MONITORING YEAR 3 ANNUAL REPORT

Final

LONE HICKORY MITIGATION SITE

Yadkin County, NC
DEQ Contract No. 6897
DMS Project No. 97135
DWR No. 20161044
USACE Action ID No. SAW-2017-00100
Yadkin River Basin
HUC 03040101

Data Collection Period: April – November 2021
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PREPARED FOR:

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January 7, 2022

Mr. Paul Wiesner
Western Regional Supervisor
NCDEQ – Division of Mitigation Services
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801

RE: Lone Hickory Mitigation Site – Monitoring Year 3 Report Draft
Yadkin River Basin – CU# 03040101 – Yadkin County
DMS Project ID No. 97135
Contract # 6897

Dear Mr. Wiesner:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services' (DMS) comments from the Draft Monitoring Year (MY) 3 report for the Lone Hickory Mitigation Site. DMS' comments are noted below in **bold**. Wildlands' responses to those comments are noted in *italics*.

DMS' comment: General: Per the 12/8/2017 IRT approved mitigation plan; "*The final performance standard for wetland hydrology will be a free groundwater surface within 12 inches of the ground surface for 19 consecutive days (9.2 percent) of the defined growing season for Yadkin County (April 4 through October 27) under typical precipitation conditions*." The IRT approved mitigation plan does not mention the use of bud burst data or soil temperature data to amend the established growing season.

Additionally, the IRT has indicated that if mitigation providers intend to utilize bud burst and soil temperature data to extend the start of the growing season then they must also utilize this data to amend the end date of the growing season. In some cases, the IRT has allowed the use of the most current WETS (USDA 2021) data to determine the growing season start and end dates; however, the IRT has indicated that they do not want growing seasons to vary in each monitoring year.

If Wildlands intends to amend the growing season dates established in the IRT approved mitigation plan, documentation and approval will be required from the IRT. The IRT will likely require a mitigation plan addendum to amend the established growing season dates.

While it is acceptable to provide complimentary/ comparison data in the report appendices, the text, tables, groundwater gage plots and CCPV maps should clearly report monitoring results based on the established success criteria. Please update the MY3 (2021) report and digital support files based on the success criteria established in the 2017 IRT approved mitigation plan.

Wildlands' response: At the present time, Wildlands does not intend to amend the established growing season dates from the approved Mitigation Plan. Text in the executive summary, Section 1.2.4, and Section 1.3 have been updated and the monitoring results are based on the growing season dates established in the approved Mitigation Plan. CCPV maps and Appendix 5 have been updated, as well. An analysis of the groundwater gage data with an extended growing season, beginning one week earlier on

March 28, 2021, is included in Section 1.2.4 for comparison purposes only. Supplemental groundwater gage and soil temperature plots have been added to Appendix 6.

DMS' comment: General: Per the 12/8/2017 IRT approved mitigation plan; "*If a gage does not meet the performance standard for a given monitoring year, rainfall patterns will be analyzed and the hydrograph will be compared to that of the reference wetlands to assess whether atypical weather conditions occurred during the monitoring period*." Based on a review of the draft report, the reference wetland gauge for the site has not been functional since November 2020 (MY2). Wildlands should make every effort to reestablish a functional reference wetland gauge for the site prior to the start of MY4 (2022). The reestablishment of the reference gauge should be documented in the MY4 (2022) report. DMS recommends establishing an on-site rain gauge for more accurate project data if it appears that wetland hydrology issues will persist in the monitoring term.

Wildlands' response: Wildlands will make every effort to reestablish a functional reference wetland gage for the Site. In the past, Wildlands has found onsite rain gages to be unreliable and often fail quickly after installation. Instead, we believe that the rainfall data obtained from the nearby Yadkinville 0.2 E Station, which is located only 2 miles from the Site, to be an accurate representation of daily rainfall totals. Therefore, we do not plan to add an onsite rain gage at this time. This text was added to Section 1.2.4.

DMS' comment: General: Based on a review of the draft MY3 report, supplemental planting is not currently planned on the site. If warranted in the future, supplemental planting efforts on the site should be completed in MY4/ MY5 to allow additional monitoring time prior to proposed project closeout. If more than 20% of the site will be supplementally planted or there is a change from the planting plan species list established in the IRT approved mitigation plan, the IRT should be consulted, and an Adaptive Management Plan (AMP) may be required.

Wildlands' response: Wildlands will consult the IRT if supplemental planting is planned for more than 20% of the Site or if there is a change from the Mitigation Plan's approved species list.

DMS' comment: Section 1.2.1 Vegetation Assessment: Wildlands' response to IRT comments from the IRT approved mitigation plan commits to a tree height success criteria as follows; "*Trees in each plot will average 7 feet in height at MY5 and 10 feet in height at MY7*." Please discuss and report average tree heights in the revised MY3 report. Please also include this vegetation height success criteria in the revised MY3 report text and future monitoring reports.

Wildlands' response: The vegetation height success criteria and average tree heights have been added to Section 1.2.1. An additional table (Table 10e) has been added to Appendix 3 summarizing the average tree heights in each vegetation plot.

DMS' comment: Section 1.2 Monitoring Year 3 Data Assessment/ 1.2.5 Areas of Concern and Management Activities: The CCPV maps and Table 6 report two (2) structure issues on UT1 Reach 1. Please briefly discuss these structure issues in the report text.

Wildlands' response: Text discussing the structure issues on UT1 Reach 1 has been added to Section 1.2.5.

DMS' comment: Section 1.2.5 Areas of Concern and Management Activities: Please include the April 2021 repair plan in the MY3 (2021) report appendices to document the maintenance work completed in MY3.

Wildlands' response: An additional appendix has been added for the MY3 repair plans.

DMS' comment: Table 6 (a-k) & Table 7: Please include the date that the project was visually assessed at the top of each table. This was an IRT request at the 2021 credit release meeting.

Wildlands' response: The dates of the visual assessments have been added to the top of Tables 6 (a-k) and Table 7.

Digital Support File Comments:

DMS' comment: The submitted CVS mdb will not produce an output using the table 7 export or the simple report function that matches Table 10 in the report. Please review the data and ensure that the mdb supports the table included in the report.

Wildlands' response: The CVS mdb included in the final electronic report files has been reviewed to ensure that the simple report function matches the Table 10 included in the report. The table 7 export seems to exclude stems added after MY0 to the "Planted woody stem entry" tab in the CVS mdb.

DMS' comment: Please consider adding a field in the stream AOC and veg AOC feature classes that describe each year a given feature was present (e.g. MY2, MY3, MY4, etc.).

Wildlands' response: A field called "Year_present_" has been added to the stream and vegetation AOC feature classes in CCPV GIS support files.

Two (2) hard copies of the Final Year 3 Monitoring Report and a full electronic submittal on an USB drive have been mailed to the DMS Western Field Office. Wildlands received a confirmation of approval of the monitoring bond on 12/28/2021 by Kristie Corson at DMS. Therefore, we are requesting approval from DMS to invoice for the completion of Task 9. Please contact me at 704-332-7754 x106 if you have any questions.

Sincerely,

Emily Reinicker, PE, CFM
Project Manager

EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) implemented a full-delivery stream and wetland mitigation project at the Lone Hickory Mitigation Site (Site) for the North Carolina Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS). The project restored and preserved a total of 12,621 linear feet (LF) of perennial and intermittent stream and restored 9.5 acres of riparian wetland in Yadkin County, NC. The Site is located within the DMS targeted watershed for the Yadkin River Basin Hydrologic Unit Code (HUC) 03040101130020 and the NC Division of Water Resources (NCDWR) Subbasin 03-07-02. The project is providing 13,164.574 stream mitigation units (SMUs) and 9.500 wetland mitigation units (WMUs) for the Yadkin River Basin HUC 03040101 (Yadkin 01).

The watershed has a long history of agricultural activity and most of the stressors to stream functions are related to this historic and recent land use practices. The major stream stressors for the Site were concentrated agricultural runoff inputs, active stream incision and head cutting, lack of stabilizing streamside vegetation, extensive agricultural manipulation through ditching, and a lack of bedform diversity. The effects of these stressors resulted in degraded water quality and habitat throughout the watershed of the Site when compared to reference conditions. The project approach for the Site focused on evaluating the existing functional condition, potential for recovery, and need for intervention.

The project goals defined in the Mitigation Plan (Wildlands, 2017) were established with careful consideration of 2009 Upper Yadkin Pee Dee River Basin Restoration Priorities (RBRP) goals and objectives to address stressors identified in the watershed. The established project goals include:

- Improve stream channel stability,
- Reconnect channels with historic floodplains and re-establish wetland hydrology and function in relic wetland areas,
- Improve instream habitat,
- Reduce sediment and nutrient input from adjacent farm fields,
- Restore and enhance native floodplain and wetland vegetation, and
- Permanently protect the project site from harmful uses.

The Site construction and as-built surveys were completed in April 2019. Monitoring Year (MY) 3 assessments and site visits were completed between April and October 2021 to evaluate the current conditions of the project.

The Site is meeting most of the required stream, vegetation, and hydrology success criteria for MY3. The overall average planted stem density for the Site is 470 stems per acre and is exceeding the MY3 requirement of 320 stems per acre. Geomorphic surveys indicate that cross-section bankfull dimensions closely match baseline conditions with some minor adjustments, and streams are functioning as intended. At least one bankfull event has been documented on all restoration stream reaches in MY3. With a drier than normal start to the growing season in 2021, two of the nine groundwater gages in the wetland re-establishment area met or exceeded hydrology success criteria. The MY3 visual assessment identified a few areas of concern including pockets of invasive species populations, small areas of low stem density, and isolated areas of bed scour. Wildlands will continue to monitor these areas and adaptive management actions will be implemented as necessary throughout the seven-year monitoring period to maintain the ecological health of the Site.

LONE HICKORY MITIGATION SITE

Monitoring Year 3 Annual Report

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APPENDICES

Section: 1 PROJECT OVERVIEW

The Lone Hickory Mitigation Site (Site) is located in Yadkin County approximately 3.5 miles south of the town of Yadkinville, NC in the Yadkin River Basin Hydrologic Unit Code (HUC) 03040101130020 and NCDWR Subbasin 03-07-02 (Figure 1). The project watershed is dominated by agricultural and forested land and located in the Inner Piedmont lithotectonic belt within the Piedmont physiographic province (NCGS, 1985).

The Site contains two valleys, separated by a ridge that runs north to south through the project limits. South Deep Creek flows along the northern boundary of the project. On the east side of the ridge (herein referenced as the East Side), UT1 flows through a steep, narrow valley that gradually widens and flattens in slope as it flows downstream to the South Deep Creek floodplain. UT1 is joined by UT1A and UT1B within the Site limits before flowing offsite to join South Deep Creek. On the west side of the ridge (herein referenced as the West Side), UT2 and UT3 flow out of steep, narrow valleys into the broad, flat floodplain of South Deep Creek. UT2B begins downstream of BMP4 and flows into UT2. UT2A and UT2 join UT3 before the stream's confluence with South Deep Creek. The East Side of the Site drains 0.44 square miles, and the West Side of the Site drains 0.87 square miles of rural land.

The Site was historically used for crop production and dairy farming which collectively contributed to degraded in-stream habitat and sediment erosion. On the East Side, streams were manipulated through ditching, impoundments, and land use changes. The West Side streams were ditched and re-routed within the adjacent floodplain which was previously altered for agricultural uses. The riparian buffers on both sides of the Site lacked stabilizing streamside vegetation due to agricultural practices. Tables 11a – 11d in Appendix 4 present the pre-restoration conditions in detail.

Construction activities were completed in April 2019 by KBS Earthworks, Inc. Turner Land Surveying, PLLC. completed the as-built survey in April 2019. Planting was completed following construction in the spring of 2019 by Bruton Natural Systems, Inc. A conservation easement has been recorded and is in place on 103 acres. The project is providing 13,164.574 Stream Mitigation Units (SMUs) and 9.500 Wetland Mitigation Units (WMUs) for the Yadkin River Basin 03040101 HUC (Yadkin 01). Annual monitoring will be conducted for seven years with close-out anticipated to commence in 2026 given the success criteria are met.

Directions and a map of the Site are provided in Figure 1 and project components are illustrated for the Site in Figure 2.

1.1 Project Goals and Objectives

The Site is providing numerous ecological benefits within the Yadkin Valley Basin. The project goals were established with careful consideration to address stressors that were identified in the NCDWR 2008 Yadkin River Basinwide Plan (NCDWR, 2008) and the RBRP (EEP, 2009).

The following project specific goals and objectives outlined in the Mitigation Plan (Wildlands, 2017) include:

Goals	Objectives
Improve stream channel stability.	Restore stream channels that will maintain a stable pattern and profile considering the hydrologic and sediment inputs to the system, the landscape setting, and the watershed conditions. Create stable tie-ins for tributaries joining restored channels. Add bank revetments and in-stream structures to protect restored streams.
Reconnect channels with historic floodplains and re-establish wetland hydrology and function in relic wetland areas.	Remove man-made impoundments, remove culvert crossings, and restore historic valley profile. Remove historic overburden from farm fields. Reconstruct stream channels with bankfull dimensions relative to the floodplain. Restore stream plan form to promote development of mutually beneficial stream/wetland complex.
Improve instream habitat.	Remove man-made impoundments and culvert crossings within easement. Install habitat features such as constructed riffles, cover logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.
Reduce sediment and nutrient input from adjacent farm fields.	Construct two step pool stormwater conveyance and three dry detention BMPs to slow and treat runoff from farm fields before entering Site streams.
Restore and enhance native floodplain and wetland vegetation.	Plant native tree and understory species in riparian zone where currently insufficient.
Permanently protect the project site from harmful uses.	Establish a conservation easement on the Site.

1.2 Monitoring Year 3 Data Assessment

Annual monitoring was conducted between April and October 2021 to assess the condition of the project. The stream, vegetation, and hydrologic success criteria for the Site follows the approved success criteria presented in the Lone Hickory Mitigation Plan (Wildlands, 2017).

1.2.1 Vegetation Assessment

Vegetation plot monitoring is being conducted in post-construction monitoring years 1, 2, 3, 5, and 7. Permanent plots are monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008) and the 2016 USACE Stream and Wetland Mitigation Guidance to assess the vegetation success. A total of 25 permanent vegetation plots were established within the project easement area. All of the permanent plots were established as a

standard 10 meter by 10 meter square plot. In addition, 15 mobile vegetation plots were established in MY1 throughout the planted conservation easement to evaluate the random vegetation performance for the Site. These plots have been and will be reestablished in different random locations in monitoring years 2, 3, 5 and 7. Mobile vegetation monitoring plot assessments will document stems, species, and height using a circular or 100 meter square/rectangular plot. The final vegetative performance standard will be the survival of 210 planted stems per acre in the planted riparian areas at the end of the required seven-year monitoring period. The interim measure of vegetative success for the Site will be the survival of at least 320 planted stems per acre at the end of monitoring year (MY) 3 and at least 260 stems per acre at the end of MY5. In NC piedmont counties, planted trees must average 7 feet in height at the end of MY5 and 10 feet in height at the end of MY7.

The MY3 vegetation survey was completed in October 2021, resulting in an average planted stem density of 470 stems per acre and an average planted stem height of 4.0 feet for all monitored permanent and mobile vegetation plots. The Site has met the MY3 density requirement of 320 planted stems per acre with 80% (20/25) of the permanent plots and 100% (15/15) of the mobile plots individually meeting this requirement. The five permanent vegetation plots (VPs 11, 12, 15, 16, and 24) not meeting the MY3 density requirement are located within the West Side of the Site in areas where dense herbaceous cover is out-competing planted stems or soil moisture conditions are deterring some stem growth. Conversely, permanent vegetation plots 12, 15, and 24 are still on track to meet the MY5 density requirement, and/or numerous native volunteer species were noted within the plots. Please refer to section 1.2.5 for further discussion about areas of low stem density.

In the permanent vegetation plots, there is survival rate of about 99% of the MY2 planted stem count. Approximately 82% of the planted stems in permanent plots are thriving with a health score (vigor) of 3 or greater. The planted tree species with the highest health scores included river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), sycamore (*Platanus occidentalis*), swamp chestnut oak (*Quercus michauxii*), and cherrybark oak (*Quercus pagoda*). Approximately 11% of monitored stems were documented with a vigor of 2, indicating that they have fair plant health with some damage present. In addition, about 3% of the monitored stems have a vigor of 1, indicating that they may not survive next year and 3% of the stems were missing. The poor tree health is a result of suffocation from dense herbaceous cover, insects, deer browsing, wet or dry soil conditions, and/or other unknown factors. The numerous volunteer stems noted in some permanent vegetation plots are not deterring planted stem growth. Please refer to Appendix 2 for vegetation plot photographs, Current Condition Plan View (CCPV) Figures 3.0-3.5 for vegetation plot locations, and Appendix 3 for vegetation data tables, including annual average tree height per plot.

1.2.2 Stream Assessment

Riffle cross-sections on the restoration and enhancement I reaches should be stable and show little change in bankfull area, maximum depth ratio, and width-to-depth ratio. Per the Interagency Review Team (IRT) guidance, bank height ratios shall not exceed 1.2 and entrenchment ratios shall be at least 1.4 for restored B channels and 2.2 for restored C channels to be considered stable. All riffle cross-sections should fall within the parameters defined for channels of the appropriate stream type. Any significant deviations will be evaluated to assess possible signs of stream channel instability. Indicators most often include trends in vertical incision or bank erosion. Changes in the channel that indicate a movement toward stability or enhanced habitat include a decrease in the width-to-depth ratio in meandering channels or an increase in pool depth. Remedial action would be deemed unnecessary if channel changes indicate a movement toward stability. Please note that the downstream extent of UT3 Reach 3 was designed to deepen relative to its floodplain as it transitions to meet the invert of South

Deep Creek; therefore, this reach is expected to have a bank height ratio greater than 1.0 and an entrenchment ratio less than 2.2.

Morphological surveys for MY3 were completed in July 2021. Cross-section survey results indicate that channel dimensions are stable and functioning as designed on all restoration reaches. When occurring, adjustments are minor in comparison to baseline conditions. Along UT1, riffle cross-sections 5 and 7 experienced increased bankfull depths in MY2 but have since stabilized in MY3. At riffle cross-section 10 along UT1 Reach 3, the max depth has more than doubled since MY0 and consequently the bank height ratio has increased to 1.3. This incision within cross-section 10 is an isolated occurrence on this steeper riffle and does not appear to be indicative of the reach. On the West Side, cross-section 15 along UT2 Reach 1 and cross-section 28 along UT3 Reach 1 are also experiencing minor incision, but this seems to be isolated and unrepresentative of most riffles within these reaches. Channel slopes become flatter as project streams enter the wetland re-establishment area and the floodplain of South Deep Creek. As a result, minor bed and bank deposition is present within cross-sections 19 and 21 along UT2A and cross-sections 29 and 30 along UT3 Reach 2, as originally noted in MY2. As woody vegetation continues to become more established and shades out herbaceous cover, baseflow is expected to become stronger and transport accumulated sediment through the system. The remaining cross-sections show little change in bankfull dimensions compared to the MY0 survey.

Reachwide pebble counts along restoration reaches continue to indicate the maintenance of coarser materials in riffle features and finer particles in pool features. Refer to Appendix 2 for the visual stability assessment tables, CCPV figures, and reference photographs. Refer to Appendix 4 for the morphological tables and plots.

1.2.3 Stream Hydrology Assessment

At the end of the seven-year monitoring period, four or more bankfull events must have occurred in separate years within the restoration reaches. At least one bankfull event was recorded within all stream restoration reaches in MY3 using stream gage pressure transducers. UT3 Reach 3 and UT2B have recorded three bankfull events in separate years, while UT1 Reach 3, UT2 Reach 2, and UT2A have recorded two bankfull event in separate years thus far. Currently, the Site is on track to meet the hydrologic success criteria for bankfull events.

Consistent flow must be documented in the restored intermittent or low flow channels (UT1 Reach 1, UT2A, and UT2B) at the Site. Under periods of normal rainfall, stream flow must be documented to occur every year for at least 30 consecutive days during the seven-year monitoring period. In MY3, UT1 Reach 1, UT2A, and UT2B all exceeded the success criteria for stream flow with 114, 210, and 42 consecutive days documented, respectively. Please refer to CCPV figures in Appendix 2 for the stream gage locations and Appendix 5 for hydrology summary data and plots.

1.2.4 Wetland Assessment

Nine groundwater monitoring gages (GWGs) were initially installed during baseline monitoring within the wetland re-establishment area using In-situ Level TROLL® 100 pressure transducers. Following recommendations from the August 19, 2019 IRT site walk, an additional gage (GWG 10) was installed adjacent to GWG 4, outside of the former ditch location, at the end of October 2019. Reporting for GWG 10 began in MY2 to replace GWG 4. Monitoring for GWG 4 ended in MY2. All monitoring gages are downloaded on a quarterly basis and maintained as needed. Calibration was completed by manually measuring water levels on all gages which validated the recorded data from the pressure transducers. Two soil temperature probes were installed on the Site during baseline monitoring near GWGs 5 and 6. The Site does not contain a rainfall gage; instead, the daily precipitation data was collected from the

nearest NC Climate Retrieval and Observations Network of the Southeast Database (NC CRONOS) Station, Yadkinville 0.2 E, NC.

A reference gage was originally established in a nearby reference wetland to compare the hydrologic response within the restored wetland areas at the Site. In MY3, Wildlands made multiple attempts to get in contact with the new landowner to obtain permission to access the gage but were unsuccessful. Therefore, Wildlands has decided to abandon the use of the current reference gage and will make every effort to reestablish a functional reference wetland gage before the start of the MY4 (2022) growing season. Updates will be documented in the MY4 annual report.

The final performance standard for wetland hydrology is the presence of groundwater within 12 inches of the ground surface for 19 consecutive days (9.2%) of the defined growing season for Yadkin County (April 4 through October 27) under typical precipitation conditions. Of the nine GWGs (GWG 1 – 3 and 5 – 10), two exceeded the success criteria for MY3 with the percentage of consecutive days of the growing season equal to 10.6%. Therefore, seven GWGs (GWG 1 – 2 and GWG 6 – 10) did not meet the success criteria this year. The precipitation data indicates a drier than normal spring at the beginning of the growing season which hindered groundwater levels within the wetland re-establishment area. Daily rainfall data was obtained from the nearby Yadkinville 0.2 E station (CoCoRaHS NCYD004) and is located approximately 2 miles from the Site. Monthly rainfall data in 2021 indicated lower than normal rainfall amounts occurred at the beginning and end of the growing season, in April and October respectively, while higher than normal rainfall amounts occurred in February, March, July, August, and September. The remaining months' (January, May, and June) rainfall amounts fell between the 30th and 70th percentiles for Yadkin County. Please refer to CCPV figures in Appendix 2 for the groundwater gage locations and Appendix 5 for hydrology data and plots.

In 2021, the soil temperature data from the onsite soil probes indicate soil temperatures consistently above 41 degrees Fahrenheit by the beginning of March 2021. Onsite leaf out conditions was photo documented on April 2, 2021. An analysis of the groundwater gage data concluded that if the growing season was extended to begin 1 week earlier on March 28, 2021, five of the nine GWGs would meet success criteria. For comparison purposes, supplemental groundwater gage plots and soil temperature plots are provided in Appendix 6. Please refer to Appendix 2 for the leaf out photograph.

1.2.5 Areas of Concern and Management Activities

Vegetation

MY3 visual assessments reveal that approximately 99% of the conservation easement is unaffected by invasive species populations. When present, these species include kudzu (*Pueraria montana*), Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), princess tree (*Paulownia tomentosa*), and tree of heaven (*Ailanthus altissima*). Invasive treatments occurred in July 2021 and primarily focused on treating kudzu re-sprouts within the West Side. Additionally, aquatic invasive species including Asian spiderwort (*Murdannia keisak*) were treated within the project streams in July 2021. These treatments have been successful in reducing previously noted areas of invasive species. Additional treatments will continue as needed to help manage and eliminate remaining invasive species populations.

Woody vegetation has become well established on over 99% of the planted acreage. A few areas of low stem density, first documented in MY2, persist in MY3. The areas with low stem density are represented by permanent vegetation plots 11 and 16 and are located along the floodplains of UT2A and UT2. Currently these plots are not meeting MY3 or MY5 interim density criteria and lack volunteers of desired woody stem species. These areas will continue to be evaluated to determine if supplemental planting is

warranted. In MY3, adaptive management activities included applying soil amendments to the floodplain between UT2A and UT2 to improve planted stem growth.

Vegetation has become well-established in areas previously identified with poor herbaceous cover, gully formation, and floodplain scour. In MY3, adaptive management activities consisted of reseeding, transplanting herbaceous plugs, and adding live stake fascines to the floodplain to help reduce the size and severity of these areas.

Streams

In MY2, areas of concern were revealed following numerous large rain events including a section of bank scour along UT3 Reach 1 (near station 306+00), structure piping along UT1 Reach 1 (near station 106+90 and 108+10) and UT3 Reach 1 (near station 303+75), and instability around the inlets/outlets of BMP3 and BMP4. Wildlands completed a repair plan in April 2021, which included the installation of brush toe along the meander bend, plugging piping at boulder/log structures, and restabilizing outlets/inlets at BMP3 and BMP4. In addition, disturbed areas associated with the repairs were reseeded and replanted as needed with live stakes, bare root trees, and transplants. Repairs appear to be stable and functioning as designed with herbaceous cover and live stakes becoming well established along banks, and rock/log sill repairs are maintaining vertical stability.

Beaver activity was noted in June 2021 along the very downstream portion of UT3 Reach 3 prior to its confluence with South Deep Creek. This was the first observation of beaver activity during the monitoring period. Maintenance occurred in the summer of 2021 and no additional dams have since been observed on the Site. A few additional minor stream areas of concern outside of the repair areas are noted on the CCPV Maps. This includes one log sill structure and one rock structure that are currently experiencing some piping along UT1 Reach 1. Currently, these areas are not negatively impacting stream function or stability but will continue to be monitored for signs of instability.

Conservation Easement

In MY2, an easement encroachment was noted from ATV activity that accessed the East Side near the upstream project extent of UT1B. Wildlands added signage, blocked access, and communicated the issue to the adjacent landowners. The encroachment is no longer an active issue, and no new trespass has been observed in MY3.

Quarterly site visits will continue to be conducted to monitor and address areas of concern. If necessary, future adaptive management will be implemented to improve herbaceous cover and woody stem densities, treat and control invasive plants, and address stream stability issues. Please refer to Appendix 2 for CCPV figures and stream stability and vegetation assessment tables.

1.3 Monitoring Year 3 Summary

The Site is meeting most of the required stream, vegetation, and hydrology success criteria for MY3. The overall average planted stem density for the Site is 470 stems per acre and is exceeding the MY3 requirement of 320 stems per acre. Geomorphic surveys indicate that cross-section bankfull dimensions closely match baseline conditions with some minor adjustments, and streams are functioning as intended. At least one bankfull event has been documented on all restoration stream reaches in MY3. With a drier than normal start to the growing season in 2021, two of the nine groundwater gages in the wetland re-establishment area met or exceeded hydrology success criteria. The MY3 visual assessment identified a few areas of concern including pockets of invasive species populations, small areas of low stem density, and isolated areas of bed scour. Wildlands will continue to monitor these areas and adaptive management actions will be implemented as necessary throughout the seven-year monitoring period to maintain the ecological health of the Site.

Section: 2 METHODOLOGY

Geomorphic data were collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All Integrated Current Condition Mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcGIS. Stream gages were installed in riffles and monitored quarterly. Monitoring methods are in accordance with the United States Army Corps of Engineers (USACE, 2016) standards for mitigation. Vegetation monitoring follows the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).

Section: 3 REFERENCES

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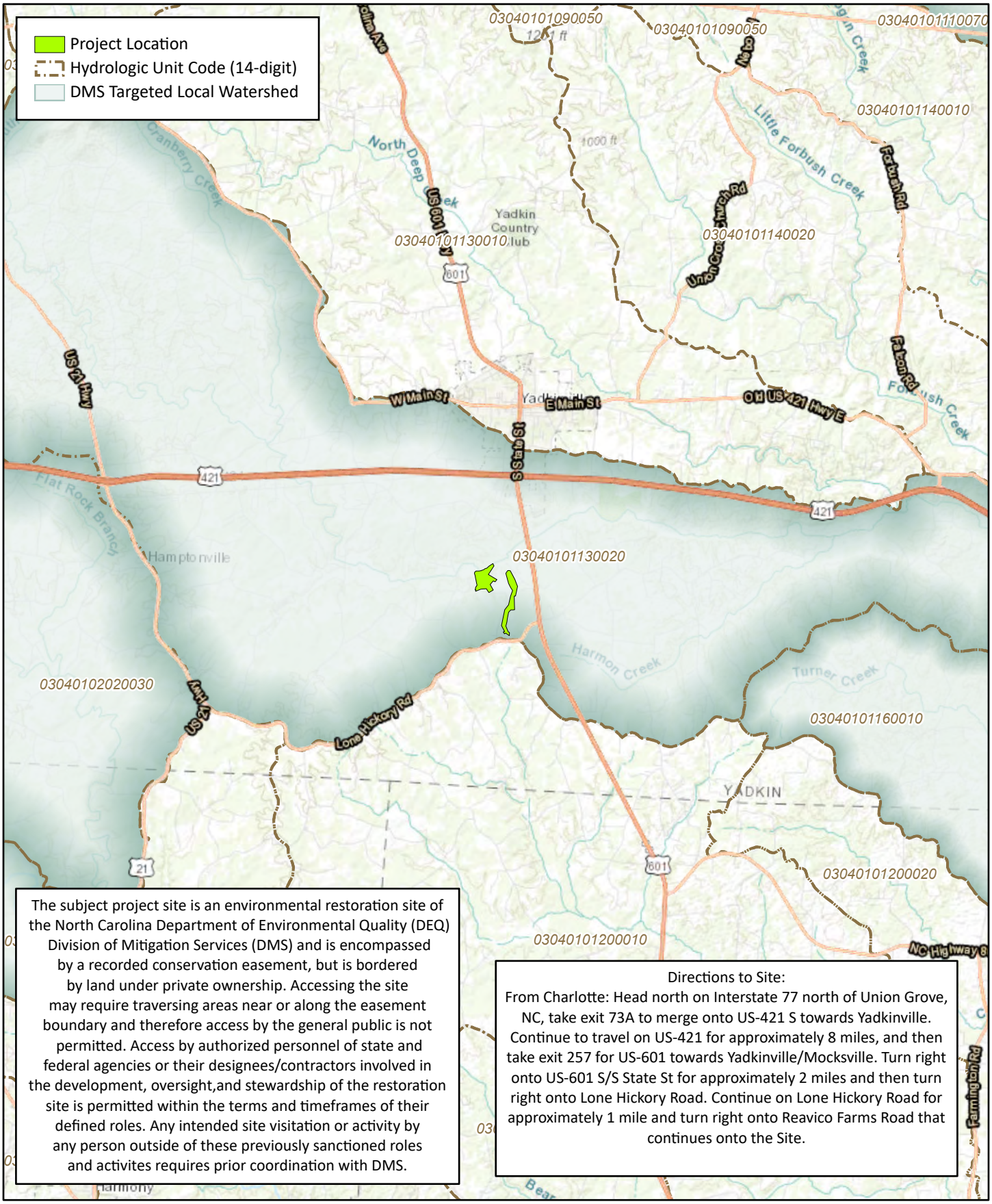
Wildlands Engineering, Inc (Wildlands), 2017. Lone Hickory Mitigation Site Mitigation Plan. DMS, Raleigh, NC.

Wildlands Engineering, Inc (Wildlands), 2019. Lone Hickory Mitigation Site As-Built Baseline Monitoring Report. DMS, Raleigh, NC.

APPENDIX 1. General Figures and Tables



The subject project site is an environmental restoration site of the North Carolina Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight,and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activites requires prior coordination with DMS.

Directions to Site:
From Charlotte: Head north on Interstate 77 north of Union Grove, NC, take exit 73A to merge onto US-421 S towards Yadkinville. Continue to travel on US-421 for approximately 8 miles, and then take exit 257 for US-601 towards Yadkinville/Mocksville. Turn right onto US-601 S/S State St for approximately 2 miles and then turn right onto Lone Hickory Road. Continue on Lone Hickory Road for approximately 1 mile and turn right onto Reavico Farms Road that continues onto the Site.

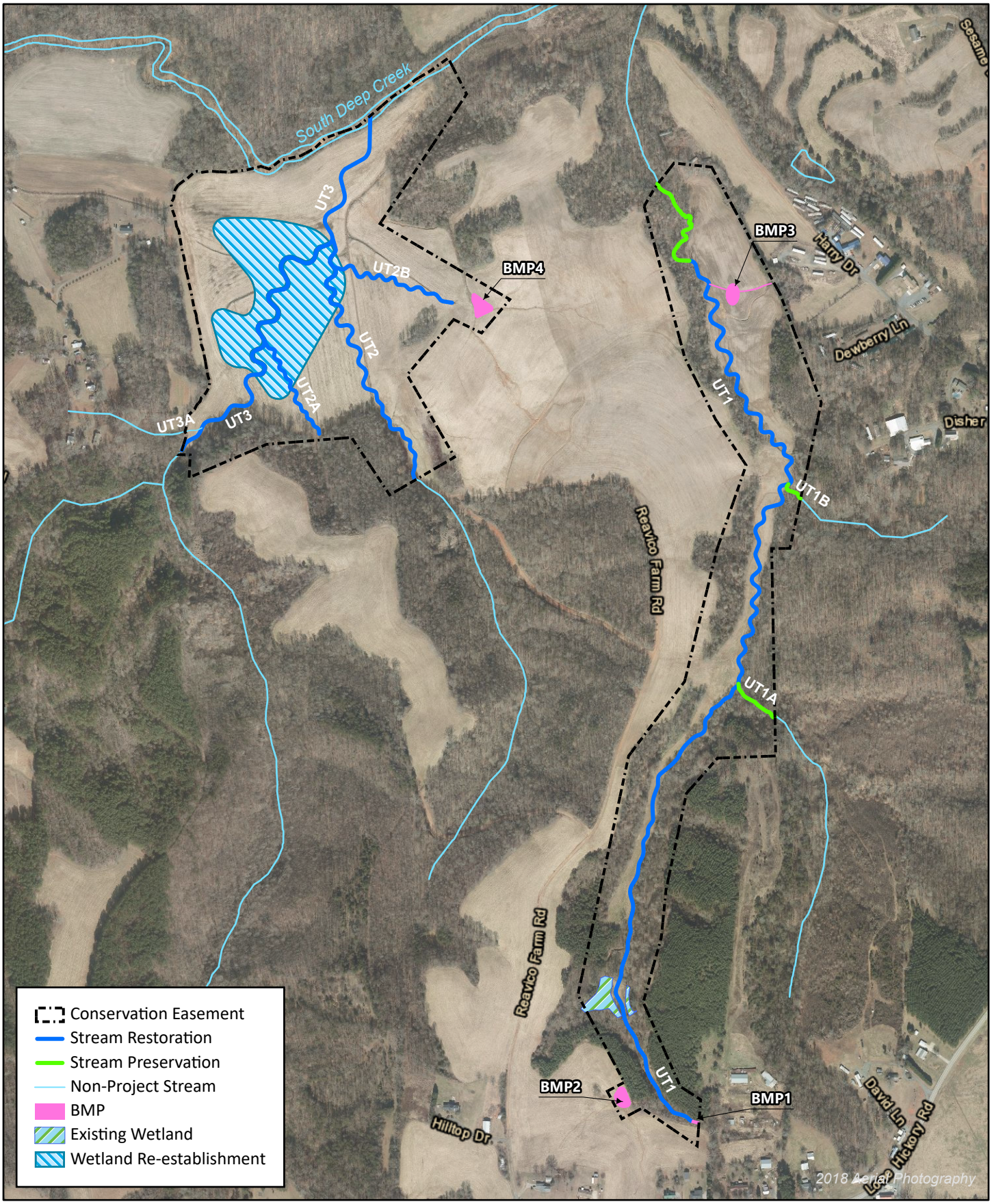
WILDLANDS ENGINEERING

0 1 2 Mile

N

Figure 1 Project Vicinity Map
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Yadkin County, NC



WILDLANDS ENGINEERING

0 350 700 Feet

N

Figure 2 Project Component/Asset Map
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Yadkin County, NC

Table 1. Mitigation Assets and Components

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Project Components								
Project Area/Reach	**Existing Footage (LF) or Acreage**	**Mitigation Plan Footage/ Acreage**	**Mitigation Category**	**Restoration Level**	**Priority Level**	**Mitigation Ratio (X:1)**	**As-Built Footage/ Acreage**	**Project Credit [1 2]**
UT1, R1, R2a, R2b, R3	6,015	5,721	Warm	Restoration	P1, P2	1.000	5,721	6,698.044
UT1 R4	659	659	Warm	Preservation	P4	10.000	659	65.900
UT1A	230	282	Warm	Preservation	N/A	10.000	282	28.200
UT1B	48	124	Warm	Preservation	N/A	10.000	123	12.400
UT2 R1, R2	2,527	1,703	Warm	Restoration	P1, P2	1.000	1,703	1,933.009
UT2A	1,184	655	Warm	Restoration	P1	1.000	655	699.002
UT2B	699	784	Warm	Restoration	P1, P2	1.000	776	893.000
UT3 R1, R2, R3	2,008	2,702	Warm	Restoration	P1, P2	1.000	2,702	2,835.019
West Side Wetlands	N/A	9.5	Warm	Re-establishment		1.000	9.5	9.500

Project Credits							
Restoration Level	**Stream**			**Riparian Wetland**		**Non-Riparian Wetland**	**Coastal Marsh**
	Warm	**Cool**	**Cold**	**Riverine**	**Non-Riv**		
Restoration	13,058.074	N/A	N/A	N/A	N/A	N/A	N/A
Re-establishment				9.500	N/A	N/A	N/A
Rehabilitation				N/A	N/A	N/A	N/A
Enhancement				N/A	N/A	N/A	N/A
Enhancement I	N/A	N/A	N/A				
Enhancement II	N/A	N/A	N/A				
Creation				N/A	N/A	N/A	N/A
Preservation	106.500	N/A	N/A	N/A	N/A	N/A	
Totals	**13,164.574**	**N/A**	**N/A**	**9.500**	**N/A**	**N/A**	**N/A**

Notes:

1. No direct credit for BMPs.

2. Credits reported have been adjusted based on buffer width deviations from standard 50-foot buffer width.

Table 2. Project Activity and Reporting History

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Activity or Report		Data Collection Complete	Completion or Delivery
404 Permit		April 2018	April 2018
Mitigation Plan		July - December 2016	December 2017
Final Design - Construction Plans		June 2018	June 2018
Construction		Oct 2018 - April 2019	Oct 2018 - April 2019
Temporary S&E mix applied to entire project area[1]		Oct 2018 - April 2019	Oct 2018 - April 2019
Permanent seed mix applied to reach/segments		Oct 2018 - April 2019	Oct 2018 - April 2019
Bare root and live stake plantings for reach/segments		February 2019 - April 2019	April 2019
Baseline Monitoring Document (Year 0)		February 2019 - May 2019	June 2019
Invasive Species Treatment		September 2019 - October 2019	October 2019
Supplemental seeding applied to UT3 floodplain		September 2019 - October 2019	October 2019
Year 1 Monitoring	Stream Survey	October 2019	November 2019
	Vegetation Survey	October 2019	
Stream Repair		April 2020	April 2020
Supplemental seeding, herbaceous plug, and live stake planting		June 2020 - August 2020	August 2020
Invasive Species Treatment		May, August, & September 2020	September 2020
Year 2 Monitoring	Stream Survey	July 2020	November 2020
	Vegetation Survey	August 2020	
Stream repair		April 2021	April 2021
Vegetation management (invasive species, soil amendments)		July 2021	July 2021
Beaver maintenance		June - August 2021	August 2021
Year 3 Monitoring	Stream Survey	July 2021	November 2021
	Vegetation Survey	October 2021	
Year 4 Monitoring	Stream Survey	2022	November 2022
	Vegetation Survey	2022	
Year 5 Monitoring	Stream Survey	2023	November 2023
	Vegetation Survey	2023	
Year 6 Monitoring	Stream Survey	2024	November 2024
	Vegetation Survey	2024	
Year 7 Monitoring	Stream Survey	2025	November 2025
	Vegetation Survey	2025	

[1]Seed and mulch is added as each section of construction is completed.

Table 3. Project Contact Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Designers Emily Reinicker, PE, CFM	**Wildlands Engineering, Inc.** 1430 South Mint Street, Suite 104 Charlotte, NC 28203 704.332.7754
Construction Contractors	**KBS Earthworks, Inc.** 5616 Coble Church Road Julian, NC 27283
Planting Contractor	**Bruton Natural Systems, Inc.** PO Box 1197 Freemont, NC 27830
Seeding Contractor	**KBS Earthworks, Inc.**
Seed Mix Sources	**KBS Earthworks, Inc.**
Nursery Stock Suppliers **Bare Roots** **Live Stakes** **Herbaceous Plugs**	**Bruton Natural Systems, Inc.**
Monitoring Performers	**Wildlands Engineering, Inc.** Kristi Suggs 704.332.7754 ext. 110

Table 4. Project Information and Attributes

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Project Information	
Project Name	Lone Hickory Mitigation Site
	Yadkin County
Project Area (acres)	103.000
Project Coordinates (latitude and longitude)	36° 5' 39.16"N 80° 40' 2.14"W
Planted Acreage (Acre of Woody Stems Planted)	99.000

Project Watershed Summary Information	
Physiographic Province	Piedmont Physiographic Province
River Basin	Yadkin River
USGS Hydrologic Unit 8-digit	03040101
USGS Hydrologic Unit 14-digit	03040101130020
DWR Sub-basin	03-07-02
Project Drainage Area (acres)	286 (East Side), 170 (UT2 - West Side), 392 (UT3 – West Side)
Project Drainage Area Percentage of Impervious Area	3% (UT1 - East Side), 1% (UT2 – West Side), 2% (UT3 – West Side)
2011 NLCD Land Use Classification	UT1 - East Side: Forest (39%), Cultivated (42%), Grassland (4%), Shrubland (7%), Urban (8%), Open Water (0%) UT2 - West Side: Forest (31%), Cultivated (40%), Grassland (9%), Shrubland (10%), Urban (0%), Open Water (10%) UT3 - West Side: Forest (57%), Cultivated (22%), Grassland (5%), Shrubland (10%), Urban (3%), Open Water (3%)

Reach Summary Information

Parameters	UT1				UT1A	UT1B	UT2		UT2A	UT2B	UT3		
	R1	R2A/R2B	R3	R4			R1	R2			R1	R2	R3
Length of reach (linear feet) - Post-Restoration	966	3,114	1,641	659	282	123	623	1,080	655	776	779	1,159	764
Valley confinement (Confined, moderately confined, unconfined)	Confined	Confined to moderately confined			Confined	Confined	Moderately confined to unconfined		Unconfined	Unconfined	Moderately confined to unconfined		
Drainage area (acres)	286				92	31	170		27	6	392		
Perennial, Intermittent, Ephemeral	I/P	P	P	P	P	P	P		I/P	P	P		
NCDWR Water Quality Classification	WS-III				WS-III	WS-III	WS-III		WS-III	WS-III	WS-III		
Morphological Description (stream type) - Pre-Restoration	G, Straigthened E/G				-	-	G	G	G	G	G	G	G
Morphological Description (stream type) - Post-Restoration	A	B	C	-	-	-	B	C	C	C/Cb	Bc	C	C
Evolutionary trend (Simon's Model) - Pre- Restoration	III/IV/V				VI	VI	III/IV/V		III/IV/V	IV/V	IV/V		
FEMA classification	Last 400LF in Zone AE backwater from South Deep				None	None	Zone AE backwater from South Deep Creek						

Wetland Summary Information

Parameters	West Side Wetlands
Size of Wetland (acres)	9.5
Wetland Type	Riparian Riverine
Mapped Soil Series	Codorus loam/Dan River and Comus soils
Drainage class	Somewhat poorly drainage/well drained
Soil Hydric Status	Yes/No
Source of Hydrology	Groundwater
Restoration or enhancement method (hydrologic, vegetative etc.)	Re-establishment

Regulatory Considerations

Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States - Section 404	Yes	Yes	USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 4134.
Waters of the United States - Section 401	Yes	Yes	USACE Action ID #SAW-2017-00100
Division of Land Quality (Erosion and Sediment Control)	Yes	Yes	NPDES Construction Stormwater General Permit NCG010000
Endangered Species Act	Yes	Yes	Categorical Exclusion Document in Mitigation Plan
Historic Preservation Act	Yes	Yes	Categorical Exclusion Document in Mitigation Plan
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	Yadkin County Floodplain Development Permit #2017-4.
Essential Fisheries Habitat	No	N/A	N/A

Table 5a. Monitoring Component Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

East Side

Parameter	Monitoring Feature	Quantity / Length by Reach						Frequency	Notes
		UT1 Reach 1	UT1 Reach 2	UT1 Reach 3	UT1 Reach 4	UT1A	UT1B		
Dimension	Riffle Cross-Section	1	4	2	N/A	N/A	N/A	Year 1, 2, 3, 5, and 7	1
	Pool Cross-Section	1	3	2	N/A	N/A	N/A		
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Substrate	Reach Wide (RW) Pebble Count	1 RW	1 RW	1 RW	N/A	N/A	N/A	Year 1, 2, 3, 5, and 7	3
Hydrology	Crest Gage (CG) and or/Transducer (SG)	1 SG	1 SG					Semi-Annual	4
Vegetation	CVS Level 2/Mobile plots	15 (10 permanent, 5 mobile)						Year 1, 2, 3, 5, and 7	5
Visual Assessment		Yes						Semi-Annual	
Exotic and Nuisance Vegetation								Semi-Annual	6
Project Boundary								Semi-Annual	7
Reference Photos	Photographs	22						Annual	

Notes:

1. Cross-sections were permanently marked with rebar to establish location. Surveys include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg.

2. Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile was collected during as-built baseline monitoring survey only, unless observations indicate widespread lack of vertical stability (greater than 10% of reach is affected) and profile survey is warranted in additional years to monitor adjustments or survey repair work.

3. Riffle 100-count substrate sampling were collected during the baseline monitoring only.

4. Crest gages and/or transducers will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. Transducers, if used, will be set to record stage once every 2 hours. The transducer will be inspected and downloaded semi-annually. A transducer was installed on the intermittent portion of UT1 Reach 1 to document 30 days of continuous flow.

5. Permanent vegetation monitoring plot assessments will follow CVS Level 2 protocols. Mobile vegetation monitoring plot assessments will document number of planted stems, height, and species using a circular or 100 m2 square/rectangular plot. 2% of the non-shaded planted acreage will be monitored with permanent plots within the 50' stream buffer, and 1% of the non-shaded planted acreage will be monitored with mobile plots beyond the 50' stream buffer. Planted shaded areas will be visually assessed.

6. Locations of exotic and nuisance vegetation will be mapped.
7. Locations of vegetation damage, boundary encroachments, etc. will be mapped.

Table 5b. Monitoring Component Summary

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

West Side

Parameter	Monitoring Feature	Quantity / Length by Reach								Frequency	Notes
		UT2 Reach 1	UT2 Reach 2	UT2A	UT2B	UT3 Reach 1	UT3 Reach 2	UT3 Reach 3	Wetland Re-establishment		
Dimension	Riffle Cross-Section	1	2	2	2	1	1	1	N/A	Year 1, 2, 3, 5, and 7	1
	Pool Cross-Section	1	1	2	2	1	1	1	N/A		
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Substrate	Reach Wide (RW) Pebble Count	1 RW	1 RW	1 RW	1 RW	1 RW	1 RW	1 RW	N/A	Year 1, 2, 3, 5, and 7	3
Stream Hydrology	Crest Gage (CG) and/or Transducer (SG)	1 SG		1 SG	1 SG	1 SG			N/A	Semi-Annual	4
Wetland Hydrology	Groundwater Gages								9	Quarterly	
Vegetation	CVS Level 2/Mobile Plots	25 (15 permanent, 10 mobile)								Year 1, 2, 3, 5, and 7	5
Visual Assessment		Yes								Semi-Annual	
Exotic and Nuisance Vegetation										Semi-Annual	6
Project Boundary										Semi-Annual	7
Reference Photos	Photographs	22								Annual	

Notes:

1. Cross-sections were permanently marked with rebar to establish location. Surveys include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg.

2. Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile was collected during as-built baseline monitoring survey only, unless observations indicate widespread lack of vertical stability (greater than 10% of reach is affected) and profile survey is warranted in additional years to monitor adjustments or survey repair work.

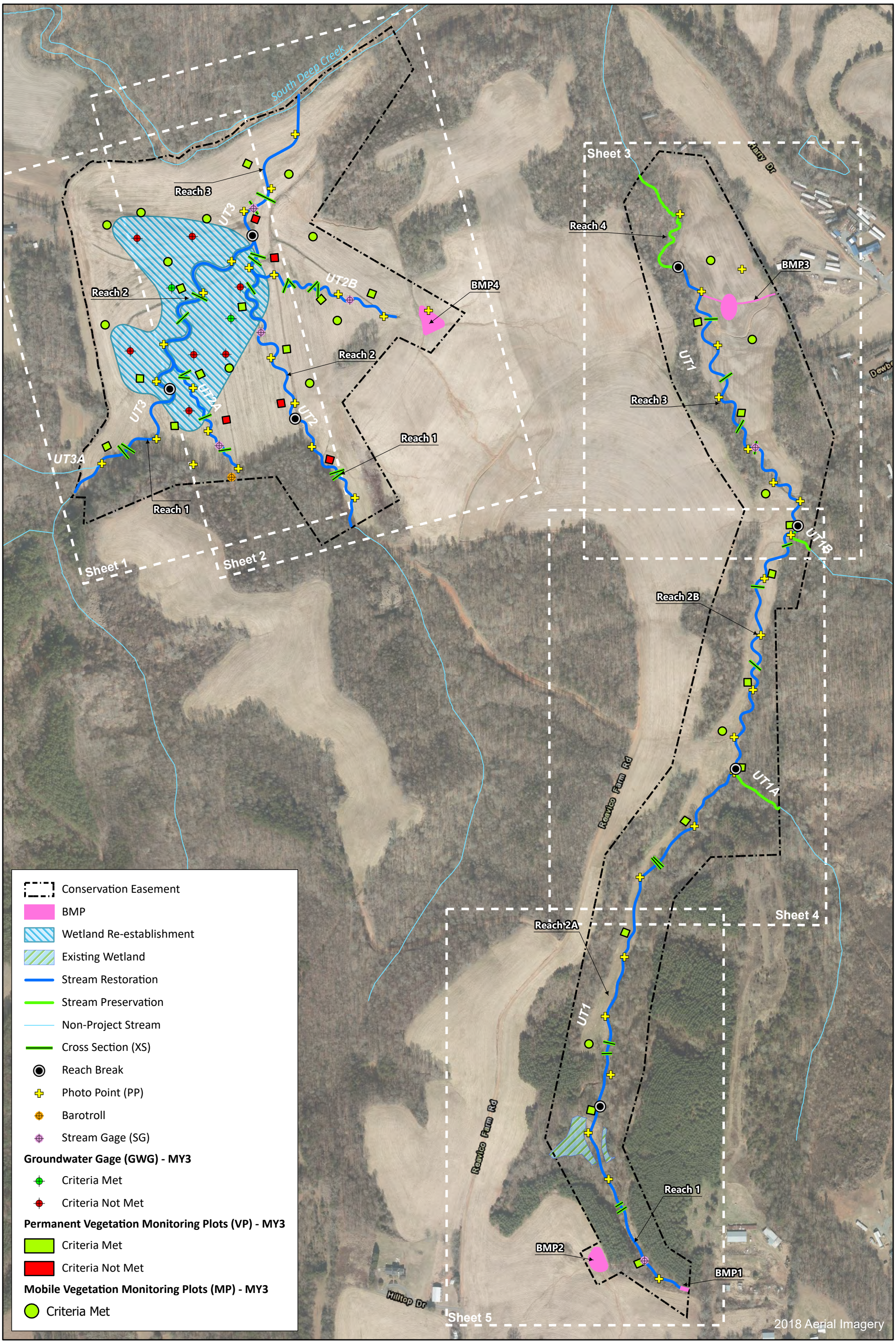
3. Riffle 100-count substrate sampling was collected during the baseline monitoring only.

4. Crest gages and/or transducers will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. Transducers, if used, will be set to record stage once every 2 hours. The transducer will be inspected and downloaded semi-annually. A transducer was installed on the intermittent portion of UT2A and UT2B to document 30 days of continuous flow.

5. Permanent vegetation monitoring plot assessments will follow CVS Level 2 protocols. Mobile vegetation monitoring plot assessments will document number of planted stems, height, and species using a circular or 100 m2 square/rectangular plot. 2% of the non-shaded planted acreage will be monitored with permanent plots within the 50' stream buffer, and 1% of the non-shaded planted acreage will be monitored with mobile plots beyond the 50' stream buffer. Planted shaded areas will be visually assessed.

6. Locations of exotic and nuisance vegetation will be mapped.
7. Locations of vegetation damage, boundary encroachments, etc. will be mapped.

APPENDIX 2. Visual Assessment Data



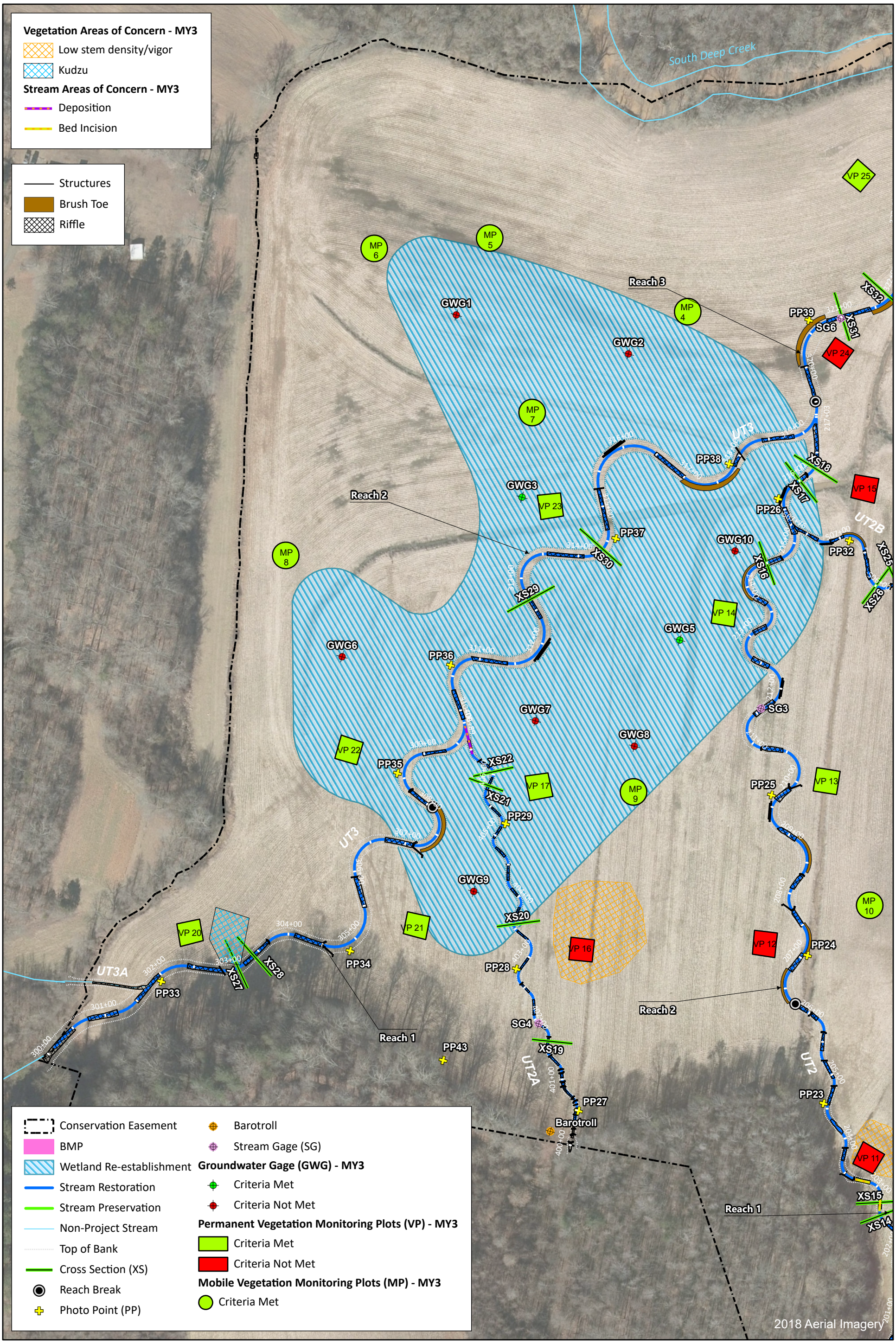
WILDLANDS ENGINEERING

0 400 800 Feet

N

Figure 3.0 Current Condition Plan View Map (Key)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Yadkin County, NC

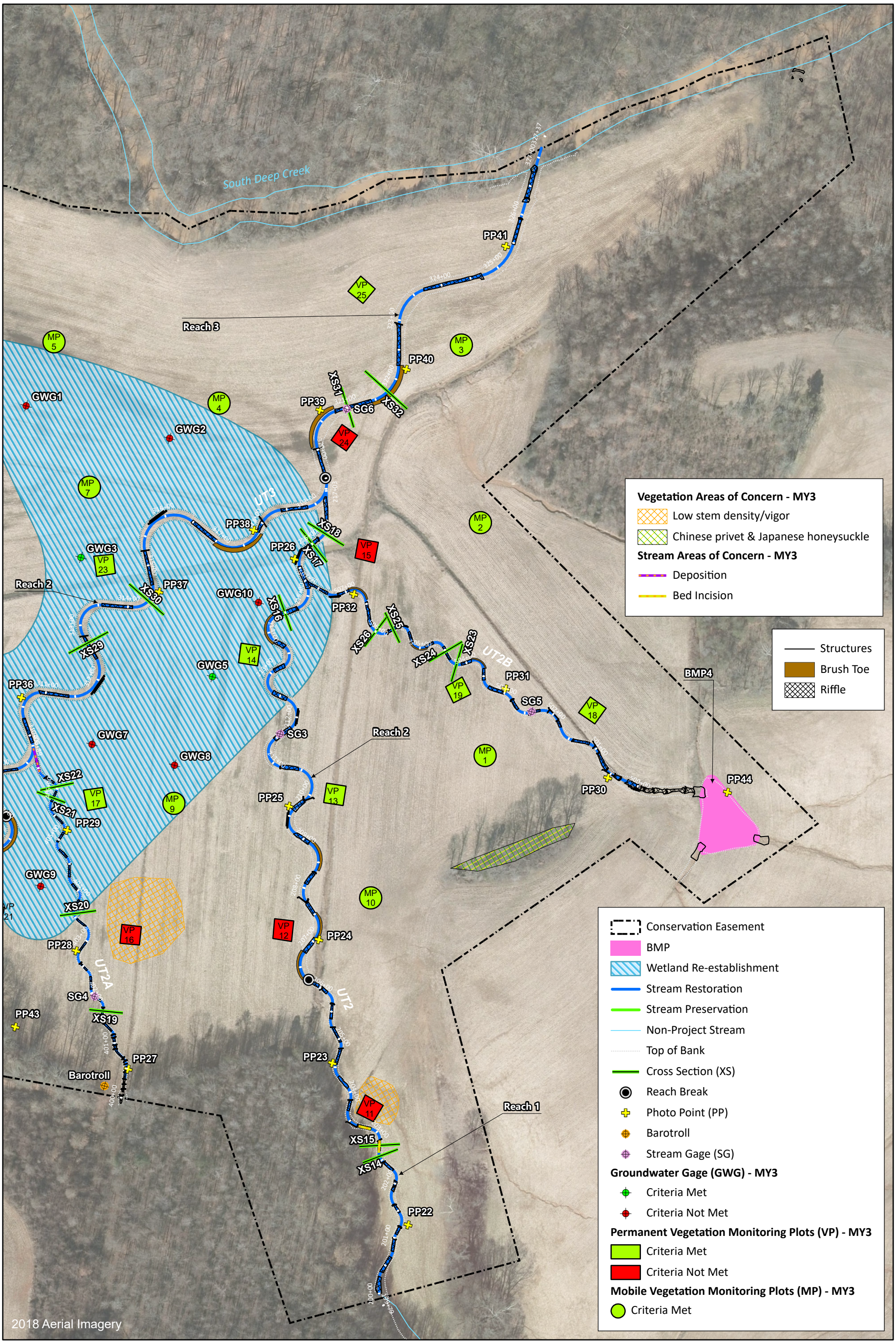


WILDLANDS ENGINEERING

0 125 250 Feet

Figure 3.1 Current Condition Plan View Map (Sheet 1)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Yadkin County, NC

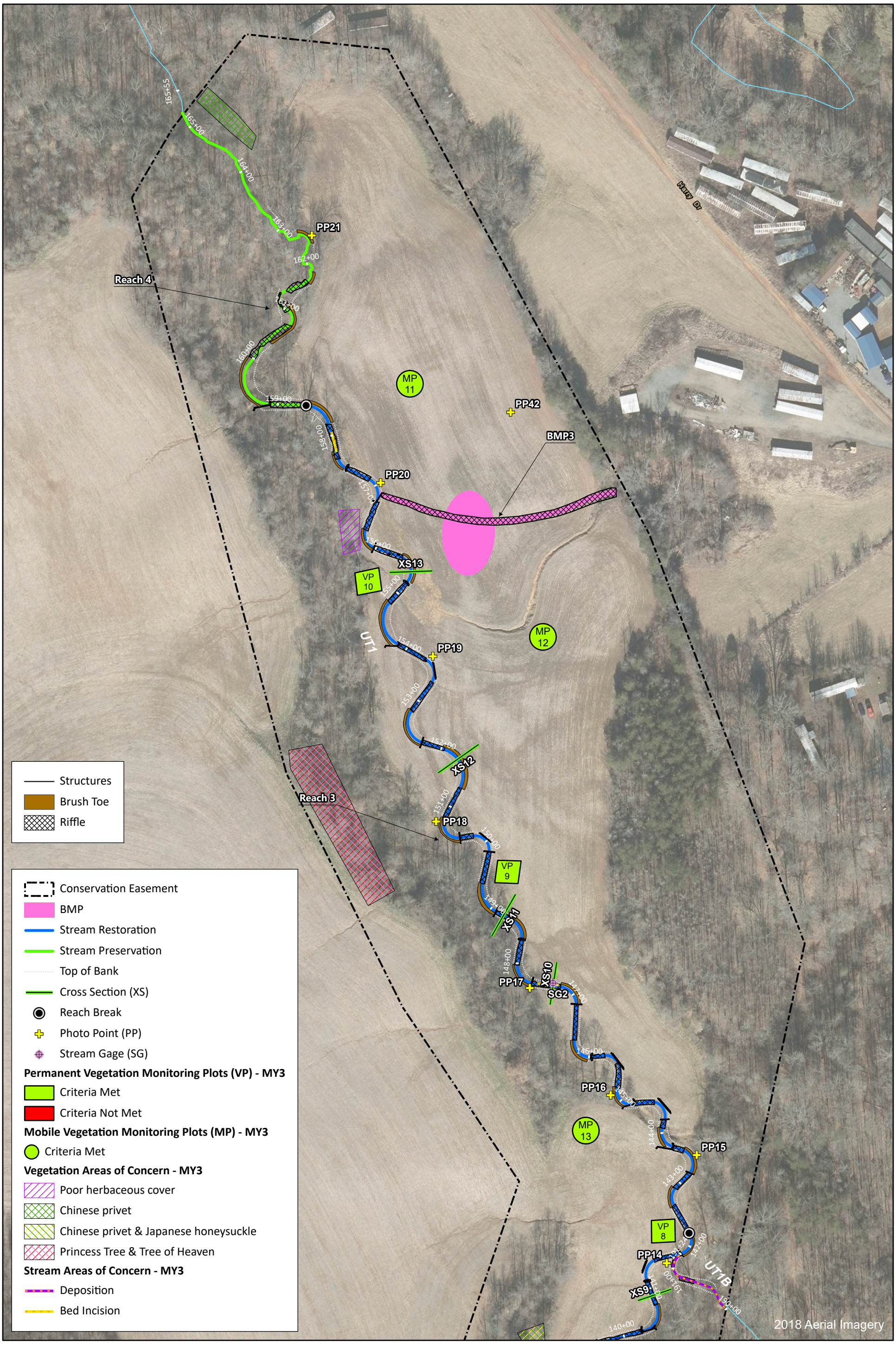


WILDLANDS ENGINEERING

0 150 300 Feet

Figure 3.2 Current Condition Plan View Map (Sheet 2)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Yadkin County, NC



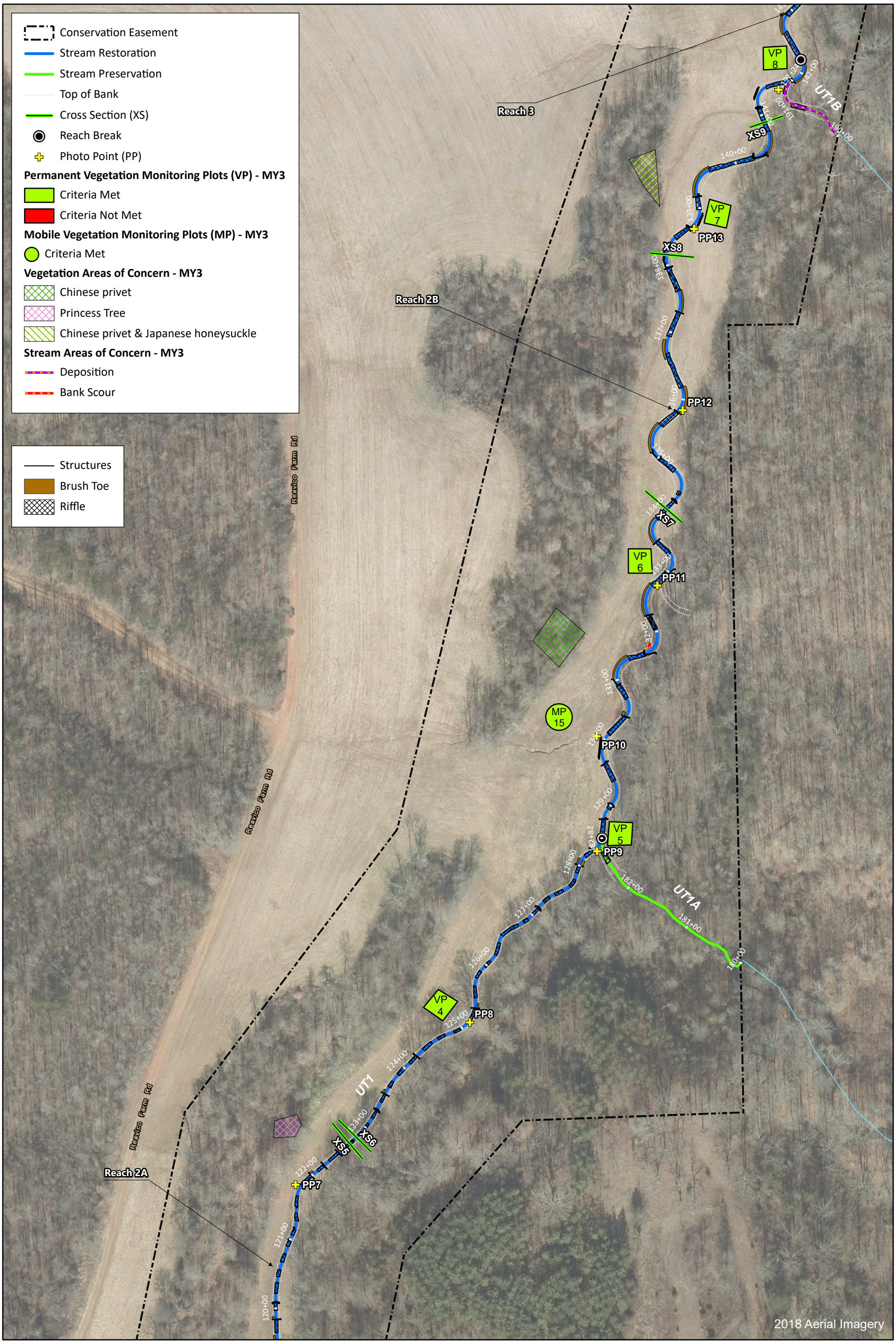
WILDLANDS ENGINEERING

0 125 250 Feet

N

Figure 3.3 Current Condition Plan View Map (Sheet 3)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Yadkin County, NC

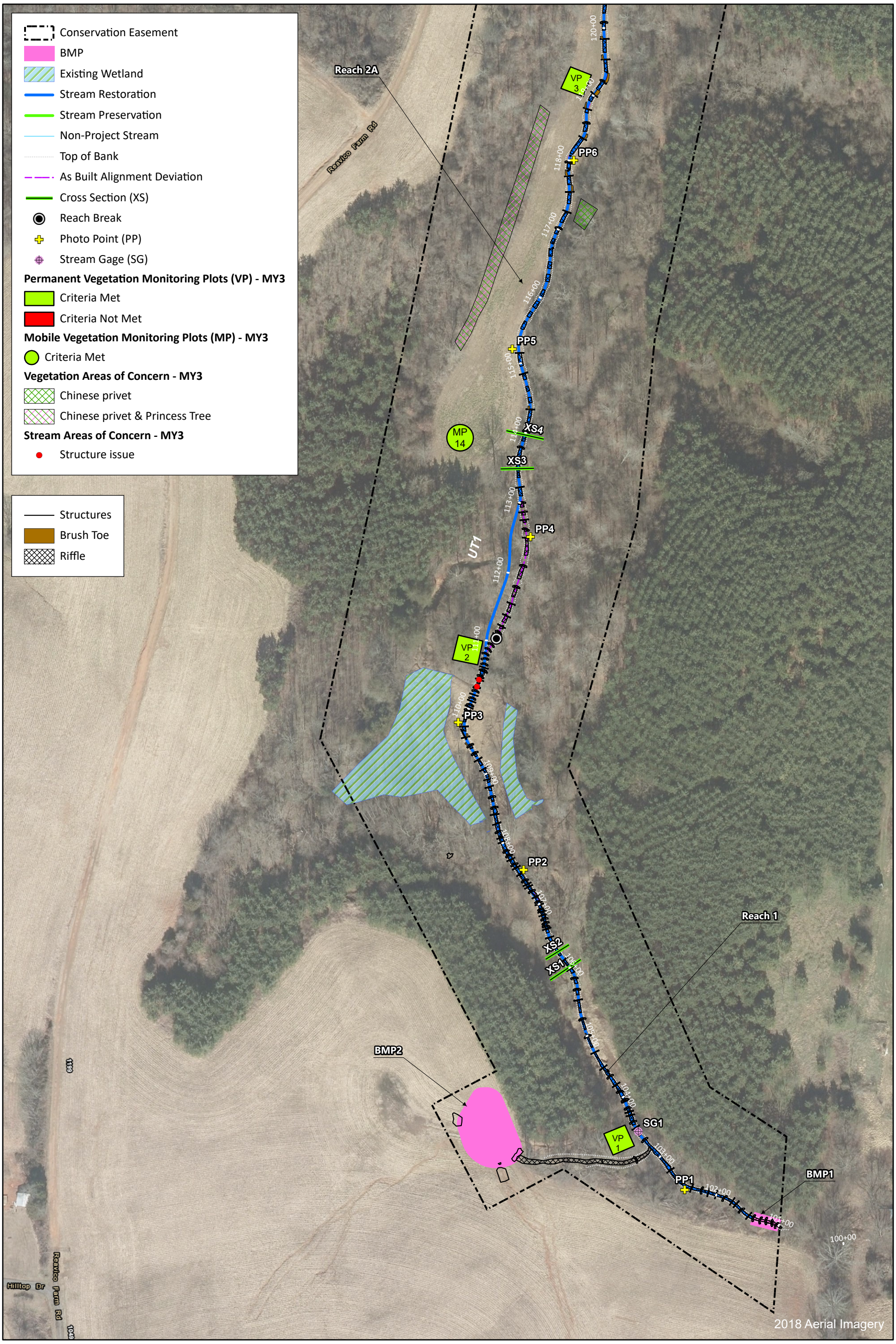


WILDLANDS ENGINEERING

0 125 250 Feet

Figure 3.4 Current Condition Plan View Map (Sheet 4)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Yadkin County, NC



WILDLANDS ENGINEERING

0 125 250 Feet

N

Figure 3.5 Current Condition Plan View Map (Sheet 5)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Yadkin County, NC

Table 6a. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Date of Visual Assessments: April 2021, October 2021
Reach: UT1 Reach 1 (STA 101+39 to 111+05)
Assessed Length: 966

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	25	25			100%			
	3. Step Pool Condition	Depth Sufficient	25	25			100%			
		Length Appropriate	N/A	N/A			N/A			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	N/A	N/A			N/A			
		Thalweg centering at downstream of meander bend (Glide)	N/A	N/A			N/A			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	84	86			98%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	84	86			98%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	84	86			98%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	84	86			98%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	84	86			98%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6b. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Date of Visual Assessments: April 2021, October 2021
Reach: UT1 Reach 2A (STA 111+05 to 128+51)
Assessed Length: 1,746

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	35	35			100%			
	3. Step Pool Condition	Depth Sufficient	35	35			100%			
		Length Appropriate	N/A	N/A			N/A			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	N/A	N/A			N/A			
		Thalweg centering at downstream of meander bend (Glide)	N/A	N/A			N/A			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	42	42			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	41	41			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	41	41			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	41	41			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	41	41			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6c. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Date of Visual Assessments: April 2021, October 2021
Reach: UT1 Reach 2B (STA 128+51 to 142+19)
Assessed Length: 1,368

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	20	20			100%			
	3. Meander Pool Condition	Depth Sufficient	20	20			100%			
		Length Appropriate	20	20			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	20	20			100%			
		Thalweg centering at downstream of meander bend (Glide)	20	20			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	10	99.6%	0	0	99.6%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	1	10	99.6%	0	0	99.6%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	33	33			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	19	19			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	19	19			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	33	33			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	33	33			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6d. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Date of Visual Assessments: April 2021, October 2021
Reach: UT1 Reach 3 (STA 142+19 to 158+60)
Assessed Length: 1,641

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			2	60	98%			
	2. Riffle Condition	Texture/Substrate	22	22			100%			
	3. Meander Pool Condition	Depth Sufficient	22	22			100%			
		Length Appropriate	22	22			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	22	22			100%			
		Thalweg centering at downstream of meander bend (Glide)	22	22			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	38	38			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	17	17			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	17	17			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	38	38			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	38	38			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6e. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Date of Visual Assessments: April 2021, October 2021
Reach: UT2 Reach 1 (STA 200+00 to 206+23)
Assessed Length: 623

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			2	42	97%			
	2. Riffle Condition	Texture/Substrate	15	15			100%			
	3. Meander Pool Condition	Depth Sufficient	14	14			100%			
		Length Appropriate	14	14			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	15	15			100%			
		Thalweg centering at downstream of meander bend (Glide)	15	15			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	11	11			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	11	11			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	12	12			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6f. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Date of Visual Assessments: April 2021, October 2021
Reach: UT2 Reach 2 (STA 206+23 to 217+03)
Assessed Length: 1,080

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	14	14			100%			
	3. Meander Pool Condition	Depth Sufficient	14	14			100%			
		Length Appropriate	14	14			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	14	14			100%			
		Thalweg centering at downstream of meander bend (Glide)	14	14			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	6	6			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	6	6			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	12	12			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6g. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Date of Visual Assessments: April 2021, October 2021
Reach: UT2A (STA 400+34 to 406+89)
Assessed Length: 655

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			1	41	97%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	18	19			95%			
	3. Meander Pool Condition	Depth Sufficient	17	17			100%			
		Length Appropriate	17	17			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	17	17			100%			
		Thalweg centering at downstream of meander bend (Glide)	17	17			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	16	16			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	13	13			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	13	13			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	16	16			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	16	16			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6h. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Date of Visual Assessments: April 2021, October 2021
Reach: UT2B (STA 500+00 to 507+76)
Assessed Length: 776

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	17	17			100%			
	3. Meander Pool Condition	Depth Sufficient	15	15			100%			
		Length Appropriate	15	15			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	15	15			100%			
		Thalweg centering at downstream of meander bend (Glide)	15	15			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	7	7			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	7	7			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	12	12			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6i. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Date of Visual Assessments: April 2021, October 2021
Reach: UT3 Reach 1 (STA 300+13 to 307+92)
Assessed Length: 779

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	8	8			100%			
	3. Meander Pool Condition	Depth Sufficient	8	8			100%			
		Length Appropriate	8	8			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	8	8			100%			
		Thalweg centering at downstream of meander bend (Glide)	8	8			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	6	6			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	5	5			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	6	6			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	6	6			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6j. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Date of Visual Assessments: April 2021, October 2021
Reach: UT3 Reach 2 (STA 307+92 to 319+51)
Assessed Length: 1,159

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	10	10			100%			
	3. Meander Pool Condition	Depth Sufficient	10	10			100%			
		Length Appropriate	10	10			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	10	10			100%			
		Thalweg centering at downstream of meander bend (Glide)	10	10			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	7	7			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	4			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	7	7			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	7	7			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6k. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Date of Visual Assessments: April 2021, October 2021
Reach: UT3 Reach 3 (STA 319+51 to STA 327+15)
Assessed Length: 764

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	6	6			100%			
	3. Meander Pool Condition	Depth Sufficient	4	4			100%			
		Length Appropriate	4	4			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	4	4			100%			
		Thalweg centering at downstream of meander bend (Glide)	4	4			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	6	6			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	4			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	6	6			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	6	6			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 7. Vegetation Condition Assessment Table

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Date of Visual Assessments: April 2021, October 2021

Planted Acreage **68.3**

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	1	0.03	0.04%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, 5, or 7 stem count criteria.	0.1	2	0.45	0.7%
		Total	**3**	**0.48**	**0.7%**
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.1	0	0.00	0.0%
		Cumulative Total	**3**	**0.48**	**0.7%**

Easement Acreage **103.2**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000	9	0.78	0.8%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	0	0.0	0.0%

Stream Photographs
MY3

	
Photo Point 1 – UT1 Reach 1, view upstream *(10/27/2021)*	**Photo Point 1** – UT1 Reach 1, view downstream *(10/27/2021)*
	
Photo Point 2 – UT1 Reach 1, view upstream *(07/08/2021)*	**Photo Point 2** – UT1 Reach 1, view downstream *(07/08/2021)*
	
Photo Point 3 – UT1 Reach 1, view upstream *(10/27/2021)*	**Photo Point 3** – UT1 Reach 1, view downstream *(10/27/2021)*

	
Photo Point 4 – UT1 Reach 2A, view upstream *(07/08/2021)*	**Photo Point 4** – UT1 Reach 2A, view downstream *(07/08/2021)*
	
Photo Point 5 – UT1 Reach 2A, view upstream *(07/08/2021)*	**Photo Point 5** – UT1 Reach 2A, view downstream *(07/08/2021)*
	
Photo Point 6 – UT1 Reach 2A, view upstream *(07/08/2021)*	**Photo Point 6** – UT1 Reach 2A, view downstream *(07/08/2021)*

	
Photo Point 7 – UT1 Reach 2A, view upstream *(07/08/2021)*	**Photo Point 7** – UT1 Reach 2A, view downstream *(07/08/2021)*
	
Photo Point 8 – UT1 Reach 2A, view upstream *(07/08/2021)*	**Photo Point 8** – UT1 Reach 2A, view downstream *(07/08/2021)*
	
Photo Point 9 – UT1 Reach 2A, view upstream *(07/08/2021)*	**Photo Point 9** – UT1 Reach 2A, view downstream *(07/08/2021)*

Photo Point 9 – UT1A, view upstream *(07/08/2021)*

Photo Point 10 – UT1 Reach 2B, view upstream *(07/08/2021)*

Photo Point 10 – UT1 Reach 2B, view downstream *(07/08/2021)*

Photo Point 11 – UT1 Reach 2B, view upstream *(07/08/2021)*

Photo Point 11 – UT1 Reach 2B, view downstream *(07/08/2021)*

	
Photo Point 12 – UT1 Reach 2B, view upstream *(07/08/2021)*	**Photo Point 12** – UT1 Reach 2B, view downstream *(07/08/2021)*
	
Photo Point 13 – UT1 Reach 2B, view upstream *(07/08/2021)*	**Photo Point 13** – UT1 Reach 2B, view downstream *(07/08/2021)*
	
Photo Point 14 – UT1 Reach 2B, view upstream *(07/08/2021)*	**Photo Point 14** – UT1 Reach 2B, view downstream *(07/08/2021)*

Photo Point 14 – UT1B, view upstream *(07/08/2021)*

Photo Point 15 – UT1 Reach 3, view upstream *(07/08/2021)*

Photo Point 15 – UT1 Reach 3, view downstream *(07/08/2021)*

Photo Point 16 – UT1 Reach 3, view upstream *(07/08/2021)*

Photo Point 16 – UT1 Reach 3, view downstream *(07/08/2021)*

	
Photo Point 17 – UT1 Reach 3, view upstream *(07/08/2021)*	**Photo Point 17** – UT1 Reach 3, view downstream *(07/08/2021)*
	
Photo Point 18 – UT1 Reach 3, view upstream *(07/08/2021)*	**Photo Point 18** – UT1 Reach 3, view downstream *(07/08/2021)*
	
Photo Point 19 – UT1 Reach 3, view upstream *(07/08/2021)*	**Photo Point 19** – UT1 Reach 3, view downstream *(07/08/2021)*

Photo Point 20 – UT1 Reach 3, view upstream *(07/08/2021)*

Photo Point 20 – UT1 Reach 3, view downstream *(07/08/2021)*

Photo Point 20 – UT1 Reach 3 BMP 3, view upstream *(07/08/2021)*

Photo Point 21 – UT1 Reach 4, view upstream *(07/08/2021)*

Photo Point 21 – UT1 Reach 4, view downstream *(07/08/2021)*

Photo Point 22 – UT2 Reach 1, view upstream *(07/08/2021)*

Photo Point 22 – UT2 Reach 1, view downstream *(07/08/2021)*

Photo Point 23 – UT2 Reach 1, view upstream *(07/08/2021)*

Photo Point 23 – UT2 Reach 1, view downstream *(07/08/2021)*

Photo Point 24 – UT2 Reach 2, view upstream *(07/08/2021)*

Photo Point 24 – UT2 Reach 2, view downstream *(07/08/2021)*

	
Photo Point 25 – UT2 Reach 2, view upstream *(07/08/2021)*	**Photo Point 25** – UT2 Reach 2, view downstream *(07/08/2021)*
	
Photo Point 26 – UT2 Reach 2, view upstream *(07/07/2021)*	**Photo Point 26** – UT2 Reach 2, view downstream *(07/07/2021)*
	
Photo Point 27 – UT2A, view upstream *(07/07/2021)*	**Photo Point 27** – UT2A, view downstream *(07/07/2021)*

	
Photo Point 28 – UT2A, view upstream *(07/07/2021)*	**Photo Point 28** – UT2A, view downstream *(07/07/2021)*
	
Photo Point 29 – UT2A, view upstream *(07/07/2021)*	**Photo Point 29** – UT2A, view downstream *(07/07/2021)*
	
Photo Point 30 – UT2B, view upstream *(07/07/2021)*	**Photo Point 30** – UT2B, view downstream *(07/07/2021)*

	
Photo Point 31 – UT2B, view upstream *(07/07/2021)*	**Photo Point 31** – UT2B, view downstream *(07/07/2021)*
	
Photo Point 32 – UT2B, view upstream *(07/07/2021)*	**Photo Point 32** – UT2B, view downstream *(07/07/2021)*
	
Photo Point 33 – UT3 Reach 1, view upstream *(07/07/2021)*	**Photo Point 33** – UT3 Reach 1, view downstream *(07/07/2021)*

Photo Point 34 – UT3 Reach 1, view upstream *(07/07/2021)*

Photo Point 34 – UT3 Reach 1, view downstream *(07/07/2021)*

Photo Point 35 – UT3 Reach 1, view upstream *(07/07/2021)*

Photo Point 35 – UT3 Reach 1, view downstream *(07/07/2021)*

Photo Point 36 – UT3 Reach 2, view upstream *(07/07/2021)*

Photo Point 36 – UT3 Reach 2, view downstream *(07/07/2021)*

Photo Point 37 – UT3 Reach 2, view upstream *(07/07/2021)*

Photo Point 37 – UT3 Reach 2, view downstream *(07/07/2021)*

Photo Point 38 – UT3 Reach 2, view upstream *(07/07/2021)*

Photo Point 38 – UT3 Reach 2, view downstream *(07/07/2021)*

Photo Point 39 – UT3 Reach 3, view upstream *(07/08/2021)*

Photo Point 39 – UT3 Reach 3, view downstream *(07/08/2021)*

	
Photo Point 40 – UT3 Reach 3, view upstream *(07/07/2021)*	**Photo Point 40** – UT3 Reach 3, view downstream *(07/07/2021)*
	
Photo Point 41 – UT3 Reach 3, view upstream *(07/07/2021)*	**Photo Point 41** – UT3 Reach 3, view downstream *(07/07/2021)*
	
Photo Point 42 – UT1 Reach 3, up valley *(07/08/2021)*	**Photo Point 42** – UT1 Reach 4, down valley *(07/08/2021)*

Photo Point 43 – UT2A, northeast view *(07/07/2021)*

Photo Point 43 – UT2A, north view *(07/07/2021)*

Photo Point 43 – UT3 Reach 3, northwest view *(07/07/2021)*

Photo Point 44 – BMP 4 above UT2B, inlet view *(07/08/2021)*

Photo Point 44 – BMP 4 above UT2B, outlet view *(07/08/2021)*

Groundwater Gage Photographs
MY3

Groundwater Gage 1 – *(10/27/2021)*

Groundwater Gage 2 – *(10/27/2021)*

Groundwater Gage 3 – *(10/27/2021)*

Groundwater Gage 5 – *(10/27/2021)*

Groundwater Gage 6 – *(10/27/2021)*

Groundwater Gage 7 – *(10/27/2021)*

Groundwater Gage 8 – *(10/27/2021)*

Groundwater Gage 9 – *(10/27/2021)*

Groundwater Gage 10 – *(10/27/2021)*

Leaf Out Photograph
MY3

Leaf Out Photo Documentation – *(4/2/2021)*

Permanent Vegetation Plot Photographs
MY3

Vegetation Plot 1 – *(10/11/2021)*

Vegetation Plot 2 – *(10/11/2021)*

Vegetation Plot 3 – *(10/11/2021)*

Vegetation Plot 4 – *(10/11/2021)*

Vegetation Plot 5 – *(10/11/2021)*

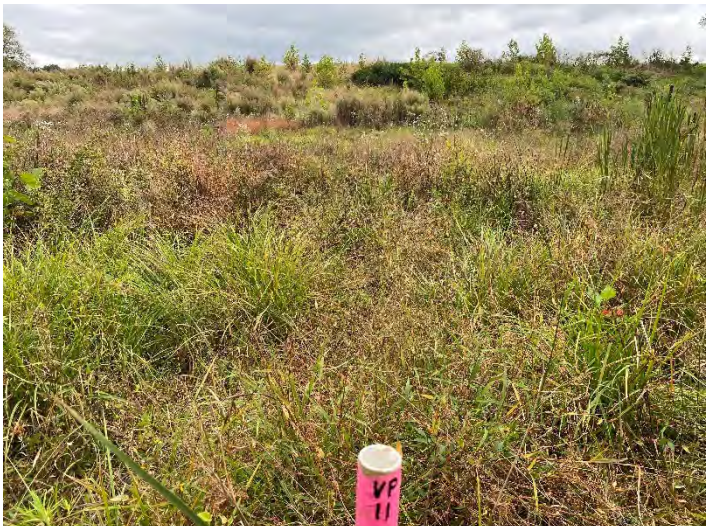
Vegetation Plot 6 – *(10/11/2021)*

Vegetation Plot 7 – *(10/11/2021)*

Vegetation Plot 8 – *(10/11/2021)*

Vegetation Plot 9 – *(10/11/2021)*

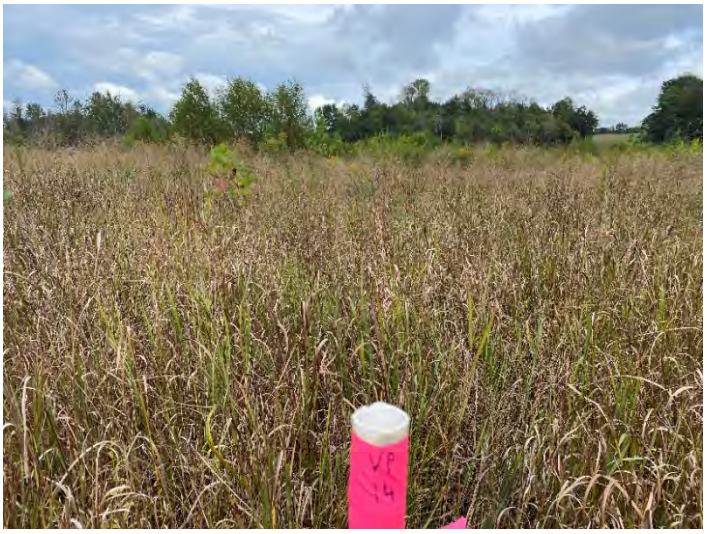
Vegetation Plot 10 – *(10/11/2021)*



Vegetation Plot 11 – *(10/11/2021)*

Vegetation Plot 12 – *(10/11/2021)*

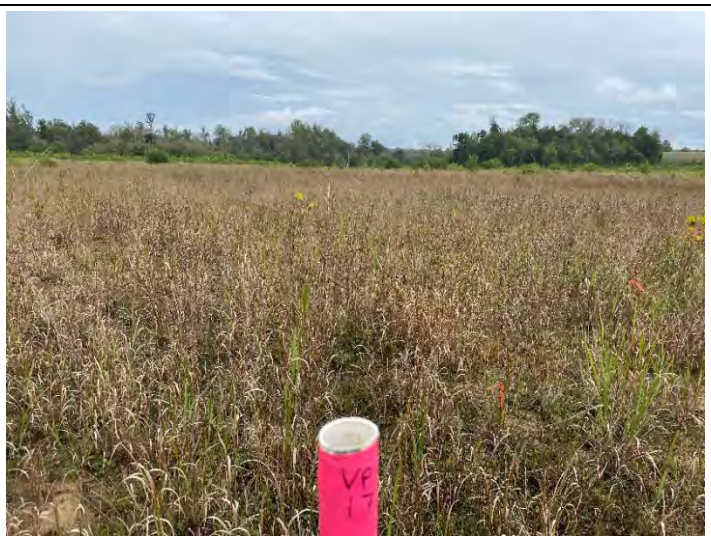
Vegetation Plot 13 – *(10/07/2021)*



Vegetation Plot 14 – *(10/07/2021)*

Vegetation Plot 15 – *(10/05/2021)*

Vegetation Plot 16 – *(10/07/2021)*



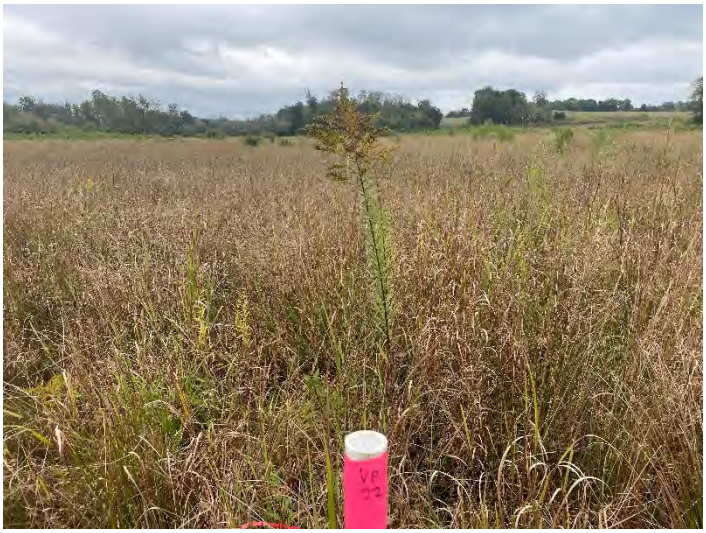
Vegetation Plot 17 – *(10/07/2021)*

Vegetation Plot 18 – *(10/05/2021)*

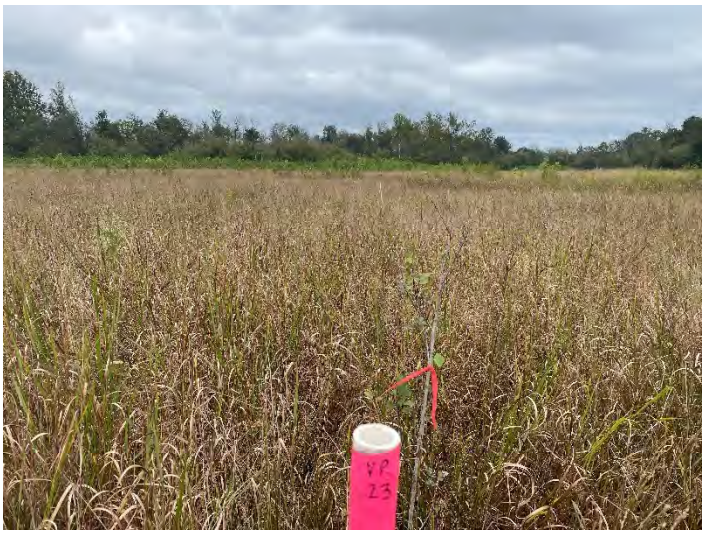
Vegetation Plot 19 – *(10/05/2021)*

Vegetation Plot 20 – *(10/07/2021)*

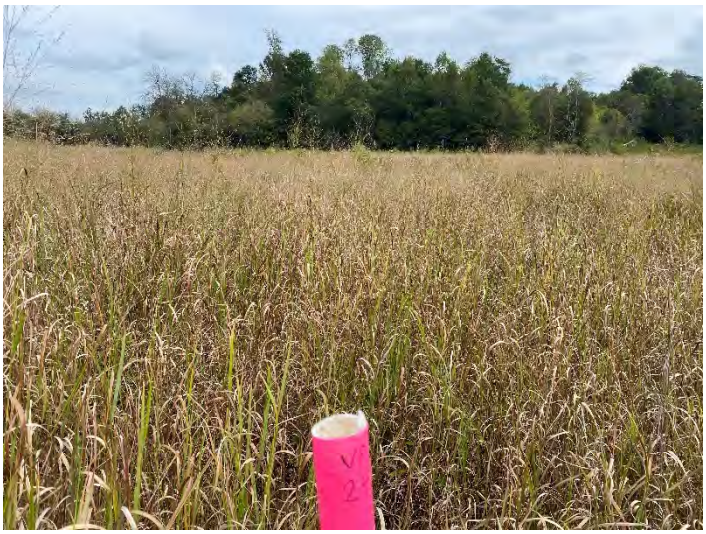
Vegetation Plot 21 – *(10/07/2021)*



Vegetation Plot 22 – *(10/07/2021)*



Vegetation Plot 23 – *(10/05/2021)*



Vegetation Plot 24 – *(10/05/2021)*

Vegetation Plot 25 – *(10/05/2021)*

Mobile Vegetation Plot Photographs
MY3

Mobile Vegetation Plot 1 – *(10/05/2021)*

Mobile Vegetation Plot 2 – *(10/05/2021)*

Mobile Vegetation Plot 3 – *(10/05/2021)*

Mobile Vegetation Plot 4 – *(10/05/2021)*

Mobile Vegetation Plot 5 – *(10/05/2021)*

Mobile Vegetation Plot 6 – *(10/05/2021)*

Mobile Vegetation Plot 7 – *(10/07/2021)*

Vegetation Plot 8 – *(10/07/2021)*

Mobile Vegetation Plot 9 – *(10/07/2021)*

Mobile Vegetation Plot 10 – *(10/07/2021)*

Mobile Vegetation Plot 11 – *(10/11/2021)*

Mobile Vegetation Plot 12 – *(10/11/2021)*

Mobile Vegetation Plot 13 – *(10/11/2021)*

Mobile Vegetation Plot 14 – *(10/11/2021)*

Mobile Vegetation Plot 15 – *(10/11/2021)*

APPENDIX 3. Vegetation Plot Data

Table 8. Vegetation Plot Criteria Attainment

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Permanent Vegetation Plot	MY3 Success Criteria Met (Y/N)	Tract Mean	Overall Mean
1	Y		
2	Y		
3	Y		
4	Y		
5	Y		
6	Y		
7	Y		
8	Y		
9	Y		
10	Y		
11	N		
12	N		
13	Y	80%	
14	Y		
15	N		
16	N		
17	Y		
18	Y		
19	Y		
20	Y		
21	Y		88%
22	Y		
23	Y		
24	N		
25	Y		
Mobile Vegetation Plot	**MY3 Success Criteria Met (Y/N)**	**Tract Mean**	
1	Y		
2	Y		
3	Y		
4	Y		
5	Y		
6	Y		
7	Y		
8	Y	100%	
9	Y		
10	Y		
11	Y		
12	Y		
13	Y		
14	Y		
15	Y		

Table 9. CVS Permanent Vegetation Plot Metadata

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Database Name	cvs-eep-entrytool-v2.5.0 Lone Hickory MY3.mdb
Database Location	L:\Active Projects\005-02163 Lone Hickory FDP\Monitoring\Monitoring Year 3\Vegetation Assessment
Computer Name	MIMI-PC
File Size	51904512
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	97135
Project Name	Lone Hickory Mitigation Site
Description	Stream and wetland mitigation project in Yadkin County, NC.
River Basin	Yadkin River Basin
Length(ft)	12,621
Required Plots (calculated)	25
Sampled Plots	25

Table 10a. Planted and Total Stem Counts
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Current Permanent Vegetation Plot Data (MY3 2021)																	
Scientific Name	**Common Name**	**Species Type**	**Permanent Plot 1**			**Permanent Plot 2**			**Permanent Plot 3**			**Permanent Plot 4**			**Permanent Plot 5**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree									2						
Acer rubrum	Red Maple	Tree															
Betula nigra	River Birch	Tree	3	3	3				2	2	2	3	3	3	2	2	23
Diospyros virginiana	American Persimmon	Tree															
Fraxinus pennsylvanica	Green Ash	Tree													3	3	3
Liquidambar styraciflua	Sweet Gum	Tree															
Liriodendron tulipifera	Tulip Poplar	Tree	2	2	2	4	4	4			2	1	1	1	2	2	2
Platanus occidentalis	Sycamore	Tree	3	3	5	4	4	20	3	3	3	4	4	17	3	3	6
Populus deltoides	Eastern Cottonwood	Tree															
Quercus lyrata	Overcup Oak	Tree															
Quercus michauxii	Swamp Chestnut Oak	Tree	2	2	2	1	1	1	4	4	4	1	1	1			
Quercus pagoda	Cherrybark Oak	Tree	4	4	4	2	2	2	2	2	2	1	1	1			
Quercus phellos	Willow Oak	Tree				2	2	2	2	2	2	1	1	1	1	1	1
Salix nigra	Black Willow	Tree															
Salix sericea	Silky Willow	Shrub Tree															
Sambucus canadensis	Common Elderberry	Shrub Tree			1												
		Stem count	14	14	17	13	13	29	13	13	17	11	11	24	11	11	35
		size (ares)	1			1			1			1			1		
		size (ACRES)	0.0247			0.0247			0.0247			0.0247			0.0247		
		Species count	5	5	6	5	5	5	5	5	7	6	6	6	5	5	5
		Stems per ACRE	567	567	688	526	526	1174	526	526	688	445	445	971	445	445	1416

Current Permanent Vegetation Plot Data (MY3 2021)																	
Scientific Name	**Common Name**	**Species Type**	**Permanent Plot 6**			**Permanent Plot 7**			**Permanent Plot 8**			**Permanent Plot 9**			**Permanent Plot 10**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree						1									
Acer rubrum	Red Maple	Tree															
Betula nigra	River Birch	Tree	3	3	3	3	3	4	3	3	73	2	2	2	2	2	2
Diospyros virginiana	American Persimmon	Tree															
Fraxinus pennsylvanica	Green Ash	Tree													2	2	2
Liquidambar styraciflua	Sweet Gum	Tree									10			2			
Liriodendron tulipifera	Tulip Poplar	Tree			1	1	1	1	2	2	2	2	2	2			1
Platanus occidentalis	Sycamore	Tree	3	3	7	5	5	5	2	2	72	5	5	9			1
Populus deltoides	Eastern Cottonwood	Tree															
Quercus lyrata	Overcup Oak	Tree															
Quercus michauxii	Swamp Chestnut Oak	Tree	1	1	1	2	2	2	1	1	1				2	2	2
Quercus pagoda	Cherrybark Oak	Tree							5	5	5	1	1	1	2	2	2
Quercus phellos	Willow Oak	Tree	2	2	2				1	1	1	2	2	2	3	3	3
Salix nigra	Black Willow	Tree															
Salix sericea	Silky Willow	Shrub Tree															
Sambucus canadensis	Common Elderberry	Shrub Tree															
		Stem count	9	9	14	11	11	13	14	14	164	12	12	18	11	11	13
		size (ares)	1			1			1			1			1		
		size (ACRES)	0.0247			0.0247			0.0247			0.0247			0.0247		
		Species count	4	4	5	4	4	5	6	6	7	5	5	6	5	5	7
		Stems per ACRE	364	364	567	445	445	526	567	567	6637	486	486	728	445	445	526

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes
P-all: Number of planted stems including live stakes
T: Total stems

Table 10b. Planted and Total Stem Counts
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Current Permanent Vegetation Plot Data (MY3 2021)																	
Scientific Name	**Common Name**	**Species Type**	**Permanent Plot 11**			**Permanent Plot 12**			**Permanent Plot 13**			**Permanent Plot 14**			**Permanent Plot 15**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree															
Acer rubrum	Red Maple	Tree															
Betula nigra	River Birch	Tree	1	1	1	3	3	3	2	2	2	3	3	3			
Diospyros virginiana	American Persimmon	Tree															
Fraxinus pennsylvanica	Green Ash	Tree							2	2	2	1	1	1	1	1	1
Liquidambar styraciflua	Sweet Gum	Tree															
Liriodendron tulipifera	Tulip Poplar	Tree															
Platanus occidentalis	Sycamore	Tree	2	2	2	1	1	3	2	2	3	4	4	5	3	3	3
Populus deltoides	Eastern Cottonwood	Tree										3	3	3			
Quercus lyrata	Overcup Oak	Tree	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2
Quercus michauxii	Swamp Chestnut Oak	Tree															
Quercus pagoda	Cherrybark Oak	Tree				2	2	2	2	2	2				1	1	1
Quercus phellos	Willow Oak	Tree							1	1	1						
Salix nigra	Black Willow	Tree			2												12
Salix sericea	Silky Willow	Shrub Tree															
Sambucus canadensis	Common Elderberry	Shrub Tree															
		Stem count	5	5	7	7	7	9	11	11	12	13	13	14	7	7	19
		size (ares)		1			1			1			1			1	
		size (ACRES)		0.0247			0.0247			0.0247			0.0247			0.0247	
		Species count	3	3	4	4	4	4	6	6	6	5	5	5	4	4	5
		Stems per ACRE	202	202	283	283	283	364	445	445	486	526	526	567	283	283	769

Current Permanent Vegetation Plot Data (MY3 2021)																	
Scientific Name	**Common Name**	**Species Type**	**Permanent Plot 16**			**Permanent Plot 17**			**Permanent Plot 18**			**Permanent Plot 19**			**Permanent Plot 20**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree									10						
Acer rubrum	Red Maple	Tree															
Betula nigra	River Birch	Tree				1	1	1				3	3	3	3	3	3
Diospyros virginiana	American Persimmon	Tree				1	1	1									
Fraxinus pennsylvanica	Green Ash	Tree				2	2	2	1	1	1	1	1	1	3	3	3
Liquidambar styraciflua	Sweet Gum	Tree									2						3
Liriodendron tulipifera	Tulip Poplar	Tree													3	3	3
Platanus occidentalis	Sycamore	Tree	2	2	4	5	5	8	6	6	6	3	3	8	3	3	38
Populus deltoides	Eastern Cottonwood	Tree				1	1	1									
Quercus lyrata	Overcup Oak	Tree	2	2	2	3	3	3	5	5	5	2	2	2	1	1	1
Quercus michauxii	Swamp Chestnut Oak	Tree															
Quercus pagoda	Cherrybark Oak	Tree							1	1	1				1	1	1
Quercus phellos	Willow Oak	Tree										2	2	2	1	1	1
Salix nigra	Black Willow	Tree															
Salix sericea	Silky Willow	Shrub Tree															
Sambucus canadensis	Common Elderberry	Shrub Tree															
		Stem count	4	4	6	13	13	16	13	13	25	11	11	16	15	15	53
		size (ares)		1			1			1			1			1	
		size (ACRES)		0.0247			0.0247			0.0247			0.0247			0.0247	
		Species count	2	2	2	6	6	6	4	4	6	5	5	5	7	7	8
		Stems per ACRE	162	162	243	526	526	647	526	526	1012	445	445	647	607	607	2145

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes
P-all: Number of planted stems including live stakes
T: Total stems

Table 10c. Planted and Total Stem Counts
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Current Permanent Vegetation Plot Data (MY3 2021)																	
Scientific Name	**Common Name**	**Species Type**	**Permanent Plot 21**			**Permanent Plot 22**			**Permanent Plot 23**			**Permanent Plot 24**			**Permanent Plot 25**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree															110
Acer rubrum	Red Maple	Tree						1	2	2	3						
Betula nigra	River Birch	Tree	1	1	1	2	2	2	2	2	2						
Diospyros virginiana	American Persimmon	Tree				1	1	1	2	2	2						
Fraxinus pennsylvanica	Green Ash	Tree				2	2	2	2	2	2	1	1	1			
Liquidambar styraciflua	Sweet Gum	Tree															
Liriodendron tulipifera	Tulip Poplar	Tree	1	1	1										2	2	12
Platanus occidentalis	Sycamore	Tree	3	3	13	3	3	4			2	1	1	9	1	1	1
Populus deltoides	Eastern Cottonwood	Tree			1	2	2	2	1	1	1						
Quercus lyrata	Overcup Oak	Tree	3	3	3	1	1	1	2	2	2	3	3	3	2	2	2
Quercus michauxii	Swamp Chestnut Oak	Tree															
Quercus pagoda	Cherrybark Oak	Tree	2	2	2										4	4	4
Quercus phellos	Willow Oak	Tree	3	3	3				2	2	2				1	1	1
Salix nigra	Black Willow	Tree															
Salix sericea	Silky Willow	Shrub Tree															
Sambucus canadensis	Common Elderberry	Shrub Tree															
		Stem count	13	13	24	11	11	13	13	13	16	5	5	13	10	10	130
		size (ares)		1			1			1			1			1	
		size (ACRES)		0.0247			0.0247			0.0247			0.0247			0.0247	
		Species count	6	6	7	6	6	7	7	7	8	3	3	3	5	5	6
		Stems per ACRE	526	526	971	445	445	526	526	526	647	202	202	526	405	405	5261

Current Permanent Vegetation Plot Data (MY3 2021) Total Stem Counts & Annual Means																	
Scientific Name	**Common Name**	**Species Type**	**MY3 (2021)**			**MY2 (2020)**			**MY1 (2019)**			**MY0 (2019)**					
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**			
Acer negundo	Box Elder	Tree			123			27			32						
Acer rubrum	Red Maple	Tree	2	2	4	1	1	3	3	3	4	3	3	3			
Betula nigra	River Birch	Tree	44	44	136	45	45	56	43	43	61	55	55	55			
Diospyros virginiana	American Persimmon	Tree	4	4	4	5	5	5	6	6	6	6	6	6			
Fraxinus pennsylvanica	Green Ash	Tree	21	21	21	21	21	21	22	22	23	23	23	23			
Liquidambar styraciflua	Sweet Gum	Tree			17			13			6						
Liriodendron tulipifera	Tulip Poplar	Tree	20	20	34	21	21	26	32	32	34	58	58	58			
Platanus occidentalis	Sycamore	Tree	71	71	254	72	72	218	75	75	188	77	77	77			
Populus deltoides	Eastern Cottonwood	Tree	7	7	8	7	7	8	8	8	8	8	8	8			
Quercus lyrata	Overcup Oak	Tree	33	33	33	31	31	31	32	32	32	33	33	33			
Quercus michauxii	Swamp Chestnut Oak	Tree	14	14	14	16	16	16	18	18	18	23	23	23			
Quercus pagoda	Cherrybark Oak	Tree	30	30	30	31	31	31	36	36	36	42	42	42			
Quercus phellos	Willow Oak	Tree	24	24	24	25	25	25	39	39	39	46	46	46			
Salix nigra	Black Willow	Tree			14			5									
Salix sericea	Silky Willow	Shrub Tree						2			2						
Sambucus canadensis	Common Elderberry	Shrub Tree			1												
		Stem count	270	270	717	275	275	487	314	314	489	374	374	374			
		size (ares)		25			25			25			25				
		size (ACRES)		0.6178			0.6178			0.6178			0.6178				
		Species count	11	11	15	11	11	15	11	11	14	11	11	11			
		Stems per ACRE	437	437	1161	445	445	788	508	508	792	605	605	605			

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes
P-all: Number of planted stems including live stakes
T: Total stems

Table 10d. Planted and Total Stem Counts
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Current Mobile Vegetation Plot (MP) Data (MY3 2021)																
Scientific Name	**Common Name**	**Species Type**	**MP1**	**MP2**	**MP3**	**MP4**	**MP5**	**MP6**	**MP7**	**MP8**	**MP9**	**MP10**	**MP11**	**MP12**	**MP13**	**MP14**	**MP15**
			PnoLS	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**
Acer negundo	Box Elder	Tree															
Acer rubrum	Red Maple	Tree					1				1			1			
Betula nigra	River Birch	Tree	1	1	3	2	3	1	1	1	1	1	2	1	1		4
Diospyros virginiana	American Persimmon	Tree															
Fraxinus pennsylvanica	Green Ash	Tree	2	1	1		3		2	1	3		1				2
Liquidambar styraciflua	Sweet Gum	Tree															
Liriodendron tulipifera	Tulip Poplar	Tree	1										5		1	3	6
Platanus occidentalis	Sycamore	Tree	2	4	1	4	5	2	3	5	2	4	4	6	6	16	4
Populus deltoides	Eastern Cottonwood	Tree								1	3						
Quercus lyrata	Overcup Oak	Tree	2	3	3	8		6	3	4		3		1	1		
Quercus michauxii	Swamp Chestnut Oak	Tree												1		1	
Quercus pagoda	Cherrybark Oak	Tree	1	2			1	1				3	1		2		1
Quercus phellos	Willow Oak	Tree	5	2	1	1	4			1	1	1					1
Salix nigra	Black Willow	Tree															
Salix sericea	Silky Willow	Shrub Tree															
Sambucus canadensis	Common Elderberry	Shrub Tree															
		Stem count	14	13	9	15	17	10	9	13	11	12	13	10	11	20	18
		size (ares)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		size (ACRES)	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247
		Species count	7	6	5	4	6	4	4	6	6	5	5	5	5	3	6
		Stems per ACRE	567	526	364	607	688	405	364	526	445	486	526	405	445	809	728

Current Mobile Vegetation Plot (MP) Data (MY3 2021) Total Stem Counts & Annual Means						
Scientific Name	**Common Name**	**Species Type**	**MY3 (2021)**	**MY2 (2020)**	**MY1 (2019)**	**MY0 (2019)**
			PnoLS	**PnoLS**	**PnoLS**	**PnoLS**
Acer negundo	Box Elder	Tree		3		
Acer rubrum	Red Maple	Tree	3		16	
Betula nigra	River Birch	Tree	23	24	28	27
Diospyros virginiana	American Persimmon	Tree		3		
Fraxinus pennsylvanica	Green Ash	Tree	16	16	8	18
Liquidambar styraciflua	Sweet Gum	Tree				
Liriodendron tulipifera	Tulip Poplar	Tree	16	10	12	47
Platanus occidentalis	Sycamore	Tree	68	47	60	43
Populus deltoides	Eastern Cottonwood	Tree	4	5		
Quercus lyrata	Overcup Oak	Tree	34	31	26	7
Quercus michauxii	Swamp Chestnut Oak	Tree	2	9		5
Quercus pagoda	Cherrybark Oak	Tree	12	41	19	56
Quercus phellos	Willow Oak	Tree	17	19	2	13
Salix nigra	Black Willow	Tree				
Salix sericea	Silky Willow	Shrub Tree				
Sambucus canadensis	Common Elderberry	Shrub Tree				
	Stem count		195	208	171	216
	size (ares)		15	15	15	15
	size (ACRES)		0.3707	0.3707	0.3707	0.3707
	Species count		10	11	8	8
	Stems per ACRE		526	561	461	583

Overall Site Annual Means			
MY3 (2021)	**MY2 (2020)**	**MY1 (2019)**	**MY0 (2019)**
PnoLS	**PnoLS**	**PnoLS**	**PnoLS**
	3		
5	1	19	3
67	69	71	82
4	8	6	6
37	37	30	41
36	31	44	105
139	119	135	120
11	12	8	8
67	62	58	40
16	25	18	28
42	72	55	98
41	44	41	59
465	483	485	590
40	40	40	40
0.9884	0.9884	0.9884	0.9884
11	12	11	11
470	489	491	597

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

Table 10e. Planted Stem Average Heights
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Average Stem Height (ft) by Plot				
	MY0	**MY1**	**MY2**	**MY3**
Permanent Plot 1	2.8	3.3	4.4	6.6
Permanent Plot 2	2.6	2.8	3.1	4.0
Permanent Plot 3	2.9	2.8	2.8	3.7
Permanent Plot 4	2.7	2.8	3.2	4.3
Permanent Plot 5	2.9	2.7	2.7	4.7
Permanent Plot 6	2.8	2.9	3.0	3.8
Permanent Plot 7	2.9	2.2	3.2	4.5
Permanent Plot 8	2.8	2.9	2.9	3.8
Permanent Plot 9	2.9	2.9	3.1	3.8
Permanent Plot 10	2.8	2.6	3.1	4.6
Permanent Plot 11	2.3	1.8	1.3	2.6
Permanent Plot 12	2.0	1.7	2.1	2.9
Permanent Plot 13	2.6	2.3	2.6	3.9
Permanent Plot 14	2.9	2.5	2.8	3.8
Permanent Plot 15	2.2	2.6	3.0	6.0
Permanent Plot 16	2.3	2.0	1.9	2.7
Permanent Plot 17	2.4	1.8	2.1	2.0
Permanent Plot 18	2.5	1.5	2.6	4.2
Permanent Plot 19	2.4	2.2	3.4	5.9
Permanent Plot 20	2.3	2.2	2.9	4.4
Permanent Plot 21	2.3	2.4	2.6	2.9
Permanent Plot 22	2.6	2.3	2.7	3.0
Permanent Plot 23	2.5	2.3	2.3	2.6
Permanent Plot 24	2.1	2.2	2.6	3.3
Permanent Plot 25	2.1	1.6	2.9	4.9
Permanent Plot Site Average	**2.5**	**2.4**	**2.8**	**3.9**
Mobile Plot 1	2.4	2.3	2.5	5.4
Mobile Plot 2	2.6	2.6	2.9	5.3
Mobile Plot 3	2.4	2.0	4.4	4.5
Mobile Plot 4	2.3	2.4	2.6	4.4
Mobile Plot 5	2.1	2.0	3.7	4.1
Mobile Plot 6	2.2	1.8	2.9	4.3
Mobile Plot 7	2.3	2.4	2.0	3.2
Mobile Plot 8	2.0	2.2	2.1	2.4
Mobile Plot 9	2.5	2.6	2.8	1.9
Mobile Plot 10	2.1	2.5	2.7	4.7
Mobile Plot 11	2.5	2.4	3.4	5.6
Mobile Plot 12	2.5	2.0	4.2	3.0
Mobile Plot 13	2.3	2.3	2.1	4.2
Mobile Plot 14	2.4	2.0	1.8	4.9
Mobile Plot 15	2.1	3.0	4.1	3.1
Mobile Plot Site Average	**2.3**	**2.3**	**2.9**	**4.1**
Overall Site Average	**2.5**	**2.3**	**2.8**	**4.0**

APPENDIX 4. Morphological Summary Data and Plots

Table 11a. Baseline Stream Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

East Side

		Pre-Restoration Condition						Design								As-Built/Baseline							
Parameter	**Gage**	**UT1 Reach 1**		**UT1 Reach 2**		**UT1 Reach 3**		**UT1 Reach 1**		**UT1 Reach 2A**		**UT1 Reach 2B**		**UT1 Reach 3**		**UT1 Reach 1**		**UT1 Reach 2A**		**UT1 Reach 2B**		**UT1 Reach 3**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																							
Bankfull Width (ft)	N/A	4.8		8.9		10.0		6.5		7.8		10.7		11.8		6.9		7.3		10.3	10.5	11.3	12.5
Floodprone Width (ft)		13.1		13.2		31.1		15	50	15	50	25	100	25	100	29		46	65+	49+	68+	60+	68+
Bankfull Mean Depth (ft)		0.8		0.8		1.3		0.5		0.5		0.8		0.8		0.6		0.6		0.8		0.7	
Bankfull Max Depth (ft)		1.4		1.3		1.9		0.6		0.7		1.0		1.0		1.0		0.9	1.0	1.2	1.3	1.1	
Bankfull Cross-sectional Area (ft^2)		3.8		7.2		13.4		3.0		4.2		8.1		9.5		4.2		4.5	4.6	7.9	8.5	8.3	8.7
Width/Depth Ratio		6.2		11.0		7.5		14.2		14.6		14.3		14.6		11.5		11.5	11.8	12.9	13.3	15.5	18.0
Entrenchment Ratio		2.7		1.5		3.1		2.2+		2.2+		2.2+		2.2+		4.2		6.3	9.0+	4.7+	6.6+	5.3+	5.4+
Bank Height Ratio		3.8		2.6		1.7		1.0		1.0		1.0		1.0		1.0		1.0		1.0		1.0	
D_{50} (mm)		15.1		41.0		19.6		---		---		---		---		59.6		37.0	37.9	35.6	45.0	41.6	47.4
Profile																							
Riffle Length (ft)	N/A																						
Riffle Slope (ft/ft)								0.020	0.041	0.011	0.055	0.018	0.045	0.016	0.048	N/A[1]	N/A[1]	0.003	0.068	0.013	0.072	0.013	0.055
Pool Length (ft)																							
Pool Max Depth (ft)		1.4		1.4		1.7		1.7		1.8		3.2		2.9		1.1	3.0	1.3	2.8	1.8	3.1	1.8	3.7
Pool Spacing (ft)		5	20	29	42	18	32	14	26	16	39	34	109	48	113	5	76	6	51	18	145	41	129
Pool Volume (ft^3)																							
Pattern																							
Channel Beltwidth (ft)	N/A	6	12	---		12	14	N/A[2]		N/A[2]		31	67	35	71	N/A[2]		N/A[2]		31	67	35	71
Radius of Curvature (ft)		3	8	---		5	12	N/A[2]		N/A[2]		20	38	19	38	N/A[2]		N/A[2]		20	38	19	38
Rc/Bankfull Width (ft/ft)		0.6	1.7	---		5	12	N/A[2]		N/A[2]		1.9	3.6	1.6	3.2	N/A[2]		N/A[2]		1.9	3.6	1.7	3.0
Meander Length (ft)		9	19	---		14	43	N/A[2]		N/A[2]		102	190	102	196	N/A[2]		N/A[2]		102	190	102	196
Meander Width Ratio		1.3	2.5	---		1.2	1.4	N/A[2]		N/A[2]		2.9	6.3	3.0	6.0	N/A[2]		N/A[2]		3.0	6.4	3.1	5.7
Substrate, Bed and Transport Parameters																							
Ri%/Ru%/P%/G%/S%	N/A																						
SC%/Sa%/G%/C%/B%/Be%																							
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$		SC/0.37/3.7/54.2/75.9/128		1.35/11.0/38/90/193.1/2048		0.19/0.39/0.73/26.3/52.5/90										0.4/1.8/33.9/108/156.5/256		0.3/14.1/21.6/67.2/137/362		0.3/0.4/22.6/59.2/104.7/362		0.3/16/25.6/62.4/113.8/180	
Reach Shear Stress (Competency) lb/ft^2		---		---		---		1.74		0.95		0.75		0.76		1.97		1.06	1.08	0.85	0.88	0.65	0.68
Max part size (mm) mobilized at bankfull								228		146		123		125		97		52	53	42	43	32	33
Stream Power (Capacity) W/m^2																							
Additional Reach Parameters																							
Drainage Area (SM)	N/A	0.07		0.37		0.45		0.07		0.12		0.32		0.44		0.07		0.12		0.32		0.44	
Watershed Impervious Cover Estimate (%)		3%						3%								3%							
Rosgen Classification		E5b		G4		E4		A4		B4		C4		C4		A4		B4		C4		C4	
Bankfull Velocity (fps)		2.9		4.8		4.1		4.1		3.7		3.8		4.0		4.8		3.9	4.0	4.1	4.2	3.7	3.8
Bankfull Discharge (cfs)		11		35		55		11		15		30		38		20.2		17.7	18.3	32.7	36.2	30.4	31.0
Q-NFF regression (2-yr)		---		---		---																	
Q-USGS extrapolation (1.2-yr)		---		---		---		11		16		34		42									
Max Q-Mannings		---		---		---		601		304		304		218									
Valley Slope (ft/ft)		0.0411		0.0454		0.0049		0.0648		0.0313		0.0225		0.0203		---		---		---		---	
Channel Thalweg Length (ft)		6,015						966		1,746		1,368		1,641		966		1,746		1,368		1,641	
Sinuosity		1.08		1.04		1.13						1.25		1.30						1.25		1.30	
Bankfull/Channel Slope (ft/ft)		0.0295		0.0256		0.0101		0.0622		0.0290		0.0180		0.0156		0.0555		0.0292		0.0182		0.0153	

1. UT1 Reach 1 riffle slopes were not calculated because this reach is comprised of a series of rock steps and cascades.
2. Pattern data is not applicable for A-type and B-type channels
SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 11b. Baseline Stream Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

West Side - UT2, UT2A, UT2B

		Pre-Restoration Condition										Design								As-built/Baseline							
Parameter	**Gage**	**UT2 Reach 1**		**UT2 Reach 2**		**UT2 Reach 3**		**UT2A**		**UT2B**		**UT2 Reach 1**		**UT2 Reach 2**		**UT2A**		**UT2B**		**UT2 Reach 1**		**UT2 Reach 2**		**UT2A**		**UT2B**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																											
Bankfull Width (ft)	N/A	8.7		7.7		8.4		3.4	4.7	3.9	4.1	6.5		11.0		5.5		7.5		8.3		11.8	11.9	5.4	5.7	7.2	9.6
Floodprone Width (ft)		12.3		10.7		13.0		5.4	11.4	5.1	6.4	130+		250+		100+		100+		69+		65+	72+	51+	57+	56+	66+
Bankfull Mean Depth (ft)		0.7		0.8		0.7		0.5	0.7	0.3		0.5		0.7		0.4		0.5		0.7		0.8	0.9	0.4	0.4	0.5	0.5
Bankfull Max Depth (ft)		0.9		1.2		1.1		0.9		0.5	0.6	0.8		1.0		0.6		0.9		1.2		1.2	1.3	0.5	0.7	0.8	0.8
Bankfull Cross-sectional Area (ft^2)		5.7		6.1		5.7		2.2	2.3	1.3	1.4	3.9		7.8		2.1		4.1		6.1		9.1	10.2	1.9	2.4	3.9	4.3
Width/Depth Ratio		13.1		9.8		12.3		5.1	9.5	11.4	13.0	14.0		16.0		14.0		14.0		11.3		13.6	15.6	13.6	15.2	13.4	21.1
Entrenchment Ratio		1.4		1.1		1.5		1.6	2.4	1.2	1.6	2.2+		2.2+		2.2+		1.4	2.2+	8.3+		5.5+	6.1+	9.0+	10.5+	6.9+	7.8+
Bank Height Ratio		4.4		2.3		3.1		2.7	3.1	6.5	7.2	1.0		1.0		1.0		1.0		1.0		1.0		1.0		1.0	
D_{50} (mm)		34.4		11.4		---		---		---		---		---		---		---		26.9		25.4	33.4	21.0	28.1	25.1	30.6
Profile																											
Riffle Length (ft)	N/A																										
Riffle Slope (ft/ft)												0.020	0.034	0.003	0.025	0.006	0.045	0.004	0.056	0.006	0.034	0.004	0.035	0.001	0.046	0.001	0.037
Pool Length (ft)																											
Pool Max Depth (ft)		1.2		1.5		1.5		---		---		1.1	1.8	1.1	2.5	0.6	1.4	0.8	1.9	1.2	2.5	2.1	3.2	0.9	1.3	1.5	2.7
Pool Spacing (ft)		24	30	22	44	23	68	---		---		8	45	39	77	19	39	26	53	15	78	45	127	18	58	7	58
Pool Volume (ft^3)																											
Pattern																											
Channel Beltwidth (ft)	N/A	---		---		---		---		---		N/A[1]		39	88	19	44	26	60	N/A[1]		39	88	19	44	26	60
Radius of Curvature (ft)		---		---		---		---		---		N/A[1]		20	39	10	19	14	23	N/A[1]		20	39	10	19	14	23
Rc/Bankfull Width (ft/ft)		---		---		---		---		---		N/A[1]		1.8	3.5	1.8	3.5	1.8	3.0	N/A[1]		1.7	3.3	1.9	3.3	1.9	2.4
Meander Length (ft)		---		---		---		---		---		N/A[1]		72	154	36	77	49	105	N/A[1]		72	154	36	77	49	105
Meander Width Ratio		---		---		---		---		---		N/A[1]		3.5	8.0	3.5	8.0	3.5	8.0	N/A[1]		3.3	7.4	3.5	7.7	3.6	6.3
Substrate, Bed and Transport Parameters																											
Ri%/Ru%/P%/G%/S%	N/A																										
SC%/Sa%/G%/C%/B%/Be%																											
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$		0.37/1.38/7.1/ 49.5/75.9/128		0.25/0.59/1.1/17.9/35.9/90				---		---		---		---		---		---		SC/SC/0.5/47.3/ 90/128		SC/SC/SC/42/ 71.7/180		SC/SC/0.5/42.5/ 90/180		SC/SC/0.4/43.3/ 82.6/256	
Reach Shear Stress (Competency) lb/ft^2		---		---		---		---		---		0.66		1.66		---		---		0.79		0.33	0.38	---		---	
Max part size (mm) mobilized at bankfull		---		---		---		---		---		112		221		---		---		39		16	19	---		---	
Stream Power (Capacity) W/m^2																											
Additional Reach Parameters																											
Drainage Area (SM)	N/A	0.14		0.26		0.27		0.02		0.04		0.14		0.26		0.02		0.05		0.14		0.26		0.02		0.05	
Watershed Impervious Cover Estimate (%)		1%						---		---		1%				---		---		1%				---		---	
Rosgen Classification		G4		G5		G5		G5		G5		B4		C4		C4		C/Cb4		B4		C4		C4		C4	
Bankfull Velocity (fps)		3.4		2.3		1.8		1.6	1.8	1.7	1.8	3.4		2.6		1.9		2.0		3.9		2.6	2.8	1.9	2.1	2.3	2.6
Bankfull Discharge (cfs)		19		14		10		4		2	3	14		20		4		8		24.0		23.6	28.9	3.7	5.1	10.1	10.1
Q-NFF regression (2-yr)		---		---		---		---		---																	
Q-USGS extrapolation (1.2-yr)		---		---		---		---		---		18		29		4		9									
Max Q-Mannings		---		---		---		---		---		331		75		52		124									
Valley Slope (ft/ft)		0.0205		0.0123		0.0086		0.0028		0.0027		0.0280		0.0045	0.0130	0.0057	0.0170	0.0060	0.0400	---		---		---		---	
Channel Thalweg Length (ft)		2,527						1,184		699		623		1080		655		776		623		1,080		655		776	
Sinuosity		1.01		1.02		1.05		1.00		1.00		1.10		1.30		1.20		1.20		1.10		1.30		1.20		1.20	
Bankfull/Channel Slope (ft/ft)		0.0154		0.0062		0.0043		0.0052		0.0107		0.0200		0.0030	0.0120	0.0050	0.0140	0.0040	0.0280	0.0180		0.0072		0.0110		0.0115	

1. Pattern data is not applicable for B-type channels
SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 11c. Baseline Stream Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

West Side - UT3

		Pre- Restoration				Design						As-Built/Baseline					
Parameter	**Gage**	**UT3 Reach 1**		**UT3 Reach 2**		**UT3 Reach 1**		**UT3 Reach 2**		**UT3 Reach 3**		**UT3 Reach 1**		**UT3 Reach 2**		**UT3 Reach 3**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																	
Bankfull Width (ft)	N/A	11.2		10.0		13.0		16.2		19.0		13.7		16.7		19.2	
Floodprone Width (ft)		17.4		150+		75		100+		42	219	73+		76+		71+	
Bankfull Mean Depth (ft)		1.2		1.0		0.9		1.0		1.1		0.9		1.0		1.0	
Bankfull Max Depth (ft)		1.8		2.1		1.4		1.7		2.0		1.5		1.9		1.9	
Bankfull Cross-sectional Area (ft^2)		13.7		10.2		12.1		16.2		21.1		12.8		16.5		19.5	
Width/Depth Ratio		9.1		9.9		14.4		16.2		17.1		14.7		17.0		19.0	
Entrenchment Ratio		1.3		14.9+		1.4	2.2+	2.2+		2.2+		5.3+		4.5+		3.7+	
Bank Height Ratio		2.6		1.4		1.0		1.0		1.0		1.0		1.0		1.0	
D_{50} (mm)		12.5		0.9		---		---		---		50.0		31.2		47.0	
Profile																	
Riffle Length (ft)	N/A																
Riffle Slope (ft/ft)						0.012	0.017	0.002	0.022	0.002	0.008	0.001	0.023	0.002	0.012	0.0002	0.005
Pool Length (ft)																	
Pool Max Depth (ft)		1.9		2.7		1.9	3.3	1.5	3.5	1.7	3.9	2.8	3.9	2.5	4.1	3.3	3.9
Pool Spacing (ft)		12	87	48	185	169	1014	57	113	67	133	64	163	53	186	83	180
Pool Volume (ft^3)																	
Pattern																	
Channel Beltwidth (ft)	N/A	4	10	---		N/A[1]		57	130	67	152	N/A[1]		57	130	67	152
Radius of Curvature (ft)		4	8	---		N/A[1]		29	57	34	67	N/A[1]		29	57	34	67
Rc/Bankfull Width (ft/ft)		0.4	0.7	---		N/A[1]		1.8	3.5	1.8	3.5	N/A[1]		1.7	3.4	1.8	3.5
Meander Length (ft)		15	28	---		N/A[1]		105	227	124	266	N/A[1]		105	227	124	266
Meander Width Ratio		0.4	0.9	---		N/A[1]		3.5	8.0	3.5	8.0	N/A[1]		3.4	7.8	3.5	7.9
Substrate, Bed and Transport Parameters																	
Ri%/Ru%/P%/G%/S%	N/A																
SC%/Sa%/G%/C%/B%/Be%																	
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$		0.22/0.87/2.5/ 22.6/47.7/64		SC/0.12/0.24/ 4.63/7.7/16		---		---		---		SC/0.2/0.4/ 59.2/107.3/180		SC/SC/0.2/41.6/ 61.5/180		SC/SC/SC/64/ 151.8/362	
Reach Shear Stress (Competency) lb/ft^2		---		---		0.61		---		---		0.42		---		---	
Max part size (mm) mobilized at bankfull		---		---		106		---		---		21		---		---	
Stream Power (Capacity) W/m^2																	
Additional Reach Parameters																	
Drainage Area (SM)	N/A	0.59		0.65		0.63		0.63		0.88		0.63		0.63		0.88	
Watershed Impervious Cover Estimate (%)		2%				2%						2%					
Rosgen Classification		G4		G5		B4c		C4		C4		B4c		C4		C4	
Bankfull Velocity (fps)		4.0		2.0		3.6		2.7		1.8		3.0		1.9		0.8	
Bankfull Discharge (cfs)		54.8		20.4		45		45		55		38.6		31.1		16.0	
Q-NFF regression (2-yr)		---		---		---		---		---							
Q-USGS extrapolation (1.2-yr)		---		---		53		56		71							
Max Q-Mannings		---		---		370		39		N/A[2]							
Valley Slope (ft/ft)		0.0145		0.0050		0.0120		0.0030	0.0140	0.0022		---		---		---	
Channel Thalweg Length (ft)		2,008				779		1159		764		779		1,159		764	
Sinuosity		1.06		1.01		1.10		1.40		1.20		1.10		1.40		1.20	
Bankfull/Channel Slope (ft/ft)		0.0107		0.0034		0.0110		0.0020	0.0110	0.0020		0.0075		0.0027		0.0005	

1. Pattern data is not applicable for B-type channels
2. UT3 Reach 3 post-restoration combines flow from the existing conditions UT2 Reach 3 and UT3.
SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 11d. Reference Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Parameter	Gage	Reference Reach Data																	
		UT to Kelly Branch		Pilot Mountain Trib		Lone Hickory UT3 - Onsite Reference		UT to South Crowders		UT to S. Fork Catawba - Vile Preserve		UT to Lyle Creek		Deep Creek Mitigation		Cooleemee Plantation	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																			
Bankfull Width (ft)	N/A	6.4		8.6		6.7		6.1	8.4	6.1	6.2	7.0	8.6	12.9		14.7	18.1
Floodprone Width (ft)		9.1		13.3		20.0		26.0	31.0	200+		45.0	49.0	135.0		140+	
Bankfull Mean Depth		0.7		0.7		0.5		1.0	1.1	0.7	0.8	0.5		1.4		0.8	1.0
Bankfull Max Depth		0.9		1.0		0.8		1.4		1.3	1.4	1.0	1.1	2.3		1.6	
Bankfull Cross-sectional Area (ft^2)		4.5		6.0		3.6		6.4	8.7	4.5	5.3	3.5	4.1	17.1		13.6	14.9
Width/Depth Ratio		9.2		12.5		13.4		5.8	8.0	7.4	8.3	14.9	18.3	9.6		14.6	24.1
Entrenchment Ratio		1.4		1.5		3.0		3.7	4.3	30+		5.7	6.4	10.5		8.8+	
Bank Height Ratio		1.0		1.0		1.0		1.4	2.1	1.0		1.0		1.0		1.0	
D50 (mm)		9.4		---		---		---		---		---		---		---	
Profile																			
Riffle Length (ft)	N/A	---		---		---		---		---		---		---		---	
Riffle Slope (ft/ft)		---		0.0150	0.1200	0.0229	0.0615	0.0202	0.0664	0.0260		0.0055	0.0597	0.0019	0.009	0.0027	0.0130
Pool Length (ft)		---		---		---		---		---		---		---		---	
Pool Max Depth (ft)		---		1.6		2.0		1.3	3	1.4		1.3		3.2		2.0	
Pool Spacing (ft)		---		7	52	13	77	28	63	45		15	28	29	103	19	35
Pool Volume (ft^3)																	
Pattern																			
Channel Beltwidth (ft)	N/A	18	34	---		12	31	81		---		21		45	71	22	30
Radius of Curvature (ft)		8	26	---		---		9	20	---		19	32	18	33	14	38
Rc/Bankfull Width (ft/ft)		1.2	4.1	---		---		1.5	2.4	---		2.7	3.7	1.4	2.6	0.9	2.3
Meander Length (ft)		27	94	---		55		45	72	---		39	44	95	130	58	70
Meander Width Ratio		2.8	5.3	---		1.8	4.6	9.6	13.3	---		2.4	3.0	3.5	5.5	1.3	1.8
Substrate, Bed and Transport Parameters																			
Ri%/Ru%/P%/G%/S%	N/A																		
SC%/Sa%/G%/C%/B%/Be%																			
d16/d35/d50/d84/d95/d100		0.25/3.2/9.4/45/ 140/---		SC/5.6/20.1/128/ 322.5/>2048		0.2/1.5/16.8/69.7/ 115.7/180		0.8/12.1/19.7/49.5/ 75.9/180		---		NA/0.07/0.17/0.54/ 4.0/8.0		SC/0.2/0.2/1.1/ 8.9/22.6		---	
Reach Shear Stress (Competency) lb/ft^2																			
Max part size (mm) mobilized at bankfull																			
Stream Power (Capacity) W/m^2																			
Additional Reach Parameters																			
Drainage Area (SM)	N/A	0.08		0.27		0.17		0.22		0.94		0.25		0.67		0.68	
Watershed Impervious Cover Estimate (%)		---		---		---		---		---		---		---		---	
Rosgen Classification		A4		B4		C4		E4		E5		C5		C5		C5	
Bankfull Velocity (fps)		4.4		5.3		3.2		2.9		11		4.7		2.4		1.8	
Bankfull Discharge (cfs)		19		32		12		22		54		18		41		26	
Q-NFF regression (2-yr)																			
Q-USGS extrapolation (1.2-yr)																			
Q-Mannings																			
Valley Length (ft)		---		---		---		---		---		---		---		---	
Channel Thalweg Length (ft)		---		---		---		---		---		---		---		---	
Sinuosity		1.2		1.05		1.32		2.20		1.03		1.10		1.60		1.10	
Water Surface Slope (ft/ft)		---		---		---		---		---		---		---		---	
Bankfull/Channel Slope (ft/ft)		0.03 - 0.065		0.0378		0.0185		0.0091		0.0068		0.0057		0.0028		0.0027	

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 12a. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

East Side (UT1 Reach 1 and UT1 Reach 2A)

	UT1 Reach 1 Cross-Section 1, Pool								UT1 Reach 1 Cross-Section 2, Riffle								UT1 Reach 2A Cross-Section 3, Pool							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	918.84	918.82	918.82	918.93					918.21	918.31	918.31	918.41					870.19	870.39	870.37	870.52				
low bank height elevation	918.84	918.82	918.82	918.93					918.21	918.21	918.25	918.36					870.19	870.39	870.37	870.52				
Bankfull Width (ft)	8.2	8.5	8.3	8.2					6.9	7.0	6.9	7.1					9.2	9.9	9.4	11.1				
Floodprone Width (ft)	---	---	---	---					29	27	28	30					---	---	---	---				
Bankfull Mean Depth (ft)	1.0	0.9	1.0	1.0					0.6	0.5	0.5	0.5					1.2	1.2	1.2	1.4				
Bankfull Max Depth (ft)	1.8	1.6	1.6	1.7					1.0	0.9	0.9	1.0					2.1	2.5	2.4	2.6				
Bankfull Cross-Sectional Area (ft^2)	8.5	7.3	8.0	8.4					4.2	3.5	3.8	3.9					11.4	12.1	11.6	15.1				
Bankfull Width/Depth Ratio	7.8	9.9	8.6	8.0					11.5	13.9	12.6	13.0					7.4	8.0	7.5	8.1				
Bankfull Entrenchment Ratio	---	---	---	---					4.2	3.8	4.1	4.2					---	---	---	---				
Bankfull Bank Height Ratio	---	---	---	---					1.0	0.9	0.9	1.0					---	---	---	---				
	UT1 Reach 2A Cross-Section 4, Riffle								**UT1 Reach 2A Cross-Section 5, Riffle**								**UT1 Reach 2A Cross-Section 6, Pool**							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	868.46	868.60	868.61	868.71					844.23	844.17	844.12	844.12					843.72	843.72	843.74	843.75				
low bank height elevation	868.46	868.68	868.61	868.73					844.23	844.26	844.24	844.29					843.72	843.72	843.74	843.75				
Bankfull Width (ft)	7.3	9.2	7.5	7.3					7.3	8.1	7.9	8.0					9.1	9.5	9.4	9.6				
Floodprone Width (ft)	46	46	49	51					65+	65+	65+	65+					---	---	---	---				
Bankfull Mean Depth (ft)	0.6	0.6	0.6	0.6					0.6	0.7	0.7	0.7					1.2	1.4	1.5	1.7				
Bankfull Max Depth (ft)	0.9	1.1	1.1	1.3					1.0	1.2	1.4	1.4					1.9	2.5	2.2	2.6				
Bankfull Cross-Sectional Area (ft^2)	4.5	5.1	4.5	4.6					4.6	5.3	5.6	5.8					10.5	13.6	13.9	15.9				
Bankfull Width/Depth Ratio	11.8	16.4	12.5	11.5					11.5	12.4	11.3	11.1					7.9	6.6	6.3	5.8				
Bankfull Entrenchment Ratio	6.3	5.0	6.5	7.0					9.0+	8.1+	8.2+	8.1+					---	---	---	---				
Bankfull Bank Height Ratio	1.0	1.1	1.0	1.0					1.0	1.1	1.1	1.1					---	---	---	---				

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

Table 12b. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

East Side (UT1 Reach 2B and UT1 Reach 3)

	UT1 Reach 2B Cross-Section 7, Riffle								UT1 Reach 2B Cross-Section 8, Pool								UT1 Reach 2B Cross-Section 9, Riffle							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	817.28	817.17	817.07	817.18					809.31	809.23	809.38	809.42					804.58	804.61	804.66	804.72				
low bank height elevation	817.28	817.14	817.13	817.27					809.31	809.23	809.38	809.42					804.58	804.64	804.71	804.66				
Bankfull Width (ft)	10.3	10.1	10.1	11.1					12.6	13.0	13.6	12.4					10.5	11.5	11.2	10.8				
Floodprone Width (ft)	68+	68+	68+	68+					---	---	---	---					49+	49+	49+	49+				
Bankfull Mean Depth (ft)	0.8	0.7	0.8	0.8					1.2	1.0	1.1	1.3					0.8	0.8	0.8	0.7				
Bankfull Max Depth (ft)	1.2	1.3	1.4	1.5					2.6	2.1	2.3	2.8					1.3	1.4	1.4	1.4				
Bankfull Cross-Sectional Area (ft^2)	7.9	7.5	8.5	8.8					15.4	12.8	14.4	16.0					8.5	8.9	9.0	7.8				
Bankfull Width/Depth Ratio	13.3	13.7	12.0	13.9					10.3	13.2	12.9	9.6					12.9	15.0	13.9	14.9				
Bankfull Entrenchment Ratio	6.6+	6.7+	6.7+	6.1+					---	---	---	---					4.7+	4.3+	4.4+	4.6+				
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.1					---	---	---	---					1.0	1.0	1.0	1.0				

	UT1 Reach 3 Cross-Section 10, Riffle								UT1 Reach 3 Cross-Section 11, Riffle								UT1 Reach 3 Cross-Section 12, Pool							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	794.10	793.96	793.89	793.59					791.15	791.14	791.33	791.49					787.94	787.82	787.89	787.73				
low bank height elevation	794.10	793.96	794.04	794.11					791.15	791.06	791.10	791.29					787.94	787.82	787.89	787.73				
Bankfull Width (ft)	11.3	10.8	10.7	11.2					12.5	11.6	10.5	11.2					16.7	16.2	15.0	12.2				
Floodprone Width (ft)	60+	60+	60+	60+					68+	68+	68+	68+					---	---	---	---				
Bankfull Mean Depth (ft)	0.7	0.8	0.9	1.2					0.7	0.7	0.6	0.6					1.1	1.1	1.0	1.0				
Bankfull Max Depth (ft)	1.1	1.3	1.7	2.5					1.1	1.1	1.1	1.2					2.4	2.4	2.2	2.0				
Bankfull Cross-Sectional Area (ft^2)	8.3	8.3	9.8	13.1					8.7	7.7	6.2	6.5					18.7	17.8	15.5	12.5				
Bankfull Width/Depth Ratio	15.5	14.1	11.6	9.6					18.0	17.4	17.9	19.3					14.8	14.7	14.5	11.9				
Bankfull Entrenchment Ratio	5.3+	5.5+	5.6+	5.3+					5.4+	5.8+	6.4+	6.0+					---	---	---	---				
Bankfull Bank Height Ratio	1.0	1.0	1.1	1.3					1.0	0.9	0.8	0.9					---	---	---	---				

	UT1 Reach 3 Cross-Section 13, Pool							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	783.88	783.76	783.92	783.56				
low bank height elevation	783.88	783.76	783.92	783.56				
Bankfull Width (ft)	15.6	16.3	16.6	9.7				
Floodprone Width (ft)	---	---	---	---				
Bankfull Mean Depth (ft)	1.4	1.4	1.3	1.7				
Bankfull Max Depth (ft)	2.6	3.0	3.0	2.8				
Bankfull Cross-Sectional Area (ft^2)	22.4	22.4	20.9	16.7				
Bankfull Width/Depth Ratio	10.9	11.9	13.2	5.6				
Bankfull Entrenchment Ratio	---	---	---	---				
Bankfull Bank Height Ratio	---	---	---	---				

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

Table 12c. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

West Side (UT2 & UT2A)

	UT2 Reach 1 Cross-Section 14, Pool								UT2 Reach 1 Cross-Section 15, Riffle								UT2 Reach 2 Cross-Section 16, Riffle							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	772.71	772.82	772.87	773.14					772.61	772.56	772.67	772.44					759.49	759.41	759.60	759.59				
low bank height elevation	772.71	772.82	772.87	773.14					772.61	772.56	772.67	772.81					759.49	759.31	759.54	759.39				
Bankfull Width (ft)	9.3	10.4	9.3	9.4					8.3	8.3	8.5	8.3					11.8	12.2	12.5	11.6				
Floodprone Width (ft)	---	---	---	---					69+	69+	69+	69+					65+	65+	65+	65+				
Bankfull Mean Depth (ft)	0.8	0.9	0.9	1.1					0.7	0.7	0.7	1.1					0.9	0.7	0.7	0.7				
Bankfull Max Depth (ft)	1.5	1.8	1.6	2.0					1.2	1.3	1.5	2.1					1.3	1.3	1.3	1.4				
Bankfull Cross-Sectional Area (ft^2)	7.6	8.9	8.3	10.2					6.1	6.1	6.1	8.8					10.2	9.0	9.3	7.8				
Bankfull Width/Depth Ratio	11.4	12.0	10.3	8.7					11.3	11.5	11.7	7.8					13.6	16.4	16.6	17.0				
Bankfull Entrenchment Ratio	---	---	---	---					8.3+	8.2+	8.1+	8.3+					5.5+	5.3+	5.2+	5.6+				
Bankfull Bank Height Ratio	---	---	---	---					1.0	1.0	1.0	1.2					1.0	0.9	0.9	0.9				
	UT2 Reach 2 Cross-Section 17, Riffle								**UT2 Reach 2 Cross-Section 18, Pool**								**UT2A Cross-Section 19, Riffle**							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	758.87	758.79	758.82	758.97					758.62	758.70	758.76	758.85					763.99	763.92	764.15	764.30				
low bank height elevation	758.87	758.82	758.93	758.95					758.62	758.70	758.76	758.85					763.99	763.94	764.15	764.28				
Bankfull Width (ft)	11.9	13.2	13.0	12.7					15.2	16.3	15.2	15.2					5.4	5.5	5.3	6.1				
Floodprone Width (ft)	72+	72+	72+	72+					---	---	---	---					57+	57+	57+	57+				
Bankfull Mean Depth (ft)	0.8	0.7	0.8	0.7					1.4	1.5	1.5	1.5					0.4	0.4	0.4	0.3				
Bankfull Max Depth (ft)	1.2	1.4	1.4	1.3					2.5	2.6	2.6	2.6					0.5	0.6	0.6	0.7				
Bankfull Cross-Sectional Area (ft^2)	9.1	9.5	10.5	8.9					21.8	24.0	22.8	23.4					1.9	2.0	1.9	1.7				
Bankfull Width/Depth Ratio	15.6	18.2	16.1	18.0					10.6	11.1	10.1	9.9					15.2	15.0	15.3	21.4				
Bankfull Entrenchment Ratio	6.1+	5.5+	5.5+	5.7+					---	---	---	---					10.5+	10.4+	10.6+	9.4+				
Bankfull Bank Height Ratio	1.0	1.0	1.1	1.0					---	---	---	---					1.0	1.0	1.0	1.0				
	UT2A Cross-Section 20, Pool								**UT2A Cross-Section 21, Riffle**								**UT2A Cross-Section 22, Pool**							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	761.60	761.65	761.73	761.72					760.53	760.61	760.72	760.76					760.53	760.60	760.59	760.64				
low bank height elevation	761.60	761.65	761.73	761.72					760.53	760.52	760.61	760.71					760.53	760.60	760.59	760.64				
Bankfull Width (ft)	6.9	6.6	6.8	7.3					5.7	5.8	5.0	6.0					7.2	9.3	7.4	7.8				
Floodprone Width (ft)	---	---	---	---					51+	51+	51+	51+					---	---	---	---				
Bankfull Mean Depth (ft)	0.6	0.6	0.5	0.5					0.4	0.3	0.4	0.3					0.6	0.5	0.5	0.4				
Bankfull Max Depth (ft)	1.2	1.2	1.1	1.1					0.7	0.6	0.6	0.5					1.1	1.1	0.9	0.8				
Bankfull Cross-Sectional Area (ft^2)	4.1	3.7	3.5	3.8					2.4	2.0	1.8	2.1					4.3	4.8	3.7	3.4				
Bankfull Width/Depth Ratio	11.6	11.7	12.9	14.0					13.6	17.2	13.7	17.1					12.1	18.1	14.9	17.8				
Bankfull Entrenchment Ratio	---	---	---	---					9.0+	8.8+	10.1+	8.6+					---	---	---	---				
Bankfull Bank Height Ratio	---	---	---	---					1.0	0.8	0.8	0.9					---	---	---	---				

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

Table 12d. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

West Side (UT2B & UT3)

	UT2B Cross-Section 23, Pool								UT2B Cross-Section 24, Riffle								UT2B Cross-Section 25, Riffle							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	761.34	761.26	761.44	761.45					761.16	761.15	761.36	761.21					760.67	760.65	760.77	760.67				
low bank height elevation	761.34	761.26	761.44	761.45					761.16	761.07	761.27	761.12					760.67	760.61	760.79	760.70				
Bankfull Width (ft)	9.9	10.1	9.8	10.2					9.6	7.9	8.3	8.1					7.2	6.9	7.4	7.3				
Floodprone Width (ft)	---	---	---	---					66+	66+	66+	66+					56+	56+	56+	56+				
Bankfull Mean Depth (ft)	0.9	0.8	0.8	0.8					0.5	0.5	0.4	0.4					0.5	0.5	0.5	0.6				
Bankfull Max Depth (ft)	1.6	1.6	1.7	1.5					0.8	0.7	0.8	0.7					0.8	0.8	0.8	0.9				
Bankfull Cross-Sectional Area (ft^2)	8.8	8.4	8.2	7.8					4.3	3.6	3.6	3.5					3.9	3.7	4.0	4.1				
Bankfull Width/Depth Ratio	11.2	12.1	11.6	13.5					21.1	17.4	19.1	18.8					13.4	12.9	13.9	13.2				
Bankfull Entrenchment Ratio	---	---	---	---					6.9+	8.3+	8.0+	8.1+					7.8+	8.2+	7.6+	7.7+				
Bankfull Bank Height Ratio	---	---	---	---					1.0	0.9	0.9	0.9					1.0	1.0	1.0	1.0				

	UT2B Cross-Section 26, Pool								UT3 Reach 1 Cross-Section 27, Pool								UT3 Reach 1 Cross-Section 28, Riffle							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	760.71	760.69	760.88	760.70					766.07	766.11	766.25	766.37					765.76	765.83	765.89	765.51				
low bank height elevation	760.71	760.69	760.88	760.70					766.07	766.11	766.25	766.37					765.76	765.79	765.85	765.96				
Bankfull Width (ft)	12.2	12.0	12.2	12.2					16.0	16.7	15.8	15.6					13.7	13.3	13.2	12.5				
Floodprone Width (ft)	---	---	---	---					---	---	---	---					73+	73+	73+	73+				
Bankfull Mean Depth (ft)	1.3	1.2	1.2	1.1					1.4	1.4	1.4	1.4					0.9	0.9	0.9	1.4				
Bankfull Max Depth (ft)	2.6	2.2	2.3	2.1					2.6	2.7	2.7	2.8					1.5	1.5	1.6	2.9				
Bankfull Cross-Sectional Area (ft^2)	15.8	14.0	14.4	13.0					21.7	23.0	22.3	21.8					12.8	12.3	12.2	17.7				
Bankfull Width/Depth Ratio	9.4	10.3	10.4	11.4					11.9	12.1	11.2	11.1					14.7	14.3	14.4	8.8				
Bankfull Entrenchment Ratio	---	---	---	---					---	---	---	---					5.3+	5.5+	5.5+	5.9+				
Bankfull Bank Height Ratio	---	---	---	---					---	---	---	---					1.0	1.0	1.0	1.2				

	UT3 Reach 2 Cross-Section 29, Riffle								UT3 Reach 2 Cross-Section 30, Pool								UT3 Reach 3 Cross-Section 31, Riffle							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	759.75	759.83	759.98	760.29					759.40	759.49	759.48	759.66					758.39	758.19	758.41	758.49				
low bank height elevation	759.75	759.84	759.79	759.82					759.40	759.49	759.48	759.66					758.39	758.19	758.43	758.45				
Bankfull Width (ft)	16.7	17.0	16.9	15.3					18.7	19.0	18.8	19.9					19.2	19.1	19.5	19.4				
Floodprone Width (ft)	76+	76+	76+	76+					---	---	---	---					71+	71+	71+	71+				
Bankfull Mean Depth (ft)	1.0	1.0	0.8	0.6					1.4	1.4	1.0	0.8					1.0	0.9	1.0	1.0				
Bankfull Max Depth (ft)	1.9	1.8	1.6	1.4					2.6	2.9	1.7	1.7					1.9	1.9	2.1	2.1				
Bankfull Cross-Sectional Area (ft^2)	16.5	16.7	13.4	9.0					26.3	26.6	18.1	15.9					19.5	17.8	19.9	18.8				
Bankfull Width/Depth Ratio	17.0	17.2	21.5	26.0					13.3	13.6	19.5	25.0					19.0	20.5	19.1	20.1				
Bankfull Entrenchment Ratio	4.5+	4.5+	4.5+	4.9+					---	---	---	---					3.7+	3.7+	3.6+	3.6+				
Bankfull Bank Height Ratio	1.0	1.0	0.9	0.7					---	---	---	---					1.0	1.0	1.0	1.0				

	UT3 Reach 3 Cross-Section 32, Pool							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	758.36	758.21	758.35	758.41				
low bank height elevation	758.36	758.21	758.35	758.41				
Bankfull Width (ft)	25.8	26.9	27.2	27.3				
Floodprone Width (ft)	---	---	---	---				
Bankfull Mean Depth (ft)	1.8	1.7	1.7	1.7				
Bankfull Max Depth (ft)	3.8	3.7	3.8	3.9				
Bankfull Cross-Sectional Area (ft^2)	45.8	46.1	45.8	47.2				
Bankfull Width/Depth Ratio	14.5	15.8	16.1	15.8				
Bankfull Entrenchment Ratio	---	---	---	---				
Bankfull Bank Height Ratio	---	---	---	---				

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

Table 13a. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT1 Reach 1

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[3]																
Bankfull Width (ft)	6.9		7.0		6.9		7.1									
Floodprone Width (ft)	29		27		28		30									
Bankfull Mean Depth (ft)	0.6		0.5		0.5		0.5									
Bankfull Max Depth (ft)	1.0		0.9		0.9		1.0									
Bankfull Cross-sectional Area (ft^2)	4.2		3.5		3.8		3.9									
Width/Depth Ratio	11.5		13.9		12.6		13.0									
Entrenchment Ratio	4.2		3.8		4.1		4.2									
Bank Height Ratio	1.0		0.9		0.9		1.0									
D_{50} (mm)	59.6															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	N/A[1]	N/A[1]														
Pool Length (ft)																
Pool Max Depth (ft)	1.1	3.0														
Pool Spacing (ft)	5	76														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	N/A[2]															
Radius of Curvature (ft)	N/A[2]															
Rc/Bankfull Width (ft/ft)	N/A[2]															
Meander Length (ft)	N/A[2]															
Meander Width Ratio	N/A[2]															
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	0.4/1.8/33.9/108/ 156.5/256		0.6/9.4/21.3/84.1/ 137.0/256		0.8/28.1/48.4/107/ 140.8/180		5.3/11.9/18.5/130.1/ 170.4/256									
Reach Shear Stress (Competency) lb/ft^2	1.97															
Max part size (mm) mobilized at bankfull	97															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.07															
Watershed Impervious Cover Estimate (%)	3%															
Rosgen Classification	A4															
Bankfull Velocity (fps)	4.8															
Bankfull Discharge (cfs)	20.2															
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	966															
Sinuosity																
Bankfull/Channel Slope (ft/ft)	0.0555															

[1]UT1 Reach 1 riffle slopes were not calculated because this reach is comprised of a series of rock steps and cascades.

[2]Pattern data is not applicable for A-type and B-type channels

[3]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13b. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT1 Reach 2A

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[2]																
Bankfull Width (ft)	7.3		8.1	9.2	7.5	7.9	7.3	8.0								
Floodprone Width (ft)	46	65+	46	65+	49	65+	51	65+								
Bankfull Mean Depth (ft)	0.6		0.6	0.7	0.6	0.7	0.6	0.7								
Bankfull Max Depth (ft)	0.9	1.0	1.1	1.2	1.1	1.4	1.3	1.4								
Bankfull Cross-sectional Area (ft^2)	4.5	4.6	5.1	5.3	4.5	5.6	4.6	5.8								
Width/Depth Ratio	11.5	11.8	12.4	16.4	11.3	12.5	11.1	11.5								
Entrenchment Ratio	6.3	9.0+	5.0	8.1+	6.5	8.2+	7.0	8.1+								
Bank Height Ratio	1.0		1.1		1.0	1.1	1.0	1.1								
D_{50} (mm)	37.0	37.9														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.003	0.068														
Pool Length (ft)																
Pool Max Depth (ft)	1.3	2.8														
Pool Spacing (ft)	6	51														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	N/A[1]															
Radius of Curvature (ft)	N/A[1]															
Rc/Bankfull Width (ft/ft)	N/A[1]															
Meander Length (ft)	N/A[1]															
Meander Width Ratio	N/A[1]															
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	0.3/14.1/21.6/67.2/ 137/362		0.3/6.7/19.9/75.9/ 128/256		7.1/16.7/20.7/55.0/ 85.0/362		0.8/4.6/10.4/70.7/ 175.5/362									
Reach Shear Stress (Competency) lb/ft^2	1.06	1.08														
Max part size (mm) mobilized at bankfull	52	53														
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.12															
Watershed Impervious Cover Estimate (%)	3%															
Rosgen Classification	B4															
Bankfull Velocity (fps)	3.9	4.0														
Bankfull Discharge (cfs)	17.7	18.3														
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	1,746															
Sinuosity																
Bankfull/Channel Slope (ft/ft)	0.0292															

[1]Pattern data is not applicable for A-type and B-type channels

[2]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13c. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT1 Reach 2B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	10.3	10.5	10.1	11.5	10.1	11.2	10.8	11.1								
Floodprone Width (ft)	49+	68+	49+	68+	49+	68+	49+	68+								
Bankfull Mean Depth (ft)	0.8		0.7	0.8	0.8		0.7	0.8								
Bankfull Max Depth (ft)	1.2	1.3	1.3	1.4	1.4		1.4	1.5								
Bankfull Cross-sectional Area (ft^2)	7.9	8.5	7.5	8.9	8.5	9.0	7.8	8.8								
Width/Depth Ratio	12.9	13.3	13.7	15.0	12.0	13.9	13.9	14.9								
Entrenchment Ratio	4.7+	6.6+	4.3+	6.7+	4.4+	6.7+	4.6+	6.1+								
Bank Height Ratio	1.0		1.0		1.0		1.0	1.1								
D_{50} (mm)	35.6	45.0														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.013	0.072														
Pool Length (ft)																
Pool Max Depth (ft)	1.8	3.1														
Pool Spacing (ft)	18	145														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	31	67														
Radius of Curvature (ft)	20	38														
Rc/Bankfull Width (ft/ft)	1.9	3.6														
Meander Length (ft)	102	190														
Meander Width Ratio	3.0	6.4														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	0.3/0.4/22.6/59.2/ 104.7/362		0.3/1.8/15.2/87/ 190.9/256		8.0/14.6/19.8/49.1/ 75.9/180		0.4/13.1/28.6/106.3/ 192.5/362									
Reach Shear Stress (Competency) lb/ft^2	0.85	0.88														
Max part size (mm) mobilized at bankfull	42	43														
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.32															
Watershed Impervious Cover Estimate (%)	3%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	4.1	4.2														
Bankfull Discharge (cfs)	32.7	36.2														
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	1,368															
Sinuosity	1.25															
Bankfull/Channel Slope (ft/ft)	0.0182															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13d. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT1 Reach 3

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	11.3	12.5	10.8	11.6	10.5	10.7	11.2									
Floodprone Width (ft)	60+	68+	60+	68+	60+	68+	60+	68+								
Bankfull Mean Depth (ft)	0.7		0.7	0.8	0.6	0.9	0.6	1.2								
Bankfull Max Depth (ft)	1.1		1.1	1.3	1.1	1.7	1.2	2.5								
Bankfull Cross-sectional Area (ft^2)	8.3	8.7	7.7	8.3	6.2	9.8	6.5	13.1								
Width/Depth Ratio	15.5	18.0	14.1	17.4	11.6	17.9	9.6	19.3								
Entrenchment Ratio	5.3+	5.4+	5.5+	5.8+	5.6+	6.4+	5.3+	6.0+								
Bank Height Ratio	1.0		0.9	1.0	0.8	1.1	0.9	1.3								
D_{50} (mm)	41.6	47.4														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.013	0.055														
Pool Length (ft)																
Pool Max Depth (ft)	1.8	3.7														
Pool Spacing (ft)	41	129														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	35	71														
Radius of Curvature (ft)	19	38														
Rc/Bankfull Width (ft/ft)	1.7	3.0														
Meander Length (ft)	102	196														
Meander Width Ratio	3.1	5.7														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	0.3/16/25.6/62.4/ 113.8/180		3.2/18.3/28.2/62.7/ 101.2/256		13.3/26.4/39.1/90/ 128/256		1.0/10.7/16.6/60/ 90/256									
Reach Shear Stress (Competency) lb/ft^2	0.65	0.68														
Max part size (mm) mobilized at bankfull	32	33														
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.44															
Watershed Impervious Cover Estimate (%)	3%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	3.7	3.8														
Bankfull Discharge (cfs)	30.4	31.0														
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	1,641															
Sinuosity	1.30															
Bankfull/Channel Slope (ft/ft)	0.0153															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13e. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT2 Reach 1

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[2]																
Bankfull Width (ft)	8.3		8.3		8.5		8.3									
Floodprone Width (ft)	69+		69+		69+		69+									
Bankfull Mean Depth (ft)	0.7		0.7		0.7		1.1									
Bankfull Max Depth (ft)	1.2		1.3		1.5		2.1									
Bankfull Cross-sectional Area (ft^2)	6.1		6.1		6.1		8.8									
Width/Depth Ratio	11.3		11.5		11.7		7.8									
Entrenchment Ratio	8.3+		8.2+		8.1+		8.3+									
Bank Height Ratio	1.0		1.0		1.0		1.2									
D_{50} (mm)	26.9															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.006	0.034														
Pool Length (ft)																
Pool Max Depth (ft)	1.2	2.5														
Pool Spacing (ft)	15	78														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	N/A[1]															
Radius of Curvature (ft)	N/A[1]															
Rc/Bankfull Width (ft/ft)	N/A[1]															
Meander Length (ft)	N/A[1]															
Meander Width Ratio	N/A[1]															
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/SC/0.5/47.3/ 90/128		3.2/18.3/28.2/62.7/ 101.2/256		0.2/0.3/1.0/64.0/ 146.7/256		0.5/4.2/7.5/60.9/ 107.3/2048									
Reach Shear Stress (Competency) lb/ft^2	0.79															
Max part size (mm) mobilized at bankfull	39															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.14															
Watershed Impervious Cover Estimate (%)	1%															
Rosgen Classification	B4															
Bankfull Velocity (fps)	3.9															
Bankfull Discharge (cfs)	24.0															
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	623															
Sinuosity	1.10															
Bankfull/Channel Slope (ft/ft)	0.0180															

[1]Pattern data is not applicable for B-type channels

[2]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13f. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT2 Reach 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	11.8	11.9	12.2	13.2	12.5	13.0	11.6	12.7								
Floodprone Width (ft)	65+	72+	65+	72+	65+	72+	65+	72+								
Bankfull Mean Depth (ft)	0.8	0.9	0.7		0.7	0.8	0.7									
Bankfull Max Depth (ft)	1.2	1.3	1.3	1.4	1.3	1.4	1.3	1.4								
Bankfull Cross-sectional Area (ft^2)	9.1	10.2	9.0	9.5	9.3	10.5	7.8	8.9								
Width/Depth Ratio	13.6	15.6	16.4	18.2	16.1	16.6	17.0	18.0								
Entrenchment Ratio	5.5+	6.1+	5.3+	5.5+	5.2+	5.5+	5.6+	5.7+								
Bank Height Ratio	1.0		0.9	1.0	0.9	1.1	0.9	1.0								
D_{50} (mm)	25.4	33.4														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.004	0.035														
Pool Length (ft)																
Pool Max Depth (ft)	2.1	3.2														
Pool Spacing (ft)	45	127														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	39	88														
Radius of Curvature (ft)	20	39														
Rc/Bankfull Width (ft/ft)	1.7	3.3														
Meander Length (ft)	72	154														
Meander Width Ratio	3.3	7.4														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/SC/SC/42/ 71.7/180		SC/0.16/9.4/52.7/ 86.3/>2048		SC/0.2/0.6/44.7/ 125.8/512		0.4/4.0/10.6/101.2/ 148.1/256									
Reach Shear Stress (Competency) lb/ft^2	0.33	0.38														
Max part size (mm) mobilized at bankfull	16	19														
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.26															
Watershed Impervious Cover Estimate (%)	1%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	2.6	2.8														
Bankfull Discharge (cfs)	23.6	28.9														
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	1,080															
Sinuosity	1.30															
Bankfull/Channel Slope (ft/ft)	0.0072															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13g. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT2A

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	5.4	5.7	5.5	5.8	5.0	5.3	6.0	6.1								
Floodprone Width (ft)	51+	57+	51+	57+	51+	57+	51+	57+								
Bankfull Mean Depth (ft)	0.4	0.4	0.3	0.4	0.4		0.3									
Bankfull Max Depth (ft)	0.5	0.7	0.6		0.6		0.5	0.7								
Bankfull Cross-sectional Area (ft^2)	1.9	2.4	2.0		1.8	1.9	1.7	2.1								
Width/Depth Ratio	13.6	15.2	15.0	17.2	13.7	15.3	17.1	21.4								
Entrenchment Ratio	9.0+	10.5+	8.8+	10.4+	10.1+	10.6+	8.6+	9.4+								
Bank Height Ratio	1.0		0.8	1.0	0.8	1.0	0.9	1.0								
D_{50} (mm)	21.0	28.1														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.001	0.046														
Pool Length (ft)																
Pool Max Depth (ft)	0.9	1.3														
Pool Spacing (ft)	18	58														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	19	44														
Radius of Curvature (ft)	10	19														
Rc/Bankfull Width (ft/ft)	1.9	3.3														
Meander Length (ft)	36	77														
Meander Width Ratio	3.5	7.7														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/SC/0.5/42.5/ 90/180		SC/0.09/5.6/75.9/ 139.4/256		SC/SC/SC/35.4/ 64/180		SC/SC/SC/61.2/ 90/256									
Reach Shear Stress (Competency) lb/ft^2	---															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.02															
Watershed Impervious Cover Estimate (%)	---															
Rosgen Classification	C4															
Bankfull Velocity (fps)	1.9	2.1														
Bankfull Discharge (cfs)	3.7	5.1														
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	655															
Sinuosity	1.20															
Bankfull/Channel Slope (ft/ft)	0.0110															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13h. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT2B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	7.2	9.6	6.9	7.9	7.4	8.3	7.3	8.1								
Floodprone Width (ft)	56+	66+	56+	66+	56+	66+	56+	66+								
Bankfull Mean Depth (ft)	0.5	0.5	0.5		0.4	0.5	0.4	0.6								
Bankfull Max Depth (ft)	0.8	0.8	0.7	0.8	0.8		0.7	0.9								
Bankfull Cross-sectional Area (ft^2)	3.9	4.3	3.6	3.7	3.6	4.0	3.5	4.1								
Width/Depth Ratio	13.4	21.1	12.9	17.4	13.9	19.1	13.2	18.8								
Entrenchment Ratio	6.9+	7.8+	8.2+	8.3+	7.6+	8.0+	7.7+	8.1+								
Bank Height Ratio	1.0		0.9	1.0	0.9	1.0	0.9	1.0								
D_{50} (mm)	25.1	30.6														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.001	0.037														
Pool Length (ft)																
Pool Max Depth (ft)	1.5	2.7														
Pool Spacing (ft)	7	58														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	26	60														
Radius of Curvature (ft)	14	23														
Rc/Bankfull Width (ft/ft)	1.9	2.4														
Meander Length (ft)	49	105														
Meander Width Ratio	3.6	6.3														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/SC/0.4/43.3/ 82.6/256		0.17/17.58/26.1/59.0/ 86.7/180		SC/8.0/21.8/51.8/ 73.4/128		0.1/13.3/31/102.3/ 160.7/362									
Reach Shear Stress (Competency) lb/ft^2	---															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.05															
Watershed Impervious Cover Estimate (%)	---															
Rosgen Classification	C4															
Bankfull Velocity (fps)	2.3	2.6														
Bankfull Discharge (cfs)	10.1	10.1														
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	776															
Sinuosity	1.20															
Bankfull/Channel Slope (ft/ft)	0.0115															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13i. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT3 Reach 1

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[2]																
Bankfull Width (ft)	13.7		13.3		13.2		12.5									
Floodprone Width (ft)	73+		73+		73+		73+									
Bankfull Mean Depth (ft)	0.9		0.9		0.9		1.4									
Bankfull Max Depth (ft)	1.5		1.5		1.6		2.9									
Bankfull Cross-sectional Area (ft^2)	12.8		12.3		12.2		17.7									
Width/Depth Ratio	14.7		14.3		14.4		8.8									
Entrenchment Ratio	5.3+		5.5+		5.5+		5.9+									
Bank Height Ratio	1.0		1.0		1.0		1.2									
D_{50} (mm)	50.0															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.001	0.023														
Pool Length (ft)																
Pool Max Depth (ft)	2.8	3.9														
Pool Spacing (ft)	64	163														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	N/A[1]															
Radius of Curvature (ft)	N/A[1]															
Rc/Bankfull Width (ft/ft)	N/A[1]															
Meander Length (ft)	N/A[1]															
Meander Width Ratio	N/A[1]															
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/0.2/0.4/59.2/ 107.3/180		SC/2.8/17.1/74.5/ 117.2/180		0.5/13.3/21.1/80.3/ 168.1/362		0.5/1.2/6.9/37/ 90/2048									
Reach Shear Stress (Competency) lb/ft^2	0.42															
Max part size (mm) mobilized at bankfull	21															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.63															
Watershed Impervious Cover Estimate (%)	2%															
Rosgen Classification	B4c															
Bankfull Velocity (fps)	3.0															
Bankfull Discharge (cfs)	38.6															
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	779															
Sinuosity	1.10															
Bankfull/Channel Slope (ft/ft)	0.0075															

[1]Pattern data is not applicable for B-type channels

[2]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13j. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT3 Reach 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	16.7		17.0		16.9		15.3									
Floodprone Width (ft)	76+		76+		76+		76+									
Bankfull Mean Depth (ft)	1.0		1.0		0.8		0.6									
Bankfull Max Depth (ft)	1.9		1.8		1.6		1.4									
Bankfull Cross-sectional Area (ft^2)	16.5		16.7		13.4		9.0									
Width/Depth Ratio	17.0		17.2		21.5		26.0									
Entrenchment Ratio	4.5+		4.5+		4.5+		4.9+									
Bank Height Ratio[1]	1.0		1.0		0.9		0.7									
D_{50} (mm)	31.2															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.002	0.012														
Pool Length (ft)																
Pool Max Depth (ft)	2.5	4.1														
Pool Spacing (ft)	53	186														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	57	130														
Radius of Curvature (ft)	29	57														
Rc/Bankfull Width (ft/ft)	1.7	3.4														
Meander Length (ft)	105	227														
Meander Width Ratio	3.4	7.8														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/SC/0.2/41.6/ 61.5/180		SC/SC/0.2/60.4/ 113.8/256		SC/0.41/6.7/20.1/ 56.9/128		0.3/1.3/4.5/20/ 63.4/256									
Reach Shear Stress (Competency) lb/ft^2	---															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.63															
Watershed Impervious Cover Estimate (%)	2%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	1.9															
Bankfull Discharge (cfs)	31.1															
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	1,159															
Sinuosity	1.40															
Bankfull/Channel Slope (ft/ft)	0.0027															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13k. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT3 Reach 3

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	19.2		19.1		19.5		19.4									
Floodprone Width (ft)	71+		71+		71+		71+									
Bankfull Mean Depth (ft)	1.0		0.9		1.0		1.0									
Bankfull Max Depth (ft)	1.9		1.9		2.1		2.1									
Bankfull Cross-sectional Area (ft^2)	19.5		17.8		19.9		18.8									
Width/Depth Ratio	19.0		20.5		19.1		20.1									
Entrenchment Ratio	3.7+		3.7+		3.6+		3.6+									
Bank Height Ratio[1]	1.0		1.0		1.0		1.0									
D_{50} (mm)	47.0															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.0002	0.005														
Pool Length (ft)																
Pool Max Depth (ft)	3.3	3.9														
Pool Spacing (ft)	83	180														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	67	152														
Radius of Curvature (ft)	34	67														
Rc/Bankfull Width (ft/ft)	1.8	3.5														
Meander Length (ft)	124	266														
Meander Width Ratio	3.5	7.9														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/SC/SC/64/ 151.8/362		SC/SC/SC/32.0/ 151.8/362		SC/SC/0.2/61.2/ 90/362		0.1/2.5/9.3/27.6/ 101.2/256									
Reach Shear Stress (Competency) lb/ft^2	---															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.88															
Watershed Impervious Cover Estimate (%)	2%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	0.8															
Bankfull Discharge (cfs)	16.0															
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	764															
Sinuosity	1.20															
Bankfull/Channel Slope (ft/ft)	0.0005															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

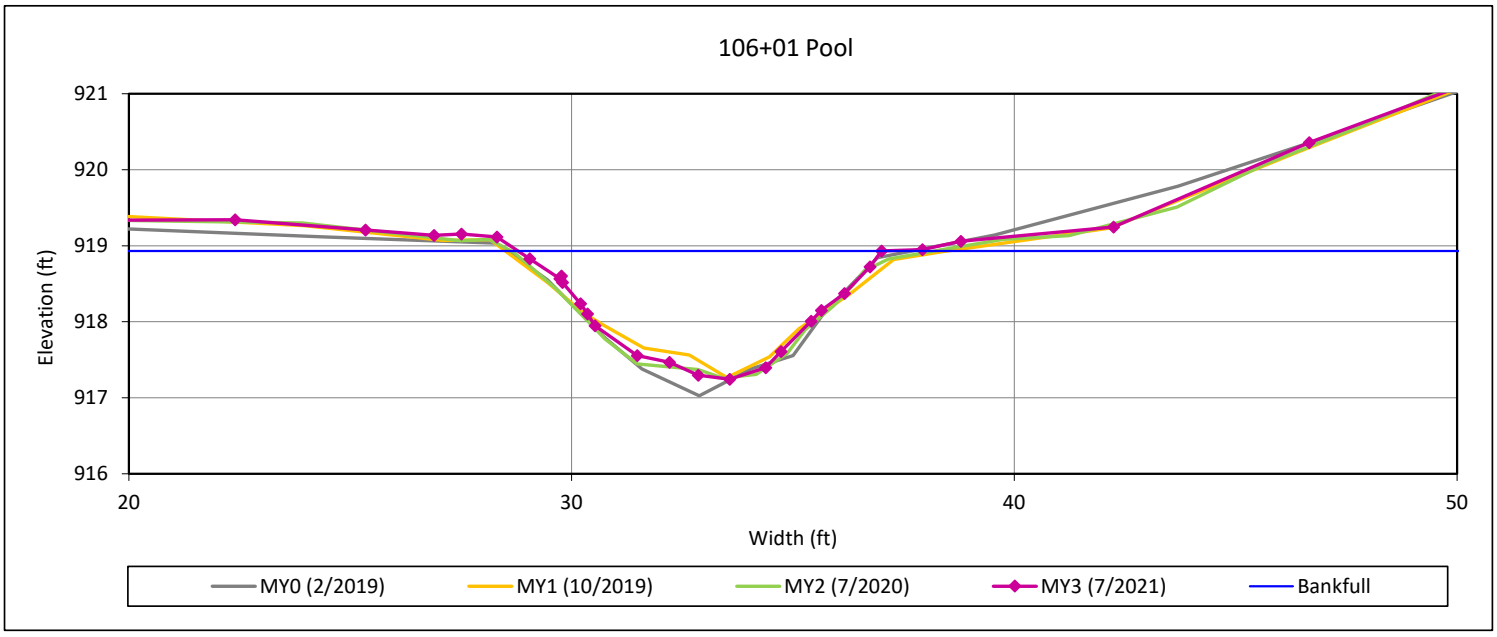
(---): Data was not provided

N/A: Not Applicable

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 1 - UT1 Reach 1



Bankfull Dimensions	
8.4	x-section area (ft.sq.)
8.2	width (ft)
1.0	mean depth (ft)
1.7	max depth (ft)
9.1	wetted perimeter (ft)
0.9	hydraulic radius (ft)
8.0	width-depth ratio

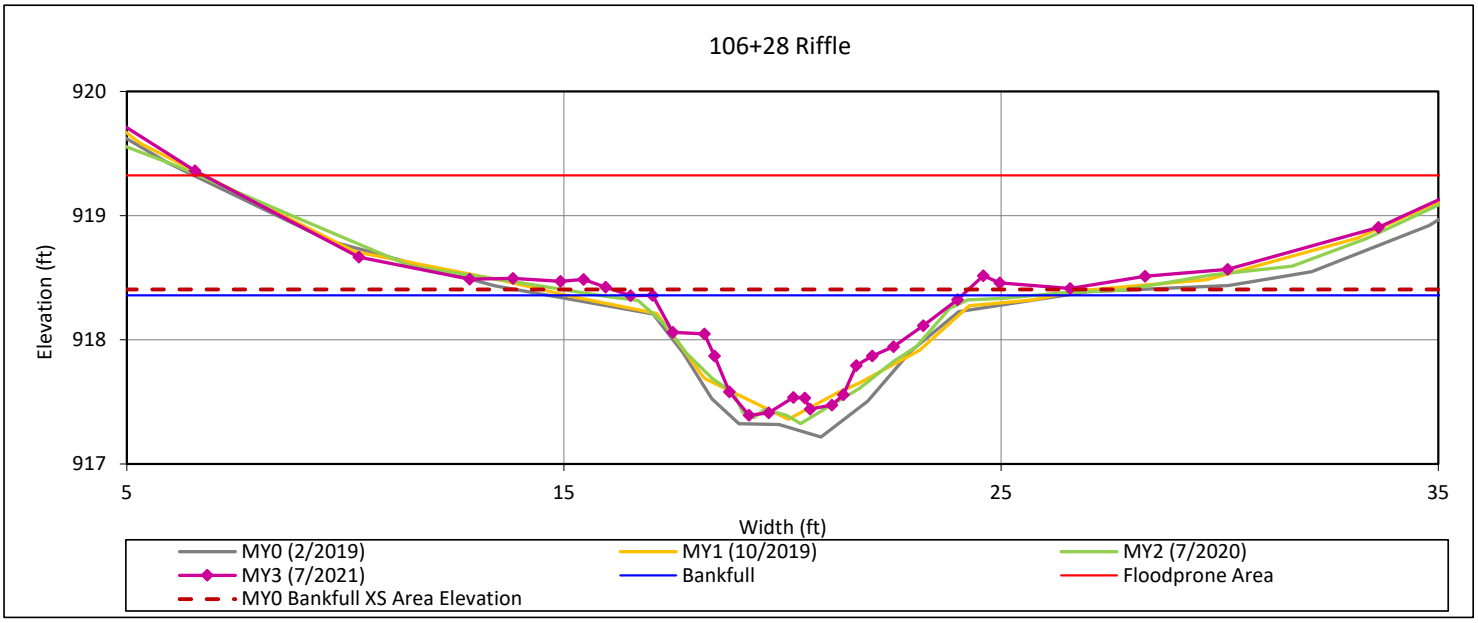
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 2 - UT1 Reach 1



Bankfull Dimensions	
3.9	x-section area (ft.sq.)
7.1	width (ft)
0.5	mean depth (ft)
1.0	max depth (ft)
7.6	wetted perimeter (ft)
0.5	hydraulic radius (ft)
13.0	width-depth ratio
29.5	W flood prone area (ft)
4.2	entrenchment ratio
1.0	low bank height ratio

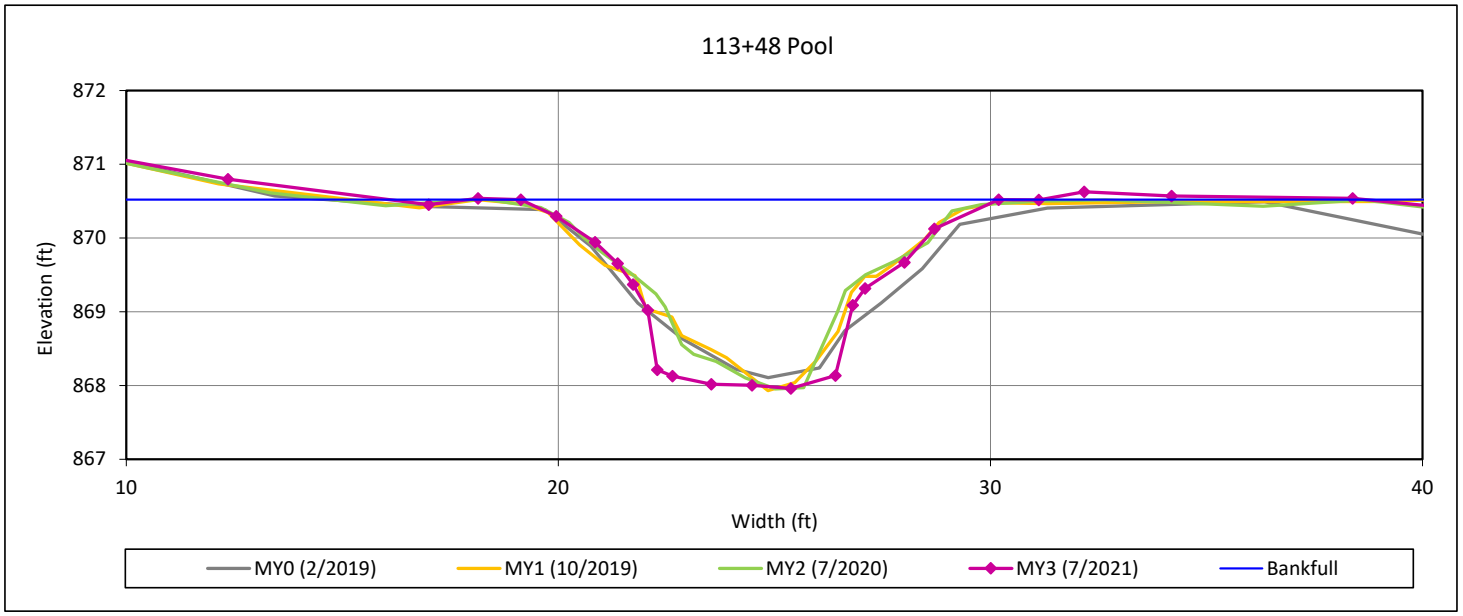
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 3 - UT1 Reach 2A



Bankfull Dimensions	
15.1	x-section area (ft.sq.)
11.1	width (ft)
1.4	mean depth (ft)
2.6	max depth (ft)
13.1	wetted perimeter (ft)
1.2	hydraulic radius (ft)
8.1	width-depth ratio

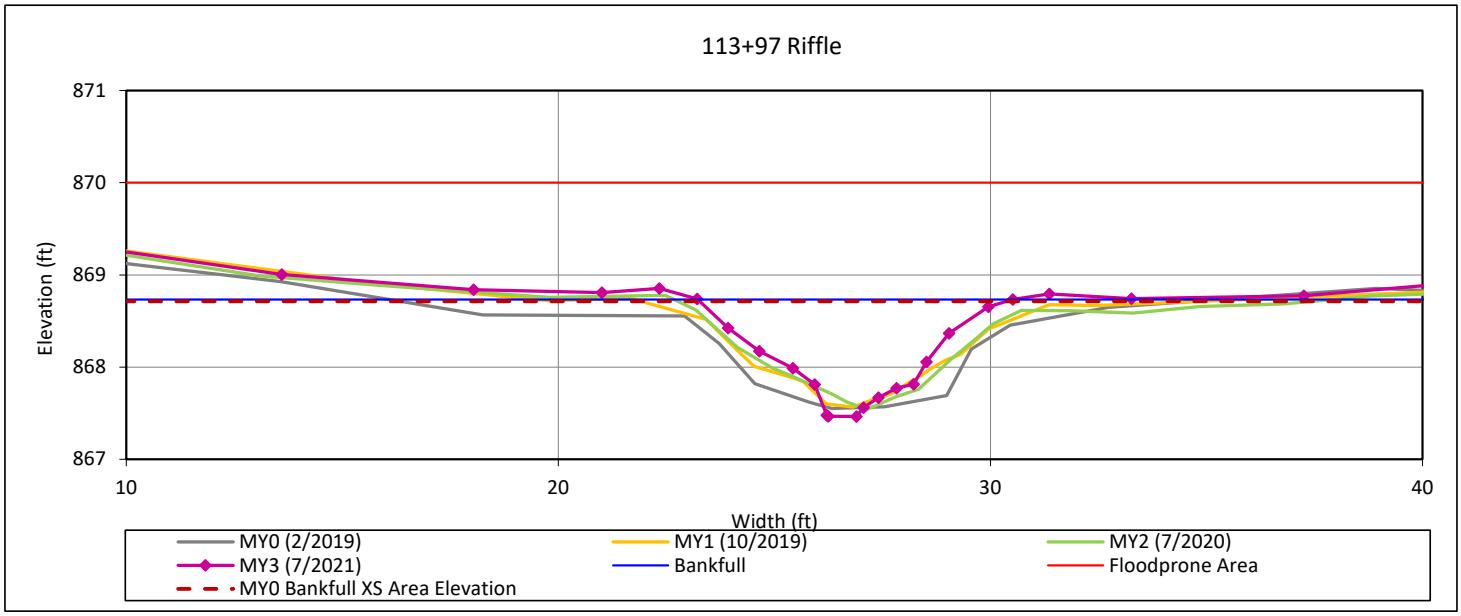
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 4 - UT1 Reach 2A



Bankfull Dimensions	
4.6	x-section area (ft.sq.)
7.3	width (ft)
0.6	mean depth (ft)
1.3	max depth (ft)
7.9	wetted perimeter (ft)
0.6	hydraulic radius (ft)
11.5	width-depth ratio
50.7	W flood prone area (ft)
7.0	entrenchment ratio
1.0	low bank height ratio

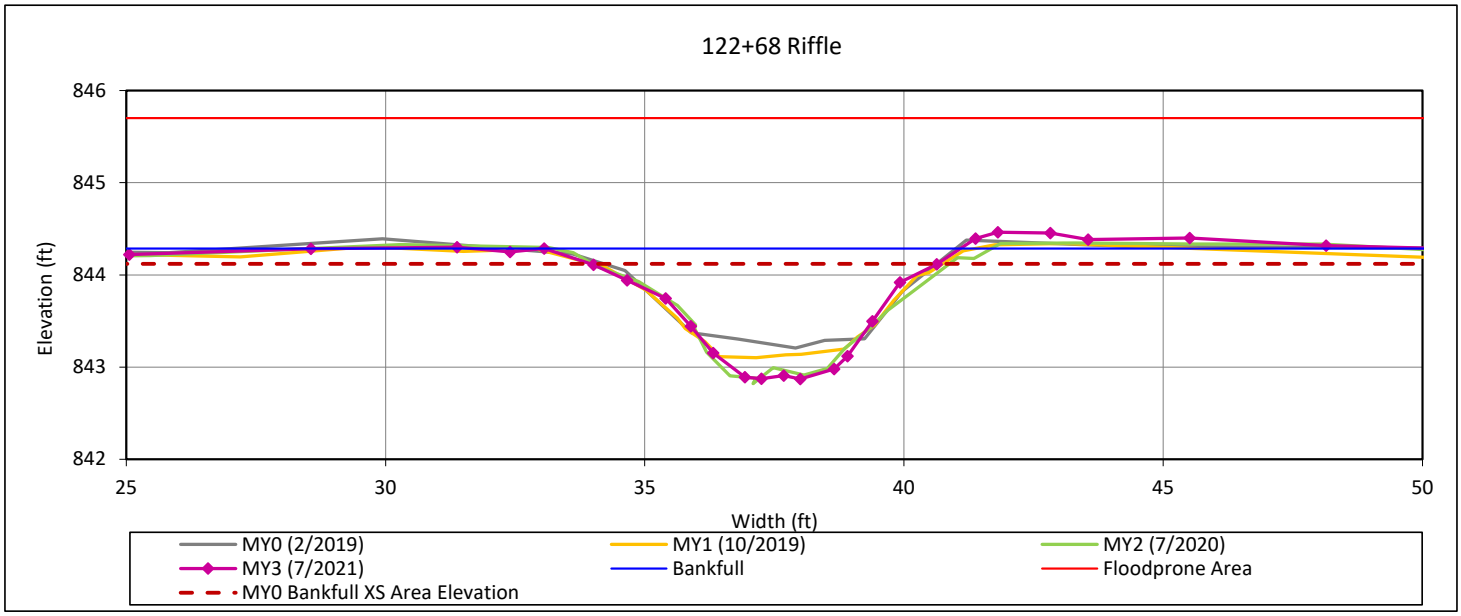
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 5 - UT1 Reach 2A



Bankfull Dimensions	
5.8	x-section area (ft.sq.)
8.0	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
8.7	wetted perimeter (ft)
0.7	hydraulic radius (ft)
11.1	width-depth ratio
65.4	W flood prone area (ft)
8.1	entrenchment ratio
1.1	low bank height ratio

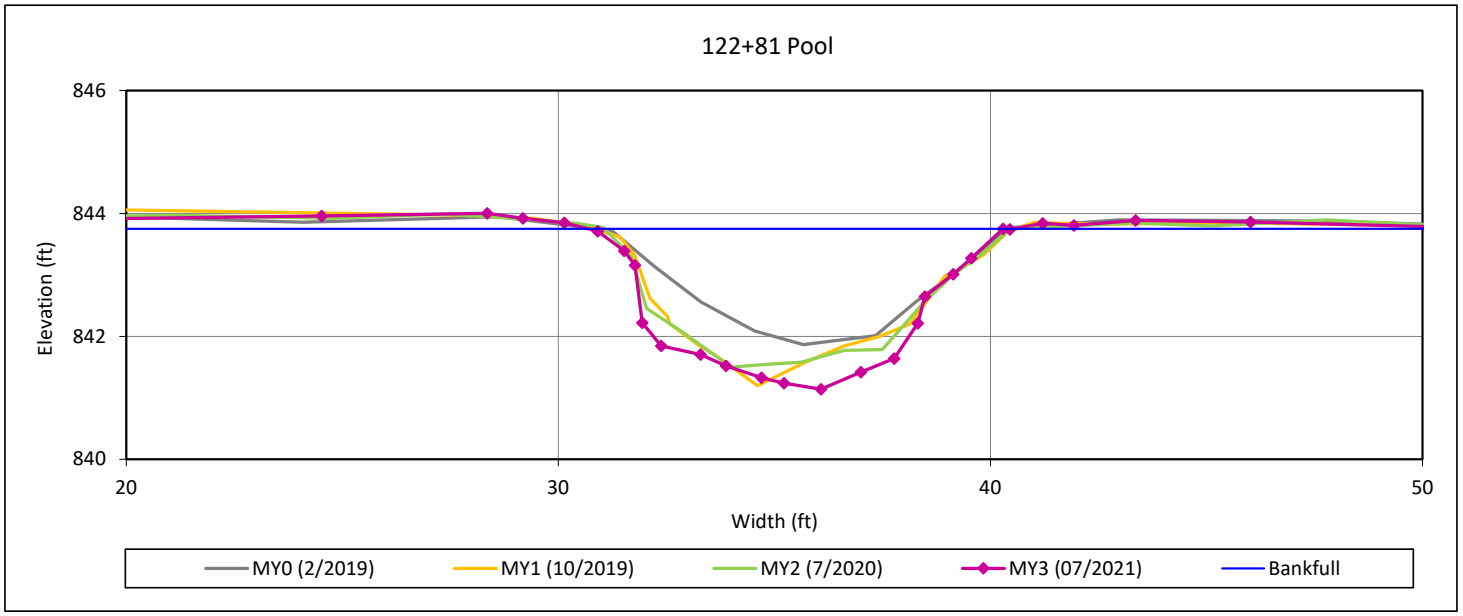
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 6 - UT1 Reach 2A



Bankfull Dimensions	
15.9	x-section area (ft.sq.)
9.6	width (ft)
1.7	mean depth (ft)
2.6	max depth (ft)
11.7	wetted perimeter (ft)
1.4	hydraulic radius (ft)
5.8	width-depth ratio

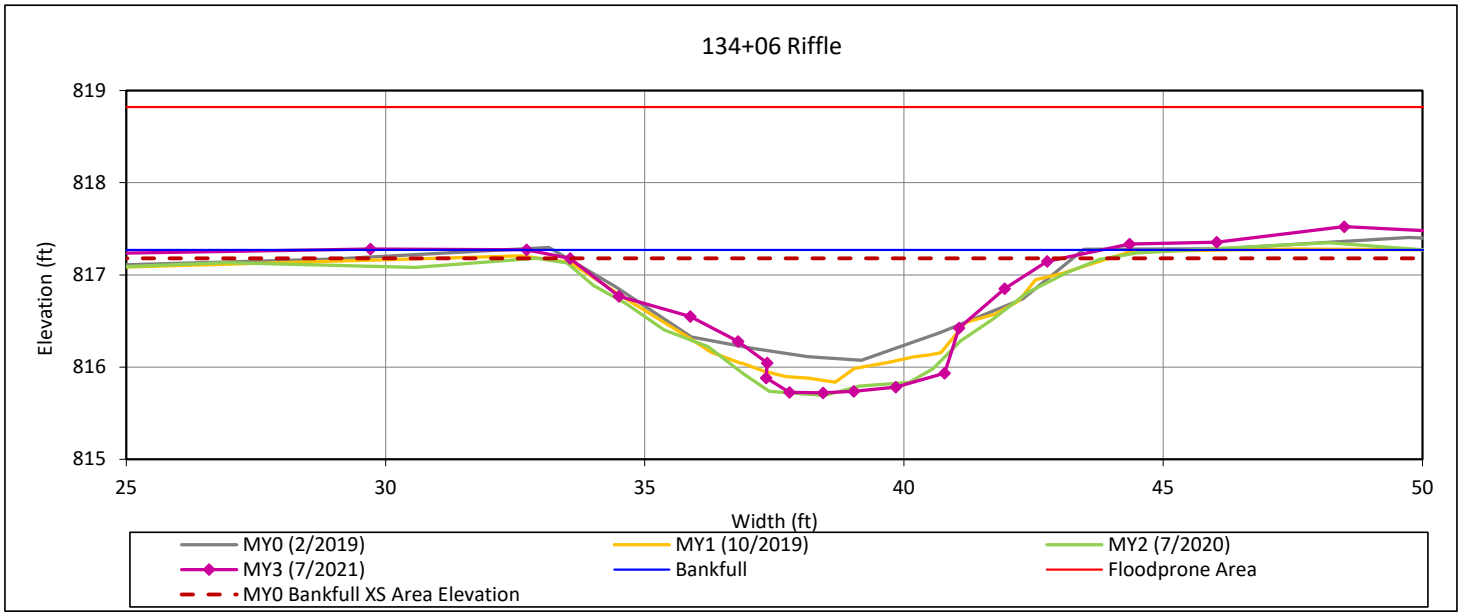
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 7 - UT1 Reach 2B



Bankfull Dimensions	
8.8	x-section area (ft.sq.)
11.1	width (ft)
0.8	mean depth (ft)
1.5	max depth (ft)
11.9	wetted perimeter (ft)
0.7	hydraulic radius (ft)
13.9	width-depth ratio
67.9	W flood prone area (ft)
6.1	entrenchment ratio
1.1	low bank height ratio

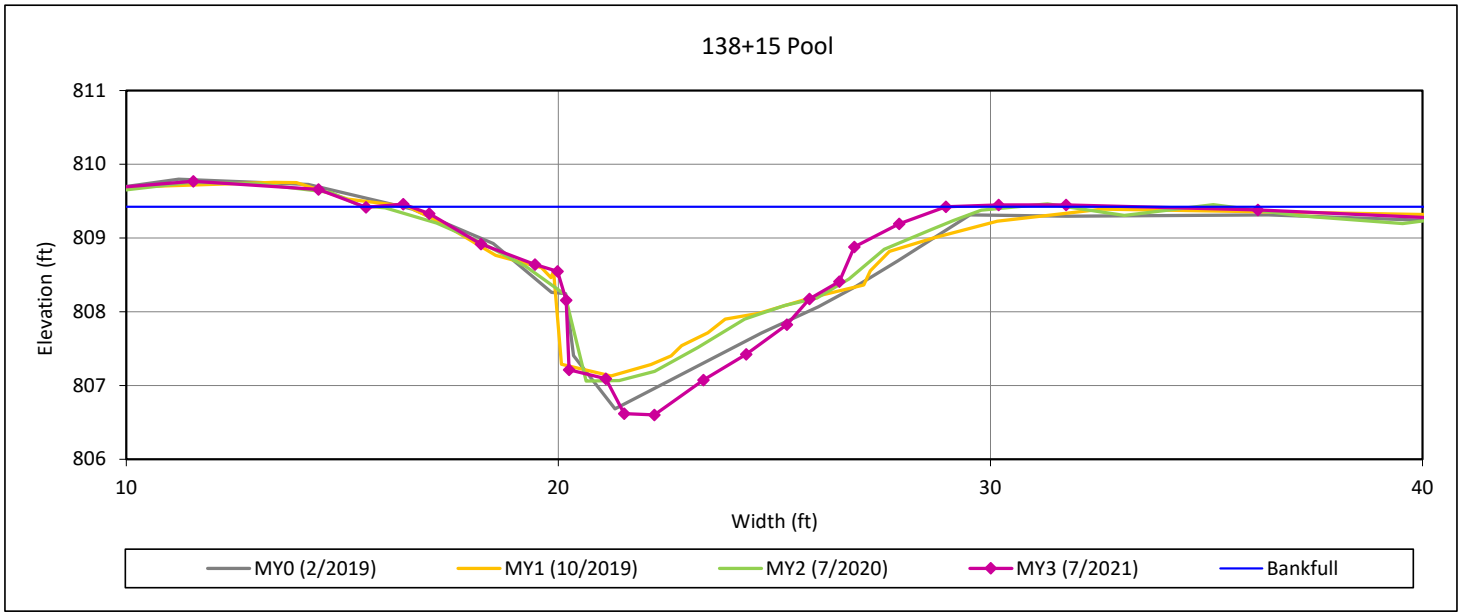
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 8 - UT1 Reach 2B



Bankfull Dimensions	
16.0	x-section area (ft.sq.)
12.4	width (ft)
1.3	mean depth (ft)
2.8	max depth (ft)
14.5	wetted perimeter (ft)
1.1	hydraulic radius (ft)
9.6	width-depth ratio

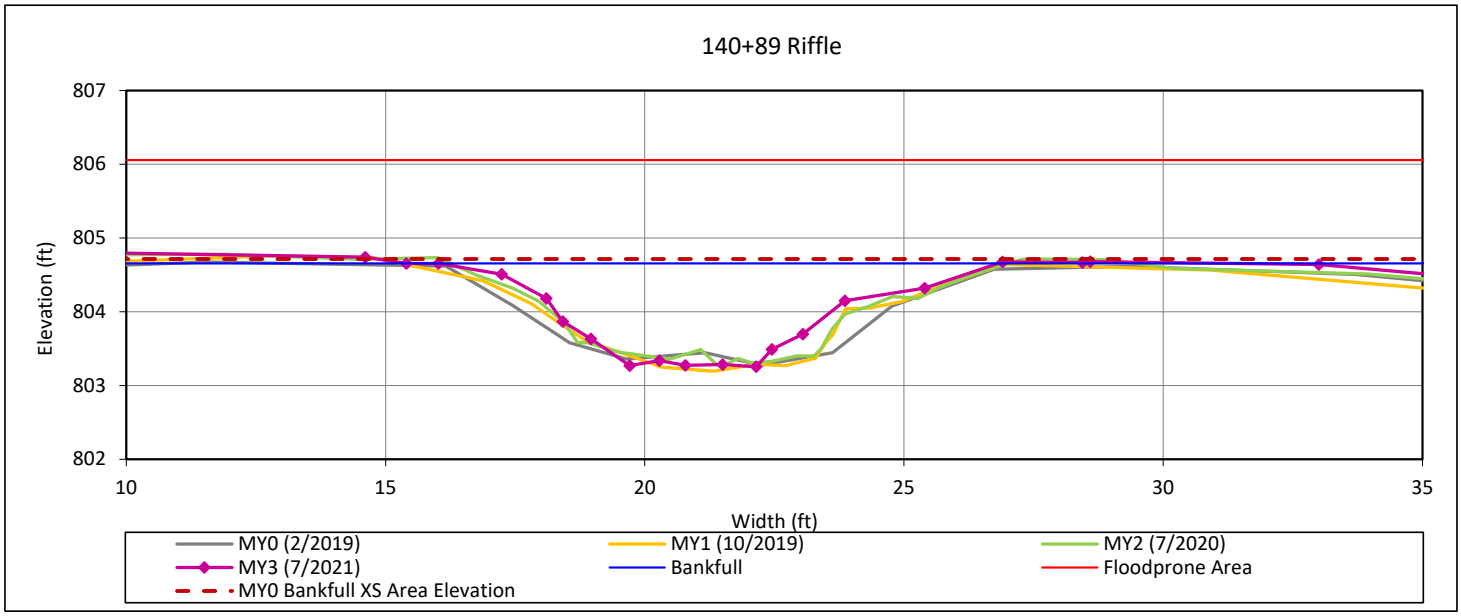
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 9 - UT1 Reach 2B



Bankfull Dimensions	
7.8	x-section area (ft.sq.)
10.8	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
11.4	wetted perimeter (ft)
0.7	hydraulic radius (ft)
14.9	width-depth ratio
49.1	W flood prone area (ft)
4.6	entrenchment ratio
1.0	low bank height ratio

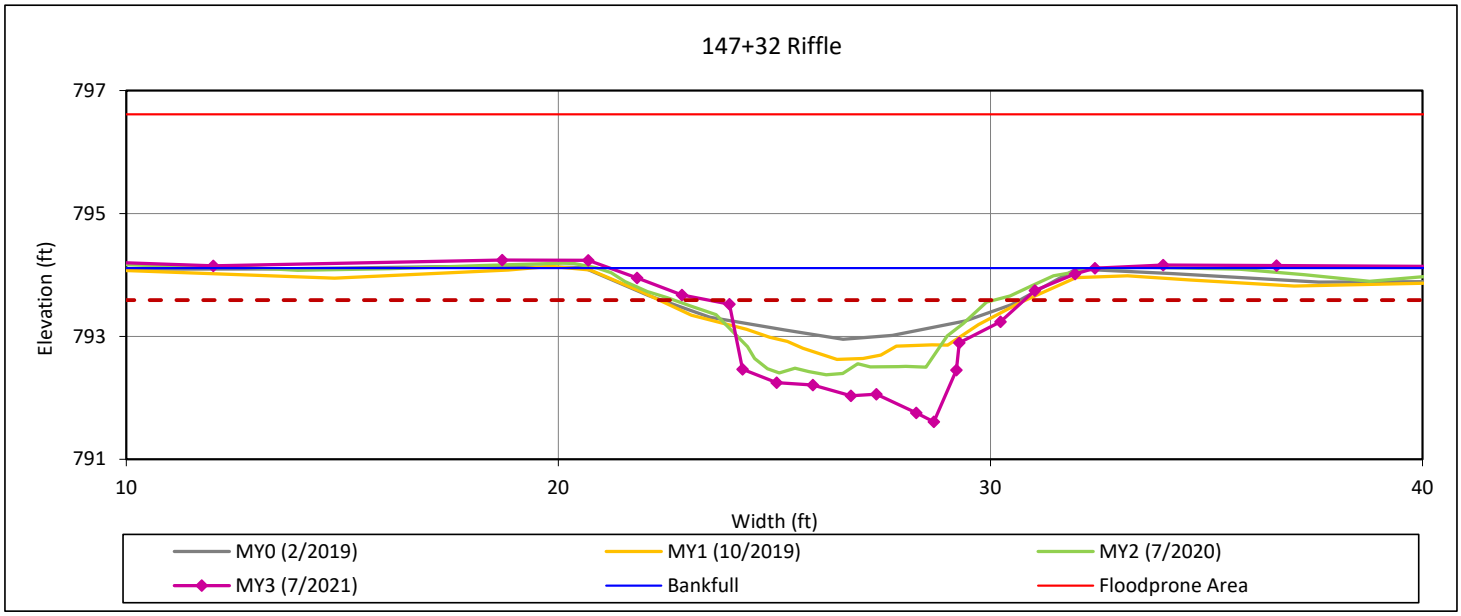
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 10 - UT1 Reach 3



Bankfull Dimensions	
13.1	x-section area (ft.sq.)
11.2	width (ft)
1.2	mean depth (ft)
2.5	max depth (ft)
13.3	wetted perimeter (ft)
1.0	hydraulic radius (ft)
9.6	width-depth ratio
59.9	W flood prone area (ft)
5.3	entrenchment ratio
1.3	low bank height ratio

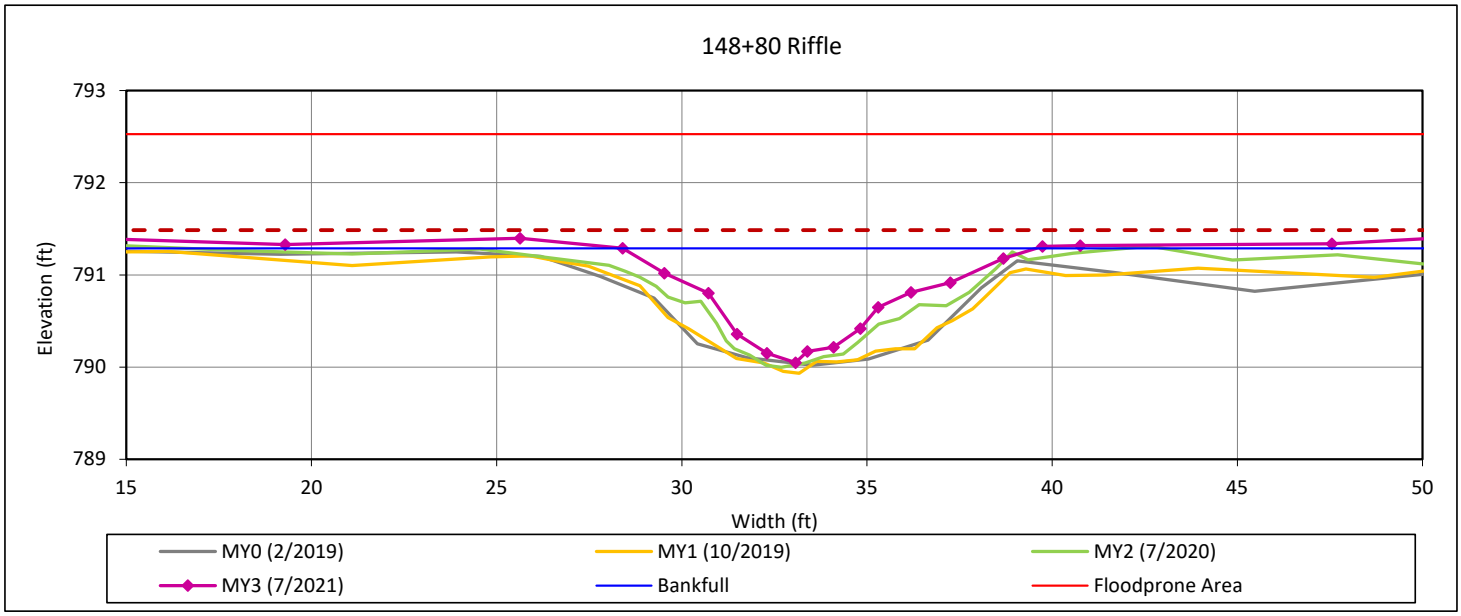
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 11 - UT1 Reach 3



Bankfull Dimensions	
6.5	x-section area (ft.sq.)
11.2	width (ft)
0.6	mean depth (ft)
1.2	max depth (ft)
11.5	wetted perimeter (ft)
0.6	hydraulic radius (ft)
19.3	width-depth ratio
67.6	W flood prone area (ft)
6.0	entrenchment ratio
0.9	low bank height ratio

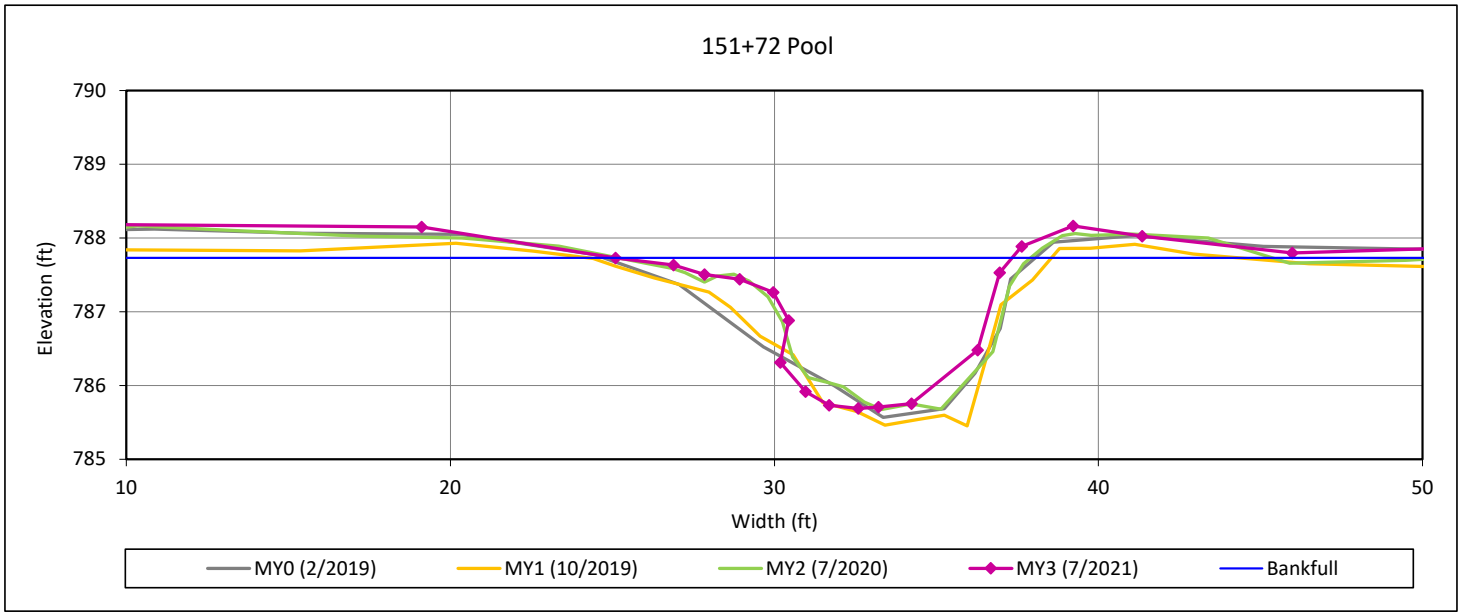
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 12 - UT1 Reach 3



Bankfull Dimensions	
12.5	x-section area (ft.sq.)
12.2	width (ft)
1.0	mean depth (ft)
2.0	max depth (ft)
14.1	wetted perimeter (ft)
0.9	hydraulic radius (ft)
11.9	width-depth ratio

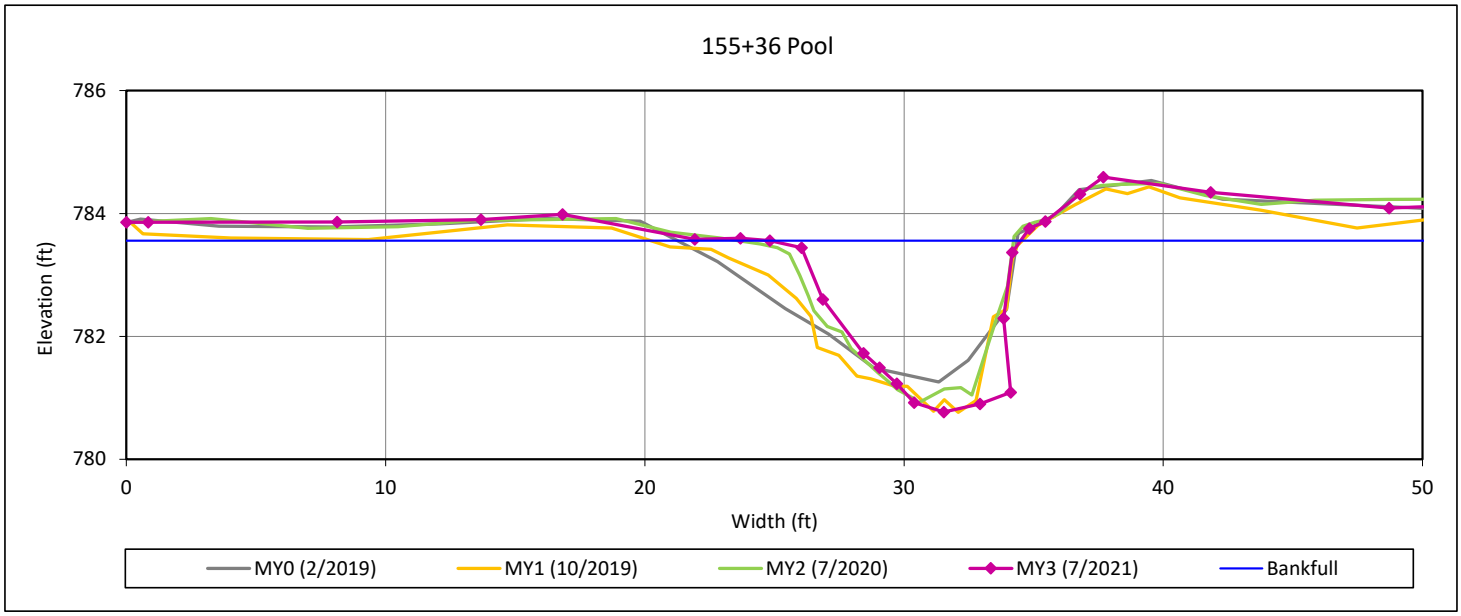
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 13 - UT1 Reach 3



Bankfull Dimensions	
16.7	x-section area (ft.sq.)
9.7	width (ft)
1.7	mean depth (ft)
2.8	max depth (ft)
12.8	wetted perimeter (ft)
1.3	hydraulic radius (ft)
5.6	width-depth ratio

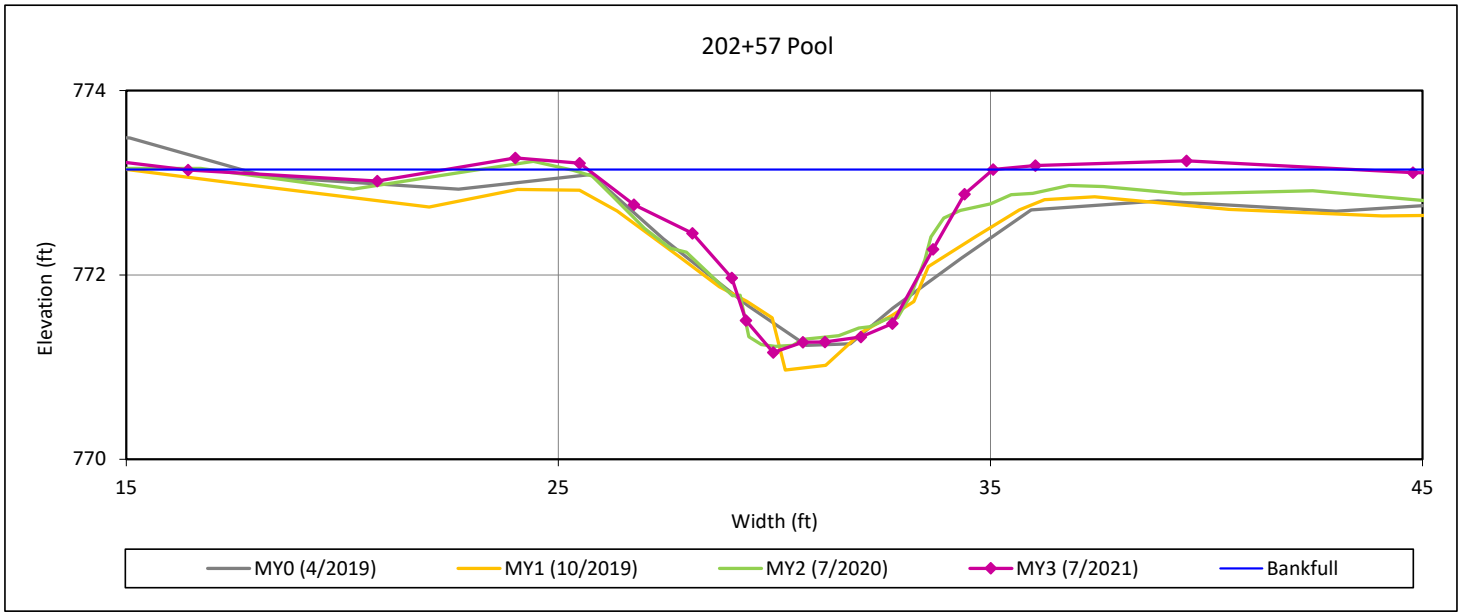
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 14 - UT2 Reach 1



Bankfull Dimensions	
10.2	x-section area (ft.sq.)
9.4	width (ft)
1.1	mean depth (ft)
2.0	max depth (ft)
10.5	wetted perimeter (ft)
1.0	hydraulic radius (ft)
8.7	width-depth ratio

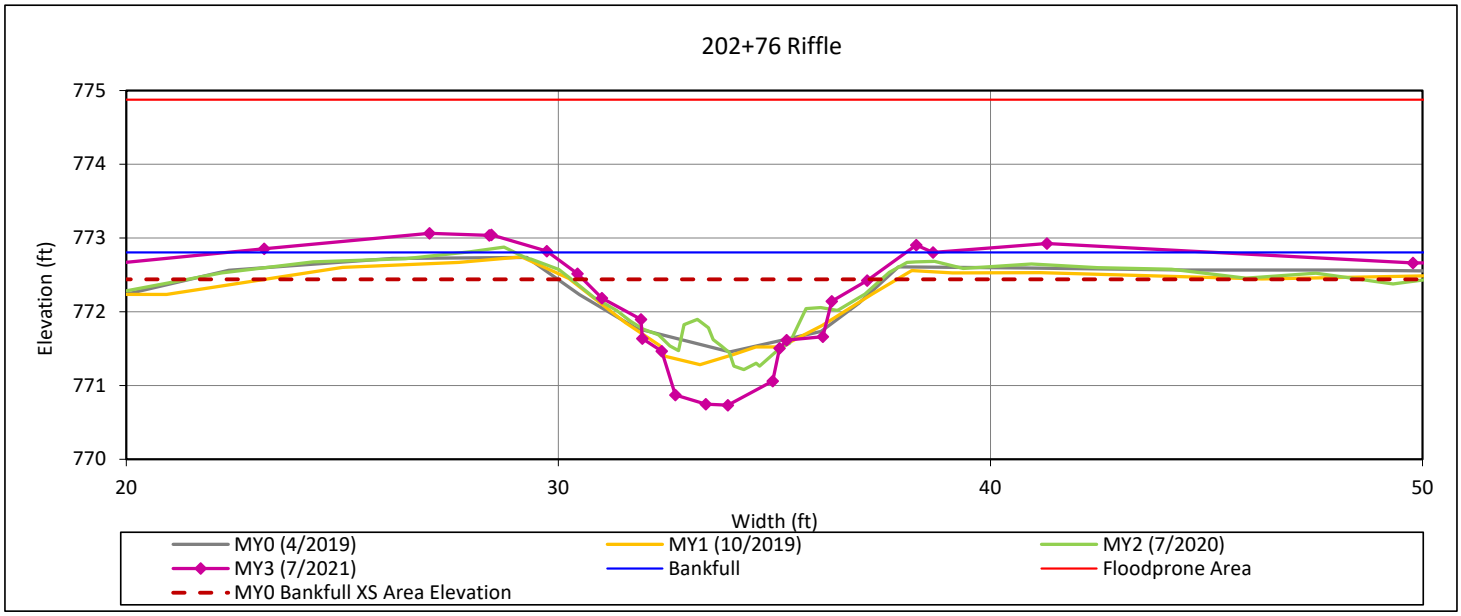
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 15 - UT2 Reach 1



Bankfull Dimensions	
8.8	x-section area (ft.sq.)
8.3	width (ft)
1.1	mean depth (ft)
2.1	max depth (ft)
9.9	wetted perimeter (ft)
0.9	hydraulic radius (ft)
7.8	width-depth ratio
68.7	W flood prone area (ft)
8.3	entrenchment ratio
1.2	low bank height ratio

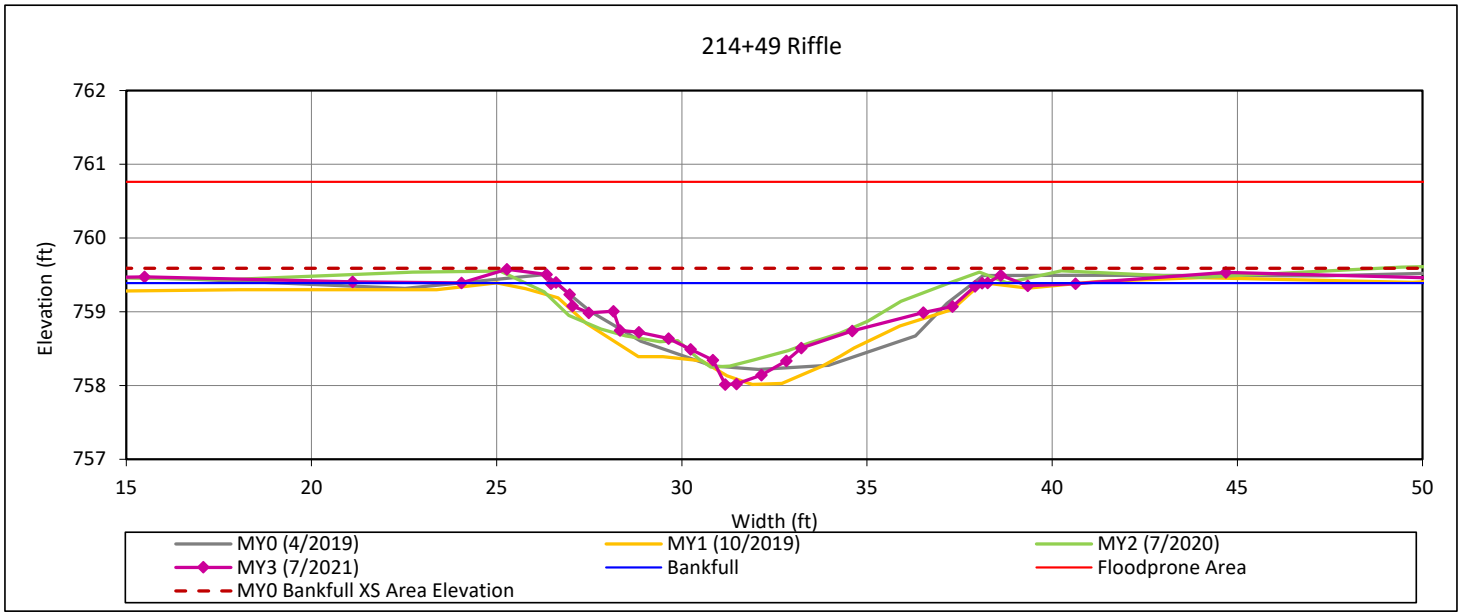
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 16 - UT2 Reach 2



Bankfull Dimensions	
7.8	x-section area (ft.sq.)
11.6	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
12.2	wetted perimeter (ft)
0.6	hydraulic radius (ft)
17.0	width-depth ratio
64.6	W flood prone area (ft)
5.6	entrenchment ratio
0.9	low bank height ratio

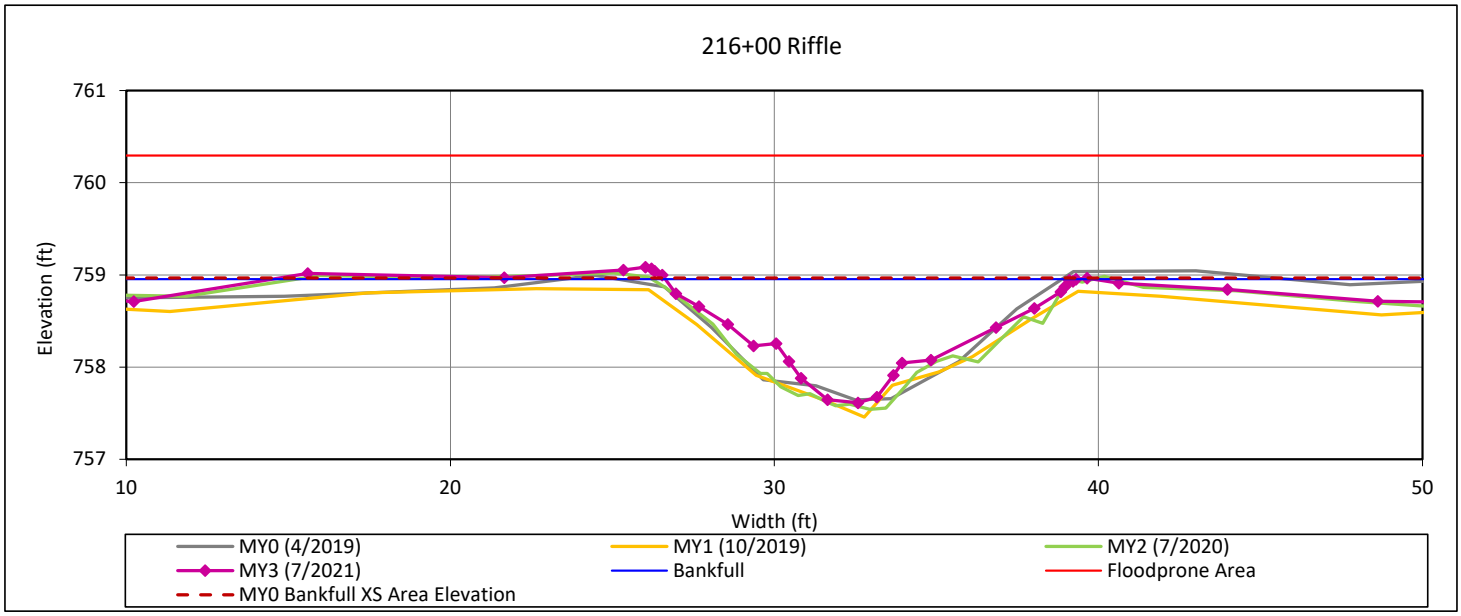
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 17 - UT2 Reach 2



Bankfull Dimensions	
8.9	x-section area (ft.sq.)
12.7	width (ft)
0.7	mean depth (ft)
1.3	max depth (ft)
13.1	wetted perimeter (ft)
0.7	hydraulic radius (ft)
18.0	width-depth ratio
72.1	W flood prone area (ft)
5.7	entrenchment ratio
1.0	low bank height ratio

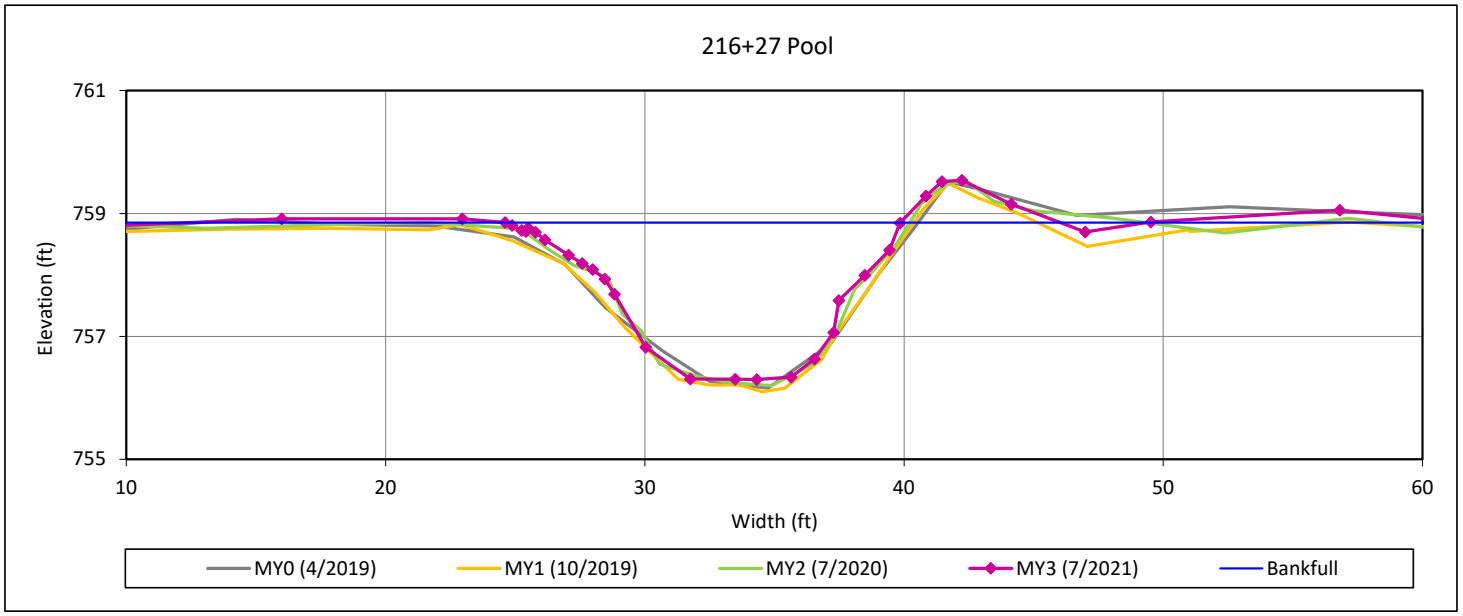
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 18 - UT2 Reach 2



Bankfull Dimensions	
23.4	x-section area (ft.sq.)
15.2	width (ft)
1.5	mean depth (ft)
2.6	max depth (ft)
16.7	wetted perimeter (ft)
1.4	hydraulic radius (ft)
9.9	width-depth ratio

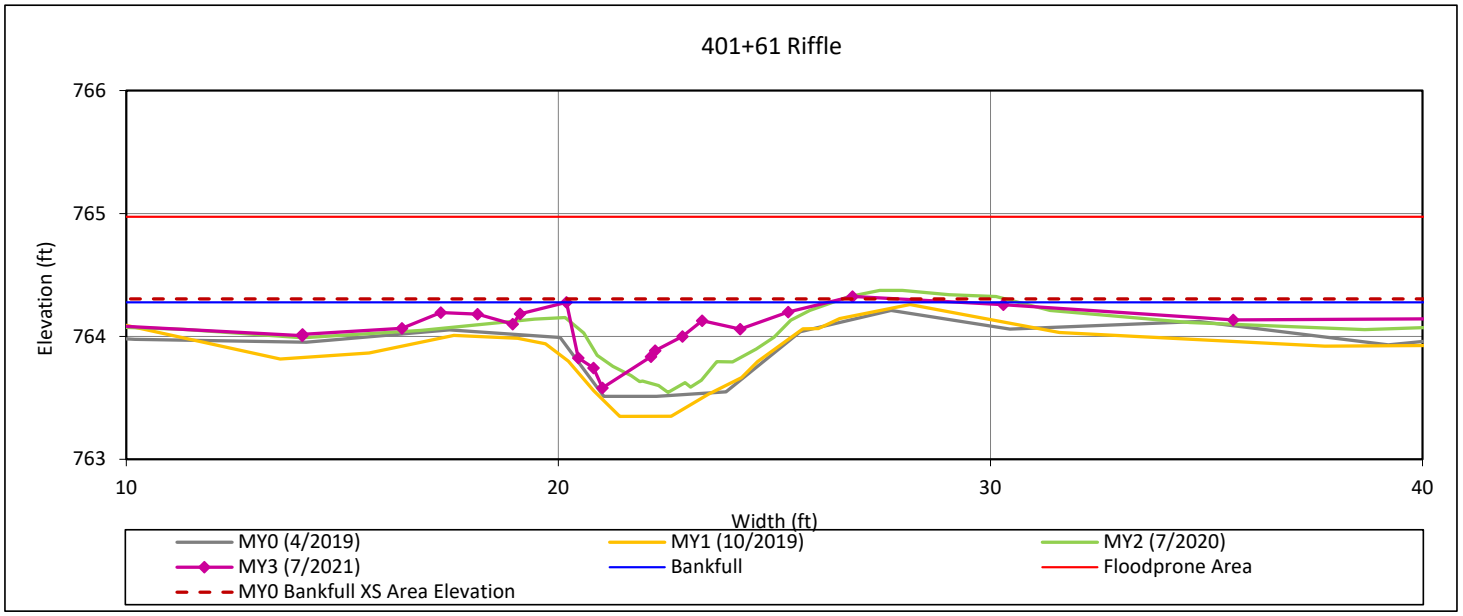
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 19 - UT2A



Bankfull Dimensions	
1.7	x-section area (ft.sq.)
6.1	width (ft)
0.3	mean depth (ft)
0.7	max depth (ft)
6.5	wetted perimeter (ft)
0.3	hydraulic radius (ft)
21.4	width-depth ratio
56.9	W flood prone area (ft)
9.4	entrenchment ratio
1.0	low bank height ratio

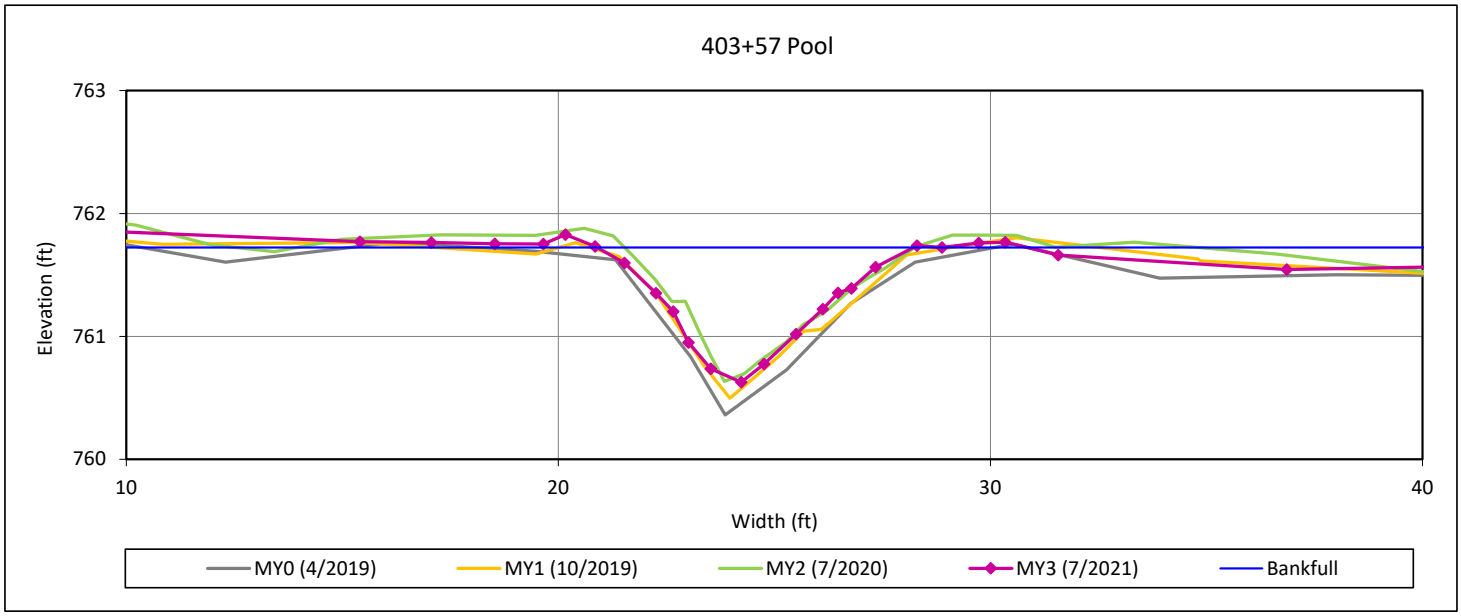
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 20 - UT2A



Bankfull Dimensions	
3.8	x-section area (ft.sq.)
7.3	width (ft)
0.5	mean depth (ft)
1.1	max depth (ft)
7.7	wetted perimeter (ft)
0.5	hydraulic radius (ft)
14.0	width-depth ratio

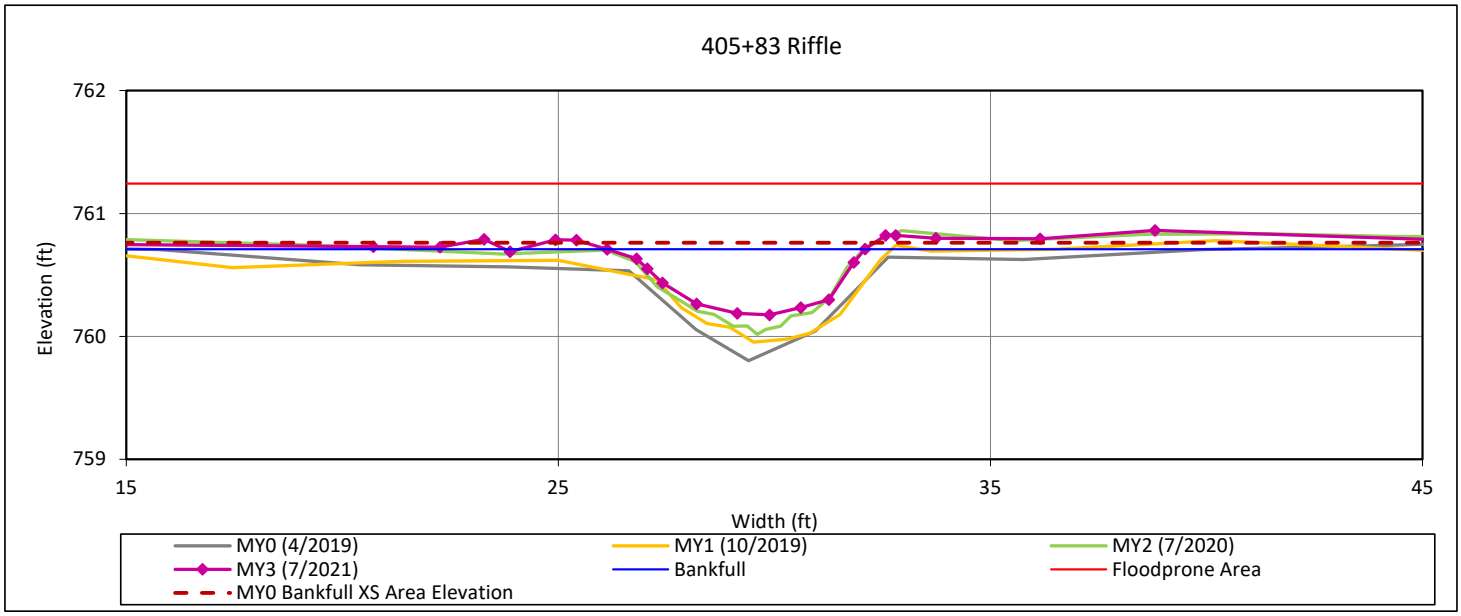
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 21 - UT2A



Bankfull Dimensions	
2.1	x-section area (ft.sq.)
6.0	width (ft)
0.3	mean depth (ft)
0.5	max depth (ft)
6.1	wetted perimeter (ft)
0.3	hydraulic radius (ft)
17.1	width-depth ratio
51.3	W flood prone area (ft)
8.6	entrenchment ratio
0.9	low bank height ratio

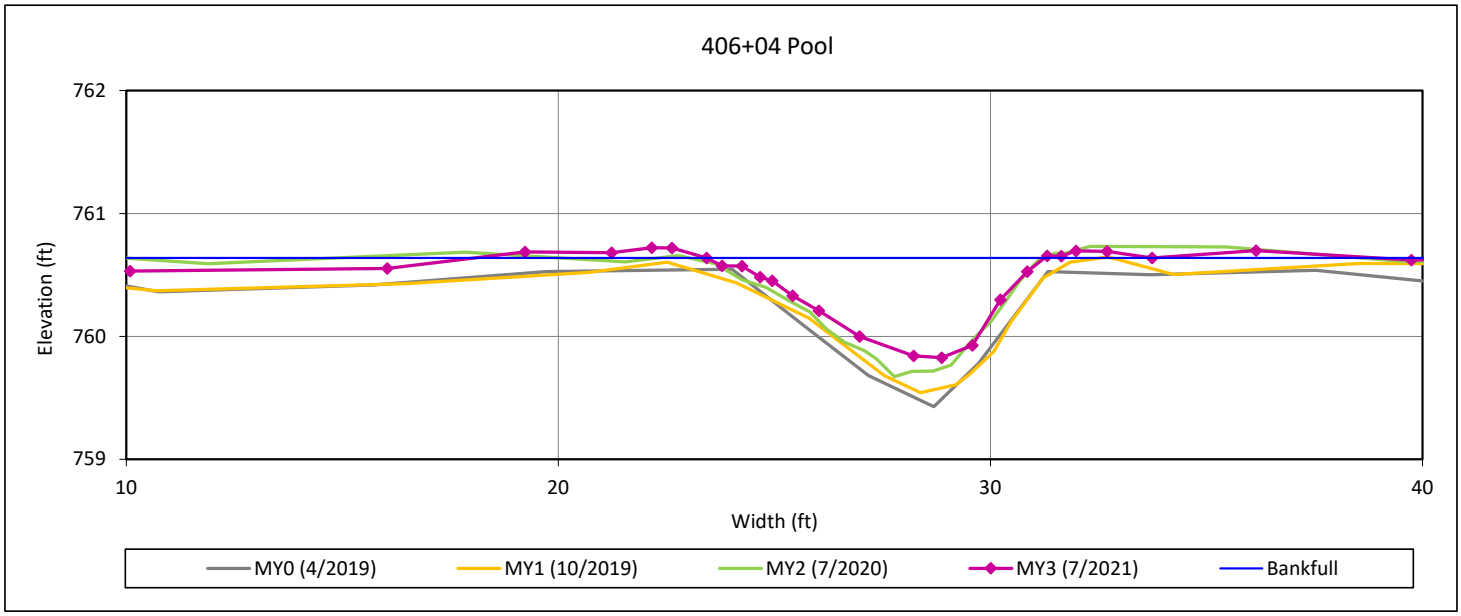
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 22 - UT2A



Bankfull Dimensions	
3.4	x-section area (ft.sq.)
7.8	width (ft)
0.4	mean depth (ft)
0.8	max depth (ft)
8.1	wetted perimeter (ft)
0.4	hydraulic radius (ft)
17.8	width-depth ratio

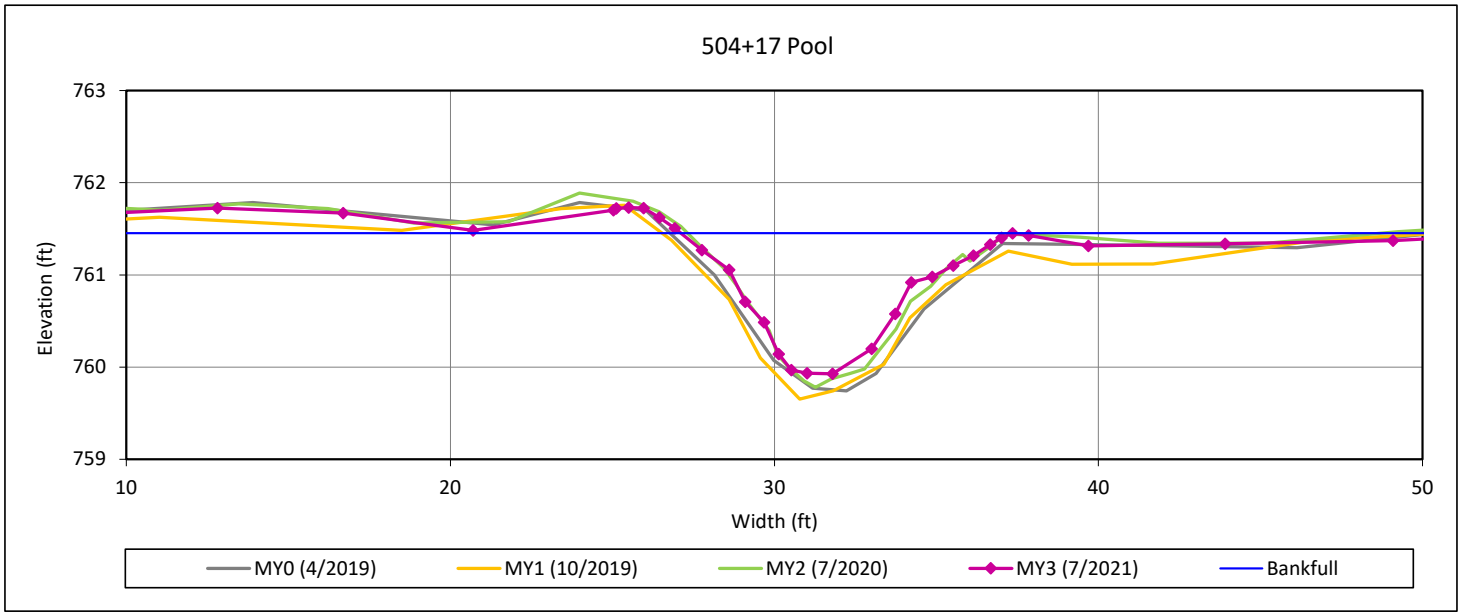
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 23 - UT2B



Bankfull Dimensions	
7.8	x-section area (ft.sq.)
10.2	width (ft)
0.8	mean depth (ft)
1.5	max depth (ft)
10.9	wetted perimeter (ft)
0.7	hydraulic radius (ft)
13.5	width-depth ratio

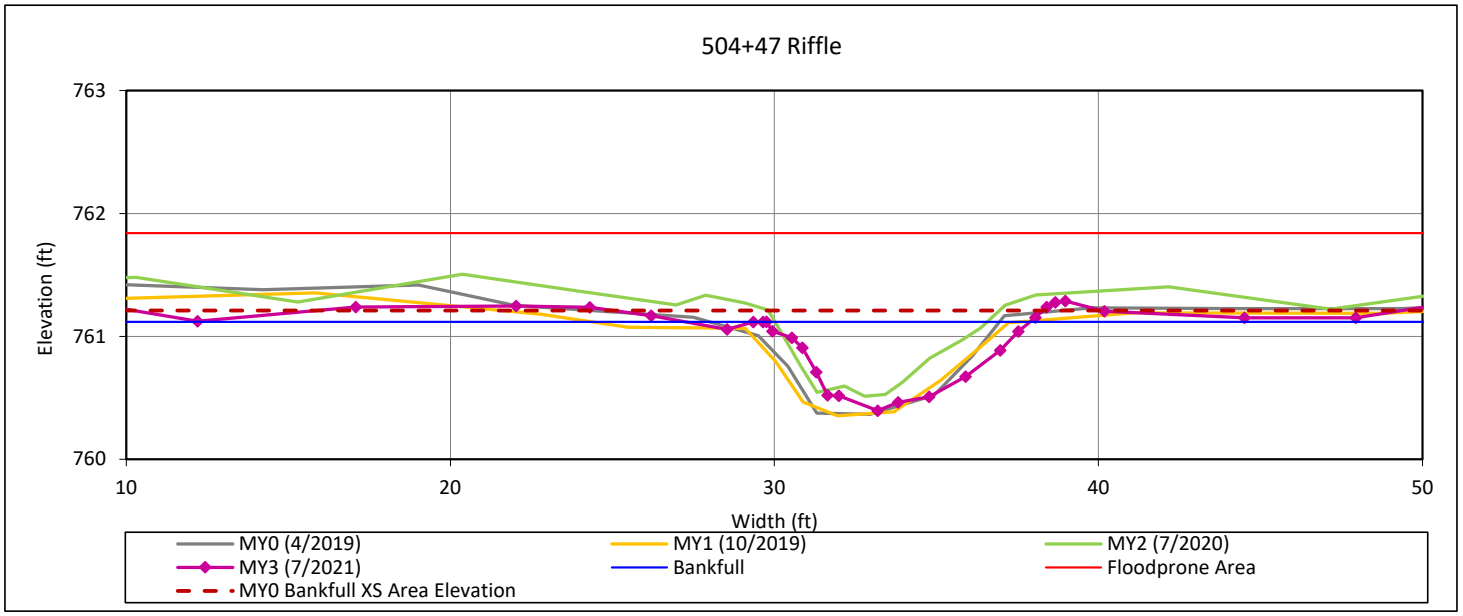
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 24 - UT2B



Bankfull Dimensions	
3.5	x-section area (ft.sq.)
8.1	width (ft)
0.4	mean depth (ft)
0.7	max depth (ft)
8.3	wetted perimeter (ft)
0.4	hydraulic radius (ft)
18.8	width-depth ratio
65.8	W flood prone area (ft)
8.1	entrenchment ratio
0.9	low bank height ratio

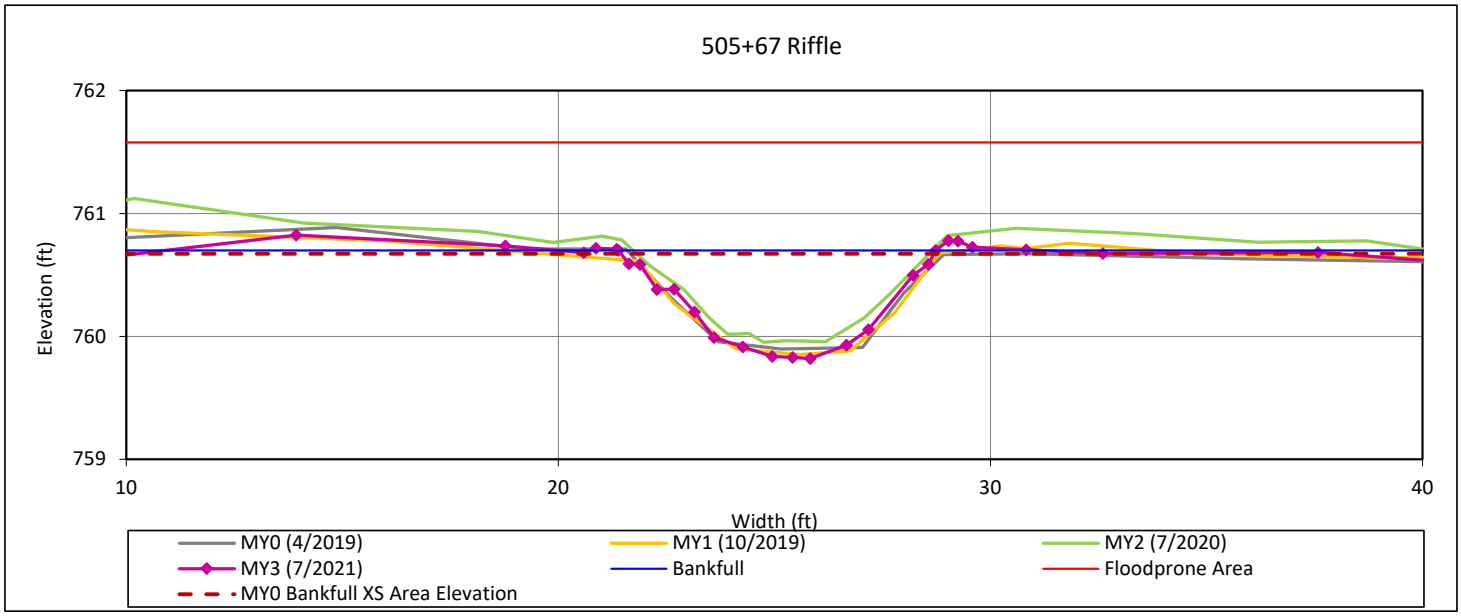
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 25 - UT2B



Bankfull Dimensions	
4.1	x-section area (ft.sq.)
7.3	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
7.7	wetted perimeter (ft)
0.5	hydraulic radius (ft)
13.2	width-depth ratio
56.3	W flood prone area (ft)
7.7	entrenchment ratio
1.0	low bank height ratio

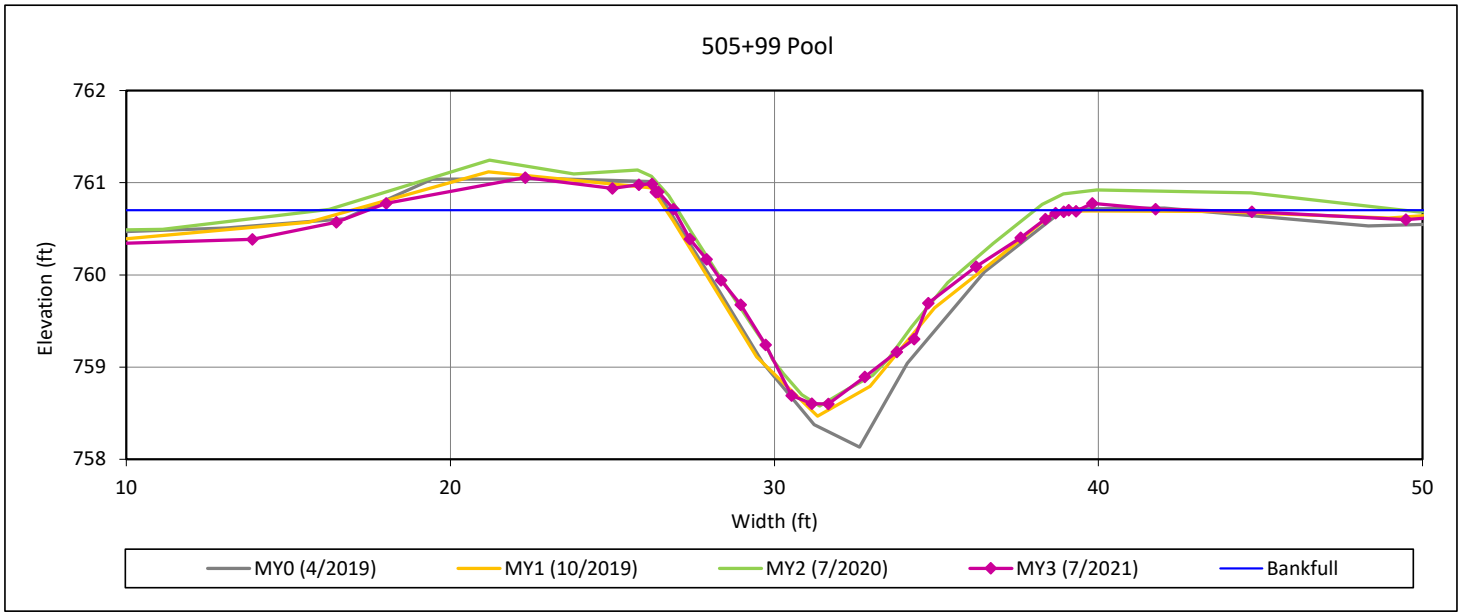
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 26 - UT2B



Bankfull Dimensions	
13.0	x-section area (ft.sq.)
12.2	width (ft)
1.1	mean depth (ft)
2.1	max depth (ft)
13.1	wetted perimeter (ft)
1.0	hydraulic radius (ft)
11.4	width-depth ratio

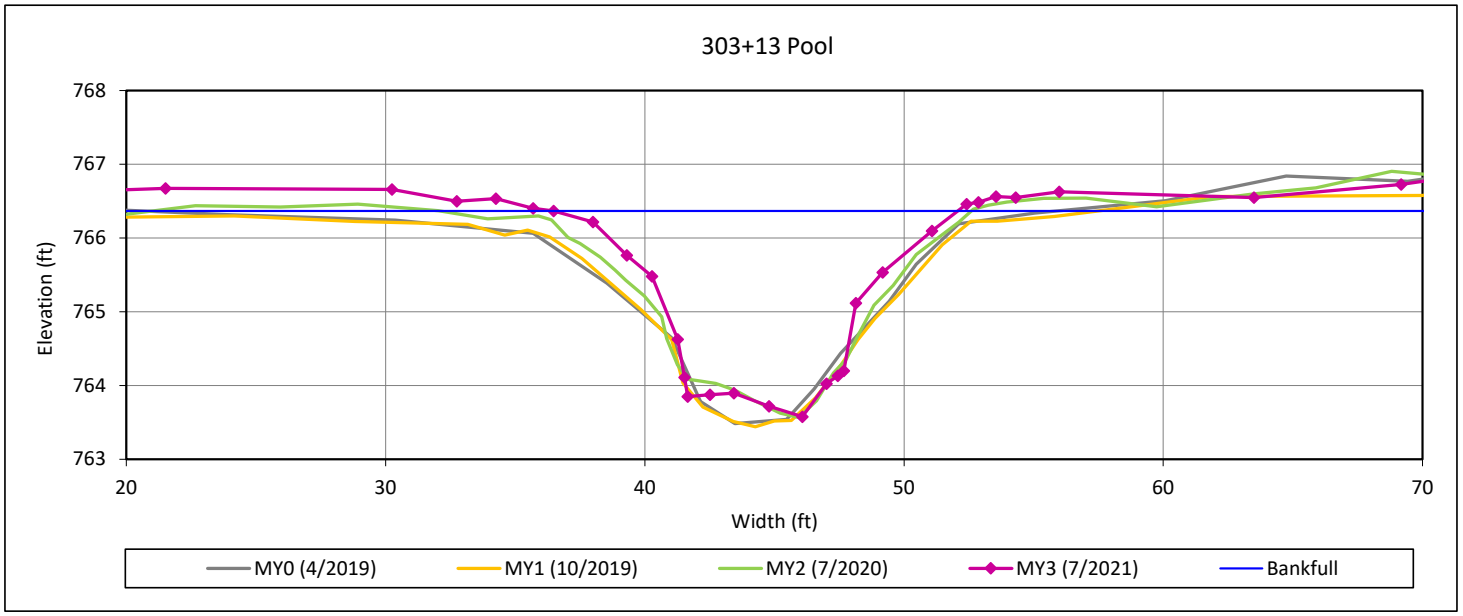
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 27 - UT3 Reach 1



Bankfull Dimensions	
21.8	x-section area (ft.sq.)
15.6	width (ft)
1.4	mean depth (ft)
2.8	max depth (ft)
17.4	wetted perimeter (ft)
1.3	hydraulic radius (ft)
11.1	width-depth ratio

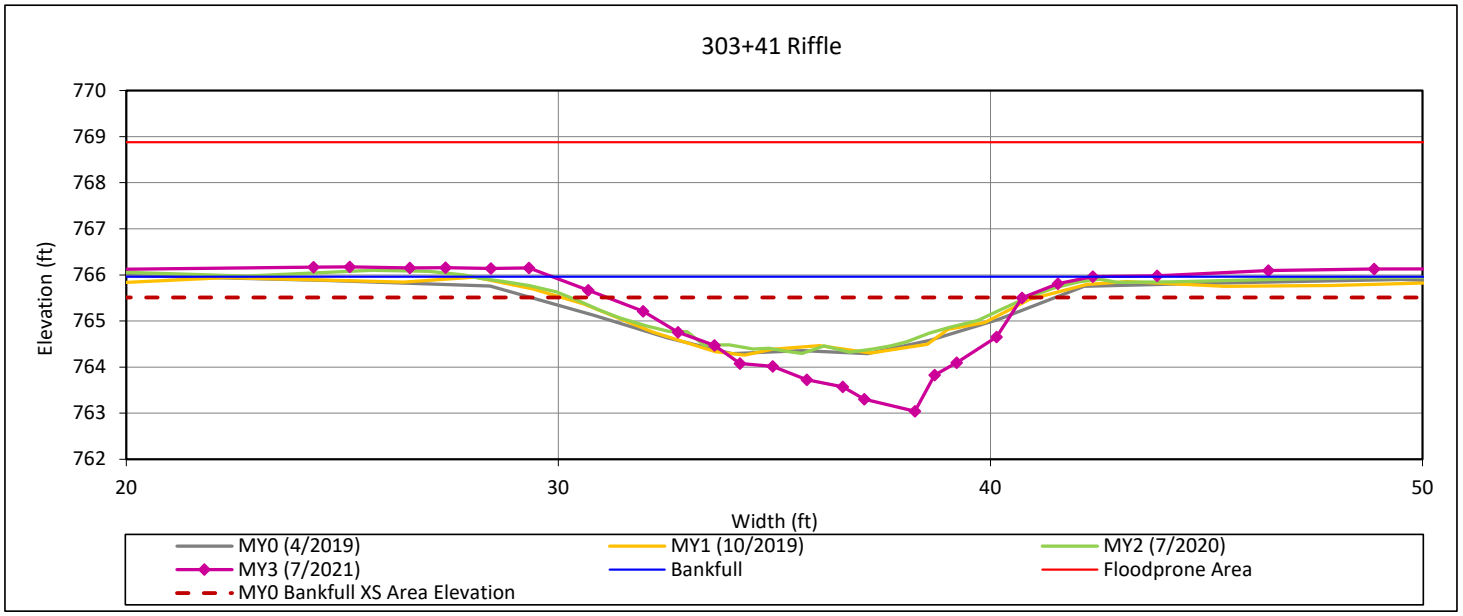
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 28 - UT3 Reach 1



Bankfull Dimensions	
17.7	x-section area (ft.sq.)
12.5	width (ft)
1.4	mean depth (ft)
2.9	max depth (ft)
14.3	wetted perimeter (ft)
1.2	hydraulic radius (ft)
8.8	width-depth ratio
73.3	W flood prone area (ft)
5.9	entrenchment ratio
1.2	low bank height ratio

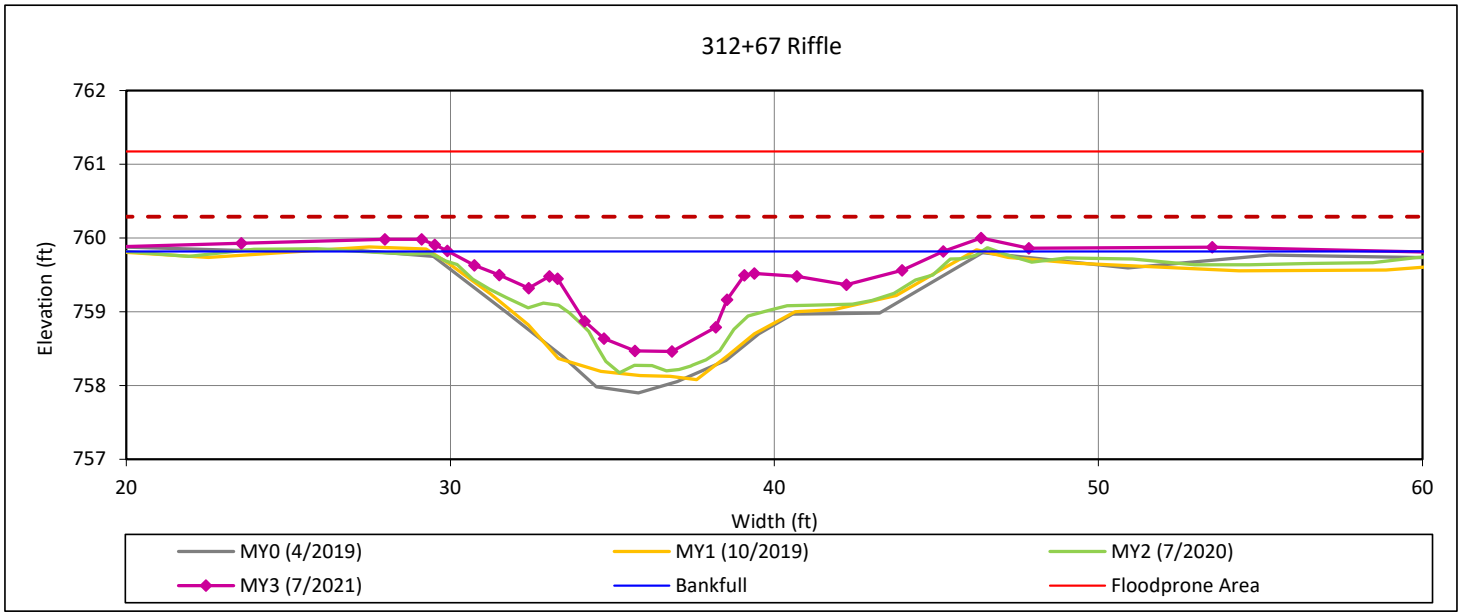
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 29 - UT3 Reach 2



Bankfull Dimensions	
9.0	x-section area (ft.sq.)
15.3	width (ft)
0.6	mean depth (ft)
1.4	max depth (ft)
15.9	wetted perimeter (ft)
0.6	hydraulic radius (ft)
26.0	width-depth ratio
75.5	W flood prone area (ft)
4.9	entrenchment ratio
0.7	low bank height ratio

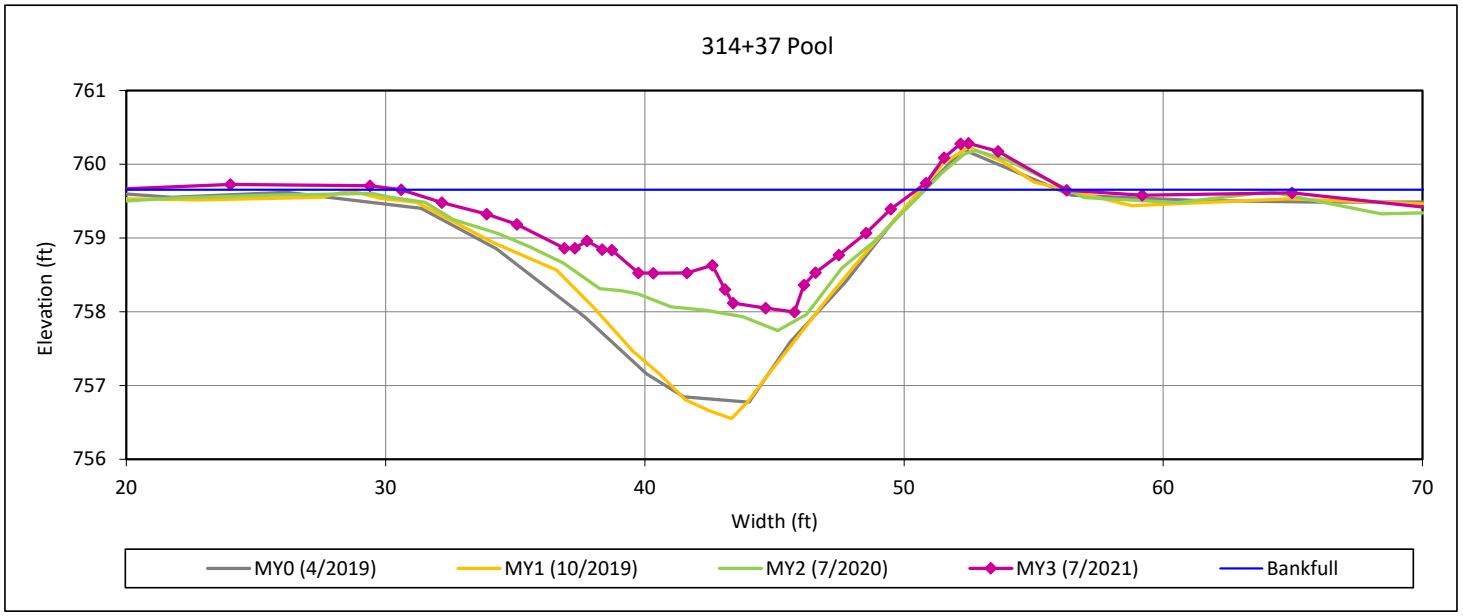
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 30 - UT3 Reach 2



Bankfull Dimensions	
15.9	x-section area (ft.sq.)
19.9	width (ft)
0.8	mean depth (ft)
1.7	max depth (ft)
20.5	wetted perimeter (ft)
0.8	hydraulic radius (ft)
25.0	width-depth ratio

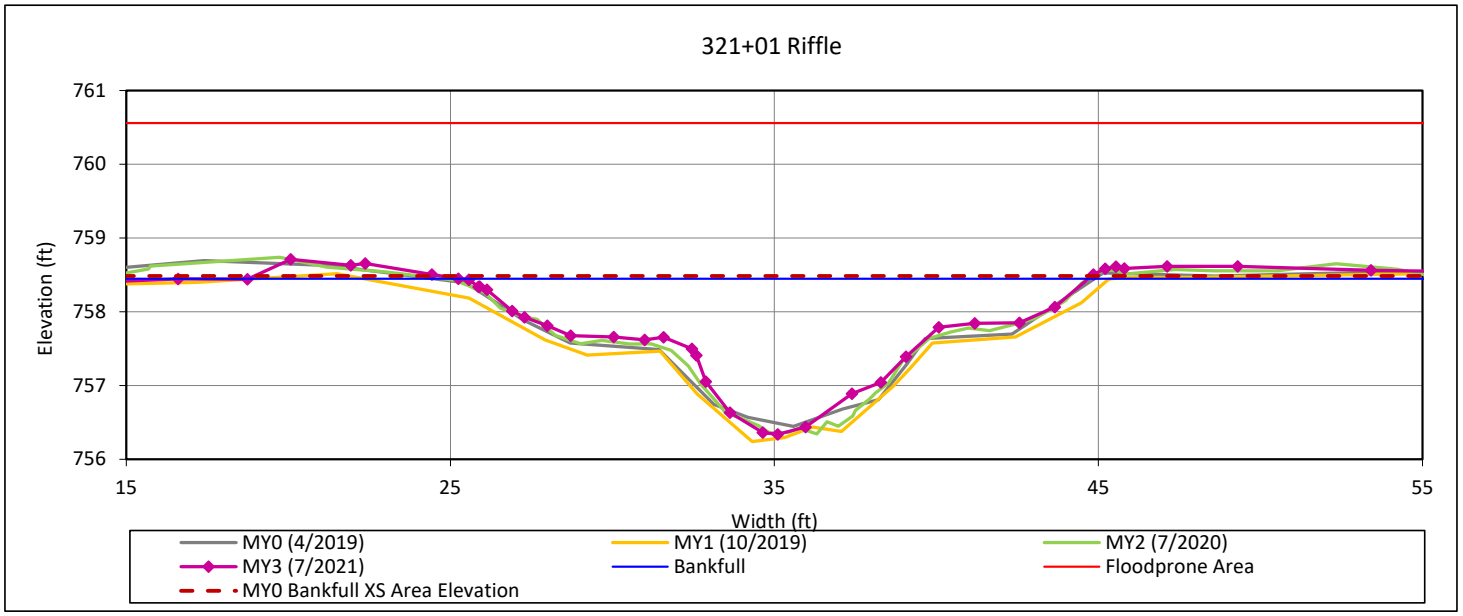
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 31 - UT3 Reach 3



Bankfull Dimensions	
18.8	x-section area (ft.sq.)
19.4	width (ft)
1.0	mean depth (ft)
2.1	max depth (ft)
20.2	wetted perimeter (ft)
0.9	hydraulic radius (ft)
20.1	width-depth ratio
70.8	W flood prone area (ft)
3.6	entrenchment ratio
1.0	low bank height ratio

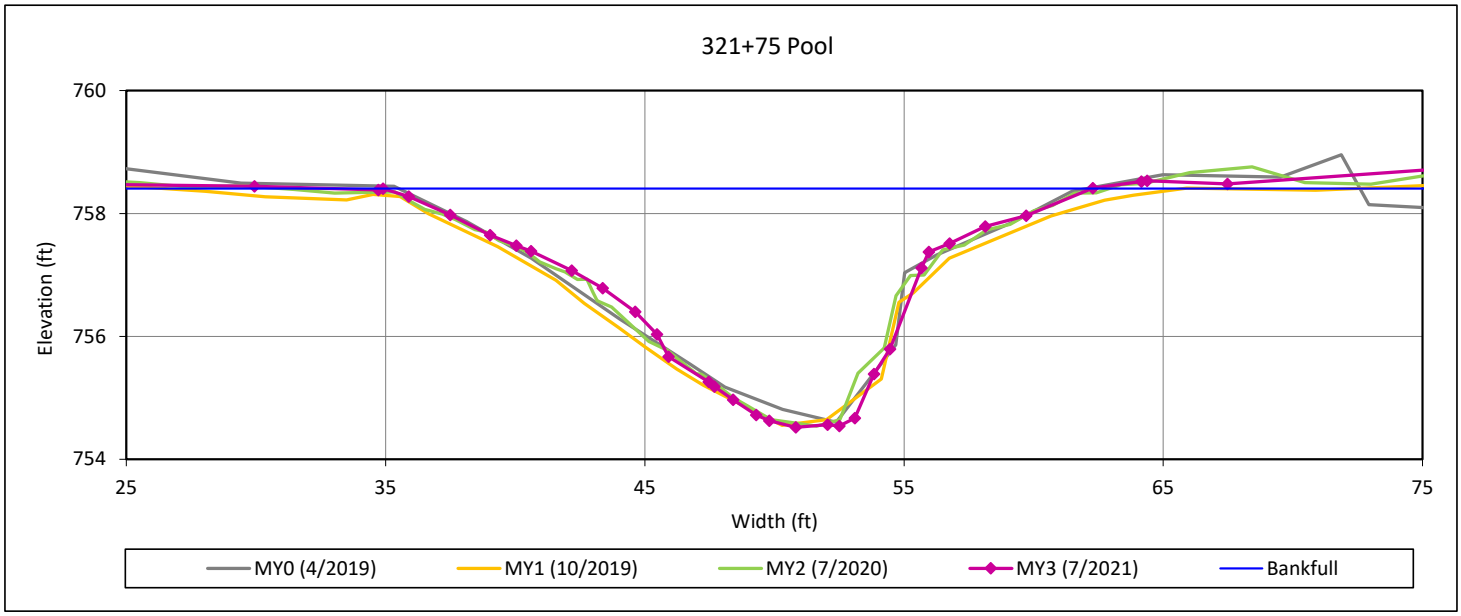
Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 3 - 2021

Cross-Section 32 - UT3 Reach 3



Bankfull Dimensions	
47.2	x-section area (ft.sq.)
27.3	width (ft)
1.7	mean depth (ft)
3.9	max depth (ft)
29.1	wetted perimeter (ft)
1.6	hydraulic radius (ft)
15.8	width-depth ratio

Survey Date: 7/2021
Field Crew: Wildlands Engineering

View Downstream

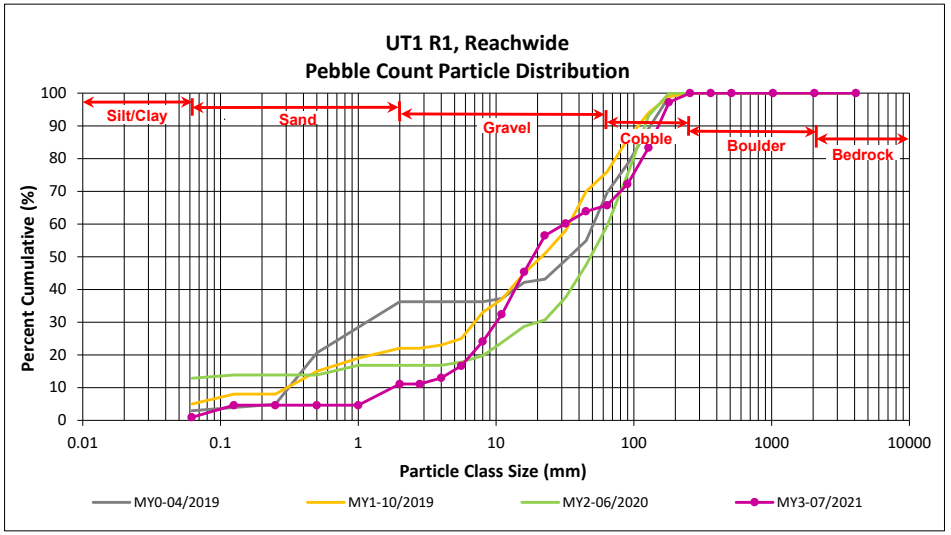
Reachwide Pebble Count Plots

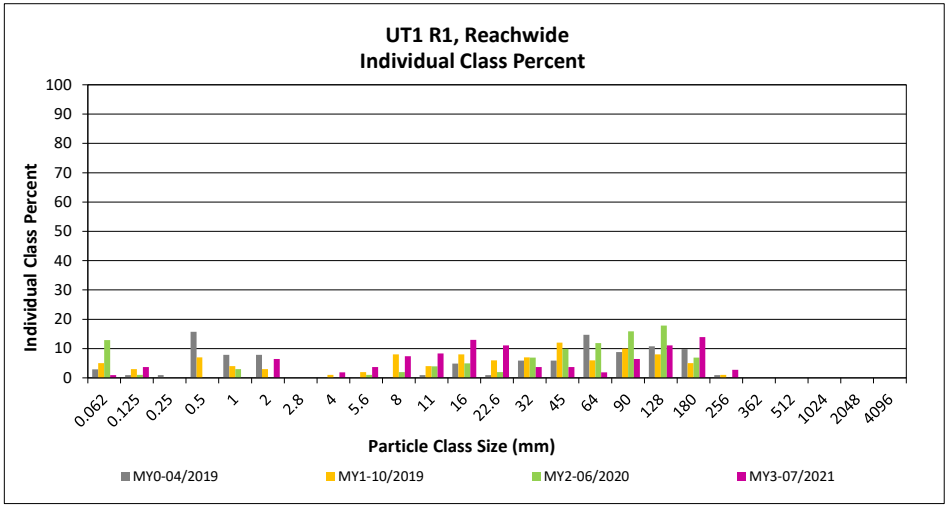
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT1 R1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		1	1	1	1
SAND	Very fine	0.062	0.125		4	4	4	5
	Fine	0.125	0.250					5
	Medium	0.25	0.50					5
	Coarse	0.5	1.0					5
	Very Coarse	1.0	2.0	2	5	7	6	11
GRAVEL	Very Fine	2.0	2.8					11
	Very Fine	2.8	4.0	1	1	2	2	13
	Fine	4.0	5.6		4	4	4	17
	Fine	5.6	8.0	1	7	8	7	24
	Medium	8.0	11.0	4	5	9	8	32
	Medium	11.0	16.0		14	14	13	45
	Coarse	16.0	22.6	8	4	12	11	56
	Coarse	22.6	32	1	3	4	4	60
	Very Coarse	32	45	2	2	4	4	64
	Very Coarse	45	64	2		2	2	66
COBBLE	Small	64	90	4	3	7	6	72
	Small	90	128	10	2	12	11	83
	Large	128	180	11	4	15	14	97
	Large	180	256	2	1	3	3	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**48**	**60**	**108**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	5.3
D_{35} =	11.9
D_{50} =	18.5
D_{84} =	130.1
D_{95} =	170.4
D_{100} =	256.0





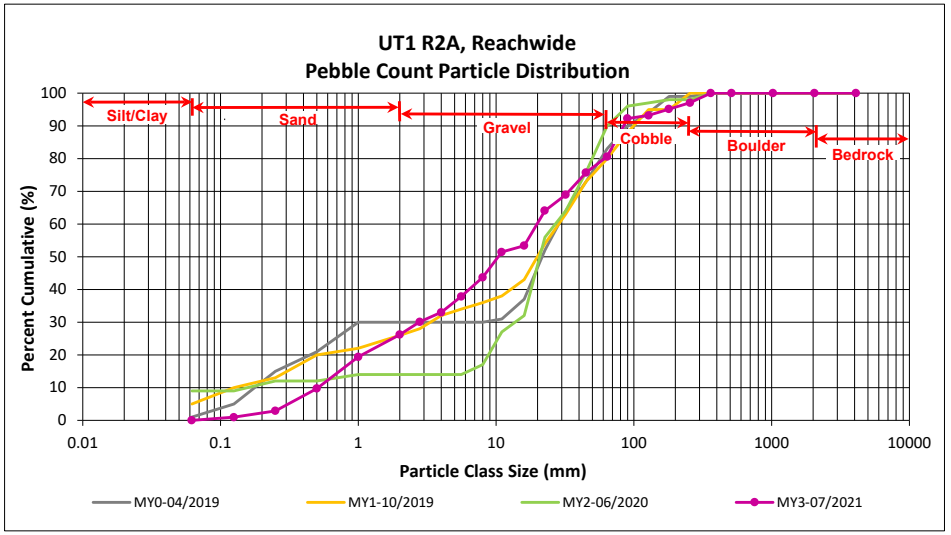
Reachwide Pebble Count Plots

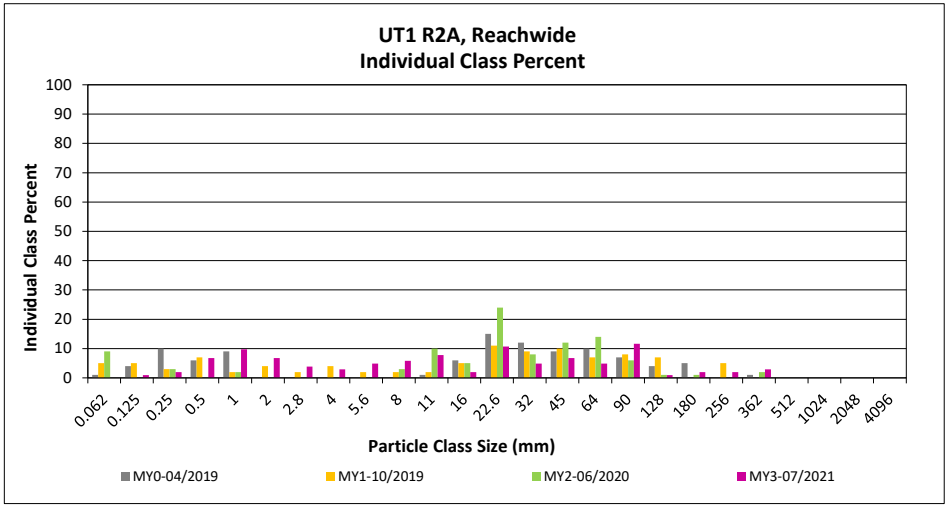
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT1 R2A, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0
SAND	Very fine	0.062	0.125		1	1	1	1
	Fine	0.125	0.250	1	1	2	2	3
	Medium	0.25	0.50		7	7	7	10
	Coarse	0.5	1.0		10	10	10	19
	Very Coarse	1.0	2.0	2	5	7	7	26
GRAVEL	Very Fine	2.0	2.8	1	3	4	4	30
	Very Fine	2.8	4.0	1	2	3	3	33
	Fine	4.0	5.6	2	3	5	5	38
	Fine	5.6	8.0	3	3	6	6	44
	Medium	8.0	11.0	5	3	8	8	51
	Medium	11.0	16.0	1	1	2	2	53
	Coarse	16.0	22.6	8	3	11	11	64
	Coarse	22.6	32	4	1	5	5	69
	Very Coarse	32	45	5	2	7	7	76
	Very Coarse	45	64	4	1	5	5	81
COBBLE	Small	64	90	10	2	12	12	92
	Small	90	128	1		1	1	93
	Large	128	180	1	1	2	2	95
	Large	180	256	1	1	2	2	97
BOULDER	Small	256	362	3		3	3	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**53**	**50**	**103**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.8
D_{35} =	4.6
D_{50} =	10.4
D_{84} =	70.7
D_{95} =	175.5
D_{100} =	362.0





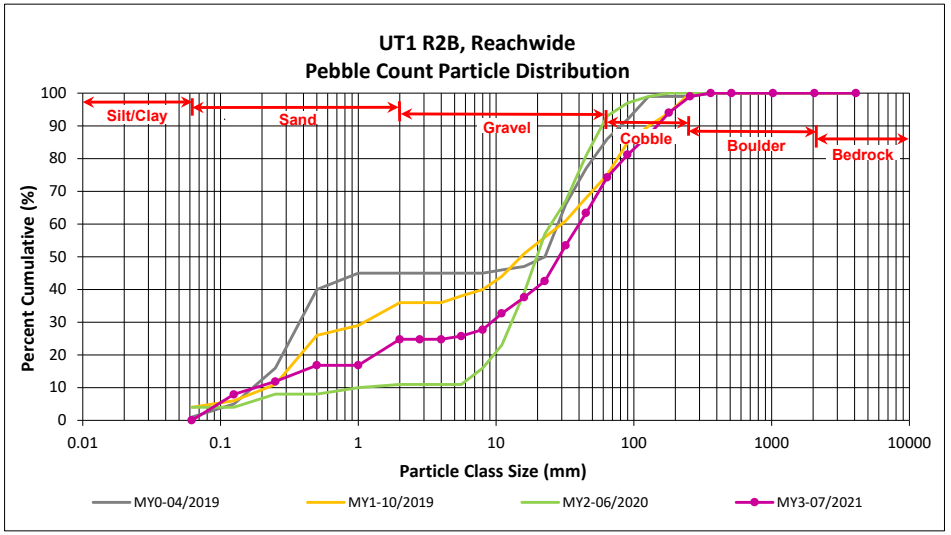
Reachwide Pebble Count Plots

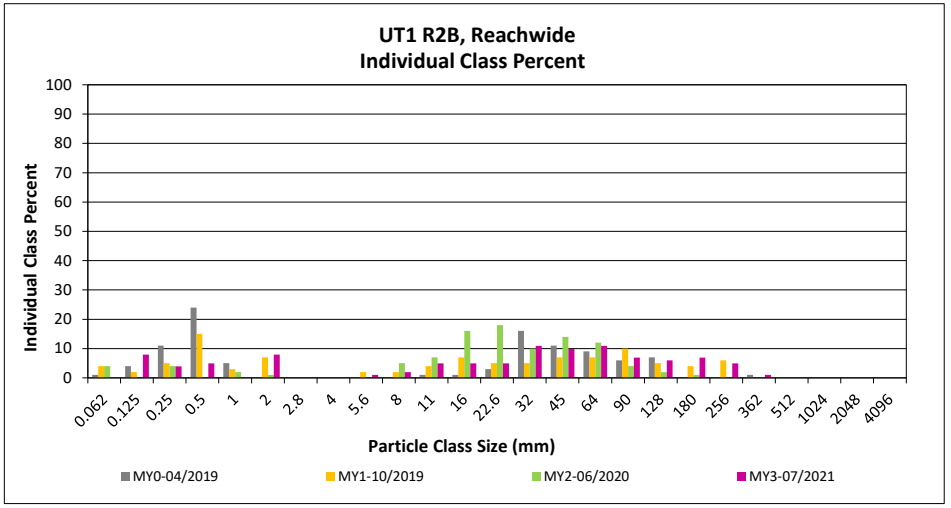
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT1 R2B, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0
SAND	Very fine	0.062	0.125		8	8	8	8
	Fine	0.125	0.250		4	4	4	12
	Medium	0.25	0.50		5	5	5	17
	Coarse	0.5	1.0					17
	Very Coarse	1.0	2.0		8	8	8	25
GRAVEL	Very Fine	2.0	2.8					25
	Very Fine	2.8	4.0					25
	Fine	4.0	5.6		1	1	1	26
	Fine	5.6	8.0		2	2	2	28
	Medium	8.0	11.0	1	4	5	5	33
	Medium	11.0	16.0	1	4	5	5	38
	Coarse	16.0	22.6	4	1	5	5	43
	Coarse	22.6	32	2	9	11	11	53
	Very Coarse	32	45	7	3	10	10	63
	Very Coarse	45	64	11		11	11	74
COBBLE	Small	64	90	7		7	7	81
	Small	90	128	5	1	6	6	87
	Large	128	180	7		7	7	94
	Large	180	256	5		5	5	99
BOULDER	Small	256	362	1		1	1	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**51**	**50**	**101**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.4
D_{35} =	13.1
D_{50} =	28.6
D_{84} =	106.3
D_{95} =	192.5
D_{100} =	362.0





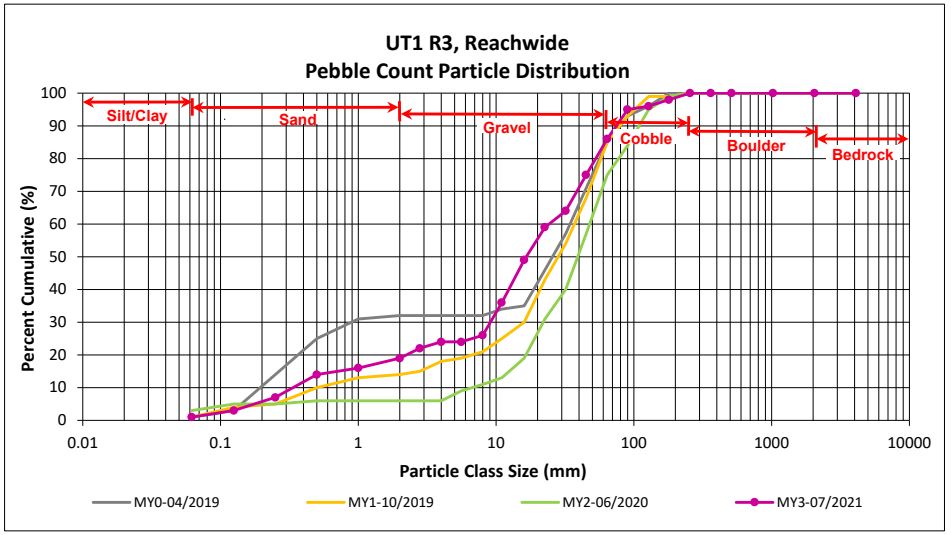
Reachwide Pebble Count Plots

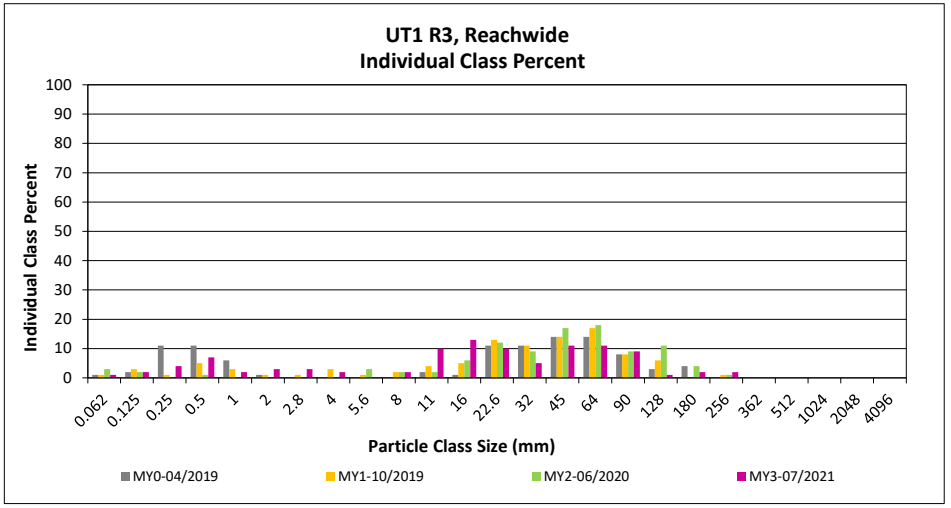
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT1 R3, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		1	1	1	1
SAND	Very fine	0.062	0.125		2	2	2	3
	Fine	0.125	0.250		4	4	4	7
	Medium	0.25	0.50		7	7	7	14
	Coarse	0.5	1.0		2	2	2	16
	Very Coarse	1.0	2.0		3	3	3	19
GRAVEL	Very Fine	2.0	2.8		3	3	3	22
	Very Fine	2.8	4.0		2	2	2	24
	Fine	4.0	5.6					24
	Fine	5.6	8.0	1	1	2	2	26
	Medium	8.0	11.0	4	6	10	10	36
	Medium	11.0	16.0	9	4	13	13	49
	Coarse	16.0	22.6	6	4	10	10	59
	Coarse	22.6	32	3	2	5	5	64
	Very Coarse	32	45	9	2	11	11	75
	Very Coarse	45	64	9	2	11	11	86
COBBLE	Small	64	90	5	4	9	9	95
	Small	90	128	1		1	1	96
	Large	128	180	2		2	2	98
	Large	180	256	1	1	2	2	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	1.0
D_{35} =	10.7
D_{50} =	16.6
D_{84} =	60.0
D_{95} =	90.0
D_{100} =	256.0





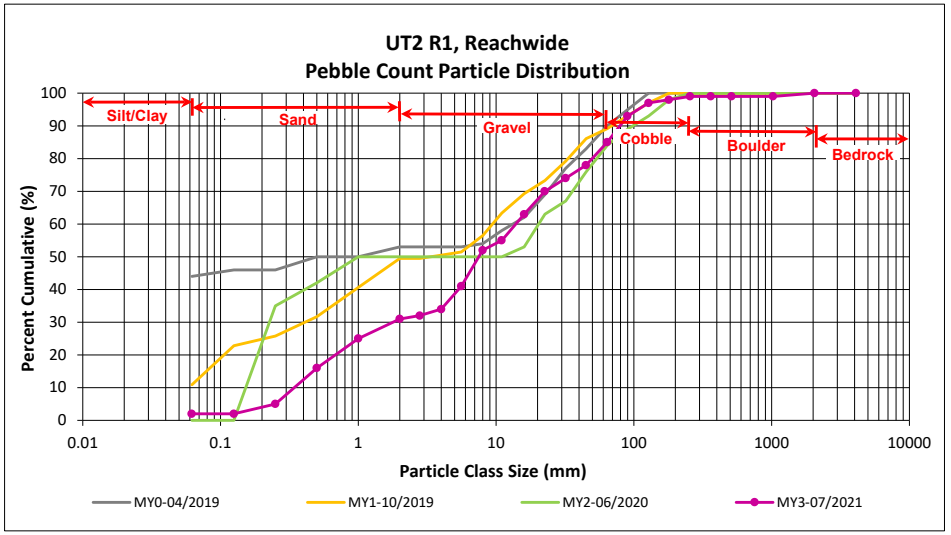
Reachwide Pebble Count Plots

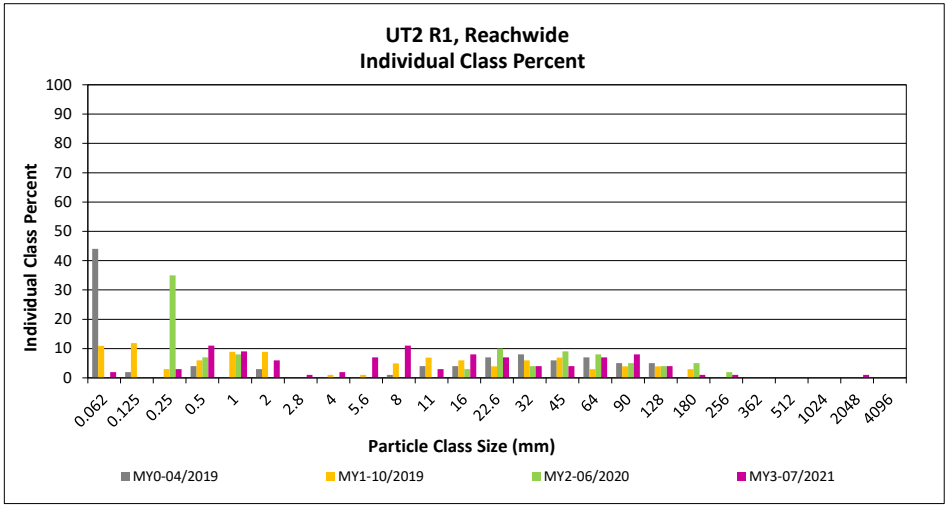
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT2 R1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		2	2	2	2
SAND	Very fine	0.062	0.125					2
	Fine	0.125	0.250		3	3	3	5
	Medium	0.25	0.50	1	10	11	11	16
	Coarse	0.5	1.0	2	7	9	9	25
	Very Coarse	1.0	2.0		6	6	6	31
GRAVEL	Very Fine	2.0	2.8		1	1	1	32
	Very Fine	2.8	4.0		2	2	2	34
	Fine	4.0	5.6	3	4	7	7	41
	Fine	5.6	8.0	7	4	11	11	52
	Medium	8.0	11.0	2	1	3	3	55
	Medium	11.0	16.0	3	5	8	8	63
	Coarse	16.0	22.6	6	1	7	7	70
	Coarse	22.6	32	4		4	4	74
	Very Coarse	32	45	4		4	4	78
	Very Coarse	45	64	6	1	7	7	85
COBBLE	Small	64	90	7	1	8	8	93
	Small	90	128	3	1	4	4	97
	Large	128	180		1	1	1	98
	Large	180	256	1		1	1	99
BOULDER	Small	256	362					99
	Small	362	512					99
	Medium	512	1024					99
	Large/Very Large	1024	2048	1		1	1	100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.5
D_{35} =	4.2
D_{50} =	7.5
D_{84} =	60.9
D_{95} =	107.3
D_{100} =	2048.0





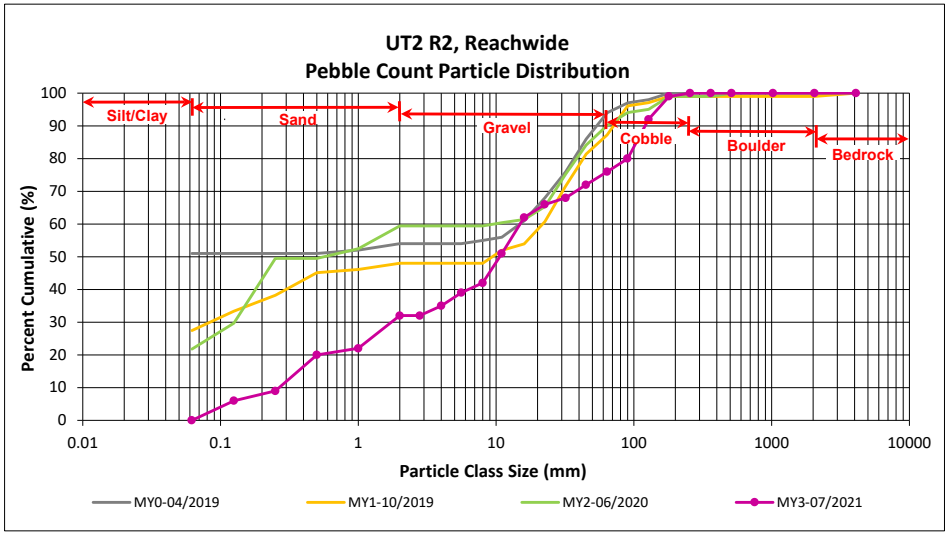
Reachwide Pebble Count Plots

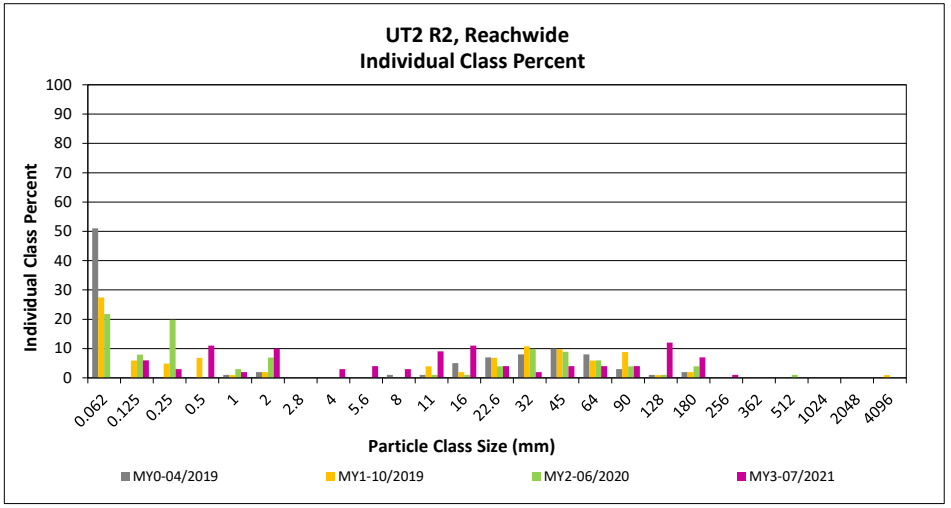
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT2 R2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0
SAND	Very fine	0.062	0.125		6	6	6	6
	Fine	0.125	0.250		3	3	3	9
	Medium	0.25	0.50		11	11	11	20
	Coarse	0.5	1.0		2	2	2	22
	Very Coarse	1.0	2.0	2	8	10	10	32
GRAVEL	Very Fine	2.0	2.8					32
	Very Fine	2.8	4.0		3	3	3	35
	Fine	4.0	5.6	1	3	4	4	39
	Fine	5.6	8.0		3	3	3	42
	Medium	8.0	11.0	5	4	9	9	51
	Medium	11.0	16.0	7	4	11	11	62
	Coarse	16.0	22.6	3	1	4	4	66
	Coarse	22.6	32	1	1	2	2	68
	Very Coarse	32	45	3	1	4	4	72
	Very Coarse	45	64	4		4	4	76
COBBLE	Small	64	90	4		4	4	80
	Small	90	128	12		12	12	92
	Large	128	180	7		7	7	99
	Large	180	256	1		1	1	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.4
D_{35} =	4.0
D_{50} =	10.6
D_{84} =	101.2
D_{95} =	148.1
D_{100} =	256.0





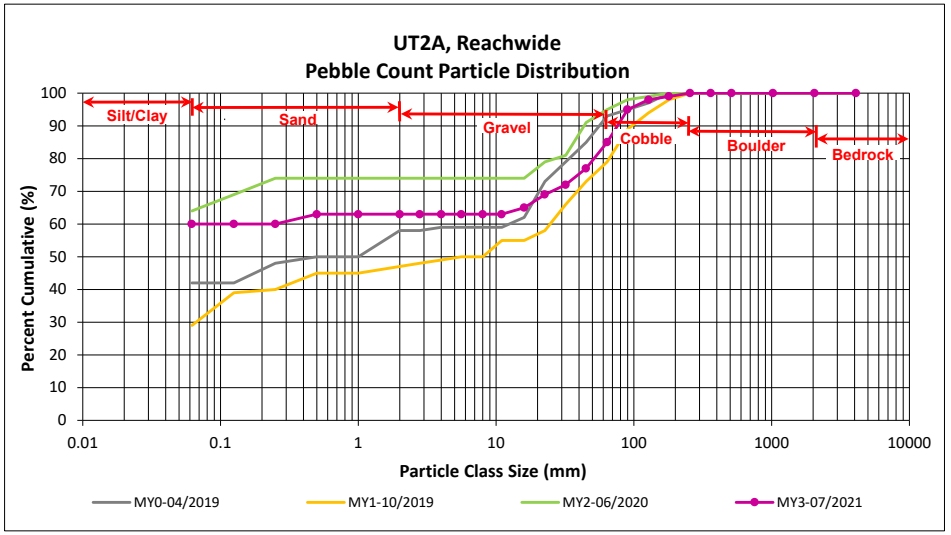
Reachwide Pebble Count Plots

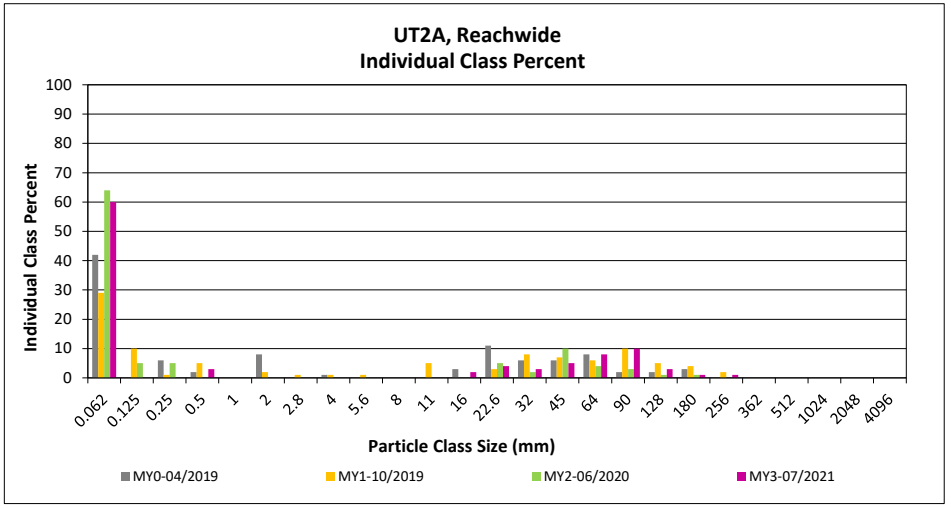
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT2A, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	13	47	60	60	60
SAND	Very fine	0.062	0.125					60
	Fine	0.125	0.250					60
	Medium	0.25	0.50		3	3	3	63
	Coarse	0.5	1.0					63
	Very Coarse	1.0	2.0					63
GRAVEL	Very Fine	2.0	2.8					63
	Very Fine	2.8	4.0					63
	Fine	4.0	5.6					63
	Fine	5.6	8.0					63
	Medium	8.0	11.0					63
	Medium	11.0	16.0	2		2	2	65
	Coarse	16.0	22.6	4		4	4	69
	Coarse	22.6	32	3		3	3	72
	Very Coarse	32	45	5		5	5	77
	Very Coarse	45	64	8		8	8	85
COBBLE	Small	64	90	10		10	10	95
	Small	90	128	3		3	3	98
	Large	128	180	1		1	1	99
	Large	180	256	1		1	1	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	50	50	100	100	100

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	Silt/Clay
D_{84} =	61.2
D_{95} =	90.0
D_{100} =	256.0





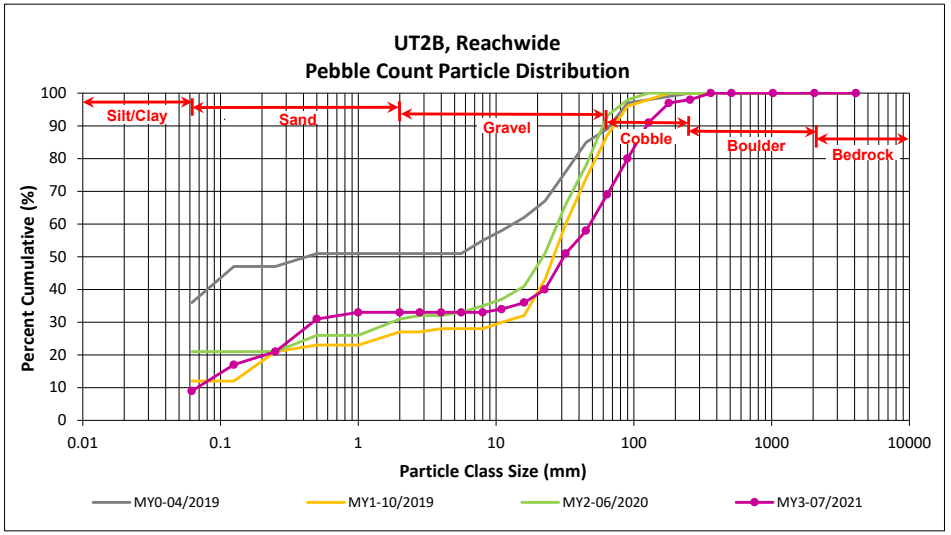
Reachwide Pebble Count Plots

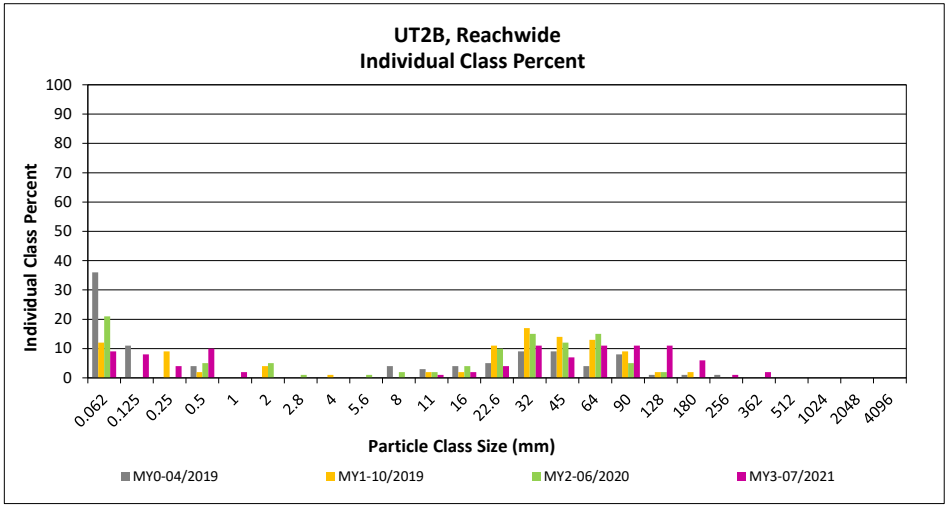
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT2B, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	8	9	9	9
SAND	Very fine	0.062	0.125	1	7	8	8	17
	Fine	0.125	0.250	2	2	4	4	21
	Medium	0.25	0.50	2	8	10	10	31
	Coarse	0.5	1.0	2		2	2	33
	Very Coarse	1.0	2.0					33
GRAVEL	Very Fine	2.0	2.8					33
	Very Fine	2.8	4.0					33
	Fine	4.0	5.6					33
	Fine	5.6	8.0					33
	Medium	8.0	11.0		1	1	1	34
	Medium	11.0	16.0		2	2	2	36
	Coarse	16.0	22.6		4	4	4	40
	Coarse	22.6	32	4	7	11	11	51
	Very Coarse	32	45	3	4	7	7	58
	Very Coarse	45	64	8	3	11	11	69
COBBLE	Small	64	90	10	1	11	11	80
	Small	90	128	10	1	11	11	91
	Large	128	180	6		6	6	97
	Large	180	256		1	1	1	98
BOULDER	Small	256	362	1	1	2	2	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	50	50	100	100	100

Reachwide	
Channel materials (mm)	
D_{16} =	0.1
D_{35} =	13.3
D_{50} =	31.0
D_{84} =	102.3
D_{95} =	160.7
D_{100} =	362.0





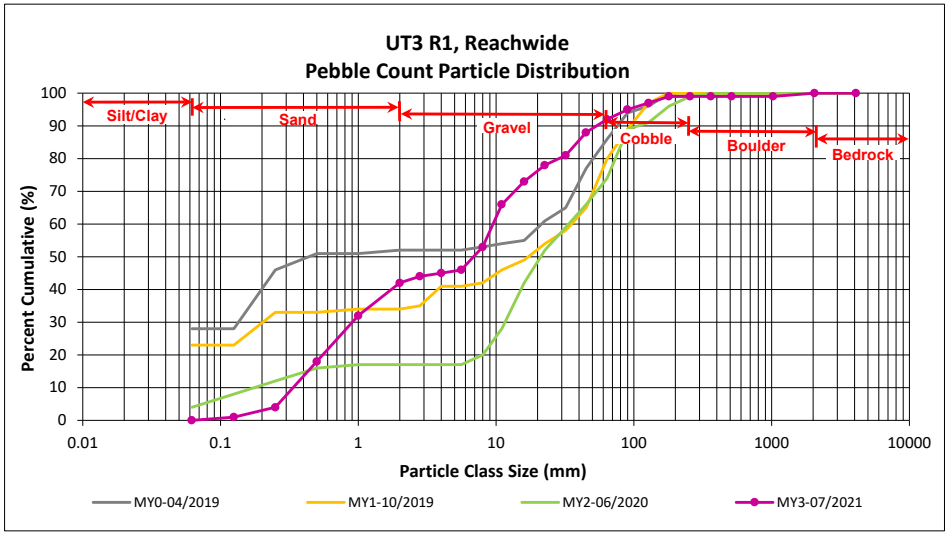
Reachwide Pebble Count Plots

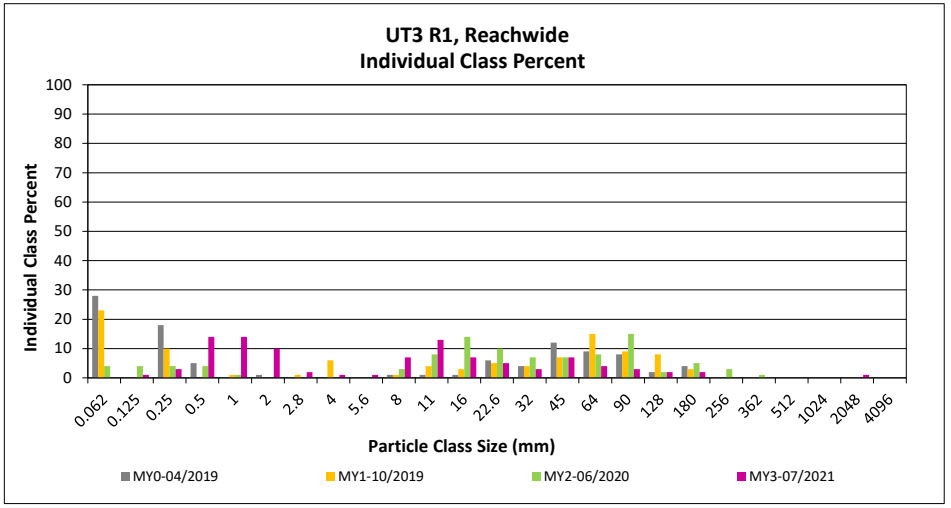
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT3 R1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0
SAND	Very fine	0.062	0.125		1	1	1	1
	Fine	0.125	0.250		3	3	3	4
	Medium	0.25	0.50	2	12	14	14	18
	Coarse	0.5	1.0	4	10	14	14	32
	Very Coarse	1.0	2.0	1	9	10	10	42
GRAVEL	Very Fine	2.0	2.8		2	2	2	44
	Very Fine	2.8	4.0		1	1	1	45
	Fine	4.0	5.6	1		1	1	46
	Fine	5.6	8.0	5	2	7	7	53
	Medium	8.0	11.0	8	5	13	13	66
	Medium	11.0	16.0	6	1	7	7	73
	Coarse	16.0	22.6	3	2	5	5	78
	Coarse	22.6	32	2	1	3	3	81
	Very Coarse	32	45	6	1	7	7	88
	Very Coarse	45	64	4		4	4	92
COBBLE	Small	64	90	3		3	3	95
	Small	90	128	2		2	2	97
	Large	128	180	2		2	2	99
	Large	180	256					99
BOULDER	Small	256	362					99
	Small	362	512					99
	Medium	512	1024					99
	Large/Very Large	1024	2048	1		1	1	100
BEDROCK	Bedrock	2048	>2048					100
			Total	50	50	100	100	100

Reachwide	
Channel materials (mm)	
D_{16} =	0.5
D_{35} =	1.2
D_{50} =	6.9
D_{84} =	37.0
D_{95} =	90.0
D_{100} =	2048.0





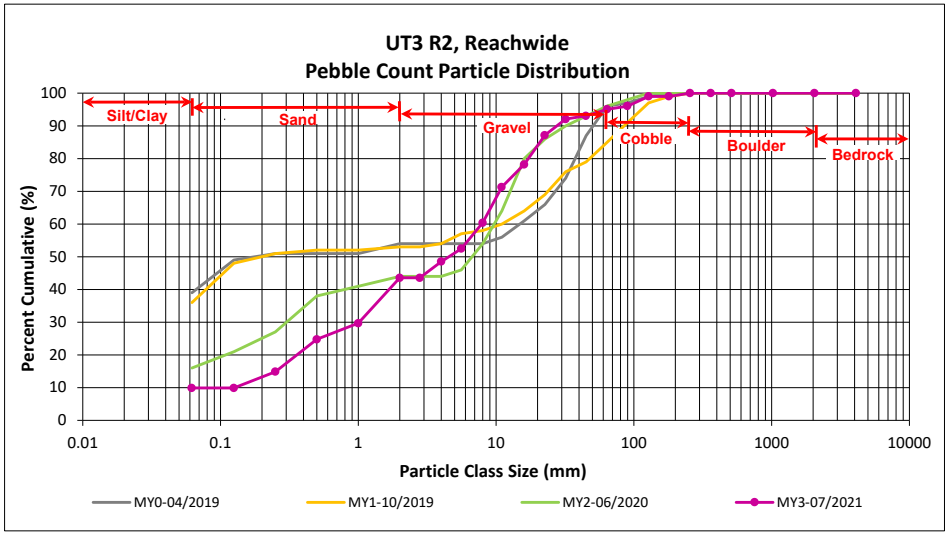
Reachwide Pebble Count Plots

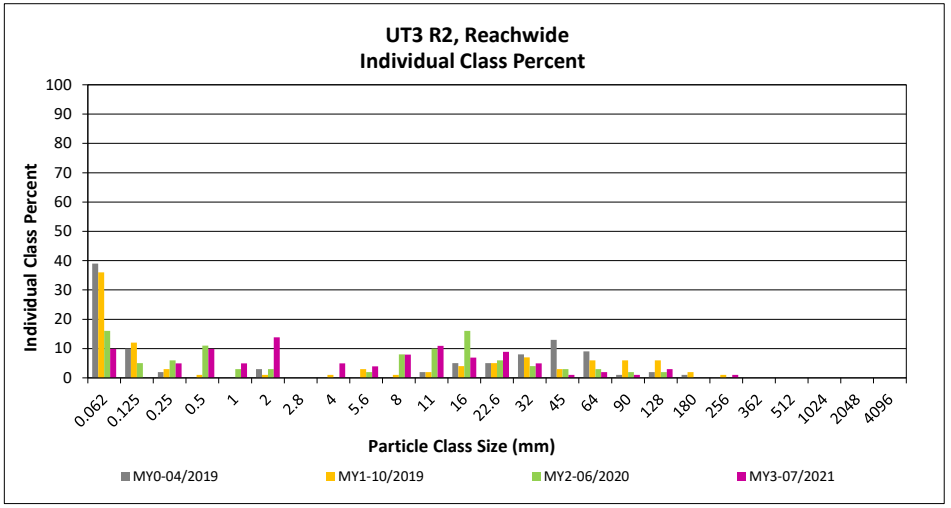
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT3 R2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		10	10	10	10
SAND	Very fine	0.062	0.125					10
	Fine	0.125	0.250	1	4	5	5	15
	Medium	0.25	0.50	5	5	10	10	25
	Coarse	0.5	1.0	4	1	5	5	30
	Very Coarse	1.0	2.0	7	7	14	14	44
GRAVEL	Very Fine	2.0	2.8					44
	Very Fine	2.8	4.0	2	3	5	5	49
	Fine	4.0	5.6		4	4	4	52
	Fine	5.6	8.0	4	4	8	8	60
	Medium	8.0	11.0	5	6	11	11	71
	Medium	11.0	16.0	6	1	7	7	78
	Coarse	16.0	22.6	8	1	9	9	87
	Coarse	22.6	32	3	2	5	5	92
	Very Coarse	32	45		1	1	1	93
	Very Coarse	45	64	1	1	2	2	95
COBBLE	Small	64	90	1		1	1	96
	Small	90	128	3		3	3	99
	Large	128	180					99
	Large	180	256	1		1	1	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**51**	**50**	**101**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.3
D_{35} =	1.3
D_{50} =	4.5
D_{84} =	20.0
D_{95} =	63.4
D_{100} =	256.0





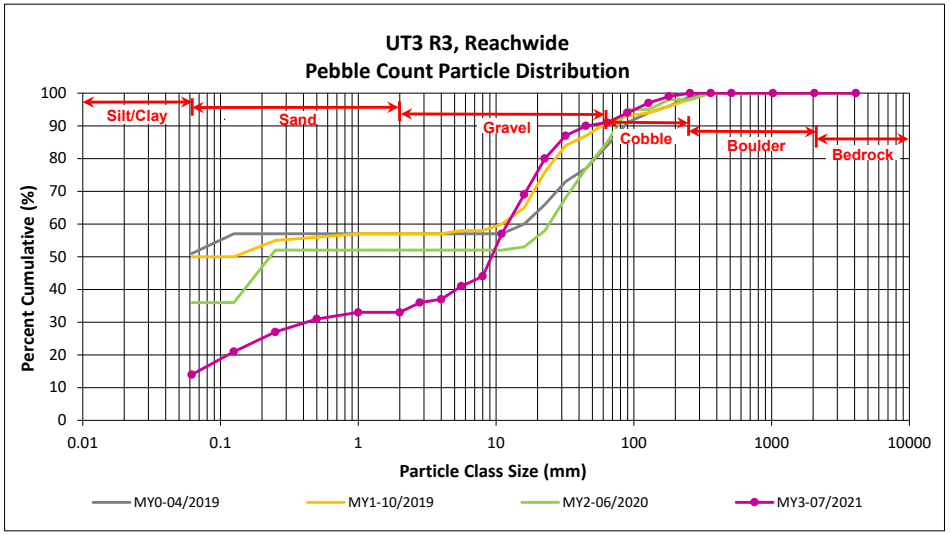
Reachwide Pebble Count Plots

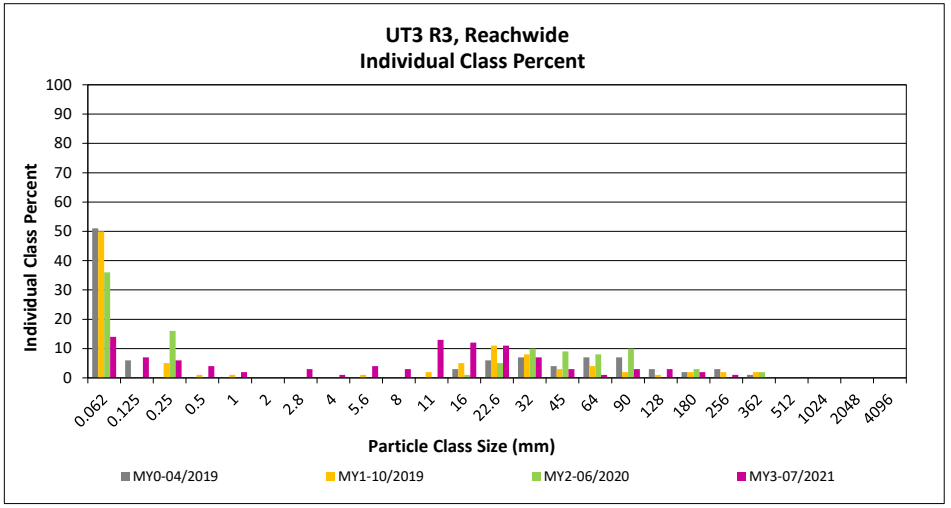
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

UT3 R3, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	13	14	14	14
SAND	Very fine	0.062	0.125	1	6	7	7	21
	Fine	0.125	0.250		6	6	6	27
	Medium	0.25	0.50	1	3	4	4	31
	Coarse	0.5	1.0		2	2	2	33
	Very Coarse	1.0	2.0					33
GRAVEL	Very Fine	2.0	2.8	1	2	3	3	36
	Very Fine	2.8	4.0	1		1	1	37
	Fine	4.0	5.6	2	2	4	4	41
	Fine	5.6	8.0	2	1	3	3	44
	Medium	8.0	11.0	9	4	13	13	57
	Medium	11.0	16.0	7	5	12	12	69
	Coarse	16.0	22.6	9	2	11	11	80
	Coarse	22.6	32	5	2	7	7	87
	Very Coarse	32	45	2	1	3	3	90
	Very Coarse	45	64	1		1	1	91
COBBLE	Small	64	90	3		3	3	94
	Small	90	128	3		3	3	97
	Large	128	180	2		2	2	99
	Large	180	256		1	1	1	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.1
D_{35} =	2.5
D_{50} =	9.3
D_{84} =	27.6
D_{95} =	101.2
D_{100} =	256.0





APPENDIX 5. Hydrology Summary Data and Plots

Table 14a. Verification of Bankfull Events
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Reach	MY	Date of Occurrence	Date of Data Collection	Method
UT1 Reach 3	MY2	2/6/2020	2/6/2020	Stream Gage
		5/27/2020	5/27/2020	
		8/6/2020	8/6/2020	
	MY3	1/9/2021	1/9/2021	
		2/20/2021	2/20/2021	
UT2 Reach 2	MY2	2/6/2020	2/6/2020	
		5/21/2020	5/21/2020	
		5/27/2020	5/27/2020	
		7/24/2020	7/24/2020	
		8/6/2020	8/6/2020	
		10/11/2020	10/11/2020	
	MY3	2/16/2021	2/16/2021	
		6/12/2021	6/12/2021	
UT2A	MY2	2/6/2020	2/6/2020	
		5/27/2020	5/27/2020	
		8/6/2020	8/6/2020	
		10/11/2020	10/11/2020	
	MY3	3/18/2021	3/18/2021	
		6/12/2021	6/12/2021	
UT2B	MY1	6/8/2019	6/8/2019	
	MY2	2/6/2020	2/6/2020	
		5/27/2020	5/27/2020	
	MY3	1/24/2021	1/24/2021	
UT3 Reach 3	MY1	6/8/2019 - 6/9/2019	6/8/2019 - 6/9/2019	
		6/23/2019	6/23/2019	
	MY2	1/11/2020	1/11/2020	
		1/24/2020	1/24/2020	
		2/6/2020 - 2/13/2020[1]	2/6/2020 - 2/13/2020	
		4/13/2020	4/13/2020	
		4/30/2020	4/30/2020	
		5/22/2020	5/22/2020	
		5/27/2020	5/27/2020	
		7/24/2020	7/24/2020	
		8/6/2020	8/6/2020	
		8/13/2020 - 8/15/2020[1]	8/13/2020 - 8/15/2020	
		8/21/2020	8/21/2020	
		9/17/2020	9/17/2020	
		9/25/2020	9/25/2020	
		10/11/2020	10/11/2020	
		10/29/2020	10/29/2020	
	MY3	1/28/2021	1/28/2021	
		2/13/2021	2/13/2021	
		2/16/2021	2/16/2021	
		2/18/2021	2/18/2021	
		3/18/2021	3/18/2021	
		3/26/2021	3/26/2021	
		6/12/2021	6/12/2021	

[1] Multiple bankfull events occurred within these date ranges.

Table 14b. Verification of Consecutive Flow Days
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

Reach	MY	Dates of Occurrence	Maximum Consecutive Days of Stream Flow	Method
UT1 Reach 1	MY1	3/27/2019 - 10/22/2019	209 days	Stream Gage
	MY2	3/8/2020 - 11/3/2020	241 days	
	MY3	5/18/2021 - 9/9/2021	114 days	
UT2A	MY1	3/25/2019 - 5/28/2019	64 days	
	MY2	2/22/2020 - 7/14/2020	143 days	
	MY3	1/1/2021 - 7/29/2021	210 days	
UT2B	MY1	4/5/2019 - 4/28/2019	23 days	
	MY2	2/5/2020 - 3/5/2020	29 days	
	MY3	1/24/2021 - 3/6/2021	42 days	

Table 15. Wetland Gage Attainment Summary

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Summary of Groundwater Gage Results for Monitoring Years 1 through 7							
Gage	Success Criteria[2] Achieved/Max Consecutive Days During Growing Season (Percentage)						
	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Reference	Yes/25 days (12.1%)	Yes/97 days (46.9%)	N/A				
1	Yes/25 days (12.1%)	Yes/46 days (22.2%)	No/16 days (7.7%)				
2	Yes/23 days (11.1%)	Yes/46 days (22.2%)	No/14 days (6.8%)				
3	Yes/24 days (11.6%)	Yes/46 days (22.2%)	Yes/22 days (10.6%)				
4 [1]	Yes/109 days (52.7%)	N/A	N/A				
5	Yes/48 days (23.2%)	Yes/86 days (41.5%)	Yes/22 days (10.6%)				
6	Yes/23 days (11.1%)	Yes/26 days (12.6%)	No/10 days (4.8%)				
7	Yes/24 days (11.6%)	No/16 days (7.7%)	No/4 days (1.9%)				
8	Yes/48 days (23.2%)	Yes/46 days (22.2%)	No/11 days (5.3%)				
9	Yes/26 days (12.6%)	Yes/46 days (22.2%)	No/14 days (6.8%)				
10 [1]	N/A	Yes/46 days (22.2%)	No/11 days (5.3%)				

[1] GWG 10 was installed adjacent to GWG 4 but outside of the former ditch location at the end of October 2019. Reporting for GWG 10 begins in MY2 and GWG 4 will be omitted from future monitoring reports.

[2] The success criteria is 19 consecutive days, (9.2%) of the growing season (April 4 to October 27).

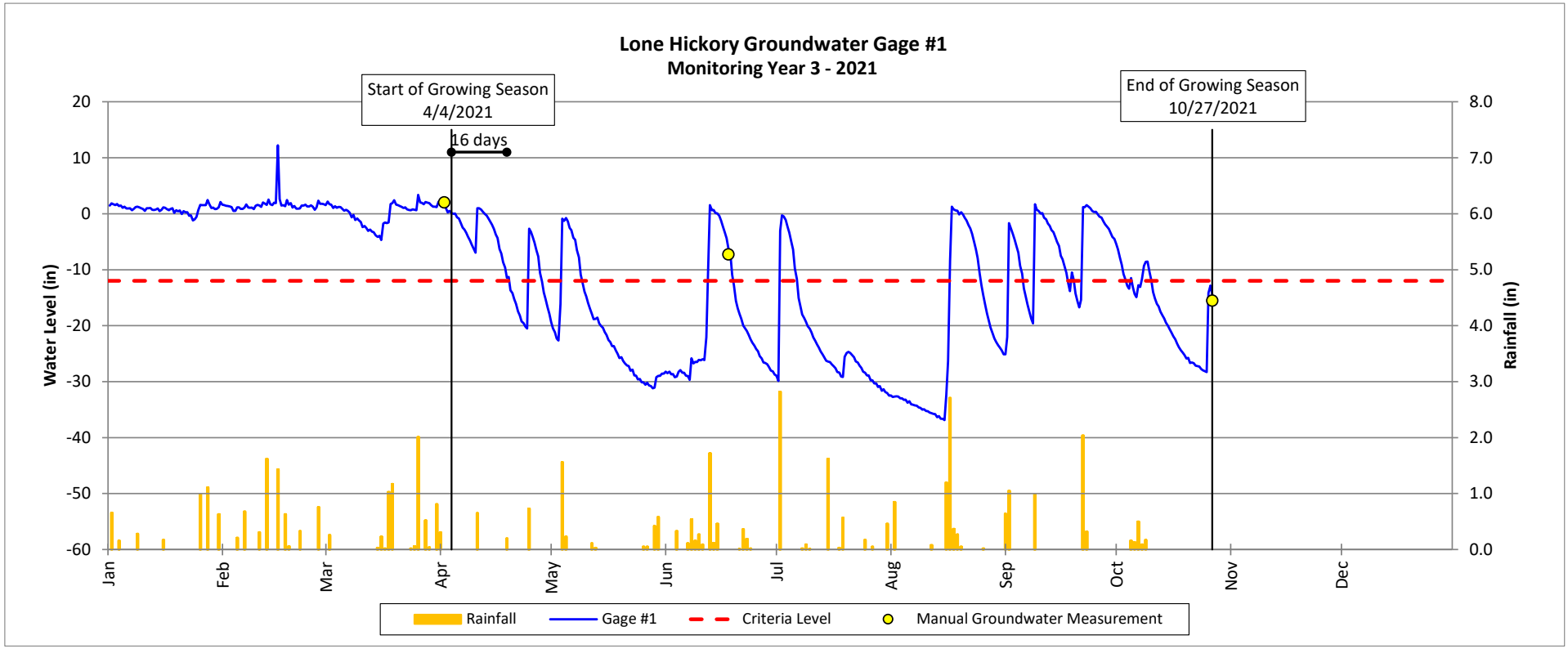
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

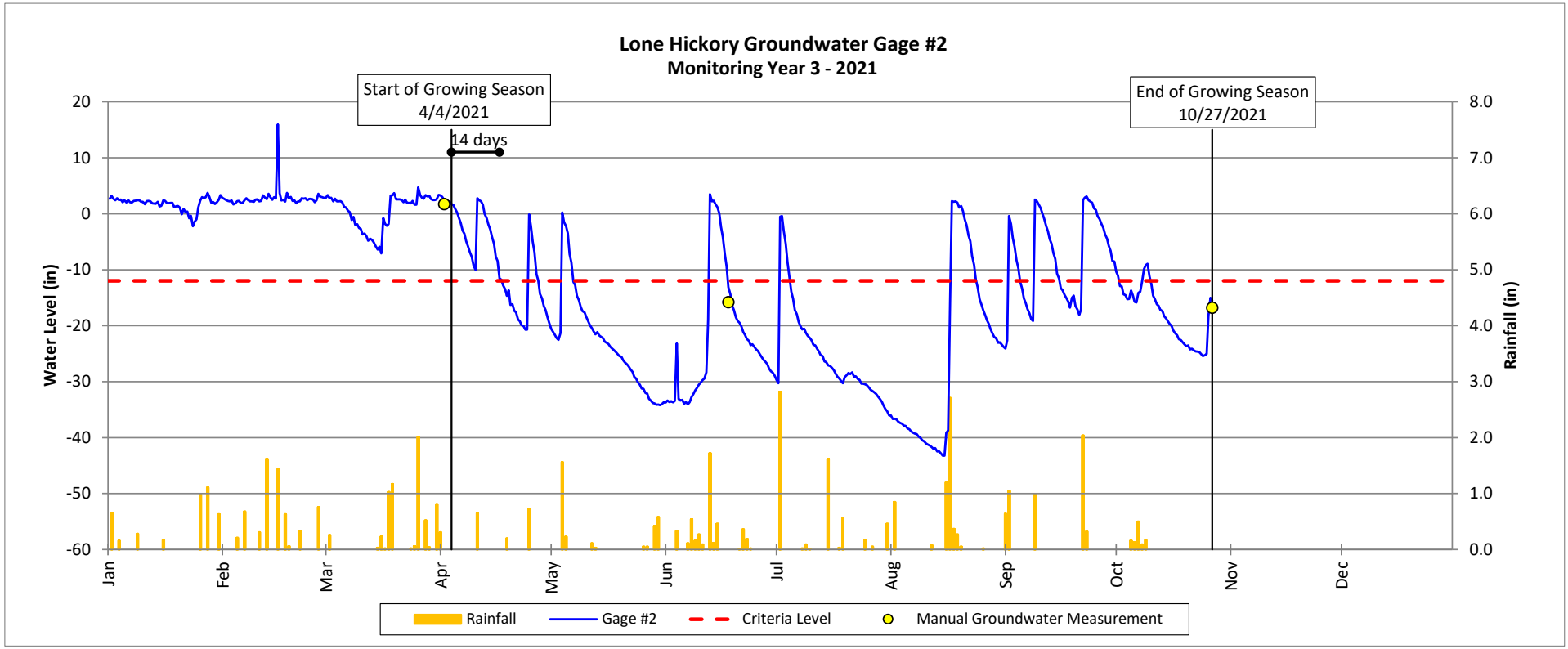
Monitoring Year 3 - 2021

Wetland Re-est



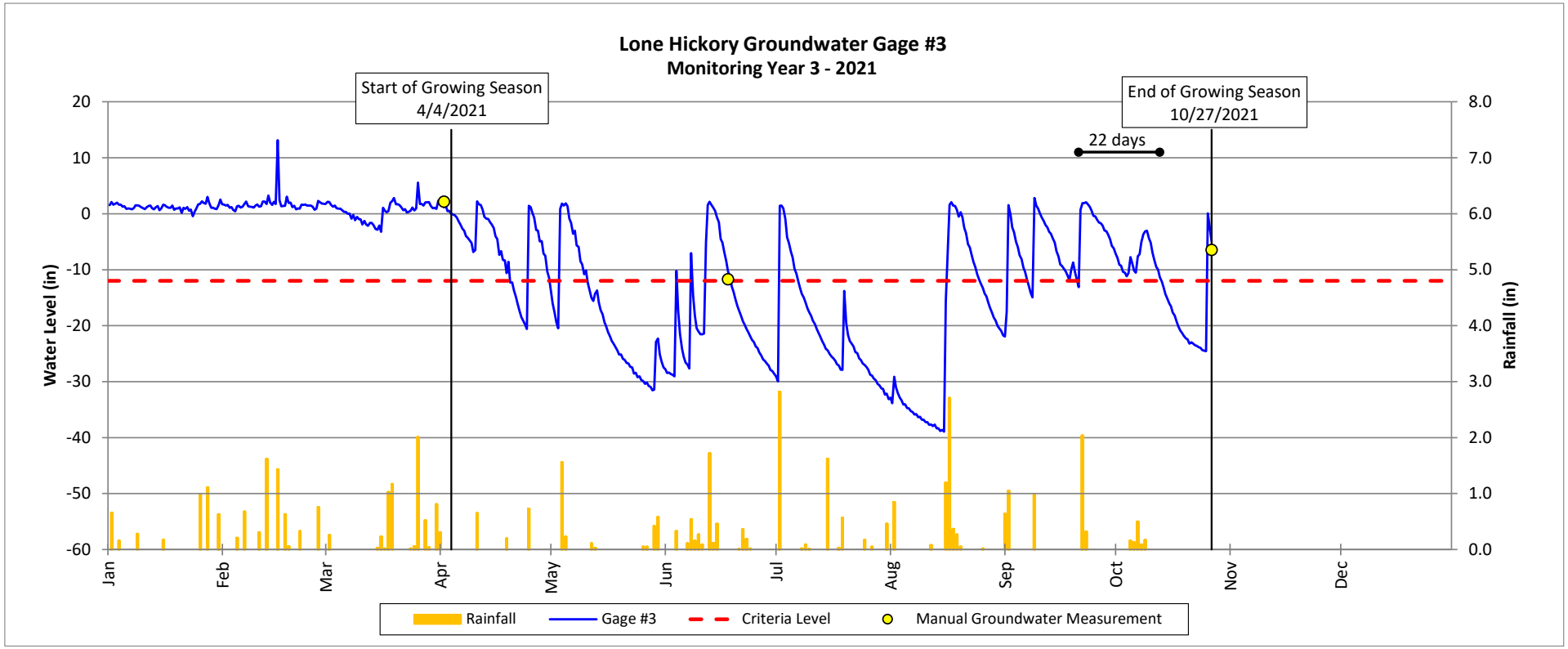
Groundwater Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021
Wetland Re-est



Groundwater Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021
Wetland Re-est



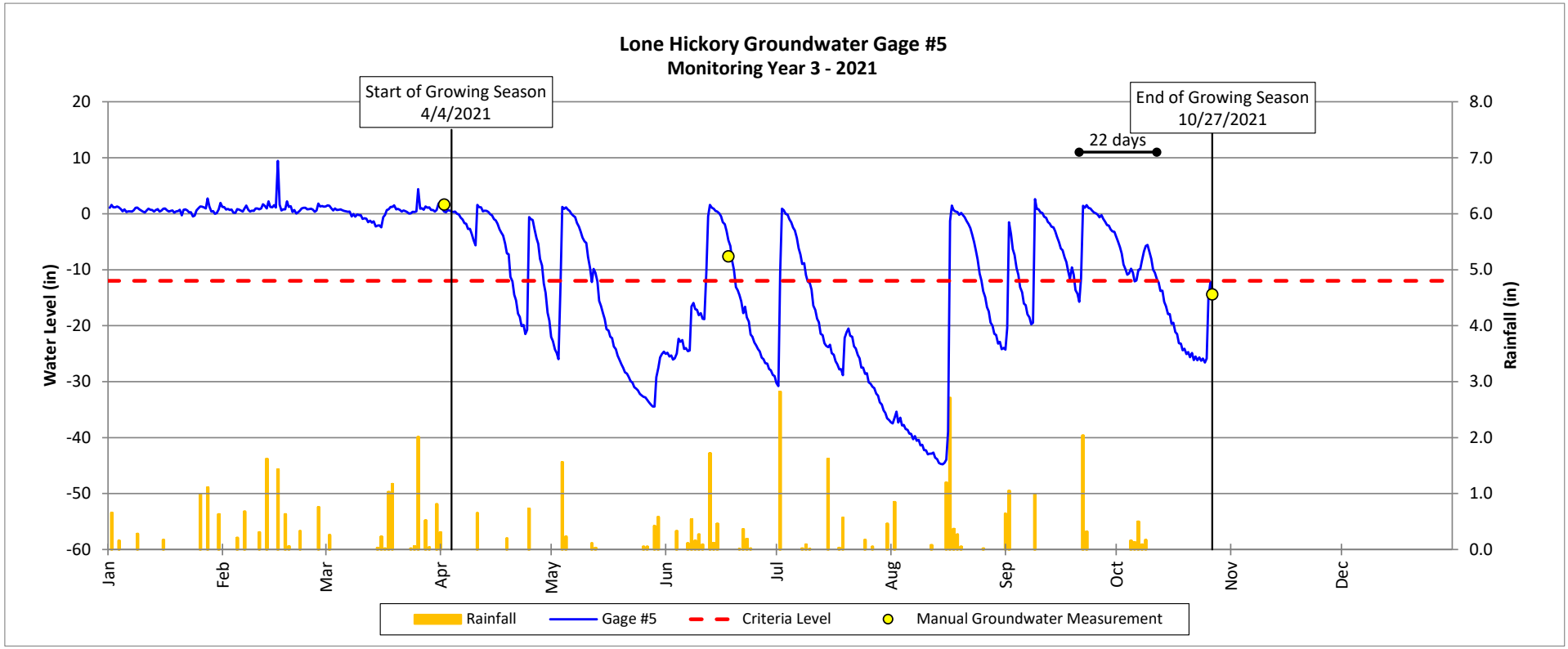
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Wetland Re-est



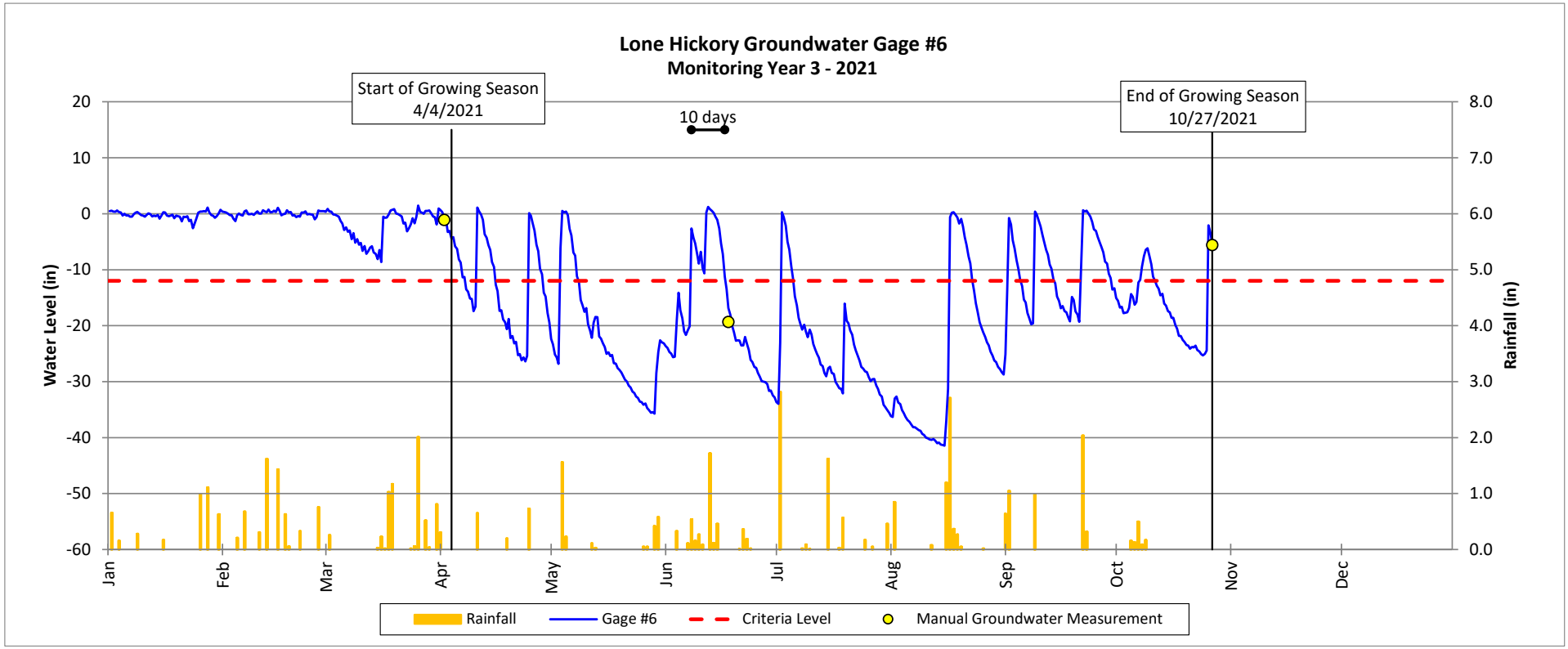
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Wetland Re-est



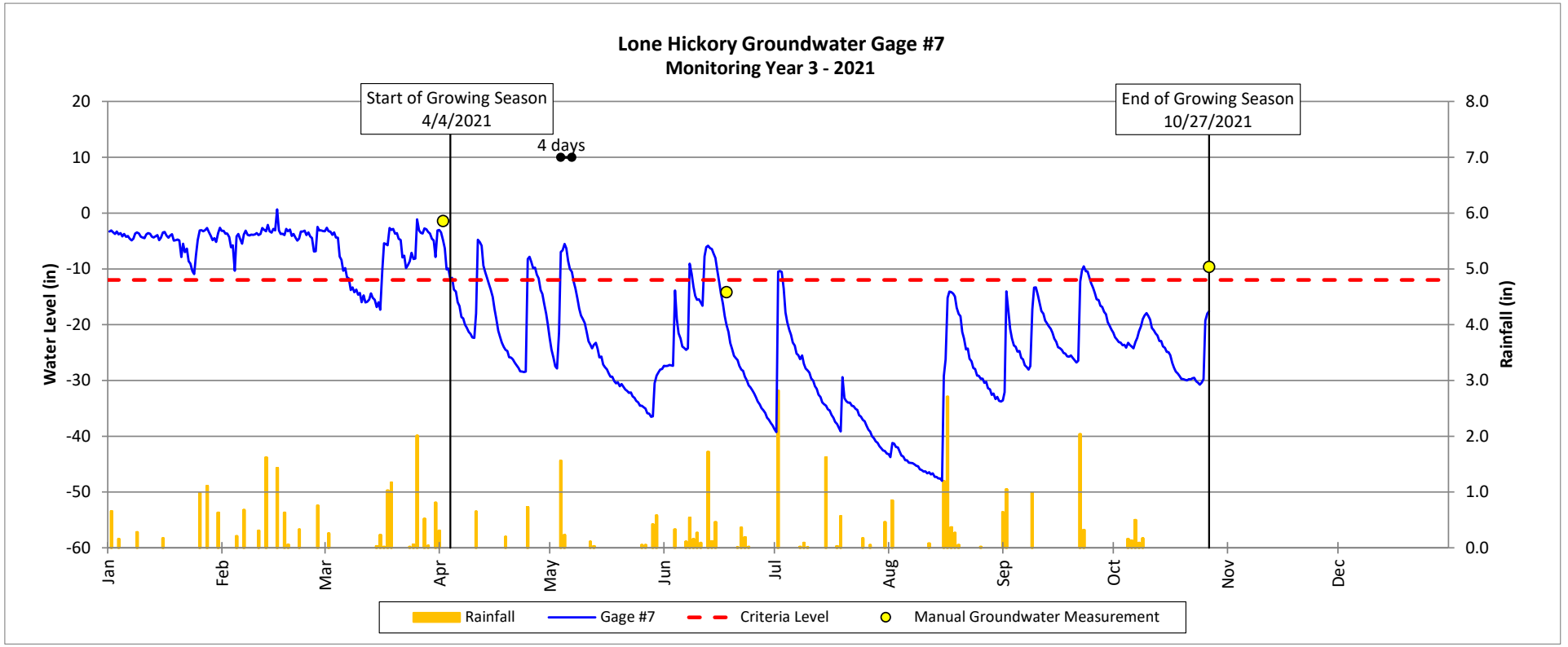
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Wetland Re-est



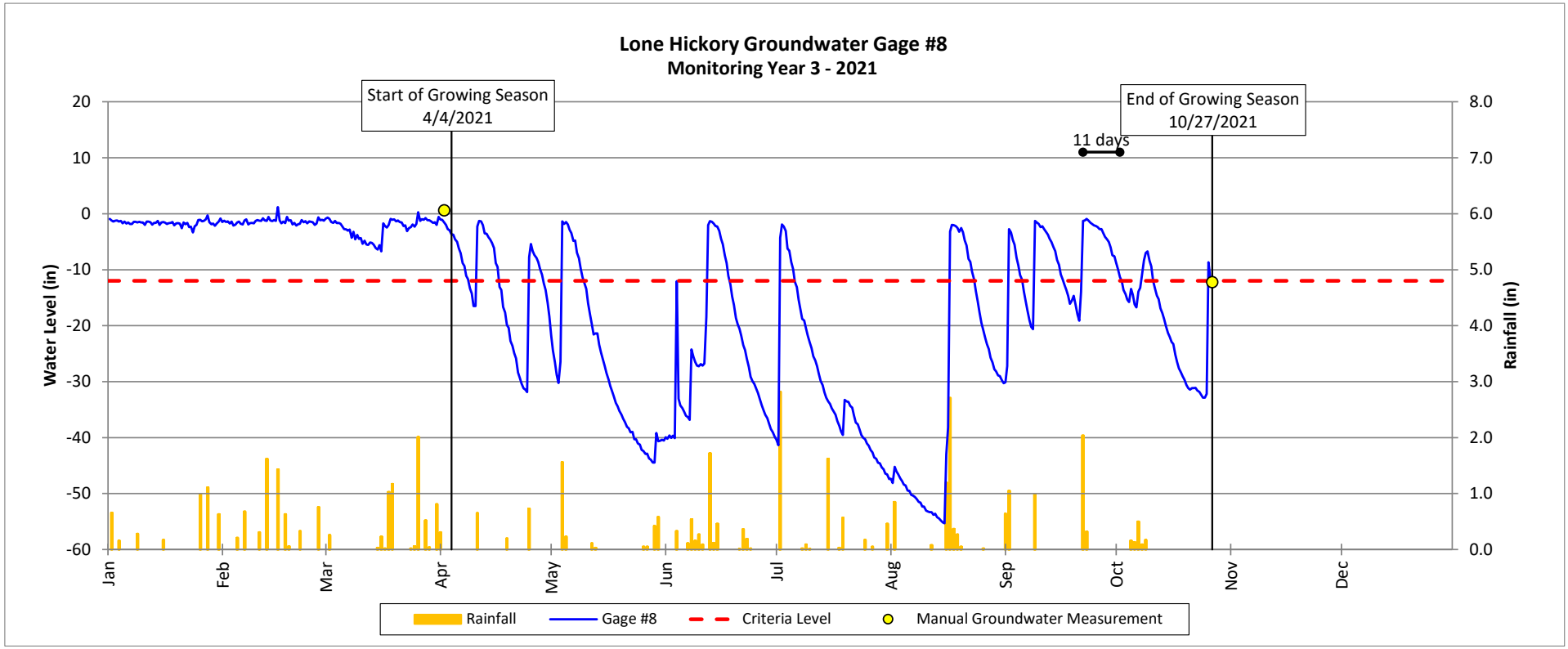
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Wetland Re-est



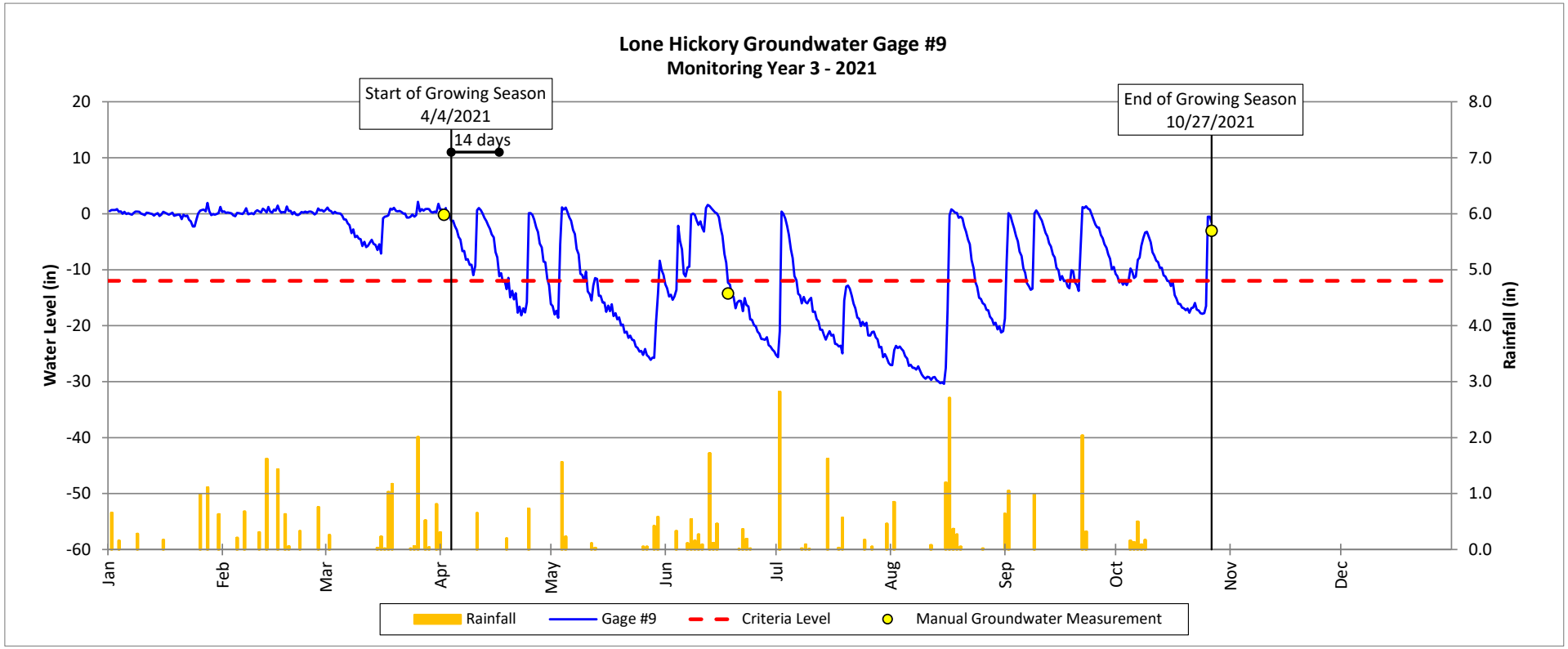
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Wetland Re-est



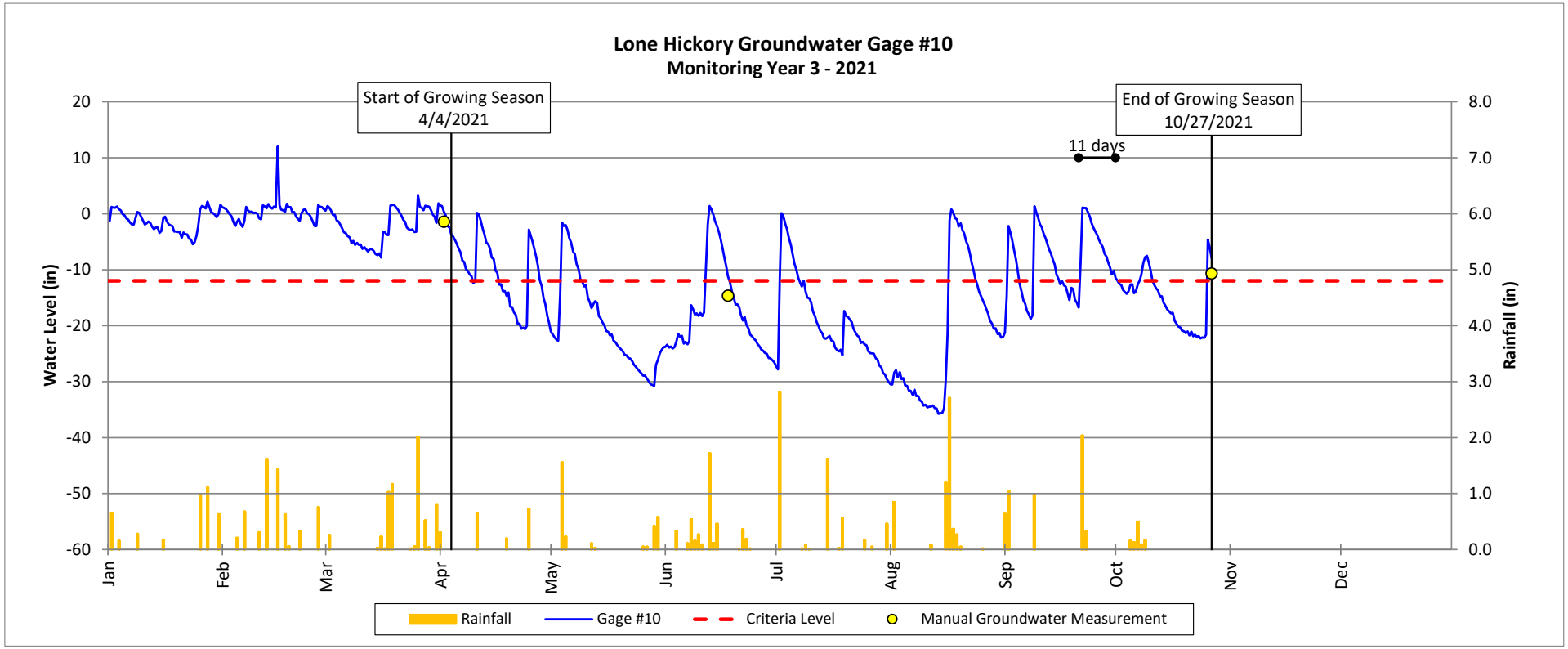
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

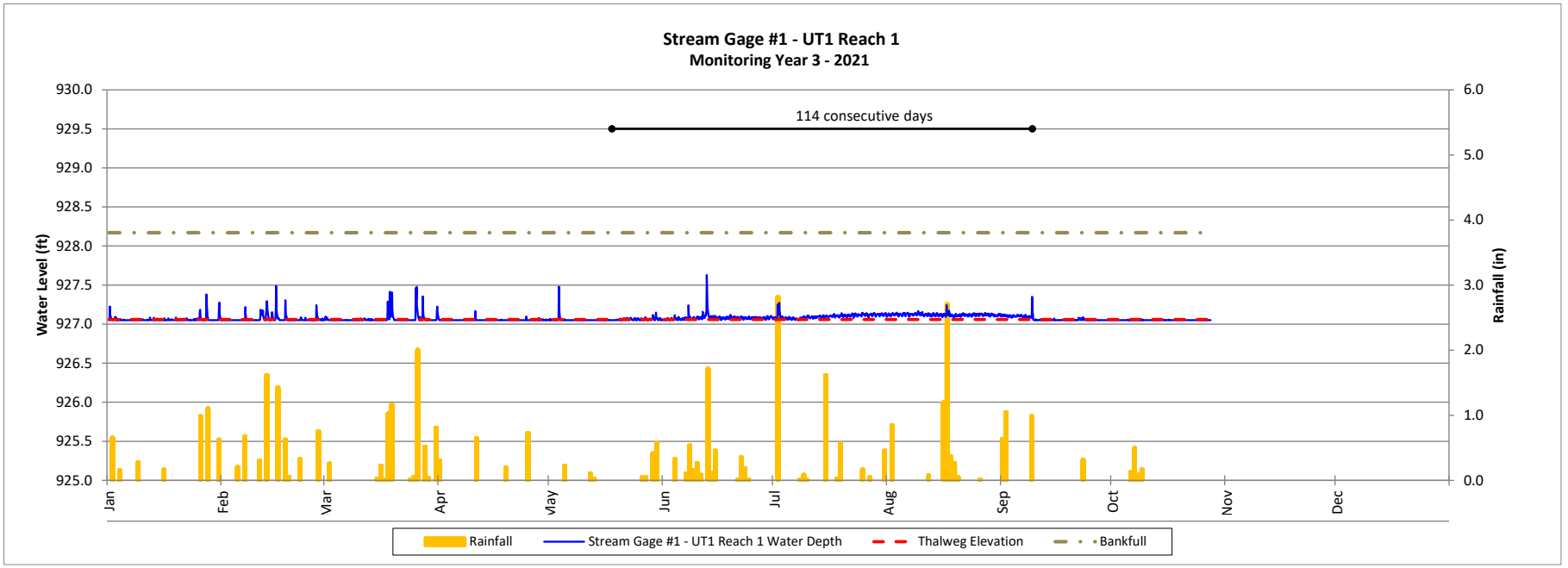
Monitoring Year 3 - 2021

Wetland Re-est



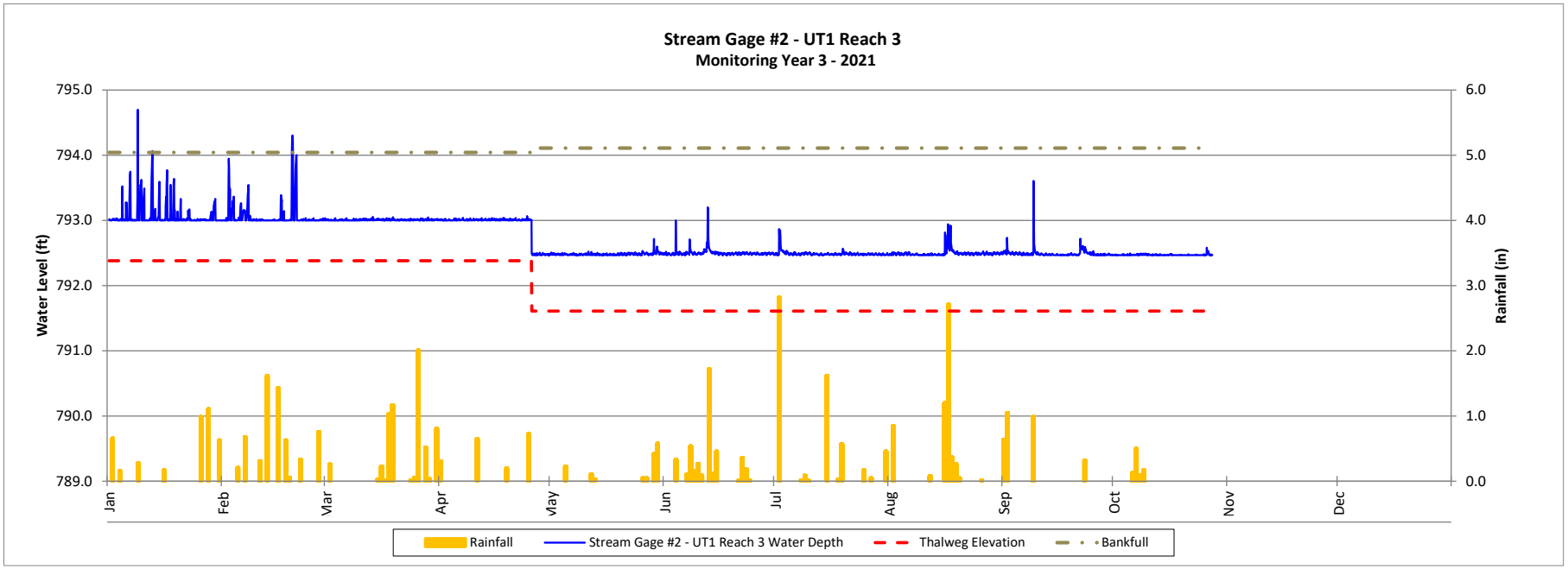
Stream Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021



Stream Gage Plots

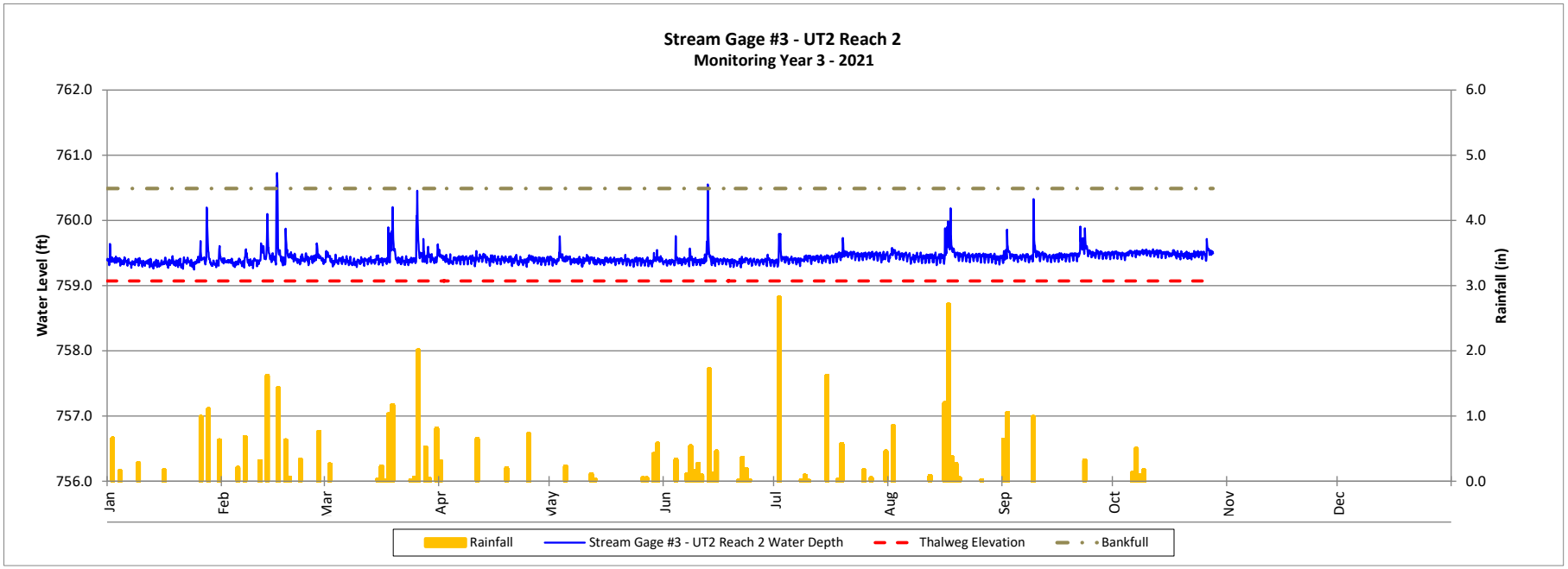
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021



- Stream gage casing was damaged in storm events and properly reinstalled on 4/26/2021

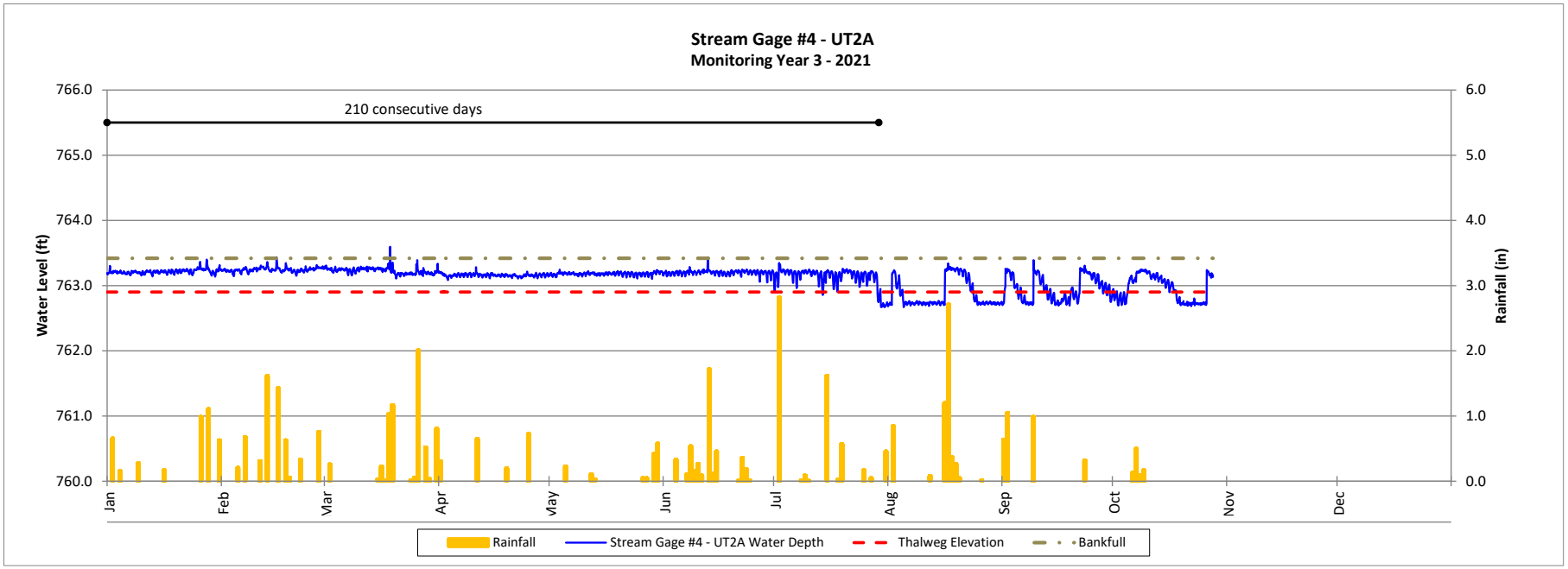
Stream Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021



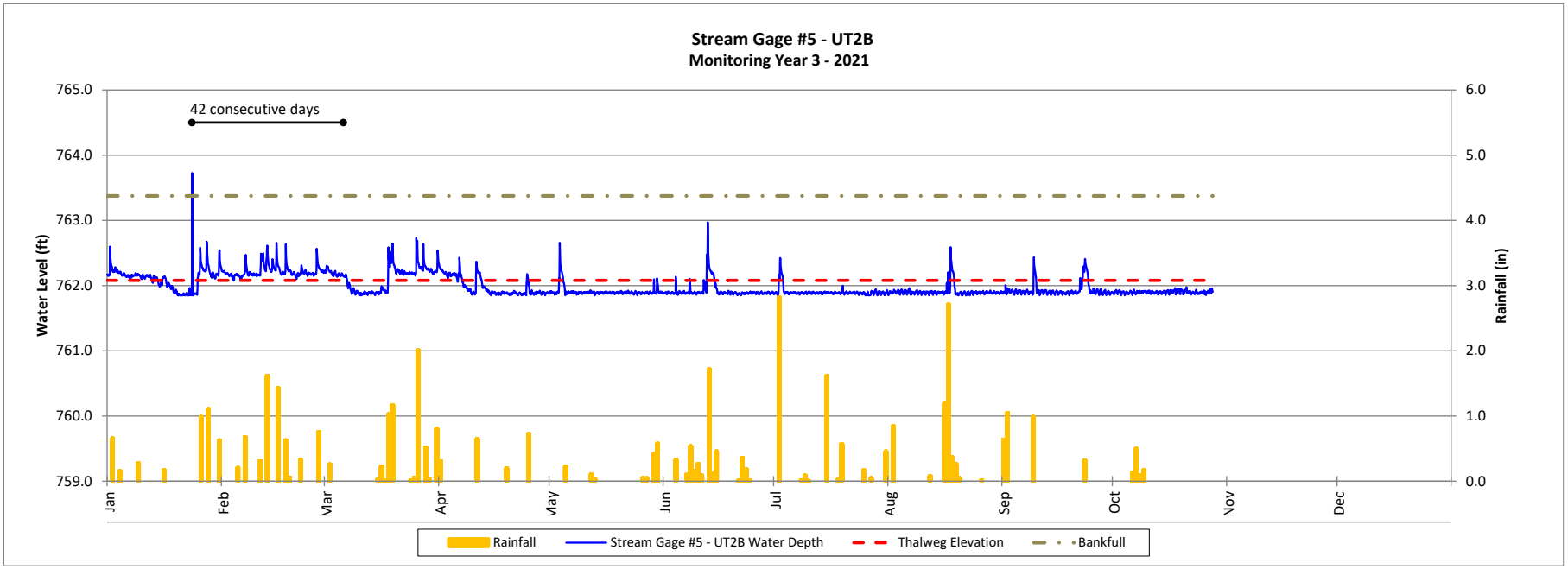
Stream Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021



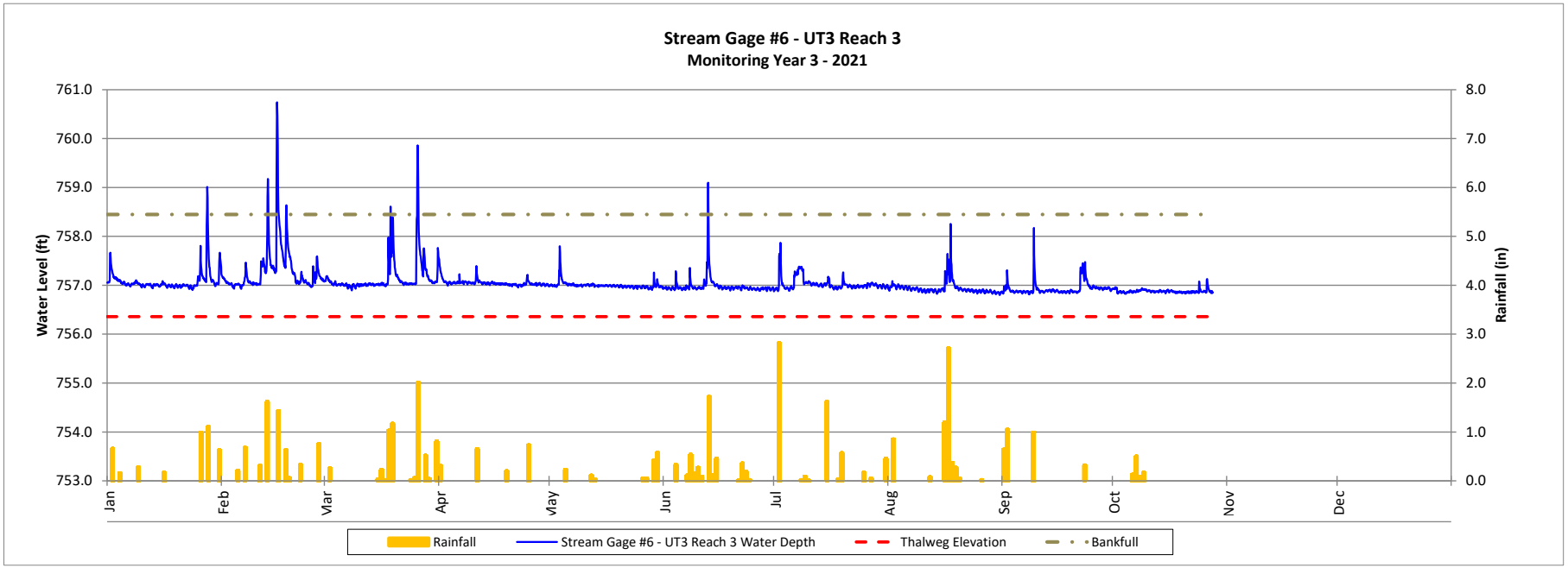
Stream Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021



Stream Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 3 - 2021

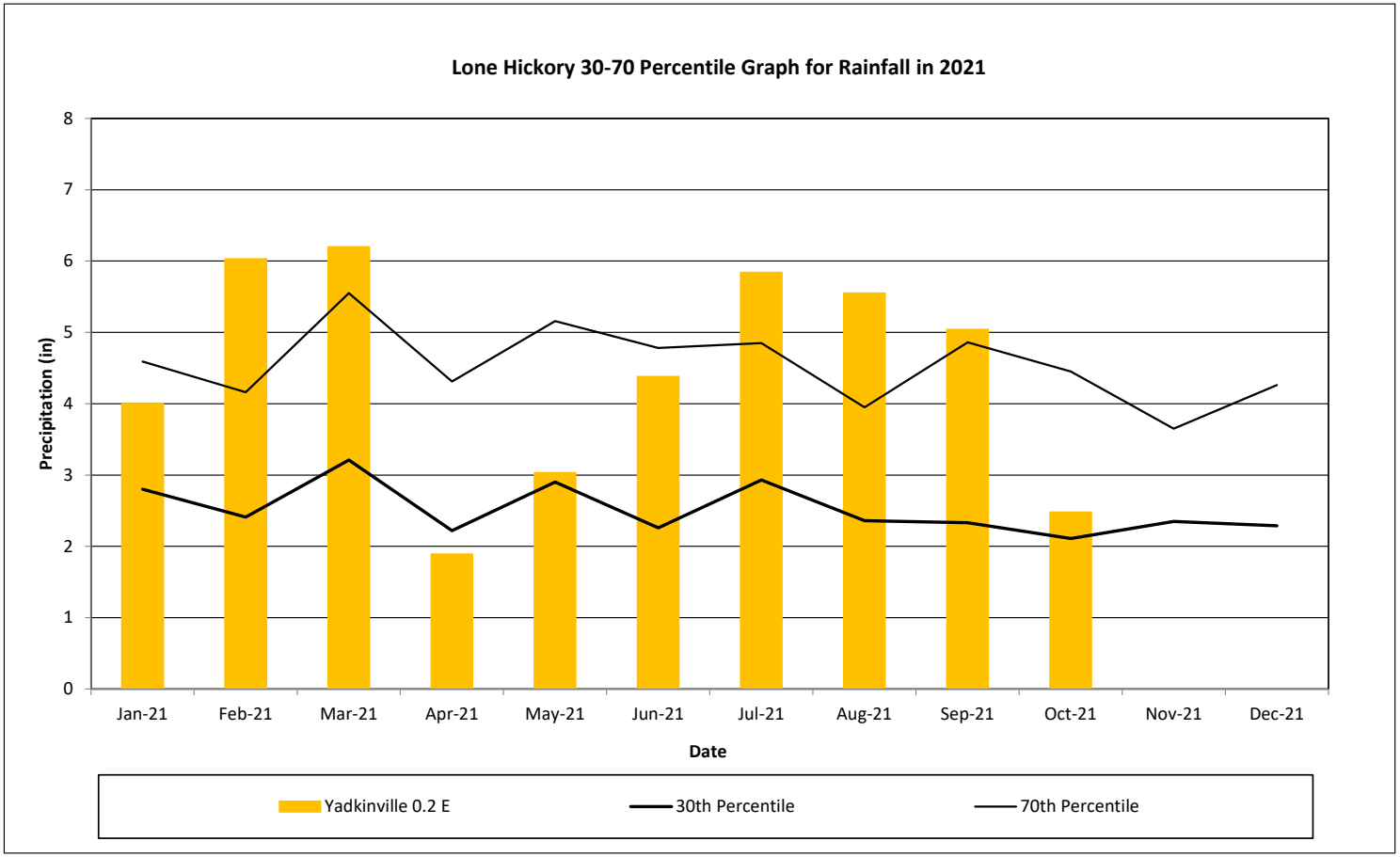


Monthly Rainfall Data

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021



2021 rainfall collected by NC CRONOS Station, Yadkinville 0.2 E, NC

30th and 70th percentile rainfall data collected from WETS station Yadkinville 6E

APPENDIX 6. Supplemental Hydrology Summary Data and Plots

Table 16. Comparison Wetland Gage Attainment Summary

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Summary of Groundwater Gage Results for Monitoring Years 1 through 7[4]							
Gage	Success Criteria[2] Achieved/Max Consecutive Days During Growing Season (Percentage)						
	MY1	MY2	MY3[3]	MY4	MY5	MY6	MY7
Reference	Yes/25 days (12.1%)	Yes/97 days (46.9%)	N/A				
1	Yes/25 days (12.1%)	Yes/46 days (22.2%)	Yes/23 days (10.7%)				
2	Yes/23 days (11.1%)	Yes/46 days (22.2%)	Yes/21 days (9.8%)				
3	Yes/24 days (11.6%)	Yes/46 days (22.2%)	Yes/23 days (10.7%)				
4 [1]	Yes/109 days (52.7%)	N/A	N/A				
5	Yes/48 days (23.2%)	Yes/86 days (41.5%)	Yes/24 days (11.2%)				
6	Yes/23 days (11.1%)	Yes/26 days (12.6%)	No/11 days (5.1%)				
7	Yes/24 days (11.6%)	No/16 days (7.7%)	No/8 days (3.7%)				
8	Yes/48 days (23.2%)	Yes/46 days (22.2%)	No/12 days (5.6%)				
9	Yes/26 days (12.6%)	Yes/46 days (22.2%)	Yes/21 days (9.8%)				
10 [1]	N/A	Yes/46 days (22.2%)	No/13 days (6.1%)				

[1] GWG 10 was installed adjacent to GWG 4 but outside of the former ditch location at the end of October 2019. Reporting for GWG 10 begins in MY2 and GWG 4 will be omitted from future monitoring reports.

[2] The established success criteria is 19 consecutive days, (9.2%) of the growing season (April 4 to October 27).

[3] For comparison purposes in MY3, the success criteria of 20 consecutive days, or (9.2%) of the extended growing season (March 28 to October 27) was evalutated.

[4] This table summarizes the groundwater gage results for MY3 with the growing season extended by 1 week for comparison purposes only.

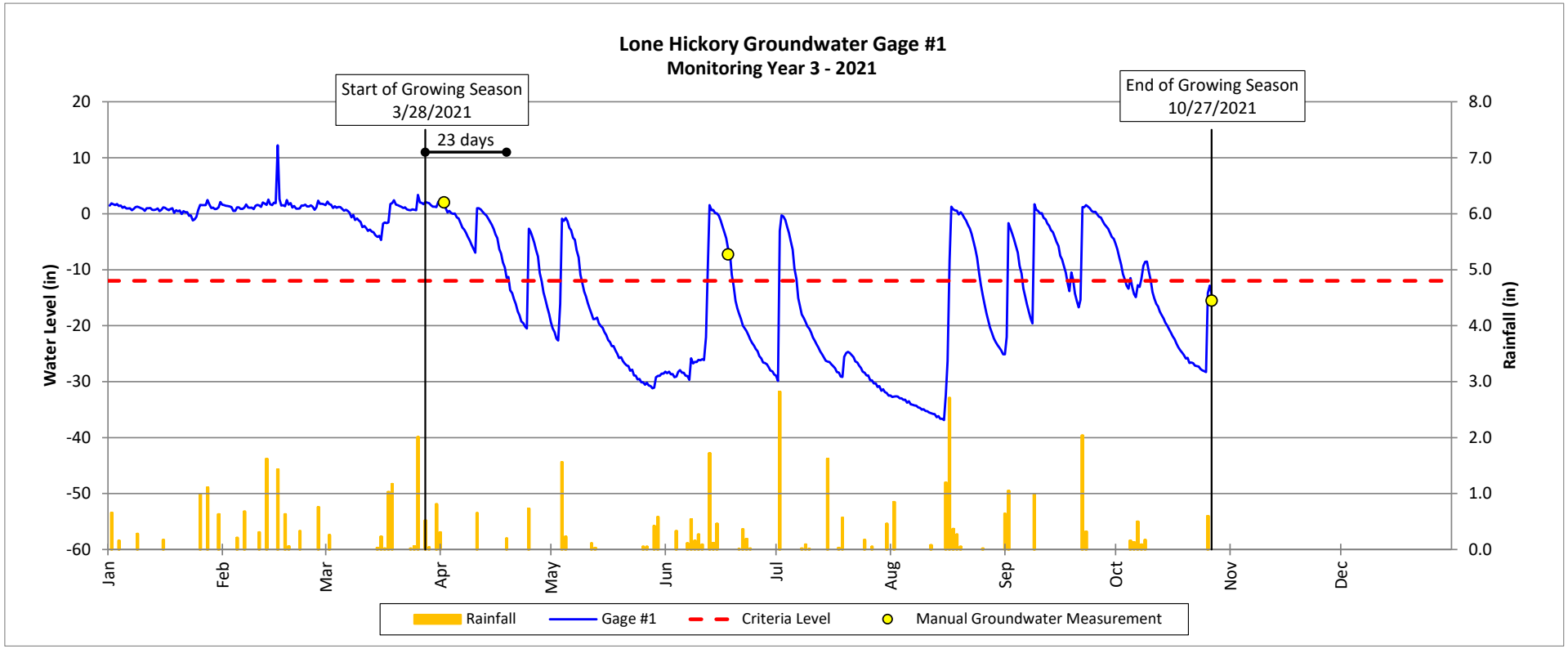
Comparison Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Wetland Re-est



Comparison Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

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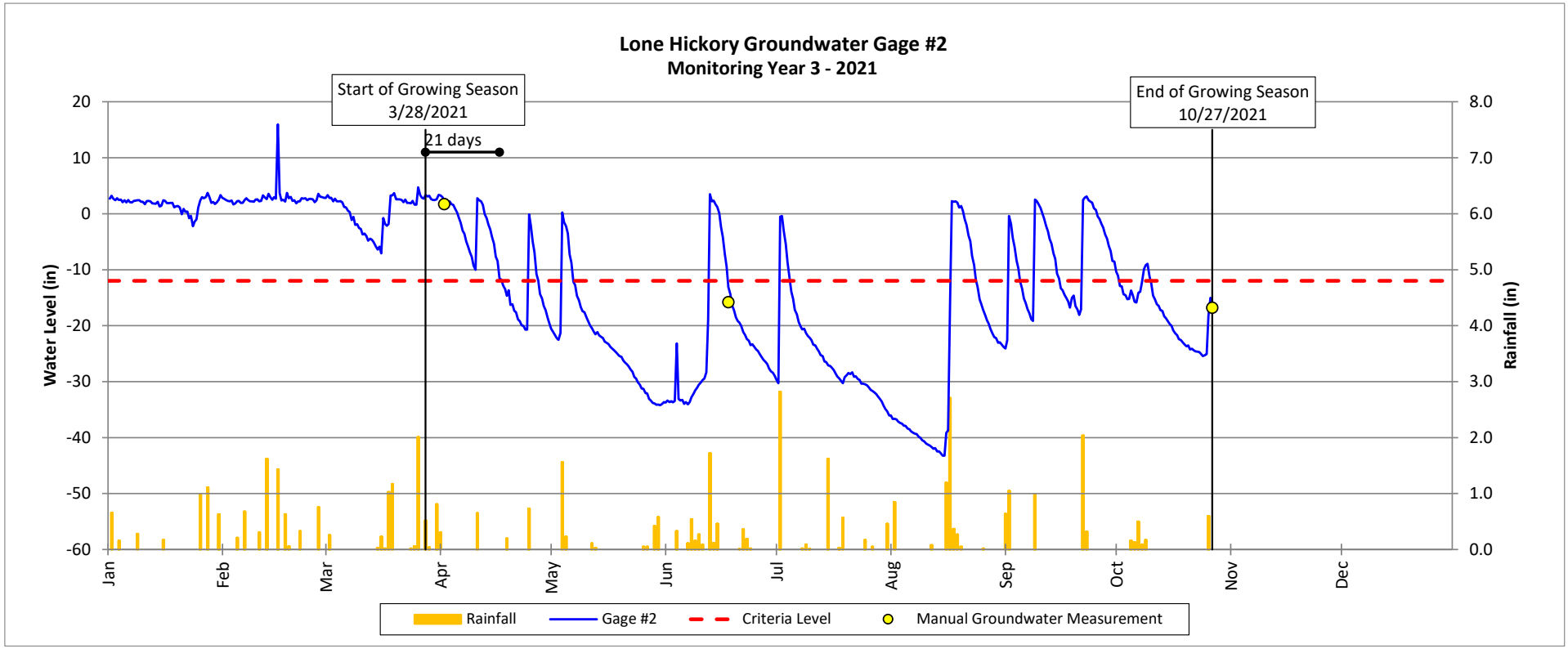


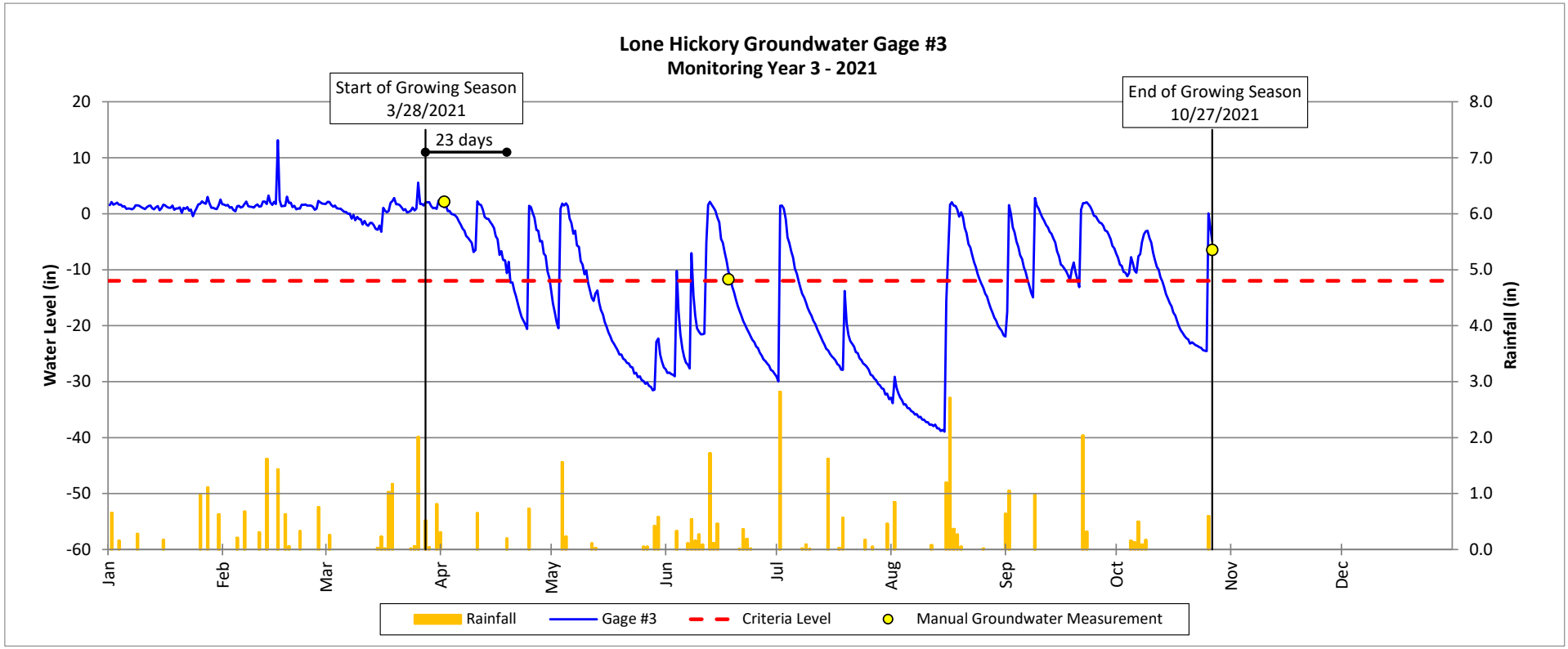
Comparison Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Wetland Re-est



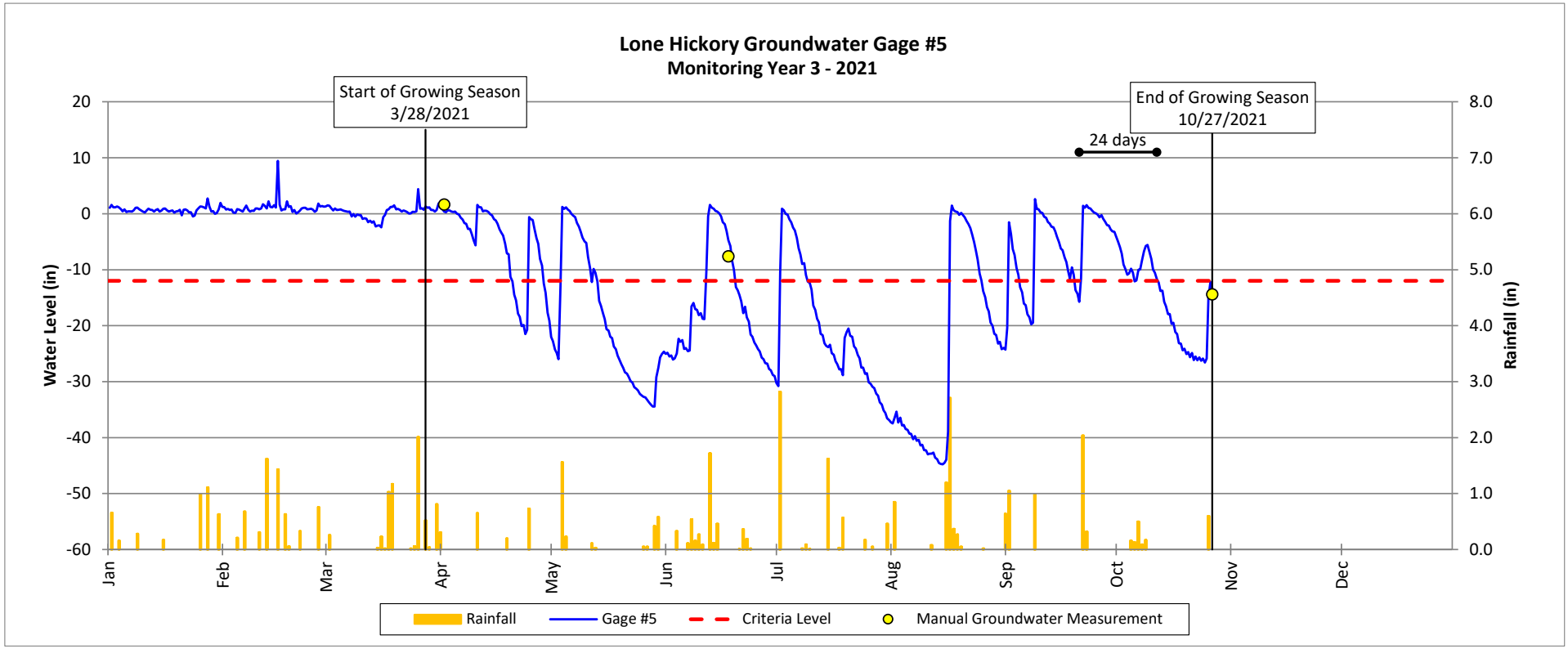
Comparison Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Wetland Re-est



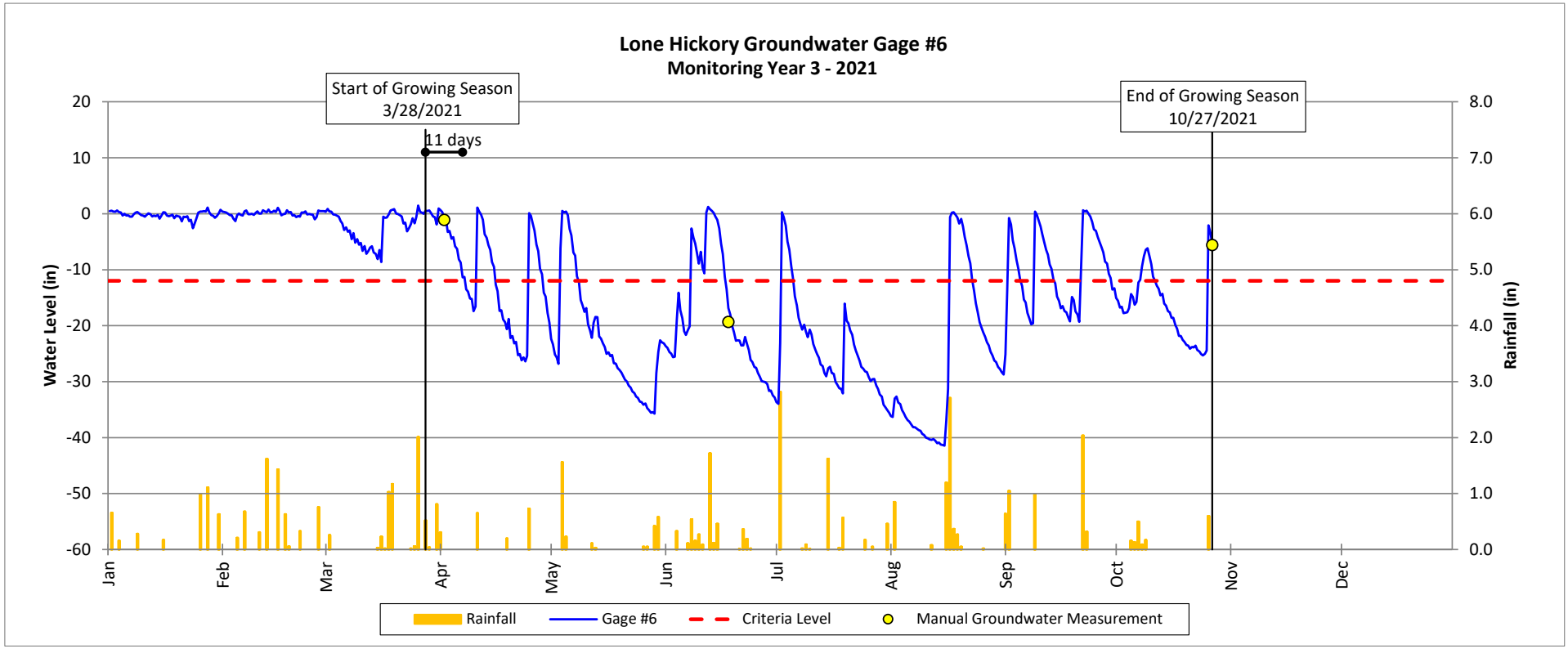
Comparison Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Wetland Re-est



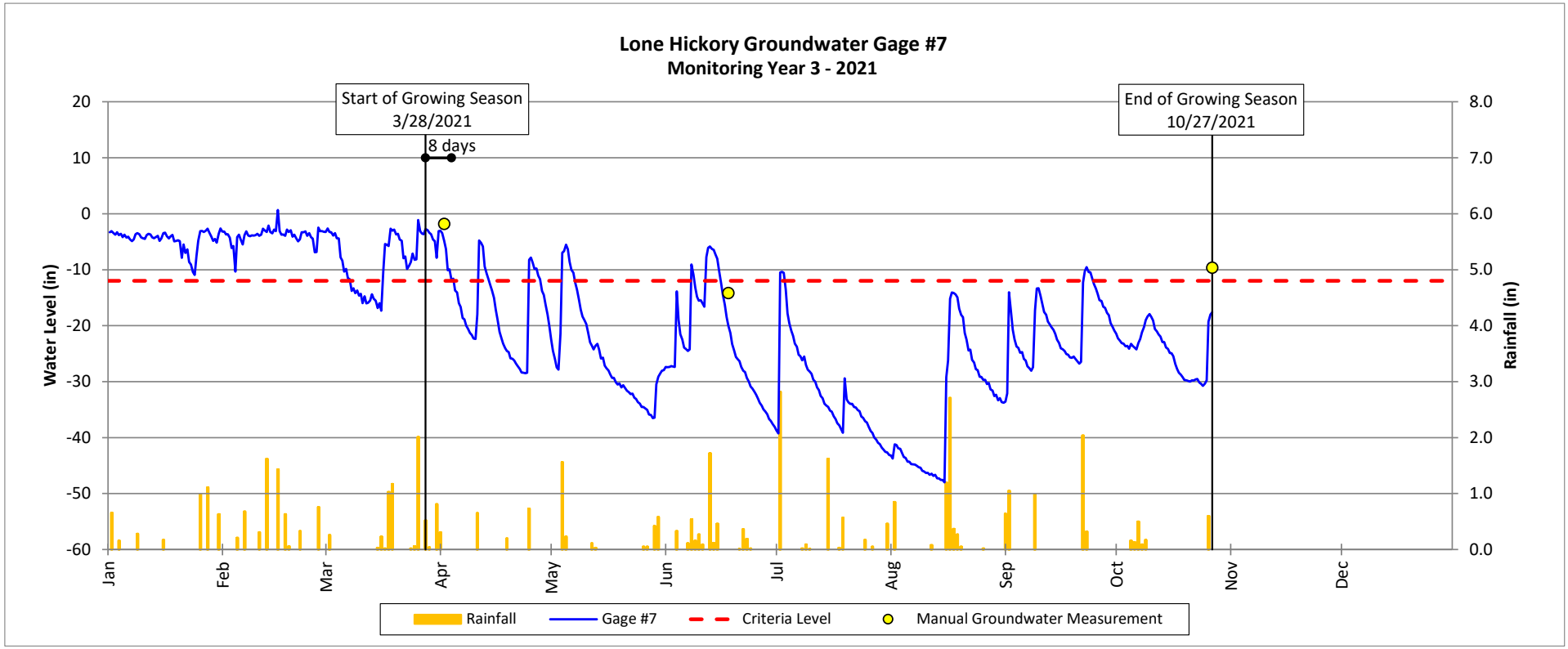
Comparison Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Wetland Re-est



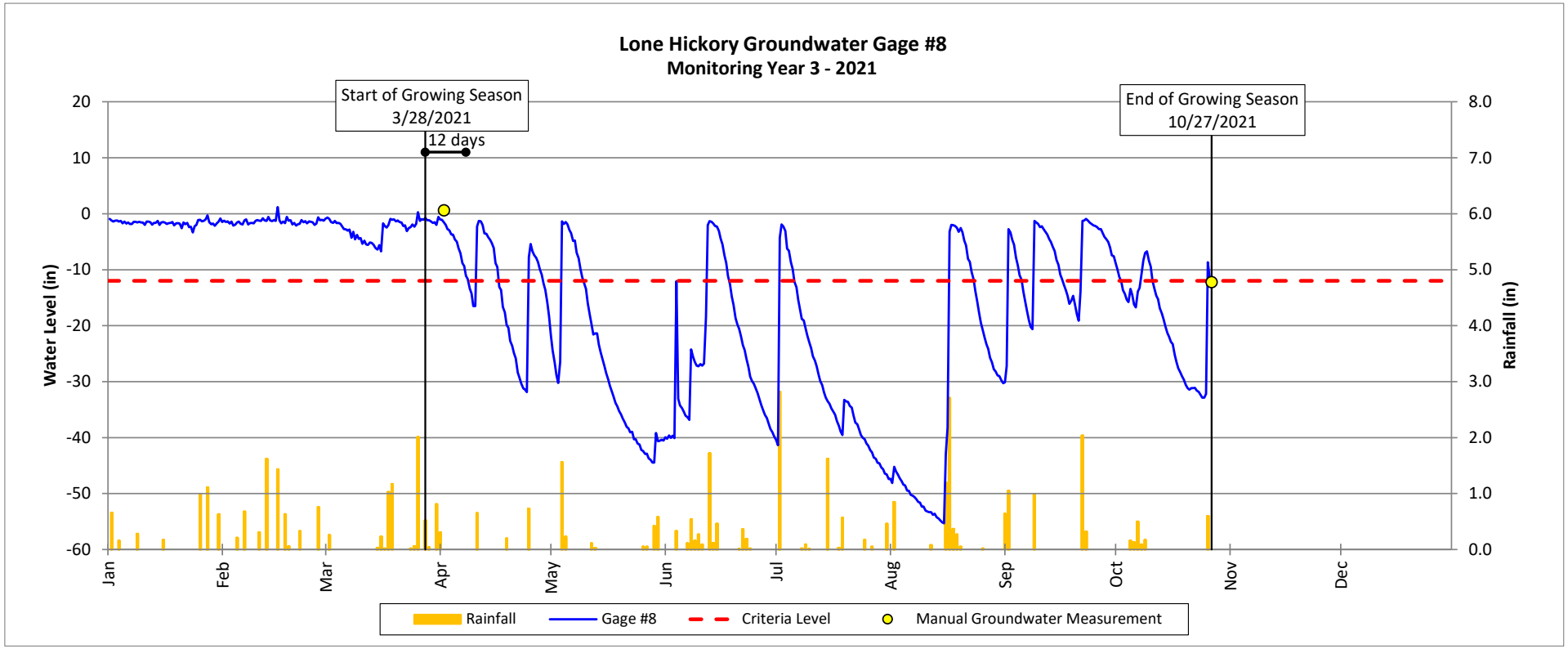
Comparison Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Wetland Re-est



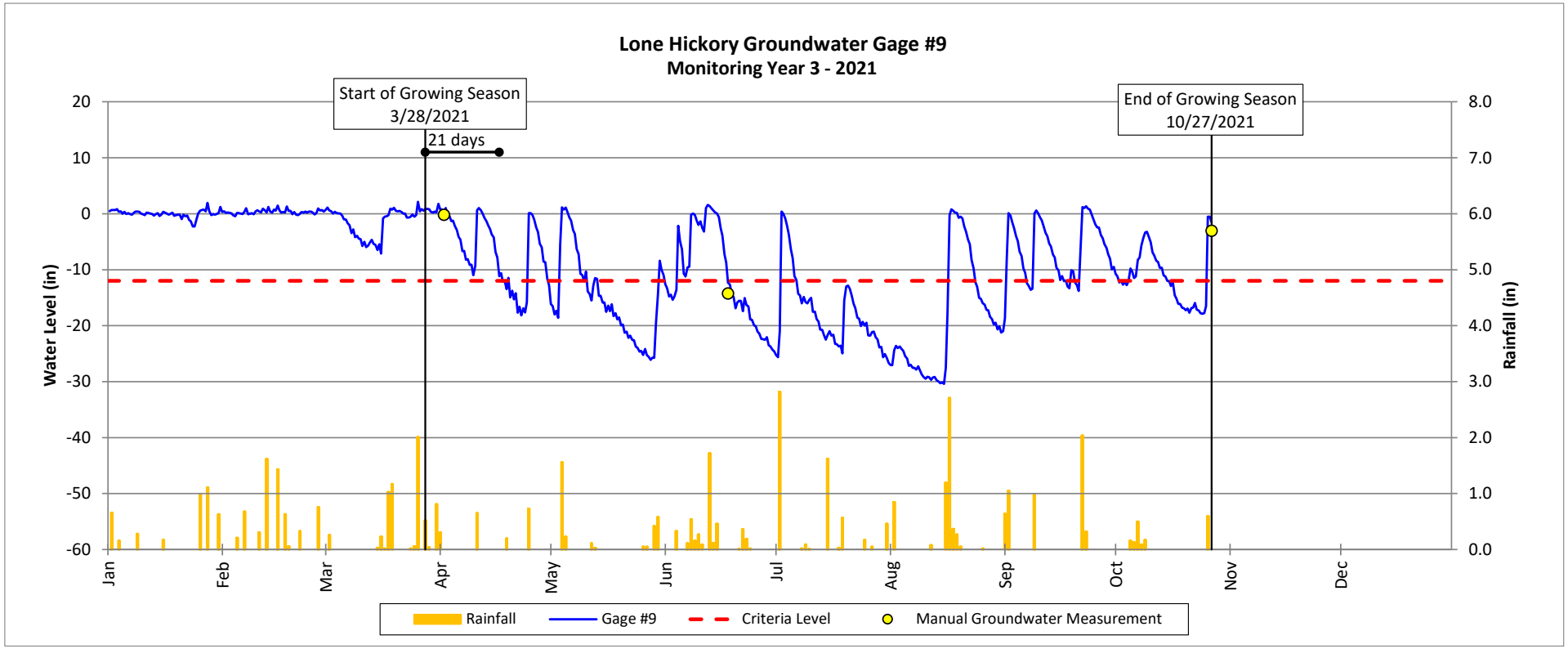
Comparison Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Wetland Re-est



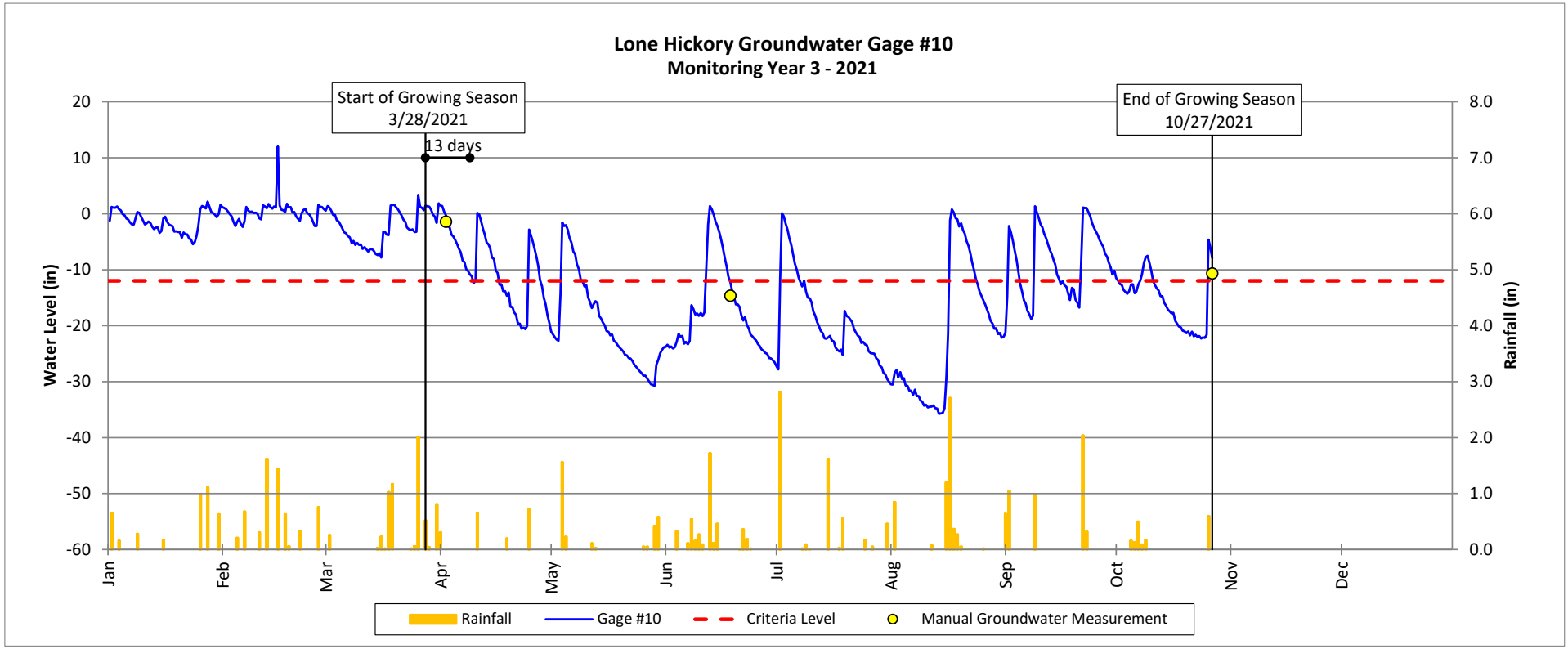
Comparison Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 3 - 2021

Wetland Re-est



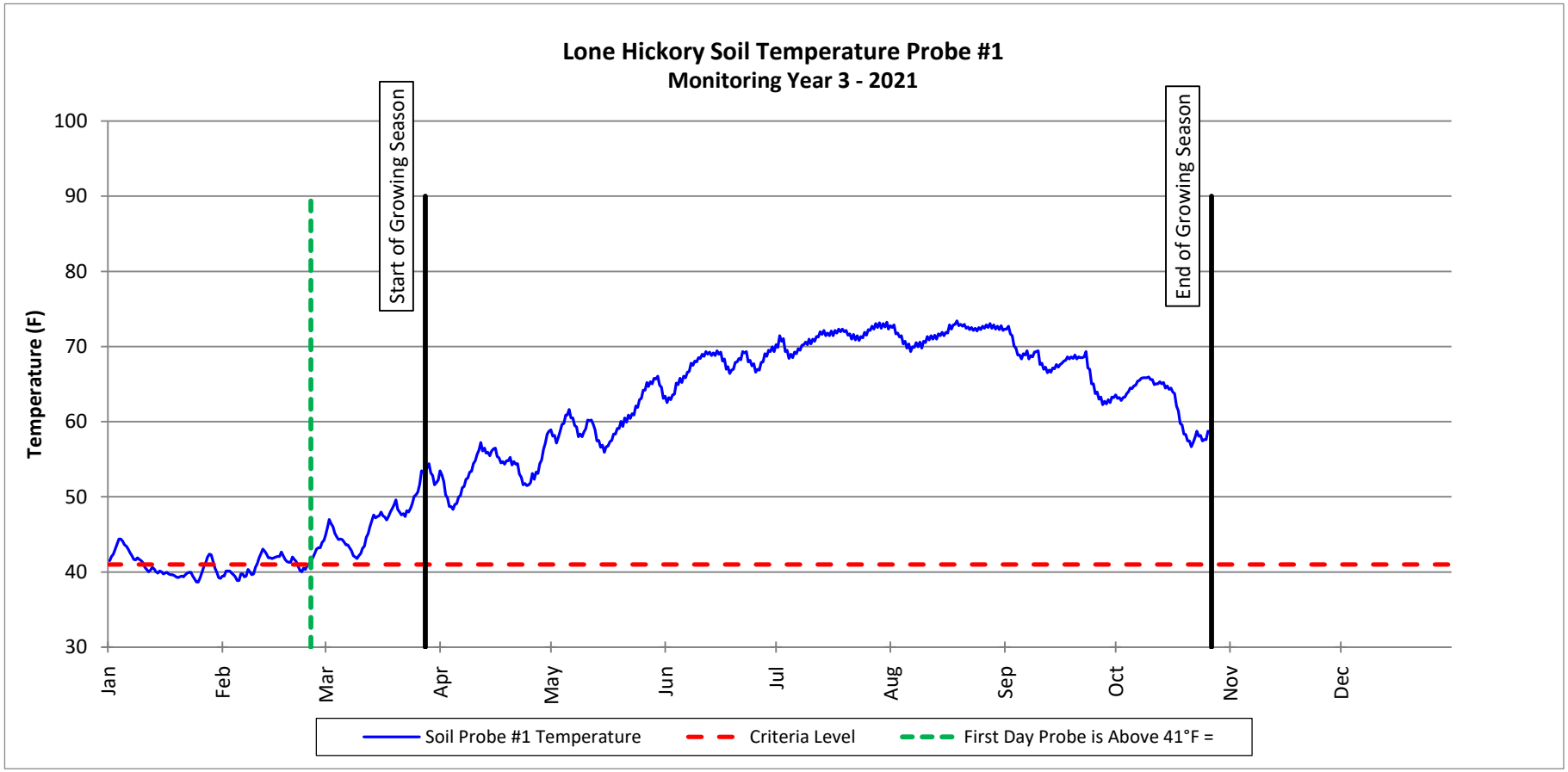
Soil Temperature Probe Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Wetland Re-est

Monitoring Year 3 - 2021



Soil Temperature Probe Plots

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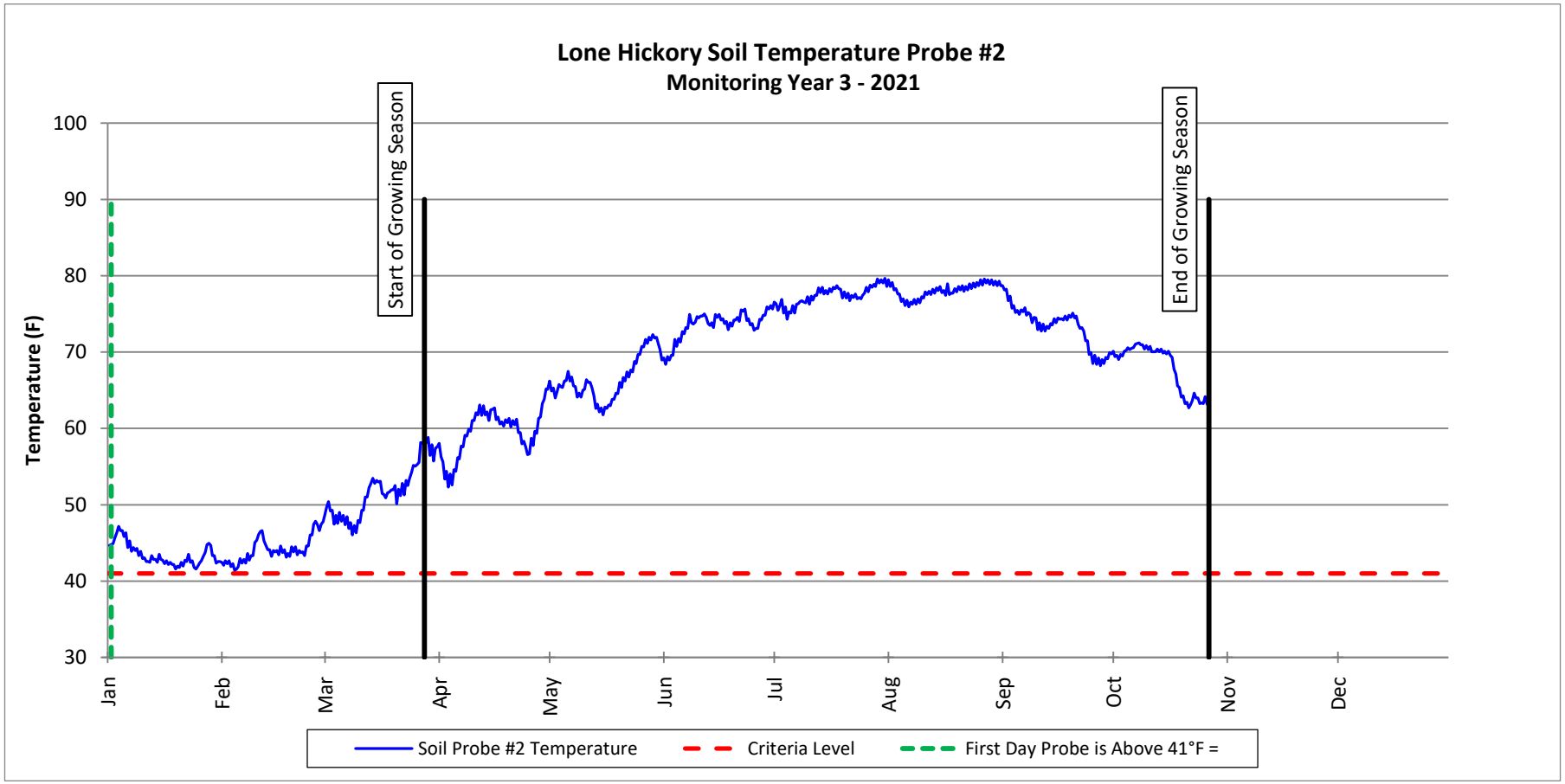
DMS Project No. 97135

Wetland Re-est

Monitoring Year 3 - 2021



APPENDIX 7. MY3 Repair Plans

Lone Hickory Mitigation Site

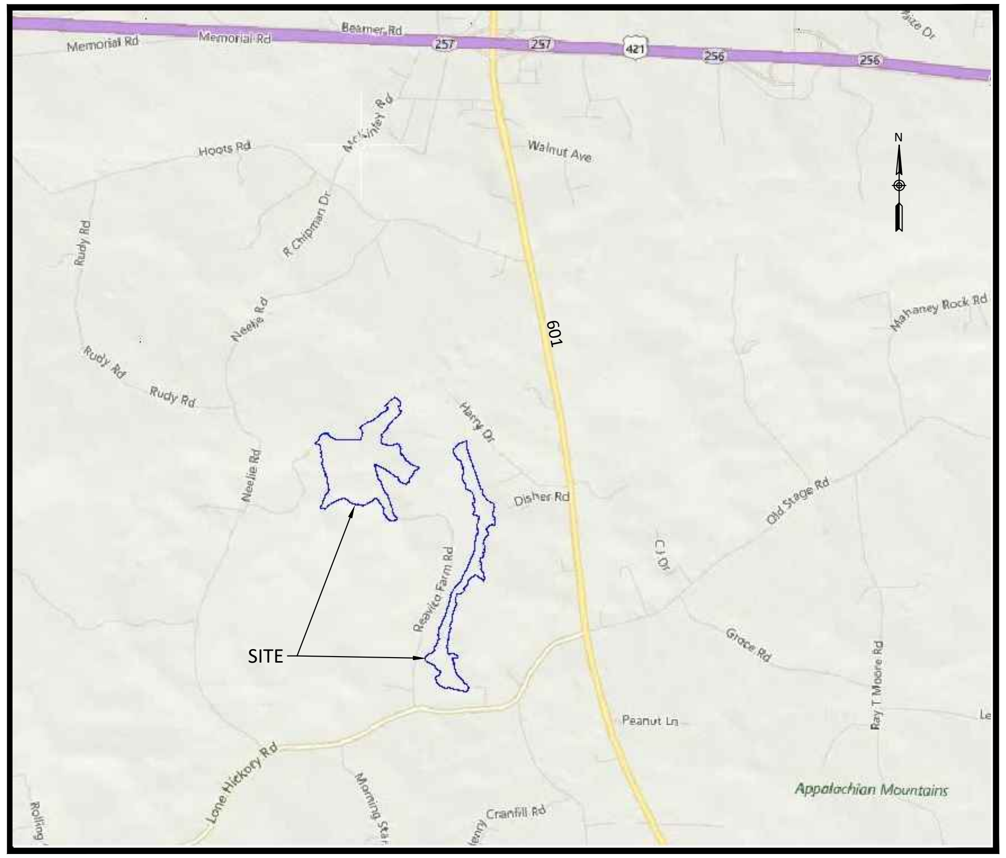
Yadkin County, North Carolina

for

NCDEQ

Division of Mitigation Services

Yadkinville, NC



Vicinity Map
Not to Scale

Environmental Quality

REPAIR DRAWINGS
ISSUED NOVEMBER 9, 2020

Sheet Index

Project Directory

Engineering:
Wildlands Engineering, Inc.
License No. F-0831
1430 South Mint Street, Ste 104
Charlotte, NC 28203
Emily G. Reinicker, PE
704-332-7754

As-Built Survey:
Turner Land Surveying, PLLC
P.O. Box 148
Swannanoa, NC 28778
Telephone: (919) 827-0745

Initial Topographic Survey:
Kee Mapping and Surveying, PA
88 Central Avenue
Asheville, NC 28801
Nolan Carmack, PLS
828-575-9021

Owner:
NCDEQ - Division of Mitigation Services
217 West Jones Street, 3rd floor
Raleigh, NC 27603

DMS Project No. 97135

Yadkin River Basin HUC 03040101

WILDLANDS ENGINEERING
1430 S. Mint Street, Ste 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
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Lone Hickory Mitigation Site Repair Drawings
Yadkin County, North Carolina

Title Sheet

Revisions:

Date: 11.09.20
Job Number: 005-02163
Project Engineer: EPN
Drawn By: JMS
Checked By: EGR

Sheet 0.1

REPAIR DRAWINGS:
Repairs will be shown in red.

Pre-construction Features

- Recorded Conservation Easement
- Pre-construction Property Line
- Pre-construction Overhead Electric
- Pre-construction Power Pole
- Pre-construction Storm Pipe
- Pre-construction Farm Road
- Pre-project Wetland Delineation
- Pre-construction Tree
- Pre-construction Bedrock
- Pre-construction Road
- Pre-construction Treeline

Design Features

10+00
- Design Thalweg Alignment

As-Built Features

- As-Built Thalweg Alignment
- As-Built Bankfull
- As-Built Major Contour (100)
- As-Built Minor Contour
- As-Built Monitoring Cross Section
- VP — Permanent Vegetation Monitoring Plots
- SG1 — Stream Gage
- GWG1 — Groundwater Gage
- Wetland Re-establishment

As-Built Structures

- As-Built Constructed Riffle
- As-Built Brush Toe
- As-Built Bank Grading in Stream Preservation Reach
- As-Built Channel Stabilization

As-Built Structures

- As-Built Log Sill
- As-Built Lunker Log
- As-Built Log J-Hook
- As-Built Boulder J-Hook
- As-Built Boulder J-Hook with Sill
- As-Built Log Vane
- As-Built Rock Sill

PROJECT NOTES:

Topographic survey was completed by Kee Mapping and Surveying in February 2017.
Parcel boundary survey completed by Kee Mapping and Surveying in July 2017.

Topographic data outside Design conservation easement supplemented with Lidar data from September 2015.

As-Built survey completed April 2019 by Turner Land Surveying.

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Lone Hickory Mitigation Site Repair Drawings
Yadkin County, North Carolina

General Notes and Symbols

Revisions:

Date: 11.09.20
Job Number: 005-02163
Project Engineer: EFN
Drawn By: JMS
Checked By: EGR

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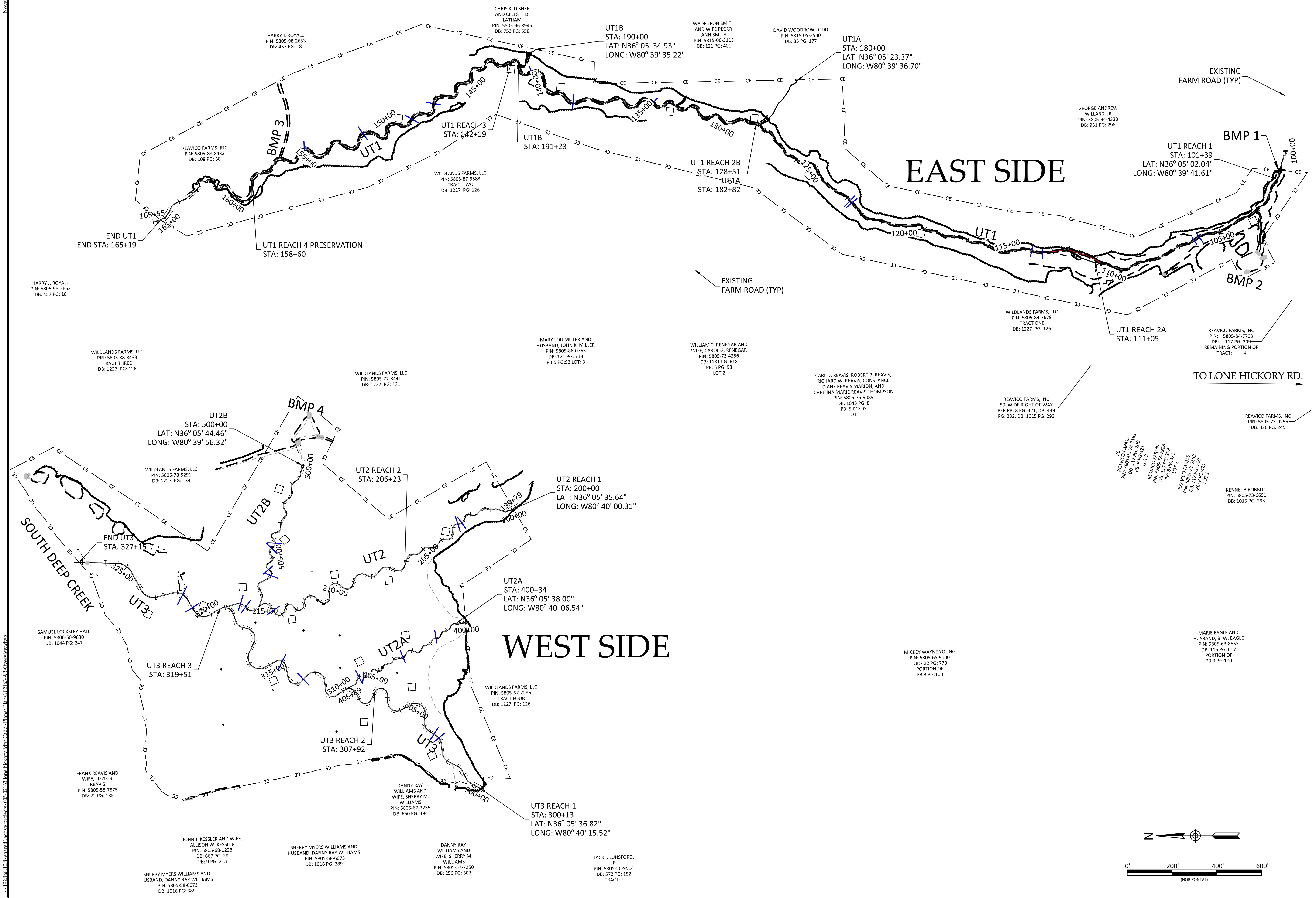

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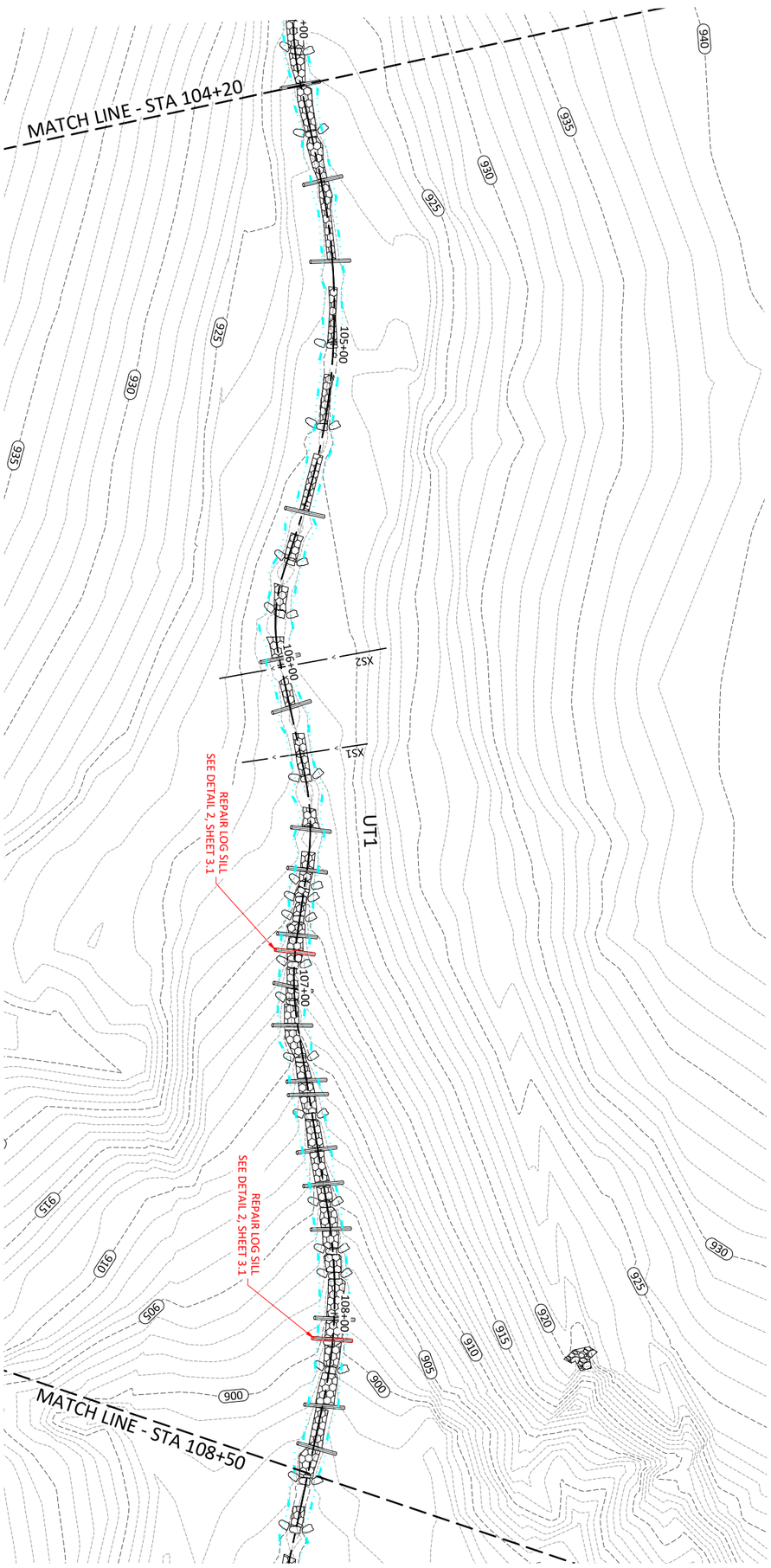
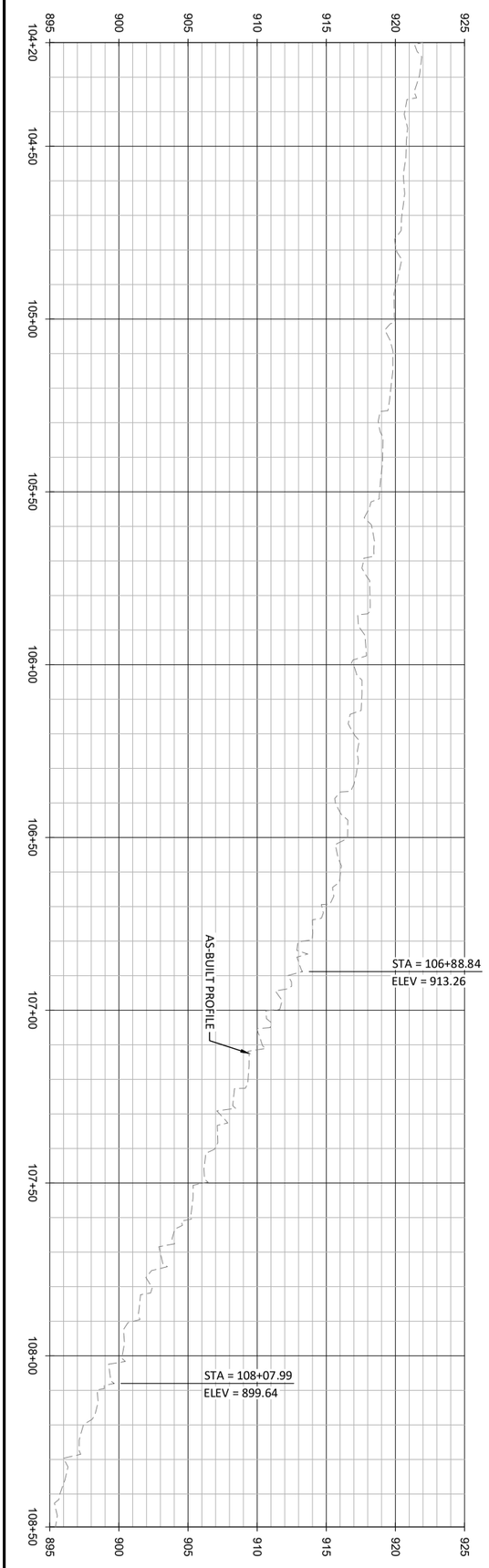
Lone Hickory Mitigation Site Repair Drawings
Yadkin County, North Carolina
Project Overview

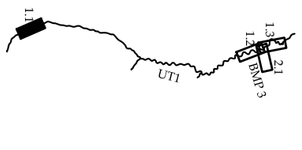
Date:	11.09.20
Job Number:	005-02163
Project Engineer:	EFN
Drawn By:	JMS
Checked By:	EGR

Revisions:

Sheet 0.3







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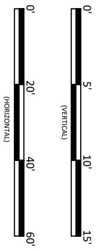

Date:	11.09.20
Job Number:	005-02163
Project Engineer:	EPN
Drawn By:	JMS
Checked By:	EGR

1.1
Sheet

Revisions:

Lone Hickory Mitigation Site Repair Drawings
Yadkin County, North Carolina

UT1
Stream Plan and Profile

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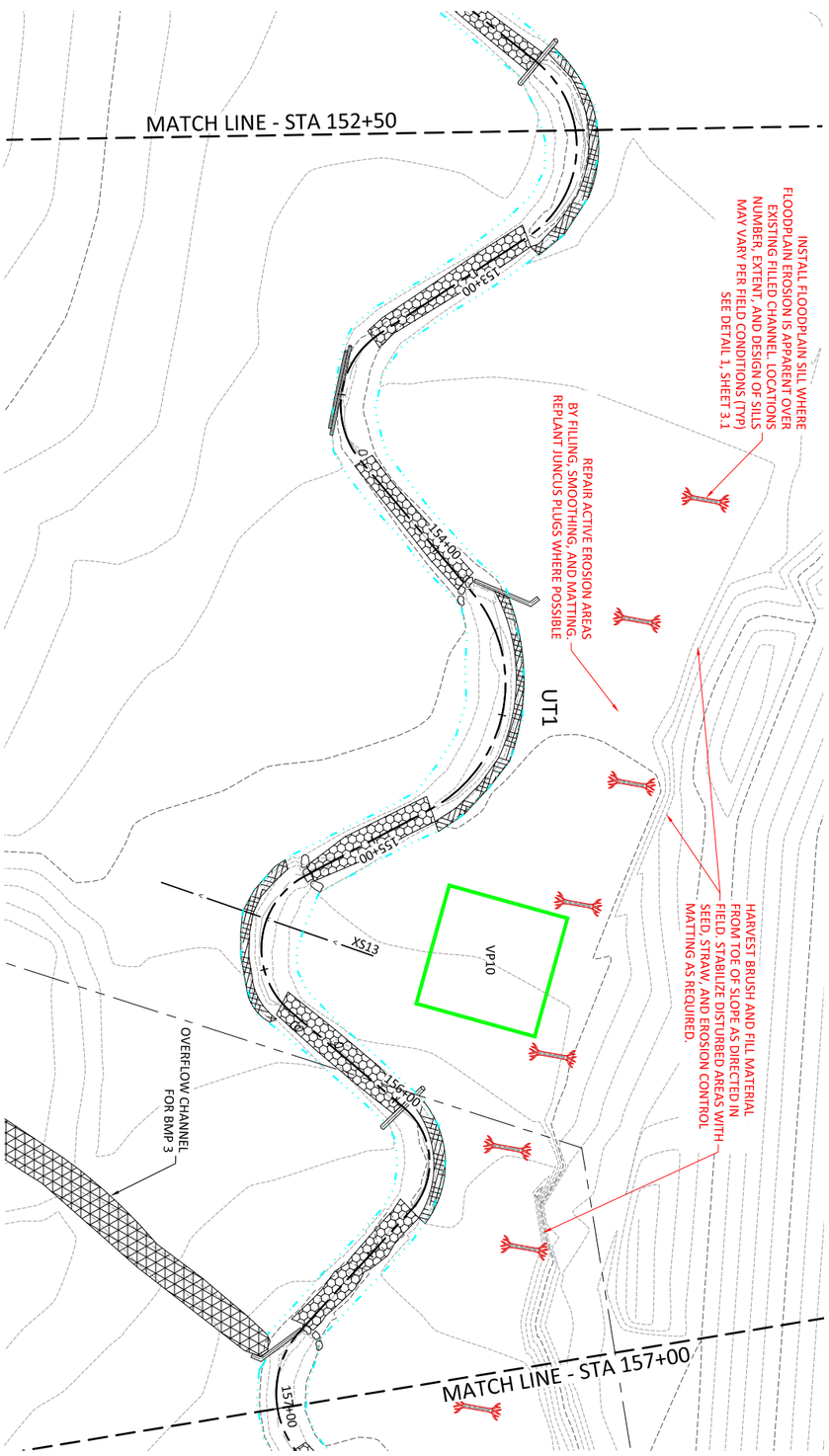

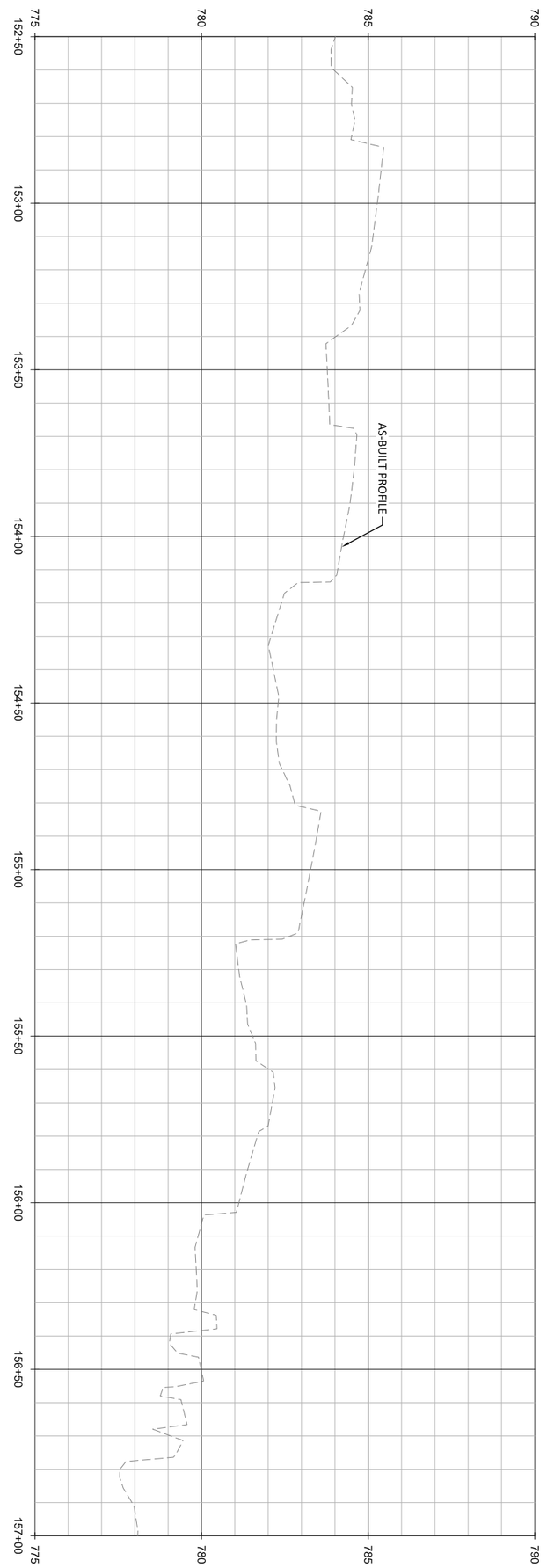

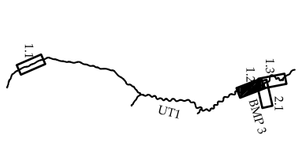

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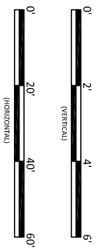

Date:	11.09.20
Job Number:	005-02163
Project Engineer:	EPN
Drawn By:	JMS
Checked By:	EGR

1.2
Sheet

Revisions:

Lone Hickory Mitigation Site Repair Drawings
Yadkin County, North Carolina

UT1
Stream Plan and Profile

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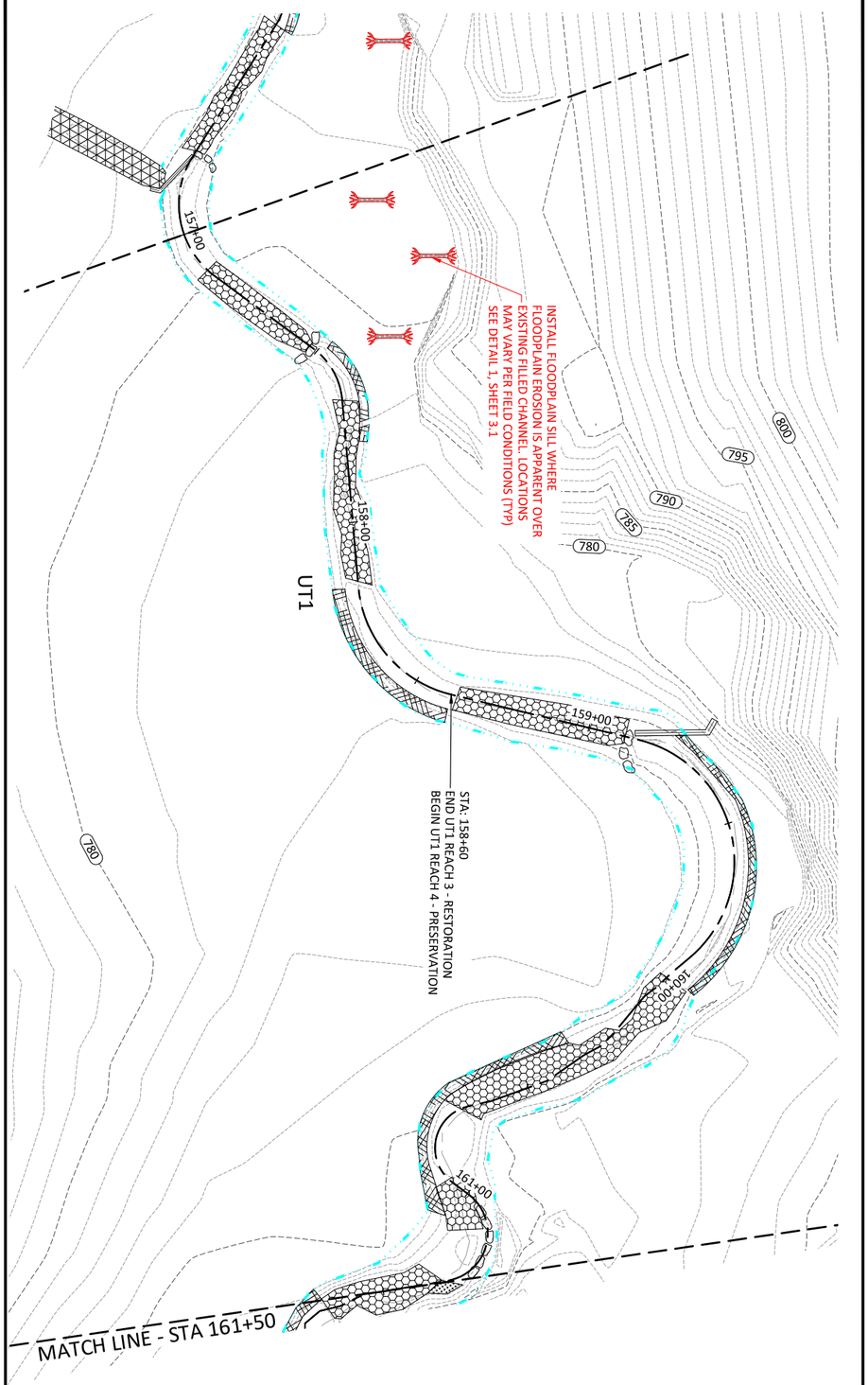

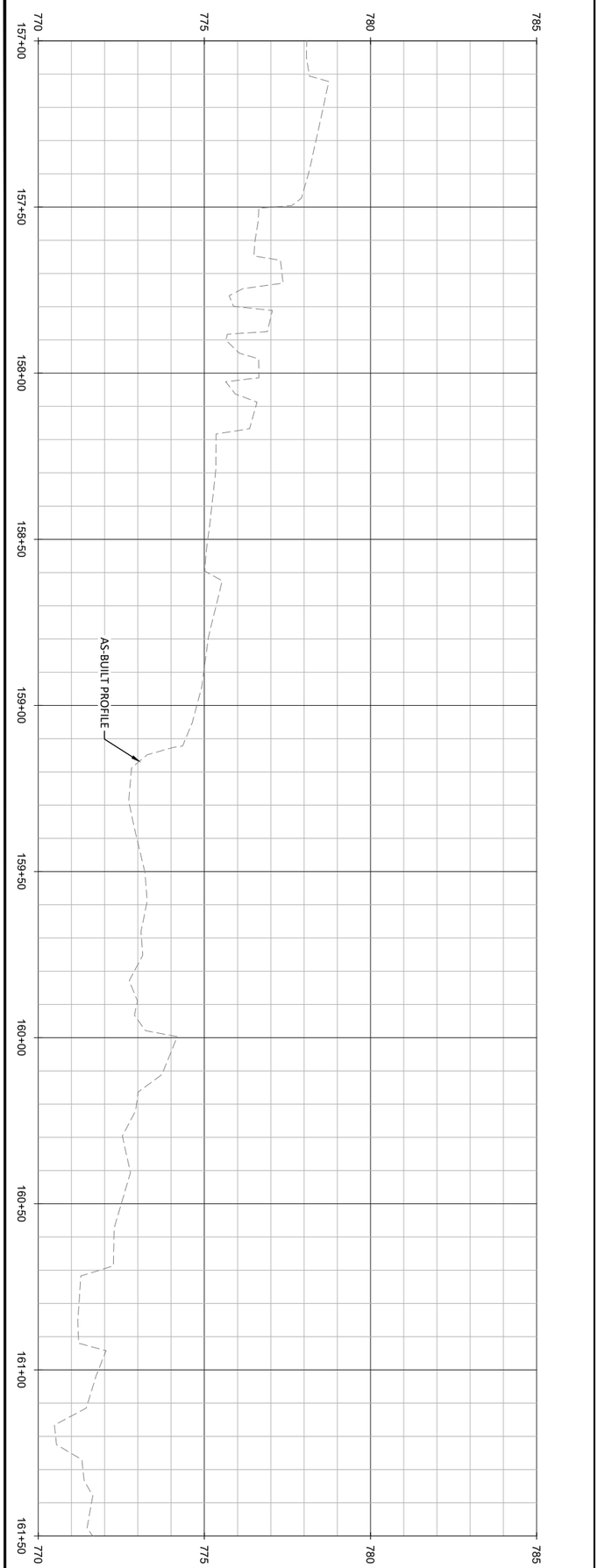

Sheet Index - East

N

0' 20' 40' 60' (HORIZONTAL)

0' 2' 4' 6' (VERTICAL)

Date:	11.09.20
Job Number:	005-02163
Project Engineer:	EPN
Drawn By:	JMS
Checked By:	EGR

1.3
Sheet

Revisions:

Lone Hickory Mitigation Site Repair Drawings
Yadkin County, North Carolina

UT1
Stream Plan and Profile

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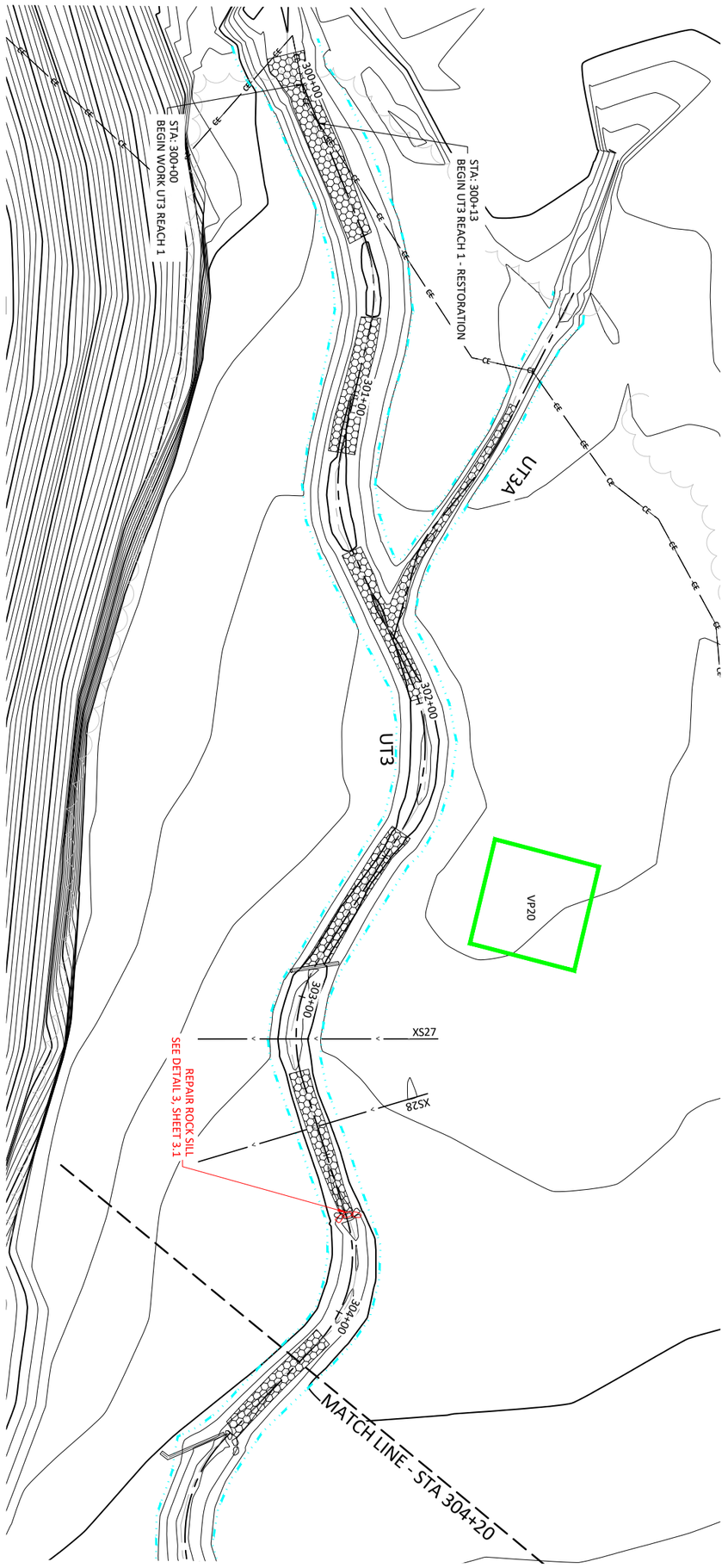

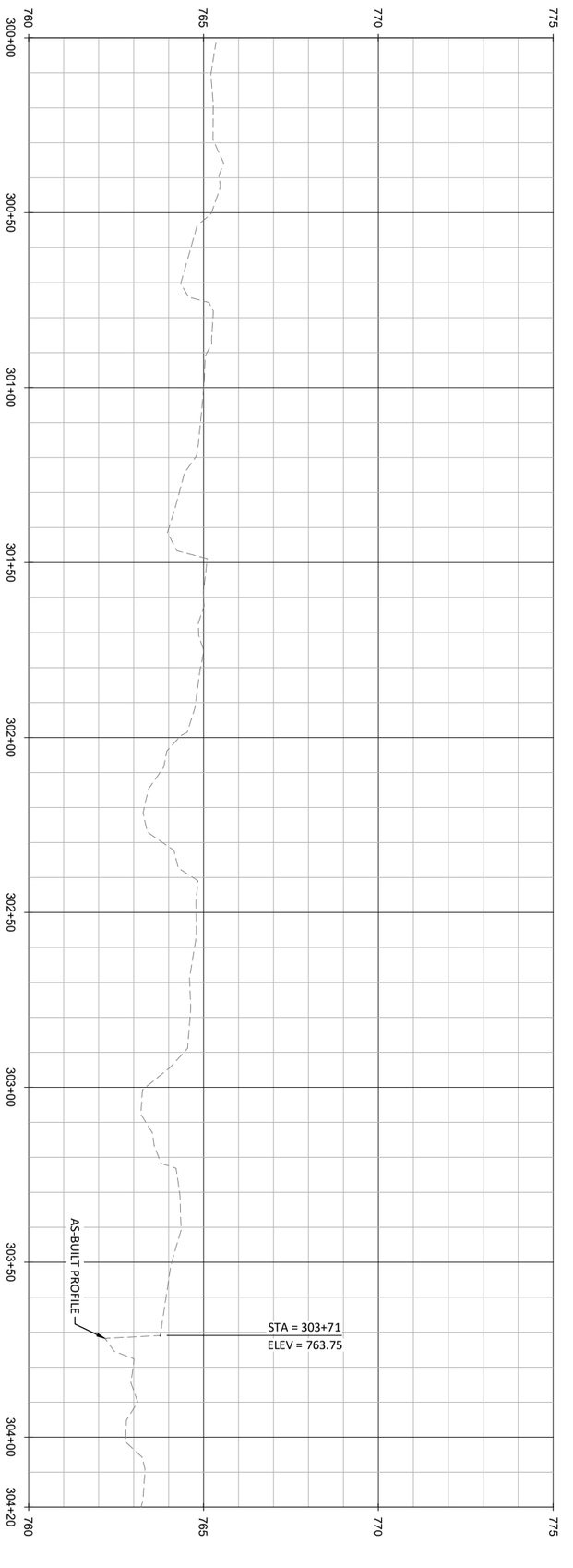

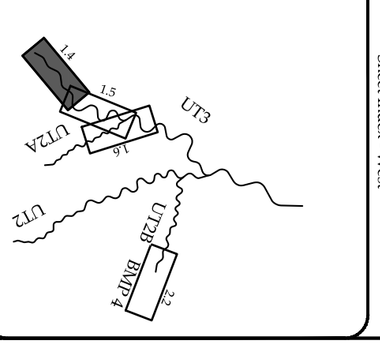

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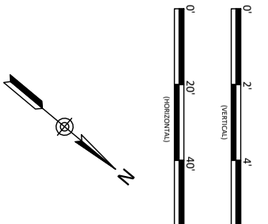

Date:	11.09.20
Job Number:	005-02163
Project Engineer:	EPN
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Checked By:	EGR

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1.4
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Lone Hickory Mitigation Site Repair Drawings
Yadkin County, North Carolina

UT3
Stream Plan and Profile

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Fax: 704.332.3306
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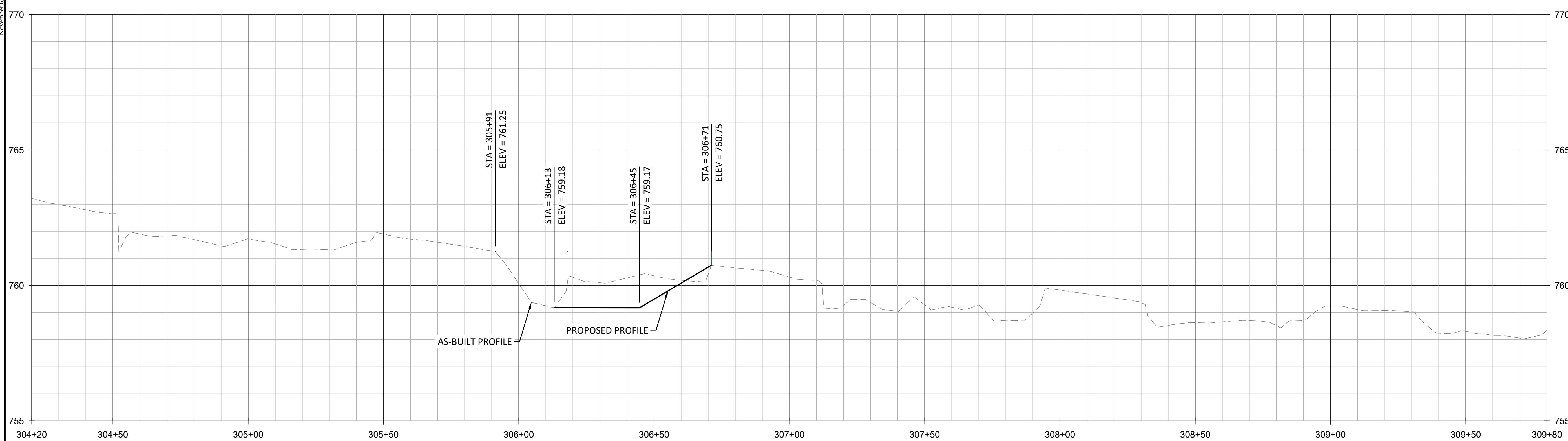
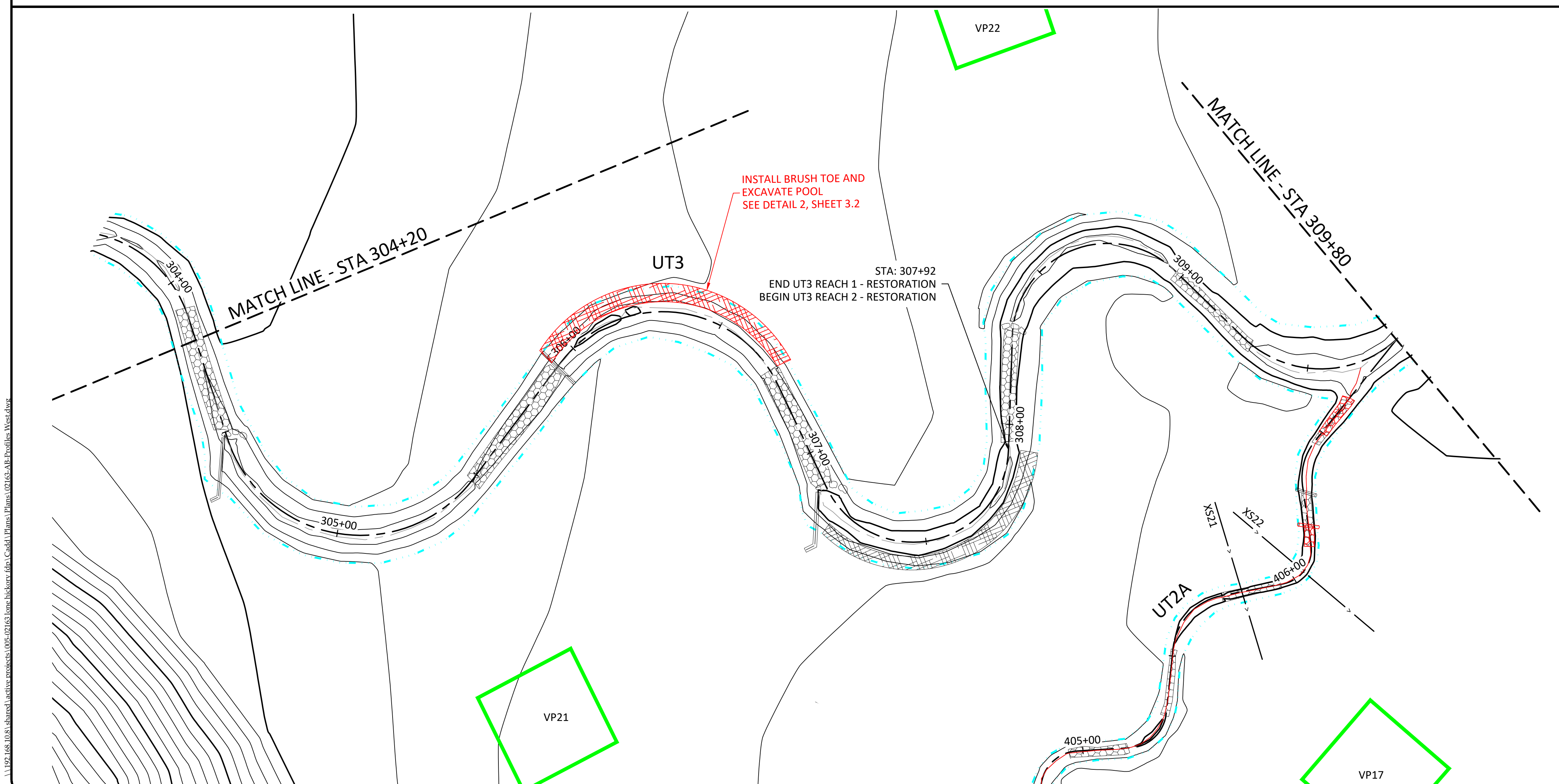
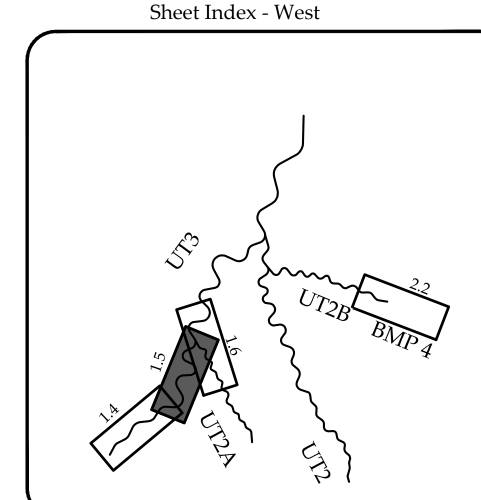




Sheet Index - West



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1430 S. Mint Street, Ste 104
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Tel: 704.332.7754
Fax: 704.332.3306
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Lone Hickory Mitigation Site Repair Drawings
Yadkin County, North Carolina

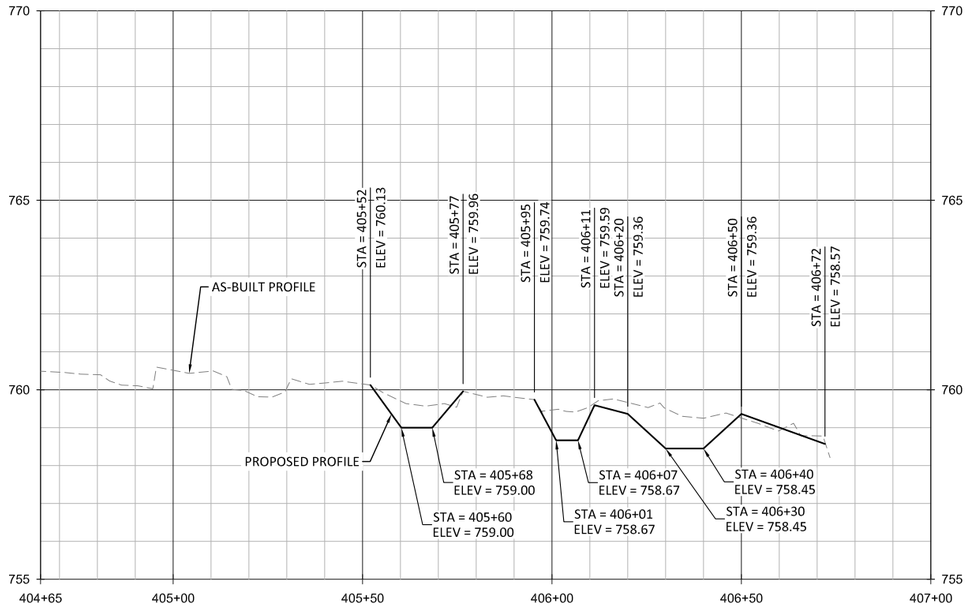
UT3
Stream Plan and Profile

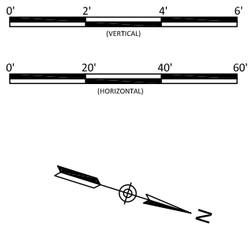
Revisions:

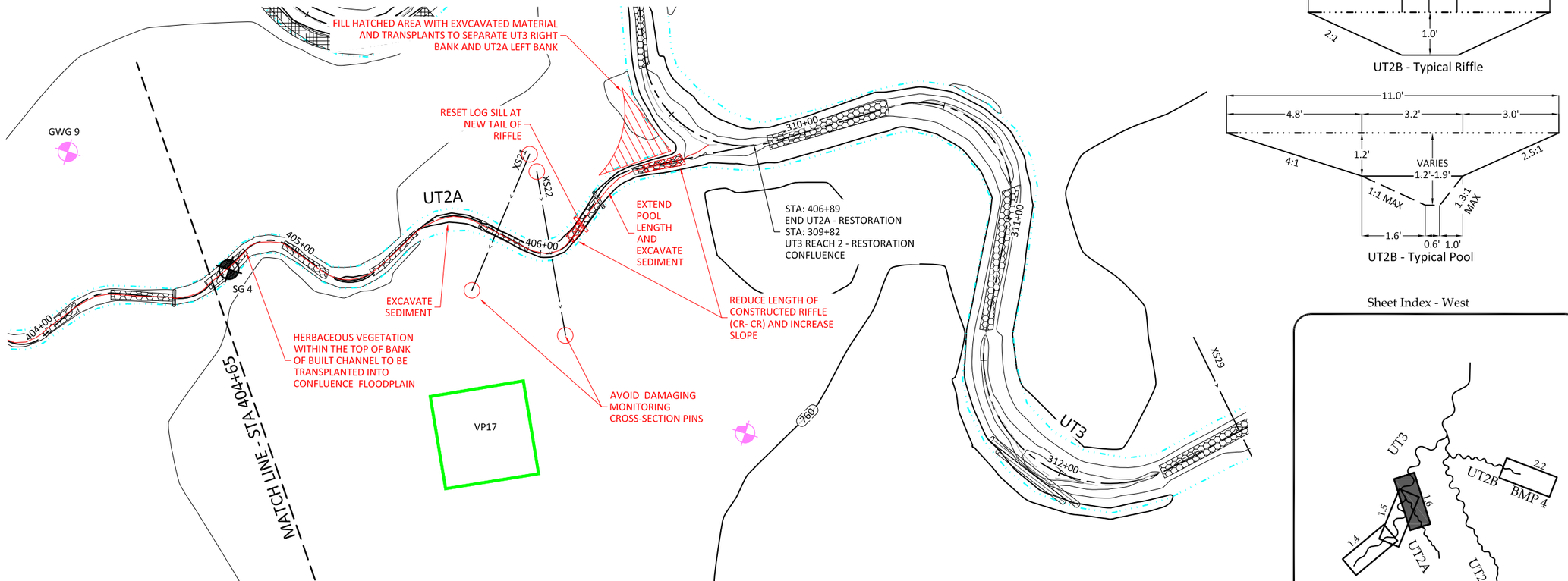
Date:	11.09.20
Job Number:	005-02163
Project Engineer:	EPN
Drawn By:	JMS
Checked By:	EGR

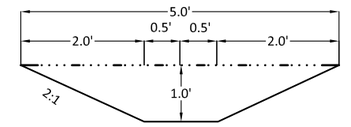
1.5
Sheet

November 11, 20[illegible]









UT2B - Typical Riffle

UT2B - Typical Pool

Sheet Index - West

L:\Active Projects\005-02163 Lone Hickory FDP\Civil\Plans\Plans\02163-All-Profiles-West.dgn

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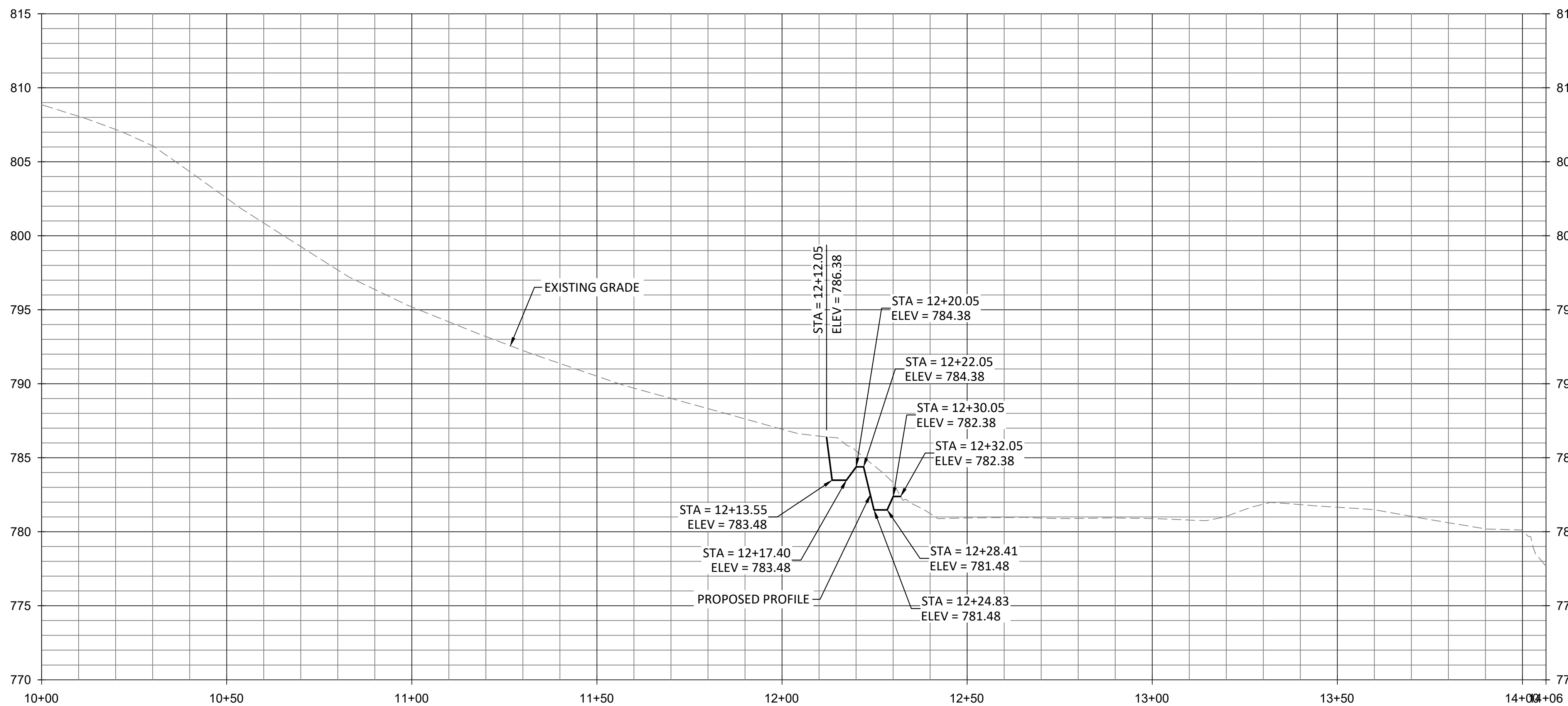
Lone Hickory Mitigation Site Repair Drawings
Yadkin County, North Carolina

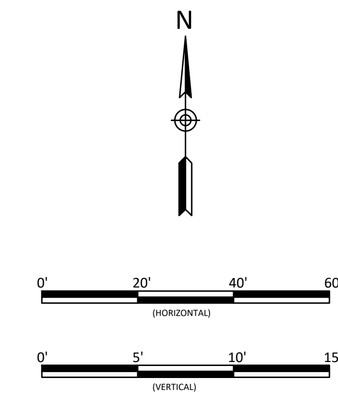
UT2A
Stream Plan and Profile

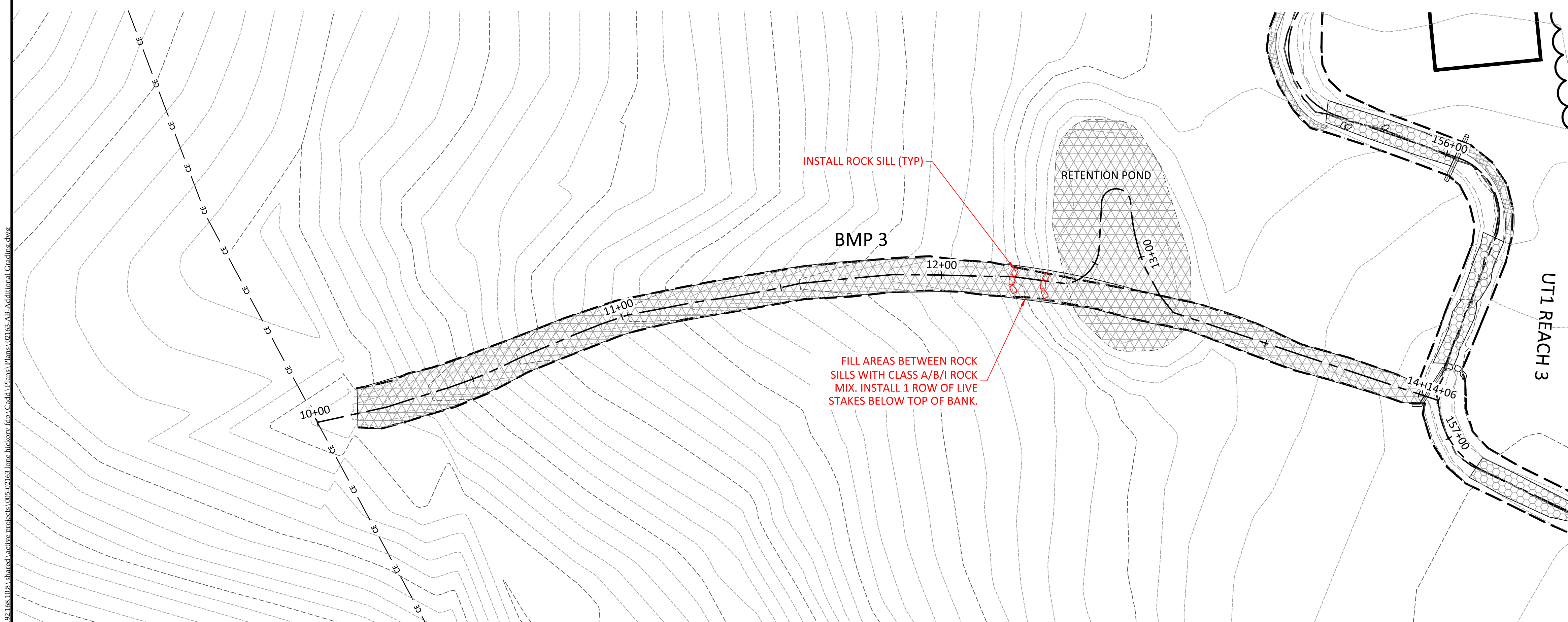
Revisions:

Date: 11.09.20
Job Number: 005-02163
Project Engineer: EPN
Drawn By: JMS
Checked By: EGR

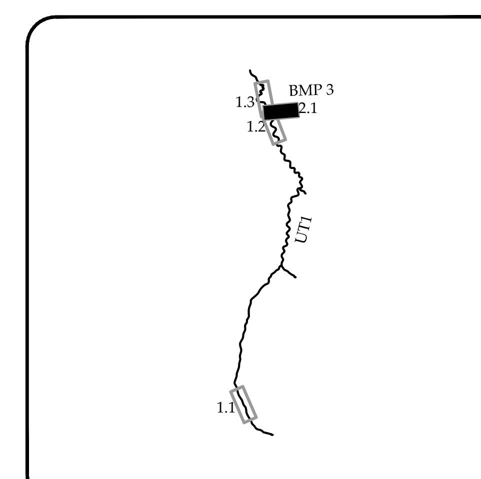
Sheet 1.6







Sheet Index - East



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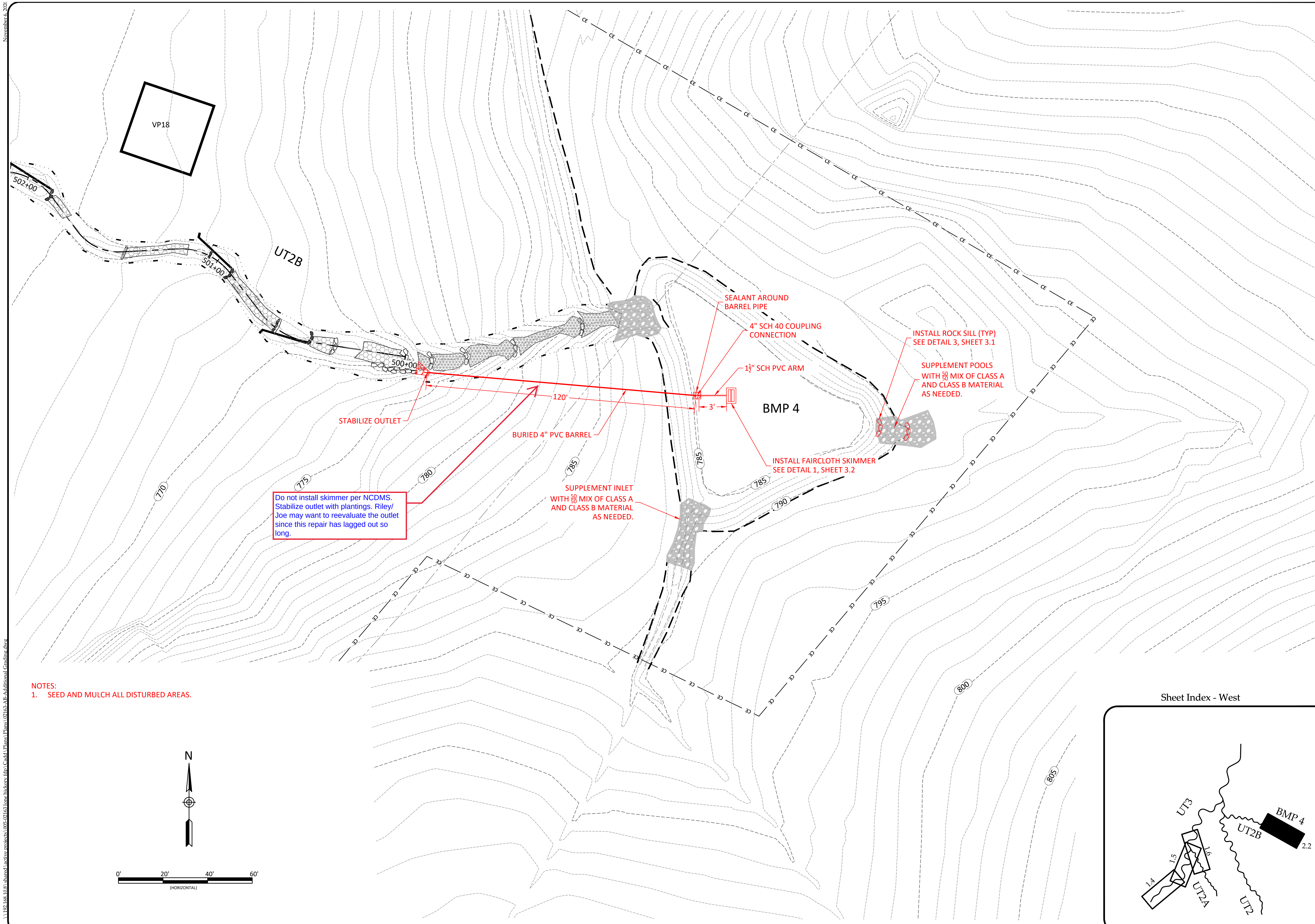
Lone Hickory Mitigation Site Repair Drawings
Yadkin County, North Carolina

BMP #3
Additional Grading

Revisions:

Date:	11.09.20
Job Number:	005-02163
Project Engineer:	EPN
Drawn By:	JMS
Checked By:	EGR

Sheet 2.1


VP18
UT2B
502+00
501+00
500+00
SEALANT AROUND BARREL PIPE
4" SCH 40 COUPLING CONNECTION
1½" SCH PVC ARM
INSTALL ROCK SILL (TYP) SEE DETAIL 3, SHEET 3.1
SUPPLEMENT POOLS WITH 50/50 MIX OF CLASS A AND CLASS B MATERIAL AS NEEDED.
BMP 4
120'
3'
STABILIZE OUTLET
BURIED 4" PVC BARREL
INSTALL FAIRCLOTH SKIMMER SEE DETAIL 1, SHEET 3.2
SUPPLEMENT INLET WITH 50/50 MIX OF CLASS A AND CLASS B MATERIAL AS NEEDED.
Do not install skimmer per NCDMS. Stabilize outlet with plantings. Riley/ Joe may want to reevaluate the outlet since this repair has lagged out so long.
770
775
780
785
790
795
800
805
N
0' 20' 40' 60'
(HORIZONTAL)
Sheet Index - West
UT3
UT2B
BMP 4
2.2
1.4
1.5
1.6
UT2A
UT2

NOTES:
1. SEED AND MULCH ALL DISTURBED AREAS.

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Lone Hickory Mitigation Site Repair Drawings
Yadkin County, North Carolina

BMP #4
Additional Grading

Date:	11.09.20
Job Number:	005-02163
Project Engineer:	EPN
Drawn By:	JMS
Checked By:	EGR

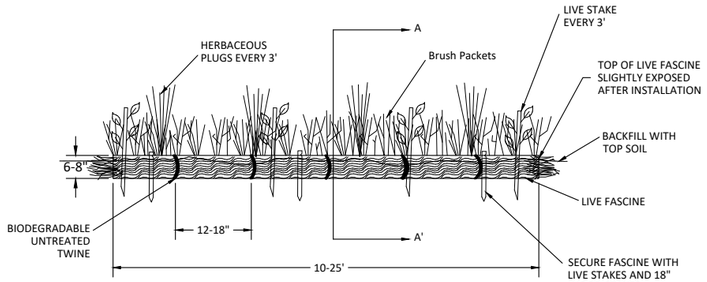
Revisions:

Sheet 2.2

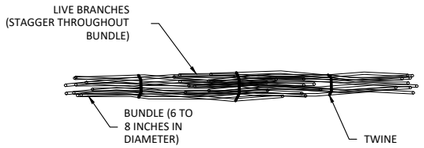
November 6, 2020

Live Stakes		
Species	**Common Name**	**Min. Size**
Salix nigra	Black Willow	0.5"-1.5" cal.
Cornus amomum	Silky Dogwood	0.5"-1.5" cal.
Salix sericea	Silky Willow	0.5"-1.5" cal.
Physocarpos opulifolius	Ninebark	0.5"-1.5" cal.
Herbaceous Plugs		
Juncus effusus	Common Rush	1.0"- 2.0" plug
Carex alata	Broadwing Sedge	1.0"- 2.0" plug

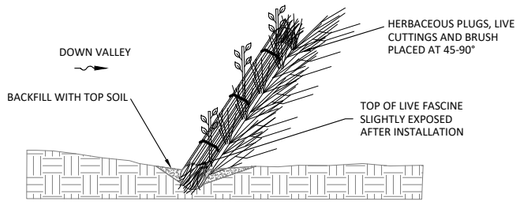
NOTE:
LIVE STAKES AND HERBACEOUS PLUGS MUST BE FROM THE LIST ABOVE OR APPROVED BY ENGINEER.



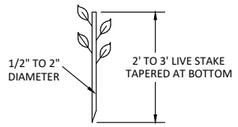
Profile View



Live Fascine Bundle

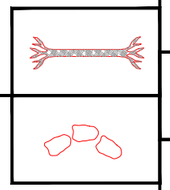


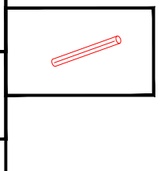
Section A - A'

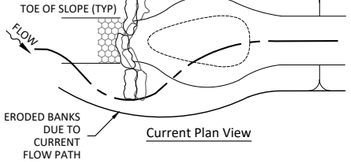


Live Stake Detail

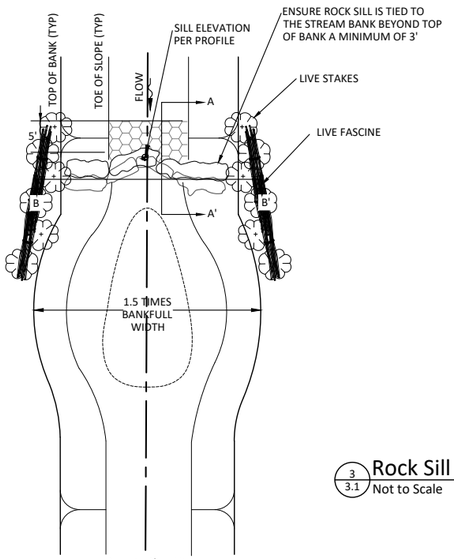
1/3.1 Floodplain Sill
Not to Scale



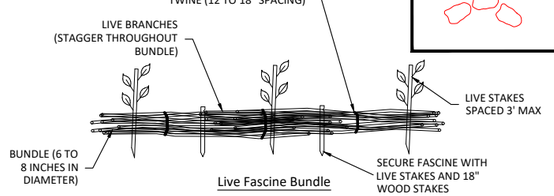




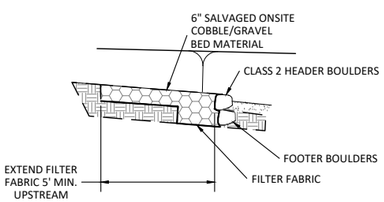
Current Plan View



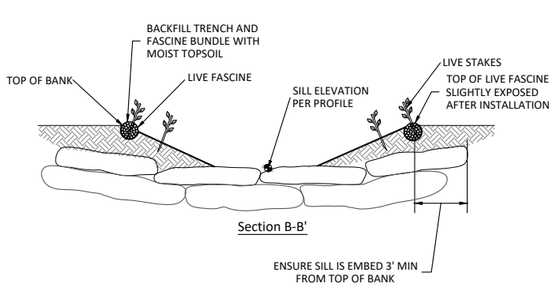
Repair Plan View



Live Fascine Bundle



Profile A-A'

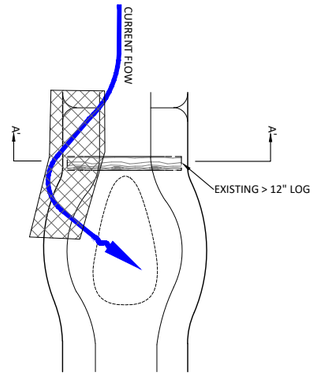


Section B-B'

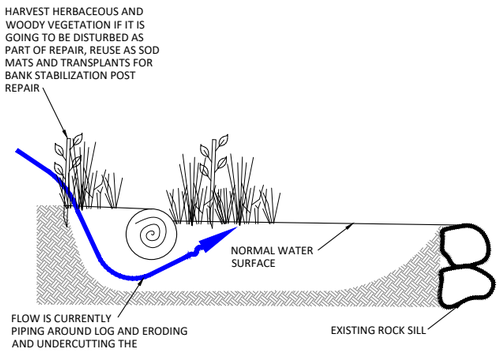
3/3.1 Rock Sill Repair
Not to Scale

REPAIR SEQUENCE:

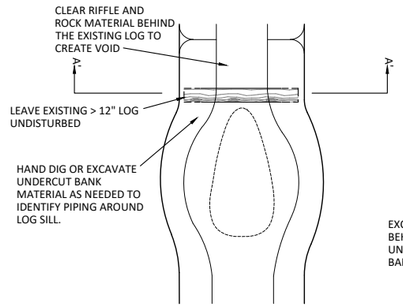
- SET UP PUMP AROUND TO DEWATER REPAIR AREA.
- EVALUATE THE AMOUNT OF BANK THAT WILL BE DISTURBED AS PART OF THE REPAIR AND HARVEST EXISTING HERBACEOUS AND WOODY VEGETATION FROM ANTICIPATED DISTURBED BANK. SET ASIDE FOR TRANSPLANTING.
- EXCAVATE REMAINING MATERIAL BEHIND THE FAILED/PIPED LOG SILL AND FROM UNDERCUT BANK.
- OVER EXCAVATE BEYOND ACTIVE EROSION AREA TO BE SURE ALL POTENTIAL PIPING AREAS ARE SEALED AS PART OF REPAIR.
- IF BANK IS UNDERCUT, TRY AND MAINTAIN TOP LEVEL OF VEGETATION DURING EXCAVATION IF POSSIBLE.
- REPLACE FILTER FABRIC BEHIND LOG.
- BACKFILL EXCAVATED CHANNEL BED AND UNDERCUT BANK AS DIRECTED IN THE DETAIL.
- PLACE LIVE FASCINE OVER BACKFILLED MIX.
- STAKE WILLOW PACKS AS SHOWN THROUGH THE FASCINE AND INTO INSITU MATERIAL. USE REBAR TO PILOT HOLE WHIPS TO ENSURE SURVIVAL.
- TRANSPLANT HARVESTED VEGETATION OVER COMPLETED BANK/SILL REPAIR.
- WHERE TRANSPLANTS ARE NOT AVAILABLE, RAKE, SEED, AND MAT REPAIR AREA FOR STABILITY.
- TURN WATER AND ENSURE FLOW IS GOING OVER THE LOG SILL POST REPAIR.
- TRIM ALL EXCESS FILTER FABRIC OUT OF SIGHT.



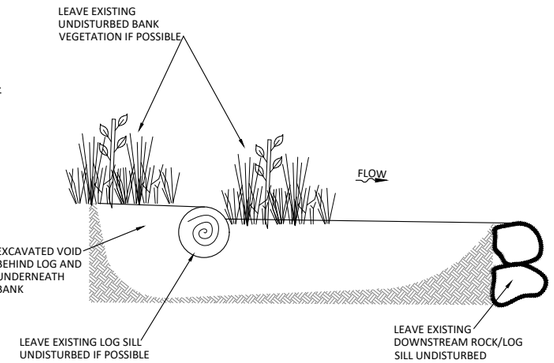
Existing Log Sills - Plan View



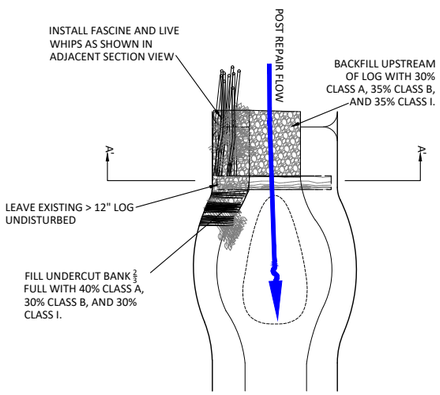
Existing Log SIll - Section View



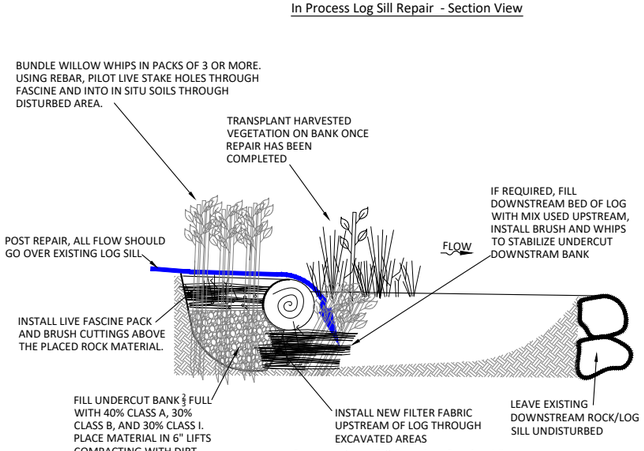
In Process Log Sill Repair - Plan View



In Process Log Sill Repair - Section View



Proposed Log Sill Repair - Plan View



Proposed Log Sill Repair - Section View

2/3.1 Log Sill Repair
Not to Scale

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Lone Hickory Mitigation Site Repair Drawings
Yadkin County, North Carolina

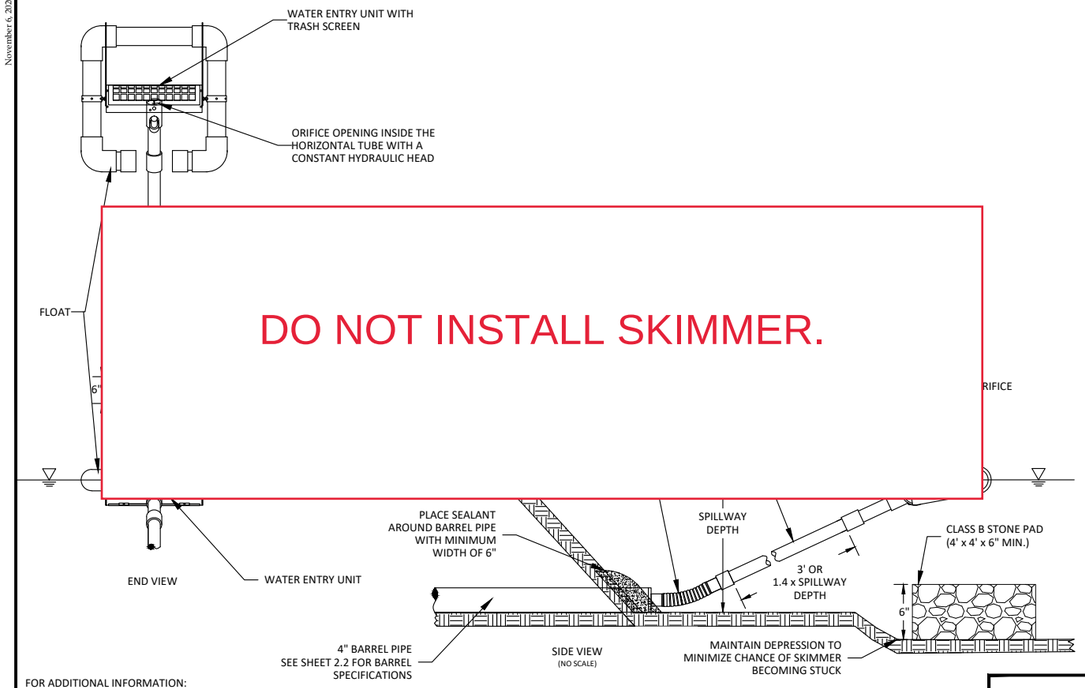
Detailed Repair Details

Revisions:

Date:	11.09.20
Job Number:	005-02163
Project Engineer:	EFN
Drawn By:	JMS
Checked By:	EGR

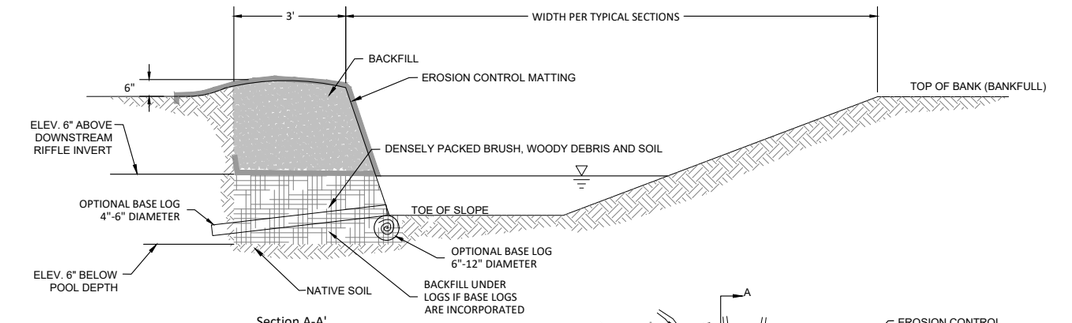
Sheet 3.1

November 6, 2020



FOR ADDITIONAL INFORMATION:
J. W. FAIRCLOTH & SON INC.
WWW.FAIRCLOTHSKIMMER.COM
TELEPHONE: (919) 732-1244
FAX: (919) 732-1266
EMAIL: WARREN@FAIRCLOTHSKIMMER.COM

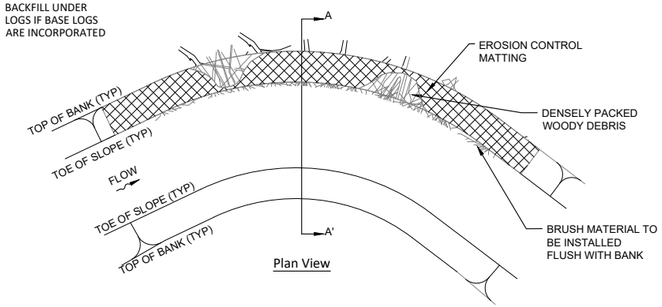
1 / 3.2 Faircloth Skimmer (BMP #4)
Not to Scale



Section A-A'

NOTES:

- GEOLIFTS 1.5' MAXIMUM MAY BE REPLACED WITH SOD MATS ON REACHES 15' BANKFULL WIDTH OR LESS AT TOP OF BANK.
- OVEREXCAVATE 3' OUTSIDE OF TOP OF BANK (BANKFULL).
- INSTALL A DENSE LAYER OF BRUSH/WOODY DEBRIS, WHICH SHALL CONSIST OF SMALL BRANCHES AND ROOTS COLLECTED ON-SITE AND SOIL TO FILL ANY VOID SPACE. LIGHTLY COMPACT BRUSH/WOODY DEBRIS LAYER.
- BRUSH SHOULD BE ALIGNED SO STEMS ARE ROUGHLY PARALLEL AND IS INSTALLED POINTING SLIGHTLY UPSTREAM.
- INSTALL MATTING OVER BRUSH/WOODY DEBRIS.
- INSTALL EARTH BACKFILL OVER BRUSH/WOODY LAYER ACCORDING TO TYPICAL SECTION DIMENSIONS.
- SEED, MULCH AND INSTALL EROSION CONTROL MATTING AND BANK STABILIZATION PER PLANS.
- BASE LOGS, IF AVAILABLE, MAY BE USED WITH THE APPROVAL OF THE ENGINEER.



Plan View

2 / 3.2 Brush Toe
Not to Scale

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Lone Hickory Mitigation Site Repair Drawings
Yadkin County, North Carolina

Details

Date:	11/09/20
Job Number:	085-02163
Project Engineer:	EPN
Drawn By:	JMS
Checked By:	EGR

Revisions:

Sheet 3.2

\\192.168.10.8\shared\active projects\085-02163 lone hickory (dp)\Cadd\Plans\02163 - Repair Details.dwg