



MONITORING YEAR 2 ANNUAL REPORT FINAL

January 2024

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 RFQ 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: January – November 2023

PREPARED FOR:



NC Department of Environmental Quality
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January 19, 2024

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

RE: Carpenter Bottom Draft MY2 Report Review
Catawba River Basin - HUC 03050102 (03050103 Expanded Service Area)
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 2 Monitoring Report for the Carpenter Bottom Mitigation Site that were received on January 2, 2024. The report has been updated to reflect those comments. The Final MY2 Report is included. DMS' comments are listed below in **bold**. Wildlands' responses to DMS' comments are noted in *italics*.

DMS Comment: WEI has actively treated *Murdannia keisak* on the site. The report indicates that a small population persists. Are the remaining populations site wide or limited to isolated reaches? Can you provide an update of where the species is found on site?

*Wildlands' response: Small patches of *Murdannia keisak* were located in some of the riffles along the main stem of Carpenter Branch Reach 1 between UT1 and the crossing (approx. STA 111+00 to 118+00). The plants were treated and are not a concern to the functioning and performance of the stream.*

DMS Comment: Game cameras were installed at the request of the IRT during the 2023 Credit Release Meeting. WEI has indicated that the cameras do not provide a level of detail that is useful due to vegetation. Does WEI plan to continue using the cameras to supplement the gauge data or discontinue use? If pictures are available from the cameras, please include them in the report to show the issue.

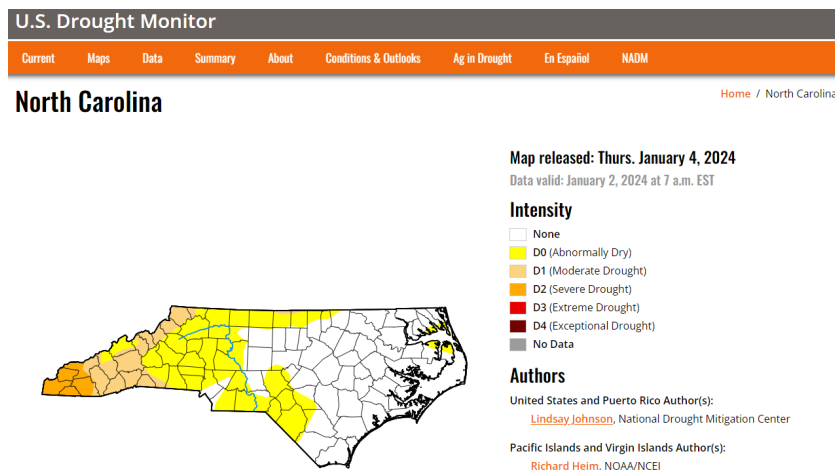
Wildlands' response: The text of section 2.5 was expanded to describe the game camera issues in more detail. A photo log was also added to Appendix A that documents stream flow conditions which confirm the data recorded by the stream gages. The photo log also illustrates problems with vegetation obstructing the game cameras' view for much of the year. Wildlands will relocate the game cameras to attempt to document different portions of UT1 and UT2; however, it is expected that by spring, the view may be obstructed by the vegetation.

DMS Comment: The IRT requested the rain data source, distance from the site and month to month rainfall graph be included in the MY2 report. Thank you for including this information, and the additional discussion regarding 2023 rainfall and how it relates to site hydrology.

Wildlands' response: You are welcome.

DMS Comment: Table 11: If possible, please update the rainfall summary table with end of year data for final submittal.

Wildlands' response: The rainfall table (table 11) and the Monthly Rainfall Data plot were updated to include all of 2023. With a 4.7" rain event at the end of December and 7.7" of rain for the month, the annual rainfall totaled about 2" more than the normal annual rainfall. The end of year rainfall was enough to bring Gaston County to an Abnormally Dry D0 status. Any impact on groundwater storage should be visible in the next monitoring year.



National Drought Mitigation Center. 2024. U.S. Drought Monitor – North Carolina. University of Nebraska-Lincoln. Accessed 01/04/24 from <https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?Southeast>

DMS Comment: WEI has included Table 12a Existing Conditions Wetland Gauge Summary to provide additional pre-construction information about the site hydrology. Does WEI have a reference gauge onsite or offsite for comparison?

Wildlands' response: As stated in the Mitigation Plan, a reference wetland gage was established approximately 6.7 miles from the Site within the floodplain of Howards Creek in Lincoln County (located at the closed-out Owl's Den Mitigation Site). This reference gage data was added to all the groundwater gage plots and will be included in future monitoring reports.

DMS Comment: Recommend either including Figure 3 from the Mitigation Plan and/or adding the six gauges shown in Table 12a to the CCPV so reviewers can easily see the location of the existing conditions gauges compared to the locations of the current monitoring gauges.

Wildlands' response: "Figure 3. Site Map (Mitigation Plan)" was added to the report after the CCPV figures. In addition, the six groundwater gages from the Mitigation Plan are included in the submitted geodatabase.

DMS Comment: In stream flow: Credits are considered at risk for reaches not meeting the 30 consecutive days of flow success criteria. DMS recommends that WEI document if portions of the reaches do meet the criteria that may not be captured by the instream flow gauge. Additional gauges and/or cameras may be used to track this.

Wildlands' response: As discussed in the previous comments, and in Section 2.5, the game cameras will be relocated in an attempt to capture different portions of UT1 and UT2; however, it is expected that by



spring, the view may be obstructed by the vegetation. An additional stream gage will be installed on the main stem of Carpenter Branch Reach 1, just below the confluence of UT3, to monitor the streamflow at this location in the reach.

DMS Comment: Digital Deliverable Comments - Please include spatial files for the MY2 random plot locations with final submittal.

Wildlands' response: The mobile vegetation plots are included in the digital files. It is the shapefile titled "VP_Mobile" and is located in the geodatabase titled "CB_AsBuilt.gdb". This shapefile includes the current and previous years' mobile plots.

As requested, Wildlands has included two (2) hard copies of the final report and a full final electronic submittal of the support files on USB. A copy of our responses to DMS's comment letter has been included inside the cover of the report, as well. Please let me know if you have any questions.

Sincerely,

A handwritten signature in black ink that reads "Mimi Caddell". The signature is written in a cursive, flowing style.

Mimi Caddell
Environmental Scientist
mcaddell@wildlandseng.com

CARPENTER BOTTOM MITIGATION SITE
Monitoring Year 2 Annual Report

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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 were 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 2 - 2023

| 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 |
| 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 features, 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-establishment | | | | 5.714 | | |
| Rehabilitation | | | | 2.631 | | |
| Totals | 3,067.849 | | | 8.345 | | |

Table 2: Goals, Performance Criteria, and Functional Improvements

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

| 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. | Visual annual assessments. | No cattle within easement |
| 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. | Streams and structures are stable. In MY2, ERs are >2.2, and BHRs are between 0.8-1.0. Visual assessments revealed no stream areas of concern. |
| 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 2: Goals, Performance Criteria, and Functional Improvements

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

| 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. | Bankfull events: MY1 (2 of 4 reaches); MY2 (3 of 4 reaches). No event on UT3 yet. Flow criteria: MY1 (SG1 and 4 met); MY2 (SG3 and 4 met). SG2 on UT1 hasn't met criteria yet. |
| 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. | Gages meeting criteria: MY1 (8/11); MY2, 2 gages added (10/13). |
| 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. | Vegetation plots meeting MY3 density criteria: MY0-MY2 - 13/13 plots. MY2 stem density of 364-810 stems/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. | 2 mowing encroachments (0.03 ac). Sign added and path blocked in MY2. All encroachments resolved by 11/2023. |

Table 3: Project Attributes

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

| 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 3: Project Attributes

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

| 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: Monitoring Year 2 Data Assessment

Annual monitoring and site visits were conducted during Monitoring Year 2 (MY2) to assess the condition of the project. The vegetation, stream, and hydrologic success criteria for the Site follow the approved success criteria presented in the Mitigation Plan (Wildlands, 2020), the performance criteria are located in Section 1.2 Tables 3a-b: Goals, Performance Criteria, and Functional Improvements. Methodology for annual monitoring is presented in the MY0 Annual Report (Wildlands, 2022).

2.1 Vegetative Assessment

The vegetative survey was completed in August 2023. Vegetation monitoring resulted in a stem density range of 364 to 810 planted stems per acre. All thirteen vegetation plots are meeting the interim requirement of 320 stems per acre required at MY3. As requested by the NC Interagency Review Team (IRT) as part of their comments from the MY0 Baseline Report (Wildlands, 2022), some of the wetland rehabilitation area was captured by the new location for mobile vegetation plot 1. The wetland rehabilitation areas will continue to be captured by some mobile plots in future monitoring years as well. Herbaceous vegetation is also abundant across the Site and includes native pollinator species indicating a healthy riparian habitat. The riparian habitat is helping to reduce nutrient runoff from the agricultural fields outside the easement and stabilize the stream banks. Refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix B for Vegetation Plot Data.

2.2 Vegetation Areas of Concern and Management Activities

The vegetation assessment indicated that the surviving stems are at a density above the MY3 interim criteria. The visual assessment across the Site found that the herbaceous cover is also well established throughout the floodplain. A Site walk was conducted in November 2023 to assess the easement boundary. No new issues of encroachment were found, and all easement signs/markings were intact. Two areas of encroachment were documented earlier in the year but both areas appear resolved. The northern encroachment is along the boundary just east of VP1; this area was mowed early in the year. An additional sign was installed, and no more mowing was observed in November 2023. The second area is located along the boundary just east of GWG 8. This area showed evidence of ATV encroachment cutting through the corner. The boundary was blocked off with logs and debris and this path is no longer being used by ATV traffic. Both areas are shown as resolved in the Areas of Concern Photographs in Appendix A and in Figure 1.

There are few areas where invasive species are a problem on the Site. The small populations of Asian spiderwort (*Murdannia keisak*) do not appear to be negatively impacting the stream or restricting flow. Small areas of hardy orange (*Citrus trifoliata*), Chinese privet (*Ligustrum sinense*), Japanese Honeysuckle (*Lonicera japonica*) and multiflora rose (*Rosa multiflora*) were scattered across the Site. These species were all treated with herbicides throughout the year in an effort to keep their presence to a minimum. There is one area of *C. trifoliata* which continues in the northwest portion of the project that is 0.16 acres in size; at 1% of the Site's acreage, it is only a minor concern. Additional chemical treatments may be needed in the following years to keep resprouts and new populations under control. Ninety-nine percent of the Site is free of invasive species and shows strong vegetative growth. Wildlands will continue to monitor for the reemergence of any invasive populations which threaten the success of the project.

2.3 Stream Assessment

Morphological surveys were conducted in July 2023. All streams within the Site are stable and functioning as designed. All 14 cross-sections at the Site show little to no change in the bankfull areas



and the width-to-depth ratios, the entrenchment ratios (ERs) are above 2.2, and the bank height ratios (BHRs) are less than 1.2 (0.8-1.0). Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table and Stream Photographs and Appendix C for Stream Geomorphology Data.

2.4 Stream Areas of Concern

A site assessment last conducted in November 2023 found that there were no stream areas of concern across the project. The banks all appear stable and are well covered by established vegetation.

2.5 Stream Hydrology Assessment

This year, bankfull events were recorded on UT1, UT2, and Carpenter Branch Reach 1. UT3 did not record a bankfull event for the second year in a row and there were no visual indicators of bankfull events occurring on this reach. Although UT3 hasn't had a bankfull event yet, it is still expected that the hydrologic success criteria for bankfull events will be met for all streams. During a site walk in January 2023, Wildlands staff found evidence of out-of-bank flow over much of the Site.

In addition, the presence of baseflow must be documented on intermittent or low flow reaches (Carpenter Branch Reach 1, UT1, UT2, and UT3) for a minimum of 30 consecutive days during a normal precipitation year. UT2 and UT3 maintained baseflow for 208 and 131 consecutive days, respectively; however, Carpenter Branch Reach 1 and UT1 did not meet the minimum requirement with 8 and 3 days, respectively. Although Carpenter Branch did not meet this year, it is not a concern at this time. The thalweg at the head of riffle is surveyed each year. Slight variations in the thalweg elevations at the head of riffle can cause discrepancies in the recorded number of days of consecutive flow. The head of riffle elevation will be verified again next year.

Game cameras were installed in MY2 to photograph the flow along UT1 and UT2 at the stream gage locations. However, the photos provided by these cameras simply confirmed data collected by the stream gages which was also verified during site visits. Most of the time, the game camera's view is obscured by herbaceous vegetation, causing photos to be unusable for stream flow documentation. Refer to Appendix A for the stream flow photo log containing game camera documentation of flow (photos 1, 2, 6, and 7) and examples of views obstructed by vegetation (photos 3 and 8). Other photos documented during site visits, photo point monitoring, and cross-section surveys also confirm the data recorded by the stream gages (photos 4, 5, 9, and 10). In MY3, Wildlands will relocate the game cameras to document different portions of UT1 and UT2; however, it is expected that by spring, the view may be obstructed by the vegetation. An additional stream gage will be installed on the main stem of Carpenter Branch Reach 1, just below the confluence of UT3, to monitor the streamflow at this location in the reach.

It is expected that baseflow duration will increase as rainfall restores groundwater levels. Rainfall is discussed in more detail in the subsequent section.

Photologs are included Appendix A, and hydrology data is presented in Appendix D.

2.6 Wetland Hydrology Assessment

Eleven groundwater gages (GWG) were installed during baseline monitoring to record the groundwater level across the Site. Because gages 9 and 10 did not meet the criteria during MY1, two additional gages (12 and 13) were installed in January 2023 to assess different portions of the wetland area. Out of the thirteen gages, ten met the success criteria this year (GWG1, 2, 3, 4, 5, 6, 7, 10, 11, and 12) for 35-96 consecutive days of the growing season. Three gages (GWG 8, 9, and 13) did not meet the success criteria this year with 6, 22, and 21 consecutive days of the growing season, respectively. The hydrology of gage 9 improved since MY1, although gage 8 did not improve. Gages 9 and 13 had groundwater levels consistently within 12-inches of the ground surface in the weeks leading up to the start of the Site's

established growing season; both gages would have met if the growing season were extended to March 1. The soil temperature plot would support this adjustment as the soil temperature only drops below 40F briefly in January.

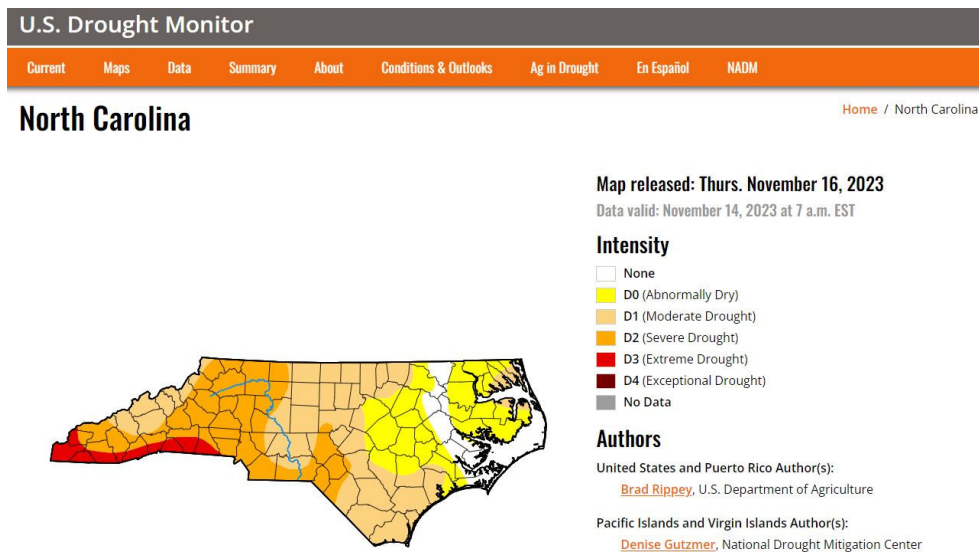
The normal and daily rainfall is determined from the Lincolnton 4 W precipitation gage, which is approximately 5 miles from the Site (NCSU, 2023; NOAA Regional Climate Centers, 2023). The rain data appears to be representative of the conditions on the Site as the larger rainfall events correspond stream level rises recorded by the stream probes.

A reference wetland was identified approximately 6.7 miles NW of the Site. This reference wetland area is a mature Piedmont Bottomland Forest that is located within the floodplain of Howards Creek in Lincoln County. This reference groundwater data is included on all of the groundwater gage plots.

It is expected that all gages will meet the criteria over time as groundwater continues to recharge across the site. However, rainfall has been sporadic. While annual total rainfall in 2022 was normal, few late-winter rains resulted in the 30-day rolling precipitation total being below the 30% of normal threshold at the start of the 2023 growing season, as shown on the groundwater gage plots in Appendix D.

Therefore, the groundwater surface was already starting to drop on March 15 across portions of the Site. The effects of the lower groundwater table can be seen in the plot for Gage 8. While the summer rainfall was at or above the normal rainfall each month, 41% of the rainfall occurred during three rain events where more than 2-inches fell (one in each month of April, May, and June). These flashy events do not help recharge the groundwater as most will drain as surface runoff. As a result, and in combination with minimal rainfall in the Fall, the 30-day rainfall amount dropped below the 30% of normal threshold on October 12. Much of the state was in a drought, with Gaston County being in a Severe drought, at the end of the growing season (National Drought Mitigation Center, 2023).

Groundwater recharge is expected to occur in the winter, but any winter rain will have to first overcome this water storage deficit. It is likely that the effect of this drought could be observed during 2024 (MY3) in both the stream and groundwater gages. With a 4.7" rain event at the end of December and 7.7" of rain for the month, the annual rainfall ended up being about 2" more than the normal annual rainfall. The rain was enough to bring Gaston County to an Abnormally Dry D0 status. Any impact on groundwater storage should be visible in the next monitoring year.



Annual inspections of the bentonite seals around the groundwater gages are a regular part of Wildlands' protocol and bentonite was added as needed this year. Refer to Appendix D Table 11 for the rainfall

summary table, and Table 12 for the wetland hydrology data. Table 12a shows the hydroperiods for the wetland gages during the existing conditions; the Figure 3 Site Map from the Mitigation Plan is included after the CCPV figures to show the original locations of the groundwater gages.

2.7 Monitoring Year 2 Summary

All 13 vegetation plots are exceeding the MY3 interim requirement of 320 planted stems per acre. All streams across the Site are stable and the cross sections show little dimensional change since the as-built survey. UT1, UT2, and Carpenter Branch Reach 1 all exhibited at least one bankfull event and are on track to meet the bankfull hydrologic criteria. Only UT3 has yet to record any bankfull events. UT2 and UT3 both met the baseflow criteria; Carpenter Branch Reach 1 met during MY1, and UT1 has yet to meet the criteria. Two new groundwater gages were installed this year. Ten of the thirteen groundwater gages met or exceeded the hydrologic success criteria. Small pockets of invasive species were treated this year and will continue to be monitored and treated as needed. Overall, the Site is on track to meet its goals and is preventing excess nutrients and sediment from entering the Catawba River tributaries.

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



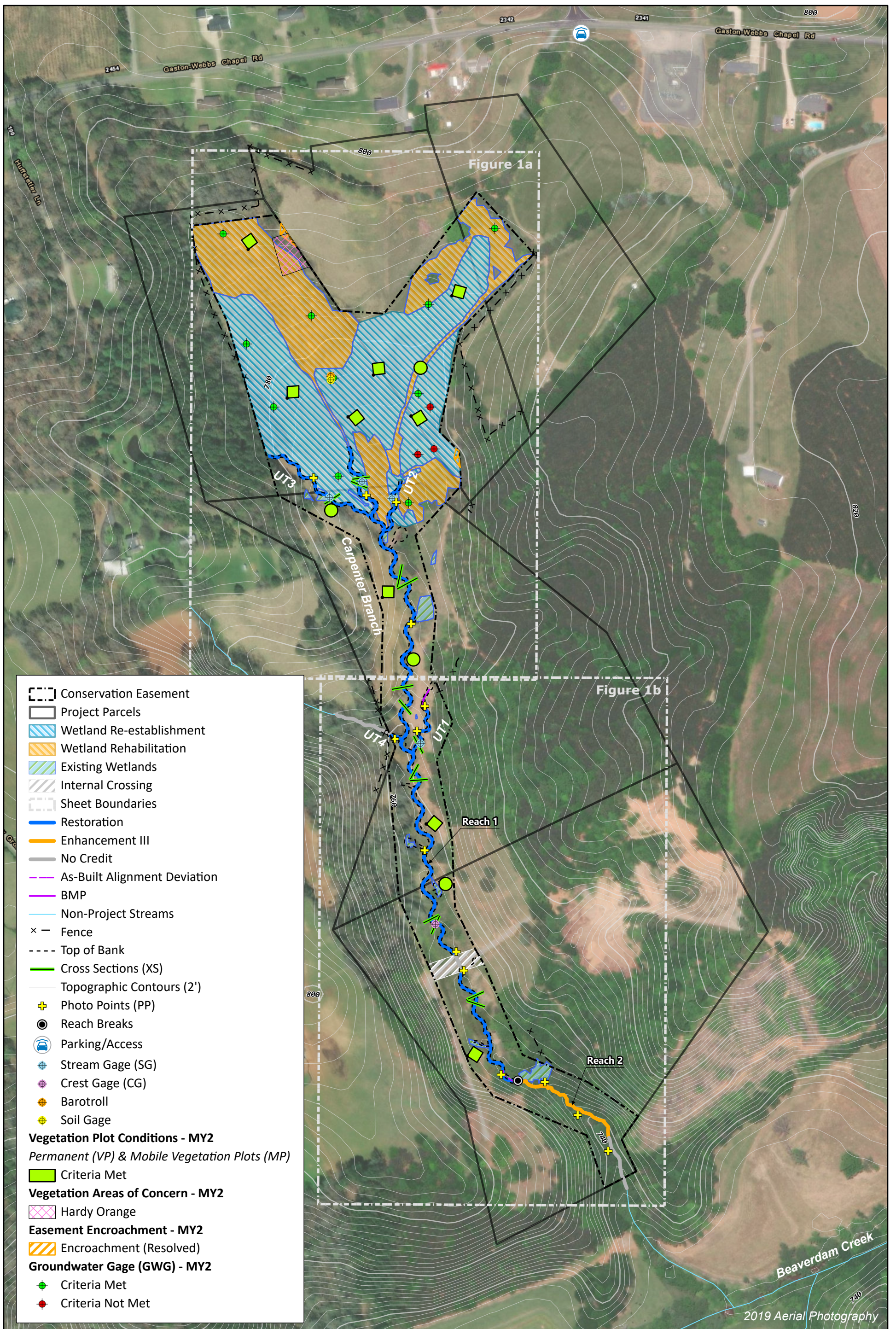
Section 3: REFERENCES

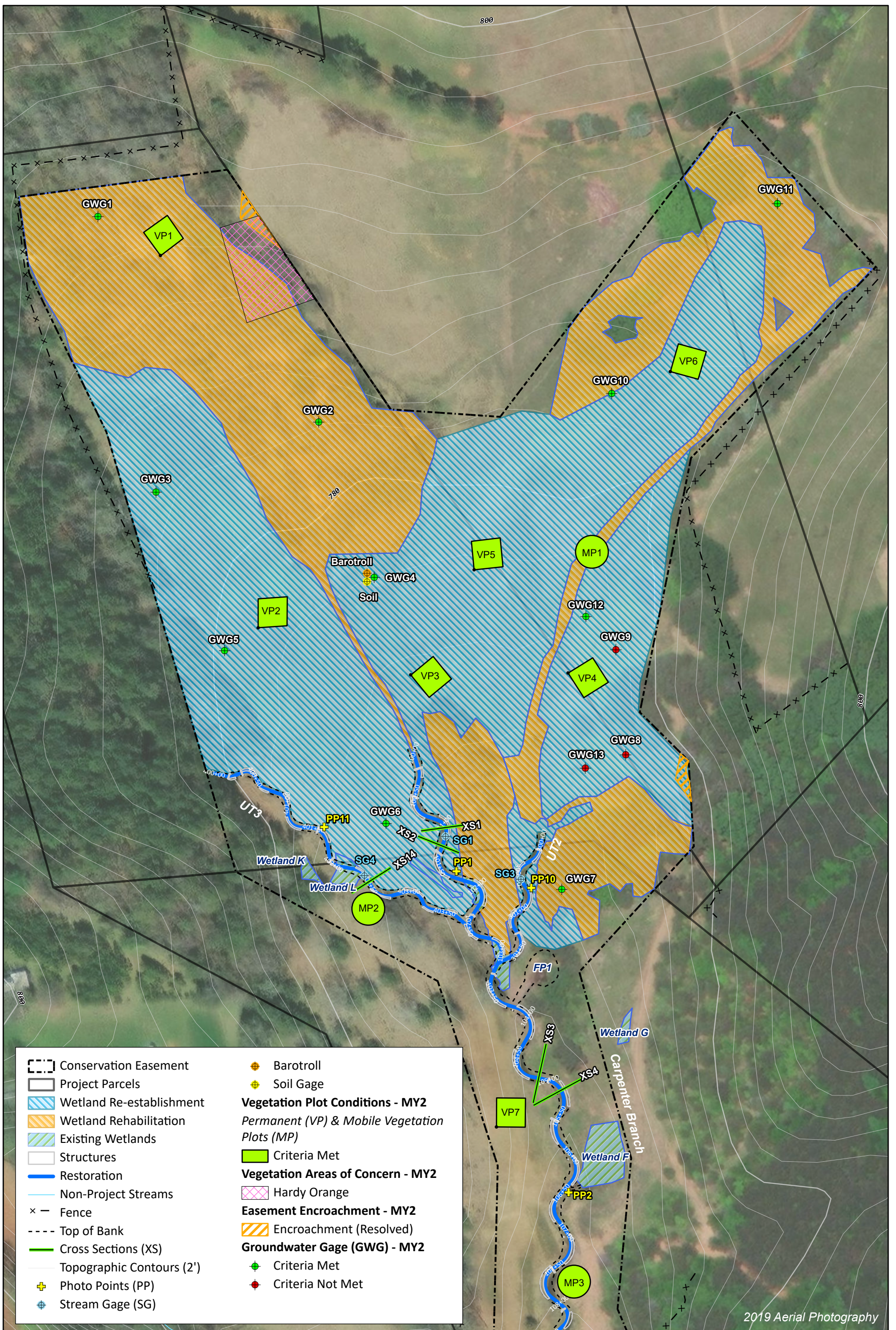
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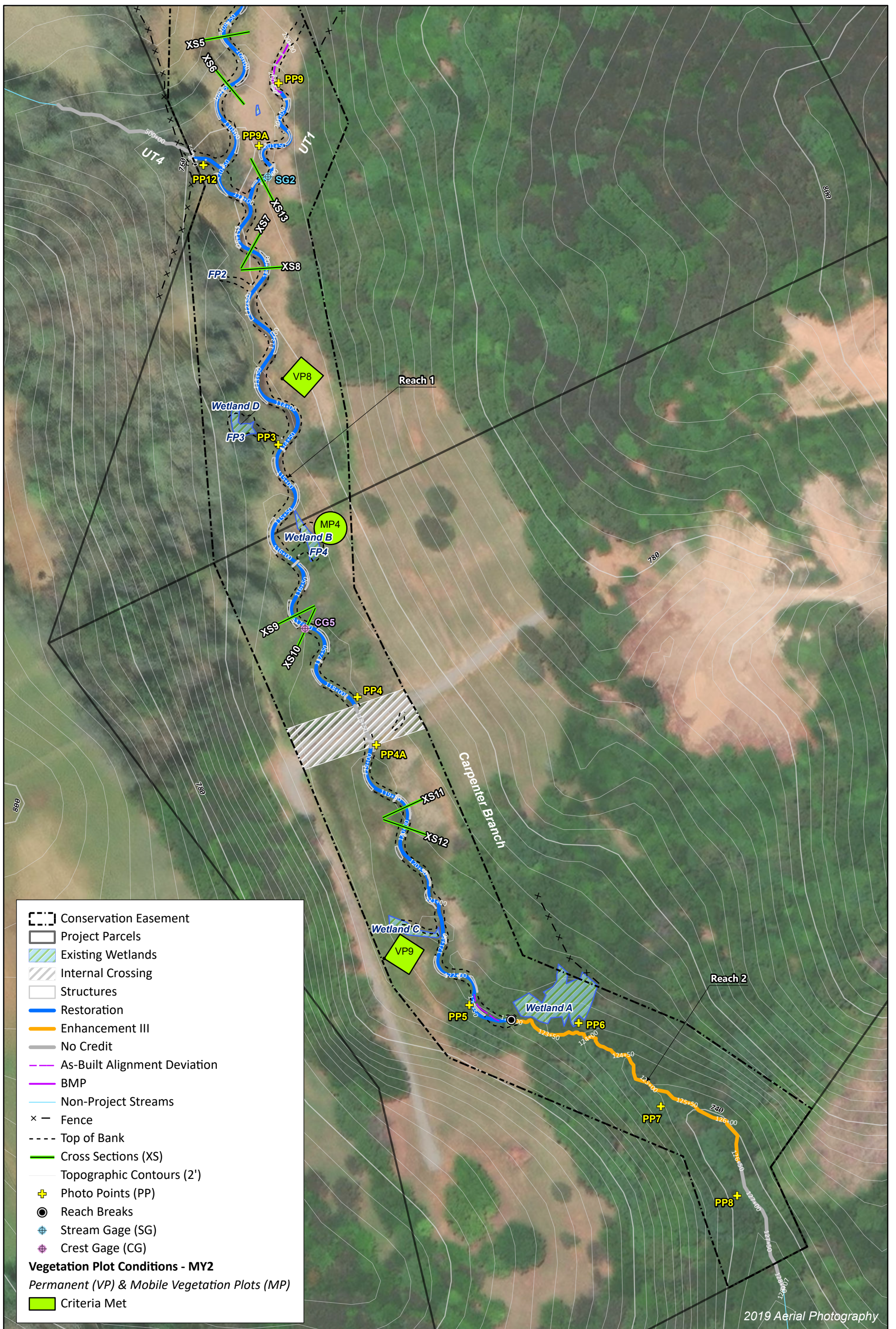
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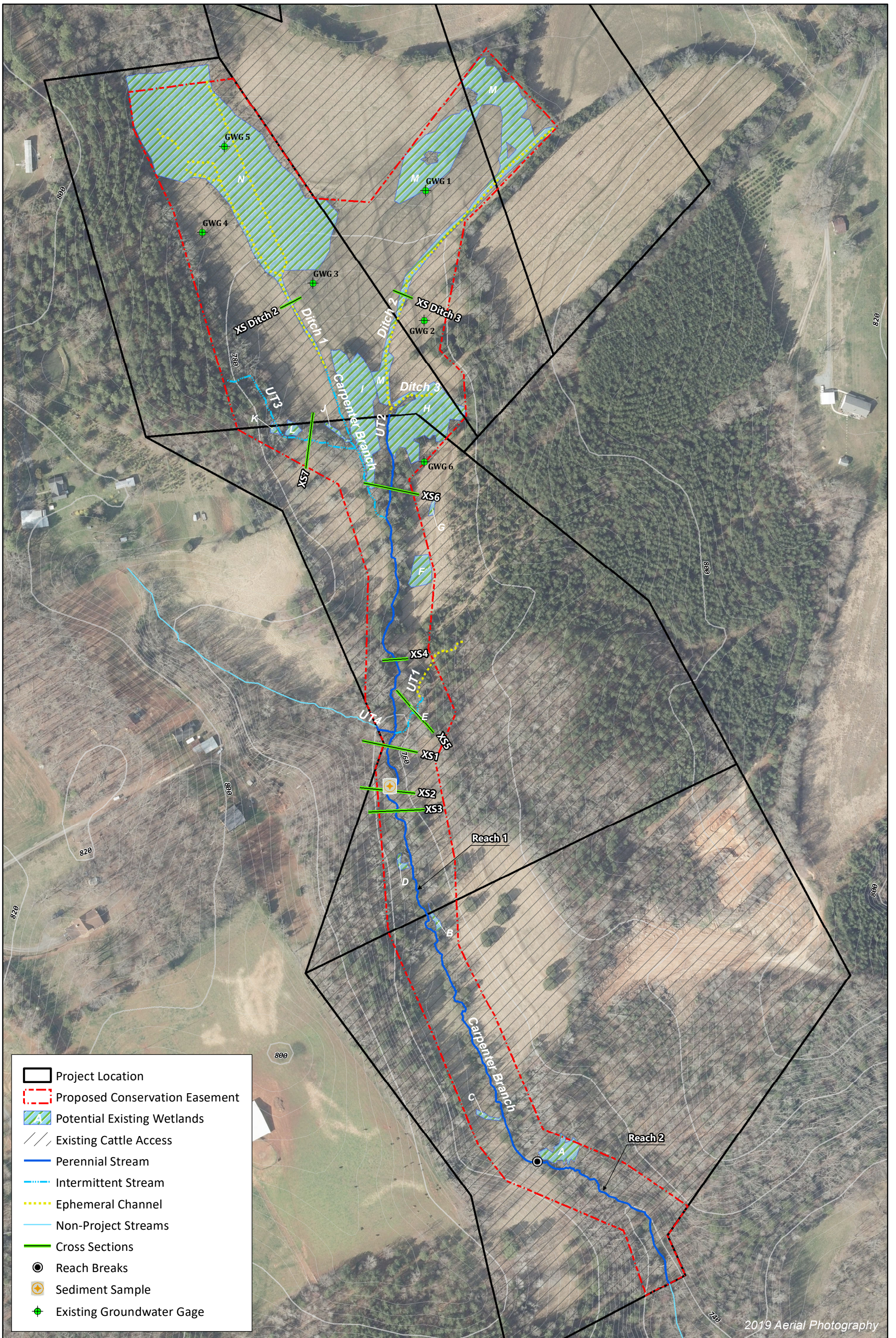


FIGURES









APPENDIX A. Visual Assessment Data

Table 4a. Visual Stream Morphology Stability Assessment Table

Carpenter Bottom Mitigation Site
 DMS Project No. 100090
 Monitoring Year 2 - 2023

Carpenter Branch Reach 1 Date Last Assessed: 11/14/2023

| 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 <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | Bank Failure | Fluvial and geotechnical - rotational, slumping, calving, or collapse. | | | 0 | 100% |
| | | | | | Totals: | 0 |
| Structure | Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 31 | 31 | | 100% |
| | Bank Protection | Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. | 45 | 45 | | 100% |

UT1 Date Last Assessed: 11/14/2023

| 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 <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | Bank Failure | Fluvial and geotechnical - rotational, slumping, calving, or collapse. | | | 0 | 100% |
| | | | | | Totals: | 0 |
| Structure | Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 6 | 6 | | 100% |
| | Bank Protection | Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. | 6 | 6 | | 100% |

Table 4b. Visual Stream Morphology Stability Assessment Table

Carpenter Bottom Mitigation Site
 DMS Project No. 100090
 Monitoring Year 2 - 2023

UT2 Date Last Assessed: 11/14/2023

| 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 <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | Bank Failure | Fluvial and geotechnical - rotational, slumping, calving, or collapse. | | | 0 | 100% |
| Totals: | | | | | 0 | 100% |
| Structure | Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 4 | 4 | | 100% |
| | Bank Protection | Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. | 5 | 5 | | 100% |

UT3 Date Last Assessed: 11/14/2023

| 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 <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | Bank Failure | Fluvial and geotechnical - rotational, slumping, calving, or collapse. | | | 0 | 100% |
| Totals: | | | | | 0 | 100% |
| Structure | Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 9 | 9 | | 100% |
| | Bank Protection | Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. | 12 | 12 | | 100% |

Table 4c. Visual Stream Morphology Stability Assessment Table

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

UT4

Date Last Assessed: 11/14/2023

| 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 <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% | |
| | Bank Failure | Fluvial and geotechnical - rotational, slumping, calving, or collapse. | | | 0 | 100% | |
| | | | | | Totals: | 0 | 100% |
| Structure | Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 1 | 1 | | 100% | |
| | Bank Protection | Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. | 0 | 0 | | N/A | |

Table 5. Vegetation Condition Assessment Table

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Date Last Assessed: 11/14/2023

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 | 0.16 | 1% |
| 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
(03/06/2023)



PHOTO POINT 1 - Carpenter Bottom R1 - downstream
(03/06/2023)



PHOTO POINT 2 - Carpenter Bottom R1 - upstream
(03/06/2023)



PHOTO POINT 2 - Carpenter Bottom R1 - downstream
(03/06/2023)



PHOTO POINT 3 - Carpenter Bottom R1 - upstream
(03/06/2023)



PHOTO POINT 3 - Carpenter Bottom R1 - downstream
(03/06/2023)





PHOTO POINT 3 - Carpenter Bottom R1 - Floodplain Pool (03/06/2023)



PHOTO POINT 4 - Carpenter Bottom R1 - upstream
(03/06/2023)



PHOTO POINT 4 - Carpenter Bottom R1 - downstream
(03/06/2023)



PHOTO POINT 4A - Carpenter Bottom R1 - upstream
(03/06/2023)



PHOTO POINT 4A - Carpenter Bottom R1 - downstream
(03/06/2023)





PHOTO POINT 5 - Carpenter Bottom R1 - upstream
(03/06/2023)



PHOTO POINT 5 - Carpenter Bottom R1 - downstream
(03/06/2023)



PHOTO POINT 6 - Carpenter Bottom R1 - upstream
(03/06/2023)



PHOTO POINT 6 - Carpenter Bottom R1 - downstream
(03/06/2023)



PHOTO POINT 7 - Carpenter Bottom R1 - upstream
(03/06/2023)



PHOTO POINT 7 - Carpenter Bottom R1 - downstream
(03/06/2023)





PHOTO POINT 8 - Carpenter Bottom R1 - upstream
(03/06/2023)



PHOTO POINT 8 - Carpenter Bottom R1 - downstream
(03/06/2023)



PHOTO POINT 9 - UT1 - upstream (03/06/2023)



PHOTO POINT 9 - UT1 - downstream (03/06/2023)



PHOTO POINT 9A - UT1 - upstream (03/06/2023)



PHOTO POINT 9A - UT1 - downstream (03/06/2023)





PHOTO POINT 10 - UT2 - upstream (03/06/2023)



PHOTO POINT 10 - UT2 - downstream (03/06/2023)



PHOTO POINT 11 - UT3 - upstream (03/06/2023)



PHOTO POINT 11 - UT3 - downstream (03/06/2023)



PHOTO POINT 12 - UT4 - upstream (03/06/2023)



PHOTO POINT 12 - UT4 - downstream - (03/06/2023)



VEGETATION PLOT PHOTOGRAPHS



PERMANENT VEG PLOT 1 (8/17/2023)



PERMANENT VEG PLOT 2 (8/17/2023)



PERMANENT VEG PLOT 3 (8/17/2023)



PERMANENT VEG PLOT 4 (8/17/2023)



PERMANENT VEG PLOT 5 (8/17/2023)



PERMANENT VEG PLOT 6 (8/17/2023)





PERMANENT VEG PLOT 7 (8/17/2023)



PERMANENT VEG PLOT 8 (8/17/2023)



PERMANENT VEG PLOT 9 (8/17/2023)



MOBILE VEG PLOT 1 (8/17/2023)



MOBILE VEG PLOT 2 (8/17/2023)





MOBILE VEG PLOT 3 (8/17/2023)



MOBILE VEG PLOT 4 (8/17/2023)



GROUNDWATER GAGE PHOTOGRAPHS



GROUNDWATER GAGE 1 (7/3/2023)



GROUNDWATER GAGE 2 (7/3/2023)



GROUNDWATER GAGE 3 (7/3/2023)



GROUNDWATER GAGE 4 (7/3/2023)



GROUNDWATER GAGE 5 (7/3/2023)



GROUNDWATER GAGE 6 (7/3/2023)





GROUNDWATER GAGE 7 (7/3/2023)



GROUNDWATER GAGE 8 (7/3/2023)



GROUNDWATER GAGE 9 (7/3/2023)



GROUNDWATER GAGE 10 (7/3/2023)



GROUNDWATER GAGE 11 (7/3/2023)



GROUNDWATER GAGE 12 (7/3/2023)





GROUNDWATER GAGE 13 (7/3/2023)



STREAM AND CREST GAGE PHOTOGRAPHS



STREAM GAGE 1 (7/3/2023)



STREAM GAGE 2 (11/14/2023)



STREAM GAGE 3 (7/3/2023)



STREAM GAGE 4 (7/3/2023)



CREST GAGE 5 (11/14/2023)



AREAS OF CONCERN PHOTOGRAPHS



Encroachment 1 – Resolved mowing encroachment in upstream floodplain (11/14/2023)

Encroachment 2 – resolved encroachment near GWG8 (03/06/2023)



PHOTOGRAPHS OF STREAM FLOW



Photo 1 – UT1 – High flow, above thalweg but below bankfull (7PM) (03/03/2023)



Photo 2 – UT1 – High flow (6PM) just prior to the bankfull event (3AM the following morning) (04/27/2023)



Photo 3 – UT1 – Typical blocked view (10PM) (07/02/2023)



Photo 4 – UT1 – No flow. This photo was taken during a site visit and confirms the water level data shown in the Recorded In-Stream Flow Events Plot (11/14/2023)



Photo 5 – UT1 – Cross-section photo confirming no flow over the riffle (07/03/2023)





Photo 6 – UT2 – High flow, above thalweg but below bankfull (3PM) (06/20/2023)



Photo 7 – UT2 – Bankfull event (3AM) (04/28/2023)



Photo 8 – UT2 – Typical blocked view (12AM) (08/23/2023)



Photo 9 – UT2 – No flow. This photo was taken during a site visit and confirms the water level data shown in the Recorded In-Stream Flow Events Plot (11/14/2023)



Photo 10 – UT2 – Photo point 10 confirming flow (03/06/2023)



APPENDIX B. Vegetation Plot Data

Table 6. Vegetation Plot Data

Carpenter Bottom Mitigation Site
 DMS Project No. 100090
Monitoring Year 2 - 2023

| | |
|----------------------------------|------------|
| 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 | 2023-08-15 |
| Plot size (ACRES) | 0.0247 |

| | Scientific Name | Common Name | Tree/ Shrub | Indicator Status | Veg Plot 1 F ⁴ | | 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 | <i>Acer negundo</i> | boxelder | Tree | FAC | 2 | 2 | | | | | | | 1 | 1 | | | 1 | 1 | 1 | 1 | 1 | 1 |
| | <i>Alnus serrulata</i> | hazel alder | Tree | OBL | 2 | 2 | | | | | | | | | | | 2 | 2 | | | | |
| | <i>Amelanchier arborea</i> | common serviceberry | Tree | FAC | | | | | | | | | | | | | 2 | 2 | | | | |
| | <i>Betula nigra</i> | river birch | Tree | FACW | | | 2 | 2 | 1 | 1 | 1 | 1 | 3 | 3 | 2 | 2 | 1 | 1 | | | | |
| | <i>Celtis laevigata</i> | sugarberry | Tree | FACW | | | | | 1 | 1 | | | | | | | | | | | | |
| | <i>Cephalanthus occidentalis</i> | common buttonbush | Shrub | OBL | 2 | 2 | | | | | | | | | 1 | 1 | | | | | | |
| | <i>Cornus amomum</i> | silky dogwood | Shrub | FACW | | | | | | | | | | | | | 1 | 1 | | | | |
| | <i>Diospyros virginiana</i> | common persimmon | Tree | FAC | | | | | | 2 | | | | | | | | | | 1 | 1 | 1 |
| | <i>Fagus grandifolia</i> | American beech | Tree | FACU | | | | | | | | | | | | | | | | | 1 | 1 |
| | <i>Lindera benzoin</i> | northern spicebush | Tree | FAC | | | | | | | | | | | 1 | 1 | 1 | 1 | | | | |
| | <i>Liriodendron tulipifera</i> | tuliptree | Tree | FACU | | | | | | | | | | | | | 2 | 2 | | | | |
| | <i>Nyssa sylvatica</i> | blackgum | Tree | FAC | 1 | 1 | 1 | 1 | | | | | | | 1 | 1 | | | | | | |
| | <i>Platanus occidentalis</i> | American sycamore | Tree | FACW | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 | 2 | 2 | 1 | 1 | 1 | 1 | 3 | 3 | 5 | 5 |
| | <i>Populus deltoides</i> | eastern cottonwood | Tree | FAC | | | | | | | | | | | | | 1 | 1 | 2 | 2 | 3 | 3 |
| | <i>Quercus michauxii</i> | swamp chestnut oak | Tree | FACW | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | |
| | <i>Quercus pagoda</i> | cherrybark oak | Tree | FACW | | | 4 | 4 | 1 | 1 | 3 | 3 | 1 | 1 | 1 | 1 | | | | 1 | | |
| <i>Quercus phellos</i> | willow oak | Tree | FAC | | | | | 1 | 1 | | | 1 | 1 | | | 1 | 1 | 1 | 1 | | | |
| <i>Sambucus canadensis</i> | American black elderberry | Tree | FAC | | | | | | | | | 1 | 1 | | | | | | | | | |
| <i>Ulmus americana</i> | American elm | Tree | FACW | 1 | 1 | 1 | 1 | 2 | 2 | | | | | 6 | 6 | | | | 1 | | | |
| <i>Ulmus rubra</i> | slippery elm | Tree | FAC | | | | 1 | | | | | | | | | | | | | | | |
| Sum | Performance Standard | | | | 13 | 13 | 11 | 12 | 11 | 13 | 9 | 9 | 10 | 10 | 14 | 14 | 13 | 13 | 7 | 10 | 11 | 11 |
| Post Mitigation Plan Species | <i>Fraxinus pennsylvanica</i> | <i>green ash</i> | <i>Tree</i> | <i>FACW</i> | | | | | | | 1 | | | | | | | | | | | |
| Sum | Proposed Standard | | | | 13 | 13 | 11 | 12 | 11 | 13 | 9 | 9 | 10 | 10 | 14 | 14 | 13 | 13 | 7 | 10 | 11 | 11 |
| Mitigation Plan Performance Standard | Current Year Stem Count | | | | 13 | | 12 | | 13 | | 9 | | 10 | | 14 | | 13 | | 10 | | 11 | |
| | Stems/Acre | | | | 526 | | 486 | | 526 | | 364 | | 405 | | 567 | | 526 | | 405 | | 445 | |
| | Species Count | | | | 7 | | 7 | | 8 | | 4 | | 7 | | 8 | | 10 | | 7 | | 5 | |
| | Dominant Species Composition (%) | | | | 23 | | 33 | | 31 | | 40 | | 30 | | 43 | | 15 | | 30 | | 45 | |
| | Average Plot Height (ft.) | | | | 3 | | 2 | | 2 | | 3 | | 2 | | 2 | | 2 | | 2 | | 4 | |
| | % Invasives | | | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | |
| Post Mitigation Plan Performance Standard | Current Year Stem Count | | | | 13 | | 12 | | 13 | | 9 | | 10 | | 14 | | 13 | | 10 | | 11 | |
| | Stems/Acre | | | | 526 | | 486 | | 526 | | 364 | | 405 | | 567 | | 526 | | 405 | | 445 | |
| | Species Count | | | | 7 | | 7 | | 8 | | 4 | | 7 | | 8 | | 10 | | 7 | | 5 | |
| | Dominant Species Composition (%) | | | | 23 | | 33 | | 31 | | 40 | | 30 | | 43 | | 15 | | 30 | | 45 | |
| | Average Plot Height (ft.) | | | | 3 | | 2 | | 2 | | 3 | | 2 | | 2 | | 2 | | 2 | | 4 | |
| | % 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.
- 4). Species identifications were corrected from the previous monitoring year.

Table 6. Vegetation Plot Data

Carpenter Bottom Mitigation Site
 DMS Project No. 100090
Monitoring Year 2 - 2023

| | |
|----------------------------------|------------|
| 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 | 2023-08-15 |
| Plot size (ACRES) | 0.0247 |

| | Scientific Name | Common Name | Tree/ Shrub | Indicator Status | Veg Plot 1 R | Veg Plot 2 R | Veg Plot 3 R | Veg Plot 4 R |
|--|----------------------------------|---------------------|----------------|---------------------|--------------|--------------|--------------|--------------|
| | | | | | Total | Total | Total | Total |
| Species Included in Approved Mitigation Plan | Acer negundo | boxelder | Tree | FAC | 2 | 2 | 4 | |
| | Alnus serrulata | hazel alder | Tree | OBL | | | 1 | 1 |
| | Amelanchier arborea | common serviceberry | Tree | FAC | | | | |
| | Betula nigra | river birch | Tree | FACW | 1 | | | 2 |
| | Celtis laevigata | sugarberry | Tree | FACW | | | | 1 |
| | Cephalanthus occidentalis | common buttonbush | Shrub | OBL | | | | |
| | Cornus amomum | silky dogwood | Shrub | FACW | 1 | | | |
| | Diospyros virginiana | common persimmon | Tree | FAC | | 4 | | 4 |
| | Fagus grandifolia | American beech | Tree | FACU | | 1 | | |
| | Lindera benzoin | northern spicebush | Tree | FAC | | | | |
| | Liriodendron tulipifera | tuliptree | Tree | FACU | | 3 | 2 | 2 |
| | Nyssa sylvatica | blackgum | Tree | FAC | 1 | | | |
| | Platanus occidentalis | American sycamore | Tree | FACW | 2 | 1 | 2 | 1 |
| | Populus deltoides | eastern cottonwood | Tree | FAC | 1 | 3 | | 2 |
| | Quercus michauxii | swamp chestnut oak | Tree | FACW | | | | |
| | Quercus pagoda | cherrybark oak | Tree | FACW | 3 | | | |
| | Quercus phellos | willow oak | Tree | FAC | | 3 | 2 | |
| Sambucus canadensis | American black elderberry | Tree | FAC | | | | | |
| Ulmus americana | American elm | Tree | FACW | 1 | 3 | | 1 | |
| Ulmus rubra | slippery elm | Tree | FAC | | | 1 | | |
| Sum | Performance Standard | | | | 12 | 20 | 12 | 14 |
| Post Mitigation Plan Species | <i>Fraxinus pennsylvanica</i> | <i>green ash</i> | <i>Tree</i> | <i>FACW</i> | | | | |
| Sum | Proposed Standard | | | | 12 | 20 | 12 | 14 |
| Mitigation Plan Performance Standard | Current Year Stem Count | | | | 12 | 20 | 12 | 14 |
| | Stems/Acre | | | | 486 | 810 | 486 | 567 |
| | Species Count | | | | 8 | 8 | 6 | 8 |
| | Dominant Species Composition (%) | | | | 25 | 20 | 33 | 29 |
| | Average Plot Height (ft.) | | | | 3 | 2 | 3 | 2 |
| | % Invasives | | | | 0 | 0 | 0 | 0 |
| Post Mitigation Plan Performance Standard | Current Year Stem Count | | | | 12 | 20 | 12 | 14 |
| | Stems/Acre | | | | 486 | 810 | 486 | 567 |
| | Species Count | | | | 8 | 8 | 6 | 8 |
| | Dominant Species Composition (%) | | | | 25 | 20 | 33 | 29 |
| | Average Plot Height (ft.) | | | | 3 | 2 | 3 | 2 |
| | % Invasives | | | | 0 | 0 | 0 | 0 |

- 1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
- 2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section contains 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 have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that have been approved in prior monitoring years through a mitigation plan addendum (regular font).
- 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" include stems from both the original mitigation plan and the current monitoring year addendum.
- 4). Species identifications were corrected from the previous monitoring year.

Table 7. Vegetation Performance Standards Summary Table

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

| Vegetation Performance Standards Summary Table | | | | | | | | | | | | |
|--|--------------------|--------------|-----------|-------------|--------------------|--------------|-----------|-------------|--------------------|--------------|-----------|-------------|
| | 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 | 526 | 3 | 7 | 0 | 486 | 2 | 7 | 0 | 526 | 2 | 8 | 0 |
| Monitoring Year 1 | 526 | 2 | 7 | 0 | 445 | 2 | 6 | 0 | 486 | 2 | 7 | 0 |
| Monitoring Year 0 | 688 | 2 | 7 | 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 | 364 | 3 | 4 | 0 | 405 | 2 | 7 | 0 | 567 | 2 | 8 | 0 |
| Monitoring Year 1 | 364 | 2 | 4 | 0 | 405 | 2 | 7 | 0 | 567 | 2 | 8 | 0 |
| Monitoring Year 0 | 607 | 2 | 7 | 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 | 526 | 2 | 10 | 0 | 405 | 2 | 7 | 0 | 445 | 4 | 5 | 0 |
| Monitoring Year 1 | 526 | 2 | 10 | 0 | 445 | 2 | 7 | 0 | 486 | 3 | 5 | 0 |
| 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 | 486 | 3 | 8 | 0 | 810 | 2 | 8 | 0 | 486 | 3 | 6 | 0 |
| Monitoring Year 1 | 486 | 2 | 8 | 0 | 405 | 2 | 8 | 0 | 445 | 2 | 6 | 0 |
| Monitoring Year 0 | 526 | 2 | 8 | 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 | 567 | 2 | 8 | 0 | | | | | | | | |
| Monitoring Year 1 | 445 | 2 | 6 | 0 | | | | | | | | |
| 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

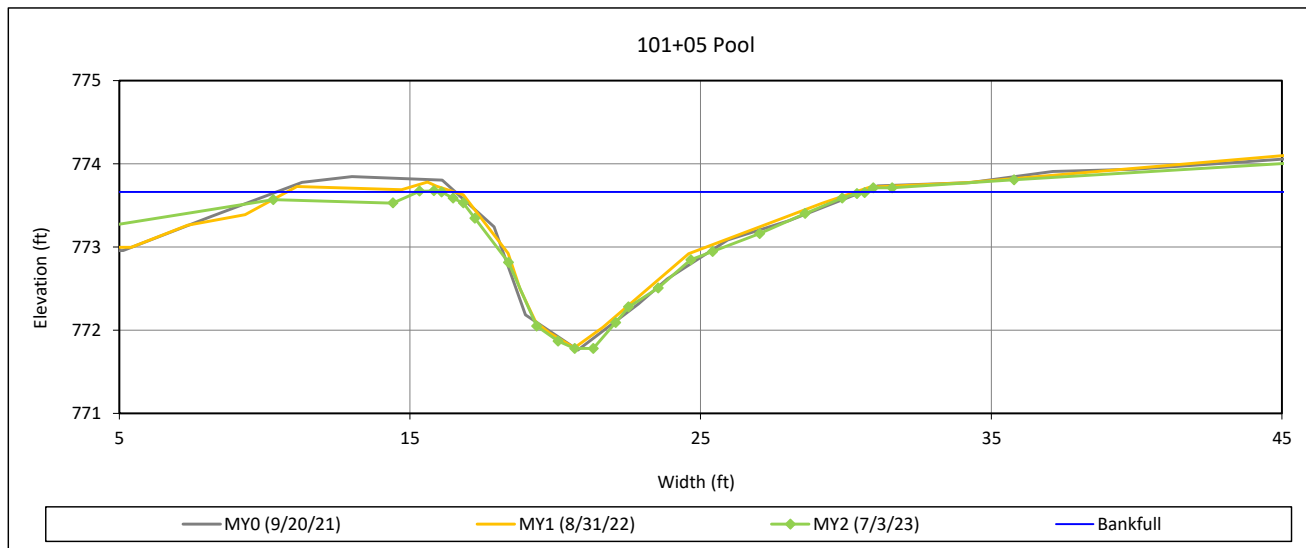
Cross-Section Plots

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Cross-Section 1 - Carpenter Branch Reach 1



Bankfull Dimensions

| | |
|------|-------------------------|
| 12.3 | x-section area (ft.sq.) |
| 14.6 | width (ft) |
| 0.8 | mean depth (ft) |
| 1.9 | max depth (ft) |
| 15.3 | wetted perimeter (ft) |
| 0.8 | hydraulic radius (ft) |
| 17.3 | width-depth ratio |

Survey Date: 7/3/23

Field Crew: Wildlands Engineering



View Downstream

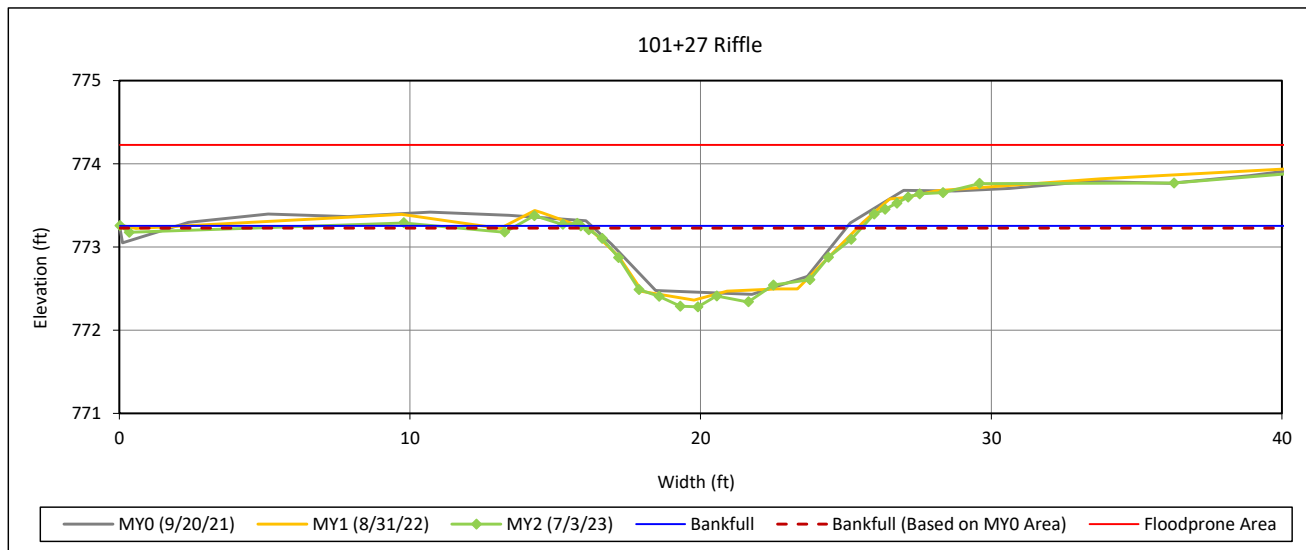
Cross-Section Plots

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Cross-Section 2 - Carpenter Branch Reach 1



Bankfull Dimensions

| | |
|------|-------------------------|
| 6.1 | x-section area (ft.sq.) |
| 9.7 | width (ft) |
| 0.6 | mean depth (ft) |
| 1.0 | max depth (ft) |
| 10.0 | wetted perimeter (ft) |
| 0.6 | hydraulic radius (ft) |
| 15.6 | width-depth ratio |
| 49.9 | W flood prone area (ft) |
| 5.1 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 7/3/23

Field Crew: Wildlands Engineering



View Downstream

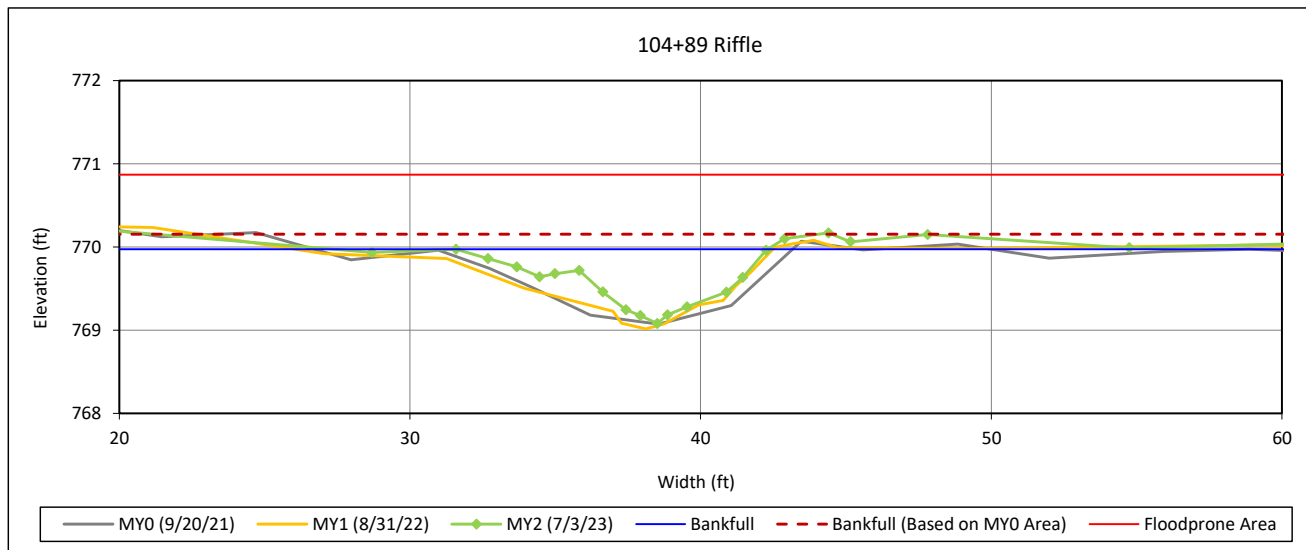
Cross-Section Plots

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Cross-Section 3 - Carpenter Branch Reach 1



Bankfull Dimensions

| | |
|------|-------------------------|
| 4.5 | x-section area (ft.sq.) |
| 10.7 | width (ft) |
| 0.4 | mean depth (ft) |
| 0.9 | max depth (ft) |
| 11.0 | wetted perimeter (ft) |
| 0.4 | hydraulic radius (ft) |
| 25.6 | width-depth ratio |
| 65.9 | W flood prone area (ft) |
| 6.1 | entrenchment ratio |
| 0.8 | low bank height ratio |

Survey Date: 7/3/23

Field Crew: Wildlands Engineering



View Downstream

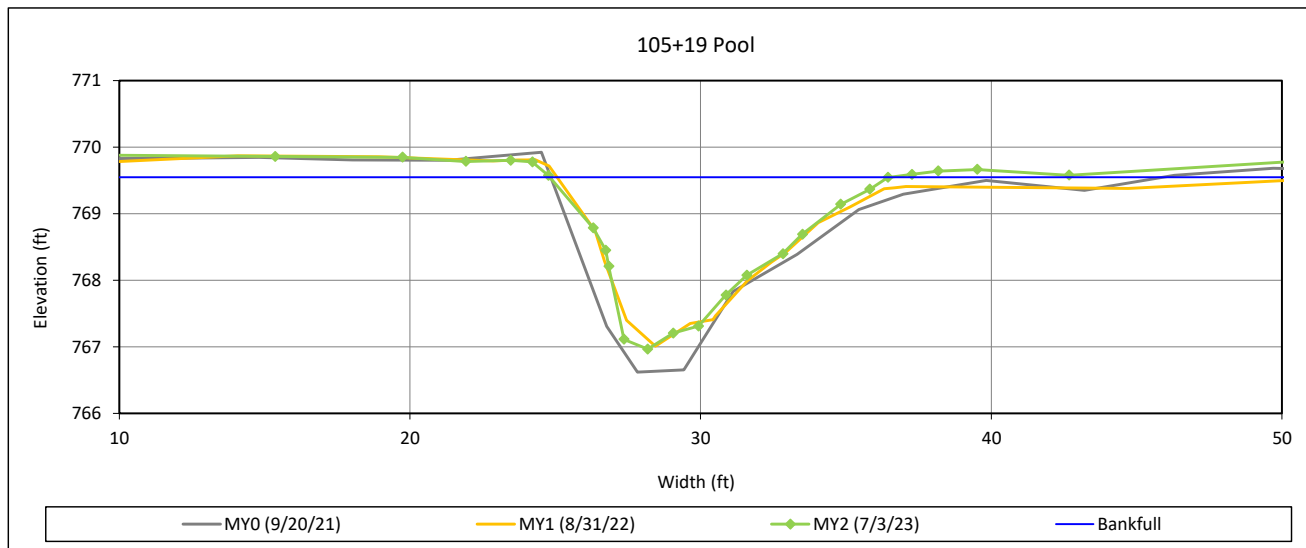
Cross-Section Plots

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Cross-Section 4 - Carpenter Branch Reach 1



Bankfull Dimensions

| | |
|------|-------------------------|
| 14.8 | x-section area (ft.sq.) |
| 11.6 | width (ft) |
| 1.3 | mean depth (ft) |
| 2.6 | max depth (ft) |
| 13.2 | wetted perimeter (ft) |
| 1.1 | hydraulic radius (ft) |
| 9.1 | width-depth ratio |

Survey Date: 7/3/23

Field Crew: Wildlands Engineering



View Downstream

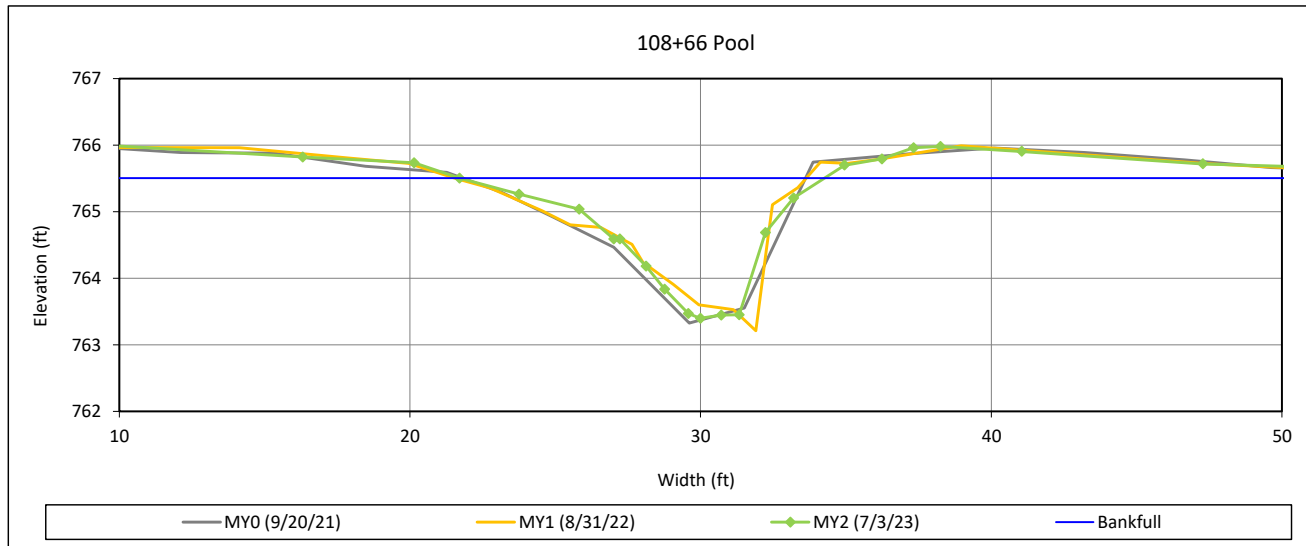
Cross-Section Plots

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Cross-Section 5 - Carpenter Branch Reach 1



Bankfull Dimensions

- 11.1 x-section area (ft.sq.)
- 12.5 width (ft)
- 0.9 mean depth (ft)
- 2.1 max depth (ft)
- 13.7 wetted perimeter (ft)
- 0.8 hydraulic radius (ft)
- 14.2 width-depth ratio

Survey Date: 7/3/23

Field Crew: Wildlands Engineering

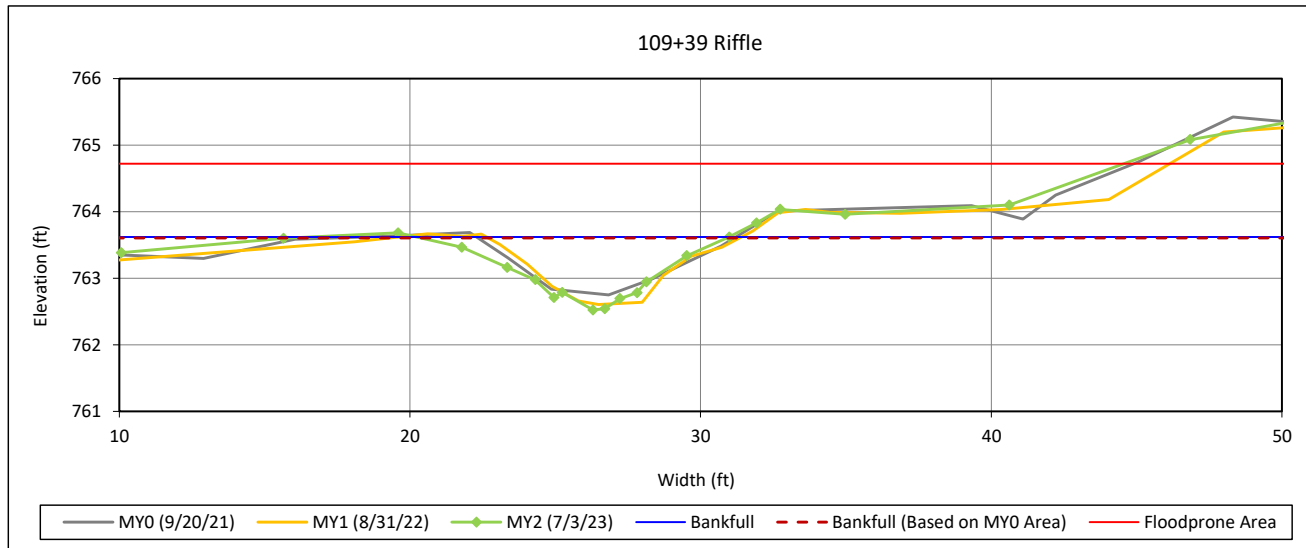


View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
 DMS Project No. 100090
Monitoring Year 2 - 2023

Cross-Section 6 - Carpenter Branch Reach 1



Bankfull Dimensions

| | |
|------|-------------------------|
| 5.5 | x-section area (ft.sq.) |
| 10.8 | width (ft) |
| 0.5 | mean depth (ft) |
| 1.1 | max depth (ft) |
| 11.1 | wetted perimeter (ft) |
| 0.5 | hydraulic radius (ft) |
| 21.1 | width-depth ratio |
| 44.5 | W flood prone area (ft) |
| 4.1 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 7/3/23

Field Crew: Wildlands Engineering



View Downstream

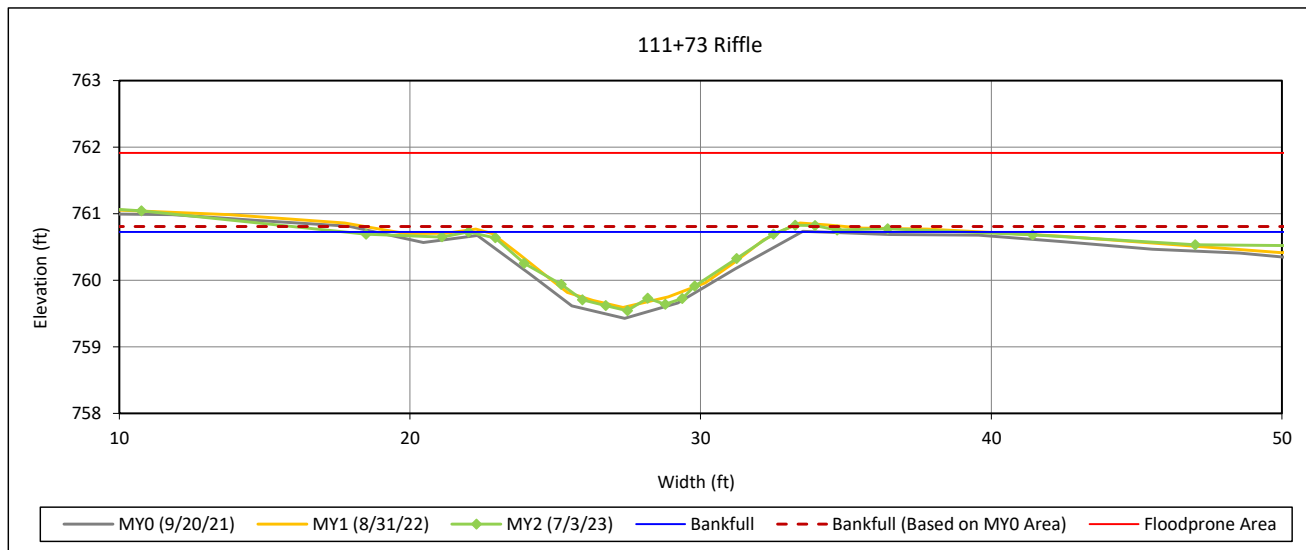
Cross-Section Plots

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Cross-Section 7 - Carpenter Branch Reach 1



Bankfull Dimensions

| | |
|------|-------------------------|
| 7.0 | x-section area (ft.sq.) |
| 10.7 | width (ft) |
| 0.7 | mean depth (ft) |
| 1.2 | max depth (ft) |
| 11.0 | wetted perimeter (ft) |
| 0.6 | hydraulic radius (ft) |
| 16.2 | width-depth ratio |
| 50.7 | W flood prone area (ft) |
| 4.8 | entrenchment ratio |
| 0.9 | low bank height ratio |

Survey Date: 7/3/23

Field Crew: Wildlands Engineering



View Downstream

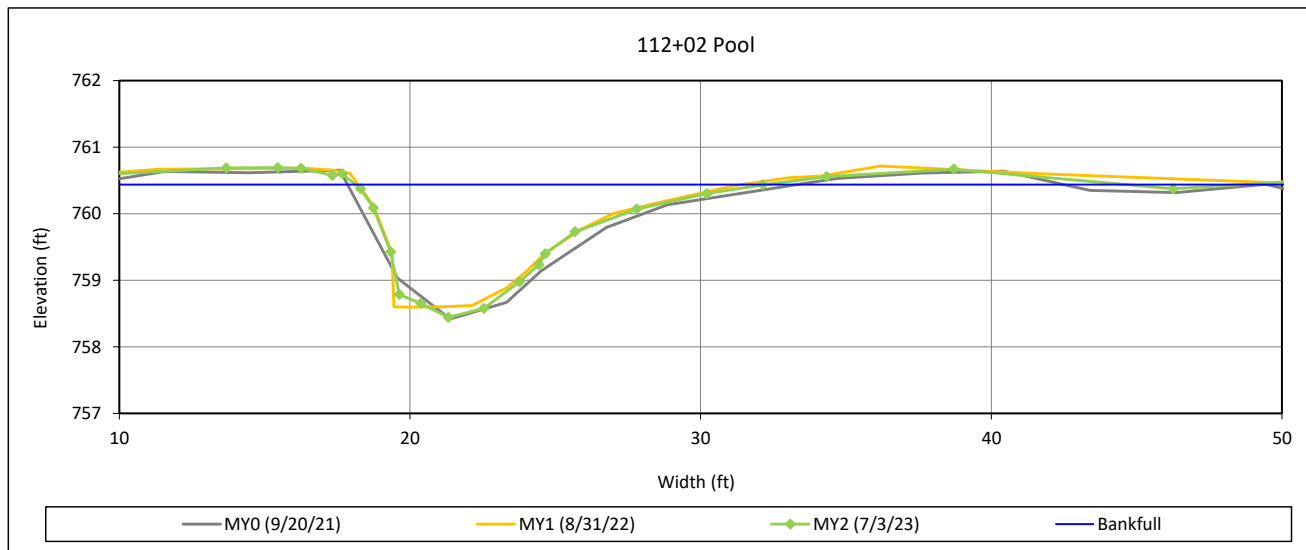
Cross-Section Plots

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Cross-Section 8 - Carpenter Branch Reach 1



Bankfull Dimensions

| | |
|------|-------------------------|
| 12.2 | x-section area (ft.sq.) |
| 14.0 | width (ft) |
| 0.9 | mean depth (ft) |
| 2.0 | max depth (ft) |
| 15.1 | wetted perimeter (ft) |
| 0.8 | hydraulic radius (ft) |
| 16.1 | width-depth ratio |

Survey Date: 7/3/23

Field Crew: Wildlands Engineering



View Downstream

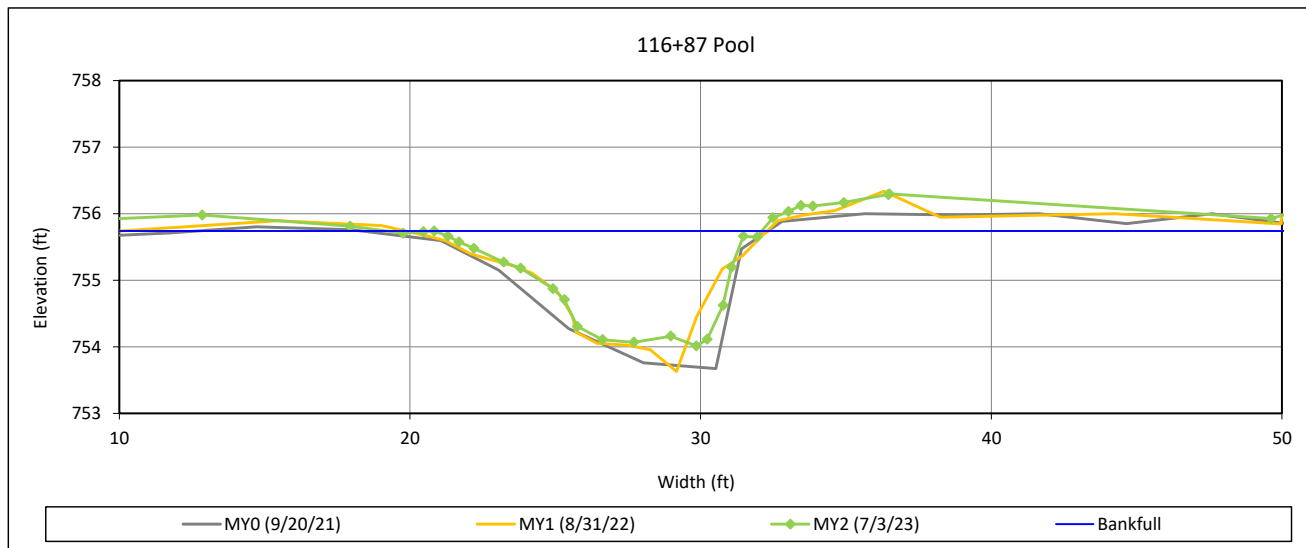
Cross-Section Plots

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Cross-Section 9 - Carpenter Branch Reach 1



Bankfull Dimensions

| | |
|------|-------------------------|
| 11.0 | x-section area (ft.sq.) |
| 11.3 | width (ft) |
| 1.0 | mean depth (ft) |
| 1.7 | max depth (ft) |
| 12.4 | wetted perimeter (ft) |
| 0.9 | hydraulic radius (ft) |
| 11.6 | width-depth ratio |

Survey Date: 7/3/23

Field Crew: Wildlands Engineering



View Downstream

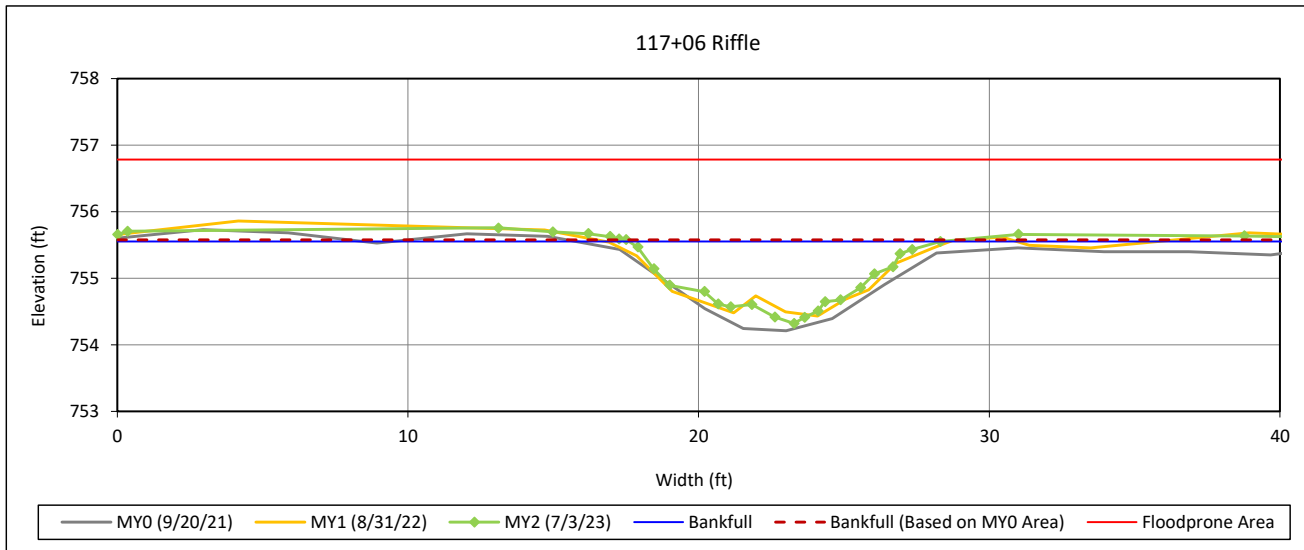
Cross-Section Plots

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Cross-Section 10 - Carpenter Branch Reach 1



Bankfull Dimensions

| | |
|------|-------------------------|
| 7.3 | x-section area (ft.sq.) |
| 10.7 | width (ft) |
| 0.7 | mean depth (ft) |
| 1.2 | max depth (ft) |
| 11.2 | wetted perimeter (ft) |
| 0.7 | hydraulic radius (ft) |
| 15.6 | width-depth ratio |
| 55.9 | W flood prone area (ft) |
| 5.2 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 7/3/23

Field Crew: Wildlands Engineering



View Downstream

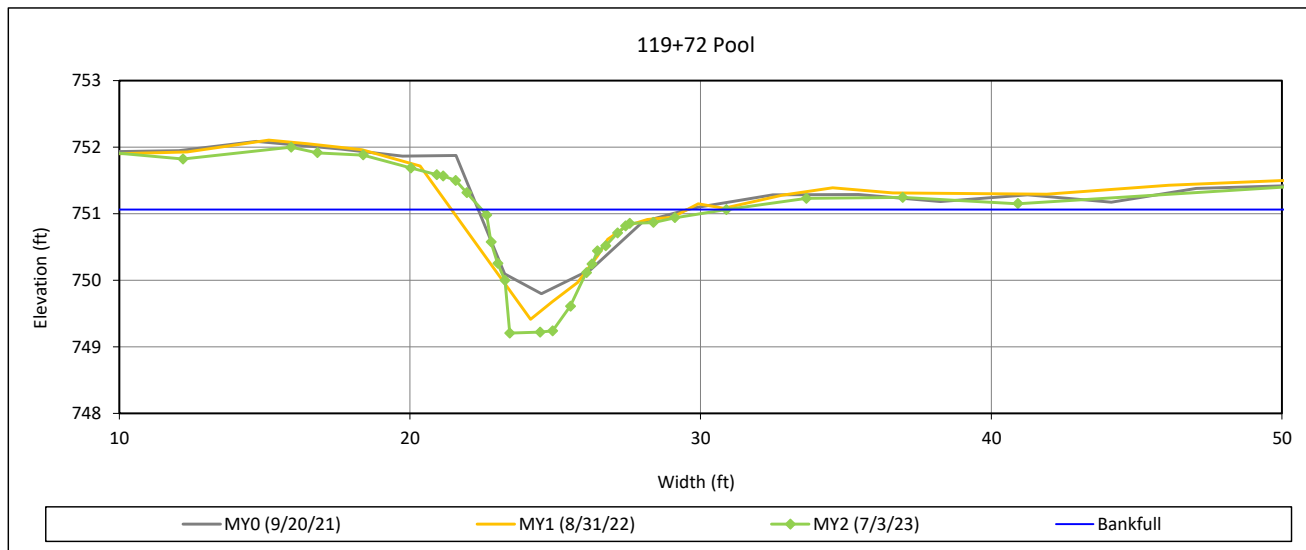
Cross-Section Plots

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Cross-Section 11 - Carpenter Branch Reach 1



Bankfull Dimensions

| | |
|------|-------------------------|
| 6.2 | x-section area (ft.sq.) |
| 8.4 | width (ft) |
| 0.7 | mean depth (ft) |
| 1.9 | max depth (ft) |
| 10.2 | wetted perimeter (ft) |
| 0.6 | hydraulic radius (ft) |
| 11.4 | width-depth ratio |

Survey Date: 7/3/23

Field Crew: Wildlands Engineering



View Downstream

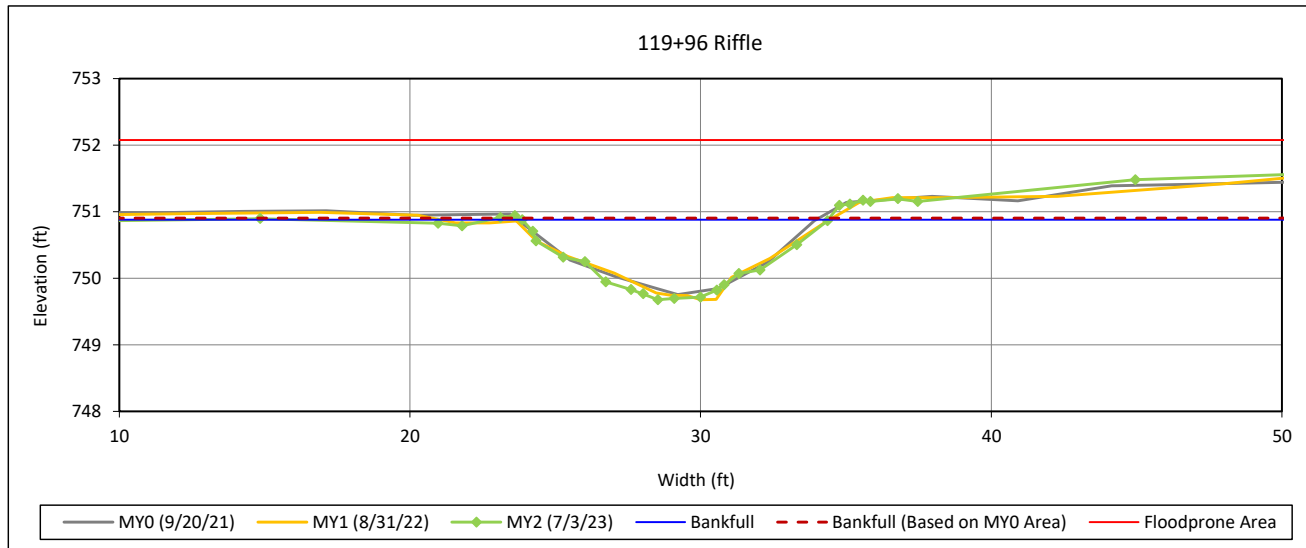
Cross-Section Plots

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Cross-Section 12 - Carpenter Branch Reach 1



Bankfull Dimensions

| | |
|------|-------------------------|
| 7.9 | x-section area (ft.sq.) |
| 10.5 | width (ft) |
| 0.8 | mean depth (ft) |
| 1.2 | max depth (ft) |
| 10.9 | wetted perimeter (ft) |
| 0.7 | hydraulic radius (ft) |
| 14.0 | width-depth ratio |
| 54.1 | W flood prone area (ft) |
| 5.1 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 7/3/23

Field Crew: Wildlands Engineering



View Downstream

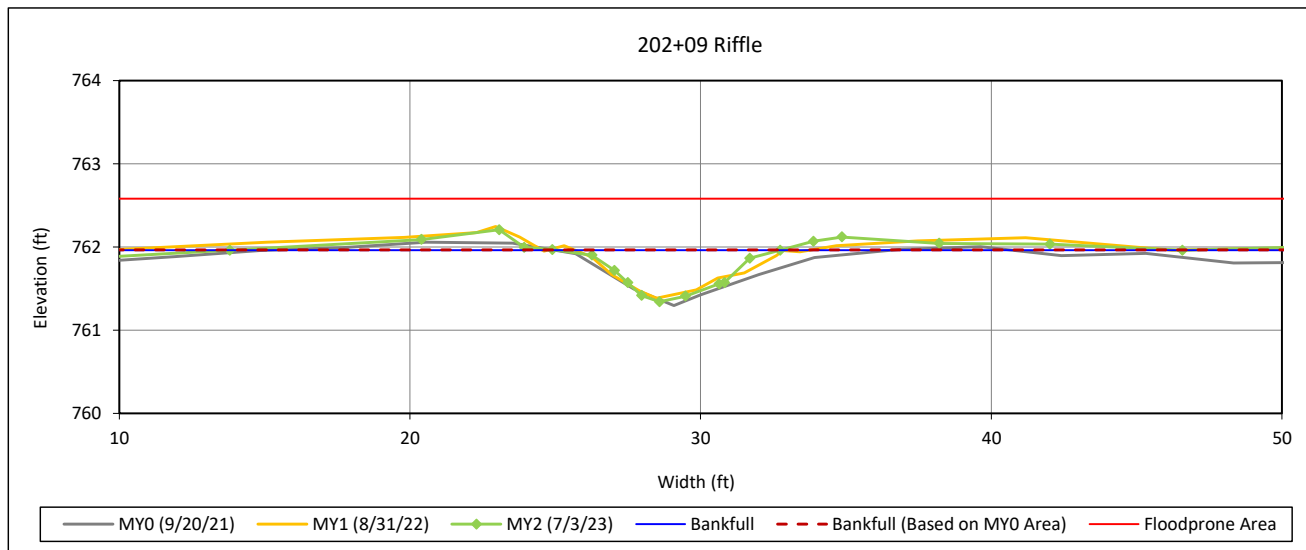
Cross-Section Plots

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Cross-Section 13 - UT1



Bankfull Dimensions

| | |
|------|-------------------------|
| 2.3 | x-section area (ft.sq.) |
| 7.7 | width (ft) |
| 0.3 | mean depth (ft) |
| 0.6 | max depth (ft) |
| 7.8 | wetted perimeter (ft) |
| 0.3 | hydraulic radius (ft) |
| 25.8 | width-depth ratio |
| 55.4 | W flood prone area (ft) |
| 7.2 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 7/3/23

Field Crew: Wildlands Engineering

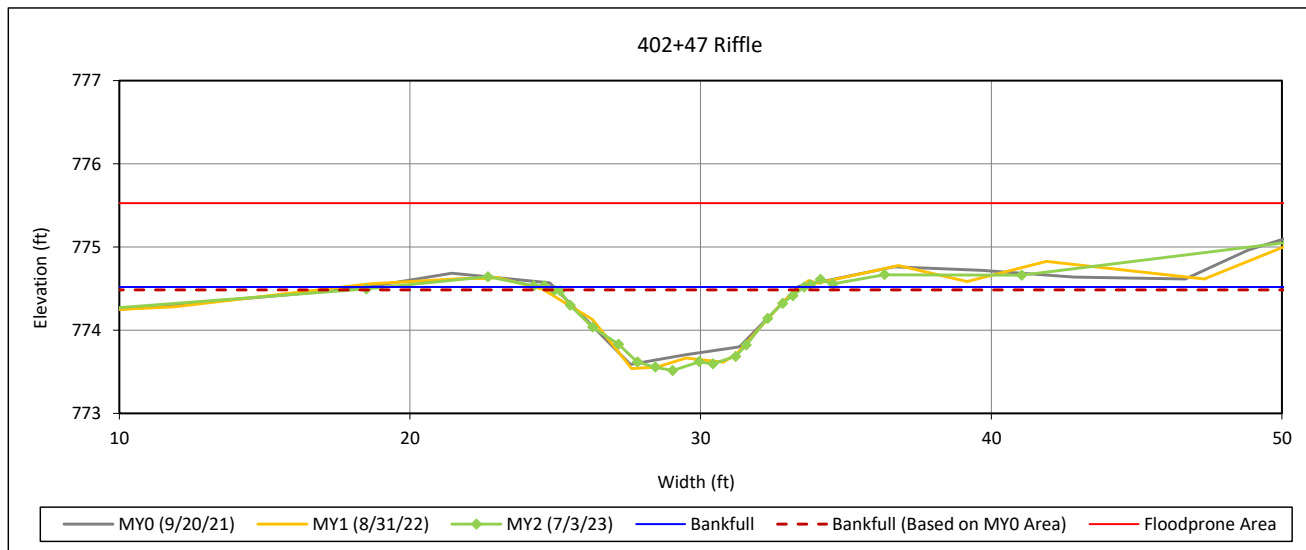


View Downstream

Cross-Section Plots

Carpenter Bottom Mitigation Site
 DMS Project No. 100090
Monitoring Year 2 - 2023

Cross-Section 14 - UT3



Bankfull Dimensions

| | |
|------|-------------------------|
| 5.4 | x-section area (ft.sq.) |
| 8.9 | width (ft) |
| 0.6 | mean depth (ft) |
| 1.0 | max depth (ft) |
| 9.2 | wetted perimeter (ft) |
| 0.6 | hydraulic radius (ft) |
| 14.5 | width-depth ratio |
| 52.6 | W flood prone area (ft) |
| 5.9 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 7/3/23
 Field Crew: Wildlands Engineering



View Downstream

Table 8a. Baseline Stream Data Summary

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

| | 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 | | |
| 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 | | |
| 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 2 - 2023

| Parameter | PRE-EXISTING CONDITIONS | | | DESIGN | | MONITORING BASELINE (MY0) | | |
|--|-------------------------|-----|---|--------|------|---------------------------|-----|---|
| | 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 2 - 2023

| 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 | -- | -- | -- | | | | 773.32 | 773.26 | 773.23 | | | | 769.96 | 770.00 | 770.16 | | | | -- | -- | -- | | | |
| Bank Height Ratio - Based on AB Bankfull ¹ Area | -- | -- | -- | | | | 1.0 | 1.0 | 1.0 | | | | 1.0 | 0.9 | 0.8 | | | | -- | -- | -- | | | |
| Thalweg Elevation | 771.76 | 771.79 | 771.78 | | | | 772.43 | 772.36 | 772.28 | | | | 769.07 | 769.02 | 769.08 | | | | 766.62 | 767.01 | 766.97 | | | |
| LTOB ² Elevation | 773.74 | 773.72 | 773.66 | | | | 773.32 | 773.30 | 773.25 | | | | 769.96 | 769.86 | 769.97 | | | | 769.29 | 769.38 | 769.55 | | | |
| LTOB ² Max Depth (ft) | 2.0 | 1.9 | 1.9 | | | | 0.9 | 0.9 | 1.0 | | | | 0.9 | 0.8 | 0.9 | | | | 2.7 | 2.4 | 2.6 | | | |
| LTOB ² Cross Sectional Area (ft ²) | 13.1 | 12.2 | 12.3 | | | | 5.8 | 6.2 | 6.1 | | | | 6.5 | 5.0 | 4.5 | | | | 15.8 | 13.0 | 14.8 | | | |
| 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 | -- | -- | -- | | | | 763.69 | 763.65 | 763.60 | | | | 760.67 | 760.82 | 760.80 | | | | -- | -- | -- | | | |
| Bank Height Ratio - Based on AB Bankfull ¹ Area | -- | -- | -- | | | | 1.0 | 1.0 | 1.0 | | | | 1.0 | 1.0 | 0.9 | | | | -- | -- | -- | | | |
| Thalweg Elevation | 763.33 | 763.21 | 763.40 | | | | 762.75 | 762.60 | 762.52 | | | | 759.43 | 759.59 | 759.54 | | | | 758.42 | 758.60 | 758.44 | | | |
| LTOB ² Elevation | 765.59 | 765.49 | 765.51 | | | | 763.69 | 763.66 | 763.62 | | | | 760.67 | 760.77 | 760.73 | | | | 760.33 | 760.42 | 760.43 | | | |
| LTOB ² Max Depth (ft) | 2.3 | 2.3 | 2.1 | | | | 0.9 | 1.1 | 1.1 | | | | 1.2 | 1.2 | 1.2 | | | | 1.9 | 1.8 | 2.0 | | | |
| LTOB ² Cross Sectional Area (ft ²) | 13.7 | 11.2 | 11.1 | | | | 5.3 | 5.4 | 5.5 | | | | 7.9 | 7.3 | 7.0 | | | | 12.1 | 11.7 | 12.2 | | | |
| 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 | -- | -- | -- | | | | 755.38 | 755.53 | 755.58 | | | | -- | -- | -- | | | | 750.97 | 750.96 | 750.91 | | | |
| Bank Height Ratio - Based on AB Bankfull ¹ Area | -- | -- | -- | | | | 1.0 | 1.0 | 1.0 | | | | -- | -- | -- | | | | 1.0 | 0.9 | 1.0 | | | |
| Thalweg Elevation | 753.67 | 753.63 | 754.01 | | | | 754.21 | 754.43 | 754.32 | | | | 749.80 | 749.41 | 749.21 | | | | 749.75 | 749.74 | 749.68 | | | |
| LTOB ² Elevation | 755.60 | 755.67 | 755.74 | | | | 755.38 | 755.55 | 755.55 | | | | 751.28 | 751.21 | 751.06 | | | | 750.97 | 750.86 | 750.88 | | | |
| LTOB ² Max Depth (ft) | 1.9 | 2.0 | 1.7 | | | | 1.2 | 1.1 | 1.2 | | | | 1.5 | 1.8 | 1.9 | | | | 1.2 | 1.1 | 1.2 | | | |
| LTOB ² Cross Sectional Area (ft ²) | 12.2 | 10.4 | 11.0 | | | | 7.6 | 7.8 | 7.3 | | | | 6.7 | 7.2 | 6.2 | | | | 8.2 | 7.1 | 7.9 | | | |
| 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 | 761.96 | 761.96 | | | | 774.53 | 774.49 | 774.48 | | | | | | | | | | | | | | | |
| Bank Height Ratio - Based on AB Bankfull ¹ Area | 1.0 | 1.0 | 1.0 | | | | 1.0 | 1.0 | 1.0 | | | | | | | | | | | | | | | |
| Thalweg Elevation | 761.30 | 761.38 | 761.34 | | | | 773.59 | 773.54 | 773.51 | | | | | | | | | | | | | | | |
| LTOB ² Elevation | 761.87 | 761.96 | 761.96 | | | | 774.53 | 774.49 | 774.52 | | | | | | | | | | | | | | | |
| LTOB ² Max Depth (ft) | 0.6 | 0.6 | 0.6 | | | | 0.9 | 1.0 | 1.0 | | | | | | | | | | | | | | | |
| LTOB ² Cross Sectional Area (ft ²) | 2.3 | 2.3 | 2.3 | | | | 5.1 | 5.2 | 5.4 | | | | | | | | | | | | | | | |

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

²LTOB 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 recoded and tracked above as LTOB max depth.

APPENDIX D. Hydrology Data

Table 10. Bankfull Events

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 2 - 2023

| Reach | MY1 (2022) | MY2 (2023) | MY3 (2024) | MY4 (2025) | MY5 (2026) | MY6 (2027) | MY7 (2028) |
|--------------------------------|--------------------------|--------------------------|------------|------------|------------|------------|------------|
| UT1 (SG2) | 03/12/2022 | 04/28/2023 | | | | | |
| UT2 (SG3) | 01/03/2022 03/12/2022 | 01/04/2023 04/28/2023 | | | | | |
| UT3 (SG4) | None | None | | | | | |
| Carpenter Branch Reach 1 (CG5) | None | 01/04/2023 04/28/2023 | | | | | |

Table 11. Rainfall Summary

Carpenter Bottom Mitigation Site
DMS Project No. 100090
Monitoring Year 2 - 2023

| | MY1 (2022) | MY2 (2023) | MY3 (2024) | MY4 (2025) | MY5 (2026) | MY6 (2027) | MY7 (2028) |
|----------------------|------------|------------|------------|------------|------------|------------|------------|
| Annual Precip Total | 53.50 | 51.28 | | | | | |
| WETS 30th Percentile | 42.98 | 42.86 | | | | | |
| WETS 70th Percentile | 54.38 | 54.06 | | | | | |
| Normal | 49.27 | 49.03 | | | | | |

WETS & Annual Precipitation Station: LINCOLNTON 4W (37109) <<http://agacis.rcc-acis.org/?fips=37109>>. Located approximately 5 mi. from the Site.

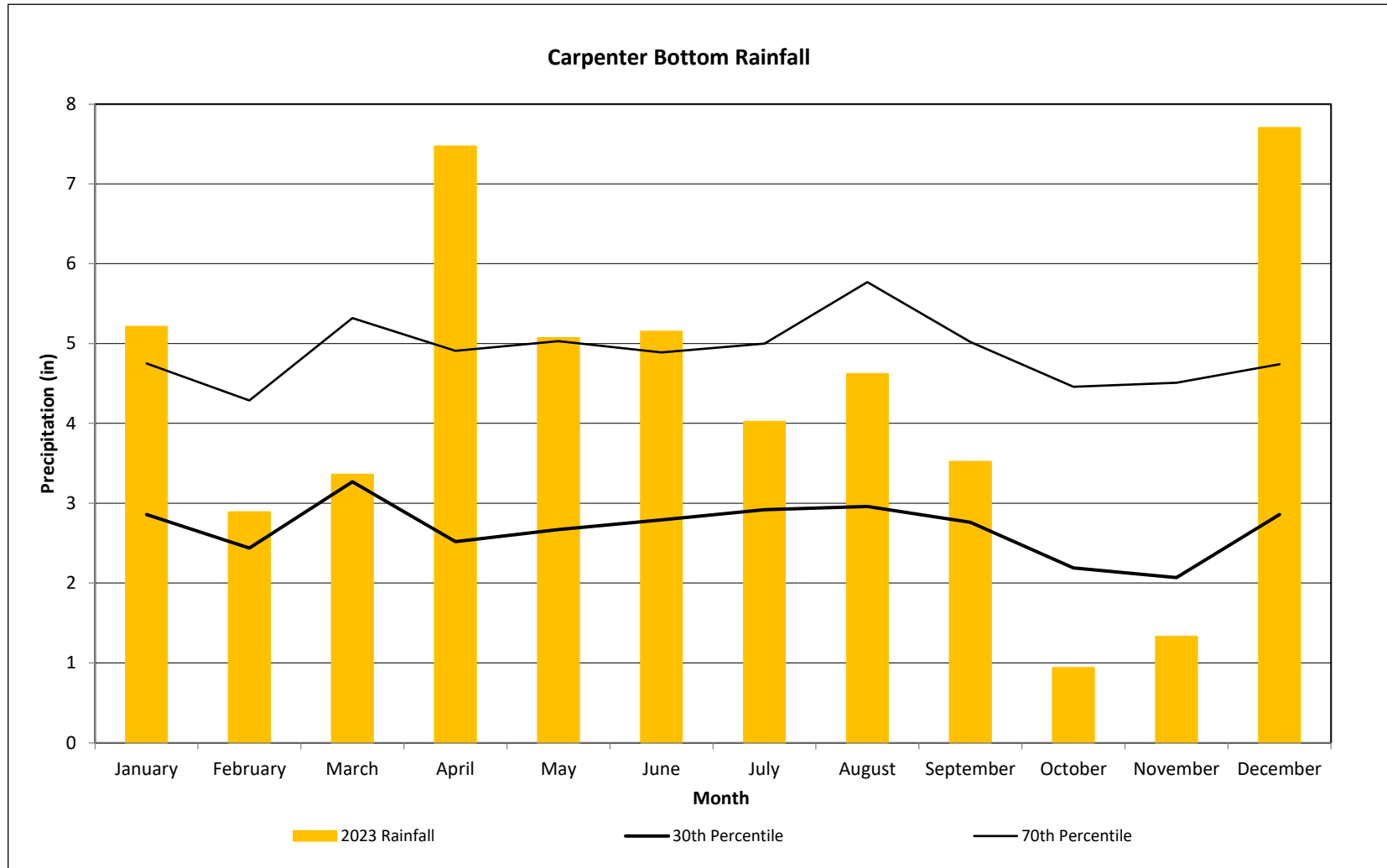
WETS Percentiles are recalculated each year based on the most recent 30-yr time period.

Monthly Rainfall Data

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023



WETS & Annual Precipitation Station: LINCOLNTON 4W (37109) <<http://agacis.rcc-acis.org/?fips=37109>>. Located approximately 5 mi. from the Site.

30th and 70th percentile rainfall data based on 30-yr climate normal (1993-2022)

Last Updated: 01/03/2024

Table 12a. Existing Conditions Wetland Gage Summary

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

| Gage ¹ | Max. Consecutive Hydroperiod (Percentage) |
|-------------------|---|
| | Existing Conditions (2019) |
| 1 | 48 Days (19.6%) |
| 2 | 22 Days (9.0%) |
| 3 | 48 Days (19.6%) |
| 4 | 22 Days (9.0%) |
| 5 | 73 Days (29.8%) |
| 6 | 13 Days (5.3%) |

¹ Gage numbers refer to the numbers and locations identified in the Mitigation Plan, which do not correspond to the gage number and locations used for post-construction monitoring. Refer to Figure 3 Site Map (Mitigation Plan) for gage locations.

Performance Standard: 30 Days (12%)

WETS Station: LINCOLNTON 4W (37109) <<http://agacis.rcc-acis.org/?fips=37109>>

Growing Season: 03/15 to 11/14 (245 Days)

Table 12b. Wetland Gage Summary

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

| Gage | Max. Consecutive Hydroperiod (Percentage) | | | | | | |
|------------------------|---|----------------------|------------|------------|------------|------------|------------|
| | MY1 (2022) | MY2 (2023) | MY3 (2024) | MY5 (2025) | MY5 (2026) | MY6 (2027) | MY7 (2028) |
| Reference ¹ | 107 Days (43.7%) | 245 Days (100.0%) | | | | | |
| 1 | 59 Days (24.1%) | 96 Days (39.2%) | | | | | |
| 2 | 45 Days (18.4%) | 53 Days (21.6%) | | | | | |
| 3 | 34 Days (13.9%) | 38 Days (15.5%) | | | | | |
| 4 | 48 Days (19.6%) | 59 Days (24.1%) | | | | | |
| 5 | 45 Days (18.4%) | 54 Days (22.0%) | | | | | |
| 6 | 14 Days (5.7%) | 35 Days (14.3%) | | | | | |
| 7 | 48 Days (19.6%) | 71 Days (29.0%) | | | | | |
| 8 | 8 Days (3.3%) | 6 Days (2.4%) | | | | | |
| 9 | 15 Days (6.1%) | 22 Days (9.0%) | | | | | |
| 10 | 42 Days (17.1%) | 55 Days (22.4%) | | | | | |
| 11 | 51 Days (20.8%) | 71 Days (29.0%) | | | | | |
| 12 | N/A ² | 35 Days (14.3%) | | | | | |
| 13 | N/A ² | 21 Days (8.6%) | | | | | |

Performance Standard: 30 Days (12%)

WETS Station: LINCOLNTON 4W (37109) <<http://agacis.rcc-acis.org/?fips=37109>>

Growing Season: 03/15 to 11/14 (245 Days)

¹ Reference well is located approximately 6.7 miles NW of the Site

² Wells 12 and 13 installed during MY2 (01/2023)

Table 13. Recorded In-Stream Flow Events Summary

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

| Reach | Max Consecutive Days/Total Days Meeting Success Criteria ¹ | | | | | | |
|-----------------------------------|---|-------------------------|------------|------------|------------|------------|------------|
| | MY1 (2022) | MY2 (2023) ² | MY3 (2024) | MY5 (2025) | MY5 (2026) | MY6 (2027) | MY7 (2028) |
| Carpenter Branch Reach 1 (SG1) | 103 Days/ 112 Days | 8 Days/ 88 Days | | | | | |
| UT1 (SG2) | 3 Days/ 24 Days | 3 Days/ 37 Days | | | | | |
| UT2 (SG3) | 21 Days/ 131 Days | 208 Days/ 252 Days | | | | | |
| UT3 (SG4) | 100 Days/ 111 Days | 131 Days/ 162 Days | | | | | |

¹ Success criteria is 30 consecutive days of flow.

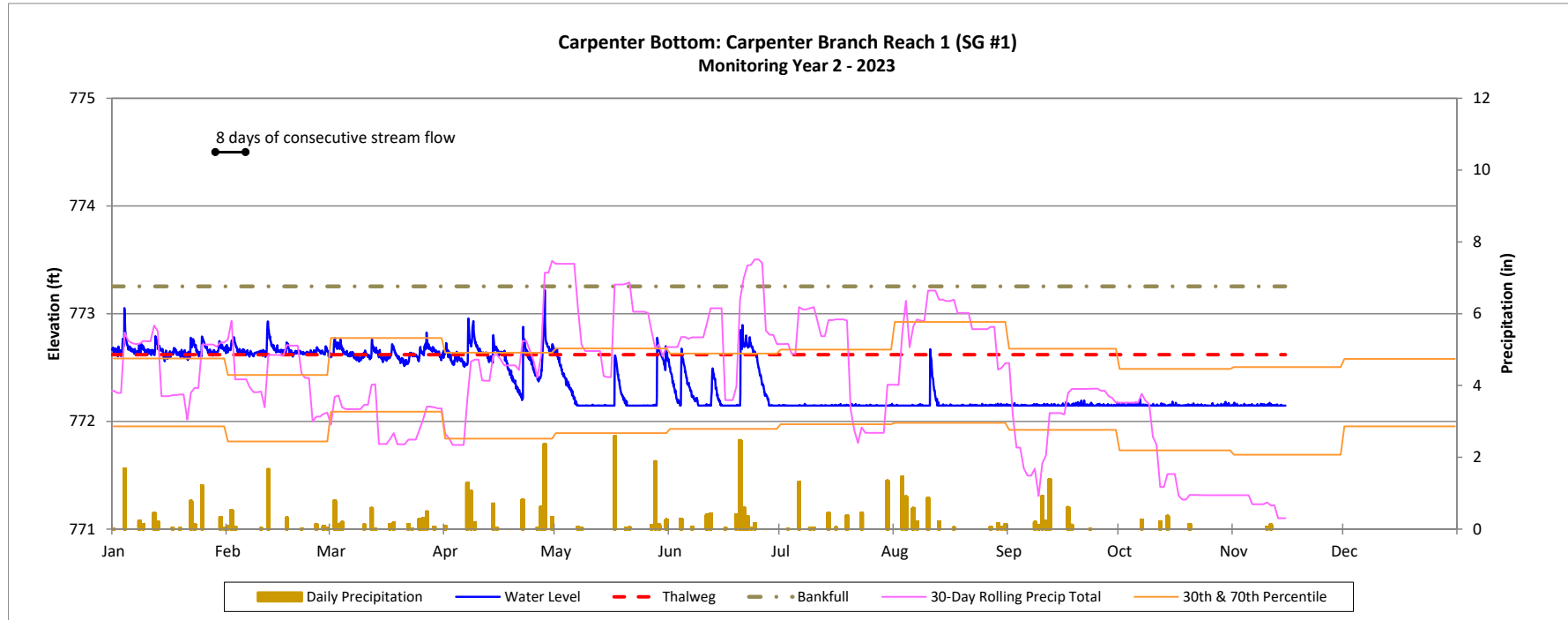
² Data collected through 11/14/2023.

Recorded In-Stream Flow Events Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

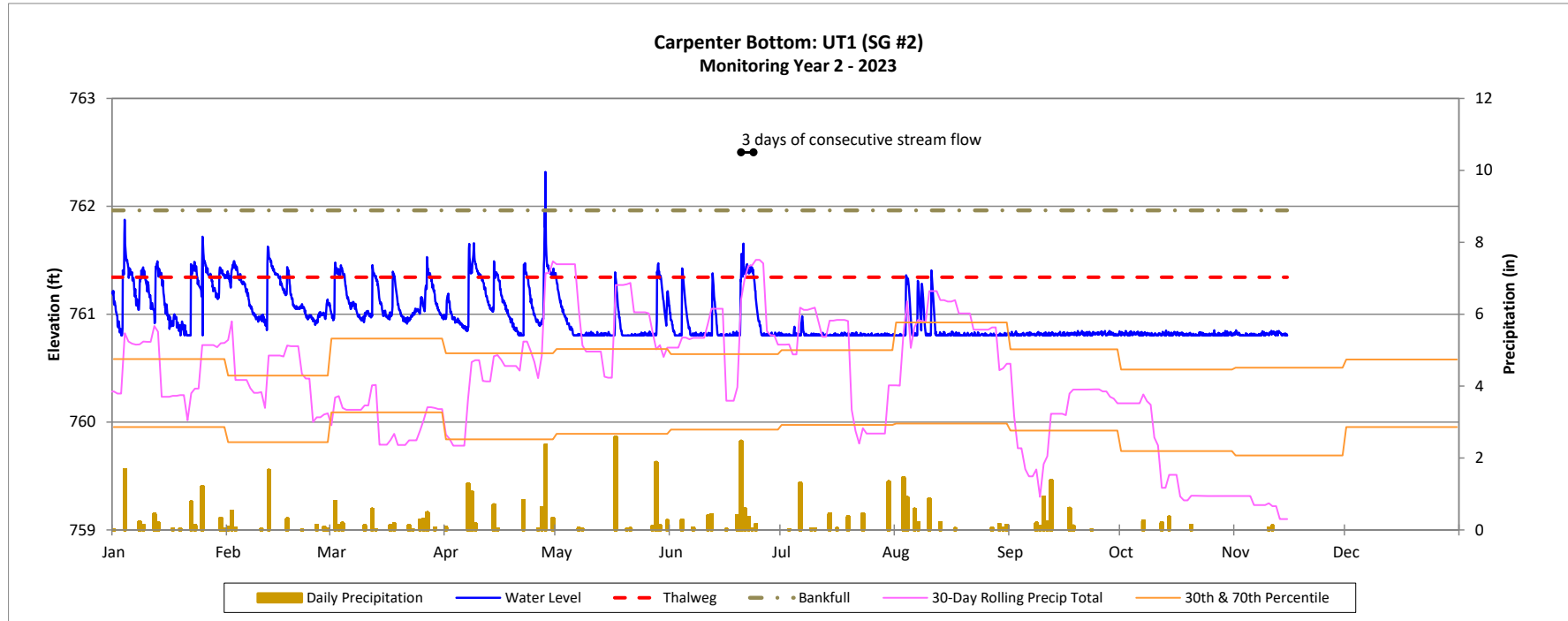


Recorded In-Stream Flow Events Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

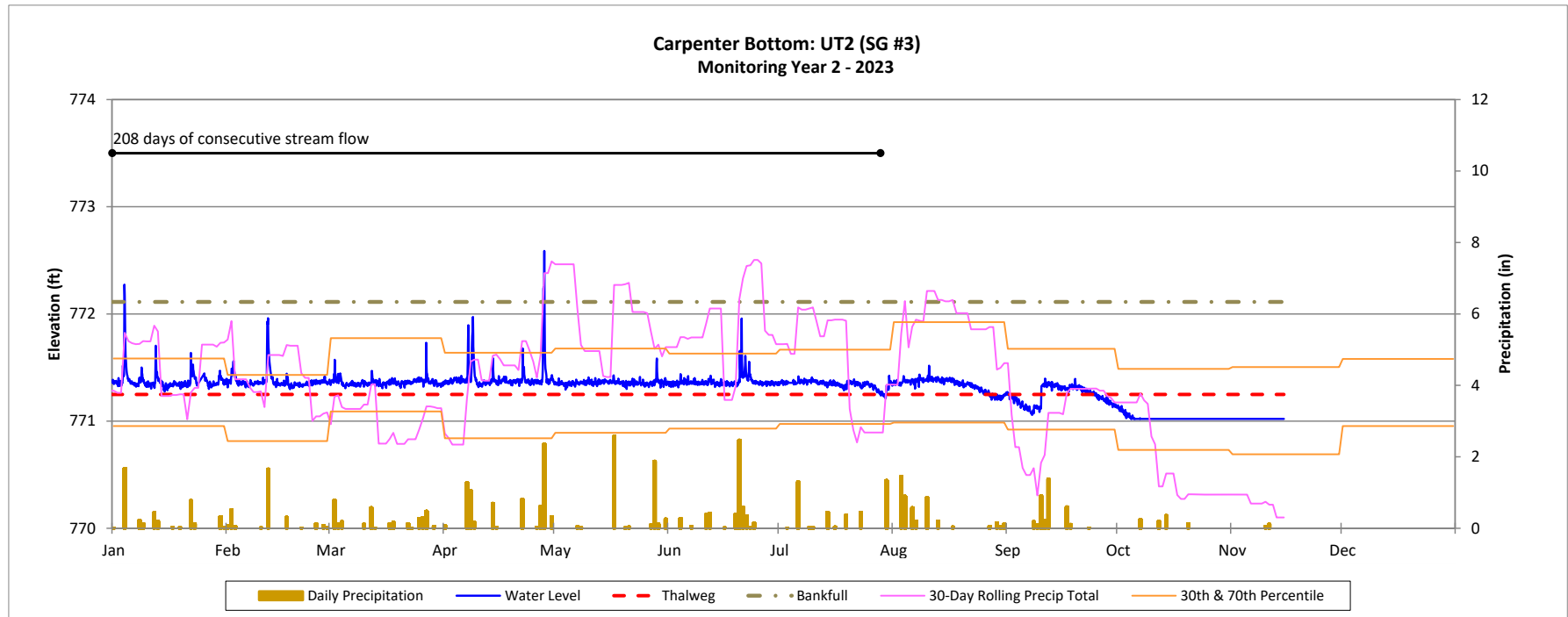


Recorded In-Stream Flow Events Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

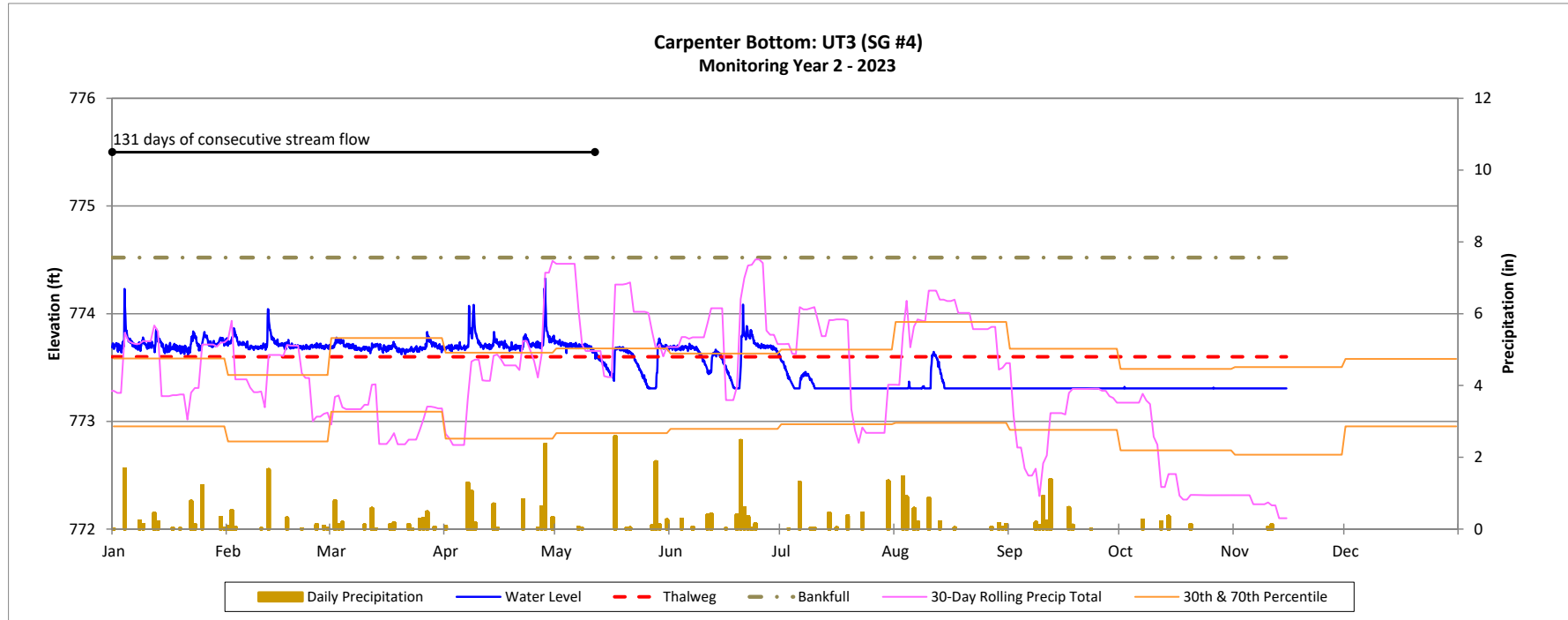


Recorded In-Stream Flow Events Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

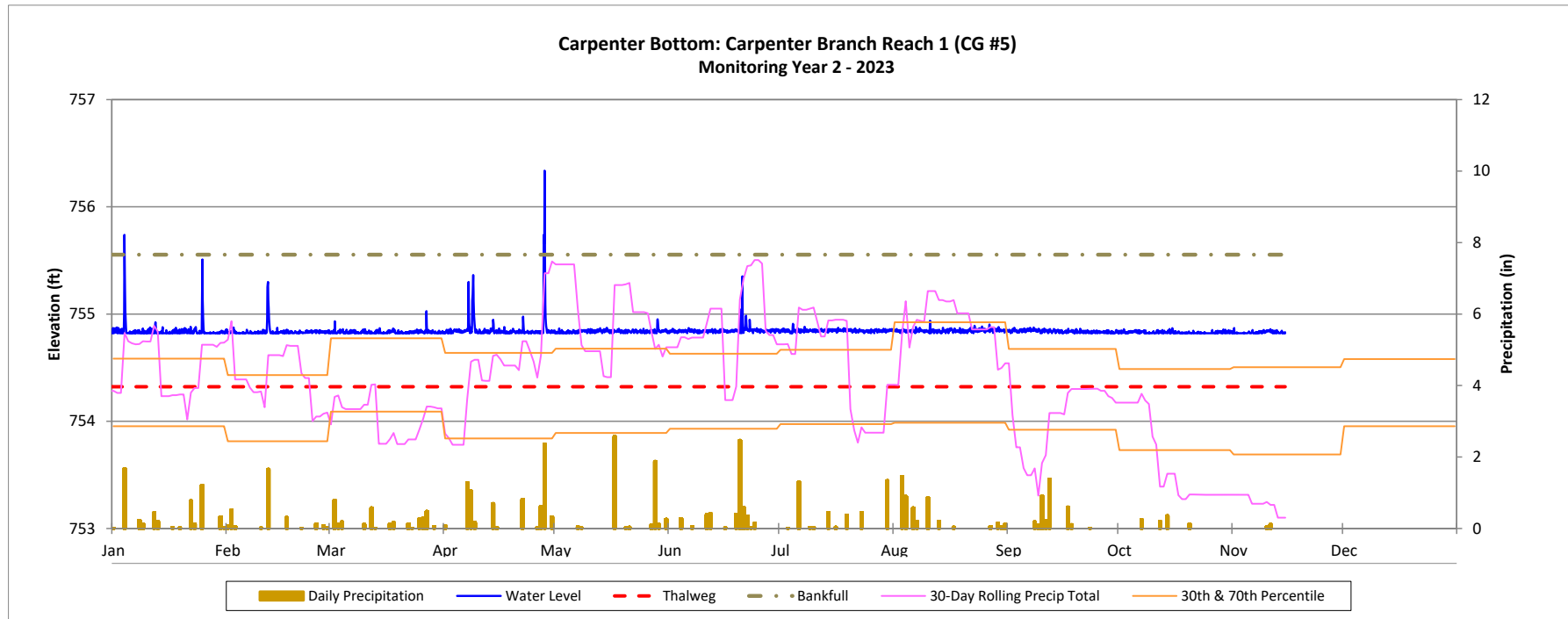


Recorded In-Stream Flow Events Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023



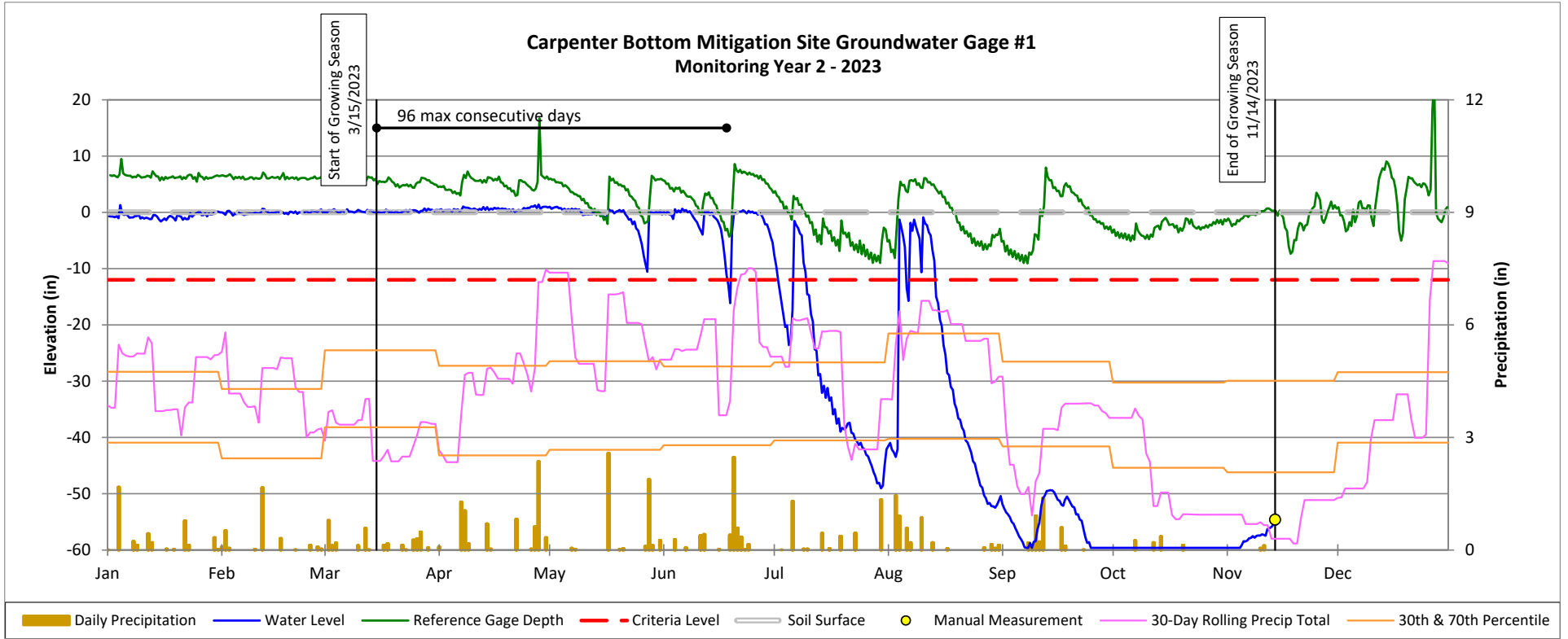
Groundwater Gage Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Rehabilitation



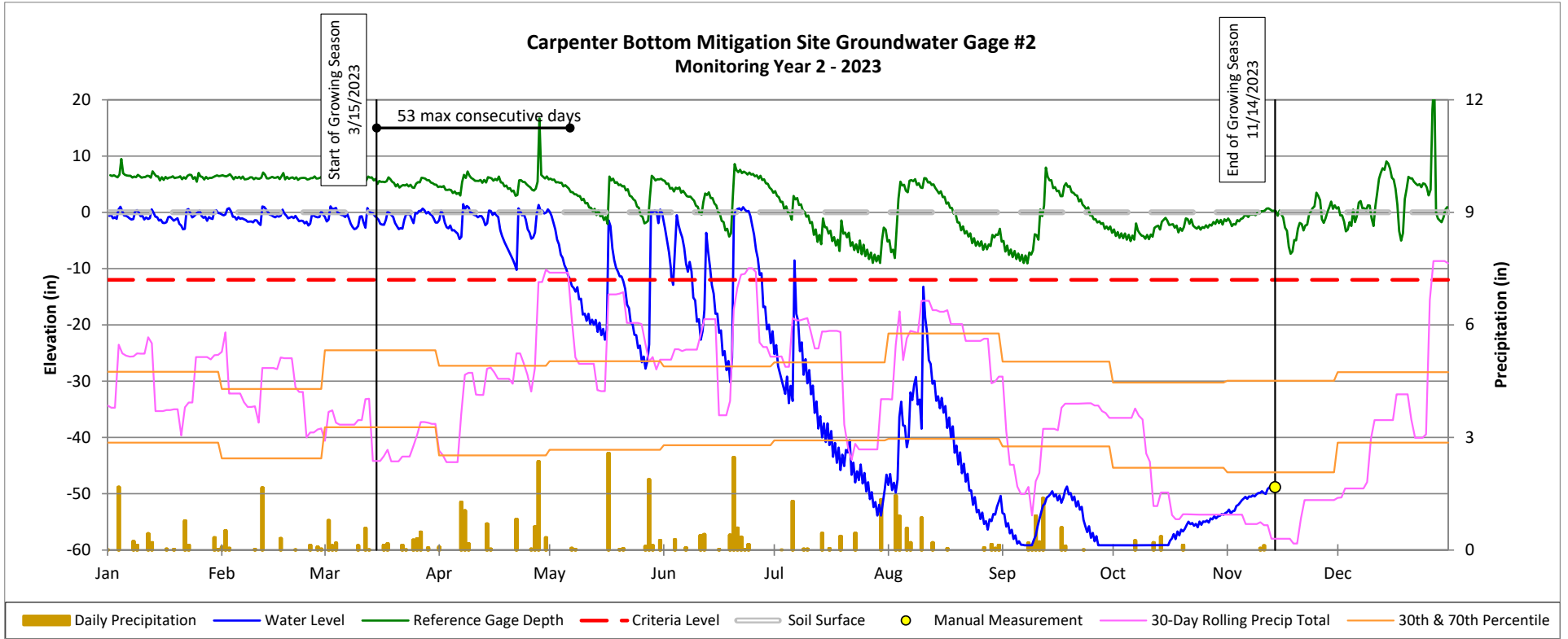
Groundwater Gage Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Rehabilitation



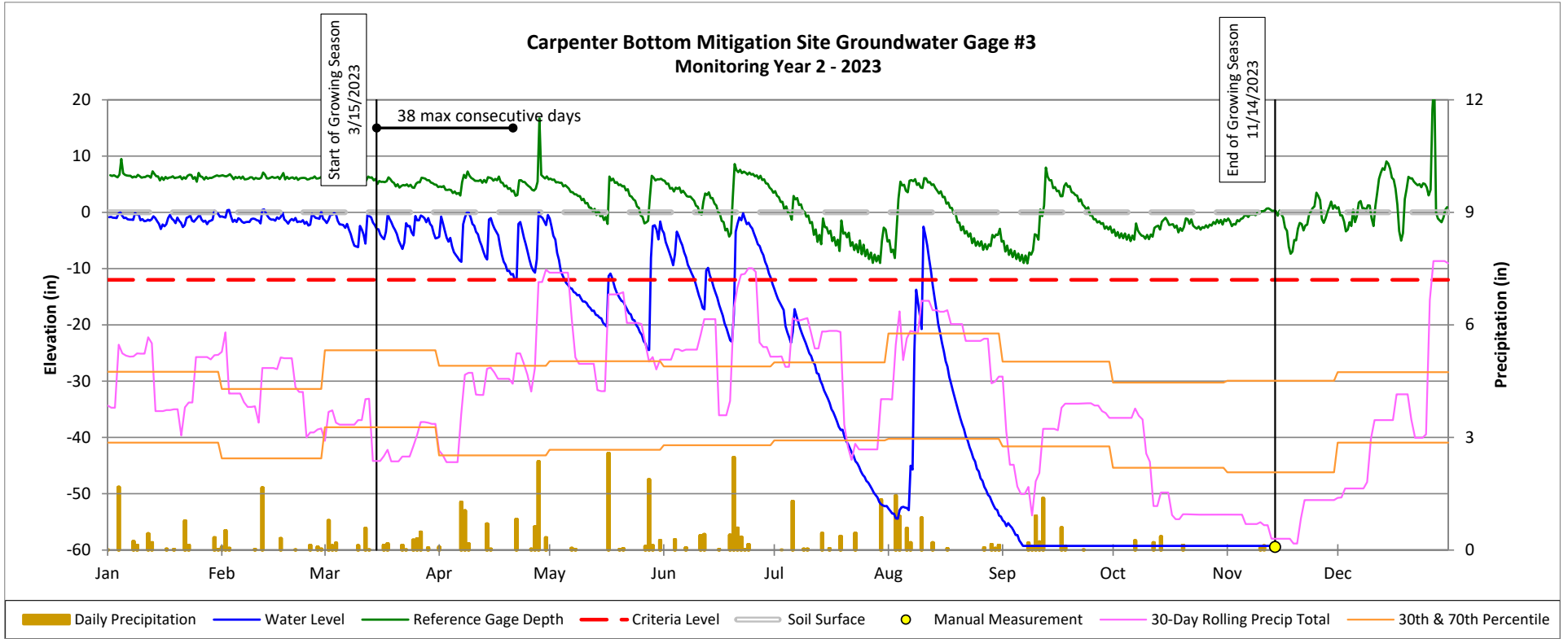
Groundwater Gage Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Re-Establishment



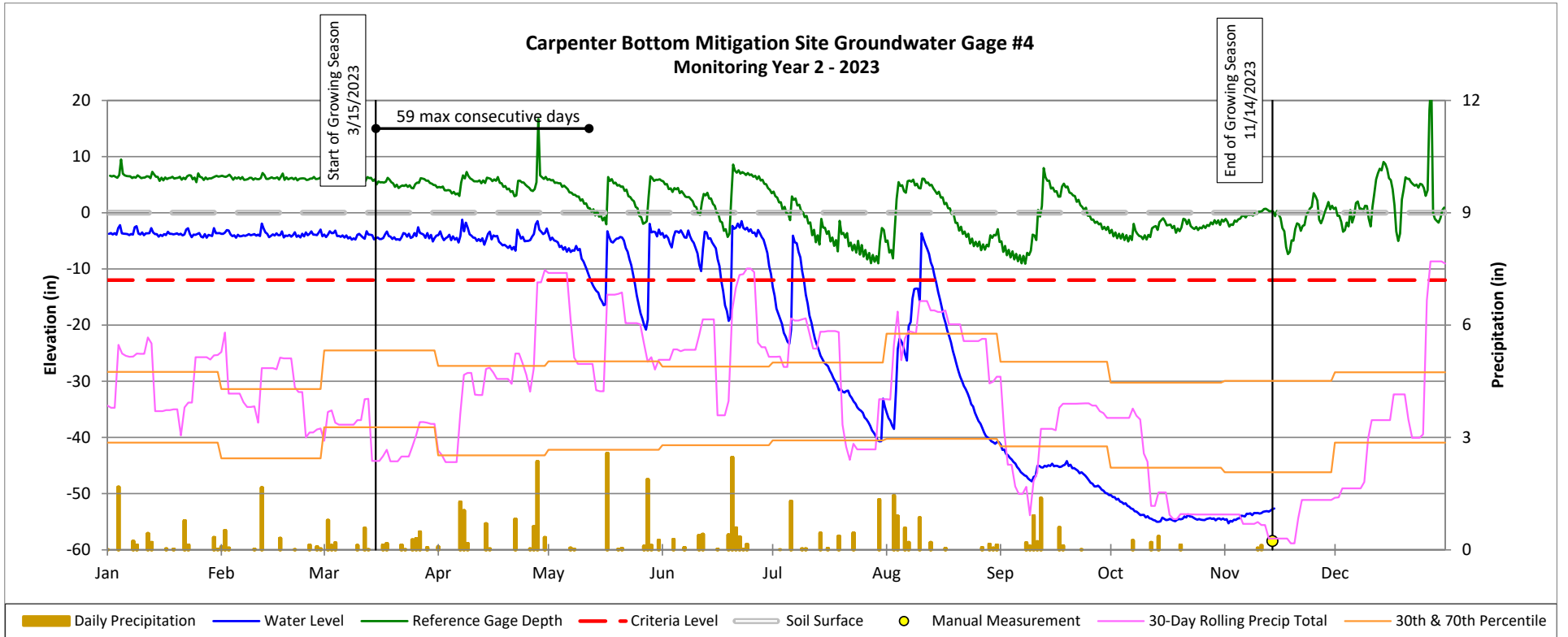
Groundwater Gage Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Re-Establishment



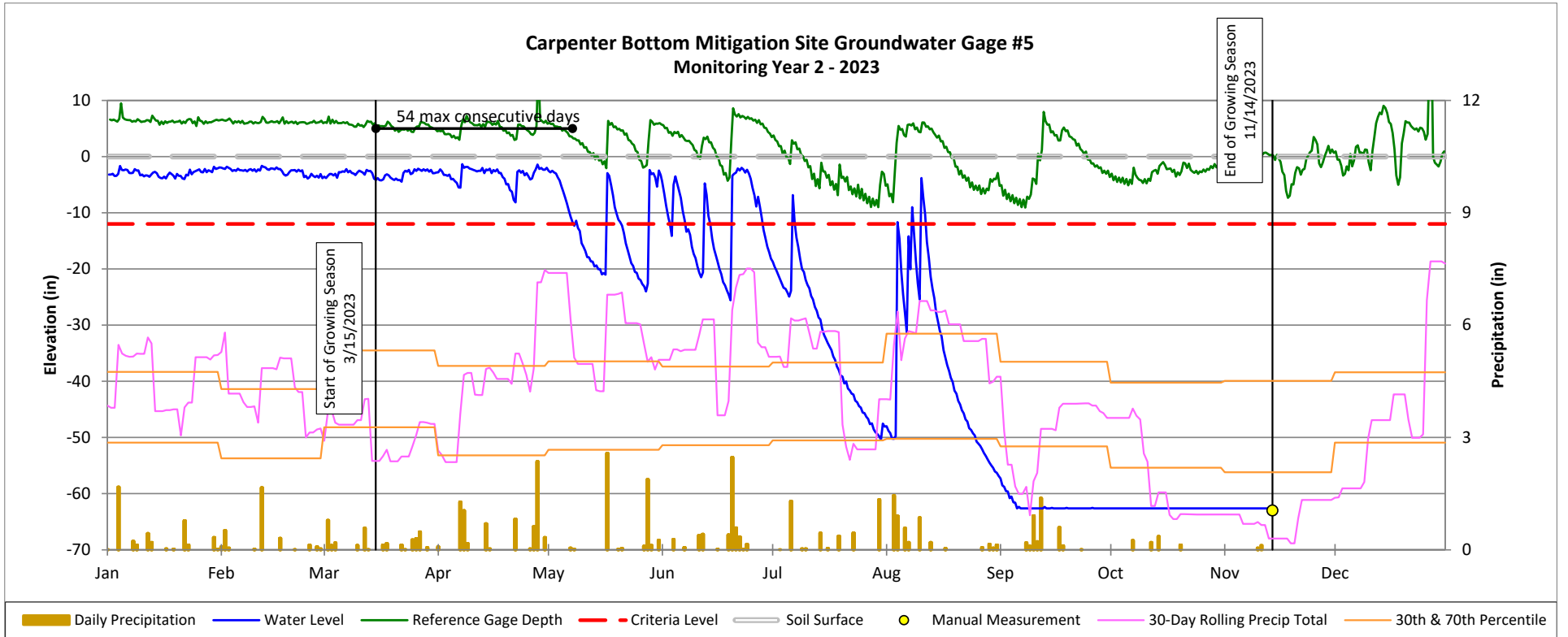
Groundwater Gage Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Re-Establishment



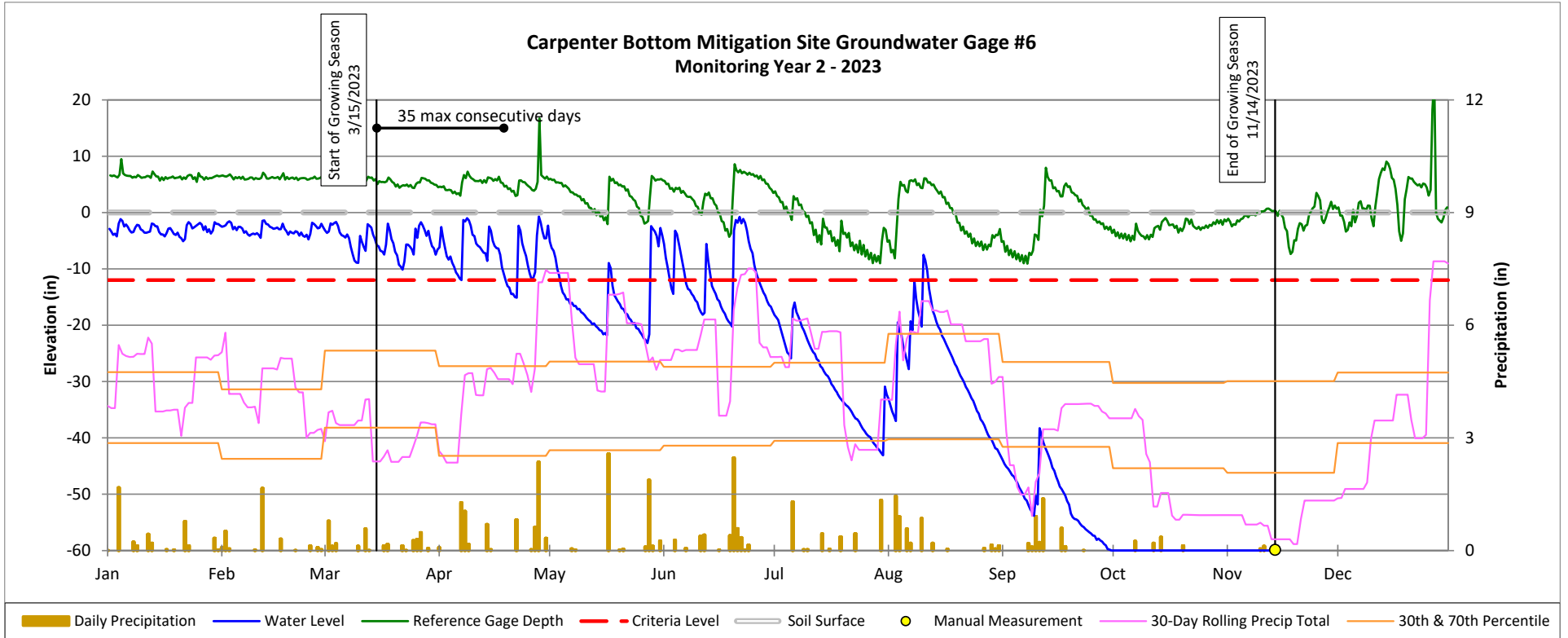
Groundwater Gage Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Re-Establishment



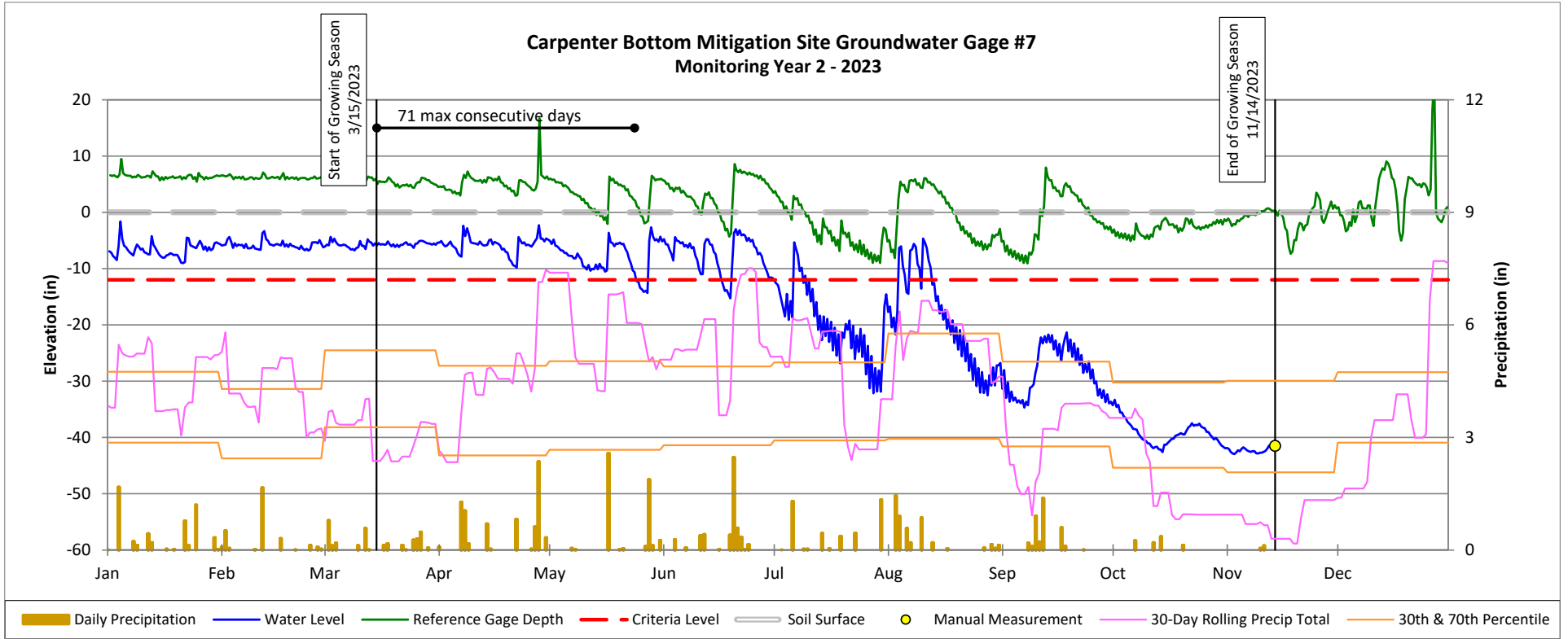
Groundwater Gage Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Rehabilitation



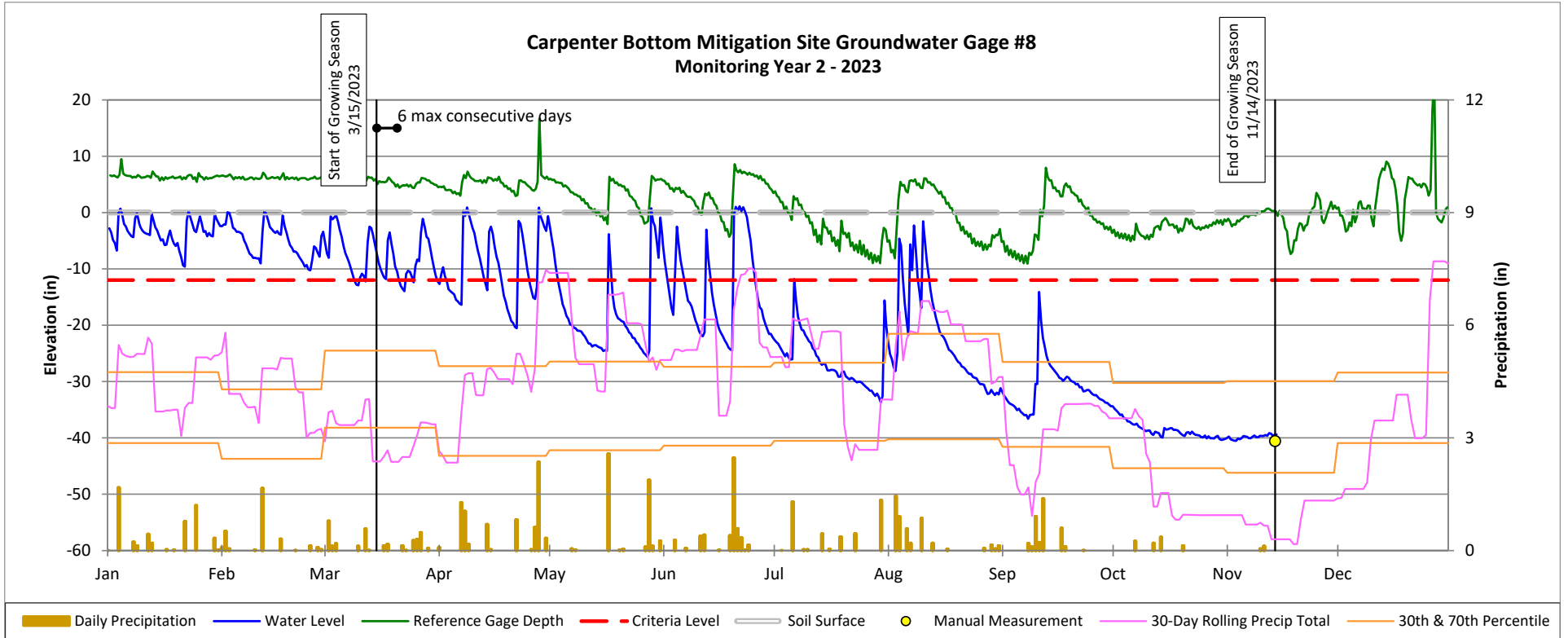
Groundwater Gage Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Re-Establishment



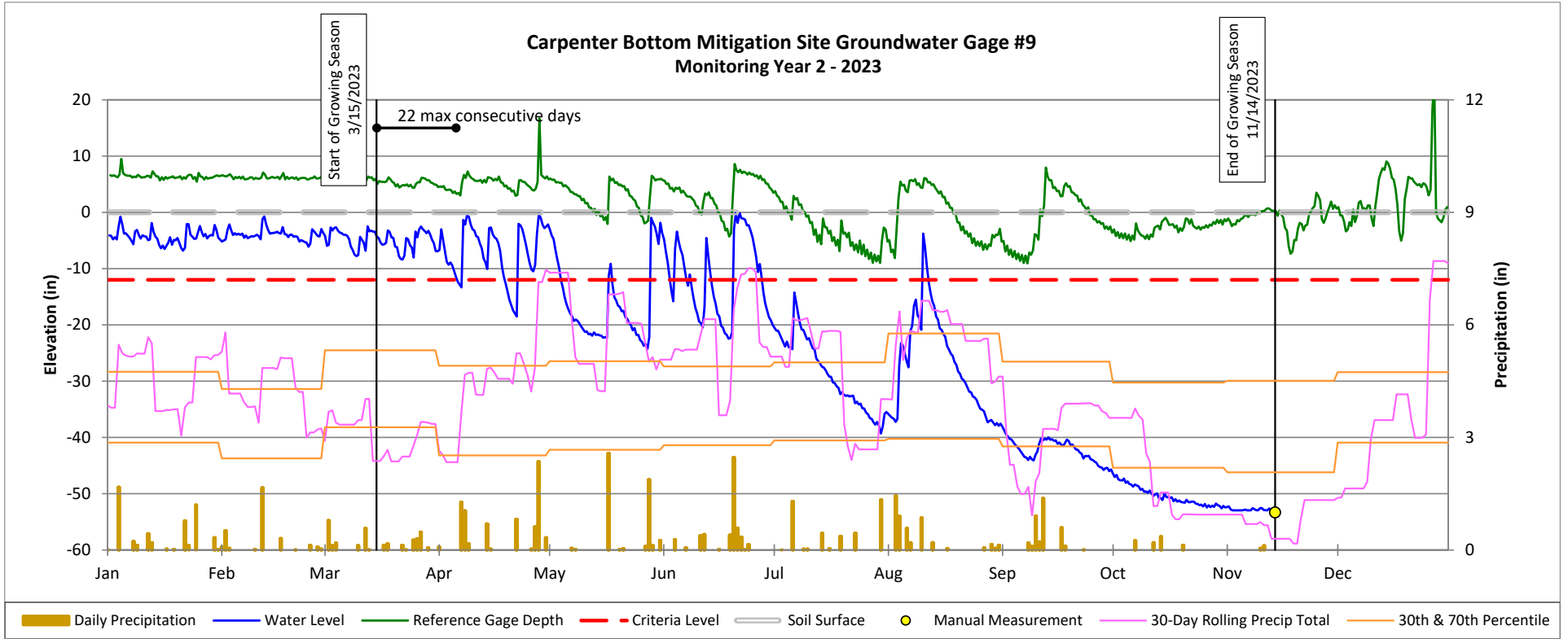
Groundwater Gage Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Re-Establishment



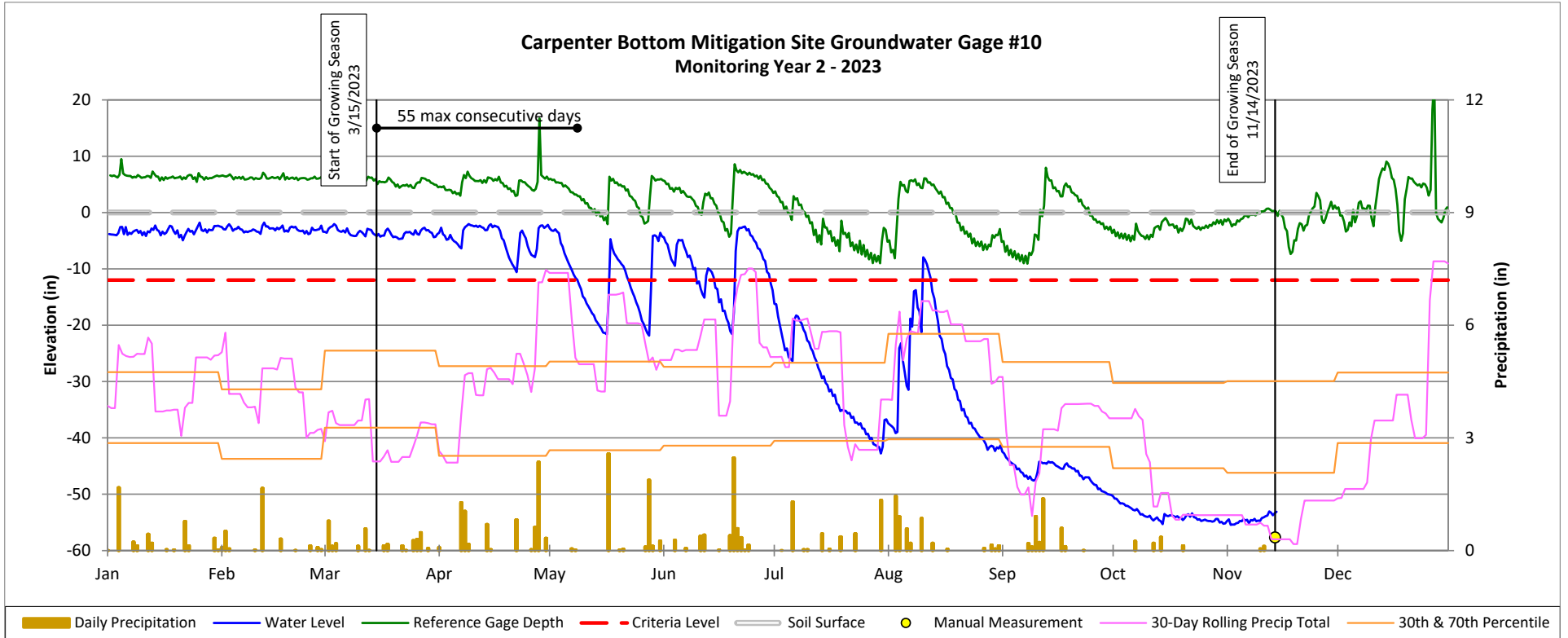
Groundwater Gage Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Re-Establishment



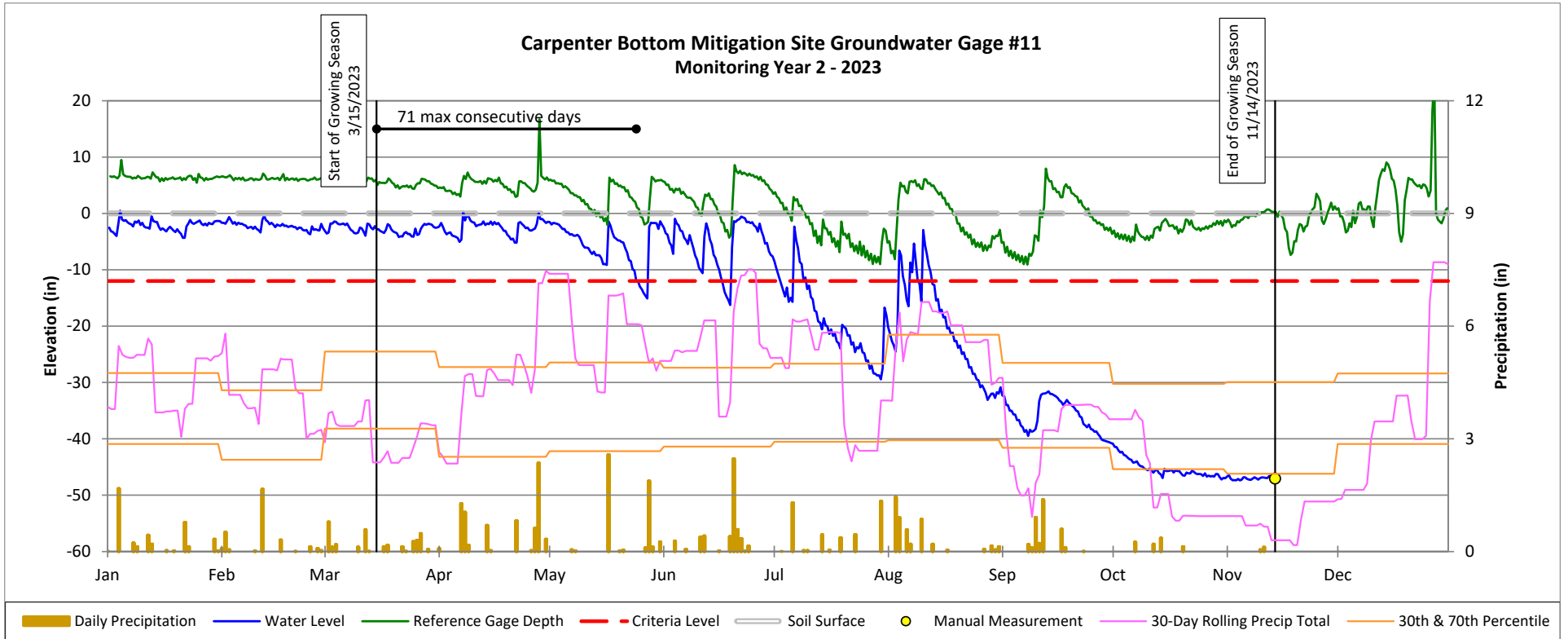
Groundwater Gage Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Rehabilitation



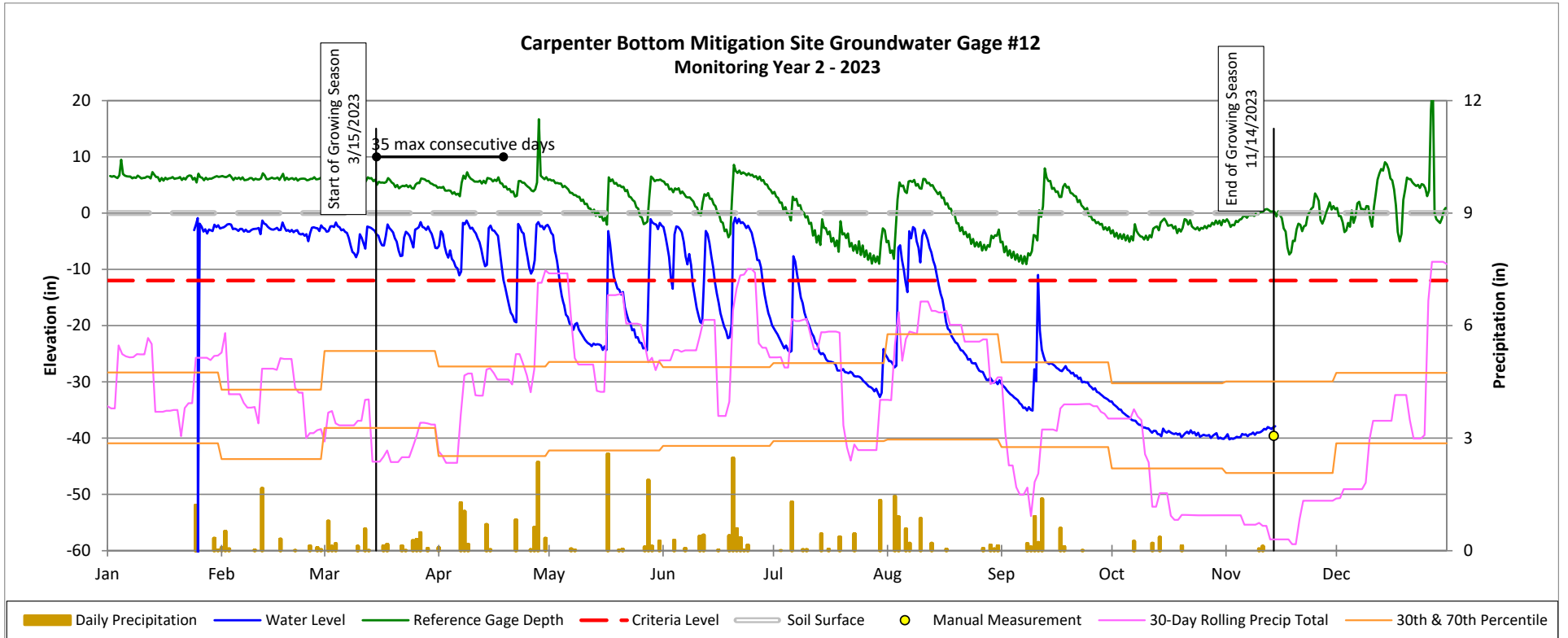
Groundwater Gage Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Re-Establishment



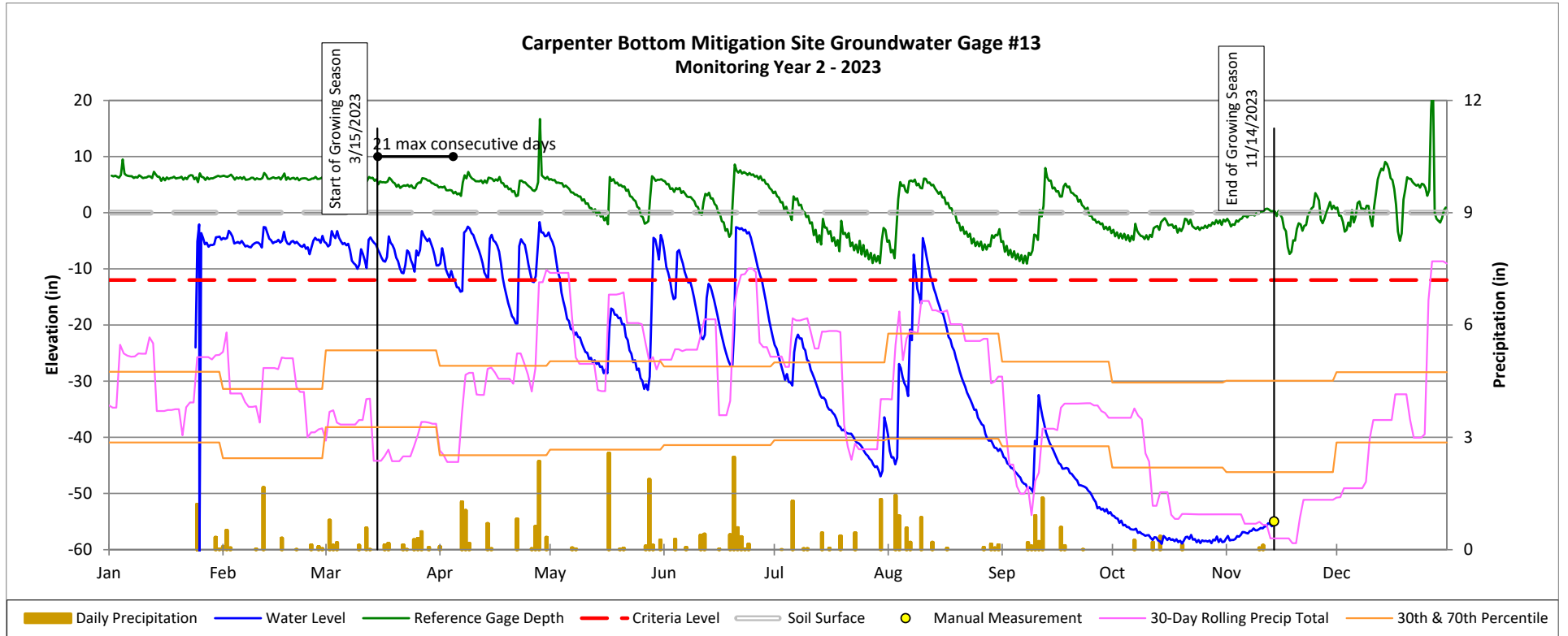
Groundwater Gage Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Re-Establishment



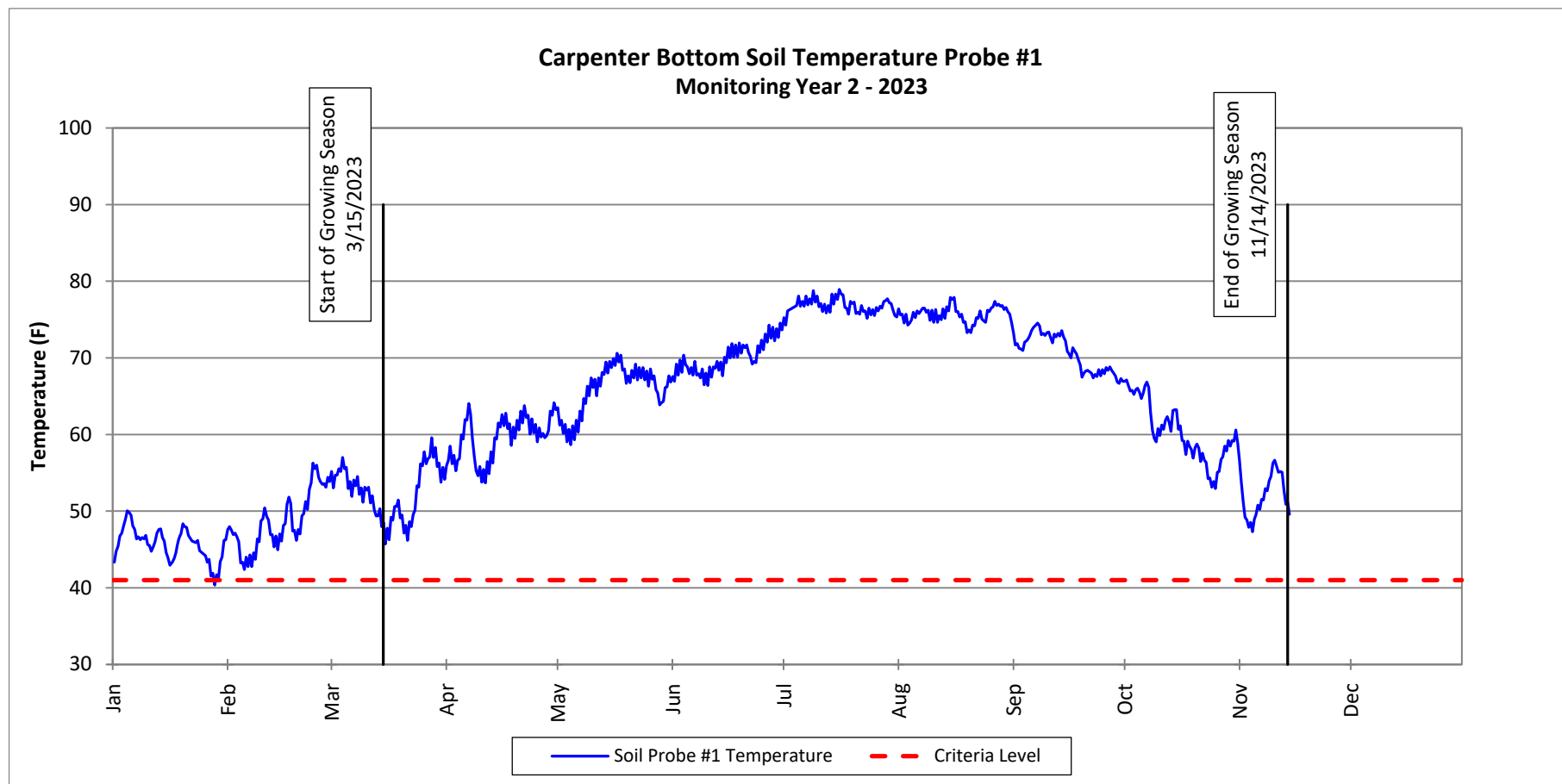
Soil Temperature Probe Plot

Carpenter Bottom Mitigation Site

DMS Project No. 100090

Monitoring Year 2 - 2023

Wetland Re-establishment



MONITORING GAUGE INSTALLATION DATA SHEET

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

Gauge Description:

Gauge ID: 61069A → GW G13
 Serial Number: 932 848
 Total Well Casing Length (A): 5.96'
 Well Casing Height Above Ground (B): 0.82'
 Distance From Eye Bolt To Probe Sensor: 5.96'
 Material: 2" PVC Well Screen
 Type of Measurement: Pressure, Temperature, & Depth
 Type of Logger: In-Situ Level Troll 100
 Gauge Location: _____

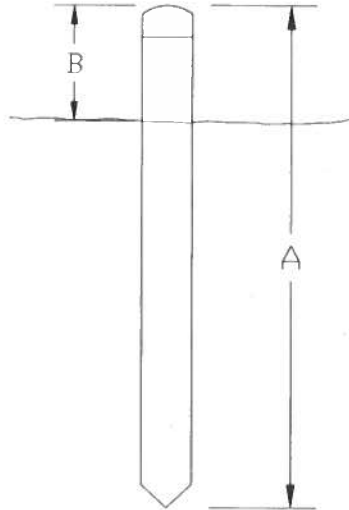
FO/BR

Notes:

Hard Packed Clay From 0.45 - 3.7'.

Soil Profile Description at Location of Well:

| Depth Range (in.) | Color | Redox | Texture | Notes |
|--------------------|-----------------|-----------------------|-------------|---|
| <u>0 - 0.45</u> | <u>10YR 4/2</u> | <u>-</u> | <u>Loam</u> | <u>Topsoil</u> |
| <u>0.45 - 2.10</u> | <u>5Y 3/1</u> | <u>(5%) 10Y 5/6</u> | <u>Clay</u> | |
| <u>2.10 - 3.8</u> | <u>5Y 4/1</u> | <u>(35%) 10YR 5/8</u> | <u>Clay</u> | <u>Concentrations of MN</u> |
| <u>3.8 - 5.2</u> | <u>5Y 4/1</u> | <u>(50%) 10YR 5/8</u> | <u>Clay</u> | <u>Clay starting to get wet / Small amount MN / Small Roc</u> |
| | | | | |
| | | | | |
| | | | | |



MONITORING GAUGE INSTALLATION DATA SHEET

Project Name:
Project Location:
Purpose of Gauge:

| |
|------------------------|
| Carpenter Bottom |
| Lincoln |
| Water Table Monitoring |

Gauge Description:

Gauge ID:
Serial Number:
Total Well Casing Length (A):
Well Casing Height Above Ground (B):
Distance From Eye Bolt To Probe Sensor
Material:
Type of Measurement:
Type of Logger:
Gauge Location:

| |
|--------------------------------|
| GW68A → GWG 12 |
| 935834 |
| 6.00' |
| 0.80' |
| 6.00' |
| 2" PVC Well Screen |
| Pressure, Temperature, & Depth |
| In-Situ Level Troll 100 |

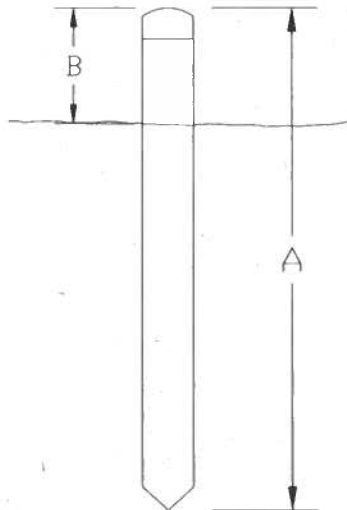
| |
|-------|
| |
| FO/BR |

Notes:

| |
|--|
| |
|--|

Soil Profile Description at Location of Well:

| Depth Range (in.) | Color | Redox | Texture | Notes |
|-------------------|---------------|-----------------|------------|--|
| 0 - 0.85 | 10YR 5/1 | (4%) 7.5YR 6/1 | Clay loam | Topsoil |
| 0.85 - 2.45 | 2.5Y 2.5/1 | (15%) 7.5YR 5/1 | Sandy Clay | |
| 2.45 - 3.75 | Clay 1 3/1 | (20%) 7.5YR 5/1 | Sandy Clay | |
| 3.75 - 4.9 | Clay 1 4/1 | (5%) 7.5YR 5/1 | Clay | |
| 4.9 - 6.2 | Clay 1 4/5G/1 | | Clay | Very Small Trace amount of - Redox & Bark |
| | | | | |
| | | | | |



APPENDIX E. Project Timeline and Contact Info

Table 14. Project Activity and Reporting History

Carpenter Bottom Mitigation Site
 DMS Project No. 100090
Monitoring Year 2 - 2023

| 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 |
| As-Built Survey Completed | | August-September 2021 | September 2021 |
| Planting Completed | | N/A | February 2022 |
| Baseline Monitoring Document (Year 0) | Stream Survey | August-September 2021 | April 2022 |
| | Vegetation Survey | February 2022 | |
| Invasive Treatment | | July, November 2022 | |
| Year 1 Monitoring | Stream Survey | August 2022 | November 2022 |
| | Vegetation Survey | | |
| Invasive Treatment | | January - August 2023 | |
| Year 2 Monitoring | Stream Survey | July 2023 | November 2023 |
| | Vegetation Survey | August 2023 | |
| 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 15. Project Contact Table

Carpenter Bottom Mitigation Site
 DMS Project No. 100090
Monitoring Year 2 - 2023

| | |
|---|---|
| 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. Mimi Caddell 828.774.5547 x107 |

APPENDIX F. Additional Documentation



July 26, 2022

ATTN: Ms. Kim Isenhour
Mitigation Project Manager, Regulatory Division
U.S. Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403-1343

RE: Carpenter Bottom Mitigation Site - MY0 Report Comments
Catawba River Basin – CU# 03040101, Gaston County
USACE Action ID No. SAW-2018-02062
NCDWR Project No. 20190049
DMS Project ID No. 100090, Contract # 7731

Dear Ms. Kim Isenhour,

Thank you for your comments in the email dated July 7, 2022 referencing the Carpenter Bottom Mitigation Site Monitoring Year 0 (MY0) Report. Wildlands Engineering, Inc. (Wildlands) has reviewed these comments and our responses are noted below.

Kim Isenhour, USACE:

- 1. How deep are the floodplain pools where the relic channel meander features were located? On recent site visits, we've noted several instances of floodplain pools being left as open water in areas where the mitigation plans calls for planted buffers. The majority of these pools have been deep enough that they will not dry seasonally and allow for herbaceous or woody vegetation establishment.*

Wildlands Response: At the location of the relic channel meander features, the floodplain pool is around 1.5' deep. The floodplain pools were designed with a max depth of 2.0' and were intended to draw down seasonally. Vegetation growth will be monitored in floodplain pools and reported on in the MY1 report.

Kim Isenhour, USACE response (July 28, 2022): *These features should be no more than 18-inches deep and should dry seasonally (ideally toward the end of spring), not draw down. The idea is that the pools will have dry periods that prevent predator species from surviving. The size of constructed ephemeral pools should be limited to prevent the formation of gaps within the tree canopy and minimize the risk of invasive plant colonization. You should also take into account the target vegetation community for the project. For example, ephemeral pools may develop herbaceous vegetative growth that may persist for a long period rather than the targeted forested community.*

Wildlands Response: The condition of the floodplain pools is discussed in more detail in section 2.6 – Wetland Hydrology Assessment of the MY1 report. Two of the four floodplain pools were existing wetland areas protected during construction, so their hydrologic functionality and their vegetation communities are assumed to be comparable to the existing conditions. When the Site was assessed on September 1,

2022, three of the pools had dried up completely and only the most upstream pool had a small area of standing water approximately 0.5 feet deep. The targeted forested community can still develop an enclosed canopy over and around these floodplain pools as they are only 27-feet wide. Consequently, these four pools are not a concern for the success and functionality of the completed project. See the MY1 report for photo documentation of the floodplain pools.

2. *In future monitoring years, please capture some of the wetland rehabilitation areas with mobile veg plots.*

Wildlands Response: Mobile veg plots will be positioned to capture wetland rehabilitation areas starting in MY2 as mobile vegetation plots are typically stationary between MY0 and MY1.

3. *Thank you for including the soil profile descriptions at each groundwater gauge. It would have been helpful to include a table with the pre-construction gauge data.*

Wildlands Response: A summary table of pre-construction gage data will be included in future as-built monitoring reports.

4. *Pebble counts were included in the data. Do you plan to keep this as a performance standard through monitoring?*

Wildlands Response: Pebble counts were included in the MY0 report as part of the baseline data collection as described in the Mitigation Plan. However, pebble counts will not be collected for the MY1-MY7 reports, unless requested by the IRT or deemed necessary based on best professional judgement. This is documented in Section 3.3 (Stream Assessment) of the MY0 report.

5. *Photo Point 12, outside the easement, appears to be a source of offsite sediment/nutrients.*

Wildlands Response: Sediment in photo point 12 is from recent fencing work at the Site. Upstream of UT4 is wooded and stable.

Erin Davis, NCDWR:

1. *DWR would like to reiterate DMS' comments/questions on the high riffles and gauge bentonite seals. WEI's responses were fine, but please closely observe these areas during MY1 and address as needed.*

Wildlands Response: These items/concerns will be noted in future monitoring reports.

2. *What are the max. depths of the floodplain pools? (may include response in MY1 report)*

Wildlands Response: The floodplain pools were designed with a max depth of 2.0' and were intended to draw down seasonally. Vegetation growth will be monitored in floodplain pools and reported on in the MY1 report.

3. *DWR appreciated that invasives were inventoried and treated pre-construction. And we were glad to see woody debris was added to the floodplain pools. DWR is ok with the proposed credit release. No site visit requested.*

Wildlands Response: Thank you for your comments.

Todd Bowers, USEPA:

1. *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%. Morphological*



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surveys conducted throughout the Site show all streams as stable and functioning as designed. Eleven groundwater wells were established at baseline conditions to monitor wetland hydrology within both wetland re-establishment and rehabilitation areas. Wetland hydrologic data will be collected and reported during MY1. No adaptive management plan needed at this time. No issues of conservation easement encroachment.

Wildlands Response: Thank you, we acknowledge the comments.

- 2. Table 2a: I recommend adding a visual confirmation that the objective of excluding livestock from the conservation easement is being met. Visual confirmation can include no sign of hoof shear or cattle excrement within the project boundaries. Trampled streams and vegetation, broken fence, destroyed banks from hooves and excrement would be positive indications of that objective not meeting standards.*

Wildlands Response: A visual confirmation of cattle exclusion will be added to Table 2A in the MY1 report.

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

Wildlands Response: Thank you, we acknowledge the comments.

As requested, Wildlands has addressed these comments and the updates are included in the MY1 Report. A copy of this comment/response letter will be included in the Appendix of the MY1 Report. If you have any questions, please feel free to contact me. Thank you!

Sincerely,

Eric Neuhaus

Senior Environmental Scientist

ksuggs@wildlandseng.com