10%
Quercus phellos	Willow Oak	6-12 ft.	0.25"-1.0"	Canopy	FAC	5%
Ulmus alata	Winged Elm	6-12 ft.	0.25"-1.0"	Canopy	FAC	5%
Quercus rubra	Northern Red Oak	6-12 ft.	0.25"-1.0"	Canopy	FACU	5%
Celtis laevigata	Sugarberry	6-12 ft.	0.25"-1.0"	Canopy	FACW	8%
Asimina triloba	Pawpaw	6-12 ft.	0.25"-1.0"	Subcanopy	FAC	5%
Euonymus americana	Strawberry Bush	6-12 ft.	0.25"-1.0"	Shrub	FAC	5%
						100%

Wetland Planting Zone (16.3 acres)

Bare Root

Species	Common Name	Indiv. Spacing	Caliper Size	Stratum	Wetland Indicator Status	% of Stems
Platanus occidentalis	Sycamore	6-12 ft.	0.25"-1.0"	Canopy	FACW	15%
Betula nigra	River Birch	6-12 ft.	0.25"-1.0"	Canopy	FACW	15%
Acer negundo	Boxelder	6-12 ft.	0.25"-1.0"	Canopy	FAC	7%
Ulmus americana	American Elm	6-12 ft.	0.25"-1.0"	Canopy	FACW	10%
Quercus phellos	Willow Oak	6-12 ft.	0.25"-1.0"	Canopy	FAC	6%
Quercus michauxii	Swamp Chestnut Oak	6-12 ft.	0.25"-1.0"	Canopy	FACW	7%
Quercus lyrata	Overcup Oak	6-12 ft.	0.25"-1.0"	Canopy	OBL	10%
Salix nigra	Black Willow	6-12 ft.	0.25"-1.0"	Canopy	OBL	10%
Alnus serrulata	Tag Alder	6-12 ft.	0.25"-1.0"	Subcanopy	OBL	5%
Cornus amomum ~~*Salix sericea*~~	Silky Dogwood ~~Silky Willow~~	6-12 ft.	0.25"-1.0"	Subcanopy	OBL	5%
Sambucus canadensis	Elderberry	6-12 ft.	0.25"-1.0"	Subcanopy	FACW	5%
Cephalanthus occidentalis	Buttonbush	6-12 ft.	0.25"-1.0"	Shrub	OBL	5%

Note: Wetland zone species were planted on 6' spacing in rows spaced 12' apart.

Temporary Seeding (34.7 acres)

Pure Live Seed

Approved Dates	Species Name	Common Name	Stratum	Density (lbs/acre)
August 15 - April 15	*Secale cereale*	Rye Grain	Herb	110
August 15 - April 15	*Avena sativa*	Winter Oats	Herb	30
April 15 - August 15	*Setaria italica*	German Millet	Herb	50
All Year	*Trifolium incarnatum*	Crimson Clover	Herb	5
All Year	*Trifolium repens*	Ladino Clover	Herb	5

Permanent Riparian Seeding (8.9 acres)

Pure Live Seed (20 lbs/acre)

Approved Dates	Species Name	Common Name	Stratum	Wetland Indicator Status	lbs/acre
All Year	*Elymus virginicus*	Virginia Wildrye	Herb	FACW	3.0
All Year	*Panicum virgatum*	Switchgrass	Herb	FAC	1.0
All Year	*Schizachyrium scoparium*	Little Bluestem	Herb	FACU	3.0
All Year	*Tripsacum dactyloides*	Eastern Gamagrass	Herb	FACW	2.0
All Year	*Dichanthelium clandestinum*	Deertongue	Herb	FAC	3.0
All Year	*Chasmanthium latifolium*	River Oats	Herb	FACU	1.0
All Year	*Sorghastrum nutans*	Indiangrass	Herb	FACU	1.6
All Year	*Juncus tenuis*	Path rush	Herb	FAC	0.4
All Year	*Rudbeckia hirta*	Blackeyed Susan	Herb	FACU	1.0
All Year	*Bidens aristosa*	Bur Marigold	Herb	FACW	1.0
All Year	*Helianthus angustifolia*	Swamp Sunflower	Herb	FACW	1.0
All Year	*Coreopsis lanceolata*	Lanceleaf Coreopsis	Herb	FACU	1.0
All Year	*Chamaecrista fasciculata var. fasciculata*	Partridge Pea	Herb	FACU	1.0

NOTE:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.

Permanent Seeding Outside Easement (9.5 acres)

Approved Dates	Species Name	Common Name	Stratum	Density (lbs/acre)	Percentage
All Year	*Festuca arundinacea*	Tall Fescue	Herb	30	55%
All Year	*Dactylis glomerata*	Orchardgrass	Herb	20	36%
All Year	*Trifolium repens*	Ladino Clover	Herb	5	9%
					100%

Permanent Wetland Seeding (16.3 acres)

Pure Live Seed (20 lbs/acre)

Approved Dates	Species Name	Common Name	Stratum	Wetland Indicator Status	Density (lbs/acre)
All Year	*Coleataenia rigidula*	Redtop Panicgrass	Herb	FACW	4
All Year	*Elymus virginicus*	Virginia wildrye	Herb	FACW	4
All Year	*Panicum virgatum*	Switchgrass	Herb	FAC	1
All Year	*Juncus effusus*	Soft Rush	Herb	FACW	1
All Year	*Juncus coriaceus*	Leathery Rush	Herb	FACW	1
All Year	*Carex vulpinoidea*	Fox Sedge	Herb	OBL	2
All Year	*Carex lurida*	Lurid Sedge	Herb	OBL	1
All Year	*Carex lupulina*	Hop Sedge	Herb	OBL	1
All Year	*Carex albuletescens*	Greenwhite Sedge	Herb	FACW	1
All Year	*Bidens aristosa*	Bur Marigold	Herb	FACW	2
All Year	*Helianthus angustifolia*	Swamp Sunflower	Herb	FACW	2

Wetland Indicator Status Legend

Abbreviation	Indicator Status	Ecological Description
OBL	Obligate	Almost always a hydrophyte, rarely in uplands
FACW	Facultative Wetland	Usually a hydrophyte but occasionally found in uplands
FAC	Facultative	Commonly occurs as either a hydrophyte or nonhydrophyte
FACU	Facultative Upland	Occasionally a hydrophyte, but usually occurs in uplands
UPL	Upland	Rarely a hydrophyte, almost always in uplands

Liberty Rock Forested Wetland Supplemental Planting (0.9 acres)

Species	Common Name	Max Spacing	Indiv. Spacing	Min. Caliper Size	Stratum	Percent of Stems
Plugs						
Conoclinium coelestinum	Blue Mistflower	12 ft	8-12 ft	1.0"- 2.0" plug	Herb	5%
Carex crinita	fringed Sedge	12 ft	8-12 ft	1.0"- 2.0" plug	Herb	10%
Eleocharis acicularis	Needle Spikerush	12 ft	8-12 ft	1.0"- 2.0" plug	Herb	7%
Juncus effusus	Soft Rush	12 ft	8-12 ft	1.0"- 2.0" plug	Herb	10%
Eutrochium fistulosum	Hollow Joe-Pye Weed	12 ft	8-12 ft	1.0"- 2.0" plug	Herb	10%
Vernonia noveboracensis	New York Ironweed	12 ft	8-12 ft	1.0"- 2.0" plug	Herb	10%
Eupatorium pefoliatum	Boneset	12 ft	8-12 ft	1.0"- 2.0" plug	Herb	10%
Lobelia cardinalis	Cardlinal Flower	12 ft	8-12 ft	1.0"- 2.0" plug	Herb	5%
Bare Roots						
Viburnum nudum	Possumhaw Viburnum	12 ft	12 ft	0.25"-1.0"	Shrub	5%
Viburnum dentatum ~~*Viburnum recognitum*~~	Arrowwood ~~Northern Arrowwood~~	12 ft	12 ft	0.25"-1.0"	Shrub	5%
Ilex decidua	Possumhaw Holly	12 ft	12 ft	0.25"-1.0"	Subcanopy	5%
Xanthorhiza simplicissima	Yellowroot	12 ft	12 ft	0.25"-1.0"	Shrub	4%
Cornus amomum	Silky Dogwood	12 ft	12 ft	0.25"-1.0"	Subcanopy	5%
Sambucus canadensis	Elderberry	12 ft	12 ft	0.25"-1.0"	Subcanopy	5%
Aesculus sylvatica	Painted Buckeye	12 ft	12 ft	0.25"-1.0"	Shrub	4%
						100%

NOTE: A minimum of four species of plugs and bare roots for Supplemental Planting was planted. Selection was based on seasonal availability

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Liberty Rock Mitigation Site
Randolph County, North Carolina

Planting Tables

Revisions:

Date: 02-28-23
Job Number: 005-02185
Project Engineer: ANA
Drawn By: CW
Checked By: GAT

Sheet 3.1

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APPENDIX F. Additional Documentation

SOIL BORING DESCRIPTIONS

Soil Boring Descriptions

Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Soil Profile Description at Location of Groundwater Well 1:

Depth Range (in.)	Color	Redox	Texture	Notes
0-17	10YR 5/1 (90%)	7.5YR 5/8 (10%)	C	Buried Charcoal
17-31	N 5 (90%) 7.5YR 5/8 (10%)	7.5YR 5/8 (10%)	C	
31-40	10YR 5/1 (100%)	---	SL	Gravelly

Soil Profile Description at Location of Groundwater Well 2:

Depth Range (in.)	Color	Redox	Texture	Notes
0-4	10YR 5/3 (98%)	2.5YR 4/8 (2%)	L	
4-7	10YR 6/2 (96%)	5YR 5/8 (4%)	L	
7-16	2.5Y 7/1 (97%)	5YR 6/8 (3%)	LS	
16-25	2.5Y 7/3 (98%)	5YR 5/8 (2%)	SL	
25-34	10YR 7/1 (100%)	---	S	
34-43	10YR 7/2 (100%)	---	S	Coarse
43-55	2.5Y 8/1 (100%)	---	S	Coarse

Soil Profile Description at Location of Groundwater Well 3:

Depth Range (in.)	Color	Redox	Texture	Notes
0-10	10YR 6/3 (85%)	2.5YR 5/8 (15%)	CLSi	
10-21	5Y 7/1 (90%)	5YR 5/8 (10%)	SSi	
21-33	2.5Y 7/1 (30%)/2.5Y 6/8 (40%)	5YR 5/8 (30%)	SiC	Sandy
33-64	5Y 6/1 (100%)	---	SC	

Soil Profile Description at Location of Groundwater Well 4:

Depth Range (in.)	Color	Redox	Texture	Notes
0-5	10YR 4/4 (85%)	7.5YR 5/6 (15%)	LSiS	
5-14	2.5Y 5/2 (100%)	---	SL	OM
14-40	2.5Y 6/4 (85%)	7.5YR 6/8 (15%)	LS	
40-70	5Y 6/1 (90%)	7.5YR 6/6 (10)%)	LS	

Soil Profile Description at Location of Groundwater Well 5:

Depth Range (in.)	Color	Redox	Texture	Notes
0-37	2.5Y 6/1 (55%)	10YR 6/8 (45%)	C	
37-41	7.5YR 7/1 (65%)	7.5YR 6/8 (35%)	CS	
41-64	5Y 6/1 (98%)	2.5YR 5/8 (2%)	CS (80%), Gravel (20%)	

Soil Profile Description at Location of Groundwater Well 6:

Depth Range (in.)	Color	Redox	Texture	Notes
0-3	10YR 4/3 (95%)	5YR 4/3 (5%)	SiL	
3-15	10YR 6/3 (90%)	7.5YR 5/8 (10%)	LS	
15-23	2.5Y 6/3 (80%)	2.5YR 4/8 (20%)	SC	
23-28	10YR 5/2 (100%)	---	SC	Undecomposed Wood
28-30	2.5Y 5/2 (100%)	---	S	

Soil Boring Descriptions

Liberty Rock Mitigation Site
DMS Project No. 100135
Monitoring Year 0 - 2023

Soil Profile Description at Location of Groundwater Well 7:

Depth Range (in.)	Color	Redox	Texture	Notes
0-9	10YR 5/1 (95%)	7.5YR 5/6 (5%)	SiCL	
9-14	10YR 5/1 (95%)	7.5YR 5/6 (5%)	CL	
14-31	10YR 5/1 (98%)	7.5YR 5/6 (2%)	SC	
31+	2.5Y 7/1 (100%)	---	S	

Soil Profile Description at Location of Groundwater Well 8:

Depth Range (in.)	Color	Redox	Texture	Notes
0-3	10YR 4/2 (97%)	5YR 5/6 (3%)	L	
3-16	10YR 5/1 (85%)	2.5YR 4/6 (15%)	CL	
16-22	7.5YR 4/1 (96%)	7.5YR 5/6 (4%)	CL	Sandy
22-30	5YR 5/1 (95%)	7.5YR 5/6 (5%)	CL	
30-39	5YR 4/1 (100%)	---	C	

Soil Profile Description at Location of Groundwater Well 9:

Depth Range (in.)	Color	Redox	Texture	Notes
0-7	10YR 4/3 (95%)	7.5YR 6/8 (5%)	SiL	
7-16	10YR 6/4 (97%)	7.5YR 6/6 (3%)	SL	
16-27	7.5YR 7/1 (75%)	7.5YR 6/8 (25%)	SiCL	
27-42	10YR 6/1 (85%)	7.5YR 6/8 (15%)	CL	Stiff (Wets/Dries)
42+	5Y 6/1 (100%)	---	SiCL	

Soil Profile Description at Location of Groundwater Well 10:

Depth Range (in.)	Color	Redox	Texture	Notes
0-19	10YR 5/6 (100%)	---	CL	
19-27	10YR 7/2 (90%)	10YR 6/8 (10%)	LC	Sandy
27-34	10YR 7/2 (100%)	---	S	
34-50	10YR 5/1 (100%)	---	S	Very Fine

Soil Profile Description at Location of Groundwater Well 11:

Depth Range (in.)	Color	Redox	Texture	Notes
0-8	2.5Y 5/2 (95%)	7.5YR 5/8 (5%)	SL	
8-11	2.5Y 6/2 (95%)	10YR 6/8 (5%)	SL	
11-25	10YR 6/3 (96%)	10YR 7/6 (4%)	S	Very Fine
25-36	2.5Y 6/3 (98%)	2.5Y 6/8 (2%)	S	Very Fine
36-45	2.5Y 6/1 (100%)	---	S (95%), Gravel (5%)	Very Fine

LUNKER BOX INSTALLATION

Lunker Box Installation *(8/04/2022)*