





## **MITIGATION PLAN**

Final

November 2019

## SASSARIXA SWAMP MITIGATION PLAN

Johnston County, NC NCDEQ Contract No. 7425 DMS ID No. 100040

Neuse River Basin HUC 03020201

USACE Action ID No. 2018-00432 RFP #: 16-007279

## PREPARED FOR:



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

## PREPARED BY:



Wildlands Engineering, Inc. 312 W Millbrook Road, Suite 225 Raleigh, NC 27609 Phone: (919) 851-9986

## DRAFT MITIGATION PLAN

#### SASSARIXA SWAMP MITIGATION SITE

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NCDEQ Contract No. 7425
DMS ID No. 100040
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## 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).
- NCDEQ 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.

## **Contributing Staff:**

Angela Allen, PE, Project Manager and Lead Designer
John Hutton, Principal in Charge
Carolyn Lanza, Existing Conditions Analysis
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Catherine Warner, Construction Documents
Nicole Macaluso and Jeff Keaton, Lead Quality Assurance



November 19, 2019

Ms. Kim Browning
Department of the Army
Wilmington District, Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403-1343

RE: Sassarixa Swamp Mitigation Site – NCIRT Comments during 30-day Mitigation Plan Review Sassarixa Swamp Mitigation Site (USACE AID# SAW-2018-00432, NCDMS # 100040) Neuse 03020201, Johnston County, NC

Dear Ms. Browning,

Thank you for compiling and providing comments on the Sassarixa Mitigation Site final draft Mitigation Plan. We have reviewed the comments dated September 13, 2019 and have revised the Mitigation Plan accordingly. This letter includes a response to each comment; comments have been reprinted with our response in *italics*. The revised Mitigation Plan is being submitted with this letter.

## DWR Comments, Mac Haupt and Katie Merritt

1. DWR has concerns regarding the 3 tributaries added since the post-contract site visit. Reaches T1B and T1D appear to be associated with wetlands. In addition, they did not appear on the DWR stream call list. The drainage areas are extremely small so there are serious questions whether these features are wetlands, or some sort of ephemeral conveyance.

During our IRT site walk, T1B was identified by IRT members as a potential reach we should assess for the jurisdictional determination (JD), which led to the evaluation of this reach. During the JD evaluation, T1A was shown with two draws, but both identified as T1A. For the purpose of plan sheets, and needing to hydrologically connect these pieces, we labeled a portion T1D. We do agree this is a short drainage feature originating from a wetland and have removed it from crediting. It will still remain part of the construction project to improve the hydrologic function and connectivity. T1C was in a portion of the floodplain not explored during the proposal phase. But found during our wetland and stream delineation site work.

2. DWR recommends a figure/concept map be included with the 401/404 mitigation plan where all State and Federal credits/offsets are being generated.

Since this review, Wildlands has communicated further with DWR to reconcile differences between DWR calls and final JD calls on this project. This communication is located within Appendix 1: Buffer Mitigation Plan (regarding T1A-C and T4R3). A Figure has been attached to this letter as further visual explanation.



3. There appears to be considerable wetland acreage on site (Figure 6). Table 6 states there are 13.034 acres of wetland on the site, which represents approximately 22% of the conservation easement/project area. We are a little surprised there wasn't more discussion of what the proposed site will do to enhance/restore these wetlands.

The RFP this project was contracted under required wetland credits to be generated from 100% restoration activities. While this project has significant wetland acreage, none of the acreage would have met the standard for restoration. However, DWR is correct in that wetlands will be enhanced and preserved as part of project development though no wetland credits are requested. A discussion of this has been added in Section 8.6.1 of the Mitigation Plan.

4. Table 16-Project Stream Assets – How does reach T1A go from existing footage of 67 to restoration footage of 358? While proposed as E2, it appears some work on channel features is being performed, however; is it possible upper T1A was not a stream as seen in the DWR stream call?

In its existing condition, T1 runs along the edge of the valley, through a small failed pond, and intersects T1A just below the old pond bed. The proposed restoration moves T1 to the center of the valley. T1A maintains its original channel configuration. In doing this, the overall length of T1 shortens and T1A lengthens. Wildlands believes this is the most appropriate channel configurations for the natural valleys.

Prior to surveying the area, the channels surrounding the failed pond and wetland areas had not been properly analyzed. Upon further inspection, both Wildlands and USACE confirmed T1A as a jurisdictional stream.

5. Section 8.6.3 – Preservation Reaches – and footnote 1 in Table 16, how much of T4 R3 is considered for preservation credit? With 275 linear feet going subterranean for significant portions of the year, it may be a different (higher) credit ratio necessary for this reach.

In the initial IRT walk, just after two major hurricanes, there were areas of sand deposition within T4-R3 causing subterranean flow. It was requested by the IRT to determine the portion of the reach where subterranean flow occurred. The 275 feet was measured during the initial design phase. Since then, Wildlands has been continually monitoring the pulsing of deposited sediment out of the reach. As of summer 2019, deposited sediment has flushed out of the reach. This is now noted in section 3.3.6 in the existing conditions description. The note has been removed from Table 16. Wildlands believes the 10:1 proposed preservation ratio is fair.

6. Figure 11 – Monitoring Component Map – The flow gauge for T2 will need to be moved down to at least mid-reach (out of the relic pond bed). DWR requires an additional flow gauge on reach



T3 at station 402+30 (design sheet 1.31). In addition, depending on the answer to #4, DWR may require another flow gauge on T4R3.

Flow gauges on T2 and T3 are added to Figure 11 as described above.

7. Design sheet 1.32 – please install a wetland gauge on stream right at station 404+75.

A wetland gauge has been added to design sheet 1.32 as described above.

8. As stated at the post contract site visit by several IRT members, DWR believes reach T2 is at a high risk for losing flow and not maintaining channel like characteristics.

This is noted. A flow gauge will be installed, and credit release will be dependent on success criteria for T2.

9. DWR believes there may be flow issues on reach T3.

This is noted. A flow gauge will be installed, and credit release will be dependent on success criteria for T3.

10. DWR requests capping the proposed *percentage* of green ash (*Fraxinus pennsylvanica*) to be planted at 5% due to emerald ash borer (*agrilus planipennis*).

Green ash has been removed from the planting plan.

11. DWR was under the impression most of the area around reaches T5A, T5B, and T5C would be protected within the conservation easement. As seen in design sheet 5.10, much of the wetland area outside reach T5A will not be in the easement. This was not the proposed easement shown in the initial proposal. If this is the case, DWR will revise recommendations for the enhancement ratios due to the fact that if cattle pressure continues adjacent to the wetlands not in the easement, the functional benefit of the enhancement is greatly reduced.

The easement has been adjusted to include the hillside seeps draining to T5A-C. A figure is attached to this memo showing the old vs. new boundary in this area.

12. Fencing is only proposed on the left side of Sassarixa Creek as shown on plan sheets 5.0-5.3. No existing or proposed fencing is shown on the right side/bank. However, there is an internal crossing proposed on Sheet 1.2. If this crossing is to give cattle access to the other side of Sassarixa in the future, there needs to be fencing installed on the left side/bank of Sassarixa Creek as part of this Plan.

There will be fencing on the right bank of Sassarixa Creek. The plans missed a call out for existing fencing tie-in. We have edited plan sheets to show proposed fencing, should any



portion of existing fencing not be located appropriately according to the recorded easement.

13. DWR would also like to reiterate the IRT's position of fragmented reaches and reaches above and below ponds. Collectively, fragmented reaches, numerous crossings and/or breaks in the stream reaches and ponds breaking up aquatic passage and nutrient flows; all these characteristics undermine the functional uplift of the potential project. In the future, this type of site will likely not be approved.

Noted.

## **USACE Comments, Kim Browning:**

1. IRT field notes from February 23, 2018 indicate the wetland areas around reaches T5A, T5B, and T5C would be protected within the conservation easement. As presented now, the easement area has changed and a large portion of the wetland area around reach T5A will not be in the easement. The enhancement ratio on this reach would be more appropriate at 4:1 due to the anticipated future impacts to surrounding wetlands by livestock.

The easement has been adjusted to include the hillside seeps draining to T5A-C. Livestock will be excluded from the area.

2. Section 5 – Functional Uplift: The functional pyramid is used to demonstrate current and projected conditions however there are no assessment data sheets to document how each reach was assessed. Please include these in the appendix.

The functional pyramid was used to frame a qualitative assessment with data from topographical survey and other acquired existing conditions data. No official functional pyramid forms were used in this analysis.

- a. NCSAM sheets are included in the appendix, which is appreciated, but this information is not discussed in the narrative. Since this is the approved assessment method, it would be beneficial to include this.
  - DMS prefers not to include discussion of NCSAM in the narrative.
- b. Table 4 indicates that Sassarixa Creek and T1C both have Functioning existing conditions (Similar to T3R2) but they are proposed as enhancement reaches. It is clear that there is livestock access and lack of riparian understory; however, given that only supplemental planting and fencing will occur (and only one-sided fencing on the main stem), the ratio for this main reach would be more appropriate at 4:1 unless there is justification for the proposed 2.5:1.



There will be fencing around the entirety of Sassarixa and T1C (See response #12 above). The ratio of 2.5:1 was agreed upon in the initial IRT site walk. Meeting minutes have been added to Appendix 5.

3. The proposed ford crossing on Sassarixa Creek has the potential for future maintenance issues, especially since it is located in a braided system. Please address any anticipated maintenance.

The ford was field located by the landowner because the channel is a single thread through this section, and it is currently used as a ford crossing. We will be making improvements to the existing crossing. It is designed with fence line that can be retracted while not in use to allow for major storm flows to pass through the floodplain without causing fence failure. Fence catching debris across floodplains is often the major cause of failure in similar situations. This will also allow for better biological and hydrological connectivity of the site when not in use. All crossings, including the ford, will be inspected upon each visual inspection site visit. Any damage from high flows will be addressed with maintenance as needed.

4. T2, T1D, and T4 appear to have inconsistent information regarding jurisdiction. T1D is not on the PJD or Stream Call form. The jurisdictional limits of T2 appear to be much shorter than proposed, especially given the fact that the pond was constructed in an upland. T4 has areas that flow subsurface. Please verify.

T2 is currently ponded and piped within the farm field. It becomes jurisdictional at a pipe outlet at the edge of the field. Based on historical aerials and surrounding hydrologic indicators, Wildlands is confident T2 will be jurisdictional as proposed post-restoration. T2 will be monitored with a gauge and credit release will be dependent on success criteria being met.

Please see response #1 in the DWR questions regarding T1D. It has been removed from credits.

Please see response to #5 in the DWR questions regarding T4. Additionally, T4 has since been re-evaluated by DWR for jurisdictionality and buffer viability. This update is included in the Buffer Mitigation Plan in Appendix 1.

5. Page 9 – The discussion states "There is no opportunity to improve hydrologic function on the rest of the site." On the contrary, the removal of the pond that separates T5A-B-C with T5 would allow for a natural flow regime. Additionally, aquatic passage is restricted here. Are cattle excluded from this pond?

Although we agree that removal of ponds are ideal practice for hydrologic functional uplift, that was not possible on this project due to landowner constraints. There is not



currently livestock access to the pond. It is used as an event space for educational programs for students as well as a wedding venue.

6. Planting Plan, Design Sheet 3.2 – does not depict reach T1D.

T1D has been added to Sheet 3.2.

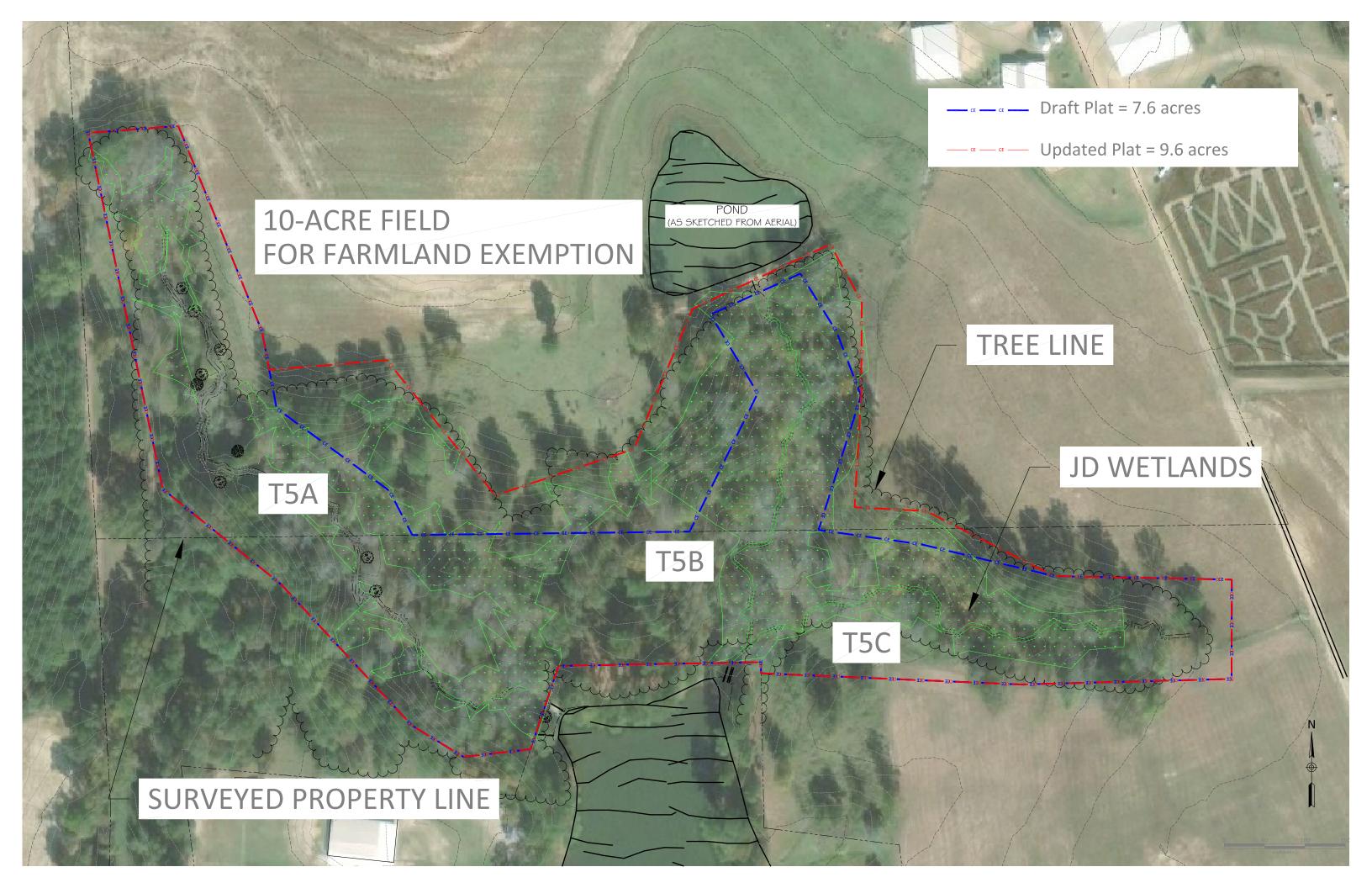
7. Section 9.2 – Please add a vigor standard of 7 feet for year 5.

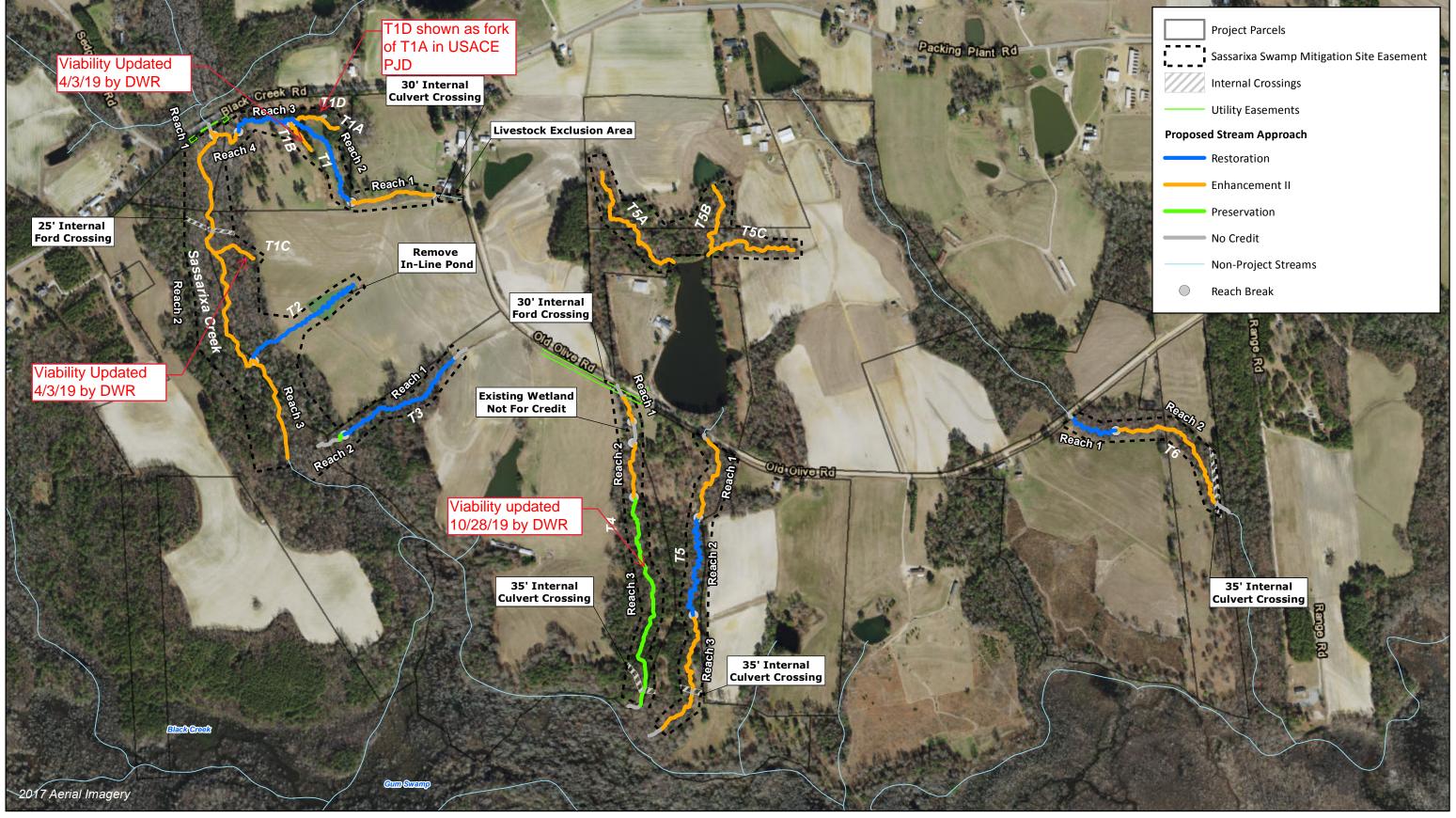
This has been added to the second sentence of Section 9.2.

If you have any questions please contact me at <a href="mailto:aallen@wildlandseng.com">aallen@wildlandseng.com</a>, (919)851-9986 x 106. Sincerely,

Angela Allen, P.E., Project Manager

afMaller







0 600 1,200 Feet

Figure 7. Concept Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201

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- Figure 3 Watershed Map
- Figure 4 Topographic Map
- Figure 5 Soils Map
- Figure 6 Existing Conditions Map
- Figure 7 FEMA Flood Map
- Figure 8 Concept Design Map
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#### **APPENDICES**

Appendix 1	<b>Buffer Mitigation Plan</b>

- Appendix 2 Site Protection Instrument
- Appendix 3 Approved JD and supporting USACE Forms
  Appendix 4 DWR Stream Identification Forms
- **Appendix 5** Data, Analysis, Supplementary Information, Figures and Maps
- **Appendix 6** Approved FHWA Categorical Exclusion Form
- **Appendix 7** Plan Sheets
- Appendix 8 Maintenance Plan
- **Appendix 9** Credit Release Schedule
- **Appendix 10** Financial Assurance



## 1.0 Introduction

The Sassarixa Swamp Mitigation Site (Site) is in Johnston County, NC approximately six miles southwest of Smithfield and five miles north of Four Oaks (Figure 1). The project is in the NC Division of Mitigation Services (DMS) targeted local watershed (TLW) for the Neuse River Basin Hydrologic Unit (HU) 03020201130030 and NC Division of Water Resources (DWR) Subbasin 03-04-04 (NC DWQ 2011). The Site was selected by DMS to provide stream mitigation credits and buffer credits in the Neuse River Basin 03020201 (Neuse 01). The project involves the restoration, enhancement, and preservation of Sassarixa Creek and seven unnamed tributaries to Sassarixa Creek, along with six unnamed tributaries to Black Creek (Figure 2). The restoration of these streams will provide 8,618.650 stream credits. The project will also restore, enhance, and preserve 58 acres of riparian buffer on site, which will provide 1,098,146.503 buffer credits. Establishment of the riparian buffer including planting, construction, and livestock exclusion will be concurrent with the establishment of the stream project. The Site will be protected by a 65-acre conservation easement. The Site Protection Instrument detailing the easement is in Appendix 2.

Project Information

Project Name
Sassarixa Swamp Mitigation Site

County
Johnston

Project Area (acres)
65.06

Project Coordinates (latitude and longitude)
35°28'19.75"N 78°26'9.60"W

13.03

**Table 1: Project Attribute Table Part 1** – Sassarixa Swamp Mitigation Site

## 2.0 Watershed Approach and Site Selection

Planted Acreage (acres of woody stems planted)

The Sassarixa Swamp Mitigation Site is in a new Targeted Local Watershed (TLW) that is not described in the 2010 Neuse River Basin Restoration Priorities (RBRP) Plan (Breeding, 2010). The TLW was added in the 2015 Neuse 01 CU Update (NCDWR, 2015) because there were more water quality issues than assets. Stressors for this TLW include impervious surfaces, disturbed riparian buffers, agricultural land use, and animal operations. The site provides the opportunity to addresses the TLW stressors of agricultural land use and animal operations, as it is an active cattle farm that lacks protected riparian buffers. The project will also address key Cataloging Unit (CU) wide restoration goals for the Neuse River 03020201 described in the RBRP including reduction of sediment and nutrient loads from agricultural lands and increasing or improving riparian buffers (NC DWQ, 2009). The project streams drain directly into Holts lake, which is a recreational lake classified as a Nutrient Sensitive Water (NSW) that drains to the Neuse River, which is a water supply for the City of Goldsboro. The Sassarixa Swamp Mitigation Site was selected because of its location within the TLW and its potential to address the TLW goals through stream restoration and buffer restoration.

Restoration of streams on the Site will directly and indirectly address stressors identified in the RBRP by creating stable stream banks, restoring meandering pattern, and restoring a forested buffer. This project will slow surface runoff, provide shade to streams, remove farm ponds, and reconnect streams to their historic floodplains and riparian wetlands, which will reduce sediment and nutrient loading. In addition, restoration will provide and improve instream and terrestrial (riparian) habitats while improving stream stability and overall hydrology.

## 3.0 Baseline and Existing Conditions

The Site watershed (Table 2 and Figure 3) is situated in the rural countryside in Johnston County near Smithfield, NC, adjacent to Holts Lake and the Black Creek Swamp. The following sections describe the existing conditions of the watershed and watershed processes including disturbance and response.

Table 2: Project Attribute Table Part 2 – Sassarixa Swamp Mitigation Site

Project Watershed Summary Information							
Physiographic Province	Coastal Plain						
Ecoregion	Rolling Coastal Plain						
River Basin	Neuse River						
USGS HUC (8-digit, 14 digit)	03020201, 03020201130030						
NCDWR Sub-basin	03-04-04						
Project Drainage Area (acres)	5,024						
Project Drainage Area Percentage of Impervious Area	0.9%						
CGIA Land Use Classification	66% agriculture, 27% forested, 7% developed						

## 3.1 Landscape Characteristics

## 3.1.1 Physiography and Topography

The Site is in the Coastal Plain physiographic province and is characterized by sandy hills and shallow valleys. The Site topography and relief are typical of the Coastal Plain, with elevations in the watershed ranging from 215 feet above mean sea level (msl) at the upstream end of tributaries, to 115 feet msl along Sassarixa Creek, as illustrated in Figure 4. Sassarixa Creek is an anabranching stream in a gentle (0.3%) unconfined alluvial valley (>400 feet). Streams T1, T1A, T1B, T1C, and T1D are in unconfined alluvial valleys with steeper slopes, ranging from 2%-3%. T2, T3, T4, and T5 streams start off with steep and moderately confined alluvial valleys that eventually widen to unconfined valleys with gentler slopes as they approach the floodplains of Sassarixa Creek and Black Creek. Slopes on these reaches range from 1% to 4% and valleys fluctuate between 30 and 60 feet in width. The alluvial valleys of T5a, T5b, and T5c are unconfined, with widths ranging from 60 to 150 feet. T6 is an unconfined alluvial valley (2%) in the upstream project extents that gradually narrows (from 150 ft to 80 ft) and steepens towards the downstream end of the project.

#### 3.1.2 Geology and Soils

The Site is in the Rolling Coastal Plain of the Coastal Plain physiographic province. The Coastal Plain is characterized by relatively flat terraces of primarily unconsolidated sediments and carbonate rocks ranging in age from Cretaceous to Quaternary. These layered materials accumulated as sediments deposited in what was once a shallow ocean or shelf interface along a shallow ocean. The deposits form roughly parallel belts that trend southwest to northeast. The site is in the belt called the Middendorf Formation (km), which formed during the Cretaceous period. Sohl and Owens (1991) describe the Middendorf formation as deeply weathered and consisting mainly of layered delta plain to fluvial deposits. Sediments are layered in think black clay and light-colored sand layers consisting of sand, sandstone, and mudstone. Sands are primarily quartz; however, outcrops of feldspar may be up to 15 percent. Due to the weathered condition of the soils and base geology, no exposed bedrock is located on site.

The sandy layers of black clay and light-colored sand were evident in soil cores taken on the site during wetland investigations. Deep layers of light color sand were noted along T5 and T6. Soils on site range between sandy loams and loamy sands. They are deep to very deep soils. The well drained soils on site like Gilead sandy loam, Cowarts sandy loam, Nason silt loam, and Uchee loamy sand, are located along

the tributaries in their narrower steeper valleys (NRCS, 2011). The poorly drained soils on site like the Bibb sandy loam and Wehadkee loam, are in the broad valley of Sassarixa Creek and the downstream portion of T1 as it flows into Sassarixa Creek. This pattern closely mimics the areas of riparian wetland occurrence within the project area. Figure 5 provides a soil map of the Site.

## 3.2 Land Use/Land Cover

The project includes several adjacent properties that have been owned and operated as a livestock farm by a single family since 1850, where livestock are continually rotated through all fields with access to the project streams. A review of historic aerials from 1950 to 2012, located in the appendix, shows that onsite streams have existed in their approximate locations with very little change to riparian buffer extents since 1950. The watershed as a whole has not changed significantly in land use or riparian buffer extents aside from the site-specific alterations listed below. Two alterations to the Site visible from historical aerial photography are the addition of the pond on T2 between 1964 and 1973, and the addition of the large pond below T5A, T5B, and T5C between 1950 and 1961. According to the landowners, in the 1960's and early 1970's a hog yard was located at the upstream end of T4 and T5, where the streams were diverted to make a hog wallow area. The hogs were moved to a hog house in the early 1970's, however goats, horses, and cattle had continuous access to this portion of the site until Hurricane Matthew struck in September 2016. The floods from the storm destroyed much of the fencing around T4 and T5 and livestock have been rotated in other fields since that time while fencing is repaired. Other portions of the site have not seen significant changes in land use with livestock or crop rotations from existing activities.

This consistency in land use within the project watershed over the past 68 years indicates that watershed processes affecting hydrology, sediment supply, and nutrient and pollutant delivery have not varied widely over time. The addition of farm ponds has been the only significant change in hydrology. With a lack of developmental pressure, watershed processes and stressors from outside the project limits are likely to remain consistent throughout the implementation, monitoring, and closeout of this project. These stressors and processes are discussed further in Section 4, below.

## 3.3 Project Resources

On May 29 through June 2, 2018, Wildlands investigated on-site jurisdictional waters of the U.S. within the project area. Jurisdictional areas were delineated using the US Army Corps of Engineers (USACE) Routine On-Site Determination Method presented in the 1987 Corps of Engineers Delineation Manual, the subsequent Regional Supplement for the Atlantic and Gulf Coastal Plain, and the evaluator's best professional judgement. All jurisdictional waters of the U.S. were located by sub-meter GPS. Wetland determination forms representative of on-site jurisdictional areas as well as non-jurisdictional upland areas are included in Appendix 3.

USACE staff approved the extent of jurisdictional resources on March 21, 2019. There are thirty-three jurisdictional wetland features located on-site (Figure 6). These wetland features are classified as Headwater Forests, Bottomland Hardwood Forests, and Riverine Swamp Forests using the North Carolina Wetland Assessment Method. The wetlands occur on the slopes and the floodplains that drain to Sassarixa Creek and its tributaries. These features exhibit prolonged saturation within 12 inches of the soil surface, hydrophytic vegetation, and a low chroma matrix and/or darkened surface horizons. Common hydrophytic vegetation includes swamp tupelo (*Nyssa biflora*), bulbous buttercup (*Ranunculus bulbosus*), and pale smartweed (*Persicaria lapathifolia*). Many of these areas are impacted by cattle grazing.

The Site contains five perennial streams (Sassarixa Creek, T3, T4, T5, and T6) and nine intermittent streams (T1, T1A, T1B, T1C, T2, T5A, T5B, T5C). A tributary of T1A has been labeled T1D in this document and the construction plans for clarity, as it is draining a separate linear wetland (wetland DD). The

confluence of T1A and T1D is a headcut located under a large tree that is threatening upstream migration and further incision of T1A and T1D. These features were confirmed by staff from NC DWR on April 4, 2018. NC DWR Stream Identification Forms (Version 4.11) are in Appendix 4 along with a confirmation letter from DWR regarding stream calls. US Army Corps of Engineers (USACE) forms and NCSAM forms are in Appendix 3. Stream features are described in more detail in Section 5. Table 3 provides a summary of water resources within the project limits. Existing conditions are also illustrated in Figure 6. Cross-section and pebble count data is in Appendix 5.

#### 3.3.1 Sassarixa Creek

Sassarixa Creek is a perennial stream that enters the Site under a bridge on Black Creek Road and flows southeast. The first two reaches (R1 and R2) are an anabranching sand bed system of E5 channels in a wide alluvial valley consisting of one large main channel and several smaller interconnected channels. There are large deposits of alluvial gravel/cobble material in the floodplain, likely originating from flood flows during hurricane Matthew in 2016 and hurricane Florence in 2018. Near the confluence with T2, the creek forms a single thread channel (Reach 3) as the valley constricts slightly. The banks along this single-thread reach are relatively stable, with localized scour on outer meander bends and erosion due to livestock access and trampling of banks. Several livestock pathways wind through the riparian buffer and cross Sassarixa Creek. There is a large amount of woody debris in the system from felled trees that help maintain pools, form grade control, and provide habitat niches. Sassarixa Creek is connected to its floodplain (Bank Height Ratio (BHR) = 1.0) and there is evidence of recent bankfull events from sand and gravel deposits at the top of bank.

#### 3.3.2 T1, T1A, T1B, and T1D

T1 enters the site at Old Olive Road in the northeast section of the project. The stream is a sand bed system with limited amounts of sediment input from the watershed due to the pond upstream of Old Olive Road. The alluvial valley is relatively narrow at the upstream limit and widens as the stream flows towards Sassarixa Creek. The first reach (R1) is most closely described as an incised and straightened B5. It has a baseflow channel with a vegetated inner berm and is incised (BHR = 3.0) but relatively stable. There is localized erosion from livestock trampling across the channel. Most of the buffer on this reach is fescue with a single row of large specimen trees along the bank. As the stream makes a 90-degree bend towards the north (start of R2), the incision increases, and it transitions to a G5 channel. This channel is impounded by a small pond along R2. Below the pond (R3), the channel remains incised (BHR = 3.1) but increases in sinuosity. The stream scores towards perennial upstream of the pond, however, the pond appears to have heavily impacted the hydrology, and the overall stream scores as intermittent. T1A is a small intermittent stream that joins T1 downstream of the existing pond. It is a relatively stable stream with an existing meander pattern and scour located along meander bends and evidence of livestock trampling the banks. The floodplain at the confluence of T1 and T1A has been heavily manipulated by livestock, where their trampling of the wetland seep has altered the surface hydrology of the wetland through continual compaction.T1D is a small and short intermittent stream reach that flows out of the linear Wetland DD into T1A from the right floodplain with the same characteristic impacts of livestock on the riparian area. T1B is a small intermittent stream that flows into T1 from the left floodplain. It is incised and is heavily manipulated by livestock access pathways trampling existing streambanks.

#### 3.3.3 T1C

T1C is an E5 channel that originates from a spring seep in a headcut on the edge of the fields at the extent of the Sassarixa Swamp floodplain. The stream is stable and has low banks, varied bedform, and a stable meander pattern. Its stability is currently threatened by lack of vegetation on banks due to livestock access.

#### 3.3.4 T2

The origin of T2 is a farm pond located in the natural valley of this drainage area that is dominated by fescue and hay production. The pond has a buried outlet pipe that daylights at the tree line with a five-foot vertical drop between the outlet and receiving stream. The stream within the forest is an intermittent, G5, sand bed system that is incised (BHR = 6.5) along the reach length and has significant scour along the streambanks from high energy produced by the system over the headcut. Livestock have access to this reach, which contributes to bank trampling, mass wasting of bank material, and inputs of fecal coliform.

#### 3.3.5 T3

T3 is a perennial stream that originates in the farm field south of Old Olive Road. It is incised at the top of reach 1 (R1) (BHR = 2.3) and the incision increases (BHR 3.9) as it flows down the steep (3.5%) alluvial valley classifying the stream as a G5. The streambed is sand with a small amount of gravel in the pavement. While T3 has a forested buffer, livestock access has impacted most of the understory and contributed to bank trampling. Headcuts along R1, caused by woody debris dams, increase incision and overall bed scour. Lack of grade control other than tree roots could continue to be a destabilizing factor for this reach and incision may continue. As T3 enters the Sassarixa Creek floodplain it flattens out and stabilizes.

#### 3.3.6 T4 and T5

T4 and T5 are perennial streams that enter the Site through culverts at Old Olive Road. They are in similar alluvial valleys that are restricted for most of the length, with the streams traversing between valley walls, but that open as the channels approach the Black Creek floodplain. The impact of the old hog wallow area discussed in Section 2.1 is evident in T4-R1 and T5-R1. Both channels include areas where the stream appears to go subterranean through wetlands due to manipulation of the channel and surrounding floodplain. T4 is most accurately described as an E5b channel, with a slightly steeper valley than T5. The T4 channel is incised (BHR= 2.0) along T4-R1 and becomes less incised as it flows downstream where livestock damage is lessened, and the riparian buffer is more mature.

At the onset of the project, T4-R3 had sediment deposits, likely from two hurricanes the previous fall, which caused 275 feet of channel to go subterranean during summer. Throughout the design process, T4-R3 has been monitored and as of the summer of 2019 those areas of sediment deposition have flushed from the system.

T5 is most accurately described as an E5 stream. Reach T5-R1 is relatively stable, with localized scour on the meander bends. The reach becomes moderately incised (BHR = 1.7) at the headcut located at the transition point between T5-R1 and T5-R2. The stream becomes narrow (width to depth ratio of 2.2), which is causing scour of the sand bed stream that is likely to continue without intervention. As the stream transitions to a wider valley along R3 the stream becomes more stable.

## 3.3.7 T5A, T5B, T5C

T5A, T5B, and T5C are the intermittent headwater streams to T5. They originate in the northernmost region of the project, upstream of a large pond. Their watersheds are primarily livestock grazing areas and row crops. These reaches are in steep alluvial valleys ranging from 2.5% -3.75%. There is minimal scour and incision along the reaches except for localized bank trampling from continued livestock access and they are moderately incised (BHR=1.3-1.7). A forested canopy covers the stream area, but livestock access has impacted the understory, which is now dominated by Japanese stiltgrass. These streams are best described as B5, sand bed channels.

## 3.3.8 T6

T6 has the widest alluvial valley of any of the tributaries on site. The perennial stream enters the project area through a culvert under Old Olive Road. Reach 1 (R1) incised G5 channel (BHR = 2.1). There is evidence of channel manipulation with dredged channel material located on the tops of banks. This incision reduces as the channel moves downstream (BHR = 1.2). Spoil piles are less present, the stream begins to increase its meander pattern, and the stream transitions to an E5 stream type.

**Table 3: Project Attribute Table Part 3** – Sassarixa Swamp Mitigation Site

Reach Summary Information														
Parameter	Sassarixa Creek	T1	T1A	T1B	T1C	T1D	T2	Т3	T4	T5	T5a	T5b	T5c	Т6
Length of Reach(If)	2,595	2,202	67	258	307	48	348	1,098	2,198	2,544	996	588	343	999
Valley Confinement (confined, moderately confined, unconfined)	unconfined	unconfined	unconfined	unconfined	moderately confined to unconfined	unconfined	moderately confined to unconfined	moderately confined to unconfined	moderately confined to unconfined	moderately confined to unconfined	unconfined	unconfined	unconfined	unconfined to moderately confined
Drainage Area (acres)	4,726	45	4	2	6	0.5	13	26	32	136	24	25	10	130
Perennial, Intermittent, Ephemeral	Р	ı	ı	ı	ı	ı	ı	Р	Р	Р	ı	ı	ı	Р
NCDWR Water Quality Classification	C, NSW	C, NSW	C, NSW	C, NSW	C, NSW	C, NSW	C, NSW	C, NSW	B, NSW	B, NSW	B, NSW	B, NSW	B, NSW	B, NSW
Stream Classification (Existing and Proposed)	E5: E5	G5: C5b	E5: E5	B5: B5	E5: E5	E5:E5	G5: C5b	B5/G5: C5b	E5b: E5b	E5	B5: B5	B5:C5b	B5: B5	G5/ E5: C5b
Evolutionary Trend (Simon)	Stage VI: Quasi Equilibrium	Stage III: Degradation	Stage III: Degradation	Stage III: Degradation	Stage III: Degradation	Stage III: Degradation	Stage IV: Degradation and widening	Stage IV: Degradation and widening	Stage III: Degradation	Stage III: Degradation	Stage III: Degradation	Stage III: Degradation	Stage III: Degradation	Stage IV: Degradation and widening
FEMA Classification	Partial Zone AE	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	х

<sup>1.</sup> Wetland areas are not proposed for restoration or enhancement credit. A Summary table of these features is in the Appendix.

## 3.4 Existing Vegetation

Three streams on site lack a riparian buffer: T1-R1, the upstream end of T2, and the upstream end of T3. The riparian zone in these areas consist primarily of fescue (*Festuca* sp.) and some areas of hay production to feed livestock. The canopy on T1-R2 is unique in that it is dominated by loblolly pine (*Pinus taeda*) with an understory of Japanese stiltgrass (*Microstegium vimeneum*). All other riparian areas include a mix of canopy species including red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), willow oak (*Quercus phellos*), tulip poplar (*Liriodendron tulipifera*), ironwood (*Carpinus caroliniana*), sycamore (*Platanus occidentalis*), water oak (*Quercus nigra*), and black willow (*Salix nigra*). While the understory of all reaches is dominated by Japanese stiltgrass, there is still a mix of understory species present, predominantly along Sassarixa Creek and T4R3. Understory species include Christmas fern (*Polystichum acrostichoides*), dogfennel (*Eupatorium caplilifolium*), greenbrier (*Smilax sp.*), Virginia creeper (*Parthenocissus quinuefolia*), sawtooth blackberry (*Rubus argutus*), common ragweed (*Ambrosia artemisifolia*), poison ivy (*Toxicodendron radicans*), common rush (*Juncus effesus*), and common sedge (*Carex sp.*). Invasive species located in the riparian buffers include Chinese privet (*Ligustrum sinese*) and Japanese honeysuckle (*Lonicera japonica*).

## 4.0 Watershed and Channel Disturbance and Response

As discussed above in Section 3.2, there has been very little change in the on-site watersheds for several decades. The primary cause of degradation to the Site is the historic and continued access of livestock to streams and wetlands. Lack of adequate riparian buffers and a grazed understory has allowed significant runoff from the grass pastures to flow into streams during storm events. This has created incision in over 50% of the stream length on site. Direct access by livestock in the channel has contributed to mass wasting of bank material.

## 5.0 Functional Uplift Potential

The potential for functional uplift is described in this section according to the Stream Functions Pyramid (Harman, 2012). The Stream Functions Pyramid describes a hierarchy of five stream functions, each of which supports the functions above it on the pyramid (and sometimes reinforces those below it). The five functions in order from bottom to top are hydrology, hydraulics, geomorphology, physicochemical, and biology.

## 5.1 Hydrology

The major watershed disturbance, prior to 1950, has been deforestation and conversion of 66% of the watersheds to agricultural land uses. These alterations in land cover typically result in reductions in rainfall interception and evapotranspiration which lead to increases in runoff and water yield (Dunne and Leopold, 1978). A primary result of these changes is an increase in both peak flows and base flows, though the magnitude of this effect is likely small in watersheds of this size. Initial increases in water yield usually change over time as vegetation regrows and crops are planted. There are no stream gauges within this watershed and, thus, no way to know the degree to which clearing of 66% of the land affected this watershed other than to say that water yields have almost certainly increased. However, these changes primarily occurred several decades ago (prior to available aerial photography) and additional clearing in the watershed has been limited. Another watershed disturbance was the creation of the farm ponds on site, as described in Section 3.2. These ponds altered the storm flows in reaches T2 and T5 by impounding water. The historic aerials for T2 show the old channel starting near the existing forebay for the pond.

The watershed has adjusted to its hydrologic regime and is stable now. Population growth in this rural area is essentially non-existent. Therefore, future alteration to the land cover and associated effects on

hydrology are not expected in the foreseeable future. No measurements of existing conditions in hydrology have been made to date for this project. However, due to the stability of the watershed the Site hydrology is assumed to be functioning (Table 4).

There is one opportunity to improve hydrologic function on site. The removal of the pond at the headwaters of T2 will allow for a natural flow regime for the tributary. Currently, in drought situations, the pond may cut off a continuous flow to the downstream reach and removal of the pond will prevent that from occurring. There is no opportunity to improve hydrologic function on the rest of the site. Even though trees will be planted within the conservation easement, this is unlikely to result in improvements to the rainfall-runoff relationship on a watershed scale.

## 5.2 Hydraulics

Hydraulic function varies across the site. The combination of entrenchment ratios (ERs) and bank height ratios (BHR) describe the streams that are currently not functioning. T1-R2, T2, T3-R1, T5-R2, and T6-R1, classified as Rosgen type G5 channels, have BHRs over 2.0 and ERs under 2.2 (both not functioning). This combination shows that they are hydraulically disconnected from their floodplains, have incised, and may be actively incising.

Several stream reaches are actively incising (BHR above 1.6 and not functioning), but still have access to their floodplains (ER above 1.4 and functioning). These streams (T1R1, T1B, T4-R1, T4-R2, T5-R1, T5A, and T5C) are considered to be functioning-at-risk overall. Without intervention they may continue to incise and degrade transitioning from Rosgen type B5 and E5 channels to Rosgen type G channels.

Sassarixa Creek, T1A, T1C, T3-R2, T5B, T5-R3, and T6-R2 do not appear to be actively incising and currently are hydraulically connected to their floodplains (BHRs less than 1.3 and ERs above 1.4). These reaches are considered functioning for hydraulics.

There is opportunity to uplift hydraulics on the Site from not functioning and functioning-at-risk to functioning. Those streams that are not functioning, as described above, can be reconstructed so that they are connected to their floodplains and so that stream flows above bankfull stage will flood the floodplain. The BHR for restored stream reaches will be 1.0 (functioning). Bankfull flow velocities and shear stress will be maintained at functioning levels through the dimension, plan, and profile design of the channel, as well as the introduction of roughness through woody and rocky material in constructed riffles and the planting of streambanks. The hydraulics of those channels that are functioning-at-risk will be improved using a lighter touch approach, which may include the grading of streambanks in areas of scour, adding floodplain benches to decrease effects of incision, the introduction of instream and streambank structures, and the planting of streambanks and riparian buffers. Livestock will be excluded from all channels.

## 5.3 Channel Geomorphology

Past channelization, incision, and ongoing sloughing and widening described in Section 4 and Section 5.2 place streams on Site in either Stage III: Degradation, or Stage IV: Degradation and Widening of the Simon Channel Evolution Model (both classified as not functioning). Overall, 53% of the site shows active incision (vertical instability) and 25% of the site shows active erosion (lateral instability). T1, T2, T3, and T6, classified as Rosgen type G5 channels, have incised and are starting to widen (Stage IV), while T1-R1, T1B, T4-R1, T4-R2, T5-R1, T5A, and T5C are actively incising and show only moderate signs of bank erosion (Stage III). The leading cause of degradation along Sassarixa Creek, T1A, T1C, T3-R2, T5-R3, and T6-R2 is a lack of riparian vegetation and/or livestock trampling banks which is contributing to the mass wasting of bank material and fining of bed material. They are considered to be early in Stage III: Degradation. Those reaches up or downstream of reaches already incised are at greatest risk for further degradation.

The bedform is inconsistent on all project streams, but varies the most on T1, T2, T3, T5-R2, and T6-R1, where pool to pool spacing ratios are all outside of the range considered functioning (> 7.0). Other project streams show spacing within functioning ranges, but that vary outside of functioning throughout the reach. Bank migration and lateral stability were not measured for this project. Overall, the existing geomorphology on site is poor and is classified as not functioning.

There is an opportunity to improve the geomorphology function on the site. The incision and bank erosion will be corrected through restoration and enhancement activities. Bedform will be diversified and spaced with appropriate design ratios. LWD will be added to the system through construction of instream structures and bank revetments and a riparian buffer will be planted. The geomorphology function will be restored to functioning (Table 4).

## 5.4 Physicochemical

No water quality sampling has been conducted on the Sassarixa Swamp Site and there are no water quality monitoring stations within the watershed. Stressors include impervious surface, disturbed riparian buffers, and agricultural land use/animal operations. The Sassarixa Swamp site has the latter two of these stressors. Incision and erosion caused by disturbed riparian buffers and livestock access likely increases TSS within the watershed, and livestock access to streams likely increases levels of fecal coliform on site. Since there is no water quality data available to evaluate the current level of physicochemical functioning, this function is not rated.

There is potential to improve the physicochemical functioning of the project streams. Water will flow over instream structures that will provide aeration, trees will be planted in the riparian zone to eventually shade and cool stream flow and help filter runoff, the streams will be reconnected to their floodplain and adjacent riparian wetlands to provide storage and treatment of overbank flows, and streambank erosion will be greatly reduced to reduce a source of sediment and nutrients. However, the potential improvements to physicochemical functioning will not happen immediately and some aspects will not occur until a mature canopy is established. Therefore, physicochemical improvements will not be included in the project success criteria for the seven-year monitoring period and the functional uplift potential is not rated (Table 4).

## 5.5 Biology

There are no available biological data for the Site, however the habitat conditions on the Site are poor on T1, T2, T3, and portions of T5 and T6. Riffles contain coarse sand and very little woody debris or organic material necessary to support diverse macroinvertebrate and fish communities. Livestock trampling has impacted the bed in these streams and caused a fining of riffle material. The lack of riparian corridors along T1, T2, and T3-R1 limit available terrestrial habitat other than pasture grass. Instream habitat is more defined along Sassarixa Creek where the anabranching channel has coarse riffles and some large trees have fallen to form woody debris jams. Sassarixa Creek also has deeper pools that provide refuge for fish species. T4-R3 has more defined riffle pool sequences, less incision in the stream, and a more mature riparian buffer due to the exclusion of livestock from this reach since 2016. Because no data on the existing communities are available to evaluate the current level of biologic functioning, this function is not rated (Table 4).

There is opportunity to improve the instream and riparian habitat in addition to the physicochemical function described in Section 5.4. Habitat will be improved by adding instream structures with a variety of rock and woody materials, adding woody bank revetments, reducing the abundance of nuisance macrophytes through chemical intervention, providing a riparian buffer to shade the stream and improve terrestrial habitat, creating pools of variable depths, and cutting of sources of fine sediments. The culvert outlets will be addressed to improve aquatic organism passage. In riparian areas, invasive species will be initially treated to encourage growth of a diverse native riparian buffer and understory,

providing a variety of terrestrial habitat niches. The biological response of the stream system will be tied to the physiochemical response post-restoration. As the physiochemical response may be delayed, the ultimate level of improvement in biology may not occur until after the completion of the seven-year monitoring period and, therefore, the functional uplift potential will be not rated (Table 4).

**Table 4: Functional Pyramid Resource Summary** – Sassarixa Swamp Mitigation Site

Functional Pyramid Resource Summary												
Resource		sarixa eek	T1R1,	T1R1/T1R3 T1R2		T1A		T1B		T1C		
Functional Category	EX	PRO	EX	PRO	EX	PRO	EX	PRO	EX	PRO	EX	PRO
Hydrology	F	F	F	F	F	F	F	F	F	F	F	F
Hydraulics	F	F	FAR	F	NF	F	F	F	FAR	F	F	F
Geomorphology	F	F	NF	F	NF	F	NF	F	NF	F	F	F
Physiochemical	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Biology	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Overall	F	F	NF	F	NF	F	NF	F	NF	F	F	F
Functional Pyramid Resource Summary Continued												
Resource	Т	1D	Т	2	Т3	R1	ТЗ	R2	T4R1	/T4R2	T5R1	/T5R3
Functional Category	EX	PRO	EX	PRO	EX	PRO	EX	PRO	EX	PRO	EX	PRO
Hydrology	F	F	FAR	F	F	F	F	F	F	F	F	F
Hydraulics	F	F	NF	F	NF	F	F	F	FAR	F	FAR	F
Geomorphology	FAR	F	NF	F	NF	F	F	F	F	F	FAR	F
Physiochemical	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Biology	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Overall	FAR	F	NF	F	NF	F	F	F	FAR	F	FAR	F
Functional Pyramid Reso	urce Sເ	ımmary	Continu	ied								
Resource	T!	5R2	T!	5A	T!	5B	T5C		Т6	R1	Т6	R2
Functional Category	EX	PRO	EX	PRO	EX	PRO	EX	PRO	EX	PRO	EX	PRO
Hydrology	F	F	F	F	F	F	F	F	F	F	F	F
Hydraulics	NF	F	FAR	F	F	F	FAR	F	NF	F	F	F
Geomorphology	NF	F	NF	F	FAR	F	NF	F	NF	F	FAR	F
Physiochemical	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Biology	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Overall	NF	F	NF	F	FAR	F	NF	F	NF	F	FAR	F

## 5.6 Overall Functional Uplift Potential

Overall, the Sassarixa Swamp Mitigation Site can be considered as Functioning-at-Risk, but the functional uplift potential is a reclassification of Functioning (Table 4). This change in overall classification is related to improvements in hydraulic and geomorphology between the existing and proposed conditions. The hydrology function will not change on the site as a whole because watershed-scale reforestation would be required to drive this function. Physicochemical and Biological improvements are likely a result of the project. However, there is no existing basis for classifying the existing condition of these functions and the likely improvements will occur gradually after construction.

Therefore, these functions are not rated and not considered in the overall functional rating. Project goals are tied only to hydraulics and geomorphology.

## 5.7 Site Constraints to Functional Uplift

Four culverts and two ford crossings will be constructed on project streams to allow for continued use of the land outside of the project area for agriculture. Each crossing is internal to the easement. Wherever possible, culverts were located at the start or end of the project reach to limit impact on stream pattern, plan, and profile. All culverts will be designed to pass well over the bankfull storm, to provide resilience to the design for future stormflows.

The valley widths on the Site will allow for the development of pattern and channel dimensions to restore stable, functioning streams and there are no other known constraints to the functional uplift described above in this section. The degree to which the physicochemical and biology functions can improve on the Site is limited by the watershed conditions beyond the project limits, upstream water quality, and the presence of source communities upstream and downstream of the Site.

## 6.0 Regulatory Considerations

Table 5, below, is a summary of regulatory considerations for the Site. These considerations are expanded upon in Sections 6.1-6.3.

Table 5: Pro	iect Attribute T	'able Part 4 –	Sassarixa Swam	o Mitigation Site

Regulatory Considerations								
Parameters	Applicable?	Resolved?	Supporting Docs?					
Water of the United States - Section 404	Yes	Yes	PCN <sup>1</sup>					
Water of the United States - Section 401	Yes	Yes	PCN					
Endangered Species Act	Yes	Yes	Appendix 6					
Historic Preservation Act	Yes	Yes	Appendix 6					
Coastal Zone Management Act	No	No	N/A					
FEMA Floodplain Compliance	No	N/A	N/A <sup>2</sup>					
Essential Fisheries Habitat	No	N/A	N/A					

- 1. PCN to be provided to DMS with Final Mitigation Plan
- 2. FEMA boundaries shown on Figure 7

## 6.1 Biological and Cultural Resources

A Categorical Exclusion for the Sassarixa Swamp Mitigation Site was submitted to DMS on April 12, 2018 and approved on April 19, 2018. This document included investigation into the presence of threatened and endangered species on Site protected under the Endangered Species Act of 1973, as well as any historical resources protected under the National Historic Preservation Act of 1966. Wildlands requested review and comment from the United States Fish and Wildlife Service on February 5, 2018 in respect to the Sassarixa Swamp Mitigation Site and its potential impacts on threatened or endangered species. USFWS responded on March 2, 2018 and stated the "proposed action is not likely to adversely affect any federally listed endangered or threatened species, their formally designated critical habitat or species currently proposed for listing under the Act." A follow up email was sent to USFWS on April 6, 2018 regarding the new addition of the yellow lance on April 4, 2018 to Johnston County's endangered species list. USFWS responded on April 9, 2018 with no additional objection. All correspondence with USFWS and a list of Threatened and Endangered Species in Johnston County, NC is included in Appendix

6. The conclusion for cultural resources according to the Categorical Exclusion research and response by the State Historic Preservation Office is that there are no historic resources that would be affected by this project. For additional information and regulatory communications please refer to the Categorical Exclusion document in Appendix 6.

## 6.2 FEMA Floodplain Compliance and Hydrologic Trespass

The Site is represented on the Johnston County Flood Insurance Rate Map Panel 1662. Sassarixa Creek and the downstream portions of T4, T5, and T6 are mapped in Zone AE from the modeled Black Creek, however no streams on Site are modeled. Areas within the mapping are slated for enhancement and preservation and will not require fill within the floodplain. Wildlands will coordinate with the Johnston County floodplain administrator to obtain the appropriate floodplain development permit for the project, if required.

## 6.3 401/404

Care has been taken to design the streams to remain hydrologically connected to existing wetlands onsite, while minimizing impacts to those wetlands. Short sections of T1, T3, and T6 are aligned through
existing, highly impacted, poor quality wetlands. This alignment was chosen because it is the natural low
point in the valley. Those re-alignments will account for the permanent impacts on site. The majority of
floodplain grading will be considered a temporary impact to wetlands as hydrologic connectivity is
anticipated to improve after channel restoration, and vegetation will be re-established. Any wetlands
within the conservation easement and outside of the limits of disturbance will be flagged with safety
fence during construction to prevent unintended impacts. This will be noted in the final construction
plans on the Erosion and Sediment Control Plan and Detail plan sheets, as well as in the project
specifications. Table 6 estimates the anticipated impacts to wetland areas on this project. The PreConstruction Notification, including this data, will be provided to DMS in the Final Mitigation Plan.

Table 6: Estimated Impacts to Project Wetlands – Sassarixa Swamp Mitigation Site

lumin dintinun al			Permanent (P) Impact		Temporar	y (T) Impact
Jurisdictional Feature	Classification	Acreage	Type of Activity	Impact Area (acres)	Type of Activity	Impact Area (acres)
Wetlands D, F, G, H, J, L, V, W, X, FF, GG	Riparian Riverine	13.034	Conversion to Stream Resource	0.123	Floodplain Grading	0.556

## 7.0 Mitigation Site Goals and Objectives

The project will improve stream functions as described in Section 5 through stream restoration and riparian buffer re-vegetation. Project goals are desired project outcomes and are verifiable through measurement and/or visual assessment. Objectives are activities that will result in the accomplishment of goals. The project will be monitored after construction to evaluate performance as described in Section 11 of this report. The project goals and related objectives are described in Table 7.

Table 7: Mitigation Goals and Objectives – Sassarixa Swamp Mitigation Site

Goal	Objective	Expected Outcomes	Function(s) Supported	
Reconnect channels with floodplains and to allow a natural flooding regime.	Reconstruct stream channels with designed bankfull dimensions and depth based on reference reach data. Remove pond above T2.	Allow more frequent flood flows to disperse on the floodplain. Support geomorphology and higher- level functions.	Geomorphology	
Improve the stability of stream channels.	Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time.	Reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary. Support all stream functions above hydrology.	Geomorphology	
Restore and enhance native floodplain and streambank vegetation.	Plant native tree and understory species in riparian zones and plant native shrub and herbaceous species on streambanks.	Reduce sediment inputs from bank erosion and runoff. Increase nutrient cycling and storage in floodplain. Provide riparian habitat. Add a source of LWD and organic material to stream. Support all stream functions.	Hydrology (local), Hydraulic, Geomorphology, Physicochemical, Biology	
Improve instream habitat.	Install habitat features such as constructed riffles, lunker logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Increase and diversify available habitats for macroinvertebrates, fish, and amphibians leading to colonization and increase in biodiversity over time. Add complexity including LWD to the streams.	Geomorphology (supporting Biology)	
Permanently protect the Site from harmful uses.	Establish conservation easements on the Site.	Protect Site from encroachment on the riparian corridor and direct impact to streams and wetlands. Support all stream functions.	Hydrology (local), Hydraulic, Geomorphic, Physicochemical, Biologic	

## 8.0 Design Approach and Mitigation Work Plan

## 8.1 Design Approach Overview

The design approach (Figure 8) for this site was developed to meet the goals and objectives described in Section 7, which were formulated based on the potential for the uplift described in Section 5, though these are not tied to performance criteria. The design is also intended to provide the expected outcomes in Section 7.

The design approach for this site utilized a combination of analog and analytical approaches for stream restoration. Reference reaches were identified to serve as the basis for design parameters. Channels were sized based on design discharge hydrologic analysis. Designs were then verified and/or modified based on a sediment transport analysis. This approach has been used on successful coastal plain

restoration projects (Falling Creek and Devil's Racetrack) and is appropriate for the simple goals and objectives for this site.

The project streams proposed for restoration on the site will be reconnected with an active floodplain and the channels will be reconstructed with stable dimension, pattern, and profile that will transport the water and sediment delivered to the system. The project streams proposed for restoration vary in design approach. The design approach for each restoration reach was determined by the existing conditions and design goals. T1-R2, T3-R1, T5-R2, and T6-R1 are primarily Priority I designs, meaning project streams will be reconnected with historic floodplains and the channels will be reconstructed with stable dimension, pattern, and profile that will transport the water and sediment delivered to the system. T2 is a Priority I design in the old pond bed and transitions to a Priority II design as it exits the pond to reconnect to Sassarixa Creek. The Priority II section will have floodplains at lower elevations than existing ground, created through excavation. Care will be taken to stockpile existing topsoil in these areas during excavation to promote vegetation growth after construction. This is discussed more in Section 8.6.1. This approach was necessitated by the elevation of a spring and drain tiles within the old pond bed. Adjacent floodplains and will be planted with native tree species. Instream structures will be constructed in the channels to help maintain stable channel morphology and improve aquatic habitat. The entire project area will be protected in perpetuity by a conservation easement.

Most of the remaining project stream length will be treated as enhancement level II. Enhancement level II consists of cattle exclusion, planting of existing floodplain, and spot-treating areas of channel instability. Channels deemed suitable for this design approach are in overall good condition or are expected to mostly self-correct any problems caused by cattle after cattle are excluded and the floodplain and streambanks are planted with native vegetation. T3-R2, and T4-R3 are in good condition, with vegetated buffers and existing cattle exclusion and will be treated as preservation.

#### 8.2 Reference Streams

Reference streams provide geomorphic parameters of a stable system, which can be used to inform design of stable channels of similar stream types in similar landscapes and watersheds. Six reference reaches were identified for this Site and used to support the design of T1, T2, T3, T5 and T6 (Figure 9). These reference reaches were chosen because of their similarities to the Site streams including drainage area, valley slope, morphology, and bed material. Geomorphic parameters for these reference reaches are summarized in Appendix 5 (except for reference reaches only used for discharge analysis). A description of each reference reach is included below.

Table 8: Stream Reference Data Used in Development of Design Parameters – Sassarixa Swamp Mitigation Site

Reference Reach Name	Still Creek	Scout West 1	Scout West 2	Scout East 1	Scout East 2	Johanna Creek
Stream Type	E5	E/C5b	E5	E5b	E5	E5/C5
T1 R2	-	Q, Dimension, Pattern, Profile	-	Q, Dimension, Profile	-	-
T1 R3	1	Q, Dimension, Pattern, Profile	ı	Q	ı	-
Т2	-	Q, Dimension, Pattern, Profile	-	Q, Dimension, Pattern, Profile	-	-
Т3	-	Q, Dimension, Pattern, Profile	-	Q, Dimension, Pattern, Profile	-	-
T5R2	Q, Dimension, Pattern, Profile	-	Q	-	Q, Dimension, Pattern, Profile	Q
T6R1	Q	-	Q	-	Q, Dimension, Pattern, Profile	Q

## 8.2.1 Scout Camp Reference Site

The Scout Camp reference site (including four surveyed streams) is a wooded area located in southeastern Johnston County near Bentonville in the Mill Creek watershed. It is situated in a similar landscape to the project site and is similar in position relative to an especially broad, flat, and low-lying zone of the Neuse River floodplain and surrounding wetlands. The small headwaters streams on the site are similar in gradient to the upper portions of the tributaries on the project site with slopes up to 4.5%. The larger streams are less steep (Scout West 2 has a gradient of 0.4%).

Scout West 1 is a very small, sand bed stream that is very steep for most of its length with an overall gradient of 2.6%. It has a width to depth ratio ranging from 5.4 in the upper sections to 19.4 in the lower, less steep reaches. Its sinuosity is 1.1 and its entrenchment ratio is high – greater than 2.2 throughout. It is most closely represented by an E/C5b according the Rosgen classification system (Rosgen, 1994) although for most of its length it is not a meandering riffle-pool stream. Much of the energy dissipation, gradient, and pool formation are controlled by sudden drops over woody structure (logs and tree roots). Scout East 1 is steeper than Scout West 1 with a slope of 4.3%. It is a smaller, steep headwater stream with pattern more akin to a B channel, but with an entrenchment ratio and floodplain access of an E channel.

Scout East 2 is a similar but larger sand bed stream with an overall slope of 1.7%, a width to depth ratio of 3.6 to 5.4, an entrenchment ratio of greater than 2.2, and a sinuosity of 1.2. It meanders more than

Scout West 1 but also has a lot of energy loss and pool formation over woody structure. It is most similar to a Rosgen E5 stream.

Scout West 2 is a larger, flatter stream with a width to depth ratio range of 5.7 to 11.0, a very large entrenchment ratio much greater than 2.2, and a sinuosity of 1.1 to 1.2. It is most similar to a Rosgen E5 stream type and functions more like an E5 as described by Rosgen with pool formations in meander bends and less drop in gradient over woody structure.

#### 8.2.2 Johanna Branch

The Johanna Branch site is also located near Bentonville as are both the Cox and Westbrook mitigation sites. Johanna Branch is a low slope (0.22%), meandering channel similar to but larger than Scout West 2.

Johanna Branch is the largest of the primary reference reaches and has the lowest slope. Its width to depth ratio is 10.1 to 19.7, its entrenchment ratio is as large as nearly 10, and its sinuosity is 1.2. Johanna Branch is most similar to an E5/C5 stream type and fits the Rosgen classification system as well or better than Scout West 2 in that it is a meandering stream with pool formation and energy dissipation in meander bends.

#### 8.2.3 Still Creek

Still Creek is located in the Cliffs of Neuse State Park east of Mount Olive near Seven Springs. Still Creek flows into Mill Creek just upstream of its confluence with the Neuse River. It is a small system, moderately flat with an overall slope of 0.88%, a width to depth ratio of 7.4 to 11.3, an entrenchment ratio of 4.85 to 13.0, and a sinuosity of 1.33. It is a sand bed system where woody debris plays a large role in the development of flow diversity and habitat niches. It is hydraulically connected to its riparian wetland system. The watershed is located entirely within park boundaries.

## 8.3 Design Channel Morphological Parameters

Reference reaches were a primary source of information to develop the pattern and profile design parameters for the streams. Ranges of pattern parameters were developed within the reference reach parameter ranges with some exceptions based on best professional judgement and knowledge from previous projects.

Most streams on site were designed to be Rosgen Type C5/E5 channels, with width-to-depth ratios on the low end of a C channel or high end of an E channel. Narrow and deeper channels are common in the ecoregion and were observed in the reference channels. However, the reference channels have established vegetation that maintain stability on steeper streambanks. The design channels will begin with flatter side slopes that will be more stable without established vegetation and will allow for sediment deposition and channel narrowing as the streambank vegetation establishes.

Proposed channel sinuosity ranges between 1.2 and 1.3+, with 1.2 being the steeper tributaries and 1.3+ in the flatter valleys. Complete design morphological parameters for all streams proposed for restoration in are in Appendix 5.

Table 9: Summary of Morphological Parameters for C5/E5 Design Stream Types – Sassarixa Swamp Mitigation Site

_		Existing Pa	Referer Parameters				Proposed Parameters			
Parameter	T1 R2	T1 R3	12	T3 R1	Scout West 1	Scout East 1	T1 R2	T1 R3	12	T3 R1
Valley Width (ft)	50 - 120	50 - 70	40 - 70	20 - 90	-	-	50 - 80	50 - 70	40 - 70	20 - 90
Contributing Drainage Area (acres)	32	40	15	24	38	13	32	40	15	24
Channel/ Reach Classification	G5	G5	G5	B5 / G5	E/C5 b	E5b	E5/C5 b	C5	C5b	C5b
Design Discharge Width (ft)	3.4	3.4	3.0	3.2 / 4.2	2.6 - 6.3	3.1	3.6	4.2	3.2	3.6
Design Discharge Depth (ft)	0.7	0.7	0.50	0.50 / 4.2	0.3 - 0.5	0.3	0.3	0.4	0.3	0.3
Design Discharge Area (ft2)	2.5	2.5	1.5	1.7	1.2 - 2.0	0.9	1.2	1.5	0.9	1.0
Design Discharge Velocity (ft/s)	3.6	3.6	3.6	4.0 / 3.6	1.3 - 2.3	2.0	2.8	2.3	2.2	2.5
Design Discharge (cfs)	-	-	-	-	2.6	1.8	3.0	3.5	2.0	2.5
Water Surface Slope	0.030	0.019	0.029	0.034	-	0.043	0.034	0.016	0.027	0.032
Sinuosity	1.2	1.3	1.1	1.2	1.1	-	1.2	1.2	1.3	1.2
Width/ Depth Ratio	4.9	4.9	6.0	6.4 / 10	5.4 - 19.9	10.5	11	12	12	12
Bank Height Ratio	3.0	3.0	10 .0	2.1 / 7.0	1.1 - 1.3	1.0	1.0	1.0	1.0	1.0
Entrenchment Ratio	2.2	2.2	1.2	7.5 / 11	>2.2	3.2	>2.2	>2.2	>2.2	>2.2
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.30 / 0.42 / 0.58 / 0.89 / 5.2 / 8.5	0.30 / 0.42 / 0.58 / 0.89 / 5.2 / 8.5	0.21 / 0.47 / 0.98 / 2.1 / 6.3 /12	0.28 / 0.44 / 1.1 / 6.3 / 8.8 / 14	-	-	-	-	-	-

**Table 10: Summary of Morphological Parameters for C5b/E5b Design Stream Types** – Sassarixa Swamp Mitigation Site

	Existing Pa	arameters	Refei Paran		Proposed Parameters		
Parameter	T5 R2	T6 R1	Still Creek	Scout East 2	T5 R2	T6 R1	
Valley Width (ft)	20 - 60	70 - 140	-	-	20 - 60	70 - 140	
Contributing Drainage Area (acres)	122	95	220	430	122	95	
Channel/ Reach Classification	E5	G5	E5	E5	C5	C5	
Design Discharge Width (ft)	3.1	4.1	6.8 - 8.0	4.7 - 6.1	5.6	6.4	
Design Discharge Depth (ft)	1.1	1.1	0.71 - 1.0	1.1 - 1.3	0.5	0.5	
Design Discharge Area (ft2)	3.5	4.4	5.7 - 6.7	6.0 - 6.9	2.7	3.3	
Design Discharge Velocity (ft/s)	3.1	2.9	1.2	2.5 - 2.9	2.3	1.7	
Design Discharge (cfs)	-	-	7.3	18	6.0	5.5	
Water Surface Slope	0.012	0.0086	0.0066	0.017	0.011	0.006	
Sinuosity	1.2	1.1	1.3	1.2	1.4	1.1	
Width/ Depth Ratio	2.8	3.7	7.4 - 11	3.6 - 5.4	12	13	
Bank Height Ratio	1.6	2.0	1.0	1.0	1.0	1.0	
Entrenchment Ratio	8.7	1.7	4.9 - 13	>2.2	>2.2	>2.2	
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.26/0.46/1.2 /2.3/4.3/6.9	6.0/15/21/30 /43/64	-	-	-	-	

## 8.4 Design Bankfull Discharge Analysis

Multiple methods including regional curves, hydraulic geometry relationships, and regional flood frequency analysis were used to develop design discharges for each of the restoration reaches. Design discharges are analyzed to determine the appropriate discharge to meet the project goals with a return interval similar to the bankfull discharge. The resulting values were compared and concurrence between the estimates were assessed. The purpose of using multiple methods to estimate bankfull discharge is to eliminate reliance on a single method as the basis of channel design. However, the methods commonly produce significantly different results, so professional judgement must be used to select a design discharge for each restoration reach.

## 8.4.1 Published Regional Curve Data

Discharge was estimated using the NC rural Coastal Plain regional Curves published by NCSU (Doll et al. 2003).

## 8.4.2 Wildlands Regional Flood Frequency Analysis

Twelve U.S. Geological Survey (USGS) stream gage sites were identified within the southeast (Virginia to Georgia) coastal plain for use in development of a project specific regional flood frequency analysis. The Hosking and Wallis (1993) homogeneity test was performed using the Homtest package in the statistical software program, R® to verify that the gages selected were appropriate. The gages used were:

- USGS 02227422 Crooked Creek Tributary Near Bristol, GA (DA = 0.28 mi<sup>2</sup>)
- USGS 0209173190 Unnamed Tributary to Sandy Run Near Lizzie, NC (DA = 0.57 mi<sup>2</sup>)
- USGS 02227990 Satilla River Tributary 2 at Atkinson, GA (DA = 0.67 mi<sup>2</sup>)
- USGS 02169960 Lake Marion Tributary Near Vance, SC (DA = 2.12 mi<sup>2</sup>)
- USGS 01668300 Farmers Hall Creek Near Champlain, VA (DA = 2.18 mi<sup>2</sup>)
- USGS 021355013 Davis Branch Near Sumter, SC (DA = 2.50 mi<sup>2</sup>)
- USGS 02136361 Turkey Creek Near Maryville, SC (DA = 4.25 mi<sup>2</sup>)
- USGS 021720725 Canton Creek Near Moncks Corner, SC (DA = 4.82 mi<sup>2</sup>)
- USGS 02148090 Swift Creek Near Camden, SC (DA = 4.90 mi<sup>2</sup>)
- USGS 02130800 Backswamp Near Darlington, SC (DA = 6.22 mi<sup>2</sup>)
- USGS 01661800 Bush Mill Stream Near Heathsville, VA (DA = 6.77 mi<sup>2</sup>)
- USGS 02102908 Flat Creek Near Inverness, NC (DA = 7.63 mi<sup>2</sup>)

Flood frequency curves were developed for the bankfull discharges using the above gage data. These drainage area—discharge relationships were used to estimate bankfull discharges for the ungaged streams on Site.

## 8.4.3 Site Specific Reference Reach Curve

Six reference reaches were identified for this project (Section 4.2). Each reference reach was surveyed to develop information for analyzing drainage area-discharge relationships as well as development of design parameters. Stable cross-sectional dimensions and channel slopes were used to compute a bankfull discharge with the Manning's equation for each reference reach. The resulting discharge values were plotted with drainage area and compared the other discharge estimation methods.

#### 8.4.4 Existing Bankfull Indicators (Manning's Equation)

A riffle cross-section was surveyed on each design reach on the Site. Bankfull indicators were identified in the field during this survey. Manning's equation was used to calculate a corresponding discharge using the pebble count information for roughness and the survey data for channel slope. It can be difficult to identify clear bankfull indicators on incised and degraded channels, so the highest quality indicators were used to calibrate others.

#### 8.4.5 Design Discharge Analysis Summary

The primary design goal for restoration reaches on site is to hydraulically connect the reaches to their existing floodplains to prevent continued incision along Site streams. The results of the discharge analysis provided a range of discharge values with the Manning's Equation results from surveyed cross-sections being the highest, followed by the Wildlands USGS Flood Frequency Analysis. The Reference Reach curve and NC rural Regional Curve produced lower discharge estimates compared to the other methods. Since on site streams are highly degraded and incised, there is less confidence in the discharge values derived from the Manning's Equation from surveyed Cross-sections. The final design values for the Site are generally in between the Reference Reach Curve, the NC rural Regional Curve, and the 1.2-year return interval discharge. Table 11 gives a summary of the discharge analysis. Figure 10 illustrates the design discharge data plotted on the NCSU coastal plain regional curve.

Table 11: Summary of Design Discharge Analysis – Sassarixa Swamp Mitigation Site

		T1R2	T1R3	T2	T3R1	T5R2	T5A	T6R1
DA (acres)		32	40	14.7	24.3	122	25.5	95.4
DA (sq. mi.)		0.05	0.06	0.02	0.04	0.19	0.04	0.15
NCRural Coastal Plain Regional Curve (cfs)		1.9	2.2	1.1	1.6	5	1.6	4.2
Wildlands Regional Flood Frequency Analysis (cfs)	1.2-year event	3.7	4.2	2.4	3.2	7.8	3.3	6.8
	1.5-year event	6.6	7.3	4.4	5.7	13.0	5.8	11.5
Site Specific Reference Reach Curve (cfs)		2.6	2.9	1.6	2.2	5.7	2.2	4.9
	XS2	4.2						
	XS3		8.8					
Manning's Equation	XS6				6.2			
from Surveyed XS (cfs)	XS9					10.9		
(6.3)	XS11						3.4	
	XS14							12.8
Design Q		3	3.5	2	2.5	6	2.5	5.5

#### 8.5 **Sediment Transport Analysis**

In order to gain an understanding of the quantity of sediment supplied to the design reaches, Wildlands performed a qualitative assessment of the historic, current, and potential future conditions of the watershed through aerial photography and field reconnaissance (as discussed in detail in Sections 3.2 and 5.1). One of the goals was to identify sources of sediment (primarily sand in texture) delivered to project reaches to determine if capacity was an important consideration in channel design or if the proposed channels would likely be supply-limited. The main sources of sediment on site were identified as existing bank erosion and runoff from adjacent agricultural fields. The ponds above T1 and T5 greatly reduce the potential for sediment input their watersheds, as they act as sediment traps. There is no anticipated change in land use in the watershed that would alter the current sediment sources and delivery.

On-site sediment delivery through bank erosion and runoff is being addressed through the stabilization of stream banks with restoration and enhancement activities and the planting of riparian buffers. With these sediment input controls in place, bedload supply is not high enough to cause the project streams to be capacity limited. Therefore, the focus of sediment transport analysis for this design was to verify that designed channels will be stable over time and can pass the sizes of sediment supplied from the watersheds. A competence analysis was performed on the streams to aid in the development of final channel designs.

Competence analyses were performed iteratively during design for each of the restoration reaches by comparing shear stress associated with the design bankfull discharge, proposed channel dimensions, and proposed channel slopes with the size distribution of the existing bed load. A HEC-RAS model of existing and proposed streams provided the shear stress and energy grade line slope data. The analysis utilized standard equations based on a methodology using the Shields (1936) curve and Andrews (1984) equation described by Rosgen (2001) to determine movable particle sizes for a given shear stress. Proposed stream design conditions were evaluated to determine what the largest movable particle size was for the design shear stress and compare that to the existing channel material. The goal is to have the D50 of the design material be mobile, while the Dmax remains stable. This provides stable grade control while allowing for continued sediment transport processes. For T2 and T6, the existing bed

material was sufficient for sediment transport needs. For T1, T3, and T5, slightly larger material will be used for D50 and Dmax in the constructed riffles.

**Table 12: Results of Competence Analysis** – Sassarixa Swamp Mitigation Site

	T1	T2	T3	T5	T6
Dbkf (ft)	0.4	0.4	0.3	0.5	0.5
Energy Grade line Slope (ft/ft)	0.030	0.028	0.034	0.012	0.013
Bankfull Shear Stress, t (lb/sq ft)	0.42	0.39	0.53	0.29	0.32
Largest movable particle size (mm)	32	30	40	22	24
Existing D50	0.6	1.0	1.1	1.2	21
Existing Dmax Bar/Subpavement (mm)	22	64	32	11	180
Proposed D50	8	1	4	2	21
Proposed Dmax	32	64	40	22	180

## 8.6 Project Implementation

#### 8.6.1 Existing Wetlands

Wetland rehabilitation is not being performed for credit on this project, however enhancement activities for wetlands will take place. Care was taken in all cases to avoid existing wetlands as much as possible in designing restored stream channels, while also restoring hydrologic connection through the raising of stream channels. All wetland areas within the easement currently lacking vegetative cover will be planted with appropriate species as noted in the planting plan sheets. Livestock will be excluded from stream and wetland complexes, allowing for understory species to recolonize both new planting areas and those currently forested. The buffer mitigation bank proposed for areas along T1, T3, T5A-C, and T65 will protect additional wetland area extending past the easement area for this project.

## 8.6.2 Restoration Reaches

The streams slated for restoration will be raised using a Priority I restoration for the greatest length possible, with short sections of Priority II at upstream and downstream tie in points where necessary (Table 13). This will raise the water table, improve hydrologic connections to any riparian wetlands, allow for frequent inundation of the floodplain, and a reduce shear stress on the channel. In sections of Priority II restoration, a floodplain will be graded at bankfull elevation. The floodplain will not meander along with the stream pattern but will be relatively straight and will be greater than twice the bankfull width of the stream. In order to promote vegetative success, topsoil will be stockpiled and replaced during construction. Soil tests will be completed to determine rates of lime and fertilizer application. Organic matter will be added to the topsoil to further improve vegetative success. Valley walls will be graded back at slopes of 5:1 or less to prevent rill erosion onto the floodplain.

Table 13: Functional Impairments and Restoration Approach – Sassarixa Swamp Mitigation Site

Resource	Reach(es)	Primary Stressors/Impairments	Restoration Approach
Sassarixa Creek	1-3	Livestock access, lack of riparian understory	Enhancement II
	1	Livestock access, lack of riparian buffer, bank trampling	Enhancement II
T1	2-3	Incision, Scour, lack of riparian vegetation, lack of habitat, livestock access	Restoration - Priority I
	4	Livestock access, lack of riparian buffer, bank trampling	Enhancement II

Resource	Reach(es)	Primary Stressors/Impairments	Restoration Approach
T1A	-	Livestock access, lack of riparian understory, lack of habitat	Enhancement II
T1B	-	Incision, Scour, lack of riparian vegetation, lack of habitat, livestock access	Enhancement II
T1C	-	Livestock access, lack of riparian understory	Enhancement II
T1D	-	Livestock access, lack of riparian understory, lack of habitat	Enhancement II
T2	-	Ponded headwater, livestock access, lack of riparian buffer	Restoration - Priority II and Priority I
T3 1 2		Incision, livestock access, lack of riparian understory, lack of habitat	Restoration - Priority I
		Sediment inputs from unstable banks upstream	Preservation
T4	1-2	Livestock access, lack of habitat, bank trampling	Enhancement II
	3	Sediment inputs from unstable banks upstream	Preservation
	1	Lack of riparian understory, localized scour	Enhancement II
T5	2	Incision, Scour, lack of riparian understory, lack of habitat, invasive species	Restoration - Priority II
	3	Lack of riparian understory, localized scour, invasive species	Enhancement II
T5A	-	Livestock Access, lack of riparian understory, lack of habitat	Enhancement II
T5B	-	Livestock Access, lack of riparian understory, lack of habitat	Enhancement II
T5C	-	Livestock Access, lack of riparian understory, lack of habitat	Enhancement II
Т6	1	Livestock Access, scour, incision, lack of habitat, lack of riparian understory	Restoration- Priority I
	2	Livestock Access, localized scour, lack of riparian understory	Enhancement II

Most of T1 (R2 and R3) will be moved from its channelized position at the edge of valley to meander through the center of the natural valley. In doing so, T1A will be lengthened to intercept the new channel, and T1B will remain in generally the same position but stabilized with bank treatments in place. The headcut at the confluence of T1A and T1D will be stabilized. The abandoned and breached pond on this reach will be filled or otherwise cut off hydraulically from the new channel to prevent preferential flow through the area.

The restoration of T2 will include the removal of the existing pond and daylighting of the drain pipe from the pond to expose a new channel. Historical aerials were referred to in determining the likely start of intermittent hydrology on T2. Historical aerials from the 50s and 60s show the stream starting just upstream of the existing forebay. Several field drains were installed near the area of the top of pond to direct stream water and field drainage into the pond. Those will be severed at the edge of the proposed buffer to provide diffuse flow into the easement at the headwaters of T2. Currently, the outlet pipe of the pond is causing subsidence of sediment around the pipe, and the pipe may be failing. The outlet pipe generally follows the low point of the valley and outlets under a large sycamore tree at the tree line. The new channel will be built within the old pond bed at an elevation set to intercept drainage from the field drains at the top of the pond. The valley will be reformed where the dam is located. The pond will be drained early on during construction. The path of the future channel will be over-excavated, and fill material from the old dam will be used to stabilize the pond bed for the construction of the bed and

banks of the new channel. The headcut at the edge of the forest will be removed and that fall distance will be spread across the proposed channel with a series of log steps. The majority of T2 will be Priority II however, it will transition to Priority I as it intercepts the floodplain of Sassarixa Creek. Stream T1C will be used as a reference for planform for the design of T2 as it reaches the floodplain of Sassarixa Creek.

T3 involves some stabilization of the drainage channel entering T1R1, and then continuing with a Priority I restoration through the wooded reach. Care will be taken to maintain select tree groups to improve the natural look of the restoration through this area.

T5-R2 is bound by two enhancement reaches, requiring short sections of Priority II restoration at tie in sections, to match the mild incision found on T5-R1 and T5-R3. Most of the reach will be Priority I restoration. While the channel is being constructed, any privet and other invasive species will be removed mechanically.

T6-R1 will be restored using Priority I restoration, with a potential short section of Priority II at the culvert inlet on Old Olive Road. Care will be taken to maintain select tree groups to improve the natural look of the restoration through this area.

Reaches proposed for restoration vary between C5/E5 and C5b/E5b stream types depending on channel width to depth ratios and valley slope. The degree of meander will vary by stream depending on the steepness of the channel and the width of the valley. Stable up and/or downstream reaches were used to inform sinuosity. The beds will be comprised of riffle-pool sequences with log drop structures. Instream bed structures will include various types of constructed riffles appropriate to the stream types and available materials, log sills and lunker logs. The structures will reinforce channel stability and serve as habitat features. The constructed riffles will be comprised of the rocky waste material from local sand mines, which contain an appropriate range of heterogenous material based on sediment transport calculations. The riffles will also incorporate woody brush material and logs. The diverse range of structures will provide grade control, diversity of habitat, and will create varied flow vectors. Log sills will be used to allow for grade drops in steeper channel reaches, mimicking natural grade control from large tree roots found in reference channels. At select outer bends, the channel banks will be constructed with brush toe revetments to reduce erosion potential, encourage pool maintenance, and provide varied pool habitat. Lunker logs will also be used to provide pool habitat variability. Livestock will be excluded from all restoration reaches. Riparian buffers will be re-established on all restoration reaches.

#### 8.6.3 Enhancement Reaches

The design plan for Enhancement II reaches (Table 13) varies based on the current level of degradation. T1R1 will include significant bank work and the addition of habitat structures, due to the damage done by livestock wallowing in the area. Select bank work, short sections of realignment, and habitat structures will be completed on T-5R1 and T5-R3. This will include the mechanical removal of a significant amount of privet and other invasive species as well as the reestablishment of a riparian buffer along the left riparian zone. T5A interventions will address the high level of impact of livestock wallowing and an undersized culvert at the downstream end pond entrance. A larger culvert will be placed at the pond and a new channel will be cut through the lower livestock wallow area. Sections of bank will be repaired at the upstream reaches and habitat features will be installed. The upper headwater wetland seeps will be protected by the easement and livestock will be excluded. This is depicted in Figure 6 as wetland CC.

Several reaches are relatively stable and will only require planting and the exclusion of livestock to improve stream function. These reaches include T1A, T1B, T1C, Sassarixa Creek, T5B, T5C, and T6-R2. Livestock will be excluded from these reaches and all other enhancement reaches either through

removal of livestock from the parcel or the installation of fencing. Riparian buffers will be re-established, and invasive species will be treated and maintained.

#### 8.6.4 Preservation Reaches

Two reaches on site are slated for preservation due to their high-quality stream and riparian buffers. These areas currently exclude livestock and will continue to do so. T4R3 has several sections of seasonally subterranean flow. In the dryer summer months, subterranean sections vary in length from 30 – 130 linear feet. In fall, winter, and spring months, the channel flows on the surface and develops above surface channels. These sections account for 275 linear feet (approximately 17.5%) of T4R3.

#### 8.6.5 Stream Crossings

Six stream crossings will be located on this project: four culverts (one each on T1, T4, T5, and T6) and two fords (on Sassarixa Creek and T4). Culverts will be designed for aquatic organism passage and not to hinder the hydraulic function of the channels during storm events. Crossings will be internal to the easement, allowing the easement holder more control of the crossing locations and functions, while the landowner maintains access to adjoining fields.

#### 8.6.6 Connectivity

All streams on site are connected to forested parcels at their downstream limits that are unlikely to ever face developmental pressures. Once riparian buffers are established on-site, mammalian and avian species will likely migrate to the newly forested areas improving terrestrial diversity.

#### 8.7 Vegetation, Planting Plan, and Land Management

#### 8.7.1 Vegetation and Planting Plan

The objective of the planting plan is to establish, over time, a thriving riparian buffer composed of native tree species. This restored buffer will improve riparian habitat, help the restored streams stay stable, shade the streams, and provide a source for LWD and organic material to the streams. The Site will generate Riparian Buffer Credits as well as SMUs for the Neuse 01 CU in accordance with 15A NCAC 02B .0295 (Effective November 1, 2015). The Site will also be in conjunction with the Sassarixa Swamp Nutrient Offset and Buffer Mitigation Parcel (DWR ID 2018-0198). The Site will be planted to the extents of the conservation easement, to include the additional buffer areas as shown in Figure 11. Riparian buffers will be planted with early and late successional native vegetation (a mixture of trees and shrubs). The specific species composition to be planted was selected based on the community type, occurrence of species in riparian buffers adjacent to the Site, best professional judgement on species establishment and anticipated Site conditions in the early years following project implementation, and the requirement of a minimum of four species according to Rule 0295. Species chosen for the planting plan are listed on Sheet 3.0 of the Draft Plans located in Appendix 7. The Draft Plans also contain additional guidance on planting zones, Site preparation, and Site stabilization during construction.

The riparian buffer areas will be planted with bare root seedlings. Species planted as bare roots will be planted at 12-foot by 6-foot spacing (targeted densities after monitoring year 3 are 320 stems per acre). In addition, streambanks will be planted with a combination of live stakes and herbaceous plugs according to the detail in the plans.

To help ensure tree growth and survival, soil amendments may be added to areas of the floodplain throughout the Site where overburden material is removed. Soil tests will be performed in areas of cut and fertilizer and lime will be applied based on the results. Additionally, topsoil will be stockpiled, and reapplied before permanent seeding and planting activities take place.

Invasive species on Site are present throughout the existing vegetation. The most prevalent species, Chinese privet (*Ligustrum sinense*) and Japanese stiltgrass (*Microstegium vimeneum*), are spread

throughout the length of the project. Multiflora rose (*Rosa multiflora*), and trifoliate orange (*Poncirus trifoliata*) are also scattered along Sassarixa Creek, but in much lower quantities. A small number of mature princess tree (*Paulownia tomentosa*) and Bradford pear (*Pyrus calleryana*) were also observed on the west side of T5. The furthest downstream portion of Sassarixa Creek included in the project also contains a low-density population of invasive water primrose (*Ludwigia hexepetela*).

One goal of this project is to treat and remove as much existing invasive species as possible before and during construction. Post construction, the presence and extents of invasive species will be monitored. Treatment of invasive species will continue as necessary throughout the life of the project to ensure project stability and success of the riparian and streambank vegetation. Additional monitoring and maintenance issues regarding vegetation can be found in Sections 9 and 10 and Appendix 8.

#### 8.7.2 Land Management

The primary goal of land management prior to construction is to effectively treat most invasive plant populations on the site. Initial work took place in August 2018 treating the water primrose population at the downstream portion of Sassarixa Creek R3. Significant work in October 2018 treated extensive populations of Chinese privet along with smaller populations of multiflora rose (*Rosa multiflora*), trifoliate orange, princess tree, and Bradford pear. All areas, other than the disjunct area along T5A, T5B, and T5C, on the site were treated at this time.

Invasive plant populations not treated or effectively controlled by the 2018 treatments will be monitored and treated post-construction. The primary invader, Chinese privet, produces seeds that typically lose viability in the seed bank within 12 months (USDA, 2012). Thus, by effectively controlling mature individuals early in the project, recruitment of Chinese privet will significantly diminish, and long-term treatment needs will be much lower. All known mature princess tree and Bradford pear individuals will also be treated prior to seed production in 2019 to limit recruitment in soils disturbed by construction. Continued treatment of the invasive water primrose will begin again in summer 2019. All other populations of invasive plants on the site will be monitored by Wildlands and treated as necessary during the monitoring period. Wildlands will also monitor the site for future land management issues, such as floodplain erosion, bare areas, and damaged fences, that arise during the monitoring period.

#### 8.8 Project Risk and Uncertainties

This project is low risk. The land use surrounding the project is currently in livestock or hay production. There are no utilities crossing the project area that would require outside maintenance. Due to the rural nature of the area, there is little risk that changes in land use upstream in the project watershed would alter the hydrology or sediment supply.

#### 9.0 Performance Standards

The stream performance standards for the project will follow approved performance standards presented in the DMS Mitigation Plan Template (version 2.3, 12/18/2014), the Annual Monitoring Template (April 2015), and the Stream Mitigation Guidelines issued October 2016 by the USACE and NCIRT. Annual monitoring and routine site visits will be conducted to assess the condition of the finished project by a qualified scientist. Specific performance standard components are proposed for stream morphology, hydrology, and vegetation. Performance standards will be evaluated throughout the seven-year post-construction monitoring.

#### 9.1 Streams

#### 9.1.1 Dimension

Riffle cross-sections on the restoration reaches should be stable and should show little change in bankfull area, maximum depth ratio, and width-to-depth ratio. Per DMS guidance, bank height ratios

shall not exceed 1.2 and entrenchment ratios shall be at least 2.2 for restored C and E channels to be considered stable. All riffle cross-sections should fall within the parameters defined for channels of the designed stream type. If any changes do occur, these changes will be evaluated to assess whether the stream channel is showing signs of instability. Indicators of instability include a vertically incising thalweg or eroding channel banks. Changes in the channel that indicate a movement toward stability or enhanced habitat include a decrease in the width-to-depth ratio in meandering channels or an increase in pool depth. It is important to note that in sand bed channels pools and bed forms (ripples, dunes, etc.) may migrate over time as a natural function of the channel hydraulics. These sorts of bed changes do not constitute a problem of indicate a need for remedial actions. Remedial action would not be taken if channel changes indicate a movement toward stability.

#### 9.1.2 Pattern and Profile

Visual assessments and photo documentation should indicate that streams are remaining stable and do not indicate a trend toward vertical or lateral instability.

#### 9.1.3 Substrate

This is a sand bed system and the nature of the bed material is not expected to change over time. No pebble counts will be conducted for the project reaches and no performance standard is being set for substrate.

#### 9.1.4 Photo Documentation

Photographs should illustrate the Site's vegetation and morphological stability on an annual basis. Cross-section photos should demonstrate no excessive erosion or degradation of the banks. Longitudinal photos should indicate the absence of persistent of mid-channel bars or vertical incision. Grade control structures should remain stable. Deposition of sediment on the bank side of vane arms is preferable, while scour pools on the channel side are expected.

#### 9.1.5 Hydrology

The occurrence of bankfull events will be documented throughout the monitoring period. Four bankfull flow events must be documented on restoration streams during the seven-year monitoring period. The four bankfull events must occur in separate years. Stream monitoring will continue until performance standards in the form of four bankfull events in separate years have been documented. Intermittent channels proposed for restoration activities (T1 Reaches 2 and 3, and T2) will be monitored for hydrology and must demonstrate at least 30 consecutive days of stream flow.

#### 9.2 Vegetation

Vegetative performance for riparian buffers associated with the stream restoration component of the project (buffer widths 0 – 50ft) will be in accordance with the Stream Mitigation Guidelines issued October 2016 by the USACE and NCIRT. The success criteria is an interim survival rate of 320 planted stems per acre at the end of monitoring year three (MY3), 260 stems per acre and an average planted vegetation height of seven feet at the end of monitoring year 5 (MY5) and a final vegetation survival rate of 210 stems per acre at the end of monitoring year 7 (MY7). Planted vegetation must average 10 feet in height in each plot at the end of the seventh year of monitoring. Vegetation monitoring will be conducted between July 1<sup>st</sup> and the end of the growing season with an emphasis on monitoring later in the growing season to capture any effects of climatic or other conditions that may adversely affect vegetation survival. Individual plot data will be provided and will include height, density, vigor, damage (if any), and survival. In fixed vegetation plots, planted woody stems will be marked annually as needed and given a coordinate, based off a known origin, so they can be found in succeeding monitoring years. Mortality will be determined from the difference between the previous year's living planted stems and the current year's living planted stems.

The extent of invasive species coverage will be monitored and controlled as necessary throughout the required monitoring period (MY7).

#### 9.3 Visual Assessments

Visual assessments should support the specific performance standards for each metric as described above.

#### 10.0 Monitoring Plan

The Site monitoring plan has been developed to ensure that the required performance standards are met, and project goals and objectives are achieved. A separate buffer monitoring report will be submitted to NCDWR each year as described in the Buffer Mitigation Plan in Appendix 1.

Table 14, below, describes how the monitoring plan is set up in order to verify project goals and objectives have been achieved.

**Table 14: Monitoring Plan** – Sassarixa Swamp Mitigation Site

Goal	Objective	Performance Standards	Monitoring Metric
Reconnect channels with floodplains and riparian wetlands to allow a natural flooding regime.	Reconstruct stream channels with designed bankfull dimensions and depth based on reference reach data and past projects in the region.	Four bankfull events in separate years within monitoring period.	Crest gauges and/or pressure transducers recording flow elevations.
Improve stability of stream channels.	Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time.	Entrenchment ratio stays over 2.2 and bank height ratio below 1.2 with visual assessments showing progression towards stability.	Cross-section monitoring and visual inspections.
Restore and enhance native floodplain and streambank vegetation.	Plant native tree and understory species in riparian zones and plant native shrub and herbaceous species on streambanks.	210 planted stems per acre at MY7. Interim survival rate of 320 planted stems per acre at MY3 and 260 at MY5.	One hundred square meter vegetation plots will be placed on 2% of the planted area of the project and monitored annually.
Improve instream habitat.	Install habitat features such as constructed riffles, lunker logs, and brush toes into restored/ enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	There is no required performance standard for this metric.	N/A
Permanently protect the Site from harmful uses.	Establish conservation easements on the Site.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.

#### **10.1** Monitoring Components

Project monitoring components are listed in more detail in Table 15. Approximate locations of the proposed monitoring components are illustrated in Figure 11.

**Table 15: Monitoring Components** – Sassarixa Swamp Mitigation Site

Damana dam	Adapthania - Fastura	Qua	Quantity/ Length by Reach				F	Neter
Parameter	Monitoring Feature	T1 T2 T3 T5		T6	Frequency	Notes		
Dimension	Riffle Cross-sections	2	1	1	1	1	Year 1, 2, 3,	1
Dimension	Pool Cross-sections	1	1	1	1	0	5, and 7	1
Pattern	Pattern			N/A			N/A	2
Profile	Longitudinal Profile			N/A			N/A	2
Substrate	Reach wide (RW), Riffle (RF) 100 pebble count		N/A			N/A	3	
Hydrology	Crest Gage and/or Transducer	1 CG	1 CG & 1 FG	1 CG & 1 FG	1 CG	N/A	Semi- Annual	4
Vegetation	CVS Level 2		10 Fixed; 1 Random			Year 1, 2, 3, 5, and 7	5	
Visual Assessment			Υ			Semi-Annual		
Exotic and nuisance vegetation					Semi-Annual	6		
Project Boundary					Semi-Annual	7		
Reference Photos	Photographs			53		·	Annual	

- 1. Cross-sections will be permanently marked with rebar to establish location. Surveys will include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg.
- Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile will be collected during as-built
  baseline monitoring survey only, unless observations indicate lack of stability and profile survey is warranted in additional
  vears.
- 3. Pebble counts will not be performed due to the sand bed nature of the streams.
- 4. Crest gages and/or transducers will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. Transducers will be set to record stage once every 3 hours. The transducer will be inspected and downloaded semi-annually.
- 5. Vegetation monitoring will follow CVS protocols, separate monitoring reports will be submitted to NCDMS and NCDWR.
- 6. Locations of exotic and nuisance vegetation will be mapped.
- 7. Locations of vegetation damage, boundary encroachments, etc. will be mapped.

#### 11.0 Long-Term Management Plan

The site will be transferred to the North Carolina Department of Environmental Quality (NCDEQ) Stewardship Program. This party shall serve as conservation easement holder and long-term steward for the property and will conduct periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. The NCDEQ Stewardship Program is developing an endowment system within the non-reverting, interest-bearing Conservation Lands Conservation Fund Account. The use of funds from the Endowment Account will be governed by North Carolina General Statue GS 113A-232(d)(3). Interest gained by the endowment fund may be used for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable.

The Site Protection Instrument can be found in Appendix 2.

#### 12.0 Adaptive Management Plan

Upon completion of Site construction, Wildlands will implement the post-construction monitoring defined in Sections 9 and 10. Project maintenance will be performed during the monitoring years to address minor issues as necessary (Appendix 8). If, during annual monitoring it is determined the Site's ability to achieve Site performance standards are jeopardized, Wildlands will notify the DMS of the need to develop a Plan of Corrective Action. Once the Plan of Corrective Action is prepared and finalized Wildlands will:

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

#### 13.0 Determination of Credits

The final stream credits associated with the Site are listed in Table 16. Stream Restoration is at a ratio of 1:1. All Preservation reaches are credited at a 10:1 ratio. Enhancement II reaches are credited at a 2.5:1 ratio. T5C is credited using the headwater stream guidance (USACE 2005), so credit is based on valley length. T4R3 is credited at a 10:1 ratio for preservation. T5R3 is an enhancement reach credited at a 4:1 ratio. Enhancement activities include short sections of channel relocation and bank stabilization, the removal of a significant amount of privet and other invasive species, and the re-establishment of a riparian buffer on the left bank. The lack of existing livestock in the reach is the reason for the increased credit ratio from the other enhancement reaches.

Buffers are the required minimum of 50 feet in all but the last 140 feet of the left bank of T6, which has a minimum of 15 feet due to the property line location and stream alignment. This accounts for 0.6 percent of the project and does not affect overall stream credits. The first 100 feet of the buffer is credited at a 1:1 ratio. The next 100 feet is credited at a ratio of 3:1, according to DWR guidelines. The riparian buffer credit asset table is in the Riparian Buffer Mitigation Plan in Appendix 1.

**Table 16: Project Stream Asset Table –** Sassarixa Swamp Mitigation Site

	Mitigation Credits							
			Stream		Riparian V	Vetland	Non-Ripari	an Wetland
	Туре		R	RE	R	RE	R	RE
	Totals		8,461.650	157.000	N/A	N/A	N/A	N/A
_			Pro	ject Compor				
Proje Compor Reacl	ent or	Existing Footage/ Acreage	Proposed Stationing Location	Approach (P1, P2, etc.)	Restoration (R) or Restoration Equivalent (RE)	Restoration Footage or Acreage	Mitigation Ratio (:1)	Proposed Credit
Sassarixa R1-I		2,595	100+35.2 - 107+96.1; 108+21.0 - 126+90.8	EII	R	2,631	2.5	1,052.400
	R1	570	200+00.0 - 205+69.5	EII	R	570	2.5	228.000
T1	R2	923	205+69.5 - 213+93.8	R, P1	R	824	1.0	824.000
11	R3	457	213+93.8 - 219+03.1	R, P1	R	509	1.0	509.000
	R4	252	219+03.1 - 221+55.2	EII	R	252	2.5	100.800
T1.	A	67	220+00.0 - 223+58.5	EII	R	358	2.5	143.200
T1	В	258	240+00.0 - 242+74.6	EII	R	275	2.5	110.000
T1	С	307	260+00.0 – 263+06.9	EII	R	307	2.5	122.800
T2	2	348	300+00.0 - 310+10.2	R, P2	R	1,010	1.0	1,010.000
Т3	R1	1,037	401+01.1 - 411+54.3	R, P1	R	1,053	1.0	1,053.000
13	R2	61	411+54.3 - 412+15.0	Р	RE	61	10.0	6.100
	R1	199	500+71.6 - 502+77.8	EII	R	206	2.5	82.400
T4	R2	400	504+26.0 - 508+23.9	EII	R	398	2.5	159.200
14	R3 <sup>1</sup>	1,599	508+23.9 - 522+48.0; 522+85.0 - 523+70.0	Р	RE	1,509	10.0	150.900
	R1	670	600+25.6 - 606+95.3	EII	R	670	2.5	268.000
T5	R2	799	606+95.3 - 615+80.6	R, P1	R	885	1.0	885.000
13	R3	1,075	615+80.6 - 621+74.7; 622+10.0 - 625+81.0	EII	R	965	4.0	241.250
T5.	Α	996	620+00.0 - 630+25.6	EII	R	1,026	2.5	410.400
T5	В	584	640+04.6 - 645+84.5	EII	R	580	2.5	232.000
T50	C <sup>1</sup>	588	-	EII	R	588	2.5	235.200
Т6	R1	343	700+15.2 - 703+96.5	R, P1	R	381	1.0	381.000
10	R2	999	703+96.5 - 714+31.7	EII	R	1,035	2.5	414.000

<sup>1.</sup> T5C Credited using the Headwater Stream guidance method of the valley length.

Component Summation				
Restoration Level	Restoration Level Stream (LF) Riparian Wetland (Acres) Non-Riparian Wetland			
Restoration	4,662	N/A	N/A	
Enhancement II	9,861	N/A	N/A	
Preservation	1,570	N/A	N/A	

#### 14.0 References

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# Appendix 1 Buffer Mitigation Plan



## RIPARIAN AREA MITIGATION PLAN

Final

November 2019

#### SASSARIXA SWAMP MITIGATION PLAN

Johnston County, NC NCDEQ Contract No. 7425 DMS ID No. 100040

Neuse River Basin HUC 03020201

USACE Action ID No. SAW 2018-00432 DWR Project No. 2018-0198 RFP #: 16-007279

#### PREPARED FOR:



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

#### FINAL RIPARIAN AREA MITIGATION PLAN

#### SASSARIXA SWAMP MITIGATION SITE

Johnston County, NC NCDEQ Contract No. 7425 DMS ID No. 100040

> Neuse River Basin HUC 03020201

#### PREPARED FOR:



### NC Department of Environmental Quality Division of Mitigation Services

1652 Mail Service Center Raleigh, NC 27699-1652

#### PREPARED BY:



#### Wildlands Engineering, Inc.

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#### This Mitigation Plan has been written in conformance with the requirements of the following:

- 15A NCAC 02B .0295 Mitigation Program Requirements for Protection and Maintenance of Riparian Buffers.
- 15A NCAC 02B. 0240, Nutrient Offset Payments Rule, amended effective September 1, 2010
- NCDEQ 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.

#### **Contributing Staff:**

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November 19, 2019

Raleigh, NC 27699-1652

Mr. Jeremiah Dow NC Department of Environmental Quality Division of Mitigation Services 1652 Mail Service Center

RE: DMS Review comments for Mitigation Plan Sassarixa Swamp Mitigation Site (DMS ID # 100040) Neuse 03020201, Johnston County, NC Contract No. 7425

Dear Mr. Dow,

Thank you for compiling and providing comments on the Sassarixa Mitigation Site draft Mitigation Plan.

1. The use of the term "buffer" or "riparian buffer" is used too loosely throughout the plan. These terms should only be used to describe an area that is within the Neuse Riparian Buffer. For this site, only the first 50' adjacent to streams subject to the rule are Neuse Riparian Buffers. Therefore, please correct applicable references to "buffer" or "riparian buffer" and replace incorrect references with "riparian areas" or "riparian restoration".

References to "buffer" or "riparian buffer" were corrected to "riparian areas" and "riparian restoration".

2. The plan describes this site as a "Buffer Restoration Project" throughout the text. However, most of the site is actually buffer enhancement w/some preservation. I recommend "buffer mitigation project" or something other than "buffer restoration project" to avoid confusion.

References to "Buffer Restoration Project" has been replaced to "Buffer Mitigation Project".

- 3. Section 2.2 page 6
  - a. This section is titled "Project Location", but it includes references to the Alternative mitigation options being proposed onsite. I recommend separating this information out into its own section.

"Project Location" has been separated out into "Project Location" and "Buffer Project Attributes".

b. Some streams onsite are "not subject". Correct where applicable.

\*Corrected to include non-subject streams too.



c. Enhancement via Cattle Exclusion is also an alternative option that should be added to this section.

Enhancement via Cattle Exclusion has been added as an alternative option.

d. For Ephemeral channels, last bullet, correct the rule reference to just be 15A NCAC 02B .0295 (n). Currently, the reference to 0295 (o) is too inclusive. For example, "enhancement" on Ephemerals can only be achieved by actually planting an area deemed "Enhancement Site" under 0295 (n). Areas deemed as "Enhancement" via cattle Exclusion are approved under 0295 (o) and cannot be achieved adjacent to Ephemeral channels. T3 Ephemeral is currently proposed as "Enhancement via Cattle Exclusion" and instead, should be Preservation according to viability letter.

The rule reference has been updated. T3 Ephemeral reach has been changed to Preservation to match the viability letter.

- e. For coastal HW Streams, add additional information.
  - i. The rule requires that the site meet success criteria for the stream mitigation. Therefore, this area requires 7 years of monitoring instead of 5.

7 years of monitoring has been added

ii. The rule requires the creditable areas to be planted to get buffer credit adjacent to HW streams. Therefore, areas currently forested on T5C must be excluded from credit, and only the restoration areas in the fields are viable.

Forested areas along the HW streams have been excluded from credit.

iii. Text says the buffer will be measured based on valley length, but where is that measurement provided or represented?

The valley length is shown in Figure 6 and Figure 7.

- 4. Section 2.5
  - a. The statement provided about the purpose of the internal crossings suggests that there may should be fencing on both sides of Sassarixa creek. No fencing is shown on the plan sheets or the figures for the right side of Sassarixa Creek. If "agriculture" in this section implies cattle, then sassaixa creek will require fencing on both sides of the easement in order to comply with 0295 (o)(6). Please explain.

Fencing has been added to the right side of Sassarixa Creek.

5. Section 5.2 & Plan Sheet 3.0 lists Green Ash to be planted. Based on concerns of the Emerald Ash Borer and its ability to spread and attack saplings (>1-inch diameter), DWR highly recommends this tree not be included in the planting plan.



Green Ash has been removed from the planting plan.

6. Provide a reasonable justification to plant Cypress trees, a softwood, which are not considered an appropriate species to meet performance standards per 0295 (n)(2)(B). Provide specifics as to where Cypress will be planted in the Plan Sheets.

Cypress has been removed from the planting plan.

- 7. Section 5.3
  - a. The viability letter notes that there are two types of enhancement on this project. Enhancement under 0295 (n) indicates that the area requires plantings vs Enhancement under 0295 (o)(6) requires just the removal of cattle. The upper reach of T4 was determined to be Enhancement under 0295 (n). Other Enhancement areas met .0295(o)(6). Correct figures where cattle exclusion is shown on the upper reach of T4 and show as "Enhancement". Confirm that the planting sheets show plantings in this area as well.

The upper reach of T4 will also be planted.

b. How will cattle be "excluded" in the buffer enhancement areas?

It has been noted in Section 5.3 that cattle will be "excluded" through fencing.

c. Correct rule reference to be 15A NCAC 02B .0295(o). It currently reads .0296

Rule reference has been corrected.

8. Section 6.2 Please revise plan to add that planted stems in the monitoring plats will all be flagged.

Flagging planted stems has now been noted in Section 6.2.

9. Table 9 – add another parameter to account for T5C needing 7 years of monitoring.

Table 9 is updated to reflect the 7 years of monitoring along T5C.

10. Section 7.1 – Add that "height" will be measured to assess the vigor of stems.

Height has been added to assess the vigor of stems.

11. Section 7.4 – Add a note about T5C and its additional monitoring to meet performance standards. The rule also requires that the stream mitigation meets the performance criteria by the USACE as well. Therefore, DWR cannot accept the restoration area adjacent to T5C without knowing it meets the final performance criteria at closeout by the IRT. Please indicate that



closeout of credits adjacent to T5C will be done at Closeout with IRT. If T5C is removed from the buffer plan all together, then none of this applies.

The additional monitoring performance for T5C has been added.

#### 12. Tables 7a & 7b

a. Use newer version to the table (request from DMS) and attempt to keep the table all on one page. If needing to split 7a and 7b on separate pages that is fine. This may require a larger paper size to accommodate this request. Please do not reduce the font size in the table too much such that it makes the table difficult to read as hard copy.

Newer version of the table is now being used.

b. Correct table based on comments provided with this letter.

Corrections have been incorporated.

c. T4 should be "Enhancement" and not "Enhancement via Cattle Excl". See comment #7.

T4 is now "Enhancement".

d. Breakout T5C credits separate from others and as "not convertible to Nutrient".

T5C credits are now separated from the others and listed as "NOC".

e. T5C is not viable for Enhancement, remove from table.

Enhancement for T5C has now been removed.

f. T3 Ephemeral reach is not viable for Enhancement via Cattle Excl. Change this to preservation.

T3 Ephemeral has been changed to preservation.

g. T4 & T5 Restoration 0-1000' are both shown with"\*\*". Explain why these two are different than other Restoration areas 0-100' shown in the table. If the explanation is due to widths, then why can't the Min-Max width be shown as different?

The asterisks have been removed with the new table.

h. Formulas may be off on table, so once newer version of the table is completed for this site, I will be able to decipher whether the subtotals and totals are compliant.

Noted.





i. T2 restoration area may need to be edited based on comment #15 below.

Noted.

13. Paragraph below Table 7b will need to be edited based on comments made in this letter. Specifically, the viability of certain streams/reaches that are stated incorrectly in the first sentence.

The paragraph below Table 7b has been removed due to the clarification from correspondence with Ms. Katie Merritt sent on August 16. 2019.

14. Table 7a-b shows nutrient offset conversions. However, there is no reference to this in the introduction of the Plan. If this site is to be reviewed by DWR to generate nutrient and/or buffer, please include language to the effect in the introduction.

Nutrient offset credits are not being request at this time, but areas may be converted to nutrient offset credits by DMS later. Since nutrients are not being requested at this time, language is not needed in the introduction. A note below Table 7a has been added indicating potential nutrient request in the future.

- 15. Figure 6
  - a. Identify the location of the Ephemeral channel along T3.

The location of the Ephemeral channel along T3 has been noted.

b. Show Preservation instead of Cattle Excl. along T3 ephemeral reach.

T3 has been changed to Preservation.

c. Add Enhancement (non-cattle excl) along T4 (R1 & R2) (see plan sheet 3.3)

T4 (R1 &2) has been changed to Enhancement (non-cattle exclusion)

d. Remove Enhancement adjacent to T5C.

T5C Enhancement has been removed.

e. T2 restoration area should only be measured from Top of Bank of the Stream Determination point by DWR or the "radius/bubble" above the point. When comparing this area to Figure 7, the top of bank appears to be measured from the proposed stream alignment beyond the wood line.

Figure 7 has been corrected to the Top of Bank of the Stream Determination point by DWR.



f. T4 Preservation area needs to be excluded from credit unless the DWR has confirmed this feature is a stream.

T4 Reach 3 has now been confirmed a stream based on the On-Site Determination for Applicability to the Neuse Riparian Area Protection Rules (15A NCAC 02B .0233) dated October 28. 2019. Supporting documentation is located in the Appendix.

g. I prefer the legend also identify the Coastal HW credits (instead of blue, use a different color)

Coastal HW credits have been identified in another color.

#### 16. Figure 8 -

a. Show the non-cattle exclusion Enhancement Area & Coastal HW area.

Figure 8 has been updated according to above changes.

b. All plots along T1 are on the same side. Please move a plot to represent the other side of T1 as well.

The vegetations plots along T1 have been moved to represent the other side.

c. There is a plot located within Cattle Exclusion areas along T4. Why?

The plot located within the Cattle Exclusion has been removed.

#### 17. Figure 9-

a. Remove T5C from being able to be converted to NOC. NOC is not viable adjacent to coastal HW stream sites as shown in the viability letter.

T5C has been removed from being converted to NOC.

18. Service Area map – This map does not comply with Rule .0295. The service area for buffer mitigation projects in the Neuse 01 below Falls Lake is the Neuse 01below Falls Lake and does not include the Falls Lake WS. Edit this map to exclude the Falls Lake completely from the service area.

The Service Area Map has been updated to exclude the Falls Lake WS.

19. There are not dates on the site photos, when were these photos taken.

Dates have been added to the site photos.



20. Overall, if the riparian efforts are done according to the plan and addresses all comments and corrections provided by DWR, the site should provide a good buffer mitigation and/or nutrient offset project.

Noted.

If you have any questions please contact me at <a href="mailto:aallen@wildlandseng.com">aallen@wildlandseng.com</a>, (919)851-9986 x 106. Sincerely,

Angela Allen, P.E., Project Manager

afnaller

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#### **APPENDIX**

**Appendix 1a** Site Protection Instrument

**Appendix 1b** NC Division of Water Resources Site Viability for Buffer Mitigation and Nutrient Offset Letter – May 21, 2018

NC Division of Water Resources Site Viability for Buffer Mitigation and Nutrient Offset Letter – April 3, 2019

On-Site Determination for Applicability to the Neuse River Riparian Buffer Rules and Water Quality Standards (15A NCAC 02B .0233) – April 4, 2018

**Appendix 1c** Overview Photos – January 7, 2019

#### 1.0 Introduction

The Sassarixa Swamp Mitigation Site (Site) is a buffer and nutrient mitigation project in conjunction with a stream mitigation project. Construction of the stream restoration project will occur concurrently with planting and excluding livestock from the riparian buffers. The Site is located in Johnston County approximately six miles southwest of Smithfield and five miles north of Four Oaks (Figures 1). The Site is comprised of approximately 65.1 acres along Sassarixa Creek and seven unnamed tributaries to Sassarixa Creek, along with six unnamed tributaries to Black Creek. Currently, the Site is characterized by a mix of active pastures, fields, and woodlands. The project will restore, enhance, and preserve riparian buffer area within the project area, which will provide 1,098,146.503 buffer credits or 55.9 acres worth of buffer mitigation.

The Site is located within the Hydrologic Unit Code (HUC) 03020201130030 and North Carolina Division of Water Resources (NCDWR) Sub-basin 03-04-04 Sassarixa Creek and seven unnamed tributaries to Sassarixa Creek, along with six unnamed tributaries to Black Creek on the Site flow into Holts Lake, which drains to the Neuse River. Holts Lake is a recreational lake classified as a Nutrient Sensitive Water (NSW) and the Neuse River is a water supply for the City of Goldsboro.

The Sassarixa Swamp Mitigation Site is located in a new Targeted Local Watershed (TLW) that is not described in the 2010 Neuse River Basin Restoration Priorities (RBRP) Plan. The TLW was added in the 2015 Neuse 01 CU Update because there were more water quality issues than assets. Stressors for this TLW include impervious surfaces, disturbed riparian areas, and agricultural land use/animal operations. The Site addresses the TLW stressors of agricultural land use/animal operations and the lack of protected riparian areas. The project will also address key Cataloging Unit (CU) wide restoration goals for the Neuse River 03020201 described in the RBRP including reduction of sediment and nutrient loads from agricultural lands and increasing or improving riparian buffers (NC DWR 2009).

This buffer mitigation project will reduce sediment and nutrient loading, improve terrestrial and in stream habitats, and improve stream and bank stability. The area surrounding the streams proposed for restoration is a mixture of active pasture, fields, and woodlands. By removing cattle access to onsite tributaries to Holts Lake, restoring a forest to maintained riparian areas and protecting and preserving



existing forested areas; the project will reduce nutrient and sediment inputs to project streams, and ultimately to Holts Lake. The restored floodplain areas will filter sediment during rainfall events. The establishment of riparian areas will create shading to minimize thermal pollution. Finally, invasive vegetation will be treated within the project area as needed and the proposed native vegetation will provide cover and food for wildlife.

#### 2.0 Mitigation Project Summary

The major goals of the proposed buffer mitigation project are to provide ecological and water quality enhancements to the Neuse River Basin by creating a functional riparian corridor and restoring the

riparian area. Specific enhancements to water quality and ecological processes are outlined below in Table 1.

**Table 1: Ecological and Water Quality Goals –** Sassarixa Swamp Mitigation Site

Goal	Objective	CU-Wide and RBRP Objectives Supported
Decrease nutrient levels	Filtering runoff from the agricultural fields through restored native buffer zones. The off-site nutrient input will also be absorbed on-site by filtering flood flows through restored floodplain areas, where flood flows can disperse through native vegetation.	Reduce nutrient inputs to waters of the Neuse River Basin.
Exclude cattle from project streams.	Install fencing around project areas adjacent to cattle pastures.	Reduce and control sediment inputs; Reduce and manage nutrient inputs; Contribute to protection of or improvement to a Water Supply Waterbody.
Decrease water temperature and increase dissolved oxygen concentrations	Establishment and maintenance of riparian buffers will create additional long-term shading of the channel flow to reduce thermal pollution.	Improve habitat to wildlife by providing additional habitat.
Restore and enhance native floodplain vegetation.	Plant native tree species in riparian zone where currently insufficient.	Reduce and control sediment inputs; Reduce and manage nutrient inputs; Provide a canopy to shade streams and reduce thermal loadings; Contribute to protection of or improvement to a Water Supply Waterbody.
Permanently protect the project Site from harmful uses.	Establish a conservation easement on the Site.	Protect aquatic habitat; protect water supply waters.

#### 2.1 Existing Site Conditions

The buffer mitigation project will place put 65.1 acres of agricultural fields and woodlands along Sassarixa Creek and several unnamed tributaries that drain into the Holts Lake watershed, part of the Neuse River Basin under a conservation easement. Out of the 65.1 acres, 55.9 acres will be proposed for a combination of riparian buffer restoration, enhancement, and preservation.

The project includes several adjacent properties that have been owned and operated as a livestock farm by a single family since 1850, where livestock are continually rotated through all fields (with access to their associated streams). The western portion of the project includes Sassarixa Creek and seven unnamed tributaries to Sassarixa Creek (T1, T1A, T1B, T1C, T1D, T2, and T3) (Figure 2). The eastern portion of the site contains six unnamed tributaries to Black Creek (T4, T5, T5A, T5B, T5C, and T6). A review of historic aerials from 1950 to 2012, located in the appendix, show that onsite streams have existed in their approximate locations with very little change to riparian zones since 1950. Two

alterations to the Site visible from aerial photography are the addition of the pond on T2 between 1964 and 1973, and the addition of the large pond below T5A, T5B, and T5C, between 1950 and 1961.

Sassarixa Creek is a perennial stream that enters the Site from Black Creek Road and flows southeast. A mature hardwood forest surrounds the stream on both sides.

T1 enters the site at Old Olive Road in the northeast section of the project. T1A and T1D enter the right bank of T1, while T1B enters from the left bank downstream of T1A and T1D. The canopy is dominated by loblolly pine (*Pinus taeda*) with an understory of Japanese stilt grass (*Microstegium vimeneum*).

T1C is a short reach that starts at the tree line and flows into Sassarixa Creek.

The origin of T2 is a farm pond located in the natural valley of this drainage area that is dominated by fescue and hay production. There is a grass swale at the outlet of the pond, and once the swale reaches the edge of the forest, there is a large (>5') headcut as it enters the valley of Sassarixa Creek.

A ditch originates south of Old Olive Road, flowing into T3 which starts as an ephemeral channel. T3 continues along a forested buffer transitioning into an intermittent stream. While the channel along T3 is forested, livestock access has impacted most of the understory.

T4 starts as an intermittent stream that enters the Site through a culvert at Old Olive Road. Roughly 200 feet down the stream breaks and becomes a degraded wetland picking back up another 300 feet to continue being an intermittent channel. The upper portion of T4 has sporadic conifer trees, while the understory has been trampled by cattle.



T5A, T5B, and T5C are the intermittent headwater streams to T5. They originate in the northernmost

region of the project, upstream of a large pond. Their watersheds are primarily livestock grazing areas and row crops.

T5 and T6 are intermittent streams that enter the project area at Old Olive Road. A mature hardwood canopy extends the length of both streams.

#### 2.2 Parcel Location

The Site is approximately six miles southwest of Smithfield and five miles north of Four Oaks (Figure 1). The site is within the DMS targeted Neuse River Basin HUC 03020201130030 and NCDWR Subbasin 03-04-04.

From Raleigh take I-40 E. Take exit 319 for NC-210 toward Smithfield/Angier. Turn left onto NC-210 E (signs for Smithfield). Continue on NC-210 E for 2.4 miles and turn right onto Lassiter Roads. After 4.6 miles, turn left onto Black Creek Road. Continue on Black Creek Road for 0.7 miles and then turn right onto Old Olive Road. The first parcel is 0.1 mile on the right of Old Olive Road. The other parcels are at various locations further down Old Olive Road.

#### 2.3 Buffer Project Attributes

**Table 2: Buffer Project Attributes –** Sassarixa Swamp Mitigation Site

Project Name	Sassarixa Swamp Mitigation Site
Hydrologic Unit Code	03020201130030
River Basin	Neuse River
Geographic Location (Lat, Long)	35°28'19.75"N 78°26'9.60"W
Site Protection Instrument (DB, PG)	To be recorded
Total Credits (BMU)	1,080,086
Types of Credits	Riparian Buffer
Mitigation Plan Date	May 2019
Initial Planting Date	March 2020
Baseline Report Date	May 2020
MY1 Report Date	November 2020
MY2 Report Date	November 2021
MY3 Report Date	November 2022
MY4 Report Date	November 2023
MY5 Report Date	November 2024

#### 2.4 Alternative Mitigation

In addition to buffer restoration on subject streams, per the Consolidated Buffer Mitigation Rules (15A NCAC 02B 0.0295 (o)), alternative mitigation is proposed on the Site in the form of buffer restoration on ephemeral channels and coastal headwater streams, and preservation of forested buffer on subject and non-subject streams. The proposed project is in compliance with these rules in the following ways:

Buffer Restoration on Ephemeral Channels 15A NCAC 02B .0295 (n):

- The ephemeral channel is directly connected to intermittent or perennial stream channels and will be protected under the same contiguous easement boundary (Figure 2).
- The area of the mitigation site on ephemeral channels does not compromise more than 25 percent of the total area of buffer mitigation.
- The mitigation area on the Site's ephemeral channels is located completely within its drainage area.
- The proposed area meets all applicable requirements of Paragraph (n) of (15A NCAC 02B .0295), for restoration or enhancement.

Buffer Restoration on Coastal Headwater Streams 15A NCAC 02B .0295 (o)(2):

- Wooded buffers planted along Outer Coastal Plain headwater stream mitigation sites may also be approved as riparian buffer mitigation credit if the Site meets all applicable requirements of 15A NCAC 02B .0295 (n).
- All success criteria specified in the approval of the stream mitigation site by the Division shall be met. Seven years of monitoring is required.



- Area of the buffer shall be measured perpendicular to the length of the valley being restored.
- The area within the proposed buffer mitigation site shall not also be used as wetland mitigation.

Enhancement via Cattle Exclusion 15A NCAC 02B .0295 (o)(6)

- Livestock is permanently excluded from riparian area.
- An enhancement plan must be provided in accordance by Paragraph (n) of 15A NCAC 02B .0295
- Grazing must be the predominant land use since the effective date of the applicable buffer rule.

Preservation on Subject Streams 15A NCAC 02B .0295 (o)(5):

- The buffer width is at least 30 feet from the stream (Figure 7).
- The area meets the requirements of 15A NCAC 02R 0.0403(c)(7), (8), and (11) with no known structures, infrastructure, hazardous substances, solid waste, or encumbrances within the mitigation boundary (see Section 4.4 for more detail).
- Preservation mitigation is being requested on no more than 25% of the total area of buffer mitigation (Table 8).

Preservation on Non-Subject Streams 15A NCAC 02B .0295 (o)(4):

- The streams were confirmed as intermittent or perennial by DWR per the On-Site Determination for Applicability to the Neuse River Riparian Buffer Rules and Water Quality Standards dated April 4, 2018
- The buffer width is at least 30 feet from the stream (Figure 7).
- Preservation mitigation is being requested on no more than 25% of the total area of buffer mitigation (Table 8).

#### 2.5 Watershed Characterization

The Site topography, as indicated on the Four Oaks, NC USGS 7.5-minute topographic quadrangle shows a series of moderately sloped valleys (1-3%) that increase in width as they approach the floodplains of Sassarixa Creek and Black Creek (Figure 3).

Drainage areas for the streams and riparian areas were determined by delineating watersheds on the Four Oaks USGS 7.5-minute topographic quadrangles. Figure 4 shows the watershed boundaries for each area. Each of the riparian watersheds are mix of active pastures, fields, and woodlands. The watershed and current land use are summarized in Table 3 below.

Table 3: Drainage Areas and Associated Land Use – Sassarixa Swamp Mitigation Site

Reach Name	DWR Stream Designation	Buffer Area (Acres)	Watershed Area (acres)	Land Use
Sassarixa Creek	Perennial	14.3	4,726	47% agricultural, 7% developed, 46% forested
T1	Intermittent	6.44	45	63% agricultural, 20% developed, 17% forested
T1A	Intermittent	0.39	6	80% agricultural, 0% developed, 20% forested
T1B	Intermittent	0.56	2	80% agricultural, 0% developed, 20% forested
T1C	Intermittent	1.20	6	80% agricultural, 0% developed, 20% forested
T1D	Intermittent	.09	0.5	80% agricultural, 0% developed, 20% forested
T2	Intermittent	1.05	13	80% agriculture, 7% developed, 13% forested
T3 R1	Ephemeral	0.80	17	80% agricultural, 7% developed, 13% forested
T3 R2	Intermittent	3.52	26	80% agricultural, 7% developed, 13% forested
T4	Intermittent	7.00	40	52% agricultural, 4% developed, 44% forested

Reach Name	DWR Stream Designation	Buffer Area (Acres)	Watershed Area (acres)	Land Use
T5	Intermittent	7.28	136	60% agricultural, 4% developed, 36% forested
T5A*	Wetland (Impacts from cattle in T5 stream resulted in a wetland)	4.33	24	80% agricultural, 0% developed, 20% forested
T5B	Intermittent	4.54	25	80% agricultural, 0% developed, 20% forested
T5C	Headwater Wetlands	0.29	10	90% agriculture, 10% forested
T6	Intermittent	4.11	130	60% agricultural, 4% developed, 36% forested

<sup>\*</sup>Proposing stream restoration to reconnect T5A stream throughout. If stream restoration is approved by the IRT and a stream channel is constructed, then the new riparian areas will be viable as an Enhancement Site per 15A NCAC 02B .0295 (o) (6).

#### 2.6 Vegetation

Three reaches on site lack a riparian buffer: T1-R1, the upstream end of T2, and the upstream end of T3. The riparian buffer in these areas consist primarily of fescue (*Festuca* sp.) and some areas of hay production to feed livestock. The canopy on T1-R2 is unique in that it is dominated by loblolly pine (*Pinus taeda*) with an understory of Japanese stiltgrass (*Microstegium vimeneum*). All other riparian areas include a mix of canopy species including red maple (*Acer rubrum*), sweetgum (*Liquidambar straciflua*), willow oak (*Quercus phellos*), tulip poplar (*Liriodendron tulipifera*), ironwood (*Carpinus caroliniana*), sycamore (*Platanus occidentalis*), water oak (*Quercus nigra*), and black willow (*Salix nigra*). While the understory of all reaches is dominated by Japanese stiltgrass, there is still a diverse mix of understory species present, especially along Sassarixa Creek and T4-R3. Understory species include Christmas fern (*Polystichum acrostichoides*), dogfennel (*Eupatorium caplilifolium*), greenbrier (*Smilax sp.*), Virginia creeper (*Parthenocissus quinuefolia*), sawtooth blackberry (*Rubus argutus*), common ragweed (*Ambrosia artemisifolia*), poison ivy (*Toxicodendron radicans*), common rush (*Juncus effesus*), and common sedge (*Carex sp.*). Invasive species located in the riparian buffers include Chinese privet (*Ligustrum sinese*) and Japanese honeysuckle (*Lonicera japonica*).

#### 2.7 Site Constraints and Access

The Site is accessible in multiple locations off Old Olive Road. Several culverts and two ford crossing will be constructed on project streams to allow for continued use of the land outside of the project area for agriculture. Each crossing is a 35-foot crossing internal to the easement. Wherever possible, culverts will be located at the start or end of the project reach to limit impact on stream pattern, plan, and profile. There are no known airport facilities within five miles of the project area (Figure 1). There is one utility easement at the start of T4 and will be used as a ford crossing. There are no other known constraints on the proposed Site.

#### 2.8 Current Site Resources

On February 9, 2018 (dated May 21, 2018) Ms. Katie Merritt, with DWR, conducted on-site determinations to review features and land use within the project boundary. In March 2019 Ms. Sam Dailey, with USACE, determined two additional features, T1B and T1C, within the project boundary as intermittent channels, resulting in an additional site-viability letter from Ms. Katie Merritt. The resulting DWR site viability letters and maps confirming the Site as suitable for riparian buffer mitigation is enclosed in the Appendix. The on-site determination approval letter from NCDWR is also included in the Appendix.

#### 2.9 Historic Site Resources

A review of historic aerials from 1950 to 2012, located in the appendix, show that onsite streams have existed in their approximate locations with very little change to riparian area extents since 1950. Two alterations to the Site visible from historical aerial photography are the addition of the pond on T2 between 1964 and 1973, and the addition of the large pond below T5A, T5B, and T5C between 1950 and 1961.

#### 3.0 Site Protection Instrument

#### 3.1 Site Protection Instruments Summary Information

The land required for riparian planting, management, and stewardship of the mitigation project includes portions of the parcels listed in Table 4. Option agreements for the project area have been signed by the property owners and a Memorandum of Option have been recorded at the Johnston County Register of Deeds. The proposed conservation easements on these properties has not yet been recorded.

Table 4: Site Protection Instrument – Sassarixa Swamp Mitigation Site

Landowner	PIN	County	Site Protection Instrument	Deed Book and Page Number	Acreage to be Protected
Hunter E. Oliver	166200-58-6572	Johnston	Conservation	DB: 3624	25.94
Janie E. Oliver	166200-59-2333	Joiniston	Easement	PG: 581	23.54
Junes Jones Olive	166200-88-5084	Johnston	Conservation	DB: 3719	15.73
Revocable Trust	166200-85-0452	JOHNSTON	Easement	PG: 717	15.75
Junes Jones Olive Revocable Trust Hunter E. Oliver	166200-57-0481 167200-17-2303	Johnston	Conservation Easement	DB: 3719 PG: 717	9.66
Mary Hunter Olive- Waller Todd Franklin Waller Amanda J. Olive	166200-49-5125	Johnston	Conservation Easement	DB: 4358 PG: 908	1.52
Tami Olive Thompson David Thompson Junes Jones Olive Revocable Trust	166200-66-6896	Johnston	Conservation Easement	DB: 3719 PG: 717	5.46
Matthew T. Keen	167200-06-5717	Johnston	Conservation Easement	DB: 4606 PG: 183	2.04
Tami Olive Thompson	166200-79-8148	Johnston	Conservation Easement	DB: 3719 PG: 717	4.71

All site protection instruments require 60-day advance notification to the Corps and the State prior to any action to void, amend, or modify the document. No such action shall take place unless approved by the State.

#### 4.0 Regulatory Considerations

Table 5, below, is a summary of regulatory considerations for the Site. These considerations are expanded upon in Sections 4.1-4.3. A copy of the signed Categorical Exclusion Form for the project can be found in the Sassarixa Swamp Mitigation Plan for the stream project.

**Table 5: Project Attribute Table** – Sassarixa Swamp Mitigation Site

Regulatory Considerations				
Parameters	Applicable?	Resolved?	Supporting Docs?	
Water of the United States - Section 404	Yes	Yes	(Appendix)	
Water of the officed States - Section 404	163	163	Site Viability Letter	
Water of the United States - Section 401	Yes	Yes	(Appendix)	
water of the offited States - Section 401	163	163	Site Viability Letter	
			Sassarixa Swamp Mitigation	
Endangered Species Act	Yes	Yes	Plan Appendix	
			(Categorical Exclusion)	
			Sassarixa Swamp Mitigation	
Historic Preservation Act	Yes	Yes	Plan Appendix	
			(Categorical Exclusion)	
Coastal Zone Management Act	No	No	N/A	
FEMA Floodplain Compliance	No	N/A	N/A	
Essential Fisheries Habitat	No	N/A	N/A	

#### 4.1 Threatened and Endangered Species

The NC Natural Heritage Program (NHP) database and the US Fish and Wildlife Service (USFWS) database were searched for federally listed threatened and endangered plant and animal species in Johnston County, NC. Five federally listed species, the red-cockaded woodpecker (*Picoides borealis*), dwarf wedgemussel (*Alasmidonta heterodon*), Tar River spinymussel (*Parvaspina steinstansana*), yellow lance (*Elliptio lanceolata*), and Michaux's sumac (*Rhus michauxii*) are currently listed in Johnston County. Table 6. list their federal status and habitat.

Table 6: Listed Threatened and Endangered Species in Johnston County, NC – Sassarixa Swamp Mitigation Site

Species	Federal Status	Habitat
Vertebrate		
Red-cockaded woodpecker (Picoides borealis)	E	Found in mature pine forests, these birds bore cavities inside of living pine trees
Invertebrate		
Dwarf wedge mussel (Alasmidonta heterodon)	E	Inhabit a wide range of stream sizes and types from small streams to large rivers. Known to live in substrates including clay, sand, gravel, pebble, and some silt depositional areas
Tar River spinymussel (Parvaspina steinstansana)	E	Live mostly in silt-free unconsolidated beds of coarse sand and gravel.  Prefer faster flowing, well oxygenated streams.
Yellow lance (Elliptio lanceolate)	Т	Lives in coarse to medium clean sand, and sometimes gravel. Usually found in the downstream portion of sand and gravel bars. Requires clean, well oxygenated water with moderate flows. Found in small to medium streams.
Vascular Plant		
Michaux's sumac (Rhus michauxii)	E	Woodland edges, woodland, sandhills and sandy forest.

E = Endangered;

Wildlands requested review and comment from the United States Fish and Wildlife Service on February 5, 2018 in respect to the Sassarixa Swamp Mitigation Site and its potential impacts on threatened or endangered species. USFWS responded on March 2, 2018 and stated the "proposed action is not likely to adversely affect any federally listed endangered or threatened species, their formally designated critical habitat or species currently proposed for listing under the Act". A follow up email was sent to USFWS on April 6, 2018 regarding the new addition of the yellow lance on April 4, 2018 to Johnston

T= Threatened

County's endangered species list. USFWS responded on April 9, 2018 with no additional objection. All correspondence with USFWS is include in the approved Categorical Exclusion found in the Sassarixa Swamp Mitigation Plan.

A pedestrian survey conducted on April 10, 2018, indicated that the Site did not provide suitable habitat for the red-cockaded woodpecker and yellow lance. The pedestrian survey did indicate that the site provides suitable habitat for the dwarf wedgemussel, Tar River spinymussel, and Michaux's sumac but no species were identified on the site. Therefore, due to the absence of the listed species on the site, the project has been determined by Wildlands to "may affect, but not likely to adversely affect" the dwarf wedgemussel and Tar River spinymussel, and to have "no effect" on the Michaux's sumac. The project will have "no effect" on the red-cockaded woodpecker and yellow lance due to the absence of suitable habitat.

#### **Cultural Resources and Significant Natural Heritage Areas** 4.2

The National Historic Preservation Act declares a national policy of historic preservation to protect, rehabilitate, restore, and reuse districts, sites, buildings, structures, and objects significant in American architecture, history, archaeology, and culture, and Section 106 mandates that federal agencies take into account the effect of an undertaking on a property that is included in, or is eligible for inclusion in, the National Register of Historic Places.

There are no existing structures in the project area. The Site is not located near any sites listed on the National Register with the State Historic Preservation Office (SHPO). SHPO was contacted February 2, 2018 and had no concerns or comments on the project site. The approved Categorical Exclusion for the project is in the Sassarixa Swamp Mitigation Plan.

#### 4.3 **FEMA Floodplain Compliance**

The Site is represented on the Johnston County Flood Insurance Rate Map Panel 1662. Sassarixa Creek and the downstream portions of T4, T5, and T6 are mapped in Zone AE from the modeled Black Creek, however no streams on Site are modeled. Areas within the mapping are slated for stream enhancement and preservation as part of them stream mitigation project and will not require net fill within the floodplain. Wildlands will coordinate with the Johnston County floodplain administrator to obtain the appropriate floodplain development permit for the project, if required.

#### **Other Environmental Issues**

An EDR Radius Map Report with Geocheck was ordered for the Site through Environmental Data Resources, Inc. on January 29, 2018. The target property and the adjacent properties are not listed in any of the Federal, State, or Tribal environmental databases searched by EDR. There were no known or potentially hazardous waste sites identified within one mile of the Parcel.

#### 4.5 Determination of Credits

Mitigation credits presented in Table 7a and 7b and Figures 6 and 9 are projections based upon site design and are intended to be used as either riparian buffer credits or nutrient offset credits, dependent on the need. Sassarixa Creek's anabranching streams have been remove for credit calculation purposes. Upon completion of site construction, the project components and credits data will be revised to be consistent with the as-built condition.

Table 7a: Riparian Buffer Credit Generation Summary for Restoration and Cattle Exclusion - Sassarixa Swamp Mitigation Site

Neuse 03020201 - Outside Falls Lake				Service Area											
	19.16394			N Credit Ratio (sf/credit)											
Credit Type	Location	Subject? (enter NO if ephemeral or ditch <sup>1</sup> )	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (sf)	Total (Creditable) Area of Buffer Mitigation (sf)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Convertible to Riparian Buffer?	Riparian Buffer Credits	Convertible to Nutrient Offset?	Delivered Nutrient Offset: N (lbs)
Buffer	Rural	No	Ephemeral	Restoration	0-100	T3	18,165	18,165	1	100%	1.00000	Yes	18,165.000	Yes	947.874
Buffer	Rural	Yes	I/P	Restoration	0-50	T4, T5B	3,930	3,930	1	100%	1.00000	Yes	3,930.000	No	_
Buffer	Rural	Yes	I/P	Restoration	0-100	T1, T1A, T1B, T1D, T3, T4, T5, T5A, T5B, T6	356,364	356,364	1	100%	1.00000	Yes	356,364.000	Yes	18,595.550
Buffer	Rural	Yes	I/P	Restoration	101-200	T2, T4, T5, T5B	43,678	43,678	1	33%	3.03030	Yes	14,413.754	Yes	2,279.176
Buffer	Rural	Yes	I/P	Enhancement	0-50	T4	210	210	2	100%	2.00000	Yes	105.000	Yes	10.958
Buffer	Rural	Yes	I/P	Enhancement	0-100	T4	59,388	59,388	2	100%	2.00000	Yes	29,694.000	Yes	3,098.945
Buffer	Rural	Yes	I/P	Enhancement	101-200	T4	3,106	3,106	2	33%	6.06061	Yes	512.490	Yes	162.075
Buffer	Rural	Yes	I/P	Enhancement via Cattle Exclusion	20-29	Sassarixa Creek, T5, T6	1,209	1,209	2	75%	2.66667	Yes	453.374	No	_
Buffer	Rural	Yes	I/P	Enhancement via Cattle Exclusion	0-50	Sassarixa Creek, T5, T6	6,420	6,420	2	100%	2.00000	Yes	3,210.000	No	_
Buffer	Rural	Yes	I/P	Enhancement via Cattle Exclusion	0-100	Sassarixa Creek, T1A, T1B, T1C, T2, T3, T5, T5A, T5B, T6	1,080,633	1,080,633	2	100%	2.00000	Yes	540,316.500	No	_
Buffer	Rural	Yes	I/P	Enhancement via Cattle Exclusion	101-200	Sassarixa Creek, T5 T5A, T5B	377,045	377,045	2	33%	6.06061	Yes	62,212.385	No	_
Buffer	Rural	Yes	Coastal Headwater	Restoration	0-100	T5C	12,481	12,481	1	100%	1.00000	Yes	12,481.000	No	_
	Totals:						1,962,629	1,962,629							

<sup>\*</sup>Per the Site Viability for Buffer Mitigation and Nutrient Offset Letter dated May 21, 2018, certain project reaches were deemed viable by DWR for nutrient offset credit at 2,273 lbs. Nitrogen per acre. The nutrient offset viable areas are depicted in Figure 9 and their associated potential nutrient offset credits are listed in Table 7a. These select project areas have a minimum easement width of 50 feet from the top of bank and will be restored, per Section 5.2. While nutrient offset credits are not being requested at this time, these areas may be converted to nutrient offset credits by DMS later.

**Table 7b: Riparian Buffer Credit Generation Summary for Preservation** - Sassarixa Swamp Mitigation Site

Enter Preservation Credits  Below  Eligible for Preservation (sf):							654,210					
Credit Type	Location	Subject?	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (sf)	Total (Creditable) Area for Buffer Mitigation (sf)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits
	Rural	No	Ephemeral		0-100	T3	16,744	16,744	10	100%	10.00000	1,674.400
D. effer	Rural	Yes	I/P	Preservation	20-29	T5	235	235	10	75%	13.33333	17.625
Buffer	Rural	Yes	I/P		0-100	T3, T4, T5	545,794	545,794	10	100%	10.00000	54,579.400
	Rural	Yes	I/P		101-200	T3	544	544	10	33%	30.30303	17.952

Preservation Area
Subtotal (sf):

Preservation as %
Total Area of Buffer
Mitigation:

Ephemeral Reaches
as % Total Area of
Buffer Mitigation:

1.4%

Table 7c: Total Riparian Buffer Credit Generation Summary – Sassarixa Swamp Mitigation Site

TOTAL AREA OF BUFFER MITIGATION (TABM)							
Mitigat	ion Totals	Square Feet	Credits				
Resto	oration:	434,618	405,353.754				
Enhar	cement:	1,528,011	636,503.749				
Prese	rvation:	563,317	56,289.000				
Total Ripa	arian Buffer:	2,525,946	1,098,146.503				
TOTAL NUTRIENT OFFSET MITIGATION							
Mitigat	ion Totals	Square Feet	Credits				
Nutrient	Nitrogen:	0	0.000				
Offset:	Phosphorus:	U	0.000				

<sup>\*</sup>Area eligible for preservation may be no more than 25% of total area, where total area is back calculated with the equation R+E/0.75.

<sup>\*</sup>Ephemeral channels may be no more than 25% of mitigation area for buffer credits, no limit on nutrients

#### **Implementation Plan** 5.0

The Wildlands Team proposes to restore high quality ecological function to Sassarixa Creek and 13 unnamed tributaries on the Site. The ecological uplift can be summarized as transforming agriculturally impacted areas to a protected forested riparian corridor. The project design will ensure that no adverse impacts to wetlands or existing riparian areas occur. All riparian restoration activities will commence in concurrence with the stream mitigation activities and not before. Therefore, the mitigation area where riparian restoration is being performed may be altered slightly depending on the implementation of the Sassarixa Swamp Stream Mitigation Plan. Planting and fencing will happen in conjunction with the Sassarixa Swamp Nutrient Offset and Buffer Mitigation Bank Parcel. Figure 7 illustrates the conceptual design for the Site.

#### 5.1 **Parcel Preparation**

The current land uses adjacent to the streams proposed for riparian restoration are active agricultural lands. Areas slated for riparian restoration that are not impacted by the construction of the stream mitigation project will require little site preparation including select herbicide treatments or limited mechanical clearing to remove undesirable underbrush or invasive species. Other areas of the easement will be graded in accordance with the Interagency Review Team (IRT) approved stream mitigation plan. After the grading for the stream mitigation is complete, the floodplain will be prepared for seeding and planting by applying stockpiled topsoil to the floodplain between bankfull elevation of the stream and the grading limits. All haul roads and other areas of compacted soil within the easement boundary will be ripped prior to planting.

As part of the stream mitigation project, the farm pond and drainpipe that currently impounds water at the headwaters of T2 will be eliminated and the channel restored. Several field drains were installed near the area at the top of the pond to direct stream water and field drainage into the pond. Those will be severed at the edge of buffer to provide diffuse flow into the easement. The earthen dam is proposed to be removed and a portion of the dam will be used to fill the pond bottom to provide stable foundation for construction of the new channel. The path of the future channel will be over-excavated, and fill material from the old dam will be used to stabilize the pond bed for the construction of the bed and banks of the new channel. Once the dam is removed, the stream restoration will begin near the upstream extent of the existing impoundment. Below the existing dam the restored channel will follow the existing valley flowing southwest until it reaches the confluence with Sassarixa Creek. Sheets 1.25-1.29 from the Sassarixa Swamp Stream Mitigation Plan (SAW# 2018-00432) set depicts the pond footprint, conservation easement boundary, and new stream alignment, which is included in Appendix 7 of the Sassarixa Swamp Stream Mitigation Plan.

The specifics of the stream restoration project, including breaching the pond on T2 and grading plan, are included in the Sassarixa Swamp Stream Mitigation Plan. A 401 permit will be required for all stream restoration work, including work within the pond on T2 and will be obtained before any work in the waters begins.

#### **Riparian Area Restoration Activities**

The revegetation plan for the riparian mitigation area will include permanent seeding, planting bare root trees, live stakes, and herbaceous plugs. These revegetation efforts will be coupled with controlling invasive species population. The specific species composition to be planted was selected based on the community type, observation of occurrence of species in riparian areas adjacent to the Parcel, and best professional judgement on species establishment and anticipated site conditions in the early years following project implementation. Table 8 list woody species that are native to the area and may

become established in the Site during the duration of the project. Refer to Sheet 3.0 of the Draft Plans located in Appendix 7 of the Sassarixa Swamp Stream Mitigation Plan for the planting plan.

Table 8: Native Woody Species to be Established – Sassarixa Swamp Mitigation Site

Scientific Name	Common Name	Dominant Method of Establishment
Acer rubrum	Red Maple	Natural Colonization
Acer negundo	Box Elder	Hand Planting
Betula nigra	River Birch	Hand Planting
Carpinus caroliniana	Ironwood	Natural Colonization
Liriodendron tulipifera	Tulip Poplar	Natural Colonization
Liquidambar straciflua	Sweetgum	Natural Colonization
Magnolia virginiana	Sweetbay Magnolia	Hand Planting
Platanus occidentalis*	American Sycamore	Hand Planting
Populus deltoides	Eastern Cottonwood	Hand Planting
Quercus michauxii	Swamp Chestnut Oak	Hand Planting
Quercus nigra*	Water Oak	Hand Planting
Quercus pagoda	Cherry Bark Oak	Hand Planting
Quercus phellos*	Willow Oak	Hand Planting
Salix nigra*	Black Willow	Hand Planting
Ulmus alata	Winged Elm	Hand Planting

<sup>\*</sup>These late successional species may naturally colonize but are not expected to reach high-density numbers, height, and/or vigor after disturbance.

Trees will be planted at a density sufficient to meet the performance standards outlined in the Rule 15A NCAC 02B .0295 of 260 trees per acre at the end of five years. No one tree species will be greater than 50% of the established stems. An appropriate seed mix will also be applied as necessary to provide temporary ground cover for soil stabilization and reduction of sediment loss during rain events in disturbed areas. This will be followed by an appropriate permanent seed mixture. Planting is scheduled to begin in March 2020.

Vegetation management and herbicide applications may be needed during tree establishment in the restoration areas to prevent establishment of invasive species that could compete with the planted native species.

#### 5.3 Riparian Area Enhancement Activities

The revegetation plan for the enhancement areas under NCAC 02B .0295 (n) will include planting supplemental bare root trees and controlling invasive species growth. The tree species to be planted are listed in Table 8.

For enhancement areas under NCAC 02B .0295 (o), cattle exclusion, planting isn't anticipated to be needed except where required in the stream mitigation plan. A seed mix will be applied where cattle have caused bare soils and cattle will be excluded from the riparian enhancement areas by fencing.

#### 5.4 Riparian Area Preservation Activities

There will be no parcel preparation work done in the riparian preservation areas, as allowed under 15A NCAC 02B .0295(o). The preservation area will be protected in perpetuity under a conservation easement.

#### 6.0 Monitoring Plan

The Site monitoring plan has been developed to ensure that the required performance standards are met, and project goals and objectives are achieved. The monitoring report shall provide project data chronology that will facilitate an understanding of project status and trends, ease population of DMS databases for analysis and research purposes and assist in close-out decision making.

#### 6.1 Monitoring Components

Project monitoring components are listed in more detail in Table 9 and Figure 8.

#### 6.2 Vegetation

Vegetation monitoring quadrants will be installed across the Site to measure the survival of the planted trees (Figure 8). The first annual monitoring activities will commence at the end of the first growing season, at least six months after planting has been completed, and will be reassessed annually no earlier than the Fall of each year. Species composition, density, height, and survival rates will be evaluated on an annual basis by plot and for the entire site. The number of monitoring quadrants required, and frequency of monitoring will be based on the DMS monitoring guidance documents. Vegetation monitoring will follow the CVS-EEP Protocol for Recording Vegetation (2008) or another DMS approved protocol. Planted stems will be flagged each monitoring year. Reference photographs of the vegetation plots and Site will be taken during the annual vegetation assessments.

#### 6.3 Overview Photographs

Overview photographs will be taken of the project area once a year to visually document stability for five years following construction.

#### 6.4 Visual Assessment

Visual assessments will be performed within the Site on a semi-annual basis during the five-year monitoring period. Problem areas with vegetative health will be noted (e.g. low stem density, vegetation mortality, invasive species or encroachment).

Table 9: Monitorin	g Components -	- Sassarixa	Swami	Mitiaation	Site
--------------------	----------------	-------------	-------	------------	------

Parameter	Monitoring Feature	Quantity	Frequency
Vagatation	CVS Level 2	9	Year 1-5
Vegetation	Visual	T5C	Year 1-7
Visual Assessment		Yes	Semi-Annual
Exotic and Nuisance Vegetation			Semi-Annual
Project Boundary			Semi-Annual

#### 7.0 Project Success Criteria

The project success criteria for the Site follows approved performance criteria presented in the guidance documents outlined in RFP 16-007279 and the Consolidated Buffer Rule (15A NCAC 02B .0295). Annual monitoring and semi-annual site visits will be conducted to assess the condition of the finished project. The buffer mitigation project has been assigned specific performance criteria components for vegetation. Performance criteria will be evaluated throughout the five-year post-construction monitoring. An outline of the performance criteria components follows.

#### 7.1 Vegetation

The final vegetative success criteria will be the health, survival, height, and density of at least 260 stems per acre at the end of the fifth year of monitoring, with a minimum of four native hardwood tree or



shrub species composition and no one species comprises more than 50 percent of stems. Vigor, species composition, and density will all be assessed. The extent of invasive species coverage will also be monitored and controlled as necessary throughout the required monitoring period.

#### 7.2 Overview Photographs

Overview photographs will be taken of the project area once a year to visually document stability for five years following construction.

#### 7.3 Visual Assessments

Visual assessments should support the specific performance standards for each metric as described above. Visual assessments will be performed within the Site on a semi-annual basis during the five-year monitoring period. Problem areas with vegetative health will be noted (e.g. low stem density, vegetation mortality, invasive species or encroachment). Areas of concern will be mapped and photographed accompanied by a written description in the annual report. Problem areas with be re-evaluated during each subsequent visual assessment. Should remedial actions be required, recommendations will be provided in the annual monitoring report.

To ensure compliance with 0295 (0) (6): A visual assessment of the cattle exclusion and preservation areas within the conservation easement will also be performed each year to confirm:

- No cattle access within the conservation easement area; no encroachment has occurred; diffuse flow is being maintained in the conservation easement area; and there has not been any cutting, clearing, filling, grading, or similar activities that would negatively affect the functioning of the buffer.
- Any issues identified during the visual assessment of the cattle exclusion and preservation
  areas will be photographed and mapped as part of the annual monitoring report with
  remedial efforts proposed or documented.

#### 7.4 Reporting Performance Criteria

Using the DMS Riparian Buffer and Nutrient Offset Buffer Baseline and Annual Monitoring Report Template version 2.0 (May 2017), a baseline monitoring document and as-built record drawings of the project will be developed for the constructed Site. Complete monitoring reports will be prepared in the fall of each monitoring year and submitted to DMS. Annual monitoring reports will be based on the above referenced DMS Template (May 2017). The monitoring period will extend five years beyond completion of construction or until performance criteria have been met. Additional visual monitoring period for Coastal Headwaters will extend seven years beyond completion of construction or until performance criteria have been met. Closeout of buffer mitigation credits adjacent to the Coastal Headwaters will be done at IRTcloseout of the stream and wetland mitigation project.

#### 7.5 Maintenance and Contingency Plans

The Wildlands Team will develop necessary adaptive measures or implement appropriate remedial actions in the event that the Site or a specific component of the Site fails to achieve the success criteria outlined above. The project-specific monitoring plan developed during the design phase will identify an appropriate threshold for maintenance intervention based on the monitored items. Any actions implemented will be designed to achieve the success criteria specified previously and will include a work schedule and updated monitoring criteria (if applicable).

#### 8.0 Stewardship

#### 8.1 Long Term Stewardship

The Site will be transferred to the North Carolina Department of Environmental Quality (NCDEQ) Stewardship Program. This party shall serve as conservation easement holder and long-term steward for the property and will conduct periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. The NCDEQ Stewardship Program is developing an endowment system within the non-reverting, interest-bearing Conservation Lands Conservation Fund Account. The use of funds from the Endowment Account will be governed by North Carolina General Statue GS 113A-232(d)(3). Interest gained by the endowment fund may be used for stewardship, monitoring, stewardship administration, and land transaction costs, if applicable.

#### 8.2 Adaptive Management Plan

Upon completion of Site construction, Wildlands will implement the post-construction monitoring defined in Section 7. Project maintenance will be performed during the monitoring years to address minor issues as necessary. If, during annual monitoring it is determined the Site's ability to achieve Site performance standards are jeopardized, Wildlands will notify the members of DMS/NCDWR and work with the DMS/NCDWR to develop contingency plans and remedial actions.

The Wildlands Team will develop necessary adaptive measures or implement appropriate remedial actions if the Site or a specific component of the Site fails to achieve the success criteria outlined above. The project-specific monitoring plan developed during the design phase will identify an appropriate threshold for maintenance intervention based on the monitored items. Any actions implemented will be designed to achieve the success criteria specified previously and will include a work schedule and updated monitoring criteria (if applicable).

#### 9.0 References

National Land Cover Database 2011 (NLCD 2011), Multi-Resolution Land Characteristics (MRLC) consortium, https://www.mrlc.gov/nlcd2011.php

Natural Resources Conservation Service (NRCS). Web Soil Survey of Johnston County. http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

North Carolina Division of Mitigation Services (DMS), 2016. River Basin Restoration Priority Transition Approach.

North Carolina Division of Water Quality (NCDWQ), 2011. Surface Water Classifications. http://deq.nc.gov/about/divisions/water-resources/planning/classification-standards/classifications

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

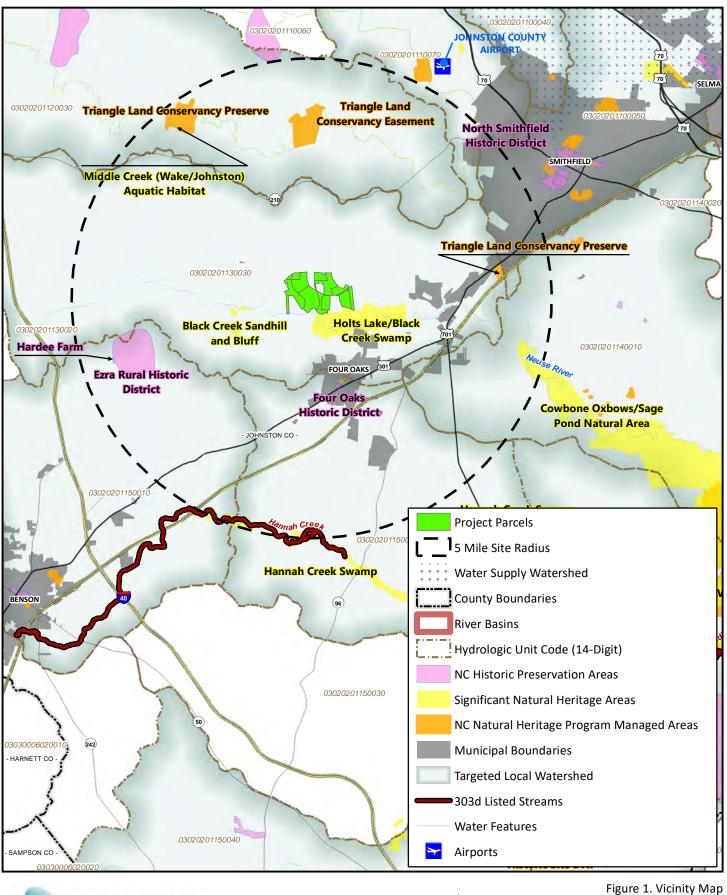
NCGS, 2013. Mineral Resources. http://deq.nc.gov/about/divisions/energy-mineral-land-resources/north-carolina-geological-survey/mineral-resources

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Rob Breeding, Eastern Watershed Planner, North Carolina Ecosystem Enhancement Program (NCEEP), 2010. Neuse River Basin Restoration Priorities.

United States Fish and Wildlife Service (USFWS), 2018. Endangered Species, Threatened Species, Federal Species of Concern and Candidate Species, Johnston County, NC.







0 1 2 Miles

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Figure 1. Vicinity Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201

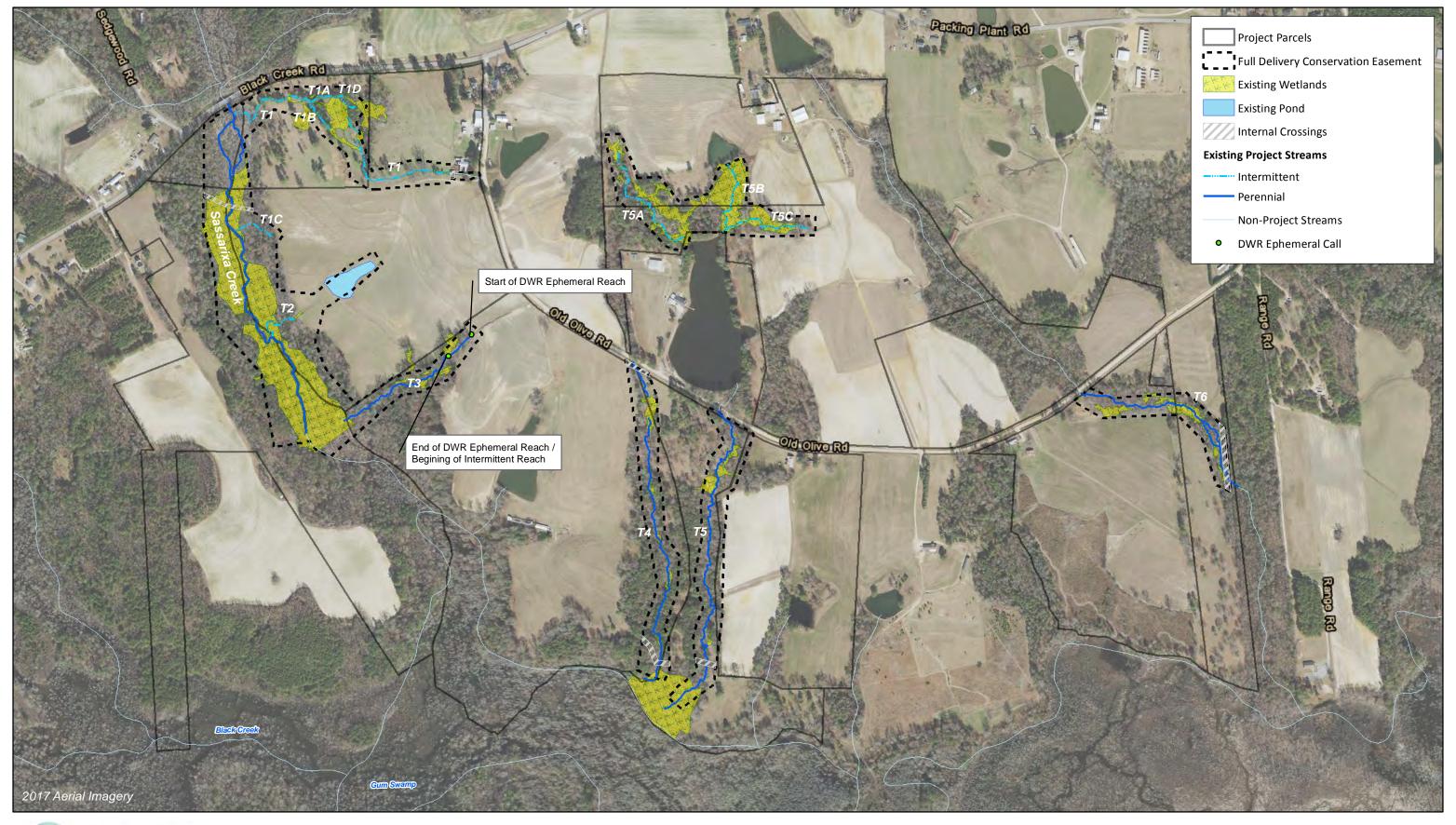
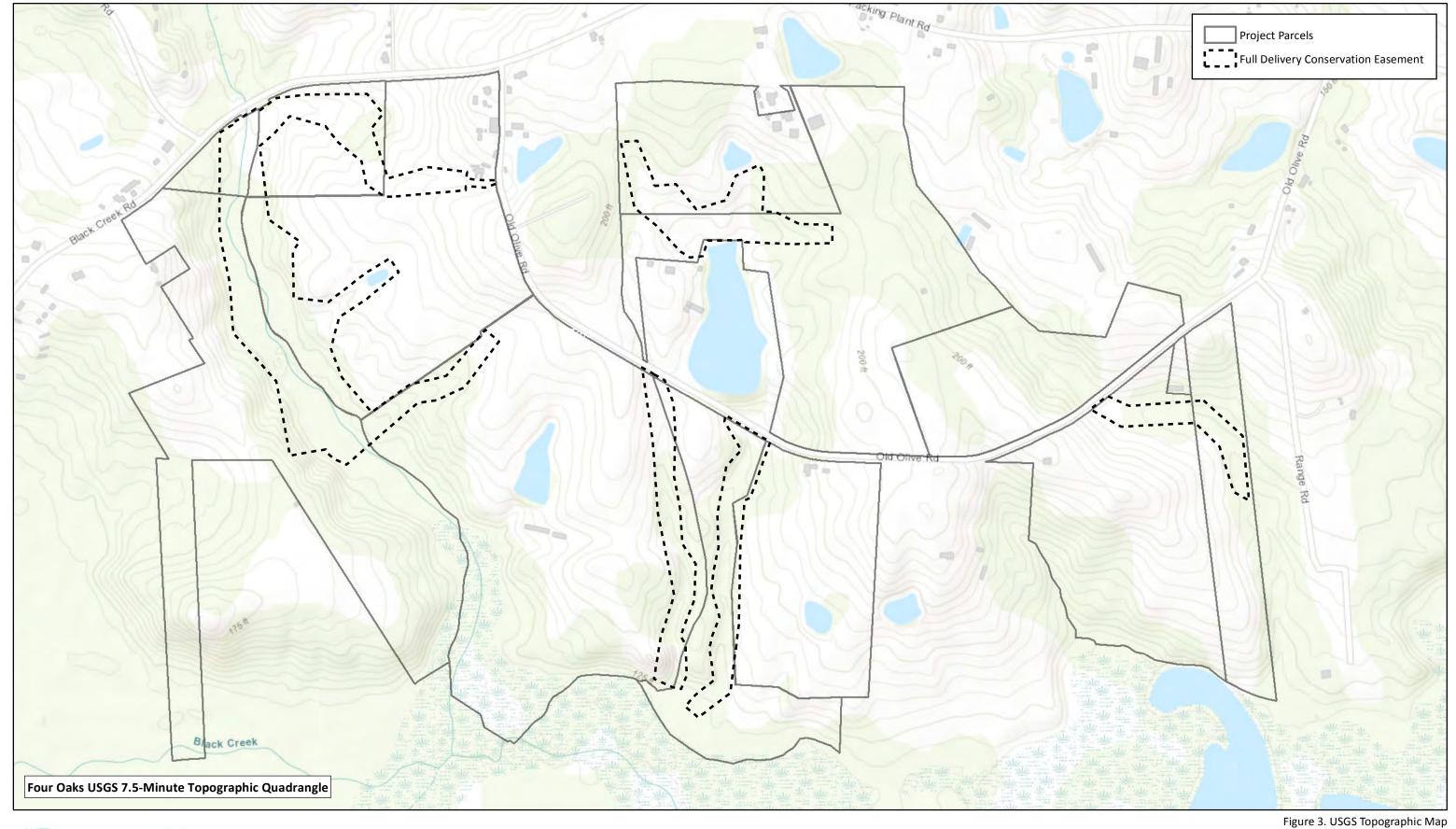




Figure 2. Site Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201





600 1,200 Feet

Sassarixa Swamp Mitigation Site
Neuse River Basin 03020201

Johnston County, NC

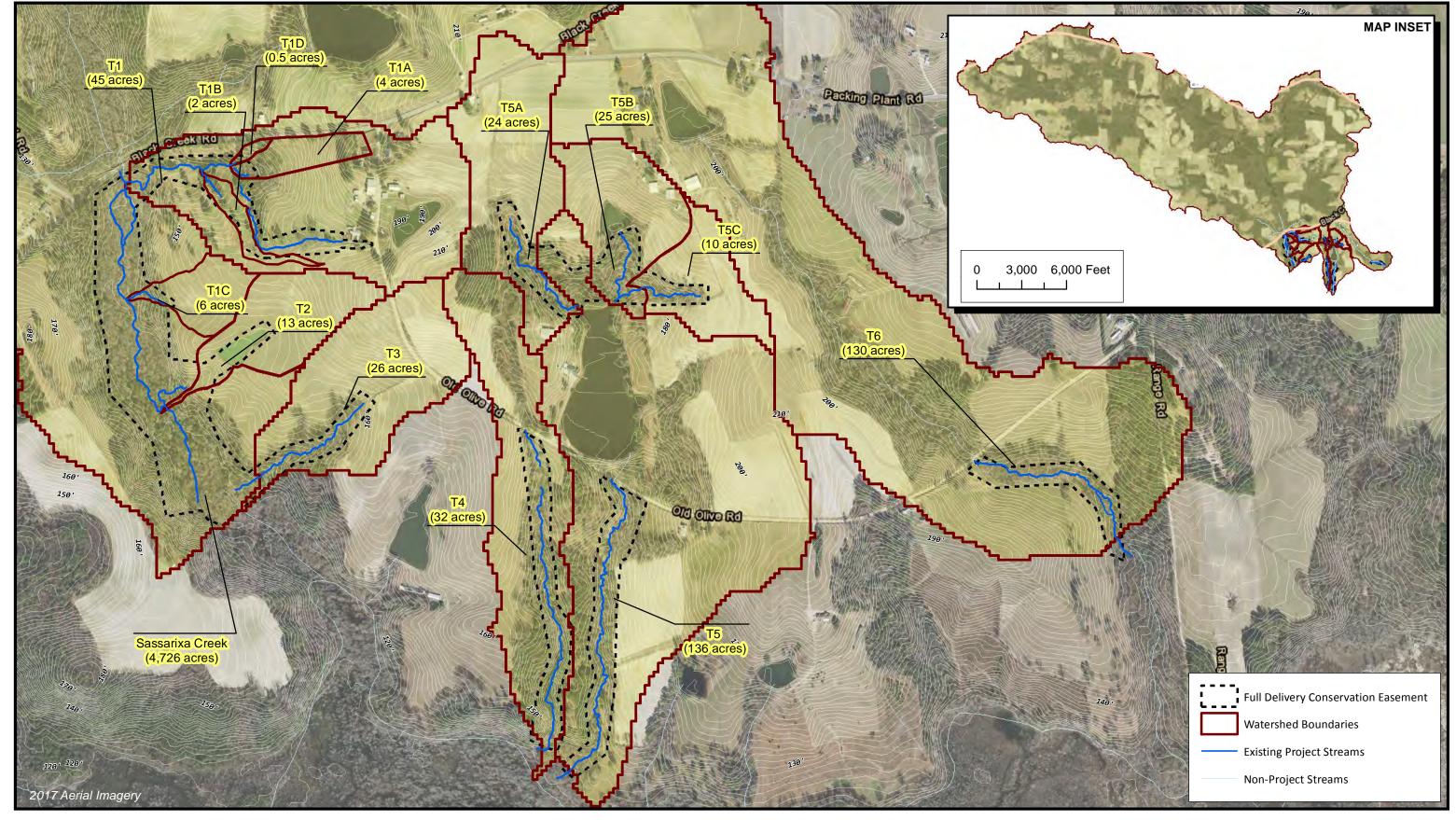




Figure 4. Watershed Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201



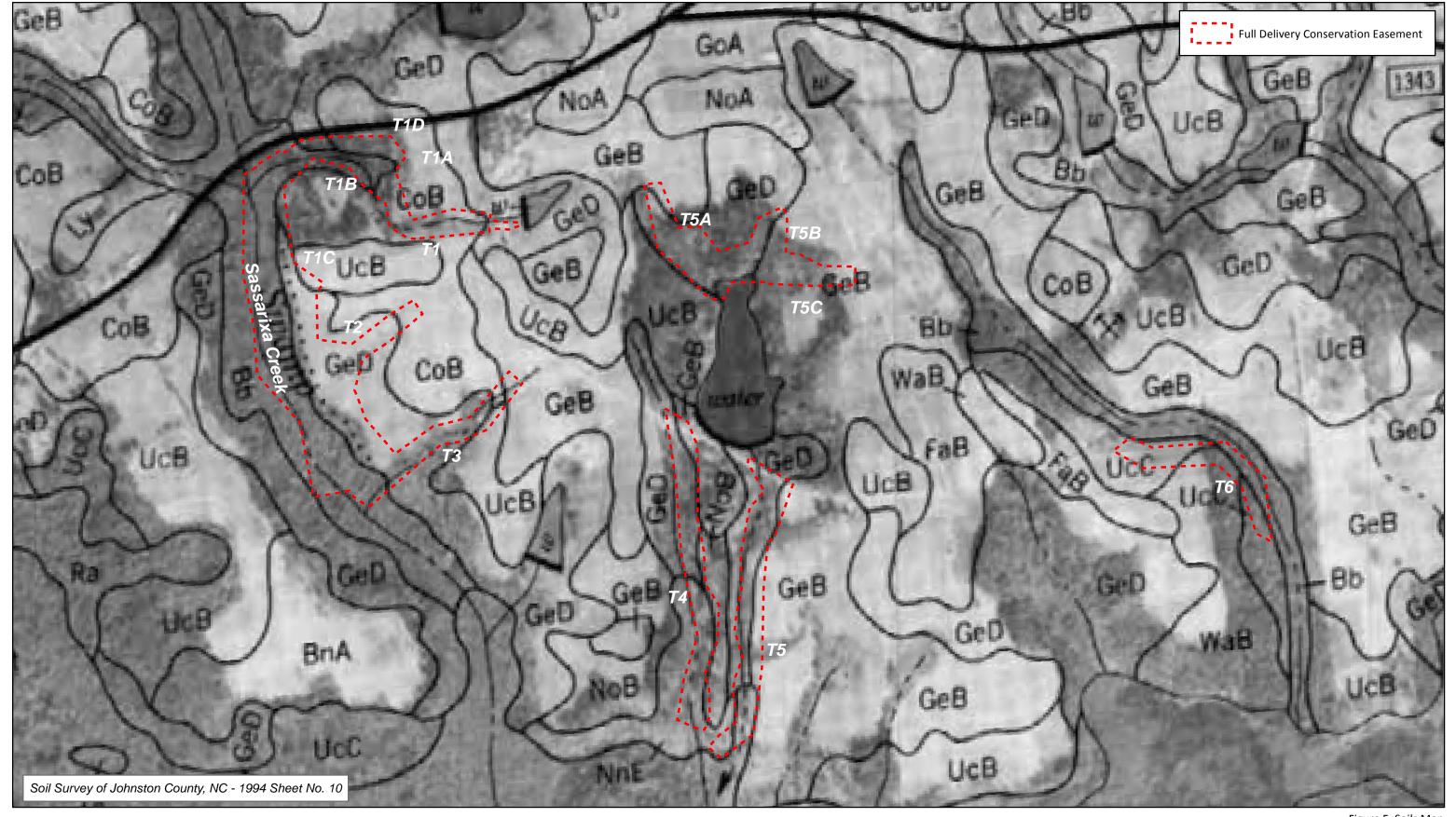
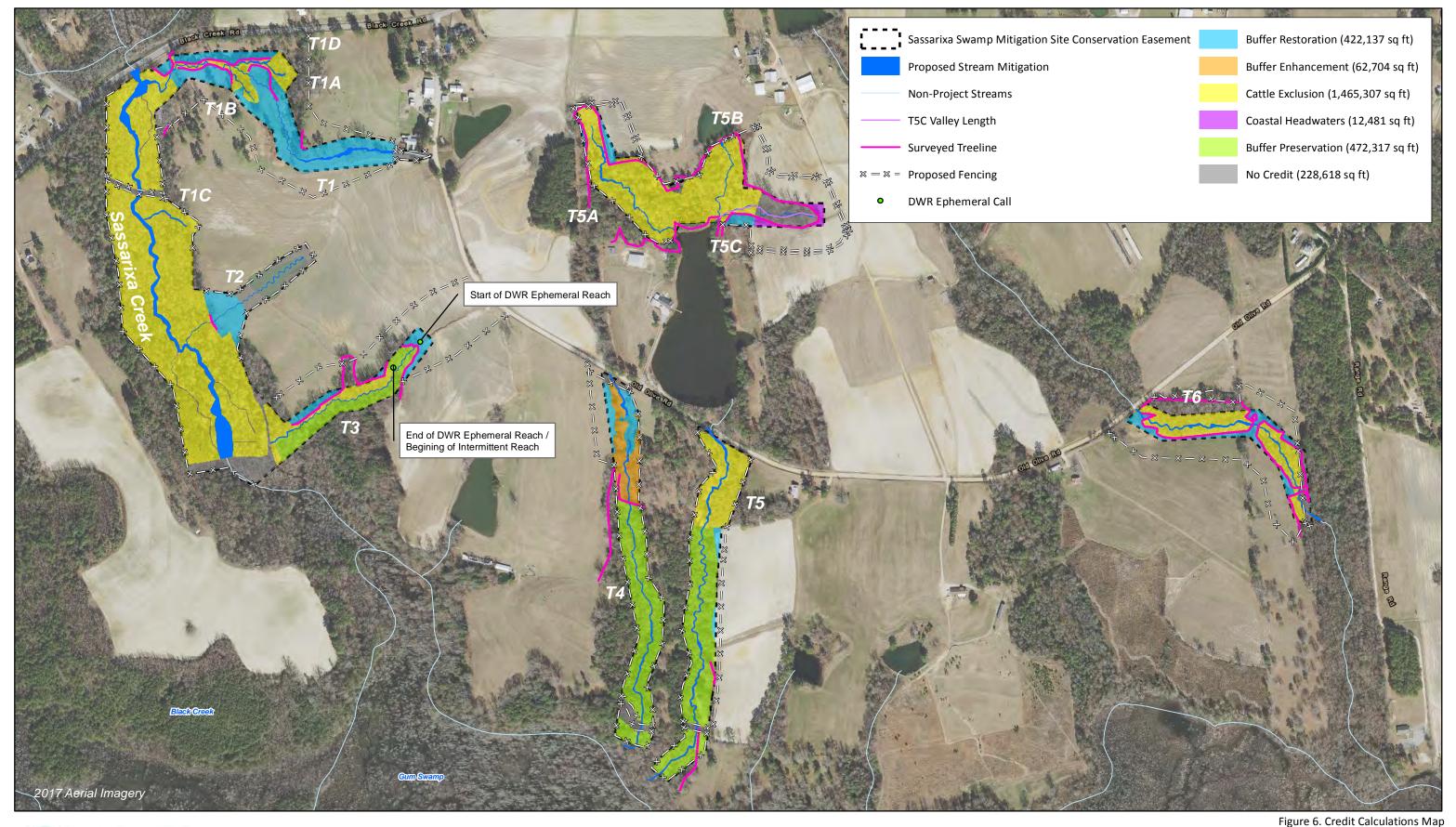




Figure 5. Soils Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201

0 600 1,200 Feet





Sassarixa Swamp Mitigation Site
Neuse River Basin 03020201

1,200 Feet

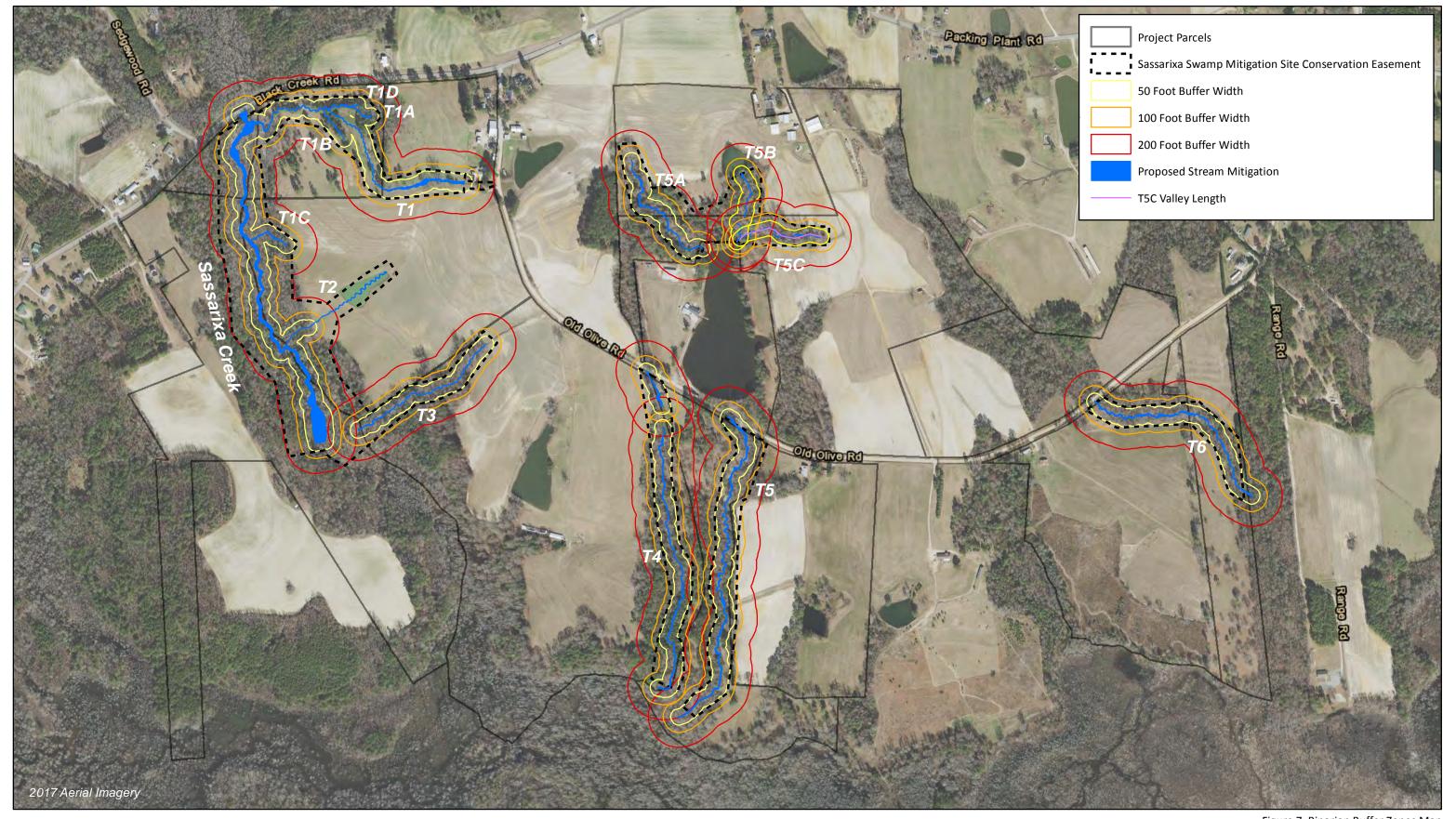




Figure 7. Riparian Buffer Zones Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201





Sassarixa Swamp Mitigation Site
Neuse River Basin 03020201

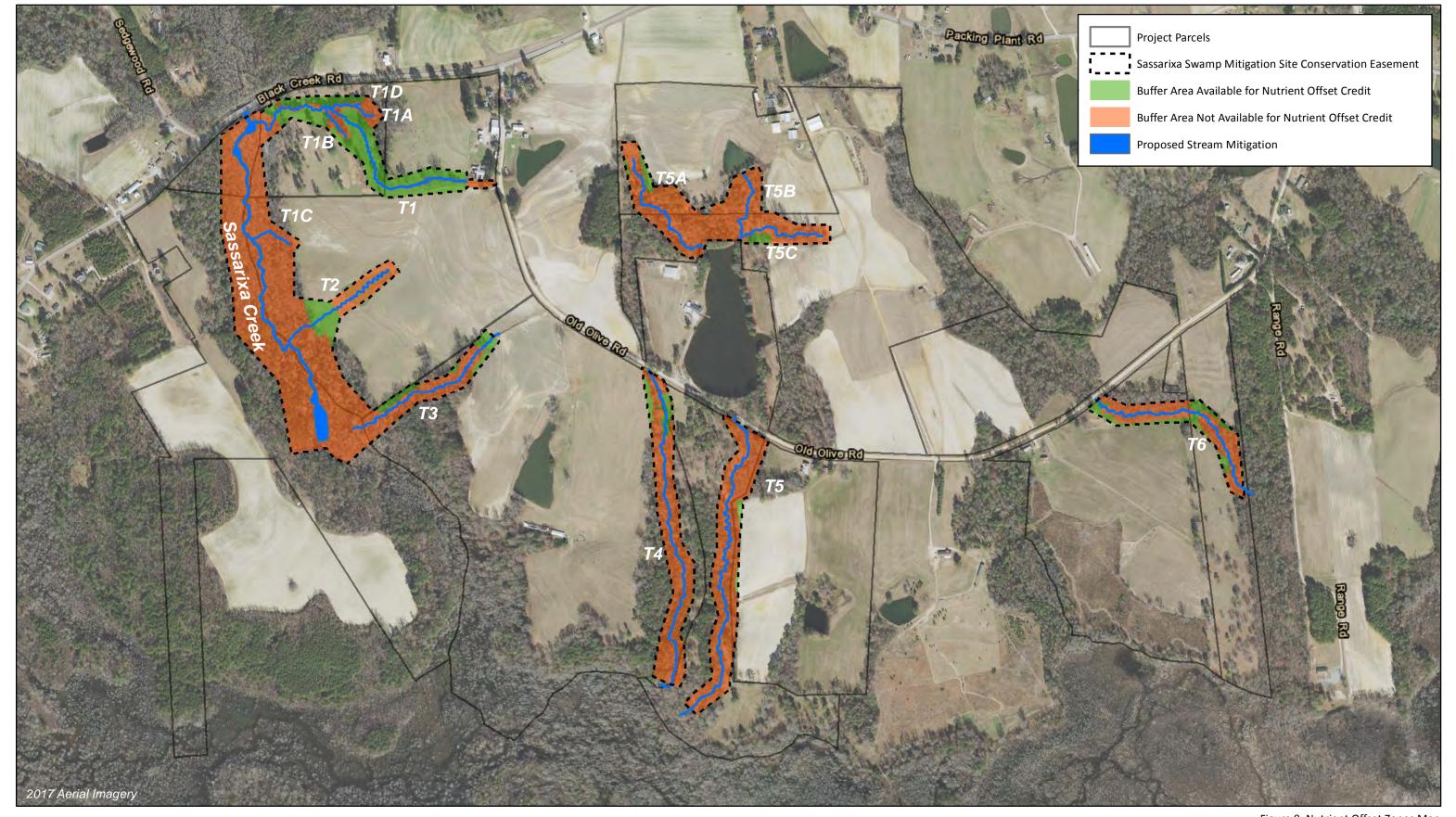
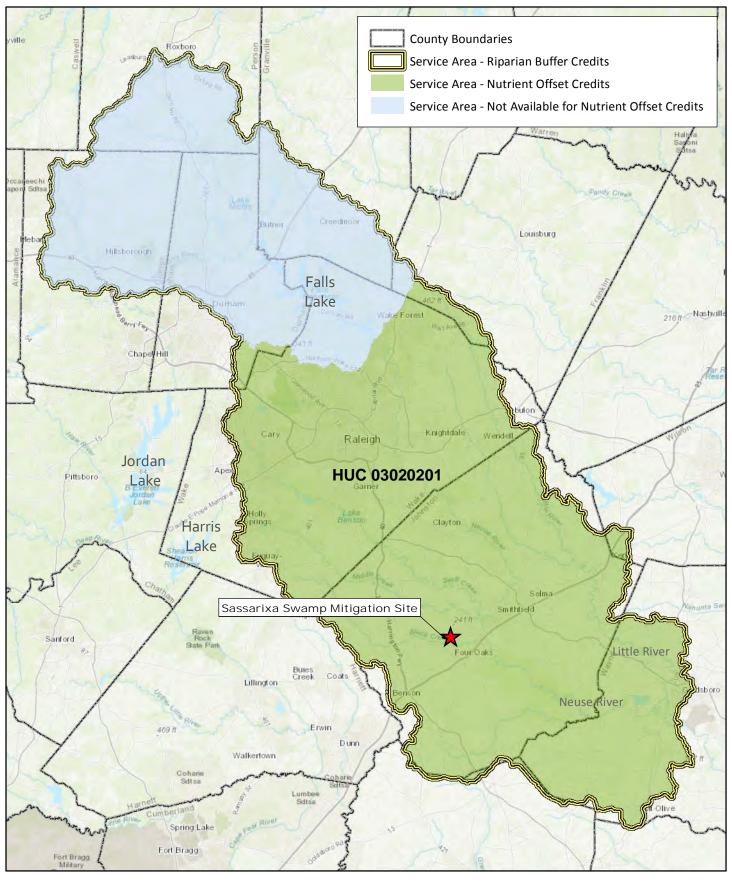




Figure 9. Nutrient Offset Zones Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201





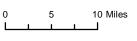




Figure 10. Service Area Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201



ROY COOPER
GIVETNIA

MICHAEL S. REGAN
Secretary
LINDA CULPEPPER
Interim Director

May 21, 2018

John Hutton Wildlands Engineering, Inc. 312 West Millbrook Rd, Suite 225 Raleigh, NC 27609

DWR ID# 2018-0198 Johnston County

(via electronic mail: jhutton@wildlandseng.com)

Re: Site Viability for Buffer Mitigation and Nutrient Offset & Buffer- Sassarixa Swamp Site 2-162 Olive Rd, Smithfield, NC

Neuse 03020201 (not in Falls WS)

Dear Mr. Hutton,

On February 9, 2018, Katie Merritt, with the Division of Water Resources (DWR), received a request from Wildlands Engineering, Inc. (WEI) for an onsite mitigation determination near the above-referenced site (Site). The Site is located in the Neuse River Basin within the 8-digit Hydrologic Unit Code 03020201. The Site is being proposed as part of a full-delivery stream and riparian buffer mitigation project for the Division of Mitigation Services (RFP #16-007279). Members of the Interagency Review Team (IRT) and Division of Mitigation Services were also present onsite. At your request, on February 23, 2018, Ms. Merritt performed an onsite assessment of riparian land uses adjacent to streams onsite, which are shown on the attached map labeled "Figure 6A".

Ms. Merritt's evaluation of the features and their associated mitigation determination for the riparian areas are provided in the table below. The evaluation was made from Top of Bank (TOB) out to 200' from each existing or *proposed* feature for buffer mitigation pursuant to 15A NCAC 02B .0295 (effective November 1, 2015) and for nutrient offset credits pursuant to 15A NCAC 02B .0240.

Feature	Classification	¹Subject to Buffer Rule	Riparian Land uses adjacent to proposed Feature (0-200')	Buffer Credit Viable	2Nutrient Offset Credit Viable at 2,273 Ibs/acre	Mitigation Type Determination w/in riparian areas
T1A	Stream @ DWR flag	No	Forested pasture actively grazed by cattle	Yes <sup>4</sup>	Yes (non- forested areas only)	Enhancement Site per 15A NCAC 02B .0295 (o) (6)
71	Stream	Yes	Forested & Non- forested pasture actively grazed by cattle	Yes <sup>4</sup>	Yes (non- forested areas only)	Fields - Restoration Site per 15A NCAC 02B .0295 (n)  Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6)
Sassarixa Creek (R2-R3)	Stream	Yes	Forested pasture grazed by cattle	Yes <sup>4</sup>	No	Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6) No cattle observed in riparian areas below R-3 (see map)

Feature	Classification	1Subject to Buffer Rule	Riparian Land uses adjacent to proposed Feature (0-200')	Buffer Credit Viable	<sup>2</sup> Nutrient Offset Credit Viable at 2,273 Ibs/acre	Mitigation Type Determination w/in ripariar areas
T2 Pond	Pond (not in line)	No	Agriculture	No	No	N/A
T2 (inside woodline)	Stream	Yes	(starts in the woodline) Forested pasture grazed by cattle	Yes <sup>4</sup>	No	Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6)
T3 (R1)	Ditch	No	Left Bank – Hay crop fields Right Bank – Non- forested pasture grazed by cattle	No	Yes	Restoration Site per 15A NCAC 02B .0295 (n)
T3 (R2)	Ephemeral	No	Left Bank- hay crop fields and forest Right Bank – a narrow fringe of forested areas; fields are actively grazed by cattle.	*Yes <sup>3,5</sup>	Yes (non- forested areas only)	Forested Areas - Preservation Site per 15A NCAC 02B .0295 (o)(7)  Fields - Restoration Site per 15A NCAC 02B .0295 (o)(7)  *Must meet additional requirements under .0295 (o)(7) to be viable for buffer mitigation
T3 (R3)	Stream	Yes	Forested, no cattle present	Yes <sup>3</sup>	No	Preservation Site per 15A NCAC 02B .0295 (o)(5)
T4 (R1)	Stream	Yes	Partial canopy forested pasture actively grazed by cattle	Yes <sup>4</sup>	Yes	Buffer Mitigation – Enhancement Site per 15A NCAC 02B .0295 (o) (6) Nutrient Offset – Enhancement Site per 15A NCAC 02B .0295 (n) (planting required)
T4 (R2)	Stream	Yes	Partial canopy forested pasture actively grazed by cattle	Yes <sup>4</sup>	Yes	Buffer Mitigation – Enhancement Site per 15A NCAC 02B .0295 (o) (6) Nutrient Offset – Enhancement Site per 15A NCAC 02B .0295 (n) (planting required)
T4 (R3)	Wetland/ Inconsistent channelization	No	Forested	No	No	N/A
T5 (R1)	Stream	Yes	Full-canopy forested pasture actively grazed by cattle	Yes <sup>4</sup>	No	Enhancement Site per 15A NCAC 02B .0295 (o) (6)
T5 (R2-R3)	Stream	Yes	Right Bank- Forested Left Bank- mostly forested with a crop field	Yes <sup>3</sup>	Yes (field anly)	Forested Areas - Preservation Site per 15A NCAC 02B (o)(5) Fields - Restoration Site per 15A NCAC 02B .0295 (n)

<u>Feature</u>	Classification	1Subject to Buffer Rule	Riparian Land uses adjacent to proposed Feature (0-200')	Buffer Credit Viable	2Nutrient Offset Credit Viable at 2,273 Ibs/acre	Mitigation Type Determination w/in riparian areas
T5A	Stream	No	Full-canopy forested pasture actively grazed by cattle with adjacent ag fields	Yes <sup>4</sup>	No	Enhancement Site per 15A NCAC 02B .0295 (o) (6)
TSA Wetland (see map)	Wetland (impacts from cattle in T5 stream resulted in a wetland)	No	Full-canopy forested pasture actively grazed by cattle	(see note)	No	Mitigation Note: Proposing stream restoration to reconnect T5A stream throughout. If stream restoration is approved by the IRT and a stream channel is constructed, then the new riparian areas will be viable as an Enhancement Site per 15A NCAC 02B .0295 (o) (6)
T5B	Stream	Yes	Full-canopy forested pasture actively grazed by cattle	Yes <sup>4</sup>	No	Enhancement Site per 15A NCAC 02B .0295 (o) (6)
TSC	Headwater Stream/ Wetland complex	No	Full canopy forested pasture surrounded by agriculture fields	*Yes (fields only)	No	Fields - Restoration Site per 15A NCAC 02B .0295 (o)(2)  *Must be approved by the IRT as a Coastal Headwater Stream Mitigation Site to be viable for credit.
T6	Stream	Yes	Combination of forested pasture and agriculture fields	Yes <sup>4</sup>	Yes (field only)	Fields - Restoration Site per 15A NCAC 02B .0295 (n)  Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6)

<sup>&</sup>lt;sup>1</sup>Subjectivity calls for the features were determined by DWR in correspondence dated April 5, 2018 and April 6, 2018 using the 1:24,000 scale quadrangle topographic map prepared by USGS and the most recent printed version of the soil survey map prepared by the NRCS.

Maps that are attached to this letter were provided by WEI and were initialed by Ms. Merritt on May 21, 2018. This letter should be provided in all stream, wetland, buffer and/or nutrient offset mitigation plans for this Site.

This letter does not constitute an approval of this site to generate mitigation credits. Pursuant to 15A NCAC 02B .0295, a mitigation proposal <u>and</u> a mitigation plan shall be submitted to DWR for written approval **prior** to conducting any mitigation activities in riparian areas and/or surface waters for buffer mitigation credit. Pursuant to 15A NCAC 02B .0240, a proposal regarding a proposed nutrient

<sup>&</sup>lt;sup>2</sup> NC Division of Water Resources - Methodology and Calculations for determining Nutrient Reductions associated with Riparian Buffer Establishment

<sup>&</sup>lt;sup>3</sup>The area of preservation credit within a buffer mitigation site shall comprise of no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 0295 (o)(5) and 15A NCAC 0295 (o)(4). Site cannot be a Preservation only site to comply with this rule.

<sup>&</sup>lt;sup>4</sup>The area described as an Enhancement Site was assessed and determined to comply with all of 15A NCAC 02B .0295(o)(6).

<sup>&</sup>lt;sup>5</sup>The area of the mitigation site on ephemeral channel shall comprise no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 02B .0295 (o)(7).

Sassarixa Swamp Site Wildlands Engineering, Inc May 21, 2018

load-reducing measure for nutrient offset credit shall be submitted to DWR for approval prior to any mitigation activities in riparian areas and/or surface waters.

All vegetative plantings, performance criteria and other mitigation requirements for riparian restoration, enhancement and preservation must follow the requirements in 15A NCAC 02B .0295 to be eligible for buffer and/or nutrient offset mitigation credits. For any areas depicted as not being viable for nutrient offset credit above, one could propose a different measure, along with supporting calculations and sufficient detail to support estimates of load reduction, for review by the DWR to determine viability for nutrient offset in accordance with 15A NCAC 02B .0240.

This viability assessment will expire on May 21, 2020 or upon the submittal of an As-Built Report to the DWR, whichever comes first. Please contact Katie Merritt at (919)-807-6371 if you have any questions regarding this correspondence.

Sincerely,

Karen &

Karen Higgins, Supervisor

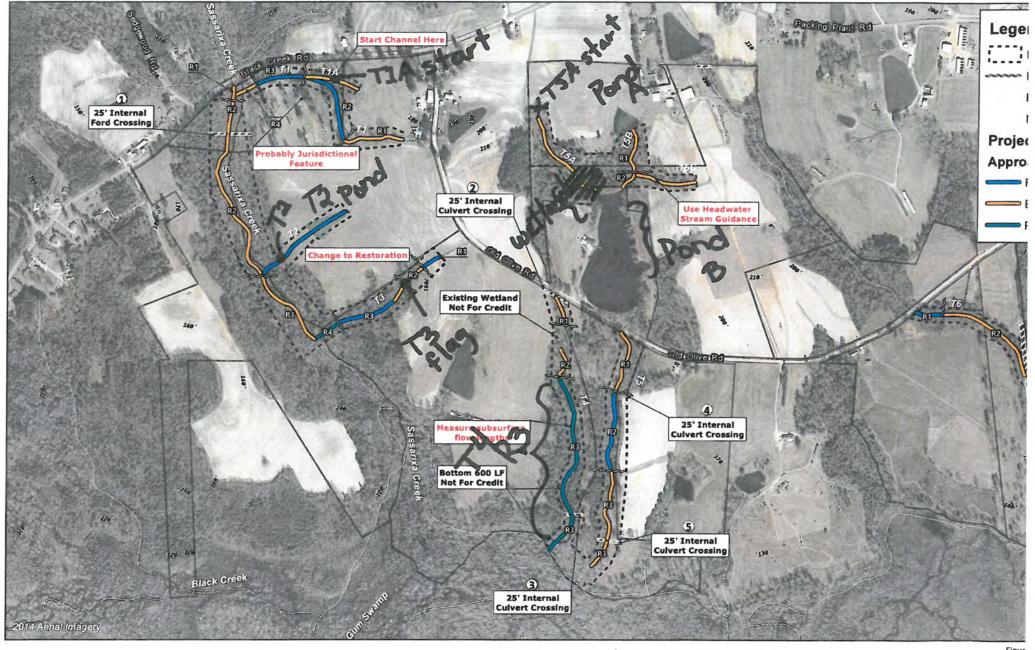
401 and Buffer Permitting Branch

KAH/km

Attachments: Figure 6A

cc: File Copy (Katie Merritt)

DMS – Jeff Schaffer (via electronic mail)





WILDLANDS DWR#-2018-0198

KYM 4/4/18

(stream determination)

Figure 6A

ROY COOPER Governor MICHAEL S. REGAN Secretary LINDA CULPEPPER Director



April 3, 2019

Angela Allen Wildlands Engineering, Inc. 312 West Millbrook Rd, Suite 225 Raleigh, NC 27609

(via electronic mail: aallen@wildlandseng.com)

DWR ID# 2018-0198 Johnston County

Re:

Site Viability for Buffer Mitigation and Nutrient Offset & Buffer- Sassarixa Swamp (T1)

2-162 Olive Rd, Smithfield, NC Neuse 03020201 (not in Falls WS)

Dear Ms. Allen,

On February 20, 2019, Katie Merritt, with the Division of Water Resources (DWR), received a request from you on behalf of Wildlands Engineering, Inc (WEI) to evaluate the potential for riparian buffer mitigation and nutrient offset on two additional features on the subject site. Features labeled T1B and T1C on the attached map labeled "Figure 3a Site Map" were evaluated by Sam Dailey with the US Army Corps of Engineers in March 2019 and these features were determined to be at least intermittent channels. The Site is also being proposed as part of a full-delivery stream and riparian buffer mitigation project for the Division of Mitigation Services (RFP #16-007279).

Ms. Merritt's evaluation of the features and their associated mitigation determination for the riparian areas are provided in the table below. This evaluation was made from Top of Bank (TOB) and landward 200' from each feature for buffer mitigation pursuant to 15A NCAC 02B .0295 (effective November 1, 2015) and for nutrient offset credits pursuant to 15A NCAC 02B .0240.



<u>Feature</u>	Classification onsite	1Subject to Buffer Rule	Riparian Land uses adjacent to Feature (0-200')	Buffer Credit Viable	2Nutrient Offset Viable at 2,273.02 lbs-N per acre	Mitigation Type Determination w/in riparian areas
TIB	Stream	No	Combination of forested and non-forested pasture actively grazed by cattle	<sup>4</sup> Yes	Yes (non- forested areas only)	Fields - Restoration Site per 15A NCAC 02B .0295 (o)(3) Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6)
TIC	Stream	No	Forested pasture actively grazed by cattle; ag fields at the upstream portion	<sup>4</sup> Yes	Yes (ag fields only)	Fields - Restoration Site per 15A NCAC 02B .0295 (o)(3)  Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6)

<sup>1</sup>Subjectivity calls for the features were determined by DWR in correspondence dated March 21, 2019 using the 1:24,000 scale quadrangle topographic map prepared by USGS and the most recent printed version of the soil survey map prepared by the NRCS.

<sup>2</sup> NC Division of Water Resources - Methodology and Calculations for determining Nutrient Reductions associated with Riparian Buffer

<sup>4</sup>The area described as an Enhancement Site was assessed and determined to comply with all 15A NCAC 02B .0295(o)(6). Cattle exclusion fencing is required to be installed around the mitigation area to get buffer credit under this part of the rule.

Establishment

Maps that are attached to this letter were prepared by WEI and initialed by Ms. Merritt on April 3, 2019. This letter should be provided in all stream and wetland, buffer and/or nutrient offset mitigation plans for this Site.

This letter does not constitute an approval of this site to generate mitigation credits. Pursuant to 15A NCAC 02B .0295, a mitigation proposal <u>and</u> a mitigation plan shall be submitted to DWR for written approval **prior** to conducting any mitigation activities in riparian areas and/or surface waters for buffer mitigation credit. Pursuant to 15A NCAC 02B .0240, a proposal regarding a proposed nutrient load-reducing measure for nutrient offset credit shall be submitted to DWR for approval prior to any mitigation activities in riparian areas and/or surface waters.

All vegetative plantings, performance criteria and other mitigation requirements for riparian restoration, enhancement and preservation must follow the requirements in 15A NCAC 02B .0295 to be eligible for buffer and/or nutrient offset mitigation credits. For any areas depicted as not being viable for nutrient offset credit above, one could propose a different measure, along with supporting calculations and sufficient detail to support estimates of load reduction, for review by the DWR to determine viability for nutrient offset in accordance with 15A NCAC 02B .0240.

This viability assessment will expire on April 3, 2021 or upon the submittal of an As-Built Report to the DWR, whichever comes first. This letter should be provided in all stream, wetland or buffer mitigation plans for this Site.

<sup>&</sup>lt;sup>3</sup>The area of preservation credit within a buffer mitigation site shall comprise of no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 0295 (o)(5) and 15A NCAC 0295 (o)(4). Site cannot be a Preservation Only site to comply with this rule.

<sup>&</sup>lt;sup>5</sup>The area of the mitigation site on ephemeral channels shall comprise no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 02B .0295 (o)(7). Cattle exclusion fencing is required to be installed around the mitigation area to get buffer credit under this part of the rule.

Please contact Katie Merritt at (919) 707-3637 if you have any questions regarding this correspondence.

Sincerely,

Karen Higgins, Supervisor 401 and Buffer Permitting Branch

Chartiche McDaniel

KAH/km

Attachments: Figure 3a

cc: File Copy (Katie Merritt)

ROY COOPER Governor MICHAEL S. REGAN Secretary LINDA CULPEPPER Director



October 28, 2019

Angela Allen Wildlands Engineering, Inc. 312 West Millbrook Rd, Suite 225 Raleigh, NC 27609

(via electronic mail: aallen@wildlandseng.com)

DWR ID# 2018-0198 Johnston County

Re: Site Viability for Buffer Mitigation and Nutrient Offset & Buffer- Sassarixa Swamp

Re-evaluation of T4-Reach 3 2-162 Olive Rd, Smithfield, NC Neuse 03020201 (not in Falls WS)

Dear Ms. Allen,

On April 4, 2018 and May 21, 2018, the Division of Water Resources (DWR) issued a stream/buffer determination letter and Site Viability letter respectively, for the subject site. On October 15, 2019, DWR received a stream determination appeal request from Wildlands Engineering, Inc (Wildlands) requesting that a feature labeled T4-R3 on the subject site be re-evaluated based on a preliminary Jurisdictional Determination (JD) by the USACE showing the feature to be a perennial stream and not a linear wetland. In support of this JD, DWR issued a revised stream /buffer determination letter on October 28, 2019. T4-R3 and its riparian areas are also being proposed as part of a full-delivery stream and riparian buffer mitigation project for the Division of Mitigation Services (RFP #16-007279).

On October 15, 2019, DWR also received a request from Wildlands to re-evaluate the potential for riparian buffer mitigation and nutrient offset along T4-R3 based on the JD by USACE.

DWR's evaluation of T4-R3 and its associated mitigation determination for the riparian areas are provided in the table below. This evaluation was made from Top of Bank (TOB) and landward 200' from each feature for buffer mitigation pursuant to 15A NCAC 02B .0295 (effective November 1, 2015) and for nutrient offset credits pursuant to 15A NCAC 02B .0240. This evaluation replaces the evaluation made on T4-R3 issued on May 21, 2018.

Feature	Classification onsite	1Subject to Buffer Rule	Riparian Land uses adjacent to Feature (0-200')	Buffer Credit Viable	2Nutrient Offset Viable at 2.273.02 lbs-N per acre	Mitigation Type Determination w/in riparian areas
T4 (R3)	Stream (see map)	Yes	Forested	<sup>3</sup> Yes	No	Preservation Site per 15A NCAC 02B .0295 (o)(5)

Subjectivity calls for the features were determined by DWR in correspondence dated October 28, 2019 using the 1:24,000 scale quadrangle topographic map prepared by USGS and the most recent printed version of the soil survey map prepared by the NRCS.

NC Division of Water Resources - Methodology and Calculations for determining Nutrient Reductions associated with Riparian Buffer Establishment

The map that is attached to this letter was prepared by Wildlands. This letter should be provided in all stream and wetland, buffer and/or nutrient offset mitigation plans for this Site.

This letter does not constitute an approval of this site to generate mitigation credits. Pursuant to 15A NCAC 02B .0295, a mitigation proposal <u>and</u> a mitigation plan shall be submitted to DWR for written approval **prior** to conducting any mitigation activities in riparian areas and/or surface waters for buffer mitigation credit. Pursuant to 15A NCAC 02B .0240, a proposal regarding a proposed nutrient load-reducing measure for nutrient offset credit shall be submitted to DWR for approval prior to any mitigation activities in riparian areas and/or surface waters.

All vegetative plantings, performance criteria and other mitigation requirements for riparian restoration, enhancement and preservation must follow the requirements in 15A NCAC 02B .0295 to be eligible for buffer and/or nutrient offset mitigation credits. For any areas depicted as not being viable for nutrient offset credit above, one could propose a different measure, along with supporting calculations and sufficient detail to support estimates of load reduction, for review by the DWR to determine viability for nutrient offset in accordance with 15A NCAC 02B .0240.

This viability assessment will expire on April 3, 2021 or upon the submittal of an As-Built Report to the DWR, whichever comes first. This letter should be provided in all stream, wetland or buffer mitigation plans for this Site.

<sup>&</sup>lt;sup>3</sup>The area of preservation credit within a buffer mitigation site shall comprise of no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 0295 (o)(5) and 15A NCAC 0295 (o)(4). Site cannot be a Preservation Only site to comply with this rule.

Please contact Katie Merritt at (919) 707-3637 if you have any questions regarding this correspondence.

Sincerely,

Mac Haupt, Acting Supervisor 401 and Buffer Permitting Branch

MH/km

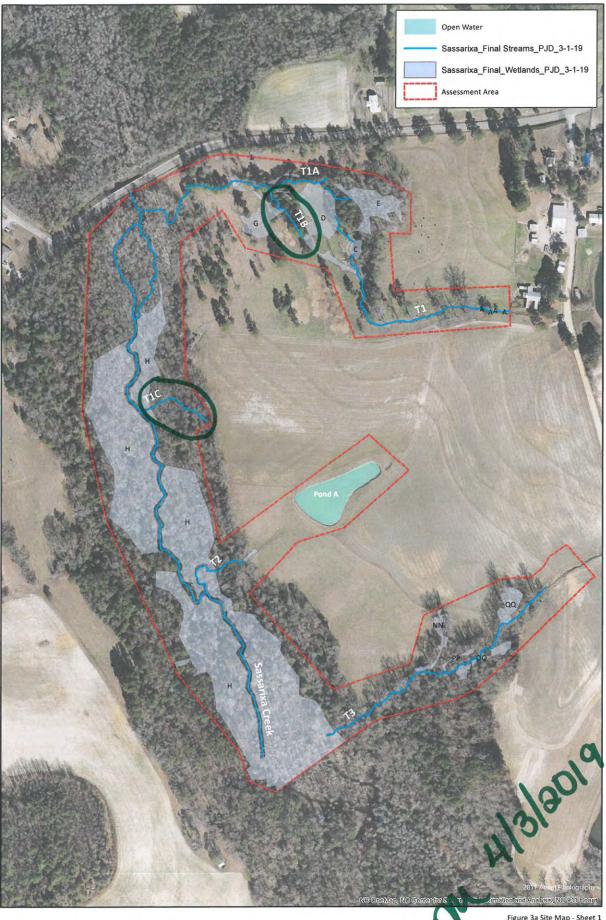
Attachments: Figure 1. Reclassification of T4 Reach 3 map

cc: File Copy (Katie Merritt)



400 Feet

Sassarixa Swamp Mitigation Site Neuse River Basin 03020201





0 112.5 225 Feet

Figure 3a Site Map - Sheet 1 Sassarixa Swamp Mitigation Site Neuse River Basin (03020201)









# Appendix 2 Site Protection Instrument

### 1.0 Site Protection Instrument

The land required for construction, management, and stewardship of this mitigation project includes portions of the parcels listed in Table 1. A conservation easement will be recorded on the parcels and includes streams being restored along with their corresponding riparian buffers. Easement Plats will be reported with the Final Mitigation Plan.

**Table 1: Site Protection Instrument** – Sassarixa Swamp Mitigation Site

Landowner	PIN	County	Site Protection Instrument	Deed Book and Page Number	Acreage to be Protected
Hunter E. Olive	166200-58-6572	Johnston	Conservation	DB: 3624	23.32
Janie E. Olive	166200-59-2333		Easement	PG: 581	
Junes Jones Olive	166200-88-5084	Johnston	Conservation	DB: 3719	14.56
Revocable Trust	166200-85-0452	Johnston	Easement	PG: 717	14.50
Junes Jones Olive Revocable Trust Hunter E. Oliver	166200-57-0481 167200-17-2303	Johnston	Conservation Easement	DB: 3719 PG: 717	35.81
Mary Hunter Olive- Waller Todd Franklin Waller Amanda J. Olive	166200-49-5125	Johnston	Conservation Easement	DB: 4358 PG: 908	1.52
Tami Olive Thompson David Thompson Junes Jones Olive Revocable Trust	166200-66-6896	Johnston	Conservation Easement	DB: 3719 PG: 717	5.53
Matthew T. Keen	167200-06-5717	Johnston	Conservation Easement	DB: 4606 PG: 183	2.05
Tami Olive Thompson	166200-79-8148	Johnston	Conservation Easement	DB: 3719 PG: 717	2.95

All site protection instruments require 60-day advance notification to the USACE and or DMS prior to any action to void, amend, or modify the document. No such action shall take place unless approved by the State.

# Appendix 3 Approved JD and Supporting USACE Assessment Forms

### U.S. ARMY CORPS OF ENGINEERS

WILMINGTON DISTRICT

Action Id. SAW-2018-00432 County: JOHNSTON U.S.G.S. Quad: FOUR OAKS

# NOTIFICATION OF JURISDICTIONAL DETERMINATION

Requestor: Wildlands Engineering, Inc.

Mr. Charlie Neaves

Address: <u>312 West Millbrook</u>

Raleigh, North Carolina 27609

Size (acres) ~83 Nearest Town Nearest Waterway River Basin Neuse River

USGS HUC <u>03020201</u> Coordinates Latitude: <u>35.473294</u>

Longitude: <u>-78.437318</u>

Location description: The project area is identified as an approximate 83 acre tract of land, located at 160 Old Olive Road, Smithfield, Johnston County, North Carolina. Waters on-site drain into Sassarixa Creek and Black Creek; both are within the Neuse River watershed (8-digit HUC: 03020201).

# **Indicate Which of the Following Apply:**

# A. Preliminary Determination

- X There are waters, including wetlands, on the above described project area, 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. 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 are wetlands on the above described 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 of the U.S. on your 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 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 of the U.S., including wetlands, on the above described project area 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 of the U.S. on your 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-2018-00432 SASSARIXA SWAMP DMS SITE

The waters of the U.S., including wetlands, on your project area have been delineated and the delineation has been
verified by the Corps. 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 of the U.S., including wetlands, have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on \_\_\_\_\_\_. 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 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 Ms. Samantha Dailey at 919-554-4884, ext. 22 or by email at Samantha.J.Dailey@usace.army.mil.

- C. Basis For Determination: N/A. An Approved JD has not been completed.
- D. Remarks: Refer to the enclosed Preliminary JD Form and Figures 3, 3a, 3b, and 3c for a detailed evaluation of the aquatic resources on-site.

#### 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 for Approved Jurisdiction Determinations (as indicated in Section B. above)

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\_\_\_\_\_\_.

#### SAW-2018-00432 SASSARIXA SWAMP DMS SITE

It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this

correspondence.

DAILEY.SAMANTHA Digitally signed by DAILEY.SAMANTHAJ.1387567948

Digitally signed by

DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=DAILEY.SAMANTHA.J.1387567948 Date: 2019.03.22 11:27:23 -04'00'

Corps Regulatory Official: J.1387567948

Expiration Date: N/A Date: March 22, 2019

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 our Customer Satisfaction Survey, located online at http://corpsmapu.usace.army.mil/cm apex/f?p=136:4:0.

# NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Wildlands Engineering, Inc.	File Number: <b>SAW-2018-00432</b>	Date: March 22, 2019		
Attached is:		See Section below		
☐ INITIAL PROFFERED PERMIT (Standard	Permit or Letter of permission)	A		
PROFFERED PERMIT (Standard Permit or	PROFFERED PERMIT (Standard Permit or Letter of permission)			
☐ PERMIT DENIAL	С			
APPROVED JURISDICTIONAL DETERMINATION		D		
PRELIMINARY JURISDICTIONAL DETE	ERMINATION	Е		

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at <a href="http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx">http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx</a> or 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 division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

#### SAW-2018-00432 SASSARIXA SWAMP DMS SITE

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 - REO	HIEST FOR APPEAL	or OBJECTIONS TO	AN INITIAI	PROFFFRED	<b>PFRMIT</b>
SECTION II - KEU	OEST FOR AFFEAL	OLODJECHONS TO	ANIMITAL	PROFFERED	

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.

If you have questions regarding this decision and/or	If you only have questions regarding the appeal process you may also
the appeal process you may contact:	contact:
District Engineer, Wilmington Regulatory Division	Mr. Jason Steele, Administrative Appeal Review Officer
Raleigh Regulatory Field Office	CESAD-PDO
Attn: Samantha Dailey	U.S. Army Corps of Engineers, South Atlantic Division
3331 Heritage Trade Drive, Suite 105	60 Forsyth Street, Room 10M15
Wake Forest, North Carolina 27587	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.

consultants, to conduct investigations of the project site during the course of the appear process. Tou will be provided a 13 day					
notice of any site investigation, and will have the opportunity to participate in all site investigations.					
	Date:	Telephone number:			
Signature of appellant or agent.					

For appeals on Initial Proffered Permits send this form to:

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

District Engineer, Wilmington Regulatory Division, Attn: #PM\_FULLNAME#, 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

## **APPENDIX 2**

#### PRELIMINARY JURISDICTIONAL DETERMINATION FORM

#### **BACKGROUND INFORMATION**

A. REPORT COMPLETION DATE FOR PRELIMINARY JURISDICTIONAL DETERMINATION (JD): March 22, 2019

B. NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:

Requestor: Wildlands Engineering, Inc.

Mr. Charlie Neaves

Address: 312 West Millbrook

Raleigh, North Carolina 27609

C. DISTRICT OFFICE, FILE NAME, AND NUMBER: Wilmington, Sassarixa Swamp DMS Site, Wildlands Engineering, Inc., Johnston County, SAW-2018-00432

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:

(USE THE ATTACHED TABLE TO DOCUMENT MULTIPLE WATERBODIES AT DIFFERENT SITES)

State: NC County/parish/borough: Johnston County City: Smithfield

Center coordinates of site (lat/long in degree decimal format): Lat. 35.473294°N, Long. -78.437318° W.

Universal Transverse Mercator:

Name of nearest water body: Neuse River (8-digit HUC: 03020201)

#### E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLIES):

☑ Office (Desk) Determination. Date: March 22, 2019
 ☑ Field Determination. Date(s): February 28, 2019

- 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 preliminary JD (check all that apply): Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

$\boxtimes$	Maps, plans, plots or plat submitted by or on behalf of th	e PJD requestor: Wildlands Engineering, Inc. submitted a		
	sdictional Determination Request on December 3, 201			
$\boxtimes$	Data sheets prepared/submitted by or on behalf of the PJ	O requestor.		
	Office concurs with data sheets/delineation report.			
_	Office does not concur with data sheets/delineation re	port.		
	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.	1 AHZ NO E O L		
	U.S. Geological Survey map(s). Cite scale & quad name:			
	USDA Natural Resources Conservation Service Soil Sur			
	National wetlands inventory map(s). Cite name: <b>Corps</b>	of Engineers SimSuite – February 2018.		
H	State/Local wetland inventory map(s): .			
H	FEMA/FIRM maps: . 100-year Floodplain Elevation is: (National Geode	etic Vertical Datum of 1929)		
	Photographs: Aerial (Name & Date): .	the Vertical Datum of 1929)		
	or Other (Name & Date):			
	Previous determination(s). File no. and date of response	letter:		
H	Other information (please specify): .			
	(prompt speedly).			
IMPOR	TANT NOTE: The information recorded on this form	has not necessarily been verified by the Corps and should		
	lied upon for later jurisdictional determinations.	<del>-</del>		
DVILEA	'.SAMA Digitally signed by DAILEY.SAMANTHAJ.1387567948			
DAILLI	DAILEY.SAMANTHA.J.1387567948 DN: c=US, o=U.S. Government,			
NTHA	1.13875 ou=DoD, ou=PKI, ou=USA,			
	cn=DAILEY.SAMANTHA.J.1387567			
67948	948 Date: 2019.03.22 11:24:14 -04'00'			
Signatu	are and date of	Signature and date of		
	atory Project Manager	person requesting preliminary JD		
_	JIRED)	(REQUIRED, unless obtaining the signature is		
` `	•	Impracticable)		

<sup>1</sup> Districts may establish timeframes for requestor to return signed PJD forms. If the requestor 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.

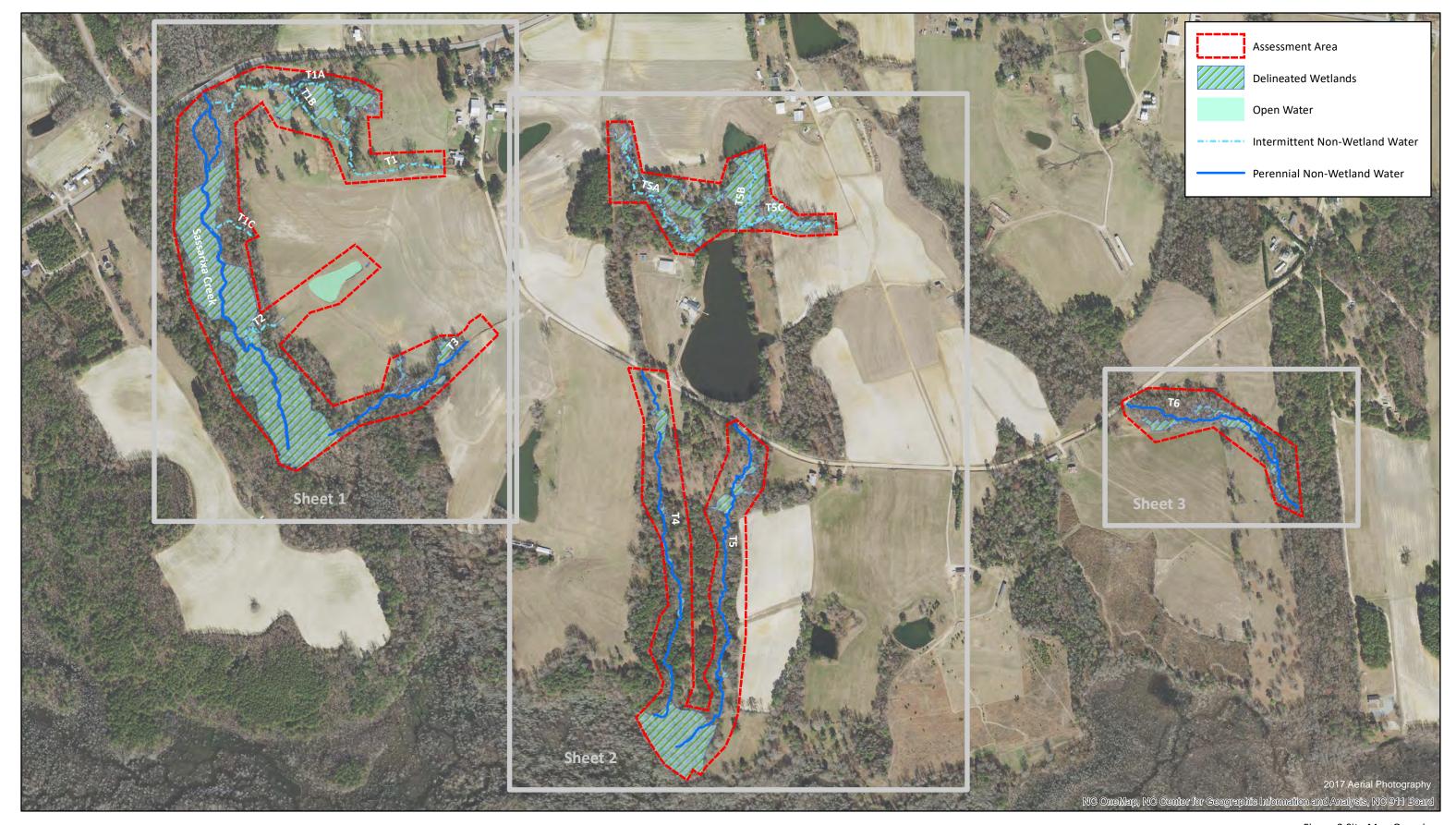
Table 1. Summary of On-Site Jurisdictional Waters

Feature	Latitude	Longitude	Cowardin Class	Estimated Amount of Aquatic Resource in Review Area	Class of Aquatic Resource
Sassarixa Creek	35.475377	-78.446255	Riverine-Unconsolidated Bottom	3142	Perennial Non-Wetland Waters of the US
T1	35.477619	-78.443646	Riverine-Streambed	1731	Intermittent Non-Wetland Waters of the US
T1A	35.478594	-78.444288	Riverine-Streambed	384	Intermittent Non-Wetland Waters of the US
T1B	35.478424	-78.444761	Riverine-Streambed	259	Intermittent Non-Wetland Waters of the US
T1C	35.476262	-78.44093	Riverine-Streambed	307	Intermittent Non-Wetland Waters of the US
T2	35.474431	-78.445631	Riverine-Streambed	354	Intermittent Non-Wetland Waters of the US
Т3	35.473283	-78.442523	Riverine-Unconsolidated Bottom	1190	Perennial Non-Wetland Waters of the US
T4	35.47037	-78.436943	Riverine-Unconsolidated Bottom	2319	Perennial Non-Wetland Waters of the US
T5	35.469702	-78.435939	Riverine-Unconsolidated Bottom	2606	Perennial Non-Wetland Waters of the US
T5A	35.476707	-78.437547	Riverine-Streambed	956	Intermittent Non-Wetland Waters of the US
T5B	35.47674	-78.435242	Riverine-Streambed	553	Intermittent Non-Wetland Waters of the US
T5C	35.476133	-78.43458	Riverine-Streambed	706	Intermittent Non-Wetland Waters of the US
T6	35.472774	-78.425131	Riverine-Unconsolidated Bottom	1750	Perennial Non-Wetland Waters of the US

Feature	Latitude	Longitude	Cowardin Class	Estimated Amount of Aquatic Resource in Review Area	Class of Aquatic Resource
Wetland A	35.477202	-78.442021	Palustrine-Emergent	0.018	Non-Section 10 Wetland
Wetland C	35.477833	-78.443679	Palustrine-Emergent	0.066	Non-Section 10 Wetland
Wetland D	35.478356	-78.444258	Palustrine-Emergent	0.710	Non-Section 10 Wetland
Wetland E	35.478495	-78.443599	Palustrine-Forested	0.476	Non-Section 10 Wetland
Wetland F	35.478670	-78.444729	Palustrine-Emergent	0.030	Non-Section 10 Wetland
Wetland G	35.478095	-78.444905	Palustrine-Emergent	0.348	Non-Section 10 Wetland
Wetland H	35.445762	-79.445763	Palustrine-Forested	11.074	Non-Section 10 Wetland
Wetland I	35.471473	-78.424226	Palustrine-Forested	0.049	Non-Section 10 Wetland
Wetland J	35.472610	-78.424949	Palustrine-Forested	0.331	Non-Section 10 Wetland
Wetland K	35.472610	-78.424949	Palustrine-Forested	0.234	Non-Section 10 Wetland
Wetland L	35.472717	-78.426815	Palustrine-Forested	0.237	Non-Section 10 Wetland
Wetland M	35.472836	-78.437100	Palustrine-Emergent	0.285	Non-Section 10 Wetland
Wetland N	35.471325	-78.437110	Palustrine-Forested	0.031	Non-Section 10 Wetland
Wetland O	35.470409	-78.436950	Palustrine-Forested	0.023	Non-Section 10 Wetland

Feature	Latitude	Longitude	Cowardin Class	Estimated Amount of Aquatic Resource in Review Area	Class of Aquatic Resource
Wetland P	35.470409	-78.436950	Palustrine-Forested	0.057	Non-Section 10 Wetland
Wetland Q	35.468516	-78.436989	Palustrine-Forested	0.014	Non-Section 10 Wetland
Wetland R	35.468496	-78.435843	Palustrine-Forested	0.035	Non-Section 10 Wetland
Wetland S	35.468496	-78.435843	Palustrine-Forested	0.450	Non-Section 10 Wetland
Wetland T	35.468496	-78.435843	Palustrine-Forested	0.009	Non-Section 10 Wetland
Wetland U	35.468496	-78.435843	Palustrine-Forested	0.133	Non-Section 10 Wetland
Wetland V	35.473363	-78.442656	Palustrine-Forested	0.133	Non-Section 10 Wetland
Wetland W	35.473321	-78.442267	Palustrine-Forested	0.139	Non-Section 10 Wetland
Wetland X	35.473321	-78.442267	Palustrine-Forested	0.035	Non-Section 10 Wetland
Wetland Y	35.471325	-78.437110	Palustrine-Forested	0.200	Non-Section 10 Wetland
Wetland Z	35.476783	-78.437307	Palustrine-Forested	1.187	Non-Section 10 Wetland
Wetland AA	35.476783	-78.437307	Palustrine-Forested	0.031	Non-Section 10 Wetland
Wetland BB	35.476783	-78.437307	Palustrine-Forested	0.043	Non-Section 10 Wetland
Wetland CC	35.477589	-78.437893	Palustrine-Forested	0.191	Non-Section 10 Wetland

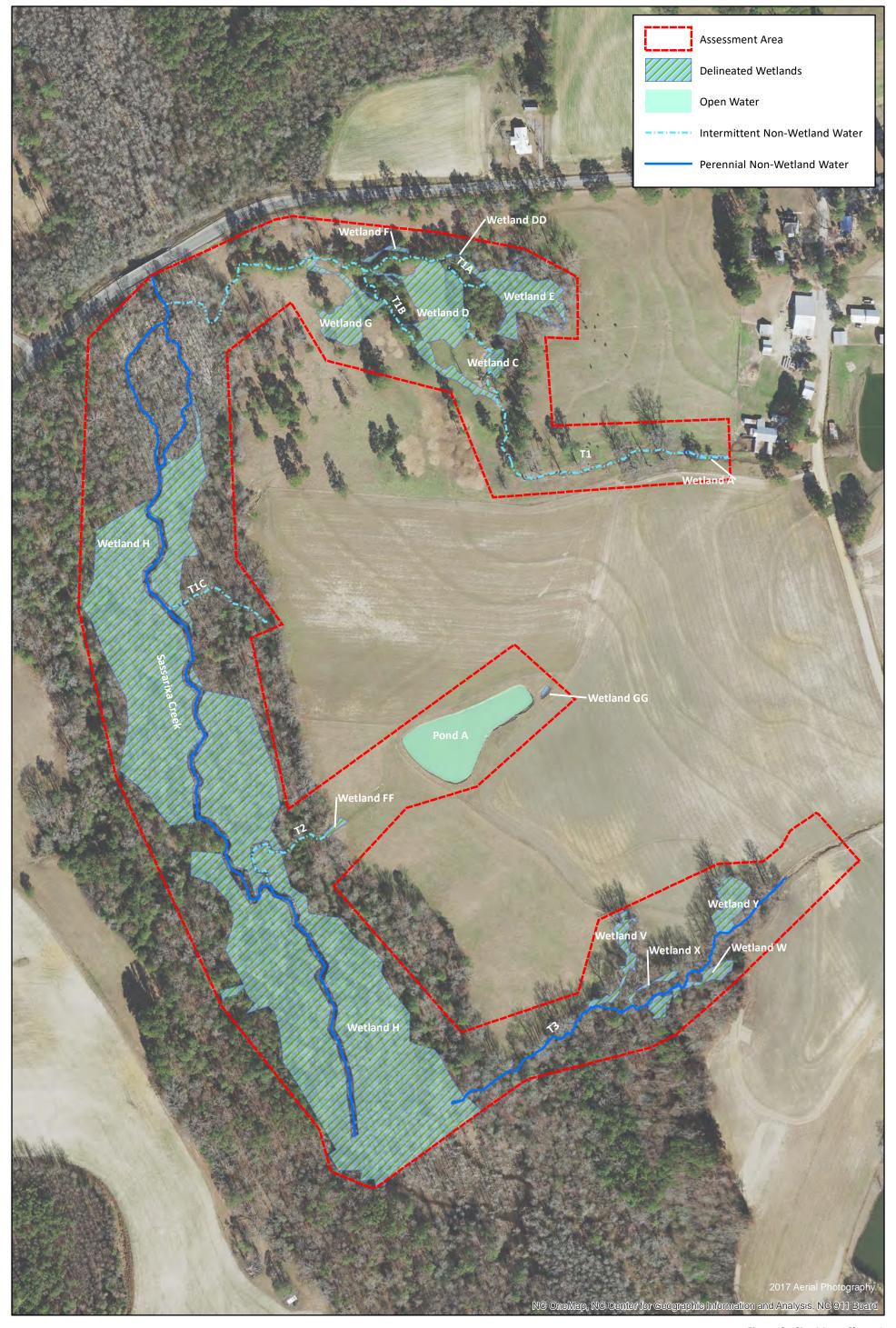
Feature	Latitude	Longitude	Cowardin Class	Estimated Amount of Aquatic Resource in Review Area	Class of Aquatic Resource
Wetland DD	35.478616	-78.443947	Palustrine-Forested	0.003	Non-Section 10 Wetland
Wetland FF	35.474567	-78.445068	Palustrine-Emergent	0.022	Non-Section 10 Wetland
Wetland GG	35.475520	-78.443236	Palustrine-Emergent	0.005	Non-Section 10 Wetland
Wetland HH	35.476782	-78.435273	Palustrine-Forested	2.391	Non-Section 10 Wetland
Wetland II	35.467781	-78.436896	Palustrine-Forested	3.091	Non-Section 10 Wetland
Pond A	35.475248	-78.443940	Lacustrine-Limnetic	0.862	Non-Section 10 Wetland





0 275 550 Feet

Figure 3 Site Map Overview Sassarixa Swamp Mitigation Site Neuse River Basin (03020201)





0 112.5 225 Feet

Figure 3a Site Map - Sheet 1 Sassarixa Swamp Mitigation Site Neuse River Basin (03020201)





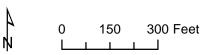


Figure 3b Site Map - Sheet 2 Sassarixa Swamp Mitigation Site Neuse River Basin (03020201)





Sassarixa Swamp Mitigation Site
Neuse River Basin (03020201)

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Four Oaks/Johnston Sampling Date: 5/29/18
Applicant/Owner: Wildlands Engineering Inc.	State: NC Sampling Point: Wetland A- DP 1
Investigator(s): C. Neaves	Section, Township, Range:
Landform (hillslope, terrace, etc.): Floodplain	Local relief (concave, convex, none): CONCAVE Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35	5.477162 Long: W 78.441764 Datum:
Soil Map Unit Name: Cowart sandy loam (Cob)	NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of y	rear? Yes ✓ No (If no, explain in Remarks.)
Are Vegetation Soil or Hydrology significantly	y disturbed? Are "Normal Circumstances" present? Yes ✓ No
	roblematic? (If needed, explain any answers in Remarks.)
SUMMARY OF FINDINGS – Attach site map showing	g sampling point locations, transects, important features, etc.
Hydrophytic Vegetation Present? Yes ✓ No	Is the Sampled Area
Hydric Soil Present? Yes ✓ No	within a Wetland?
Wetland Hydrology Present? Yes No Remarks:	
Remarks.	
HYDROLOGY	
Wetland Hydrology Indicators:	Secondary Indicators (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)	Surface Soil Cracks (B6)
Surface Water (A1)  Aquatic Fauna (B	
High Water Table (A2)  Marl Deposits (B1	<u> </u>
Saturation (A3) Hydrogen Sulfide	<b>=</b>
	heres along Living Roots (C3) Dry-Season Water Table (C2)
Sediment Deposits (B2)  Presence of Redu	
	ction in Tilled Soils (C6) Saturation Visible on Aerial Imagery (C9)
Algal Mat or Crust (B4) Thin Muck Surface    Iron Deposits (B5) Other (Explain in F	
Iron Deposits (B5) Other (Explain in I	Remarks) Shallow Aquitard (D3)  FAC-Neutral Test (D5)
Water-Stained Leaves (B9)	Sphagnum moss (D8) (LRR T, U)
Field Observations:	Spines (25, (2.11.), 2,
Surface Water Present? Yes ✓ No Depth (inches	s): <u>0</u>
Water Table Present? Yes  No Depth (inches	
Saturation Present? Yes Vo Depth (inches	s): 0 Wetland Hydrology Present? Yes V No
(includes capillary fringe)  Describe Recorded Data (stream gauge, monitoring well, aerial photographics)	tos. previous inspections), if available:
	, ,
Remarks:	
Bench along stream channel.	

nes of pla	ants.		Sampling Point: Wetland A - DP
			Dominance Test worksheet:
			Number of Dominant Species That Are OBL, FACW, or FAC:  1 (A)
			Total Number of Dominant
			Species Across All Strata: 1 (B)
			Percent of Dominant Species
			That Are OBL, FACW, or FAC: 100 (A/B)
			Prevalence Index worksheet:
			Total % Cover of: Multiply by:
20% of	total cover	:	OBL species x 1 =
			FACW species x 2 =
			FAC species x 3 =
			FACU species x 4 =
			UPL species x 5 =
			Column Totals: (A) (B)
			(5)
			Prevalence Index = B/A =
			Hydrophytic Vegetation Indicators:
20% of	total cover	:	1 - Rapid Test for Hydrophytic Vegetation
			2 - Dominance Test is >50%
			3 - Prevalence Index is ≤3.0 <sup>1</sup>
			Problematic Hydrophytic Vegetation¹ (Explain)
			<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
			Definitions of Five Vegetation Strata:
			Tree – Woody plants, excluding woody vines,
20 % 01	total cover		approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
70	Yes	FACW	Carling 10/a decade and a sector discovered to the
10	No	OBL	Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less
5			than 3 in. (7.6 cm) DBH.
			Shrub – Woody plants, excluding woody vines,
			approximately 3 to 20 ft (1 to 6 m) in height.
			Herb – All herbaceous (non-woody) plants, including
			herbaceous vines, regardless of size, and woody
			plants, except woody vines, less than approximately 3 ft (1 m) in height.
			Woody vine – All woody vines, regardless of height.
85	= Total Cov	/er	
20% of	total cover	17	
			Hydrophytic
	- Total Cas		Vegetation
:	- Total Cov		
: 20% of			Present? Yes ✓ No No
	Absolute % Cover	% Cover Species?  ———————————————————————————————————	Absolute % Cover Species? Status  = Total Cover  = 20% of total cover:  TO Yes FACW  10 No OBL  5 No FACU   85 = Total Cover  = 20% of total cover:  17

Sampling Point: Wetland A - DP 1

SOIL

Profile Desc	ription: (Describe	to the dep	th needed to docur	nent the	indicator	or confirm	n the absence of ind	licators.)
Depth	<u>Matrix</u>			x Featur			<b>-</b> .	
(inches)	Color (moist)		Color (moist) 10 YR 6/6		Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
0-3	10 YR 6/2	90		10	<u> C                                   </u>	. <u>PL</u>	<u>s</u>	
3-12+	2.5 YR 4/1	95	7.5 YR 5/6	5	<u>C</u>	<u>PL</u>	SL	
					_			
<sup>1</sup> Tyne: C=C	oncentration D=De	nletion RM:	=Reduced Matrix, M	S=Maske	d Sand Gr	ains	<sup>2</sup> Location: PL=P	Pore Lining, M=Matrix.
			LRRs, unless othe					roblematic Hydric Soils <sup>3</sup> :
Histosol	(A1)		Polyvalue Be	low Surf	ace (S8) <b>(</b> I	LRR S, T, I	<b>U)</b> 1 cm Muck (/	A9) <b>(LRR O)</b>
	oipedon (A2)		Thin Dark Su				I I	A10) (LRR S)
Black Hi	, ,		Loamy Muck	-		₹ 0)		rtic (F18) (outside MLRA 150A,B)
	en Sulfide (A4)		Loamy Gleye		(F2)			podplain Soils (F19) (LRR P, S, T)
l r	d Layers (A5) Bodies (A6) <b>(LRR I</b>	> T II)	✓ Depleted Ma Redox Dark		F6)		(MLRA 15	Bright Loamy Soils (F20)
11 1 -	icky Mineral (A7) <b>(L</b>						`	Material (TF2)
	esence (A8) (LRR I		Redox Depre				1 1	/ Dark Surface (TF12)
	ıck (A9) (LRR P, T)		Marl (F10) <b>(L</b>	,			Other (Expla	in in Remarks)
	d Below Dark Surfac	ce (A11)	Depleted Oc				31 P 4	
	ark Surface (A12) rairie Redox (A16) <b>(</b>	MIRA 1504	Iron-Mangan  (A) Umbric Surfa				•	of hydrophytic vegetation and ydrology must be present,
	lucky Mineral (S1) (		Delta Ochric					sturbed or problematic.
	Gleyed Matrix (S4)	, ,	Reduced Ver	. , .	,			·
	Redox (S5)		Piedmont Flo					
	Matrix (S6)		Anomalous E	Bright Loa	amy Soils	(F20) <b>(MLF</b>	RA 149A, 153C, 153D	D)
	rface (S7) (LRR P, Layer (if observed)							
	Layer (II observed)							
Depth (in							Hydric Soil Prese	ent? Yes ✓ No
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Four Oaks/Johnston Sampling Date: 5/29/18
Applicant/Owner: Wildlands Engineering Inc.	State: NC Sampling Point: Wetland B - DP 2
Investigator(s): C. Neaves	Section, Township, Range:
Landform (hillslope, terrace, etc.): Floodplain	Local relief (concave, convex, none): CONCAVE Slope (%): <1%
Subregion (LRR or MLRA): MLRA 133A Lat: N 3	35.477172 Long: W 78.442475 Datum:
Soil Map Unit Name: Cowart sandy loam (CoB)	NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time o	
	ntly disturbed? Are "Normal Circumstances" present? Yes No ✓
	problematic? (If needed, explain any answers in Remarks.)
	ing sampling point locations, transects, important features, etc.
Command of Findings - Attach site map show	
Hydrophytic Vegetation Present? Yes No	Is the Sampled Area
Hydric Soil Present? Yes ✓ No	within a Wetland? Yes Vo
Wetland Hydrology Present? Yes No	
Remarks:	
Man-made depression adjacent to stream channel.	
HYDROLOGY	
Wetland Hydrology Indicators:	Secondary Indicators (minimum of two required)
Primary Indicators (minimum of one is required; check all that app	
✓ Surface Water (A1) Aquatic Fauna	
✓ High Water Table (A2)     Marl Deposits (I	B15) (LRR U) Drainage Patterns (B10)
✓ Saturation (A3) Hydrogen Sulfice	de Odor (C1) Moss Trim Lines (B16)
Water Marks (B1) Oxidized Rhizos	spheres along Living Roots (C3)Dry-Season Water Table (C2)
Sediment Deposits (B2)  Presence of Re	duced Iron (C4) Crayfish Burrows (C8)
	duction in Tilled Soils (C6) Saturation Visible on Aerial Imagery (C9)
Algal Mat or Crust (B4) Thin Muck Surfa	
Iron Deposits (B5) Other (Explain i	
Inundation Visible on Aerial Imagery (B7) Water-Stained Leaves (B9)	FAC-Neutral Test (D5) Sphagnum moss (D8) (LRR T, U)
Field Observations:	Spriagrium moss (Do) (ERR 1, U)
Surface Water Present? Yes ✓ No Depth (incl	nes): 0
Water Table Present? Yes ✓ No Depth (incl	
Saturation Present? Yes ✓ No Depth (incl	
(includes capillary fringe)	
Describe Recorded Data (stream gauge, monitoring well, aerial pl	notos, previous inspections), if available:
Remarks:	

201	Absolute Dominant Indicator	Dominance Test worksheet:
Tree Stratum (Plot size: 30'	<u> % Cover Species? Status</u>	Number of Dominant Species
1	- —— —— ——	That Are OBL, FACW, or FAC: (A)
2		Total Number of Deminent
3		Total Number of Dominant Species Across All Strata: (B)
4.		
		Percent of Dominant Species
5		That Are OBL, FACW, or FAC: (A/B)
6		Prevalence Index worksheet:
	= Total Cover	Total % Cover of: Multiply by:
50% of total cover:	20% of total cover:	
Sapling Stratum (Plot size: 15')		OBL species x 1 =
1.		FACW species x 2 =
2.		FAC species x 3 =
		FACU species x 4 =
3		UPL species x 5 =
4		Column Totals: (A) (B)
5		Column rotals (A) (B)
6	. —— ——	Prevalence Index = B/A =
	= Total Cover	Hydrophytic Vegetation Indicators:
50% of total cover:	20% of total cover:	1 - Rapid Test for Hydrophytic Vegetation
Shrub Stratum (Plot size: 15'		2 - Dominance Test is >50%
		<del>                                   </del>
1		3 - Prevalence Index is ≤3.0 <sup>1</sup>
2		Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
3		
4		<sup>1</sup> Indicators of hydric soil and wetland hydrology must
5		be present, unless disturbed or problematic.
6		Definitions of Five Vegetation Strata:
	= Total Cover	
50% of total agreer	20% of total cover:	Tree – Woody plants, excluding woody vines,
	20 % Of total cover.	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Herb Stratum (Plot size: 5' )		(1.5 only or larger in diameter at broadt neight (BBH).
1		Sapling – Woody plants, excluding woody vines,
2		approximately 20 ft (6 m) or more in height and less
3		than 3 in. (7.6 cm) DBH.
4.		Shrub – Woody plants, excluding woody vines,
5.		approximately 3 to 20 ft (1 to 6 m) in height.
		Harb All barbassaus (non woody) plants, including
6	- — — — — —	Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody
7		plants, except woody vines, less than approximately
8		3 ft (1 m) in height.
9		Woody vine – All woody vines, regardless of height.
10		**************************************
11.		
	= Total Cover	
50% of total cover:	20% of total cover:	
Woody Vine Stratum (Plot size: 30' )		
1		
2		
3		
4		
5.		Hydrophytic
	= Total Cover	Vegetation
500% of total anyon	20% of total cover:	Present? Yes No No
Remarks: (If observed, list morphological adaptations bel	OW).	
No constation and sout		
No vegetation present		

Sampling Point: Wetland B - DP 2

Sampling Point: Wetland B - DP 2

epth	Matrix			ox Featur	es		m the absence of	ŕ
nches)	Color (moist)	%	Color (moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
-4	10YR 5/1	70	10YR 7/6	30	<u>C</u>	M	SL	
-12+	2.5YR 4/1	75	5YR 4/6	25	С	PL	L _	
				_				
						-		
				_				
			— De duce d Metrice B				21	L-Dave Lining M-M-Makele
		·	=Reduced Matrix, M LRRs, unless othe			rains.		L=Pore Lining, M=Matrix. r Problematic Hydric Soils <sup>3</sup> :
Histosol		ioabio to aii	Polyvalue B			LRR S. T.		ck (A9) (LRR O)
_	pipedon (A2)		Thin Dark S					ck (A10) (LRR S)
	istic (A3)		Loamy Muc	-		R O)	1 1	Vertic (F18) (outside MLRA 150)
	en Sulfide (A4)		Loamy Gley		(F2)			t Floodplain Soils (F19) <b>(LRR P, S</b>
7'	d Layers (A5) Bodies (A6) <b>(LRR</b>	P T II)	✓ Depleted M Redox Dark		F6)		Anomalo	us Bright Loamy Soils (F20)
	ıcky Mineral (A7) (			,	. ,			ent Material (TF2)
Muck Pr	esence (A8) (LRR	U)	Redox Depr					llow Dark Surface (TF12)
	ıck (A9) <b>(LRR P, T</b>		Marl (F10) (				Other (E)	rplain in Remarks)
	d Below Dark Surfa	ace (A11)	Depleted O				) <b>T</b> ) 31m dia a t	
7	ark Surface (A12) rairie Redox (A16)	(MLRA 150	Iron-Manga  A) Umbric Surf					ors of hydrophytic vegetation and nd hydrology must be present,
-	lucky Mineral (S1)		Delta Ochrid	, ,				s disturbed or problematic.
7	Gleyed Matrix (S4)		Reduced Ve	ertic (F18)	(MLRA 1	50A, 150B	3)	•
	Redox (S5)		Piedmont F					
<b>-</b>	l Matrix (S6) rface (S7) <b>(LRR P</b>	C T II)	Anomalous	Bright Loa	amy Soils	(F20) (ML)	RA 149A, 153C, 1	53D)
	Layer (if observed							
Туре:		•						
	ches):		<u> </u>				Hydric Soil Pr	resent? Yes No
marks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Fou	r Oaks/Johnston	Sampling Date: <u>5/29/18</u>
Applicant/Owner: Wildlands Engineering Inc.		State: NC	Sampling Point: Wetland C - DP 3
Investigator(s): C. Neaves	Section, Township	o, Range:	
Landform (hillslope, terrace, etc.): Floodplain	Local relief (conca	ve, convex, none): concave	Slope (%): <1%
Subregion (LRR or MLRA): MLRA 133A Lat: N 35	.477835	Long: W 78.443692	Datum:
Soil Map Unit Name: Cowart Sandy Loam (CoB)		NWI classifica	ation: N/A
Are climatic / hydrologic conditions on the site typical for this time of ye	ear? Yes ✓ N	No (If no, explain in Re	emarks.)
Are Vegetation Soil or Hydrology significantly	y disturbed?	Are "Normal Circumstances" pi	resent? Yes No ✓
Are Vegetation Soil or Hydrology naturally pr	oblematic?	(If needed, explain any answer	s in Remarks.)
SUMMARY OF FINDINGS – Attach site map showing	g sampling poi	nt locations, transects,	important features, etc.
Hydrophytic Vegetation Present? Yes ✓ No	1		
Hydric Soil Present? Yes ✓ No	Is the Sam		¬ ┌──
Wetland Hydrology Present? Yes / No	within a W	etland? Yes	No
Remarks:	,		
Man-made impoundment of stream. Dam has breach	ed.		
HYDROLOGY			
Wetland Hydrology Indicators:		Secondary Indicat	tors (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)	)	Surface Soil (	
✓ Surface Water (A1) Aquatic Fauna (B1			etated Concave Surface (B8)
✓ High Water Table (A2)       Marl Deposits (B15)	,	Drainage Patt	· · ·
Saturation (A3) Hydrogen Sulfide	Odor (C1)	Moss Trim Lir	nes (B16)
Water Marks (B1)	heres along Living R	Roots (C3) Dry-Season V	Vater Table (C2)
Sediment Deposits (B2)  Presence of Redu	` '	Crayfish Burro	` ′
	ction in Tilled Soils (	· · ·	sible on Aerial Imagery (C9)
Algal Mat or Crust (B4)  Thin Muck Surface  Iron Deposits (B5)  Other (Explain in F	, ,	Geomorphic F	, ,
Iron Deposits (B5) Other (Explain in F Inundation Visible on Aerial Imagery (B7)	temarks)	Shallow Aquit	` '
Water-Stained Leaves (B9)			oss (D8) (LRR T, U)
Field Observations:			
Surface Water Present? Yes ✓ No Depth (inches	s): <u>0</u>		
Water Table Present? Yes ✓ No Depth (inches	s): <u>0</u>		
Saturation Present? Yes V No Depth (inches	s): <u>0</u>	Wetland Hydrology Present	t? Yes <u>√</u> No
(includes capillary fringe)  Describe Recorded Data (stream gauge, monitoring well, aerial phot	os, previous inspec	tions), if available:	
		,	
Remarks:			

201	Absolute	Dominani	Indicator	Dominance Test worksheet:
Tree Stratum (Plot size: 30'	% Cover	Species'	? <u>Status</u>	Number of Dominant Species
1				That Are OBL, FACW, or FAC: 1 (A)
2				
				Total Number of Dominant
3				Species Across All Strata: (B)
4				Percent of Dominant Species
5				That Are OBL, FACW, or FAC: 100 (A/B)
6				
		= Total Co	ver	Prevalence Index worksheet:
50% of total cover:				Total % Cover of: Multiply by:
30% of total cover	20% 0	total cove	ı. <u> </u>	OBL species x 1 =
Sapling Stratum (Plot size: 15'				FACW species x 2 =
1				
2				FAC species x 3 =
3				FACU species x 4 =
				UPL species x 5 =
4				Column Totals: (A) (B)
5				(-/
6				Prevalence Index = B/A =
		= Total Co	ver	Hydrophytic Vegetation Indicators:
50% of total cover:				
151		5000		1 - Rapid Test for Hydrophytic Vegetation
				2 - Dominance Test is >50%
1				3 - Prevalence Index is ≤3.0 <sup>1</sup>
2				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
3				
4				1-4:-444444444
				<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
5				
6				Definitions of Five Vegetation Strata:
		= Total Co	ver	Tree – Woody plants, excluding woody vines,
50% of total cover:	20% of	f total cove	r:	
50% of total cover:	20% of	f total cove	r:	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Herb Stratum (Plot size: 5'				approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Herb Stratum (Plot size: 5' ) 1.Persicaria Lapathifolium	50	Yes	FACW	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines,
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus	50 10	Yes No	FACW FAC	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less
Herb Stratum (Plot size: 5' ) 1.Persicaria Lapathifolium	50	Yes	FACW	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines,
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus	50 10 5	Yes No No	FACW FAC	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4.	50 10 5	Yes No No	FACW FAC	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5	Yes No No	FACW FAC	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5	Yes No No	FACW FAC	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5	Yes No No	FACW FACOBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5	Yes No No	FACW FACOBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5	Yes No No	FACW FACOBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Herb Stratum (Plot size: 5'  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4.  5.  6.  7.  8.  9.	50 10 5	Yes No No	FACW FACOBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5	Yes No No	FACW FACOBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4.	50 10 5	Yes No No	FACW FAC OBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5	Yes No No	FACW FAC OBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5 	Yes No No	FACW OBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5 	Yes No No Total Co	FACW OBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Herb Stratum (Plot size: 5')  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5 	Yes No No  = Total Coef total cove	FACW OBL OBL OWNER	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5 	Yes No No  = Total Co f total cove	FACW FAC OBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Herb Stratum (Plot size: 5')  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5 	Yes No No  = Total Co f total cove	FACW FAC OBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Herb Stratum (Plot size: 5' )  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5 	Yes No No  Total Cove	FACWOBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Herb Stratum (Plot size: 5'  1.Persicaria Lapathifolium  2. Ranunculus bulbosus  3. Juncus effusus  4	50 10 5 ————————————————————————————————	Yes No No  Total Cof total cove	FACWOBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Herb Stratum (Plot size: 5'   1.   Persicaria Lapathifolium   2.   Ranunculus bulbosus   3.   Juncus effusus   4.     5.	50 10 5 ————————————————————————————————	Yes No No  Total Cof total cove	FACWOBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.  Woody vine – All woody vines, regardless of height.
Herb Stratum (Plot size: 5'	50 10 5 ————————————————————————————————	Yes No No Total Cove	FACW FAC OBL	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.  Woody vine – All woody vines, regardless of height.
Herb Stratum (Plot size: 5'	50 10 5 	Yes No No Total Cove	FACW FAC OBL  THE STATE OF THE	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.  Woody vine – All woody vines, regardless of height.
Herb Stratum (Plot size: 5'   1.   Persicaria Lapathifolium   2.   Ranunculus bulbosus   3.   Juncus effusus   4.     5.	50 10 5 	Yes No No Total Cove	FACW FAC OBL  THE STATE OF THE	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.  Woody vine – All woody vines, regardless of height.  Hydrophytic Vegetation
Herb Stratum (Plot size: 5'	50 10 5 	Yes No No Total Cove	FACW FAC OBL  THE STATE OF THE	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.  Woody vine – All woody vines, regardless of height.  Hydrophytic Vegetation
Herb Stratum (Plot size: 5'	50 10 5 	Yes No No Total Cove	FACW FAC OBL  THE STATE OF THE	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).  Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.  Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.  Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.  Woody vine – All woody vines, regardless of height.  Hydrophytic Vegetation

Sampling Point: Wetland C - DP 3

SOIL Sampling Point: Wetland C - DP 3

Profile Desc	cription: (Describe	to the depth	needed to docur	nent the i	indicator	or confirm	n the absence of	findicators.)
Depth	<u>Matrix</u>			x Feature		. 2	<b>-</b> .	
(inches)	Color (moist)	<u>%</u> _	Color (moist) 10 YR 6/3	<u>%</u>	Type	Loc <sup>2</sup>	Texture	Remarks
0-12	10YR 4/1	70	10 11 0/3	30	<u>C</u>	<u>M</u>	LS	
Type: C=C	oncentration, D=Dep	letion RM=R	Peduced Matrix MS	. ———— S=Masker	Sand Gr	ains	<sup>2</sup> Location: P	L=Pore Lining, M=Matrix.
	Indicators: (Applic					u		or Problematic Hydric Soils <sup>3</sup> :
Histosol	(A1)		Polyvalue Be	low Surfa	ce (S8) <b>(I</b>	RR S, T, U	ر <b>ا</b> ) 🔲 1 cm Mu	ck (A9) <b>(LRR O)</b>
	pipedon (A2)		Thin Dark Su				I r	ck (A10) <b>(LRR S)</b>
11	istic (A3)		Loamy Muck			R O)	1 1	Vertic (F18) (outside MLRA 150A,B)
	en Sulfide (A4) d Layers (A5)		Loamy Gleye Depleted Mai		F2)			t Floodplain Soils (F19) <b>(LRR P, S, T)</b> us Bright Loamy Soils (F20)
	Bodies (A6) (LRR P	, T, U)	Redox Dark	. ,	-6)		(MLRA	
5 cm Mu	icky Mineral (A7) <b>(LF</b>	RR P, T, U)	Depleted Dar	k Surface	(F7)		Red Pare	ent Material (TF2)
17 1	resence (A8) (LRR U	)	Redox Depre		8)			allow Dark Surface (TF12)
	ıck (A9) <b>(LRR P, T)</b> d Below Dark Surfac	o (A11)	Marl (F10) (L	-	/MIDA4	E4\	Other (E	xplain in Remarks)
II .	ark Surface (A12)	e (ATT)	Iron-Mangan		•	•	T) <sup>3</sup> Indicat	ors of hydrophytic vegetation and
	rairie Redox (A16) (N	/ILRA 150A)						nd hydrology must be present,
	/lucky Mineral (S1) <b>(l</b>	RR O, S)	Delta Ochric		,			s disturbed or problematic.
	Gleyed Matrix (S4)		Reduced Ver					
19 1	Redox (S5) I Matrix (S6)		Piedmont Flo				гэд) RA 149A, 153C, 1	53D)
	rface (S7) (LRR P, S	S, T, U)		J	,	, (	, ·	,
Restrictive	Layer (if observed):							
Туре:			_					
	ches):		<u> </u>				Hydric Soil P	resent? Yes 🗸 No
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Four Oaks/	<u>Johnston</u>	Sampling Date: <u>5/29/18</u>
Applicant/Owner: Wildlands Engineering Inc.		_ State: NC	Sampling Point: Wetland D/DD/EE - DP 4
Investigator(s): C. Neaves	Section, Township, Range:		
Landform (hillslope, terrace, etc.): Floodplain	Local relief (concave, conve	ex, none): none	Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35.	478304 Long:	W 78.444135	Datum:
Soil Map Unit Name: Bibb sandy loam (Bb)		NWI classifica	ation: N/A
Are climatic / hydrologic conditions on the site typical for this time of ye	ear? Yes ✓ No	(If no, explain in Re	emarks.)
Are Vegetation Soil or Hydrology significantly	disturbed? Are "Norn	nal Circumstances" p	resent? Yes 🗸 No
Are Vegetation Soil or Hydrology naturally pro	oblematic? (If needed	d, explain any answer	rs in Remarks.)
SUMMARY OF FINDINGS – Attach site map showing	sampling point locat	tions, transects,	, important features, etc.
Hydrophytic Vegetation Present?  Hydric Soil Present?  Wes ✓ No  Yes ✓ No  Wesland Hydrology Present?  Yes ✓ No	Is the Sampled Area within a Wetland?	a Yes ✓	No
Remarks:			
HYDROLOGY			
Wetland Hydrology Indicators:		Secondary Indicat	tors (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)		Surface Soil (	Cracks (B6)
Surface Water (A1)  Aquatic Fauna (B1	•		jetated Concave Surface (B8)
✓ High Water Table (A2)      Marl Deposits (B15)      ✓ High Water Table (A2)		Drainage Pat	
✓ Saturation (A3) Hydrogen Sulfide (		Moss Trim Lir	
Water Marks (B1)	eres along Living Roots (C3)  ced Iron (C4)	Crayfish Burn	Water Table (C2)
	tion in Tilled Soils (C6)		sible on Aerial Imagery (C9)
Algal Mat or Crust (B4)  Thin Muck Surface	, ,	Geomorphic I	
Iron Deposits (B5) Other (Explain in R	, ,	Shallow Aquit	, ,
Inundation Visible on Aerial Imagery (B7)		FAC-Neutral	Test (D5)
Water-Stained Leaves (B9)		Sphagnum m	noss (D8) <b>(LRR T, U)</b>
Field Observations:	^		
Surface Water Present? Yes No Depth (inches	·		
Water Table Present? Yes ✓ No Depth (inches			
Saturation Present? Yes No Depth (inches (includes capillary fringe)	): U Wetland	d Hydrology Present	t? Yes No
Describe Recorded Data (stream gauge, monitoring well, aerial photo	os, previous inspections), if a	vailable:	
Remarks:			

VEGETATION	(Five Strata) -	Use scientific	names of plants.
VECEIAIIOI	u ive ouatar –		Hallics of Dialics

	Alice International In	Sampling Point: Wetland D/DD/EE-DP
<u> Free Stratum</u> (Plot size: <u>30'</u> )	Absolute Dominant In % Cover Species?	Status
		Number of Dominant Species That Are OBL, FACW, or FAC:  (A)
		gposico / isi osc / iii osi ata.
		Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)
·		That Are OBL, FACW, or FAC: 100 (A/B)
•	= Total Cover	Prevalence Index worksheet:
50% of total cover:	20% of total cover: _	Total % Cover of: Multiply by:
Sapling Stratum (Plot size: 15' )	20 70 01 total 00 01: _	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 =
	= Total Cover	nyuropriyuc vegetation mulcators.
	20% of total cover: _	1 - Rapid Test for Hydrophytic Vegetation
Shrub Stratum (Plot size: 15' )		2 - Dominance Test is >50%
•		3 - Prevalence Index is ≤3.0 <sup>1</sup>
i		
l		
j		be present, unless disturbed or problematic.
S		Definitions of Five Vegetation Strata:
	= Total Cover	Tree – Woody plants, excluding woody vines,
50% of total cover:	20% of total cover: _	approximately 20 ft (6 m) or more in height and 3 in.
<u>lerb Stratum</u> (Plot size: <u>5'</u> )		(7.6 cm) or larger in diameter at breast height (DBH).
Persicaria lapathifolium	65 FACW \	Sapiing – woody plants, excluding woody vines,
Ranunculus bulbosus	15FACN	
Juncus effusus	<u>5 OBL N</u>	than 3 in. (7.6 cm) DBH.
·		Shrub – Woody plants, excluding woody vines,
i		approximately 3 to 20 ft (1 to 6 m) in height.
i		Herb – All herbaceous (non-woody) plants, including
·		herbaceous vines, regardless of size, <u>and</u> woody
		plants, except woody vines, less than approximately  3 ft (1 m) in height.
0		Woody vine – All woody vines, regardless of height.
1		
	85 = Total Cover	
50% of total cover: 42.5	20% of total cover: _1	
Voody Vine Stratum (Plot size: 30' )		
/ Tot olds.		
•		
i		——— Hydrophytic Vegetation
	= Total Cover	Present? Yes V No
50% of total cover:	200/ -51-1-1	Flescitt: Test V   Not

S

	Wetland D/DD/EE - DP 4
OIL	Sampling Point:

Profile Desc Depth	ription: (Descrit: Matrix		th needed to docu Red	ment the ox Feature		r or confirr	n the absence o	of indicators.)
(inches)	Color (moist)	%	Color (moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
0-8	2.5Y 4/1	85	5YR 4/6	15	С	PL	SiL	
8-12+	2.5Y 4/1	60	7.5YR 6/6	40	С	М	SL	
							·	
							· ·	
<sup>1</sup> Type: C=C	oncentration, D=D	epletion, RM=		– ——— IS=Maske	d Sand G	 Grains.	<sup>2</sup> Location:	PL=Pore Lining, M=Matrix.
			LRRs, unless othe					for Problematic Hydric Soils <sup>3</sup> :
Histosol	(A1)		Polyvalue B	elow Surfa	ace (S8)	(LRR S, T,	<b>U)</b> 1 cm M	uck (A9) (LRR O)
	pipedon (A2)		Thin Dark S				I I	uck (A10) (LRR S)
	stic (A3)		Loamy Muck	-		RO)	1 1	ed Vertic (F18) (outside MLRA 150A,B)
_ ` `	en Sulfide (A4) d Layers (A5)		Loamy Gley  ✓ Depleted Ma		(F2)			ont Floodplain Soils (F19) (LRR P, S, T)
	Bodies (A6) <b>(LRR</b>	PTU	Redox Dark		F6)			lous Bright Loamy Soils (F20) <b>A 153B)</b>
T 1 -	ıcky Mineral (A7) (			,	,			rent Material (TF2)
	esence (A8) (LRR		Redox Depr				1 1	nallow Dark Surface (TF12)
1 cm Mu	ick (A9) <b>(LRR P, 1</b>	Γ)	Marl (F10) (I	LRR U)			Other (	Explain in Remarks)
	d Below Dark Surf	ace (A11)	Depleted Oc					
	ark Surface (A12)	(BIL D. A.CO.)	Iron-Mangar					ators of hydrophytic vegetation and
	rairie Redox (A16) Mucky Mineral (S1)		Umbric Surfa					and hydrology must be present, ss disturbed or problematic.
	Gleyed Matrix (S4)		Reduced Ve			•		33 disturbed of problematic.
_	Redox (S5)		Piedmont FI					
	Matrix (S6)		Anomalous	Bright Loa	my Soils	(F20) <b>(MLF</b>	RA 149A, 153C,	153D)
	rface (S7) (LRR P							
Restrictive	Layer (if observe	d):						
Туре:								
Depth (in	ches):		<u> </u>				Hydric Soil I	Present? Yes Y No No
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Fou	r Oaks/Johnston	Sampling Date: <u>5/29/18</u>			
Applicant/Owner: Wildlands Engineering Inc.		State: NC Sampling Point: W				
Investigator(s): C. Neaves	Section, Township	Section, Township, Range:				
Landform (hillslope, terrace, etc.): Hill Slope	Local relief (conca	ve, convex, none): none	Slope (%): <u>3</u>			
Subregion (LRR or MLRA): MLRA 133A Lat: N	35.478280	Long: W 78.443515	Datum:			
Soil Map Unit Name: Cowarts Loamy Sand (CoB)		NWI classific	cation: N/A			
Are climatic / hydrologic conditions on the site typical for this time of	of year? Yes 🗸 🖊	No (If no, explain in F	Remarks.)			
Are Vegetation Soil or Hydrology signification	antly disturbed?	Are "Normal Circumstances"	present? Yes ✓ No			
	y problematic?	(If needed, explain any answe	ers in Remarks.)			
SUMMARY OF FINDINGS – Attach site map show	ing sampling poi	nt locations, transects	s, important features, etc.			
Hydrophytic Vegetation Present?  Hydric Soil Present?  Wetland Hydrology Present?  Yes ✓ No  Yes ✓ No	Is the Sam within a We		No			
Remarks:						
HYDROLOGY						
Wetland Hydrology Indicators:		Secondary Indica	ators (minimum of two required)			
Primary Indicators (minimum of one is required; check all that ap	ply)	Surface Soil	Cracks (B6)			
✓ Surface Water (A1) Aquatic Fauna	(B13)		getated Concave Surface (B8)			
High Water Table (A2)  Marl Deposits	(B15) (LRR U)	Drainage Pa	atterns (B10)			
Saturation (A3) Hydrogen Sulfi	de Odor (C1)	Moss Trim L	ines (B16)			
Water Marks (B1) ✓ Oxidized Rhizo	ospheres along Living R	Roots (C3) Dry-Season	Water Table (C2)			
Sediment Deposits (B2)	educed Iron (C4)	Crayfish Bur	rows (C8)			
	eduction in Tilled Soils (	, , Ш	isible on Aerial Imagery (C9)			
Algal Mat or Crust (B4) Thin Muck Sur	, ,		: Position (D2)			
Iron Deposits (B5) Other (Explain	in Remarks)	Shallow Aqu	, ,			
Inundation Visible on Aerial Imagery (B7)		FAC-Neutral	, ,			
Water-Stained Leaves (B9) Field Observations:	1	Spnagnum r	moss (D8) (LRR T, U)			
Surface Water Present? Yes No Depth (inc	thes): 0					
Water Table Present? Yes ✓ No Depth (inc	_					
Saturation Present? Yes ✓ No Depth (inc		Wetland Hydrology Preser	nt? Yes ✓ No			
(includes capillary fringe)  Describe Recorded Data (stream gauge, monitoring well, aerial p	,					
Describe Recorded Data (stream gauge, monitoring well, aerial p	flotos, previous irispec	tions), ii avallable.				
Remarks:						

/EGETATION (Five Strata) – Use scientific nar	nes of pla	ants.		Sampling Point: Wetland E	- DP 5
001	Absolute	Dominant	Indicator	Dominance Test worksheet:	
<u>Tree Stratum</u> (Plot size: <u>30'</u> ) 1 Nyssa biflora	<u>% Cover</u> 65	Species? Yes	<u>Status</u> OBL	Number of Dominant Species That Are OBL, FACW, or FAC:  (A	۸۱
2. Liriodendron tulipifera				That Ale OBE, FACTO, OF FAC.	7)
3				Total Number of Dominant Species Across All Strata:  4 (E	В)
4					
5.				Percent of Dominant Species That Are OBL, FACW, or FAC: 75	A/B)
6.				// // // // // // // // // // // // //	00,
	85	= Total Cov	er	Prevalence Index worksheet:	
50% of total cover: 42.5				Total % Cover of: Multiply by:	
15'	20 70 01	total cover.	• ——	OBL species x 1 =	
				FACW species x 2 =	
1				FAC species x 3 =	
2				FACU species x 4 =	
3				UPL species x 5 =	
4					(B)
5				Column Totals: (A)	(B)
6				Prevalence Index = B/A =	
		= Total Cov	er		
50% of total cover:				Hydrophytic Vegetation Indicators:	
Shrub Stratum (Plot size: 15' )	20 /0 01	total cover.		1 - Rapid Test for Hydrophytic Vegetation	
1. Persea borbonia	5	Yes	FACW	2 - Dominance Test is >50%	
•				3 - Prevalence Index is ≤3.01	
2				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	
3				_	
4				Indicators of hydric soil and wetland hydrology mus	st
5				be present, unless disturbed or problematic.	
6				Definitions of Five Vegetation Strata:	
	5	= Total Cov	er	<u></u>	
50% of total cover: <u>2.5</u>				Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in	
51	20 /0 01	total cover.		(7.6 cm) or larger in diameter at breast height (DBH	
	60	Yes	FAC		,
_				Sapling – Woody plants, excluding woody vines,	_
2				approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.	5
3				dian o in. (1.6 only BBH.	
4				Shrub – Woody plants, excluding woody vines,	
5				approximately 3 to 20 ft (1 to 6 m) in height.	
6				Herb - All herbaceous (non-woody) plants, includin	ng
7.				herbaceous vines, regardless of size, and woody	•
8.				plants, except woody vines, less than approximately	У
				3 ft (1 m) in height.	
9				Woody vine - All woody vines, regardless of heigh	ıt.
10					
11					
		= Total Cov			
50% of total cover: 30	20% of	total cover:	<u> 12 </u>		
Woody Vine Stratum (Plot size: 30'					
1					
2.					
3					
4					
5				Hydrophytic	
		= Total Cov	er	Vegetation Value V	
50% of total cover:	20% of	total cover	:	Present? Yes ▼ No No	
Remarks: (If observed, list morphological adaptations belo				1	
(,,,,,,,	<i>)</i> -				

SOIL Sampling Point: Wetland E - DP 5

Profile Desc	cription: (Describe	to the depth	needed to docum	nent the i	ndicator	or confirm	the absence	of indicators.)
Depth	Matrix			x Feature:				
(inches)	Color (moist)		Color (moist)	%	Type <sup>1</sup>	<u>Loc<sup>2</sup></u>	Texture	Remarks
0-4	10YR 2/1	100					Mucky L	
4-12	10YR 6/1	100					<u>S</u>	
				· ——				
				. ——				
	oncentration, D=Dep					ains.		PL=Pore Lining, M=Matrix.
	Indicators: (Applic	able to all L						for Problematic Hydric Soils <sup>3</sup> :
Histosol	(A1) pipedon (A2)		Polyvalue Be Thin Dark Su					Muck (A9) (LRR O) Muck (A10) (LRR S)
Black Hi			Loamy Muck				I F	ed Vertic (F18) (outside MLRA 150A,B)
	n Sulfide (A4)		Loamy Gleye			. •,		ont Floodplain Soils (F19) (LRR P, S, T)
Stratified	d Layers (A5)		Depleted Mat	trix (F3)			Anoma	alous Bright Loamy Soils (F20)
11 1 -	Bodies (A6) (LRR F		Redox Dark	,	*		`	RA 153B)
	icky Mineral (A7) (L		Depleted Dar				1 1	arent Material (TF2)
1 <b>7 1</b>	esence (A8) (LRR U Ick (A9) (LRR P, T)	J)	Redox Depre		8)			hallow Dark Surface (TF12) (Explain in Remarks)
	d Below Dark Surfac	e (A11)	Depleted Och	•	(MLRA 1	51)		(Explain in Remarks)
	ark Surface (A12)	- ()	Iron-Mangan				T) <sup>3</sup> Indic	ators of hydrophytic vegetation and
Coast Pi	rairie Redox (A16) (	MLRA 150A)	Umbric Surfa	ce (F13) <b>(</b>	LRR P, T	, U)	wet	land hydrology must be present,
	lucky Mineral (S1) (	LRR O, S)	Delta Ochric		,			ess disturbed or problematic.
	Gleyed Matrix (S4)		Reduced Ver					
	Redox (S5) Matrix (S6)		Piedmont Flo				эд) A 149A, 153C	153D)
	rface (S7) <b>(LRR P,</b> \$	S. T. U)		ngni Loui	113 00113 (1	20) (III 211	A 140A, 1000	, 1332)
	Layer (if observed)							
Туре:								
Depth (in	ches):						Hydric Soil	Present? Yes
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Four Oaks/Johnston Sampling Date: 5/29/18					
Applicant/Owner: Wildlands Engineering Inc.	State: NC Sampling Point: Wetland F- DP 6					
Investigator(s): C. Neaves	Section, Township, Range:					
Landform (hillslope, terrace, etc.): Floodplain	Local relief (concave, convex, none): CONCAVE Slope (%): <2					
Subregion (LRR or MLRA): MLRA 133A Lat: N 3	35.478607 Long: W 78.444722 Datum:					
Soil Map Unit Name: Bibb sandy loam (Bb)	NWI classification: N/A					
Are climatic / hydrologic conditions on the site typical for this time of						
	atly disturbed? Are "Normal Circumstances" present? Yes ✓ No ✓					
	problematic? (If needed, explain any answers in Remarks.)					
SUMMARY OF FINDINGS – Attach site map show	ng sampling point locations, transects, important features, etc.					
Hydrophytic Vegetation Present? Yes ✓ No	Is the Sampled Area					
Hydric Soil Present? Yes ✓ No	within a Wetland?					
Wetland Hydrology Present? Yes Vo.						
Remarks:	_					
Hydrology altered by cattle and stream incision.						
HYDROLOGY						
Wetland Hydrology Indicators:	Secondary Indicators (minimum of two required)					
Primary Indicators (minimum of one is required; check all that app						
Surface Water (A1)  Aquatic Fauna (						
→ High Water Table (A2)  Marl Deposits (B						
Saturation (A3) Hydrogen Sulfid						
	pheres along Living Roots (C3) Dry-Season Water Table (C2)					
Sediment Deposits (B2)						
Drift Deposits (B3)	luction in Tilled Soils (C6) Saturation Visible on Aerial Imagery (C9)					
Algal Mat or Crust (B4) Thin Muck Surfa	Ice (C7) Geomorphic Position (D2)					
Iron Deposits (B5) Other (Explain in						
Inundation Visible on Aerial Imagery (B7)	FAC-Neutral Test (D5)					
Water-Stained Leaves (B9)	Sphagnum moss (D8) (LRR T, U)					
Field Observations:  Surface Water Present?  Yes No ✓ Depth (inch	inals.					
Water Table Present? Yes ✓ No Depth (inches Saturation Present? Yes ✓ No Depth (inches Saturation Present? Yes ✓ No Depth (inches Saturation Present?						
(includes capillary fringe)						
Describe Recorded Data (stream gauge, monitoring well, aerial ph	otos, previous inspections), if available:					
Remarks:						

<b>/EGETATION (Five Strata)</b> – Use scientific na			la dia da a	Sampling Point: Wetland F - DF
Tree Stratum (Plot size: 30'	% Cover	•	<u>Status</u>	Dominance Test worksheet:  Number of Dominant Species That Are ORL FACW or FAC: 1
1				That Are OBL, FACW, or FAC: (A)
2 3				Total Number of Dominant Species Across All Strata:  1 (B)
4				Species Across All Strata: (B)
5				Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)
6				That Are OBL, FACW, or FAC: 100 (A/B)
		= Total Co	ver	Prevalence Index worksheet:
50% of total cover:	20% of	total cover	r:	Total % Cover of: Multiply by:
Sapling Stratum (Plot size: 15' )				OBL species x 1 =
1				FACW species x 2 =
2.				FAC species x 3 =
3.				FACU species x 4 =
4.				UPL species x 5 =
5.				Column Totals: (A) (B)
5.				Prevalence Index = B/A =
		= Total Co		Hydrophytic Vegetation Indicators:
50% of total cover:	20% of	total cover	r:	1 - Rapid Test for Hydrophytic Vegetation
Shrub Stratum (Plot size: 15'				✓ 2 - Dominance Test is >50%
1				3 - Prevalence Index is ≤3.0 <sup>1</sup>
2				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
3				
4				<sup>1</sup> Indicators of hydric soil and wetland hydrology must
5				be present, unless disturbed or problematic.
6				Definitions of Five Vegetation Strata:
	:	= Total Co	ver	Tree – Woody plants, excluding woody vines,
50% of total cover:	20% of	total cover	r:	approximately 20 ft (6 m) or more in height and 3 in.
Herb Stratum (Plot size: 5')			0.01	(7.6 cm) or larger in diameter at breast height (DBH).
1.Carex comcosa	70	<u>Yes</u>	OBL	Sapling - Woody plants, excluding woody vines,
<sub>2.</sub> Boehmeria cylindrica	10	<u>No</u>	FACW	approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.
3	- ——			alan o III. (7.0 olin) BBH.
4				Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
5				approximately 3 to 20 ft (1 to 0 fff) in fleight.
5				Herb – All herbaceous (non-woody) plants, including
7				herbaceous vines, regardless of size, <u>and</u> woody plants, except woody vines, less than approximately
8				3 ft (1 m) in height.
9				Woody vine – All woody vines, regardless of height.
10				
11				
10		= Total Co		
50% of total cover: 40	20% of	total cover	r: <u>10</u>	
Woody Vine Stratum (Plot size: 30' )				
1				
2.				
3				
4				
5				Hydrophytic
		= Total Co		Vegetation Present? Yes  ✓ No
50% of total cover:	700/ -4	total agrees	r·	1

SOIL Sampling Point: Wetland F - DP 6

Profile Des	cription: (Describe	to the depth	needed to docur	nent the i	indicator	or confirm	n the absence of in	dicators.)
Depth	<u>Matrix</u>			x Feature		. 2	<b>-</b> .	5
(inches)	Color (moist)		Color (moist)		Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
0-12+	2.5Y4/1	90	5YR 4/6	10	<u>C</u>	<u>PL</u>	<u>L</u>	
	-							
						· ——		_
<sup>1</sup> Type: C=C	oncentration, D=Dep	oletion, RM=R	Reduced Matrix, MS	S=Masked	d Sand Gi	ains.	<sup>2</sup> Location: PL=F	Pore Lining, M=Matrix.
Hydric Soil	Indicators: (Applic	cable to all Li	RRs, unless other	wise not	ed.)		Indicators for P	roblematic Hydric Soils <sup>3</sup> :
Histoso	(A1)		Polyvalue Be				J)1 cm Muck (	(A9) (LRR O)
	pipedon (A2)		Thin Dark Su					(A10) (LRR S)
1 1	istic (A3)		Loamy Muck			₹ 0)		ertic (F18) (outside MLRA 150A,B)
	en Sulfide (A4) d Layers (A5)		Loamy Gleye		F2)			loodplain Soils (F19) (LRR P, S, T)
I — I	a Layers (A5) : Bodies (A6) <b>(LRR F</b>	T III	☐ Depleted Mar Redox Dark	. ,	-6)		(MLRA 15	Bright Loamy Soils (F20)
	ucky Mineral (A7) <b>(L</b>		Depleted Dai	•	,		_ `	Material (TF2)
	resence (A8) (LRR l		Redox Depre					w Dark Surface (TF12)
	uck (A9) (LRR P, T)	•	Marl (F10) (L	.RR U)	,		Other (Expla	ain in Remarks)
	d Below Dark Surfac	ce (A11)	Depleted Ocl		•	•		
	ark Surface (A12)		Iron-Mangan					of hydrophytic vegetation and
	rairie Redox (A16) (				•	r, u)		hydrology must be present,
	Mucky Mineral (S1) ( Gleyed Matrix (S4)	LKK (), (5)	Delta Ochric Reduced Ver		,	50A 150B)		sturbed or problematic.
_	Redox (S5)		Piedmont Flo					
19 1	d Matrix (S6)		_				RA 149A, 153C, 153	D)
Dark Su	ırface (S7) (LRR P,	S, T, U)	_					
Restrictive	Layer (if observed)	:						
Туре:								
Depth (in	ches):						Hydric Soil Pres	ent? Yes 🗸 No
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Four Oa	aks/Johnston	Sampling Date: <u>5/30/18</u>
Applicant/Owner: Wildlands Engineering Inc.		State: NC	Sampling Point: Wetland G - DP 7
Investigator(s): C. Neaves	Section, Township, Rar		
Landform (hillslope, terrace, etc.): Floodplain	Local relief (concave, c	convex, none): concave	Slope (%): 2
Subregion (LRR or MLRA): MLRA 133A Lat: N 35	.478197 <u></u> ι	Long: W 78.444888	Datum:
Soil Map Unit Name: Cowart sandy loam (CoB)		NWI classifica	ition: N/A
Are climatic / hydrologic conditions on the site typical for this time of y	ear? Yes 🗸 No	(If no, explain in Re	marks.)
Are Vegetation Soil or Hydrology significantly	y disturbed? Are "	"Normal Circumstances" pr	esent? Yes ✓ No
Are Vegetation Soil or Hydrology naturally pr	roblematic? (If ne	eeded, explain any answers	s in Remarks.)
SUMMARY OF FINDINGS - Attach site map showing	g sampling point k	ocations, transects,	important features, etc.
Hydrophytic Vegetation Present?  Hydric Soil Present?  Wetland Hydrology Present?  Yes ✓ No ✓ N	Is the Sampled within a Wetlan		No
Remarks:			
HYDROLOGY			
Wetland Hydrology Indicators:		Secondary Indicate	ors (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)	)	Surface Soil C	Cracks (B6)
Surface Water (A1) Aquatic Fauna (B <sup>2</sup>	13)	Sparsely Vege	etated Concave Surface (B8)
High Water Table (A2) Marl Deposits (B1	5) (LRR U)	Drainage Patt	erns (B10)
Saturation (A3) Hydrogen Sulfide	, ,	Moss Trim Lin	` '
	heres along Living Roots		Vater Table (C2)
Sediment Deposits (B2)	, ,	Crayfish Burro	, ,
	ction in Tilled Soils (C6)		ible on Aerial Imagery (C9)
Algal Mat or Crust (B4) Thin Muck Surface	, ,	Geomorphic F	, ,
Iron Deposits (B5) Other (Explain in I	Remarks)	Shallow Aquit	, ,
Inundation Visible on Aerial Imagery (B7) Water-Stained Leaves (B9)		FAC-Neutral	oss (D8) <b>(LRR T, U)</b>
Field Observations:		Opriagrium in	555 (D0) (ERR 1, 0)
Surface Water Present? Yes ✓ No Depth (inches	s): 0		
Water Table Present? Yes ✓ No Depth (inches	·		
Saturation Present? Yes V No Depth (inches		etland Hydrology Present	? Yes / No
(includes capillary fringe)  Describe Recorded Data (stream gauge, monitoring well, aerial photography)		s) if available:	
Describe Necorded Data (Stream gauge, monitoring well, aerial pro-	os, previous irispections,	s), ii avallable.	
Remarks:			

201	Absolute	Dominant	Indicator	Dominance Test worksheet:
Tree Stratum (Plot size: 30'	% Cover	Species?	<u>Status</u>	Number of Dominant Species
1				That Are OBL, FACW, or FAC: 2 (A)
2				
				Total Number of Dominant
3				Species Across All Strata: (B)
4				Percent of Dominant Species
5				That Are OBL, FACW, or FAC: 100 (A/B)
6				
		= Total Co	ver	Prevalence Index worksheet:
EON/ of total agreem				Total % Cover of: Multiply by:
50% of total cover:	20% 0	r total cover		OBL species x 1 =
Sapling Stratum (Plot size: 15'				
1				FACW species x 2 =
2				FAC species x 3 =
3.				FACU species x 4 =
				UPL species x 5 =
4				Column Totals: (A) (B)
5				Column Totals (A) (B)
6				Prevalence Index = B/A =
		= Total Co	ver	
500% of total anyon				Hydrophytic Vegetation Indicators:
50% of total cover:	∠∪% 0	i total covel		1 - Rapid Test for Hydrophytic Vegetation
Shrub Stratum (Plot size: 15')				✓ 2 - Dominance Test is >50%
1				3 - Prevalence Index is ≤3.01
2				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
3.				Problematic Hydrophytic Vegetation (Explain)
4				<sup>1</sup> Indicators of hydric soil and wetland hydrology must
5				be present, unless disturbed or problematic.
6				Definitions of Five Vegetation Strata:
		= Total Co		
50% of total cover:				Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in.
	20%0	I total covel		(7.6 cm) or larger in diameter at breast height (DBH).
Herb Stratum (Plot size: 5'	<b>50</b>	V	ODI	(7.5 off) of larger in diameter at broadt neight (BBH).
1.Carex comcosa	50	Yes	OBL	Sapling – Woody plants, excluding woody vines,
2. Persecaria lapathifolia	30	Yes	FACW	approximately 20 ft (6 m) or more in height and less
3. Ranunculus bulbosus	10	No	FAC	than 3 in. (7.6 cm) DBH.
4 Juncus effusus	10	No	OBL	Shrub – Woody plants, excluding woody vines,
··			ODL	approximately 3 to 20 ft (1 to 6 m) in height.
5				
6				Herb – All herbaceous (non-woody) plants, including
7				herbaceous vines, regardless of size, <u>and</u> woody
8.				plants, except woody vines, less than approximately 3 ft (1 m) in height.
				3 it (1 iii) iii ileigiit.
9				Woody vine – All woody vines, regardless of height.
10				
11				
	100	= Total Co	ver	
50% of total cover: 20				
	20700	i total covel		
Woody Vine Stratum (Plot size: 30'				
1				
2				
3.				
4				
5	. ——			Hydrophytic
		= Total Co	ver	Vegetation
50% of total cover:				Present? Yes Y No No
Remarks: (If observed, list morphological adaptations beld				
Tremains. (II observed, list morphological adaptations bett	JW ).			
				· · · · · · · · · · · · · · · · · · ·

Sampling Point: Wetland G - DP 7

Sampling Point: \_\_\_

SOIL

Profile Desc	ription: (Describe	to the dept	h needed to docum	nent the	indicator	or confirm	the absence	of indicators.)
Depth (in shees)	Matrix	%	Redox Color (moist)	<u>Feature</u>		Loc <sup>2</sup>	Texture	Domonto
(inches) 0-3	Color (moist) 10 YR 3/2	100	Color (Illoist)	%	_Type <sup>1</sup> _	LOC	SiL	Remarks Remarks
3-6	10 YR 6/1	90	7.5 YR 5/8	10	<u>C</u>	PL	SL	
6-12+	10 YR 7/2		7.5 YR 6/8	30	<u>C</u>	PL,M	SCL	
0 12								
		. ——						
<sup>1</sup> Type: C=Co	oncentration, D=Dep	letion, RM=	Reduced Matrix, MS	=Masked	d Sand Gr	ains.	<sup>2</sup> Location:	PL=Pore Lining, M=Matrix.
	ndicators: (Applic							for Problematic Hydric Soils <sup>3</sup> :
Histosol			Polyvalue Bel					fluck (A9) (LRR O)
Histic Ep	oipedon (A2)		Thin Dark Sui				I f	Muck (A10) (LRR S)
	n Sulfide (A4)		Loamy Mucky			. 0)		ed Vertic (F18) (outside MLRA 150A,B) ont Floodplain Soils (F19) (LRR P, S, T)
	l Layers (A5)		Depleted Mat		(. –)			llous Bright Loamy Soils (F20)
	Bodies (A6) (LRR P		Redox Dark S					RA 153B)
	cky Mineral (A7) (LF		Depleted Dari				1 1	arent Material (TF2)
17 1	esence (A8) (LRR U ck (A9) (LRR P, T)	)	Redox Depre		8)			hallow Dark Surface (TF12) Explain in Remarks)
	d Below Dark Surfac	e (A11)	Depleted Och	-	(MLRA 1	51)		Explain in Normanay
	ırk Surface (A12)		Iron-Mangane				•	ators of hydrophytic vegetation and
	rairie Redox (A16) (N					, U)		land hydrology must be present,
	lucky Mineral (S1) <b>(L</b> Gleyed Matrix (S4)	.RR O, S)	Delta Ochric (		,	.0Δ 150R)		ess disturbed or problematic.
	edox (S5)		Piedmont Flo		•			
Stripped	Matrix (S6)						A 149A, 153C,	, 153D)
	rface (S7) (LRR P, S _ayer (if observed):						T	
Type:	zayer (ii observed).							
	ches):		_				Hydric Soil	Present? Yes No No
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Four Oaks/Johnston	Sampling Date: <u>5/29/18</u>
Applicant/Owner: Wildlands Engineering Inc.	State: NC	Sampling Point: Upland - DP 8
Investigator(s): C. Neaves	Section, Township, Range:	
Landform (hillslope, terrace, etc.):	Local relief (concave, convex, none): CON	vex Slope (%): 3
Subregion (LRR or MLRA): MLRA 133A Lat: N 35.	477481 Long: W 78.4437	'42 Datum:
Soil Map Unit Name: Bibb sandy loam (Bb)	NWI cla	assification: N/A
Are climatic / hydrologic conditions on the site typical for this time of ye	ear? Yes ✓ No (If no, explai	n in Remarks.)
Are Vegetation Soil or Hydrology significantly	disturbed? Are "Normal Circumstan	ces" present? Yes ✓ No
Are Vegetation Soil or Hydrology naturally pro	oblematic? (If needed, explain any a	answers in Remarks.)
SUMMARY OF FINDINGS – Attach site map showing	sampling point locations, trans	ects, important features, etc.
		,
Hydrophytic Vegetation Present? Yes No No	Is the Sampled Area	
Hydric Soil Present? Yes No	within a Wetland? Yes	No ✓
Wetland Hydrology Present? Yes No ✓ Remarks:		
HYDROLOGY		
Wetland Hydrology Indicators:	Secondary	Indicators (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)	Surface	e Soil Cracks (B6)
Surface Water (A1) Aquatic Fauna (B1	3) Sparse	ly Vegetated Concave Surface (B8)
High Water Table (A2)  Marl Deposits (B15)	5) (LRR U) Draina	ge Patterns (B10)
Saturation (A3) Hydrogen Sulfide (	Odor (C1) Moss T	rim Lines (B16)
		ason Water Table (C2)
Sediment Deposits (B2)  Presence of Reduc	` ' '	h Burrows (C8)
	, ,	tion Visible on Aerial Imagery (C9)
Algal Mat or Crust (B4)  Thin Muck Surface  Iron Deposits (B5)  Other (Explain in F	, ,	orphic Position (D2) v Aquitard (D3)
Inundation Visible on Aerial Imagery (B7)		eutral Test (D5)
Water-Stained Leaves (B9)		num moss (D8) (LRR T, U)
Field Observations:		, , , , , ,
Surface Water Present? Yes No Depth (inches	):	
Water Table Present? Yes No Depth (inches	):	
Saturation Present? Yes No Depth (inches	): Wetland Hydrology P	resent? Yes No _✓
(includes capillary fringe)  Describe Recorded Data (stream gauge, monitoring well, aerial photo	os, previous inspections), if available:	
gaage, memoring non, contain price	, promoto mopositorio, maramator	
Remarks:		

<b>/EGETATION (Five Strata)</b> – Use scientific nam	nes of pla	ants.		Sampling Point: Upland	3 - DP 8
T 01 1 (5) 1 30'		Dominant		Dominance Test worksheet:	
<u>Tree Stratum</u> (Plot size: 30' ) 1.		Species?		Number of Dominant Species That Are OBL, FACW, or FAC:  0	(A)
2				Total Number of Dominant	
3					(B)
4.					` /
5.				Percent of Dominant Species That Are OBL, FACW, or FAC:	(A /D)
6				That Are OBL, FACW, or FAC:	(AVB)
		Total Cov	/er	Prevalence Index worksheet:	
50% of total cover:				Total % Cover of: Multiply by:	_
20% of total cover	20% 01	total cover		OBL species x 1 =	_
Sapling Stratum (Plot size: 15' )				FACW species x 2 =	
1				FAC species x 3 =	
2				FACU species x 4 =	
3				UPL species x 5 =	
4					
5				Column Totals: (A)	_ (B)
6				Prevalence Index = B/A =	
		= Total Cov	/er	Hydrophytic Vegetation Indicators:	
50% of total cover:	20% of	total cover		1 - Rapid Test for Hydrophytic Vegetation	
Shrub Stratum (Plot size: 15'				2 - Dominance Test is >50%	
1					
				3 - Prevalence Index is ≤3.0¹	
2				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain	1)
3					
4				¹Indicators of hydric soil and wetland hydrology m	nust
5				be present, unless disturbed or problematic.	
6				Definitions of Five Vegetation Strata:	
		= Total Cov	/er	Tree – Woody plants, excluding woody vines,	
50% of total cover:	20% of	total cover	:	approximately 20 ft (6 m) or more in height and 3	
Herb Stratum (Plot size: 5' )				(7.6 cm) or larger in diameter at breast height (DE	3H).
1.Cynodon dactylon	90	Yes	FACU	Sapling – Woody plants, excluding woody vines,	
2. Amaranthus hybridus	5	No	<u>UPL</u>	approximately 20 ft (6 m) or more in height and le	ess
3				than 3 in. (7.6 cm) DBH.	
4.				Shrub – Woody plants, excluding woody vines,	
E .				approximately 3 to 20 ft (1 to 6 m) in height.	
6.				Herb – All herbaceous (non-woody) plants, include	lina
7				herbaceous vines, regardless of size, and woody	_
				plants, except woody vines, less than approximat	ely
8				3 ft (1 m) in height.	
9				Woody vine - All woody vines, regardless of height	ght.
10					
11	<u></u>				
47.5		= Total Cov			
50% of total cover: <u>47.5</u>	20% of	total cover	: <u>19</u>		
Woody Vine Stratum (Plot size: 30')					
1					
2					
3.					
4					
5.				l	
J				Hydrophytic Vogetation	
		= Total Cov		Vegetation Present? Yes No	
50% of total cover:		total cover	:		
Remarks: (If observed, list morphological adaptations below	<b>N</b> ).				

Sampling Point: \_\_\_\_\_

SOIL

Profile Desc	ription: (Describe t	o the depth	needed to docur	nent the i	ndicator	or confirn	n the absence of in	dicators.)
Depth	Matrix			x Features				
(inches)	Color (moist)		Color (moist)		Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
0-3	10 YR 3/3						SL	
3-7	10 YR 5/4	7	7.5 YR 6/6	10			S	
7-12+	10 YR 6/6						S	_
								_
								_
								_
1Tyrpe: C=C	oncentration, D=Deple	tion DM-D	educed Matrix MS	- ——— S-Masked	Sand Cr		2l ocation: DI =	Pore Lining, M=Matrix.
	ndicators: (Applica					aii15.		Problematic Hydric Soils <sup>3</sup> :
Histosol		DIO TO GII EI	Polyvalue Be			DD C T I		(A9) (LRR O)
_	pipedon (A2)		Thin Dark Su					(A10) (LRR S)
Black Hi			Loamy Muck				I f	ertic (F18) (outside MLRA 150A,B)
1 1	n Sulfide (A4)		Loamy Gleye			. •,		loodplain Soils (F19) (LRR P, S, T)
	l Layers (A5)		Depleted Ma	,	-,			Bright Loamy Soils (F20)
	Bodies (A6) (LRR P,	T, U)	Redox Dark	, ,	6)		(MLRA 15	
	cky Mineral (A7) (LR		Depleted Dai	rk Surface	(F7)		Red Parent	Material (TF2)
Muck Pr	esence (A8) (LRR U)		Redox Depre	essions (F8	3)		Very Shallo	w Dark Surface (TF12)
1 cm Mu	ck (A9) (LRR P, T)		Marl (F10) (L	.RR U)			Other (Expla	ain in Remarks)
Depleted	d Below Dark Surface	(A11)	Depleted Ocl		•	*		
	rk Surface (A12)		Iron-Mangan				•	of hydrophytic vegetation and
	airie Redox (A16) (M					, U)		hydrology must be present,
	lucky Mineral (S1) (L	RR O, S)	Delta Ochric					sturbed or problematic.
	leyed Matrix (S4)		Reduced Ver					
	edox (S5)		Piedmont Flo					D)
	Matrix (S6)	T 11)	Anomalous E	sright Loan	ny Solis (	F20) (NILF	RA 149A, 153C, 153	ט)
	rface (S7) (LRR P, S, _ayer (if observed):	1, 0)						
	ayer (ii observed).							
Type:	-h \.		_				Undela Call Dean	ent? Yes No
Depth (inc	лies)						Hydric Soil Pres	ent? YesNo_❤
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Four (	Oaks/Johnston	Sampling Date:
Applicant/Owner: Wildlands Engineering Inc.		State: NC	Sampling Point: Wetland H - DP 9
Investigator(s): C. Neaves	Section, Township, F		
Landform (hillslope, terrace, etc.): floodplain	Local relief (concave	, convex, none): none	Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35.	.475029	Long: W 78.445762	Datum:
Soil Map Unit Name: Bibb sandy loam (Bb)		NWI classifica	ation: N/A
Are climatic / hydrologic conditions on the site typical for this time of ye	ear? Yes ✓ No	(If no, explain in Re	emarks.)
Are Vegetation Soil or Hydrology significantly	disturbed? Are	e "Normal Circumstances" pr	resent? Yes ✓ No
Are Vegetation Soil or Hydrology naturally pro		needed, explain any answer	
SUMMARY OF FINDINGS – Attach site map showing	g sampling point	locations, transects,	important features, etc.
Hydrophytic Vegetation Present? Yes ✓ No Hydric Soil Present? Yes ✓ No	Is the Sample		, <u> </u>
Hydric Soil Present? Yes ✓ No Wetland Hydrology Present? Yes ✓ No	within a Wetl	and? Yes <u>√</u>	No
Remarks:			
HYDROLOGY			
Wetland Hydrology Indicators:		Secondary Indicat	ors (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)		Surface Soil 0	
Surface Water (A1) Aquatic Fauna (B1	•		etated Concave Surface (B8)
✓ High Water Table (A2)  Marl Deposits (B15)		Drainage Patt	
✓ Saturation (A3)	Odor (C1) neres along Living Roo	Moss Trim Lir	Vater Table (C2)
Sediment Deposits (B2)  Presence of Reduce		Crayfish Burro	` '
	ction in Tilled Soils (C6	<u> </u>	sible on Aerial Imagery (C9)
Algal Mat or Crust (B4) Thin Muck Surface	,	Geomorphic F	~ , ,
Iron Deposits (B5) Other (Explain in F	Remarks)	Shallow Aquit	ard (D3)
Inundation Visible on Aerial Imagery (B7)		FAC-Neutral	Test (D5)
		Sphagnum m	oss (D8) (LRR T, U)
Field Observations:			
Surface Water Present? Yes No Depth (inches			
Water Table Present? Yes ✓ No Depth (inches			[7] [7]
Saturation Present? Yes No Depth (inches (includes capillary fringe)	s): <u>4</u>	Vetland Hydrology Present	t? Yes <u> </u>
Describe Recorded Data (stream gauge, monitoring well, aerial photo	os, previous inspection	ns), if available:	
Damado			
Remarks:			

20'	Absolute			Dominance Test worksheet:
Tree Stratum (Plot size: 30' )		Species?		Number of Dominant Species
1. Nyssa biflora	40	Yes	<u>OBL</u>	That Are OBL, FACW, or FAC: $\frac{4}{}$ (A)
2. Acer rubrum	40	Yes	<u>FAC</u>	Total Number of Dominant
3				Species Across All Strata: 4 (B)
4				
5.				Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)
6.				That Ale OBL, FACW, of FAC.
·	80	= Total Co		Prevalence Index worksheet:
50% of total cover: 40				Total % Cover of: Multiply by:
	20% 0	rtotal cover	10	OBL species x 1 =
Sapling Stratum (Plot size: 15' )				FACW species x 2 =
1				
2				FAC species x 3 =
3				FACU species x 4 =
4				UPL species x 5 =
5.				Column Totals: (A) (B)
6.				
<u> </u>		= Total Cov		Prevalence Index = B/A =
				Hydrophytic Vegetation Indicators:
50% of total cover:	20% of	total cover	:	1 - Rapid Test for Hydrophytic Vegetation
Shrub Stratum (Plot size: 15')	40	V		✓ 2 - Dominance Test is >50%
1. Ligustrum sinense	40	Yes	<u>FAC</u>	3 - Prevalence Index is ≤3.0 <sup>1</sup>
2				Problematic Hydrophytic Vegetation¹ (Explain)
3				
4.				Indicators of hydric cail and watland hydrology must
5.				Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
				Definitions of Five Vegetation Strata:
6				Definitions of Five Vegetation Strata.
00		= Total Co	_	Tree – Woody plants, excluding woody vines,
50% of total cover: <u>20</u>	20% of	f total cover	. 8	approximately 20 ft (6 m) or more in height and 3 in.
Herb Stratum (Plot size: 5')				(7.6 cm) or larger in diameter at breast height (DBH).
1.Microstegium vimineum	80	Yes	<u>FAC</u>	Sapling – Woody plants, excluding woody vines,
2				approximately 20 ft (6 m) or more in height and less
3.				than 3 in. (7.6 cm) DBH.
4				Shrub – Woody plants, excluding woody vines,
				approximately 3 to 20 ft (1 to 6 m) in height.
5				
6				Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody
7				plants, except woody vines, less than approximately
8				3 ft (1 m) in height.
9				Manda da da Allaca da dina a manda a afin si ahi
10				Woody vine – All woody vines, regardless of height.
11.				
	00	= Total Co		
50% of total cover: 40				
	20 % 01	total cover		
,				
1				
2				
3				
4				
5.				Hydrophytic
		= Total Co		Hydrophytic Vegetation
50% of total cover:				Present? Yes No No
		total cover	·	
Remarks: (If observed, list morphological adaptations below	ow).			

Sampling Point: Wetland H - DP 9

Sampling Point: Wetland H - DP 9

SOIL

Profile Desc	ription: (Describe	to the dept	h needed to docum	ent the	indicator	or confirm	n the absence o	of indicators.)
Depth	Matrix			Feature				
(inches)	Color (moist)	<u>%</u>	Color (moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>	<u>Texture</u>	Remarks
0-3	10YR 4/1	95	10YR 4/6	5	<u> </u>	<u>PL</u>	SiL	
3-12+	10YR 5/1	90	10YR 5/8	10	<u>C</u>	<u>PL</u>	SL	
					-			
					-			
			Reduced Matrix, MS			ains.		PL=Pore Lining, M=Matrix.
		able to all	LRRs, unless other		-	DD 0 T I		for Problematic Hydric Soils <sup>3</sup> :
Histosol	(A1) ipedon (A2)		Polyvalue Bel Thin Dark Sur					uck (A9) (LRR O) uck (A10) (LRR S)
Black Hi			Loamy Mucky					ed Vertic (F18) (outside MLRA 150A,B)
	n Sulfide (A4)		Loamy Gleye			,		ont Floodplain Soils (F19) (LRR P, S, T)
	l Layers (A5)		✓ Depleted Mat	, ,			Anomal	lous Bright Loamy Soils (F20)
	Bodies (A6) (LRR P		Redox Dark S	,				A 153B)
	cky Mineral (A7) <b>(LI</b> esence (A8) <b>(LRR L</b>		Depleted Darl				1 1	rent Material (TF2) nallow Dark Surface (TF12)
I	ck (A9) (LRR P, T)	• •	Marl (F10) (LI		0)			Explain in Remarks)
	Below Dark Surfac	e (A11)	Depleted Och	,	(MLRA 1	51)		
	rk Surface (A12)		Iron-Mangane	se Mass	ses (F12) <b>(</b>	LRR O, P,	•	ators of hydrophytic vegetation and
	airie Redox (A16) (I			, ,		', U)		and hydrology must be present,
	lucky Mineral (S1) (I ileyed Matrix (S4)	LRR O, S)	Delta Ochric (		,	OA 150B)		ss disturbed or problematic.
	edox (S5)		Piedmont Flo	, ,	•		•	
1	Matrix (S6)						RA 149A, 153C,	153D)
	face (S7) (LRR P, \$		<del></del>					
Restrictive L	.ayer (if observed)	:						
Туре:			<u> </u>					
	ches):		<u> </u>				Hydric Soil I	Present? Yes Y No No
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smithfield / Johnston Sampling Date: 5/29/2018
Applicant/Owner: Wildlands Engineering Inc.	State: NC Sampling Point: Wetland I - DP10
Investigator(s): W. Taylor	Section, Township, Range:
Landform (hillslope, terrace, etc.): floodplain	Local relief (concave, convex, none): concave Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35	.471489 Long: W 78.424216 Datum:
Soil Map Unit Name: Bibb Sandy Loam (Bb)	NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of year	
	y disturbed? Are "Normal Circumstances" present? Yes No ✓
Are Vegetation Soil or Hydrology naturally pr	
	g sampling point locations, transects, important features, etc.
SOMMANT OF FINDINGS - Attach site map showing	3 sampling point locations, transects, important leatures, etc.
Hydrophytic Vegetation Present? Yes ✓ No	Is the Sampled Area
Hydric Soil Present? Yes ✓ No	within a Wetland?
Wetland Hydrology Present? Yes No	
Remarks:	zina
Vegetation significantly impacted due to livestock graz	ing.
HYDROLOGY	
Wetland Hydrology Indicators:	Secondary Indicators (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)	Surface Soil Cracks (B6)
Surface Water (A1)  Aquatic Fauna (B1)	13) Sparsely Vegetated Concave Surface (B8)
High Water Table (A2)  Marl Deposits (B15)	5) (LRR U)
✓ Saturation (A3) Hydrogen Sulfide (	
	heres along Living Roots (C3)Dry-Season Water Table (C2)
Sediment Deposits (B2)  Presence of Reduction Process (B2)	
Drift Deposits (B3) Recent Iron Reduction  Algal Mat or Crust (B4) Thin Muck Surface	ction in Tilled Soils (C6) Saturation Visible on Aerial Imagery (C9)  e (C7) Geomorphic Position (D2)
Iron Deposits (B5) Other (Explain in F	
Inundation Visible on Aerial Imagery (B7)	FAC-Neutral Test (D5)
Water-Stained Leaves (B9)	Sphagnum moss (D8) (LRR T, U)
Field Observations:	
Surface Water Present? Yes ✓ No Depth (inches	· ————
Water Table Present? Yes ✓ No Depth (inches	
Saturation Present? Yes V No Depth (inches	s): <u>0-12+</u>   Wetland Hydrology Present? Yes <u> \lambda</u> No
(includes capillary fringe)  Describe Recorded Data (stream gauge, monitoring well, aerial photo	os, previous inspections), if available:
Remarks:	

<b>/EGETATION (Five Strata)</b> – Use scientific na	ines or pr	arits.		Sampling Point: Wetland I - DP1
30'		Dominant		Dominance Test worksheet:
<u>Tree Stratum</u> (Plot size: <u>30'</u> ) <sub>1.</sub> Nyssa biflora	<u>% Cover</u> 60	Yes	<u>Status</u> OBL	Number of Dominant Species That Are OBL, FACW, or FAC:  (A)
2. Acer rubrum	15	Yes	FAC	Total Number of Dominant
3				Species Across All Strata: 4 (B)
4 5				Percent of Dominant Species That Are OBL FACW or FAC: 100 (A/B)
5 6				That Are OBL, FACW, or FAC: 100 (A/B)
	75	= Total Cov	er	Prevalence Index worksheet:
50% of total cover: <u>37.5</u>	20% of	f total cover	15	Total % Cover of: Multiply by:
Sapling Stratum (Plot size: 15' )				OBL species x 1 =
1				FACW species x 2 =
2				FACU species x 3 = FACU species x 4 =
3				UPL species x 5 =
4				Column Totals: (A) (B)
5				Column Totals (V) (B)
6				Prevalence Index = B/A =
E00/ -51-1-1		= Total Cov		Hydrophytic Vegetation Indicators:
Shrub Stratum (Plot size: 15' 50% of total cover:)	20% 01	total cover		1 - Rapid Test for Hydrophytic Vegetation
1. Ligustrum sinense	30	Yes	FAC	✓ 2 - Dominance Test is >50%
2. Persea borbonia	5	No	FACW	3 - Prevalence Index is ≤3.0¹
3.				Problematic Hydrophytic Vegetation¹ (Explain)
4.				<sup>1</sup> Indicators of hydric soil and wetland hydrology must
5.				be present, unless disturbed or problematic.
6				Definitions of Five Vegetation Strata:
	35	= Total Cov	er	Tree – Woody plants, excluding woody vines,
50% of total cover: <u>17.5</u>	20% of	ftotal cover	7	approximately 20 ft (6 m) or more in height and 3 in.
Herb Stratum (Plot size: 5' )	70	V	EAC	(7.6 cm) or larger in diameter at breast height (DBH).
1.Microstegium vimineum			FAC_	Sapling – Woody plants, excluding woody vines,
2				approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.
3				Chrush Wandy plants avaluding wandy vince
4				Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
5				Herb – All herbaceous (non-woody) plants, including
7				herbaceous vines, regardless of size, and woody
8.				plants, except woody vines, less than approximately 3 ft (1 m) in height.
9.				, , ,
10.				Woody vine – All woody vines, regardless of height.
11				
	70	= Total Cov	er	
50% of total cover: <u>35</u>	20% of	ftotal cover	14	
Woody Vine Stratum (Plot size: 30')				
1				
2				
3				
4				
b	0			Hydrophytic
		= Total Cov		Vegetation Present? Yes ✓ No
CAN/	2007 -	Ftatal a		
50% of total cover:  Remarks: (If observed, list morphological adaptations believed)		total cover		

SOIL Sampling Point: Wetland I - DP10

Profile Desc	cription: (Describe	to the depth	needed to docun	nent the i	indicator	or confirn	n the absence of i	ndicators.)
Depth	Matrix			x Feature				D
(inches)	Color (moist)		Color (moist) 10YR 4/6		Type'	Loc <sup>2</sup>	Texture	Remarks
0-12	10YR 2/1	95	1011 4/0	5	<u>C</u>	<u>PL</u>	sandy loam	
Type: C=C	oncentration, D=Dep	letion RM=F	Peduced Matrix MS	. ———— S=Masker	Sand Gr	ains	2l ocation: Pl	=Pore Lining, M=Matrix.
	Indicators: (Applic					<u>u</u>		Problematic Hydric Soils <sup>3</sup> :
Histosol	(A1)		Polyvalue Be	low Surfa	ce (S8) (I	RR S, T, U	J) 🔲 1 cm Muck	(A9) (LRR O)
	oipedon (A2)		Thin Dark Su				I F	(A10) (LRR S)
1 1	istic (A3)		Loamy Mucky			R O)	1 1	Vertic (F18) (outside MLRA 150A,B)
	en Sulfide (A4) d Layers (A5)		Loamy Gleye  ✓ Depleted Mat		F2)			Floodplain Soils (F19) (LRR P, S, T) s Bright Loamy Soils (F20)
	Bodies (A6) (LRR F	P, T, U)	Redox Dark		-6)		(MLRA	
11 -	ucky Mineral (A7) <b>(L</b> l		Depleted Dar	k Surface	(F7)		Red Parer	nt Material (TF2)
17 1	resence (A8) (LRR L	J)	Redox Depre		8)			ow Dark Surface (TF12)
	uck (A9) <b>(LRR P, T)</b> d Below Dark Surfac	o (A11)	Marl (F10) (L Depleted Och	-	/MIDA4	E4\	Other (Exp	plain in Remarks)
II .	u Below Dark Suriac ark Surface (A12)	e (ATT)	Iron-Mangan	, ,	•	•	. <b>T)</b> 3Indicator	rs of hydrophytic vegetation and
	rairie Redox (A16) (I	MLRA 150A)					•	d hydrology must be present,
	Mucky Mineral (S1) (	LRR O, S)	Delta Ochric		,			disturbed or problematic.
_	Gleyed Matrix (S4)		Reduced Ver					
19 1	Redox (S5) I Matrix (S6)		Piedmont Flo				+9A) RA 149A, 153C, 15	3D)
	rface (S7) (LRR P,	S, T, U)		J	,	, (	<b>,,</b>	,
Restrictive	Layer (if observed)	:						
Туре:			_					
Depth (in	ches):		_				Hydric Soil Pre	esent? Yes  No No
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smithfield / Johnston Sampling Date: 5/29/2018
Applicant/Owner: Wildlands Engineering Inc.	State: NC Sampling Point: Wetland J/K - DP11
Investigator(s): W. Taylor	Section, Township, Range:
Landform (hillslope, terrace, etc.): floodplain	Local relief (concave, convex, none): <u>concave</u> Slope (%): <u>&lt;1</u>
Subregion (LRR or MLRA): MLRA 133A Lat: N 35	5.472718 Long: W -78.425102 Datum:
Soil Map Unit Name: Bibb Sandy Loam (Bb)	NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of ye	ear? Yes ✓ No (If no, explain in Remarks.)
Are Vegetation Soil or Hydrology significantly	y disturbed? Are "Normal Circumstances" present? Yes No ✓
Are Vegetation Soil or Hydrology naturally pr	roblematic? (If needed, explain any answers in Remarks.)
SUMMARY OF FINDINGS – Attach site map showing	g sampling point locations, transects, important features, etc.
Hydrophytic Vegetation Present? Yes ✓ No	1
Hydric Soil Present? Yes ✓ No	Is the Sampled Area
Wetland Hydrology Present? Yes / No	within a Wetland? Yes No
Remarks:	
Vegetation significantly impacted due to livestock graz	zing.
HYDROLOGY	
Wetland Hydrology Indicators:	Secondary Indicators (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)	
✓ Surface Water (A1) Aquatic Fauna (B1	
✓ High Water Table (A2)       Marl Deposits (B15)	5) (LRR U)
Saturation (A3) Hydrogen Sulfide (	Odor (C1) Moss Trim Lines (B16)
	heres along Living Roots (C3)Dry-Season Water Table (C2)
Sediment Deposits (B2)  Presence of Reduc	
	ction in Tilled Soils (C6) Saturation Visible on Aerial Imagery (C9)
Algal Mat or Crust (B4)  Thin Muck Surface  Iron Deposits (B5)  Other (Explain in F	
Inundation Visible on Aerial Imagery (B7)	FAC-Neutral Test (D5)
Water-Stained Leaves (B9)	Sphagnum moss (D8) (LRR T, U)
Field Observations:	
Surface Water Present? Yes ✓ No Depth (inches	· ———
Water Table Present? Yes ✓ No Depth (inches	
Saturation Present? Yes Vo Depth (inches (includes capillary fringe)	s): 0-12+ Wetland Hydrology Present? Yes 📝 No
Describe Recorded Data (stream gauge, monitoring well, aerial photo	tos, previous inspections), if available:
Remarks:	

VEGETATION	(Five Strata) -	Use scientific	names of plants
VECEIAIIOII	u ive onatar –	030 3010111110	Hallics of Dialits

EGETATION (Five Strata) – Use scientific na	nes or pr	arits.		Sampling Point: Wetland J/K - DP
20'		Dominant		Dominance Test worksheet:
<u>Free Stratum</u> (Plot size: <u>30'</u> ) Salix nigra	<u>% Cover</u> 25	Yes	<u>Status</u> OBL	Number of Dominant Species That Are ORL FACW or FAC: 4
·				That Are OBL, FACW, or FAC: 4 (A)
Acer rubrum				Total Number of Dominant
Quercus phellos		<u>No</u>	FACW.	Species Across All Strata: 4 (B)
				Percent of Dominant Species
·				That Are OBL, FACW, or FAC: 100 (A/B)
	45	= Total Cov	er er	Prevalence Index worksheet:
50% of total cover: 22.5	20% of	f total cover	9	Total % Cover of: Multiply by:
apling Stratum (Plot size: 15' )				OBL species x 1 =
Acer rubrum	5	Yes	FAC	FACW species x 2 =
				FAC species x 3 =
				FACU species x 4 =
·				UPL species x 5 =
				Column Totals: (A) (B)
•				(-)
				Prevalence Index = B/A =
	5	= Total Cov	er	Hydrophytic Vegetation Indicators:
50% of total cover:	20% of	f total cover	:	1 - Rapid Test for Hydrophytic Vegetation
Shrub Stratum (Plot size: 15'				✓ 2 - Dominance Test is >50%
Ligustrum sinense	2	No	FAC	3 - Prevalence Index is ≤3.0¹
-				
				Problematic Hydrophytic Vegetation¹ (Explain)
l				Indicators of hydric soil and wetland hydrology must
i				be present, unless disturbed or problematic.
ò				Definitions of Five Vegetation Strata:
	2	= Total Cov	er	Tree – Woody plants, excluding woody vines,
50% of total cover:	20% of	f total cover	:	approximately 20 ft (6 m) or more in height and 3 in.
<u>lerb Stratum</u> (Plot size: <u>5'</u> )				(7.6 cm) or larger in diameter at breast height (DBH).
Persicaria longiseta	70	Yes	FAC	Sapling – Woody plants, excluding woody vines,
Carex bullata	5	No	OBL	approximately 20 ft (6 m) or more in height and less
Juncus effusus	2	No	OBL	than 3 in. (7.6 cm) DBH.
				Shrub – Woody plants, excluding woody vines,
·				approximately 3 to 20 ft (1 to 6 m) in height.
·				Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody
				plants, except woody vines, less than approximately
·				3 ft (1 m) in height.
· <u> </u>				Woody vine – All woody vines, regardless of height.
0				woody vine – All woody vines, regardless of height.
1				
	77	= Total Cov	er er	
50% of total cover: <u>38.5</u>		f total cover		
Voody Vine Stratum (Plot size: 30')				
	· ——			
•				
•				
i				Hydrophytic
	0	= Total Cov	er	Vegetation
				Present? Yes ✓ No
50% of total cover:	20% ላ	fitotal cover	•	11000IK1 100 T INO

SOIL Sampling Point: Wetland J/K - DP11

Profile Desc	ription: (Describe	to the depth	needed to docum	ent the	indicator	or confirm	n the absence of	f indicators.)
Depth	Matrix			Feature		<del></del>		
(inches)	Color (moist)		Color (moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
<u>0-12</u>	10YR 3/1	<u>95                                    </u>	10YR 5/6	5	<u>C</u>	<u>PL</u>	sandy loam	
								_
	-							
<sup>1</sup> Type: C=C	oncentration, D=Dep	oletion, RM=F	Reduced Matrix, MS	=Maske	d Sand Gr	ains.		L=Pore Lining, M=Matrix.
Hydric Soil	Indicators: (Applic	able to all L	RRs, unless other	wise not	ed.)		Indicators fo	or Problematic Hydric Soils <sup>3</sup> :
Histosol	(A1)		Polyvalue Bel				U)1 cm Mu	ck (A9) (LRR O)
· —	pipedon (A2)		Thin Dark Sui				I f	ck (A10) <b>(LRR S)</b>
Black Hi			Loamy Mucky			R O)	1 1	Vertic (F18) (outside MLRA 150A,B)
	n Sulfide (A4) d Layers (A5)		Loamy Gleye		(F2)			t Floodplain Soils (F19) (LRR P, S, T) bus Bright Loamy Soils (F20)
	Bodies (A6) (LRR F	T 11)	Redox Dark S	, ,	<del>-</del> 6)			A 153B)
17 1	icky Mineral (A7) (L		Depleted Dark	,	*		— ·	ent Material (TF2)
	esence (A8) (LRR l		Redox Depre				1 1	allow Dark Surface (TF12)
17 1	ick (A9) (LRR P, T)		Marl (F10) (LI		ŕ			xplain in Remarks)
11 1	d Below Dark Surfac	e (A11)	Depleted Och		•	•		
	ark Surface (A12)		Iron-Mangane					ors of hydrophytic vegetation and
	rairie Redox (A16) (							nd hydrology must be present,
	lucky Mineral (S1) ( Gleyed Matrix (S4)	LKK U, S)	Delta Ochric (	. , .				s disturbed or problematic.
	ledox (S5)		Piedmont Flo		•			
1 1	Matrix (S6)						RA 149A, 153C, 1	53D)
Dark Su	rface (S7) (LRR P,	S, T, U)	_					·
Restrictive	Layer (if observed)	:						
Туре:								
Depth (in	ches):						Hydric Soil P	resent? Yes 🔨 No
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smithfield / Johnston Sampling Date: 5/30/2018
Applicant/Owner: Wildlands Engineering Inc.	State: NC Sampling Point: Wetland L - DP12
Investigator(s): W. Taylor	Section, Township, Range:
Landform (hillslope, terrace, etc.): floodplain	Local relief (concave, convex, none): concave Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35	.472717 Long: W -78.426815 Datum:
Soil Map Unit Name: Bibb Sandy Loam (Bb)	NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of year	
	y disturbed? Are "Normal Circumstances" present? Yes No ✓
Are Vegetation Soil or Hydrology naturally pr	
	g sampling point locations, transects, important features, etc.
SOMMANT OF FINDINGS - Attach site map showing	3 sampling point locations, transects, important leatures, etc.
Hydrophytic Vegetation Present? Yes ✓ No	Is the Sampled Area
Hydric Soil Present? Yes ✓ No	within a Wetland?
Wetland Hydrology Present? Yes No	
Remarks:	zina
Vegetation significantly impacted due to livestock graz	ing.
HYDROLOGY	
Wetland Hydrology Indicators:	Secondary Indicators (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)	Surface Soil Cracks (B6)
Surface Water (A1)  Aquatic Fauna (B1)	Sparsely Vegetated Concave Surface (B8)
High Water Table (A2)  Marl Deposits (B15)	5) (LRR U)
✓ Saturation (A3) Hydrogen Sulfide (	
	neres along Living Roots (C3) Dry-Season Water Table (C2)
Sediment Deposits (B2)  Presence of Reduce	
Drift Deposits (B3) Recent Iron Reduction Algal Mat or Crust (B4) Thin Muck Surface	ction in Tilled Soils (C6) Saturation Visible on Aerial Imagery (C9)  e (C7) Geomorphic Position (D2)
Iron Deposits (B5) Other (Explain in F	
Inundation Visible on Aerial Imagery (B7)	FAC-Neutral Test (D5)
Water-Stained Leaves (B9)	Sphagnum moss (D8) (LRR T, U)
Field Observations:	
Surface Water Present? Yes Vo Depth (inches	· ————
Water Table Present? Yes V No Depth (inches	
Saturation Present? Yes Vo Depth (inches (includes capillary fringe)	s): 0-12+ Wetland Hydrology Present? Yes V No
Describe Recorded Data (stream gauge, monitoring well, aerial photo	os, previous inspections), if available:
Remarks:	

VEGETATION	(Five Strata) -	Use scientific	names of plants.

<b>/EGETATION (Five Strata)</b> – Use scientific nar	nes of pla	ants.		Sampling Point: Wetland L - DP12
201		Dominant		Dominance Test worksheet:
Tree Stratum (Plot size: 30'		Species?		Number of Dominant Species
<sub>1.</sub> Liquidambar styraciflua	70	Yes	<u>FAC</u>	That Are OBL, FACW, or FAC: 7 (A)
2. Acer rubrum	15	No	FAC	Total Novel on of Densiry and
3.				Total Number of Dominant Species Across All Strata: 7 (B)
				Species Across Air Strata.
4				Percent of Dominant Species
5				That Are OBL, FACW, or FAC: 100 (A/B)
6				Prevalence Index worksheet:
40.5		= Total Co\		Total % Cover of: Multiply by:
50% of total cover: 42.5	20% of	total cover	: 1/	
Sapling Stratum (Plot size: 15' )				OBL species x 1 =
1. Nyssa biflora	5	Yes	OBL	FACW species x 2 =
<sub>2.</sub> Liquidambar styraciflua	5	Yes	FAC	FAC species x 3 =
3.				FACU species x 4 =
				UPL species x 5 =
4				Column Totals: (A) (B)
5				(2)
6				Prevalence Index = B/A =
	10	= Total Cov	/er	Hydrophytic Vegetation Indicators:
50% of total cover: 5	20% of	total cover	. 2	1 - Rapid Test for Hydrophytic Vegetation
Shrub Stratum (Plot size: 15' )				
1. Ligustrum sinense	5	Yes	FAC	2 - Dominance Test is >50%
				3 - Prevalence Index is ≤3.0¹
2				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
3				
4				<sup>1</sup> Indicators of hydric soil and wetland hydrology must
5				be present, unless disturbed or problematic.
6				Definitions of Five Vegetation Strata:
	5	= Total Co	 /er	
50% of total cover: <u>2.5</u>				Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in.
	20 70 01	total cover	· <del>· · · · · · · · · · · · · · · · · · </del>	(7.6 cm) or larger in diameter at breast height (DBH).
Herb Stratum (Plot size: 5' )	35	Yes	FAC	(The only of larger in diameter at present neight (BBT)).
1. Microstegium vimineum				Sapling – Woody plants, excluding woody vines,
2. Persicaria longiseta	35	<u>Yes</u>	<u>FAC</u>	approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.
3				than 3 m. (7.0 dm) DBH.
4				Shrub – Woody plants, excluding woody vines,
5.				approximately 3 to 20 ft (1 to 6 m) in height.
6.				Herb – All herbaceous (non-woody) plants, including
				herbaceous vines, regardless of size, and woody
7				plants, except woody vines, less than approximately
8				3 ft (1 m) in height.
9				Woody vine - All woody vines, regardless of height.
10				**************************************
11				
	70	= Total Cov	/er	
50% of total cover: 35	20% of	total cover	· 14	
Woody Vine Stratum (Plot size: 30')	20 70 01	total oover		
	5	Yes	FAC	
1. Smilax rotundifolia		163	FAC	
2				
3				
4				
5.				Hadron bodio
	5	= Total Co		Hydrophytic Vegetation
500/ - 51-1-1 25				Present? Yes V No
50% of total cover: 2.5		total cover	· <u> </u>	
Remarks: (If observed, list morphological adaptations below	w).			

SOIL Sampling Point: Wetland L - DP12

Profile Desc	cription: (Describe	to the depth	needed to docur	nent the i	indicator	or confirm	n the absence of i	indicators.)
Depth	Matrix			x Feature			<b>-</b> .	
(inches)	Color (moist)		Color (moist)		Type'	Loc <sup>2</sup>	Texture	Remarks
0-12	10YR 2/1	90	10YR 4/6	10	<u>C</u>	<u>PL</u>	sandy loam	
								_
		- — –		· ——				
								_
	oncentration, D=Dep					ains.		=Pore Lining, M=Matrix.
1 —	Indicators: (Applic	able to all L						Problematic Hydric Soils <sup>3</sup> :
Histosol			Polyvalue Be					k (A9) (LRR O)
	oipedon (A2) istic (A3)		Thin Dark Su				I f	k (A10) <b>(LRR S)</b> Vertic (F18) <b>(outside MLRA 150A,B)</b>
1 1	en Sulfide (A4)		Loamy Gleye			( 0)		Floodplain Soils (F19) (LRR P, S, T)
	d Layers (A5)		Depleted Mat		/			s Bright Loamy Soils (F20)
	Bodies (A6) (LRR F	P, T, U)	Redox Dark		<del>-</del> 6)		(MLRA	
	ucky Mineral (A7) <b>(L</b> l		Depleted Dar				1 1	nt Material (TF2)
17 1	esence (A8) (LRR U	J)	Redox Depre		8)			low Dark Surface (TF12)
	ick (A9) (LRR P, T)	~ (Add)	Marl (F10) (L	-	(BAL D A 4	E4)	Other (Exp	plain in Remarks)
II .	d Below Dark Surfac ark Surface (A12)	e (ATT)	Depleted Oct	, ,	•	•	T) <sup>3</sup> Indicato	rs of hydrophytic vegetation and
	rairie Redox (A16) (I	VILRA 150A)						d hydrology must be present,
	/lucky Mineral (S1) (		Delta Ochric					disturbed or problematic.
	Gleyed Matrix (S4)		Reduced Ver					
19 1	Redox (S5)		Piedmont Flo					
	l Matrix (S6) rface (S7) <b>(LRR P, 3</b>	2 T IIV	Anomalous E	Bright Loar	my Solls (	F20) (IVILR	A 149A, 153C, 15	(3D)
	Layer (if observed)						T	
	Layor (II obsorvou)							
1	ches):		_				Hydric Soil Pre	esent? Yes V No
Remarks:			_				1 . ,	
Tromanio.								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smithfield / Johnston Sampling Date: 5/30/2018
Applicant/Owner: Wildlands Engineering Inc.	State: NC Sampling Point: Upland - DP13
Investigator(s): W. Taylor	Section, Township, Range:
Landform (hillslope, terrace, etc.): floodplain	Local relief (concave, convex, none): CONCAVE Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N :	35.472841 Long: W 78.426061 Datum:
Soil Map Unit Name: Bibb Sandy Loam (Bb)	NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of	
	ntly disturbed? Are "Normal Circumstances" present? Yes No ✓
	problematic? (If needed, explain any answers in Remarks.)
,	
SUMMARY OF FINDINGS – Attach site map show	ing sampling point locations, transects, important features, etc.
Hydrophytic Vegetation Present? Yes ✓ No	Is the Sampled Area
Hydric Soil Present? Yes No ✓	within a Wetland? Yes No ✓
Wetland Hydrology Present? Yes No ✓	
Remarks:	
Vegetation significantly impacted due to livestock gr	azing.
HYDROLOGY	
Wetland Hydrology Indicators:	Secondary Indicators (minimum of two required)
Primary Indicators (minimum of one is required; check all that app	
Surface Water (A1)  Aquatic Fauna	
High Water Table (A2)  Marl Deposits (	
Saturation (A3) Hydrogen Sulfic	<u> </u>
	spheres along Living Roots (C3) Dry-Season Water Table (C2)
	duced Iron (C4) Crayfish Burrows (C8)
Drift Deposits (B3)	duction in Tilled Soils (C6) Saturation Visible on Aerial Imagery (C9)
Algal Mat or Crust (B4) Thin Muck Surf	ace (C7) Geomorphic Position (D2)
Iron Deposits (B5) Other (Explain	, , , , , , , , , , , , , , , , , , , ,
Inundation Visible on Aerial Imagery (B7)	FAC-Neutral Test (D5)
Water-Stained Leaves (B9)	Sphagnum moss (D8) (LRR T, U)
Field Observations:  Surface Water Present?  Yes  No  Depth (incl	hoo):
Water Table Present? Yes No Depth (incl	· — —
Saturation Present? Yes No Depth (incl	
(includes capillary fringe)	
Describe Recorded Data (stream gauge, monitoring well, aerial pl	notos, previous inspections), if available:
Remarks:	
Tromano.	

VEGETATION	(Five Strata) -	Use scientific	names of plants.

EGETATION (Five Strata) – Use scientific na				Sampling Point: Upland - DP
<u>Free Stratum</u> (Plot size: 30')		Dominant Species?		Dominance Test worksheet:
Acer rubrum		Yes	FAC	Number of Dominant Species That Are OBL, FACW, or FAC:  (A)
				Total Number of Dominant
				Species Across All Strata: 3 (B)
				Derecht of Deminent Species
				Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B
				(13
	90	= Total Co	ver	Prevalence Index worksheet:
50% of total cover: <u>45</u>				Total % Cover of: Multiply by:
apling Stratum (Plot size: 15' )				OBL species x 1 =
				FACW species x 2 =
				FAC species x 3 =
				FACU species x 4 =
				UPL species x 5 =
				Column Totals: (A) (B)
•				(5)
				Prevalence Index = B/A =
		= Total Co	ver	Hydrophytic Vegetation Indicators:
50% of total cover:	20% of	total cover	r:	1 - Rapid Test for Hydrophytic Vegetation
hrub Stratum (Plot size: 15' )				✓ 2 - Dominance Test is >50%
Ligustrum sinense	3	No	FAC	3 - Prevalence Index is ≤3.0¹
-				
				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
				1
l				<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
i				
S				Definitions of Five Vegetation Strata:
	3			Tree – Woody plants, excluding woody vines,
50% of total cover:	20% of	total cover	r:	approximately 20 ft (6 m) or more in height and 3 in.
lerb Stratum (Plot size: 5')	4.0		E40	(7.6 cm) or larger in diameter at breast height (DBH).
Microstegium vimineum	40	Yes	FAC	Sapling – Woody plants, excluding woody vines,
·				approximately 20 ft (6 m) or more in height and less
· <u> </u>				than 3 in. (7.6 cm) DBH.
·				Shrub – Woody plants, excluding woody vines,
				approximately 3 to 20 ft (1 to 6 m) in height.
				Herb – All herbaceous (non-woody) plants, including
				herbaceous vines, regardless of size, and woody
·				plants, except woody vines, less than approximately
				3 ft (1 m) in height.
				Woody vine - All woody vines, regardless of height.
0				
1	40			
20		= Total Co		
50% of total cover: 20	20% of	total cover	r: <u>8</u>	
Voody Vine Stratum (Plot size: 30' )				
. Smilax rotundifolia	5	Yes	<u>FAC</u>	
				Hydrophytic
•	5	= Total Co	ver	Hydrophytic Vegetation
	-	- 10ta100	v 🗸 I	
50% of total cover: 2.5		total cover	1	Present? Yes Y No No

SOIL Sampling Point: Upland - DP13

Profile Desc	cription: (Describe t	o the depth	needed to docur	nent the i	ndicator	or confirm	n the absence of in	dicators.)
Depth	Matrix			x Features	5			
(inches)	Color (moist)		Color (moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
0-4	10YR 3/3						sandy loam	
4-12	10YR 3/3						sandy loam	
l <del></del>								
	oncentration, D=Depl					ains.		Pore Lining, M=Matrix.
	Indicators: (Applica	able to all LR			-			roblematic Hydric Soils <sup>3</sup> :
Histosol	(A1) pipedon (A2)		Polyvalue Be					A9) (LRR O) A10) (LRR S)
	istic (A3)		Loamy Muck					ertic (F18) (outside MLRA 150A,B)
	en Sulfide (A4)		Loamy Gleye	-		. •,		oodplain Soils (F19) (LRR P, S, T)
	d Layers (A5)		Depleted Ma		,			Bright Loamy Soils (F20)
	Bodies (A6) (LRR P,		Redox Dark	,	*		(MLRA 15	•
	ıcky Mineral (A7) <b>(LR</b>		Depleted Da				1 1	Material (TF2)
17 1	esence (A8) (LRR U)	1	Redox Depre	,	3)			w Dark Surface (TF12)
11 1	ick (A9) <b>(LRR P, T)</b> d Below Dark Surface	. (Δ11)	Marl (F10) <b>(L</b> Depleted Oc		MIRA 14	54)	Other (Expla	nin in Remarks)
	ark Surface (A12)	/ (/ \	Iron-Mangan	, ,	•	•	T) <sup>3</sup> Indicators	of hydrophytic vegetation and
	rairie Redox (A16) <b>(M</b>	ILRA 150A)	Umbric Surfa					nydrology must be present,
	lucky Mineral (S1) <b>(L</b>	RR O, S)	Delta Ochric					sturbed or problematic.
	Gleyed Matrix (S4)		Reduced Ver					
19 1	Redox (S5)	ı	Piedmont Flo					2)
	l Matrix (S6) rface (S7) <b>(LRR P, S</b> ,	T 11)	Anomalous E	srigni Loan	ny Solis (i	F∠U) (WILK	RA 149A, 153C, 153I	٥)
	Layer (if observed):	, 1, 0,					1	
	,							
1	ches):		_				Hydric Soil Pres	ent? Yes No ✓
Remarks:	<u> </u>		<del></del>				1 -	

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smithfie	eld / Johnston :	Sampling Date: <u>5/30/2018</u>
Applicant/Owner: Wildlands Engineering Inc.		State: NC 5	Sampling Point: Wetland M - DP14
Investigator(s): W. Taylor	Section, Township, Ra		
Landform (hillslope, terrace, etc.): floodplain	Local relief (concave, c	convex, none): CONCAVE	Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35.	.472836 ι	Long: W -78.437100	Datum:
Soil Map Unit Name: Gilead Sandy Loam (GeD)		NWI classifica	tion: N/A
Are climatic / hydrologic conditions on the site typical for this time of ye	ear? Yes 🗸 No	(If no, explain in Re	marks.)
Are Vegetation Soil or Hydrology significantly	disturbed? Are "	"Normal Circumstances" pro	esent? Yes No ✓
Are Vegetation Soil or Hydrology naturally pro	oblematic? (If ne	eeded, explain any answers	in Remarks.)
SUMMARY OF FINDINGS – Attach site map showing	g sampling point l	ocations, transects,	important features, etc.
Hydrophytic Vegetation Present? Yes ✓ No			
Hydric Soil Present? Yes ✓ No	Is the Sampled		1 — I
Wetland Hydrology Present? Yes / No	within a Wetlar	nd? Yes	No
Remarks:	'		
Vegetation significantly impacted due to livestock graz	ing.		
HYDROLOGY			
Wetland Hydrology Indicators:		Secondary Indicate	ors (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)		Surface Soil C	
✓ Surface Water (A1) Aquatic Fauna (B1	3)		etated Concave Surface (B8)
✓ High Water Table (A2)       Marl Deposits (B15)	5) (LRR U)	Drainage Patte	erns (B10)
Saturation (A3) Hydrogen Sulfide (	Odor (C1)	Moss Trim Lin	es (B16)
Water Marks (B1) Oxidized Rhizosph	eres along Living Roots	s (C3) Dry-Season W	/ater Table (C2)
Sediment Deposits (B2)  Presence of Reduce	` ,	Crayfish Burro	` ′
	etion in Tilled Soils (C6)		ible on Aerial Imagery (C9)
Algal Mat or Crust (B4)  Thin Muck Surface  Trust (B5)  Other (Explain in F	, ,	Geomorphic P Shallow Aquita	, ,
Inundation Visible on Aerial Imagery (B7)	(ciriains)	FAC-Neutral T	` '
Water-Stained Leaves (B9)			oss (D8) (LRR T, U)
Field Observations:			
Surface Water Present? Yes Vo Depth (inches	): <u>0.25</u>		
Water Table Present? Yes ✓ No Depth (inches			
Saturation Present? Yes V No Depth (inches	): <u>0-12+</u>   <b>W</b> e	etland Hydrology Present	? Yes No
(includes capillary fringe)  Describe Recorded Data (stream gauge, monitoring well, aerial photo	os, previous inspections	s), if available:	
Remarks:			

mes of pla			Sampling Point: Wetland M - D
			Dominance Test worksheet:
10		OBL	Number of Dominant Species That Are OBL, FACW, or FAC:  3  (A)
			Total Number of Dominant
			Species Across All Strata: 3 (B)
			Because of Bernin and On a sing
			Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/E
10	= Total Co	ver	Prevalence Index worksheet:
20% of	f total cover	r: 2	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
			5 1 1 50
		ver	Prevalence Index = B/A =
			Hydrophytic Vegetation Indicators:
20 % 01	i total covel	·	1 - Rapid Test for Hydrophytic Vegetation
			2 - Dominance Test is >50%
			3 - Prevalence Index is ≤3.01
		-	Problematic Hydrophytic Vegetation¹ (Explain)
			<sup>1</sup> Indicators of hydric soil and wetland hydrology must
			be present, unless disturbed or problematic.
			Definitions of Five Vegetation Strata:
			Tree – Woody plants, excluding woody vines,
20% of	f total cover	r:	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
40	Voo	OPI	(7.0 cm) or larger in diameter at breast neight (DBH).
			Sapling – Woody plants, excluding woody vines,
			approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.
			dian's in (1.5 sin) BBn.
_ 5	<u>No</u>	<u>OBL</u>	Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
			approximately 3 to 20 ft (1 to 6 fff) in neight.
			Herb – All herbaceous (non-woody) plants, including
- ——			herbaceous vines, regardless of size, <u>and</u> woody plants, except woody vines, less than approximately
			3 ft (1 m) in height.
			Mondy sine All weeks since regardless of height
			Woody vine – All woody vines, regardless of height.
60	= Total Co	ver	
20% of	f total cover	r: <u>12</u>	
- —			Hydrophytic Vegetation
 20% of	= Total Co		Present? Yes No No
	Absolute % Cover 10  10  20% of 20% of 5  40 10 5 5 60 20% of 60	Absolute   Dominant   % Cover   10   Yes    10   = Total Co   20% of total cover   = Total Co   20% of total cover   40   Yes   10   Yes   10   Yes   5   No   5   No   60   = Total Co   20% of total cover   20% of total cover   40   Yes   50   No   60   = Total Co   20% of total cover   60   = Total Co   20% of total cover   60   = Total Co   20% of total cover	Absolute Species? Status 10 Yes OBL  10 = Total Cover 20% of total cover: 20% of total cover:  = Total Cover 20% of total cover:  40 Yes OBL 10 Yes FAC 5 No OBL 5 No OBL 60 = Total Cover 20% of total cover:  20% of total cover:

SOIL Sampling Point: Wetland M - DP14

Profile Desc	cription: (Describe to	the depth r	needed to docun	nent the indicat	or or confirn	n the absence of in	dicators.)
Depth	Matrix			x Features			
(inches)	Color (moist)	%	Color (moist)		<u>Loc<sup>2</sup></u>	Texture	Remarks
0-4	10YR 2/1					loamy sand	
4-12	10YR 3/1					loamy sand	
							-
<del></del>							
	oncentration, D=Deple				Grains.		Pore Lining, M=Matrix.
Hydric Soil	Indicators: (Applicat	ole to all LR	_				roblematic Hydric Soils <sup>3</sup> :
Histosol	(A1)	ļ		low Surface (S8)		U) L 1 cm Muck	(A9) (LRR O)
	pipedon (A2)	ļ		rface (S9) <b>(LRR</b>		I f	(A10) (LRR S)
	stic (A3)	ļ		y Mineral (F1) <b>(L</b>	RR O)		ertic (F18) (outside MLRA 150A,B)
	en Sulfide (A4)	ļ	Loamy Gleye	, ,			oodplain Soils (F19) (LRR P, S, T)
	d Layers (A5)	ļ	Depleted Mat	, ,			Bright Loamy Soils (F20)
	Bodies (A6) (LRR P, 1		Redox Dark	` '		(MLRA 15	-
	icky Mineral (A7) (LRR	(P, T, U) [		k Surface (F7)		1 1	Material (TF2)
17 1	resence (A8) (LRR U)	l	Redox Depre				w Dark Surface (TF12)
	ick (A9) (LRR P, T)	(A44)	Marl (F10) (L		( 4 E 4 )	Other (Expir	ain in Remarks)
	d Below Dark Surface ( ark Surface (A12)	AII) [		nric (F11) <b>(MLR<i>A</i> ese Masses</b> (F12	-	T) <sup>3</sup> Indicators	of hydrophytic vegetation and
	rairie Redox (A16) <b>(ML</b>	RA 150A)		ce (F13) <b>(LRR F</b>			nydrology must be present,
	fucky Mineral (S1) <b>(LR</b>			(F17) <b>(MLRA 15</b>			sturbed or problematic.
	Gleyed Matrix (S4)	[		tic (F18) <b>(MLRA</b>			starbed of problematic.
	Redox (S5)	Ī		odplain Soils (F			
1 1	Matrix (S6)	أ	_			RA 149A, 153C, 153	D)
	rface (S7) (LRR P, S,	T, U)			- (·/ <b>(</b>	<b>,,</b>	-,
	Layer (if observed):	,					
Depth (in			_			Hydric Soil Pres	ent? Yes ✓ No
			<b>-</b>			Tiyanc Con Fies	ent: res_vNo
Remarks:							

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smit	hfield / Johnston	Sampling Date: <u>5/30/2018</u>
Applicant/Owner: Wildlands Engineering Inc.		State: NC	Sampling Point: Wetland N - DP15
Investigator(s): W. Taylor	Section, Township,	, Range:	
Landform (hillslope, terrace, etc.): floodplain	Local relief (concav	ve, convex, none): concave	Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35	.471325	Long: W -78.437110	Datum:
Soil Map Unit Name: Gilead Sandy Loam (GeD)		NWI classific	
Are climatic / hydrologic conditions on the site typical for this time of y	ear? Yes ✓ N	lo (If no, explain in R	
		Are "Normal Circumstances" p	
		If needed, explain any answe	<del></del>
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	·		•
SUMMARY OF FINDINGS – Attach site map showing	g sampling poir	nt locations, transects	, important features, etc.
Hydrophytic Vegetation Present? Yes ✓ No	]   le the Samu	alad Araa	
Hydric Soil Present? Yes ✓ No	Is the Samp within a We		No
Wetland Hydrology Present? Yes   ✓ No			
Remarks:	•		
HYDROLOGY			
		Socondary Indica	tors /minimum of two required)
Wetland Hydrology Indicators:  Primary Indicators (minimum of one is required; check all that apply)			tors (minimum of two required) Cracks (R6)
Primary Indicators (minimum of one is required; check all that apply)  ✓ Surface Water (A1)  Aquatic Fauna (B <sup>2</sup> )		Surface Soil	getated Concave Surface (B8)
✓ High Water Table (A2)  Aquatic Fauna (B)  Aquatic Fauna (B)  Marl Deposits (B1)		✓ Drainage Pat	, ,
✓ Saturation (A3) Hydrogen Sulfide		Moss Trim Li	, ,
	heres along Living R	=	Water Table (C2)
Sediment Deposits (B2) Presence of Redu		Crayfish Buri	
Drift Deposits (B3)	ction in Tilled Soils (0	C6) Saturation Vi	sible on Aerial Imagery (C9)
Algal Mat or Crust (B4) Thin Muck Surface	, ,		Position (D2)
Iron Deposits (B5) Other (Explain in I	Remarks)	Shallow Aqui	, ,
Inundation Visible on Aerial Imagery (B7)  Water-Stained Leaves (B9)		FAC-Neutral	Test (D5) noss (D8) <b>(LRR T, U)</b>
Field Observations:		Spriagrium	loss (Do) (LRK 1, U)
Surface Water Present? Yes V No Depth (inches	s): 0.25		
Water Table Present? Yes ✓ No Depth (inches			
Saturation Present? Yes ✓ No Depth (inches		Wetland Hydrology Presen	nt? Yes ✓ No
(includes capillary fringe)		iona) if available:	
Describe Recorded Data (stream gauge, monitoring well, aerial phot	los, previous inspect	ions), if available:	
Remarks:			
Nemarks.			

VEGETATION	(Five Strata) -	Use scientific	names of plants.

/EGETATION (Five Strata) – Use scientific na	mes of pla	ants.		Sampling Point: Wetland N - I	DP15
0.01	Absolute	Dominant	Indicator	Dominance Test worksheet:	
<u>Tree Stratum</u> (Plot size: <u>30'</u> )	% Cover	Species?		Number of Dominant Species	
1. Acer rubrum	30	Yes	FAC	That Are OBL, FACW, or FAC: $\frac{7}{}$ (A)	)
2. Nyssa biflora	10	No	OBL		
3. Quercus phellos	10	No	FACV	Total Number of Dominant Species Across All Strata:  8 (B)	١
4 Salix nigra	10			Opecies Across Air Strata.	,
"		<u>No</u>	<u>OBL</u>	Percent of Dominant Species	
5				That Are OBL, FACW, or FAC: 88 (A/	/B)
6				Prevalence Index worksheet:	
	<u>60</u>	= Total Cov	er er		
50% of total cover: <u>30</u>	20% of	total cover	12	Total % Cover of: Multiply by:	
Sapling Stratum (Plot size: 15' )				OBL species x 1 =	
1. Acer rubrum	5	Yes	FAC	FACW species x 2 =	
- Liquidambar etyraciflua	5	Yes	EAC	FAC species x 3 =	
				FACU species x 4 =	
3				UPL species x 5 =	
4				1	Β,
5				Column Totals: (A) (E	۵)
6				Dravalance Index = B/A =	
		= Total Cov	er	Prevalence Index = B/A =	
50% of total cover: 5			_	Hydrophytic Vegetation Indicators:	
	20% of	total cover		1 - Rapid Test for Hydrophytic Vegetation	
Shrub Stratum (Plot size: 15')	4.5		E A O\A/	2 - Dominance Test is >50%	
1. Arundinaria tecta	15	Yes	FACW	3 - Prevalence Index is ≤3.01	
2. Persea borbonia	5	Yes	FACW	Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	
3					
4.				1	
_				Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	i
5				' '	
6				Definitions of Five Vegetation Strata:	
	<u>20</u>	= Total Cov	er/	Tree – Woody plants, excluding woody vines,	
50% of total cover: <u>10</u>	20% of	total cover	4	approximately 20 ft (6 m) or more in height and 3 in.	
Herb Stratum (Plot size: 5')				(7.6 cm) or larger in diameter at breast height (DBH).	
1.Microstegium vimineum	60	Yes	FAC	Continue 10/control of the control o	
				Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less	
2	- ——			than 3 in. (7.6 cm) DBH.	
3					
4				Shrub – Woody plants, excluding woody vines,	
5				approximately 3 to 20 ft (1 to 6 m) in height.	
6				Herb - All herbaceous (non-woody) plants, including	1
7.				herbaceous vines, regardless of size, and woody	
·				plants, except woody vines, less than approximately	
8				3 ft (1 m) in height.	
9				Woody vine - All woody vines, regardless of height.	
10				vvosay viiis v iii vosay viiiso, regaraises ei rieigiii.	
11					
	60	= Total Cov	er er		
50% of total cover: <u>30</u>		total cover			
	20 70 01	total cover			
Woody Vine Stratum (Plot size: 30' )	4.5	Vaa	EAO		
1. Vitis rotundifolia	15	Yes	FAC		
2. Parthenocissus quinquefolia	5	Yes	FACU		
3					
4.					
5	20			Hydrophytic	
40		= Total Cov		Vegetation Present? Yes No	
50% of total cover: 10	20% of	total cover	<u> 4                                   </u>	11050H: 165 ¥ HO	
Remarks: (If observed, list morphological adaptations believed)	ow).				

SOIL Sampling Point: Wetland N - DP15

Profile Desc	cription: (Describe	to the depth	needed to docun	nent the i	ndicator	or confirn	n the absence of i	ndicators.)
Depth	<u>Matrix</u>			x Feature				D
(inches)	Color (moist)		Color (moist) 10YR 4/6		Type'	Loc <sup>2</sup>	Texture	Remarks
0-12	10YR 2/2	95	1011 4/0	5	<u>C</u>	<u>PL</u>	sandy loam	
Type: C=C	oncentration, D=Dep	letion RM=5	Peduced Matrix MS	. ———— S=Masker	Sand Gr	ains	2l ocation: Pl	=Pore Lining, M=Matrix.
	Indicators: (Applic					u		Problematic Hydric Soils <sup>3</sup> :
Histosol	(A1)		Polyvalue Be	low Surfa	ce (S8) <b>(I</b>	RR S, T, U	ل) 🔲 1 cm Muck	(A9) (LRR O)
	oipedon (A2)		Thin Dark Su				I F	(A10) (LRR S)
1 1	istic (A3)		Loamy Mucky			R O)	1 1	Vertic (F18) (outside MLRA 150A,B)
	en Sulfide (A4) d Layers (A5)		Loamy Gleye  ✓ Depleted Mat		F2)			Floodplain Soils (F19) (LRR P, S, T) s Bright Loamy Soils (F20)
	Bodies (A6) (LRR F	P, T, U)	Redox Dark		6)		(MLRA	
11 -	ucky Mineral (A7) <b>(L</b>		Depleted Dar	k Surface	(F7)		Red Parer	nt Material (TF2)
17 1	resence (A8) (LRR U	J)	Redox Depre		8)			ow Dark Surface (TF12)
	uck (A9) <b>(LRR P, T)</b> d Below Dark Surfac	o (A11)	Marl (F10) (L Depleted Och	-	/MIDA 4	E4\	Other (Exp	plain in Remarks)
II .	u Below Dark Suriac ark Surface (A12)	e (ATT)	Iron-Mangan	, ,	•	•	. <b>T)</b> 3Indicator	rs of hydrophytic vegetation and
	rairie Redox (A16) (	MLRA 150A)						d hydrology must be present,
	Mucky Mineral (S1) (	LRR O, S)	Delta Ochric		,			disturbed or problematic.
	Gleyed Matrix (S4)		Reduced Ver					
19 1	Redox (S5) I Matrix (S6)		Piedmont Flo				+9A) RA 149A, 153C, 15	3D)
	rface (S7) (LRR P,	S, T, U)		J	,	, (	<b>,,</b>	,
Restrictive	Layer (if observed)	:						
Туре:			_					
Depth (in	ches):		_				Hydric Soil Pre	esent? Yes  No No
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smith	field / Johnston	Sampling Date: <u>5/30/2018</u>
Applicant/Owner: Wildlands Engineering Inc.		State: NC	Sampling Point: Wetland O/P - DP16
Investigator(s): W. Taylor	Section, Township, F	Range:	
Landform (hillslope, terrace, etc.): floodplain	Local relief (concave	e, convex, none): concave	Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35	.470409	Long: W -78.436950	Datum:
Soil Map Unit Name: Nason Silt Loam (NnE)		NWI classifica	ation: N/A
Are climatic / hydrologic conditions on the site typical for this time of ye	ear? Yes ✓ No	(If no, explain in Re	emarks.)
Are Vegetation Soil or Hydrology significantly	/ disturbed? Ar	e "Normal Circumstances" p	resent? Yes ✓ No
Are Vegetation Soil or Hydrology naturally pr	oblematic? (If	needed, explain any answer	rs in Remarks.)
SUMMARY OF FINDINGS – Attach site map showing	g sampling point	t locations, transects,	, important features, etc.
Hydrophytic Vegetation Present?  Hydric Soil Present?  Wes ✓ No  Yes ✓ No  Wetland Hydrology Present?  Yes ✓ No	Is the Sampl within a Wet		No
Remarks:			
HYDROLOGY			
Wetland Hydrology Indicators:		Secondary Indicat	tors (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)		Surface Soil (	Cracks (B6)
Surface Water (A1) Aquatic Fauna (B1		= ' ' '	etated Concave Surface (B8)
High Water Table (A2)  Marl Deposits (B19)		Drainage Pat	
✓ Saturation (A3)	Odor (C1) neres along Living Ro	Moss Trim Lin	Nater Table (C2)
Sediment Deposits (B2)   Presence of Reduc		Crayfish Burn	
	ction in Tilled Soils (C	<u> </u>	sible on Aerial Imagery (C9)
Algal Mat or Crust (B4)  Thin Muck Surface	,	Geomorphic	
Iron Deposits (B5) Other (Explain in F	, ,	Shallow Aquit	, ,
Inundation Visible on Aerial Imagery (B7)	,	FAC-Neutral	, ,
Water-Stained Leaves (B9)		Sphagnum m	oss (D8) (LRR T, U)
Field Observations:			
Surface Water Present? Yes No Depth (inches	s):		
Water Table Present? Yes No✓ Depth (inches			
Saturation Present? Yes Vo Depth (inches (includes capillary fringe)	s): <u>0-12+                                    </u>	Netland Hydrology Presen	t? Yes <u>√</u> No
Describe Recorded Data (stream gauge, monitoring well, aerial photo	os, previous inspectio	ns), if available:	
Remarks:			

<b>VEGETATION</b>	(Five Strata	) - Use	scientific	names	of r	olants.
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301	Absolute	Dominant	Indicator	Dominance Test worksheet:
Tree Stratum (Plot size: 30'		Species?		Number of Dominant Species 7
1. Acer rubrum	5	Yes	<u>FAC</u>	That Are OBL, FACW, or FAC: 7 (A)
2				Total Number of Dominant
3				Species Across All Strata: 7 (B)
4				
5				Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)
6				That Ale OBL, FACW, of FAC. (AVB)
· .	5	– Total Co		Prevalence Index worksheet:
50% of total cover: 2.5				Total % Cover of: Multiply by:
	20% of	total cover	:	OBL species x 1 =
Sapling Stratum (Plot size: 15')	10	Yes	FAC	FACW species x 2 =
1. <u>Liquidambar styraciflua</u>				FAC species x 3 =
2				
3				FACU species x 4 =
4				UPL species x 5 =
5				Column Totals: (A) (B)
6.				Drawalanaa Inday — D/A —
	10	= Total Co		Prevalence Index = B/A =
50% of total cover: 5			_	Hydrophytic Vegetation Indicators:
15'	20 70 01	total cover	• =	1 - Rapid Test for Hydrophytic Vegetation
Shrub Stratum (Plot size: 15 )  1. Liquidambar styraciflua	5	Yes	FAC	2 - Dominance Test is >50%
			FAC	3 - Prevalence Index is ≤3.0 <sup>1</sup>
2. Ligustrum sinense		Yes	<u>FAC</u>	Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
3				
4				<sup>1</sup> Indicators of hydric soil and wetland hydrology must
5				be present, unless disturbed or problematic.
6				Definitions of Five Vegetation Strata:
		= Total Co	ver	
50% of total cover: 5			_	Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in.
Herb Stratum (Plot size: 5'				(7.6 cm) or larger in diameter at breast height (DBH).
1.Microstegium vimineum	50	Yes	FAC	
Mecardonia acuminata		Yes		Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less
				than 3 in. (7.6 cm) DBH.
3				
4				Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
5				approximately 3 to 20 ft (1 to 6 fff) in fleight.
6				Herb – All herbaceous (non-woody) plants, including
7				herbaceous vines, regardless of size, and woody
8				plants, except woody vines, less than approximately 3 ft (1 m) in height.
9.				
10				Woody vine – All woody vines, regardless of height.
11				
· · · · · · · · · · · · · · · · · · ·	90			
45		= Total Co		
50% of total cover: <u>45</u>	20% of	total cover	10	
Woody Vine Stratum (Plot size: 30'	40	V	E40	
1. Ampelopsis arborea	10	Yes	<u>FAC</u>	
2				
3				
4				
5.				Hydrophytic
	10	= Total Co		Vegetation
50% of total cover: <u>5</u>		total cover		Present? Yes ✓ No
		total covel	· <u>-</u>	
Remarks: (If observed, list morphological adaptations belo	<b>ν</b> ().			

Sampling Point: Wetland O/P - DP16

Sampling Point: Wetland O/P - DP16

SOIL

Profile Desc	ription: (Describe	to the depth	needed to docum	nent the	indicator	or confirm	the absence of inc	dicators.)
Depth	Matrix			κ Feature	s			
(inches)	Color (moist)	%	Color (moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
0-12	10YR 2/2	90	10YR 4/6	10	<u> </u>	<u>PL</u>	sandy loam	
				-				
1T. mai. C-C.			laduand Matrix MC		- <del> </del>		2l postion: DL-D	Open Lining ManMatrix
	oncentration, D=Dep ndicators: (Applic					ams.		ore Lining, M=Matrix. roblematic Hydric Soils <sup>3</sup> :
Histosol		able to all L	Polyvalue Be			DD C T I		-
_	ipedon (A2)		Thin Dark Su					A3) (LRR S)
Black Hi			Loamy Mucky				I F	rtic (F18) (outside MLRA 150A,B)
	n Sulfide (A4)		Loamy Gleye			,		oodplain Soils (F19) (LRR P, S, T)
	Layers (A5)		Depleted Mat		` /			Bright Loamy Soils (F20)
- r	Bodies (A6) (LRR P	P, T, U)	Redox Dark S	Surface (I	F6)		(MLRA 15	
5 cm Mu	cky Mineral (A7) <b>(L</b> I	RR P, T, U)	Depleted Dar	k Surface	e (F7)		Red Parent I	Material (TF2)
I	esence (A8) <b>(LRR L</b>	J)	Redox Depre		8)			v Dark Surface (TF12)
	ck (A9) (LRR P, T)		Marl (F10) (L	-			Other (Expla	in in Remarks)
	Below Dark Surfac	e (A11)	Depleted Och				- 31 p (	
	rk Surface (A12)	MI DA 450A)	Iron-Mangane				•	of hydrophytic vegetation and
	airie Redox (A16) <b>(I</b> lucky Mineral (S1) <b>(</b> I		Umbric Surfa Delta Ochric			, 0)		ydrology must be present, sturbed or problematic.
	lleyed Matrix (S4)	LIKIK (J., (J.)	Reduced Ver			NA 150B)		starbed or problematic.
	edox (S5)		Piedmont Flo		•			
	Matrix (S6)		_	•	. ,	•	A 149A, 153C, 153E	0)
Dark Sui	face (S7) (LRR P,	S, T, U)	_	_				
Restrictive I	ayer (if observed)							
Туре:								
Depth (inc	ches):		_				Hydric Soil Prese	ent? Yes ▼ No No
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smit	thfield / Johnston	Sampling Date: <u>5/30/2018</u>
Applicant/Owner: Wildlands Engineering Inc.		State: NC	Sampling Point: Wetland Q - DP17
Investigator(s): W. Taylor	Section, Township,	, Range:	
Landform (hillslope, terrace, etc.): floodplain	Local relief (concav	ve, convex, none): concave	Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35	.468516	Long: W -78.436989	Datum:
Soil Map Unit Name: Nason Silt Loam (NnE)		NWI classifica	
Are climatic / hydrologic conditions on the site typical for this time of ye	ear? Yes	lo (If no, explain in Re	
		Are "Normal Circumstances" pr	
Are Vegetation Soil or Hydrology naturally pr		If needed, explain any answer	
			•
SUMMARY OF FINDINGS – Attach site map showing	g sampling poli	nt locations, transects,	important features, etc.
Hydrophytic Vegetation Present? Yes ✓ No	Is the Sam	nlad Araa	
Hydric Soil Present? Yes ✓ No	within a We		No
Wetland Hydrology Present? Yes ✓ No			<u> </u>
Remarks:			
HYDROLOGY			
Wetland Hydrology Indicators:		Secondary Indicat	tors (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)		Surface Soil 0	
✓ Surface Water (A1) Aquatic Fauna (B1			etated Concave Surface (B8)
✓ High Water Table (A2)     Marl Deposits (B15)	•	Drainage Patt	· · /
Saturation (A3) Hydrogen Sulfide	Odor (C1)	Moss Trim Lir	nes (B16)
Water Marks (B1) Oxidized Rhizosph	neres along Living R	oots (C3) Dry-Season V	Vater Table (C2)
Sediment Deposits (B2)	, ,	Crayfish Burro	` ′
	ction in Tilled Soils (	· —	sible on Aerial Imagery (C9)
Algal Mat or Crust (B4)  Thin Muck Surface  Other (Explain in F	, ,	Geomorphic F	, ,
Iron Deposits (B5) Other (Explain in F Inundation Visible on Aerial Imagery (B7)	temarks)	Shallow Aquit	` '
Water-Stained Leaves (B9)			oss (D8) (LRR T, U)
Field Observations:			
Surface Water Present? Yes ✓ No Depth (inches	s): <u>0.5</u>		
Water Table Present? Yes ✓ No Depth (inches	s): <u>0-12+</u>		
Saturation Present? Yes Vo Depth (inches	s): <u>0-12+</u>	Wetland Hydrology Present	t? Yes <u>√</u> No
(includes capillary fringe)  Describe Recorded Data (stream gauge, monitoring well, aerial phot	os, previous inspect	ions), if available:	
		,,	
Remarks:			

EGETATION (Five Strata) – Use scientific n	<u> </u>			Sampling Point: Wetland Q - DP
<u> Free Stratum</u> (Plot size: <u>30'</u> )		Dominant Species?		Dominance Test worksheet:
Nyssa biflora	15	Yes	OBL	Number of Dominant Species That Are OBL, FACW, or FAC:  3 (A)
2 3				Total Number of Dominant
				Species Across All Strata: (B)  Percent of Dominant Species
•				That Are OBL, FACW, or FAC: 100 (A/B)
i				Prevalence Index worksheet:
50% of total cover: 7.5		= Total Cov		Total % Cover of: Multiply by:
Sapling Stratum (Plot size: 15' )	20% 0	r total cover		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 =
	0	= Total Cov	/er	Hydrophytic Vegetation Indicators:
50% of total cover:	20% of	f total cover	:	1 - Rapid Test for Hydrophytic Vegetation
Shrub Stratum (Plot size: 15'	10	Vaa	FAC	✓2 - Dominance Test is >50%
Ligustrum sinense		Yes	FACW	3 - Prevalence Index is ≤3.0 <sup>1</sup>
Persea borbonia		Yes	FACVV	Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
3				
				Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
5 5				Definitions of Five Vegetation Strata:
	20	= Total Cov	/er	
50% of total cover: <u>10</u>				Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in.
Herb Stratum (Plot size: 5' )	0	NI.	FAC	(7.6 cm) or larger in diameter at breast height (DBH).
Microstegium vimineum  Boehmeria cylindrica	$-\frac{2}{2}$	No		Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less
` <del></del>		<u>No</u>	FACW	than 3 in. (7.6 cm) DBH.
·				Shrub – Woody plants, excluding woody vines,
				approximately 3 to 20 ft (1 to 6 m) in height.
				Herb – All herbaceous (non-woody) plants, including
				herbaceous vines, regardless of size, <u>and</u> woody
				plants, except woody vines, less than approximately 3 ft (1 m) in height.
o				Woody vine – All woody vines, regardless of height.
1.				
	4	= Total Cov	/er	
50% of total cover:	20% of	f total cover	:	
Voody Vine Stratum (Plot size: 30' )				
k				
·				
i				Hydrophytic
50% of total cover:		= Total Cov		Vegetation Present?  Yes  ✓ No
	2004 전	t total cover		

SOIL Sampling Point: Wetland Q - DP17

		to the dept	h needed to docum			or confirn	n the absence	of indicators.)
Depth (inches)	Matrix Color (moist)	%	Redox Color (moist)	<u>Feature</u>	S Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
0-6	10YR 3/1	95	10YR 4/6	5	С	PL	loam	
6-12	10YR 3/2	98	10YR 4/6	2	С	PL	loam	
			Reduced Matrix, MS			ains.	<sup>2</sup> Location:	PL=Pore Lining, M=Matrix.
		able to all	LRRs, unless other					for Problematic Hydric Soils <sup>3</sup> :
Histosol	(A1) pipedon (A2)		Polyvalue Bel				. —	luck (A9) <b>(LRR O)</b> luck (A10) <b>(LRR S)</b>
	istic (A3)		Loamy Mucky				I f	ed Vertic (F18) (outside MLRA 150A,B)
	en Sulfide (A4)		Loamy Gleye		(F2)			ont Floodplain Soils (F19) (LRR P, S, T)
I ——	d Layers (A5) Bodies (A6) <b>(LRR F</b>	) T III	Depleted Mat	٠,	<del>-</del> 6)			lous Bright Loamy Soils (F20)
1 7 7	ucky Mineral (A7) (L						`	arent Material (TF2)
17 1	esence (A8) (LRR U	J)	Redox Depre		(8)			hallow Dark Surface (TF12)
	uck (A9) <b>(LRR P, T)</b> d Below Dark Surfac	e (Δ11)	Marl (F10) <b>(L</b> Depleted Och	-	(MIRA1	51)	Other (	Explain in Remarks)
II I	ark Surface (A12)	,	Iron-Mangane				T) <sup>3</sup> Indic	ators of hydrophytic vegetation and
	rairie Redox (A16) (					<sup>-</sup> , U)		and hydrology must be present,
	Mucky Mineral (S1) ( Gleyed Matrix (S4)	LRR O, S)	Delta Ochric (			50A. 150B)		ess disturbed or problematic.
	Redox (S5)		Piedmont Flo		•			
	Matrix (S6)		Anomalous B	right Loa	my Soils (	F20) (MLR	RA 149A, 153C,	, 153D)
	rface (S7) (LRR P, S Layer (if observed)							
Type:	ayor (ii oboor rou)							
Depth (in	ches):						Hydric Soil	Present? Yes No No
Remarks:							<u> </u>	

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smit	hfield / Johnston	Sampling Date: <u>5/30/2018</u>
Applicant/Owner: Wildlands Engineering Inc.		State: NC	Sampling Point: Wetland R - DP18
Investigator(s): W. Taylor	Section, Township,	Range:	
Landform (hillslope, terrace, etc.): floodplain	Local relief (concav	re, convex, none): concave	Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35	.468496	Long: W -78.435843	Datum:
Soil Map Unit Name: Wehadkee Loam (Wt)		NWI classifica	
Are climatic / hydrologic conditions on the site typical for this time of ye	ear? Yes ✓ N	o (If no, explain in Re	
		are "Normal Circumstances" pi	
		f needed, explain any answer	
			,
SUMMARY OF FINDINGS – Attach site map showing	g sampling poir	it locations, transects,	important features, etc.
Hydrophytic Vegetation Present? Yes ✓ No	Is the Samp	alad Araa	
Hydric Soil Present? Yes ✓ No	within a We		No
Wetland Hydrology Present? Yes ✓ No			<u> </u>
Remarks:			
HYDROLOGY			
Wetland Hydrology Indicators:		Secondary Indicat	ors (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)		Surface Soil (	
✓ Surface Water (A1) Aquatic Fauna (B1			etated Concave Surface (B8)
✓ High Water Table (A2)     Marl Deposits (B1)	,	✓ Drainage Patt	· · ·
Saturation (A3) Hydrogen Sulfide	Odor (C1)	Moss Trim Lir	
Water Marks (B1) Oxidized Rhizosph	neres along Living Ro	oots (C3) Dry-Season V	Vater Table (C2)
Sediment Deposits (B2)  Presence of Reduction	ced Iron (C4)	Crayfish Burro	ows (C8)
	ction in Tilled Soils (C	· —	sible on Aerial Imagery (C9)
Algal Mat or Crust (B4)  Thin Muck Surface  Other (Fundament	, ,	Geomorphic F	` '
Iron Deposits (B5) Other (Explain in F Inundation Visible on Aerial Imagery (B7)	Remarks)	Shallow Aquit	` '
Water-Stained Leaves (B9)			oss (D8) (LRR T, U)
Field Observations:		ориадиан	
Surface Water Present? Yes ✓ No Depth (inches	s): <u>0.25</u>		
Water Table Present? Yes ✓ No Depth (inches	s): <u>0-12+</u>		
Saturation Present? Yes Vo Depth (inches	s): <u>0-12+</u>	Wetland Hydrology Present	?? Yes ✓ No
(includes capillary fringe)  Describe Recorded Data (stream gauge, monitoring well, aerial phot	os, previous inspecti	ons), if available:	
gange, memoring tren, acrea, price	, p	ono,, n aramano.	
Remarks:			

VEGETATION	(Five Strata) -	Use scientific	names of plants.

<b>EGETATION (Five Strata) –</b> Use scientific nar	nes or pro	arits.		Sampling Point: Wetland R - DP		
20'		Dominant		Dominance Test worksheet:		
Tree Stratum (Plot size: 30' 1. Liquidambar styraciflua	<u>% Cover</u> 10	Species? Yes	Status FAC	Number of Dominant Species That Are OBL, FACW, or FAC:  4 (A)		
2				Total Number of Dominant		
3 1				Species Across All Strata: (B)  Percent of Dominant Species		
5 S				That Are OBL, FACW, or FAC: 100 (A/B)		
	10	= Total Co		Prevalence Index worksheet:		
50% of total cover: 5				Total % Cover of: Multiply by:		
Sapling Stratum (Plot size: 15' )	20 70 01	10101 00101		OBL species x 1 =		
				FACW species x 2 =		
2.				FAC species x 3 =		
3.				FACU species x 4 =		
·				UPL species x 5 =		
· 				Column Totals: (A) (B)		
5.				Prevalence Index = B/A =		
	0	= Total Co\	⁄er	Hydrophytic Vegetation Indicators:		
50% of total cover:	20% of	total cover	:	1 - Rapid Test for Hydrophytic Vegetation		
Shrub Stratum (Plot size: 15' )				2 - Dominance Test is >50%		
Ligustrum sinense	10	Yes	FAC	3 - Prevalence Index is ≤3.0¹		
2.				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)		
3				Troblematic Hydrophytic regulation (Explain)		
4. <u> </u>				Indicators of hydric soil and wetland hydrology must		
5				be present, unless disturbed or problematic.		
S				Definitions of Five Vegetation Strata:		
	10	= Total Co\	er			
50% of total cover: 5			_	Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).		
Herb Stratum (Plot size: 5' ) HMicrostegium vimineum	80	Yes	FAC			
Carex bullata	10	No	OBL	<ul> <li>Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less</li> </ul>		
Rersicaria longiseta	5	No	FAC	than 3 in. (7.6 cm) DBH.		
, i ersicana longiseta	<u> </u>	INU	FAC	Shrub – Woody plants, excluding woody vines,		
5.				approximately 3 to 20 ft (1 to 6 m) in height.		
S				Herb – All herbaceous (non-woody) plants, including		
7.				herbaceous vines, regardless of size, and woody		
3				plants, except woody vines, less than approximately		
o o				3 ft (1 m) in height.		
10				Woody vine - All woody vines, regardless of height.		
1.						
	95	= Total Co				
50% of total cover: 47.5		total cover				
	20% 01	total cover	. 13			
<u>Noody Vine Stratum</u> (Plot size: <u>30'</u> ) . Vitis rotundifolia	10	Yes	FAC			
Smilax rotundifolia	2	No	FAC			
"		140	-7.0			
3						
4						
5	10			Hydrophytic		
	12	= Total Co\	⁄er	Vegetation Present? Yes   ✓ No		
50% of total cover: 6		total cover		I Present? Yesl ▼ I Nol I		

SOIL Sampling Point: Wetland R - DP18

Profile Des	cription: (Describe	to the dept	h needed to docur	nent the i	indicator	or confirm	n the absence of i	ndicators.)
Depth	Matrix			<u>x Feature</u>		12	T	Dama anka
(inches)	Color (moist)	- <u>%</u> - 95	Color (moist) 10YR 4/6	. <u>%</u> 5	Type' C	Loc <sup>2</sup>	Texture	Remarks
0-6	10YR 2/2	_ 95	10111 4/0	<u> </u>	<del></del>	<u>PL</u>	sandy loam	
6-12	2.5Y 2/1						sandy	
				_				
								_
<sup>1</sup> Type: C=C	oncentration, D=De	pletion. RM=	Reduced Matrix. M	S=Masked	d Sand Gr	ains.	<sup>2</sup> Location: PL:	=Pore Lining, M=Matrix.
	Indicators: (Appli							Problematic Hydric Soils <sup>3</sup> :
Histosol			Polyvalue Be	low Surfa	ce (S8) <b>(I</b>	.RR S, T, I	U)1 cm Muck	(A9) (LRR O)
	pipedon (A2)		Thin Dark Su				I F	(A10) (LRR S)
	istic (A3) en Sulfide (A4)		Loamy Muck			R O)	1 1	/ertic (F18) (outside MLRA 150A,B) Floodplain Soils (F19) (LRR P, S, T)
	d Layers (A5)		Depleted Ma		,FZ)			s Bright Loamy Soils (F20)
11 F	Bodies (A6) (LRR	P, T, U)	Redox Dark		<del>-</del> 6)		(MLRA 1	
	ucky Mineral (A7) <b>(L</b>		Depleted Da				1 1	t Material (TF2)
17 1	resence (A8) (LRR	•	Redox Depre	,	8)			ow Dark Surface (TF12)
	uck (A9) <b>(LRR P, T)</b> d Below Dark Surfa		Marl (F10) (L		(MIRA 1	51)	Other (Exp	olain in Remarks)
II .	ark Surface (A12)	CC (A11)	Iron-Mangan		•		, <b>T</b> ) <sup>3</sup> Indicator	s of hydrophytic vegetation and
	rairie Redox (A16)	(MLRA 150A	) 🔲 Umbric Surfa	ce (F13)	(LRR P, 1	, U)		hydrology must be present,
	Mucky Mineral (S1)	(LRR O, S)	Delta Ochric	. , ,	,			disturbed or problematic.
	Gleyed Matrix (S4) Redox (S5)		Reduced Ver				,	
19 1	Matrix (S6)						RA 149A, 153C, 15	3D)
	rface (S7) (LRR P,	S, T, U)		J		, , ,	, ,	,
Restrictive	Layer (if observed	):						
1								
	ches):		<u> </u>				Hydric Soil Pre	sent? Yes  No No
Remarks:								
1								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smithfield / Johnston Sampling Date: 5/30/2018
Applicant/Owner: Wildlands Engineering Inc.	State: NC Sampling Point: Wetland S/T/U 19
Investigator(s): W. Taylor	Section, Township, Range:
Landform (hillslope, terrace, etc.): floodplain	Local relief (concave, convex, none): CONCAVE Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 3	35.468496 Long: W -78.435843 Datum:
Soil Map Unit Name: Wehadkee Loam (Wt)	NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time o	
	ntly disturbed? Are "Normal Circumstances" present? Yes No ✓
	problematic? (If needed, explain any answers in Remarks.)
	ing sampling point locations, transects, important features, etc.
SOMMARY OF FINDINGS - Attach site map show	ng sampling point locations, transects, important leatures, etc.
Hydrophytic Vegetation Present? Yes ✓ No	Is the Sampled Area
Hydric Soil Present? Yes ✓ No	within a Wetland? Yes ✓ No
Wetland Hydrology Present? Yes No	
Remarks:	
Vegetation significantly disturbed due to livestock gr	azing.
HYDROLOGY	
Wetland Hydrology Indicators:	Secondary Indicators (minimum of two required)
Primary Indicators (minimum of one is required; check all that app	ly) Surface Soil Cracks (B6)
Surface Water (A1)  Aquatic Fauna	(B13) Sparsely Vegetated Concave Surface (B8)
High Water Table (A2)  Marl Deposits (	B15) (LRR U) Drainage Patterns (B10)
✓ Saturation (A3) Hydrogen Sulfice	de Odor (C1) Moss Trim Lines (B16)
Water Marks (B1) Oxidized Rhizos	spheres along Living Roots (C3)Dry-Season Water Table (C2)
✓ Sediment Deposits (B2) Presence of Re	duced Iron (C4) Crayfish Burrows (C8)
	duction in Tilled Soils (C6) Saturation Visible on Aerial Imagery (C9)
Algal Mat or Crust (B4) Thin Muck Surfa	
Iron Deposits (B5) Other (Explain i	· L · · · · · · · · · · · · · · · · · ·
Inundation Visible on Aerial Imagery (B7) Water-Stained Leaves (B9)	FAC-Neutral Test (D5) Sphagnum moss (D8) (LRR T, U)
Field Observations:	Spriagrium moss (Do) (ERR 1, U)
Surface Water Present? Yes No ✓ Depth (incl	ies):
Water Table Present? Yes No Depth (incl	· ———
	nes): 0-12+ Wetland Hydrology Present? Yes V No
(includes capillary fringe)	
Describe Recorded Data (stream gauge, monitoring well, aerial pl	lotos, previous inspections), if available:
Remarks:	

mes of pla	ants.		Sampling Point: Wetland	S/T/U 19
			Dominance Test worksheet:	
		<u>Status</u> FAC	Number of Dominant Species That Are OBL, FACW, or FAC:  3	(A)
			Total Number of Dominant	
			1	(B)
			Devent of Development Consider	
				(A/B)
<u>15</u>	= Total Cov	/er		
20% of	f total cover	3		_
			Column Totals: (A)	(B)
			Dravalance Index - R/A -	
	= Total Cov			
			1 <del></del>	
			1 <del></del>	
				. \
			Problematic Hydrophytic Vegetation (Explain	1)
			1	
				ust
. ———			' '	
	- Total Car		Definitions of Five Vegetation Strata.	
			Tree – Woody plants, excluding woody vines,	
20% or	total cover	·		
30	Yes	FACW		,.
				ee
			than 3 in. (7.6 cm) DBH.	33
· —			Short Meadan last and discount for a second size	
	INO	<u>OBL</u>		
. ——				
				ing
			plants, except woody vines, less than approximate	ely
		-	3 ft (1 m) in height.	
			Woody vine - All woody vines, regardless of heig	ıht.
. ——				,
20% of	ftotal cover	11.4		
			Hydrophytic	
^	= Total Cov	/er	Vegetation /	
0	- Total Co	/ ( )		
20% of			Present? Yes ▼ No No	
	Absolute % Cover 15  15  15  20% of  20% of  30  20  57  20% of	Species?   15   Yes	Absolute % Cover Species? Status 15 Yes FAC  15 = Total Cover 20% of total cover:  20% of total cover:  30 Yes FAC  20 Yes FAC  30 Yes FAC  50 No OBL  20 No OBL  57 = Total Cover 20% of total cover:  11.4	Absolute Species? Status 15 Yes FAC    15 Yes FAC

SOIL Sampling Point: Wetland S/T/U 19

Profile Desc	ription: (Describe	to the dept	h needed to docun	nent the	indicator	or confirr	n the absence of in	dicators.)
Depth	<u>Matrix</u>			x Feature	es		<b>-</b> .	
(inches)	Color (moist)		Color (moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
0-2	10YR 3/1		10YR 4/6				loam	
2-12	10YR 4/1	80	10 1 R 4/6	20	<u>C</u>	<u>PL</u>	loam	
					-			
1- 0.0							2	
			Reduced Matrix, MS RRs, unless other			ains.		Pore Lining, M=Matrix.  Problematic Hydric Soils <sup>3</sup> :
Histosol		able to all i	Polyvalue Be		-	PPST		(A9) (LRR O)
_	pipedon (A2)		Thin Dark Su					(A10) (LRR S)
1 — '	istic (A3)		Loamy Muck					ertic (F18) (outside MLRA 150A,B)
	en Sulfide (A4)		Loamy Gleye	d Matrix	(F2)		Piedmont F	loodplain Soils (F19) (LRR P, S, T)
I ——	d Layers (A5)		Depleted Mat					Bright Loamy Soils (F20)
177	Bodies (A6) (LRR F		Redox Dark	,			(MLRA 1	53B) Material (TF2)
	icky Mineral (A7) <b>(L</b> esence (A8) <b>(LRR (</b>		Depleted Dar				1 1	w Dark Surface (TF12)
19 1	ick (A9) (LRR P, T)	<b>-</b> ,	Marl (F10) (L	,	0)			ain in Remarks)
	d Below Dark Surfac	ce (A11)	Depleted Och	-	(MLRA 1	51)		,
	ark Surface (A12)		Iron-Mangan					of hydrophytic vegetation and
	rairie Redox (A16) (			, ,		', U)		hydrology must be present,
	Mucky Mineral (S1) ( Gleyed Matrix (S4)	LRR O, S)	Delta Ochric Reduced Ver		,	.OA 150B		isturbed or problematic.
	Redox (S5)		Piedmont Flo		•		•	
19 1	l Matrix (S6)						RA 149A, 153C, 153	D)
	rface (S7) (LRR P,							
Restrictive	Layer (if observed)	:						
Туре:								
	ches):						Hydric Soil Pres	sent? Yes ¥ No No
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smithfield / Johnston Sampling Date: 5/30/2018				
Applicant/Owner: Wildlands Engineering Inc.	State: NC Sampling Point: Upland - DP20				
Investigator(s): W. Taylor	Section, Township, Range:				
Landform (hillslope, terrace, etc.): floodplain	Local relief (concave, convex, none): CONCAVE Slope (%): <1				
	5.471624 Long: W -78.437102 Datum:				
Soil Map Unit Name: Gilead Sandy Loam (GeD)	NWI classification: N/A				
Are climatic / hydrologic conditions on the site typical for this time of					
Are Vegetation Soil or Hydrology naturally p	problematic? (If needed, explain any answers in Remarks.)				
SUMMARY OF FINDINGS - Attach site map showing	ng sampling point locations, transects, important features, etc.				
Hydrophytic Vegetation Present? Hydric Soil Present? Wetland Hydrology Present?  Remarks:  Yes  No  Yes  No  V	Is the Sampled Area within a Wetland? Yes No ✓				
HYDROLOGY  Wetland Hydrology Indicators:	Secondary Indicators (minimum of two required)				
Primary Indicators (minimum of one is required; check all that apply					
Surface Water (A1)  Aquatic Fauna (B	Sparsely Vegetated Concave Surface (B8)				
High Water Table (A2)  Marl Deposits (B					
Saturation (A3) Hydrogen Sulfide	<u>=</u>				
	pheres along Living Roots (C3) Dry-Season Water Table (C2)				
Sediment Deposits (B2)  Presence of Red  Drift Deposits (B3)  Recent Iron Red	luced Iron (C4) Crayfish Burrows (C8) uction in Tilled Soils (C6) Saturation Visible on Aerial Imagery (C9)				
Algal Mat or Crust (B4)  Thin Muck Surface					
Iron Deposits (B5) Other (Explain in	· · · · · · · · · · · · · · · · · · ·				
Inundation Visible on Aerial Imagery (B7)	FAC-Neutral Test (D5)				
Water-Stained Leaves (B9)	Sphagnum moss (D8) (LRR T, U)				
Field Observations:					
Surface Water Present? Yes No Depth (inche	· — —				
Water Table Present? Yes No Depth (inche					
Saturation Present? Yes No Depth (inche (includes capillary fringe)	es): Wetland Hydrology Present? Yes No 🗸				
Describe Recorded Data (stream gauge, monitoring well, aerial pho	otos, previous inspections), if available:				
Remarks:					

VEGETATION (Five Strata) – Use scientific na	mes of pla	ants.		Sampling Point: Upland - DP20
001	Absolute	Dominant	Indicator	Dominance Test worksheet:
<u>Tree Stratum</u> (Plot size: 30'		Species?		Number of Dominant Species
1. llex opaca	30	Yes	<u>FAC</u>	That Are OBL, FACW, or FAC: 5 (A)
2. Quercus phellos	20	<u>Yes</u>	<u>FACW</u>	Total Number of Dominant
3. Liriodendron tulipifera	40	Yes	<u>FACU</u>	Species Across All Strata: 6 (B)
4				Percent of Dominant Species
5				That Are OBL, FACW, or FAC: 83 (A/B)
6				
	90	= Total Cov	er er	Prevalence Index worksheet:
50% of total cover: 45	20% of	ftotal cover	18	Total % Cover of: Multiply by:
Sapling Stratum (Plot size: 15')				OBL species x 1 =
1. <u>llex opaca</u>	10	Yes	FAC	FACW species x 2 =
2				FAC species x 3 =
3				FACU species x 4 =
4				UPL species x 5 =
5				Column Totals: (A) (B)
6				Prevalence Index = B/A =
	10	= Total Cov	er	Hydrophytic Vegetation Indicators:
50% of total cover: 5			•	
Shrub Stratum (Plot size: 15' )		1000100101		1 - Rapid Test for Hydrophytic Vegetation
1. Ligustrum sinense	5	Yes	FAC	✓ 2 - Dominance Test is >50%
2. Juniperus virginiana	1	No	FACU	3 - Prevalence Index is ≤3.0¹
				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
3				
4				Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
5				
6	- <u> </u>			Definitions of Five Vegetation Strata:
2.5		= Total Cov		Tree – Woody plants, excluding woody vines,
50% of total cover: <u>2.5</u>	20% of	total cover	<u> </u>	approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Herb Stratum (Plot size: 5' )	50	Yes	FAC	(7.0 cm) of larger in diameter at breast height (DBH).
1.Microstegium vimineum				Sapling – Woody plants, excluding woody vines,
2	- ——			approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.
3				
4				Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
5				approximately 3 to 20 ft (1 to 6 ff) in neight.
6				Herb – All herbaceous (non-woody) plants, including
7				herbaceous vines, regardless of size, <u>and</u> woody plants, except woody vines, less than approximately
8				3 ft (1 m) in height.
9				Woody vine – All woody vines, regardless of height.
10				woody vine - All woody vines, regardless of fleight.
11				
	50	= Total Cov	er	
50% of total cover: 25	20% of	f total cover	10	
Woody Vine Stratum (Plot size: 30'				
1				
2.				
3.				
4				
5.				Undrambutia
	0	= Total Cov	er	Hydrophytic Vegetation
50% of total cover:				Present? Yes No No
		total cover	· <u> </u>	
Remarks: (If observed, list morphological adaptations below	JVV ).			

SOIL Sampling Point: Upland - DP20

Profile Desc	cription: (Describe t	o the depth	needed to docum	nent the i	ndicator	or confirm	the absence	of indicators.)
Depth (in shock)	Matrix	<u></u> %	Redox Color (moist)	K Features		Loc <sup>2</sup>	Toyture	Demonto
(inches) 0-2	Color (moist) 10YR 3/3		Color (Moist)	%	_Type'	LOC	<u>Texture</u> loam	Remarks
2-10	7.5YR 4/3						sandy loam	
10-12	2.5Y 3/3						sandy loam	
10-12	2.01 0/0						- Carray Toann	
1Type: C=C	oncentration, D=Deple	etion PM-P	educed Matrix MS		Sand Gra	———	2l ocation:	PL=Pore Lining, M=Matrix.
	Indicators: (Applica					um3.		for Problematic Hydric Soils <sup>3</sup> :
Histosol			Polyvalue Be	low Surfac	e (S8) <b>(L</b>	RR S, T, L	J) 🔲 1 cm N	Muck (A9) (LRR O)
I — I	oipedon (A2)		Thin Dark Su				1 r	fluck (A10) (LRR S)
	istic (A3) en Sulfide (A4)		Loamy Mucky Loamy Gleye			. O)		ed Vertic (F18) (outside MLRA 150A,B) ont Floodplain Soils (F19) (LRR P, S, T)
	d Layers (A5)		Depleted Mat	,	_/		1 1	lous Bright Loamy Soils (F20)
11 1	Bodies (A6) (LRR P,		Redox Dark S	•	*		`	RA 153B)
	ucky Mineral (A7) <b>(LR</b> resence (A8) <b>(LRR U)</b>		Depleted Dar				1 1	arent Material (TF2) hallow Dark Surface (TF12)
17 1	uck (A9) (LRR P, T)		Marl (F10) (L		,,			Explain in Remarks)
11 1	d Below Dark Surface	(A11)	Depleted Och					
	ark Surface (A12) rairie Redox (A16) <b>(M</b>	L BA 450A)	Iron-Mangane Umbric Surfa					ators of hydrophytic vegetation and land land hydrology must be present,
	/Jucky Mineral (S1) <b>(L</b>		Delta Ochric			, 0,		ess disturbed or problematic.
Sandy C	Gleyed Matrix (S4)	, , ,	Reduced Ver	tic (F18) <b>(</b> I	MLRA 15			·
19 1	Redox (S5)		Piedmont Flo					4520)
	l Matrix (S6) rface (S7) <b>(LRR P, S,</b>	T. U)	Anomalous B	rignt Loan	ny Solis (i	-20) (IVILK	A 149A, 153C,	, 1530)
	Layer (if observed):	., -,						
Туре:			_					
Depth (in	ches):		_				Hydric Soil	Present? Yes No ◀
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smith	field / Johnston	Sampling Date: <u>5/30/2018</u>
Applicant/Owner: Wildlands Engineering Inc.		State: NC	Sampling Point: Wetland V - DP21
Investigator(s): W. Taylor	Section, Township, F		
Landform (hillslope, terrace, etc.): floodplain	Local relief (concave	, convex, none): <u>concave</u>	Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35	.473363	Long: W -78.442656	Datum:
Soil Map Unit Name: Gilead Sandy Loam (GeD)		NWI classifica	ition: N/A
Are climatic / hydrologic conditions on the site typical for this time of ye	ear? Yes ✓ No	(If no, explain in Re	marks.)
Are Vegetation Soil or Hydrology significantly	/ disturbed?Are	e "Normal Circumstances" pr	resent? Yes No 🗸
Are Vegetation Soil or Hydrology naturally pr	oblematic? (If	needed, explain any answers	s in Remarks.)
SUMMARY OF FINDINGS – Attach site map showing	g sampling point	locations, transects,	important features, etc.
Hydrophytic Vegetation Present? Yes ✓ No			
Hydric Soil Present? Yes ✓ No	Is the Sample		7 <u> </u>
Wetland Hydrology Present? Yes / No	within a Wetl	and? Yes	No
Remarks:	'		
Vegetation significantly impacted by livestock grazing.			
HYDROLOGY			
Wetland Hydrology Indicators:		Secondary Indicate	ors (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)		Surface Soil C	
✓ Surface Water (A1) Aquatic Fauna (B1	13)		etated Concave Surface (B8)
✓ High Water Table (A2)       Marl Deposits (B15)	5) (LRR U)	✓ Drainage Patt	erns (B10)
Saturation (A3) Hydrogen Sulfide (	Odor (C1)	Moss Trim Lin	ies (B16)
Water Marks (B1) Oxidized Rhizosph	neres along Living Roo	ots (C3) Dry-Season V	Vater Table (C2)
Sediment Deposits (B2) Presence of Reduce	` '	✓ Crayfish Burro	` ′
	ction in Tilled Soils (C6	· —	sible on Aerial Imagery (C9)
Algal Mat or Crust (B4)  Thin Muck Surface  Iron Deposits (B5)  Other (Explain in F	, ,	Geomorphic F	, ,
Iron Deposits (B5) Other (Explain in F Inundation Visible on Aerial Imagery (B7)	remarks)	Shallow Aquit	` '
Water-Stained Leaves (B9)			oss (D8) (LRR T, U)
Field Observations:			
Surface Water Present? Yes ✓ No Depth (inches	s): <u>0.25</u>		
Water Table Present? Yes ✓ No Depth (inches	s): <u>0-12+</u>		
Saturation Present? Yes V No Depth (inches	s): <u>0-12+                                    </u>	Vetland Hydrology Present	? Yes 🗸 No
(includes capillary fringe)  Describe Recorded Data (stream gauge, monitoring well, aerial photometric photometric production of the produ	os, previous inspection	ns), if available:	
		,,	
Remarks:			

<b>/EGETATION (Five Strata)</b> – Use scientific na				Sampling Point: Wetland V	- DP21
Tree Stratum (Plot size: 30'		Dominant Species?		Dominance Test worksheet:	
1. Acer rubrum	00	Yes	FAC	Number of Dominant Species That Are OBL, FACW, or FAC:  4	(A)
2				Total Number of Dominant	
3				Species Across All Strata: 4	B)
4	- ——			Percent of Dominant Species	
5				1 100	A/B)
6				Prevalence Index worksheet:	
40		= Total Co		Total % Cover of: Multiply by:	
50% of total cover: 40	20% of	f total cover	: 10	OBL species x 1 =	
Sapling Stratum (Plot size: 15' )				FACW species x 2 =	
1				FAC species x 3 =	
2				FACU species x 4 =	
3				UPL species x 5 =	
4				Column Totals: (A)	(B)
5				Osianiii rotais.	(0)
6				Prevalence Index = B/A =	
		= Total Co		Hydrophytic Vegetation Indicators:	
50% of total cover:	20% of	f total cover	:	1 - Rapid Test for Hydrophytic Vegetation	
Shrub Stratum (Plot size: 15')	10	Yes	FAC	2 - Dominance Test is >50%	
1. Acer rubrum			FACW	3 - Prevalence Index is ≤3.0 <sup>1</sup>	
2. Persea borbonia		Yes		Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	ı
3					
4				<sup>1</sup> Indicators of hydric soil and wetland hydrology mus	ıst
5				be present, unless disturbed or problematic.	
6	15			Definitions of Five Vegetation Strata:	
7.5		= Total Co	_	Tree – Woody plants, excluding woody vines,	
50% of total cover: 7.5	20% of	f total cover	: 3	approximately 20 ft (6 m) or more in height and 3 in (7.6 cm) or larger in diameter at breast height (DBH	
Herb Stratum (Plot size: 5' 1.Persicaria longiseta	10	Yes	FAC	(7.5 cm) or larger in diameter at breast neight (BBI)	17.
2 Microstegium vimineum	2		FAC	Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less	
		<u>No</u>	<u>FAC</u>	than 3 in. (7.6 cm) DBH.	5
3	- ——			Character 10/2 and a planetar annulus discourse de crimos	
4				Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.	
5					
6				Herb – All herbaceous (non-woody) plants, includin herbaceous vines, regardless of size, and woody	ng
7				plants, except woody vines, less than approximately	ly
8				3 ft (1 m) in height.	
9				Woody vine - All woody vines, regardless of heigh	nt.
10					
11	12				-
50% of total cover: 6		= Total Co			
·	20% 01	rtotal cover	2.4		
Woody Vine Stratum (Plot size: 30' )					
1	- ——				
2					
3					
4					
5				Hydrophytic	
		= Total Co		Vegetation Present? Yes No	
50% of total cover:	20% of	ftotal cover	:	100_4	

SOIL Sampling Point: Wetland V - DP21

Profile Desc	cription: (Describe t	o the depth r	needed to docu	ment the i	ndicator	or confirn	n the absence of	indicators.)
Depth	Matrix			ox Features				
(inches)	Color (moist)		Color (moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
0-12	10YR 2/1						sandy loam	
1T. mai. C=C	anaantrotian D-Dani	otion DM-Do	duped Metrix M	C-Maakad	Cand Cr		2l postion: DI	-Dara Lining ManMatrix
	oncentration, D=Depl Indicators: (Applica					airis.		L=Pore Lining, M=Matrix.  r Problematic Hydric Soils <sup>3</sup> :
Histosol					-	DD C T I		ck (A9) (LRR O)
_	pipedon (A2)	Ì	Polyvalue Be					ck (A10) (LRR S)
	istic (A3)	İ	Loamy Muck					Vertic (F18) (outside MLRA 150A,B)
	en Sulfide (A4)	ì	Loamy Gley	-		. 0,	_ I I	Floodplain Soils (F19) (LRR P, S, T)
	d Layers (A5)	Í	Depleted Ma		-/			us Bright Loamy Soils (F20)
	Bodies (A6) (LRR P,	τ. υ) [	Redox Dark	. ,	6)		(MLRA	
1 7 7	icky Mineral (A7) (LR		Depleted Da		*		`	ent Material (TF2)
	esence (A8) (LRR U)	T .	Redox Depr				Very Sha	llow Dark Surface (TF12)
1 cm Mu	ick (A9) (LRR P, T)	<u> </u>	Marl (F10) (I	LRR U)				plain in Remarks)
11/1	d Below Dark Surface	e (A11)	Depleted Oc	hric (F11) (	(MLRA 1	51)		
Thick D	ark Surface (A12)	Ļ	Iron-Mangar	nese Masse	es (F12) (	LRR O, P,	T) <sup>3</sup> Indicate	ors of hydrophytic vegetation and
Coast P	rairie Redox (A16) <b>(M</b>	ILRA 150A) 📙	Umbric Surfa	ace (F13) (	LRR P, T	, U)	wetlan	nd hydrology must be present,
	lucky Mineral (S1) <b>(L</b>	RRO,S)	— Delta Ochric					disturbed or problematic.
_	Gleyed Matrix (S4)	<u> </u>	Reduced Ve	. , ,				
19 1	Redox (S5)	Ļ	Piedmont Fl					
	Matrix (S6)	L	Anomalous I	Bright Loan	ny Soils (I	F20) (MLR	RA 149A, 153C, 1	53D)
	rface (S7) (LRR P, S Layer (if observed):						1	
1			_				1	
	ches):		_				Hydric Soil Pr	esent? Yes ¥ No No
Remarks:								

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smithfield	d / Johnston	Sampling Date: <u>5/30/2018</u>
Applicant/Owner: Wildlands Engineering Inc.		State: NC	Sampling Point: Wet W/XFF/GG - DP22
Investigator(s): W. Taylor	Section, Township, Range	je:	
Landform (hillslope, terrace, etc.): floodplain / hillside seep	Local relief (concave, con	nvex, none): concave	Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35	.473321 Lor	ng: W -78.442267	Datum:
Soil Map Unit Name: Gilead Sandy Loam (GeD) & Uchee I	oamy Sand (UcB)	NWI classifica	ation: N/A
Are climatic / hydrologic conditions on the site typical for this time of y	ear? Yes ✓ No	(If no, explain in Re	emarks.)
Are Vegetation Soil or Hydrology significantl	y disturbed? Are "No	ormal Circumstances" pr	resent? Yes ✓ No
		ded, explain any answers	
SUMMARY OF FINDINGS – Attach site map showin	g sampling point loc	cations, transects,	important features, etc.
Hydrophytic Vegetation Present? Yes ✓ No	In the Committed A		
Hydric Soil Present? Yes ✓ No	Is the Sampled A	/	No
Wetland Hydrology Present? Yes ✓ No	within a wetiand	r res	NO
Remarks:			
HYDROLOGY			
Wetland Hydrology Indicators:		Secondary Indicat	ors (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)	)	Surface Soil C	Cracks (B6)
Surface Water (A1)  Aquatic Fauna (B)	13)		etated Concave Surface (B8)
High Water Table (A2)  Marl Deposits (B1	5) (LRR U)	Drainage Patt	erns (B10)
Saturation (A3) Hydrogen Sulfide	Odor (C1)	Moss Trim Lin	nes (B16)
	heres along Living Roots (C		Vater Table (C2)
Sediment Deposits (B2)  Presence of Redu	` '	✓ Crayfish Burro	, ,
	ction in Tilled Soils (C6)		sible on Aerial Imagery (C9)
Algal Mat or Crust (B4) Thin Muck Surface  Iron Deposits (B5) Other (Explain in	, ,	Geomorphic F Shallow Aquit	, ,
Inundation Visible on Aerial Imagery (B7)	(emains)	FAC-Neutral	, ,
Water-Stained Leaves (B9)			oss (D8) (LRR T, U)
Field Observations:			
Surface Water Present? Yes No Depth (inches	s):		
Water Table Present? Yes No ✓ Depth (inches	s):		
Saturation Present? Yes Vo Depth (inches	s): <u>0-12+</u> Wetla	and Hydrology Present	? Yes ✓ No
(includes capillary fringe)  Describe Recorded Data (stream gauge, monitoring well, aerial pho	os, previous inspections), i	if available:	
January Community Communit	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
Remarks:			

EGETATION (Five Strata) – Use scientific nar	nes of pla	ants.		Sampling Point: Wet W/X/FF/GG - DI
- 30'		Dominant		Dominance Test worksheet:
Tree Stratum (Plot size: 30' )		Species?		Number of Dominant Species That Are ORL FACW or FAC: 7
Nyssa biflora	40	Yes	<u>OBL</u>	That Are OBL, FACW, or FAC: (A)
2. <u>Liriodendron tulipifera</u>	20	<u>Yes</u>	<u>FACU</u>	Total Number of Dominant
<sub>3.</sub> Betula nigra	10	No	FACV#	Species Across All Strata: 8 (B)
4				
5.				Percent of Dominant Species That Are ORL FACW or FAC: 88
				That Are OBL, FACW, or FAC: OO (A/B)
S	70			Prevalence Index worksheet:
35		= Total Cov		Total % Cover of: Multiply by:
50% of total cover: 35	20% of	total cover:	14	OBL species x 1 =
Sapling Stratum (Plot size: 15' )				
1				FACW species x 2 =
2				FAC species x 3 =
3				FACU species x 4 =
1.				UPL species x 5 =
				Column Totals: (A) (B)
5				
5				Prevalence Index = B/A =
		= Total Cov		Hydrophytic Vegetation Indicators:
50% of total cover:	20% of	total cover:		1 - Rapid Test for Hydrophytic Vegetation
Shrub Stratum (Plot size: 15' )				2 - Dominance Test is >50%
1. Persea borbonia	80	Yes	FACW	3 - Prevalence Index is ≤3.0 <sup>1</sup>
2. Ligustrum sinense	5	No	FAC	Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
3.				Problematic Hydrophytic Vegetation (Explain)
4.				1
				Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
5				
5	<u></u>			Definitions of Five Vegetation Strata:
		= Total Cov		Tree – Woody plants, excluding woody vines,
50% of total cover: <u>42.5</u>	20% of	total cover:	1/	approximately 20 ft (6 m) or more in height and 3 in.
Herb Stratum (Plot size: <u>5'</u> )				(7.6 cm) or larger in diameter at breast height (DBH).
1.Boehmeria cylindrica	5	Yes	FACW	Sapling – Woody plants, excluding woody vines,
2. Parathelypteris noveboracensis	5	Yes	FAC	approximately 20 ft (6 m) or more in height and less
3.				than 3 in. (7.6 cm) DBH.
1				Shrub – Woody plants, excluding woody vines,
<sup>†</sup> ·				approximately 3 to 20 ft (1 to 6 m) in height.
5				
5				Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody
7				plants, except woody vines, less than approximately
3				3 ft (1 m) in height.
)				Manda de Allessa de da se esta de la constante
10				Woody vine – All woody vines, regardless of height.
I1.				
	10	= Total Cov	er	
50% of total cover: 5				
	20% 01	total cover		
Noody Vine Stratum (Plot size: 30' )				
1				
2.				
3				
4. <u> </u>				
5.				Livedyan busis
··	0	= Total Cov	er	Hydrophytic Vegetation
				Present? Yes No
500/ 51 1 1	0001	4-4-1 -		
50% of total cover:		total cover		100 4 10

SOIL
Sampling Point: Wet W/X/FF/GG - DP22

Profile Des	cription: (Describe t	to the depth	needed to docui	ment the in	dicator	or confirm	n the absence of	indicators.)
Depth	Matrix			x Features				
(inches)	Color (moist)		Color (moist)		Type	Loc <sup>2</sup>	Texture	Remarks
0-12	10YR 2/1						sandy loam	
-								
1T. max. C=C	encentration D-Dani	ation DM-D	aduand Matrix M		Cond Cr		2l acetion: DI	-Dere Lining M-Metrix
	oncentration, D=Depl Indicators: (Applica	· · · · · · · · · · · · · · · · · · ·				airis.		_=Pore Lining, M=Matrix. r <b>Problematic Hydric Soils</b> <sup>3</sup> :
Histoso		able to all Liv			-	DD C T I		k (A9) (LRR O)
_	pipedon (A2)		Polyvalue Be					k (A10) (LRR S)
	istic (A3)		Loamy Muck					Vertic (F18) (outside MLRA 150A,B)
	en Sulfide (A4)		Loamy Gley	-		٠,		Floodplain Soils (F19) (LRR P, S, T)
	d Layers (A5)		Depleted Ma		_,			us Bright Loamy Soils (F20)
I ——	Bodies (A6) (LRR P,	T, U)	Redox Dark	` '	)		(MLRA	
11 -	ucky Mineral (A7) (LR		Depleted Da	,	·		`	nt Material (TF2)
	resence (A8) (LRR U		Redox Depre				Very Sha	llow Dark Surface (TF12)
1 cm M	uck (A9) (LRR P, T)		Marl (F10) (I	_RR U)				plain in Remarks)
Deplete	d Below Dark Surface	e (A11)	Depleted Oc	hric (F11) <b>(N</b>	VILRA 15	51)		
	ark Surface (A12)		Iron-Mangan	iese Masses	s (F12) (I	LRR O, P,	•	ors of hydrophytic vegetation and
	rairie Redox (A16) (N		Umbric Surfa			, U)		d hydrology must be present,
	Mucky Mineral (S1) (L	.RR O, S)	Delta Ochric		,			disturbed or problematic.
	Gleyed Matrix (S4)		Reduced Ve					
19 1	Redox (S5)	ſ	Piedmont Flo					(A.D.)
	d Matrix (S6)	. <del>.</del>	Anomalous I	Bright Loamy	y Solis (I	-20) (IVILR	RA 149A, 153C, 1	53U)
	rface (S7) (LRR P, S Layer (if observed):						T	
1	-l \-		_				I I I I I I I I I I I I I I I I I I I	
	ches):		_				Hydric Soil Pr	esent? Yes Y No No
Remarks:								
1								

### WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smithfield / Johnston Sampling Date: 5/30/2018					
Applicant/Owner: Wildlands Engineering Inc.	State: NC Sampling Point: Upland - DP23					
Investigator(s): W. Taylor	Section, Township, Range:					
Landform (hillslope, terrace, etc.): floodplain	Local relief (concave, convex, none): <u>CONCAVE</u> Slope (%): <u>&lt;1</u>					
	35.473383 Long: W -78.442430 Datum:					
Soil Map Unit Name: Gilead Sandy Loam (GeD)	NWI classification: N/A					
Are climatic / hydrologic conditions on the site typical for this time of						
	ntly disturbed? Are "Normal Circumstances" present? Yes ✓ No					
	problematic? (If needed, explain any answers in Remarks.)					
	ing sampling point locations, transects, important features, etc.					
Hydrophytic Vegetation Present? Yes ✓ No	Is the Sampled Area					
Hydric Soil Present? Yes No. ✓	within a Wetland? Yes No ✓					
Wetland Hydrology Present? Yes No						
Remarks:						
HYDROLOGY						
Wetland Hydrology Indicators:	Secondary Indicators (minimum of two required)					
Primary Indicators (minimum of one is required; check all that app						
Surface Water (A1)  Aquatic Fauna (						
High Water Table (A2)  Marl Deposits (B						
Saturation (A3) Hydrogen Sulfide Odor (C1) Moss Trim Lines (B16)						
Water Marks (B1) Oxidized Rhizos	spheres along Living Roots (C3)Dry-Season Water Table (C2)					
Sediment Deposits (B2)	duced Iron (C4) Crayfish Burrows (C8)					
	duction in Tilled Soils (C6) Saturation Visible on Aerial Imagery (C9)					
Algal Mat or Crust (B4) Thin Muck Surfa						
Iron Deposits (B5) Other (Explain i						
Inundation Visible on Aerial Imagery (B7) Water-Stained Leaves (B9)	FAC-Neutral Test (D5) Sphagnum moss (D8) (LRR T, U)					
Field Observations:	Spriagram moss (50) (ERR 1, 0)					
Surface Water Present? Yes No Depth (inch	nes):					
Water Table Present? Yes No Depth (inch	· ————					
Saturation Present? Yes No Depth (includes capillary fringe)						
Describe Recorded Data (stream gauge, monitoring well, aerial ph	notos, previous inspections), if available:					
Remarks:						

/EGETATION (Five Strata) – Use scientific nar	nes of pla	ants.		Sampling Point: Upland - DP23
001	Absolute	Dominant	Indicator	Dominance Test worksheet:
Tree Stratum (Plot size: 30'		Species?		Number of Dominant Species
1. Liriodendron tulipifera	40	Yes	<u>FACU</u>	That Are OBL, FACW, or FAC: 3 (A)
2. Acer rubrum	<u>15</u>	Yes	<u>FAC</u>	Total Number of Dominant
3. Liquidambar styraciflua	10	No	FAC	Species Across All Strata: 4 (B)
4.				
5.				Percent of Dominant Species That Are OBL, FACW, or FAC: 75  (A/B)
<u> </u>				That Ale OBL, FACTO, OT FAC.
o	65	= Total Cov	er	Prevalence Index worksheet:
50% of total cover: 32.5				Total % Cover of: Multiply by:
15'	20 70 0.	lotar cover.		OBL species x 1 =
	10	Yes	FAC	FACW species x 2 =
1. Acer rubrum				FAC species x 3 =
2				FACU species x 4 =
3				UPL species x 5 =
4				
5				Column Totals: (A) (B)
6				Prevalence Index = B/A =
	10	= Total Cov	er er	Hydrophytic Vegetation Indicators:
50% of total cover: 5			_	1 - Rapid Test for Hydrophytic Vegetation
Shrub Stratum (Plot size: 15' )	_			✓ 2 - Dominance Test is >50%
1. Ilex opaca	2	No	FAC	1 <del></del> -
				3 - Prevalence Index is ≤3.0¹
2				Problematic Hydrophytic Vegetation¹ (Explain)
3				
4				<sup>1</sup> Indicators of hydric soil and wetland hydrology must
5				be present, unless disturbed or problematic.
6				Definitions of Five Vegetation Strata:
		= Total Cov		Tree – Woody plants, excluding woody vines,
50% of total cover:	20% of	total cover:	:	approximately 20 ft (6 m) or more in height and 3 in.
Herb Stratum (Plot size: 5' )				(7.6 cm) or larger in diameter at breast height (DBH).
1 Microstegium vimineum	40	Yes	FAC	Sapling – Woody plants, excluding woody vines,
2. Phytolacca americana	5	No	FACU	approximately 20 ft (6 m) or more in height and less
3.				than 3 in. (7.6 cm) DBH.
Δ				Shrub – Woody plants, excluding woody vines,
5.				approximately 3 to 20 ft (1 to 6 m) in height.
				Harb All barbaccaus (non-woody) plants, including
				Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody
7				plants, except woody vines, less than approximately
8				3 ft (1 m) in height.
9				Woody vine – All woody vines, regardless of height.
10				vvocay viile / iii vocay viiles, regaraless of freight.
11				
	45	= Total Cov	er er	
50% of total cover: <u>22.5</u>	20% of	total cover:	9	
Woody Vine Stratum (Plot size: 30')	_			
1				
2.				
3				
4				
5				Hydrophytic
	0 :	= Total Cov	er	Vegetation Present? Yes V
50% of total cover:	20% of	total cover:	·	Present? resNO
Remarks: (If observed, list morphological adaptations belo	w).			

SOIL Sampling Point: Upland - DP23

1	cription: (Describe t	o the depth				or confirn	n the absence of in	dicators.)
Depth (inches)	Matrix Color (moist)	<del></del> _	Redo Color (moist)	<u>x Feature</u> %	s Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
0-1	10YR 3/3		O O I (III O I O I )	·			sandy loam	remano
1-12							sandy loam	
1-12	10YR 5/3			- ——			Sandy Idam	
1Type: C=C	oncentration, D=Depl	etion PM-P	aduced Matrix Mi	S-Masker	Sand Gr	aine	2l ocation: DI =	Pore Lining, M=Matrix.
	Indicators: (Applica					ullis.		Problematic Hydric Soils <sup>3</sup> :
Histoso			Polyvalue Be			.RR S. T. U		(A9) (LRR O)
	pipedon (A2)		Thin Dark Su					(A10) (LRR S)
Black H	istic (A3)		Loamy Muck	y Mineral	(F1) <b>(LRR</b>	(O)	Reduced Ve	ertic (F18) (outside MLRA 150A,B)
	en Sulfide (A4)		Loamy Gleye		F2)			oodplain Soils (F19) (LRR P, S, T)
11 F	d Layers (A5)	T 10	Depleted Ma		-0)			Bright Loamy Soils (F20)
17 1 -	: Bodies (A6) <b>(LRR P,</b> ucky Mineral (A7) <b>(LR</b>		Redox Dark Depleted Da		*		(MLRA 15	Material (TF2)
	resence (A8) (LRR U		Redox Depre				1 1	w Dark Surface (TF12)
17 1	uck (A9) (LRR P, T)	,	Marl (F10) <b>(L</b>		-,			ain in Remarks)
	d Below Dark Surface	e (A11)	Depleted Oc	hric (F11)	(MLRA 1	51)		
	ark Surface (A12)		Iron-Mangan					of hydrophytic vegetation and
	rairie Redox (A16) (N		Umbric Surfa			, U)		hydrology must be present,
	Mucky Mineral (S1) <b>(L</b> Gleyed Matrix (S4)	.KK 0, 3)	Delta Ochric Reduced Ver		,	ΛΔ 150R)		sturbed or problematic.
	Redox (S5)		Piedmont Flo					
19 1	d Matrix (S6)		<del>_</del>				RA 149A, 153C, 153	D)
	ırface (S7) (LRR P, S							
Restrictive	Layer (if observed):							
Type:			_					
	ches):		_				Hydric Soil Pres	ent? YesNo_ <b>√</b>
Remarks:								

### WETLAND DETERMINATION DATA FORM - Atlantic and Gulf Coastal Plain Region

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smithfi	ield / Johnston :	Sampling Date: <u>5/30/2018</u>
Applicant/Owner: Wildlands Engineering Inc.		State: NC S	Sampling Point: Wetland Y - DP24
Investigator(s): W. Taylor	Section, Township, Ra	ange:	
Landform (hillslope, terrace, etc.): floodplain	Local relief (concave,	convex, none): concave	Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35.	.471325	Long: W -78.437110	Datum:
Soil Map Unit Name: Gilead Sandy Loam (GeD)		NWI classifica	
Are climatic / hydrologic conditions on the site typical for this time of ye	ear? Yes ✓ No		
Are Vegetation Soil or Hydrology significantly		"Normal Circumstances" pro	
Are Vegetation Soil or Hydrology naturally pro		needed, explain any answers	
SUMMARY OF FINDINGS – Attach site map showing			
Solving Attach site map showing		locations, transects,	important leatures, etc.
Hydrophytic Vegetation Present? Yes ✓ No	Is the Sample	d Area	
Hydric Soil Present? Yes ✓ No	within a Wetla		No No
Wetland Hydrology Present? Yes No			
Remarks:			
Vegetation affected by livestock grazing.			
HYDROLOGY			
Wetland Hydrology Indicators:		Secondary Indicate	ors (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)		Surface Soil C	racks (B6)
Surface Water (A1)  Aquatic Fauna (B1)	3)	Sparsely Vege	etated Concave Surface (B8)
High Water Table (A2) Marl Deposits (B15)	5) <b>(LRR U)</b>	✓ Drainage Patte	erns (B10)
✓ Saturation (A3) Hydrogen Sulfide (		Moss Trim Lin	· ·
	eres along Living Root		/ater Table (C2)
Sediment Deposits (B2)  Presence of Reduce	` '	Crayfish Burro	` ′
Drift Deposits (B3) Recent Iron Reduction Algal Mat or Crust (B4) Thin Muck Surface	ction in Tilled Soils (C6)	Geomorphic P	ible on Aerial Imagery (C9)
✓ Iron Deposits (B5)  Other (Explain in F	, ,	Shallow Aquita	, ,
Inundation Visible on Aerial Imagery (B7)	,	FAC-Neutral T	` '
✓ Water-Stained Leaves (B9)		Sphagnum mo	oss (D8) (LRR T, U)
Field Observations:			
Surface Water Present? Yes ✓ No Depth (inches	· —		
Water Table Present? Yes ✓ No Depth (inches			
Saturation Present? Yes Vo Depth (inches (includes capillary fringe)	): <u>0-12+</u>   <b>w</b>	etland Hydrology Present	? Yes <u>√</u> No
Describe Recorded Data (stream gauge, monitoring well, aerial photo	os, previous inspections	s), if available:	
Remarks:			

**VEGETATION (Five Strata)** – Use scientific names of plants.

20'		Dominant		Dominance Test worksheet:
Tree Stratum (Plot size: 30'		Species?		Number of Dominant Species
<sub>1.</sub> Nyssa biflora	70	Yes	<u>OBL</u>	That Are OBL, FACW, or FAC: (A)
2				Total Number of Dominant
3				Species Across All Strata: (B)
				(B)
4				Percent of Dominant Species
5				That Are OBL, FACW, or FAC: (A/B)
6				Prevalence Index worksheet:
		= Total Co		
50% of total cover: <u>35</u>	20% of	f total cover	r: <u>14</u>	Total % Cover of: Multiply by:
Sapling Stratum (Plot size: 15' )				OBL species x 1 =
1. Persea borbonia	20	Yes	<b>FACW</b>	FACW species x 2 =
2 Nyssa biflora	10	Yes	OBL	FAC species x 3 =
				FACU species x 4 =
3				UPL species x 5 =
4				Column Totals: (A) (B)
5				Column Totals (A) (B)
6				Prevalence Index = B/A =
<del>-</del>	30	= Total Co	ver	Hydrophytic Vegetation Indicators:
50% of total cover: 15			_	
	20 70 0	o.ai covei		1 - Rapid Test for Hydrophytic Vegetation
Shrub Stratum (Plot size: 15')				2 - Dominance Test is >50%
1				3 - Prevalence Index is ≤3.0 <sup>1</sup>
2				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
3				
4.				Indicators of hydric call and water of hydrology and
				Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
5				
6				Definitions of Five Vegetation Strata:
		= Total Co		Tree – Woody plants, excluding woody vines,
50% of total cover:	20% of	f total cover	r:	approximately 20 ft (6 m) or more in height and 3 in.
Herb Stratum (Plot size: 5'				(7.6 cm) or larger in diameter at breast height (DBH).
1.Murdannia keisak	40	Yes	OBL	Sapling – Woody plants, excluding woody vines,
2 Impatiens capensis	10	No	FACV	approximately 20 ft (6 m) or more in height and less
3. Microstegium vimineum	10	No	FAC	than 3 in. (7.6 cm) DBH.
	10	INU	170	
4				Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
5				approximately 5 to 20 it (1 to 6 iii) iii fleight.
6				Herb – All herbaceous (non-woody) plants, including
7				herbaceous vines, regardless of size, and woody
8.				plants, except woody vines, less than approximately 3 ft (1 m) in height.
9				Woody vine - All woody vines, regardless of height.
10				
11				
	60	= Total Co	ver	
50% of total cover: <u>30</u>	20% of	f total cover	r: <u>12</u>	
Woody Vine Stratum (Plot size: 30')				
1				
2				
3				
4				
5				Hydrophytic
	0	= Total Co	ver	Vegetation
50% of total cover:				Present? Yes V No No
		i total covel	· <u> </u>	
Remarks: (If observed, list morphological adaptations below	ow).			

Sampling Point: Wetland Y - DP24

Wetland Y - D24
Sampling Point:

SOIL

SUIL								S	ampling Point:	
Profile Desc	ription: (Describe t	o the depth	needed to docur	nent the inc	dicator o	or confirm	n the absence	of indicate	ors.)	
Depth	Matrix		Redo	x Features						
(inches)	Color (moist)	%	Color (moist)		Type <sup>1</sup>	Loc <sup>2</sup>	Texture		Remarks	
0-12	10YR 2/1						loam			
<u> </u>										
				· —— -						
l										
										<del>.</del>
										-
1										
	oncentration, D=Depl					ins.			ining, M=Matrix	
	Indicators: (Applica	ible to all LR							matic Hydric S	Soils":
Histosol			Polyvalue Be				J)	luck (A9) <b>(I</b>	LRR O)	
	pipedon (A2)		Thin Dark Su					luck (A10)		
Black Hi			Loamy Muck			O)	Reduce	ed Vertic (F	18) <b>(outside N</b>	ILRA 150A,B)
Hydroge	n Sulfide (A4)		Loamy Gleye	ed Matrix (F2	2)		Piedmo	ont Floodpl	ain Soils (F19)	(LRR P, S, T)
L Stratified	d Layers (A5)		Depleted Ma	. ,			Anoma	lous Bright	Loamy Soils (F	F20)
17 1 -	Bodies (A6) (LRR P,		Redox Dark		·			(A 153B)		
	icky Mineral (A7) <b>(LR</b>		Depleted Dai	rk Surface (I	=7)		Red Pa	rent Mater	ial (TF2)	
│ <b>└</b> ──┴Muck Pr	esence (A8) (LRR U)		Redox Depre	essions (F8)			Very Si	hallow Darl	k Surface (TF12	2)
1 cm Mu	ick (A9) (LRR P, T)		Marl (F10) (L	.RR U)			Other (	Explain in I	Remarks)	
Depleted	d Below Dark Surface	(A11)	Depleted Oc	hric (F11) <b>(N</b>	ILRA 15	1)				
Thick Da	ark Surface (A12)		Iron-Mangan	ese Masses	(F12) <b>(I</b>	RR O, P,	T) <sup>3</sup> Indic	ators of hyd	drophytic veget	ation and
Coast Pi	rairie Redox (A16) <b>(M</b>	LRA 150A)	Umbric Surfa	ce (F13) <b>(L</b>	RR P, T,	U)	wetl	and hydrol	ogy must be pr	esent,
Sandy N	lucky Mineral (S1) <b>(L</b>	RR O, S)	Delta Ochric	(F17) <b>(MLR</b>	A 151)		unle	ss disturbe	ed or problemat	ic.
Sandy G	Gleyed Matrix (S4)		Reduced Ver	tic (F18) <b>(M</b>	LRA 150	0A, 150B)				
Sandy R	ledox (S5)		Piedmont Flo	odplain Soi	ls (F19)	(MLRA 14	I9A)			
	Matrix (S6)	l	Anomalous E	Bright Loamy	/ Soils (F	20) <b>(MLR</b>	A 149A, 153C,	153D)		
Dark Su	rface (S7) (LRR P, S	, T, U)								
Restrictive I	Layer (if observed):									
Туре:										
Depth (inc	ches):						Hydric Soil	Present?	Yes 🗸	No
Remarks:			_				1 -		<u> </u>	
rtemarks.										

### WETLAND DETERMINATION DATA FORM - Atlantic and Gulf Coastal Plain Region

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smith	field / Johnston	Sampling Date: <u>6/1/2018</u>
Applicant/Owner: Wildlands Engineering Inc.		State: NC	Sampling Point: Wet Z/AA/BB/HH -DP25
Investigator(s): W. Taylor	Section, Township, R		
Landform (hillslope, terrace, etc.): floodplain	Local relief (concave,	, convex, none): CONCAVE	Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35.	.476783	Long: W -78.437307	Datum:
Soil Map Unit Name: Gilead Sandy Loam (GeD)		NWI classifica	ition: N/A
Are climatic / hydrologic conditions on the site typical for this time of ye	ear? Yes 🗸 No	(If no, explain in Re	marks.)
Are Vegetation Soil or Hydrology significantly	disturbed? Are	e "Normal Circumstances" pr	resent? Yes No 🗸
Are Vegetation Soil or Hydrology naturally pro	oblematic? (If	needed, explain any answers	s in Remarks.)
SUMMARY OF FINDINGS – Attach site map showing	g sampling point	locations, transects,	important features, etc.
Hydrophytic Vegetation Present? Yes ✓ No			
Hydric Soil Present? Yes ✓ No	Is the Sample		7 C
Wetland Hydrology Present? Yes / No	within a Wetl	and? Yes <u></u>	No
Remarks:	-		
Vegetation significantly disturbed due to livestock graz	zing.		
HYDROLOGY			
Wetland Hydrology Indicators:		Secondary Indicate	ors (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)		Surface Soil C	cracks (B6)
✓ Surface Water (A1) Aquatic Fauna (B1	3)	Sparsely Vege	etated Concave Surface (B8)
High Water Table (A2) Marl Deposits (B15)	5) (LRR U)	✓ Drainage Patt	erns (B10)
Saturation (A3) Hydrogen Sulfide (	Odor (C1)	Moss Trim Lin	es (B16)
	neres along Living Roo	· · · =	Vater Table (C2)
Sediment Deposits (B2)  Presence of Reduce	, ,	Crayfish Burro	` ′
	ction in Tilled Soils (C6	· <u> </u>	sible on Aerial Imagery (C9)
Algal Mat or Crust (B4)  Thin Muck Surface  Trust (B5)  Other (Explain in F	, ,	Geomorphic F	, ,
Inundation Visible on Aerial Imagery (B7)	(Ciriai Ka)	FAC-Neutral 1	` '
Water-Stained Leaves (B9)			oss (D8) (LRR T, U)
Field Observations:			
Surface Water Present? Yes Vo Depth (inches	s): <u>0.25</u>		
Water Table Present? Yes ✓ No Depth (inches			
Saturation Present? Yes V No Depth (inches	s): <u>0-12+                                    </u>	Vetland Hydrology Present	? Yes No
(includes capillary fringe)  Describe Recorded Data (stream gauge, monitoring well, aerial photo	os, previous inspection	ns), if available:	
Remarks:			

Dominant Species? Yes Yes Yes	Status	Dominance Test worksheet:         Number of Dominant Species         That Are OBL, FACW, or FAC:       4       (A)         Total Number of Dominant Species Across All Strata:       4       (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:         Indicators of Hydrophytic Vegetation (Explain)
Yes Yes Yes Yes	FAC OBL FAC OBL FAC  er 10 FAC  FAC  FAC	That Are OBL, FACW, or FAC:  Total Number of Dominant Species Across All Strata:  Percent of Dominant Species That Are OBL, FACW, or FAC:  Total % Cover of:  Multiply by:  OBL species
Yes Yes  Total Cover Yes  Total Cover Yes  Total Cover  Total Cover  Total Cover  Total Cover	OBL_FAC	Total Number of Dominant Species Across All Strata:  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  1 - Rapid Test for Hydrophytic Vegetation  1 - Rapid Test for Hydrophytic Vegetation  Problematic Hydrophytic Vegetation (Explain)  1 Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
Yes  = Total Cover Yes  = Total Cover total cover Yes  = Total Cover Yes	FAC  er 10  FAC  er 2  FAC	Species Across All Strata:  Percent of Dominant Species That Are OBL, FACW, or FAC:  Total % Cover of:  Multiply by:  OBL species  FACW species  FAC species  FAC species  FACU species  FACU species  Column Totals:  (A)  Prevalence Index = B/A =  Hydrophytic Vegetation Indicators:  1 - Rapid Test for Hydrophytic Vegetation  Problematic Hydrophytic Vegetation¹ (Explain)  1 Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
= Total Cover Yes  = Total Cover total cover Yes  = Total Cover	er 10  FAC  er 2  FAC	Percent of Dominant Species That Are OBL, FACW, or FAC:    Total % Cover of:   Multiply by:
= Total Cover Yes  = Total Cover total cover  Yes  = Total Cover Yes	er 10er 2	That Are OBL, FACW, or FAC: 100 (A/B)  Prevalence Index worksheet:
= Total Cover Yes  = Total Cover total cover  Yes  = Total Cover Yes	er 10er 2	That Are OBL, FACW, or FAC: 100 (A/B)  Prevalence Index worksheet:
= Total Cover Yes  = Total Cover total cover  Yes  = Total Cover Yes	er 10er 2	Prevalence Index worksheet:
Total Cover  Yes  Total Cover  Yes  Total Cover	10 FAC	Total % Cover of:  OBL species
Total Cover  Yes  Total Cover  Yes  Total Cover	10 FAC	OBL species
Yes  = Total Cover  Yes  = Total Cover	FAC	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 ≤3.0¹  Problematic Hydrophytic Vegetation¹ (Explain)  ¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
= Total Covertotal cover	er 2 FAC	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 ≤3.0¹  Problematic Hydrophytic Vegetation¹ (Explain)  ¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
= Total Covertotal cover	er 2 FAC	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 ≤3.0¹  Problematic Hydrophytic Vegetation¹ (Explain)  ¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
= Total Cover Yes  = Total Cover	er 2 FAC	FACU species x 4 =
Total Cover Yes	FAC	UPL species x 5 = (B)  Prevalence Index = B/A =  Hydrophytic Vegetation Indicators:  1 - Rapid Test for Hydrophytic Vegetation  ✓ 2 - Dominance Test is >50%  3 - Prevalence Index is ≤3.0¹  Problematic Hydrophytic Vegetation¹ (Explain)  ¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
Total Cover Yes	FAC	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 ≤3.0¹  Problematic Hydrophytic Vegetation¹ (Explain)  ¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
= Total Covertotal cover	FAC	Prevalence Index = B/A =
Total Covertotal cover	er 2	Hydrophytic Vegetation Indicators:  1 - Rapid Test for Hydrophytic Vegetation  ✓ 2 - Dominance Test is >50%  3 - Prevalence Index is ≤3.0¹  Problematic Hydrophytic Vegetation¹ (Explain)  ¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
Yes	2 FAC	Hydrophytic Vegetation Indicators:  1 - Rapid Test for Hydrophytic Vegetation  ✓ 2 - Dominance Test is >50%  3 - Prevalence Index is ≤3.0¹  Problematic Hydrophytic Vegetation¹ (Explain)  ¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
Yes	2 FAC	1 - Rapid Test for Hydrophytic Vegetation  2 - Dominance Test is >50%  3 - Prevalence Index is ≤3.0¹  Problematic Hydrophytic Vegetation¹ (Explain)  ¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
Yes	FAC	2 - Dominance Test is >50% 3 - Prevalence Index is ≤3.0¹ Problematic Hydrophytic Vegetation¹ (Explain)  ¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
= Total Cov		3 - Prevalence Index is ≤3.0¹ Problematic Hydrophytic Vegetation¹ (Explain)  ¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
= Total Cov		Problematic Hydrophytic Vegetation <sup>1</sup> (Explain) <sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
= Total Cov		Problematic Hydrophytic Vegetation <sup>1</sup> (Explain) <sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
= Total Cov		¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
= Total Cov		be present, unless disturbed or problematic.
= Total Cov		be present, unless disturbed or problematic.
= Total Cov		' '
	er	Definitions of Five Vegetation Strata:
	er	
total cover		Tree – Woody plants, excluding woody vines,
	1	approximately 20 ft (6 m) or more in height and 3 in.
		(7.6 cm) or larger in diameter at breast height (DBH).
Yes	FAC	Sapling – Woody plants, excluding woody vines,
No	FAC	approximately 20 ft (6 m) or more in height and less
		than 3 in. (7.6 cm) DBH.
		Shrub – Woody plants, excluding woody vines,
		approximately 3 to 20 ft (1 to 6 m) in height.
		Herb – All herbaceous (non-woody) plants, including
		herbaceous vines, regardless of size, <u>and</u> woody plants, except woody vines, less than approximately
		3 ft (1 m) in height.
		Woody vine - All woody vines, regardless of height.
T-1-1-0		
= Total Cov		
total cover	18	
		Hydrophytic
= Total Cov		Vegetation
= Total Cover		
	total cover:	total cover: <u>18</u>

SOIL Sampling Point: Wet Z/AA/BB/HH DP25

Profile Desc	ription: (Describe t	o the depth i	needed to docui	ment the ir	ndicator	or confirm	n the absence of	indicators.)
Depth	Matrix			x Features				
(inches)	Color (moist)		Color (moist)		Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
0-12	10YR 2/1						loam	
¹Type: C=C	oncentration, D=Depl	etion RM=Re	duced Matrix M	S=Masked	Sand Gr	ains	2l ocation: Pl	.=Pore Lining, M=Matrix.
	Indicators: (Applica		· · · · · · · · · · · · · · · · · · ·			aii13.		Problematic Hydric Soils <sup>3</sup> :
Histosol			Polyvalue Be		-	RR S. T. L		k (A9) <b>(LRR O)</b>
_	pipedon (A2)	1	Thin Dark Su					k (A10) (LRR S)
	stic (A3)	[	Loamy Muck					Vertic (F18) (outside MLRA 150A,B)
	en Sulfide (A4)		Loamy Gley	ed Matrix (F	-2)		Piedmont	Floodplain Soils (F19) (LRR P, S, T)
Stratifie	d Layers (A5)	ļ	Depleted Ma	trix (F3)			Anomalou	is Bright Loamy Soils (F20)
1 7 7	Bodies (A6) (LRR P,		Redox Dark	,	*		(MLRA	•
	ıcky Mineral (A7) <b>(LR</b>		Depleted Da				1 1	nt Material (TF2)
17 1	esence (A8) (LRR U)		Redox Depre	,	i)			low Dark Surface (TF12)
11/1	ick (A9) (LRR P, T)	. (666).	Marl (F10) (L		BAL D A 44	54)	Other (Ex	plain in Remarks)
	d Below Dark Surface ark Surface (A12)	; (AII) [	Depleted Oc Iron-Mangan	. , ,		•	T) <sup>3</sup> Indicato	rs of hydrophytic vegetation and
	rairie Redox (A16) <b>(M</b>	ILRA 150A)	Umbric Surfa				•	d hydrology must be present,
	Mucky Mineral (S1) (L	· F	Delta Ochric			, -,		disturbed or problematic.
	Gleyed Matrix (S4)		Reduced Ve		,	0A, 150B)		·
Sandy F	Redox (S5)	إ	Piedmont Fl	oodplain Sc	oils (F19)	(MLRA 14	I9A)	
	l Matrix (S6)		Anomalous I	Bright Loam	ny Soils (I	F20) <b>(MLR</b>	RA 149A, 153C, 15	53D)
	rface (S7) (LRR P, S	, T, U)						
Restrictive	Layer (if observed):							
Type:			_					
Depth (in	ches):		_				Hydric Soil Pre	esent? Yes <b>Y</b> No No
Remarks:							•	

### WETLAND DETERMINATION DATA FORM - Atlantic and Gulf Coastal Plain Region

Project/Site: Sassarixa Swamp Mitigation Site	City/County: Smit	hfield / Johnston	Sampling Date: <u>6/1/2018</u>
Applicant/Owner: Wildlands Engineering Inc.		State: NC	Sampling Point: Wetland CC - DP26
Investigator(s): W. Taylor	Section, Township,	, Range:	
Landform (hillslope, terrace, etc.): floodplain	Local relief (concav	ve, convex, none): concave	Slope (%): <1
Subregion (LRR or MLRA): MLRA 133A Lat: N 35	.477589	Long: W -78.437893	Datum:
Soil Map Unit Name: Gilead Sandy Loam (GeB & GeD)		NWI classifica	ation: N/A
Are climatic / hydrologic conditions on the site typical for this time of ye	ear? Yes ✓ N	lo (If no, explain in Re	emarks.)
Are Vegetation Soil or Hydrology significantly	y disturbed?	Are "Normal Circumstances" pr	resent? Yes No ✓
Are Vegetation Soil or Hydrology naturally pr	oblematic?	If needed, explain any answer	s in Remarks.)
SUMMARY OF FINDINGS – Attach site map showing	g sampling poir	nt locations, transects,	important features, etc.
Hydrophytic Vegetation Present? Yes ✓ No	1		
Hydric Soil Present? Yes ✓ No	Is the Samp		¬ ┌──
Wetland Hydrology Present? Yes / No	within a We	itland? Yes	No
Remarks:	,		
Vegetation significantly impacted by livestock grazing.			
HYDROLOGY			
Wetland Hydrology Indicators:		Secondary Indicat	tors (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)		Surface Soil (	Cracks (B6)
✓ Surface Water (A1) Aquatic Fauna (B1	13)	Sparsely Veg	etated Concave Surface (B8)
✓ High Water Table (A2)       Marl Deposits (B1:	5) (LRR U)	✓ Drainage Patt	terns (B10)
Saturation (A3) Hydrogen Sulfide	Odor (C1)	Moss Trim Lir	nes (B16)
Water Marks (B1) Oxidized Rhizosph	neres along Living R	oots (C3)Dry-Season V	Vater Table (C2)
Sediment Deposits (B2) Presence of Redu	` ,	Crayfish Burro	` ′
	ction in Tilled Soils (0	·	sible on Aerial Imagery (C9)
Algal Mat or Crust (B4)  Thin Muck Surface  Iron Deposits (B5)  Other (Explain in F	, ,	Geomorphic F	, ,
Inundation Visible on Aerial Imagery (B7)	(ciriains)	FAC-Neutral	` ′
Water-Stained Leaves (B9)			oss (D8) (LRR T, U)
Field Observations:			
Surface Water Present? Yes Vo Depth (inches	s): <u>0.25</u>		
Water Table Present? Yes ✓ No Depth (inches			
Saturation Present? Yes V No Depth (inches	s): <u>0-12+</u>	Wetland Hydrology Present	t? Yes <u>√</u> No
(includes capillary fringe)  Describe Recorded Data (stream gauge, monitoring well, aerial phot	os, previous inspecti	ions), if available:	
Remarks:			

/EGETATION (Five Strata) – Use scientific nar	nes of pla	ants.		Sampling Point: Wetland CC DP26
201		Dominant		Dominance Test worksheet:
Tree Stratum (Plot size: 30'		Species?		Number of Dominant Species
1. Acer rubrum	10	Yes	<u>FAC</u>	That Are OBL, FACW, or FAC: $\frac{4}{}$ (A)
2. Salix nigra	10		<u>OBL</u>	Total Number of Dominant
3. Liquidambar styraciflua	<u>10</u>	<u>Yes</u>	<u>FAC</u>	Species Across All Strata: 4 (B)
4. Nyssa biflora	5	<u>No</u>	<u>OBL</u>	Develop of Development Consider
5				Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)
6				
	35	= Total Cov	er	Prevalence Index worksheet:
50% of total cover: <u>17.5</u>	20% of	total cover:	7	Total % Cover of: Multiply by:
Sapling Stratum (Plot size: 15'				OBL species x 1 =
1				FACW species x 2 =
2.				FAC species x 3 =
3.				FACU species x 4 =
4.				UPL species x 5 =
				Column Totals: (A) (B)
5				
6		= Total Cov		Prevalence Index = B/A =
500/ 51 1 5			_	Hydrophytic Vegetation Indicators:
50% of total cover: <u>5</u>	20% of	total cover:		1 - Rapid Test for Hydrophytic Vegetation
Shrub Stratum (Plot size: 15')	1	No	OBL	2 - Dominance Test is >50%
1. Salix nigra				3 - Prevalence Index is ≤3.0 <sup>1</sup>
2				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
3				_
4				<sup>1</sup> Indicators of hydric soil and wetland hydrology must
5				be present, unless disturbed or problematic.
6				Definitions of Five Vegetation Strata:
	1	= Total Cov	er	Tree – Woody plants, excluding woody vines,
50% of total cover:	20% of	total cover:		approximately 20 ft (6 m) or more in height and 3 in.
Herb Stratum (Plot size: 5')				(7.6 cm) or larger in diameter at breast height (DBH).
1 Persicaria longiseta	80	Yes	FAC	Sapling – Woody plants, excluding woody vines,
2. Juncus effusus	3	No	OBL	approximately 20 ft (6 m) or more in height and less
3. Eupatorium capillifolium	2	No	FACU	than 3 in. (7.6 cm) DBH.
4				Shrub – Woody plants, excluding woody vines,
5.				approximately 3 to 20 ft (1 to 6 m) in height.
6.				Herb – All herbaceous (non-woody) plants, including
				herbaceous vines, regardless of size, and woody
7				plants, except woody vines, less than approximately
8				3 ft (1 m) in height.
9				Woody vine – All woody vines, regardless of height.
10				
11	0.5			
40.5		= Total Cov		
50% of total cover: 42.5	20% of	total cover:	1/	
Woody Vine Stratum (Plot size: 30'				
1				
2				
3				
4				
5.				Hydrophytic
	0	= Total Cov	er	Vegetation
50% of total cover:	20% of	total cover		Present? Yes ▼ No

SOIL Sampling Point: Wetland CC DP26

Profile Desc	cription: (Describe	to the depti	n needed to docun	nent the i	indicator	or confirm	the absence o	f indicators.)
Depth	Matrix			x Feature		12	Tandona	Damanika
(inches)	Color (moist)		Color (moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>	Texture	Remarks
0-4	10YR 3/2		10YR 5/4				loam	
4-12	10YR 3/2	95	10113/4	5	<u>C</u>	<u>PL</u>	sandy loam	
					· ——			
1							2, ,,	
	oncentration, D=Dep Indicators: (Applic					ains.		PL=Pore Lining, M=Matrix.  or Problematic Hydric Soils <sup>3</sup> :
Histosol		able to all L	Polyvalue Be			DD C T I		-
_	oipedon (A2)		Thin Dark Su					ck (A9) <b>(LRR O)</b> ck (A10) <b>(LRR S)</b>
	istic (A3)		Loamy Mucky				I F	Vertic (F18) (outside MLRA 150A,B)
Hydroge	en Sulfide (A4)		Loamy Gleye			,	1 1	it Floodplain Soils (F19) (LRR P, S, T)
	d Layers (A5)		✓ Depleted Mat					ous Bright Loamy Soils (F20)
11 -	Bodies (A6) (LRR F		Redox Dark	,	*		`	A 153B)
	ıcky Mineral (A7) <b>(L</b> l esence (A8) <b>(LRR L</b>		Depleted Dar				1 1	ent Material (TF2) allow Dark Surface (TF12)
17 1	ick (A9) (LRR P, T)	')	Marl (F10) (L	,	0)			xplain in Remarks)
	d Below Dark Surfac	e (A11)	Depleted Och		(MLRA 1	51)		xpiair iii recinaire)
Thick Da	ark Surface (A12)	, ,	Iron-Mangane	ese Mass	ès (F12) (	LRR O, P,	T) <sup>3</sup> Indicat	ors of hydrophytic vegetation and
	rairie Redox (A16) <b>(</b> I					', U)		nd hydrology must be present,
	Mucky Mineral (S1) (	LRR O, S)	Delta Ochric		,	O. 450D)		s disturbed or problematic.
	Gleyed Matrix (S4) Redox (S5)		Reduced Ver Piedmont Flo		•			
19 1	Matrix (S6)						RA 149A, 153C, 1	(53D)
	rface (S7) (LRR P,	S, T, U)			,	, (	,	,
Restrictive	Layer (if observed)							
Туре:								
Depth (in	ches):						Hydric Soil P	resent? Yes 🗸 No
Remarks:							'	
1								

NC DWO Stream Identification Form Version 4.11 Sarrarixa Creek Date: Project/Site: 5asswix & Latitude: County: Johnston Evaluator: Longitude: Total Points: Stream Determination (circle one) Other Stream is at least intermittent Ephemeral Intermittent Perennial e.g. Quad Name: if ≥ 19 or perennial if ≥ 30\* A. Geomorphology (Subtotal = 78 Absent Weak Moderate Strong 1<sup>a.</sup> Continuity of channel bed and bank 0 2. Sinuosity of channel along thalweg 0 1 2 3. In-channel structure: ex. riffle-pool, step-pool, 0 1 2 ripple-pool sequence 4. Particle size of stream substrate 0 2 5. Active/relict floodplain 0 2 6. Depositional bars or benches 0 2 7. Recent alluvial deposits 0 8. Headcuts 0 1 9. Grade control large frees & 120003 bons 0 0.5 10. Natural valley 0 0.5 (1.5 1 11. Second or greater order channel No = 0Yes =(3> artificial ditches are not rated; see discussions in manual B. Hydrology (Subtotal = 12. Presence of Baseflow 0 2 1 13. Iron oxidizing bacteria 0 2 14. Leaf litter (7) 1.5 0.5 15. Sediment on plants or debris 0 0.5 1 16. Organic debris lines or piles 0 0.5 1 17. Soil-based evidence of high water table? No = 0Yes = (3) C. Biology (Subtotal = 18. Fibrous roots in streambed 2 0 19. Rooted upland plants in streambed (3) 2 1 0 20. Macrobenthos (note diversity and abundance) (n) 1 2 3 21. Aquatic Mollusks (B) 1 2 3 22. Fish 0 (U) 1 1.5  $\overline{\mathbb{O}}$ 23. Crayfish 0.5 1,5 24. Amphibians 0 0.5 1.5 Snakes, Groap 25. Algae 0 (1.5) 0.5 FACW = 0.75; OBL = 1.5 Other = 0 26. Wetland plants in streambed \*perennial streams may also be identified using other methods. See p. 35 of manual. Notes: Anabranching System Sketch:

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

Notes: charnel inturrupted by pand + dam, may brail just below dan for for few hundred feet

Sketch:

Immediated Stream DIS Pond

Further DIS

photos

Sketch:

Date: 7/3/	Project/Site: _	035951 Ka	Latitude: 35	.478291	
Evaluator:	County:	Stream Determination (circle one) Ephemeral (intermittent Perennial		78.444 614	
Total Points: Stream is at least intermittent if ≥ 19 or perennïal if ≥ 30*	Stream Determi Ephemeral Inte				
A. Geomorphology (Subtotal =)	Absent	Weak	Moderate	Strong	
1ª. Continuity of channel bed and bank	0	1	(2)	3	
2. Sinuosity of channel along thalweg	0	1	(2)	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	6	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  a artificial ditches are not rated; see discussions in manual	No	0 = 0	Yes = 3		
B. Hydrology (Subtotal =)  12. Presence of Baseflow	0	1	(Z)	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?		0 = 0	Yes		
C. Biology (Subtotal = )					
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	0	1.5	
25. Algae	(9)	0,5	1	1.5	
26. Wetland plants in streambed		FACW = 0.75; OB	L = 1.5 Other = 0	12	
		l.			
*perennial streams may also be identified using other meth					
*perennial streams may also be identified using other methodology in the stream south	^				

Date: 4/8/17	Project/Site: 5	ASSARIXA	Latitude:			
Evaluator: TAYLOR	County: Jou	Stream Determination (circle one) Ephemeral intermittent Perennial		Longitude:		
Total Points: Stream is at least intermittent if ≥ 19 or perennial if ≥ 30*	Stream Determi			Other 2 e.g. Quad Name:		
A. Geomorphology (Subtotal = \\3)	Absent	Weak	Moderate	Strong		
1 <sup>a.</sup> Continuity of channel bed and bank	0	1	(2)	3		
2. Sinuosity of channel along thalweg	0	<b>O</b>	2	3		
3. In-channel structure: ex. riffle-pool, step-pool,	0	1	(2)	3		
ripple-pool sequence						
4. Particle size of stream substrate	0	(1)	2	3		
5. Active/relict floodplain	0		2	3		
6. Depositional bars or benches	0	$\bigcirc$	2	3		
7. Recent alluvial deposits	0	1	2	3		
8. Headcuts	0	1		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 = 8 Yes = 3					
a artificial ditches are not rated; see discussions in manual  B. Hydrology (Subtotal = 5.5.)						
12. Presence of Baseflow		4	2	3		
		1	2			
13. Iron oxidizing bacteria		1	2	3		
14. Leaf litter	1.5	1	(0.5)	0		
15. Sediment on plants or debris	0	0.5	<b>O</b>	1.5		
16. Organic debris lines or piles	0	0.5		<del>&gt; 1.5</del>		
17. Soil-based evidence of high water table?	No	= 0		3		
C. Biology (Subtotal = 6.5)			····			
18. Fibrous roots in streambed	3	2	1	0		
19. Rooted upland plants in streambed		2	1	0		
20. Macrobenthos (note diversity and abundance)		1	2	3		
21. Aquatic Mollusks	0	1	2	3		
22. Fish	80	0.5	1	1.5		
23. Crayfish	Ø	0.5	1	1.5		
24. Amphibians	6		1	1.5		
25. Algae		0.5	7 - 4.5 - 0# 0	1.5		
26. Wetland plants in streambed	/o Coo - 25 of	FACW = 0.75; OBI	_= 1.5 Other = 0			
*perennial streams may also be identified using other method	is. See p. 30 of manual	•	<del></del>			
Notes:				· · · · · · · · · · · · · · · · · · ·		
Sketch: BELOW HEADCUT	, INSIDÉ =	or Wood	LINE			

Date: 9-8-17	Project/Site: 5	ASSARIKA	Latitude:	Latitude:	
Evaluator: Daybe	County: 500	حمور وحم	Longitude:	Longitude:	
Total Points: Stream is at least intermittent if $\geq$ 19 or perennial if $\geq$ 30*	Stream Determi	nation (circle one rmittent Perenni		3	
A. Geomorphology (Subtotal = \(\frac{1}{8}\)	Absent	Weak	Moderate	Strong	
1 <sup>a</sup> Continuity of channel bed and bank	0	1	0	3	
2. Sinuosity of channel along thalweg	0	<b>O</b>	2	3	
In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3	
4. Particle size of stream substrate	0	1	<b>(D)</b>	3	
5. Active/relict floodplain	0	1	2	<b>(3)</b>	
6. Depositional bars or benches	0	1	(2)	3	
7. Recent alluvial deposits	0	1	2	3	
8. Headcuts	0	1	3	3	
9. Grade control	0	0.5	1	1.5	
10. Natural valley	0	0.5	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		1	2	3	
13. Iron oxidizing bacteria	62	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		1.5	
17. Soil-based evidence of high water table?	No	= 0	Yes =	:3)	
C. Biology (Subtotal =)	-				
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)	6	1	2	3	
21. Aquatic Mollusks	0	1	2	3	
22. Fish	0	0.5	1	1.5	
23. Crayfish	8	0.5	1	1.5	
24. Amphibians	0	<b>(15)</b>	1	1.5	
25. Algae	6	0.5	1	1.5	
26. Wetland plants in streambed		FACW = 0.75; C	DBL = 1.5 Offer = 0	`	
*perennial streams may also be identified using other method	s. See p. 35 of manual			/	
Notes:					
Notes:					
Sketch: - MUCH OLORE OF A SCORES	VERE 22~	146 57 RE	Au THAN	) ( <del>T</del>	

Date: 9-8-(¬	Project/Site: 5	ASSARIXA	Latitude:		
Evaluator: D. TAYBL	County: 50		Longitude:		
Total Points:  Stream is at least intermittent if ≥ 19 or perennial if ≥ 30*	Stream Determination (circle one) Ephemeral Intermittent Perennial		Other e.g. Quad Name:		
A. Geomorphology (Subtotal = 16 )	Absent	Weak	Moderate	Strong	
1ª. Continuity of channel bed and bank	0	1	2	(F)	
2. Sinuosity of channel along thalweg	0	1	2	3	
In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	0	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	<u> </u>	3	
8. Headcuts	0	1	<u> </u>	3	
9. Grade control	0	(i.5)	1	1.5	
10. Natural vallev	0	0.5	1	(1.5)	
11. Second or greater order channel		o=0)	' Yes =		
a artificial ditches are not rated; see discussions in manual	·		103-	<del>-</del>	
B. Hydrology (Subtotal = 65)					
12. Presence of Baseflow		1	2	3	
13. Iron oxidizing bacteria	(6)	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	o = 0	Yes =		
C. Biology (Subtotal = 5.75)	<u> </u>				
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)	6	1	2	3	
21. Aquatic Mollusks	6	1	2	3	
22. Fish	8	0.5	1	1.5	
23. Crayfish	0,	<u>(13</u> )	1	1.5	
24. Amphibians	0	03	1	1.5	
25. Algae	(0)	0.5	1	1.5	
			-15 Other = 0		
	See n. 35 of more	<del></del>	- 1.5 Outer - 0		
<u> </u>	see p. so oi manua	1.			
26. Wetland plants in streambed *perennial streams may also be identified using other methods. S Notes:		FACY = 0.75, OBL	= 1.5 Other = 0		

Date: 9-8-17	Project/Site:	Project/Site: SASSACIKA				
Evaluator: TAYLOR	County: Joh	ر ۱۵۶۹۵	Longitude:			
Total Points:  Stream is at least intermittent if ≥ 19 or perennial if ≥ 30*  41, 25	Stream Determ	ination (circle one) ermittent Perennial	Other Ce.g. Quad Name	Other 5 e.g. Quad Name:		
A. Geomorphology (Subtotal = 25)	Absent	Weak	Moderate	Strong		
1 <sup>a</sup> Continuity of channel bed and bank	0	1	2	(3')		
2. Sinuosity of channel along thalweg	0	1	(2)	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		(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)		1.5		
10. Natural valley	0	0.5	1 -	(1.5)		
11. Second or greater order channel		o = 0	Yes			
a artificial ditches are not rated; see discussions in manual	in in	0 - 0	(Tes	-3/		
B. Hydrology (Subtotal = 10.5)						
12. Presence of Baseflow	0	1	2	3		
13. Iron oxidizing bacteria	0	<b>1</b>	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	<u>(1.5)</u>		
17. Soil-based evidence of high water table?	N	o = 0	Yes:			
C. Biology (Subtotal = 5.75)	<del></del>	······································				
18. Fibrous roots in streambed	3	2	<u> </u>	0		
19. Rooted upland plants in streambed	3	2	1			
20. Macrobenthos (note diversity and abundance)	0	(1)	2	3		
21. Aquatic Mollusks	(6)	1	2	3		
22. Fish	<b>7</b> 0	0.5	1	1.5		
23. Crayfish	0	(0.5)	1	1.5		
24. Amphibians	0	(0.3)	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	s. See p. 35 of manua	1.				
Notes:						
Sketch:						

Project/Site: Secounty: Stream Determine	ination (circle one)	Longitude:		
Stream Determi	ination (circle one)	Other		
		Other e.g. Quad Name: \( \( \)		
Absent	Weak	Moderate	Strong	
0	1	<b>3</b>	3	
0	0	2	3	
0	1	<b>②</b>	3	
0	1	2	3	
0	1	<b>D</b>	3	
0	1	<b>Ø</b>	3	
0	1	<b>ව</b>	3	
0	<b>B</b>	2	3	
0	<b>9.5</b>	1	1.5	
0	0.5		1.5	
- 1		Yes =		
0	1	$\bigcirc$ 2	3	
(0)	-	2	3	
1.5	(1)	0.5	0	
0	0.5	4	1.5	
0	0.5	1	1.5	
No	o = 0	Yes=	: 3	
3	2	<b>(D)</b>	0	
3	2	1	0	
0	<u>(1)</u>	2	3	
(D)	1	2	3	
<b>6</b>	0.5	1	1.5	
0	(0.5)	1	1.5	
0		1	1.5	
0		1	1.5	
	FACW = 0.75:) OBI			
ee p. 35 of manua				
1	<del> </del>	***		
	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 0 1 0 0 1 0 0 0.5 0 0.5 0 0.5 0 0.5 No = 0  3 2 3 2 3 2 0 1 0 1 0 0.5 0 0.5 0 0.5 0 0.5 0 0.5 0 0.5 0 0.5 0 0.5	0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	

NC DWQ Stream Identification Form Version 4.11

Date: 9-8-17 Project/Site:

Date: 9-8-17	Project/Site: SASSACUXA		Latitude:		
Evaluator: D TAYLOR	County: 504	いいっし	Longitude:		
Total Points:  Stream is at least intermittent 13.25 if ≥ 19 or perennial if ≥ 30*	Stream Determ	ination (circle one) ermittent Perennial	Other T 5 13 e.g. Quad Name:		
A. Geomorphology (Subtotal = 11,5)	Absent	Weak	Moderate	Strong	
1 <sup>a.</sup> Continuity of channel bed and bank	0	1	<b>3</b>	3	
Sinuosity of channel along thalweg	0	B	2	3	
In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	0	2	3	
Particle size of stream substrate	0	0	2	3	
5. Active/relict floodplain	0	1	<b>(2</b> )	3	
6. Depositional bars or benches	0	· (b)	2	3	
7. Recent alluvial deposits	0	<b>(1)</b>	2	3	
8. Headcuts	0	①	2	3	
9. Grade control	0	(6.5)	1	1.5	
10. Natural valley	0	0.5	_ (1)	1.5	
11. Second or greater order channel	No	o = 0	Yes =	: 3	
artificial ditches are not rated; see discussions in manual					
B. Hydrology (Subtotal = 5.5)					
12. Presence of Baseflow	0	<b>O</b>	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	o = 0	(Yes =	.3)	
C. Biology (Subtotal = $(6.25)$					
18. Fibrous roots in streambed	3	2	0	0	
19. Rooted upland plants in streambed	3	Ø	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	<u>OF</u>	1	1.5	
24. Amphibians	0	03	1	1.5	
25. Algae	0	05	1	1.5	
26. Wetland plants in streambed		FACV( = 0.75; OBL	. = 1.5 Other = 0		
*perennial streams may also be identified using other methods.	See p. 35 of manua	<u>l </u>			
Notes:					
Sketch:					

	Project/Site:	SSARIKA	Latitude:		
Evaluator: D. TAYLOR	Project/Site:	2570-2	Longitude:	· · · · · · · · · · · · · · · · · · ·	
Total Points: Stream is at least intermittent if ≥ 19 or perennial if ≥ 30*	Stream Determi	nation (circle one)	Other TSC e.g. Quad Name:		
A. Geomorphology (Subtotal = 13	Absent	Weak	Moderate	Strong	
1a. Continuity of channel bed and bank	0	<b>a</b>	2	3	
2. Sinuosity of channel along thalweg	0	(1)	2	3	
In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	@	3	
4. Particle size of stream substrate	0	1	2	3	
5. Active/relict floodplain	0	1	<b>Ø</b>	3	
6. Depositional bars or benches	0	0	2	3	
7. Recent alluvial deposits	0	1	2	3	
8. Headcuts	0	0	2	3	
9. Grade control	0	0.3	1	1.5	
10. Natural valley	0	0.5	1 *	(1.5)	
11. Second or greater order channel	No	= 9)	Yes =	3	
artificial ditches are not rated; see discussions in manual					
B. Hydrology (Subtotal =)					
12. Presence of Baseflow	(O)	1	2	3	
13. Iron oxidizing bacteria	6	1	2	3	
14. Leaf litter	1.5	(1)	0.5	0	
15. Sediment on plants or debris	0	0.5	$\bigcirc$	1.5	
16. Organic debris lines or piles	0	0.5	0	1.5	
7. Soil-based evidence of high water table?	No	= 0	Yes =	3	
C. Biology (Subtotal = 6.25)					
8. Fibrous roots in streambed	3	2	0	0	
9. Rooted upland plants in streambed	3	<b>3</b>	1	0	
20. Macrobenthos (note diversity and abundance)	σ	00	2	3	
21. Aquatic Mollusks	<b>D</b>	1	2	3	
22. Fish	0	0.5	1	1.5	
23. Crayfish	0	03	1	1.5	
24. Amphibians	0	<b>65</b> )	1	1.5	
5. Algae	0	(0.3)	1	1.5	
6. 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.				
percentage and and are					

Date: 9-8-17	Project/Site: 5	ASSARIXA	Latitude:		
Evaluator: D. TAYLOR	County: 50	40570	Longitude:		
l Total Points:	1	ination (circl <del>e one</del> )	Other		
Stream is at least intermittent 38.25 if ≥ 19 or perennial if ≥ 30*	Ephemeral Inte	ermittent (Perennia)	e.g. Quad Name:		
	<del></del>		<u> </u>		
A. Geomorphology (Subtotal = 21)	Absent	Weak	Moderate	Strong	
1 <sup>a.</sup> Continuity of channel bed and bank	0	1	2	(3)	
2. Sinuosity of channel along thalweg	0	1	$\mathcal{L}$	3	
In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	<u>(2)</u>	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 = 0	Yes:	= 3	
<sup>a</sup> artificial ditches are not rated; see discussions in manual					
B. Hydrology (Subtotal =)					
12. Presence of Baseflow	0		2	3	
13. Iron oxidizing bacteria	0	0	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 = $6.25$ )					
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		2	3	
21. Aquatic Mollusks	(92)	1	2	3	
22. Fish	6	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	s. See p. 35 of manua	ſ.			
Notes:					
			•		
Sketch:					

## NC SAM FIELD ASSESSMENT RESULTS Accompanies User Manual Version 2.1

USACE AID #:	NCDWR #:
and circle the location of the number all reaches on the a and explanations of request NC SAM User Manual for ex	sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, a stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and ttached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions ed information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the kamples of additional measurements that may be relevant.  ESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).
PROJECT/SITE INFORMA	
1. Project name (if any):	DOSSELL WO SCHOOL
Applicant/owner name:     County:	W IWANA LING
County:     River basin:     Site coordinates (decimal)	Sohns con 0 6. Nearest named water body on USGS 7.5-minute quad: Sasana Creek degrees, at lower enu of assessment reach):
STREAM INFORMATION: 9. Site number (show on att 11. Channel depth from bed 12. Channel width at top of	(depth and width can be approximations) ached map):Sa_Sa_Cra_Crach10. Length of assessment reach evaluated (feet):  I (in riffle, if present) to top of bank (feet):Sf_E
CC - CALL CONTROL	
16. Estimated geomorphic valley shape (skip for	
Tidal Marsh Stream):	(more sinuous stream, flatter valley slope) (less sinuous stream, steeper valley slope)
☐Section 10 water ☐Essential Fish Habita ☐Publicly owned prope ☐Anadromous fish ☐Documented present List species:	ON: erations evaluated? ☐ Yes ☐ No If Yes, check all that apply to the assessment area. ☐ Classified Trout Waters ☐ Water Supply Watershed (☐ I ☐ II ☐ III ☐ IV ☐ V)  at ☐ Primary Nursery Area ☐ High Quality Waters/Outstanding Resource Waters ☐ NCDWR Riparian buffer rule in effect ☐ Nutrient Sensitive Waters ☐ 303(d) List ☐ CAMA Area of Environmental Concern (AEC)  ce of a federal and/or state listed protected species within the assessment area.
1. Channel Water – asset   ☐ A Water through  ☐ B No flow, water  ☐ C No water in as	ssment reach metric (skip for Size 1 streams and Tidal Marsh Streams) out assessment reach. in pools only. ssessment reach. triction – assessment reach metric
noint of obstru	of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction <u>or</u> fill to the ucting flow <u>or</u> a channel choked with aquatic macrophytes <u>or</u> ponded water <u>or</u> impoundment on flood or ebb within nt reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams,
3. Feature Pattern – asse □A A majority of t □B Not A	essment reach metric he assessment reach has altered pattern (examples: straightening, modification above or below culvert).
Majority of ass	Profile – assessment reach metric sessment reach metric sessment reach has a substantially altered stream profile (examples: <a href="channel-down-cutting">channel down-cutting</a> , existing damming, over very aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these
Consider only curren active bank failure, acti  ☐A < 10% of chal	channel unstable

6.	Streamside Area Interaction – streamside area metric Consider for the Left Bank (LB) and the Right Bank (RB).									
	LB □A □B	RB □A □®	Mode refere	rate eviden ence interac	ce of conditio tion (example	s: limited streams	erms, leve side area a	es, dowr	nteraction n-cutting, aggradation, dredging) that adverse isruption of flood flows through streamside are ninor ditching [including mosquito ditching])	ly affect a, leaky
	□c	□с	Exter [exan of floo mosq	sive eviden ples: causo d flows thro	ce of condition eways with floo gugh streamsing) or floodpla	ons that adversely oodplain and chan de area] <u>or</u> too mu	affect ret nel constr ch floodp	erence in iction, bul lain/intert	nteraction (little to no floodplain/intertidal zone lkheads, retaining walls, fill, stream incision, disidal zone access [examples: impoundments, ir tor assessment reach is a man-made feature	sruption ntensive
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/Sket section. □ F Livestock with access to stream or intertidal zone □ G Excessive algae in stream or intertidal zone								Sketch"	
		Othe	raded mars er: to no stres			idal zone (remova ain in "Notes/Sket			mowing, destruction, etc)	
8.	Rece For S □A □B □C	Size 1 or 2 Drou Drou	streams, l ght condití	D1 drought ons <u>and</u> no ons <u>and</u> rair	or higher is co rainfall or rair	idal Marsh Strea onsidered a drough ofall not exceeding g 1 inch within the	nt; for Size	ithin the I	treams, D2 drought or higher is considered a c ast 48 hours	lrought.
9.	Larg				essment read		f Yes. ski	p to Metri	ic 13 (Streamside Area Ground Surface Condi	ítion)
10.			eam Habit ∐No	at Types – Degraded i sedimentati	assessment n-stream hab on, mining, e	reach metric pitat over majority	of the a	assessme	ent reach (examples of stressors include ex r example, rip-rap], recent dredging, and sn	cessive
	10b.	Check a  □A  □B  □C □D  □D  □D	Multiple a (include li Multiple s vegetation Multiple s 5% under	ur (occurs in iquatic mack verworts, licks and/or in nags and low cut banks a extend to the intercurs in intercurs intercurs in intercurs in intercurs in intercurs in intercurs in intercurs in intercurs in intercurs in intercurs in inter	f > 5% covera cophytes and thens, and alg leaf packs a gs (including and/or root m	age of assessmen aquatic mosses gal mats) and/or emergent	3		Size 4 Coastal Plain streams) 5% oysters or other natural hard bottoms Submerged aquatic vegetation Low-tide refugia (pools) Sand bottom 5% vertical bank along the marsh Little or no habitat	
									OAL MARSH STREAMS***************	****
		orm and ☐Yes							streams and Tidal Marsh Streams) Coastal Plain streams)	
			evaluated Riffle-run Pool-glide	Check the section (ever section (ever	e appropriate aluate 11c) valuate 11d)			skip for (	Coastai Piam streams)	
	11c.	In riffle s at least (R) = pre	ections, choone box in esent but < ot exceed RR	eck all that of each row 10%, Com	cccur below the skip for Size mon (C) = > cch assessme	ne normal wetted pe 4 Coastal Plain 10-40%, Abundar	operimeter streams it (A) = > olite - 4096 m 256 mm) mm) mm) 2 mm)	and Tida 40-70%, m)	sessment reach – whether or not submerged.  Il Marsh Streams). Not Present (NP) = abser Predominant (P) = > 70%. Cumulative perce	nt, Rare
	11d.	□Yes	⊠No A	re pools fille	ed with sedim	ent? (skip for Siz	e 4 Coas	tal Plain	streams and Tidal Marsh Streams)	

12.	C 100 C 100 C	Tyes	□No	was an in-stream aquatic life assessment performed as described in the User Manual?  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.
			Aqu Beee Acad Asia Cru Dan Dipt May Mid Mos Mus Coth Sala Sto	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams. It frogs atic reptiles agic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) tiles disfly larvae (T) an clam (Corbicula) stacean (isopod/amphipod/crayfish/shrimp) anselfly and dragonfly larvae erans \(\frac{\gamma_{\text{CW}}}{\text{CW}}\) (1) algorithms (2) algorithms (3) alg
	Cons	sider for RB □A □B □C	the Left Lit Mo Se	bund Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)  Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.  Itele or no alteration to water storage capacity over a majority of the streamside area over a lateration to water storage capacity over a majority of the streamside area over a lateration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, lateration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, lateration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, lateration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, lateration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, lateration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, lateration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, lateration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, lateration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, lateration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, lateration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, lateration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, lateration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction).
14.	Streat Constant LB	amside A sider for RB □A □B □C	Area Wa the Lef Ma	ter Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types) to Bank (LB) and the Right Bank (RB) of the streamside area.  Injority of streamside area with depressions able to pond water ≥ 6 inches deep sijority of streamside area with depressions able to pond water 3 to 6 inches deep sijority of streamside area with depressions able to pond water < 3 inches deep
15.	Cons	sider for	the Lefeter of as	streamside area metric (skip for Tidal Marsh Streams) t Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal seessment reach. e wetlands present in the streamside area?
16.	Base	eflow Co ck all co Stre Pon Obs Evic Stre	ntributo ntributo eams and ids (inclu struction dence of	ors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams) rs within the assessment reach or within view of and draining to the assessment reach. d/or springs (jurisdictional discharges) ide wet detention basins; do not include sediment basins or dry detention basins) passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir) bank seepage or sweating (iron in water indicates seepage) or bank soil reduced (dig through deposited sediment if present) above
17.	Base	ck all tha Evic Obs Urb Evic Ass	at apply dence of struction an strea dence th	substantial water withdrawals from the assessment reach (includes areas excavated for pump installation) not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit) m (≥ 24% impervious surface for watershed) at the streamside area has been modified resulting in accelerated drainage into the assessment reach t reach relocated to valley edge
18.	Shar Cons A B C	sider asp Stre Deg	ect. Co eam sha graded (	ent reach metric (skip for Tidal Marsh Streams) nsider "leaf-on" condition. ding is appropriate for stream category (may include gaps associated with natural processes) example: scattered trees) ding 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 A A A A A A A A A A A A A A A
	□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  \[ \begin{align*} \BA & Mature forest \\ \BB & Non-mature woody vegetation \overline{or} modified vegetation structure \\ \BC & \BC & Herbaceous vegetation with or without a strip of trees < 10 feet wide \\ \BC & \BC & Little or no vegetation \end{align*}  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 A A A A A A A A A A A A A
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 Medium to high stem density  B 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 The total length of buffer breaks is < 25 percent.  B 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         A       A         B       B         B       B         C       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.         B       C       C         C       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). $\Box A < 46  \Box B  46 \text{ to } < 67  \Box C  67 \text{ to } < 79  \Box D  79 \text{ to } < 230  \Box E \geq 230$
Note	water rusty Brown; man road starts the reach

# NC SAM FIELD ASSESSMENT RESULTS Accompanies User Manual Version 2.1

USACE AID	)#:			NCDWR #:	
INSTRUCTI and circle th number all re and explana NC SAM Us	ONS: Attach a ske ne location of the si eaches on the atta ations of requested her Manual for exar	tream reach under evaluched map, and include a information. Record in nples of additional meas	uation. If multiple a separate form for the "Notes/Sketch surements that may	stream reaches will be evaluated each reach. See the NC SAM L " section if supplementary meas	7.5-minute topographic quadrangle, on the same property, identify and user Manual for detailed descriptions urements were performed. See the n the assessment area).
	SITE INFORMATIO	ON:			11115/19
	ame (if any):	Sassarikas	wamp ?	2. Date of evaluation:	-1/10/18
Control of the contro	/owner name:	Wildlands		4. Assessor name/organization: 5. Nearest named water body	carsim
5. County: 7. River bas	iler –	SUMATEON		on USGS 7.5-minute quad:	Sacrocka
		egrees, at lower end of a	assessment reach)		2012-11-100
		pth and width can be			
9. Site numb	per (show on attacl	ned map): TI F	2 \ 10. Le	ength of assessment reach evalu	
12. Channel 14. Feature STREAM C	I width at top of bar type: ☐Perennial ATEGORY INFOR	flow Intermittent flow MATION:	13. Is as w	ssessment reach a swamp steam	Jnable to assess channel depth.  n? ☐Yes ☑No  ☐ Outer Coastal Plain (O)
15. NC SAM	/I Zone:	☐ Mountains (M)	☐ Piedmont (P)		U Outer Coastal Plain (O)
16 Estimate	ed geomorphic	- (	,		
	hape (skip for	DIA	<u></u>	□в	<u></u>
	arsh Stream):	(more sinuous stream	Calculation of the second second		tream, steeper valley slope)
for Tida	ned size: (skip al Marsh Stream) AL INFORMATION	⊠Size 1 (< 0.1 mi²)	☐Size 2 (0.1 to	o < 0.5 mi²) Size 3 (0.5 to <	< 5 mi²)
□Docu List s	romous fish mented presence species: gnated Critical Hab		listed protected sp	pecies within the assessment are	ironmental Concern (AEC) ea.
19. Are add	litional stream infor	mation/supplementary r	neasurements incl	uded in "Notes/Sketch" section o	or attached?  Yes  No
⊠A □B □C	Water throughout No flow, water in No water in assect of Flow Restrict At least 10% of a point of obstruction.	t assessment reach. pools only. ssment reach. tion – assessment rea assessment reach in-str	nch metric ream habitat or riffl loked with aquatic	macrophytes or ponded water of	ected by a flow restriction <u>or</u> fill to the or impoundment on flood or ebb within It the channel, tidal gates, debris jams
3. Feature	Pattern – assess	ment reach metric			an abayo or balancashired
□A □A B	Not A			amples: straightėning, modificati	on above or below culvert).
Feature □A ☑B	Majority of asses	ofile – assessment read esment reach has a substaggradation, dredging,	stantially altered st	ream profile (examples: channe here appropriate channel profile	down-cutting, existing damming, ove has not reformed from any of these
Consid	er only current in	channel down-cutting (h el unstable innel unstable	ents from which t	he stream has currently recover dening, and artificial hardening (	vered. Examples of instability include such as concrete, gabion, rip-rap).

0.		Consider for the Left Bank (LB) and the Right Bank (RB).									
	LB	RB		it ballk (t	-b) and th	ie Kignt	Dank (KD),				
		A	re	loderate e ference ir	vidence o iteraction (	f conditio example	<ul><li>s: limited stream</li></ul>	erms, leve side area	ees, dow	nteraction n-cutting, aggradation, dredging) that adversely affed disruption of flood flows through streamside area, leak minor ditching [including mosquito ditching])	et y
			C E: [e of m	xtensive e xamples: flood flow	vidence o causeway s through (tching]) <u>o</u>	f conditio /s with flo streamsio	ns that adversely odplain and chan de area] <u>or</u> too mi	/ affect rei nel constr uch floodp	ference in iction, but lain/inter	nteraction (little to no floodplain/intertidal zone acces ilkheads, retaining walls, fill, stream incision, disruptio tidal zone access [examples: impoundments, intensiv it or assessment reach is a man-made feature on a	n
7.	Wat	ter Qualit	y Stres	sors – as	sessment	reach/ir	ntertidal zone m	etric			
		eck all that Disc Exc Not O Odd	at apply colored cessive s iceable or (not ir	water in s sedimenta evidence ocluding n	tream or ir tion (buryi of pollutan atural sulfi	ntertidal z ng of stre t dischar de odors	one (milky white, eam features or inges entering the	blue, unn tertidal zo assessme	ne) nt reach	ater discoloration, oil sheen, stream foam) and causing a water quality problem ne assessment reach. Cite source in "Notes/Sketch	n
	MF			ith access	to stream	or intert	idal zone				
	□G	Exc	essive a	algae in st	ream or in	tertidal zo	one				
		Oth	er:	narsh veg stressors	etation in t	he interti (expla	dal zone (remova ain in "Notes/Ske	II, burning ch" sectio	, regular n)	mowing, destruction, etc)	
8.	For B	Size 1 or Dro Dro	2 strean ught cor ught cor	ns, D1 dro nditions <u>ar</u> nditions <u>ar</u>	ught or hig <u>id</u> no rainf <u>id</u> rainfall e	her is co all or rain	idal Marsh Strea nsidered a droug fall not exceeding g 1 inch within th	ht; for Size	ithin the	streams, D2 drought or higher is considered a drought last 48 hours	0.00
9.		ge or Dan	igerous		- assessm						
44	□Y <sub>0</sub>							If Yes, ski	p to Metr	ic 13 (Streamside Area Ground Surface Condition).	
10.		Irai in-sti ∐Yes	ream Ha ⊠No	Degra sedim	ded in-str entation, r	eam hab mining, e	reach metric itat over majorit xcavation, in-str stal Plain strear	eam hard	ening [fo	ent reach (examples of stressors include excessive or example, rip-rap], recent dredging, and snagging o to Metric 12)	)
	10b.	Check	all that	occur (oc	curs if > 5	% covera	ge of assessmer	nt reach) (	skip for	Size 4 Coastal Plain streams)	
	☐A Multiple aquatic macrophyte (include liverworts, lichens, a ☐B Multiple sticks and/or leaf p.			s, and algal mats) $\frac{3}{2}$ $\frac{2}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ Submerged aquatic vegetation							
	vegetation ☐C Multiple snags and logs (includi							Sand bottom 5% vertical bank along the marsh			
		D					ats and/or roots ed perimeter	0 2	□K	Little or no habitat	
		☑E Little or no habitat									
****	*****	******	****	***REMAI	NING QUI	ESTIONS	ARE NOT APP	LICABLE	FOR TIE	DAL MARSH STREAMS************************************	
										streams and Tidal Marsh Streams)	
		⊠Yes	□No							Coastal Plain streams)	
	11b.	Bedform	n evalua		ck the app				m. et 175 mi	,	
		⊠A □B □C	Riffle-i Pool-g	un section lide section	n (evaluat on (evalua	e 11c) te 11d)		: Life)			
	11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams). Not Present (NP) = abs (R) = present but < 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%. Predominant (P) = > 70%. Cumulative per							I Marsh Streams). Not Present (NP) = absent Rare	Υ.		
		NP	R	ed 100% i C	or each as	ssessmei P	it reach.				
			H	日	R	R	Bedrock/sapr Boulder (256		m)		
		卤	ğ	Ħ	Ë	d	Cobble (64 -	256 mm)	11)		
			Z ·	H	H		Gravel (2 – 64 Sand (.062 –				
			X				Silt/clay (< 0.0				
		Ä					Detritus Artificial (rip-ra	an concre	ete etc.)		
	11d.	⊠Yes	□No	Are poo	ls filled wit	h sedime				streams and Tidal Marsh Streams)	
		G. S. C. L. A.	-	1	- The Name of Street	2.3000.00	1			anamina dia tian maion on camo	

12.	12a. 🖾	Yes DN	was an in-stream aquatic life assessment performed as described in the User Manual?  The of the following reasons and skip to Metric 13.   No Water  Other:		
	12b.	Yes 🗐	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.		
			Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.  Justic reptiles  quatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)  eletles  addisfly larvae (T)  sian clam (Corbicula)  rustacean (isopod/amphipod/crayfish/shrimp)  amselfly and dragonfly larvae  pterans  ayfly larvae (E)  egaloptera (alderfly, fishfly, dobsonfly larvae)  idges/mosquito larvae  osquito fish (Gambusia) or mud minnows (Umbra pygmaea)  ussels/Clams (not Corbicula)  ther fish  alamanders/tadpoles  nails  tonefly larvae (P)  pullid larvae		
13			forms/leeches		
13.	Conside LB A B C	er for the L RB A B B B C	Fround Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types) of Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.  Little or no alteration to water storage capacity over a majority of the streamside area Moderate alteration to water storage capacity over a majority of the streamside area Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, ivestock disturbance, buildings, man-made levees, drainage pipes)		
14.	Streams Conside LB  A B B C	side Area er for the I RB DA BB C	Vater Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types) eft Bank (LB) and the Right Bank (RB) of the streamside area.  Majority of streamside area with depressions able to pond water ≥ 6 inches deep Majority of streamside area with depressions able to pond water 3 to 6 inches deep Majority of streamside area with depressions able to pond water < 3 inches deep		
15.	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 a wetled perimeter of assessment reach. LB RB □Y □Y Are wetlands present in the streamside area? ☑N ☑N				
16.	Baseflo	All contrib Streams Ponds (in Obstruct Evidence	tors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams) tors within the assessment reach or within view of and draining to the assessment reach. und/or springs (jurisdictional discharges) clude wet detention basins; do not include sediment basins or dry detention basins) on passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir) of bank seepage or sweating (iron in water indicates seepage) ed or bank soil reduced (dig through deposited sediment if present) ne above		
17.		all that ap Evidence Obstruct Urban st Evidence Assessn	ly. of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation) on not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit) eam (≥ 24% impervious surface for watershed) that the streamside area has been modified resulting in accelerated drainage into the assessment reach ent reach relocated to valley edge ne above		
18.	Shadin Conside A B C	er aspect. Stream : Degrade	ment reach metric (skip for Tidal Marsh Streams) Consider "leaf-on" condition. nading is appropriate for stream category (may include gaps associated with natural processes) I (example: scattered trees) fey ໄປເຊັ້ງ ໄດ້ເຂັ້ນ		

19.	to the Vegeta LB	der "vege first brea ated W RB LE	tated buffi k. ooded B RB A □A B □B C □C	≥ 100 feet w From 50 to < From 10 to < From 10 to <	skip for Tidal Mars led buffer" separat ide <u>or</u> extends to the 100 feet wide 50 feet wide 30 feet wide le or no trees	ely for left ba		ght bank (RI	3) starting at	the top of bank ou
20.	Buffer Consi LB A B C D D D E	Structure der for lef RB A B B C D D	Mature f Non-mat Herbace Maintain	) and right bar orest ure woody veg	ic (skip for Tidal M nk (RB) for Metric 1 etation <u>or</u> modified v with or without a str	9 ("Vegetate regetation stru	d" Buffer Widt	th).		
21.	within If none Abuts LB F	all appro	priate box stream (< 3 Illowing str 80 feet RB A ∐A B □B	es for left ban 0 feet), or is be	ric (skip for Tidal M k (LB) and right bar etween 30 to 50 feet s on either bank, cl Row crops Maintained turf Pasture (no livest Pasture (active liv	nk (RB). Indic of stream (30- neck here and ock)/commerc	cate if listed stre -50 feet). d skip to Metri		cream (Abuts),	does not abut but is
22.	Stem I Consid LB A B B C	Density – s der for left RB □A ☑B □C	Medium Low sten	) and right bar to high stem de n density	skip for Tidal Mars nk (RB) for Metric 1 ensity fer <u>or</u> predominantly	9 ("Wooded"				
23.	Contin Consid LB	uity of Ve er whether RB ☑A ☑B ☑C	The total The total	buffer is continuous length of buffe length of buffe	side area metric (sl nuous along stream r breaks is < 25 pero r breaks is between r breaks is > 50 pero	(parallel). Bre cent. 25 and 50 per	aks are areas	s) lacking veget	ation > 10 feet	wide.
24.	Evalua	tive Comp te the dom ment reach RB □A □B	inant vege n habitat. Vegetatic with non- Vegetatic species. communi communi Vegetatic	on is close to unative invasive invasive invasive in indicates dis This may inties with non-nities missing unon is severely controlled.	ea metric (skip for 10 feet of each bank Indisturbed in specie species absent or seturbance in terms clude communities ative invasive specie derstory but retains of	es present and parse. of species div of weedy na es present, bu g canopy tree species diver	e of the waters  I their proportion  versity or proportive species that not dominant  s.  sity or proportion	ons. Lower's ortions, but is nat develop is, over a large	trata compose s still largely of after clear-cu e portion of the canopy is abs	d of native species, composed of native titing or clearing or expected strata or sent 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.  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. C	A < 46	□В	46 to < 67	onductivity measure □C 67 to < 79 €	□D 79	9 to < 230	□E ≥ 230	er),	

### NC SAM FIELD ASSESSMENT RESULTS Accompanies User Manual Version 2.1

1		and the state of t
	USACE AID #:	NCDWR #:
r	and circle the location of the number all reaches on the atl and explanations of requeste	sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and tached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the
1	NOTE EVIDENCE OF STRE	amples of additional measurements that may be relevant.  SSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).
1	PROJECT/SITE INFORMAT  I. Project name (if any):	$T_{r} = T_{r} = T_{r}$
	Applicant/owner name:	4. Assessor name/organization: Wildlands Eng
7	5. County; 7. River basin: 3. Site coordinates (decimal c	6. Nearest named water body on USGS 7.5-minute quad:  LISCUNXA LICEN  6. Nearest named water body on USGS 7.5-minute quad:  LISCUNXA LICEN
9	TREAM INFORMATION: (c). Site number (show on attach	depth and width can be approximations)  ched map): T   R 3
1	<ol> <li>Channel width at top of ba</li> <li>Feature type: ☐Perennia</li> </ol>	(in riffle, if present) to top of bank (feet): 3 ← Unable to assess channel depth.  ank (feet): 4 ← 13. Is assessment reach a swamp steam? Yes No al flow Intermittent flow Tidal Marsh Stream
	5. NC SAM Zone:	RMATION:  Mountains (M) Piedmont (P) Minner Coastal Plain (I) Outer Coastal Plain (O)
1	6. Estimated geomorphic valley shape (skip for	
	Tidal Marsh Stream):	(more sinuous stream, flatter valley slope) (less sinuous stream, steeper valley slope)
	7. Watershed size: (skip for Tidal Marsh Stream)	Size 1 (< 0.1 mi²)
	DDITIONAL INFORMATION	N: ations evaluated? ☐ Yes ☐ No If Yes, check all that apply to the assessment area.
	☐ Section 10 water ☐ Essential Fish Habitat ☐ Publicly owned property ☐ Anadromous fish ☐ Documented presence List species:	□ Classified Trout Waters □ Water Supply Watershed (□ □ □ □ □ □ □ □ □ V □ □ □ Primary Nursery Area □ High Quality Waters/Outstanding Resource Waters  y □ NCDWR Riparian buffer rule in effect □ Nutrient Sensitive Waters □ 303(d) List □ □ CAMA Area of Environmental Concern (AEC)  of a federal and/or state listed protected species within the assessment area.
10	Designated Critical Hab	
13	9. Are additional stream into	rmation/supplementary measurements included in "Notes/Sketch" section or attached?   Yes   No
1.		
2.	At least 10% of a point of obstructi	ction – assessment reach metric assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the ing flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams,
3.	Feature Pattern – assess  ☐A A majority of the ☐B Not A	ment reach metric assessment reach has altered pattern (examples: straightening, modification above or below culvert).
1.		file – assessment reach metric
	<sup>™</sup> Majority of asses	sment reach has a substantially altered stream profile (examples: <a href="channel down-cutting">channel down-cutting</a> , existing damming, over aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these
5.		y – assessment reach metric
	Consider only current in	stability, not past events from which the stream has currently recovered. Examples of instability include channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap). I unstable nnel unstable

6.				eraction -									
	LB	RB	the Len	Bank (LB	) and the	e Right E	запк (КБ).						
	DA DB	□A □A	Mo ref or	oderate eviderence inte intermittent	dence of raction (e bulkhea	conditior examples ids, cause	s: limited streams eways with flood;	erms, leve side area a olain cons	es, dowr access, d triction, n	n-cutting, aggradation, dredging) that adversely affect isruption of flood flows through streamside area, leaky ninor ditching [including mosquito ditching])			
	ПС		Ex [ex of t	tensive evi camples: ca flood flows	dence of auseways through s hing]) <u>or</u>	condition s with floo streamsid	ns that adversely odplain and chan de area] <u>or</u> too mu	affect ref nel constr ich floodp	erence in iction, bul lain/intert	steraction (little to no floodplain/intertidal zone access lkheads, retaining walls, fill, stream incision, disruption idal zone access [examples: impoundments, intensive tor assessment reach is a man-made feature on an			
7.	Wate	er Qualit	y Stress	ors – asse	ssment	reach/in	tertidal zone me	etric					
		Check all that apply.  A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)											
	□В	B <u>Excessive</u> sedimentation (burying of stream features or intertidal zone)											
	ΠE												
	₩.F	☑F Livestock with access to stream or intertidal zone											
	□G □H	G Excessive algae in stream or intertidal zone											
		Oth	er:		200111111		in in "Notes/Sket			moving, accuration, etcy			
			e to no s					Care No.					
8.		Size 1 or Dro Dro	2 stream ught con ught con	s, D1 droug ditions <u>and</u>	ght or hig no rainfa	her is co all or rain	idal Marsh Strea nsidered a droug fall not exceeding g 1 inch within the	ht; for Size	ithin the I	treams, D2 drought or higher is considered a drought. last 48 hours			
9.	Larg	-		Stream - a				lf Yes ski	n to Metr	ic 13 (Streamside Area Ground Surface Condition).			
10		1.4			7		reach metric	11 100, 511	p to Meti	to to (estecational river elevatia estimate elevation).			
		∐Yes		Degrad sedime	ed in-strontation, r	eam hab nining, e	itat over majority	eam hard	ening [fo	ent reach (examples of stressors include excessive r example, rip-rap], recent dredging, and snagging) to Metric 12)			
	10b.									Size 4 Coastal Plain streams)			
		ПА		le aquatic r le liverwort			aquatic mosses gal mats)	idal	□F □G	5% oysters or other natural hard bottoms Submerged aquatic vegetation			
		ДВ	Multipl vegeta		d/or leaf	packs a	ind/or emergent	k for J h Stre	□H	Low-tide refugia (pools) Sand bottom			
		□C □D	Multipl 5% un	e snags ar dercut ban	ks and/o	r root ma	lap trees) ats and/or roots ed perimeter	Check for Tidal Marsh Streams Only	□ĸ	5% vertical bank along the marsh Little or no habitat			
		□E		or no habita		mai wett	sa perimeter						
***	*****	******	*****	***DEMAIN	ING OU	ESTIONS	S APE NOT APP	LICABLE	EOD TII	DAL MARSH STREAMS************************************			
										streams and Tidal Marsh Streams)			
41,													
		☐Yes Bodforn	No.					siream? (	skip ior	Coastal Plain streams)			
	TID.	⊠A □B □C	Riffle-i Pool-g	ted. Checl run section lide section il bedform :	(evaluat ı (evalua	te 11c) ite 11d)	letric 12, Aquatio	c Life)					
	11c.	at least (R) = pr	one bor	x in each r	ow (skip Common	for Size (C) = > '	e 4 Coastal Plain 10-40%, Abunda	streams	and Tida	sessment reach – whether or not submerged. Check al Marsh Streams). Not Present (NP) = absent, Rare Predominant (P) = > 70%. Cumulative percentages			
		NP	R	С	A	P	Bedrock/sapr	rolito					
		X					Boulder (256	-4096 m					
		L X	H	179.	H	H	Cobble (64 – Gravel (2 – 6						
			Ë		Ē	Ē	Sand (.062 -	2 mm)					
			Н	X.	H	H	Silt/clay (< 0. Detritus						
		X					Artificial (rip-r						
	11d.	□Yes	⊠No	Are pools	s filled wi	ith sedim	ent? (skip for Si	ze 4 Coas	stal Plain	streams and Tidal Marsh Streams)			

14.	12a.	∀Yes	□No	Was an in-stream aquatic life assessment performed as described in the User Manual?  to 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 □Adu □Agu	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams. It frogs atic reptiles
				atic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
				disfly larvae (T) an clam ( <i>Corbicula</i> )
			□ Dan	stacean (isopod/amphipod/crayfish/shrimp) nselfly and dragonfly larvae
				rfly larvae (E)
		11	□Mid	galoptera (alderfly, fishfly, dobsonfly larvae) ges/mosquito larvae
			Mus	equito fish ( <i>Gambusia</i> ) or mud minnows ( <i>Umbra pygmaea)</i> essels/Clams (not <i>Corbicula</i> )
				er fish amanders/tadpoles
			Stor	nefly larvae (P) ulid larvae
	1		□Wor	ms/leeches
13.				ound Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)  Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.
	□A □B	□A □B		le or no alteration to water storage capacity over a majority of the streamside area derate alteration to water storage capacity over a majority of the streamside area
	ĎC	⊠c		vere alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, stock disturbance, buildings, man-made levees, drainage pipes)
14.				ter Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types) Bank (LB) and the Right Bank (RB) of the streamside area.
	□A □B □C	□A □B □C	Ma	jority of streamside area with depressions able to pond water ≥ 6 inches deep jority of streamside area with depressions able to pond water 3 to 6 inches deep jority of streamside area with depressions able to pond water < 3 inches deep
15.	Consi	der for	the Left	streamside area metric (skip for Tidal Marsh Streams)  Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal sessment reach.
	⊠Y □N	□Y ⊠N	Are	wetlands present in the streamside area?
16.	Check	all con	tributor	rs – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams) 's within the assessment reach or within view of <u>and</u> draining to the assessment reach.
	⊠A ⊠B	Pond	ds (inclu	/or springs (jurisdictional discharges) de wet detention basins; do not include sediment basins or dry detention basins)
	CDEF	Evide Strea	ence of	passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir) bank seepage or sweating (iron in water indicates seepage) or bank soil reduced (dig through deposited sediment if present)
17.	Basef	ow Det	ractors	– assessment area metric (skip for Tidal Marsh Streams)
	□A □B □C	Obst Urba	ence of a ruction r n stream	substantial water withdrawals from the assessment reach (includes areas excavated for pump installation) not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit) in (≥ 24% impervious surface for watershed)
	D D D F	Asse		the streamside area has been modified resulting in accelerated drainage into the assessment reach reach relocated to valley edge  Above
18.	Shadii	ıg – ass	sessme	nt reach metric (skip for Tidal Marsh Streams) sider "leaf-on" condition.
	□A □B □C	Strea Degr	am shad aded (e:	ing is appropriate for stream category (may include gaps associated with natural processes)  xample: scattered trees)  ing is gone or largely absent

19.	Consider "vege to the first breal	ooded 3 RB  A □A ≥ 100 feet wide <u>or</u> extends to the edge of the watershed B □B From 50 to < 100 feet wide C □C From 30 to < 50 feet wide D □D From 10 to < 30 feet wide
20.		e – streamside area metric (skip for Tidal Marsh Streams) t bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).  Mature forest Non-mature woody vegetation or modified vegetation structure Herbaceous vegetation with or without a strip of trees < 10 feet wide Maintained shrubs Little or no vegetation
21.	Check all appro within 30 feet of s If none of the fo	A
22.		streamside area metric (skip for Tidal Marsh Streams) t bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width). Medium to high stem density Low stem density No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground
23.		r vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams) r vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.  The total length of buffer breaks is < 25 percent. The total length of buffer breaks is between 25 and 50 percent. The total length of buffer breaks is > 50 percent.
24.	Vegetative Comp Evaluate the domassessment read LB RB □A □A	
	□в □в	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.  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.	25a.	ssessment reach metric (skip for all Coastal Plain streams)  No Was conductivity measurement recorded? t one of the following reasons.  No Water Other:
	25b. Check the t ☐A < 46	pox corresponding to the conductivity measurement (units of microsiemens per centimeter).  □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
Note	es/Sketch:	

USACE	AID #:			NCDWR #:	
and circl number a and expl NC SAM NOTE E	e the location of the stall reaches on the attactantions of requested to User Manual for exan VIDENCE OF STRESS	ream reach under evaluated map, and include a information. Record in inples of additional measons AFFECTING TH	uation. If multiple so a separate form for e the "Notes/Sketch" surements that may	ream reaches will be evaluated each reach. See the NC SAM U section if supplementary meas	7.5-minute topographic quadrangle, d on the same property, identify and Jser Manual for detailed descriptions urements were performed. See the n the assessment area).
	CT/SITE INFORMATIC			71.2	
1. Projec	ct name (if any):	Sassarxic Swa	mo 2.	Date of evaluation:	0/18
	cant/owner name:	Wildlands	4.	Assessor name/organization:	Wildlands Eng
5. Count	y:	"Sonnston	6.	Nearest named water body	21
7. River	basin:	Neuse		on USGS 7.5-minute quad:	Sussarixa Creek
0.0 CO		grees, at lower end of a			
	umber (show on attach	pth and width can be ed map): TA A		ngth of assessment reach evalu	rated (feet):
11. Char 12. Char 14. Feat	nnel depth from bed (in nnel width at top of bar	riffle, if present) to top k (feet): 5 € flow ⊠Intermittent flow	of bank (feet): 0	,5 □lessment reach a swamp stean	Jnable to assess channel depth.
15. NC S	SAM Zone:	☐ Mountains (M)	☐ Piedmont (P)	☑ Inner Coastal Plain (I)	Outer Coastal Plain (O)
				1	/
	nated geomorphic	MA		□B	
	y shape (skip for I Marsh Stream):		m flattar vallav aland		ream, steeper valley slope)
		(more sinuous stream			
for T	ershed size: (skip Fidal Marsh Stream) DNAL INFORMATION:	Size 1 (< 0.1 mi²)	☐Size 2 (0.1 to	< 0.5 mi <sup>2</sup> ) ☐Size 3 (0.5 to <	5 mi²)
			No If Yes chec	k all that apply to the assessm	ent area
□Pt □Ar □Do	ssential Fish Habitat ublicly owned property nadromous fish ocumented presence o st species:	☐303(d) List	parian buffer rule in	effect Nutrient Sensitive V	ronmental Concern (AEC)
	esignated Critical Habit	at (list species)			
			neasurements includ	led in "Notes/Sketch" section o	r attached?  Yes  No
DA □B □C	Water throughout No flow, water in p No water in asses ence of Flow Restrict At least 10% of as point of obstructin	assessment reach. cools only. sment reach. con – assessment reacssessment reach. g flow or a channel cho	ch metric eam habitat or riffle- oked with aquatic m	acrophytes or ponded water or	ected by a flow restriction <u>or</u> fill to the impoundment on flood or ebb within the channel, tidal gates, debris jams,
ДВ	beaver dams). Not A	acii (examples, anacii	sized of perefied ear	volta, addoctiaje tilat continue	the channel, total gates, goons jame,
3. Featu	ure Pattern – assessn	nent reach metric			
□A ØB			ltered pattern (exan	nples: straightening, modificatio	n above or below culvert).
4. Featu	ure Longitudinal Prof	ile – assessment reac	h metric		
□A	widening, active a disturbances).				down-cutting, existing damming, over has not reformed from any of these
ŊВ	Not A				
Cons	sider only current ins	nannel down-cutting (he unstable nel unstable	nts from which the		ered. Examples of instability include such as concrete, gabion, rip-rap).

6.					– stream LB) and th		metric Bank (RB).						
	LB ⊠A	RB					ns that adversely	, offeet re	foranco in	torantian			
	ВВ		B Mo	oderate e ference in	evidence on teraction	f condition (examples	ns (examples: be	erms, leve side area a	es, down access, di	-cutting, sruption	aggradation of flood flow	s through st	that adversely affect treamside area, leaky o ditching)
	□c		Ex [ex of mo	tensive e camples: flood flov	evidence c causewa vs through litching]) <u>o</u>	of condition ys with floo streamsic	ns that adversely odplain and chan le area] <u>or</u> too mu	affect ref nel constr ich floodp	erence in iction, bull lain/interti	teraction kheads, dal zone	(little to no retaining wa access [exa	floodplain/ir lls, fill, strea amples: impo	ntertidal zone access m incision, disruptior oundments, intensive -made feature on ar
7.					sessmen	t reach/in	tertidal zone me	etric					
	$\square A$	ck all tha Disc			stream or i	ntertidal zo	one (milky white,	blue, unn	atural wat	er disco	loration, oil	sheen, strea	am 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											
	Odor (not including natural sulfide odors)  Current published or collected data indicating degraded water quality in the assessment reach. Cite source in "Notes/Sketch"												
		sec	tion.					water qua	anty in the	e assess	ment reach	. Gite sour	ce in "Notes/Sketch
	IXIF □G												
		Oth			etation in		dal zone (remova in in "Notes/Sket			nowing,	destruction,	etc)	
8.	Rece	ent Weat	her – wa	atershed	l metric (s	kip for Ti	dal Marsh Strea	ms)					
	For S	Droi Droi	ught con ught con	ditions <u>a</u>	<u>nd</u> no rain <u>nd</u> rainfall	fall or rain	nsidered a droug fall not exceeding g 1 inch within the	g 1 inch w	ithin the la	reams, D ast 48 ho	02 drought o ours	r higher is c	considered a drought
9.	Larg				– assessr too large			lf Yes. ski	p to Metri	: 13 (Str	eamside Ar	ea Ground S	Surface Condition).
10.		-1.4					reach metric			2.5.4			sando denamen,
	10a.	□Yes	□No	sedin	nentation,	mining, e	itat over majorit xcavation, in-str stal Plain strear	eam hard	ening [for	exampl	e, rip-rap],	of stressor recent dred	rs include excessive ging, and snagging
	10b,	Check:	all that o	occur (oc	ccurs if > 5	5% covera	ge of assessmer						1 1 m H
		□A	(includ Multipl	le liverwo e sticks	orts, lichen	s, and alg	aquatic mosses al mats) nd/or emergent	Check for Tidal Marsh Streams Only	□F □G □H	Subme Low-ti	erged aquat de refugia (¡	ic vegetation	ard bottoms n
		DC D	5% un	e snags dercut b		or root ma	ats and/or roots	Check 1 Marsh 3	□k □l	5% ve	bottom rtical bank a or no habitat	along the ma	arsh
		□Е		r no hab		rmal wette	ed perimeter						
													*******
11.							etric (skip for Si						ams)
		Yes	∐No				atural sand-bed	stream? (	skip for C	oastal I	Plain strear	ns)	
	11b.	Bedforn  B B C	Riffle-r Pool-g	un sectio lide secti	eck the ap on (evaluation (evaluation) on absent (evaluation)	te 11c) ate 11d)	box(es). etric 12, Aquatic	: Life)					
	11c.	at least (R) = pr	sections, one boresent bu	check al <b>c in eac</b> h it ≤ 10%	I that occu row (skip , Common	r below the for Size	e normal wetted 4 Coastal Plain 0-40%, Abundar	perimeter streams	and Tidal	Marsh	Streams).	Not Present	submerged. <b>Check</b> (NP) = absent, Rare nulative percentages
		should r	not exce	ed 100% C	for each a	issessmei P	nt reach.		X 2		amtia	to the	
		M M			H		Bedrock/sapr Boulder (256		m) 16	il Oi	arofin.	MINISH	
		N N	Ē		Ē	Ē	Cobble (64 -	256 mm)					
				M	Ä		Gravel (2 – 6- Sand (.062 –	2 mm)					
						$\boxtimes$	Silt/clay (< 0,0 Detritus						
	44.5	<b>7</b>					Artificial (rip-r						
	11d.	☐Yes	No	Are po	ols filled w	ith sedime	ent? (skip for Siz	ze 4 Coas	tal Plain	streams	and Tidal	Warsh Stream	ams)

12.		□Yes □	sessment reach metric (skip for Tidal Marsh Streams)  No Was an in-stream aquatic life assessment performed as described in the User Manual?  t 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
		H	Caddisfly larvae (T) Asian clam ( <i>Corbicula</i> )
			Crustacean (isopod/amphipod/crayfish/shrimp) Damselfly and dragonfly larvae
			Dipterans
		H F	]Mayfly larvae (E) ]Megaloptera (alderfly, fishfly, dobsonfly larvae)
			Midges/mosquito larvae (5)
			Mosquito fish ( <i>Gambusia</i> ) or mud minnows ( <i>Umbra pygmaea</i> ) Mussels/Clams (not <i>Corbicula</i> )
			Other fish
			Salamanders/tadpoles  Snails
			Stonefly larvae (P) Tipulid larvae
			Worms/leeches
13.			Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types) Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.
	$\square A$	□A	Little or no alteration to water storage capacity over a majority of the streamside area
	□B	□B □B	Moderate alteration to water storage capacity over a majority of the streamside area 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.			Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types) Left Bank (LB) and the Right Bank (RB) of the streamside area.
	·MA □B □C	⊠A □B □C	Majority of streamside area with depressions able to pond water ≥ 6 inches deep Majority of streamside area with depressions able to pond water 3 to 6 inches deep Majority of streamside area with depressions able to pond water < 3 inches deep
15.	Cons wette	ider for the d perimeter	e – streamside area metric (skip for Tidal Marsh Streams)  Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal of assessment reach.
	LB □Y	RB ⊠Y □N	Are wetlands present in the streamside area?
16.	Chec □A	k all contrib	outors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams) outors within the assessment reach or within view of <u>and</u> draining to the assessment reach. and/or springs (jurisdictional discharges)
		Obstruct Evidence Stream I	nclude wet detention basins; do not include sediment basins or dry detention basins) tion passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir) to of bank seepage or sweating (iron in water indicates seepage) to be dor bank soil reduced (dig through deposited sediment if present) the above
17.		flow Detract k all that ap	tors – assessment area metric (skip for Tidal Marsh Streams) ply.
		Obstruct Urban st Evidence Assessn	e of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation) ition not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit) tream (≥ 24% impervious surface for watershed) that the streamside area has been modified resulting in accelerated drainage into the assessment reach then treach relocated to valley edge the above
18.	Shad		sment reach metric (skip for Tidal Marsh Streams) Consider "leaf-on" condition.
	DA □B □C	Stream s Degrade	shading is appropriate for stream category (may include gaps associated with natural processes)  d (example: scattered trees)  shading is gone or largely absent

19	Con to th	er Width – streamside area metric (skip for Tidal Marsh Streams) sider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starti te first break.	ng at the top of bank out
	LB ⊠A □B	etated Wooded  RB LB RB	
		□D □D □D From 10 to < 30 feet wide	
	□E		
20.	Con LB A B C C C C C C C C C C C C C C C C C	er Structure – streamside area metric (skip for Tidal Marsh Streams) sider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).  RB A Mature forest B Non-mature woody vegetation or modified vegetation structure C Herbaceous vegetation with or without a strip of trees < 10 feet wide D Maintained shrubs Little or no vegetation	
21.	Che withing Abut LB AB	RB LB RB LB RB  \[ \text{A}  \text{A}  \text{A}  \text{A}  \text{A}  \text{Row crops} \]	vbuts), does not abut but is
22.		n Density – streamside area metric (skip for Tidal Marsh Streams)	
	Con	sider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).	
	MA	☐/A Medium to high stem density	
	□B □C	<ul> <li>☐B Low stem density</li> <li>☐C No wooded riparian buffer or predominantly herbaceous species or bare ground</li> </ul>	
23		inuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)	
	Cons	ider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation >	10 feet wide.
	LB ⊠A	RB ☑A The total length of buffer breaks is < 25 percent.	
	В	B The total length of buffer breaks is between 25 and 50 percent.	
	ПС	☐C The total length of buffer breaks is > 50 percent.	
24.	Eval asse	etative Composition – streamside area metric (skip for Tidal Marsh Streams)  Late the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever come  ssment reach habitat.	es first) as it contributes to
	LB □A	RB  Vegetation is close to undisturbed in species present and their proportions. Lower strata co	mnosed of native species
		with non-native invasive species absent or sparse.	X
e	Ø₿	☑B Vegetation indicates disturbance in terms of species diversity or proportions, but is still la species. This may include communities of weedy native species that develop after cl	rgely composed of native ear-cutting or clearing or
nmun	ty	communities with non-native invasive species present, but not dominant, over a large portion	
	ПС	communities missing understory but retaining canopy trees.  Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy with non-native invasive species dominant over a large portion of expected strata or communities stands of non-characteristic species or communities inappropriately composed of a single spe	nities composed of planted
25.	Con	ductivity – assessment reach metric (skip for all Coastal Plain streams)	<u> </u>
		☐Yes ☑No Was conductivity measurement recorded?  If No, select one of the following reasons. ☐No Water ☐Other:	
		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	
Mar	00/01	. Fahr	
1401	es/Ske	AGN.	

USACE	AID #:			NCDWR#	
quadrang identify a detailed performe NOTE EV	gle, and circle the locat and number all reache descriptions and expl d. See the NC SAM U VIDENCE OF STRESS	tion of the stream reactes on the attached ma anations of requested lser Manual for exampl SORS AFFECTING TH	h under evaluation. p, and include a se information. Reco es of additional mea	If multiple stream reaches will eparate form for each reach.	
	T/SITE INFORMATIO t name (if any):	n: Sassariya Swa	2	Date of evaluation:	9/10/18
	ant/owner name:	W. la land 5		Assessor name/organization:	Carolyn Lanza
5. County	The second secon	Schneton		Nearest named water body	caro in acre
7. River	pasin:	neusc		on USGS 7.5-minute quad:	Sassarika Creek
Property and the second second		grees, at lower end of a			
9. Site nu	ımber (show on attach		of truling 10. Ler	ngth of assessment reach evalu	
Leafing Language Lines	inel depth from bed (in inel width at top of ban	riffle, if present) to top k (feet): 3 F b		1€ □U sessment reach a swamp strea	Inable to assess channel depth.
The second secon		flow Intermittent flo		and the state of t	III. Lites Elite
	CATEGORY INFORM				T
15. NC S	AM Zone:	☐Mountains (M)	☐Piedmont (P)	Inner Coastal Plain (I)	☐Outer Coastal Plain (O)
16. Estim	nated geomorphic	1	1		
	shape (skip for	□ (a	$\overline{}$	□b	<u> </u>
V 72.72	Marsh Stream):	(more sinuous stream			tream, steeper valley slope)
	rshed size: (skip Fidal Marsh Stream)	∑Size 1 (< 0.1 mi²)	☐Size 2 (0.1 to	< 0.5 mi <sup>2</sup> )	5 mi²)
100000	NAL INFORMATION:				
The second second second			s □No If Yes, chec	ck all that apply to the assessm	ent area.
	ction 10 water	☐Classified T			rshed ( I I II III IV V)
	sential Fish Habitat	□Primary Nur			s/Outstanding Resource Waters
	blicly owned property		arian buffer rule in e		Carrier and the contract of th
	adromous fish	□303(d) List	listed protected spe	cies within the assessment are	ronmental Concern (AEC)
And the second second	st species:	a rodorar arrarer exace	mates protester spe		
	esignated Critical Habit				
19. Are a	dditional stream inform	nation/supplementary n	neasurements inclu	ded in "Notes/Sketch" section o	r attached?  Yes  No
1. Chan	nal Water - assessm	ent reach metric (ski	o for Size 1 stream	s and Tidal Marsh Streams)	
□ A		assessment reach.		- ana 11441 maran - 11441, 1157	
□В	No flow, water in p	ools only.			
□с	No water in assess	sment reach.			
<u> </u>		ion – assessment rea			ested by a flavourable black as fill to the
ПА					ected by a flow restriction or fill to the minimum method in more method or ebb within
					t the channel, tidal gates, debris jams,
5lb	beaver dams).				
□B	Not A				
and the second	ire Pattern – assessm		in the second second second	1	the state of the Santa and Santa at San
□A ☑B	Not A	ssessment reach has a	altered pattern (exar	nples: straightening, modification	on above or below culvert).
		ni - 1921-1921-1924	t usatula		
<ol> <li>Feature</li></ol>		ile – assessment reac sment reach has a sul		tream profile (examples: char	nnel down-cutting, existing damming,
ш.,					profile has not reformed from any of
	these disturbances	s).			
□В	Not A				
		- assessment reachy			and emission entries are
					ered. Examples of instability include such as concrete, gabion, rip-rap).
active A	e bank failure, active cr < 10% of channel		au-cut), active wide	and artificial hardening (s	such as concists, gabion, hp-rap).
□в	10 to 25% of chan	nel unstable			
⊠C	> 25% of channel				

6.				raction – strean Bank (LB) and t						
	□A ⊠B	□A □B	Mo refe	derate evidence rence interaction	of condition (example	s: limited strean	rms, leve nside are	es, <u>dowr</u> a access	nteraction n-cutting, aggradation, dredging) that adversel s, disruption of flood flows through streamsid tion, minor ditching [including mosquito ditchin	e area
	□c	□c	Ext [exa dist imp	ensive evidence amples: causev uption of flood	of conditior vays with flows thro nsive mosq	is that adversely floodplain and c ough streamside uito ditching]) <u>or</u>	affect ref hannel o area]	erence in constriction or too r	nteraction (little to no floodplain/intertidal zone on, bulkheads, retaining walls, fill, stream in much floodplain/intertidal zone access [exalar zone unnaturally absent or assessment rea	access ncision amples
7.		ck all tha	t apply.			tertidal zone me		otural wa	ter discoloration, oil sheen, stream foam)	
	□B □C □D □E ☑F	Exce Notic Odor Curr Lives	essive se ceable ev r (not inc ent publi stock wit	dimentation (bury vidence of polluta luding natural sul shed or collected n access to strea	ring of strea nt discharg fide odors) data indica m or intertion	am features or int es entering the a ating degraded wa dal zone	ertidal zo ssessme	ne) nt reach <u>a</u>	and causing a water quality problem assessment reach. Cite source in "Notes" sec	tion.
	GHOO	Degr Othe	aded ma		the intertio				mowing, destruction, etc.)	
8.		Size 1 or ght.	2 strear	ns, D1 drought o	r higher is		ought; fo		or 4 streams, D2 drought or higher is consid	lered a
	□ B □ C	Drou	ght cond			fall not exceeding 1 inch within the			ast 48 nours	
9.		e or Dang es ⊠No		Stream – assess am too large or o			, skip to	Metric 1	3 (Streamside Area Ground Surface Condit	ion).
10.		ral In-str ∐Yes	eam Hab ∐No	sedimentation,	tream habi mining, e	tat over majority	am hard	ening [for	ent reach (examples of stressors include exe r example, rip-rap], recent dredging, and sna to Metric 12)	cessive agging)
	10b.	Check a  □A  ☑B  □C □D	Multiple (includi Multiple vegetat Multiple	e aquatic macrop ng liverworts, lich e sticks and/or le	hytes and a lens, and a af packs al (including l	equatic mosses lgal mats) nd/or emergent ap trees)	neck for Tidal arsh Streams Only	□F □G	Size 4 Coastal Plain streams) 5% oysters or other natural hard bottoms Submerged aquatic vegetation Low-tide refugia (pools) Sand bottom 5% vertical bank along the marsh Little or no habitat	
		□E	in bank	s extend to the n no habitat				ЦК	Ettile of no napital	
									OAL MARSH STREAMS************************************	***
11.		orm and							streams and Tidal Marsh Streams) Coastal Plain streams)	
7		-10	evaluate Riffle-ru Pool-gli	ed. Check the a in section (evalu de section (evali	ppropriate ate 11c) uate 11d)			skip for v	oodstal Flam streams)	
	11c.	In riffle s	sections,	check all that o	ccur below h row. No	the normal wett	ed perim = absent tive percentive - 4096 m 256 mm) mm) 2 mm) 62 mm)	, Rare (Rentages s	ne assessment reach – whether or not subm  R) = present but ≤ 10%, Common (C) = > 1  should not exceed 100% for each assessment	0-40%
	114	TVoc	MNo	Are peole filled	with codima	n+2				

12.	12a.	Yes	□No	Was an in-stream aquatic life assessment performed as described in the User Manual?  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.
			Aqu Bee Cad Asia Crus Dan Dipt May	atic reptiles atic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) tles (including water pennies) disfly larvae (Trichoptera [T]) n clam (Corbicula) stacean (isopod/amphipod/crayfish/shrimp) nselfly and dragonfly larvae erans (true flies) fly larvae (Ephemeroptera [E]) aloptera (alderfly, fishfly, dobsonfly larvae)
			☐ Mos ☐ Mus ☐ Othe ☐ Sala ☐ Sna ☐ Stor ☐ Tipu	manders/tadpoles
13.		der for	the Lef Litt Mo Sev	und Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types) t Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland le or no alteration to water storage capacity over a majority of the streamside area derate alteration to water storage capacity over a majority of the streamside area vere alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil npaction, livestock disturbance, buildings, man-made levees, drainage pipes)
14.			the Left Ma Ma	er Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types) Bank (LB) and the Right Bank (RB) of the streamside area.    ority of streamside area with depressions able to pond water ≥ 6 inches deep     ority of streamside area with depressions able to pond water 3 to 6 inches deep     ority of streamside area with depressions able to pond water < 3 inches deep
15.	Consi	der for	the Left ter of as	streamside area metric (skip for Tidal Marsh Streams)  Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal sessment reach.  wetlands present in the streamside area?
16.	Basef	low Cor all con Strea Pond Obst Evide Strea	itributor ams and ds (inclu- ruction t ence of	rs – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams) rs within the assessment reach or within view of and draining to the assessment reach. /or springs (jurisdictional discharges) de wet detention basins; do not include sediment basins or dry detention basins) hat passes some flow during low-flow periods affecting assessment reach (ex: beaver dam, bottom-release dam) bank seepage or sweating (iron oxidizing bacteria in water indicates seepage) or bank soil reduced (dig through deposited sediment if present)
17.	Basef	all that Evidence Obst Urba Evidence Asse	t apply. ence of a cruction of an stream ence that	— assessment area metric (skip for Tidal Marsh Streams)  substantial water withdrawals from the assessment reach (includes areas excavated for pump installation) not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit) in (≥ 24% impervious surface for watershed) at the streamside area has been modified resulting in accelerated drainage into the assessment reach reach relocated to valley edge above
18.	Shadi	der aspe Strea Degr	ect. Con am shad aded (e	nt reach metric (skip for Tidal Marsh Streams) sider "leaf-on" condition. ing is appropriate for the stream category (may include gaps associated with natural processes) xample: scattered trees) ing 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 □B From 50 to < 100 feet wide  □C □C □C □C □C □C From 30 to < 50 feet wide  □D □D □D □D □D From 10 to < 30 feet wide  □E □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 MA 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 □ 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 A A A A A A A A A B A B A
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 Medium to high stem density  B B C 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
	<ul> <li>□A □A The total length of buffer breaks is &lt; 25 percent.</li> <li>□B □B The total length of buffer breaks is between 25 and 50 percent.</li> <li>□C □C The total length of buffer breaks is &gt; 50 percent.</li> </ul>
24.	Vegetative Composition – First 100 feet of 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 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.  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. Vary the 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?
	25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter). $\Box A < 46  \Box B  46 \text{ to} < 67  \Box C  67 \text{ to} < 79  \Box D  79 \text{ to} < 230  \Box E \geq 230$
Note	es/sketch: Abundonti Oxidizing in nerals on leafing month

USACE AID #:	NCDWR#
INSTRUCTIONS: Attach a quadrangle, and circle the local identify and number all reach detailed descriptions and experformed. See the NC SAM NOTE EVIDENCE OF STRES	sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic ation of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, nes on the attached map, and include a separate form for each reach. See the NC SAM User Manual for planations of requested information. Record in the "Notes" section if supplementary measurements were User Manual for examples of additional measurements that may be relevant.
	2. Date of evaluation: 4/10/18 4. Assessor name/organization: Carry Lang 56/15/20 6. Nearest named water body on USGS 7.5-minute quad: egrees, at lower end of assessment reach): epth and width can be approximations)
Site number (show on attact     Channel depth from bed (ii     Channel width at top of bar	hed map): T3 RU 10. Length of assessment reach evaluated (feet):  n riffle, if present) to top of bank (feet):
16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream): 17. Watershed size: (skip	☐a ☐b ☐b (more sinuous stream, flatter valley slope) (less sinuous stream, steeper valley slope) ☐Size 1 (< 0.1 mi²) ☐Size 2 (0.1 to < 0.5 mi²) ☐Size 3 (0.5 to < 5 mi²) ☐Size 4 (≥ 5 mi²)
□ Section 10 water □ Essential Fish Habitat □ Publicly owned property □ Anadromous fish □ Documented presence of List species: □ Designated Critical Habi	tions evaluated?
☐A At least 10% of a point of obstructir	tion – assessment reach metric assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction <u>or</u> fill to the ag flow <u>or</u> a channel choked with aquatic macrophytes <u>or</u> ponded water <u>or</u> impoundment on flood or ebb within each (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams,
3. Feature Pattern – assessi ☐A A majority of the a ☑B Not A	ment reach metric assessment reach has altered pattern (examples: straightening, modification above or below culvert).
☐A Majority of asses	file – assessment reach metric ssment reach metric ssment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, ctive aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of es).
Consider only current ins	nnel unstable

6.				raction – Bank (LB			metric ank (RB).				(1)
	□A □B	Little or no evidence of conditions that adversely affect reference interaction  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])  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,									
	С	□c	Ext [ex: dis: imp	ensive evi amples: uption of oundmen	dence of causewa flood f s, intens	condition ys with lows thro ive mosq	s that adversely floodplain and c ough streamside	affect ret hannel o area]	ference ir constrictic <u>or</u> too r	iteraction (little to no floodplain/interti	dal zone access stream incision ess [examples
7.	Water Quality Stressors – assessment reach/intertidal zone metric Check all that apply.  Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)  Excessive sedimentation (burying of stream features or intertidal zone)  Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem  Odor (not including natural sulfide odors)  Current published or collected data indicating degraded water quality in the assessment reach. Cite source in "Notes" set Livestock with access to stream or intertidal zone  Excessive algae in stream or intertidal zone  Begraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc.)  Other: (explain in "Notes/Sketch" section)  Little to no stressors										
8.	Rece	ent Weather – watershed metric (skip for Tidal Marsh Streams)  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 ght.  Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours  Drought conditions and rainfall exceeding 1 inch within the last 48 hours  No drought conditions									
9.	the same of the			Stream -				ekin ta	Motric 1	3 (Streamside Area Ground Surfac	e Condition)
10.	Natu	7.0		bitat Type Degrad sedime	s – asse ed in-str ntation, i	essment i eam habi mining, e	each metric tat over majority	of the	assessme lening [fo	ent reach (examples of stressors in r example, rip-rap], recent dredging	clude excessive
	10b.	Check a	Multiple (includ Multiple vegeta Multiple 5% und in bank	e aquatic ing liverwo e sticks artion e snags ardercut bar	macrophy orts, liche nd/or leaf nd logs (i nks and/o o the nor	tes and	aquatic mosses Igal mats) nd/or emergent	neck for Tidal arsh Streams Only	T-1-	Size 4 Coastal Plain streams) 5% oysters or other natural hard b Submerged aquatic vegetation Low-tide refugia (pools) Sand bottom 5% vertical bank along the marsh Little or no habitat	ottoms
****	*****	*****	******	**REMAIN	IING QU	ESTIONS	ARE NOT APP	LICABLE	FOR TII	DAL MARSH STREAMS**********	k*****
11.										streams and Tidal Marsh Streams	) (
		⊠Yes  Bedform  □A  □B  □C	Riffle-r Pool-gl	ed. <b>Chec</b> un section ide section	k the app (evaluat n (evalua	oropriate te 11c) ite 11d)			(skip ioi	Coastal Plain streams)	
	11c.	Check a Abundar NP	at least at (A) = 3	one box > 40-70%, C	in each Predomi A □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	row. No	ot Present (NP)  > 70%. Cumula  Bedrock/sapr Boulder (256 Cobble (64 – Gravel (2 – 64 Sand (.062 – Silt/clay (< 0.0 Detritus Artificial (rip-ra	= absent ative perco olite - 4096 m 256 mm) 4 mm) 2 mm) 062 mm)	t, Rare (F entages :	he assessment reach – whether or R) = present but ≤ 10%, Common (ishould not exceed 100% for each ass	C) = > 10-40%
	114	□Vec	MNO	Are nool	e filled wi	th sadime	nt?				

12	12a. 🖫	Yes [	No	was an in-stream aquatic life assessment performed as described in the User Manual?  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.		
			Adul Aqua Aqua Beet Cado Asia Crus Dam	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams. It frogs atic reptiles atic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) alies (including water pennies) adisfly larvae (Trichoptera [T]) and (Corbicula) aticcean (isopod/amphipod/crayfish/shrimp) asselfly and dragonfly larvae arrans (true flies) and dragonfly larvae [E])		
		, [	Meg Midg Mose Mus	aloptera (alderfly, fishfly, dobsonfly larvae) ges/mosquito larvae ー いんさん quito fish ( <i>Gambusia</i> ) or mud minnows ( <i>Umbra pygmaea</i> ) sels/Clams (not <i>Corbicula</i> )		
			]Snai ]Ston ]Tipu	manders/tadpoles Watc( \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		
13.	Conside runoff.	er for the		und Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types) Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland		
	ĻB □A □B □C	RB ⊠A □B □C	Mod	e or no alteration to water storage capacity over a majority of the streamside area derate alteration to water storage capacity over a majority of the streamside area ere alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil apaction, livestock disturbance, buildings, man-made levees, drainage pipes)		
14.				er Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types) Bank (LB) and the Right Bank (RB) of the streamside area.		
	□A □B ☑C	□A □B □C	Maj	ority of streamside area with depressions able to pond water ≥ 6 inches deep ority of streamside area with depressions able to pond water 3 to 6 inches deep ority of streamside area with depressions able to pond water < 3 inches deep		
15.	Conside	er for the	Left	streamside area metric (skip for Tidal Marsh Streams)  Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal sessment reach.		
	N⊠N	□N □N	Are	wetlands present in the streamside area?		
16.		II contri Stream Ponds ( Obstruc Evidence	butors and/ s and/ (includation the ce of the bed of	rs – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams) s within the assessment reach or within view of and draining to the assessment reach. For springs (jurisdictional discharges) de wet detention basins; do not include sediment basins or dry detention basins) hat passes some flow during low-flow periods affecting assessment reach (ex: beaver dam, bottom-release dam) brank seepage or sweating (iron oxidizing bacteria in water indicates seepage) or bank soil reduced (dig through deposited sediment if present)		
17.	7. 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	ı – asses r aspect. Stream Degrad	Ssmer Cons shadi ed (ex	nt reach metric (skip for Tidal Marsh Streams) sider "leaf-on" condition. ng is appropriate for the stream category (may include gaps associated with natural processes) cample: scattered trees) ng is gone or largely absent		

19.	Consider "veget to the first break Vegetated Wolfe RB LB A A A A A B A B B B B C C C C C C	egetated Wooded B RB LB RB  A NA NA ≥ 100 feet wide or extends to the edge of the watershed B NB NB NB From 50 to < 100 feet wide C NC							
20.	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 Mature forest  B Non-mature woody vegetation or modified vegetation structure  C C Herbaceous vegetation with or without a strip of trees < 10 feet wide  D Maintained shrubs  E Little or no vegetation								
21.	Check all approprise within 30 feet of If none of the following the following states of the following	A □A □A Row crops B □B □B Maintained turf							
22.		streamside area metric (skip for Tidal Marsh Streams) bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).  Medium to high stem density Low stem density No wooded riparian buffer or predominantly herbaceous species or bare ground							
23.		yegetated Buffer – streamside area metric (skip for Tidal Marsh Streams) vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.  The total length of buffer breaks is < 25 percent. The total length of buffer breaks is between 25 and 50 percent. The total length of buffer breaks is > 50 percent.							
24.	Evaluate the dom assessment reach	position – First 100 feet of streamside area metric (skip for Tidal Marsh Streams) inant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to a habitat.							
	□A □A ☑B ☑B	with non-native invasive species absent or sparse.  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							
	_c _c	communities missing understory but retaining canopy trees. Privet, rivel care, Moly 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.		ssessment reach metric (skip for all Coastal Plain streams) No Was conductivity measurement recorded?							
	25b. Check the b	ox corresponding to the conductivity measurement (units of microsiemens per centimeter).  □B 46 to < 67 □C 67 to < 79 □D 79 to < 230 □E ≥ 230							

Х

1	USACE AID #:	NCDWR #:	
a n a N	and circle the location of the strea number all reaches on the attache and explanations of requested int NC SAM User Manual for exampl	n of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadram reach under evaluation. If multiple stream reaches will be evaluated on the same property, identifying an include a separate form for each reach. See the NC SAM User Manual for detailed descormation. Record in the "Notes/Sketch" section if supplementary measurements were performed. Sees of additional measurements that may be relevant.  RS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).	ntify and criptions
	PROJECT/SITE INFORMATION:		
	1. Project name (if any): Sa	SSGROYTA SU)amp 2. Date of evaluation: U110/18	
		4. Assessor name/organization: Wildlands Eng	
	5. County: 5	6. Nearest named water body on USGS 7.5-minute quad:	
		on USGS 7.5-minute quad: Sacsacixa	
S	그 그렇게 하는 아이들에게 되었다. 그는 그들을 때 어디지는 것이다. 그리고 있다. 그것이다	and width can be approximations)	
1	<ol><li>11. Channel depth from bed (in rif</li></ol>	fle, if present) to top of bank (feet):	pth.
14	12. Channel width at top of bank ( 14. Feature type: ⊠Perennial flo STREAM CATEGORY INFORMA	w □Intermittent flow □Tidal Marsh Stream	
		☐ Mountains (M) ☐ Piedmont (P)     Inner Coastal Plain (I)   ☐ Outer Coastal Plain (O	))
0			/
16	16. Estimated geomorphic		
	valley shape (Skip for		
1	: [ - [ - [ - [ - [ - [ - [ - [ - [ - [	more sinuous stream, flatter valley slope) (less sinuous stream, steeper valley slope) $\square$ Size 1 (< 0.1 mi <sup>2</sup> ) $\square$ Size 2 (0.1 to < 0.5 mi <sup>2</sup> ) $\square$ Size 3 (0.5 to < 5 mi <sup>2</sup> ) $\square$ Size 4 ( $\ge$ 5 mi <sup>2</sup>	21
,	for Tidal Marsh Stream)	Sole ( ( 0.1 m) Sole 2 (0.1 to ( 0.3 m) ) Sole 3 (0.3 to ( 3 m) ) Sole 4 (2 3 m)	λ
	ADDITIONAL INFORMATION:	s evaluated? ☑Yes ☐No If Yes, check all that apply to the assessment area.	
	☐Section 10 water ☐Essential Fish Habitat ☐Publicly owned property ☐Anadromous fish	□ Classified Trout Waters □ Water Supply Watershed (□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	
7.5	☐Designated Critical Habitat		
19	<ol><li>Are additional stream informat</li></ol>	on/supplementary measurements included in "Notes/Sketch" section or attached?	
1.	Channel Water – assessmen   ☐A Water throughout ass  ☐B No flow, water in poo  ☐C No water in assessm	s only.	
2.	At least 10% of asse	<ul> <li>assessment reach metric</li> <li>ssment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or ow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or election (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debounded</li> </ul>	bb within
3.		t reach metric	
		essment reach has altered pattern (examples: straightening, modification above or below culvert).	
4.			
		nt reach has a substantially altered stream profile (examples: channel down-cutting, existing damm radation, dredging, and excavation where appropriate channel profile has not reformed from any	
5.		seasement reach metric	
J.	Consider only current instat	ility, not past events from which the stream has currently recovered. Examples of instability nel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip- table unstable	y include rap).

S.	Con	sider for th	a Interaction – streamside area metric Left Bank (LB) and the Right Bank (RB).						
	LB RB  A Little or no evidence of conditions that adversely affect reference interaction  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	□с	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						
		Excessive sedimentation (burying of stream features or intertidal zone)  Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem  Odor (not including natural sulfide odors)							
	GH GH	Excess Degrad Other:	ck with access to stream or intertidal zone ve algae in stream or intertidal zone ed marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc) (explain in "Notes/Sketch" section) no stressors						
		ent Weather – watershed metric (skip for Tidal Marsh Streams)  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. Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours  Drought conditions and rainfall exceeding 1 inch within the last 48 hours  No drought conditions							
			ous Stream – assessment reach metric Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).						
0.		The second of th	n Habitat Types – assessment reach metric  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.		hat occur (occurs if > 5% coverage of assessment reach) (skip for Size 4 Coastal Plain streams)  ultiple aquatic macrophytes and aquatic mosses neclude liverworts, lichens, and algal mats)  ultiple sticks and/or leaf packs and/or emergent egetation ultiple snags and logs (including lap trees)  undercut banks and/or root mats and/or roots banks extend to the normal wetted perimeter title or no habitat						
***	*****	******	********REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS************************************						
1.	Bedf	orm and S	bstrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)						
		7	No Is assessment reach in a natural sand-bed stream? (skip for Coastal Plain streams)						
	11b.	⊠A F	aluated. Check the appropriate box(es). ffle-run section (evaluate 11c) pol-glide section (evaluate 11d) atural bedform absent (skip to Metric 12, Aquatic Life)						
	11c.	at least or (R) = pres	ions, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. Check box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams). Not Present (NP) = absent, Rare in but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages exceed 100% for each assessment reach.  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.		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.								
	12b.	Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, apply. If No, skip to Metric 13.	then snags)? If Yes, check all that						
	1	>1 Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa	" for Size 3 and 4 streams.						
		☐ Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats☐ Beetles	)						
		☐ Caddisfly larvae (T) ☐ Asian clam ( <i>Corbicula</i> ) ☐ Crustacean (isopod/amphipod/crayfish/shrimp)							
		Damselfly and dragonfly larvae							
		☐ Mayfly larvae (E) ☐ Megaloptera (alderfly, fishfly, dobsonfly larvae) ☐ Midges/mosquito larvae							
		☐Mosquito fish (Gambusia) or mud minnows (Umbra pygmaea)							
		☐Other fish ☐Salamanders/tadpoles							
	H	│							
12	Stroams	☐ ── ── ── ── ── ── ── ── ── ── ── ── ──	ms and R valley types)						
10.	Conside LB	er for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to b  RB	oth overbank flow and upland runoff.						
	⊠A □B □C	Little or no alteration to water storage capacity over a majority of the streamside are Moderate alteration to water storage capacity over a majority of the streamside area Severe alteration to water storage capacity over a majority of the streamside area (exclivestock disturbance, buildings, man-made levees, drainage pipes)							
14.		side Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh S er for the Left Bank (LB) and the Right Bank (RB) of the streamside area. RB	treams, and B valley types)						
	□A □B ☑C	<ul> <li>☐A Majority of streamside area with depressions able to pond water ≥ 6 inches deep</li> <li>☐B Majority of streamside area with depressions able to pond water 3 to 6 inches deep</li> <li>☐C Majority of streamside area with depressions able to pond water &lt; 3 inches deep</li> </ul>							
15.	Conside	I Presence – streamside area metric (skip for Tidal Marsh Streams) er for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the s perimeter of assessment reach. RB	streamside area or within the normal						
	DA	☐Y Are wetlands present in the streamside area? ☐N							
16.		w Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streall contributors within the assessment reach or within view of and draining to the assess Streams and/or springs (jurisdictional discharges)  Ponds (include wet detention basins; do not include sediment basins or dry detention basins)							
	□C □D □E □F	Obstruction passing flow during low-flow periods within the assessment area (beaver dam, lea Evidence of bank seepage or sweating (iron in water indicates seepage)  Stream bed or bank soil reduced (dig through deposited sediment if present)  None of the above	aky dam, bottom-release dam, weir)						
17.		w Detractors – assessment area metric (skip for Tidal Marsh Streams) ill that apply.							
3	□A □B □C □D □E	Evidence of substantial water withdrawals from the assessment reach (includes areas excava Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: water Urban stream (≥ 24% impervious surface for watershed)  Evidence that the streamside area has been modified resulting in accelerated drainage into the Assessment reach relocated to valley edge	ertight dam, sediment deposit)						
18	□F	None of the above g – assessment reach metric (skip for Tidal Marsh Streams)							
10.		or aspect. Consider "leaf-on" condition.  Stream shading is appropriate for stream category (may include gaps associated with natural Degraded (example: scattered trees)  Stream shading is gone or largely absent	processes)						

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						
	$\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $						
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 Mature forest  B Non-mature woody vegetation or modified vegetation structure  C C Herbaceous vegetation with or without a strip of trees < 10 feet wide  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 A A A A A A A A A A A A A						
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 Medium to high stem density  B B Low stem density  C 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 The total length of buffer breaks is < 25 percent.  B 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.	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 □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 □						
25.	stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.  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). $\Box A < 46  \Box B  46 \text{ to} < 67  \Box C  67 \text{ to} < 79  \Box D  79 \text{ to} < 230  \Box E \geq 230$						
Note	es/Sketch:						

USACE A			NCDWR #:						
and circle number al and expla NC SAM	the location of the s I reaches on the atta nations of requested Jser Manual for exam	tream reach under evalua ched map, and include a s l information. Record in th mples of additional measu	tion. If multiple sti separate form for e ne "Notes/Sketch" s rements that may l	ream reaches will be evaluate ach reach. See the NC SAM section if supplementary mea	5 7.5-minute topographic quadrangle, d on the same property, identify and User Manual for detailed descriptions surements were performed. See the in the assessment area).				
PROJECT	T/SITE INFORMATION	ON:			11.21.0				
	name (if any):	sassarina Swa	$\frac{mp}{l}$ 2.	Date of evaluation:	9/10/18				
Applica     S. County	nt/owner name:	Wildland	4.	Assessor name/organization: Nearest named water body	Wildlands Eng				
7. River b	asin:	Neuse egrees, at lower end of ass		on USGS 7.5-minute quad:	S9SSANX 9				
STREAM	INFORMATION: (de	epth and width can be ap	proximations)	di promonenti i con il	and the office of the office o				
11. Chanr 12. Chanr 14. Featui	nel width at top of ba re type: ∭Perennia CATEGORY INFOR	n riffle, if present) to top of nk (feet): 2,5 I flow □Intermittent flow the control of the con	bank (feet):	essment reach a swamp steal	Unable to assess channel depth.				
				1	/				
	ated geomorphic	MA							
	shape (skip for Marsh Stream):	(more sinuous stream,	flatter valley slope		tream, steeper valley slope)				
for Tid ADDITIOI 18. Were □Sed	shed size: (skip dal Marsh Stream) NAL INFORMATION regulatory considera ction 10 water sential Fish Habitat		ut Waters	k all that apply to the assessm ⊟Water Supply Wate					
□Puk □Ana □Doo List	olicly owned property adromous fish	□NCDWR Ripa □303(d) List of a federal and/or state lis	rian buffer rule in e	effect Nutrient Sensitive	Naters ironmental Concern (AEC)				
			asurements includ	ed in "Notes/Sketch" section of	or attached?  Yes No				
MA □B □C	Water throughou No flow, water in No water in asse nce of Flow Restric At least 10% of a point of obstructi	t assessment reach. pools only. ssment reach. tion – assessment reach assessment reach in-strea	ı metric m habitat or riffle- ed with aquatic ma	acrophytes or ponded water of	ected by a flow restriction <u>or</u> fill to the or impoundment on flood or ebb within of the channel, tidal gates, debris jams,				
3. Featur □A □B	re Pattern – assess A majority of the Not A		ered pattern (exam	nples: straightening, modificati	on above or below culvert).				
4. Featur □A ☑B	Majority of asses		ntially altered strea		I down-cutting, existing damming, over e has not reformed from any of these				
Consi	der only current in	channel down-cutting (hea I unstable nnel unstable	s from which the	stream has currently recovining, and artificial hardening (	vered. Examples of instability include such as concrete, gabion, rip-rap).				

6.					– stream LB) and f						
	LB										
	□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □									n-cutting, aggradation, dredging) that adversely af disruption of flood flows through streamside area, le	fect aky
	С	: 🗀 (	Ex [e: of me	densive of xamples: flood floo	evidence o causewa ws through litching]) <u>c</u>	of conditio ys with flo streamsio	ons that adversely oodplain and chan de area] <u>or</u> too mu	affect re nel consti ich floodp	ference ir riction, bu blain/interl	nteraction (little to no floodplain/intertidal zone acc llkheads, retaining walls, fill, stream incision, disrup tidal zone access [examples: impoundments, intens t or assessment reach is a man-made feature on	tion sive
7.					ssessmen	it reach/ir	ntertidal zone me	etric	7,61	1.4	
	□A	Check all that apply.  A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)									
	□B □C	Exc	essive s	edimenta	ation (bury	ing of stre	eam features or in	tertidal zo	one)		
		Odd	or (not in	cluding r	natural sulf	fide odors	)			and causing a water quality problem	
	DE		rent pub tion.	lished or	r collected	I data indi	icating degraded	water qu	ality in th	ne assessment reach. Cite source in "Notes/Sket	tch"
	□F □F	Live	stock w		s to strear						
	□G □H	Deg	essive a raded m	igae in s iarsh veç	tream or in getation in	the interti	one idal zone (remova	l, burning	, regular	mowing, destruction, etc)	
	∏J	Oth	er:	tressors			ain in "Notes/Sket				
8.					l metric (s	skip for T	idal Marsh Strea	ms)			
	For S	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.  □ Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours									
	□A □B						nfall not exceeding g 1 inch within the			last 48 hours	
	MC			condition							
9.	Larg □Ye				– assessi s too large			f Yes, sk	ip to Metr	ic 13 (Streamside Area Ground Surface Condition)	).
10.			ream Ha ⊠No				reach metric	F 16	w = 'alumnus.co		
$\rightarrow$	Tua.	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.	10b. Check all that occur (occurs if > 5% coverage of assessment reach) (skip for Size 4 Coastal Plain streams)									
	Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)						□F □G	5% oysters or other natural hard bottoms Submerged aquatic vegetation			
		¥B	Multip vegeta		and/or lea	af packs a	and/or emergent	for Stre		Low-tide refugia (pools) Sand bottom	
		⊠C.	Multip	Multiple snags and logs (including lap trees)  5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter  5% vertical bank along the marsh Little or no habitat							
		MD	in ban							Little or no habitat	
		□E	Little c	r no hab	itat						
***	*****	******	*****	***REMA	INING QU	JESTIONS	S ARE NOT APP	LICABLE	FOR TIE	DAL MARSH STREAMS************************************	
11.	Bedi	form and	Substr	ate – ass	sessment	reach me	etric (skip for Siz	ze 4 Coas	stal Plain	streams and Tidal Marsh Streams)	
	11a.	☑Yes	□No	Is asse	essment re	each in a r	natural sand-bed	stream? (	skip for	Coastal Plain streams)	
	11b.		n evalua	ted. Che	ck the ap	propriate	e box(es).				
		XA XB			on (evalua ion (evalu						
		ПС	Natura	l bedforr	n absent (	skip to M	letric 12, Aquatio	: Life)			
	11c.	at least	one box	x in each	row (ski	p for Size	4 Coastal Plain	streams	and Tida	sessment reach – whether or not submerged. <b>Che</b> Il <b>Marsh Streams)</b> . Not Present (NP) = absent, R Predominant (P) = > 70%. Cumulative percentag	are
		should r	not exce	ed 100% C	for each a	assessme P	nt reach.				
		7	È	Ď			Bedrock/sapr				
		X V		H	H	H	Boulder (256 Cobble (64 –		m)		
		Ā		X	ğ		Gravel (2 - 64	4 mm)			
		H	H				Sand (.062 – Silt/clay (< 0.0				
			H			H	Detritus Artificial (rip-ra		eté etc.\		
	11d.	□Yes	□No		- VIII / A					streams and Tidal Marsh Streams)	

4		Yes	□No	Was an in-stream aquatic life assessment performed as described in the User Manual?  e 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	□Aqu □Aqu	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.  It frogs latic reptiles latic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
			∐Asia	ldisfly larvae (T) an clam ( <i>Corbicula</i> ) stacean (isopod/amphipod/crayfish/shrimp) nselfly and dragonfly larvae terans
			☐Meg ☐Mid ☐Mos	rfly larvae (E) galoptera (alderfly, fishfly, dobsonfly larvae) ges/mosquito larvae squito fish ( <i>Gambusia</i> ) or mud minnows ( <i>Umbra pygmaea)</i> ssels/Clams (not <i>Corbicula</i> ) er fish
			□Sala □Sna □Stor □Tipu	amanders/tadpoles
1	3. Stre Con LB	amside A sider for RB	rea Gro the Left	ound Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)  Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.
	⊠A □B □C	ØA □B	Mo Se	tle or no alteration to water storage capacity over a majority of the streamside area oderate alteration to water storage capacity over a majority of the streamside area vere alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction estock disturbance, buildings, man-made levees, drainage pipes)
1		sider for RB	the Left	ter Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types) t Bank (LB) and the Right Bank (RB) of the streamside area. sjority of streamside area with depressions able to pond water ≥ 6 inches deep
	□B ⊠C	□В	Ma	ajority of streamside area with depressions able to pond water 3 to 6 inches deep ajority of streamside area with depressions able to pond water < 3 inches deep
1	Con	sider for	the Left	streamside area metric (skip for Tidal Marsh Streams) t Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the norma ssessment reach.
	☑Y □N	MY		e wetlands present in the streamside area?
1		ck all cor Stre Pon Obs Evid Stre	ntributo ams and ds (inclu truction lence of	ors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams) rs within the assessment reach or within view of and draining to the assessment reach.  If or springs (jurisdictional discharges) Ide wet detention basins; do not include sediment basins or dry detention basins) passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir) bank seepage or sweating (iron in water indicates seepage) or bank soil reduced (dig through deposited sediment if present) above
1		eck all tha Evid Obs Urba Evid Ass	t apply. lence of truction an stream lence that	substantial water withdrawals from the assessment reach (includes areas excavated for pump installation) not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit) m (≥ 24% impervious surface for watershed) at the streamside area has been modified resulting in accelerated drainage into the assessment reach reach relocated to valley edge
1		sider aspo Stre Deg	ect. Cor am shad raded (e	ent reach metric (skip for Tidal Marsh Streams) nsider "leaf-on" condition. ding is appropriate for stream category (may include gaps associated with natural processes) example: scattered trees)

1	to Ve	tuffer 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. The starting are the top of bank out the first break. The starting are the top of bank out the starting are the top of bank out
	E	B RB LB RB  A MA ≥ 100 feet wide <u>or</u> 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 D From 10 to < 30 feet wide E E E E E < 10 feet wide <u>or</u> no trees
2		uffer Structure – streamside area metric (skip for Tidal Marsh Streams) onsider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).  B RB  JA JA Mature forest B B Non-mature woody vegetation or modified vegetation structure C JC Herbaceous vegetation with or without a strip of trees < 10 feet wide D D Maintained shrubs JE JE Little or no vegetation
2	CI wi If Ab LE	uffer Stressors – streamside area metric (skip for Tidal Marsh Streams)  heck all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is ithin 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).  none of the following stressors occurs on either bank, check here and skip to Metric 22:  buts < 30 feet 30-50 feet  B RB LB RB  A B RB  A B B B B B B B B B B B B B B B B B B
2	Co LB M	tem Density – streamside area metric (skip for Tidal Marsh Streams) onsider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).  RB A Medium to high stem density B B Low stem density C No wooded riparian buffer or predominantly herbaceous species or bare ground
2	Co LB	ontinuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams) onsider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.  RB IA 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.
2	Ev	
		with non-native invasive species absent or sparse.  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.  Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent <u>or</u> communities with non-native invasive species dominant over a large portion of expected strata <u>or</u> communities composed of planted stands of non-characteristic species <u>or</u> communities inappropriately composed of a single species <u>or</u> no vegetation.
28		onductivity – assessment reach metric (skip for all Coastal Plain streams) 5a. □Yes ☑No Was conductivity measurement recorded? 1f No, select one of the following reasons. □No Water □Other:
	25	ib. 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

	SACE AID #:				NCDWR #:	
ar nu ar N	nd circle the locat umber all reaches nd explanations o C SAM User Man	ion of the str on the attac f requested i ual for exam	eam reach under eval hed map, and include nformation. Record in ples of additional mea	uation. If multiple s a separate form for o the "Notes/Sketch" surements that may	tream reaches will be evaluate each reach. See the NC SAM I section if supplementary meas	6 7.5-minute topographic quadrangle, ad on the same property, identify and User Manual for detailed descriptions surements were performed. See the in the assessment area).
PI	ROJECT/SITE IN	FORMATIO	N:			1 1
1.	Project name (if	any):	sassanxa sv	vamp 2	Date of evaluation: 4	/10/18
	Applicant/owner	name:	Wildian Johnston	ds 4	. Assessor name/organization:	Wildlands Eng
7.	County: River basin:		Meuse		Nearest named water body on USGS 7.5-minute quad:	Sassanxa
		The second second second	grees, at lower end of		-	
	Site number (sho		oth and width can be ed map); 75 B		ngth of assessment reach eval	uated (feet):
11 12 14 S	1. Channel depth 2. Channel width	from bed (in at top of banl ⊒Perennial f DRY INFORN	riffle, if present) to top k (feet): 1.5 low Intermittent flow	of bank (feet): 13. Is as:	sessment reach a swamp stear	Unable to assess channel depth.
-					1	1
16	6. Estimated geor	morphic	MA		□в	
	valley shape (s		1			torano atranan vallavi atana)
1	Tidal Marsh St		(more sinuous stream	tream, steeper valley slope)		
17	7. Watershed size	The second secon	Size 1 (< 0.1 mi²)	☐Size 2 (0.1 to	$< 0.5 \text{ mi}^2$ ) Size 3 (0.5 to	< 5 mi²)
Δ	for Tidal Marsl DDITIONAL INFO					
10,700			ons evaluated? TYes	s TNo If Yes, chec	ck all that apply to the assessm	nent area.
	☐Section 10 w		Classified T			ershed ( I I II III IV IV)
	Essential Fis		Primary Nu		☐ High Quality Wate	rs/Outstanding Resource Waters
	☐Publicly own			parian buffer rule in		
1	Anadromous		☐303(d) List			ironmental Concern (AEC)
			a federal and/or state	listed protected spe	cies within the assessment are	ea.
	List species:  ☐Designated (		at (list enocios)			
10				neasurements inclu	ded in "Notes/Sketch" section of	or attached? Tyes TNo
13	. Ale additional s	sucam mom	alloti/supplementary i	neasurements more	ded iii Notes/Sketch Section C	or attached! Tes Tivo
1.	MA Water ☐B No flo		assessment reach. ools only.	p for Size 1 stream	s and Tidal Marsh Streams)	
2.	☐A At lea point of the as	st 10% of as of obstructing sessment re or dams).	g flow or a channel ch	eam habitat or riffle oked with aquatic m	nacrophytes or ponded water o	ected by a flow restriction <u>or</u> fill to the <u>or</u> impoundment on flood or ebb within at the channel, tidal gates, debris jams,
			1 51 - A.V.S.F			
3.			nent reach metric ssessment reach has a	altered pattern (exar	mples: straightening, modificati	on above or below culvert).
4.	Feature Longit	udinal Profi	le – assessment read	h metric		
	☐A Majori widen	ity of assessi ing, active a pances).	ment reach has a subs	tantially altered stre		down-cutting, existing damming, over has not reformed from any of these
5.	Signs of Active	e Instability	– assessment reach	metric		
٠,	Consider only active bank failu □ A < 10% □ B 10 to 2	current ins	tability, not past eve lannel down-cutting (he unstable nel unstable	nts from which the		vered. Examples of instability include such as concrete, gabion, rip-rap).

U.						Right B	ank (RB).					
	LB	RB		- 52	5.		3 3				30	
	⊠A □B	ĎA □B	Mo refe or i	derate ev erence inte ntermitter	idence of eraction (e nt bulkhea	conditions examples: ds, cause	limited st ways with	es: be treamsi floodp	rms, leve ide area a lain cons	es, down access, di triction, m	-cutting, aggradation, dredging) that adversely sruption of flood flows through streamside area ninor ditching [including mosquito ditching])	a, leaky
	□с	□c	[exa of fl mos	amples: c lood flows squito dite	causeways through s ching]) <u>or</u>	s with floo treamside	dplain and e area] <u>or</u> t	l chann too mud	el constri ch floodpl	ction, bul ain/interti	teraction (little to no floodplain/intertidal zone a kheads, retaining walls, fill, stream incision, dis dal zone access [examples: impoundments, into or assessment reach is a man-made feature	ruption tensive
207				erstream c	¥.					juni 🔭 ,		
7.		r Quality k all that		ors – ass	essment	reach/int	ertidal zo	ne me	tric	7	e plant the	
	□A □B □C □D	Disco Exce Notic Odor	olored w ssive se eable ev (not inc	dimentati vidence o luding na	on (buryin f pollutant tural sulfid	g of strea discharge le odors)	m feature es enterinç	s or int g the a	ertidal zo ssessme	ne) nt reach <u>a</u>	ter discoloration, oil sheen, stream foam) and causing a water quality problem	
	ΠE	Curre section		ished or d	collected c	data indic	ating degr	raded v	vater qua	ality in the	e assessment reach. Cite source in "Notes/S	sketch"
	⊠F □G □H	Lives Exce	tock with	gae in stre	to stream eam or inte tation in th	ertidal zor	ne	emoval	burnina	regular r	nowing, destruction, etc)	
		Other					n in "Notes				nermig, deed delien, etc)	
8.					notric /ck	in for Tid	lal Marsh	Ctrone	na)	2		
0.		ize 1 or 2 Droug Droug	streams ght cond ght cond	s, D1 drou litions <u>and</u>	ight or higl d no rainfa	her is con Ill or rainfa	sidered a	drough eeding	t; for Size	ithin the la	reams, D2 drought or higher is considered a dr ast 48 hours	ought.
9.	60				assessm oo large o			ess? If	Yes, skij	o to Metri	c 13 (Streamside Area Ground Surface Condit	ion).
10.							each metr				¥	
	10a. The 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)									essive .gging)		
		Check al □A □B	Multiple (include	e aquatic e liverwort	macrophyt ts, lichens	tes and a , and alga	quatic mo:	sses		skip for S	Size 4 Coastal Plain streams) 5% oysters or other natural hard bottoms Submerged aquatic vegetation Low-tide refugia (pools)	
		□C □D	5% und	e snags ai dercut bar		root mat	ap trees) is and/or r d perimete		Check for Tidal Marsh Streams Only	□I □J □K	Sand bottom 5% vertical bank along the marsh Little or no habitat	
		□E		no habita		nai wotto	a pominote	<b>51</b>				
****	*****	*****	*****	**DEN#AIN	JING OHE	etione:	ADE NOT	r Appl	ICABLE	COD TID	AL MARSH STREAMS************************************	***
											streams and Tidal Marsh Streams)	
		∭Yes	□No								Coastal Plain streams)	
		4	evaluate		k the app						,	
		X)A X)B	Riffle-ru Pool-gli	ın section de sectio	ı (evaluate n (evaluat	e 11c) te 11d)	tric 12, A	quatic	Life)			
		at least of (R) = pre	one box sent but	in each i t ≤ 10%, (	r <mark>ow (skip</mark> Common (	for Size 4 (C) = > 10	<b>4 Coastal</b> 0-40%, Ab	Plain s	streams	and Tidal	sessment reach – whether or not submerged. (I Marsh Streams). Not Present (NP) = absent Predominant (P) = > 70%. Cumulative percer	t, Rare
ł		NP	ot excee R □	d 100% fo C □	or each as A □	sessmen P □	Bedrock					
	y (5								- 4096 mı !56 mm)	m)		
			图				Gravel ( Sand (.0					
			Ē	X X	Ē	Ē	Silt/clay	(< 0.0				
		<b>Ā</b>					Detritus Artificial		p, concre	ete, etc.)		
	11d.	□Yes	⊠No	Are pool	s filled wit	h sedimer	nt? (skip f	for Size	e 4 Coas	tal Plain	streams and Tidal Marsh Streams)	

12.	Out the will	Yes	□No	Was an in-stream aquatic life assessment performed as described in the User Manual?  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.						
			Aqu   Bee   Cad   Asia   Crus   Dam   Dipt   May   Meg   Mide	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams. It frogs atic reptiles actic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) alies disfly larvae (T) n clam (Corbicula) atacean (isopod/amphipod/crayfish/shrimp) alieselfly and dragonfly larvae (E) aloptera (alderfly, fishfly, dobsonfly larvae) ges/mosquito larvae quito fish (Gambusia) or mud minnows (Umbra pygmaea) sels/Clams (not Corbicula)						
			□Sna □Stor □Tipu	efly larvae (P) lid larvae						
13.	Cons	sider for	rea Gro	ms/leeches und Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types) Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.						
	LB □A □B □C	RB □A □B 団C	Moderate alteration to water storage capacity over a majority of the streamside area Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil comp livestock disturbance, buildings, man-made levees, drainage pipes)							
14.	Consider for the LB RB □A □A □B		the Left Ma Ma	a Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types) e Left Bank (LB) and the Right Bank (RB) of the streamside area.  Majority of streamside area with depressions able to pond water ≥ 6 inches deep Majority of streamside area with depressions able to pond water 3 to 6 inches deep Majority of streamside area with depressions able to pond water < 3 inches deep						
15.	Cons	sider for	Presence – streamside area metric (skip for Tidal Marsh Streams) r for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the norm erimeter of assessment reach.  RB  XY  Are wetlands present in the streamside area?							
16.	rs – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams) rs within the assessment reach or within view of and draining to the assessment reach. /or springs (jurisdictional discharges) de wet detention basins; do not include sediment basins or dry detention basins) bassing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir) bank seepage or sweating (iron in water indicates seepage) or bank soil reduced (dig through deposited sediment if present)									
17.	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 de □ 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									
18.	□F None Shading – ass Consider aspe □A Strea □B Degr		None of the above  ing – assessment reach metric (skip for Tidal Marsh Streams) ider aspect. Consider "leaf-on" condition.  Stream shading is appropriate for stream category (may include gaps associated with natural processes)  Degraded (example: scattered trees)  Stream shading is gone or largely absent							

19.	Buffer Width $\sim$ 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 $\square$ A $\square$ A $\square$ A $\supseteq$ 100 feet wide or extends to the edge of the watershed $\square$ B $\square$ B $\square$ B $\square$ B $\square$ B From 50 to < 100 feet wide $\square$ C $\square$ C $\square$ C $\square$ C $\square$ C rom 30 to < 50 feet wide $\square$ D $\square$ D $\square$ D $\square$ D $\square$ D $\square$ D From 10 to < 30 feet wide $\square$ E $\square$ E $\square$ E $\square$ E $\square$ E $\square$ E < 10 feet wide $\square$ C 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 Mature forest  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 A A A A A A A A A A A A A
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 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 MA 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       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       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).
Note	□A < 46 □B 46 to < 67 □C 67 to < 79 □D 79 to < 230 □E ≥ 230 es/Sketch;

USACE A	ID #:	NCDWR #:
and circle number all and explar NC SAM U	the location of the s reaches on the atta nations of requested Jser Manual for exar	etch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, tream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and ched map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the mples of additional measurements that may be relevant.  SORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).
4 4 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	SITE INFORMATION	ON: 4/10/10
	name (if any):	5985971X9 SWaMP 2. Date of evaluation: 4/10/18
	nt/owner name:	Wildland S 4. Assessor name/organization: Wildlands Eng
5. County: 7. River ba	asin:	Neuse. 4 6. Nearest named water body on USGS 7.5-minute quad: Sqssarixq Swamp
STREAM		egrees, at lower end of assessment reach):  epth and width can be approximations) hed map): 75 C 10. Length of assessment reach evaluated (feet):
11. Chann 12. Chann 14. Featur	el depth from bed (in tel width at top of bal te type: ☐Perennial CATEGORY INFOR	n riffle, if present) to top of bank (feet): 25 Unable to assess channel depth.  nk (feet): 13. Is assessment reach a swamp steam? Yes No  I flow Antermittent flow Tidal Marsh Stream
		\
16. Estima	ated geomorphic	□B □B
	shape (skip for	
THE STATE OF	Marsh Stream):	(more sinuous stream, flatter valley slope) (less sinuous stream, steeper valley slope)  Size 1 (< 0.1 mi²)
for Tic	shed size: (skip dal Marsh Stream) NAL INFORMATION	<i>y</i> ,
□Pub □Ana □Doo	ential Fish Habitat blicly owned property adromous fish cumented presence t species:	☐ Primary Nursery Area ☐ High Quality Waters/Outstanding Resource Waters ☐ NCDWR Riparian buffer rule in effect ☐ Nutrient Sensitive Waters ☐ 303(d) List ☐ CAMA Area of Environmental Concern (AEC) of a federal and/or state listed protected species within the assessment area.
	signated Critical Hab	pitat (list species)
19. Are ac	ditional stream infor	rmation/supplementary measurements included in "Notes/Sketch" section or attached?   Yes  No
□B □C	Water throughout No flow, water in No water in asse	ssment reach.
2. Evider □A □A	At least 10% of a	ction – assessment reach metric assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the aing flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams,
3. Featur	re Pattern – assess A majority of the Not A	sment reach metric assessment reach has altered pattern (examples: straightening, modification above or below culvert).
	Majority of asses	ofile – assessment reach metric sement reach metric sement reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these
Consi	der only current in	annel unstable

6.						ide area r e Right B						
	⊠A □B	⊠A □B	Mo ref	oderate ev erence int	idence o eraction	f conditions examples:	: limited stream:	erms, leve side area a	es, dowr access, d	n-cutting, aggradation,	dredging) that adversely affet through streamside area, lea	ect
	□c	ПС	Ex [ex of mo	tensive ev camples: c flood flows	vidence o causeway s through ching]) <u>o</u>	f condition s with floo streamside	s that adversely dplain and chan e area] <u>or</u> too mu	affect ref nel constr ich floodp	erence ir iction, bu ain/intert	nteraction (little to no fl lkheads, retaining walls idal zone access [exan	g mosquito ditariling)) oodplain/intertidal zone acce s, fill, stream incision, disrupti nples: impoundments, intensi is a man-made feature on	on ve
7.		ck all tha Disc Exce Notic Odo Curr secti Lives	t apply. olored vessive secable er (not independent published) stock with a second contraction.	vater in streedimentate vidence occluding na lished or other than access lgae in streediments.	ream or in ion (buryi f pollutan tural sulfi collected to stream eam or in	ntertidal zo ng of strea t discharge de odors) data indic or intertidal zor	am features or in es entering the ating degraded lal zone ne	blue, unn ntertidal zo assessme water qua	ne) nt reach : ality in th	nter discoloration, oil shand causing a water que assessment reach.	uality problem Cite source in "Notes/Sketc	xh"
		Othe	er:	tressors	tollori III		n in "Notes/Sket			mownig, destruction, e	10)	
3.		Size 1 or 2 Drou Drou	stream ight con ight con	s, D1 drou ditions <u>an</u>	ight or his d no raint	gher is con all or rainfa	dal Marsh Strea sidered a droug all not exceedin 1 inch within th	ht; for Size	ithin the	treams, D2 drought or last 48 hours	higher is considered a drougl	nt.
).	Larg					nent reach		lf Vac eki	n to Metr	ic 13 /Streamside Ares	Ground Surface Condition).	
10.		11		bitat Type Degrad sedime	es – asse ded in-str entation,	essment re eam habit mining, ex	each metric tat over majorit	y of the a	assessme	ent reach (examples or r example, rip-rap], re	of stressors include excession of stressors include excession of strength of the strength of t	ve
	10b.	Check a	Multipl (includ Multipl vegeta Multipl 5% un in banl	e aquatic e liverwor e sticks a tion e snags a dercut ba	macroph ts, lichen nd/or lea nd logs (i nks and/o to the no	ytes and a s, and alga f packs an ncluding la or root mat	quatic mosses al mats) id/or emergent	Check for Tidal and Marsh Streams 40	skip for	Size 4 Coastal Plain s 5% oysters or other Submerged aquatic Low-tide refugia (po Sand bottom 5% vertical bank ald Little or no habitat	natural hard bottoms vegetation ools)	
											IS*********	
1.										streams and Tidal M		
			evaluat Riffle-r Pool-g	ted. Chec un section lide section	k the ap (evalua n (evalua	propriate te 11c) ite 11d)			sмр тог	Coastal Plain streams	g.	
	11c.	at least	ections, one boo	check all in each it ≤ 10%,	that occu row (skip Common	r below the	e normal wetted 4 Coastal Plain 0-40%, Abunda	perimeter streams nt (A) = > colite - 4096 m 256 mm) 4 mm) 2 mm) 062 mm)	and Tida 40-70%, m)	I Marsh Streams). No	ther or not submerged. Checot Present (NP) = absent, Ra 70%. Cumulative percentage	re
	11d.	□Yes	MNo	Are pool	s filled w	ith sedime	nt? (skip for Si	ze 4 Coas	tal Plain	streams and Tidal M	arsh Streams)	

Z.			□No	Was an in-stream aquatic life assessment performed as described in the User Manual?  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	Aqu Aqu Aqu Bee Cad Asia Crus Dan Dipt May Meg Mos Oth Sala Stor	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams. It frogs atic reptiles actic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) tiles disfly larvae (T) in clam (Corbicula) stacean (isopod/amphipod/crayfish/shrimp) inselfly and dragonfly larvae erans offly larvae (E) galoptera (alderfly, fishfly, dobsonfly larvae) ges/mosquito larvae (aquito fish (Gambusia) or mud minnows (Umbra pygmaea) issels/Clams (not Corbicula) in the control of the control of the control of the corbicula of
3.	Streat Cons	imside A sider for RB DA DB	the Left Litt Mo	bund Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)  Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.  le or no alteration to water storage capacity over a majority of the streamside area derate alteration to water storage capacity over a majority of the streamside area vere alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction,
			live	estock disturbance, buildings, man-made levees, drainage pipes) ter Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)
4.			the Left Ma Ma	is Bank (LB) and the Right Bank (RB) of the streamside area.  ijority of streamside area with depressions able to pond water ≥ 6 inches deep ijority of streamside area with depressions able to pond water 3 to 6 inches deep ijority of streamside area with depressions able to pond water < 3 inches deep
15.	Cons	ider for	the Left eter of as	streamside area metric (skip for Tidal Marsh Streams) t Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal seessment reach. e wetlands present in the streamside area?
16.		k all cor Stre Pon Obs Evid Stre	ntributo ams and ds (inclu truction lence of	ors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams) rs within the assessment reach or within view of and draining to the assessment reach.  If or springs (jurisdictional discharges) de wet detention basins; do not include sediment basins or dry detention basins) passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir) bank seepage or sweating (iron in water indicates seepage) or bank soil reduced (dig through deposited sediment if present) above
17.	Base	eflow De ck all tha Evic Obs Urba Evic Ass	tractors at apply. lence of truction an stread	- assessment area metric (skip for Tidal Marsh Streams)  substantial water withdrawals from the assessment reach (includes areas excavated for pump installation) not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit) m (≥ 24% impervious surface for watershed) at the streamside area has been modified resulting in accelerated drainage into the assessment reach reach relocated to valley edge
18.	Shac	ider asp Stre Deg	ect. Cor am sha raded (e	ent reach metric (skip for Tidal Marsh Streams) nsider "leaf-on" condition.  ding is appropriate for stream category (may include gaps associated with natural processes) example: scattered trees)  ding 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
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 B Non-mature woody vegetation or modified vegetation structure  C C C Herbaceous vegetation with or without a strip of trees < 10 feet wide  D D D Maintained shrubs  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 Row crops B 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 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
	<ul> <li>MA</li> <li>Medium to high stem density</li> <li>B</li> <li>B</li> <li>C</li> <li>C</li> <li>Mowooded riparian buffer or predominantly herbaceous species or bare ground</li> </ul>
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
	<ul> <li>☑A</li> <li>☑B</li> <li>☑B</li> <li>☐C</li> <li>☐C</li> <li>☐C</li> <li>☐D</li> <li></li></ul>
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
	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.
	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.  Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent <u>or</u> communities with non-native invasive species dominant over a large portion of expected strata <u>or</u> communities composed of planted stands of non-characteristic species <u>or</u> communities inappropriately composed of a single species <u>or</u> 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
Note	s/Sketch:

l	USACE AID #:		NCDWR #:	
a n a N	INSTRUCTIONS: Attach a sketch of the and circle the location of the stream reanumber all reaches on the attached map and explanations of requested informations of the stream of a NOTE EVIDENCE OF STRESSORS AND AND TRESSORS AND	ach under evaluation. If multiple so, and include a separate form for ion. Record in the "Notes/Sketchadditional measurements that may	stream reaches will be evaluate each reach. See the NC SAM " section if supplementary mea y be relevant.	ed on the same property, identify and User Manual for detailed descriptions surements were performed. See the
	PROJECT/SITE INFORMATION:	10000 0 1000		4/10/18
			2. Date of evaluation:	
	3. Applicant/owner name:	I W I I I I I I I I I I I I I I I I I I	Assessor name/organization:	Wildlands Eng
10.0	5. County: 7. River basin:	Johnston 6 Puse 4	<ol> <li>Nearest named water body on USGS 7.5-minute quad:</li> </ol>	Sassanxa Swamp
	8. Site coordinates (decimal degrees, at			
	STREAM INFORMATION: (depth and 9. Site number (show on attached map)		ength of assessment reach eval	uated (feet):
1 1	11. Channel depth from bed (in riffle, if p 12. Channel width at top of bank (feet): 14. Feature type: ☑Perennial flow ☐I STREAM CATEGORY INFORMATION	7.5 13. Is as Intermittent flow ☐ Tidal Marsh St	sessment reach a swamp stea	Unable to assess channel depth. m? ∐Yes ☑No
1		ountains (M) ☐ Piedmont (P)	Inner Coastal Plain (I)	Outer Coastal Plain (O)
4	10 Fatingted assessments	j		
1	16. Estimated geomorphic valley shape (skip for		□в	
Ш		sinuous stream, flatter valley slop	oe) (less sinuous s	stream, steeper valley slope)
1	for Tidal Marsh Stream)	e 1 (< 0.1 mi²)	< 0.5 mi <sup>2</sup> ) Size 3 (0.5 to	< 5 mi²)
100	ADDITIONAL INFORMATION:  18. Were regulatory considerations eval	lusted? Type The If you obs	all that apply to the access	cont area
	☐Essential Fish Habitat ☐Publicly owned property	□ Classified Trout Waters □ Primary Nursery Area □ NCDWR Riparian buffer rule in □ 303(d) List al and/or state listed protected sp	☐ High Quality Water of Environment of Environment ☐ High Quality Water of Environment of Envir	rironmental Concern (AEC)
1	Designated Critical Habitat (list sp	pecies)		
1	19. Are additional stream information/su		ided in "Notes/Sketch" section	or attached?  Yes  No
1.	1. Channel Water – assessment read  A Water throughout assessm  B No flow, water in pools only  C No water in assessment re	nent reach. y.	ns and Tidal Marsh Streams)	
2.	At least 10% of assessme point of obstructing flow or	ent reach in-stream habitat or riffle r a channel choked with aquatic r	nacrophytes or ponded water of	fected by a flow restriction or fill to the or impoundment on flood or ebb within at the channel, tidal gates, debris jams,
3.		ch metric ent reach has altered pattern (exa	mnles: straightening, modificati	on above or below culvert)
	⊠B Not A		mpiss, straightening, modificati	on above of bolow durvery.
4.	MA Majority of assessment rea	ach has a substantially altered stre	eam profile (examples: channe nere appropriate channel profil	l down-cutting, existing damming, over e has not reformed from any of these
5.	5. Signs of Active Instability - asses	sment reach metric		
347		not past events from which the own-cutting (head-cut), active wide able		vered. Examples of instability include such as concrete, gabion, rip-rap).

6.	Con	sider for			– streams .B) and the		metric Bank (RB).	Α.		
	LB □A ▼B	RB □A ☑B	Mo refe	derate e erence in	vidence of iteraction (	conditior examples	s: limited stream	erms, leve side area	ees, dowr access, d	nteraction Lcutting, aggradation, dredging) that adversely affect isruption of flood flows through streamside area, leaky ninor ditching [including mosquito ditching])
	□с		Ext [ex of f mo	tensive e amples: lood flow	vidence of causeway s through s tching]) or	condition s with floo streamsid	ns that adversely odplain and chan le area] <u>or</u> too mi	affect re nel consti uch floodp	ference in riction, bul lain/intert	teraction (little to no floodplain/intertidal zone access kheads, retaining walls, fill, stream incision, disruption idal zone access [examples: impoundments, intensive or assessment reach is a man-made feature on an
7.	Chec	ck all tha Disc Exc Noti Odo	t apply. colored w essive se ceable e r (not ince	vater in s edimenta vidence cluding n	tream or in tion (buryir of pollutant atural sulfic	tertidal zo ng of stre discharg de odors)	am features or inges entering the	blue, unr ntertidal zo assessme	one) ent reach <u>s</u>	ter discoloration, oil sheen, stream foam)  and causing a water quality problem e assessment reach. Cite source in "Notes/Sketch"
	FG H	Exce Deg Othe	essive al raded m	gae in st arsh veg	s to stream ream or int etation in th	ertidal zo ne intertio	one			mowing, destruction, etc)
8.	Rece	ent Weat Size 1 or 3 Droi Droi	her – wa 2 stream: ught cond ught cond	i <b>tershed</b> s, D1 dro ditions <u>ar</u>	ought or hig nd no rainfa nd rainfall e	her is co all or rain	dal Marsh Streansidered a droug fall not exceeding 1 inch within th	ht; for Siz g 1 inch v	vithin the I	treams, D2 drought or higher is considered a drought. ast 48 hours
9,	Larg	6			- assessm too large c			If Yes, sk	ip to Metri	c 13 (Streamside Area Ground Surface Condition).
10.		ral In-str ∐Yes		Degra sedim	ided in-stre entation, r	eam hab nining, e	reach metric itat over majorit xcavation, in-str stal Plain strea	eam hard	lening [fo	ent reach (examples of stressors include excessive rexample, rip-rap], recent dredging, and snagging) to Metric 12)
	10b.	Check a □A □B □C □D □D □D	Multiple (include Multiple vegeta Multiple 5% und in bank	e aquation e liverwo e sticks a tion e snags a dercut ba	ccurs if > 59 macrophy orts, lichens and/or leaf and logs (in anks and/o I to the nor	% covera tes and a s, and alg packs a ncluding l r root ma	ge of assessme aquatic mosses al mats) nd/or emergent		skip for S	Size 4 Coastal Plain streams) 5% oysters or other natural hard bottoms Submerged aquatic vegetation Low-tide refugia (pools) Sand bottom 5% vertical bank along the marsh Little or no habitat
***	*****	*****	*****	**REMA	INING QUI	ESTIONS	ARE NOT APP	LICABLE	FOR TIE	DAL MARSH STREAMS********************
										streams and Tidal Marsh Streams)
	11a.	□Yes	□No	Is asse	ssment rea	ach in a n	natural sand-bed	stream?	(skip for	Coastal Plain streams)
	11b.	Bedform ☑A ☑B ☐C	Riffle-r Pool-gl	un sectio ide secti	ck the app on (evaluat on (evalua n absent (s	e 11c) te 11d)	box(es). etric 12, Aquati	c Life)		
	11c.	at least (R) = pr	one box esent bu	t in each t ≤ 10%,	row (skip	for Size (C) = > 1	4 Coastal Plain 10-40%, Abunda	rolite - 4096 m 256 mm) 4 mm) 2 mm) 062 mm)	and Tida 40-70%, nm)	sessment reach – whether or not submerged. Check I Marsh Streams). Not Present (NP) = absent, Rare Predominant (P) = > 70%. Cumulative percentages
	11d.	□Yes	MNo	Are poo	ols filled wit	th sedime	ent? (skip for Si	ze 4 Coas	stal Plain	streams and Tidal Marsh Streams)

	12.	12a.	Yes	□No	was an in-stream aquatic life assessment performed as described in the User Manual?  The 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 apply. If No, skip to Metric 13.	, check all that					
			1 0000000000000000000000000000000000000	Aquadaquadaquadaquadaquadaquadaquadaquad	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams and "taxa" for Size 3 and 4 streams and "taxa" for Size 3 and 4 streams and algal mats) quatic reptiles quatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) quatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) quatic macrophytes and a	eams.					
	13.	Strea	mside A	rea Gro	orms/leeches round Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley typ ft Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and	oes) d upland runoff.					
		LB □A □B ⊠C	RB □A □B ☑C	Lit Mo Se	ittle or no alteration to water storage capacity over a majority of the streamside area  Moderate alteration to water storage capacity over a majority of the streamside area  Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, sover a majority of the streamside area (examples)						
	14.	Streat Cons LB A B B	mside A ider for RB □A □B □C	the Lef Ma Ma	later Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valle of the Bank (LB) and the Right Bank (RB) of the streamside area.  Majority of streamside area with depressions able to pond water ≥ 6 inches deep  Majority of streamside area with depressions able to pond water 3 to 6 inches deep  Majority of streamside area with depressions able to pond water < 3 inches deep	y types)					
	15.	<ol> <li>Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)</li> <li>Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the wetted perimeter of assessment reach.</li> <li>LB RB</li> </ol>									
		N □	⊠Ν □Υ	Ar	are wetlands present in the streamside area?						
	16.		k all con Strea Pond Obst Evide Strea	tributo ams and ds (inclu ruction ence of am bed	tors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams) fors within the assessment reach or within view of and draining to the assessment reach. Ind/or springs (jurisdictional discharges) Idude wet detention basins; do not include sediment basins or dry detention basins) In passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-rele If bank seepage or sweating (iron in water indicates seepage) If or bank soil reduced (dig through deposited sediment if present) If present is a seepage of the assessment area (beaver dam, leaky dam, bottom-rele If a seepage or sweating (iron in water indicates seepage)	ase dam, weir)					
*	17.		k all that Evid Obst Urba Evid Asse	t apply ence of ruction in strea ence th essmen	rs – assessment area metric (skip for Tidal Marsh Streams) y. of substantial water withdrawals from the assessment reach (includes areas excavated for pump installa n not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sedimen am (≥ 24% impervious surface for watershed) hat the streamside area has been modified resulting in accelerated drainage into the assessment reach nt reach relocated to valley edge e above	t deposit)					
	18.		ider aspe Strea Degr	ect. Co am sha raded (e	nent reach metric (skip for Tidal Marsh Streams) onsider "leaf-on" condition. ading is appropriate for stream category (may include gaps associated with natural processes) (example: scattered trees) ading is gone or largely absent						

	Vegetated LB RB	st break. I Wood		and "wood	ed buffer" separate	ely for left ban	k (LB) and r	ight bank (RB)	starting at the top	of bank out
	ĎIA ⊠A ∐B ∐B	. ⊠A	NA 2		de <u>or</u> extends to the 100 feet wide	edge of the wa	atershed			
		□C	□C I	From 30 to <	50 feet wide					
				From 10 to < < 10 feet wide						
20.	Consider LB	for left ba RB □A M ☑B N □C H □D M	ank (LB) a Mature fore Mon-mature Herbaceous Maintained	nd right ban est e woody vege s vegetation	c (skip for Tidal M ik (RB) for Metric 1 etation <u>or</u> modified v with or without a str	9 ("Vegetated' egetation struc	" Buffer Wid ture	th).		
21.	Buffer Str Check all within 30 f	ressors : appropriation of street of street of street of street of street of the follow -< 30 fc LB	streamsid ate boxes am (< 30 f ving stres eet 3 RB L B B [ B B [ C C ]	le area metri for left bank eet), or is bel	ic (skip for Tidal M (LB) and right bar tween 30 to 50 feet on either bank, ch Row crops Maintained turf Pasture (no livest Pasture (active liv	nk (RB). Indica of stream (30-5 neck here and neck)/commercia	te if listed str 0 feet). skip to Metr	ic 22: 🔲	am (Abuts), does r	not abut but is
22.	Consider LB F MA B □B [	for left ba RB ☑A M ☑B L	ink (LB) ai ledium to l ow stem d	nd right ban high stem dei ensity	skip for Tidal Mars k (RB) for Metric 1 nsity er <u>or</u> predominantly	9 ("Wooded" E				
23.	Consider v LB F □A [ □B [	whether ve RB ☑A T ☑B T	getated bu he total ler he total ler	uffer is contin ngth of buffer ngth of buffer	ide area metric (sl uous along stream breaks is < 25 perc breaks is between breaks is > 50 perc	parallel). Brea ent. 25 and 50 perc	ks are areas		on > 10 feet wide.	
24.	Evaluate the assessment LB F	he domina nt reach ha RB ]A V	nt vegetati abitat. egetation i	ion within 100	ea metric (skip for 0 feet of each bank ndisturbed in specie	or to the edge s present and t	of the waters			
	⊠в [	∑B V sp co	egetation pecies. T ommunities	indicates dis This may inc s with non-na	species absent or s turbance in terms clude communities ative invasive specie	of species dive of weedy natives of present, but	ve species t not dominan	hat develop aft	er clear-cutting of	r clearing or
		□C V	egetation i ith non-na	is severely di tive invasive	derstory but retainin isturbed in terms of species dominant o stic species <u>or</u> comr	species divers ver a large por	ity or proport tion of expec	ted strata or cor	nmunities compos	ed of planted
25.	25a. □Y€	es 🗌 No	Was co	onductivity me	(skip for all Coasta easurement recorde ons.	d?			_	
	25b. Ched □A	ck the box < 46	correspon	ding to the co 6 to < 67	onductivity measure ☐C 67 to < 79	ment (units of r □D 79	microsiemens to < 230	per centimeter) □E ≥ 230		
Note	es/Sketch:									

USACE AID #:				NCDW			
and circle the I number all read and explanatio	ocation of the stre ches on the attach ns of requested in Manual for examp	ch of the assessment a eam reach under evalued map, and include a nformation. Record in oles of additional meas ORS AFFECTING TH	uation. If multiple a separate form fo the "Notes/Sketo surements that m	e stream reach or each reach. ch" section if s ay be relevant	es will be evaluate See the NC SAM to supplementary meas sees.	d on the same prope Jser Manual for deta surements were perf	iled descriptions formed. See the
PROJECT/SIT	E INFORMATION	1:			. 1	10/18	
<ol> <li>Project name</li> <li>Applicant/ow</li> </ol>	The state of the s	Sassanxa Si	wamp	2. Date of eva	name/organization:	Wildlands Eng	
<ul><li>5. County:</li><li>7. River basin:</li></ul>	mer name. -	Wildlan Johnst	HON	6. Nearest na	med water body 7.5-minute quad:	Sassanxa	Swamp
8. Site coordina		rees, at lower end of a	assessment reacl				
STREAM INFO	ORMATION: (dep	th and width can be	approximations	) Length of asse	essment reach eval	uated (feet):	
11. Channel de 12. Channel w 14. Feature typ	idth at top of bank	riffle, if present) to top k (feet): 5.5 low ∏Intermittent flov	of bank (feet): 13. Is	Z.5 assessment re	each a swamp stea	Unable to assess ch	annel depth.
15. NC SAM Z		☐ Mountains (M)	☐ Piedmont (I	P) [Alnne	r Coastal Plain (I)	Outer Coasta	l Plain (O)
					1	1	
27. A.S. S. S. S.				1			
16. Estimated	geomorphic be (skip for	NA -	<u></u>		□В		60.
	sh Stream):	(more sinuous stream				tream, steeper valle	William Annual Control of the Contro
ADDITIONAL	larsh Stream)	□Size 1 (< 0.1 mi²) ons evaluated? □Yes			☐Size 3 (0.5 to		4 (≥ 5 mi²)
☐Publicly ☐Anadror	ented presence of	□Primary Nui □NCDWR Ri □303(d) List a federal and/or state	iparian buffer rule	in effect	Nutrient Sensitive CAMA Area of Env	rironmental Concern	
Designa	ated Critical Habit	at (list species)				, 1 10 DV	FINE
19. Are addition	onal stream inform	nation/supplementary r	measurements in	cluded in "Not	es/Sketch" section	or attached? Lives	LINO
MA V □B N			p for Size 1 stre	ams and Tida	l Marsh Streams)		
□ A p ti	At least 10% of as	ion – assessment rea sessment reach in-str g flow <u>or</u> a channel ch each (examples: unde	ream habitat or r	ic macrophytes	or ponded water	or impoundment on	flood of epp within
□A A	attern – assessn A majority of the a Not A	nent reach metric ssessment reach has	altered pattern (e	examples: strai	ghtening, modificat	ion above or below o	culvert).
⊠A N	Aniority of access	ile – assessment rea ment reach has a sub- aggradation, dredging,	stantially altered	where approp	(examples: channe riate channel profi	el down-cutting, exis le has not reformed	ting damming, over from any of these
Consider active ban □A ☑B	only current ins	nnel unstable	ents from which	the stream I widening, and	nas currently reco artificial hardening	vered. Examples of (such as concrete, g	of instability include abion, rip-rap).

6			r the Left				a metric Bank (RB).			
		A D	A Litt B Mo ref	derate e erence ir	vidence on teraction	f conditio (example	s: limited strear	berms, lev nside area	ees, down	nteraction n-cutting, aggradation, dredging) that adversely affect lisruption of flood flows through streamside area, leaky minor ditching [including mosquito ditching])
		c 🗀	C Ex [ex of t mo	tensive e amples: lood flov	evidence c causeway s through itching]) o	of condition ys with flo streamsi	ons that adverse oodplain and cha de area] <u>or</u> too n	ly affect re nnel const nuch floodp	ference in riction, bu plain/inter	nteraction (little to no floodplain/intertidal zone access lkheads, retaining walls, fill, stream incision, disruption tidal zone access [examples: impoundments, intensive tor assessment reach is a man-made feature on an
7		iter Quali eck all th			sessmen	t reach/ir	ntertidal zone r	netric		
		A Dis	colored w	ater in s	tream or i	ntertidal z	zone (milky white	e, blue, unr	natural wa	ater discoloration, oil sheen, stream foam)
		C No	ticeable e	vidence	of pollutar	nt dischar		intertidal zi assessme	one) ent reach	and causing a water quality problem
			or (not ind rrent publ	cluding n ished or	atural sulf collected	ide odors data indi	i) icating degrade	d water qu	ality in th	e assessment reach. Cite source in "Notes/Sketch"
	[X]	F Liv	ction. estock wit	th acces	s to strean	n or intert	tidal zone			
					ream or ir etation in			al. burning	a. regular	mowing, destruction, etc)
		Oth	ner: le to no st			(expla	ain in "Notes/Sk	etch" section	on)	mennigi accusotici i coo,
8					metric (s	kip for T	idal Marsh Stre	eams)		
	Fo	r Size 1 or A Dro B Dro	2 stream ought cond	s, D1 dro ditions <u>ar</u> ditions <u>ar</u>	ought or hi nd no rain nd rainfall	gher is co fall or rair	onsidered a drou nfall not exceedi ig 1 inch within t	ght; for Siz	vithin the	treams, D2 drought or higher is considered a drought. last 48 hours
9.		rge or Da Yes 🌃					ch metric rous to assess?	If Yes, sk	ip to Metr	ic 13 (Streamside Area Ground Surface Condition).
1		tural In-st a. ∐Yes		Degra sedim	nded in-streentation,	ream hab mining, e	reach metric bitat over major excavation, in-s astal Plain stre	ream hard	lening [fo	ent reach (examples of stressors include excessive r example, rip-rap], recent dredging, and snagging) to Metric 12)
	101	Check □A	all that o	ccur (od	ccurs if > 5	% covera	age of assessme		skip for	Size 4 Coastal Plain streams) 5% oysters or other natural hard bottoms
		ДВ	(includ	e liverwo e sticks	rts, lichen	s, and alg		a g	□G	Submerged aquatic vegetation Low-tide refugia (pools) Sand bottom
		∏C ∏D	Multiple 5% une	e snags dercut b	anks and/	or root m	lap trees) ats and/or roots ted perimeter	Check	□j □k	5% vertical bank along the marsh Little or no habitat
		□E		r no habi			o a Constitution			
**	*****	*****	*****	**REMA	INING QU	ESTION	S ARE NOT AP	PLICABLE	FOR TIE	DAL MARSH STREAMS************************************
1	l. Be	dform and	d Substra	ite – ass	essment	reach m	etric (skip for S	ize 4 Coa	stal Plain	streams and Tidal Marsh Streams)
		ı. 🗌 Yes	□No					d stream?	(skip for	Coastal Plain streams)
	111	D. Bedform  ☑A  ☑B  ☐C	Riffle-re Pool-gl	un sectic ide secti	n (evalua on (evalua	te 11c) ate 11d)	e box(es). letric 12, Aquat	ic Life)		
	110	at least (R) = p	t one box resent bu	in each t ≤ 10%,	row (skip	o for Size (C) = >	e 4 Coastal Plai 10-40%, Abunda	n streams	and Tida	sessment reach – whether or not submerged. Check al Marsh Streams). Not Present (NP) = absent, Rare Predominant (P) = > 70%. Cumulative percentages
		w					Bedrock/sap Boulder (25 Cobble (64 Gravel (2 –	6 – 4096 m - 256 mm)		
							Sand (.062 - Silt/clay (< 0 Detritus Artificial (rip	- 2 mm) 1.062 mm)	ete eta l	
	114	□Ves	DANO			-	ant? (akin for S			otrogram and Tidal Manch Sturage

12.	The state of	Yes	□No	sment reach metric (skip for Tidal Marsh Streams)  Was an in-stream aquatic life assessment performed as described in the User Manual?  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.
		10000000000000	□Aqu □Bee □Cad □Asia	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.  It frogs atic reptiles atic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)  Itles disfly larvae (T) In clam (Corbicula)  Istacean (isopod/amphipod/crayfish/shrimp) Inselfly and dragonfly larvae
			☐May ☐Meg	fly larvae (E) paloptera (alderfly, fishfly, dobsonfly larvae) ges/mosquito larvae
			☐Mos ☐Mus ☐Oth	quito fish ( <i>Gambusia</i> ) or mud minnows ( <i>Umbra pygmaea</i> ) sels/Clams (not <i>Corbicula</i> ) er fish amanders/tadpoles
			☐Stor	nefly larvae (P) Ilid larvae ms/leeches
13.		amside A	rea Gro	bund Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)  Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.
	□A □B ☑C	⊠A □B □C	Mo Se	le or no alteration to water storage capacity over a majority of the streamside area derate alteration to water storage capacity over a majority of the streamside area vere alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, estock disturbance, buildings, man-made levees, drainage pipes)
14.			the Left Ma	ter Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types) Bank (LB) and the Right Bank (RB) of the streamside area.  jority of streamside area with depressions able to pond water ≥ 6 inches deep jority of streamside area with depressions able to pond water 3 to 6 inches deep
	ЙÇ	ДC		jority of streamside area with depressions able to pond water < 3 inches deep
15.	Cons	sider for	the Left	streamside area metric (skip for Tidal Marsh Streams)  Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal sessment reach.
	N ∏ N	□Y □Y		e wetlands present in the streamside area?
16.	Base Chee A A B C C D C C C C C C C C C C C C C C C C	ck all cor Strea Pond Obst Evid Strea	ntributo ams and ds (inclu truction ence of	rs – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams) rs within the assessment reach or within view of and draining to the assessment reach.  Wor springs (jurisdictional discharges) de wet detention basins; do not include sediment basins or dry detention basins) passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir) bank seepage or sweating (iron in water indicates seepage) or bank soil reduced (dig through deposited sediment if present) above
17.	Base	eflow Det ck all tha Evid Obsi Urba Evid Asse	tractors t apply. ence of truction an stream ence that	- assessment area metric (skip for Tidal Marsh Streams) substantial water withdrawals from the assessment reach (includes areas excavated for pump installation) not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit) m (≥ 24% impervious surface for watershed) at the streamside area has been modified resulting in accelerated drainage into the assessment reach reach relocated to valley edge
18.	Shad	ding – as sider aspe Strea Degr	sessme ect. Cor am shac raded (e	ent reach metric (skip for Tidal Marsh Streams) sider "leaf-on" condition. ding is appropriate for stream category (may include gaps associated with natural processes) example: scattered trees) ding is gone or largely absent

Note	/Sketch:
	Sb. 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
25.	Conductivity – assessment reach metric (skip for all Coastal Plain streams)  15a. □Yes □No Was conductivity measurement recorded?  If No, select one of the following reasons. □No Water □Other:
1.	communities missing understory but retaining canopy trees.  Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent <u>or</u> communities with non-native invasive species dominant over a large portion of expected strata <u>or</u> communities composed of planted stands of non-characteristic species <u>or</u> communities inappropriately composed of a single species <u>or</u> no vegetation.
150	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.
	B RB  ☐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.
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.
	B RB  A The total length of buffer breaks is < 25 percent. B 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.
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.
LL.	Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).  B RB  A Medium to high stem density  B B Low stem density  C C No wooded riparian buffer or predominantly herbaceous species or bare ground
22	f none of the following stressors occurs on either bank, check here and skip to Metric 22:    Abuts
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 vithin 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
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).  B RB  A NA Mature forest  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 Little or no vegetation
	Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank ou of the first break.  /egetated Wooded  _B RB LB RB  A NA ≥ 100 feet wide or extends to the edge of the watershed  B B NB NB 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 NB NB NB C C C To C C To C To C To C To C To C

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

## NC SAM FIELD ASSESSMENT RESULTS Accompanies User Manual Version 2.1

U	ISACE AID #:	NCDWR #:
ar nu ar No	nd circle the location of the umber all reaches on the nd explanations of reque C SAM User Manual for	a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, ne stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions sted information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the examples of additional measurements that may be relevant.  RESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).
100	ROJECT/SITE INFORMA	ATION:
	Project name (if any):	SOSSONXQ &WOM D 2. Date of evaluation: 4/10/18
3.	Applicant/owner name:	WILDIANDS 4. Assessor name/organization: Wildlands Eng
100	County: River basin:	Johnston  Neuse  6. Nearest named water body on USGS 7.5-minute quad:  SQSSQTXQ
		al degrees, at lower end of assessment reach):
9.	Site number (show on a	
12	2. Channel width at top o	d (in riffle, if present) to top of bank (feet): Z,S F( ☐ Unable to assess channel depth.  f bank (feet): ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
100	TREAM CATEGORY INI	
15	5. NC SAM Zone:	☐ Mountains (M) ☐ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)
	v – mod do d	
16	<ol><li>Estimated geomorphic valley shape (skip for</li></ol>	□B □B
14	Tidal Marsh Stream):	(more sinuous stream, flatter valley slope) (less sinuous stream, steeper valley slope)
	7. Watershed size: (skip for Tidal Marsh Strea	
	DDITIONAL INFORMAT	
18	<ol> <li>Were regulatory considers</li> <li>Section 10 water</li> </ol>	lerations evaluated? ☑Yes ☐No If Yes, check all that apply to the assessment area. ☐Water Supply Watershed (☐I ☐II ☐IV ☐V)
	☐Essential Fish Habit	
	☐Publicly owned prop	
	☐Anadromous fish	☐303(d) List ☐CAMA Area of Environmental Concern (AEC)
		ce of a federal and/or state listed protected species within the assessment area.
	List species:	
10	Designated Critical	Habitat (list species) Information/supplementary measurements included in "Notes/Sketch" section or attached? ☐Yes ☑No
15	9. Are additional stream i	nformation/supplementary measurements included in Notes/Sketch section or attached? Lives wino
1.	Channel Water - asse	ssment reach metric (skip for Size 1 streams and Tidal Marsh Streams)
		nout assessment reach.
		r in pools only.
	☐C No water in a	ssessment reach.
2.		triction – assessment reach metric
		of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the ucting flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within
		ent reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams,
	beaver dams	
	□® Not A	
3.	Feature Pattern - ass	
		he assessment reach has altered pattern (examples: straightening, modification above or below culvert).
	D Not A	
4.		Profile – assessment reach metric
		sessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over
	disturbances)	ive aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these
	☐B Not A	
5.		ility – assessment reach metric
٠.		t instability, not past events from which the stream has currently recovered. Examples of instability include
	active bank failure, acti	ve channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
	☐A < 10% of cha	
	□B 10 to 25% of □C > 25% of cha	channel unstable
		mor undusid

6.			rea interaction – streamside area metric the Left Bank (LB) and the Right Bank (RB).
	LB	RB	the Left Datik (LD) and the Right Datik (RD).
	⊠A □B	⊠A □B	Little or no evidence of conditions that adversely affect reference interaction  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	□с	Extensive evidence of conditions that adversely affect reference interaction (Ilitle 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.	Wate	er Quality	Stressors – assessment reach/intertidal zone metric
		ck all tha	
	∐A □B		plored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam) ssive sedimentation (burying of stream features or intertidal zone)
	□c		eable evidence of pollutant discharges entering the assessment reach <u>and</u> causing a water quality problem
		Odo	(not including natural sulfide odors)
	DE	secti	ent published or collected data indicating degraded water quality in the assessment reach. Cite source in "Notes/Sketch"
	ØF □G		tock with access to stream or intertidal zone
			ssive algae in stream or intertidal zone
		Othe	aded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc) r: (explain in "Notes/Sketch" section)
			to no stressors
8.	Rece	ent Weatl	er – watershed metric (skip for Tidal Marsh Streams)
			streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.
	□A		ght conditions <u>and</u> no rainfall or rainfall not exceeding 1 inch within the last 48 hours ght conditions <u>and</u> rainfall exceeding 1 inch within the last 48 hours
	MC		rought conditions
9.	Larg	e or Dan	perous Stream – assessment reach metric
	□Y€	The second second	5 24 1일 1일 1일 1일 1일 1일 20 1일
10.	Natu	ıral In-str	eam Habitat Types – assessment reach metric
	10a.	□Yes	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 a	Il 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)  Multiple sticks and/or leaf packs and/or emergent vegetation  Multiple snags and logs (including lap trees)  5% undercut banks and/or root mats and/or roots  Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)  Submerged aquatic vegetation  Low-tide refugia (pools)  Sand bottom  5% vertical bank along the marsh  Little or no habitat
		Ď(B	Multiple sticks and/or leaf packs and/or emergent 5 4 H Low-tide refugia (pools)
			Multiple sticks and/or leaf packs and/or emergent vegetation Sand bottom  Nultiple sticks and/or leaf packs and/or emergent Sand bottom Sand bottom
			Multiple snags and logs (including lap trees)  5% undercut banks and/or root mats and/or roots  5% undercut banks and/or root mats and/or roots  5% vertical bank along the marsh  Little or no habitat
			in banks extend to the normal wetted perimeter
		□E	Little or no habitat .
***	*****	*******	**************************************
			Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)
		ĭ∑Yes	□No Is assessment reach in a natural sand-bed stream? (skip for Coastal Plain streams)
		1	
	110.	ĎÂ	evaluated. Check the appropriate box(es). Riffle-run section (evaluate 11c)
		[X]B	Pool-glide section (evaluate 11d)
	5.4	С	Natural bedform absent (skip to Metric 12, Aquatic Life)
	11c.		ections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. Check one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams). Not Present (NP) = absent, Rare
		(R) = pre	sent but < 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages
			ot exceed 100% for each assessment reach.
		ΝP	R C A P Bedrock/saprolite
			□ □ □ Boulder (256 – 4096 mm)
			☐ ☐ ☐ Cobble (64 − 256 mm) ☐ ☐ Gravel (2 − 64 mm)
		日	□ □ □ Sand (.062 – 2 mm)
			☐ ☐ Silt/clay (< 0.062 mm)
		$\boxtimes$	Detritus Artificial (rip-rap, concrete, etc.)
	114		MNo Are pools filled with sediment? (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12.		Yes	□No	ment reach metric (skip for Tidal Marsh Streams)  Was an in-stream aquatic life assessment performed as described in the User Manual?  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		atic reptiles
			Beet	atic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) les disfly larvae (T)
			☐Asia ☐Crus	n clam ( <i>Corbicula</i> ) tacean (isopod/amphipod/crayfish/shrimp) selfly and dragonfly larvae
			□Dipte□May	erans lly larvae (E)
			Midg	aloptera (alderfly, fishfly, dobsonfly larvae) es/mosquito larvae
		K K	☐Mus	quito fish ( <i>Gambusia</i> ) or mud minnows ( <i>Umbra pygmaea</i> ) sels/Clams (not <i>Corbicula</i> )
			□Othe □Sala □Snai	manders/tadpoles
		Ħ	Stor	efly larvae (P) iid larvae
	Lest to	Ξ.	□Wor	ms/leeches
13.	Cons	sider for t	rea Gro he Left	und Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types) Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.
	LB □A □B □C	RB □A □B ☑C	Mo Sev	e or no alteration to water storage capacity over a majority of the streamside area derate alteration to water storage capacity over a majority of the streamside area dereate alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction stock disturbance, buildings, man-made levees, drainage pipes)
14.	Strea Cons	amside A sider for t RB	rea Wat	er Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types) Bank (LB) and the Right Bank (RB) of the streamside area.
	A B C	□A □B □C	Ma	ority of streamside area with depressions able to pond water ≥ 6 inches deep ority of streamside area with depressions able to pond water 3 to 6 inches deep ority of streamside area with depressions able to pond water < 3 inches deep
15.	Con	sider for t	he Left	streamside area metric (skip for Tidal Marsh Streams) Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the norma sessment reach.
	□N □A FB	RB ⊠Y □N	Are	wetlands present in the streamside area?
16.		ck all con	tributor	rs – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams) s within the assessment reach or within view of <u>and</u> draining to the assessment reach. for springs (jurisdictional discharges)
		Pond Obst Evide Strea	ls (incluer ruction pence of	de wet detention basins; do not include sediment basins or dry detention basins) bassing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir) bank seepage or sweating (iron in water indicates seepage) or bank soil reduced (dig through deposited sediment if present)
17.	Base	eflow Det	ractors	– assessment area metric (skip for Tidal Marsh Streams)
	□A □B □C	Obst	ence of ruction i	substantial water withdrawals from the assessment reach (includes areas excavated for pump installation) not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit) in (≥ 24% impervious surface for watershed)
	XD III	Evide Asse	ence tha	t the streamside area has been modified resulting in accelerated drainage into the assessment reach relocated to valley edge
18.				nt reach metric (skip for Tidal Marsh Streams) sider "leaf-on" condition.
	DIA DB DC	Strea Degr	am shad aded (e	ing is appropriate for stream category (may include gaps associated with natural processes)  kample: scattered trees)  ing is gone or largely absent

	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       ≥ 100 feet wide or extends to the edge of the watershed         □B       □B       □B       □B       □B       □B       □C       □C <t< td=""></t<>
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  MA 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  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 Row crops  B B B B B B B Maintained turf  C C C C C C C Pasture (no livestock)/commercial horticulture  D 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  MA Medium to high stem density  B B B Low stem density  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 The total length of buffer breaks is < 25 percent.  B 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       ✓ Note       ✓ One         ☑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
25.	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.  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:

## Appendix 4 DWR Stream Identification Forms

## 1.0 DWR Stream Classification

The results of the DWR Stream Classification Forms are listed in the table below. DWR forms can be found in this appendix and in the digital submission to DMS. DWR forms were completed by Wildlands for all on-site streams.

**Table 1: DWR Form Summary** – Sassarixa Swamp Mitigation Site

Stream	Geomorphology Score	Hydrology Score	Biology Score	Total Score
Sassarixa Creek	28.5	13	9	50.5
T1	18.5	2.5	5	26
T1A	14	4.5	5	23.5
T1B	15	8	4.75	27.75
T1C	16.5	8.5	3.75	28.75
T2	13	5.5	6.5	25
T3	18	6.5	6.5	31
T4	18	6.5	5.75	30.25
T5	25	10.5	5.75	41.25
T5A	15.5	8	6.25	29.75
T5B	11.5	5.5	6.25	23.25
T5C	13	6	6.25	25.25
Т6	21	9	8.25	38.25

NC DWO Stream Identification Form Version 4.11 Sarrarixa Creek Date: Project/Site: 5asswix & Latitude: County: Johnston Evaluator: Longitude: Total Points: Stream Determination (circle one) Other Stream is at least intermittent Ephemeral Intermittent Perennial e.g. Quad Name: if  $\geq$  19 or perennial if  $\geq$  30\* A. Geomorphology (Subtotal = 78 Absent Weak Moderate Strong 1<sup>a.</sup> Continuity of channel bed and bank 0 2. Sinuosity of channel along thalweg 0 1 2 3. In-channel structure: ex. riffle-pool, step-pool, 0 1 2 ripple-pool sequence 4. Particle size of stream substrate 0 2 5. Active/relict floodplain 0 2 6. Depositional bars or benches 0 2 7. Recent alluvial deposits 0 8. Headcuts 0 1 9. Grade control large frees & 120003 bons 0 0.5 10. Natural valley 0 0.5 (1.5 1 11. Second or greater order channel No = 0Yes =(3> artificial ditches are not rated; see discussions in manual B. Hydrology (Subtotal = 12. Presence of Baseflow 0 2 1 13. Iron oxidizing bacteria 0 2 14. Leaf litter (7) 1.5 0.5 15. Sediment on plants or debris 0 0.5 1 16. Organic debris lines or piles 0 0.5 1 17. Soil-based evidence of high water table? No = 0Yes = (3) C. Biology (Subtotal = 18. Fibrous roots in streambed 2 0 19. Rooted upland plants in streambed (3) 2 1 0 20. Macrobenthos (note diversity and abundance) (n) 1 2 3 21. Aquatic Mollusks (B) 1 2 3 22. Fish 0 (U) 1 1.5  $\overline{\mathbb{O}}$ 23. Crayfish 0.5 1,5 24. Amphibians 0 0.5 1.5 Snakes, Groap 25. Algae 0 (1.5) 0.5 FACW = 0.75; OBL = 1.5 Other = 0 26. Wetland plants in streambed \*perennial streams may also be identified using other methods. See p. 35 of manual. Notes: Anabranching System Sketch:

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

Notes: charnel inturrupted by pand + dam, may brail just below dan for for few hundred feet

Sketch:

Immediated Stream DIS Pond

Further DIS

photos

Sketch:

Date: 7/3/	Project/Site: _	035951 Ka	Latitude: 35	.478291
Evaluator:	County:	donaton	Longitude: -	78.444 614
Total Points: Stream is at least intermittent if ≥ 19 or perennïal if ≥ 30*	Stream Determi Ephemeral Inte	nation (circle one) rmittent Perennial	Other e.g. Quad Name:	
A. Geomorphology (Subtotal =)	Absent	Weak	Moderate	Strong
1ª. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	1	(2)	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	6	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  a artificial ditches are not rated; see discussions in manual	No	0 = 0	Yes =	= 3
B. Hydrology (Subtotal =)  12. Presence of Baseflow	0	1	(Z)	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?		0 = 0	Yes	
C. Biology (Subtotal = )				
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	0	1.5
25. Algae	(9)	0,5	1	1.5
26. Wetland plants in streambed		FACW = 0.75; OB	L = 1.5 Other = 0	12
		I.		
*perennial streams may also be identified using other meth				
*perennial streams may also be identified using other methodology in the stream south	^			

NC DWQ Stream Identification Form Version 4.11 35.47 6266 Latitude: Date: Project/Site: Longitude: \_ 78.44608 Evaluator: County: Total Points: Stream Determination (circle one) Other Stream is at least intermittent Ephemeral Intermittent Perennial e.g. Quad Name: Sasar xalny K if  $\geq$  19 or perennial if  $\geq$  30\* A. Geomorphology (Subtotal = Absent Weak Moderate Strong 1<sup>a.</sup> Continuity of channel bed and bank 0 62 3 2. Sinuosity of channel along thalweg 0 3 1 2/ 3. In-channel structure: ex. riffle-pool, step-pool, 0 1 2 3 ripple-pool sequence 4. Particle size of stream substrate 0 3 1 5. Active/relict floodplain 0 3 2 6. Depositional bars or benches 0 1 (2) 3 7. Recent alluvial deposits 0 (1) 2 3 8. Headcuts 0 2 3 1 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 = 0Yes = 3a artificial ditches are not rated; see discussions in manual B. Hydrology (Subtotal = 12. Presence of Baseflow 0 2 1 3 13. Iron oxidizing bacteria 2 1 14. Leaf litter 1.5 0.5 0 81 15. Sediment on plants or debris (0) 0.5 1 1.5 16. Organic debris lines or piles 0 9.5 1.5 17. Soil-based evidence of high water table? No = 0Yes = 3 C. Biology (Subtotal = 18. Fibrous roots in streambed 0 19. Rooted upland plants in streambed 3 2 (1) 0 20. Macrobenthos (note diversity and abundance) 0 (1) 2 3 0 2 3 21. Aquatic Mollusks 1 22. Fish 0 0.5 1.5 1 23. Crayfish 0 0.5 1 1.5 0 1.5 24. Amphibians 0.5 1 1.5 25. Algae 0 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:

Date: 4/8/17	Project/Site: 5	ASSARIXA	Latitude:	
Evaluator: TAYLOR	County: Jou	بره ۱۶۰	Longitude:	***************************************
Total Points: Stream is at least intermittent if ≥ 19 or perennial if ≥ 30*	Stream Determi	nation (circle one) rmittent Perennial	Other e.g. Quad Name:	2
A. Geomorphology (Subtotal = \\3)	Absent	Weak	Moderate	Strong
1 <sup>a.</sup> Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	<b>O</b>	2	3
3. In-channel structure: ex. riffle-pool, step-pool,	0	1	(2)	3
ripple-pool sequence				
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0		2	3
6. Depositional bars or benches	0	$\bigcirc$	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1		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		=0	Yes =	3
a artificial ditches are not rated; see discussions in manual  B. Hydrology (Subtotal = 5.5.)				
12. Presence of Baseflow		4	2	3
		1	2	
13. Iron oxidizing bacteria		1	2	3
14. Leaf litter	1.5	1	(0.5)	0
15. Sediment on plants or debris	0	0.5	<b>O</b>	1.5
16. Organic debris lines or piles	0	0.5		<del>&gt; 1.5</del>
17. Soil-based evidence of high water table?	No	= 0		3
C. Biology (Subtotal = 6.5)			····	
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed		2	1	0
20. Macrobenthos (note diversity and abundance)		1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	80	0.5	1	1.5
23. Crayfish	Ø	0.5	1	1.5
24. Amphibians	6		1	1.5
25. Algae		0.5	7 - 4.5 - 0# 0	1.5
26. Wetland plants in streambed	/o Coo > 25 of	FACW = 0.75; OBI	_= 1.5 Other = 0	
*perennial streams may also be identified using other method	is. See p. 30 of manual	•	<del></del>	
Notes:				· · · · · · · · · · · · · · · · · · ·
Sketch: BELOW HEADCUT	, INSIDÉ =	or Wood	LINE	

Date: 9-8-17	Project/Site: 5	ASSARIKA	Latitude:	
Evaluator: Daybe	County: 500	حمور وحمي	Longitude:	
Total Points: Stream is at least intermittent if $\geq$ 19 or perennial if $\geq$ 30*	Stream Determine	nation (circle one rmittent Perenni		3
A. Geomorphology (Subtotal = \(\frac{1}{8}\)	Absent	Weak	Moderate	Strong
1ª. Continuity of channel bed and bank	0	1	0	3
2. Sinuosity of channel along thalweg	0	<b>O</b>	2	3
In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	<b>(D)</b>	3
5. Active/relict floodplain	0	1	2	<b>(3)</b>
6. Depositional bars or benches	0	1	(2)	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	3	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	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		1	2	3
13. Iron oxidizing bacteria	62	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		1.5
17. Soil-based evidence of high water table?	No	= 0	Yes =	:3)
C. Biology (Subtotal =)				
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)	6	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	8	0.5	1	1.5
24. Amphibians	0	<b>(15)</b>	1	1.5
25. Algae	6	0.5	1	1.5
26. Wetland plants in streambed		FACW = 0.75; C	DBL = 1.5 Offer = 0	`
*perennial streams may also be identified using other method	s. See p. 35 of manual			/
Notes:				
Notes:				
Sketch: - MUCH OLORE OF A SCORES	VERE 22~	146 57 RE	Au THAN	) ( <del>T</del>

Determina eral Interm	Weak  1  1  1  1  1  1  1  1  1  1  1  1  1	Moderate  2 2 2 2 2 1 1 1 Yes =	Strong  3 3 3 3 3 1.5 (1.5)
Sent  O  No =	Weak  1  1  1  1  1  1  1  1  1  1  1  1  1	e.g. Quad Name:  Moderate  2 2 2 2 2 2 1 1	Strong  3 3 3 3 3 3 1.5
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 0.5	2 2 2 2 2 2 2 2 2 2 1	3 3 3 3 3 3 3 3 3 1.5
No =	1 1 1 1 1 1 0.5	2 2 2 2 2 2 2 2 2 2 1	3 3 3 3 3 3 3 3 3 1.5
No =	1 1 1 1 1 1 0.5	2 2 2 2 2 2 2 2 2 1	3 3 3 3 3 3 3 1.5
No =	1 1 1 1 1 0.5	2 2 2 2 2 2 2 3 1	3 3 3 3 1.5
No =	1 1 1 1 0.5	2 2 2 2 1	3 3 3 3 1.5
No =	1 1 1 0.5 0.5	② ② 1 1	3 3 3 1.5
No =	1 1 0.5 0.5	2 2 1 1	3 3 1.5
No =	0.5	2 2 1 1	3 3 1.5
No =	0.5	1 1	3 1.5
No =	0.5	1	1.5
No =	0.5	1	
	0	1	( 1.0)
	<del></del>		
) ノー	1	2	3
5	1	2	3
5	7	0.5	0
			1.5
			(1.5)
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	2	7	0
I			0
3			3
			3
			1.5
			1.5
			1.5
		<u>'</u>	1.5
		•	1.5
	ACTV = 0.79, OB	L = 1.5 Other = 0	
ormanual.			
	No =	0.5 0.5 No = 0  3 2 3 1 1 0.5 6 0.5 6 0.5 7 0.	0.5 1 0.5 1 No = 0 Yes =  3 2 1 1 2 1 2 0.5 1 1 2 0.5 1 1 0.5 1 1 0.5 1 1 0.5 1 1 0.5 1 1 0.5 1 1 0.5 1 1 0.5 1

Date:   Q -   Q
Stream Determination (circle one)   Ephemeral Intermittent   Ferennia   Stream is at least intermittent   Ferennia   Stream Determination (circle one)   e.g. Quad Name:
A. Geomorphology (Subtotal = 25)  Absent  Weak  Moderate  Strong  1º 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  4. Particle size of stream substrate  0 1 2 3  5. Active/relict floodplain  0 1 2 3  6. Depositional bars or benches  7. Recent alluvial deposits  8. Headcuts  9. Grade control  10. Natural valley  11. Second or greater order channel  8. Hydrology (Subtotal = 10.5)  12. Presence of Baseflow  0 1 2 3  13. Iron oxidizing bacteria
A. Geomorphology (Subtotal = 25)  Absent  Weak  Moderate  Strong  1º 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  4. Particle size of stream substrate  0 1 2 3  5. Active/relict floodplain  0 1 2 3  6. Depositional bars or benches  7. Recent alluvial deposits  8. Headcuts  9. Grade control  10. Natural valley  11. Second or greater order channel  Partificial ditches are not rated; see discussions in manual  8. Hydrology (Subtotal = 10.5)  12. Presence of Baseflow  0 1 2 3  13. Iron oxidizing bacteria
1a 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       No = 0       Yes = 3         B. Hydrology (Subtotal = 10.5)       3         12. Presence of Baseflow       0       1       2       3         13. Iron oxidizing bacteria       0       1       2       3
1a 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       No = 0       Yes = 3         B. Hydrology (Subtotal = 10.5)       3         12. Presence of Baseflow       0       1       2       3         13. Iron oxidizing bacteria       0       1       2       3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence  4. Particle size of stream substrate  5. Active/relict floodplain  6. Depositional bars or benches  7. Recent alluvial deposits  8. Headcuts  9. Grade control  10. Natural valley  11. Second or greater order channel  a artificial ditches are not rated; see discussions in manual  8. Hydrology (Subtotal = 10.5)  12. Presence of Baseflow  1
ripple-pool sequence  4. Particle size of stream substrate  5. Active/relict floodplain  6. Depositional bars or benches  7. Recent alluvial deposits  8. Headcuts  9. Grade control  10. Natural valley  11. Second or greater order channel  12. Active/relict floodplain  13. Iron oxidizing bacteria  14. Particle size of stream substrate  15. Active/relict floodplain  16. Depositional bars or benches  17. Carrier alluvial deposits  18. Headcuts  19. Grade control  10. O. D.
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         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
6. Depositional bars or benches  7. Recent alluvial deposits  8. Headcuts  9. Grade control  10. Natural valley  11. Second or greater order channel  a artificial ditches are not rated; see discussions in manual  B. Hydrology (Subtotal = 10.5)  12. Presence of Baseflow  13. Iron oxidizing bacteria  0 1 2 3  14 2 3  15 3 4  16 5 7  17 1 5 7  18 1 5 7  19 1 5 7  10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
7. Recent alluvial deposits  8. Headcuts  9. Grade control  10. Natural valley  11. Second or greater order channel  a artificial ditches are not rated; see discussions in manual  B. Hydrology (Subtotal = 10.5)  12. Presence of Baseflow  13. Iron oxidizing bacteria  0  11  2  3  12  3  13. Iron oxidizing bacteria
8. Headcuts  9. Grade control  10. Natural valley  11. Second or greater order channel  a artificial ditches are not rated; see discussions in manual  B. Hydrology (Subtotal = 10.5)  12. Presence of Baseflow  13. Iron oxidizing bacteria  14. Description of the discussion of the dis
9. Grade control  10. Natural valley  11. Second or greater order channel  a artificial ditches are not rated; see discussions in manual  B. Hydrology (Subtotal = 10.5)  12. Presence of Baseflow  13. Iron oxidizing bacteria  10. 0.5  1
9. Grade control  10. Natural valley  11. Second or greater order channel  a artificial ditches are not rated; see discussions in manual  B. Hydrology (Subtotal = 10.5)  12. Presence of Baseflow  13. Iron oxidizing bacteria  10. 0.5  1
11. Second or greater order channel  a rtificial 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 3
11. Second or greater order channel  a rtificial 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
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 3
12. Presence of Baseflow       0       1       2       3         13. Iron oxidizing bacteria       0       1       2       3
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
16. Organic debris lines or piles 0 0.5 1
17. Soil-based evidence of high water table? No = 0
C. Biology (Subtotal = 5.75)
18. Fibrous roots in streambed 3 2 0
19. Rooted upland plants in streambed 3 2 1
20. Macrobenthos (note diversity and abundance) 0 2 3
21. Aquatic Mollusks         0         1         2         3
22. Fish 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:
Oncton.

Frojecusile. Su	ASSARIXA	Latitude:	
County: STOP Stream Determination (circle one) Ephemeral Intermittent Perennial		Longitude:  Other e.g. Quad Name: \( \tau \)	
0	1	<b>2</b>	3
0	0	2	3
0	1	<b>②</b>	3
0	1	2	3
0	1	<b>D</b>	3
0	1	<b>Ø</b>	3
0	1	<u>ත</u>	3
0	<b>B</b>	2	3
0	(a.5)	1	1.5
0	0.5		1.5
1 1		Yes =	
0	1	$\overline{2}$	3
(0)	2	2	3
1.5	(1)	0.5	0
0	0.5	4	1.5
0	0.5	1	1.5
No	= 0	Yes = 3	
3	2	(P)	0
3	2	1	0
0	1)	2	3
(1)	1	2	3
0	0.5	1	1.5
0	<u>(05)</u>	1	1.5
0	0.5	1	1.5
0	(0.5)	1	1.5
0	0.5 FACW = 0.75;) OBL		1.5
0 See p. 35 of manual	FACW = 0.75; OBL		1.5
	No   No   No   No   No   No   No   No	Stream Determination (circle one)   Ephemeral Intermittent   Perennial	Stream Determination (circle one)   Ephemeral Intermittent Perennial   Perennial   e.g. Quad Name:

NC DWQ Stream Identification Form Version 4.11

Date: 9-8-17 Project/Site:

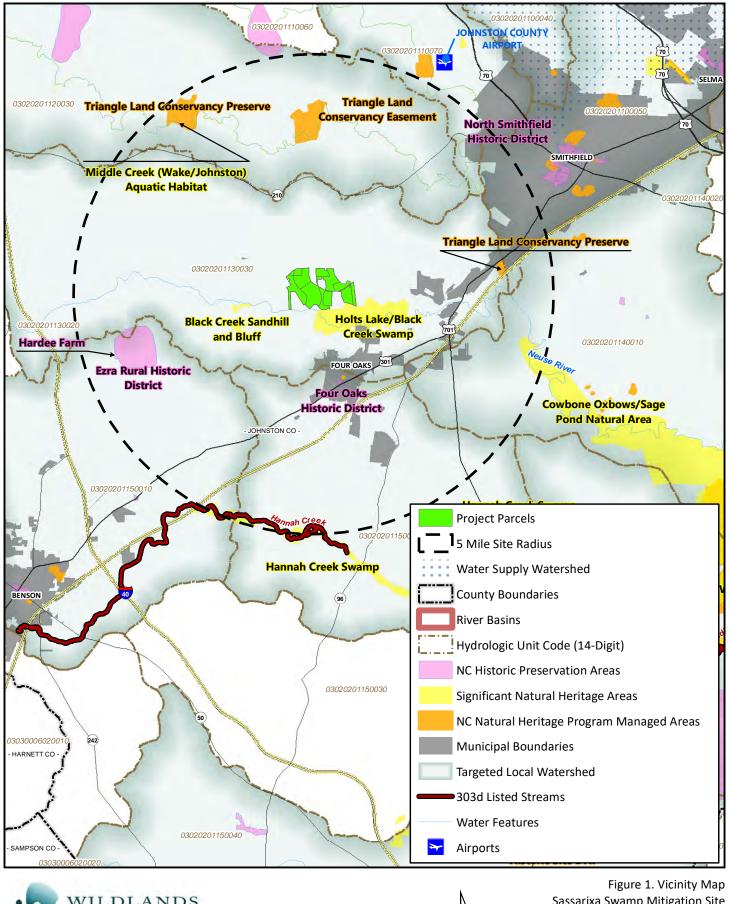
Date: 9-8-17	Project/Site: 5	Project/Site: SASSACUKA  County: Stream Determination (circle one) Ephemeral Intermittent Perennial		Latitude:		
Evaluator: D TAYLOR	County: 504			Longitude:		
Total Points: Stream is at least intermittent 13.25 if ≥ 19 or perennial if ≥ 30*	Stream Determ			3		
A. Geomorphology (Subtotal = 11, 5)	Absent	Weak	Moderate	Strong		
1 <sup>a</sup> Continuity of channel bed and bank	0	1	<b>(2)</b>	3		
Sinuosity of channel along thalweg	0	B	2	3		
In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	0	2	3		
Particle size of stream substrate	0	<b>D</b>	2	3		
5. Active/relict floodplain	0	1	3	3		
6. Depositional bars or benches	0	. (5)	2	3		
7. Recent alluvial deposits	0		2	3		
8. Headcuts	0	①	2	3		
9. Grade control	0	(0.5)		1.5		
10. Natural valley	0	0.5		1.5		
11. Second or greater order channel	(No	5=0	Yes	= 3		
<sup>a</sup> artificial ditches are not rated; see discussions in manual						
B. Hydrology (Subtotal = 5.5)				T		
12. Presence of Baseflow	0	<b>O</b>	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)			=.3)		
C. Biology (Subtotal = (25)		· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·		
18. Fibrous roots in streambed	3	2	0	0		
19. Rooted upland plants in streambed	3	Ø)	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	<u> </u>	1	1.5		
24. Amphibians	0	93	1	1.5		
25. Algae	0	03	1	1.5		
26. Wetland plants in streambed		FACV( = 0.75; OBL	_ = 1.5 Other = 0	)		
*perennial streams may also be identified using other method	ods. See p. 35 of manua	l				
Notes:						
Sketch:						

Date: 9-8-17	Project/Site: SASSARIKA		Latitude:		
Evaluator: D. TAYLOR	County: Johnston		Longitude:		
Total Points: Stream is at least intermittent if ≥ 19 or perennial if ≥ 30*  Z 5.25	Stream Determination (circle one) Ephemeral Intermittent Perennial		Other TSC e.g. Quad Name:		
A. Geomorphology (Subtotal = 13	Absent	Weak	Moderate	Strong	
1ª. Continuity of channel bed and bank	0	<b>(D)</b>	2	3	
2. Sinuosity of channel along thalweg	0	<u>(1)</u>	2	3	
In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	0	3	
4. Particle size of stream substrate	0	0	2	3	
5. Active/relict floodplain	0	1	<u>a</u>	3	
6. Depositional bars or benches	0	0	2	3	
7. Recent alluvial deposits	0	1	2	3	
8. Headcuts	0	0	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	o=9)	Yes :	= 3	
<sup>a</sup> artificial ditches are not rated; see discussions in manual					
B. Hydrology (Subtotal =)		-			
12. Presence of Baseflow	(0)	1	2	3	
13. Iron oxidizing bacteria	(A)	1	2	3	
14. Leaf litter	1.5	0	0.5	0	
15. Sediment on plants or debns	0	0.5	(1)	1.5	
16. Organic debris lines or piles	0 1	0.5	0	1.5	
17. Soil-based evidence of high water table?	No = 0 (es = 3			3	
C. Biology (Subtotal = (0.25)					
18. Fibrous roots in streambed	3	2	0	0	
19. Rooted upland plants in streambed	3	<b>2</b>	1	0	
20. Macrobenthos (note diversity and abundance)	O O	0	2	3	
21. Aquatic Mollusks	0	1	2	3	
22. Fish	<i>Ø</i>	0.5	1	1.5	
23. Crayfish	0	<b>O</b> 2	1	1.5	
24. Amphibians	0 0	(03)	1	1.5	
25. Algae	0 1		· · · · · · · · · · · · · · · · · · ·	1.5	
<ul><li>26. Wetland plants in streambed</li><li>*perennial streams may also be identified using other methods.</li></ul>	Coo. 7. 25 of		= 1.5 Other = 0		
Notes:	See p. 33 of manua	. —			
Notes.					
Sketch:					
				į	

Date: 9-8-17	Project/Site: 5	ASSARIXA	Latitude:	
Evaluator: D. TAYLOR	County: Jacquesto		Longitude:	
Total Points:  Stream is at least intermittent	Stream Determination (circle one) Ephemeral Intermittent (Perennia)		Other	
A. Geomorphology (Subtotal = 21)	Absent	Weak	Moderate	Strong
1 <sup>a.</sup> Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	<u>(2)</u>	3
In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
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	( = 9)	Yes	= 3
<sup>a</sup> artificial ditches are not rated; see discussions in manual				
B. Hydrology (Subtotal =)				
12. Presence of Baseflow	0		2	3
13. Iron oxidizing bacteria	0	0	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)			= 3)
C. Biology (Subtotal = 8,25)				
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	(9)	1	2	3
22. Fish	6	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 method	s. See p. 35 of manua	f.		
Notes:				
Sketch:				
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## Appendix 5

Data, Analysis, Supplementary Information, Figures, and Maps





2 Miles 0 1

Sassarixa Swamp Mitigation Site Neuse River Basin 03020201

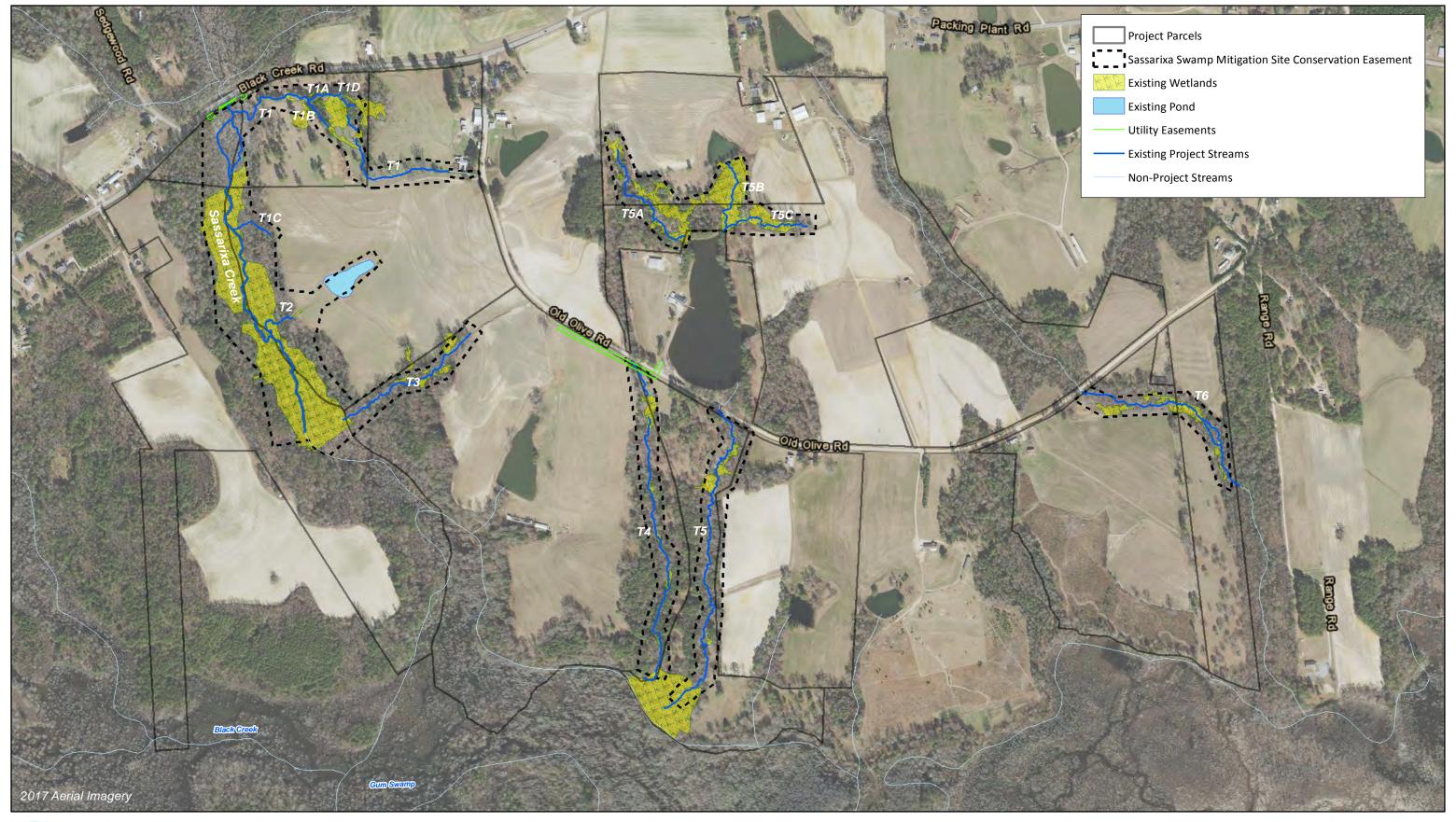




Figure 2. Site Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201

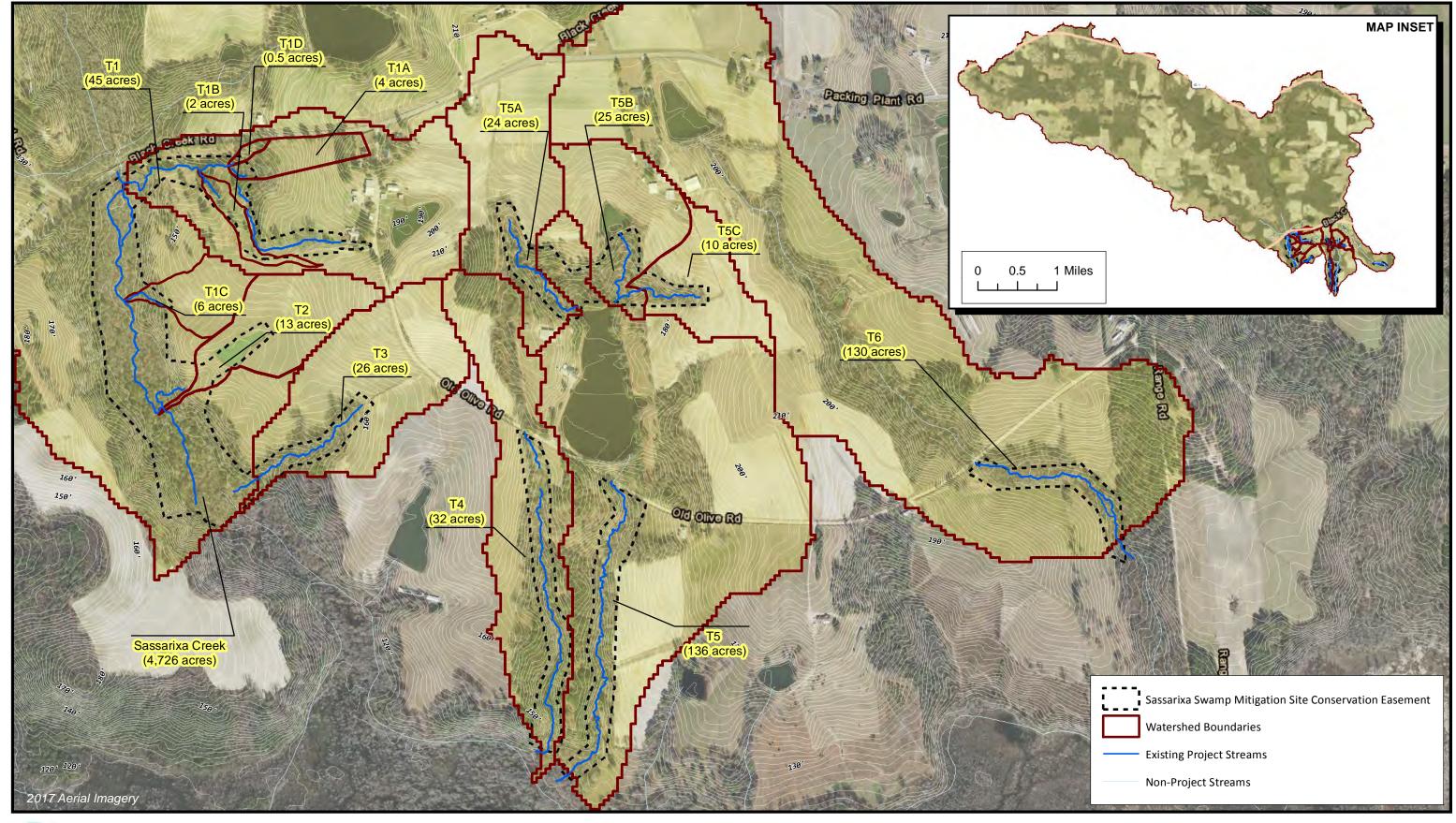
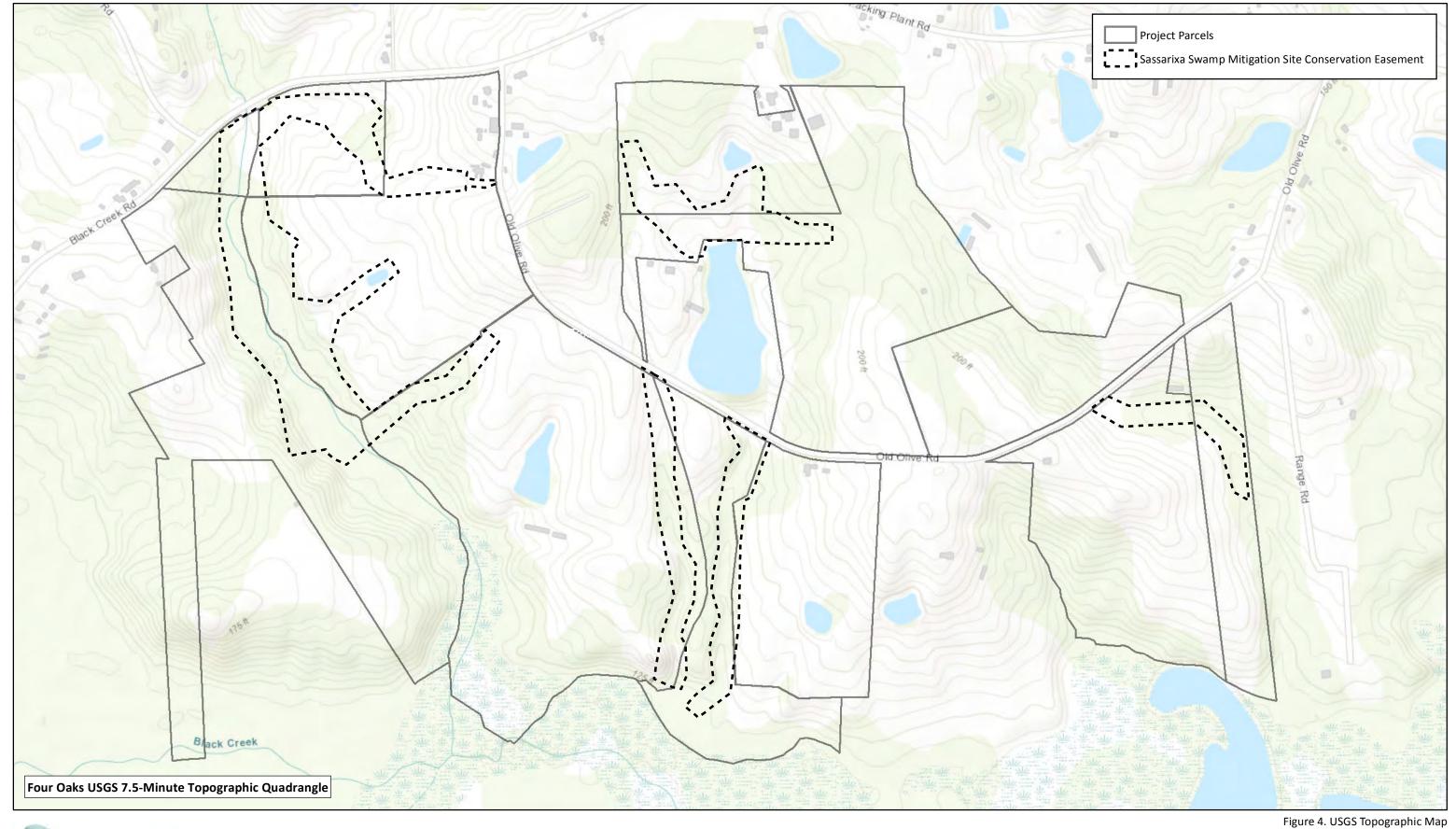




Figure 3. Watershed Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201

0 600 1,200 Feet





Sassarixa Swamp Mitigation Site
Neuse River Basin 03020201

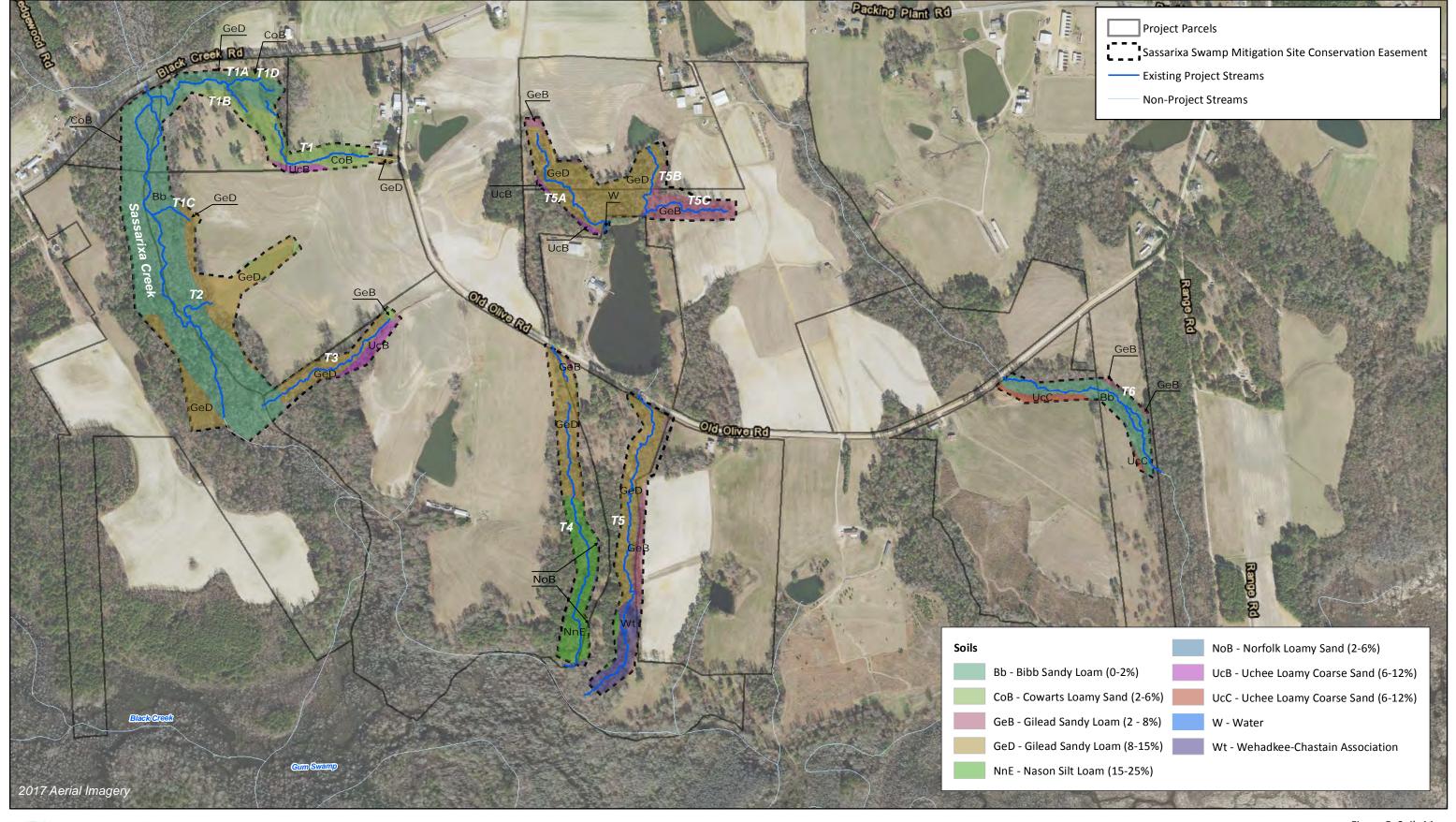
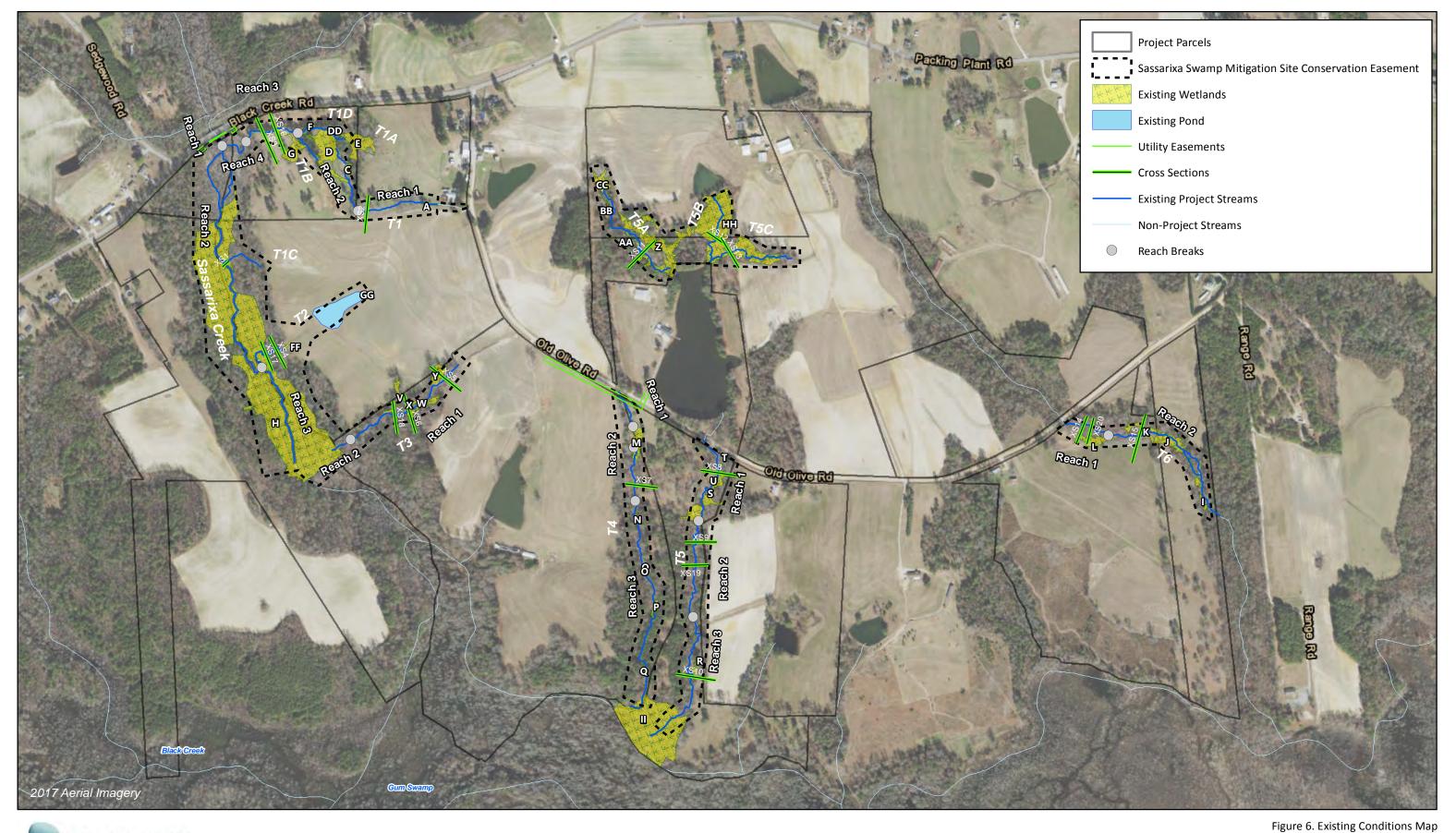


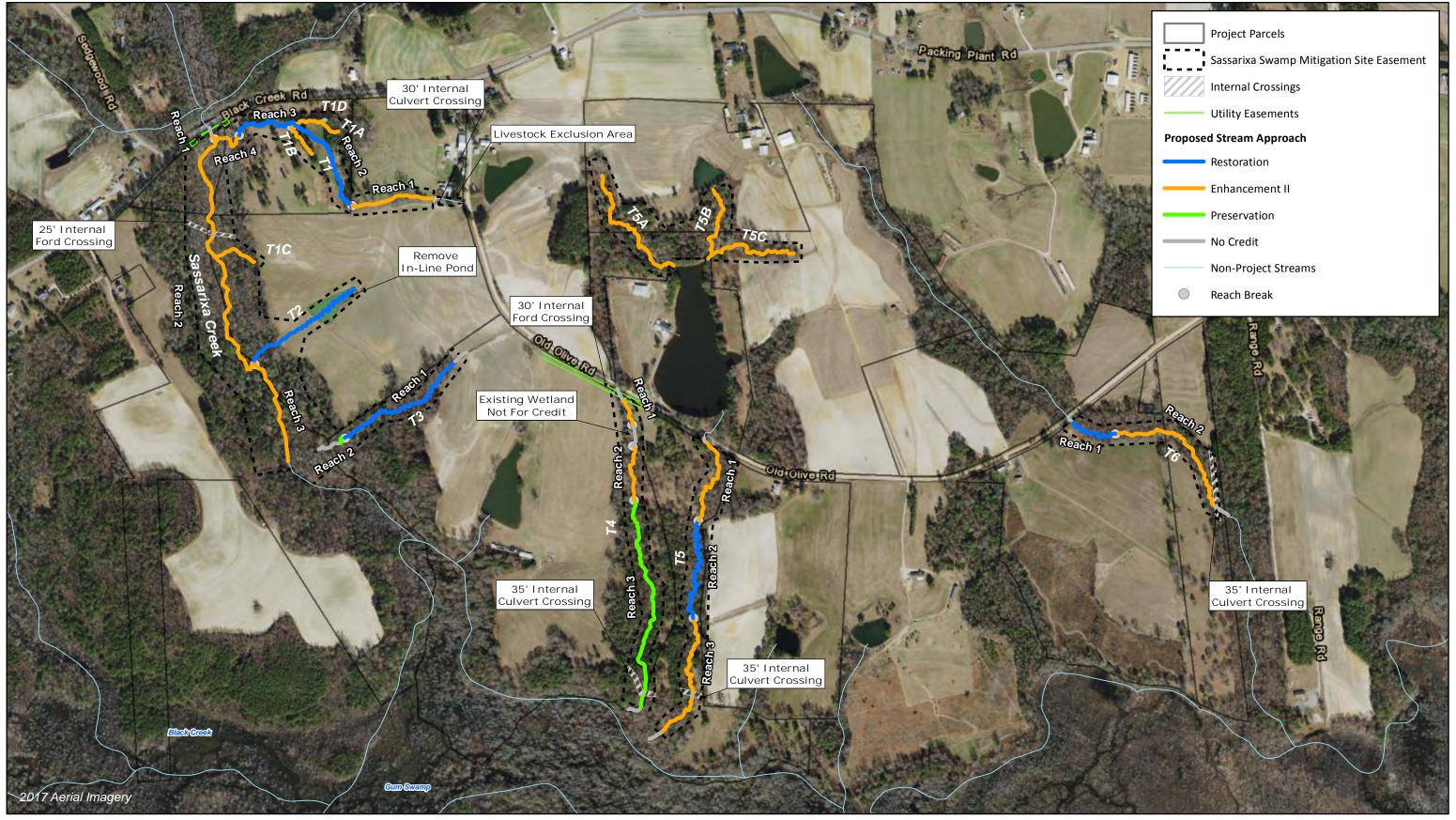


Figure 5. Soils Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201





Sassarixa Swamp Mitigation Site
Neuse River Basin 03020201





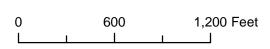


Figure 7. Concept Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201

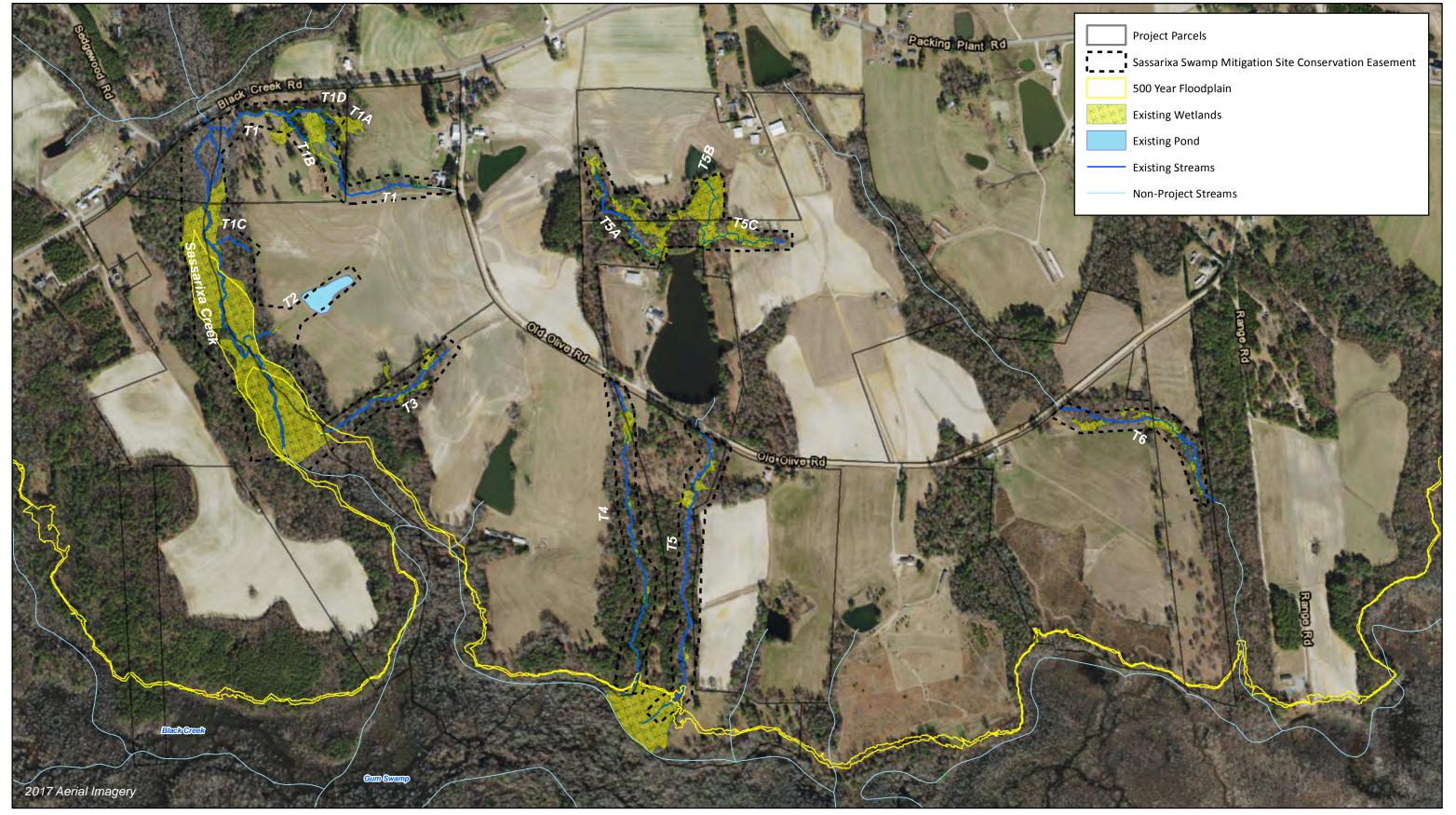
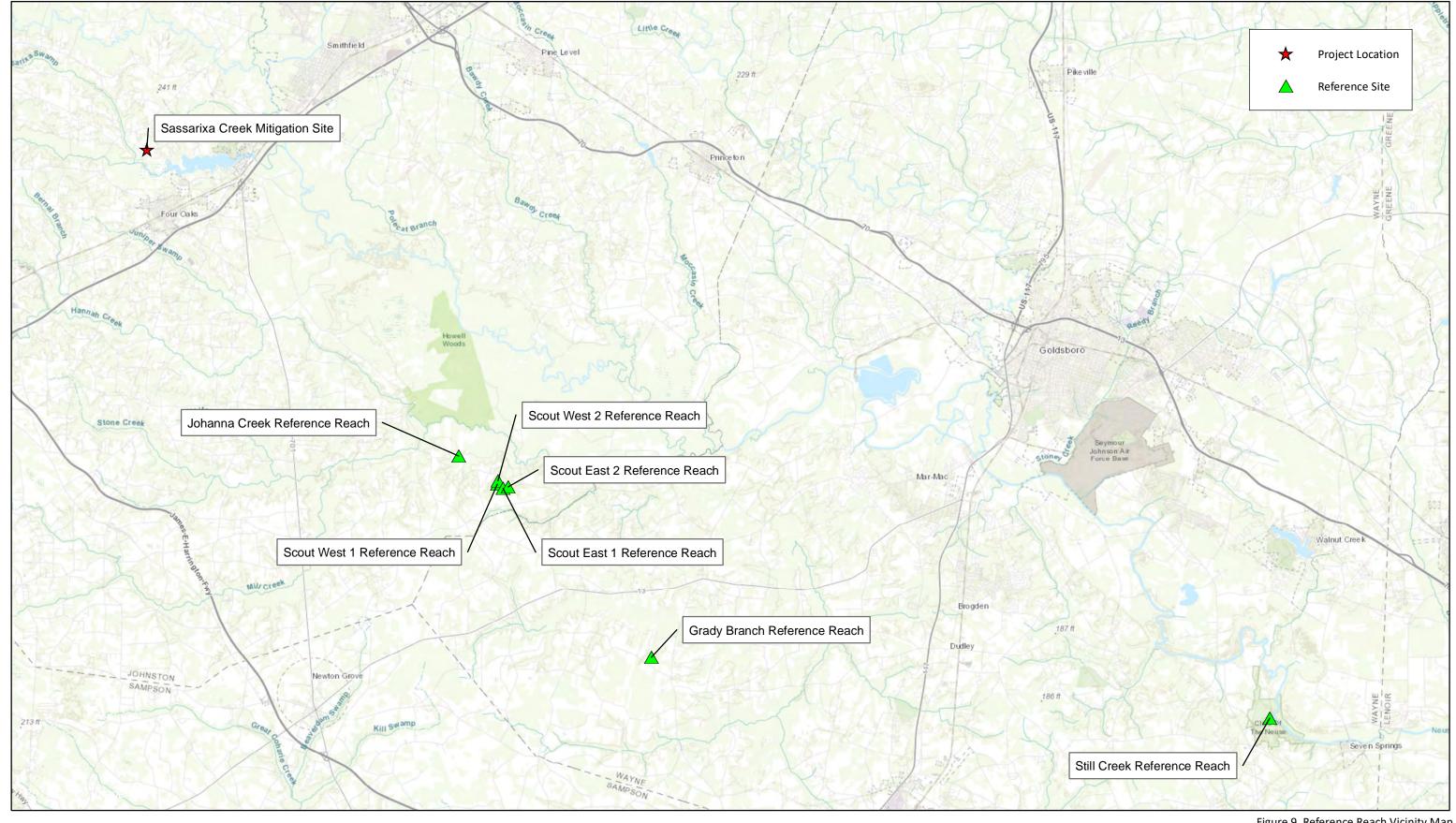




Figure 8. FEMA Floodplain Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201





0 3 6 Miles

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Figure 9. Reference Reach Vicinity Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201

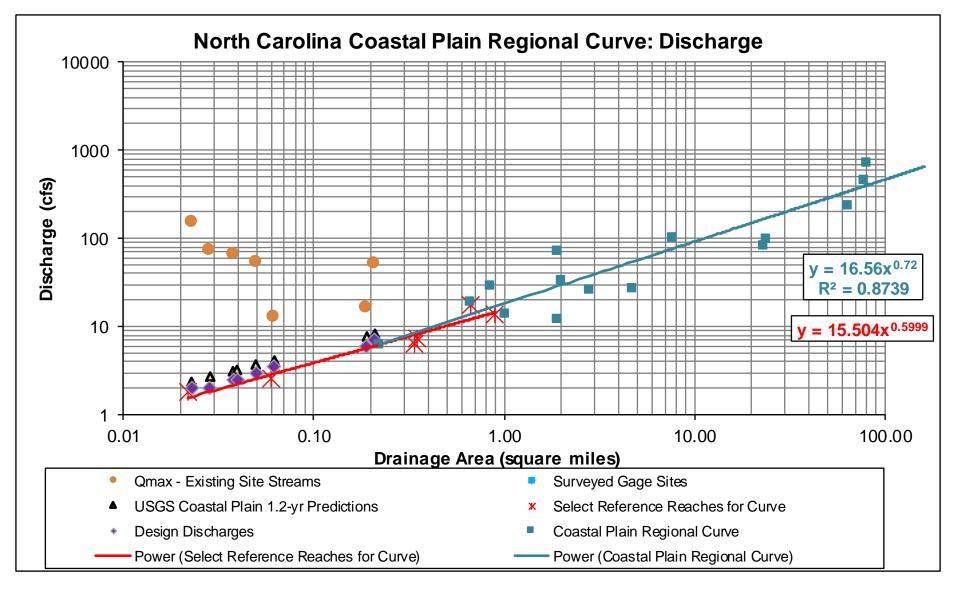
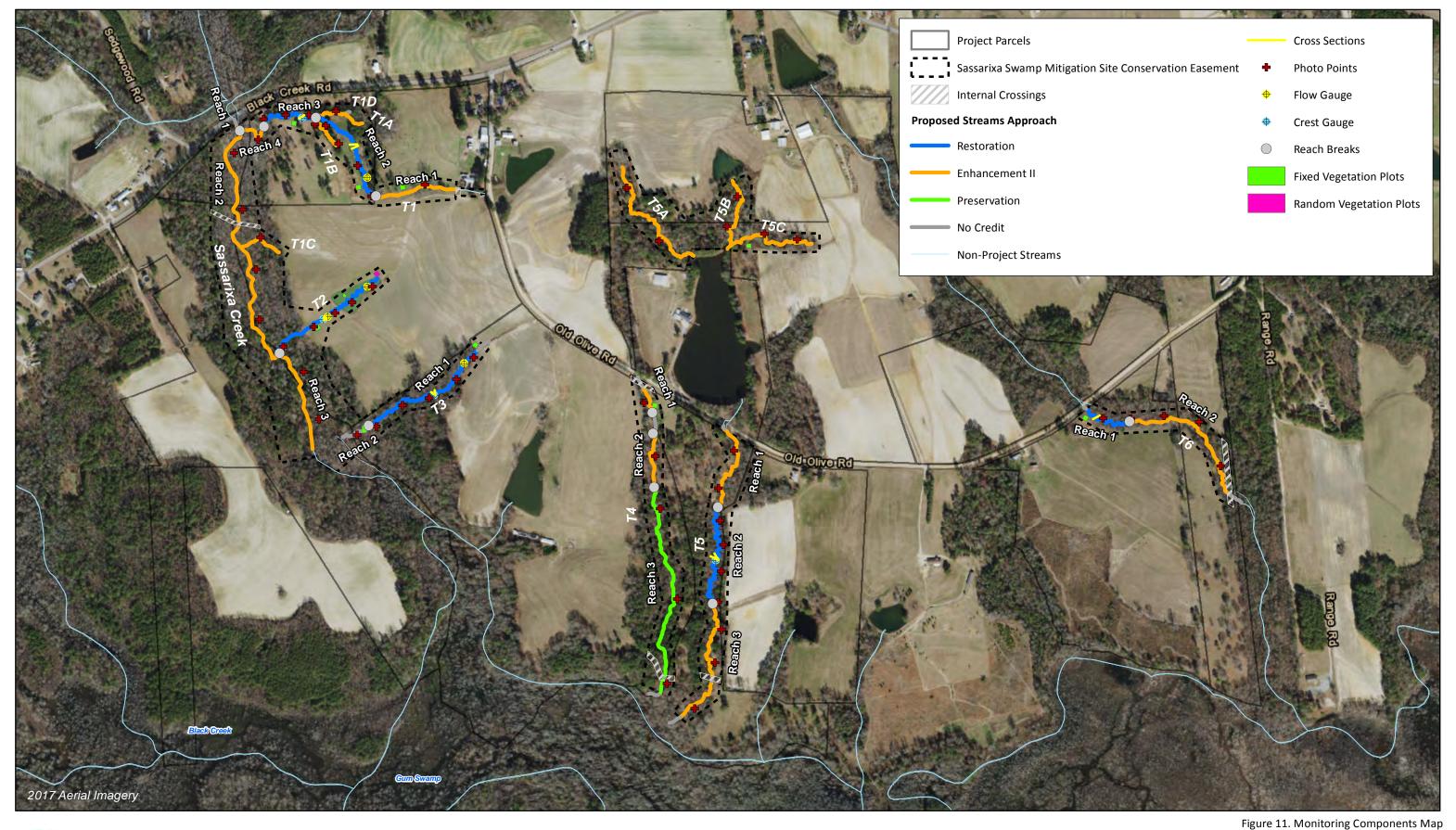


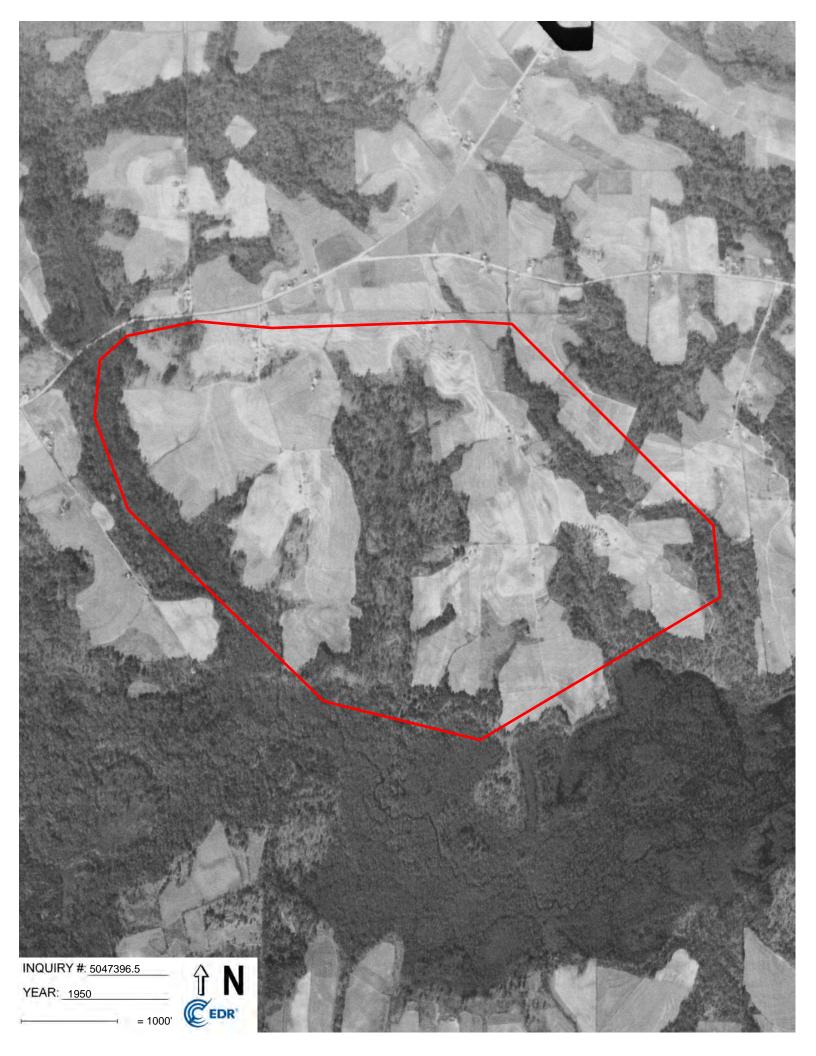


Figure 10. Discharge Analysis Graph Sassarixa Swamp Mitigation Site Neuse River Basin 03020201





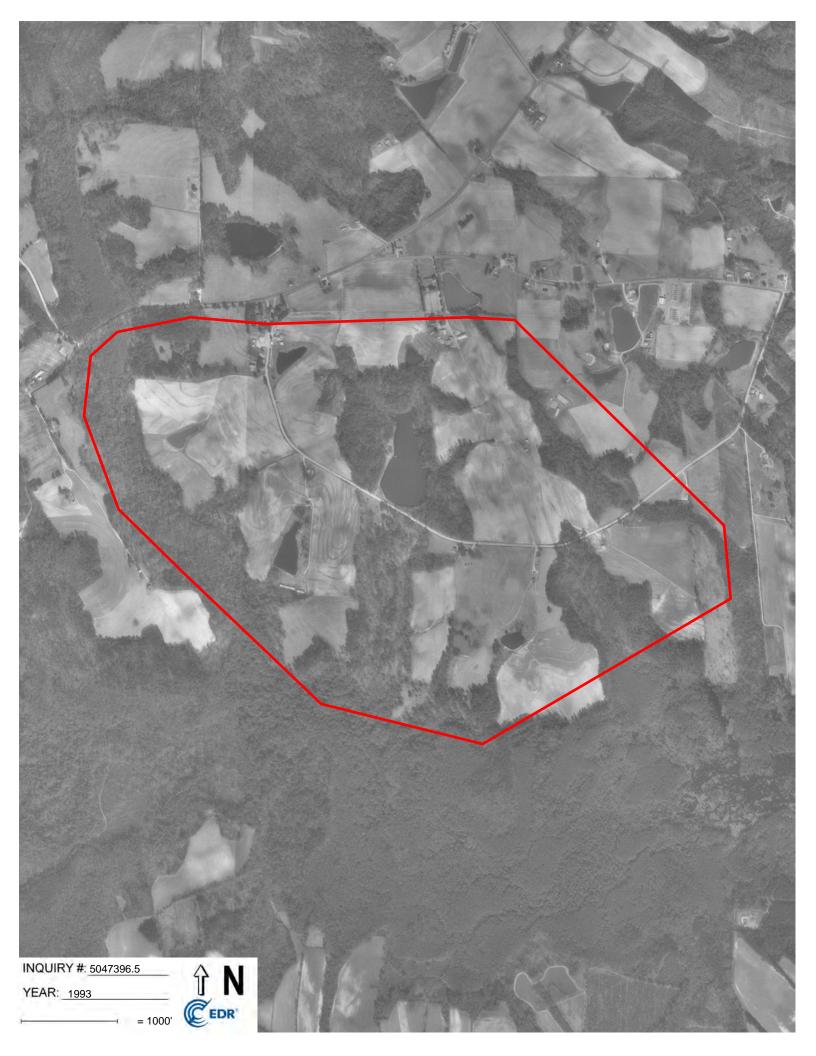
Sassarixa Swamp Mitigation Site
Neuse River Basin 03020201















Sassarixa Creek Reach 2 - looking downstream







T1 Reach 1 - looking upstream

**T1 Reach 1** - looking downstream





T1 Reach 3 - looking upstream

T1 Reach 3 - looking downstream









T5 Reach 3 - looking downstream





T5 Reach 4 - looking upstream

T5 Reach 4 - looking downstream





**T5A** - looking upstream

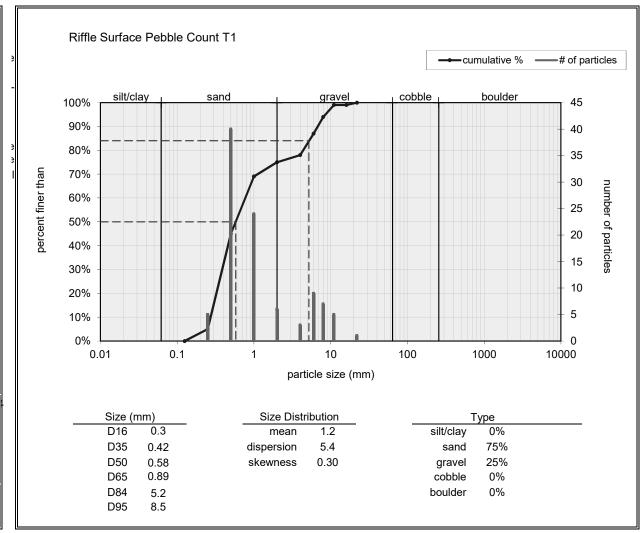
T5A - looking downstream



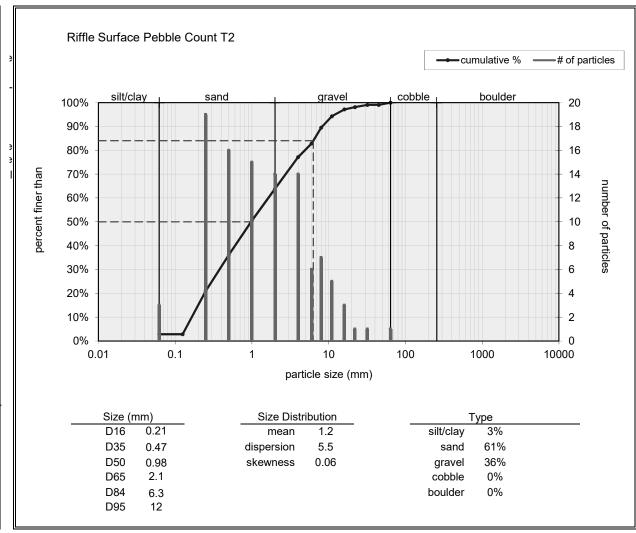


stream type drainage area bankfull cross- sectional area avg velocity during bankfull event width at bankfull maximum depth at bankfull bankfull width to depth ratio low bank height bank height ratio floodprone area width entrenchment ratio max pool depth at bankfull pool depth ratio pool width at bankfull pool width at bankfull pool oross- sectional area pool area ratio pool-pool spacing pool-pool spacing pool-pool spacing ratio valley slope channel slope Schannel sinuosity K belt width meander width  Abkf Abkf Abkf Abkf Abkf Abkf Abkf Abk	kf	sq mi SF fps feet feet feet feet	min 0.050 2 3 3 3 4 4 3 3 3 7 2 2	22/R3  max 35  0.063  2.5  3.4 0  70  3.9  3.0  7.6  2.2 3	min	max 65 5023 5 66 60 60 60 60 60 6.	min  B5  0.0  1.7  4.0  3.2  0.70  0.50  6.4  1.5  2.1	- R1 max / G5 038 1.7 3.6 4.2 0.56 0.42 10 3.9 7.0 4.6	min E 0. 3. 3 3 1 1 2 2 2 1 1	R2 max ::5 19	### T6 ### ### ### ### ### ### ### ### #	max 5 115 4 9 11 7 0 0
stream type  drainage area bankfull cross- sectional area avg velocity during bankfull event width at bankfull maximum depth at bankfull bankfull width to depth ratio low bank height entrenchment ratio max pool depth at bankfull pool width at bankfull  pool width at bankfull  pool width ratio pool width ratio pool width ratio pool area ratio pool-pool spacing pool-pool spacing ratio valley slope channel slope sinuosity K bett vidth meander width pAbkf  Abkf	kf	feet feet feet feet	0.050 2 3 3 1 0. 4 3 3 7	355 0.063 2.5 3.6 3.4 0 70 3.0 3.0	0.000000000000000000000000000000000000	55 5023 .5 .6 .0 .0 .0 .0 .9	85, 0.0 1.7 4.0 3.2 0.70 0.50 6.4 1.5 2.1	7 G5 338 1.7 3.6 4.2 0.56 0.42 10 3.9 7.0	1 1 2 2 1 1	.5 .19 .5 .1 .1 .4 .1 .8 .2	4. 2. 4. 1. 3. 3. 2.	5 15 4 9 1 5 1 7 0
drainage area bankfull cross- sectional area avg velocity during bankfull event width at bankfull maximum depth at bankfull bankfull width to depth ratio low bank height entrenchment ratio max pool depth at bankfull pool width at bankfull pool width ratio pool width ratio pool width ratio pool area ratio pool-pool spacing pool-pool spacing ratio valley slope channel slope sinuosity belt width what bankfull cross- sectional area pool-pool spacing ratio valley slope sinuosity belt width what bankfull pool width ratio pool-pool spacing pool-pool spacing ratio valley slope sinuosity belt width meander width bankfull bankfull pool width ratio pool-pool spacing ratio valley slope sinuosity belt width meander width bankfult bankfull pool-pool spacing ratio valley slope sinuosity belt width meander width bankfult bankfull spacing ratio valley slope sinuosity belt width meander width bankfult bankfull spacing ratio valley slope spacing ratio valley slope spacing ratio valley slope spacing ratio valley slope spacing ratio valley slope spacing ratio valley slope spacing ratio	kf	feet feet feet feet	0.050 2 3 3 1 0. 4 3 3 7	0.063 0.5 0.6 0.6 0.70 0.9 0.0 0.0 0.7 0.6	0.4 1 3 0.0 0 6 3 6	.5 .6 .0 .0 .0 .0 .0 .9	0.0 1.7 4.0 3.2 0.70 0.50 6.4 1.5 2.1	1.7 3.6 4.2 0.56 0.42 10 3.9 7.0	0. 3 3 1 1 2 2 1	19	0.3 4. 2. 4. 1. 3. 3.	15 4 9 1 5 1 7 0
bankfull cross- sectional area avg velocity during bankfull event width at bankfull maximum depth at bankfull bankfull width to depth ratio low bank height ratio floodprone area width entrenchment ratio max pool depth at bankfull pool width at bankfull pool width ratio pool width ratio pool width ratio pool area ratio pool area ratio pool-pool spacing pool-pool spacing ratio valley slope channel slope Schanne sinuosity K belt width  Vbkf  Vbkf  Vbkf  Vbkf  Vbkf  Vbkf  Vbkf  Vbkf  Wbkf  Amax  Amax  Abkf  Amax  Abkf  Amax  Abkf  Amax  Abkf  A	kf	feet feet feet feet	2 3 3 1 0. 4 3 3 7	2.5 3.6 3.4 0 0 3.0 3.0	1 3 3 0. 0. 0 6 3 3 6 6 3 1	.5 .6 .6	1.7 4.0 3.2 0.70 0.50 6.4 1.5 2.1	1.7 3.6 4.2 0.56 0.42 10 3.9 7.0	3 3 3 1 1 2 2 1	.5 .1 .1 .4 .1 .8 .26	4. 2. 4. 1. 3. 3.	4 9 1 5 1 7 0
sectional area avg velocity during bankfull event width at bankfull maximum depth at bankfull bankfull width to depth ratio low bank height entrenchment ratio max pool depth at bankfull pool width at bankfull  pool width at bankfull  pool width ratio  pool width ratio  BKf pool cross- sectional area pool-pool spacing pool-pool spacing ratio valley slope channel slope Sinuosity Shekf	kf	fps feet feet feet feet	3 3 1 0. 4 3 3 7	3.6 3.4 0 70 3.9 3.0 3.0	3 0 0 6 3 6		4.0 3.2 0.70 0.50 6.4 1.5 2.1	3.6 4.2 0.56 0.42 10 3.9 7.0	3 3 1 1 2 2	.1	2. 4. 1. 3. 3.	9 1 5 1 7 0
avg velocity during bankfull event width at bankfull maximum depth at bankfull mean depth at bankfull width to depth ratio low bank height shankfull entrenchment ratio max pool depth at bankfull pool width at bankfull pool width at bankfull pool area ratio  Bkf pool cross- sectional area pool-pool spacing pool-pool spacing ratio valley slope channel slope Schanne sinuosity Skeft Sk	kf	feet feet feet feet	3 1 0. 4 3 3 7	3.4 0 70 3.9 3.0 2.6	3 0 0 6 3 6	.0 60 50 .0 .9 .5	3.2 0.70 0.50 6.4 1.5 2.1	4.2 0.56 0.42 10 3.9 7.0	3 1 1 2 2 2	.1 .4 .1 .8 .2 .6	4. 1. 3. 3.	1 5 1 7 0
event width at bankfull  maximum depth at bankfull  mean depth at bankfull  bankfull width to depth ratio  low bank height  at bankfull  bank height  bank height ratio  floodprone area width entrenchment ratio  max pool depth at bankfull  pool width at bankfull  pool width ratio  BKf pool cross- sectional area pool-pool spacing pool-pool spacing pool-pool spacing ratio  valley slope channel slope Sinuosity K belt width  dmax  wbkf/d  wbkf/d  dbkf/d  dbkf/d  dbkf/d  dbkf/d  wbkf/d  wbkf/d  wbkf/d  wbkf/d  wbkf/d  pool/d  pool/d  pool width ratio pool/d  pool spacing pool-pool spacing pool-pool spacing ratio valley slope channel slope Sinuosity K belt width meander width  meander width  meander width  wbkf/d  w	kf	feet feet feet feet	3 1 0. 4 3 3 7	3.4 0 70 3.9 3.0 2.6	3 0 0 6 3 6	.0 60 50 .0 .9 .5	3.2 0.70 0.50 6.4 1.5 2.1	4.2 0.56 0.42 10 3.9 7.0	3 1 1 2 2 2	.1 .4 .1 .8 .2 .6	4. 1. 3. 3.	1 5 1 7 0
width at bankfull whit at bankfull data bankfull mean depth at bankfull bankfull whit to depth ratio low bank height bank height bank height bank height data bankfull width entrenchment ratio max pool depth at bankfull pool width at bankfull pool width ratio dpool	kf	feet feet feet	1 0. 4 3 3 7	0 70 9 0 0	0 0 6 3 6	.60 .50 0 9 5	0.70 0.50 6.4 1.5 2.1	0.56 0.42 10 3.9 7.0	1 1 2 2	.4 .1 .8 .2	1. 1. 3. 3.	5 1 7 0
bankfull  maximum depth at bankfull  mean depth at bankfull  bankfull width to depth ratio  floodprone area width entrenchment ratio  max pool depth at bankfull  pool depth ratio  pool width at bankfull  pool width at bankfull  pool width ratio  Bkf pool cross-sectional area pool-pool spacing pool-pool spacing ratio  yalley slope channel slope  Sinuosity  Maker depth at bankfull  pool width at bankfull  pool width ratio  pool width ratio  pool spacing pool-pool spacing spacing ratio  valley slope  Schannel slope  Sinuosity  K  meander width  Mokef / d  donate  Mokef / d  belt width  webtf / d  belt width  meander width  denate depth at d  denate webte  webtf / d  belt width  webtf / d  belt width  meander width  meander width  meander width	kf	feet feet feet	1 0. 4 3 3 7	0 70 9 0 0	0 0 6 3 6	.60 .50 0 9 5	0.70 0.50 6.4 1.5 2.1	0.56 0.42 10 3.9 7.0	1 1 2 2	.4 .1 .8 .2	1. 1. 3. 3.	5 1 7 0
maximum depth at bankfull bankfull with to depth ratio low bank height bank height bank height bank height ratio floodprone area width entrenchment ratio max pool depth at bankfull pool width at bankfull pool width ratio pool width ratio wpool width ratio pool area ratio Apool/Apool area ratio pool-pool spacing pool-pool spacing pool-pool spacing ratio valley slope Schannel slope Schannel slope Schannel slope Schannel slope Sinuosity K belt width meander width between sinuosity meander width space shannel slope Schannel slope Scha	kf	feet	0. 4 3 3 7	.70 1.9 3.0 3.0 7.6	0. 6 3 6	50 .0 .9 .5	0.50 6.4 1.5 2.1 24	0.42 10 3.9 7.0	1 2 2	.1 .8 .2	1. 3. 3.	1 7 0
at bankfull  mean depth at bankfull  bankfull width to depth ratio  low bank height  bank height ratio  floodprone area width entrenchment ratio  max pool depth at bankfull  pool depth ratio  pool width at bankfull  pool width ratio  BKf pool cross-sectional area  pool-pool spacing pool-pool spacing ratio  valley slope channel slope  sinuosity  belt width  down/d  pool-pool spacing ratio  sinuosity  k  meander width  whit	kf	feet	0. 4 3 3 7	.70 1.9 3.0 3.0 7.6	0. 6 3 6	50 .0 .9 .5	0.50 6.4 1.5 2.1 24	0.42 10 3.9 7.0	1 2 2	.1 .8 .2	1. 3. 3.	1 7 0
bankfull bankfull width to depth ratio low bank height bank height ratio floodprone area width entrenchment ratio  max pool depth at bankfull  pool width at bankfull  pool width ratio  Bkf pool cross- sectional area pool-pool spacing pool-pool spacing ratio valley slope channel slope Sinuosity  meader width  whoth whit  whoth whoth whit  whoth whit  whoth whit  whoth whit  whoth wh	kf	feet	4 3 3 7 2	3.0 3.0 7.6	3 6 3		6.4 1.5 2.1 24	10 3.9 7.0	2 2	.8	3. 3.	7 0 0
bankfull width to depth ratio low bank height ratio floodprone area width entrenchment ratio max pool depth at bankfull pool depth ratio dpool width at bankfull pool width ratio wpool width ratio bankfull pool width ratio wpool width ratio bankfull pool or coss-sectional area pool area ratio Apool/A pool-pool spacing pool-pool spacing ratio valley slope Schannel s	kf	feet	4 3 3 7 2	3.0 3.0 7.6	3 6 3		6.4 1.5 2.1 24	10 3.9 7.0	2 2	.8	3. 3.	7 0 0
to depth ratio low bank height bank height ratio floodprone area width entrenchment ratio max pool depth at bankfull pool depth ratio pool width at bankfull pool width ratio Bkf pool cross-sectional area pool-pool spacing pool-pool spacing ratio valley slope channel slope sinuosity chart bankfull should be be be be be be be be be be be be be	ikf	feet	3 3 7 2	3.0	3 3	5.5	1.5 2.1 24	3.9 7.0	2	.6	3.	0
low bank height bank height ratio floodprone area width entrenchment ratio max pool depth at bankfull pool depth ratio pool width at bankfull pool width ratio pool width ratio pool width ratio Bkf pool cross-sectional area pool area ratio pool-pool spacing pool-pool spacing ratio valley slope channel slope Sinuosity Shark		feet	3 7 2	3.0 7.6	3	i.5 i.6	2.1	7.0	1	.6	2.	0
bank height ratio floodprone area width entrenchment ratio  max pool depth at bankfull  pool width at bankfull  pool width ratio  Bkf pool cross- sectional area pool-pool spacing pool-pool spacing ratio valley slope channel slope Sinuosity  belt width  BhR Wfpa  dpool/d  pool/d  pool/d  pool y  pool-pool spacing pool-pool spacing ratio valley slope channel slope Sinuosity Shale whit  belt width  whit  meander width  Menual Slope  Shale Shale Shale Webt  Menual Slope Schannel Shale Webt  Menual Slope Shale Shale Webt  Menual Slope Shale  <u>+</u> +	feet	3 7 2	3.0 7.6	3	i.5 i.6	2.1	7.0	1	.6	2.	0	
ratio floodprone area width entrenchment ratio  max pool depth at bankfull pool depth ratio  pool width at bankfull  pool width ratio  Bkf pool cross-sectional area pool area ratio  pool-pool spacing pool-pool spacing ratio valley slope channel slope Sinuosity  belt width  wfpaper  wfpaper  kf pool cross-sectional area pool area ratio  pool-pool spacing pool-pool spacing ratio valley slope channel slope Sinuosity  k belt width  meander width	<del> </del>		7	2.6	3	.6	24					
ratio floodprone area width entrenchment ratio  max pool depth at bankfull  pool depth ratio  pool width at bankfull  pool width ratio  Bkf pool cross- sectional area  pool-pool spacing pool-pool spacing ratio  valley slope channel slope Sinuosity  kypacity  kypacit	<u>+</u>		7	2.6	3	.6	24					
width entrenchment ratio  max pool depth at bankfull  pool depth ratio   dpool/depth r			2	2.2	1			4.6	2	27	7.	0
ratio  max pool depth at bankfull  pool depth ratio dpool/d  pool width at bankfull  pool width ratio wpool/d  Bkf pool cross-sectional area dpool-pool spacing pool-pool spacing ratio valley slope channel slope Schannel slope Sinuosity K  belt width wbit dpool dpool which we shall be shall		feet				2	7.5					
max pool depth at bankfull pool depth ratio dpool/d pool width at bankfull pool width ratio wpool/d pool width ratio wpool/d Bkf pool cross-sectional area pool area ratio Apool/A pool-pool spacing pool-pool spacing ratio valley slope Schannel slo		feet					2.2 1.2 7.5 1.1		8.7		1.7	
at bankfull  pool depth ratio   dpool/depth ratio   pool width at bankfull   pool width ratio   wpool/well before the pool width ratio   wpool/well before the pool cross-sectional area   pool area ratio   pool-pool spacing pool-pool spacing ratio   p-p/well spacing ratio   valley slope   Swalle channel slope   Schannel slope		feet	1	3			7.5	7.3		0./		
pool depth ratio   d <sub>pool</sub> /d   pool width at bankfull   pool width ratio   w <sub>pool</sub> /v   Bkf pool cross-sectional area   pool area ratio   A <sub>pool</sub> /A   pool-pool spacing pool-pool spacing ratio   valley slope   S <sub>valle</sub>   channel slope   S <sub>chann</sub>   sinuosity   K   belt width   meander width		1000			1.9		1.7		1.7		2.3	
pool width at bankfull  pool width ratio wpool/v  Bkf pool cross-sectional area  pool area ratio Apool/A  pool-pool spacing pool-pool spacing ratio valley slope Channel slope Schannel sinuosity K  belt width wbit				1.5		-			-	••		
pool width at bankfull  pool width ratio wpool/v  Bkf pool cross-sectional area  pool area ratio Apool/A  pool-pool spacing pool-pool spacing ratio valley slope Channel slope Schannel sinuosity K  belt width wbit	nkf		1.9		3	.8	3.4	4.0	1	.5	2.	1
bankfull Wpool/V  pool width ratio Wpool/V  Bkf pool cross- sectional area  pool area ratio Apool/A  pool-pool spacing pool-pool spacing ratio  valley slope Svalle channel slope Schannel slope sinuosity K  belt width Wbit	+											
Bkf pool cross- sectional area  pool area ratio Apool/A  pool-pool spacing pool-pool spacing ratio valley slope Svalle channel slope Schanne sinuosity K belt width Wbit		feet	3.8		3	.6	5	.3	9	.3	7.	0
Bkf pool cross- sectional area  pool area ratio Apool/A  pool-pool spacing pool-pool spacing ratio valley slope Svalle channel slope Schanne sinuosity K belt width Wbit	bkf		1	1.1		2	1.7	1.3	3	.0	1.	7
sectional area  pool area ratio  pool-pool spacing pool-pool spacing ratio  valley slope channel slope sinuosity belt width  sectional area  Apool/A p-p/W p-p/W S-pacing ratio  Valley slope Channel slope S-channel Sinuosity belt width meander width	+						_	_		_		
pool-pool spacing pool-pool spacing ratio valley slope S <sub>valle</sub> channel slope Sinuosity K belt width W <sub>bit</sub>		SF	3	3.4	4.6		5	.9	9	.8	11	.3
pool-pool spacing pool-pool spacing ratio valley slope S <sub>valle</sub> channel slope Sinuosity K belt width W <sub>bit</sub>	okf		1	4	3.1		3.5	3.5	2	.8	2.6	
spacing p-p  pool-pool spacing ratio  valley slope S <sub>vallet</sub> channel slope S <sub>chann</sub> sinuosity K  belt width W <sub>bit</sub>	+											
pool-pool spacing ratio p-p/W valley slope S <sub>vallet</sub> channel slope S <sub>chann</sub> sinuosity K belt width w <sub>bit</sub>		feet	19	103	34	87	17	148	31	174	33	83
spacing ratio valley slope S <sub>valley</sub> channel slope S <sub>chann</sub> sinuosity K belt width w <sub>blt</sub>			5.6	30	11	29	5.3	46	10	56	8.0	20
channel slope S <sub>chann</sub> sinuosity K belt width W <sub>blt</sub>												
sinuosity K belt width W <sub>blt</sub>	+!	feet/ foot	0.022	0.034		040 029	0.039		0.013		0.023	
belt width W <sub>blt</sub>	+	feet/ foot	0.019	0.030		.14	0.034 1.16		0.012 1.23		0.0086 1.11	
meander width	+	feet	13	37	21	33	15	48	14	34	46	39
	-	1000				İ						
ratio w <sub>blt</sub> /w	kf		3.8	11	7.0	11	4.7	15	4.5	11	11	10
meander length L <sub>m</sub>		feet	41	222	67	140	46	176	44	115	95	160
meander length	ı		12	65	22	47	1.4	E.F.	1.4	27	22	20
ratio L <sub>m</sub> /W <sub>t</sub>	+		12	65	22	47	14	55	14	37	23	39
Linear Wavelength	f		33	164	60	106	39	141	33	89	87	147
Linear	if											
Wavelength LW/w	:f		9.7	48	20	35	12	44	11	29	21	36
Ratio radius of												
radius of R <sub>c</sub>			20	50	9.2	52	14	68	9.0	43	38	82
radius of		feet										
curvature ratio R <sub>c</sub> / w <sub>t</sub>	kf	feet		15	3.1	17	4.4	21	3.2	14	10	20

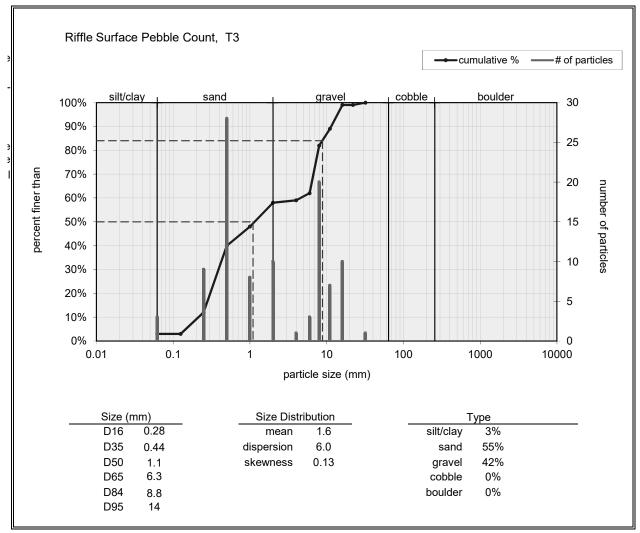
Riffle Surface ▼	
Material Size Range (mm)	Count
silt/clay 0 - 0.062	
very fine sand 0.062 - 0.125	
fine sand 0.125 - 0.25	5
medium sand 0.25 - 0.5	40
coarse sand 0.5 - 1	24
very coarse sand 1 - 2	6
very fine gravel 2 - 4	3
fine gravel 4 - 6	9
fine gravel 6 - 8	7
modium graval 9 11	5
medium gravel 11 - 16	
coarse gravel 16 - 22	1
coarse gravel 22 - 32	
very coarse gravel 32 - 45	
very coarse gravel 45 - 64	
small cobble 64 - 90 medium cobble 90 - 128	
large cobble 128 - 180	
very large cobble 180 - 256 small boulder 256 - 362	
small boulder 362 - 512	
medium boulder 512 - 1024	
large boulder 1024 - 2048	
very large boulder 2048 - 4096	
total particle count:	100
bedrock	
clay hardpan	
detritus/wood	
artificial	
total count:	100
Note: T1, XS3, AA, JP 4/18/18	



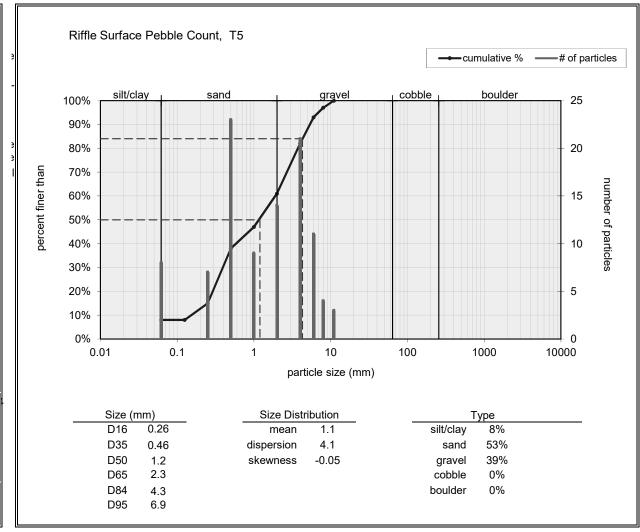
Riffle Surface	▼	
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	3
very fine sand	0.062 - 0.125	
fine sand	0.125 - 0.25	19
medium sand	0.25 - 0.5	16
coarse sand	0.5 - 1 1 - 2	15
very coarse sand	1 - 2	14
very fine gravel	2 - 4	14
fine gravel	4 - 6	6
fine gravel	6 - 8	7
medium gravel	8 - 11	5
medium gravel	11 - 16	3
coarse gravel	16 - 22	1
coarse gravel	22 - 32	1
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	1
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
tota	al particle count:	105
bedrock		
clay hardpan		
detritus/wood		
artificial		
	total count:	105
Note: T2, XS 4, A	A, JP, 4/18/18	



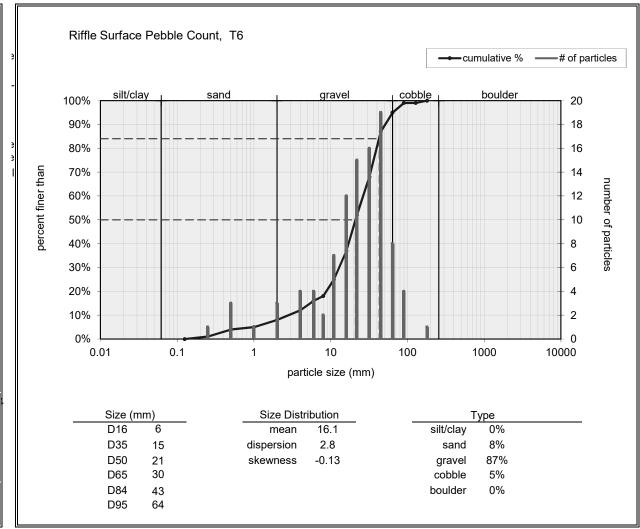
Riffle Surface	▼	
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	3
very fine sand	0.062 - 0.125	
fine sand	0.125 - 0.25	9
medium sand	0.25 - 0.5	28
coarse sand	0.5 - 1 1 - 2	8
very coarse sand	1 - 2	10
very fine gravel	2 - 4	1
fine gravel	4 - 6	3
fine gravel	6 - 8	20
medium gravel	8 - 11	7
medium gravel	11 - 16	10
coarse gravel	16 - 22	
coarse gravel	22 - 32	1
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
tota	al particle count:	100
bedrock		
clay hardpan		
detritus/wood		
artificial		
a tinolar	total count:	100
Note: T3, XS 6, A	A, JP, 4/18/18	



Riffle Surface ▼	
Material Size Range (mm	Count
silt/clay 0 - 0.062	8
very fine sand 0.062 - 0.125	
fine sand 0.125 - 0.25	7
medium sand 0.25 - 0.5	23
coarse sand 0.5 - 1	9
very coarse sand 1 - 2	14
very fine gravel 2 - 4	21
fine gravel 4 - 6	11
fine gravel 6 - 8	4
modium graval 8 - 11	3
medium gravel 11 - 16	
coarse gravel 16 - 22	
coarse gravel 22 - 32	
very coarse gravel 32 - 45	
very coarse gravel 45 - 64	
small cobble 64 - 90	
medium cobble 90 - 128	
large cobble 128 - 180	
very large cobble 180 - 256	
small boulder 256 - 362	
small boulder <u>362 - 512</u>	
medium boulder 512 - 1024	
large boulder <u>1024</u> - 2048	
very large boulder 2048 - 4096	
total particle count:	100
bedrock	
clay hardpan	
detritus/wood	
artificial	
total count:	100
Note: T5, XS9, AA, JP, 4/18/18	



Riffle Surface	▼	
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	
very fine sand	0.062 - 0.125	
	0.125 - 0.25	1
medium sand	0.25 - 0.5	3
coarse sand	0.5 - 1 1 - 2	1
very coarse sand	1 - 2	3
very fine gravel	2 - 4	4
fine gravel	4 - 6	4
fine gravel	6 - 8	2
medium gravel	8 - 11	7
medium gravel	11 - 16	12
coarse gravel	16 - 22	15
coarse gravel	22 - 32	16
very coarse gravel	32 - 45	19
very coarse gravel	45 - 64	8
small cobble	64 - 90	4
medium cobble	90 - 128	
large cobble	128 - 180	1
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
tota	al particle count:	100
bedrock		
clay hardpan		
detritus/wood		
artificial		
aitillolai	total count:	100
		100
Note: T6, XS 14,	AA, JP, 4/18/18	•





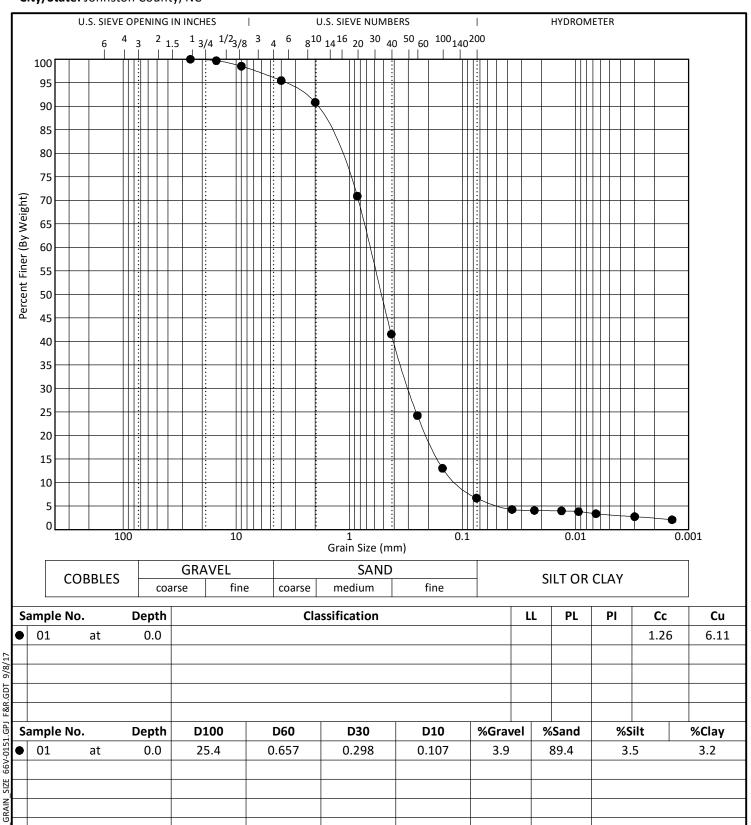
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## Froehling & Robertson, Inc.

# GRAIN SIZE DISTRIBUTION

Project No: 66V-0151 Client: Wildlands

Project: Sassarixa Swamp
City/State: Johnston County, NC



## **FROEHLING & ROBERTSON**

### SIEVE ANALYSIS

**Project:** Sassarixa Swamp

Client: Wildlands

Project No: <u>66V-0151</u>

Date: 8/31/2017

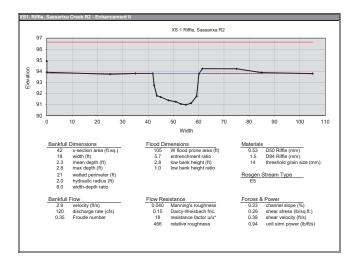
Sample 01 Sassarixa Swamp	Weight Retained	Percent Retained	Percent Passing
10" - 256 mm	0	0	100
5" - 128 mm	0	0	100
2.5" - 64 mm	0	0	100
1.0" - 25.4 mm	0	0	100
5/8" - 15 mm	31.01	0.3	99.7
3/8" - 9 mm	154.36	1.5	98.5
#5 - 4 mm	473.32	4.5	95.5
#10 - 2 mm	957.11	9.2	90.8
#2085 mm	22.30	29.1	70.9
#40425 mm	55.15	58.4	41.6
#6025 mm	74.53	75.7	24.3
#100150 mm	87.08	87.0	13.0
#200075 mm	94.16	93.3	6.7

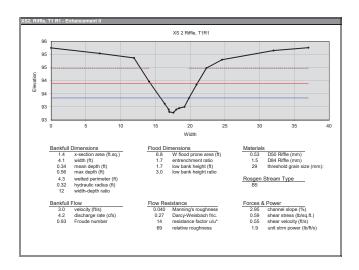
Sample 01 Sassarixa Swamp								
Pan #	J-7							
Wet soil + tare (G)	15034.30							
Dry soil + tare	13079.20							
Wt. of Water	1955.10							
Tare wt.	2639.70							
Dry wt. of Soil	10439.50							
Moisture %	18.7							

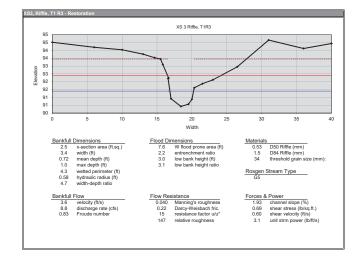
Largest Particle (1) mm	17.31
Largest Particle (2) mm	22.74
Largest Particle (1) Wt. Grams	16.25
Largest Particle (2) Wt. Grams	7.83

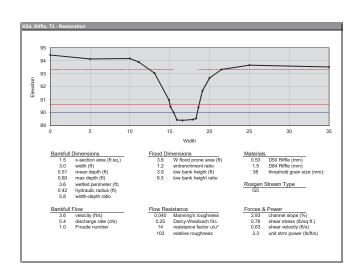
\*Hydrometer Sample Split on the #10 Sieve

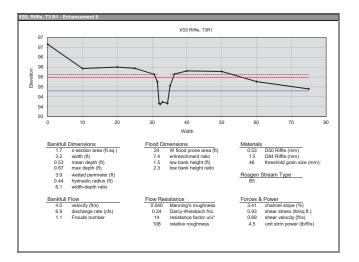
Performed By: Dave Jenks Date: 9/8/2017

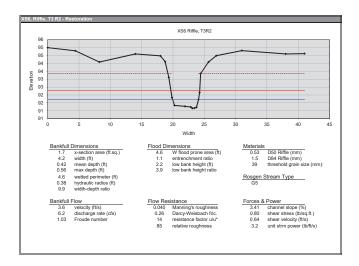


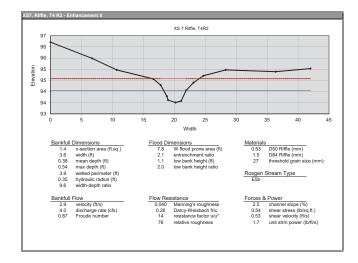


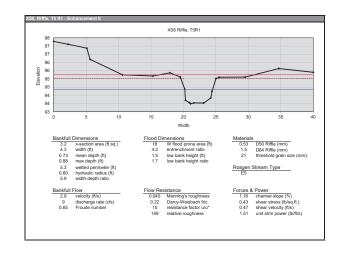


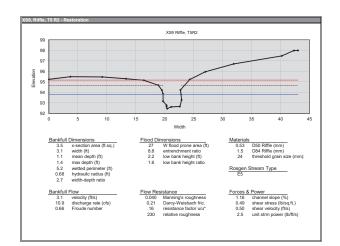


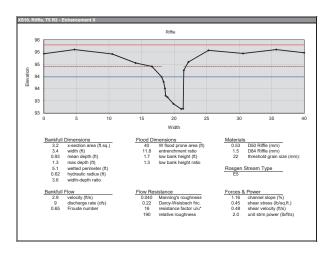


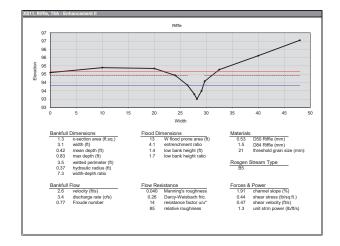


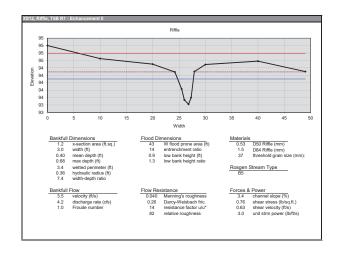


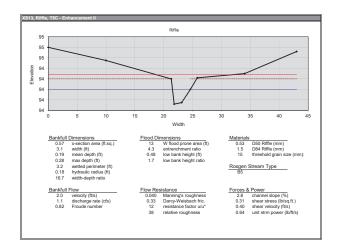


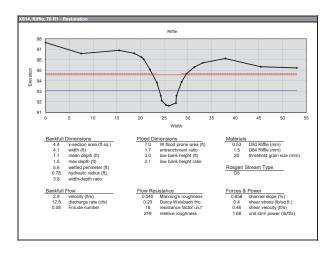


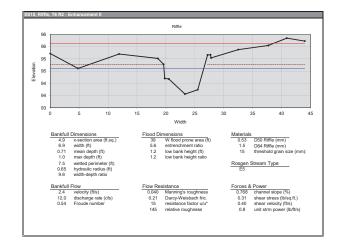


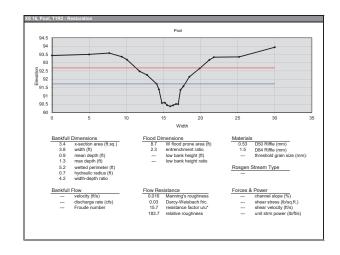


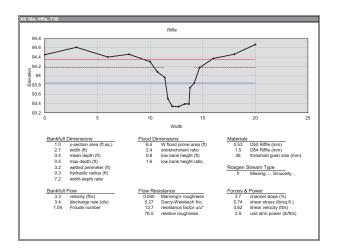


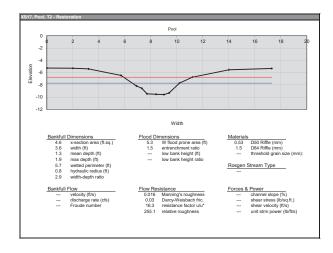


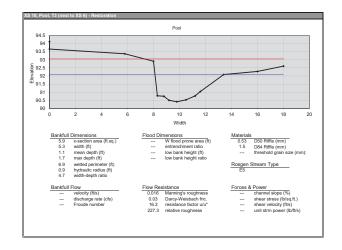


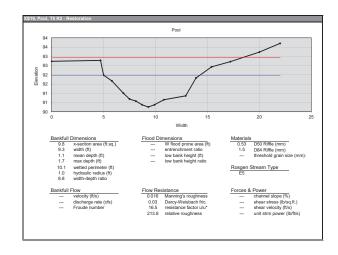


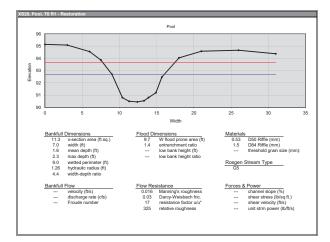












			T1R2				T1R3		T2 R1A			
	Notation	Units	Typical			Typical			Typical			
			Section Values	Min	Max	Section Values	Min	Max	Section Values	Min	Max	
stream type				C5b/E5b			C5/E5			C5b/E5b		
drainage area	DA	sq mi		0.050			0.063		0.023			
design discharge	Q	cfs		3.0			3.5			2.0		
bankfull cross- sectional area	$A_bkf$	SF	1.2	-		1.5	-		1.5		-	
average velocity during bankfull event	$V_{\mathrm{bkf}}$	fps	-	2.8		-	2.3		-	1.4		
Cross Section						<u>l</u>						
width at bankfull	W <sub>bkf</sub>	feet	3.6		-	4.2		-	4.2		-	
maximum depth at bankfull	d <sub>max</sub>	feet	0.50	0.40	0.53	0.50	0.42	0.56	0.50	0.42	0.56	
mean depth at bankfull	d <sub>bkf</sub>	feet	0.33		-	0.35		-	0.35		-	
bankfull width to depth ratio	$w_{bkf}/d_{bkf}$		11		-	12		-	12		-	
max depth ratio	d <sub>max</sub> /d <sub>bkf</sub>	feet	-	1.2	1.6	-	1.2	1.6	-	1.2	1.6	
bank height ratio	BHR	-	-	1.0	1.2	-	1.0	1.2	-	1.0	1.2	
floodprone area width	$W_fpa$	feet	-	>7.9		-	>9.2		-	>9.2		
entrenchment ratio	ER	-	-	>2.2		-	>2	2.2	-	>2.2		
Slope valley slope	c	feet/ foot		0.032 - 0.045			.012 - 0.032			0.0077		
channel slope	S <sub>valley</sub>		0.027 - 0.038	0.025	0.041	0.010 - 0.026	0.0092	0.025	0.0055	0.0077	0.0064	
Profile	S <sub>chnl</sub>	Jeet/ Joot	0.027 - 0.038	0.025	0.041	0.010 - 0.026	0.0092	0.025	0.0055	0.0051	0.0064	
riffle slope	S <sub>riffle</sub>	feet/foot	-	0.025	0.062	-	0.010	0.073	-	0.0056	0.019	
riffle slope ratio	$S_{riffle}/S_{chnl}$	-	-	1.0	1.5	-	1.1	2.9	-	1.1	2.9	
pool slope	S <sub>p</sub>	feet/foot	-	0.0000	0.0000	-	0.0000	0.0000	-	0.0000	0.0000	
pool slope ratio	$S_p/S_{chnl}$	-	-	0.00	0.00	-	0.00	0.00	-	0.00	0.00	
pool-to-pool spacing	L <sub>p-p</sub>	feet	-	18	44	-	21	50	-	21	50	
pool spacing ratio	$L_{p-p}/W_{bkf}$	-	-	4.9	12	-	4.9	12	-	4.9	12	
pool cross-sectional area	$A_pool$	SF	2.5 - 3.1	1.6	3.6	3.6 - 4.5	2.0	4.5	3.6 - 4.5	2.0	4.5	
pool area ratio	A <sub>pool</sub> /A <sub>bkf</sub>	-	-	1.3	3.0	-	1.3	3.0	-	1.3	3.0	
maximum pool depth	d <sub>pool</sub>	feet	1.0 - 1.3	0.5	1.4	1.2 - 1.5	0.53	1.5	1.2 - 1.5	0.53	1.5	
pool depth ratio	d <sub>pool</sub> /d <sub>bkf</sub>	-	-	1.5	4.2	-	1.5	4.2	-	1.5	4.2	
pool width at bankfull	F:	feet	5.0	4.3	5.8	6.0	5.0	6.7	6.0	5.0	6.7	
pool width ratio  Pattern	w <sub>pool</sub> /w <sub>bkf</sub>	-	-	1.2	1.6	-	1.2	1.6	-	1.2	1.6	
sinuosity	K	-	-		.2	-		2	-		.4	
belt width	w <sub>blt</sub>	feet	-	9.0	24	-	11	28	-	11	28	
meander width ratio linear wavelength (formerly meander	W <sub>blt</sub> /W <sub>bkf</sub>	- feet	-	2.5	6.6	-	2.5	6.6 50	-	2.5 25	50	
length) linear wavelength ratio (formerly meander length ratio)	LW/w <sub>bkf</sub>	-	-	6.0	12	-	6.0	12	-	6.0	12	
meander length	L <sub>m</sub>	feet	-	94	180	-	130	260	-	150	300	
meander length ratio	$L_m/W_{bkf}$	-	-	26	51	-	31	62	-	35	71	
radius of curvature radius of curvature	R <sub>c</sub>	feet	-	7.2	14	-	8.4	17	-	8.4	17	
ratio	$R_c/w_{bkf}$	-	-	2.0	4.0	-	2.0	4.0	-	2.0	4.0	

		T2 R1B		T3R1				T5R2		T6R1			
	Typical Section	Min	Max										
stream type	Values	C5b/E5b		Values	C5b/E5b		Values	C5/E5		Values	C5/E5		
drainage area		0.023			0.038			0.19			0.15		
design discharge		2.0			2.5			6.0			5.5		
bankfull cross- sectional area	0.88		-	1.0	-		2.7	-		3.3			
average velocity during bankfull event	-	2	.2	- 2.5		-	2.3		- 1.7		.7		
Cross Section								<u> </u>			l		
width at bankfull	3.2		-	3.6		-	5.6		-	6.4		-	
maximum depth at bankfull	0.40	0.34	0.45	0.40	0.35	0.46	0.70	0.58	0.8	0.70	0.49	0.66	
mean depth at bankfull	0.28		-	0.29		-	0.48		-	0.41		-	
bankfull width to depth ratio	12		-	12		- 12			-	12		-	
max depth ratio	-	1.2	1.6	-	1.2	1.6	-	1.2	1.6	-	1.2	1.6	
bank height ratio	-	1.0	1.2	-	1.0	1.2	-	1.0	1.2	-	1.0	1.2	
floodprone area width	-	>7	7.0	-	>7	7.9	-	>11 -				14	
entrenchment ratio Slope	-	>2	2.2	-	>2	2.2	-	>2	2.2	-	- >2.2		
valley slope	С	0.012 - 0.033		С	0.016 - 0.045		(	0.012 - 0.019		0	.0064 - 0.016	j	
channel slope	0.011 - 0.027	0.011	0.030	0.019 - 0.039	0.028	0.033	0.0090 - 0.014	0.0086	0.017	0.0055 - 0.014	0.0049	0.015	
Profile									i I				
riffle slope	-	0.012	0.087	-	0.028	0.050	-	0.0095	0.049	-	0.0054	0.044	
riffle slope ratio	-	1.1	2.9	-	1.0	1.5	-	1.1	2.9	-	1.1	2.9	
pool slope	-	0.0000	0.0000	-	0.0000	0.0000	-	0.0000	0.0000	-	0.0000	0.0000	
pool slope ratio	-	0.00	0.00	-	0.00	0.00	-	0.00	0.00	-	0.00	0.00	
pool-to-pool spacing	-	16	38	-	18	43	-	27	67	-	31	77	
pool spacing ratio	-	4.9	12	-	4.9	12	-	4.9	12	-	4.9	12	
pool cross-sectional area	2.0 - 2.5	1.1	2.6	2.5 - 3.1	1.3	3.0	6.4 - 8.0	3.5	8.1	9.0 - 11	4.3	9.9	
pool area ratio	-	1.3	3.0	-	1.3	3.0	-	1.3	3.0	-	1.3	3.0	
maximum pool depth	0.90 - 1.1	0.42	1.2	1.0 - 1.3	0.44	1.2	1.6 - 2.0	1.0	2.0	1.9 - 2.4	0.82	1.7	
pool depth ratio	-	1.5	4.2	-	1.5	4.2	-	2.0	4.2	-	2.0	4.2	
pool width at bankfull		3.8	5.1	5.0	4.3	5.8	8.0	6.7	9.0	9.5	7.7	10	
pool width ratio  Pattern	-	1.2	1.6	-	1.2	1.6	-	1.2	1.6	-	1.2	1.6	
sinuosity	-		.1	-		2	-		.4	-		.2	
belt width meander width ratio	-	8.0 2.5	21 6.6	-	9.0 2.5	24 6.6	-	14 2.5	37 6.6	-	16 2.5	42.2 6.6	
linear wavelength (formerly meander length)	-	19	38	-	2.3	43	-	34	67	-	38	77	
linear wavelength ratio (formerly meander length ratio)	-	6.0	12	-	6.0	12	-	6.0	12	-	6.0	12	
meander length	-	77	150	-	90	180	-	250	510	-	290	570	
meander length ratio	-	24	48	-	25	50	-	45	91	-	45	89	
radius of curvature radius of curvature	-	6.4	13		7.2	14		11	22		13	26	
radius of curvature ratio	-	2.0	4.0		2.0	4.0		2.0	4.0	ĺ	2.0	4.0	

			Refer		Geomorph	iic Parameti	ers I	T5R2,	T6P1			
			Securit 1		R3, T2, T3	Fost 1	C+:III	Creek		Foot 2		
	Notation	Units	min	West 1 max	min	East 1 max	min max		Scout Min	Max		
stream type				C5b		E5b		E5		5		
drainage area	DA	sq mi		06	0.02		0.35		-			67
design discharge	Q	cfs	2.6		1.8		7.3		17.5			
bankfull cross-	A <sub>bkf</sub>	SF	1.2	2	0	0.9		5.7 6.7		6.9		
sectional area average velocity during bankfull	V <sub>bkf</sub>	fps	1.3	2.3		2	1.2		2.9	2.5		
event	- DKI	Jps	1.0		oss-Section				2.3	2.0		
I				Ci								
width at bankfull	W <sub>bkf</sub>	feet	2.6	6.3	3	.1	6.8	8.0	4.7	6.1		
maximum depth at bankfull	d <sub>max</sub>	feet	0.5	0.7	0	.5	1.1	1.4	1.7	1.8		
mean depth at bankfull bankfull width to	$d_{bkf}$	feet	0.3	0.5	0	.3	0.7	1.0	1.1	1.3		
depth ratio	w <sub>bkf</sub> /d <sub>bkf</sub>		5.4	19.9		05	7.4	11.3	3.6	5.4		
depth ratio bank height ratio	d <sub>max</sub> /d <sub>bkf</sub>	feet	1.5	1.9		.6 1	1	1.7	1.4	1.5 1		
floodprone area	W <sub>fpa</sub>	feet		20		.0	69	88		50		
width entrenchment	ER	-	>2	2.2	3	.2	5			2.2		
ratio					Slone	Slope						
valley slope	S <sub>valley</sub>	feet/foot	0.0	)29		452	0.	0088	0.0	197		
channel slope	S <sub>chnl</sub>	feet/foot		- 0.0433				0.0066		168		
	- Cilli	,,			Profile							
riffle slope	S <sub>riffle</sub>	feet/foot	0.026	0.047	-	-	-	-	-	-		
riffle slope ratio	S <sub>riffle</sub> /S <sub>chnl</sub>	, ,,	1	1.8	-	-	-	-	-	-		
pool slope	Sp	feet/foot	0.0125	0.027	-	-	0.	0001	-	-		
pool slope ratio	S <sub>p</sub> /S <sub>chnl</sub>		0.5	1.1	-	-	0.2		-	-		
pool-to-pool spacing	L <sub>p-p</sub>	feet	27	67	-	-		45	-	-		
pool spacing ratio	$L_{p-p}/w_{bkf}$		4.9	12.2	-	-	6	5.18	-	-		
pool cross- sectional area	A <sub>pool</sub>	SF	2	.2	-	-			-	-		
pool area ratio	$A_{pool}/A_{bkf}$		1	.3	-	-		1.2	-	-		
maximum pool depth	$d_{pool}$	feet	0	.6	-	-	1	45	-	i		
pool depth ratio	$d_{pool}/d_{bkf}$		:	1	-	-	1	73	-	-		
pool width at bankfull	w <sub>pool</sub>	feet	6	.7	-	-	g	0.04	-	-		
pool width ratio	w <sub>pool</sub> /w <sub>bkf</sub>		1	1.2 -		-	1	24	-	-		
					Pattern							
sinuosity	K			.1		-		33		.2		
belt width	W <sub>blt</sub>	feet	8.7	14.3	-	-	15	48	7.2	16.2		
meander width ratio	w <sub>blt</sub> /w <sub>bkf</sub>		1.6	2.6	-	-	2.06	6.59	1.3	3		
linear wavelength (formerly meander length)	L <sub>m</sub>	feet	39.8	84.8	-	-	43	84	36.5	63.2		
linear wavelength ratio (formerly meander length ratio)	L <sub>m</sub> /w <sub>bkf</sub>		7.2	15.4	-	-	5.9	11.53	6.8	11.7		
radius of curvature	$R_c$	feet	3.1	9	-	-	21	47	5.5	16		
radius of curvature ratio	R <sub>c</sub> / w <sub>bkf</sub>		0.6	1.6	-	-	2.88	6.45	1	3		

#### IRT Field Meeting Notes - Sassarixa Swamp

#### February 23, 2018

#### **Meeting Attendees**

Andrea Hughes/USACE
Ross Sullivan/USACE
Mac Haupt/NCDWR
Travis Wilson/NCWRC
Jeff Schaffer/ NCDMS
Katie Merritt/NCDWR
John Hutton/Wildlands
Angela Allen/Wildlands
Daniel Taylor/Wildlands

Angela Allen of Wildlands Engineering, Inc. (Wildlands) led the group on a tour of the proposed mitigation site. The purpose of the tour was to present the site to a group of NCIRT members and to get input into the management/mitigation options implemented at the site. During the tour, the group openly discussed the condition of the stream channels on the site and the design options and crediting scenarios they felt would be most appropriate to restore, enhance, and preserve the channels. The accompanying map identifies the stream reach names.

#### <u>T1</u>

The group agreed with the approaches and ratios along T1 presented in the technical proposal. The group noted a small channel along the left bank of T1 entering into Reach 3 that may be jurisdictional. This channel would be filled with its flow routed into T1 as it is moved to the center of the valley. The feature will need to be delineated and accounted for with the permitting of this project. It was also noted that flow should be monitored along T1 during the course of the project with a transducer placed half way down the reach. Documenting hoof shear and livestock presence in T1-R3 was recommended.

#### T1A

It was recommended that the start of the jurisdictional feature T1A be moved about half way down the reach shown in the proposal to the point where several seeps joined together at a headcut. This will be surveyed and adjusted at the mitigation plan stage. The IRT agreed that 2.5:1 was an appropriate ratio for this enhancement 2 reach.

#### Sassarixa Swamp

The group agreed with the approach of E2 for Sassarixa Creek and the proposed credit ratio. They noted care should be taken in the design of the internal crossing to prevent livestock access into the easement area. As this is an anabranching system, it was agreed that the easement width should extend a minimum of 50 feet past the outermost channel. This would include most or all of the width of the valley floor. Early treatment to control privet was recommended on this reach, since once livestock are fenced out it will grow faster.

#### <u>T2</u>

The group agreed with the approach and credit ratio for T2, however, they noted that there may be significant challenges presented with the existing pond. It was agreed the pond is feed by a seep, but that the existing pond is quite deep and could present a construction issue. The group requested information on how water is routed through the pond at the mitigation plan stage.

#### T3

The group discussed and agreed that restoration and the proposed credit ratio was appropriate for R1, R2, and R3. The small E2 reach of R2 is not worth breaking out with another activity and more good could be done for the system by continuing a restoration approach.

#### <u>T4</u>

The group agreed with the approach on T4 and felt leaving out the linear wetland area between R1 and R2 was the appropriate call. Several sections of subsurface flow were noted along R3, including a long section at the top of the reach. The IRT requested a quantification of the percentage of the system where flow is subsurface (subsurface reaches greater than 30ft in length). This will be used to determine if crediting of the reach needs to be altered (according to stream length). It was noted that these subsurface areas may have been the result of excessive sediment deposition during hurricane Mathew and that the stream could cut through them over time. Continued documentation of stream conditions through the life of the project is recommended. The proposed credit ratio of 10:1 for preservation was agreed upon.

#### T5A-B-C

The group discussed crediting of the E2 reaches above the existing pond. It was agreed that since the entire floodplain width was being protected including numerous wetland seep areas where no wetland credit is being requested, and that since these are the headwaters to reach T5, that the ratio of 2.5:1 is acceptable for the reaches. The design of T5A will include a channel connection at the downstream end where the livestock trampling has caused sheet flow. The group agreed that T5C will be credited according to the headwater stream guidance with credit given for valley length.

#### <u>T5</u>

Reach 3 (slated as E2) was relatively stable, and the group agreed that the credit ratio may require adjusting to 3:1 or 4:1. They requested documentation of the proportion of the buffer area that will be planted, and continued documentation of existing conditions. The group commented that the length of R2 attributed to restoration will depend on a further examination of existing conditions to determine the level of incision and need for restoration as opposed to E2, specifically towards the downstream end of the reach. This will be evaluated at the mitigation plan phase of the project.

No comments were given by the group. Credit ratios were agreed upon.

#### **Summary**

The NCIRT generally agreed upon approaches presented in the proposal, with the exception of changing T3-R2 from E2 to Restoration and potentially reducing the length of restoration in T5-R2 based on design level data. The starting point of stream T1A will be adjusted to the confluence of several seeps. The percentage of subsurface flow on T4-R3 will be evaluated and information provided to the NCIRT. This may or may not affect overall credits on this reach. Crediting for T5C will be according to the headwater stream guidance. Crediting ratios on the E2 reach of T5-R3 may be adjusted to 3:1 or 4:1 based on information provided in the mitigation plan (e.g. proportion of new buffer planted along reach).

All intermittent streams will include flow monitoring at the midpoint of the reach and impact of livestock on site will continue to be monitored.

#### Contacts

Jeff Schaffer will serve as the Project Manager for NCDMS and the main point of contact. Angela Allen will be the Wildlands Project Manager and coordinate/submit project deliverables directly to Jeff Schaffer for distribution to all NCIRT team members.

#### Action Items and Next Steps

- Project Schedule Wildlands is ready to proceed immediately with the Task 1 deliverable (Categorical Exclusion) and does not anticipate project delays.
- After the jurisdictional determination has been conducted, any wetland areas that will be impacted by the proposed work (filled or drained) will need to be identified and functional replacement for those losses should be proposed and discussed in the draft mitigation plan.
- USACE requires Jurisdictional (JD) stream/wetland calls for the project. Wildlands will coordinate with USACE for on-site JD verification prior to mitigation plan submittal.
- Wildlands will provide NCIRT with requested data discussed in the Summary during the mitigation plan phase of the project.

This represents Wildlands' interpretation of the meeting discussions. If any meeting attendees should find any information contained in these meeting minutes to be in error and/or incomplete based on individual comments or conversations, please notify Angela Allen with corrections/additions as soon as possible.

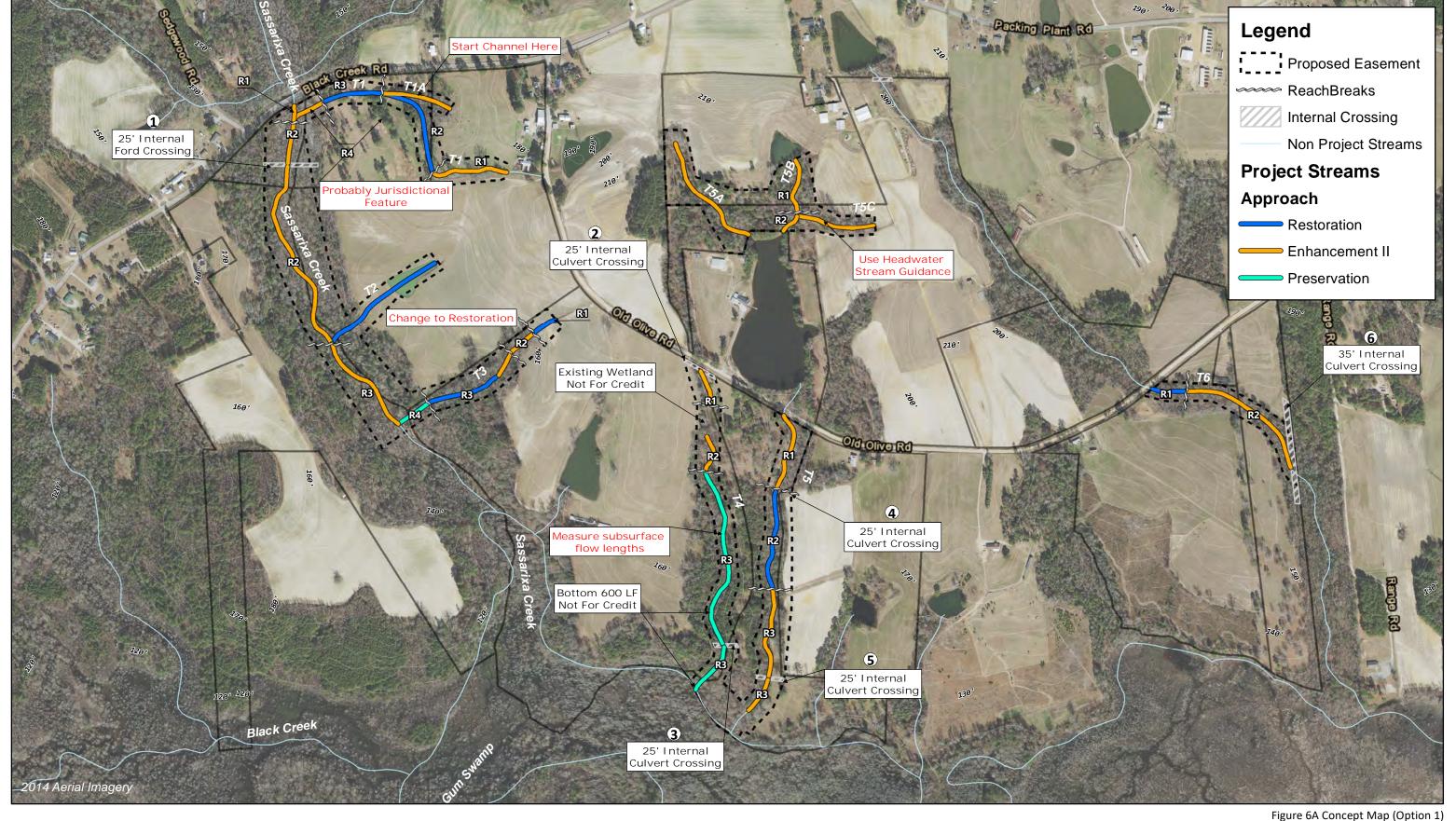
Sincerely,

Angela Allen

aallen@wildlandseng.com

af Maller

919.851.9986 x 106





Sassarixa Swamp Mitigation Site Neuse River Basin 03020201

# Appendix 6 Approved FHWA Categorical Exclusion Form

# Categorical Exclusion Form for Ecosystem Enhancement Program 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:	Sassartxa Swamp Mitigation Site		
County Name:	Johnston County		
EEP Number:	100040		
Project Sponsor:	Wildlands Engineering, Inc.		
Project Contact Name:	Carolyn Lanza		
Project Contact Address:	312 W. Millibrook, Suite 225, Raleigh NC 27609		
Project Contact E-mail:	clanza@wiidlandsang.com		
EEP Project Manager:	Jeff Schaffer		
Project Description			
area for agriculture (specifically livestock unnamed tributaries. Four flowing into Sa	a stream mitigation project located approximately 6 miles southwest of in Johnston County. A single family has owned and operated the projected a production) since 1850. The project includes Sassarixa Creek and ten assarixa Creek and six flowing into Black Creek for a total of 15,581 linear tream mitigation units to the Division of Mitigation Services in the Neuse		
The Part of the Pa	For Official Use Only		
Reviewed By:	For Official Use Only		
Date  Conditional Approved By:	EEP Project Manager  For Division Administrator		
	FHWA		
Check this box if there are outstanding issues			
Final Approval By:			
4-19-18	- Della for		
Date	For Division Administrator FHWA		
	Table 1 April		
=			

Part 2: All Projects		
Regulation/Question	Response	
Coastal Zone Management Act (CZMA)		
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 (C	ERCLA)	
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 (Un	iform 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	
<ul> <li>4. Has the owner of the property been informed:</li> <li>* prior to making an offer that the agency does not have condemnation authority; and</li> <li>* what the fair market value is believed to be?</li> </ul>	☑ 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?			
	☐ No		
	✓ N/A ☐ Yes		
3. Is the project listed on, or eligible for listing on, the National Register of Historic			
Places?	□ No		
A library than effects of the markers and the effects of the large markers and the effects of th	✓ N/A		
4. Have the effects of the project on this site been considered?	Yes		
	I No ✓ N/A		
Antiquities Act (AA)	V IN/A		
1. Is the project located on Federal lands?	∏Yes		
1. Is the project located on rederal lands:	∏ No		
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects	☐ Yes		
of antiquity?	∏ No		
	I 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		
O Will the second of the form of the land	✓ 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)			
Are federal Threatened and Endangered species and/or Designated Critical Habitat	✓ Yes		
listed for the county?	☐ 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		
Habitat?	✓ No   □ N/A		
4. Is the project "likely to adversely affect" the species and/or "likely to adversely modify"	Yes		
Designated Critical Habitat?	☑ res		
	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?			
	☐ No ☑ N/A		
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	│		
	✓ N/A		
Farmland Protection Policy Act (FPPA)			
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)	LI IN/A		
	✓ Yes		
Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	□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		
	I No ✓ N/A		
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish	1 Habitat)		
1. Is the project located in an estuarine system?	☐ Yes ✓ No		
2. Is suitable habitat present for EFH-protected species?	Yes		
	│		
3. Is sufficient design information available to make a determination of the effect of the	Yes		
project on EFH?	∐ No ☑ N/A		
4. Will the project adversely affect EFH?	│		
	☑ N/A		
5. Has consultation with NOAA-Fisheries occurred?	Yes		
	│		
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	Yes		
federal agency?	□ No ☑ N/A		

## Sassarixa Swamp Mitigation Site Categorical Exclusion SUMMARY

#### Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) provides a Federal "Superfund" to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment.

As the Sassarixa Swamp Mitigation Site is a full-delivery project; an EDR Radius Map Report with Geocheck was ordered for the site through Environmental Data Resources, Inc on January 29, 2018. Neither the target property nor the adjacent properties were listed in any of the Federal, State, or Tribal environmental databases searched by the EDR. The assessment revealed no evidence of any "recognized environmental conditions" in connection with the target property. The Executive Summary of the EDR report is included in the Appendix. The full report is available if needed.

#### **National Historic Preservation Act (Section 106)**

The National Historic Preservation Act declares a national policy of historic preservation to protect, rehabilitate, restore, and reuse districts, sites, buildings, structures, and objects significant in American architecture, history, archaeology, and culture, and Section 106 mandates that federal agencies take into account the effect of an undertaking on a property that is included in, or is eligible for inclusion in, the National Register of Historic Places.

Wildlands Engineering, Inc. (Wildlands) requested review and comment from the State Historic Preservation Office (SHPO) with respect to any archeological and architectural resources related to the Sassarixa Swamp Mitigation Site on February 2, 2018. SHPO responded on February 28, 2018 and stated they were aware of "no historic resources which would be affected by the project" and would have no further comment. All correspondence related to Section 106 is included in the Appendix.

#### Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)

These acts, collectively known as the Uniform Act, provide for uniform and equitable treatment of persons displaced from their homes, businesses, non-profit associations, or farms by federal and federally-assisted programs, and establish uniform and equitable land acquisition policies.

Sassarixa Swamp Mitigation Site is a full-delivery project that includes land acquisition. Notification of the fair market value of the project property and the lack of condemnation authority by Wildlands was included in the signed Option Agreements for the project property. Copies of the relevant section of the Option Agreements is included in the Appendix.

#### **Endangered Species Act (ESA)**

Section 7 of the ESA requires federal agencies, in consultation with and with the assistance of the Secretary of the Interior or of Commerce, as appropriate, to ensure that actions they authorize, fund or carry out are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat for these species.

The Johnston County listed endangered species includes the red-cockaded woodpecker (*Picoides borealis*), dwarf wedgemussel (*Alasmidonta heterodon*), Tar River spinymussel (*Parvaspina steinstansana*), yellow lance (*Elliptio lanceolata*) and Michaux's sumac (*Rhus michauxii*).

A pedestrian survey conducted on April 10, 2018, indicated that the Site did not provide suitable habitat for the red-cockaded woodpecker and yellow lance. The pedestrian did indicate that the site provides suitable habitat for the dwarf wedgemussel, Tar River spinymussel, and Michaux's sumac but no species were identified on the site. Therefore, due to the absence of the listed species on the site, the project has been determined by Wildlands to "may affect, but not likely to adversely affect" the dwarf

wedgemussel and Tar River spinymussel, and to have "no effect" on the Michaux's sumac. The project will have "no effect" on the red-cockaded woodpecker and yellow lance due to the absence of suitable habitat.

Wildlands requested review and comment from the United States Fish and Wildlife Service (USFWS) on February 5, 2018 in respect to the Sassarixa Swamp Mitigation Site and its potential impacts on threatened or endangered species. USFWS responded on March 2, 2018 commenting "that the proposed action is not likely to adversely affect any federally-listed endangered or threatened species, their formally designated critical habitat, or species currently proposed for listing under the Act at these sites". A follow up email was sent to USFWs on April 6, 2018 regarding the new addition of the yellow lance on April 4, 2018 to Johnston County's endangered species list. USFWS responded on April 9, 2018 with no additional objection. All documents and correspondence submitted to the USFWS are included in the Appendix.

#### **Farmland Protection Policy Act (FPPA)**

The FPPA requires that, before taking or approving any federal action that would result in conversion of farmland, the agency must examine the effects of the action using the criteria set forth in the FPPA, and, if there are adverse effects, must consider alternatives to lessen them.

The Sassarixa Swamp Mitigation Site includes the conversion of prime farmland. As such, Form AD-1006 has been completed and submitted to the Natural Resources Conservation Service (NRCS). The completed form and correspondence documenting its submittal is included in the Appendix.

#### Fish and Wildlife Coordination Act (FWCA)

The FWCA requires consultation with the USFWS and the appropriate state wildlife agency on projects that alter or modify a water body. Reports and recommendations prepared by these agencies document project effects on wildlife and identify measures that may be adopted to prevent loss or damage to wildlife resources.

The Sassarixa Swamp Mitigation Site includes stream restoration. Wildlands requested comment on the project from both the USFWS and the North Carolina Wildlife Resources Commission (NCWRC) on February 5, 2018. NCWRC responded on March 21, 2018 and had no objections to the project. USFWS responded on March 2, 2018 and had no objections to the project. All correspondence with the two agencies is included in the Appendix.

#### Migratory Bird Treaty Act (MBTA)

The MBTA makes it unlawful for anyone to kill, capture, collect, possess, buy, sell, trade, ship, import, or export any migratory bird. The indirect killing of birds by destroying their nests and eggs is covered by the MBTA, so construction in nesting areas during nesting seasons can constitute a taking.

Wildlands requested comment on the Sassarixa Swamp Mitigation Site from the USFWS regarding migratory birds on February 5, 2018. The USFWS responded on March 2, 2018 but had no comment regarding migratory birds. All correspondence with USFWS is included in the Appendix.

# Sassarixa Swamp Mitigation Site Categorical Exclusion APPENDIX

Sassarixa Swamp 274-420 Old Olive Rd Smithfield, NC 27577

Inquiry Number: 5170847.2s

January 29, 2018

## The EDR Radius Map™ Report with GeoCheck®



6 Armstrong Road, 4th floor Shelton, CT 06484 Toll Free: 800.352.0050 www.edrnet.com

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Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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#### **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**

274-420 OLD OLIVE RD SMITHFIELD, NC 27577

#### **COORDINATES**

Latitude (North): 35.4734440 - 35° 28' 24.39" Longitude (West): 78.4370220 - 78° 26' 13.27"

Universal Tranverse Mercator: Zone 17 UTM X (Meters): 732551.9 UTM Y (Meters): 3928369.0

Elevation: 167 ft. above sea level

#### USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map: 5948588 FOUR OAKS, NC

Version Date: 2013

#### AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from: 20140611 Source: USDA

#### MAPPED SITES SUMMARY

Target Property Address: 274-420 OLD OLIVE RD SMITHFIELD, NC 27577

Click on Map ID to see full detail.

MAP RELATIVE DIST (ft. & mi.)

1D SITE NAME ADDRESS DATABASE ACRONYMS ELEVATION 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

#### 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-CESQG......RCRA - Conditionally Exempt Small Quantity Generator

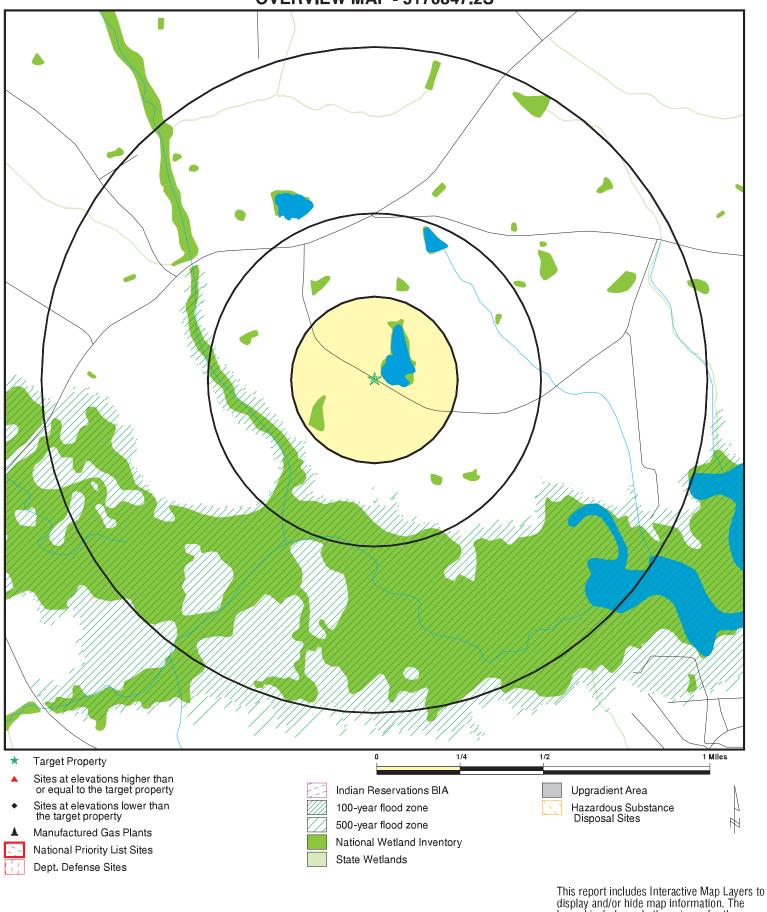
#### Federal institutional controls / engineering controls registries

LUCIS...... Land Use Control Information System US ENG CONTROLS...... Engineering Controls Sites List

## **EXECUTIVE SUMMARY**

There were no unmapped sites in this report.

#### **OVERVIEW MAP - 5170847.2S**



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: Sassarixa Swamp

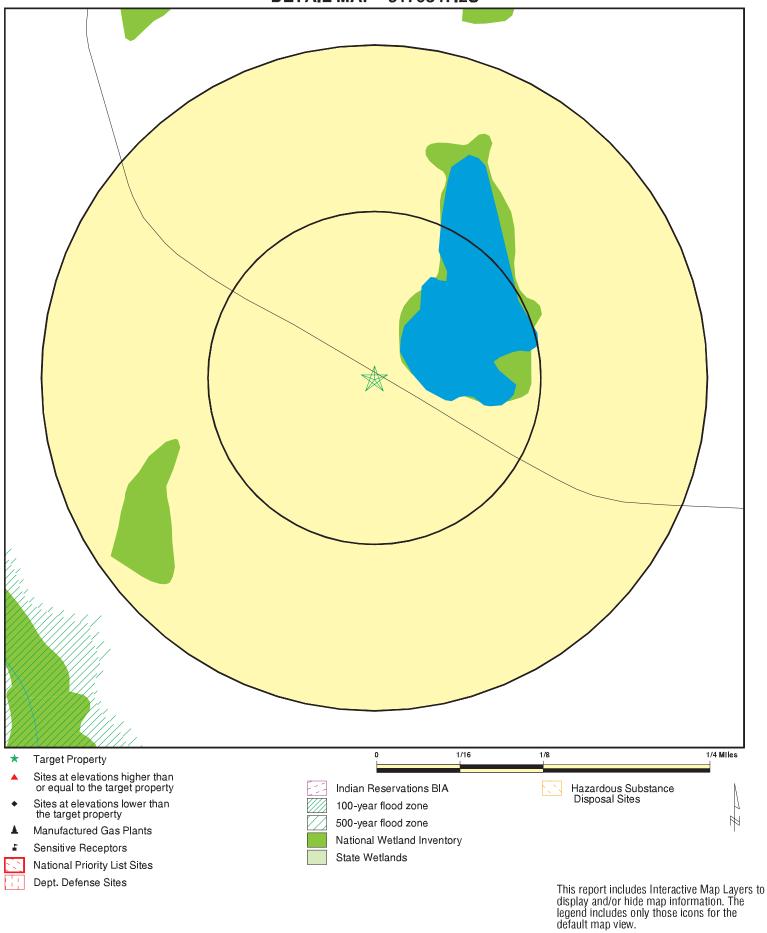
ADDRESS: 274-420 Old Olive Rd
Smithfield NC 27577

LAT/LONG: 35.473444 / 78.437022

CLIENT: Wildlands Eng, Inc.
CONTACT: Carolyn Lanza
INQUIRY #: 5170847.2s
DATE: January 29, 2018 1:19 pm

Copyright © 2018 EDR, Inc. © 2015 TomTom Rel. 2015.

#### **DETAIL MAP - 5170847.2S**



SITE NAME:

ADDRESS:

LAT/LONG:

Sassarixa Swamp

274-420 Old Olive Rd

Smithfield NC 27577

35.473444 / 78.437022

January 29, 2018 1:20 pm

Copyright © 2018 EDR, Inc. © 2015 TomTom Rel. 2015.

Wildlands Eng, Inc.

Carolyn Lanza

CLIENT: CONTACT:

DATE:

INQUIRY#: 5170847.2s

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted	
STANDARD ENVIRONMENTAL RECORDS									
Federal NPL site list									
NPL Proposed NPL NPL LIENS	1.000 1.000 TP		0 0 NR	0 0 NR	0 0 NR	0 0 NR	NR NR NR	0 0 0	
Federal Delisted NPL site	e list								
Delisted NPL	1.000		0	0	0	0	NR	0	
Federal CERCLIS list									
FEDERAL FACILITY SEMS	0.500 0.500		0 0	0 0	0 0	NR NR	NR NR	0 0	
Federal CERCLIS NFRAF	site list								
SEMS-ARCHIVE	0.500		0	0	0	NR	NR	0	
Federal RCRA CORRAC	TS facilities li	st							
CORRACTS	1.000		0	0	0	0	NR	0	
Federal RCRA non-CORI	RACTS TSD f	acilities list							
RCRA-TSDF	0.500		0	0	0	NR	NR	0	
Federal RCRA generator	s list								
RCRA-LQG RCRA-SQG RCRA-CESQG	0.250 0.250 0.250		0 0 0	0 0 0	NR NR NR	NR NR NR	NR NR NR	0 0 0	
Federal institutional con engineering controls reg									
LUCIS US ENG CONTROLS US INST CONTROL	0.500 0.500 0.500		0 0 0	0 0 0	0 0 0	NR NR NR	NR NR NR	0 0 0	
Federal ERNS list									
ERNS	TP		NR	NR	NR	NR	NR	0	
State- and tribal - equiva	lent NPL								
NC HSDS	1.000		0	0	0	0	NR	0	
State- and tribal - equiva	lent CERCLIS	3							
SHWS	1.000		0	0	0	0	NR	0	
State and tribal landfill a solid waste disposal site									
SWF/LF OLI	0.500 0.500		0 0	0 0	0 0	NR NR	NR NR	0 0	
State and tribal leaking s	storage tank l	ists							
LAST	0.500		0	0	0	NR	NR	0	

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
LUST INDIAN LUST LUST TRUST	0.500 0.500 0.500		0 0 0	0 0 0	0 0 0	NR NR NR	NR NR NR	0 0 0
State and tribal registere	d storage tar	nk lists						
FEMA UST UST AST INDIAN UST	0.250 0.250 0.250 0.250		0 0 0	0 0 0 0	NR NR NR NR	NR NR NR NR	NR NR NR NR	0 0 0
State and tribal institution control / engineering con		s						
INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary	cleanup site	es						
VCP INDIAN VCP	0.500 0.500		0 0	0 0	0 0	NR NR	NR NR	0 0
State and tribal Brownfie	lds sites							
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMEN	TAL RECORDS	<u>s</u>						
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / S Waste Disposal Sites	olid							
SWRCY HIST LF INDIAN ODI ODI DEBRIS REGION 9 IHS OPEN DUMPS	0.500 0.500 0.500 0.500 0.500 0.500		0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	NR NR NR NR NR	NR NR NR NR NR	0 0 0 0 0
Local Lists of Hazardous Contaminated Sites	waste /							
US HIST CDL US CDL	TP TP		NR NR	NR NR	NR NR	NR NR	NR NR	0 0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
Records of Emergency R	elease Repo	rts						
HMIRS SPILLS IMD SPILLS 90 SPILLS 80	TP TP 0.500 TP TP		NR NR 0 NR NR	NR NR 0 NR NR	NR NR 0 NR NR	NR NR NR NR NR	NR NR NR NR NR	0 0 0 0
Other Ascertainable Reco	ords							
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
FUDS DOD SCRD DRYCLEANERS US FIN ASSUR EPA WATCH LIST 2020 COR ACTION TSCA TRIS SSTS ROD RMP RAATS PRP PADS ICIS FTTS MLTS COAL ASH DOE COAL ASH EPA PCB TRANSFORMER RADINFO HIST FTTS DOT OPS CONSENT INDIAN RESERV FUSRAP UMTRA LEAD SMELTERS US AIRS US MINES ABANDONED MINES FINDS UXO DOCKET HWC ECHO FUELS PROGRAM COAL ASH DRYCLEANERS Financial Assurance NPDES UIC	1.000 1.000 0.500 TP TP 0.250 TP TP 1.000 TP TP TP TP TP TP TP TP TP TP TP TP TP		000 RR 0 RR R 0 R R R R R R R R R R R R	0 0 0 RR 0 RR 0 R R R R R R R R R R O O O O	0 0 0 RR RR R O R R R R R R R R R O O O O	0 0 R R R R R R O R R R R R R R R R R R	$\begin{array}{c} R & R & R & R & R & R & R & R & R & R $	000000000000000000000000000000000000000
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records  EDR MGP  EDR Hist Auto  EDR Hist Cleaner  EDR RECOVERED GOVERN	1.000 0.125 0.125 <b>MENT ARCHIV</b>	/ES	0 0 0	0 NR NR	0 NR NR	0 NR NR	NR NR NR	0 0 0
Exclusive Recovered Gov	vt. Archives	_						
RGA HWS	TP		NR	NR	NR	NR	NR	0

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
RGA LF RGA LUST	TP TP		NR NR	NR NR	NR NR	NR NR	NR NR	0
- Totals		0	0	0	0	0	0	0

#### NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

Map ID		MAP FINDINGS		
Direction		4		
Distance				EDR ID Number
Elevation	Site		Database(s)	EPA ID Number

NO SITES FOUND

Zip Database(s)	
ΙİΖ	
Site Address	
Site Name	
EDR ID	
ity ED	
Ö	l

ORPHAN SUMMARY

Count: 0 records.



February 2, 2018

Renee Gledhill-Earley State Historic Preservation Office 4617 Mail Service Center Raleigh, NC 27699-4617

Subject: Sassarixa Swamp Mitigation Site

Johnston County, North Carolina

Dear Ms. Gledhill-Earley,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the Sassarixa Swamp Mitigation Site. A Site Map and USGS Topographic Map with approximate project areas are enclosed. The topographic figure was prepared from the Four Oaks, 7.5-Minute USGS Topographic Quadrangles.

The Sassarixa Swamp Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The project will include stream restoration on Sassarixa Creek and four unnamed tributaries to Sassarixa Creek, along with six unnamed tributaries to Black Creek all which flow into Holts Lake. The site has historically been disturbed due to livestock use. There are no existing structures within the project area. Furthermore, no archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes.

We ask that you review this site based on the attached information to determine the presence of any historic properties.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the project.

Sincerely,

Carolyn Lanza

**Environmental Scientist** 

Carolyn Lanza

Attachment:

Figure 1 Site Map

Figure 2 USGS Topographic Map



## 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

February 28, 2017

Carolyn Lanza Wildlands Engineering 1430 South Mint Street, Suite 104 Charlotte, NC 28203

Re: Sassarixa Swamp Mitigation Site, Johnston County, ER 18-0279

Dear Ms. Lanza:

Thank you for your email of February 2, 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 <a href="mailto:environmental.review@ncdcr.gov">environmental.review@ncdcr.gov</a>. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

✓ Ramona M. Bartos

Rence Bledhill-Earley

Buyer's obligations under this agreement. Seller hereby releases Buyer from any obligations under this agreement arising after the effective date of any assignment of this agreement by Buyer.

- 4.7 Value of Mitigation Property; No Power of Eminent Domain. In accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Buyer hereby notifies Seller that: (i) Buyer believes that the fair market value of the Mitigation Values of the Mitigation Property is an amount equal to the Purchase Price; and (ii) Buyer does not have the power of eminent domain.
- 4.8 **Entire Agreement**. Each party acknowledges they are not relying on any statements made by the other party, other than in this agreement, regarding the subject matter of this agreement. Neither party will have a basis for bringing any claim for fraud in connection with any such statements.
- 4.9 **Additional Documents**. Before and after Closing, each party shall sign and deliver documents as needed and as requested by the other party to carry out the purpose of this agreement. This section survives Closing.
- 4.10 **Dispute Resolution**. In the event of any dispute, claim, question or disagreement arising out of or relating to this agreement, either party may invoke the Dispute Resolution provision of this section by notifying the other party in writing of the matter in dispute and of the party's intention to resolve the dispute under this section. The parties shall then attempt to resolve the dispute informally for a period of 15 calendar days from the date of the notice. The period of informal negotiations may be extended 15 calendar days by written agreement of the parties to the dispute. If the parties are unable to resolve the dispute through informal negotiation, any party may invoke formal dispute resolution through mediation. The parties will agree to mediate all disputes in good faith and shall agree on a North Carolina Superior Court Certified Mediator to mediate the dispute. The mediation process must commence within 60 days of the selection of a mediator and the costs of mediation shall be borne equally by both parties. If mediation fails to resolve the dispute between the parties, either party may seek judicial resolution of the dispute in a North Carolina Court.
- 4.11 Attorneys' Fees. If either party commences an action against the other to interpret or enforce any of the terms of this agreement or because of the breach by the other party of any of the terms of this agreement, the losing party shall pay to the prevailing party reasonable attorneys' fees, expenses, court costs, litigation costs and any other expenses incurred in connection with the prosecution or defense of such action, whether or not the action is prosecuted to a final judgment.
- 4.12 **Memorandum**. Concurrently with the signing of this agreement, Buyer and Seller agree to sign a Memorandum of Option which will be recorded against the Property in the Register of Deeds of the County stated in paragraph A within five business days after the Effective Date.
- 4.13 **Landowner Authorization**. Concurrently with the signing of this agreement, Seller agrees to sign the Landowner Authorization Form.
- 4.14 **Tax Deferred Exchange**. If Seller desires to effect a tax-deferred exchange (the "Exchange") in connection with Buyer's purchase of the Conservation Easement, the parties agree to cooperate in effecting the Exchange. Seller is responsible for all additional costs associated with the

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specific performance. Nothing stated in this section 4.3.2 precludes any action under any indemnification or defense provision in this agreement, nor for the award of attorney's fees and costs in conjunction with any action relating to this agreement.

- 3.3 **Brokers**. Buyer employs three North Carolina licensed real estate brokers, none of which have received a commission or finder's fee in connection with this agreement. Buyer has not employed a broker or finder or incurred any liability for any brokerage fee, commission or finder's fee in connection with this agreement.
- 3.4 **Notice.** All notices required by this agreement shall be in writing, shall be given only in accordance with the provisions of this Section, shall be addressed to the Parties in the manner stated below, and shall be conclusively deemed properly delivered: (a) upon receipt when hand delivered during normal business hours; (b) upon the day of delivery if the notice has been deposited in an authorized receptacle of the United States Postal Service as first-class, registered or certified mail, postage prepaid, with a return receipt requested; (c) one business day after the notice has been deposited with either FedEx or United Parcel Service to be delivered by overnight delivery; or (d) if sent by email, upon receipt of an acknowledgement email sent to the sender's email address in which the party receiving the email notice acknowledges having received that email. An automatic "read receipt" is not acknowledgement for purposes of this section 4.5. The addresses of the parties to receive notices are as follows:

Seller: Hunter Olive

Buyer:

Central Marketing Inc.

P.O. Box 148

Smithfield, NC 27577

Email:

Wildlands Engineering, Inc.

1430 S. Mint Street, Suite 104

Charlotte, NC 28203

Attention: Shawn Wilkerson swikerson@wildlandseng.com

- 3.5 **Assignment**. Buyer has the right to assign this agreement without the consent of Seller. No assignment shall be effective unless the assignee has delivered to Seller a written assumption of Buyer's obligations under this agreement. Seller hereby releases Buyer from any obligations under this agreement arising after the effective date of any assignment of this agreement by Buyer.
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Buyer\_W

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## Attention: Shawn Wilkerson swikerson@wildlandseng.com

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#### swikerson@wildlandseng.com

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eller Jane

seller / W Buyer

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Seller:

Tami Olive Thompson

Lazy O Farm

3583 Packing Plant Road Smithfield, NC 27577

Buyer:

Wildlands Engineering, Inc. 1430 S. Mint Street, Suite 104

Charlotte, NC 28203

Attention: Shawn Wilkerson swikerson@wildlandseng.com

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Seller Seller

Buyer



February 5, 2018

Emily Wells US Fish and Wildlife Service P.O. Box 33726 Raleigh, North Carolina 27636-3726

**Subject:** Sassarixa Swamp Mitigation Site

Johnston County, North Carolina

Dear Ms. Wells,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to endangered species, migratory birds, or other trust resources associated with the proposed Sassarixa Swamp Mitigation Site. A USGS Topographic Map and an Overview Site Map showing the approximate project area are enclosed. The topographic figure was prepared from the Four Oaks, 7.5-Minute USGS Topographic Quadrangles.

The Sassarixa Swamp Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The project will include stream restoration on Sassarixa Creek and four unnamed tributaries to Sassarixa Creek, along with six unnamed tributaries to Black Creek all which flow into Holts Lake. The site has historically been disturbed due to livestock use.

According to your website (https://www.fws.gov/raleigh/species/cntylist/johnston.html) the threatened or endangered species for Johnston County are: the red-cockaded woodpecker (*Picoides borealis*), dwarf wedgemussel (*Alasmidonta heterodon*), Tar River spinymussel (*Parvaspina steinstansana*) and Michaux's sumac (*Rhus michauxii*). If we have not heard from you in 30 days, we will assume that you do not have any comments regarding associated laws and that you do not have any information relevant to this project at the current time.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

Carolyn Lanza

**Environmental Scientist** 

Carolyn Lanza

Attachment:

Figure 1 USGS Topographic Map

Figure 2 Site Map



## United States Department of the Interior

#### FISH AND WILDLIFE SERVICE

Raleigh ES Field Office Post Office Box 33726 Raleigh, North Carolina 27636-3726

March 2, 2018

Ms. Carolyn Lanza Wildlands Engineering, Inc. 1430 South Mint Street, Suite 104 Charlotte, NC 28203

Re: Sassarixa Swamp Mitigation Site-Johnston County, NC

#### Dear Ms. Lanza:

This letter is to inform you that the Service has established an on-line project planning and consultation process which assists developers and consultants in determining whether a federally-listed species or designated critical habitat may be affected by a proposed project. For future projects, please visit the Raleigh Field Office's project planning website at <a href="https://www.fws.gov/raleigh/pp.html">https://www.fws.gov/raleigh/pp.html</a>. If you are only searching for a list of species that may be present in the project's Action Area, then you may use the Service's Information, Planning, and Consultation System (IPaC) website to determine if any listed, proposed, or candidate species may be present in the Action Area and generate a species list. The IPaC website may be viewed at <a href="https://ecos.fws.gov/ipac/">https://ecos.fws.gov/ipac/</a>. The IPaC web site contains a complete and frequently updated list of all endangered and threatened species protected by the provisions of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)(Act), a list of federal species of concern that are known to occur in each county in North Carolina, and other resources.

Section 7 of the Act requires that all federal agencies (or their designated non-federal representative), in consultation with the Service, insure that any action federally authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species. A biological assessment or evaluation may be prepared to fulfill that requirement and in determining whether additional consultation with the Service is necessary. In addition to the federally-protected species list, information on the species' life histories and habitats and information on completing a biological assessment or

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<sup>&</sup>lt;sup>1</sup> The term "federal species of concern" refers to those species which the Service believes might be in need of concentrated conservation actions. Federal species of concern receive no legal protection and their designation does not necessarily imply that the species will eventually be proposed for listing as a federally endangered or threatened species. However, we recommend that all practicable measures be taken to avoid or minimize adverse impacts to federal species of concern.

evaluation and can be found on our web page at http://www.fws.gov/raleigh. Please check the web site often for updated information or changes.

If your project contains suitable habitat for any of the federally-listed species known to be present within the county where your project occurs, the proposed action has the potential to adversely affect those species. As such, we recommend that surveys be conducted to determine the species' presence or absence within the project area. The use of North Carolina Natural Heritage program data should not be substituted for actual field surveys.

If you determine that the proposed action may affect (i.e., likely to adversely affect or not likely to adversely affect) a federally-protected species, you should notify this office with your determination, the results of your surveys, survey methodologies, and an analysis of the effects of the action on listed species, including consideration of direct, indirect, and cumulative effects, before conducting any activities that might affect the species. If you determine that the proposed action will have no effect (i.e., no beneficial or adverse, direct or indirect effect) on federally listed species, then you are not required to contact our office for concurrence (unless an Environmental Impact Statement is prepared). However, you should maintain a complete record of the assessment, including steps leading to your determination of effect, the qualified personnel conducting the assessment, habitat conditions, site photographs, and any other related articles.

With regard to the above-referenced project, we offer the following remarks. Our comments are submitted pursuant to, and in accordance with, provisions of the Endangered Species Act.

Based on the information provided and other information available, it appears that the proposed action is not likely to adversely affect any federally-listed endangered or threatened species, their formally designated critical habitat, or species currently proposed for listing under the Act at these sites. We believe that the requirements of section 7(a)(2) of the Act have been satisfied for your project. Please remember that obligations under section 7 consultation must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner that was not considered in this review; or, (3) a new species is listed or critical habitat determined that may be affected by the identified action.

However, the Service is concerned that restoring stream reaches that flow into a pond may not be appropriate. T5A-C appears to flow into a pond that isn't proposed to be drained and restored, so the benefit of restoring these features may be lost once the water enters the pond.

The Service may also have concerns about the potential impacts the proposed action might have on aquatic species in general. Aquatic resources are highly susceptible to sedimentation. Therefore, we recommend that all practicable measures be taken to avoid adverse impacts to aquatic species, including implementing directional boring methods and stringent sediment and erosion control measures. An erosion and sedimentation control plan should be submitted to and approved by the North Carolina Division of Land Resources, Land Quality Section prior to construction. Erosion and sedimentation controls should be installed and maintained between the construction site and any nearby down-gradient surface waters. In addition, we recommend maintaining natural, vegetated buffers on all streams and creeks adjacent to the project site.

The North Carolina Wildlife Resources Commission has developed a Guidance Memorandum (a copy can be found on our website at (http://www.fws.gov/raleigh) to address and mitigate secondary and cumulative impacts to aquatic and terrestrial wildlife resources and water quality. We recommend that you consider this document in the development of your projects and in completing an initiation package for consultation (if necessary).

We hope you find our web page useful and informative and that following the process described above will reduce the time required, and eliminate the need, for general correspondence for species' lists. If you have any questions or comments, please contact Emily Wells of this office at (919) 856-4520 ext. 25.

Sincerely,

Pete Benjamin

From: Carolyn Lanza
To: "Wells, Emily"

**Subject:** RE: [EXTERNAL] yellow lance (Elliptio lanceolata)

**Date:** Monday, April 9, 2018 11:19:00 AM

Hi Emily,

Yes, Sassarixa Swamp is in Johnston County. I was mixing it up with the Catfish Pond Mitigation Site in Durham County, which does not have yellow lance.

Thank you,

Carolyn

**Carolyn Lanza** | *Environmental Scientist* **O**: 919.851.9986 x113 **M**: 313.969.7318

#### Wildlands Engineering, Inc.

312 West Millbrook Road, Suite 225 Raleigh, NC 27609

From: Wells, Emily <emily\_wells@fws.gov> Sent: Monday, April 9, 2018 11:11 AM

To: Carolyn Lanza <clanza@wildlandseng.com>

**Subject:** Re: [EXTERNAL] yellow lance (Elliptio lanceolata)

Hi Carolyn,

Isn't Sassarixa Swamp in Johnston County? Yellow Lance is known to be in Neuse system in Johnston County, but not in the area that this project is located. In addition, the onsite work for this project would not be in potential suitable habitat for the species, so the comment letter would not need to be changed.

Thank you, Emily

On Fri, Apr 6, 2018 at 1:20 PM, Carolyn Lanza < clanza@wildlandseng.com > wrote:

Hi Emily,

As of Tuesday (4/3/18) the yellow lance (*Elliptio lanceolata*) was put on Durham County's T & E list. I received USFWS Response Letter for Sassarixa Swamp on March 2, 2018. How should I go about making this amendment?

Thank you,

#### U.S. Department of Agriculture

## **FARMLAND CONVERSION IMPACT RATING**

PART I (To be completed by Federal Agency)			Date Of Land Evaluation Request 2/13/18				
Name Of Project Sassarixa Swamp Mitigation Si	ite	Federal Agency Involved NC Division of Mitigation Services					
Proposed Land Use Stream Restoration		County And State Johnston County, NC					
PART II (To be completed by NRCS)	Date Requ	est Received By	NRCS 3/12/18				
Does the site contain prime, unique, statewide o	_⊥ mland?	Yes N	lo Acres Irrigate	ed Average Far	m Size		
(If no, the FPPA does not apply do not comple			None	156 acres			
Major Crop(s) CORN	Farmable Land In Go	ovt. Jurisdiction	า	Amount Of F	armland As Defin	ned in FPPA	
	Acres: 390, 735		% 76		379, 107 acres		
Name Of Land Evaluation System Used Johnston county, NC LESA	Name Of Local Site A	Assessment S	ystem		valuation Returne 2018   by eMail		
PART III (To be completed by Federal Agency)					Site Rating		
A. Total Acres To Be Converted Directly			Site A 63.4	Site B	Site C	Site D	
B. Total Acres To Be Converted Indirectly			03.4				
C. Total Acres In Site			63.4	0.0	0.0	0.0	
PART IV (To be completed by NRCS) Land Evalu	ation Information		00.1	0.0	0.0	0.0	
			0.4				
A. Total Acres Prime And Unique Farmland     B. Total Acres Statewide And Local Important F	Earmland		6.1 22.0				
C. Percentage Of Farmland In County Or Local		onverted	0.0				
D. Percentage Of Farmland In Govt. Jurisdiction With			76.6				
PART V (To be completed by NRCS) Land Evalua		ilivo valao					
Relative Value Of Farmland To Be Convert		00 Points)	11	0	0	0	
PART VI (To be completed by Federal Agency) Site Assessment Criteria (These criteria are explained in 7	CFR 658.5(b)	Maximum Points					
1. Area In Nonurban Use		15	15				
2. Perimeter In Nonurban Use		10	10				
Percent Of Site Being Farmed	2	20	20				
4. Protection Provided By State And Local Gov	vernment 2	20	20				
5. Distance From Urban Builtup Area		15	10				
6. Distance To Urban Support Services		15	4				
7. Size Of Present Farm Unit Compared To Av	•	10	5				
8. Creation Of Nonfarmable Farmland		10	10				
9. Availability Of Farm Support Services		5	0				
10. On-Farm Investments		20	0				
11. Effects Of Conversion On Farm Support Ser		10 10					
12. Compatibility With Existing Agricultural Use							
TOTAL SITE ASSESSMENT POINTS		160	94	0	0	0	
PART VII (To be completed by Federal Agency)							
Relative Value Of Farmland (From Part V)		100	11	0	0	0	
Total Site Assessment (From Part VI above or a local site assessment)		160	94	0	0	0	
TOTAL POINTS (Total of above 2 lines)		260	105	0	0	0	
Site Selected: D	ate Of Selection				te Assessment Us	sed? No 🗖	

Reason For Selection:

From: <u>Carolyn Lanza</u>

To: "Cortes, Milton - NRCS, Raleigh, NC"

Subject: RE: Request for AD1006 Form - Sassarixa Swamp Mitigation Site - Johnston County, NC

Date:Tuesday, April 3, 2018 5:00:00 PMAttachments:AD1006 Sassarixa Swamp (003).pdf

image001.png

#### Milton

Attached is the completed AD1006 form for the Sassarixa Swamp Mitigation Site for your files.

Thanks for your help.

**Carolyn Lanza** | *Environmental Scientist* **O**: 919.851.9986 x113 **M**: 313.969.7318

#### Wildlands Engineering, Inc.

312 West Millbrook Road, Suite 225 Raleigh, NC 27609

From: Cortes, Milton - NRCS, Raleigh, NC < Milton.Cortes@nc.usda.gov>

Sent: Monday, March 26, 2018 3:28 PM

**To:** Carolyn Lanza <clanza@wildlandseng.com> **Cc:** Charlie Neaves <cneaves@wildlandseng.com>

Subject: RE: Request for AD1006 Form - Sassarixa Swamp Mitigation Site - Johnston County, NC

**Importance:** High

#### Carolyn:

Please find attached the Farmland Conversion Impact Rating for the Sassarixa Swamp Mitigation Site - Johnston County, NC.

Let us know if we can be of further assistance

#### Cordially;

Milton Cortes
Assistant State Soil Scientist
USDA Natural Resources Conservation Service
4407 Bland Rd, Suite 117
Raleigh, NC 27609
Phone: 919-873-2171

milton.cortes@nc.usda.gov



**From:** Carolyn Lanza [mailto:clanza@wildlandseng.com]

**Sent:** Monday, March 12, 2018 7:32 AM

**To:** Cortes, Milton - NRCS, Raleigh, NC < <u>Milton.Cortes@nc.usda.gov</u>>

**Cc:** Charlie Neaves < cneaves@wildlandseng.com>

Subject: FW: Request for AD1006 Form - Sassarixa Swamp Mitigation Site - Johnston County, NC

#### Milton,

I am following up on my February submittal for Sassarixa Swamp AD1006. We have received comments from other agencies requesting coordinates, so I am including them for the other projects Wildlands has submitted as well.

Sassarixa Swamp: 35.476537, -78.446634 Catfish Pond: 36.162130, -78.907381 McClenny: 35.389648, -78.058428.

Thank you for your assistance and please let me know if you need any additional information.

**Carolyn Lanza** | *Environmental Scientist* **O**: 919.851.9986 x113 **M**: 313.969.7318

#### Wildlands Engineering, Inc.

312 West Millbrook Road, Suite 225 Raleigh, NC 27609

From: Carolyn Lanza

Sent: Tuesday, February 13, 2018 4:36 PM

To: Milton.Cortes@nc.usda.gov

Subject: Request for AD1006 Form - Sassarixa Swamp Mitigation Site - Johnston County, NC

Milton,

I have a request for a completed AD-1006 form for a NCDENR Division of Mitigation Services (DMS) stream restoration project (Sassarixa Swamp Mitigation Site) located in Johnston County. Please find a Soils Map attached in addition to the AD-1006 form with Parts I and III filled out. The soil breakdown is included on the Soils Map.

Thank you for your assistance and please let me know if you need any additional information.

**Carolyn Lanza** | *Environmental Scientist* **0**: 919.851.9986 x113 **M**: 313.969.7318

#### Wildlands Engineering, Inc.

312 West Millbrook Road, Suite 225 Raleigh, NC 27609

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February 5, 2018

Shannon Deaton North Carolina Wildlife Resource Commission Division of Inland Fisheries 1721 Mail Service Center Raleigh, NC 27699

Subject: Sassarixa Swamp Mitigation Site

Johnston County, North Carolina

Dear Ms. Deaton,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to fish and wildlife issues associated with the proposed Sassarixa Swamp Mitigation Site. A USGS Topographic Map and an Overview Site Map showing the approximate project area are enclosed. The topographic figure was prepared from the Four Oaks, 7.5-Minute USGS Topographic Quadrangles.

The Sassarixa Swamp Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The project will include stream restoration on Sassarixa Creek and four unnamed tributaries to Sassarixa Creek, along with six unnamed tributaries to Black Creek all which flow into Holts Lake. The site has historically been disturbed due to livestock use.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

**Carolyn Lanza** 

**Environmental Scientist** 

Carolyn Lanza

Attachment:

Figure 1 USGS Topographic Map

Figure 2 Site Map



# 

Gordon Myers, Executive Director

March 21, 2018

Ms. Carolyn Lanza
Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Subject: Request for Environmental Information for the Sassarixa Swamp Mitigation Project, Johnston

County, North Carolina.

Dear Ms. Lanza,

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) have reviewed the proposed project description. Comments are provided in accordance with certain provisions of the Clean Water Act of 1977 (as amended), 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.).

Wildlands Engineering, Inc. has developed the Sassarixa Swamp Mitigation Project in order to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channels have been identified as significantly degraded. This project will include stream restoration to Sassarixa Creek, four unnamed tributaries to Sassarixa Creek and six unnamed tributaries to Black Creek. The Natural Heritage Natural Area – Holts Lake/Black Creek Swamp – is located directly downstream of the proposed mitigation sites. The project areas are located south of Black Creek Road, along portions of Old Olive Road, north of Four Oaks.

Stream 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. The NCWRC recommends the use of biodegradable and wildlife-friendly sediment and erosion control devices. Silt fencing, fiber rolls and/or other products should have loose-weave netting that is made of natural fiber materials with movable joints between the vertical and horizontal twines. Silt fencing and similar products that have been reinforced with plastic or metal mesh should be avoided as they impede the movement of terrestrial wildlife species. Excessive silt and sediment loads can have detrimental effects on aquatic resources including destruction of spawning habitat, suffocation of eggs and clogging of gills. Any invasive plant species that are found onsite should be removed.

**Telephone:** (919) 707-0220 • **Fax:** (919) 707-0028

Page 2

March 21, 2018

Scoping – Sassarixa Swamp Mitigation Project

Thank you for the opportunity to review and comment on this project. If I can be of further assistance, please contact me at (910) 409-7350 or <a href="mailto:gabriela.garrison@ncwildlife.org">gabriela.garrison@ncwildlife.org</a>.

Sincerely,

Gabriela Garrison

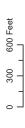
Gabrile Garrian

Eastern Piedmont Habitat Conservation Coordinator

Habitat Conservation Program

# Sassarixa Swamp Mitigation Site Categorical Exclusion

# **FIGURES**









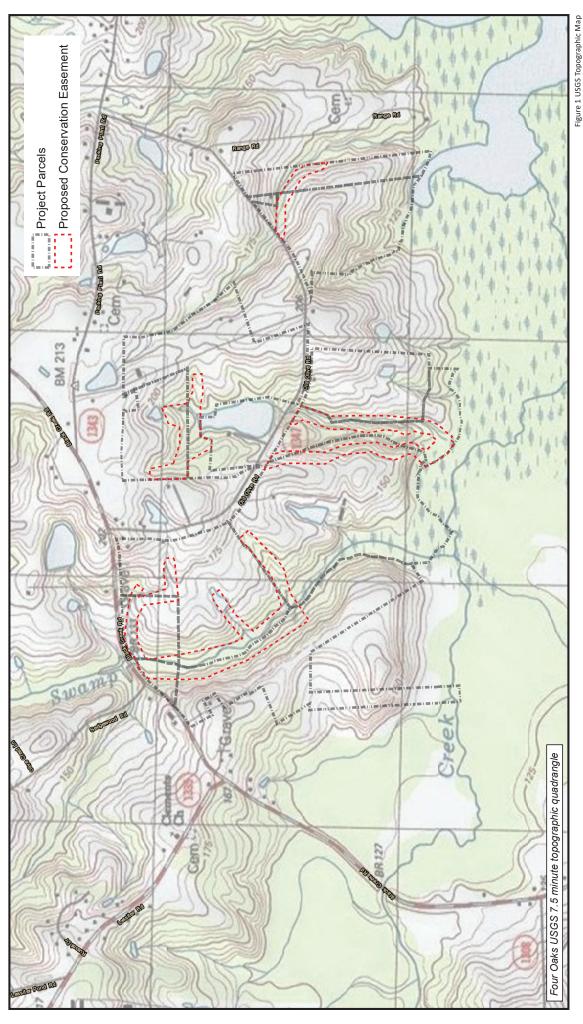




Figure 1 USGS Topographic Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201

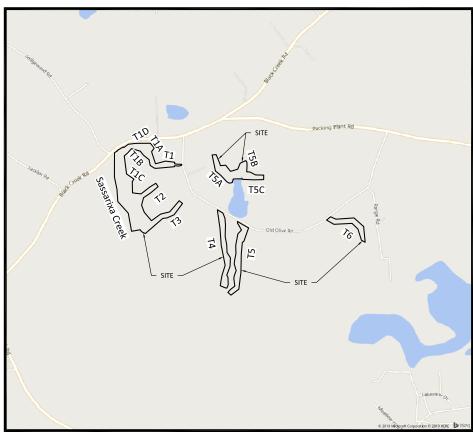
Johnston County, NC

200

# Appendix 7 Plan Sheets – See Report Attachment

# Sassarixa Swamp Mitigation Site

Neuse River Basin 03020201 Johnston County, North Carolina



Vicinity Map
Not to Scale



90% PLANS MITIGATION PLAN **SUBMITTAL** ISSUED NOVEMBER 2019

Stream Origins		
Stream	Latitude	Longitude
Sassarixa Creek	N35° 28' 42.20"	W78° 26' 47.71"
T1	N35° 28' 37.81"	W78° 26′ 29.83″
T1A	N35° 28' 42.25"	W78° 26′ 37.42″
T1B	N35° 28' 40.77"	W78° 26′ 39.59″
T1C	N35° 28' 33.68"	W78° 26' 44.27"
T1D	N35° 28' 43.01"	W78° 26' 38.46"
T2	N35° 28' 31.91"	W78° 26' 36.28"
T3	W78° 26' 36.28"	W78° 26' 28.15"
T4	N35° 28' 25.04"	W78° 26' 15.03"
T5	N35° 28' 21.72"	W78° 26' 08.08"
T5A	N35° 28' 39.23"	W78° 26' 16.24"
T5B	N35° 28' 38.28"	W78° 26' 07.29"
T5C	N35° 28' 34.05"	W78° 26' 00.85"
Т6	N35° 28' 22.94"	W78° 25' 38.59"

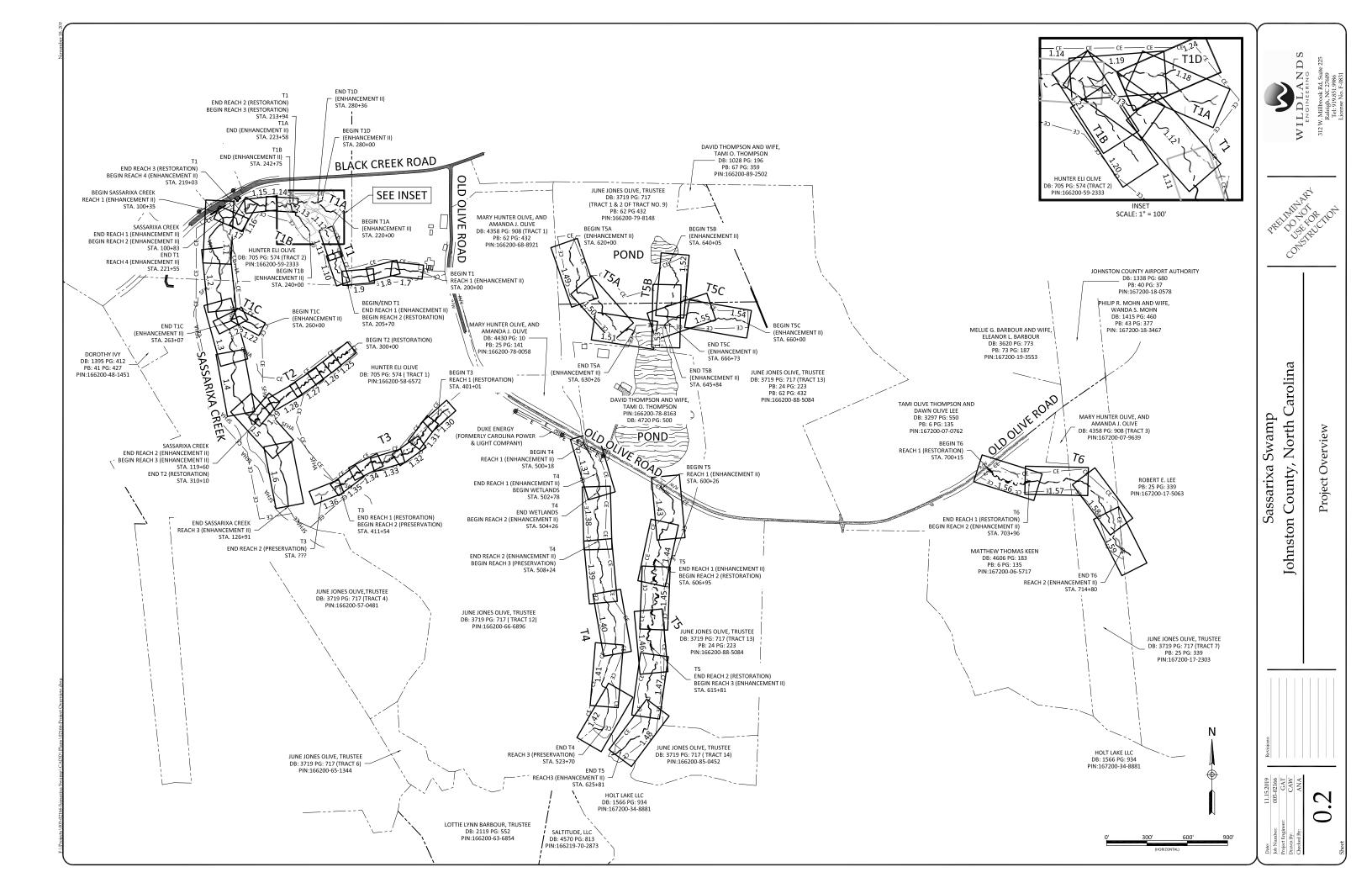
#### Sheet Index Cover Sheet **Project Overview** 0.2 General Notes And Symbols 0.3 Stream Plan And Profile 1.1-1.59 Additional Grading Overview 2.0 T2 Additional Grading 2.1 **Planting Tables** 3.0 Planting Plan Overview 3.1 Planting Plan 3.2-3.5 Erosion And Sediment Control Plan Overview 4.0 Erosion and Sediment Control Plan 4.1 - 4.12Fencing Plan Overview 5.0 Fencing Plans 5.1-5.13 Details 6.0-6.11

### **Project Directory**

Engineering:
Wildlands Engineering, Inc
License No. F-0831
312 W. Millbrook Rd, Suite 225
Raleigh, NC 27609
Angela Allen, PE, Project Manage
Greg Turner, PE, Project Engineer
919-851-9986

Surveying: Kee Mapping and Surveying, PA 88 Central Avenue Asheville, NC 28801 Phillip B. Kee, PLS 828-645-8275

Sassarixa Swamp Johnston County, North Carolina



#### General Notes for All Construction Reaches

- All grosion and sediment control practices shall comply with the North Carolina Frosion and Sediment Control Planning and Design Manual 2. Contractor will install pump-around systems to divert flow while working in live, flowing channels. The Contractor shall operate and ain the pump-around system 24 hours a day until all disturbed areas are stabilized. The disturbed area within the pump around must be stabilized with temporary seeding, mulch and erosion control matting by the end of each workday. Contractor shall not remove
- pump-around systems and advance to the next work area until the current work area is completed and stabilized. . No material from the off-line proposed stream channel excavation may be backfilled into the adjacent existing stream channel until the newly constructed proposed stream section is completed, stabilized, and the stream flow has been diverted into it, not even if that section of old/ existing stream is being pumped.
- 4. In areas without a pump-around system, Contractor shall disturb only as much channel bank as can be stabilized with temporary seeding,
- mulch, and a sod mat or erosion control matting by the end of each workday.

  5. Clearing and grubbing activities shall not extend more than 150 linear feet ahead of in-stream work.
- When crossing an active section of new or old stream channel, a Timber Mat shall be installed according to the details and specifications 7. All graded areas with slopes steeper than 3:1 will be stabilized within seven (7) working days. All other areas will be stabilized within 14 working days.
- 8. Locations for staging and stockpile areas and temporary stream crossings have been provided on the Plans. Additional or alternative staging and/or stockpile areas and stream crossings may be used by the Contractor provided that all practices comply with the North Carolina Erosion and Sediment Control Planning and Design Manual and that the areas are approved by the Engineer prior to plementation. Short-term stockpile areas are those that will remain in place for a short period of time so that the disturbed area can be stabilized within the timeframes in item #7 of the General Construction Notes. Additional stockpile areas and other short-term stockpiles staging areas, and stream crossings not shown on the plans will require approval of the Division of Energy, Mineral, and Land Resources.
- 9. Vegetation on-site to be used as transplant material (juncus, small trees, and sod mats) shall not be disturbed until Contractor is prepared
- 10. Various types of constructed riffles are specified on the plans. Contractor shall build the specific types of constructed riffles at locations shown on the Plans. Changes in constructed riffle type must be approved by the Engineer
- 11. Existing fence located inside the conservation easement shall be removed during construction
- 12. Contractor is to make every effort to avoid damaging or removing existing trees.
- 13. Under no circumstances will the Contractor exceed the limits of disturbance and/or go outside of temporary construction access areas

- 1. Call NC DEQ LQS at the Raleigh Regional Office at 919-791-4200 to schedule a pre-construction meeting at least 48 hours prior to project
- 2. Contact North Carolina "One Call" Center (1.800.632.4949) before any excavation.

  3. Contact Division of Energy, Mineral and Land Resources (919-791-4200) before any work begins on the project and notify them of the start 16. Prepare floodplain for seeding by applying stockpiled topsoil to the floodplain between bankfull elevation and the grading limits,
- 4. Mobilize equipment and materials to the Site.
- 5. Identify and establish construction entrance, staging and stockpile areas, haul roads, silt fence, tree protection fencing, safety fencing, and 17. If at any time circumstances should arise where water has been turned into the new channel and additional work must be done mporary stream crossings as indicated on the Plans for work areas. 6. All haul roads shall be monitored for sediment loss daily. In the event of sediment loss, silt fence or other acceptable sediment and erosion
- control practices shall be installed. Silt fence outlets shall be located at points of low elevation or a minimum spacing of 150 ft. 7. Set up temporary facilities, locate equipment within the staging area, and stockpile materials needed for the initial stages of construction
- within the stockpile area(s).
- 8. Install and maintain an onsite rain gauge and logbook to record the rainfall amounts and dates. Maintain an approved copy of the E&SC plan with placard and approval letter and a copy of the NPDES permit with a minimum of 30 days of self-inspection reports on site until project closure by NCDEQ. Complete the self-inspection as required by NCDEQ permit. Rainfall records, completed self-inspection forms and permits should be maintained on site.
- 9. Monitor site for sediment loss and inspect all erosion control features after each rain event. Maintain erosion control features according to the North Carolina Frosion and Sediment Control Manual.

#### Construction Sequence

- L. Erosion and Sediment Control (E&SC) permit and a Certificate of Coverage (COC) must be obtained before land disturbing activities occur. The COC can be obtained by filling out the Electronic Notice of Intent (e-NOI) form at deg.nc.gov/NCG01. Please note, the e-NOI form may only be filled out once the plans have been approved. A copy of the E&SC permit, the COC and a hard copy of the plans must be kept on site, preferably in a permit box, and accessible during inspection.
- 2. This project may be constructed in phases according to construction entrances and grouped streams (T1 and T2, T3, T4 and T5, T6, and TA-TC). The Contractor shall not start construction on one phase and move to another phase before stabilizing the first, unless a crew is continuing work on the initial phase.
- 8. All construction entrances are located off of Old Olive Road.
- 4. Install temporary livestock fencing as necessary to secure project area under construction. Conservation easement Fencing may be installed prior to construction to reduce or eliminate the need for temporary fencing.
- 5. Perform any necessary clearing and grubbing in phases as work progresses. Bank vegetation and vegetation immediately adjacent to live channels shall be left undisturbed as long as possible. Remove all non-native and invasive vegetation prior to beginning the channel construction. Take care with vegetation marked for transplant from the old channel to new channel. Do not disturb transplant vegetation until time of transplant.
- 6. Construction of all channels are to be done in the dry. Construction should generally progress from upstream to downstream to prevent sediment runoff from upstream construction affecting completed downstream reaches. Use a pump around as shown on the plans and discussed in the General Notes.
- Where feasible, more than one offline section may be constructed concurrently. Offline sections shall be tied online sequentially from downstream to upstream.
- 8. As work progresses, remove and stockpile the top three inches of soil from the active grading area. Stockpiled topsoil shall be kept separate for onsite replacement prior to floodplain seeding.
- 9. Construct the proposed stream channel to the grade specified in the cross-sections and profile. Transfer coarse material from abandoned channel riffles to new channel riffles utilizing a pump-around when doing so.
- . Grade the adjacent floodplain area according to grades shown on the plan.
- 11. Install in-stream structures (riffles, angled log sill, log J-hook, cover log, and boulder sill) and in-bank bioengineering such as brush toe and sod mats after channel grading is completed according to details and specification
- 12. Seed (with specified temporary seed and permanent seed mix) and straw mulch areas where the coir fiber matting is to be
- 13. Install coir fiber matting according to plans and specifications.
- 14. Sod mats may be used in lieu of coir fiber matting, where available, to stabilize all stream banks as the preferential stabilization method. Coir fiber matting may be used where sod mats are not available or if coir fiber matting is the preferred at the discretion
- 15. Backfill abandoned channel sections with stockpiled soil according to the grades shown on the Plans. Non-native and invasive
- ripping, and raking/smoothing. Seed with specified temporary and permanent seed mix and mulch. Any areas within the ervation easement that have not been graded shall be treated according to the planting plan.
- he floodplain, erosion control devices will be installed to protect the new channel from sedimentation
- 18. Once all phases of channel and floodplain construction are complete, prepare the floodplain areas for planting per the
- 19. Install live stakes and herbaceous plugs along the stream banks according to the plans and specification
- 20. When the project is complete, the permittee shall contact DEMLR to close out the E&SC Plan. After DEMLR informs the permittee of the project close out, via inspection report, the permittee shall visit deq.nc.gov/NCg01 to submit an electronic notice of Termination (e-NOT). A \$100 annual general permit fee will be charged until the e-NOT has been filled out.

#### Construction Demobilization

Remove temporary stream crossings

**Erosion Control Features** 

Proposed Construction Entrance See Detail 2, Sheet 6.10

Proposed Silt Fence Gravel Outlet

Proposed Tree Protection Fencing See Detail 3, Sheet 6.8

Proposed Stockpile/Staging Area

Proposed Limits Of Disturbance

Proposed Temporary Stream Crossing with Silt Fence - Timber Mat

Proposed Pump Around

See Detail 1, Sheet 6.10

Proposed Silt Fence

See Detail 2. Sheet 6.9

See Detail 4. Sheet 6.9

Proposed Haul Road

- 2. The Contractor shall ensure that the site is free of trash and leftover materials prior to demobilization of equipment from
- Complete the removal of any additional stockpiled material from the site.
- 4. Demobilize grading equipment from the site.
- 5. All rock and other stockpiled materials must be removed from the limits of disturbance and conservation easement. All areas outside the conservation easement shall be returned to pre-project conditions or better
- 6. Seed, mulch, and stabilize staging areas, stockpile areas, haul roads, and construction entrances. Pasture seed mix is to be applied to areas of disturbance outside of the conservation easement.

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Carolina

and Symbols neral Notes

North County, ]

Swamp Sassarixa Johnston

See Detail 1, Sheet 6.0

Proposed Native Material Riffle



See Detail 2, Sheet 6.0



Proposed Lunker Log See Detail 2, Sheet 6.1



Proposed Brush Toe See Details 1, Sheet 6.2 **Proposed Culvert** See Detail Sheets 6.3-6.7

Proposed Stream Bank Grading

## **Proposed Features**

— CE — CE — CE — Proposed Conservation Easement — CE-IX — CE-IX — Proposed Conservation Easement Crossing ——— CE-B ——— CE-B ——— Proposed Bank Conservation Easement 10+00 Proposed Stream Alignment - · · · - Proposed Bankfull Proposed 5' Major Contour Proposed 1' Minor Contour O— Proposed Five-Strand Barbed Wire Fence

── Proposed High Tensile Wire Fence Proposed Angled Log Riffle CR-ALR

roposed Woody Riffle See Detail 3, Sheet 6.0

Proposed Angled Log Sill See Detail 1, Sheet 6.1



#### — OHE — Existing Overhead Utility — OUE —— OUE — Existing Utility Easement Existing Storm Pipe ---- Existing 1' Minor Contour

— — Existing Property Boundary

Existing NCDOT Right-of-way

- Existing Edge of Pavement

**Existing Features** 

Existing Guardrail

— — Existing Thalweg — ⋄ ⋄ o — — — ⋄ ⋄ o — — Existing Top of Bank

— X — X — X Existing Fence Existing Treeline

Existing Tree

**Existning Spring** Existing Fire Hydrant

→ Existing Guy Anchor

**Existing Debris** 

Existing Wetland Area



Existing Gravel Road

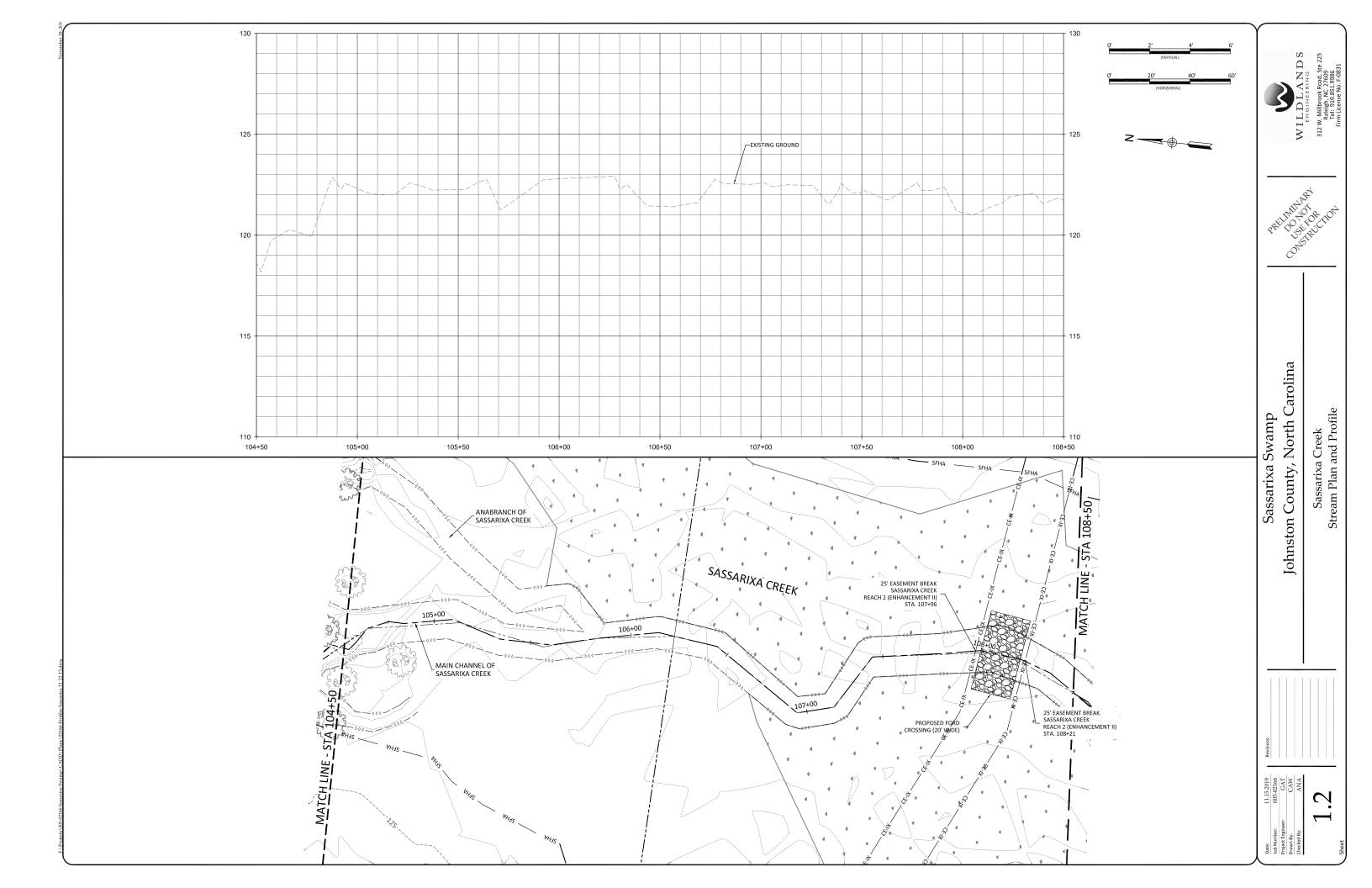
**Existing Bedrock** 

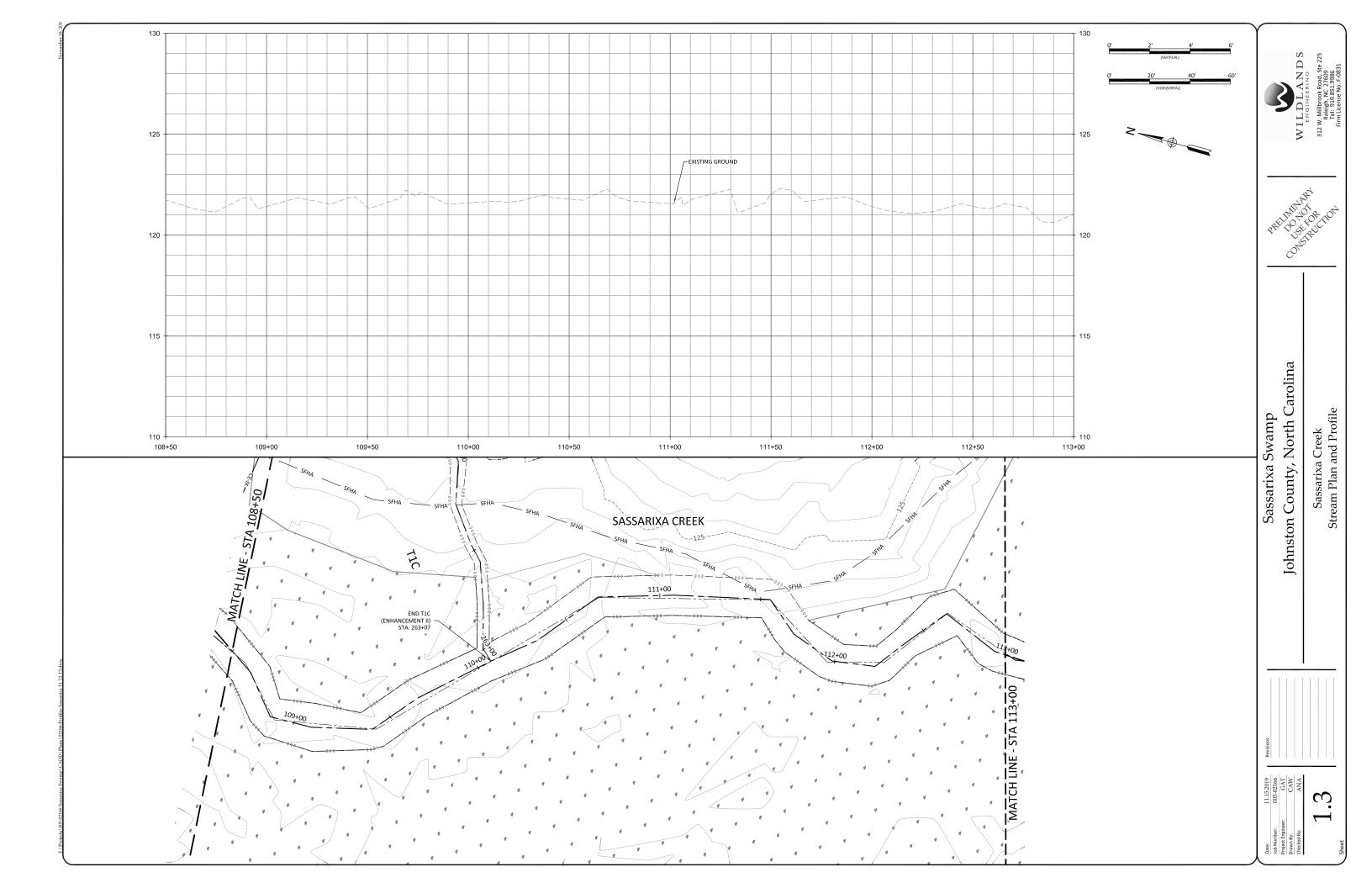
**Existing Rip Rap** Corrugated Plastic Pipe

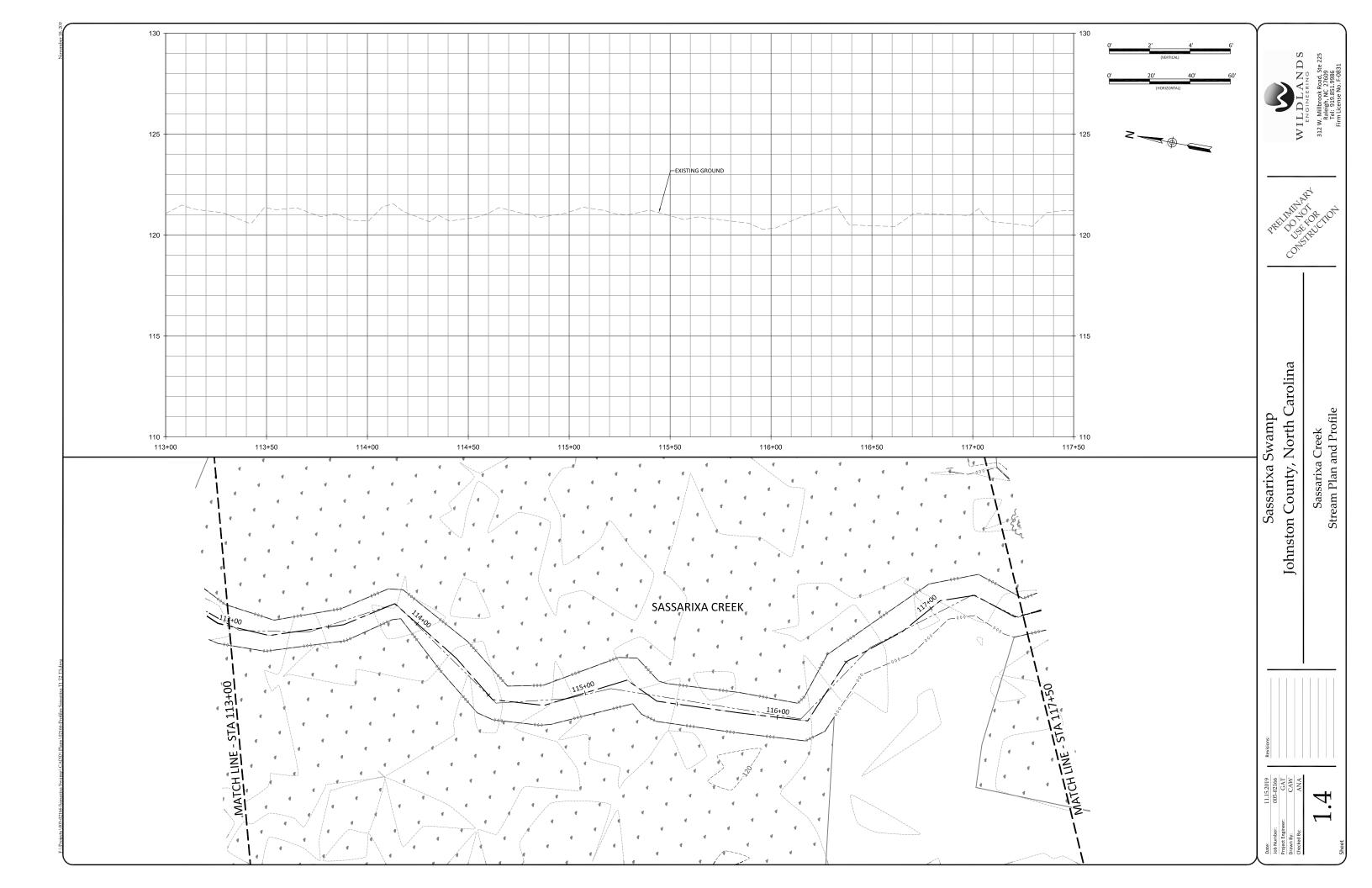
Polyvinyl Chloride Pipe Corrugated Metal Pipe

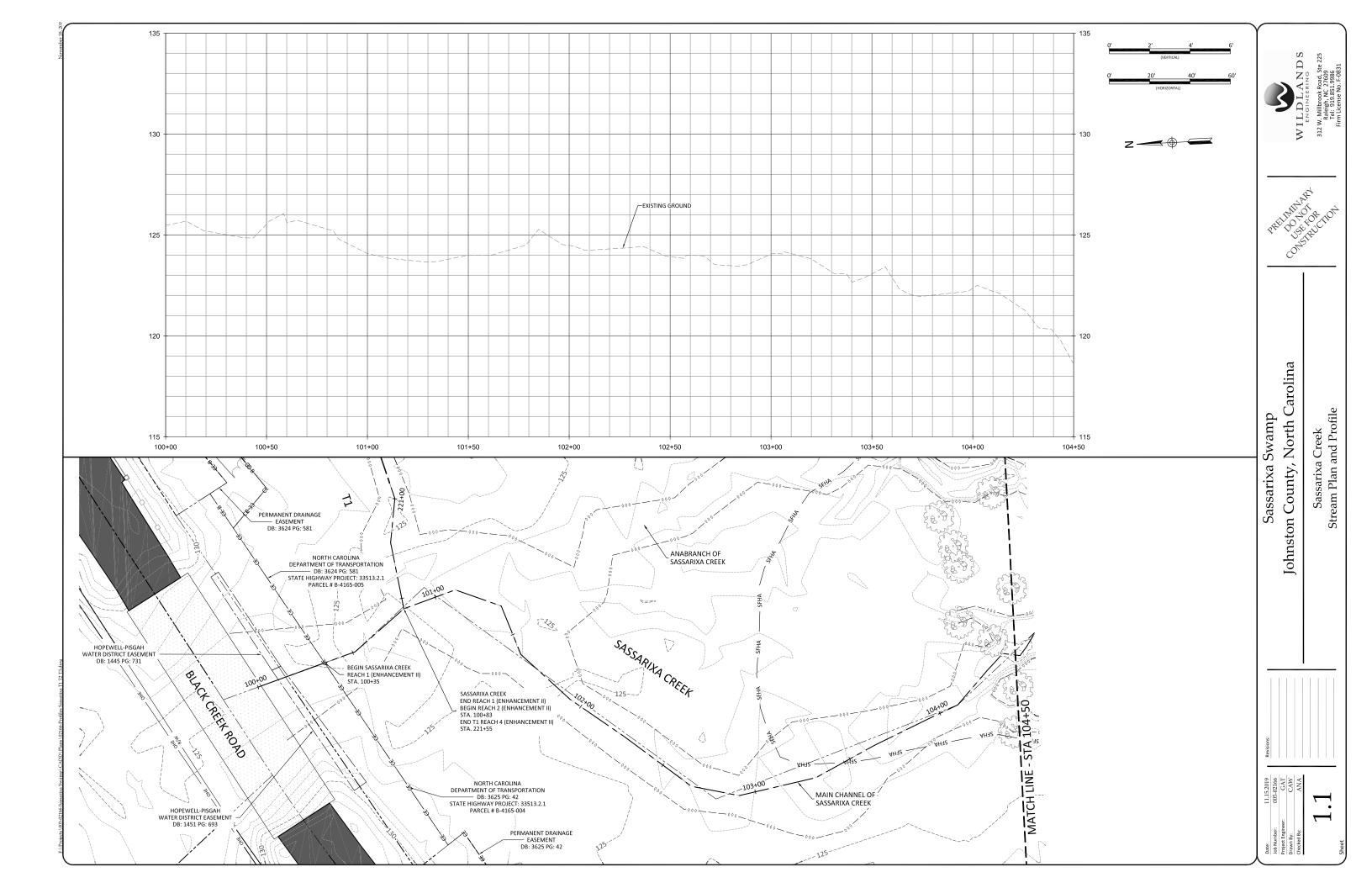
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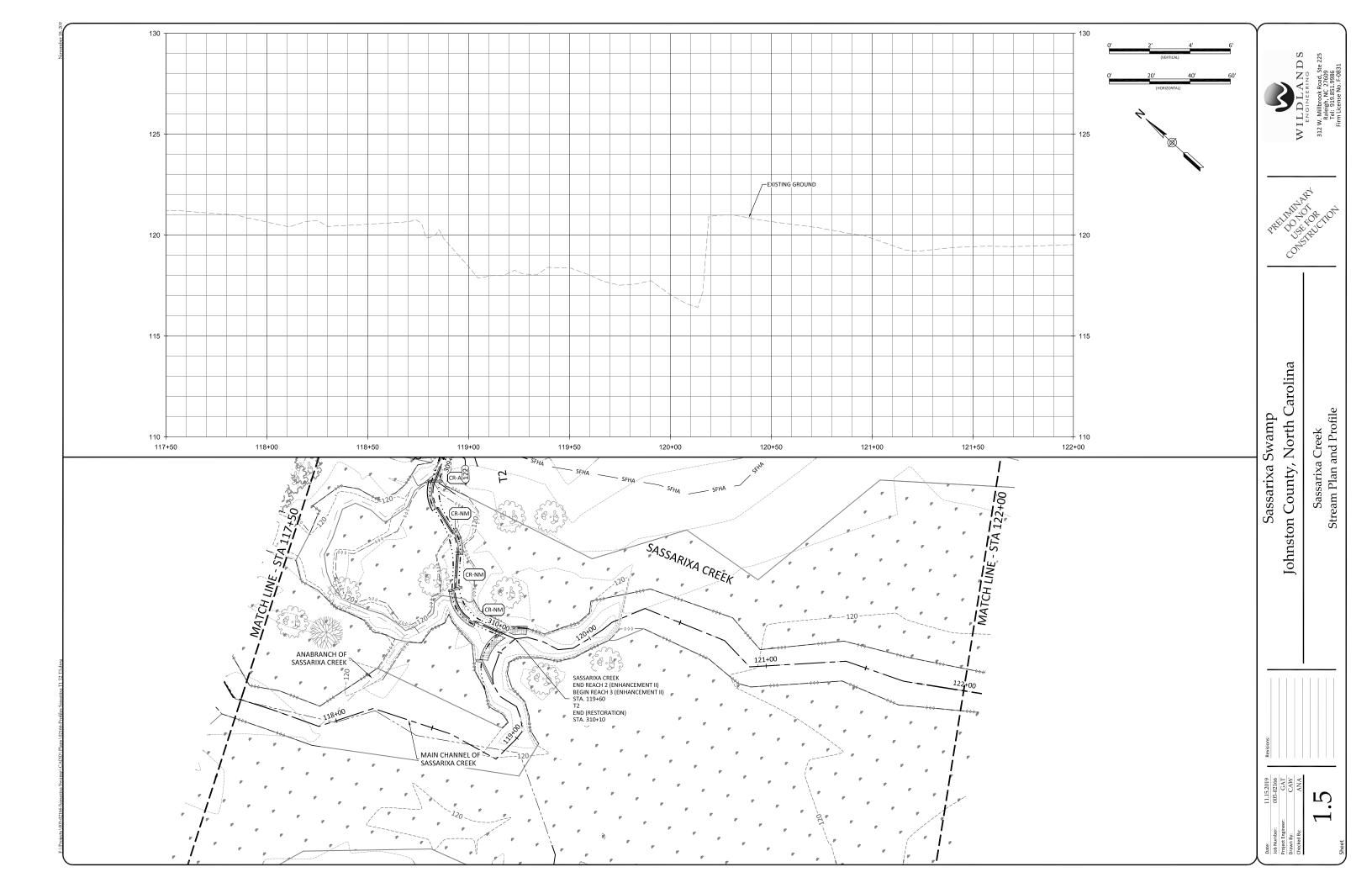
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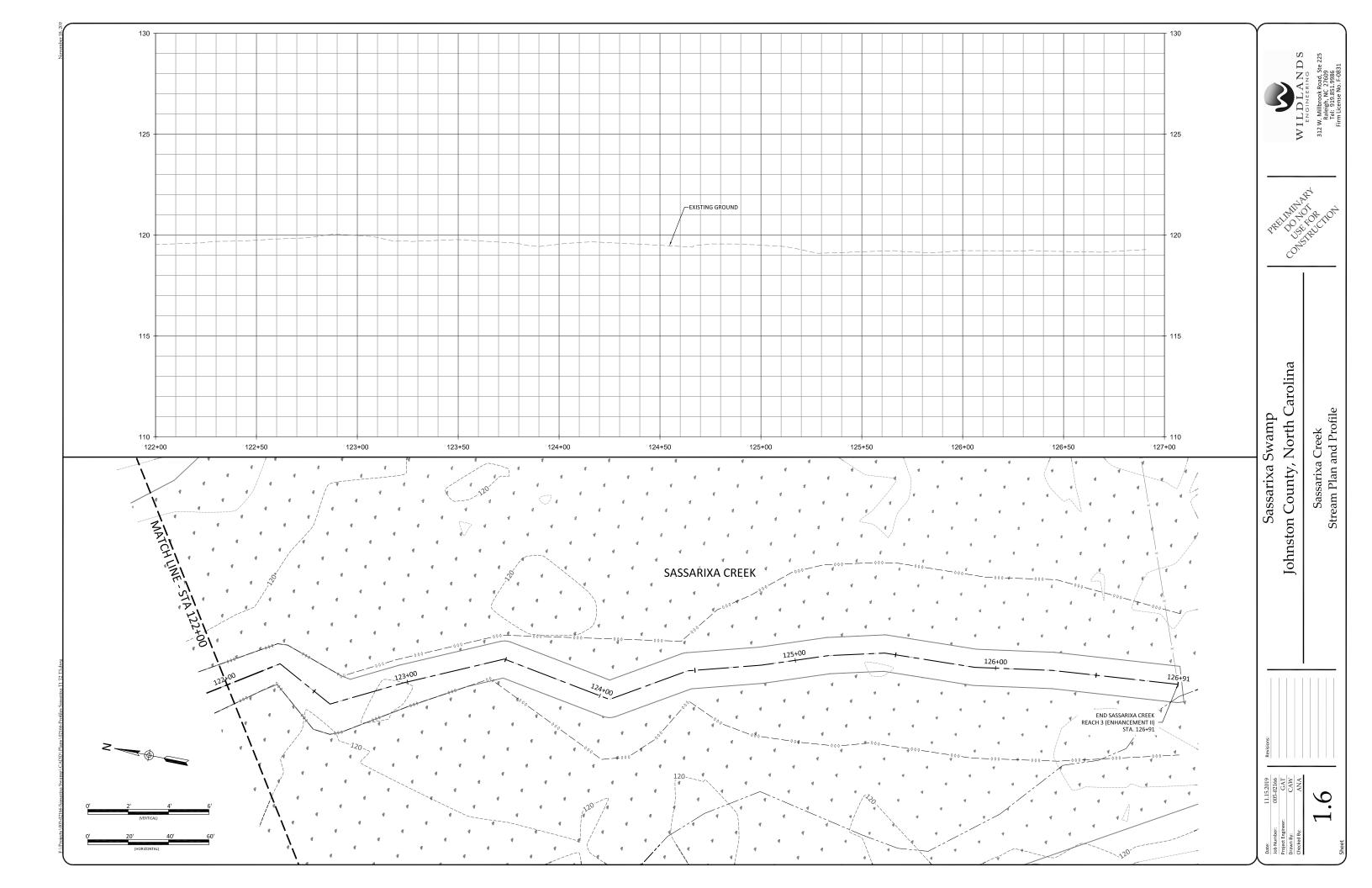


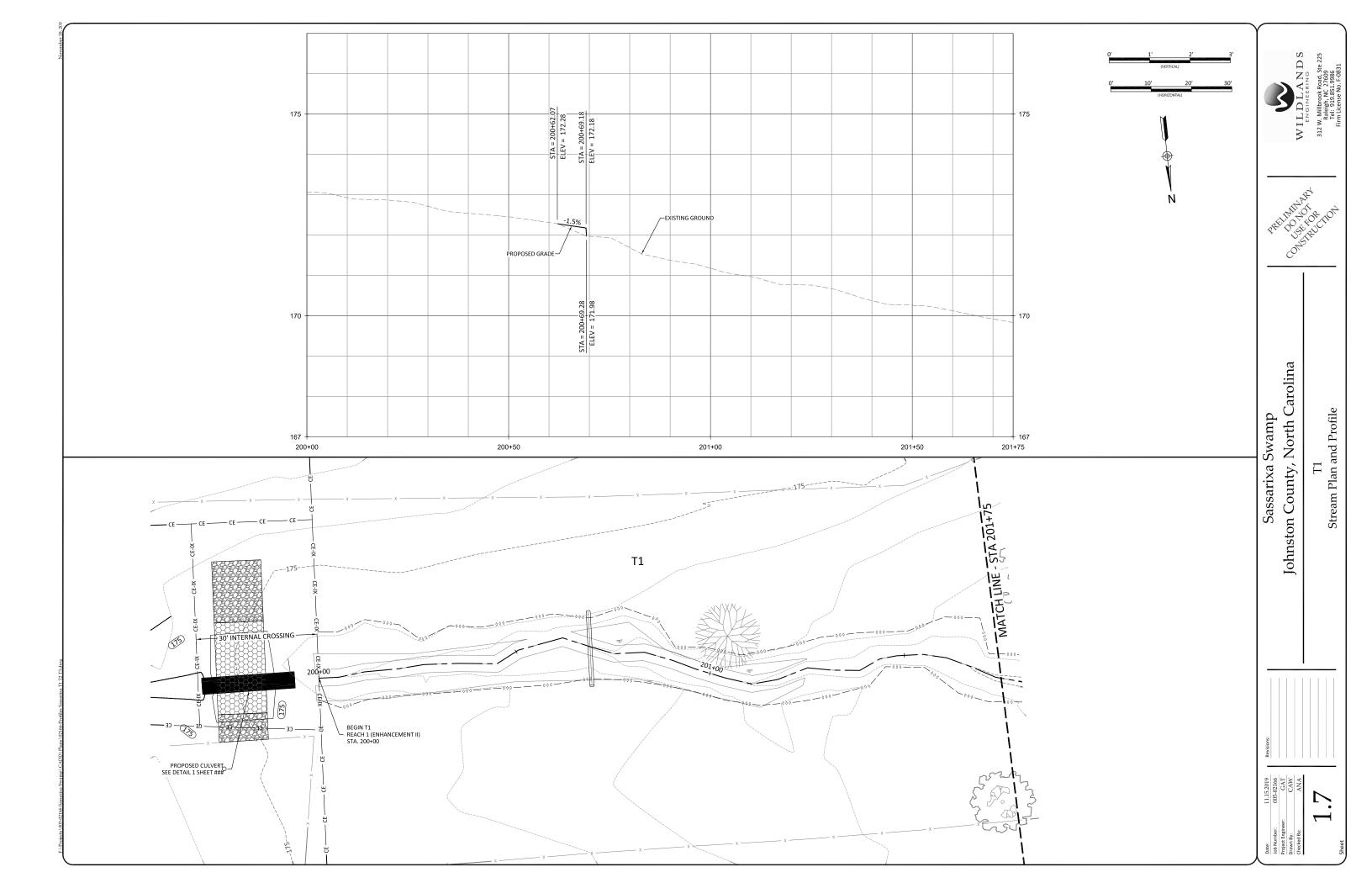




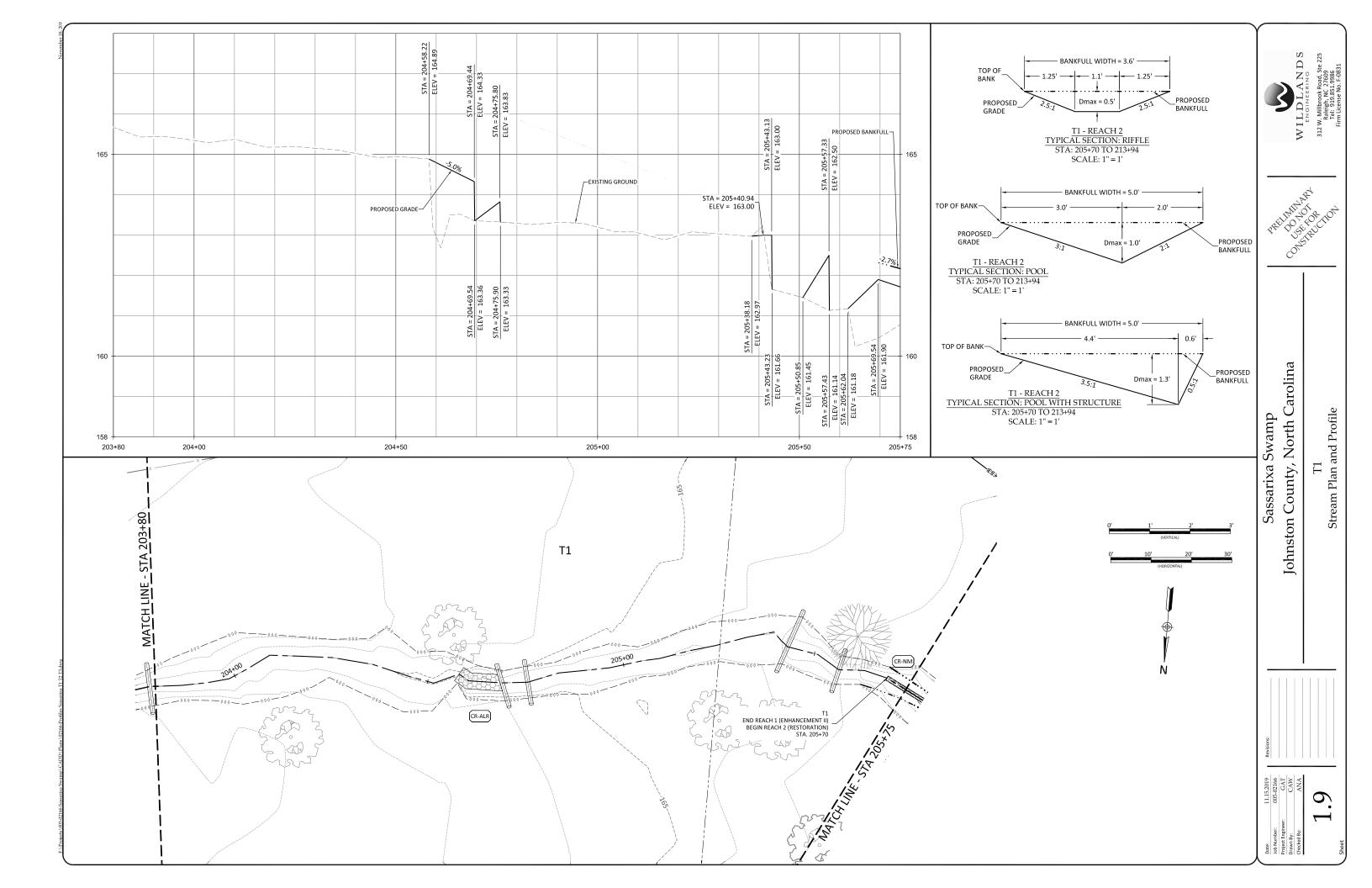


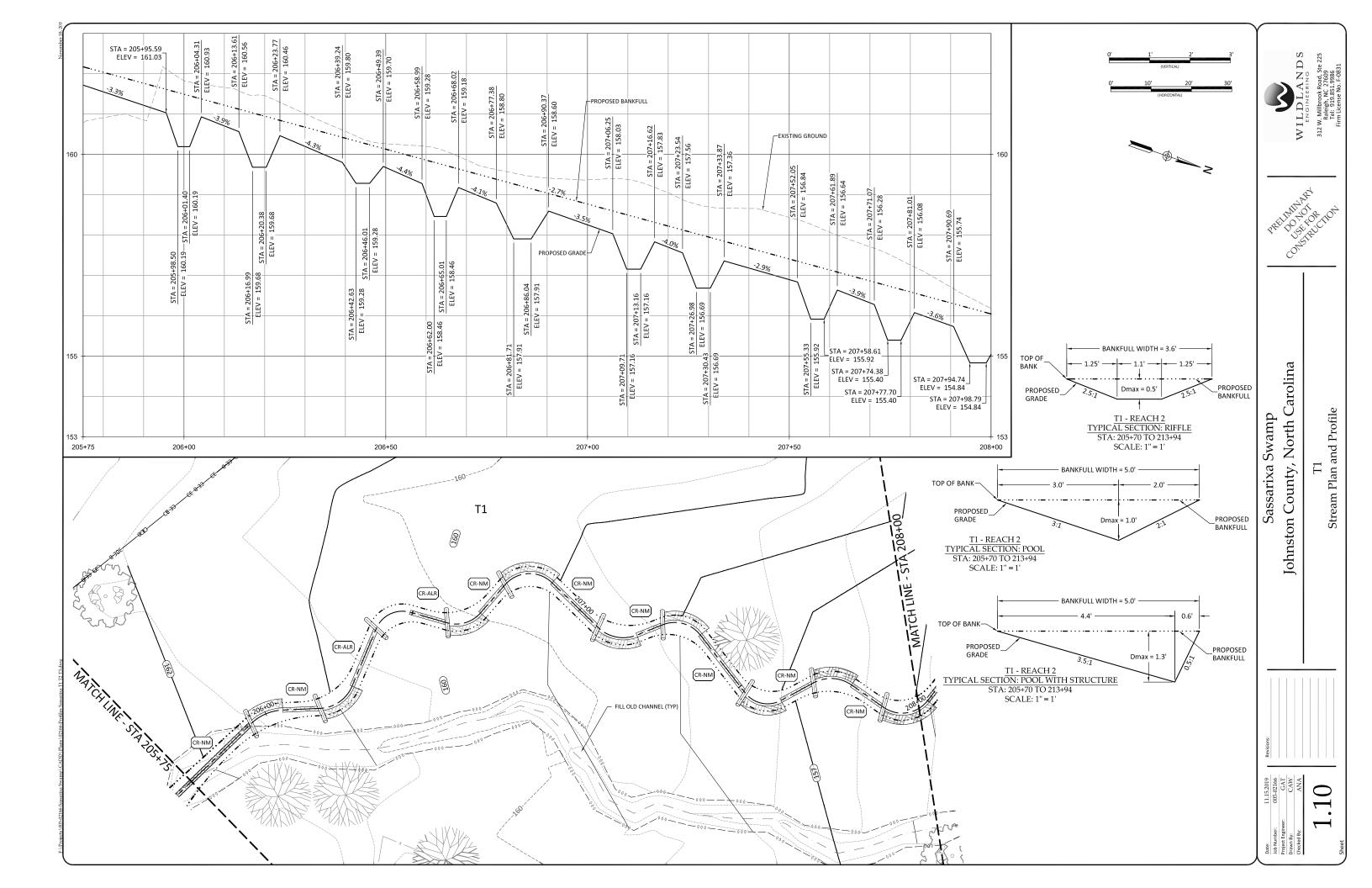


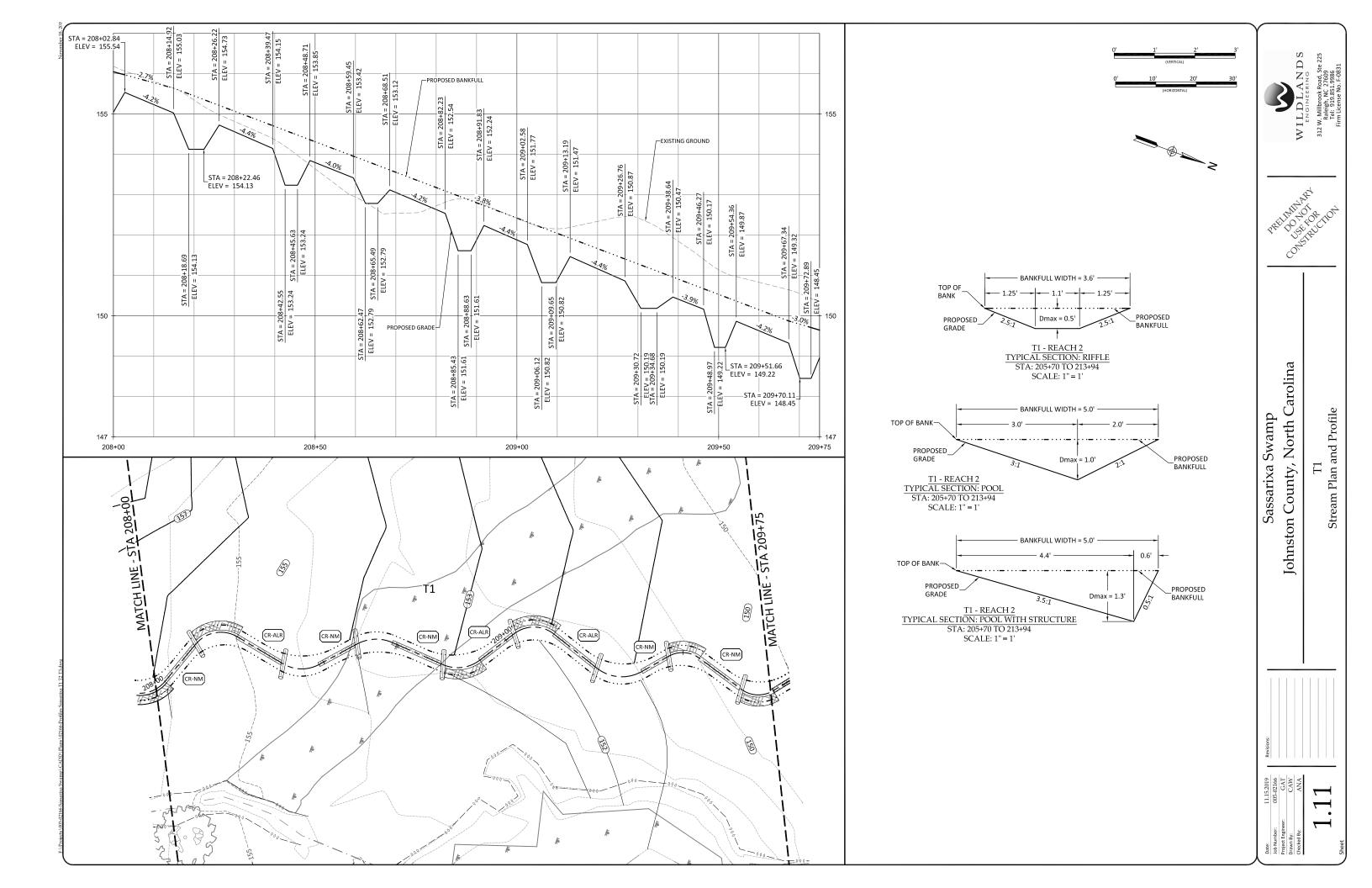


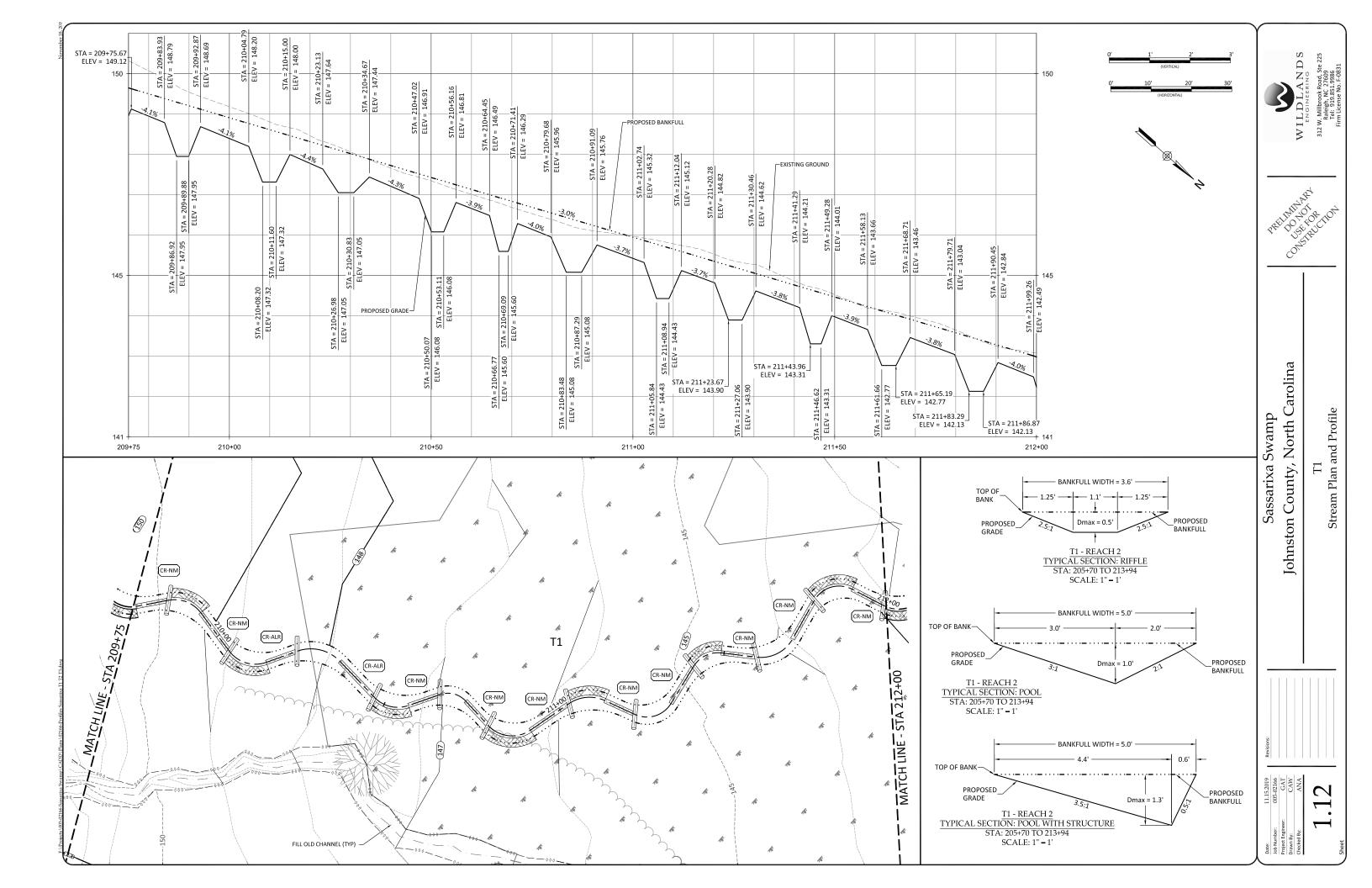


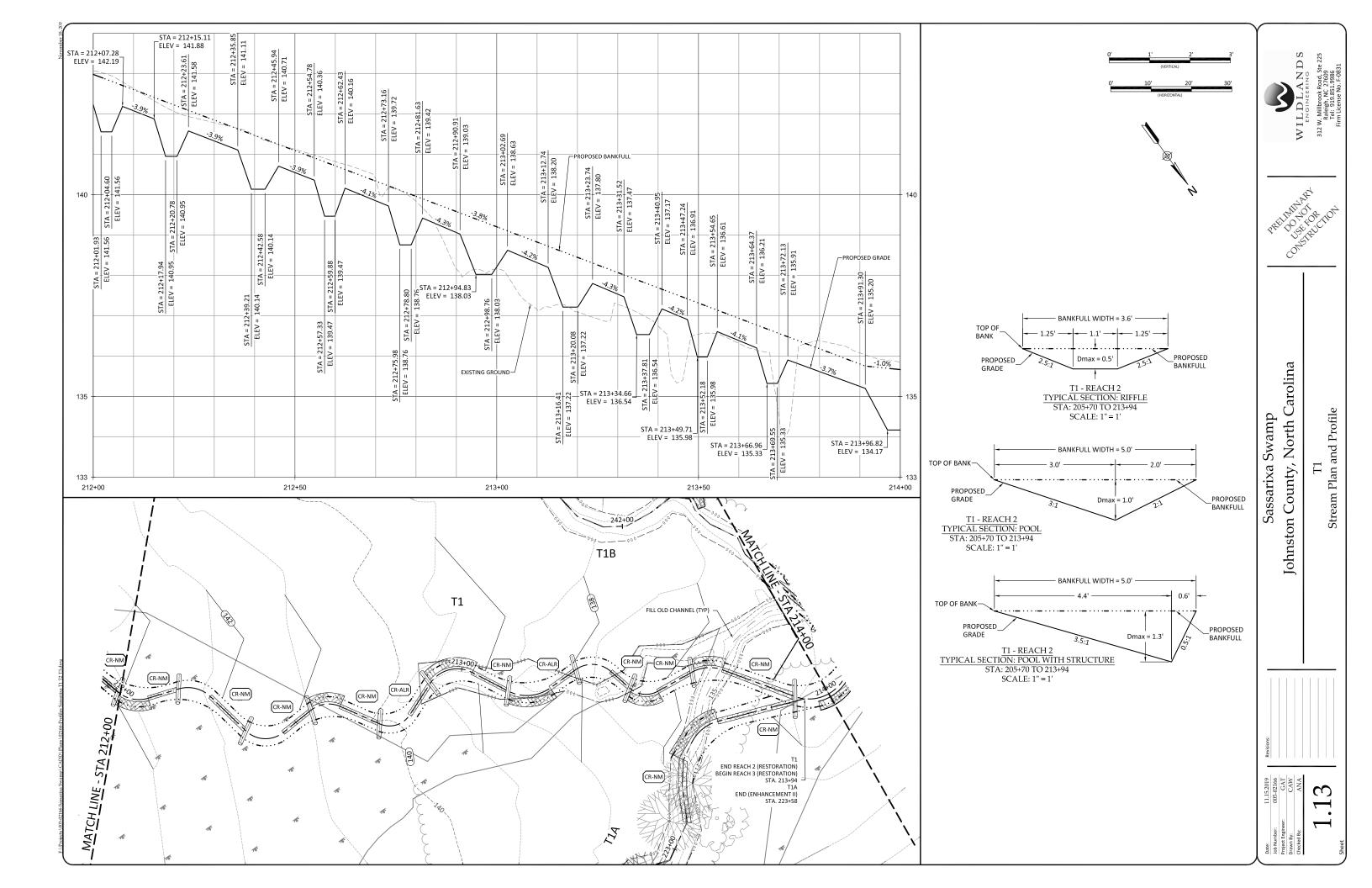


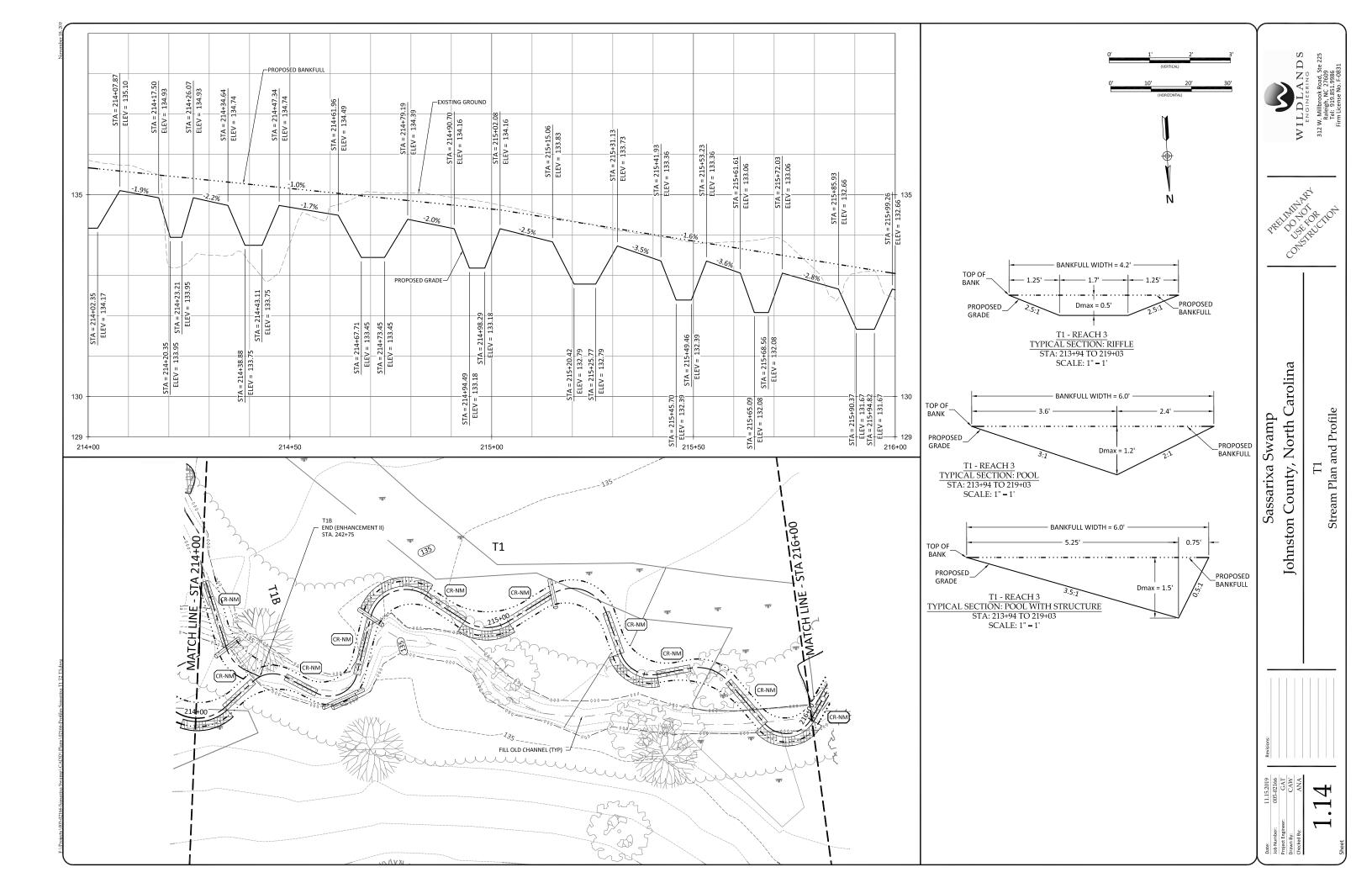


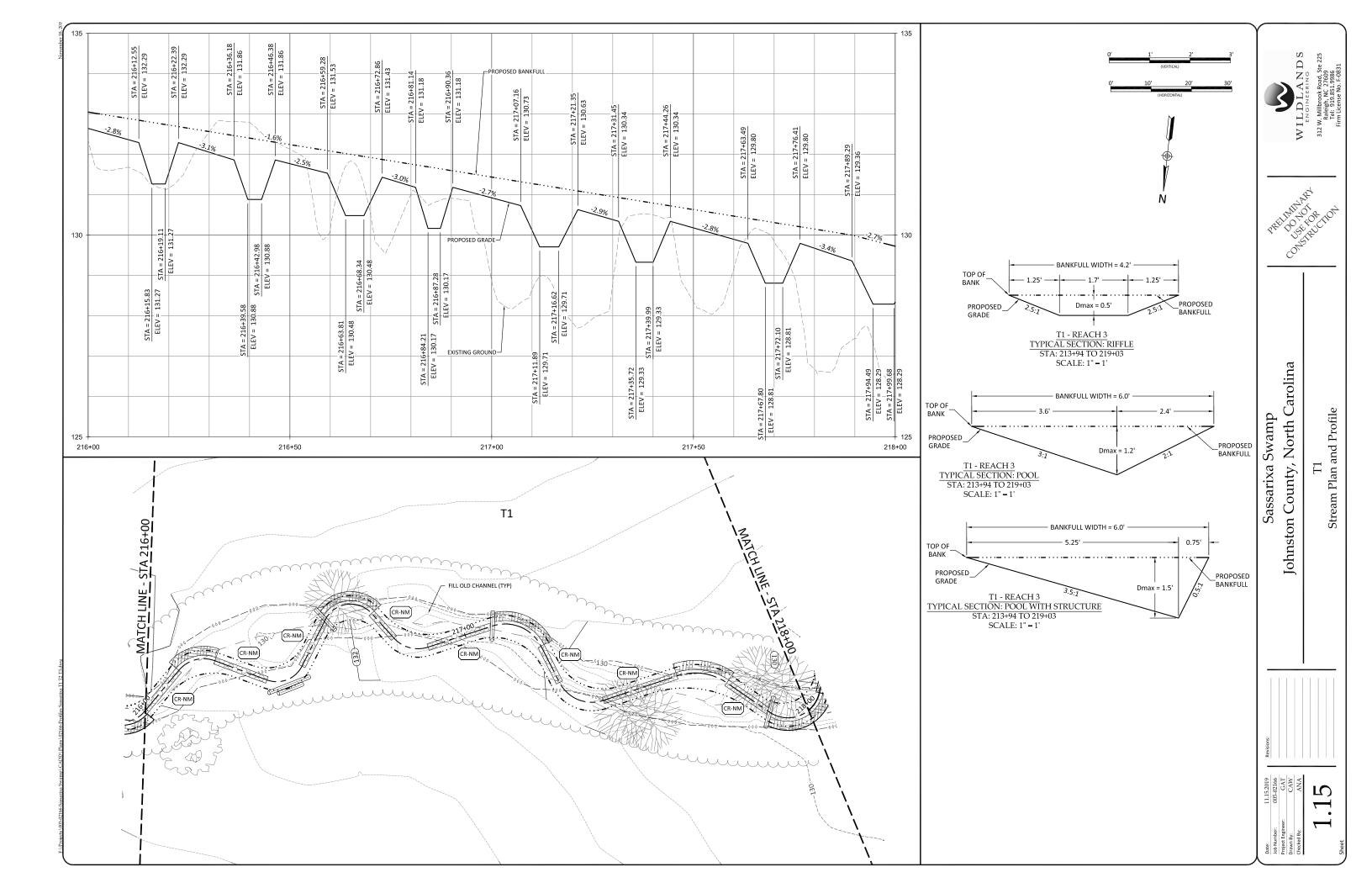


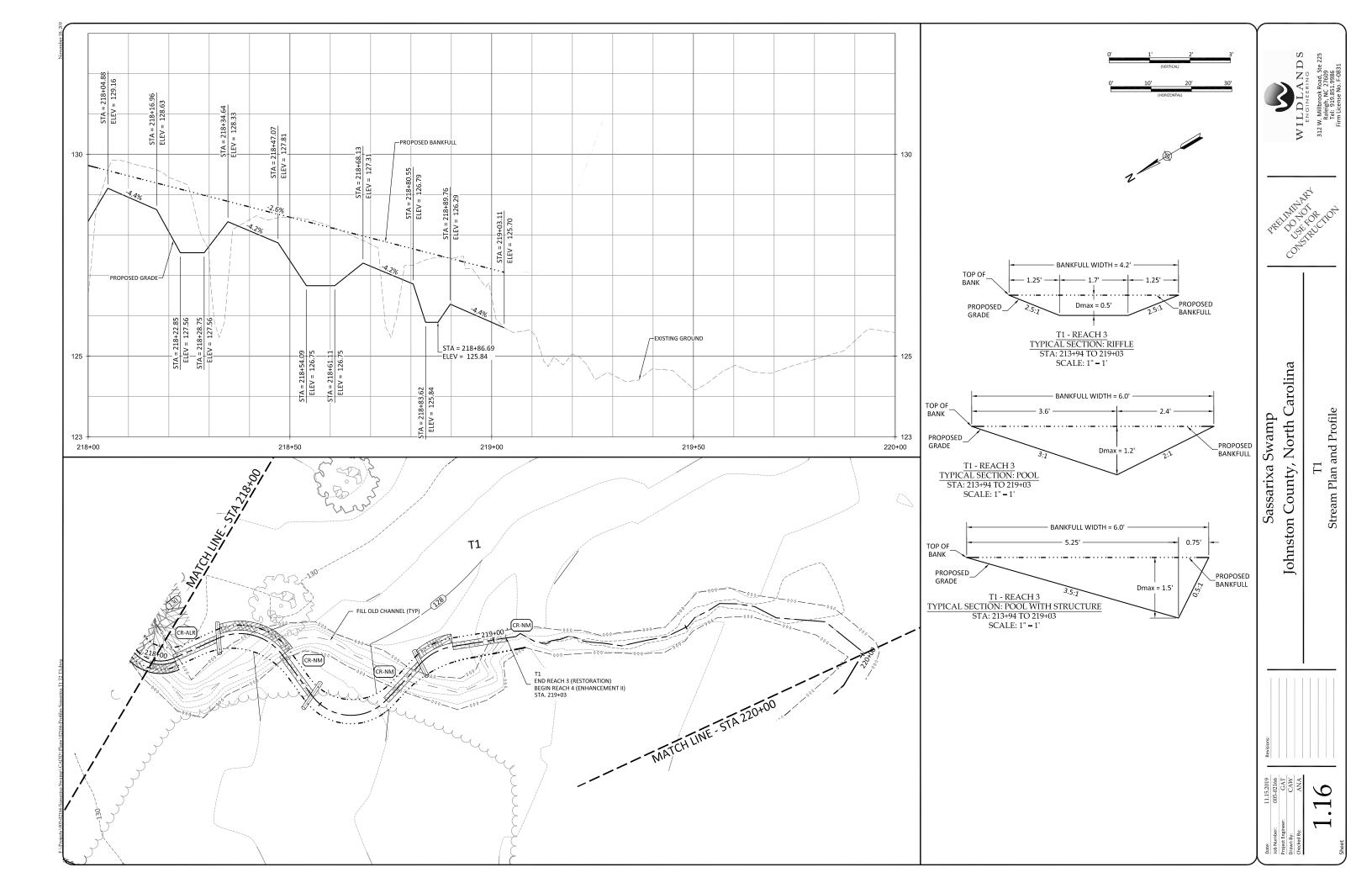


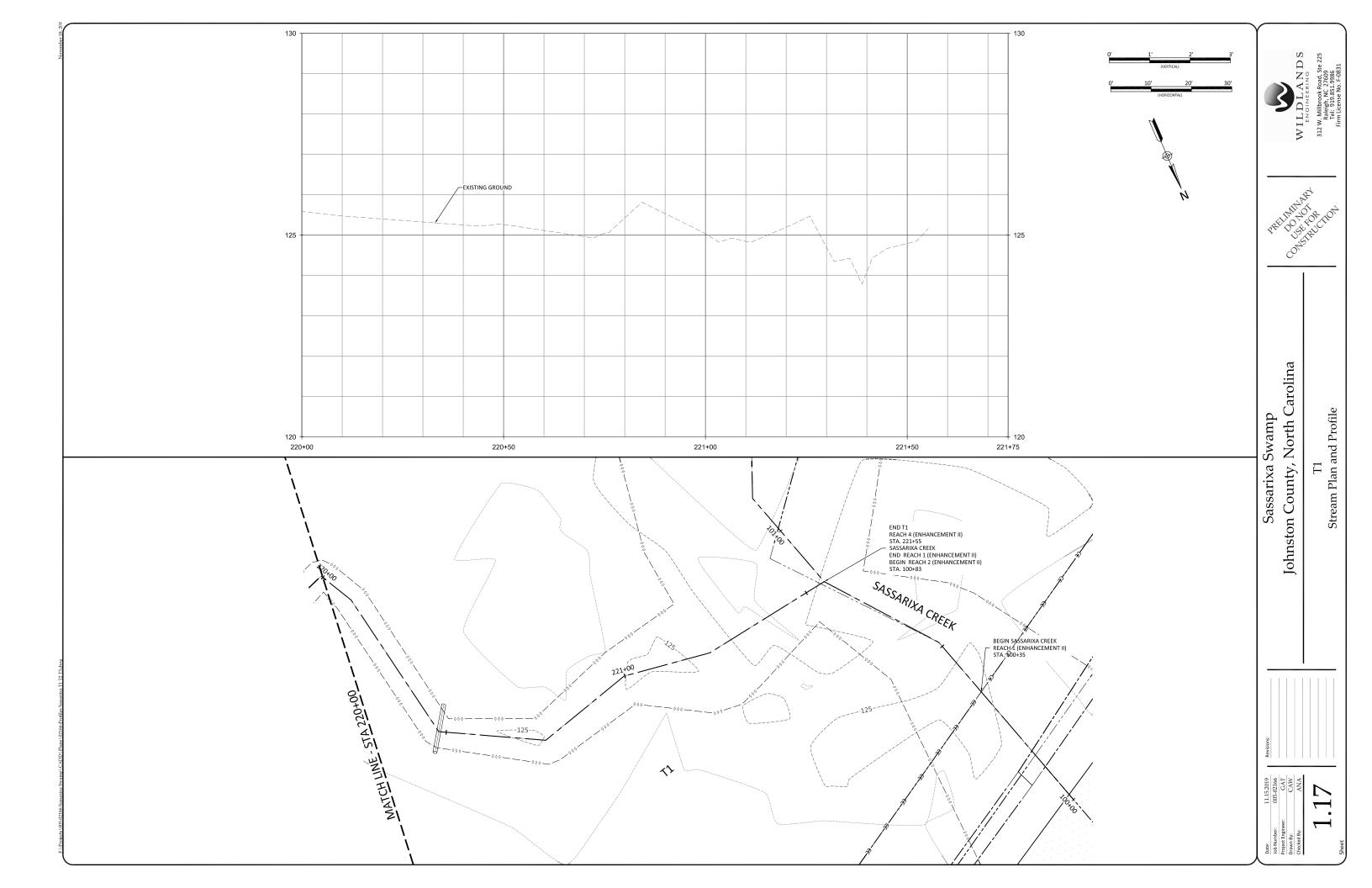


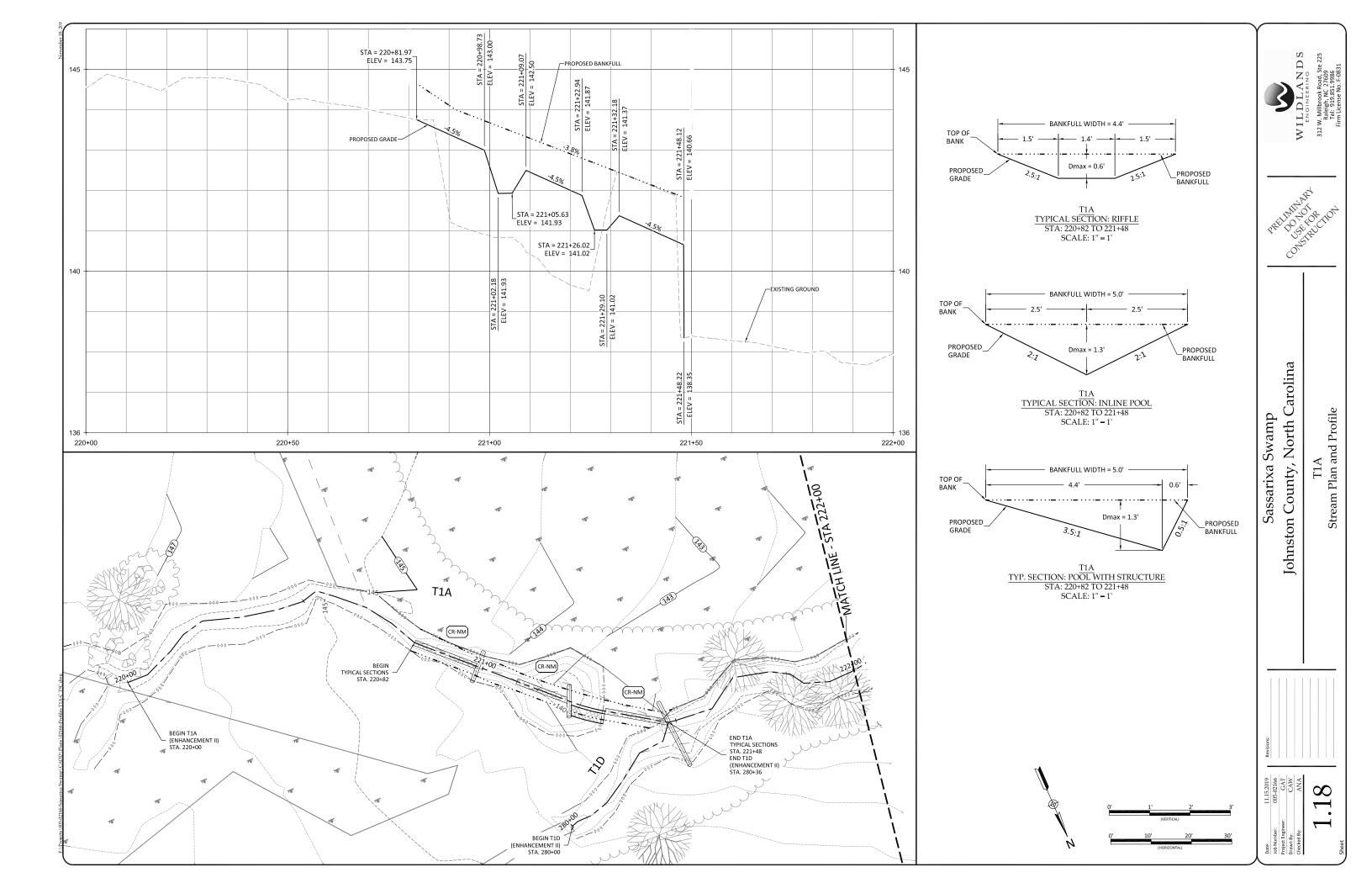


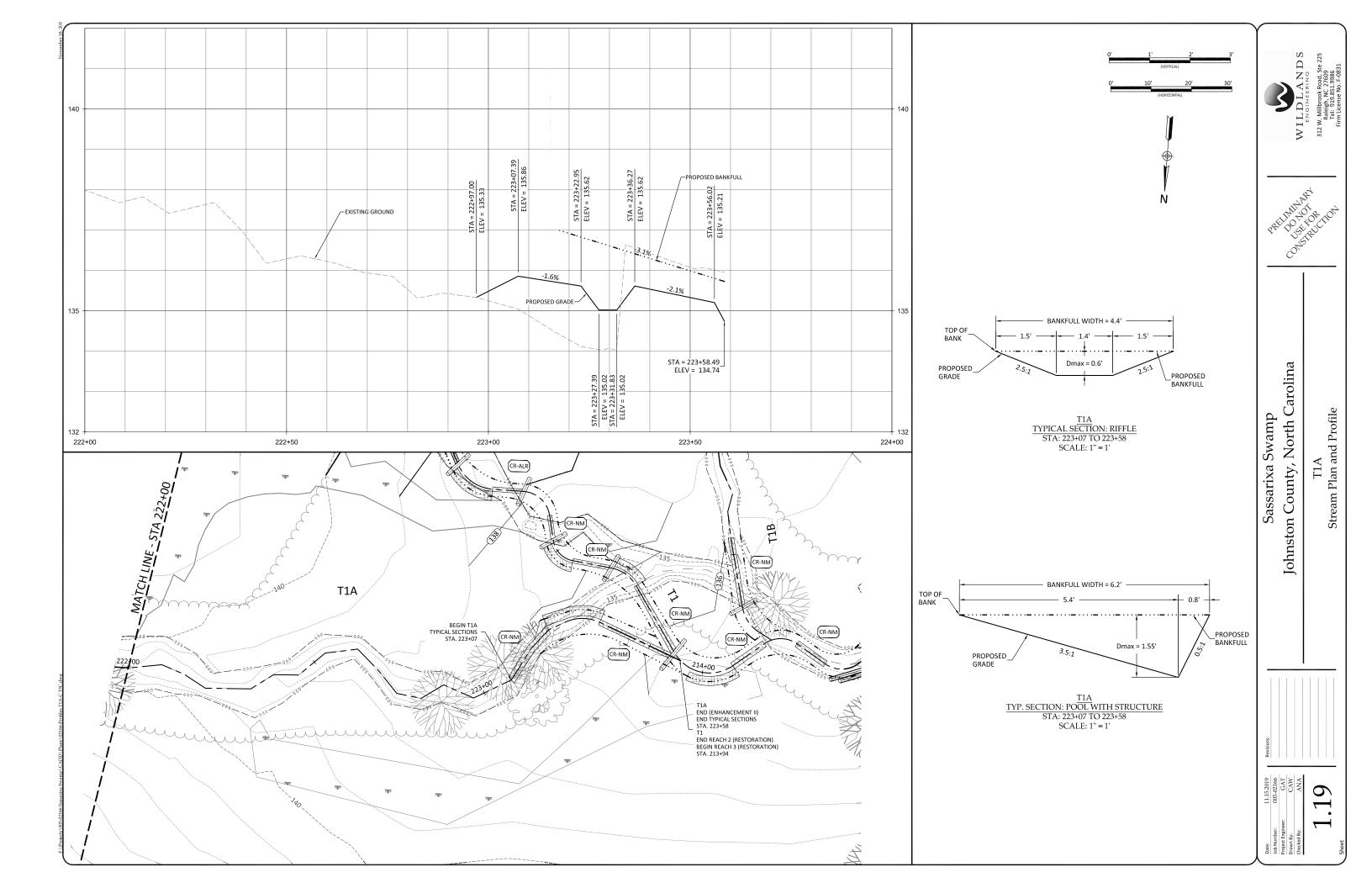




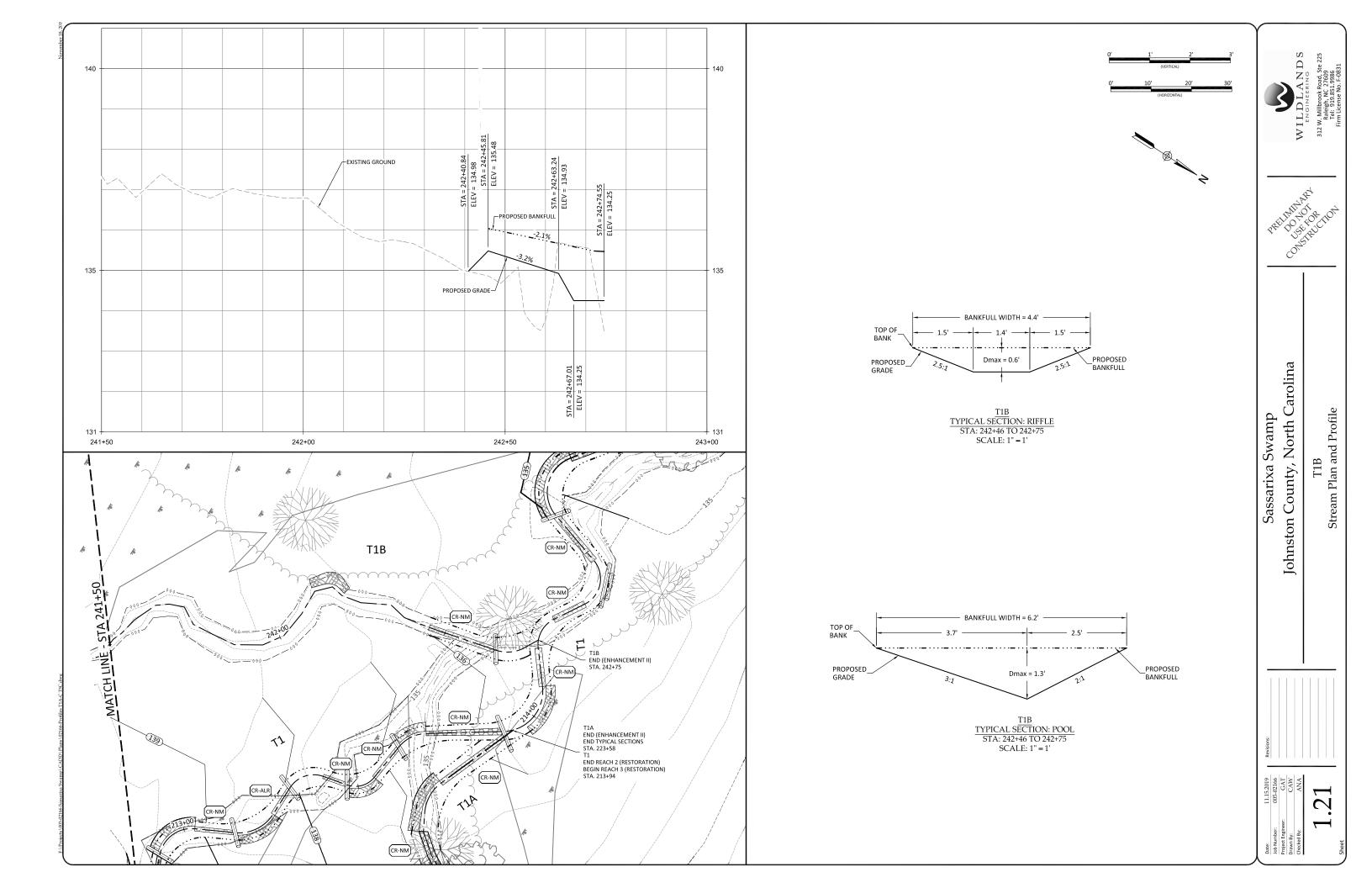


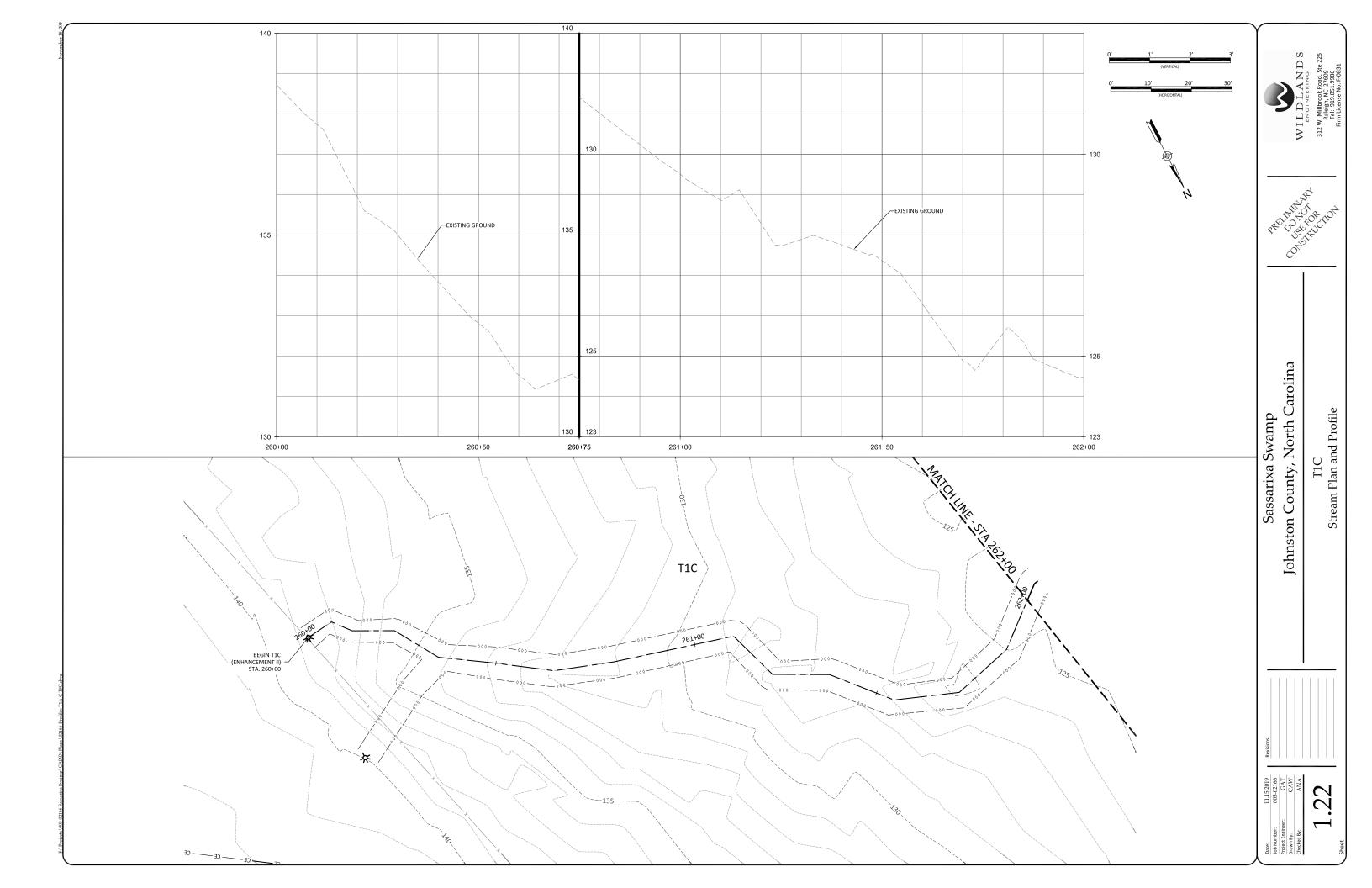


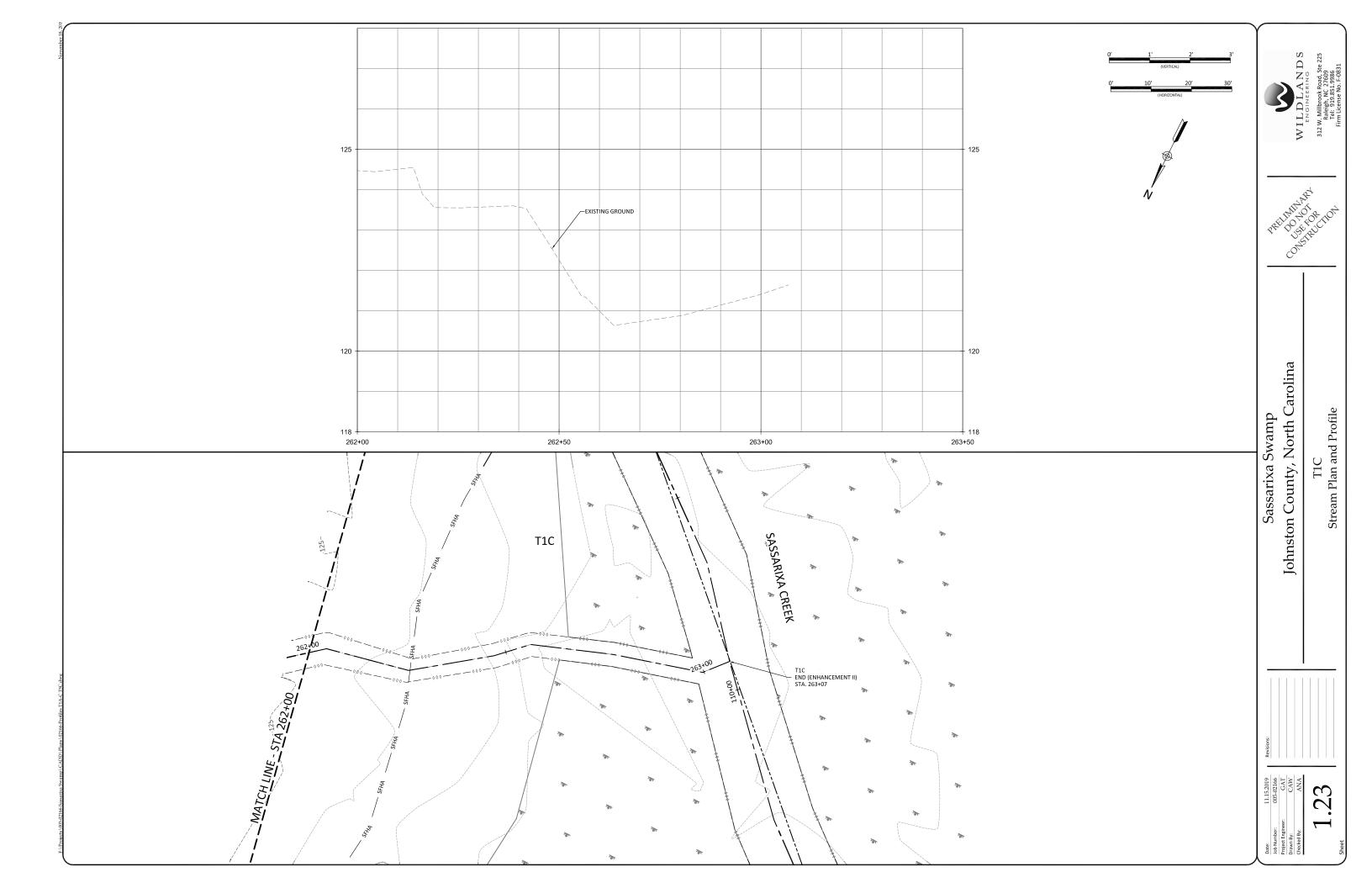


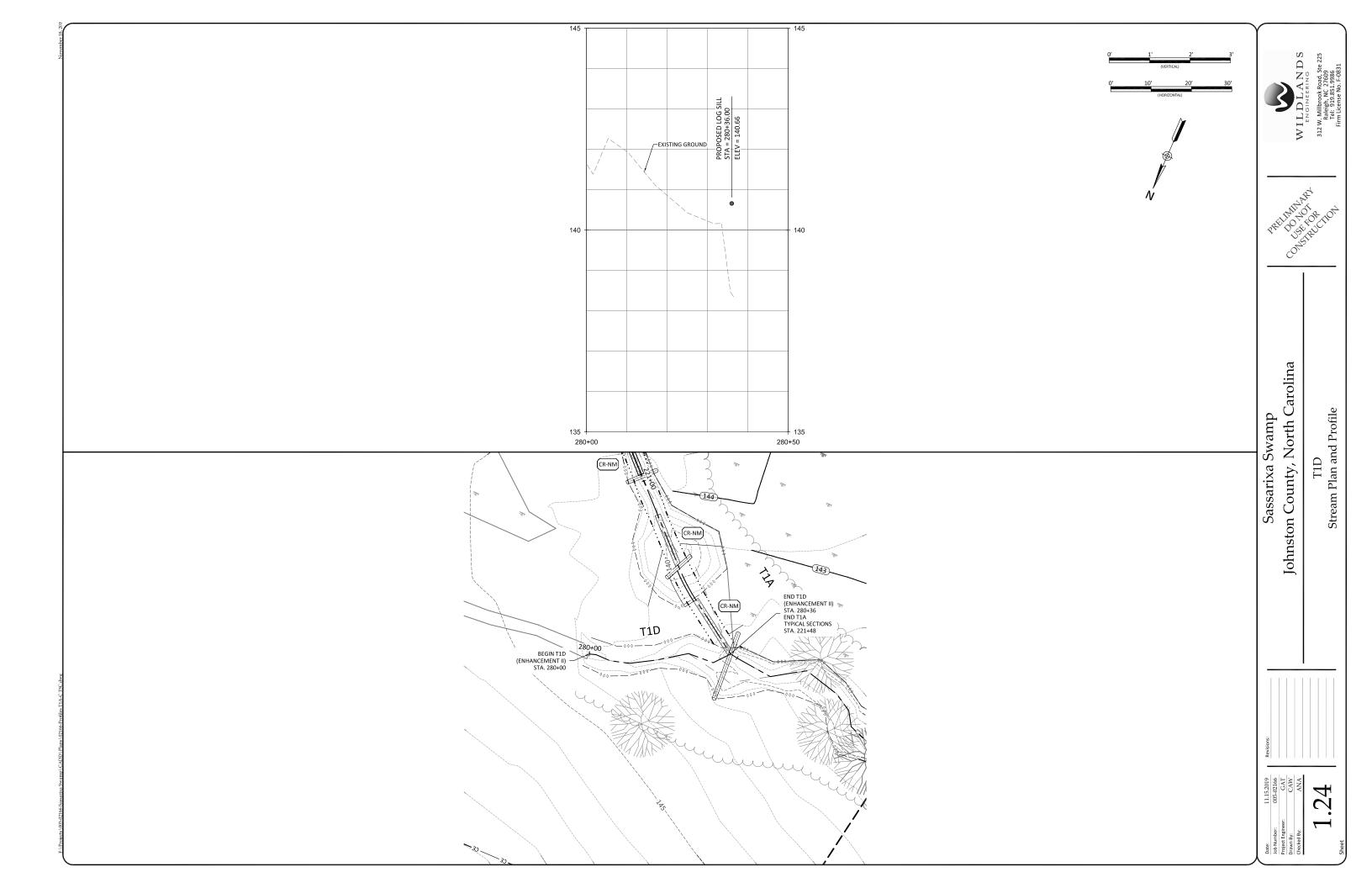


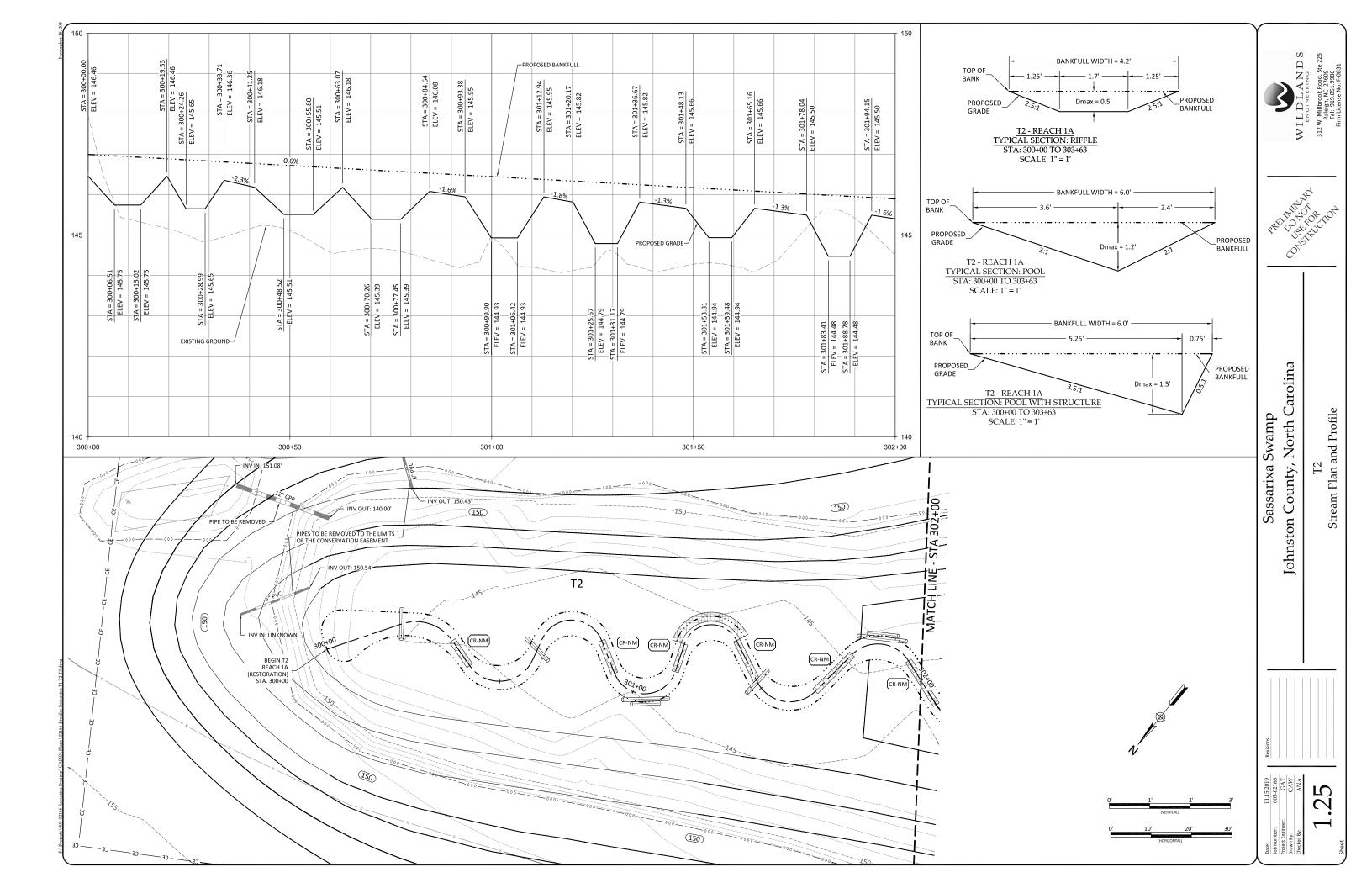


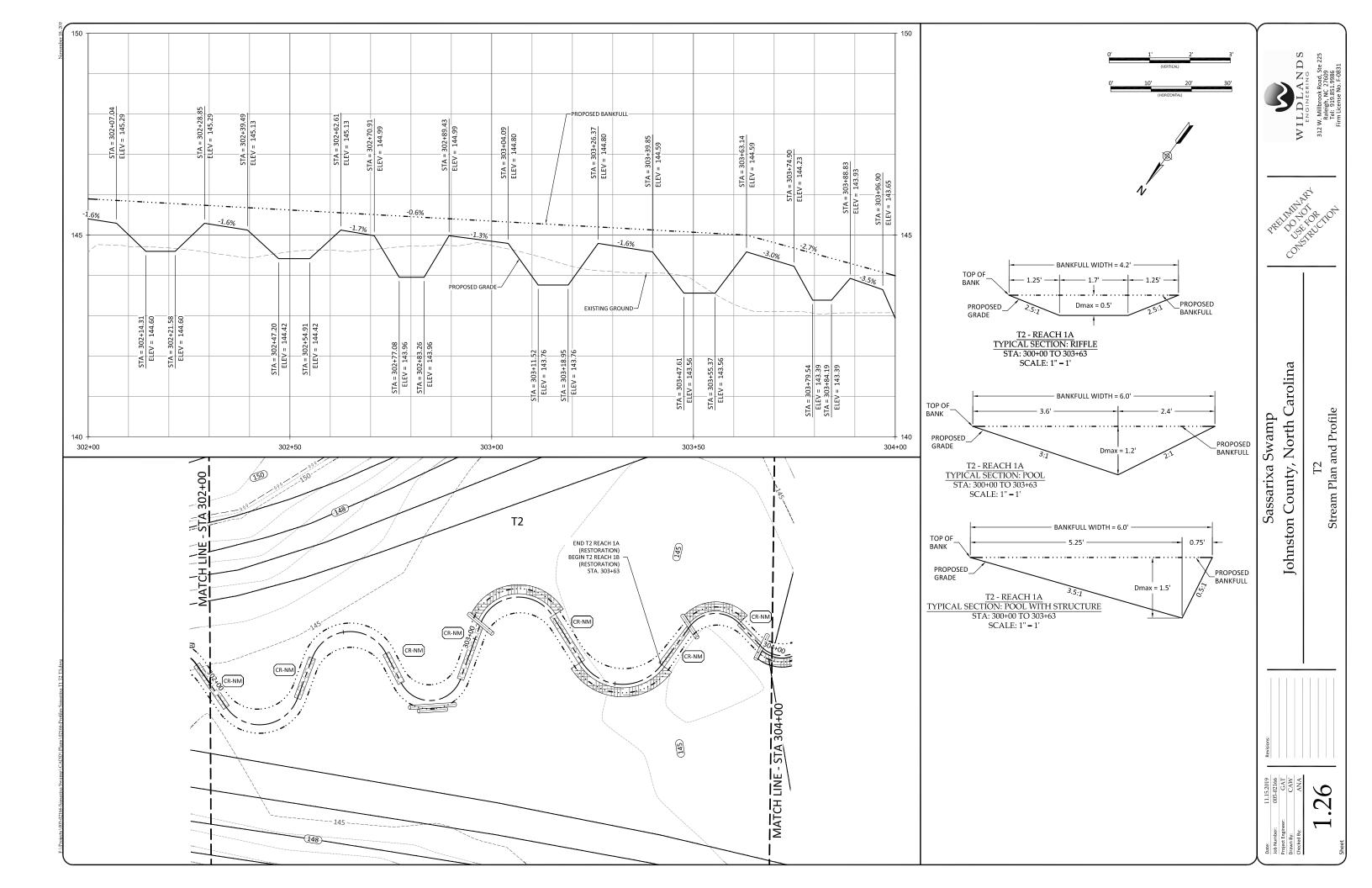


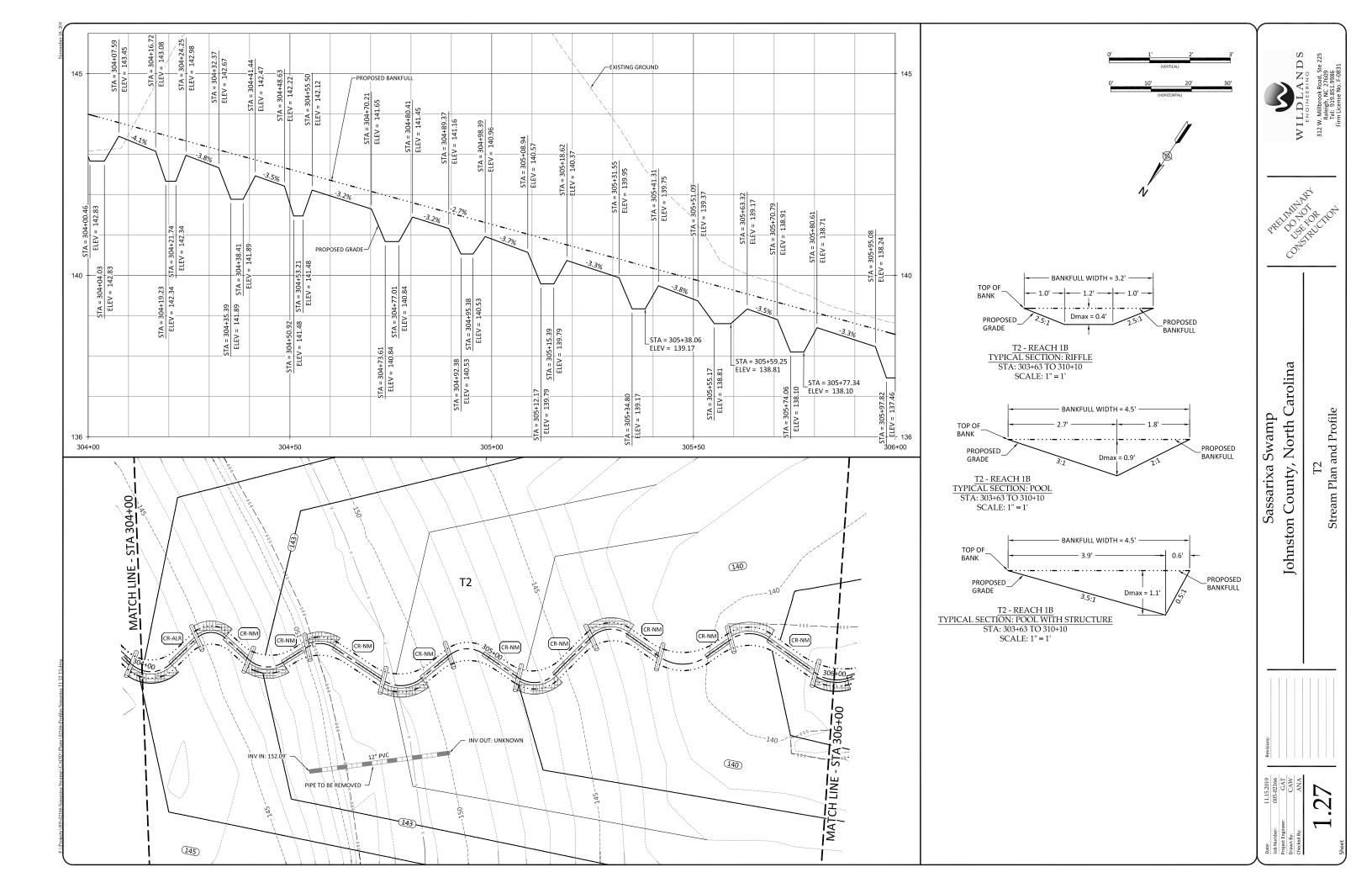


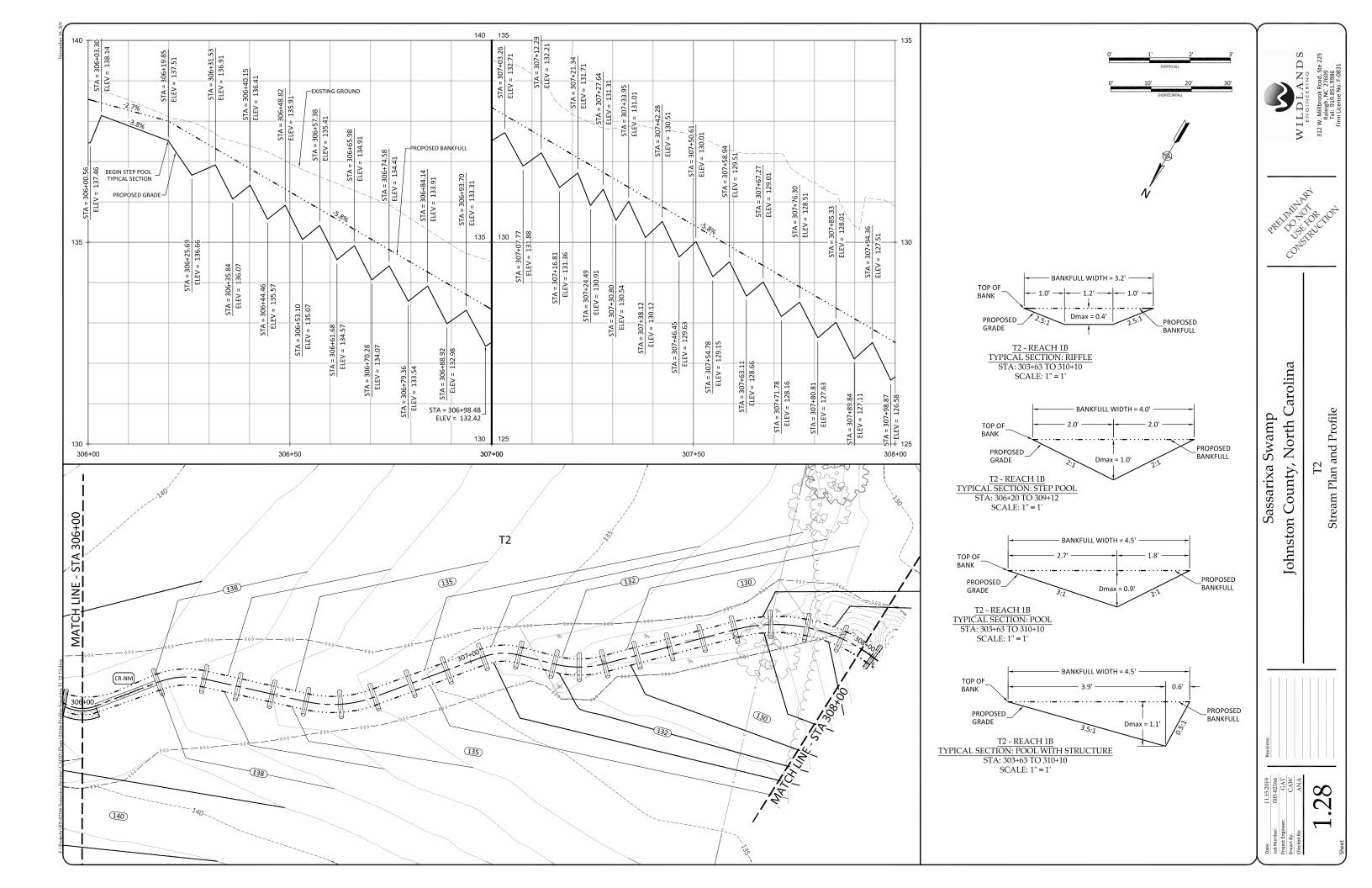


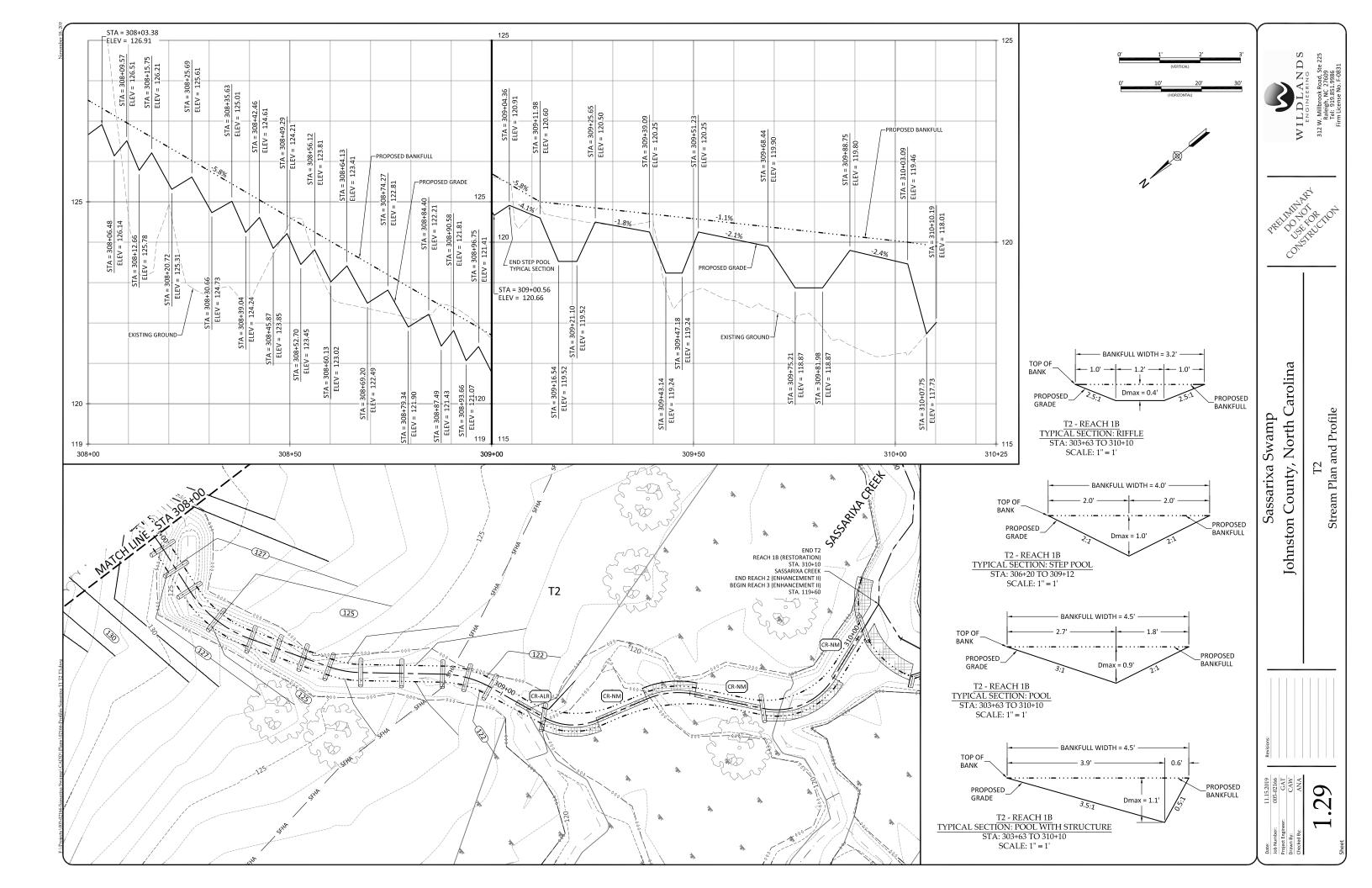


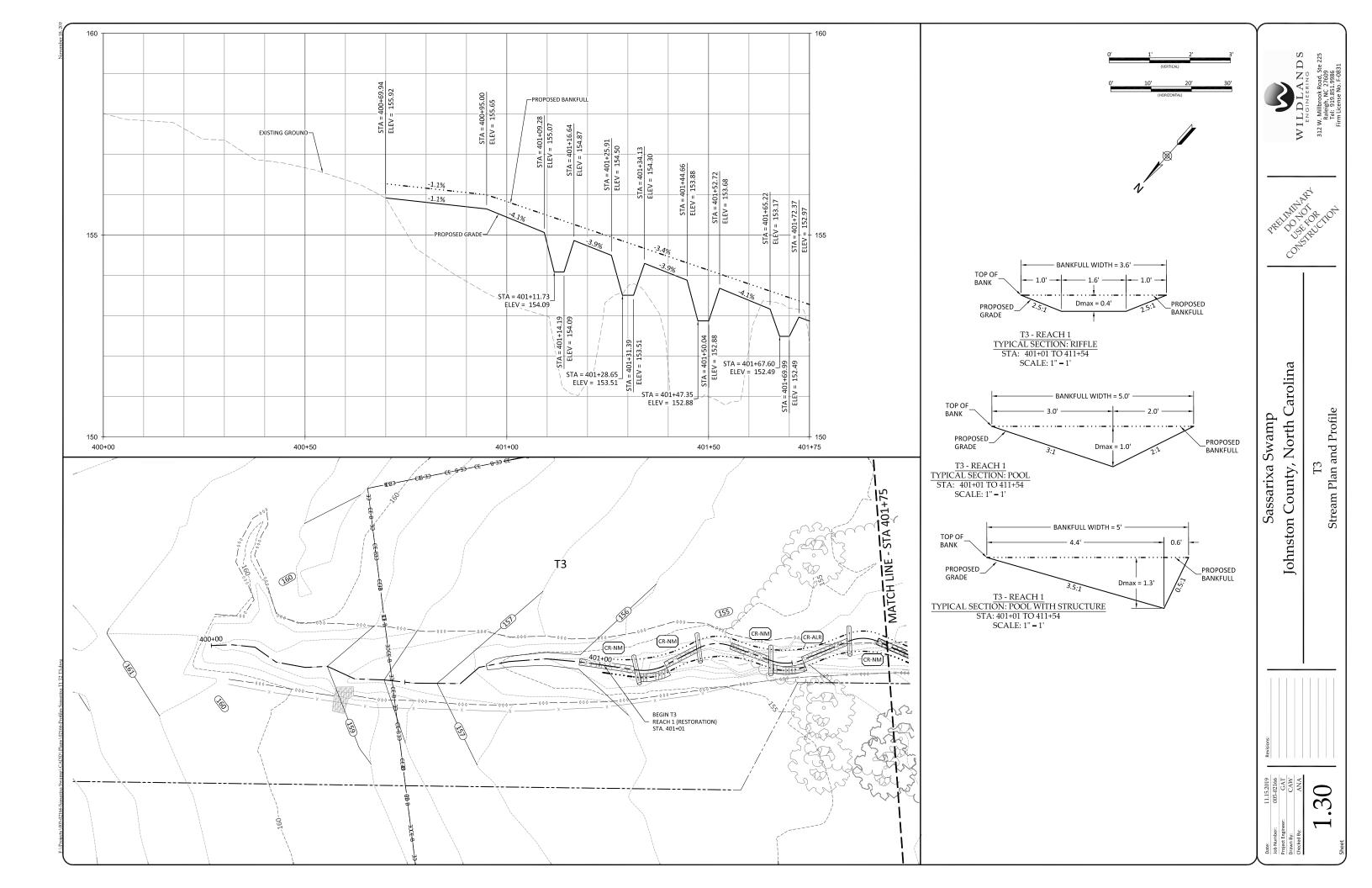


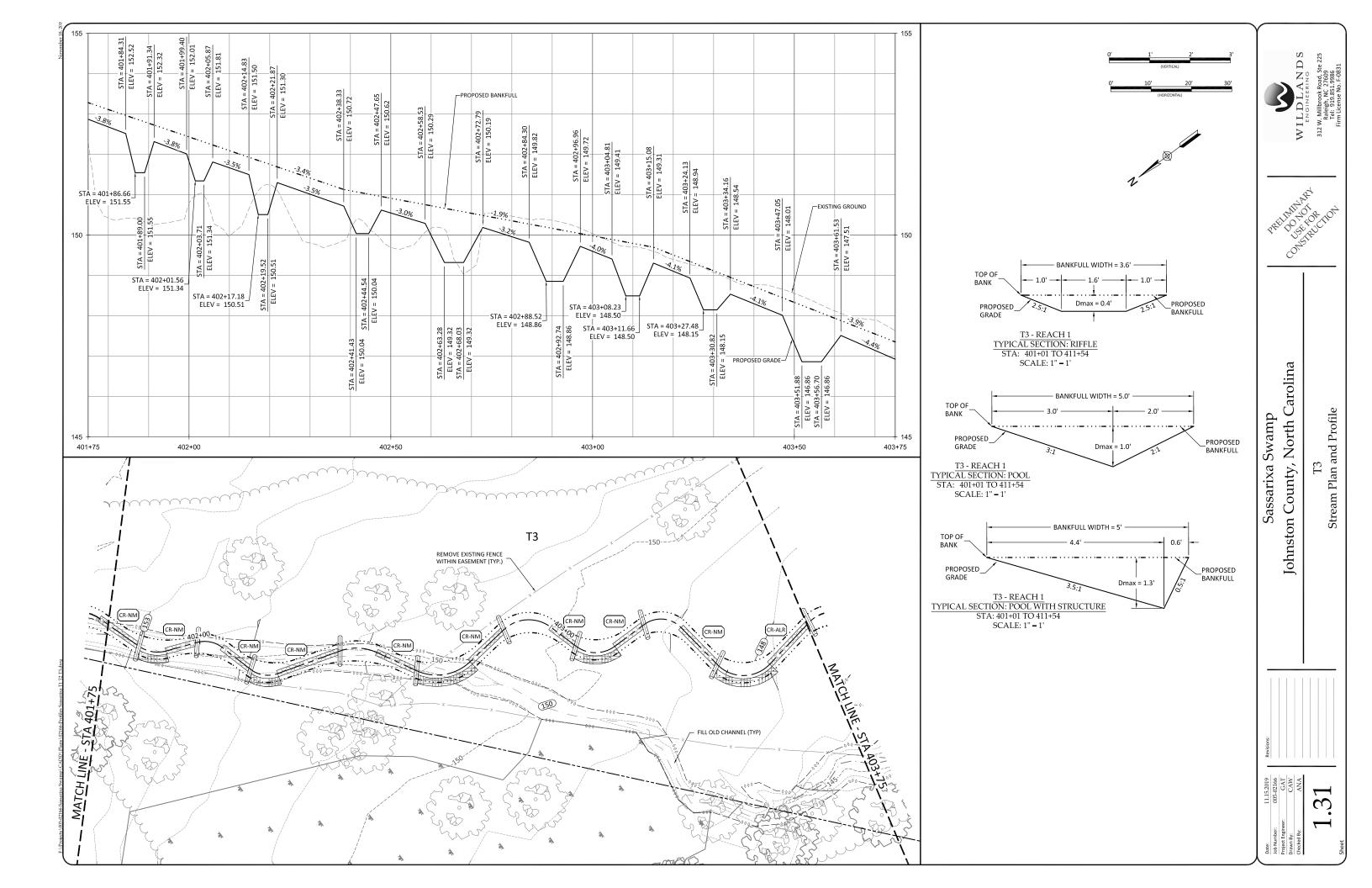


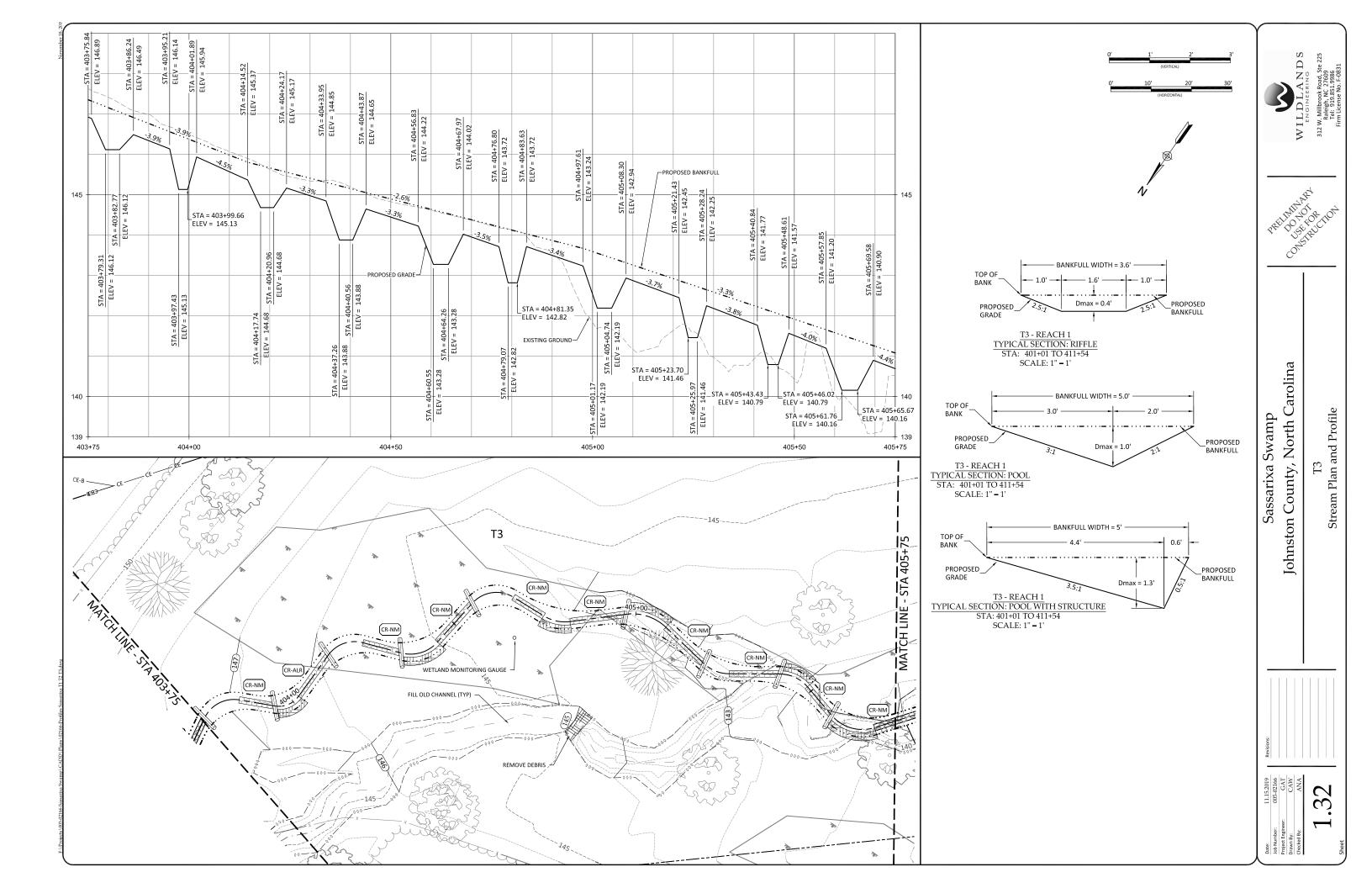


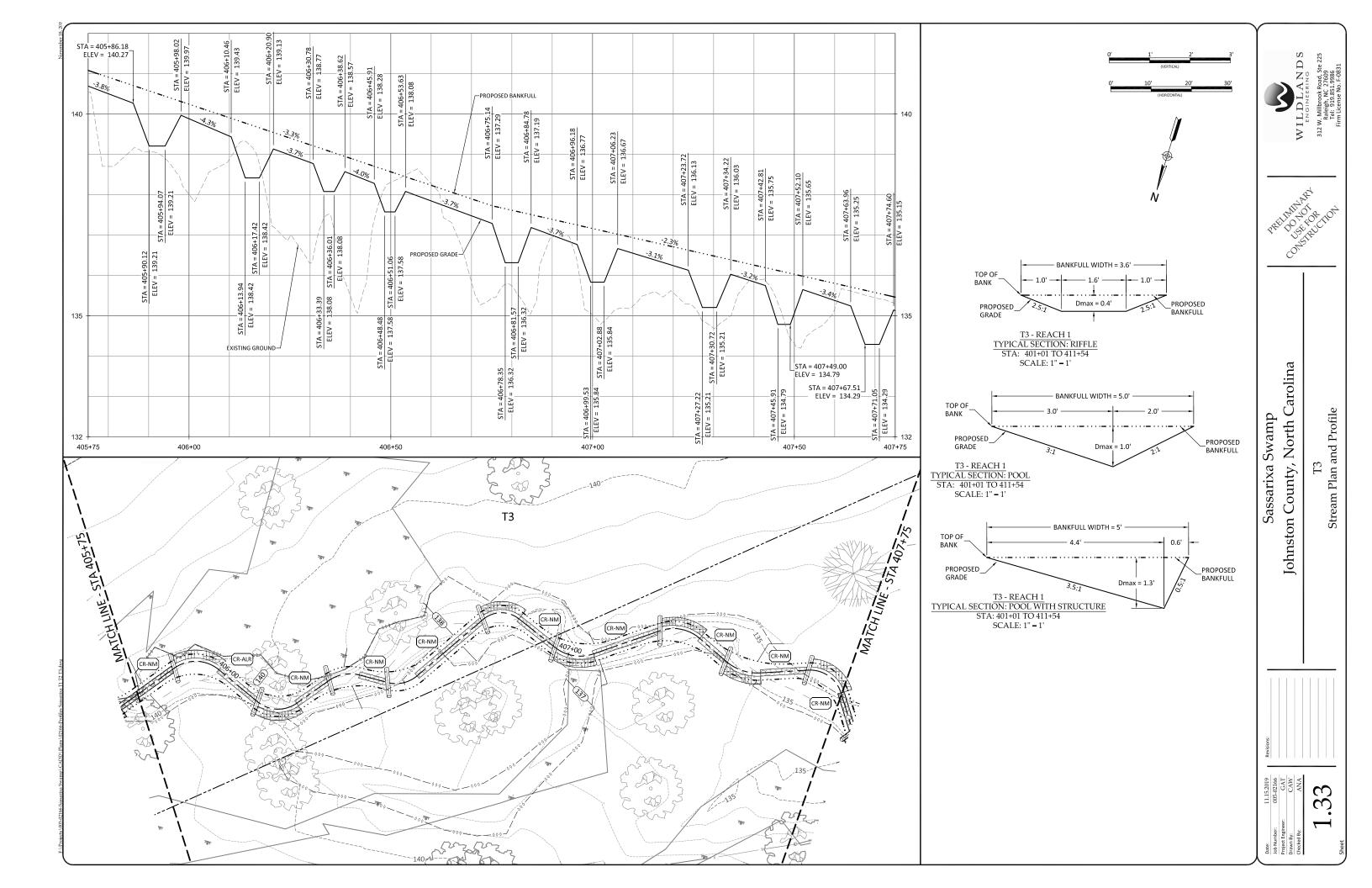


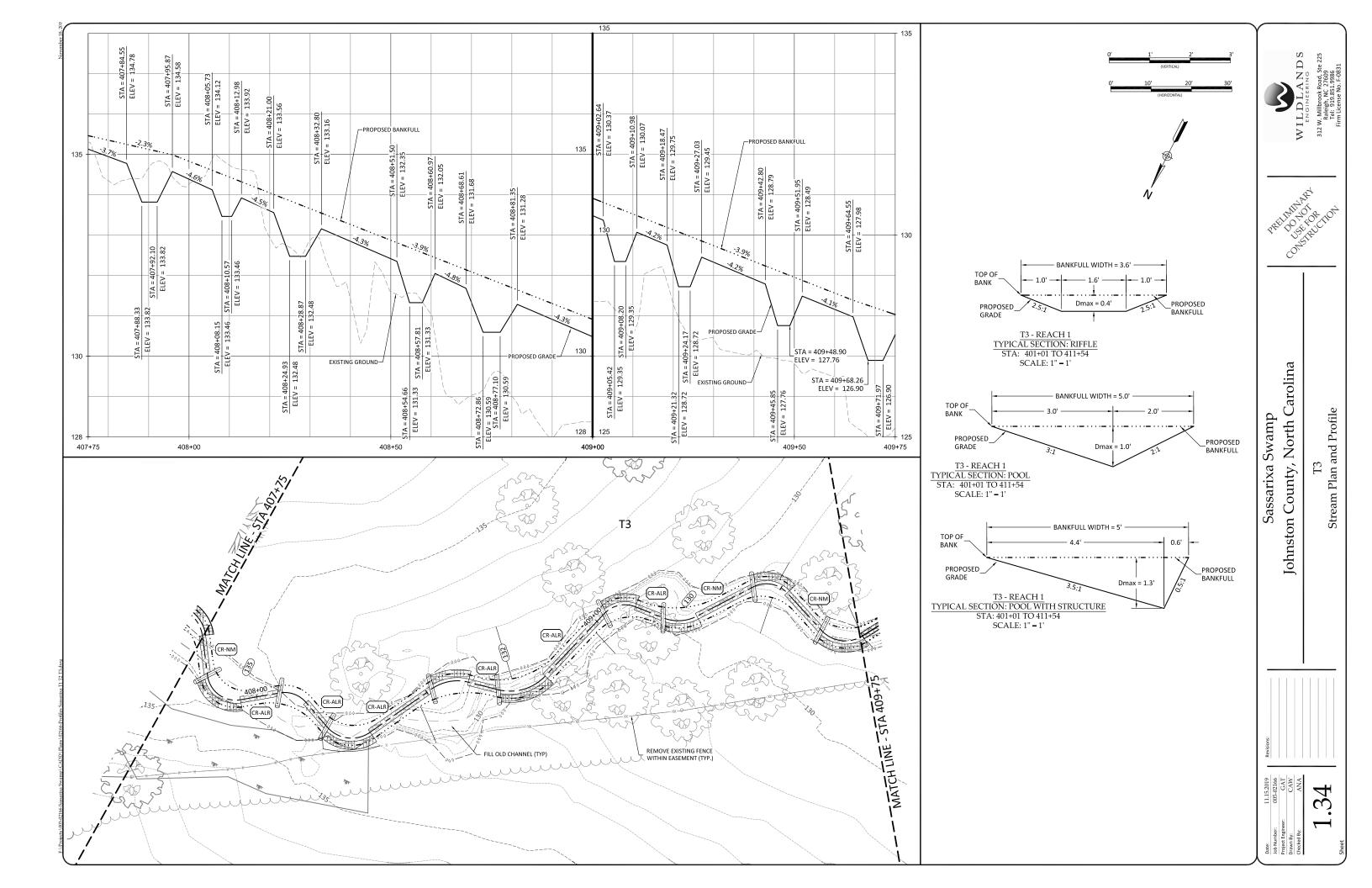


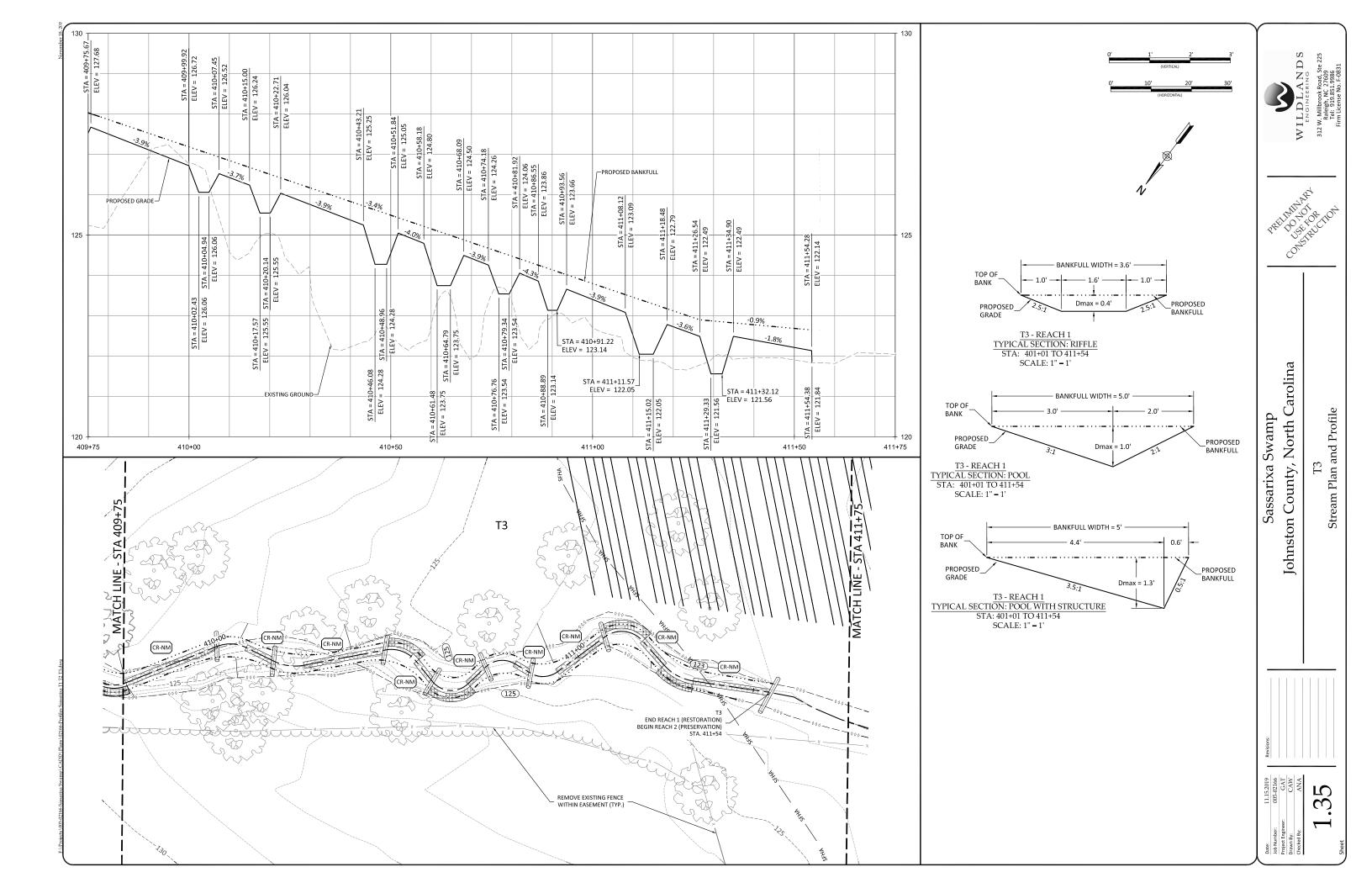


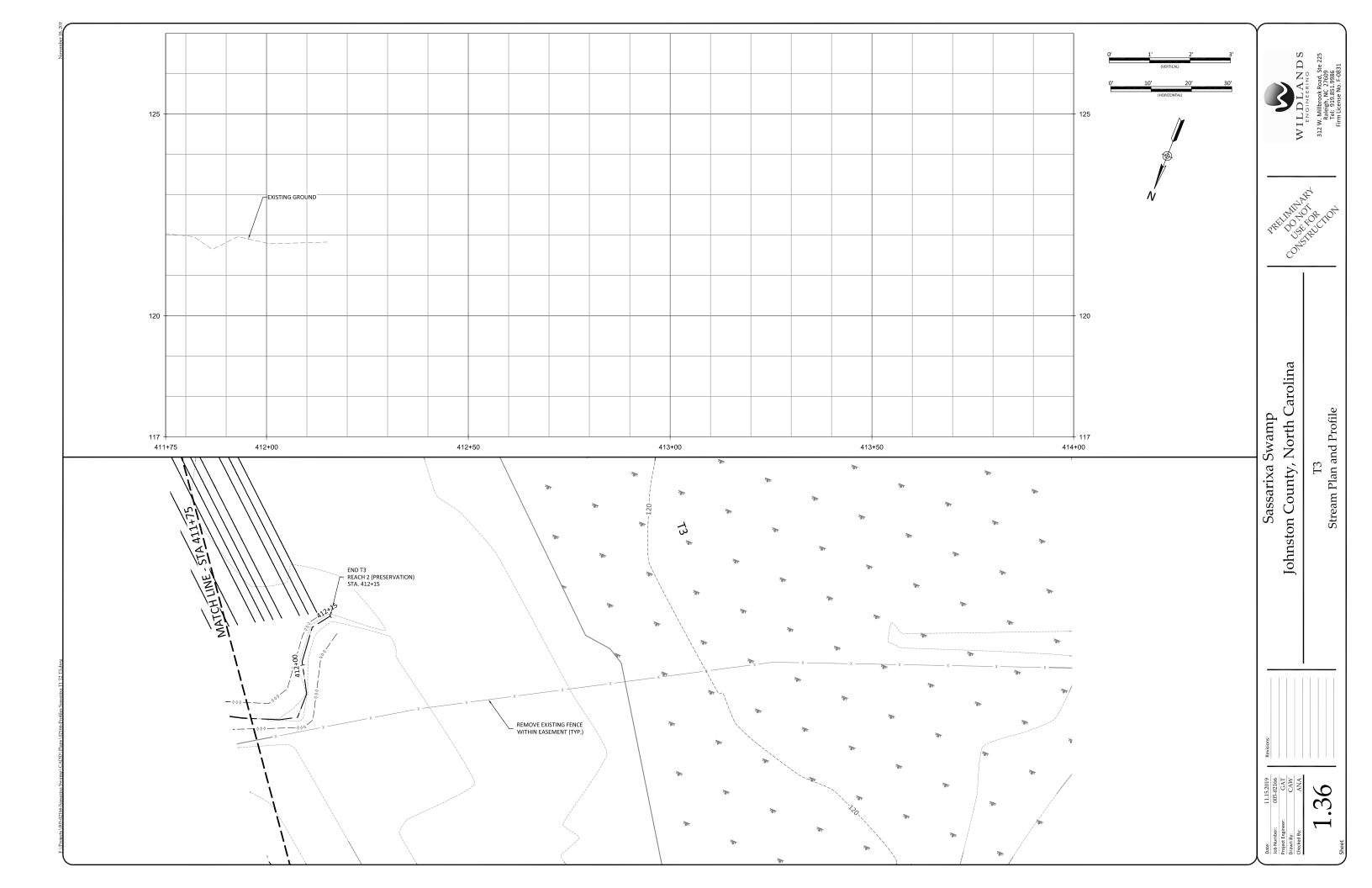


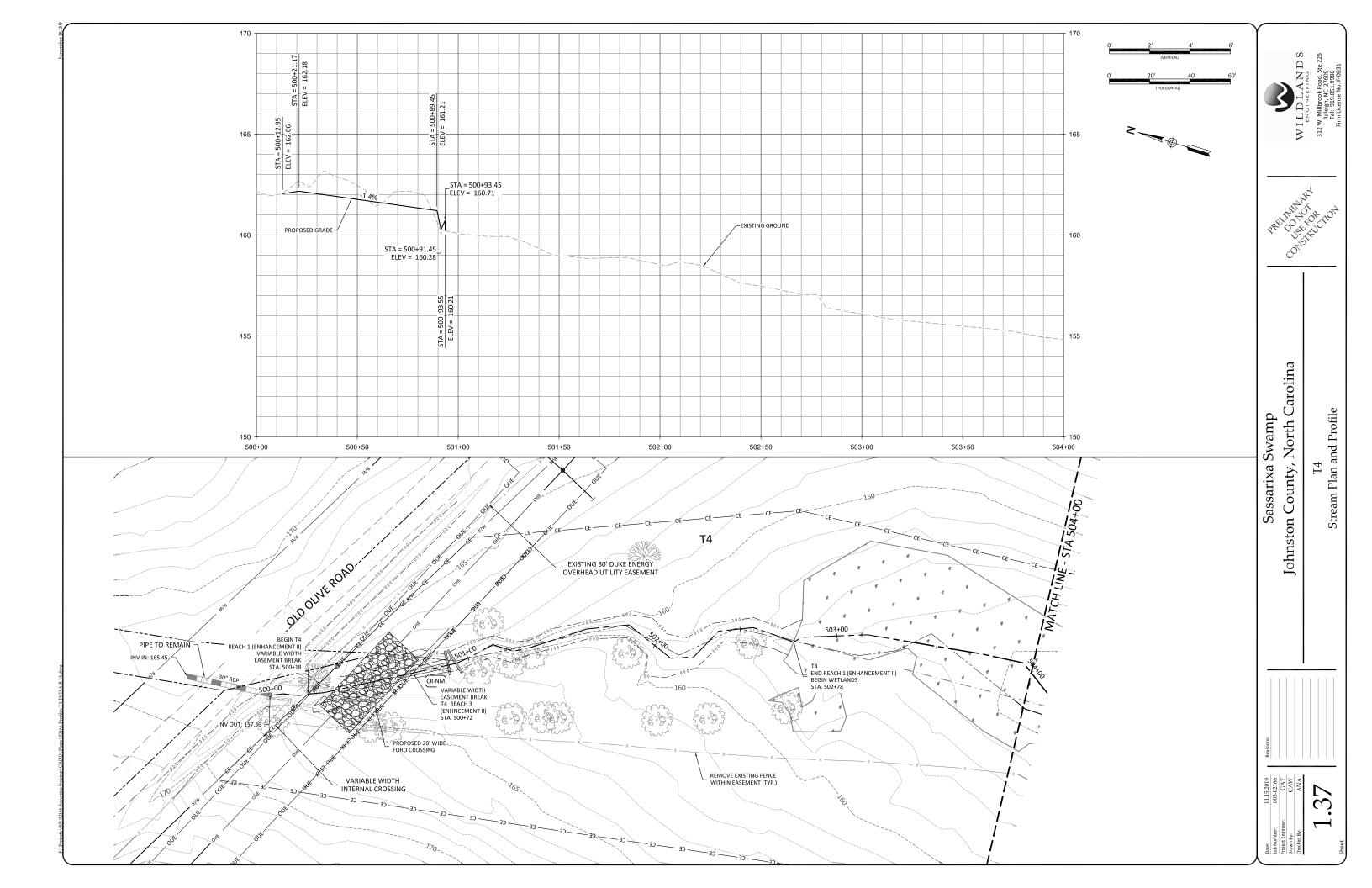


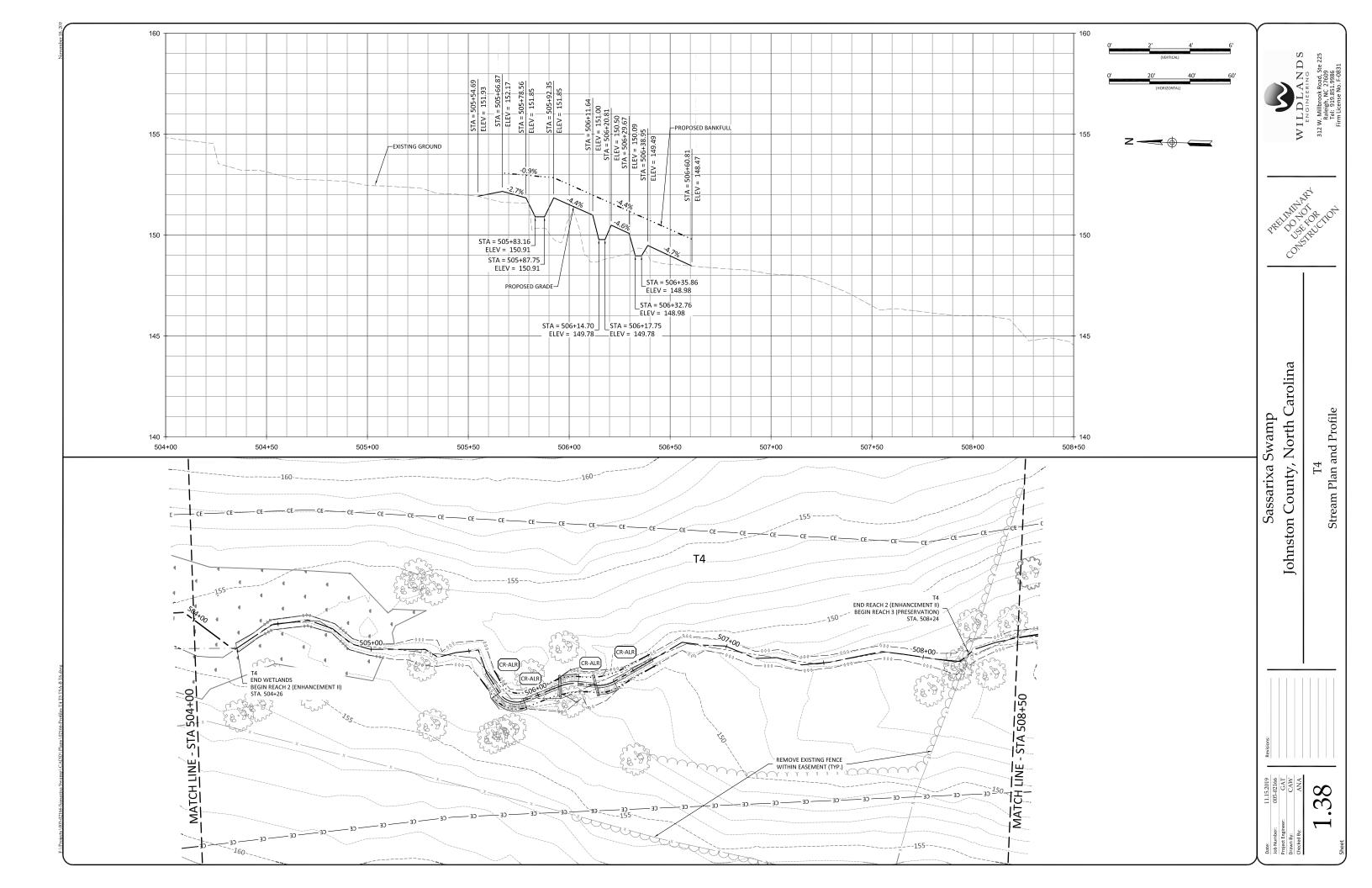


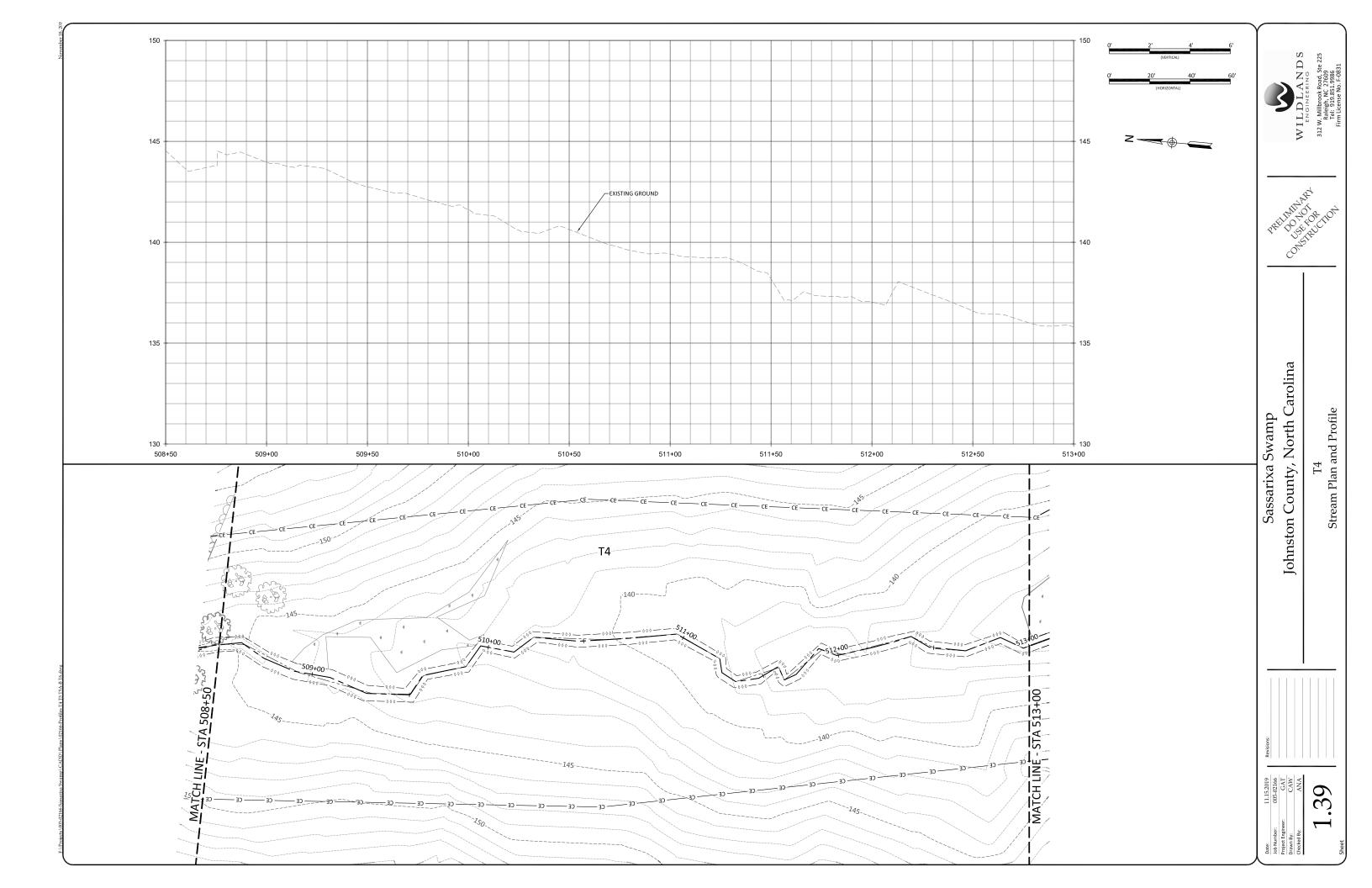


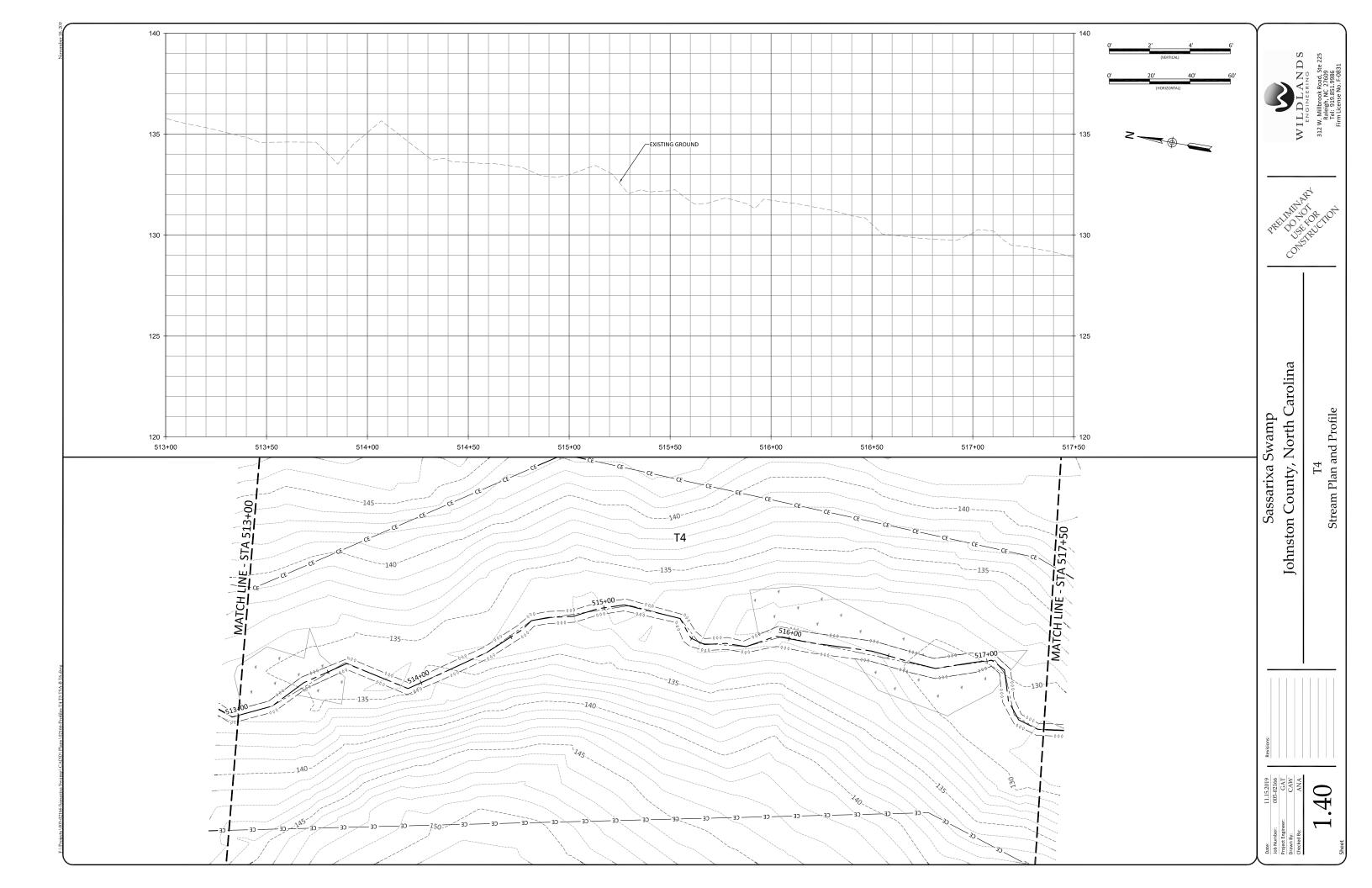


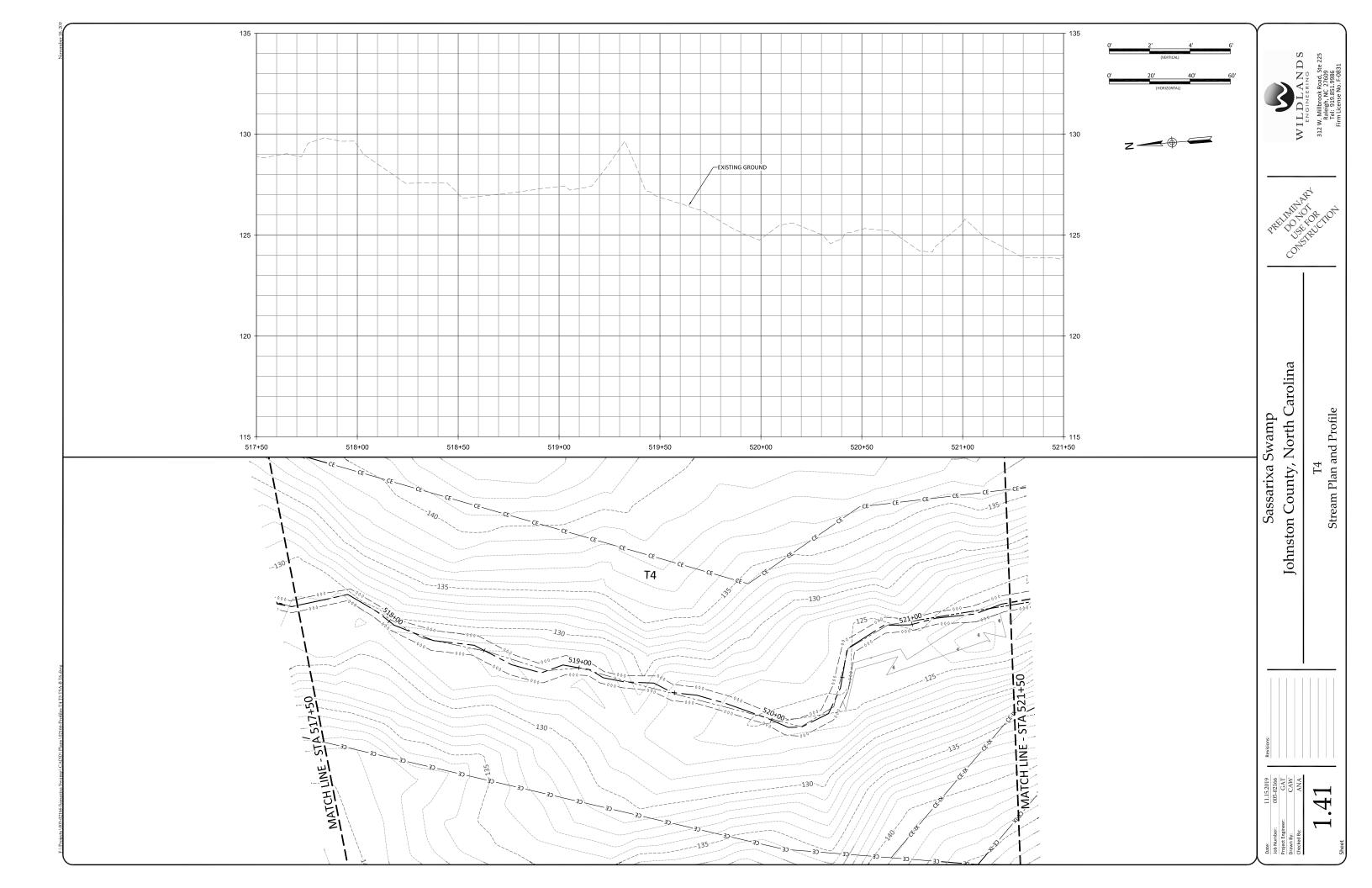


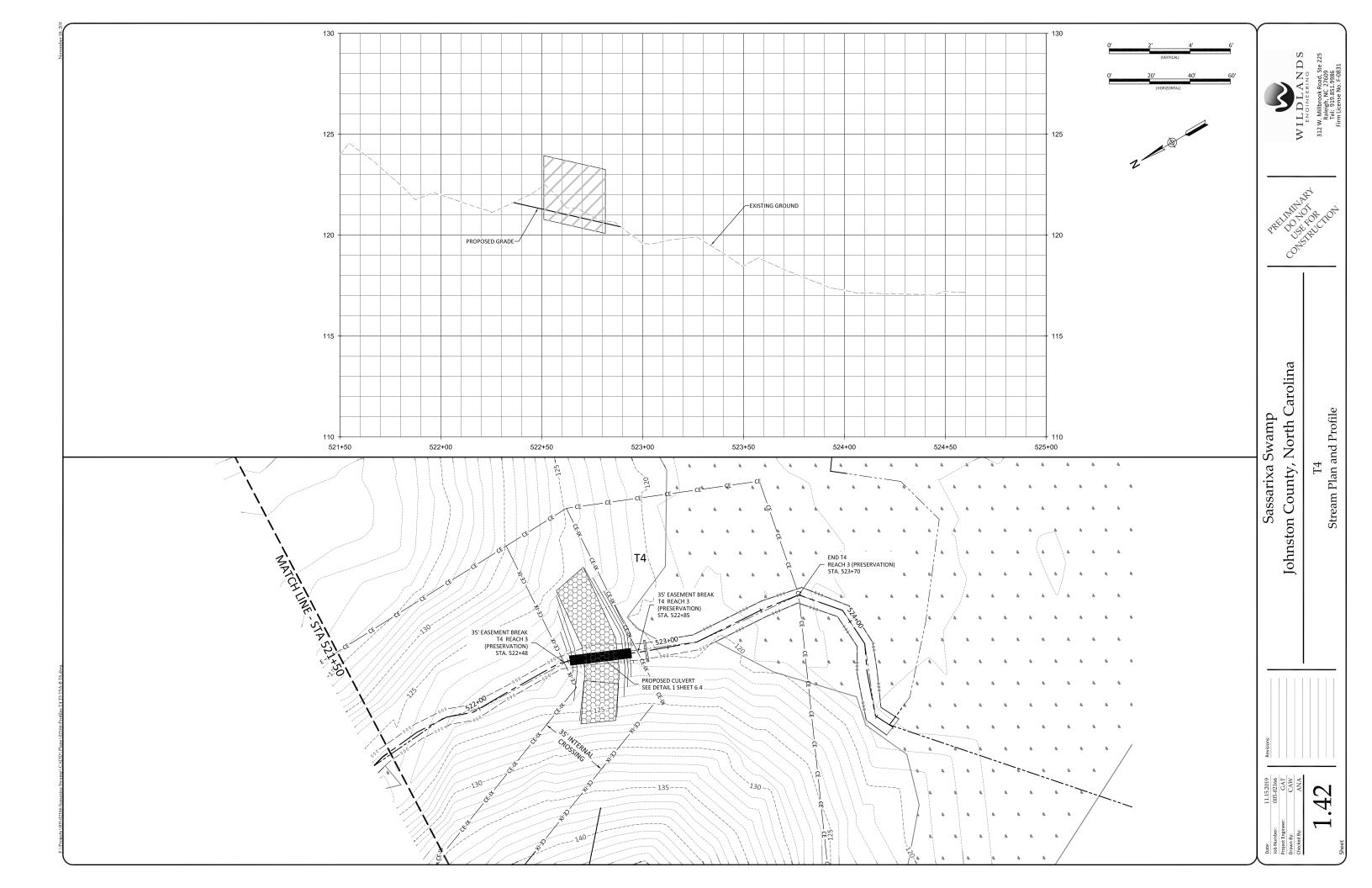


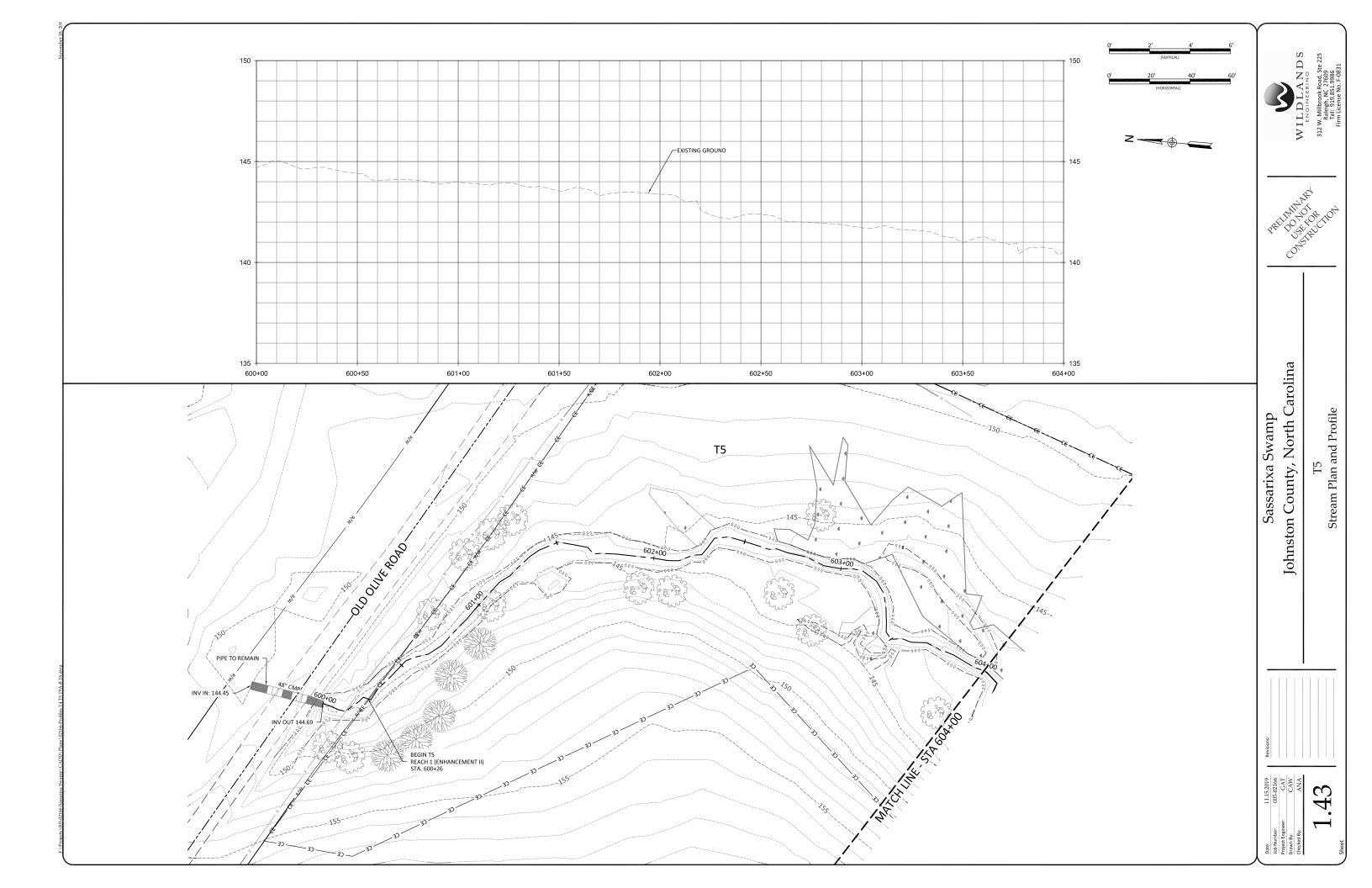


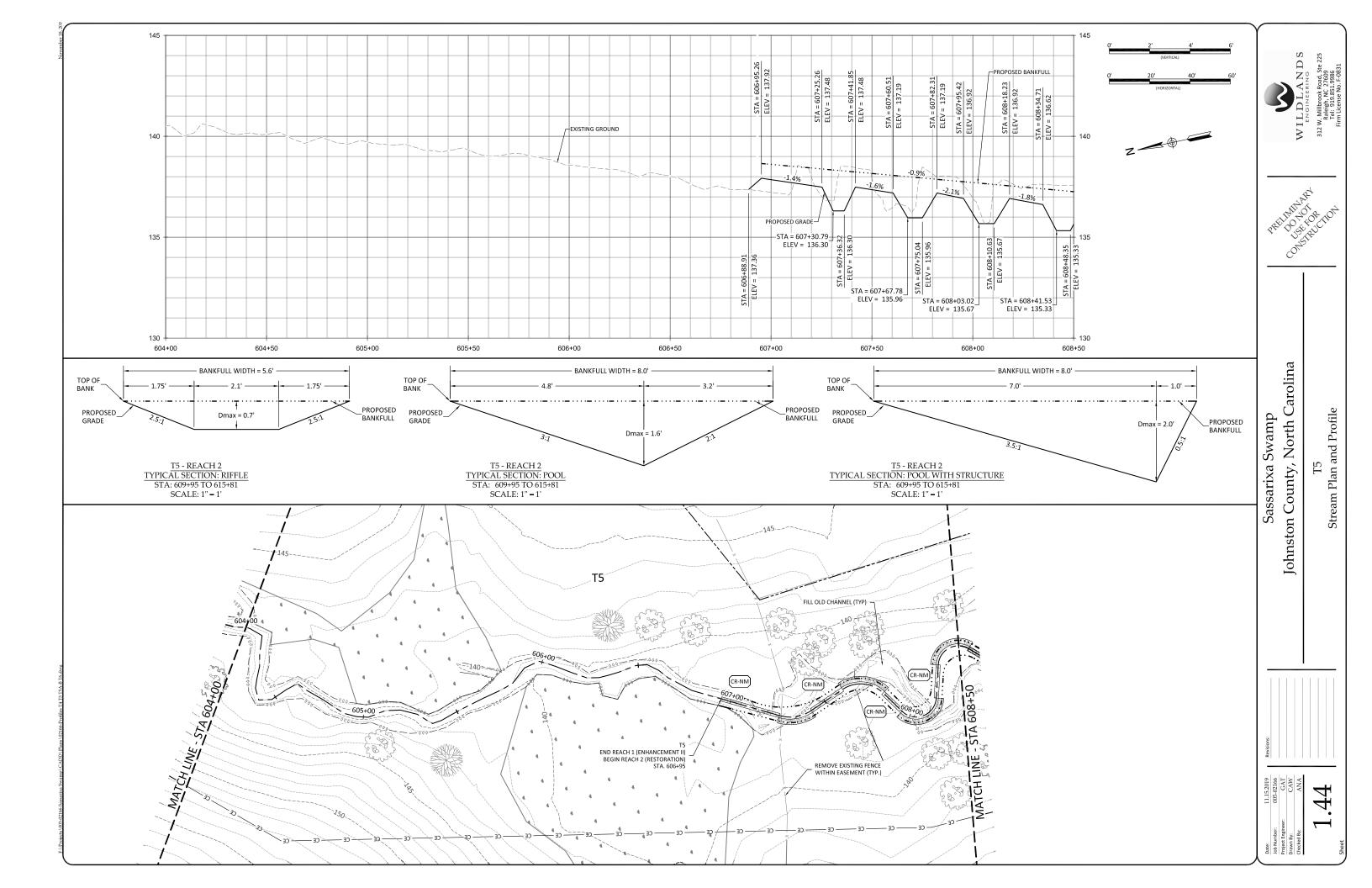


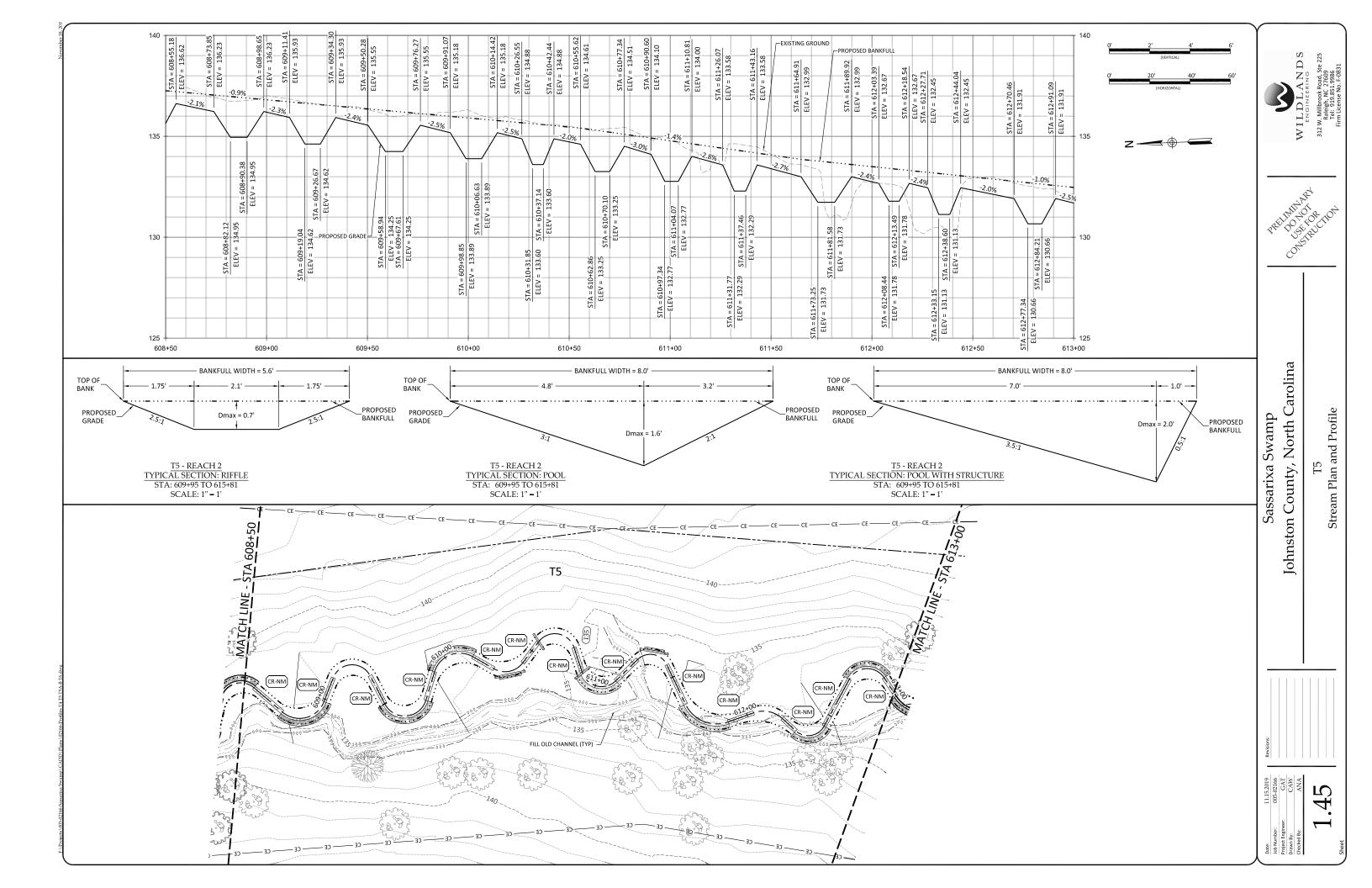


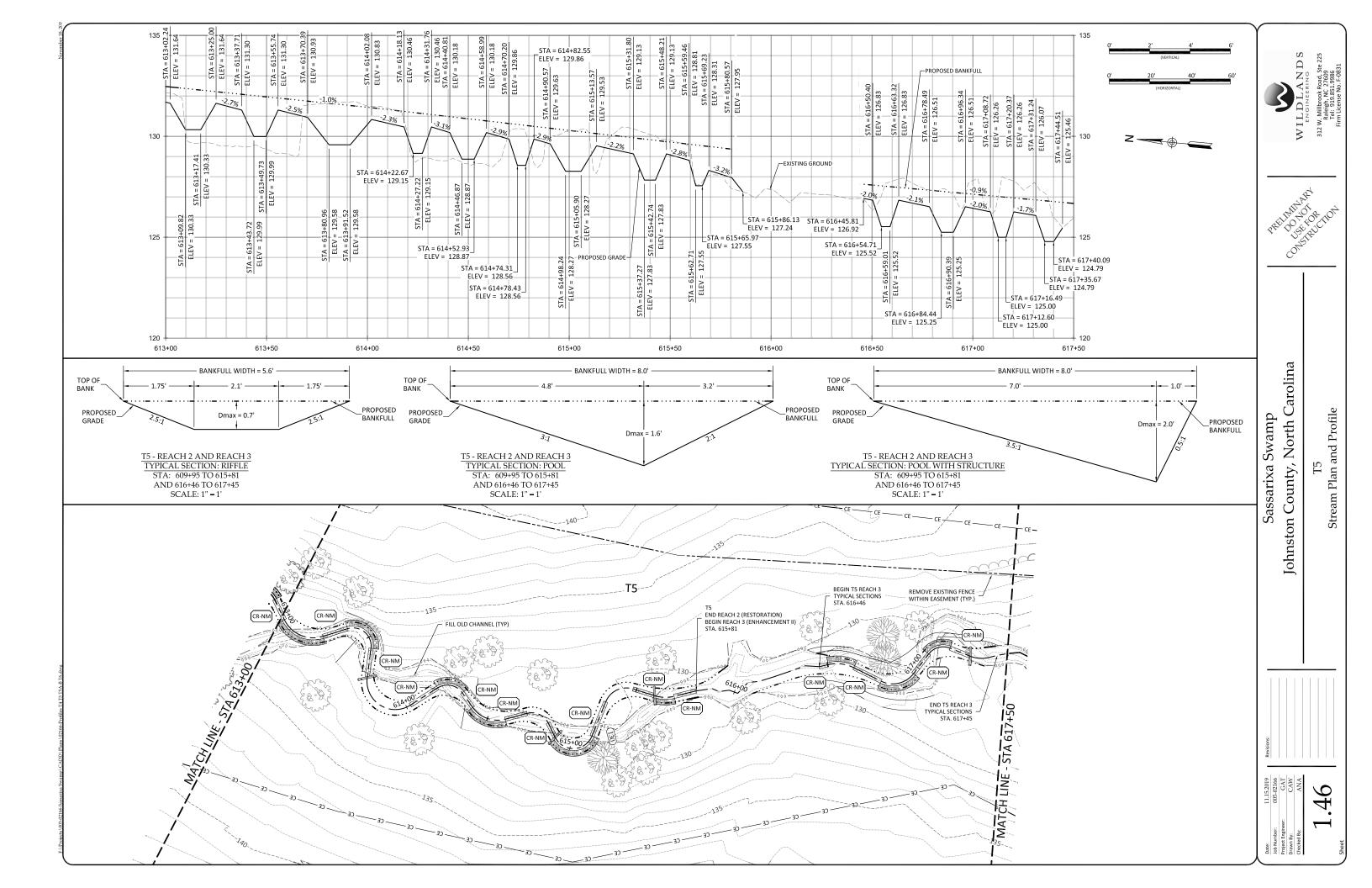


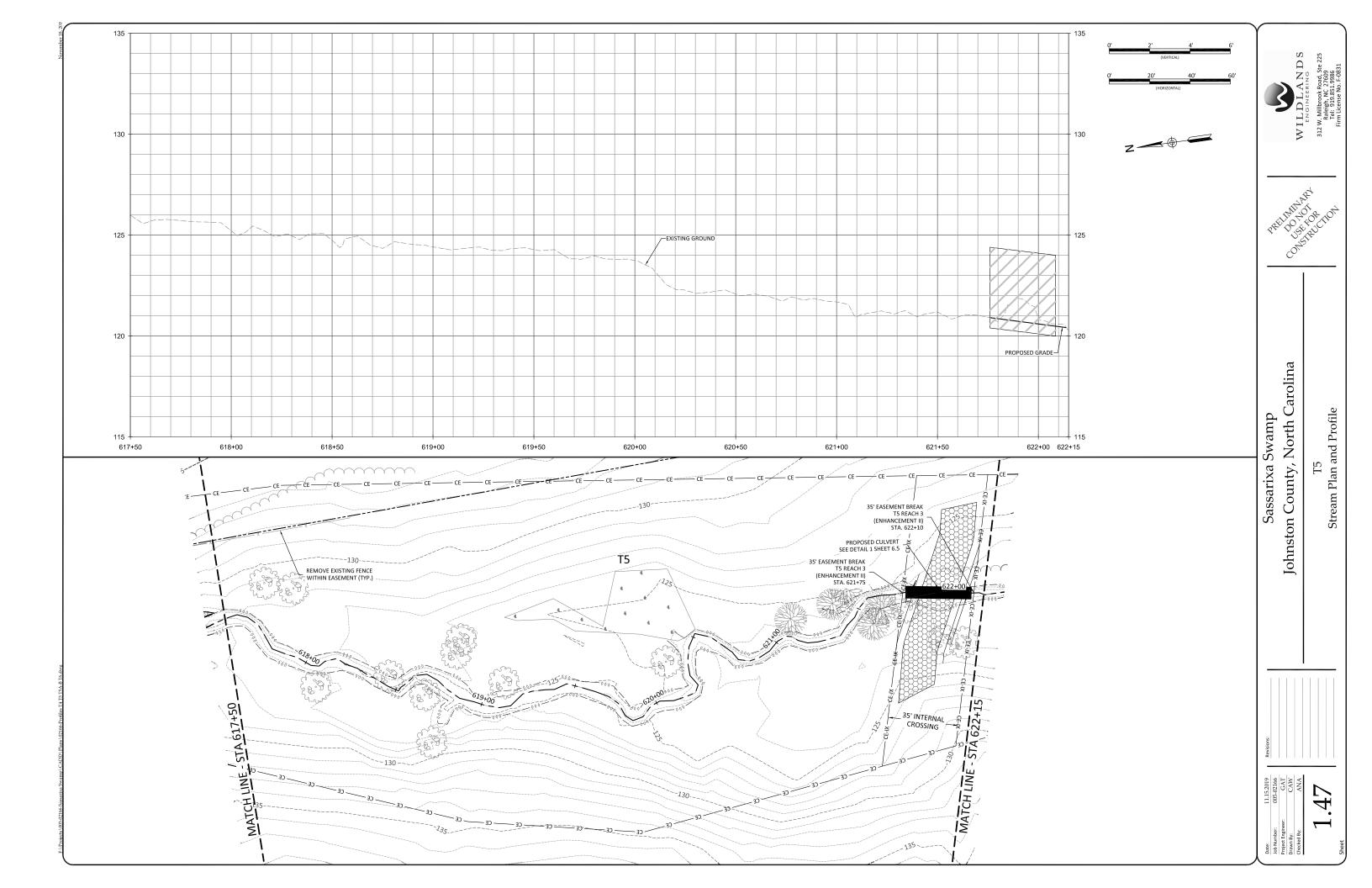


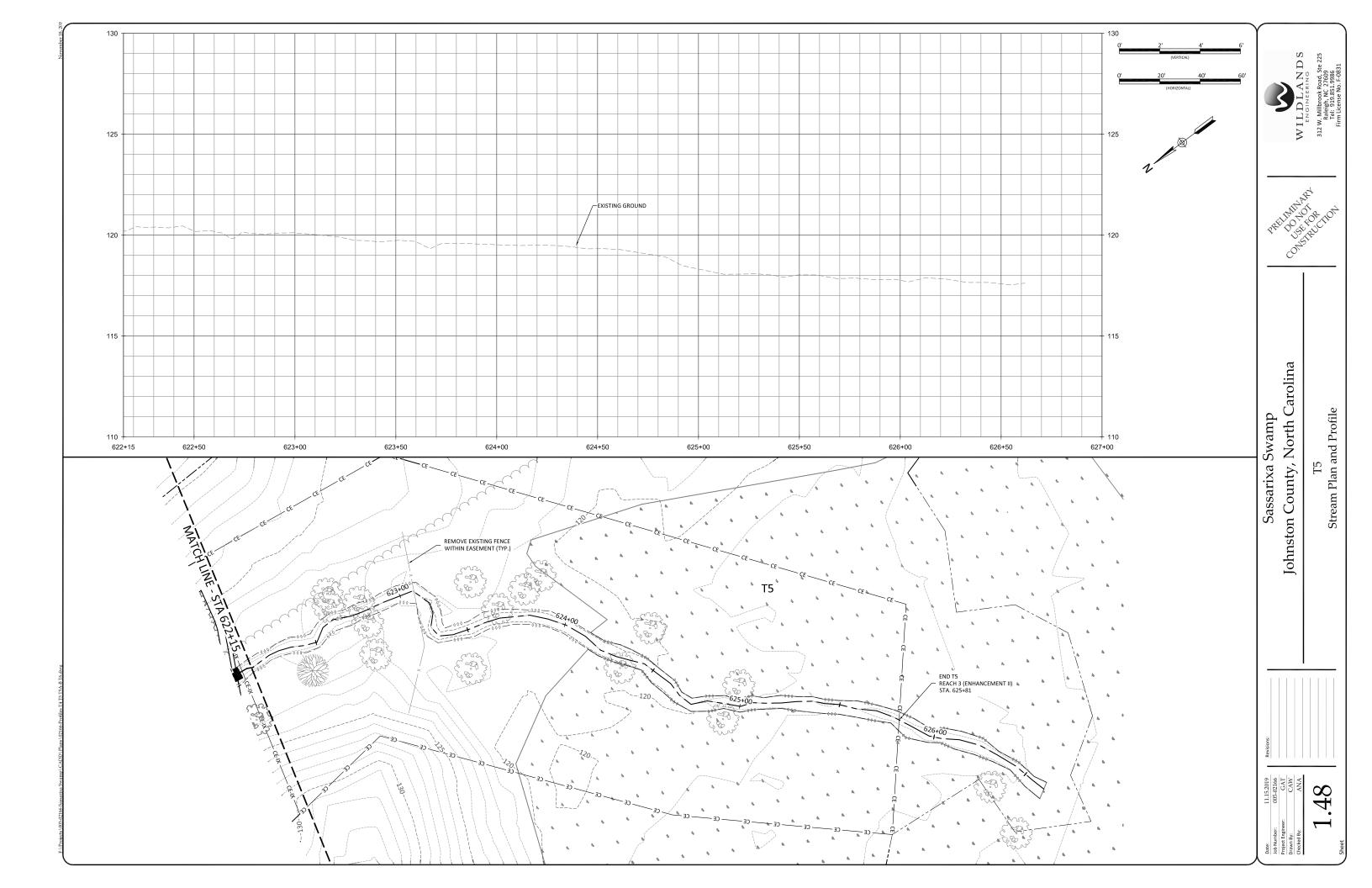


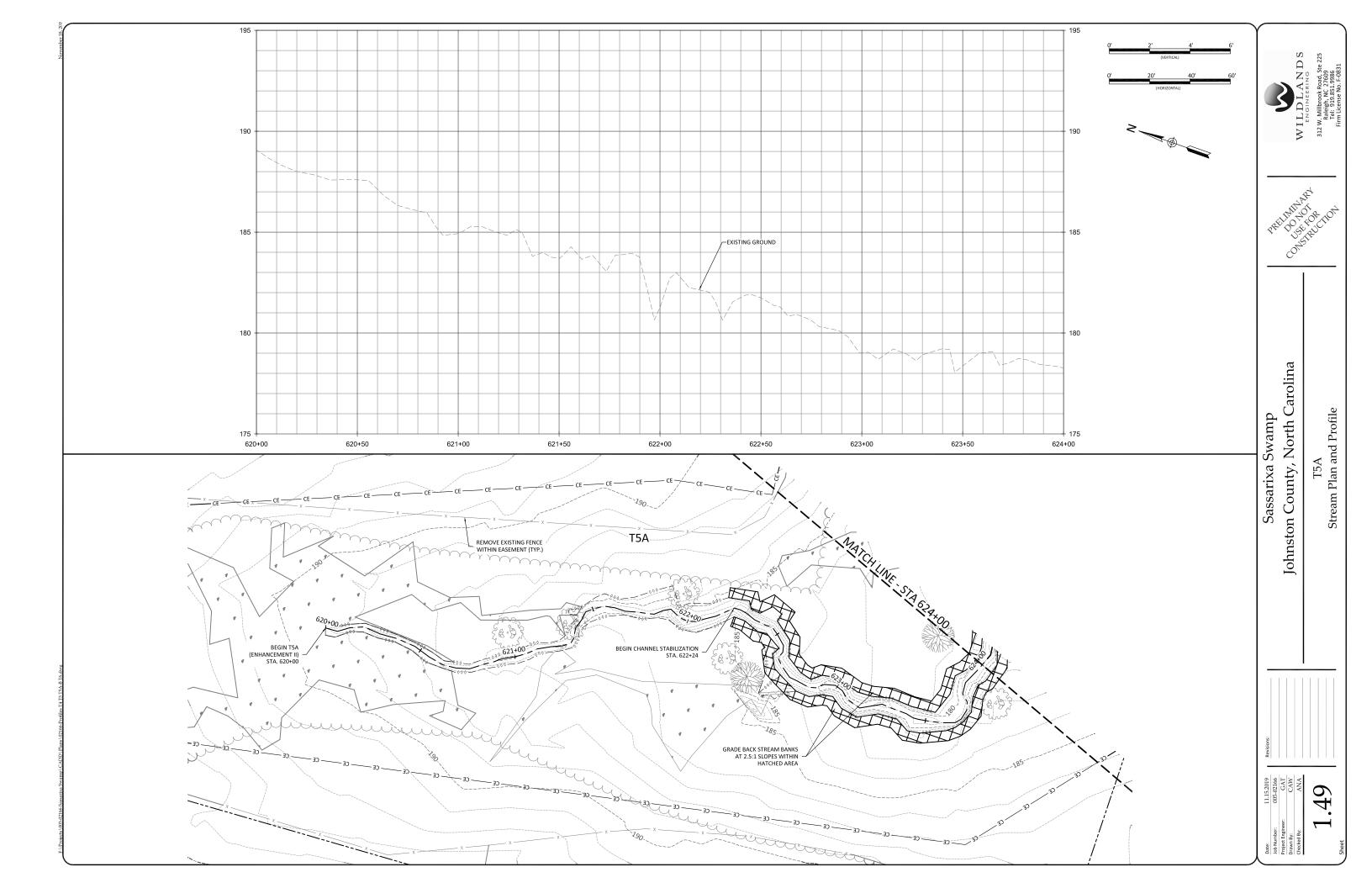


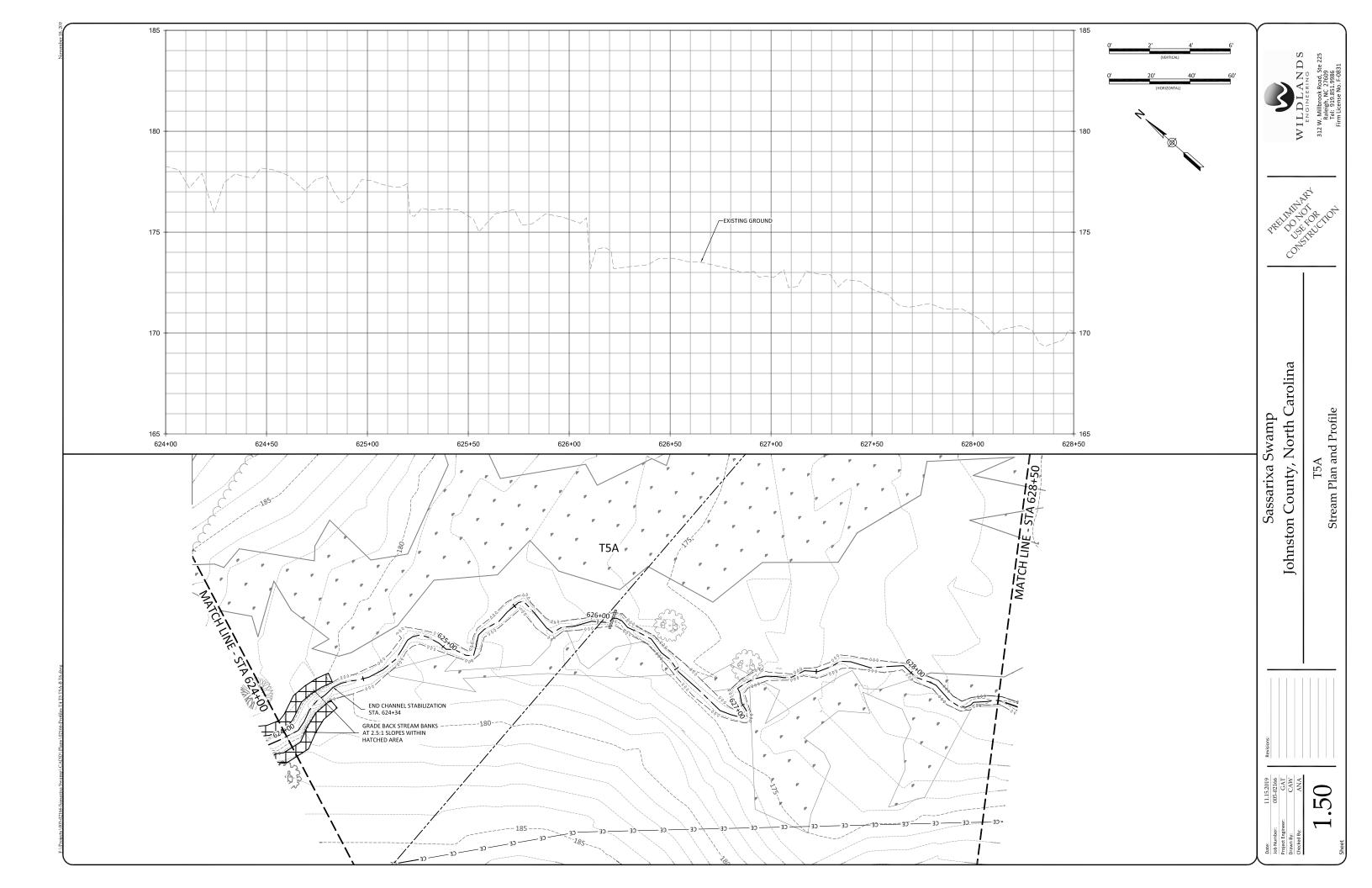


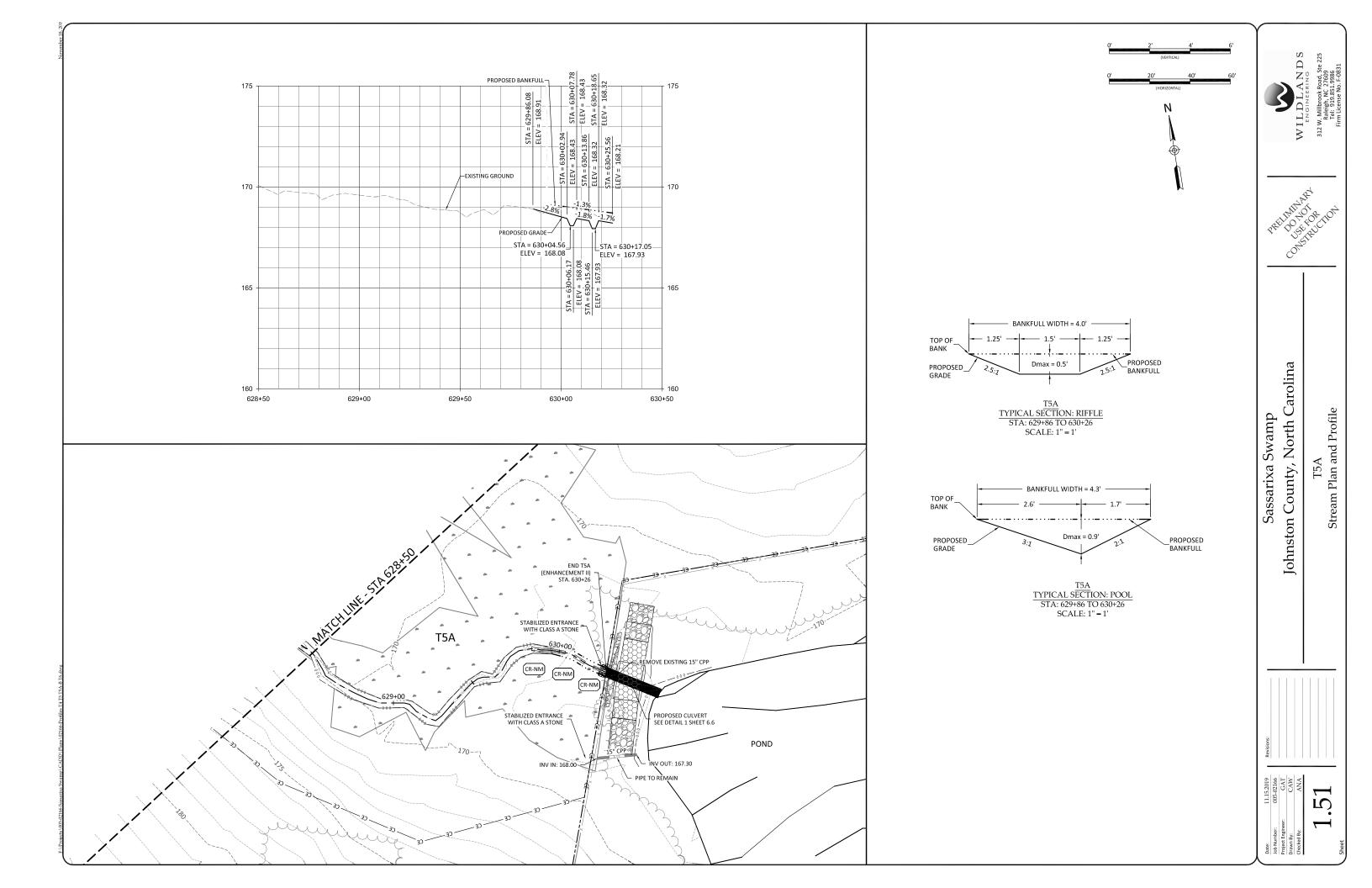


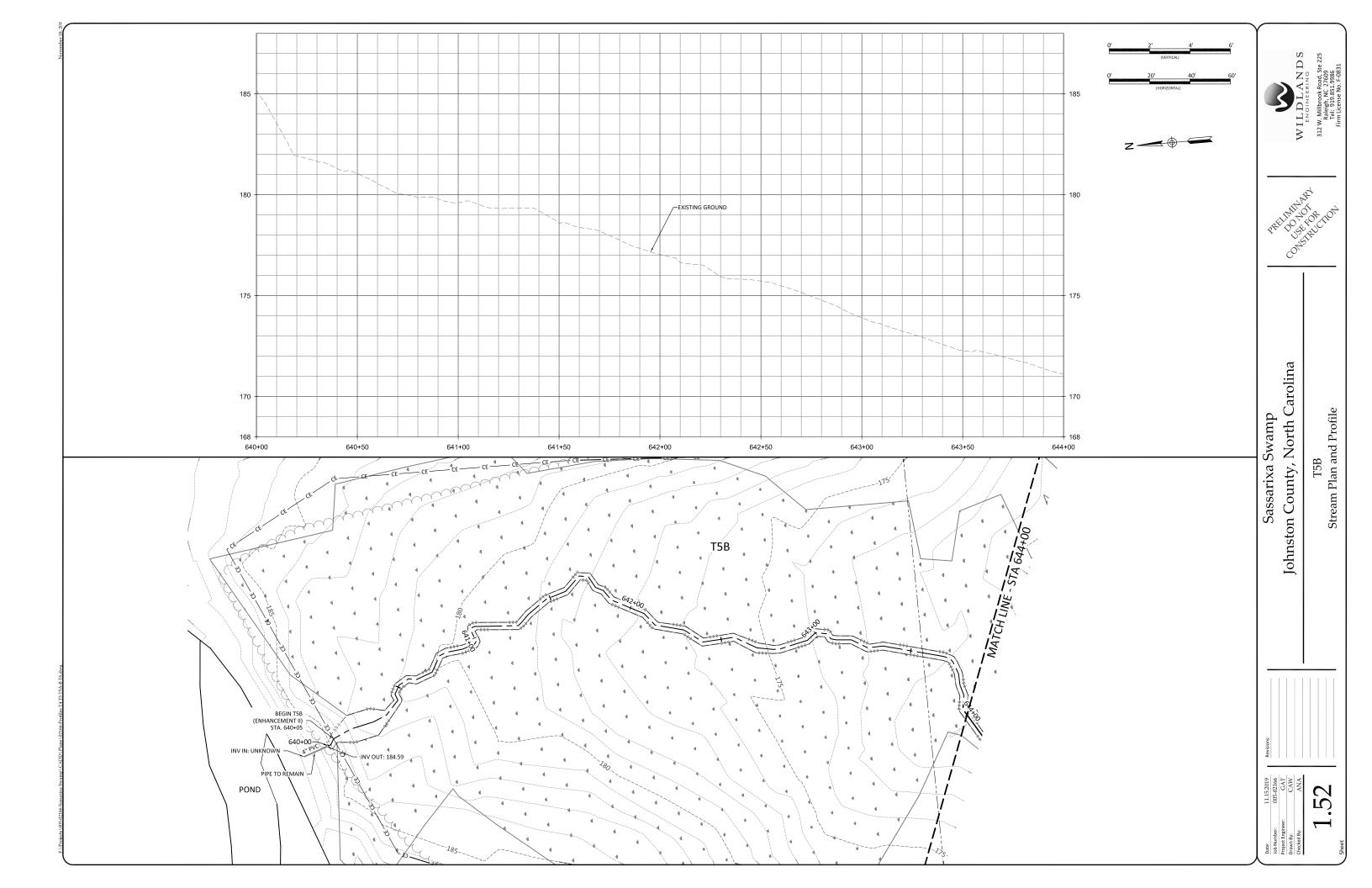


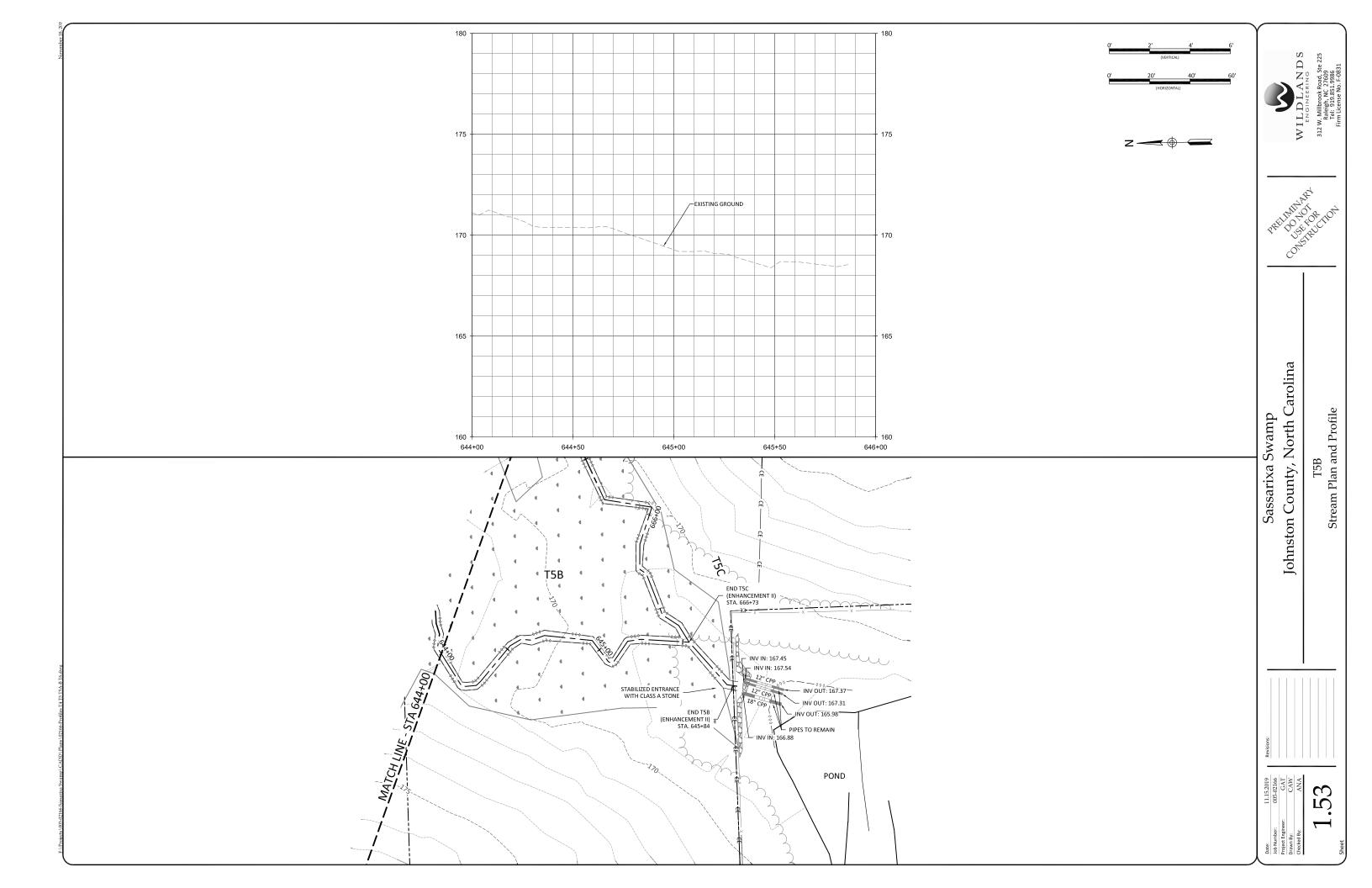


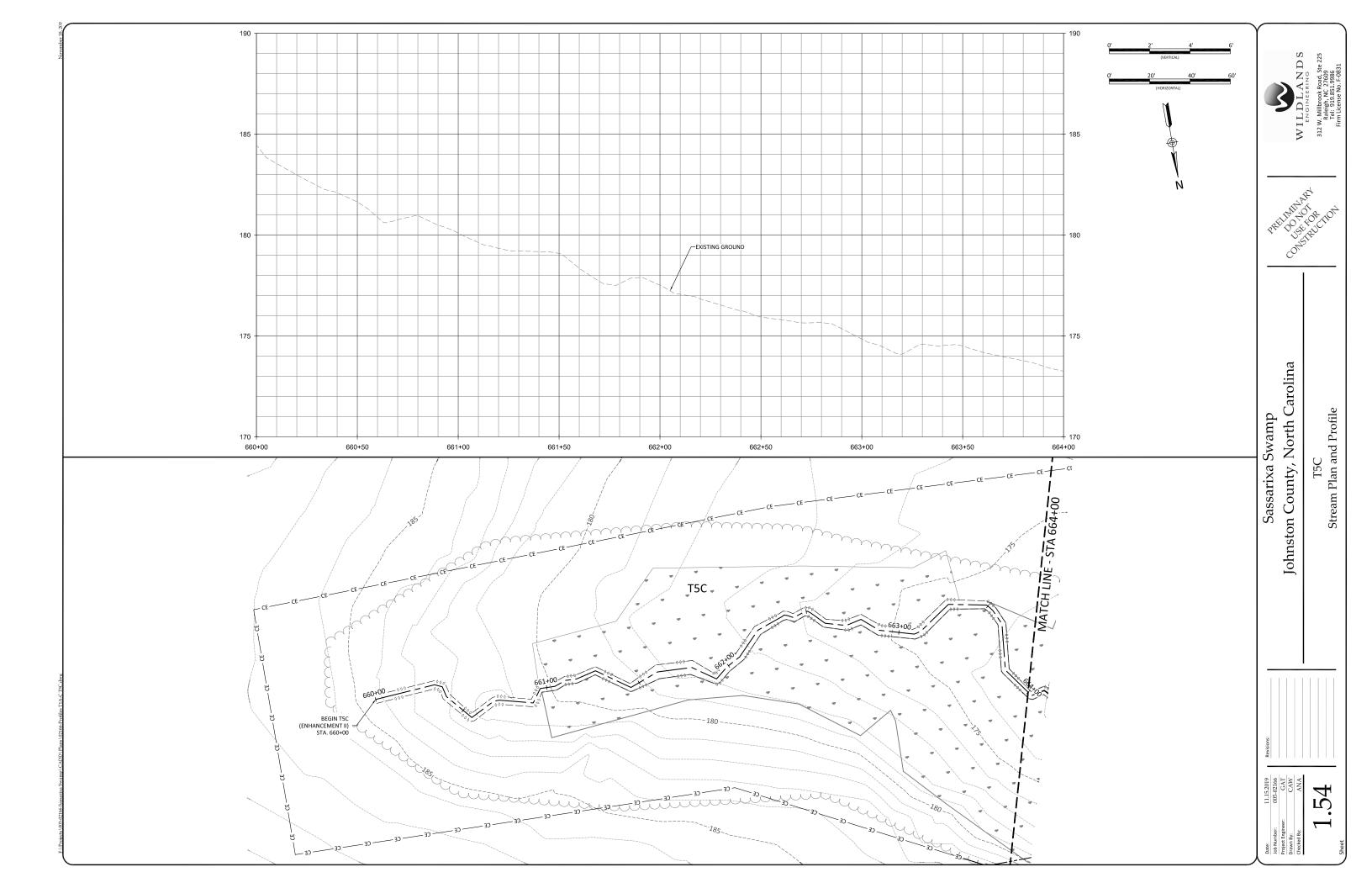


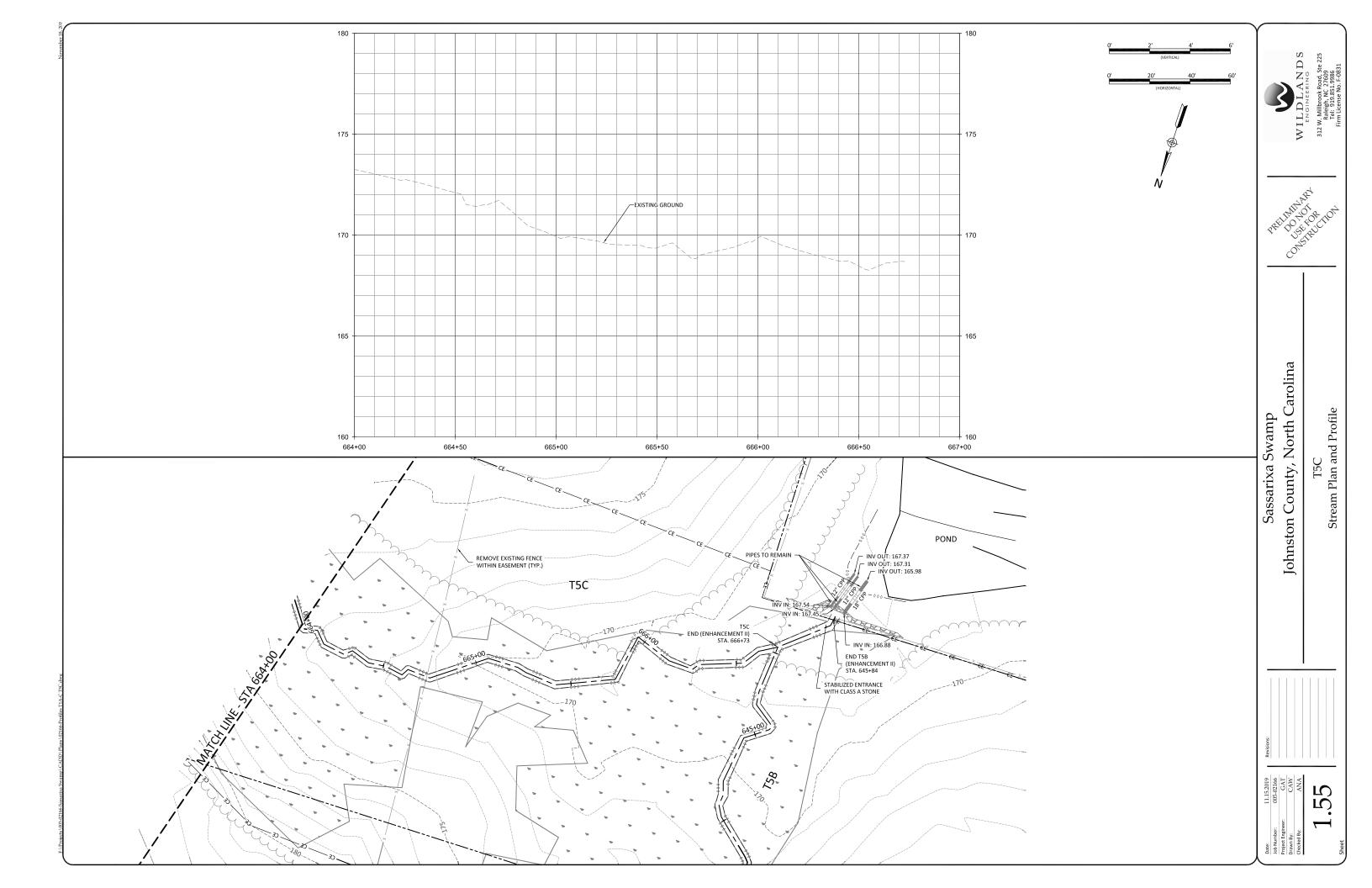


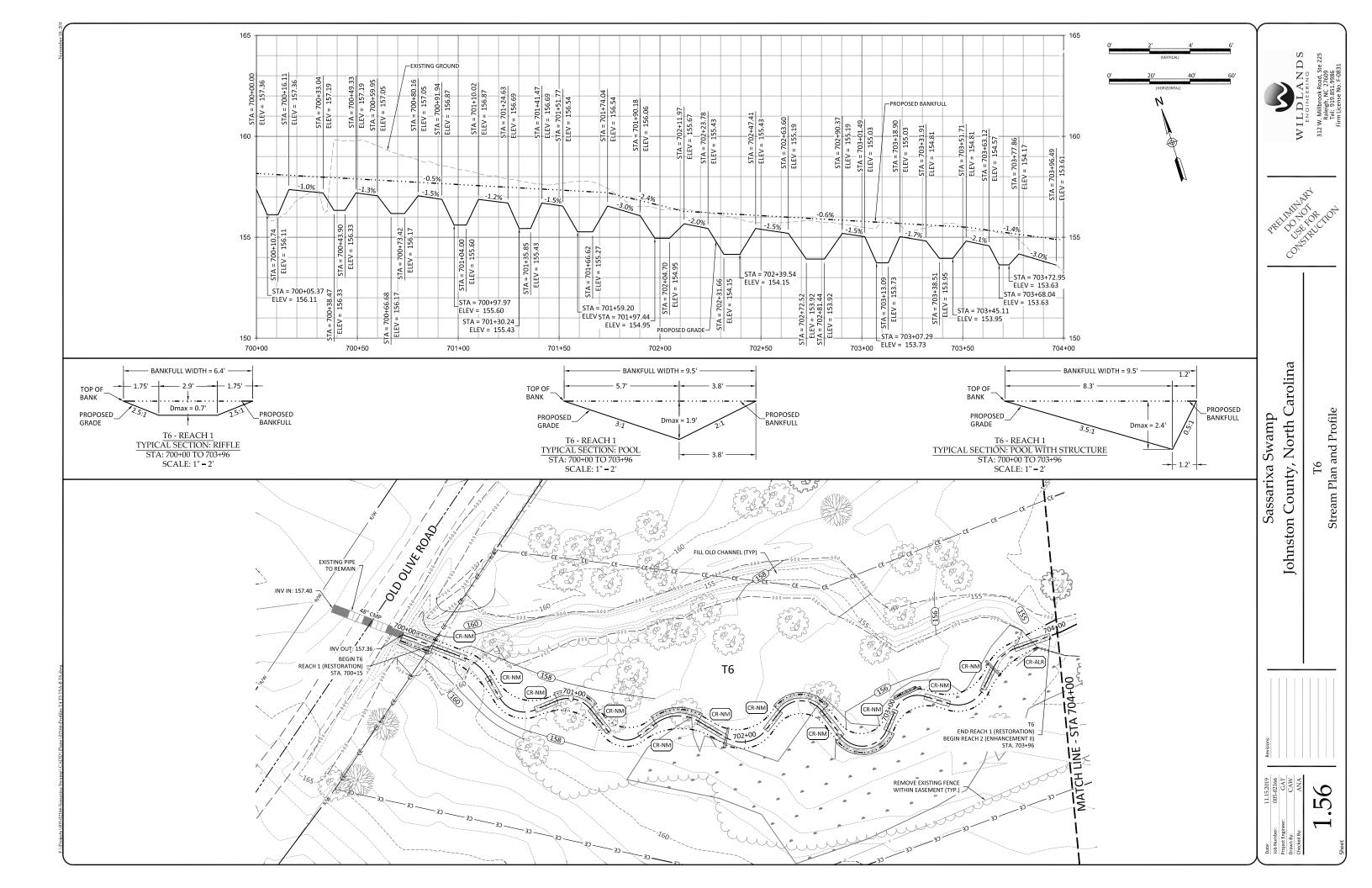


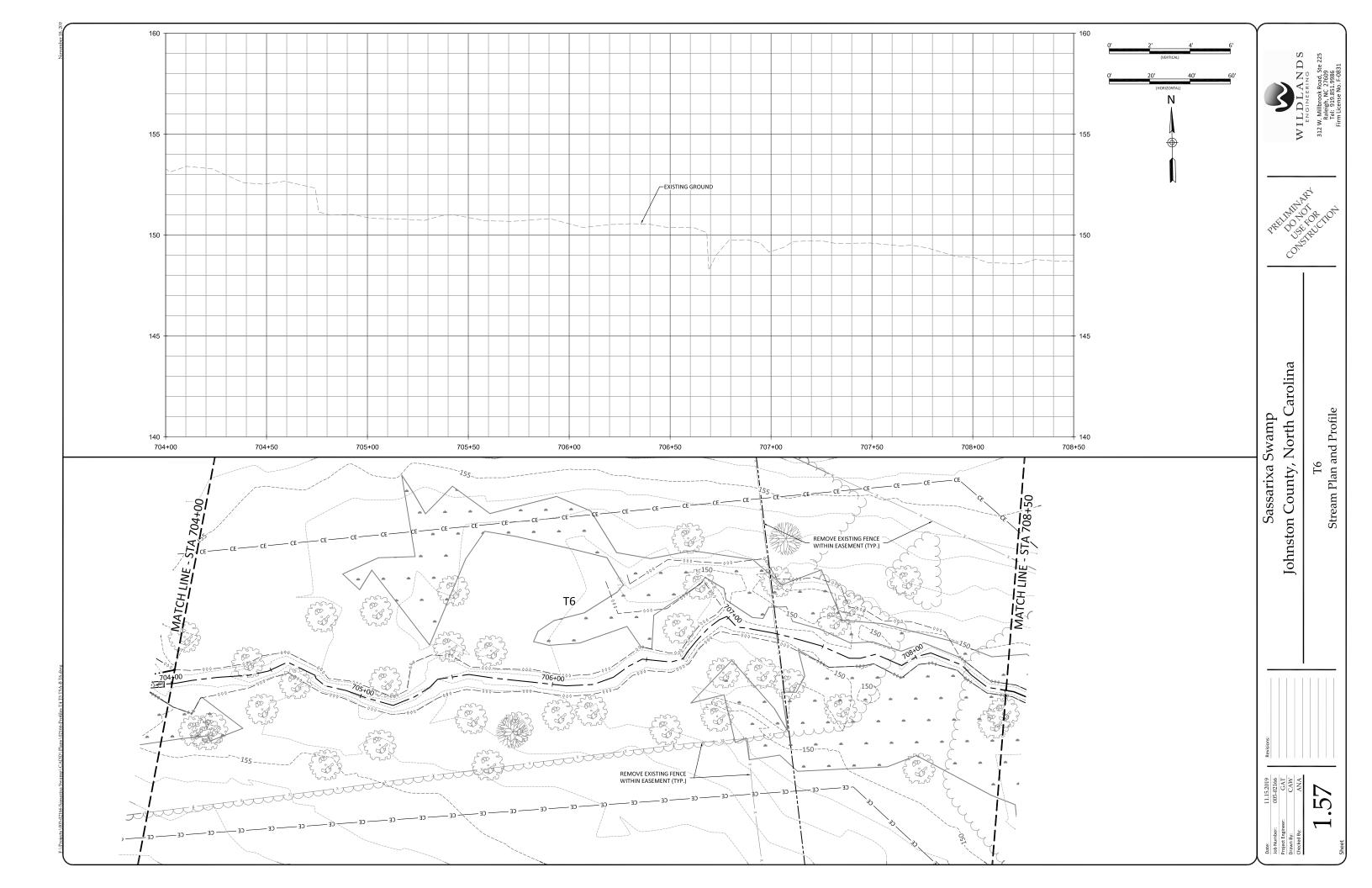


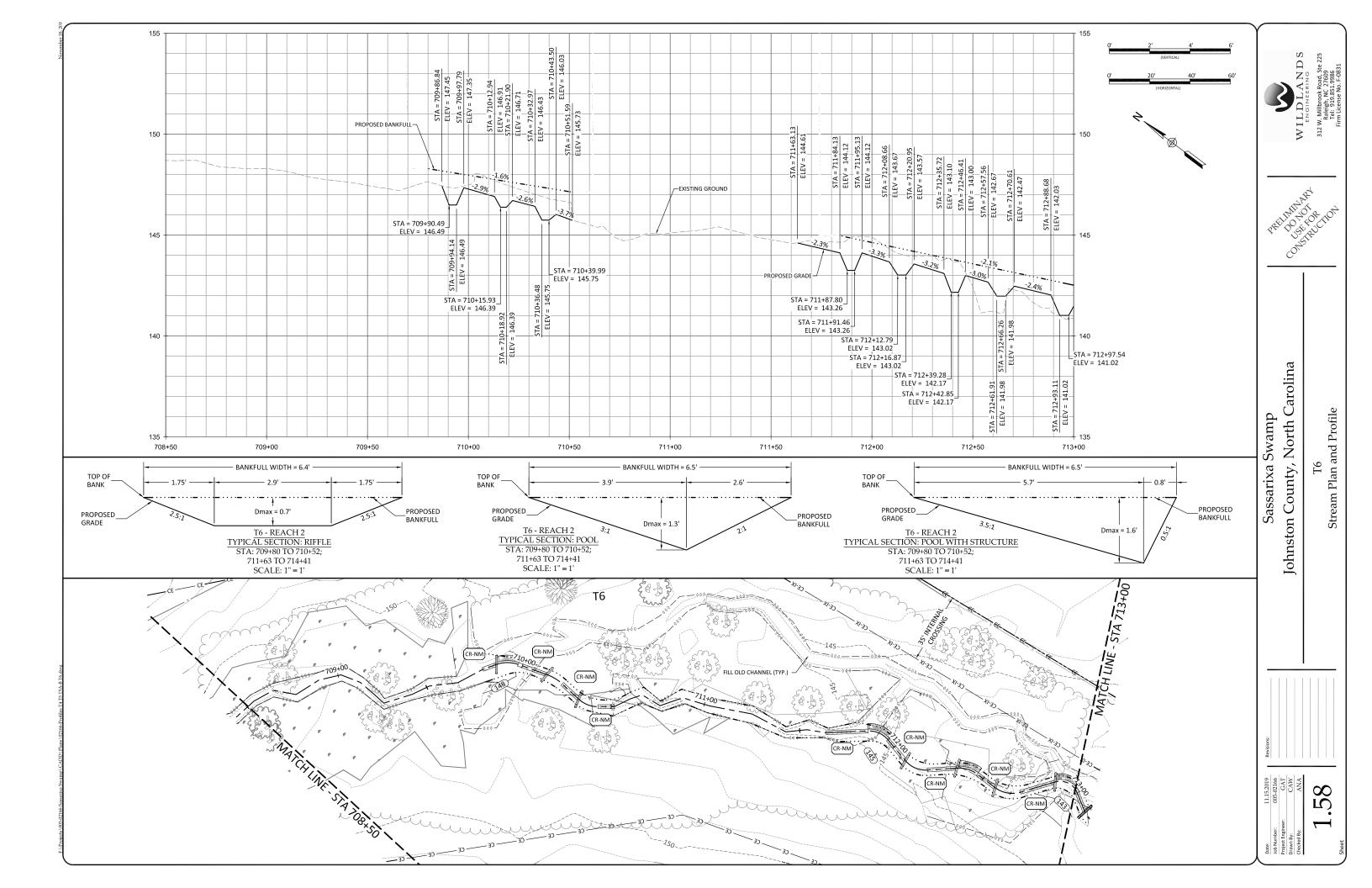


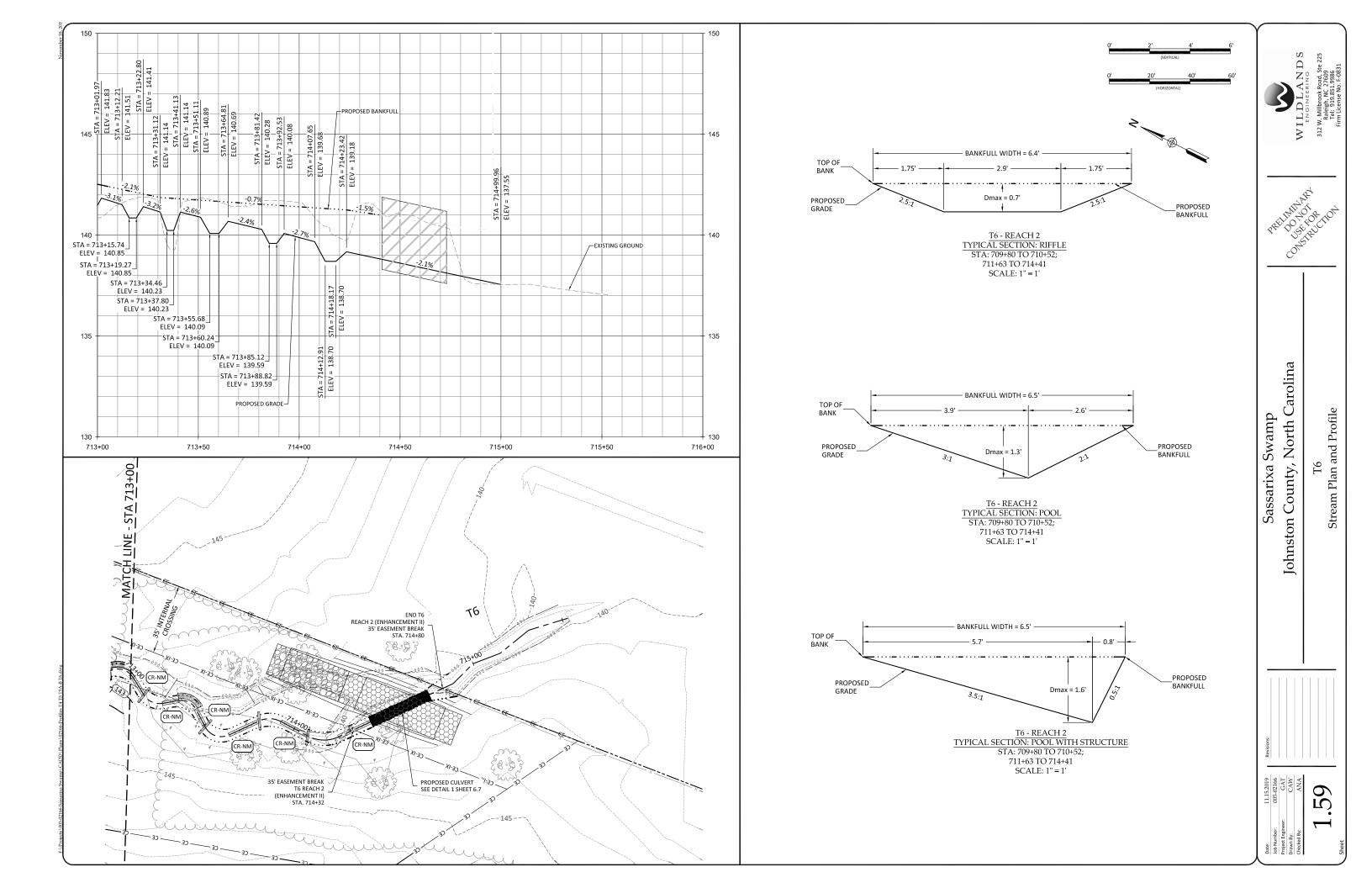




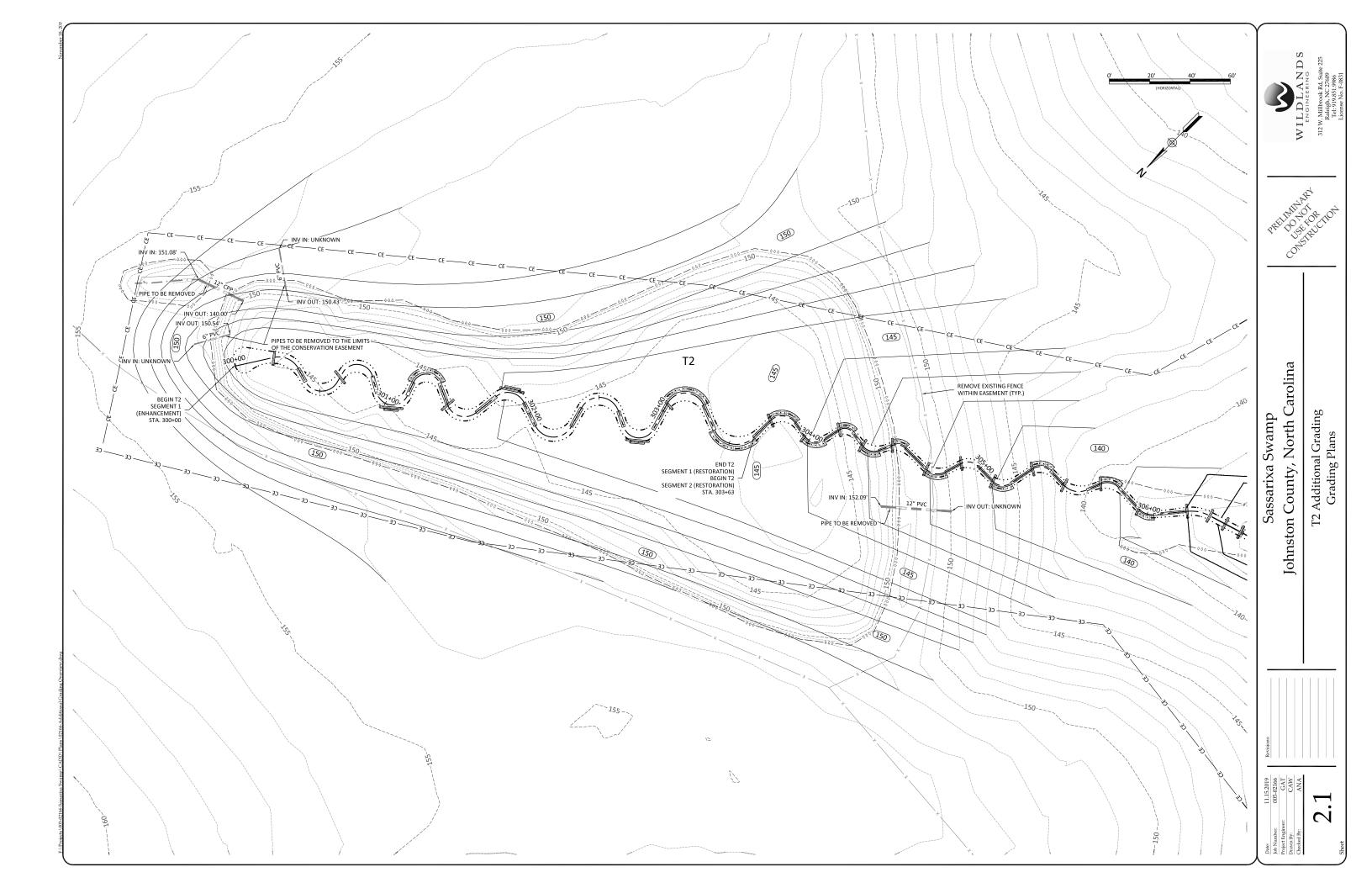














Zone 1 - Streambank Planting Zone (See Detail 1, Sheet 6.8)



Zone 2 - Buffer Planting Zone (See Detail 2, Sheet 6.8)



Zone 3 - Floodplain and Wetland Planting Zone (See Detail Detail 2, Sheet 6.8)

Note: Non-hatched areas within easement are currently vegetated and will be planted as needed to achieve target density. Buffer planting will occur within the Limits of Disturbance

	Strea	mbank Pla	nting Zon	e			
Live Stakes							
Species	Common Name	Indiv. Spacing	Min. Size	Stratum	% of Stems		
Salix nigra	Black Willow	3-6 ft.	0.5"-1.5" cal.	Shrub	15%		
Cornus ammomum	Silky Dogwood	3 <b>-</b> 6 ft.	0.5"-1.5" cal.	Shrub	45%		
Salix sericea	Sliky Willow	3 <b>-</b> 6 ft.	0.5"-1.5" cal.	Shrub	40%		
					100%		
		Herbaceous	Plugs				
Juncus effusus	Common Rush	4 ft.	1.0"- 2.0" plug	Herb	40%		
Carex alata	Broadwing Sedge	4 ft.	1.0"- 2.0" plug	Herb	40%		
Panicum virgatum	Switchgrass	4 ft.	1.0"- 2.0" plug	Herb	20%		
					100%		

Black Willow is only acceptable to be planted on any stream with a top of bank width of 10' or greater. Use elderberry on any stream who's top of bank width is less than 10'.



	Buffer Planting Zone						
Bare Root							
Species	Common Name	Max Spacing	Indlv. Spacing	Min. Caliper Size	Stratum	# of Stems	
Quercus phellos	Willow Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	15%	
Platanus occidentalis	Sycamore	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	20%	
Betula nigra	River Birch	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	20%	
Quercus michauxii	Swamp Chestnut Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	15%	
Quercus nigra	Water Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	7%	
Acer negundo	Box Elder	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	10%	
Populus deltoides	Eastern Cottonwood	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	7%	
Magnolia virginiana	Sweetbay Mangolina	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	6%	
			•			100%	



Priority 1 Floodplain and Wetland Planting Zone							
Bare Root							
Species	Common Name	Max Spacing	Indiv. SpacIng	Min. Caliper Size	Stratum	# of Stems	
Betula nigra	River Birch	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	20%	
Acer negundo	Box Elder	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	10%	
Quercus pagoda	Cherry Bark Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	10%	
Ulmus Alata	Winged Elm	12 ft.	6 <b>-</b> 12 ft.	0.25"-1.0"	Canopy	5%	
Platanus occidentalis	Sycamore	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	20%	
Quercus michauxii	Swamp Chestnut Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	15%	
Salix nigra	Black Willow	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	5%	
Quercus phellos	Willow Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	10%	
Quercus nigra	Water Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	5%	
-		•	•			100%	

		Permanent	Riparian S	SeedIng			
Pure Live Seed (20 lbs / acre)							
Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)	рН	Percentage	
A <b>ll</b> Year	Panicum rigidulum	Redtop Panlcgrass	Herb	1.6	5.0-7.5	8%	
All Year	Sorghastrum nutans	Indiangrass	Herb	2.0	4.8-8.0	10%	
All Year	Elymus virginicus	Virginia Wildrye	Herb	3.0	5.0-7.0	15%	
All Year	Bidens aristosa	Bur Marigold	Herb	1.0	6.0-8.0	5%	
All Year	Helianthus angustifolius	Narrowleaf Sunflower	Herb	1.0	4.0-7.0	5%	
A <b>ll</b> Year	Chasmanthiu m latifolium	River Oats	Herb	1.0	5.0-7.0	5%	
All Year	Rudbeckia hirta	Blackeyed Susan	Herb	1.0	6.0-7.0	5%	
All Year	Coreopsis lanceolata	Lanceleaf Coreopsis	Herb	1.0	6.0-7.0	5%	
A <b>ll</b> Year	Carex vulpinoidea	Fox Sedge	Herb	2.0	6.8-8.9	10%	
A <b>ll</b> Year	Panicum clandestinum	Deertongue	Herb	3.4	4.0-7.5	17%	
A <b>ll</b> Year	Elymus riparius	Riverbank Wildrye	Herb	1.0	4.5-7.2	5%	
A <b>ll</b> Year	Panicum virgatum	Switchgrass	Herb	1.0	4.5-8.0	5%	
A <b>ll</b> Year	Chamaecrista fasciculata	Partridge Pea	Herb	1.0	5.5-7.5	5%	
						100%	

<sup>\*</sup>Wetland Status for Southeastern US

Most information provided by Ernst Conservation Seeds

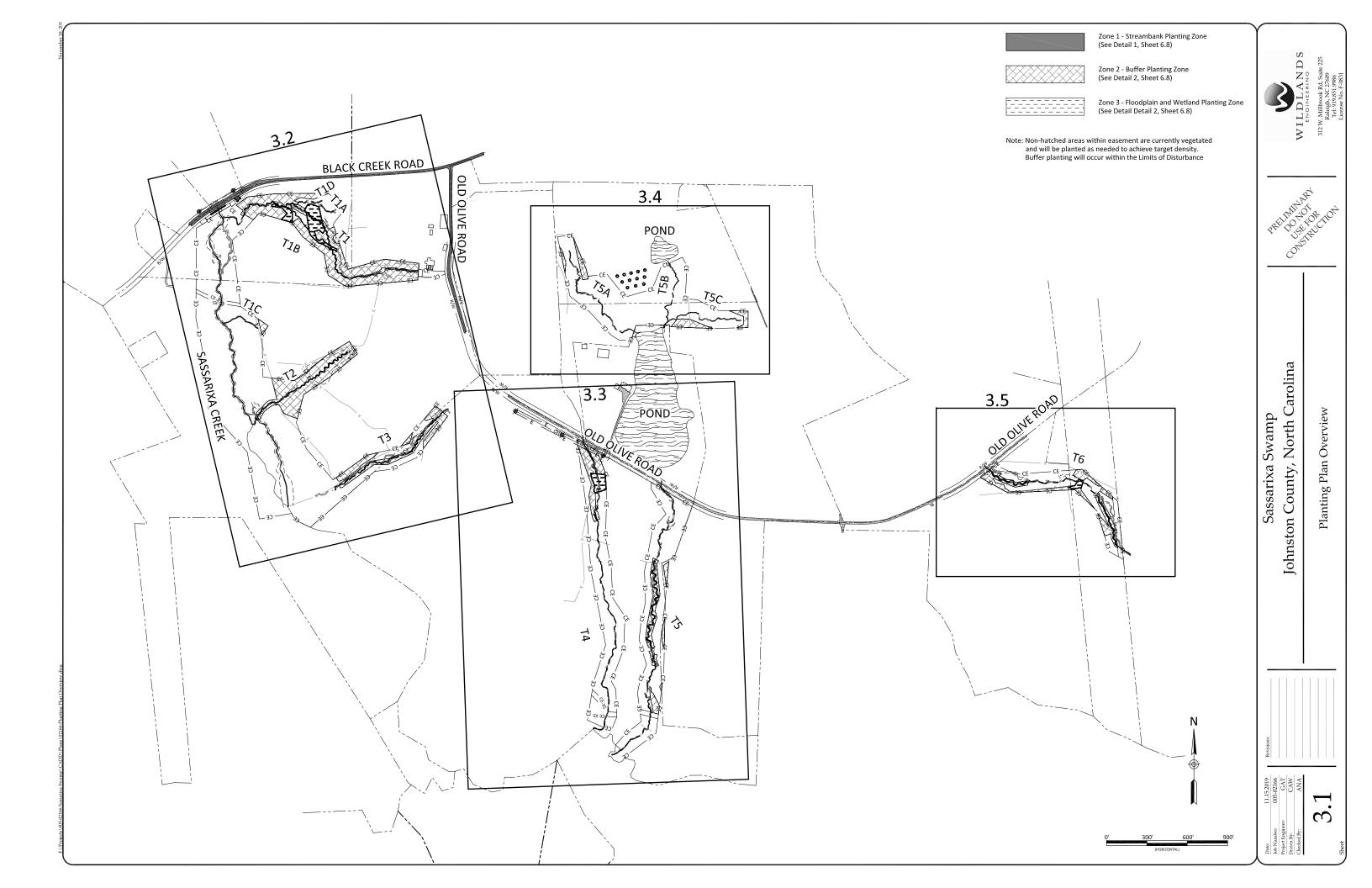
	Permanent Seeding Outside Easement						
Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)	Percentage		
All Year	Festuca arundinacea	Tall Fescue	Herb	40	70%		
All Year	Festuca rubra	Creeping Red Fescue	Herb	40	10%		
A <b>ll</b> Year	Dactylis glomerata	Orchardgrass	Herb	40	20%		
				•	100%		

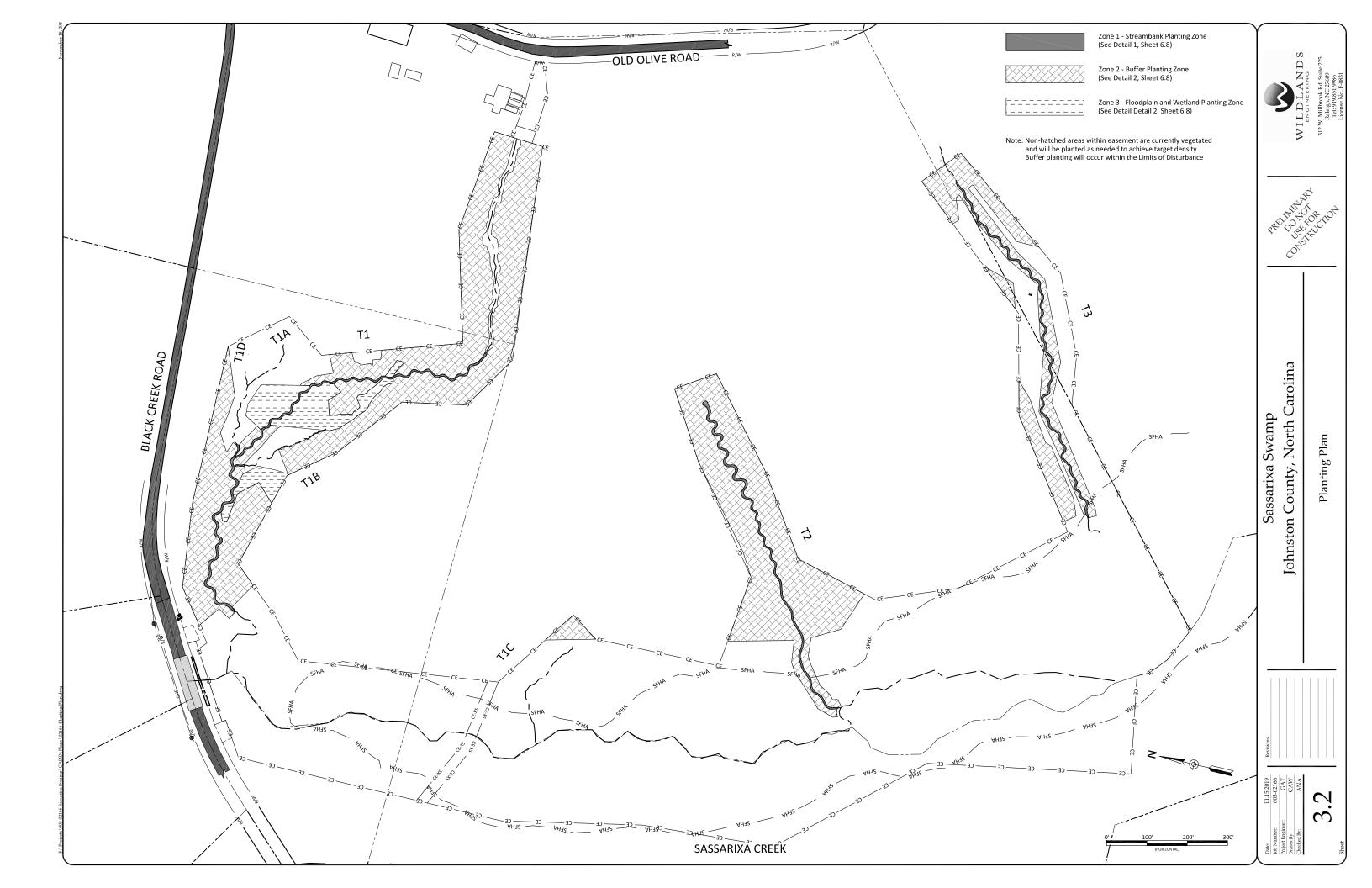
Temporary SeedIng							
Pure Live Seed							
Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)			
Aug 15 - May 1	Secale cereale	Rye Grain	Herb	140			
May 1 - Aug 15	Setaria italica	German Millet	Herb	50			

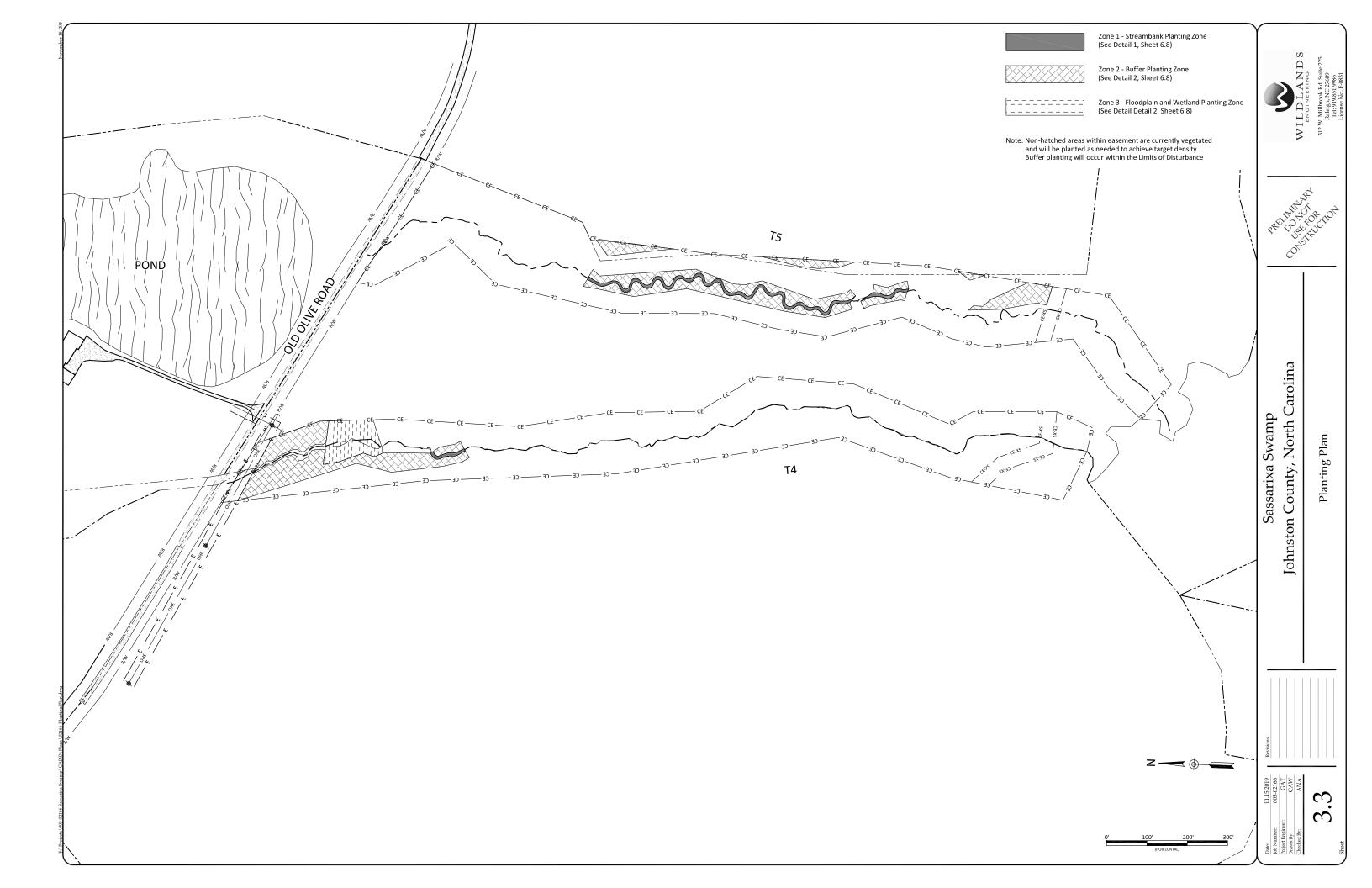


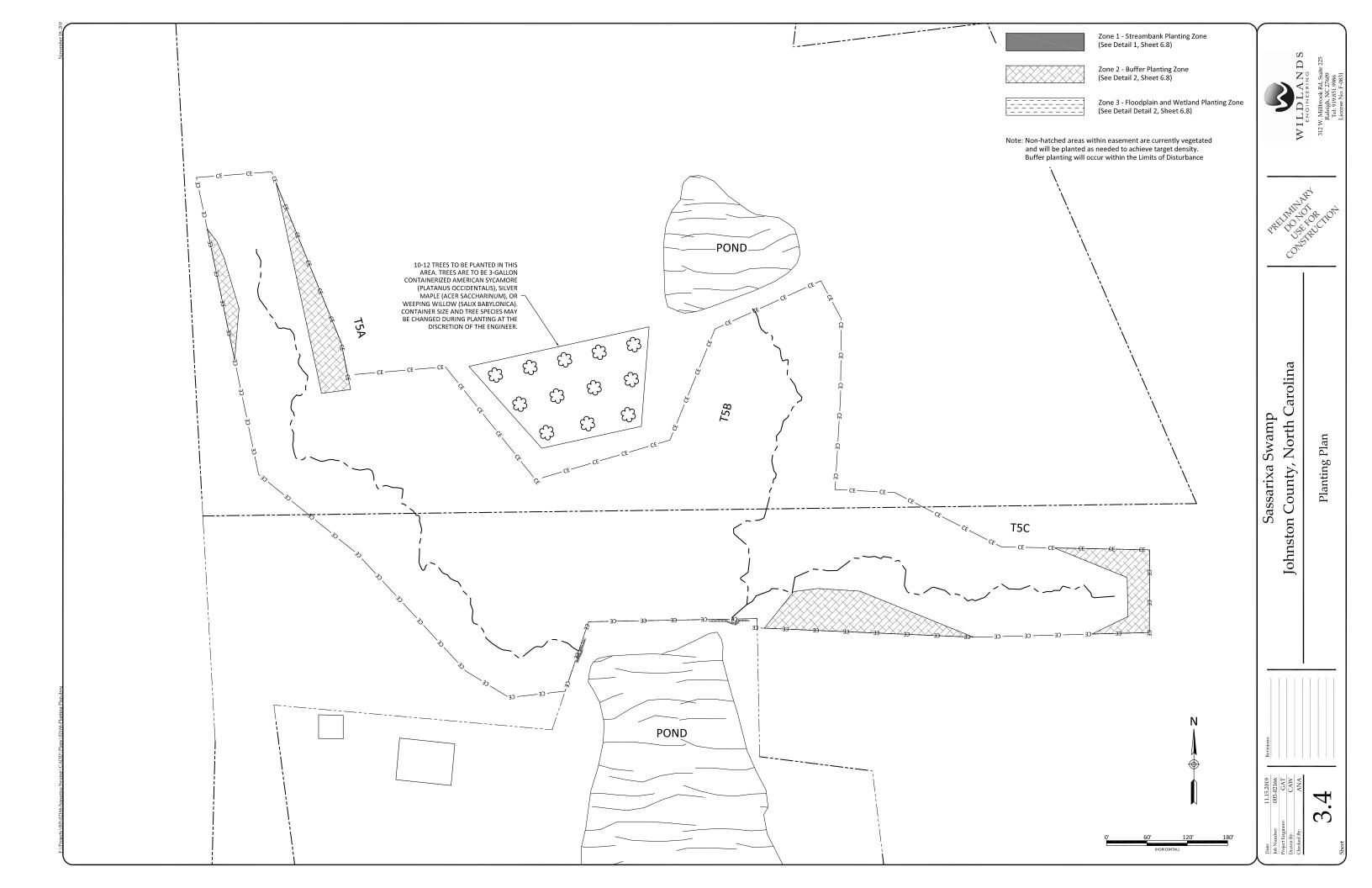
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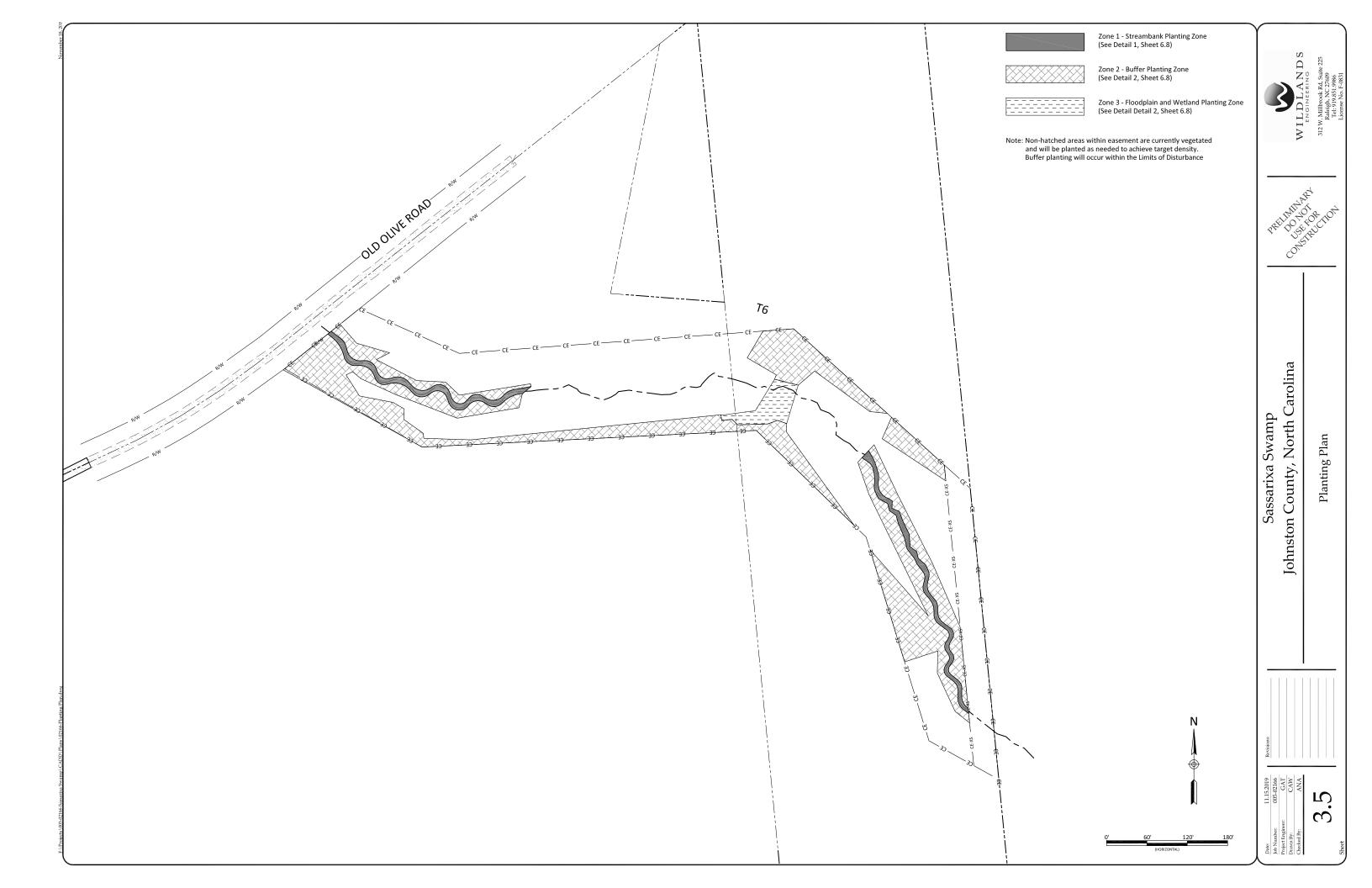
Planting Tables

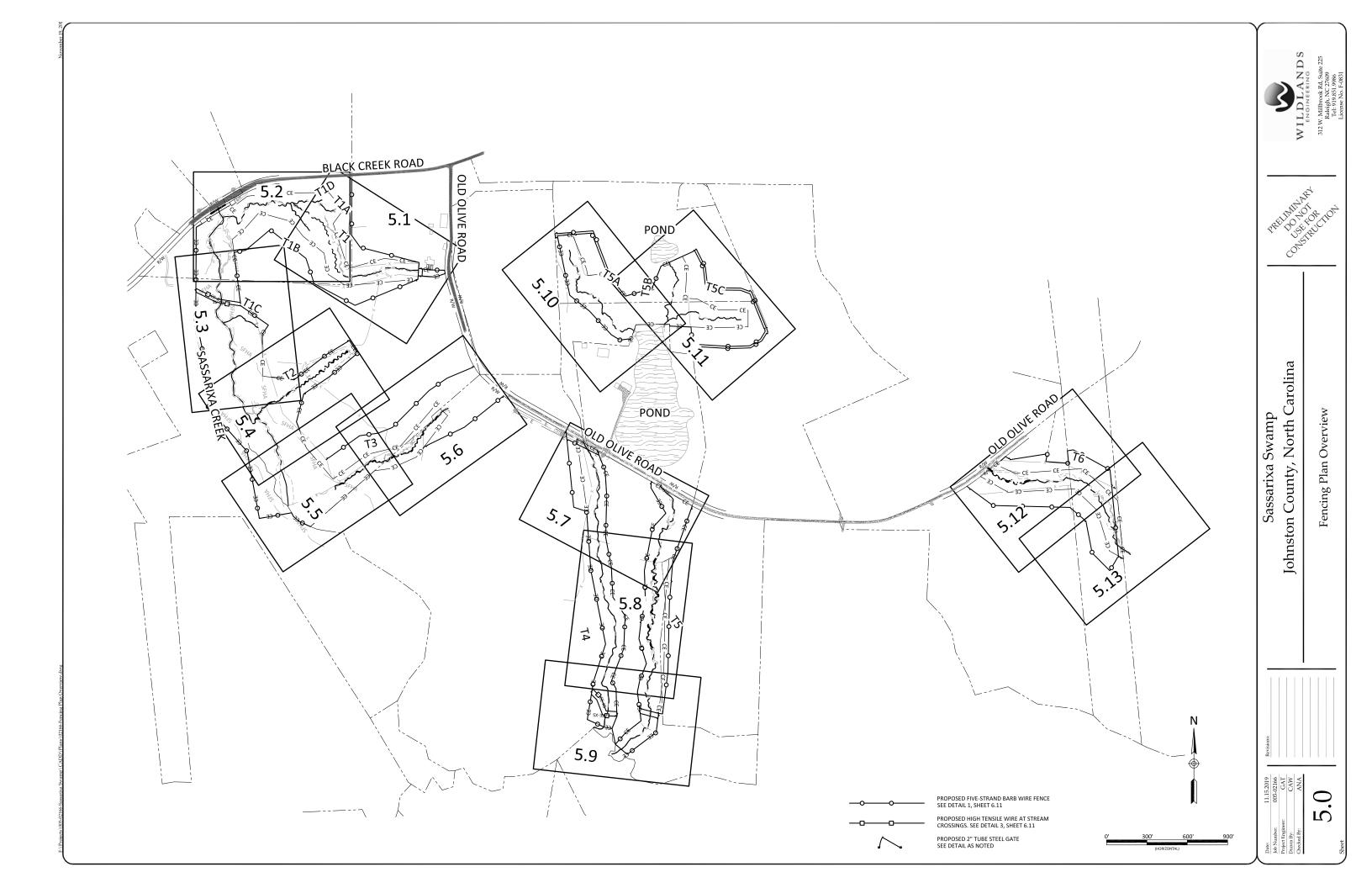


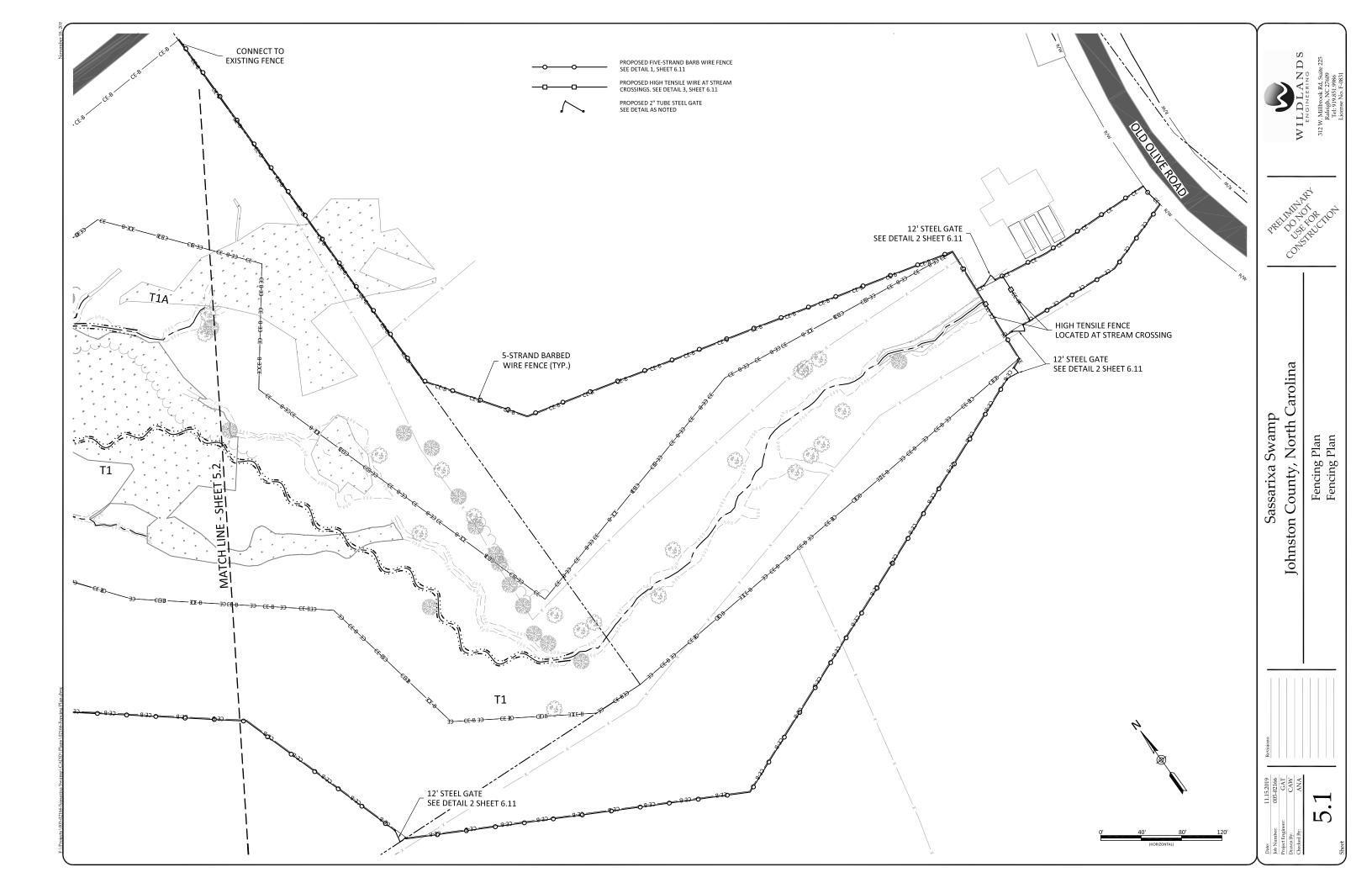


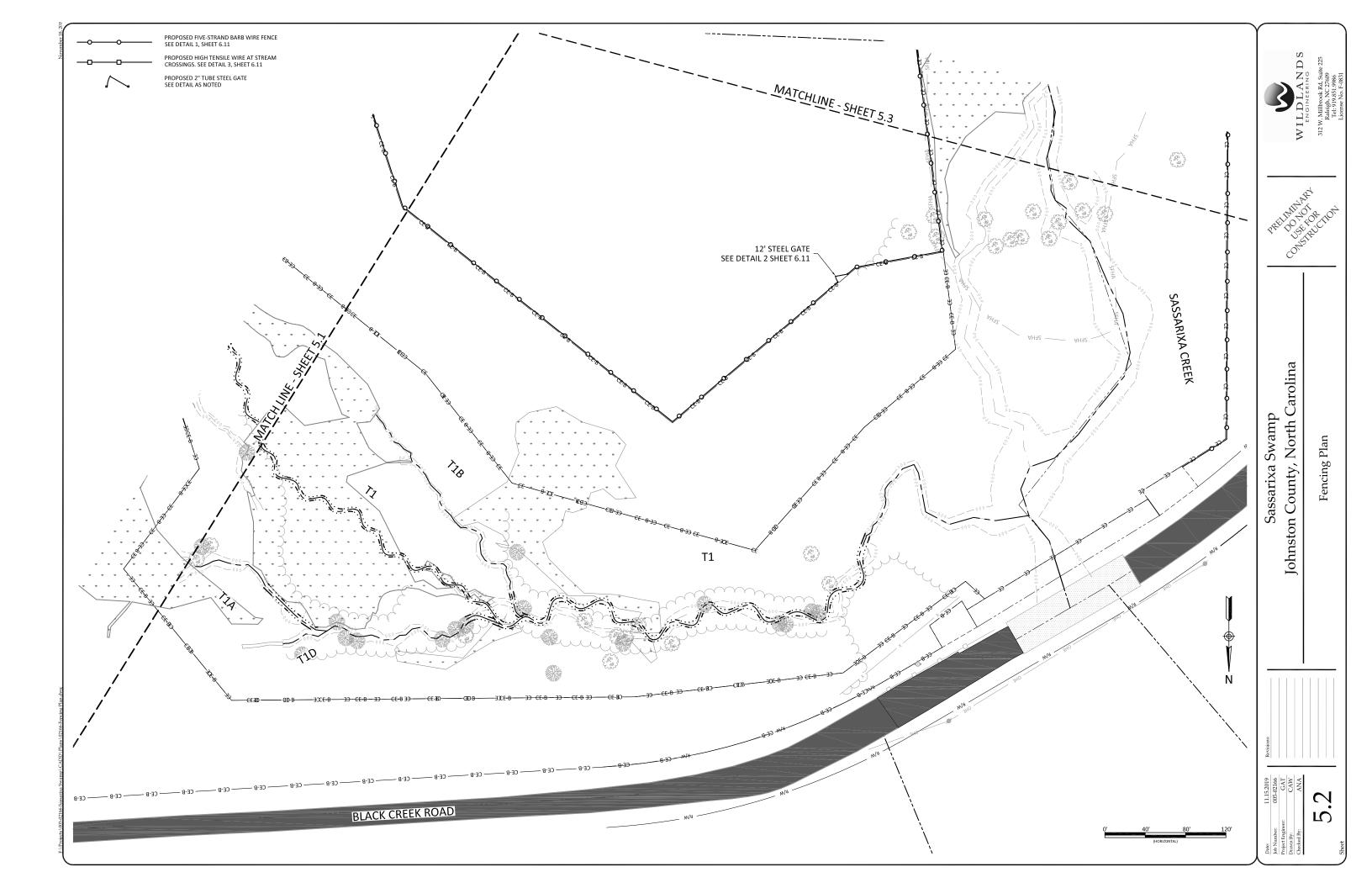


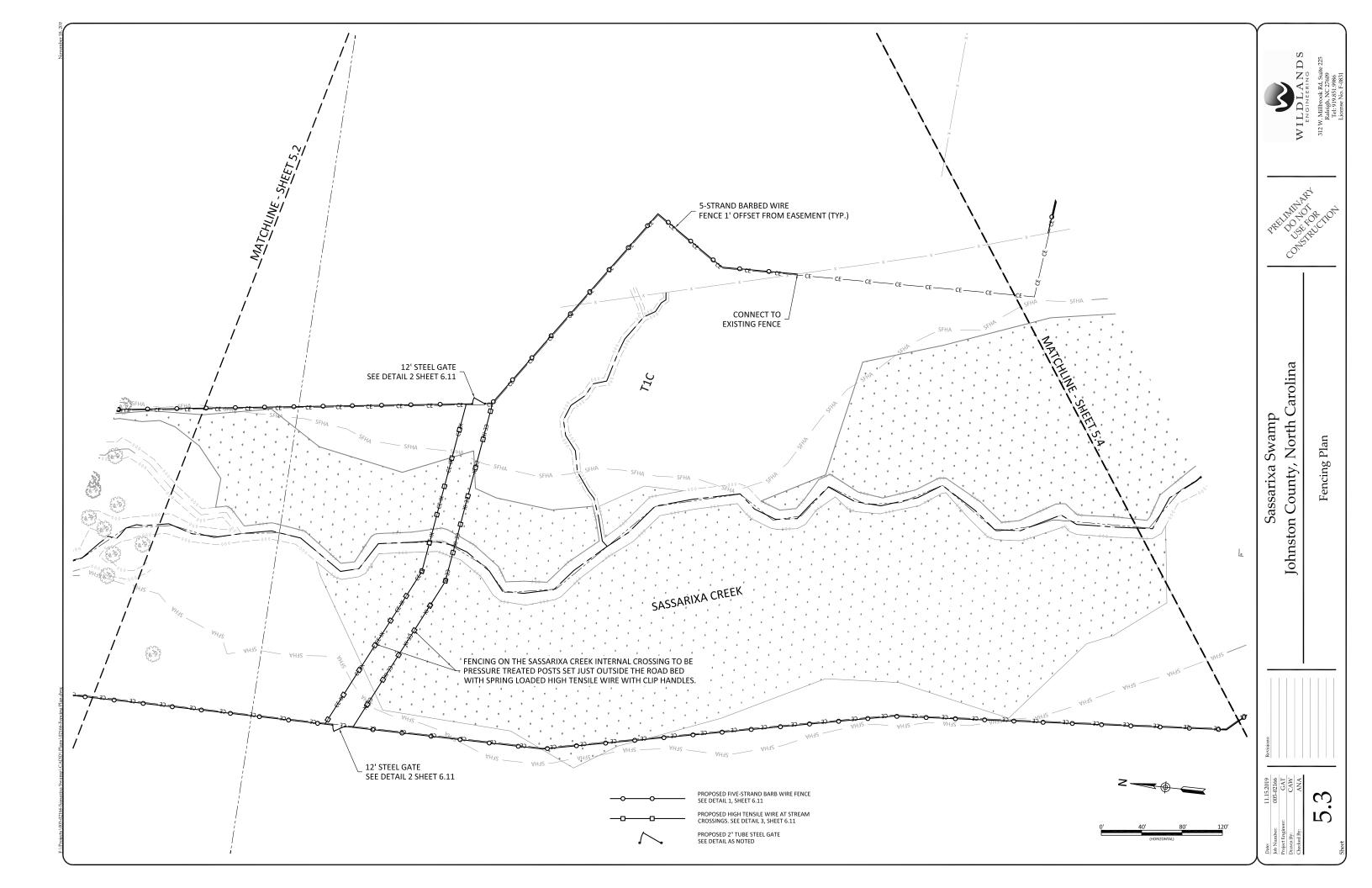


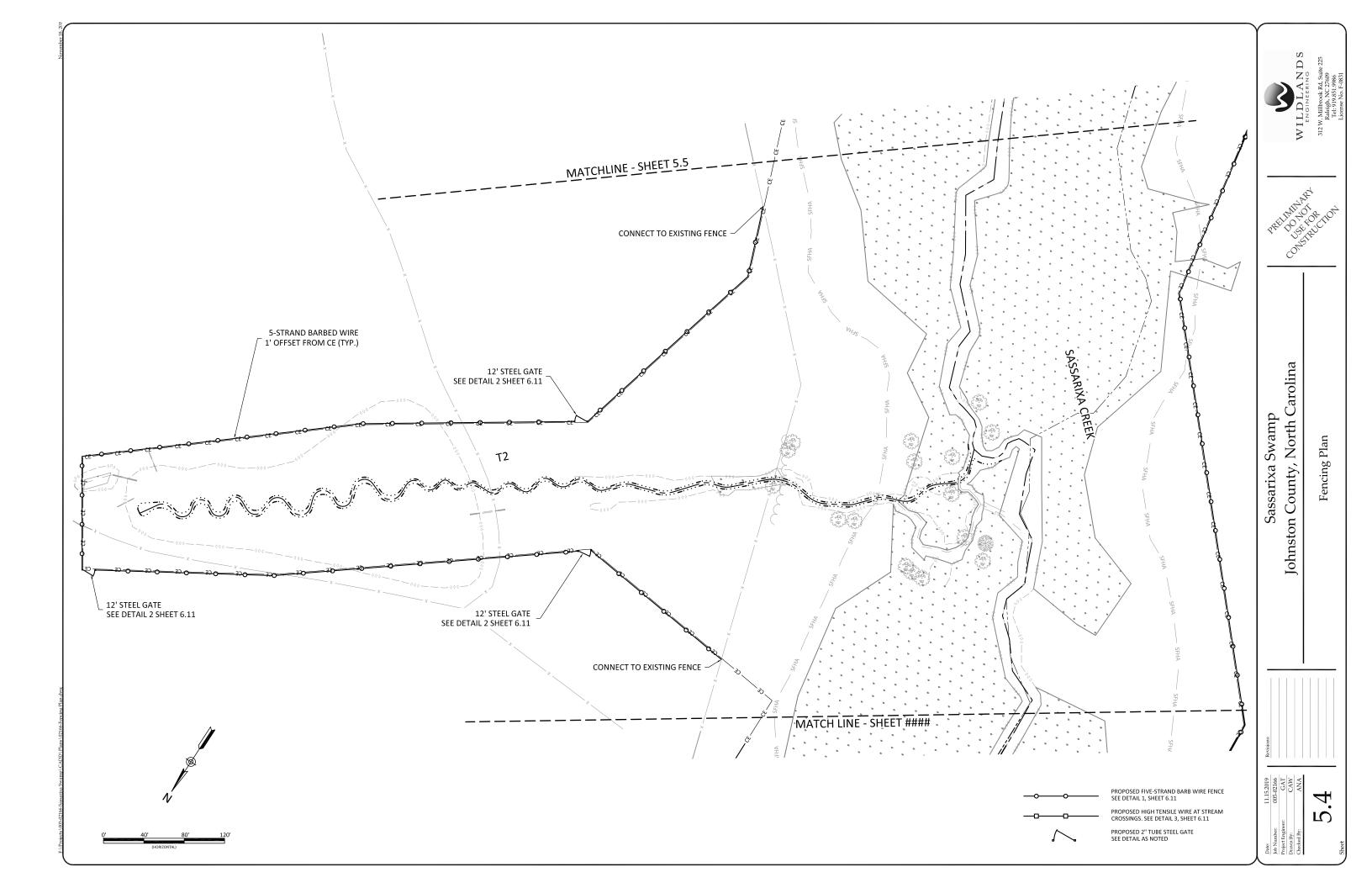


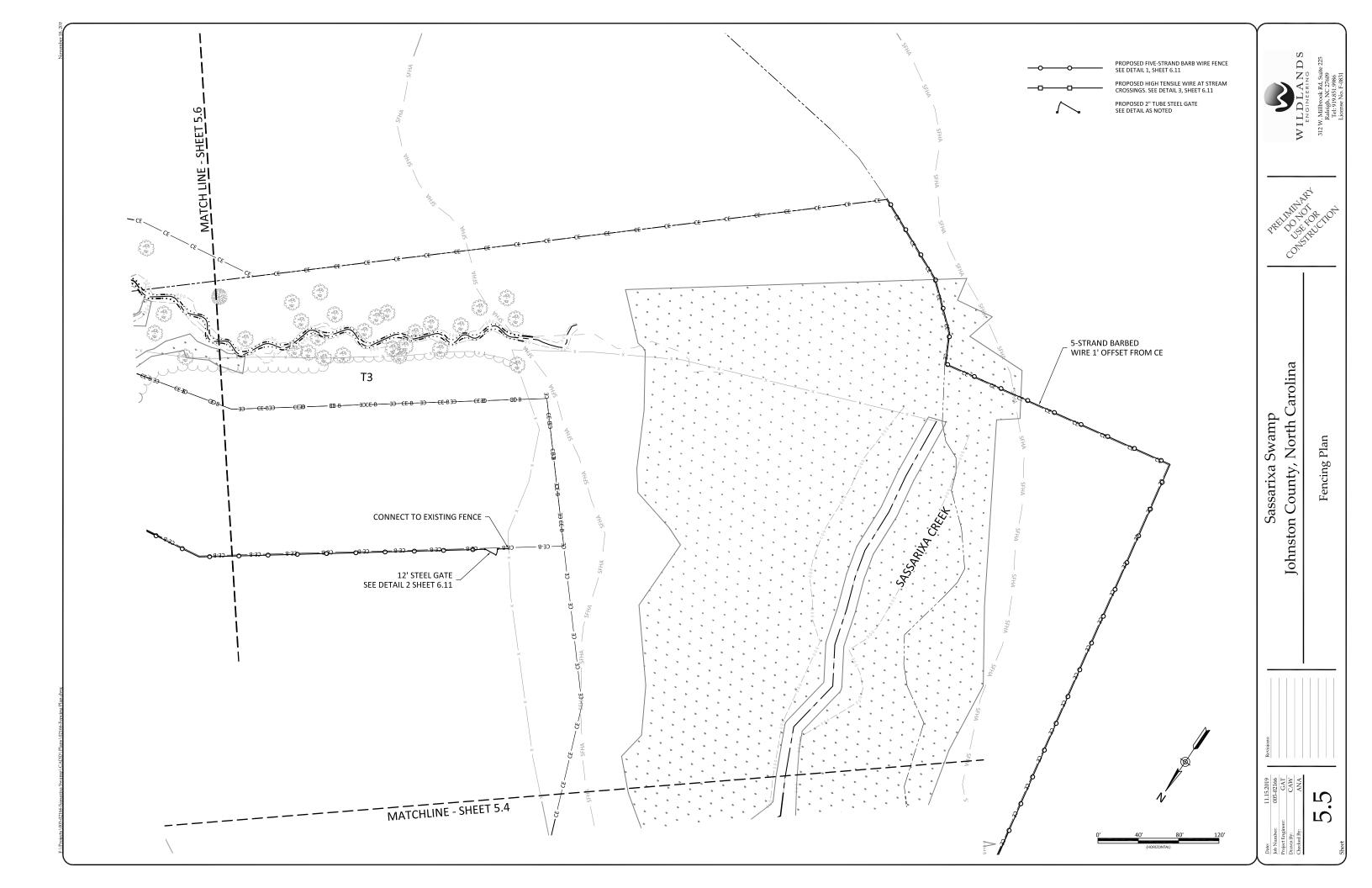


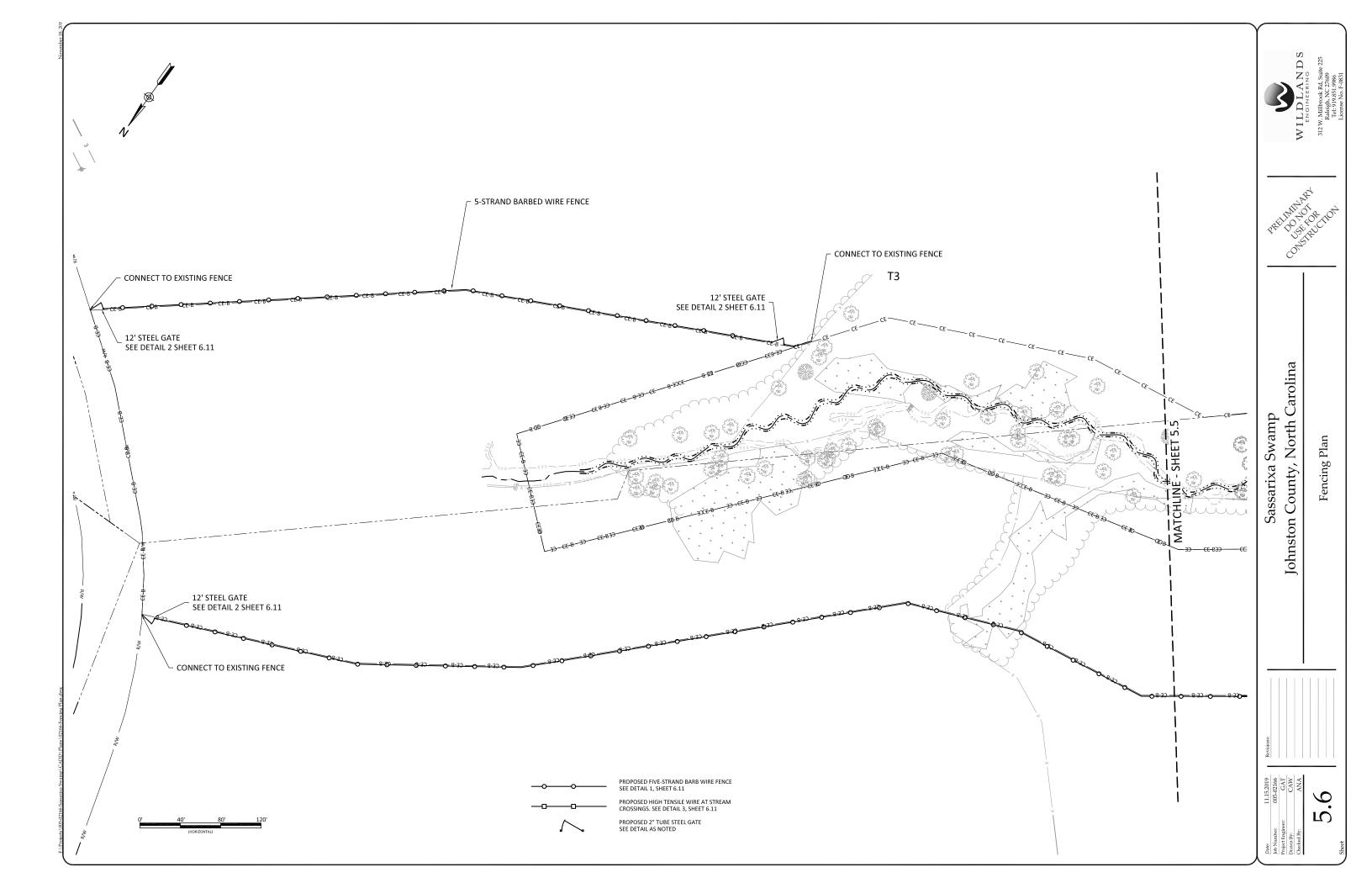


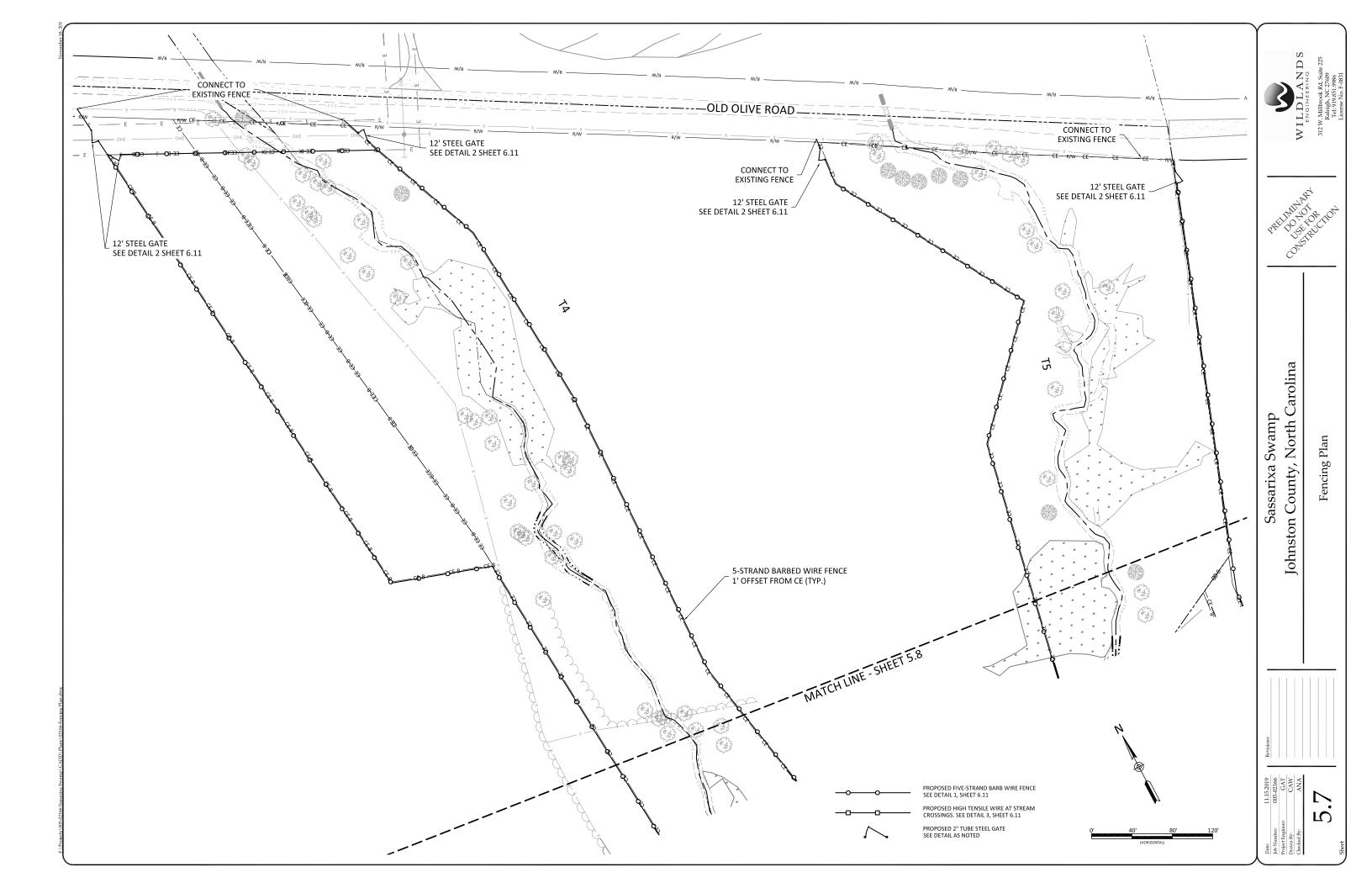


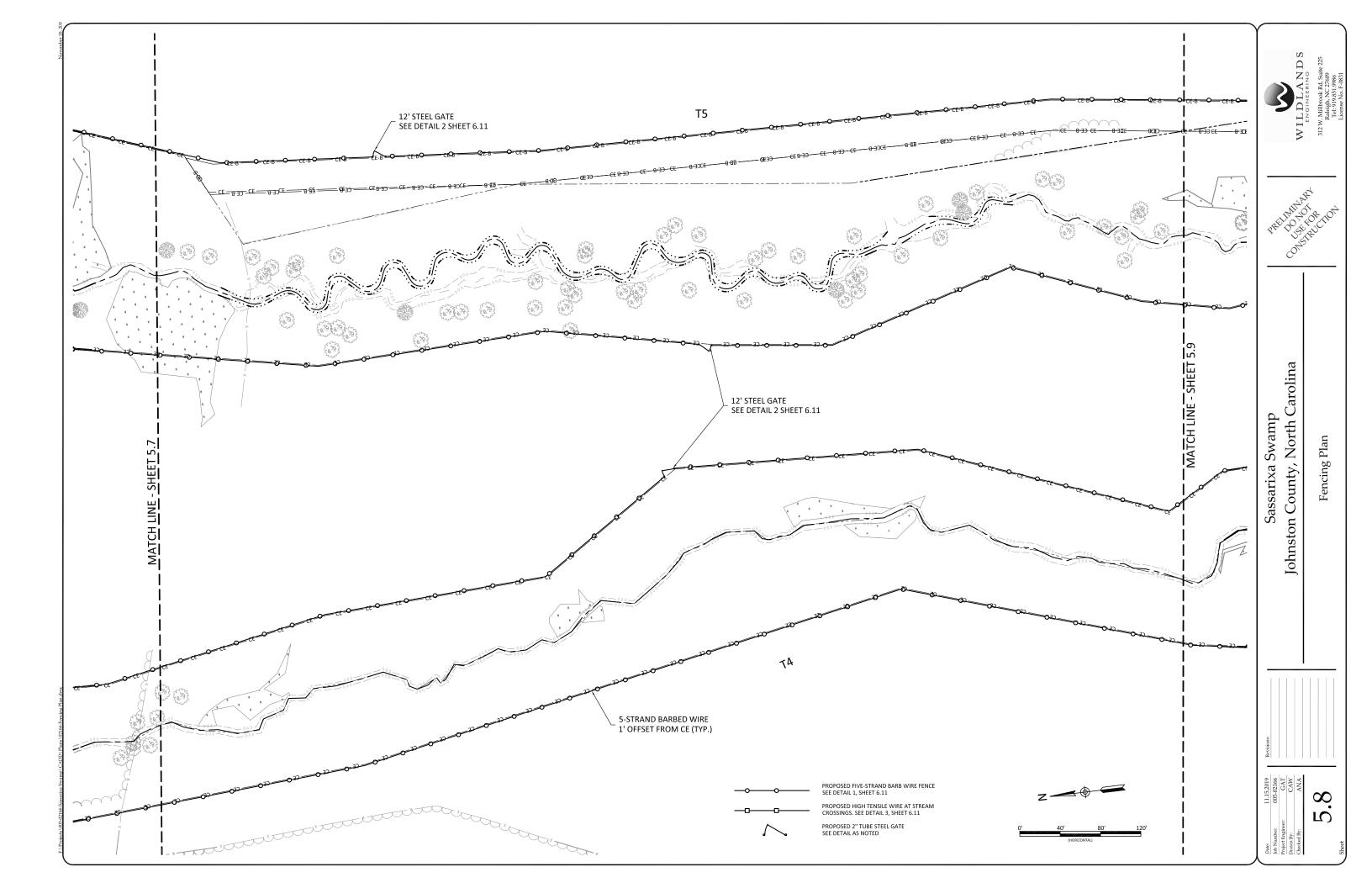


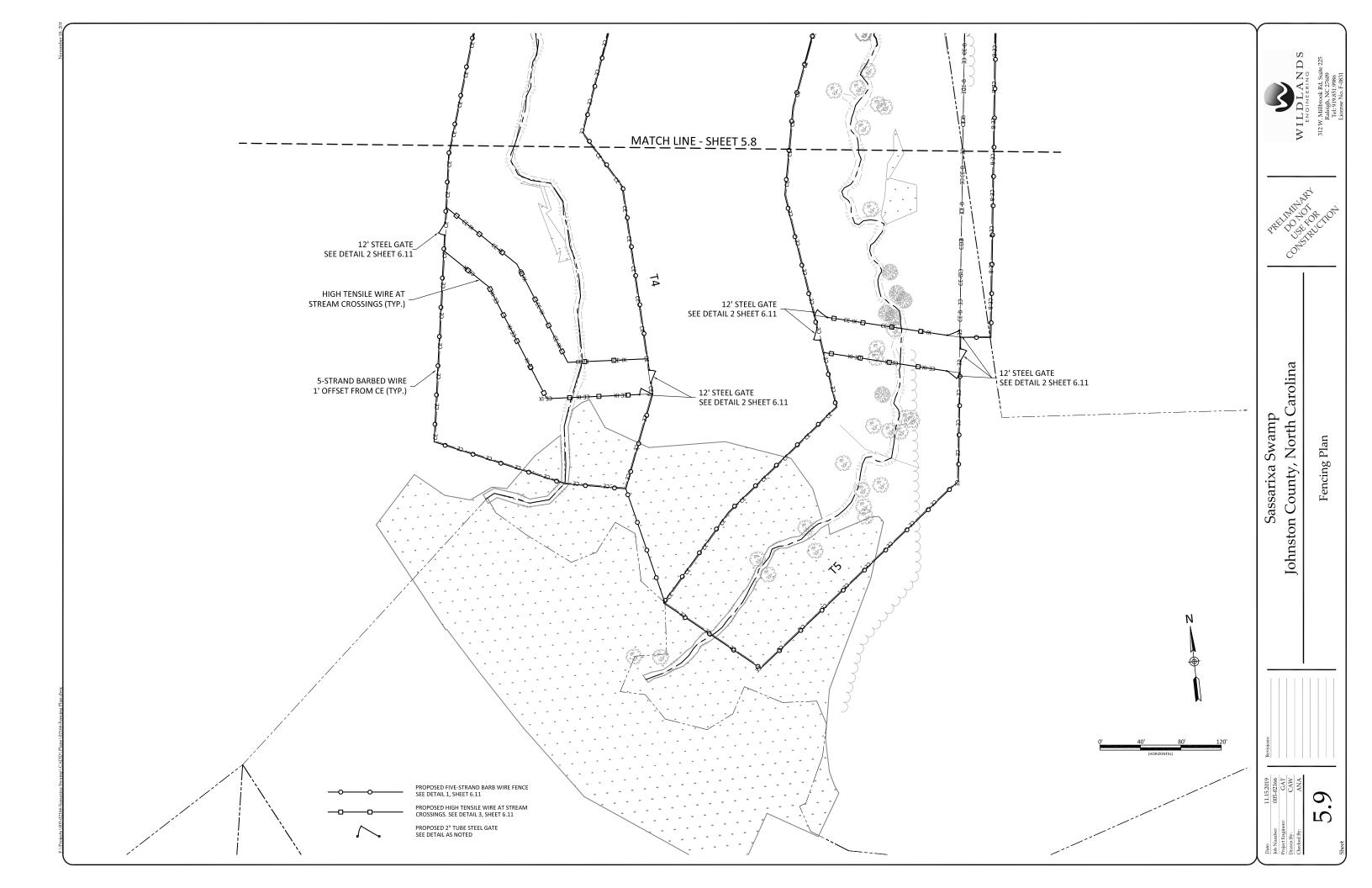


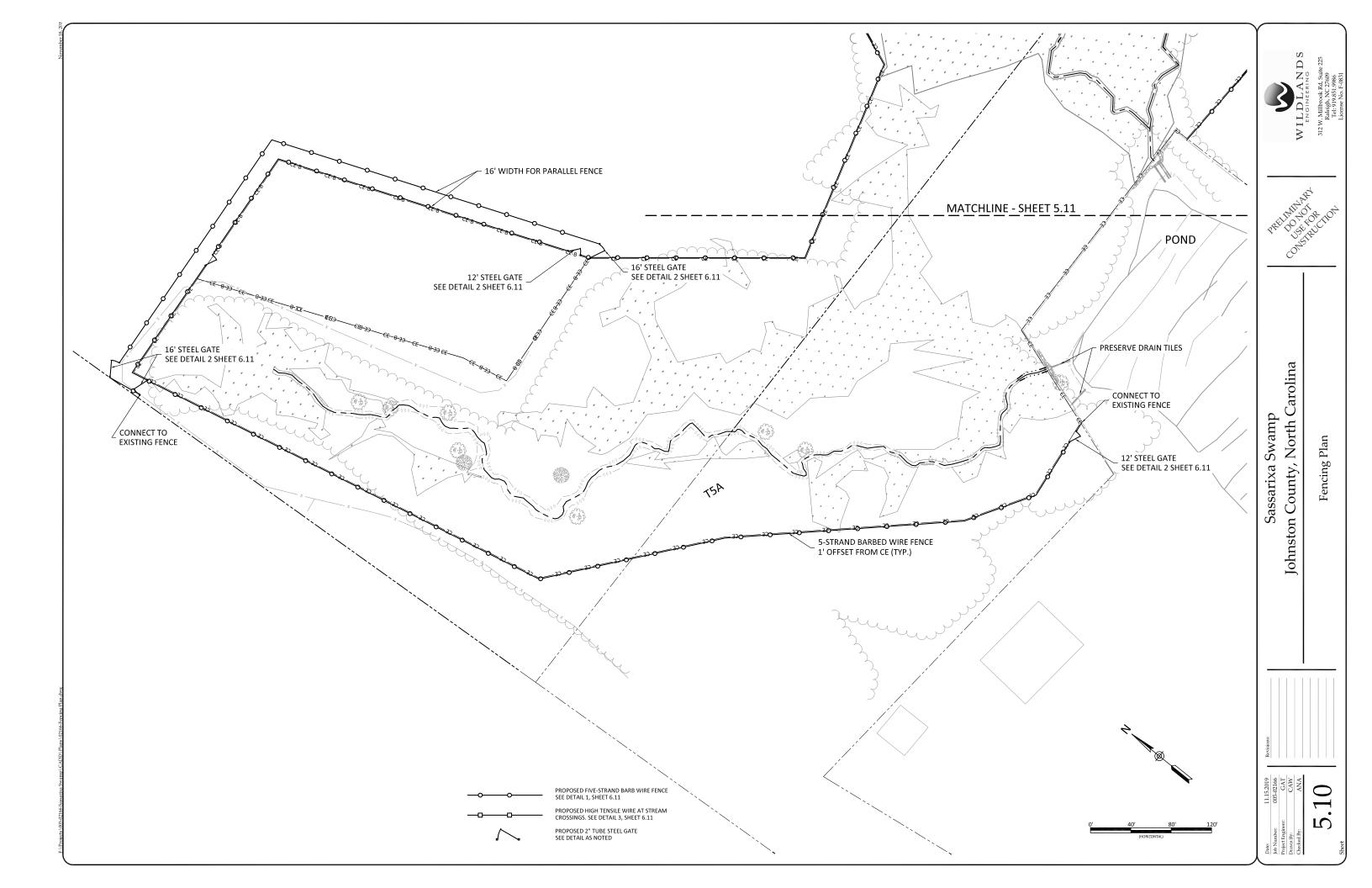


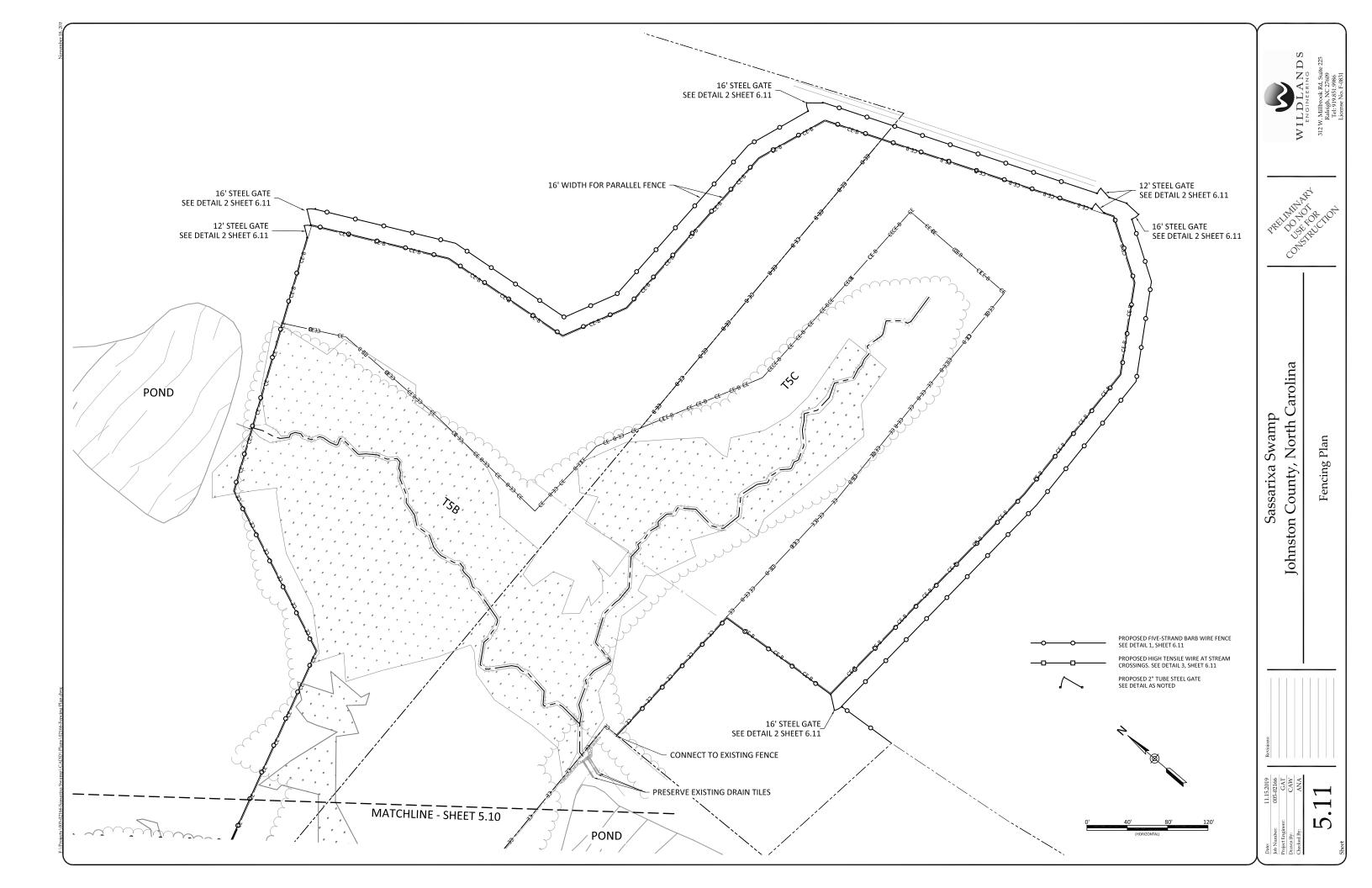


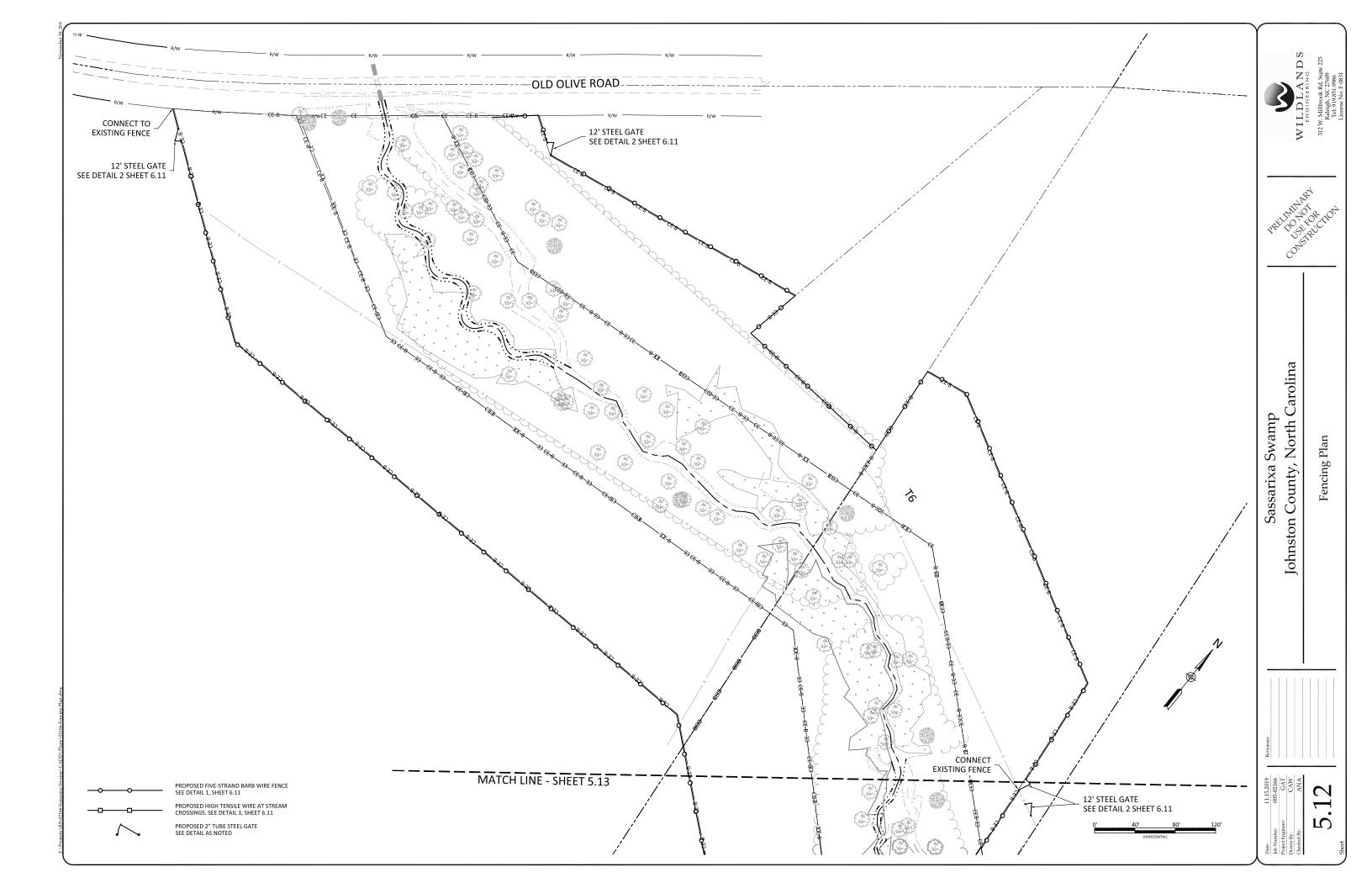


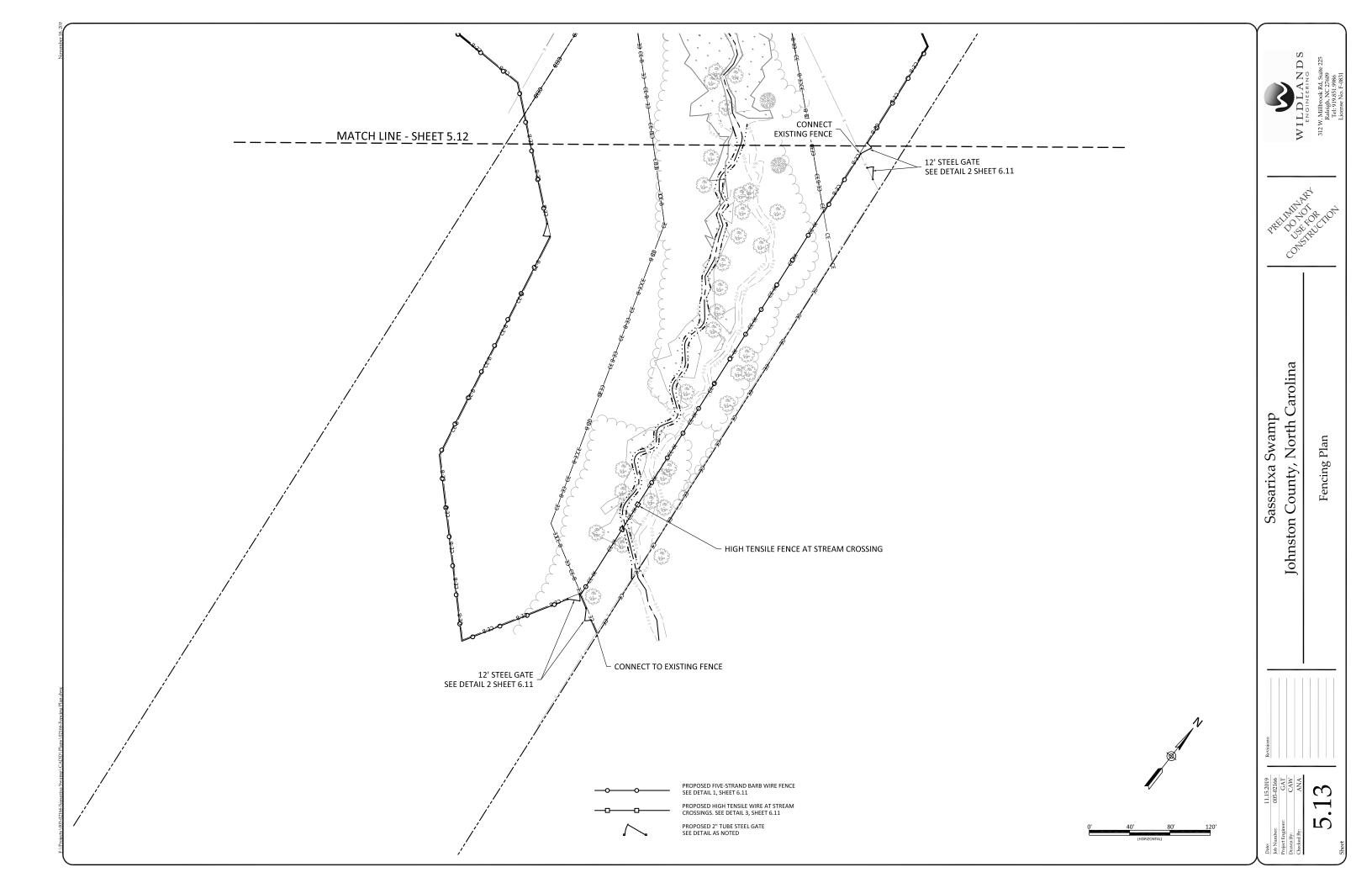


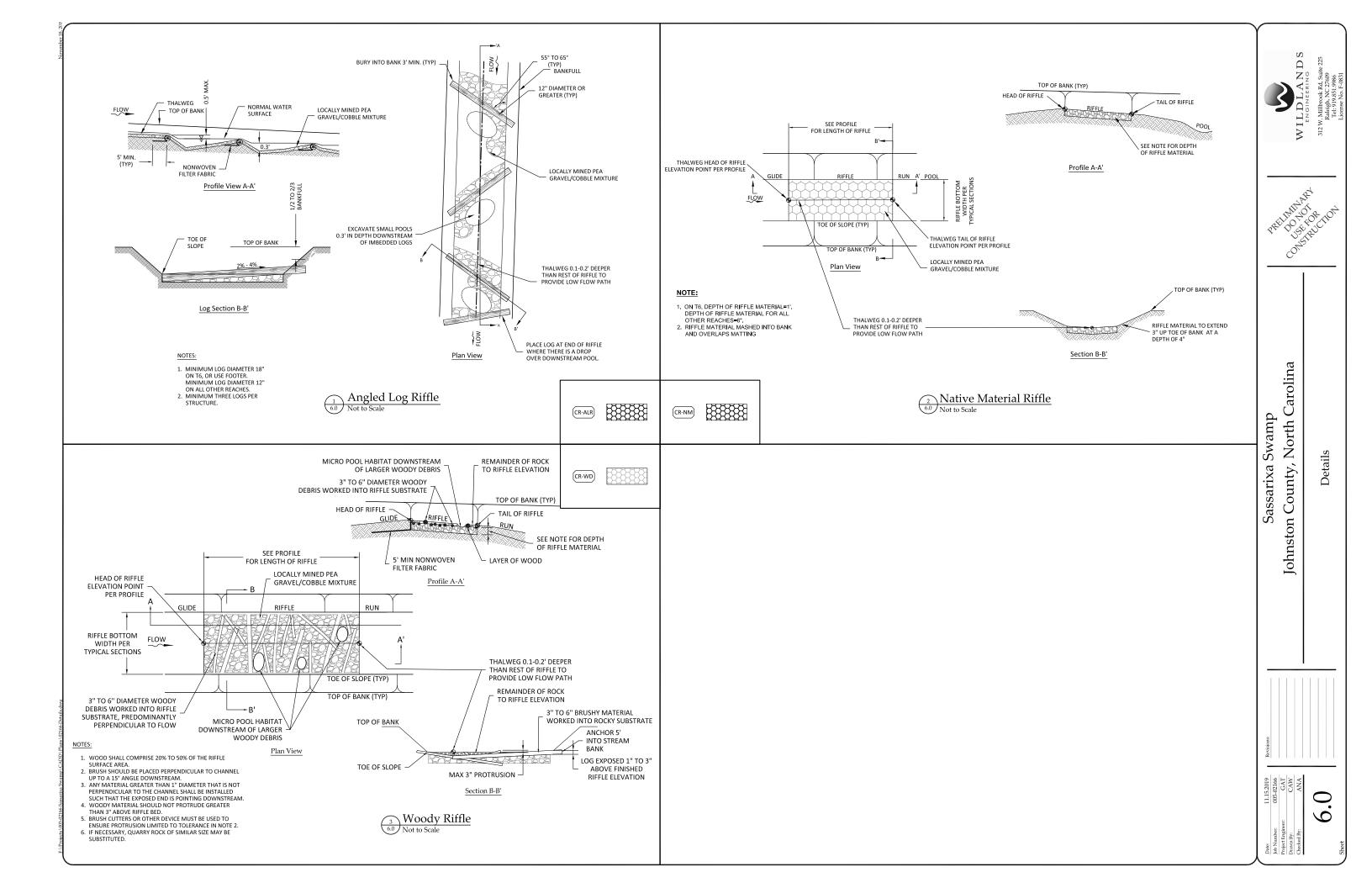


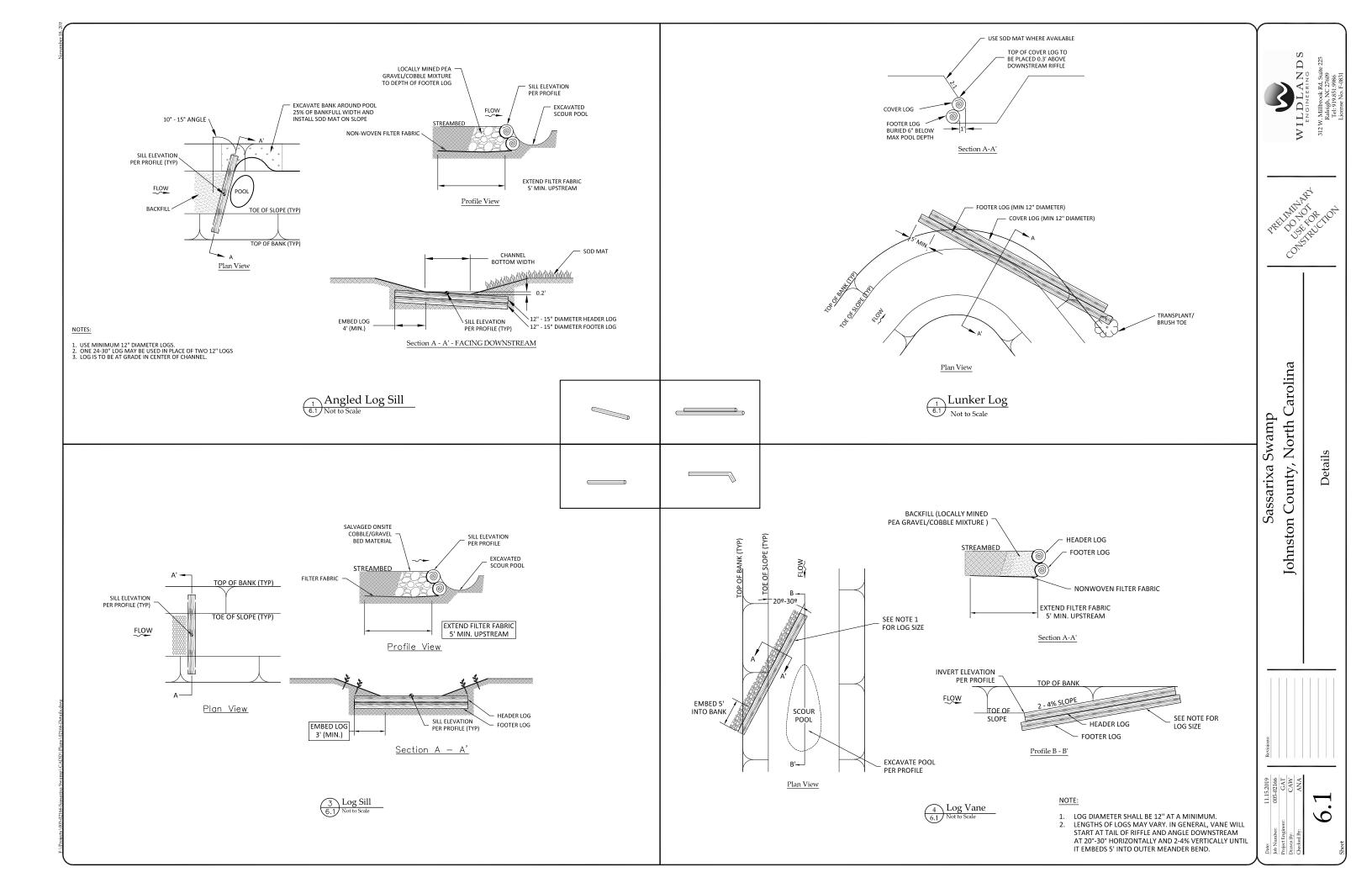


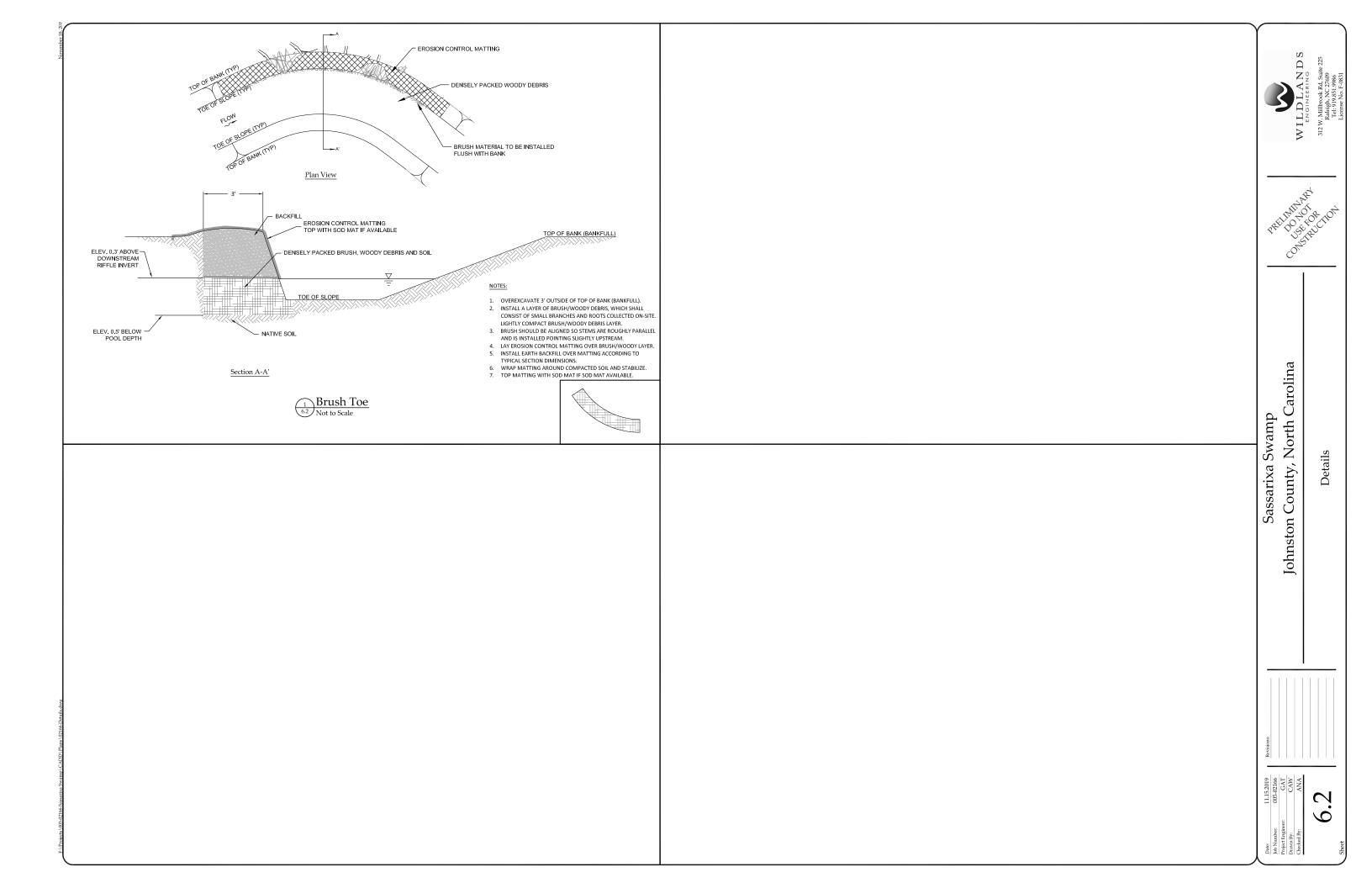


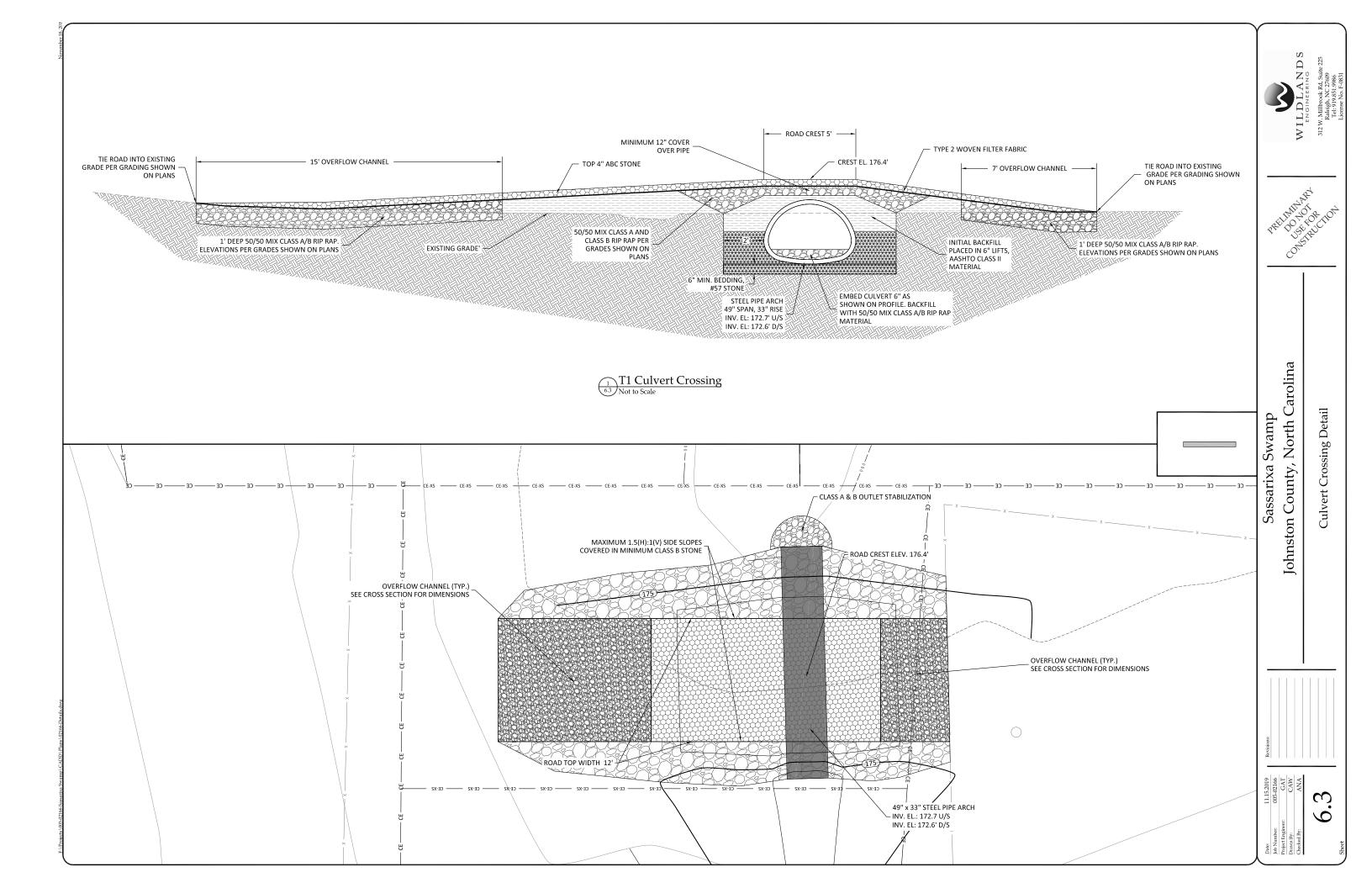


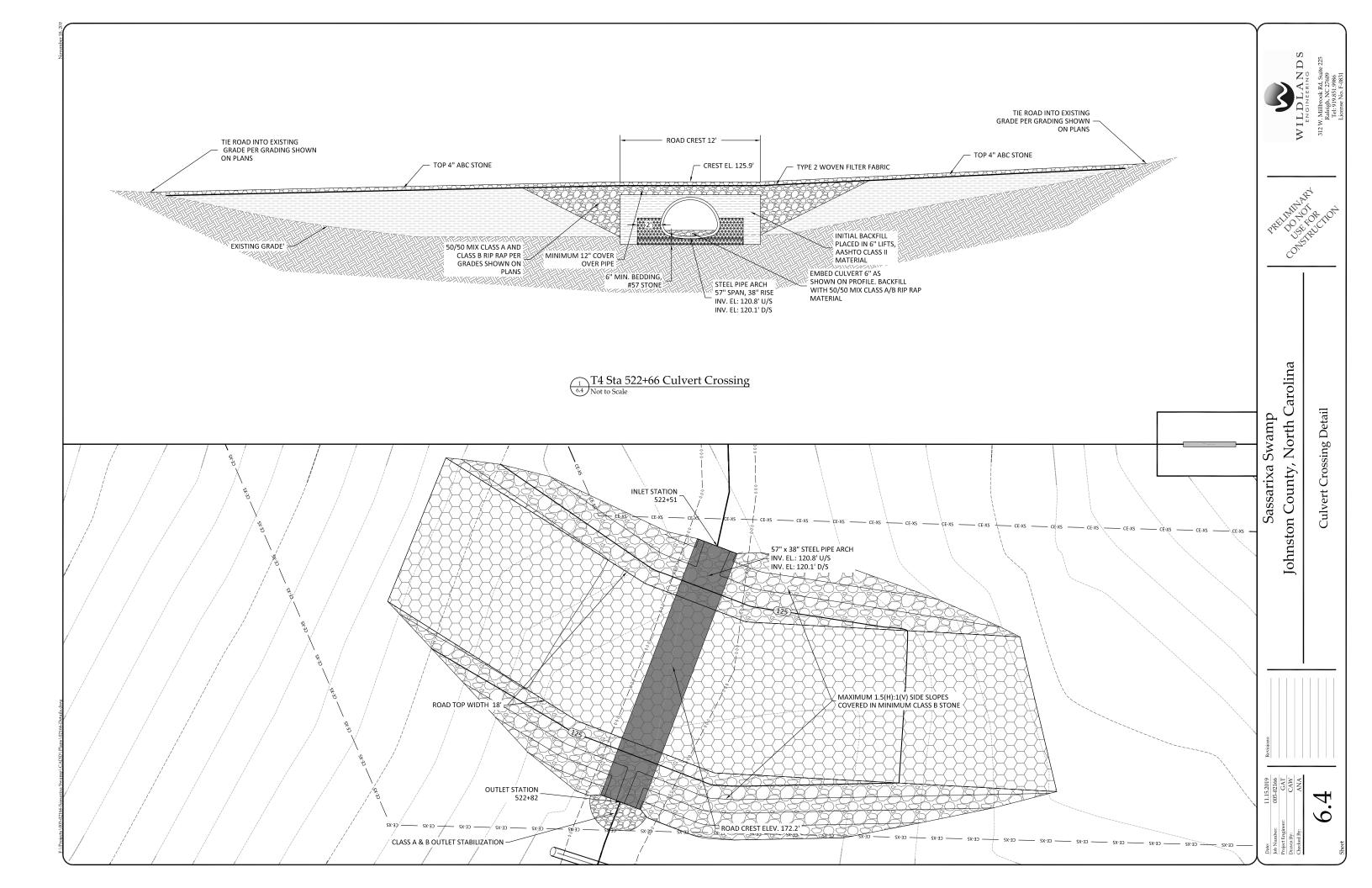


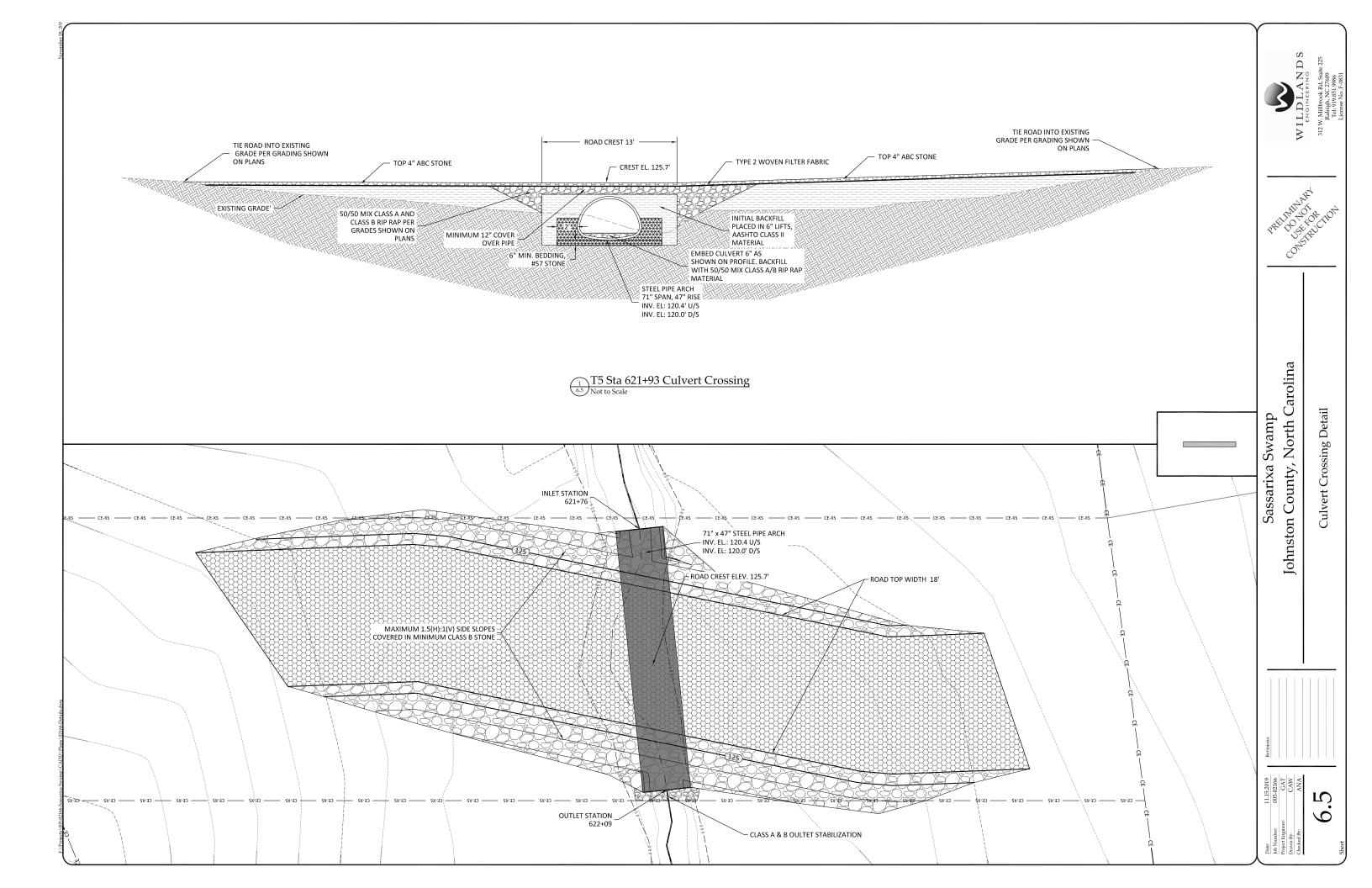


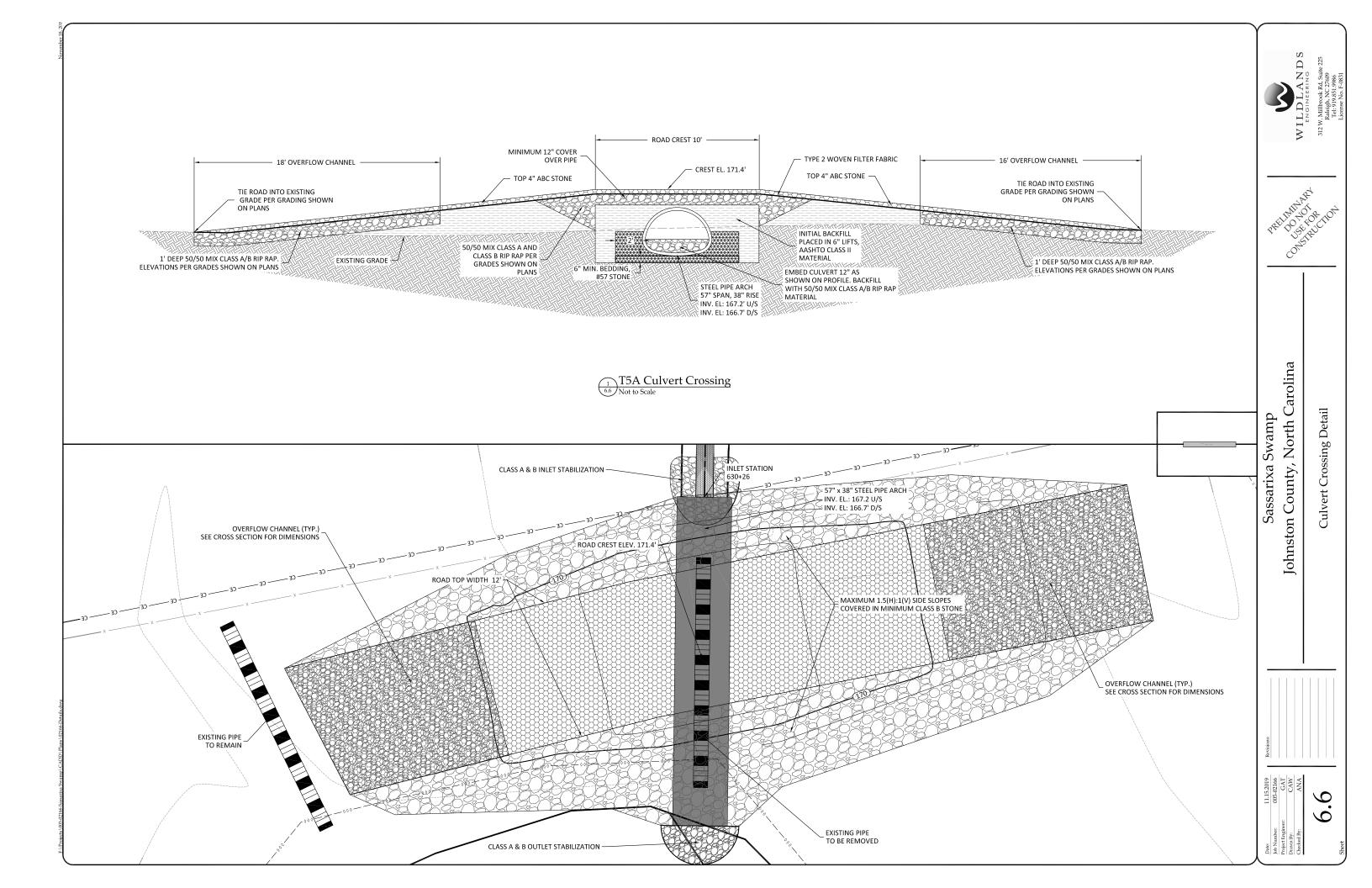


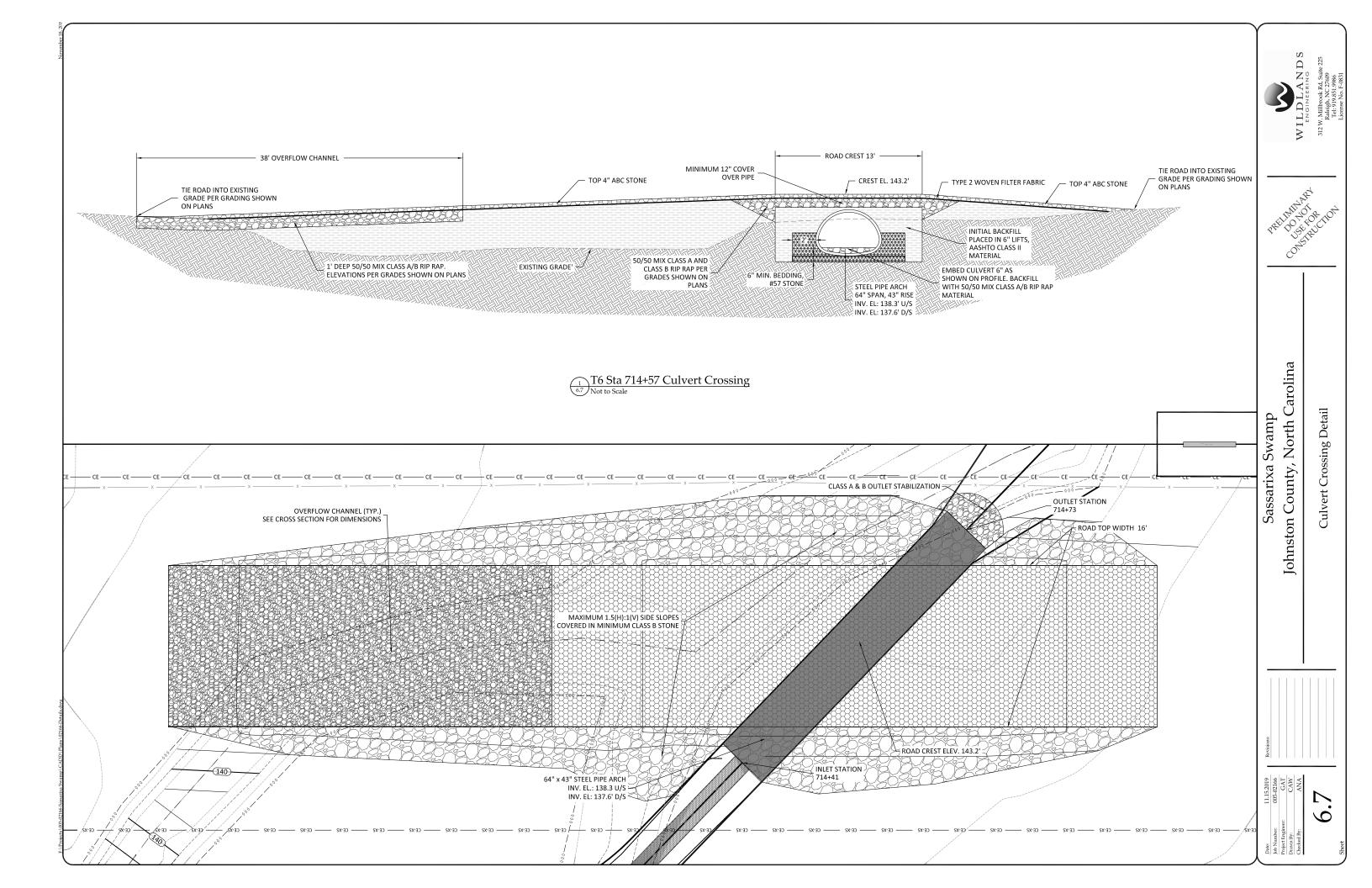


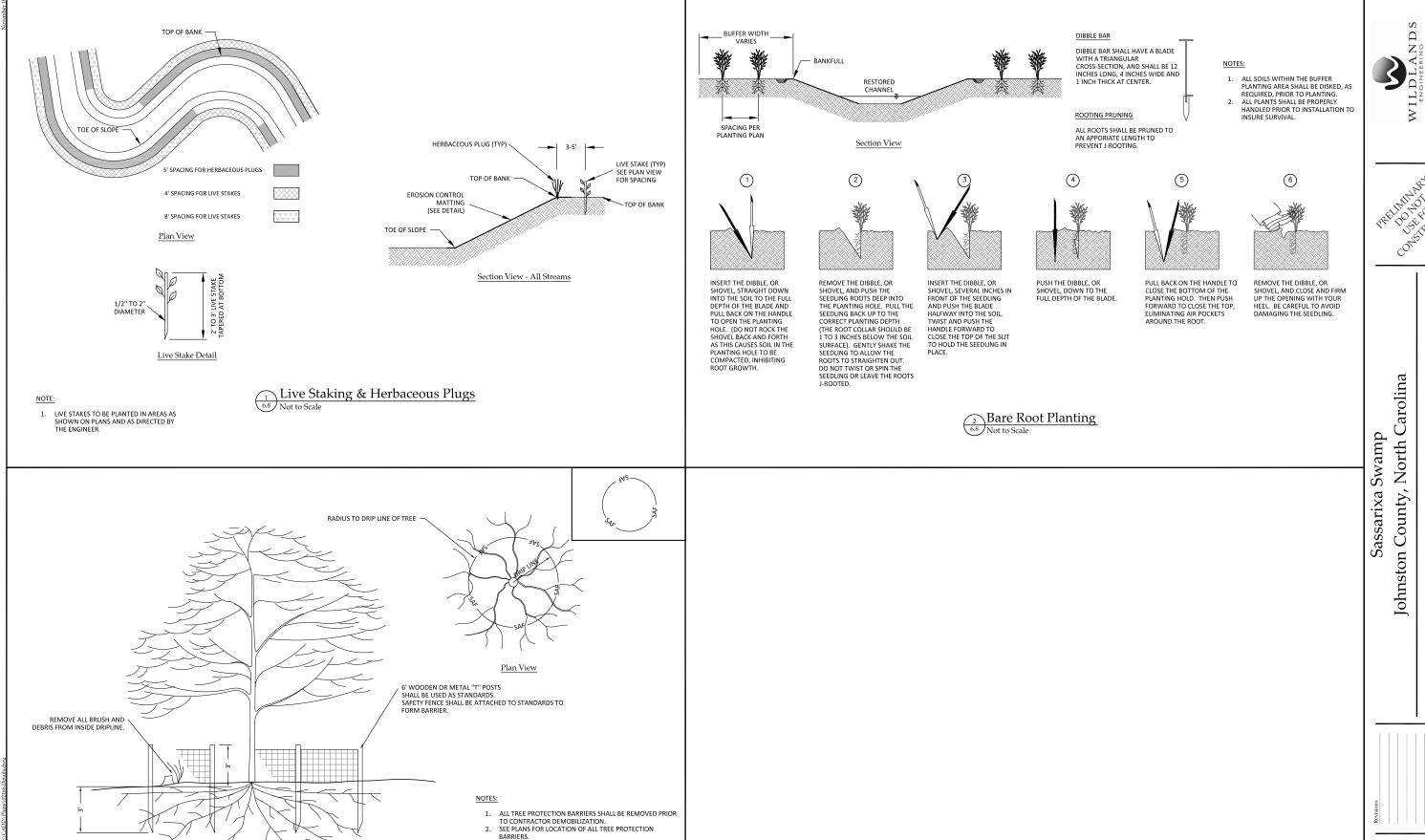






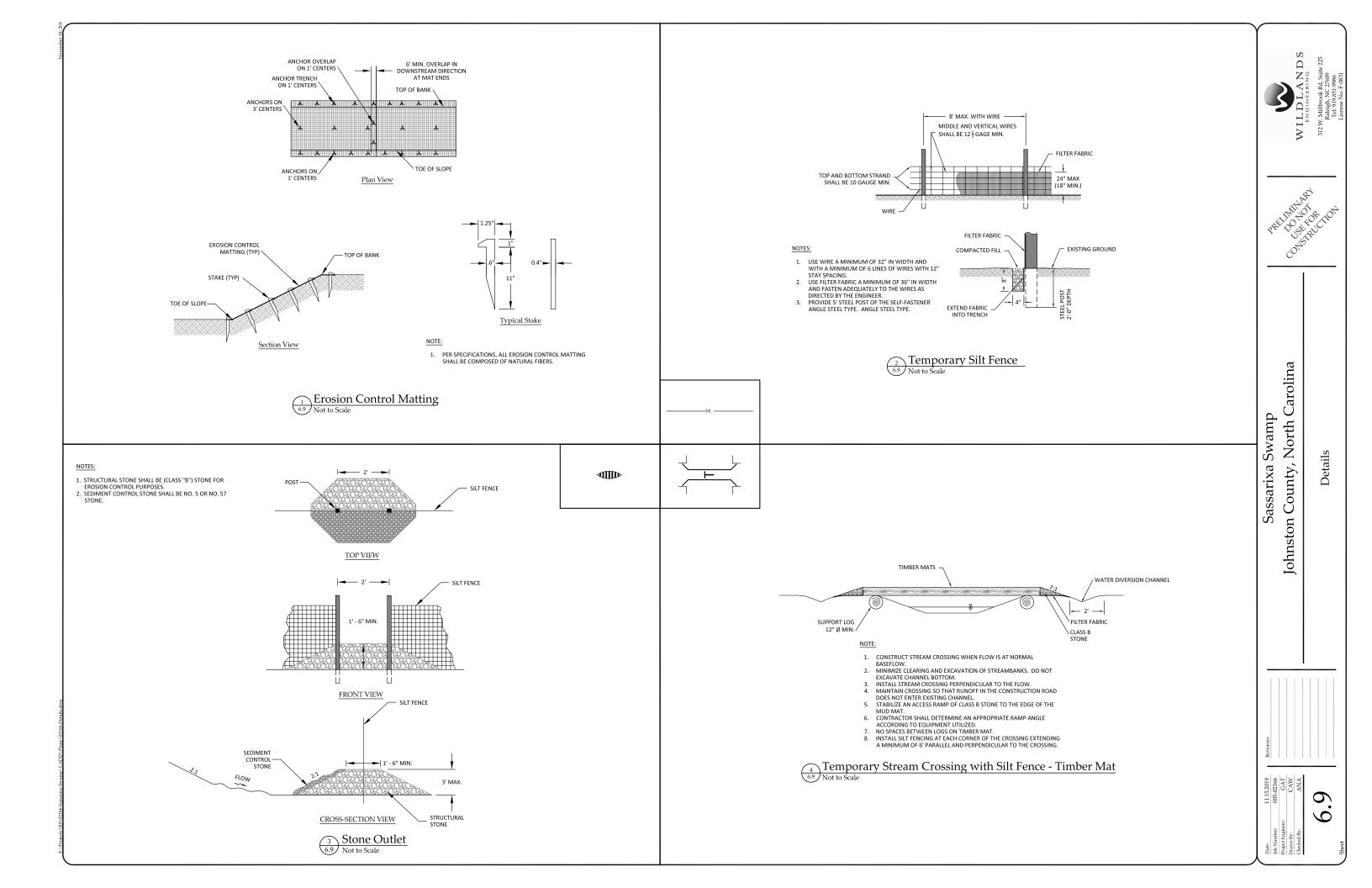


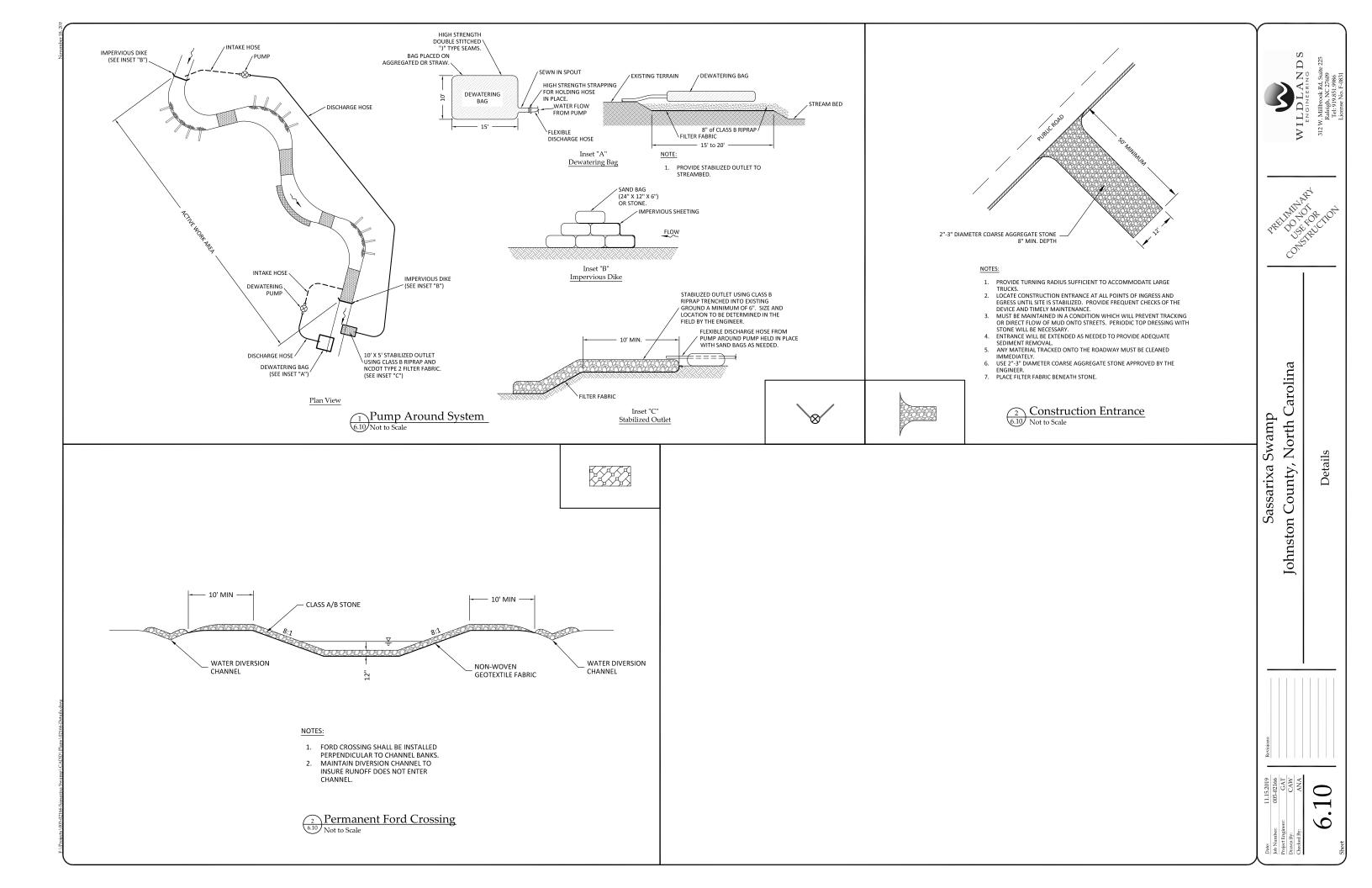


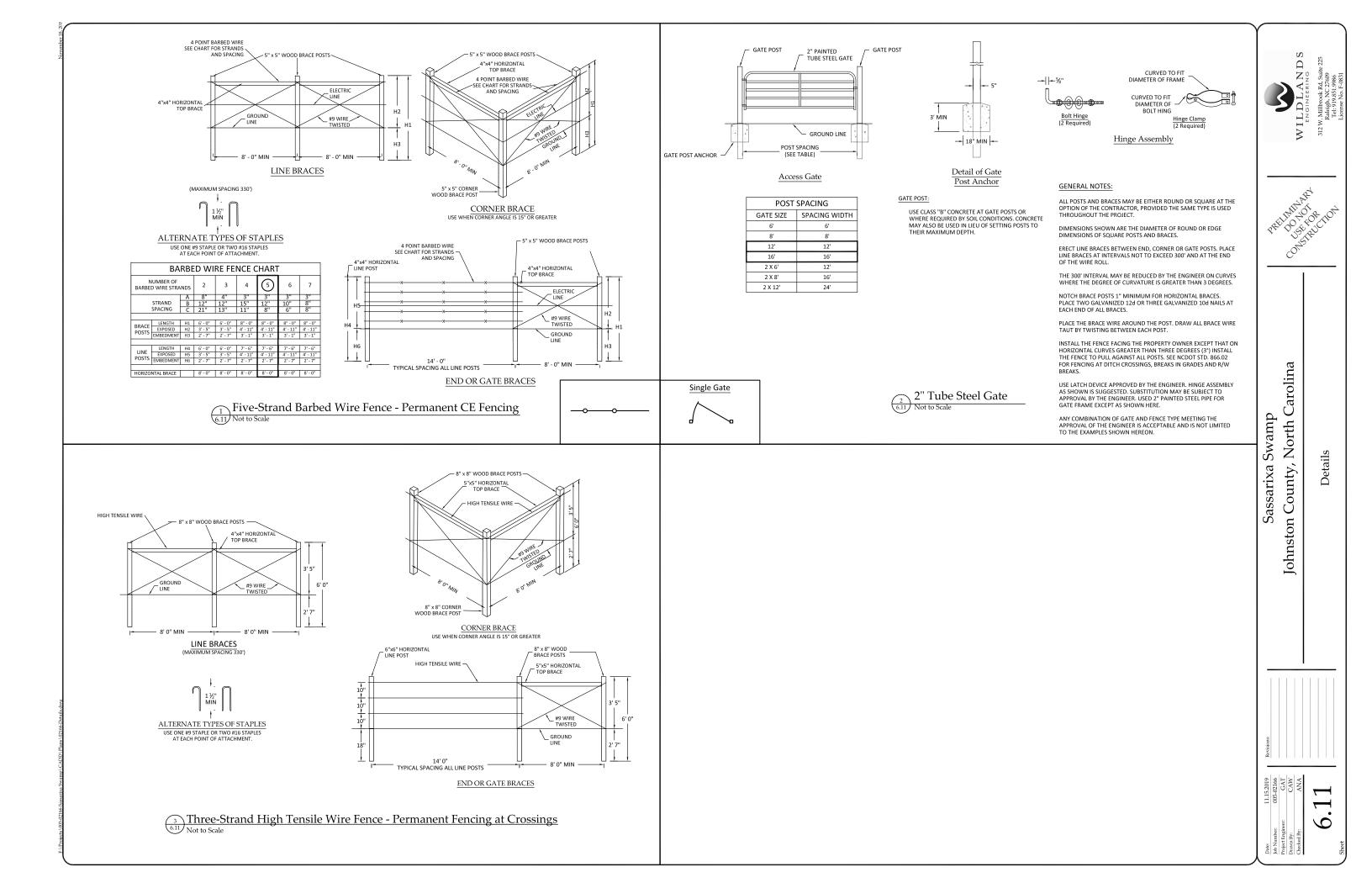


Section View

Tree Protection Fencing
Not to Scale







## Appendix 8 Maintenance Plan

## 1.0 Maintenance Plan

The site shall be monitored on a regular basis and a physical inspection of the site shall be conducted a minimum of once per year throughout the post-construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two (2) years following site construction and may include the following:

**Table1: Maintenance Plan** – Sassarixa Swamp Mitigation Site

Component/Feature	Maintenance through project close-out		
Stream	Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel. Areas where storm water and floodplain flows intercept the channel may also require maintenance to prevent bank erosion. Beaver dams that inundate the stream channels shall be removed and the beaver shall be trapped if deemed necessary.		
Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance with NC Department or Agriculture (NCDA) rules and regulations.		
Site boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, 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.		

Additional maintenance activities are discussed in the Vegetation and Land Management section of the mitigation plan.

# Appendix 9 Credit Release Schedule

## 1.0 Credit Release Schedule

All credit releases will be based on the total credit generated as reported by the as-built survey of the mitigation site. Under no circumstances shall any mitigation project be debited until the necessary 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 Interagency Review Team (IRT), 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 as follows:

Table A: Credit Release Schedule - Stream Credits

Credit Release Milestone	Credit Release Activity	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 5monitoring 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 interim performance standards have been met	10%	90% (100%*)

<sup>\*10%</sup> reserve credits to be held back until the bankfull performance standard has been met.

### 1.1 Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan can be released by DMS without prior written approval of the DE upon satisfactory completion of the following activities:

- a. Approval of the final Mitigation Plan.
- b. Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property.
- c. Completion of project construction (the initial physical and biological improvements to the mitigation site) pursuant to the mitigation plan; per the DMS Instrument, construction means that a mitigation site has been constructed in its entirety, to include planting, and an as-built

- report has been produced. As-built reports must be sealed by an engineer prior to project closeout, if appropriate but not prior to the initial allocation of released credits.
- d. Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.

## 1.2 Subsequent Credit Releases

All subsequent credit releases must be approved by the DE, in consultation with the IRT, based on a determination that required performance standards have been achieved. For stream projects a reserve of 10% of a site's total stream credits shall 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 two bankfull events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT. As projects approach milestones associated with credit release, the DMS will submit a request for credit release to the DE along with documentation substantiating achievement of criteria required for release to occur. This documentation will be included with the annual monitoring report.

# Appendix 10 Financial Assurance

#### **Financial Assurances**

Pursuant to Section IV H and Appendix III of the Division of Mitigation Service's In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environment and Natural Resources has provided the US Army Corps of Engineers 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.



## RIPARIAN AREA MITIGATION PLAN

Final

November 2019

#### SASSARIXA SWAMP MITIGATION PLAN

Johnston County, NC NCDEQ Contract No. 7425 DMS ID No. 100040

Neuse River Basin HUC 03020201

USACE Action ID No. SAW 2018-00432 DWR Project No. 2018-0198 RFP #: 16-007279

#### PREPARED FOR:



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

#### FINAL RIPARIAN AREA MITIGATION PLAN

#### SASSARIXA SWAMP MITIGATION SITE

Johnston County, NC NCDEQ Contract No. 7425 DMS ID No. 100040

> Neuse River Basin HUC 03020201

#### PREPARED FOR:



### NC Department of Environmental Quality Division of Mitigation Services

1652 Mail Service Center Raleigh, NC 27699-1652

#### PREPARED BY:



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#### This Mitigation Plan has been written in conformance with the requirements of the following:

- 15A NCAC 02B .0295 Mitigation Program Requirements for Protection and Maintenance of Riparian Buffers.
- 15A NCAC 02B. 0240, Nutrient Offset Payments Rule, amended effective September 1, 2010
- NCDEQ 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.

#### **Contributing Staff:**

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November 19, 2019

Raleigh, NC 27699-1652

Mr. Jeremiah Dow NC Department of Environmental Quality Division of Mitigation Services 1652 Mail Service Center

RE: DMS Review comments for Mitigation Plan Sassarixa Swamp Mitigation Site (DMS ID # 100040) Neuse 03020201, Johnston County, NC Contract No. 7425

Dear Mr. Dow,

Thank you for compiling and providing comments on the Sassarixa Mitigation Site draft Mitigation Plan.

1. The use of the term "buffer" or "riparian buffer" is used too loosely throughout the plan. These terms should only be used to describe an area that is within the Neuse Riparian Buffer. For this site, only the first 50' adjacent to streams subject to the rule are Neuse Riparian Buffers. Therefore, please correct applicable references to "buffer" or "riparian buffer" and replace incorrect references with "riparian areas" or "riparian restoration".

References to "buffer" or "riparian buffer" were corrected to "riparian areas" and "riparian restoration".

2. The plan describes this site as a "Buffer Restoration Project" throughout the text. However, most of the site is actually buffer enhancement w/some preservation. I recommend "buffer mitigation project" or something other than "buffer restoration project" to avoid confusion.

References to "Buffer Restoration Project" has been replaced to "Buffer Mitigation Project".

- 3. Section 2.2 page 6
  - a. This section is titled "Project Location", but it includes references to the Alternative mitigation options being proposed onsite. I recommend separating this information out into its own section.

"Project Location" has been separated out into "Project Location" and "Buffer Project Attributes".

b. Some streams onsite are "not subject". Correct where applicable.

\*Corrected to include non-subject streams too.



c. Enhancement via Cattle Exclusion is also an alternative option that should be added to this section.

Enhancement via Cattle Exclusion has been added as an alternative option.

d. For Ephemeral channels, last bullet, correct the rule reference to just be 15A NCAC 02B .0295 (n). Currently, the reference to 0295 (o) is too inclusive. For example, "enhancement" on Ephemerals can only be achieved by actually planting an area deemed "Enhancement Site" under 0295 (n). Areas deemed as "Enhancement" via cattle Exclusion are approved under 0295 (o) and cannot be achieved adjacent to Ephemeral channels. T3 Ephemeral is currently proposed as "Enhancement via Cattle Exclusion" and instead, should be Preservation according to viability letter.

The rule reference has been updated. T3 Ephemeral reach has been changed to Preservation to match the viability letter.

- e. For coastal HW Streams, add additional information.
  - i. The rule requires that the site meet success criteria for the stream mitigation. Therefore, this area requires 7 years of monitoring instead of 5.

7 years of monitoring has been added

ii. The rule requires the creditable areas to be planted to get buffer credit adjacent to HW streams. Therefore, areas currently forested on T5C must be excluded from credit, and only the restoration areas in the fields are viable.

Forested areas along the HW streams have been excluded from credit.

iii. Text says the buffer will be measured based on valley length, but where is that measurement provided or represented?

The valley length is shown in Figure 6 and Figure 7.

- 4. Section 2.5
  - a. The statement provided about the purpose of the internal crossings suggests that there may should be fencing on both sides of Sassarixa creek. No fencing is shown on the plan sheets or the figures for the right side of Sassarixa Creek. If "agriculture" in this section implies cattle, then sassaixa creek will require fencing on both sides of the easement in order to comply with 0295 (o)(6). Please explain.

Fencing has been added to the right side of Sassarixa Creek.

5. Section 5.2 & Plan Sheet 3.0 lists Green Ash to be planted. Based on concerns of the Emerald Ash Borer and its ability to spread and attack saplings (>1-inch diameter), DWR highly recommends this tree not be included in the planting plan.



Green Ash has been removed from the planting plan.

6. Provide a reasonable justification to plant Cypress trees, a softwood, which are not considered an appropriate species to meet performance standards per 0295 (n)(2)(B). Provide specifics as to where Cypress will be planted in the Plan Sheets.

Cypress has been removed from the planting plan.

- 7. Section 5.3
  - a. The viability letter notes that there are two types of enhancement on this project. Enhancement under 0295 (n) indicates that the area requires plantings vs Enhancement under 0295 (o)(6) requires just the removal of cattle. The upper reach of T4 was determined to be Enhancement under 0295 (n). Other Enhancement areas met .0295(o)(6). Correct figures where cattle exclusion is shown on the upper reach of T4 and show as "Enhancement". Confirm that the planting sheets show plantings in this area as well.

The upper reach of T4 will also be planted.

b. How will cattle be "excluded" in the buffer enhancement areas?

It has been noted in Section 5.3 that cattle will be "excluded" through fencing.

c. Correct rule reference to be 15A NCAC 02B .0295(o). It currently reads .0296

Rule reference has been corrected.

8. Section 6.2 Please revise plan to add that planted stems in the monitoring plats will all be flagged.

Flagging planted stems has now been noted in Section 6.2.

9. Table 9 – add another parameter to account for T5C needing 7 years of monitoring.

Table 9 is updated to reflect the 7 years of monitoring along T5C.

10. Section 7.1 – Add that "height" will be measured to assess the vigor of stems.

Height has been added to assess the vigor of stems.

11. Section 7.4 – Add a note about T5C and its additional monitoring to meet performance standards. The rule also requires that the stream mitigation meets the performance criteria by the USACE as well. Therefore, DWR cannot accept the restoration area adjacent to T5C without knowing it meets the final performance criteria at closeout by the IRT. Please indicate that



closeout of credits adjacent to T5C will be done at Closeout with IRT. If T5C is removed from the buffer plan all together, then none of this applies.

The additional monitoring performance for T5C has been added.

#### 12. Tables 7a & 7b

a. Use newer version to the table (request from DMS) and attempt to keep the table all on one page. If needing to split 7a and 7b on separate pages that is fine. This may require a larger paper size to accommodate this request. Please do not reduce the font size in the table too much such that it makes the table difficult to read as hard copy.

Newer version of the table is now being used.

b. Correct table based on comments provided with this letter.

Corrections have been incorporated.

c. T4 should be "Enhancement" and not "Enhancement via Cattle Excl". See comment #7.

T4 is now "Enhancement".

d. Breakout T5C credits separate from others and as "not convertible to Nutrient".

T5C credits are now separated from the others and listed as "NOC".

e. T5C is not viable for Enhancement, remove from table.

Enhancement for T5C has now been removed.

f. T3 Ephemeral reach is not viable for Enhancement via Cattle Excl. Change this to preservation.

T3 Ephemeral has been changed to preservation.

g. T4 & T5 Restoration 0-1000' are both shown with"\*\*". Explain why these two are different than other Restoration areas 0-100' shown in the table. If the explanation is due to widths, then why can't the Min-Max width be shown as different?

The asterisks have been removed with the new table.

h. Formulas may be off on table, so once newer version of the table is completed for this site, I will be able to decipher whether the subtotals and totals are compliant.

Noted.





i. T2 restoration area may need to be edited based on comment #15 below.

Noted.

13. Paragraph below Table 7b will need to be edited based on comments made in this letter. Specifically, the viability of certain streams/reaches that are stated incorrectly in the first sentence.

The paragraph below Table 7b has been removed due to the clarification from correspondence with Ms. Katie Merritt sent on August 16. 2019.

14. Table 7a-b shows nutrient offset conversions. However, there is no reference to this in the introduction of the Plan. If this site is to be reviewed by DWR to generate nutrient and/or buffer, please include language to the effect in the introduction.

Nutrient offset credits are not being request at this time, but areas may be converted to nutrient offset credits by DMS later. Since nutrients are not being requested at this time, language is not needed in the introduction. A note below Table 7a has been added indicating potential nutrient request in the future.

- 15. Figure 6
  - a. Identify the location of the Ephemeral channel along T3.

The location of the Ephemeral channel along T3 has been noted.

b. Show Preservation instead of Cattle Excl. along T3 ephemeral reach.

T3 has been changed to Preservation.

c. Add Enhancement (non-cattle excl) along T4 (R1 & R2) (see plan sheet 3.3)

T4 (R1 &2) has been changed to Enhancement (non-cattle exclusion)

d. Remove Enhancement adjacent to T5C.

T5C Enhancement has been removed.

e. T2 restoration area should only be measured from Top of Bank of the Stream Determination point by DWR or the "radius/bubble" above the point. When comparing this area to Figure 7, the top of bank appears to be measured from the proposed stream alignment beyond the wood line.

Figure 7 has been corrected to the Top of Bank of the Stream Determination point by DWR.



f. T4 Preservation area needs to be excluded from credit unless the DWR has confirmed this feature is a stream.

T4 Reach 3 has now been confirmed a stream based on the On-Site Determination for Applicability to the Neuse Riparian Area Protection Rules (15A NCAC 02B .0233) dated October 28. 2019. Supporting documentation is located in the Appendix.

g. I prefer the legend also identify the Coastal HW credits (instead of blue, use a different color)

Coastal HW credits have been identified in another color.

#### 16. Figure 8 -

a. Show the non-cattle exclusion Enhancement Area & Coastal HW area.

Figure 8 has been updated according to above changes.

b. All plots along T1 are on the same side. Please move a plot to represent the other side of T1 as well.

The vegetations plots along T1 have been moved to represent the other side.

c. There is a plot located within Cattle Exclusion areas along T4. Why?

The plot located within the Cattle Exclusion has been removed.

#### 17. Figure 9-

a. Remove T5C from being able to be converted to NOC. NOC is not viable adjacent to coastal HW stream sites as shown in the viability letter.

T5C has been removed from being converted to NOC.

18. Service Area map – This map does not comply with Rule .0295. The service area for buffer mitigation projects in the Neuse 01 below Falls Lake is the Neuse 01below Falls Lake and does not include the Falls Lake WS. Edit this map to exclude the Falls Lake completely from the service area.

The Service Area Map has been updated to exclude the Falls Lake WS.

19. There are not dates on the site photos, when were these photos taken.

Dates have been added to the site photos.



20. Overall, if the riparian efforts are done according to the plan and addresses all comments and corrections provided by DWR, the site should provide a good buffer mitigation and/or nutrient offset project.

Noted.

If you have any questions please contact me at <a href="mailto:aallen@wildlandseng.com">aallen@wildlandseng.com</a>, (919)851-9986 x 106. Sincerely,

Angela Allen, P.E., Project Manager

afnaller

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#### **APPENDIX**

**Appendix 1a** Site Protection Instrument

**Appendix 1b** NC Division of Water Resources Site Viability for Buffer Mitigation and Nutrient Offset Letter – May 21, 2018

NC Division of Water Resources Site Viability for Buffer Mitigation and Nutrient Offset Letter – April 3, 2019

On-Site Determination for Applicability to the Neuse River Riparian Buffer Rules and Water Quality Standards (15A NCAC 02B .0233) – April 4, 2018

**Appendix 1c** Overview Photos – January 7, 2019

#### 1.0 Introduction

The Sassarixa Swamp Mitigation Site (Site) is a buffer and nutrient mitigation project in conjunction with a stream mitigation project. Construction of the stream restoration project will occur concurrently with planting and excluding livestock from the riparian buffers. The Site is located in Johnston County approximately six miles southwest of Smithfield and five miles north of Four Oaks (Figures 1). The Site is comprised of approximately 65.1 acres along Sassarixa Creek and seven unnamed tributaries to Sassarixa Creek, along with six unnamed tributaries to Black Creek. Currently, the Site is characterized by a mix of active pastures, fields, and woodlands. The project will restore, enhance, and preserve riparian buffer area within the project area, which will provide 1,098,146.503 buffer credits or 55.9 acres worth of buffer mitigation.

The Site is located within the Hydrologic Unit Code (HUC) 03020201130030 and North Carolina Division of Water Resources (NCDWR) Sub-basin 03-04-04 Sassarixa Creek and seven unnamed tributaries to Sassarixa Creek, along with six unnamed tributaries to Black Creek on the Site flow into Holts Lake, which drains to the Neuse River. Holts Lake is a recreational lake classified as a Nutrient Sensitive Water (NSW) and the Neuse River is a water supply for the City of Goldsboro.

The Sassarixa Swamp Mitigation Site is located in a new Targeted Local Watershed (TLW) that is not described in the 2010 Neuse River Basin Restoration Priorities (RBRP) Plan. The TLW was added in the 2015 Neuse 01 CU Update because there were more water quality issues than assets. Stressors for this TLW include impervious surfaces, disturbed riparian areas, and agricultural land use/animal operations. The Site addresses the TLW stressors of agricultural land use/animal operations and the lack of protected riparian areas. The project will also address key Cataloging Unit (CU) wide restoration goals for the Neuse River 03020201 described in the RBRP including reduction of sediment and nutrient loads from agricultural lands and increasing or improving riparian buffers (NC DWR 2009).

This buffer mitigation project will reduce sediment and nutrient loading, improve terrestrial and in stream habitats, and improve stream and bank stability. The area surrounding the streams proposed for restoration is a mixture of active pasture, fields, and woodlands. By removing cattle access to onsite tributaries to Holts Lake, restoring a forest to maintained riparian areas and protecting and preserving



existing forested areas; the project will reduce nutrient and sediment inputs to project streams, and ultimately to Holts Lake. The restored floodplain areas will filter sediment during rainfall events. The establishment of riparian areas will create shading to minimize thermal pollution. Finally, invasive vegetation will be treated within the project area as needed and the proposed native vegetation will provide cover and food for wildlife.

#### 2.0 Mitigation Project Summary

The major goals of the proposed buffer mitigation project are to provide ecological and water quality enhancements to the Neuse River Basin by creating a functional riparian corridor and restoring the

riparian area. Specific enhancements to water quality and ecological processes are outlined below in Table 1.

**Table 1: Ecological and Water Quality Goals –** Sassarixa Swamp Mitigation Site

Goal	Objective	CU-Wide and RBRP Objectives Supported	
Decrease nutrient levels	Filtering runoff from the agricultural fields through restored native buffer zones. The off-site nutrient input will also be absorbed on-site by filtering flood flows through restored floodplain areas, where flood flows can disperse through native vegetation.	Reduce nutrient inputs to waters of the Neuse River Basin.	
Exclude cattle from project streams.	Install fencing around project areas adjacent to cattle pastures.	Reduce and control sediment inputs; Reduce and manage nutrient inputs; Contribute to protection of or improvement to a Water Supply Waterbody.	
Decrease water temperature and increase dissolved oxygen concentrations	Establishment and maintenance of riparian buffers will create additional long-term shading of the channel flow to reduce thermal pollution.	Improve habitat to wildlife by providing additional habitat.	
Restore and enhance native floodplain vegetation.	Plant native tree species in riparian zone where currently insufficient.	Reduce and control sediment inputs; Reduce and manage nutrient inputs; Provide a canopy to shade streams and reduce thermal loadings; Contribute to protection of or improvement to a Water Supply Waterbody.	
Permanently protect the project Site from harmful uses.	Establish a conservation easement on the Site.	Protect aquatic habitat; protect water supply waters.	

#### 2.1 Existing Site Conditions

The buffer mitigation project will place put 65.1 acres of agricultural fields and woodlands along Sassarixa Creek and several unnamed tributaries that drain into the Holts Lake watershed, part of the Neuse River Basin under a conservation easement. Out of the 65.1 acres, 55.9 acres will be proposed for a combination of riparian buffer restoration, enhancement, and preservation.

The project includes several adjacent properties that have been owned and operated as a livestock farm by a single family since 1850, where livestock are continually rotated through all fields (with access to their associated streams). The western portion of the project includes Sassarixa Creek and seven unnamed tributaries to Sassarixa Creek (T1, T1A, T1B, T1C, T1D, T2, and T3) (Figure 2). The eastern portion of the site contains six unnamed tributaries to Black Creek (T4, T5, T5A, T5B, T5C, and T6). A review of historic aerials from 1950 to 2012, located in the appendix, show that onsite streams have existed in their approximate locations with very little change to riparian zones since 1950. Two

alterations to the Site visible from aerial photography are the addition of the pond on T2 between 1964 and 1973, and the addition of the large pond below T5A, T5B, and T5C, between 1950 and 1961.

Sassarixa Creek is a perennial stream that enters the Site from Black Creek Road and flows southeast. A mature hardwood forest surrounds the stream on both sides.

T1 enters the site at Old Olive Road in the northeast section of the project. T1A and T1D enter the right bank of T1, while T1B enters from the left bank downstream of T1A and T1D. The canopy is dominated by loblolly pine (*Pinus taeda*) with an understory of Japanese stilt grass (*Microstegium vimeneum*).

T1C is a short reach that starts at the tree line and flows into Sassarixa Creek.

The origin of T2 is a farm pond located in the natural valley of this drainage area that is dominated by fescue and hay production. There is a grass swale at the outlet of the pond, and once the swale reaches the edge of the forest, there is a large (>5') headcut as it enters the valley of Sassarixa Creek.

A ditch originates south of Old Olive Road, flowing into T3 which starts as an ephemeral channel. T3 continues along a forested buffer transitioning into an intermittent stream. While the channel along T3 is forested, livestock access has impacted most of the understory.

T4 starts as an intermittent stream that enters the Site through a culvert at Old Olive Road. Roughly 200 feet down the stream breaks and becomes a degraded wetland picking back up another 300 feet to continue being an intermittent channel. The upper portion of T4 has sporadic conifer trees, while the understory has been trampled by cattle.



T5A, T5B, and T5C are the intermittent headwater streams to T5. They originate in the northernmost

region of the project, upstream of a large pond. Their watersheds are primarily livestock grazing areas and row crops.

T5 and T6 are intermittent streams that enter the project area at Old Olive Road. A mature hardwood canopy extends the length of both streams.

#### 2.2 Parcel Location

The Site is approximately six miles southwest of Smithfield and five miles north of Four Oaks (Figure 1). The site is within the DMS targeted Neuse River Basin HUC 03020201130030 and NCDWR Subbasin 03-04-04.

From Raleigh take I-40 E. Take exit 319 for NC-210 toward Smithfield/Angier. Turn left onto NC-210 E (signs for Smithfield). Continue on NC-210 E for 2.4 miles and turn right onto Lassiter Roads. After 4.6 miles, turn left onto Black Creek Road. Continue on Black Creek Road for 0.7 miles and then turn right onto Old Olive Road. The first parcel is 0.1 mile on the right of Old Olive Road. The other parcels are at various locations further down Old Olive Road.

#### 2.3 Buffer Project Attributes

**Table 2: Buffer Project Attributes –** Sassarixa Swamp Mitigation Site

Project Name	Sassarixa Swamp Mitigation Site
Hydrologic Unit Code	03020201130030
River Basin	Neuse River
Geographic Location (Lat, Long)	35°28'19.75"N 78°26'9.60"W
Site Protection Instrument (DB, PG)	To be recorded
Total Credits (BMU)	1,080,086
Types of Credits	Riparian Buffer
Mitigation Plan Date	May 2019
Initial Planting Date	March 2020
Baseline Report Date	May 2020
MY1 Report Date	November 2020
MY2 Report Date	November 2021
MY3 Report Date	November 2022
MY4 Report Date	November 2023
MY5 Report Date	November 2024

#### 2.4 Alternative Mitigation

In addition to buffer restoration on subject streams, per the Consolidated Buffer Mitigation Rules (15A NCAC 02B 0.0295 (o)), alternative mitigation is proposed on the Site in the form of buffer restoration on ephemeral channels and coastal headwater streams, and preservation of forested buffer on subject and non-subject streams. The proposed project is in compliance with these rules in the following ways:

Buffer Restoration on Ephemeral Channels 15A NCAC 02B .0295 (n):

- The ephemeral channel is directly connected to intermittent or perennial stream channels and will be protected under the same contiguous easement boundary (Figure 2).
- The area of the mitigation site on ephemeral channels does not compromise more than 25 percent of the total area of buffer mitigation.
- The mitigation area on the Site's ephemeral channels is located completely within its drainage area.
- The proposed area meets all applicable requirements of Paragraph (n) of (15A NCAC 02B .0295), for restoration or enhancement.

Buffer Restoration on Coastal Headwater Streams 15A NCAC 02B .0295 (o)(2):

- Wooded buffers planted along Outer Coastal Plain headwater stream mitigation sites may also be approved as riparian buffer mitigation credit if the Site meets all applicable requirements of 15A NCAC 02B .0295 (n).
- All success criteria specified in the approval of the stream mitigation site by the Division shall be met. Seven years of monitoring is required.



- Area of the buffer shall be measured perpendicular to the length of the valley being restored.
- The area within the proposed buffer mitigation site shall not also be used as wetland mitigation.

Enhancement via Cattle Exclusion 15A NCAC 02B .0295 (o)(6)

- Livestock is permanently excluded from riparian area.
- An enhancement plan must be provided in accordance by Paragraph (n) of 15A NCAC 02B .0295
- Grazing must be the predominant land use since the effective date of the applicable buffer rule.

Preservation on Subject Streams 15A NCAC 02B .0295 (o)(5):

- The buffer width is at least 30 feet from the stream (Figure 7).
- The area meets the requirements of 15A NCAC 02R 0.0403(c)(7), (8), and (11) with no known structures, infrastructure, hazardous substances, solid waste, or encumbrances within the mitigation boundary (see Section 4.4 for more detail).
- Preservation mitigation is being requested on no more than 25% of the total area of buffer mitigation (Table 8).

Preservation on Non-Subject Streams 15A NCAC 02B .0295 (o)(4):

- The streams were confirmed as intermittent or perennial by DWR per the On-Site Determination for Applicability to the Neuse River Riparian Buffer Rules and Water Quality Standards dated April 4, 2018
- The buffer width is at least 30 feet from the stream (Figure 7).
- Preservation mitigation is being requested on no more than 25% of the total area of buffer mitigation (Table 8).

#### 2.5 Watershed Characterization

The Site topography, as indicated on the Four Oaks, NC USGS 7.5-minute topographic quadrangle shows a series of moderately sloped valleys (1-3%) that increase in width as they approach the floodplains of Sassarixa Creek and Black Creek (Figure 3).

Drainage areas for the streams and riparian areas were determined by delineating watersheds on the Four Oaks USGS 7.5-minute topographic quadrangles. Figure 4 shows the watershed boundaries for each area. Each of the riparian watersheds are mix of active pastures, fields, and woodlands. The watershed and current land use are summarized in Table 3 below.

**Table 3: Drainage Areas and Associated Land Use –** Sassarixa Swamp Mitigation Site

Reach Name	DWR Stream Buffer Area Designation (Acres) Watershed Area (acres)			Land Use
Sassarixa Creek	Perennial	14.3	4,726	47% agricultural, 7% developed, 46% forested
T1	Intermittent	6.44	45	63% agricultural, 20% developed, 17% forested
T1A	Intermittent	0.39	6	80% agricultural, 0% developed, 20% forested
T1B	Intermittent	0.56	2	80% agricultural, 0% developed, 20% forested
T1C	Intermittent	1.20	6	80% agricultural, 0% developed, 20% forested
T1D	Intermittent	.09	0.5	80% agricultural, 0% developed, 20% forested
T2	Intermittent	1.05	13	80% agriculture, 7% developed, 13% forested
T3 R1	Ephemeral	0.80	17	80% agricultural, 7% developed, 13% forested
T3 R2	Intermittent	3.52	26	80% agricultural, 7% developed, 13% forested
T4	Intermittent	7.00	40	52% agricultural, 4% developed, 44% forested

Reach Name	DWR Stream Designation	Buffer Area (Acres)	Watershed Area (acres)	Land Use
T5	Intermittent	7.28	136	60% agricultural, 4% developed, 36% forested
T5A*	Wetland (Impacts from cattle in T5 stream resulted in a wetland)	4.33	24	80% agricultural, 0% developed, 20% forested
T5B	Intermittent	4.54	25	80% agricultural, 0% developed, 20% forested
T5C	Headwater Wetlands	0.29	10	90% agriculture, 10% forested
T6	Intermittent	4.11	130	60% agricultural, 4% developed, 36% forested

<sup>\*</sup>Proposing stream restoration to reconnect T5A stream throughout. If stream restoration is approved by the IRT and a stream channel is constructed, then the new riparian areas will be viable as an Enhancement Site per 15A NCAC 02B .0295 (o) (6).

#### 2.6 Vegetation

Three reaches on site lack a riparian buffer: T1-R1, the upstream end of T2, and the upstream end of T3. The riparian buffer in these areas consist primarily of fescue (*Festuca* sp.) and some areas of hay production to feed livestock. The canopy on T1-R2 is unique in that it is dominated by loblolly pine (*Pinus taeda*) with an understory of Japanese stiltgrass (*Microstegium vimeneum*). All other riparian areas include a mix of canopy species including red maple (*Acer rubrum*), sweetgum (*Liquidambar straciflua*), willow oak (*Quercus phellos*), tulip poplar (*Liriodendron tulipifera*), ironwood (*Carpinus caroliniana*), sycamore (*Platanus occidentalis*), water oak (*Quercus nigra*), and black willow (*Salix nigra*). While the understory of all reaches is dominated by Japanese stiltgrass, there is still a diverse mix of understory species present, especially along Sassarixa Creek and T4-R3. Understory species include Christmas fern (*Polystichum acrostichoides*), dogfennel (*Eupatorium caplilifolium*), greenbrier (*Smilax sp.*), Virginia creeper (*Parthenocissus quinuefolia*), sawtooth blackberry (*Rubus argutus*), common ragweed (*Ambrosia artemisifolia*), poison ivy (*Toxicodendron radicans*), common rush (*Juncus effesus*), and common sedge (*Carex sp.*). Invasive species located in the riparian buffers include Chinese privet (*Ligustrum sinese*) and Japanese honeysuckle (*Lonicera japonica*).

#### 2.7 Site Constraints and Access

The Site is accessible in multiple locations off Old Olive Road. Several culverts and two ford crossing will be constructed on project streams to allow for continued use of the land outside of the project area for agriculture. Each crossing is a 35-foot crossing internal to the easement. Wherever possible, culverts will be located at the start or end of the project reach to limit impact on stream pattern, plan, and profile. There are no known airport facilities within five miles of the project area (Figure 1). There is one utility easement at the start of T4 and will be used as a ford crossing. There are no other known constraints on the proposed Site.

#### 2.8 Current Site Resources

On February 9, 2018 (dated May 21, 2018) Ms. Katie Merritt, with DWR, conducted on-site determinations to review features and land use within the project boundary. In March 2019 Ms. Sam Dailey, with USACE, determined two additional features, T1B and T1C, within the project boundary as intermittent channels, resulting in an additional site-viability letter from Ms. Katie Merritt. The resulting DWR site viability letters and maps confirming the Site as suitable for riparian buffer mitigation is enclosed in the Appendix. The on-site determination approval letter from NCDWR is also included in the Appendix.

#### 2.9 Historic Site Resources

A review of historic aerials from 1950 to 2012, located in the appendix, show that onsite streams have existed in their approximate locations with very little change to riparian area extents since 1950. Two alterations to the Site visible from historical aerial photography are the addition of the pond on T2 between 1964 and 1973, and the addition of the large pond below T5A, T5B, and T5C between 1950 and 1961.

#### 3.0 Site Protection Instrument

#### 3.1 Site Protection Instruments Summary Information

The land required for riparian planting, management, and stewardship of the mitigation project includes portions of the parcels listed in Table 4. Option agreements for the project area have been signed by the property owners and a Memorandum of Option have been recorded at the Johnston County Register of Deeds. The proposed conservation easements on these properties has not yet been recorded.

Table 4: Site Protection Instrument – Sassarixa Swamp Mitigation Site

Landowner	PIN	County	Site Protection Instrument	Deed Book and Page Number	Acreage to be Protected
Hunter E. Oliver	166200-58-6572	Johnston	Conservation	DB: 3624	25.94
Janie E. Oliver	166200-59-2333	Joiniston	Easement	PG: 581	23.54
Junes Jones Olive	166200-88-5084	Johnston	Conservation	DB: 3719	15.73
Revocable Trust	166200-85-0452	JOHNSTON	Easement	PG: 717	15.75
Junes Jones Olive Revocable Trust Hunter E. Oliver	166200-57-0481 167200-17-2303	Johnston	Conservation Easement	DB: 3719 PG: 717	9.66
Mary Hunter Olive- Waller Todd Franklin Waller Amanda J. Olive	166200-49-5125	Johnston	Conservation Easement	DB: 4358 PG: 908	1.52
Tami Olive Thompson David Thompson Junes Jones Olive Revocable Trust	166200-66-6896	Johnston	Conservation Easement	DB: 3719 PG: 717	5.46
Matthew T. Keen 167200-06-5717		Johnston	Conservation Easement	DB: 4606 PG: 183	2.04
Tami Olive Thompson	166200-79-8148	Johnston	Conservation Easement	DB: 3719 PG: 717	4.71

All site protection instruments require 60-day advance notification to the Corps and the State prior to any action to void, amend, or modify the document. No such action shall take place unless approved by the State.

#### 4.0 Regulatory Considerations

Table 5, below, is a summary of regulatory considerations for the Site. These considerations are expanded upon in Sections 4.1-4.3. A copy of the signed Categorical Exclusion Form for the project can be found in the Sassarixa Swamp Mitigation Plan for the stream project.

**Table 5: Project Attribute Table** – Sassarixa Swamp Mitigation Site

Regulatory Considerations								
Parameters	Applicable?	Resolved?	Supporting Docs?					
Water of the United States - Section 404	Yes	Yes	(Appendix)					
Water of the officed States - Section 404	163	163	Site Viability Letter					
Water of the United States - Section 401	Yes	Yes	(Appendix)					
water of the offited States - Section 401	163	163	Site Viability Letter					
			Sassarixa Swamp Mitigation					
Endangered Species Act	Yes	Yes	Plan Appendix					
			(Categorical Exclusion)					
			Sassarixa Swamp Mitigation					
Historic Preservation Act	Yes	Yes	Plan Appendix					
			(Categorical Exclusion)					
Coastal Zone Management Act	No	No	N/A					
FEMA Floodplain Compliance	No	N/A	N/A					
Essential Fisheries Habitat	No	N/A	N/A					

#### 4.1 Threatened and Endangered Species

The NC Natural Heritage Program (NHP) database and the US Fish and Wildlife Service (USFWS) database were searched for federally listed threatened and endangered plant and animal species in Johnston County, NC. Five federally listed species, the red-cockaded woodpecker (*Picoides borealis*), dwarf wedgemussel (*Alasmidonta heterodon*), Tar River spinymussel (*Parvaspina steinstansana*), yellow lance (*Elliptio lanceolata*), and Michaux's sumac (*Rhus michauxii*) are currently listed in Johnston County. Table 6. list their federal status and habitat.

Table 6: Listed Threatened and Endangered Species in Johnston County, NC – Sassarixa Swamp Mitigation Site

Species	Federal Status	Habitat		
Vertebrate				
Red-cockaded woodpecker (Picoides borealis)		Found in mature pine forests, these birds bore cavities inside of living pine trees		
Invertebrate				
Dwarf wedge mussel (Alasmidonta heterodon)	E	Inhabit a wide range of stream sizes and types from small streams to large rivers. Known to live in substrates including clay, sand, gravel, pebble, and some silt depositional areas		
Tar River spinymussel (Parvaspina steinstansana)	E	Live mostly in silt-free unconsolidated beds of coarse sand and gravel.  Prefer faster flowing, well oxygenated streams.		
Yellow lance (Elliptio lanceolate)	Т	Lives in coarse to medium clean sand, and sometimes gravel. Usually found in the downstream portion of sand and gravel bars. Requires clean, well oxygenated water with moderate flows. Found in small to medium streams.		
Vascular Plant				
Michaux's sumac (Rhus michauxii)	E	Woodland edges, woodland, sandhills and sandy forest.		

E = Endangered;

Wildlands requested review and comment from the United States Fish and Wildlife Service on February 5, 2018 in respect to the Sassarixa Swamp Mitigation Site and its potential impacts on threatened or endangered species. USFWS responded on March 2, 2018 and stated the "proposed action is not likely to adversely affect any federally listed endangered or threatened species, their formally designated critical habitat or species currently proposed for listing under the Act". A follow up email was sent to USFWS on April 6, 2018 regarding the new addition of the yellow lance on April 4, 2018 to Johnston

T= Threatened

County's endangered species list. USFWS responded on April 9, 2018 with no additional objection. All correspondence with USFWS is include in the approved Categorical Exclusion found in the Sassarixa Swamp Mitigation Plan.

A pedestrian survey conducted on April 10, 2018, indicated that the Site did not provide suitable habitat for the red-cockaded woodpecker and yellow lance. The pedestrian survey did indicate that the site provides suitable habitat for the dwarf wedgemussel, Tar River spinymussel, and Michaux's sumac but no species were identified on the site. Therefore, due to the absence of the listed species on the site, the project has been determined by Wildlands to "may affect, but not likely to adversely affect" the dwarf wedgemussel and Tar River spinymussel, and to have "no effect" on the Michaux's sumac. The project will have "no effect" on the red-cockaded woodpecker and yellow lance due to the absence of suitable habitat.

#### **Cultural Resources and Significant Natural Heritage Areas** 4.2

The National Historic Preservation Act declares a national policy of historic preservation to protect, rehabilitate, restore, and reuse districts, sites, buildings, structures, and objects significant in American architecture, history, archaeology, and culture, and Section 106 mandates that federal agencies take into account the effect of an undertaking on a property that is included in, or is eligible for inclusion in, the National Register of Historic Places.

There are no existing structures in the project area. The Site is not located near any sites listed on the National Register with the State Historic Preservation Office (SHPO). SHPO was contacted February 2, 2018 and had no concerns or comments on the project site. The approved Categorical Exclusion for the project is in the Sassarixa Swamp Mitigation Plan.

#### 4.3 **FEMA Floodplain Compliance**

The Site is represented on the Johnston County Flood Insurance Rate Map Panel 1662. Sassarixa Creek and the downstream portions of T4, T5, and T6 are mapped in Zone AE from the modeled Black Creek, however no streams on Site are modeled. Areas within the mapping are slated for stream enhancement and preservation as part of them stream mitigation project and will not require net fill within the floodplain. Wildlands will coordinate with the Johnston County floodplain administrator to obtain the appropriate floodplain development permit for the project, if required.

#### **Other Environmental Issues**

An EDR Radius Map Report with Geocheck was ordered for the Site through Environmental Data Resources, Inc. on January 29, 2018. The target property and the adjacent properties are not listed in any of the Federal, State, or Tribal environmental databases searched by EDR. There were no known or potentially hazardous waste sites identified within one mile of the Parcel.

#### 4.5 Determination of Credits

Mitigation credits presented in Table 7a and 7b and Figures 6 and 9 are projections based upon site design and are intended to be used as either riparian buffer credits or nutrient offset credits, dependent on the need. Sassarixa Creek's anabranching streams have been remove for credit calculation purposes. Upon completion of site construction, the project components and credits data will be revised to be consistent with the as-built condition.

Table 7a: Riparian Buffer Credit Generation Summary for Restoration and Cattle Exclusion - Sassarixa Swamp Mitigation Site

Ne	use 0302020	1 - Outside Fall	s Lake	Service Area											
	19.16394 N Credit Ratio (sf/credit)														
Credit Type	Location	Subject? (enter NO if ephemeral or ditch <sup>1</sup> )	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (sf)	Total (Creditable) Area of Buffer Mitigation (sf)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Convertible to Riparian Buffer?	Riparian Buffer Credits	Convertible to Nutrient Offset?	Delivered Nutrient Offset: N (lbs)
Buffer	Rural	No	Ephemeral	Restoration	0-100	T3	18,165	18,165	1	100%	1.00000	Yes	18,165.000	Yes	947.874
Buffer	Rural	Yes	I/P	Restoration	0-50	T4, T5B	3,930	3,930	1	100%	1.00000	Yes	3,930.000	No	_
Buffer	Rural	Yes	I/P	Restoration	0-100	T1, T1A, T1B, T1D, T3, T4, T5, T5A, T5B, T6	356,364	356,364	1	100%	1.00000	Yes	356,364.000	Yes	18,595.550
Buffer	Rural	Yes	I/P	Restoration	101-200	T2, T4, T5, T5B	43,678	43,678	1	33%	3.03030	Yes	14,413.754	Yes	2,279.176
Buffer	Rural	Yes	I/P	Enhancement	0-50	T4	210	210	2	100%	2.00000	Yes	105.000	Yes	10.958
Buffer	Rural	Yes	I/P	Enhancement	0-100	T4	59,388	59,388	2	100%	2.00000	Yes	29,694.000	Yes	3,098.945
Buffer	Rural	Yes	I/P	Enhancement	101-200	T4	3,106	3,106	2	33%	6.06061	Yes	512.490	Yes	162.075
Buffer	Rural	Yes	I/P	Enhancement via Cattle Exclusion	20-29	Sassarixa Creek, T5, T6	1,209	1,209	2	75%	2.66667	Yes	453.374	No	_
Buffer	Rural	Yes	I/P	Enhancement via Cattle Exclusion	0-50	Sassarixa Creek, T5, T6	6,420	6,420	2	100%	2.00000	Yes	3,210.000	No	_
Buffer	Rural	Yes	I/P	Enhancement via Cattle Exclusion	0-100	Sassarixa Creek, T1A, T1B, T1C, T2, T3, T5, T5A, T5B, T6	1,080,633	1,080,633	2	100%	2.00000	Yes	540,316.500	No	_
Buffer	Rural	Yes	I/P	Enhancement via Cattle Exclusion	101-200	Sassarixa Creek, T5 T5A, T5B	377,045	377,045	2	33%	6.06061	Yes	62,212.385	No	_
Buffer	Rural	Yes	Coastal Headwater	Restoration	0-100	T5C	12,481	12,481	1	100%	1.00000	Yes	12,481.000	No	_
						Totals:	1,962,629	1,962,629							

<sup>\*</sup>Per the Site Viability for Buffer Mitigation and Nutrient Offset Letter dated May 21, 2018, certain project reaches were deemed viable by DWR for nutrient offset credit at 2,273 lbs. Nitrogen per acre. The nutrient offset viable areas are depicted in Figure 9 and their associated potential nutrient offset credits are listed in Table 7a. These select project areas have a minimum easement width of 50 feet from the top of bank and will be restored, per Section 5.2. While nutrient offset credits are not being requested at this time, these areas may be converted to nutrient offset credits by DMS later.

**Table 7b: Riparian Buffer Credit Generation Summary for Preservation** - Sassarixa Swamp Mitigation Site

Enter Preservation Credits  Below  Eligible for Preservation (sf):							654,210					
Credit Type	Location	Subject?	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (sf)	Total (Creditable) Area for Buffer Mitigation (sf)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits
	Rural	No	Ephemeral		0-100	T3	16,744	16,744	10	100%	10.00000	1,674.400
D. effer	Rural	Yes	I/P	Dung samustian	20-29	T5	235	235	10	75%	13.33333	17.625
Buffer	Rural	Yes	I/P	Preservation	0-100	T3, T4, T5	545,794	545,794	10	100%	10.00000	54,579.400
	Rural	Yes	I/P		101-200	T3	544	544	10	33%	30.30303	17.952

Preservation Area
Subtotal (sf):

Preservation as %
Total Area of Buffer
Mitigation:

Ephemeral Reaches
as % Total Area of
Buffer Mitigation:

1.4%

Table 7c: Total Riparian Buffer Credit Generation Summary – Sassarixa Swamp Mitigation Site

TOTAL AREA OF BUFFER MITIGATION (TABM)						
Mitigat	ion Totals	Square Feet	Credits			
Resto	oration:	434,618	405,353.754			
Enhar	cement:	1,528,011	636,503.749			
Prese	rvation:	563,317	56,289.000			
Total Ripa	arian Buffer:	2,525,946	1,098,146.503			
TO	TAL NUTRIENT	OFFSET MITIGATION				
Mitigat	ion Totals	Square Feet	Credits			
Nutrient	Nitrogen:	0	0.000			
Offset:	Phosphorus:	U	0.000			

<sup>\*</sup>Area eligible for preservation may be no more than 25% of total area, where total area is back calculated with the equation R+E/0.75.

<sup>\*</sup>Ephemeral channels may be no more than 25% of mitigation area for buffer credits, no limit on nutrients

#### **Implementation Plan** 5.0

The Wildlands Team proposes to restore high quality ecological function to Sassarixa Creek and 13 unnamed tributaries on the Site. The ecological uplift can be summarized as transforming agriculturally impacted areas to a protected forested riparian corridor. The project design will ensure that no adverse impacts to wetlands or existing riparian areas occur. All riparian restoration activities will commence in concurrence with the stream mitigation activities and not before. Therefore, the mitigation area where riparian restoration is being performed may be altered slightly depending on the implementation of the Sassarixa Swamp Stream Mitigation Plan. Planting and fencing will happen in conjunction with the Sassarixa Swamp Nutrient Offset and Buffer Mitigation Bank Parcel. Figure 7 illustrates the conceptual design for the Site.

#### 5.1 **Parcel Preparation**

The current land uses adjacent to the streams proposed for riparian restoration are active agricultural lands. Areas slated for riparian restoration that are not impacted by the construction of the stream mitigation project will require little site preparation including select herbicide treatments or limited mechanical clearing to remove undesirable underbrush or invasive species. Other areas of the easement will be graded in accordance with the Interagency Review Team (IRT) approved stream mitigation plan. After the grading for the stream mitigation is complete, the floodplain will be prepared for seeding and planting by applying stockpiled topsoil to the floodplain between bankfull elevation of the stream and the grading limits. All haul roads and other areas of compacted soil within the easement boundary will be ripped prior to planting.

As part of the stream mitigation project, the farm pond and drainpipe that currently impounds water at the headwaters of T2 will be eliminated and the channel restored. Several field drains were installed near the area at the top of the pond to direct stream water and field drainage into the pond. Those will be severed at the edge of buffer to provide diffuse flow into the easement. The earthen dam is proposed to be removed and a portion of the dam will be used to fill the pond bottom to provide stable foundation for construction of the new channel. The path of the future channel will be over-excavated, and fill material from the old dam will be used to stabilize the pond bed for the construction of the bed and banks of the new channel. Once the dam is removed, the stream restoration will begin near the upstream extent of the existing impoundment. Below the existing dam the restored channel will follow the existing valley flowing southwest until it reaches the confluence with Sassarixa Creek. Sheets 1.25-1.29 from the Sassarixa Swamp Stream Mitigation Plan (SAW# 2018-00432) set depicts the pond footprint, conservation easement boundary, and new stream alignment, which is included in Appendix 7 of the Sassarixa Swamp Stream Mitigation Plan.

The specifics of the stream restoration project, including breaching the pond on T2 and grading plan, are included in the Sassarixa Swamp Stream Mitigation Plan. A 401 permit will be required for all stream restoration work, including work within the pond on T2 and will be obtained before any work in the waters begins.

#### **Riparian Area Restoration Activities**

The revegetation plan for the riparian mitigation area will include permanent seeding, planting bare root trees, live stakes, and herbaceous plugs. These revegetation efforts will be coupled with controlling invasive species population. The specific species composition to be planted was selected based on the community type, observation of occurrence of species in riparian areas adjacent to the Parcel, and best professional judgement on species establishment and anticipated site conditions in the early years following project implementation. Table 8 list woody species that are native to the area and may

become established in the Site during the duration of the project. Refer to Sheet 3.0 of the Draft Plans located in Appendix 7 of the Sassarixa Swamp Stream Mitigation Plan for the planting plan.

Table 8: Native Woody Species to be Established – Sassarixa Swamp Mitigation Site

Scientific Name	Common Name	Dominant Method of Establishment
Acer rubrum	Red Maple	Natural Colonization
Acer negundo	Box Elder	Hand Planting
Betula nigra	River Birch	Hand Planting
Carpinus caroliniana	Ironwood	Natural Colonization
Liriodendron tulipifera	Tulip Poplar	Natural Colonization
Liquidambar straciflua	Sweetgum	Natural Colonization
Magnolia virginiana	Sweetbay Magnolia	Hand Planting
Platanus occidentalis*	American Sycamore	Hand Planting
Populus deltoides	Eastern Cottonwood	Hand Planting
Quercus michauxii	Swamp Chestnut Oak	Hand Planting
Quercus nigra*	Water Oak	Hand Planting
Quercus pagoda	Cherry Bark Oak	Hand Planting
Quercus phellos*	Willow Oak	Hand Planting
Salix nigra*	Black Willow	Hand Planting
Ulmus alata	Winged Elm	Hand Planting

<sup>\*</sup>These late successional species may naturally colonize but are not expected to reach high-density numbers, height, and/or vigor after disturbance.

Trees will be planted at a density sufficient to meet the performance standards outlined in the Rule 15A NCAC 02B .0295 of 260 trees per acre at the end of five years. No one tree species will be greater than 50% of the established stems. An appropriate seed mix will also be applied as necessary to provide temporary ground cover for soil stabilization and reduction of sediment loss during rain events in disturbed areas. This will be followed by an appropriate permanent seed mixture. Planting is scheduled to begin in March 2020.

Vegetation management and herbicide applications may be needed during tree establishment in the restoration areas to prevent establishment of invasive species that could compete with the planted native species.

#### 5.3 Riparian Area Enhancement Activities

The revegetation plan for the enhancement areas under NCAC 02B .0295 (n) will include planting supplemental bare root trees and controlling invasive species growth. The tree species to be planted are listed in Table 8.

For enhancement areas under NCAC 02B .0295 (o), cattle exclusion, planting isn't anticipated to be needed except where required in the stream mitigation plan. A seed mix will be applied where cattle have caused bare soils and cattle will be excluded from the riparian enhancement areas by fencing.

#### 5.4 Riparian Area Preservation Activities

There will be no parcel preparation work done in the riparian preservation areas, as allowed under 15A NCAC 02B .0295(o). The preservation area will be protected in perpetuity under a conservation easement.

#### 6.0 Monitoring Plan

The Site monitoring plan has been developed to ensure that the required performance standards are met, and project goals and objectives are achieved. The monitoring report shall provide project data chronology that will facilitate an understanding of project status and trends, ease population of DMS databases for analysis and research purposes and assist in close-out decision making.

#### 6.1 Monitoring Components

Project monitoring components are listed in more detail in Table 9 and Figure 8.

#### 6.2 Vegetation

Vegetation monitoring quadrants will be installed across the Site to measure the survival of the planted trees (Figure 8). The first annual monitoring activities will commence at the end of the first growing season, at least six months after planting has been completed, and will be reassessed annually no earlier than the Fall of each year. Species composition, density, height, and survival rates will be evaluated on an annual basis by plot and for the entire site. The number of monitoring quadrants required, and frequency of monitoring will be based on the DMS monitoring guidance documents. Vegetation monitoring will follow the CVS-EEP Protocol for Recording Vegetation (2008) or another DMS approved protocol. Planted stems will be flagged each monitoring year. Reference photographs of the vegetation plots and Site will be taken during the annual vegetation assessments.

#### 6.3 Overview Photographs

Overview photographs will be taken of the project area once a year to visually document stability for five years following construction.

#### 6.4 Visual Assessment

Visual assessments will be performed within the Site on a semi-annual basis during the five-year monitoring period. Problem areas with vegetative health will be noted (e.g. low stem density, vegetation mortality, invasive species or encroachment).

Table 9: Monitorin	g Components -	- Sassarixa	Swami	Mitiaation	Site
--------------------	----------------	-------------	-------	------------	------

Parameter	Monitoring Feature	Quantity	Frequency
Vegetation	CVS Level 2	9	Year 1-5
	Visual	T5C	Year 1-7
Visual Assessment		Yes	Semi-Annual
Exotic and Nuisance Vegetation			Semi-Annual
Project Boundary			Semi-Annual

#### 7.0 Project Success Criteria

The project success criteria for the Site follows approved performance criteria presented in the guidance documents outlined in RFP 16-007279 and the Consolidated Buffer Rule (15A NCAC 02B .0295). Annual monitoring and semi-annual site visits will be conducted to assess the condition of the finished project. The buffer mitigation project has been assigned specific performance criteria components for vegetation. Performance criteria will be evaluated throughout the five-year post-construction monitoring. An outline of the performance criteria components follows.

#### 7.1 Vegetation

The final vegetative success criteria will be the health, survival, height, and density of at least 260 stems per acre at the end of the fifth year of monitoring, with a minimum of four native hardwood tree or



shrub species composition and no one species comprises more than 50 percent of stems. Vigor, species composition, and density will all be assessed. The extent of invasive species coverage will also be monitored and controlled as necessary throughout the required monitoring period.

#### 7.2 Overview Photographs

Overview photographs will be taken of the project area once a year to visually document stability for five years following construction.

#### 7.3 Visual Assessments

Visual assessments should support the specific performance standards for each metric as described above. Visual assessments will be performed within the Site on a semi-annual basis during the five-year monitoring period. Problem areas with vegetative health will be noted (e.g. low stem density, vegetation mortality, invasive species or encroachment). Areas of concern will be mapped and photographed accompanied by a written description in the annual report. Problem areas with be re-evaluated during each subsequent visual assessment. Should remedial actions be required, recommendations will be provided in the annual monitoring report.

To ensure compliance with 0295 (0) (6): A visual assessment of the cattle exclusion and preservation areas within the conservation easement will also be performed each year to confirm:

- No cattle access within the conservation easement area; no encroachment has occurred; diffuse flow is being maintained in the conservation easement area; and there has not been any cutting, clearing, filling, grading, or similar activities that would negatively affect the functioning of the buffer.
- Any issues identified during the visual assessment of the cattle exclusion and preservation areas will be photographed and mapped as part of the annual monitoring report with remedial efforts proposed or documented.

#### 7.4 Reporting Performance Criteria

Using the DMS Riparian Buffer and Nutrient Offset Buffer Baseline and Annual Monitoring Report Template version 2.0 (May 2017), a baseline monitoring document and as-built record drawings of the project will be developed for the constructed Site. Complete monitoring reports will be prepared in the fall of each monitoring year and submitted to DMS. Annual monitoring reports will be based on the above referenced DMS Template (May 2017). The monitoring period will extend five years beyond completion of construction or until performance criteria have been met. Additional visual monitoring period for Coastal Headwaters will extend seven years beyond completion of construction or until performance criteria have been met. Closeout of buffer mitigation credits adjacent to the Coastal Headwaters will be done at IRTcloseout of the stream and wetland mitigation project.

#### 7.5 Maintenance and Contingency Plans

The Wildlands Team will develop necessary adaptive measures or implement appropriate remedial actions in the event that the Site or a specific component of the Site fails to achieve the success criteria outlined above. The project-specific monitoring plan developed during the design phase will identify an appropriate threshold for maintenance intervention based on the monitored items. Any actions implemented will be designed to achieve the success criteria specified previously and will include a work schedule and updated monitoring criteria (if applicable).

#### 8.0 Stewardship

#### 8.1 Long Term Stewardship

The Site will be transferred to the North Carolina Department of Environmental Quality (NCDEQ) Stewardship Program. This party shall serve as conservation easement holder and long-term steward for the property and will conduct periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. The NCDEQ Stewardship Program is developing an endowment system within the non-reverting, interest-bearing Conservation Lands Conservation Fund Account. The use of funds from the Endowment Account will be governed by North Carolina General Statue GS 113A-232(d)(3). Interest gained by the endowment fund may be used for stewardship, monitoring, stewardship administration, and land transaction costs, if applicable.

#### 8.2 Adaptive Management Plan

Upon completion of Site construction, Wildlands will implement the post-construction monitoring defined in Section 7. Project maintenance will be performed during the monitoring years to address minor issues as necessary. If, during annual monitoring it is determined the Site's ability to achieve Site performance standards are jeopardized, Wildlands will notify the members of DMS/NCDWR and work with the DMS/NCDWR to develop contingency plans and remedial actions.

The Wildlands Team will develop necessary adaptive measures or implement appropriate remedial actions if the Site or a specific component of the Site fails to achieve the success criteria outlined above. The project-specific monitoring plan developed during the design phase will identify an appropriate threshold for maintenance intervention based on the monitored items. Any actions implemented will be designed to achieve the success criteria specified previously and will include a work schedule and updated monitoring criteria (if applicable).

#### 9.0 References

National Land Cover Database 2011 (NLCD 2011), Multi-Resolution Land Characteristics (MRLC) consortium, https://www.mrlc.gov/nlcd2011.php

Natural Resources Conservation Service (NRCS). Web Soil Survey of Johnston County. http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

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

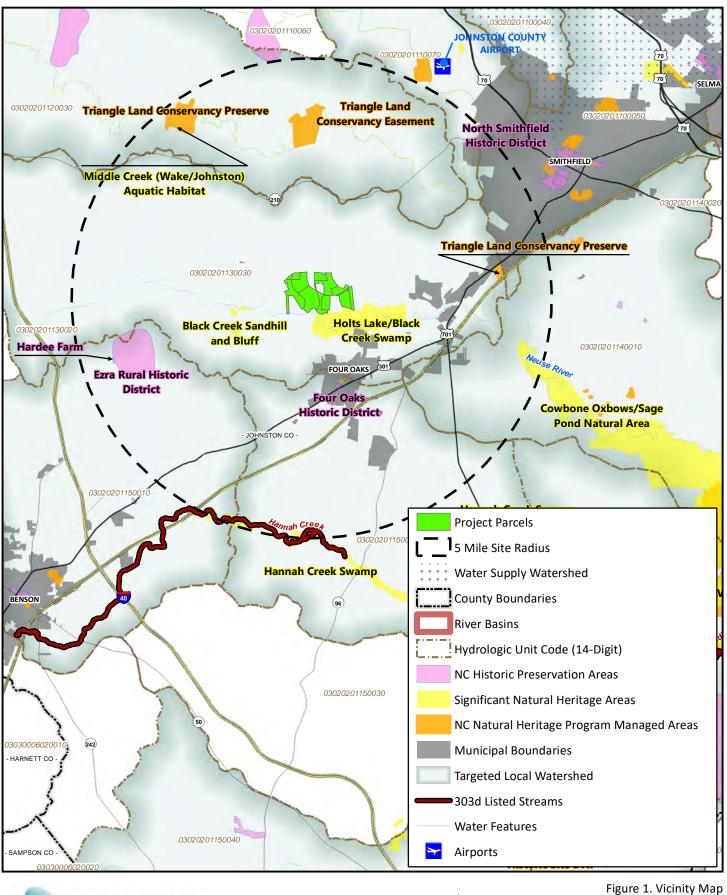
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Rob Breeding, Eastern Watershed Planner, North Carolina Ecosystem Enhancement Program (NCEEP), 2010. Neuse River Basin Restoration Priorities.

United States Fish and Wildlife Service (USFWS), 2018. Endangered Species, Threatened Species, Federal Species of Concern and Candidate Species, Johnston County, NC.







0 1 2 Miles

h

Figure 1. Vicinity Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201

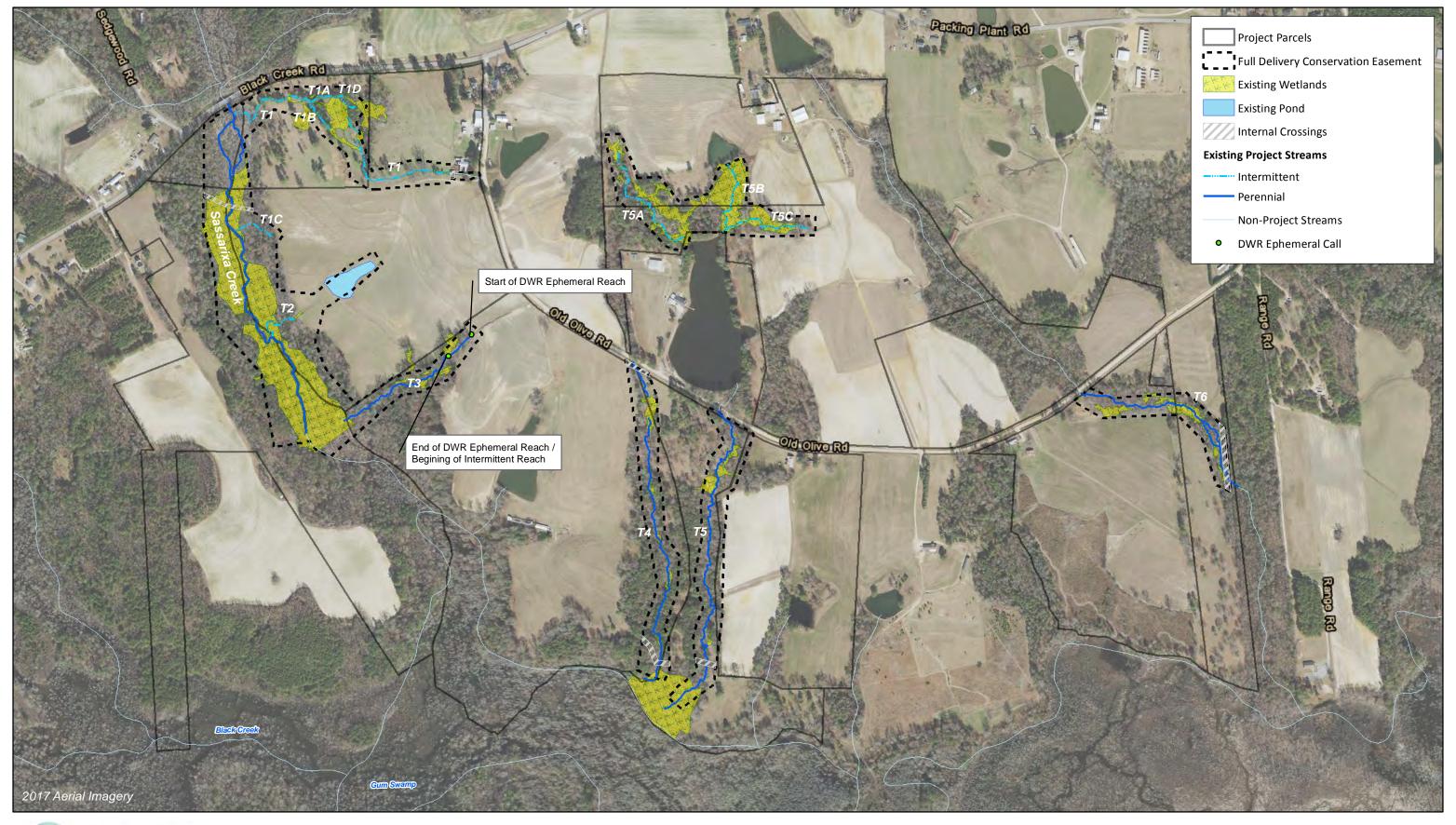
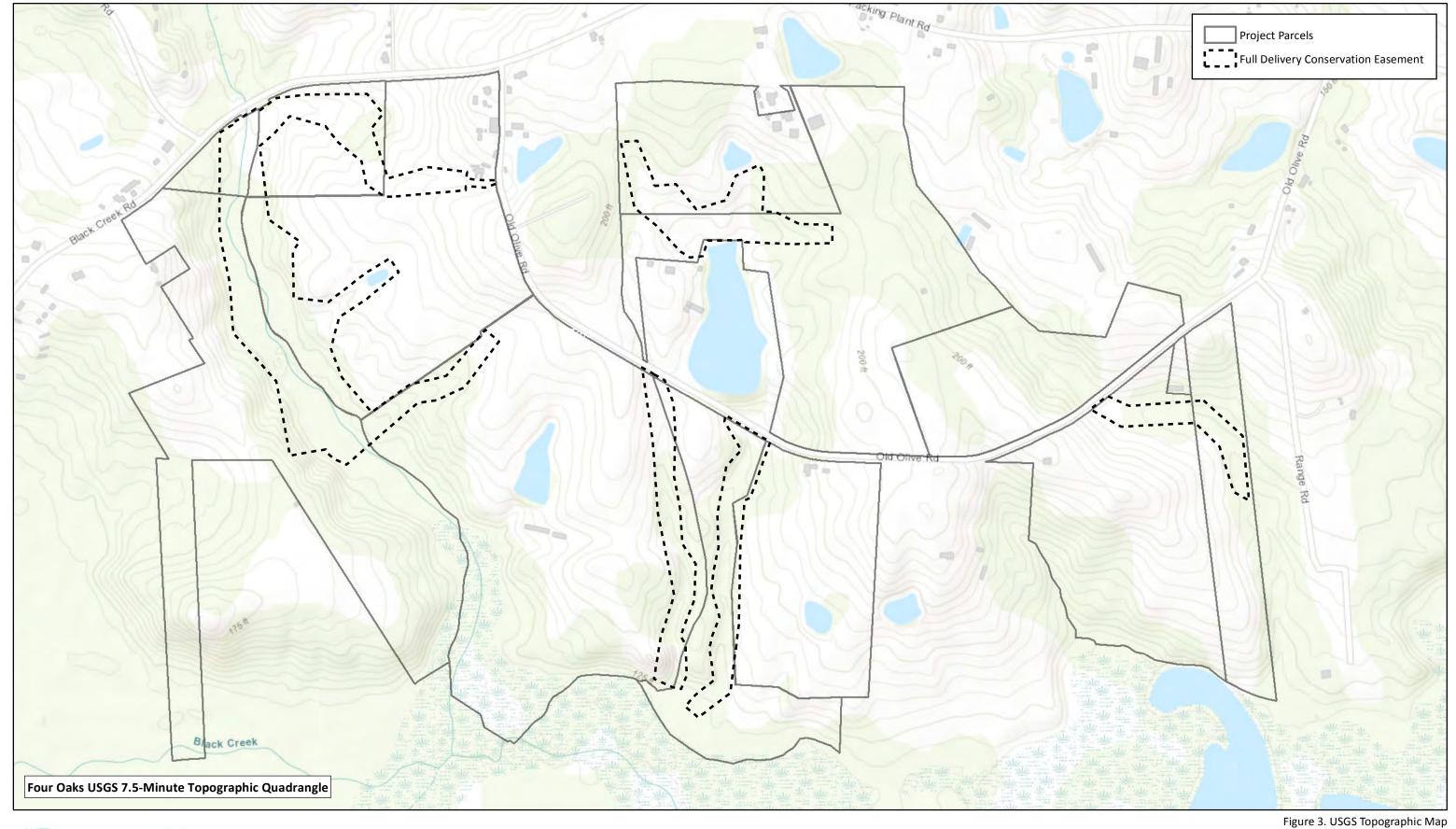




Figure 2. Site Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201





600 1,200 Feet

Sassarixa Swamp Mitigation Site
Neuse River Basin 03020201

Johnston County, NC

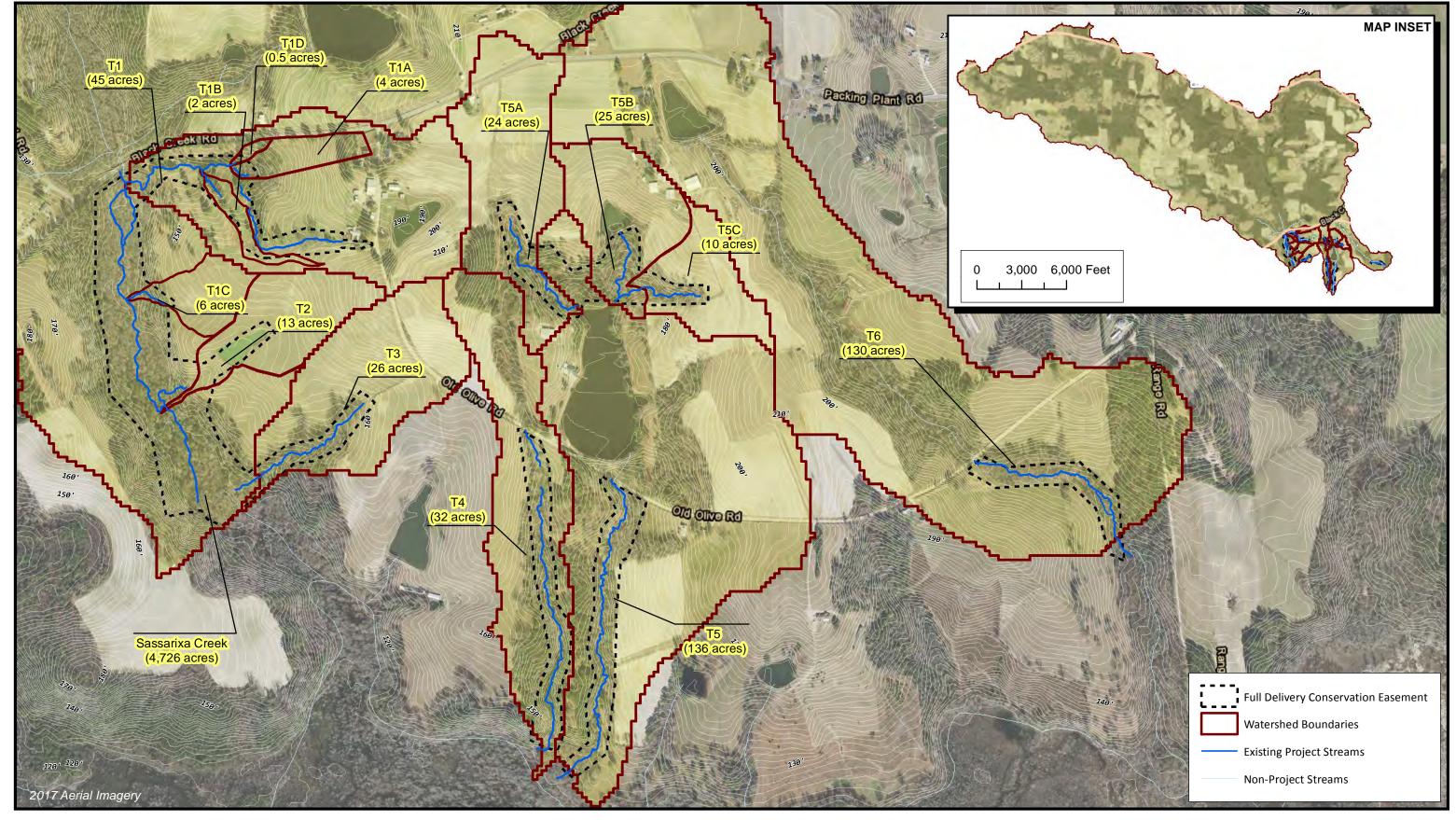




Figure 4. Watershed Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201



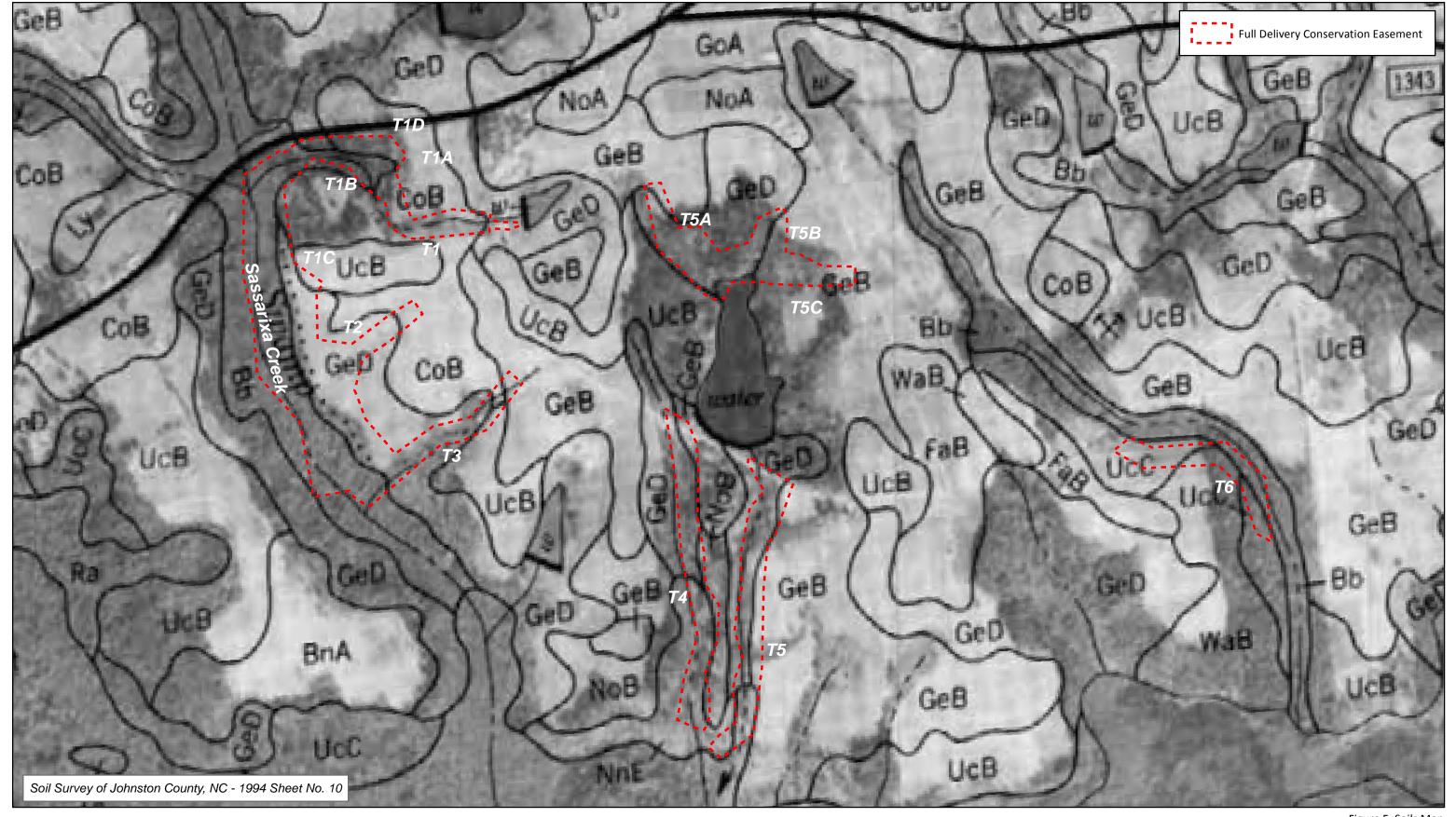
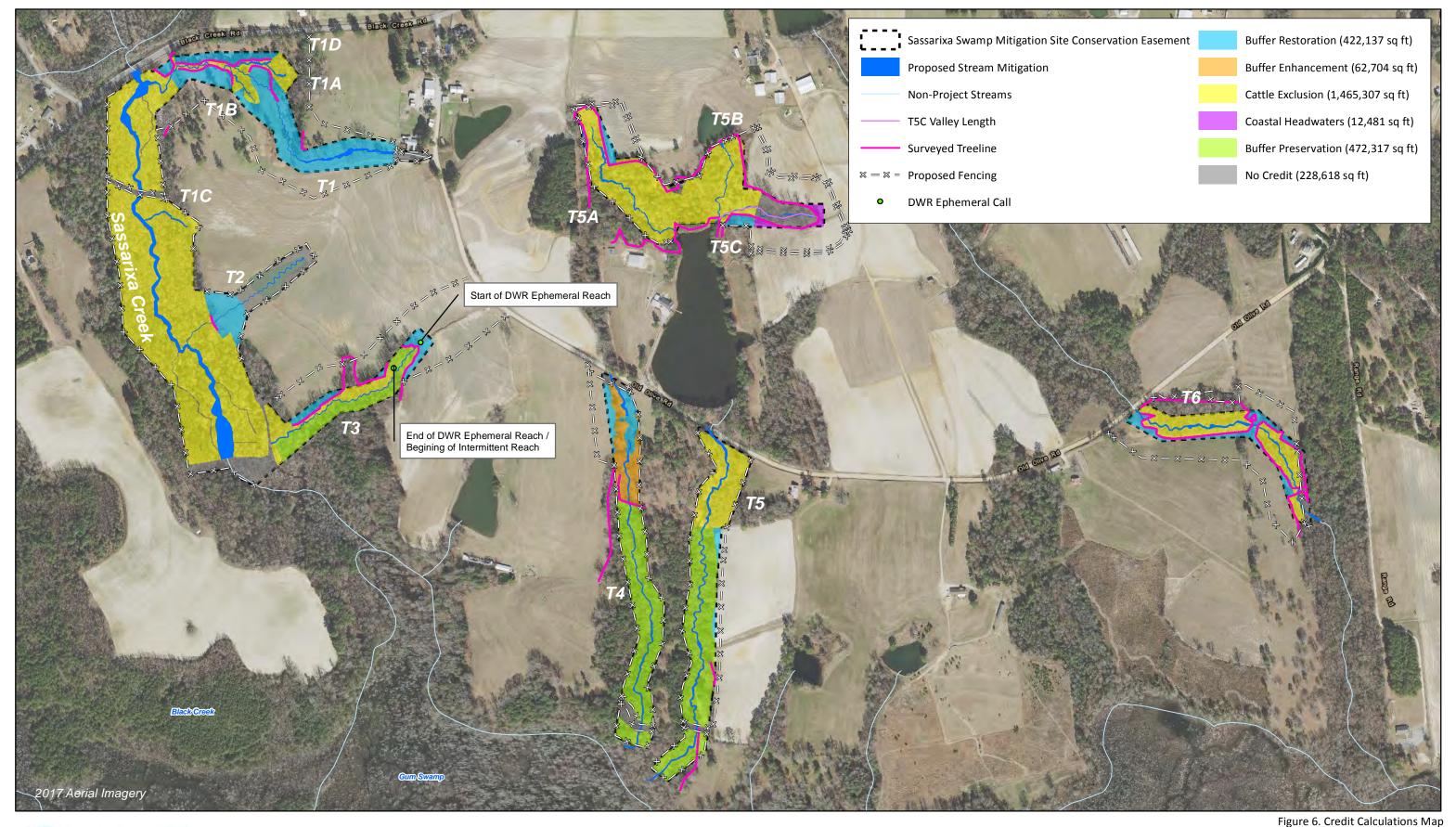




Figure 5. Soils Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201

0 600 1,200 Feet





Sassarixa Swamp Mitigation Site
Neuse River Basin 03020201
1,200 Feet

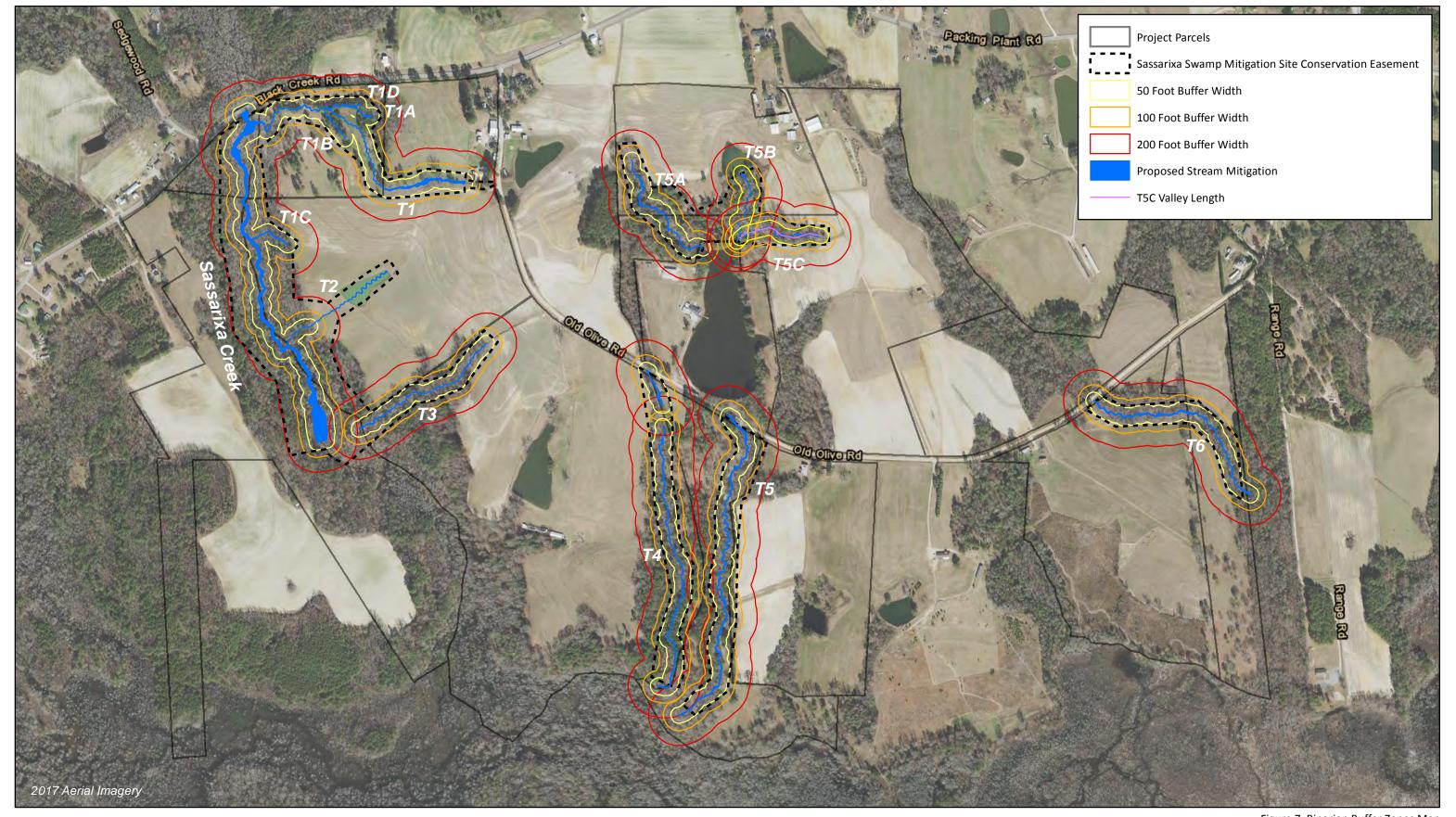




Figure 7. Riparian Buffer Zones Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201





Sassarixa Swamp Mitigation Site
Neuse River Basin 03020201

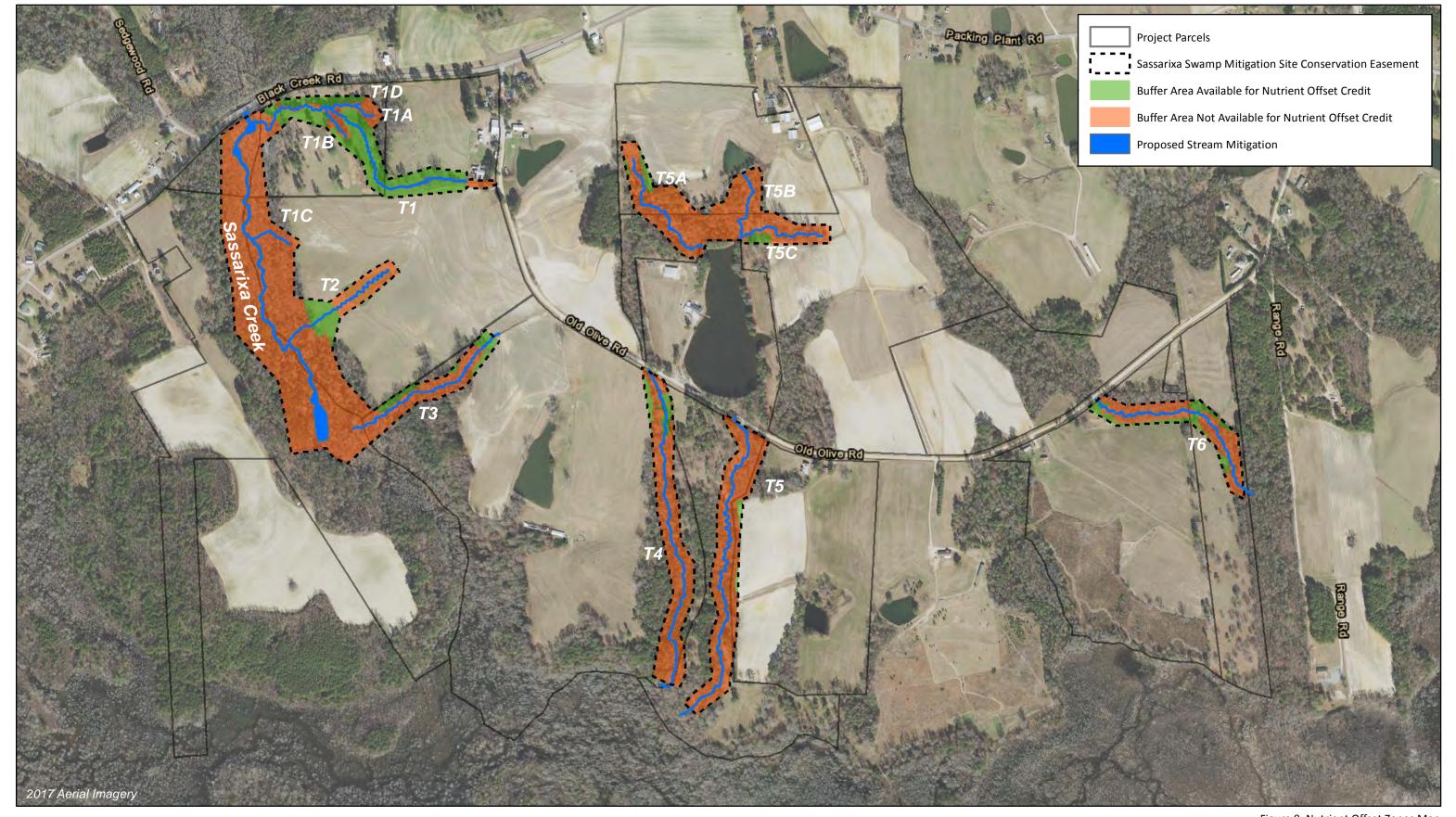
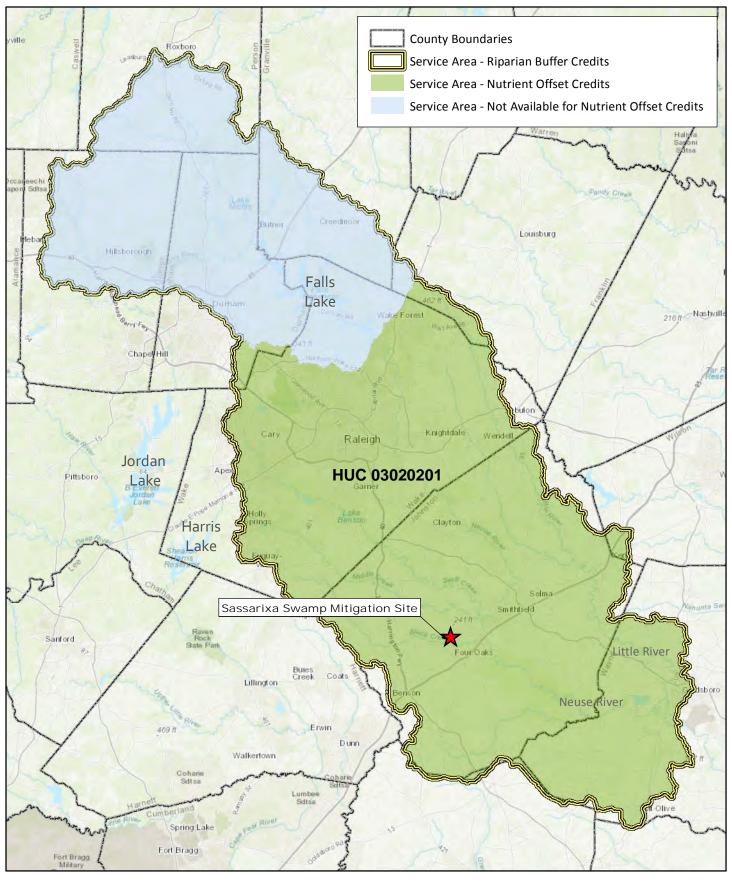




Figure 9. Nutrient Offset Zones Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201





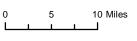




Figure 10. Service Area Map Sassarixa Swamp Mitigation Site Neuse River Basin 03020201



ROY COOPER
GIVETNIA

MICHAEL S. REGAN
Secretary
LINDA CULPEPPER
Interim Director

May 21, 2018

John Hutton Wildlands Engineering, Inc. 312 West Millbrook Rd, Suite 225 Raleigh, NC 27609

DWR ID# 2018-0198 Johnston County

(via electronic mail: jhutton@wildlandseng.com)

Re: Site Viability for Buffer Mitigation and Nutrient Offset & Buffer- Sassarixa Swamp Site 2-162 Olive Rd, Smithfield, NC

Neuse 03020201 (not in Falls WS)

Dear Mr. Hutton,

On February 9, 2018, Katie Merritt, with the Division of Water Resources (DWR), received a request from Wildlands Engineering, Inc. (WEI) for an onsite mitigation determination near the above-referenced site (Site). The Site is located in the Neuse River Basin within the 8-digit Hydrologic Unit Code 03020201. The Site is being proposed as part of a full-delivery stream and riparian buffer mitigation project for the Division of Mitigation Services (RFP #16-007279). Members of the Interagency Review Team (IRT) and Division of Mitigation Services were also present onsite. At your request, on February 23, 2018, Ms. Merritt performed an onsite assessment of riparian land uses adjacent to streams onsite, which are shown on the attached map labeled "Figure 6A".

Ms. Merritt's evaluation of the features and their associated mitigation determination for the riparian areas are provided in the table below. The evaluation was made from Top of Bank (TOB) out to 200' from each existing or *proposed* feature for buffer mitigation pursuant to 15A NCAC 02B .0295 (effective November 1, 2015) and for nutrient offset credits pursuant to 15A NCAC 02B .0240.

Feature	Classification	¹Subject to Buffer Rule	Riparian Land uses adjacent to proposed Feature (0-200')	Buffer Credit Viable	2Nutrient Offset Credit Viable at 2,273 Ibs/acre	Mitigation Type Determination w/in riparian areas
T1A	Stream @ DWR flag	No	Forested pasture actively grazed by cattle	Yes <sup>4</sup>	Yes (non- forested areas only)	Enhancement Site per 15A NCAC 02B .0295 (o) (6)
71	Stream	Yes	Forested & Non- forested pasture actively grazed by cattle	Yes <sup>4</sup>	Yes (non- forested areas only)	Fields - Restoration Site per 15A NCAC 02B .0295 (n)  Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6)
Sassarixa Creek (R2-R3)	Creek grazed by cattle		No	Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6) No cattle observed in riparian areas below R-3 (see map)		

Feature	Classification	1Subject to Buffer Rule	Riparian Land uses adjacent to proposed Feature (0-200')	Buffer Credit Viable	<sup>2</sup> Nutrient Offset Credit Viable at 2,273 Ibs/acre	Mitigation Type Determination w/in ripariar areas	
T2 Pond	Pond (not in line)	No	Agriculture	No	No	N/A	
T2 (inside woodline)	Stream	Yes	(starts in the woodline) Forested pasture grazed by cattle	Yes <sup>4</sup>	No	Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6)	
T3 (R1)	Ditch	No	Left Bank – Hay crop fields Right Bank – Non- forested pasture grazed by cattle	No	Yes	Restoration Site per 15A NCAC 02B .0295 (n)	
T3 (R2)	Ephemeral	No	Left Bank- hay crop fields and forest Right Bank – a narrow fringe of forested areas; fields are actively grazed by cattle.	*Yes <sup>3,5</sup>	Yes (non- forested areas only)	Forested Areas - Preservation Site per 15A NCAC 02B .0295 (o)(7)  Fields - Restoration Site per 15A NCAC 02B .0295 (o)(7)  *Must meet additional requirements under .0295 (o)(7) to be viable for buffer mitigation	
T3 (R3)	Stream	Yes	Forested, no cattle present	Yes <sup>3</sup>	No	Preservation Site per 15A NCAC 02B .0295 (o)(5)	
T4 (R1)	Stream	Yes	Partial canopy forested pasture actively grazed by cattle	Yes <sup>4</sup>	Yes	Buffer Mitigation – Enhancement Site per 15 NCAC 02B .0295 (o) (6)  Nutrient Offset – Enhancement Site per 15A NCAC 02B .0295 (n) (planting required)	
T4 (R2)	Stream	Yes	Partial canopy forested pasture actively grazed by cattle	Yes <sup>4</sup>	Yes	Buffer Mitigation – Enhancement Site per 15/ NCAC 02B .0295 (o) (6)  Nutrient Offset – Enhancement Site per 15A NCAC 02B .0295 (n) (planting required)	
T4 (R3)	Wetland/ Inconsistent channelization	No	Forested	No	No	N/A	
T5 (R1)	Stream	Yes	Full-canopy forested pasture actively grazed by cattle	Yes <sup>4</sup>	No	Enhancement Site per 15A NCAC 02B .0295 (c)	
T5 (R2-R3)	Stream	Yes	Right Bank- Forested Left Bank- mostly forested with a crop field	Yes <sup>3</sup>	Yes (field anly)	Forested Areas - Preservation Site per 15A NCAC 02B (o)(5)  Fields - Restoration Site per 15A NCAC 02B .0295 (n)	

Classification	1Subject to Buffer Rule	Riparian Land uses adjacent to proposed Feature (0-200')	Buffer Credit Viable	2Nutrient Offset Credit Viable at 2,273 lbs/acre	Mitigation Type Determination w/in riparian areas	
Stream	No	Full-canopy forested pasture actively grazed by cattle with adjacent ag fields	Yes <sup>4</sup>	No	Enhancement Site per 15A NCAC 02B .0295 (o) (6)	
Wetland (impacts from cattle in T5 stream resulted in a wetland)	No	Full-canopy forested pasture actively grazed by cattle	(see note)	No	Mitigation Note: Proposing stream restoration to reconnect T5/stream throughout. If stream restoration is approved by the IRT and a stream channel is constructed, then the new riparian areas will be viable as an Enhancement Site per 15A NCAC 02B .0295 (a) (6)	
Stream	Yes	Full-canopy forested pasture actively grazed by cattle	Yes <sup>4</sup>	No	Enhancement Site per 15A NCAC 02B .0295 (o) (6)	
Headwater Stream/ Wetland complex	No	Full canopy forested pasture surrounded by agriculture fields	*Yes (fields only)	No	Fields - Restoration Site per 15A NCAC 02B .0295 (o)(2)  *Must be approved by the IRT as a Coastal Headwater Stream Mitigation Site to be viable for credit.	
Stream	Yes	Combination of forested pasture and agriculture fields	Yes <sup>4</sup>	Yes (field only)	Fields - Restoration Site per 15A NCAC 02B .0295 (n)  Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6)	
	Stream  Wetland (impacts from cattle in T5 stream resulted in a wetland)  Stream  Headwater Stream/ Wetland complex	Stream No  Wetland (impacts from cattle in T5 stream resulted in a wetland)  Stream Yes  Headwater Stream/ Wetland complex	Stream  No Full-canopy forested pasture actively grazed by cattle with adjacent ag fields  Wetland (impacts from cattle in T5 stream resulted in a wetland)  Stream  Yes Full-canopy forested pasture actively grazed by cattle  Full-canopy forested pasture actively grazed by cattle  Full-canopy forested pasture actively grazed by cattle  Full-canopy forested pasture actively grazed by cattle  Full canopy forested pasture surrounded by agriculture fields  Stream  Yes Combination of forested pasture and	Stream  No Full-canopy forested pasture actively grazed by cattle with adjacent ag fields  Wetland (impacts from cattle in T5 stream resulted in a wetland)  Stream  Yes Full-canopy forested pasture actively grazed by cattle  Full-canopy forested pasture actively grazed by cattle  Full-canopy forested pasture actively grazed by cattle  Full-canopy forested pasture actively grazed by cattle  Full-canopy forested pasture actively grazed by cattle  Headwater Stream/ Wetland complex  Yes Combination of forested pasture and	to Buffer Rule  The second results of the se	

<sup>&</sup>lt;sup>1</sup>Subjectivity calls for the features were determined by DWR in correspondence dated April 5, 2018 and April 6, 2018 using the 1:24,000 scale quadrangle topographic map prepared by USGS and the most recent printed version of the soil survey map prepared by the NRCS.

Maps that are attached to this letter were provided by WEI and were initialed by Ms. Merritt on May 21, 2018. This letter should be provided in all stream, wetland, buffer and/or nutrient offset mitigation plans for this Site.

This letter does not constitute an approval of this site to generate mitigation credits. Pursuant to 15A NCAC 02B .0295, a mitigation proposal <u>and</u> a mitigation plan shall be submitted to DWR for written approval **prior** to conducting any mitigation activities in riparian areas and/or surface waters for buffer mitigation credit. Pursuant to 15A NCAC 02B .0240, a proposal regarding a proposed nutrient

<sup>&</sup>lt;sup>2</sup> NC Division of Water Resources - Methodology and Calculations for determining Nutrient Reductions associated with Riparian Buffer Establishment

<sup>&</sup>lt;sup>3</sup>The area of preservation credit within a buffer mitigation site shall comprise of no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 0295 (o)(5) and 15A NCAC 0295 (o)(4). Site cannot be a Preservation only site to comply with this rule.

<sup>&</sup>lt;sup>4</sup>The area described as an Enhancement Site was assessed and determined to comply with all of 15A NCAC 02B .0295(o)(6).

<sup>&</sup>lt;sup>5</sup>The area of the mitigation site on ephemeral channel shall comprise no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 02B .0295 (o)(7).

Sassarixa Swamp Site Wildlands Engineering, Inc May 21, 2018

load-reducing measure for nutrient offset credit shall be submitted to DWR for approval prior to any mitigation activities in riparian areas and/or surface waters.

All vegetative plantings, performance criteria and other mitigation requirements for riparian restoration, enhancement and preservation must follow the requirements in 15A NCAC 02B .0295 to be eligible for buffer and/or nutrient offset mitigation credits. For any areas depicted as not being viable for nutrient offset credit above, one could propose a different measure, along with supporting calculations and sufficient detail to support estimates of load reduction, for review by the DWR to determine viability for nutrient offset in accordance with 15A NCAC 02B .0240.

This viability assessment will expire on May 21, 2020 or upon the submittal of an As-Built Report to the DWR, whichever comes first. Please contact Katie Merritt at (919)-807-6371 if you have any questions regarding this correspondence.

Sincerely,

Karen &

Karen Higgins, Supervisor

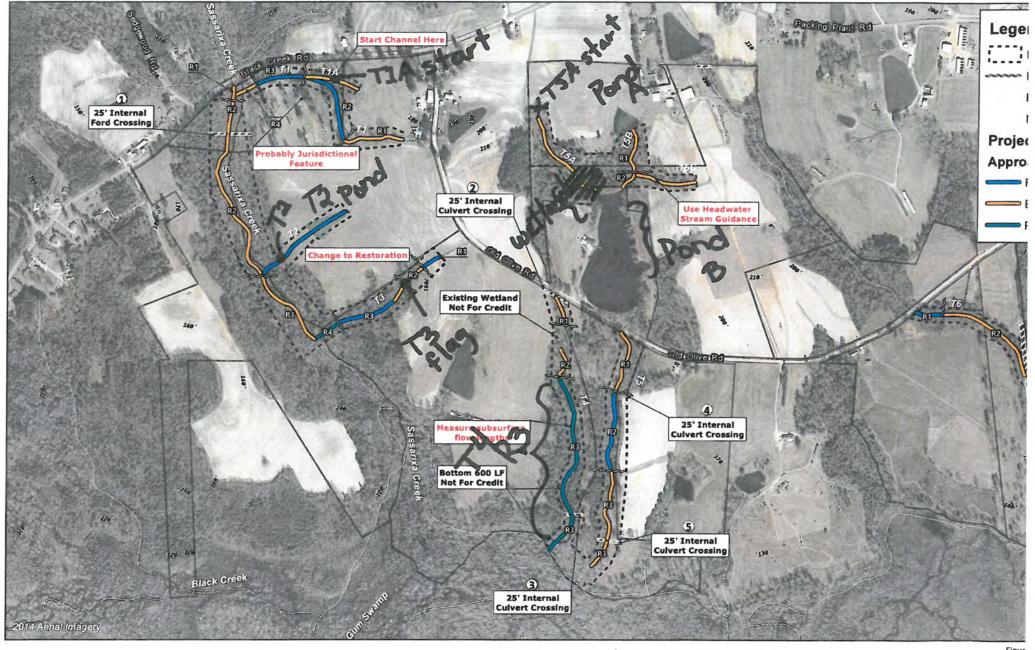
401 and Buffer Permitting Branch

KAH/km

Attachments: Figure 6A

cc: File Copy (Katie Merritt)

DMS – Jeff Schaffer (via electronic mail)





WILDLANDS DWR#-2018-0198

KYM 4/4/18

(stream determination)

Figure 6A

ROY COOPER Governor MICHAEL S. REGAN Secretary LINDA CULPEPPER Director



April 3, 2019

Angela Allen Wildlands Engineering, Inc. 312 West Millbrook Rd, Suite 225 Raleigh, NC 27609

(via electronic mail: aallen@wildlandseng.com)

DWR ID# 2018-0198 Johnston County

Re:

Site Viability for Buffer Mitigation and Nutrient Offset & Buffer- Sassarixa Swamp (T1)

2-162 Olive Rd, Smithfield, NC Neuse 03020201 (not in Falls WS)

Dear Ms. Allen,

On February 20, 2019, Katie Merritt, with the Division of Water Resources (DWR), received a request from you on behalf of Wildlands Engineering, Inc (WEI) to evaluate the potential for riparian buffer mitigation and nutrient offset on two additional features on the subject site. Features labeled T1B and T1C on the attached map labeled "Figure 3a Site Map" were evaluated by Sam Dailey with the US Army Corps of Engineers in March 2019 and these features were determined to be at least intermittent channels. The Site is also being proposed as part of a full-delivery stream and riparian buffer mitigation project for the Division of Mitigation Services (RFP #16-007279).

Ms. Merritt's evaluation of the features and their associated mitigation determination for the riparian areas are provided in the table below. This evaluation was made from Top of Bank (TOB) and landward 200' from each feature for buffer mitigation pursuant to 15A NCAC 02B .0295 (effective November 1, 2015) and for nutrient offset credits pursuant to 15A NCAC 02B .0240.



<u>Feature</u>	Classification onsite	1Subject to Buffer Rule	Riparian Land uses adjacent to Feature (0-200')	Buffer Credit Viable	2Nutrient Offset Viable at 2,273.02 lbs-N per acre	Mitigation Type Determination w/in riparian areas
TIB	Stream	No	Combination of forested and non-forested pasture actively grazed by cattle	<sup>4</sup> Yes	Yes (non- forested areas only)	Fields - Restoration Site per 15A NCAC 02B .0295 (o)(3) Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6)
TIC	Stream	No	Forested pasture actively grazed by cattle; ag fields at the upstream portion	<sup>4</sup> Yes	Yes (ag fields only)	Fields - Restoration Site per 15A NCAC 02B .0295 (o)(3) Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6)

<sup>1</sup>Subjectivity calls for the features were determined by DWR in correspondence dated March 21, 2019 using the 1:24,000 scale quadrangle topographic map prepared by USGS and the most recent printed version of the soil survey map prepared by the NRCS.

<sup>2</sup> NC Division of Water Resources - Methodology and Calculations for determining Nutrient Reductions associated with Riparian Buffer

<sup>4</sup>The area described as an Enhancement Site was assessed and determined to comply with all 15A NCAC 02B .0295(o)(6). Cattle exclusion fencing is required to be installed around the mitigation area to get buffer credit under this part of the rule.

Establishment

Maps that are attached to this letter were prepared by WEI and initialed by Ms. Merritt on April 3, 2019. This letter should be provided in all stream and wetland, buffer and/or nutrient offset mitigation plans for this Site.

This letter does not constitute an approval of this site to generate mitigation credits. Pursuant to 15A NCAC 02B .0295, a mitigation proposal <u>and</u> a mitigation plan shall be submitted to DWR for written approval **prior** to conducting any mitigation activities in riparian areas and/or surface waters for buffer mitigation credit. Pursuant to 15A NCAC 02B .0240, a proposal regarding a proposed nutrient load-reducing measure for nutrient offset credit shall be submitted to DWR for approval prior to any mitigation activities in riparian areas and/or surface waters.

All vegetative plantings, performance criteria and other mitigation requirements for riparian restoration, enhancement and preservation must follow the requirements in 15A NCAC 02B .0295 to be eligible for buffer and/or nutrient offset mitigation credits. For any areas depicted as not being viable for nutrient offset credit above, one could propose a different measure, along with supporting calculations and sufficient detail to support estimates of load reduction, for review by the DWR to determine viability for nutrient offset in accordance with 15A NCAC 02B .0240.

This viability assessment will expire on April 3, 2021 or upon the submittal of an As-Built Report to the DWR, whichever comes first. This letter should be provided in all stream, wetland or buffer mitigation plans for this Site.

<sup>&</sup>lt;sup>3</sup>The area of preservation credit within a buffer mitigation site shall comprise of no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 0295 (o)(5) and 15A NCAC 0295 (o)(4). Site cannot be a Preservation Only site to comply with this rule.

<sup>&</sup>lt;sup>5</sup>The area of the mitigation site on ephemeral channels shall comprise no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 02B .0295 (o)(7). Cattle exclusion fencing is required to be installed around the mitigation area to get buffer credit under this part of the rule.

Please contact Katie Merritt at (919) 707-3637 if you have any questions regarding this correspondence.

Sincerely,

Karen Higgins, Supervisor 401 and Buffer Permitting Branch

Chartiche McDaniel

KAH/km

Attachments: Figure 3a

cc: File Copy (Katie Merritt)

ROY COOPER Governor MICHAEL S. REGAN Secretary LINDA CULPEPPER Director



October 28, 2019

Angela Allen Wildlands Engineering, Inc. 312 West Millbrook Rd, Suite 225 Raleigh, NC 27609

(via electronic mail: aallen@wildlandseng.com)

DWR ID# 2018-0198 Johnston County

Re: Site Viability for Buffer Mitigation and Nutrient Offset & Buffer- Sassarixa Swamp

Re-evaluation of T4-Reach 3 2-162 Olive Rd, Smithfield, NC Neuse 03020201 (not in Falls WS)

Dear Ms. Allen,

On April 4, 2018 and May 21, 2018, the Division of Water Resources (DWR) issued a stream/buffer determination letter and Site Viability letter respectively, for the subject site. On October 15, 2019, DWR received a stream determination appeal request from Wildlands Engineering, Inc (Wildlands) requesting that a feature labeled T4-R3 on the subject site be re-evaluated based on a preliminary Jurisdictional Determination (JD) by the USACE showing the feature to be a perennial stream and not a linear wetland. In support of this JD, DWR issued a revised stream /buffer determination letter on October 28, 2019. T4-R3 and its riparian areas are also being proposed as part of a full-delivery stream and riparian buffer mitigation project for the Division of Mitigation Services (RFP #16-007279).

On October 15, 2019, DWR also received a request from Wildlands to re-evaluate the potential for riparian buffer mitigation and nutrient offset along T4-R3 based on the JD by USACE.

DWR's evaluation of T4-R3 and its associated mitigation determination for the riparian areas are provided in the table below. This evaluation was made from Top of Bank (TOB) and landward 200' from each feature for buffer mitigation pursuant to 15A NCAC 02B .0295 (effective November 1, 2015) and for nutrient offset credits pursuant to 15A NCAC 02B .0240. This evaluation replaces the evaluation made on T4-R3 issued on May 21, 2018.

Feature	Classification onsite	1Subject to Buffer Rule	Riparian Land uses adjacent to Feature (0-200')	Buffer Credit Viable	2Nutrient Offset Viable at 2.273.02 lbs-N per acre	Mitigation Type Determination w/in riparian areas
T4 (R3)	Stream (see map)	Yes	Forested	<sup>3</sup> Yes	No	Preservation Site per 15A NCAC 02B .0295 (o)(5)

Subjectivity calls for the features were determined by DWR in correspondence dated October 28, 2019 using the 1:24,000 scale quadrangle topographic map prepared by USGS and the most recent printed version of the soil survey map prepared by the NRCS.

NC Division of Water Resources - Methodology and Calculations for determining Nutrient Reductions associated with Riparian Buffer Establishment

The map that is attached to this letter was prepared by Wildlands. This letter should be provided in all stream and wetland, buffer and/or nutrient offset mitigation plans for this Site.

This letter does not constitute an approval of this site to generate mitigation credits. Pursuant to 15A NCAC 02B .0295, a mitigation proposal <u>and</u> a mitigation plan shall be submitted to DWR for written approval **prior** to conducting any mitigation activities in riparian areas and/or surface waters for buffer mitigation credit. Pursuant to 15A NCAC 02B .0240, a proposal regarding a proposed nutrient load-reducing measure for nutrient offset credit shall be submitted to DWR for approval prior to any mitigation activities in riparian areas and/or surface waters.

All vegetative plantings, performance criteria and other mitigation requirements for riparian restoration, enhancement and preservation must follow the requirements in 15A NCAC 02B .0295 to be eligible for buffer and/or nutrient offset mitigation credits. For any areas depicted as not being viable for nutrient offset credit above, one could propose a different measure, along with supporting calculations and sufficient detail to support estimates of load reduction, for review by the DWR to determine viability for nutrient offset in accordance with 15A NCAC 02B .0240.

This viability assessment will expire on April 3, 2021 or upon the submittal of an As-Built Report to the DWR, whichever comes first. This letter should be provided in all stream, wetland or buffer mitigation plans for this Site.

<sup>&</sup>lt;sup>3</sup>The area of preservation credit within a buffer mitigation site shall comprise of no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 0295 (o)(5) and 15A NCAC 0295 (o)(4). Site cannot be a Preservation Only site to comply with this rule.

Please contact Katie Merritt at (919) 707-3637 if you have any questions regarding this correspondence.

Sincerely,

Mac Haupt, Acting Supervisor 401 and Buffer Permitting Branch

MH/km

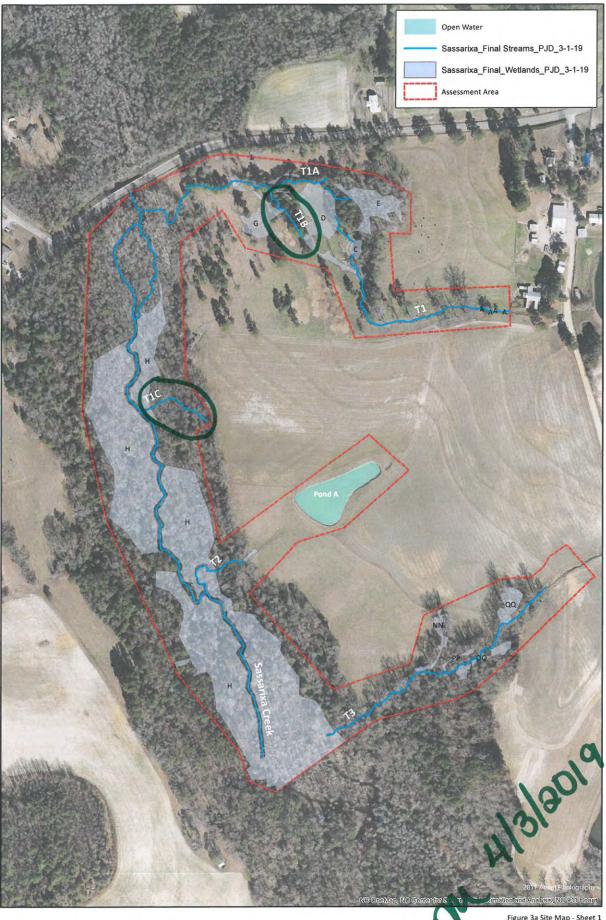
Attachments: Figure 1. Reclassification of T4 Reach 3 map

cc: File Copy (Katie Merritt)



400 Feet

Sassarixa Swamp Mitigation Site Neuse River Basin 03020201





0 112.5 225 Feet

Figure 3a Site Map - Sheet 1 Sassarixa Swamp Mitigation Site Neuse River Basin (03020201)







