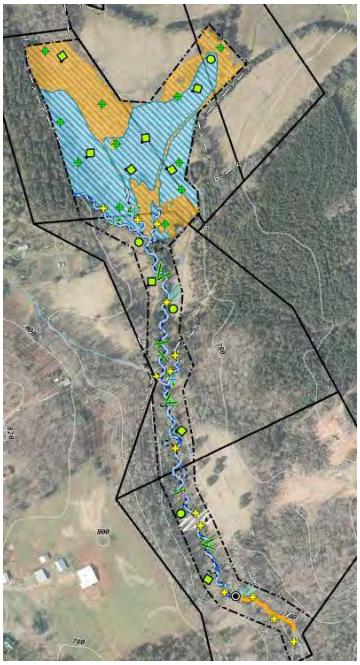


MONITORING YEAR 0 ANNUAL REPORT
FINAL

May 2022

CARPENTER BOTTOM MITIGATION SITE
Gaston County, NC
Catawba River Basin
HUC 03050102
(03050103 Expanded Service Area)

DMS Project No. 100090
NC DEQ Contract No. 7731
DMS RFP No. 16-007133-CT03
Date of Issue: April 24, 2017
USACE Action ID No. SAW-2018-02062
DWR Project No. 2019-0049
Data Collection Dates: August 2021 - February 2022

PREPARED FOR:

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

PREPARED BY:

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

Phone: 704.332.7754
Fax: 704.332.3306

May 27, 2022

Mr. Matthew Reid
Project Manager
NCDEQ – Division of Mitigation Services
5 Ravenscroft Drive, Suite 102
Asheville, NC 28801

RE: Carpenter Bottom Draft MY0 Report Review
Catawba River Basin - CU# 03050102
Gaston County
DMS Project ID No. 100090
Contract #7731

Dear Mr. Reid:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments from the Draft Year 0 Monitoring Report for the Carpenter Bottom Mitigation Site that were received on May 4, 2022. The report has been updated to reflect those comments. The Final MY0 Report is included. DMS' comments are listed below in **bold**. Wildlands' responses to DMS' comments are noted in *italics*.

DMS' Comment: Please add "Date of Issue: April 24, 2017" following RFP number on title page.

Wildlands' response: The RFP issuance date of April 24, 2017 has been added to the title page.

DMS' Comment: Table 2a: Recommend including the Monitoring Table Components from mitigation plan in the MY0 report, or list the number of monitoring stations for each metric in the measurement column of Table 2a.

Wildlands' response: The measurement column of Table 2a was updated to include the quantity of monitoring components for each goal/performance criteria.

DMS' Comment: Table 3a: There is a discrepancy between the Restoration Tributary Summary Information for Carpenter Branch R1 and R2 lengths when compared to Table 5 in the Mitigation Plan. Please revise or explain the discrepancy in existing lengths.

Wildlands' response: Table 3. The pre-project stream length for Carpenter Branch Reach 1 and 2 was corrected to match the mitigation plan and also what is reported in Table 1.

DMS' Comment: Section 2.1: There were a significant number of additional brush toes added during construction. While DMS agrees the addition of wood and increase bank stability will be beneficial, can WEI please add an explanation as to why this change was made during construction? Did a storm event reveal a need for additional bank protection, was their extra material on site, etc.?

Wildlands' response: Additional brush material was available on site based on the limits of clearing during design and construction. A portion of the additional brush was able to be burned, however utilizing additional brush material as habitat in the small headwater channels was determined a better use of the material. Brush toes were installed for habitat, not for additional stability, in this instance.

DMS' Comment: Floodplain pool on right floodplain near sta: 112+25 should be included as a red line change. This feature was not in the original design.

Wildlands' response: The floodplain pool on the right floodplain near STA 112+25 has been corrected and included as a red line change. The following text was also added to section 2.1.1 of the report: "Floodplain pool - Pool added to preserve relic channel meander feature with existing mature vegetation."

DMS' Comment: Sta: 122+39 – 122+84 note specifies 38 linear feet are realigned. Redline drawing says 44'. Please review and update as necessary for consistency.

Wildlands' response: The STA 122+39 – 122+84 note was revised, in the report and on the record drawings, for clarification. The stationing listed represents where the channel realignment deviates from the design; however, the actual channel realignment resulted in 38 linear feet, for a loss of 6 linear feet.

DMS' Comment: 3.6 Wetland Hydrology: Section 8.3 of the approved Mitigation Plan defines the growing season based on the Gaston County, NC WETS table as March 15th to November 14th representing a 250 day growing season. Wildlands proposed a 12% growing season of 30 consecutive days based on this data which was approved by the IRT. Confirming season dates with a soil temperature probe is appreciated, but please continue to use the success criteria approved in the Mitigation Plan. Please update section to reflect the Mitigation Plan.

Wildlands' response: As requested the text has been revised to better reflect the growing season limits defined in the Site's Mitigation Plan.

DMS' Comment: Table 4c: Calculation for Bank Protection under the Structure category is displaying a formula error due to having a 0 value in the formula. Recommend manually changing to 100% or NA for final.

Wildlands' response: Table 4c. Since there are no bank protection structures on the reach, the total performing percentage is not applicable and was updated to N/A.

DMS' Comment: Groundwater gage 7 and gage 8 photos: Gage photos appear to show a minimal amount of bentonite surrounding the wells when compared to other gages. The bentonite cap may just be hard to see in the photos. As regular maintenance, please inspect and add bentonite as necessary.

Wildlands' response: Wildlands mixes some of the surrounding soil with the bentonite and dampens the mixture which provides a better seal around the pipe collar. However, this can alter the pellet-like texture and the appearance of the bentonite cap. Wildlands will continue to monitor, inspect, refurbish the bentonite surrounding the wells on a regular basis. The bentonite seals on gages 7 and 8 are not a concern at this time.

DMS' Comment: Monitoring gage installation data sheets are a welcome addition to the report. Thanks for including.

Wildlands' response: Thank you for the comment.

DMS' Comment: XS 2,3 and 6 photos appear to show riffles with very little to no flow on the surface. Does WEI have concerns regarding the depth of riffle material and the ability to achieve surface flow over these areas?

Wildlands' response: Wildlands does not have concerns about the stream's ability to achieve surface flow over the upstream extent of Carpenter Branch Reach 1. Cross section 2 is on an intermittent reach, so it is not surprising that the reach is dry in the September photos. Cross sections 3 and 6 both show some staining on the rocks indicating that flow has occurred over the riffles. It is expected that once the stream

has time to stabilize and the riffle material settles, winter rain will recharge the streams and flow will return as shown in the photos taken in February at PP1 and PP2.

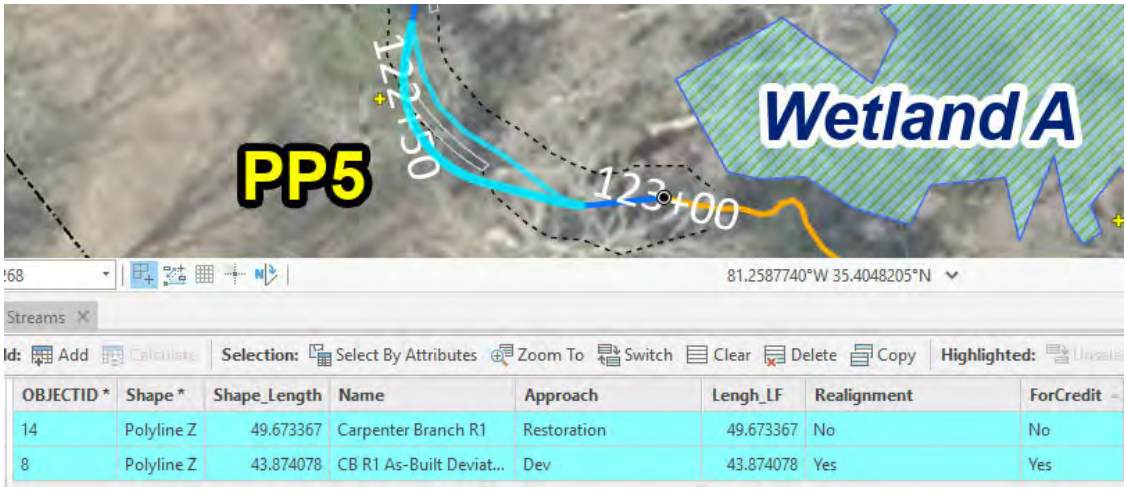
DMS' Comment: Table 10: Please change the Project Instituted date to October 9, 2018.

Wildlands' response: In Table 10, the Project Instituted date was changed from July 6, 2017 (the date of Wildland's contract with NCDEQ, #7244) to October 9, 2018 (the date of the fully executed original contract with the NCDEQ, #7731).

Digital Deliverable Comments:

DMS' Comment: There are two depictions of what appears to be an outer meander bend on centerline for Carpenter Branch R1; one is labeled as such and lists the length as 49.673, the other is labeled as CB R1 As-built Deviation and lists length as 43.874. Please verify the submission of all centerlines (feature class = Streams_PH) are sourced from the As-built survey.

Wildlands' response: The feature class "Streams_PH" was renamed to "Streams" and the attribute table was modified for clarity. A credit/no credit column was added, and the realignment attribute of OID#14 was changed to "No". There are two lines shown in the map because one line represents the proposed stream alignment, and the other is the deviation. The lines match what is used and shown in the CAD plan set (Sheet 1.1.6); the deviation line in GIS matches the red line in CAD. The longer segment (OID#14) is the proposed centerline, and the shorter segment (OID#8) is the deviation. The deviation length was used when calculating the as-built creditable stream length.



OBJECTID *	Shape *	Shape_Length	Name	Approach	Lengh_LF	Realignment	ForCredit
14	Polyline Z	49.673367	Carpenter Branch R1	Restoration	49.673367	No	No
8	Polyline Z	43.874078	CB R1 As-Built Deviat...	Dev	43.874078	Yes	Yes

As requested, Wildlands has included one (1) hard copy of the final report and a full final electronic submittal of the support files on USB. A copy of the DMS comment letter and our response letter have been included inside the front cover of the report's hard copy, as well. Please let me know if you have any questions.

Sincerely,

Kristi Suggs

Kristi Suggs
Senior Environmental Scientist
ksuggs@wildlandseng.com

CARPENTER BOTTOM MITIGATION SITE

Monitoring Year 0 Annual Report

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TABLES

FIGURES

APPENDICES

Section 1: PROJECT OVERVIEW

The Carpenter Bottom Mitigation Site (Site) is located in Gaston County, NC approximately 4.1 miles south of the City of Lincolnton and just south of the Gaston County/Lincoln County border. The Site drains to Beaverdam Creek, which drains to the Catawba River. The Site is located within the South Fork Catawba River (High Shoals) WS-IV water supply watershed and is located just outside the Indian Creek Targeted Local Watershed (TLW). Table 3 presents information related to the project attributes.

1.1 Project Quantities and Credits

Mitigation work within the Site included the restoration and enhancement of perennial and intermittent stream channels and the rehabilitation and re-establishment of historically altered wetlands. Table 1 below shows stream and wetland credits by reach and the total amount of credits expected at closeout.

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.

1.3 Project Attributes

The project includes the headwaters of a tributary to Beaverdam Creek and occurs on adjacent properties that have a history of agricultural use. The Site has been ditched and maintained as an active cattle and hay pasture as far back as 1950; however, a small, forested area within the proposed wetland restoration area was allowed to reforest starting around 1973. In 2014, approximately 2.4 acres was deforested to provide additional pasture. Table 3 below and Table 8 in Appendix C present additional information on pre-restoration conditions.

Table 1. Mitigation Assets and Components

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

PROJECT MITIGATION QUANTITIES										
Project Segment	**Existing Footage or Acreage**	**Mitigation Plan Footage or Acreage**	**Mitigation Category**	**Restoration Level**	**Priority Level**	**Mitigation Ratio (X:1)**	**Mitigation Plan Credits**		**As-Built Footage or Acreage**	**Comments**
Stream										
Carpenter Branch - Reach 1	2,564	2,249.689	Warm	R	P1, P2	1.0	2,249.689		2,243.000	Full channel restoration, riparian planting, livestock exclusion, invasive species treatment, permanent conservation easement; culvert crossing
Carpenter Branch - Reach 2		353.080	Warm	EIII	--	8.0	44.135		353.000	Invasive species treatment, permanent conservation easement
Carpenter Branch - Reach 2 - No Credit		124.000	--	--	--	0.0	0.000		124.000	Invasive species treatment, permanent conservation easement
UT1	123	174.819	Warm	R	P1, P2	1.0	174.819		175.000	Full channel restoration, stormwater BMP implementation, riparian planting, livestock exclusion, permanent conservation easement
UT2	245	178.196	Warm	R	P1	1.0	178.196		178.000	Full channel restoration, riparian planting, invasive species treatment, livestock exclusion, permanent conservation easement
UT3	387	384.661	Warm	R	P1	1.0	384.661		385.000	Full channel restoration, riparian planting, livestock exclusion, invasive species treatment, permanent conservation easement
UT4	50	36.349	Warm	R	P1	1.0	36.349		36.000	Daylighting stream and restoration of natural channel fetaures, riparian planting, permanent conservation easement
Wetland										
Wetland Re-establishment	0.000	5.714	RR	RE	--	1.0	5.714		5.714	Re-establish hydrology via the plugging/filling of drainage features, wetland planting, invasive species treatment, livestock exclusion, permanent conservation easement
Wetland Rehabilitation	4.130	3.947	RR	RH	--	1.5	2.631		3.947	Improve hydrology via the plugging/filling of drainage features, wetland planting, invasive species treatment, livestock exclusion, permanent conservation easement

Restoration Level	**Stream**			**Riparian Wetland**	**Non-rip Wetland**	**Coastal Marsh**
	Warm	**Cool**	**Cold**			
Restoration	3,023.714					
Enhancement III	44.135					
Re-esablishment				5.714		
Rehabilitation				2.631		
Totals	**3,067.849**			**8.345**		

Table 2a: Goals, Performance Criteria, and Functional Improvements

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Exclude livestock from stream channels and wetlands.	Decommission pastures on Site and exclude livestock via the removal from stream channels, wetlands, and riparian areas.	Reduce direct fecal coliform and nutrient inputs to the Site streams. Reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary. Eliminate cattle trampling of wetlands.	There is no required performance standard for this metric.	N/A	N/A
Improve the stability of stream channels.	Reconstruct stream channels with stable dimension, pattern, and profile. Reconnect streams to existing floodplain. Add bank revetments and in-stream structures to protect restored streams.	Reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary. Increase floodplain engagement.	ER stays over 2.2 and BHR below 1.2 with visual assessments showing progression towards stability.	Cross-section monitoring (8 riffles & 6 pools) will be conducted during MY1, MY2, MY3, MY5 & MY7. 12 reference photo points were established throughout the Site. Upstream and downstream photos will be taken at each point on an annual basis during visual site inspections.	No deviations from design.
Improve instream habitat.	Install habitat features such as constructed steps, constructed riffles, and brush toe on restored reaches. Add woody materials to channel beds. Construct pools of varying depth.	Increase and diversify available habitats for macroinvertebrates, fish, and amphibians. Promote aquatic species migration and recolonization and increase in biodiversity over time. Add complexity including LWD to the streams.	There is no required performance standard for this metric.	Visual annual assessments.	N/A

Table 2b: Goals, Performance Criteria, and Functional Improvements

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Reconnect channels with floodplains and to allow a natural flooding regime.	Reconstruct stream channels with designed bankfull dimensions and depth based on reference reach data.	Allow more frequent flood flows to disperse on the floodplain.	Four bankfull events on restored channels in separate years within monitoring period. At least 30 consecutive days of flow for Carpenter Branch R1, UT1, UT2, and UT3.	Five automated transducers were installed throughout the Site. One transducer (SG1) will be recording days of consecutive stream flow. Another (CG5) will be recording bankfull events. The remaining three (SG2, SG3, & SG4) will be recording consecutive days of stream flow and bankfull events.	Reported in MY1.
Restore wetland function and hydrology.	Restore wetlands through re-establishment of hydrology. Remove the drainage effects of agricultural ditching and maintenance.	Raise water table and hydrate riparian wetlands.	Free groundwater surface within 12 inches of the ground surface for a minimum of 12% (30 consecutive days) of the growing season for Gaston County.	11 groundwater gages were installed in wetland re-establishment and rehabilitation areas and will be monitored annually.	Reported in MY1.
Restore and enhance native floodplain and wetland vegetation.	Plant native tree, shrub, and understory species in riparian and proposed wetland restoration zones.	Reduce sediment inputs from bank erosion and runoff. Increase nutrient cycling and storage in floodplain. Provide riparian and wetland habitat. Add a source of LWD and organic material to Site streams. Support all stream functions.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7. 7 feet average height at MY5, and 10 feet at MY7.	9 permanent and 4 mobile 100 square meter vegetation plots were installed within 2% of the open planted areas and will be assessed in MY1, MY2, MY3, MY5 and MY7. Shaded planted areas will be visually assessed.	All 13 vegetation plots have a planted stem density greater than 320 stems per acre.
Permanently protect the project site from harmful uses.	Establish conservation easements on the 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.

Table 3a: Project Attributes

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

PROJECT INFORMATION			
Project Name	Carpenter Bottom Mitigation Site	County	Gaston County
Project Area (acres)	18.0	Project Coordinates	35.410725, -81.260717
PROJECT WATERSHED SUMMARY INFORMATION			
Physiographic Province	Piedmont	River Basin	Catawba River
USGS HUC 8-digit[1]	03050102	USGS HUC 14-digit	03050102050020
DWR Sub-basin	03-08-35	Land Use Classification	43% forest, 43% agricultural row crops and hay, 8% grassland/herbaceous, <1% shrubland, 5% urban, <1% impervious
Project Drainage Area (acres)	180	Percentage of Impervious Area	0.65%

RESTORATION TRIBUTARY SUMMARY INFORMATION						
Parameters	**Carpenter Branch - Reach 1**	**Carpenter Branch - Reach 2**	**UT1**	**UT2**	**UT3**	**UT4**
Pre-project length (feet)	2,087	477	123	245	387	50
Post-project (feet)	2,243	353	175	178	385	36
Valley confinement (Confined, moderately confined, unconfined)	Moderately confined	Confined	Confined	Moderately confined	Moderately confined	Confined
Drainage area (acres)	48 / 180		20	39	17	23
Perennial, Intermittent, Ephemeral	I / P	P	I	P	I	P
DWR Water Quality Classification	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV
Dominant Stream Classification (existing)[2]	G4	--	G4/5	G4/5	G4/5	--
Dominant Stream Classification (proposed)[2]	C4	--	C4	C4	C4b	C4
Dominant Evolutionary class (Simon) if applicable	III / IV	V	III	III	III	I

REGULATORY CONSIDERATIONS			
Parameters	**Applicable?**	**Resolved?**	**Supporting Documentation**
Water of the United States - Section 404	Yes	Yes	USACE Action ID No. SAW-2018-02062
Water of the United States - Section 401	Yes	Yes	DWR # 2019-0049
Endangered Species Act	Yes	Yes	Categorical Exclusion in Mitigation Plan (Wildlands, 2020)
Historic Preservation Act	Yes	Yes	
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

1 - Expanded Service Area 03050103

2 - The Rosgen classification system (Rosgen, 1994) and Simon Channel Evolution Model (Simon, 1989) are for natural streams. These channels have been heavily manipulated by man and therefore may not fit the classification category or channel evolution as described by these models. Results of the classification and model are provided for illustrative purposes only.

Table 3b: Project Attributes

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

WETLAND SUMMARY INFORMATION							
Parameters	**Wetland A**	**Wetland B**	**Wetland C**	**Wetland D**	**Wetland E**	**Wetland F**	**Wetland G**
Size of Wetland (acres)	0.07	0.01	0.01	0.01	<0.01	0.07	<0.01
Wetland Type (non-riparian, riparian riverine, or riparian non-riverine)	Riparian Riverine						
Mapped Soil Series	Pacolet	Worsham	Pacolet	Pacolet	Worsham	Worsham	Worsham
Drainage Class	Well drained	Poorly drained	Well drained	Well drained	Poorly drained	Poorly drained	Poorly drained
Soil Hydric Status (field/mapping)	No	Yes	No	No	Yes	Yes	Yes
Souce of Hydrology	Groundwater & overbank flooding	Groundwater & overbank flooding	Groundwater & overbank flooding	Groundwater	Groundwater & overbank flooding	Groundwater & overbank flooding	Groundwater & overbank flooding
Restoration or enhancement method (hydrologic, vegetative, etc.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Parameters	**Wetland H**	**Wetland I**	**Wetland J**	**Wetland K**	**Wetland L**	**Wetland M**	**Wetland N**
Size of Wetland (acres)	0.39	0.36	0.01	<0.01	0.02	1.02	2.35
Wetland Type (non-riparian, riparian riverine, or riparian non-riverine)	Riparian Riverine						
Mapped Soil Series	Worsham	Worsham/ Winnsboro	Worsham/ Winnsboro	Winnsboro	Winnsboro	Worsham	Worsham
Drainage Class	Poorly drained	Poorly drained/Well drained	Poorly drained/Well drained	Well drained	Well drained	Poorly drained	Poorly drained
Soil Hydric Status (field/mapping)	Yes	Yes/No	Yes/No	No	No	Yes	Yes
Souce of Hydrology	Groundwater	Groundwater	Groundwater & overbank flooding	Groundwater & overbank flooding	Groundwater	Groundwater	Groundwater
Restoration or enhancement method (hydrologic, vegetative, etc.)	Hydrologic, Vegetative	Hydrologic, Vegetative	N/A	N/A	N/A	Hydrologic, Vegetative	Hydrologic, Vegetative

Section 2: As-Built Condition (Baseline)

The Site construction and as-built surveys were completed in July and September 2021, respectively. The Site's construction planting was completed on February 1, 2022. The survey included developing an as-built topographic surface as well as surveying the as-built channel centerlines, top of banks, structures, cross-sections, gages (stream and wetland), and photo points. The collection of sediment data was completed in August 2021. Vegetative data collection was completed in early February 2022.

2.1 As-Built/Record Drawings

No significant field adjustments were made during construction that differ from the design plans. Minimal adjustments were conducted only where needed and mainly included changes of the material type and the addition and/or removal of structures. These changes were made due to unforeseen site conditions and availability of on-site materials. In all instances, the changes provide the same, if not better, stability, habitat, and functional uplift. A sealed half-size set of record drawings and the as-built survey are in Appendix E and include the post-construction survey, alignments, structures, and monitoring features. The record drawing also includes redlines for any field adjustments made during construction that were different from the design plans and/or monitoring installations that were adjusted after survey was complete. Specific changes are detailed below.

2.1.1 Carpenter Branch Reach 1

- STA 100+18 - Rock sill installed as grade control.
- STA 100+18-100+29 - Brush toe installed to increase bank stability.
- STA 100+94-101+15 - Brush toe installed to increase bank stability.
- STA 101+94-102+21 - Brush toe installed to increase bank stability.
- Floodplain pool - Root wads added to floodplain pool to increase habitat diversity.
- Floodplain pool - Added stabilized outlet to increase stability at confluence.
- STA 104+44-104+78 - Brush toe added to increase stability.
- STA 105+10-105+36 - Brush toe added to increase stability.
- STA 106+41 - Outlet installed to stabilize wetland overflow.
- STA 106+55 - Log sill omitted due to adequate stability.
- STA 107+04-107+37 - Brush toe added due to extra material availability.
- STA 111+83 - Log sill added to provide grade control.
- STA 111+83 - 112+08 - Brush toe added due to extra material availability.
- Floodplain pool - Log sill and stabilized outlet installed to stabilize flow from floodplain pool.
- STA 112+15 - 113+00 - Profile was lowered due to low area in the floodplain and to promote drainage to the constructed channel.
- STA 112+36 - 112+68 - Brush toe added to increase stability.
- STA 112+89 - Log sill moved from STA 112+36 to provide grade control.
- STA 113+00 - 113+83 - Profile was lowered due to low area in the floodplain and to promote drainage to the constructed channel.
- STA 112+92 - 113+16 - Brush toe added due to extra material availability.
- Floodplain pool - Pool added to preserve relic channel meander feature with existing mature vegetation.
- Floodplain pool - Log sill and stabilized outlet added to stabilize floodplain pool confluence.

- STA 114+60 - Log j-hook moved from STA 114+01 to increase stability downstream of the floodplain pool confluence.
- STA 115+10-115+37 - Brush toe added to increase stability.
- STA 115+58-115+95 - Brush toe added to increase stability.
- Floodplain pool - Log sill and stabilized outlet added to stabilize floodplain pool confluence.
- STA 116+18 - Rock sill added to increase stability downstream of floodplain pool confluence.
- STA 116+68 - 116+98 - Brush toe replaced log j-hook at STA 116+68 for additional bank stability.
- STA 117+06 - Crest gage added after survey was collected to monitor bankfull events.
- STA 120+17 - 120+30 - Brush toe added to increase stability.
- STA 120+80 - 121+07 - Brush toe added due to extra material availability.
- Floodplain pool - Floodplain pool not installed due to sufficient material on-site to provide cut/fill balance.
- STA 122+66 - 122+91 - Brush toe added to increase stability.
- STA 122+13 - 122+33 - Brush toe added to increase stability.
- STA 122+42 - Rock sill omitted due to channel realignment.
- STA 122+39-122+84 - 44 linear feet of channel was re-aligned to allow for trees on left bank to be saved. This realignment shortened the channel length to 38 linear feet.
- STA 122+45-122+69 - Brush toe added to increase stability due to channel re-alignment.

2.1.2 Carpenter Branch Reach 2

- No deviations from design.

2.1.3 UT1

- STA 199+85 - 200+00 - Riffle added to stabilize stream bed after culvert removal.
- PP-9A - Photo point was added after survey was completed to provide an additional visual monitoring location on UT1.

2.1.4 UT2

- STA 300+00 - 301+78 - Profile was lowered as part of a design change prior to construction. The grading was updated to better fit into the existing valley topography.
- STA 300+12 - Rock sill moved from STA 300+37 for better grade control.

2.1.5 UT3

- STA 402+23 - Log sill omitted due to adequate stream stability at this location.
- STA 403+23 - Log sill omitted due to adequate stream stability at this location.
- STA 403+54 - Rock sill omitted due to adequate stability from downstream log j-hook.

2.1.6 UT4

- STA 501+56 - 501+75 - Profile grade was raised to transition existing grade to proposed grade.

2.1.7 Wetland Re-establishment Area

- GWG 5 was relocated to a more representative area based on professional judgement in the field.

2.1.8 Vegetation Planting List & Plan

Changes within the planted riparian buffer were minimal and consisted of one species change and five planting density changes within the Open Area Buffer Planting Zone. Flowering dogwood (*Cornus florida*) was replaced by silky dogwood (*Cornus amomum*). The stem densities were updated from 10% to 11% for boxelder (*Acer negundo*), Tulip poplar (*Liriodendron tulipifera*), willow oak (*Quercus phellos*), American beech (*Fagus grandifolia*), and cottonwood (*Populus deltoides*). Silky dogwood was already included as an approved species within the Final Mitigation Plan's planting list (Wildlands, 2020), so no approval for the inclusion of the species is needed.

The vegetation planting plan changes were limited to the addition of four floodplain pools and a short sections of channel re-alignment. The changes are depicted on sheets 3.1 - 3.4 of the record drawings and are shown in red. They are outlined below.

- Carpenter Branch Reach 1
    - STA 103+90 - "Open Area Buffer Planting" was replaced by a floodplain pool in the left floodplain during final design.
    - STA 112+30 and 114+55 - "Open Area Buffer Planting" was replaced by a floodplain pool in the right floodplain during final design.
    - STA 116+10 - "Open Area Buffer Planting" was replaced by a floodplain pool in the left floodplain during final design.
    - STA 122+32 - 122+95 - "Open Area Buffer Planting" changed to "Riparian Corridor Planting" due to channel realignment.
    - STA 122+37 - 122+75 - "Riparian Corridor Planting" changed to "Open Area Buffer Planting" due to channel realignment.

Section 3: Monitoring Year 0 Data Assessment

Monitoring Year 0 (MY0) site visits were conducted between August 2021 and February 2022 to assess the condition of the project. Cross-section, longitudinal profile, and sediment data collection were completed by September 2021. The collection of vegetative data was completed in early February 2022. Locations of the monitoring devices are depicted in Figures 1 through 1b. The vegetation and stream success criteria for the Site follow the approved success criteria presented in the Mitigation Plan (Wildlands, 2020). Performance criteria for vegetation, stream, and hydrologic assessment are located in Section 1.2 Table 2: Goals, Performance Criteria, and Functional Improvements. The first annual monitoring assessment (MY1) will be completed in the fall of 2022, at least 6 months after the MY0 assessment. The streams will be monitored for a total of seven years, with the final monitoring activities scheduled for 2028.

3.1 Vegetative Assessment

A total of 13 vegetation plots, 9 permanent and 4 mobile, were established throughout the project area. Mobile plots established in MY0 will be used for vegetative assessment in MY1. Baseline 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 was 601 planted stems per acre. All 13 vegetation plots met the interim success criteria and are on track to meet the final success criteria required for MY7, and no species dominance per plot was greater than 50%. 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 applications were implemented prior to construction over the entire Site. Chinese privet (*Ligustrum sinense*), hardy orange (*Citrus trifoliata*), and multiflora rose (*Rosa multiflora*) were treated with herbicidal applications. During construction, both the treated, dead plants and the surviving plants were mechanically removed to prevent the spread of invasive species that could compete with planted native species. Invasive species will continue to be monitored and controlled as necessary.

3.3 Stream Assessment

Morphological surveys conducted throughout the Site show all streams as stable and functioning as designed. All riffle cross-sections at the Site were constructed slightly larger than proposed design dimensions; however, they do fall within the parameters defined for channel's stream type. It is anticipated that cross-sections will narrow, and cross-sectional areas may decrease in size due to natural channel adjustments such as the establishment of herbaceous vegetation along the tops of banks and slight bed and or bank deposition. Bank height ratios are less than 1.2, and entrenchment ratios are greater than 2.2.

Pebble counts were conducted in August of 2021. As documented in the Site's Mitigation Plan (Wildlands, 2020), reachwide counts were conducted on each restoration reach to establish stream classification at baseline conditions, and 100-count substrate sampling was collected at each surveyed riffle cross-section to characterize pavement at as-built. However, based on a DMS Technical Workgroup memo from 10/19/21 and concurrence received on 10/27/2021 from the DMS project manager for Carpenter Bottom, pebble count collection is no longer required for the project from MY1 - MY7. Therefore, pebble counts will not be conducted during the remaining monitoring years unless requested by the IRT or deemed necessary based on best professional judgement. A copy of the DMS

Technical Workgroup Memo (2021) and the email confirmation from the DMS project manager (Reid, 2021) are located in Appendix F.

Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table and stream photographs and to Appendix C for stream geomorphology data.

3.4 Stream Areas of Concern

The Site is performing as designed. Wildlands will continue to assess the Site and will report any issues during MY1.

3.5 Stream Hydrology

Five pressure transducers will be used to monitor stream hydrology. The gage on the intermittent portion of Carpenter Branch Reach 1 will measure baseflow conditions. The automated crest gage on Carpenter Branch downstream of UT1 will only collect bankfull event data. The other three transducers located on UT1, UT2, and UT3 will measure both baseflow conditions and bankfull events. All gages were set to record every two hours. Hydrologic data will be collected and reported during MY1.

3.6 Wetland Hydrology

Eleven groundwater wells were established at baseline conditions to monitor wetland hydrology within both wetland re-establishment and rehabilitation areas. Groundwater gages are set to record the groundwater level two times per day and will be downloaded during site visits. As described in the Site's Mitigation Plan (Wildlands, 2020), the North Carolina WETS table defines growing season for Gaston County from March 15th to November 14th, with a duration criterion of 12% of the 250-day growing season or 30 consecutive days of inundation. The locations of the groundwater gages closely mimic those outlined in the Site's Mitigation Plan and are denoted in Figures 1a -1b. Wetland hydrologic data will be collected and reported during MY1.

3.7 Adaptive Management Plan

No adaptive management plans are needed at this time.

3.8 Monitoring Year Summary

Overall, the Site looks good, is performing as intended, and is on track to meet success criteria. All vegetation plots are on track to exceed the MY3 interim requirement of 320 planted stems per acre, and all streams within the Site are stable and functioning as designed. Invasive species were treated prior to construction and will continue to be assessed throughout the 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 included with the MY0 digital data submittal.

Section 4: METHODOLOGY

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

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

Section 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.* NC Stream Restoration Institute, NC State University.

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

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

North Carolina Division of Mitigation Services (NC DMS). 2007. Catawba River Basin Restoration Priorities. Raleigh, NC.

NC DMS. 2017. DMS Annual Monitoring Report Format, Data Requirements, and Content Guidance. June 2017, Raleigh, NC.

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

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

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

North Carolina Division of Water Quality (NC DWR). 2010. Catawba River Basinwide Water Quality Plan.

NC DWR. 2015. Surface Water Classifications. http://portal.ncdenr.org/web/wq/ps/csu/classifications.

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

NCGS, 2017. NCGS Publications. https://deq.nc.gov/about/divisions/energy-mineral-landresources/north-carolina-geological-survey/interactive-geologic-maps

NC IRT. 2016. Wilmington District Stream and Wetland Compensatory Mitigation Update; October 24, 2016. Accessed at: https://saw-reg.usace.army.mil/PN/2016/Wilmington-District-Mitigation-Update.pdf

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

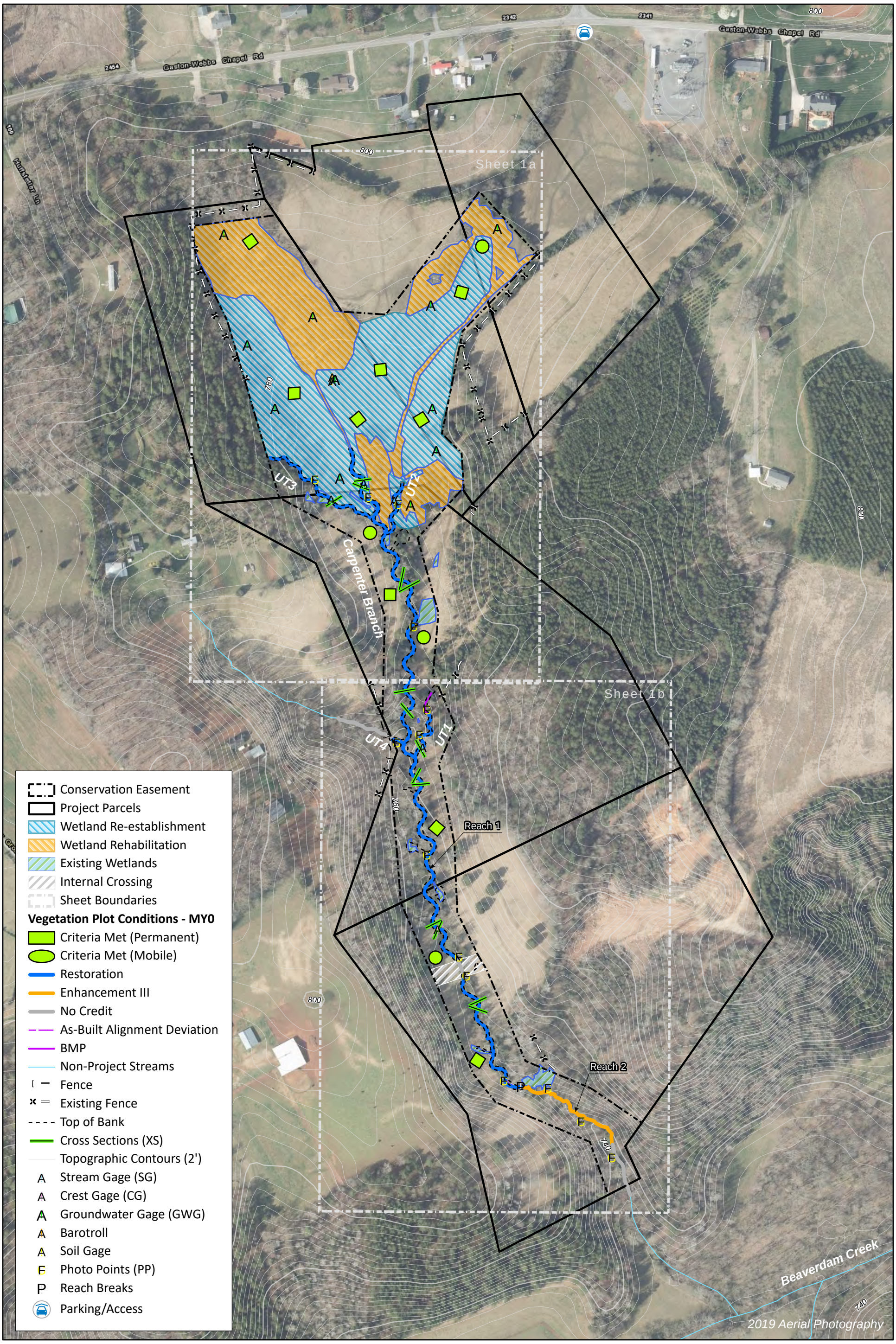
Rosgen, D.L. 1994. A Classification of Natural Rivers. *Catena* 22:169-199.

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

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

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

Wildlands Engineering, Inc. (Wildlands). 2020. Carpenter Bottom Mitigation Site: Mitigation Plan. DMS, Raleigh, NC.



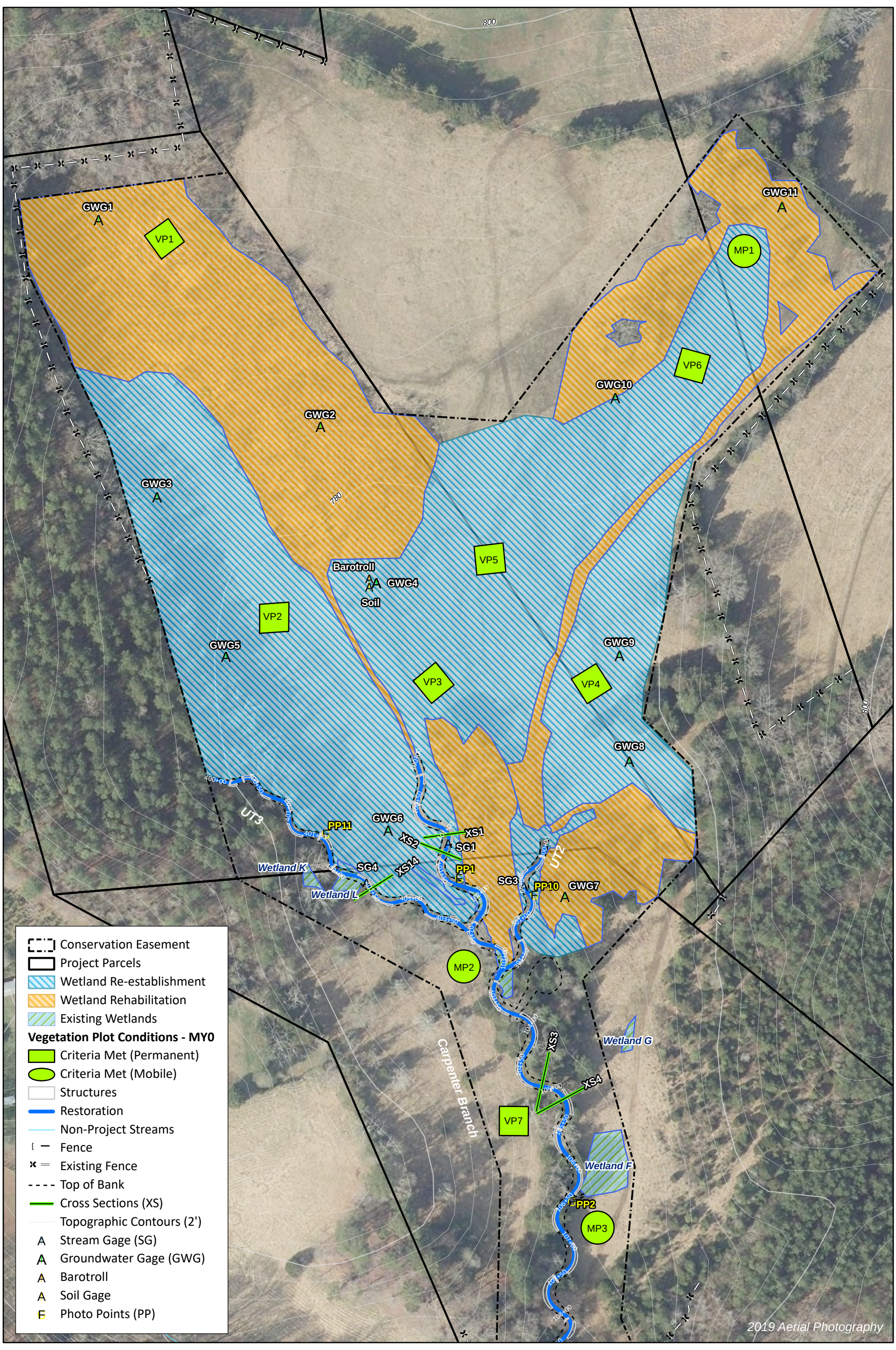
WILDLANDS ENGINEERING

0 250 500 Feet

1

Figure 1. Current Condition Plan View (Key)
Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Gaston County, NC



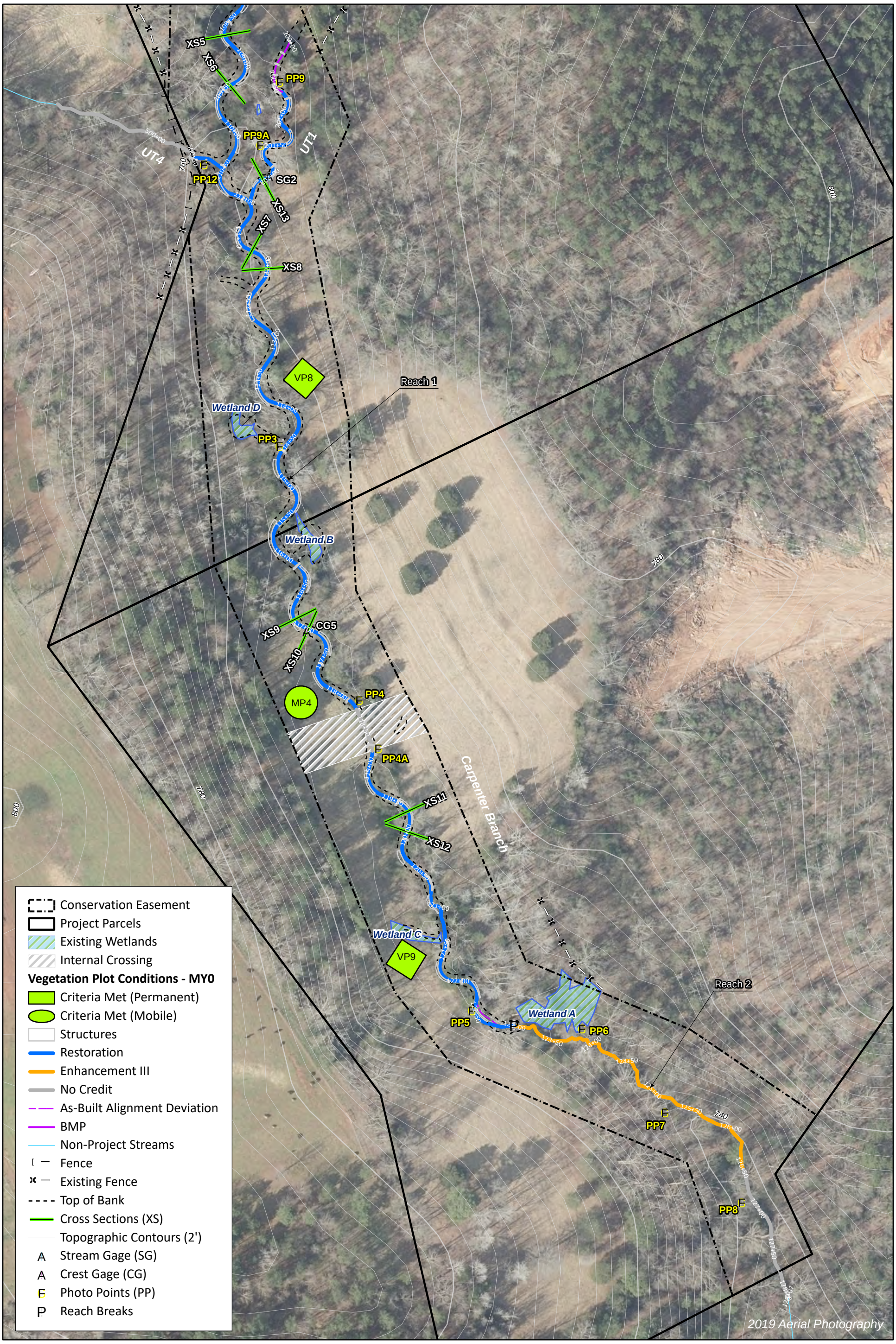
WILDLANDS ENGINEERING

0 100 200 Feet

1

Figure 1a. Current Condition Plan View
Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Gaston County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

1

Figure 1b. Current Condition Plan View
Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Gaston County, NC

APPENDIX A. Visual Assessment Data

Table 4a. Visual Stream Morphology Stability Assessment Table

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Carpenter Branch Reach 1 Date Last Assessed: 02/08/2022

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	2,243
					Assessed Bank Length	4,486
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.	31	31		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	45	45		100%

UT1 Date Last Assessed: 02/08/2022

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	175
					Assessed Bank Length	350
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%.	6	6		100%

Table 4b. Visual Stream Morphology Stability Assessment Table

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 0 - 2022

UT2 Date Last Assessed: 02/08/2022

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	178
					Assessed Bank Length	356
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	4	4		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	5	5		100%

UT3 Date Last Assessed: 02/08/2022

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	385
					Assessed Bank Length	770
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	9	9		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	12	12		100%

Table 4c. Visual Stream Morphology Stability Assessment Table

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 0 - 2022

UT3 Date Last Assessed: 02/08/2022

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	36
					Assessed Bank Length	72
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%.	0	0		N/A

Table 5. Vegetation Condition Assessment Table
Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Date Last Assessed: 2/8/2022
Planted Acreage **15.94**

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

Easement Acreage **18.00**

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

STREAM PHOTOGRAPHS

	
PHOTO POINT 1 - Carpenter Bottom R1 - upstream (2/3/2022)	**PHOTO POINT 1** - Carpenter Bottom R1 - downstream (2/3/2022)
	
PHOTO POINT 2 - Carpenter Bottom R1 - upstream (2/3/2022)	**PHOTO POINT 2** - Carpenter Bottom R1 - downstream (2/3/2022)
	
PHOTO POINT 3 - Carpenter Bottom R1 - upstream (2/3/2022)	**PHOTO POINT 3** - Carpenter Bottom R1 - downstream (2/3/2022)

PHOTO POINT 3 - Carpenter Bottom R1 - Floodplain Pool (2/3/2022)

PHOTO POINT 4 - Carpenter Bottom R1 - upstream (2/3/2022)

PHOTO POINT 4 - Carpenter Bottom R1 - downstream (2/3/2022)

PHOTO POINT 4A - Carpenter Bottom R1 - upstream (2/3/2022)

PHOTO POINT 4A - Carpenter Bottom R1 - downstream (2/3/2022)

	
PHOTO POINT 5 - Carpenter Bottom R1 - upstream (2/3/2022)	**PHOTO POINT 5** - Carpenter Bottom R1 - downstream (2/3/2022)
	
PHOTO POINT 6 - Carpenter Bottom R1 - upstream (2/3/2022)	**PHOTO POINT 6** - Carpenter Bottom R1 - downstream (2/3/2022)
	
PHOTO POINT 7 - Carpenter Bottom R1 - upstream (2/3/2022)	**PHOTO POINT 7** - Carpenter Bottom R1 - downstream (2/3/2022)

	
PHOTO POINT 8 - Carpenter Bottom R1 - upstream (2/3/2022)	**PHOTO POINT 8** - Carpenter Bottom R1 - downstream (2/3/2022)
	
PHOTO POINT 9 - UT1 - upstream (2/3/2022)	**PHOTO POINT 9** - UT1 - downstream (2/3/2022)
	
PHOTO POINT 9A - UT1 - upstream (2/3/2022)	**PHOTO POINT 9A** - UT1 - downstream (2/3/2022)

	
PHOTO POINT 10 - UT2 - upstream (2/3/2022)	**PHOTO POINT 10** - UT2 - downstream (2/3/2022)
	
PHOTO POINT 11 - UT3 - upstream (2/3/2022)	**PHOTO POINT 11** - UT3 - downstream (2/3/2022)
	
PHOTO POINT 12 - UT4 - upstream (2/3/2022)	**PHOTO POINT 12** - UT4 - downstream (2/3/2022)

VEGETATION PLOT PHOTOGRAPHS

	
PERMANENT VEG PLOT 1 (2/2/2022)	**PERMANENT VEG PLOT 2** (2/2/2022)
	
PERMANENT VEG PLOT 3 (2/2/2022)	**PERMANENT VEG PLOT 4** (2/2/2022)
	
PERMANENT VEG PLOT 5 (2/2/2022)	**PERMANENT VEG PLOT 6** (2/2/2022)

PERMANENT VEG PLOT 7 (2/2/2022)

PERMANENT VEG PLOT 8 (2/2/2022)

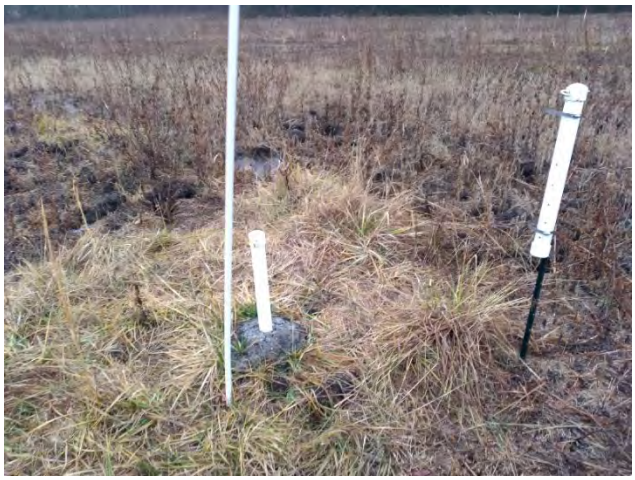
PERMANENT VEG PLOT 9 (2/3/2022)

MOBILE VEG PLOT 1 (2/2/2022)

MOBILE VEG PLOT 2 (2/2/2022)

	
MOBILE VEG PLOT 3 (2/2/2022)	**MOBILE VEG PLOT 4** (2/2/2022)

GROUNDWATER GAGE PHOTOGRAPHS

	
GROUNDWATER GAGE 1 (2/3/2022)	**GROUNDWATER GAGE 2** (2/3/2022)
	
GROUNDWATER GAGE 3 (2/3/2022)	**GROUNDWATER GAGE 4** (2/3/2022)
	
GROUNDWATER GAGE 5 (2/3/2022)	**GROUNDWATER GAGE 6** (2/3/2022)

GROUNDWATER GAGE 7 (2/3/2022)

GROUNDWATER GAGE 8 (2/3/2022)

GROUNDWATER GAGE 9 (2/3/2022)

GROUNDWATER GAGE 10 (2/3/2022)

GROUNDWATER GAGE 11 (2/3/2022)

MONITORING GAUGE INSTALLATION DATA SHEET

Project Name:	Carpenter Bottom
Project Location:	
Purpose of Gauge:	Water Table Monitoring

8/4/2021
JT/BR/EB/SW

Gauge Description:

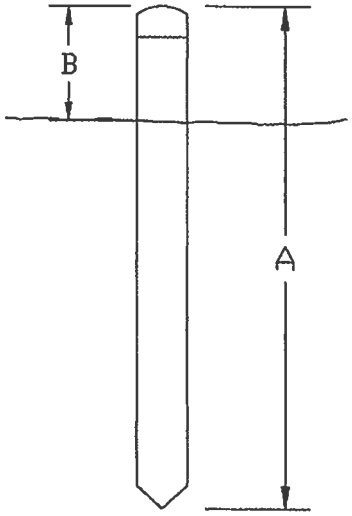
Gauge ID:	GWCB#1
Serial Number:	
Total Well Casing Length (A):	—
Well Casing Height Above Ground (B):	1.35 feet
Distance From Eye Bolt To Probe Sensor	6.34 feet
Material:	2" PVC Well Screen
Type of Measurement:	Pressure, Temperature, & Depth
Type of Logger:	In-Situ Level Troll 100
Gauge Location:	

Notes:

Water Depth 5.03 feet

Soil Profile Description at Location of Well:

Depth Range (in/Ft)	Color	Redox	Texture	Notes
0.0 - 0.8	Gley1 4/N	5YR 4/6, 20%	silt loam	
0.8 - 1.2	Gley1 2.5/N	2.5YR 4/8, 2%	clay	
1.2 - 2.6	Gley1 4/N	10YR 6/8, 15%	sandy clay	
2.6 - 3.2	Gley1 2.5/N	—	sandy loam	
3.2 - 4.2	Gley1 3/N	7.5YR 5/8, 10%	sandy clay loam	
4.2 - 5.2	Gley2 5/5B	10YR 5/8, 10%	sandy clay loam	



MONITORING GAUGE INSTALLATION DATA SHEET

Project Name:	Carpenter Bottom
Project Location:	
Purpose of Gauge:	Water Table Monitoring

8/4/2021
BR/DW/DT/EB

Gauge Description:

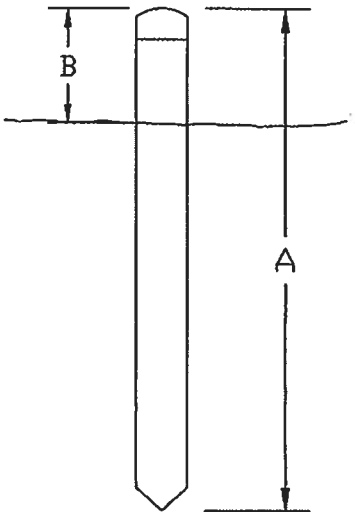
Gauge ID:	GWG #2
Serial Number:	
Total Well Casing Length (A):	
Well Casing Height Above Ground (B):	1.52 feet
Distance From Eye Bolt To Probe Sensor	6.49 feet
Material:	2" PVC Well Screen
Type of Measurement:	Pressure, Temperature, & Depth
Type of Logger:	In-Situ Level Troll 100
Gauge Location:	

Notes:

no free water

Soil Profile Description at Location of Well:

Depth Range (in) (Ft.)	Color	Redox	Texture	Notes
0 - 1.1	10YR 3/1	—	silty clay loam	
1.1 - 2.0	Gley1 4/N	10YR 6/8, 15%	clay	
2.0 - 2.4	Gley1 5/N	10YR 5/8 30%	clay	#charcoal throughout
2.4 - 3.4	Gley1 3/N	7.5YR 5/8, 3%	silty clay loam	#depletions
	Gley2 5/5BG			
3.4 - 4.6	Gley2 4/5	5Y 5/6, 10%	silt clay loam	



MONITORING GAUGE INSTALLATION DATA SHEET

Project Name:	Carpenter Bottom
Project Location:	
Purpose of Gauge:	Water Table Monitoring

8/4/2021
DW/EB/ST/BR

Gauge Description:

Gauge ID:	GWG #3
Serial Number:	
Total Well Casing Length (A):	
Well Casing Height Above Ground (B):	1.91 feet
Distance From Eye Bolt To Probe Sensor	82 5/8 inch
Material:	2" PVC Well Screen
Type of Measurement:	Pressure, Temperature, & Depth
Type of Logger:	In-Situ Level Troll 100
Gauge Location:	

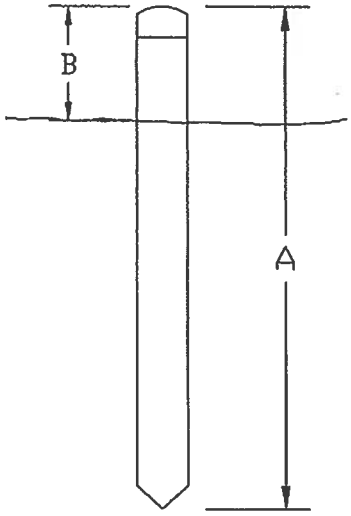
Notes:

water depth: 74 1/8 inch
* soil info from previous GWG #4 in preliminary assessment data
* well reused for monitoring

Soil Profile Description at Location of Well:

7/4/2019

Depth Range (in) (Ft.)	Color	Redox	Texture	Notes
0-1.5	10YR 3/1	10YR 5/6 1%	clay	
1.5-3.0	10YR 3/1	10YR 5/6 20%	clay	
3.0-5.0	2.5Y 4/1	10YR 5/8 40%	clay	gravel



MONITORING GAUGE INSTALLATION DATA SHEET

Project Name:	Carpenter Bottom
Project Location:	
Purpose of Gauge:	Water Table Monitoring

8/4/2021
SW/EB/ST/BR

Gauge Description:

Gauge ID:	GWG #4
Serial Number:	
Total Well Casing Length (A):	
Well Casing Height Above Ground (B):	1.88 feet
Distance From Eye Bolt To Probe Sensor	8 5/8 inch
Material:	2" PVC Well Screen
Type of Measurement:	Pressure, Temperature, & Depth
Type of Logger:	In-Situ Level Troll 100
Gauge Location:	

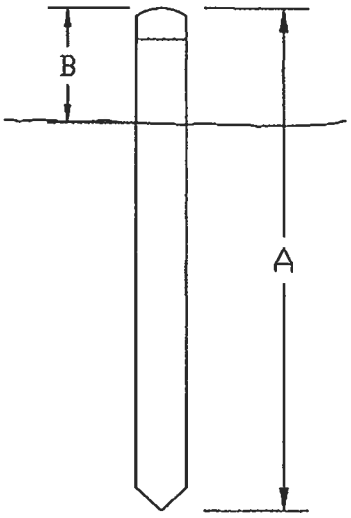
Notes:

Water depth: 47 inches
*Soil info from previous GWG3 in preliminary assessment data
*well reused for monitoring

Soil Profile Description at Location of Well:

4/2019

Depth Range (in) (Ft.)	Color	Redox	Texture	Notes
0 - 0.5	10YR 3/1		clay	
0.5 - 2.5	5Y 3/1	2.5Y 5/6 7%	clay	
2.5 - 3.5	10YR 3/1	10YR 5/8 30%	clay	
3.5 - 4.5	2.5Y 4/1	10YR 5/8 50%	clay	fine gravel
4.5 - 5.0	Gley1 4/N	10YR 5/8 50%	clay	& fine gravel



MONITORING GAUGE INSTALLATION DATA SHEET

2/8/2022
JT / BR

Project Name:	Carpenter Bottom
Project Location:	
Purpose of Gauge:	Water Table Monitoring

Gauge Description:

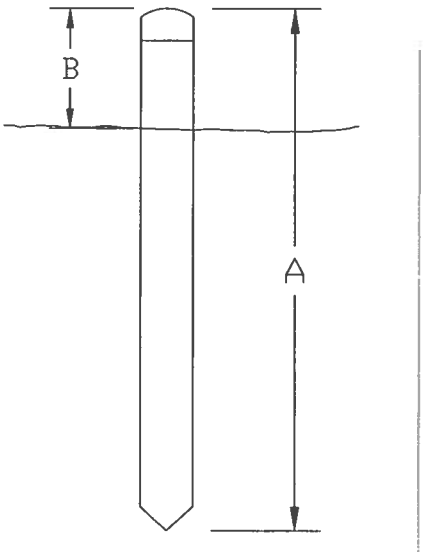
Gauge ID:	GWB#5 - New
Serial Number:	
Total Well Casing Length (A):	
Well Casing Height Above Ground (B):	1.13'
Distance From Eye Bolt To Probe Sensor	6.45'
Material:	2" PVC Well Screen
Type of Measurement:	Pressure, Temperature, & Depth
Type of Logger:	In-Situ Level Troll 100
Gauge Location:	

Notes:

4.70' to free water

Soil Profile Description at Location of Well:

Depth Range (in) (Ft.)	Color	Redox	Texture	Notes
0.0 - 0.8	10YR 3/2	-	Loam	
0.8 - 1.6	2.5Y 7/1	5% 10YR 5/6	Loamy clay	
1.6 - 3.0	2.5Y 6/1	30% 10YR 5/8	clay	
3.0 - 3.8	2.5Y 5/1	40% 10YR 6/8	clay	5% Manganese
3.8 - 4.4	2.5Y 5/1	40% 2.5Y 6/6	sandy clay	Depleted Matrix
4.4 - 5.2	2.5Y 5/1	-	Clayey sand	w/ small gravel



MONITORING GAUGE INSTALLATION DATA SHEET

Project Name:	Carpenter Bottom
Project Location:	
Purpose of Gauge:	Water Table Monitoring

8/3/2021
SW/EB/ST/BR

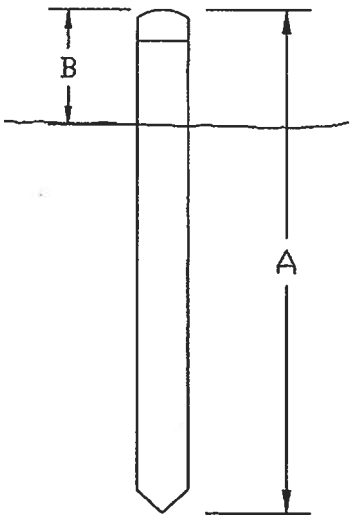
Gauge Description:

Gauge ID:	GWG#6
Serial Number:	
Total Well Casing Length (A):	
Well Casing Height Above Ground (B):	1.31 ft
Distance From Eye Bolt To Probe Sensor	6.39 ft.
Material:	2" PVC Well Screen
Type of Measurement:	Pressure, Temperature, & Depth
Type of Logger:	In-Situ Level Troll 100
Gauge Location:	

Notes:
no free water

Soil Profile Description at Location of Well:

Depth Range (in) (Ft.)	Color	Redox	Texture	Notes
0-1.5	10YR, 2/2	—	silty clay loam	
1.5-1.8	10YR, 2/2	10YR 5/8 20%	silty clay loam	
1.8-2.8	10YR, 6/8	2.5Y 4/1 20%	sandy clay loam (depleted)	
2.8-3.9	10YR, 4/6	2.5Y 5/1 20%	clay	* Black charcoal, depletions
3.9-4.8	5Y 5/2	10YR 6/8 15%	clay	
4.8-5.2	Gley2 6/10Y	10YR 3/6 10%	silt loam	



MONITORING GAUGE INSTALLATION DATA SHEET

Project Name:	Carpenter Bottom
Project Location:	
Purpose of Gauge:	Water Table Monitoring

8/3/2021
MW/EB/DT/BR

Gauge Description:

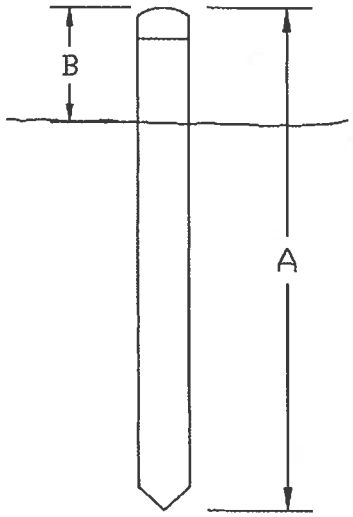
Gauge ID:	GWG #7
Serial Number:	
Total Well Casing Length (A):	
Well Casing Height Above Ground (B):	1.39 ft.
Distance From Eye Bolt To Probe Sensor	6.40 ft.
Material:	2" PVC Well Screen
Type of Measurement:	Pressure, Temperature, & Depth
Type of Logger:	In-Situ Level Troll 100
Gauge Location:	

Notes:

full water: 2.15 ft.

Soil Profile Description at Location of Well:

Depth Range (in) (Ft.)	Color	Redox	Texture	Notes
0 - 0.8	10YR 4/1	5YR 4/6 30%	silt loam	
0.8 - 1.4	10YR 2/1	10YR 5/8 3%	silty clay loam	
1.4 - 3.3	Gley1 5/5N	10YR 5/8 1%	clay loam	
3.3 - 4.2	Gley2 5/10G	—	sandy clay	
4.2 - 5.0	Gley2 4/10G	—	silty clay loam	



MONITORING GAUGE INSTALLATION DATA SHEET

Project Name:	Carpenter Bottom
Project Location:	
Purpose of Gauge:	Water Table Monitoring

8/3/2021
JW/EB/ST/BR

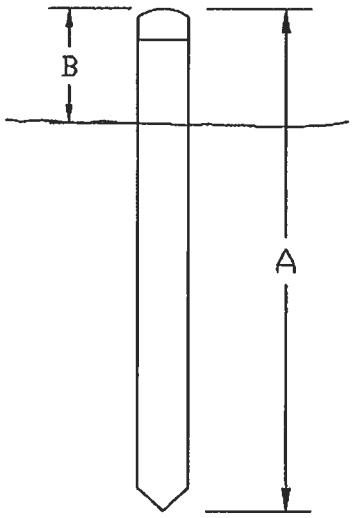
Gauge Description:

Gauge ID:	SWG #8
Serial Number:	
Total Well Casing Length (A):	
Well Casing Height Above Ground (B):	1.54 ft
Distance From Eye Bolt To Probe Sensor	6.4 ft.
Material:	2" PVC Well Screen
Type of Measurement:	Pressure, Temperature, & Depth
Type of Logger:	In-Situ Level Troll 100
Gauge Location:	

Notes:
well water depth: 4.8 ft.

Soil Profile Description at Location of Well:

Depth Range (in) (Ft.)	Color	Redox	Texture	Notes
0 - 0.7	2.5YR 4/2	7.5YR 5/6, 10%	c	ay loam
0.7 - 1.3	10YR 4/2	10YR 5/8 5%	clay	
1.3 - 2.3	2.5Y 5/2	10YR 4/6 20%	sandy clay	
2.3 - 2.8	Gley1 5/N	10YR 5/8 25%	clay	
		30-40% charcoal		
2.8 - 3.6	10YR 6/8	Gley1 4/N 30%	sandy clay	* depletion
3.6 - 4.8	Gley2 5/10G	7.5YR 5/8 5%	clay	
4.8 - 5.0	Gley2 4/10G	—	silt loam	*mica throughout



MONITORING GAUGE INSTALLATION DATA SHEET

8/4/2021
SW/EB/ST/BR

Project Name:	Carpenter Bottom
Project Location:	
Purpose of Gauge:	Water Table Monitoring

Gauge Description:

Gauge ID:	GWG#9
Serial Number:	
Total Well Casing Length (A):	
Well Casing Height Above Ground (B):	2.39 ft
Distance From Eye Bolt To Probe Sensor	82 1/4 inch
Material:	2" PVC Well Screen
Type of Measurement:	Pressure, Temperature, & Depth
Type of Logger:	In-Situ Level Troll 100
Gauge Location:	

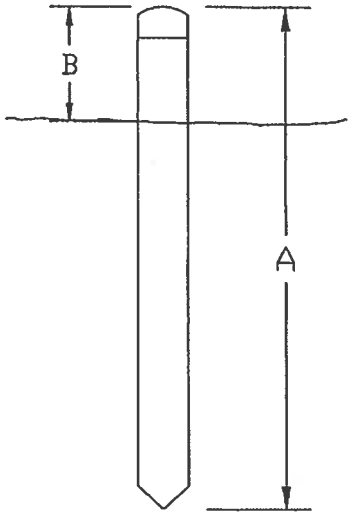
Notes:

water depth 50 7/8 inch.
*used previous GWG2 soil profile from preliminary assessment on 3/4/2019
* Well re-used for monitoring

Soil Profile Description at Location of Well:

Depth Range (in) (Ft.)	Color	Redox	Texture	Notes
0-0.5	10YR 5/3		clay	
0.5-1.5	10YR 3/2	2.5Y 5/6 5%	Clay	
1.5-3.0	2.5Y 5/1	2.5Y 5/6 40%	Clay	
3.0-5.0	5Gley1 5/N	10YR 5/8 90%	Clay	gravel

3/4/2019



MONITORING GAUGE INSTALLATION DATA SHEET

Project Name:	Carpenter Bottom
Project Location:	
Purpose of Gauge:	Water Table Monitoring

8/4/2021
SW/EB/ST/BR

Gauge Description:

Gauge ID:	GW Well #10
Serial Number:	
Total Well Casing Length (A):	
Well Casing Height Above Ground (B):	2.05 feet
Distance From Eye Bolt To Probe Sensor	82 5/8 inch
Material:	2" PVC Well Screen
Type of Measurement:	Pressure, Temperature, & Depth
Type of Logger:	In-Situ Level Troll 100
Gauge Location:	

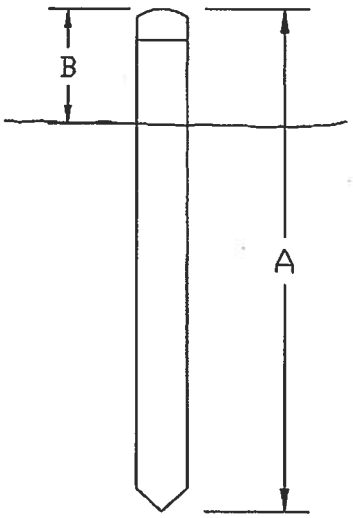
Notes:

water depth : 50.5 inch
* used previous GW well soil profile from preliminary assessment on 3/4/2019
* well reused for monitoring

Soil Profile Description at Location of Well:

4/8/2019

Depth Range (in.) (Ft.)	Color	Redox	Texture	Notes
0-0.4	10YR 3/1		clay	
0.4-2.0	10YR 3/1	10YR 5/6 5%	clay	
2.0-3.5	7.5YR 2.5/1	7.5YR 5/6 5%	clay	
3.5-5.0	Gley1 3/N	10YR 5/8 30%	clay	



MONITORING GAUGE INSTALLATION DATA SHEET

Project Name:	Carpenter Bottom
Project Location:	
Purpose of Gauge:	Water Table Monitoring

8/3/2021
JW/EB/JT/BR

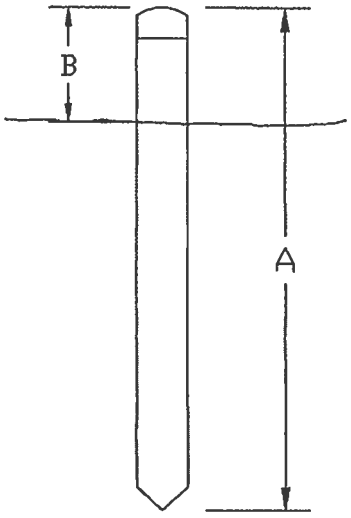
Gauge Description:

Gauge ID:	GWG # 11
Serial Number:	
Total Well Casing Length (A):	
Well Casing Height Above Ground (B):	1.90 feet
Distance From Eye Bolt To Probe Sensor	6.94 feet
Material:	2" PVC Well Screen
Type of Measurement:	Pressure, Temperature, & Depth
Type of Logger:	In-Situ Level Troll 100
Gauge Location:	

Notes:
free water depth: 4.64 feet

Soil Profile Description at Location of Well:

Depth Range (in) (Ft.)	Color	Redox	Texture	Notes
0 - 0.9	10YR 4/2	5YR 5/8, 5%	sandy	loam
0.9 - 1.1	10YR 3/1	5YR 5/8, 5%	silty	clay
		2.5YR 5/8, 5%		
1.1 - 1.6	Gley1 2.5/N	5YR 4/6, 3%	sandy	clay loam
1.6 - 2.5	Gley1 3/N	7.5YR 5/8 20%	clay	
2.5 - 2.9	Gley1 4/N	10YR 5/8, 30%	clay loam	* mag indicator
		5YR 4/6 20%		
2.9 - 4.3	Gley1 3/N	7.5YR 5/8, 3%	sandy	clay loam
43 - 53	Gley2 0/5B	7.5YR 5/8, 20%	clay	



APPENDIX B. Vegetation Plot Data

Table 6a. Vegetation Plot Data

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Planted Acreage	15.938
Date of Initial Plant	2022-02-01
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2022-02-02
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 5 F		Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F		Veg Plot 9 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	3	3			1	1	2	2	1	1			1	1	1	1	1	1
	Alnus serrulata	hazel alder	Tree	OBL	3	3											2	2				
	Amelanchier arborea	common serviceberry	Tree	FAC													2	2				
	Betula nigra	river birch	Tree	FACW			2	2	1	1	1	1	3	3	2	2	1	1	3	3	1	1
	Celtis laevigata	sugarberry	Tree	FACW					2	2												
	Cephalanthus occidentalis	common buttonbush	Shrub	OBL	4	4							1	1	1	1						
	Cornus amomum	silky dogwood	Shrub	FACW													1	1				
	Diospyros virginiana	common persimmon	Tree	FAC																	1	1
	Fagus grandifolia	American beech	Tree	FACU															3	3	2	2
	Lindera benzoin	northern spicebush	Tree	FAC			1	1							1	1	3	3				
	Liriodendron tulipifera	tuliptree	Tree	FACU													2	2	1	1		
	Nyssa sylvatica	blackgum	Tree	FAC			1	1			1	1	1	1	1	1						
	Platanus occidentalis	American sycamore	Tree	FACW	3	3	3	3	4	4	3	3	2	2	1	1	1	1	3	3	5	5
	Populus deltoides	eastern cottonwood	Tree	FAC													1	1	2	2	3	3
	Quercus michauxii	swamp chestnut oak	Tree	FACW	3	3	1	1	1	1	1	1	1	1	1	1						
	Quercus pagoda	cherrybark oak	Tree	FACW			4	4	3	3	3	3	1	1	1	1						
	Quercus phellos	willow oak	Tree	FAC			2	2	2	2	3	3	3	3			2	2	2	2	1	1
	Sambucus canadensis	American black elderberry	Tree										2	2								
	Ulmus americana	American elm	Tree	FACW	1	1	1	1	2	2	1	1			6	6						
Sum	Performance Standard				17	17	15	15	16	16	15	15	15	15	14	14	16	16	15	15	14	14
Mitigation Plan Performance Standard	Current Year Stem Count					17		15		16		15		15		14		16		15		14
	Stems/Acre					688		607		648		607		607		567		648		607		567
	Species Count					6		8		8		8		9		8		10		7		7
	Dominant Species Composition (%)					24		27		25		20		20		43		19		20		36
	Average Plot Height (ft.)					2		2		2		2		2		2		2		2		3
	% Invasives					0		0		0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					17		15		16		15		15		14		16		15		14
	Stems/Acre					688		607		648		607		607		567		648		607		567
	Species Count					6		8		8		8		9		8		10		7		7
	Dominant Species Composition (%)					24		27		25		20		20		43		19		20		36
	Average Plot Height (ft.)					2		2		2		2		2		2		2		2		3
	% Invasives					0		0		0		0		0		0		0		0		0

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

Table 6b. Vegetation Plot Data

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Planted Acreage	15.938
Date of Initial Plant	2022-02-01
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2022-02-02
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 1 R Total	Veg Plot 2 R Total	Veg Plot 3 R Total	Veg Plot 4 R Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	2	2	1	3
	Alnus serrulata	hazel alder	Tree	OBL	3			
	Amelanchier arborea	common serviceberry	Tree	FAC		3		
	Betula nigra	river birch	Tree	FACW	4	5	2	1
	Celtis laevigata	sugarberry	Tree	FACW				
	Cephalanthus occidentalis	common buttonbush	Shrub	OBL	1			
	Cornus amomum	silky dogwood	Shrub	FACW				
	Diospyros virginiana	common persimmon	Tree	FAC			1	
	Fagus grandifolia	American beech	Tree	FACU			1	3
	Lindera benzoin	northern spicebush	Tree	FAC		1	1	1
	Liriodendron tulipifera	tuliptree	Tree	FACU		2	1	1
	Nyssa sylvatica	blackgum	Tree	FAC				
	Platanus occidentalis	American sycamore	Tree	FACW	2	1	2	4
	Populus deltoides	eastern cottonwood	Tree	FAC			4	1
	Quercus michauxii	swamp chestnut oak	Tree	FACW				
	Quercus pagoda	cherrybark oak	Tree	FACW	1			
	Quercus phellos	willow oak	Tree	FAC		2		
	Sambucus canadensis	American black elderberry	Tree					
	Ulmus americana	American elm	Tree	FACW				
Sum	Performance Standard				13	16	13	14
Mitigation Plan Performance Standard	Current Year Stem Count				13	16	13	14
	Stems/Acre				526	648	526	567
	Species Count				6	7	8	7
	Dominant Species Composition (%)				31	31	31	29
	Average Plot Height (ft.)				2	2	2	2
	% Invasives				0	0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count				13	16	13	14
	Stems/Acre				526	648	526	567
	Species Count				6	7	8	7
	Dominant Species Composition (%)				31	31	31	29
	Average Plot Height (ft.)				2	2	2	2
	% Invasives				0	0	0	0

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

Table 7. Vegetation Performance Standards Summary Table
Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

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

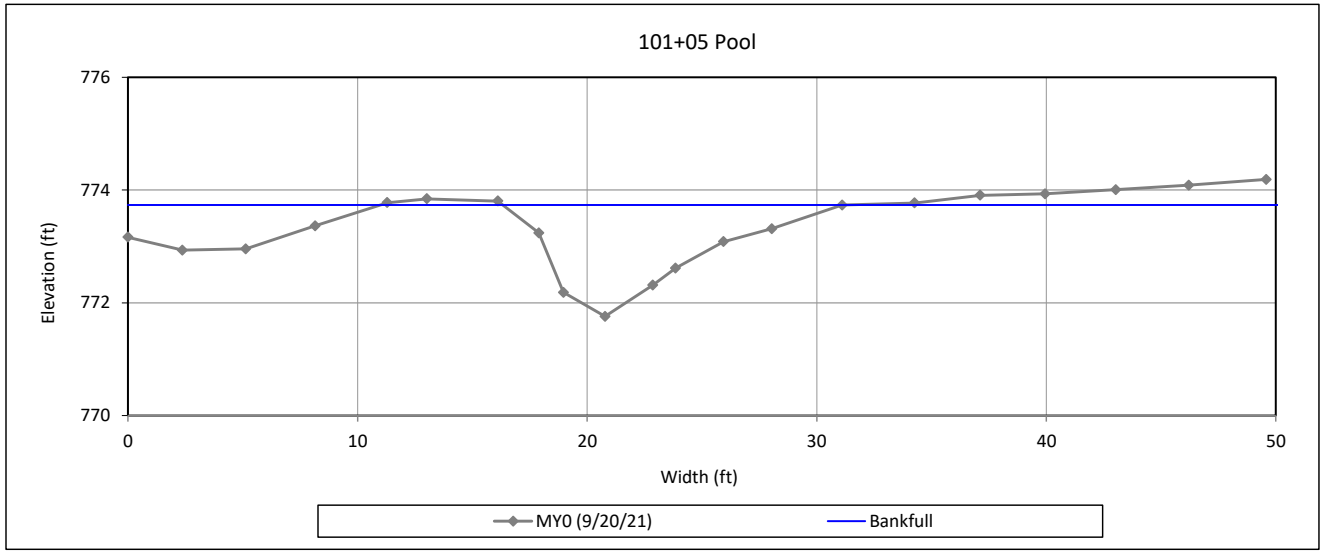
*Each monitoring year represents a different plot for the random vegetation plot "groups". Random plots are denoted with an R, and fixed plots with an F.

APPENDIX C. Stream Geomorphology Data

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 1 - Carpenter Branch Reach 1



Bankfull Dimensions	
13.1	x-section area (ft.sq.)
14.8	width (ft)
0.9	mean depth (ft)
2.0	max depth (ft)
15.5	wetted perimeter (ft)
0.8	hydraulic radius (ft)
16.7	width-depth ratio

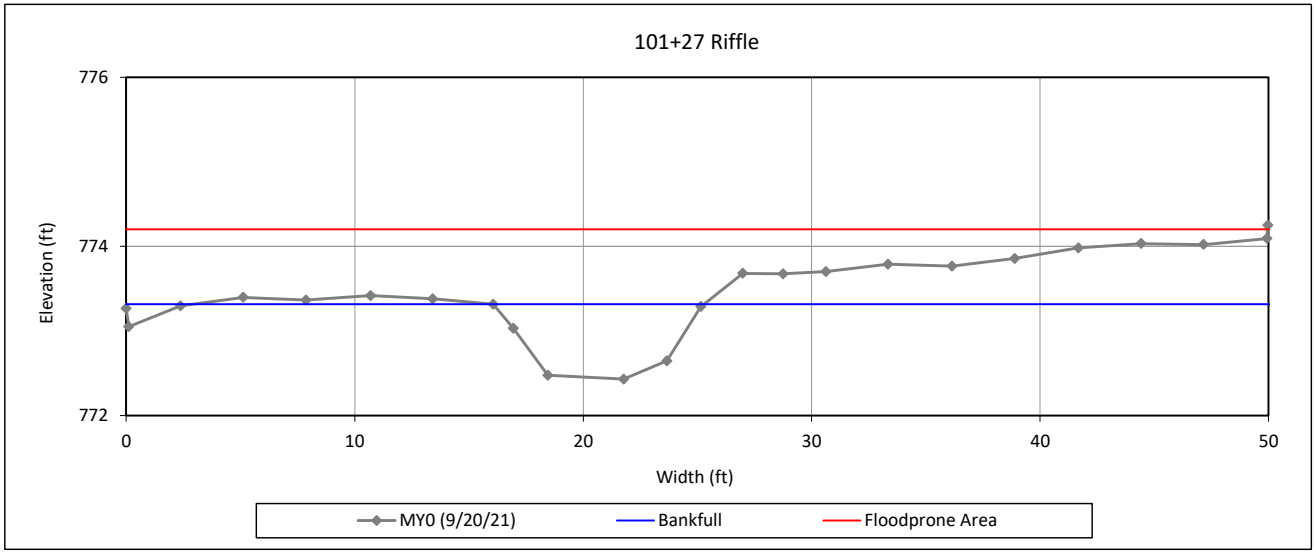
Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 2 - Carpenter Branch Reach 1



Bankfull Dimensions

5.8	x-section area (ft.sq.)
9.2	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
9.5	wetted perimeter (ft)
0.6	hydraulic radius (ft)
14.6	width-depth ratio
50.0	W flood prone area (ft)
5.4	entrenchment ratio
1.0	low bank height ratio

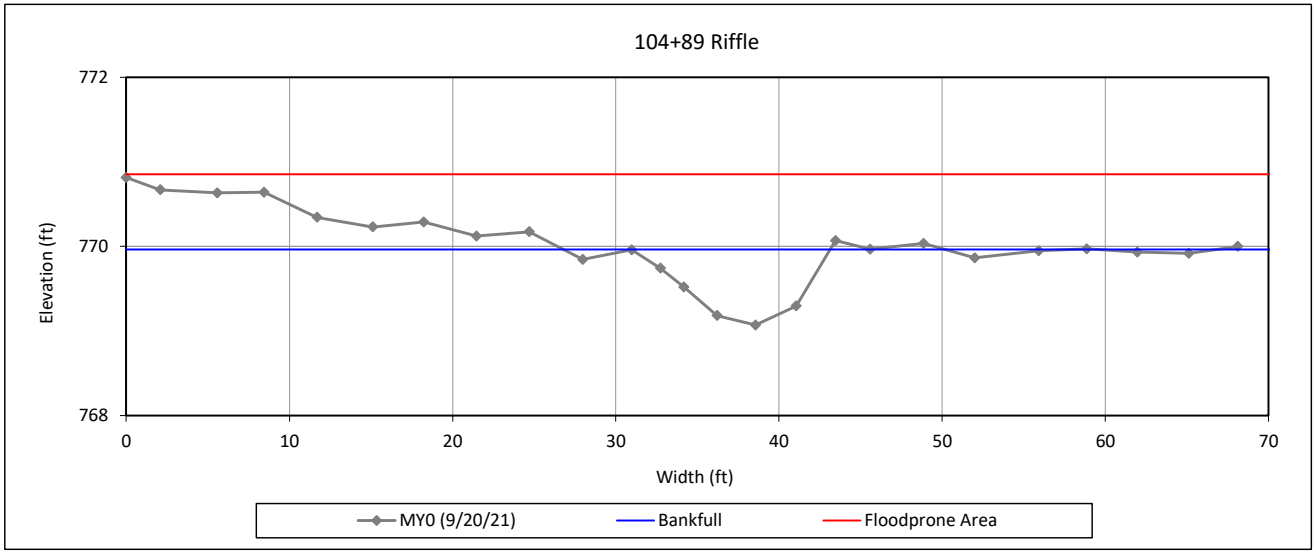
Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 3 - Carpenter Branch Reach 1



Bankfull Dimensions

6.5	x-section area (ft.sq.)
12.2	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
12.3	wetted perimeter (ft)
0.5	hydraulic radius (ft)
22.7	width-depth ratio
68.1	W flood prone area (ft)
5.6	entrenchment ratio
1.0	low bank height ratio

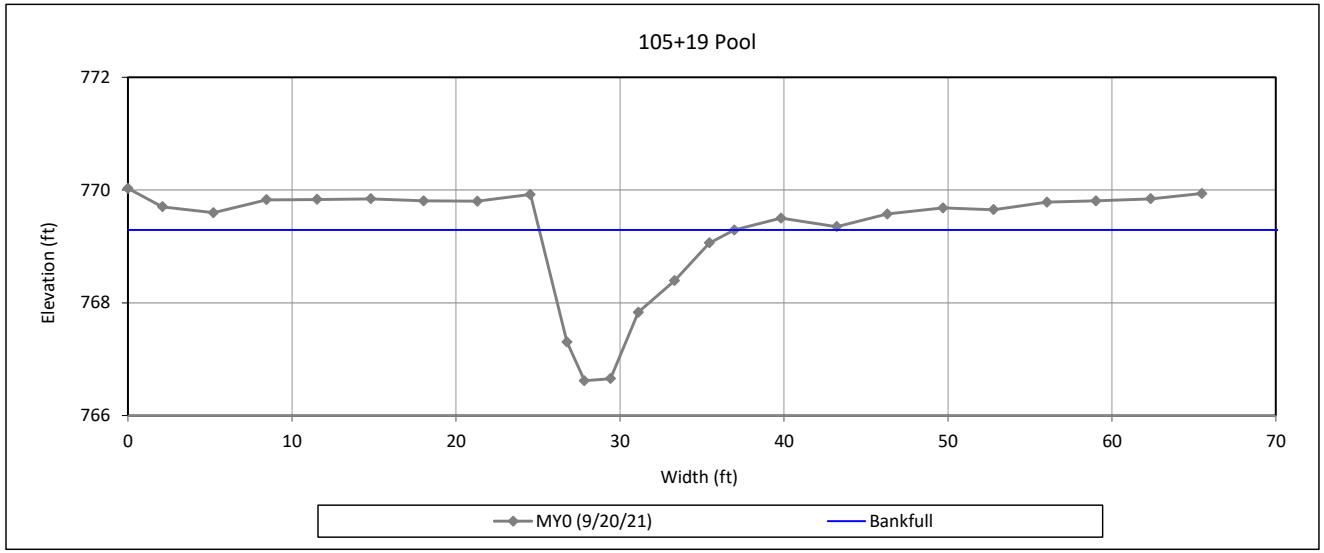
Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 4 - Carpenter Branch Reach 1



Bankfull Dimensions	
15.8	x-section area (ft.sq.)
11.9	width (ft)
1.3	mean depth (ft)
2.7	max depth (ft)
13.6	wetted perimeter (ft)
1.2	hydraulic radius (ft)
9.0	width-depth ratio

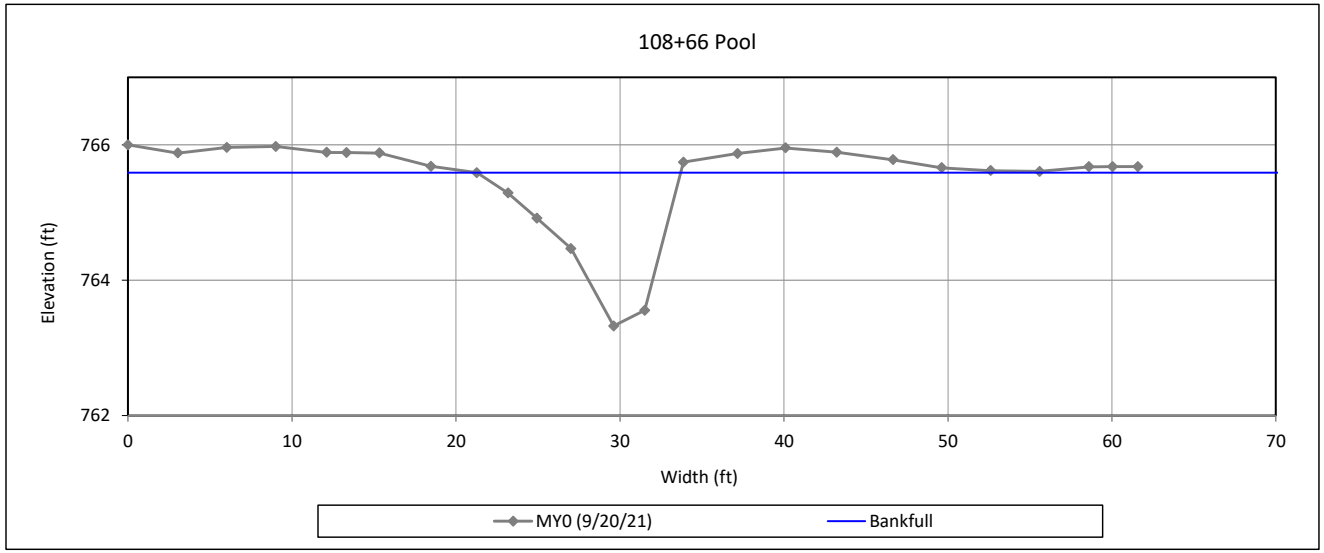
Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 5 - Carpenter Branch Reach 1



Bankfull Dimensions	
13.7	x-section area (ft.sq.)
12.4	width (ft)
1.1	mean depth (ft)
2.3	max depth (ft)
13.6	wetted perimeter (ft)
1.0	hydraulic radius (ft)
11.3	width-depth ratio

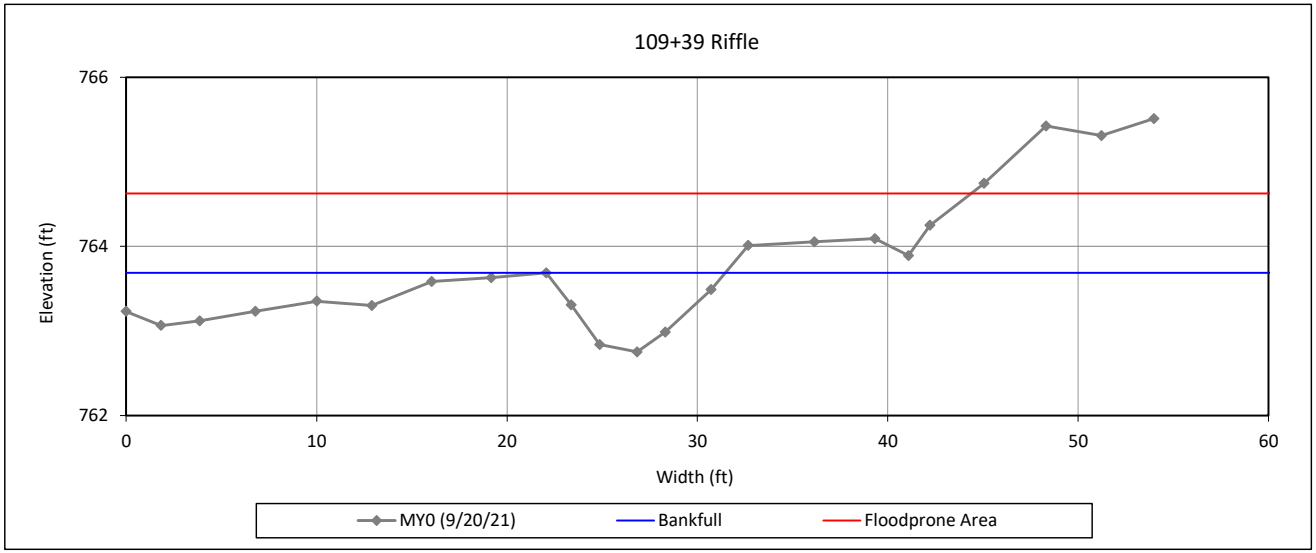
Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 6 - Carpenter Branch Reach 1



Bankfull Dimensions

5.3	x-section area (ft.sq.)
9.4	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
9.6	wetted perimeter (ft)
0.5	hydraulic radius (ft)
16.7	width-depth ratio
44.4	W flood prone area (ft)
4.7	entrenchment ratio
1.0	low bank height ratio

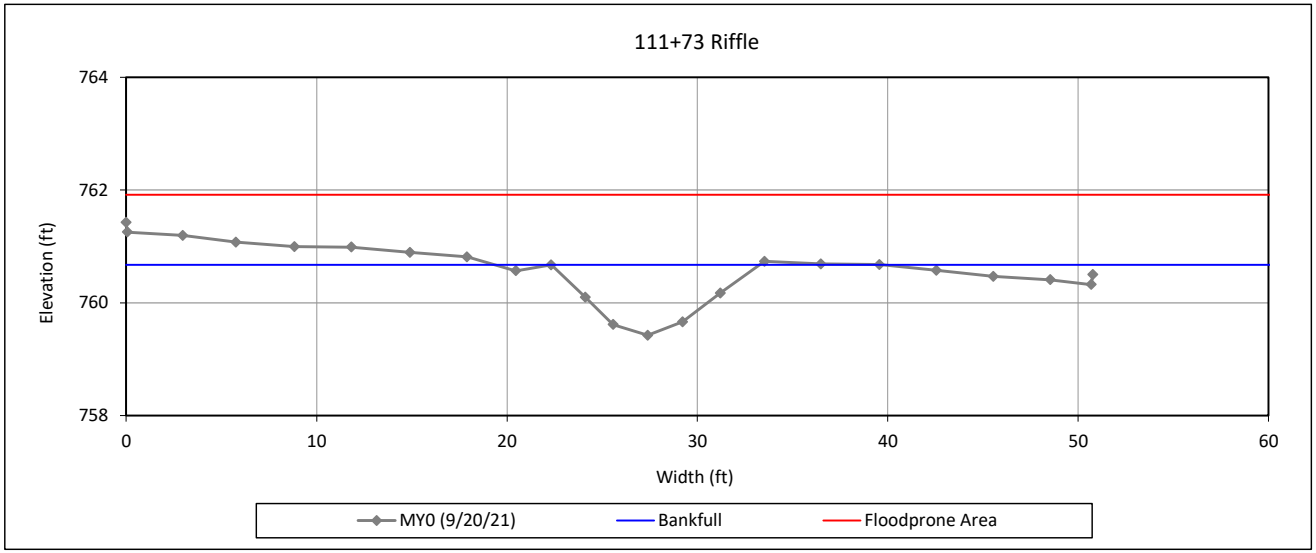
Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 7 - Carpenter Branch Reach 1



Bankfull Dimensions

7.9	x-section area (ft.sq.)
10.9	width (ft)
0.7	mean depth (ft)
1.2	max depth (ft)
11.2	wetted perimeter (ft)
0.7	hydraulic radius (ft)
15.2	width-depth ratio
50.8	W flood prone area (ft)
4.6	entrenchment ratio
1.0	low bank height ratio

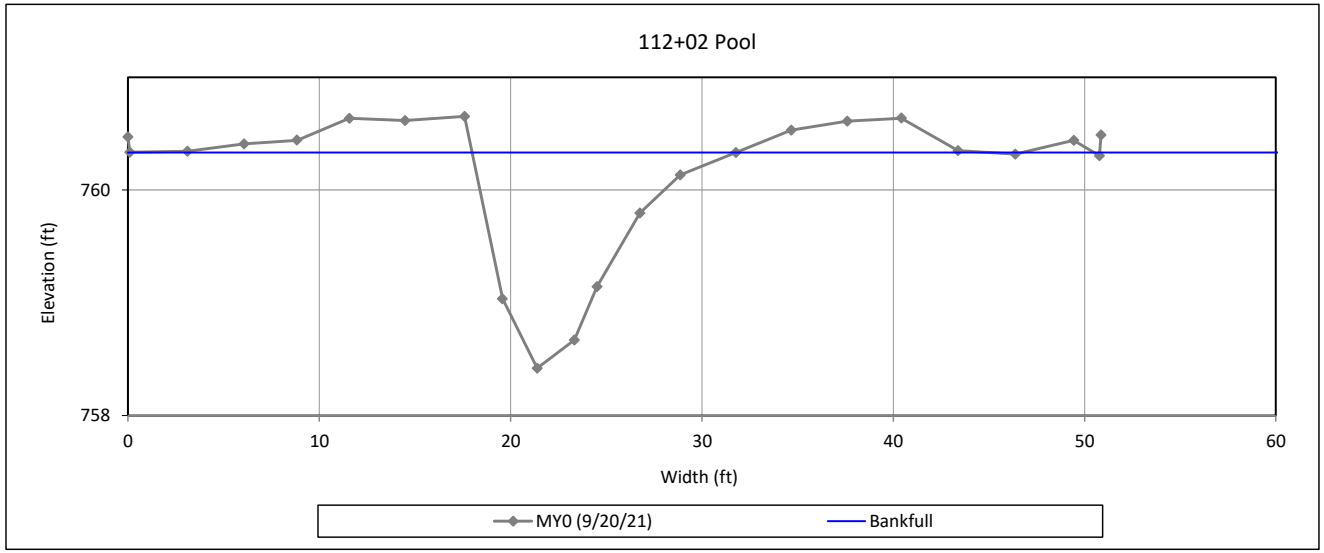
Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 8 - Carpenter Branch Reach 1



Bankfull Dimensions	
12.1	x-section area (ft.sq.)
13.8	width (ft)
0.9	mean depth (ft)
1.9	max depth (ft)
14.6	wetted perimeter (ft)
0.8	hydraulic radius (ft)
15.7	width-depth ratio

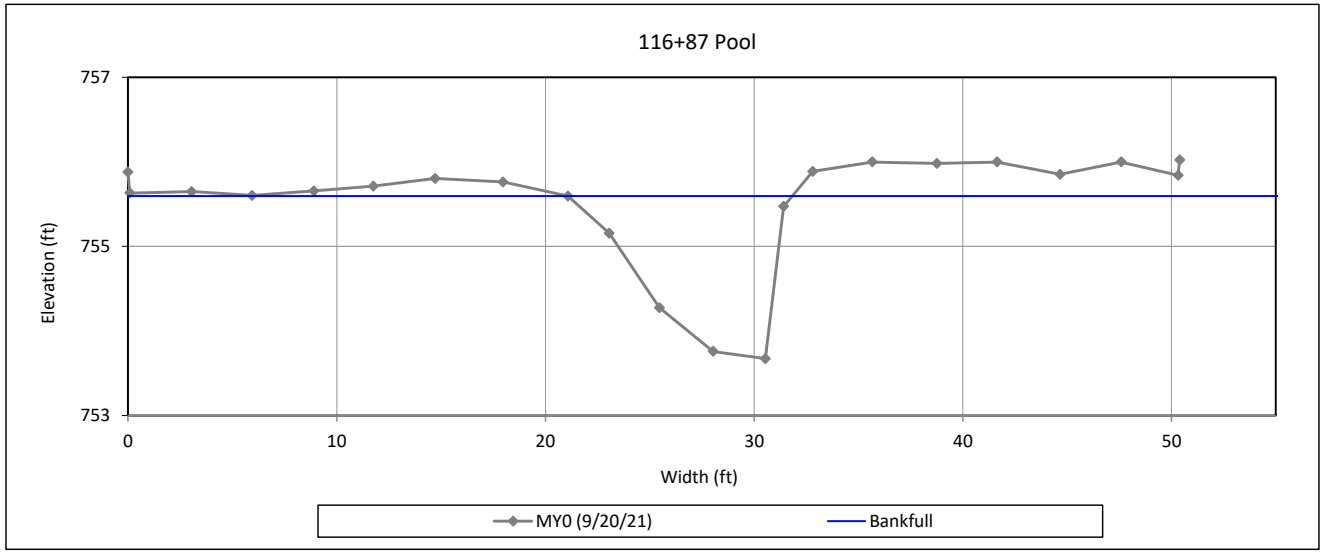
Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 9 - Carpenter Branch Reach 1



Bankfull Dimensions	
12.2	x-section area (ft.sq.)
10.8	width (ft)
1.1	mean depth (ft)
1.9	max depth (ft)
12.2	wetted perimeter (ft)
1.0	hydraulic radius (ft)
9.5	width-depth ratio

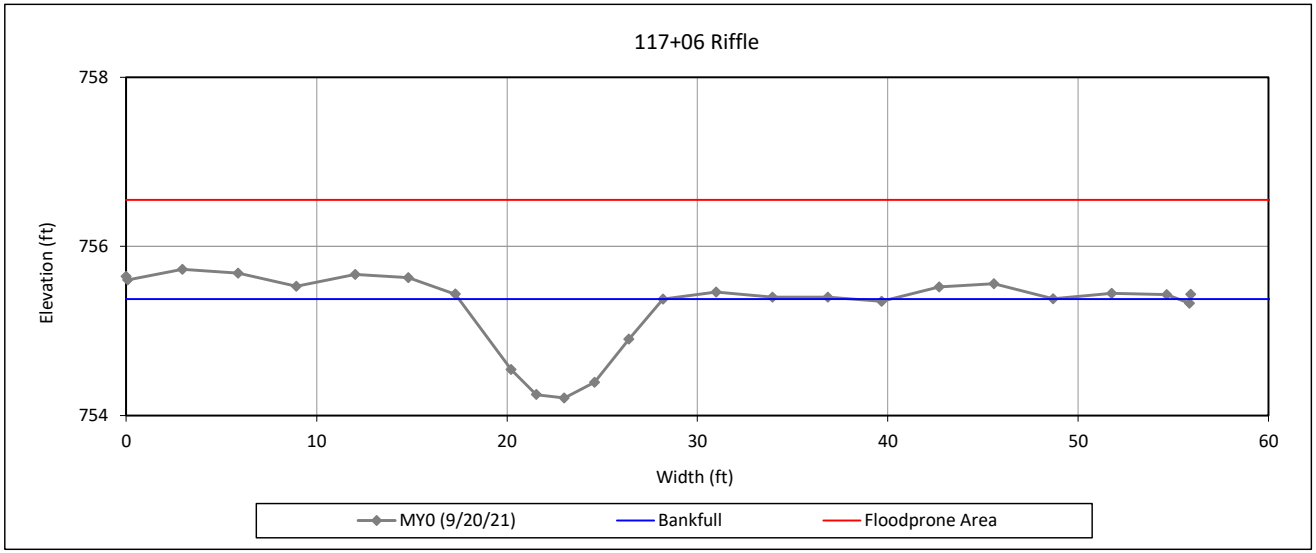
Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 10 - Carpenter Branch Reach 1



Bankfull Dimensions

7.6	x-section area (ft.sq.)
10.7	width (ft)
0.7	mean depth (ft)
1.2	max depth (ft)
11.0	wetted perimeter (ft)
0.7	hydraulic radius (ft)
15.1	width-depth ratio
55.9	W flood prone area (ft)
5.2	entrenchment ratio
1.0	low bank height ratio

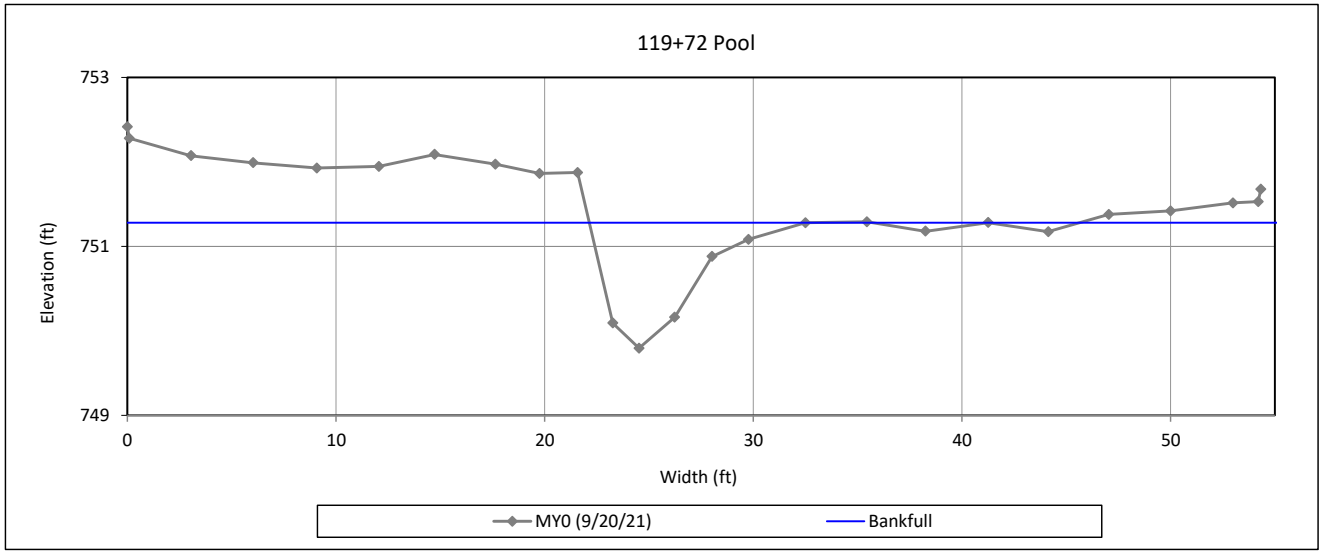
Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 11 - Carpenter Branch Reach 1



Bankfull Dimensions	
6.7	x-section area (ft.sq.)
10.4	width (ft)
0.6	mean depth (ft)
1.5	max depth (ft)
11.1	wetted perimeter (ft)
0.6	hydraulic radius (ft)
15.9	width-depth ratio

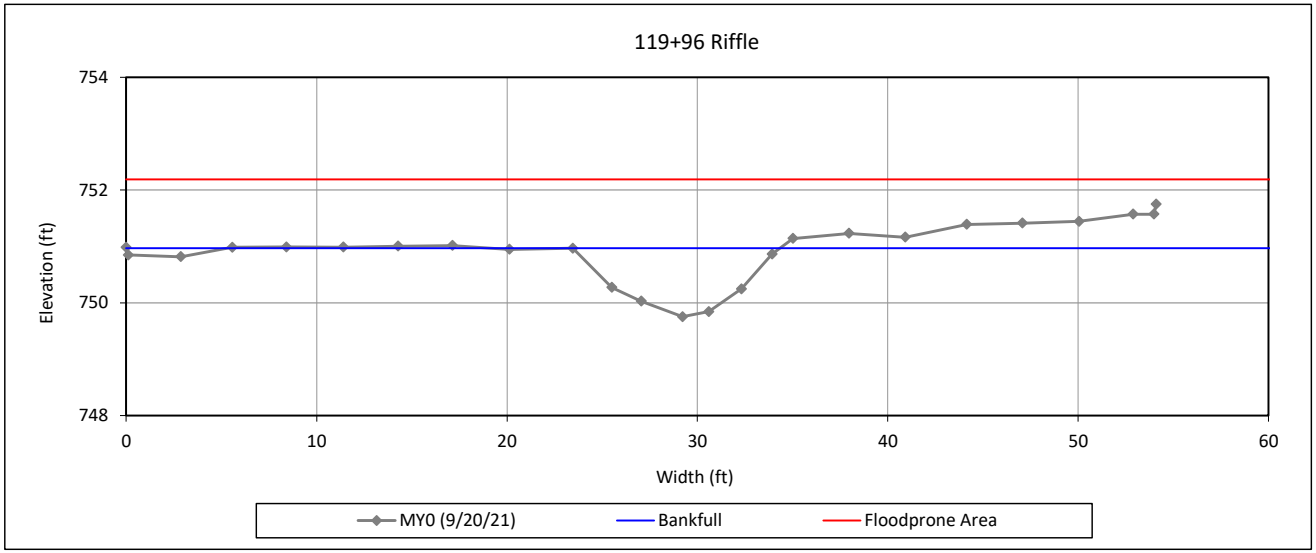
Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 12 - Carpenter Branch Reach 1



Bankfull Dimensions

8.2	x-section area (ft.sq.)
10.9	width (ft)
0.8	mean depth (ft)
1.2	max depth (ft)
11.2	wetted perimeter (ft)
0.7	hydraulic radius (ft)
14.4	width-depth ratio
54.1	W flood prone area (ft)
5.0	entrenchment ratio
1.0	low bank height ratio

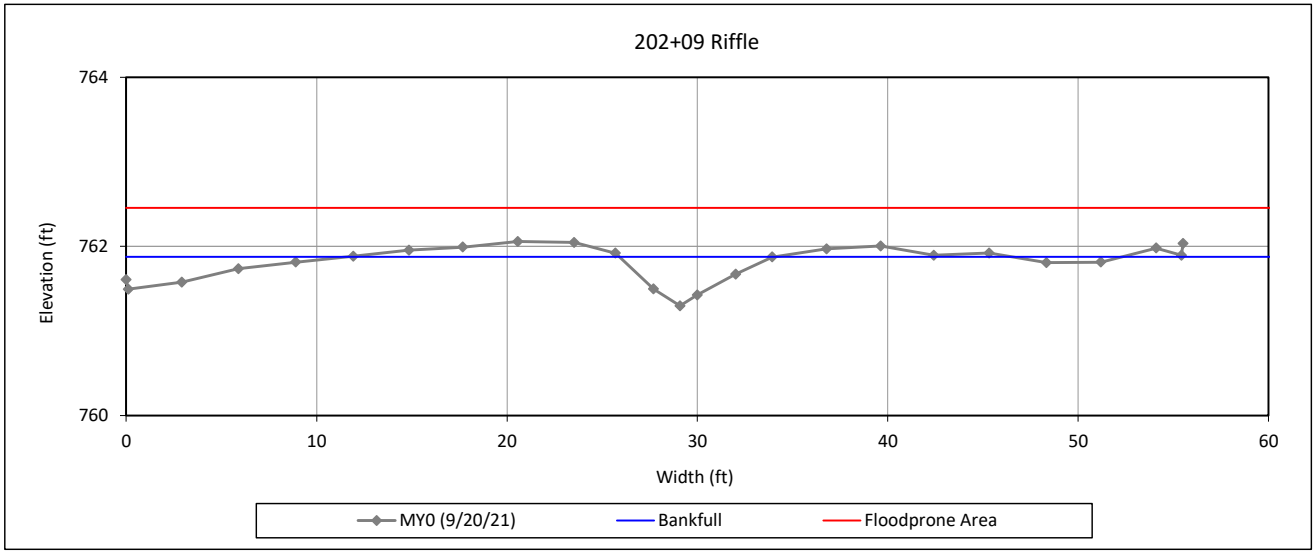
Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 13 - UT1



Bankfull Dimensions

2.3	x-section area (ft.sq.)
8.0	width (ft)
0.3	mean depth (ft)
0.6	max depth (ft)
8.1	wetted perimeter (ft)
0.3	hydraulic radius (ft)
27.6	width-depth ratio
55.5	W flood prone area (ft)
6.9	entrenchment ratio
1.0	low bank height ratio

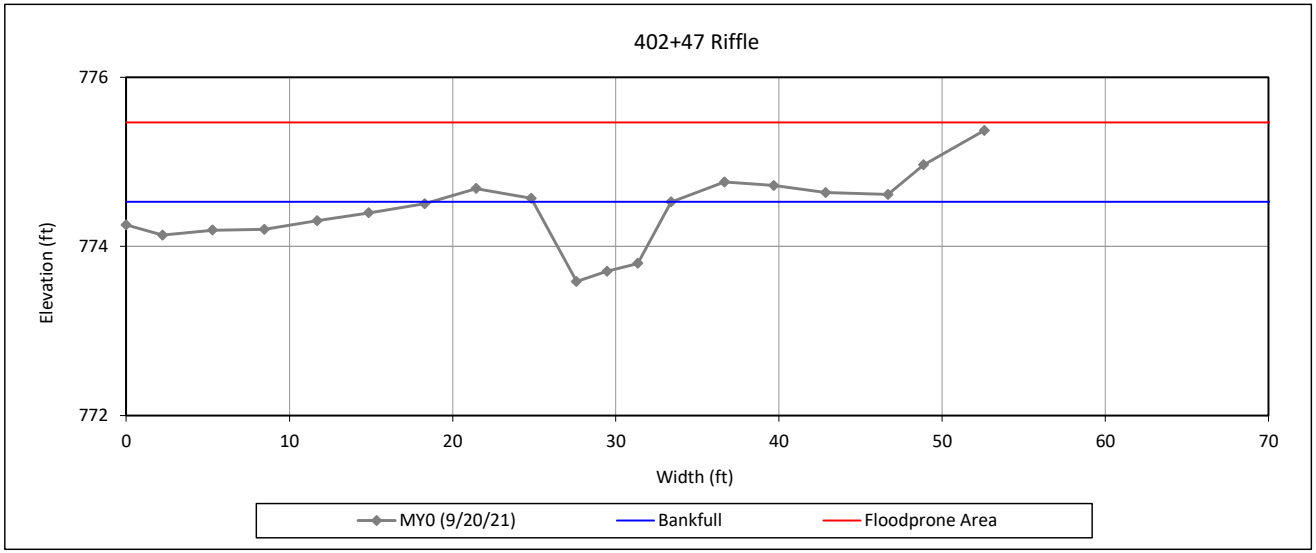
Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Cross-Section 14 - UT3



Bankfull Dimensions

5.1	x-section area (ft.sq.)
8.4	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
8.7	wetted perimeter (ft)
0.6	hydraulic radius (ft)
14.0	width-depth ratio
52.6	W flood prone area (ft)
6.2	entrenchment ratio
1.0	low bank height ratio

Survey Date: 9/20/21
Field Crew: Turner Land Surveying

View Downstream

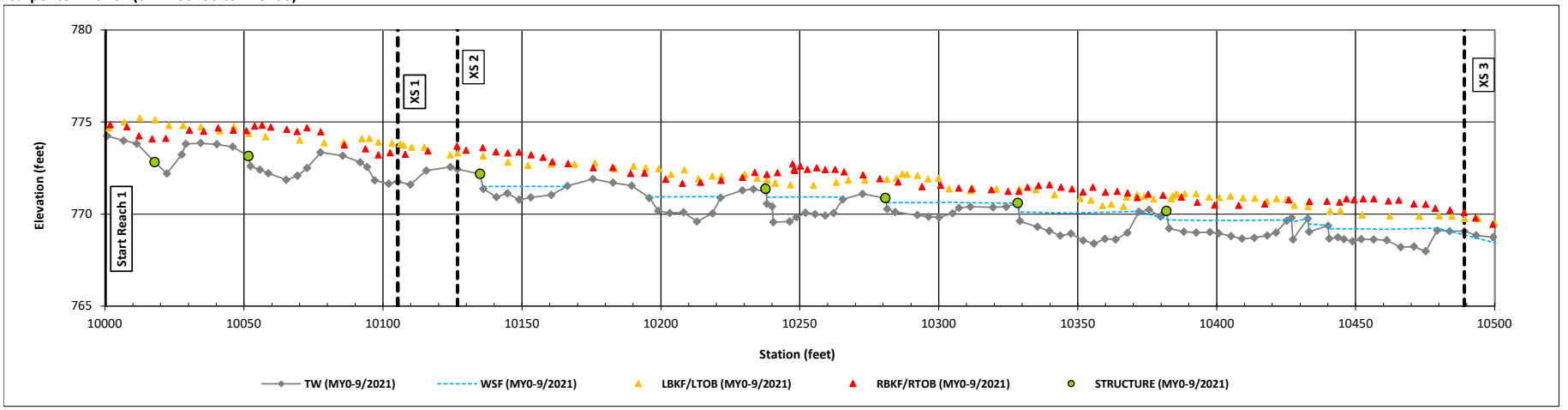
Longitudinal Profile Plots

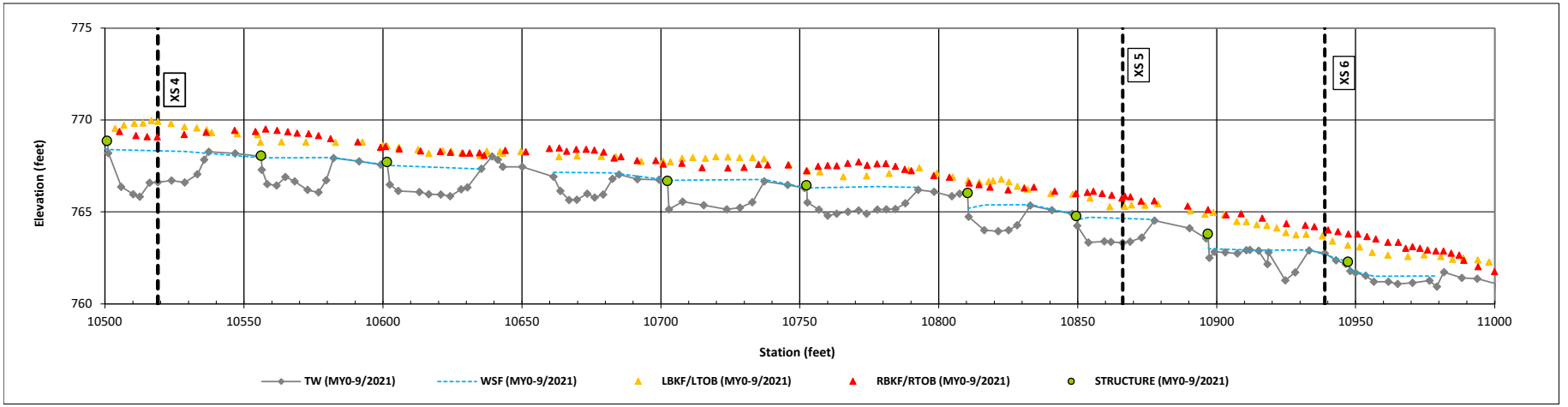
Carpenter Bottom Mitigation Site

DMS ID No. 100090

Monitoring Year 0 - 2022

Carpenter Branch (STA 100+00 to 110+00)





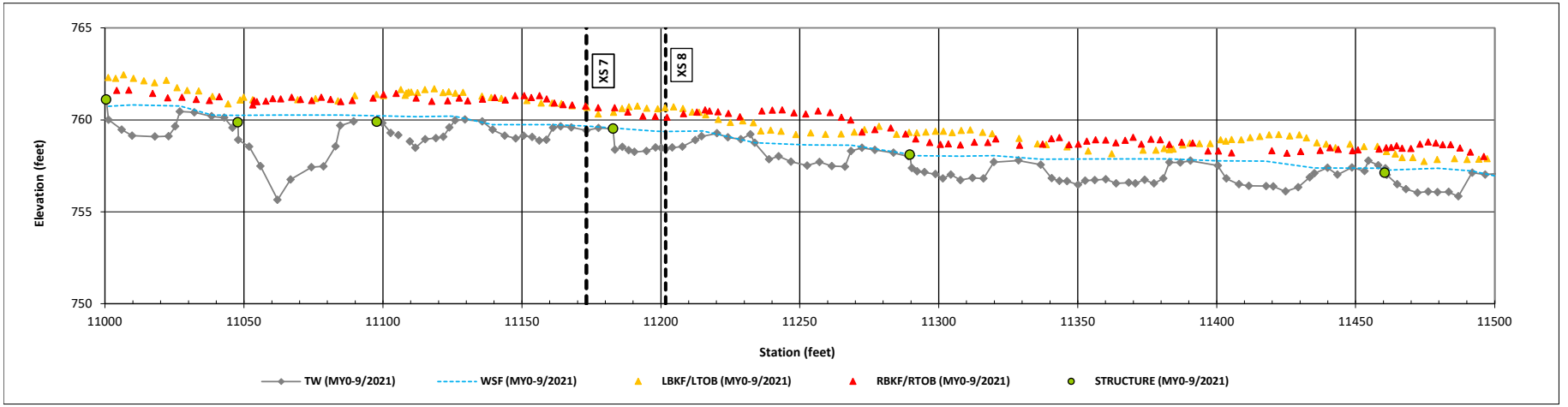
Longitudinal Profile Plots

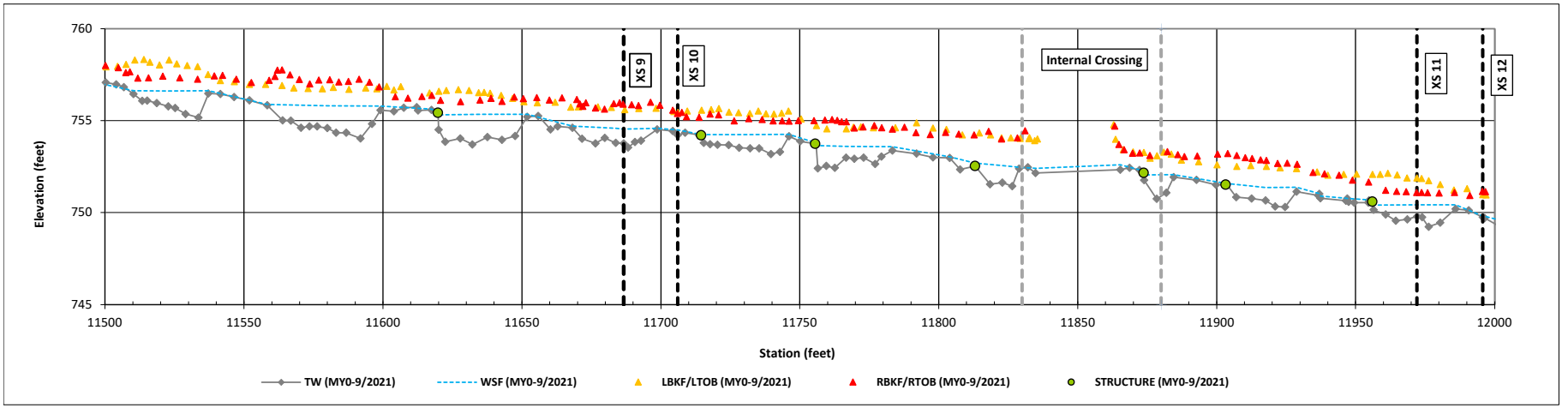
Carpenter Bottom Mitigation Site

DMS ID No. 100090

Monitoring Year 0 - 2022

Carpenter Branch (STA 110+00 to 120+00)





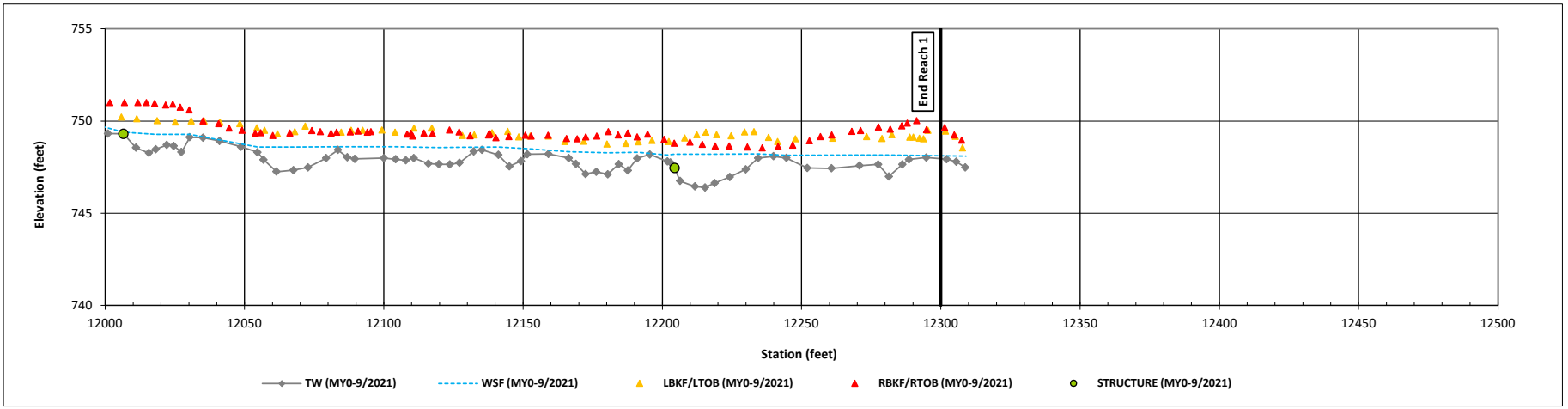
Longitudinal Profile Plots

Carpenter Bottom Mitigation Site

DMS ID No. 100090

Monitoring Year 0 - 2022

Carpenter Branch (STA 120+00 to 123+00)



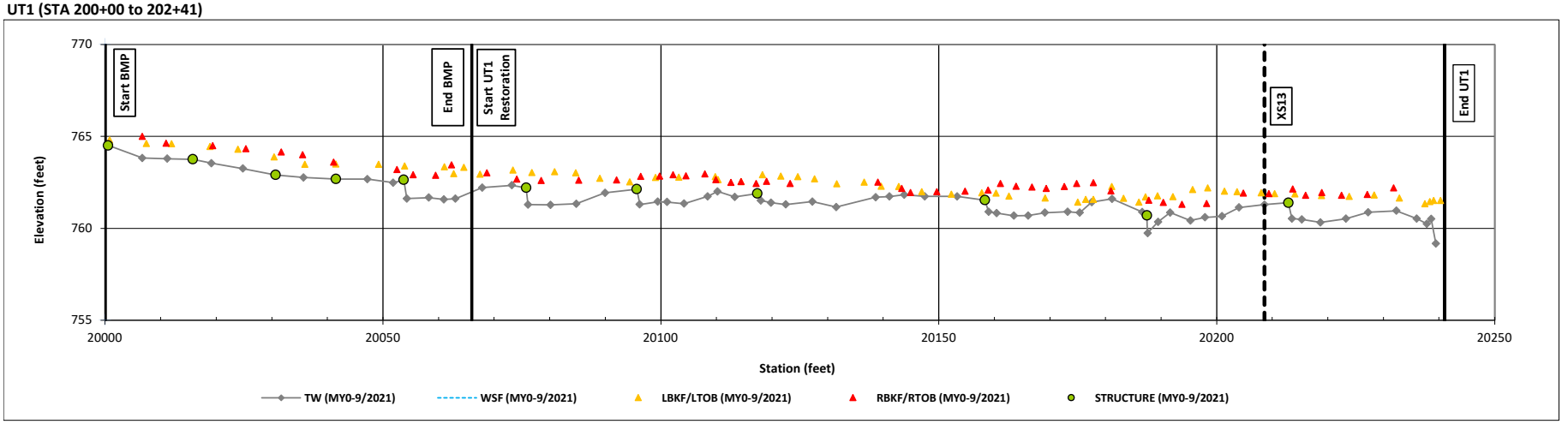
Longitudinal Profile Plots

Carpenter Bottom Mitigation Site

USACE Action ID No. SAW-2018-02062

Monitoring Year 0 - 2022

UT1 (STA 200+00 to 202+41)

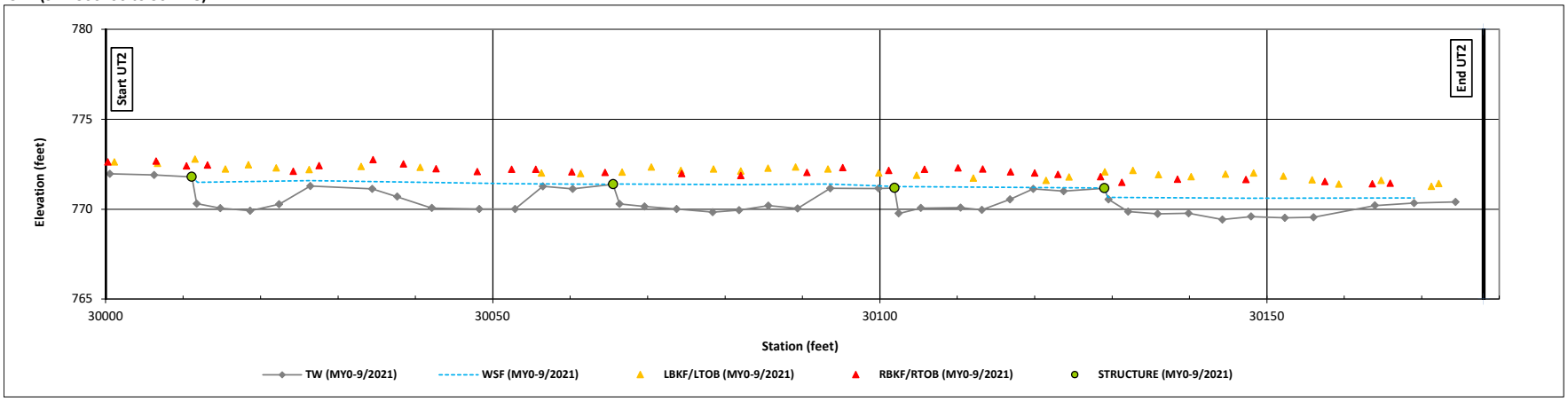


** - Channel was dry during As-Built Survey.*

Longitudinal Profile Plots

Carpenter Bottom Mitigation Site
USACE Action ID No. SAW-2018-02062
Monitoring Year 0 - 2022

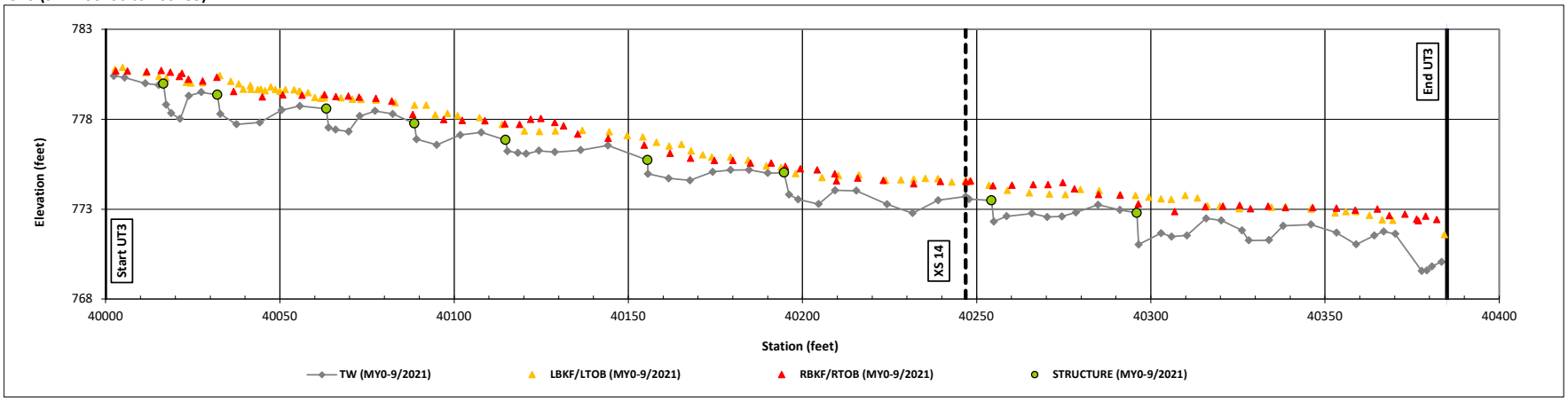
UT2 (STA 300+00 to 301+78)



Longitudinal Profile Plots

Carpenter Bottom Mitigation Site
USACE Action ID No. SAW-2018-02062
Monitoring Year 0 - 2022

UT3 (STA 400+00 to 403+85)

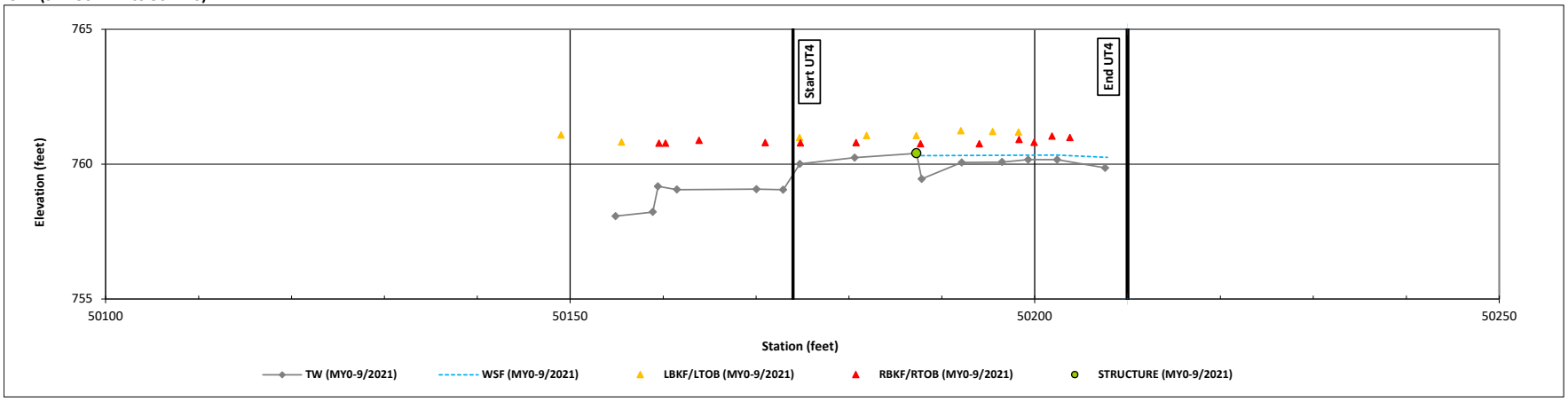


** - Channel was dry during As-Built Survey.*

Longitudinal Profile Plots

Carpenter Bottom Mitigation Site
USACE Action ID No. SAW-2018-02062
Monitoring Year 0 - 2022

UT4 (STA 501+74 to 502+10)



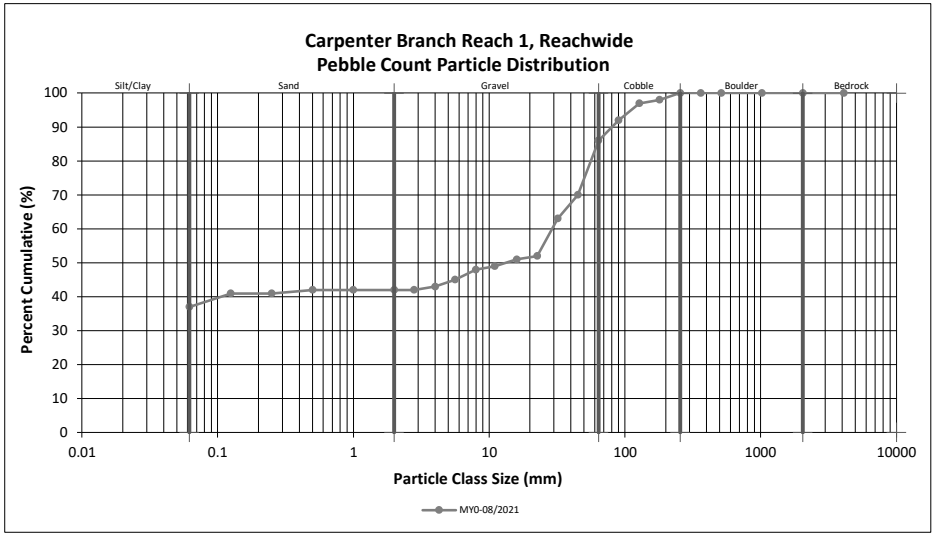
Reachwide and Cross-Section Pebble Count Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Carpenter Branch 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	1	36	37	37	37
SAND	Very fine	0.062	0.125		4	4	4	41
	Fine	0.125	0.250					41
	Medium	0.25	0.50		1	1	1	42
	Coarse	0.5	1.0					42
	Very Coarse	1.0	2.0					42
GRAVEL	Very Fine	2.0	2.8					42
	Very Fine	2.8	4.0		1	1	1	43
	Fine	4.0	5.6		2	2	2	45
	Fine	5.6	8.0		3	3	3	48
	Medium	8.0	11.0		1	1	1	49
	Medium	11.0	16.0		2	2	2	51
	Coarse	16.0	22.6	1		1	1	52
	Coarse	22.6	32	11		11	11	63
	Very Coarse	32	45	7		7	7	70
	Very Coarse	45	64	16		16	16	86
COBBLE	Small	64	90	6		6	6	92
	Small	90	128	5		5	5	97
	Large	128	180	1		1	1	98
	Large	180	256	2		2	2	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} =	Silt/Clay
D_{50} =	13.3
D_{84} =	61.2
D_{95} =	111.2
D_{100} =	256.0



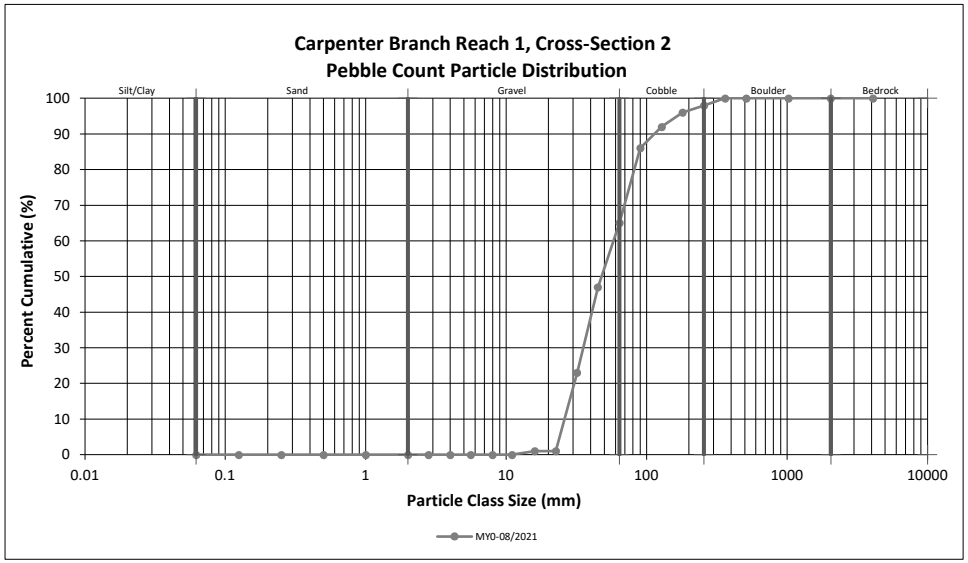
Reachwide and Cross-Section Pebble Count Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Carpenter Branch 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			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			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.6			0
	Fine	5.6	8.0			0
	Medium	8.0	11.0			0
	Medium	11.0	16.0	1	1	1
	Coarse	16.0	22.6			1
	Coarse	22.6	32	22	22	23
	Very Coarse	32	45	24	24	47
	Very Coarse	45	64	18	18	65
COBBLE	Small	64	90	21	21	86
	Small	90	128	6	6	92
	Large	128	180	4	4	96
	Large	180	256	2	2	98
BOULDER	Small	256	362	2	2	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 2	
Channel materials (mm)	
D_{16} =	28.6
D_{35} =	37.9
D_{50} =	47.7
D_{84} =	87.1
D_{95} =	165.3
D_{100} =	362.0



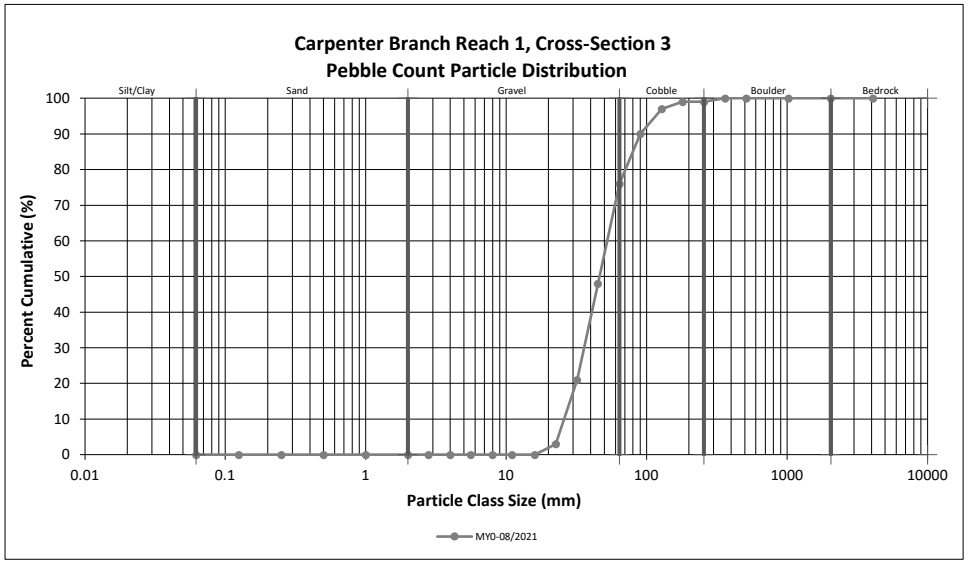
Reachwide and Cross-Section Pebble Count Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Carpenter Branch Reach 1, Cross-Section 3

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: 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			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.6			0
	Fine	5.6	8.0			0
	Medium	8.0	11.0			0
	Medium	11.0	16.0			0
	Coarse	16.0	22.6	3	3	3
	Coarse	22.6	32	18	18	21
	Very Coarse	32	45	27	27	48
	Very Coarse	45	64	28	28	76
COBBLE	Small	64	90	14	14	90
	Small	90	128	7	7	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 3	
Channel materials (mm)	
D_{16} =	29.1
D_{35} =	38.2
D_{50} =	46.1
D_{84} =	77.8
D_{95} =	115.7
D_{100} =	362.0



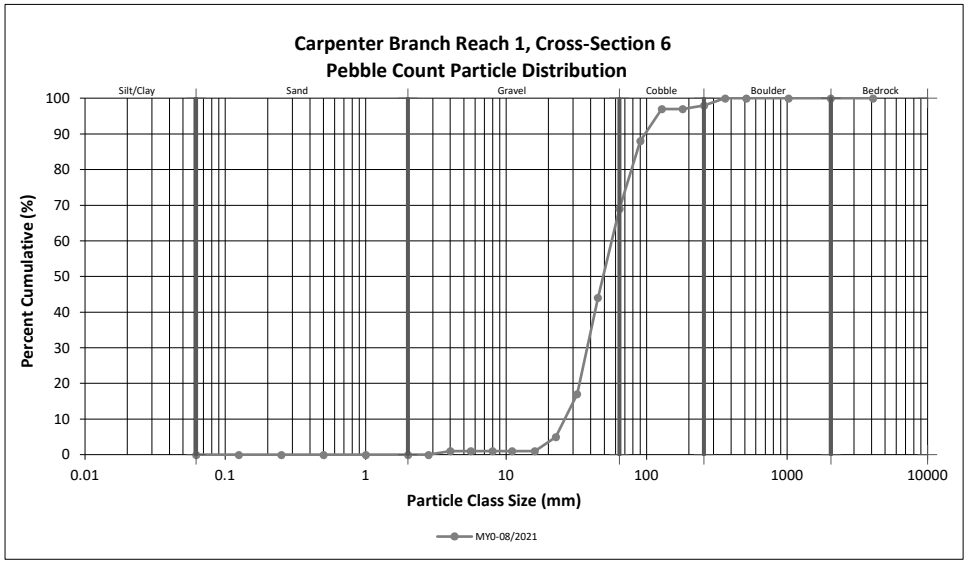
Reachwide and Cross-Section Pebble Count Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Carpenter Branch Reach 1, Cross-Section 6

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: 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			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0	1	1	1
	Fine	4.0	5.6			1
	Fine	5.6	8.0			1
	Medium	8.0	11.0			1
	Medium	11.0	16.0			1
	Coarse	16.0	22.6	4	4	5
	Coarse	22.6	32	12	12	17
	Very Coarse	32	45	27	27	44
	Very Coarse	45	64	25	25	69
COBBLE	Small	64	90	19	19	88
	Small	90	128	9	9	97
	Large	128	180			97
	Large	180	256	1	1	98
BOULDER	Small	256	362	2	2	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} =	31.1
D_{35} =	40.2
D_{50} =	49.0
D_{84} =	83.8
D_{95} =	118.4
D_{100} =	362.0



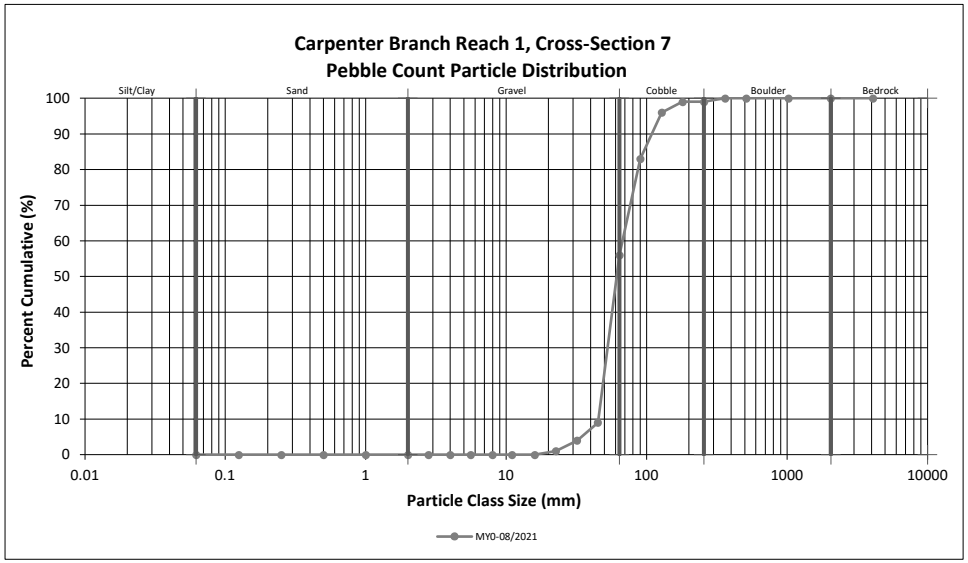
Reachwide and Cross-Section Pebble Count Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Carpenter Branch Reach 1, Cross-Section 7

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: 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			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.6			0
	Fine	5.6	8.0			0
	Medium	8.0	11.0			0
	Medium	11.0	16.0			0
	Coarse	16.0	22.6	1	1	1
	Coarse	22.6	32	3	3	4
	Very Coarse	32	45	5	5	9
	Very Coarse	45	64	47	47	56
COBBLE	Small	64	90	27	27	83
	Small	90	128	13	13	96
	Large	128	180	3	3	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 7	
Channel materials (mm)	
D_{16} =	47.4
D_{35} =	54.7
D_{50} =	61.2
D_{84} =	92.5
D_{95} =	124.6
D_{100} =	362.0



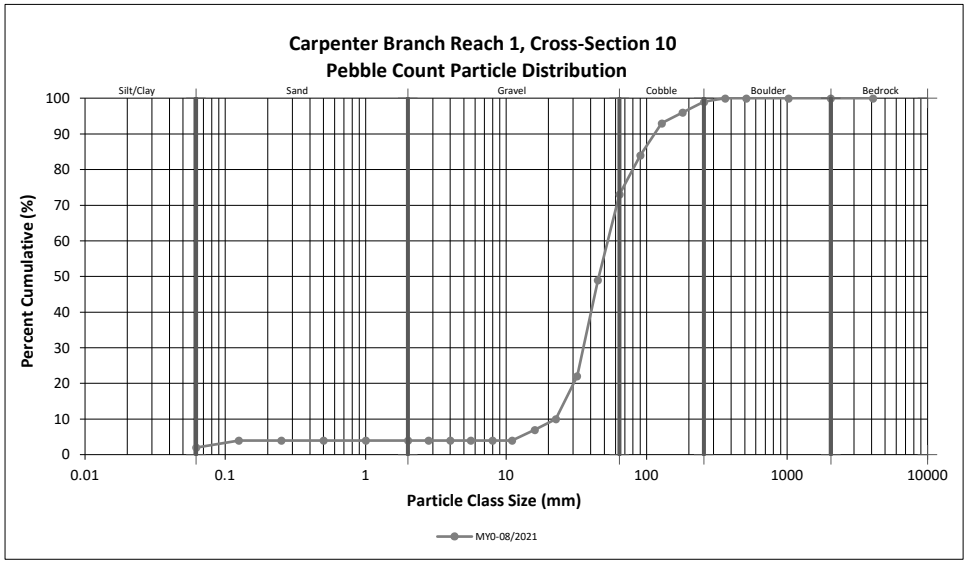
Reachwide and Cross-Section Pebble Count Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Carpenter Branch Reach 1, Cross-Section 10

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	2	2
SAND	Very fine	0.062	0.125	2	2	4
	Fine	0.125	0.250			4
	Medium	0.25	0.50			4
	Coarse	0.5	1.0			4
	Very Coarse	1.0	2.0			4
GRAVEL	Very Fine	2.0	2.8			4
	Very Fine	2.8	4.0			4
	Fine	4.0	5.6			4
	Fine	5.6	8.0			4
	Medium	8.0	11.0			4
	Medium	11.0	16.0	3	3	7
	Coarse	16.0	22.6	3	3	10
	Coarse	22.6	32	12	12	22
	Very Coarse	32	45	27	27	49
	Very Coarse	45	64	24	24	73
COBBLE	Small	64	90	11	11	84
	Small	90	128	9	9	93
	Large	128	180	3	3	96
	Large	180	256	3	3	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 10	
Channel materials (mm)	
D_{16} =	26.9
D_{35} =	37.7
D_{50} =	45.7
D_{84} =	90.0
D_{95} =	160.7
D_{100} =	362.0



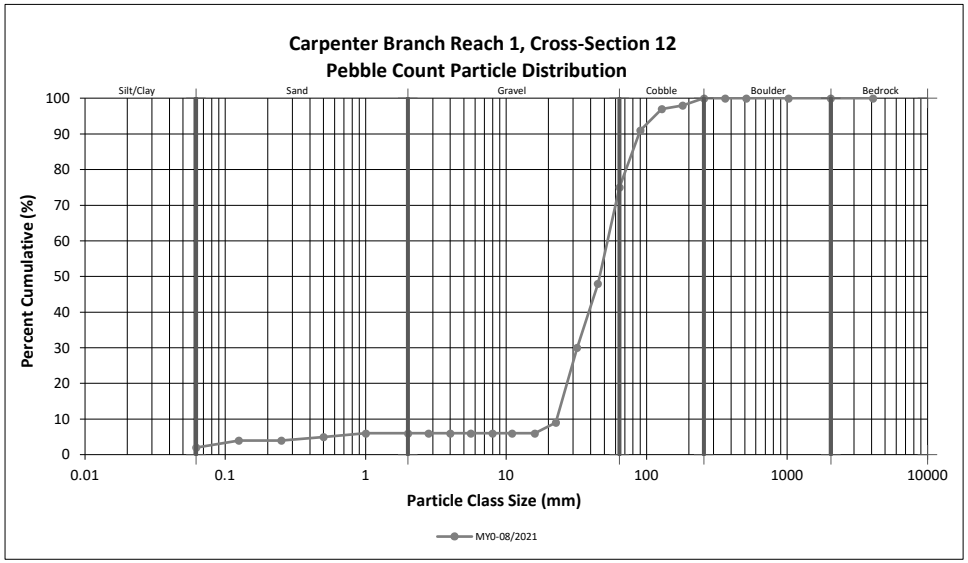
Reachwide and Cross-Section Pebble Count Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Carpenter Branch Reach 1, Cross-Section 12

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	2	2
SAND	Very fine	0.062	0.125	2	2	4
	Fine	0.125	0.250			4
	Medium	0.25	0.50	1	1	5
	Coarse	0.5	1.0	1	1	6
	Very Coarse	1.0	2.0			6
GRAVEL	Very Fine	2.0	2.8			6
	Very Fine	2.8	4.0			6
	Fine	4.0	5.6			6
	Fine	5.6	8.0			6
	Medium	8.0	11.0			6
	Medium	11.0	16.0			6
	Coarse	16.0	22.6	3	3	9
	Coarse	22.6	32	21	21	30
	Very Coarse	32	45	18	18	48
	Very Coarse	45	64	27	27	75
COBBLE	Small	64	90	16	16	91
	Small	90	128	6	6	97
	Large	128	180	1	1	98
	Large	180	256	2	2	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 12	
Channel materials (mm)	
D_{16} =	25.4
D_{35} =	35.2
D_{50} =	46.2
D_{84} =	77.5
D_{95} =	113.8
D_{100} =	256.0



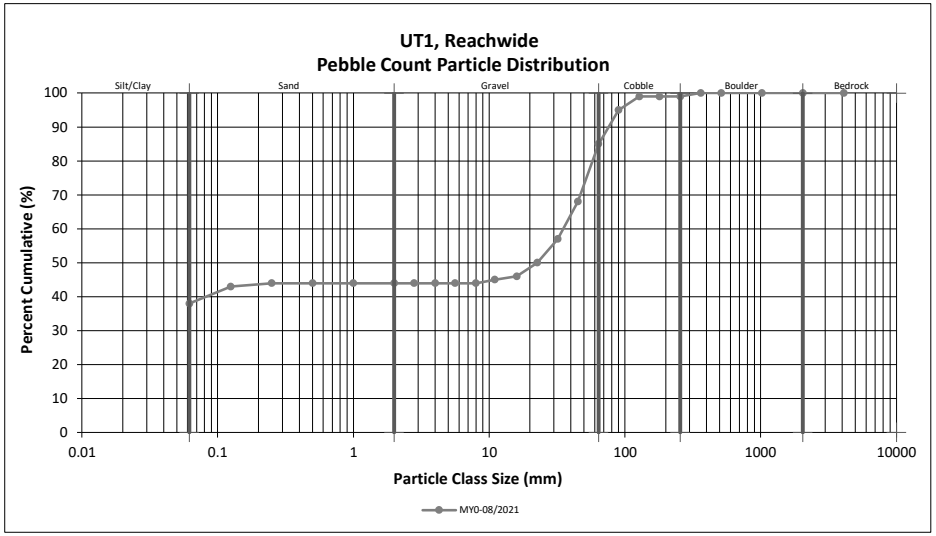
Reachwide and Cross-Section Pebble Count Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

UT1, 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		38	38	38	38
SAND	Very fine	0.062	0.125		5	5	5	43
	Fine	0.125	0.250		1	1	1	44
	Medium	0.25	0.50					44
	Coarse	0.5	1.0					44
	Very Coarse	1.0	2.0					44
GRAVEL	Very Fine	2.0	2.8					44
	Very Fine	2.8	4.0					44
	Fine	4.0	5.6					44
	Fine	5.6	8.0					44
	Medium	8.0	11.0		1	1	1	45
	Medium	11.0	16.0		1	1	1	46
	Coarse	16.0	22.6	3	1	4	4	50
	Coarse	22.6	32	5	2	7	7	57
	Very Coarse	32	45	10	1	11	11	68
	Very Coarse	45	64	17		17	17	85
COBBLE	Small	64	90	10		10	10	95
	Small	90	128	4		4	4	99
	Large	128	180					99
	Large	180	256					99
BOULDER	Small	256	362	1		1	1	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} =	Silt/Clay
D_{50} =	22.6
D_{84} =	62.7
D_{95} =	90.0
D_{100} =	362.0



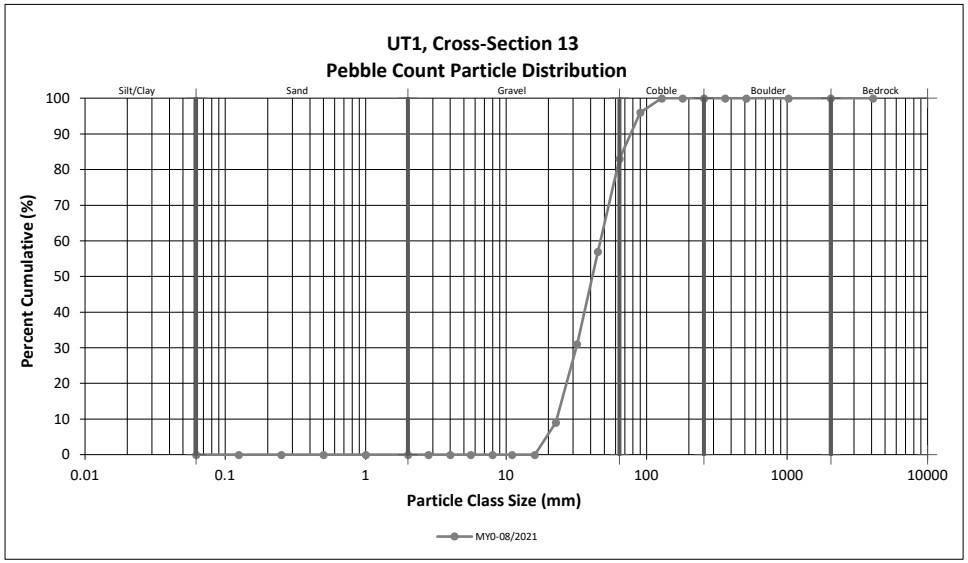
Reachwide and Cross-Section Pebble Count Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

UT1, Cross-Section 13

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary Class Percentage	Summary 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			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.6			0
	Fine	5.6	8.0			0
	Medium	8.0	11.0			0
	Medium	11.0	16.0			0
	Coarse	16.0	22.6	9	9	9
	Coarse	22.6	32	22	22	31
	Very Coarse	32	45	26	26	57
	Very Coarse	45	64	26	26	83
COBBLE	Small	64	90	13	13	96
	Small	90	128	4	4	100
	Large	128	180			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 13	
Channel materials (mm)	
D_{16} =	25.2
D_{35} =	33.7
D_{50} =	41.1
D_{84} =	65.7
D_{95} =	87.7
D_{100} =	128.0

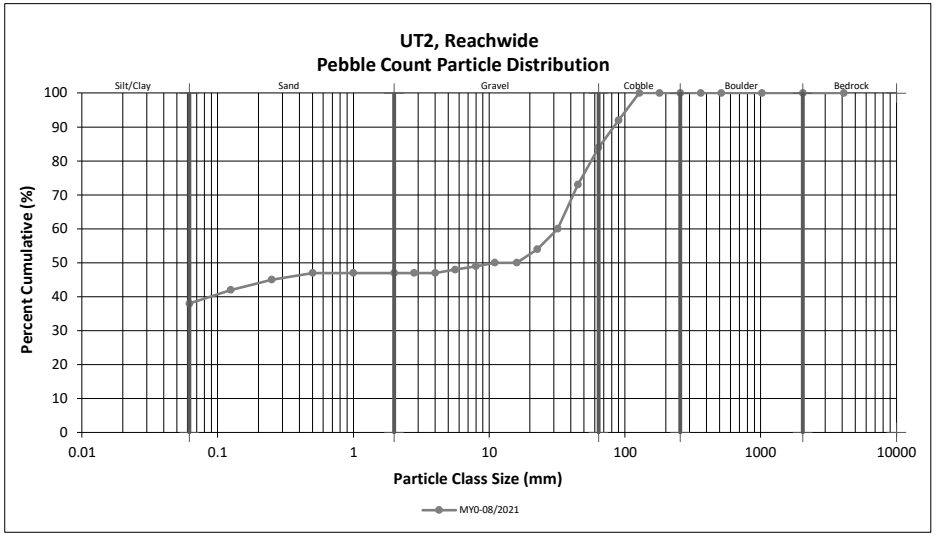


Reachwide and Cross-Section Pebble Count Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

UT2, 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	1	37	38	38	38
SAND	Very fine	0.062	0.125		4	4	4	42
	Fine	0.125	0.250		3	3	3	45
	Medium	0.25	0.50		2	2	2	47
	Coarse	0.5	1.0					47
	Very Coarse	1.0	2.0					47
GRAVEL	Very Fine	2.0	2.8					47
	Very Fine	2.8	4.0					47
	Fine	4.0	5.6		1	1	1	48
	Fine	5.6	8.0		1	1	1	49
	Medium	8.0	11.0		1	1	1	50
	Medium	11.0	16.0					50
	Coarse	16.0	22.6	4		4	4	54
	Coarse	22.6	32	6		6	6	60
	Very Coarse	32	45	12	1	13	13	73
	Very Coarse	45	64	11		11	11	84
COBBLE	Small	64	90	8		8	8	92
	Small	90	128	8		8	8	100
	Large	128	180					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} =	Silt/Clay
D_{50} =	11.0
D_{84} =	64.0
D_{95} =	102.7
D_{100} =	128.0

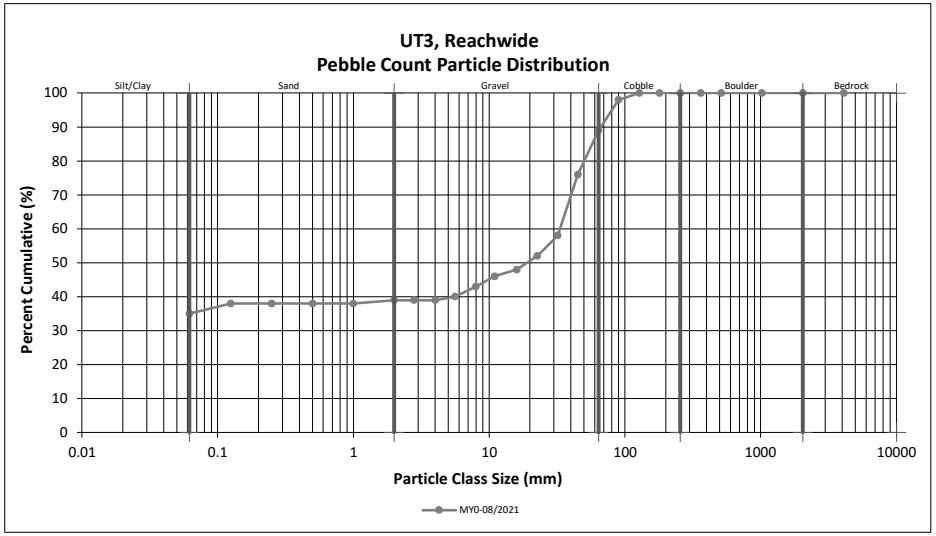
Reachwide and Cross-Section Pebble Count Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

UT3, 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		35	35	35	35
SAND	Very fine	0.062	0.125		3	3	3	38
	Fine	0.125	0.250					38
	Medium	0.25	0.50					38
	Coarse	0.5	1.0					38
	Very Coarse	1.0	2.0		1	1	1	39
GRAVEL	Very Fine	2.0	2.8					39
	Very Fine	2.8	4.0					39
	Fine	4.0	5.6		1	1	1	40
	Fine	5.6	8.0		3	3	3	43
	Medium	8.0	11.0		3	3	3	46
	Medium	11.0	16.0		2	2	2	48
	Coarse	16.0	22.6	3	1	4	4	52
	Coarse	22.6	32	5	1	6	6	58
	Very Coarse	32	45	18		18	18	76
	Very Coarse	45	64	13		13	13	89
COBBLE	Small	64	90	9		9	9	98
	Small	90	128	2		2	2	100
	Large	128	180					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} =	Silt/Clay
D_{50} =	19.0
D_{84} =	55.9
D_{95} =	80.3
D_{100} =	128.0



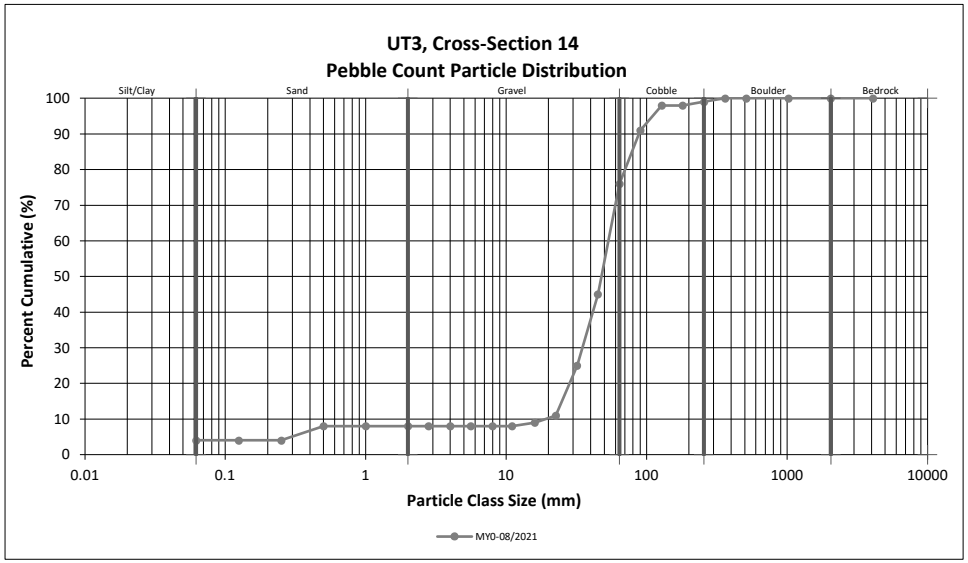
Reachwide and Cross-Section Pebble Count Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

UT3, Cross-Section 14

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	4	4	4
SAND	Very fine	0.062	0.125			4
	Fine	0.125	0.250			4
	Medium	0.25	0.50	4	4	8
	Coarse	0.5	1.0			8
	Very Coarse	1.0	2.0			8
GRAVEL	Very Fine	2.0	2.8			8
	Very Fine	2.8	4.0			8
	Fine	4.0	5.6			8
	Fine	5.6	8.0			8
	Medium	8.0	11.0			8
	Medium	11.0	16.0	1	1	9
	Coarse	16.0	22.6	2	2	11
	Coarse	22.6	32	14	14	25
	Very Coarse	32	45	20	20	45
	Very Coarse	45	64	31	31	76
COBBLE	Small	64	90	15	15	91
	Small	90	128	7	7	98
	Large	128	180			98
	Large	180	256	1	1	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 14	
Channel materials (mm)	
D_{16} =	25.6
D_{35} =	37.9
D_{50} =	47.6
D_{84} =	76.8
D_{95} =	110.1
D_{100} =	362.0



Reachwide and Cross-Section Pebble Count Plots

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

UT4, 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	35	37	37	37
SAND	Very fine	0.062	0.125	1	15	16	16	53
	Fine	0.125	0.250					53
	Medium	0.25	0.50					53
	Coarse	0.5	1.0					53
	Very Coarse	1.0	2.0					53
GRAVEL	Very Fine	2.0	2.8					53
	Very Fine	2.8	4.0					53
	Fine	4.0	5.6					53
	Fine	5.6	8.0	1		1	1	54
	Medium	8.0	11.0					54
	Medium	11.0	16.0					54
	Coarse	16.0	22.6	3		3	3	57
	Coarse	22.6	32	7		7	7	64
	Very Coarse	32	45	12		12	12	76
	Very Coarse	45	64	11		11	11	87
COBBLE	Small	64	90	7		7	7	94
	Small	90	128	3		3	3	97
	Large	128	180	1		1	1	98
	Large	180	256	1		1	1	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} =	Silt/Clay
D_{50} =	0.1
D_{84} =	58.1
D_{95} =	101.2
D_{100} =	512.0

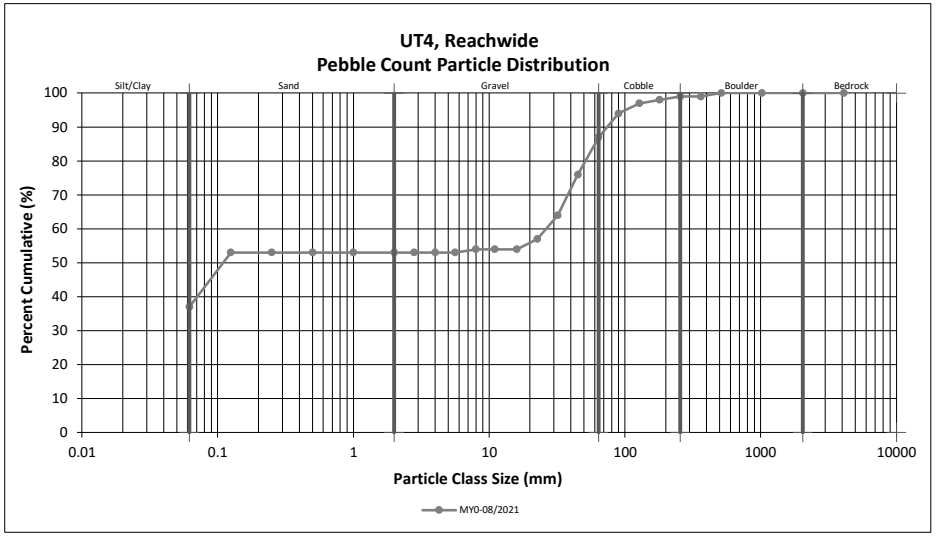


Table 8a. Baseline Stream Data Summary

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**Carpenter Branch R1**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	10.2		1	7.5		9.2	12.2	6
Floodprone Width (ft)	14.2		1	17.0	26.0	44.4	68.1	6
Bankfull Mean Depth	0.7		1	0.6		0.5	0.8	6
Bankfull Max Depth	1.2		1	0.7	0.9	0.9	1.2	6
Bankfull Cross Sectional Area (ft^2)	7.0		1	4.4		5.3	8.2	6
Width/Depth Ratio	14.9		1	12.5		14.4	22.7	6
Entrenchment Ratio	1.4		1	2.2	3.5	4.6	5.6	6
Bank Height Ratio	3.4		1	1.0	1.1	1.0	1.0	6
Max part size (mm) mobilized at bankfull	37 / 90			32 / 81		46	61	6
Rosgen Classification	G4			C4		C4		
Bankfull Discharge (cfs)	14.0			14.0		14.0		
Sinuosity	1.1			1.2		1.2		
Water Surface Slope (ft/ft)[2]	0.0130			0.0120		0.0109		
Other	--			--		--		
Parameter	**UT1**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	3.1		1	5.0		8.0		1
Floodprone Width (ft)	4.2		1	11.0	18.0	55.5		1
Bankfull Mean Depth	0.6		1	0.4		0.3		1
Bankfull Max Depth	0.8		1	0.5	0.6	0.6		1
Bankfull Cross Sectional Area (ft^2)	1.8		1	1.9		2.3		1
Width/Depth Ratio	5.2		1	12.5		27.6		1
Entrenchment Ratio	1.4		1	2.2	3.5	6.9		1
Bank Height Ratio	6.1		1	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	--			--		41		1
Rosgen Classification	G4/5			C4		C4		
Bankfull Discharge (cfs)	6.8			6.0		6.0		
Sinuosity	1.1			1.3		1.2		
Water Surface Slope (ft/ft)[2]	0.0258			0.0200		0.0153		
Other	--			--		--		

1. ER for the baseline/monitoring parameters are based on the width of the cross-section, in lieu of assuming the width across the floodplain.
2. Channel slope is calculated from the surface of the channel bed rather than water surface.
(---): Data was not provided, N/A: Not Applicable

Table 8b. Baseline Stream Data Summary

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 0 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**UT3**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	9.5		1	6.0		8.4		1
Floodprone Width (ft)	N/A		1	13.0	21.0	52.6		1
Bankfull Mean Depth	0.3		1	0.5		0.6		1
Bankfull Max Depth	0.7		1	0.6	0.8	0.9		1
Bankfull Cross Sectional Area (ft^2)	2.8		1	2.9		5.1		1
Width/Depth Ratio	31.9		1	12.0		14.0		1
Entrenchment Ratio	N/A		1	2.2	3.5	6.2		1
Bank Height Ratio	1.3		1	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	--			--		48		1
Rosgen Classification	G4/5			C4b		C4b		
Bankfull Discharge (cfs)	6.2			8.0		8.0		
Sinuosity	1.0			1.2		1.1		
Water Surface Slope ($ft/ft)^2$	0.0260			0.0230		0.0237		
Other	---			---		---		

1. ER for the baseline/monitoring parameters are based on the width of the cross-section, in lieu of assuming the width across the floodplain.

2. Channel slope is calculated from the surface of the channel bed rather than water surface.

(---): Data was not provided, N/A: Not Applicable

Table 9. Cross-Section Morphology Monitoring Summary

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 0 - 2022

	Carpenter Branch 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	773.74						773.32						769.96						769.29					
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00						1.00						1.00						1.00					
Thalweg Elevation	771.76						772.43						769.07						766.62					
LTOB[2] Elevation	773.74						773.32						769.96						769.29					
LTOB[2] Max Depth (ft)	2.0						0.9						0.9						2.7					
LTOB[2] Cross Sectional Area (ft^2)	13.1						5.8						6.5						15.8					

	Carpenter Branch Reach 1																							
	Cross-Section 5 (Pool)						Cross-Section 6 (Riffle)						Cross-Section 7 (Riffle)						Cross-Section 8 (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	765.59						763.69						760.67						760.33					
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00						1.00						1.00						1.00					
Thalweg Elevation	763.33						762.75						759.43						758.42					
LTOB[2] Elevation	765.59						763.69						760.67						760.33					
LTOB[2] Max Depth (ft)	2.3						0.9						1.2						1.9					
LTOB[2] Cross Sectional Area (ft^2)	13.7						5.3						7.9						12.1					

	Carpenter Branch Reach 1																							
	Cross-Section 9 (Pool)						Cross-Section 10 (Riffle)						Cross-Section 11 (Pool)						Cross-Section 12 (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	755.60						755.38						751.28						750.97					
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00						1.00						1.00						1.00					
Thalweg Elevation	753.67						754.21						749.80						749.75					
LTOB[2] Elevation	755.60						755.38						751.28						750.97					
LTOB[2] Max Depth (ft)	1.9						1.2						1.5						1.2					
LTOB[2] Cross Sectional Area (ft^2)	12.2						7.6						6.7						8.2					

	UT1						UT3					
	Cross-Section 13 (Riffle)						Cross-Section 14 (Riffle)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	761.87						774.53					
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00						1.00					
Thalweg Elevation	761.30						773.59					
LTOB[2] Elevation	761.87						774.53					
LTOB[2] Max Depth (ft)	0.6						0.9					
LTOB[2] Cross Sectional Area (ft^2)	2.3						5.1					

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

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

APPENDIX D. Project Timeline and Contact Info

Table 10. Project Activity and Reporting History

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Activity or Deliverable		Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted		N/A	October 9, 2018
Mitigation Plan Approved		December 2020	December 2020
Construction (Grading) Completed		N/A	July 2021
Planting Completed		N/A	February 2022
As-Built Survey Completed		August-September 2021	September 2021
Baseline Monitoring Document (Year 0)	Stream Survey	August-September 2021	April 2022
	Vegetation Survey	February 2022	
Year 1 Monitoring	Stream Survey		
	Vegetation Survey		
Year 2 Monitoring	Stream Survey		
	Vegetation Survey		
Year 3 Monitoring	Stream Survey		
	Vegetation Survey		
Year 4 Monitoring			
Year 5 Monitoring	Stream Survey		
	Vegetation Survey		
Year 6 Monitoring			
Year 7 Monitoring	Stream Survey		
	Vegetation Survey		

Table 11. Project Contact Table

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 0 - 2022

Designer Eric Neuhaus, PE	**Wildlands Engineering, Inc.** 167-B Haywood Rd Asheville, NC 28806 828.774.5547
Construction Contractor	**Wildlands Construction, Inc.** 1430 S. Mint St., Suite 104 Charlotte, NC 28203
Planting Contractor	**Bruton Natural Systems, Inc.** PO Box 1197 Fremont, NC 27830
Seeding Contractor	**Canady's Landscape & Erosion Control, LLC.**
Nursery Stock Supplies	**Bruton Natural Systems, Inc.**
Herbaceous Plugs	**Wetland Plants, Inc.**
Monitoring Performers Monitoring, POC	**Wildlands Engineering, Inc.** Kristi Suggs 704.332.7754

APPENDIX E. Record Drawings and Sealed As-Built Survey

May 19, 2023

Carpenter Bottom Mitigation Site Record Drawings

Gaston County, North Carolina
for
NCDEQ
Division of Mitigation Services

Vicinity Map
Not to Scale

Environmental Quality

RECORD DRAWINGS
APRIL 1, 2022

Sheet Index

Project Directory

Engineering:
Wildlands Engineering, Inc
License No. F-0831
167-B Haywood Rd
Asheville, NC 28806
Eric Neuhaus, Project Engineer
865-207-8835

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

Owner:
NCDEQ
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699
Matthew Reid
828-231-7912

DMS Project No. 100090
Catawba River Basin 03050102

USACE Action ID
No. SAW-2018-02062
NCDWR #20190049

WILDLANDS ENGINEERING
167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. F-0831

NORTH CAROLINA PROFESSIONAL SEAL 042660 ENGINEER ERIC NEUHAUS 4/1/2022

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

Title Sheet

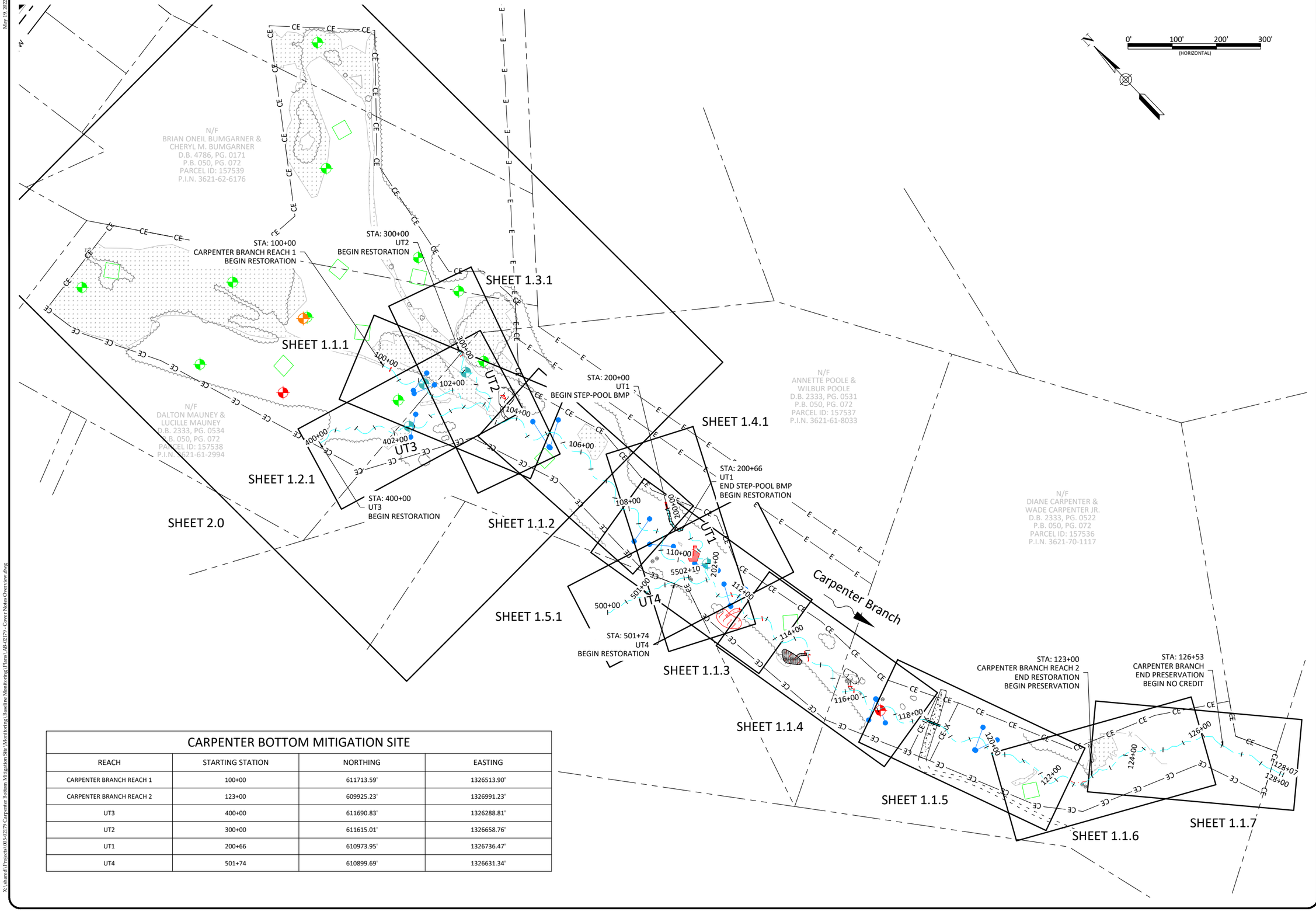
Revisions:

Date: 4.01.2022
Job Number: 005-02179
Project Engineer: EPN
Drawn By: ABP
Checked By: ---

Sheet 0.1

X:\Shared\Projects\005-02179 Carpenter Bottom Mitigation Site\Monitoring\Baseline Monitoring\Plans\MR-02179 - Cover Notes Overview.dwg

May 19, 2022



CARPENTER BOTTOM MITIGATION SITE			
REACH	STARTING STATION	NORTHING	EASTING
CARPENTER BRANCH REACH 1	100+00	611713.59'	1326513.90'
CARPENTER BRANCH REACH 2	123+00	609925.23'	1326991.23'
UT3	400+00	611690.83'	1326288.81'
UT2	300+00	611615.01'	1326658.76'
UT1	200+66	610973.95'	1326736.47'
UT4	501+74	610899.69'	1326631.34'

WILDLANDS ENGINEERING
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Tel: 828.774.5547
License No. P-0831

NORTH CAROLINA PROFESSIONAL SEAL 042660 ENGINEER ERIC NEUHAUS
4/1/2022

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

Project Overview

Revisions:

Date: 4.01.2022
Job Number: 005-02179
Project Engineer: EHN
Drawn By: ABP
Checked By: ---

Sheet 0.2

X:\shared\Projects\005-02179 Carpenter Bottom Mitigation Site\Monitoring\Baseline Monitoring\Plans\AR-02179 - Cover Notes Overview.dwg

May 19, 2022

Pre-Contruction Features

- Pre-construction Property Line
- Pre-construction Access Easement (E)
- Pre-construction Fence (X)
- Pre-construction Wetland
- Pre-Construction Bedrock
- Pre-Construction Treeline
- Pre-Construction Tree

Design Features

- Design Alignment (10+00)
- Design Major Contour (100)
- Design Minor Contour
- Design Culvert
- Design Riffle
- Design Brush Toe
- Design Log Sill
- Design Log J-Hook
- Design Rock Sill
- Design Rock Toe
- Wetland Re-establishment
- Wetland Rehabilitation
- Design Floodplain Pool

As-Built Features

- As-Built Thalweg Alignment
- As-Built Bankfull
- Recorded Conservation Easement (CE)
- As-Built Internal Crossing (CE-IX)
- As-Built Major Contour (100)
- As-Built Minor Contour
- As-Built Culvert
- As-Built Limits of Disturbance (LOD)
- As-Built Fence
- As-Built Riffle
- As-Built Brush Toe
- As-Built Log Sill
- As-Built Log J-Hook
- As-Built Rock Sill
- As-Built Rock Toe
- As-Built Stream Crossing
- As-Built Stabilized Outlet
- As-Built Rip Rap
- As-Built Farm Road
- Wetland Re-establishment
- Wetland Rehabilitation
- As-Built Floodplain Pool
- As-Built Root Wads

Monitoring Features

- Monitoring Cross Section (XS-#)
- Photo Point (PP-#)
- Stream Gage (SG-#)
- Groundwater Gage (GWG-#)
- Crest Gage (CG-#)
- Barotroll (BT)
- Vegetation Plot (VEG, VP-#, VEG)

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

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167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. F-0831

NORTH CAROLINA PROFESSIONAL SEAL 042660 ENGINEER ERIC NEUHAUS 4/1/2022

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

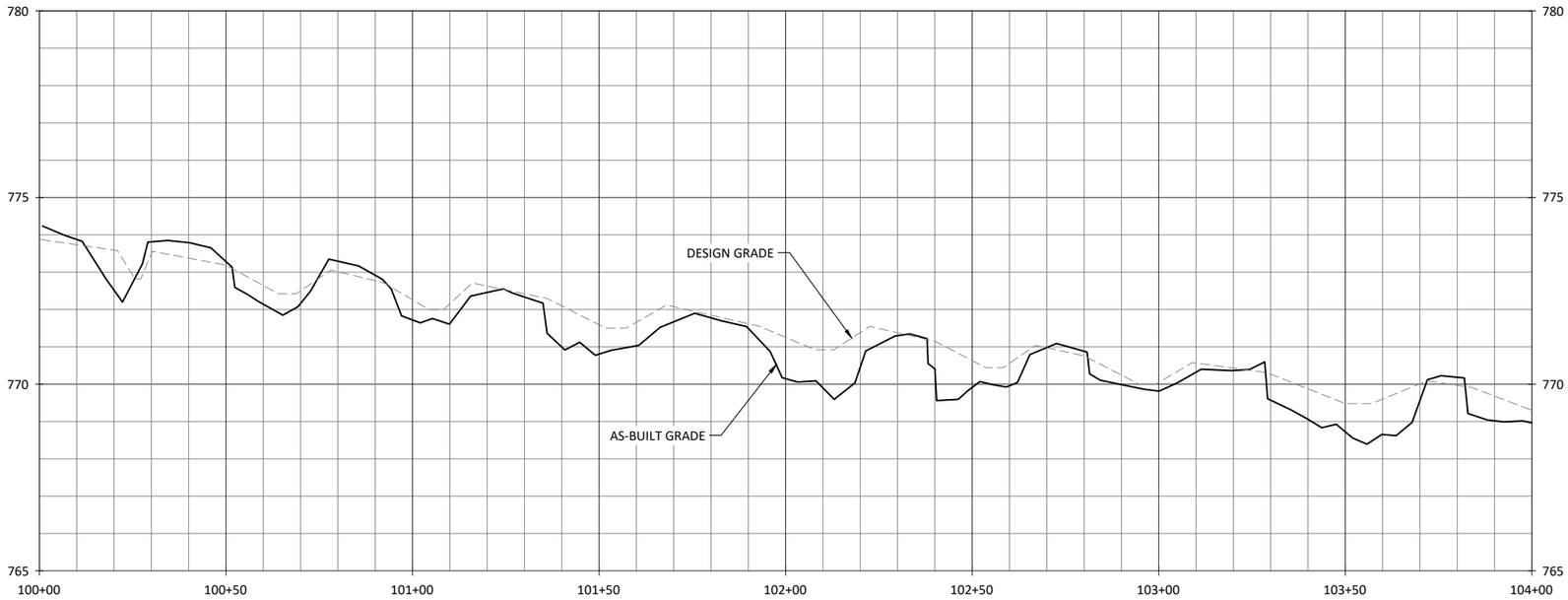
General Notes and Symbols

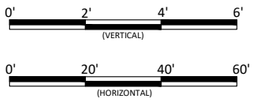
Revisions:

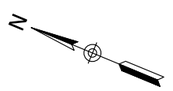
Date: 4.01.2022
Job Number: 005-02179
Project Engineer: EPN
Drawn By: ABP
Checked By: ---

Sheet 0.3

May 19, 2022







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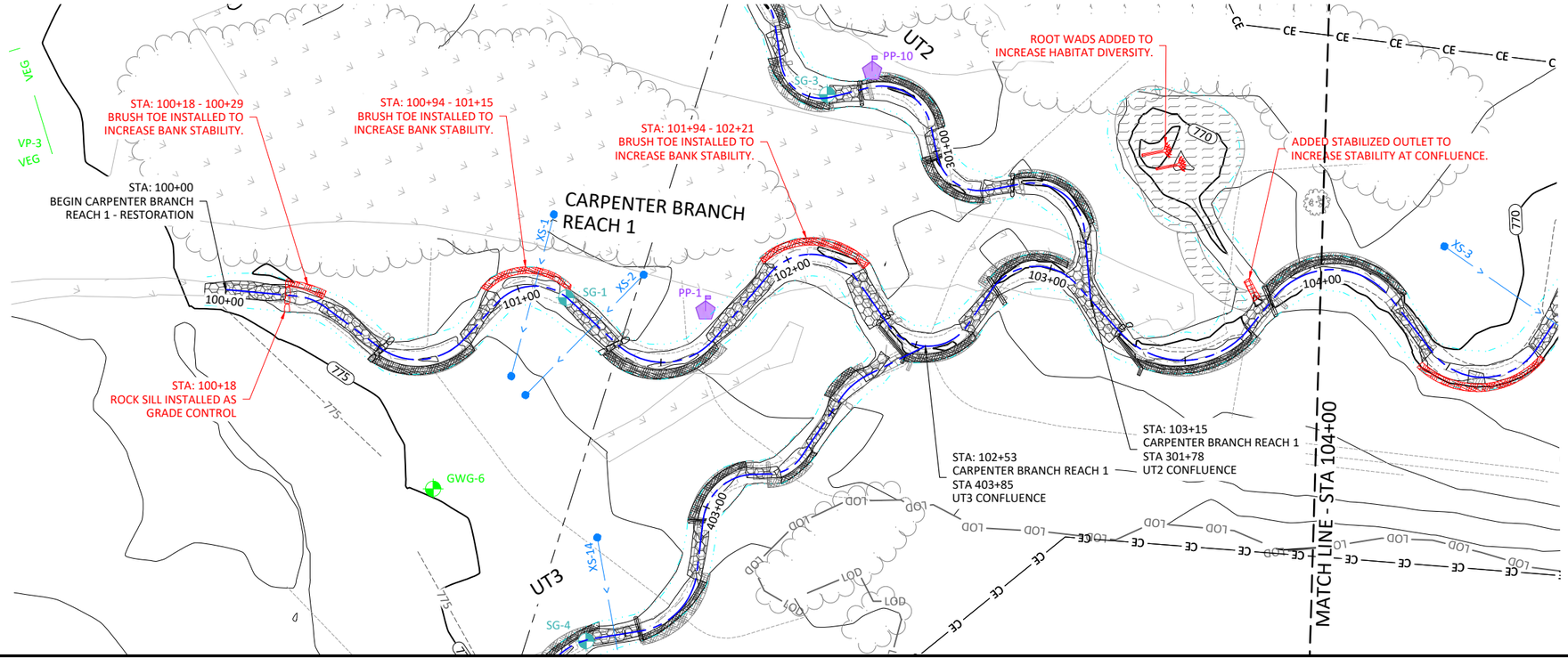
Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

Carpenter Branch
Stream Plan and Profile



NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR UT2 IS ADDRESSED ON SHEET 1.3.1.
3. AS-BUILT INFORMATION FOR UT3 IS ADDRESSED ON SHEET 1.2.1.

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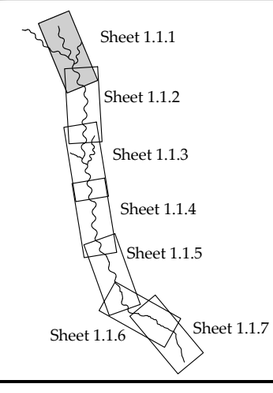

Revisions: -

Date: 4.01.2022
Job Number: 005-02179
Project Engineer: EHN
Drawn By: ABP
Checked By: ---

Sheet 1.1.1

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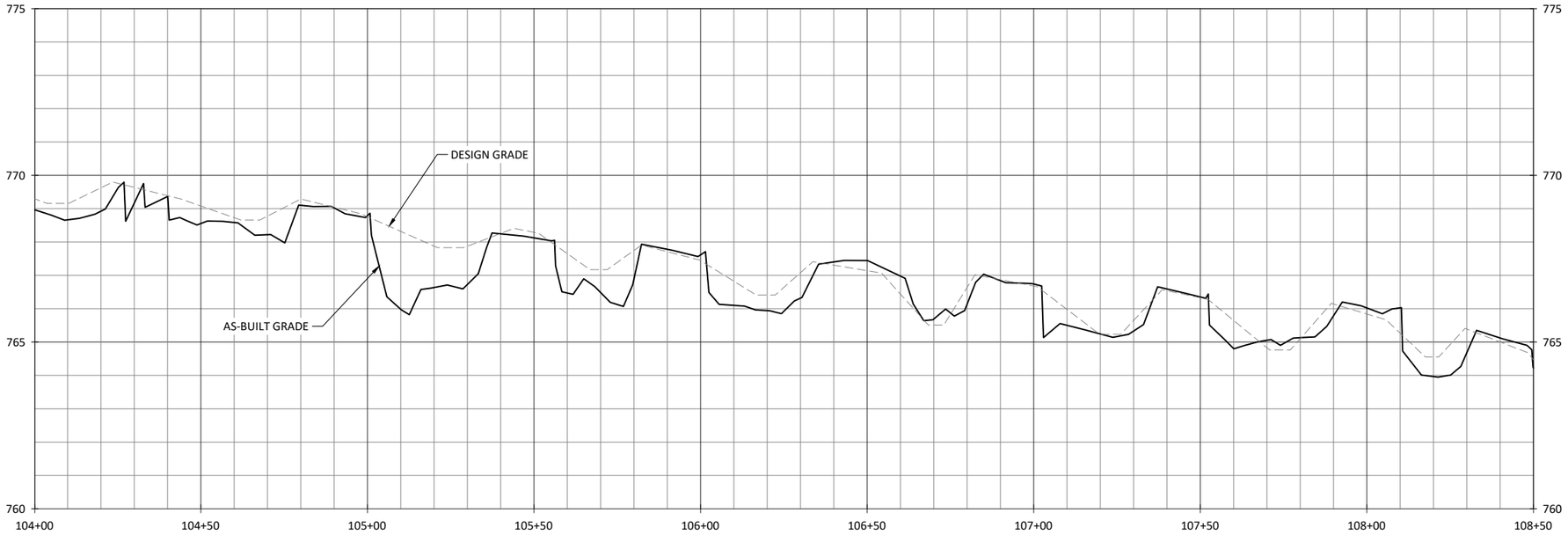
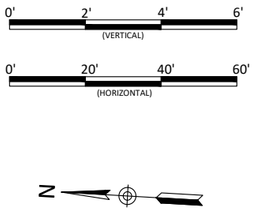
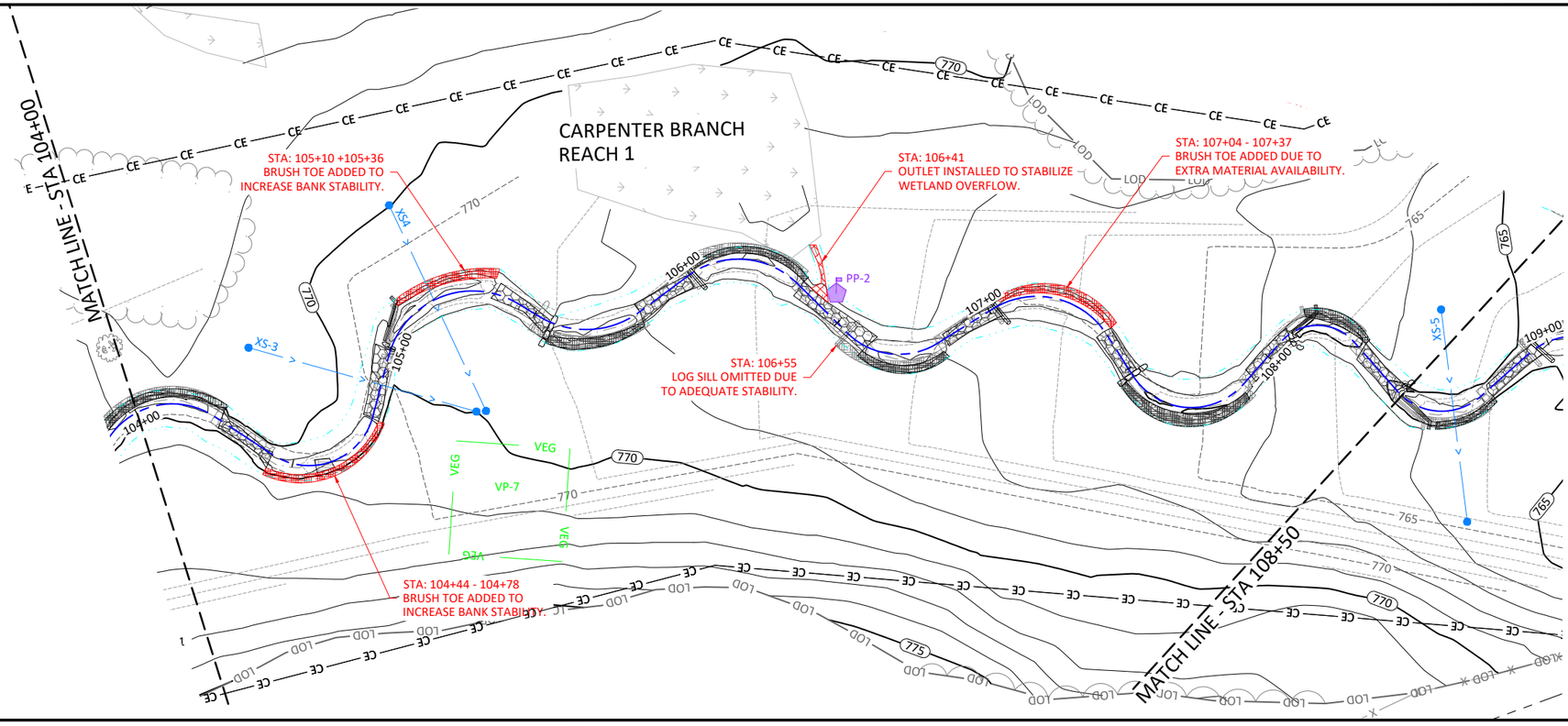
May 19, 2022







NOTE:
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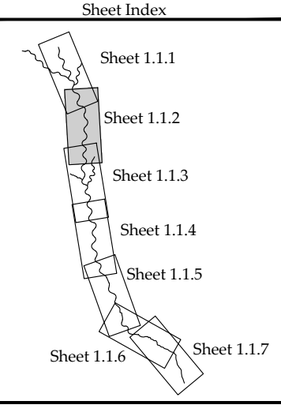

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4/1/2022

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

Carpenter Branch
Stream Plan and Profile

Revisions: ---

Date: 4.01.2022
Job Number: 005-02179
Project Engineer: EHN
Drawn By: ABP
Checked By: ---

Sheet 1.1.2

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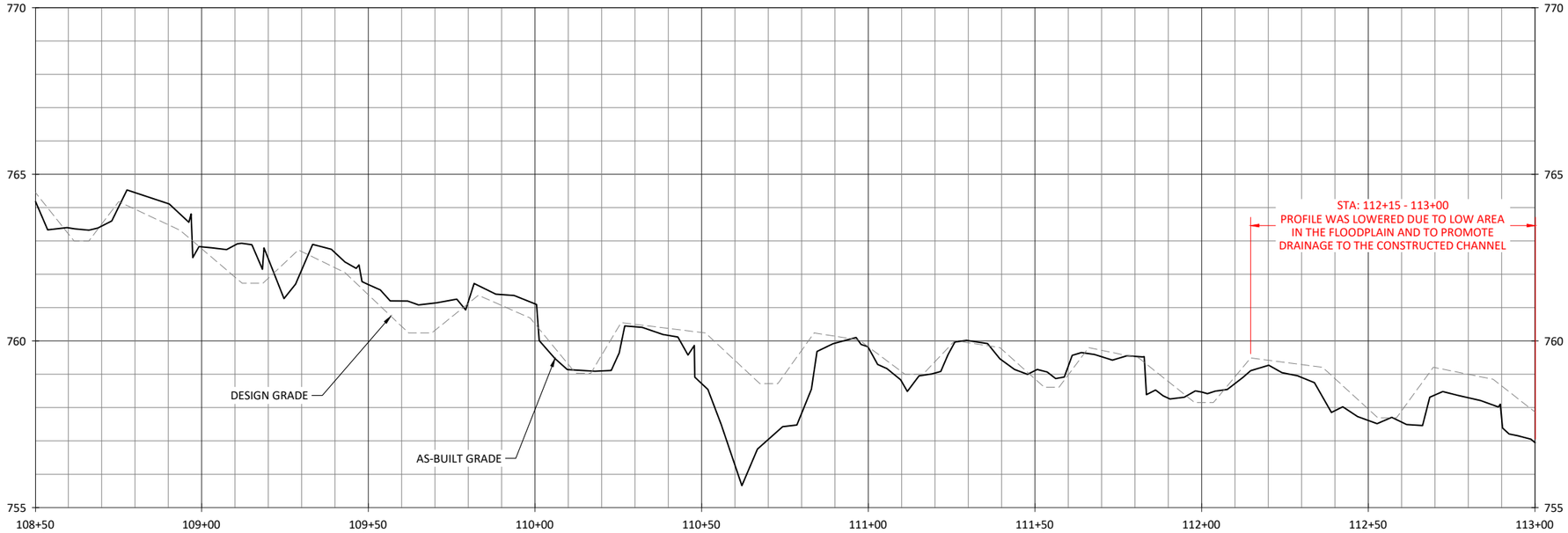
May 19, 2022



0' 2' 4' 6' (VERTICAL)

0' 20' 40' 60' (HORIZONTAL)

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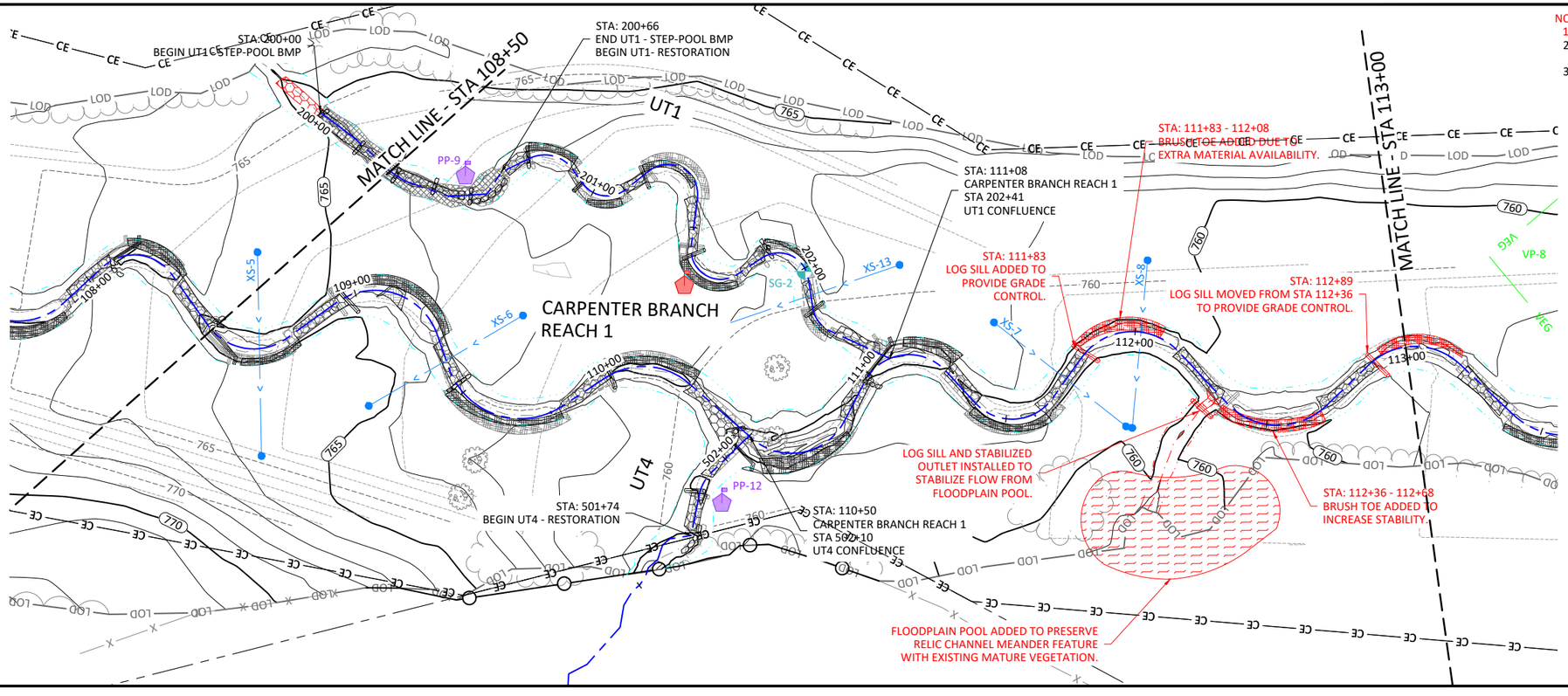
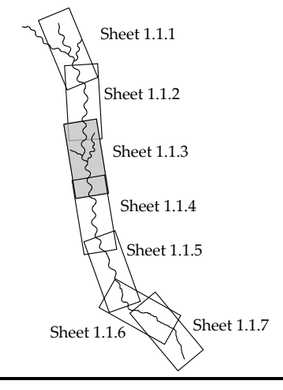


NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR UT1 IS ADDRESSED ON SHEET 1.4.1.
3. AS-BUILT INFORMATION FOR UT4 IS ADDRESSED ON SHEET 1.5.1.

Sheet Index



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4/1/2022

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

Carpenter Branch
Stream Plan and Profile

Revisions:
5.12.2022

Date: 4.01.2022
Job Number: 005-02179
Project Engineer: EHN
Drawn By: ABP
Checked By: ---

Sheet 1.1.3

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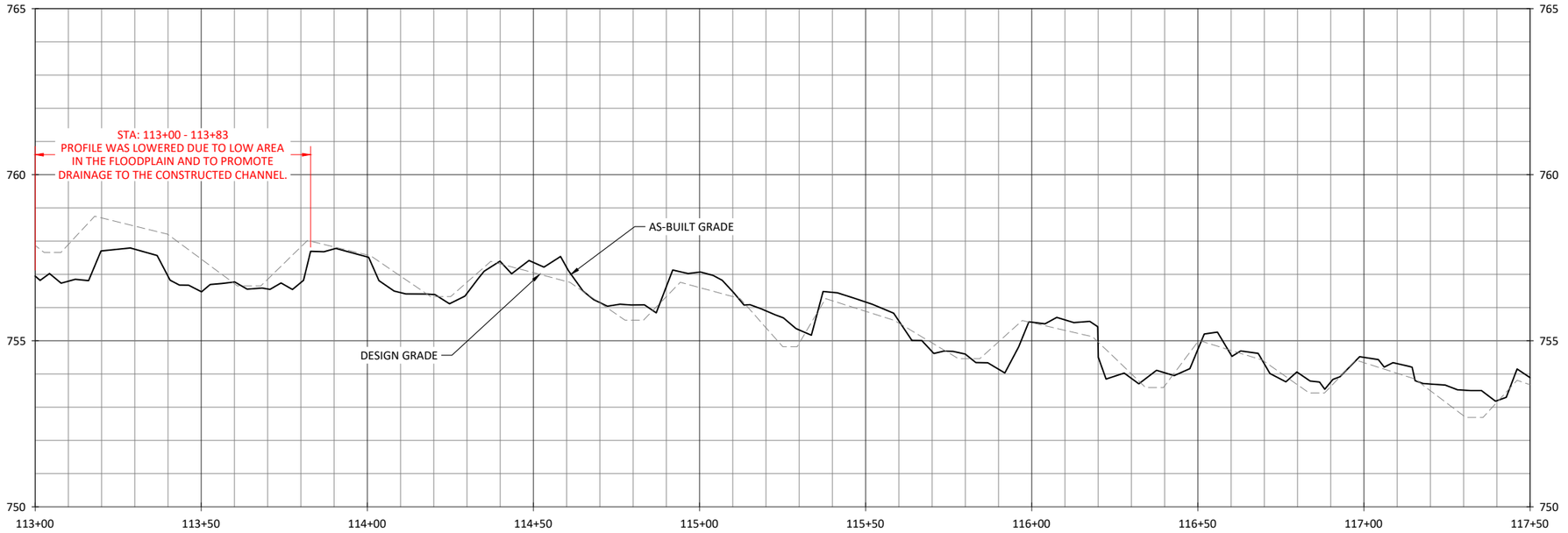
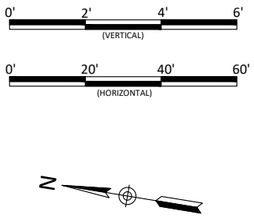
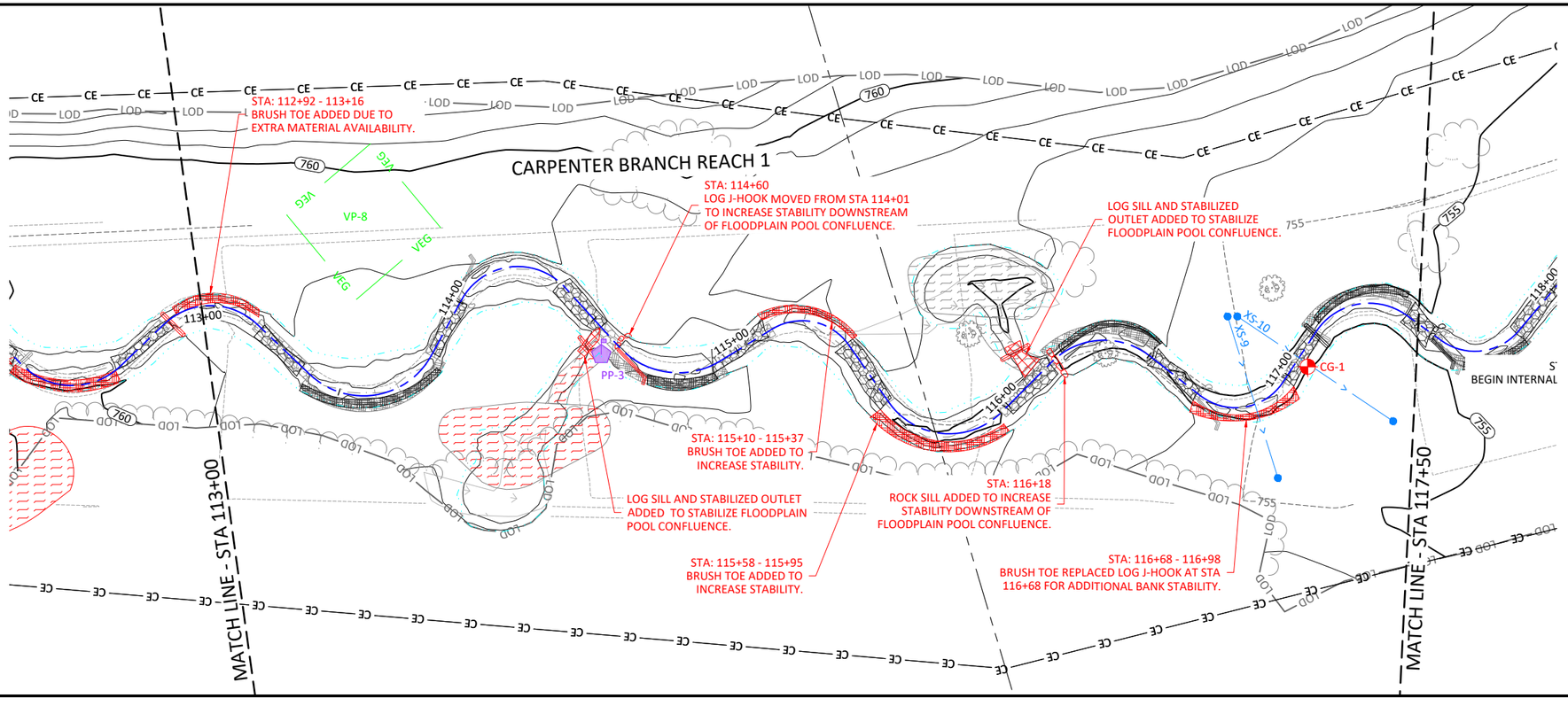
May 19, 2022

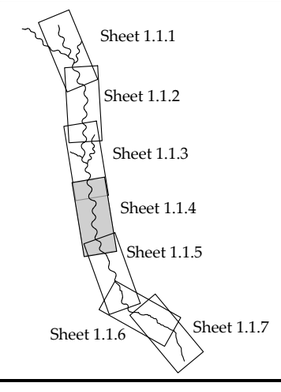






NOTE:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. CREST GAGE ADDED AFTER SURVEY WAS COLLECTED TO MONITOR BANKFULL EVENTS.

Sheet Index



WILDLANDS ENGINEERING
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Tel: 828.774.5547
License No. F-0831

NORTH CAROLINA PROFESSIONAL SEAL 042660 ENGINEER ERIC NEUHAUS
4/1/2022

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

Carpenter Branch
Stream Plan and Profile

Revisions: ---

Date: 4/01/2022
Job Number: 005-02179
Project Engineer: EHN
Drawn By: ABP
Checked By: ---

Sheet 1.1.4

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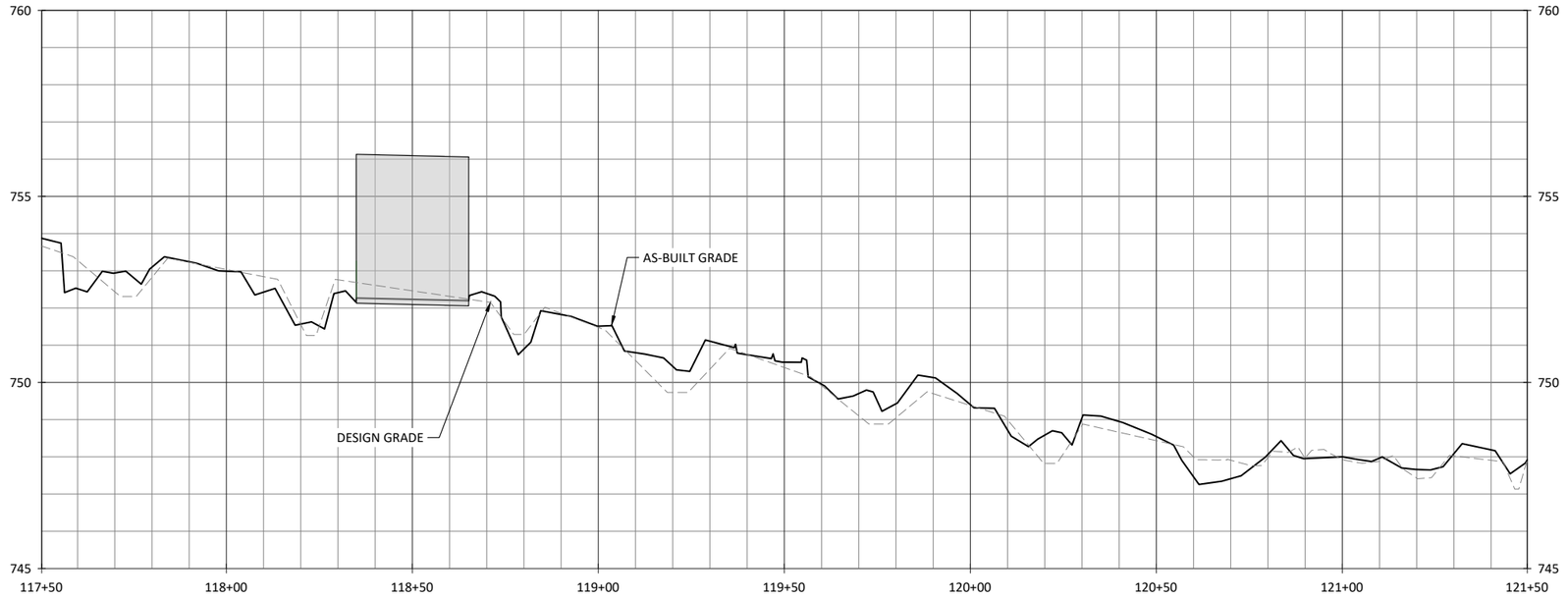
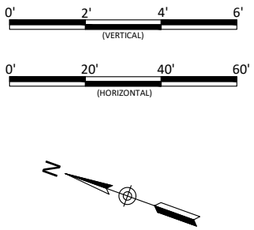
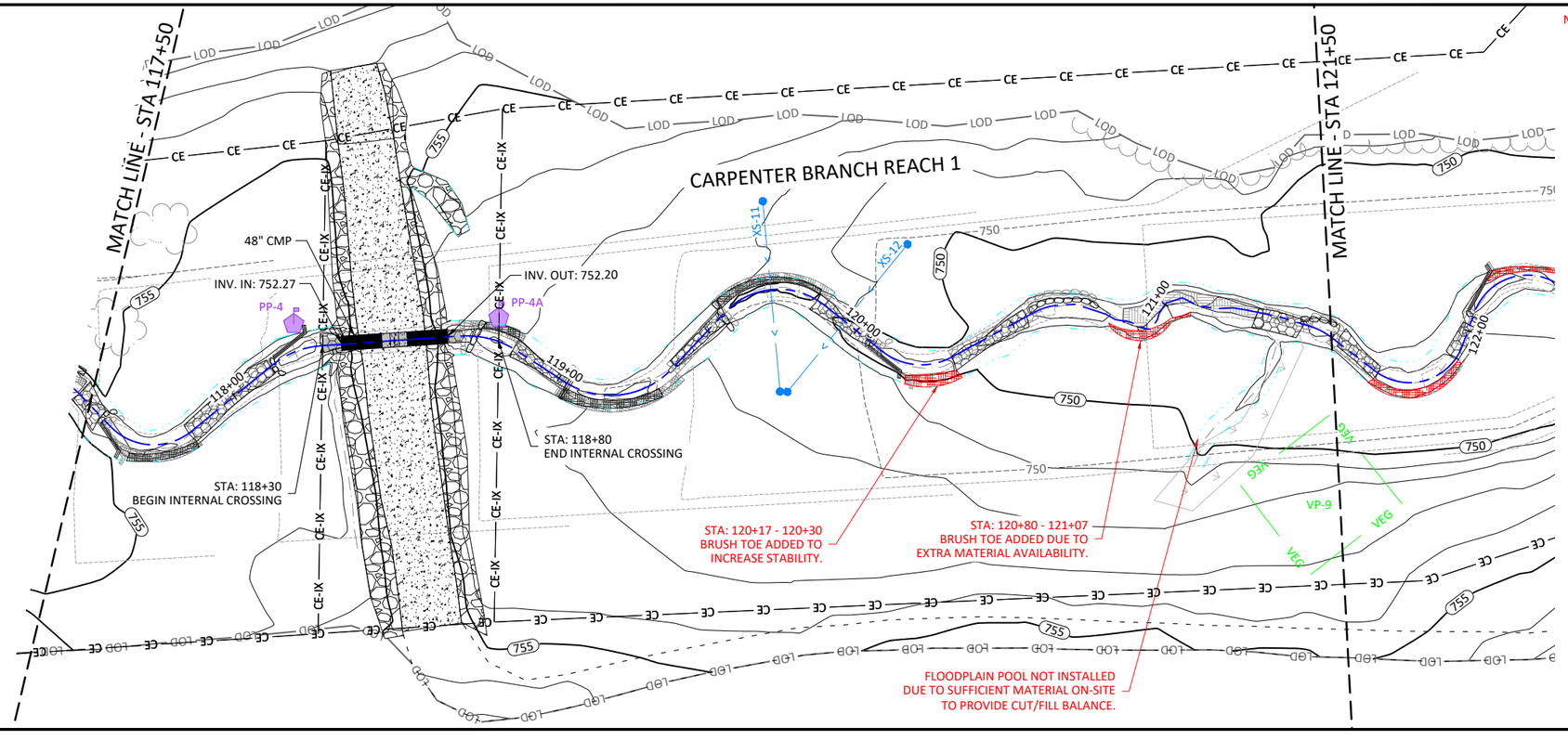
May 19, 2022







NOTE:
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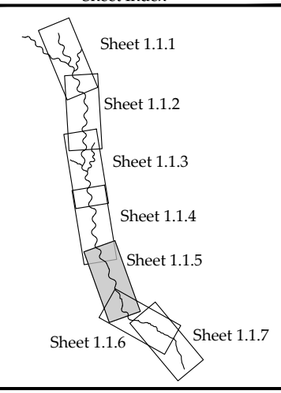
Sheet Index



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Asheville, NC 28806
Tel: 828.774.5547
License No. P-0831

NORTH CAROLINA PROFESSIONAL SEAL 042660 ENGINEER ERIC NEUHAUS
4/1/2022

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

Carpenter Branch
Stream Plan and Profile

Revisions:

Date:	4/01/2022
Job Number:	005-02179
Project Engineer:	EHN
Drawn By:	ABP
Checked By:	---

Sheet 1.1.5

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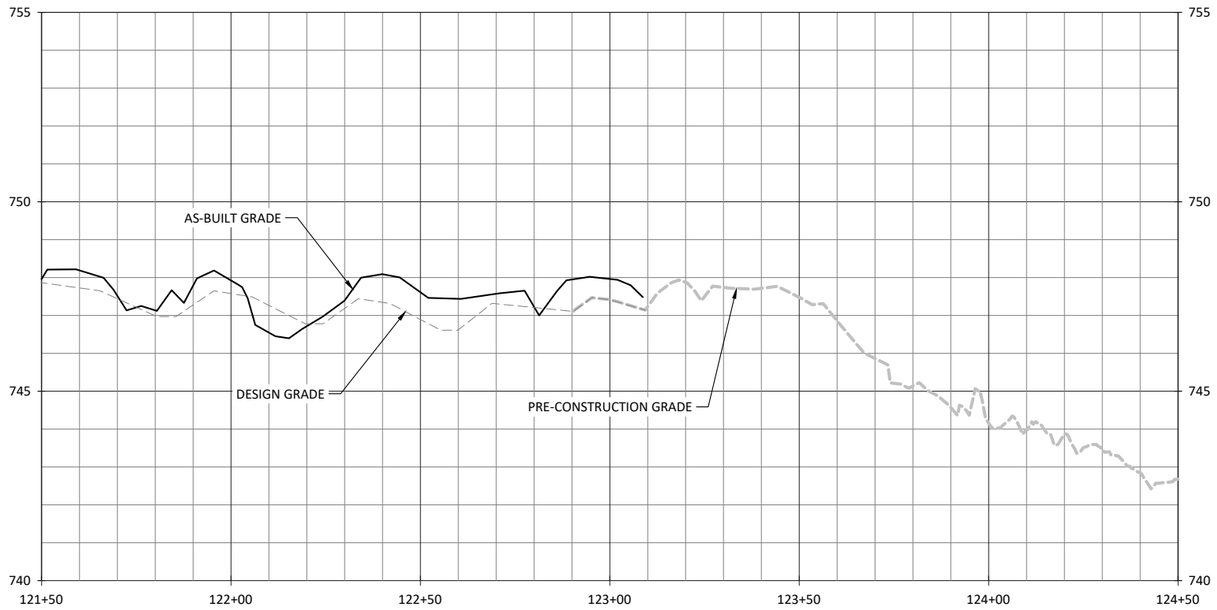
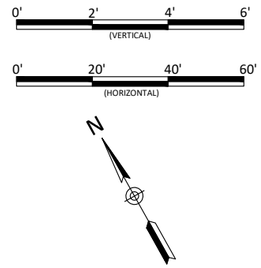


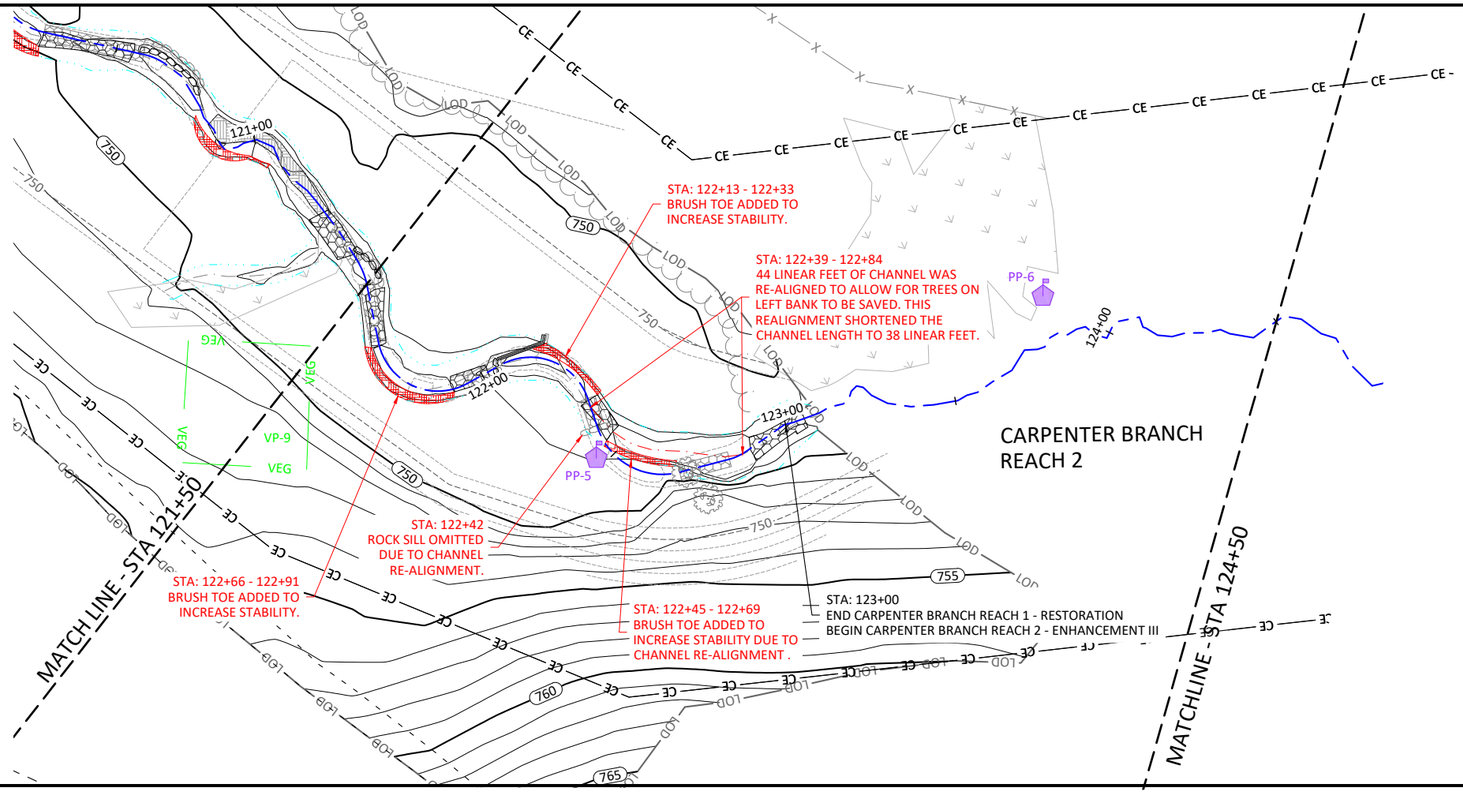


WILDLANDS ENGINEERING
167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. F-0831

NORTH CAROLINA PROFESSIONAL SEAL 042660 ENGINEER ERIC NEUHAUS
4/1/2022

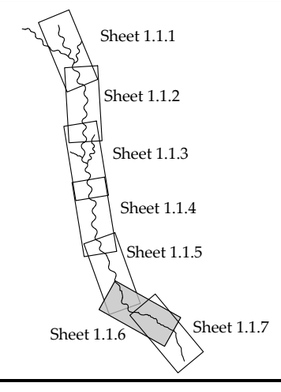
Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

Carpenter Branch
Stream Plan and Profile



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

Sheet Index



Revisions:

Date:	4.01.2022
Job Number:	005-02179
Project Engineer:	EHN
Drawn By:	ABP
Checked By:	---

Sheet 1.1.6

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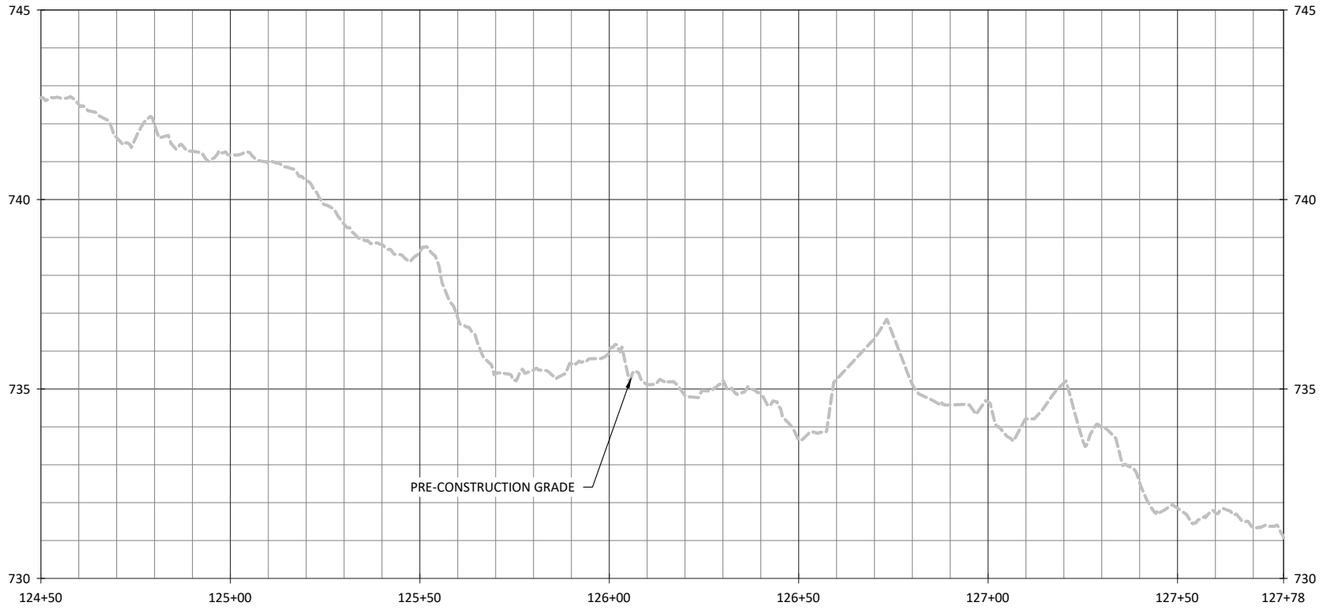
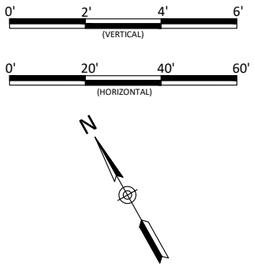
May 19, 2022

May 19, 2023





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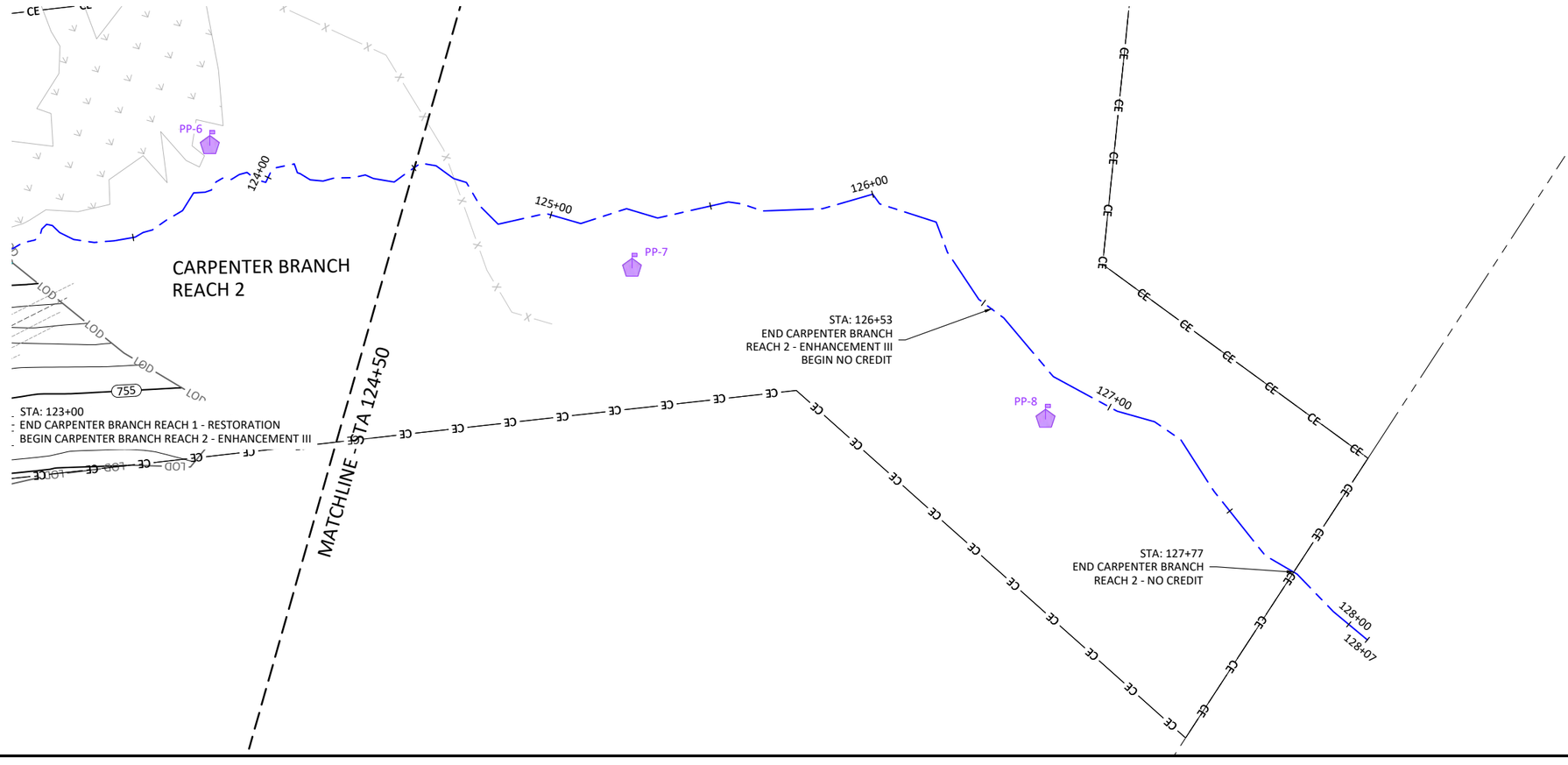

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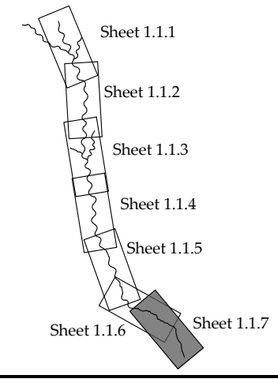

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NORTH CAROLINA PROFESSIONAL SEAL 042660 ENGINEER ERIC NEUHAUS
4/1/2022

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

Carpenter Branch
Stream Plan and Profile

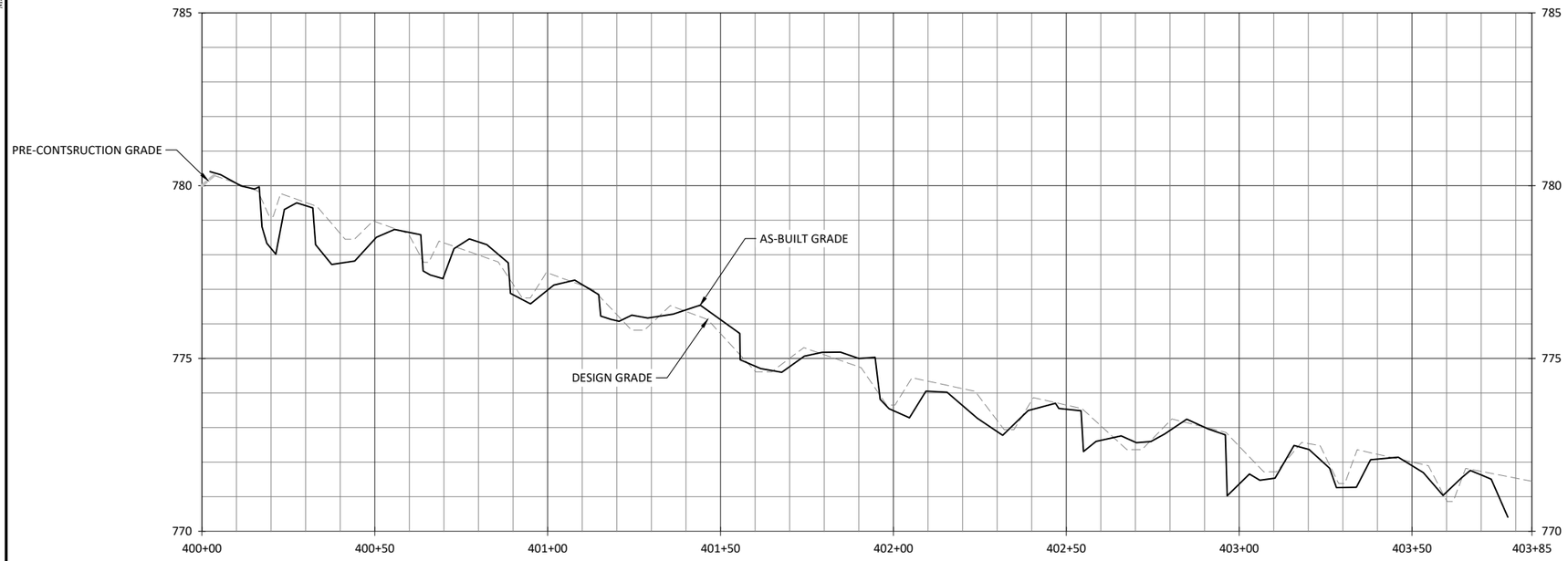
Revisions:

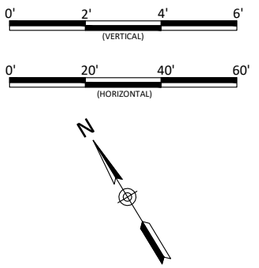
Date:	4.01.2022
Job Number:	005-02179
Project Engineer:	EPN
Drawn By:	ABP
Checked By:	---

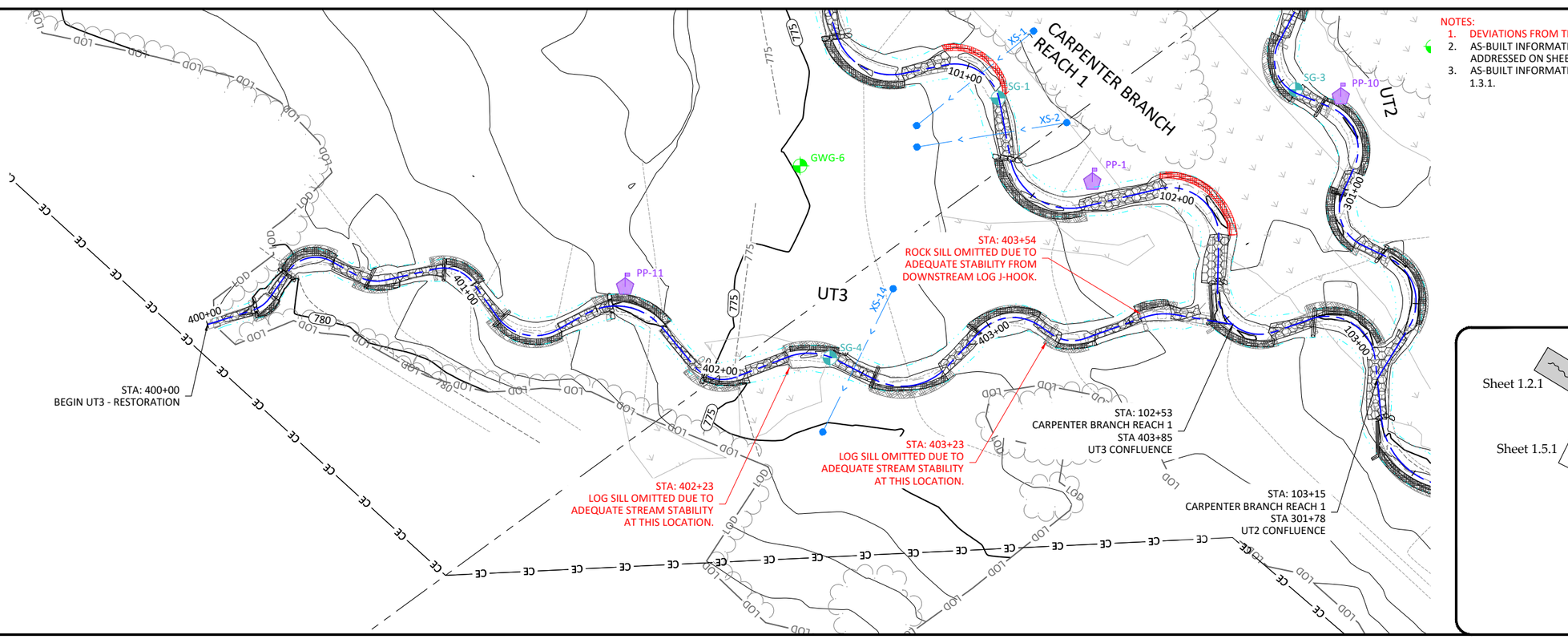
Sheet 1.1.7

X:\Shared\Projects\005-02179 Carpenter Bottom Mitigation Site\Monitoring\Baseline Monitoring\Plans\AR-02179 - Plan and Profile.dwg

May 19, 2023

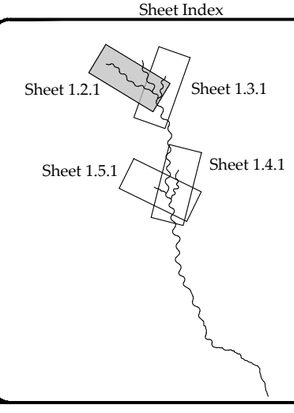






NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR CARPENTER BRANCH IS ADDRESSED ON SHEETS 1.1.1 THROUGH 1.1.7
3. AS-BUILT INFORMATION FOR UT2 IS ADDRESSED ON SHEET 1.3.1.

Sheet Index



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NORTH CAROLINA PROFESSIONAL SEAL 042660 ENGINEER ERIC NEUHAUS
4/1/2022

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

UT3
Stream Plan and Profile

Revisions:

Date:	4.01.2022
Job Number:	005-02179
Project Engineer:	EPN
Drawn By:	ABP
Checked By:	---

Sheet 1.2.1

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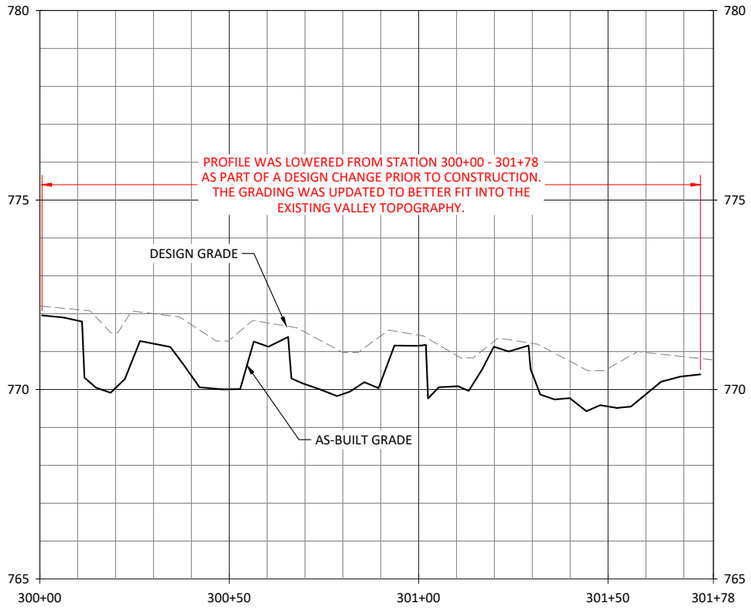
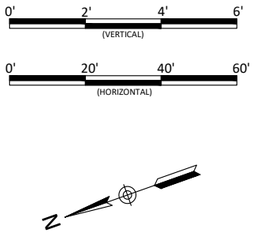
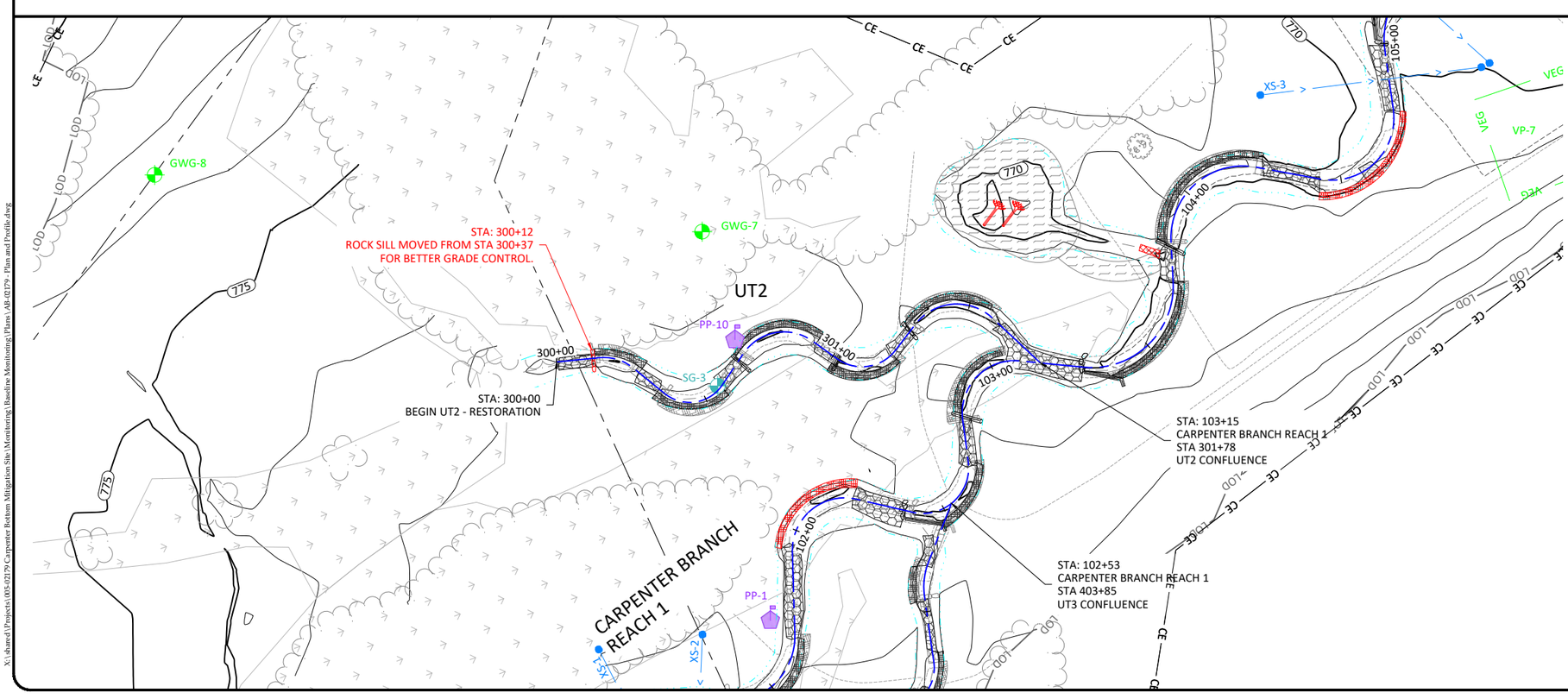
May 19, 2023







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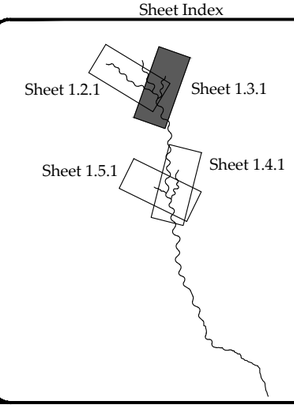
3. AS-BUILT INFORMATION FOR UT3 IS ADDRESSED ON SHEET 1.2.1.

Sheet Index



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NORTH CAROLINA PROFESSIONAL SEAL 042660 ENGINEER ERIC NEUHAUS
4/1/2022

Carpenter Bottom Mitigation Site
Gaston County, North Carolina
As-Built Record Drawings

UT2
Stream Plan and Profile

Revisions:

Date: 4.01.2022
Job Number: 005-02179
Project Engineer: EPN
Drawn By: ABP
Checked By: ---

Sheet 1.3.1

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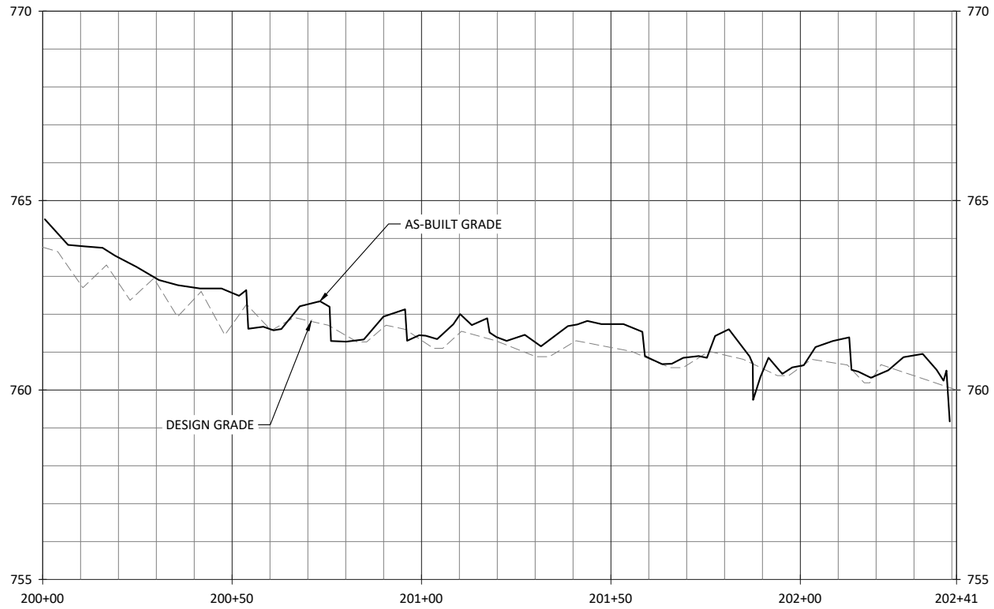
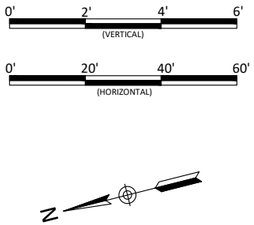
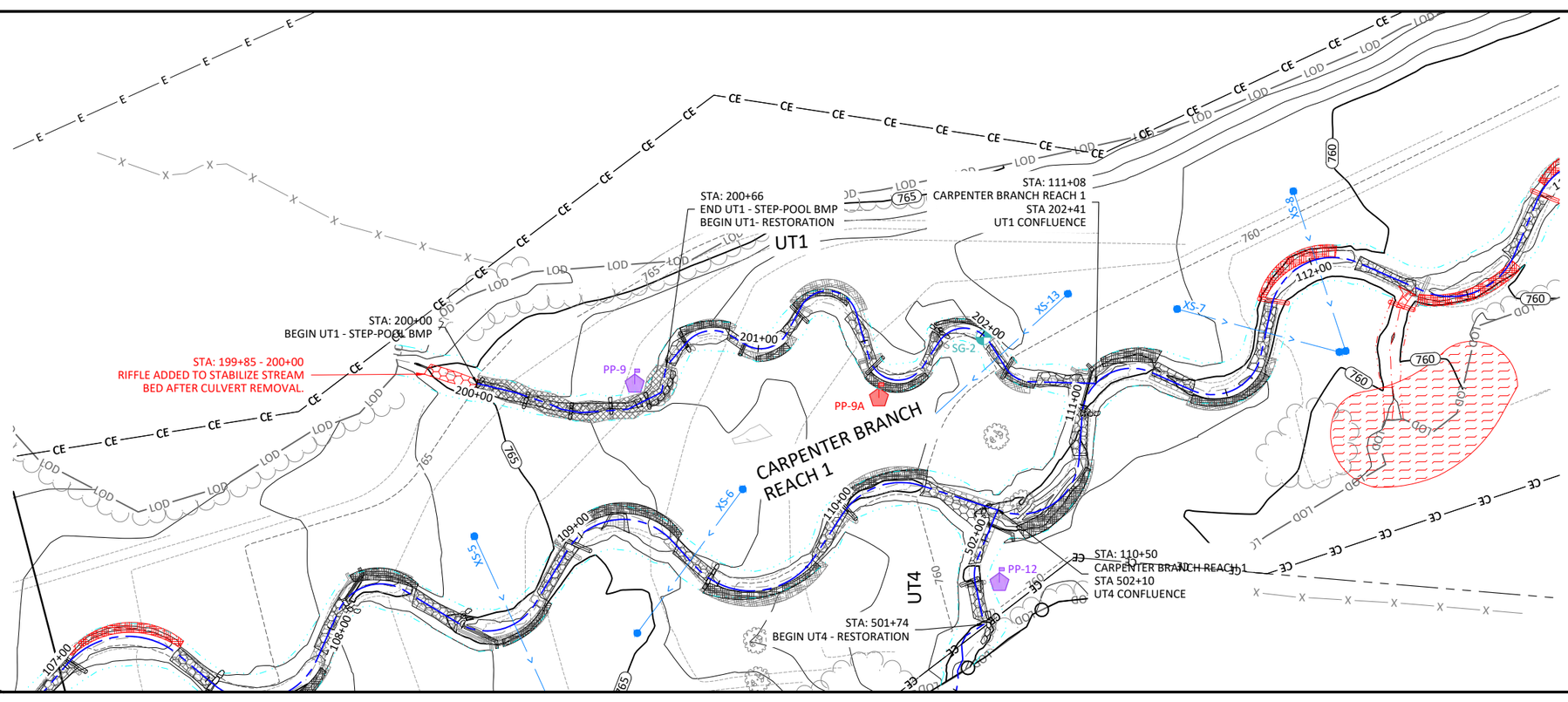
May 19, 2023







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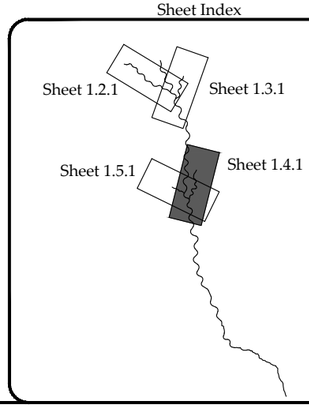
3. AS-BUILT INFORMATION FOR UT4 IS ADDRESSED ON SHEET 1.5.1.
4. PHOTO POINT WAS ADDED AFTER SURVEY WAS COMPLETED TO PROVIDE AN ADDITIONAL VISUAL MONITORING LOCATION ON UT1.

Sheet Index



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NORTH CAROLINA PROFESSIONAL SEAL 042660 ENGINEER ERIC NEUHAUS
4/1/2022

Carpenter Bottom Mitigation Site
Gaston County, North Carolina

UT1
Stream Plan and Profile

Revisions:

Date:	4.01.2022
Job Number:	005-02179
Project Engineer:	EPN
Drawn By:	ABP
Checked By:	---

Sheet 1.4.1

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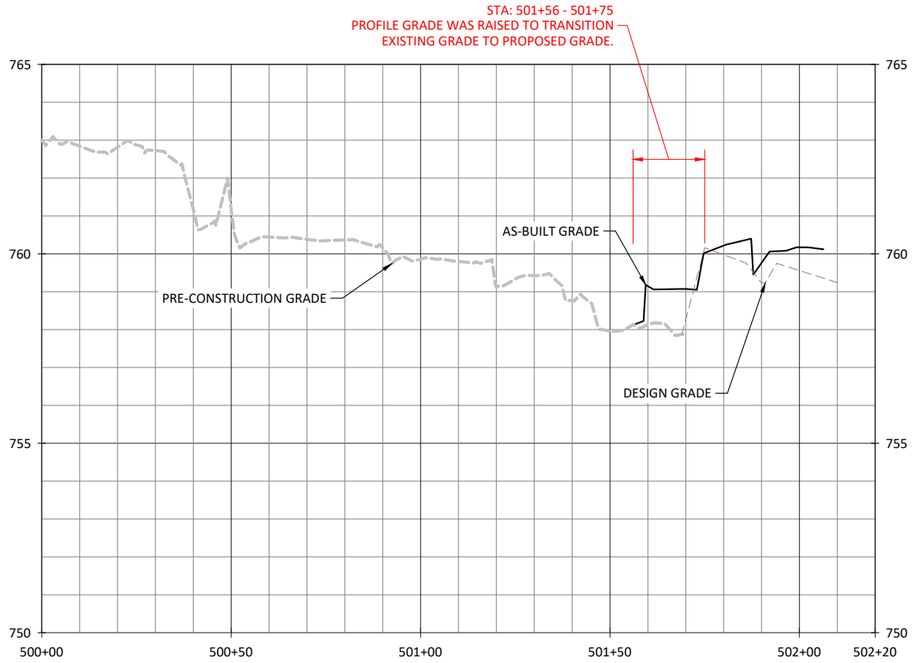
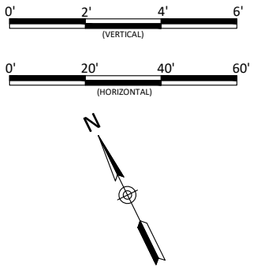
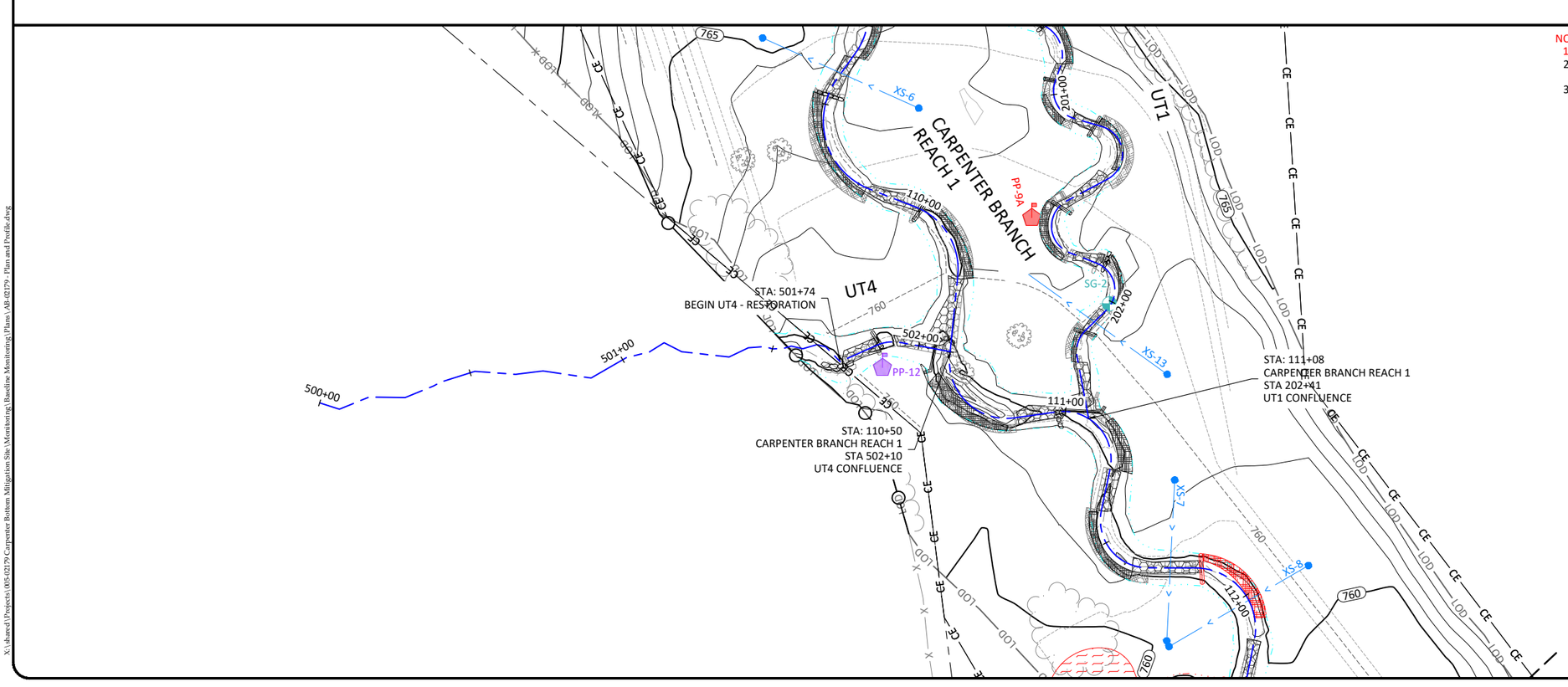
May 19, 2023







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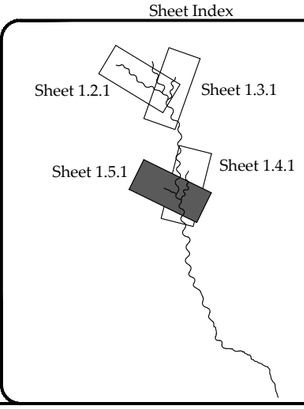
Sheet Index



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NORTH CAROLINA PROFESSIONAL SEAL 042660 ENGINEER ERIC NEUHAUS
4/1/2022

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

UT4
Stream Plan and Profile

Date:	4.01.2022
Job Number:	005-02179
Project Engineer:	EPN
Drawn By:	ABP
Checked By:	---

Revisions:

Sheet 1.5.1

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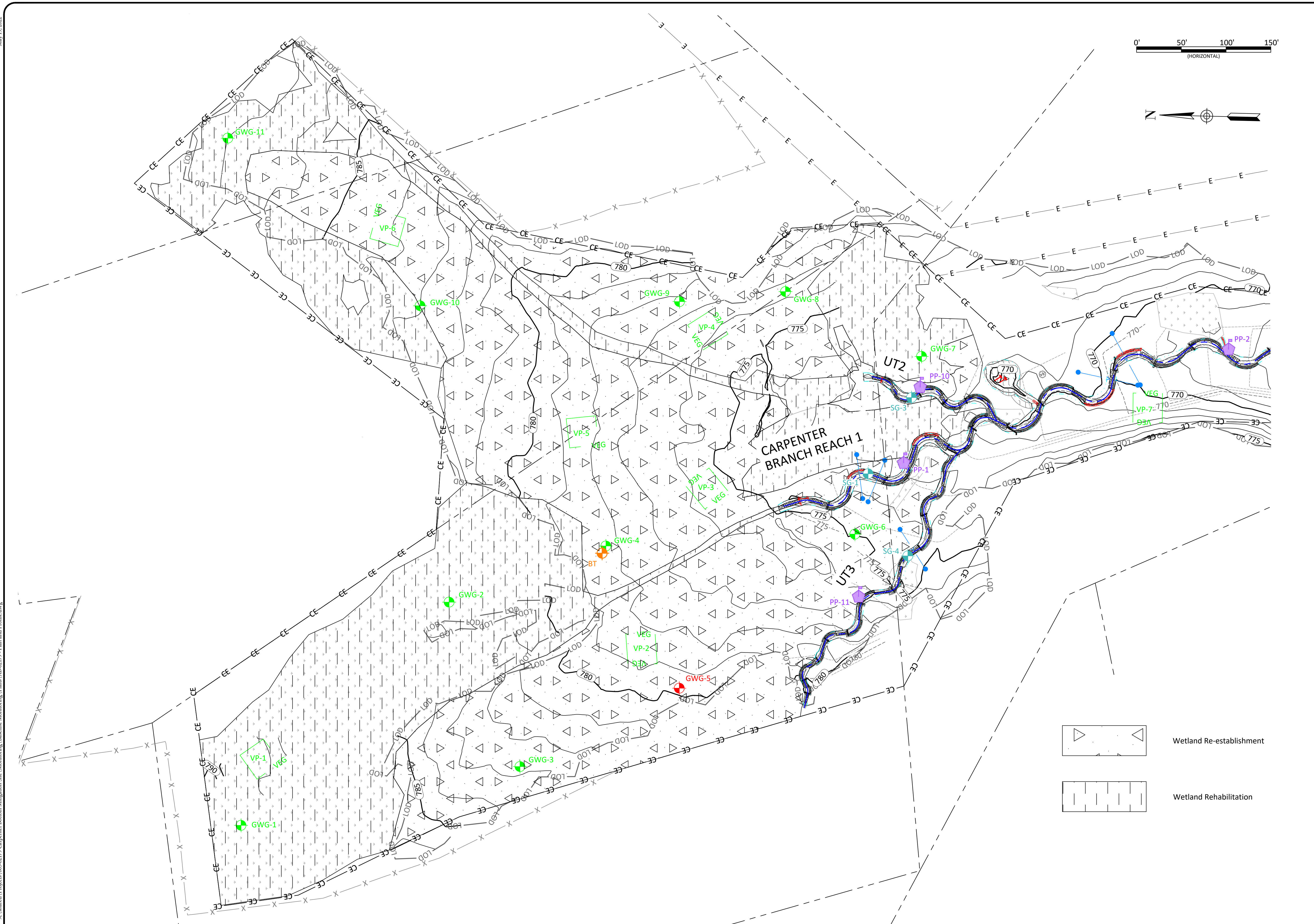
May 19, 2022



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NORTH CAROLINA PROFESSIONAL SEAL 042660 ENGINEER ERIC NEUHAUS 4/1/2022

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

Wetland Overview

Revisions:

Date:	4.01.2022
Job Number:	005-02179
Project Engineer:	EPN
Drawn By:	ABP
Checked By:	----

Sheet 2.0

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May 19, 2022

Open Area Buffer Planting

Open Buffer Planting Zone Trees							
Bare Root							
Species	**Common Name**	**Max Spacing**	**Indiv. Spacing**	**Min. Caliper Size**	**Stratum**	Wetland Indicator	**# of Stems**
Acer negundo	Boxelder	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FAC	~~10%~~ 11%
Platanus occidentalis	Sycamore	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	FACW	15%
Betula nigra	River Birch	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	FACW	15%
Liriodendron tulipifera	Tulip Poplar	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	FACU	~~10%~~ 11%
Quercus Phellos	Willow Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FAC	~~10%~~ 11%
Fagus grandifolia	American Beech	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACU	~~10%~~ 11%
Diospyros virginiana	Persimmon	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FAC	5%
Populus deltoides	Cottonwood	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FAC	~~10%~~ 11%
						Total	**90%**
Alternates							
Nyssa sylvatica	Black Gum	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FAC	0%
Acer saccharinum	Silver Maple	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	0%
Ulmus rubra	Slippery Elm	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	FAC	0%

Open Buffer Planting Zone Small Trees / Shrubs							
Bare Root							
Species	**Common Name**	**Max Spacing**	**Indiv. Spacing**	**Min. Caliper Size**	**Stratum**	Wetland Indicator	**# of Stems**
Alnus serrulata	Tag Alder	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	OBL	2%
Hamamelis virginiana	Witch Hazel	12 ft.	6-12 ft.	0.25”-1.0”	Sub-Canopy	FACU	2%
~~*Cornus florida*~~ *Cornus amomum*	~~Flowering Dogwood~~ Silky Dogwood	12 ft.	6-12 ft.	0.25”-1.0”	~~Sub-Canopy~~ Shrub	~~FACU~~ FACW	2%
Lindera benzoin	Spicebush	12 ft.	6-12 ft.	0.25”-1.0”	Shrub	FAC	2%
Amelanchier arborea	Serviceberry	12 ft.	6-12 ft.	0.25"-1.0"	Shrub	FAC	2%
						Total	**10%**
Alternates							
Asima triloba	Pawpaw	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	FAC	0%
Carpinus caroliniana	American Hornbeam	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	FAC	0%

Partially Vegetated Buffer Area Planting

Partially Buffer Planting Zone Trees							
Bare Root							
Species	**Common Name**	**Max Spacing**	**Indiv. Spacing**	**Min. Caliper Size**	**Stratum**	Wetland Indicator	**# of Stems**
Carpinus caroliniana	American Hornbeam	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	FAC	10%
Euonymus americana	Strawberry Bush	12 ft.	6-12 ft.	0.25”-1.0”	Shrub	FAC	10%
Lindera benzoin	Spicebush	12 ft.	6-12 ft.	0.25”-1.0”	Sub-Canopy	FAC	10%
Fagus grandifolia	American Beech	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	FACU	10%
Ulmus rubra	Slippery Elm	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	FAC	10%
Hamamelis virginiana	Witchhazel	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	FACU	10%
Calycanthus floridus	Sweetshrub	12 ft.	6-12 ft.	0.25"-1.0"	Shrub	FACU	10%
Cornus florida	Flowering Dogwood	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	FACU	10%
Asima triloba	Pawpaw	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	FAC	10%
Quercus rubra	Northern Red Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACU	10%
						Total	**100%**

Wetland Planting

Wetland Planting Zone Trees							
Bare Root							
Species	**Common Name**	**Max Spacing**	**Indiv. Spacing**	**Min. Caliper Size**	**Stratum**	Wetland Indicator	**# of Stems**
Platanus occidentalis	Sycamore	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	FACW	15%
Quercus pagoda	Cherrybark Oak	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	FACW	15%
Quercus phellos	Willow Oak	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	FAC	10%
Ulmus americana	American Elm	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	10%
Nyssa sylvatica	Black Gum	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FAC	5%
Quercus michauxii	Swamp Chestnut Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	10%
Acer negundo	Boxelder	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FAC	5%
Celtis laevigata	Sugarberry	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	5%
Betula nigra	River Birch	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	FACW	10%
						Total	**85%**
Alternate							
Acer saccharinum	Silver Maple	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	0%

Wetland Planting Zone Small Trees/Shrubs							
Bare Root							
Species	**Common Name**	**Max Spacing**	**Indiv. Spacing**	**Min. Caliper Size**	**Stratum**	Wetland Indicator	**# of Stems**
Alnus serrulata	Tag Alder	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	OBL	5%
Lindera benzoin	Spicebush	12 ft.	6-12 ft.	0.25”-1.0”	Shrub	FAC	3%
Cephalanthus occidentalis	Buttonbush	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	OBL	5%
Sambucus canadensis	Elderberry	12 ft.	6-12 ft.	0.25"-1.0"	Shrub	FAC	2%
						Total	**15%**
Alternate							
Alnus serrulata	Tag Alder	12 ft.	6-12 ft.	Tubling	Sub-Canopy	OBL	~~5%~~ 0%

Partially Vegetated Wetland Planting

Partially Vegetated Wetland Planting Zone							
Bare Root							
Species	**Common Name**	**Max Spacing**	**Indiv. Spacing**	**Min. Caliper Size**	**Stratum**	Wetland Indicator	**# of Stems**
Platanus occidentalis	Sycamore	12 ft.	6-12 ft.	0.25”-1.0”	Canopy	FACW	15%
Nyssa sylvatica	Black Gum	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FAC	15%
Alnus serrulata	Tag Alder	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	OBL	15%
Acer negundo	Boxelder	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FAC	15%
Celtis laevigata	Sugarberry	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	15%
Cephalanthus occidentalis	Buttonbush	12 ft.	6-12 ft.	0.25"-1.0"	Sub-Canopy	OBL	15%
Quercus michauxii	Swamp Chestnut Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	10%

TEMPORARY SEEDING		
APPROVED DATE	**TYPE**	**PLANTING RATE (lbs/acre)**
Jan 1 – May 1	Rye Grain (Secale Cereale)	120
	Ladino clover (Trifolium Repens)	5
	Crimson Clover (Trifolium incarnatum)	5
	Straw Mulch	4,000
May 1 – Aug 15	German Millet (*Setaria italica*)	40
	Ladino clover (Trifolium Repens)	5
	Crimson Clover (Trifolium incarnatum)	5
	Straw Mulch	4,000
Aug 15 – Dec 31	Rye Grain (*Secale Cereale*)	120
	Ladino clover (Trifolium Repens)	5
	Crimson Clover (Trifolium incarnatum)	5
	Straw Mulch	4,000

Riparian Corridor Planting (Streambanks)

Streambank Planting Zone							
Live Stakes							
Species	**Common Name**	**Max Spacing**	**Indiv. Spacing**	**Min. Size**	**Stratum**	Wetland Indicator	**% of Stems**
Salix nigra	Black Willow	8 ft.	6-8 ft.	0.5”-1.5” cal.	Shrub	OBL	25%
Cornus amomum	Silky Dogwood	8 ft.	6-8 ft.	0.5”-1.5” cal.	Shrub	FACW	20%
Salix sericea	Silky Willow	8 ft.	6-8 ft.	0.5”-1.5” cal.	Shrub	OBL	25%
Cephalathus occidentalis	Buttonbush	8 ft.	6-8 ft.	0.5"-1.5" cal.	Shrub	OBL	15%
Sambucus canadensis	Elderberry	8 ft.	6-8 ft.	0.5"-1.5" cal.	Shrub	FAC	15%
						Total	**100%**
Herbaceous Plugs							
Juncus effusus	Common Rush	5 ft.	3-5 ft.	1.0”- 2.0” plug	Herb	FACW	40%
Carex crinita	Fringed Sedge	5 ft.	3-5 ft.	1.0”- 2.0” plug	Herb	OBL	10%
Carex lurida	Lurid Sedge	5 ft.	3-5 ft.	1.0”- 2.0” plug	Herb	OBL	20%
Carex lupulina	Hop Sedge	5 ft.	3-5 ft.	1.0"-2.0" plug	Herb	OBL	15%
Scirpus cyperinus	Woolgrass	5 ft	3-5 ft.	1.0"-2.0" plug	Herb	FACW	15%
						Total	**100%**

Permanent Seeding

Riparian Seeding - Open Canopy					
Pure Live Seed (20 lbs/ acre)					
Approved Date	**Species Name**	**Common Name**	**Stratum**	Wetland Indicator	**Density (lbs/acre)**
All Year	*Schizachyrium scoparium*	Little Bluestem	Herb	FACU	4.0
All Year	*Panicum virgatum*	Switchgrass	Herb	FAC	2.0
All Year	*Panicum rigidulum*	Redtop Panicgrass	Herb	FACW	1.0
All Year	*Rudbeckia hirta*	Blackeyed Susan	Herb	FACU	1.0
All Year	*Coreopsis lanceolata*	Lanceleaf Coreopsis	Herb	FACU	1.0
All Year	*Carex vulpinoidea*	Fox Sedge	Herb	OBL	1.0
All Year	*Panicum clandestinum*	Deertongue	Herb	FAC	2.0
All Year	*Elymus virginicus*	Virginia Wild Rye	Herb	FACW	2.0
All Year	*Sorghastrum nutans*	Indiangrass	Herb	FACU	3.0
All Year	*Bidens aristosa*	Showy Tickseed Sunflower	Herb	FACW	1.0
All Year	*Helianthus angustifolia*	Narrowleaf Sunflower	Herb	FACW	1.0
All Year	*Coreopsis tinctoria*	Plains corepsis	Herb	FAC	1.0

Wetland Seeding - Open Canopy					
Pure Live Seed (20 lbs/ acre)					
Approved Date	**Species Name**	**Common Name**	**Stratum**	Wetland Indicator	**Density (lbs/acre)**
All Year	*Coleataenia anceps*	Beaked Panicgrass	Herb	FAC	3.0
All Year	*Carex vulpinoidea*	Fox Sedge	Herb	OBL	2.0
All Year	*Elymus virginicus*	Virginia Wild Rye	Herb	FACW	4.0
All Year	*Bidens aristosa*	Showy Tickseed Sunflower	Herb	FACW	3.0
All Year	*Panicum cirgatum*	Switchgrass	Herb	FAC	3.0
All Year	*Polygonum pensylvanicum*	Smartweed	Herb	FACW	1.0
All Year	*Juncus effusus*	Common Rush	Herb	OBL	2.0
All Year	*Panicum dichotomiflorum*	Smooth Panicgrass	Herb	FACW	2.0

Stabilization Seeding

Stabilization Seeding		
Pure Live Seed (32 lbs/ac)		
Species Name	**Common Name**	**lbs/acre**
Festuca arundinacea	Fescue (KY 31)	20
Dactylis glomerata	Orchard Grass	12

WILDLANDS ENGINEERING
167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. F-0831

NORTH CAROLINA PROFESSIONAL SEAL 042660 ENGINEER ERIC NEUHAUS 4/1/2022

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

Planting Plan

Revisions:

Date: 4.01.2022
Job Number: 005-02179
Project Engineer: EPN
Drawn By: ABP
Checked By: ---

Sheet 3.0

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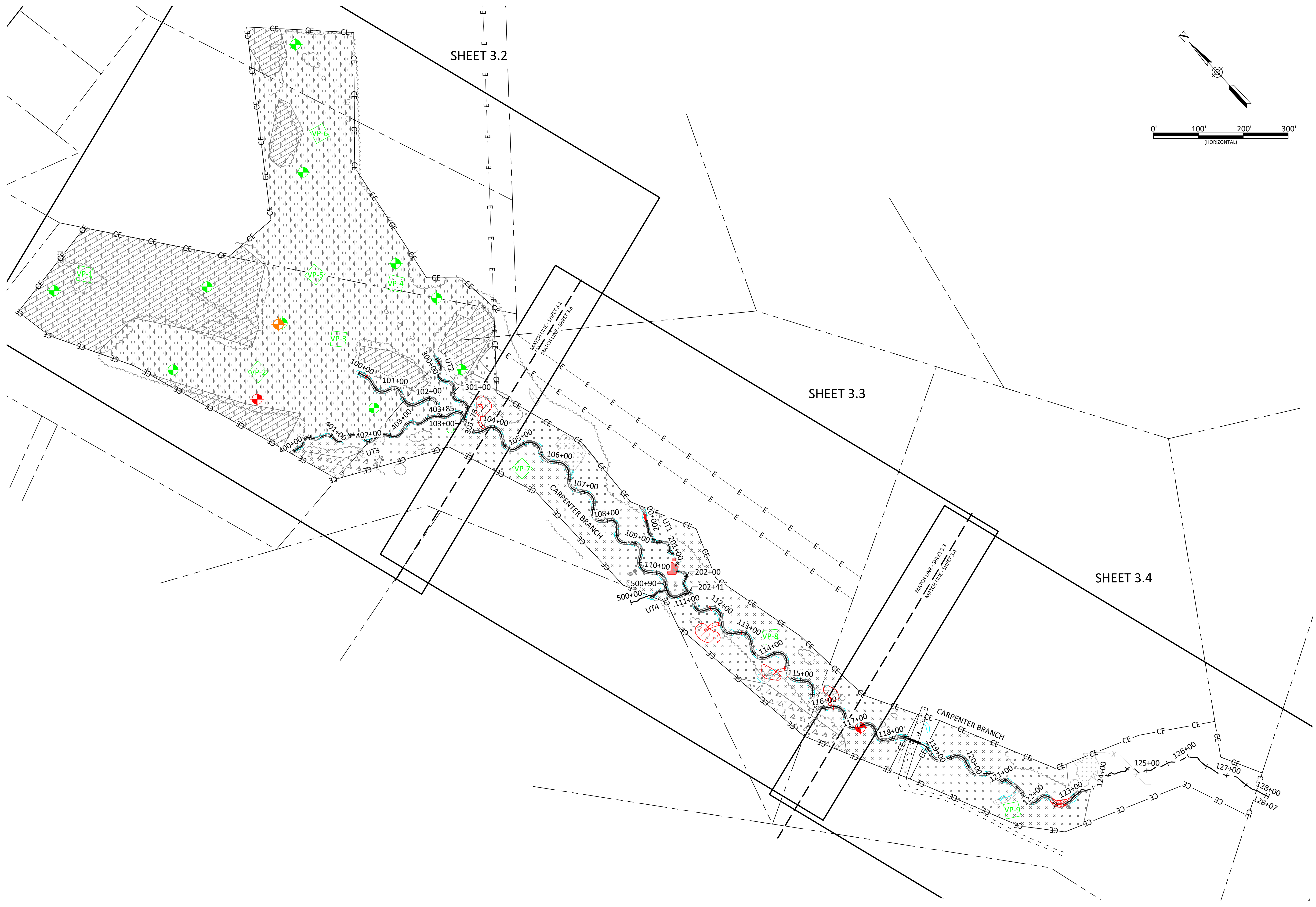

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

Planting Overview
Planting Plan

WILDLANDS ENGINEERING
167-B Haywood Rd
Asheville, NC 28806
Tel: 828.774.5547
License No. F-0831

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 042660 ERIC NEUHAUS 4/1/2022

Revisions:

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Project Engineer:	EPN
Drawn By:	ABP
Checked By:	----

Sheet 3.1

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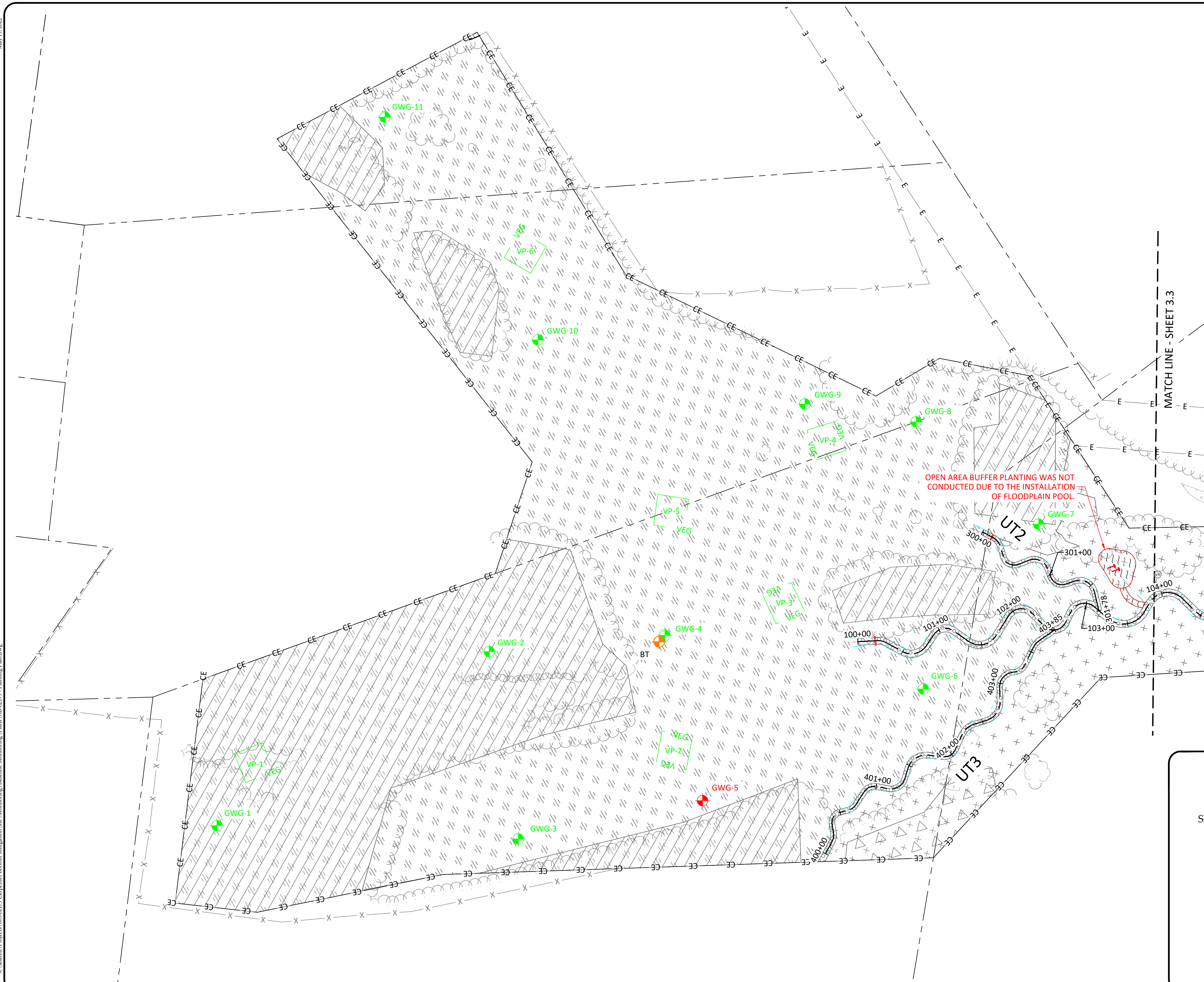
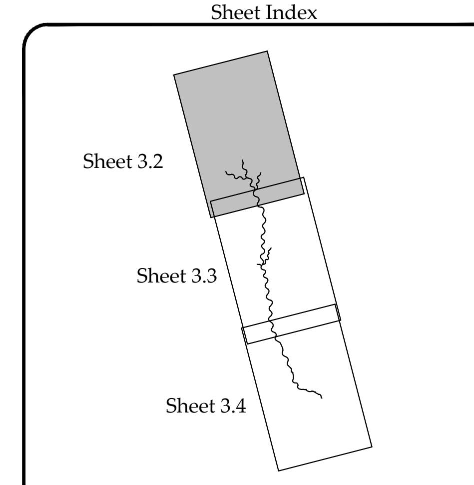
May 19, 2022



Sheet Index



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4/1/2022

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Gaston County, North Carolina

Planting Plan

Revisions:

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Project Engineer: EPN
Drawn By: ABP
Checked By: ---

Sheet 3.2

May 19, 2022

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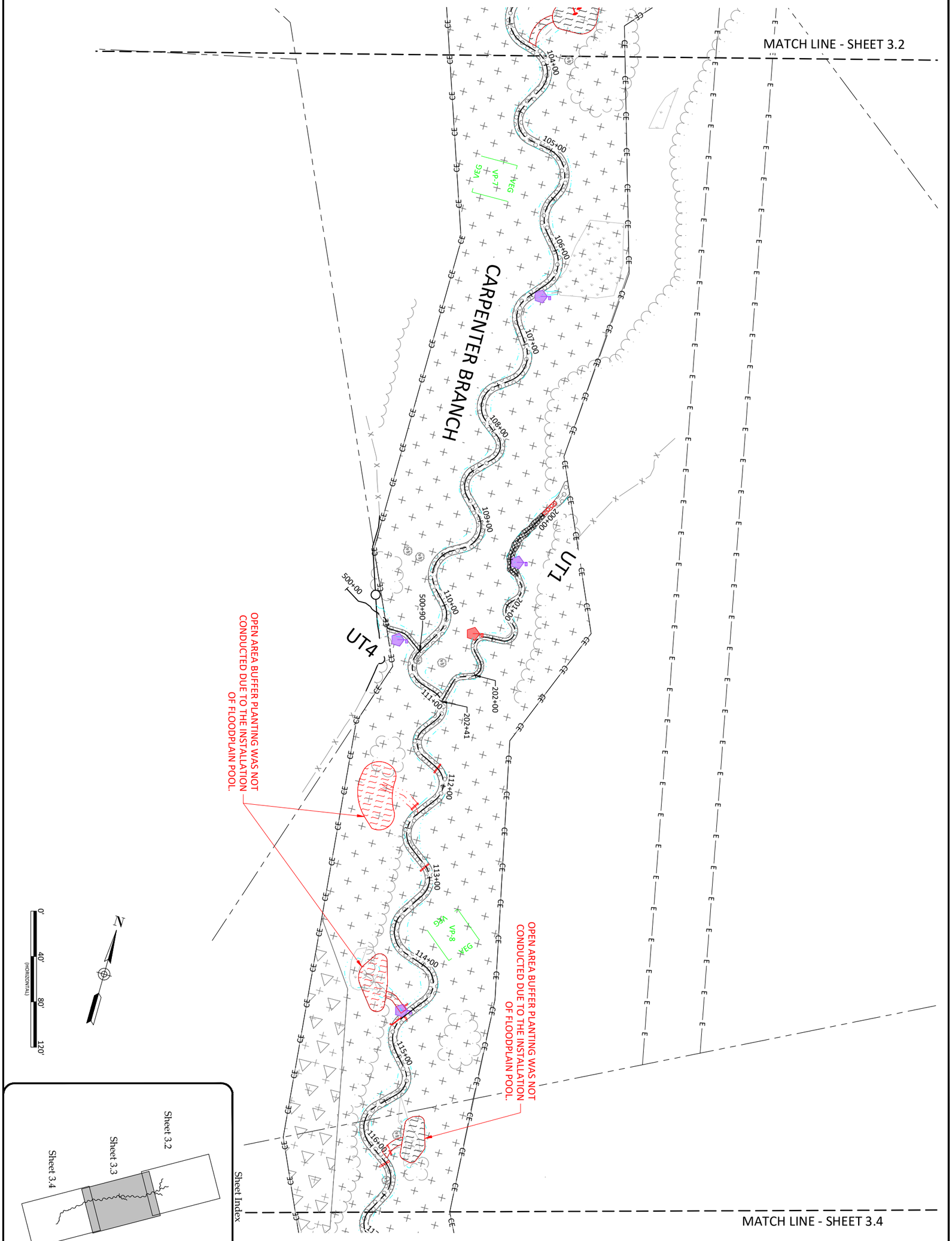

Sheet Index

Date:	4.01.2022
Job Number:	005-02179
Project Engineer:	EPN
Drawn By:	ABP
Checked By:	---

Revisions:

3.3
Sheet

Carpenter Bottom Mitigation Site Record Drawings
Gaston County, North Carolina

Planting Plan

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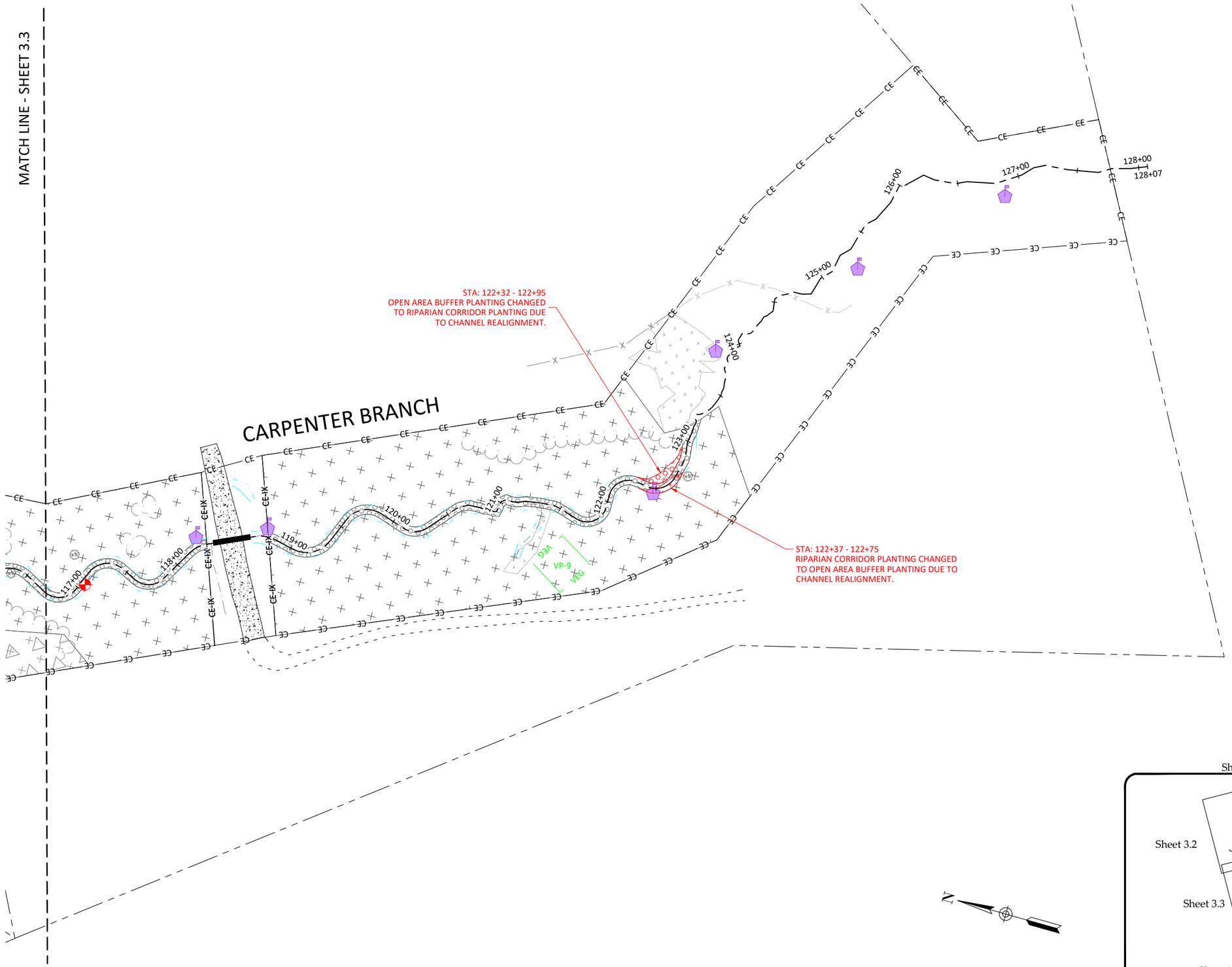
May 19, 2023

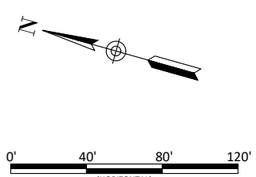
MATCH LINE - SHEET 3.3

CARPENTER BRANCH

STA: 122+32 - 122+95
OPEN AREA BUFFER PLANTING CHANGED
TO RIPARIAN CORRIDOR PLANTING DUE
TO CHANNEL REALIGNMENT.

STA: 122+37 - 122+75
RIPARIAN CORRIDOR PLANTING CHANGED
TO OPEN AREA BUFFER PLANTING DUE TO
CHANNEL REALIGNMENT.





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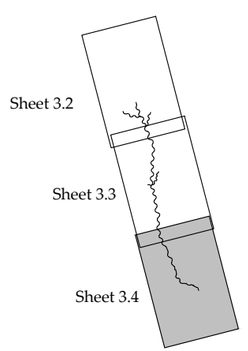

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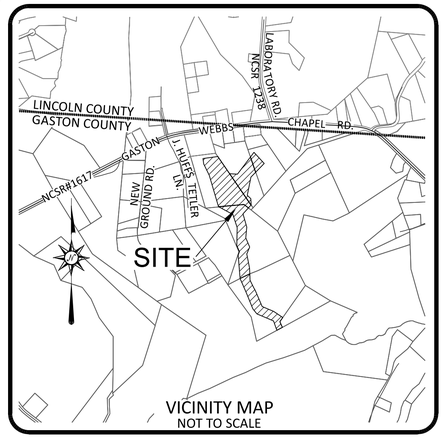
Sheet 3.4

X:\shared\Projects\005-02179 Carpenter Bottom Mitigation Site\Monitoring\Baseline Monitoring\Plans\AR-02179 - Planting Plan.dwg

CARPENTER BOTTOM MITIGATION SITE AS-BUILT



VICINITY MAP
NOT TO SCALE

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 31st DAY OF MARCH, 2022.

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

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

I, DAVID S. TURNER, CERTIFY THAT THIS PROJECT WAS COMPLETED UNDER MY DIRECT AND RESPONSIBLE CHARGE FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; THAT THIS 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 AUG-SEPT 2021; THAT THE SURVEY WAS COMPLETED ON 1 SEPT 2021; AND ALL COORDINATES ARE BASED ON NAD83 (2011) AND ALL ELEVATIONS ARE BASED ON NAVD88. WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER, AND SEAL THIS 31st DAY OF MARCH, 2022.

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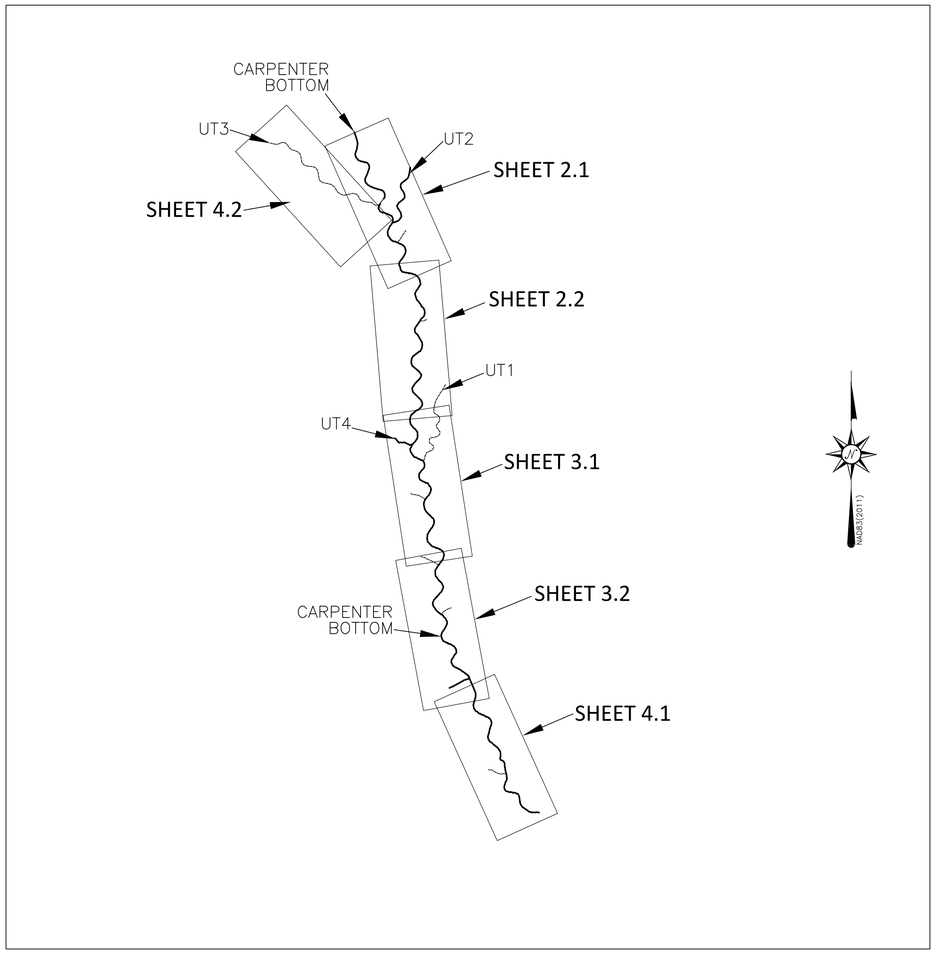
NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

GENERAL NOTES:
1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. HORIZONTAL DATUM IS NAD83(2011) & VERTICAL DATUM IS NAVD88.
3. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
4. THE PURPOSE OF THIS MAP IS TO SHOW THE AS-BUILT CONDITIONS OF THE CARPENTER BOTTOM STREAM MITIGATION.
5. THE CONTROL NETWORK WAS ESTABLISHED BY TURNER LAND SURVEYING DURING THE EXISTING CONDITIONS SURVEY AND RECOVERED AND SUPPLEMENTED DURING THE AS-BUILT SURVEY. THE COORDINATES ARE LISTED IN THE CHART BELOW.
6. NO PROPERTY RESEARCH, INVESTIGATION, OR INDEPENDENT SEARCH FOR ENCUMBERANCES, RESTRICTIVE COVENANTS, EASEMENTS OF RECORD, OWNERSHIP, TITLE EVIDENCE, OR OTHER FACTS THAT AN ACCURATE AND CURRENT TITLE EXAMINATION MAY DISCLOSE WERE PERFORMED FOR THIS SURVEY. A LICENSED ATTORNEY-AT-LAW SHOULD BE CONSULTED REGARDING CORRECT OWNERSHIP, WIDTH, AND LOCATION OF EASEMENTS AND OTHER TITLE QUESTIONS REVEALED BY A TITLE EXAMINATION.
7. SUBJECT TO ALL EASEMENTS, RIGHT OF WAYS, AND/OR ENCUMBRANCES THAT MAY AFFECT THE PROPERTY(S).
8. THIS SURVEYOR DOES NOT CERTIFY TO THE EXISTENCE OR NON-EXISTENCE OF ANY UNDERGROUND UTILITIES THAT MAY OR MAY NOT EXIST WITHIN THE BOUNDARIES AS SHOWN HEREON.

AS-BUILT CONTROL

PointNo.	Northing(Y)	Easting(X)	Elev(Z)	Description
3	612086.54	1326180.10	784.36	TLS#3RBC
4	611528.40	1326556.50	772.84	TLS#4NL
5	611439.90	1326648.70	771.39	TLS#5NL
6	611253.14	1326645.54	770.75	TLS#6NL
7	611063.04	1326623.90	769.58	TLS#7NL
9	610902.16	1326642.59	760.04	TLS#9NL
10	610684.24	1326646.43	758.07	TLS#10NL
11	610489.77	1326713.15	757.26	TLS#11NL
12	610273.85	1326772.05	753.54	TLS#12NL
16	609936.41	1327070.38	748.52	TLS#16NL
24	611518.28	1326546.56	772.97	TLS#24NL
26	611243.76	1326626.21	770.45	TLS#26NL
27	611045.95	1326598.27	770.81	TLS#27NL
28	610772.62	1326767.48	763.23	TLS#28NL
29	610497.07	1326753.15	757.53	TLS#29NL
31	610023.52	1326931.85	749.32	TLS#31NL
32	609683.75	1327066.96	768.05	TLS#32NL
50	610438.65	1326803.22	756.77	TLS#50NL
102	611714.31	1326322.55	779.54	TLS#102NL
104	611825.58	1326846.11	785.34	TLS#104NL
105	611672.25	1326804.09	777.77	TLS#105NL
106	611649.29	1326624.34	772.99	TLS#106NL
107	611066.93	1326750.80	767.28	TLS#107NL



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SCALE: 1 inch = 100 feet

SURVEY FOR:
WILDLANDS ENGINEERING, INC
LICENSE NO. F-0831
167-B HAYWOOD RD
ASHEVILLE, NC 28806
ERIC NEUHAUS, PE PROJECT ENGINEER
865-207-8835

AS-BUILT SURVEY PERFORMED BY
TURNER LAND SURVEYING, PLLC
AUGUST-SEPTEMBER 2021

THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.

REVISIONS, DATE AND INITIAL:

TURNER LAND SURVEYING
P.O. BOX 148
SWANNANOA, NC 28778
P-0702 (919) 827-0745
www.turnerlandsurveying.com
Certified DBE/WBE

AS-BUILT SURVEY FOR:
CARPENTER BOTTOM MITIGATION SITE
CHERRYVILLE TOWNSHIP, GASTON COUNTY, NORTH CAROLINA
LINCOLNTON TOWNSHIP, LINCOLN COUNTY, NORTH CAROLINA

DATE: 8/24/2021
SURVEYED BY: DST/CPG/EHK
DRAWN BY: EGT/DST
REVIEWED BY: DST/EGT
PROJECT: 19-020
FILE: CARPENTER BOTTOM_AB.DWG
SCALE: AS SHOWN

SHEET 1 of 4

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 31st DAY OF MARCH, 2022.

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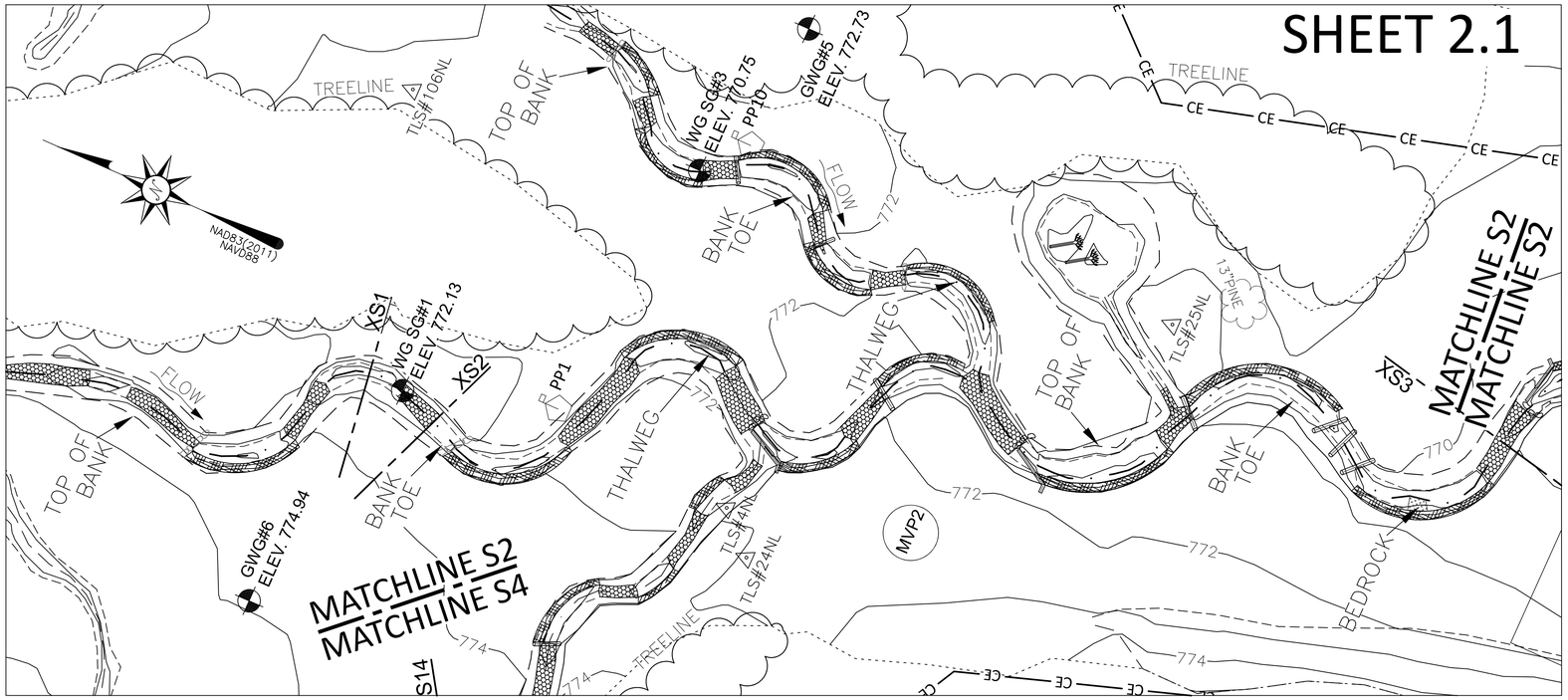
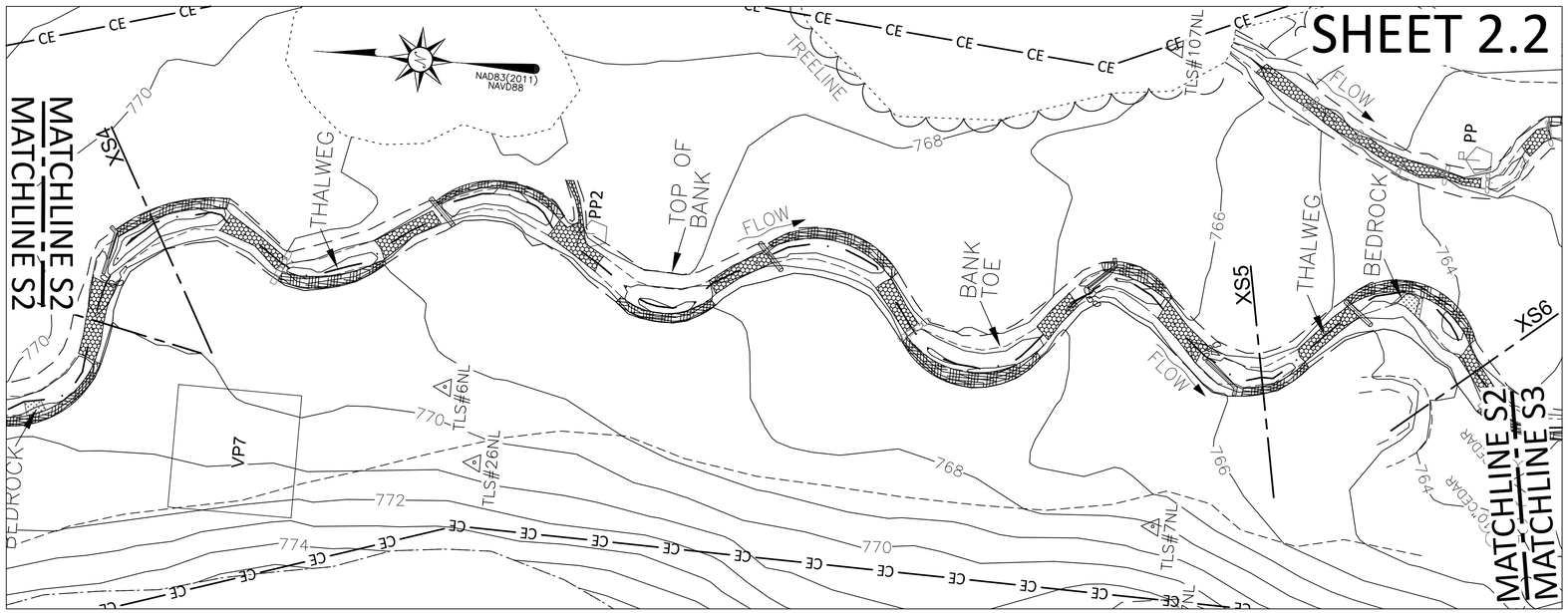
GENERAL NOTES:
1. SEE SHEET 1 FOR GENERAL NOTES

CARPENTER BOTTOM MITIGATION SITE

SHEET 2.1



SHEET 2.2



LEGEND:

- THALWEG
- TOP OF BANK/TERRACE
- BANK TOE/TERRACE TOE
- AS-BUILT SURVEY LIMITS
- FARM PATH
- FENCELINE
- CONSERVATION EASEMENT
- CONTOURS
- TREELINE
- TREE
- LOG SILL
- ROCK SILL
- J-HOOK LOG SILL
- ROOTWAD
- GRAVEL/CROSSING
- RIPRAP/STONE
- BEDROCK
- BRUSH TOE
- CONSTRUCTED RIFFLE
- CROSS-SECTION
- STREAM GAUGE
- MONITORING WELL/GROUND WATER GAUGE
- PHOTO POINT
- VEGETATION PLOT/ MOVEABLE VEGETATION PLOT
- CONTROL POINT

SCALE: 1 inch = 20 feet

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REVISIONS, DATE AND INITIAL:

AS-BUILT SURVEY FOR:

CARPENTER BOTTOM MITIGATION SITE

GASTON COUNTY, NORTH CAROLINA
LINCOLN COUNTY, NORTH CAROLINA
CHERRYVILLE TOWNSHIP, GASTON COUNTY
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FILE:	CARPENTER BOTTOM_AB.DWG
SCALE:	AS SHOWN

SHEET 2 of 4

CARPENTER BOTTOM MITIGATION SITE

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GENERAL NOTES:
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LEGEND:

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- BANK TOE/TERRACE TOE
- AS-BUILT SURVEY LIMITS
- FARM PATH
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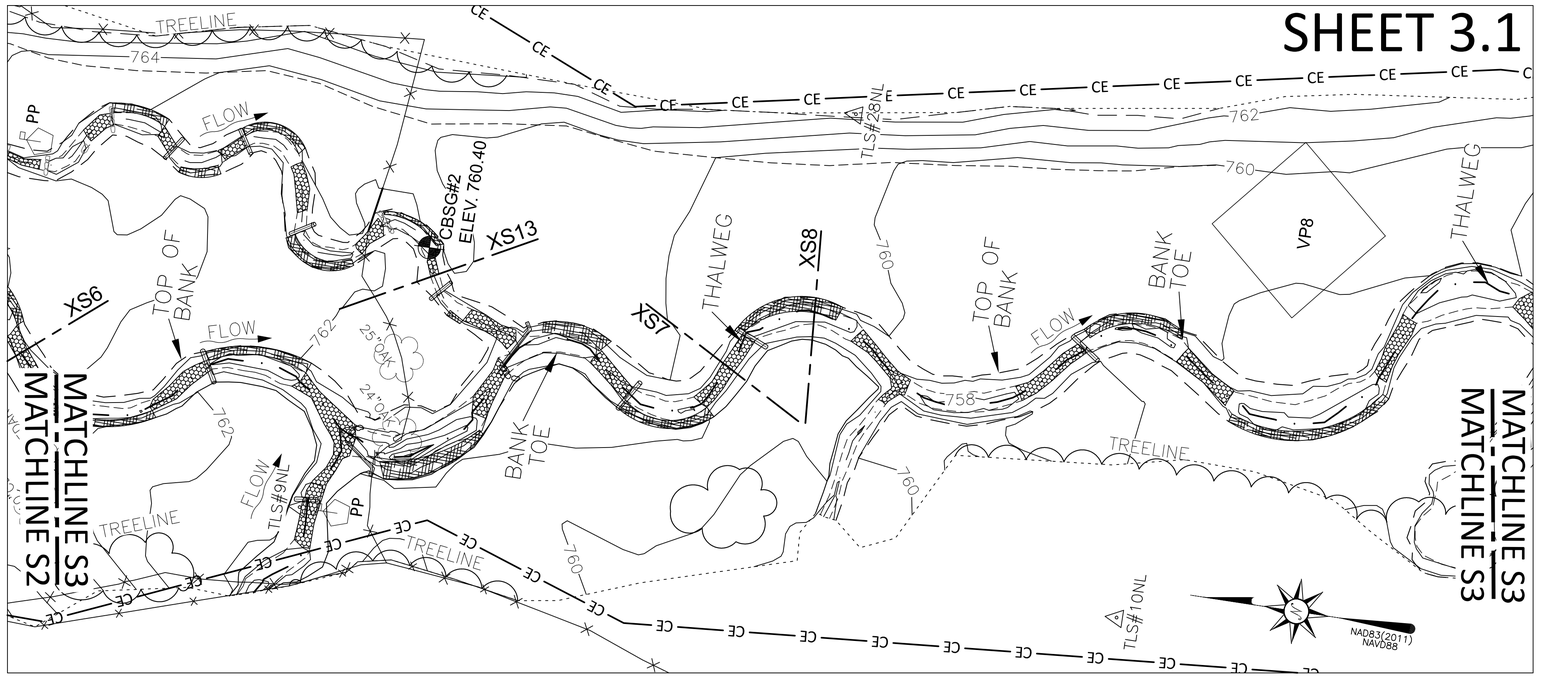
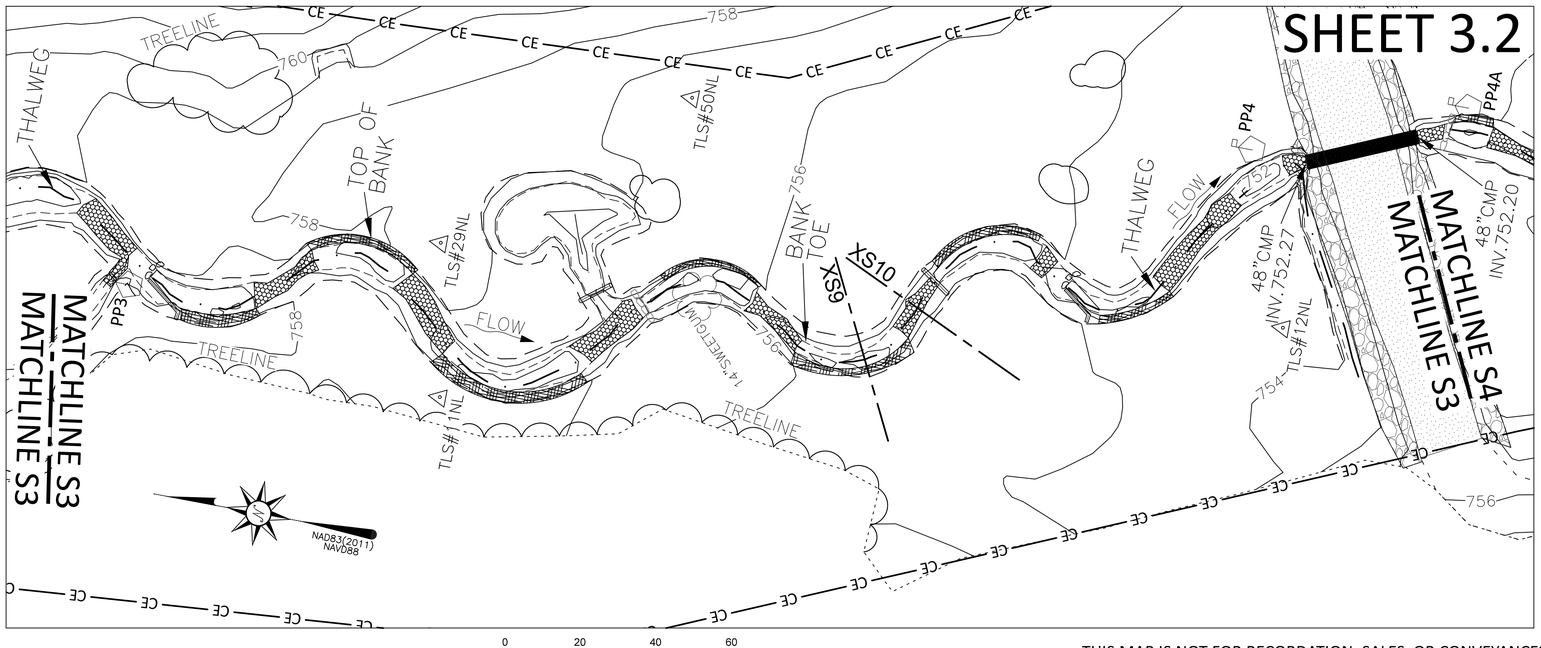
- PP1 PHOTO POINT
- VP31 / MVP2 VEGETATION PLOT/ MOVEABLE VEGETATION PLOT
- TLS#12NL CONTROL POINT





0 20 40 60
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DAVID S. TURNER, P.L.S. #L-4551

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

I, DAVID S. TURNER, CERTIFY THAT THIS PROJECT WAS COMPLETED UNDER MY DIRECT AND RESPONSIBLE CHARGE FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; THAT THIS 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 AUG-SEPT 2021; THAT THE SURVEY WAS COMPLETED ON 1 SEPT 2021; AND ALL COORDINATES ARE BASED ON NAD83 (2011) AND ALL ELEVATIONS ARE BASED ON NAVD88. WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER, AND SEAL THIS 31st DAY OF MARCH, 2022.

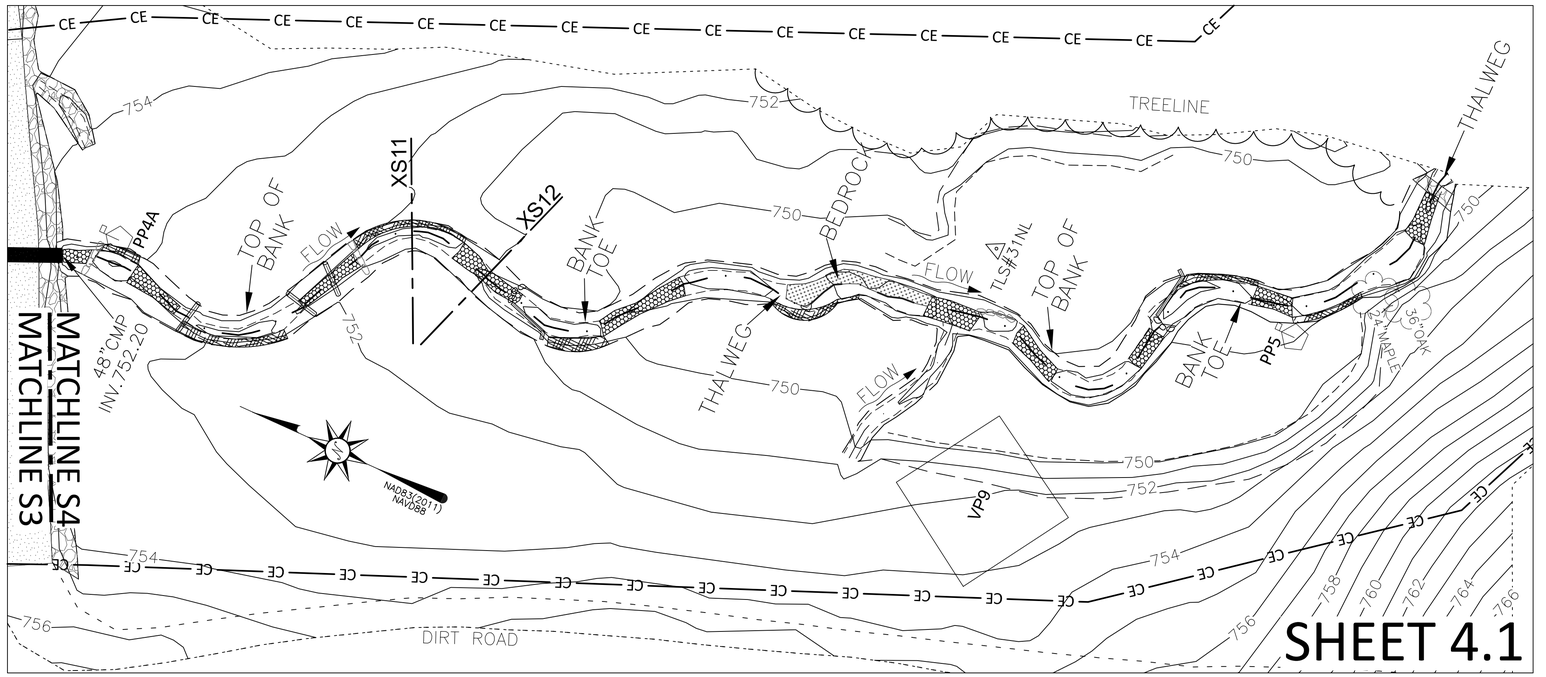
DAVID S. TURNER, P.L.S. #L-4551

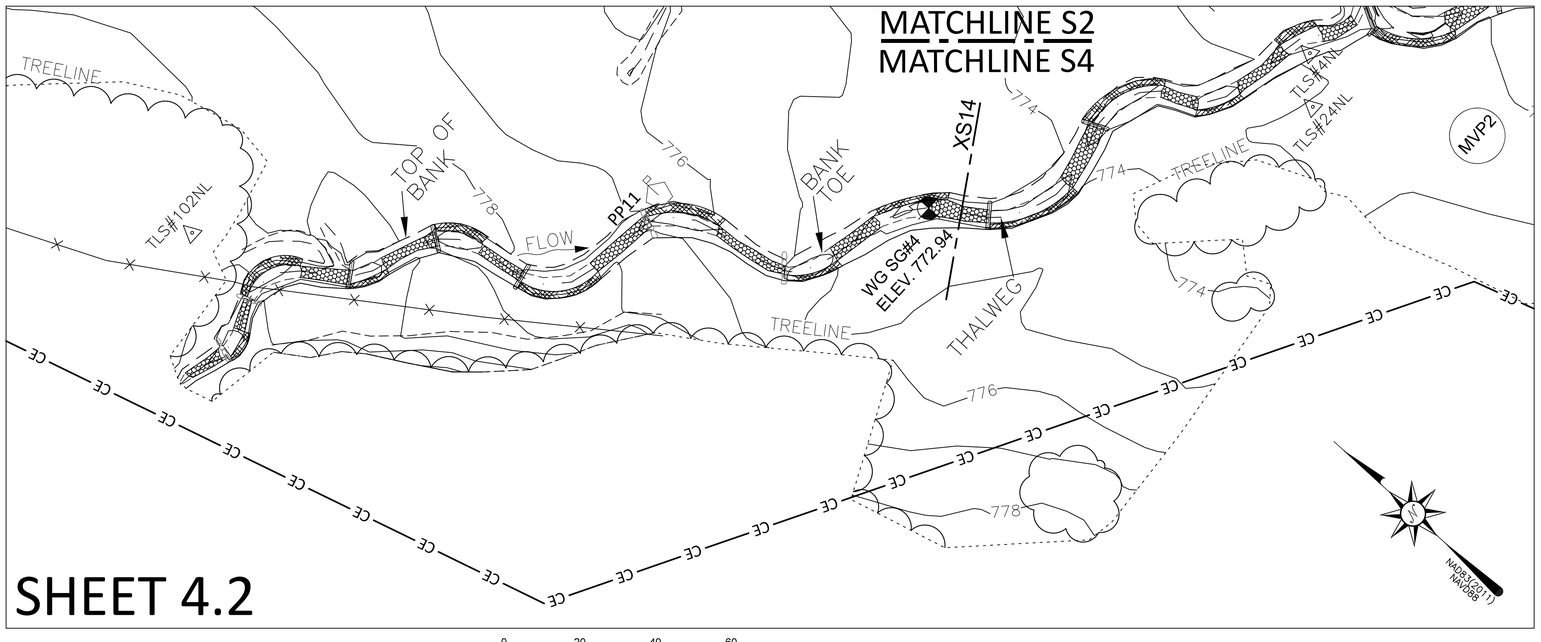
NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

GENERAL NOTES:
1. SEE SHEET 1 FOR GENERAL NOTES

LEGEND:

- THALWEG
- TOP OF BANK/TERRACE
- BANK TOE/TERRACE TOE
- AS-BUILT SURVEY LIMITS
- FARM PATH
- FENCELINE
- CE — CE — CE — CONSERVATION EASEMENT
- 776 — CONTOURS
- TREELINE
- 14" MAPLE — TREE
- LOG SILL
- ROCK SILL
- J-HOOK LOG SILL
- ROOTWOOD
- GRAVEL/CROSSING
- RIPRAP/STONE
- BEDROCK
- BRUSH TOE
- CONSTRUCTED RIFFLE
- XS1 — CROSS-SECTION
- STREAM GAUGE
- MW/GWG — MONITORING WELL/GROUND WATER GAUGE
- PP1 — PHOTO POINT
- VP31 / MVP2 — VEGETATION PLOT/ MOVEABLE VEGETATION PLOT
- TLS#12NL — CONTROL POINT





0 20 40 60
SCALE: 1 inch = 20 feet

THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.

TURNER LAND SURVEYING
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www.turnerlandsurveying.com
Certified DBE/WBE

REVISIONS, DATE AND INITIAL:

AS-BUILT SURVEY FOR:

CARPENTER BOTTOM MITIGATION SITE

GASTON COUNTY, NORTH CAROLINA
LINCOLN COUNTY, NORTH CAROLINA

CHERRYVILLE TOWNSHIP
LINCOLNTON TOWNSHIP

DATE:	8/24/2021
SURVEYED BY:	DST/CPG/EHK
DRAWN BY:	EGT/DST
REVIEWED BY:	DST/EGT
PROJECT:	19-020
FILE:	CARPENTER BOTTOM_AB.DWG
SCALE:	AS SHOWN

SHEET 4 of 4

APPENDIX F. Correspondence

WILDLANDS
ENGINEERING

MEETING MINUTES

MEETING:	Post Contract IRT Site Visit **CARPENTER BOTTOM Mitigation Site** Catawba River Basin 03050103 (expanded service area); Gaston County, NC NCDEQ Contract No. 7731 Wildlands Project No. 005-02179
DATE:	Wednesday, January 16, 2019, 9:30 am
LOCATION:	Gaston-Webbs Chapel Road Lincolnton, NC 28092

Attendees

Todd Tugwell, USACE
Kim Browning, USACE
Paul Wiesner, Division of Mitigation Services (NCDMS)
Matthew Reid, NCDMS
Melonie Allen, NCDMS
Kirsten Ullman, NCDMS
Mac Haupt, NC Department of Environmental Quality
Olivia Munzer, NC Wildlife Resource Commission
Shawn Wilkerson, Wildlands Engineering
Eric Neuhaus, Wildlands Engineering

Materials

- Wildlands Engineering Technical Proposal 8/10/2018 in response to NCDMS RFQ 09132018

Meeting Notes

1. Wildlands gave a brief site overview before the walk which discussed stream and wetland approach and general site conditions.
2. The group entered the proposed wetland re-establishment area from the northeast field adjacent to Ditch 3 as shown on the proposal concept map. Wildlands was asked about plans for Ditch 3 and it was noted that the ditch would be filled within the proposed wetland re-establishment area. Upstream of the proposed wetland re-establishment area, drainage from Ditch 3 will be directed into the wetland to support hydrology.
3. Soil borings were taken towards the eastern edge of the proposed wetland re-establishment area. The consensus from the group was that site soils were depleted with a low chroma, consistent with the Licensed Soil Scientist (LSS) investigation included with the proposal. Site soils were deemed suitable for the proposed wetland restoration at the surface.

4. The walk continued into the proposed wetland rehabilitation area, where two headwater ditches were observed, and soils were double checked for consistency. A rehabilitation approach was discussed including plugging of the existing drainage ditches, treatment of invasive vegetation (including but not limited to hardy orange, Chinese privet, and white pine trees), wetland plantings, and cattle exclusion. IRT members noted that a jurisdictional delineation will need to be done to verify the wetland rehabilitation boundary, but overall, they agreed with the approach. Soils observed within the rehabilitation area were consistent with previous soil borings taken within the re-establishment area.
5. NC Wildlife Resource Commission noted that there is potential habitat for a stream specific crayfish and dwarf flowered heartleaf species on-site. Wildlands noted that they would look for these specific species as part of the categorical exclusion and threatened and endangered species walks.
6. A soil boring was taken within the wetland re-establishment area west of Ditch 2 shown on the proposal concept map. Soils were consistent with other observations on site and were deemed appropriate for wetland re-establishment at the surface.
7. Overall, IRT members agreed with the proposed wetland restoration approach and proposed ratios of 1:1 for areas of wetland re-establishment and 1.5:1 for areas of wetland rehabilitation.
8. Wildlands will prioritize getting the jurisdictional delineation completed within the proposed wetland rehabilitation area. Additionally, Wildlands will install groundwater gages throughout the wetland restoration area prior to the 2019 growing season.
9. The walk continued south toward the headwater tributaries of Carpenter's Branch. IRT and NCDMS representatives were shown the approximate location of intermittent and perennial stream calls based on field mapping. It was discussed that these calls would be further refined as the project moved forward, but generally intermittent and perennial calls presented in the proposal were agreed upon.
10. Ditch 1 shown on the proposal map east of the wetland rehabilitation area was discussed in detail. Wildlands current proposed approach was to install channel plugs at various locations upstream of the intermittent call to redirect drainage back into the adjacent proposed wetland area. It was noted that if the channel was deemed jurisdictional above the current field call, Wildlands would either restore or enhance the channel and include it within the proposed conservation easement.
11. The site walk continued to the headwaters and ultimately down the entire length of Carpenter's Branch. Wildlands originally proposed all streams on-site including headwater tributaries, the entire length of Carpenter's Branch, and UT1 for an enhancement II approach at a 2.5:1 credit ratio. After field observations and discussions with the IRT, it was determined that the streams on-site need to be fully restored using a priority I approach until an existing bedrock portion of the channel, which will be proposed for a preservation approach. The change in approach will be incorporated by Wildlands and updated crediting information will be supplied to DMS.
12. It was noted that a current culvert crossing over an unnamed tributary from the right floodplain will be removed as part of the project. The portion of this channel within the proposed conservation easement will be restored and tied to the proposed alignment of Carpenter's Branch as part of the project.
13. IRT members noted that a flow gage will need to be installed along UT1 to document continuity of flow for the project reach, regardless of stream approach.
14. In addition to restoring Carpenter's Branch with a Priority I restoration approach, Wildlands agreed that they would discuss putting the additional property (approximately 5.7 acres) on the right floodplain of Carpenter's Branch within the proposed conservation easement with the property owner. This would allow for an extended buffer along the right floodplain of Carpenter's Branch and allow Wildlands to eliminate the proposed 30' internal culvert crossing shown in the proposal.
15. The IRT noted that the site could be a prime candidate for benthic and water quality monitoring with a potential associated 2% credit bonus if property monitoring was carried out.

To: DMS Technical Workgroup, DMS operations staff

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

RE: Pebble count data requirements

Date: October 19, 2021

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

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

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

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

Kristi Suggs

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

I am absolutely OK with not doing pebble counts anymore!

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

Thanks!

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

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

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

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

Matthew,

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

Kristi

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

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

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

FYI!

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

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

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

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

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

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