FINAL
YEAR 6 (2021) ANNUAL MONITORING REPORT

NEIGHBORS BRANCH/WALTON CRAWLEY BRANCH STREAM & WETLAND RESTORATION SITE

NCDMS Project No. 92872
Contract No. D09023S
USACE Action ID No. SAW-2009-917 & NCDWR Project No. 10-0123v2
SCO No. 08-07308-01
McDowell County, North Carolina

Data Collection: April-November 2021
Submission: December 2021

PREPARED FOR:

N.C. DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1601 MAIL SERVICE CENTER
RALEIGH, NORTH CAROLINA 27699-1601

Axiom Environmental, Inc.

Axiom Environmental, Inc.

218 Snow Avenue, Raleigh, NC 27603 919-215-1693

December 21, 2021

Mr. Matthew Reid
North Carolina Department of Environmental Quality
Division of Mitigation Services
5 Ravenscroft Drive, #102
Asheville, North Carolina 28801

RE: Neighbors Branch/Walton Crawley Branch Monitoring (DMS Project # 92872, Contract # D09023S)
Final Year 6 (2021) Annual Monitoring Report **12-004.21**

Dear Matthew:

Axiom Environmental, Inc. (AXE) is pleased to provide you with two hard copies and a USB drive containing electronic files for the Final Neighbors Branch/Walton Crawley Branch Year 6 (2021) Annual Monitoring Report. We received your comments via email on December 17, 2021 and have addressed them as follows.

- At this time, the IRT has agreed to closeout Neighbors Branch in late 2022. DMS will coordinate with Axiom for contracted closeout services as the project moves through the closeout process. Thank you for all your help with this project.
  Axiom is on standby for site closeout and is happy to help.

- Please update the NCDWR Project Number on the title page and second page to 10-0123v2.
  The NCDWR project number was updated.

- Last paragraph in Streams section page 5: Please change State Property to DEQ Stewardship. DMS and DEQ Stewardship met with the land owner to discuss the encroachment.
  This sentence was updated accordingly.

- Please add that invasive treatment occurred in February, April and June 2021 during MY6 to invasive discussion on page 6.
  These treatment dates were added to the invasive discussion.

- Table 2: Please add Feb/Apr/Jun 2021 to Completion or Delivery column for Invasive Species Treatment in MY6.
  This entry was added to Table 2.

- Table 5a-e and Table 6: Please add dates to the top of each table for when the assessment field work was completed. The IRT has requested that this information be included at the 2021 Credit Release Meeting.
  A row for assessment date was added to the top of each table.

- CCPV: Thank you for providing updated invasive polygons on the CCPV. DMS will direct the invasive contractor to these areas before the project closes out.
  Axiom is happy to help.

- Please include the attached DMS/IRT meeting minutes from the March 24, 2021 site visit in the appendix with before the repair plans.
  These meeting minutes were included in Appendix F.

Digital Files Review

- Please submit a line feature that characterizes the 60 ft of degradation along UT1 to Neighbors Branch.
  This line feature was created and included in the digital submittal. Additionally, the narrative in the report regarding stream areas of concern was updated to clarify that this degradation occurs in two separate but close reaches of UT1. These are the same reaches proposed for repair in January 2022 (Appendix F).

- Please ensure that cross section values are reported consistently across figures and tables, and specifically use the same number of significant digits for clarity.
  The cross-section values were double checked and corrected as necessary for consistency. Most variables are reported to 1 decimal place, but bank height ratio is shown to 2 decimal places for informational purposes.

- Please submit raw crest gauge data.
  The crest gauges onsite are the old cork crest gauges. These are disassembled and inspected for the level of cork to be above the top of bank. This is noted, but no actual raw data exists. Crest gauge data is typically paired with visual observations such as wrack or laid-back vegetation in the floodplain to confirm the occurrence of a bankfull event.

Please let us know if you have any questions or comments regarding any component of this submittal. Thank you for the opportunity to continue to assist the Division of Mitigation Services with this important project.

Sincerely,
AXIOM ENVIRONMENTAL, INC.

Kenan R. Jernigan
Project Scientist

Attachments: 2 hard copies Year 6 (2021) Neighbors Branch/Walton Crawley Branch Annual Monitoring Report
1 USB drive containing digital support files

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AXIOM ENVIRONMENTAL, INC.
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APPENDICES

1.0 PROJECT SUMMARY

The North Carolina Division of Mitigation Services (NCDMS) has established the Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site (Site). The primary goals of the project focused on improving water quality and long term stability by reducing nutrient loading from the on-site cattle and horse operation, reducing excess sedimentation input from Site channel banks and contributing non-jurisdictional tributaries/drainages, reducing excess sedimentation from Site access roads and deteriorated crossings, increasing the attenuation of floodwater flows, reintroducing natural watershed flows to Walton Crawley Branch by removing a pond and restoring the channel through its natural valley, and restoring and enhancing aquatic and riparian habitat. Long term stability will be evidenced by channels maintaining stable inverts and banks over an extended period of time.

These goals were accomplished through the following objectives.

- Reduce point (i.e. cattle/horses directly accessing the channel) and non-point source (i.e. stormwater runoff through pastures) pollution associated with an on-site cattle and horse operation by installing exclusionary fencing along the stream and riparian buffer, and by providing a vegetative buffer on stream banks and adjacent floodplains to treat nutrient enriched surface runoff from adjacent pastureland.
- Stabilize degraded portions of on-site streams, eroding ephemeral/stormwater channels, and existing maintained dirt roads to reduce sediment inputs. Stabilization methods included:
    - Restoring a stable dimension, pattern, and profile to selected sections of channels to ensure the channel will transport and attenuate watershed flows and sediment loads without aggrading or degrading.
    - Stabilize selected channel banks by excavating bankfull benches, placing stream structures to reduce shearing forces on outside meander bends, and planting native vegetative species to provide soil stability.
    - Stabilize ephemeral/stormwater channels by planting native vegetation along eroded banks and floodplain and constructing stabilization weirs through the channel valley to lower facet slopes and decrease erosion.
    - Place gravel along existing degraded soil roads that are situated adjacent to Site streams.
- Reintroduce natural watershed flows to Walton Crawley Branch by restoring the channel through the low point of the natural valley and removing a dam that impedes natural down valley flows.
- Improve aquatic habitat by enhancing stream bed variability, providing shading/covered areas within the stream channel, and introducing woody debris in the form of rootwads, log vanes, and log sills.
- Enhance fish passage within Neighbors Branch and Walton Crawley Creek. This was accomplished by eliminating a pond and restoring the stream through the natural valley and by restoring Neighbors Branch and replacing an existing perched culvert to allow fish passage upstream.
- Enhance riparian wildlife habitat by:
    - Fencing cattle out of existing wetlands and planting impacted wetlands with native vegetative species. Wetlands were also restored by raising Site stream inverts to allow groundwater tables to rise throughout the affected valleys.
    - Fencing livestock out of existing and restored riparian buffers as well as installing alternative watering devices that will ensure livestock have sufficient watering areas. This is detailed further in the Farm Management Plans completed for the Site by NCDMS.
    - Vegetating the existing fescue dominated riparian buffers with native trees, shrubs, herbs, and grasses. Forest vegetation species were selected by studying a Reference Forest Ecosystem located on-site and reviewing Montane Alluvial Forest species listed in

Classification of the Natural Communities of North Carolina: Third Approximation (Schafale and Weakley 1990).

- Creating wildlife corridors through agricultural lands which have significantly dissected the landscape. The corridors will provide connectivity to a diversity of habitats including mature forest, early successional forest, stream-side forest, riparian wetlands, and uplands.

The Site is located approximately six miles southeast of the town of Marion (Figure 1, Appendix B). The Site is situated due southwest of the intersection of Deer Park Road and Harmony Grove Road in McDowell County, North Carolina and is located within the United States Geological Survey (USGS) Hydrologic Unit and Targeted Local Watershed 03050101040010 (North Carolina Division of Water Quality Subbasin 03-08-30) of the Catawba River Basin and will service USGS 8-digit Cataloging Unit 03050101.

The contributing watersheds are characterized primarily by forest land (approximately 84 percent of the total area) with pasture at the lower elevations (approximately 10 percent of the total area) and low-density residential development scattered along the outer fringes of the watershed. Impervious surfaces appear to account for approximately one percent of the watershed land surface. Prior to Site construction, riparian vegetation had been removed, stream channels were manipulated, and hoof shear from livestock on stream banks and floodplain soils was responsible for degraded water quality and unstable channel characteristics (stream entrenchment, erosion, and bank collapse).

Project mitigation efforts resulted in the following:

- Restore 2456 linear feet of Site streams
- Enhance (Level I) 202 linear feet of Site streams
- Enhance (Level II) 1863 linear feet of Site streams
- Preserve 3139 linear feet of Site streams
- Restore 0.52 acre of existing hydric soils to riparian wetlands
- Enhance 1.62 acres of riparian wetlands
- Preserve 1.29 acres of riparian wetlands

The Muddy Creek Restoration Partnership (Partnership) was formed in 1998 to address impacts to the Muddy Creek Watershed. The Partnership completed the *Muddy Creek Watershed Restoration Initiative Feasibility Report and Restoration Plan* (Watershed Plan) for the Muddy Creek Watershed in December of 2003 (MCRP 2003). Since 2004 NCDMS has informally participated in the Partnership by implementing priority projects named by the partnership and adopted the 2003 report as part of its Local Watershed Plan (LWP). The NCDMS's *Upper Catawba River Basin Restoration Priorities* (2009) identifies North Muddy Creek as a Targeted Local Watershed (TLW). The Site is located within the North Muddy Creek Watershed. In 2008 NCDMS contracted with a consulting firm to conduct outreach programs with landowners and identify additional project sites in the Muddy Creek Watershed.

The primary goals identified by the Partnership's Watershed Plan include the following.

1. Restore the Watershed to its Full Intended Use
2. Restore Riparian Buffers
3. Enhance Open Space Preservation
4. Improve Water Quality
5. Restore Physical Habitat
6. Establish a Trout Fishery

The Watershed Plan listed the following components of watershed restoration to be expected:

1. Natural Channel Design Stream Restoration
2. Riparian Reforestation
3. Livestock Exclusion
4. Riparian Forest Preservation

These four components were included within the *Neighbors Branch/Walton Crawley Branch Site Mitigation Plan* (NCDMS 2013). The project restored the watershed to its full intended use by restoring a stream, floodplain, and riparian wetland ecosystem through stream and wetland restoration, enhancement, and preservation. The project restored riparian buffers through revegetation of buffer zones with native riparian and wetland species along all Site streams. The project enhanced open space preservation by placing Site streams, wetlands, and their buffers into a permanent conservation easement. The overall Site helps improve water quality by reducing sedimentation in on-Site streams and planted a vegetated riparian buffer that filters nutrients from adjacent pasturelands. Additionally, exclusionary fencing and alternate watering devices removed livestock from accessing on-site channels and riparian buffers. The project restored and enhanced physical habitat for both aquatic and terrestrial species by planting native vegetation along stream banks and riparian buffers, creating wildlife corridors through a dissected landscape, and restoring bedform variability to Site streams. The stabilization of streams and buffers in the project area enhanced water quality in downstream receiving waters, which should help in the re-establishment of the watershed's ability to host trout and enhance their ability to propagate.

Site design was completed on March 7, 2013. Site construction and planting were completed in December 2015. Completed project activities, reporting history, completion dates, project contacts, and project attributes are summarized in Tables 1-4 (Appendix A).

Stream Success Criteria: Success criteria for stream restoration will include 1) successful classification of the reach as a functioning stream system (Rosgen 1996) and 2) channel variables indicative of a stable stream system.

Collected data will be utilized to determine the success in restoring stream channel stability. Specifically, the width-to-depth ratio and bank-height ratios should be indicative of a stable or moderately unstable channel with minimal changes in cross-sectional area, channel width, and/or bank erosion along the monitoring reach. In addition, channel abandonment and/or shoot cutoffs must not occur and sinuosity values must remain relatively constant. Visual assessment of instream structures will be conducted to determine if failure has occurred. Failure of a structure may be indicated by collapse of the structure, undermining of the structure, abandonment of the channel around the structure, and/or stream flow beneath the structure.

Stream Dimension: General maintenance of a stable cross-section and hydrologic access to the floodplain features over the course of the monitoring period will generally represent success in dimensional stability. Some changes in dimension (such as lowering of bankfull width) should be expected. Riffle cross-sections should generally maintain a bank-height ratio approaching 1.0, with some variation in this ratio naturally occurring. Pool cross-sections naturally adjust based on recent flows and time between flows, therefore more leeway on pool cross-section geometry is expected.

Stream Pattern and Profile: The profile should not demonstrate significant trends towards degradation or aggradation over a significant portion of a reach. Additionally, bed form variables should remain noticeably intact and consistent with original design parameters that were based off

of reference conditions. Pattern features should show little adjustment over the standard 5-year monitoring period and will be monitored to ensure adjustment is minor prior to close out.

Substrate: Substrate measurements should indicate the progression towards or the maintenance of the known distributions from the design phase.

Sediment Transport: There should be an absence of any significant trend in the aggradational or depositional potential of the channel.

Hydraulics: A minimum of two bankfull events must be documented within the standard 5-year monitoring period. The two bankfull events shall occur within separate years.

Vegetation Success Criteria: Success criteria have been established to verify that the vegetation component supports community elements necessary for forest development. Success criteria are dependent upon the density and growth of characteristic forest species. An average density of 320 stems per acre of planted stems must be surviving in the first three monitoring years. Subsequently, 290 planted stems per acre must be surviving in year 4, and 260 planted stems per acre in year 5.

Wetland Hydrology Success Criteria: Target hydrological characteristics include saturation or inundation for 5 to 12.5 percent of the growing season, during average climatic conditions. During growing seasons with atypical climatic conditions, groundwater gauges in reference wetlands may dictate threshold hydrology success criteria (75 percent of reference). These areas are expected to support hydrophytic vegetation. If wetland parameters are marginal as indicated by vegetation and/or hydrology monitoring, a jurisdictional determination will be performed.

2.0 METHODS

Monitoring of restoration efforts will be performed for five years, or until success criteria are fulfilled. Monitoring is proposed for the stream channel, vegetation, and wetland hydrology. In general, the restoration success criteria, and required remediation actions, are based on the *Stream Mitigation Guidelines* (USACE et al. 2003). Monitoring features are described below and are depicted on Figures 2A-B (Appendix B).

Streams

The restored stream reaches are proposed to be monitored for geometric activity as follows.

- 1750 linear feet of stream profile
- 5 riffle cross-sections
- 3 pool cross-section

The data will be presented in graphic and tabular format. Data to be presented will include 1) cross-sectional area, 2) bankfull width, 3) average depth, 4) maximum depth, 5) width-to-depth ratio, 6) meander wavelength, 7) belt-width, 8) water surface slope, and 9) sinuosity. Substrate analysis will be evaluated through pebble counts at five cross sections and data presented as a D50 for stream classification and tracking purposes. The stream will subsequently be classified according to stream geometry and substrate (Rosgen 1996). Significant changes in channel morphology will be tracked and reported by comparing data in each successive monitoring year. Annual photographs will include 43 fixed station photographs (Appendix B). In addition, the Site contains two stream crest gauges to assist with documentation of

bankfull events. One bankfull event was documented during monitoring year 6 (2021) making a total of at least nine bankfull events occurring in six separate monitoring years (Table 12, Appendix E).

Early in year 1 (2016), several structures were damaged by significant storm events that occurred shortly after Site construction. Warranty repair work was completed in October 2016 to address these issues. The repaired structures remained stable during year 6 (2021). One stream area of concern remained during year 6 (2021) monitoring. The header of a drop structure at the bottom of a series of structures on UT-1 to Neighbors Branch (approximately 11+15) has failed, causing serious degradation in the accompanying pool and downstream riffle. A similar issue has occurred at the bottom of the subsequent series of structures at approximate sta. 11+60 (Area of Concern #1, Figure 2A, Appendix B). The down-cutting is a threat to the integrity of the rock structure above the pool. Overall site streams were exhibiting stability and no areas of additional instability were observed.

In March 2019, DMS developed implemented an adaptive management plan and repaired several areas of concern that were identified in the MY3 report. The work included removing debris that was dumped in the easement near the downstream end of Walton Crawley Branch and around two culverted crossings outside the easement. A log J-hook structure at approximately sta: 21+35 on Walton Crawley Branch was repaired by hand. The material behind the vane arm had scoured out during a high flow event and this material was replaced by hand. The final repair consisted of stabilizing a log J-hook structure near sta: 26+65 on Walton Crawley Branch and repairing approximately 20 feet of adjacent stream bank erosion. The eroding banks were upstream of the structure and were damaged during a high flow event. If these banks were not repaired, the log J-hook would have likely failed in the future. The banks were regraded, matted and live staked. During the stream bank repairs, the log J-hook structure was stabilized by adding additional rock and ensuring the footer and header logs were intact. The repairs that occurred in March 2019 have been successful and remain stable through year 6 (2021).

DMS met with the IRT on March 24, 2021 at the Neighbors Branch/Walton Crawley Restoration Site to review the site and discuss several areas that were identified for repairs. Following that meeting, DMS contracted with a designer and developed a repair plan to address six areas. The work included in the repair will address several deep gullies from offsite drainage, repair two ephemeral drainages, address two perched culverts, repair failing boulder structures (Area of Concern #1), and address a headcut. The repair is scheduled to occur in January 2022. The repair plan is included in Appendix F. DMS will notify the IRT once the repair has been completed.

During the March 24, 2021 site visit, an encroachment was identified at the stream crossing on the Neighbors Branch preservation reach. The landowner was re-establishing an existing soil road that crosses Neighbors Branch to access property. The equipment operator was unaware of the easement corner and a small portion of the road encroached upon the conservation easement. DMS contracted a PLS to remark the entire conservation easement throughout the project site. DMS and DEQ Stewardship has since met with the landowner and discussed the encroachment. A solution has been reached, and the area of the road that was pushed into the conservation easement will be planted as part of the repair occurring in January 2022.

Vegetation

Restoration monitoring procedures for vegetation will monitor plant survival and species diversity. Planted areas within the Site include approximately 12.3 acres. After planting of the area was completed, eight vegetation plots were installed and monitored at the Site; annual monitoring results can be found in Appendix C. Annual measurements of vegetation will consist of 8 CVS vegetation plots.

A photographic record of plant growth should be included in each annual monitoring report; current monitoring photographs are included in Appendix B. During the first year, vegetation will receive a cursory, visual evaluation on a periodic basis to ascertain the degree of overtopping of planted elements by nuisance species. Subsequently, quantitative sampling of vegetation will be performed as outlined in the *CVS-EEP Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008) in September of the first monitoring year and annually between June 1 and September 30 for the remainder of the monitoring period until vegetation success criteria are achieved.

Year 6 stem count measurements indicate planted stem densities are well-above the required 260 stems per acre. Planted stem density across the Site is 410 planted stems per acre (excluding livestakes) (Table 9, Appendix C). In addition, all eight individual CVS plots met success criteria based on planted stems alone. Therefore, the Site is currently meeting vegetation success criteria.

Several dense populations of Chinese privet (*Ligustrum sinense*) and multiflora rose (*Rosa multiflora*) were observed along Neighbors Branch, Walton Crawley Branch, and UT-2 to Walton-Crawley Branch (Figures 2A-B, Appendix B). NCDMS currently has implemented an invasive management plan and is under contract through closeout. Invasive treatments occurred in February, April, and June 2021 during year 6 (2021). During the last site visit invasive treatment areas were closely inspected. Treatments throughout the site have been extremely successful, and populations of invasive species have been reduced significantly.

Several areas of compromised easement integrity were observed during year 6 (2021). The fence on the northeast side of the crossing over UT-2 to Neighbors Brach has been compromised by large amounts of sediment during several high flow events. DMS has been working with the landowner to repair the downed fence, and some repairs have been made; however, the overall integrity of the fence remains questionable. A permanent repair to this fence is included in the January 2022 repair plan (Appendix F). Additionally, a footpath and bridge identified in MY3 that extends through the conservation easement just north of UT-1 remains. DMS and DEQ Stewardship worked with the landowner to limit the width of the path to a minimum cutting for foot traffic only. Based on visual observations and photo-documentation, the foot path has remained the same width with no additional vegetation disturbed. These areas are depicted on Figures 2A-B (Appendix B).

Wetland Hydrology

Two groundwater monitoring gauges were installed to take measurements after hydrological modifications were performed at the Site. Hydrological sampling will occur during the growing season (March 26 to November 5). Approximate locations of gauges are depicted on Figure 2A (Appendix B), and hydrology data can be found in Appendix E.

Both gauges were saturated or inundated for the entire 2021 growing season. Wetland hydrology is currently meeting success criteria.

3.0 REFERENCES

Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, North Carolina.

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Rosgen D. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs, Colorado.

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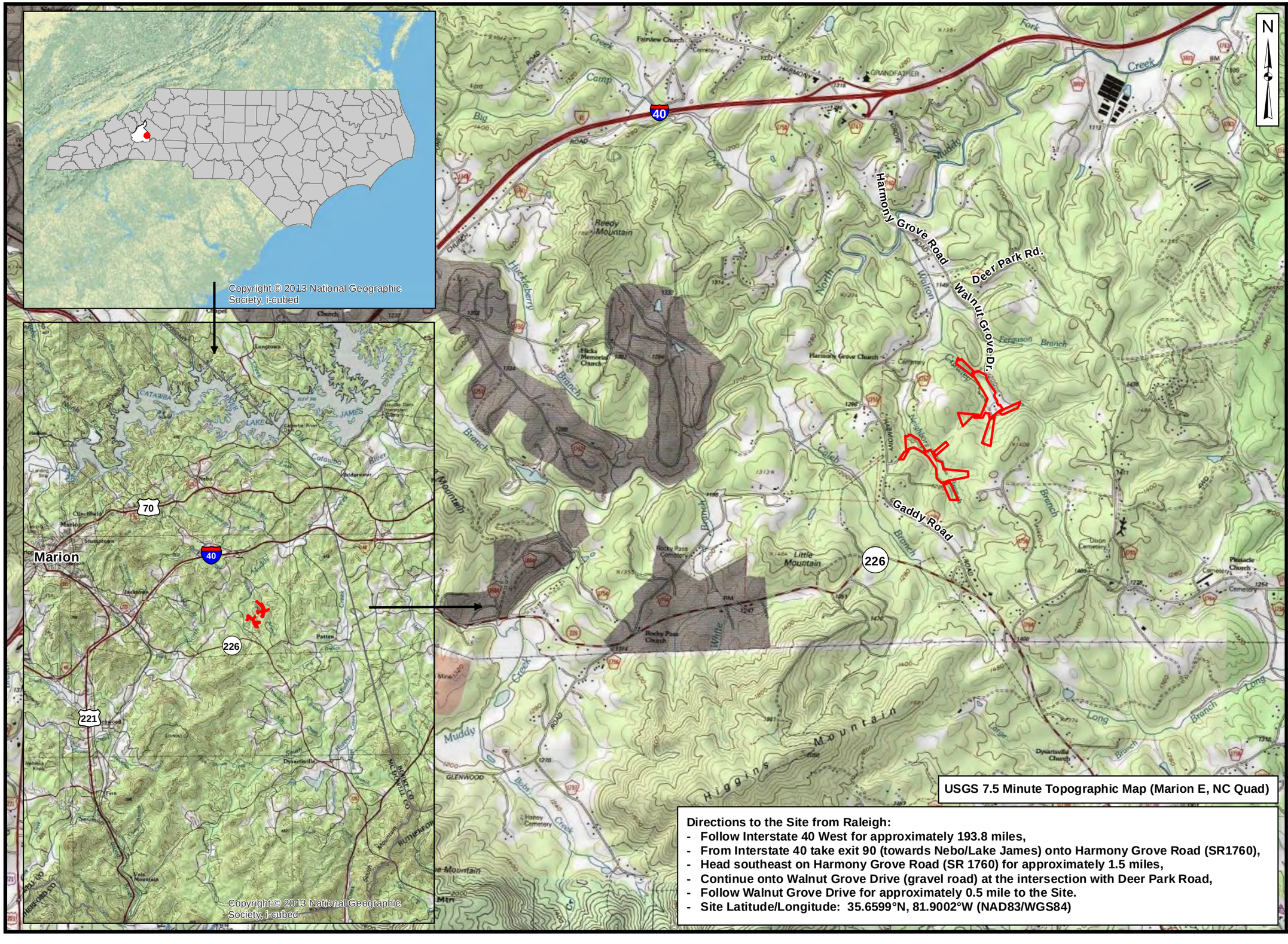
Appendix A.
Site Location Map and Background Tables

Figure 1. Site Location
Table 1. Project Mitigation Components
Table 2. Project Activity and Reporting History
Table 3. Project Contacts Table
Table 4. Project Attributes Table



USGS 7.5 Minute Topographic Map (Marion E, NC Quad)

Directions to the Site from Raleigh:

- Follow Interstate 40 West for approximately 193.8 miles,
- From Interstate 40 take exit 90 (towards Nebo/Lake James) onto Harmony Grove Road (SR1760),
- Head southeast on Harmony Grove Road (SR 1760) for approximately 1.5 miles,
- Continue onto Walnut Grove Drive (gravel road) at the intersection with Deer Park Road,
- Follow Walnut Grove Drive for approximately 0.5 mile to the Site.
- Site Latitude/Longitude: 35.6599°N, 81.9002°W (NAD83/WGS84)

Axiom Environmental, Inc.

Prepared for:

NC Department of Environmental Quality

Division of Mitigation Services

Project:

Neighbors Branch/ Walton Crawley Branch Stream and Wetland Restoration Site

DMS Project # 92872

McDowell County, NC

Title:

Site Location

Drawn by: KRJ

Date: JUN 2016

Scale: 1:30000

Project No.: 12-004.21

FIGURE

1

Table 1. Project Components and Mitigation Credits

Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site/ DMS Number 92872

Mitigation Credit Summations					
Stream	**Riparian Wetland**	**Nonriparian Wetland**	**Buffer**	**Nitrogen Offset**	**Phosphorous Offset**
3953.667	**1.588**	**---**	**---**	**---**	**---**

Projects Components							
Project Component –or-Reach ID	**Stationing**	**Existing Footage or Acreage**	**Restoration Footage or Acreage**	**Restoration Level/Equivalent**	**Mitigation Ratio**	**Mitigation Credits**	**Comment**
Walton Crawley	15+40 – 27+36 (09+37 – 21+68)	2498	1196 1231-35 = 1196	Restoration (PI)	1:1	1186	Channel returned to natural valley. The easement break at the road crossing has been removed from credit summation. A 20 foot reach lies within a powerline ROW and will receive half credit. Removed 35 feet from credit calculations for road crossing.
Walton Crawley	29+11 – 29+23		12	Enhance I	1.5:1	8	Bank grading and stabilization.
Walton Crawley	27+36 – 29+11 29+23 – 29+90		242	Enhance II	2.5:1	97	Fence cattle out of easement area and remove invasive plants. The easement break at 29+90 has been removed from credit summation.
Walton Crawley	10+00 – 15+40 29+90 – 35+01		1051	Preservation	5:1	210	The easement break has been removed from credit summation.
UT 1 Walton Crawley As-built Plan Stationing	18+13 – 20+01 (10+00 – 11+88)	872	188 188	Restoration (PI)	1:1	188	Restore channel through existing pond and reconnect to Walton Crawley.
UT 1 Walton Crawley	14+83 – 18+13		330	Enhance II	2.5:1	132	Fence cattle out of easement area and remove invasive plants.
UT 1 Walton Crawley	10+00 – 14+83		483	Preservation	5:1	97	The easement break has been removed from credit summation.
UT 2 Walton Crawley As-built Plan Stationing	10+00 – 13+83 (10+00 – 13+83) 16+36 – 18+02 (10+00 – 11+66)	600	549 549	Restoration (PI)	1:1	549	Channel routed to the center of the valley, away from toe of slope.
UT 2 Walton Crawley	13+83 – 16+36		253	Enhance II	2.5:1	101	Fence cattle out of easement area and remove invasive plants.
Neighbors Branch As-built Plan Stationing	24+74 – 29+97 (09+93 – 15+52)	2262	523 559 – 36 = 523	Restoration (PI)	1:1	523	Channel routed through low point of valley and invert raised from perched culvert. The easement break at the road crossing has been removed from credit summation. Removed 36 feet from credit calculations for road crossing.

Neighbors Branch	18+89 – 19+09		20	Enhance I	1.5:1	13	Place channel structure and stabilize bank. The easement break has been removed from credit summation.
Neighbors Branch	18+69 – 18+89 19+09 – 24+74 29+97 – 33+39		927	Enhance II	2.5:1	371	Fence cattle out of easement area and matt, seed, and plant vegetation on scoured banks.
Neighbors Branch	09+67 – 18+69		902	Preservation	5:1	180	The easement break has been removed from credit summation.
UT 1 Neighbors Branch As-built Plan Stationing	10+56 – 10+95 11+50 – 12+81 (10+06 – 10+44 10+77 – 12+09)	281	170 170	Enhance I	1.5:1	113	Bank grading and stabilization.
UT 1 Neighbors Branch	10+00 – 10+56 10+95 – 11+50		111	Enhance II	2.5:1	44	Fence cattle out of easement area and plant vegetation.
UT 3 Neighbors Branch	11+72 – 18+75	703	703	Preservation	5:1	141	---
Riparian Wetland	---	0.0	0.52	Restoration	1:1	0.52	Restore hydrology to hydric soils adjacent to Neighbors Branch.
Riparian Wetland	---	1.62	1.62	Enhancement	2:1	0.81	Plant native vegetation on impacted wetlands and fence cattle.
Riparian Wetland	---	1.29	1.29	Preservation	5:1	0.26	---

Length and Area Summations

Restoration Level	**Stream (linear footage)**	**Riparian Wetland (acreage)**		**Nonriparian Wetland (acreage)**	**Buffer (square feet)**	**Upland (acres)**
		Riverine	Non-Riverine			
Restoration	2,456	0.52		--		
Enhancement (Level I)	202	1.62		--		
Enhancement (Level II)	1,863	--		--		
Preservation	3,139	1.29		--		
Totals	**7,660**	**3.43**		--		
Mitigation Units	**3,953.667 SMUs**	**1.588 Riparian WMUs**		**0.00 Nonriparian WMUs**		

BMP Elements

Element	**Location**	**Purpose/Function**	**Notes**

Table 2. Project Activity and Reporting History
Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site / DMS Number 92872

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Project Institution		
Mitigation Plan	April 2009	March 7, 2013
Permits Issued		
Final Design – Construction Plans		April 2014
Construction	--	December 2015
Temporary S&E Mix applied to Entire Project Site	--	December 2015
Permanent Seed Mix applied to the Entire Project Site	--	December 2015
Bare Root; Containerized; and B&B Plantings for the Entire Project Site	--	December 2015
Baseline Monitoring Document (Year 0 Monitoring Baseline)	April 2016	July 2016
Repair	--	October 2016
Year 1 Monitoring	November 2016	January 2017
Year 2 Monitoring	November 2017	December 2017
Year 2 Vegetation Monitoring	August 30, 2017	--
Year 2 Geomorphology Monitoring	February 22, 2017	--
Year 3 Monitoring	November 2018	November 2018
Year 3 Vegetation Monitoring	September 26, 2018	--
Year 3 Geomorphology Monitoring	March 22, 2018	--
Repair/Maintenance	--	March 2019
Year 4 Monitoring	November 2019	January 2020
Year 4 Vegetation Monitoring	July 2019	--
Year 4 Geomorphology Monitoring	May 2019	--
Invasive Species Treatment	--	Aug/Sep/Nov/Dec 2019
Year 5 Monitoring	November 2020	January 2021
Year 5 Vegetation Monitoring	October 2020	--
Year 5 Geomorphology Monitoring	February 2020	--
Year 6 Monitoring	November 2021	December 2021
Year 6 Vegetation Monitoring	August 2021	--
Year 6 Geomorphology Monitoring	March 2021	--
Invasive Species Treatment	--	Feb/Apr/Jun 2021
Repairs/Maintenance	January 2022	--
Invasive Species Treatment	--	Ongoing

Table 3. Project Contact Table
Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site / DMS Number 92872

Designer	Florence & Hutcheson Engineering (Now HDR) 5121 Kingdom Way, Suite 100 Raleigh, NC 27607 Kevin Williams (919) 851-6066
Construction Plans and Sediment and Erosion Control Plans	Florence & Hutcheson Engineering (Now HDR) 5121 Kingdom Way, Suite 100 Raleigh, NC 27607 Kevin Williams (919) 851-6066
Construction Contractor	Carolina Environmental Contracting, Inc. Mount Airy, NC (336) 320-3849
Planting Contractor	Keller Environmental 7291 Haymarket Lane Raleigh, NC 27615 Jay Keller (919) 749-8259
As-built Surveyor	Turner Land Surveying. PLLC 3719 Benson Drive Raleigh, NC 27609 Elisabeth Turner (919) 827-0745
Baseline Data Collection	Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis (919) 215-1693

Table 4. Project Baseline Information and Attributes

Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site / DMS Number 92872

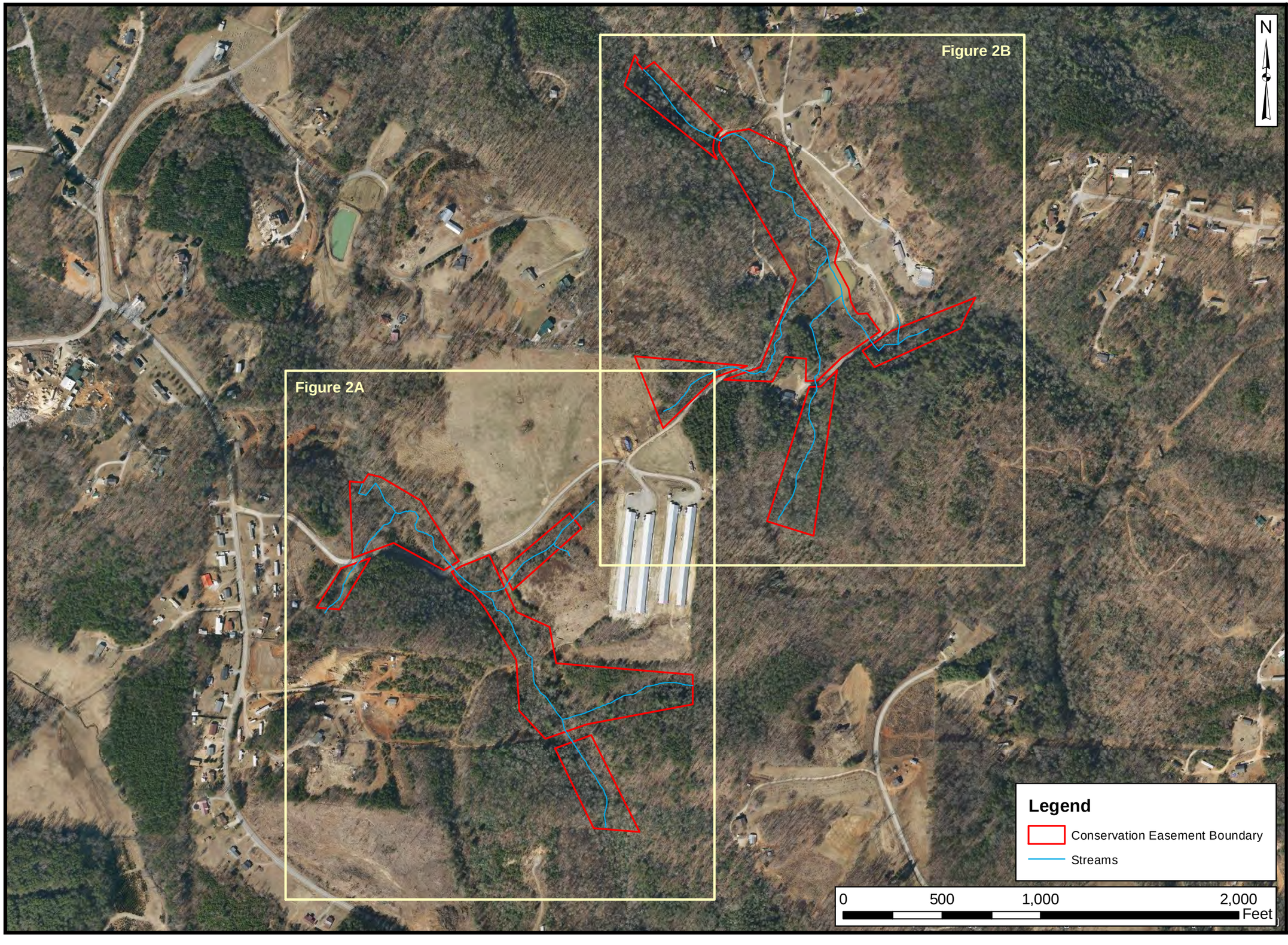
Project Information						
Project name	Neighbors Branch/Walton Crawley Branch Mitigation Site					
Project county	McDowell County, North Carolina					
Project area (Acres)	33.4					
Project coordinates (lat/long)	35.6599°N, 81.9002°W					
Project Watershed Summary Information						
Physiographic region	Blue Ridge					
Project river basin	Catawba River Basin					
USGS hydrologic unit (8 digit)	03050101					
NCDWQ Sub-basin	03-08-30					
Project drainage area (acres)	678					
% Drainage area impervious	< 1%					
CGIA land use classification	----					
Reach Summary Information						
Parameters	**Walton Crawley Branch**	**UTs to Walton Crawley Branch**		**Neighbors Branch**	**UTs to Neighbors Branch**	
		UT 1	**UT 2**		**UT 1**	**UT 3**
Length of reach (linear feet)	2529	1001	802	2339	281	875
Valley classification	VIII	II	II	VIII	II	II
Drainage area (acres)	458	29	20	220	13	15
NCDWQ stream identification score	18.5	25	25	33.5	23.5	16.5
NCDWQ water quality classification	C	C	C	C	C	C
Morphological description (stream type)	B4/5c-G4/5	E5	E5-G5	E5/4-G5/4	E5/4	E5
Design Rosgen stream type	C4	E/C5	E/C5	C4	E5/4	E5
Evolutionary trend						
Design approach (P1, P2, P3, E, etc.)	PI, EI, EII, & P	PI, EII, & P	PI & EII	PI, EI, EII, & P	EI & EII	P
Underlying mapped soils	Elsinboro, Evard, Hayesville	Evard	Evard, Hayesville	Hayesville, Iotla	Evard	Hayesville
Drainage class	Well	Well	Well	Well / SW Poorly	Well	Well
Soil hydric status	Nonhydric	Nonhydric	Nonhydric	Nonhydric / Hydric	Nonhydric	Nonhydric
Slope	0.0340	0.0380	0.0545	0.0260	0.0820	0.0656
FEMA classification	Not Mapped	Not Mapped	Not Mapped	Not Mapped	Not Mapped	Not Mapped
Native vegetation community	Forest / Pasture	Forest	Forest	Forest / Pasture	Forest	Forest
% Composition of exotic invasive spp.	<5	<5	<5	<5	<5	<5

Wetland Summary Information						
Parameters	**Walton Crawley Branch**	**UTs to Walton Crawley Branch**		**Neighbors Branch**	**UTs to Neighbors Branch**	
		UT 1	**UT 2**		**UT 1**	**UT 3**
Size of wetland (acres)	0.95	0.37	N/A	1.88	0.23	N/A
Wetland type	Riparian Riverine	Riparian Riverine	N/A	Riparian Riverine	Riparian Riverine	N/A
Mapped soil series	Wehadkee	Wehadkee	N/A	Wehadkee	Wehadkee	N/A
Drainage class	poorly	poorly	N/A	poorly	poorly	N/A
Soil hydric status	hydric	hydric	N/A	hydric	hydric	N/A
Source of hydrology	Overbank and springs	Overbank and springs	N/A	Overbank and springs	Overbank and springs	N/A
Hydrologic impairment	Cleared	Invasives	N/A	Drained/ Cleared/ Invasives	Invasives	N/A
Native vegetation community	Forest / Pasture	Forest	N/A	Forest / Pasture	Forest	N/A
% Composition of exotic invasive spp.	<5	<5	N/A	<5	<5	N/A

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the US – Section 404	Yes	Yes	SAW-2009-917
Waters of the US – Section 401	Yes	Yes	SAW-2009-917
Endangered Species Act	Yes	Yes	No Effect – CE Document
Historic Preservation Act	Yes	Yes	CE Document
Coastal Zone Management Act (CZMA/CAMA)	No	NA	NA
FEMA Floodplain Compliance	No	NA	NA
Essential Fisheries Habitat	No	NA	NA

Appendix B
Visual Assessment Data

Figures 2, 2A-2B. Current Conditions Plan View
Figures 3, 3A-3B. Project Assets
Tables 5A-5E. Visual Stream Morphology Stability Assessment
Table 6. Vegetation Condition Assessment
Stream Fixed Station Photo Points
Vegetation Plot Photos



Axiom Environmental, Inc.

Prepared for:

NC Department of Environmental Quality

Division of Mitigation Services

Project:

Neighbors Branch/ Walton Crawley Branch Stream and Wetland Restoration Site

DMS Project # 92872

McDowell County, NC

Title:

Current Conditions Plan View

Drawn by: KRJ

Date: NOV 2021

Scale: 1:5500

Project No.: 12-004.21

FIGURE

2

Legend

- Conservation Easement Boundary
- Streams
- Structures
- Wetland Restoration - 0.52 ac
- Wetland Enhancement - 0.30 ac
- Wetland Preservation - 1.29 ac
- Stream Monitoring Reach
- Cross-Sections
- Groundwater Gauges
- Photo Point Locations
- Crest Gauge
- CVS Plots Meeting Success Criteria During MY6 (2021)
- Dense Privet
- Dense Multiflora Rose

N

Area of Concern #1 - Will be repaired January 2022

Compromised Fence - Will be repaired January 2022

UT-1

UT-2

UT-3

Neighbors Branch

XS-1

XS-2

XS-3

0 250 500 1,000 Feet

Axiom Environmental, Inc.

Prepared for:

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Division of Mitigation Services

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Neighbors Branch/ Walton Crawley Branch Stream and Wetland Restoration Site

DMS Project # 92872

McDowell County, NC

Title:

Current Conditions Plan View

Drawn by: KRJ

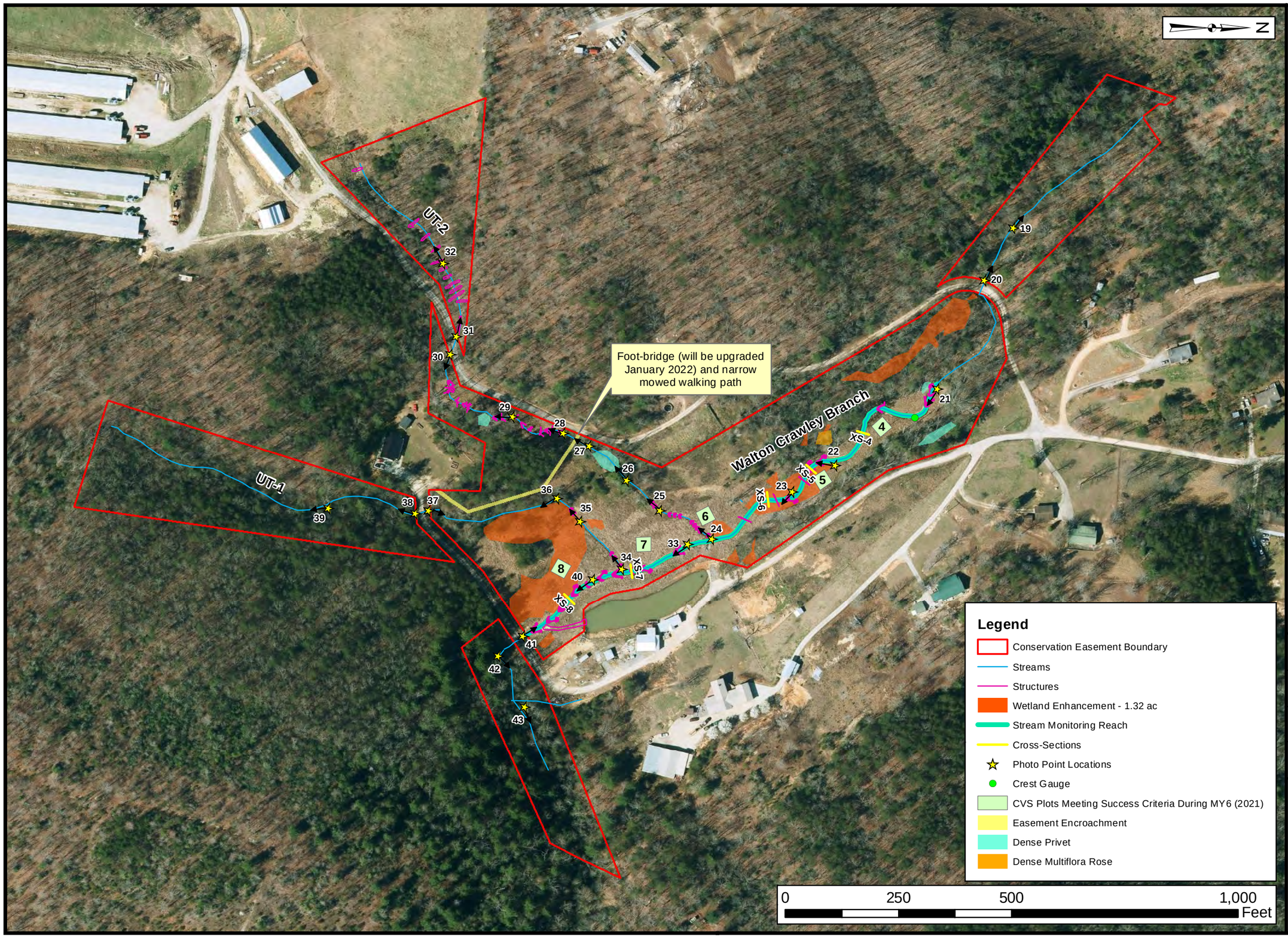
Date: NOV 2021

Scale: 1:2400

Project No.: 12-004.21

FIGURE

2A



Axiom Environmental, Inc.

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Project:

Neighbors Branch/ Walton Crawley Branch Stream and Wetland Restoration Site

DMS Project # 92872

McDowell County, NC

Title:

Current Conditions Plan View

Drawn by: KRJ

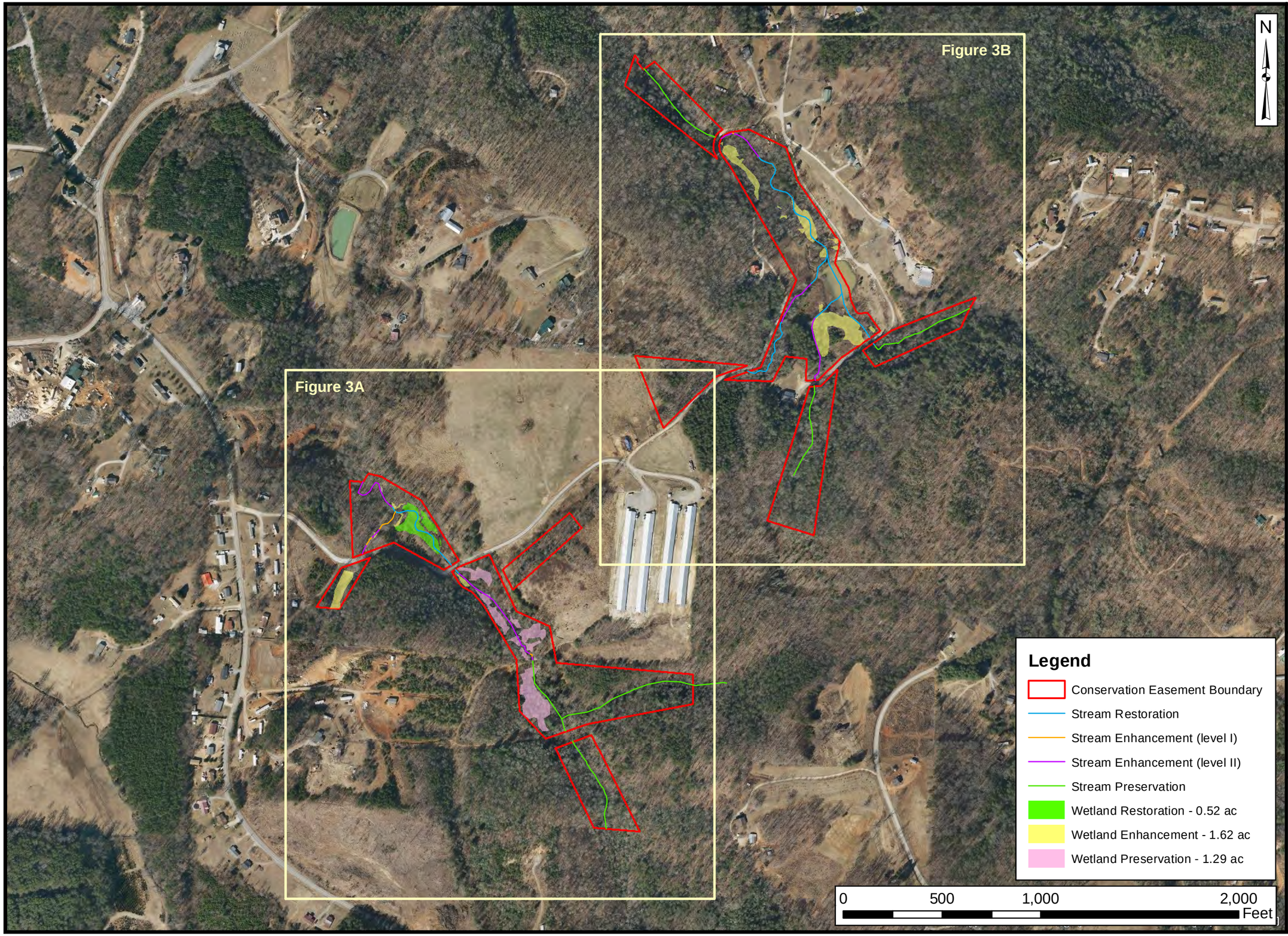
Date: NOV 2021

Scale: 1:2400

Project No.: 12-004.21

FIGURE

2B



Axiom Environmental, Inc.

Prepared for:

NC Department of Environmental Quality

Division of Mitigation Services

Project:

Neighbors Branch/ Walton Crawley Branch Stream and Wetland Restoration Site

DMS Project # 92872

McDowell County, NC

Title:

Project Assets

Drawn by: KRJ

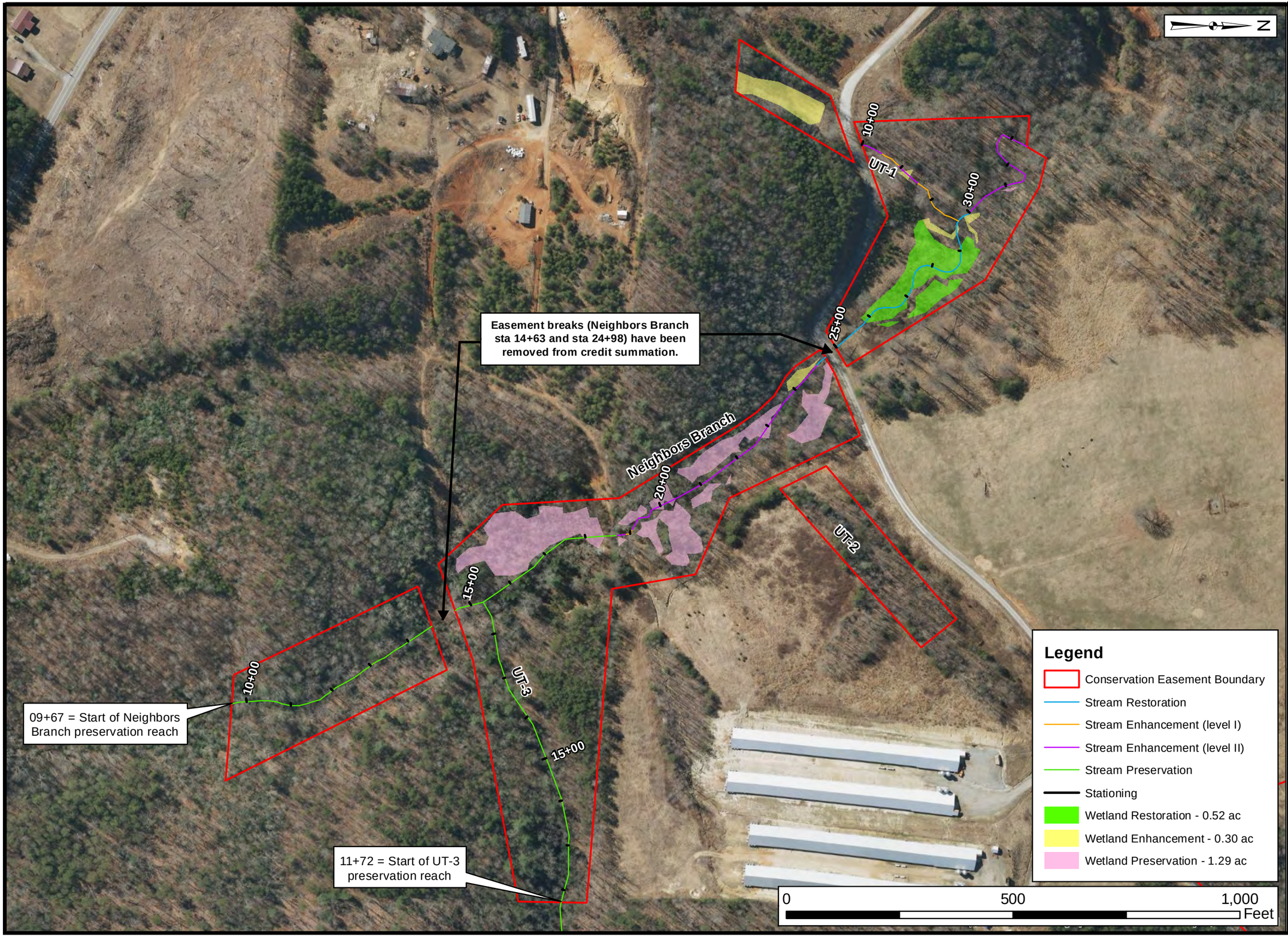
Date: JUL 2016

Scale: 1:5500

Project No.: 12-004.21

FIGURE

3



Axiom Environmental, Inc.

Prepared for:

NC Department of Environmental Quality

Division of Mitigation Services

Project:

Neighbors Branch/ Walton Crawley Branch Stream and Wetland Restoration Site

DMS Project # 92872

McDowell County, NC

Title:

Project Assets

Drawn by: KRJ

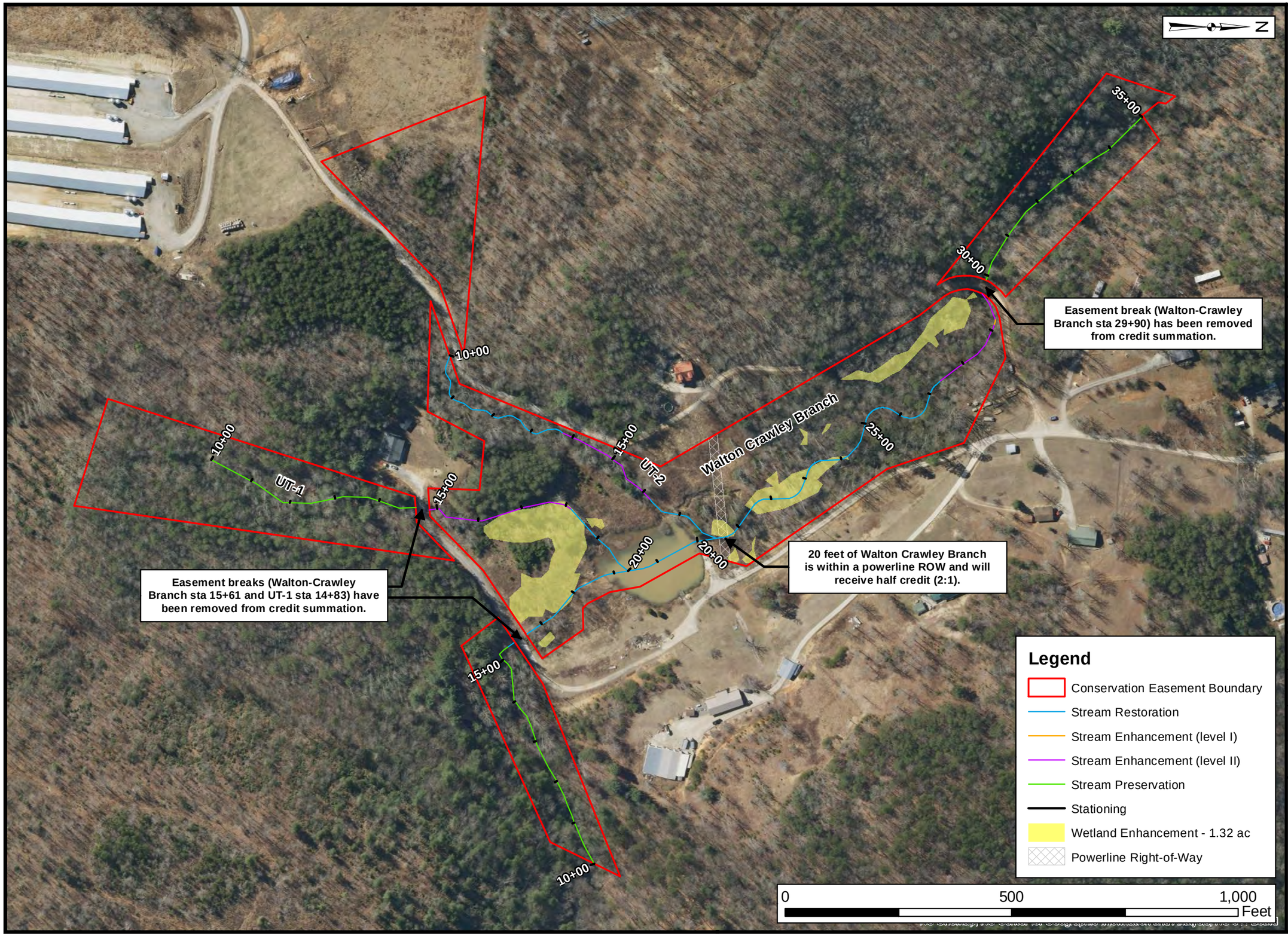
Date: JUL 2016

Scale: 1:2400

Project No.: 12-004.21

FIGURE

3A



Axiom Environmental, Inc.

Prepared for:

NC Department of Environmental Quality

Division of Mitigation Services

Project:

Neighbors Branch/ Walton Crawley Branch Stream and Wetland Restoration Site

DMS Project # 92872

McDowell County, NC

Title:

Project Assets

Drawn by: KRJ

Date: MAY 2018

Scale: 1:2400

Project No.: 12-004.21

FIGURE

3B

Table 5A **Visual Stream Morphology Stability Assessment**
Reach ID **Walton Crawley Branch**
Assessed Length **1450**
Assessment Date **4-Nov-21**

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	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	26	26			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	25	25			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	25	25			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	25	25			100%			
		2. Thalweg centering at downstream of meander (Glide)	25	25			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			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%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	24	24			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	24	24			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	24	24			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	23	24			96%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	24	24			100%			

Table 5B **Visual Stream Morphology Stability Assessment**
Reach ID **UT1 to Walton Crawley Branch**
Assessed Length **518**
Assessment Date **4-Nov-21**

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	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	8	8			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	7	7			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	7	7			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	7	7			100%			
		2. Thalweg centering at downstream of meander (Glide)	7	7			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			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%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	10	10			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	10	10			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	10	10			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	10	10			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	10	10			100%			

Table 5C **Visual Stream Morphology Stability Assessment**
Reach ID **UT2 to Walton Crawley Branch**
Assessed Length **802**
Assessment Date **4-Nov-21**

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	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	12	12			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	13	13			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	13	13			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	13	13			100%			
		2. Thalweg centering at downstream of meander (Glide)	13	13			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			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%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**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.	12	12			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	12	12			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	12	12			100%			

Table 5D **Visual Stream Morphology Stability Assessment**
Reach ID **Neighbors Branch**
Assessed Length **1470**
Assessment Date **4-Nov-21**

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	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	22	22			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	21	21			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	21	21			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	21	21			100%			
		2. Thalweg centering at downstream of meander (Glide)	21	21			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			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%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**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.	16	16			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	16	16			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	16	16			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	16	16			100%			

Table 5E **Visual Stream Morphology Stability Assessment**
Reach ID **UT1 to Neighbors Branch**
Assessed Length **281**
Assessment Date **4-Nov-21**

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	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			1	60	79%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	19	20			95%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	19	19			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	19	19			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	19	19			100%			
		2. Thalweg centering at downstream of meander (Glide)	19	19			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			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%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	17	20			85%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	17	20			85%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	20	20			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	17	20			85%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	17	20			85%			

Table 6 — Vegetation Condition Assessment

Neighbors Branch/Walton Crawley Branch Mitigation Project

Assessment Date 4-Nov-21

Planted Acreage[1] 11.78

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	None	0.1 acres	none	0	0.00	0.0%
2. Low Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
2B. Low Planted Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	None	0.25 acres	N/A	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%

Easement Acreage[2] 33.4

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Isolated populations of Chinese privet, and multiflora rose	100 SF	blue and orange polygons	11	0.18	0.5%
5. Easement Encroachment Areas[3]	Mowed footpath and footbridge contructed within easement.	none	yellow	1	0.07	0.2%

1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

2 = The acreage within the easement boundaries.

3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1,2 or 3) as well as a parallel tally in item 5.

4 = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern spcies are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by DMS such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likley trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly ealry in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolzing invasives polygons, particulalry for situations where the conditon for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
August & October 2021

Photo Point 1 – Neighbors Branch

Photo Point 2 – Neighbors Branch

Photo Point 3 – UT-1 to Neighbors Branch

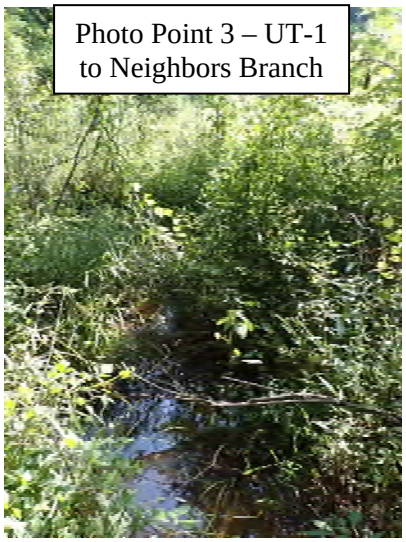


Photo Point 4 – UT-1 to Neighbors Branch

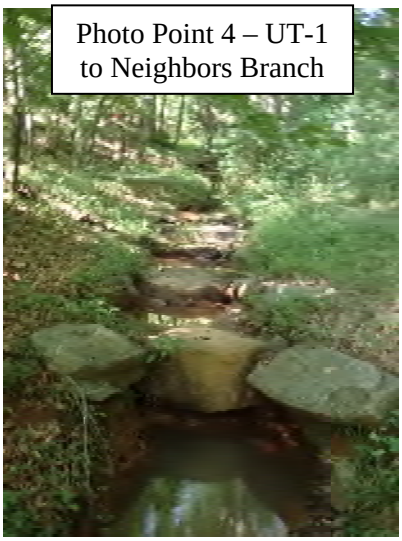


Photo Point 5 – UT-1 to Neighbors Branch

Photo Point 6 – UT-1 to Neighbors Branch

Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
August and October 2021
(continued)

Photo Point 7 – Neighbors Branch

Photo Point 8 – Neighbors Branch

Photo Point 9 – Neighbors Branch

Photo Point 10 – Neighbors Branch

Photo Point 11 – Neighbors Branch

Photo Point 12 – UT-2 to Neighbors Branch

Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
August & October 2021
(continued)

Photo Point 13 – UT-2 to Neighbors Branch

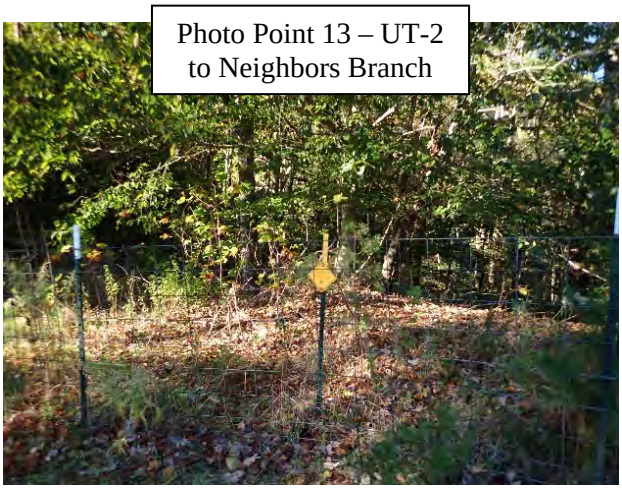


Photo Point 14 – Neighbors Branch

Photo Point 15 – UT-3 to Neighbors Branch

Photo Point 16 – UT-3 to Neighbors Branch

Photo Point 17 – Neighbors Branch -

Photo Point 18 – Neighbors Branch

Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
August & October 2021
(continued)

Photo Point 19 – Walton Crawley Branch

Photo Point 20 - Walton Crawley Branch

Photo Point 21 - Walton Crawley Branch

Photo Point 22 - Walton Crawley Branch

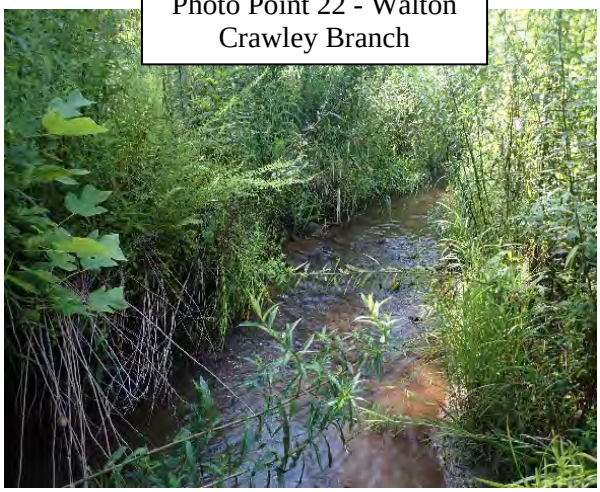


Photo Point 23 - Walton Crawley Branch

Photo Point 24 – UT-2 to Walton Crawley Branch

Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
August & October 2021
(continued)

Photo Point 25 – UT-2 to Walton Crawley Branch

Photo Point 26 – UT-2 to Walton Crawley Branch

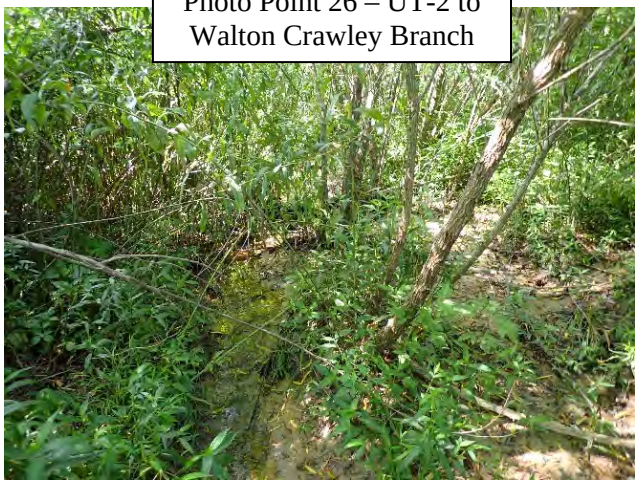


Photo Point 27 – UT-2 to Walton Crawley Branch

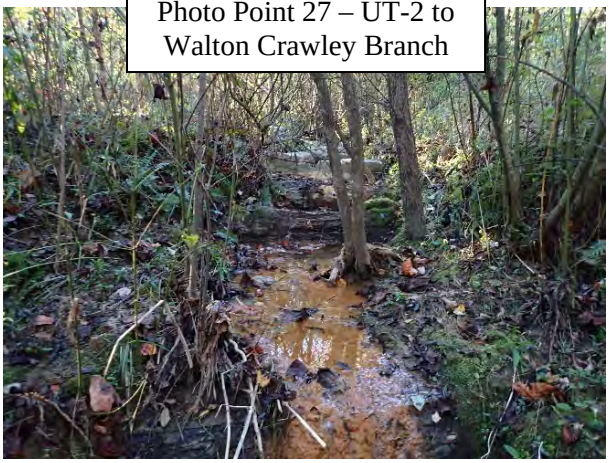


Photo Point 28 – UT-2 to Walton Crawley Branch

Photo Point 29 – UT-2 to Walton Crawley Branch

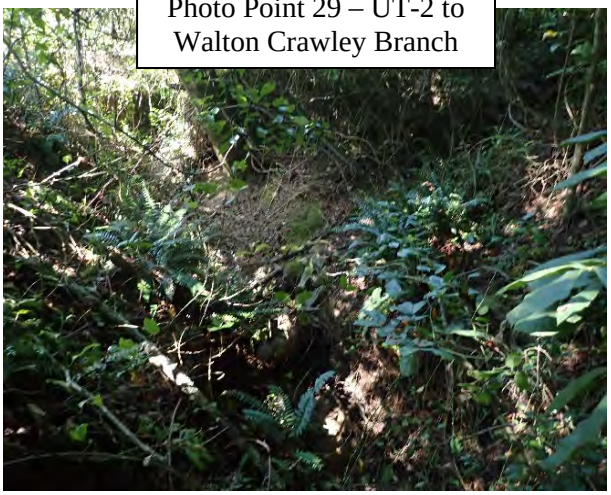


Photo Point 30 – UT-2 to Walton Crawley Branch

Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
August & October 2021
(continued)

Photo Point 31 – UT-2 to Walton Crawley Branch

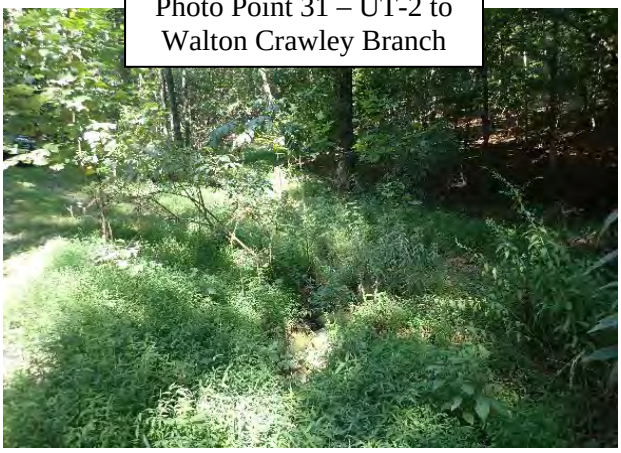


Photo Point 32 – UT-2 to Walton Crawley Branch

Photo Point 33 - Walton Crawley Branch

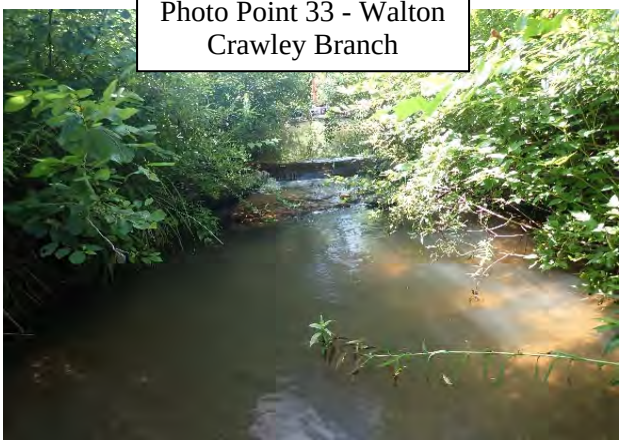


Photo Point 34 – UT-1 to Walton Crawley Branch

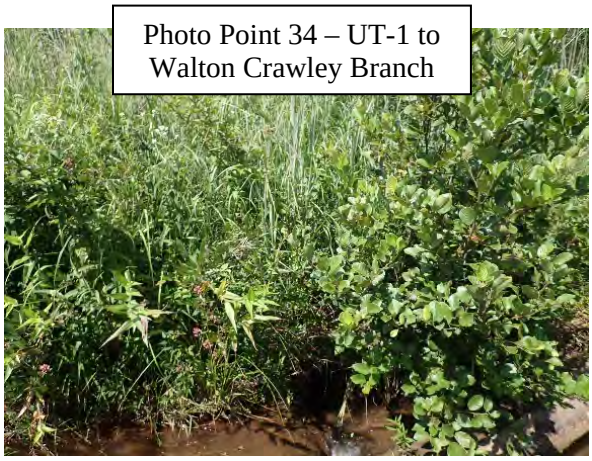


Photo Point 35 – UT-1 to Walton Crawley Branch

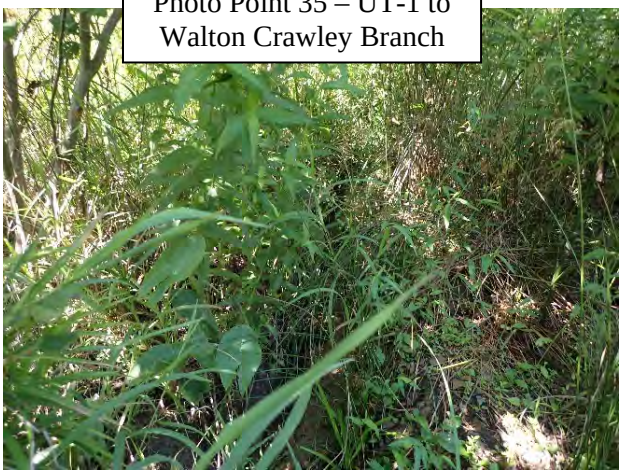
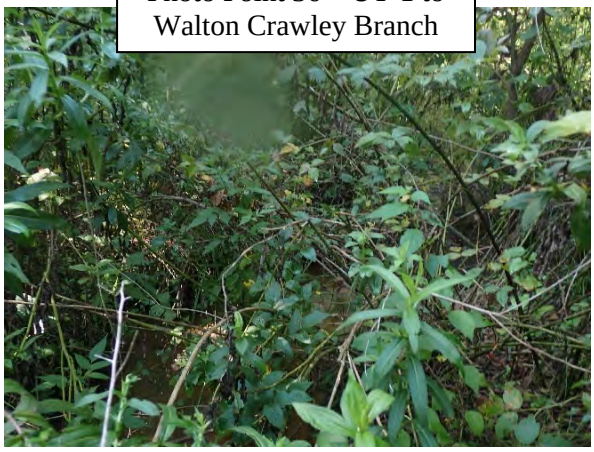


Photo Point 36 – UT-1 to Walton Crawley Branch



Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
August & October 2021
(continued)

Photo Point 37 – UT-1 to Walton Crawley Branch

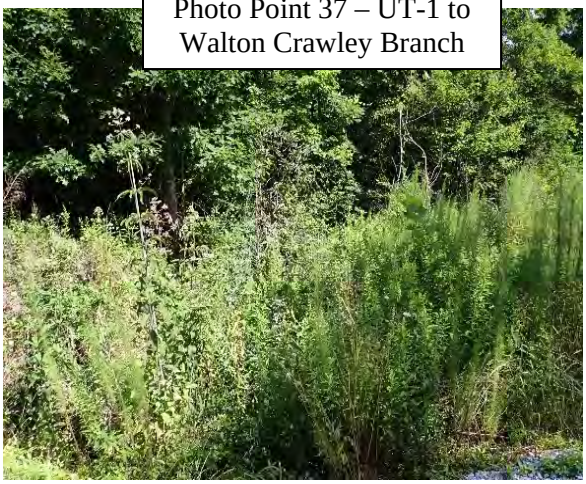


Photo Point 38 – UT-1 to Walton Crawley Branch

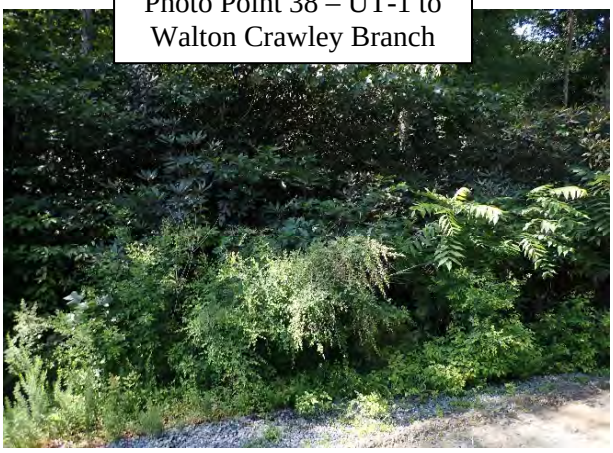


Photo Point 39 – UT-1 to Walton Crawley Branch

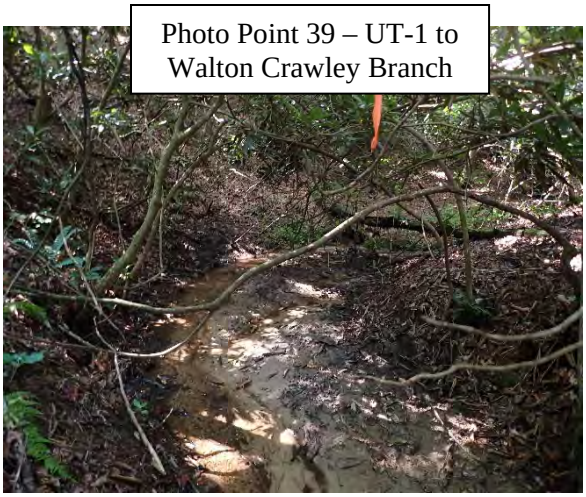


Photo Point 40 - Walton Crawley Branch

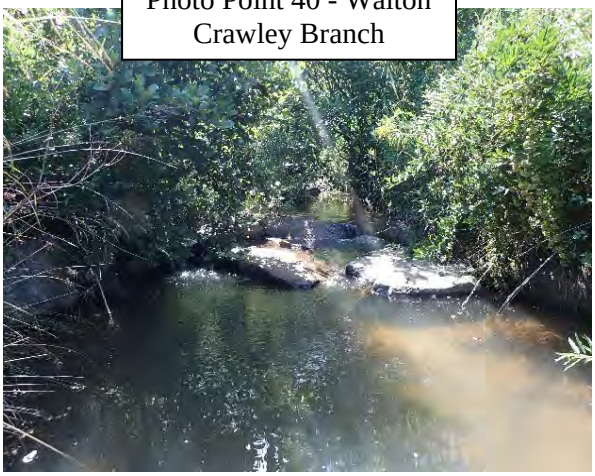
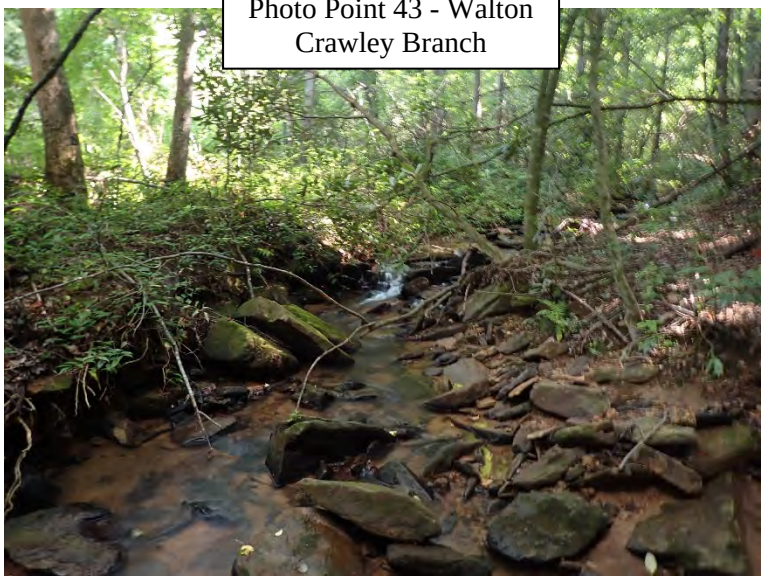


Photo Point 41 - Walton Crawley Branch

Photo Point 42 - Walton Crawley Branch

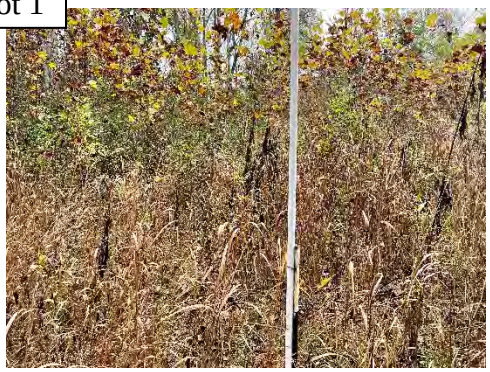
Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
August & October 2021
(continued)

Photo Point 43 - Walton Crawley Branch



Neighbors Branch/Walton Crawley Branch
Vegetation Monitoring Photographs Taken November 2021

Plot 1



Plot 2

Plot 3

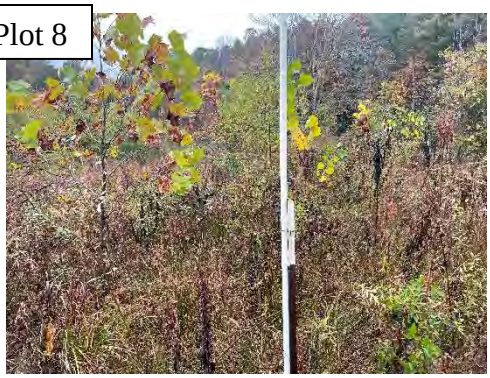
Plot 4

Plot 5

Plot 6

Plot 7

Plot 8



Appendix C.
Vegetation Data

Table 7. Vegetation Plot Success Summary
Table 8. CVS Vegetation Plot Metadata
Table 9. Total Planted Stems by Plot and Species

Table 7. Vegetation Plot Success Summary

Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	100%
2	Yes	
3	Yes	
4	Yes	
5	Yes	
6	Yes	
7	Yes	
8	Yes	

Table 8. CVS Vegetation Plot Metadata

Report Prepared By	Corri Faquin
Date Prepared	11/5/2021 14:25
database name	Axiom-NeighborsWalton-MY6.mdb
database location	S:\Business\Projects\12\12-004 EEP Monitoring\12-004.21 Neighbors Bob\Neighbors Branch and Walton Crawley Branch\2021 MY-06\CVS
computer name	MADDIE-LT
file size	58728448
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	92872
project Name	Neighbors Branch/ Walton Crawley Branch
River Basin	Catawba
length(ft)	
stream-to-edge width (ft)	
Required Plots (calculated)	
Sampled Plots	8

Table 9. Total and Planted Stems by Plot and Species
Project Code 92872. Project Name: Neighbors Branch/ Walton Crawley Branch

			Current Plot Data (MY6 2021)																							
			92872-01-0001			92872-01-0002			92872-01-0003			92872-01-0004			92872-01-0005			92872-01-0006			92872-01-0007			92872-01-0008		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	red maple	Tree	1	1	1				2	2	2	4	4	4												
Alnus serrulata	hazel alder	Shrub																								1
Betula nigra	river birch	Tree				1	1	1	5	5	5	4	4	4							1	1	1	1	1	1
Cornus amomum	silky dogwood	Shrub																								
Diospyros virginiana	common persimmon	Tree							1	1	1							1	1	1	2	2	2	2	2	2
Fraxinus pennsylvanica	green ash	Tree							4	4	4	1	1	1	6	6	6	5	5	5	2	2	2	1	1	1
Liriodendron tulipifera	tuliptree	Tree												5	1	1	1									
Nyssa	tupelo	Tree																								
Nyssa sylvatica	blackgum	Tree																								
Platanus occidentalis	American sycamore	Tree	7	7	13	6	6	11	4	4	10			4			2				4	4	4	2	2	2
Quercus	oak	Tree																								
Quercus nigra	water oak	Tree													1	1	1	4	4	4	2	2	2			
Quercus phellos	willow oak	Tree	1	1	1							1	1	1										2	2	2
Quercus rubra	northern red oak	Tree																						2	2	2
Salix nigra	black willow	Tree																								
Sambucus canadensis	Common Elderberry	Shrub																								
		Stem count	9	9	15	7	7	12	16	16	22	10	10	19	8	8	10	10	10	10	11	11	11	10	10	11
		size (ares)	1			1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	3	3	3	2	2	2	5	5	5	4	4	6	3	3	4	3	3	3	5	5	5	6	6	7
		Stems per ACRE	364.2	364.2	607	283.3	283.3	485.6	647.5	647.5	890.3	404.7	404.7	768.9	323.7	323.7	404.7	404.7	404.7	404.7	445.2	445.2	445.2	404.7	404.7	445.2

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%

PnoLS = Planted excluding livestakes
P-all = Planting including livestakes
T = All planted and natural recruits including livestakes
T includes natural recruits

Table 9. Total and Planted Stems by Plot and Species (continued)
Project Code 92872. Project Name: Neighbors Branch/ Walton Crawley Branch

			Annual Means																				
			MY6 (2021)			MY5 (2020)			MY4 (2019)			MY3 (2018)			MY2 (2017)			MY1 (2016)			MY0 (2016)		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	red maple	Tree	7	7	7	10	10	12	10	10	11	10	10	14	10	10	10	11	11	11	6	6	17
Alnus serrulata	hazel alder	Shrub			1						1												
Betula nigra	river birch	Tree	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	15	15	15	16	16	16
Cornus amomum	silky dogwood	Shrub																1	1	1	1	1	1
Diospyros virginiana	common persimmon	Tree	6	6	6	7	7	8	7	7	11	5	5	5	5	5	8	1	1	1	1	1	1
Fraxinus pennsylvanica	green ash	Tree	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	24	24	24	31	31	31
Liriodendron tulipifera	tuliptree	Tree	1	1	6	1	1	14	1	1	20	1	1	12	1	1	8			3			
Nyssa	tupelo	Tree							1	1	1	2	2	2	1	1	1	1	1	1			
Nyssa sylvatica	blackgum	Tree				1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	6	6	6
Platanus occidentalis	American sycamore	Tree	23	23	46	23	23	45	23	23	54	23	23	41	24	24	59	28	28	81	29	29	29
Quercus	oak	Tree																1	1	1			
Quercus nigra	water oak	Tree	7	7	7	7	7	7	7	7	7	7	7	7	6	6	6	2	2	2	4	4	4
Quercus phellos	willow oak	Tree	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	12	12	12	12	12	12
Quercus rubra	northern red oak	Tree	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	1	1	1	1	1	1
Salix nigra	black willow	Tree															6			3			10
Sambucus canadensis	Common Elderberry	Shrub						1			1						2						4
		Stem count	81	81	110	86	86	125	87	87	144	87	87	121	87	87	140	100	100	159	107	107	132
		size (ares)	8			8			8			8			8			8			8		
		size (ACRES)	0.20			0.20			0.20			0.20			0.20			0.20			0.20		
		Species count	9	9	10	10	10	11	11	11	13	11	11	11	11	11	13	12	12	14	10	10	12
		Stems per ACRE	409.7	409.7	556.4	435	435	632.3	440.1	440.1	728.4	440.1	440.1	612.1	440.1	440.1	708.2	505.9	505.9	804.3	541.3	541.3	667.7

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%

PnoLS = Planted excluding livestakes
P-all = Planting including livestakes
T = All planted and natural recruits including livestakes
T includes natural recruits

Appendix D.
Stream Measurements and Geomorphology Data

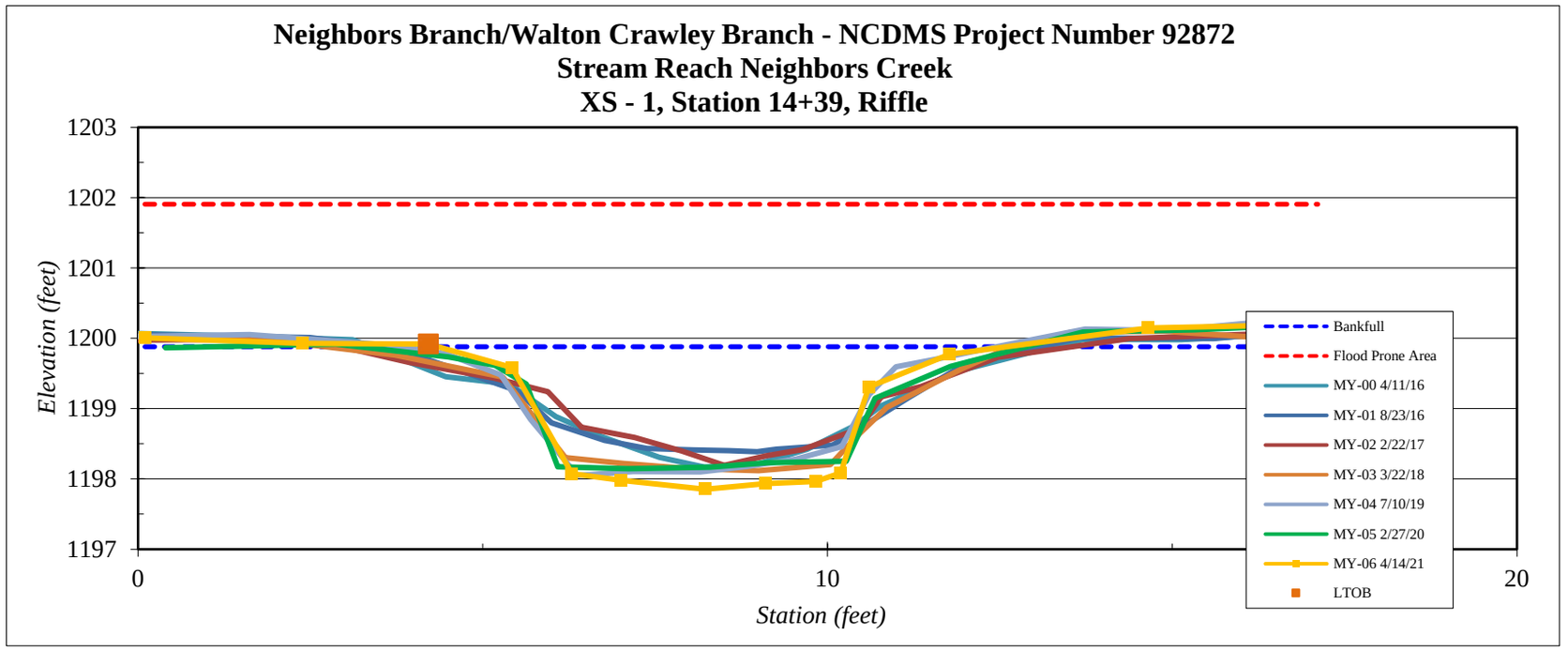
Cross Section Plots
Longitudinal Profile Plots
Substrate Plots
Tables 10A-10B. Baseline Stream Data Summary
Tables 11A-11D. Monitoring Data-Dimensional Data Summary

Site	Neighbors Br./Walton Crawley Br.
Project Number:	92872
XS ID	XS - 1, Riffle
Reach	Neighbors Branch
Date:	4/14/2021
Field Crew:	Perkinson, Keith

Station	Elevation
0.10	1200.01
2.39	1199.93
4.21	1199.92
5.43	1199.58
6.30	1198.07
7.01	1197.98
8.23	1197.85
9.10	1197.93
9.83	1197.96
10.19	1198.08
10.60	1199.31
11.77	1199.77
14.66	1200.15
17.11	1200.20

SUMMARY DATA	
Bankfull Elevation:	1199.9
LTOB Elevation:	1199.9
Bankfull Cross-Sectional Area:	9.5
Bankfull Width:	8.3
Flood Prone Area Elevation:	1201.9
Flood Prone Width:	100.0
Max Depth at Bankfull:	2.0
Low Bank Height:	2.1
Mean Depth at Bankfull:	1.2
W / D Ratio:	7.2
Entrenchment Ratio:	12.1
Bank Height Ratio:	1.02

Stream Type	E

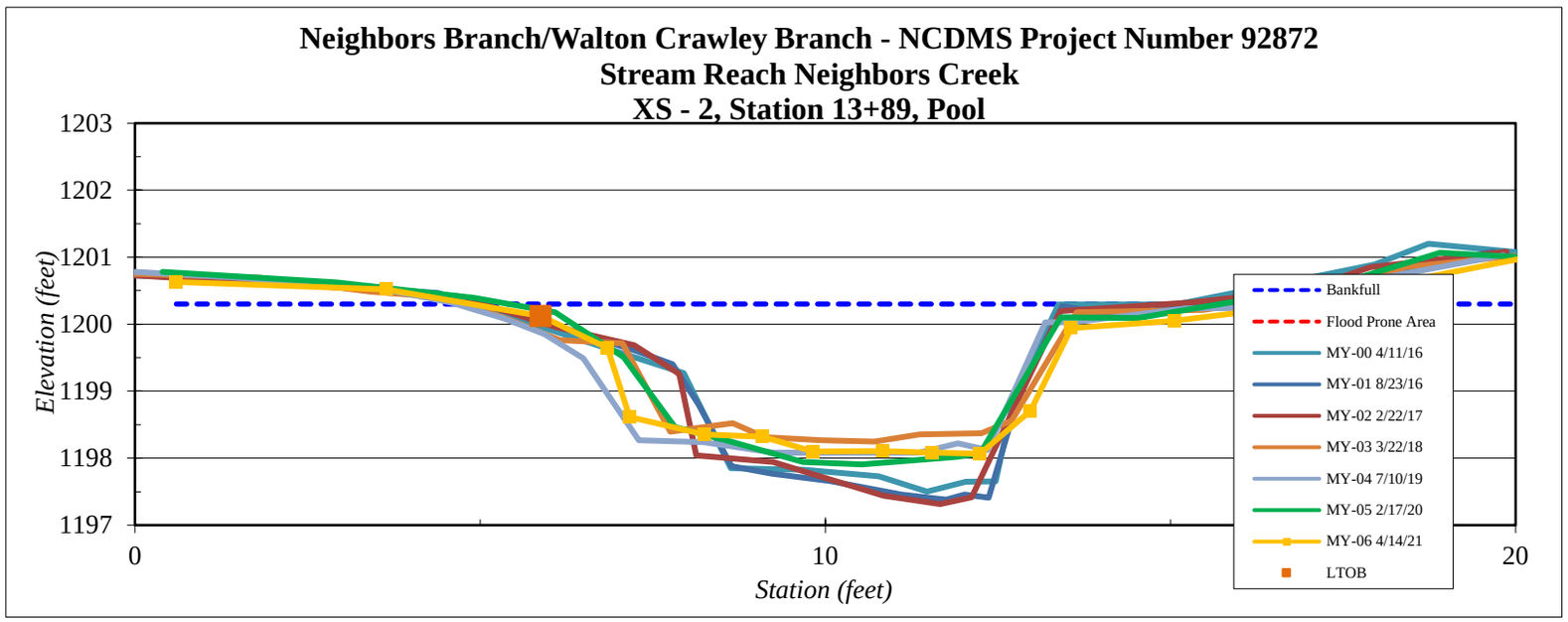


Site	Neighbors Br./Walton Crawley Br.
Project Number:	92872
XS ID	XS - 2, Pool
Reach	Neighbors Branch
Date:	4/14/2021
Field Crew:	Perkinson, Keith

Station	Elevation
0.6	1200.6
3.6	1200.5
5.9	1200.1
6.8	1199.6
7.2	1198.6
8.2	1198.4
9.1	1198.3
9.8	1198.1
10.8	1198.1
11.5	1198.1
12.2	1198.1
13.0	1198.7
13.6	1199.9
15.1	1200.1
16.3	1200.2
20.1	1201.0
20.2	1201.0

SUMMARY DATA	
Bankfull Elevation:	1200.3
LTOB Elevation:	1199.9
Bankfull Cross-Sectional Area:	14.0
Bankfull Width:	11.9
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.2
Low Bank Height:	2.1
Mean Depth at Bankfull:	1.2
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.92

Stream Type	E

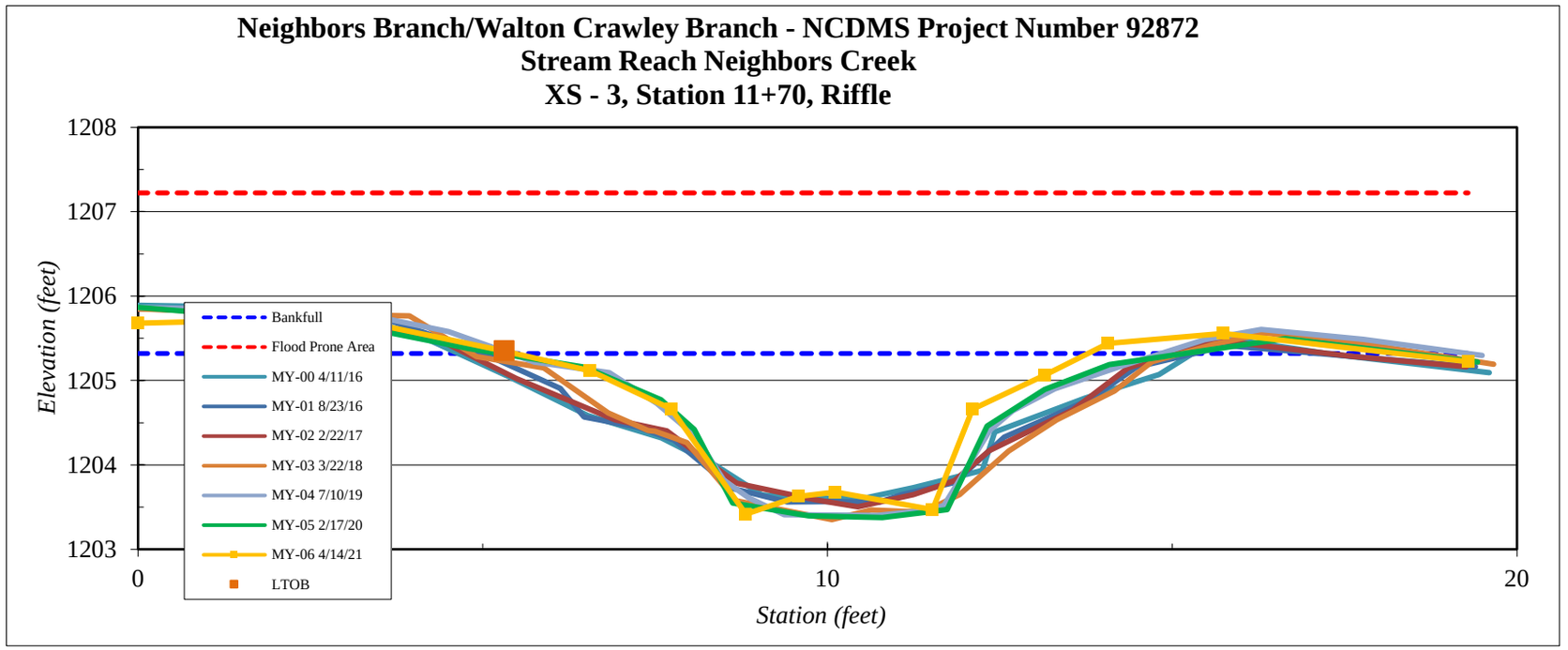


Site	Neighbors Br./Walton Crawley Br.
Project Number:	92872
XS ID	XS - 3, Riffle
Reach	Neighbors Branch
Date:	4/14/2021
Field Crew:	Perkinson, Keith

Station	Elevation
0.00	1205.68
3.00	1205.74
5.31	1205.35
6.56	1205.12
7.73	1204.66
8.81	1203.42
9.58	1203.63
10.12	1203.68
11.52	1203.47
12.10	1204.66
13.15	1205.06
14.07	1205.44
15.74	1205.56
19.29	1205.22

SUMMARY DATA	
Bankfull Elevation:	1205.3
LTOB Elevation:	1205.3
Bankfull Cross-Sectional Area:	8.1
Bankfull Width:	9.4
Flood Prone Area Elevation:	1207.2
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.9
Low Bank Height:	1.9
Mean Depth at Bankfull:	0.9
W / D Ratio:	10.8
Entrenchment Ratio:	10.7
Bank Height Ratio:	1.02

Stream Type	E

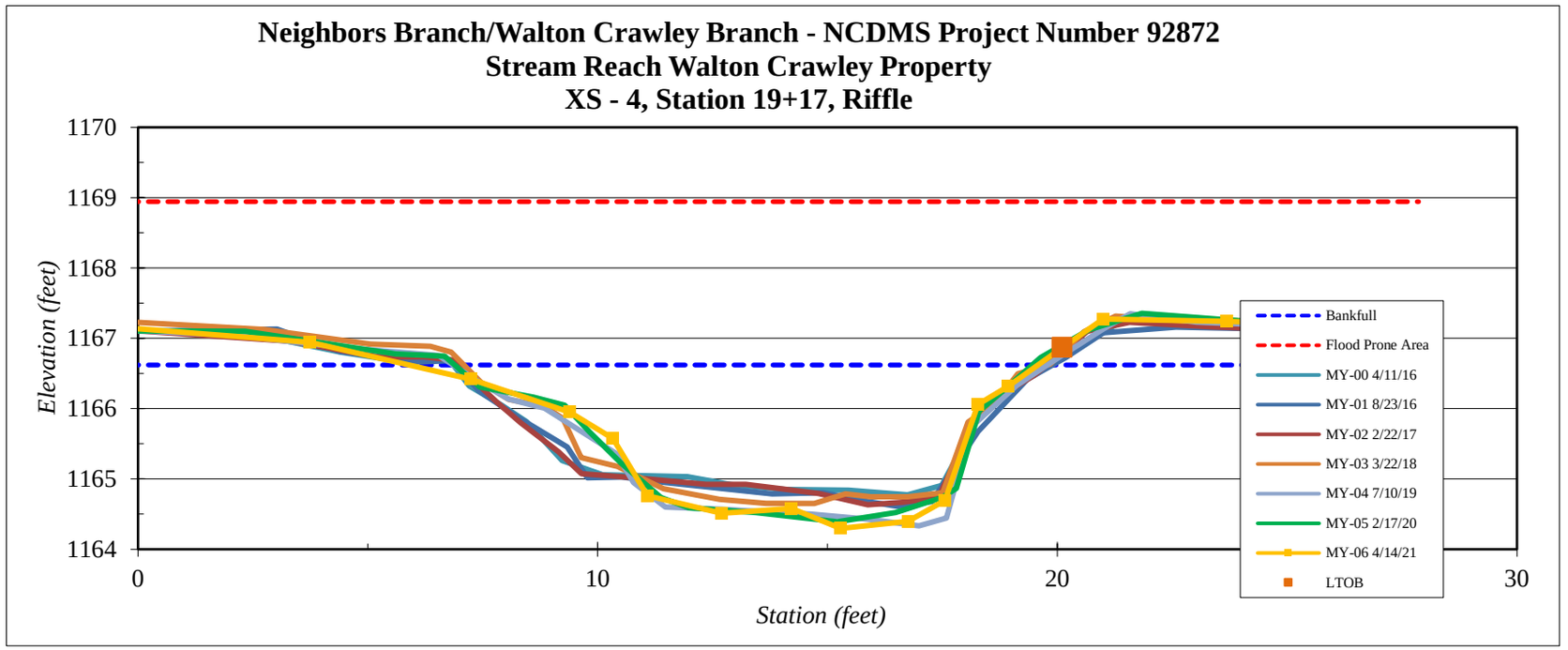


Site	Neighbors Br./Walton Crawley Br.
Project Number:	92872
XS ID	XS - 4, Riffle
Reach	Walton Crawley Branch
Date:	4/14/2021
Field Crew:	Perkinson, Keith

Station	Elevation
-0.20	1167.15
3.74	1166.94
7.25	1166.42
9.40	1165.95
10.33	1165.57
11.08	1164.76
12.70	1164.51
14.22	1164.58
15.28	1164.30
16.75	1164.40
17.56	1164.70
18.27	1166.06
18.93	1166.32
20.11	1166.87
21.00	1167.27
23.68	1167.24
27.9	1167.18

SUMMARY DATA	
Bankfull Elevation:	1166.6
LTOB Elevation:	1166.9
Bankfull Cross-Sectional Area:	17.9
Bankfull Width:	13.7
Flood Prone Area Elevation:	1168.9
Flood Prone Width:	100.0
Max Depth at Bankfull:	2.3
Low Bank Height:	2.6
Mean Depth at Bankfull:	1.3
W / D Ratio:	10.5
Entrenchment Ratio:	7.3
Bank Height Ratio:	1.11

Stream Type	E

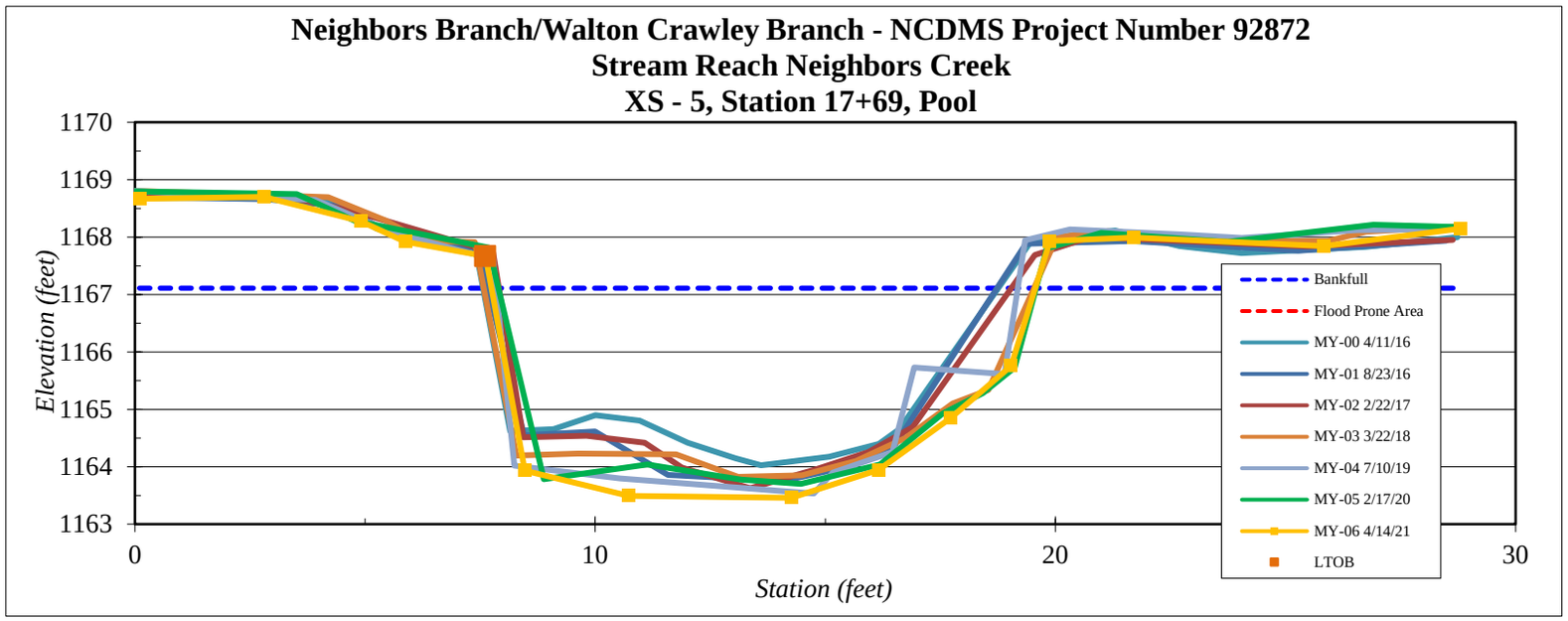


Site	Neighbors Br./Walton Crawley Br.
Project Number:	92872
XS ID	XS - 5, Pool
Reach	Walton Crawley Branch
Date:	4/14/2021
Field Crew:	Perkinson, Keith

Station	Elevation
0.1	1168.7
2.8	1168.7
4.9	1168.3
5.9	1167.9
7.6	1167.7
8.5	1163.9
10.7	1163.5
14.3	1163.5
16.2	1163.9
17.7	1164.8
19.0	1165.8
19.9	1167.9
21.7	1168.0
25.8	1167.8
28.8	1168.1

SUMMARY DATA	
Bankfull Elevation:	1167.1
LTOB Elevation:	1167.7
Bankfull Cross-Sectional Area:	35.1
Bankfull Width:	11.8
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	3.7
Low Bank Height:	4.2
Mean Depth at Bankfull:	3.0
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.15

Stream Type	E

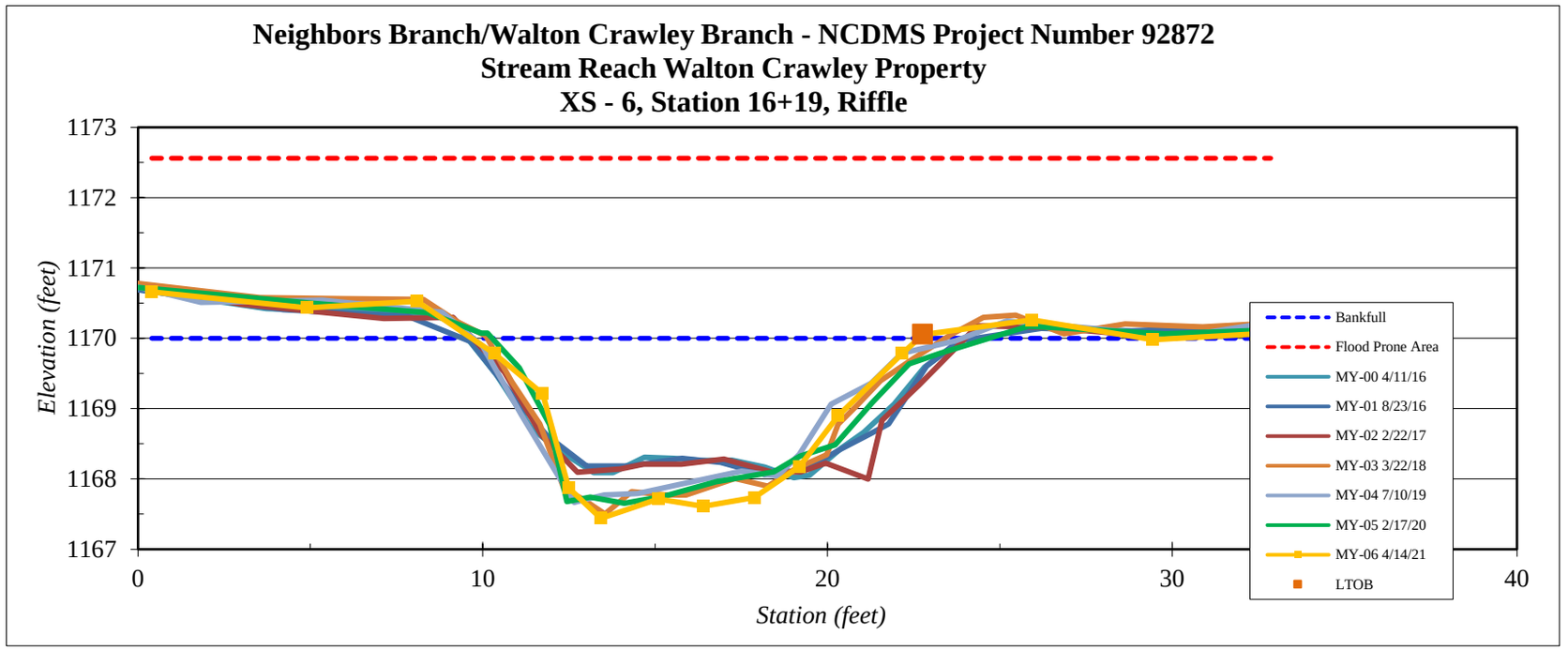


Site	Neighbors Br./Walton Crawley Br.
Project Number:	92872
XS ID	XS - 6, Riffle
Reach	Walton Crawley Branch
Date:	4/14/2021
Field Crew:	Perkinson, Keith

Station	Elevation
0.40	1170.66
4.91	1170.43
8.08	1170.53
10.34	1169.78
11.74	1169.21
12.49	1167.87
13.42	1167.44
15.09	1167.72
16.39	1167.61
17.88	1167.74
19.18	1168.17
20.31	1168.90
22.16	1169.78
22.77	1170.05
25.94	1170.26
29.43	1169.98
32.9	1170.07

SUMMARY DATA	
Bankfull Elevation:	1170.0
LTOB Elevation:	1170.3
Bankfull Cross-Sectional Area:	20.2
Bankfull Width:	14.0
Flood Prone Area Elevation:	1172.6
Flood Prone Width:	100.0
Max Depth at Bankfull:	2.6
Low Bank Height:	2.6
Mean Depth at Bankfull:	1.4
W / D Ratio:	9.7
Entrenchment Ratio:	7.1
Bank Height Ratio:	1.02

Stream Type	E

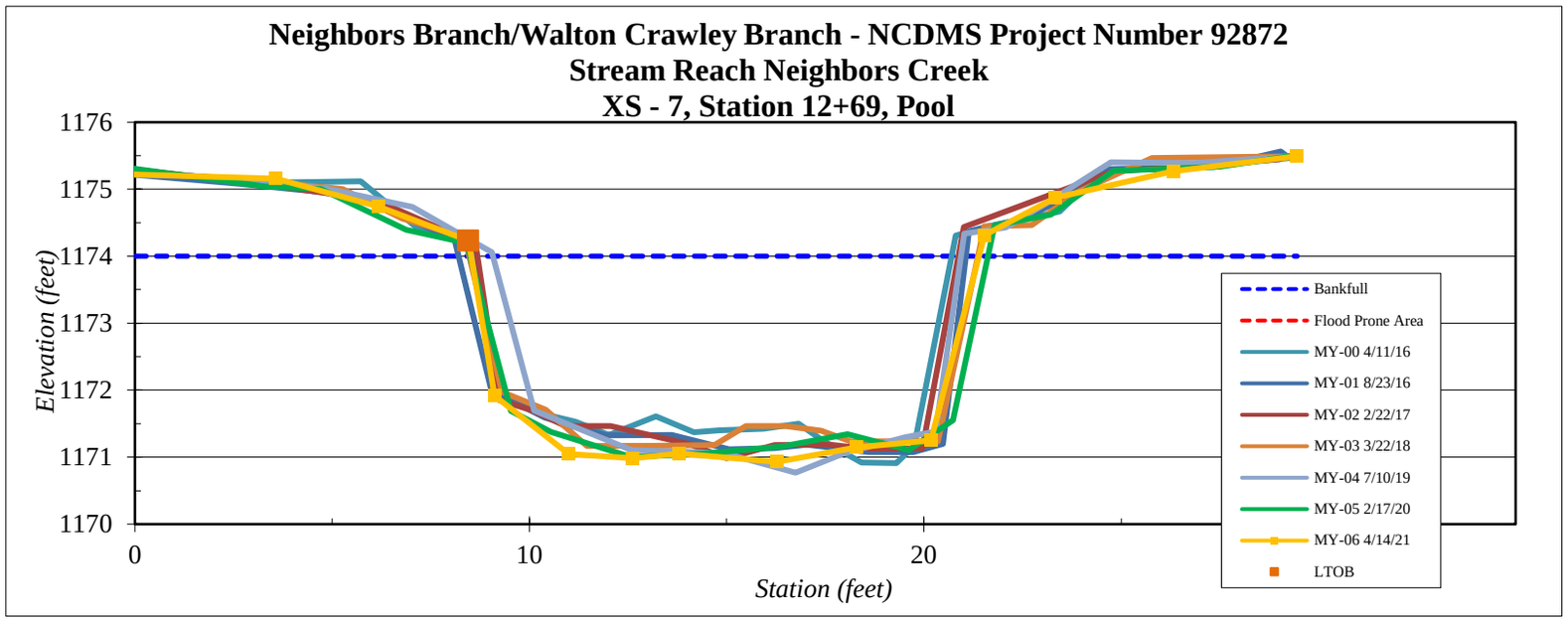


Site	Neighbors Br./Walton Crawley Br.
Project Number:	92872
XS ID	XS - 7, Pool
Reach	Walton Crawley Branch
Date:	4/14/2021
Field Crew:	Perkinson, Keith

Station	Elevation
-0.5	1175.2
3.6	1175.2
6.2	1174.7
8.5	1174.2
9.1	1171.9
11.0	1171.0
12.6	1171.0
13.8	1171.1
16.3	1170.9
18.3	1171.1
20.2	1171.3
21.5	1174.3
23.3	1174.9
26.3	1175.3
29.5	1175.5

SUMMARY DATA	
Bankfull Elevation:	1174.0
LTOB Elevation:	1174.2
Bankfull Cross-Sectional Area:	34.1
Bankfull Width:	12.9
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	3.1
Low Bank Height:	3.3
Mean Depth at Bankfull:	2.6
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.08

Stream Type	E

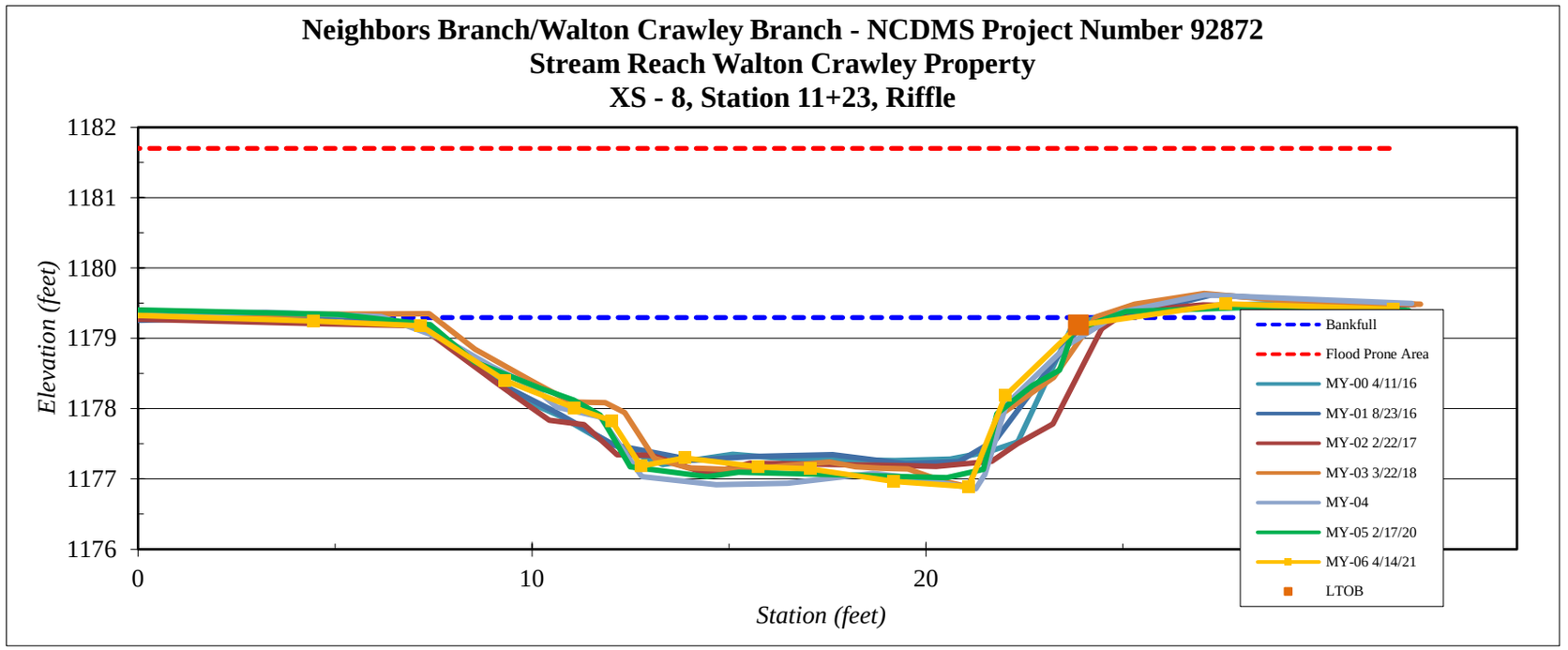


Site	Neighbors Br./Walton Crawley Br.
Project Number:	92872
XS ID	XS - 8, Riffle
Reach	Walton Crawley Branch
Date:	4/14/2021
Field Crew:	Perkinson, Keith

Station	Elevation
-0.20	1179.33
4.47	1179.24
7.17	1179.18
9.31	1178.40
11.07	1178.01
12.02	1177.83
12.77	1177.18
13.87	1177.30
15.74	1177.17
17.07	1177.14
19.18	1176.97
21.09	1176.89
22.02	1178.18
23.88	1179.19
27.61	1179.49
31.86	1179.42

SUMMARY DATA	
Bankfull Elevation:	1179.3
LTOB Elevation:	1179.2
Bankfull Cross-Sectional Area:	27.0
Bankfull Width:	23.5
Flood Prone Area Elevation:	1181.7
Flood Prone Width:	100.0
Max Depth at Bankfull:	2.4
Low Bank Height:	2.3
Mean Depth at Bankfull:	1.1
W / D Ratio:	20.4
Entrenchment Ratio:	4.3
Bank Height Ratio:	0.96

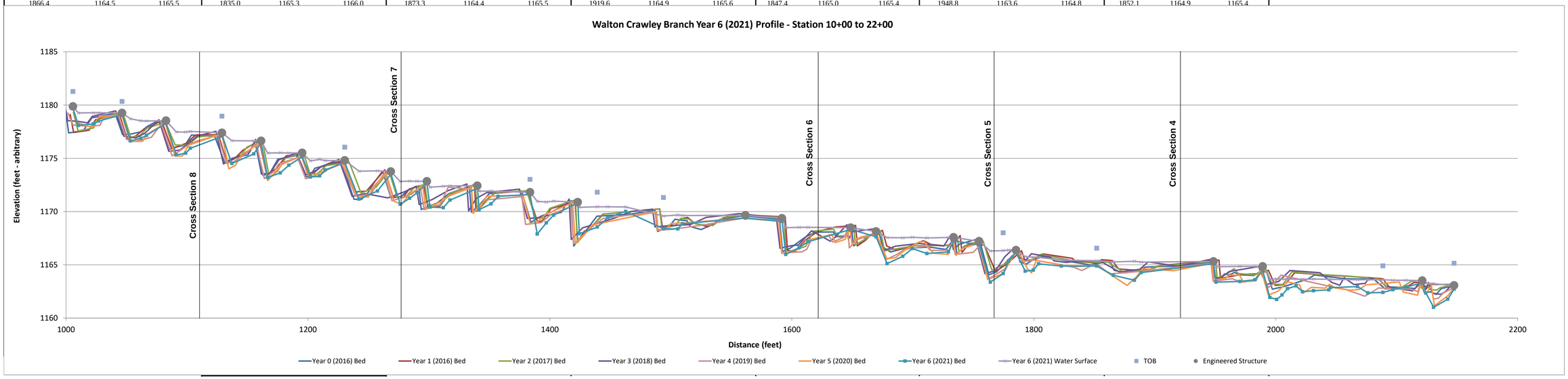
Stream Type	E



Project Name Neighbors Branch/Walton Crawley Branch - Profile
Reach Walton Crawley Branch, Station 10+00 - 22+00
Feature Profile
Date 4/14/21
Crew Perkinson, Keith

2016 Year 0 Monitoring \Survey			2016 Year 1 Monitoring \Survey			2017 Year 2 Monitoring \Survey			2018 Year 3 Monitoring \Survey			2019 Year 4 Monitoring \Survey			2020 Year 5 Monitoring \Survey			2021 Year 6 Monitoring Survey		
Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation
2147.7	1163.1	1163.3	2147.7	1163.1	1163.4	2146.6	1163.2	1163.3	2146.6	1163.3	1163.5	2148.1	1162.9	1163.1	2148.1	1163.0	1163.2	2147.4	1162.7	1163.1
2136.7	1162.8	1163.4	2127.6	1163.2	1163.6	2135.8	1162.8	1163.3	2140.5	1162.5	1163.5	2138.6	1162.4	1163.1	2142.4	1162.1	1163.1	2142.2	1161.8	1163.1
2132.5	1162.2	1163.3	2123.9	1162.7	1163.6	2132.9	1162.6	1163.2	2136.4	1162.2	1163.5	2134.3	1161.9	1163.1	2131.0	1161.2	1163.1	2130.5	1161.0	1163.2
2128.3	1162.5	1163.3	2121.6	1163.4	1163.7	2127.3	1162.7	1163.3	2129.5	1162.3	1163.5	2130.2	1161.8	1163.1	2128.7	1163.0	1163.3	2124.1	1162.3	1163.3
2122.8	1162.4	1163.5	2114.1	1163.3	1163.9	2125.3	1163.1	1163.5	2126.2	1163.3	1163.7	2128.4	1163.2	1163.3	2124.0	1162.3	1163.3	2121.2	1163.3	1163.5
2119.2	1163.5	1163.7	2109.9	1163.0	1163.9	2122.6	1162.7	1163.5	2124.8	1162.9	1163.7	2119.8	1163.3	1163.6	2120.3	1163.3	1163.6	2107.6	1162.9	1163.5
2115.3	1162.8	1163.7	2101.0	1162.9	1163.9	2120.6	1162.8	1163.6	2121.8	1163.1	1163.7	2117.4	1162.5	1163.6	2117.2	1162.1	1163.6	2096.8	1162.7	1163.6
2104.0	1162.9	1163.8	2094.9	1162.8	1163.8	2119.4	1163.6	1163.7	2120.0	1163.3	1163.8	2111.7	1162.7	1163.6	2105.3	1162.4	1163.7	2088.6	1162.4	1163.6
2091.7	1162.9	1163.8	2088.3	1163.7	1164.1	2111.5	1163.4	1163.8	2113.2	1162.6	1163.9	2102.8	1162.7	1163.6	2102.1	1163.4	1163.7	2076.2	1162.4	1163.6
2085.1	1163.6	1163.9	2060.8	1163.9	1164.4	2103.9	1162.9	1163.7	2097.8	1162.8	1163.9	2084.8	1162.8	1163.6	2074.5	1163.1	1163.6	2067.6	1163.0	1163.6
2057.2	1163.7	1164.3	2048.0	1164.0	1164.4	2092.7	1162.7	1163.8	2090.3	1162.7	1163.9	2080.8	1162.5	1163.6	2068.8	1162.7	1163.7	2045.2	1162.9	1163.6
2031.9	1164.0	1164.5	2015.6	1164.3	1164.8	2085.5	1163.7	1163.9	2080.4	1163.7	1164.2	2073.5	1162.0	1163.6	2061.5	1162.6	1163.7	2043.9	1162.6	1163.6
2026.5	1163.7	1164.6	2007.5	1163.1	1164.8	2058.9	1164.0	1164.3	2077.4	1163.8	1164.3	2057.6	1162.7	1163.6	2049.2	1162.8	1163.8	2031.2	1162.6	1163.7
2007.1	1163.0	1164.6	1999.5	1163.1	1164.8	2037.4	1164.1	1164.5	2073.9	1163.3	1164.2	2046.8	1162.9	1163.6	2044.1	1163.2	1163.7	2022.2	1162.5	1163.6
1997.2	1162.7	1164.6	1993.9	1164.5	1165.0	2013.4	1164.3	1164.7	2064.6	1163.1	1164.2	2026.4	1163.4	1163.9	2041.0	1162.8	1163.7	2016.7	1163.0	1163.7
1991.6	1164.6	1165.0	1986.7	1164.2	1165.0	2005.8	1163.1	1164.7	2056.5	1163.8	1164.5	2004.3	1164.0	1164.4	2029.4	1162.9	1163.8	2009.7	1162.8	1163.7
1981.9	1164.0	1164.9	1972.6	1164.1	1165.0	1996.8	1163.2	1164.7	2052.9	1163.1	1164.5	1997.4	1163.2	1164.5	2022.6	1162.3	1163.8	2005.2	1162.2	1163.7
1969.8	1164.1	1164.9	1954.3	1163.7	1165.1	1991.4	1164.7	1164.9	2046.1	1163.4	1164.4	1993.7	1162.9	1164.4	2019.6	1163.1	1163.8	2000.9	1161.8	1163.7
1966.1	1164.3	1164.9	1953.1	1165.4	1165.6	1983.0	1164.1	1164.9	2036.5	1164.3	1164.6	1987.8	1164.5	1164.7	2009.9	1163.4	1163.9	1995.1	1161.9	1163.7
1961.1	1164.0	1165.0	1916.9	1165.1	1165.6	1969.1	1164.2	1165.0	2011.7	1164.5	1165.0	1983.8	1163.5	1164.7	2001.5	1162.5	1163.8	1989.3	1164.5	1164.8
1957.7	1164.1	1164.9	1903.5	1164.9	1165.6	1965.6	1164.6	1164.9	2002.3	1163.4	1165.0	1971.6	1163.4	1164.8	1993.7	1162.2	1163.9	1982.8	1163.6	1164.9
1951.6	1163.6	1165.0	1895.6	1164.5	1165.6	1960.0	1164.2	1164.9	1992.1	1163.1	1164.9	1963.9	1163.7	1164.7	1987.9	1164.5	1164.8	1970.2	1163.4	1164.9
1950.3	1165.3	1165.4	1881.5	1164.5	1165.6	1951.5	1163.8	1164.9	1985.7	1164.8	1165.1	1948.3	1163.4	1164.7	1982.5	1163.6	1164.8	1950.7	1163.4	1164.8
1916.9	1164.9	1165.5	1870.0	1164.6	1165.6	1950.2	1165.4	1165.5	1961.6	1164.4	1165.1	1946.6	1165.1	1165.3	1973.0	1163.4	1164.8	1948.6	1165.1	1165.3
1892.2	1164.8	1165.5	1864.9	1165.4	1165.8	1901.2	1164.9	1165.5	1953.9	1163.7	1165.1	1885.1	1164.3	1165.3	1970.2	1164.0	1164.8	1888.8	1164.3	1165.3
1886.9	1164.5	1165.5	1856.2	1165.5	1165.9	1893.4	1164.5	1165.5	1949.0	1163.8	1165.1	1862.7	1164.1	1165.3	1962.2	1164.0	1164.8	1883.2	1163.6	1165.3
1875.7	1164.2	1165.5	1851.4	1165.2	1165.9	1881.7	1164.5	1165.5	1947.3	1165.5	1165.6	1853.9	1164.9	1165.4	1958.8	1163.8	1164.8	1865.8	1164.0	1165.3
1866.4	1164.5	1165.5	1835.0	1165.3	1166.0	1873.3	1164.4	1165.5	1919.6	1164.9	1165.6	1847.4	1165.0	1165.4	1948.8	1163.6	1164.8	1852.1	1164.9	1165.4

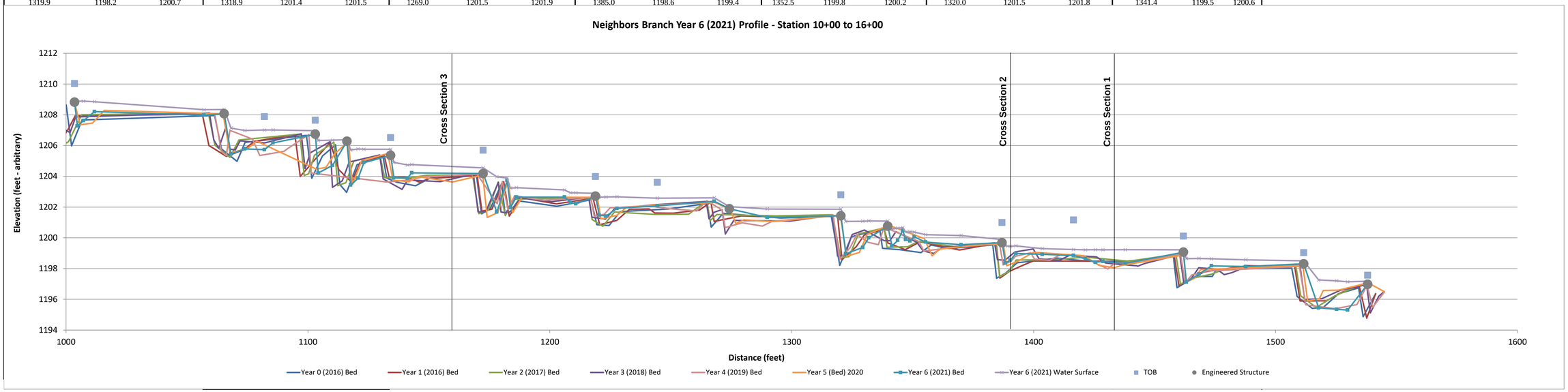
	2016	2016	2017	2018	2019	2020	2021
Avg. Water Surface	0.0145	0.0143	0.0146	0.0145	0.0144	0.0145	0.0147
Riffle Length	24	24	25	20	22	26	26
Avg. Riffle Slope	0.0032	0.0055	0.0030	0.0087	0.0055	0.0018	0.0029
Pool Length	25	23	22	27	26	21	27
Pool to Pool Spacing	43	42	41	41	47	40	48



Project Name Neighbors Branch/Walton Crawley Branch - Profile
Reach Neighbors Branch, Station 10+00 - 16+00
Feature Profile
Date 4/14/21
Crew Perkinson, Keith

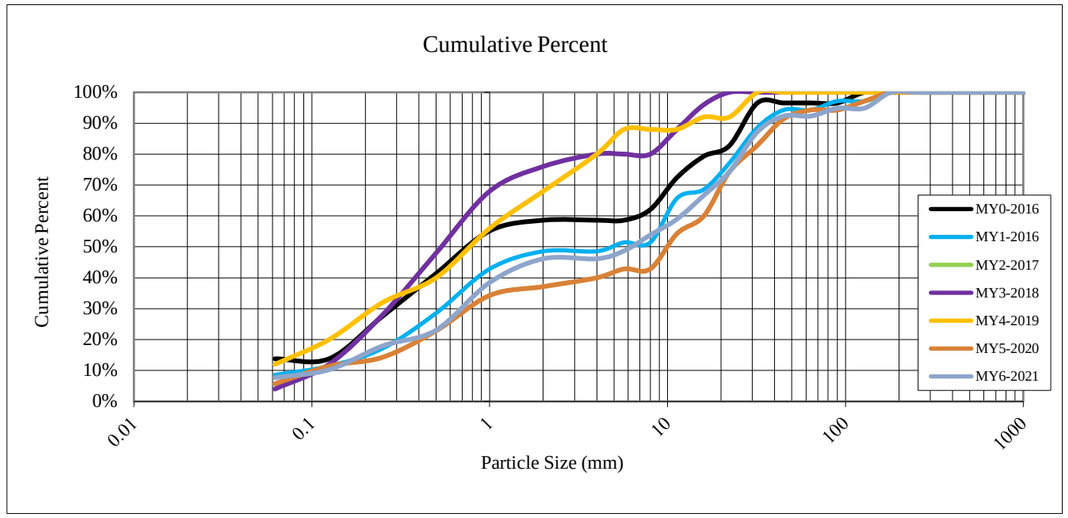
2016 Year 0 Monitoring \Survey			2016 Year 1 Monitoring \Survey			2017 Year 2 Monitoring \Survey			2018 Year 3 Monitoring \Survey			2019 Year 4 Monitoring \Survey			2020 Year 5 Monitoring \Survey			2021 Year 6 Monitoring \Survey		
Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation
1541.4	1196.4	1196.4	1541.4	1196.4	1196.4	1535.4	1197.0	1196.9	1545.0	1196.5	1196.6	1545.0	1196.5	1196.6	1545.0	1196.5	1196.6	1538.1	1197.0	1197.2
1536.2	1194.9	1196.4	1537.7	1194.8	1196.4	1524.5	1196.2	1196.9	1542.7	1196.2	1196.6	1540.2	1195.5	1196.6	1538.3	1197.1	1197.1	1529.8	1195.3	1197.1
1534.4	1196.7	1196.9	1534.6	1196.8	1196.9	1516.8	1195.5	1196.9	1539.2	1195.1	1196.5	1537.8	1196.9	1197.1	1526.0	1196.6	1197.2	1525.3	1195.4	1197.2
1526.1	1196.4	1196.9	1527.5	1196.5	1196.9	1510.4	1196.2	1196.9	1537.6	1197.0	1197.0	1533.6	1195.7	1197.0	1519.7	1196.6	1197.1	1517.8	1195.4	1197.3
1519.8	1195.5	1196.9	1521.1	1195.9	1196.9	1508.3	1198.2	1198.2	1526.8	1196.6	1197.0	1524.8	1195.4	1197.1	1518.1	1196.0	1197.1	1511.7	1198.3	1198.5
1515.2	1195.4	1196.9	1510.1	1195.9	1197.0	1478.7	1197.9	1198.3	1519.1	1196.0	1197.1	1512.5	1195.6	1197.1	1513.3	1195.9	1197.1	1487.7	1198.1	1198.6
1508.9	1196.2	1197.0	1507.9	1198.1	1198.3	1473.5	1197.6	1198.3	1512.1	1196.0	1197.1	1509.9	1198.1	1198.4	1511.3	1198.2	1198.4	1473.6	1198.2	1198.6
1506.7	1198.0	1198.2	1488.4	1198.2	1198.3	1465.3	1197.4	1198.4	1510.1	1198.2	1198.3	1471.4	1197.8	1198.5	1469.0	1197.9	1198.5	1468.4	1197.6	1198.7
1475.6	1198.0	1198.3	1475.6	1197.9	1198.3	1460.7	1197.0	1198.3	1486.0	1198.0	1198.4	1465.4	1197.6	1198.5	1466.6	1197.4	1198.5	1463.1	1197.1	1198.6
1473.9	1197.5	1198.3	1470.3	1197.8	1198.3	1458.8	1198.9	1198.9	1482.1	1197.7	1198.4	1462.6	1197.1	1198.4	1463.2	1197.1	1198.5	1461.9	1199.1	1199.2
1467.1	1197.5	1198.3	1460.0	1196.9	1198.3	1439.4	1198.5	1198.9	1478.8	1197.6	1198.4	1460.8	1198.9	1199.1	1462.0	1198.9	1199.1	1438.0	1198.3	1199.2
1459.3	1196.8	1198.4	1458.2	1198.8	1199.0	1421.4	1198.7	1199.0	1475.7	1198.0	1198.4	1441.2	1198.4	1199.0	1436.1	1198.2	1199.1	1428.7	1198.5	1199.2
1457.8	1198.8	1198.9	1434.3	1198.4	1199.0	1408.3	1198.6	1199.0	1468.2	1198.1	1198.4	1433.9	1198.4	1199.1	1433.4	1198.1	1199.1	1425.5	1198.4	1199.2
1439.1	1198.5	1199.0	1429.2	1198.5	1199.0	1392.8	1198.6	1199.0	1465.0	1197.3	1198.5	1430.7	1198.0	1199.1	1427.0	1198.2	1199.1	1421.4	1198.6	1199.2
1421.5	1198.5	1199.0	1399.7	1198.5	1199.1	1389.8	1197.8	1199.0	1462.1	1197.1	1198.5	1426.5	1198.3	1199.1	1420.8	1198.8	1199.2	1416.5	1198.9	1199.2
1410.0	1198.7	1199.0	1395.0	1198.2	1199.1	1386.0	1197.5	1199.0	1460.4	1198.9	1199.1	1419.7	1198.8	1199.2	1400.0	1199.1	1199.4	1403.6	1198.9	1199.3
1393.1	1198.4	1199.1	1390.1	1197.8	1199.1	1384.4	1199.6	1199.7	1445.7	1198.3	1199.0	1411.4	1198.9	1199.3	1393.4	1198.5	1199.5	1392.7	1199.0	1199.5
1388.5	1197.7	1199.0	1386.0	1197.4	1199.1	1367.0	1199.4	1199.7	1443.0	1198.2	1199.1	1406.6	1198.5	1199.3	1388.9	1198.2	1199.5	1390.4	1198.5	1199.4
1384.7	1197.4	1199.0	1384.5	1199.7	1199.7	1352.5	1199.8	1199.9	1442.8	1198.2	1199.1	1400.3	1198.6	1199.3	1387.5	1199.6	1199.9	1388.3	1198.4	1199.5
1383.2	1199.5	1199.7	1369.3	1199.2	1199.8	1348.0	1199.4	1199.9	1429.8	1198.4	1199.1	1398.8	1199.0	1199.3	1374.4	1199.5	1200.0	1386.9	1199.7	1199.9
1364.9	1199.3	1199.8	1353.1	1199.7	1199.9	1339.4	1199.4	1200.1	1426.0	1198.8	1199.0	1392.6	1198.8	1199.4	1361.0	1199.3	1200.0	1370.0	1199.6	1200.1
1357.6	1199.5	1199.9	1346.9	1199.2	1200.0	1338.2	1200.6	1200.7	1414.9	1198.9	1199.4	1390.4	1198.4	1199.4	1358.1	1198.8	1200.0	1355.4	1199.7	1200.2
1353.4	1199.0	1199.9	1339.7	1199.7	1200.2	1327.7	1200.3	1200.6	1410.5	1198.5	1199.3	1387.4	1198.2	1199.4	1354.8	1199.9	1200.2	1350.7	1200.1	1200.4
1344.8	1199.2	1199.9	1338.2	1200.6	1200.7	1323.7	1198.8	1200.6	1402.2	1198.6	1199.4	1385.9	1199.6	1199.8	1340.1	1200.8	1201.0	1348.9	1199.8	1200.4
1337.5	1199.3	1200.3	1330.0	1200.2	1200.7	1320.3	1198.7	1200.7	1399.9	1199.3	1199.4	1364.3	1199.4	1199.9	1331.1	1200.2	1201.0	1347.1	1199.9	1200.4
1336.4	1200.5	1200.7	1326.7	1199.4	1200.8	1316.8	1201.5	1201.5	1392.3	1199.1	1199.5	1361.1	1199.3	1200.0	1328.0	1199.1	1201.0	1345.9	1200.5	1200.7
1324.7	1200.1	1200.7	1320.8	1198.6	1200.7	1293.6	1201.4	1201.6	1388.2	1198.5	1199.5	1354.6	1199.1	1199.9	1322.7	1198.8	1201.0	1343.8	1199.8	1200.6
1319.9	1198.2	1200.7	1318.9	1201.4	1201.5	1269.0	1201.5	1201.9	1385.0	1198.6	1199.4	1352.5	1199.8	1200.2	1320.0	1201.5	1201.8	1341.4	1199.5	1200.6

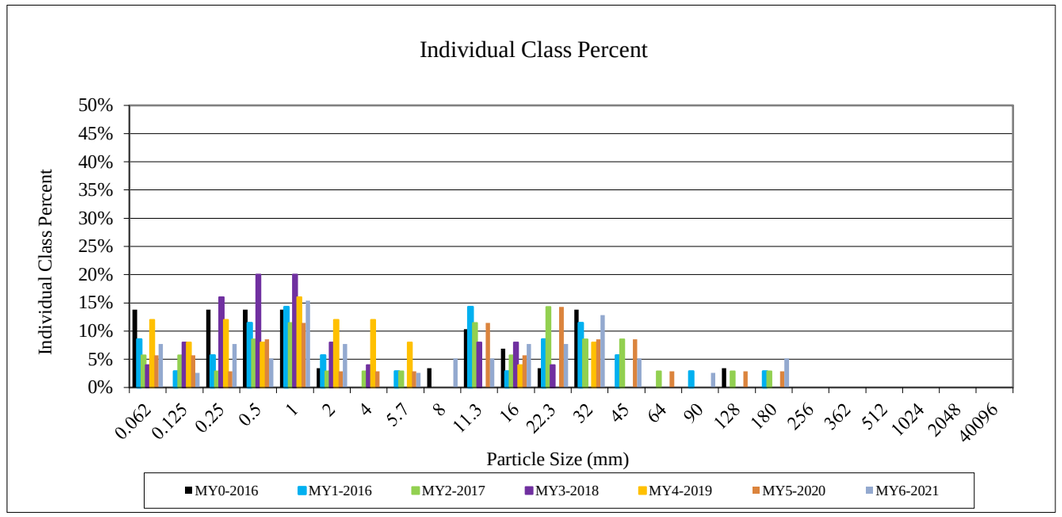
	2016	2016	2017	2018	2019	2020	2021
Avg. Water Surface	0.0222	0.0220	0.0221	0.0225	0.0240	0.0229	0.0218
Riffle Length	28	26	31	19	18	28	31
Avg. Riffle Slope	0.0043	0.0046	0.0041	0.0082	0.0140	0.0086	0.0055
Pool Length	12	15	12	9	17	12	10
Pool to Pool Spacin	36	34	38	26	30	36	32



Project Name: Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site					
Cross-Section: 1					
Feature: Riffle					
			2021		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	3	8%	8%
Sand	very fine sand	0.125	1	3%	10%
	fine sand	0.250	3	8%	18%
	medium sand	0.50	2	5%	23%
	coarse sand	1.00	6	15%	38%
	very coarse sand	2.0	3	8%	46%
Gravel	very fine gravel	4.0	0	0%	46%
	fine gravel	5.7	1	3%	49%
	fine gravel	8.0	2	5%	54%
	medium gravel	11.3	2	5%	59%
	medium gravel	16.0	3	8%	67%
	course gravel	22.3	3	8%	74%
	course gravel	32.0	5	13%	87%
	very coarse gravel	45	2	5%	92%
	very coarse gravel	64	0	0%	92%
Cobble	small cobble	90	1	3%	95%
	medium cobble	128	0	0%	95%
	large cobble	180	2	5%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			39	100%	100%

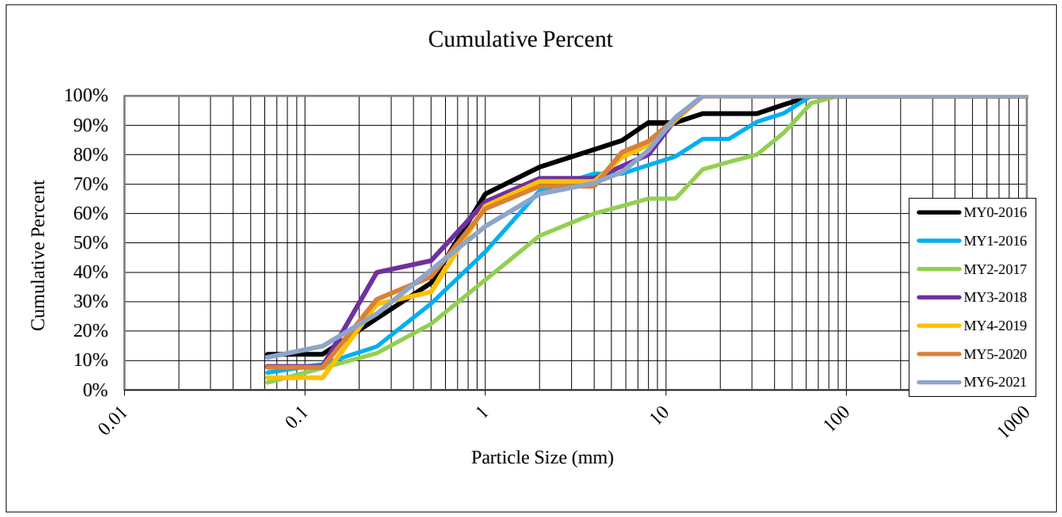
Summary Data	
D50	6.4
D84	29
D95	129

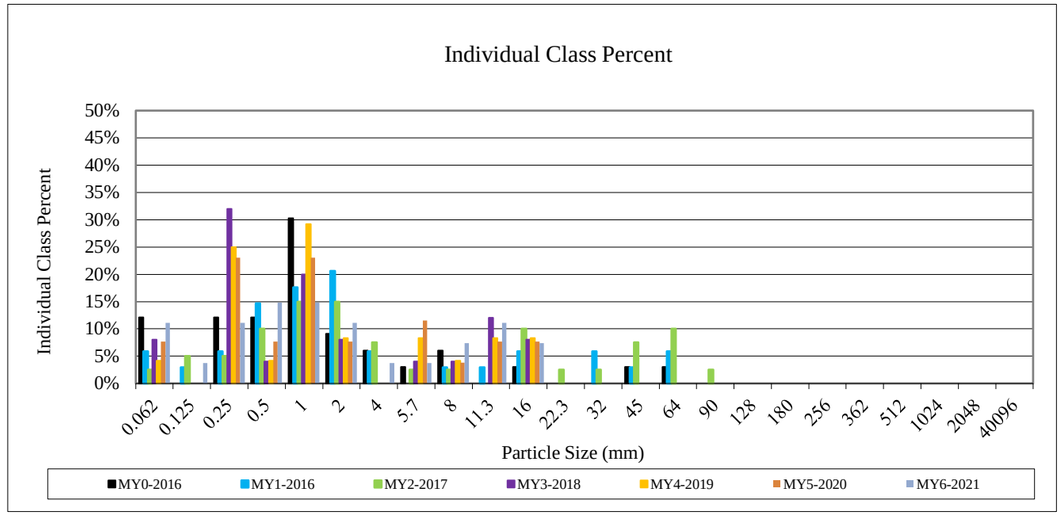




Project Name: Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site					
Cross-Section: 3					
Feature: Riffle					
			2021		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	3	11%	11%
Sand	very fine sand	0.125	1	4%	15%
	fine sand	0.250	3	11%	26%
	medium sand	0.50	4	15%	41%
	coarse sand	1.00	4	15%	56%
	very coarse sand	2.0	3	11%	67%
Gravel	very fine gravel	4.0	1	4%	70%
	fine gravel	5.7	1	4%	74%
	fine gravel	8.0	2	7%	81%
	medium gravel	11.3	3	11%	93%
	medium gravel	16.0	2	7%	100%
	course gravel	22.3	0	0%	100%
	course gravel	32.0	0	0%	100%
	very coarse gravel	45	0	0%	100%
	very coarse gravel	64	0	0%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			27	100%	100%

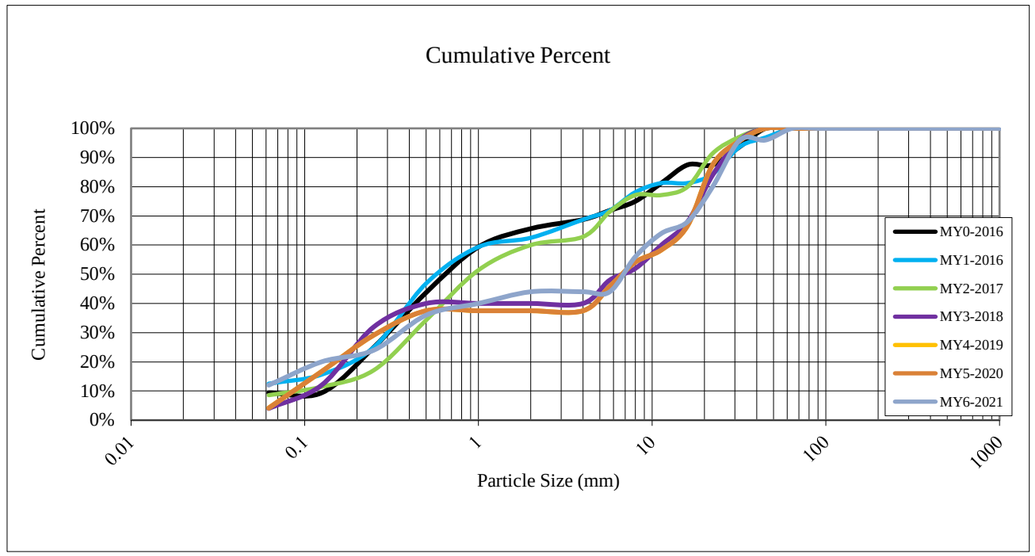
Summary Data	
D50	0.8
D84	9
D95	12

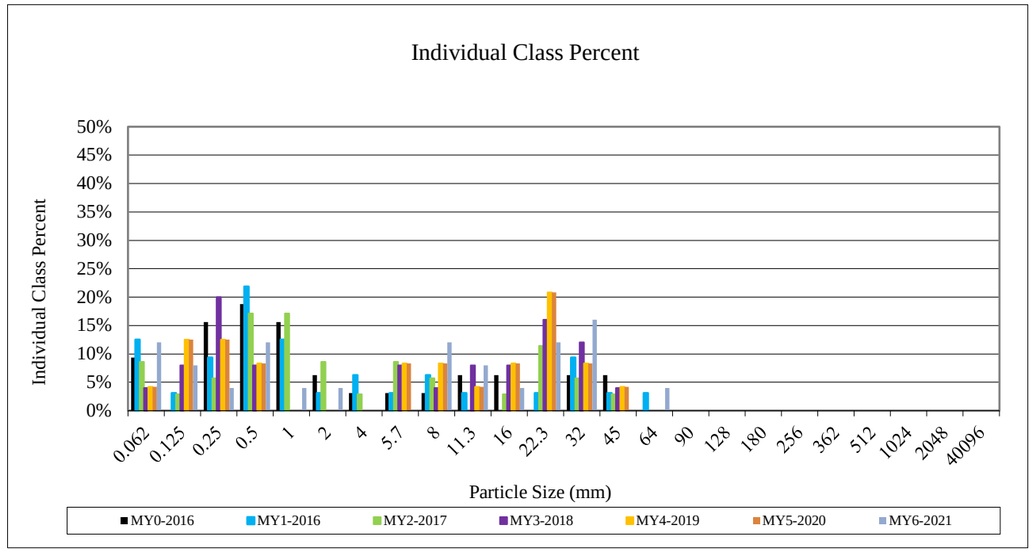




Project Name: Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site					
Cross-Section: 4					
Feature: Riffle					
			2021		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	3	12%	12%
Sand	very fine sand	0.125	2	8%	20%
	fine sand	0.250	1	4%	24%
	medium sand	0.50	3	12%	36%
	coarse sand	1.00	1	4%	40%
	very coarse sand	2.0	1	4%	44%
Gravel	very fine gravel	4.0	0	0%	44%
	fine gravel	5.7	0	0%	44%
	fine gravel	8.0	3	12%	56%
	medium gravel	11.3	2	8%	64%
	medium gravel	16.0	1	4%	68%
	course gravel	22.3	3	12%	80%
	course gravel	32.0	4	16%	96%
	very coarse gravel	45	0	0%	96%
	very coarse gravel	64	1	4%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			25	100%	100%

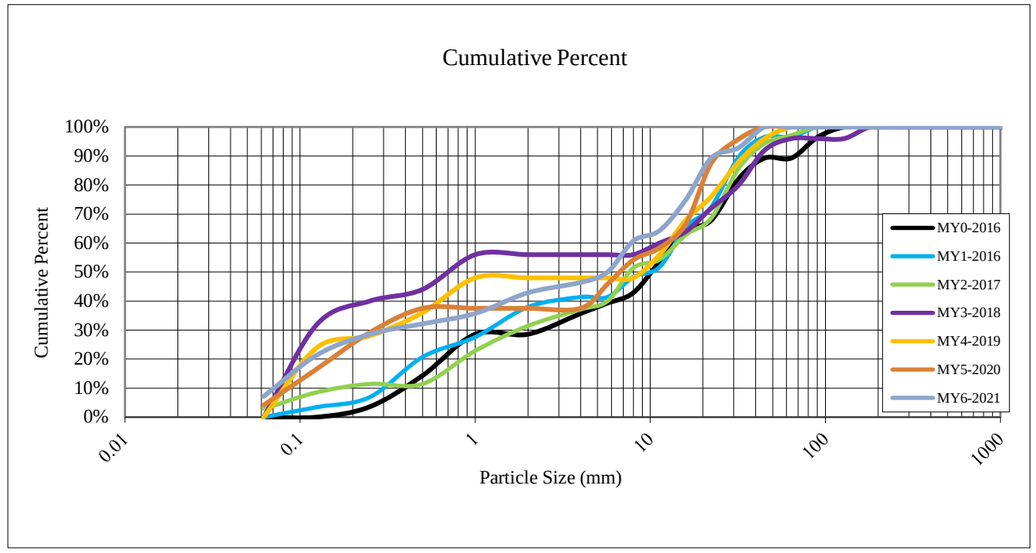
Summary Data	
D50	6.9
D84	24
D95	31

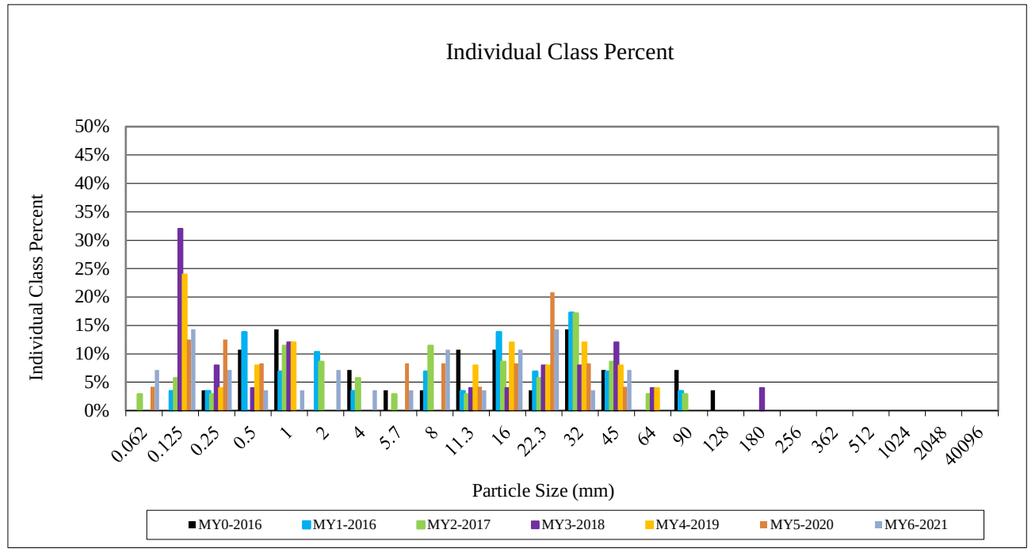




Project Name: Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site					
Cross-Section: 6					
Feature: Riffle					
			2021		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	2	7%	7%
Sand	very fine sand	0.125	4	14%	21%
	fine sand	0.250	2	7%	29%
	medium sand	0.50	1	4%	32%
	coarse sand	1.00	1	4%	36%
	very coarse sand	2.0	2	7%	43%
Gravel	very fine gravel	4.0	1	4%	46%
	fine gravel	5.7	1	4%	50%
	fine gravel	8.0	3	11%	61%
	medium gravel	11.3	1	4%	64%
	medium gravel	16.0	3	11%	75%
	course gravel	22.3	4	14%	89%
	course gravel	32.0	1	4%	93%
	very coarse gravel	45	2	7%	100%
	very coarse gravel	64	0	0%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			28	100%	100%

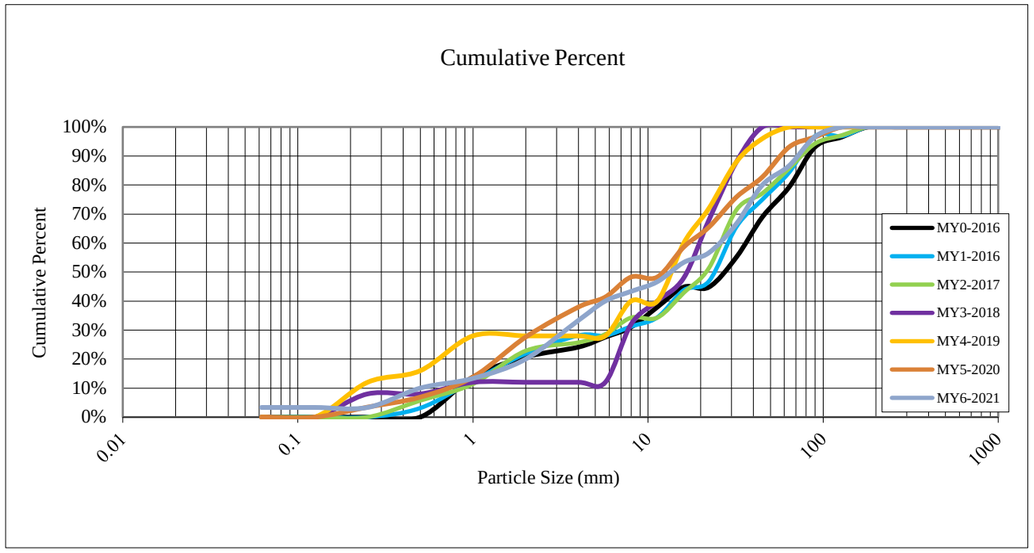
Summary Data	
D50	6
D84	20
D95	35





Project Name: Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site					
Cross-Section: 8					
Feature: Riffle					
			2021		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	1	3%	3%
Sand	very fine sand	0.125	0	0%	3%
	fine sand	0.250	0	0%	3%
	medium sand	0.50	2	7%	10%
	coarse sand	1.00	1	3%	13%
	very coarse sand	2.0	2	7%	20%
Gravel	very fine gravel	4.0	4	13%	33%
	fine gravel	5.7	2	7%	40%
	fine gravel	8.0	1	3%	43%
	medium gravel	11.3	1	3%	47%
	medium gravel	16.0	2	7%	53%
	course gravel	22.3	1	3%	57%
	course gravel	32.0	3	10%	67%
	very coarse gravel	45	4	13%	80%
	very coarse gravel	64	2	7%	87%
Cobble	small cobble	90	3	10%	97%
	medium cobble	128	1	3%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			30	100%	100%

Summary Data	
D50	13.3
D84	56
D95	85



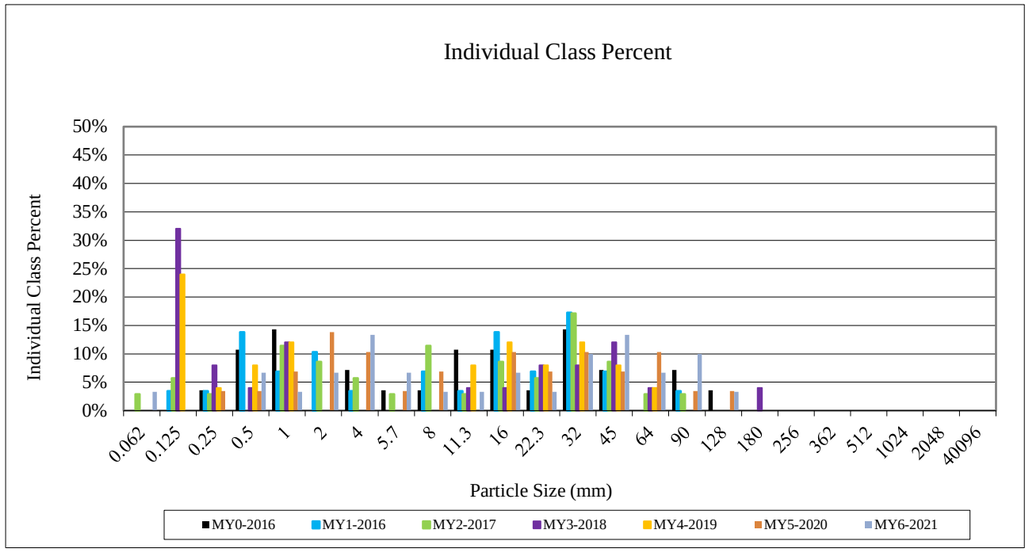


Table 10a. Baseline Stream Data Summary (Neighbors Creek)
Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site - NCDMS Project Number 92872

Parameter	Gauge	Regional Curve			Pre-Existing Condition (Neighbors Cr)					Reference Reach(es) Data					Design (Neighbors Cr)			Monitoring Baseline (Neighbors Cr)					
Dimension and Substrate - Riffle Only		**LL**	**UL**	**Eq.**	**Min**	**Mean**	**Med**	**Max**	**SD**	**Min**	**Mean**	**Med**	**Max**	**SD**	**Min**	**Max**	**Med**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
BF Width (ft)					5.4			5.9			12.7						11.0	9.6		11.1	12.5		2
Floodprone Width (ft)					7.4			17.1			150						70			100			2
BF Mean Depth (ft)					0.9			1.1			0.9						0.8	0.8		0.8	0.8		2
BF Max Depth (ft)					1.2			1.5			1.2						1.1	1.5		1.7	1.8		2
BF Cross Sectional Area (ft^2)					4.9			6.5			11.4						8.3	8.0		9.0	9.9		2
Width/Depth Ratio					5.3			5.8			14.1						14.0	12.0		13.8	15.6		2
Entrenchment Ratio					1.4			2.9			11.8						6.4	8.0		9.2	10.4		2
Bank Height Ratio					1.6			2.6			1.0						1.0			1.0			2
Profile																							
Riffle length (ft)																		5.4	28.3	25.5	64.7	18.2	13
Riffle slope (ft/ft)					0.025			0.035			0.0344						0.0120	0.0000	0.0043	0.0022	0.0121	0.0046	13
Pool length (ft)																		6.5	11.9	10.4	21.3	5.2	15
Pool Max depth (ft)					1.7			1.8			2.2						2.0	2.8		2.8	2.8		1
Pool spacing (ft)					16.4			99.2		38.8			64.7		33.0	56.1		7.0	36.1	37.9	74.7	19.8	15
Pattern																							
Channel Beltwidth (ft)					8			22		30.5			32		27.5	66		27.5			66		2
Radius of Curvature (ft)					5			22		14.5			20		22	44		22			44		2
Rc:Bankfull width (ft/ft)					0.9			1.5		1.1			1.6		2	4		2			4		2
Meander Wavelength (ft)					30			128		95			98		44	110		44			110		2
Meander Width ratio					1.5			4.1		2.4			2.5		4	10		4			10		2
Transport parameters																							
Reach Shear Stress (competency) lbs/ft^2																							
Max part size (mm) mobilized at bankfull																							
Stream Power (transport capacity) W/m^2																							
Additional Reach Parameters																							
Rosgen Classification					G5/4 - E5/4					C					C			E/C					
Bankfull Velocity (fps)					3.86 - 5.09																		
Bankfull Discharge (cfs)					25																		
Valley Length (ft)					----					----													
Channel Thalweg Length (ft)					----					----					----			541					
Sinuosity					1.01 - 1.21					1.22					1.18			1.18					
Water Surface Slope (ft/ft)					0.019 - 0.0204					0.0205					0.008			0.0222					
BF slope (ft/ft)					----					----					----			----					
Bankfull Floodplain Area (acres)					----					----					----			----					
% of Reach with Eroding Banks					----					----													
Channel Stability or Habitat Metric					----					----													
Biological or Other					----					----													

Table 10b. Baseline Stream Data Summary (Walton Crawley Property)
Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site - NCDMS Project Number 92872

Parameter	Gauge	Regional Curve			Pre-Existing Condition (WC Property)					Reference Reach(es) Data					Design (WC Property)			Monitoring Baseline (WC Property)					
Dimension and Substrate - Riffle Only		**LL**	**UL**	**Eq.**	**Min**	**Mean**	**Med**	**Max**	**SD**	**Min**	**Mean**	**Med**	**Max**	**SD**	**Min**	**Max**	**Med**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
BF Width (ft)					7.9			9.4			12.7						15.5	13.2		14.3	16.8		3
Floodprone Width (ft)					12.9			16.8			150				55	90				100			3
BF Mean Depth (ft)					0.8			0.9			0.9						1.1	1.3		1.4	1.5		3
BF Max Depth (ft)					0.9			1.1			1.2						1.4	1.9		2.0	2.0		3
BF Cross Sectional Area (ft^2)					6.2			8.4			11.4						16.6	17.6		19.4	25.0		3
Width/Depth Ratio					10.2			10.4			14.1						14.0	10.2		10.2	11.2		3
Entrenchment Ratio					1.6			1.8			11.8						4.5	6.0		7.0	7.6		3
Bank Height Ratio					1.0			2.8			1.0						1.0			1.0			3
Profile																							
Riffle length (ft)																		6.7	23.9	16.2	58.1	18	20
Riffle slope (ft/ft)					0.024			0.030			0.0344						0.0077	0.0000	0.0032	0.0018	0.0113	0.0036	20
Pool length (ft)																		7.9	24.8	24.8	63.1	10.8	27
Pool Max depth (ft)					1.9			2.1			2.2						2.4	1.3		1.4	1.5		2
Pool spacing (ft)					6.0			40.8		38.8			64.7		15.5	79.2		14.9	42.5	36.4	93.6	21.3	27
Pattern																							
Channel Beltwidth (ft)					16			25		30.5			32		38.8	93		38.8			93		2
Radius of Curvature (ft)					5			14		14.5			20		31	62		31			62		2
Rc:Bankfull width (ft/ft)					0.5			1.5		1.1			1.6		2	4		2			4		2
Meander Wavelength (ft)					103			121		95			98		77.5	155		77.5			155		2
Meander Width ratio					11			12.9		2.4			2.5		5	10		5			10		2
Transport parameters																							
Reach Shear Stress (competency) lbs/ft^2																							
Max part size (mm) mobilized at bankfull																							
Stream Power (transport capacity) W/m^2																							
Additional Reach Parameters																							
Rosgen Classification					B/G					C					C			E/C					
Bankfull Velocity (fps)					3.9-7.5																		
Bankfull Discharge (cfs)					24-63																		
Valley Length (ft)					----					----													
Channel Thalweg Length (ft)					----					----					----			1148					
Sinuosity					1.01-1.2					1.22					1.1			1.1					
Water Surface Slope (ft/ft)					0.0135-0.0340					0.0205					0.0045			0.0145					
BF slope (ft/ft)					----					----					----			----					
Bankfull Floodplain Area (acres)					----					----					----			----					
% of Reach with Eroding Banks					----					----													
Channel Stability or Habitat Metric					----					----													
Biological or Other					----					----													

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections)
Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site - NCDMS Project Number 92872

Parameter	Cross Section 1 (Neighbors Branch) Riffle							Cross Section 2 (Neighbors Branch) Pool							Cross Section 3 (Neighbors Branch) Riffle						
Dimension*	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY0	MY1	MY2	MY3	MY4	MY5	MY6
BF Width (ft)	12.5	11.1	11.9	9.5	9.8	11.9	8.3	8.5	10.4	9.7	12.8	11.7	11.2	11.9	9.6	8.7	8.9	8.2	8.5	8.0	9.4
Floodprone Width (ft) (approx)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	NA	NA	NA	NA	NA	NA	100.0	100.0	100.0	100.0	100.0	100.0	100.0
BF Mean Depth (ft)	0.8	0.9	0.8	1.0	1.0	0.8	1.2	1.6	1.4	1.4	1.1	1.2	1.3	1.2	0.8	0.9	0.9	1.0	1.0	1.0	0.9
BF Max Depth (ft)	1.8	1.6	1.8	1.7	1.9	1.8	2.0	2.8	2.9	3.0	2.2	2.2	2.5	2.2	1.5	1.5	1.6	1.7	1.8	1.8	1.9
Low Bank Height (ft)	1.8	1.6	1.8	1.7	1.9	1.8	2.1	2.8	2.9	3.0	2.2	2.2	2.5	2.1	1.5	1.5	1.6	1.8	1.8	1.8	1.9
BF Cross Sectional Area (ft^2)	9.9	9.6	9.5	9.5	9.5	9.5	9.5	13.6	14.1	14.0	14.0	14.0	14.0	14.0	8.0	8.1	8.1	8.1	8.1	8.1	8.1
Width/Depth Ratio	15.8	12.8	14.9	9.5	10.1	14.9	7.2	NA	NA	NA	NA	NA	NA	NA	11.5	9.3	9.8	8.3	8.9	7.9	10.8
Entrenchment Ratio	8.0	9.0	8.4	10.5	10.2	8.4	12.1	NA	NA	NA	NA	NA	NA	NA	10.4	11.5	11.2	12.2	11.8	12.5	10.7
Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0	1.02	1.0	1.0	1.0	1.0	1.0	1.0	0.92	1.0	1.0	1.0	1.1	1.0	1.0	1.02
d50 (mm)	0.8	4.9	9.8	0.8	0.8	9.8	6.4	----	----	----	----	----	----	----	0.7	1.1	1.8	0.8	0.8	0.7	0.8

*Beginning in Year 3 (2018), the bankfull elevation and channel cross section dimensions are calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (9/2018).

Table 11b. Monitoring Data - Stream Reach Data Summary
Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site - NCDMS Project Number 92872

Parameter	Baseline (Neighbors Branch)						MY-1 (Neighbors Branch)						MY-2 (Neighbors Branch)						MY-3 (Neighbors Branch)						MY-4 (Neighbors Branch)						MY-5 (Neighbors Branch)						MY-6 (Neighbors Branch)					
Dimension and Substrate - Riffle Only	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
BF Width (ft)	9.6		11.1	12.5		2	8.7		9.9	11.1		2	8.9		10.4	11.9		2	8.2		9.0	9.7		2	8.5		9.2	9.8		2	8.0		10.0	11.9		2	8.3		8.9	9.4		2
Floodprone Width (ft)			100			2			100			2			100			2			100			2			100			2			100			2			100			2
BF Mean Depth (ft)	0.8		0.8	0.8		2	0.9		0.9	0.9		2	0.8		0.9	0.9		2	1.0		1.0	1.0		2	1.0		1.0	1.0		2	0.8		0.9	1.0		2	0.9		1.1	1.2		2
BF Max Depth (ft)	1.5		1.7	1.8		2	1.5		1.6	1.6		2	1.6		1.7	1.8		2	1.7		1.7	1.7		2	1.8		1.9	1.9		2	1.8		1.8	1.8		2	1.9		2.0	2.0		2
BF Cross Sectional Area (ft^2)	8.0		9.0	9.9		2	8.1		8.9	9.6		2	8.1		8.8	9.5		2	8.1		8.8	9.5		2	8.1		8.8	9.5		2	8.1		8.8	9.5		2	8.1		8.8	9.5		2
Width/Depth Ratio	12.0		13.8	15.6		2	9.7		11.0	12.3		2	9.9		12.4	14.9		2	8.3		9.1	9.9		2	8.9		9.5	10.1		2	7.9		11.4	14.9		2	7.2		9.0	10.8		2
Entrenchment Ratio	8.0		9.2	10.4		2	9.0		10.3	11.5		2	8.4		9.8	11.2		2	10.3		11.3	12.2		2	10.2		11.0	11.8		2	8.4		10.5	12.5		2	10.7		11.4	12.1		2
Bank Height Ratio			1.0			2			1.0			2			1.0			2	1.0		1.0	1.1		2	1.0		1.0	1.0		2	1.0		1.0	1.0		2	1.02		1.02	1.02		2
Profile																																										
Riffle length (ft)	5.4	28.3	25.5	64.7	18.2	13	7.2	26.2	24.9	58.5	17.6	12	8	31	30	66	18	12	2	19	13	55	15	19	6.2	18.1	15.9	38.5	10.5	13	5.5	26.5	27.8	49.1	13.1	13	7.8	31	26.7	92.6	24	11
Riffle slope (ft/ft)	0.0000	0.0043	0.0022	0.0121	0.0046	13	0.0000	0.0046	0.0035	0.0157	0.0046	12	0.0000	0.0041	0.0028	0.0143	0.0042	12	0.0000	0.0082	0.0026	0.0482	0.0127	19	0.0000	0.0140	0.0057	0.0657	0.0204	13	0.0000	0.0086	0.0040	0.0317	0.0097	13	0.0002	0.0055	0.0053	0.0134	0.0045	11
Pool length (ft)	7	12	10	21	5	15	7	15	15	26	5	16	4	12	11	27	6	14	3	9	8	20	4	21	5	17	12	48	13	16	6	12	12	49	7	15	4	10	9	26	6	15
Pool Max depth (ft)	2.8		2.8	2.8		1	2.9		2.9	2.9		1	3.0		3.0	3.0		1	2.2		2.2	2.2		1.0	2.2		2.2	2.2		1	2.5		2.5	2.5		1	2.2		2.2	2.2		1
Pool spacing (ft)	7	36	38	75	20	15	7	34	32	74	19	16	11	38	38	74	19	14	7	26	26	63	15	21	10	30	26	70	17	15	11	36	37	61	14	15	6	32	26	101	24	15
Pattern																																										
Channel Beltwidth (ft)	27.5			66		2																																				
Radius of Curvature (ft)	22			44		2																																				
Rc:Bankfull width (ft/ft)	2			4		2																																				
Meander Wavelength (ft)	44			110		2																																				
Meander Width ratio	4			10		2																																				
Additional Reach Parameters																																										
Rosgen Classification	E/C-type						E/C-type						E/C-type						E/C-type						E/C-type						E/C-type						E/C-type					
Channel Thalweg Length (ft)	541						547						538						548						484						542						535					
Sinuosity	1.18						1.18						1.18						1.18						1.18						1.18						1.18					
Water Surface Slope (Channel) (ft/ft)	0.0222						0.022						0.0221						0.0225						0.024						0.0229						0.0218					
BF slope (ft/ft)	-----						-----						-----						-----						-----						-----						-----					
Ri%/RU%P%G%/S%																																										
SC%/SA%/G%/C%/B%BE%																																										
d16/d35/d50/d84/d95																																										
% of Reach with Eroding Banks	0						0						0						0						0						0						0					
Channel Stability or Habitat Metric																																										
Biological or Other																																										

Table 11c. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections)
Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site - NCDMS Project Number 92872

Parameter	Cross Section 4 (Walton Crawley Br)							Cross Section 5 (Walton Crawley Br)							Cross Section 6 (Walton Crawley Br)							Cross Section 7 (Walton Crawley Br)							Cross Section 8 (Walton Crawley Br)						
	Riffle							Pool							Riffle							Pool							Riffle						
Dimension*	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY0	MY1	MY2	MY3	MY4	MY5	MY6
BF Width (ft)	13.2	13.1	13.0	13.0	12.7	12.6	13.7	11.9	11.7	11.9	12.2	11.4	11.8	11.8	14.3	14.5	14.2	13.2	14.6	14.4	14.0	12.2	13.0	12.6	13.0	12.5	13.2	12.9	16.8	16.9	17.4	17.2	17.9	18.4	23.5
Floodprone Width (ft) (approx)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	NA	NA	NA	NA	NA	NA	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	NA	NA	NA	NA	NA	NA	100.0	100.0	100.0	100.0	100.0	100.0	100.0
BF Mean Depth (ft)	1.3	1.4	1.4	1.4	1.4	1.4	1.3	2.8	3.0	2.9	2.9	3.1	3.0	3.0	1.4	1.3	1.4	1.5	1.4	1.4	1.4	2.7	2.8	2.7	2.6	2.7	2.6	2.6	1.5	1.4	1.6	1.6	1.5	1.5	1.2
BF Max Depth (ft)	1.9	2.0	2.0	2.0	2.2	2.2	2.3	3.7	4.0	4.1	3.6	3.9	3.7	3.7	2.0	1.9	2.0	2.5	2.4	2.3	2.6	3.4	3.2	3.3	3.0	3.5	3.0	3.1	2.0	2.0	2.1	2.5	2.4	2.3	2.4
Low Bank Height (ft)	1.9	2.0	2.0	2.1	2.5	2.4	2.6	3.7	4.0	4.1	4.1	4.1	4.1	4.2	2.0	1.9	2.0	2.5	2.4	2.4	2.6	3.4	3.2	3.3	3.1	3.1	3.2	3.3	2.0	2.0	2.1	2.5	2.4	2.2	2.3
BF Cross Sectional Area (ft^2)	17.6	18.2	17.9	17.9	17.9	17.9	17.9	32.9	35.2	35.1	35.1	35.1	35.1	35.1	19.4	19.5	20.2	20.2	20.2	20.2	20.2	33.0	35.9	34.1	34.1	34.1	34.1	34.1	25.0	24.4	27.0	27.0	27.0	27.0	27.0
Width/Depth Ratio	9.9	9.4	9.4	9.4	9.0	8.9	10.5	NA	NA	NA	NA	NA	NA	NA	10.5	10.8	10.0	8.6	10.6	10.3	9.7	NA	NA	NA	NA	NA	NA	NA	11.3	11.7	11.2	11.0	11.9	12.5	20.4
Entrenchment Ratio	7.6	7.6	7.7	7.7	7.9	7.9	7.3	NA	NA	NA	NA	NA	NA	NA	7.0	6.9	7.0	7.6	6.8	6.9	7.1	NA	NA	NA	NA	NA	NA	NA	6.0	5.9	5.7	5.8	5.6	5.4	4.3
Bank Height Ratio	1.0	1.0	1.0	1.1	1.1	1.1	1.11	1.0	1.0	1.0	1.1	1.1	1.1	1.15	1.0	1.0	1.0	1.0	1.0	1.0	1.02	1.0	1.0	1.0	1.0	0.9	1.1	1.08	1.0	1.0	1.0	1.0	1.0	1.0	0.96
d50 (mm)	0.7	0.6	0.9	7.0	7.0	6.9	6.9	----	----	----	----	----	----	----	9.9	9.4	7.7	0.8	0.8	6.9	6.0	----	----	----	----	----	----	----	26.5	23.4	20.9	18.0	18.0	11.7	13.3

*Beginning in Year 3 (2018), the bankfull elevation and channel cross section dimensions are calculated using a fixed bankfull Area as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (9/2018).

Table 11d. Monitoring Data - Stream Reach Data Summary
Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site - NCDMS Project Number 92872

Parameter	Baseline (Walton Crawley Br)						MY-1 (Walton Crawley Br)						MY-2 (Walton Crawley Br)						MY-3 (Walton Crawley Br)						MY-4 (Walton Crawley Br)						MY-5 (Walton Crawley Br)						MY-6 (Walton Crawley Br)					
Dimension and Substrate - Riffle Only	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
BF Width (ft)	13.2		14.3	16.8		3	13.1		14.5	16.9		3	13.0		14.2	17.4		3	13.0		13.2	17		3	12.7		14.6	17.9		3	12.6		14.4	18.6		3	13.7		14.0	23.5		3
Floodprone Width (ft)			100			3			100			3			100			3			100			3			100			3			100			3			100			3
BF Mean Depth (ft)	1.3		1.4	1.5		3	1.3		1.4	1.4		3	1.4		1.4	1.5		3	1.4		1.5	1.6		3	1.4		1.4	1.5		3	1.4		1.4	1.5		3	1.3		1.4	1.5		3
BF Max Depth (ft)	1.9		2.0	2.0		3	1.9		2.0	2.0		3	2.0		2.0	2.1		3	2.0		2.4	2.5		3	2.2		2.4	2.4		3	2.2		2.3	2.3		3	2.3		2.4	2.6		3
BF Cross Sectional Area (ft^2)	17.6		19.4	25.0		3	18.2		19.5	24.4		3	17.9		20.2	27.0		3	17.9		20.2	26.4		3	17.9		20.2	27.0		3	17.9		20.2	27.0		3	17.9		20.2	27.0		3
Width/Depth Ratio	10.2		10.2	11.2		3	9.4		11.2	12.1		3	9.3		10.1	11.6		3	8.6		9.4	10.9		3	9.0		10.6	11.9		3	8.9		10.3	12.9		3	9.7		10.5	20.4		3
Entrenchment Ratio	6.0		7.0	7.6		3	5.9		6.9	7.6		3	5.7		7.0	7.7		3	5.9		7.6	7.7		3	5.6		6.8	7.9		3	5.4		6.9	7.9		3	4.1		7.1	7.3		3
Bank Height Ratio			1.0			3			1.0			3			1.0			3	1.0		1.0	1.1		3	1.0		1.0	1.1		3	1.0		1.0	1.1		3	0.96		1.02	1.11		3
Profile																																										
Riffle length (ft)	6.7	23.9	16.2	58.1	18	20	6	24	20	73	17	22	7	25	19	72	19	21	3	20	16	58	14	19	6.1	22.1	16.6	61.5	16.9	19	8	25.6	17.4	89.1	20.3	22	6.1	26.2	19.6	82.4	21.2	18
Riffle slope (ft/ft)	0.0000	0.0032	0.0018	0.0113	0.0036	20	0.0000	0.0055	0.0015	0.0241	0.0071	21	0.0000	0.0030	0.0013	0.0124	0.0041	21	0.0000	0.0087	0.0040	0.0481	0.0131	19.00	0.0000	0.0055	0.0021	0.0303	0.0082	18	0.0000	0.0018	0.0001	0.0094	0.0026	22	0.0000	0.0029	0.0011	0.0182	0.0045	18
Pool length (ft)	8	25	25	63	11	27	6	23	22	41	9	27	6	22	20	57	10	28	5	27	25	63	14	28	9	26	25	58	12	28	5	21	19	40	9	29	17	27	24	47	9	24
Pool Max depth (ft)	1.3		1.4	1.5		2	3.2		3.6	4.0		2	3.3		3.7	4.1		2	3.0		3.3	3.6		2	3.5	3.7	3.7	3.9		2	3.0		3.7	3.7		2						2
Pool spacing (ft)	15	43	36	94	21	27	20	42	35	94	19	27	6	41	35	94	22	28	6	41	37	102	21	28	20	47	42	113	24	28	8	40	36	101	22	28	28	49	41	129	24	23
Pattern																																										
Channel Beltwidth (ft)	38.8			93		2																																				
Radius of Curvature (ft)	31			62		2																																				
Rc:Bankfull width (ft/ft)	2			4		2																																				
Meander Wavelength (ft)	77.5			155		2																																				
Meander Width ratio	5			10		2																																				
Additional Reach Parameters																																										
Rosgen Classification	E/C-type						E/C-type						E/C-type						E/C-type						E/C-type						E/C-type						E/C-type					
Channel Thalweg Length (ft)	1148						1144						1141						1147						1147						1142						1142					
Sinuosity	1.1						1.1						1.1						1.1						1.1						1.1						1.1					
Water Surface Slope (Channel) (ft/ft)	0.0145						0.0143						0.0146						0.0145						0.0144						0.0145						0.0147					
BF slope (ft/ft)	-----						-----						-----						-----						-----						-----						-----					
Ri%/RU%/P%/G%/S%																																										
SC%/SA%/G%/C%/B%/BE%																																										
d16/d35/d50/d84/d95																																										
% of Reach with Eroding Banks	0						0						0						0						0						0						0					
Channel Stability or Habitat Metric																																										
Biological or Other																																										

Appendix E.
Hydrology Data

Table 12. Verification of Bankfull Events
Table 13. Wetland Hydrology Criteria Attainment Summary
Figure E1. 30-70 Percentile Graph for Rainfall
Groundwater Gauge Graphs

Table 12. Verification of Bankfull Events
Neighbors Branch/Walton Crawley Branch Site (DMS Project Number 92872)

Date of Data Collection	Date of Occurrence	Method	Photo (if available)
August 19, 2016	July 4, 2016	Crest gauge data indicates a bankfull event after approximately 1.88 inches of rain documented* in one day.	---
May 18, 2017	April 23, 2017	Crest gauge data indicates a bankfull event after approximately 1.76 inches of rain documented* in one day.	---
May 9, 2018	April 24, 2018	Crest gauge data along with wrack observed on the floodplains of both Neighbors Branch and Walton Crawley Branch indicate a bankfull event after 3.89 inches of rain documented** over two days.	1-2
September 25, 2018	September 16, 2018	Crest gauge data indicates a bankfull event after 2.42 inches of rain** resulting from the remnants of Hurricane Florence.	--
November 8, 2018	October 11, 2018	Crest gauge data along with wrack, sediment, and laid-back vegetation indicate a bankfull event after 2.79 inches of rain** resulting from Hurricane Michael.	3
November 13, 2019	October 31, 2019	Crest gauge data along with visual evidence throughout the site indicate an overbank event occurred after approximately 3.15 inches of rain***	4
February 17, 2020	January 12, 2020	Crest gauge data along with wrack and laid-back vegetation indicate a bankfull event after 1.79 inches of rain**	5
May 28, 2020	May 20, 2020	Wrack observed on TOB and in floodplain of Walton-Crawley Branch after approximately 5.90 inches of rain documented^ over 2 days	6
October 20, 2021	October 8, 2021	Large wrack and logs observed along TOB and in floodplain of Neighbors Branch and Walton-Crawley Branch after approximately 6.84 inches of rain documented^ over 2 days	7-8

*Weather Underground 2017
**Weather Underground 2018
*** National Weather Service
^ NRCC AgACIS 2021

Photo 1: Wrack on TOB of Neighbors Branch

Photo 2: Wrack in the floodplain of Walton Crawley Branch

Photo 3: Wrack, sediment, and laid-back vegetation in the floodplain of Neighbors Branch

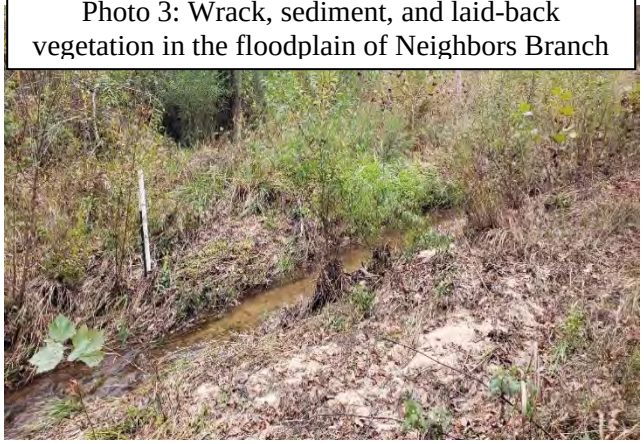


Photo 4: Reclining vegetation in the floodplain of Neighbors Branch

Photo 5: Wrack and laid-back vegetation in the floodplain of Neighbors Branch

Photo 6: Wrack on the top of bank of Walton-Crawley Branch

Photo 7: Wrack throughout floodplain of Neighbors Branch

Photo 8: Drift deposits and logs throughout the floodplain of Walton-Crawley Branch

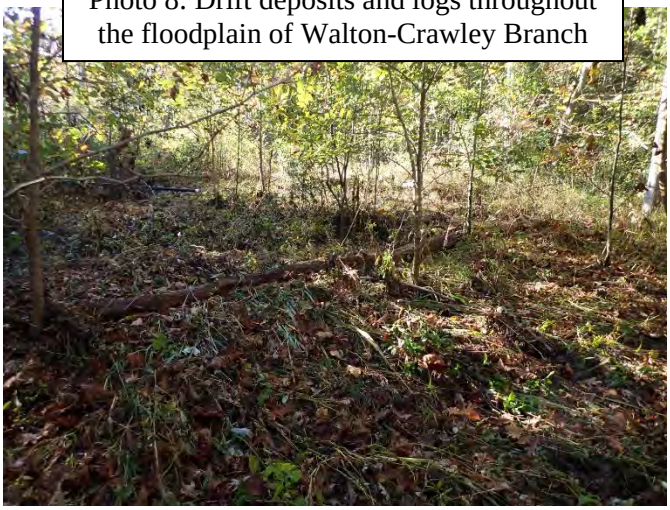


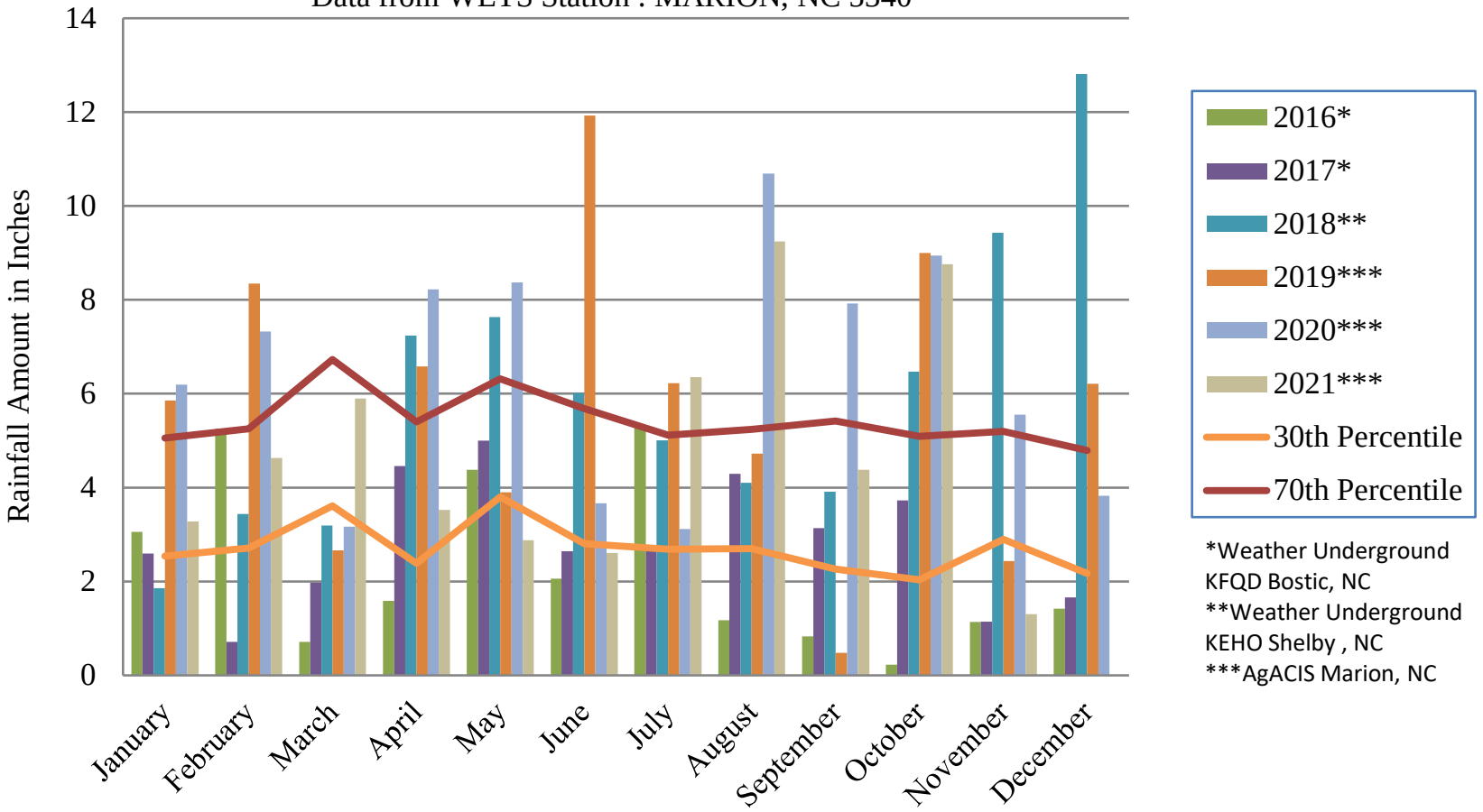
Table 13. Wetland Hydrology Criteria Attainment Summary
Neighbors Branch/Walton Crawley Branch Site (DMS Project Number 92872)

Gauge	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)					
	Year 1 (2016)	**Year 2 (2017)**	**Year 3 (2018)**	**Year 4 (2019)**	**Year 5 (2020)**	**Year 6 (2021)**
1	Yes/208 Days (92.4%)	Yes/225 Days* (100%)	Yes/225 Days** (100%)	Yes/181 Days (80%)	Yes/208 Days (92.4%)	Yes/224 Days (100%)
2	Yes/164 Days (72.9%)	Yes/225 Days (100%)	Yes/225 Days^ (100%)	Yes/181 Days (80%)	Yes/208 Days (92.4%)	Yes/224 Days (100%)

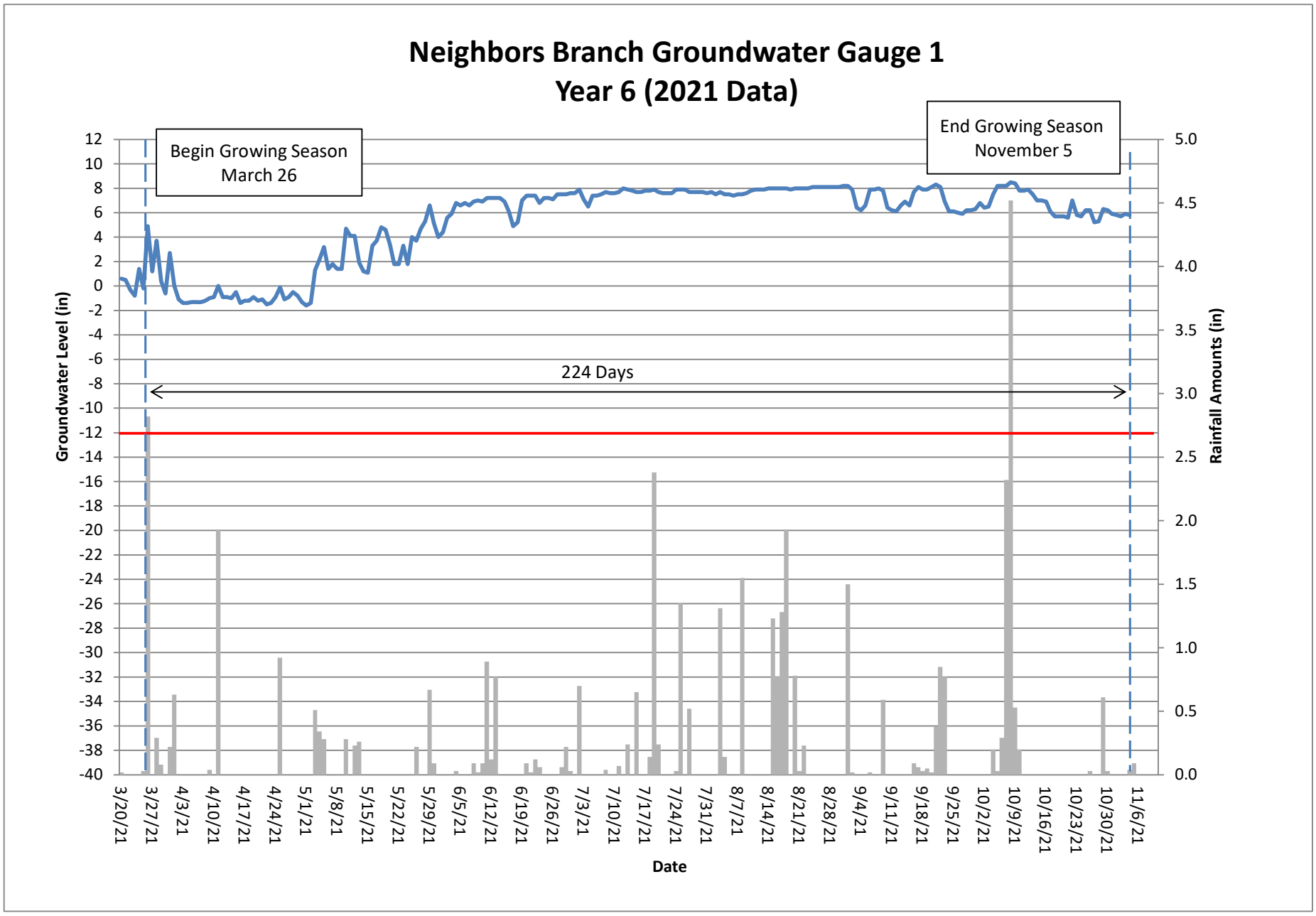
*Gauge 1 malfunctioned for 6 days (July 29 to August 3, 2017); however, based on precipitation data as well as data from Gauge 2, it is expected that this gauge would have continued to be saturated/inundated during this 6 day period.
**Gauge 1 batteries died several time throughout the growing season due to excessive inundation resulting in data loss; however, groundwater was at or near the soil surface for the entire 2018 growing season.
^Gauge 2 missed several days of data collection due to a malfunction caused by excessive inundation during the remnants of Hurricane Florence. It began collecting points again once overbank flow receded.

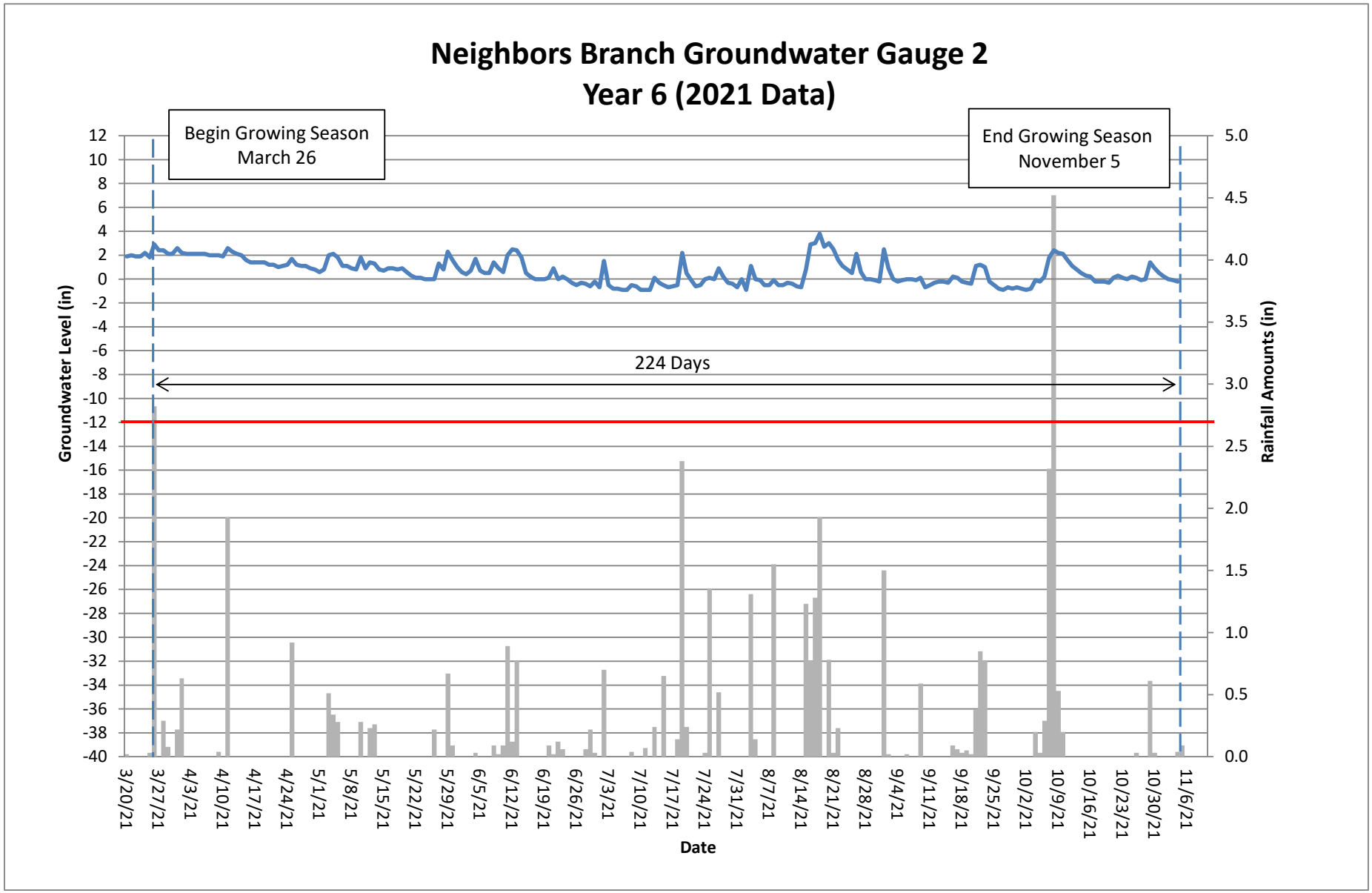
Figure E1: Neighbors Branch/Walton Crawley Branch
30-70 Percentile Graph for Rainfall

Data from WETS Station : MARION, NC 5340



*Weather Underground KFQD Bostic, NC
**Weather Underground KEHO Shelby , NC
***AgACIS Marion, NC


Neighbors Branch Groundwater Gauge 1
Year 6 (2021 Data)
Begin Growing Season
March 26
End Growing Season
November 5
224 Days
Groundwater Level (in)
Rainfall Amounts (in)
Date
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3/20/21
3/27/21
4/3/21
4/10/21
4/17/21
4/24/21
5/1/21
5/8/21
5/15/21
5/22/21
5/29/21
6/5/21
6/12/21
6/19/21
6/26/21
7/3/21
7/10/21
7/17/21
7/24/21
7/31/21
8/7/21
8/14/21
8/21/21
8/28/21
9/4/21
9/11/21
9/18/21
9/25/21
10/2/21
10/9/21
10/16/21
10/23/21
10/30/21
11/6/21


Neighbors Branch Groundwater Gauge 2
Year 6 (2021 Data)
Begin Growing Season
March 26
End Growing Season
November 5
224 Days
Groundwater Level (in)
Rainfall Amounts (in)
Date
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3/20/21
3/27/21
4/3/21
4/10/21
4/17/21
4/24/21
5/1/21
5/8/21
5/15/21
5/22/21
5/29/21
6/5/21
6/12/21
6/19/21
6/26/21
7/3/21
7/10/21
7/17/21
7/24/21
7/31/21
8/7/21
8/14/21
8/21/21
8/28/21
9/4/21
9/11/21
9/18/21
9/25/21
10/2/21
10/9/21
10/16/21
10/23/21
10/30/21
11/6/21

Appendix F.
Remedial Action

March 24, 2021 DMS/IRT Meeting Minutes
Construction Plans for January 2022 Repairs

ROY COOPER
Governor
DIONNE DELLI-GATTI
Secretary
TIM BAUMGARTNER
Director

NORTH CAROLINA
Environmental Quality

MEETING MINUTES

MEETING: Neighbors Branch/Walton Crawley Branch Site Meeting
DMS Project #: 92872
USACE Action ID#: SAW-2009-917
NCDWR Project #: 2010-0122
Catawba 01, McDowell County, NC

DATE: On-site Meeting: Wednesday, March 24, 2021 @ 9:00 am – 12:00 pm

ATTENDEES: Todd Tugwell, USACE
Erin Davis, NCDWR
Andrea Leslie, NCWRC
Tim Baumgartner, NCDMS
Paul Wiesner, NCDMS
Matthew Reid, NCDMS

PURPOSE:

NCDMS requested a meeting with the NCIRT to view the Neighbors Branch/Walton Crawley stream and wetland restoration project. The Site is located within the Catawba 01 basin in McDowell County NC. The Site was scheduled for regulatory closeout in 2021, but DMS has withdrawn the Site due to several concerns identified in winter 2020/2021. Neighbors Branch/Walton Crawley is a DBB project instituted in August 2008. As a result, the IRT has not viewed this site. The purpose of the meeting was to introduce the IRT to the Site and show them the site concerns so DMS can develop and implement a repair plan.

1. An overview of the site was given at the culvert crossing on Neighbors Branch, and the site walk proceeded upstream.
2. The group stopped to view the deep rills/gullies that formed from water coming off the chicken houses. Possible solutions include installing a sediment basin near the fence line and stabilizing the gully with steps. DMS indicated they did not have control outside of the easement, but would stabilize the gully inside the easement to handle the water from the chicken houses.
3. The group continued upstream to view the conservation easement break just upstream of the UT3 confluence with Neighbors Branch. Several items were discussed:
    - A well house was viewed on the left flood plain within the conservation easement. DMS explained that this was known and identified on the conservation easement plat.
    - A PVC pipe was seen in the conservation easement. DMS will investigate this further. It was unknown if this pipe was in use or debris from recent well upgrades.
    - A road is being constructed but stops before crossing the creek. DMS identified this road construction in February 2021 and has concerns that the location and/or material is encroaching into the conservation easement. DMS property is currently investigating this issue with the land owner. NCIRT indicated that the land owner should contact the Asheville USACE office and speak with Brandee Boggs regarding necessary permits as well as contacting NCDLR before conducting any additional work. DMS will make this recommendation to the land owner.

- A brief discussion was had regarding the preservation ratio of 5:1 for the site. The IRT agreed that 5:1 would be OK due to the age of the project, wider buffers and overall preservation quality.
- Some Multiflora Rose was identified while walking. DMS indicated the site was under contract for invasive species control and would continue to be treated until closeout. The location of the viewed invasives will be passed on to the contractor for treatment.

4. The group walked back downstream and proceeded to UT2 to view the ephemeral channel rip-rap stabilization weirs that have failed. All agreed that including this reach in the project and protecting it with a conservation easement provides benefit even though no credit is being sought. Multiple options were discussed for repairing this reach, and the goal will be stabilization. Options discussed included:
    - Removing material from wing portions and pushing all rip-rap material into channel
    - Adding grade control throughout the channel
    - Beaver dam analog
    - Gabion baskets
5. The site visit continued downstream to UT1. Several boulder step structures have failed and DMS pointed out that footers were not used on this reach. These structures will be repaired.
6. The ponded wetland enhancement area was viewed next. It was determined that a portion of the dam was within the conservation easement, and there was a concern of future failure due to trees growing on the dam. It was also noted that the ponded area must dry at times due to trees growing in the bottom. The NCIRT suggested a more appropriate ratio for this wetland enhancement area is 5:1.
7. The site visit continued to the Walton Crawley portion and a discussion was had regarding the downstream culvert crossing on Walton Crawley Branch. It was noted the culvert was installed on bedrock resulting in a perched culvert. The NCIRT indicated this should have been corrected during installation by using rock steps or other methods. More attention to detail should be used when installing culverts to ensure aquatic passage in the future.
8. Kudzu was noted within the conservation easement near the road while walking up to UT2. DMS will continue invasive treatment.
9. A second ephemeral channel with failed rip-rap stabilization weirs was viewed upstream of UT2. Similar discussions were had involving stabilizing this reach as earlier.
10. DMS pointed out the ongoing repairs the land owner has completed to the side ditch of the road outside the conservation easement. These repairs have resulted in sediment input into UT2. The sediment does appear to be moving through the system.
11. A foot bridge/trail crossing on UT2 was discussed. It was noted that DMS Property and Stewardship were aware of the trail, and the conservation easement language during this time period allowed for existing trails. The IRT recommended installing additional signage and posts to keep the width of the trail down.
12. A headcut was viewed near the foot bridge. DMS will address this during the repair.
13. The NCIRT said that the Enhancement II section of UT2 would need to be discussed at closeout. There are concerns with the close proximity of the road, down cutting and general quality of the stream. Chinese Silver Grass may have been identified along the right flood plain of UT2. This will be verified and treated if necessary.
14. The group walked upstream from the confluence of UT2 and Walton Crawley Branch pass the pond and to the culvert crossing. The pond history was explained and the landowners passive pipe for water flow into the pond was observed.
15. The site visit concluded by walking Walton Crawley Branch back to the vehicles.

DMS will move forward with contracting with a designer to develop a repair plan for the site. The goal will be to implement repairs in 2021 and submit the site for closeout in 2022. DMS will continue to monitor the site and include additional photos of repaired areas to ensure they remain stable.

KCI JOB# : 162104243

SCO #: 21-23321-01

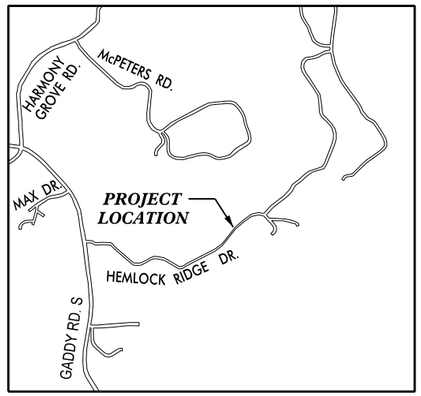
STATE	DMS PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
N.C.	92872	1	19

NCDEQ DIVISION OF MITIGATION SERVICES

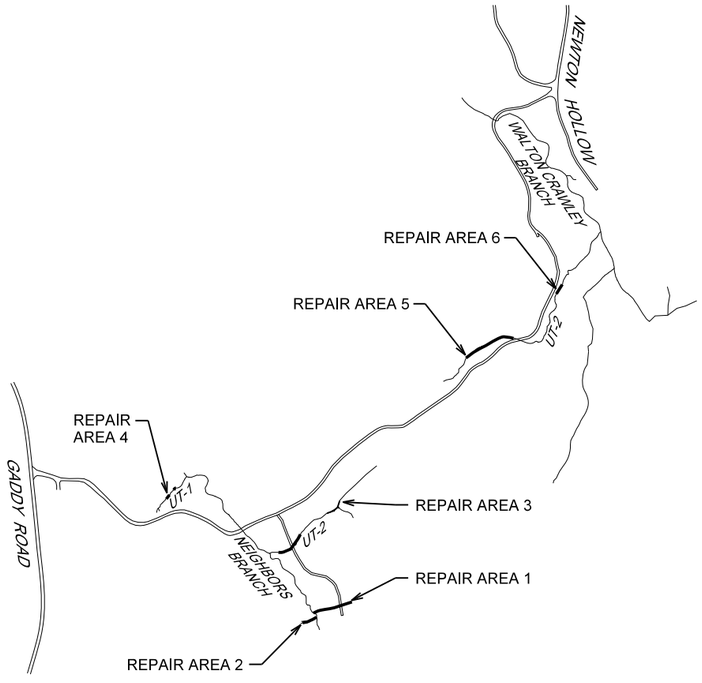
NEIGHBORS BRANCH REPAIR

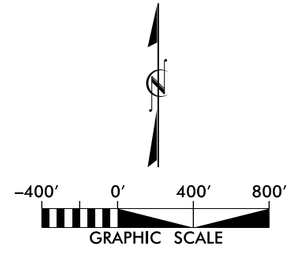
McDOWELL COUNTY, NORTH CAROLINA

LAT: 35.65896 LONG: –81.90710



VICINITY MAP
NOT TO SCALE





INDEX OF SHEETS

DIRECTIONS TO SITE

From Raleigh, take I–40 West to Exit 86. Take a left onto NC–226 South, and travel 2.4 miles. Take a left onto Harmony Grove Road, and travel 1.9 miles. Take a right onto Gaddy Road, and travel 0.25 mile. Take a left onto Hemlock Ridge Drive, and follow the gravel driveway to the project location.

PROJECT DATA

THE SCOPE OF THESE PLANS INCLUDES THE REPAIR OF 6 AREAS ALONG THE EXISTING STREAM RESTORATION PROJECT, NEIGHBORS BRANCH. THIS INCLUDES THE INSTALLATION OF CONSTRUCTED RIFFLE STRUCTURES, BANK STABILIZATION, WATER QUALITY TREATMENT AREAS AND PLANTING INSTALLATION.

LIMITS OF DISTURBANCE = 2.25 ACRES

NOTE: THIS AREA REPRESENTS THE ENTIRE AREA POSSIBLE FOR THE CONTRACTOR TO WORK WITHIN. IT IS EXPECTED THAT A LESSER AMOUNT WILL ACTUALLY BE DISTURBED DURING CONSTRUCTION ACTIVITIES.

Prepared In the Office of:

KCI ASSOCIATES OF NC

ENGINEERS • PLANNERS • SCIENTISTS

4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

KRISTIN E. KNIGHT, PE
PROJECT ENGINEER

ALEX FRENCH
PROJECT DESIGNER

Prepared for:

NCDEQ – DIVISION OF MITIGATION SERVICES

MATTHEW REID
DMS PROJECT MANAGER

LIN XU
DMS REVIEW COORDINATOR

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 040899 ENGINEER KRISTIN E. KNIGHT

SIGNATURE: 9-27-2021 P.E.

GENERAL NOTES:

UTILITY/SUBSURFACE PLANS:

* NO SUBSURFACE PLANS ARE AVAILABLE ON THIS PROJECT. EXISTING UNDERGROUND UTILITIES HAVE NOT BEEN VERIFIED. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING A UTILITY LOCATOR AND ESTABLISHING THE EXACT LOCATION OF ANY AND ALL EXISTING UTILITIES IN THE PROJECT REACH.

THE BASE FILE USED IN THESE CONSTRUCTION DOCUMENTS WAS CREATED BY COMBINING THE ORIGINAL STREAM AS-BUILT SURVEY AND THE DATA GATHERED BY KCI ASSOCIATES OF NC ON JUNE 1, 2021. PLEASE NOTE THAT ALL KCI CONTROL POINTS AND PROFILES SHOWN INSIDE THESE PLANS ARE BASED OFF OF ASSUMED COORDINATES. TOPOGRAPHY SHOWN IN PLANS IS BUILT FROM 'NC FLOODPLAIN MAPPING PROGRAM' LIDAR, USING THE PHASE 5 2017 QL1 DATA SET.

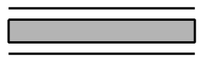
AS-BUILT DRAWINGS FOR THE ORIGINAL NEIGHBORS BRANCH RESTORATION PROJECT WERE ISSUED AND SEALED BY ELISABETH G. TURNER, PLS L-4440 ON SEPTEMBER 17, 2015, PRIOR TO THIS PROPOSED PROJECT.

CONTROL POINTS

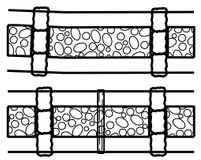
POINT	DESC.	NORTHING	EASTING	ELEV
1	KCI#1	706687087.00	1138093.79	1000.00
2	KCI#2	706687022.31	1137987.98	992.99
3	KCI#3	706687039.38	1138233.70	1020.06
4	KCI#4	707061.82	1137943.71	1000.00
5	KCI#5	707087.09	1138113.98	1009.00
6	KCI#6	706997.38	1137883.03	996.94
10	KCI#10	708113.47	1138987.36	1000.00
11	KCI#11	708089.43	1138792.99	1018.11
12	KCI#12	708074.43	1139009.42	1002.35
13	KCI#13	708367.23	1139345.91	1000.00
14	KCI#14	708309.16	1139328.42	1000.16
15	KCI#15	708403.91	1139393.29	1000.64

PROJECT LEGEND

PROPOSED 'RIFFLE ENHANCEMENT' .....
(REPAIR AREAS 1, 2, 3, 4 & 5)

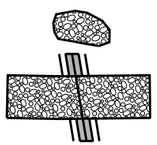


PROPOSED 'RIFFLE GRADE CONTROL WITH BOULDER DROPS' .....
(REPAIR AREAS 1, 3 & 5)



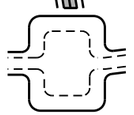
PROPOSED 'CASCADE RIFFLE WITH LIVE LIFT' .....
(REPAIR AREA 6)

PROPOSED 'STONE PROTECTION' .....
(SEE NOTES IN PLAN SHEETS)



PROPOSED 'ROCK FORD CROSSING' .....
(REPAIR AREAS 1 & 3)

PROPOSED 'WATER QUALITY TREATMENT AREA' .....
(REPAIR AREAS 2 & 3)



NORTH CAROLINA PROFESSIONAL SEAL 040899 ENGINEER KRISTIN E. KATO

09-27-2021

REVISIONS

NORTH CAROLINA
Environmental Quality

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

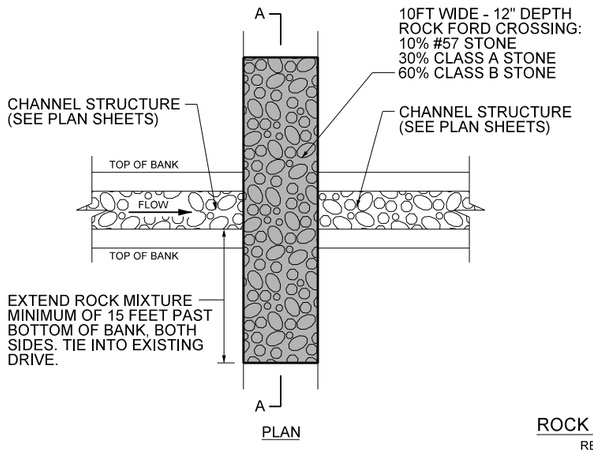
NEIGHBORS BRANCH REPAIR
DMS # 92872

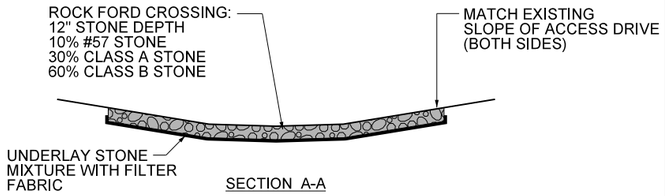
MCDOWELL COUNTY, NORTH CAROLINA

DATE: AUGUST 2021
SCALE: GRAPHIC

GENERAL NOTES, CONTROL POINTS & LEGEND

SHEET 2 OF 19



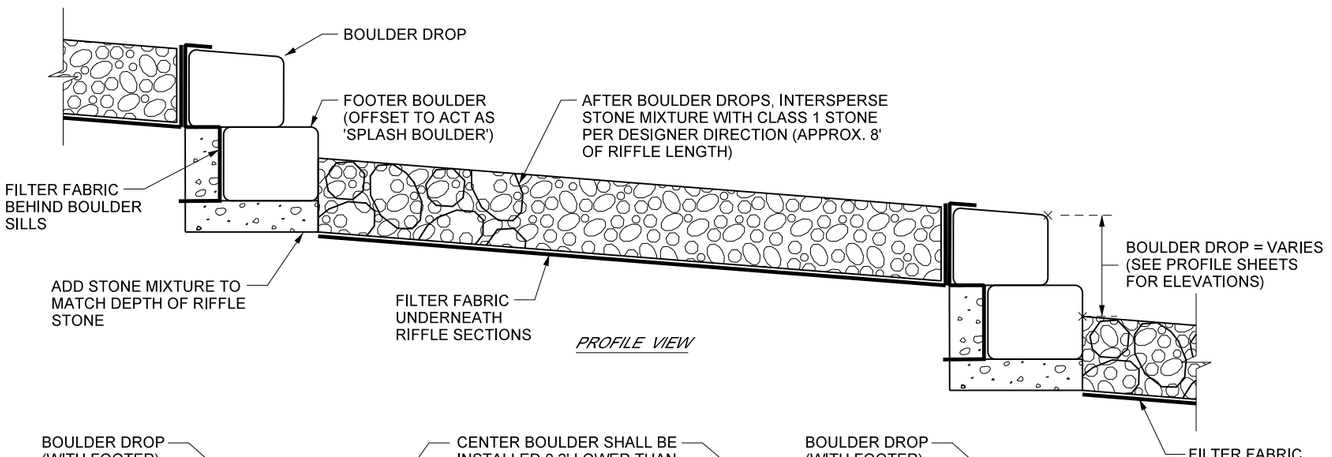


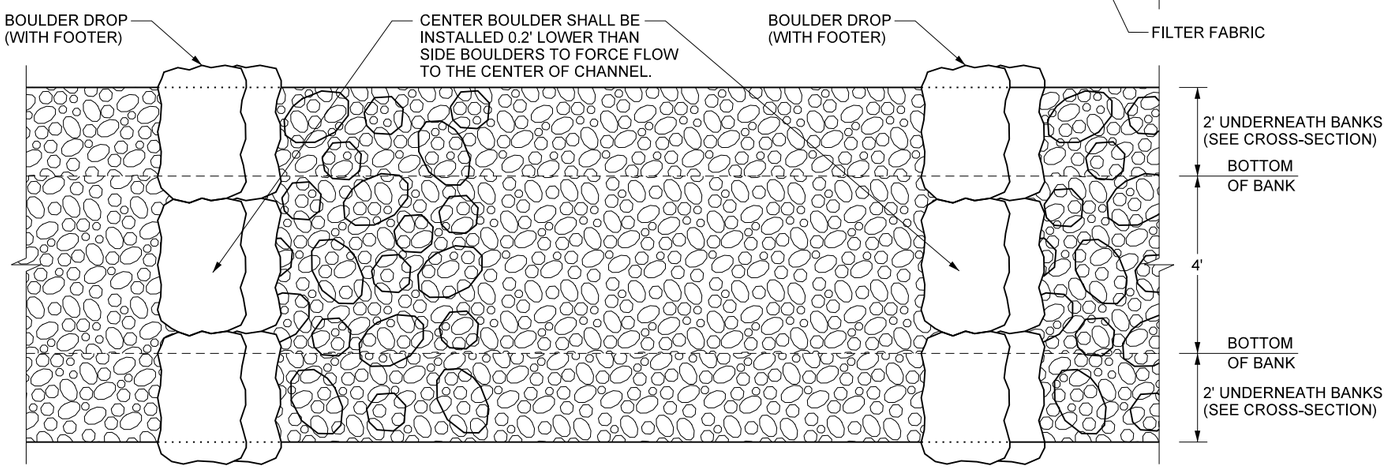
NOTE:

TOP 2" OF ROCK MIXTURE SHALL BE FINISHED WITH A COMBINATION OF #57 STONE AND NATIVE BED MATERIAL TO ENSURE THAT A SMOOTH, TAMPED SURFACE.

ROCK FORD CROSSING

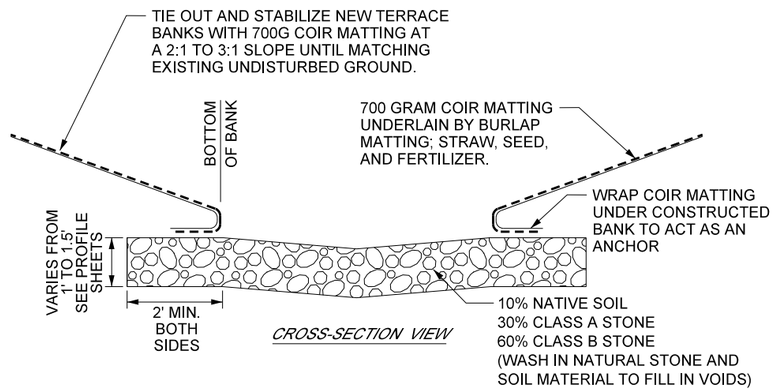
REPAIR AREAS 2 & 3





RIFFLE GRADE CONTROL WITH BOULDER DROPS

REPAIR AREAS 1, 3 & 5



NOTES:

START BY INSTALLING STONE / SOIL MIXTURE. FINISH BY WASHING IN NATURAL STREAM BED / NATIVE MATERIAL TO FILL IN VOIDS AND OBTAIN FINAL GRADE. ENSURE THAT THE MIXTURE IS WELL PACKED TO MINIMIZE WATER PIPING.

WRAP COIR MATTING UNDER CONSTRUCTED BANK THROUGHOUT ENTIRE STRUCTURE LENGTH.

BOULDERS SHOULD BE APPROX. 2'x1.5'x3' IN SIZE (WxDxL).

FILTER FABRIC SHALL SPAN THE ENTIRE LENGTH OF EACH RIFFLE; AND EXTEND UPWARD AT BOULDER SILL TO HELP FORCE FLOW OVER EACH BOULDER DROP.

USE 1.5'x2"x2" WOODEN STAKES (WITH NAIL AT TOP) AT 3' SPACING ALONG ALL NEW BANKS TO SECURE COIR MATTING. 1' ECOSTAKES CAN BE USED FOR TIE-OUTS.

CREATE STONE MIXTURE RAMP UNDERNEATH NEW BANKS AT BOULDER DROPS TO ALLOW FOR SMOOTH TRANSITION TO LOWER BANK ELEVATION.

BOULDER DROP NOTE:

LOCATIONS WITH 1' BOULDER DROPS WILL ONLY REQUIRE A SINGLE BOULDER IF LARGE ENOUGH BOULDERS ARE USED. COORDINATE WITH DESIGNER PRIOR TO INSTALLATION TO ENSURE BOULDER SIZE IS ADEQUATE. 1.5' AND 2' DROPS WILL REQUIRE A FOOTER BOULDER - 2 BOULDERS. SEE BOULDER SIZING IN NOTES ABOVE.

NORTH CAROLINA PROFESSIONAL SEAL 040899 ENGINEER KRISTIN E. KIRCHER

09-27-2021

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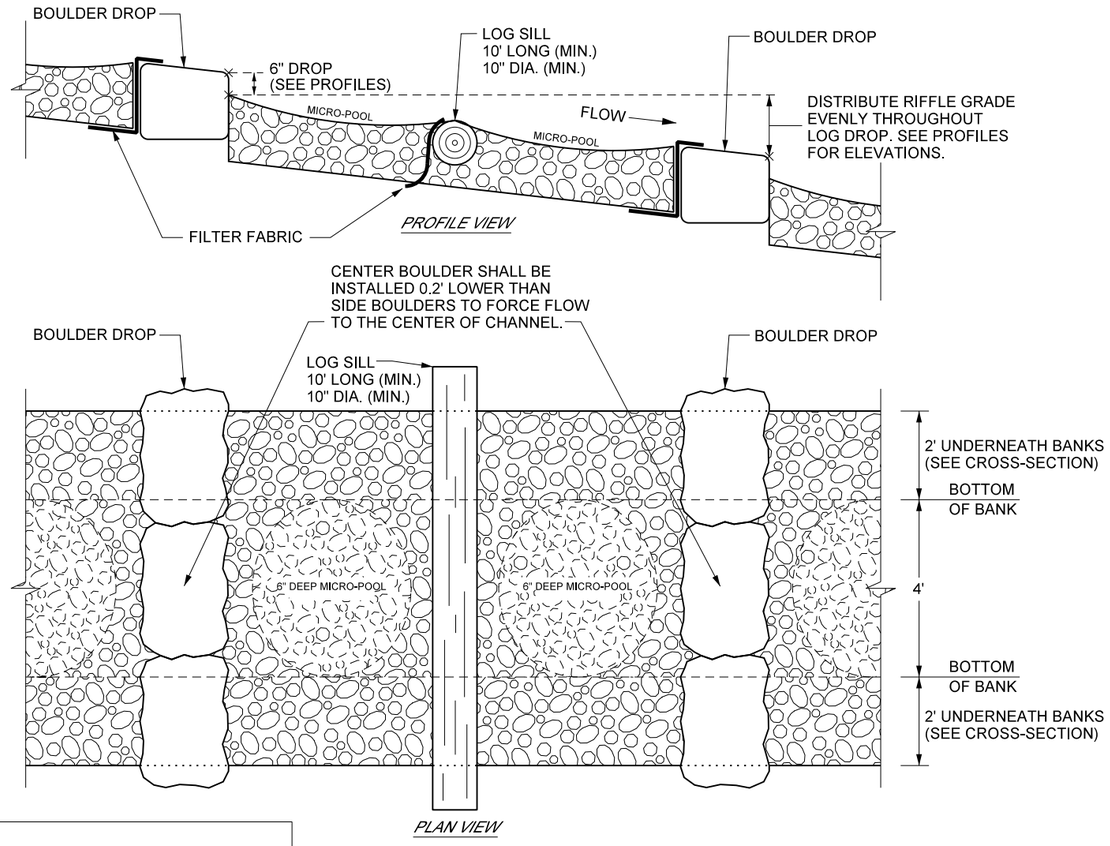
NEIGHBORS BRANCH REPAIR
DMS # 92872
MCDOWELL COUNTY, NORTH CAROLINA

DATE: AUGUST 2021
SCALE: N.T.S.

DETAILS

SHEET 3 OF 19



NOTES:

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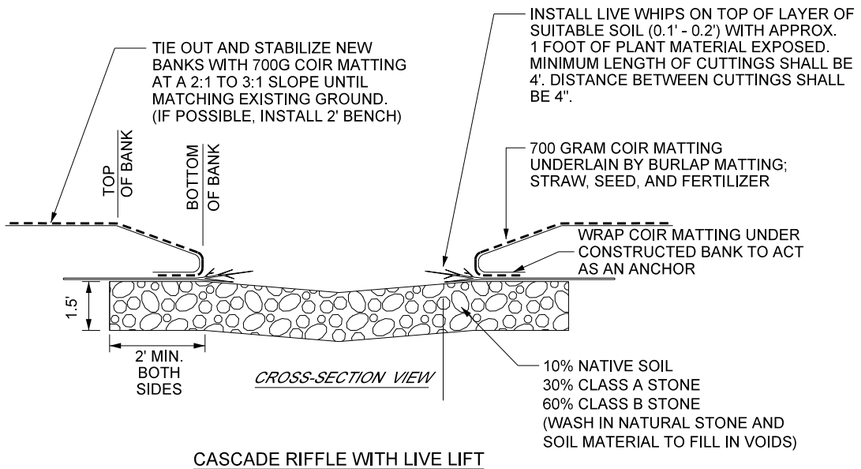
WRAP COIR MATTING UNDER CONSTRUCTED BANK THROUGHOUT ENTIRE STRUCTURE LENGTH.

BOULDERS SHOULD BE APPROX. 2'x1.5'x3' IN SIZE (WxDxL). IF BOULDERS ARE LESS THAN 2' IN DEPTH, THEN A ROW OF FOOTER BOULDERS WILL NEED TO BE ADDED TO MEET THE DESIRED 2' MINIMUM DEPTH OF THE SILL.

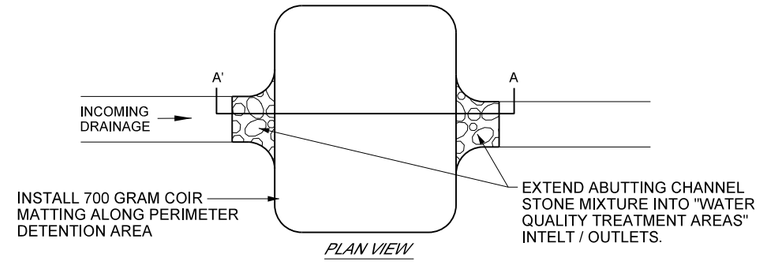
FILTER FABRIC SHALL BE INSTALLED BEHIND EACH BOULDER AND LOG SILL TO HELP FORCE FLOW TO THE SURFACE AND OVER THE SILLS.

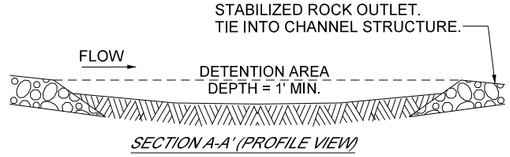
USE 1.5'x2"x2" WOODEN STAKES (WITH NAIL AT TOP) AT 3' SPACING ALONG ALL NEW BANKS TO SECURE COIR MATTING. 1' ECOSTAKES CAN BE USED FOR TIE-OUTS.



CASCADE RIFFLE WITH LIVE LIFT

REPAIR AREA 6





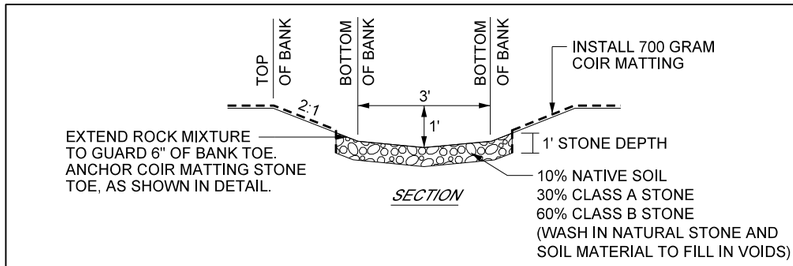
NOTES:

EXACT DIMENSIONS OF WATER QUALITY TREATMENT AREA TO BE COORDINATED WITH DESIGN REPRESENTATIVE AT TIME OF INSTALLATION.

ONCE TREATMENT AREA IS GRADED, DETENTION AREA WILL HAVE SEED (TEMPORARY/PERMANENT MIX) AND STRAW INSTALLED.

WATER QUALITY TREATMENT AREA

(REPAIR AREAS 2 & 3



STONE INSTALLATION:

START BY INSTALLING STONE / SOIL MIXTURE. FINISH BY WASHING IN NATURAL STREAM BED MATERIAL TO FILL IN VOIDS AND OBTAIN FINAL GRADE. ENSURE THAT THE MIXTURE IS WELL PACKED TO MINIMIZE WATER PIPING.

FABRIC STAKING NOTE:

USE 1.5'x2"x2" WOODEN STAKES (WITH NAIL AT TOP) AT 3' SPACING ALONG ALL NEW BANKS TO SECURE COIR MATTING. 1' ECOSTAKES CAN BE USED FOR TIE-OUTS.

RIFFLE ENHANCEMENT

REPAIR AREAS 1, 2, 3, 4 & 5

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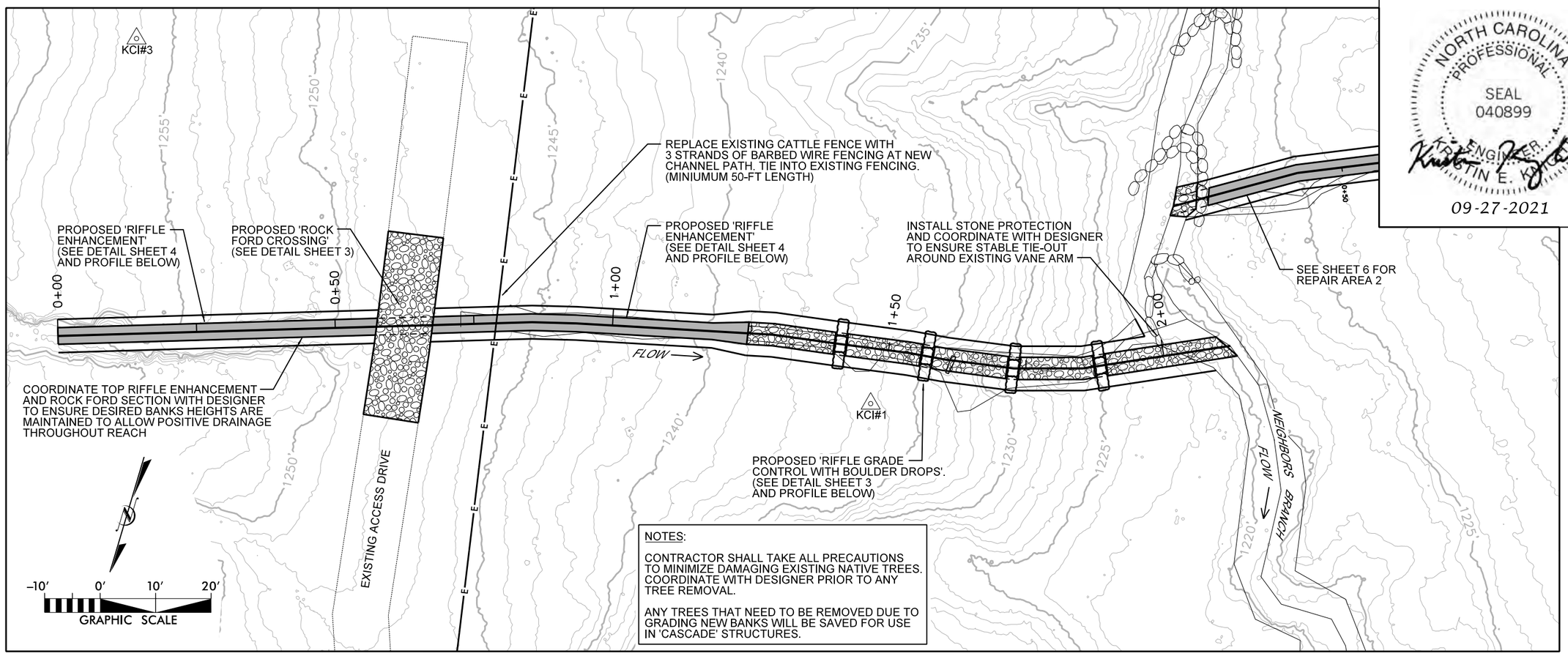
SCALE: N.T.S.

DETAILS

SHEET 4 OF 19

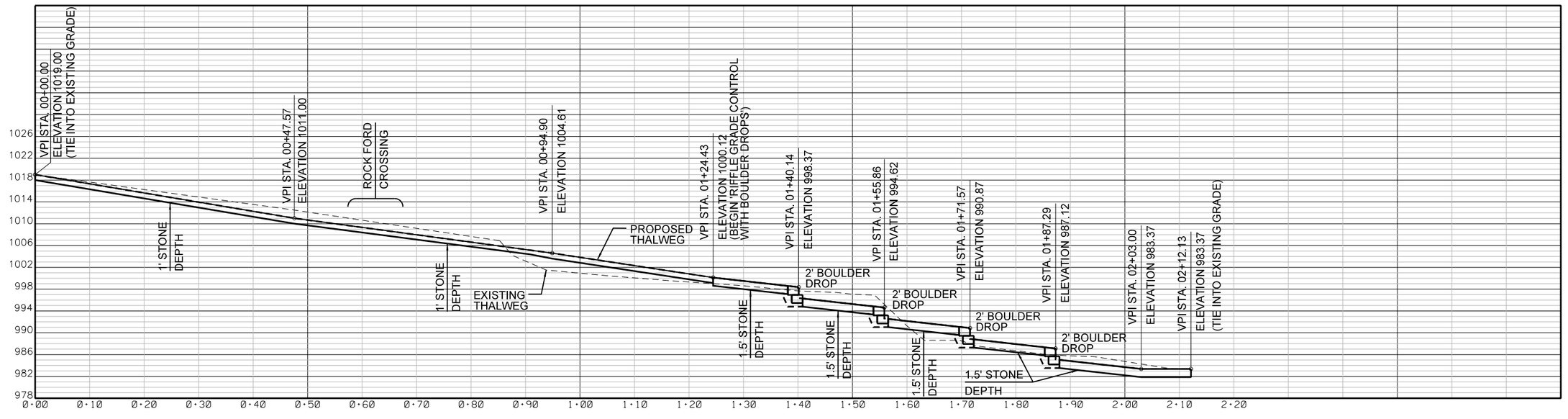


NOTES:

CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGING EXISTING NATIVE TREES. COORDINATE WITH DESIGNER PRIOR TO ANY TREE REMOVAL.

ANY TREES THAT NEED TO BE REMOVED DUE TO GRADING NEW BANKS WILL BE SAVED FOR USE IN 'CASCADE' STRUCTURES.

** NOTE: ALL PROFILE ELEVATIONS SHOULD BE CONSIDERED FINISHED GRADE FOLLOWING STRUCTURE INSTALLATION **



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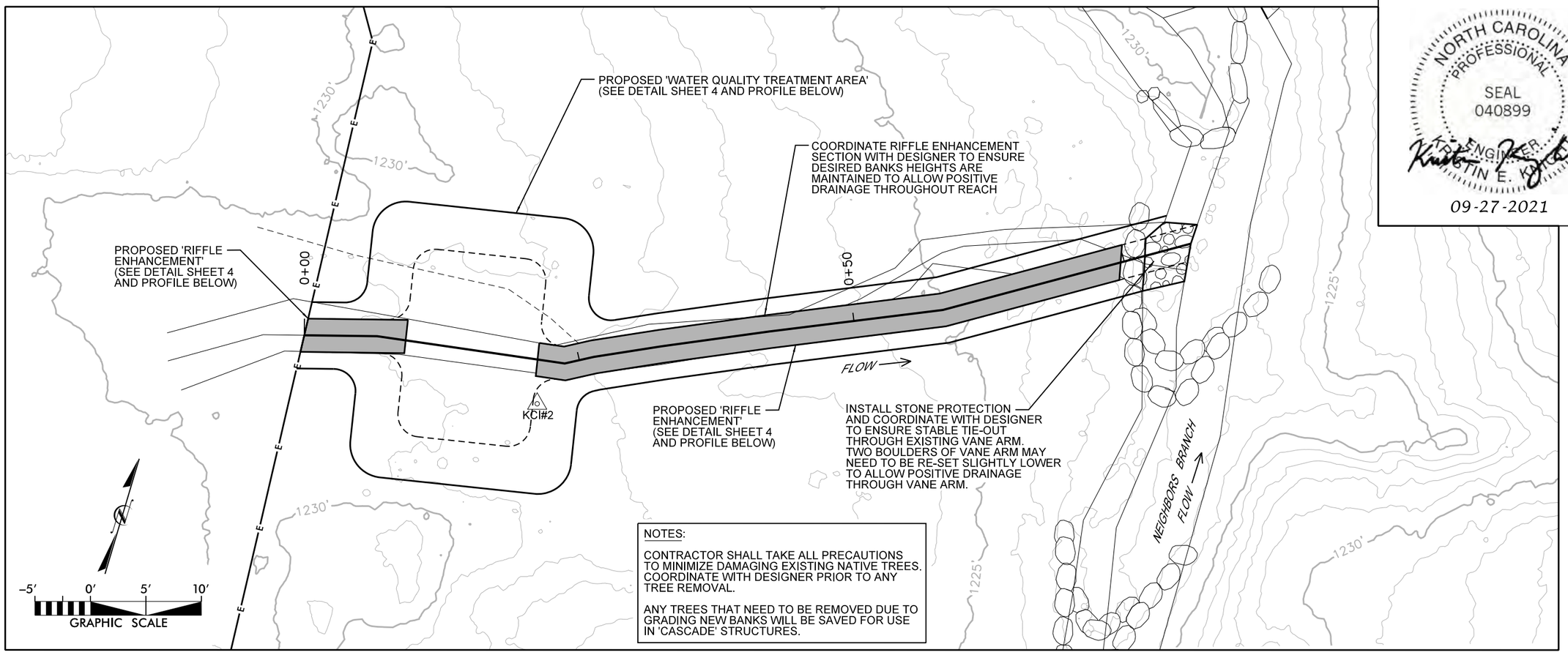
REPAIR AREA 1

SHEET 5 OF 19



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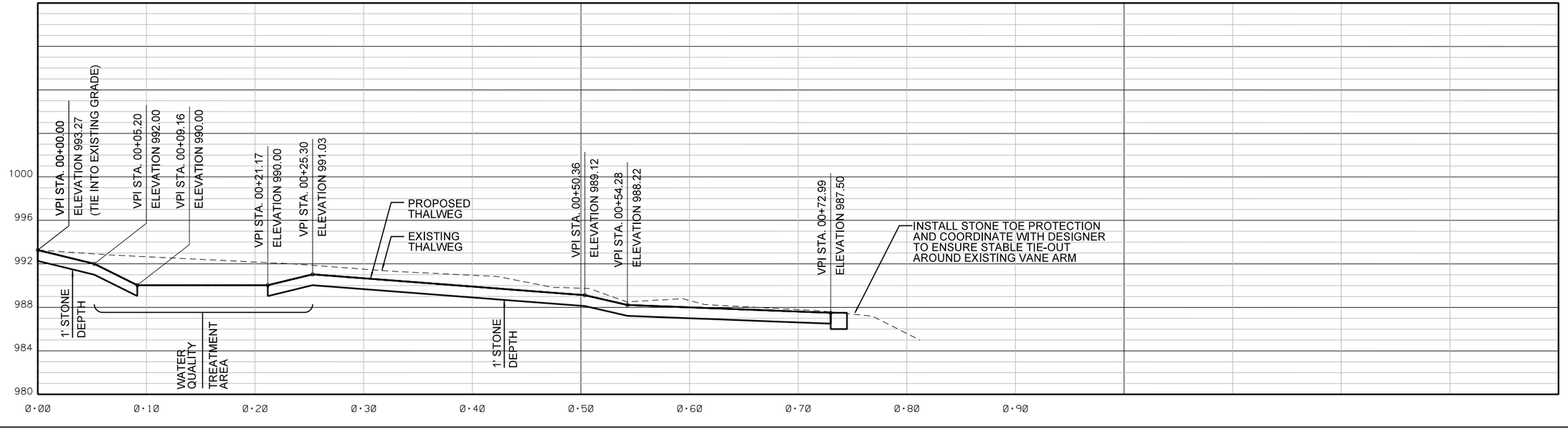

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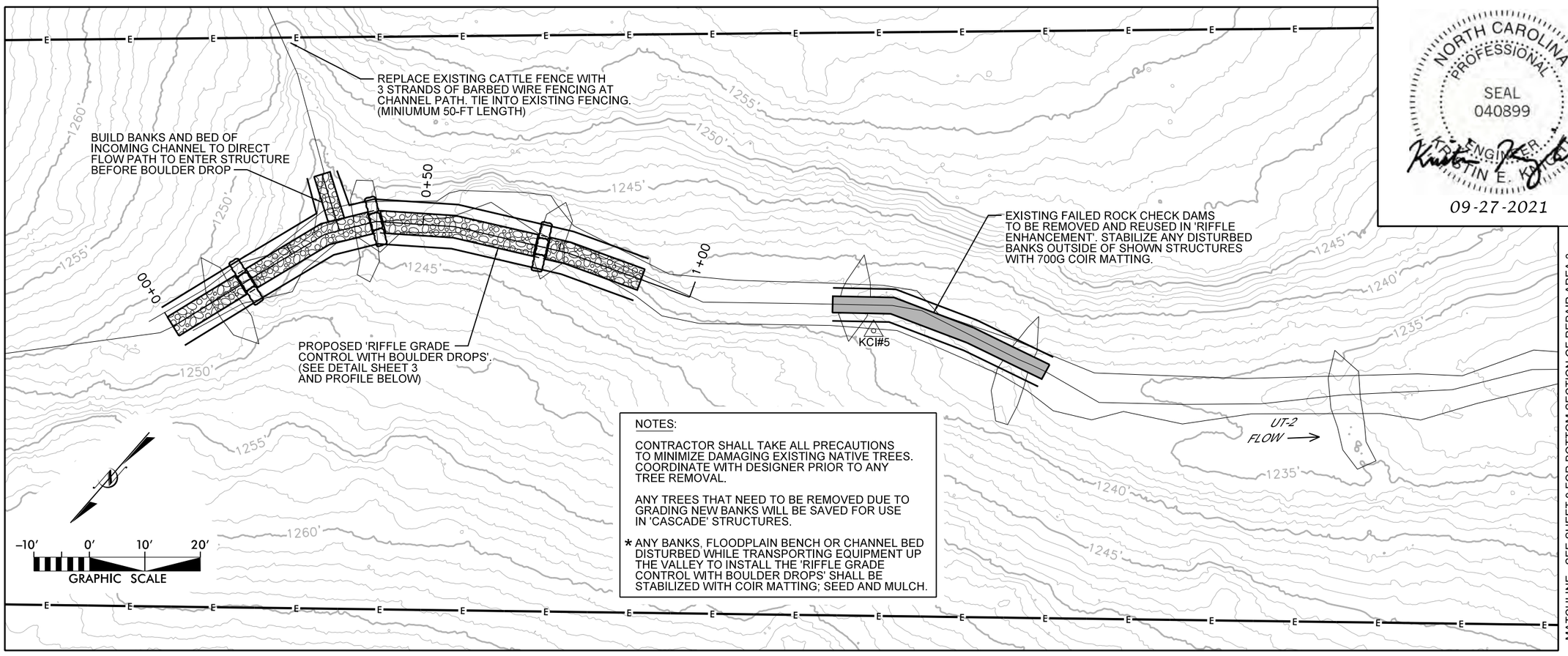
REPAIR AREA 2

SHEET 6 OF 19



NOTES:

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ANY TREES THAT NEED TO BE REMOVED DUE TO GRADING NEW BANKS WILL BE SAVED FOR USE IN 'CASCADE' STRUCTURES.

* ANY BANKS, FLOODPLAIN BENCH OR CHANNEL BED DISTURBED WHILE TRANSPORTING EQUIPMENT UP THE VALLEY TO INSTALL THE 'RIFFLE GRADE CONTROL WITH BOULDER DROPS' SHALL BE STABILIZED WITH COIR MATTING; SEED AND MULCH.

** NOTE: ALL PROFILE ELEVATIONS SHOULD BE CONSIDERED FINISHED GRADE FOLLOWING STRUCTURE INSTALLATION **

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REPAIR AREA 3 (TOP)

SHEET 7 OF 19

MATCHLINE - SEE SHEET 7 FOR TOP SECTION OF REPAIR AREA 3

EXISTING ROCK CHECK DAMS CAUSING BANK EROSION SHALL BE REMOVED AND DISTRIBUTED THROUGH CHANNEL BED. COORDINATE WITH DESIGNER PRIOR TO STARTING WORK.

PROPOSED 'RIFFLE ENHANCEMENT' (SEE DETAIL SHEET 4 AND PROFILE BELOW)

PROPOSED 'ROCK FORD CROSSING' (SEE DETAIL SHEET 3) COORDINATE WITH DESIGNER TO ENSURE DESIRED BANKS HEIGHTS ARE MAINTAINED TO ALLOW POSITIVE DRAINAGE THROUGH ROAD CROSSING.

PROPOSED 'RIFFLE GRADE CONTROL WITH BOULDER DROPS'. (SEE DETAIL SHEET 3 AND PROFILE BELOW)

REPLACE EXISTING CATTLE FENCE WITH 3 STRANDS OF BARBED WIRE FENCING AT NEW CHANNEL PATH. TIE INTO EXISTING FENCING; MINIUMUM 50-FT LENGTH FOR EACH SIDE OF THE ROAD. (ANY FALLEN FENCING SHALL BE REPLACED WITH 3 STRANDS OF BARBED WIRE FENCING)

PROPOSED 'RIFFLE ENHANCEMENT' (SEE DETAIL SHEET 4 AND PROFILE BELOW)

PROPOSED 'WATER QUALITY TREATMENT AREA' (SEE DETAIL SHEET 4 AND PROFILE BELOW)

KCI#4

EXISTING ACCESS DRIVE

UT-2 FLOW

NEIGHBORS BRANCH FLOW

1+00

0+00

50+0

1240'

1235'

1230'

1225'

1220'

1215'

–10′ 0′ 10′ 20′

GRAPHIC SCALE

NOTES:

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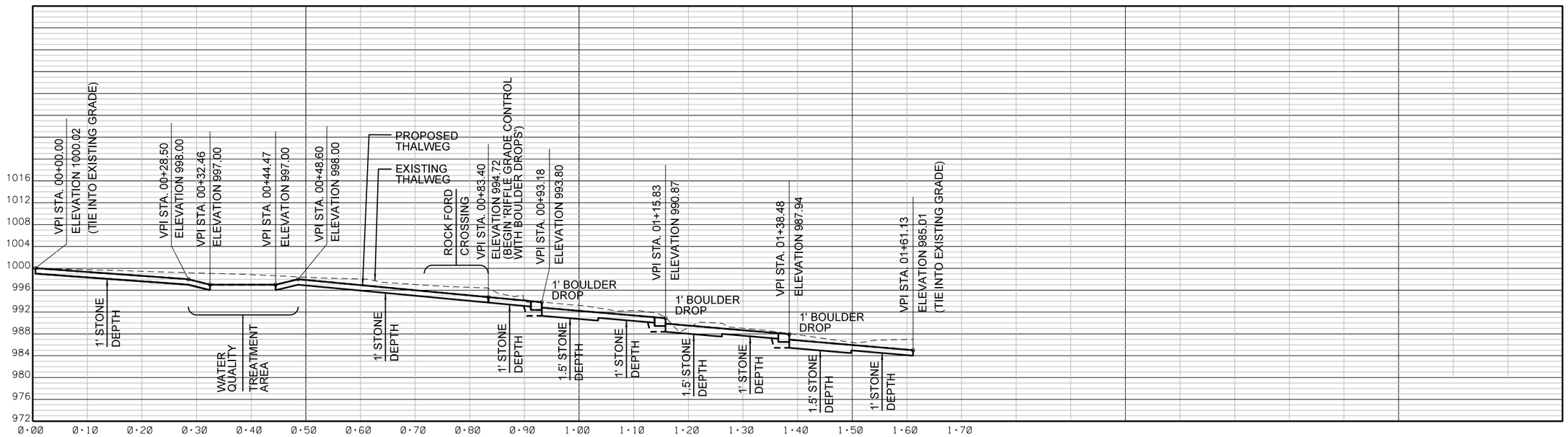

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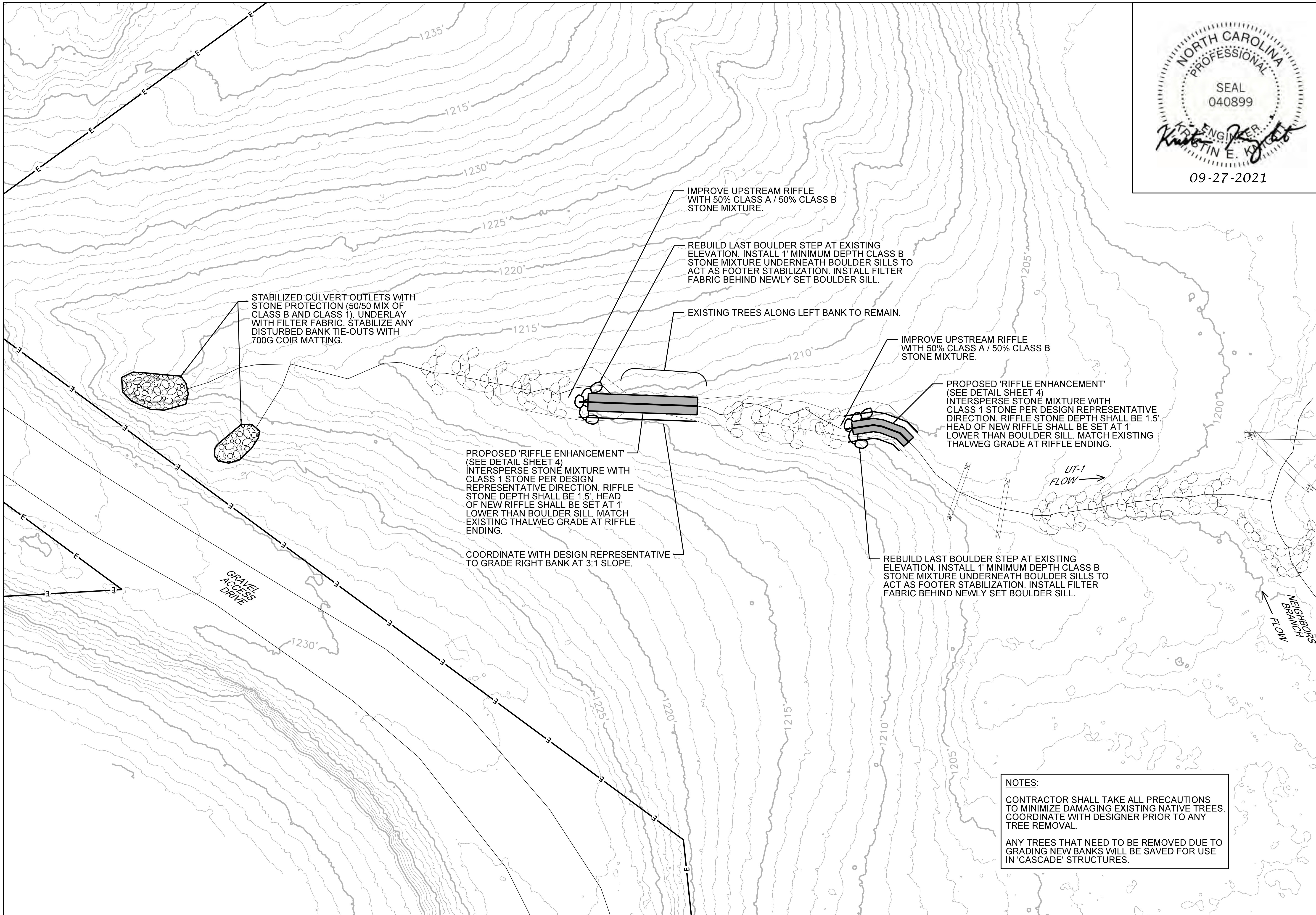
REPAIR AREA 3 (BOTTOM)

SHEET 8 OF 19



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REPAIR AREA 4

SHEET 9 OF 19

NOTES:

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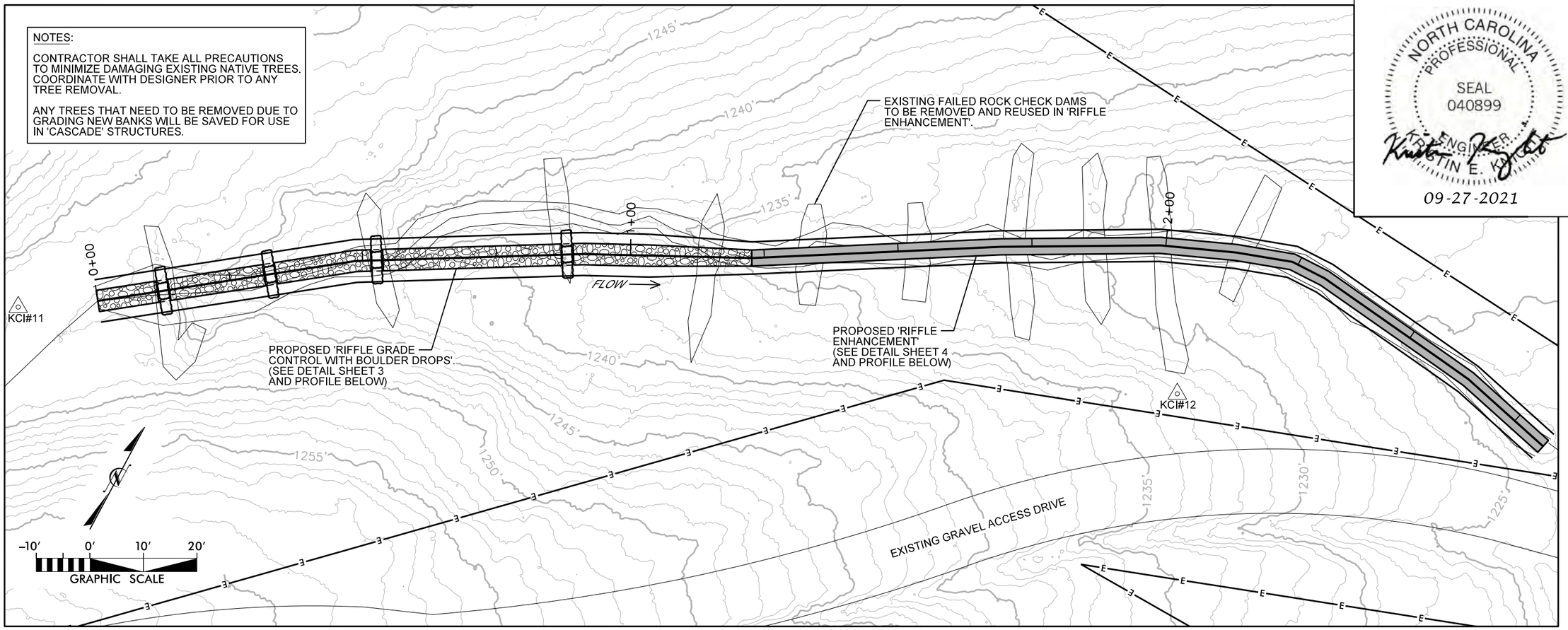

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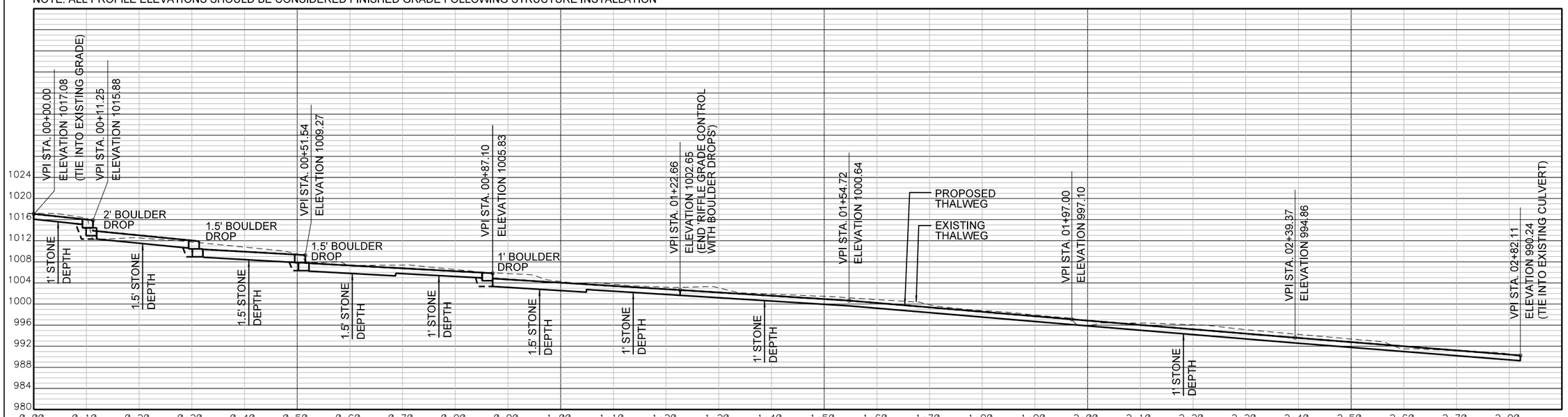

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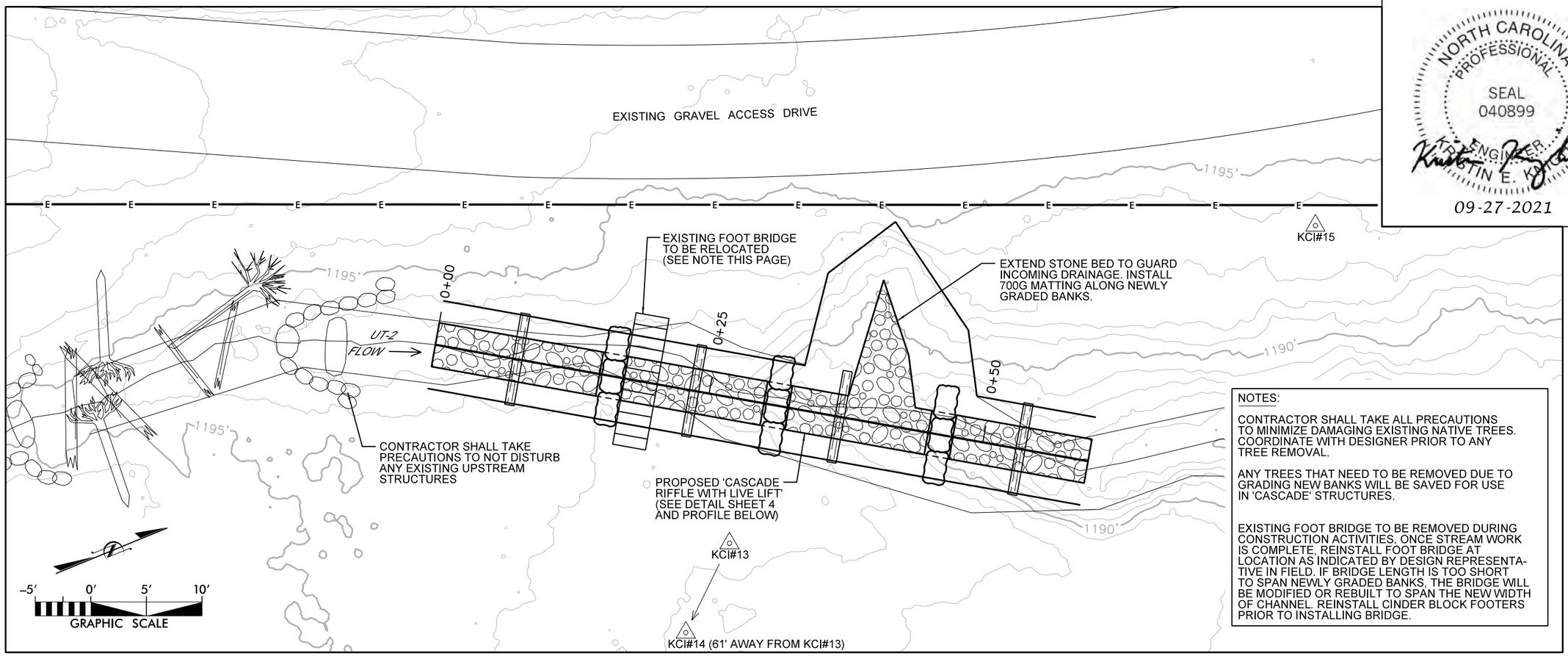
REPAIR AREA 5

SHEET 10 OF 19



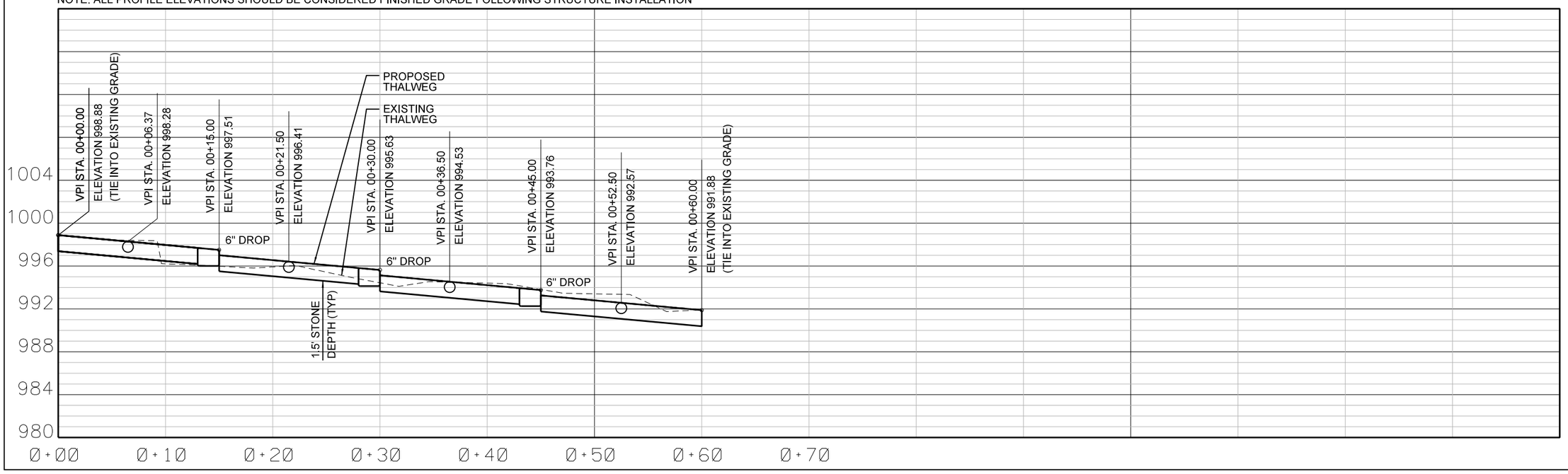
NOTES:

CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGING EXISTING NATIVE TREES. COORDINATE WITH DESIGNER PRIOR TO ANY TREE REMOVAL.

ANY TREES THAT NEED TO BE REMOVED DUE TO GRADING NEW BANKS WILL BE SAVED FOR USE IN 'CASCADE' STRUCTURES.

EXISTING FOOT BRIDGE TO BE REMOVED DURING CONSTRUCTION ACTIVITIES. ONCE STREAM WORK IS COMPLETE, REINSTALL FOOT BRIDGE AT LOCATION AS INDICATED BY DESIGN REPRESENTATIVE IN FIELD. IF BRIDGE LENGTH IS TOO SHORT TO SPAN NEWLY GRADED BANKS, THE BRIDGE WILL BE MODIFIED OR REBUILT TO SPAN THE NEW WIDTH OF CHANNEL. REINSTALL CINDER BLOCK FOOTERS PRIOR TO INSTALLING BRIDGE.

** NOTE: ALL PROFILE ELEVATIONS SHOULD BE CONSIDERED FINISHED GRADE FOLLOWING STRUCTURE INSTALLATION **



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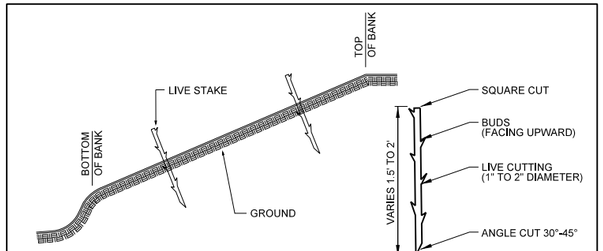
REPAIR
AREA 6

SHEET 11 OF 19



LIVE STAKES DETAIL

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09-27-2021

SEDIMENTATION AND EROSION CONTROL NOTES:

1. IT IS THE INTENT OF THESE PLANS THAT AS SOON AS AN AREA OF GRADING IS COMPLETE IT SHALL BE STABILIZED IN ACCORDANCE WITH THE EROSION CONTROL PRACTICES DESCRIBED IN THESE PLANS.DUE TO THE ANTICIPATED DURATION AND SEQUENCE OF THE CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS REQUIRED TO MINIMIZE, AS MUCH AS POSSIBLE, THE AMOUNT OF THE AREA THAT IS DISTURBED AT ONE TIME.
2. THE CONTRACTOR SHALL EXERCISE EVERY REASONABLE PRECAUTION THROUGHOUT THE CONSTRUCTION OF THE PROJECT TO PREVENT EROSION AND SEDIMENTATION. EROSION CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE PROJECT PLANS, NORTH CAROLINA SEDIMENT AND EROSION CONTROL GUIDELINES AND AS DIRECTED BY THE DESIGNER.
3. IN THE EVENT OF A STORM, THE CONTRACTOR WILL BE RESPONSIBLE FOR REMOVAL OR PROTECTION OF ANY EQUIPMENT, TOOLS, MATERIALS OR OTHER ITEMS NEEDED TO COMPLETE THE WORK THAT COULD BE AFFECTED BY STORMWATER.
4. EACH SEDIMENT CONTROL DEVICE WILL BE REMOVED AFTER ALL WORK IN THE CORRESPONDING CONSTRUCTION PHASE HAS BEEN COMPLETED AND ADEQUATE PERMANENT GROUND COVER HAS BEEN RE-ESTABLISHED ON THE DISTURBED AREAS, AS DETERMINED BY THE DESIGNER.
5. THE CONSTRUCTION ENTRANCES AND STAGING AREAS IDENTIFIED ON THE PLANS PROVIDE THE ONLY ACCESS POINTS INTO THE LIMITS OF DISTURBANCE. NO ADDITIONAL ACCESS POINTS SHALL BE USED WITHOUT APPROVAL OF THE DESIGNER.
6. ALL EXCAVATED MATERIAL SHALL BE STOCKPILED WITHIN THE LIMITS OF DISTURBANCE FOR LATER USE AS FILL MATERIAL. SILT FENCE SHALL BE INSTALLED ON THE LOW SIDE OF ANY TEMPORARY OR PERMANENT SPOIL AND TOPSOIL PILES. THESE SPOIL PILES SHALL ALSO BE SEEDED AND MULCHED FOR VEGETATIVE STABILIZATION WITHIN 7 DAYS THAT THEY ARE CREATED. ALL SPOIL MATERIAL SHALL STAY ON THE SITE AND SHALL NOT BE REMOVED FROM THE SUBJECT PROPERTY WITHOUT DESIGNER APPROVAL.
7. IF EXTRA SOIL IS ACCUMULATED DURING THE INSTALLATION OF THE NEW STREAM STRUCTURES AND BANK GRADING, AND CAN NOT BE INSTALLED AT THE REPAIR AREA, THEN THE SOIL DISPOSAL AREAS SHOWN ON SHEETS 18 AND 19 OF THE EROSION CONTROL PLAN WILL BE USED. THE CONTRACTOR SHALL SPREAD THE SOIL OUT EVENLY THROUGHOUT THE ENTIRE ALLOTTED LOCATIONS TO MINIMIZE THE HEIGHT OF THE SOIL PILES. THESE AREAS CAN NOT EXCEED 5-FT IN HEIGHT AND MUST BE INSTALLED IN A MANNER TO SMOOTHLY TRANSITION THE PERIMETER OF THE AREAS INTO THE EXISTING GRADES. CONTRACTOR SHALL COORDINATE ANY DISPOSAL ACTIVITIES WITH THE DESIGNER PRIOR TO STARTING. SEE NOTE 6 ABOVE FOR SILT FENCE AND SEEDING STABILIZATION SCHEDULE.
8. ALL EROSION AND SEDIMENT CONTROL PRACTICES WILL BE CHECKED FOR STABILITY AND FUNCTIONAL OPERATION FOLLOWING EVERY RUNOFF PRODUCING RAIN EVENT AND/OR AT LEAST ONCE PER WEEK. ANY NEEDED MAINTENANCE OR REPAIRS SHALL BE MADE IMMEDIATELY TO MAINTAIN ALL MEASURES AS DESIGNED. ACCUMULATED SEDIMENT SHALL BE REMOVED FROM CONTROL MEASURES WHEN THEY REACH APPROXIMATELY 50% OF THEIR FUNCTIONAL CAPACITY. THESE MEASURES SHALL BE REPAIRED IF DISTURBED DURING MAINTENANCE. ALL SEEDED AREAS SHALL BE FERTILIZED, RESEEDED AND MULCHED, AS NECESSARY, TO PROMOTE THE ESTABLISHMENT OF VEGETATION COVER.
9. THE CONSTRUCTION MANAGER AND EROSION CONTROL CONTACT FOR THIS SITE IS ALEX FRENCH. OFFICE PHONE (919) 783-9214 / CELL PHONE (919) 523-7995.
10. IF OFFSITE DISPOSAL IS NEEDED, IT SHALL ONLY BE AT THE DISCRETION OF THE DESIGNER AND AT A PERMITTED OFF-SITE FACILITY OR SITE.

SEEDING NOTES:

TEMPORARY SEED MIX

THE CONTRACTOR SHALL UTILIZE THE FOLLOWING SEED/FERTILIZER MIX IN SEEDING ALL DISTURBED AREAS WITHIN THE PROJECT LIMITS:

SUMMER MIX (APRIL 15 - AUGUST 15)
GERMAN MILLET. . . . . SETARIA ITALICA . . . . . 20 LBS / ACRE
BROWNTOP MILLET. . . . UROCHLOA RAMOSA. . . . 20 LBS / ACRE

WINTER MIX (AUGUST 15 - APRIL 15)
RYE GRAIN. . . . . SECALE CEREALE. . . . . 100 LBS / ACRE
WHEAT. . . . . TRITICUM AESTIVUM. . . . . 20 LBS / ACRE

PERMANENT SEED MIX

THE CONTRACTOR SHALL UTILIZE THE FOLLOWING PERMANENT NATIVE SEED MIX (PLUS A TEMPORARY NURSE CROP-SEE TECHNICAL SPECIFICATIONS) AND FERTILIZER SPECIFICATION IN ALL STREAMSIDE AND FLOODPLAIN NATURAL AREAS .

		APPLICATION RATE (IN MIX)
PERMANENT NATIVE SPECIES	% OF MIX	LBS / ACRE
VIRGINIA WILD RYE -- ELYMUS VIRGINICUS	35	8.75
BEAKED PANIC GRASS -- PANICUM ANCEPS	20	5.00
RIVER OATS -- CHASMANTHIUM LATIFOLIUM	30	7.50
DEER TONGUE -- DICHANTHELIUM CLANDESTINUM	5	1.25
FOX SEDGE -- CAREX VULPINOIDEA	5	1.25
REDTOP -- AGROSTIS ALBA	5	1.25
TOTAL	100	25

FERTILIZER AND LIMESTONE SHALL BE APPLIED AT THE RATE OF 500 LBS / ACRE AND 2000 LBS / ACRE, RESPECTIVELY.
FERTILIZER SHALL BE 5-10-10 ANALYSIS. UPON SOIL ANALYSIS A DIFFERENT RATIO OF FERTILIZER MAY BE USED.

SEEDBED PREPARATION

THE SEEDBED SHALL BE COMPRISED OF LOOSE SOIL AND NOT COMPACTED. THIS MAY REQUIRE LIGHT MECHANICAL LOOSENING OF THE SOIL. SOIL AMENDMENTS SHOULD FOLLOW THE FERTILIZER AND LIMING DESCRIPTION IN THE ABOVE SECTIONS. FOLLOWING SEEDING, MULCHING SHALL FOLLOW THE BELOW APPLICATION METHODS AND AMOUNTS.

MULCHING

SEEDED AREAS ARE TO BE PROTECTED BY SPREADING STRAW MULCH UNIFORMLY TO FORM A CONTINUOUS BLANKET (75% COVERAGE = 2 TONS/ACRE) OVER SEEDED AREAS. CONTRACTOR MAY PROPOSE ALTERNATE METHODS OF SEED, FERTILIZER AND LIMING (HYDRO-SEEDING) UPON SUBMISSION TO THE DESIGNER OF CALCULATIONS SHOWING THE EQUIVALENCY OF THE PROPOSED METHOD.

PLANTING NOTES:

BARE ROOT PLANTING

BARE ROOT PLANTS SHALL BE PLANTED THROUGHOUT ALL DISTURBED AREAS WITHIN THE CONSERVATION EASEMENT; INCLUDING AREAS WHERE CONTAINER PLANTS ARE INSTALLED. SEE BELOW FOR PLANTING SCHEDULE.

12" - 18" BARE ROOT MATERIAL
435 STEMS/ACRE (10' X 10' SPACING), RANDOM SPECIES PLACEMENT

COMMON NAME	SCIENTIFIC NAME
AMERICAN SYCAMORE	PLATANUS OCCIDENTALIS
SOUTHERN RED OAK	QUERCUS FALCATA
RIVER BIRCH	BETULA NIGRA

THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING A SURVIVAL DENSITY OF 320 STEMS/ACRE ON ALL AREAS CLEARED AND PLANTED FOR THE DURATION OF THE FIRST GROWING SEASON FOLLOWING INSTALLATION AND SHALL INCUR THE COST OF REPLACEMENT THROUGH THIS PERIOD.

LIVE STAKE PLANTING

LIVE STAKES SHALL BE INSTALLED AT 2' CENTER SPACING ON ALL DISTURBED STREAM BANKS, AT RANDOM SPECIES PLACEMENT.

AT LEAST THREE OF THE LISTED SPECIES MUST BE INSTALLED AND NO SINGLE LIVE STAKING SPECIES SHALL COMPOSE MORE THAN 40% OF THE TOTAL NUMBER OF LIVE STAKES TO BE INSTALLED.

COIR MATTING AND LIVE STAKES SHALL BE INSTALLED ALONG ANY DISTURBED BANKS WITHIN THE REPAIR AREAS THAT DO NOT HAVE SOIL LIFTS.

COMMON NAME	SCIENTIFIC NAME
BLACK WILLOW	SALIX NIGRA
SILKY WILLOW	SALIX SERICEA
SILKY DOGWOOD	CORNUS AMOMUM
ELDERBERRY	SAMBUCUS CANADENSIS

CONTAINER PLANTS

2 GALLON CONTAINERS,
2 ROWS AT 10' SPACING TO BE INSTALLED ALONG NEW CHANNEL BANKS INSIDE THE CONSERVATION EASEMENT.

COMMON NAME	SCIENTIFIC NAME
AMERICAN SYCAMORE	PLATANUS OCCIDENTALIS
SOUTHERN RED OAK	QUERCUS FALCATA
RIVER BIRCH	BETULA NIGRA

LIVE WHIPS

LIVE WHIPS SHALL BE ½" - 1" IN DIAMETER AND 4-6 FEET IN LENGTH AND BE COMPOSED OF FRESHLY CUT, DORMANT BRANCHES CONSISTING OF A RANDOM MIX MADE UP OF THE FOLLOWING TREES:

COMMON NAME	SCIENTIFIC NAME
BLACK WILLOWS	SALIX NIGRA
SILKY WILLOWS	SALIX SERICEA
SILKY DOGWOOD	CORNUS AMOMUM

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DATE: AUGUST 2021
SCALE: N.T.S.

EROSION CONTROL PLAN

SHEET 12 OF 19

GROUND STABILIZATION AND MATERIALS HANDLING PRACTICES FOR COMPLIANCE WITH THE NCG01 CONSTRUCTION GENERAL PERMIT

Implementing the details and specifications on this plan sheet will result in the construction activity being considered compliant with the Ground Stabilization and Materials Handling sections of the NCG01 Construction General Permit (Sections E and F, respectively). The permittee shall comply with the Erosion and Sediment Control plan approved by the delegated authority having jurisdiction. All details and specifications shown on this sheet may not apply depending on site conditions and the delegated authority having jurisdiction.

SECTION E: GROUND STABILIZATION

Required Ground Stabilization Timeframes		
Site Area Description	**Stabilize within this many calendar days after ceasing land disturbance**	**Timeframe variations**
(a) Perimeter dikes, swales, ditches, and perimeter slopes	7	None
(b) High Quality Water (HQW) Zones	7	None
(c) Slopes steeper than 3:1	7	If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed
(d) Slopes 3:1 to 4:1	14	-7 days for slopes greater than 50' in length and with slopes steeper than 4:1 -7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed
(e) Areas with slopes flatter than 4:1	14	-7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed unless there is zero slope

Note: After the permanent cessation of construction activities, any areas with temporary ground stabilization shall be converted to permanent ground stabilization as soon as practicable but in no case longer than 90 calendar days after the last land disturbing activity. Temporary ground stabilization shall be maintained in a manner to render the surface stable against accelerated erosion until permanent ground stabilization is achieved.

GROUND STABILIZATION SPECIFICATION

Stabilize the ground sufficiently so that rain will not dislodge the soil. Use one of the techniques in the table below:

Temporary Stabilization	Permanent Stabilization
• Temporary grass seed covered with straw or other mulches and tackifiers • Hydroseeding • Rolled erosion control products with or without temporary grass seed • Appropriately applied straw or other mulch • Plastic sheeting	• Permanent grass seed covered with straw or other mulches and tackifiers • Geotextile fabrics such as permanent soil reinforcement matting • Hydroseeding • Shrubs or other permanent plantings covered with mulch • Uniform and evenly distributed ground cover sufficient to restrain erosion • Structural methods such as concrete, asphalt or retaining walls • Rolled erosion control products with grass seed

EQUIPMENT AND VEHICLE MAINTENANCE

1. Maintain vehicles and equipment to prevent discharge of fluids.
2. Provide drip pans under any stored equipment.
3. Identify leaks and repair as soon as feasible, or remove leaking equipment from the project.
4. Collect all spent fluids, store in separate containers and properly dispose as hazardous waste (recycle when possible).
5. Remove leaking vehicles and construction equipment from service until the problem has been corrected.
6. Bring used fuels, lubricants, coolants, hydraulic fluids and other petroleum products to a recycling or disposal center that handles these materials.

LITTER, BUILDING MATERIAL AND LAND CLEARING WASTE

1. Never bury or burn waste. Place litter and debris in approved waste containers.
2. Provide a sufficient number and size of waste containers (e.g dumpster, trash receptacle) on site to contain construction and domestic wastes.
3. Locate waste containers at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
4. Locate waste containers on areas that do not receive substantial amounts of runoff from upland areas and does not drain directly to a storm drain, stream or wetland.
5. Cover waste containers at the end of each workday and before storm events or provide secondary containment. Repair or replace damaged waste containers.
6. Anchor all lightweight items in waste containers during times of high winds.
7. Empty waste containers as needed to prevent overflow. Clean up immediately if containers overflow.
8. Dispose waste off-site at an approved disposal facility.
9. On business days, clean up and dispose of waste in designated waste containers.

PAINT AND OTHER LIQUID WASTE

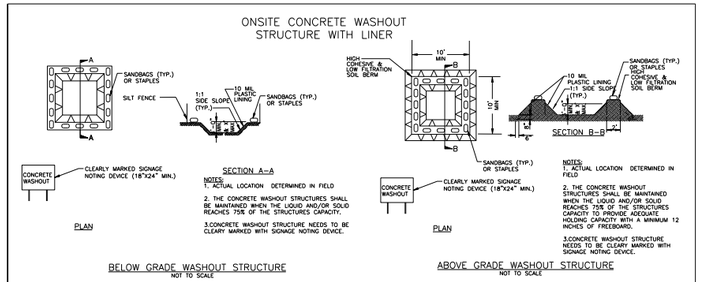
1. Do not dump paint and other liquid waste into storm drains, streams or wetlands.
2. Locate paint washouts at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
3. Contain liquid wastes in a controlled area.
4. Containment must be labeled, sized and placed appropriately for the needs of site.
5. Prevent the discharge of soaps, solvents, detergents and other liquid wastes from construction sites.

PORTABLE TOILETS

1. Install portable toilets on level ground, at least 50 feet away from storm drains, streams or wetlands unless there is no alternative reasonably available. If 50 foot offset is not attainable, provide relocation of portable toilet behind silt fence or place on a gravel pad and surround with sand bags.
2. Provide staking or anchoring of portable toilets during periods of high winds or in high foot traffic areas.
3. Monitor portable toilets for leaking and properly dispose of any leaked material. Utilize a licensed sanitary waste hauler to remove leaking portable toilets and replace with properly operating unit.

EARTHEN STOCKPILE MANAGEMENT

1. Show stockpile locations on plans. Locate earthen-material stockpile areas at least 50 feet away from storm drain inlets, sediment basins, perimeter sediment controls and surface waters unless it can be shown no other alternatives are reasonably available.
2. Protect stockpile with silt fence installed along toe of slope with a minimum offset of five feet from the toe of stockpile.
3. Provide stable stone access point when feasible.
4. Stabilize stockpile within the timeframes provided on this sheet and in accordance with the approved plan and any additional requirements. Soil stabilization is defined as vegetative, physical or chemical coverage techniques that will restrain accelerated erosion on disturbed soils for temporary or permanent control needs.



CONCRETE WASHOUTS

1. Do not discharge concrete or cement slurry from the site.
2. Dispose of, or recycle settled, hardened concrete residue in accordance with local and state solid waste regulations and at an approved facility.
3. Manage washout from mortar mixers in accordance with the above item and in addition place the mixer and associated materials on impervious barrier and within lot perimeter silt fence.
4. Install temporary concrete washouts per local requirements, where applicable. If an alternate method or product is to be used, contact your approval authority for review and approval. If local standard details are not available, use one of the two types of temporary concrete washouts provided on this detail.
5. Do not use concrete washouts for dewatering or storing defective curb or sidewalk sections. Stormwater accumulated within the washout may not be pumped into or discharged to the storm drain system or receiving surface waters. Liquid waste must be pumped out and removed from project.
6. Locate washouts at least 50 feet from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available. At a minimum, install protection of storm drain inlet(s) closest to the washout which could receive spills or overflow.
7. Locate washouts in an easily accessible area, on level ground and install a stone entrance pad in front of the washout. Additional controls may be required by the approving authority.
8. Install at least one sign directing concrete trucks to the washout within the project limits. Post signage on the washout itself to identify this location.
9. Remove leavings from the washout when at approximately 75% capacity to limit overflow events. Replace the tarp, sand bags or other temporary structural components when no longer functional. When utilizing alternative or proprietary products, follow manufacturer's instructions.
10. At the completion of the concrete work, remove remaining leavings and dispose of in an approved disposal facility. Fill pit, if applicable, and stabilize any disturbance caused by removal of washout.

HERBICIDES, PESTICIDES AND RODENTICIDES

1. Store and apply herbicides, pesticides and rodenticides in accordance with label restrictions.
2. Store herbicides, pesticides and rodenticides in their original containers with the label, which lists directions for use, ingredients and first aid steps in case of accidental poisoning.
3. Do not store herbicides, pesticides and rodenticides in areas where flooding is possible or where they may spill or leak into wells, stormwater drains, ground water or surface water. If a spill occurs, clean area immediately.
4. Do not stockpile these materials onsite.

HAZARDOUS AND TOXIC WASTE

1. Create designated hazardous waste collection areas on-site.
2. Place hazardous waste containers under cover or in secondary containment.
3. Do not store hazardous chemicals, drums or bagged materials directly on the ground.

NCG01 GROUND STABILIZATION AND MATERIALS HANDLING

EFFECTIVE: 04/01/19

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NEIGHBORS BRANCH REPAIR
DMS # 92872
MCDOWELL COUNTY, NORTH CAROLINA

DATE: AUGUST 2021
SCALE: N.T.S.

EROSION CONTROL PLAN

SHEET 13A OF 19

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION A: SELF-INSPECTION

Self-inspections are required during normal business hours in accordance with the table below. When adverse weather or site conditions would cause the safety of the inspection personnel to be in jeopardy, the inspection may be delayed until the next business day on which it is safe to perform the inspection. In addition, when a storm event of equal to or greater than 1.0 inch occurs outside of normal business hours, the self-inspection shall be performed upon the commencement of the next business day. Any time when inspections were delayed shall be noted in the Inspection Record.

Inspect	Frequency (during normal business hours)	Inspection records must include:
(1) Rain gauge maintained in good working order	Daily	Daily rainfall amounts. If no daily rain gauge observations are made during weekend or holiday periods, and no individual-day rainfall information is available, record the cumulative rain measurement for those un-attended days (and this will determine if a site inspection is needed). Days on which no rainfall occurred shall be recorded as "zero." The permittee may use another rain-monitoring device approved by the Division.
(2) E&SC Measures	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	1. Identification of the measures inspected, 2. Date and time of the inspection, 3. Name of the person performing the inspection, 4. Indication of whether the measures were operating properly, 5. Description of maintenance needs for the measure, 6. Description, evidence, and date of corrective actions taken.
(3) Stormwater discharge outfalls (SDOs)	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	1. Identification of the discharge outfalls inspected, 2. Date and time of the inspection, 3. Name of the person performing the inspection, 4. Evidence of indicators of stormwater pollution such as oil sheen, floating or suspended solids or discoloration, 5. Indication of visible sediment leaving the site, 6. Description, evidence, and date of corrective actions taken.
(4) Perimeter of site	At least once per 7 calendar days and within 24 hours of a rain event > 1.0 inch in 24 hours	If visible sedimentation is found outside site limits, then a record of the following shall be made: 1. Actions taken to clean up or stabilize the sediment that has left the site limits, 2. Description, evidence, and date of corrective actions taken, and 3. An explanation as to the actions taken to control future releases.
(5) Streams or wetlands onsite or offsite (where accessible)	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	If the stream or wetland has increased visible sedimentation or a stream has visible increased turbidity from the construction activity, then a record of the following shall be made: 1. Description, evidence and date of corrective actions taken, and 2. Records of the required reports to the appropriate Division Regional Office per Part III, Section C, Item (2)(a) of this permit.
(6) Ground stabilization measures	After each phase of grading	1. The phase of grading (installation of perimeter E&SC measures, clearing and grubbing, installation of storm drainage facilities, completion of all land-disturbing activity, construction or redevelopment, permanent ground cover). 2. Documentation that the required ground stabilization measures have been provided within the required timeframe or an assurance that they will be provided as soon as possible.

NOTE: The rain inspection resets the required 7 calendar day inspection requirement.

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION B: RECORDKEEPING

1. E&SC Plan Documentation

The approved E&SC plan as well as any approved deviation shall be kept on the site. The approved E&SC plan must be kept up-to-date throughout the coverage under this permit. The following items pertaining to the E&SC plan shall be kept on site and available for inspection at all times during normal business hours.

Item to Document	Documentation Requirements
(a) Each E&SC measure has been installed and does not significantly deviate from the locations, dimensions and relative elevations shown on the approved E&SC plan.	Initial and date each E&SC measure on a copy of the approved E&SC plan or complete, date and sign an inspection report that lists each E&SC measure shown on the approved E&SC plan. This documentation is required upon the initial installation of the E&SC measures or if the E&SC measures are modified after initial installation.
(b) A phase of grading has been completed.	Initial and date a copy of the approved E&SC plan or complete, date and sign an inspection report to indicate completion of the construction phase.
(c) Ground cover is located and installed in accordance with the approved E&SC plan.	Initial and date a copy of the approved E&SC plan or complete, date and sign an inspection report to indicate compliance with approved ground cover specifications.
(d) The maintenance and repair requirements for all E&SC measures have been performed.	Complete, date and sign an inspection report.
(e) Corrective actions have been taken to E&SC measures.	Initial and date a copy of the approved E&SC plan or complete, date and sign an inspection report to indicate the completion of the corrective action.

2. Additional Documentation to be Kept on Site

In addition to the E&SC plan documents above, the following items shall be kept on the site and available for inspectors at all times during normal business hours, unless the Division provides a site-specific exemption based on unique site conditions that make this requirement not practical:

(a) This General Permit as well as the Certificate of Coverage, after it is received.

(b) Records of inspections made during the previous twelve months. The permittee shall record the required observations on the Inspection Record Form provided by the Division or a similar inspection form that includes all the required elements. Use of electronically-available records in lieu of the required paper copies will be allowed if shown to provide equal access and utility as the hard-copy records.

3. Documentation to be Retained for Three Years

All data used to complete the e-NOI and all inspection records shall be maintained for a period of three years after project completion and made available upon request. [40 CFR 122.41]

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION C: REPORTING

1. Occurrences that Must be Reported

Permittees shall report the following occurrences:

(a) Visible sediment deposition in a stream or wetland.

(b) Oil spills if:
- They are 25 gallons or more,
- They are less than 25 gallons but cannot be cleaned up within 24 hours,
- They cause sheen on surface waters (regardless of volume), or
- They are within 100 feet of surface waters (regardless of volume).

(c) Releases of hazardous substances in excess of reportable quantities under Section 311 of the Clean Water Act (Ref: 40 CFR 110.3 and 40 CFR 117.3) or Section 102 of CERCLA (Ref: 40 CFR 302.4) or G.S. 143-215.85.

(d) Anticipated bypasses and unanticipated bypasses.

(e) Noncompliance with the conditions of this permit that may endanger health or the environment.

2. Reporting Timeframes and Other Requirements

After a permittee becomes aware of an occurrence that must be reported, he shall contact the appropriate Division regional office within the timeframes and in accordance with the other requirements listed below. Occurrences outside normal business hours may also be reported to the Department's Environmental Emergency Center personnel at (800) 858-0368.

Occurrence	Reporting Timeframes (After Discovery) and Other Requirements
(a) Visible sediment deposition in a stream or wetland	• ***Within 24 hours***, an oral or electronic notification. • ***Within 7 calendar days***, a report that contains a description of the sediment and actions taken to address the cause of the deposition. Division staff may waive the requirement for a written report on a case-by-case basis. • If the stream is named on the NC 303(d) list as impaired for sediment-related causes, the permittee may be required to perform additional monitoring, inspections or apply more stringent practices if staff determine that additional requirements are needed to assure compliance with the federal or state impaired-waters conditions.
(b) Oil spills and release of hazardous substances per Item 1(b)-(c) above	• ***Within 24 hours***, an oral or electronic notification. The notification shall include information about the date, time, nature, volume and location of the spill or release.
(c) Anticipated bypasses [40 CFR 122.41(m)(3)]	• ***A report at least ten days before the date of the bypass, if possible***. The report shall include an evaluation of the anticipated quality and effect of the bypass.
(d) Unanticipated bypasses [40 CFR 122.41(m)(3)]	• ***Within 24 hours***, an oral or electronic notification. • ***Within 7 calendar days,*** a report that includes an evaluation of the quality and effect of the bypass.
(e) Noncompliance with the conditions of this permit that may endanger health or the environment[40 CFR 122.41(l)(7)]	• ***Within 24 hours***, an oral or electronic notification. • ***Within 7 calendar days***, a report that contains a description of the noncompliance, and its causes; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time noncompliance is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. [40 CFR 122.41(l)(6). • Division staff may waive the requirement for a written report on a case-by-case basis.

NCG01 SELF-INSPECTION, RECORDKEEPING AND REPORTING

EFFECTIVE: 04/01/19

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DATE: AUGUST 2021
SCALE: N.T.S.

EROSION CONTROL PLAN

SHEET 13B OF 19

09-27-2021

SEQUENCE OF CONSTRUCTION:

THE CONTRACTOR IS RESPONSIBLE FOR FOLLOWING THE SEQUENCE OF CONSTRUCTION IN ACCORDANCE WITH THE PLANS AND THE FOLLOWING PROVISIONS, AS DIRECTED BY THE DESIGNER. CONSTRUCTION SHALL PROCEED IN THE SPECIFIED MANNER UNLESS OTHERWISE DIRECTED OR APPROVED BY THE DESIGNER. THE FOLLOWING PROVISIONS, ALONG WITH THE INSTRUCTIONS CONTAINED IN THE PLANS, CONSTITUTE THE SEQUENCE OF CONSTRUCTION.

GENERAL SITE NOTES:
- UNDER NO CIRCUMSTANCES SHALL ANY WASTE MATERIAL OR TEMPORARY STOCKPILING MATERIAL BE PLACED IN ANY AREAS OUTSIDE OF THE LIMITS OF DISTURBANCE.
- ALL PUMP AROUND OPERATIONS SHALL BE INSTALLED IN A MANNER THAT IT WILL BE ALLOWED TO RUN 24 HOURS A DAY UNLESS THE CHANNEL WITHIN THE PUMP AROUND LOCATION CAN BE FINISHED AND STABILIZED WITHIN THE WORK DAY.

PHASE 1: INITIAL SITE PREPARATION.
1. IDENTIFY PROJECT BOUNDARY, LIMITS OF DISTURBANCE, SENSITIVE AREAS, STAGING AREA, AND ACCESS POINTS WITH THE DESIGNER.
2. CONSTRUCT THE STAGING AREA IN A MANNER TO SUPPORT THE EXECUTION OF THE PROJECT IN PHASES AS INDICATED IN THE PLANS AND AS DIRECTED BY THE DESIGNER.
3. INSTALL EROSION CONTROL DEVICES IN ACCORDANCE WITH THE SITE STABILIZATION PLAN AND AS DIRECTED BY THE DESIGNER.

PHASE 2: COMPLETE REPAIR AREAS
4. BEFORE CONSTRUCTION ACTIVITIES START, IN AREAS WITH FLOW, INSTALL PUMP AROUND OPERATIONS AS SHOWN IN PLANS.
5. INSTALL CHANNEL STABILIZATION STRUCTURES AND BANK GRADING AS SHOWN IN PLANS.
6. ONCE DISTURBED AREAS AND EXPOSED SLOPES ARE STABILIZED, REMOVE PUMP AROUND SYSTEM AND RETURN FLOW TO THE CHANNEL.
* UPON APPROVAL FROM THE DESIGNER, REPAIR AREAS MAY BE CONSTRUCTED SEQUENTIALLY OR CONCURRENTLY. THE ORDER IN WHICH REPAIR AREAS ARE CONSTRUCTED MUST BE APPROVED BY THE DESIGNER.

PHASE 3: PLANTING
7. LIVE STAKES, BARE ROOT & CONTAINER TREES SHALL BE INSTALLED DURING THE DORMANT SEASON (OCTOBER 28 - APRIL 6). PREPARE AND INSTALL LIVE STAKES, BARE ROOT & CONTAINER TREES IN ACCORDANCE WITH THE BID PACKAGE AND AS DIRECTED BY THE DESIGNER.

PHASE 4: COMPLETION OF PROJECT SITE
8. REMOVE ALL REMAINING WASTE MATERIALS AND RESTORE THE REMAINING STAGING AND STOCKPILING AREAS, ACCESS ROADS, FENCES AND ENTRANCES TO THEIR PRIOR CONDITION. SEED AND MULCH ALL DISTURBED AREAS UTILIZING THE SEED AND MULCH MIXES SPECIFIED IN THE PLANS.

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EROSION CONTROL PLAN

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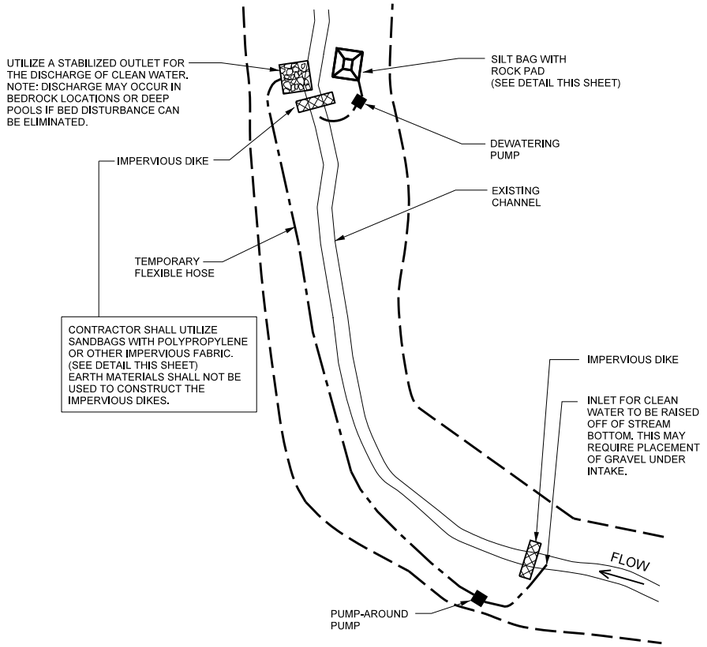


SEQUENCE OF DEWATERING OPERATIONS

* ANY DEVIATION FROM ABOVE DEWATERING PLAN WILL REQUIRE DESIGNER APPROVAL.

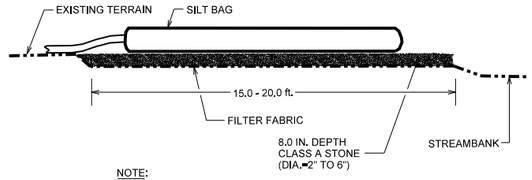
1. INSTALL SILT BAGS(S) AND ROCK PAD(S) AND STABILIZED OUTLET.
2. INSTALL UPSTREAM PUMP AND TEMPORARY FLEXIBLE HOSE.
3. PLACE UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. PLACE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS. DEWATER ENTRAPPED AREA.
5. PERFORM REPAIR WORK IN ACCORDANCE WITH THE PLANS.
6. EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF IMPERVIOUS DIKES. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE (DOWNSTREAM IMPERVIOUS DIKES FIRST).
7. REMOVE SILT BAG(S) AND STABILIZE DISTURBED AREA WITH SEED AND MULCH.

EXAMPLE OF PUMP-AROUND OPERATION

SCALE: NTS

STILLING BASIN MAINTENANCE:

1. SEDIMENT BAGS SHALL BE REPLACED AND DISPOSED OF WHEN IT IS THREE-QUARTERS FULL OF SEDIMENT OR WHEN IT IS IMPRACTICAL FOR THE BAG TO FILTER THE SEDIMENT OUT AT A REASONABLE FLOW RATE.
2. ACCUMULATED SEDIMENT SHOULD BE DISPOSED OF IN A DESIGNATED DISPOSAL AREA.
3. SPENT BAGS SHOULD BE DISPOSED OF PROPERLY AND NOT BURIED.
4. GRAVEL PADS SHOULD BE CHECKED DAILY DURING USE TO ENSURE THAT GRAVEL HAS NOT BEEN WASHED AWAY OR BEEN CHOKED BY EXCESSIVE SEDIMENTATION.
5. REPLACE PAD WITH CLEAN GRAVEL, AS NEEDED.



NOTE:

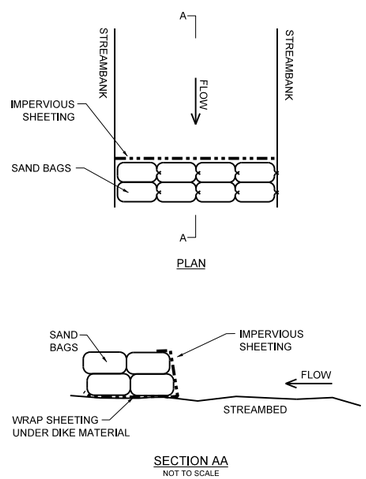
PROVIDE STABILIZED OUTLET DOWN BANK TO STREAM

EXTRA SILT BAGS MUST BE MAINTAINED ON-SITE AND IN CLOSE PROXIMITY TO THE ACTIVE PUMP-AROUND OPERATION.

SILT BAGS MAY NOT BE PLACED ON SLOPES GREATER THAN 5% WITHOUT ADDITIONAL STABILITY MEASURES.

SPECIAL STILLING BASIN (SILT BAG) WITH ROCK PAD

SCALE: NTS



NOTES:

DIKE MATERIAL SHALL BE LARGE SANDBAGS. WATERBAGS MAY BE USED UPON APPROVAL OF THE DESIGNER.

DIKE MATERIAL MAY NOT BE EARTH OR DIRT.

DIKE MATERIAL MUST CONFORM TO THE SHAPE OF THE STREAM CHANNEL AND MUST BE HIGH ENOUGH IN THE CHANNEL TO NOT ALLOW FLOW TO OVERTOP THE DIKE.

IMPERVIOUS SHEETING SHOULD BE PLASTIC OR RUBBER SHEETING THICK ENOUGH TO NOT BE EASILY PUNCTURED GIVEN THE CONDITIONS OF THE CHANNEL.

ROCKS, SANDBAGS, OR OTHER WEIGHTS (NOT DIRT OR EARTH) MAY BE USED TO WEIGH DOWN THE SHEETING TO ENSURE THAT THERE IS PROPER CONTACT BETWEEN THE SHEETING AND THE BANKS AND BED OF THE CHANNEL.

IMPERVIOUS DIKE DETAIL

SCALE: NTS

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EROSION CONTROL PLAN

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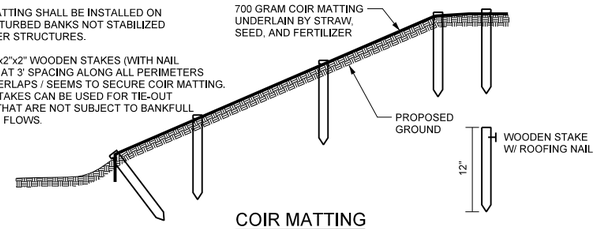
NOTES:

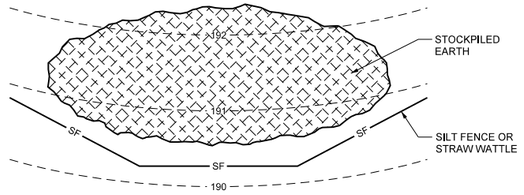
COIR MATTING SHALL BE INSTALLED ON ANY DISTURBED BANKS NOT STABILIZED BY OTHER STRUCTURES.

USE 1.5'x2"x2" WOODEN STAKES (WITH NAIL AT TOP) AT 3' SPACING ALONG ALL PERIMETERS AND OVERLAPS / SEEMS TO SECURE COIR MATTING. 1' ECOSTAKES CAN BE USED FOR TIE-OUT AREAS THAT ARE NOT SUBJECT TO BANKFULL STREAM FLOWS.



COIR MATTING

SCALE: NTS



NOTES:

TEMPORARY SEEDING MUST BE APPLIED TO STOCKPILES IF NOT RELOCATED WITHIN 7 DAYS.

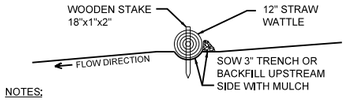
ALL STOCKPILES SHALL BE WITHIN LIMITS OF DISTURBANCE.

SILT FENCE SHALL BE INSTALLED DOWN GRADIENT OF ALL STOCKPILES.

STOCKPILE LOCATIONS DEPICTED ON SITE PLANS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE DEPENDING ON THE AREA THAT IS BEING WORKED UPON. EXACT LOCATION AND QUANTITY OF STOCKPILES WILL BE DETERMINED BY DESIGN REPRESENTATIVE IN THE FIELD.

TEMPORARY STOCKPILE DETAIL

SCALE: NTS



NOTES:

WATTLES SHALL BE INSTALLED ON TOP OF ANY FINISHED BANK OR TERRACE TIE-OUTS THAT ARE SUBJECT TO RILLING.

WATTLES SHALL BE INSTALLED ALONG LOW SIDE OF HAUL ROADS WITH HEAVY USE OR THAT SHOW SEDIMENT ISUUES; OR AS DIRECTED BY DESIGNER.

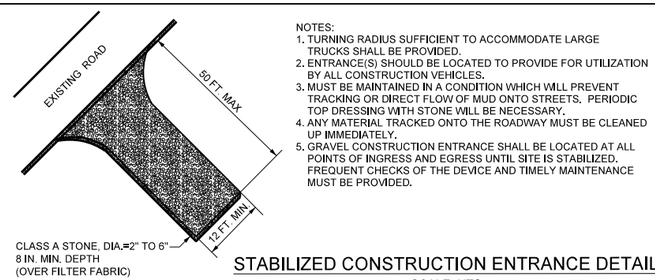
WATTLES SHALL BE INSTALLED ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

ALL WATTLE JUNCTIONS SHALL BE OVERLAPPED AND STAKED TO ENSURE CONTINUOUS PROTECTION.

STAKES SHALL BE INSTALLED ALONG WATTLES AT 5 FEET SPACING.

STRAW WATTLE DETAIL

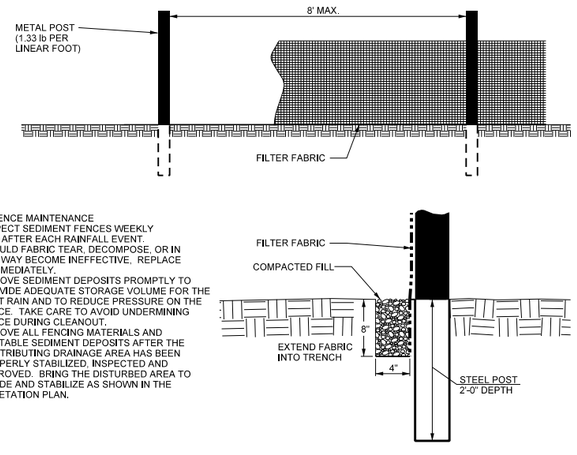
NOT TO SCALE



NOTES:
1. TURNING RADIUS SUFFICIENT TO ACCOMMODATE LARGE TRUCKS SHALL BE PROVIDED.
2. ENTRANCE(S) SHOULD BE LOCATED TO PROVIDE FOR UTILIZATION BY ALL CONSTRUCTION VEHICLES.
3. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOP DRESSING WITH STONE WILL BE NECESSARY.
4. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED UP IMMEDIATELY.
5. GRAVEL CONSTRUCTION ENTRANCE SHALL BE LOCATED AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE MUST BE PROVIDED.

STABILIZED CONSTRUCTION ENTRANCE DETAIL

SCALE: NTS

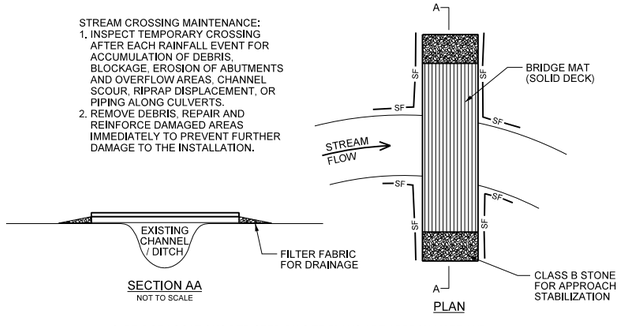


SILT FENCE MAINTENANCE
1. INSPECT SEDIMENT FENCES WEEKLY AND AFTER EACH RAINFALL EVENT.
2. SHOULD FABRIC TEAR, DECOMPOSE, OR IN ANY WAY BECOME INEFFECTIVE, REPLACE IT IMMEDIATELY.
3. REMOVE SEDIMENT DEPOSITS PROMPTLY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING FENCE DURING CLEANOUT.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED, INSPECTED AND APPROVED. BRING THE DISTURBED AREA TO GRADE AND STABILIZE AS SHOWN IN THE VEGETATION PLAN.

SILT FENCE DETAIL

SCALE: NTS

STREAM CROSSING MAINTENANCE:
1. INSPECT TEMPORARY CROSSING AFTER EACH RAINFALL EVENT FOR ACCUMULATION OF DEBRIS, BLOCKAGE, EROSION OF ABUTMENTS AND OVERFLOW AREAS, CHANNEL SCOUR, RIPRAP DISPLACEMENT, OR PIPING ALONG CULVERTS.
2. REMOVE DEBRIS, REPAIR AND REINFORCE DAMAGED AREAS IMMEDIATELY TO PREVENT FURTHER DAMAGE TO THE INSTALLATION.



SECTION AA
NOT TO SCALE

PLAN

1. BRIDGE LOCATIONS DEPICTED ON SITE PLANS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE DEPENDING ON THE AREA THAT IS BEING WORKED UPON. EXACT LOCATION AND QUANTITY OF BRIDGE CROSSINGS WILL BE DETERMINED BY DESIGN REPRESENTATIVE IN THE FIELD.
2. WIDTH OF EACH MAT IS DEPENDENT ON THE SIZE OF THE EQUIPMENT MEANT TO CROSS IT.
3. APPROACH STABILIZATION, COMPOSED OF CLASS B STONE, WILL BE REQUIRED FOR EACH SECTION OF THE BRIDGE.
4. BRIDGE SHALL BE CONSTRUCTED OF A SOLID DECK.

TEMPORARY BRIDGE MAT CROSSING

NORTH CAROLINA PROFESSIONAL SEAL 040899 ENGINEER KRISTIN E. KNOTT

09-27-2021

REVISIONS

NORTH CAROLINA *Environmental Quality*

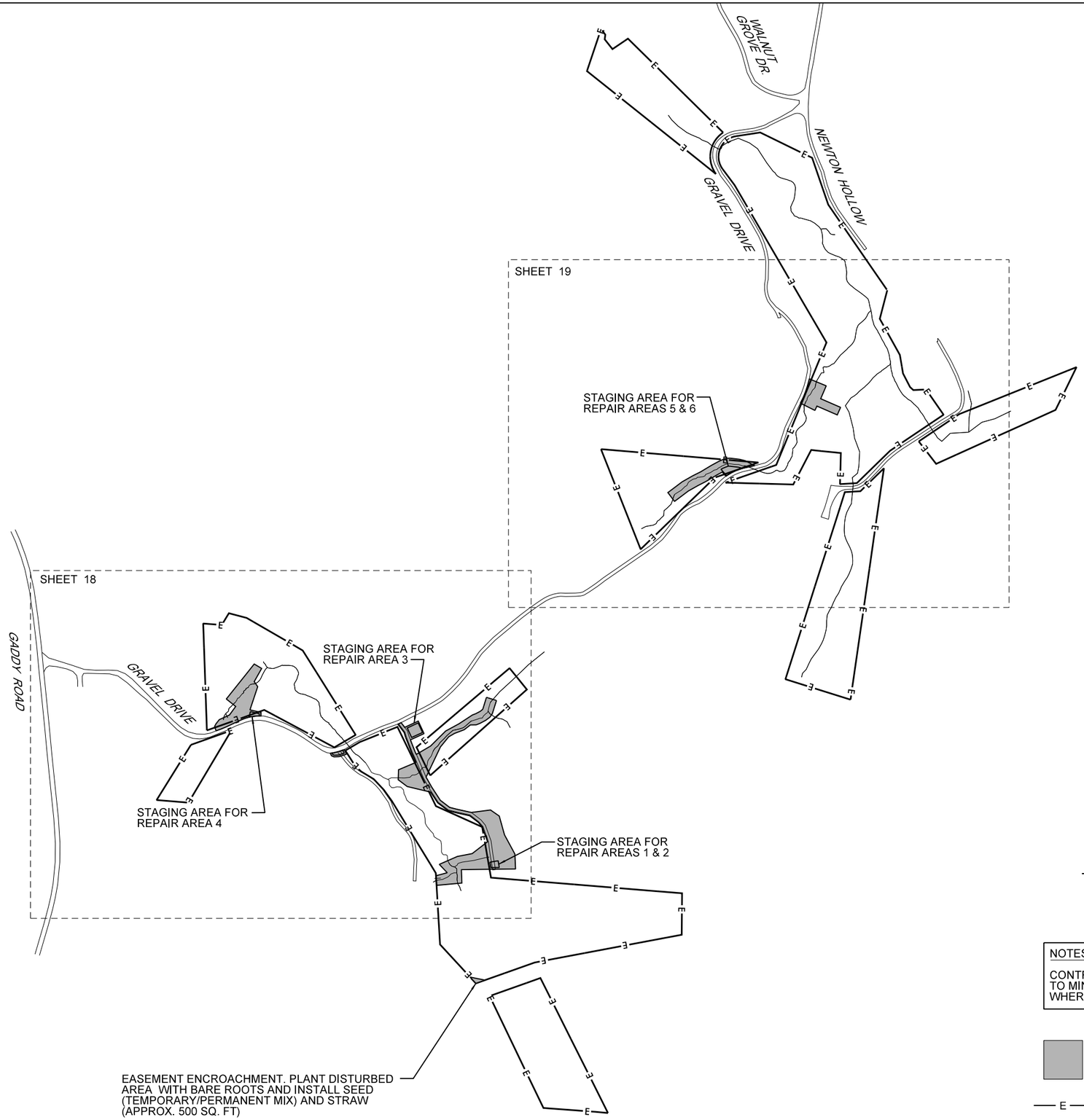
KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

NEIGHBORS BRANCH REPAIR
DMS # 92872
MCDOWELL COUNTY, NORTH CAROLINA

DATE: AUGUST 2021
SCALE: N.T.S.

EROSION CONTROL PLAN

SHEET 16 OF 19



NORTH CAROLINA PROFESSIONAL SEAL 040899 ENGINEER KRISTIN E. KNOTT

09-27-2021

REVISIONS

–200′ 0′ 200′ 400′

GRAPHIC SCALE

NOTES:

CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGING EXISTING NATIVE TREES WHERE POSSIBLE.

LIMITS OF DISTURBANCE: TOTAL = 2.25 ACRES

E EXISTING CONSERVATION EASEMENT

NORTH CAROLINA
Environmental Quality

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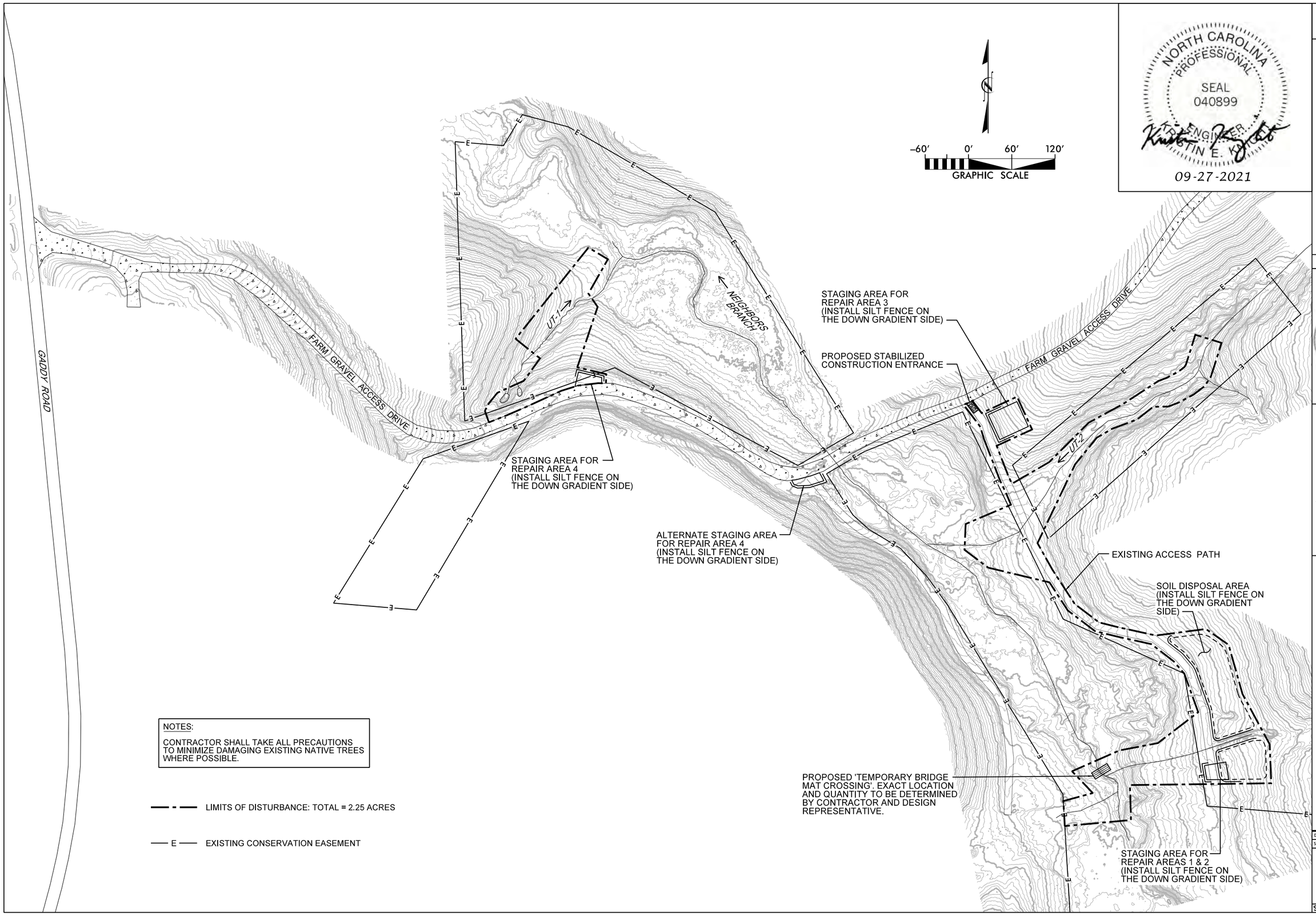
MCDOWELL COUNTY, NORTH CAROLINA

DATE: AUGUST 2021
SCALE: GRAPHIC

EROSION CONTROL PLAN
-OVERVIEW-

SHEET 17 OF 19



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LIMITS OF DISTURBANCE: TOTAL = 2.25 ACRES

E EXISTING CONSERVATION EASEMENT

NORTH CAROLINA PROFESSIONAL SEAL 040899 ENGINEER KRISTIN E. KRAFT

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EROSION CONTROL PLAN

SHEET 18 OF 19

NOTES:

CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGING EXISTING NATIVE TREES WHERE POSSIBLE.

LIMITS OF DISTURBANCE: TOTAL = 2.25 ACRES

E EXISTING CONSERVATION EASEMENT

–60′ 0′ 60′ 120′

GRAPHIC SCALE

PROPOSED 'TEMPORARY BRIDGE MAT CROSSING'. EXACT LOCATION AND QUANTITY TO BE DETERMINED BY CONTRACTOR AND DESIGN REPRESENTATIVE.

SOIL DISPOSAL AREA (INSTALL STRAW WATTLES AROUND ENTIRE AREA)

STAGING AREA FOR REPAIR AREAS 5 & 6 (INSTALL SILT FENCE ON THE DOWN GRADIENT SIDE)

FARM GRAVEL ACCESS DRIVE

UT-2

UT-1

WALTON CRAWLEY BRANCH

NORTH CAROLINA PROFESSIONAL SEAL 040899 ENGINEER KRISTIN E. KNOTT

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SHEET 19 OF 19