UT to Magness Creek Mitigation Project
Mitigation Plan – Final

Cleveland County, North Carolina
Broad River Basin: 03050105
DMS Project ID No. 100081, DMS RFP #16-007400 (Issued: 12/7/2017)
DEQ Contract No. 7604, USACE Action ID SAW-2018-01759, DWR# 20181275

Prepared for:

NC Department of Environmental Quality (DEQ)
Division of Mitigation Services (DMS)
217 West Jones St. – Suite 3000A
Raleigh, North Carolina 27603

July 2021

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF:

July 30, 2021

Regulatory Division

Re: NCIRT Review and USACE Approval of the NCDMS UT to Magness Creek Mitigation Site / Cleveland Co./ SAW-2018-01759/ NCDMS Project # 100081

Mr. Tim Baumgartner
North Carolina Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

Dear Mr. Baumgartner:

The purpose of this letter is to provide the North Carolina Division of Mitigation Services (NCDMS) with all comments generated by the North Carolina Interagency Review Team (NCIRT) during the 30-day comment period for the UT to Magness Draft Mitigation Plan, which closed on May 29, 2021. These comments are attached for your review.

Based on our review of these comments, we have determined that no major concerns have been identified with the Draft Mitigation Plan, which is considered approved with this correspondence. However, several minor issues were identified, as described in the attached comment memo, which must be addressed in the Final Mitigation Plan.

The Final Mitigation Plan is to be submitted with the Preconstruction Notification (PCN) Application for Nationwide permit approval of the project along with a copy of this letter. Issues identified above must be addressed in the Final Mitigation Plan. All changes made to the Final Mitigation Plan should be summarized in an errata sheet included at the beginning of the document. If it is determined that the project does not require a Department of the Army permit, you must still provide a copy of the Final Mitigation Plan, along with a copy of this letter, to the USACE Mitigation Office at least 30 days in advance of beginning construction of the project. Please note that this approval does not preclude the inclusion of permit conditions in the permit authorization for the project, particularly if issues mentioned above are not satisfactorily addressed. Additionally, this letter provides initial approval for the Mitigation Plan, but this does not guarantee that the project will generate the requested amount of mitigation credit. As you are aware, unforeseen issues may arise during construction or monitoring of the project that may require maintenance or reconstruction that may lead to reduced credit.

Thank you for your prompt attention to this matter, and if you have any questions regarding this letter, the mitigation plan review process, or the requirements of the Mitigation Rule, please call me at 919-554-4884, ext 60.

Sincerely,

Kimberly Danielle Browning

Digitally signed by Kimberly Danielle Browning
Date: 2021.07.30 13:15:06 -04'00'

Kim Browning
Mitigation Project Manager
for Tyler Crumbley, Deputy Chief
USACE Regulatory Division

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List
Paul Wiesner—NCDMS
Mickey Clemmons, Scott King—MBI

July 27, 2021

Kim Browning, Mitigation Project Manager
Regulatory Division
US Army Corps of Engineers – Wilmington District
69 Darlington Ave
Wilmington, NC 28403

Subject: Response to IRT Comments for Final Draft Mitigation Plan review
UT to Magness Creek Mitigation Project, Cleveland County, Broad River Basin,
CU# 03050105, DMS Project #100081, DEQ Contract #7604, USACE #SAW-2018-01759

Ms. Browning:

Please find enclosed our responses to the IRT review comments dated July 14, 2021 in reference to the UT to Magness Creek Mitigation Project's Final Draft Mitigation Plan. We have revised the document in response to the referenced review comments as outlined below.

NCWRC Comments, Olivia Munzer:

1. Pg. 3-6 – italicize "Diospyros virginiana"
Response: Correction made.

2. Pg. 3-7, Section 3.1.3 – Fix "Reach 1'sbuffers"
Response: Revision made to final text.

3. Planting list: I recommend using the following website to make sure the species is native to the area/County (https://auth1.dpr.ncparks.gov/flora/index.php)
- Shingle Oak is found in the mountains – find an alternative present in Cleveland Co.
- Overcup and cherrybark oak are not found in Cleveland Co, rather they are found more east.
- Redtop is non-native. Please find alternative that is native to NC and found in Cleveland Co.
- I recommend adding another native pollinator species to the seed mix.

Response: The recommended website was used in the evaluation of the proposed planted species. For the bare root mix, the cited Shingle, Overcup, and Cherrybark oaks were replaced with a mix of Water Oak (*Quercus nigra*) and Pin Oak (*Quercus palustris*). For the seed mix, Redtop has been replaced with the native Autumn bentgrass (*Agrostis perennans*), and spotted beebalm (*Monarda punctata*) was added as an additional native pollinator species.

USACE Comments, Kim Browning:

1. Appendix I, Categorical Exclusions: Please note that NCWRC requested to be alerted if the Broad River spiny crayfish is observed during construction so they can be relocated (letter dated August 17, 2018).

Response: Baker will look for this species during our construction inspection field days and if discovered will alert NCWRC as per their request.

2. Figure 11 and Section 6.5.1: It's noted in Section 3.2.3 that Wetlands F, E and D are not proposed for credit generation. If you anticipate that these wetlands may be needed to meet contract amounts should other parts of the site not meet success, please monitor these areas so data is available, if needed.
Response: Absolutely. If it is ever even a consideration that these wetlands might ultimately be needed for credits Baker will quickly begin monitoring them using appropriate measures.

3. Figure 11: Please ensure that the portion of stream that runs through the crossing is shown as "not for credit" on the figure.
Response: Figure 11 was revised as requested, though Figure 12 is the formal Project Asset and Credit Map and shows that section of stream within the crossing as being 'not for credit' as do the plan sheets and the digital files.

a. Please add a temporary veg plot or transect to Reach 1A near cross-section 1, to include some of the area where the berms/spoil piles are removed.
Response: Baker will include temporary veg transects along the berm/spoil removal area of upper Reach 1A for both the As-Built and MY1 reports to help demonstrate vegetation establishment in this location.

b. Please shift one of the wetland gauges in the southeastern wetland closer to the boundary of the wetland re-establishment area boundary.
Response: The upper gauge location was shifted closer to the boundary as requested.

4. Figures 11 & 12: Please label the three wetland re-establishment polygons for clarity.
Response: Figures revised as requested.

5. Section 4.1, page 4-1: The text states that the crossing will allow livestock access to an area of shade on the other side of the easement. Do you anticipate that livestock will create wallowing areas in the wooded area and create the need for a BMP to filter runoff into the easement?
Response: This shaded area is located along the slope of a dry upland hill adjacent to the project. Since this area will not have any grazing opportunity (with very little in the way of grass) and has no water, it is anticipated that it will only be used during very hot weather. Thus, it is not expected to develop any areas of significant cattle impacts. Also, the vegetated buffer will act as a filter for any potential sediment movement, but again, since there is no running water coming from this area this should be limited.

6. Table 6.1: The reference reach parameter for the reach near Toney Rd has a BHR listed as 3.3, which indicates the channel is incised. I would expect this number to be less than 1.2 for a reference reach.

Response: This reach was selected for several important reasons; it has a very similar drainage area to the main stem; it is located quite close to the project within the same Magness Creek watershed, ecoregion, and geology; and it provided a good confirmation for bankfull depth as it had strong bankfull indicators present. With a BHR of 3.3 it is clearly incised but has also clearly developed a new channel geometry within its incised system. Thus, it was still able to provide good stream data that contributed to the confirmation of design parameters, particularly confirmation of the regional curve describing this site and the accurate bankfull cross-sectional area.

7. Section 6.1 and Appendix K: Thank you for including the information that a rotational grazing plan was developed with NRCS. This information supports the potential success of long-term stewardship of the conservation easement. Two questions arise when looking at the NRCS Conservation Plan Map: Will the eastern side of the easement be fenced through the woods for livestock exclusion? Will the waterline for the cattle watering tanks be co-located with the culverted or ford crossing? Currently it is shown bisecting the stream, south of UT2, and potentially going through portions of the existing wetlands in the conservation easement.
Response: We're glad we were able to obtain an NRCS grazing plan as part of this project and that you appreciated its inclusion to the mitigation plan. The maps within it were assembled by the NRCS agent and intended as more 'big-picture' schematics to show the number and general field locations of features. The pipe for the watering tank will <u>not</u> go through the easement itself but through the crossing at the easement break. The NRCS map primarily just showed new fencing, but new or updated/improved fencing will be installed along the entirety of the easement (and also around the section of the main stem located outside the easement just downstream of the project) as shown in the plan sheets, to include that eastern section through the woods.

8. Page 6-6, UT2: It is understood that the channel is currently perennial and is deeply incised. Do you anticipate that the channel may lose perennial flow when the channel is raised 1-3 feet, especially given the small 31-acre drainage area?
Response: Baker is very confident that flow will be maintained. The bottommost section of Reach UT2 is very steep as it had to cut down to meet the highly incised main stem. This is the area where the greatest channel lift will occur. The majority of the channel will only have comparatively minor lift, which should not cause any concern regarding loss of hydrology. Additionally, flow has been strong throughout the site assessment; never once having been absent in our field visits. It appears to have significant contributions to hydrology from seeps/springs on the adjacent hill slope and in the upstream area.

9. Table 6.2c, page 6-7: The current BHR for UT2 is listed as 7.62 and proposed as 1.0. Will this proposed BHR be attainable considering the reach is described as deeply incised with a BHR greater than 10 in the text on page 6-6, and the channel will only be raised 1-3 feet?
Response: In addition to raising the channel (as discussed above), significant grading of the side slopes will be conducted along this reach to reduce the BHR to the proposed 1.0. The existing stream channel has the top of bank defined by the valley floor that is several feet above the channel. There is no floodplain that can be accessed by this stream flow, even in

extreme flooding. By grading and raising the channel a new top of bank and narrow floodplain will be established below this existing valley floor, at the proper bankfull elevation. We will create a channel with the correct dimension, pattern, and profile, and with a floodplain within the existing deeply incised and overwide channel. This approach mimics what the channel would do naturally over an extended period of time, and if there were no continuing livestock impacts.

10. Section 6.6.2: I suggest that you add the proposed planting date window. You may want to consider listing your planting season to November 15-March 22, or something that coincides with the WETS table information on page 7-3.
Response: A planting date window was provided in Section 6.6.2 (towards the end of the second paragraph) of between November 15th and March 15th. This was taken from the 2016 IRT guidance document. Using the WETS table dates is certainly a good, logical recommendation (and one we might pursue on future projects with IRT consent) but at this point in the review process Baker would prefer to stick with the currently stated dates.

11. Page 8-2: The as-built/baseline report should also include confirmation of easement markings.
Response: Baker will include a confirmation that the entire conservation easement has been appropriately marked with the as-built report.

12. General note: Thank you for the inclusion of site photos to show pre-construction conditions, and for the level of detail in the existing and proposed conditions of the site.
Response: We're glad you appreciated them. We'll try to provide similar information on future projects.

13. Design Sheet 6: Please provide a detail of the proposed BMP, specifically where the stone weir outlet ties into the channel. Will there be an area of concentrated flow that enters the BMP from the adjacent field?
Response: Baker has added a BMP detail as Sheet 12. The BMP outfall will be a rock-lined outlet protection structure, which will tie into the channel of the mainstem, within a riffle as shown in the new detail and on the plans (Sheet 6). There is an existing swale upslope of the proposed BMP where concentrated flow will enter into the BMP's forebay. The BMP is being constructed in the deeply scoured bottommost section of the swale where a headcut currently exists, as shown in the plans on Sheet 6.

<u>DWR Comments, Erin Davis:</u>

1. Page 6-7, Stormwater BMP – Please state whether the designed wet pond BMP necessitates long term maintenance (beyond the 7-yr monitoring period).
Response: There is no expectation of long-term maintenance for the BMP beyond the 7-year monitoring period. The drainage area is vegetated and stable but steep, producing a significant volume of high-velocity runoff (and certainly nutrient-laden from livestock), though not particularly highly sediment-laden runoff. This has resulted in a large headcut

(that *does* generate significant erosion) near the stream, which will be replaced by the BMP designed to slow down the flow and treat the estimated volume of runoff. From past experience Baker believes the potential for forebay cleanout is relegated to the immediate post-construction period before vegetation establishment, which we will correct should it arise. Baker will ensure that the BMP is stable and functioning properly throughout the monitoring period. Similar BMPs have been successfully installed by Baker on previous projects.

2. Page 7-2, Section 7.2 – Based on the planting plan (Sheets 12 & 13) there does not appear to be any undisturbed wooded areas within the site, so the number and locations of veg plots should be representative of the entire project area.
Response: Baker is planning on planting the entirety of the easement and will monitor accordingly with the proposed device installation and performance criteria. However, there are some wooded areas along the left bank of the lower portion of the project where we *hope* to keep as many of the existing mature trees as possible and where we hope to only plant shrub and understory species. While of course these relatively small areas would still be monitored, a permanent veg plot seems less appropriate here than do random veg plots (two of which are proposed per year) or temporary transects (which Baker routinely collects and provides in the annual reports). The text referenced in Section 7.2 is really just part of a general description of our planting practices.

3. Page 7-3, Section 7.2 – DWR is ok with the requested exclusion of specified shrub and understory species from the vigor performance standard.
Response: Thank you for the confirmation.

4. Page 7-3, Section 7.3 – Please explain why an onsite rain gauge is not being proposed. Given the distance to the weather station, do you expect that the data will accurately represent onsite rainfall events?
Response: In addition to the primary rain gauge being used for the project (the historic 'Shelby 2NW' gauge, and has been in operation since 1893, and from which the WETS table data for the County was derived) there are also several newer weather stations collecting precipitation data for the area. There are rain gauges located 2.0 miles NW, 3.6 miles SE, and 4.4 miles due South from the site and which can be used to corroborate data collected from the primary gauge. Baker has chosen to use the Shelby 2NW as the primary gauge as it is the most sophisticated of all the station arrays, collecting the largest range of data, presumably receiving the most maintenance and internal data review (as it is the official weather station for the County), and to allow for direct comparisons of annual versus historic rainfall data. This portion of Cleveland County is not mountainous and does not contain the type of high elevation terrain that can cause difficulties with rainfall estimates using nearby gauges. Baker is confident that the gauges present are more than adequate to obtain the rainfall data needed to determine if conditions are wetter or dryer than 'normal' in order to determine wetland success.

5. Figure 4 – Please show the location of the pre-construction groundwater well mentioned in DMS' comments. DWR is interested to review available data included in the Final Mit Plan.
Response: The location of the pre-construction groundwater wells were added to Figure 4 as requested, while the well data is provided in Appendix A.

6. Figure 11 – DWR requests that the two groundwater wells in the southern wetland credit area be shifted so that one is closer to the stream channel and the other closer to the easement boundary, since these are the zones that we are most concerned with meeting the minimum hydroperiod performance standard.
Response: In conjunction with the well location shift requested by the Corps in their comment 3b, the monitoring wells were adjusted a bit further. Baker is confident this entire area will meet the hydroperiod performance standard.

7. Sheet 6 – If possible, please include a detail/section for the Wet Pond BMP for review.
Response: A BMP detail has been added as Sheet 12 to the plans.

8. Sheet 7 – This sheet shows boulder/log steps proposed within constructed riffles. Won't installing a step create a pool? Are these three riffle sections expected to maintain their construction elevation and remain stable long term?
Response: This is a good question. The purpose of the boulder and log steps being placed within the riffles is primarily to help hold grade and improve stability where the riffles are steeper. These will have smaller pools formed in association with them, but these are not geomorphic pools but rather pools dependent on the structures themselves. They will be built lower in the riffle profile and at a relatively flat angle as compared to the typical vanes whose purpose is to turn the water at channel bends and protect the banks, contributing to the development of geomorphic pools. Small, localized pools will form within the riffle below these structures, though they will function as simply a small habitat variation within the riffle. The depth and size of rock being placed in the constructed riffles is more than sufficient to hold these mini-pools to a stable size and shape. This design feature has been used successfully on many previous projects.

9. Sheet 9 – DWR is glad to see the geolift brush toe proposed along the Reach 1 meander and UT2 right bank near the confluence as this may be an area particularly susceptible to erosive forces.
Response: Indeed. Baker will keep a close watch on this confluence to ensure it remains stable throughout the monitoring period. However, the other mitigating factor is that when the flow in UT2 is high, the flow within the mainstem will also likely be high. This mainstem flow is likely to "dampen" any affect of the tributary on the mainstem.

10. Sheet 10 – DWR appreciates the installation of a gated ford crossing proposed south of the mitigation site in an effort to limit water quality impacts immediately downstream of the project.
Response: Thank you for the positive feedback.

11. Design Details – Since a ford crossing is proposed for construction (although not within the project easement area) can a typical detail please be included for review?
Response: A typical detail of a rock ford crossing was added to the plan sheets.

12. Overall, DWR is pleased that the draft mitigation plan addressed so many IRT comments/ questions made on previous projects (e.g. vernal pool depth, soil restoration, species diversity, limiting crossings, access gates). Additionally, the level of detail provided in the soils report, including the mapped boring points and photos, was very helpful. DWR also appreciated all of DMS' initial comments.
Response: Thank you for noting this. We'll try to provide a similar level of detailed information on future projects.

We hope these responses adequately address the IRT comments. Please do not hesitate to contact me should you have any further questions regarding our response submittal.

Sincerely,

Scott King, LSS, PWS
Project Manager

UT to Magness Creek Mitigation Project
Mitigation Plan – Final

Cleveland County, North Carolina

Broad River Basin: 03050105

DMS Project ID No. 100081, DMS RFP #16-007400 (Issued: 12/7/2017),

DEQ Contract No. 7604, USACE Action ID SAW-2018-01759, DWR# 20181275

Prepared for:

NC Department of Environmental Quality (DEQ)
Division of Mitigation Services (DMS)
217 West Jones St. – Suite 3000A
Raleigh, NC 27603

Prepared by:

Michael Baker
INTERNATIONAL

This mitigation plan has been written in conformance with the requirements of the following:

- Federal Rule for compensatory mitigation project sites as described in the Federal Register Title 33 Navigation and Navigable Waters Volume 3 Chapter 2 Section § 332.8 paragraphs (c)(2) through (c)(14).
- DEQ Division of Mitigation Services In-Lieu Fee Instrument signed and dated July 28, 2010.

These documents govern DMS operations and procedures for the delivery of compensatory mitigation.

July 2021

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1.0 PROJECT INTRODUCTION

The UT to Magness Creek Mitigation Project (project) is located on four adjacent parcels of an active cattle farm in Cleveland County, North Carolina, roughly halfway between the communities of Fallston and Lawndale as shown on the Project Vicinity Map (Figure 1). The project farm entrance is located at 2803 Selkirk Drive (State Rd 1803), on the left about 0.6 miles south of the origin of Selkirk Drive at Falls St. The coordinates for the approximate center of the project are 35.406463 N Latitude, -81.528866 W Longitude.

The project area lies within the Broad River Basin, Hydrologic Unit Code (HUC) 03050105-080060 (the Big Harris/Magness Creek Watershed), which is identified as a Targeted Local Watershed (TLW) in the NC Division of Mitigation Services' (DMS) 2009 *Broad River Basin Restoration Priorities* (RBRP) report. The project is located in the Piedmont Physiographic Region, within the Southern Outer Piedmont Level IV ecoregion. The project watershed drains into Magness Creek approximately 0.5 miles below the project easement. Magness Creek then flows for approximately 1.5 miles to its confluence with the First Broad River. Both of these receiving streams are designated as WS-IV waters by the DWR surface water classification.

The project will restore 3,174.48 linear feet (LF) and enhance an additional 325.21 LF of stream along three project reaches. Additionally, the project will restore-by-reestablishment or restore-by-rehabilitation a total of 1.891 acres of riparian wetlands. All of these resources will be protected within a permanent conservation easement.

Current and historic agricultural use on the project site has predominantly been livestock pasture. These activities have negatively impacted both water quality and streambank stability along the project stream reaches. The resulting observed stressors include streambank erosion, sedimentation, excess nutrient input, channel modification, and the loss of riparian buffers.

To address the observed stressors, the goals of this project include:

- Reconnect stream reaches to their floodplains,
- Restore or improve hydrology to adjacent hydric soils and riparian wetlands,
- Improve stream stability,
- Improve aquatic habitat,
- Reestablish forested riparian buffers, and
- Permanently protect the project in a conservation easement.

The project is anticipated to generate a total of 3,391.287 warm-water stream mitigation credits (contracted for 3,000) along with 1.879 wetland mitigation credits (contracted for 1.7), and the site will be protected by an 11.66 acre permanent conservation easement (Appendix B).

2.0 WATERSHED APPROACH AND SITE SELECTION

The UT to Magness Creek project is located in Cleveland County within the Big Harris/Magness Creek subwatershed (03050105-080060) of the Broad River Basin (Figure 1), which is identified as a TLW in DMS' 2009 *Broad River Basin Restoration Priorities* (RBRP) report. This report indicates that this watershed contains a portion of the First Broad River that is impaired due to high turbidity levels. Other issues associated with the watershed include high fecal coliform bacteria counts and degraded aquatic habitat. Although there are no 303(d) listed streams found in this watershed, it does contain many degraded streams. Of all the Broad River TLWs, this watershed has 49% of land dedicated to some form of agricultural production, the second greatest percentage among all the TLWs. This report also states that many streams in this TLW are highly unstable, having eroding banks and limited aquatic habitat. At the time the RBRP was produced the Cleveland County Natural Resources Conservation Service (NRCS) had established the watershed as a priority for water quality improvement.

The NC Division of Water Resources' (formerly Division of Water Quality) *2008 Broad River Basinwide Water Quality Plan* (DWR 2008) identifies five specific stressors as impacting the monitored streams found in the project watershed: fecal coliform bacteria, habitat degradation, turbidity, nutrient impacts, and low pH. It subsequently makes several recommendations to address those stressors and improve water quality, which include reducing erosion along streams (to reduce sedimentation and turbidity), improving habitat in degraded streams, fencing livestock out of streams, and the restoration of riparian buffers. The UT to Magness Creek project will directly implement all four of those recommendations.

The NC Wildlife Resources Commission (WRC) 2015 Wildlife Action Plan (WRC 2015) identifies the project as being located within a Tier 2 Priority watershed for wildlife conservation. The plan notes that there are eight Species of Greatest Conservation Need (SGCN) in the basin, including two crayfish species and six freshwater fish species. The plan also makes several management practice recommendations for this basin including reducing of high rates of erosion and sedimentation, restoring riparian vegetation, protecting water supply watersheds, and protecting headwaters throughout the basin. Further, the plan encourages working with conservation programs and partnerships, and specifically promotes the land conservation efforts of DMS' 2009 RBRP report.

In addition, the protection and restoration of the UT to Magness Creek site will assist in providing a geographical connection with surrounding conservation features such as the Big Harris Creek Mitigation Site, First Broad Leatherwood Slope Natural Area, Hicks Hills Bluffs and Forests Natural Area, Catawba Lands Conservation Easement, Knob Creek Natural Area, and Buffalo Creek Rare Plant Site (Figure 3).

Thus, the UT to Magness Creek project will directly and/or indirectly address many of the priority stressors identified in the watershed planning documents discussed above, through the implementation of many of their recommended management practices, and will permanently protect the entire project area within a conservation easement. Therefore, the proposed project location and restoration approaches align well with the overall goals and implementation needs outlined by DMS.

3.0 BASELINE AND EXISTING CONDITIONS

The following sections will describe the existing conditions found on the UT to Magness Creek project and include a description and history of the surrounding landscape and overall watershed land use and conditions, as well as a discussion of the specific environmental impacts and responses produced on the project site.

Table 3.1 below provides a summary of the key project attributes and individual reach parameters for the existing conditions on site. Existing stream lengths listed below include only those sections within the conservation easement.

Table 3.1. Project Attributes for Existing Conditions
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Project Information				
Project Name	UT to Magness Creek Mitigation Project			
County	Cleveland			
Project Area within Easement (acres)	11.66			
Project Coordinates (latitude and longitude)	35.406463 N, -81.528866 W			
Project Watershed Summary Information				
Physiographic Province	Piedmont			
River Basin	Broad			
USGS Hydrologic Unit 8-digit	03050105			
DWR Sub-basin	03-08-04			
Project Drainage Area (acres)	397 acres / 0.62 square miles			
Project Thermal Regime	Warm			
Project Drainage Area Percentage of Impervious Area	2.35% impervious area			
Land Use Classification[1]	48.1% pasture/hay, 25.7% forested, 9.2% open space, 8.9% cultivated crops, 4.9% developed, 2.6% herbaceous, 0.6% scrub/shrub.			
Reach Summary Information				
Parameters	**Reach 1A**	**Reach 1B**	**UT2**	
Pre-project length within CE (feet)	2,141	932	320	
Post-project length within CE (feet)	2,249	925	325	
Valley confinement (Confined, moderately confined, unconfined)	Moderately Confined	Moderately confined	Moderately confined	
Drainage area (acres)	330	397	31	
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	
NCDWR Water Quality Classification	WS-IV	WS-IV	WS-IV	
Dominant Stream Classification (existing)	B4	B4	F4	
Dominant Stream Classification (proposed)	C4	C4	B4	

Table 3.1. Project Attributes for Existing Conditions UT to Magness Creek Mitigation Project – DMS Project No. 100081				
Dominant Evolutionary class (Simon)	IV – Degradation and Widening	IV – Degradation and Widening	III – Degrading	
Wetland Summary Information				
Parameters	**Wetland Group W1 (REE)**	**Wetland Group W2 (RH)**		
Pre-project size (acres) within CE	0.0	0.035		
Post-project size (acres) within CE	1.856	0.035		
Wetland Type (riparian, non-riparian)	Riparian	Riparian		
Mapped Soil Series	Chewacla loam	Chewacla loam		
Soil Hydric Status	Yes	Yes		
Regulatory Considerations				
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**	
Water of the United States - Section 404	Yes	Yes	PCN	
Water of the United States - Section 401	Yes	Yes	PCN	
Endangered Species Act	Yes	Yes	Categorical Exclusion	
Historic Preservation Act	Yes	Yes	Categorical Exclusion	
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A	
Essential Fisheries Habitat	No	N/A	N/A	
[1] Source: USGS National Land Cover Database (NLCD) for 2016				

3.1 Watershed Processes and Resource Conditions

3.1.1 Landscape Characteristics

The UT to Magness Creek Mitigation Project (project) is located on an active cattle farm in Cleveland County. The project is located in the Piedmont Physiographic Region, within the Level IV Ecoregion 45b: Southern Outer Piedmont. This ecoregion is described as a complex mosaic of metamorphic and igneous rocks with moderately dissected irregular plains and hills. Once largely cultivated, much of the region is now in planted pine or has reverted to successional pine and hardwood forest. The Southern Outer Piedmont is typified by lower elevations (this project site is located at ~900 feet), less precipitation, and less general relief than the rest of the Piedmont. Pine (mostly loblolly and shortleaf) dominates old fields, with mixed oak forests found scattered in the less-altered landscapes. Gneiss, schist, and granite are typical bedrock types, with deep saprolite and mostly red, clayey subsoils dominating (Griffith et al., 2002).

Jurisdictional Streams and Wetlands

Field evaluations for the presence of jurisdictional features on the project were conducted in February and November of 2018 and included the determination of stream intermittent/perennial status, wetland delineations, and both stream and wetland qualitative assessments. These evaluations were based on the most recent guidance documents (NCDEQ 2010, USACE 1987 and 2012, NC-SAM 2015, and NC-WAM 2016). Results from these field reviews indicate that there are approximately 3,700 total linear feet of jurisdictional stream and approximately 0.189 acres of existing jurisdictional wetlands located within the proposed project boundary (Figure 4). Tables 3.2 and 3.3 below present the summary findings of the stream and wetland classifications and assessment ratings. These field assessments were subsequently confirmed

by USACE in the Preliminary JD received on June 17, 2019. Copies of all the completed assessment forms and PJD confirmation can be found in Appendices F, G, and H.

Project Reach 1 is the main UT to Magness Creek comprising the project and is denoted as a "blue-line" stream on the USGS Topographic Map (Lawndale Quadrangle, Figure 2). The upstream portion of this reach is referred to as Reach 1A with Reach 1 below the proposed crossing designated as Reach 1B. The additional tributaries UT1, UT2, and UT3 were identified in the field flowing from east of the project, onto the left bank of Reach 1. It should be noted that the IRT did not accept UT1 or UT3 (was not proposed) as jurisdictional in the field (and thus are not available for mitigation credit) during their post-contract site review. DWR stream forms were completed for all stream reaches in the project area, and Reach 1 and UT2 were identified as perennial systems, while the remaining reaches were intermittent.

Reach 1 has been straightened and dredged in the past for agricultural use and currently has full access by livestock. As a result, it is deeply incised and has long sections of very steep, eroding banks as well as long sections of overly wide channel. The resulting incision and sediment loss have significantly impacted channel bed features. Reaches UT1, UT2, and UT3 also have unlimited access by livestock and have all cut down in their lower sections as a result of the receiving stream (Reach 1) being significantly incised. Additionally, all the reaches lack appropriate riparian buffers, with either sections of absent or narrow buffers or buffers lacking any subcanopy / understory or herbaceous layers due to livestock pressure. Invasive species on the project include Chinese privet (*Ligustrum sinense*), multiflora rose (*Rosa multiflora*), and trifoliate orange (*Poncirus trifoliate*) found scattered throughout the buffer. Thus, given the level of degradation observed, all reaches rated as 'Low' in the NC-SAM assessment.

Nine separate wetland areas were also found scattered throughout the project floodplain totaling 0.191 acres. With the exception of one wetland, all are found entirely within the easement for a total of 0.189 acres within the project area. They all are classified as headwater forest in the NC-WAM methodology, though they have all been almost entirely cleared for agricultural use as pasture, with current livestock access to each one. Due to this clearing, they classify as emergent wetlands in the Cowardin system. Most of the wetlands have been hydrologically impacted as well, either from the deep incision of the adjacent stream, and/or through some degree of shallow ditching. Wetland areas D, H, I and J are located within the stream top-of-banks and are wet inner berms, appearing more as wetlands due to the heavy and continuous impact from livestock. Thus, given the significant level of degradation observed in the wetlands, they all rated as 'Low' in the NC-WAM assessment. Further information and discussion of the project's jurisdictional features can be found in Section 3.2.3.

Table 3.2. Summary of Field Investigations to Determine Intermittent/Perennial Status
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Project Reach Designation	Existing Project Reach Length (ft)[1]	NCDWR Stream Classification Score	NC-SAM Rating	Watershed Drainage Area (acres)[2]	Stream Status
Reach 1	3,073	49	Low	379	Perennial
UT1	180	27.5	Low	21	Intermittent
UT2	320	38	Low	31	Perennial
UT3	110	25.5	Low	20	Intermittent

Notes: [1]Existing Reach length within the Conservation Easement only, [2]Watershed drainage area was estimated using the online USGS StreamStats program, as well as topographic and LiDAR information at the downstream end of each reach.

Table 3.3. Summary of Field Investigations for Jurisdictional Wetlands
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Project Wetland Designation	Existing Wetland Area		Classification		
	Total (ac)	Within Conservation Easement (ac)	NC-WAM Classification	NC-WAM Rating	Cowardin
W-A	0.009	0.009	Headwater Forest	Low	PEM
W-B	0.026	0.026	Headwater Forest	Low	PEM
W-C	0.019	0.019	Headwater Forest	Low	PEM
W-D	0.014	0.014	Headwater Forest	Low	PEM
W-E	0.018	0.015	Headwater Forest	Low	PEM
W-F	0.048	0.048	Headwater Forest	Low	PEM
W-H	0.013	0.013	Headwater Forest	Low	PEM
W-I	0.014	0.014	Headwater Forest	Low	PEM
W-J	0.030	0.030	Headwater Forest	Low	PEM
	0.191	**0.189**			

Climatic Conditions

The Shelby 2 NW, NC weather station in Cleveland County is located approximately 7 miles south of the project site. As reported in the AgACIS (Agricultural Applied Climate Information System) data generated for this station, the WETS table (Appendix A) lists the average annual rainfall for the surrounding area as 49.39 inches, based on data collected from 1990 - 2016 as shown below in Table 3.4 along with the monthly historic averages. This station will be used to determine departures from normal rainfall amounts throughout the project. The WETS table also reports the growing season for the site as 226 days in length beginning on March 23 and ending on November 4, using the 50% probability data for a temperature of 28° F or higher (http://agacis.rcc-acis.org/?fips=37045).

Table 3.4. Comparison of Monthly Rainfall Amounts for Project Site and Long-term Averages
UT to Magness Mitigation Project – DMS Project No. 100081

Month	Shelby 2 NW Station Average Monthly Precipitation (in)	30% Probability Precipitation is less than (in)	30% Probability Precipitation is more than (in)
January	4.47	3.09	5.32
February	3.32	2.41	3.90
March	4.62	3.12	5.52
April	3.92	2.47	4.73
May	4.20	2.82	5.03
June	4.42	2.54	5.38
July	4.61	2.92	5.56
August	4.31	2.43	5.26
September	3.90	2.05	4.77
October	3.70	1.76	4.44
November	3.67	1.89	4.48
December	4.24	3.16	4.96
Total	**49.39**		
Annual Averages		**41.58**	**53.16**

Geology and Soils

Geologically, the Magness Creek Site lies within the Inner Piedmont Belt, consisting of metamorphic rock primarily in the mica schist formation. Lenses and layers of quartz schist, micaceous quartzite, calc-silicate rock, biotite gneiss, amphibolite, and phyllite are also found throughout this formation, with garnet, staurolite, kyanite, or sillimanite occurring locally (NCGS, 1985). The NE Shelby Quadrangle for Cleveland County, (USGS, 1962) further indicates that the Magness Creek Site is located above light to dark-gray, foliated, layered, fine to medium grained, inequigranular biotite gneiss and schist, with deeply weathered brassy to red-colored saprolite commonly found in thin to thick layers, usually warped into broad open folds.

The project site is located within the Felsic Crystalline Soil System of the Piedmont Soil Region of North Carolina (Daniels et al., 1999), formed primarily in residium saprolite from the underlying bedrock metamorphic or igneous parent materials. Topographically, broad gently sloping uplands are common with moderately to steeply sloping areas with narrow convex ridges and steep valley slopes along branching, dendritic stream patterns. Finer-textured soils such as Cecil and Pacolet typically dominate the uplands, while more coarse-loamy soils such as Chewacla and Toccoa are commonly found throughout the floodplains.

The specific soils found in the general surrounding area of the Magness Creek site are dominated by a classic Piedmont soil transitional landscape with Cecil clay loam soils (2-8% slopes) found in the broad interstream divides, with Pacolet sandy clay loam soils (8-15% slopes) found on the steeper slopes along the stream channels, with Chewacla loams (0-2% slopes) found throughout the floodplains (See Figure 7). These Chewacla loams dominate the proposed project site itself, and are very deep, somewhat poorly drained, moderately permeable soils formed in alluvium and commonly found in river valleys throughout the Piedmont and Coastal Plain (NRCS, 2006). Their formal taxonomic classification is: fine-loamy, mixed, active, thermic Fluvaquentic Dystrudepts. Chewacla soils are listed by the NRCS as being hydric for Cleveland County, NC.

Topography

The general topography within the project's 0.62 square mile drainage area is fairly typical of this portion of the Piedmont region. The surrounding terrain consists of steep hills overlooking narrow stream valleys. The average elevation of the drainage area is ~940 feet, with a minimum elevation of ~840 feet and a maximum elevation of ~1,030 feet. The topography of the project site itself and its immediate surrounding area is very similar, with adjacent moderate to steeply sloped hills overlooking the project streams and narrow floodplain. The project valley slopes vary significantly for each of the two main project reaches. The valley slope for Reach 1 is approximately 1.9%, while the UT2 valley has a 11.1% slope. The steepness of UT2 is a result of the significant downcutting observed in its lower section as it eroded to meet the incised channel of Reach 1. The project area within the easement has a high-point elevation of ~920 feet and a low-point elevation of ~850 feet. Figures 2 and 10 depict the topography for the project site and immediate surrounding area.

Existing Vegetation:

Vegetation on the project has been heavily disturbed from years of use in agriculture, in particular from livestock. The project stream buffers are currently used for livestock grazing and subsequently much of the buffers consist of a range of typical pasture grasses (fescues and clovers) with scattered weeds and other common herbaceous species present such as docks (*Rumex spp.*), dogfennel (*Eupatorium capillifolium*), common violet (*Viola sororia*), buttercup (*Ranunculus spp.*), goldenrod (*Solidago spp.*), horsenettle (*Solanum carolinense*), plantains (*Plantago spp.*), and dandelions (*Taraxacum officiniale*), with smartweed (*Polygonum pennsylvatica*), soft rush (*Juncus effusus*), sedges (*Carex spp.*), and jewelweed (*Impatiens capensis*) found in wetter areas. Mature trees are found scattered throughout the

buffers of the middle portion of Reach 1 and along UT2. They primarily consist of red maple (*Acer rubrum*), tulip poplar (*Liriodendron tulipifera*), and sycamore (*Platanus occidentalis*), with some persimmon (*Diospyros virginiana*), black walnut (*Juglans nigra*), and American holly (*Ilex opaca*) also present. There is a notable lack of any understory/subcanopy layer on the project, as well as heavily impacted shrub and herbaceous layers, all likely the result of livestock grazing pressure.

Notable invasive species found on the site include Chinese privet (*Ligustrum sinense*), multi-flora rose (*Rosa multiflora*), and trifoliate orange (*Poncirus trifoliate*), all are found thinly scattered within the project buffer.

3.1.2 Land Use / Land Cover, Impacts, Historic, Current and Future

Relevant land use / land cover and their impacts were investigated for the project and surrounding watershed through landowner discussions, a review of historic aerial photographs, GIS analysis using historic datasets, and field reconnaissance.

Based on landowner conversations historic agricultural uses on the project site itself have included the current livestock pasture as well as the adjacent turkey houses for well over forty years (1979 aerial shows established turkey houses and pastureland). These activities have negatively impacted both water quality and streambank stability along the project streams and their tributaries. The resulting stressors include excess nutrient input, streambank erosion and sedimentation, channel modification, and the loss of riparian buffers.

The USGS National Land Cover Database (NLCD) for 2016 shows that the entire 0.62 square mile (397 acres) project drainage area was 48.1% pasture/hay, 25.7% forested, 9.2% open space, 8.9% cultivated crops, 4.9% developed, 2.6% herbaceous, and 0.6% scrub/shrub. For comparison, the 2009 Broad RBRP describes the overall Big Harris / Magness Creek watershed (51 square miles) as being somewhat similar with approximately 49% total agriculture, 39% forested, and 12% developed.

Historic aerial photographs from 1947, 1961, 1979, and 1993 were reviewed for the project and its immediate surrounding area (Figures 9A – 9D). The aerials all show the recognizable project area in various stages of agricultural development and use, as is the surrounding area. The adjacent fields to the project itself are cleared and used for pasture in each photo. The 1947 aerial reveals that the project area was once largely cleared, with trees primarily observable only along the lower section of Reach 1 in the right buffer. Reach 1 is only faintly visible in the photo though it does appear to have been straightened and impacted from the adjacent agricultural activity (e.g. field terracing and vehicle paths) in both the upper and lower sections. The 1961 aerial reveals the project was further cleared or thinned by this date, especially in the upper portion of Reach 1. Reach 1 is also much more visible in this photo and has clearly been straightened. The 1979 aerial shows that reforestation is occurring within the project area, though it is clearly still thin along upper Reach 1. The reach is still visible in several sections (particularly in the upper portion) and shows some migration from its previously straightened condition as the stream has carved itself a new pattern. The turkey houses still located on the farm are now visible in this photo as well. The 1993 aerial reveals no additional reforestation from that previously observed on the project (though no new clearing observed either) along with continued significant stream pattern migration. Numerous sections of Reach 1 are visible and appear similar to their present condition, with an overly torturous sinuosity. By comparison, the most recent aerial from 2019 shows a project landscape quite similar to the 1993 aerial, with the continued maturity of the forested areas, though not appearing any larger in extent. Reach 1 is clearly visible and has migrated significantly from its previously observed straightened alignment seen in the earlier aerials.

Overall, the historic aerial assessment reveals that the project area itself appears to have been highly impacted since at least 1947 with straightened channels and the clearing of substantial portions of buffer for pasture utilization. The larger project watershed area has always been shown to be dominated by agriculture and remains as such to the present day. The only notable change observed over time is the

reforestation of the riparian buffer on the farm immediately upstream of the project (upstream of Reach 1). Shown as completely bare in 1947 and 1961, and partially cleared in 1979, it has since slowly reforested.

Thus, the history of the land use and land cover of the site and surrounding area indicates that significant impacts to water quality have occurred, certainly resulting in increases in erosion, sedimentation, and nutrient inputs to the streams, and decreases in stream and riparian habitat and function. The future for the project and its watershed will also likely remain largely undeveloped and agricultural in nature within a general rural landscape through the project's lifespan.

3.1.3 Watershed Disturbance and Response

The watershed disturbances are described above and include the straightening/channelization of project reaches, livestock impacts, and the removal or degradation of forested buffers. The project reaches have been heavily impacted from these modifications and land use practices. Reach 1's buffers are mostly cleared and planted in pasture grasses, though there are some scattered mature trees present. The remaining buffer areas do have a somewhat sparse layer of mature trees, though they completely lack a subcanopy and have heavily degraded shrub and herbaceous layers due to livestock impacts.

The reaches have responded to these disturbances by becoming increasingly incised; Reach 1 has cut down to bedrock in several locations and is now becoming increasingly overwide, while UT2 has cut down to meet the incised channel elevation of the receiving Reach 1. Large sections of the reaches are laterally eroding, as streambanks are mostly vertical with large areas of scour and with some isolated mass wasting, all of which is exacerbated by livestock hoof shear. The lack of protective woody and deep rooting vegetation along the majority of the project reaches has also contributed to accelerated bank erosion and migration. While there are sections of reach with established trees and root mass along the banks, they are still experiencing erosion (as evidenced by the number of fallen trees noted along the bank) and their roots are increasingly exposed. The channel incision and associated decrease in overbank flooding frequency has also likely resulted in a lowered water table in the adjacent floodplain. Thus, the cumulative effects of the watershed disturbance have severely impacted the functioning of the project reaches and buffers.

3.2 Regulatory Review

3.2.1 Categorical Exclusion

The National Environmental Policy Act of 1969 (NEPA) requires agencies to use an interdisciplinary approach in planning and decision-making for actions that will have an impact on the environment. The Federal Highway Administration (FHWA) and NC Department of Transportation (NCDOT) have determined that DMS projects will not involve significant impacts and therefore a Categorical Exclusion (Cat-Ex) is the appropriate type of environmental document for this project. FHWA has also determined that stream restoration projects are considered land disturbing activities; therefore, Parts 2 and 3 of the DMS Cat-Ex checklist and a summary of the findings applicable to the environmental regulations associated for this project are included.

The Cat-Ex for the UT to Magness Creek Mitigation Project was approved by FHWA and DMS on May 22, 2019. The Cat-Ex summarized impacts to natural, cultural, and historical resources and documented coordination with stakeholders and federal and state agencies. All documentation for the Cat-Ex is included in Appendix I.

3.2.2 FEMA Regulated Floodplain Compliance

The UT to Magness Creek project is located within FEMA Zone X as noted on the Cleveland County Flood Insurance Rate Map Panel 3710264100J (Figure 8). The topography of the site (valley slope and proposed slope) supports the design without creating the potential for hydrologic trespass. The

streambed will not be raised within the first 120 feet from the conservation easement and ties into existing ground approximately 70 feet upstream of the culvert below Selkirk Drive.

3.2.3 Section 404 / 401 Permitting

The proposed project area was reviewed for the presence of jurisdictional wetlands and waters of the United States in accordance with the provisions on Executive Order 11990, the Clean Water Act, and subsequent federal regulations and guidance. In fulfillment of the project's Section 404 / 401 permitting requirement, a Pre-Construction Notification (PCN) will be submitted for a Nationwide Permit (NWP) 27: Aquatic Habitat Restoration, Enhancement, and Establishment Activities. As discussed previously in Section 3.1.1, the project area was evaluated in the field for the presence of these resource features in February and November 2018 and the results were subsequently confirmed in the field by the USACE and a PJD was received on June 17, 2019 (Appendix H).

The proposed mitigation design will avoid or minimize all disturbance or impacts to the existing stream and wetland features during project construction wherever practicable. Due to the inherent nature of the project, a complete avoidance of all impacts to jurisdictional features is not possible. However, any impacts to stream or wetland resources from construction (both temporary and permanent) will be more than offset by the ultimate restoration and/or enhancement of stream and wetland resources both in their overall length or area and in the resource functional uplift. As part of the project, approximately 1.8 acres of wetlands will be restored through both the hydrologic reestablishment of hydric soils and from the rehabilitation of two existing jurisdictional wetlands. Though no wetland credits are being sought for the remainder of the existing wetlands, they will be enhanced (except as noted below) through the restoration of a more natural flooding regime, by raising their water table, and by planting native wetland vegetation. All existing streams are currently rated as 'Low' in NC-SAM, and all existing wetlands are rated as 'Low' in NC-WAM. Ultimately, the project will restore resource function such that all features will be rated higher than their current respective assessments. Approximately 0.07 acres of wetlands found on wet inner berms within the stream top-of-banks of Reach 1 will be impacted during construction, along with an additional 0.01 acres from the filling of a drainage ditch. A copy of the Pre-Construction Notification (PCN) will be provided with the Final Mitigation Plan, which will include figures detailing the areas of temporary and permanent impacts.

4.0 FUNCTIONAL UPLIFT POTENTIAL

Current stream and watershed conditions within the project site, as well as throughout the Magness Creek watershed as described in previous sections, allow for functional improvements. Channel incision, removal of riparian buffer, and livestock impacts are the predominant impairments within the project reaches, and have contributed to the overall degradation of the local ecosystem due to a lack of floodplain connectivity, minimal bedform variation, poorly functioning riparian buffers, and high amounts of sediment inputs from bank erosion.

The uplift for these project reaches will primarily be achieved at the hydraulic and geomorphological functional levels. Hydraulic improvements will come from the reintroduction of bankfull flows to the historic floodplain through a Priority 1 Restoration of Reach 1. The approach will elevate the stream beds and add an appropriate meandering pattern to the channel. Priority I restoration will also reestablish floodplain connectivity and return a hydraulic routing regime allowing flood stages to access a broader flood prone area. The restoration will allow frequent flood flows to spread out instead of containing them within the existing confined channel. Raising the streambed should also raise the adjacent groundwater table, which will improve the hydrology of the adjacent pockets of existing wetlands found alongside project streams.

Geomorphological functional uplift will be achieved through channels sized to the bankfull flow, a planform and profile design emphasizing improved bedform variation with high amounts of woody debris for bank protection and habitat, and the reestablishment of a forested riparian corridor. These improvements will be achieved through both the Restoration of Reach 1 and the Level I Enhancement of UT2. As a result, bank migration and lateral stability will be restored to a sustainable level and the banks and bed will accommodate design flows in a stable manner. Sediment inputs will decrease due to reduced bank erosion and sediment transport can return to a stable level that will accommodate watershed inputs. Riparian plantings will further support geomorphological functionality by increasing bank stability.

Consideration of future impacts to the area that could limit functional uplift opportunities is important when assessing project potential. As mentioned in previous sections, the project exists within a predominantly rural area where agriculture is the primary land use. Substantial changes to the surrounding area are not expected as the watershed is not likely to experience a significant increase in development in the future based on previous land use changes over time, and the area is most likely to remain dominantly rural. Therefore, the hydrology of the site will likely remain relatively unchanged as well. However, the restoration effort will allow the stream to remain stable during any potential future development as the project work includes improved access to the floodplain, significant bank stabilization, restored buffers, and numerous in-stream grade control structures.

4.1 Project Constraints

The principle constraints to achieve maximum uplift potential for the project are related to upstream and off-site issues, as these existing upstream conditions within the project watershed could have significant impacts to potential physicochemical and biological improvements. Examples of upstream of off-site water quality issues include nutrient and sediment loading, and the presence of diverse biology near the site to ultimately repopulate the improved habitat post-construction. An additional project constraint is the necessity of an easement break for a culverted crossing located in the lower section of Reach 1. The crossing will allow livestock access to an area of shade on the other side of the easement and to rotate livestock without disturbing the restored stream or adjacent riparian areas. Though no credit is being sought for this section, restoration or enhancement measures will continue as practicable through the break to maintain project continuity and ensure the long-term success of the project.

4.2 Functional Uplift Summary

Substantial functional uplift for the UT to Magness Creek Mitigation project is expected and is described in detail above. Improvements to site hydraulics and geomorphology will be clear and measurable post-

construction, while improvements to other functions such as physicochemical and biological may not be as easily determined and can be greatly affected by offsite conditions. Since only the hydraulics and geomorphology of the project streams are being directly measured, project goals are primarily linked to these functions. While project vegetation will also be monitored and can be linked to biological and physicochemical uplift, these parameters are more difficult to directly measure. Table 5.1 summarizes the project goals and objectives that will lead to functional improvements and the monitoring tools that will be used to track these changes to the site.

5.0 MITIGATION PROJECT GOALS AND OBJECTIVES

The goals and objectives for the UT to Magness Creek project are detailed below in Table 5.1. They represent the logical conclusion to the previous discussions of current site conditions and historic use, watershed disturbance and response, and the functional uplift potential for the project. The listed goals are broad statements about intended project accomplishments and are consistent with the identified watershed priorities as outlined in the Watershed Approach and Site Selection discussion in Section 2. By comparison, the objectives and outcomes are intended to be more specific, measurable, and represent direct steps towards accomplishing the associated goal. The project objectives will have performance standards and success criteria associated with them as described later in Section 7 of this report and will be evaluated throughout the monitoring phase of the project.

Table 5.1 Mitigation Project Goals and Objectives
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Goals	Objectives	Functional Level	Monitoring Measurement Tool
Reconnect stream reaches to their floodplains	To raise channel beds and/or excavate sloping vegetated floodplains appropriate for stream type, by utilizing either a Priority I Restoration approach for Reach 1 (C-type), or an Enhancement Level I approach for UT2 (B-type).	Hydraulics	Flood Frequency Cross-Sectional Survey
Restore or improve hydrology to adjacent hydric soils and riparian wetlands	To raise adjacent channel beds and remove drainage ditches to raise groundwater tables within the buffer.	Hydraulics	Groundwater Wells
Improve stream stability	To construct streams of appropriate dimensions, pattern, and profile in restored reaches, slope stream banks on enhanced streams, install grade control with plunge pools, and utilize bio-engineering to provide long term stability.	Geomorphology	Cross-Sectional Survey Visual Inspection Photo Points
Improve aquatic habitat	Construct an appropriate channel morphology to all streams increasing the number and depths of pools, increasing the amount of woody debris with structures including geo-lifts with brush toe, woody riffles, log vanes/weirs, cross-vanes, and/or J-hooks.	Geomorphology	Cross-Sectional Survey Visual Inspection Photo Points
Reestablish forested riparian buffers	Establish riparian buffers at a 50-ft minimum width along all stream reaches, planted with native tree and shrub species.	Geomorphology	Vegetation Plots Visual Inspection Photo Points
Permanently protect the project	Establish a permanent conservation easement restricting land use in perpetuity. This will prevent site disturbance and allow the project to mature and stabilize.	Geomorphology	Visual Inspection

6.0 DESIGN APPROACH AND MITIGATION WORK PLAN

6.1 Project Design Approach

The selection of project design criteria was based on a combination of approaches, including a review of information from reference streams within the geographic area, regime equations, evaluation of monitoring results from numerous past projects, and best professional judgment. Evaluating data from reference reach surveys and the monitoring results from multiple NC projects provided the most pertinent background information to determine the appropriate design parameters given the existing conditions and overall site functional uplift potential. The design parameters for the site also took into consideration current guidelines from the USACE and DMS. Additionally, a Grazing Plan was completed for the farm by the NRCS and landowner, with input from Baker. This Plan was developed as guidance for the landowner regarding how to maximize his pasture of grazing by his cattle herd. The pasture was separated into multiple paddocks, a livestock watering system was laid out showing a well location, the appropriate number and general locations of watering tanks, as well as the appropriate type and location of livestock fencing. The needs and requirements for the stream restoration project were included in this analysis and plan preparation. The grazing plan overview information can be found in Appendix K.

While reference reach data can be a useful aid in designing channel dimension, pattern, and profile, there are limitations in smaller stream systems. The flow patterns and channel formation for most reference reach quality streams is often controlled by slope, drainage areas, and larger trees and/or other deep-rooted vegetation. Some meander geometry parameters, such as radius of curvature, are particularly affected by vegetation control. Pattern ratios observed in reference reaches may not be applicable or are often adjusted in the design criteria to create more conservative designs that are less likely to erode after construction, before the permanent vegetation is established. Reference reach data was used to provide additional confidence in the design parameters chosen but not used as the only basis for design parameter selection.

Two reference reaches were selected from stable locations within ½ mile of the project location. One reference reach is located further downstream of Reach 1 itself (but off the project site), while the second was located on another nearby UT to Magness Creek found above the intersection of Toney Road and Ball Park Road southwest of the project. A third reference reach selected was an unnamed tributary that was part of the Puzzle Creek project in adjacent Rutherford County. Additionally, reference parameters from Baker's internal database based on successful past projects were consulted and analyzed. The data shown on Table 6.1 helped to provide a basis for evaluating the project site and determining the stream systems that may have been present historically with consideration for how they may have been influenced by changes within the watershed.

Table 6.1 Reference Reach Parameters Used to Inform Design
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Parameter	Reach near Toney Rd (½ Mile SW of Project)	Downstream of Reach 1 (Off Project Site)	UT to Puzzle Creek	Baker Composite Reference Data
Valley Width (ft)	120	140	–	
Contributing Drainage Area (ac)	275	621	1,024	
Channel/Reach Classification	B4	B4	C4	C4
Discharge Width (ft)	9.4	13.7	14 – 18	
Discharge Depth (ft)	1.2	1.3	1.5 – 1.6	
Discharge Area (ft^2)	10.9	17.5	24 – 28	
Discharge Velocity (ft/s)	2.6	3.1	5.0 – 5.8	3.5 – 5.0
Discharge (cfs)	28.5	54.0	140	

Table 6.1 Reference Reach Parameters Used to Inform Design
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Parameter	Reach near Toney Rd (½ Mile SW of Project)	Downstream of Reach 1 (Off Project Site)	UT to Puzzle Creek	Baker Composite Reference Data
Water Surface Slope[1]	–	–	0.0085	
Sinuosity	low	low	1.21	1.2 – 1.4
Width/Depth Ratio	8.1	10.7	8.2 – 12.0	10 – 15
Bank Height Ratio	3.3	1.28	1.0 – 1.1	1.0
Entrenchment Ratio	1.77	1.83	>2.8	
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)[1]	–	–	–	

1. Water Surface Slope is not reported because profile information was not taken at this site; neither were pebble counts.

After examining the assessment data collected at the site and exploring the potential for functional uplift, specific approaches were developed for each reach that would address the restoration or enhancement of stream functions within the project area. Prior to impacts from past channel manipulation, the topography, elevation, adjacent vegetation, and soils on site indicate that the project area most likely functioned in the past as a Piedmont Alluvial Forest system. Therefore, overall design approaches were formulated to best restore and/or enhance this type of system. First, an appropriate stream type for the valley type, slope, and desired stream functions was selected and designed for each reach. Then a design plan was developed to improve the hydrology, geomorphology, and habitat of the project streams.

6.2 Design Morphological Parameters

For design purposes, the selected approaches chosen for each reach were based on the maximum potential for functional uplift as determined during the site field assessments as previously described in Section 4. The specific design parameters were developed based on those approaches so that appropriate planform geometry, cross-section dimensions, and reach profiles could be accurately described for developing construction plan documents. The overall design philosophy is to use these design parameters as conservative values for the selected stream types and to allow natural variability in stream dimension, facet slope, and bed features to form over longer periods of time under the processes of flooding, re-colonization of vegetation, sediment deposition, and other watershed influences.

The following tables present the design stream morphology parameters proposed for Restoration and Enhancement reaches, as needed. The proposed stream design values and design criteria were selected using existing conditions surveys and bankfull identification, sediment collection and analysis, regional curve analysis, nearby reference reach data, and Baker's internal reference ratios proven to be successful on numerous past projects. Following the initial application of the design criteria, detailed refinements were made to accommodate the existing valley and channel morphology. This step minimizes unnecessary disturbance of the riparian area and wetlands, makes adjustments around specific features in the field, maximizes the uplift to the ecological resources, and allows for some natural channel adjustment following construction.

Reach 1: Restoration

Reach 1 consists of the mainstem of the UT to Magness Creek within the project area, which extends from the upstream northern terminus of the project at an existing property line that is fenced and flows south then southwest approximately 3,205 feet to the end of the project reach. The project ends approximately 203 feet upstream of a culverted road crossing at Selkirk Drive (SR 1803). The project ending point is just upstream of where the FEMA designated floodplain begins. The project ending point was selected to avoid conflicts

with this jurisdictional area and potential costly FEMA permitting. Reach 1 is a perennial channel with a valley slope of approximately 0.01 percent and a drainage area of 0.38 square miles (245 acres) at the beginning of the reach and grows to 0.62 square miles (397 acres) at Selkirk Drive. Flow has been consistent within the project limits for the last two years of site identification and field activities. Reach 1 is very incised with bank height ratios (BHR) of 2.0 or greater throughout most of its length and significantly more on many sections. This reach is exhibiting bank scour over more than 80% of the channel, on both banks. Mass wasting is occurring at multiple locations along the reach and this significant erosion has resulted in multiple trees being undercut and falling into the channel. Many large poplar trees have their root systems exposed on the stream bank (see front cover) and will be falling into the creek in short order unless this situation can be addressed.

The bed material of R1 is predominantly composed of medium gravel (d50 = 10.2 mm), but with extensive sections of high sand deposition, particularly in locations where the channel has significant lateral erosion, causing the channel to become overly wide. This sand is due to extensive bank erosion within the reach. The reach lacks deep pools except in a few areas were bedrock is exposed and creates a knickpoint with a drop that causes scour and deeper pool formation. Much of the remaining sand and gravel dominated channel is almost entirely composed of riffles or deeper runs. As a result, habitat is fairly homogenous throughout the reach with little diversity of bedform. Reach 1 is difficult to classify using Rosgen classification terminology given the extreme instability and can be called an incised B, C or F stream type depending on the existing condition cross section used to do the classification. We are calling the upper end of the reach a B and the lower reach a C. These designations are because of the three stream types our cross sections indicated are present and these two are generally the more stable forms. However, more than entrenchment, width/depth ratio and sinuosity, the parameters used to determine stream type, indicate that this project reach is unstable.

Reach 1 has a riparian buffer that varies from being primarily pasture grasses and other weedy herbaceous vegetation with only scattered trees in the upper and lower sections, to having a stand of larger trees present within the buffer of the middle section of the reach. Aside from these mature canopy trees (primarily tulip poplar), the buffer lacks any significant understory vegetation with no smaller subcanopy, shrub, or native herbaceous species present. This lack of understory is certainly due to grazing pressure and shade. There are scattered invasive species found within the buffer but there are no thick stands. Invasive vegetation consists of Chinese privet (*Ligustrum sinense*), Multiflora rose (*Rosa multiflora*) and trifoliate orange (*Poncirus trifoliate*).

There is no one specific existing crossing along R1, but rather a number of locations where livestock and possibly past stream bank alteration, have created areas of unstable stream bank. These low stream bank locations are used by livestock as crossings, as watering areas, and as general loafing areas during hot weather. A couple of these low bank areas are also used by the landowner as crossing locations for his tractor or 4-wheeler if he needs to cross the stream. There are no utility crossings of the stream within the project reach. At one location approximately 1,500 feet down R1 on the right bank, there is significant overland flow coming down a stormwater conveyance and entering the stream. At the location where it enters the stream a significant headcut has developed on the stream bank. This is the proposed location of a Best Management Practice (BMP) installation.

A Priority Level I restoration approach was selected to fully restore stream and associated buffer functions to R1. The channel will be raised to reconnect the stream to its historic floodplain. This will promote more frequent over bank flooding thus reducing erosive stream energies during storm events greater than the bankfull discharge and will improve adjacent groundwater hydrology. The floodplain area will also act as a sediment sink providing storage of sediment from upstream sources instead of sending all the sediment load downstream. The very top of the reach will include a relatively short transitional section of channel where the stream bed elevation is being raised to a point where the existing valley floor (the new floodplain) can be accessed at a bankfull flow. Between the beginning of the conservation easement and the point where the stream can fully access the floodplain, the stream banks will be lowered to the planned flood plain elevation. This flood plain bench will gradually slope to the existing ground elevation, thus providing improved access

to the floodplain until the bed elevation can be fully raised. The bench will be held to as low a slope as possible At its downstream end, another transitional section will begin approximately 200 feet upstream of the project terminus by dropping the bed elevation relative to the floodplain, with stream bank sloping again being conducted as described above. Soil amendments will be applied as appropriate to the exposed subsoil on the sloped banks, which will be loosened prior to having stockpiled topsoil replaced on the surface. It is likely topsoil and significant amendments will not be required as excavation may expose a buried A horizon which is rich in organic matter.

The reach will be designed as a Rosgen C4 stream type and will be restored using appropriate riffle-pool morphology, which will restore a proper channel meander geometry and incorporate deep pools. This will greatly improve habitat throughout this reach. For design purposes, Reach 1 has been divided into an upper, Reach 1A, and lower, Reach 1B, sections to account for the increase in drainage area over the entire length of R1. Each sub-reach will have the channel dimensions sized appropriately. Reach 1A will run from the beginning of the project to Station 33+51.77 and Reach 1B will run from Station 33+81.98 to the end of the project. There will be a break in the conservation easement between 1A and 1B where a culverted crossing will be installed. The design width-to-depth ratio for the channel will be 14.2 and 15.2 for 1A and 1B, respectively, though over time the channel may narrow due to deposition of sediment and growth of streambank vegetation. Channel narrowing should not risk downcutting because any narrowing would be in response to stabilizing processes (i.e., vegetation establishment, point bar formation, etc.). The entrenchment ratio will be significantly greater than 2.2 on both sub-reaches as the adjacent flood-prone width allows, while the sinuosity for both will be 1.2. Channel banks will be graded to stable slopes, and will provide floodplain access, promote stability, and provide sediment storage.

Table 6.2a Reach 1A Stream Design Morphology Parameters.
UT to Magness Creek Mitigation Project - DMS Project No. 100081

Parameter	Existing Condition	Reference Conditions	Proposed
Valley Width (ft)	110 - 150	120 / 130	110 - 150
Contributing Drainage Area[1] (acres)	251 - 293	275 / 621	245 - 330
Channel/Reach Classification[2]	B4c	B4 / C4	C4
Discharge Width (ft)	11.32 – 29.0	9.4 / 14.4	12.5
Discharge Depth (ft)	0.90 – 0.44	0.84 / 1.16	0.9
Discharge Area (ft^2)	10.2 – 12.6	10.5 / 13.7	11.0
Discharge Velocity (ft/s)	2.7 – 2.9	2.5 / 2.7	2.5
Discharge (cfs)	26.9 – 36.0	26.9 / 37.0	27
Water Surface Slope	0.0124 – 0.0076	0.011	0.0110
Sinuosity	1.14 – 1.23	1.2	1.2
Width/Depth Ratio	12.58 – 65.9	8.14 / 15.2	14.2
Bank Height Ratio	3.09 – 6.25	1.0/ 3.28	1.0
Entrenchment Ratio	1.96 – 1.07	1.8 / 3.2	3.2
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	2.11 / 6.81 / 10.16/ 17.32 / 30.02 / 90	-	2.11 / 6.81 / 10.16/ 19.34 / 48.71 / 90

1. Existing and Reference Condition drainage areas were taken from the surveyed cross-section locations, while the Proposed drainage areas shown are from the top and bottom of the reach.

2. Stream type varied with each cross-section and we could have chosen an existing stream type as B or C. B was selected because it came from a more stable reach.

Table 6.2b Reach 1B Stream Design Morphology Parameters. UT to Magness Creek Mitigation Project - DMS Project No. 100081			
Parameter	**Existing Condition**	**Reference Condition**	**Proposed**
Valley Width (ft)	110 -150	120 / 130	200
Contributing Drainage Area[1] (acres)	371	275 / 621	352 - 397
Channel/Reach Classification[2]	C4	B4 / C4	C4
Discharge Width (ft)	11.32 – 29.0	9.4 / 14.4	14.5
Discharge Depth (ft)	0.90 – 0.44	0.84 / 1.16	1.0
Discharge Area (ft^2)	10.2 – 12.6	10.5 / 13.7	13.8
Discharge Velocity (ft/s)	2.7 – 2.9	2.5 / 2.7	2.7
Discharge (cfs)	26.9 – 36.0	26.9 / 37.0	37
Water Surface Slope	0.0124 – 0.0076	0.011	0.0110
Sinuosity	1.14 – 1.23	1.2	1.20
Width/Depth Ratio	12.58 – 65.9	8.14 / 15.2	15.2
Bank Height Ratio	3.09 – 6.25	1.0/ 3.28	1.0
Entrenchment Ratio	1.96 – 1.07	1.8 / 3.2	2.8
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.33 / 2.66 / 7.65 / 19.34 / 48.71 / 90	-	2.11 / 6.81 / 10.16/ 19.34 / 48.71 / 90

1. Existing and Reference Condition drainage areas were taken from the surveyed cross-section locations, while the Proposed drainage areas shown are from the top and bottom of the reach.

2. Stream type varied with each cross-section and we could have chosen an existing stream type as C or F. C was selected because it came from a more stable reach.

In-stream structures such as constructed riffles, cross-vanes, log jams, and j-hooks will be constructed using boulder, stone, brush, and log materials. This technique will provide the appropriate bedform morphology, protect stream banks, improve aquatic habitat, and ensure grade control along this reach. Bioengineering techniques such as geolifts, root wads, toe wood, brush layers, and live stakes are also proposed to protect restored stream banks and to promote woody vegetation growth along the stream banks. Sections of the old channel not incorporated into the new channel alignment will be completely filled using suitable material up to the floodplain elevation. Where possible and appropriate, some small vernal pools may also be constructed within the alignment of the old channel. These will be small depressions that are a foot or less lower than bankfull to allow for temporary ponding of water and additional habitat diversity.

Mature trees within the riparian buffer of R1 have been avoided in the design plan form to the extent possible, so that as few as possible will have to be removed. Any trees and native brush removed will be used within the channel to the extent possible. Riparian buffers 50 feet or greater will be established throughout the reach and will be planted with appropriate native species. The invasive vegetation will be mechanically removed during construction and will be chemically treated thereafter throughout the monitoring phase. Removed invasive vegetation will not be used in the channel.

There is one break in the project conservation easement along R1 and it is between R1A and R1B as described above. There will be a culverted crossing installed at this location to allow livestock to use the forested area to the east of the easement in the heat of the summer. This opening is also required by the State Property Office so that we do not create a landlocked area of the landowner's property with the easement. There will

be gates installed, so that access to this crossing can be controlled. The culvert crossing will consist of an appropriately sized primary culvert with secondary floodplain culverts installed higher to carry flow across the floodplain (see Appendix A for pipe sizing summary). Below the project reach and outside of the easement there will also be a ford crossing installed using NRCS standards, so that the banks will be stable. Below this crossing livestock will be excluded from the stream with barbed wire fencing. The entire conservation easement around Reach 1 will also be fenced using barbed wire to exclude livestock and reduce sediment, fecal coliform, and nutrient inputs. Access gates (small 4' gates or larger) will be installed at various locations to allow for monitoring activities and inspection of the easement. Since livestock are being excluded from the stream as their water source, a groundwater well and a livestock drinker system is being installed to provide water. These agricultural practices have been planned by NRCS and are detailed in the Yarboro Farm Plan (see Appendix K).

UT2: Enhancement Level I

There is only one tributary to R1 that is being improved through the restoration project, UT2. UT2 has a confluence with the mainstem at approximately Station 38+90 on the left bank. This tributary is a perennial stream that begins upslope of the project property, to the east of the mainstem, and flows west crossing the property line approximately 325 feet upstream of the confluence. The channel has an existing slope from the property line to the confluence of 0.0206. The channel is deeply incised with a bank height ratio much greater than 10; however, the ratio gradually decreases as the channel approaches the mainstem and is slightly less than 5 near the confluence. The soil banks along this reach, though quite steep, continue to be impacted by livestock as they move across and through the channel, and there are numerous livestock crossing trails found across this reach. As a result, the channel is experiencing active erosion for well over 80 percent of the streambank length. The absence of vegetation along the majority of the bank of this project reach also contributes to ongoing instability. The right (northern) buffer of the reach does have a good stand of hardwood trees, though several of the trees located near the stream bank have recently fallen due to undermining from the incised channel. The left (southern) buffer has a narrow, somewhat thin stand of trees with pasture coming to within 10-20 feet of the stream's top of bank. Between station 11+00 and 12+50 of UT2 the channel drops three feet and has a series of very tight meanders between trees. The roots are acting as a knickpoint for the dropping channel, but it is aligned against a steep left bank and any soil eroding from the slope falls directly into the stream.

An Enhancement Level 1 approach was selected for this reach. The stream banks are unstable due to livestock use, and there is little woody or herbaceous vegetation on the steep banks which is causing sedimentation in the stream. The Enhancement I approach will allow for addressing stream bank erosion issues by establishing stable stream dimensions and reducing the slope of the high banks along the reach. This channel is a B type stream and will need to be raised to meet the elevation of the proposed mainstem. The channel cannot be raised to the valley surface given the high degree of incision; however, it can be raised 1 to 3 feet which will significantly reduce the entrenchment of the channel and allow the development of a significantly wider floodplain within the incised channel. Establishing an entrenchment value of at least 1.4 to 2.2 will be done by bank grading and raising the channel. Grade control is limited to tree roots through this reach due to an absence of bedrock. Vertical stability will be achieved, and habitat improved through the reach by installing grade control structures at intervals across the reach and stabilizing meander bends with bioengineered bank revetments. These structures will provide energy dissipation and grade control and will also provide a diversity of habitat types as they support pools with connecting riffles. The in-stream structures selected will be similar to those described above for Reach 1. The design width-to-depth ratio for the channel will be 12.3, though over time the channel may narrow due to deposition of sediment and the growth of streambank vegetation. Channel narrowing should not risk instability because any narrowing would be in response to stabilizing processes (i.e., vegetation establishment, point bar formation, sequestering of sediment on the floodplain, etc.). Steep channel banks will be graded to stable slopes, and connected to sloping floodplains, this will promote stability and provide sediment storage. The existing hardwood trees along the top of the

steep banks will be protected as much as possible. Fallen trees will be removed and trees that must be removed to conduct enhancement of the channel will be used as part of in-stream structures.

Riparian buffers at least 50 feet in width will be restored with native species and protected along all of UT2. Any invasive species found scattered along the banks and within the riparian buffers of the reach will be removed at construction and throughout the monitoring period. Additionally, barbed wire fencing will be installed to exclude livestock and reduce sediment, fecal coliform, and nutrient inputs.

Table 6.2c Reach UT2 Stream Design Morphology Parameters.
UT to Magness Creek Mitigation Project - DMS Project No. 100081

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	80	120 / 80	80
Contributing Drainage Area[1] (acres)	30	275 / 31	31
Channel/Reach Classification	F4	B4 / B4	B4
Discharge Width (ft)	5.05	9.44 / 5.71	6.25
Discharge Depth (ft)	0.32	1.16 / 0.46	0.5
Discharge Area (ft^2)	1.63	10.9 / 2.66	2.7
Discharge Velocity (ft/s)	3.16	2.61 / 1.94	1.9
Discharge (cfs)	5.15	28.5 / 5.15	5.15
Water Surface Slope	0.0206	-	0.0100
Sinuosity	1.18	N/A / 1.20	1.2
Width/Depth Ratio	15.8	8.1 / 12.3	12.3
Bank Height Ratio	7.62	3.2 / 1.0	1.0
Entrenchment Ratio	1.33	1.8 / 2.2	2.2
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.06/ 0.17/ 2.37/ 10.32/ 37.95/45	-	0.06/ 0.17/ 2.37/ 10.32/ 37.95/45

[1]Existing Condition and Reference drainage areas were taken from the surveyed cross-section locations, while the Proposed drainage area was taken from the downstream end of the reach.

Stormwater BMP on Reach 1A

A wet pond type stormwater BMP is proposed on the west side of Reach 1A of the UT to Magness project near station 25+00. This wet pond will receive stormwater runoff from 4.19 acres of drainage area, which contains no impervious area; however, this area is a primary livestock gathering site with very compacted ground. Sizing of the BMP was completed using a 1-inch design storm rainfall depth, and runoff was calculated using the simple method. This BMP was designed to meet the stormwater design criteria of a wet pond following the North Carolina Stormwater Design Guidance Manual. Almost all of the minimum design criteria (MDC) were able to be accommodated; however, one criterion could not be met as outlined below. Even with these limitations, the design will be able to provide water quality improvement benefits.

The BMP collects surface runoff along the western side of the proposed wet pond, and then discharges runoff through an overflow weir along the northern side and is designed to detain the 1-inch storm for water quality. The BMP meets the requirements for main pool surface area and volume (MDC-1), main pool depth (MDC-2), sediment storage (MDC-3), location of inlet and outlet (MDC-4), forebay (MDC-5), vegetated shelf, and protection of the receiving stream (MDC-8). The revegetation for the BMP will meet the requirements of landscaping plan MDC-11. Peak attenuation is not proposed for this BMP.

The BMP is unable to meet MDC-7, which requires a 2-5 day drawdown time between the temporary and permanent pool elevations. For a BMP of this size, meeting this criterion would require an orifice that would likely be subject to frequent clogging in the proposed application; therefore, the BMP was designed to accommodate the required treatment volume of the permanent pool and the temporary pool below the outlet. A stone weir structure is proposed for the wet pond outlet, which also eliminates the need for a trash rack (MDC-10). No fountains are proposed, which eliminates MDC-9.

6.3 Design Discharge Analysis

6.3.1 Bankfull Stage Discharge

Upon completion of the geomorphic field survey, identification of bankfull stages and corresponding discharges were made at various locations along Reaches 1 and UT2. However, on degraded, incised streams such as these, discernible indicators are often altered or not present, and the reliability of the indicators can be inconsistent due to the altered condition of the stream channels. For this reason, regional curve relationships (based on drainage areas) from two well developed curves were also used to develop the bankfull discharge estimates for the project reaches. The curve relationships were compared to most stable representative cross sections taken on site to confirm the bankfull field calls and to ultimately select an appropriate design discharge estimate.

6.3.2 Bankfull Hydraulic Geometry Relationships (Regional Curve Predictions)

Regional curves are available for a range of stream types and physiographic provinces. The published NC Rural Piedmont Regional Curve (Harman et al., 1999) and the unpublished NC Rural Mountain and Piedmont Regional Curve developed by the Natural Resources Conservation Service (Walker, 2018) were used for comparison with site-specific field methods of estimating bankfull discharge. The regional curve equations developed from the studies are shown below in Table 6.3, while Table 6.4 compares the estimated regional curve bankfull areas for the project reaches with those measured from bankfull indicators in the field. Baker has successfully implemented a significant number of stream restoration projects in North Carolina using both these regional curves, though the general design team preference is for the more recent NRCS equations as they continue to be revised with the addition of new stream data.

Table 6.3 NC Rural Regional Curve Equations
UT to Magness Creek Mitigation Project – DMS Project No. 100081

NC Rural Piedmont Regional Curve Equations (Harman et al., 1999)	NC Rural Mountain and Piedmont Regional Curve Equations, Revised (Walker, 2018)
$Q_{bkf} = 89.04\ A_w^{0.72}$	$Q_{bkf} = 55.33\ A_w^{0.79}$
$A_{bkf} = 21.43\ A_w^{0.68}$	$A_{bkf} = 19.13\ A_w^{0.65}$
$W_{bkf} = 11.89\ A_w^{0.43}$	$W_{bkf} = 17.41\ A_w^{0.37}$
$D_{bkf} = 1.5\ A_w^{0.32}$	$D_{bkf} = 1.10\ A_w^{0.28}$

Table 6.4 Comparison of Bankfull Areas
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Reach	DA (sq mi)	Bankfull Area Estimates from 1999 / 2018 Regional Curves (sq ft)	Bankfull Area Measured at Bankfull Indicator (sq ft)	Design Bankfull Area (sq ft)
Reach 1A	0.40*	11.50 / 10.51	10.2 (XS-1), 12.4 (XS-2), 10.9 (REF XS-4)	11.0
Reach 1B	0.62	15.48 / 14.00	12.6 (XS-5), 17.5 (REF XS-1)	13.8
UT2	0.05	2.75 / 2.66	1.6 (XS-4)	2.7

*Drainage Area for R1A taken from the selected design location towards the top of this reach around XS-1

The results of the bankfull area comparison as shown above in Table 6.4 reveal that the regional curves are very well aligned in their predictions of bankfull area, which subsequently also align well with the field measured estimates. These values were then compared with the off-project reference reach and stream projects of similar size. Based on this evaluation, the final design values were then selected using designer experience and best professional judgement.

6.3.3 Bankfull Discharge Summary

Table 6.5 provides a summary of the existing condition bankfull discharge and velocity analyses based on the preferred regional curve (Walker, 2018) and the values derived from the Manning's 'n' associated with Stream Type, alongside the design values. The design velocity estimates were determined using the design bankfull discharge with the design cross-sectional areas. The design values ultimately selected will provide for stable stream channels, while during above bankfull flows the streams will have improved access to their floodplain, thus reducing stream scour potential and improving streambank stability.

Table 6.5 Bankfull Discharge and Velocity Analysis Summary
UT to Magness Creek Mitigation Project - DMS Project No. 100081

Reach Section	DA (mi^2)	Bankfull Discharge from Regional Curve / Manning's 'n' (cfs)	Design Bankfull Discharge (cfs)	Bankfull Velocity from Regional Curve / Manning's 'n' (ft/sec)	Design Bankfull Velocity (ft/sec)
Reach 1A	0.40*	26.9 / 24.6	27	2.6 / 2.4	2.5
Reach 1B	0.62	38.0 / 26.3	38	2.7 / 2.1	2.8
UT2	0.05	5.1 / 2.5	5.2	3.2 / 1.5	1.9

*Drainage Area for R1A taken from the selected design location towards the top of this reach around XS-1

6.4 Sediment Transport Analysis

For this project, a qualitative sediment supply analysis was conducted from visual inspections of the project reaches and from aerial photography of the greater watershed. Stream power can be calculated but does not provide useful information since a sediment rating curve has not been developed for the site. Thus, the focus of this project's sediment transport analysis will be on competency to demonstrate the ability of the constructed channels to pass the sediment present in the watershed.

Current sediment supply appears to be largely due to bank erosion from within the project reaches themselves. The incised reaches, nearly vertical in most sections, are now in the process of eroding and widening. Livestock access to the project reaches, along with their historic ditching and straightening, have clearly accelerated this erosion. Field inspections reveal that aggradation is a problem for the site; primarily in those sections of the stream where lateral migration and over-widening is a problem and notable bar formations are observed. There are also long sections of channel that have sediment-filled pools and/or embedded riffles found throughout Reaches 1 and UT2. Once the project is complete, on-site sediment sources from bank erosion along all reaches will be stabilized.

Additionally, some sediment is also being contributed to the project from off-site sources upstream of Reach 1. The watershed above the project was once largely cleared, had streams straightened, and was used for agriculture, similar to the project site itself. Substantial portions of the riparian buffer upstream have since reforested over time, but a visual inspection of channel sections in this upstream area reveal that they are still quite incised, with some resulting sections of eroding banks, and one or more headcuts is/are present. However, the observed bedload sediment supply found within it does not appear large enough to result in capacity-limited stream channels on the project site.

6.4.1 Sediment Competency Analysis

To conduct the sediment competency analyses; pebble count, pavement, and subpavement sediment samples were taken at or near surveyed riffle cross sections on Reaches 1A, 1B, and UT2. The sediment samples were weighed to generate cumulative frequency plots. The sediment competence analysis was conducted using the methodologies presented in WARSSS (2006). Design mean depth and slope were checked against the predicted required depths and slopes to provide confidence that the design streams will be able to transport their sediment supplies. Analyses were conducted using a dimensional shear stress methodology, which utilizes both the Shield's and Modified Shield's/CO Data curves to compare the shear stress value to the size particle able to be entrained by that shear stress. The Modified Shield's curve is based on Colorado field data (WARSSS, 2006) and the Shield's Curve is based on laboratory and field data compiled from various sources (Leopold, Wolman, and Miller, 1964). The results from the analyses are presented below in Table 6.6.

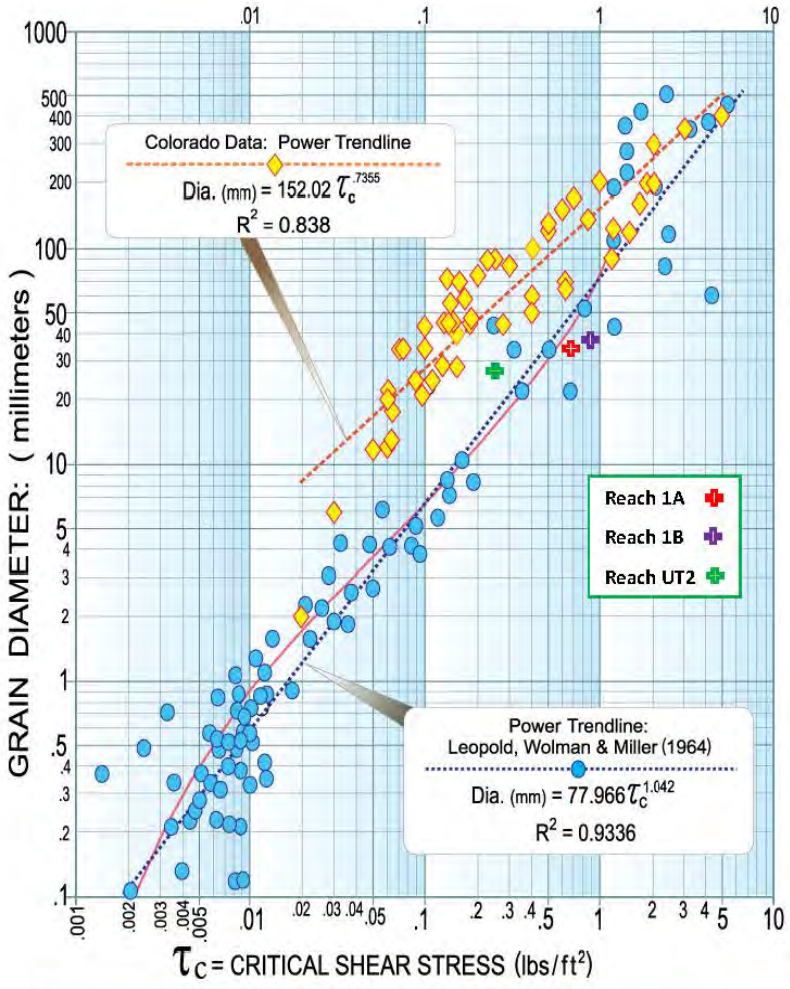
Table 6.6 Sediment Competence Analysis
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Parameter	Reach 1A	Reach 1B	Reach UT2
Design Bankfull Slope, average (ft/ft)	0.0110	0.0110	0.0100
Design Mean Depth (ft)	0.9	1.0	0.5
D50 Pebble Count (mm)	10.2	7.7	2.4
D100 Pebble Count (mm)	90	90	45
D50 Pavement (mm)	6.9	23.6	5.6
D50 Subpavement (mm)	6.6	5.9	10.7
D100 Subpavement (mm)	35	38	27
Design Dimensional Shear (lbs./sq-ft)	0.53	0.58	0.23
Largest Movable Particle (mm) (Mod. Shield's Curve/CO Data)	95	102	52
Largest Movable Particle (mm) (Shield's Curve)	40	44	17
Predicted Shear Stress to move D100 (lbs./sq-ft) (Mod. Shield's Curve/CO Data)	0.15	0.16	0.10
Predicted Shear Stress to move D100 (lbs./sq-ft) (Shield's Curve)	0.48	0.50	0.37
Predicted mean depth to move D100 (ft) (Mod. Shield's Curve/CO Data)	0.22	0.23	0.09
Predicted mean depth to move D100 (ft) (Shield's Curve)	0.70	0.73	0.33
Predicted slope to move D100 (ft/ft) (Mod. Shield's Curve/CO Data)	0.0027	0.0027	0.0032
Predicted slope to move D100 (ft/ft) (Shield's Curve)	0.0087	0.0084	0.0119

The sediment transport analysis using the design geometry and profile values were compared with their predicted values. As can be seen from the figure below, design shear stress values plotted against the measured D100 Subpavement values match quite well within the scatter of the data points, particularly for the Shield's Curve data, lending confidence that the stream will be able to move the existing bed load that is currently supplied (and which will be harvested and reused in the new channels). Using the estimated dimensional shear for the design channels, the predicted largest moveable particles based on the curves match well with the existing D100 subpavement and pebble count sizes for all three reaches. Further, the predicted shear stresses, mean depths, and slopes required to move the D100 values are all within the actual design value ranges,

particularly for the Shield's curve predictions. All of this again indicates that the designed system should have no difficulty moving the existing bed load.

The post-construction channels will include constructed riffles that will contain larger sized materials; a mix of Class 1, Class B, Class A, and ABC stone, in addition to harvested native channel material (the existing bed load noted above), for a combined D50 of approximately 100 mm (though only about 15% of the stone will be larger than is expected to be actively transported and mobile). Thus, the analysis shows that the new channels should not produce enough shear stress to entrain the largest particles in the system, consequently allowing the constructed channel beds to remain stable, while still allowing for the active movement and transport of much of the bed load through the stream system.



Laboratory and field data on critical shear stress required to initiate movement of grains (Leopold, Wolman, & Miller, 1964). The solid line is the Shields curve of *the threshold of motion*; transposed from the Θ versus R_g form into the present form, in which critical shear stress is plotted as a function of grain diameter.

(Adapted from WARSSS, Figure 5-49, Rosgen 2009)

6.5 Wetland Mitigation Design Approach

6.5.1 Wetland Restoration

The wetland mitigation design component of the project consists of two approaches: restoration by re-establishment and restoration by rehabilitation, each conducted in accordance with the Federal Mitigation Rule (33CFR Part 332.2/40 CFR 230.92) as described in DWR's wetland mitigation consistency guidance memo (DWR 2013). The goal of wetland re-establishment is to restore natural historic functions in areas where evidence of hydric soil conditions are present but appropriate wetland hydrology and vegetation are not, thus resulting in a gain in both wetland resource area and in wetland functions. This restoration approach will not be conducted in existing jurisdictional wetlands but is based on a detailed soil analysis and hydric soil delineation conducted by a licensed soil scientist (Appendix J). Six main activities will be employed to restore on-site wetlands:

- Connecting adjacent stream channels to their relic floodplains through Priority I stream restoration,
- Planting native wetland species to reforest the wetlands,
- Removing invasive species from wetlands,
- Exclude livestock from wetlands,
- Removal of drainage ditches from wetland areas along Reach R1, and
- Permanently protect wetlands within a conservation easement.

As a result of raising the adjacent streambeds and reconnecting the streams to their relic floodplains, significant hydrologic lift will occur across the project area, raising the local water table and restoring wetland hydrology to drained hydric soils adjacent to the stream and wetland system. Additionally, drainage ditches located within the easement will be filled, further improving hydrology to the wetlands. All wetlands will be planted with appropriate species to re-establish a wetland vegetation community, and all invasive plants will be treated or removed. Thus, restoration by reestablishment approach will restore the appropriate wetland resource hydrology and vegetation functions, and will expand the total wetland resource area present on the project.

The goal of wetland restoration through rehabilitation is to restore or greatly improve most, if not all, the historic natural functions to a heavily degraded, but still existing jurisdictional wetland resource. The areas proposed for this approach (wetlands W-A and W-B) were determined to be jurisdictional by the USACE (Appendix H), but are heavily degraded with clear impacts to both the hydrology and vegetation resource functions. These wetlands are adjacent to incised streams, have nearby drainage ditches, and have had much of their natural vegetation impacted through livestock grazing. Thus, this rehabilitation approach will result in significant improvements to both the wetland hydrology and vegetation functions, but will not result in a gain in wetland resource area.

Additionally, although not for credit, wetlands W-E and W-F located in the floodplain of lower Reach 1B on the project will be enhanced. These wetlands were determined to be jurisdictional by the USACE, but have experienced some level of degradation, in particular to their vegetation function. Enhancement of these wetlands will primarily involve their revegetation with appropriate wetland community species, along with livestock exclusion and the treatment or removal of all invasive vegetation present. Thus, this non-credited enhancement will primarily result in an improvement to the wetland vegetation function, but will not result in any gain in wetland resource area.

6.5.2 Target Wetland Types

The mitigation approaches described above for the riparian wetland restoration areas will target the ultimate restoration of "Headwater Forest" or "Bottomland Hardwood Forest" wetland types as identified by the North Carolina Wetland Assessment Method (NCWAM 2016); a Palustrine, Forested, Broadleaved Deciduous (PFO1) wetland type (Cowardin et al. 1979); and the wetlands found within the Piedmont Alluvial Forest and

Piedmont Bottomland Forest communities as described by Schafale (2012). The hydrology of this riparian system is expected to be intermittently to frequently flooded and inundated (NRCS, Web Soil Survey).

6.6 Vegetation and Planting Plan

6.6.1 Existing Vegetation and Proposed Plant Community Characterization

Existing vegetation on the project has been heavily disturbed from years of use in agriculture, in particular from livestock. The project stream buffers are currently used for livestock grazing and subsequently much of the buffers consist of a range of typical pasture grasses (fescues and clovers) with scattered weeds and other common herbaceous species present such as docks (*Rumex spp.*), dogfennel (*Eupatorium capillifolium*), common violet (*Viola sororia*), buttercup (*Ranunculus spp.*), goldenrod (*Solidago spp.*), horsenettle (*Solanum carolinense*), plantains (*Plantago spp.*), and dandelions (*Taraxacum officiniale*), with smartweed (*Polygonum pennsylvatica*), soft rush (*Juncus effusus*), sedges (*Carex spp.*), and jewelweed (*Impatiens capensis*) found in wetter areas. Mature trees are found scattered throughout the buffers of the middle portion of Reach 1 and along UT2. Species primarily consist of red maple (*Acer rubrum*), tulip poplar (*Liriodendron tulipifera*), and sycamore (*Platanus occidentalis*), with some persimmon (*Diospyros virginiana*), black walnut (*Juglans nigra*), and American holly (*Ilex opaca*) also present. There is a notable lack of any understory/subcanopy layer on the project, as well as heavily impacted shrub and herbaceous layers on the project, all likely the result of livestock grazing pressure.

Notable invasive species found on the site include Chinese privet (*Ligustrum sinense*), multi-flora rose (*Rosa multiflora*), and trifoliate orange (*Poncirus trifoliate*), all are thinly scattered within the project buffer.

However, the riparian areas along the project reaches and wetlands would naturally be comprised of species more consistent with those of a Piedmont Alluvial Forest (Schafale 2012) and Southern Piedmont Small Floodplain and Riparian Forest (CES202.323, NatureServe 2021) ecosystems. The wetland areas would also likely include species found within the Piedmont Bottomland Forest ecosystem (Schafale, 2012).

6.6.2 Proposed Riparian Vegetation Plantings

The vegetative components of this restoration project include streambank, wetlands, and general riparian planting zones within the buffer. These planting boundaries will be comprised of species found within native plant communities as presented below in Table 6.7 and shown on the revegetation plan sheets in Appendix L. In addition to the planting zones noted above, any areas of the site that are disturbed or adversely impacted by the construction process will also be planted. Existing non-native grasses (such as fescue) within the easement will be treated prior to or concurrent with construction, as appropriate.

Bare-root trees and live stakes will be planted within designated areas of the conservation easement, with the objective of establishing a minimum 50-foot buffer along all proposed streambanks for all the stream reaches within the project boundary. In many areas, the buffer width will be in excess of 50 feet along one or both streambanks. In general, bare-root vegetation will be planted at a total target density of 680 stems per acre. Planting will be conducted during the dormant season, with all trees and shrubs installed between November 15th and March 15th. The anticipated planted area for the project is approximately 10.7 acres.

Selected species for hardwood revegetation planting are presented in Table 6.7. Riparian zone species wetness tolerance will range from being at least somewhat tolerant of flooding to very tolerant. Observations will be made during construction of the site regarding the relative wetness of areas to be planted as compared to the revegetation plan, which will also incorporate the location of the jurisdictional wetlands to facilitate the accurate planting of appropriate species in their correct planting zone.

Once the vegetative species are transported to the site, they should be planted within two days. Disturbed soils across the site will be prepared by sufficiently loosening to a depth of four inches prior to planting as described in the technical specifications. Heavily compacted soils (e.g., hardpans or areas that experienced heavy equipment use) will be loosened to a depth of eight to ten inches by disking or ripping to prepare for

tree planting. In any areas where excavation depths exceed ten inches, topsoil shall be separated from rocks, brush, or roots, stockpiled, and placed back over these areas to achieve design grades and create a soil base for vegetation. Trees and shrubs will be planted by manual labor using a dibble bar, mattock, planting bar, or other approved method. Planting holes for the trees will be sufficiently deep to allow the roots to spread out and down without "J-rooting." Soil will be loosely compacted around trees once they have been planted to prevent roots from drying out. Soil tests will be conducted in the riparian buffer areas during construction, and soil amendments such as fertilizer or lime may be added as recommended to improve growing conditions for plant establishment.

Live stakes will be installed at a minimum of 40 stakes per 1,000 square feet and stakes will be spaced two to three feet apart around pools and six to eight feet apart in the riffle sections using triangular spacing along the streambanks between the toe of the streambank and bankfull elevation. Site variations may require slightly different spacing as appropriate.

Permanent seed mixtures will be applied to all disturbed areas of the project site. Table 6.8 lists the species, mixtures, and application rates that will be used. A mixture is provided that is suitable for this project's streambank, riparian, and wetland areas. Mixtures will also include temporary seeding (rye grain or browntop millet) to allow for application with mechanical broadcast spreaders. To provide rapid growth of herbaceous ground cover and biological habitat value, the permanent seed mixture specified will be applied to all areas within the conservation easement from the toe of the stream banks to the easement boundary excluding areas that are already forested. The species provided are deep-rooted and have been shown to proliferate along restored stream channels, providing long-term stability.

Final species selection may change due to a refinement of site-specific conditions during construction or species availability at the time of planting. If species substitution is required, the planting Contractor will submit a revised planting list for approval prior to the procurement of plant stock.

Table 6.7 Proposed Bare-Root and Live Stake Species
UT to Magness Creek Mitigation Project - DMS Project No. 100081

Botanical Name	Common Name	% Planted by Species	Wetland Tolerance
All Buffer Plantings at 680 stems/acre using 8' X 8' spacing General Riparian Zone – Overstory/Canopy Species			
Liriodendron tulipifera	Tulip Poplar	15%	FACU
Betula nigra	River Birch	15%	FACW
Platanus occidentalis	Sycamore	15%	FACW
Quercus phellos	Willow Oak	10%	FAC
Celtis laevigata	Sugarberry	10%	FACW
Quercus nigra	Water Oak	5%	FAC
Fraxinus pennsylvanica	Green Ash	5%	FACW
Diospyros virginiana	Persimmon	5%	FAC
Ulmus americana	American Elm	5%	FACW
General Riparian Zone – Understory/Shrub Species			
Carpinus caroliniana	American Hornbeam	5%	FAC
Lindera benzoin	Spicebush	2.5%	FAC
Asimina triloba	Pawpaw	2.5%	FAC
Magnolia tripetala	Umbrella Tree	2.5%	FACU
Halesia carolina	Carolina Silverbell	2.5%	FAC
Wetland Zone – Overstory/Canopy Species			
Betula nigra	River Birch	15%	FACW

Table 6.7 Proposed Bare-Root and Live Stake Species
UT to Magness Creek Mitigation Project - DMS Project No. 100081

Botanical Name	Common Name	% Planted by Species	Wetland Tolerance
Platanus occidentalis	Sycamore	15%	FACW
Quercus michauxii	Swamp Chestnut Oak	15%	FACW
Quercus palustris	Pin Oak	10%	FACW
Quercus phellos	Willow Oak	5%	FAC
Nyssa sylvatica	Blackgum	5%	FAC
Acer negundo	Box Elder	5%	FAC
Fraxinus pennsylvanica	Green Ash	5%	FACW
Ulmus americana	American Elm	5%	FACW
Wetland Zone – Understory/Shrub Species			
Alnus serrulata	Tag Alder	5%	OBL
Ilex verticillata	Winterberry	2.5%	FACW
Cephalanthus occidentalis	Buttonbush	2.5%	OBL
Cornus amomum	Silky Dogwood	2.5%	FACW
Aronia arbutifolia	Red Chokeberry	2.5%	FACW
Streambank Live Stake Plantings			
Salix sericea	Silky Willow	25%	OBL
Sambucus canadensis	Elderberry	20%	FACW
Cephalanthus occidentalis	Buttonbush	10%	OBL
Cornus amomum	Silky Dogwood	20%	FACW
Salix nigra	Black Willow	25%	OBL

Table 6.8 Proposed Permanent Seed Mixture
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Botanical Name	Common Name	% Planted by Species	Density (lbs/ac)	Wetland Tolerance
Agrostis perennans	Autumn Bentgrass	10%	1.5	FACW
Elymus virginicus	Virginia Wildrye	15%	2.25	FACW
Panicum virgatum	Switchgrass	15%	2.25	FAC
Tripsacum dactyloides	Eastern Gamma Grass	5%	0.75	FACW
Polygonum pennsylvanicum	Pennsylvania Smartweed	5%	0.75	FACW
Schizachyrium scoparium	Little Blue Stem	5%	0.75	FACU
Juncus effusus	Soft Rush	5%	0.75	FACW
Bidens frondosa (or aristosa)	Beggars Tick	5%	0.75	FACW
Coreopsis lanceolata	Lance-Leaved Tick Seed	10%	1.5	FACU
Dichanthelium clandestinum	Deer Tongue	10%	1.5	FAC
Andropogon gerardii	Big Blue Stem	5%	0.75	FAC
Sorghastrum nutans	Indian Grass	5%	0.75	FACU

Monarda punctata	Spotted Beebalm	5%	0.75	FACU
	Total	**100%**	**15.00**	
Note: Final species selection may change due to refinement of site conditions or to availability at the time of planting. If species substitution is required, the planting Contractor will submit a revised planting list to Baker for approval prior to the procurement of plant stock.				

6.7 Project Work Plan

The project work plan is included in the plan sheet set for the project and provides a detailed description of proposed construction timing and sequencing, specific in-stream structure and other construction element designs, as well as a description of all grading and planting activities. All work will be conducted using common machinery, tools, equipment, and techniques for the successful implementation of the project. The complete plan sheets can be found in Appendix L.

6.8 Project Risks and Uncertainties

Due to the rural nature of the project watershed, with established historic agriculture dominated by pasture and hay production, the overall project risk for the UT to Magness Creek site is considered low. The anticipated potential project risks are described below:

Land Use Development: There is the potential for increased land use development within the project watershed that could alter the watershed hydrology, particularly to runoff quantity and quality. These changes would be out of the control of the provider.

Methods to Address: While any potential future development within the project watershed is out of the control of the provider, the stream restoration and enhancement techniques being applied to the project reaches will help protect them from further degradation and reduce downstream impacts usually associated with watershed development.

Easement Encroachment: Any encroachment to the conservation easement including livestock access, mowing, utility easement violations, culvert maintenance, etc.

Methods to Address: The landowners are fully aware of the land use restrictions associated with the conservation easement. The project streams will be fenced to exclude livestock and the entire easement boundary will be clearly marked using DMS-approved protocols. Any encroachments will be appropriately remedied by the provider throughout the monitoring phase.

Drought and Floods: There is the potential for extreme climatic conditions during the monitoring phase of the project. These conditions would be out of the control of the provider.

Methods to Address: The provider will take appropriate measures to address any impacts to the project caused by the extreme climatic conditions. Such measures may include vegetation replanting, channel or structure repair, soil amendments, etc.

Beavers: While there is no evidence of beaver activity currently present on the site, there is the potential for beavers to move onto the project during the monitoring phase. This would be out of the control of the provider.

Methods to Address: The provider will take appropriate steps to remove the beaver from the project during the monitoring phase and repair any damage they may have caused.

Hydrologic Trespass: Hydrologic trespass is an extremely unlikely issue for the project and is not considered to be a reasonable project risk. For one, the stream floodplain is quite narrow and the adjacent valley slopes are quite steep. Further, Reach 1 will not be backing water up at the upper project limit, while the off-site areas upstream of Reach 1 are significantly incised with riparian buffers that are undeveloped and largely forested. All these factors indicate that there should be no concern with hydrologic trespass.

7.0 PERFORMANCE STANDARDS

The performance standards and success criteria for the project will follow the NCIRT guidance document *Wilmington District Stream and Wetland Compensatory Mitigation Update* dated October 24, 2016. Monitoring activities will be conducted for a period of 7 years unless otherwise noted.

Based on the design approaches, different monitoring methods are proposed for the project reaches. Reaches 1A and 1B will have a Priority I Restoration design approach implemented, while on UT2 we will implement an Enhancement Level I approach. For all project reaches, geomorphic monitoring methods and specific success criteria components and evaluations are described below. Report documentation will follow the DMS's templates *Annual Monitoring Report Format, Data, and Content Requirement* (October 2020).

7.1 Stream Monitoring

Geomorphic monitoring of the proposed restoration reaches will be conducted annually following the completion of construction to evaluate the effectiveness of the restoration practices. The methods used and related success criteria for each monitored stream parameter are described below. Figure 11 shows the approximate locations of the proposed monitoring devices throughout the project site.

7.1.1 Bankfull Events and Flooding Functions

The occurrence of bankfull events within the monitoring period will be documented using in-stream continuous stage recorders (using pressure transducers) installed per the recent DMS guidance. Two continuous stage recorders will be installed for the project; one each in Reaches 1A and UT2. Additionally, photographs will also be used to document the occurrence of debris lines and sediment deposition on the floodplain during monitoring site visits.

Four bankfull events must be documented, in separate years, within the seven-year monitoring period. Otherwise, monitoring will continue until the required four bankfull events have been documented.

7.1.2 Cross Sections

Permanent cross sections will be installed at an approximate rate of one cross section per twenty bankfull widths of restored stream, with approximately half of the cross sections located at riffles and half located at pools. Fourteen total cross sections are proposed for this project. Each cross section will be marked on both streambanks with permanent monuments using rebar cemented in place to establish the exact transect used. A common benchmark will be used for cross sections and to facilitate easy comparison of year-to-year data. The cross section surveys will occur in years one, two, three, five, and seven, and must include measurements of Bank Height Ratio (BHR) and Entrenchment Ratio (ER). The monitoring survey will include points measured at all breaks in slope, including top of streambanks, bankfull, inner berm, edge of water, and thalweg, if the features are present. Riffle cross sections will be classified using the Rosgen Stream Classification System (Rosgen 1994 and 1996). The BHR cross section parameter will be calculated following the technical workgroup guidance memo 'Standard Measurement of the BHR Parameter' provided by DMS in 2018, which will apply the as-built bankfull cross sectional area to the current monitoring year channel to determine bankfull elevation. The Low Top of Bank (LTOB) depth will also be provided with the monitoring data.

There should be little change in as-built cross sections. If changes do take place, they will be documented in the survey data and evaluated to determine if they represent a movement toward a more unstable condition (e.g., down-cutting or erosion) or a movement toward increased stability (e.g., settling, vegetative changes, deposition along the streambanks, or decrease in width/depth ratio). Using the Rosgen Stream Classification System, all monitored cross sections should fall within the quantitative parameters plus or minus the standard deviation (W/D +/- 2, BHR and ER +/- 0.2) i.e. BHR no more than 1.2 and ER no less than 2.2 for 'C' and 1.4 to 2.2 for 'B', stream types defined for channels of the design stream type. Given the smaller channel sizes

and meander geometry of the proposed steams, bank pins will not be installed unless monitoring results indicate active lateral erosion. The cross sections will document stability in the surveyed riffle or pool to confirm they are maintaining appropriate form for that feature and are not eroding/scouring or aggrading/filling with sediment, and thus are continuing to provide improved habitat as intended.

Reference photo transects will be taken at each permanent cross section. Lateral photos should not indicate excessive erosion or continuing degradation of the streambanks. The survey tape will be centered in the photographs of the streambanks. Photographers shall try to consistently maintain the same area in each photo over time.

7.1.3 Longitudinal Profile and Pattern

A longitudinal profile will be surveyed for the entire length of constructed channel immediately after construction to document as-built baseline conditions. The survey will be tied to a permanent benchmark and measurements will include thalweg, water surface, bankfull, and top of low bank. Each of these measurements will be taken at the head of each feature (e.g., riffle, pool) and at the maximum pool depth. The longitudinal profile should show that the bedform features installed are consistent with intended design stream type. The longitudinal profile will not be taken during subsequent monitoring years unless vertical channel instability has been documented or remedial actions/repairs are deemed necessary.

Pattern measurements such as sinuosity, radius of curvature, and meander width ratio will be calculated on newly constructed meanders using the plan views from the as-built plan sheets and reported in the as-built baseline document. Subsequent visual monitoring will be conducted annually to document any changes or excessive lateral movement in the plan view of the constructed channel.

7.1.4 Visual Assessment

Visual monitoring assessments of all stream sections will be conducted at least once per monitoring year following the requirements described in the DMS monitoring guidance documents. Photographs will be used to visually document system performance and any areas of concern related to streambank stability, condition of in-stream structures, channel migration, headcuts, channel aggradation (bar formation) or degradation, live stake mortality, impacts from invasive plant species or animal species, riparian vegetation success, condition of pools and riffles, culvert and crossing stability, any easement encroachments noted, and an overall stream morphology assessment. All photo point locations and any areas of concern will be shown in the Current Condition Plan View (CCPV) figure in the as-built/baseline and annual monitoring reports.

7.2 Vegetation Monitoring

Restoration of the riparian vegetation on a site is dependent upon the successful planting and establishment of native woody species, along with the volunteer regeneration of the plant community. To determine if the success criteria are achieved, vegetation monitoring plots will be installed and monitored across the restoration site in accordance with the CVS-DMS Protocol for Recording Vegetation, Version 4.2 (Lee at al., 2008). These vegetation plots shall consist of both permanent and random plots, totaling a minimum of 2% of the planted portion of the site established within the planted riparian buffer areas per CVS Monitoring Levels 1 and 2. Six fixed plots and two random plots are proposed to monitor vegetation for this project. The size of each individual plot will be 100 square meters. No plots will be established within any undisturbed wooded areas found within the project boundary.

Vegetation monitoring will occur in the fall, prior to the loss of leaves. Data from the permanent vegetation plots will include: species, height, vigor, planted vs. volunteer, and age (based on the year the stem was planted, or first observed if a volunteer). Data from the random plots will include only the species and height. Both plot types will include invasive and exotic species data, if present. Plot densities will also be calculated for each plot. Individual plant stems will be marked such that they can be found in succeeding monitoring

years in the permanent plots. Mortality will be determined from the difference between the previous year's living, planted stems and the current year's living, planted stems.

At the end of the first full growing season from baseline (MY0), after a minimum of 180 days, species composition, heights, stem density, and survival will be evaluated for monitoring year one (MY1). Vegetation plots shall subsequently be monitored in Years 2, 3, 5 and 7 or until the final success criteria are achieved. The interim measure of vegetative success for the site will require the survival of at least 320 stems per acre at the end of the Year 3 monitoring period. At Year 5, density must be no less than 260 stems per acre. The final vegetative success criteria will be the survival of 210 stems per acre at the end of the Year 7 monitoring period. Volunteer plants may count towards the vegetation performance standard if they are on the approved planted species list and are present for at least two growing seasons, or at the discretion of the IRT. A single species should only account for up to 50% of the required number of stems to meet success criteria.

Additionally, the height of the vegetation at Year 5 should average 7 feet tall, while at Year 7 should average 10 feet tall. Certain native species, which are appropriate to plant on-site to provide a diverse vegetation community, do not typically grow to these heights in 7 years and will be excluded from the height performance standard. For this project, these excluded species include all of the understory/shrub species presented in Table 6.7. Baker would also like to note that the overstory planting list contains numerous slower growing species such as a mix of five oak species and persimmon at a combined total of 35% of the planted stems for both the general riparian and wetland planted areas.

While measuring species density and height is the current accepted methodology for evaluating vegetation success on mitigation projects, species density and height alone may be inadequate for assessing plant community health. For this reason, the vegetation monitoring plan may incorporate the evaluation of additional plant community indices, native volunteer species, and the presence of invasive species vegetation to assess overall vegetative success.

Required remedial action will be provided on a case-by-case basis, such as: replanting more wet/drought tolerant species as appropriate, conducting beaver management/dam removal, and the treatment of undesirable/ invasive species vegetation, etc. Any necessary remedial action will continue to be monitored as part of the vegetation performance assessment until the corrective action demonstrates that it is trending towards or again meeting the standard requirement. Invasive species will be treated such that they compose no more than 5% of the easement area, and a visual inspection of the entire site for the presence of invasive species will be conducted at least annually. Existing mature woody vegetation will be visually monitored during annual site visits to document any mortality due to construction activities or changes to the water table that negatively impact existing forest cover or favorable buffer vegetation.

Additionally, herbaceous vegetation, primarily native species grasses, will be seeded/planted throughout the site. During and immediately following construction activities, all ground cover at the project site must follow the NC Erosion and Sedimentation Control requirements.

7.3 Wetland Monitoring

All credited wetland restoration areas will be monitored for a minimum of seven years post-construction or until final wetland success criteria are met. Hydroperiod performance criteria for restored wetland areas will be met when the site is saturated within twelve inches of the soil surface for a consecutive period equal to twelve percent of the growing season. The WETS table for the Shelby 2NW weather station located approximately 7 miles south of the project site in Cleveland County reports that for the years 1990-2016, the growing season for the site is 226 days in length and begins on March 23 and ends on November 4, using the 50% probability data for a temperature of 28° F or higher (generated in AgACIS database, http://agacis.rcc-acis.org/?fips=37045). Twelve percent of 226 days is 27.1 days. To determine if the rainfall is normal for the given year, monthly rainfall amounts will be tallied from an onsite rain gauge and compared to the Shelby 2NW weather station.

After construction is complete, groundwater monitoring wells will be installed within the credited wetland restoration areas and their coordinate locations and ground level elevations will be recorded. Four wells are proposed for installation within the three wetland restoration areas (totaling ~1.7 acres), which will more than adequately characterize the minor surface variations that are found across the wetlands. Installation and monitoring of the groundwater stations will follow the USACE standard methods outlined in the *ERDC TNWRAP-05-2* (USACE, 2005). Water table depths will be recorded daily. See Figure 11 for locations of the proposed post-construction monitoring wells.

The non-credited wetland areas (totaling just 0.063 acres) will still be enhanced through both the reestablishment of a vegetated buffer consisting of appropriate native species, and through the exclusion of livestock. Hydrologic improvement of these wetlands is also anticipated through the restoration of the adjacent reaches, which will raise the stream bed and reestablish a floodplain connection, thus raising the adjacent water tables and increasing flood frequency. It is also expected that through these same measures additional floodplain wetlands will naturally reestablish so as to further offset the wetland impacts necessary during construction.

Periodic visual inspections will be conducted for all wetlands, even those small areas not for credit. Visual inspection of proposed wetland areas will be conducted to document any visual indicators that would be typical of jurisdictional wetlands. This could include, but is not limited to, vegetation types present, surface flow patterns, stained leaves, and ponded water. Wetland plant establishment will be documented along with other visual indicators noted above, and as part of the general vegetation monitoring protocol as described previously in Section 7.2.

7.4 Stormwater BMP Monitoring

A stormwater BMP will be constructed as part of the overall restoration approach for Reach 1 as described in detail in Section 6.2. The BMP will be visually monitored for vegetative survivability, outlet stability, and permanent pool storage capacity using photo documentation throughout the 7-Year monitoring period. Maintenance measures to be implemented during the monitoring may include the replacement of dead vegetation (herbaceous and/or woody) as needed, and the removal of excess sedimentation from the permanent pools, as needed. Additionally, should the outlet of the constructed wetland become unstable during the monitoring period, corrective measures will be implemented to rectify the instability issues.

Please note that this BMP is not being installed for direct mitigation credit, but for the water quality improvement of the adjacent receiving stream. As such, there are no formal performance standards or success criteria being presented for the BMP.

8.0 MONITORING PLAN

The monitoring plan for the UT to Magness Creek Mitigation Project is outlined below in Table 8.1 and describes the measurable connections between the previously stated goals and objectives to the performance standards and expected functional uplift. The approximate post-construction monitoring feature locations can be found in Figure 11.

Table 8.1 Monitoring Plan Overview
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Goal	Treatment	Performance Standards	Monitoring Metric	Outcome	Likely Functional Uplift
Reconnect stream reaches to their floodplains.	Restore streams with appropriate channel dimensions and raise stream bed elevations.	Four bankfull events during the 7-year monitoring period.	Continuous stage recorders used to record bankfull events.	Increased bankfull events, restoring a more natural flooding regime to the system.	A dissipation of damaging high flows during flood events, hydrologic improvement of adjacent wetlands, and increased floodplain access for sediment storage.
Restore or improve hydrology to adjacent hydric soils and riparian wetlands.	To raise adjacent channel beds and remove ditches to raise groundwater tables within the buffer.	Water table for restored wetlands raised to within 12" of the surface for a consecutive 12% of the growing season.	Groundwater monitoring wells in restored wetland areas	Established, functioning wetlands of appropriate hydrology and vegetated with appropriate wet species.	Restored or improved wetland habitat, increased nitrogen removal by dentrification, increased carbon sequestration in soil, improved flood water storage capacity
Improve stream stability.	Restore streams with appropriate dimensions, pattern, and profile, stabilize streambanks, provide floodplain access, utilize bio-engineering.	Restored streams will maintain bank-height-ratios of less than 1.2 and entrenchment ratios greater than 2.2 (C-type) provided visual inspections also reveal stabilization.	Cross section surveys and visual inspections with photographic documentation.	Stable stream banks with appropriate channel dimensions and sediment transport.	A reduction in sediment loss to streams from bank erosion, along with the resulting nutrient loss, increased woody debris and organic material in stream resulting in improved habitat.
Improve aquatic habitat.	Install a variety of in-stream structures, increasing the woody debris and the number and types of pools. Reduce sedimentation within riffles.	N/A	Inventory comparisons of in-stream structures and features from existing conditions and as-built project surveys and assessments.	Increased number of pools and woody structures and debris compared to the existing conditions.	An increase in the quantity and quality of aquatic habitat features for macroinvertebrates and fish.

Table 8.1 Monitoring Plan Overview
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Goal	Treatment	Performance Standards	Monitoring Metric	Outcome	Likely Functional Uplift
Reestablish forested riparian buffers.	Plant appropriate native hardwood tree and shrub species on streambanks and in the riparian buffer at a 50-foot minimum width in all areas within the conservation easement where established native trees and shrubs do not exist.	Interim survival rates of 320 stems/acre at MY3 and 260 steams/acre at MY5, with final rate of 210 stems/acre at MY7. Average heights of 7 feet at MY5 and 10 feet at MY7	Vegetation monitoring plots (100 m^2 each covering 2% of the total planted area).	At the end of monitoring, a vegetated riparian buffer will be established at a minimum 50-foot width and at a minimum 210 stems/acre of native species, including volunteers (with IRT approval).	Improved riparian corridor habitat for native species, improved stabilization of stream floodplain (reducing sediment loss), increased woody and organic material in buffer/stream system.
Permanently protect the project.	Establish a permanent Conservation Easement (CE) for the entire project.	N/A	Visual inspections to confirm no encroachments into CE.	Restored streams, wetlands, and buffers protected from damaging encroachments.	The functional uplift improvements from the project are maintained and protected in perpetuity.

The as-built / baseline report will be submitted within 90 days of the completion of project construction (to include complete as-built record drawings with all vegetation planted and monitoring devices installed), and will follow the most recent DMS guidance *Annual Monitoring Report Format, Data, and Content Requirements* (October 2020). The subsequent annual monitoring reports will also follow this new document, while the closeout report will follow the Closeout Report Template – ver. 2.2 (January 2016). There will be at least a minimum of 6 months between the data collected for the As-Built Baseline (MY0) Report and the Year 1 Annual Monitoring Report.

The annual monitoring reports will provide the information defined below within Table 8.2 and will be submitted to DMS by December 1st of the year during which the monitoring was conducted. The monitoring reports will provide a project data chronology for DMS to document the project status and trends, will assist with the population of DMS databases for analysis and research purposes, and will assist in decision making regarding progress towards a successful project close-out. Project success criteria must be met by the final monitoring year prior to project closeout, or monitoring will continue until unmet criteria are successfully met as directed by DMS and NCIRT.

Table 8.2 Monitoring Requirements and Schedule
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Required	Parameter	Frequency	Number/Locations	Notes
X	Pattern	Baseline/As-built (MY0)	Reach 1	Pattern measurements will be calculated as part of the as-built/baseline report. Additional pattern data, such as bank erosion pins/arrays, will be collected only if there are visual indications or cross

Table 8.2 Monitoring Requirements and Schedule
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Required	Parameter	Frequency	Number/Locations	Notes
				section survey data that suggest significant changes have occurred.
X	Dimension	Monitoring Years 1, 2, 3, 5 and 7	14 total cross sections: 12 on Reach 1 and 2 on UT2.	Cross sections to be monitored over seven (7) years and shall include assessment of bank height ratio (BHR) and entrenchment ratio (ER).
X	Longitudinal Profile	Baseline/As-built (MY0)	Reaches 1 and UT2	For the Restoration and Enhancement I components of this project, the entire channel length will be surveyed as part of the as-built record drawings.
X	Surface Water Hydrology	Annually	2 crest gauges (continuous stage recorders using pressure transducers) installed in-stream within Reach 1A and UT2.	The devices will be inspected on a quarterly/semi-annual basis to document the occurrence of bankfull events and flow duration.
X	Groundwater Hydrology	Annually	4 groundwater monitoring wells in wetland restoration locations.	The devices will be inspected and downloaded on a quarterly basis to document groundwater hydrology in wetland restoration areas.
X	Vegetation	Monitoring Years 1, 2, 3, 5 and 7	6 fixed vegetation plots will be established throughout the planted area, with 2 additional random plots each year (8 plots total annually).	Vegetation will be monitored using the Carolina Vegetation Survey (CVS) protocols. Plots will be 100 m^2 in size and total 2% of the planted area.
X	Exotic and Nuisance Vegetation and Animals	Annually and as needed	Project wide	Locations of exotic and nuisance vegetation will be visually assessed, photographed, and mapped. These areas will be treated as needed. Beaver signs and damage will be noted and beaver will be trapped if discovered.
X	Visual Assessment	Annually and as needed	Project wide	Representative photographs will be taken to capture the state of the restored stream, wetland, and vegetated buffer conditions. Stream photos will be preferably taken in the same location when the vegetation is minimal to document any areas of concern or to identify trends.
X	Project Boundary	Annually	Complete easement boundary	Locations of fence damage, vegetation damage, boundary encroachments, etc. will be photographed and mapped.

Table 8.2 Monitoring Requirements and Schedule
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Required	Parameter	Frequency	Number/Locations	Notes
X	Stormwater BMP	Semi-Annually	BMP on Reach 1A	Stormwater BMP will be visually monitored for stability and vegetation survival during the 7-year monitoring period.

9.0 ADAPTIVE MANAGEMENT PLAN

Upon completion of site construction, the post-construction monitoring protocols previously defined in this document will be implemented. Project maintenance will be performed as previously described in this document. If, during the course of annual monitoring it is determined the site's ability to achieve site performance standards are jeopardized, DMS will be notified of the need to develop a Plan of Corrective Action. The Plan of Corrective Action may be prepared using in-house technical staff or may require engineering and consulting services. Once the Plan of Corrective Action is prepared and finalized Michael Baker will:

1. Notify the USACE as required by the Nationwide 27 permit general conditions.
2. Notify the NCDWR.
3. Revise performance standards, maintenance requirements, and monitoring requirements as necessary and/or required by the USACE.
4. Obtain other permits as necessary.
5. Implement the Corrective Action Plan.
6. Provide the USACE a Record Drawing of Corrective Actions. This document shall depict the extent and nature of the work performed.

10.0 LONG-TERM MANAGEMENT PLAN

The NC Department of Environmental Quality's Stewardship Program currently houses DMS stewardship endowments within the non-reverting, interest-bearing Conservation Lands Stewardship Endowment Account. The use of funds from the Endowment Account is governed by North Carolina General Statute GS 113A-232(d)(3). Interest gained by the endowment fund may be used only for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable. The DEQ Stewardship Program intends to manage the account as a non-wasting endowment. Only interest generated from the endowment funds will be used to steward the compensatory mitigation sites. Interest funds not used for those purposes will be re-invested in the Endowment Account to offset losses due to inflation. The site-protection instrument for the site is included in Appendix B.

The project site will be protected and managed under the agreed upon terms outlined in the recorded conservation easement. The appropriate signage will be installed to mark the conservation easement boundary. The long-term manager/steward will be responsible for inspecting the site easement and signage, and for taking any corrective maintenance actions as needed. The landowner shall contact the long-term manager/steward regarding any clarification about easement restrictions and is responsible for maintaining all livestock-excluding fencing and/or permanent crossings. Should land use change in the future, the landowner will be responsible for the installation and maintain of any additional fencing that might be required to fulfill the conditions of the conservation easement.

11.0 DETERMINATION OF CREDITS

The determination of stream credits for the UT to Magness Creek Mitigation Project are detailed below in Tables 11.1 and 11.2 and are shown in Figure 12. They have been calculated according to all applicable DMS, IRT, and DEQ guidance documents. The Credit Release Table can be found in Appendix C.

Table 11.1 Project Mitigation Quantities and Credits

UT to Magness Creek Mitigation Project - DMS Project No. 100081

Project Segment	Original Mitigation Plan Ft/Ac	As-Built Ft/Ac	Original Mitigation Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Credits
Stream						
Reach 1A	2,249.60	N/A	Warm	R	1.0	2,249.600
Reach 1B	924.88	N/A	Warm	R	1.0	924.880
Reach UT2	325.21	N/A	Warm	E1	1.5	216.807
					Total:	**3,391.287**
Wetland						
Wetland Group W1	1.856	N/A	R	REE	1.0	1.856
Wetland Group W2	0.035	N/A	R	RH	1.5	0.023
					Total:	**1.879**

Table 11.2 Project Credits

	Stream			Riparian	Non-Rip	Coastal
Restoration Level	**Warm**	**Cool**	**Cold**	**Wetland**	**Wetland**	**Marsh**
Restoration	3,174.480	0.000	0.000	0.000	0.000	0.000
Re-establishment				1.856	0.000	0.000
Rehabilitation				0.023	0.000	0.000
Enhancement				0.000	0.000	0.000
Enhancement I	216.807	0.000	0.000			
Enhancement II	0.000	0.000	0.000			
Creation				0.000	0.000	0.000
Preservation	0.000	0.000	0.000	0.000	0.000	
Totals	**3,391.287**	**0.000**	**0.000**	**1.879**	**0.000**	**0.000**

Total Stream Credit 3,391.287

Total Wetland Credit 1.879

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APPENDIX A: FIGURES, PHOTOS, AND SUPPLEMENTARY DATA

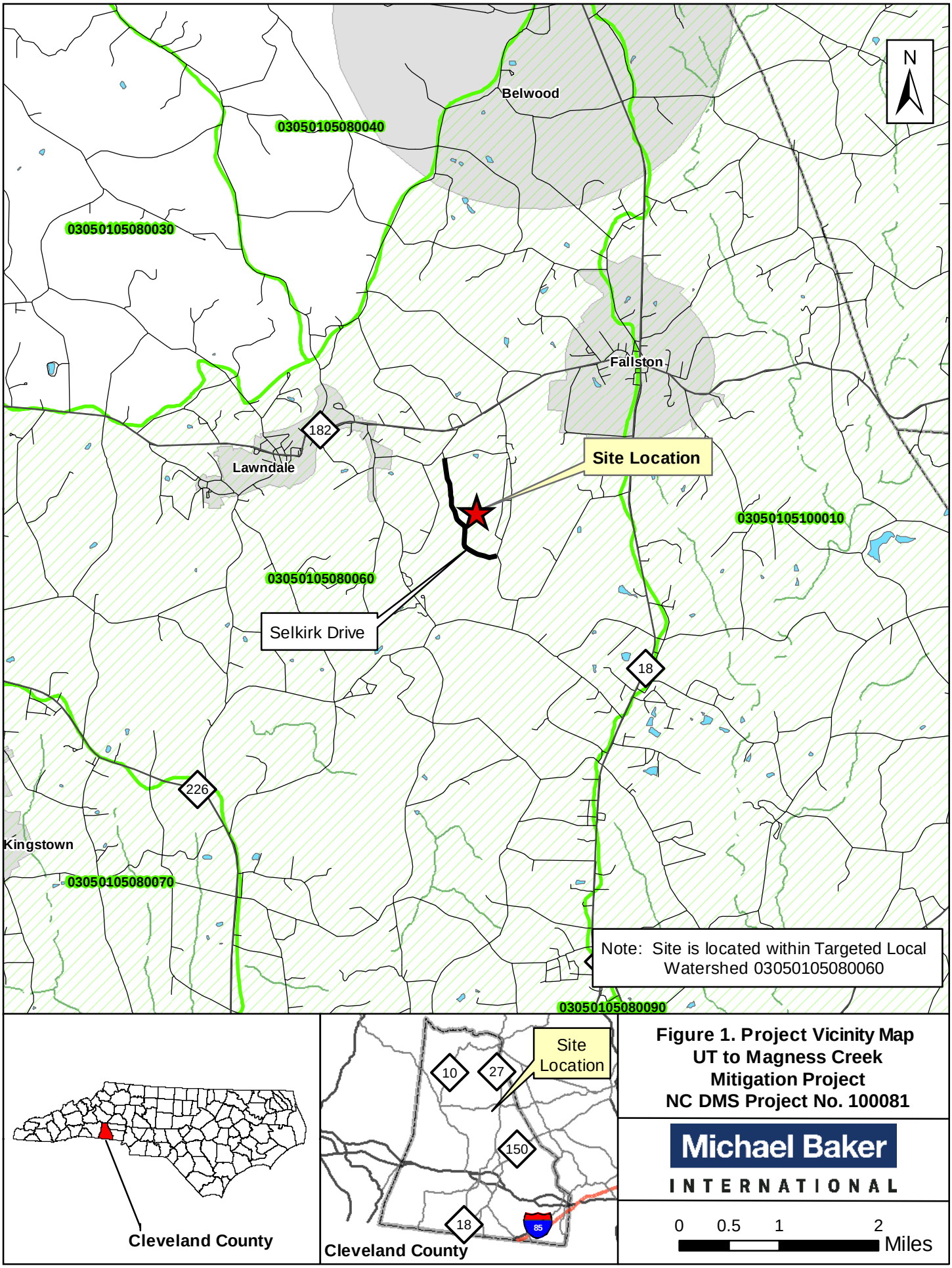
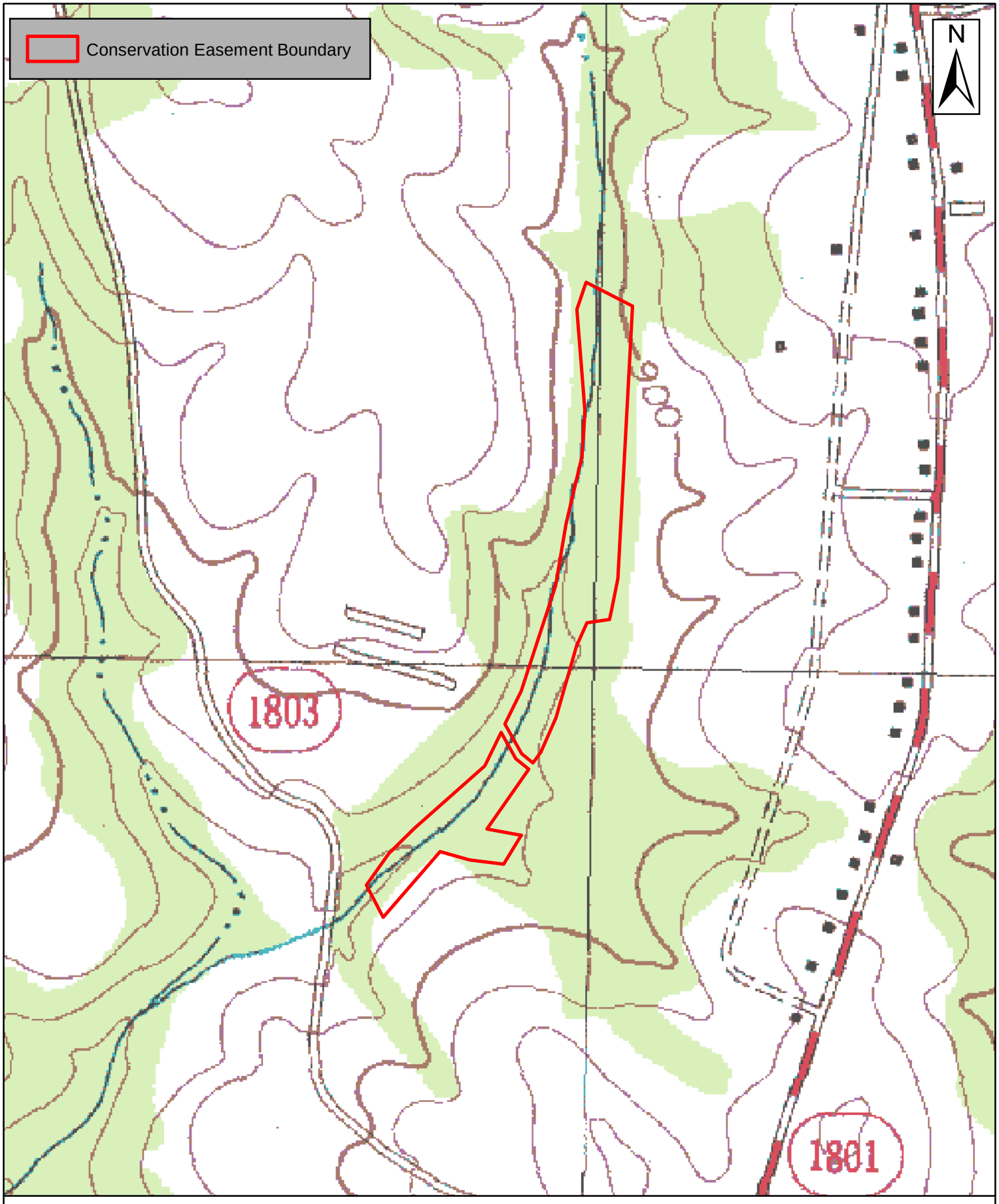


Figure 1. Project Vicinity Map
UT to Magness Creek
Mitigation Project
NC DMS Project No. 100081

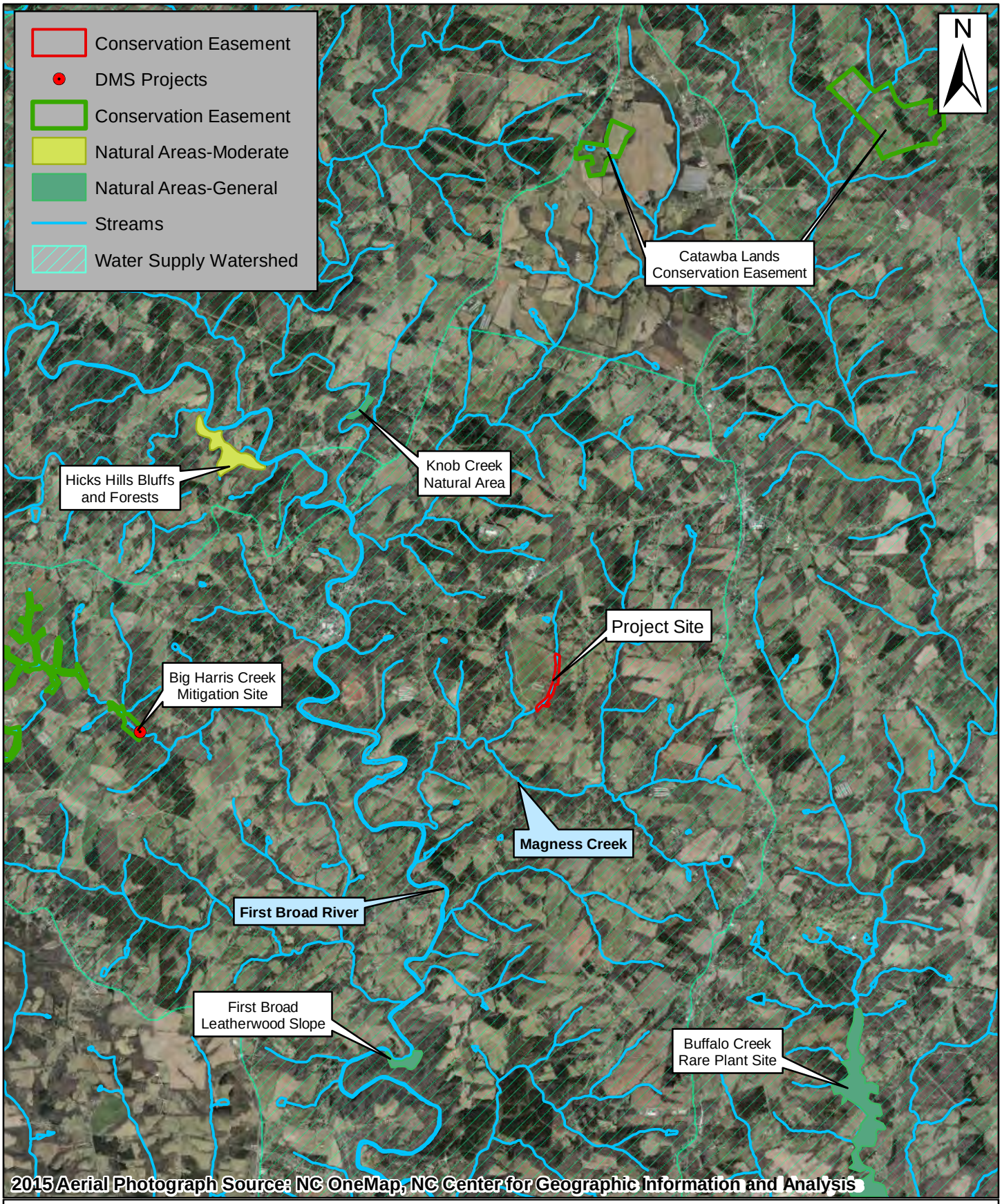
Michael Baker
INTERNATIONAL



Michael Baker INTERNATIONAL

0 250 500 1,000 Feet

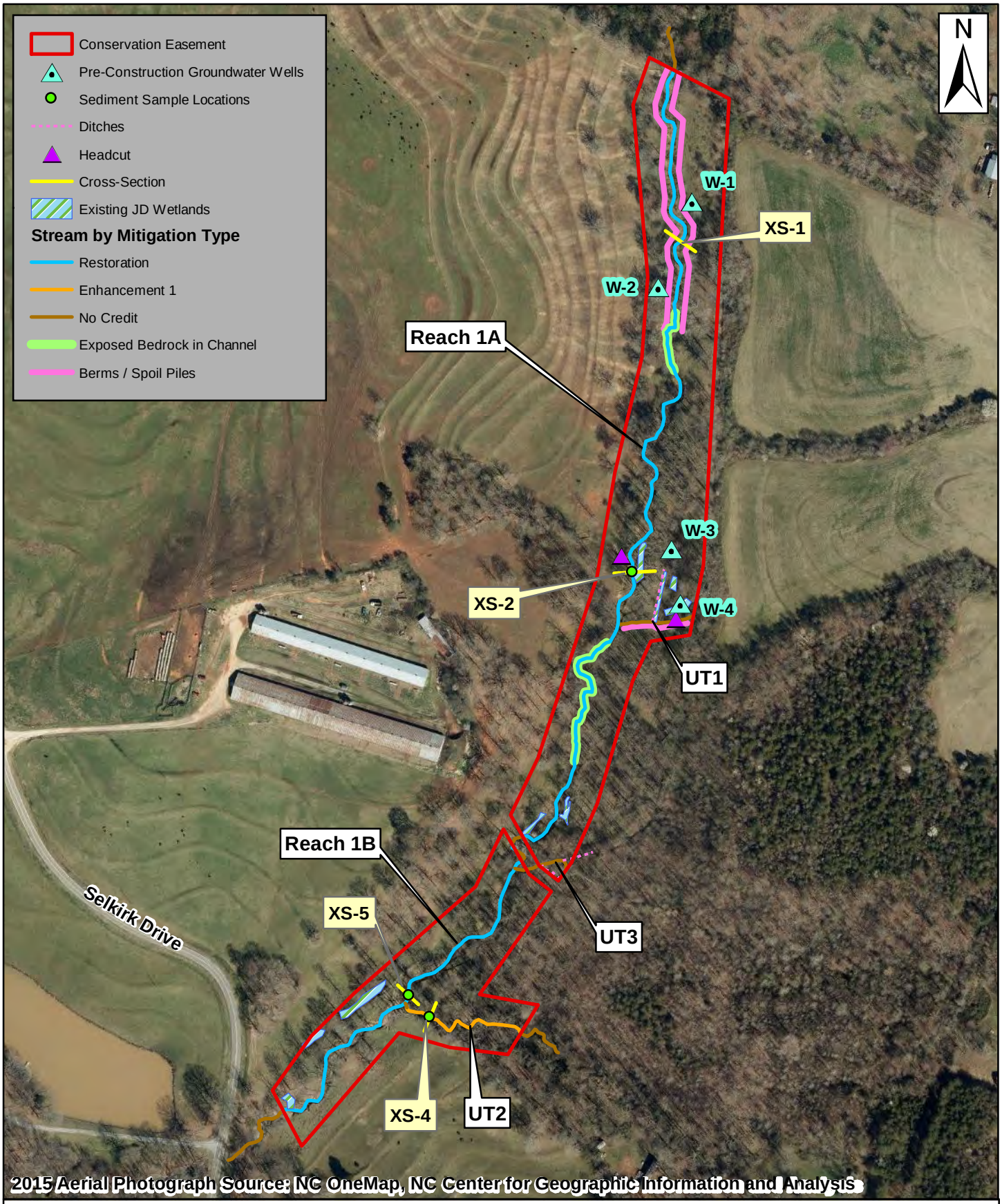
Figure 2. USGS Map (Lawndale Quad)
UT to Magness Creek Project
Cleveland County



Michael Baker INTERNATIONAL

0 1 2 Miles

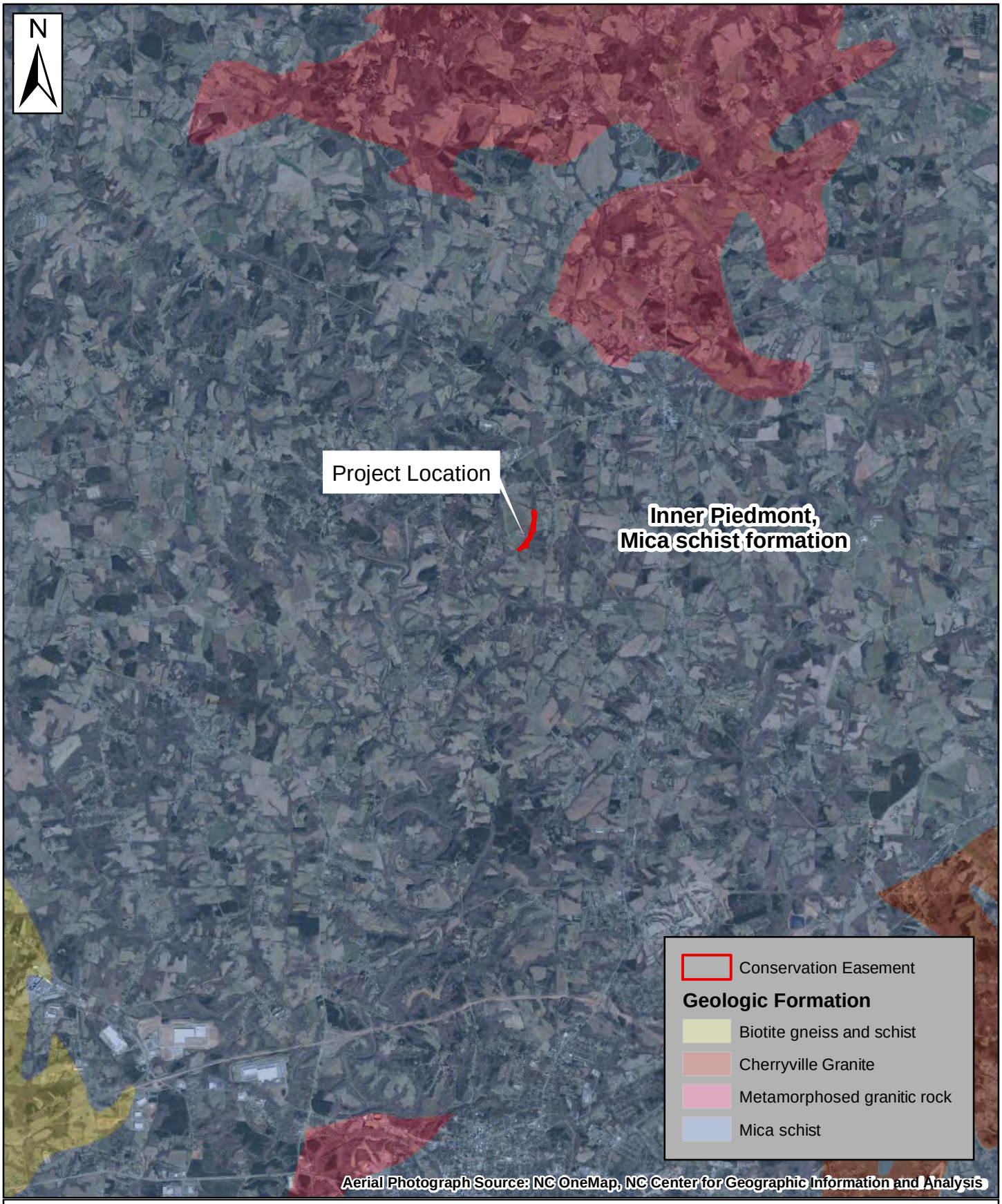
Figure 3. Adjacent and Proximal Planning Elements Map
UT to Magness Creek Project
Cleveland County



Michael Baker INTERNATIONAL

0 250 500 Feet

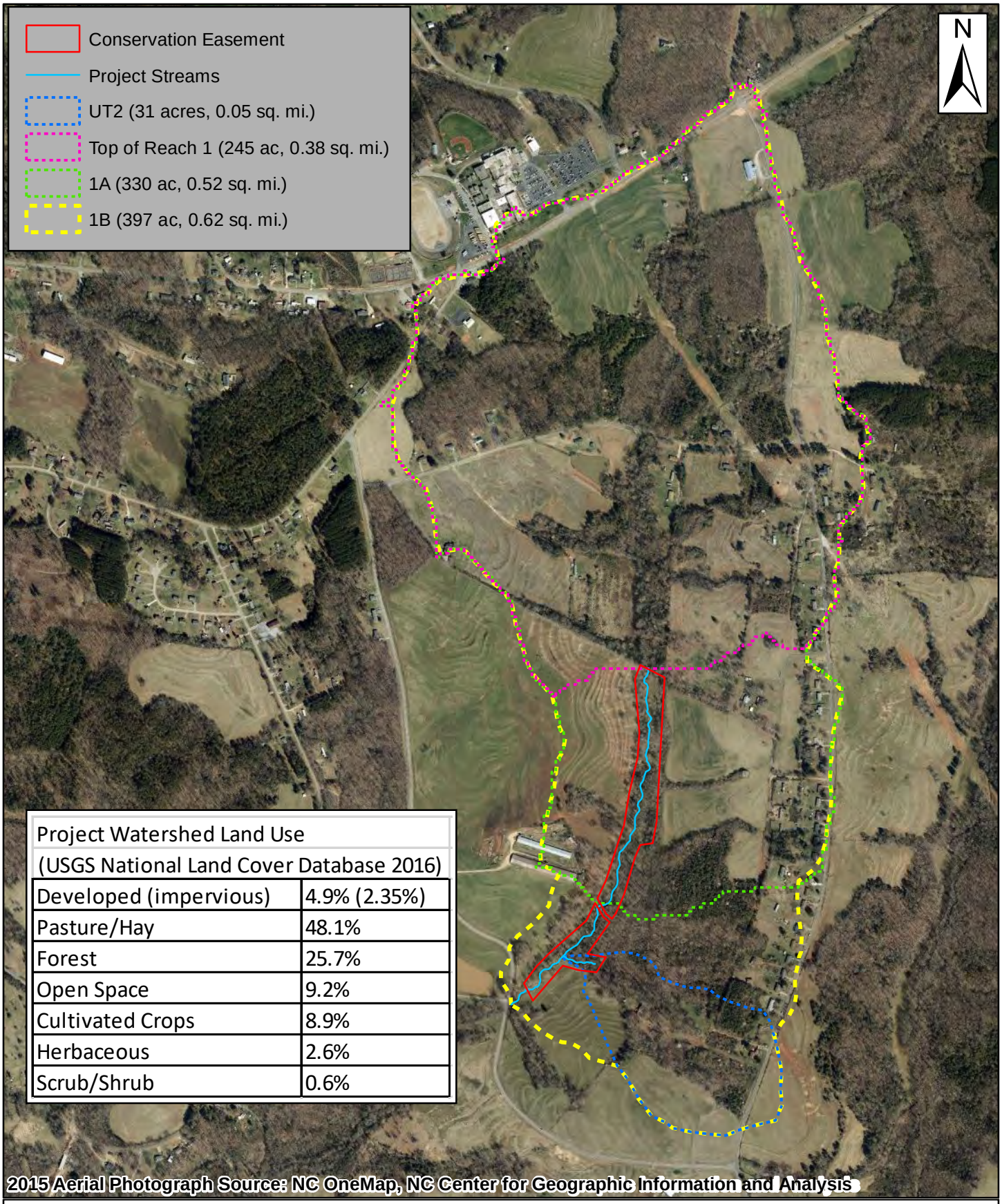
Figure 4. Existing Conditions and Features
UT to Magness Creek Project
Cleveland County



Michael Baker INTERNATIONAL

0 1.5 3 Miles

Figure 5. Geologic Features
UT to Magness Creek Project
Cleveland County

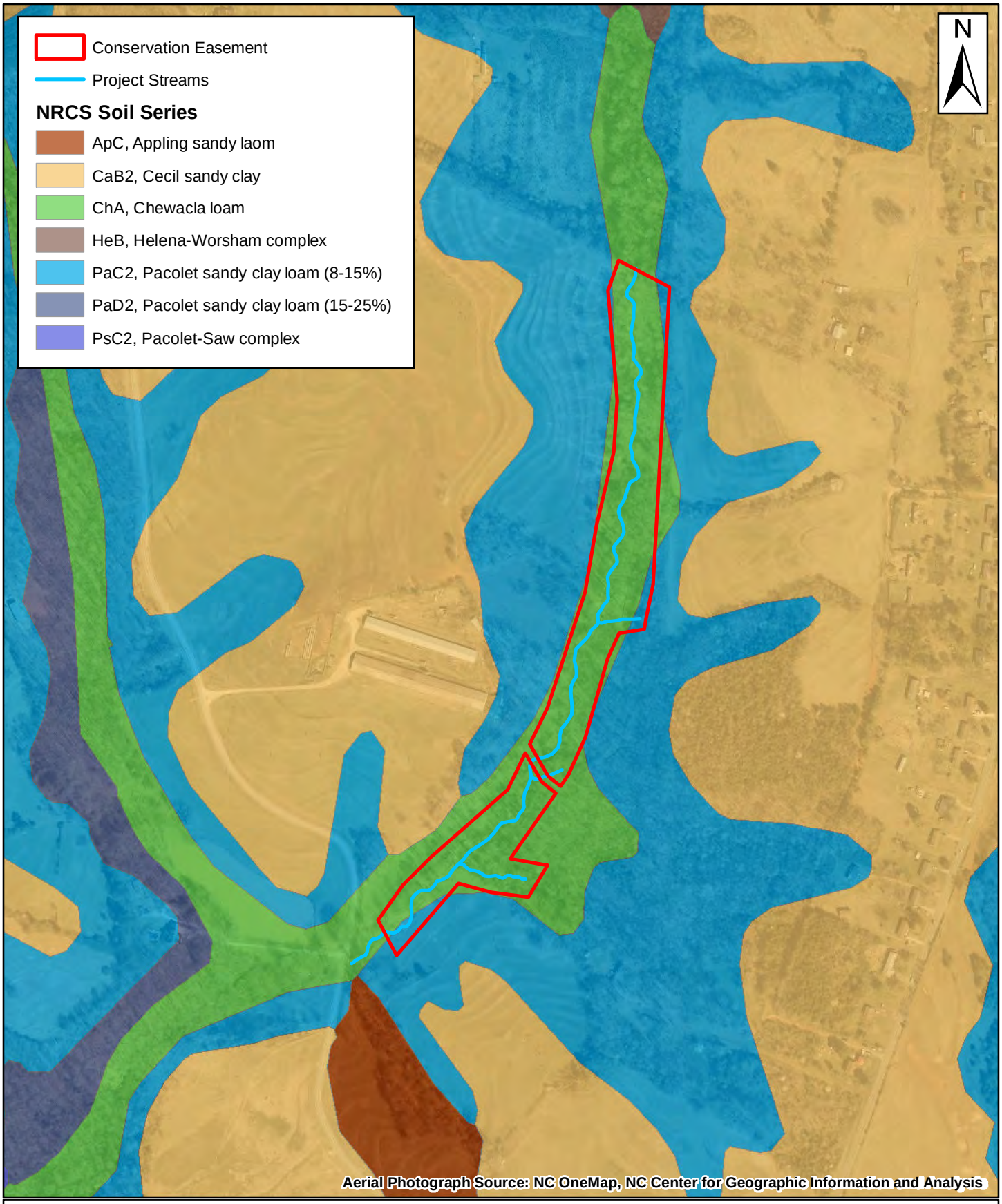


Project Watershed Land Use (USGS National Land Cover Database 2016)	
Developed (impervious)	4.9% (2.35%)
Pasture/Hay	48.1%
Forest	25.7%
Open Space	9.2%
Cultivated Crops	8.9%
Herbaceous	2.6%
Scrub/Shrub	0.6%

Michael Baker INTERNATIONAL

0 1,000 2,000 Feet

Figure 6. Drainage Area and Land Use Map
UT to Magness Creek Project
Cleveland County



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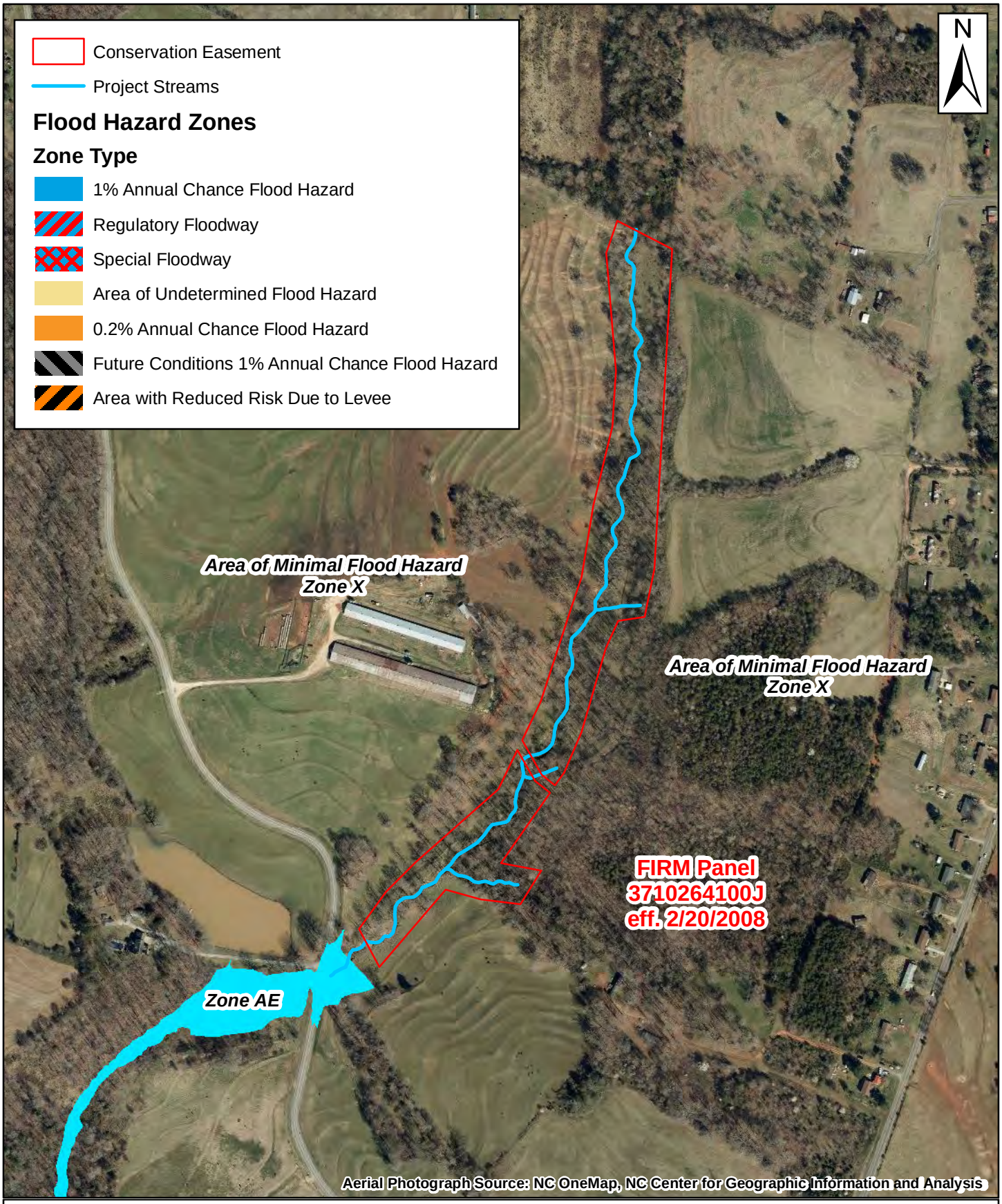
0 490 980 Feet

Figure 7. NRCS Soils Map
UT to Magness Creek Project
Cleveland County



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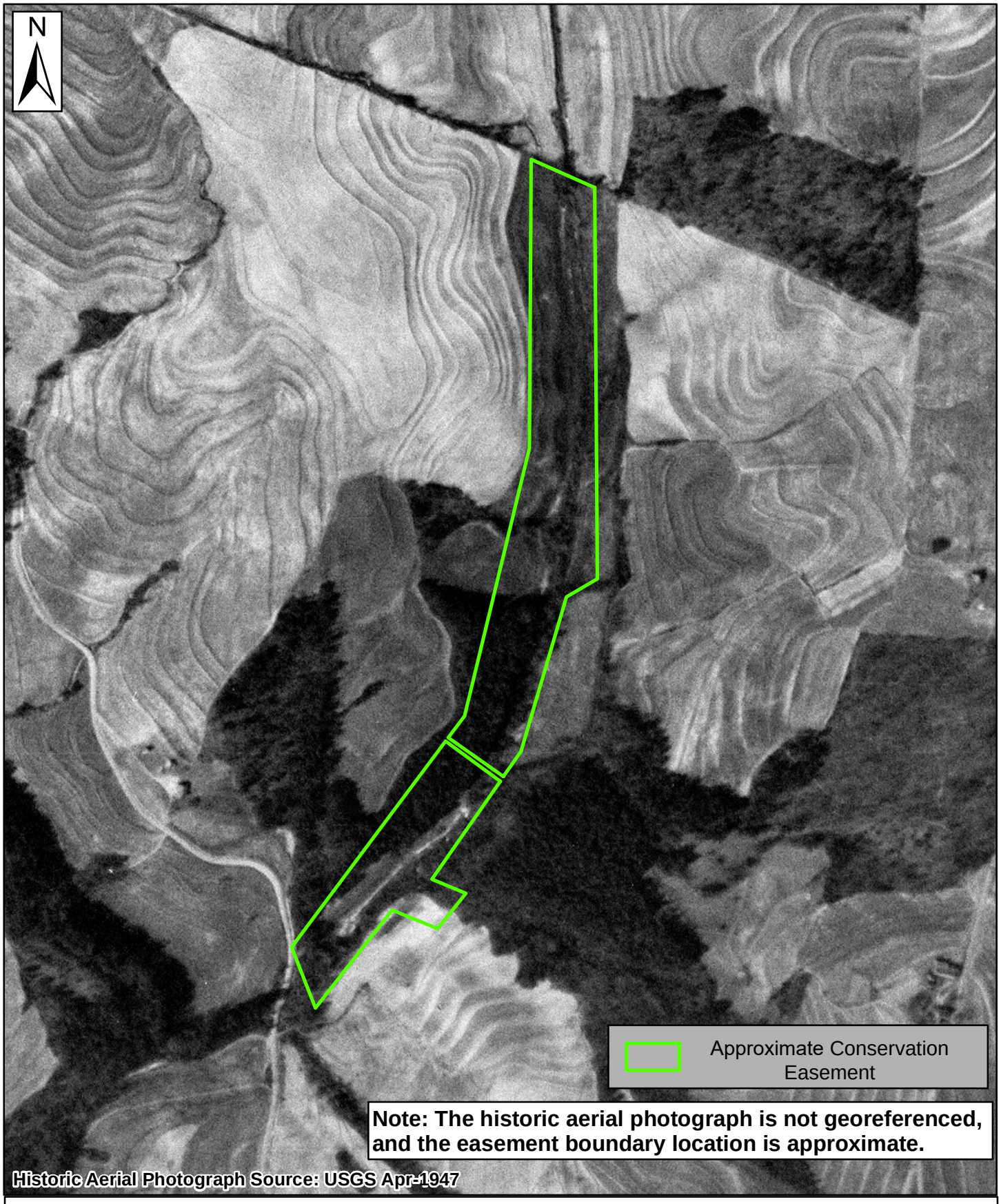
0 500 1,000 Feet

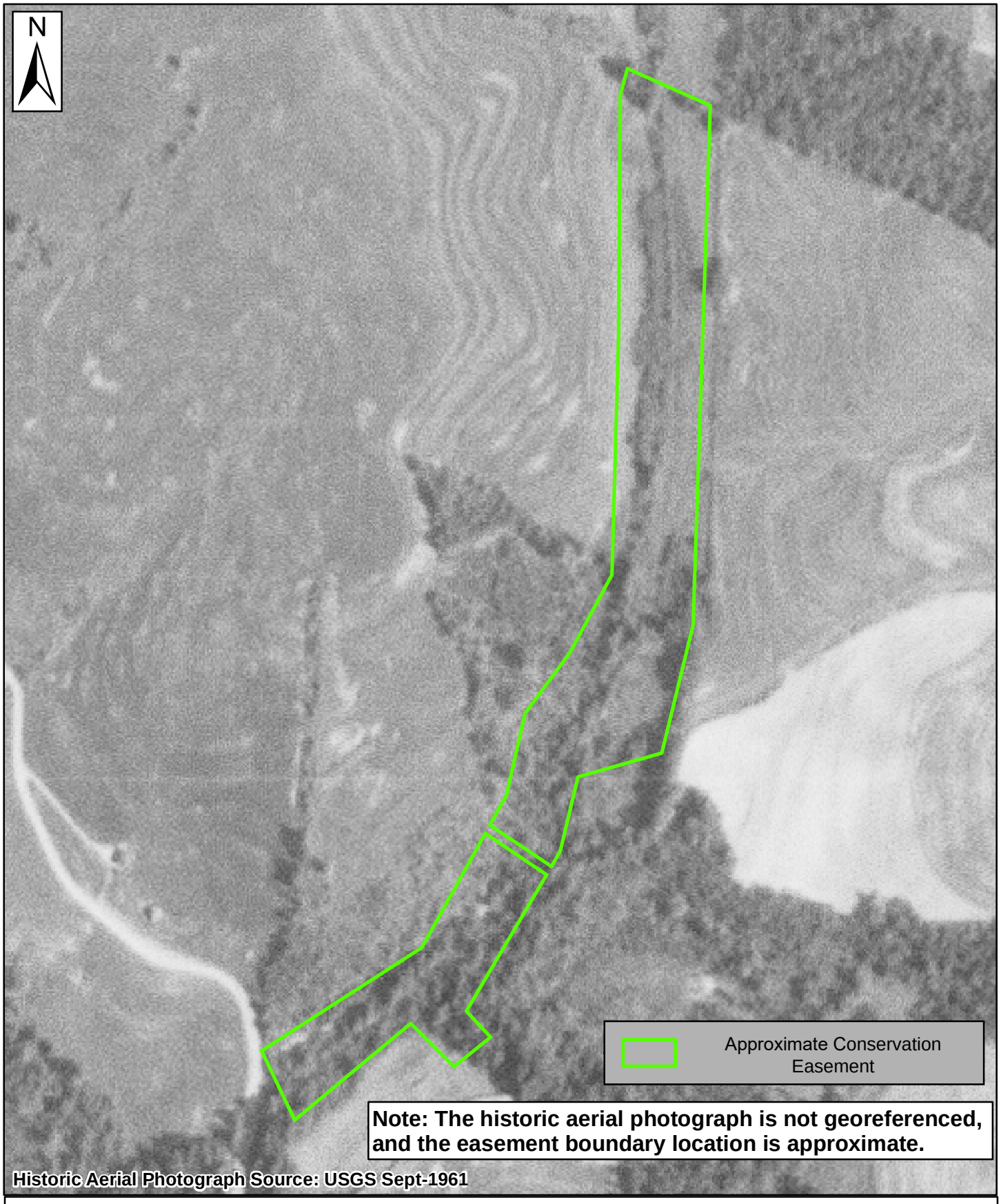
Figure 8
FEMA Floodplain Map
UT to Magness Creek
Stream Mitigation Project



Michael Baker INTERNATIONAL

Not to Scale

Figure 9A
Historic Aerial 1947
UT to Magness Creek Project
Cleveland County



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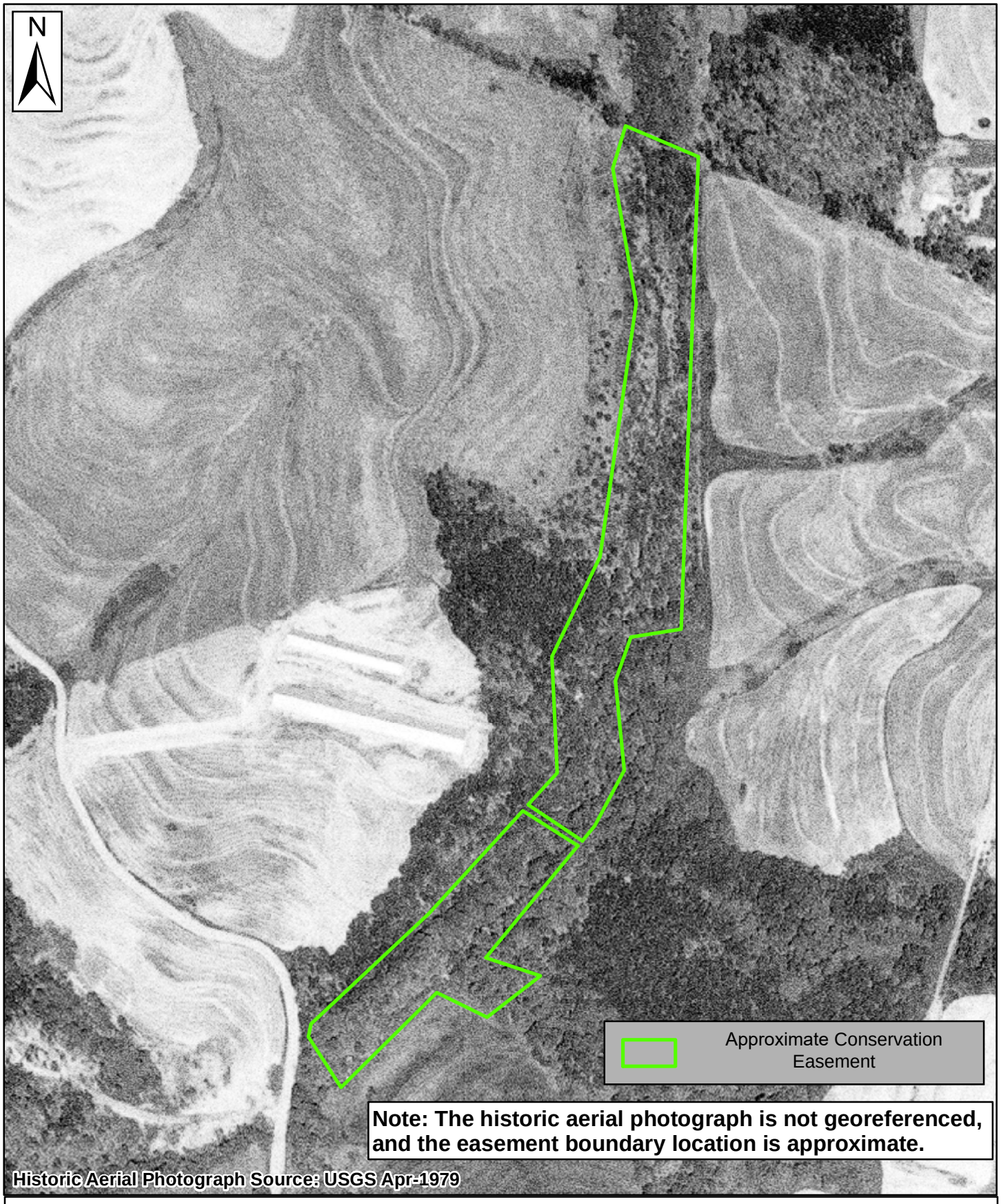
Not to Scale

Figure 9B
Historic Aerial 1961
UT to Magness Creek Project
Cleveland County



Michael Baker INTERNATIONAL

Not to Scale

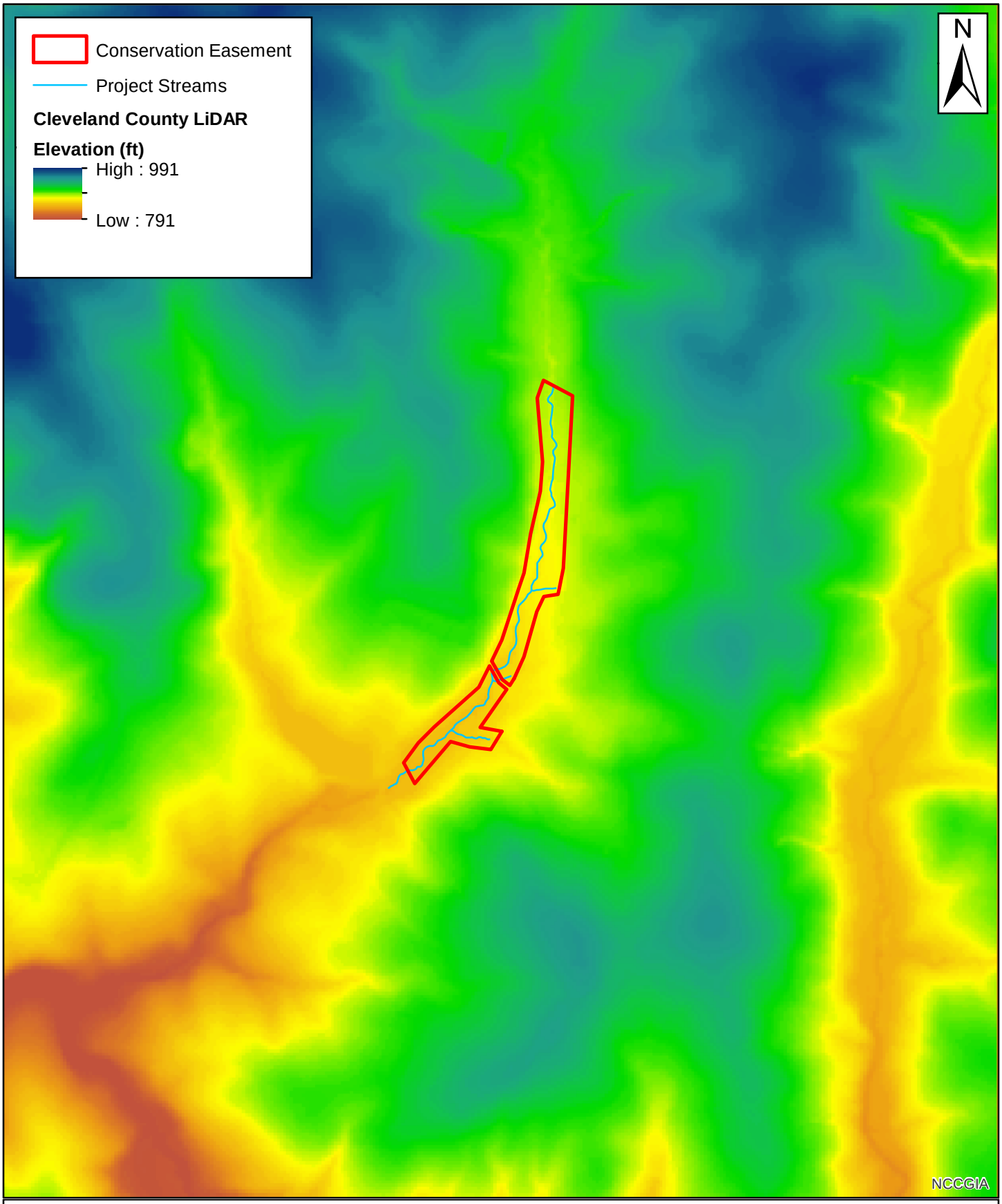
Figure 9C
Historic Aerial 1979
UT to Magness Creek Project
Cleveland County

Michael Baker INTERNATIONAL

0 300 600 Feet

1 inch = 300 feet

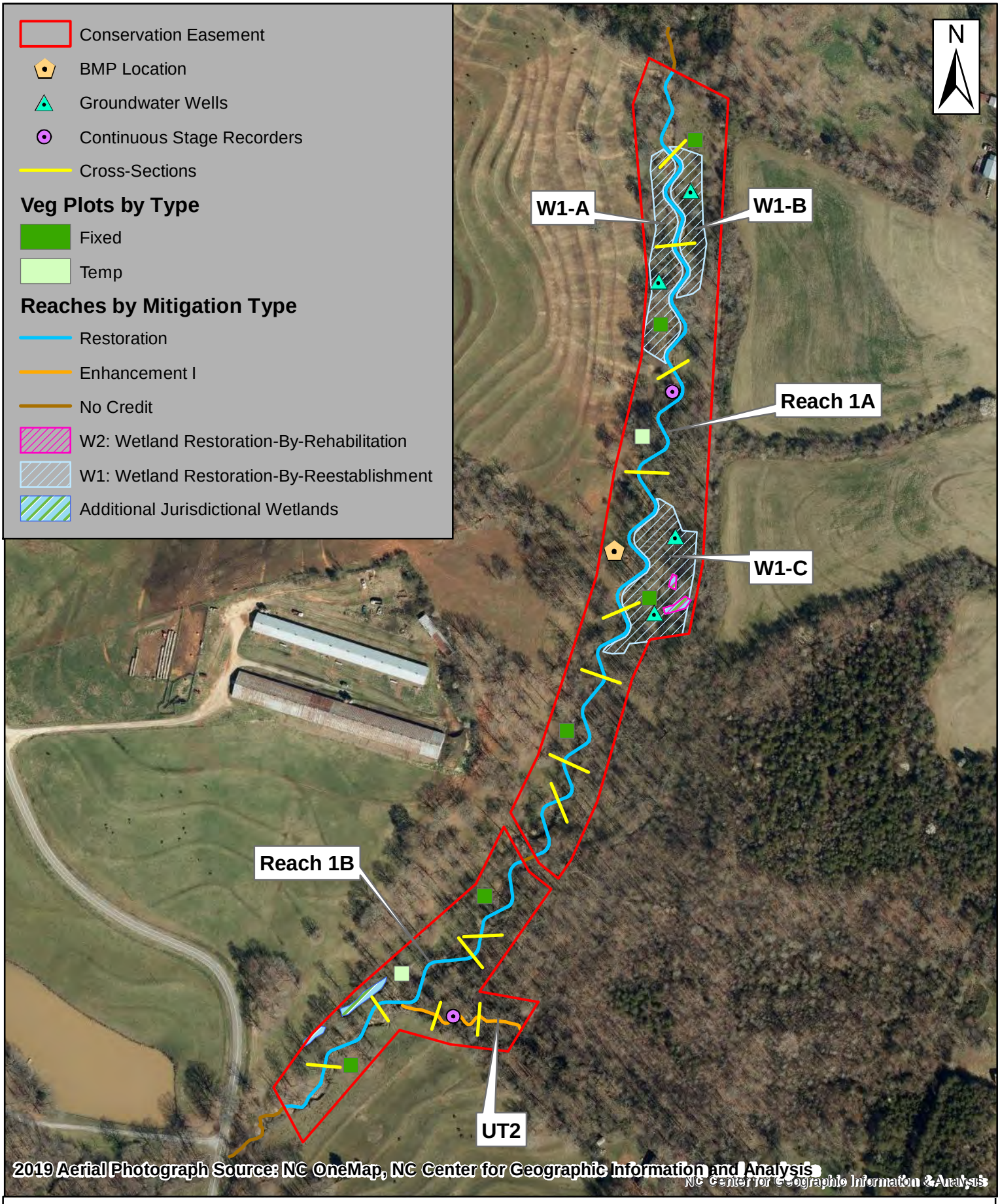
Figure 9D
Historic Aerial 1993
UT to Magness Creek Project
Cleveland County



Michael Baker INTERNATIONAL

0 1,000 2,000 Feet

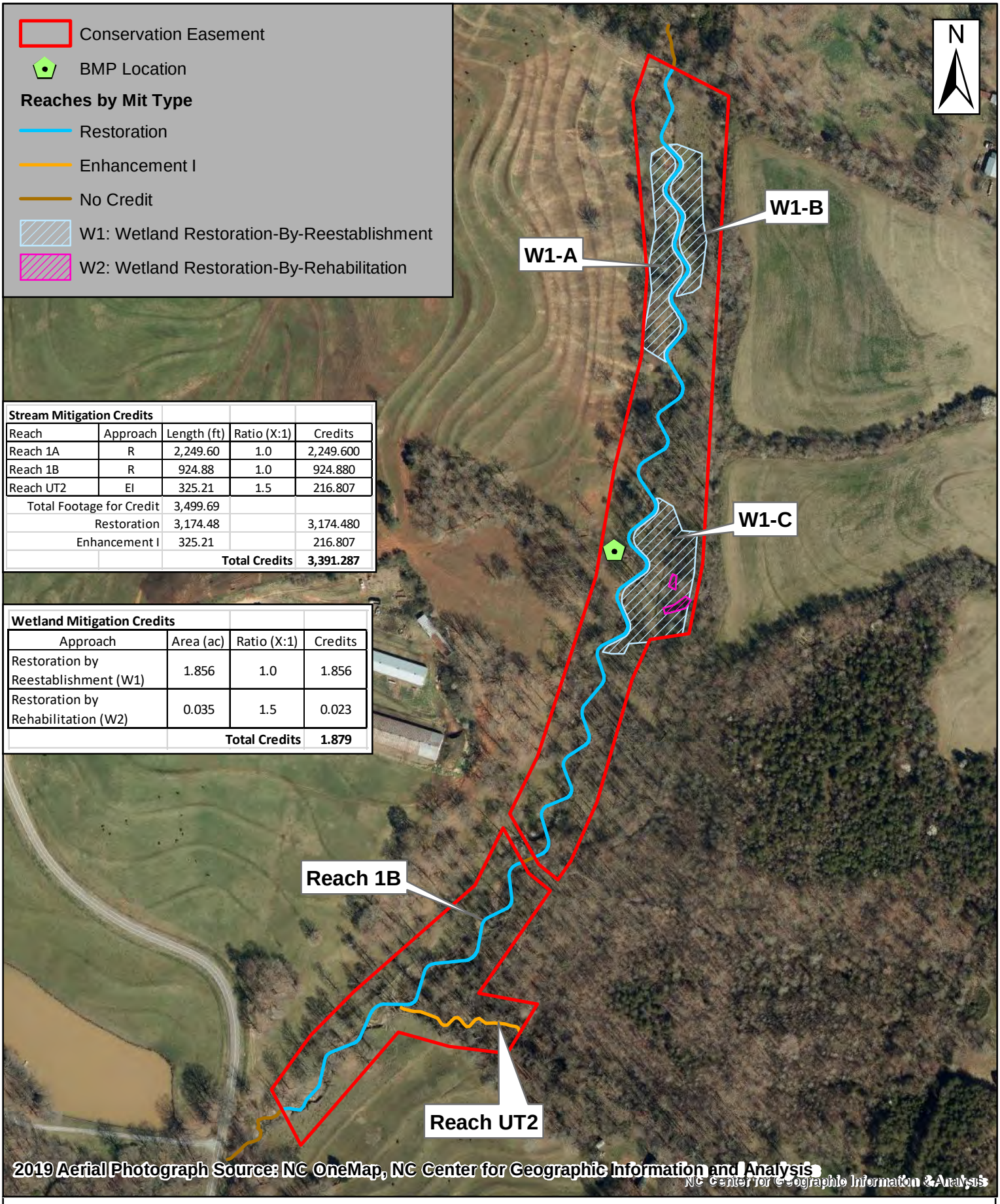
Figure 10. LiDAR Map UT to Magness Creek Project Cleveland County



Michael Baker INTERNATIONAL

0 125 250 500 Feet

Figure 11. Proposed Monitoring Features
UT to Magness Creek Project
Cleveland County



Stream Mitigation Credits

Reach	Approach	Length (ft)	Ratio (X:1)	Credits
Reach 1A	R	2,249.60	1.0	2,249.600
Reach 1B	R	924.88	1.0	924.880
Reach UT2	EI	325.21	1.5	216.807
Total Footage for Credit		3,499.69		
Restoration		3,174.48		3,174.480
Enhancement I		325.21		216.807
			Total Credits	**3,391.287**

Wetland Mitigation Credits

Approach	Area (ac)	Ratio (X:1)	Credits
Restoration by Reestablishment (W1)	1.856	1.0	1.856
Restoration by Rehabilitation (W2)	0.035	1.5	0.023
		Total Credits	**1.879**

Michael Baker INTERNATIONAL

0 125 250 500 Feet

Figure 12. Project Asset and Credit Map
UT to Magness Creek Project
Cleveland County

UT to Magness Creek Mitigation Project Photo-Log (2/19/18)

Top of Reach 1A, looking upstream at start of project

Upper Reach 1A, downstream

Upper Reach 1A, downstream

Upper Reach 1A, downstream

Upper Reach 1A, downstream

Upper Reach 1A, downstream

UT to Magness Creek Mitigation Project Photo-Log (2/19/18)

Middle Reach 1A: BMP location at massive headcut on right bank with soil auger for scale (2/21/18)

Lower Reach 1A, upstream

Lower Reach 1A, downstream

Lower Reach 1A, right bank scour

Upper Reach 1B, upstream

Upper Reach 1B, downstream

UT to Magness Creek Mitigation Project Photo-Log (2/19/18)

Upper Reach 1B, upstream

Top of Reach UT2, looking upstream

Middle Reach UT2, downstream

Lower Reach UT2, looking downstream to its confluence with Reach 1B

Lower Reach 1B, downstream

Lower Reach 1B, downstream

UT to Magness Creek Mitigation Project Photo-Log (2/19/18)

Lower Reach 1B, upstream

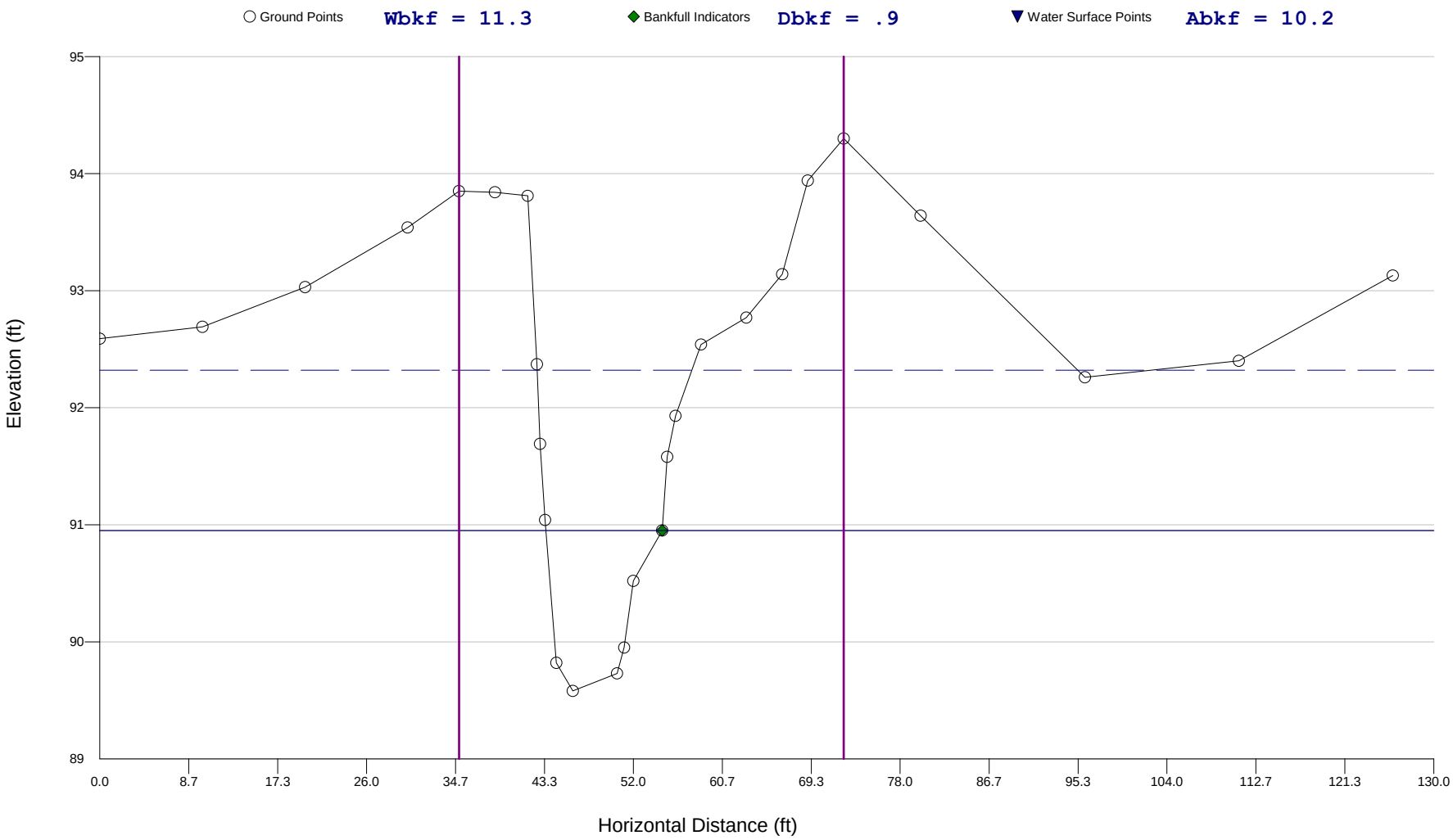
Lower Reach 1B: Buried A-horizon exposed along the left bank

Lower Reach 1B, downstream

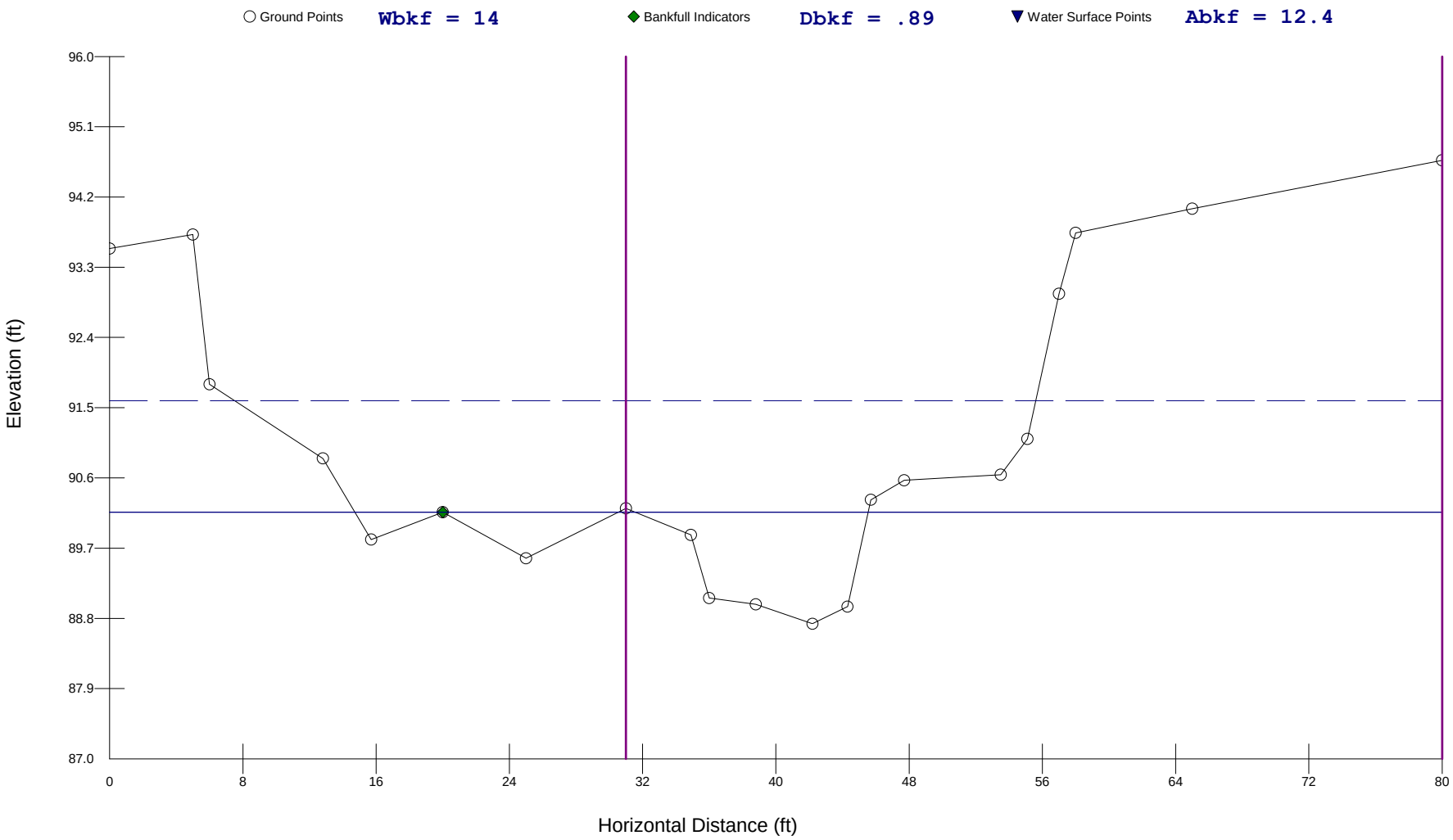
Lower Reach 1B, looking downstream at end of project (pipe culvert under Selkirk Dr. visible)

Cattle in the channel on Reach 1A (2/28/18)

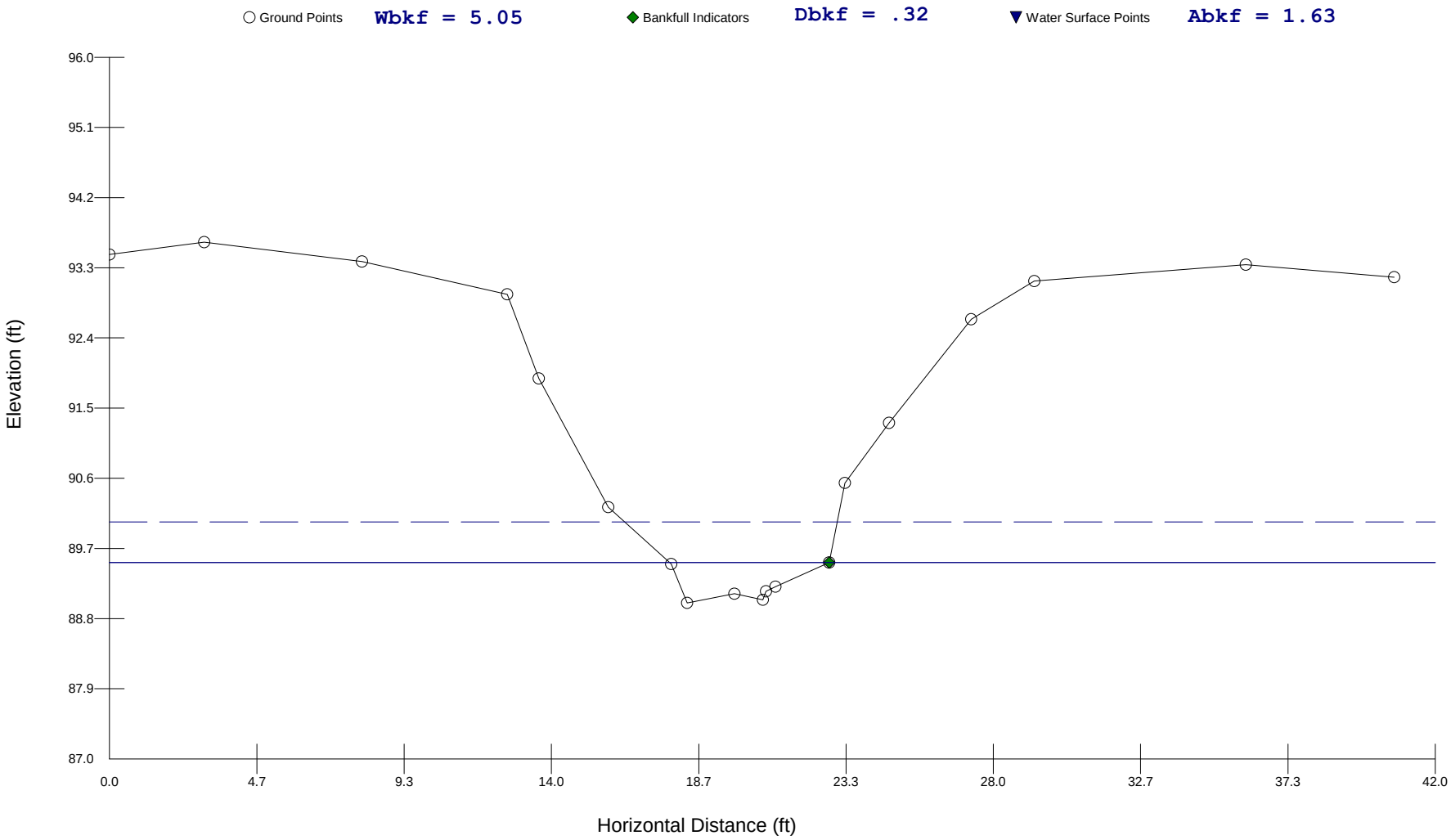
XS-1 on Reach 1A



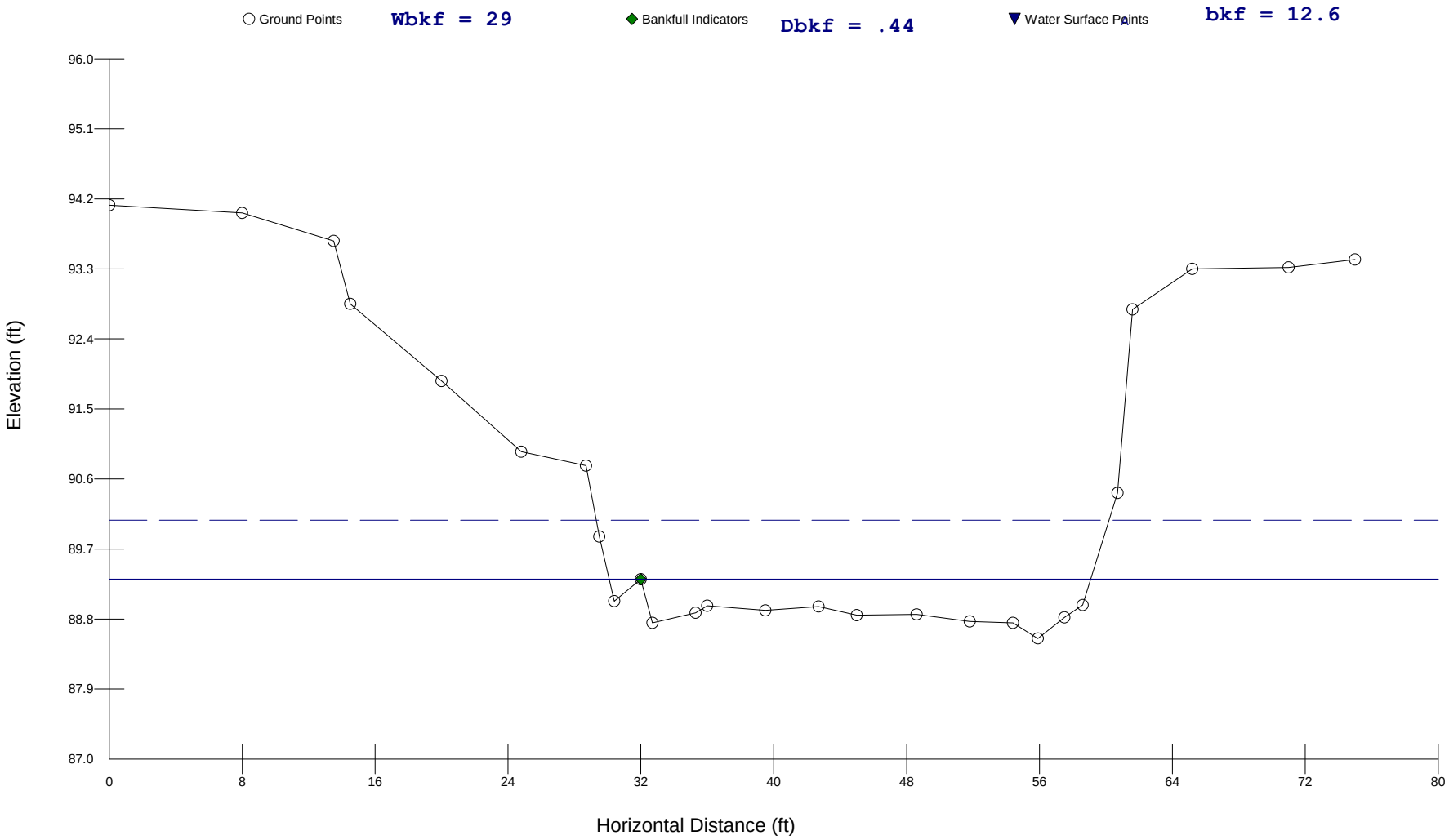
XS-2 on Reach 1A



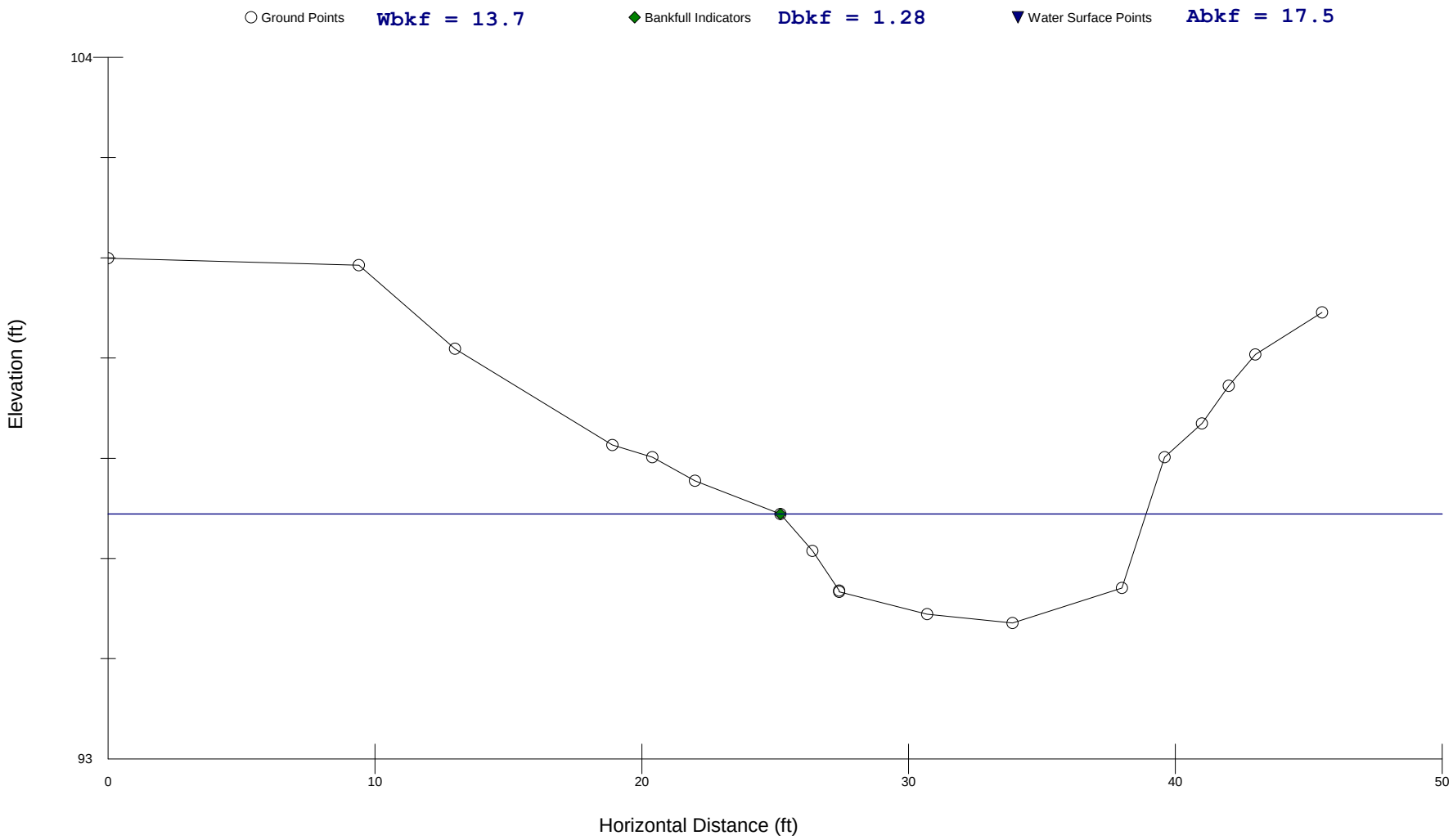
XS-4 on Reach UT2



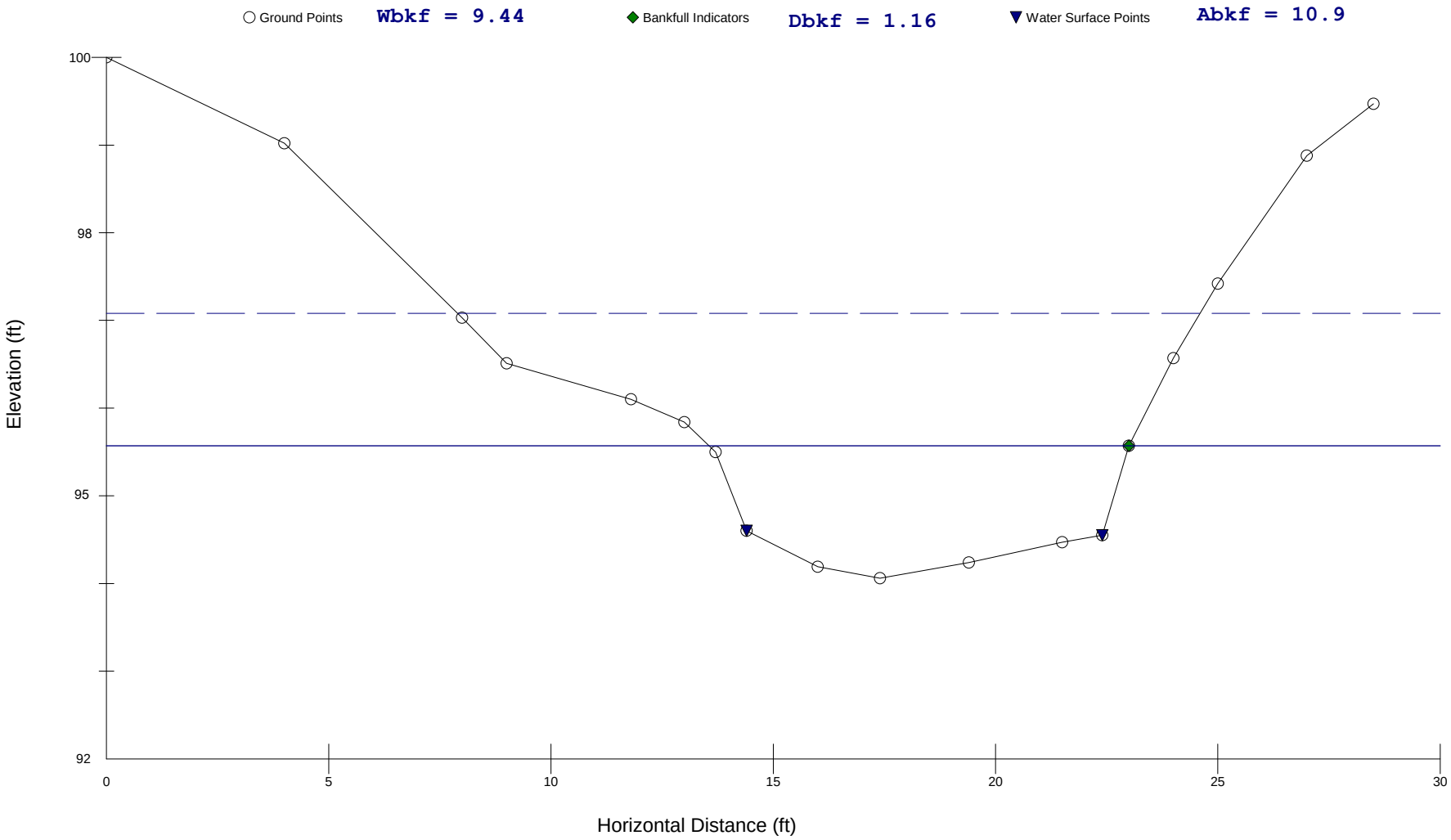
XS-5 on Reach 1B



Reference Reach (XS-1)



Reference Reach (XS-4)

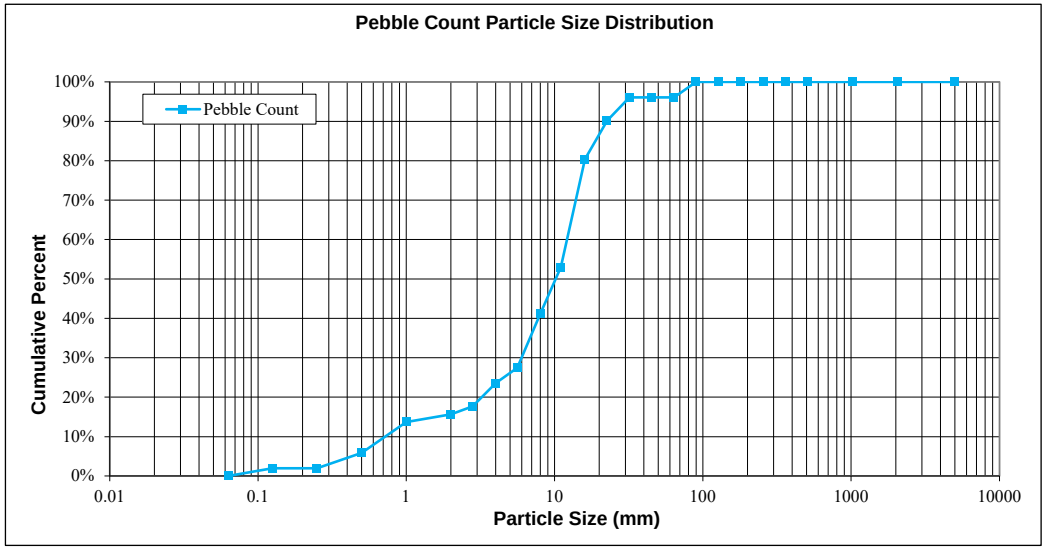


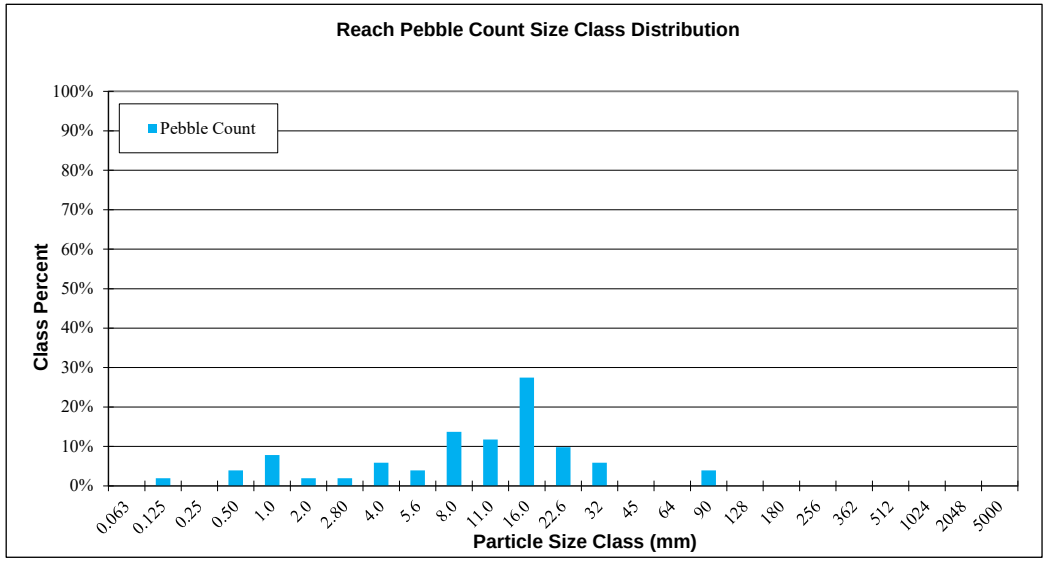
Cross-Section Pebble Count: Reach 1A

SITE OR PROJECT:	UT to Magness Creek
REACH/LOCATION:	Reach 1A
FEATURE:	Riffle at XS-2
DATE:	

			Pebble Count			Distribution
MATERIAL	PARTICLE	SIZE (mm)	Total	Class %	% Cum	Plot Size (mm)
Silt/Clay	Silt / Clay	< .063	0	0%	0%	0.063
Sand	Very Fine	.063 - .125	2	2%	2%	0.125
	Fine	.125 - .25	0	0%	2%	0.25
	Medium	.25 - .50	4	4%	6%	0.50
	Coarse	.50 - 1.0	8	8%	14%	1.0
	Very Coarse	1.0 - 2.0	2	2%	16%	2.0
Gravel	Very Fine	2.0 - 2.8	2	2%	18%	2.80
	Very Fine	2.8 - 4.0	6	6%	24%	4.0
	Fine	4.0 - 5.6	4	4%	27%	5.6
	Medium	5.6 - 8.0	14	14%	41%	8.0
	Medium	8.0 - 11.0	12	12%	53%	11.0
	Medium	11.0 - 16.0	28	27%	80%	16.0
	Coarse	16 - 22.6	10	10%	90%	22.6
	Coarse	22.6 - 32	6	6%	96%	32
	Very Coarse	32 - 45	0	0%	96%	45
	Very Coarse	45 - 64	0	0%	96%	64
Cobble	Small	64 - 90	4	4%	100%	90
	Small	90 - 128			100%	128
	Large	128 - 180			100%	180
	Large	180 - 256			100%	256
Boulder	Small	256 - 362			100%	362
	Small	362 - 512			100%	512
	Medium	512 - 1024			100%	1024
	rge-Very La	1024 - 2048			100%	2048
Bedrock	Bedrock	> 2048			100%	5000
Total % of whole count			102	100%		

Summary Data			
Channel materials			
D16 =	2.11	D84 =	17.32
D35 =	6.81	D95 =	30.02
D50 =	10.16	D100 =	90



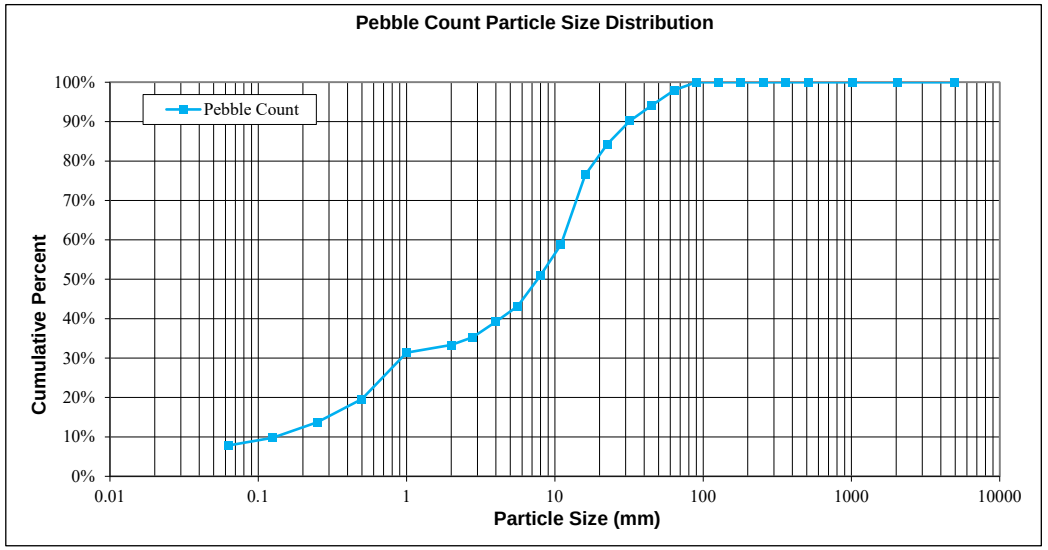


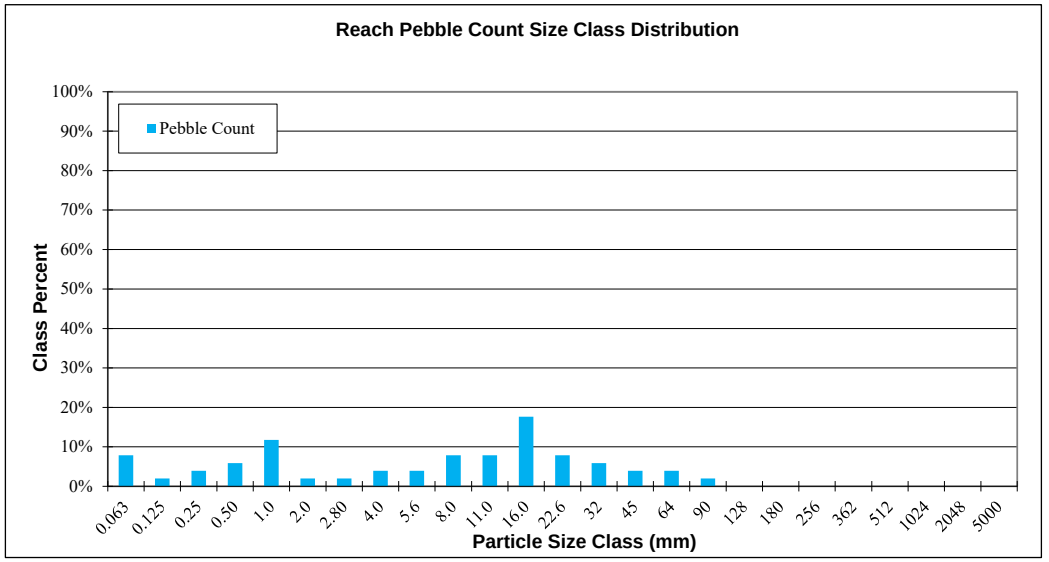
Cross-Section Pebble Count: Reach 1B

SITE OR PROJECT:	UT to Magness Creek
REACH/LOCATION:	Reach 1B
FEATURE:	Riffle at XS-5
DATE:	

			Pebble Count			Distribution
MATERIAL	PARTICLE	SIZE (mm)	Total	Class %	% Cum	Plot Size (mm)
Silt/Clay	Silt / Clay	< .063	8	8%	8%	0.063
Sand	Very Fine	.063 - .125	2	2%	10%	0.125
	Fine	.125 - .25	4	4%	14%	0.25
	Medium	.25 - .50	6	6%	20%	0.50
	Coarse	.50 - 1.0	12	12%	31%	1.0
	Very Coarse	1.0 - 2.0	2	2%	33%	2.0
Gravel	Very Fine	2.0 - 2.8	2	2%	35%	2.80
	Very Fine	2.8 - 4.0	4	4%	39%	4.0
	Fine	4.0 - 5.6	4	4%	43%	5.6
	Medium	5.6 - 8.0	8	8%	51%	8.0
	Medium	8.0 - 11.0	8	8%	59%	11.0
	Medium	11.0 - 16.0	18	18%	76%	16.0
	Coarse	16 - 22.6	8	8%	84%	22.6
	Coarse	22.6 - 32	6	6%	90%	32
	Very Coarse	32 - 45	4	4%	94%	45
	Very Coarse	45 - 64	4	4%	98%	64
Cobble	Small	64 - 90	2	2%	100%	90
	Small	90 - 128			100%	128
	Large	128 - 180			100%	180
	Large	180 - 256			100%	256
Boulder	Small	256 - 362			100%	362
	Small	362 - 512			100%	512
	Medium	512 - 1024			100%	1024
	rge-Very La	1024 - 2048			100%	2048
Bedrock	Bedrock	> 2048			100%	5000
Total % of whole count			102	100%		

Summary Data			
Channel materials			
D16 =	0.33	D84 =	19.34
D35 =	2.66	D95 =	48.71
D50 =	7.65	D100 =	90



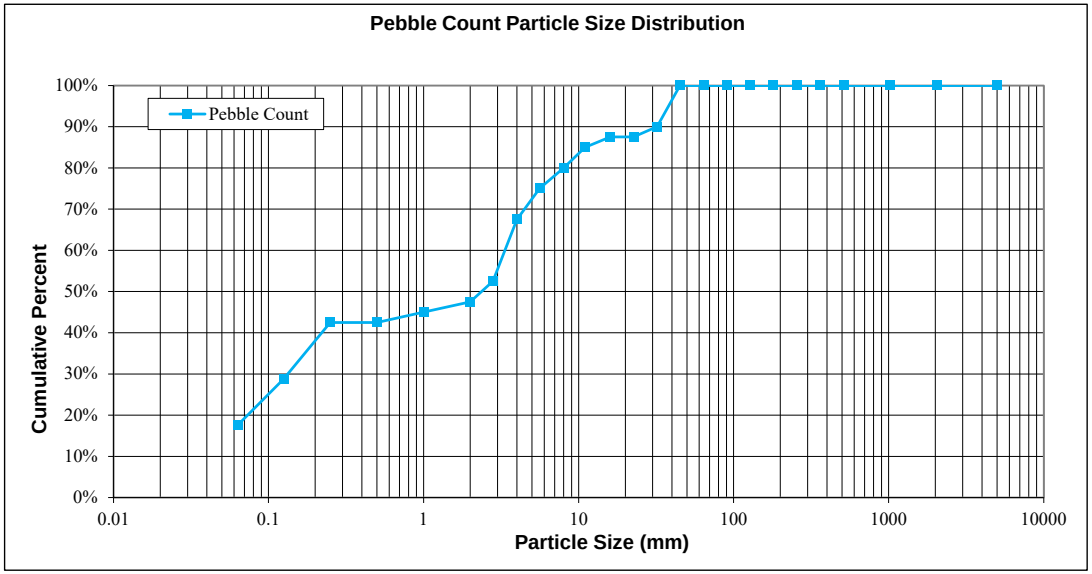


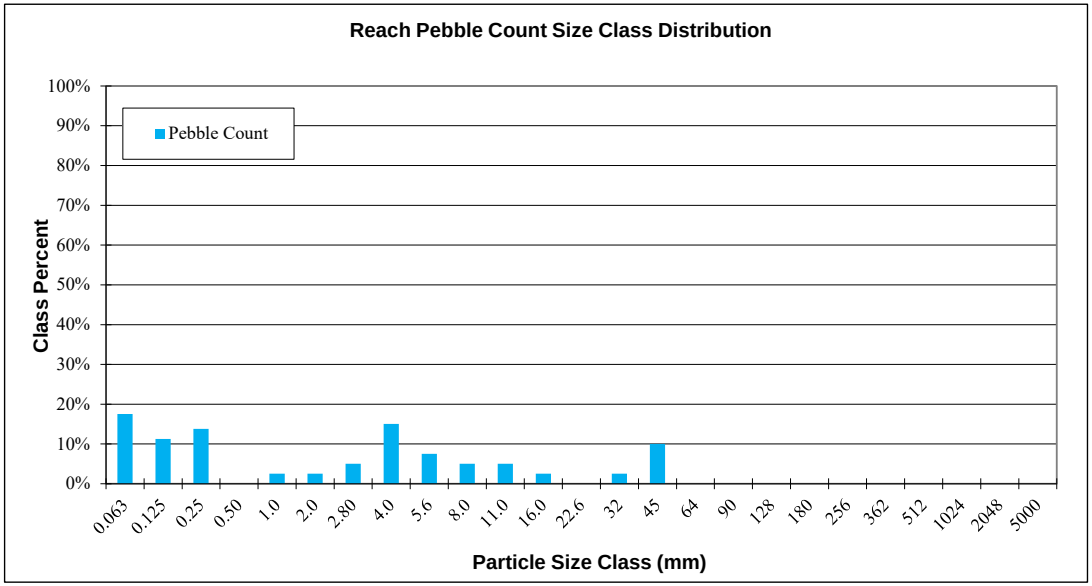
Cross-Section Pebble Count: Reach UT2

SITE OR PROJECT:	UT to Magness Creek
REACH/LOCATION:	Reach UT2
FEATURE:	Riffle
DATE:	

			Pebble Count			Distribution
MATERIAL	PARTICLE	SIZE (mm)	Total	Class %	% Cum	Plot Size (mm)
Silt/Clay	Silt / Clay	< .063	14	18%	18%	0.063
Sand	Very Fine	.063 - .125	9	11%	29%	0.125
	Fine	.125 - .25	11	14%	43%	0.25
	Medium	.25 - .50	0	0%	43%	0.50
	Coarse	.50 - 1.0	2	3%	45%	1.0
	Very Coarse	1.0 - 2.0	2	3%	48%	2.0
Gravel	Very Fine	2.0 - 2.8	4	5%	53%	2.80
	Very Fine	2.8 - 4.0	12	15%	68%	4.0
	Fine	4.0 - 5.6	6	8%	75%	5.6
	Medium	5.6 - 8.0	4	5%	80%	8.0
	Medium	8.0 - 11.0	4	5%	85%	11.0
	Medium	11.0 - 16.0	2	3%	88%	16.0
	Coarse	16 - 22.6	0	0%	88%	22.6
	Coarse	22.6 - 32	2	3%	90%	32
	Very Coarse	32 - 45	8	10%	100%	45
	Very Coarse	45 - 64			100%	64
Cobble	Small	64 - 90			100%	90
	Small	90 - 128			100%	128
	Large	128 - 180			100%	180
	Large	180 - 256			100%	256
Boulder	Small	256 - 362			100%	362
	Small	362 - 512			100%	512
	Medium	512 - 1024			100%	1024
	rge-Very La	1024 - 2048			100%	2048
Bedrock	Bedrock	> 2048			100%	5000
Total % of whole count			80	100%		

Summary Data			
Channel materials			
D16 =	0.06	D84 =	10.32
D35 =	0.17	D95 =	37.95
D50 =	2.37	D100 =	45.00





Michael Baker
INTERNATIONAL

Memo

Subject: UT to Magness BMP Design Summary

Author(s): Cody Batchelder, P.E.

Date: November 19, 2020

A stormwater best management practice (BMP) is proposed on the west side of the UT to Magness stream near station 25+00. This wet pond will receive stormwater runoff from 4.19 acres of drainage area, which contains no impervious area. Sizing of the BMP was completed using a 1-inch design storm rainfall depth, and runoff was calculation using the simple method. This BMP was designed to meet the stormwater design criteria of a wet pond following the North Carolina Stormwater Design Guidance Manual. Most of the minimum design criteria (MDC) were able to be accommodated; however, a few could not be met as outlined below. Even with these limitations, the design will be able to provide water quality improvement benefits.

The BMP collects surface runoff along the western side of the proposed wet pond, and then discharges runoff through an overflow weir along the northern side, and is designed to detain the 1-inch storm for water quality. The BMP meets the requirements for main pool surface area and volume (MDC-1), main pool depth (MDC-2), sediment storage (MDC-3), location of inlet and outlet (MDC-4), forebay (MDC-5), vegetated shelf, and protection of the receiving stream (MDC-8). The revegetation for the BMP will meet the requirements of landscaping plan MDC-11. Peak attenuation is not proposed for this BMP.

The BMP is unable to meet MDC-7, which requires a 2-5 day drawdown time between the temporary and permanent pool elevations. For a BMP of this size, meeting this criterion would require an orifice that would likely be subject to frequent clogging in the proposed application; therefore, the BMP was designed to accommodate the required treatment volume of the permanent pool and the temporary pool below the outlet. A low maintenance stone weir structure is proposed for the wet pond outlet, which also eliminates the need for a trash rack (MDC-10). No fountains are proposed, which eliminates MDC-9.

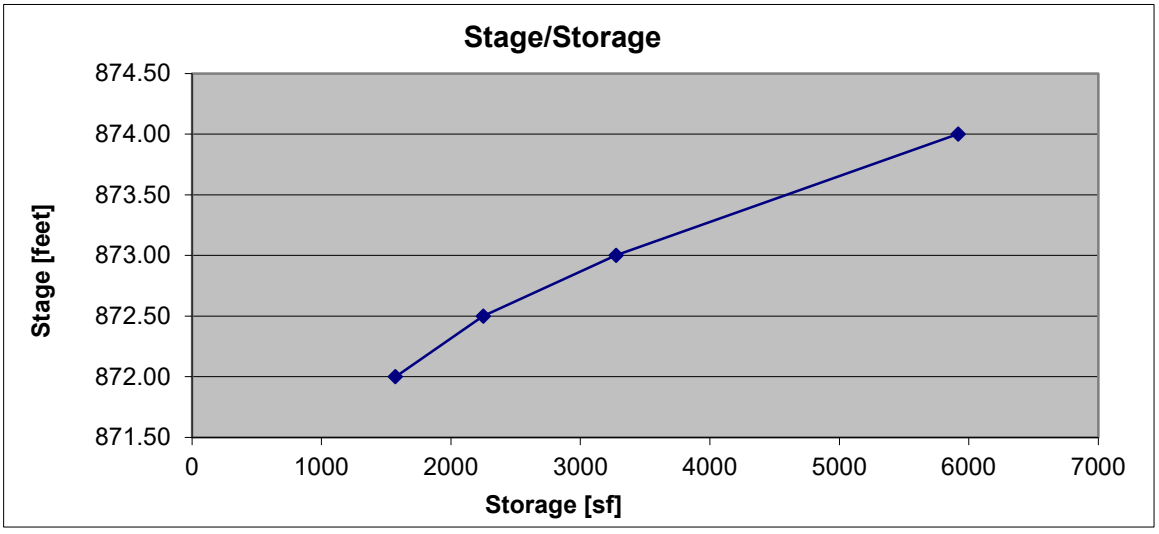
UT to Magness Stream Mitigation Project

Calcs by: CDB
Checked by:_____

BMP Stage/Storage, Volume, and Surface Area Calculations

Elevation	Area (sf)	Avg. Area (sf)	Height (ft)	Inc vol (cf)	Acc vol (ft3)	Notes
869.00	100					Main Pool Only
872.00	946	523	3	1569	**1569**	Top of Permanent Pool, Main Pool Only
872.50	1770	1358	0.5	679	2248	Middle of Veg Shelf, Main Pool+Forebay Area
873.00	2332	2051	0.5	1026	3274	Top of Veg Shelf, Invert of Outlet, Main Pool+Forebay Area
874.00	2950	2641	1	2641	5915	Top of Pond/Outlet, Main Pool+Forebay Area

Deep Water Surface Area	523	sf
% Deep Pool	17.7%	
Shallow Water Surface Area	1809	sf
% Shallow Water	61.3%	
Temporary Ponding Surface Area	618	sf
% Temporary Ponding	20.9%	



Pervious Area	4.19
Impervious Area	0.00

4.19

The Simple Method		
$R_V = 0.05 + 0.9 * I_A$	Step 1 in the Simple Method	
R_V	0.050	Runoff coefficient (unitless)
I_A	0.000	Impervious fraction [impervious portion of drainage area (ac)/drainage area (ac)], (unitless)
$V = 3630 * R_D * R_V * A$	Step 2 in the Simple Method	
V	760.49	Volume of runoff that must be controlled for the design storm (cubic feet)
V	0.2095	Volume of runoff that must be controlled for the design storm (acre-in)
R_D	1.00	Design storm rainfall depth (in) (Typically 1.0" or 1.5")
A	4.19	Watershed area (ac)

***CN Method in this spreadsheet is for 2 CN areas only. The equations may need to be tweaked if using multiple CNs or use a composite pervious CN.

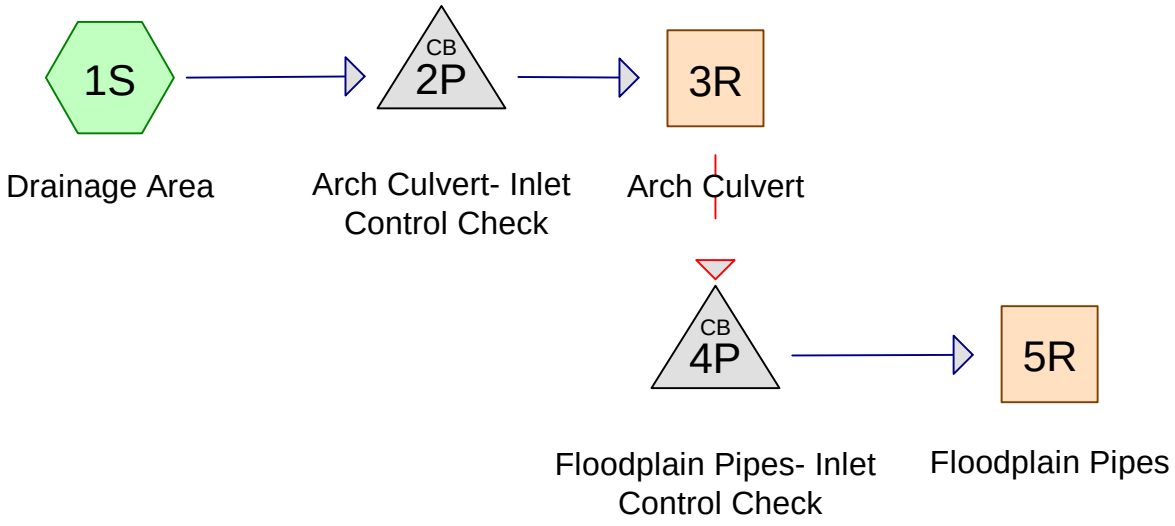
Discrete SCS Curve Number Method		
$Q^* = (P - 0.2S)^2 / (P + 0.8S)$		
Q* (From Impervious)	0.79	Runoff depth (in)
P	1.0	Rainfall depth (in) (Typically 1.0" or 1.5")
S	0.20	Potential maximum retention after rainfall begins (in)
S = (1000 / CN) - 10	0.20	S is related to the soil and surface characteristics through the curve number (CN)
CN (Impervious)	98	Related to hydrologic soil group and ground cover. (Refer to DWQ Design Manual for CN Tables and explanation)
S = (1000 / CN) - 10	4.49	
CN (Pervious)	69.00	
Q* (From Pervious)	0.00224	
P	1.00	
S	4.49	
Q*total	0.793	(in)
Soil Type	PaC2 Pacolet sandy clay loam, 8 to 15 percent slopes, moderately eroded, Cecil sandy clay loam, 2 to 8 percent slopes, moderately eroded, Chewacla loam, 0 to 2 percent slopes, frequently flooded	http://websoilsurvey.nrcs.usda.gov/app/
Hydrologic Soil Group SCS (1986)	B	Refer to DWQ Design Manual after the soil series in the area of interest is identified

BMP Sizing		
V = A(Q*)	0.0094	SCS Method Volume of Runoff (ac-in) Required Storage Volume
DV	34.07	SCS Method Volume of Runoff (cubic feet) Required Storage Volume
V	0.21	Simple Method Volume of Runoff (ac-in) Required Storage Volume
DV	760.48	Simple Method Volume of Runoff (cubic feet) Required Storage Volume
Wetland Parameters		
Required Ponding Depth	N/A	Depends on desired vegetation type and inundation time. Usually 6-12" (in)
Required BMP Surface Area	N/A	(ac) SCS Method
Required BMP Surface Area	N/A	(ft^2) SCS Method
Required BMP Surface Area	N/A	(ac) Simple Method
Required BMP Surface Area	N/A	(ft^2) Simple Method
Actual Wetland Surface Area	N/A	(ac) Measured in Cadd, GIS or by hand.
Actual Wetland Surface Area	N/A	(ft^2)
Actual Wetland Storage Volume	N/A	(ft^3)
Wet Pond Parameters		
Vmp	1853	(ft^3) Vmp=0.87*HRT/Ts*DV (Method 1)
SA/DA	0.51	Table 1 or 2 from Stormwater Design Manual (Method 2)
Surface Area	931	(ft^2) (Method 2)
Actual Pond Surface Area	946	(ft^2) Measured in Cadd, GIS or by hand
Davg	1.96	(ft)
Sediment Storage	0.5	(ft) 0.5' per MDC 3
Forebay Volume	278	(ft^3) 15-20% volume of main pool per MDC5

According to the DWQ BMP design manual, the BMP must be designed to treat a volume at least as large as the volume calculated using the simple method

DWQ recommends 9" but requires ponding depth to be less then 12"*

UT to Magness Creek: Culvert Design Calculations



Subcat Reach Pond Link

Routing Diagram for Culvert Analysis- Arch+Floodplain Pipes
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net, Printed 11/24/2020
HydroCAD® 10.10-4b Sampler s/n S29052 © 2020 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: Drainage Area

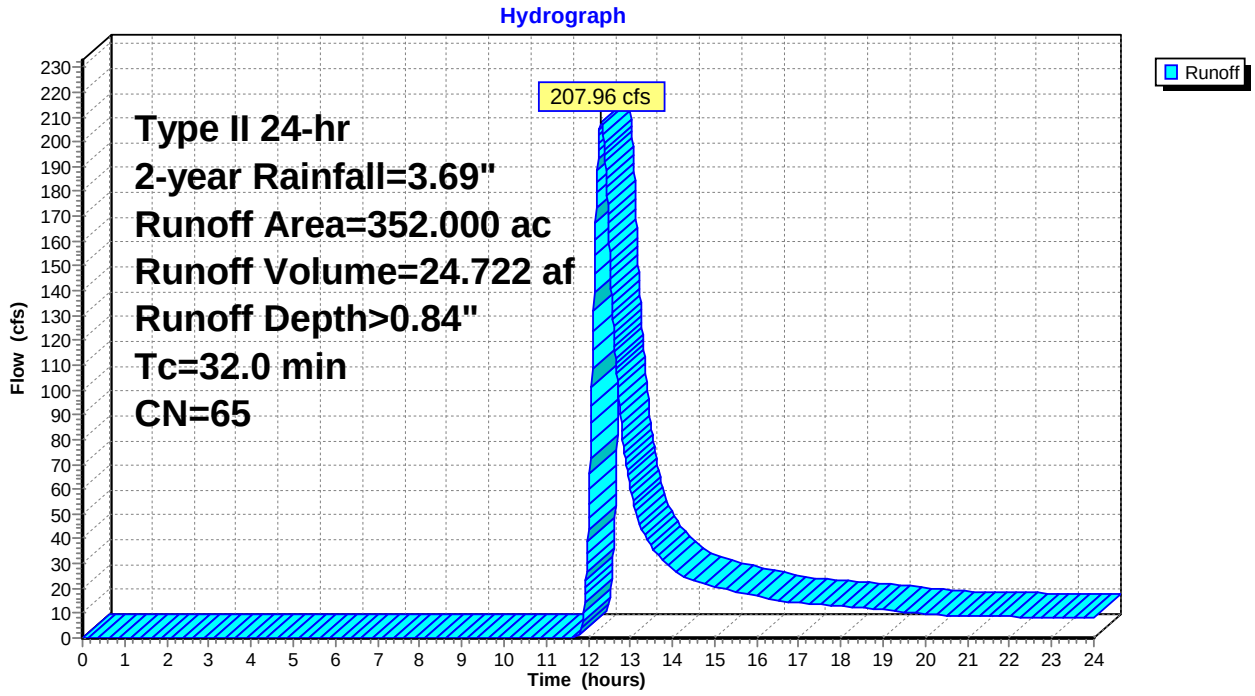
Runoff = 207.96 cfs @ 12.31 hrs, Volume= 24.722 af, Depth> 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-year Rainfall=3.69"

Area (ac)	CN	Description
352.000	65	Woods/grass comb., Fair, HSG B
352.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.0					**Direct Entry,**

Subcatchment 1S: Drainage Area



Summary for Arch Culvert- Inlet Control Check

[57] Hint: Peaked at 870.28' (Flood elevation advised)

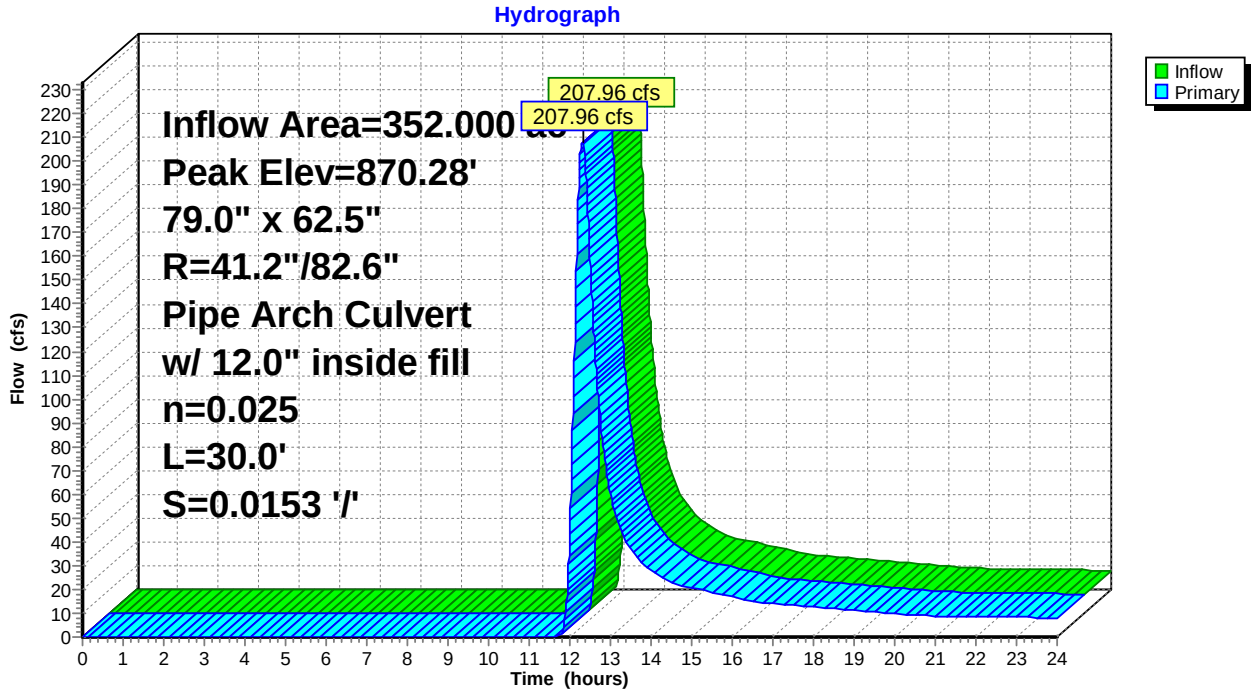
Inflow Area = 352.000 ac, 0.00% Impervious, Inflow Depth > 0.84" for 2-year event
Inflow = 207.96 cfs @ 12.31 hrs, Volume= 24.722 af
Outflow = 207.96 cfs @ 12.31 hrs, Volume= 24.722 af, Atten= 0%, Lag= 0.0 min
Primary = 207.96 cfs @ 12.31 hrs, Volume= 24.722 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 870.28' @ 12.31 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	861.27'	**79.0" W x 62.5" H, R=41.2"/82.6" Pipe Arch CMP_Arch_1 81x59 w/ 12.0" inside** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 860.27' / 859.81' S= 0.0153 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 23.02 sf

Primary OutFlow Max=207.96 cfs @ 12.31 hrs HW=870.28' TW=864.59' (Dynamic Tailwater)
1=CMP_Arch_1 81x59 (Inlet Controls 207.96 cfs @ 9.03 fps)

Arch Culvert- Inlet Control Check



Summary for Arch Culvert

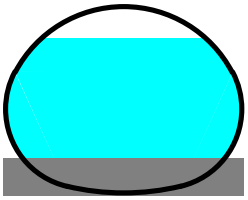
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 352.000 ac, 0.00% Impervious, Inflow Depth > 0.84" for 2-year event
Inflow = 207.96 cfs @ 12.31 hrs, Volume= 24.722 af
Outflow = 198.46 cfs @ 12.26 hrs, Volume= 24.644 af, Atten= 5%, Lag= 0.0 min
Overflow = 9.57 cfs @ 12.31 hrs, Volume= 0.076 af

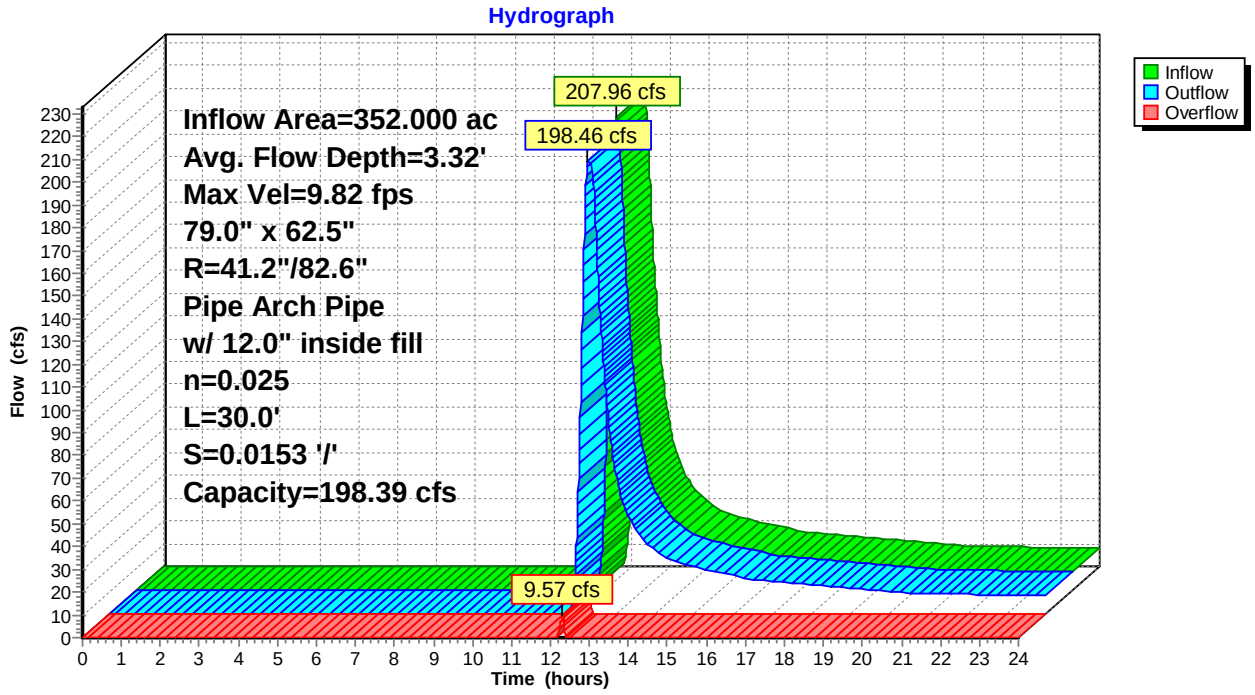
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 9.82 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.68 fps, Avg. Travel Time= 0.1 min

Peak Storage= 606 cf @ 12.26 hrs
Average Depth at Peak Storage= 4.32' above invert (3.32' above fill) , Surface Width= 4.61'
Bank-Full Depth= 5.21' above invert (4.21' above fill) Flow Area= 23.0 sf, Capacity= 198.39 cfs
Any excess flow will be diverted to the secondary overflow

79.0" W x 62.5" H, R=41.2"/82.6" Pipe Arch Pipe w/ 12.0" inside fill
n= 0.025 Corrugated metal
Length= 30.0' Slope= 0.0153 '/' (101 Elevation Intervals)
Inlet Invert= 860.27', Outlet Invert= 859.81'



Arch Culvert



Summary for Floodplain Pipes- Inlet Control Check

[57] Hint: Peaked at 862.77' (Flood elevation advised)
[63] Warning: Exceeded Reach 3R INLET depth by 0.20' @ 0.00 hrs

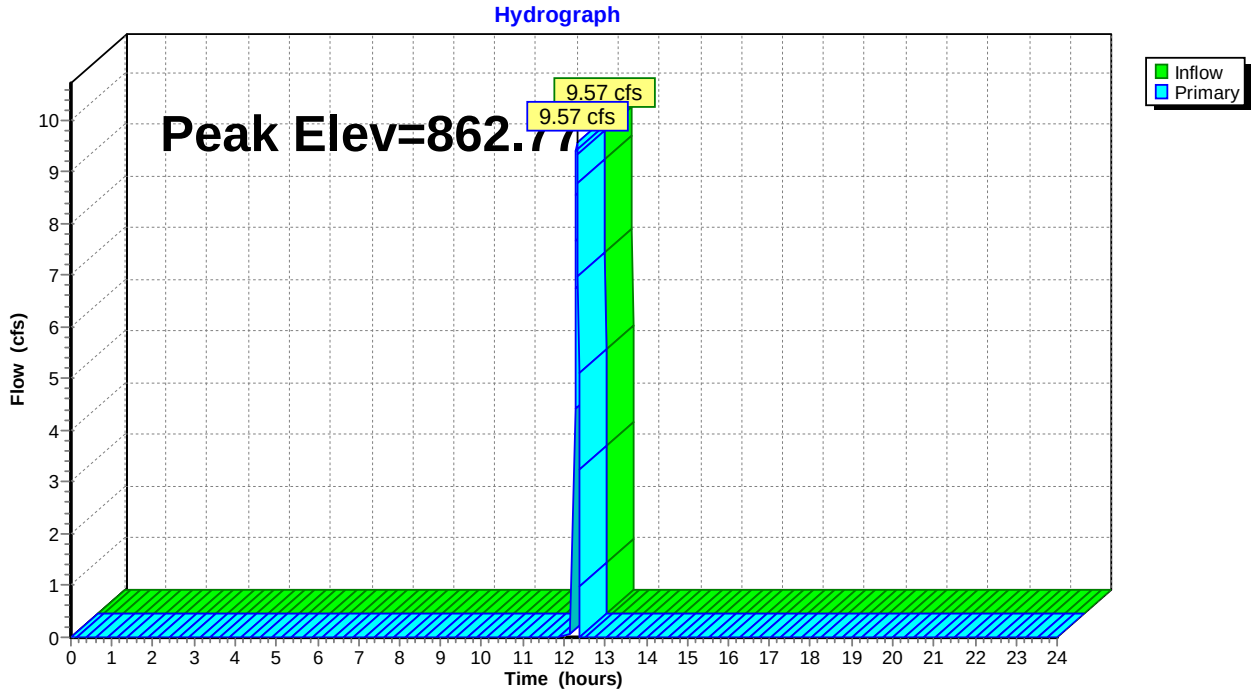
Inflow	=	9.57 cfs @	12.31 hrs, Volume=	0.076 af
Outflow	=	9.57 cfs @	12.31 hrs, Volume=	0.076 af, Atten= 0%, Lag= 0.0 min
Primary	=	9.57 cfs @	12.31 hrs, Volume=	0.076 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 862.77' @ 12.32 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	861.47'	**24.0" Round CMP_Round 24"** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 861.47' / 861.01' S= 0.0153 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Primary	861.47'	**24.0" Round CMP_Round 24"** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 861.47' / 861.01' S= 0.0153 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf

Primary OutFlow Max=9.46 cfs @ 12.31 hrs HW=862.76' TW=862.26' (Dynamic Tailwater)
└─**1=CMP_Round 24"** (Outlet Controls 4.73 cfs @ 3.13 fps)
└─**2=CMP_Round 24"** (Outlet Controls 4.73 cfs @ 3.13 fps)

Floodplain Pipes- Inlet Control Check



Summary for Floodplain Pipes

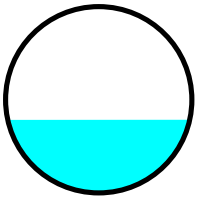
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require smaller dt or Finer Routing
[80] Warning: Exceeded Pond 4P by 0.13' @ 12.39 hrs (0.06 cfs 0.000 af)

Inflow	=	9.57 cfs @	12.31 hrs, Volume=	0.076 af
Outflow	=	9.61 cfs @	12.31 hrs, Volume=	0.076 af, Atten= 0%, Lag= 0.1 min

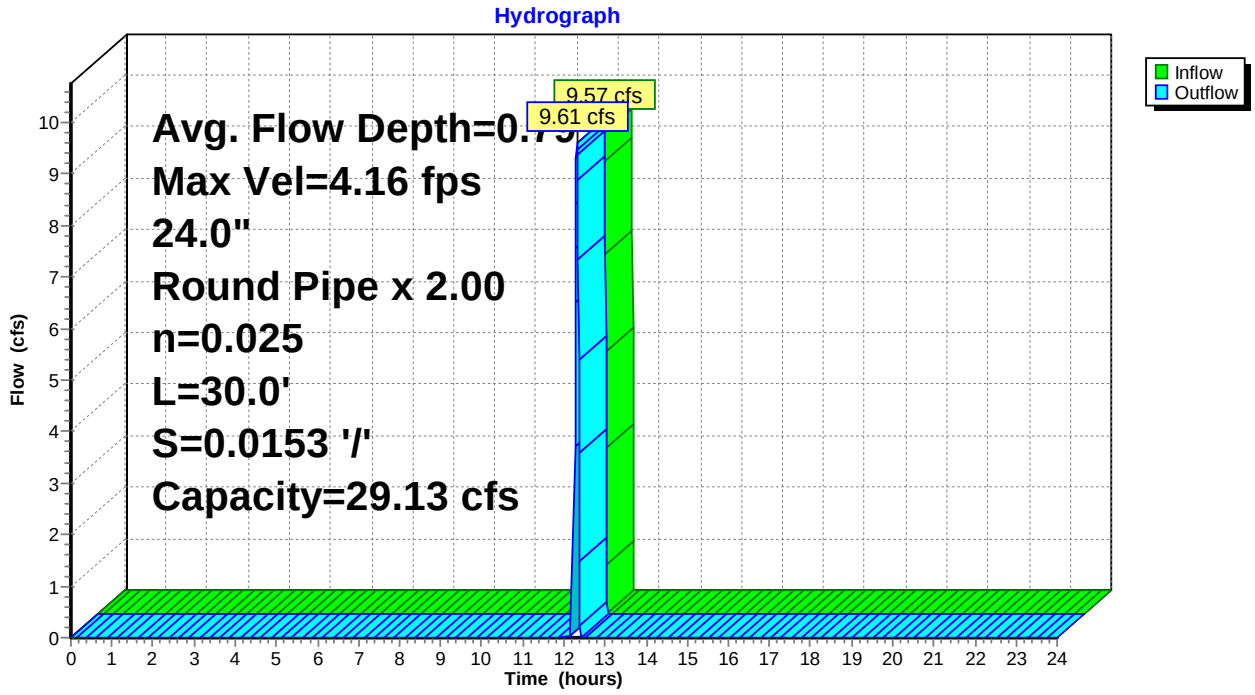
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.16 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.17 fps, Avg. Travel Time= 0.2 min

Peak Storage= 69 cf @ 12.31 hrs
Average Depth at Peak Storage= 0.79' , Surface Width= 3.91'
Bank-Full Depth= 2.00' Flow Area= 6.3 sf, Capacity= 29.13 cfs

A factor of 2.00 has been applied to the storage and discharge capacity
24.0" Round Pipe
n= 0.025 Corrugated metal
Length= 30.0' Slope= 0.0153 '/'
Inlet Invert= 861.47', Outlet Invert= 861.01'



Floodplain Pipes



WETS Table

UT to Magness Creek WETS Table (Shelby weather station, apx. 7 miles from site)

WETS Station: SHELBY 2 NW, NC

Requested years: 1990 - 2016

Month	Avg Max Temp	Avg Min Temp	Avg Mean Temp	Avg Precip	30% chance precip less than	30% chance precip more than	Avg number days precip 0.10 or more	Avg Snowfall
Jan	51.5	28.3	39.9	4.47	3.09	5.32	7	1.9
Feb	54.8	30.3	42.6	3.32	2.41	3.90	6	1.1
Mar	63.2	37.7	50.5	4.62	3.12	5.52	7	0.6
Apr	71.9	45.8	58.8	3.92	2.47	4.73	6	0.0
May	78.6	55.2	66.9	4.20	2.82	5.03	7	0.0
Jun	85.7	62.9	74.3	4.42	2.54	5.38	7	0.0
Jul	88.9	66.6	77.7	4.61	2.92	5.56	8	0.0
Aug	87.4	65.6	76.5	4.31	2.43	5.26	6	0.0
Sep	81.7	58.6	70.2	3.90	2.05	4.77	6	0.0
Oct	72.3	46.0	59.1	3.70	1.76	4.44	5	0.0
Nov	62.7	36.3	49.5	3.67	1.89	4.48	5	0.1
Dec	53.8	31.0	42.4	4.24	3.16	4.96	7	0.6
Annual:					41.58	53.16		
Average	71.1	47.0	59.0	-	-	-	-	-
Total	-	-	-	49.39			76	4.4

GROWING SEASON DATES

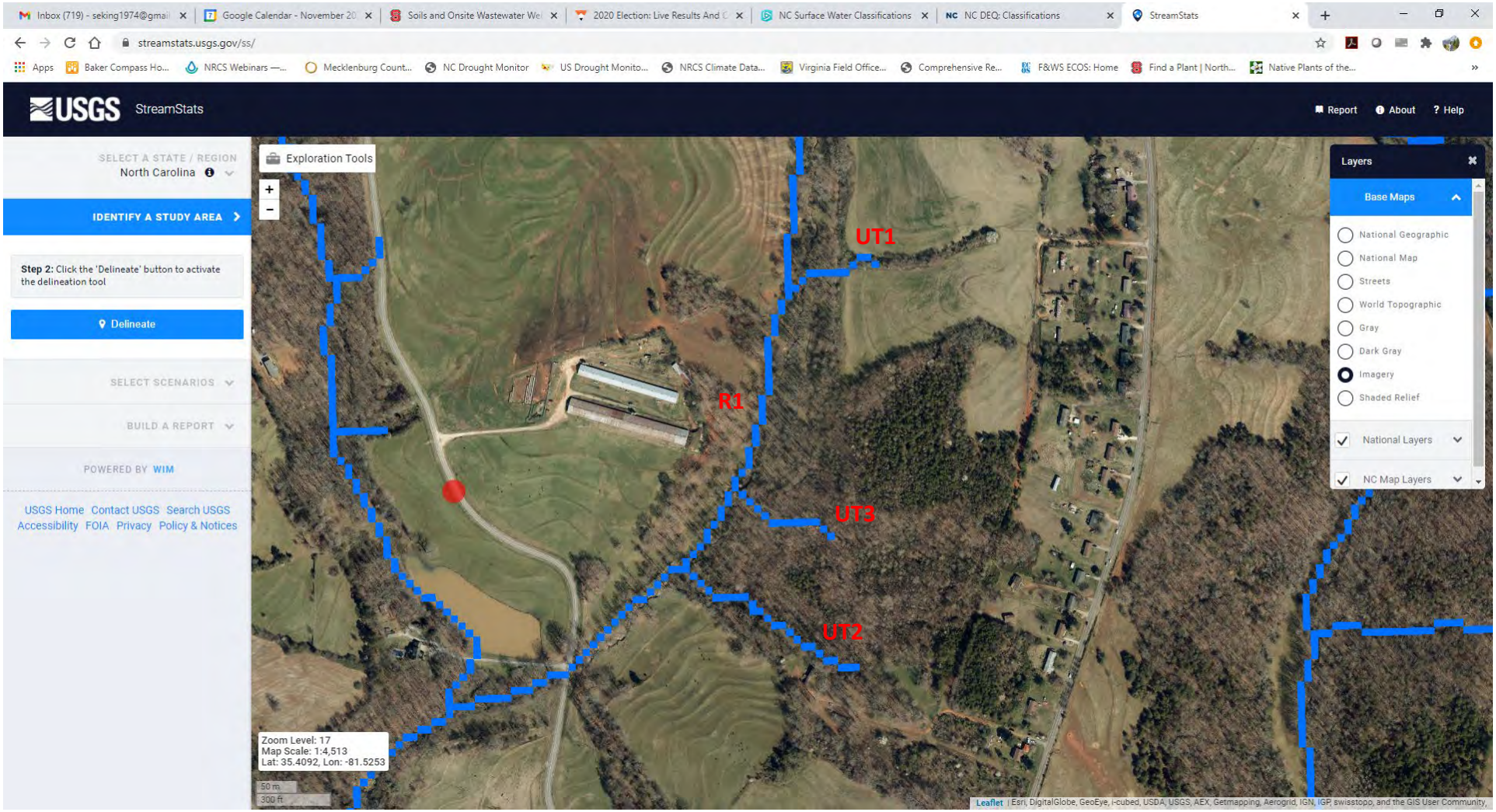
Years with missing data:	24 deg = 3	28 deg = 3	32 deg = 3
Years with no occurrence:	24 deg = 0	28 deg = 0	32 deg = 0
Data years used:	24 deg = 24	28 deg = 24	32 deg = 24
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	3/12 to 11/21: 254 days	3/23 to 11/4: 226 days	4/6 to 10/25: 202 days
70 percent *	3/8 to 11/26: 263 days	3/18 to 11/9: 236 days	4/3 to 10/29: 209 days

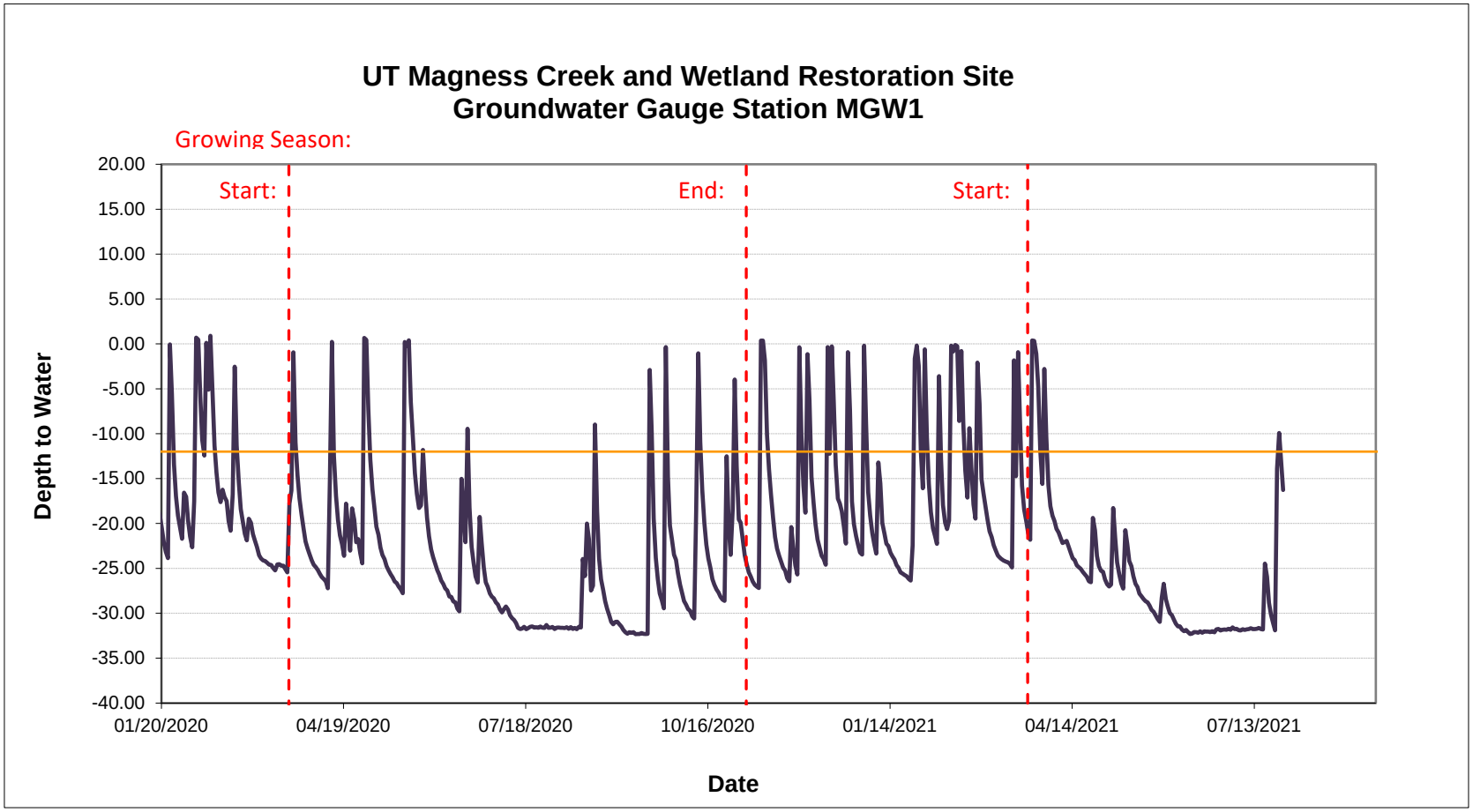
* Percent chance of the growing season occurring between the Beginning and Ending dates.

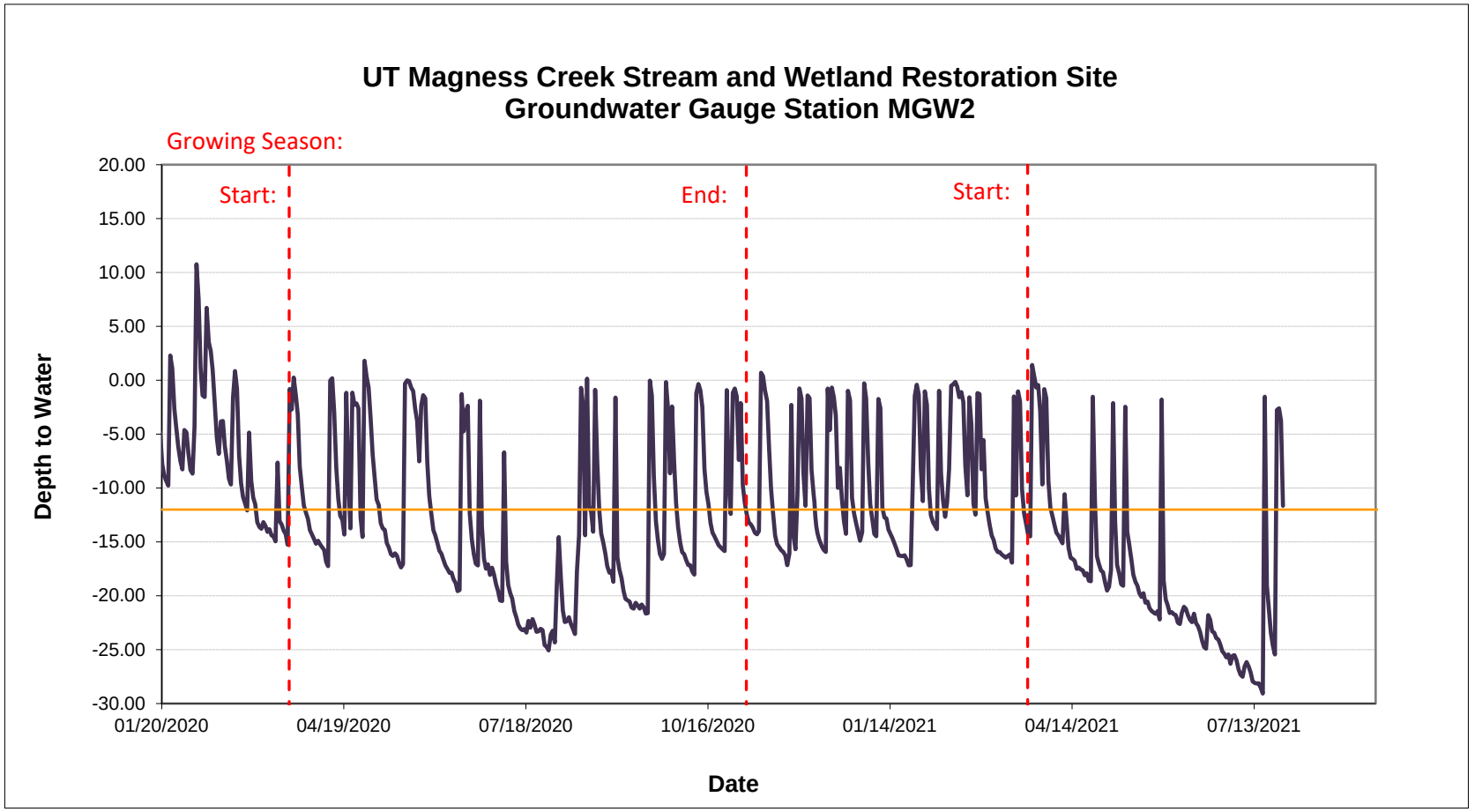
STATS TABLE - total precipitation (inches)

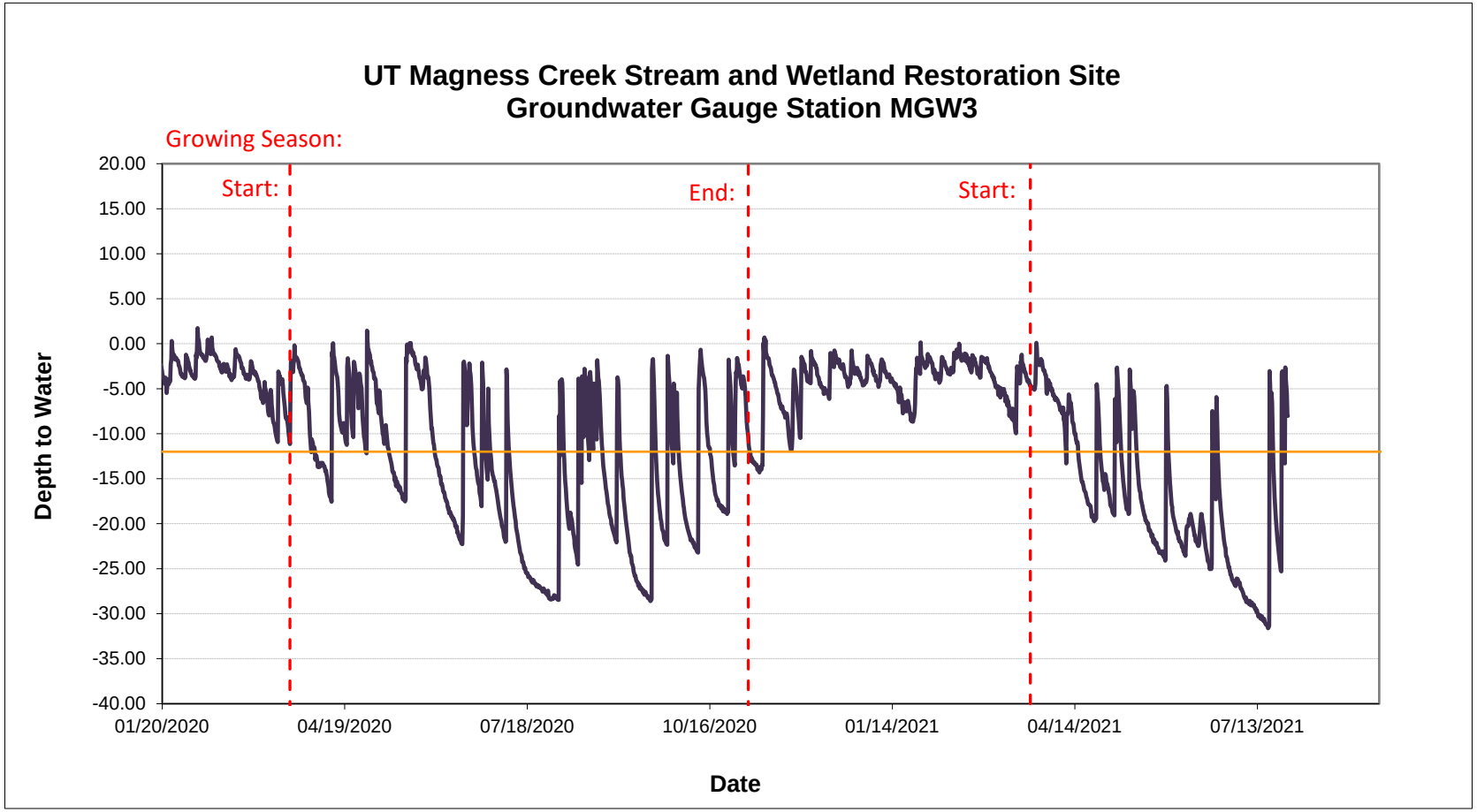
Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl
1893		M6.34		3.24	4.23	9.16	5.32	6.35	5.57	M8.75	3.60	1.55	54.11
1894	4.62	6.05	1.40	M1.40	2.16	1.37	2.77	4.62	M3.26		0.70	6.50	34.85
1895		M1.55	M6.72	M4.15	M3.13								15.55
1896													
1897													
1898													
1899													
1900													
1901													
1902													
1903													
1904													

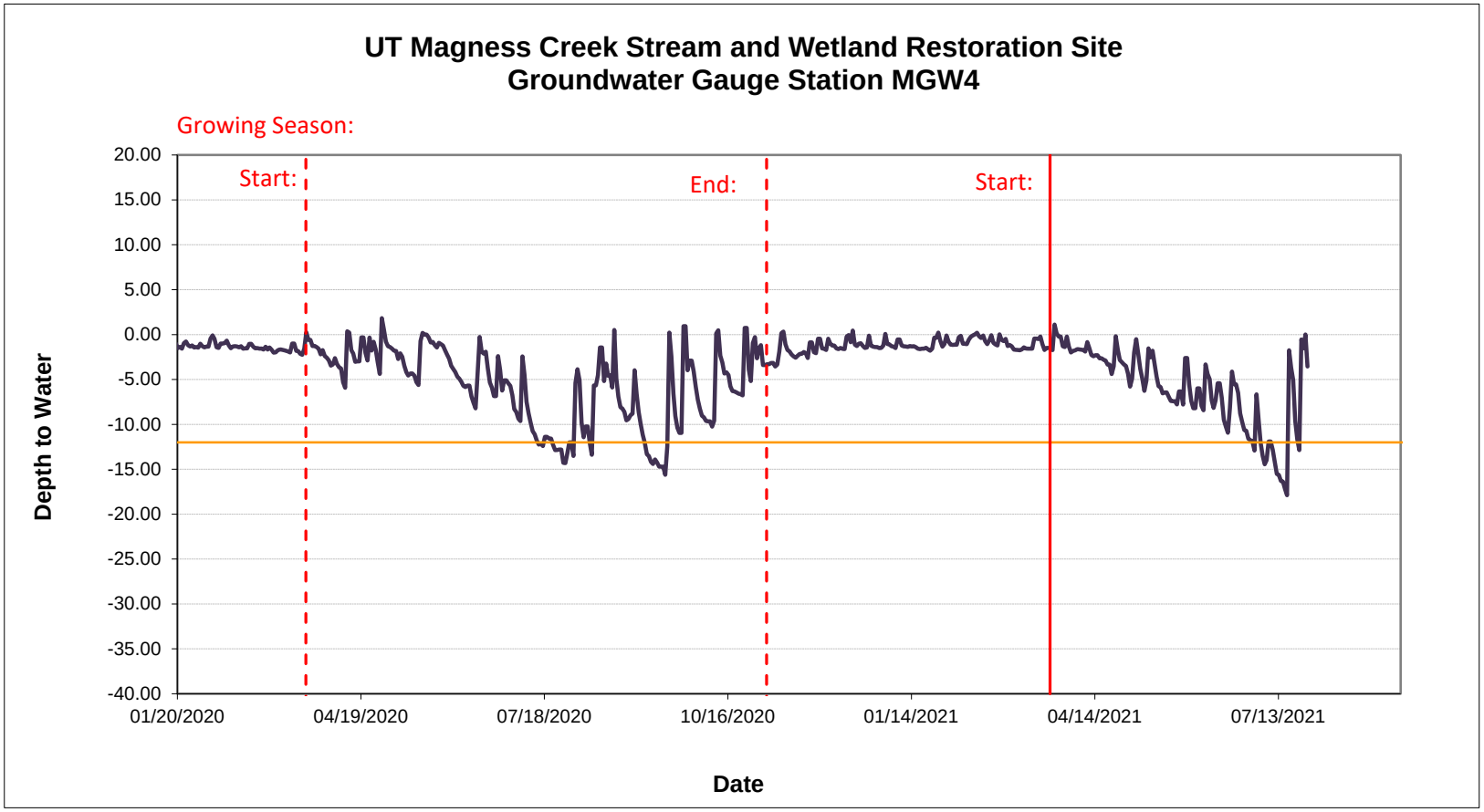
UT to Magness Creek project: USGS StreamStats website (https://streamstats.usgs.gov/ss/)




UT Magness Creek and Wetland Restoration Site
Groundwater Gauge Station MGW1
Growing Season:
Start:
End:
Start:
Depth to Water
20.00
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-30.00
-35.00
-40.00
01/20/2020
04/19/2020
07/18/2020
10/16/2020
01/14/2021
04/14/2021
07/13/2021
Date


UT Magness Creek Stream and Wetland Restoration Site
Groundwater Gauge Station MGW2
Growing Season:
Start:
End:
Start:
Depth to Water
20.00
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-30.00
01/20/2020
04/19/2020
07/18/2020
10/16/2020
01/14/2021
04/14/2021
07/13/2021
Date


UT Magness Creek Stream and Wetland Restoration Site
Groundwater Gauge Station MGW3
Growing Season:
Start:
End:
Start:
Depth to Water
20.00
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-30.00
-35.00
-40.00
01/20/2020
04/19/2020
07/18/2020
10/16/2020
01/14/2021
04/14/2021
07/13/2021
Date



Note: Well #4 is located within an existing JD wetland

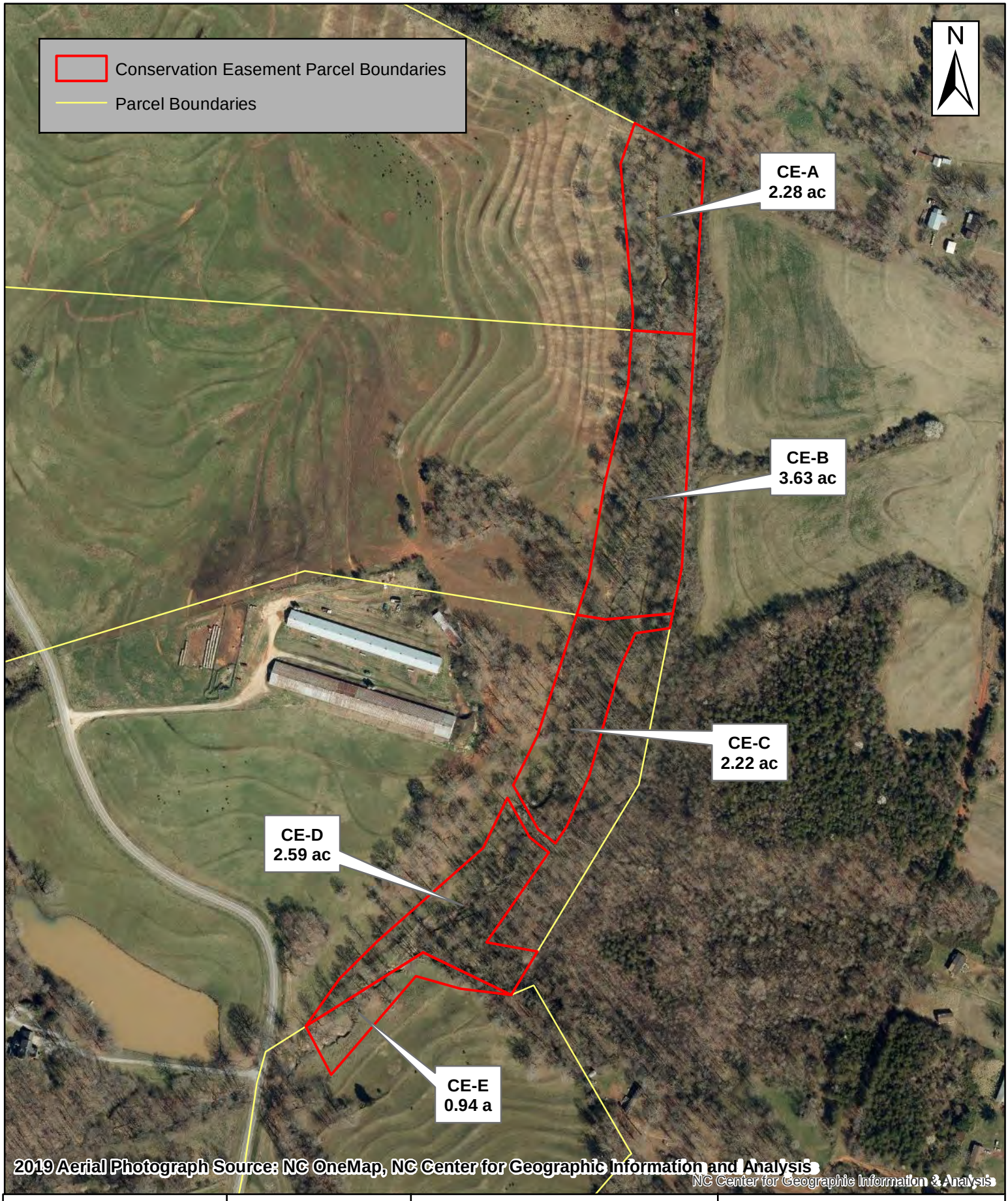
APPENDIX B: SITE PROTECTION INSTRUMENT

The land required for the construction, management, and stewardship of this mitigation project includes portions of the parcels listed below in Table B.1. The conservation easement boundaries are shown in Figure B.1, and a copy of the Draft survey plat is provided below.

Table B.1 Site Protection Instrument Summary
UT to Magness Creek Mitigation Project – DMS Project No. 100081

CE Areas in Parcel	Landowner	Parcel PIN Number	County	Site Protection Instrument	Deed Book and Page Numbers	Total Acreage Protected
A	Robert E. Yarboro and Kay Dixon Yarboro	2641-53-8722	Cleveland	Conservation Easement	Book 1168, Page 030	2.28
B	Robert E. Yarboro and Kay Dixon Yarboro	2641-52-8927	Cleveland	Conservation Easement	Book 1168, Page 030	3.63
C	Robert E. Yarboro and Kay Dixon Yarboro	2641-41-9802	Cleveland	Conservation Easement	Book 16D, Page 143	2.22
D	Robert E. Yarboro and Kay Dixon Yarboro	2641-41-9802	Cleveland	Conservation Easement	Book 16D, Page 143	2.59
E	Robert E. Yarboro and Kay Dixon Yarboro	2641-60-0979	Cleveland	Conservation Easement	Book 1105, Page 421	0.94

A conservation easement has been obtained and recorded from the landowners for the entire project. The easement and survey plat documents were reviewed and approved by NCDMS and State Property Office (SPO) and will held by the State of North Carolina. The easement and survey documents were recorded (Book 43, Pages 180-182) at the Cleveland County Register of Deeds on December 11, 2020.



Michael Baker INTERNATIONAL	North Carolina Division of Mitigation Services DMS Proj. No. 100081	0 125 250 500 Feet	Figure B-1. Site Protection Instrument Map UT to Magness Creek Project Cleveland County

BK 43 PG 180

CLEVELAND COUNTY, NORTH CAROLINA

CERTIFICATE OF SURVEY AND ACCURACY:

I, HAMPTON JAMES LARK, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION FROM DEED DESCRIPTION(S) RECORDED IN DB: 1168 PG: 30, DB: 16-D PG: 143, DB: 1069 PG: 439, DB: 1105 PG: 2421 & DB: 1810 PG: 2076; THAT THE BOUNDARIES NOT SURVEYED ARE INDICATED AS DRAWN FROM INFORMATION AS REFERENCED; THAT THE RATIO OF PRECISION AS CALCULATED IS GREATER THAN 1:10,000; THAT THE GPS PORTION OF THIS PROJECT WAS TO PERFORM A GRID TIE TO THE NC STATE PLANE COORDINATE SYSTEM AND INFORMATION USED IS SHOWN & NOTED HEREON; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.

I ALSO HEREBY CERTIFY THAT THIS PLAT IS OF ONE OF THE FOLLOWING: GS 47-30 F(11) D; THAT THE SURVEY IS OF ANOTHER CATEGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT-ORDERED SURVEY, OR OTHER EXEMPTION OR EXCEPTION TO THE DEFINITION OF SUBDIVISION.

GPS METADATA
CLASS OF SURVEY: HORIZONTAL: A
FIELD PROCEDURE: STATIC NETWORK
DATE: 06/06/19
DATUM: NAD83(2011)
EPOCH: 2010
GEOID: 12B
AVERAGE COMBINED FACTOR: 0.99983783
POSITIONAL ACCURACY: HORIZONTAL: 0.03'
UNITS: USFT
CORS USED: NCSH, NCSP, NCMG

WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER, & SEAL THIS 1ST DAY OF DECEMBER, 2020.

NORTH CAROLINA PROFESSIONAL SEAL L-2865 LAND SURVEYOR HAMPTON JAMES LARK

HAMPTON JAMES LARK PLS L-2865

THIS PLAT DOES NOT CREATE A SUBDIVISION OF PROPERTY IN CLEVELAND COUNTY. THE PURPOSE OF THIS SURVEY IS TO IDENTIFY THE CONSERVATION EASEMENT AREAS ONLY. NO TRANSFER OF PROPERTY IS TAKING PLACE.

I, Donna Mellon, REVIEW OFFICER FOR CLEVELAND COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED, MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

Donna Mellon 12-11-2020
REVIEW OFFICER DATE

CERTIFICATE OF OWNERSHIP AND DEDICATION

I (WE) CERTIFY THAT I AM (WE ARE) ALL OF THE OWNER(S) OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH PROPERTY IS LOCATED IN THE JURISDICTION OF CLEVELAND COUNTY AND THAT I/WE HEREBY ADOPT THIS PLAN WITH MY/OUR FREE CONSENT.

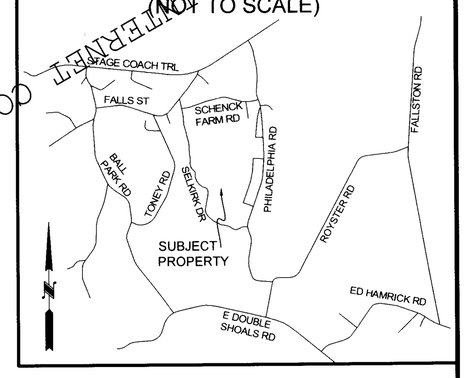
Robert E. Yarboro — DATE
ROBERT E. YARBORO

Kay Dixon Yarboro — DATE
KAY DIXON YARBORO

STATE OF NORTH CAROLINA CONSERVATION EASEMENT
CONSERVATION EASEMENT CORNER-NC DMS CAP (TYPICAL)

TOTAL CONSERVATION EASEMENT AREA
11.66 ACRES
AREA A: 2.28
AREA B: 3.63
AREA C: 2.22
AREA D: 2.59
AREA E: 0.94

VICINITY MAP
(NOT TO SCALE)



GRID TIE INFORMATION

CONTROL POINT	CONTROL POINT
RBCC "KEE" (503)	RBCC "KEE" (502)
STATE PLANE COORDINATES	STATE PLANE COORDINATES
N: 612135.16'	N: 613828.20'
E: 1245413.08'	E: 1246311.21'
CF: .99983850	CF: .99983715

*CONTROL POINT #503 BEING LOCATED S 27°56'43" W A GRID DISTANCE OF 1916.51' FROM CONTROL POINT #502.

N
GRID NORTH
NAD 83(2011)

SHEET 2

DONALD L. SCHENCK & WIFE, EDAHLIA H. SCHENCK
PIN: 2641-54-2716
DB: 1127 PG: 1277

ROBERT E. YARBORO & WIFE, KAY DIXON YARBORO
PIN: 2641-54-0498
DB: 1168 PG: 30 (PARCEL 3)
PB: 7 PG: 46 (PORTION OF TRACT 8)

DONALD L. SCHENCK
PIN: 2641-54-5728
DB: 1142 PG: 1266 & DB: 1369 PG: 1839

GENE W. SCHENCK, SR. (LIFE ESTATE)
WARREN SCHENCK
PIN: 2641-64-4323
DB: 1405 PG: 314 & DB: 1592 PG: 70

DORCAS S. ROSS
PIN: 2641-64-7567
PORTION OF
DB: 11-I PG: 423

GENE W. SCHENCK, SR. (LIFE ESTATE)
GENE W. SCHENCK, JR.
PIN: 2641-73-3827
DB: 1742 PG: 1127
(PARCELS ONE, FOUR & FIVE)

GWENDOLYN B. BROWN
PIN: 2641-44-5099
DB: 1093 PG: 1195

WILLIE L. GLOVER & WIFE, ROSETTA L. GLOVER
PIN: 2641-43-6847
DB: 1600 PG: 1016

CONTROL POINT
RBCC "KEE" (502)

ROBERT E. YARBORO & WIFE, KAY DIXON YARBORO
PIN: 2641-53-8722
DB: 1168 PG: 30 (PARCEL 2)
PB: 7 PG: 46 (PORTION OF TRACT 9)

AREA A
2.28 ACRES

CLYDE J. HEAFNER
PIN: 2641-43-4601
PORTION OF DB: 1706 PG: 197
PB: 22 PG: 73 (LOT 2)

FLOW

JESSICA B. SMITH
PIN: 2641-42-5818
DB: 1750 PG: 241
PB: 39 PG: 187

SELKIRK DRIVE
SR 1885 (FORMERLY SR 1803)
19' ASPHALT
(SEE NOTE #7)

ROBERT E. YARBORO & WIFE, KAY DIXON YARBORO
PIN: 2641-52-8927
DB: 1168 PG: 30 (PARCEL 1, TRACT 10)
PB: 7 PG: 46 (TRACT 10)

AREA B
3.63 ACRES

APPARENT GAP BETWEEN THE ROBERT & KAY YARBORO PROPERTIES & THE PROPERTY OF CEDAR LAKE FARM, LLC AS DESCRIBED IN DB: 1587 PG: 1352 (TRACT 4)

SHEET 3

CEDAR LAKE FARM, LLC
PIN: 2641-72-1337
DB: 1587 PG: 1352
(TRACT 4)

AREA C
2.22 ACRES

BUILDING (CHICKEN HOUSE)
BARN
SHED
PROPANE TANK
SILO
BUILDING (CHICKEN HOUSE)
18" CMP

SHEET 2

DEXTER K. MADDOX
PIN: 2641-42-2147
DB: 1084 PG: 262 & DB: 1431 PG: 1853

CONTROL POINT
RBCC "KEE" (503)

ROBERT E. YARBORO & WIFE, KAY DIXON YARBORO
PIN: 2641-41-9802
DB: 16-D PG: 143 & DB: 1069 PG: 439
PB: 7 PG: 46 (TRACT 11)

ROBERT E. YARBORO & WIFE, KAY DIXON YARBORO
PIN: 2641-41-9802
DB: 16-D PG: 143 & DB: 1069 PG: 439
PB: 7 PG: 46 (TRACT 11)

AREA D
2.59 ACRES

SELKIRK DRIVE
SR 1885 (FORMERLY SR 1803)
19' ASPHALT
(SEE NOTE #7)

DENNIS A. BRIDGES & WIFE, JANET S. BRIDGES
PIN: 2641-41-3628
DB: 17-M PG: 325 & DB: 17-R PG: 603

DUKE ENERGY UTILITY LINE
SEE NOTE #6

AREA E
0.94 ACRE

SFHA (ZONE AE) PER F.I.R.M. MAP NO. 3710264100J

DENNIS A. BRIDGES & WIFE, JANET S. BRIDGES
PIN: 2641-41-3006
DB: 16-Q PG: 524

ROBERT E. YARBORO & WIFE, KAY DIXON YARBORO
PIN: 2641-60-0979
DB: 1105 PG: 2421 & DB: 1810 PG: 2076

ROY P. SHARPE & WIFE, DRUSILLA D. SHARPE
PIN: 2641-71-0003
DB: 1632 PG: 190

JAMES FREDERICK BEAM & WIFE, MARGARET O. BEAM,
PORTION OF DB: 1047 PG: 54 (TRACT NO. 1)
HEIRS OF RUTH S. BEAM
PORTION OF DB: 1047 PG: 58 (TRACT NO. 1) & ESTATE FILE: 09E-629
CAROLINE BROWN REYNOLDS
PORTION OF DB: 1047 PG: 62 (TRACT NO. 1),
DB: 1329 PG: 2007 (TRACT NO. 1) & DB: 1643 PG: 1879 (TRACT NO. 1)
DAVID CONRAD BEAM & WIFE, REBECCA P. BEAM
DB: 1047 PG: 66 (TRACT NO. 1)
PIN: 2641-60-7498

CONSERVATION EASEMENT CORNER		
#	NORTHING	EASTING
1	613321.32	1246633.32
2	613362.77	1246636.12
3	613763.14	1246603.13
4	613872.42	1246640.77
5	613777.11	1246825.89
6	613309.83	1246800.26
7	612692.11	1246766.40
8	612567.46	1246741.69
9	612528.76	1246734.02
10	612515.06	1246643.52
11	612421.87	1246601.18
12	612137.01	1246519.64
13	612000.71	1246459.78
14	611957.09	1246429.40
15	611992.99	1246384.40
16	612110.96	1246317.60
17	612243.18	1246381.67
18	612564.93	1246486.53
19	612662.52	1246518.34
20	612908.64	1246560.13
21	613175.92	1246623.51
22	611469.85	1245764.79
23	611596.24	1245855.81
24	611697.21	1245956.37
25	611944.67	1246237.03
26	612078.15	1246301.70
27	611973.16	1246361.15
28	611932.41	1246412.22
29	611693.59	1246245.91
30	611668.54	1246382.04
31	611553.32	1246312.23
32	611570.31	1246176.90
33	611603.57	1246058.65
34	611341.02	1245832.75

JAMES FREDERICK BEAM & WIFE, MARGARET O. BEAM,
PORTION OF DB: 1047 PG: 54 (TRACT NO. 1)
HEIRS OF RUTH S. BEAM
PORTION OF DB: 1047 PG: 58 (TRACT NO. 1) & ESTATE FILE: 09E-629
CAROLINE BROWN REYNOLDS
PORTION OF DB: 1047 PG: 62 (TRACT NO. 1),
DB: 1329 PG: 2007 (TRACT NO. 1) & DB: 1643 PG: 1879 (TRACT NO. 1)
DAVID CONRAD BEAM & WIFE, REBECCA P. BEAM
DB: 1047 PG: 66 (TRACT NO. 1)
PIN: 2641-60-7498

GRID TIE INFORMATION

1. ALL DISTANCES AND COORDINATES ARE GROUND MEASUREMENTS IN US SURVEY FEET UNLESS OTHERWISE NOTED.
2. AREAS CALCULATED BY THE COORDINATE METHOD.
3. PROPERTY SUBJECT TO ALL EASEMENTS, RIGHT OF WAYS AND RESTRICTIONS THAT ARE RECORDED, UNRECORDED, WRITTEN AND UNWRITTEN.
4. CLEVELAND COUNTY GIS WEBSITE USED TO IDENTIFY ADJOINING PROPERTY OWNERS.
5. THE PROFESSIONAL SURVEYOR HAS MADE NO INVESTIGATION OR INDEPENDENT SEARCH FOR EASEMENTS, RIGHT OF WAYS, ENCUMBRANCES, RESTRICTIVE COVENANTS, CORRECT OWNERSHIP OR ANY OTHER FACTS THAT AN ACCURATE AND CURRENT TITLE SEARCH MAY DISCLOSE. A NC LICENSED ATTORNEY SHOULD BE CONSULTED.
6. THE TYPICAL RIGHT OF WAY WIDTH REQUIRED FOR OVERHEAD DISTRIBUTION POWER LINES OF ANY VOLTAGE IS NORMALLY A 30 FOOT WIDE CORRIDOR (15 FEET ON EACH SIDE) PER DUKE ENERGY. REFERENCE IS MADE TO DB: 6-J PG: 472 AND DB: 6-Q PG: 137, IN WHICH NO WIDTH IS GIVEN.
7. ALTHOUGH NO DEED WAS FOUND GRANTING A RIGHT OF WAY FOR SELKIRK DRIVE, SR 1885 (FORMERLY SR 1803), TO THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, MONUMENTATION WAS FOUND INDICATING THAT THE DEPARTMENT IS CLAIMING A 60 FOOT WIDE RIGHT OF WAY. IT IS ADVISABLE, THEREFORE, TO PLAN FOR NO IMPROVEMENTS CLOSER THAN THIRTY FEET FROM THE PRESENT ROAD CENTERLINE.
8. UTILITIES WERE LOCATED BASED ON VISIBLE ABOVE GROUND STRUCTURES, THEREFORE THE LOCATION OF UNDERGROUND UTILITIES ARE APPROXIMATE OR MAY BE PRESENT AND NOT SHOWN HEREON. CALL 1-800-632-4949 BEFORE DIGGING.
9. ALL EXISTING FENCES WITHIN THE CONSERVATION EASEMENT AREAS ARE TO BE REMOVED.
10. FIELD WORK WAS CONDUCTED BETWEEN THE DATES OF 06/06/19 & 11/30/20.
11. THE STATE OF NORTH CAROLINA, ITS EMPLOYEES AND AGENTS, SUCCESSORS AND ASSIGNS, RECEIVE A PERPETUAL RIGHT OF ACCESS TO THE EASEMENT AREA OVER THE PROPERTY AT REASONABLE TIMES TO UNDERTAKE ANY ACTIVITIES TO RESTORE, CONSTRUCT, MANAGE, MAINTAIN, ENHANCE, AND MONITOR THE STREAM, WETLAND AND ANY OTHER RIPARIAN RESOURCES IN THE EASEMENT AREA, IN ACCORDANCE WITH RESTORATION ACTIVITIES OR A LONG-TERM MANAGEMENT PLAN AS DESCRIBED IN SECTION II OF THE CONSERVATION EASEMENT AGREEMENT.
12. BY GRAPHIC DETERMINATION, A PORTION OF THE SUBJECT PROPERTY APPEARS TO LIE WITHIN A SPECIAL FLOOD HAZARD AREA (SFHA) AS DETERMINED BY THE F.E.M.A. MAP# 3710264100J DATED 02/20/2008.
13. PROPERTY IS ZONED RESIDENTIAL (R) DEFINED BY THE CLEVELAND COUNTY, NC UNIFIED DEVELOPMENT CODE.

LEGEND:

- SET 5/8" REBAR W/ "KEE" CONTROL POINT CAP IN CONCRETE
- UNMARKED POINT
- NCDOT CONCRETE RIGHT OF WAY MONUMENT
- EXISTING IRON PIN (AS NOTED)
- SET 5/8" BY 30" REBAR W/ 3-1/4" DIAMETER ALUMINUM CE CAP
- SET 5/8" REBAR W/ "KEE" CAP
- MAG NAIL SET
- TREE (AS NOTED)
- TREE STUMP
- WATER METER
- WATER VALVE
- E — ELECTRIC UTILITY BOX
- UTILITY POLE
- GUY ANCHOR
- GAS VALVE
- (#) — CONSERVATION EASEMENT CORNER NUMBER
- CONSERVATION EASEMENT (CE)
- GRAVEL
- ASPHALT
- STREAM/WATER
- GAP AREA
- CONCRETE
- SOIL ROADBED
- CE — CONSERVATION EASEMENT
- BOUNDARY LINE
- BOUNDARY LINE NOT SURVEYED
- INTERIOR DEED LINE
- ADJOINING DEED LINES
- UTILITY RIGHT OF WAY (R/W) TYPICAL
- SFHA — SPECIAL FLOOD HAZARD AREA
- FENCE
- OW — OVERHEAD WIRE
- TIE LINE ONLY

PB: PLAT BOOK
DB: DEED BOOK
PG: PAGE
RBR: REBAR
RBC: REBAR WITH ID CAP
RBCC: REBAR WITH ID CAP SET IN CONCRETE
POB: POINT OF BEGINNING
IP: IRON PIPE
IR: IRON ROD
N.A.D.: NORTH AMERICAN DATUM 1983
SPC: STATE PLANE COORDINATES
CF: COMBINED FACTOR
CMP: CORRUGATED METAL PIPE
CPP: CORRUGATED PLASTIC PIPE

Document No: 200048006
Recorded 12/11/2020 02:02:15 PM
Fee Amt: $21.00 Page 1 of 1
Cleveland County North Carolina
Betsy S. Hamrick, Register of Deeds
BK 43 PG 180 - 180 (1)

SHEET #: 1 OF 3

A CONSERVATION EASEMENT SURVEY FOR: THE STATE OF NORTH CAROLINA, DIVISION OF MITIGATION SERVICES

"UT TO MAGNESS CREEK"
SPO FILE NO. 23-CR DMS SITE ID NO. 100081

PARCEL IDENTIFICATION #: 2641-53-8722, 2641-52-8927, 2641-41-9802 & 2641-60-0979

CURRENT OWNERS LISTED AS:
ROBERT E. YARBORO & WIFE, KAY DIXON YARBORO
SITE ADDRESS: 2810 SELKIRK DRIVE, LAWNDALE, NC 28090

DEED REFERENCE: DB: 1168 PG: 30, DB: 16-D PG: 143, DB: 1069 PG: 439, DB: 1105 PG: 2421 & DB: 1810 PG: 2076
CLEVELAND COUNTY, NORTH CAROLINA

SURVEY BY: JB,PD,NMH,DV,AC DRAWN BY: NH CHECKED BY: HJL
SURVEY DATE: 12/01/20 JOB #190545-CE

REVISION: DATE:

0' 150' 300' 450'
ONE INCH = ONE HUNDRED & FIFTY FEET

SHEET SIZE: 24X36" SCALE: 1"=150'

Kee MAPPING & SURVEYING
P.O. Box 2566
Asheville, NC 28802
(828) 575-9021
www.keemap.com
License # C-3039

Bk 43 Pg 181

Bk 43 Pg 181

WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER, & SEAL THIS 1ST DAY OF DECEMBER, 2020.

NORTH CAROLINA PROFESSIONAL SEAL L-2865 LAND SURVEYOR HAMPTON JAMES LARK

Hampton James Lark

HAMPTON JAMES LARK PLS L-2865

N

GRID NORTH
NAD83 (2011)

GRID TIE INFORMATION

CONTROL POINT	CONTROL POINT
RBCC "KEE" (503)	RBCC "KEE" (502)
STATE PLANE COORDINATES	STATE PLANE COORDINATES
N: 612135.16'	N: 613628.20'
E: 1245413.08'	E: 1246311.21'
CF: .99983850	CF: .99983715

"CONTROL POINT #503 BEING LOCATED S 27°56'43" W A GRID DISTANCE OF 1916.51' FROM CONTROL POINT #502.

LEGEND:

- SET 5/8" REBAR W/ "KEE" CONTROL POINT CAP IN CONCRETE
- UNMARKED POINT
- EXISTING IRON PIN (AS NOTED)
- SET 5/8" BY 30" REBAR W/ 3-1/4" DIAMETER ALUMINUM CE CAP
- SET 5/8" REBAR W/ "KEE" CAP
- MAG NAIL SET
- TREE (AS NOTED)
- WATER VALVE
- UTILITY POLE
- GUY ANCHOR
- GAS VALVE
- (#) CONSERVATION EASEMENT CORNER NUMBER
- CONSERVATION EASEMENT (CE)
- GRAVEL
- ASPHALT
- STREAM/WATER
- GAP AREA
- CONCRETE
- SOIL ROADBED
- CE — CONSERVATION EASEMENT
- BOUNDARY LINE
- BOUNDARY LINE NOT SURVEYED
- ADJOINING CE AREA
- ADJOINING DEED LINES
- UTILITY RIGHT OF WAY (R/W) TYPICAL
- FENCE
- OW — OVERHEAD WIRE

PB:	PLAT BOOK
DB:	DEED BOOK
PG:	PAGE
RBR	REBAR
RBC	REBAR WITH ID CAP
RBCC	REBAR WITH ID CAP SET IN CONCRETE
POB	POINT OF BEGINNING
IP	IRON PIPE
IR	IRON ROD
N.A.D.	NORTH AMERICAN DATUM 1983
SPC	STATE PLANE COORDINATES
CF	COMBINED FACTOR
CMP	CORRUGATED METAL PIPE
CPP	CORRUGATED PLASTIC PIPE

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-54-0498
DB: 1168 PG: 30 (PARCEL 3)
PB: 7 PG. 46 (PORTION OF TRACT 8)

DONALD L. SCHENCK
PIN: 2641-54-5728
DB: 1142 PG: 1266 &
DB: 1369 PG: 1839

GWENDOLYN B. BROWN
PIN: 2641-44-5099
DB: 1093 PG: 1195

WILLIE L. GLOVER & WIFE
ROSETTA L. GLOVER
PIN: 2641-43-6847
DB: 1600 PG: 1016

24" CPP

CLYDE D. HEAFNER
PIN: 2641-43-4601
PORTION OF DB: 1706 PG: 197
PB: 22 PG: 73 (LOT 2)

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-53-8722
DB: 1168 PG: 30 (PARCEL 2)
PB: 7 PG: 46 (PORTION OF TRACT 9)

JESSICA B. SMITH
PIN: 2641-42-5818
DB: 1750 PG: 241
PB: 39 PG: 187

24" CPP

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-52-8927
DB: 1168 PG: 30 (PARCEL 1, TRACT 10)
PB: 7 PG: 46 (TRACT 10)

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-41-9802
DB: 16-D PG: 143 & DB: 1069 PG: 439
PB: 7 PG: 46 (TRACT 11)

36" CPP

GENE W. SCHENCK, SR. (LIFE ESTATE)
WARREN SCHENCK
PIN: 2641-64-4323
DB: 1405 PG: 314 &
DB: 1592 PG: 70

DORCAS S. ROSS
PIN: 2641-64-7567
PORTION OF DB: 11-I PG: 423

GENE W. SCHENCK, SR.
(LIFE ESTATE)
GENE W. SCHENCK, JR.
PIN: 2641-73-3827
DB: 1742 PG: 1127
(PARCELS ONE, FOUR & FIVE)

CEDAR LAKE FARM, LLC
PIN: 2641-72-1337
DB: 1587 PG: 1352 (TRACT 4)

SELKIRK DRIVE
SR 1885 (FORMERLY SR 1803)
19' ASPHALT
(SEE NOTE #7)

S 62°45'24" E 161.19'

3/4" REBAR

S 62°45'24" E 575.29'

CONTROL POINT
RBCC "KEE" (502)

S 62°45'24" E 208.21'

5/8" IRON ROD (5)

N 19°20'21" E
152.58'

(3)

AREA A
2.28 ACRES

N 04°29'39" W 409.73'

FLOW

S 03°08'18" W 467.98'

(1759.18')
S 86°03'42" E 2231.83' (TOTAL)

N 03°51'47" E
41.54'

(2)

(167.34')

(6)

5/8" RBC (1) POB
N: 613321.32'
E: 1246633.32'
(LOCATED N 45°48'41" E
1701.76' FROM CONTROL
POINT #503)

N 03°51'47" E 145.72'

APPARENT GAP BETWEEN THE ROBERT & KAY YARBORO PROPERTIES & THE PROPERTY OF CEDAR LAKE FARM, LLC AS DESCRIBED IN DB: 1587 PG: 1352 (TRACT 4)

(21)

N 13°20'19" E 274.69'

FLOW

AREA B
3.63 ACRES

(20)

N 09°38'16" E 245.64'

S 03°08'18" W 618.65'

(19)

N 16°07'07" E
152.55'

(78.06')

FLOW

S 85°12'40" W 178.69'

(18)

16" MAPLE (8)

S 11°12'40" W
172.07'

N 11°12'40" E 462.89'

AREA C
SEE SHEET 3

(732.68')
S 80°52'34" E 810.78' (TOTAL)

N 73°10'38" E 1011.45' (TOTAL)

(729.47')

(291.98')

(10.76')

FLOW

1/2" REBAR

AXLE

(281.41')
N 72°50'32" E 296.17' (TOTAL)

BUILDING (CHICKEN HOUSE)

BARN

PROPANE TANK

SILO

BUILDING (CHICKEN HOUSE)

18" CMP

OW

FLOW

(7.17')

4" IRON BAR

(298.14')

CLEVELAND COUNTY, NORTH CAROLINA

THIS PLAT DOES NOT CREATE A SUBDIVISION OF PROPERTY IN CLEVELAND COUNTY. THE PURPOSE OF THIS SURVEY IS TO IDENTIFY THE CONSERVATION EASEMENT AREAS ONLY. NO TRANSFER OF PROPERTY IS TAKING PLACE.

I, Donna Mellon, REVIEW OFFICER FOR CLEVELAND COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED, MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

Donna Mellon 12-11-2020
REVIEW OFFICER DATE

CERTIFICATE OF OWNERSHIP AND DEDICATION

I (WE) CERTIFY THAT I AM (WE ARE) ALL OF THE OWNER(S) OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH PROPERTY IS LOCATED IN THE JURISDICTION OF CLEVELAND COUNTY AND THAT I/WE HEREBY ADOPT THIS PLAN WITH MY/OUR FREE CONSENT.

ROBERT E. YARBORO DATE

KAY DIXON YARBORO DATE

STATE OF NORTH CAROLINA CONSERVATION EASEMENT

CONSERVATION EASEMENT CORNER-NC DMS CAP (TYPICAL)

TOTAL CONSERVATION EASEMENT AREA
5.91 ACRES
AREA A: 2.28
AREA B: 3.63

Doc No: 200048007
Recorded: 12/11/2020 02:02:16 PM
Fee Amt: $21.00 Page 1 of 1
Cleveland County North Carolina
Betsy S. Harnage, Register of Deeds
Bk 43 PG 181 - 181 (1)

CONSERVATION EASEMENT CORNER		
#	NORTHING	EASTING
1	613321.32	1246633.32
2	613362.77	1246636.12
3	613763.14	1246603.13
4	613872.42	1246640.77
5	613777.11	1246825.89
6	613309.83	1246800.26
7	612692.11	1246766.40
8	612567.46	1246741.69
18	612564.93	1246486.53
19	612662.52	1246518.34
20	612908.64	1246560.13
21	613175.92	1246623.51

SHEET #: 2 OF 3

A CONSERVATION EASEMENT SURVEY FOR:
THE STATE OF NORTH CAROLINA,
DIVISION OF MITIGATION SERVICES
"UT TO MAGNESS CREEK"
SPO FILE NO. 23-CR DMS SITE ID NO. 100081

PARCEL IDENTIFICATION #: 2641-53-8722 & 2641-52-8927

CURRENT OWNERS LISTED AS:
ROBERT E. YARBORO & WIFE, KAY DIXON YARBORO
SITE ADDRESS: 2810 SELKIRK DRIVE, LAWNDALE, NC 28090

DEED REFERENCE: DB: 1168 PG: 30
CLEVELAND COUNTY, NORTH CAROLINA

SURVEY BY: JB,PD,NMH,DV,AC DRAWN BY: NH CHECKED BY: HJL
SURVEY DATE: 12-01-20 JOB #190545-CE

REVISION: DATE:

0' 100' 200' 300'

ONE INCH = ONE HUNDRED FEET

SHEET SIZE: 24X36" SCALE: 1"=100'

Kee MAPPING & SURVEYING
P.O. Box 2566
Asheville, NC 28802
(828) 575-9021
www.keemap.com
License # C-3039

Bk 43 PG 182

WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER, & SEAL THIS 1ST DAY OF DECEMBER, 2020.

NORTH CAROLINA PROFESSIONAL SEAL L-2865 LAND SURVEYOR HAMPTON JAMES LARK

Hampton James Lark

HAMPTON JAMES LARK PLS L-2865

CLEVELAND COUNTY, NORTH CAROLINA

THIS PLAT DOES NOT CREATE A SUBDIVISION OF PROPERTY IN CLEVELAND COUNTY. THE PURPOSE OF THIS SURVEY IS TO IDENTIFY THE CONSERVATION EASEMENT AREAS ONLY. NO TRANSFER OF PROPERTY IS TAKING PLACE.

I, Donna Mellon REVIEW OFFICER FOR CLEVELAND COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED, MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

Donna Mellon 12-8-2020
REVIEW OFFICER DATE

CERTIFICATE OF OWNERSHIP AND DEDICATION

I (WE) CERTIFY THAT I AM (WE ARE) ALL OF THE OWNER(S) OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH PROPERTY IS LOCATED IN THE JURISDICTION OF CLEVELAND COUNTY AND THAT I/WE HEREBY ADOPT THIS PLAN WITH MY/OUR FREE CONSENT.

ROBERT E. YARBORO DATE

KAY DIXON YARBORO DATE

LEGEND:

- SET 5/8" REBAR W/ "KEE" CONTROL POINT CAP IN CONCRETE
- UNMARKED POINT
- NCDOT CONCRETE RIGHT OF WAY MONUMENT
- EXISTING IRON PIN (AS NOTED)
- SET 5/8" BY 30" REBAR W/ 3-1/4" DIAMETER ALUMINUM CE CAP
- SET 5/8" REBAR W/ "KEE" CAP
- MAG NAIL SET
- TREE (AS NOTED)
- TREE STUMP
- WATER METER
- WATER VALVE
- ELECTRIC UTILITY BOX
- UTILITY POLE
- (#) CONSERVATION EASEMENT CORNER NUMBER
- CONSERVATION EASEMENT (CE)
- GRAVEL
- ASPHALT
- STREAM/WATER
- GAP AREA
- SOIL ROADBED
- CONCRETE
- CE — CONSERVATION EASEMENT
- BOUNDARY LINE
- BOUNDARY LINE NOT SURVEYED
- ADJOINING CE LAYER
- INTERIOR DEED LINE
- ADJOINING DEED LINES
- UTILITY RIGHT OF WAY (R/W) TYPICAL
- SFHA — SPECIAL FLOOD HAZARD AREA
- x—x FENCE
- ow OVERHEAD WIRE
- TIE LINE ONLY

PB:	PLAT BOOK
DB:	DEED BOOK
PG:	PAGE
RBR	REBAR
RBC	REBAR WITH ID CAP
RBCC	REBAR WITH ID CAP SET IN CONCRETE
POB	POINT OF BEGINNING
IP	IRON PIPE
IR	IRON ROD
N.A.D.	NORTH AMERICAN DATUM 1983
SPC	STATE PLANE COORDINATES
CF	COMBINED FACTOR
CMP	CORRUGATED METAL PIPE
CPP	CORRUGATED PLASTIC PIPE

ROBERT E. YARBORO & WIFE,
KAY DIXON YARBORO
PIN: 2641-52-8927
DB: 1168 PG: 30 (PARCEL 1, TRACT 10)
PB: 7 PG. 46 (TRACT 10)

JESSICA B. SMITH
PIN: 2641-42-5818
DB. 1750 PG. 241
PB. 39 PG. 187

N 73°10'38" E 1011.45 (TOTAL) (729.47') (281.98')

S 80°52'34" E 810.76' (TOTAL) (732.68')

(10.76') 1/2" REBAR FLOW

(287.41') N 72°56'32" E 298.17' (TOTAL) AXLE

36" CPP

BUILDING (CHICKEN HOUSE) SHED PROPANE TANK SILO BUILDING (CHICKEN HOUSE) BARN 18" CMP

CONTROL POINT RBCC "KEE" (503)

ROBERT E. YARBORO & WIFE,
KAY DIXON YARBORO
PIN: 2641-41-9802
DB: 16-D PG: 143 & DB: 1069 PG: 439
PB: 7 PG: 46 (TRACT 11)

SELKIRK DRIVE
SR 1885 (FORMERLY SR 1803)
19' ASPHALT
(SEE NOTE #7)

ROBERT E. YARBORO & WIFE,
KAY DIXON YARBORO
PIN: 2641-41-9802
DB: 16-D PG: 143 & DB: 1069 PG: 439
PB: 7 PG: 46 (TRACT 11)

DUKE ENERGY UTILITY LINE
(SEE NOTE #6)

SFHA (ZONE AE) PER F.I.R.M. MAP NO. 3710264100J

DENNIS A. BRIDGES & WIFE,
JANET S. BRIDGES
PIN: 2641-41-3628
DB: 17-M PG. 325 &
DB: 17-R PG. 603

DENNIS A. BRIDGES & WIFE,
JANET S. BRIDGES
PIN: 2641-41-3006
DB: 16-Q PG. 524

JAMES FREDERICK BEAM & WIFE, MARGARET O. BEAM,
PORTION OF DB: 1047 PG: 54 (TRACT NO. 1)
HEIRS OF RUTH S. BEAM
PORTION OF DB: 1047 PG: 58 (TRACT NO. 1) & ESTATE FILE: 09E-629
CAROLINE BROWN REYNOLDS
PORTION OF DB: 1047 PG: 62 (TRACT NO. 1), DB: 1329 PG: 2007 (TRACT NO. 1) & DB: 1643 PG: 1879 (TRACT NO. 1)
DAVID CONRAD BEAM & WIFE, REBECCA P. BEAM
DB: 1047 PG: 66 (TRACT NO. 1)
PIN: 2641-60-7498

FORMER LOCATION OF CENTERLINE OF SR 1803 PER DB: 1105 PG: 2421

5' x 7' CMP 30" CMP

N 15°23'50" E 86.96'

N 14°57'26" E 128.84'

S 85°57'04" W 102.23'

N 27°16'52" W 145.66'

5/8" RBC (22) POB
N: 611469.85'
E: 1245764.79'
(LOCATED S 27°51'45" E 752.55' FROM CONTROL POINT #503)

N 44°53'06" E 142.50'

N 35°45'55" E 105.75'

S 57°49'10" W 369.16' (TOTAL) (357.35')

ROBERT E. YARBORO & WIFE,
KAY DIXON YARBORO
PIN: 2641-60-0979
DB: 1105 PG: 2421 &
DB: 1810 PG: 2076

AREA B
SEE SHEET 2

5/8" RBC (18) POB
N: 612564.93'
E: 1246486.53'
(LOCATED N 68°10'51" E 1156.28' FROM CONTROL POINT #503)

(78.08') FLOW N 85°12'40" E 178.69'

16" MAPLE (8)
TERMINUS OF 3RD CALL
DB: 1168 PG: 30 (PARCEL 1, TRACT 10)
TERMINUS OF 4TH CALL
DB: 16-D PG: 143 (TRACT NO. 1)

S 11°12'40" W 39.45'

S 81°23'28" W 91.53'

S 03°08'18" W 618.65'

S 11°12'40" W 127.07'

S 47°26'04" W 102.36'

N 18°09'07" E 338.46'

AREA C
2.22 ACRES

S 11°12'40" W 423.15'

S 15°49'25" W 298.80'

N 25°51'07" E 146.69'

N 37°31'14" W 185.57'

S 29°51'07" E 168.32'

S 25°51'07" E 168.32'

S 37°31'14" E 185.57'

S 34°42'35" W 148.97'

S 34°51'09" W 53.16'

L1

L2

N 25°51'07" E 168.32'

N 48°26'47" E 374.16'

AREA D
2.59 ACRES

FLOW

S 34°51'09" W 291.05'

S 79°34'26" E 138.42'

S 11°12'40" W 620.48'

N 64°17'26" W 360.82'

S 31°12'40" W 134.72'

AREA E
0.94 ACRE

14" PINE STUMP (31)
TERMINUS OF 5TH CALL
DB: 16-D PG: 143 (TRACT NO. 1)
TERMINUS OF 2ND CALL
DB: 1810 PG: 2076

N 74°17'23" W 122.84'

N 82°50'31" W 136.39'

S 40°42'32" W 346.36'

ROBERT E. YARBORO & WIFE,
KAY DIXON YARBORO
PIN: 2641-60-0979
DB: 1105 PG: 2421 &
DB: 1810 PG: 2076

APPARENT GAP BETWEEN THE ROBERT & KAY YARBORO PROPERTIES & THE PROPERTY OF CEDAR LAKE FARM, LLC AS DESCRIBED IN DB: 1587 PG: 1352 (TRACT 4)

CEDAR LAKE FARM, LLC
PIN: 2641-72-1337
DB: 1587 PG: 1352 (TRACT 4)

ROY P. SHARPE & WIFE,
DRUSILLA D. SHARPE
PIN: 2641-71-0003
DB: 1632 PG: 190

DB: 1587 PG: 1352
DB: 1105 PG: 2421

JAMES FREDERICK BEAM & WIFE, MARGARET O. BEAM,
PORTION OF DB: 1047 PG: 54 (TRACT NO. 1)
HEIRS OF RUTH S. BEAM
PORTION OF DB: 1047 PG: 58 (TRACT NO. 1) & ESTATE FILE: 09E-629
CAROLINE BROWN REYNOLDS
PORTION OF DB: 1047 PG: 62 (TRACT NO. 1),
DB: 1329 PG: 2007 (TRACT NO. 1) & DB: 1643 PG: 1879 (TRACT NO. 1)
DAVID CONRAD BEAM & WIFE, REBECCA P. BEAM
DB: 1047 PG: 66 (TRACT NO. 1)
PIN: 2641-60-7498

GRID NORTH
NAD83 (2011)

GRID TIE INFORMATION

CONTROL POINT RBCC "KEE" (503) STATE PLANE COORDINATES	CONTROL POINT RBCC "KEE" (502) STATE PLANE COORDINATES
N: 612135.16'	N: 613828.20'
E: 1245413.08'	E: 1246311.21'
CF: 99983850	CF: 99983715

*CONTROL POINT #503 BEING LOCATED S 27°56'43" W A GRID DISTANCE OF 1916.51' FROM CONTROL POINT #502.

CONSERVATION EASEMENT CORNER-NC DMS CAP (TYPICAL)

TOTAL CONSERVATION EASEMENT AREA
5.75 ACRES
AREA C: 2.22
AREA D: 2.59
AREA E: 0.94

CONSERVATION EASEMENT CORNER		
#	NORTHING	EASTING
8	612567.46	1246741.69
9	612528.76	1246734.02
10	612515.06	1246643.52
11	612421.87	1246601.18
12	612137.01	1246519.64
13	612000.71	1246459.78
14	611957.09	1246429.40
15	611992.99	1246384.40
16	612110.96	1246317.60
17	612243.18	1246381.67
18	612564.93	1246486.53
22	611469.85	1245764.79
23	611596.24	1245855.81
24	611697.21	1245956.37
25	611944.67	1246237.03
26	612078.15	1246301.70
27	611973.16	1246361.15
28	611932.41	1246412.22
29	611693.59	1246245.91
30	611668.54	1246382.04
31	611553.32	1246312.23
32	611570.31	1246176.90
33	611603.57	1246058.65
34	611341.02	1245832.75

LINE	BEARING	DISTANCE
L1	N 51°24'56" W	57.57'
L2	S 51°24'56" E	65.33'
L3	S 34°51'09" W	30.06'
L4	S 25°51'07" W	36.46'

Doc No: 2000408008
Recorded: 12/11/2020 02:02:17 PM
Fee Amt: $21.00
Page 1 of 1
Cleveland County North Carolina
Betsy S. Harnage, Register of Deeds
BK 43 PG 182 - 182 (1)

SHEET #: 3 OF 3

A CONSERVATION EASEMENT SURVEY FOR: THE STATE OF NORTH CAROLINA, DIVISION OF MITIGATION SERVICES

"UT TO MAGNESS CREEK"

SPO FILE NO. 23-CR DMS SITE ID NO. 100081

PARCEL IDENTIFICATION #: 2641-41-9802 & 2641-60-0979

CURRENT OWNERS LISTED AS:
ROBERT E. YARBORO & WIFE, KAY DIXON YARBORO
SITE ADDRESS: 2810 SELKIRK DRIVE, LAWNDALE, NC 28090

DEED REFERENCE: DB: 16-D PG: 143, DB: 1069 PG: 439, DB: 1105 PG: 2421 & DB: 1810 PG: 2076
CLEVELAND COUNTY, NORTH CAROLINA

SURVEY BY: JB,PD,NMH,DV,AC DRAWN BY: NH CHECKED BY: HJL
SURVEY DATE: 12-01-20 JOB #190545-CE
REVISION: DATE:

0' 80' 160' 240'
ONE INCH = ONE EIGHTY FEET

SHEET SIZE: 24X36" SCALE: 1"=80'

Kee MAPPING & SURVEYING
P.O. Box 2566
Asheville, NC 28802
(828) 575-9021
www.keemap.com
License # C-3039

APPENDIX C: CREDIT RELEASE SCHEDULE

All credit releases will be based on the total approved credits generated as reported by the as-built / baseline report for the mitigation site. Under no circumstances shall any mitigation project be debited until the necessary Department of the Army (DA) authorization has been received for its construction or the District Engineer (DE) has otherwise provided written approval for the project in the case where no DA authorization is required for construction of the mitigation project. The DE, in consultation with the NCIRT, will determine if performance standards have been satisfied sufficiently to meet the requirements of the release schedules below. In cases where some performance standards have not been met, credits may still be released depending on the specifics of the case. Monitoring may be required to restart or be extended, depending on the extent to which the site fails to meet the specified performance standard. The release of project credits will be subject to the criteria described in Table C.1 as follows:

Table C.1 Stream Credit Release Schedule
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Credit Release Milestone	Release Activity	ILF/DMS	
		Interim Release	Total Released
1	Site Establishment	0%	0%
2	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	30%	30%
3	Year 1 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	40%
4	Year 2 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	50%
5	Year 3 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	60%
6*	Year 4 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	65% (75%**)
7	Year 5 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	75% (85%**)
8*	Year 6 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	80% (90%**)
9	Year 7 monitoring report demonstrates that channels are stable, and performance standards have been met and project has been approved for closeout	10%	90% (100%**)

* Please note that vegetation data may not be required with monitoring reports submitted during these monitoring years unless otherwise required by the Mitigation Plan or directed by the NCIRT.
**10% reserve of credits to be held back until the bankfull event performance standard has been met.

Table C.1 Wetland Credit Release Schedule
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Credit Release Milestone	Release Activity	ILF/NCDMS	
		Interim Release	Total Released
1	Site Establishment	0%	0%
2	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	30%	30%
3	Year 1 monitoring report demonstrates that interim performance standards have been met	10%	40%
4	Year 2 monitoring report demonstrates that interim performance standards have been met	10%	50%
5	Year 3 monitoring report demonstrates that interim performance standards have been met	15%	65%
6*	Year 4 monitoring report demonstrates that interim performance standards have been met	5%	70%
7	Year 5 monitoring report demonstrates that interim performance standards have been met	15%	85%
8*	Year 6 monitoring report demonstrates that interim performance standards have been met	5%	90%
9	Year 7 monitoring report demonstrates that performance standards have been met	10%	100%

*Please note that vegetation plot data may not be required with monitoring reports submitted during these monitoring years unless otherwise required by the Mitigation Plan or directed by the NCIRT.

The following conditions apply to all the credit release schedules:

a. A reserve of 10% of a site's total stream credits will be released after four bankfull events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than four bankfull events occur during the monitoring period, release of these reserve credits is at the discretion of the NCIRT.

b. After the second milestone, the credit releases are scheduled to occur on an annual basis, assuming that the annual monitoring report has been provided to the USACE in accordance with Section IV (General Monitoring Requirements) of the 2016 Wilmington District Stream and Wetland Compensatory Mitigation Update, and that the monitoring report demonstrates that interim performance standards are being met and that no other concerns have been identified on-site during the visual monitoring. All credit releases require written approval from the USACE.

c. The credits associated with the final credit release milestone will be released only upon a determination by the USACE, in consultation with the NCIRT, of functional success as defined in the Mitigation Plan.

APPENDIX D: FINANCIAL ASSURANCE

Pursuant to Section IV H and Appendix III of the NC Division of Mitigation Services' In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environmental Quality has provided the USACE-Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by DMS. This commitment provides financial assurance for all mitigation projects implemented by the program.

APPENDIX E: MAINTENANCE PLAN

The site will be monitored on a regular basis and a physical inspection of the site will be performed at least once a year throughout the post-construction monitoring period until performance standards are met. These site inspections may identify issues that require routine maintenance. Routine maintenance is most likely to be expected in the first two years following site construction and may include the following components as described below in Table E.1:

Table E.1 Routine Maintenance Components
UT to Magness Creek Mitigation Project – DMS Project No. 100081

Component/Feature	Maintenance through project close-out
Stream	Routine channel maintenance and repair activities may include modifying in-stream structures to prevent piping, securing loose coir matting, and supplemental installations of live stakes and other target vegetation along the project reaches. Areas of concentrated stormwater and floodplain flows that intercept the channel may also require maintenance to prevent streambank failures and head-cutting until vegetation becomes established.
Vegetation	Vegetation will be maintained to ensure the health and vigor of the targeted plant community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, and fertilizing. Exotic invasive plant species will be treated by mechanical and/or chemical methods. Any invasive plant species control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations.
Site Boundary	Site boundaries will be demarcated in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries shall be identified by fence, marker, bollard, post, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as needed basis.
Farm Road Crossing	The farm road crossings within the site may be maintained only as allowed by the recorded Conservation Easement, deed restrictions, rights of way, or corridor agreements. Culverts and fords located at crossings outside the easement will be maintained for stability and flow whenever possible with respect to these restrictions.
Beaver Management	Routine maintenance and repair activities caused by beaver activity may include supplemental planting, pruning, and dam breeching, dewatering, and/or removal. Beaver management will be performed in accordance with US Department of Agriculture (USDA) rules and regulations using accepted trapping and removal techniques only within the project boundary.

APPENDIX F: DWR STREAM IDENTIFICATION FORMS

Main Stem: Reach 1

At top of mainstem - at XS1 to top

NC DWQ Stream Identification Form Version 4.11

Date: 2/27	**Project/Site:** UT to Mayness	**Latitude:**
Evaluator: MC & RM	**County:** Cleveland	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 49	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 26)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	2	(3)
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	2	(3)
8. Headcuts	(0)	1	2	3
9. Grade control	0	0.5	1	(1.5)
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 10.5)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	1	(1.5)
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 12.5)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance) E&T	0	1	2	(3)
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	0	0.5	1	(1.5)
23. Crayfish	0	0.5	(1)	1.5
24. Amphibians	0	0.5	(1)	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

Reach UT1

NC DWQ Stream Identification Form Version 4.11

Date:	Project/Site: UT1 UT to Negress	Latitude:
Evaluator:	County:	Longitude:
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 27.5	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other *e.g. Quad Name:*

A. Geomorphology (Subtotal = 14.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	(1)	2	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	(1)	2	3
9. Grade control	0	0.5	(1) Roots	1.5
10. Natural valley	0	(0.5)	1	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	1	(2)	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	1	(1.5)
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 4)				
18. Fibrous roots in streambed	3	2	(1)	0
19. Rooted upland plants in streambed	3	2	(1)	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	0	(0.5)	1	1.5
24. Amphibians	0	(0.5)	1	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

Reach UT2

NC DWQ Stream Identification Form Version 4.11

Date: 2/21/18	**Project/Site:** UT2 Mulloway	**Latitude:**
Evaluator: MMC + JB	**County:** Cleveland	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 38	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 19)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	2	(3)
8. Headcuts	0	(1)	2	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	(0.5)	1	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 10.5)				
12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	1	(2)	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	0.5	1	(1.5)
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 8.5)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	0	0.5	(1)	1.5
24. Amphibians	0	0.5	(1)	1.5
25. Algae	0	(0.5)	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

Reach UT3

NC DWQ Stream Identification Form Version 4.11

Date: 11/8/18	**Project/Site:** Magness - UT3	**Latitude:**
Evaluator: RM	**County:** Cleveland	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 25.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 14)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	0	1	(2)	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts 3 in 100' section	0	1	2	(3)
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	(0.5)	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 6.5)				
12. Presence of Baseflow	0	(1)	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	1	(0.5)	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 3)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

APPENDIX G: NC-SAM AND NC-WAM ASSESSMENT FORMS

NC SAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 2.1

Main Stem

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): UT to Magness Creek
2. Date of evaluation: 11/8/18
3. Applicant/owner name: Baker Engineering
4. Assessor name/organization: S. King, R. Myers / Baker
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Magness Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): -81.5314, 35.4035

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): (see map)
10. Length of assessment reach evaluated (feet): 50'
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 5' ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 15'
13. Is assessment reach a swamp steam? ☐Yes ☐No
14. Feature type: ☒Perennial flow ☐Intermittent flow ☐Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☐ Mountains (M) ☒ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)
16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):
☐A  (more sinuous stream, flatter valley slope)
☒B  (less sinuous stream, steeper valley slope)
17. Watershed size: (**skip for Tidal Marsh Stream**) ☐Size 1 (< 0.1 mi²) ☐Size 2 (0.1 to < 0.5 mi²) ☒Size 3 (0.5 to < 5 mi²) ☐Size 4 (≥ 5 mi²)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
☐Section 10 water ☐Classified Trout Waters ☐Water Supply Watershed (☐I ☐II ☐III ☒IV ☐V)
☐Essential Fish Habitat ☐Primary Nursery Area ☐ High Quality Waters/Outstanding Resource Waters
☐Publicly owned property ☐NCDWR Riparian buffer rule in effect ☐Nutrient Sensitive Waters
☐Anadromous fish ☐303(d) List ☐CAMA Area of Environmental Concern (AEC)
☐Documented presence of a federal and/or state listed protected species within the assessment area.
List species:
☐Designated Critical Habitat (list species)
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☐Yes ☒No

1. Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)
☒A Water throughout assessment reach.
☐B No flow, water in pools only.
☐C No water in assessment reach.

2. Evidence of Flow Restriction – assessment reach metric
☐A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
☒B Not A

3. Feature Pattern – assessment reach metric
☐A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
☒B Not A

4. Feature Longitudinal Profile – assessment reach metric
☒A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
☐B Not A

5. Signs of Active Instability – assessment reach metric
Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
☐A < 10% of channel unstable
☐B 10 to 25% of channel unstable
☒C > 25% of channel unstable

6. Streamside Area Interaction – streamside area metric
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☐A	☐A	Little or no evidence of conditions that adversely affect reference interaction
☒B	☒B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☐C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] or too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) or floodplain/intertidal zone unnaturally absent or assessment reach is a man-made feature on an interstream divide

7. Water Quality Stressors – assessment reach/intertidal zone metric
Check all that apply.

- ☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
- ☒B Excessive sedimentation (burying of stream features or intertidal zone)
- ☒C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- ☐D Odor (not including natural sulfide odors)
- ☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in "Notes/Sketch" section.
- ☒F Livestock with access to stream or intertidal zone
- ☐G Excessive algae in stream or intertidal zone
- ☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
- ☐I Other: _____ (explain in "Notes/Sketch" section)
- ☐J Little to no stressors

8. Recent Weather – watershed metric (skip for Tidal Marsh Streams)
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- ☐A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- ☐B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- ☒C No drought conditions

9. Large or Dangerous Stream – assessment reach metric
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. Natural In-stream Habitat Types – assessment reach metric
10a. ☒Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**

- ☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
- ☒B Multiple sticks and/or leaf packs and/or emergent vegetation
- ☐C Multiple snags and logs (including lap trees)
- ☐D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
- ☐E Little or no habitat

Check for Tidal Marsh Streams Only

- ☐F 5% oysters or other natural hard bottoms
- ☐G Submerged aquatic vegetation
- ☐H Low-tide refugia (pools)
- ☐I Sand bottom
- ☐J 5% vertical bank along the marsh
- ☐K Little or no habitat

**************************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*********************************

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**

- ☒A Riffle-run section **(evaluate 11c)**
- ☐B Pool-glide section **(evaluate 11d)**
- ☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☐	☐	☒	☐	☐	Bedrock/saprolite
☒	☐	☐	☐	☐	Boulder (256 – 4096 mm)
☒	☐	☐	☐	☐	Cobble (64 – 256 mm)
☒	☐	☐	☐	☐	Gravel (2 – 64 mm)
☐	☐	☐	☒	☐	Sand (.062 – 2 mm)
☐	☐	☒	☐	☐	Silt/clay (< 0.062 mm)
☐	☒	☐	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☐No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: _____

12b. ☐Yes ☒No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☐	☐	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☐	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☐	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☐	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☐A	☐A	Little or no alteration to water storage capacity over a majority of the streamside area
☐B	☐B	Moderate alteration to water storage capacity over a majority of the streamside area
☒C	☒C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)
Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☐Y	☐Y	Are wetlands present in the streamside area?
☒N	☒N	

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)
Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

☒A	Streams and/or springs (jurisdictional discharges)
☐B	Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
☐C	Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
☒D	Evidence of bank seepage or sweating (iron in water indicates seepage)
☐E	Stream bed or bank soil reduced (dig through deposited sediment if present)
☐F	None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)
Check all that apply.

☐A	Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
☐B	Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
☐C	Urban stream (≥ 24% impervious surface for watershed)
☐D	Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
☐E	Assessment reach relocated to valley edge
☒F	None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)
Consider aspect. Consider "leaf-on" condition.

☐A	Stream shading is appropriate for stream category (may include gaps associated with natural processes)
☒B	Degraded (example: scattered trees)
☐C	Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated LB	Vegetated RB	Wooded LB	Wooded RB	
☒A	☒A	☐A	☐A	≥ 100 feet wide or extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☐D	☐D	☒D	☒D	From 10 to < 30 feet wide
☐E	☐E	☐E	☐E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☐A	☐A	Mature forest
☒B	☒B	Non-mature woody vegetation or modified vegetation structure
☐C	☐C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

Abuts LB	Abuts RB	< 30 feet LB	< 30 feet RB	30-50 feet LB	30-50 feet RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☐B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☒D	☒D	☒D	☒D	☒D	☒D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☐A	☐A	Medium to high stem density
☒B	☒B	Low stem density
☐C	☐C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☐A	☐A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☒C	☒C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☐A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☒B	☒B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☐C	☐C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☐Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	UT to Magness Creek	Date of Assessment	11/8/18
Stream Category	Pb3	Assessor Name/Organization	S. King, R. Myers / Baker

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	NO
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	NA	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**LOW**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**LOW**	
(2) Stream-side Habitat	**MEDIUM**	
(3) Stream-side Habitat	**MEDIUM**	
(3) Thermoregulation	**MEDIUM**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	**LOW**	

NC SAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 2.1

Reach UT2

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): UT to Magness Creek
2. Date of evaluation: 11/8/18
3. Applicant/owner name: Baker Engineering
4. Assessor name/organization: R. Myers / Baker
5. County: Cleveland
6. Nearest named water body on USGS 7.5-minute quad: Magness Creek
7. River basin: Broad
8. Site coordinates (decimal degrees, at lower end of assessment reach): -81.5314, 35.4035

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Reach UT2
10. Length of assessment reach evaluated (feet): 25'
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 5' ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 12'
13. Is assessment reach a swamp steam? ☐Yes ☐No
14. Feature type: ☒Perennial flow ☐Intermittent flow ☐Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☐ Mountains (M) ☒ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)
16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):
☐A  (more sinuous stream, flatter valley slope)
☒B  (less sinuous stream, steeper valley slope)
17. Watershed size: (**skip for Tidal Marsh Stream**) ☒Size 1 (< 0.1 mi^2) ☐Size 2 (0.1 to < 0.5 mi^2) ☐Size 3 (0.5 to < 5 mi^2) ☐Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
☐Section 10 water ☐Classified Trout Waters ☐Water Supply Watershed (☐I ☐II ☐III ☒IV ☐V)
☐Essential Fish Habitat ☐Primary Nursery Area ☐ High Quality Waters/Outstanding Resource Waters
☐Publicly owned property ☐NCDWR Riparian buffer rule in effect ☐Nutrient Sensitive Waters
☐Anadromous fish ☐303(d) List ☐CAMA Area of Environmental Concern (AEC)
☐Documented presence of a federal and/or state listed protected species within the assessment area.
List species:
☐Designated Critical Habitat (list species)
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☐Yes ☒No

1. Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)

☒A Water throughout assessment reach.
☐B No flow, water in pools only.
☐C No water in assessment reach.

2. Evidence of Flow Restriction – assessment reach metric

☐A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
☒B Not A

3. Feature Pattern – assessment reach metric

☐A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
☒B Not A

4. Feature Longitudinal Profile – assessment reach metric

☒A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
☐B Not A

5. Signs of Active Instability – assessment reach metric

Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).

☐A < 10% of channel unstable
☒B 10 to 25% of channel unstable
☐C > 25% of channel unstable

6. Streamside Area Interaction – streamside area metric
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☐A	☒A	Little or no evidence of conditions that adversely affect reference interaction
☒B	☐B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☐C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] or too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) or floodplain/intertidal zone unnaturally absent or assessment reach is a man-made feature on an interstream divide

7. Water Quality Stressors – assessment reach/intertidal zone metric
Check all that apply.

- ☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
- ☒B Excessive sedimentation (burying of stream features or intertidal zone)
- ☒C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- ☐D Odor (not including natural sulfide odors)
- ☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in "Notes/Sketch" section.
- ☒F Livestock with access to stream or intertidal zone
- ☐G Excessive algae in stream or intertidal zone
- ☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
- ☐I Other: _____ (explain in "Notes/Sketch" section)
- ☐J Little to no stressors

8. Recent Weather – watershed metric (skip for Tidal Marsh Streams)
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- ☐A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- ☐B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- ☒C No drought conditions

9. Large or Dangerous Stream – assessment reach metric
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. Natural In-stream Habitat Types – assessment reach metric
10a. ☒Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**

- ☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
- ☒B Multiple sticks and/or leaf packs and/or emergent vegetation
- ☐C Multiple snags and logs (including lap trees)
- ☐D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
- ☐E Little or no habitat

Check for Tidal Marsh Streams Only

- ☐F 5% oysters or other natural hard bottoms
- ☐G Submerged aquatic vegetation
- ☐H Low-tide refugia (pools)
- ☐I Sand bottom
- ☐J 5% vertical bank along the marsh
- ☐K Little or no habitat

**************************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS**************************************

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**

- ☒A Riffle-run section **(evaluate 11c)**
- ☒B Pool-glide section **(evaluate 11d)**
- ☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☒	☐	☐	☐	☐	Bedrock/saprolite
☒	☐	☐	☐	☐	Boulder (256 – 4096 mm)
☒	☐	☐	☐	☐	Cobble (64 – 256 mm)
☒	☐	☐	☐	☐	Gravel (2 – 64 mm)
☐	☐	☐	☒	☐	Sand (.062 – 2 mm)
☐	☐	☐	☒	☐	Silt/clay (< 0.062 mm)
☐	☐	☒	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☒Yes ☐No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: _____

12b. ☐Yes ☒No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☐	☐	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☐	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☐	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☐	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☐A	☐A	Little or no alteration to water storage capacity over a majority of the streamside area
☒B	☒B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☐C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)
Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☐Y	☐Y	Are wetlands present in the streamside area?
☒N	☒N	

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)
Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

☒A	Streams and/or springs (jurisdictional discharges)
☐B	Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
☐C	Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
☒D	Evidence of bank seepage or sweating (iron in water indicates seepage)
☐E	Stream bed or bank soil reduced (dig through deposited sediment if present)
☐F	None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)
Check all that apply.

☐A	Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
☐B	Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
☐C	Urban stream (≥ 24% impervious surface for watershed)
☒D	Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
☐E	Assessment reach relocated to valley edge
☐F	None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)
Consider aspect. Consider "leaf-on" condition.

☐A	Stream shading is appropriate for stream category (may include gaps associated with natural processes)
☒B	Degraded (example: scattered trees)
☐C	Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
☐A	☒A	☐A	☒A	≥ 100 feet wide or extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☒D	☐D	☒D	☐D	From 10 to < 30 feet wide
☐E	☐E	☐E	☐E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☐A	☒A	Mature forest
☐B	☐B	Non-mature woody vegetation or modified vegetation structure
☒C	☐C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☐B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☒D	☒D	☒D	☒D	☒D	☒D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☐A	☐A	Medium to high stem density
☐B	☒B	Low stem density
☒C	☐C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☐A	☐A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☒C	☒C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☐A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☐B	☒B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☒C	☐C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☐Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	UT to Magness Creek	Date of Assessment	11/8/18
Stream Category	Pb1	Assessor Name/Organization	R. Myers / Baker

Notes of Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	NO
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	NA	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**MEDIUM**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**LOW**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**LOW**	
(2) Stream-side Habitat	**MEDIUM**	
(3) Stream-side Habitat	**MEDIUM**	
(3) Thermoregulation	**MEDIUM**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	**LOW**	

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	UT to Magness Creek	Date of Evaluation	11/8/18
Applicant/Owner Name	Baker Engineering	Wetland Site Name	UT to Magness wetlands
Wetland Type	Headwater Forest	Assessor Name/Organization	S. King, R. Myers / Baker
Level III Ecoregion	Piedmont	Nearest Named Water Body	Magness Creek
River Basin	Broad	USGS 8-Digit Catalogue Unit	03050105
County	Cleveland	NCDWR Region	Mooresville
☒ Yes ☐ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.4068, -81.5283

Evidence of stressors affecting the assessment area (may not be within the assessment area)

Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations - Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☐ Yes ☒ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☐A	☐A	Not severely altered
☒B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐A	☐A	Water storage capacity and duration are not altered.
☐B	☒B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☒C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☒C	☒C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☐D	☐D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☒B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☒B	☒B	☒B	Confined animal operations (or other local, concentrated source of pollutants
☒C	☒C	☒C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☐B From 30 to < 50 feet
- ☐C From 15 to < 30 feet
- ☒D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐Yes ☒No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☒G	☒G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☒B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☒I	☒I	From 0.1 to < 0.5 acre
☒J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☒D	☒D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☒B 1 to 4
☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☒B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☐C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☒A	☒A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☒C	☒C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☒B	☐B	Moderate density herb layer
	☐C	☒C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

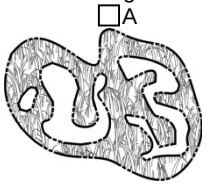
☒A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

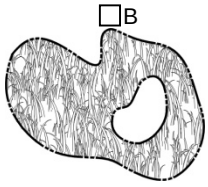
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

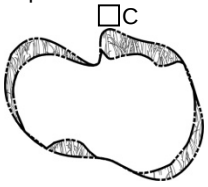
Include both natural debris and man-placed natural debris.
☒A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☐B Not A

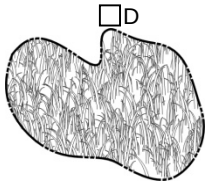
21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A 

☐B 

☐C 

☐D 

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☐A Overbank and overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	UT to Magness wetlands	Date of Assessment	11/8/18
Wetland Type	Headwater Forest	Assessor Name/Organization	S. King, R. Myers / Baker

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	NO
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence (Y/N)	**NO**
	Particulate Change	Condition	**MEDIUM**
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Soluble Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**MEDIUM**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence (Y/N)	**NO**
Habitat	Condition	**LOW**

Overall Wetland Rating **LOW**

APPENDIX H: APPROVED JD AND WETLAND FORMS

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2019-00664** County: **Cleveland** U.S.G.S. Quad: **NC- Lawndale**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Requestor: **Micky Clemmons**

Address: **797 Haywood Ave., Suite 201**
Asheville, NC 28806
Telephone Number: **828-412-6100**
E-mail: **mclemmons@mbakerintl.com**

Size (acres) **10.79**
Nearest Waterway **Magness Creek**
USGS HUC **03050105**

Nearest Town **Lawndale**
River Basin **Santee**
Coordinates Latitude: **35.404463**
Longitude: **-81.530205**

Location description: **The review area is located 0.301 miles Northwest of the intersection of Philadelphia Road and Shaker Drive in Cleveland County. PIN(s): 2641540498, 2641538722, 2641538722, 2641528927, 2641528927, 2641419802, 2641600979.**

Indicate Which of the Following Apply:

A. Preliminary Determination

☒ There appear to be **waters, including wetlands** on the above described project area/property, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344) and/or Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403). The **waters, including wetlands** have been delineated, and the delineation has been verified by the Corps to be sufficiently accurate and reliable. The approximate boundaries of these waters are shown on the enclosed delineation map dated **5/16/2019**. Therefore this preliminary jurisdiction determination may be used in the permit evaluation process, including determining compensatory mitigation. For purposes of computation of impacts, compensatory mitigation requirements, and other resource protection measures, a permit decision made on the basis of a preliminary JD will treat all waters and wetlands that would be affected in any way by the permitted activity on the site as if they are jurisdictional waters of the U.S. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). However, you may request an approved JD, which is an appealable action, by contacting the Corps district for further instruction.

☐ There appear to be **waters, including wetlands** on the above described project area/property, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344) and/or Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403). However, since the **waters, including wetlands** have not been properly delineated, this preliminary jurisdiction determination may not be used in the permit evaluation process. Without a verified wetland delineation, this preliminary determination is merely an effective presumption of CWA/RHA jurisdiction over all of the **waters, including wetlands** at the project area, which is not sufficiently accurate and reliable to support an enforceable permit decision. We recommend that you have the **waters, including wetlands** on your project area/property delineated. As the Corps may not be able to accomplish this wetland delineation in a timely manner, you may wish to obtain a consultant to conduct a delineation that can be verified by the Corps.

B. Approved Determination

☐ There are Navigable Waters of the United States within the above described project area/property subject to the permit requirements of Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403) and Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

☐ There are **waters, including wetlands** on the above described project area/property subject to the permit requirements of Section 404 of the Clean Water Act (CWA) (33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

☐ We recommend you have the **waters, including wetlands** on your project area/property delineated. As the Corps may not be able to accomplish this wetland delineation in a timely manner, you may wish to obtain a consultant to conduct a delineation that can be verified by the Corps.

SAW-2019-00664

☐ The **waters, including wetlands** on your project area/property have been delineated and the delineation has been verified by the Corps. The approximate boundaries of these waters are shown on the enclosed delineation map dated **DATE**. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to CWA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

☐ The **waters, including wetlands** have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on **DATE**. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

☐ There are no waters of the U.S., to include wetlands, present on the above described project area/property which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

☐ The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management in **Morehead City, NC, at (252) 808-2808** to determine their requirements.

Placement of dredged or fill material within waters of the US, including wetlands, without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). Placement of dredged or fill material, construction or placement of structures, or work within navigable waters of the United States without a Department of the Army permit may constitute a violation of Sections 9 and/or 10 of the Rivers and Harbors Act (33 USC § 401 and/or 403). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **Catherine M. Janiczak at 704-510-1438 or Catherine.M.Janiczak@usace.army.mil**.

C. Basis For Determination: Basis For Determination: See the preliminary jurisdictional determination form dated 06/17/2019.

D. Remarks: None.

E. Attention USDA Program Participants

This delineation/determination has been conducted to identify the limits of Corps' Clean Water Act jurisdiction for the particular site identified in this request. The delineation/determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA Program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

F. Appeals Information **(This information applies only to approved jurisdictional determinations as indicated in B. above)**

This correspondence constitutes an approved jurisdictional determination for the above described site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and request for appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the following address:

US Army Corps of Engineers
South Atlantic Division
Attn: Jason Steele, Review Officer
60 Forsyth Street SW, Room 10M15
Atlanta, Georgia 30303-8801

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by **Not applicable**.
It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this correspondence.

Corps Regulatory Official: Catherine M. Janiczak

Date of JD: **06/17/2019** Expiration Date of JD: **Not applicable**

SAW-2019-00664
The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete the Customer Satisfaction Survey located at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0

Copy furnished:

Agent:	**Holland Youngman**
Address:	**797 Haywood Road, Suite 201** **Asheville, NC 28806**
Telephone Number:	**828-412-6103**
E-mail:	**Holland.Youngman@mbakerintl.com**

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: **Micky Clemmons**	File Number: **SAW-2019-00664**	Date: **06/17/2019**

Attached is:	See Section below
☐ INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
☐ PROFFERED PERMIT (Standard Permit or Letter of permission)	B
☐ PERMIT DENIAL	C
☐ APPROVED JURISDICTIONAL DETERMINATION	D
☒ PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at or http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx or the Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the district engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT		
REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)		
ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.		
POINT OF CONTACT FOR QUESTIONS OR INFORMATION:		
If you have questions regarding this decision and/or the appeal process you may contact: **District Engineer, Wilmington Regulatory Division** **Attn: Catherine M. Janiczak** **Charlotte Regulatory Office** **U.S Army Corps of Engineers** **8430 University Executive Park Drive, Suite 615** **Charlotte, North Carolina 28262**	If you only have questions regarding the appeal process you may also contact: Mr. Jason Steele, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137	
RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.		
_____ Signature of appellant or agent.	Date:	Telephone number:

For appeals on Initial Proffered Permits send this form to:

District Engineer, Wilmington Regulatory Division, **Attn: Catherine M. Janiczak, 69 Darlington Avenue, Wilmington, North Carolina 28403**

For Permit denials, Proffered Permits and Approved Jurisdictional Determinations send this form to:

Division Engineer, Commander, U.S. Army Engineer Division, South Atlantic, Attn: Mr. Jason Steele, Administrative Appeal Officer, CESAD-PDO, 60 Forsyth Street, Room 10M15, Atlanta, Georgia 30303-8801
Phone: (404) 562-5137

PRELIMINARY JURISDICTIONAL DETERMINATION (PJD) FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PJD: 06/17/2019

B. NAME AND ADDRESS OF PERSON REQUESTING PJD: Micky Clemmons, Micky **LAST**, 797 Haywood Ave., Suite 201,Asheville, NC 28806

C. DISTRICT OFFICE, FILE NAME, AND NUMBER: Wilmington District, Yaraboro PJD, SAW-2019-00664

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION: The review area is located 0.301 miles Northwest of the intersection of Philadelphia Road and Shaker Drive in Cleveland County. PIN(s): 2641540498, 2641538722, 2641538722, 2641528927, 2641528927, 2641419802, 2641600979.

(USE THE TABLE BELOW TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES)

State: NC County: Cleveland City: Lawndale
Center coordinates of site (lat/long in degree decimal format): Latitude: 35.404463 Longitude: -81.530205

Universal Transverse Mercator:

Name of nearest waterbody: Magness Creek

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☒ Field Determination. Date(s): 05/16/2019

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION.

Site Number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resources in review area (acreage and linear feet, if applicable	Type of aquatic resources (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
Main Stream	35.407123	-81.528623	3,109 linear feet	Non-wetland	Sec. 404
UT1	35.407123	-81.528623	161 linear feet	Non-wetland	Sec. 404
UT2	35.407123	-81.528623	260 linear feet	Non-wetland	Sec. 404
UT3	35.407123	-81.528623	120 linear feet	Non-wetland	Sec. 404
W-J	35.407123	-81.528623	0.03 acres	Wetland	Sec. 404
W-A	35.407002	-81.528357	0.009 acres	Wetland	Sec. 404
W-B	35.406850	-81.528315	0.026 acres	Wetland	Sec. 404
W-C	35.406889	-81.528485	0.019 acres	Wetland	Sec. 404

Site Number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resources in review area (acreage and linear feet, if applicable	Type of aquatic resources (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
W-I	35.405534	-81.529151	0.014 acres	Wetland	Sec. 404
W-H	35.405439	-81.529403	0.013 acres	Wetland	Sec. 404
W-F	35.404289	-81.530696	0.048 acres	Wetland	Sec. 404
W-E	35.404035	-81.5311077	0.018 acres	Wetland	Sec. 404
W-D	35.403633	-81.531248	0.014 acres	Wetland	Sec. 404

1) The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.

2) In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre- construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there *"may be"* waters of the U.S. and/or that there *"may be"* navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information.

SUPPORTING DATA. Data reviewed for PJD (check all that apply)

Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

☒ Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
Map: Figure 5.1 (Dated 05/16/2019)_

☒ Data sheets prepared/submitted by or on behalf of the PJD requestor.

☒ Office concurs with data sheets/delineation report.

☐ Office does not concur with data sheets/delineation report. Rationale:_____

☐ Data sheets prepared by the Corps:_____

☐ Corps navigable waters' study:_____

☐ U.S. Geological Survey Hydrologic Atlas:_____

☐ USGS NHD data.

☐ USGS 8 and 12 digit HUC maps.

☒ U.S. Geological Survey map(s). Cite scale & quad name: Lawndale Quadrangle_

☒ Natural Resources Conservation Service Soil Survey. Citation: USDA NRCS 2016 SSURGO____

☐ National wetlands inventory map(s). Cite name:_____

☐ State/local wetland inventory map(s):_____

☐ FEMA/FIRM maps:_____

☐ 100-year Floodplain Elevation is:_____ (National Geodetic Vertical Datum of 1929)

☒ Photographs: ☒ Aerial (Name & Date): 2015 NC One Map_____

or ☐ Other (Name & Date):_____

☐ Previous determination(s). File no. and date of response letter:_____

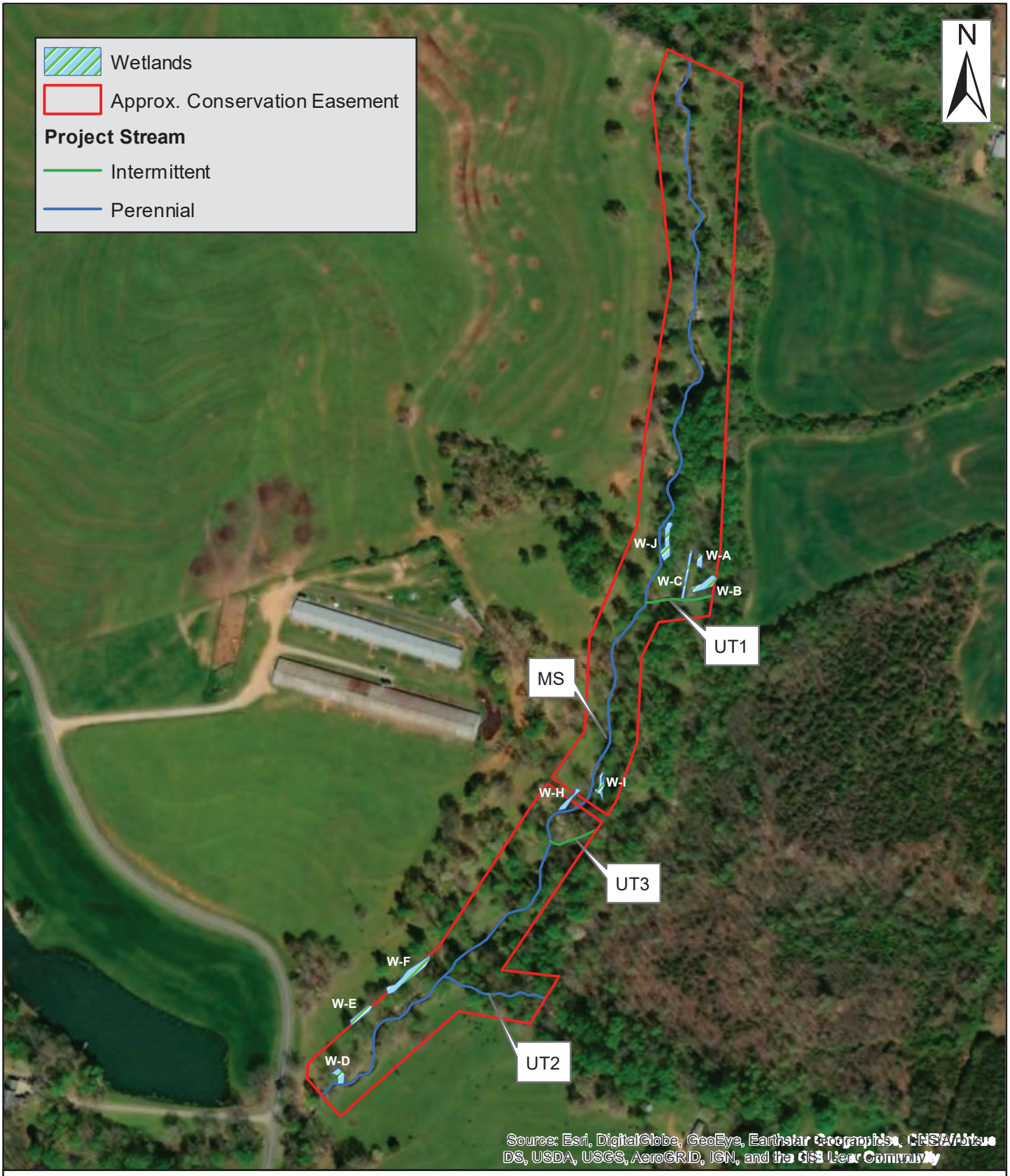
☐ Other information (please specify):_____

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Catherine M. Janiczak
Signature and date of Regulatory staff member completing PJD
06/17/2019

_____
Signature and date of person requesting PJD (REQUIRED, unless obtaining the signature is impracticable)[1]

[1] Districts may establish timeframes for requester to return signed PJD forms. If the requester does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.



Michael Baker INTERNATIONAL

0 200 400 800 Feet

Figure 5.1 - Updated 5/16/19
Review Area
UT to Magness Creek
Stream Mitigation Project
Cleveland County, NC

Data Point W-1

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: UT to Muddy Creek City/County: Cleveland Sampling Date: 11/8/18

Applicant/Owner: Baker Engineering State: NC Sampling Point: W-1

Investigator(s): S. Kay, R. Myers Section, Township, Range: —

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): ~ 1%

Subregion (LRR or MLRA): P-136 Lat: 35.4068 Long: -81.5283 Datum: NAD 83 - SP

Soil Map Unit Name: Chewacla loam (0-2%) NWI classification: —

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation X, Soil ____, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:
The autumn of 2018 has been very wet, significantly above average.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 1-2"
Water Table Present?	Yes X	No ____	Depth (inches): surface
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): surface

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Ditches/drains cut in/around this wetland complex, but indicators of hydrology still present here.
Wetland in a shallow depression/swale, which holds water.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W-1

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	60	Y	FAC
2. Platanus occidentalis	20	N	FACW
3. Liriodendron tulipifera	30	Y	FACU
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. –			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Polygonum pensylvanicum	90	Y	FACW
2. Carex lurida	10	N	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
Woody Vine Stratum (Plot size:)			
1. –			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

__ 1 - Rapid Test for Hydrophytic Vegetation

__ 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0[1]

__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

Significant disturbance to understory here, Cattle have access and certainly impact vegetation. Wetland depression supports wet herbaceous layer though

Sampling Point: W-1

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4"	10YR 3/2	100	—				sandy loam	rich topsoil (mica)
4-6"	10YR 3/1	80	10YR 5/1	20	D	M	silty loam	organic-rich layer
6-12"	10YR 4/1	98	10YR 6/1	2	D	M	sandy loam	"
12-24"	10YR 3/1	98	5YR 5/6	2	C	M	sandy clay	"

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

Dark, organic-rich soil with redox features observed here.

Dat Point W-2

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: UT to Magness Creek City/County: Cleveland Sampling Date: 11/2/18

Applicant/Owner: Rahn Engineering State: NC Sampling Point: W-2

Investigator(s): S. Hog / R. Myers Section, Township, Range: –

Landform (hillslope, terrace, etc.): floodplain depression Local relief (concave, convex, none): concave Slope (%): ~1%

Subregion (LRR or MLRA): P-136 Lat: 35.4043 Long: -81.5307 Datum: NAD83-SP

Soil Map Unit Name: Chewacla loam (0-2%) NWI classification: –

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:
The autumn of 2018 has been very wet, significantly above average.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2) floodplain depression
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): ~1/2"
Water Table Present?	Yes X	No ____	Depth (inches): surface
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): surface

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Located in a floodplain depression area (though very shallow) this narrow, linear area has indicators of hydrology present.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W-2

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	50	Y	FAC
2. Platanus occidentalis	20	Y	FACW
3. Liriodendron tulipifera	5	N	FACU
4. Diospyros virginiana	15	N	FAC
5.			
6.			
7.			
8.			
	90	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1. –			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
		= Total Cover	

Herb Stratum (Plot size:)			
1. Polygonum pensylvanicum	90	Y	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	

Woody Vine Stratum (Plot size:)			
1. –			
2.			
3.			
4.			
5.			
6.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Include photo numbers here or on a separate sheet.)

Understory + herbaceous layers significantly disturbed by cattle access. Area is weedy but smartweed dominates the wetland depression. Late fall visit makes veg ID difficult.

SOIL

Sampling Point: W-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6"	10YR 5/2	80	5YR 5/6	20	C	M	silt loam	mica
6-18	10YR 4/4	100	-				clay loam	clay layer perching water
18"+	10YR 2/1	80	-				silt loam	buried A-horizon

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

Buried A-horizon observed here at ~18". Very dark, hydric layer. Clay fill/colluvial deposition above it that appears to help hold/perch water in this depression. Hydric soils (depletions) resulting.

Data Point
W-3

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: UT to Muddy Creek City/County: Cleveland Sampling Date: 11/8/18

Applicant/Owner: Baker Engineering State: NC Sampling Point: W-2

Investigator(s): S. King / R. Myers Section, Township, Range: –

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): slightly convex Slope (%): ~5%

Subregion (LRR or MLRA): P-136 Lat: 35.4091 Long: -81.5288 Datum: NAD83-SW

Soil Map Unit Name: Pacolet sandy clay loam (8-15%) NWI classification: –

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No X (If no, explain in Remarks.)

Are Vegetation X, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:
The autumn of 2018 has been very wet, significantly above average.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
No hydrology indicators present.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W-3

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. —			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size:)			
1. —			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		

Herb Stratum (Plot size: 10'x10')			
1. Festuca arundinacea	85%	Y	FACU
2. Trifolium pratense	10%	N	FACU
3. Dactylis glomerata	20%	N	FACU
4. Eupatoriadelphus capillifolium	10%	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	125% = Total Cover		

Woody Vine Stratum (Plot size:)			
1. —			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (Include photo numbers here or on a separate sheet.)

This area is managed cow pasture with a mixed assortment of pasture grasses + common weeds. (Landowner identified species planted)

SOIL

Sampling Point: W-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1"	10YR 3/4	100%	—				loam	topsoil
1-3"	10YR 5/4	100%	—				loam	
3-12+	2.5YR 4/6	100%	—				clay	dense, some mica

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

Upland soil clearly present here.

APPENDIX I: APPROVED FHWA CATEGORICAL EXCLUSION FORMS

(Complete Categorical Exclusion included in electronic submittal)

Michael Baker
INTERNATIONAL

We Make a Difference

May 23, 2019

Paul Wiesner, Project Manager
NCDEQ - Division of Mitigation Services
5 Ravenscroft Drive, Ste. 102
Asheville, NC 28801

Subject: Task 1: Environmental Screening Documentation Submittal for the UT to Magness Creek Mitigation Project; Broad River Basin – CU# 03050105 – Cleveland County, NC
NCDMS Project ID No. 100081; NCDEQ Contract No. 007604

Dear Mr. Wiesner:

Please find enclosed two hard copies and one digital copy of the final Categorical Exclusion (CE) for the UT to Magness Creek Mitigation Project in Cleveland County, NC. The Project is located in the Broad River Basin (Cataloging Unit 03050105) and the NC Division of Mitigation Services Targeted Local Watershed (TLW) 03050105-080060. The project drains directly to Magness Creek and the First Broad River, which is a drinking water source for the City of Shelby and other downstream municipalities. Existing reaches within the project site flow to the south-southwest where the downstream extent of the project is bordered by Selkirk Drive.

The proposed project is a full-delivery, stream mitigation effort for the NC Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS) in response to RFP#: 16-007400. The project will involve the restoration and enhancement of approximately 3,210 linear feet (LF) of existing stream, and the re-establishment and rehabilitation of 1.72 acres of riparian wetlands. A Best Management Practice (BMP) in the form of a constructed sediment detention pond will be installed in an unstable ephemeral drainage that receives run-off from an area that is frequently used by livestock. A conservation easement will be implemented along all project reaches at least 30 feet from the top of bank and will incorporate some of the existing functional wetlands. The conservation easement will protect the entire project area in perpetuity. Livestock will be excluded from the conservation easement with permanent fencing.

In addition to the submittal of the CE document for the completion of Task 1, Baker submitted the Landowner Authorization Forms prior to the on-site project review meeting with the Interagency Review Team (IRT) and DMS on September 27, 2018, as required. Based on the preliminary mitigation plans and the on-site meeting, and the subsequent contract amendment for riparian wetland credits, the project will generate 3,123 stream mitigation units (SMUs) and 1.707 wetland mitigation units (WMUs) in the Broad River Basin. The proposed activities are outlined below in Tables 1 & 2.

Table 1. UT to Magness Stream Details

Reach ID	Length (ft)	Mitigation Approach	Credit Ratio	SMUs
MS	2,950	Restoration	1:1	2,950
UT2	260	Enhancement I	1:5:1	173
			Total Credits	3,123

Michael Baker Engineering, Inc.
797 Haywood Road, Suite 201
Asheville, NC 28806 | Office: 828.350.1408

Table 2. UT to Magness Wetland Details			
Mitigation Approach	**Acres**	**Credit Ratio**	**WMUs**
Proposed Re-establishment	1.684	1:1	1.684
Proposed Rehabilitation	0.034	1:5:1	0.023
		Total Credits	**1.707**

If you have any questions or concerns, please feel free to contact me at (828) 412-6100 or via my email address at mclemmons@mbakerint.com.

Sincerely,

Micky Clemmons
Project Manager

Cc: File

Appendix A

Categorical Exclusion Form for Division of Mitigation Services Projects

Version 1.4

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	UT to Magness Creek
County Name:	Cleveland
EEP Number:	Project # 100081; Contract # 7604
Project Sponsor:	Michael Baker Engineering, Inc.
Project Contact Name:	Micky Clemmons
Project Contact Address:	797 Haywood Road, Suite 201, Asheville, NC
Project Contact E-mail:	Mclemmons@mbakerintl.com
EEP Project Manager:	Paul Wiesner (paul.wiesner@ncdenr.gov)

Project Description

The UT to Magness Creek mitigation project is located in Cleveland County, NC, east of the Town of Lawndale, within the Broad River Basin (03050105) and the NC DMS Targeted Local Watershed (TLW) 03050105080060. Located within a water supply watershed (WS-IV), the project drains directly to Magness Creek and the First Broad River, which is a drinking water source for the City of Shelby and other downstream municipalities. Existing reaches within the project site flow to the south-southwest where the downstream extent of the project is bordered by Selkirk Drive.

The existing stream reaches have been significantly impacted by unrestricted livestock access and the removal or impairment of riparian buffers. Most of the project reaches are incised, unstable, and exhibit areas of active bank erosion from both high flows and livestock access. Riparian buffer vegetation varies from areas with no woody buffer vegetation to areas with large trees but at low density and without any significant understory.

The project will involve the restoration and enhancement of approximately 3,210 linear feet (LF) of existing stream, and the re-establishment and rehabilitation of 1.72 acres of riparian wetlands. A Best Management Practice (BMP) in the form of a constructed sediment detention pond will be installed in an unstable ephemeral drainage that receives run-off from an area that is frequently used by livestock. Native riparian buffers will be established along all proposed reaches. A conservation easement will be implemented along all project reaches in an excess of 30 feet from the top of bank and will incorporate some of the existing functional wetlands.

For Official Use Only

Reviewed By:

5/21/19 — Paul Wiesner

Date — **DMS Project Manager**

Conditional Approved By:

Date — **For Division Administrator FHWA**

☐ **Check this box if there are outstanding issues**

Final Approval By:

5/22/19 — Donald William Brew

Date — **For Division Administrator FHWA**

Part 2: All Projects Regulation/Question	Response
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☒ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☒ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☒ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☒ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☒ No ☐ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☒ No ☐ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☐ No ☒ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☒ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☒ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☒ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☒ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☒ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Does the project require the acquisition of real estate?	☒ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☒ No ☐ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☒ Yes ☐ No ☐ N/A

Part 3: Ground-Disturbing Activities Regulation/Question	Response
American Indian Religious Freedom Act (AIRFA)	
1. Is the project located in a county claimed as "territory" by the Eastern Band of Cherokee Indians?	☒ Yes ☐ No
2. Is the site of religious importance to American Indians?	☐ Yes ☒ No ☐ N/A
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	☐ Yes ☐ No ☒ N/A
4. Have the effects of the project on this site been considered?	☐ Yes ☐ No ☒ N/A
Antiquities Act (AA)	
1. Is the project located on Federal lands?	☐ Yes ☒ No
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Archaeological Resources Protection Act (ARPA)	
1. Is the project located on federal or Indian lands (reservation)?	☐ Yes ☒ No
2. Will there be a loss or destruction of archaeological resources?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Endangered Species Act (ESA)	
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	☒ Yes ☐ No
2. Is Designated Critical Habitat or suitable habitat present for listed species?	☒ Yes ☐ No ☐ N/A
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	☐ Yes ☒ No ☐ N/A
4. Is the project "likely to adversely affect" the specie and/or "likely to adversely modify" Designated Critical Habitat?	☐ Yes ☐ No ☒ N/A
5. Does the USFWS/NOAA-Fisheries concur in the effects determination?	☐ Yes ☐ No ☒ N/A
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?	☐ Yes ☐ No ☒ N/A

Executive Order 13007 (Indian Sacred Sites)	
1. Is the project located on Federal lands that are within a county claimed as "territory" by the EBCI?	☐ Yes ☒ No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	☐ Yes ☐ No ☒ N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	☐ Yes ☐ No ☒ N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	☒ Yes ☐ No
2. Has NRCS determined that the project contains prime, unique, statewide or locally important farmland?	☒ Yes ☐ No ☐ N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	☒ Yes ☐ No ☐ N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	☒ Yes ☐ No
2. Have the USFWS and the NCWRC been consulted?	☒ Yes ☐ No ☐ N/A
Land and Water Conservation Fund Act (Section 6(f))	
1. Will the project require the conversion of such property to a use other than public, outdoor recreation?	☐ Yes ☒ No
2. Has the NPS approved of the conversion?	☐ Yes ☐ No ☒ N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	☐ Yes ☒ No
2. Is suitable habitat present for EFH-protected species?	☐ Yes ☐ No ☒ N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	☐ Yes ☐ No ☒ N/A
4. Will the project adversely affect EFH?	☐ Yes ☐ No ☒ N/A
5. Has consultation with NOAA-Fisheries occurred?	☐ Yes ☐ No ☒ N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	☐ Yes ☒ No
2. Have the USFWS recommendations been incorporated?	☐ Yes ☐ No ☒ N/A
Wilderness Act	
1. Is the project in a Wilderness area?	☐ Yes ☒ No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	☐ Yes ☐ No ☒ N/A

UT to Magness Creek Mitigation Project / Categorical Exclusion – Summary

Broad River Basin – CU# 03050105– Cleveland County, NC
NCDMS Project ID No. 100081; NCDEQ Contract No. 007604

Project Background

The UT to Magness Creek mitigation project is proposing to restore and enhance approximately 3,385 linear feet (LF) of stream within the Broad River Basin for the purpose of obtaining stream mitigation credit for the NC Division of Mitigation Services (DMS). Project reaches have been significantly impacted by historic channelization, unrestricted livestock access, and a lack of quality riparian buffers. Stream banks consist of heavily grazed pasture grass with some areas of widely scattered trees, mixed with pockets of invasive species. Project reaches are unstable, incised and exhibit active bank erosion from both high flows and livestock access. A constructed sediment detention pond will be installed in an unstable ephemeral drainage to treat pasture run-off from an area that is frequently used by livestock. Livestock will be permanently excluded from all project areas. Buffers in excess of 30 feet will be established along all proposed reaches. In addition, most of the existing functional wetlands will be incorporated inside the conservation easement to protect them in perpetuity.

The National Environmental Policy Act of 1969 (NEPA) requires agencies to use an interdisciplinary approach in planning and decision-making for actions that will have an impact on the environment. The Federal Highway Administration (FHWA) and NC Department of Transportation (NCDOT) have determined that DMS projects will not involve significant impacts and therefore a Categorical Exclusion (CE) is the appropriate type of environmental document for this project. FHWA has also determined that stream restoration projects are considered land disturbing activities; therefore, Parts 2 and 3 of the DMS CE checklist and a summary of the findings applicable to the environmental regulations associated for this project are included. Supporting documentation is included in the Appendix.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

A preliminary review of the project and adjacent parcels zoning/land use status was conducted on August 1, 2018 using the Cleveland County,NC GIS Tax Mapping application (https://www.webgis.net/nc/Cleveland/). Results from this review did not indicate any commercial or industrial designations within the project parcels nor those abutting or adjacent the project properties. A search of environmental records for the project area was conducted on August 6, 2018 by Environmental Data Resources, Inc (EDR). Results from the EDR's Radius Map Report did not find any current nor historic hazardous waste records for any properties within or adjacent to the project review area. See the Appendix for full EDR report. Based on these results, no additional documentation is required to meet regulatory compliance for CERCLA.

National Historic Preservation Act (Section 106)

Michael Baker Engineering, Inc. (Baker) requested a review and comment from the State Historic Preservation Office (SHPO) on any possible issues that might emerge with respect to architectural, archaeological, and/or cultural resources from the restoration project on August 3, 2018. On December 17, 2018, NC DMS sent a review request to the Eastern Band of Cherokee Indians' Tribal Historic Preservation Office (EBCI THPO), the United Keetoowah Band of Cherokee Indians in Oklahoma's (UKB) THPO, and the Cherokee Nation's THPO. On September 4, 2018, Baker received a response letter from SHPO finding that no historic resources would be affected by the project. On January 8, 2019, NC DMS received a response letter from the Cherokee Nation stating that "no instances where this project intersects or adjoin" records of cultural and historic resources; therefore, no impacts to Cherokee resources are "foreseen…at this time". On April 10, 2019, Baker received a correspondence email stating that the United Keetowah Band of Cherokee (UKB) concurs with the recommendation not to conduct a cultural resource survey for

the UT to Magness Creek mitigation project. No response was received from the Eastern Band of the Cherokee Indians (EBCI). All correspondence on this issue is included in the Appendix.

Uniform Relocation Assistance and Real Property Act

Prior to signing the Option Agreement for the Conservation Easement, each property owner of the land involved in the restoration project was notified that Baker does not have condemnation authority and as to the fair market value of the land involved. Copies of each Option Agreement is included in the Appendix.

Endangered Species Act (ESA)

Michael Baker Engineering, Inc. (Baker) conducted an on-line review of the project area with the use of the United States Fish and Wildlife Service (USFWS) IPAC website (https://ecos.fws.gov/ipac/), on August 6, 2018. This review generated an *Official Species List* (OSL), which identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of the proposed project and/or may be affected by proposed project. Results from review found the following two federally listed species. No USFWS designated critical habitats were located within the project boundaries.

Scientific Name	Common Name	Federal Status	Habitat Present	Biological Conclusion
Myotis septentrionalis	Northern Long-eared Bat	T	No	No Effect
Hexastylis naniflora	Dwarf-flowered Heartleaf	T	Yes	No Effect

Baker conducted a two-mile radius search using the Natural Heritage Program (NCNHP) Data Explorer (https://ncnhde.natureserve.org/) on August 6, 2018. Results from this search found no known occurrences of any of the above referenced species within two miles of the project site.

Based on our review, field surveys, USFWS and FHWA consultation, Baker has developed the following determinations for the above referenced species.

***Myotis septentrionalis* (Northern Long-Eared Bat) – Threatened**

USFWS optimal survey window: June 1- August 15

In North Carolina, the NLEB occurs in the mountains, with scattered records in the Piedmont and coastal plain. In western North Carolina, NLEB spend winter hibernating in caves and mines. Since this species is not known to be a long-distance migrant, and caves and subterranean mines are extremely rare in eastern North Carolina, it is uncertain whether or where NLEB hibernate in eastern NC. During the summer, NLEB roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees (typically ≥3 inches dbh). This bat also been found, rarely, roosting in structures like barns and sheds, under eaves of buildings, behind window shutters, in bridges, and in bat houses. Pregnant females give birth from late May to late July. Foraging occurs on forested hillsides and ridges, and occasionally over forest clearings, over water, and along tree-lined corridors. Mature forests may be an important habitat type for foraging.

No critical habitat has been designated for this species.

Biological Conclusion: No Effect

The IPAC Official Species List generated on August 6, 2018, stated that the presence of the species may be affected by the proposed project; therefore, Baker conducted a two-mile radius search using the Natural Heritage Program's Data Explorer (https://ncnhde.natureserve.org/) on August 6, 2018 and found no known occurrences of the NLEB within two miles of the Project site, nor are there any caves within the project area that would provide hibernation habitat. Because the project will include the removal/clearing of trees, Baker conducted a field review on May 23, 2018 to determine the presence or absence of roosting habitat for the species within the project area. Results of the field review found that there were no shagbark hickory

or similar type trees within the project area that would provide roosting habitat for the NLEB; therefore, no suitable habitat will be removed nor cleared as result of the project. Based on these findings, the biological opinion criteria outlined in the *Range-wide Programmatic Consultation for Indiana Bat and Northern Long-eared Bat* (Version 5.0, February 2018) deems that the project will meet Section 7(a)(2) requirements of the ESA with the use of the 2018 programmatic biological opinion of "No Effect" for the NLEB. A copy of the Consistency letter (TAILS 04EN1000-2018-R-0615) associated with the project determination is included in the Appendix.

***Hexastylis naniflora* (Dwarf-flowered heartleaf) – Threatened**

USFWS Recommended Survey Window: mid-March – early July

The dwarf-flowered heartleaf is a low-growing evergreen perennial that has heart-shape leaves that are four to six centimeters long. The leaves are dark green and leathery and are supported by long thin leaf stems connecting it to an underground stem. The blooms are small, inconspicuous jug-shaped flowers that are usually beige to dark brown or purple. The flowers are found near the base of the leaf stems and are often buried beneath the leaf litter. The plant grows in acidic soils along bluffs and adjacent slopes, in boggy areas next to streams, and along slopes of nearby hillsides and ravines.

No critical habitat has been designated for this species.

Biological Conclusion: No Effect

A review of NCNHP records conducted on August 6, 2018 did not indicate any known occurrences of the Dwarf-flowered heartleaf within 2.0 miles of the study area. However, acidic soils and a few small pockets of open wooded area occur along the top of the stream bank within the project site.

Since these conditions may provide marginal habitat for the species, a project site review was conducted on May 23, 2018. No populations or individuals of the species were identified during the site review. The project will have "No Effect" on the species.

Farmland Protection Policy Act (FPPA)

On August 7, 2018, Baker submitted the AD-1006 form for the UT to Magness Creek Mitigation Project to the North Carolina State Natural Resources Conservation Service (NRCS) Office. The NRCS responded on August 27, 2018 with the determination that implementation of this restoration project would result in the conversion of 10.3 acres of prime and unique farmland soils and of 0.70 acres of statewide important or local important farmland soils. Baker submitted the completed AD-1006 form to the NRCS Assistant State Soil Scientist September 19, 2018. The completed AD-1006 form and all correspondence on this issue is included in the Appendix.

Fish and Wildlife Coordination Act (FWCA)

A letter was sent by Baker to the NC Wildlife Resources Commission (NCWRC) and the USFWS on August 7, 2018 requesting their comment and review on the UT to Magness Creek Mitigation Project. On August 17, 2018, Baker received a response letter from the NCWRC stating they do not anticipate impacts to federally listed endangered or threatened species as a result of the proposed project. However, the presence of the Broad River spiny crayfish (*Cambarus spicatus*), a federal and state species of concern, has been documented on Magness Creek proper. Therefore, NCWRC requests to be alerted if the crayfish is observed during construction, so that they can be safely relocated. As of September 19, 2018, Baker has not received any comments from the USFWS. Copies of all correspondence are included in the Appendix.

Migratory Bird Treaty Act (MBTA)

A letter was sent by Baker to the USFWS on August 7, 2018 requesting their comment and review on the UT to Magness Creek Mitigation Project in relation to migratory birds. As of September 19, 2018, Baker has not received any comments from the USFWS on this issue. All correspondence with the USFWS is included in the Appendix.

APPENDIX

UT To Magness Creek
Selkirk Drive
Lawndale, NC 28090

Inquiry Number: 5383530.2s
August 06, 2018

The EDR Radius Map™ Report

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13), the ASTM Standard Practice for Environmental Site Assessments for Forestland or Rural Property (E 2247-16), the ASTM Standard Practice for Limited Environmental Due Diligence: Transaction Screen Process (E 1528-14) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

SELKIRK DRIVE
LAWNDALE, NC 28090

COORDINATES

Latitude (North):	35.4065000 - 35˚ 24' 23.40''
Longitude (West):	81.5293000 - 81˚ 31' 45.48''
Universal Tranverse Mercator:	Zone 17
UTM X (Meters):	451939.2
UTM Y (Meters):	3918053.8
Elevation:	893 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	5947038 LAWNDALE, NC
Version Date:	2013

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	20140618
Source:	USDA

MAPPED SITES SUMMARY

Target Property Address:
SELKIRK DRIVE
LAWNDALE, NC 28090

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

EXECUTIVE SUMMARY

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL ---------- National Priority List
Proposed NPL ---------- Proposed National Priority List Sites
NPL LIENS ---------- Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL ---------- National Priority List Deletions

Federal CERCLIS list

FEDERAL FACILITY ---------- Federal Facility Site Information listing
SEMS ---------- Superfund Enterprise Management System

Federal CERCLIS NFRAP site list

SEMS-ARCHIVE ---------- Superfund Enterprise Management System Archive

Federal RCRA CORRACTS facilities list

CORRACTS ---------- Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF ---------- RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG ---------- RCRA - Large Quantity Generators
RCRA-SQG ---------- RCRA - Small Quantity Generators
RCRA-CESQG ---------- RCRA - Conditionally Exempt Small Quantity Generator

Federal institutional controls / engineering controls registries

LUCIS ---------- Land Use Control Information System
US ENG CONTROLS ---------- Engineering Controls Sites List

US INST CONTROL..... Sites with Institutional Controls

Federal ERNS list

ERNS..... Emergency Response Notification System

State- and tribal - equivalent NPL

NC HSDS..... Hazardous Substance Disposal Site

State- and tribal - equivalent CERCLIS

SHWS..... Inactive Hazardous Sites Inventory

State and tribal landfill and/or solid waste disposal site lists

SWF/LF..... List of Solid Waste Facilities
OLI..... Old Landfill Inventory

State and tribal leaking storage tank lists

LAST..... Leaking Aboveground Storage Tanks
LUST..... Regional UST Database
INDIAN LUST..... Leaking Underground Storage Tanks on Indian Land
LUST TRUST..... State Trust Fund Database

State and tribal registered storage tank lists

FEMA UST..... Underground Storage Tank Listing
UST..... Petroleum Underground Storage Tank Database
AST..... AST Database
INDIAN UST..... Underground Storage Tanks on Indian Land

State and tribal institutional control / engineering control registries

INST CONTROL..... No Further Action Sites With Land Use Restrictions Monitoring

State and tribal voluntary cleanup sites

INDIAN VCP..... Voluntary Cleanup Priority Listing
VCP..... Responsible Party Voluntary Action Sites

State and tribal Brownfields sites

BROWNFIELDS..... Brownfields Projects Inventory

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS..... A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

SWRCY..... Recycling Center Listing

HIST LF	Solid Waste Facility Listing
INDIAN ODI	Report on the Status of Open Dumps on Indian Lands
DEBRIS REGION 9	Torres Martinez Reservation Illegal Dump Site Locations
ODI	Open Dump Inventory
IHS OPEN DUMPS	Open Dumps on Indian Land

Local Lists of Hazardous waste / Contaminated Sites

US HIST CDL	Delisted National Clandestine Laboratory Register
US CDL	National Clandestine Laboratory Register

Local Land Records

LIENS 2	CERCLA Lien Information

Records of Emergency Release Reports

HMIRS	Hazardous Materials Information Reporting System
SPILLS	Spills Incident Listing
IMD	Incident Management Database
SPILLS 90	SPILLS 90 data from FirstSearch
SPILLS 80	SPILLS 80 data from FirstSearch

Other Ascertainable Records

RCRA NonGen / NLR	RCRA - Non Generators / No Longer Regulated
FUDS	Formerly Used Defense Sites
DOD	Department of Defense Sites
SCRD DRYCLEANERS	State Coalition for Remediation of Drycleaners Listing
US FIN ASSUR	Financial Assurance Information
EPA WATCH LIST	EPA WATCH LIST
2020 COR ACTION	2020 Corrective Action Program List
TSCA	Toxic Substances Control Act
TRIS	Toxic Chemical Release Inventory System
SSTS	Section 7 Tracking Systems
ROD	Records Of Decision
RMP	Risk Management Plans
RAATS	RCRA Administrative Action Tracking System
PRP	Potentially Responsible Parties
PADS	PCB Activity Database System
ICIS	Integrated Compliance Information System
FTTS	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
MLTS	Material Licensing Tracking System
COAL ASH DOE	Steam-Electric Plant Operation Data
COAL ASH EPA	Coal Combustion Residues Surface Impoundments List
PCB TRANSFORMER	PCB Transformer Registration Database
RADINFO	Radiation Information Database
HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing
DOT OPS	Incident and Accident Data
CONSENT	Superfund (CERCLA) Consent Decrees
INDIAN RESERV	Indian Reservations
FUSRAP	Formerly Utilized Sites Remedial Action Program
UMTRA	Uranium Mill Tailings Sites
LEAD SMELTERS	Lead Smelter Sites

US AIRS ---- Aerometric Information Retrieval System Facility Subsystem
US MINES ---- Mines Master Index File
ABANDONED MINES ---- Abandoned Mines
FINDS ---- Facility Index System/Facility Registry System
ECHO ---- Enforcement & Compliance History Information
DOCKET HWC ---- Hazardous Waste Compliance Docket Listing
UXO ---- Unexploded Ordnance Sites
FUELS PROGRAM ---- EPA Fuels Program Registered Listing
AIRS ---- Air Quality Permit Listing
ASBESTOS ---- ASBESTOS
COAL ASH ---- Coal Ash Disposal Sites
DRYCLEANERS ---- Drycleaning Sites
Financial Assurance ---- Financial Assurance Information Listing
NPDES ---- NPDES Facility Location Listing
UIC ---- Underground Injection Wells Listing
AOP ---- Animal Operation Permits Listing

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP ---- EDR Proprietary Manufactured Gas Plants
EDR Hist Auto ---- EDR Exclusive Historical Auto Stations
EDR Hist Cleaner ---- EDR Exclusive Historical Cleaners

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA HWS ---- Recovered Government Archive State Hazardous Waste Facilities List
RGA LF ---- Recovered Government Archive Solid Waste Facilities List
RGA LUST ---- Recovered Government Archive Leaking Underground Storage Tank

SURROUNDING SITES: SEARCH RESULTS

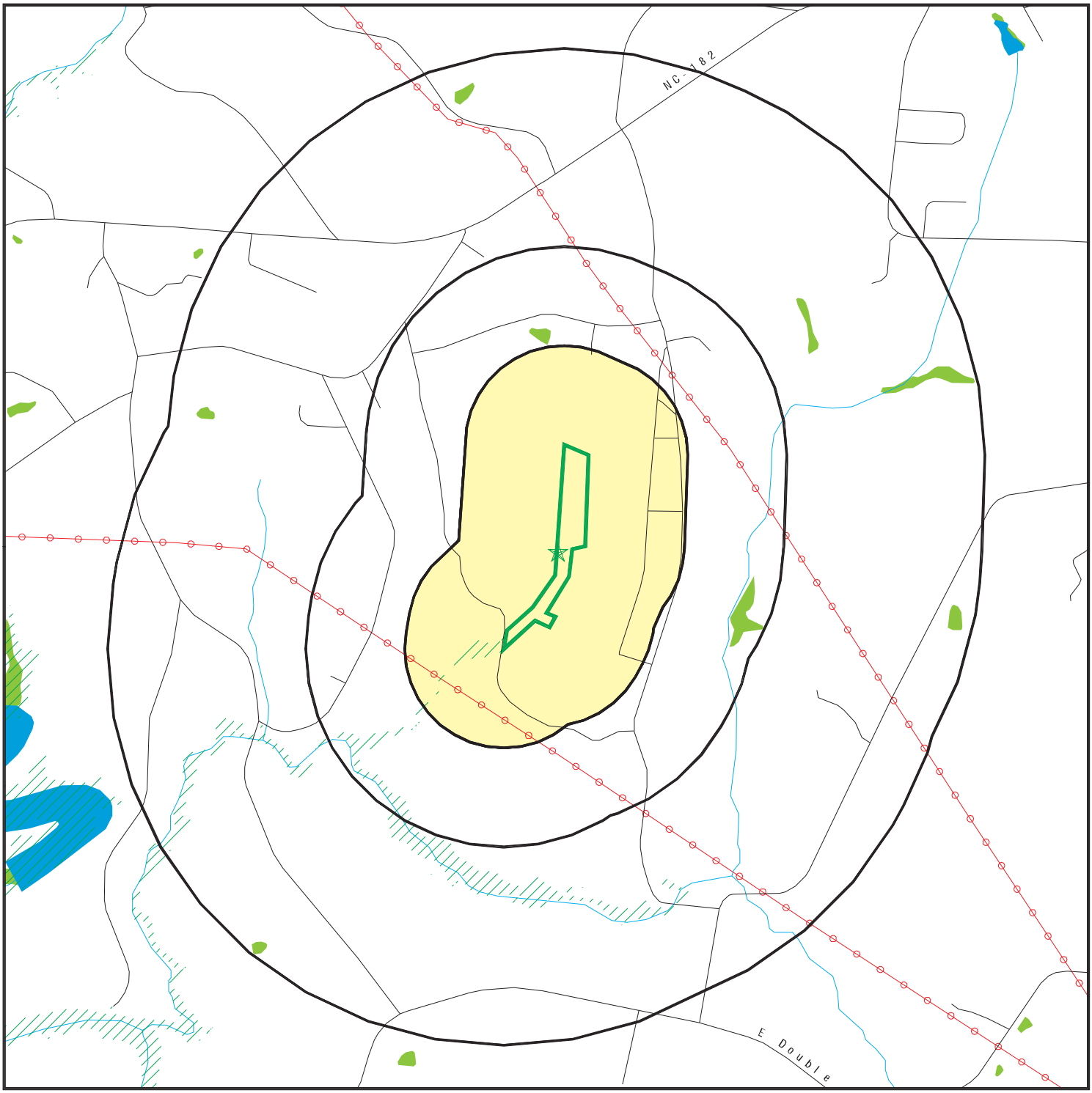
Surrounding sites were not identified.

Unmappable (orphan) sites are not considered in the foregoing analysis.

EXECUTIVE SUMMARY

There were no unmapped sites in this report.

OVERVIEW MAP - 5383530.2S



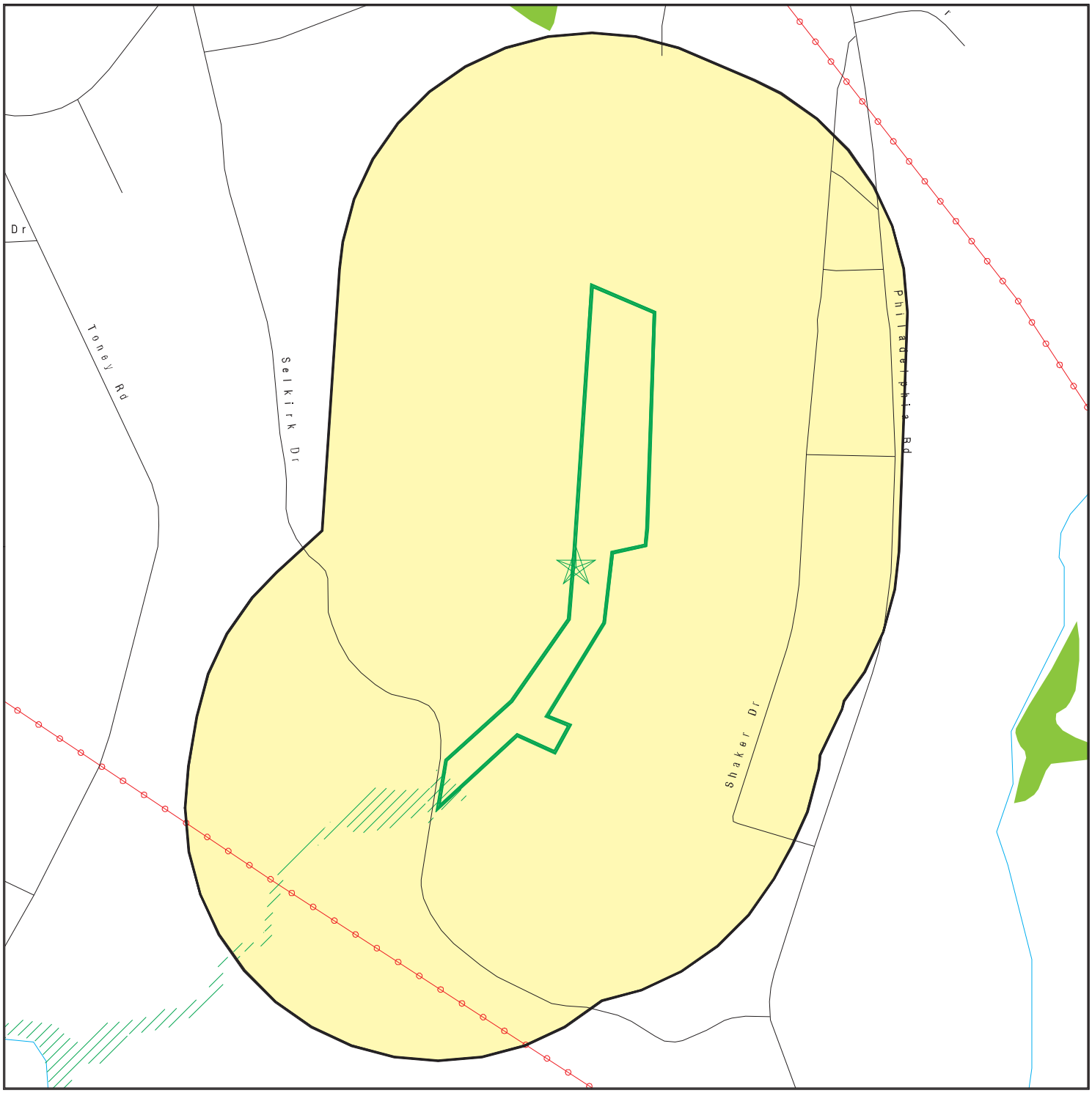
0 1/4 1/2 1 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- Upgradient Area
- Hazardous Substance Disposal Sites

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	UT To Magness Creek	CLIENT:	Michael Baker Engineering, Inc.
ADDRESS:	Selkirk Drive Lawndale NC 28090	CONTACT:	Kristi Suggs
LAT/LONG:	35.4065 / 81.5293	INQUIRY #:	5383530.2s
		DATE:	August 06, 2018 4:52 pm

DETAIL MAP - 5383530.2S



0 1/8 1/4 1/2 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- Hazardous Substance Disposal Sites

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	UT To Magness Creek	CLIENT:	Michael Baker Engineering, Inc.
ADDRESS:	Selkirk Drive Lawndale NC 28090	CONTACT:	Kristi Suggs
LAT/LONG:	35.4065 / 81.5293	INQUIRY #:	5383530.2s
		DATE:	August 06, 2018 4:54 pm

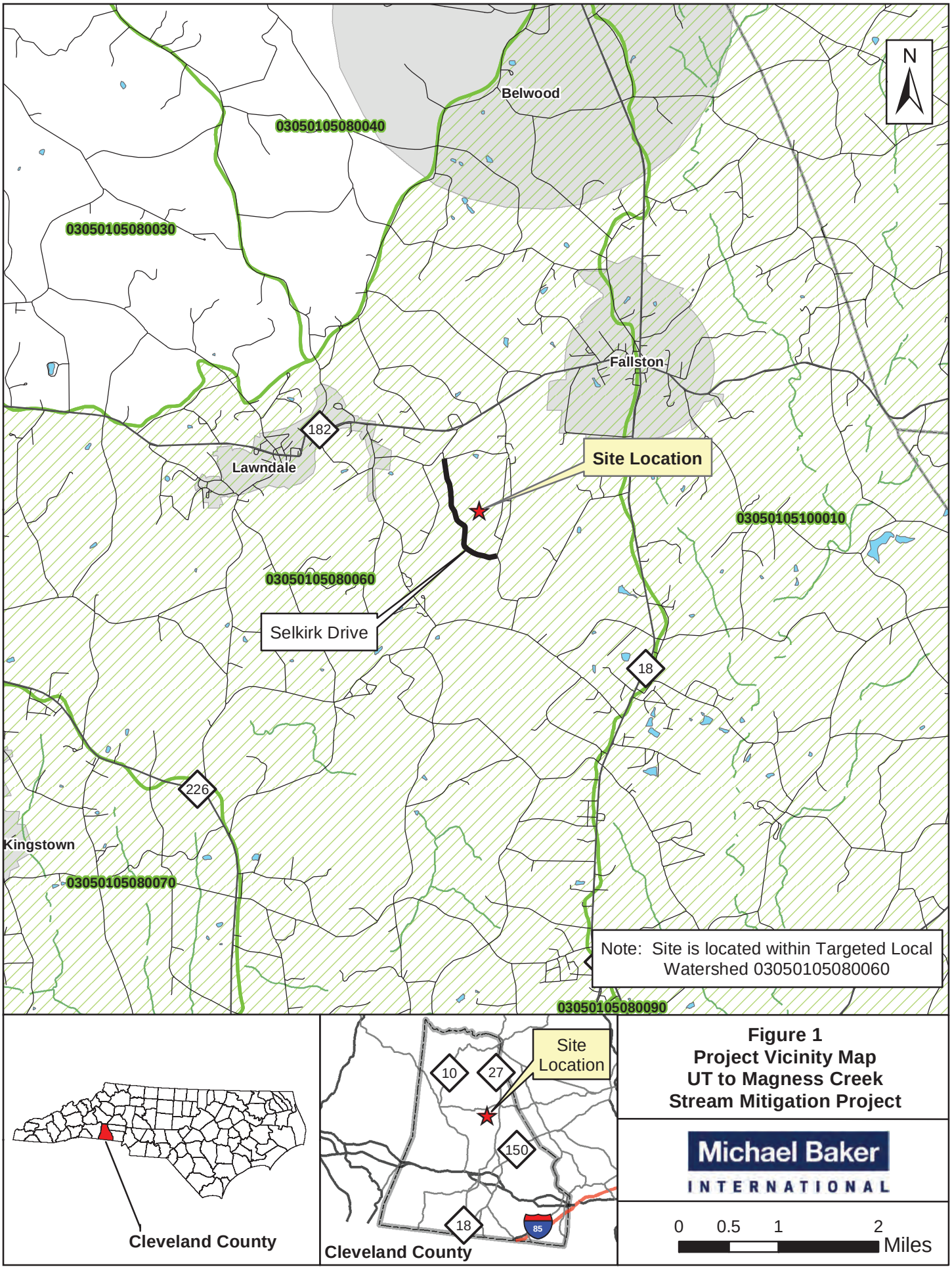
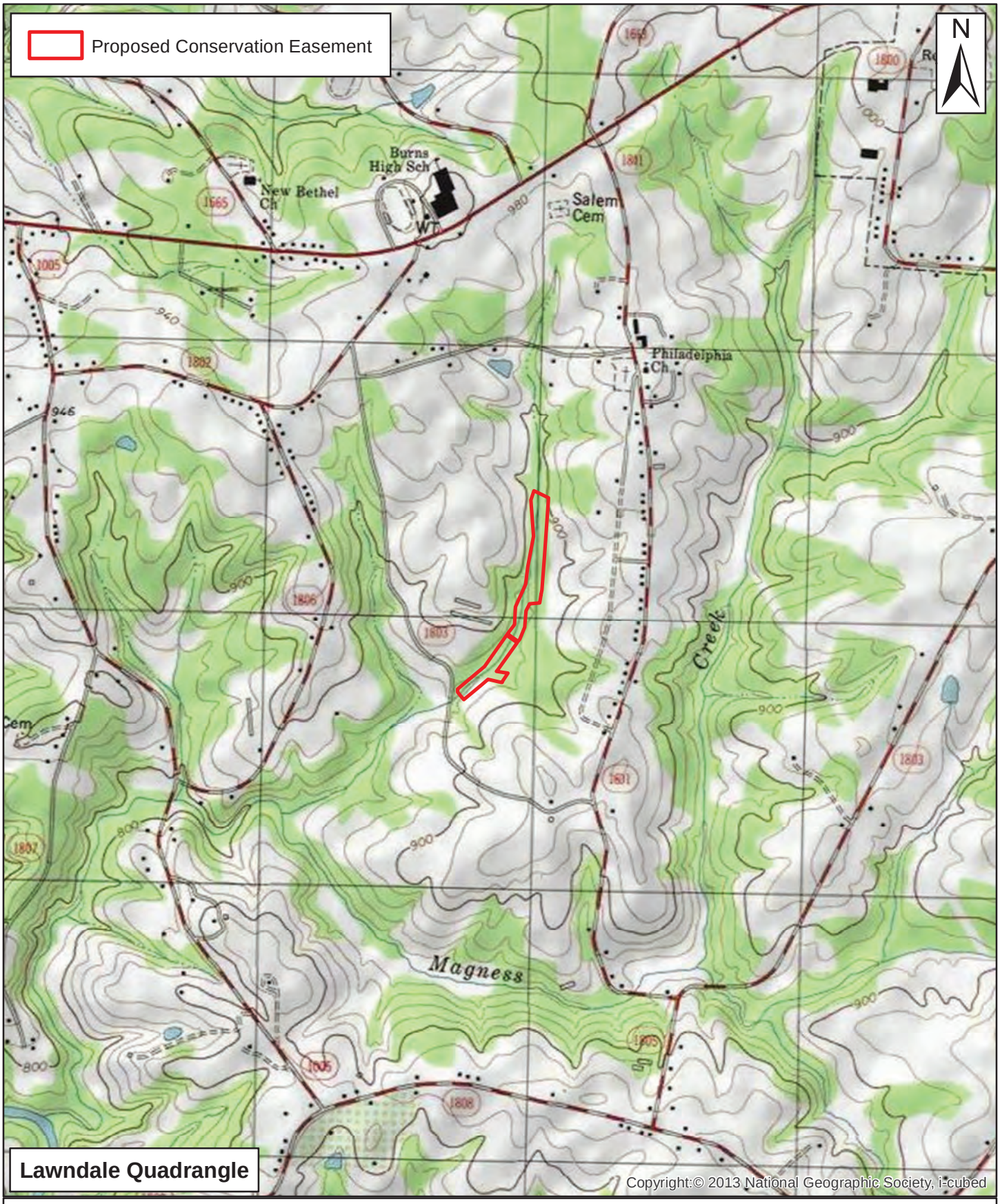


Figure 1
Project Vicinity Map
UT to Magness Creek
Stream Mitigation Project

Michael Baker INTERNATIONAL

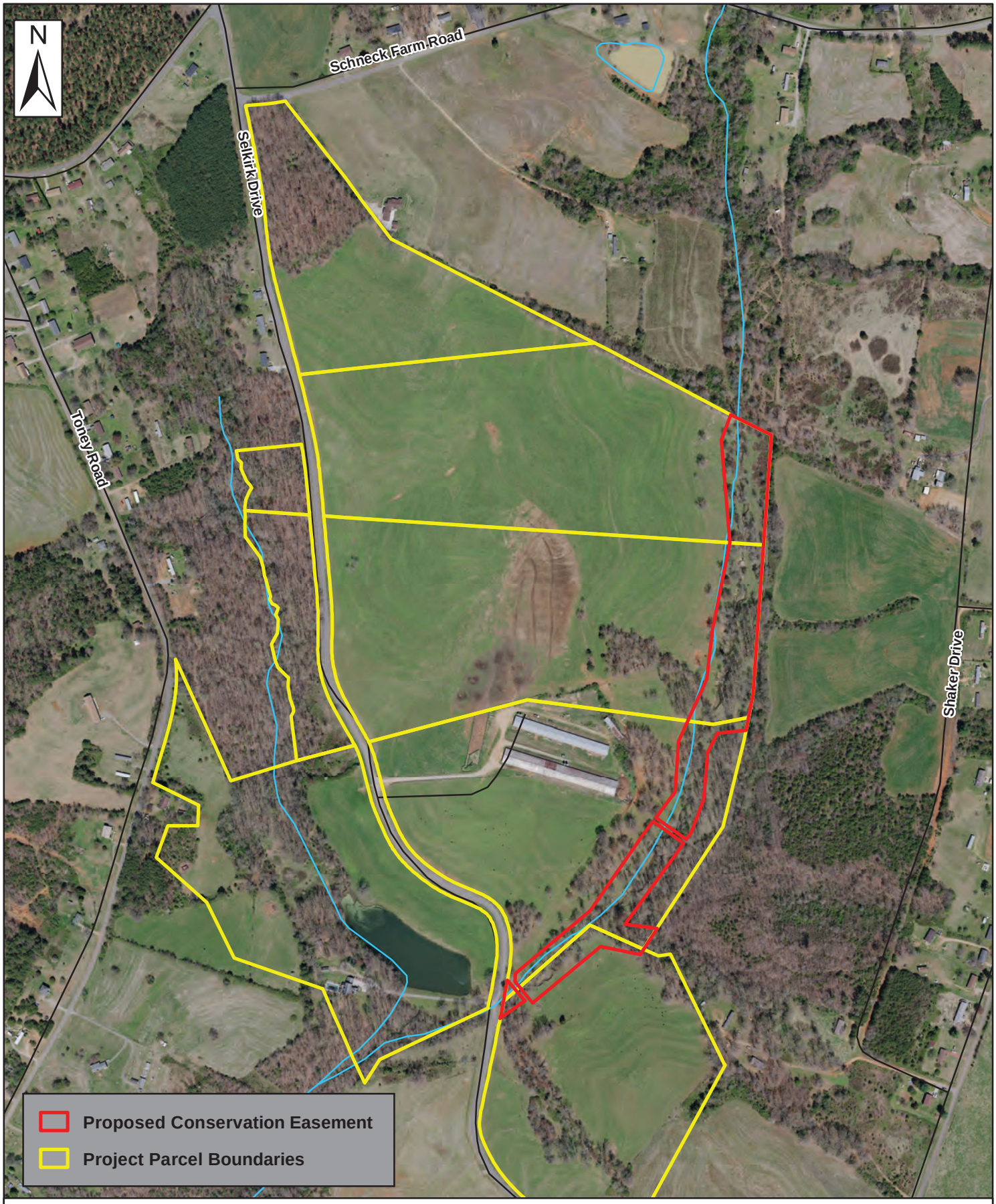


Michael Baker INTERNATIONAL

0 1,600 3,200 Feet

1 inch = 1,600 feet

Figure 2
USGS Topographic Map
UT to Magness Creek
Stream Mitigation Project

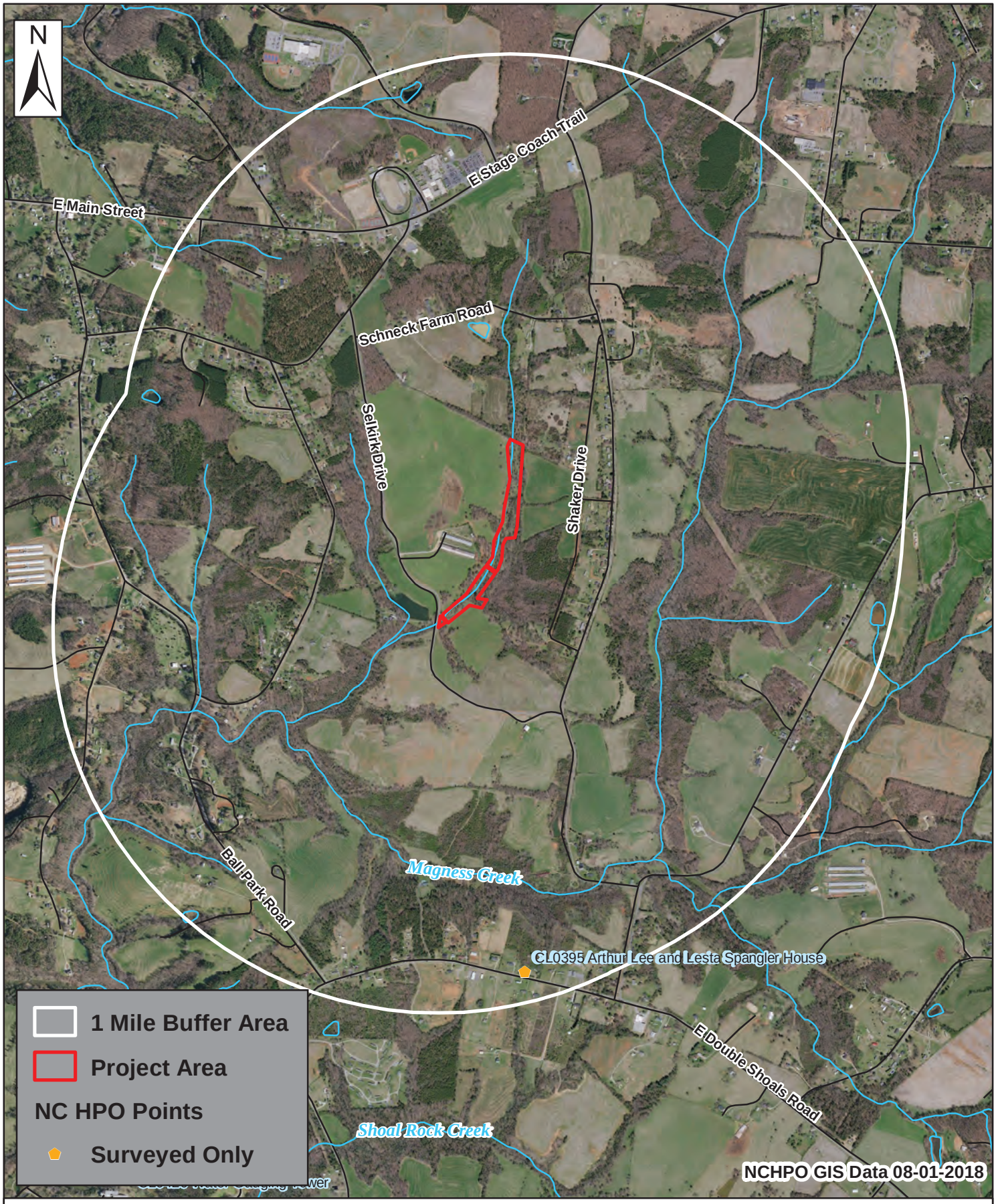


Michael Baker INTERNATIONAL

0 550 1,100 Feet

1" = 550'

Figure 3
Project Area Map
UT to Magness Creek
Mitigation Project



Michael Baker INTERNATIONAL

0 0.334 0.668 Miles

1" = 1/3 Miles

Figure 3
NC HPO Map
UT to Magness Creek
Mitigation Project

OPTION TO PURCHASE CONSERVATION EASEMENT

THIS OPTION TO PURCHASE CONSERVATION EASEMENT (the "Option") is made and entered into this 23rd day of February, 2018 (the "Effective Date"), by and among Robert and Kay Yarboro; residing at 2803 Selkirk Drive; Lawndale, NC 28090 (the "Grantor"), and **MICHAEL BAKER ENGINEERING, INC.**, a corporation organized in the State of New York with offices at 797 Haywood Rd., Suite 201, Asheville, North Carolina 28806 ("Baker").

WITNESSETH:

WHEREAS, Grantor is the owner of that certain real property located in Cleveland County, North Carolina, containing 168.71 acres (PINs 2641419802, 26141528927, 2641538722, 2641540498, 2641600979), more or less, as more particularly described on Exhibit A attached hereto and incorporated herein by reference, together with the improvements thereon and all appurtenances thereto belonging and appertaining, and all creeks, streams, rights-of-way, roads, streets and ways bounding said real property (collectively the "Property"); and

WHEREAS, Grantor has agreed to convey to Baker, an exclusive right and option to acquire a conservation easement, as more particularly described on the attached Exhibit B (the "Easement"), over the Property in accordance with the terms of this Option; and

WHEREAS, Baker is interested in acquiring the Easement in order to develop and construct a full delivery wetland, stream, and/or buffer restoration project over the lands covered by the Easement (the "Work") in conjunction with requests for proposals issued under the Division of Mitigation Services (formerly the Ecosystem Enhancement Program and Wetlands Restoration Program) within the North Carolina Department of Environmental Quality ("DEQ") and Baker has agreed to undertake such Work with respect to the Easement in accordance with the scope of work set forth in Exhibit C, attached hereto; and

WHEREAS, in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Baker hereby notifies Grantor that: (i) Baker believes the fair market value of the Easement is the Purchase Price, pursuant to Paragraph 4(a), together with the value of the environmental improvements to be made to the Easement by Baker in performing the Work on the Easement; and (ii) Baker does not possess the power of eminent domain;

NOW THEREFORE, in consideration of the sum of [redacted] (the "Signing Date Option Deposit") and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto agree as follows:

1. Grant of Option. Grantor hereby grants unto Baker, its successors and assigns, which shall be limited to a third-party designated by Baker qualified to be the grantee of a conservation easement under N.C.G.S. §121-35(2), the exclusive right and option to purchase the Easement in accordance with and subject to the terms and conditions set forth in this Option.

2. Term. The term of this Option shall commence on the Effective Date and shall expire Thirty-Six (36) months after the Effective Date (the "Term"), unless extended by the parties, in writing. A Memorandum of Option to Purchase Easement in the form attached as Exhibit D shall be executed by both parties simultaneously with this Option and recorded at Baker's sole discretion and expense in the county where the Property is located to provide record notice of this Option. In no event shall this Option be recorded or filed in the public records.

3. Exclusivity of Option. Grantor covenants and agrees that it will take no action to sell or transfer the Easement during the Term, and that Grantor will not encumber the Property in a manner that would impair the intended use of the Easement hereunder, it being intended and agreed that the Option is exclusive to Baker and Baker's successors and assigns.

4. Exercise of Option. At any time prior to the expiration of the Term, Baker may exercise this Option by giving Grantor no less than thirty (30) days prior written notice of the date Baker desires to consummate the purchase of the Easement under this Option (the "Closing"). Closing shall take place at a time and place reasonably acceptable to both parties. The terms of the purchase and sale of the Easement at Closing shall be as follows:

a. Purchase Price. The total purchase price for the Easement shall be [redacted] per acre (the "Purchase Price") included in the Easement as determined by the Survey prepared pursuant to Paragraph 4(b), below. The Option Deposit shall be credited towards the Purchase Price at Closing.

b. Survey. Prior to Closing, Baker shall obtain, at Baker's expense, a survey prepared by a registered land surveyor duly licensed in the State of North Carolina showing the boundary of the Easement as well as all easements, rights-of-way, encroachments and improvements located thereon, and the exact acreage of the Easement (the "Survey"), and that Baker shall have consulted with Grantor and taken in to account Grantor's concerns as to the exact delineation of boundaries of the Easement. Following consultation with Grantor and the completion of the Survey, a new legal description of the Easement shall be prepared from the Survey. The new legal description shall be substituted for the description currently attached hereto as Exhibit B, and all references contained herein to the "Easement" shall be deemed to refer to the new description prepared from the Survey.

c. Prorations, Costs and Expenses of Closing. At Closing, ad valorem taxes for the current year for the Easement area shall be prorated, and Grantor shall remain responsible for all other ad valorem taxes applicable to the remainder of the Property subsequent to Closing. At Closing, Grantor shall pay any outstanding ad valorem taxes for prior years on Grantor's real or personal property, any late list penalties, revenue stamps or transfer taxes applicable to the Easement, and any mortgages or liens with respect to the Property. At Closing, Baker shall pay any costs related to the Survey, any title examination expenses, title insurance premiums, recording costs for the deed conveying the Easement, costs of recordation of any recorded plats showing the Easement, as well as any engineering or site plan costs. Each party shall bear its own accounting and attorney fees.

d. Closing Documents and Title. At Closing, Grantor shall deliver (i) a deed substantially in the form of the attached Exhibit E (the "Deed") conveying the Easement to Baker or to a legally qualified non-profit organization or government agency as contained in N.C.G.S. §121-35(2) designated by Baker, provided, that the final form of the Deed shall be in form mutually acceptable to Baker and Grantor so long as such form is consistent with the provisions of Article 4, The Conservation and Historic Preservation Agreements Act as contained in N.C.G.S. §121-34 through 42. The Deed shall convey good, marketable and insurable title to the Easement, free and clear from all mortgages, liens, easements, covenants, restrictions and other encumbrances, except those previously accepted by Baker in writing; (ii) lien affidavits warranting and holding harmless any title insurance company insuring title to the Easement, from and against unpaid mechanics and

materialmen's liens; and (iv) any other documents and papers necessary or appropriate in connection with the consummation of the transaction contemplated by this Option.

At Closing, Baker shall deliver (i) a Settlement Statement setting forth each party's costs, expenses, prorations and other financial analysis of the purchase and sale of the Easement as contemplated hereby; (ii) the Note as defined in item 4(e), below; and (iii) any other documents necessary to consummate the transaction contemplated by the Option.

e. Payment. It is understood that funding for the purchase of the Easement shall be provided by the State of North Carolina pursuant to the Division of Mitigation Services of DEQ and that such funding is made subsequent to recording of the Easement and subsequent to Closing. Therefore, at Closing, Baker shall deliver to Grantor a promissory note in the amount of the Purchase Price, less the Option Deposit and closing costs, mortgage pay-offs, expenses, and prorations applicable to Grantor, which promissory note shall bear interest at Zero Percent (0%) per annum on the unpaid balance until paid or until default and which promissory note shall be due and payable in full on the date ninety (90) days after the Closing (the "Note"). At the time of Closing, Baker shall record the Deed and any plat referenced in the Deed and deliver copies of the recorded documents to the State Property Office for review and funding. The Note shall contain an express provision that if the DEQ fails to fund the purchase of the Easement in the amount of the Purchase Price thereby causing Baker to fail to pay the Note in full on or before the maturity date, then Baker, as Grantor's sole remedy, shall be liable to Grantor for all reasonable costs and expenses, including reasonable attorney fees, required to have the Easement removed and the title to the Property returned to the condition it was prior to the imposition of the Easement, at which point the Note, this Option, and all duties, responsibilities and liabilities with respect thereto shall be null and void. Otherwise, Baker shall pay the Note in full upon receipt of funding by the State of North Carolina.

f. Condition of Property; Intended Use. Prior to Closing, Grantor shall remove all rubbish and trash, including any hazardous waste or harmful chemical substances, from the Easement but shall otherwise keep the Property in the same condition as of the Effective Date, reasonable wear and tear excepted. Grantor shall prevent and refrain from any use of the Property for any purpose or in any manner that would diminish the value of the Easement or adversely affect Baker's intended use of the land for the Easement, which use is to provide the Division of Mitigation Services within DEQ with wetland, stream, and/or buffer mitigation credits. Grantor acknowledges that Baker will enter into an agreement with DEQ to provide these credits, and Grantor agrees not to undertake or permit any activities on the Property that would diminish Baker's ability to obtain such credits. If any adverse change occurs in the condition of the Easement prior to Closing, whether such change is caused by Grantor or by forces beyond Grantor's reasonable control, Baker may elect to (i) refuse to accept the Easement at Closing; (ii) accept the Property at Closing, or a portion thereof with a corresponding adjustment of the Purchase Price; or (iii) terminate this Option and the transaction itself and declare this Option null and void.

g. Warranty of Title. Grantor covenants, represents and warrants that, as of the Effective Date and Closing: (i) Grantor is the sole owner(s) of the Property and is seized of the Property in fee simple absolute; (ii) Grantor has the right and authority to convey this Option and the Easement and Grantor will hold the grantee of the Easement harmless from any failure in Grantor's right and authority to convey the Easement, including issues of title; (iii) there is legal access to the Property and to the Easement; (iv) the Easement is free from any and all encumbrances, except those accepted by Baker in writing; (v) Grantor

will defend title to the Easement against all lawful claims of other parties; (vi) that the Property is free of any hazardous wastes.

5. Right of Entry and Inspections. Baker, and its agents and employees or other authorized representatives, may enter upon the Property during the Term for the purpose of making surveys, conducting soil, engineering, geological and other subsoil or environmental tests to determine the suitability of the Property for the Easement. Baker shall repair or pay for any damage done to the Property caused while such tests are being made. Baker shall advise Grantor at least twenty-four hours in advance of any entry upon the Property for the purposes of surveying, testing or inspecting as set forth herein. Baker shall be permitted during the Term to obtain land use permits or other approvals relating to any part of the Easement, and Grantor agrees to execute such documents, petitions, and authorizations as may be appropriate or required in order to obtain such land use permits and approvals. Grantor shall join with Baker in applications and any non-judicial or non-administrative proceedings to obtain such approvals if necessary. After Closing, Baker reserves the right to perform periodic inspections of the Easement to ensure compliance with easement restrictions contained in the Deed. If Baker does not duly exercise this Option and purchase the Easement, Baker shall return the Property to the condition in which it existed prior to any investigations undertaken by Baker, its agents, employees or contractors pursuant to this Option.

6. Permanent Access and Construction Easements. In connection with this Option and delivery of the Easement, Grantor shall also:

(a) convey and grant to Baker, its successors, assigns, contractors and agents, a non-exclusive temporary construction easement, the location of which shall be determined in the sole discretion of Grantor, for ingress, egress and regress on, over and upon Grantor's Property, sufficient to allow Baker, its agents and contractors to construct and restore the Easement area to stream and/or wetland conditions required by DEQ, said temporary construction easement to include sufficient access to allow heavy equipment to access the Property and the Easement, as necessary; and

(b) convey and grant to Baker, its successors and assigns, a non-exclusive permanent easement for ingress and egress to the Easement, the location of which shall be determined in the sole discretion of Grantor, in order that Baker, its successors and assigns, may have a permanent means of adequately accessing the area covered by the Easement. The permanent access easement referred to herein shall be set forth in an accurate survey, the legal description of which shall be included in a recorded permanent access easement which shall run with the land.

7. Indemnification. Baker agrees to indemnify and save harmless Grantor from and against any loss, claim, damage, cost or expense (including reasonable attorney's fees) suffered or incurred by Grantor by reason of any injury to person or damage to property on or about the Property to the extent caused by Baker, its officers, employees, agents, invitees, contractors, or subcontractors entering or conducting work upon the Property, except for any loss, claim, damage, cost or expense suffered or incurred as a result of the negligence or intentional misconduct of Grantor or Grantor's employees, agents or invitees.

8. Notices. Unless otherwise set forth, any notice or other communication required or permitted hereunder shall be in writing and (a) delivered by overnight courier; (b) sent by facsimile transmission, or (c) mailed by Registered or Certified Mail, postage prepaid, addressed as follows (or to such other address for a party as shall be specified by like notice; provided that notice of change of address shall be effective only upon receipt thereof);

If to Baker: Jake Byers
Michael Baker Engineering
797 Haywood Rd. Suite 201
Asheville, NC 28806

If to the Grantor: Robert and Kay Yarboro
2803 Selkirk Drive
Lawndale, NC 28090

9. Miscellaneous.

a. This Option, together with the exhibits attached hereto which are incorporated herein by reference, contains the entire understanding of the parties hereto with respect to the subject matter contained herein. No amendment, modification, or discharge of this Option, and no waiver hereunder, shall be valid or binding unless set forth in writing and duly executed by the parties hereto.

b. Any provision of this Option that shall be found to be contrary to applicable law or otherwise unenforceable shall not affect the remaining terms of this Option, which shall be construed as if the unenforceable provision or clause were absent from this Option.

c. This Option shall be binding upon and inure to the benefit of the parties and their respective heirs, personal representatives, successors, and assigns.

d. This Option shall be governed by and construed in accordance with the laws of the State of North Carolina without application of its conflicts of laws provisions.

e. No act or failure to act by either party shall be deemed a waiver of its rights hereunder, and no waiver in any one circumstance or of any one provision shall be deemed a waiver in other circumstances or of other provisions.

f. Grantor agrees to not mow or otherwise damage vegetation within Easement area after Baker plants or replants the same. If Grantor or Grantor's agents or invitees damage vegetation within the Easement, Grantor will replace the lost or damaged vegetation at their expense.

g. Baker shall ensure that access to portions of the Grantor's property shall not be impeded by the proposed.

j. This Option shall not be assignable by Baker, except to another entity acquiring at least fifty-one percent (51%) interest in Baker or Baker's business or to an entity qualified to be the grantee of a conservation easement under N.C.G.S § 121-35

h. Baker shall exclude livestock from the area included within the conservation easement by constructing a woven wire fence along the surveyed easement line. This fence will be constructed according to NRCS specifications and will include gates as needed for managing crossings and to provide human access.

i. Baker shall install a well, waterlines and up to 5 insulated, pressurized water tanks to provide a water source for livestock, when they are excluded from the restored stream channel and buffer. This water system will be installed according to NRCS standards.

j. Baker shall install two ford type stream crossings in accordance with NRCS standards, to provide livestock access to pasture areas that are separated from other pastures by the conservation easement fencing.

IN WITNESS WHEREOF, the parties have duly executed this Option as of the date first above written.

GRANTOR:

By: Robert E. Yarboro

Print Name: Robert E Yarboro

Title: Owner

GRANTOR:

By: Kay Yarboro

Print Name: Kay Yarboro

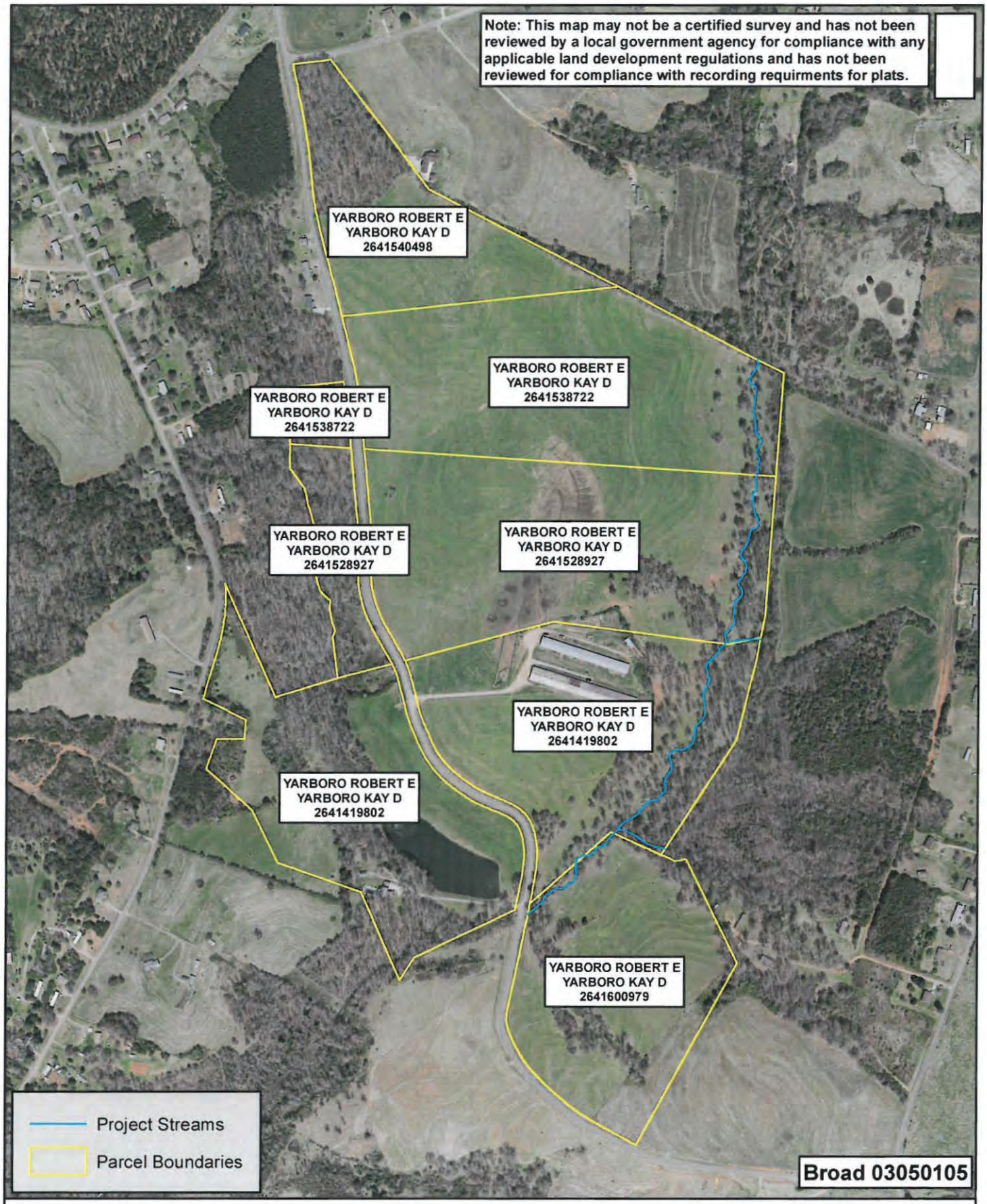
Title: Owner

MICHAEL BAKER ENGINEERING, INC.:

By: Dwain Hathaway

Print Name: Dwain Hathaway

Title: Vice President



Michael Baker INTERNATIONAL

0 250 500 1,000 Feet

Exhibit A
Landowner(s):
Yarboro, Robert E. and Kay D.

Michael Baker
INTERNATIONAL

We Make a Difference

August 3, 2018

Renee Gledhill-Earley, Environmental Review Coordinator
State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
Email: Environmental.Review@ncdcr.gov

RE: Project Review Request
UT to Magness Creek Mitigation Project
Cleveland County, North Carolina
Broad River Basin (Catalog Unit - 03050105)

Dear Ms. Gledhill-Earley:

Michael Baker Engineering, Inc. (Baker) is contracted by the North Carolina Division of Mitigation Services (NCDMS) to conduct stream and/or wetland restoration/enhancement activities for the above-referenced project. We are requesting an office review of the attached documentation and comment on any possible issues that may emerge with respect to archaeological or cultural resources associated with the proposed stream and/or wetland restoration/enhancement project.

The project area is located in Cleveland County, North Carolina approximately 1.0 mile southeast of the Town of Lawndale. The project is located on the United States Geological Survey's (USGS) Lawndale Topographic Quadrangle. The center of the project area is located at 35.4065 N and -81.5293 W. The project site flows south-southwest and is bordered at the downstream extent by Selkirk Drive. Please see the enclosed Vicinity and USGS Topographic Maps for a depiction of the project site location.

The UT to Magness Creek site was identified to provide compensatory mitigation for unavoidable stream impacts. The existing stream reaches have been significantly impacted by unrestricted livestock access and the removal or impairment of riparian buffers. Most of the project reaches are incised, unstable, and exhibit areas of active bank erosion from both high flows and livestock access. Riparian buffer vegetation varies from areas with no woody buffer vegetation to areas with large trees but at low density and without any significant understory.

The project will involve the restoration and enhancement of approximately 3,385 LF of existing stream. Degraded riparian wetlands will be restored and/or enhanced with the implementation of Priority Level 1 restoration, livestock exclusion, and native riparian buffer plantings; however, no wetland credit is being sought. A Best Management Practice (BMP) in the form of a constructed wet pond will be installed in an unstable ephemeral drainage that receives run-off from an area that is frequently used by livestock. Native riparian buffers will be established along all proposed reaches. A conservation easement will be implemented along all project reaches in an excess of 50 feet from the top of bank and will incorporate some of the existing functional wetlands. Livestock will be excluded from the conservation easement with permanent fencing.

Michael Baker Engineering, Inc.
Ballantyne One, 15720 Brixham Ave., Suite 300, Office 336
Charlotte, NC 28277 | Office: 704.665.2200

An on-line search was conducted on August 3, 2018 using the HPOWEB GIS Map Service to identify any historic properties listed on the National Register of Historic Places that lie within a one-mile radius of the project site. Results from the search identified only one surveyed area of historic reference: Arthur Lee and Lesta Spangler House (Site ID CL0395). Please refer to the enclosed SHPO Map for a depiction of the project area's location relative to the historic property.

On-site investigations and discussions with landowners have not revealed any potential cultural resources within the proposed easement areas. No archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes, and no existing structures are located within the areas proposed for restoration or enhancement. The majority of the site has historically been disturbed due to past and current management for pasture grazing and livestock production.

Baker appreciates your timely attention to this matter. If we do not hear from you within 30 days, we will assume that there are no comments with regard to the project area and archaeological and cultural resources. Please feel free to contact us if you have any questions regarding this project or the extent of proposed disturbance. I can be reached at (704) 579-4828 or via my email address at ksuggs@mbakerintl.com.

Sincerely,

Kristi Suggs

Enclosures: Vicinity Map
USGS Topographic Map
SHPO Map

Cc: Eastern Band of Cherokee Indians (EBCI)
File

North Carolina Department of Natural and Cultural Resources

State Historic Preservation Office

Ramona M. Bartos, Administrator

Governor Roy Cooper
Secretary Susi H. Hamilton

Office of Archives and History
Deputy Secretary Kevin Cherry

September 4, 2018

Kristi Suggs
Michael Baker Engineering, Inc.
Ballantyne One
15720 Brixham Avenue, Suite 300, Office 318
Charlotte, NC 28277

Re: UT to Magness Creek Mitigation Project, Lawndale, Cleveland County, ER 18-1817

Dear Ms. Suggs:

Thank you for your letter of August 3, 2018, concerning the above project.

We have conducted a review of the project and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the project as proposed.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

Michael Baker
INTERNATIONAL

We Make a Difference

August 3, 2018

Holly Austin
Section 106 Assistant
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719
Email: hollymaustin@gmail.com

RE: Project Review Request
UT to Magness Creek Mitigation Project
Cleveland County, North Carolina
Broad River Basin (Catalog Unit - 03050105)

Dear Ms. Austin:

Michael Baker Engineering, Inc. (Baker) is contracted by the North Carolina Division of Mitigation Services (NCDMS) to conduct stream and/or wetland restoration/enhancement activities for the above-referenced project. We are requesting an office review of the attached documentation and comment on any possible issues that may emerge with respect to archaeological or cultural resources associated with the proposed stream and/or wetland restoration/enhancement project.

The project area is located in Cleveland County, North Carolina approximately 1.0 mile southeast of the Town of Lawndale. The project is located on the United States Geological Survey's (USGS) Lawndale Topographic Quadrangle. The center of the project area is located at 35.4065 N and -81.5293 W. The project site flows south-southwest and is bordered at the downstream extent by Selkirk Drive. Please see the enclosed Vicinity and USGS Topographic Maps for a depiction of the project site location.

The UT to Magness Creek site was identified to provide compensatory mitigation for unavoidable stream impacts. The existing stream reaches have been significantly impacted by unrestricted livestock access and the removal or impairment of riparian buffers. Most of the project reaches are incised, unstable, and exhibit areas of active bank erosion from both high flows and livestock access. Riparian buffer vegetation varies from areas with no woody buffer vegetation to areas with large trees but at low density and without any significant understory.

The project will involve the restoration and enhancement of approximately 3,385 LF of existing stream. Degraded riparian wetlands will be restored and/or enhanced with the implementation of Priority Level 1 restoration, livestock exclusion, and native riparian buffer plantings; however, no wetland credit is being sought. A Best Management Practice (BMP) in the form of a constructed wet pond will be installed in an unstable ephemeral drainage that receives run-off from an area that is frequently used by livestock. Native riparian buffers will be established along all proposed reaches. A conservation easement will be implemented along all project reaches in an excess of 50 feet from the top of bank and will incorporate some of the existing functional wetlands. Livestock will be excluded from the conservation easement with permanent fencing.

On-site investigations and discussions with landowners have not revealed any potential cultural resources within the proposed easement areas. No archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes, and no existing structures are located within the areas proposed for restoration or enhancement. The majority of the site has historically been disturbed due to past and current management for pasture grazing and livestock production.

Baker appreciates your timely attention to this matter. If we do not hear from you within 30 days, we will assume that there are no comments with regard to the project area or archaeological or cultural resources. Please feel free to contact us if you have any questions regarding this project or the extent of proposed disturbance. I can be reached at (704) 579-4828 or via my email address at ksuggs@mbakerintl.com.

Sincerely,

Kristi Suggs

Enclosures: Vicinity Map
USGS Topographic Map
Project Area Map

Cc: NC State Historic Preservation Office (SHPO)
File

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
TIM BAUMGARTNER
Director

NORTH CAROLINA
Environmental Quality

Stephen Yerka
Historic Preservation Specialist
Tribal Historic Preservation Office
Eastern Band of the Cherokee Indians
syerka@nc-cherokee.com

12/17/18

Dear Mr. Yerka,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed UT to Magness Creek mitigation site. The Federal Highway Administration (FHWA) is the lead federal agency for this proposed mitigation project. A USGS Topographic Map and a proposed project conceptual map showing the project area are enclosed. The topographic figure was prepared from the Lawndale, 7.5-Minute USGS Topographic Quadrangle. The project location (Latitude and Longitude) is as follows: (35.4065 N, -81.5293 W).

The UT to Magness Creek mitigation project is located in Cleveland County, NC, east of the Town of Lawndale, within the Broad River Basin (03050105) and the NC DMS Targeted Local Watershed (TLW) 03050105080060. Located within a water supply watershed (WS-IV), the project drains directly to Magness Creek and the First Broad River, which is a drinking water source for the City of Shelby and other downstream municipalities. This TLW consists of a mix of rural and commercial land use, with approximately 49% of land dedicated to some form of agricultural production. Like the project area, many streams within this TLW are highly unstable with eroding banks and limited aquatic habitat.

Land use within the project area consists predominantly of livestock production but has also included row crops. Project stream reaches have been significantly impacted by historic channelization, unrestricted livestock access, and the removal or impairment of riparian buffers. Most of the reaches are incised, unstable, and exhibit areas of active bank erosion from high flows, hoof shear, and raw banks. Riparian buffer vegetation varies from areas with no woody buffer vegetation to areas with large trees but at low density and without any significant understory.

The project will involve the restoration and enhancement of approximately 3,385 LF of existing stream. Degraded riparian wetlands will be restored and/or enhanced with the implementation of Priority Level 1 restoration, livestock exclusion, and native riparian

buffer plantings; however, no wetland credit is being sought. A Best Management Practice (BMP) in the form of a constructed wet pond will be installed in an unstable ephemeral drainage that receives run-off from an area that is frequently used by livestock. Native riparian buffers will be established along all proposed reaches. A conservation easement will be implemented along all project reaches in an excess of 50 feet from the top of bank and will incorporate the BMP as well as some of the existing functional wetlands. Livestock will be excluded from the conservation easement with permanent fencing.

We ask that you review this site based on the attached information to determine the presence of any known historic properties. Please feel free to contact us with any questions that you may have concerning this project.

Respectfully,

Paul Wiesner

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801

Attachments:
Figure 1: USGS Topographic Map
Figure 2: Proposed Project Conceptual Map

cc: Donnie Brew, FHWA

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
TIM BAUMGARTNER
Director

NORTH CAROLINA
Environmental Quality

Elizabeth Toombs
Cherokee Nation
Tribal Historic Preservation Office
P.O. Box 948
Tahlequah, OK 74465
elizabeth-toombs@cherokee.org

12/17/18

Dear Ms. Toombs,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed UT to Magness Creek mitigation site. The Federal Highway Administration (FHWA) is the lead federal agency for this proposed mitigation project. A USGS Topographic Map and a proposed project conceptual map showing the project area are enclosed. The topographic figure was prepared from the Lawndale, 7.5-Minute USGS Topographic Quadrangle. The project location (Latitude and Longitude) is as follows: (35.4065 N, -81.5293 W).

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Land use within the project area consists predominantly of livestock production but has also included row crops. Project stream reaches have been significantly impacted by historic channelization, unrestricted livestock access, and the removal or impairment of riparian buffers. Most of the reaches are incised, unstable, and exhibit areas of active bank erosion from high flows, hoof shear, and raw banks. Riparian buffer vegetation varies from areas with no woody buffer vegetation to areas with large trees but at low density and without any significant understory.

The project will involve the restoration and enhancement of approximately 3,385 LF of existing stream. Degraded riparian wetlands will be restored and/or enhanced with the

implementation of Priority Level 1 restoration, livestock exclusion, and native riparian buffer plantings; however, no wetland credit is being sought. A Best Management Practice (BMP) in the form of a constructed wet pond will be installed in an unstable ephemeral drainage that receives run-off from an area that is frequently used by livestock. Native riparian buffers will be established along all proposed reaches. A conservation easement will be implemented along all project reaches in an excess of 50 feet from the top of bank and will incorporate the BMP as well as some of the existing functional wetlands. Livestock will be excluded from the conservation easement with permanent fencing.

We ask that you review this site based on the attached information to determine the presence of any known historic properties. Please feel free to contact us with any questions that you may have concerning this project.

Respectfully,

Paul Wiesner

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801

Attachments:
Figure 1: USGS Topographic Map
Figure 2: Proposed Project Conceptual Map

cc: Donnie Brew, FHWA

GWYᎯ DᏃᏢ
CHEROKEE NATION®
P.O. Box 948 • Tahlequah, OK 74465-0948 • 918-453-5000 • cherokee.org

Office of the Chief

Bill John Baker
Principal Chief
ᎤᏢ Gh ᏗSSᏯᏍᎩ
ᎤEᎾGᏯ

S. Joe Crittenden
Deputy Principal Chief
ᏍᏆ KG ᏗEᎩᏍᎩ
ᎳᏢᏁ DᏓᎶᏁ ᎤEᎾGᏯ

January 8, 2019

Paul Wiesner
North Carolina Department of Environmental Quality
Western DMS Field Office
5 Ravenscroft Drive, Suite 102
Asheville, NC 28801

Re: Magness Creek Mitigation Project

Mr. Paul Wiesner:

The Cherokee Nation (Nation) is in receipt of your correspondence about **Magness Creek Mitigation Project**, and appreciates the opportunity to provide comment upon this project. Please allow this letter to serve as the Nation's interest in acting as a consulting party to this proposed undertaking.

The Nation maintains databases and records of cultural, historic, and pre-historic resources in this area. Our Historic Preservation Office reviewed this project, cross referenced the project's legal description against our information, and found no instances where this project intersects or adjoins such resources. Thus, the Nation does not foresee this project imparting impacts to Cherokee cultural resources at this time.

However, the Nation requests that the North Carolina Department of Environmental Quality (NCDEQ) halt all project activities immediately and re-contact our Offices for further consultation if items of cultural significance are discovered during the course of this project.

Additionally, the Nation requests that NCDEQ conduct appropriate inquiries with other pertinent Tribal and Historic Preservation Offices regarding historic and prehistoric resources not included in the Nation's databases or records.

If you require additional information or have any questions, please contact me at your convenience. Thank you for your time and attention to this matter.

Wado,

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation Tribal Historic Preservation Office
elizabeth-toombs@cherokee.org
918.453.5389

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
TIM BAUMGARTNER
Director

NORTH CAROLINA
Environmental Quality

Sheila Bird 12/17/18
Tribal Historic Preservation Office
United Keetoowah Band of Cherokee Indians in Oklahoma
P. O. Box 746
Tahlequah, OK 74465
sbird@ukb-nsn.gov

Dear Ms. Bird,

The North Carolina Department of Environmental Quality (NCDEQ) – Division of Mitigation Services (DMS) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed UT to Magness Creek mitigation site. The Federal Highway Administration (FHWA) is the lead federal agency for this proposed mitigation project. A USGS Topographic Map and a proposed project conceptual map showing the project area are enclosed. The topographic figure was prepared from the Lawndale, 7.5-Minute USGS Topographic Quadrangle. The project location (Latitude and Longitude) is as follows: (35.4065 N, -81.5293 W).

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The project will involve the restoration and enhancement of approximately 3,385 LF of existing stream. Degraded riparian wetlands will be restored and/or enhanced with the

implementation of Priority Level 1 restoration, livestock exclusion, and native riparian buffer plantings; however, no wetland credit is being sought. A Best Management Practice (BMP) in the form of a constructed wet pond will be installed in an unstable ephemeral drainage that receives run-off from an area that is frequently used by livestock. Native riparian buffers will be established along all proposed reaches. A conservation easement will be implemented along all project reaches in an excess of 50 feet from the top of bank and will incorporate the BMP as well as some of the existing functional wetlands. Livestock will be excluded from the conservation easement with permanent fencing.

We ask that you review this site based on the attached information to determine the presence of any known historic properties. Please feel free to contact us with any questions that you may have concerning this project.

Respectfully,

Paul Wiesner

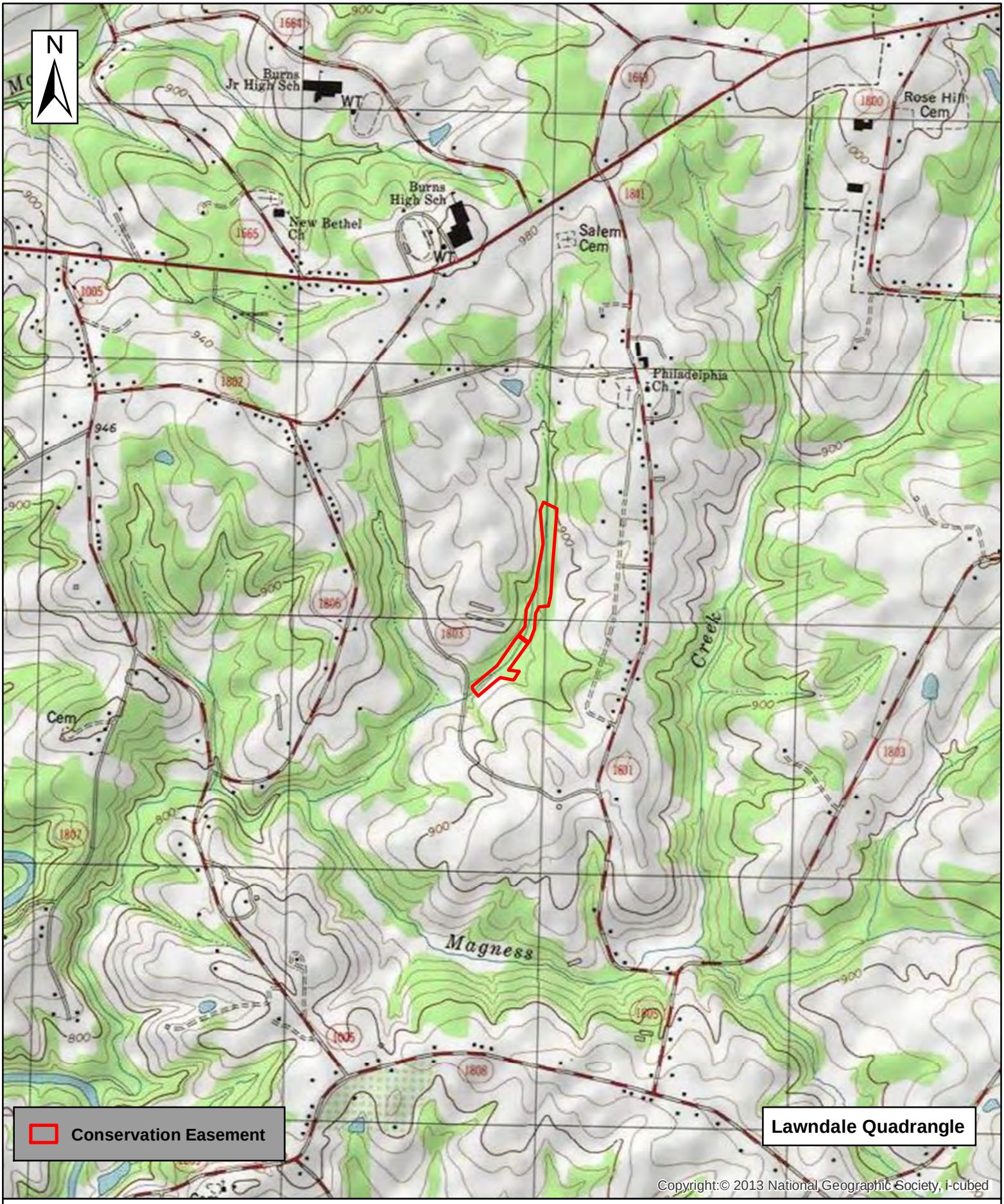
Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801

Attachments:
Figure 1: USGS Topographic Map
Figure 2: Proposed Project Conceptual Map

cc: Donnie Brew, FHWA

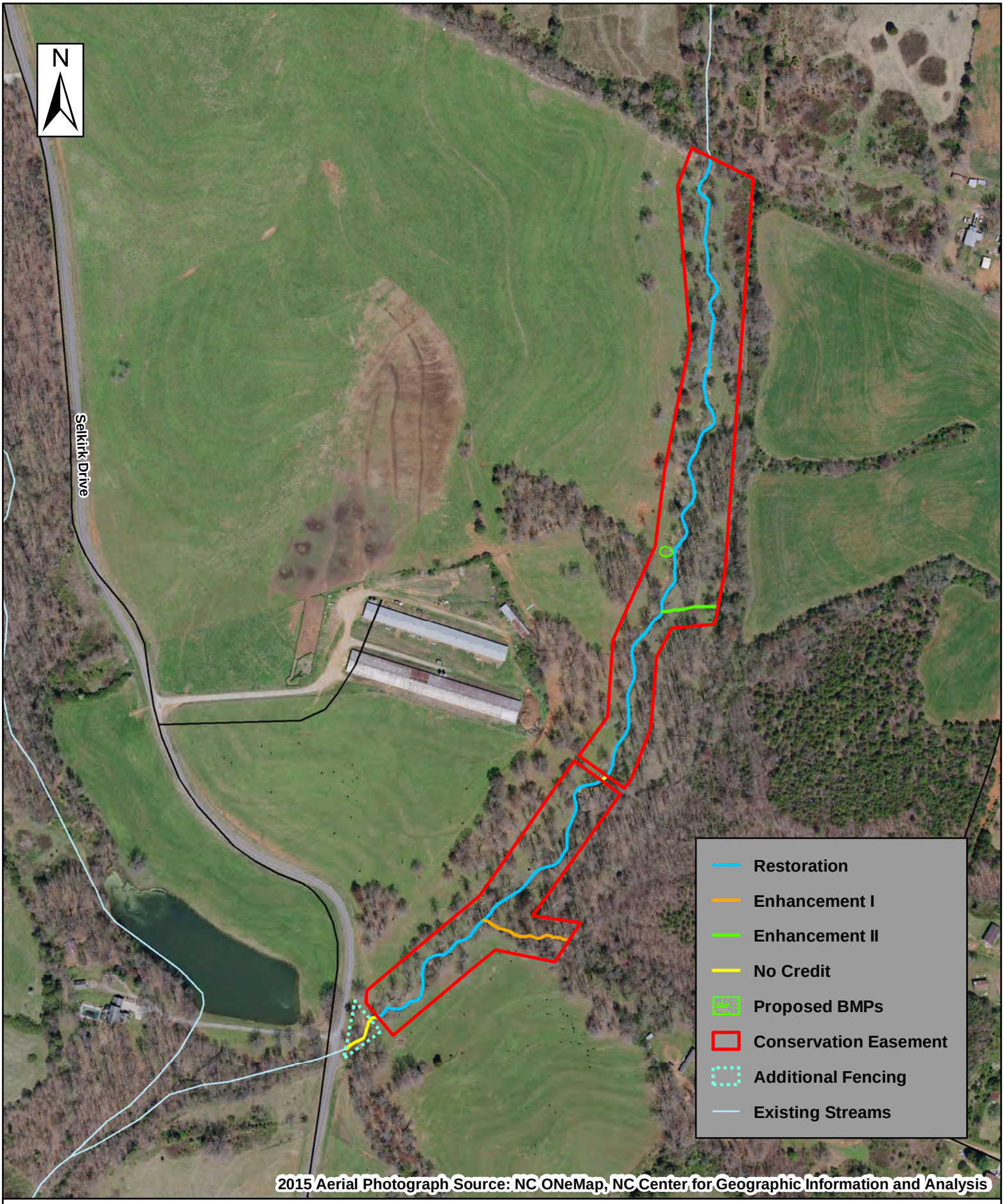


Michael Baker INTERNATIONAL

0 1,600 3,200 Feet

1" =1,600'

Figure 1: USGS Topographic Map
UT to Magness Creek
Mitigation Project



Michael Baker INTERNATIONAL

0 350 700 Feet

1" = 350'

Figure 2: Proposed Project Conceptual Map
UT to Magness Creek Mitigation Project

United Keetoowah Band
Of Cherokee Indians in Oklahoma
Office of Historic Preservation
P.O. Box 746 • Tahlequah, OK 74465
18263 W Keetoowah Circle • Tahlequah, OK 74464
Phone: (918) 871-2800 • Fax: (918) 414-4000
www.ukb-nsn.gov

January 16, 2019

RE: UT to Magness Creek Mitigation Site

To Whom It May Concern:

Thank you for consulting with the United Keetoowah Band of Cherokee Indians in Oklahoma (UKB).

Information on Native American use in the project vicinity show that prehistoric, ethnographic, historic, and/or traditional sites of value to the UKB surround the project area. The UKB objects to projects that will disturb or destroy archaeological sites that may be eligible for the Nation Register of Historic Places and requests copies of the State Historic Preservation Officer's report and any archaeological surveys that are performed for the above-mentioned project. If no surveys have been undertaken, we recommend that a cultural resources survey be completed prior to project implementation.

Please note that these comments are based on information available to us at the time of the project review. We reserve the right to revise our comments as information becomes available.

If you have any questions or concerns, please contact me by phone or by email,

Thank You,

Erin N. Thompson

Erin Thompson
Tribal Archaeologist/NAGPRA Coordinator
United Keetoowah Band of Cherokee
18263 W. Keetoowah Circle
Tahlequah, OK 74464
918-871-2838
ethompson@ukb-nsn.gov

Archaeological Consultants of the Carolinas

121 E. First Street, Clayton, North Carolina 27520
(919) 553-9007 fax (919) 553-9077
archcon.org

March 4, 2019

Ms. Erin Thompson
Tribal Archaeologist
United Keetoowah Band of Cherokee
18263 W. Keetoowah Circle
Tahlequah, OK 74464

RE: UT to Magness Creek Stream Mitigation Project, Cleveland County, North Carolina

Dear Ms. Thompson:

Mr. Micky Clemmons of Michael Baker International has contacted my firm regarding conducting an archaeological survey of the proposed impact areas associated with the UT to Magness Creek Stream Mitigation project in Cleveland County, North Carolina. The goals of this project are to restore and enhance several small streams within a proposed conservation easement. There are several stream segments included in the overall plan, with a total length of approximately 2,700 feet. The proposed impact corridors are approximately 200 feet in width encompassing the stream bed and adjoining banks.

After reviewing the project, the North Carolina State Historic Preservation Office (SHPO) stated that they were aware of no cultural resources that would be affected by the project (letter dated September 4, 2018). They did not request any archaeological investigations. Likewise, the Ms. Elizabeth Toombs, Tribal Historic Preservation Officer with the Cherokee Nation Tribal Historic Preservation Office was unaware of any "cultural, historic, and pre-historic resources" that would be impacted by the proposed mitigation project. However, you noted the sensitivity of the project vicinity for "prehistoric, ethnographic, historic, and/or traditional sites of value to the UKB" and stated that the tribe would object to any projects that would disturb any archaeological sites in the project impact area that would be considered eligible for the National Register of Historic Places (NRHP; letter dated January 16, 2019). You further requested a copy of any investigation report to review or, if no investigation had been undertaken, that one be conducted. This request led to Mr. Clemmons contacting us.

A review of the project maps and plans provided by Mr. Clemmons indicates that an archaeological survey of the proposed impact areas would not be productive. Due to the constraints of the project corridor's width, we would be examining only a narrow area of steep slope grading to the various stream banks. These banks have undergone severe erosion with approximately 72 percent of the project corridor exhibiting bank scour and erosion. In addition, the soils along the mitigation corridor are classified as Chewacla loam, which are poorly drained. Further, there are spoil piles along the project corridor and indications that the stream has been channelized. Overall, the conditions in the project area are considered to have extremely low potential for the presence of archaeological deposits and virtually no potential for any such deposits to be intact.

I appreciate your concern for the preservation of NRHP eligible archaeological resources, particularly those associated with the Cherokee. However, in this case, I do not think the expense and effort would result in any contribution to our understanding of lifeways in the project vicinity. I respectfully request that the recommendation for an archaeological survey of the proposed UT to Magness Creek Stream Mitigation project area be reconsidered.

Thank you so much for your consideration of this request. Should you wish to speak with me further about this request, please do not hesitate to call me at (919) 553-9007.

Sincerely,

Dawn Reid
President

Attachment: Photos of site conditions.

Example of the significant erosion at the upper end of this project site.

Dark soil layer indicating wetland condition in the recent past prior to excessive erosion from upland slopes.

High banks indicating past channelization.

Extremely overwide channel from past stream bank erosion and upland erosion to channel from terraced pasture slopes.

Channelized buffer to drain water from wetlands across the floodplain.

Eroding stream banks and erosion within buffer due to livestock access.

Email thread regarding submittal of report by Archeological Consultants of the Carolinas to the United Keetoowah Band of Cherokee, concluding in their concurrence with the reports findings. Read from bottom to top.

From: Brew, Donnie (FHWA)
To: Wiesner, Paul
Subject: [External] FW: Follow-up RE: Request regarding UT to Magness Creek Stream Mitigation Project, Cleveland County, North Carolina
Date: Wednesday, April 10, 2019 10:50:09 AM

fyi

From: Erin Thompson [mailto:ethompson@ukb-nsn.gov]
Sent: Wednesday, April 10, 2019 10:06 AM
To: Brew, Donnie (FHWA) <Donnie.Brew@dot.gov>
Subject: RE: Follow-up RE: Request regarding UT to Magness Creek Stream Mitigation Project, Cleveland County, North Carolina

The UKB concurs with the recommendation not to conduct a cultural resource survey for the UT to Magness Creek Mitigation Project, Cleveland County, North Carolina.

Thank you,

Erin Thompson
Interim THPO
United Keetoowah Band of Cherokee
18627 W. Keetoowah Circle
Tahlequah, OK 74464
918-871-2838 (O)
480-275-9009 (C)

From: Brew, Donnie (FHWA) <Donnie.Brew@dot.gov>
Sent: Wednesday, April 10, 2019 6:11 AM
To: Erin Thompson <ethompson@ukb-nsn.gov>
Cc: Wiesner, Paul <paul.wiesner@ncdenr.gov>
Subject: Follow-up RE: Request regarding UT to Magness Creek Stream Mitigation Project, Cleveland County, North Carolina

Good morning Ms. Thompson,

Hope you are having a good week.

The purpose of this email is to follow up on the email below from last month.

At your earliest convenience, please let me know if you concur with our recommendation to not conduct a cultural resource survey at the proposed UT to Magness Creek stream

mitigation project site in Cleveland County, North Carolina.

Thank you,

Donnie

Donnie Brew
Preconstruction & Environment Engineer
Federal Highway Administration
310 New Bern Ave, Suite 410
Raleigh, NC 27601
donnie.brew@dot.gov
919-747-7017

From: Brew, Donnie (FHWA)
Sent: Wednesday, March 06, 2019 10:58 AM
To: ethompson@ukb-nsn.gov
Cc: Wiesner, Paul <paul.wiesner@ncdenr.gov>
Subject: Request regarding UT to Magness Creek Stream Mitigation Project, Cleveland County, North Carolina

Good morning Ms. Thompson,

Hope you are having a good week.

On January 10, 2019 the Wilmington District, United States Army Corps of Engineers issued a Public Notice for a proposed North Carolina Division of Mitigation Services (DMS) mitigation project named "UT to Magness Creek Stream Mitigation Project", in Cleveland County, North Carolina. (Corps Action ID#: SAW-2018-01759)

The UKB responded on January 16, 2019.

The Federal Highway Administration (FHWA) is the lead federal agency for this project that is being administered by the NC DMS.

There are 4 attachments to this email. One is an analysis of the proposed project site by Archeological Consultants of the Carolinas (AAC) to get their perspective on the potential benefit of an archaeological survey of the proposed mitigation site. The other attachments

are supporting documents that are referenced in the AAC memo.

Please review this additional information and let us know if you concur with our recommendation to not conduct cultural resource survey for this particular project site.

I look forward to hearing back from you.

Respectfully,

Donnie

Donnie Brew
Preconstruction & Environment Engineer
Federal Highway Administration
310 New Bern Ave, Suite 410
Raleigh, NC 27601
donnie.brew@dot.gov
919-747-7017

North Carolina Department of Natural and Cultural Resources
Natural Heritage Program

Governor Roy Cooper | Secretary Susi H. Hamilton

NCNHDE-6640

August 6, 2018

Kristi Suggs
Michael Baker Engineering, Inc.
Ballantyne One - 15720 Brixham Hill Ave.
Charlotte, NC 28277
RE: UT to Magness Creek Mitigation Project; 167680/01

Dear Kristi Suggs:

The North Carolina Natural Heritage Program (NCNHP) appreciates the opportunity to provide information about natural heritage resources for the project referenced above.

A query of the NCNHP database indicates that there are records for rare species, important natural communities, natural areas, and/or conservation/managed areas within the proposed project boundary. These results are presented in the attached 'Documented Occurrences' tables and map.

The attached 'Potential Occurrences' table summarizes rare species and natural communities that have been documented within a one-mile radius of the property boundary. The proximity of these records suggests that these natural heritage elements may potentially be present in the project area if suitable habitat exists. Tables of natural areas and conservation/managed areas within a one-mile radius of the project area, if any, are also included in this report.

If a Federally-listed species is documented within the project area or indicated within a one-mile radius of the project area, the NCNHP recommends contacting the US Fish and Wildlife Service (USFWS) for guidance. Contact information for USFWS offices in North Carolina is found here: https://www.fws.gov/offices/Directory/ListOffices.cfm?statecode=37.

Please note that natural heritage element data are maintained for the purposes of conservation planning, project review, and scientific research, and are not intended for use as the primary criteria for regulatory decisions. Information provided by the NCNHP database may not be published without prior written notification to the NCNHP, and the NCNHP must be credited as an information source in these publications. Maps of NCNHP data may not be redistributed without permission.

Also please note that the NC Natural Heritage Program may follow this letter with additional correspondence if a Dedicated Nature Preserve, Registered Heritage Area, Clean Water Management Trust Fund easement, or an occurrence of a Federally-listed species is documented near the project area.

If you have questions regarding the information provided in this letter or need additional assistance, please contact Rodney A. Butler at rodney.butler@ncdcr.gov or 919-707-8603.

Sincerely,
NC Natural Heritage Program

MAILING ADDRESS:
1651 Mail Service Center
Raleigh, NC 27699-1651

Telephone: (919) 707-8107
www.ncnhp.org

LOCATION:
121 West Jones Street
Raleigh, NC 27603

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Intersecting the Project Area
UT to Magness Creek Mitigation Project
Project No. 167680/01
August 6, 2018
NCNHDE-6640

Element Occurrences Documented Within Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Crustacean	31053	Cambarus spicatus	Broad River Spiny Crayfish	2017-05-24	E	3-Medium	---	Special Concern	G3	S2

No Natural Areas are Documented within the Project Area

No Managed Areas Documented within the Project Area

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/content/help. Data query generated on August 6, 2018; source: NCNHP, Q3 July 2018. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Within a One-mile Radius of the Project Area
UT to Magness Creek Mitigation Project
Project No. 167680/01
August 6, 2018
NCNHDE-6640

Element Occurrences Documented Within a One-mile Radius of the Project Area

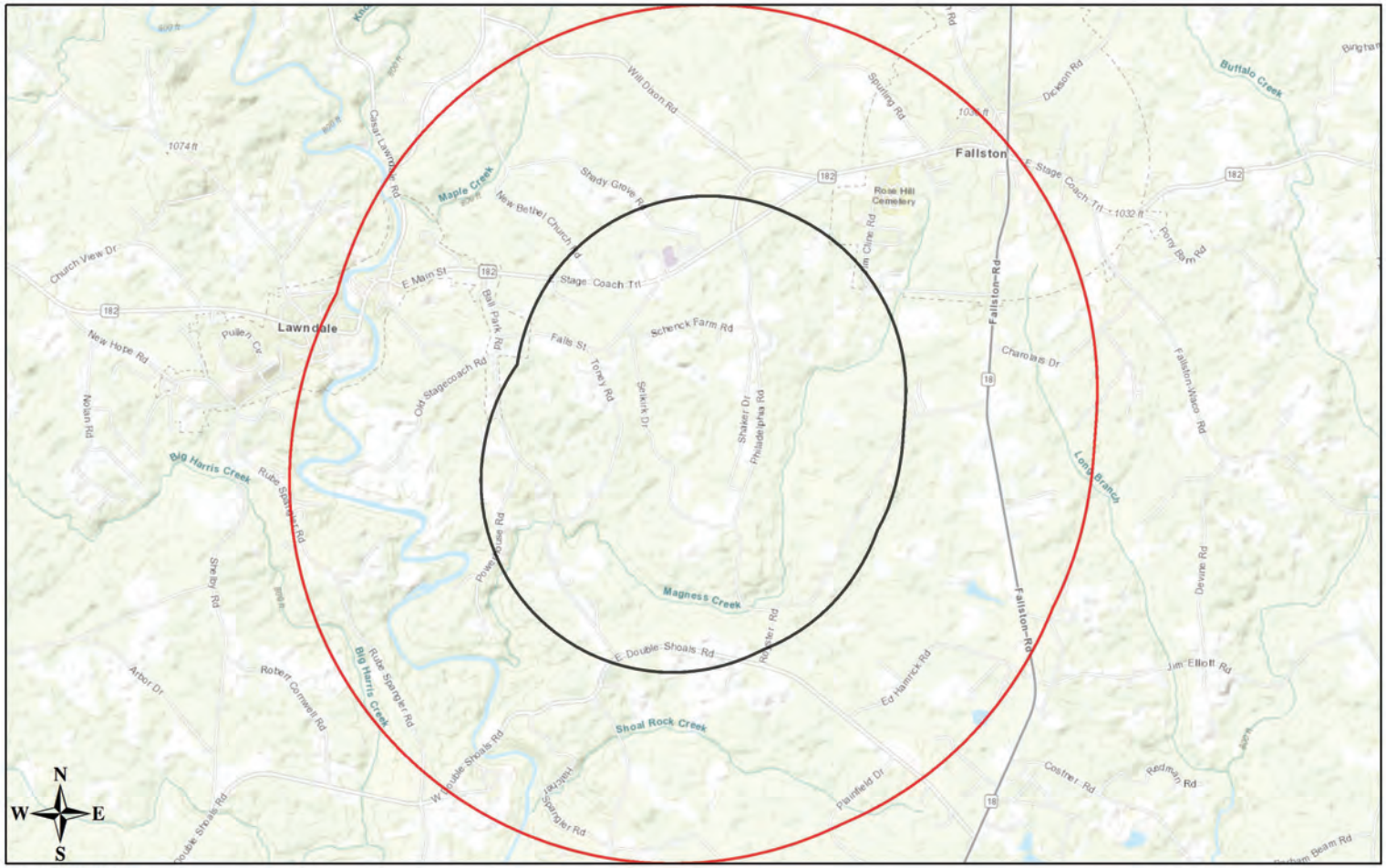
Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Crustacean	38123	Cambarus lenati	Broad River Stream Crayfish	2017-04-20	E	3-Medium	---	Significantly Rare	G2	S2
Crustacean	31053	Cambarus spicatus	Broad River Spiny Crayfish	2017-05-24	E	3-Medium	---	Special Concern	G3	S2
Freshwater Fish	32506	Etheostoma thalassinum	Seagreen Darter	2017-04-20	E	3-Medium	---	Significantly Rare	G4	S3

No Natural Areas are Documented Within a One-mile Radius of the Project Area

No Managed Areas are Documented Within a One-mile Radius of the Project Area

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/content/help. Data query generated on August 6, 2018; source: NCNHP, Q3 July 2018. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

NCNHDE-6640: UT to Magness Creek Mitigation Project



August 6, 2018

Project Boundary

Buffered Project Boundary

1:45,515

0 0.375 0.75 1.5 mi

0 0.5 1 2 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

Michael Baker
INTERNATIONAL

We Make a Difference

August 7, 2018

United States Fish and Wildlife Service
Asheville Ecological Services Field Office
Attn: Marella Buncick, Endangered Species Biologist
160 Zillicoa Street
Asheville, NC 28801

RE: Categorical Exclusion for UT to Magness Creek Mitigation Project, Cleveland County, NC
NCDEQ DMS Full-Delivery Project ID #100081, Broad River Basin (03050105)
IPAC Consultation Code: 04EN1000-2018-SLI-0615

Dear Ms. Buncick:

Michael Baker Engineering, Inc. (Baker) respectfully requests review and comment from the US Fish and Wildlife Service (USFWS) on any possible concerns they may have with regards to the implementation of the UT to Magness Creek Mitigation Project. Please note that this request is in support of the development of the Categorical Exclusion (CE) for the referenced project.

The project area is located in Cleveland County, North Carolina approximately 1.0 mile southeast of the Town of Lawndale on the United States Geological Survey's (USGS) Lawndale Topographic Quadrangle. The center of the project area is located at 35.4065 N and -81.5293 W. Located within a water supply watershed (WS-IV), the project drains directly to Magness Creek and the First Broad River, which is a drinking water source for the City of Shelby and other downstream municipalities. Existing reaches within the project site flow to the south-southwest where the downstream extent of the project is bordered by Selkirk Drive. Please see the enclosed Vicinity and USGS Topographic Maps for a depiction of the project site location.

The UT to Magness Creek site was identified to provide compensatory mitigation for unavoidable stream impacts. The existing stream reaches have been significantly impacted by unrestricted livestock access and the removal or impairment of riparian buffers. Most of the project reaches are incised, unstable, and exhibit areas of active bank erosion from both high flows and livestock access. Riparian buffer vegetation varies from areas with no woody buffer vegetation to areas with large trees but at low density and without any significant understory.

The project will involve the restoration and enhancement of approximately 3,385 LF of existing stream. Degraded riparian wetlands will be restored and/or enhanced with the implementation of Priority Level 1 restoration, livestock exclusion, and native riparian buffer plantings; however, no wetland credit is being sought. A Best Management Practice (BMP) in the form of a constructed wet pond will be installed in an unstable ephemeral drainage that receives run-off from an area that is frequently used by livestock. Native riparian buffers will be established along all proposed reaches. A conservation easement will be implemented along all project reaches in an excess of 50 feet from the top of bank and will incorporate

Michael Baker Engineering, Inc.
Ballantyne One, 15720 Brixham Hill Ave., Ste. 300 Office 336
Charlotte, NC 28277 | Office: 704.665.2200

some of the existing functional wetlands. Livestock will be excluded from the conservation easement with permanent fencing.

Data Review and Analysis

Michael Baker Engineering, Inc. (Baker) conducted an on-line review of the project area with the use of the United States Fish and Wildlife Service (USFWS) IPAC website (https://ecos.fws.gov/ipac/), on August 6, 2018. This review generated an *Official Species List* (OSL), which identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of the proposed project and/or may be affected by proposed project. Results from review, found the following two federally listed species. No USFWS designated critical habitats were located within the project boundaries.

Scientific Name	Common Name	Federal Status
Myotis septentrionalis	Northern long-eared bat	Threatened
Hexastylis naniflora	Dwarf-flowered Heartleaf	Threatened

On August 6, 2018, Baker conducted a two-mile radius search using the Natural Heritage Program (NCNHP) Data Explorer (https://ncnhde.natureserve.org/). Results from this search and found no known occurrences of any of the above referenced species within two miles of the project site.

***Myotis septentrionalis* (Northern long-eared bat) – Threatened**

USFWS optimal survey window: June 1- August 15

In North Carolina, the northern long-eared bat (NLEB) occurs in the mountains, with scattered records in the Piedmont and coastal plain. In western North Carolina, NLEB spend winter hibernating in caves and mines. Since this species is not known to be a long-distance migrant, and caves and subterranean mines are extremely rare in eastern North Carolina, it is uncertain whether or where NLEB hibernate in eastern NC. During the summer, NLEB roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees (typically ≥3 inches dbh). This bat also been found, rarely, roosting in structures like barns and sheds, under eaves of buildings, behind window shutters, in bridges, and in bat houses. Pregnant females give birth from late May to late July. Foraging occurs on forested hillsides and ridges, and occasionally over forest clearings, over water, and along tree-lined corridors. Mature forests may be an important habitat type for foraging.

No critical habitat has been designated for this species and the project site is located outside of a county and/or watershed where NLEB maternity trees or hibernation sites are known to occur. Additionally, a two-mile radius search using the Natural Heritage Program's Data Explorer (https://ncnhde.natureserve.org/) on August 6, 2018 found no known occurrences of the NLEB within two miles of the Project site.

No critical habitat has been designated for this species.

***Hexastylis naniflora* (Dwarf-flowered heartleaf) – Threatened**

USFWS Recommended Survey Window: mid-March – early July

The dwarf-flowered heartleaf is a low-growing evergreen perennial that has heart-shape leaves that are four to six centimeters long. The leaves are dark green and leathery and are supported by long thin leaf stems connecting it to an underground stem. The blooms are small, inconspicuous jug-shaped flowers that are usually beige to dark brown or purple. The flowers are found near the base of the leaf stems and are often buried beneath the leaf litter. The plant grows in acidic soils along bluffs and adjacent slopes, in boggy areas next to streams, and along slopes of nearby hillsides and ravines.

No critical habitat has been designated for this species.

Please provide comments on any possible issues that may arise with respect to the endangered species, migratory birds or other natural resources from the construction of the proposed project. The following additional supporting documentation has been included for reference: Vicinity Map, USGS Topographic Map, and Project Site Map. If Baker has not received response from you within 30 days, we will assume that the USFWS does not have any comment or information relevant to the implementation of this project at the current time.

We thank you in advance for your timely response, input, and cooperation. Please contact me if you have any further questions or comments. I can be reached at (704) 579-4828 or via my email address at ksuggs@mbakerintl.com.

Sincerely,

Kristi Suggs

Cc: File

Enclosures

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Asheville Ecological Services Field Office
160 Zillicoa Street
Asheville, NC 28801-1082
Phone: (828) 258-3939 Fax: (828) 258-5330
http://www.fws.gov/nc-es/es/countyfr.html

IPaC Record Locator: 361-13503224 August 07, 2018

Subject: Consistency letter for the 'UT to Magness Creek Mitigation Project' project (TAILS 04EN1000-2018-R-0615) under the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

To whom it may concern:

The U.S. Fish and Wildlife Service (Service) has received your request dated to verify that the UT to Magness Creek Mitigation Project (Proposed Action) may rely on the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (PBO) to satisfy requirements under Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based on the information you provided (Project Description shown below), you have determined that the Proposed Action will have no effect on the endangered Indiana bat (Myotis sodalis) or the threatened Northern long-eared bat (Myotis septentrionalis). If the Proposed Action is not modified, no consultation is required for these two species.

For Proposed Actions that include bridge/structure removal, replacement, and/or maintenance activities: If your initial bridge/structure assessments failed to detect Indiana bats, but you later detect bats during construction, please submit the Post Assessment Discovery of Bats at Bridge/Structure Form (User Guide Appendix E) to this Service Office. In these instances, potential incidental take of Indiana bats may be exempted provided that the take is reported to the Service.

If the Proposed Action may affect any other federally-listed or proposed species and/or designated critical habitat, additional consultation between the lead Federal action agency and this Service Office is required. If the proposed action has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act may also be required. In either of these circumstances, please advise the lead Federal action agency for the Proposed Action accordingly.

The following species may occur in your project area and are not covered by this determination:

- Dwarf-flowered Heartleaf, Hexastylis naniflora (Threatened)

Project Description

The following project name and description was collected in IPaC as part of the endangered species review process.

Name

UT to Magness Creek Mitigation Project

Description

The UT to Magness Creek mitigation project is located in Cleveland County, NC, east of the Town of Lawndale, within the Broad River Basin (03050105) and the NC DMS Targeted Local Watershed (TLW) 03050105080060. Located within a water supply watershed (WS-IV), the project drains directly to Magness Creek and the First Broad River, which is a drinking water source for the City of Shelby and other downstream municipalities. Existing reaches within the project site flow to the south-southwest where the downstream extent of the project is bordered by Selkirk Drive.

The existing stream reaches have been significantly impacted by unrestricted livestock access and the removal or impairment of riparian buffers. Most of the project reaches are incised, unstable, and exhibit areas of active bank erosion from both high flows and livestock access. Riparian buffer vegetation varies from areas with no woody buffer vegetation to areas with large trees but at low density and without any significant understory.

The project will involve the restoration and enhancement of approximately 3,385 LF of existing stream. Degraded riparian wetlands will be restored and/or enhanced with the implementation of Priority Level 1 restoration, livestock exclusion, and native riparian buffer plantings; however, no wetland credit is being sought. A Best Management Practice (BMP) in the form of a constructed wet pond will be installed in an unstable ephemeral drainage that receives run-off from an area that is frequently used by livestock. Native riparian buffers will be established along all proposed reaches. A conservation easement will be implemented along all project reaches in an excess of 50 feet from the top of bank and will incorporate some of the existing functional wetlands. Livestock will be excluded from the conservation easement with permanent fencing.

Determination Key Result

Based on the information you provided, you have determined that the Proposed Action will have no effect on the endangered Indiana bat and/or the threatened Northern long-eared bat. Therefore, no consultation with the U.S. Fish and Wildlife Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended 16 U.S.C. 1531 et seq.) is required for these two species.

Qualification Interview

1. Is the project within the range of the Indiana bat[1]?

   [1] See Indiana bat species profile

   Automatically answered
   No

2. Is the project within the range of the Northern long-eared bat[1]?

   [1] See Northern long-eared bat species profile

   Automatically answered
   Yes

3. Which Federal Agency is the lead for the action?

   A) Federal Highway Administration (FHWA)

4. Are all project activities limited to non-construction[1] activities only? (examples of non-construction activities include: bridge/abandoned structure assessments, surveys, planning and technical studies, property inspections, and property sales)

   [1] Construction refers to activities involving ground disturbance, percussive noise, and/or lighting.

   No

5. Does the project include any activities that are greater than 300 feet from existing road/rail surfaces[1]?

   [1] Road surface is defined as the actively used [e.g. motorized vehicles] driving surface and shoulders [may be pavement, gravel, etc.] and rail surface is defined as the edge of the actively used rail ballast.

   Yes

6. Are all project activities greater than 300 feet from existing road/rail surfaces[1]?

   [1] Road surface is defined as the actively used [e.g. motorized vehicles] driving surface and shoulders [may be pavement, gravel, etc.] and rail surface is defined as the edge of the actively used rail ballast.

   No

7. Does the project include any activities within 0.5 miles of an Indiana bat and/or NLEB hibernaculum[1]?

   [1] For the purpose of this consultation, a hibernaculum is a site, most often a cave or mine, where bats hibernate during the winter (see suitable habitat), but could also include bridges and structures if bats are found to be hibernating there during the winter.

   No

8. Is the project located within a karst area?

   No

9. Is there any suitable[1] summer habitat for Indiana Bat or NLEB within the project action area[2]? (includes any trees suitable for maternity, roosting, foraging, or travelling habitat)

   [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

   [2] The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR Section 402.02). Further clarification is provided by the national consultation FAQs.

   No

10. Does the project include maintenance of the surrounding landscape at existing facilities (e.g., rest areas, stormwater detention basins)?

    No

11. Does the project include wetland or stream protection activities associated with compensatory wetland mitigation?

    Yes

12. Does the project include slash pile burning?

    No

13. Does the project include any bridge removal, replacement, and/or maintenance activities (e.g., any bridge repair, retrofit, maintenance, and/or rehabilitation work)?

    No

14. Does the project include the removal, replacement, and/or maintenance of any structure other than a bridge? (e.g., rest areas, offices, sheds, outbuildings, barns, parking garages, etc.)

    No

15. Will the project involve the use of temporary lighting during the active season?

    No

16. Will the project install new or replace existing permanent lighting?

    No

17. Will the project raise the road profile above the tree canopy?

    No

18. Is the location of this project consistent with a No Effect determination in this key?

    Automatically answered

    Yes, because the project action area is outside of suitable Indiana bat and/or NLEB summer habitat

Determination Key Description: FHWA, FRA, FTA Programmatic Consultation For Transportation Projects Affecting NLEB Or Indiana Bat

This key was last updated in IPaC on March 16, 2018. Keys are subject to periodic revision.

This decision key is intended for projects/activities funded or authorized by the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and/or Federal Transit Administration (FTA), which require consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the Endangered Species Act (ESA) for the endangered Indiana bat (Myotis sodalis) and the threatened Northern long-eared bat (NLEB) (Myotis septentrionalis).

This decision key should only be used to verify project applicability with the Service's February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects. The programmatic biological opinion covers limited transportation activities that may affect either bat species, and addresses situations that are both likely and not likely to adversely affect either bat species. This decision key will assist in identifying the effect of a specific project/activity and applicability of the programmatic consultation. The programmatic biological opinion is not intended to cover all types of transportation actions. Activities outside the scope of the programmatic biological opinion, or that may affect ESA-listed species other than the Indiana bat or NLEB, or any designated critical habitat, may require additional ESA Section 7 consultation.

Michael Baker
INTERNATIONAL

We Make a Difference

August 7, 2018

NC Wildlife Resource Commission
Attn: Olivia Munzer, Western Piedmont Coordinator
2430 Turner Road
Mebane, NC 27302
Email: olivia.munzer@ncwildlife.org

RE: Categorical Exclusion Project Review Request
UT to Magness Creek Mitigation Project, Cleveland County, NC
NCDEQ DMS Full-Delivery Project ID #100081
Broad River Basin (03050105)

Dear Ms. Munzer:

Michael Baker Engineering, Inc. (Baker) respectfully requests review and comment from the NC Wildlife Resource Commission (WRC) on any possible concerns they may have with regards to the implementation of the UT to Magness Creek Mitigation Project. Please note that this request is in support of the development of the Categorical Exclusion (CE) for the referenced project.

The project area is located in Cleveland County, North Carolina approximately 1.0 mile southeast of the Town of Lawndale on the United States Geological Survey's (USGS) Lawndale Topographic Quadrangle. The center of the project area is located at 35.4065 N and -81.5293 W. Located within a water supply watershed (WS-IV), the project drains directly to Magness Creek and the First Broad River, which is a drinking water source for the City of Shelby and other downstream municipalities. Existing reaches within the project site flow to the south-southwest where the downstream extent of the project is bordered by Selkirk Drive. Please see the enclosed Vicinity and USGS Topographic Maps for a depiction of the project site location.

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Michael Baker Engineering, Inc.
Ballantyne One, 15720 Brixham Hill Ave., Ste. 300 Office 336
Charlotte, NC 28277 | Office: 704.665.2200

some of the existing functional wetlands. Livestock will be excluded from the conservation easement with permanent fencing.

Data Review and Analysis

Michael Baker Engineering, Inc. (Baker) conducted an on-line review of the project area with the use of the United States Fish and Wildlife Service (USFWS) IPAC website (https://ecos.fws.gov/ipac/), on August 6, 2018. This review generated an *Official Species List* (OSL), which identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of the proposed project and/or may be affected by proposed project. Results from review, found the following two federally listed species. No USFWS designated critical habitats were located within the project boundaries.

Scientific Name	Common Name	Federal Status
Myotis septentrionalis	Northern long-eared bat	Threatened
Hexastylis naniflora	Dwarf-flowered Heartleaf	Threatened

On August 6, 2018, Baker conducted a two-mile radius search using the Natural Heritage Program (NCNHP) Data Explorer (https://ncnhde.natureserve.org/). Results from this search and found no known occurrences of any of the above referenced species within two miles of the project site.

***Myotis septentrionalis* (Northern long-eared bat) – Threatened**

USFWS optimal survey window: June 1- August 15

In North Carolina, the northern long-eared bat (NLEB) occurs in the mountains, with scattered records in the Piedmont and coastal plain. In western North Carolina, NLEB spend winter hibernating in caves and mines. Since this species is not known to be a long-distance migrant, and caves and subterranean mines are extremely rare in eastern North Carolina, it is uncertain whether or where NLEB hibernate in eastern NC. During the summer, NLEB roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees (typically ≥3 inches dbh). This bat also been found, rarely, roosting in structures like barns and sheds, under eaves of buildings, behind window shutters, in bridges, and in bat houses. Pregnant females give birth from late May to late July. Foraging occurs on forested hillsides and ridges, and occasionally over forest clearings, over water, and along tree-lined corridors. Mature forests may be an important habitat type for foraging.

No critical habitat has been designated for this species and the project site is located outside of a county and/or watershed where NLEB maternity trees or hibernation sites are known to occur. Additionally, a two-mile radius search using the Natural Heritage Program's Data Explorer (https://ncnhde.natureserve.org/) on August 6, 2018 found no known occurrences of the NLEB within two miles of the Project site.

No critical habitat has been designated for this species.

***Hexastylis naniflora* (Dwarf-flowered heartleaf) – Threatened**

USFWS Recommended Survey Window: mid-March – early July

The dwarf-flowered heartleaf is a low-growing evergreen perennial that has heart-shape leaves that are four to six centimeters long. The leaves are dark green and leathery and are supported by long thin leaf stems connecting it to an underground stem. The blooms are small, inconspicuous jug-shaped flowers that are usually beige to dark brown or purple. The flowers are found near the base of the leaf stems and are often buried beneath the leaf litter. The plant grows in acidic soils along bluffs and adjacent slopes, in boggy areas next to streams, and along slopes of nearby hillsides and ravines.

No critical habitat has been designated for this species.

Please provide comments on any possible issues that may arise with respect to the endangered species, migratory birds or other natural resources from the construction of the proposed project. The following additional supporting documentation has been included for reference: Vicinity Map, USGS Topographic Map, and Project Site Map. If Baker has not received response from you within 30 days, we will assume that the NCWRC does not have any comment or information relevant to the implementation of this project at the current time.

We thank you in advance for your timely response, input, and cooperation. Please contact me if you have any further questions or comments. I can be reached at (704) 579-4828 or via my email address at ksuggs@mbakerintl.com.

Sincerely,

Kristi Suggs

Cc: File

Enclosures

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

17 August 2018

Ms. Kristi Suggs
Michael Baker International
Ballantyne One, 15720 Brixham Hill Ave.
Suite 300, Office 336
Charlotte, North Carolina 28277

Subject: Request for Project Review and Comments
UT to Magness Creek Mitigation Site
Cleveland County, North Carolina
NCDEQ DMS Full-Delivery Project ID#100081

Dear Ms. Suggs,

Biologists with the North Carolina Wildlife Resource Commission (NCWRC) received your letter on 07 August 2018 requesting review and comment on any possible concerns regarding the UT to Magness Creek Mitigation Site. Biologists with NCWRC have reviewed the provided documents. Comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667e) and North Carolina General Statutes (G.S. 113-131 et seq.).

The UT to Magness Creek Mitigation Site is located along Selkirk Drive and south of Schneck Farm Road near Lawndale, Cleveland County, North Carolina. The mitigation site is in agricultural and riparian forested lands. The project will provide compensatory mitigation for unavoidable impacts to streams within the Broad River Basin (HUC 03050105). The project will restore and enhance approximately 3,385 linear feet of an unnamed tributary to Magness Creek and riparian wetlands; however, no wetland credits are being requested.

We have records for the federal species of concern and state special concern Broad River spiny crayfish (*Cambarus spicatus*) along Magness Creek. We have no records of federal or state-listed species at or adjacent to the site. However, the lack of records from the site does not imply or confirm the absence of federal or state rare, threatened, or endangered species. An on-site survey is the only definitive means to determine if the proposed project would impact rare, threatened, or endangered species.

Based upon the information provided to NCWRC, it is unlikely that stream and wetland mitigation will adversely affect any federal or state-listed species. However, we recommend leaving snags and mature trees or if necessary, remove tees outside the maternity roosting season for bats (May 15 – August 15). We recommend that riparian buffers are as wide as possible, given site constraints and landowner needs. NCWRC generally recommends a woody buffer of 100 feet on perennial streams to maximize the

Mailing Address: Habitat Conservation • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

benefits of buffers, including bank stability, stream shading, treatment of overland runoff, and wildlife habitat.

Stream and wetland restoration projects often improve water quality and aquatic habitat. Establishing native, forested buffers in riparian areas will help protect water quality, improve aquatic and terrestrial habitats, and provide a travel corridor for wildlife species. Provided stringent measures are taken to minimize erosion and sedimentation from construction/restoration activities, we do not anticipate the project to result in significant adverse impacts to aquatic and terrestrial wildlife resources.

Thank you for the opportunity to provide comments. If I can be of additional assistance, please call (919) 707-0364 or email olivia.munzer@ncwildlife.org.

Sincerely,

Olivia Munzer
Western Piedmont Habitat Conservation Coordinator
Habitat Conservation Program

Ec: William T. Russ, NCWRC

Michael Baker
INTERNATIONAL

We Make a Difference

August 7, 2018

Milton Cortes, Assistant State Soil Scientist
USDA Natural Resources Conservation Service
4407 Bland Rd., Suite 117
Raleigh, NC 27609
Email: Milton.Cortes@nc.usda.gov

RE: Prime and Important Farmland Soils
NCDMS, UT to Magness Creek Mitigation Project
Cleveland County, NC

Dear Mr. Cortes:

Michael Baker Engineering, Inc. (Baker) is contracted by the North Carolina Division of Mitigation Services (NCDMS) to conduct stream restoration/enhancement activities for the above-referenced project.

The project area is located in Cleveland County, North Carolina approximately 1.0 mile southeast of the Town of Lawndale on the United States Geological Survey's (USGS) Lawndale Topographic Quadrangle. The center of the project area is located at 35.4065 N and -81.5293 W. Located within a water supply watershed (WS-IV), the project drains directly to Magness Creek and the First Broad River, which is a drinking water source for the City of Shelby and other downstream municipalities. Existing reaches within the project site flow to the south-southwest where the downstream extent of the project is bordered by Selkirk Drive. Please see the enclosed USGS Topographic Maps for a depiction of the project site location.

The UT to Magness Creek site was identified to provide compensatory mitigation for unavoidable stream impacts. The existing stream reaches have been significantly impacted by unrestricted livestock access and the removal or impairment of riparian buffers. Most of the project reaches are incised, unstable, and exhibit areas of active bank erosion from both high flows and livestock access. Riparian buffer vegetation varies from areas with no woody buffer vegetation to areas with large trees but at low density and without any significant understory.

The project will involve the restoration and enhancement of approximately 3,385 LF of existing stream. Degraded riparian wetlands will be restored and/or enhanced with the implementation of Priority Level 1 restoration, livestock exclusion, and native riparian buffer plantings; however, no wetland credit is being sought. A Best Management Practice (BMP) in the form of a constructed wet pond will be installed in an unstable ephemeral drainage that receives run-off from an area that is frequently used by livestock. Native riparian buffers will be established along all proposed reaches. A conservation easement will be implemented along all project reaches in an excess of 50 feet from the top of bank and will incorporate some of the existing functional wetlands. Livestock will be excluded from the conservation easement with permanent fencing.

Baker conducted a review of the project area using the US Department of Agriculture Natural Resources Conservation Service's (USDA NRCS) Web Soil Survey. A Soils Classification Report and Map was generated for the soils that are present within the proposed conservation easement. Based on the data determined from this review, there are a total of 10.3 acres of Chewacla loam (ChA) and 0.7 acres of Pacolet sand clay loam (PaC2) within the project area.

Please feel free to contact me if you have any questions regarding this project or need any additional information. I can be reached at (704) 579-4828 or via my email address at ksuggs@mbakerintl.com.

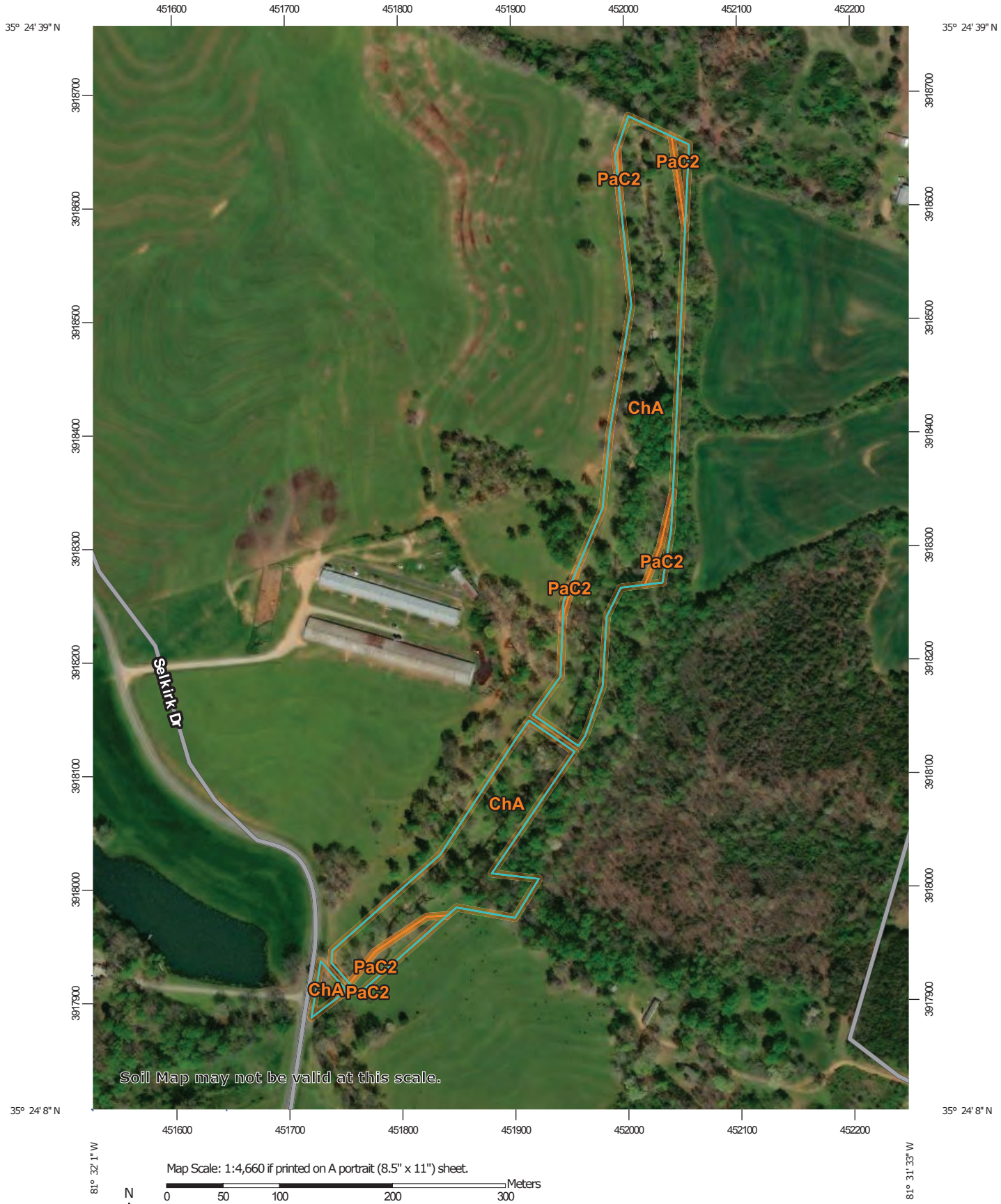
Sincerely,

Kristi Suggs

Enclosures: USGS Topographic Map
NRCS Soils Classification Report & Map
FFPA Form AD-1006

Cc: File

Soil Map—Cleveland County, North Carolina
(UT to Magness Creek Mitigation Project)



Map Scale: 1:4,660 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cleveland County, North Carolina
Survey Area Data: Version 20, Sep 26, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 23, 2014—Nov 28, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	10.3	93.8%
PaC2	Pacolet sandy clay loam, 8 to 15 percent slopes, moderately eroded	0.7	6.2%
Totals for Area of Interest		**11.0**	**100.0%**

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 8/7/2018
Name of Project UT to Magness Creek Mitigation Project	Federal Agency Involved FHWA
Proposed Land Use Stream Mitigation	County and State Cleveland, NC
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 08/07/2018 / Person Completing Form: Milton Cortes NC NRCS

Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☑ NO ☐	Acres Irrigated: none	Average Farm Size: 113 acres
Major Crop(s): CORN	Farmable Land In Govt. Jurisdiction Acres: 79% % 236,827 acres	Amount of Farmland As Defined in FPPA Acres: 61.4% % 93,263 acres	
Name of Land Evaluation System Used: Cleveland Co,. NC LESA	Name of State or Local Site Assessment System: N/A	Date Land Evaluation Returned by NRCS: August 27. 2018 by eMail	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	11.0			
B. Total Acres To Be Converted Indirectly	0			
C. Total Acres In Site	11.0			
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	10.30			
B. Total Acres Statewide Important or Local Important Farmland	0.70			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted	0.0118			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value	4.4%			
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)	97			

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)	15			
2. Perimeter In Non-urban Use	(10)	10			
3. Percent Of Site Being Farmed	(20)	20			
4. Protection Provided By State and Local Government	(20)	20			
5. Distance From Urban Built-up Area	(15)	5			
6. Distance To Urban Support Services	(15)	5			
7. Size Of Present Farm Unit Compared To Average	(10)	10			
8. Creation Of Non-farmable Farmland	(10)	0			
9. Availability Of Farm Support Services	(5)	5			
10. On-Farm Investments	(20)	10			
11. Effects Of Conversion On Farm Support Services	(10)	0			
12. Compatibility With Existing Agricultural Use	(10)	0			
TOTAL SITE ASSESSMENT POINTS	160	100	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	97	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	100	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	197	0	0	0

Site Selected: A	Date Of Selection 9/19/2018	Was A Local Site Assessment Used? YES ☑ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form: FHWA	Date: 9/19/2018

(See Instructions on reverse side) **Form AD-1006 (03-02)**

APPENDIX J: HYDRIC SOILS REPORT

Hydric Soils Investigation

UT to Magness Creek Mitigation Project

Cleveland County, NC

Prepared by:

Michael Baker

INTERNATIONAL

Michael Baker Engineering, Inc.

8000 Regency Parkway – Suite 600

Cary, NC 27518

Scott E. King, LSS #1301

January 14, 2019

Introduction

Michael Baker Engineering, Inc. conducted a hydric soils investigation along the floodplains of an unnamed tributary to Magness Creek (main stem) and two of its smaller tributaries (UT1 and UT2) in Cleveland County, NC for the purpose of identifying potential opportunities for historic wetland restoration as part of a proposed mitigation project for the NC Division of Mitigation Services (DMS). More specifically, the investigation was to confirm the presence and location of any hydric soils found on site. Currently, the approximately 12-acre subject area (represented by a potential conservation easement boundary) is mostly managed as livestock pasture with scattered trees found along the floodplain of the lower section of the main stem and along UT1 and UT2.

Methodology

Prior to the field investigation, the NRCS soils layer was reviewed for the site (Figure 1), along with the NRCS' most recent compilation (2016) of hydric soils for Cleveland County, North Carolina. Chewacla loam (0-2% slopes, frequently flooded) was found to be mapped throughout the floodplains of the subject area. The Chewacla soil series is a recognized NRCS-listed Hydric Soils for Cleveland County. Chewacla loams are taxonomically categorized as Fine-loamy, mixed, active, thermic Fluvaquentic Dystrudepts. Additionally, Wehadkee loam (Fine-loamy, mixed, active, nonacid, thermic Fluvaquentic Endoaquepts) is listed as a component soil series of Chewacla in the NRCS descriptions, which is also listed as a Hydric Soil for Cleveland County.

The USGS map for the subject area (Lawndale Quad) was also reviewed (Figure 2). It identifies the main stem itself as a blue-line stream. Two other significant flowing unnamed tributaries (UT1 and UT2) were also discovered in the field flowing into the middle and lower sections of the main stem from the east, but are not shown on the USGS map. Additionally, NWI data from the USFWS was reviewed for the site but did not reveal the presence of any previously identified wetlands located along the floodplain of the site.

Hand-turned soil auger borings and soils analyses were conducted throughout the subject area, and the hydric soil boundary was marked using the 126 GPS points subsequently captured with a TopCon Tesla Real Time Kinematic (RTK) GNSS Receiver. This device collects survey data to a minimum Class B Horizontal Accuracy and all points were georeferenced to the NAD83 State Plane Coordinate System in US Survey Feet. This survey system is capable of collecting point data with an accuracy of less than one tenth of a foot. Hydric soils were identified using the NRCS document "Field Indicators of Hydric Soils in the United States: A Guide for Identifying and Delineating Hydric Soils, Version 7.0, 2010". Seven representative boring descriptions are provided in this report, and numerous photos of soil borings and hydric soil are presented in an enclosed photo-log.

Results and Conclusions

The on-site field investigation was conducted in November of 2018 and January 2019. Extensive areas of hydric soils and buried hydric soils were discovered throughout the floodplain, totaling 1.9 and 4.6 acres respectively, as shown in Figure 3. Soils meeting hydric status were described by one or more of the following hydric soil indicators described below:

F6 Redox Dark Surface:
A layer that is at least 10 cm (4 inches) thick, is entirely within the upper 30 cm (12 inches) of the mineral soil, and has:
a. Matrix value of 3 or less and chroma of 1or less and 2 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings, or
b. Matrix value of 3 or less and chroma of 2 or less and 5 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings.

F3 Depleted Matrix:
A layer that has a depleted matrix with 60 percent or more chroma of 2 or less and that has a minimum thickness of either:
a. 5 cm (2 inches) if the 5 cm is entirely within the upper 15 cm (6 inches) of the soil, or
b. 15 cm (6 inches), starting within 25 cm (10 inches) of the soil surface.

F8 Redox Depressions:
In closed depressions subject to ponding, 5 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings in a layer that is 5 cm (2 inches) or more thick and is entirely within the upper 15 cm (6 inches) of the soil.

Furthermore, with regards to mitigation potential, three categories of hydric soil were discovered on site:

1. Hydric soils appropriate for restoration. These are the areas that meet one or more hydric soil indicators and appear to have been hydrologically impacted by significant adjacent stream downcutting caused by the deliberate dredging and straightening of the main stem and connecting tributaries. Additionally, in at least one location a drainage ditch was dug to help drain a wetland area. These soils have also been significantly impacted by the use of the entire area as pasture for cattle, particularly to the vegetation. These areas are suitable for wetland restoration through re-establishment, presumably as part of a Priority Level I Restoration of the main stem and the accompanying raising of the channel beds in the lower sections of the tributaries in reconnecting them to the raised main stem. The filling of any drainage ditches near wetland areas within the final easement is also recommended. These efforts should restore groundwater hydrology and increase flooding frequency to these areas. Additionally, the planting of a full riparian buffer would restore the appropriate vegetation to the wetlands. This hydric soil category accounts for approximately 1.9 acres.

2. Buried hydric soils. These are hydric soil areas that have clear fill material located on top of a buried A-horizon. The fill material certainly appears to derive from the adjacent upland soils (Pacolet/Cecil soils) located on the steep valley hillslopes, and was either directly placed in the wetlands to deliberately fill them, or were eroded down from historic agricultural use on the hillslopes. The average depth of fill is between roughly 1.0 – 1.5 ft for most of the floodplain of the main stem. However, in the lowermost floodplain after its confluence with UT2, the depth of fill is roughly 2.0 ft. The buried A-horizon is clearly identified as such due to the pronounced accumulation of organic matter in the layer. The soil is very dark grey or black (Munsell Chroma of 1 and Value of 2 or 3) and obviously formed on the soil surface. Organic matter, in particular to this significant a degree and thickness, does *not* translocate or accumulate at depth in fine-textured soils. This layer is indicative of a very wet environment where reducing conditions inhibited the usual decomposition rate of organic matter, thus resulting in its accumulation. This hydric soil category accounts for approximately 4.6 acres.

Although buried hydric soils are often considered suitable for restoration through the removal of fill material and the reestablishment of hydrology, recent discussion with the NC-IRT indicates that they do *not* consider these project soils suitable due to the depth of fill present and to the presumed historic nature of the fill. Thus, while these areas are described in this report they are not recommended for wetland restoration purposes.

3. Hydric soils located within existing wetland areas. The existing wetlands are found in scattered pockets throughout the floodplain of the main stem and UT1, as well as in several located within the stream banks of the main stem on wet inner berms. These hydric soils account for approximately 0.2 acres. These estimates are approximate until the wetland areas are confirmed by the Corps of Engineers. The wetlands appear suitable for a mix of either restoration-by-rehabilitation or enhancement depending on the differing levels of impact observed to each area.

References

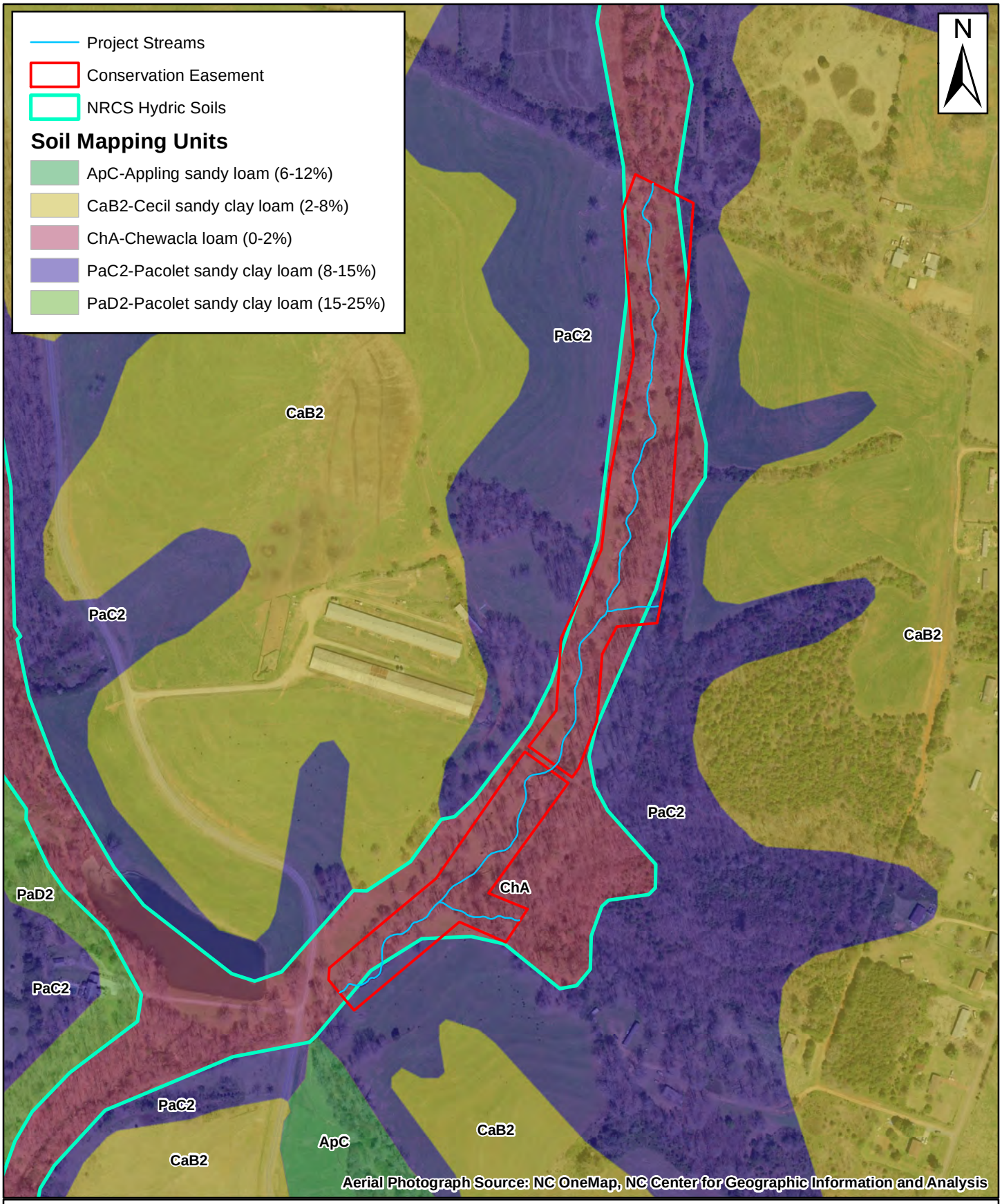
Soil Survey Staff. Gridded Soil Survey Geographic (gSSURGO) Database for North Carolina. United States Department of Agriculture, Natural Resources Conservation Service. Available online at https://gdg.sc.egov.usda.gov/. (FY2016 official release).

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/.

Natural Resource Conservation Service (NRCS) National List of Hydric Soils of the United States, 2016 revision.

United States Department of Agriculture, Natural Resources Conservation Service. 2010. *Field Indicators of Hydric Soils in the United States*, Version 7.0. L.M. Vasilas, G.W. Hurt, and C.V. Noble (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

United States Fish and Wildlife Service. National Wetlands Inventory website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. http://www.fws.gov/wetlands/



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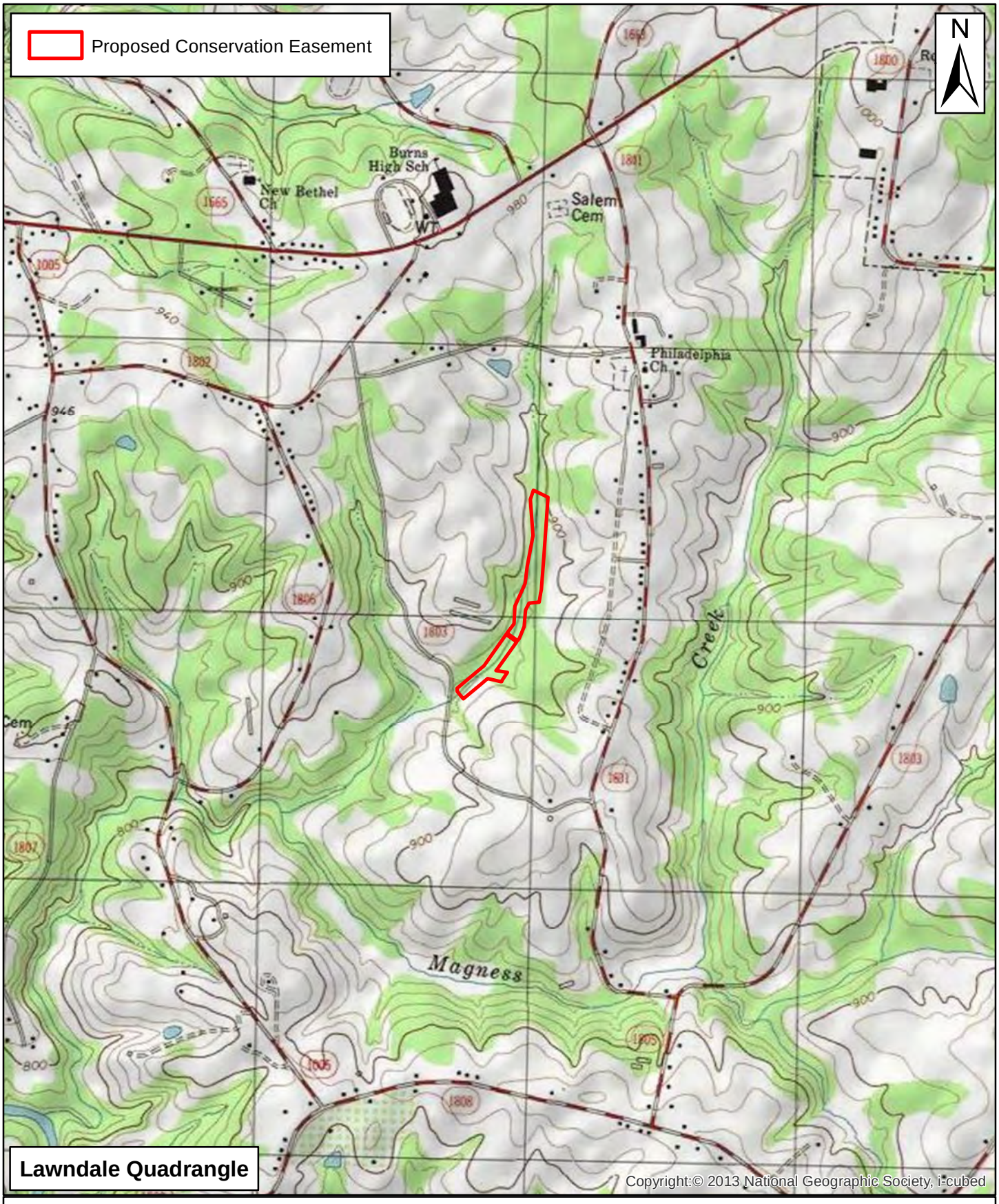
0 400 800 Feet

1 inch = 400 feet

Figure 1
NRCS Soils Map
UT to Magness Creek
Stream Mitigation Project



Michael Baker INTERNATIONAL

0 1,600 3,200 Feet

1 inch = 1,600 feet

Figure 2
USGS Topographic Map
UT to Magness Creek
Stream Mitigation Project

Soil Description Form

Project: UT to Magness Creek

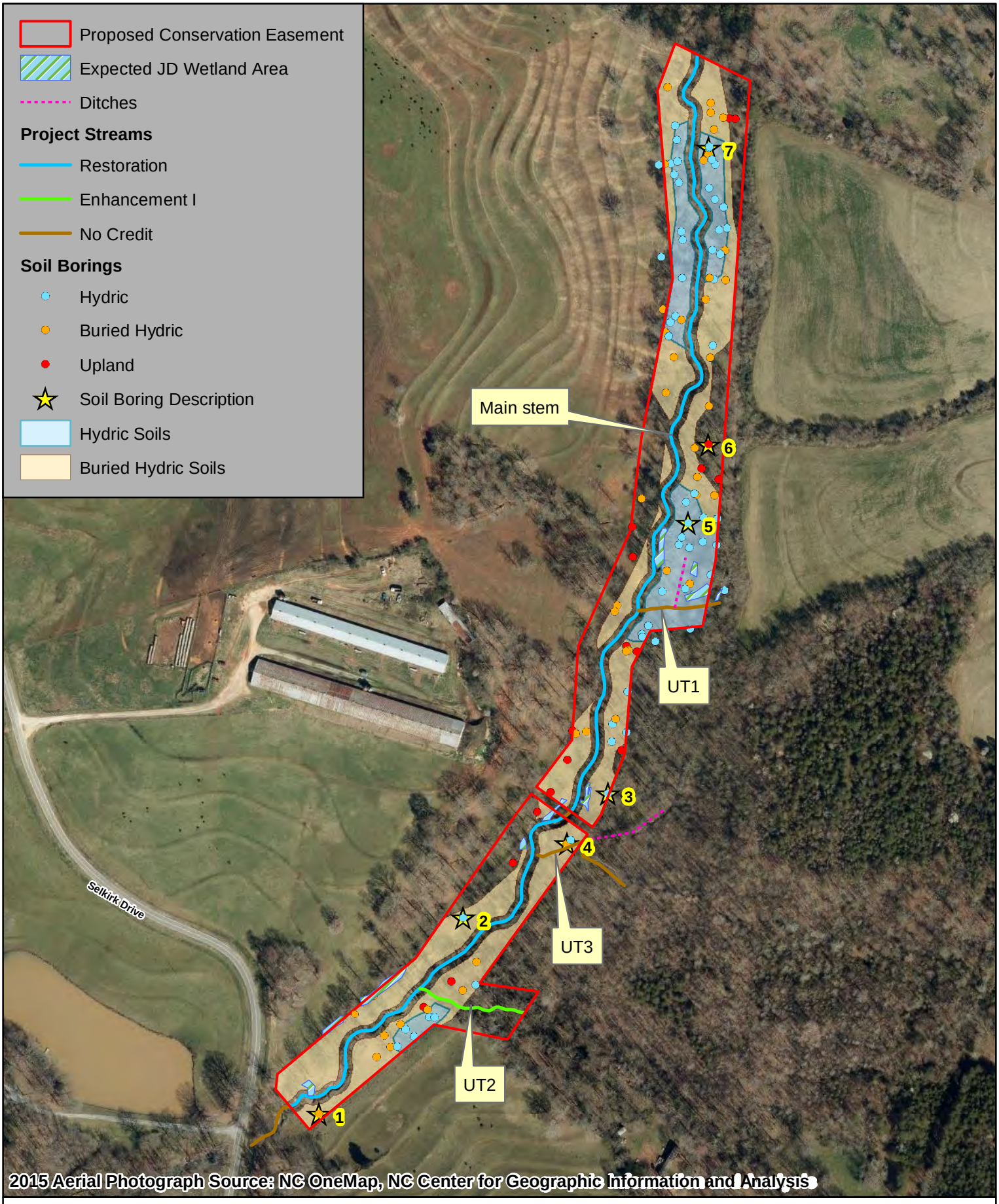
County: Cleveland

Date: 11/8/18

Staff: S. King / R. Myers

Michael Baker INTERNATIONAL

Boring	Horizon	Depth	Texture / Structure / Consistence	Matrix Color	Mottle Color(s) (Quantity / Size / Contrast)
SB 1	A	0-.4'	silt loam	10YR 4/2	(micro), none
	B1	.4-1'	sandy clay loam	10R 4/6	none
	B2	1'-1.9'	loamy clay	10R 4/6	(micro) none
	B3	2-2.5'	sandy loam	10YR 4/1	(micro) 10YR 6/3 & 3/1 (20% combined)
	buried A	2.5'+	silt loam/silt	10YR 2/1	buried A horizon
SB2	A	0-.2'	silt loam	10YR 5/3	-
	B1	.2-.5	silt loam	10YR 5/3	7.5YR 4/6
	B2	.5-1.0	silt loam	10YR 5/1	5YR 4/6
	buried A	1.0'+	silt loam	10YR 2/1	buried A horizon
SB3	A	0-.3'	sandy loam	10YR 3/2	-
	B1	.3-.6'	silty loam	10YR 3/1	~20% 10YR 5/1 depletions
	B2	.6-1.2'	sandy loam	10YR 4/1	coarse sand 2% depletions 5/1
	B3	1.2-2.0'+	sandy clay	10YR 3/1	~2% 5YR 5/6 conc + 5% depletions
SB4	A	0-.2'	loam	7.5YR 4/4	-
	B1	.2-.9'	loam (some sand)	5YR 4/6	very homogeneous
	B2	.9-1.5'	silt loam	10YR 3/1	~2% matrix
	B3	1.5-2.0'+	silt loam	10YR 4/1	5% matrix 5YR 5/6
SB5	A	0-.6'	silt loam	10YR 3/3	-
	buried A	.6-1.5'+	silt loam (some gravel)	10YR 2/1	buried A with mottles → 10% 5YR 4/6
SB6	A	0-.2'	loam	10YR 3/3	
	B1	.2-.7'	silt loam	5YR 3/4	
	B2	.7-1.4'	clay loam	2.5Y 6/3	5YR 4/6
	B3	1.4-2.1'+	clay loam (gravel)	10YR 5/1	5YR 4/6 10%
SB7	A	0-.2'	loam	7.5YR 3/3	-
	B1	.2-.7'	sandy loam	5YR 4/6	-
	B2	.7-1.2'	silt loam	10YR 5/1	5YR 4/6 20% (OX rhizos) Seasonal
	buried A	1.2-1.7'	silt loam	10YR 2/1	5YR 4/6 5%



Michael Baker INTERNATIONAL

0 125 250 500 Feet

N

Figure 3.
Hydric Soil Map
UT to Magness Creek

Soil Boring #1: Buried hydric soil (A-horizon)

Soil Boring #1: Close-up showing soil depletion forming above buried A-horizon

Soil Boring #2: Buried hydric soil (A-horizon)

Soil Boring #2: close-up showing soil depletion forming above buried A-horizon

Soil Boring #3: Hydric soil

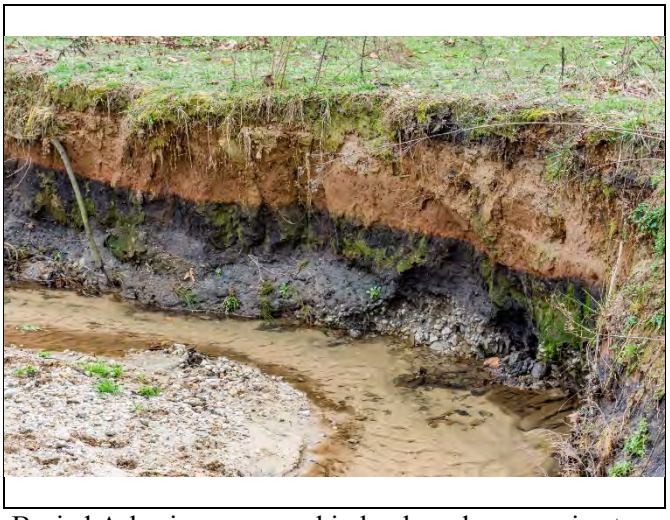
Soil Boring #4: Buried hydric soil

Soil Boring #5: Hydric soil

Soil Boring #6: Upland soil (depletions too deep)

Soil Boring #7: Hydric soil above a buried A-horizon

Soil Boring #7: Close-up showing soil depletions formed above the buried A-horizon



Buried A-horizon exposed in bank on lower main stem

Hydric soil from buried A-horizon

Buried A-horizon at ~1 ft depth exposed on bank in middle of main stem

Close-up of exposed A-horizon showing soil depletions above buried A-horizon

Hydric soil from buried A-horizon

Hydric soil from buried A-horizon

Hydric soil present in floodplain of upper main stem

Hydric soil present in floodplain of middle main stem

Hydric soil present in floodplain of upper main stem

Hydric soil present in floodplain of middle main stem

Hydric soil present in floodplain of lower main stem

Buried A-horizon in floodplain of lower main stem

Additional soil boring showing hydric soil above buried A-horizon on floodplain of upper main stem.

Additional soil boring showing buried hydric soil above buried A-horizon on floodplain of upper main stem.

Additional soil boring showing hydric soil in floodplain of upper main stem.

Additional soil boring showing hydric soil above buried A-horizon in floodplain of upper main stem.

Additional soil boring showing hydric soil in floodplain of middle main stem.

Additional soil boring showing hydric soil in floodplain of middle main stem.

Additional soil boring showing hydric soil above buried A-horizon in floodplain of middle main stem

Sample hydric soil from middle of main stem

APPENDIX K: CORRESPONDENCE

Michael Baker
INTERNATIONAL

Memo Regarding UT to Magness Creek Post Contract IRT Field Meeting

Memo Date: 10/12/18

Meeting Held: 9/27/18 from 9:00 to 11:30 P.M.

Project: UT to Magness Creek, DEQ Contract #7604; DMS Project #100081

Attendees:

Todd Tugwell (Corps of Engineers),
Mac Haupt (DWR),
Paul Wiesner (DMS),
Matthew Reid (DMS),
Todd Bowers (EPA),
Olivia Munzer (WRC),
William Russ (WRC),
Micky Clemmons (Michael Baker),
Katie McKeithan (Michael Baker), and
Russell Myers (Michael Baker).

Meeting Minutes:

This memo and all responses will be included in the Mitigation Plan to serve as a record of field discussions including crediting ratios and approaches.

The following provides a summary of procedures, discussions, and conclusions reached by the group.

The group met at the landowner's drive and moved vehicles to better parking near his poultry houses. IRT members were then transported to the lower end of the project site where the site walk began. A general site overview and map orientation was provided by Micky. The group walked upstream from Selkirk Road to the top of the project along the left bank and returned to the lower end along the right bank.

As we began the walk upstream Micky pointed out that the area immediately above the culvert would not be included within the easement. There are two reasons for excluding this area. The FEMA Zone AE extends to just above the culvert under Selkirk Road (shown in Proposal, Figure 5), and a livestock crossing is needed into the lower pasture along the left bank. Ending the project site upstream of this culvert allows for the livestock crossing and avoids any impacts to the FEMA Zone AE and associated permitting. Todd pointed out that this will also avoid any future issues with NCDOT if they must widen the road or extend the culvert. It was asked if we could place gates on the crossing, so the landowner could limit access when livestock needed to be moved across the stream. Micky responded that Michael Baker could not control how the landowner managed his farm outside of the easement area. However, gates will be placed on the crossing and the landowner will be encouraged to manage access to it. It was also pointed out that there will be an area between the crossing and the culvert that would be fenced to limit livestock to the hardened crossing area. Micky pointed out that there is an existing ditch line that NCDOT has graded and rip-rapped into the pasture and that this would be improved and connected to the channel using a rock lined channel.

We continued upstream to UT2 and walked up the reach along the left bank to the property line. Micky indicated that due to the significant incision and short reach, the stream would be restored using an Enhancement I approach by developing a floodplain bench at the existing elevation. Mac pointed out that several trees would need to be removed, but this will provide good woody material to use for stream structures. The proposed actions for this tributary appeared to be accepted by the group.

The site review continued upstream. Between UT2 and UT1 the group observed drainage ditches that were cut across the floodplain in the past. It was pointed out by Todd that it would be advantageous to remove these ditches in support of wetland functions and Micky indicated that this would be done within the easement area and outside of the easement area if the landowner agreed. The group also observed the invasive trifoliate orange, *Poncirus trifoliata*, growing along the stream with small orange-like fruit; small groups of the invasive privet, *Ligustrum sp*. and multiflora rose, *Rosa multiflora*. Bedrock seams crossing the channel were pointed out by members of the group and Micky was asked how Michael Baker planned to address them within the project plans. He indicated that as the channel is meandered and raised up, some of the exposed bedrock will likely be buried, but it is likely other areas of bedrock may be exposed and will be utilized within the new channel.

IRT members observed that due to the degradation and incision of the existing channel Michael Baker will need a significant amount of fill material to narrow and raise the channel and asked where we planned to obtain this fill. Micky pointed out that there were locations along the floodplain where slopes from higher ground extended or pinched the floodplain along the right side of the stream. These slopes could be cut to provide fill and an area at the back of the poultry houses has been identified as an area the landowner would like leveled which will produce a significant amount of fill. Michael Baker staff feel that between these two options we will have enough fill.

The group stopped at an old ford crossing on UT1. Todd expressed concerns about this intermittent channel being used to generate mitigation credit. At the time of the site visit this channel had no flow and little standing water within it. Micky explained that this was the first time that no flow was observed within the channel during multiple Michael Baker site visits and that the channel scored (27.5) as an intermittent channel based on the NCDWR Stream Classification Form. Todd indicated that the USACE prefers channels be evaluated with the NCSAM instrument and that he was skeptical of the score reported. A lively discussion was held on the pros and cons of including this channel, but in the end, it was agreed that the channel would be excluded from stream mitigation unit (SMU) crediting. Depending on the final jurisdictional call, this channel will most likely be raised to restore channel hydrology to an elevation that best supports wetland functions.

The group continued up the channel to the top of the mainstem. Mac used his auger to check for hydric soils in a couple of locations along the channel and found hydric indicators in these soil samples. Olivia asked how we would utilize the first bedrock seam that is providing channel grade control and how we would repair the upper end of the channel where it is overwide. Micky explained that, at the bedrock point, the plan is to use the bedrock as the beginning of the Priority I channel. The channel is likely to meander offline from this point, at a higher elevation, that allows the stream to access the floodplain. The overwide area will be decreased in width and the proper dimension will be constructed. From this location most, site visit participants walked back down the right bank returning to Selkirk Road and then to their vehicles.

Once everyone returned to their vehicles the group stopped to summarize thoughts on what they had seen and recommendations on how Michael Baker should proceed. These ideas are summarized in the bullets below:

- The IRT accepted the proposed approach for the mainstem and for UT2.
- The IRT does not agree that restoration or enhancement activities should be carried out on UT1 to produce mitigation credit. Michael Baker accepts this assessment and will exclude this channel from any effort to provide SMUs.
- Paul indicated that the DMS will be interested in obtaining any wetland mitigation credits that the site might produce. To this end the IRT recommended an evaluation of existing hydric soils be carried out. Their feelings were that wetlands along the channel would likely be in isolated pockets and their extent would have to be carefully evaluated. They also recommended detail planning for how gauges should be deployed to assess future success, particularly if wetlands are isolated.
- There were no recommendations on the proposed BMP and it was acceptable as proposed.

The proposed approaches and ratios for each reach are provided in the following Table and in the attached map (Attachment A). These are the approaches and ratios agreed upon at this IRT field visit and will be utilized during the project design. Michael Baker and DMS understand that the final design approach and crediting rationale must be justified in the Mitigation Plan.

Reach Name	Approach	Approximate Length (LF)	Ratio	Credits
MS	R	2,950	1:1	2,950
UT2	EI	260	1.5:1	173
Total		3,210*		3,123

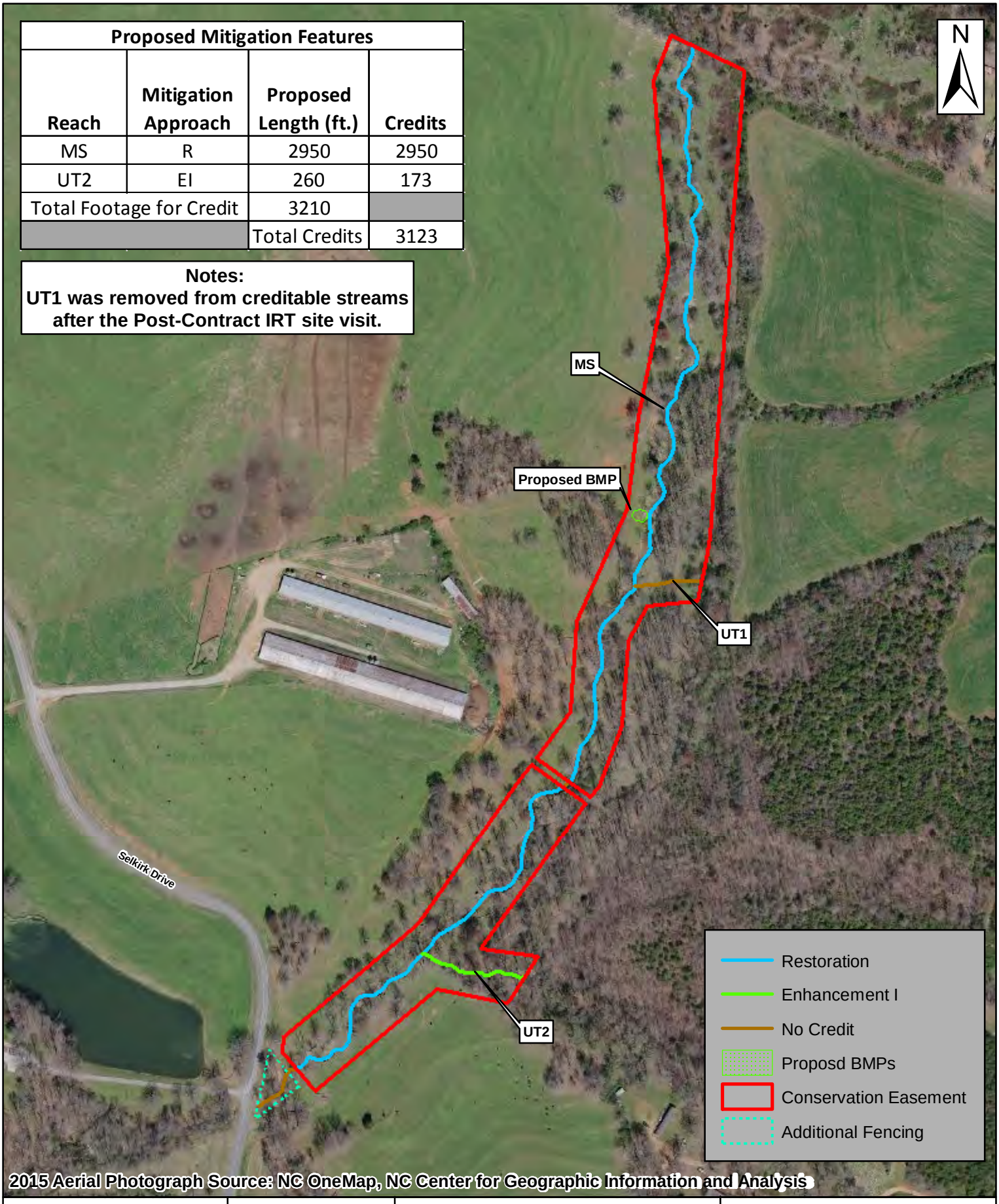
*Actual stream footage will likely change when a survey is completed.

Please let me know if you feel any of the above information is not presented as discussed in the field.

Sincerely,

Micky Clemmons

Micky Clemmons, PM



Michael Baker INTERNATIONAL

North Carolina Division of Mitigation Services
DMS Proj. No. 100081

0 150 300 600 Feet

1 inch = 300 feet

Post IRT Site Visit
Proposed Mitigation Features
UT to Magness Creek
Stream Mitigation Project
Cleveland County, NC

NRCS
Natural Resources
Conservation Service

Grazing Plan

Robert E Yarboro

Planning Scenarios:
Benchmark

Planned

Date: Monday, January 14, 2019

Name:	Robert Yarboro
Address:	2803 Selkirk Dr. Lawndale, NC
Work Telephone:	
Home Telephone:	
Mobile Telephone:	
FAX:	
County:	Cleveland
Region:	Piedmont
Planner:	CME
Notes:	

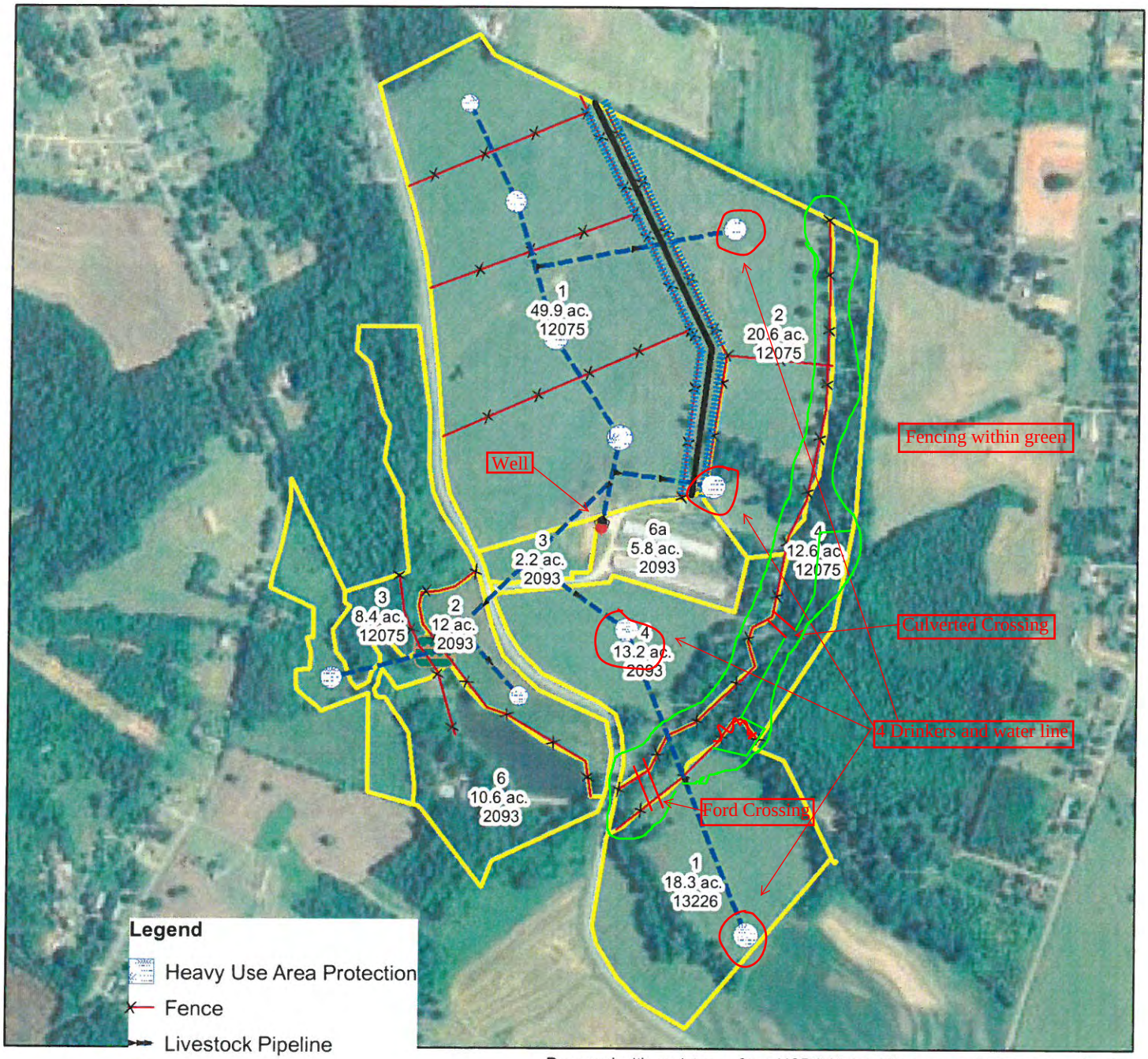
CONSERVATION PLAN MAP

Date: 1/8/2019

Customer(s): ROBERT E YARBORO

Agency: USDA-NRCS

Assisted By: Carter Edgerton



Prepared with assistance from USDA-Natural Resources Conservation Service

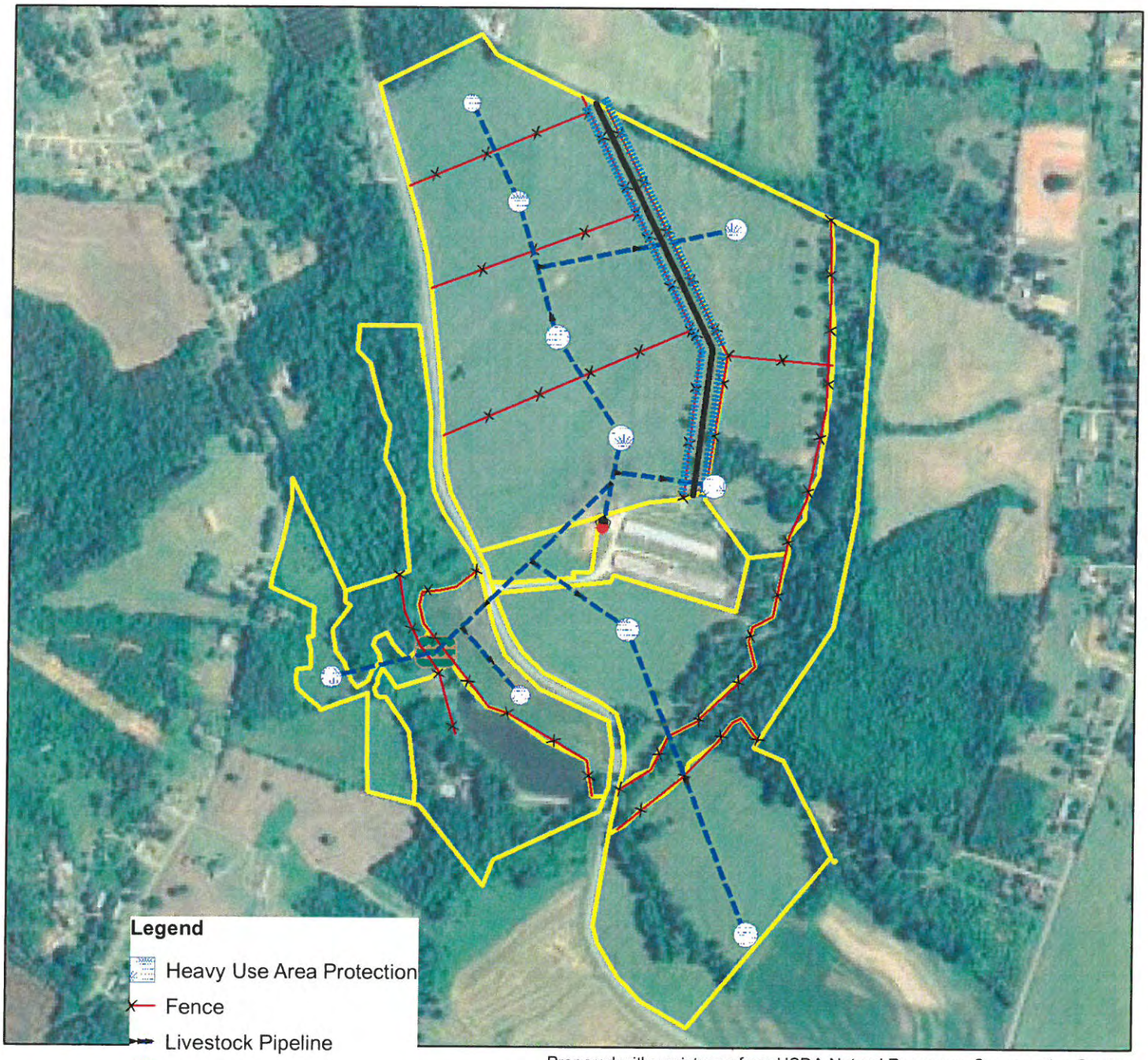
CONSERVATION PLAN MAP

Date: 1/8/2019

Customer(s): ROBERT E YARBORO

Agency: USDA-NRCS

Assisted By: Carter Edgerton



Prepared with assistance from USDA-Natural Resources Conservation Service

USDA

APPENDIX L: PLAN SHEETS

STATE	BAKER PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
NC	167680	1	31

NORTH CAROLINA
DIVISION OF MITIGATION SERVICES

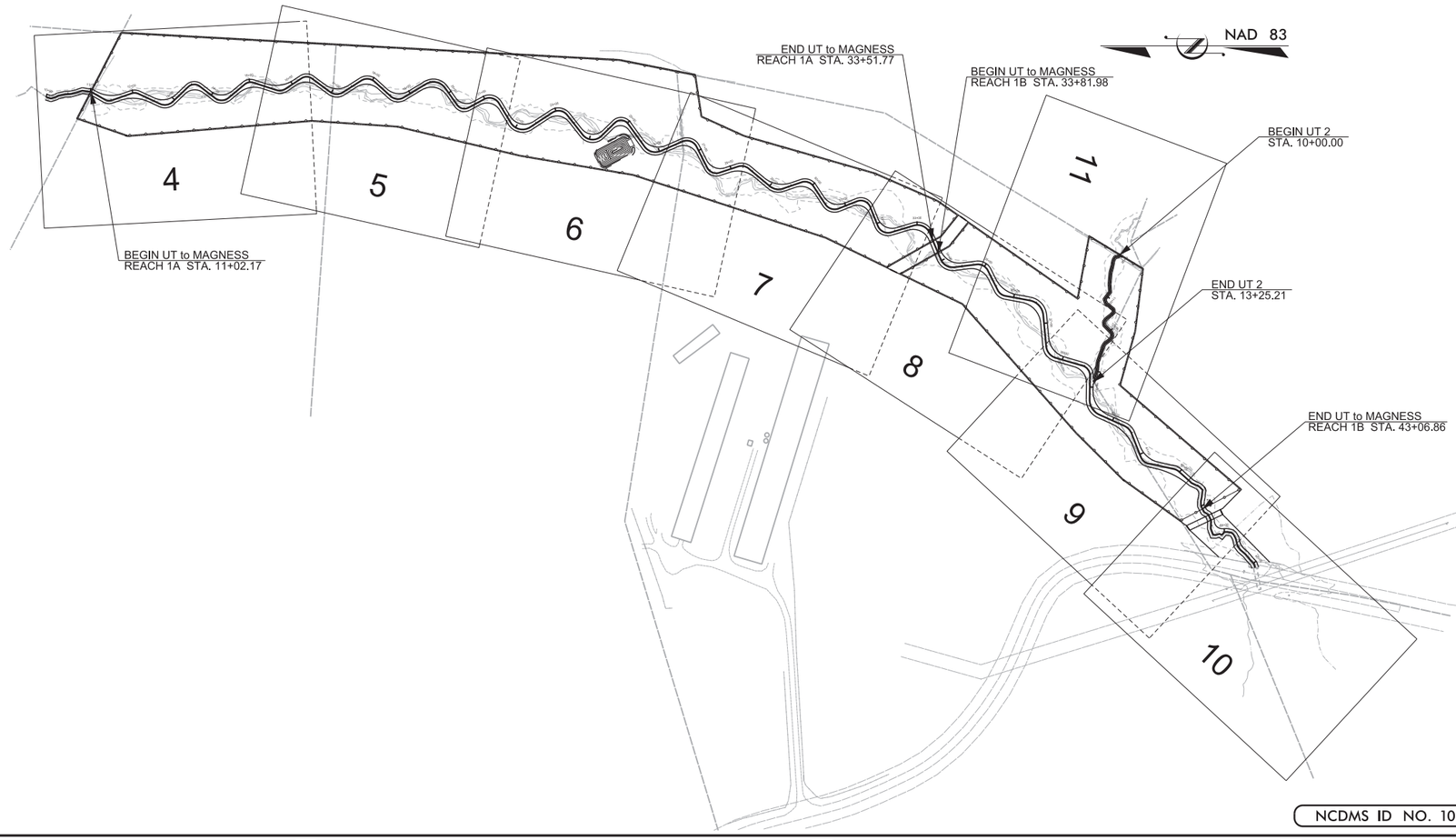
CLEVELAND COUNTY

LOCATION: FROM LAWNDALE, TAKE NC–182 1.9 MILES EAST TO FALL STREET ON LEFT, GO .28 MILES TO SELKIRK ROAD ON LEFT, TRAVEL .87 MILES SOUTH AND SITE IS EAST OF SELKIRK ROAD AT CULVERT.

TYPE OF WORK: STREAM RESTORATION AND ENHANCEMENT

VICINITY MAP

INDEX OF SHEETS



NCDMS ID NO. 100081

PROJECT: 167680

UT to MAGNESS CREEK

GRAPHIC SCALES

20 0 20 40
PLANS

20 0 20 40
PROFILE (HORIZONTAL)

5 0 5 10
PROFILE (VERTICAL)

MITIGATION SUMMARY

STREAM: REACH	STREAM RESTORATION (Ft.)	STREAM ENHANCEMENT I (Ft.)	RATIO	CREDIT
1A	2,249.60	0	1:1	2,249.600
1B	924.88	0	1:1	924.880
UT2	0	325.21	1.5:1	216.807
		TOTAL STREAM CREDITS		3,391.287

WETLAND: APPROACH	AREA (Ac.)	RATIO	CREDIT
RESTORATION BY RE–ESTABLISHMENT	1.856	1:1	1.856
RESTORATION BY REHABILITATION	0.035	1.5:1	0.023
	TOTAL WETLAND CREDITS		1.879

PREPARED FOR THE OFFICE OF:

NCDEQ – NC DMS
217 WEST JONES STREET, SUITE 3000A
RALEIGH, NC 27603

CONTACT: PAUL WIESNER
PROJECT MANAGER

Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

LETTING DATE:

KATHLEEN M. MCKEITHAN, PE
PROJECT ENGINEER

PROJECT ENGINEER

PROGRESS DRAWING
FOR REVIEW PURPOSES ONLY
DO NOT USE FOR CONSTRUCTION

SIGNATURE: *P.E.*

2/26/03

STREAM CONVENTIONAL SYMBOLS

SUPERCEDES SHEET 1-B

- ROCK J-HOOK
- GRADE CONTROL ROCK J-HOOK
- ROCK VANE
- OUTLET PROTECTION
- ROCK CROSS VANE
- ROCK DOUBLE DROP ROCK CROSS VANE
- SINGLE WING DEFLECTOR
- DOUBLE WING DEFLECTOR
- TEMPORARY SILT CHECK
- ROOT WAD
- LOG J-HOOK
- GRADE CONTROL LOG J-HOOK
- LOG VANE
- LOG STEP
- LOG CROSS VANE
- LOG AND ROCK STEP POOL
- BOULDER STEP
- CONSTRUCTED RIFFLE
- BOULDER CLUSTER
- ROCK STEP POOL
- WLB JURISDICTIONAL WETLAND BOUNDARY

**NOTE: ALL ITEMS ABOVE MAY NOT BE USED ON THIS PROJECT

- SAFETY FENCE
- TF TAPE FENCE
- FP 100 YEAR FLOOD PLAIN
- CE CONSERVATION EASEMENT
- 435 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- LIMITS OF DISTURBANCE
- PROPERTY LINE
- FOOT BRIDGE
- TEMPORARY STREAM CROSSING
- PERMANENT STREAM CROSSING
- TRANSPLANTED VEGETATION
- TREE REMOVAL
- TREE PROTECTION
- CHANNEL PLUG
- CHANNEL FILL
- BRUSH TOE WITH MATTING AND DOUBLE LIVE STAKES
- GEOLIFT WITH BRUSH TOE
- GEOLIFT WITH LIVE BRUSH, LOGS, AND ROOT WADS
- NON-CREDITED JURISDICTIONAL WETLANDS
- WETLAND RE-ESTABLISHMENT
- WETLAND ENHANCEMENT

STANDARD SPECIFICATIONS

NORTH CAROLINA
EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL
MARCH 2009 (REV 2013)

6.06 TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
6.24 RIPARIAN AREA SEEDING
6.60 TEMPORARY SEDIMENT TRAP
6.62 TEMPORARY SILT FENCE
6.63 TEMPORARY ROCK DAM
6.70 TEMPORARY STREAM CROSSING

PROJECT REFERENCE NO.	SHEET NO.
167680	1-A

PROGRESS DRAWING
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Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100081

GENERAL NOTES

1. THE CONTRACTOR IS REQUIRED TO INSTALL IN-STREAM STRUCTURES USING A TRACK HOE WITH A HYDRAULIC THUMB OF SUFFICIENT SIZE TO PLACE BOULDERS (4'x3'x2'), LOGS AND ROOTWADS.
2. WORK IS BEING PERFORMED AS AN ENVIRONMENTAL RESTORATION PLAN. THE CONTRACTOR SHOULD MAKE ALL REASONABLE EFFORTS TO REDUCE SEDIMENT LOSS AND MINIMIZE DISTURBANCE OF THE SITE WHILE PERFORMING THE CONSTRUCTION WORK.
3. CONSTRUCTION IS SCHEDULED FOR THE SUMMER OF 2021.
4. CONTRACTOR SHOULD CALL NORTH CAROLINA "ONE-CALL" BEFORE EXCAVATION STARTS. (1-800-632-4949)
5. BOULDER SIZES FOR IN-STREAM STRUCTURES SHALL BE A MINIMUM OF 4'x3'x2' AND CAN BE CHANGED PER DIRECTION OF THE ENGINEER.
6. ALL ON-SITE ALLUVIUM SHALL BE HARVESTED AND STOCKPILED PRIOR TO FILLING ABANDONED CHANNELS.
7. TOPSOIL SHALL BE EXCAVATED TO A DEPTH OF 8" AND STOCKPILED SEPARATELY FROM UNDERCUT SOIL. 6" OF TOPSOIL SHALL BE PLACED ON ALL BANKFULL BENCHES AND AS DIRECTED BY THE ENGINEER.
8. ALL DISTURBED EMBANKMENTS SHALL BE MATTED WITH COIR FIBER MATTING OR AS DIRECTED BY THE ENGINEER.
9. ALL STREAM BANKS SHALL BE LIVE STAKED.
10. UNLESS THE ALIGNMENT IS BEING ALTERED, THE EXISTING CHANNEL DIMENSIONS ARE TO REMAIN UNLESS OTHERWISE NOTED.
11. CONTRACTOR WILL ENSURE THAT FENCING IS INSTALLED ON OR OUTSIDE THE CONSERVATION EASEMENT AS SHOWN ON THE PLANS BUT NO MORE THAN 1' OUTSIDE.
12. WHERE PROPOSED FENCE CROSSES EXISTING STREAMS, THE CONTRACTOR SHALL UTILIZE A SECTION OF BREAK AWAY FENCE, A FLOOD GATE, OR ELECTRIFIED CHAINS AS DIRECTED BY THE ENGINEER.

VEGETATION SELECTION

Proposed Bare-Root and Live Stake Species
UT to Magness Creek Mitigation Project - NCDMS Project No. 100081

Botanical Name	Common Name	% Planted by Species	Wetland Tolerance
All Buffer Plantings at 680 stems/acre using 8' X 8' spacing			
General Riparian Zone – Overstory/Canopy Species			
Liriodendron tulipifera	Tulip Poplar	15%	FACU
Betula nigra	River Birch	15%	FACW
Platanus occidentalis	Sycamore	15%	FACW
Quercus phellos	Willow Oak	10%	FAC
Celtis laevigata	Sugarberry	10%	FACW
Quercus nigra	Water Oak	5%	FAC
Fraxinus pennsylvanica	Green Ash	5%	FACW
Diospyros virginiana	Persimmon	5%	FAC
Ulmus americana	American Elm	5%	FACW
General Riparian Zone – Understory/Shrub Species			
Carpinus caroliniana	American Hornbeam	5%	FAC
Lindera benzoin	Spicebush	2.5%	FAC
Asimina triloba	Pawpaw	2.5%	FAC
Magnolia tripetala	Umbrella Tree	2.5%	FACU
Halesia carolina	Carolina Silverbell	2.5%	FAC

Wetland Zone – Overstory/Canopy Species			
Betula nigra	River Birch	15%	FACW
Platanus occidentalis	Sycamore	15%	FACW
Quercus michauxii	Swamp Chestnut Oak	15%	FACW
Quercus palustris	Pin Oak	10%	FACW
Quercus phellos	Willow Oak	10%	FAC
Nyssa sylvatica	Blackgum	5%	FAC
Acer negundo	Box Elder	5%	FAC
Fraxinus pennsylvanica	Green Ash	5%	FACW
Ulmus americana	American Elm	5%	FACW
Wetland Zone – Understory/Shrub Species			
Alnus serrulata	Tag Alder	5%	OBL
Ilex verticillata	Winterberry	2.5%	FACW
Cephalanthus occidentalis	Buttonbush	2.5%	OBL
Cornus amomum	Silky Dogwood	2.5%	FACW
Aronia arbutifolia	Red Chokeberry	2.5%	FACW
Streambank Live Stake Plantings			
Salix sericea	Silky Willow	25%	OBL
Sambucus canadensis	Elderberry	20%	FACW
Cephalanthus occidentalis	Buttonbush	10%	OBL
Cornus amomum	Silky Dogwood	20%	FACW
Salix nigra	Black Willow	25%	OBL

Proposed Permanent Seed Mixture
UT to Magness Creek Mitigation Project – NCDMS Project No. 100081

Botanical Name	Common Name	% Planted by Species	Density (lbs/ac)	Wetland Tolerance
Agrostis perennans	Autumn Bentgrass	10%	1.5	FACW
Elymus virginicus	Virginia Wildrye	15%	2.25	FACW
Panicum virgatum	Switchgrass	15%	2.25	FAC
Tripsacum dactyloides	Eastern Gamma Grass	5%	0.75	FACW
Polygonum pennsylvanicum	Pennsylvania Smartweed	5%	0.75	FACW
Schizachyrium scoparium	Little Blue Stem	5%	0.75	FACU
Juncus effusus	Soft Rush	5%	0.75	FACW
Bidens frondosa (or aristosa)	Beggars Tick	5%	0.75	FACW
Coreopsis lanceolata	Lance-Leaved Tick Seed	10%	1.5	FACU
Dichanthelium clandestinum	Tioga Deer Tongue	10%	1.5	FAC
Andropogon gerardii	Big Blue Stem	5%	0.75	FAC
Sorghastrum nutans	Indian Grass	5%	0.75	FACU
Monarda punctata	Spotted Beebalm	5%	0.75	FACU
	Total	**100%**	**15**	

Note: Final species selection may change due to refinement of site conditions or to availability at the time of planting. If species substitution is required, the planting Contractor will submit a revised planting list to Baker for approval prior to the procurement of plant stock.

PROJECT REFERENCE NO.	SHEET NO.
167680	1-B
NCDMS ID NO. 100081	

2/26/03

*S.U.E = SUBSURFACE UTILITY ENGINEER

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CONVENTIONAL SYMBOLS

BOUNDARIES AND PROPERTY:

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin — EIP
- Property Corner
- Property Monument — ECM
- Parcel/Sequence Number — 123
- Existing Fence Line
- Proposed Woven Wire Fence
- Proposed Chain Link Fence
- Proposed Barbed Wire Fence
- Existing Wetland Boundary — WLB
- Proposed Wetland Boundary — WLB
- Existing Endangered Animal Boundary — EAB
- Existing Endangered Plant Boundary — EPB

BUILDINGS AND OTHER CULTURE:

- Gas Pump Vent or U/G Tank Cap
- Sign — S
- Well — W
- Small Mine
- Foundation
- Area Outline
- Cemetery
- Building
- School
- Church
- Dam

HYDROLOGY:

- Stream or Body of Water
- Hydro, Pool or Reservoir
- Jurisdictional Stream — JS
- Buffer Zone 1 — BZ 1
- Buffer Zone 2 — BZ 2
- Flow Arrow
- Disappearing Stream
- Spring
- Wetland
- Proposed Lateral, Tail, Head Ditch — FLOW
- False Sump

RAILROADS:

- Standard Gauge — CSX TRANSPORTATION
- RR Signal Milepost — MILEPOST 35
- Switch — SWITCH
- RR Abandoned
- RR Dismantled

RIGHT OF WAY:

- Baseline Control Point
- Existing Right of Way Marker
- Existing Right of Way Line
- Proposed Right of Way Line — RW
- Proposed Right of Way Line with Iron Pin and Cap Marker — RW
- Proposed Right of Way Line with Concrete or Granite Marker — RW
- Existing Control of Access — CA
- Proposed Control of Access — CA
- Existing Easement Line — E
- Proposed Temporary Construction Easement — E
- Proposed Temporary Drainage Easement — TDE
- Proposed Permanent Drainage Easement — PDE
- Proposed Permanent Utility Easement — PUE
- Proposed Temporary Utility Easement — TUE
- Proposed Permanent Easement with Iron Pin and Cap Marker

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement
- Existing Curb
- Proposed Slope Stakes Cut — C
- Proposed Slope Stakes Fill — F
- Proposed Wheel Chair Ramp — WCR
- Existing Metal Guardrail
- Proposed Guardrail
- Existing Cable Guiderail
- Proposed Cable Guiderail
- Equality Symbol
- Pavement Removal

VEGETATION:

- Single Tree
- Single Shrub
- Hedge
- Woods Line
- Orchard
- Vineyard — Vineyard

EXISTING STRUCTURES:

MAJOR:

- Bridge, Tunnel or Box Culvert — CONC
- Bridge Wing Wall, Head Wall and End Wall — CONC WW

MINOR:

- Head and End Wall — CONC HW
- Pipe Culvert
- Footbridge
- Drainage Box: Catch Basin, DI or JB — CB
- Paved Ditch Gutter
- Storm Sewer Manhole — S
- Storm Sewer — S

UTILITIES:

POWER:

- Existing Power Pole
- Proposed Power Pole
- Existing Joint Use Pole
- Proposed Joint Use Pole
- Power Manhole — P
- Power Line Tower
- Power Transformer
- U/G Power Cable Hand Hole — HH
- H-Frame Pole
- Recorded U/G Power Line — P
- Designated U/G Power Line (S.U.E.*) — P

TELEPHONE:

- Existing Telephone Pole
- Proposed Telephone Pole
- Telephone Manhole — T
- Telephone Booth
- Telephone Pedestal — T
- Telephone Cell Tower
- U/G Telephone Cable Hand Hole — HH
- Recorded U/G Telephone Cable — T
- Designated U/G Telephone Cable (S.U.E.*) — T
- Recorded U/G Telephone Conduit — TC
- Designated U/G Telephone Conduit (S.U.E.*) — TC
- Recorded U/G Fiber Optics Cable — T FO
- Designated U/G Fiber Optics Cable (S.U.E.*) — T FO

WATER:

- Water Manhole — W
- Water Meter
- Water Valve
- Water Hydrant
- Recorded U/G Water Line — W
- Designated U/G Water Line (S.U.E.*) — W
- Above Ground Water Line — A/G Water

TV:

- TV Satellite Dish
- TV Pedestal — C
- TV Tower
- U/G TV Cable Hand Hole — HH
- Recorded U/G TV Cable — TV
- Designated U/G TV Cable (S.U.E.*) — TV
- Recorded U/G Fiber Optic Cable — TV FO
- Designated U/G Fiber Optic Cable (S.U.E.*) — TV FO

GAS:

- Gas Valve
- Gas Meter
- Recorded U/G Gas Line — G
- Designated U/G Gas Line (S.U.E.*) — G
- Above Ground Gas Line — A/G Gas

SANITARY SEWER:

- Sanitary Sewer Manhole
- Sanitary Sewer Cleanout
- U/G Sanitary Sewer Line — SS
- Above Ground Sanitary Sewer — A/G Sanitary Sewer
- Recorded SS Forced Main Line — FSS
- Designated SS Forced Main Line (S.U.E.*) — FSS

MISCELLANEOUS:

- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box — S
- Utility Unknown U/G Line — ?UTL
- U/G Tank; Water, Gas, Oil
- A/G Tank; Water, Gas, Oil
- U/G Test Hole (S.U.E.*)
- Abandoned According to Utility Records — AATUR
- End of Information — E.O.I.

9/8/2020
M:\Projects\167680_UT to Magness C:\Design\Plans\167680_PSH_01B.dgn
mcrae

revised 02/02/00

2/26/03

PROJECT REFERENCE NO.	SHEET NO.
167680	2

PROGRESS DRAWING
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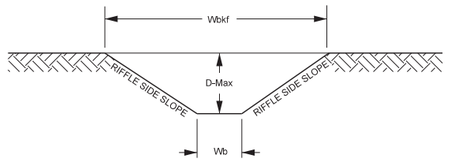
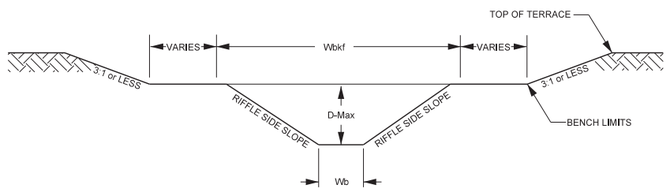
Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100081

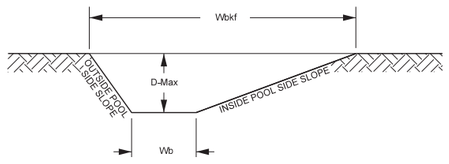
TYPICAL RIFFLE, POOL, AND BANKFULL BENCH CROSS SECTIONS



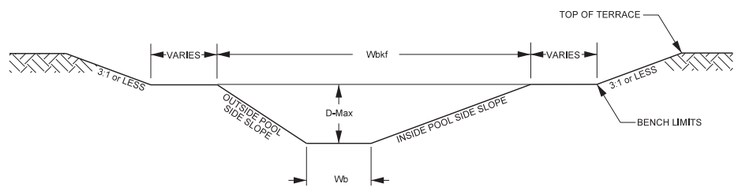
RIFFLE



RIFFLE WITH BANKFULL BENCH



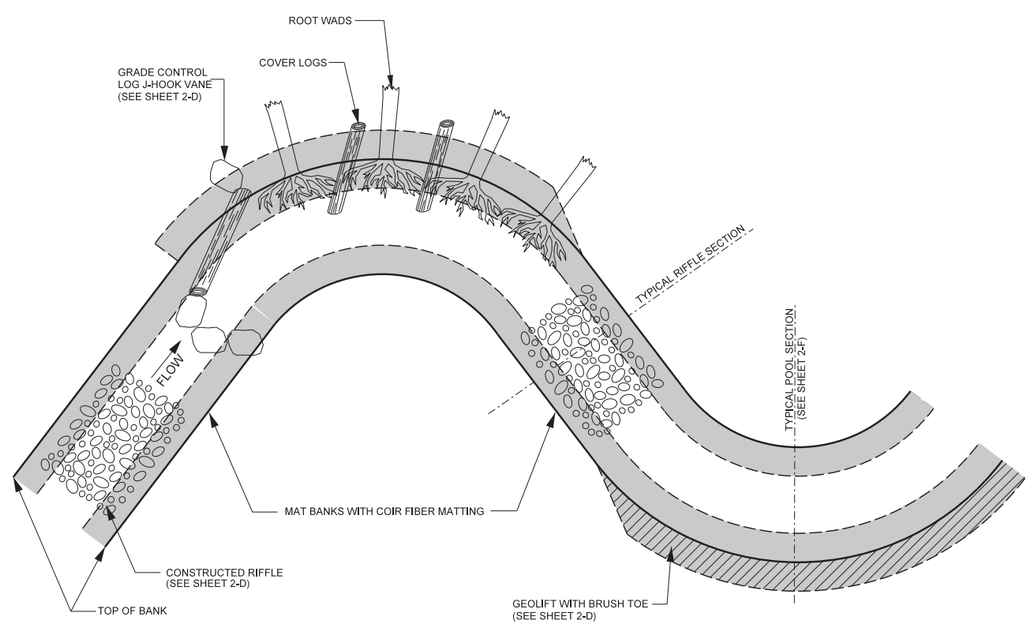
POOL



POOL WITH BANKFULL BENCH

	UT to MAGNESS REACH 1A 11+02.17 to 33+53.65		UT to MAGNESS REACH 1B 33+79.06 to 43+06.86		UT2	
	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL
WIDTH OF BANKFULL (Wbkf)	12.5	18.0	14.5	20.0	6.3	8.0
AVERAGE DEPTH	0.9	1.4	1.0	1.8	0.5	0.9
MAXIMUM DETPH (Dmax)	1.2	2.5	1.3	3.0	0.6	1.3
WIDTH TO DEPTH RATIO (bkf W/D)	14.2	13.1	15.2	11.3	12.5	9.1
BANKFULL AREA (Abkf)	11.0	24.7	13.8	35.3	2.7	7.0
BOTTOM WIDTH (Wb)	8.3	1.8	10.0	3.5	4.2	2.8
RIFFLE SIDE SLOPE (X:1)	2.0	N/A	2.0	N/A	2.0	N/A
INSIDE POOL SIDE SLOPE	N/A	4.0	N/A	4.0	N/A	2.0
OUTSIDE POOL SIDE SLOPE	N/A	1.5	N/A	1.5	N/A	2.0

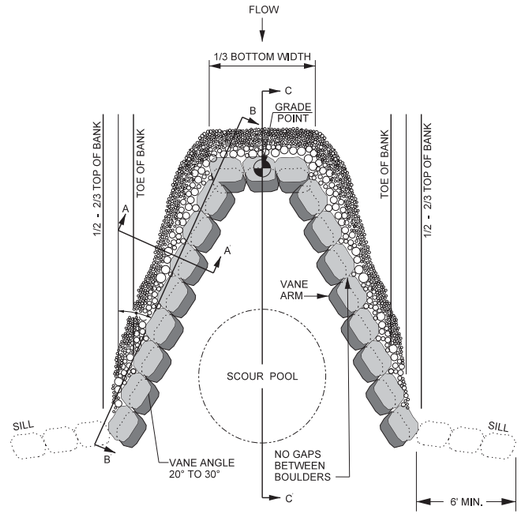
TYPICAL STRUCTURE PLACEMENT



STRUCTURE NOTES:

1. GENERALLY CONSTRUCTED RIFFLES, ROOT WADS, LOG VANES AND COIR FIBER MATTING WILL BE INSTALLED IN THE LOCATION AND SEQUENCE AS SHOWN.
2. ANY CHANGES TO NUMBER OR LOCATION OF STRUCTURES DURING CONSTRUCTION MUST BE APPROVED BY THE DESIGN ENGINEER.
3. COIR FIBER MATTING TO BE INSTALLED ON ALL RESTORED STREAMBANKS, FLOODPLAIN BENCHING, AND TERRACE SLOPES AS DESCRIBED IN THE TECHNICAL SPECIFICATIONS.
4. ROOTWADS MAY BE REPLACED WITH GEOLIFT.

ROCK CROSS VANE

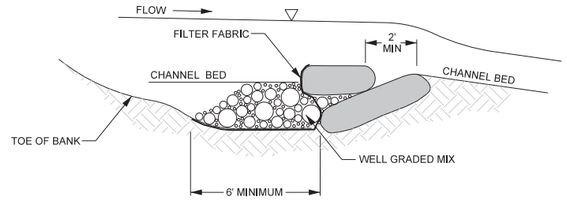


PLAN VIEW

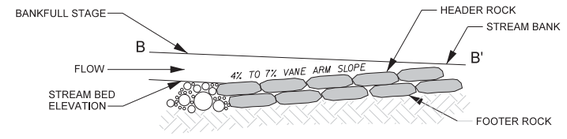
REACH	VANE LENGTH	BOULDER SIZE
REACH 1A	11,3'	2'x3'x4'
REACH 1B	14,0'	2'x3'x4'
UT2	N/A	N/A

NOTES FOR ALL VANE STRUCTURES:

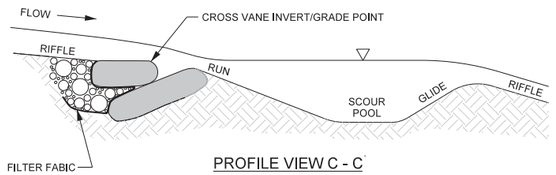
1. INSTALL FILTER FABRIC FOR DRAINAGE BEGINNING AT THE MIDDLE OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF SIX FEET.
2. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS AND PLACE FILL ON UPSTREAM SIDE OF VANE ARM, BETWEEN THE ARM AND STREAMBANK.
3. CONSTRUCT ANGLE AND SLOPE SPECIFICATIONS AS SHOWN.
4. BACKFILL VANE ARMS AND INVERT WITH A WELL GRADED MIX OF CLASS B, A, AND #57 STONE.
5. ON-SITE ALLUVIUM SHALL BE INCORPORATED INTO THE STONE BACKFILL WHERE AVAILABLE.
6. BOULDER SILL MUST BE A MINIMUM OF 6'.
7. BOULDERS FOR REACH 1A AND REACH 1B MUST BE AT LEAST 2'x3'x4'; WHILE BOULDERS FOR UT2 SHOULD BE 1'x2'x3'.



SECTION A - A'



PROFILE VIEW B - B'
VANE ARM



PROFILE VIEW C - C'

4/14/2021
N:\Projects\167680_UT to Magness C:\Design\Plans\167680_PSH_02.dgn
mcneal

2/26/03

PROJECT REFERENCE NO.	SHEET NO.
167680	2A

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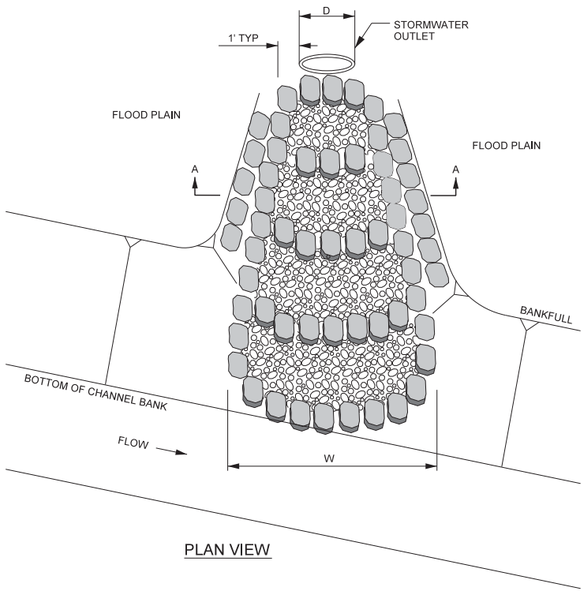
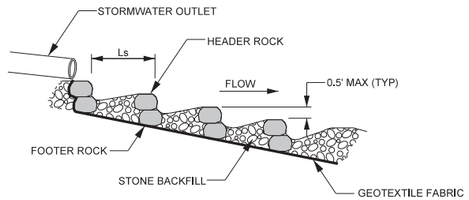
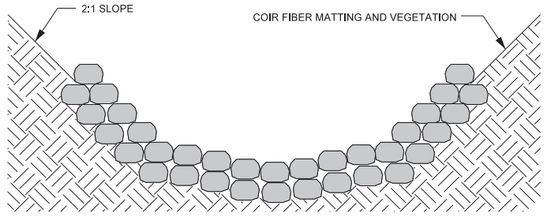
OUTLET PROTECTION



PLAN VIEW

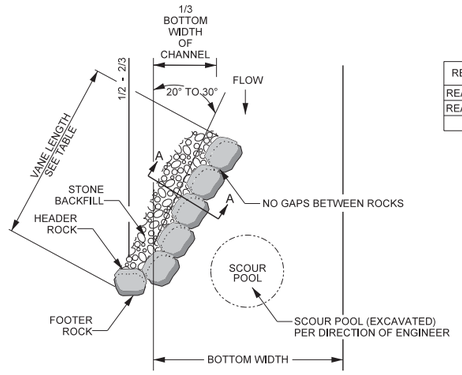


PROFILE VIEW



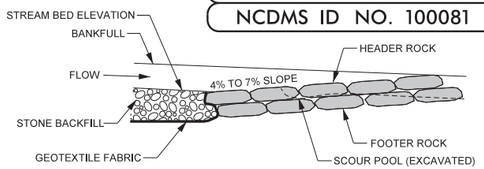
CROSS SECTION A - A

ROCK VANE

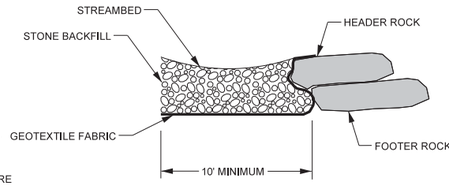


PLAN VIEW

REACH	VANE LENGTH	BOULDER SIZE
REACH 1A	11,3'	2'x3'x4'
REACH 1B	14,0'	2'x3'x4'
UT2	N/A	N/A



PROFILE VIEW

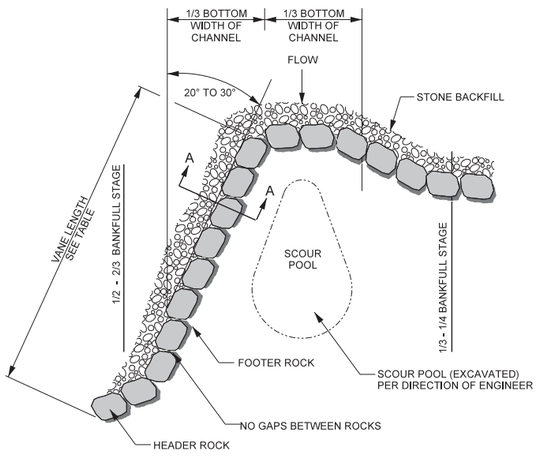


SECTION A - A

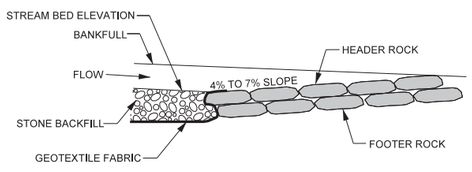
NOTES FOR ALL VANE STRUCTURES:

1. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS.
2. START AT BANK AND PLACE FOOTER ROCKS FIRST AND THEN HEADER (TOP) ROCK.
3. CONTINUE WITH STRUCTURE, FOLLOWING ANGLE AND SLOPE SPECIFICATIONS.
4. AN EXTRA ROCK CAN BE PLACED IN SCOUR POOL FOR HABITAT IMPROVEMENT.
5. USE HAND PLACED STONE TO FILL GAPS ON UPSTREAM SIDE OF HEADER AND FOOTER ROCKS.
6. INSTALL GEOTEXTILE FABRIC BEGINNING AT THE TOP OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF SIX FEET.
7. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION 2"-4" BELOW THE THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE. FILL SHOULD BE CONCAVE BEHIND THE VANE ARM TO ALLOW POOLING OF FLOW.
8. START SLOPE AT 2/3 TO 3/4 TIMES THE BANKFULL STAGE.
9. ALL REACHES, BOULDER SIZE 1' x 2' x 3' TO 2' x 2' x 4'.

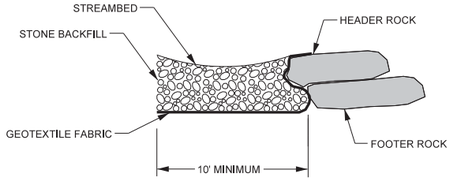
GRADE CONTROL ROCK J-HOOK VANE



PLAN VIEW



PROFILE VIEW



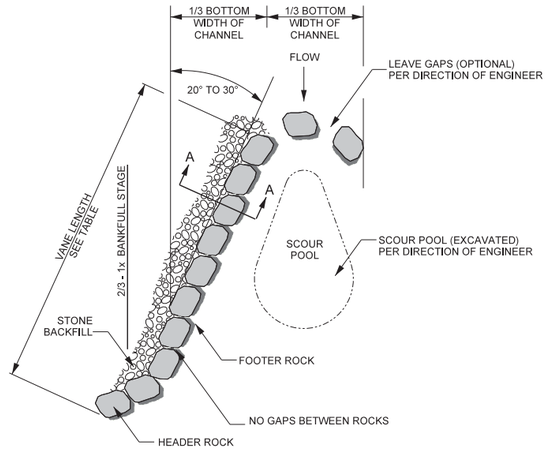
SECTION A - A

NOTES FOR ALL VANE STRUCTURES:

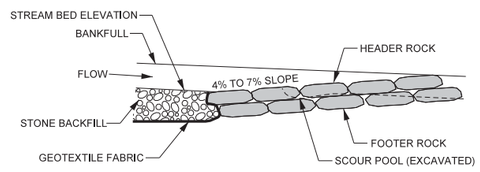
1. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS.
2. START AT BANK AND PLACE FOOTER ROCKS FIRST AND THEN HEADER (TOP) ROCK.
3. CONTINUE WITH STRUCTURE, FOLLOWING ANGLE AND SLOPE SPECIFICATIONS.
4. AN EXTRA ROCK CAN BE PLACED IN SCOUR POOL FOR HABITAT IMPROVEMENT.
5. USE HAND PLACED STONE TO FILL GAPS ON UPSTREAM SIDE OF HEADER AND FOOTER ROCKS.
6. INSTALL GEOTEXTILE FABRIC BEGINNING AT THE TOP OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF SIX FEET.
7. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION 2"-4" BELOW THE THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE. FILL SHOULD BE CONCAVE BEHIND THE VANE ARM TO ALLOW POOLING OF FLOW.
8. START SLOPE AT THE BANKFULL STAGE.
9. REACH 1A AND 1B, BOULDER SIZE 2' x 3' x 4'.

REACH	VANE LENGTH	BOULDER SIZE
REACH 1A	11,3'	2'x3'x4'
REACH 1B	14,0'	2'x3'x4'
UT2	N/A	N/A

ROCK J-HOOK VANE

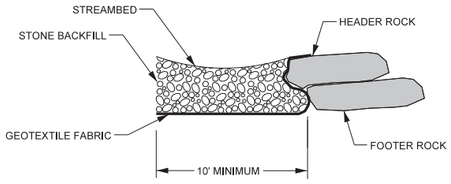


PLAN VIEW



PROFILE VIEW

REACH	VANE LENGTH	BOULDER SIZE
REACH 1A	11,3'	2'x3'x4'
REACH 1B	14,0'	2'x3'x4'
UT2	N/A	N/A



SECTION A - A

NOTES FOR ALL VANE STRUCTURES:

1. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS.
2. START AT BANK AND PLACE FOOTER ROCKS FIRST AND THEN HEADER (TOP) ROCK.
3. CONTINUE WITH STRUCTURE, FOLLOWING ANGLE AND SLOPE SPECIFICATIONS.
4. AN EXTRA ROCK CAN BE PLACED IN SCOUR POOL FOR HABITAT IMPROVEMENT.
5. USE HAND PLACED STONE TO FILL GAPS ON UPSTREAM SIDE OF HEADER AND FOOTER ROCKS.
6. INSTALL GEOTEXTILE FABRIC BEGINNING AT THE TOP OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF SIX FEET.
7. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION 2"-4" BELOW THE THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE. FILL SHOULD BE CONCAVE BEHIND THE VANE ARM TO ALLOW POOLING OF FLOW.
8. START SLOPE AT THE BANKFULL ELEVATION.
9. REACH 1A AND 1B, BOULDER SIZE 2' x 3' x 4'.

12/3/2020
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mcreed

2/26/03

PROJECT REFERENCE NO.	SHEET NO.
167680	2B

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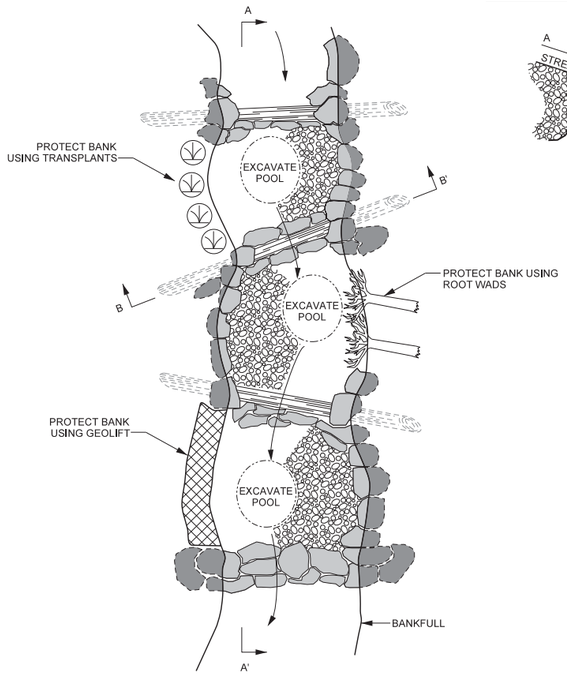
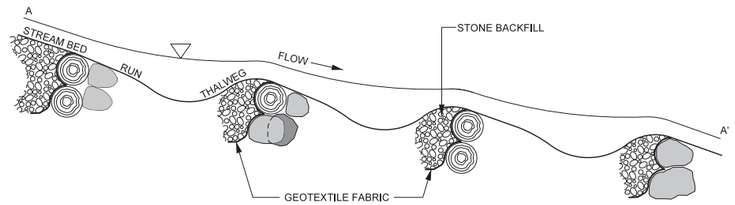
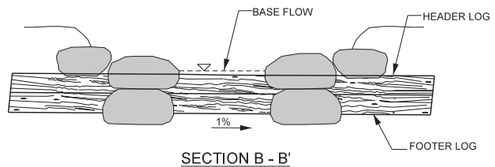
LOG AND ROCK STEP / POOL



PLAN VIEW



SECTION A - A'



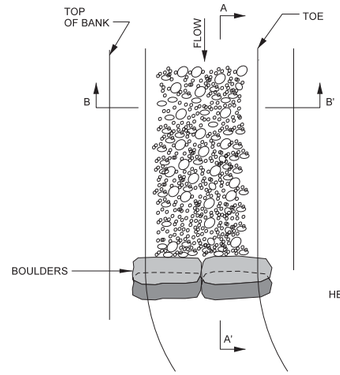
SECTION B - B'

REACH	BOULDER SIZE
REACH 1A	2'x3'x4'
REACH 1B	2'x3'x4'
UT2	1'x2'x3'

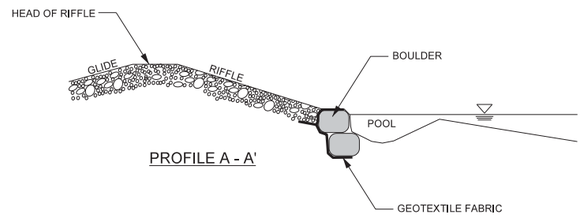
NOTES:

1. LOGS SHOULD BE AT LEAST 10" IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, AND RECENTLY HARVESTED AND EXTENDING INTO THE BANK 5' ON EACH SIDE.
2. SOIL SHOULD BE COMPACTED WELL AROUND BURIED PORTIONS OF LOG.
3. GEOTEXTILE FABRIC SHOULD BE NAILED TO THE LOG BELOW THE BACKFILL.
4. BOULDERS SHOULD BE PLACED ON TOP OF HEADER LOG FOR ANCHORING.
5. TRANSPLANTS CAN BE USED INSTEAD OF BOUDERS, PER DIRECTION OF ENGINEER.
6. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION OF THE TOP OF THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE.

BOULDER STEP



PLAN VIEW



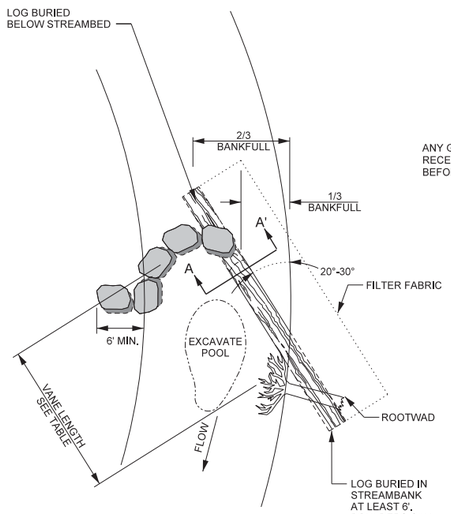
PROFILE A - A'

NOTES:

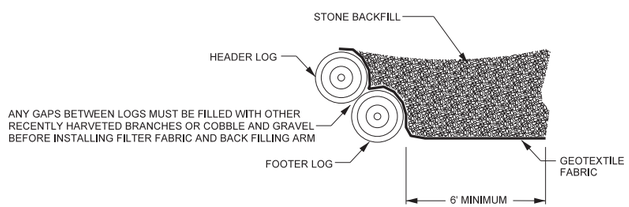
1. FOOTERS SHALL BE INSTALLED SUCH THAT 1/4 TO 1/3 OF THE LENGTH IS DOWNSTREAM OF THE HEADER.
2. SOIL SHALL BE WELL COMPACTED AROUND BURIED PORTION OF FOOTERS WITH THE BUCKET OF EXCAVATOR.
3. INSTALL NON-WOVEN FILTER FABRIC UNDERNEATH FOOTER BOULDERS.
4. UNDERCUT THE RIFFLE ELEVATION 12 INCHES TO ALLOW FOR A LAYER OF STONE.
5. INSTALL EROSION CONTROL MATTING ALONG COMPLETED BANKS SUCH THAT THE EROSION CONTROL MATTING AT THE TOE OF THE BANK EXTENDS DOWN TO THE UNDERCUT ELEVATION.
6. FILL TRENCH WITH GRADED MIX OF CLASS A, CLASS B, AND #57 STONE TO THE BED ELEVATION OF THE CHANNEL.
7. BOULDER STEPS MUST BE EXTENDED TO A MINIMUM OF 2' INTO THE BANK. USE SILL BOULDERS IF NECESSARY.
8. THALWEG AND STEP INVERT WILL BE CONCAVE AND SHAPED PER DIRECTION OF THE DESIGNER.

REACH	BOULDER SIZE
REACH 1A	2'x3'x4'
REACH 1B	2'x3'x4'
UT2	1'x2'x3'

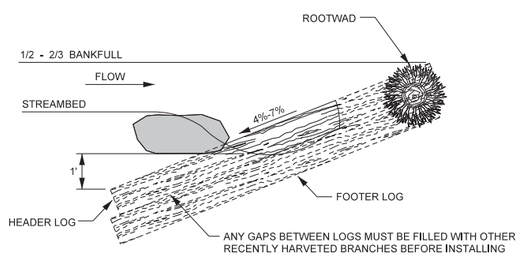
GRADE CONTROL LOG J-HOOK VANE



PLAN VIEW



SECTION A - A'



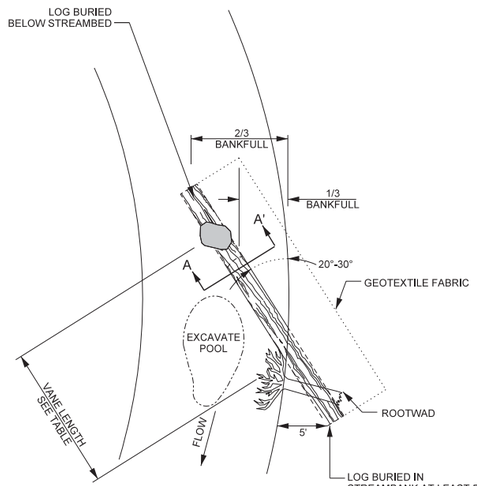
PROFILE VIEW

NOTES:

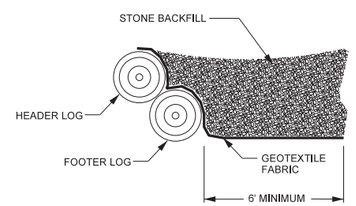
1. LOGS SHOULD BE AT LEAST 10" IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, RECENTLY HARVESTED, AND FOOTERED.
2. BOULDERS MUST BE OF SUFFICIENT SIZE TO ANCHOR LOGS.
3. SOIL SHOULD BE COMPACTED WELL AROUND BURIED PORTIONS OF LOG.
4. ROOTWADS SHOULD BE PLACED BENEATH THE HEADER LOG AND PLACED SO THAT IT LOCKS THE HEADER LOG INTO THE BANK, SEE ROOTWAD DETAIL.
5. BOULDERS SHOULD BE PLACED ON TOP OF HEADER LOG FOR ACHORING.
6. HEADER BOULDERS TO BE PLACED 0.5 TO 0.75 FEET APART.
7. FILTER FABRIC SHOULD BE NAILED TO THE LOG BELOW THE BACKFILL.
8. TRANSPLANTS OR BOULDERS CAN BE USED INSTEAD OF ROOWADS, PER DIRECTION OF ENGINEER.
9. BOULDER SILL MUST BE A MINIMUM OF 6'.
10. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION OF THE TOP OF THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE.

REACH	VANE LENGTH	BOULDER SIZE
REACH 1A	11,3'	2'x3'x4'
REACH 1B	14,0'	2'x3'x4'
UT2	N/A	N/A

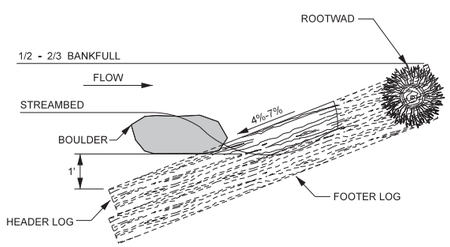
LOG VANE



PLAN VIEW



SECTION A - A'



PROFILE VIEW

NOTES:

1. LOGS SHOULD BE AT LEAST 10" IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, AND RECENTLY HARVESTED.
2. BOULDERS MUST BE OF SUFFICIENT SIZE TO ANCHOR LOGS.
3. SOIL SHOULD BE COMPACTED WELL AROUND BURIED PORTIONS OF LOGS.
4. ROOTWADS SHOULD BE PLACED BENEATH THE HEADER LOG AND PLACED SO THAT IT LOCKS THE HEADER LOG INTO THE BANK, SEE ROOTWAD DETAIL.
5. BOULDER SHOULD BE PLACED ON TOP OF HEADER LOG FOR ANCHORING.
6. GEOTEXTILE FABRIC SHOULD BE NAILED TO THE LOG BELOW THE BACKFILL.
7. TRANSPLANTS CAN BE USED INSTEAD OF ROOTWADS, PER DIRECTION OF ENGINEER.
8. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION OF THE TOP OF THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE.

REACH	VANE LENGTH	BOULDER SIZE
REACH 1A	11,3'	2'x3'x4'
REACH 1B	14,0'	2'x3'x4'
UT2	N/A	N/A

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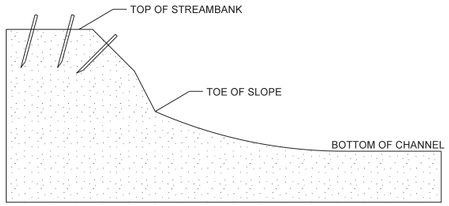
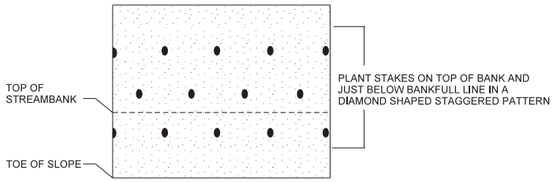
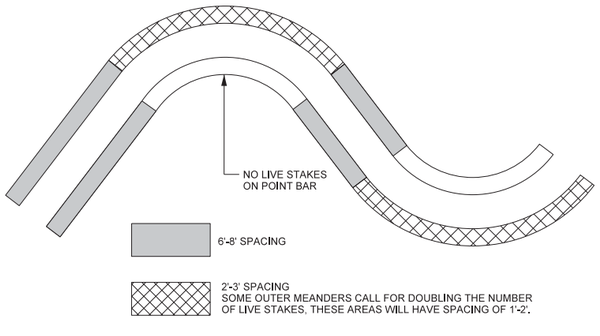
LIVE STAKING



CROSS SECTION VIEW



PLAN VIEW



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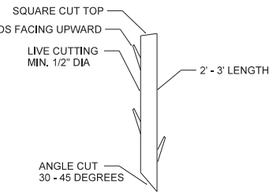
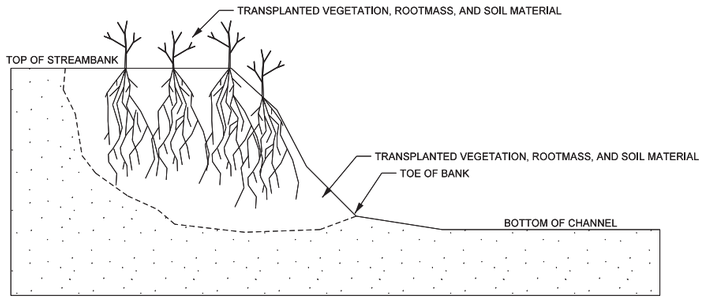


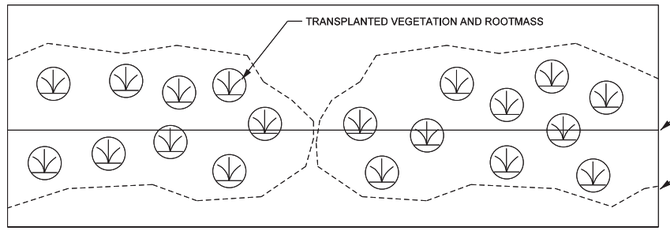
LIVE STAKE DETAIL

NOTES:
1. STAKES SHOULD BE CUT AND INSTALLED ON THE SAME DAY.
2. DO NOT INSTALL STAKES THAT HAVE BEEN SPLIT.
3. STAKES MUST BE INSTALLED WITH BUDS POINTING UPWARDS.
4. STAKES SHOULD BE INSTALLED PERPENDICULAR TO BANK.
5. STAKES SHOULD BE 1/2 TO 2 INCHES IN DIAMETER AND 2 TO 3 FT LONG.
6. STAKES SHOULD BE INSTALLED LEAVING 1/5 OF STAKE ABOVE GROUND.
7. DOUBLE THE LIVE STAKES IN MEANDER BENDS THAT HAVE A BRUSH TOE AND BANKS ARE MATTED.

TRANSPLANTED VEGETATION



CROSS SECTION VIEW



PLAN VIEW

NOTES:
1. EXCAVATE A HOLE IN THE BANK TO BE STABILIZED THAT WILL ACCOMMODATE THE SIZE OF TRANSPLANT TO BE PLACED. BEGIN EXCAVATION AT THE TOE OF THE BANK.
2. EXCAVATE TRANSPLANT USING A FRONT END LOADER. EXCAVATE THE ENTIRE ROOT MASS AND AS MUCH ADDITIONAL SOIL MATERIAL AS POSSIBLE. IF ENTIRE ROOT MASS CAN NOT BE EXCAVATE IN ONE BUCKET LOAD, THE TRANSPLANT IS TOO LARGE AND ANOTHER SHOULD BE SELECTED.
3. PLACE TRANSPLANT IN THE BANK TO BE STABILIZED SO THAT VEGETATION IS ORIENTATED VERTICALLY.
4. FILL IN ANY HOLES AROUND THE TRANSPLANT AND COMPACT.
5. ANY LOOSE SOIL LEFT IN THE STREAM SHOULD BE REMOVED.
6. PLACE MULTIPLE TRANSPLANTS CLOSE TOGETHER SUCH THAT THEY TOUCH.

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Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
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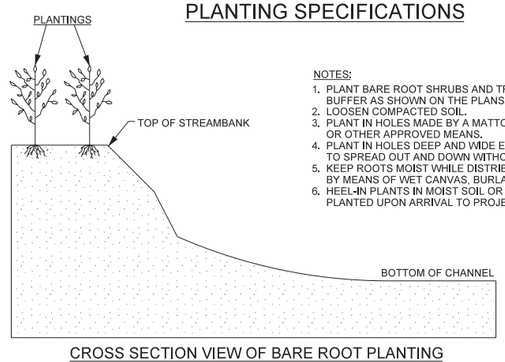
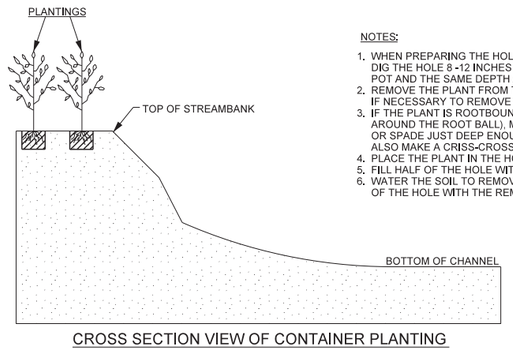
PLANTING SPECIFICATIONS



CROSS SECTION VIEW OF BARE ROOT PLANTING

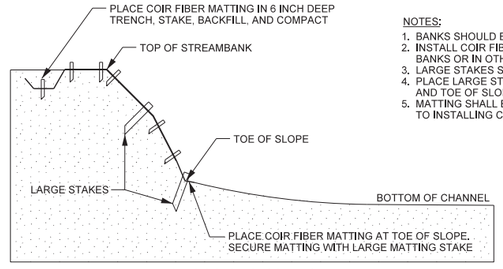
NOTES:
1. PLANT BARE ROOT SHRUBS AND TREES TO THE WIDTH OF THE BUFFER AS SHOWN ON THE PLANS.
2. LOOSEN COMPACTED SOIL.
3. PLANT IN HOLES MADE BY A MATTOCK, DIBBLE, PLANTING BAR, OR OTHER APPROVED MEANS.
4. PLANT IN HOLES DEEP AND WIDE ENOUGH TO ALLOW THE ROOTS TO SPREAD OUT AND DOWN WITHOUT J-ROOTING.
5. KEEP ROOTS MOIST WHILE DISTRIBUTING OR WAITING TO PLANT BY MEANS OF WET CANVAS, BURLAP, OR STRAW.
6. HEEL-IN PLANTS IN MOIST SOIL OR SAWDUST IF NOT PROMPTLY PLANTED UPON ARRIVAL TO PROJECT SITE.



CROSS SECTION VIEW OF CONTAINER PLANTING

NOTES:
1. WHEN PREPARING THE HOLE FOR A POTTED PLANT OR SHRUB DIG THE HOLE 8 -12 INCHES LARGER THAN THE DIAMETER OF THE POT AND THE SAME DEPTH AS THE POT.
2. REMOVE THE PLANT FROM THE POT. LAY THE PLANT ON ITS SIDE IF NECESSARY TO REMOVE THE POT.
3. IF THE PLANT IS ROOTBOUND (ROOTS GROWING IN A SPIRAL AROUND THE ROOT BALL), MAKE VERTICAL CUTS WITH A KNIFE OR SPADE JUST DEEP ENOUGH TO CUT THE NET OF ROOTS. ALSO MAKE A CRISS-CROSS CUT ACROSS THE BOTTOM OF THE BALL.
4. PLACE THE PLANT IN THE HOLE.
5. FILL HALF OF THE HOLE WITH SOIL (SAME SOIL REMOVED FOR BACKFILL).
6. WATER THE SOIL TO REMOVE AIR POCKETS AND FILL THE REST OF THE HOLE WITH THE REMAINING SOIL.

COIR FIBER MATTING



CROSS SECTION VIEW

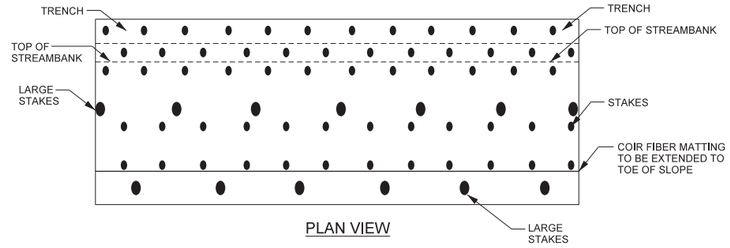
NOTES:
1. BANKS SHOULD BE SEEDED PRIOR TO PLACEMENT OF MATTING.
2. INSTALL COIR FIBER MATTING PER SPECIFICATIONS ALONG STREAM BANKS OR IN OTHERS LOCATIONS SPECIFIED BY ENGINEER.
3. LARGE STAKES SHOULD NOT BE SPACED FURTHER THAN 36" APART.
4. PLACE LARGE STAKES ALONG ALL SEAMS, IN THE CENTER OF BANK, AND TOE OF SLOPE.
5. MATTING SHALL BE PLACED ON BANKS, STAKED, AND TRENCHED PRIOR TO INSTALLING CONSTRUCTED RIFFLE MATERIAL.

TYPICAL LARGE MATTING STAKE

LEG LENGTH	17.00 IN (43.18 CM) (TAPERED TO POINT)
WIDTH	1.5 IN (3.81 CM)
THICKNESS	1.5 IN (3.81 CM)

TYPICAL SMALL MATTING STAKE

LEG LENGTH	11.00 IN (27.94 CM)
HEAD WIDTH	1.25 IN (3.18 CM)
HEAD THICKNESS	0.40 IN (1.02 CM)
LEG WIDTH	0.60 IN (1.52 CM) (TAPERED TO POINT)
LEG THICKNESS	0.40 IN (1.02 CM)
TOTAL LENGTH	12.00 IN (30.48 CM)



PLAN VIEW

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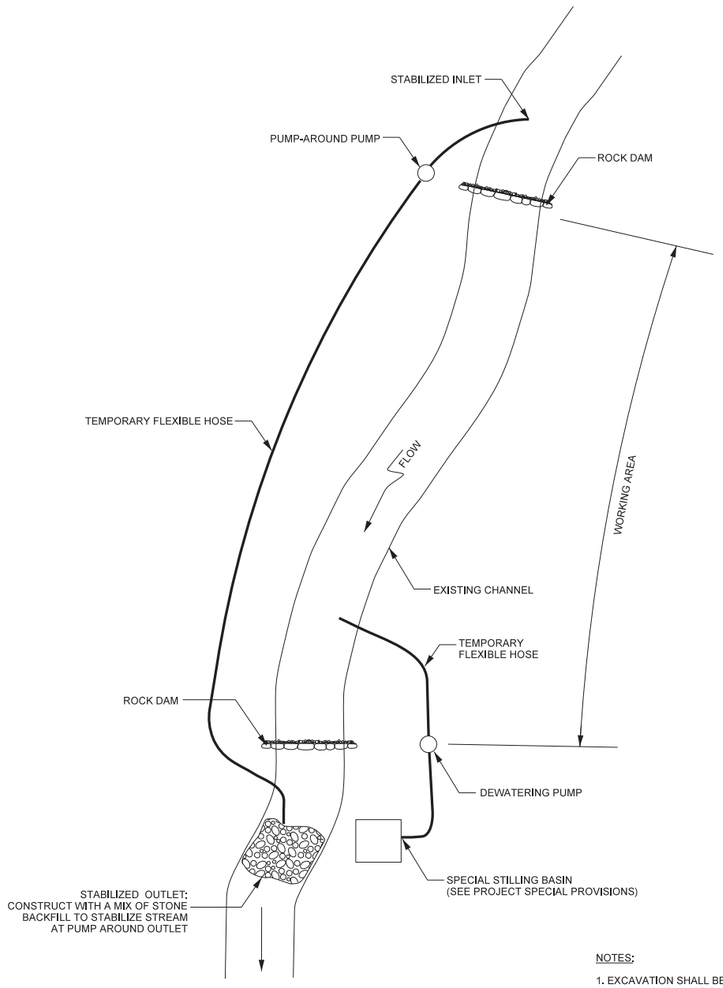
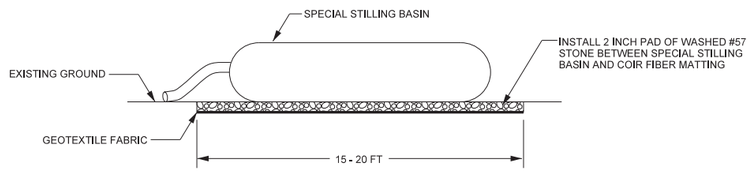
TYPICAL PUMP AROUND OPERATION



NOTES:

1. EXCAVATION SHALL BE PERFORMED IN ONLY DRY SECTIONS OF CHANNEL.
2. IMPERVIOUS DIKES SHOULD BE USED TO ISOLATE WORK AREAS FROM STREAM FLOW.
3. THE CONTRACTOR SHALL NOT DISTURB MORE AREA THAN CAN BE STABILIZED IN ONE WORKING DAY.
4. THE PUMP-AROUND PUMP SHOULD ADEQUATELY CONVEY 1 CFS (450 GALLONS PER MINUTE).



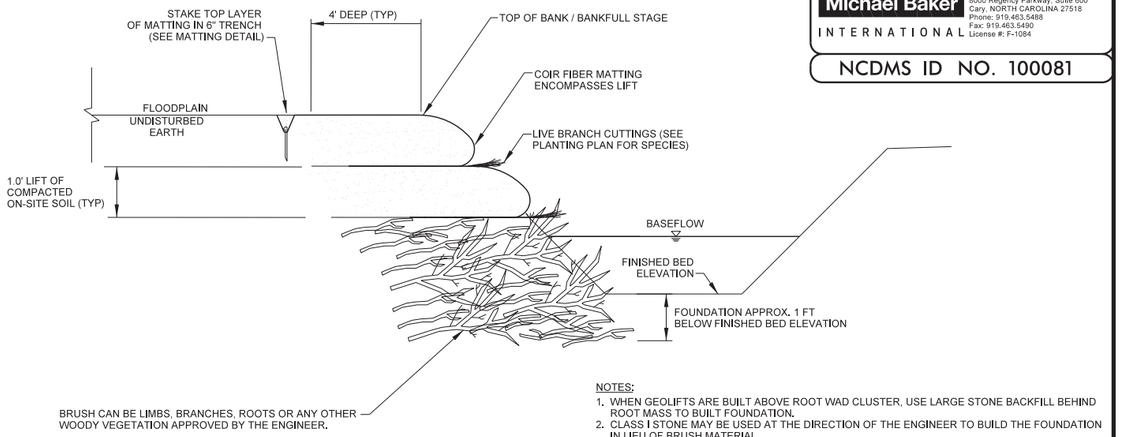
SEQUENCE OF CONSTRUCTION FOR TYPICAL PUMP AROUND

1. INSTALL STABILIZED OUTLET AT THE DOWNSTREAM END OF THE DESIGNATED PROJECT WORKING AREA.
2. THE CONTRACTOR WILL INSTALL THE PUMP AROUND PUMP AND THE TEMPORARY FLEXIBLE HOSE THAT WILL CONVEY THE BASE FLOW FROM UPSTREAM OF THE WORK SITE TO THE SPECIAL STILLING BASIN OR STABILIZED OUTLET.
3. INSTALL UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. INSTALL THE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS IF NEEDED TO DEWATER THE ENTRAPPED AREA. THE PUMP AND HOSE FOR THIS PURPOSE SHALL BE OF SUFFICIENT SIZE TO DEWATER THE WORK AREA. THIS WATER WILL FLOW INTO A SPECIAL STILLING BASIN.
5. THE CONTRACTOR WILL PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLAN AND FOLLOWING THE GENERAL CONSTRUCTION SEQUENCE.
6. THE CONTRACTOR WILL EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF THE IMPERVIOUS DIKE. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE STARTING WITH THE DOWNSTREAM DIKE FIRST.
7. THE CONTRACTOR WILL COMPLETE ALL GRADING AND STABILIZATION IN ONE DAY WITHIN THE PUMP AROUND AREA BETWEEN THE IMPERVIOUS DIKES.
8. ONCE THE WORKING AREA IS COMPLETED, REMOVE THE SPECIAL STILLING BASIN AND STABILIZED OUTLET AND STABILIZE DISTURBED AREAS WITH SEED AND MULCH.

GEOLIFT WITH BRUSH TOE

NOTES:

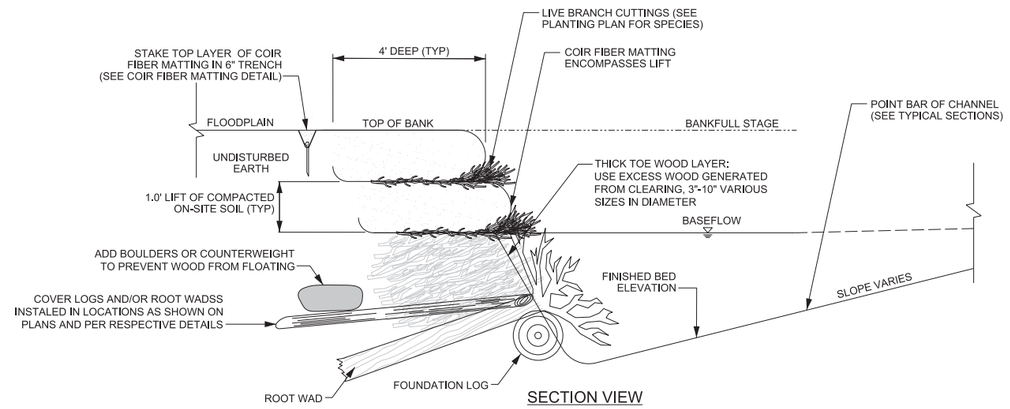
1. LIVE BRANCH CUTTINGS SHALL BE THE SAME SPECIES AS THE LIVE STAKES AND SHALL BE INSTALLED DURING VEGETATION DORMANCY.
2. LIVE BRANCH CUTTINGS SHALL BE INSTALLED AT A DENSITY OF 20-30 CUTTINGS PER LINEAR FOOT AND A MAXIMUM DIAMETER OF 2.5 INCHES.
3. NUMBER OF SOIL LIFTS MAY VARY. IN GENERAL LIFTS SHALL EXTEND TO THE TOP OF BANK OR BANKFULL STAGE.



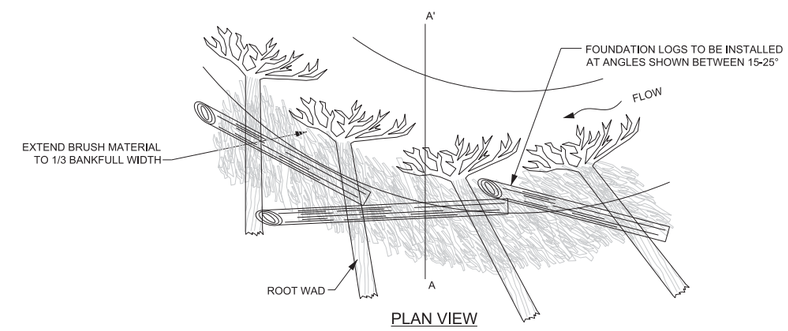
NOTES:

1. WHEN GEOLIFTS ARE BUILT ABOVE ROOT WAD CLUSTER, USE LARGE STONE BACKFILL BEHIND ROOT MASS TO BUILT FOUNDATION.
2. CLASS I STONE MAY BE USED AT THE DIRECTION OF THE ENGINEER TO BUILD THE FOUNDATION IN LIEU OF BRUSH MATERIAL.

GEOLIFT WITH LIVE BRUSH, LOGS AND ROOT WADS



SECTION VIEW



PLAN VIEW

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Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
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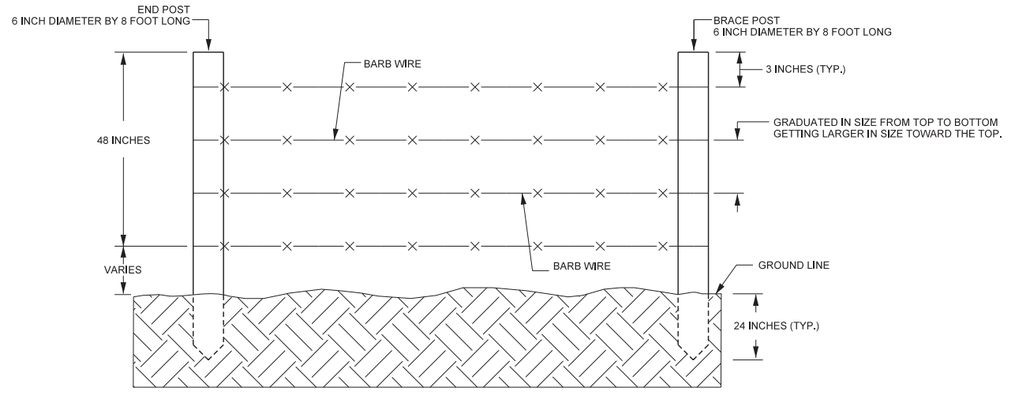
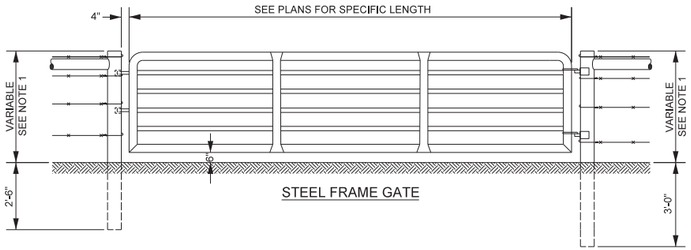
BARB WIRE FIELD FENCE



NOTE:

1. END POSTS SHALL BE INSTALLED AT A SPACING OF 10-15 FEET.

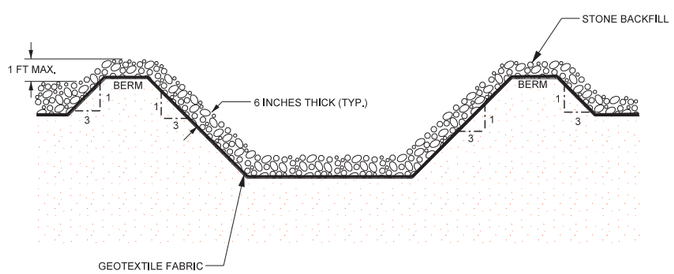
STEEL GATES



NOTES:

1. POST HEIGHT DIMENSION SHALL BE THE SAME AS REQUIRED FOR THE ADJACENT FENCE.
2. CONSTRUCT AN END OR STRESS PANEL, AS REQUIRED IN THE SPECIFICATION, ON EACH SIDE OF GATE.
3. HINGES AND LOCKS SHALL BE INSTALLED AS SPECIFIED BY GATE MANUFACTURER.

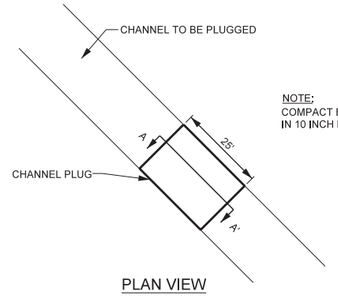
FORD STREAM CROSSING



NOTES:

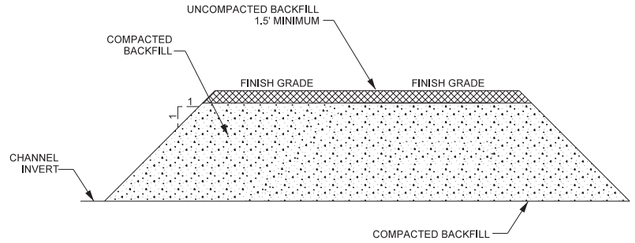
1. CONSTRUCT STREAM CROSSING WHEN FLOW IS LOW.
2. HAVE ALL NECESSARY MATERIALS AND EQUIPMENT ON-SITE BEFORE WORK BEGINS.
3. MINIMIZE CLEARING AND EXCAVATION OF STREAMBANKS. DO NOT EXCAVATE CHANNEL BOTTOM. COMPLETE ONE SIDE BEFORE STARTING ON THE OTHER SIDE.
4. INSTALL STREAM CROSSING AT RIGHT ANGLE TO THE FLOW.
5. GRADE SLOPES TO A 3:1 SLOPE. TRANSPLANT SOD FROM ORIGINAL STREAMBANK ONTO SIDE SLOPES.
6. MAINTAIN CROSSING SO THAT RUNOFF IN THE CONSTRUCTION ROAD DOES NOT ENTER EXISTING CHANNEL.
7. A STABILIZED PAD OF STONE BACKFILL, 6 INCHES THICK, LINED WITH GEOTEXTILE FABRIC SHALL BE USED OVER THE BERM AND ACCESS SLOPES.
8. WIDTH OF THE CROSSING SHALL BE SUFFICIENT TO ACCOMMODATE THE LARGEST VEHICLE CROSSING THE CHANNEL.
9. CONTRACTOR SHALL DETERMINE AN APPROPRIATE RAMP ANGLE ACCORDING TO EQUIPMENT UTILIZED.

CHANNEL PLUG



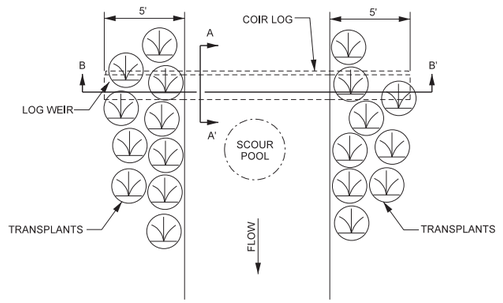
PLAN VIEW

NOTE:
COMPACT BACKFILL USING ON-SITE HEAVY EQUIPMENT IN 10 INCH LIFTS.

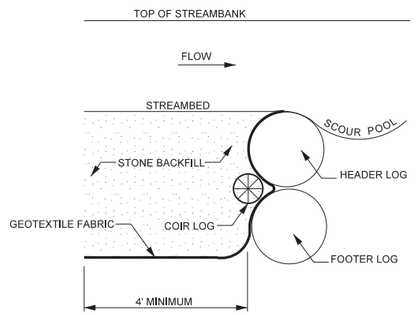


SECTION A - A'

LOG STEP



PLAN VIEW



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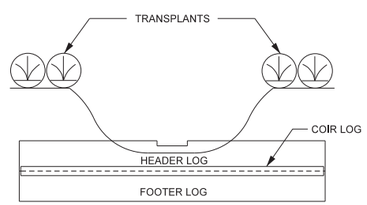

CROSS SECTION VIEW B - B'

NOTES:

1. LOGS SHOULD BE AT LEAST 10 INCHES IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, AND RECENTLY HARVESTED.
2. TOP OF HEADER LOG SHOULD BE SET AT SAME ELEVATION AS THE STREAMBED.
3. DIAMETER OF COIR LOG SHOULD BE APPROXIMATELY 1/2 DIAMETER OF LOGS.
4. USE GEOTEXTILE FABRIC WITH COIR LOGS TO SEAL GAPS BETWEEN LOGS.
5. PLACE TRANSPLANTS ALONG BANKS TO PROTECT AGAINST BANK EROSION.
6. THE HEADER LOG SHOULD BE NOTCHED 2 - 3 INCHES DEEP IN THE CENTER AND FOR 20 - 30% OF THE CHANNEL WIDTH.

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Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
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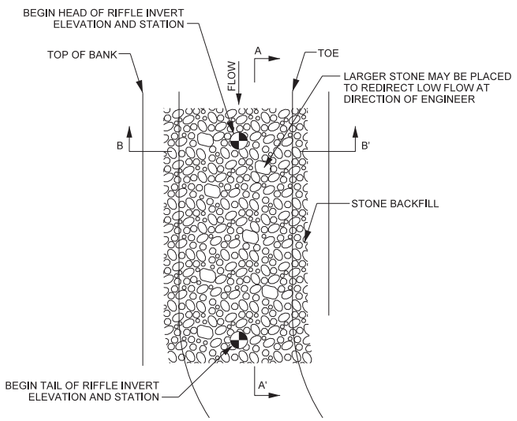
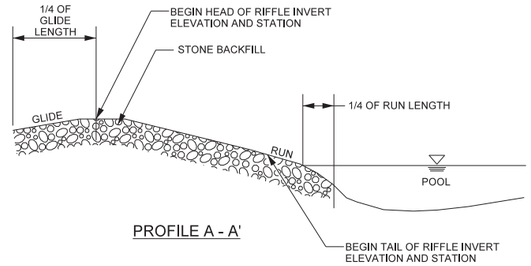
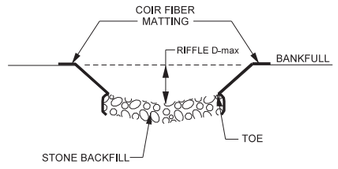
CONSTRUCTED RIFFLE



PLAN VIEW



PROFILE A - A'



SECTION B - B'

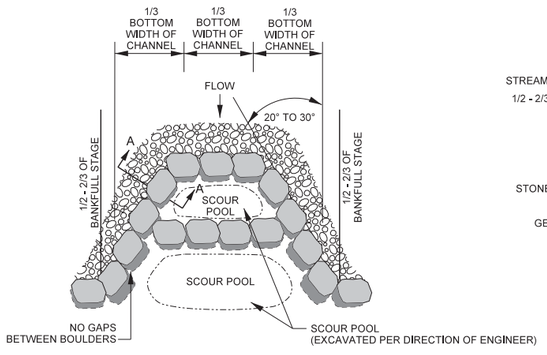
NOTES: STONE CONSTRUCTED RIFFLE

1. UNDERCUT CHANNEL BED ELEVATION AS NEEDED TO ALLOW FOR LAYERS OF STONE TO ACHIEVE FINAL GRADE.
2. INSTALL COIR FIBER MATTING ALONG COMPLETED BANKS SUCH THAT THE EROSION CONTROL MATTING AT THE TOE OF THE BANK EXTENDS DOWN TO THE UNDERCUT ELEVATION.
3. INSTALL STONE BACKFILL, COMPACTED TO GRADE.
4. FINAL CHANNEL BED SHAPE SHOULD BE ROUNDED, SMOOTH, AND CONCAVE, WITH THE ELEVATION OF THE BED 0.2 FT DEEPER IN THE CENTER THAN AT THE EDGES.
5. STONE BACKFILL SHALL CONSIST OF 5% CLASS I, 10% CLASS B, 50% CLASS A, 20% ABC, AND 15% ON-SITE ALLUVIUM.
6. CONSTRUCTED RIFFLES SHALL BE 12" THICK.
7. BOULDERS FOR REACH 1A AND 1B MUST BE AT LEAST 2' x 3' x 4'; WHILE BOULDERS FOR UT2 SHOULD BE 1' x 2' x 3'.
8. SATURATED WOODY DEBRIS THAT IS EXISTING WITHIN THE CHANNEL CAN BE RELOCATED INTO THE NEW RIFFLE AREAS.

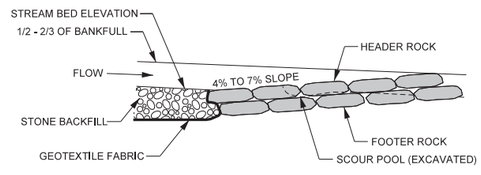
NOTES: NATURAL ALLUVIUM RIFFLE

1. STOCK PILE NATURAL ALLUVIUM RIFFLE FROM SECTIONS OF CHANNEL THAT ARE BEING ABONDONED AND FILLED.
2. APPLY NATURAL ALLUVIUM BED MATERIAL IN THOSE RIFFLES WHERE STONE IS NOT INDICATED.
3. ANY WATER LOGGED WOODY MATERIAL COLLECTED SHOULD BE INSTALLED WITH BED MATERIAL.

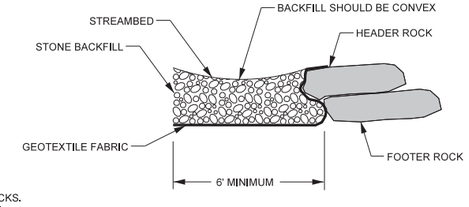
ROCK DOUBLE DROP CROSS VANE



PLAN VIEW



PROFILE VIEW

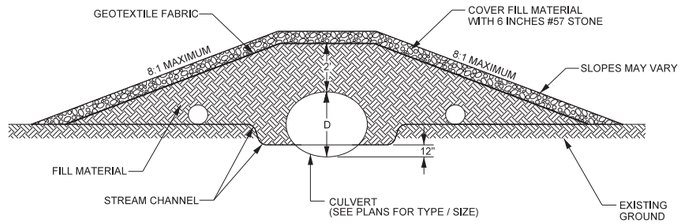


SECTION A - A

NOTES FOR ALL VANE STRUCTURES:

1. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS.
2. START AT BANK AND PLACE FOOTER ROCKS FIRST AND THEN HEADER (TOP) ROCK.
3. CONTINUE WITH STRUCTURE, FOLLOWING ANGLE AND SLOPE SPECIFICATIONS.
4. AN EXTRA ROCK CAN BE PLACED IN SCOUR POOL FOR HABITAT IMPROVEMENT.
5. USE HAND PLACED STONE TO FILL GAPS ON UPSTREAM SIDE OF HEADER AND FOOTER ROCKS.
6. INSTALL GEOTEXTILE FABRIC BEGINNING AT THE TOP OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF SIX FEET.
7. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION 2"-4" BELOW THE THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE. FILL SHOULD BE CONCAVE BEHIND THE VANE ARM TO ALLOW POOLING OF FLOW.
8. START SLOPE AT 3/4 THE BANKFULL ELEVATION.
9. ALL REACHES, BOULDER SIZE 2' x 2' x 4'.

PERMANENT STREAM CROSSING

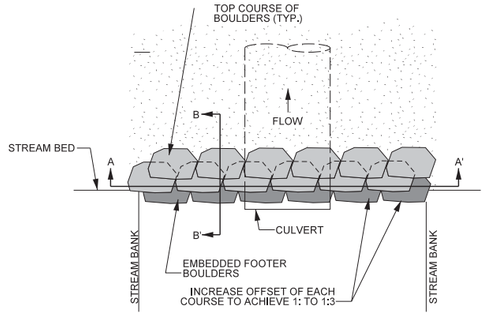


CROSS SECTION VIEW

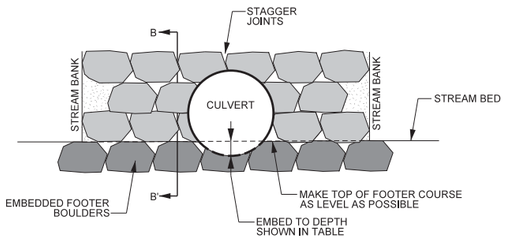
NOTES:

1. SIZE DIMENSIONS SHOWN ON PLANS.
2. APPLY SUFFICIENT FILL (2' MIN) OVER CULVERT TO PREVENT COLLAPSE.
3. STABILIZE SIDE SLOPES WITH EROSION CONTROL MATTING AND FILL AROUND CULVERTS WITH CLASS II STONE.
4. INSTALL HEADWALLS AND ENDWALLS AS SHOWN ON THE PLANS AND DETAIL.

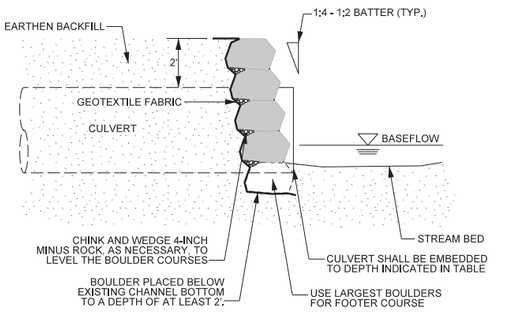
BOULDER HEADWALL / ENDWALL



PLAN VIEW



SECTION A - A'

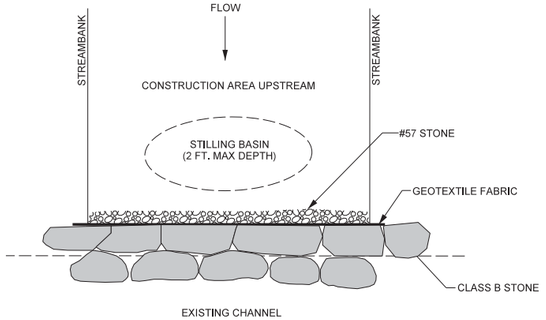


SECTION B - B'

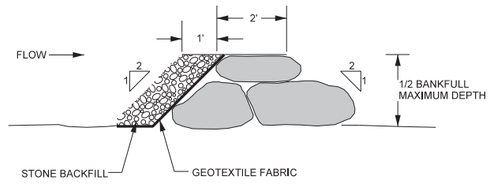
NOTES:

1. BOULDERS SHALL BE TOUCHING SO THAT VOID SPACE IS MINIMIZED.
2. BOULDERS SHOULD EXTEND BELOW SCOUR DEPTH, FOOTER BOULDERS SHALL BE AT LEAST 2' BELOW THE EXISTING BED
3. GEOTEXTILE MATTING SHOULD BE PLACED BETWEEN BOULDERS AND SOIL.
4. BOULDERS SHOULD BE BACKFILLED AND COMPACTED. VOID SPACE BETWEEN FABRIC AND BOULDER OR ROCK FILL MATERIAL, SHOULD BE MINIMIZED.
5. BOULDERS SHOULD NOT BE HIGHER THAN THE TOP OF CROSSING ELEVATION.
6. FILTER FABRIC SHOULD BE PLACED BEHIND BOULDERS, BURIED BELOW BOULDER DEPTH, AND EXTEND INTO THE BANK.

ROCK DAM



PLAN VIEW



CROSS SECTION

NOTES:
CLEAN OUT STILLING BASIN OF TRAPPED SEDIMENT PRIOR TO REMOVAL.

12/3/2020
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mdeal

2/26/03

PROJECT REFERENCE NO.	SHEET NO.
167680	3

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Cary, NORTH CAROLINA 27518
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Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100081

GENERAL CONSTRUCTION SEQUENCE

A general construction sequence is provided below for the UT to Magness Creek Mitigation Project. The site construction, including grading and planting activities, will be conducted using common machinery, tools, equipment and techniques for successfully implementing the project.

1. Contractor shall contact North Carolina “One Call” Center (1.800.632.4949) before any excavation.
2. Contractor shall prepare stabilized construction entrances and haul roads as indicated on the plans.
3. The Contractor shall mobilize equipment, materials, prepare staging area(s) and stockpile area(s) as shown on the plans.
4. Construction traffic shall be restricted to the area denoted as “Limits of Disturbance” or “Haul Roads” on the plans.
5. The Contractor shall install temporary silt fence around the staging area(s). Temporary silt fencing will also be placed around the temporary stockpile areas as material is stockpiles throughout the construction period.
6. The Contractor shall install temporary rock dams at locations indicated on the plans.
7. The Contractor shall install all temporary and permanent stream crossings as shown on the plans in accordance with the NC Erosion and Sediment Control Planning and Design Manual. The existing channel and ditches on site will remain open during the initial stages of construction to allow for drainage and to maintain site accessibility.
8. The Contractor shall construct only the portion of channel that can be completed and stabilized within the same day.
9. The Contractor shall apply temporary seed and mulch to all disturbed areas at the end of each work day.
10. The Contractor shall clear and grub, where necessary, an area adequate to construct the stream channel and grading operations after all Sedimentation and Erosion Control practices have been installed and approved. Construction in a live channel shall utilize a pump-around or flow diversion measure as shown on the plans.
11. Contractor shall begin construction upstream and proceed in a downstream direction until the reach is completed. The Contractor may concurrently work on separate reaches as long as no more is disturbed than can be stabilized in that same day.
12. After excavating the channel to design grades, installing in-stream structures, applying seed and mulch, matting, and installing transplants, the new channel can receive flow after approval by the Engineer.
13. Water will be turned into the constructed channel once the area in and around the new channel has been stabilized. Immediately begin plugging, filling, and grading the abandoned channel, as indicated on plans, moving in a downstream direction to allow for drainage of the old channels. No water shall be turned into any section of channel prior to the channel being completely stabilized with all structures installed.
14. Any grading activities adjacent to the stream channel shall be completed prior to turning water into the new stream channel segments. The Contractor shall not grade or roughen any areas where excavation activities have not been completed.
15. Once a stream work phase is complete, apply temporary seeding, permanent seeding, and mulching to any areas disturbed during construction. Apply permanent seeding mixtures, as shown on the vegetation plan. Temporary seeding shall be applied in all disturbed areas such that ground cover is established within 15 working days following completion of any phase of grading. Permanent ground cover shall be established for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction.
16. Contractor shall improve and construct the crossing by installing the culvert, stabilizing side slopes, installing head/end walls according to the plans and specifications.
17. All disturbed areas should be seeded and mulched before leaving the project. Remove temporary stream crossings and any in-stream temporary rock dams as construction is completed at their location, and any remaining at the end of construction.
18. The Contractor shall mechanically remove invasive species during grubbing operations and treat areas of invasive species vegetation throughout the project area according to the plans and specifications prior to demobilization.
19. The Contractor shall plant woody vegetation and live stakes, according to planting details and specifications. The Contractor shall complete the live staking and reforestation (bare-root planting) phase of the project and apply permanent seeding at the appropriate time of the year.
20. The Contractor shall ensure that the site is free of trash and leftover materials prior to demobilization of equipment from the site.

MAINTENANCE PLAN

1. Qualified personnel, on a daily basis will evaluate all temporary erosion and sedimentation control practices for stability and operation.
2. Inspect and maintain all erosion control measures every 7 days and after each significant rainfall (0.5 inches or greater) and document with inspection reports and written logs will be kept.
3. A rain gauge will also be kept on-site and daily rainfall amounts will be recorded.
4. Any repairs needed will be performed immediately to maintain all practices as designed.
5. The contractor shall be responsible for the maintenance of temporary on-site erosion control and sedimentation control measures.
6. The contractor shall be responsible for implementing and following the approved sedimentation and erosion control plan.
7. A copy of the combined self-inspection monitoring form can be found on the DEMLR website at: (http://deq.nc.gov/about/divisions/energy-mineral-land-resources/erosion-sediment-control/forms).

12/3/2020
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167680	4

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Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100081

WETLAND RE-ESTABLISHMENT
WETLAND REHABILITATION
FILL EXISTING CHANNEL
CHANNEL PLUG

NAD 83

PIN: 2641-72-1337

REMOVE EXISTING FENCE WITHIN CONSERVATION EASEMENT (TYP.)

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-53-8722
DB: 1168 PG: 30 (PARCEL 2)
PB: 7 PG: 46 (PORTION OF TRACT 9)

DORCAS S. ROSS
PIN: 2641-64-7567
PORTION OF DB: 11-I PG: 423

BEGIN UT to MAGNESS
REACH 1A STA. 11+02.17

GEOLIFT WITH BRUSH TOE (TYP.)

CONSTRUCTED RIFFLE (TYP.)

GEOLIFT WITH LIVE BRUSH, LOGS AND ROOT WADS (TYP.)

10+00 11+00 12+00 13+00 14+00 15+00

MATCH LINE STA. 15+60
SEE SHEET 5

GENE W. SCHENCK, SR. (LIFE ESTATE)
WARREN SCHENCK
PIN: 2641-64-4323
DB: 1405 PG: 314 &
DB; 1592 PG; 70

LOG VANE (TYP.)

GRADE CONTROL ROCK J-HOOK VANE (TYP.)

BRUSH TOE WITH MATTING AND DOUBLE LIVE STAKES (TYP.)

INSTALL 4' GATE

INSTALL BARBED WIRE FENCE (TYP.)

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-53-8722
DB: 1168 PG: 30 (PARCEL 2)
PB: 7 PG: 46 (PORTION OF TRACT 9)

UT TO MAGNESS CREEK
PLAN & PROFILE VIEW

20 0 20 40
SCALE (FT)

BEGIN UT to MAGNESS
REACH 1A
STA. 10+00.00
EL = 882.24'

EXISTING GROUND

DESIGN BANKFULL

DESIGN THALWEG

PI=10+10.00 EL=882.25
PI=10+20.00 EL=882.20
PI=10+30.00 EL=882.25
PI=10+40.00 EL=882.39
PI=10+50.00 EL=882.34
PI=10+60.00 EL=882.28
PI=10+70.00 EL=882.20
PI=10+80.00 EL=882.03
PI=10+90.00 EL=882.08
PI=11+00.00 EL=881.78
PI=11+10.00 EL=882.10
PI=11+20.00 EL=882.17
PI=11+27.00 EL=882.10
PI=11+30.00 EL=880.80
PI=11+47.00 EL=880.80
PI=11+52.00 EL=882.16
PI=11+97.00 EL=882.00
PI=12+02.00 EL=880.70
PI=12+08.00 EL=880.70
PI=12+13.00 EL=882.00
PI=12+65.00 EL=881.90
PI=12+70.00 EL=880.60
PI=12+88.69 EL=880.60
PI=12+93.69 EL=881.84'
PI=13+41.23 EL=881.30'
PI=13+46.23 EL=880.00'
PI=13+63.00 EL=880.00'
PI=13+70.00 EL=881.25'
PI=14+10.00 EL=880.90'
PI=14+15.00 EL=879.51'
PI=14+36.00 EL=879.51'
PI=14+43.00 EL=880.82'
PI=14+85.00 EL=880.50'
PI=14+90.00 EL=879.20'
PI=15+05.00 EL=879.20'
PI=15+10.00 EL=880.45'
PI=15+55.00 EL=879.80'
PI=15+60.00 EL=878.50'

890 880 870 860

10+00 11+00 12+00 13+00 14+00 15+00

4/14/2021
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167680	5

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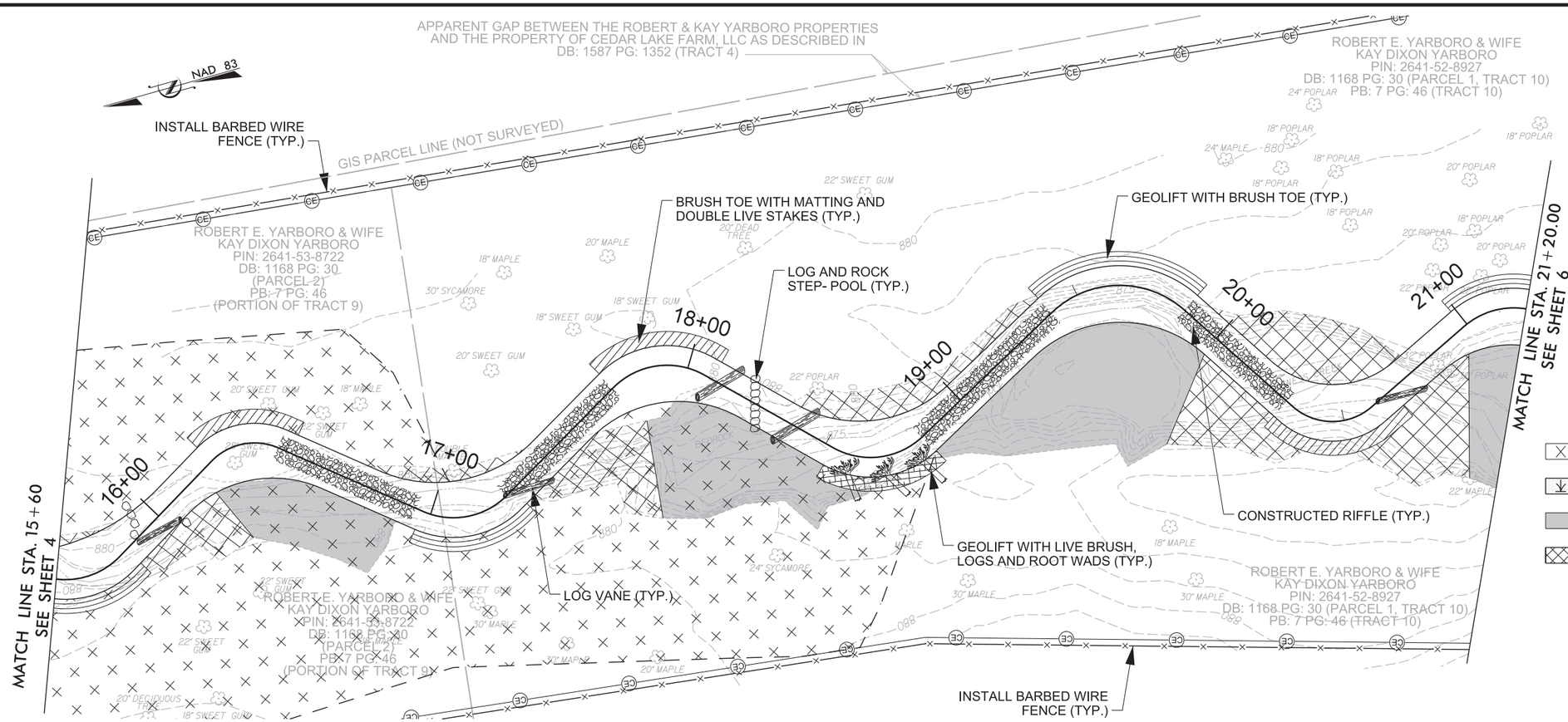
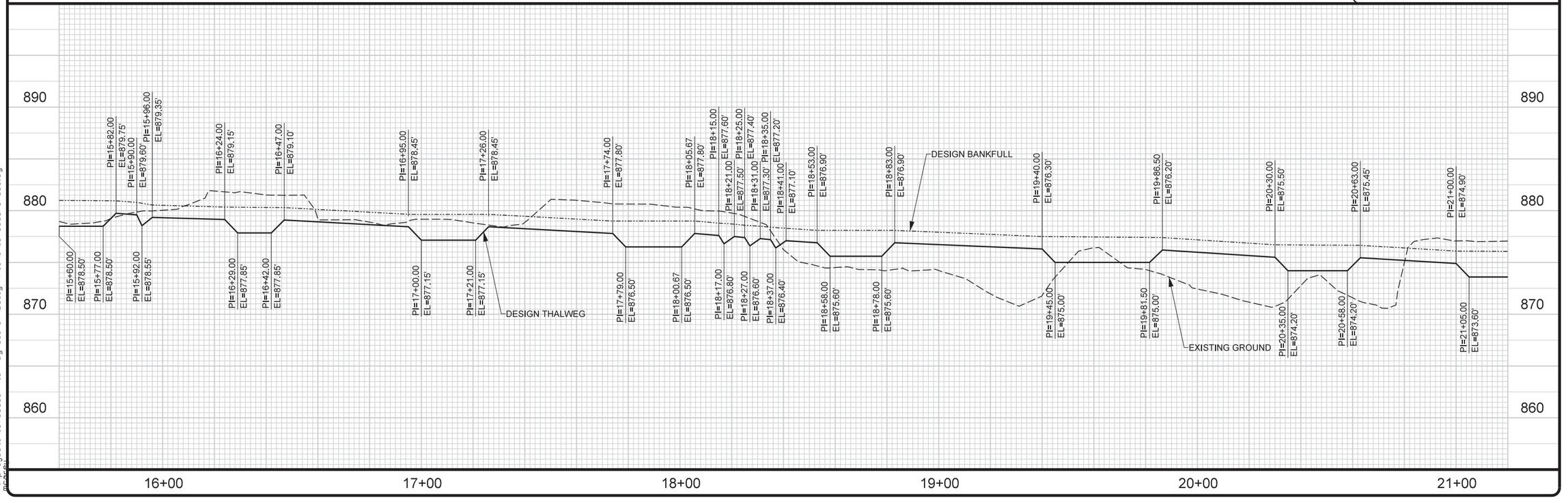


UT TO MAGNESS CREEK PLAN & PROFILE VIEW

20 0 20 40
SCALE (FT)



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167680	6

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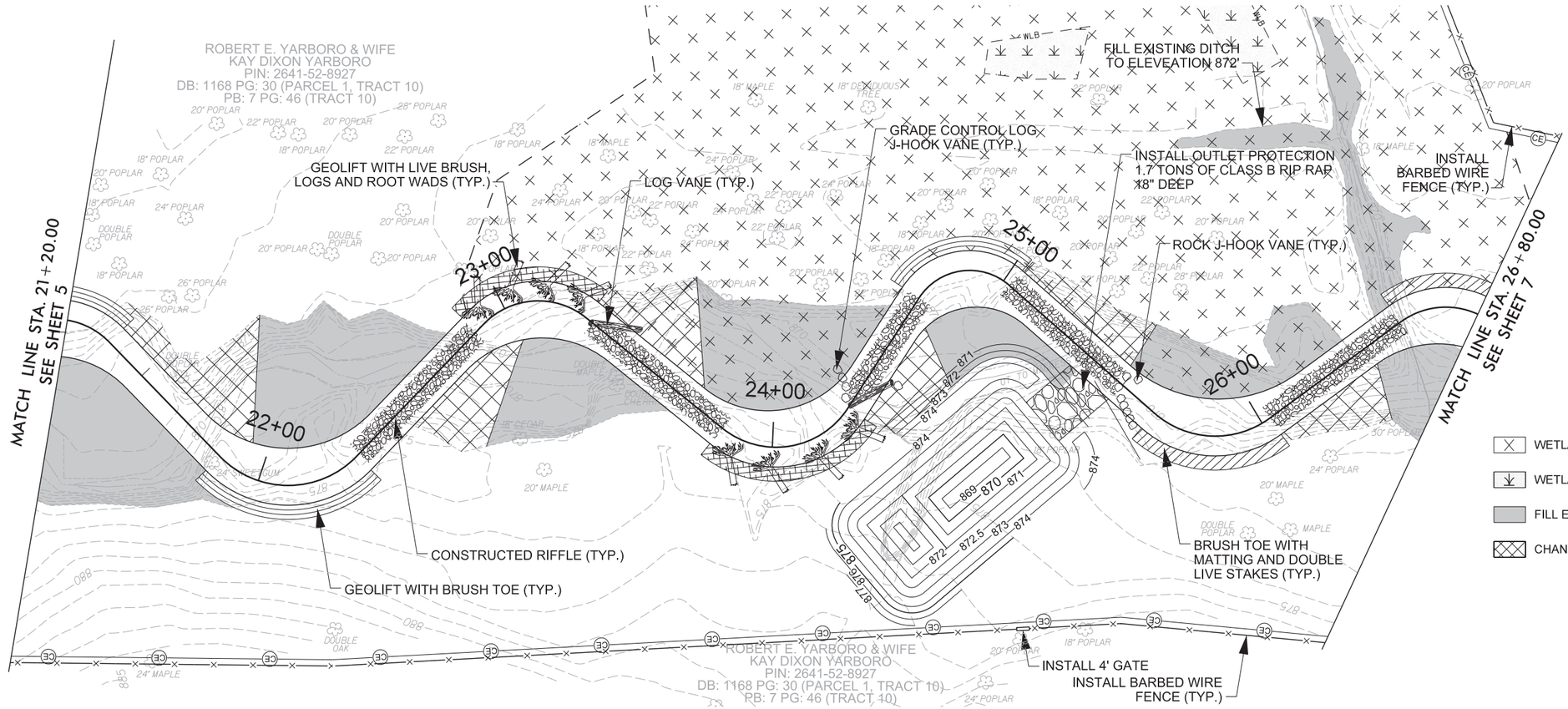
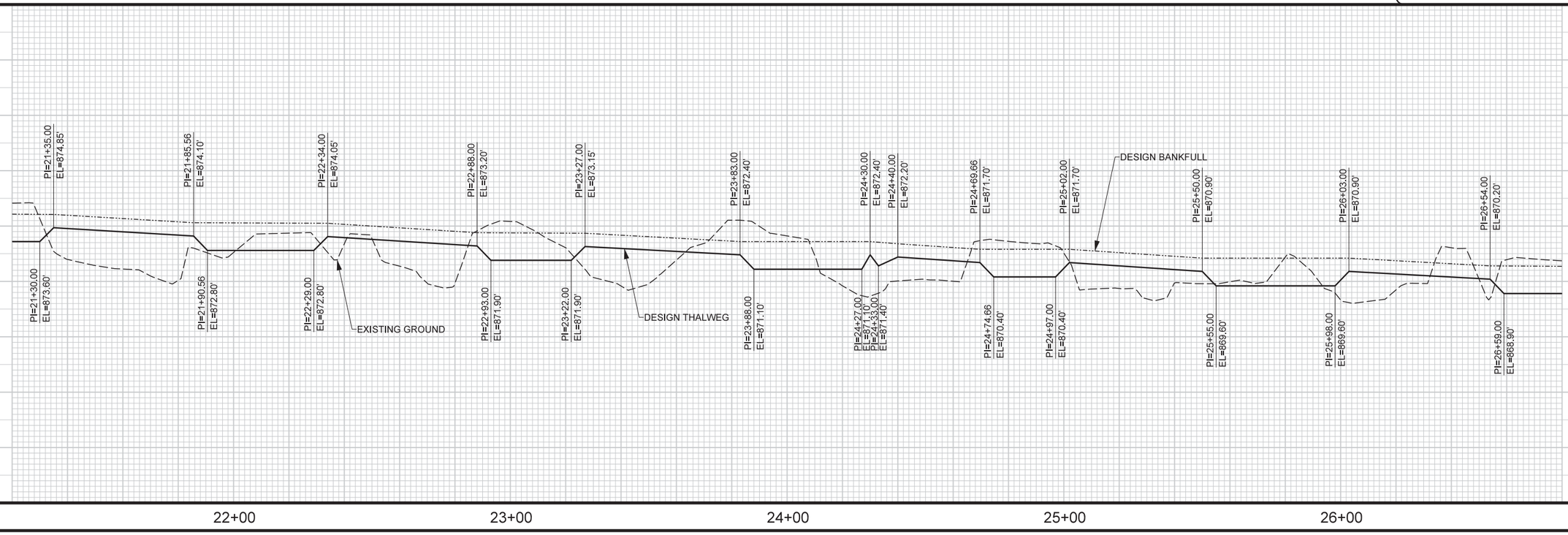


NAD 83

UT TO MAGNESS CREEK
PLAN & PROFILE VIEW

20 0 20 40
SCALE (FT)



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Cary, NORTH CAROLINA 27518
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Fax: 919.463.5490
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NCDMS ID NO. 100081

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-41-9802
DB: 16-D PG: 143 & DB: 1069 PG: 439
PB: 7 PG: 46 (TRACT 11)

NAD 83

MATCH LINE STA. 26+80.00
SEE SHEET 6

MATCH LINE STA. 32+40.00
SEE SHEET 8

INSTALL BARBED WIRE FENCE (TYP.)

BRUSH TOE WITH MATTING AND DOUBLE LIVE STAKES (TYP.)

CONSTRUCTED RIFFLE (TYP.)

27+00 28+00 29+00 30+00 31+00 32+00

GEOLIFT WITH BRUSH TOE (TYP.)

LOG AND ROCK STEP- POOL (TYP.)

LOG STEP (TYP.)

BOULDER STEP (TYP.)

GEOLIFT WITH LIVE BRUSH, LOGS AND ROOT WADS (TYP.)

INSTALL BARBED WIRE FENCE (TYP.)

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-41-9802
DB: 16-D PG: 143 & DB: 1069 PG: 439
PB: 7 PG: 46 (TRACT 11)

WETLAND RE-ESTABLISHMENT
WETLAND REHABILITATION
FILL EXISTING CHANNEL
CHANNEL PLUG

UT TO MAGNESS CREEK PLAN & PROFILE VIEW

20 0 20 40
SCALE (FT)

DESIGN BANKFULL
DESIGN THALWEG
EXISTING GROUND

880 870 860 850 840

PI=26+91.00 EL=870.15'
PI=26+86.00 EL=868.90'
PI=27+42.00 EL=869.40'
PI=27+47.00 EL=868.10'
PI=27+73.27 EL=868.32'
PI=27+68.27 EL=868.10'
PI=27+78.00 EL=869.20'
PI=27+83.00 EL=867.90'
PI=27+90.00 EL=868.70'
PI=28+14.00 EL=868.40'
PI=28+19.00 EL=867.10'
PI=28+40.52 EL=868.33'
PI=28+35.52 EL=867.10'
PI=28+60.00 EL=867.95'
PI=28+63.00 EL=866.65'
PI=28+70.00 EL=867.45'
PI=29+01.00 EL=866.83'
PI=29+06.00 EL=865.53'
PI=29+30.70 EL=866.76'
PI=29+26.00 EL=865.53'
PI=29+41.00 EL=866.56'
PI=29+44.00 EL=865.26'
PI=29+51.00 EL=866.06'
PI=29+74.00 EL=865.60'
PI=29+79.00 EL=864.30'
PI=30+05.00 EL=865.52'
PI=30+00.00 EL=864.30'
PI=30+18.00 EL=865.27'
PI=30+20.00 EL=863.97'
PI=30+28.00 EL=864.72'
PI=30+35.00 EL=864.58'
PI=30+37.00 EL=863.58'
PI=30+45.00 EL=864.28'
PI=30+51.00 EL=864.16'
PI=30+66.00 EL=862.86'
PI=30+77.00 EL=862.86'
PI=30+82.00 EL=864.09'
PI=30+90.00 EL=863.93'
PI=30+93.00 EL=862.63'
PI=31+00.00 EL=863.43'
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PI=31+32.00 EL=861.60'
PI=31+56.00 EL=861.60'
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PI=31+76.00 EL=862.33'
PI=31+80.00 EL=862.25'
PI=31+82.00 EL=861.25'
PI=31+86.00 EL=861.95'
PI=31+90.00 EL=861.87'
PI=31+92.00 EL=860.57'
PI=31+96.00 EL=861.57'
PI=32+06.00 EL=861.37'
PI=32+11.00 EL=860.07'
PI=32+36.00 EL=860.07'

27+00 28+00 29+00 30+00 31+00 32+00

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License #: F-1084

NCDMS ID NO. 100081

END UT to MAGNESS
REACH 1A STA. 33+51.77

INSTALL BARBED WIRE FENCE (TYP.)

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-41-9802
DB: 16-D PG: 143 & DB: 1069 PG: 439
PB: 7 PG: 46 (TRACT 11)

ROCK VANE (TYP.)

LOG STEP (TYP.)

33+00

INSTALL 16' GATE

24 LF - 81" W x 59" H CMP
ARCHED CULVERT
INV. IN 859.33'
INV. OUT 859.08'

BOULDER HEAD AND ENDWALL (TYP.)

ROCK DOUBLE DROP CROSS VANE (TYP.)

34+00

BRUSH TOE WITH MATTING AND DOUBLE LIVE STAKES (TYP.)

35+00

LOG VANE (TYP.)

36+00

CONSTRUCTED RIFFLE (TYP.)

GEOLIFT WITH LIVE BRUSH, LOGS AND ROOT WADS (TYP.)

37+00

38+00

MATCH LINE – SEE SHEET 11

MATCH LINE STA. 32+40.00
SEE SHEET 8

MATCH LINE STA. 38+00.00
SEE SHEET 9

BEGIN UT to MAGNESS
REACH 1B STA. 33+81.98

GEOLIFT WITH BRUSH TOE (TYP.)

LOG AND ROCK STEP- POOL (TYP.)

2 FLOODPLAIN PIPES
24 LF - 24" CMP
INV. IN 861.47'
INV. OUT 861.01'

INSTALL 4' GATE

INSTALL 16' GATE

INSTALL 4' GATE

INSTALL BARBED WIRE FENCE (TYP.)

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-41-9802
DB: 16-D PG: 143 & DB: 1069 PG: 439
PB: 7 PG: 46 (TRACT 11)

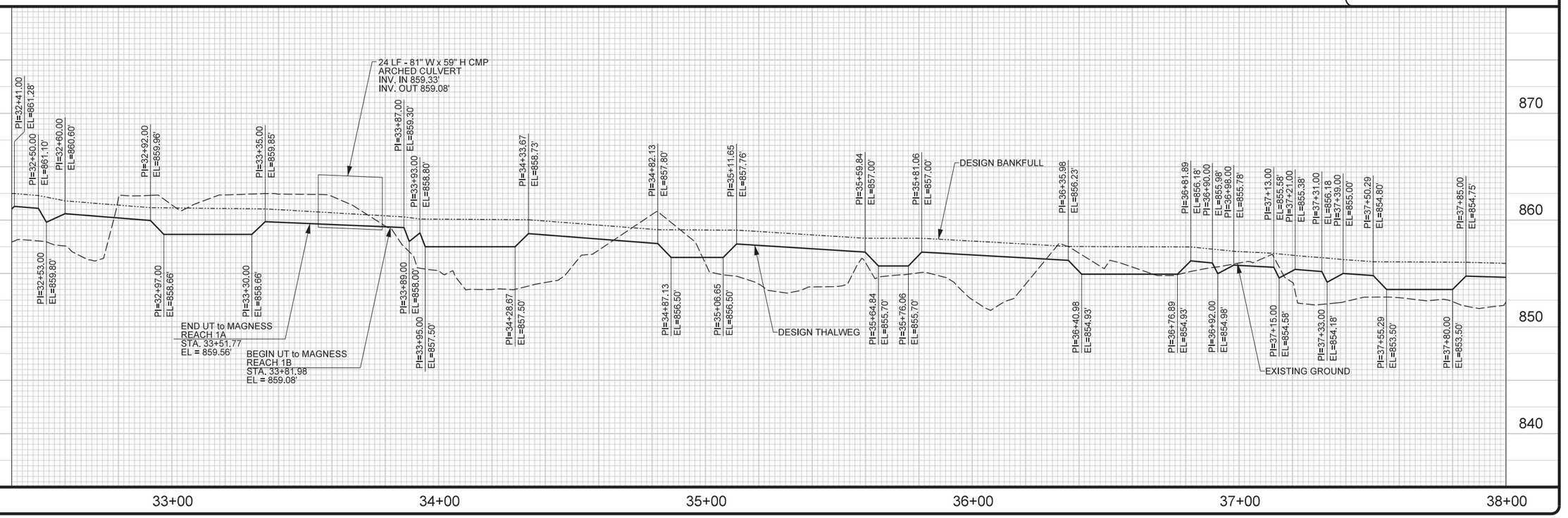
CONTROL POINT
5/8" RBCC (303)
GROUND COORDINATES
N: 611887.74'
E: 1246151.64'
ELEV: 861.98'

NAD 83

FILL EXISTING CHANNEL
CHANNEL PLUG
WETLAND RE-ESTABLISHMENT
WETLAND REHABILITATION

UT TO MAGNESS CREEK PLAN & PROFILE VIEW

20 0 20 40
SCALE (FT)



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167680	9

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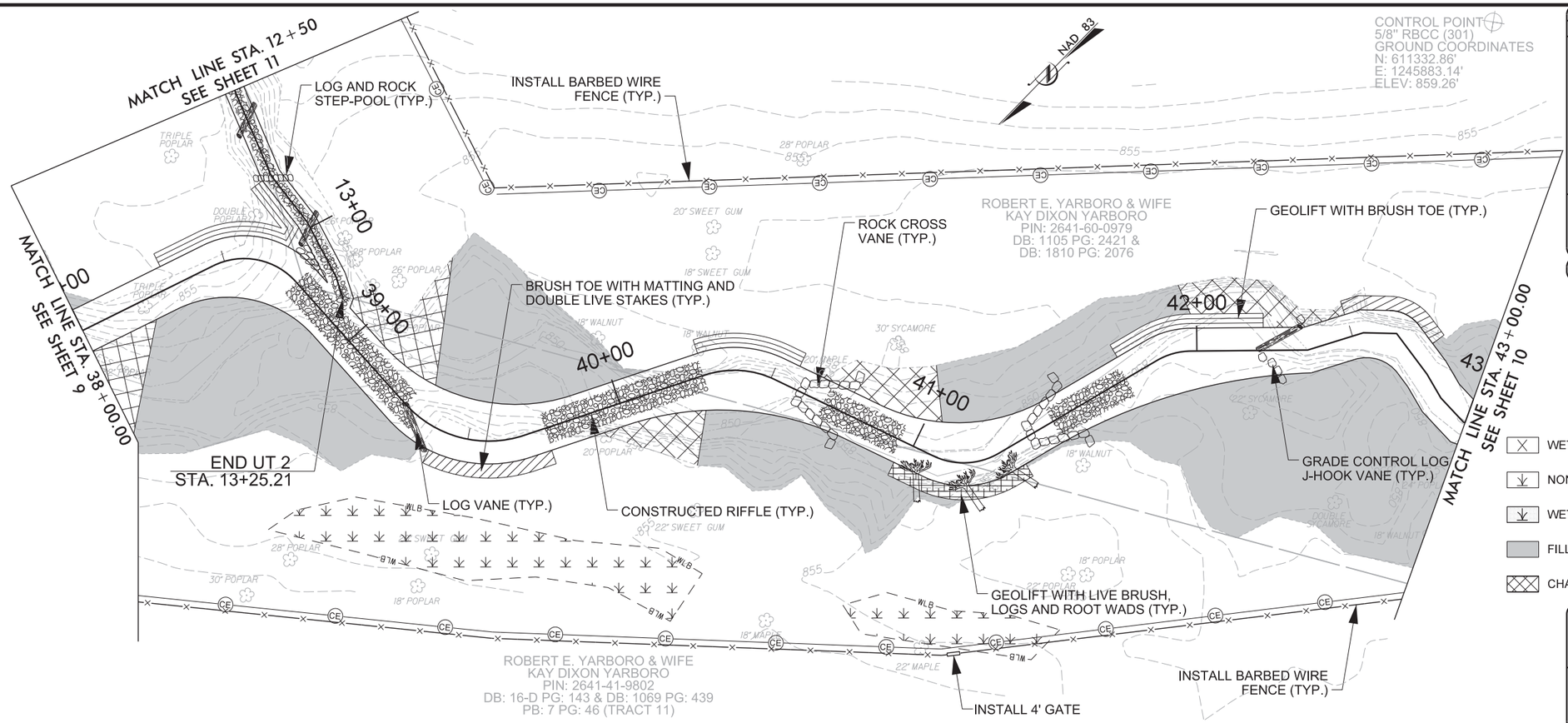
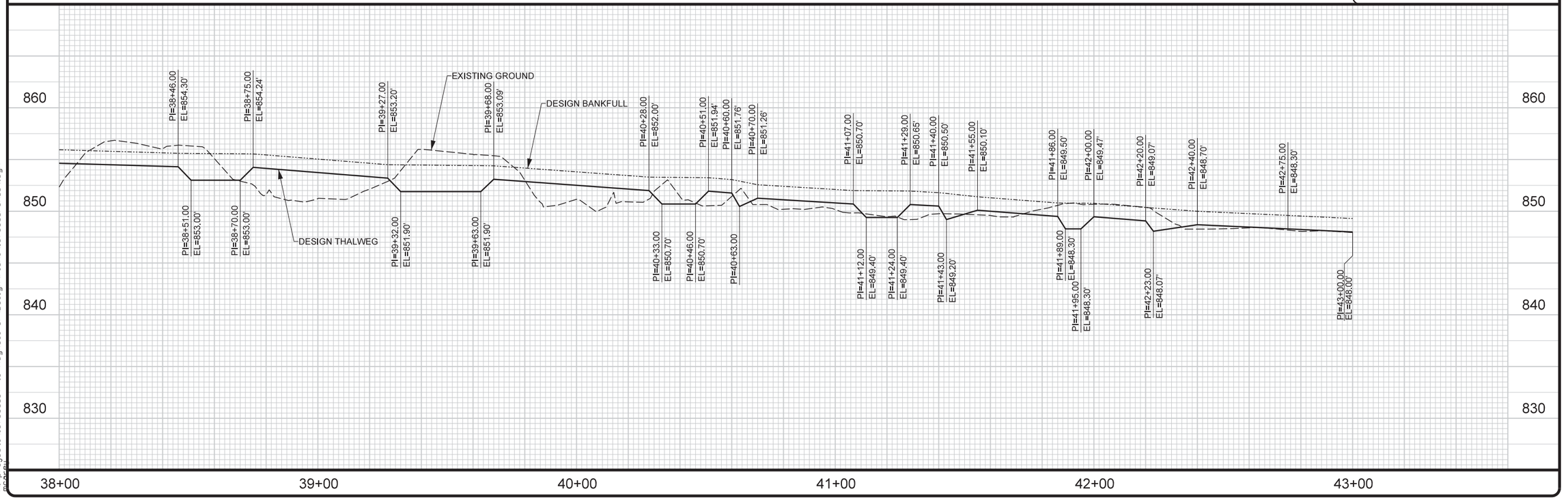
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100081



UT TO MAGNESS CREEK
PLAN & PROFILE VIEW

20 0 20 40
SCALE (FT)



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mcarey

2/26/03

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167680	10

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NAD 83

PERMANENT FORD STREAM CROSSING

INSTALL 12' GATE

BARBED WIRE FENCE INSTALLED OUTSIDE OF THE CONSERVATION EASEMENT

MATCH LINE STA. 43+00.00
SEE SHEET 9

END UT to MAGNESS
REACH 1B STA. 43+06.86

INSTALL 12' GATE

SFHA (ZONE AE) PER F.I.R.M. MAP NO. 3710264100J

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-60-0979
DB: 1105 PG: 2421 &
DB: 1810 PG: 2076

DUKE ENERGY UTILITY EASEMENT

JAMES FREDRICK BEAM & WIFE MARGARET O. BEAM,
PORTION OF DB: 1047 PG: 54 (TRACT NO. 1)
HEIRS OF RUTH S. BEAM
PORTION OF DB: 1047 PG: 58 (TRACT NO. 1) & ESTATE FILE: 09E-629
CAROLINE BROWN REYNOLDS
PORTION OF DB: 1047 PG: 62 (TRACT NO. 1), DB: 1329 PG: 2007 (TRACT NO. 1) &
DB: 1643 PG: 1879 (TRACT NO. 1)
DAVID CONRAD BEAM & WIFE REBECCA P. BEAM
DB: 1047 PG: 66 (TRACT NO. 1)
PIN: 2641-60-7498

SELKIRK DRIVE (SR 1803)
(AS DRAFTED FROM AERIAL)

UT TO MAGNESS CREEK

5' x 7' ELLIPTICAL CMP
INV IN 847.10'
INV OUT 846.45'

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-41-9802
DB: 16-D PG: 143 & DB: 1069 PG: 439
PB: 7 PG: 46 (TRACT 11)

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-41-9802
DB: 16-D PG: 143 & DB: 1069 PG: 439
PB: 7 PG: 46 (TRACT 11)

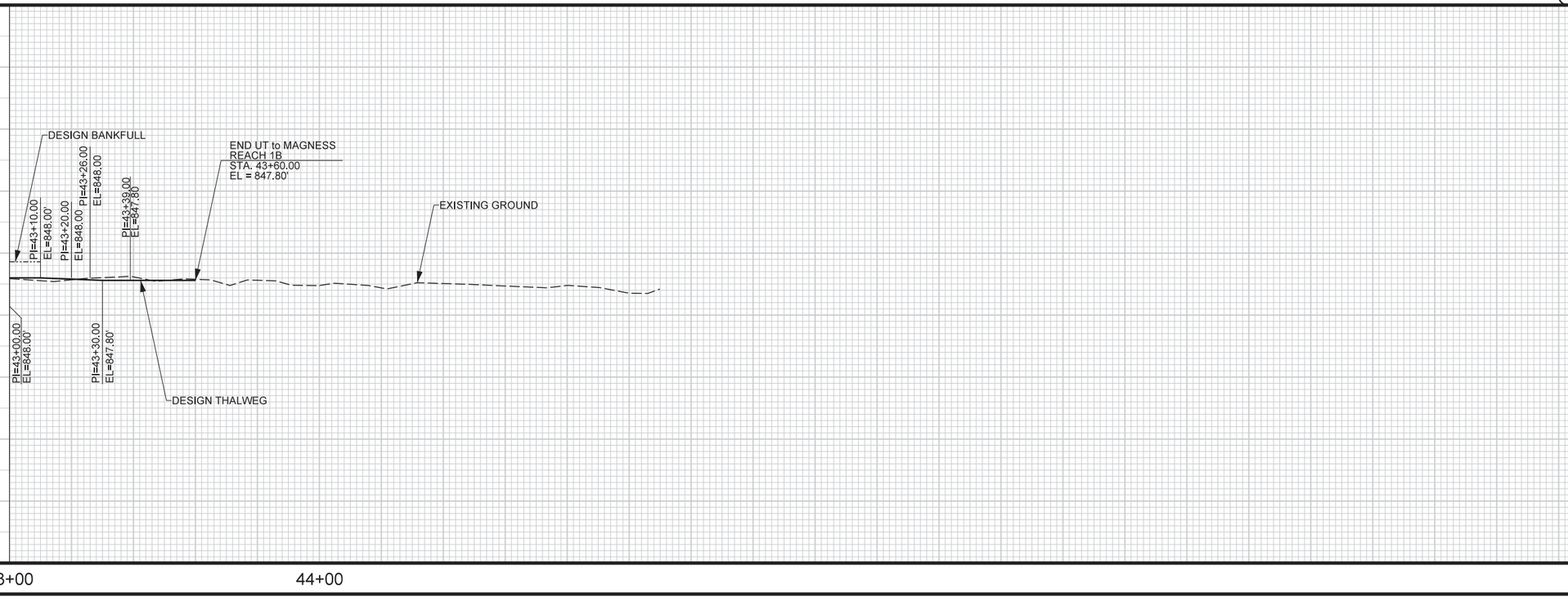
SFHA (ZONE AE) PER F.I.R.M. MAP NO. 3710264100J

FILL EXISTING CHANNEL

CHANNEL PLUG

UT TO MAGNESS CREEK PLAN & PROFILE VIEW

20 0 20 40
SCALE (FT)



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167680	11

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NAD 83

GIS PARCEL LINE (NOT SURVEYED)

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-60-0979
DB: 1105 PG: 2421 &
DB: 1810 PG: 2076

ROY P. SHARPE & WIFE
DRUSILLA D. SHARPE
PIN: 2641-71-0003
DB: 1632 PG: 190

CEDAR LAKE FARM, LLC
PIN: 2641-72-1337
DB: 1587 PG: 1352 (TRACT 4)

ROBERT E. YARBORO & WIFE
KAY DIXON YARBORO
PIN: 2641-41-9802
DB: 16-D PG: 143 & DB: 1069 PG: 439
PB: 7 PG: 46 (TRACT 11)

CONTROL POINT
NCGS MONUMENT (302)
GROUND COORDINATES
N: 611569.06'
E: 1246122.01'
ELEV: 860.26'

INSTALL BARBED WIRE FENCE (TYP.)

VEGETATED GEOLIFT w/ TOE WOOD AND DOUBLE LIVE STAKES (TYP.)

BEGIN UT 2
STA. 10+00.00

LOG STEP (TYP.)

PLANT HEAVY WITH DOUBLE LIVE STAKES (TYP.)

LOG VANE (TYP.)

VEGETATED GEOLIFT w/ TOE WOOD AND DOUBLE LIVE STAKES (TYP.)

10+00

11+00

12+00

MATCH LINE STA. 12+50
SEE SHEET 9

MATCH LINE – SEE SHEET 8

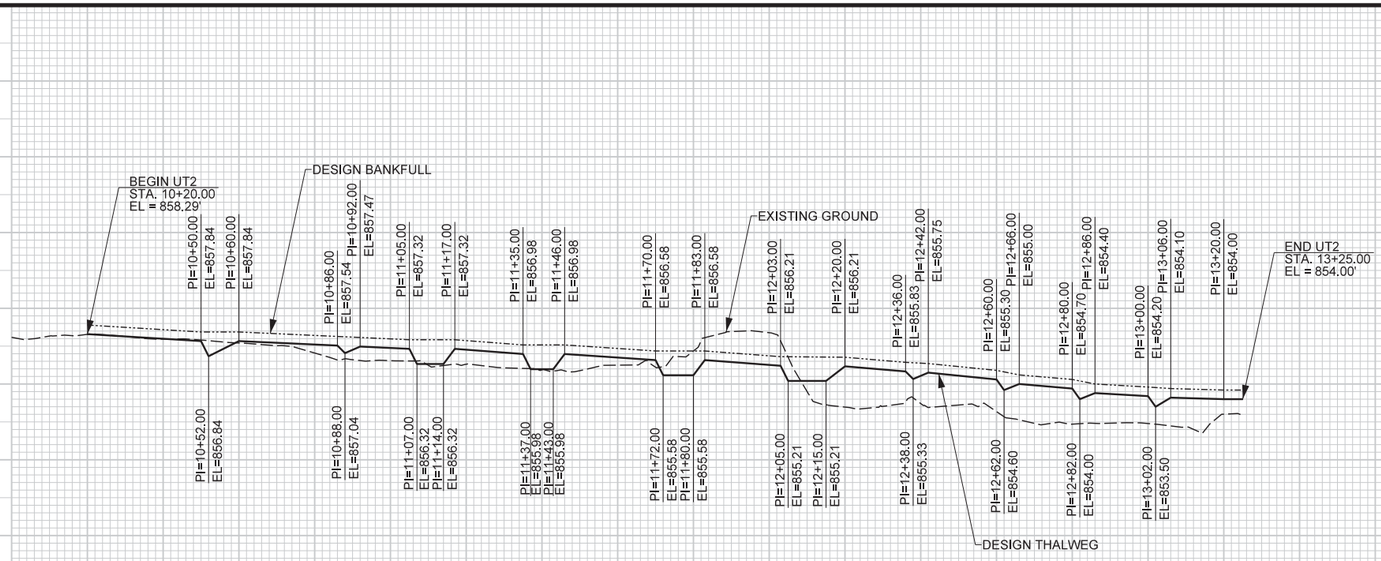
INSTALL BARBED WIRE FENCE (TYP.)

FILL EXISTING CHANNEL

CHANNEL PLUG

UT TO MAGNESS CREEK
PLAN & PROFILE VIEW

20 0 20 40
SCALE (FT)



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mcreel

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BAKER PROJECT REFERENCE NO.	SHEET NO.
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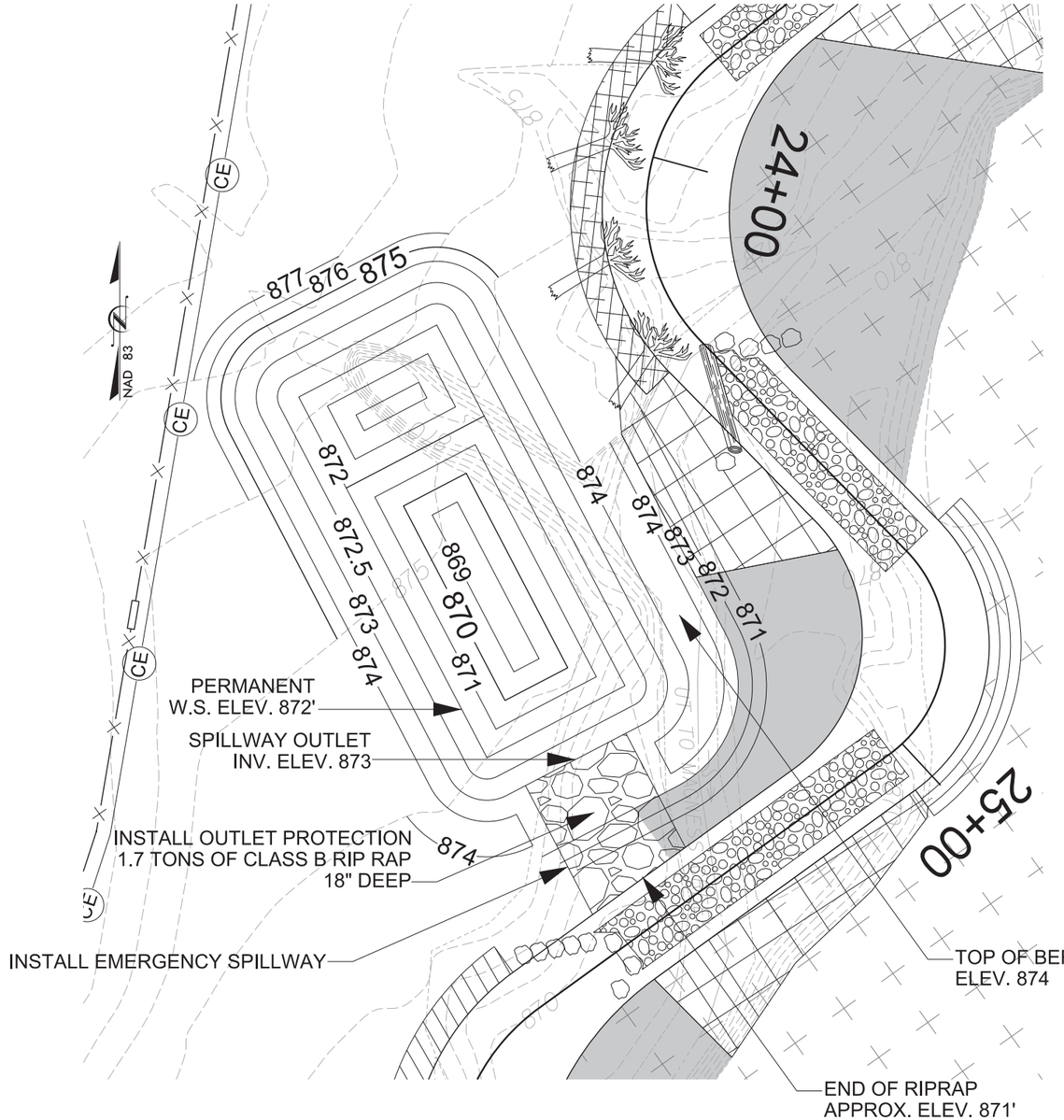

Proposed BMP Planted Species
UT to Magness Creek Mitigation Project - NCDMS Project No. 100081

Botanical Name	Common Name	% Planted by Species	Wetland Tolerance
Shallow Water Zone (50 Herbaceous Plants per 200 ft²)			
Juncus effusus	Common Rush	15%	FACW
Carex vulpinoidea	Fox Sedge	15%	OBL
Peltandra virginica	Arrow Arum	10%	OBL
Pontederia cordata	Pickerelweed	10%	OBL
Saururus cernuus	Lizard's Tail	10%	OBL
Scirpus cyperinus	Woolgrass	10%	FACW
Sparganium americanum	Bur-reed	10%	FAC
Carex lurida	Shallow Sedge	10%	OBL
Polygonum pensylvanicum	Smartweed	10%	FACW
Temporary Inundation Zone (8 shrubs per 200 ft²)			
Alnus serrulata	Tag Alder	15%	OBL
Cephalanthus occidentalis	Buttonbush	15%	OBL
Cornus amomum	Silky Dogwood	15%	FACW
Ilex verticillata	Winterberry	15%	FACW
Physocarpus opulifolius	Ninebark	10%	FACW
Sambucus canadensis	Elderberry	10%	FACW
Vaccinium fuscatum	Black Highbush Blueberry	10%	FACW
Xanthorhiza simplicissima	Yellowroot	10%	FACW

Notes: -Final species selection may change due to refinement of site conditions or to availability at the time of planting. If species substitution is required, the planting Contractor will submit a revised planting list to Baker for approval prior to the procurement of plant stock.

-Shallow Water planting zone is from basin bottom to elevation 872.0' while Temporary Inundation planting zone is from elevation 872.0' to 873.0'.

-Embankments and perimeter fill slopes will be planted with non-clumping turf grasses (no trees or woody shrubs).

UT to MAGNESS CREEK BMP PLAN VIEW

10 0 10 20
SCALE (FT)

7/27/2021
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mcreay

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BAKER PROJECT REFERENCE NO.	SHEET NO.
167680	13

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8000 Regency Parkway, Suite 600
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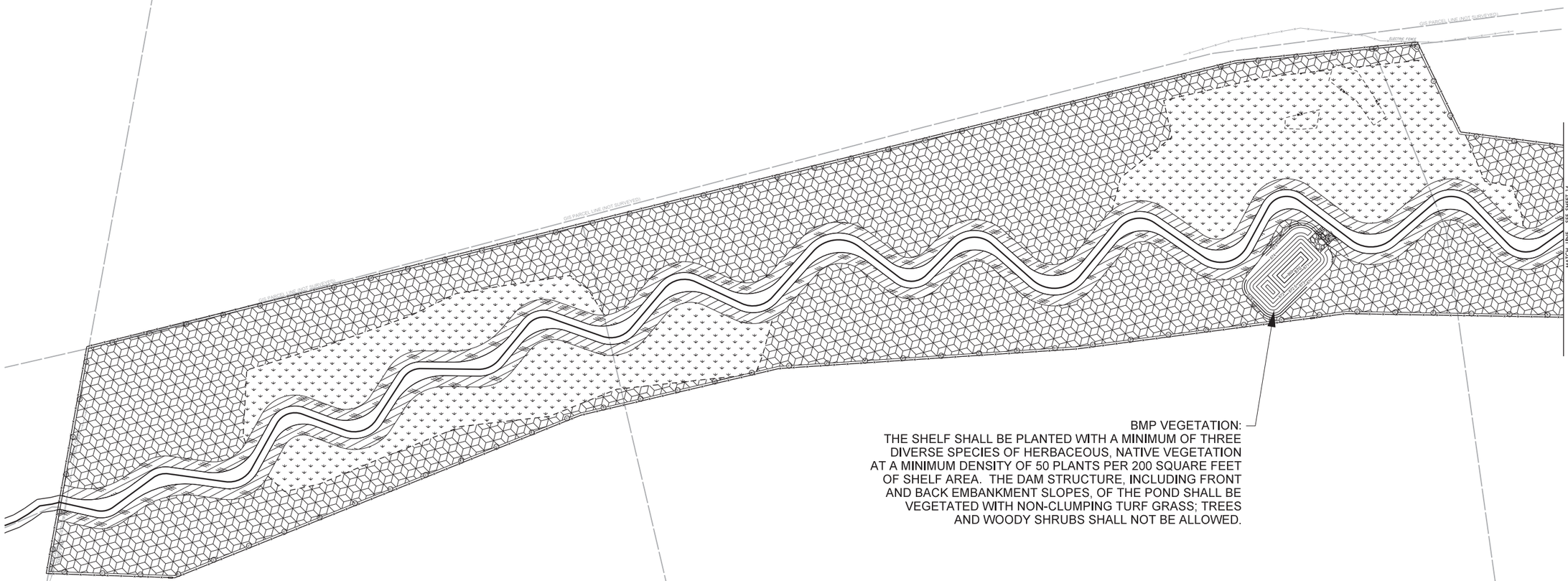
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100081

NAD 83



BMP VEGETATION:
THE SHELF SHALL BE PLANTED WITH A MINIMUM OF THREE DIVERSE SPECIES OF HERBACEOUS, NATIVE VEGETATION AT A MINIMUM DENSITY OF 50 PLANTS PER 200 SQUARE FEET OF SHELF AREA. THE DAM STRUCTURE, INCLUDING FRONT AND BACK EMBANKMENT SLOPES, OF THE POND SHALL BE VEGETATED WITH NON-CLUMPING TURF GRASS; TREES AND WOODY SHRUBS SHALL NOT BE ALLOWED.

SEEDED, MULCHED, COVERED WITH COIR MATTING, AND LIVE STAKED

SEEDED, MULCHED, AND PLANTED WITH BARE ROOT TREES (WETLAND ZONE)

SEEDED, MULCHED, AND PLANTED WITH BARE ROOT TREES (GENERAL RIPARIAN ZONE)

UT TO MAGNESS CREEK REVEGETATION PLAN

50 0 50 100
SCALE (FT)

7/27/2021
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mgreen

2/26/03

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167680	14

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NCDMS ID NO. 100081

NAD 83

GIS PARCEL LINE (NOT SURVEYED)

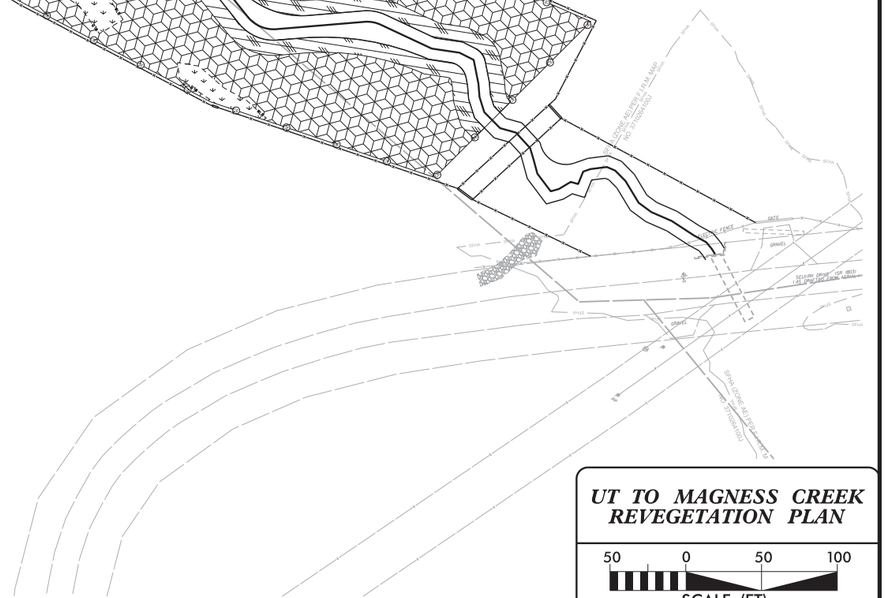
EXISTING EDGE OF WATER

MATCH LINE - SEE SHEET 13

SEEDED, MULCHED, COVERED WITH COIR MATTING, AND LIVE STAKED

SEEDED, MULCHED, AND PLANTED WITH BARE ROOT TREES (WETLAND ZONE)

SEEDED, MULCHED, AND PLANTED WITH BARE ROOT TREES (GENERAL RIPARIAN ZONE)



UT TO MAGNESS CREEK REVEGETATION PLAN

50 0 50 100
SCALE (FT)

7/27/2021
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STATE	BAKER PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
NC	167680	EC-1	9

NORTH CAROLINA
DIVISION OF MITIGATION SERVICES

EROSION & SEDIMENTATION CONTROL PLAN

LOCATION: FROM LAWNDALE, TAKE NC–182 1.9 MILES EAST TO FALL STREET ON LEFT, GO .28 MILES TO SELKIRK ROAD ON LEFT, TRAVEL .87 MILES SOUTH AND SITE IS EAST OF SELKIRK ROAD AT CULVERT.

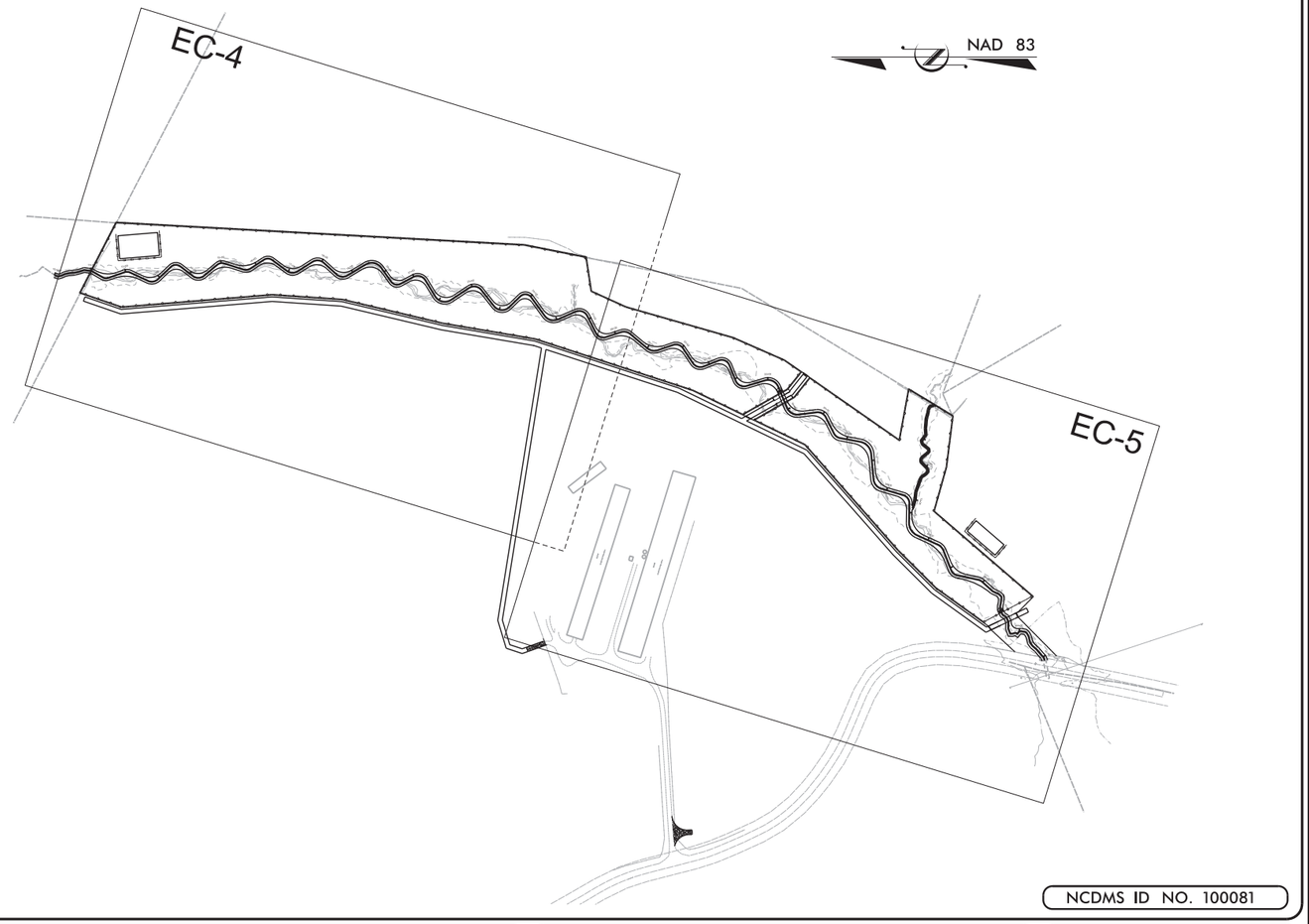
TYPE OF WORK: STREAM RESTORATION AND ENHANCEMENT

UT to MAGNESS CREEK

PROJECT: 167680

MAINTENANCE PLAN:

1. QUALIFIED PERSONNEL, ON A DAILY BASIS WILL EVALUATE ALL TEMPORARY EROSION AND SEDIMENTATION CONTROL PRACTICES FOR STABILITY AND OPERATION.
2. INSPECT AND MAINTAIN ALL EROSION CONTROL MEASURES EVERY 7 DAYS AND AFTER EACH SIGNIFICANT RAINFALL (1.0 INCHES OR GREATER) AND DOCUMENT WITH INSPECTION REPORTS.
3. A RAIN GAUGE WILL ALSO BE KEPT ON-SITE AND DAILY RAINFALL AMOUNTS WILL BE RECORDED.
4. ANY REPAIRS NEEDED WILL BE PERFORMED IMMEDIATELY TO MAINTAIN ALL PRACTICES AS DESIGNED.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE OF TEMPORARY ON-SITE EROSION AND SEDIMENTATION CONTROL MEASURES.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING AND FOLLOWING THE APPROVED SEDIMENTATION AND EROSION CONTROL PLAN.
7. A COPY OF THE COMBINED SELF-INSPECTION MONITORING FORM CAN BE DOUND ON DEMLR WEBSITE AT: (http://deq.nc.gov/about/divisions/energy-mineral-land-resources/erosion-sediment-control-forms)



STD. NO.	DESCRIPTION	SYMBOL
6.06	TEMPORARY GRAVEL CONSTRUCTION ACCESS	
6.62	TEMPORARY SILT FENCE	
6.63	TEMPORARY ROCK DAM	
	TEMPORARY STREAM CROSSING	
	TEMPORARY WETLAND MAT	
	LIMITS OF DISTURBANCE	

NCDMS ID NO. 100081

GRAPHIC SCALES

100 0 100 200

50 0 50 100

PLANS

THIS PROJECT CONTAINS EROSION CONTROL PLANS FOR ALL PHASES OF CONSTRUCTION.

TOTAL DISTURBED AREA = ??.? Acres

PROJECT STANDARDS

THE FOLLOWING STANDARDS AS THEY APPEAR IN THE "NC EROSION CONTROL PLANNING AND DESIGN MANUAL" AND ARE APPLICABLE TO THIS PROJECT AND BY REFERENCE HEREBY ARE CONSIDERED PART OF THE PLANS.

6.06	TEMPORARY GRAVEL CONSTRUCTION ACCESS
6.20	TEMPORARY DIVERION
6.24	RIPARIAN AREA SEEDING
6.62	SILT FENCE
6.63	TEMPORARY ROCK DAM

PREPARED IN THE OFFICE OF:

Michael Baker INTERNATIONAL

Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

LETTING DATE:

KATHLEEN M. MCKEITHAN, PE
PROJECT ENGINEER

PROJECT ENGINEER

PROGRESS DRAWING
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P.E.

SIGNATURE:

2/26/03

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

POLYACRYLAMIDES (PAMS) AND FLOCCULANTS

1. Select flocculants that are appropriate for the soils being exposed during construction, selecting from the *NC DWR List of Approved PAMS/Flocculants*.
2. Apply flocculants at or before the inlets to Erosion and Sediment Control Measures.
3. Apply flocculants at the concentrations specified in the *NC DWR List of Approved PAMS/Flocculants* and in accordance with the manufacturer's instructions.
4. Provide ponding area for containment of treated Stormwater before discharging offsite.
5. Store flocculants in leak-proof containers that are kept under storm-resistant cover or surrounded by secondary containment structures.

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.

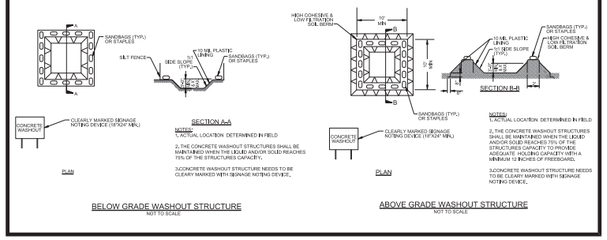
PORTABLE TOILETS

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.

ONSITE CONCRETE WASHOUT STRUCTURE WITH LINER



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

BAKER PROJECT REFERENCE NO.	SHEET NO.
167680	EC-1A

PROJECT ENGINEER

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Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
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BAKER PROJECT REFERENCE NO. 167680 | SHEET NO. EC-1B

PROJECT ENGINEER

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NCDMS ID NO. 100081

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. Occurences 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.

PART II, SECTION G, ITEM (4)
DRAW DOWN OF SEDIMENT BASINS FOR MAINTENANCE OR CLOSE OUT

Sediment basins and traps that receive runoff from drainage areas of one acre or more shall use outlet structures that withdraw water from the surface when these devices need to be drawn down for maintenance or close out unless this is infeasible. The circumstances in which it is not feasible to withdraw water from the surface shall be rare (for example, times with extended cold weather). Non-surface withdrawals from sediment basins shall be allowed only when all of the following criteria have been met:

(a) The E&SC plan authority has been provided with documentation of the non-surface withdrawal and the specific time periods or conditions in which it will occur. The non-surface withdrawal shall not commence until the E&SC plan authority has approved these items,
(b) The non-surface withdrawal has been reported as an anticipated bypass in accordance with Part III, Section C, Item (2)(c) and (d) of this permit,
(c) Dewatering discharges are treated with controls to minimize discharges of pollutants from stormwater that is removed from the sediment basin. Examples of appropriate controls include properly sited, designed and maintained dewatering tanks, weir tanks, and filtration systems,
(d) Vegetated, upland areas of the sites or a properly designed stone pad is used to the extent feasible at the outlet of the dewatering treatment devices described in Item (c) above,
(e) Velocity dissipation devices such as check dams, sediment traps, and riprap are provided at the discharge points of all dewatering devices, and
(f) Sediment removed from the dewatering treatment devices described in Item (c) above is disposed of in a manner that does not cause deposition of sediment into waters of the United States.

NCG01 SELF-INSPECTION, RECORDKEEPING AND REPORTING

EFFECTIVE: 04/01/19

2/5/2021
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mcgeary

2/26/03

PROJECT REFERENCE NO.	SHEET NO.
167680	EC-2

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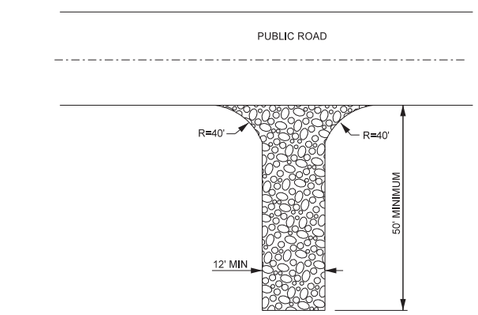
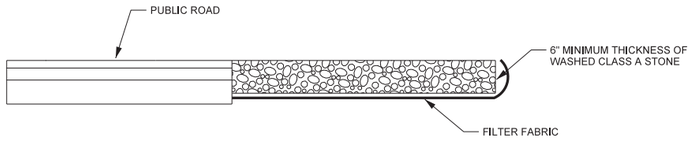
Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100081

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE /EXIT

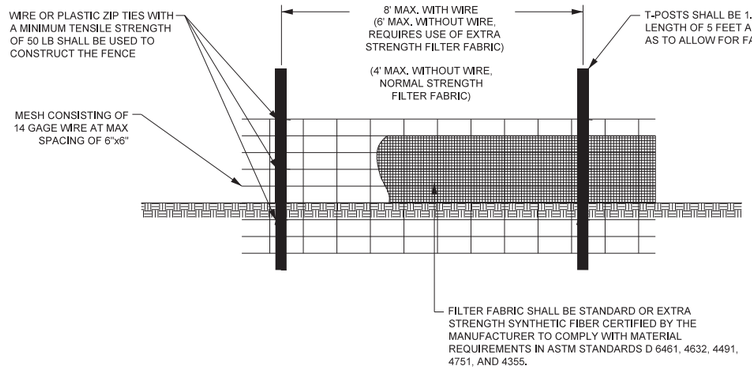




NOTES:

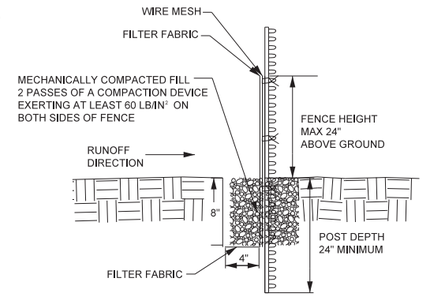
SPECIFICATION NO. 6.06 - CONSTRUCTION ACCESS "N.C. EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL MARCH 2009"

TEMPORARY SILT FENCE

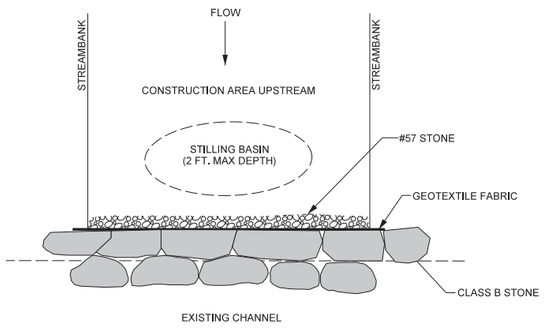


NOTES:
1. AVOID JOINTS, UNAVOIDABLE JOINTS MUST HAVE 4' OF CLOTH OVERLAP AND SHOULD TIE INTO THE NEXT ADJACENT POST.
2. PLACE ON CONTOUR EXCEPT ENDS WHICH SHOULD BE 1' ABOVE GRADE TO PREVENT CUT AROUND.
3. WRAP APPROX. 6" OF FABRIC AROUND END POSTS AND SECURE WITH TIES.
4. REMOVE ONCE AREA IS STABLE.
5. CONTRACTOR SHALL SIDE CAST SPOIL MATERIAL FROM TRENCHING FOR SILT FENCE ONTO HIGH GROUND OR ONTO THE PERMITTED WETLAND IMPACT SIDE TO AVOID UNPERMITTED WETLAND IMPACTS.

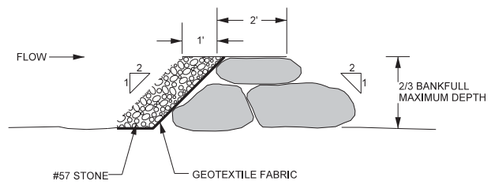
MAINTENANCE NOTES:
1. INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.
3. REMOVE SEDIMENT DEPOSITS AS NECESSARY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING THE FENCE DURING CLEANOUT.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.



TEMPORARY ROCK DAM



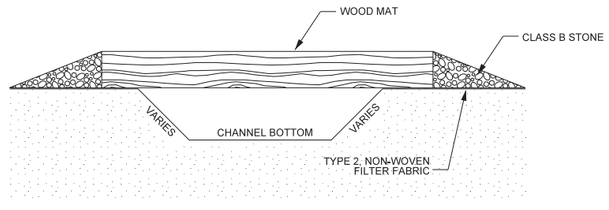
PLAN VIEW



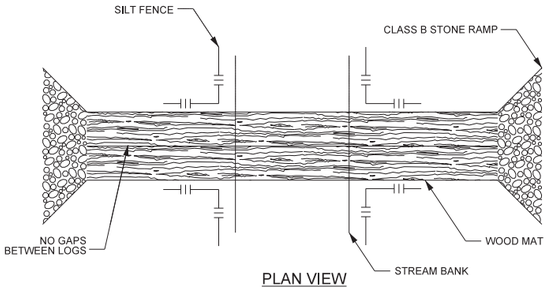
CROSS SECTION

NOTES:
1. TEMPORARY ROCK CHECK DAMS SHALL BE INSTALLED AT THE END OF THE REACH THAT IS UNDER CONSTRUCTION WITHIN THE CURRENT PHASE OF CONSTRUCTION AND/OF AS DESIGNATED ON THE EROSION CONTROL PLANS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSPECTING THE TEMPORARY ROCK CHECK DAMS ON A DAILY BASIS AND CLEANING OR REPAIRING THEM AS NEEDED.
3. THE CONTRACTOR SHALL BE REQUIRED TO REMOVE SEDIMENT FROM THE CHECK DAMS ONCE THE DEPTH OF SEDIMENT REACHES 12 INCHES.

TEMPORARY STREAM AND WETLAND CROSSING - WOOD MAT



CROSS SECTION



PLAN VIEW

NOTES:
1. CONSTRUCT STREAM CROSSING WHEN FLOW IS LOW.
2. HAVE ALL NECESSARY MATERIALS AND EQUIPMENT ON-SITE BEFORE WORK BEGINS.
3. MINIMIZE CLEARING AND EXCAVATION OF STREAMBANKS. DO NOT EXCAVATE CHANNEL BOTTOM.
4. LINE STREAMBANK AND ACCESS RAMP AREA WITH NON-WOVEN FILTER FABRIC.
5. INSTALL STREAM CROSSING AT RIGHT ANGLE TO THE FLOW.
6. TRANSPLANT SOD FROM ORIGINAL STREAMBANK ONTO SIDE SLOPES FOR LATER USE.
7. MAINTAIN CROSSING SO THAT RUNOFF IN THE CONSTRUCTION ROAD DOES NOT ENTER EXISTING CHANNEL BY INSTALLING SILT FENCE ON ALL FOUR CORNERS ADJACENT TO THE STREAM. SEE SILT FENCE DETAIL.
8. STABILIZE AN ACCESS RAMP OF CLASS B STONE TO THE EDGE OF THE MUD MAT.
9. THE WOOD MAT SHALL BE OF SUFFICIENT SIZE AND WIDTH TO SUPPORT THE LARGEST VEHICLE CROSSING THE CHANNEL.
10. CONTRACTOR SHALL DETERMINE AN APPROPRIATE RAMP ANGLE ACCORDING TO EQUIPMENT UTILIZED, RECOMMENDED AT A 5:1 SLOPE.

TEMPORARY STREAM CROSSING MAINTENANCE NOTES:
1. INSPECT TEMPORARY STREAM CROSSINGS AFTER RUN-OFF PRODUCING RAINS TO CHECK FOR BLOCKAGE IN CHANNEL, EROSION OF ABUTMENTS, CHANNEL SCOUR, RIPRAP DISPLACEMENT, OR PIPING. MAKE ALL REPAIRS IMMEDIATELY TO PREVENT FURTHER DAMAGE TO THE INSTALLATION.

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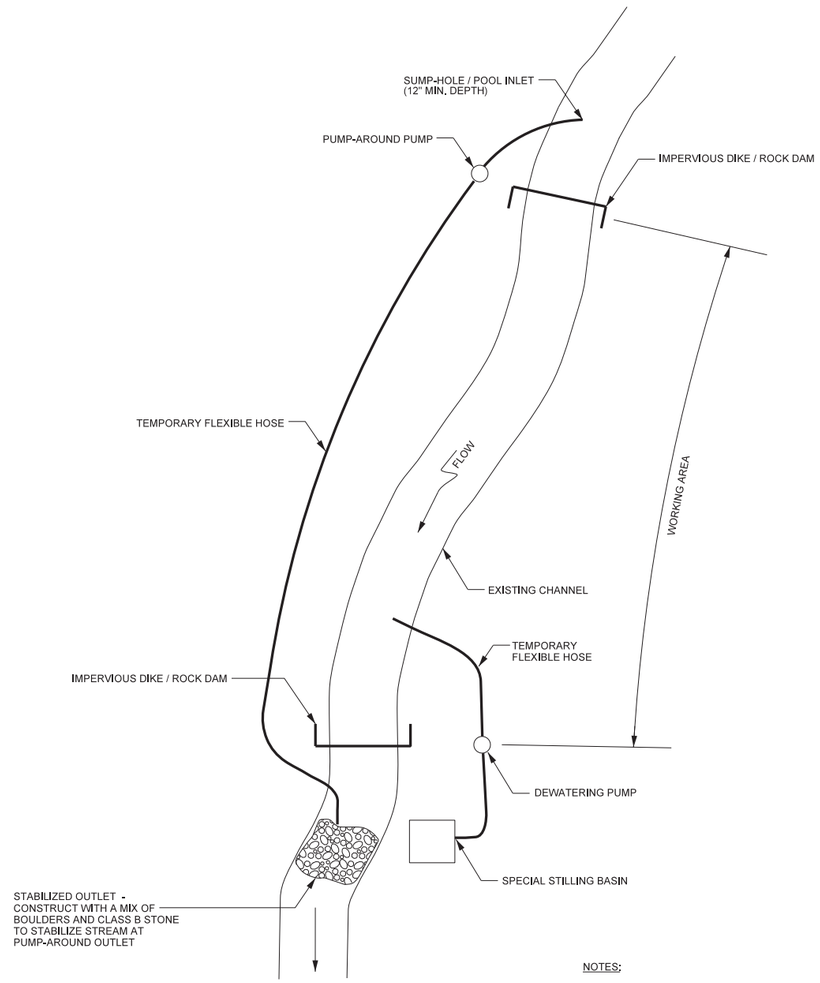
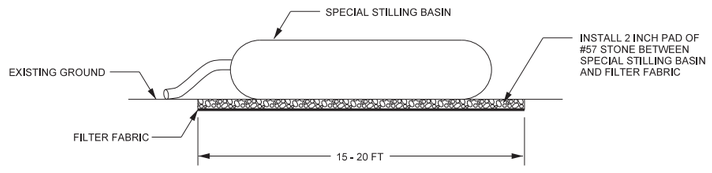
TYPICAL PUMP-AROUND OPERATION



NOTES:

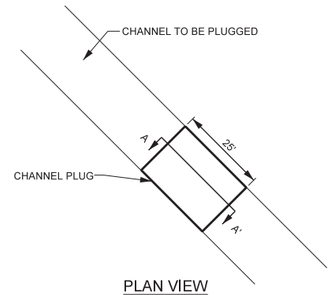
1. EXCAVATION SHALL BE PERFORMED IN ONLY DRY SECTIONS OF CHANNEL.
2. IMPERVIOUS DIKES SHOULD BE USED TO ISOLATE WORK AREAS FROM STREAM FLOW.
3. THE CONTRACTOR SHALL NOT DISTURB MORE AREA THAN CAN BE STABILIZED IN ONE WORKING DAY.
4. THE PUMP-AROUND PUMP SHOULD ADEQUATELY CONVEY 1 CFS (450 GALLONS PER MINUTE).



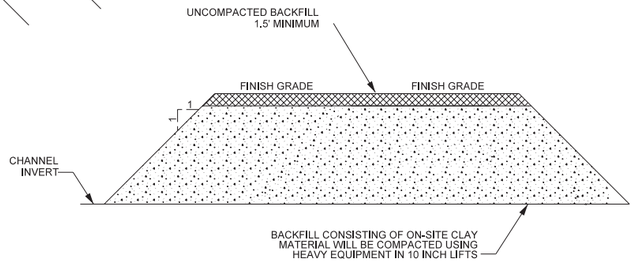
SEQUENCE OF CONSTRUCTION FOR TYPICAL PUMP AROUND

1. INSTALL STABILIZED OUTLET AT THE DOWNSTREAM END OF THE DESIGNATED PROJECT WORKING AREA.
2. THE CONTRACTOR WILL INSTALL THE PUMP AROUND PUMP AND THE TEMPORARY FLEXIBLE HOSE THAT WILL CONVEY THE BASE FLOW FROM UPSTREAM OF THE WORK SITE TO THE SPECIAL STILLING BASIN OR STABILIZED OUTLET.
3. INSTALL UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. INSTALL THE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS IF NEEDED TO DEWATER THE ENTRAPPED AREA. THE PUMP AND HOSE FOR THIS PURPOSE SHALL BE OF SUFFICIENT SIZE TO DEWATER THE WORK AREA. THIS WATER WILL FLOW INTO A SPECIAL STILLING BASIN.
5. THE CONTRACTOR WILL PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLAN AND FOLLOWING THE GENERAL CONSTRUCTION SEQUENCE.
6. THE CONTRACTOR WILL EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF THE IMPERVIOUS DIKE. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE STARTING WITH THE DOWNSTREAM DIKE FIRST.
7. THE CONTRACTOR WILL COMPLETE ALL GRADING AND STABILIZATION IN ONE DAY WITHIN THE PUMP AROUND AREA BETWEEN THE IMPERVIOUS DIKES.
8. ONCE THE WORKING AREA IS COMPLETED, REMOVE THE SPECIAL STILLING BASIN AND STABILIZED OUTLET AND STABILIZE DISTURBED AREAS WITH SEED AND MULCH.

CHANNEL PLUG



PLAN VIEW



NOTE:
1. BACKFILL CONSISTING OF ON-SITE CLAY MATERIAL WILL BE COMPACTED USING HEAVY EQUIPMENT IN 10 INCH LIFTS.
2. THE REMAINDER OF THE EXISTING CHANNEL TO BE PLUGGED WILL BE COMPLETED FILLED TO THE NEW TOP-OF-BANK ELEVATION.

PROJECT REFERENCE NO.	SHEET NO.
167680	EC-2A

PROJECT ENGINEER

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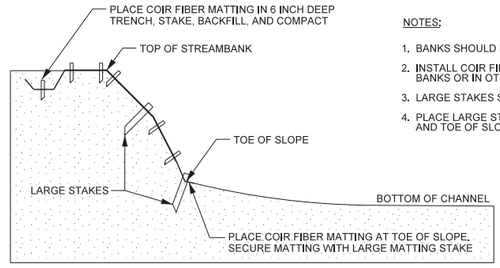
Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100081

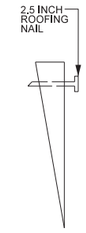
COIR FIBER MATTING



CROSS SECTION VIEW

NOTES:

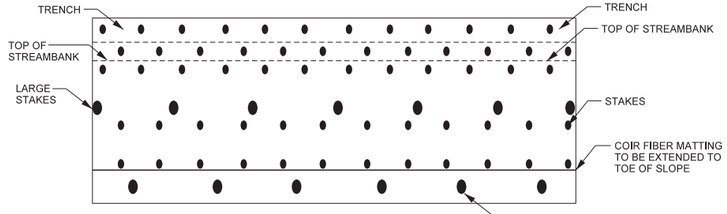
1. BANKS SHOULD BE SEEDED PRIOR TO PLACEMENT OF MATTING.
2. INSTALL COIR FIBER MATTING PER SPECIFICATIONS ALONG STREAM BANKS OR IN OTHERS LOCATIONS SPECIFIED BY ENGINEER.
3. LARGE STAKES SHOULD NOT BE SPACED FURTHER THAN 36" APART.
4. PLACE LARGE STAKES ALONG ALL SEAMS, IN THE CENTER OF BANK, AND TOE OF SLOPE.



TYPICAL LARGE MATTING STAKE

THE WOOD STAKE SHALL HAVE THE FOLLOWING DIMENSIONS:

LEG LENGTH	17.00 IN (43.18 CM) (TAPERED TO POINT)
WIDTH	1.5 IN (3.81 CM)
THICKNESS	1.5 IN (3.81 CM)



PLAN VIEW

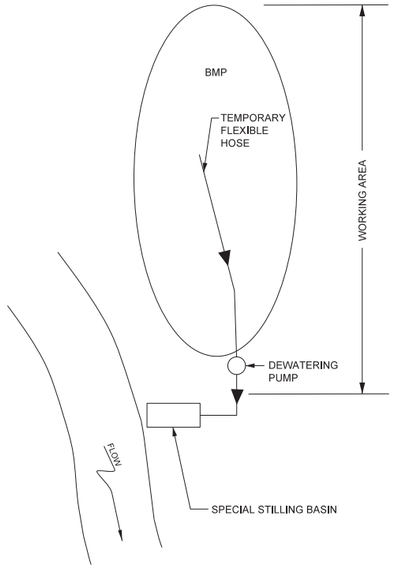
TYPICAL SMALL MATTING STAKE

THE WOOD STAKE SHALL HAVE THE FOLLOWING DIMENSIONS:

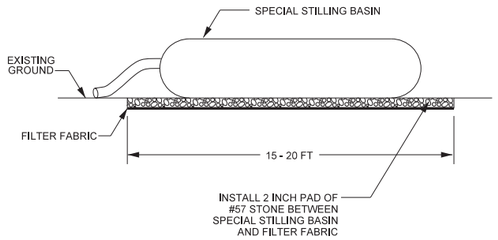
LEG LENGTH	11.00 IN (27.94 CM)
HEAD WIDTH	1.25 IN (3.18 CM)
HEAD THICKNESS	0.40 IN (1.02 CM)
LEG WIDTH	0.60 IN (1.52 CM) (TAPERED TO POINT)
LEG THICKNESS	0.40 IN (1.02 CM)
TOTAL LENGTH	12.00 IN (30.48 CM)

2/26/03

DEWATERING PUMP



SPECIAL STILLING BASIN



1. INSTALL SPECIAL SILLING BASIN OUTSIDE OF THE DESIGNATED PROJECT WORKING AREA.
2. THE CONTRACTOR WILL INSTALL THE DEWATERING PUMP AND THE TEMPORARY FLEXIBLE HOSE THAT WILL CONVEY THE WATER IN THE BMP TO THE SPECIAL STILLING BASIN OR STABILIZED OUTLET.
3. THE CONTRACTOR WILL PERFORM WORK IN ACCORDANCE WITH THE PLAN AND FOLLOWING THE GENERAL CONSTRUCTION SEQUENCE.
4. THE CONTRACTOR WILL EXCAVATE ANY ACCUMULATED SILT, REMOVE PUMPS, AND TEMPORARY FLEXIBLE HOSE.
5. ONCE THE WORKING AREA IS COMPLETED, REMOVE THE SPECIAL STILLING BASIN AND STABILIZE DISTURBED AREAS WITH SEED AND MULCH.

SEQUENCE OF CONSTRUCTION FOR DEWATERING PUMP

1. WHEN NECESSARY, INSTALL THE PUMPING APPARATUS TO DEWATER THE BMP WORK AREA. THE PUMP AND HOSE SHALL BE OF SUFFICIENT SIZE TO DEWATER THE BMP WITHIN 24 HOURS. THE WATER SHALL BE PUMPED FROM THE BMP TO THE SPECIAL STILLING BASIN.
2. THE CONTRACTOR MAY THEN FINISH GRADE AND PLANT THE BMP IN ACCORDANCE WITH THE PLAN AND THE GENERAL CONSTRUCTION SEQUENCE.
3. ONCE GRADING AND PLANTING ARE COMPLETE, REMOVE PUMP AND HOSE.
4. STABILIZE DISTURBED AREAS WITH TEMPORARY SEED AND MULCH.

TEMPORARY SEEDING SELECTION AND APPLICATION RATES				
Common Name	**Scientific Name**	**Application Time**	**Application Rate**	**Total (lbs/acre)**
Cereal rye	*Secale cereale*	Sept - March	3 lb/1,000 sq ft.	130 lbs/acre
Browntop millet	*Panicum ramosum*	April - Aug	1 lb/1,000 sq ft.	44 lbs/acre

TEMPORARY STABILIZATION TIMEFRAMES		
SITE AREA DESCRIPTION	STABILIZATION	TIME FRAME EXCEPTIONS
PERIMITER DIKES, SWALE, DITCHES AND SLOPES	7 DAYS	NONE
HIGH QUALITY WATER (HQW) ZONES	7 DAYS	NONE
SLOPES STEEPER THAN 3:1	7 DAYS	If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed.
SLOPES 3:1 OR FLATTER	14 DAYS	7 days for slopes greater than 50' in length
ALL OTHER AREAS WITH SLOPES FLATTER THAN 4:1	14 DAYS	None, except for perimeters and HQW Zones
* ALL CHANNEL WORK MUST BE STABILIZED DAILY		

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Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
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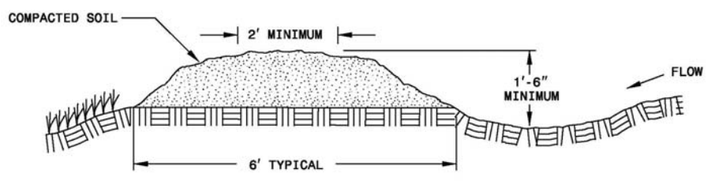
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.
1-12

ENGLISH STANDARD DRAWING FOR
TEMPORARY DIVERSION

SHEET 1 OF 1
1630.05

NOTES

EXCAVATE TEMPORARY DIVERSION WITH NON-VERTICAL SIDE SLOPES AND NOT GREATER THAN 1.5:1 SLOPE.
SEED BERM CREATED BY COMPACTED SOIL AS DIRECTED.



CROSS SECTIONAL VIEW

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.
1-12

ENGLISH STANDARD DRAWING FOR
TEMPORARY DIVERSION

SHEET 1 OF 1
1630.05

2/15/2021
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2/26/03

BAKER PROJECT REFERENCE NO.	SHEET NO.
167680	EC-3

PROGRESS DRAWING
FOR REVIEW PURPOSES ONLY
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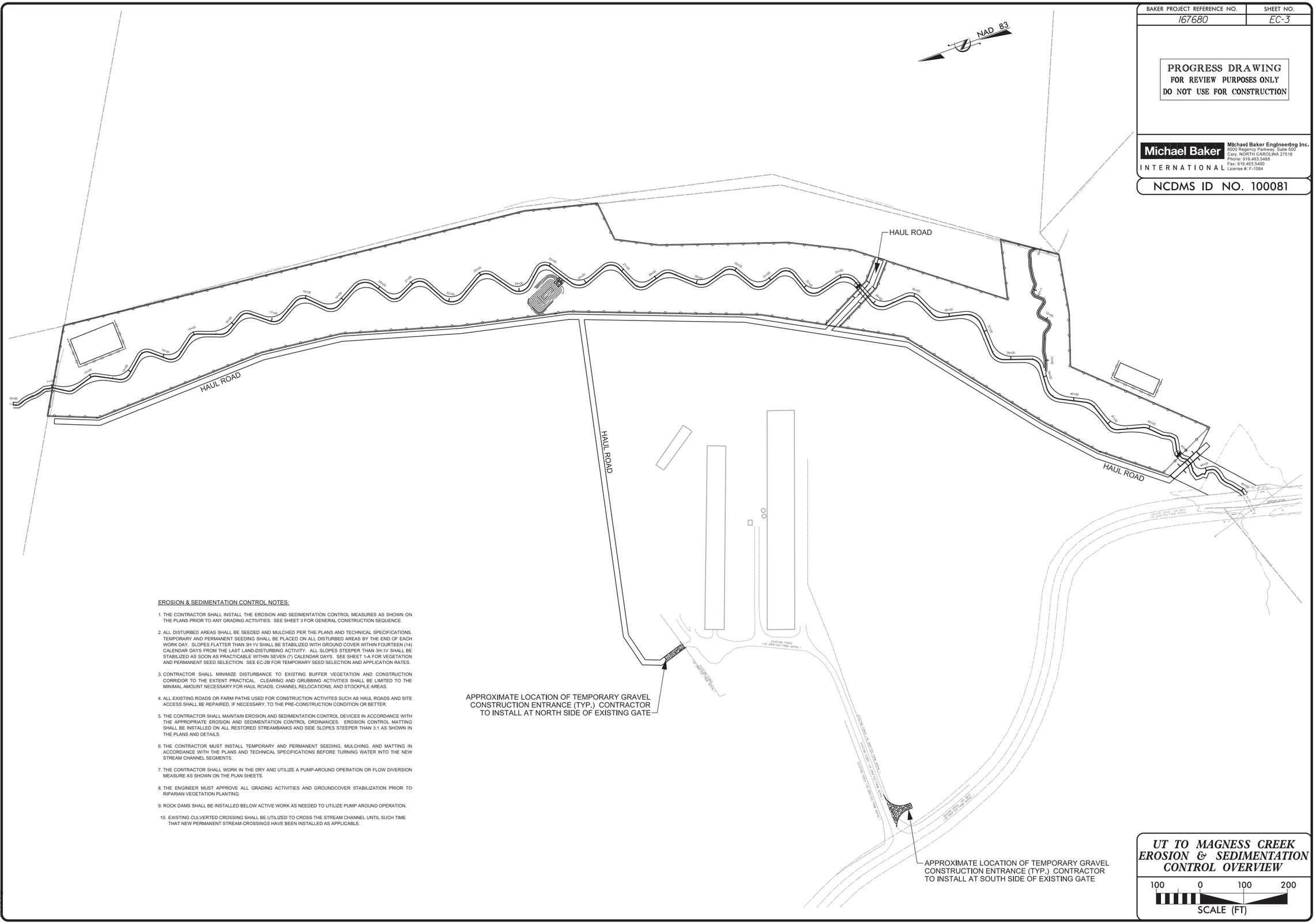
Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100081



EROSION & SEDIMENTATION CONTROL NOTES:

1. THE CONTRACTOR SHALL INSTALL THE EROSION AND SEDIMENTATION CONTROL MEASURES AS SHOWN ON THE PLANS PRIOR TO ANY GRADING ACTIVITIES. SEE SHEET 3 FOR GENERAL CONSTRUCTION SEQUENCE.
2. ALL DISTURBED AREAS SHALL BE SEEDED AND MULCHED PER THE PLANS AND TECHNICAL SPECIFICATIONS. TEMPORARY AND PERMANENT SEEDING SHALL BE PLACED ON ALL DISTURBED AREAS BY THE END OF EACH WORK DAY. SLOPES FLATTER THAN 3H:1V SHALL BE STABILIZED WITH GROUND COVER WITHIN FOURTEEN (14) CALENDAR DAYS FROM THE LAST LAND-DISTURBING ACTIVITY. ALL SLOPES STEEPER THAN 3H:1V SHALL BE STABILIZED AS SOON AS PRACTICABLE WITHIN SEVEN (7) CALENDAR DAYS. SEE SHEET 1-A FOR VEGETATION AND PERMANENT SEED SELECTION. SEE EC-2B FOR TEMPORARY SEED SELECTION AND APPLICATION RATES.
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8. THE ENGINEER MUST APPROVE ALL GRADING ACTIVITIES AND GROUNDCOVER STABILIZATION PRIOR TO RIPARIAN VEGETATION PLANTING.
9. ROCK DAMS SHALL BE INSTALLED BELOW ACTIVE WORK AS NEEDED TO UTILIZE PUMP AROUND OPERATION.
10. EXISTING CULVERTED CROSSING SHALL BE UTILIZED TO CROSS THE STREAM CHANNEL UNTIL SUCH TIME THAT NEW PERMANENT STREAM CROSSINGS HAVE BEEN INSTALLED AS APPLICABLE.

UT TO MAGNESS CREEK
EROSION & SEDIMENTATION CONTROL OVERVIEW

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BAKER PROJECT REFERENCE NO.	SHEET NO.
167680	EC-4

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Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
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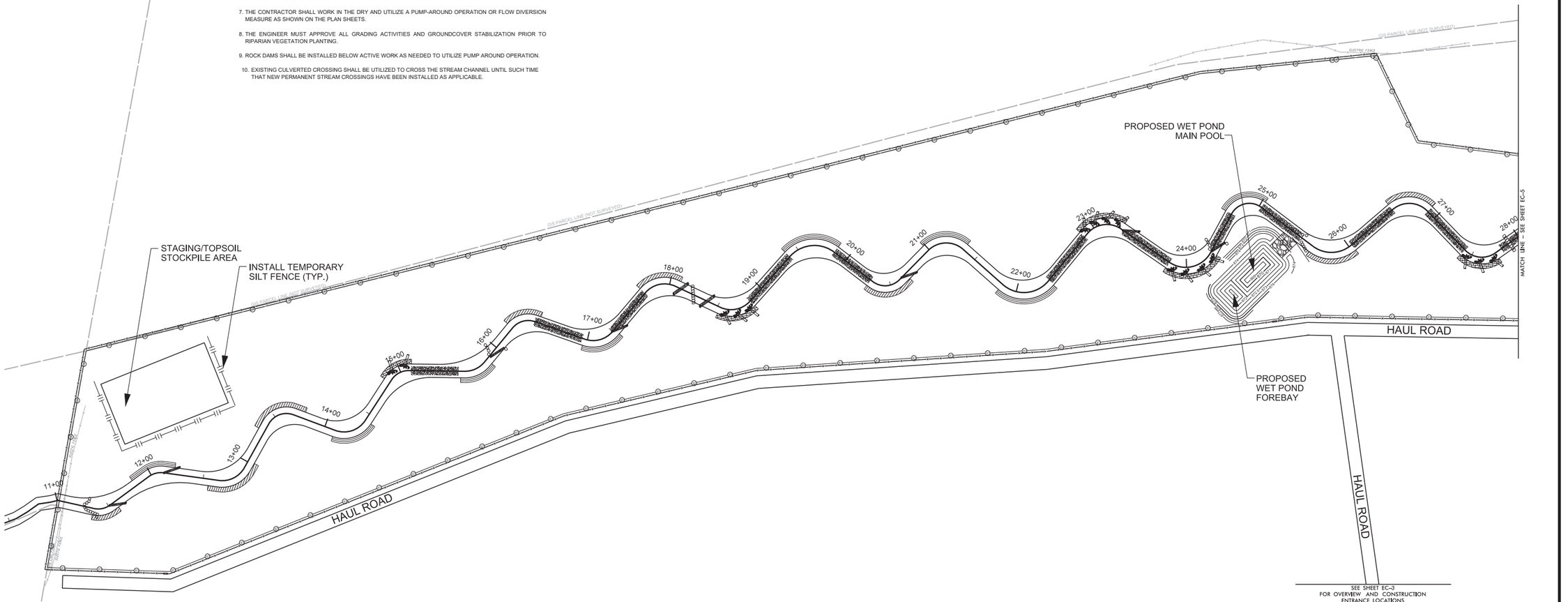

UT TO MAGNESS CREEK
EROSION & SEDIMENTATION CONTROL PLAN

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BAKER PROJECT REFERENCE NO.	SHEET NO.
167680	EC-5

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Michael Baker INTERNATIONAL
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8000 Regency Parkway, Suite 600
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Fax: 919.463.5490
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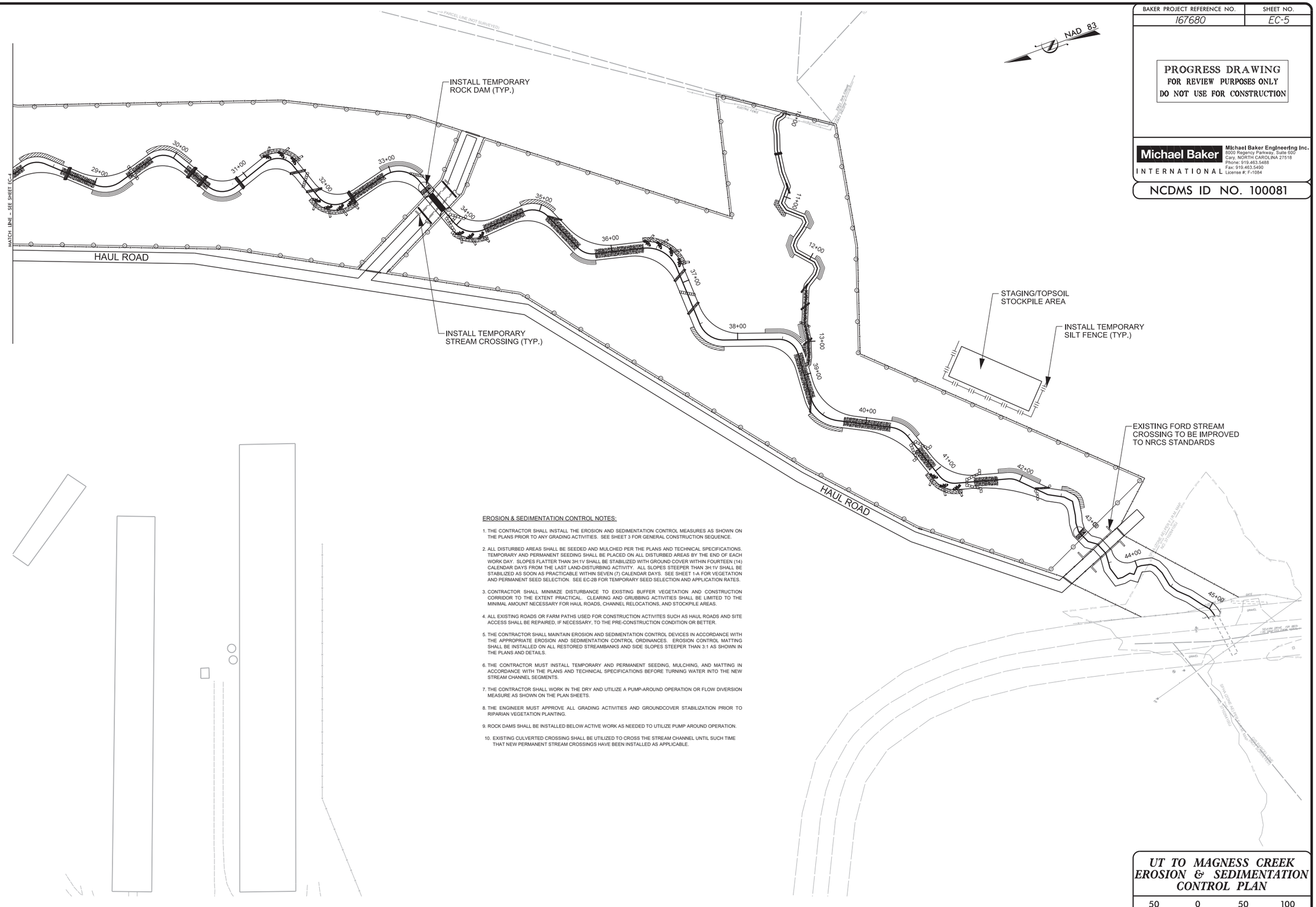
NAD 83



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UT TO MAGNESS CREEK EROSION & SEDIMENTATION CONTROL PLAN

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SCALE (FT)

4/14/2021
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