MITIGATION PLAN

Rough Horn Swamp Restoration Site
DMS Project Number 97005
DMS Contract 6596
SAW-2015-00952
NCDEQ DWR 2015-0903

Rough Horn Swamp II Restoration Site
DMS Project Number 100053
DMS Contract 7514
SAW-2016-02026
NCDEQ DWR 2015-0903

Columbus County, North Carolina

FULL-DELIVERY PROJECT

Lumber River Basin
Cataloging Unit 03040203

Prepared for:
NC Department of Environmental Quality
Division of Mitigation Services
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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*
- *NCAC Rule 15A NCAC 02B .0295, effective November 1, 2015, for riparian buffer mitigation.*

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

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1.0 PROJECT INTRODUCTION

The Rough Horn Swamp Restoration Site (RHS) is a 34.5-acre full-delivery wetland mitigation project being developed for the North Carolina Division of Mitigation Services (DMS) in the Lumber River Basin (03040203 8-digit cataloging unit) in Columbus County, North Carolina. The site's natural hydrologic regime and vegetation have been substantially modified to make the site suitable for agriculture. This site offers the chance to restore impacted agricultural lands to a stable wetland ecosystem.

The Rough Horn Swamp II Wetland Restoration Site (RHSII) is a 62.3-acre drained stream/wetland complex that is located immediately upstream of RHS to the north and east. RHSII was originally initiated by KCI as a proposed mitigation bank when additional mitigation opportunities arose beyond the needs of the RHS contract. A mitigation banking prospectus was submitted for RHSII in September 2016 and a North Carolina Interagency Review Team (NCIRT) site visit took place on October 26, 2016. Following the DMS Request for Proposals #16-00733 in September 2017 for this cataloging unit, KCI was able to convert the project to a second full-delivery site. Although the sites are technically two separate projects, they will be treated as one contiguous restoration site from KCI's perspective – from design and permitting up through construction and monitoring. The RHSII site offers the opportunity to continue the uplift upstream within the project watershed by restoring an integrated stream and wetland system to the adjoining RHS project.

The RHS and RHSII are located near the Town of Evergreen in the west-central portion of Columbus County. Specifically, the site is located just southwest of the intersection of Old Boardman Road and CCC Road, as seen in Figure 1. The center of the RHS site is at approximately 35.4481° N and 78.9390° W near the southcentral portion of the Evergreen North USGS Quadrangle. RHSII is to the north and east of RHS with an approximate centroid of 35.4465° N and 78.9328° W.

The mitigation approach for RHS and RHSII will aim to restore an integrated stream/wetland ecosystem that will buffer and support the Long Bay Creek/Lumber River corridor. Wetland restoration (re-establishment) actions will focus on filling on-site ditches to redevelop wetland hydrology and planting the site with native vegetation. Wetland enhancement and preservation of existing wetlands will also be completed at RHSII. In addition, Long Bay Creek will be restored as a coastal plain headwater stream/wetland system in its historic flowpath, which will elevate the groundwater table and increase flood frequency throughout the site. Once site grading is complete, the projects will be planted with native tree species and be monitored for seven years.

Table 1. RHS Credit Summary

Rough Horn Swamp Restoration Site, Columbus County DMS Contract 6596; DMS Project Number 97005										
Mitigation Credits										
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer		Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE	R	RE		
Linear Feet/Acres	2,132*		20.267	-	11.873	-				
Credits	0		20.267	-	11.873	-				
TOTAL CREDITS	**0**		**20.267**		**11.873**					

R=Restoration RE=Restoration Equivalent

* 2,132 SMCs provided for no credit.

Table 2. RHSII Credit Summary

Rough Horn Swamp II Restoration Site, Columbus County DMS Contract 7514; DMS Project Number 100053										
Mitigation Credits										
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer		Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE	R	RE		
Linear Feet/Acres	4,446	680	17.079	21.275	1.619*					
Credits	4,446	118	17.079	3.914	0					
TOTAL CREDITS	**4,564**		**20.993**		**0**					

R=Restoration RE=Restoration Equivalent

Wetland restoration comprises 80% of the WMC's. Stream preservation has been limited to 10% of the total stream linear footage.

* 2.895 Non-Riparian WMCs provided for no credit.

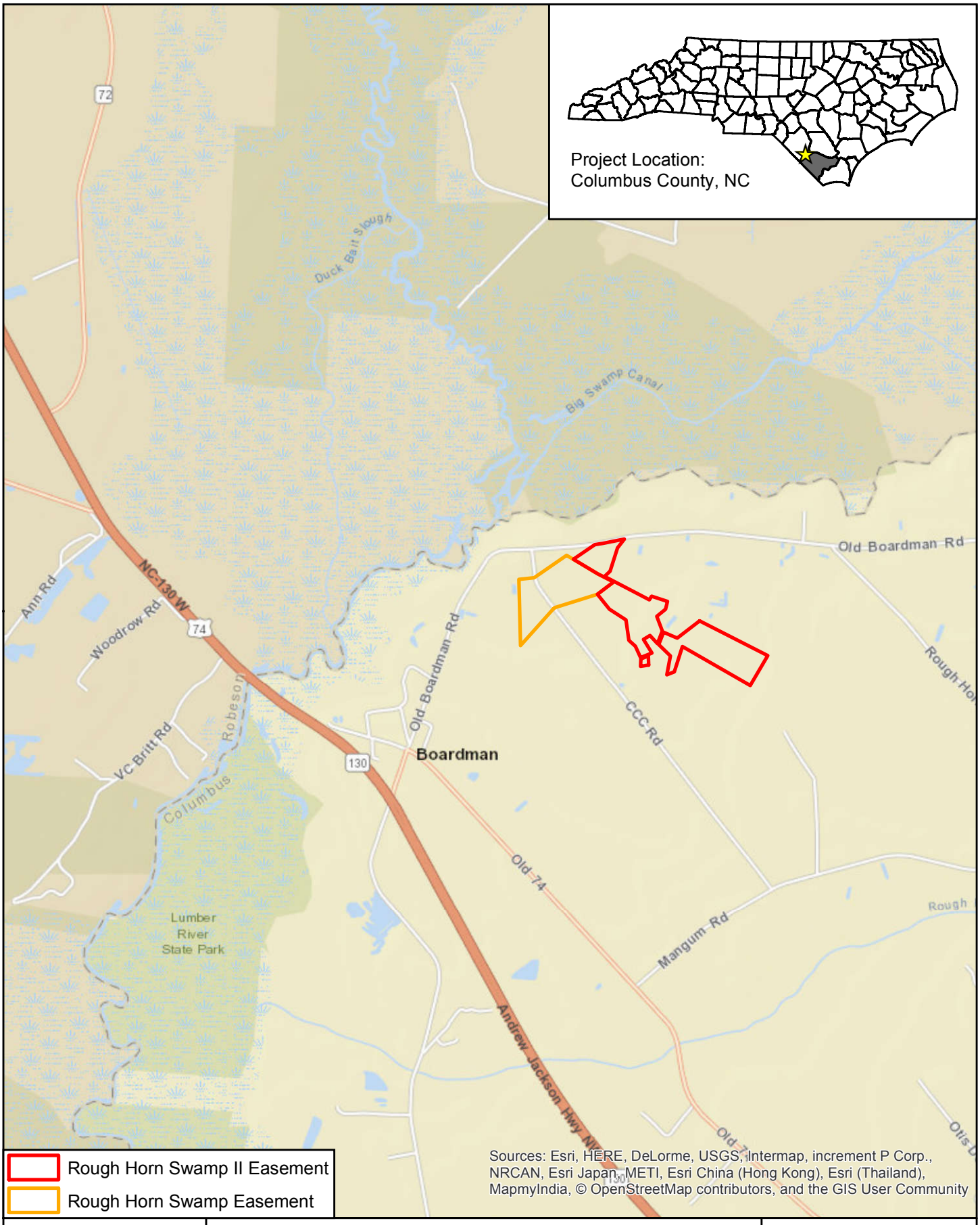


FIGURE 1. VICINITY MAP
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC

2.0 WATERSHED APPROACH AND SITE SELECTION

The RHS and RHSII projects were identified as an opportunity to improve and protect stream and wetland functions within the 14-digit watershed, 03040203190010 (Porter Swamp), a Targeted Local Watershed (TLW). This watershed contains the Town of Boardman and a portion of Fair Bluff. It has a large amount of Significant Natural Heritage Area (SNHAs) and Natural Heritage Elements of Occurrence, primarily related to the Lumber River; however, at the time the 2008 Lumber River Basin Restoration Priorities (RBRP) for the 03040203 CU was created, there were no lands in conservation.

The goals and priorities for RHS and RHSII are based on the information presented in the RBRP for the 03040203 CU (NCEEP 2008). The project will support the following basin priorities:

-Replacing buffer
-Repairing channelized streams
-Preserving existing resources

The project watershed at the downstream end of the two sites is comprised of 2.81 square miles (1,800 acres). The projects aim to uphold the goals consistent with several CU-wide watershed improvement objectives by restoring an integrated wetland/stream and reducing nutrient impacts to the Lumber River and its tributaries from existing and adjacent agricultural practices.

The section of the Lumber River below the site is DWQ 14-(13), which is classified for surface water as C; Sw (Secondary Recreation; Swamp Waters). This reach of the Lumber River was not listed as impaired under the 2016 303(d) list. Figure 3 shows the project site and watershed in relation to the TLW.

Several SNHAs are in close proximity to the projects. These include Net Hole/Buck Landing Swamp approximately 2,000 feet to the west, Big Swamp/Old Whiteville Road approximately 2 miles to the northeast, Flowers Swamp approximately 2 miles to the west, and Bluff Swamp/Princess Ann Swamp, approximately 1.5 miles to the southwest. The primary stream through the two projects (Long Bay Creek) drains directly to Net Hole/Buck Landing Swamp (adjacent to the Lumber River). The completed projects will ultimately connect a forested corridor fragmented only by one two-lane roadway from Long Bay to Net Hole/Buck Landing Swamp.

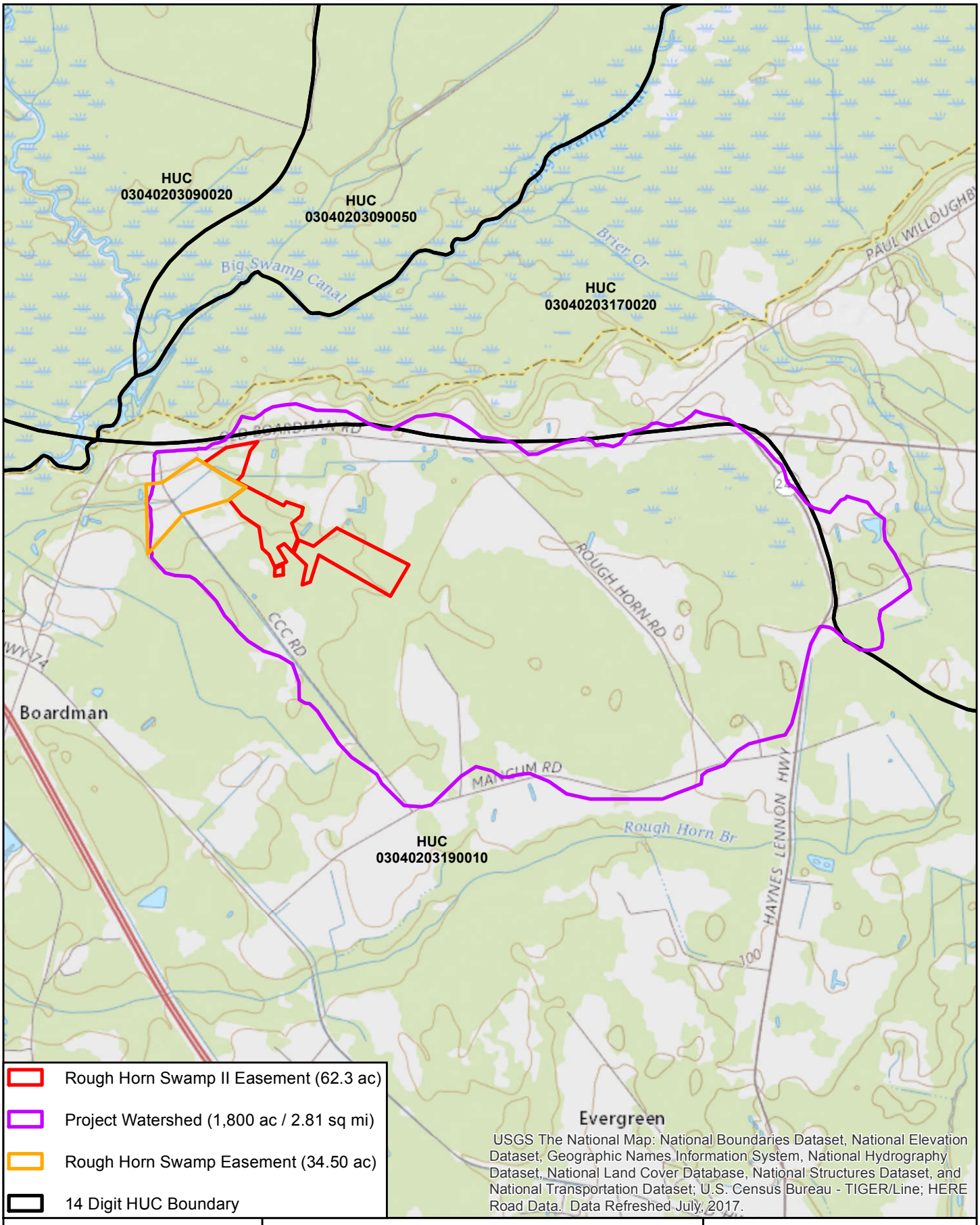


FIGURE 2. USGS TOPOGRAPHIC MAP
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC

Source: USGS National Map, Evergreen Quadrangle

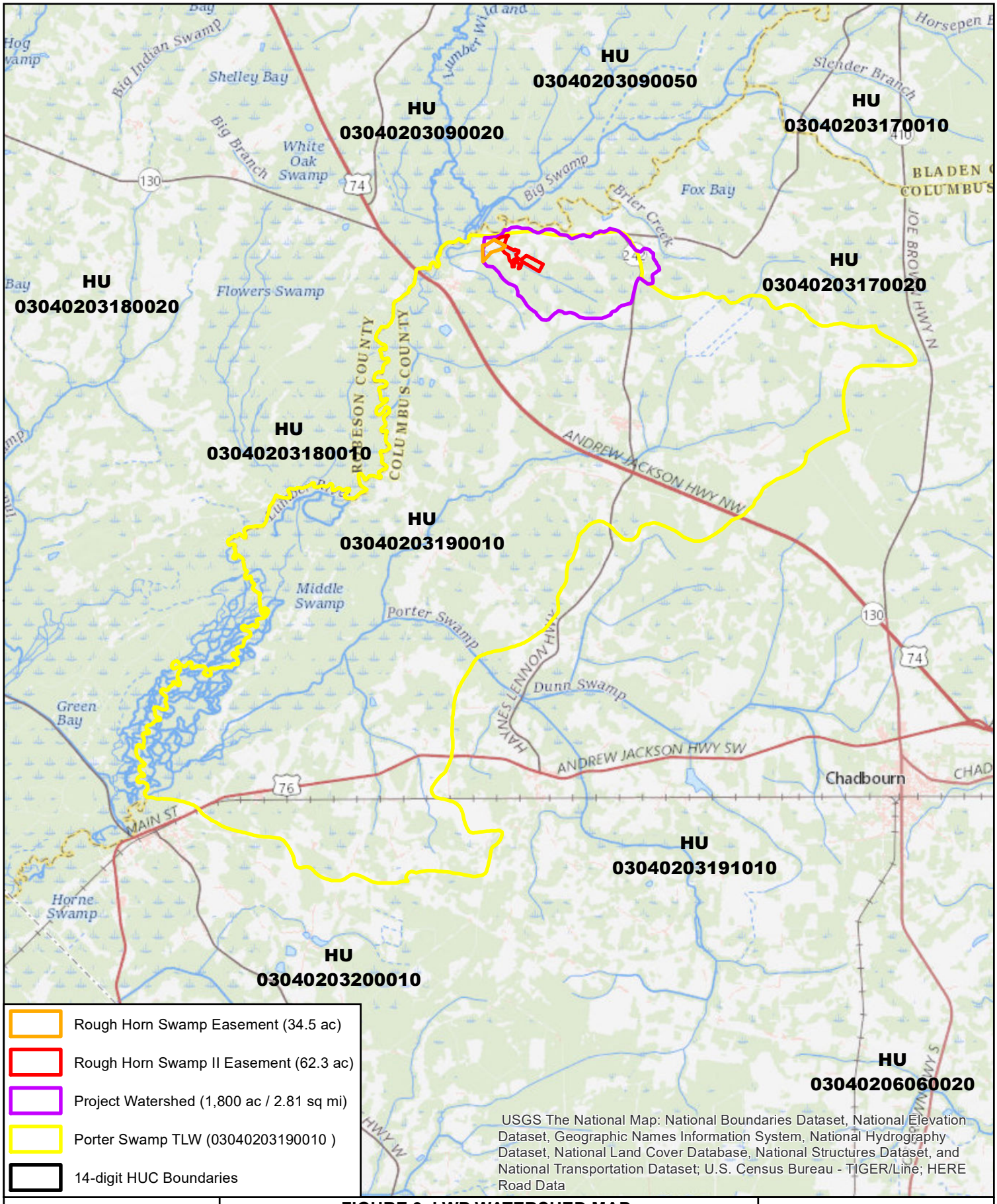


FIGURE 3. LWP WATERSHED MAP
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC

Source: USGS National Map, Evergreen Quadrangle

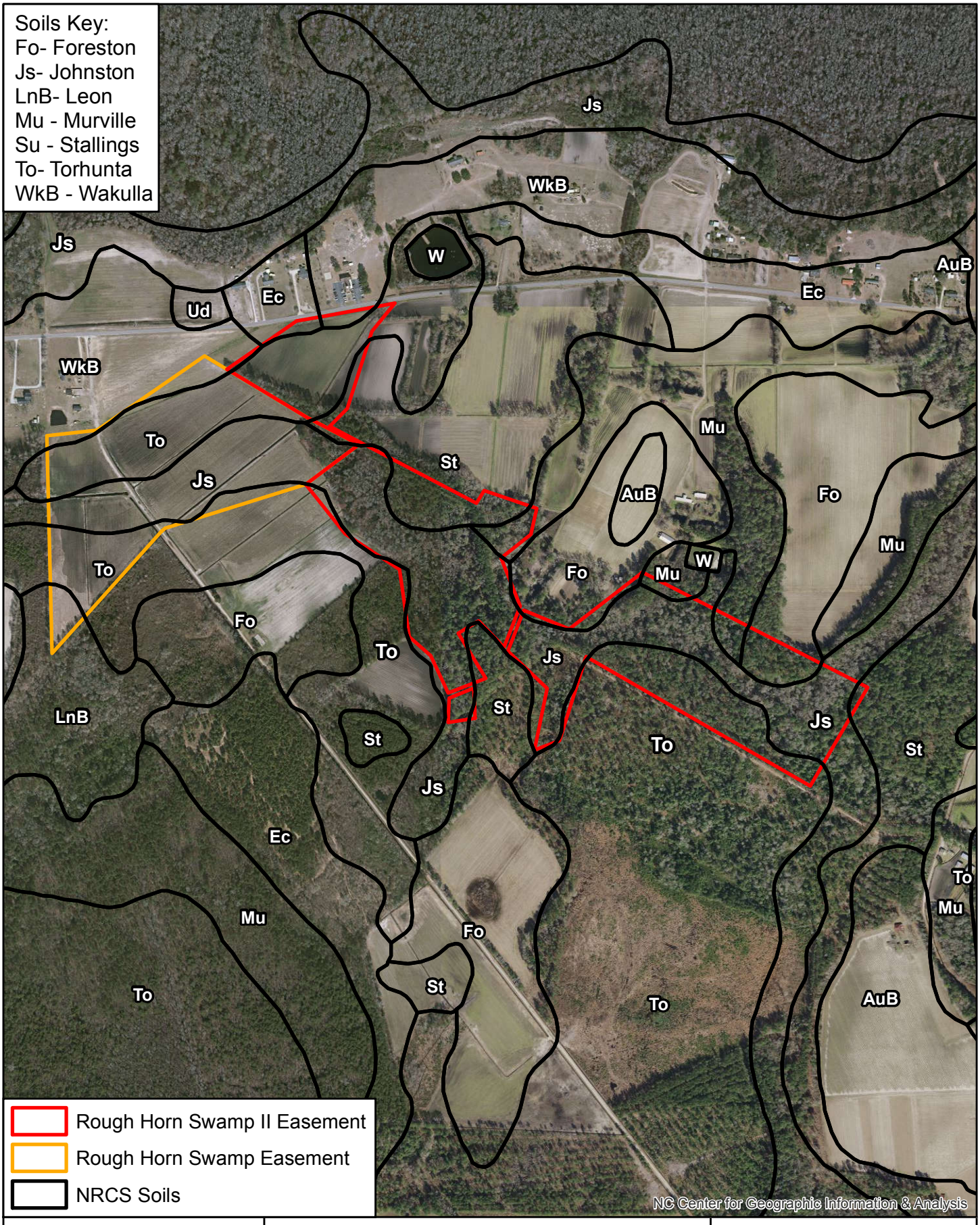
3.0 BASELINE AND EXISTING CONDITIONS

3.1 Watershed Processes and Resource Conditions

3.1.1 Landscape Characteristics

The site lies within the Mid-Atlantic Floodplains and Low Terraces (Level IV 63n) ecoregion of the Coastal Plain physiographic province. These areas are characterized by large, sluggish rivers, deep-water swamps, oxbow lakes, and alluvial deposits with abrupt textural changes. Cypress-gum swamps are common, along with bottomland hardwoods of wetland oaks, green ash, red maple, and hickories (Griffith et al 2002). The geology at the site is described as Yorktown Formation and Duplin Formation, Undivided Yorktown Formation (Tpy). The Yorktown Formation is described as having fossiliferous clay with varying amounts of fine-grained sand, bluish gray, and shell material commonly concentrated in lenses. The Duplin Formation is described as being shelly with medium- to coarse-grained sand, sandy marl, and limestone, bluish gray.

According to the Columbus County Soil Survey, the soils within the project site are mapped as Torhunta fine sandy loam, Johnston loam, Wakulla coarse sand and Leon sand (see Figure 4). The restoration efforts will be conducted within the areas mapped as Torhunta and Johnston. Torhunta series soils are very poorly drained soils located on upland bays and stream terraces. Torhunta series soils typically have a high water table (0.5’ to 1.5’ from the surface) from December to May, but are listed as having a flood frequency of “none” in the Columbus County Soil Survey. Johnston soils are also very poorly drained soils that are located along major drainageways and floodplains. Similar to Torhunta series soils, Johnston soils have a seasonally high water table, but unlike Torhunta soils they are frequently flooded. The boundary between these two soil types was determined to be a factor, along with elevation data for determining the boundary between riparian and non-riparian wetland areas. The mapped soils were evaluated by a Licensed Soil Scientist (LSS) and small differences from the soil survey boundaries of these two soil series were mapped in the field. Both the mapped soil survey soils and the field-verified soils are described in more detail in Section 12.2 along with the soil boring descriptions by a LSS.

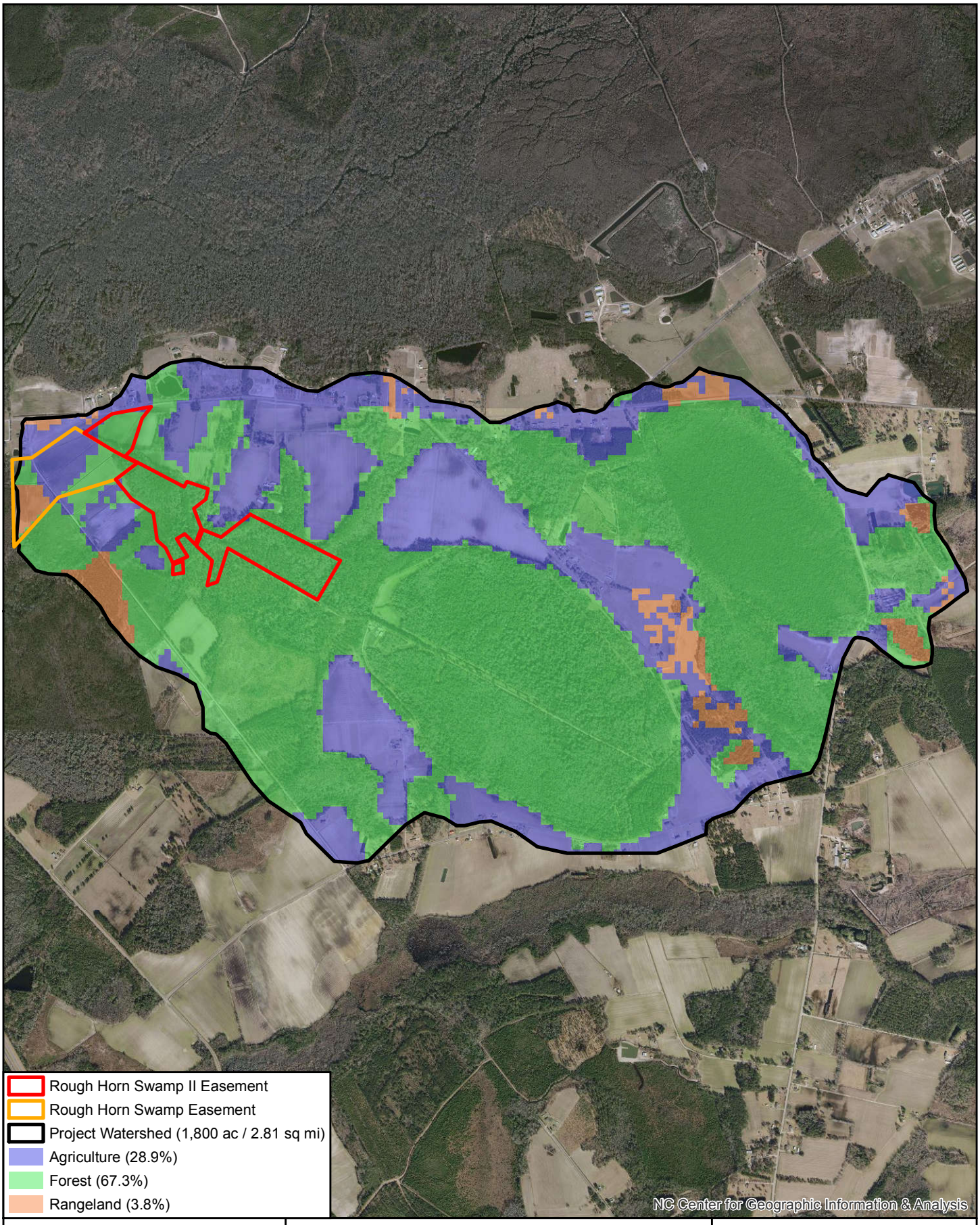


0 400 800 Feet

FIGURE 4. NRCS SOIL SURVEY
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC

N

Source: NRCS Soil Survey, Columbus County; NC Statewide Orthoimagery, 2016 and 2017.



0 1,000 2,000 Feet

FIGURE 5. PROJECT WATERSHED LAND USE ROUGH HORN SWAMP RESTORATION SITE & ROUGH HORN SWAMP II RESTORATION SITE COLUMBUS COUNTY, NC

N

Image Source: NC Statewide Orthoimagery, 2016 and 2017 NCCGIA Land Cover, 1995

3.1.2 Land Use/Land Cover and Chronology of Impacts

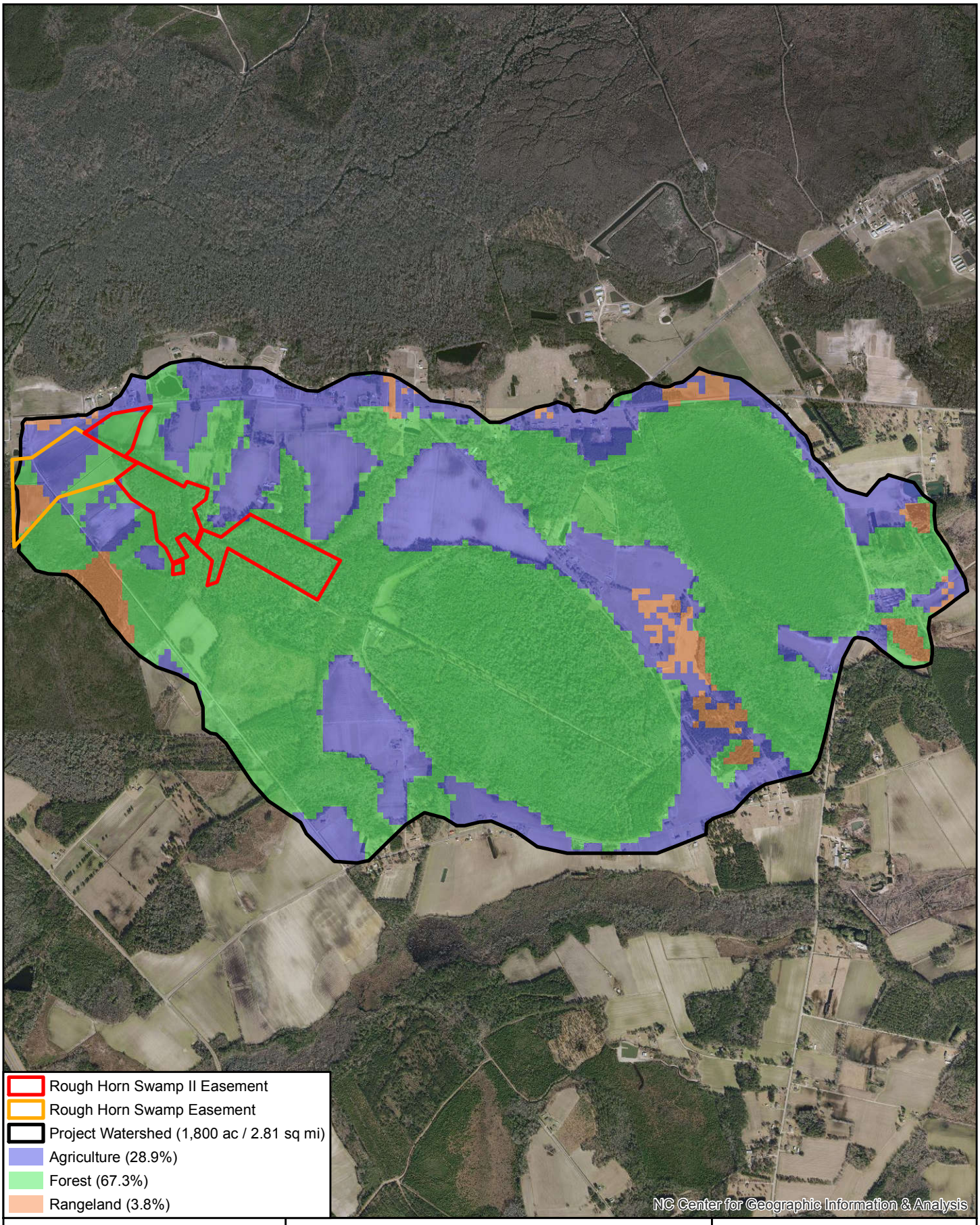
The project watershed for RHS is comprised of 2.81 square miles (1,800 acres). Current land use within the project watershed was taken from the North Carolina Center for Geographic Information and Analysis (NCCGIA) land cover data and consists of forest (67.3%), agriculture (28.9%), and rangeland/pasture (3.8%). Current land use is shown in Figure 5. Impervious surface is low at approximately 1%. The RHSII site is located upstream of the RHS site and is included entirely within the RHS watershed. Currently the development pressure is low in the immediate area around the projects, with only minimal changes in impervious surface anticipated in the near future.

Historic aerial photographs were examined for any information pertaining to historic land use and site hydrology. The reviewed aerials are seen in Figures 6A, 6B, 6C, and 6D. Historic aerials were obtained from the Columbus County Soil and Water Conservation District from 1938, 1950, 1957, 1966, 1972, and 1979, and 1993 and 2000 from USGS EarthExplorer and NC OneMap. From this photographic record, it is apparent that the area surrounding the project site has been a mix of agricultural and forested land for many years.

In the 1938 aerial, the RHS site is predominantly forested with the northern and northeastern corners of the site cleared, and the main ditches flowing to the Lumber River are already installed by this point. The RHSII site is entirely forested.

By 1950, the northern corner of the RHS site is no longer in agricultural use and this area continues to reforest up through 1966. By 1957, drainage ditches are visible in the northwestern portion of the RHSII site, and the land has been cleared in this area. In the 1966 aerial, additional land has been cleared to the south of the sites, and the sites remains mostly unchanged in the 1972 photo.

Evidence of smaller drainage features on both sites can be seen in the 1979 photo. By 1979, the RHS site's northern fields are all cleared again, and by 1998 the entire RHS site is in agricultural production. The sites remain in a similar condition up until the present, where the majority of the sites are ditched and drained. Some ditches present in the RHSII forested land are not visible on the aerials. The date of their installation is unknown.



0 1,000 2,000 Feet

FIGURE 5. PROJECT WATERSHED LAND USE ROUGH HORN SWAMP RESTORATION SITE & ROUGH HORN SWAMP II RESTORATION SITE COLUMBUS COUNTY, NC

N

Image Source: NC Statewide Orthoimagery, 2016 and 2017 NCCGIA Land Cover, 1995

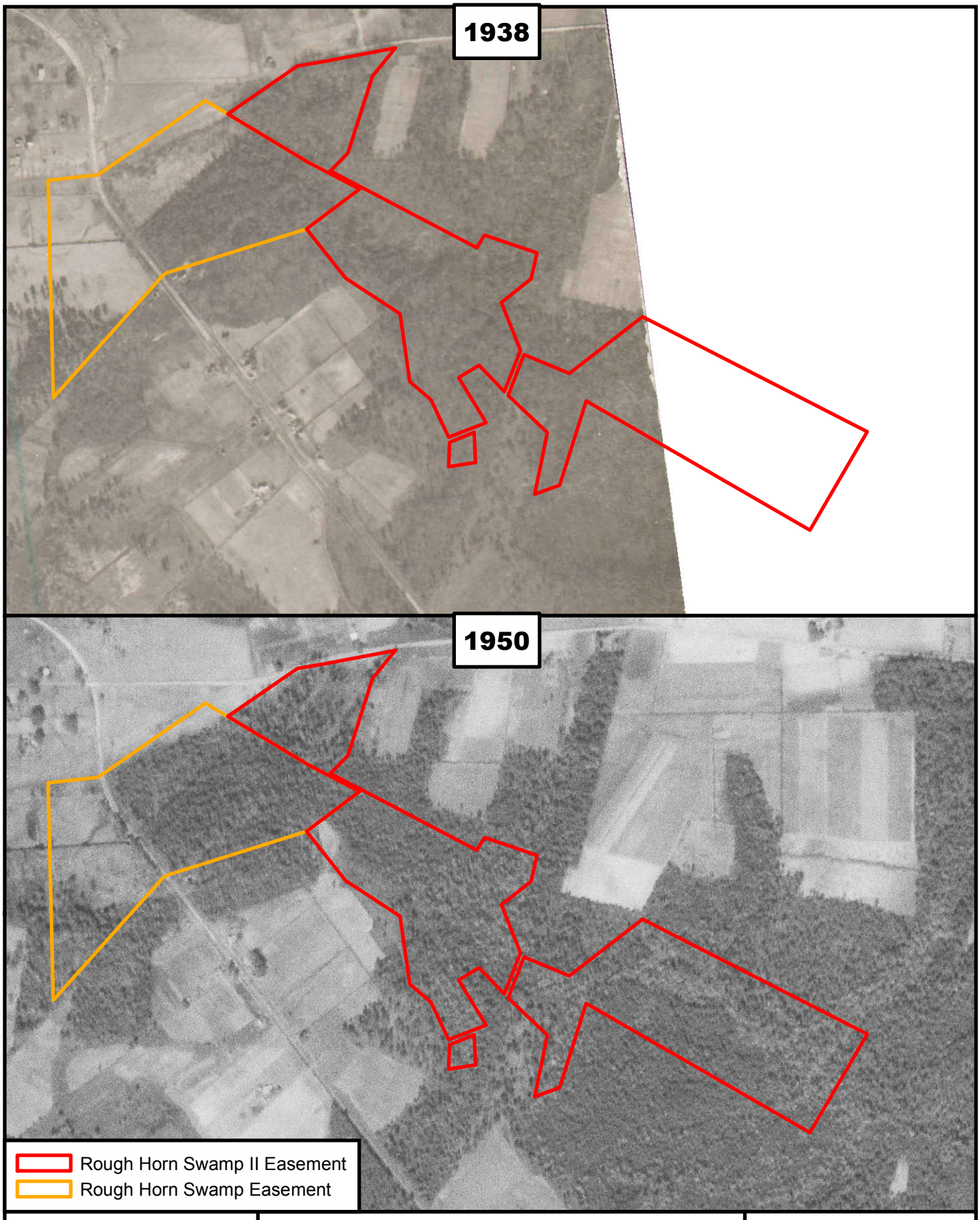
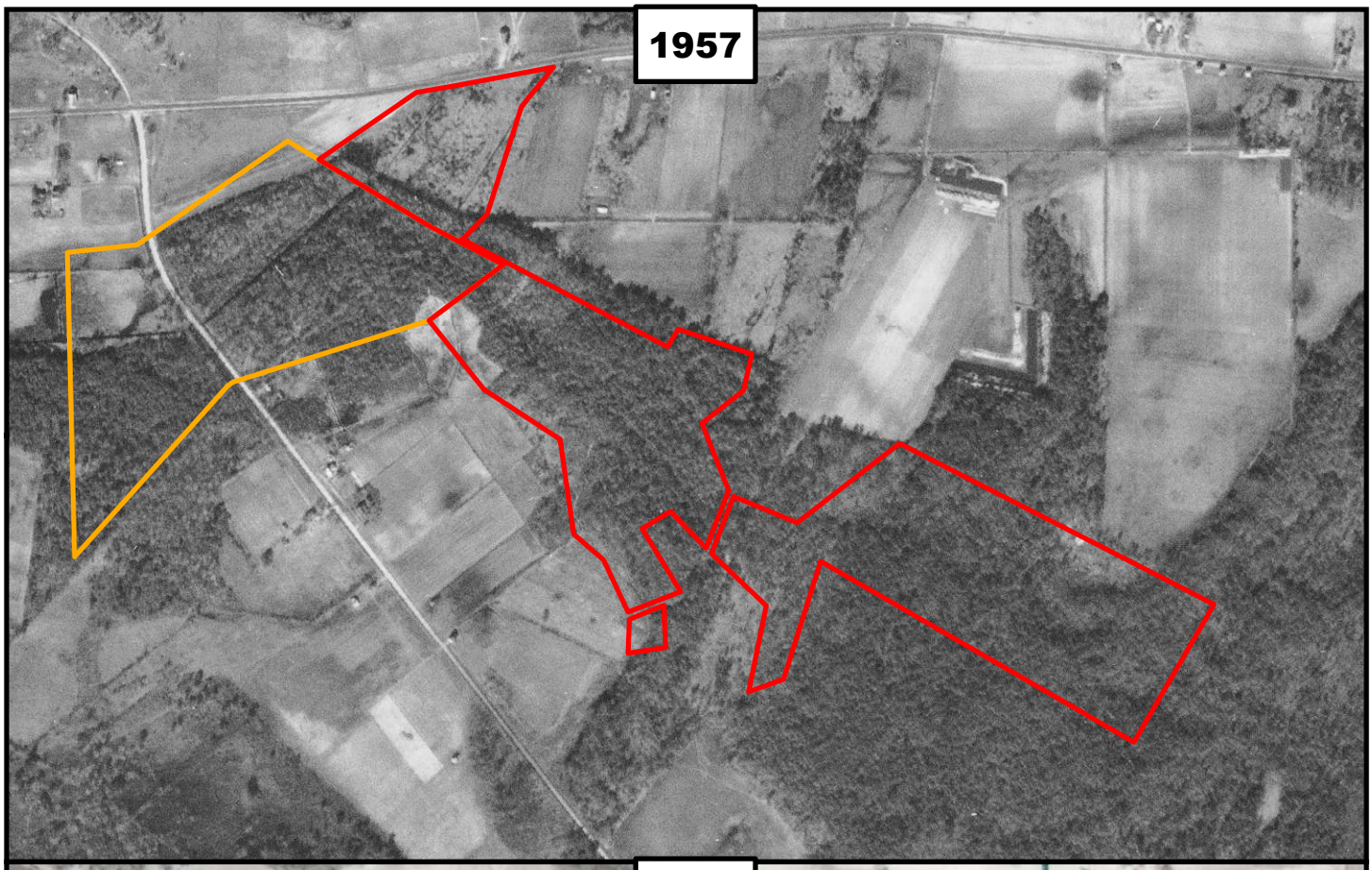
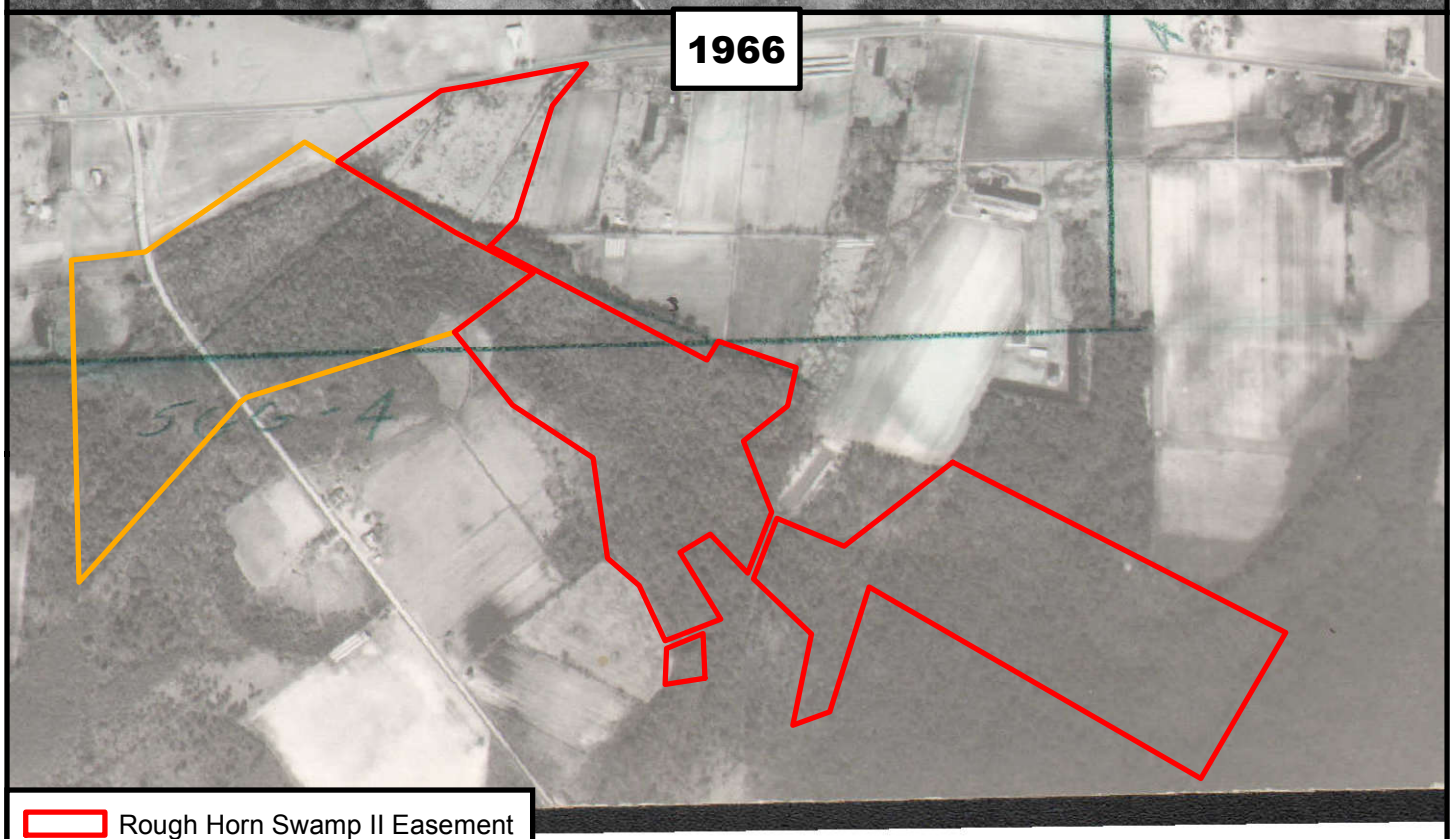


FIGURE 6A. HISTORIC AERIAL PHOTOGRAPHS
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC

Image Source:
USGS Earth Explorer.



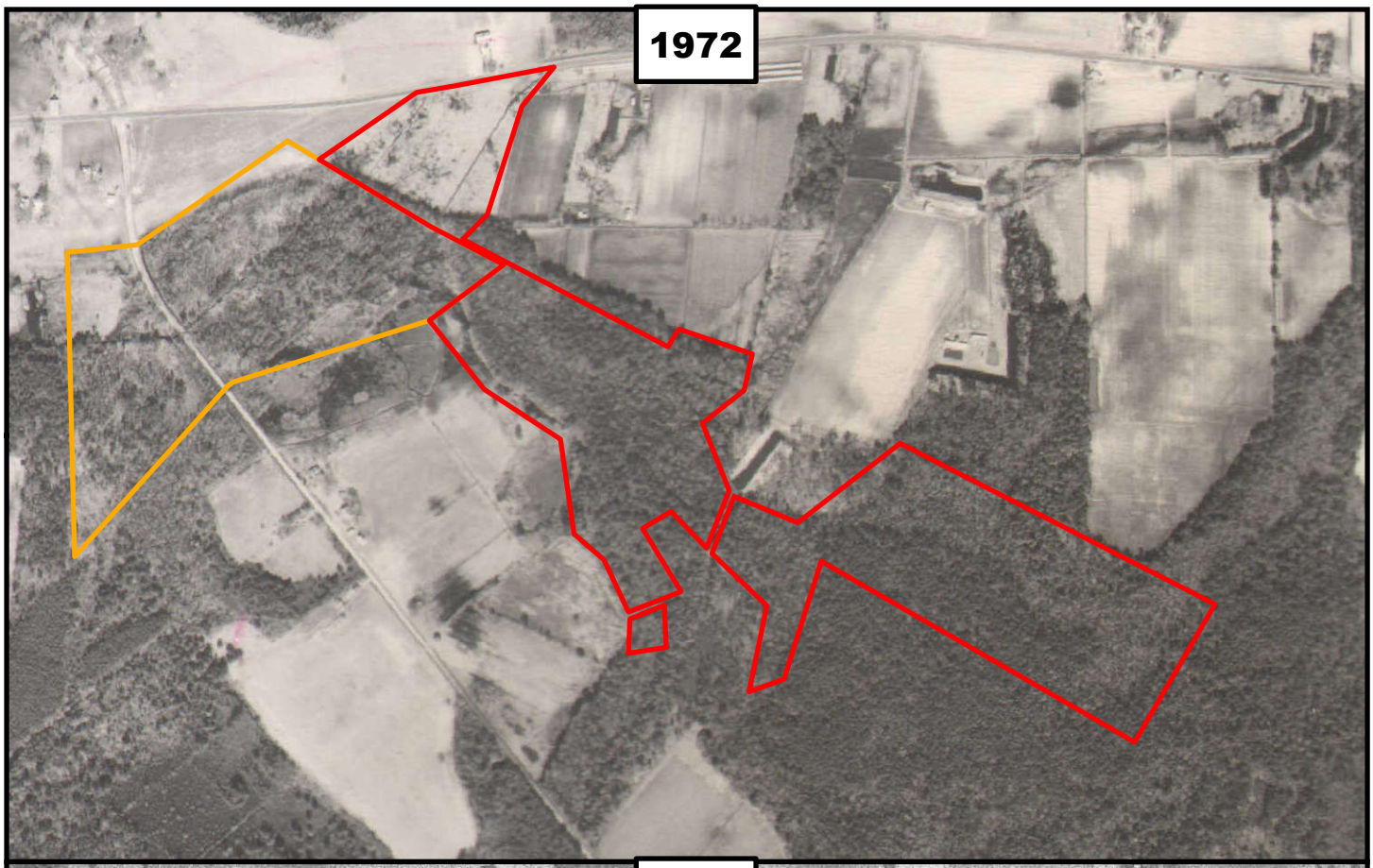


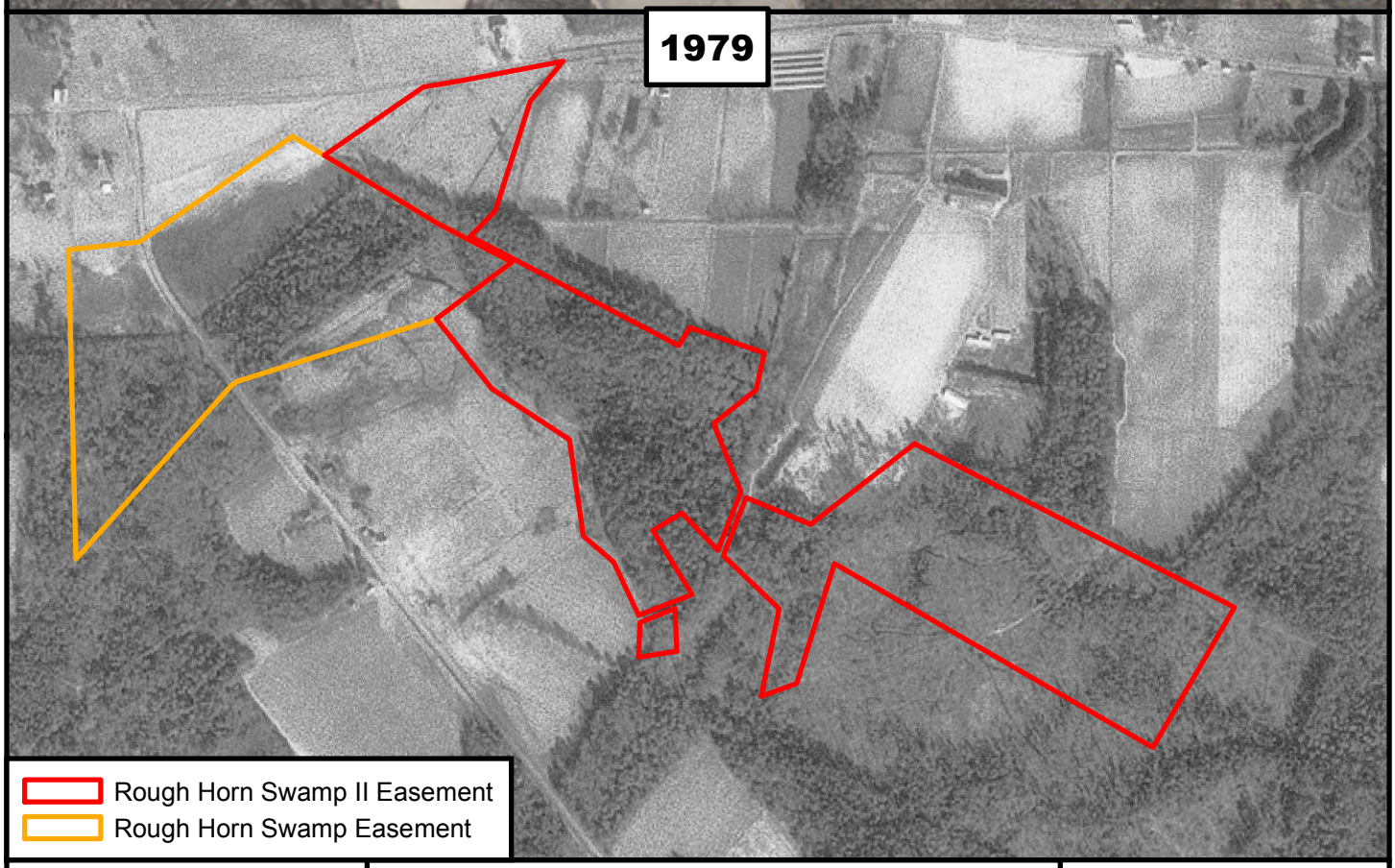
Rough Horn Swamp II Easement
Rough Horn Swamp Easement

0 400 800
Feet

FIGURE 6B. HISTORIC AERIAL PHOTOGRAPHS
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC

Image Source:
USGS Earth Explorer.





Rough Horn Swamp II Easement
Rough Horn Swamp Easement

0 400 800
Feet

FIGURE 6C. HISTORIC AERIAL PHOTOGRAPHS
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC

Image Source:
USGS Earth Explorer.

FIGURE 6D. HISTORIC AERIAL PHOTOGRAPHS
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC

Image Source:
NC OneMap.

3.1.3 Watershed Disturbance and Existing Site Conditions

Throughout the project watershed, there have been hydrologic and vegetative modifications to allow for agriculture and timber uses. Drainage ditches and channelized streams have caused stream flow to be disconnected from the adjacent wetlands and floodplains and decreased the flooding frequency. On the two project sites, riparian wetlands have been drained or modified. The existing project streams have also been relocated, straightened, and channelized. Project photos are included in Sections 3.1.4 and 3.1.5, and Figure 7 provides an overview of the site conditions. A map of the existing site topography based on recent LIDAR mapping is included in Section 12.2.

There are six existing streams within the two projects. The primary stream is Long Bay Creek, a ditched channel that originates from Long Bay, a drained Carolina Bay, and flows in a northwesterly direction beginning at the eastern edge of RHSII and then flows west-southwest through the RHS project. The stream enters the RHSII site in the wooded section on the eastern end of the project and flows in a straight line for approximately 2,071 lf until it reaches an existing crossing, which is a 48-inch corrugated metal pipe (CMP), partially buried. After this point, the channel continues toward the northwest for another 1,611 lf until the end of the RHSII easement. Spoil piles remain in the wooded area along Long Bay Creek as evidence of past manipulation of the channel. Remnant portions of the natural Long Bay channel are evident within the wooded area to the south and west of the existing ditched channel. This is evidenced by soil survey data, on-site soils evaluations and information gathered during landowner and local resident interviews. The relic channel of Long Bay Creek is not channelized and follows a more natural stream morphology. This channel was historically part of an existing wetland/stream complex with lower banks and high width/depth ratios. Surveyed valley cross-sections are included in Section 12.2 and show the modifications to this forested portion of Long Bay Creek at the RHSII site and as it transitions into the RHS site downstream.

The second project stream is Unnamed Tributary 1 (UT1) to Long Bay Creek, which enters from the northwestern section of RHSII. This stream has also been straightened and ditched and flows for 815 lf through an existing farm field and then reaches Long Bay Creek within the RHS boundary. The third existing project stream is Unnamed Tributary 2 (UT2) located in the center of RHSII. The first 516 lf of this stream have a single-thread channel with occasional braided sections, low banks, and mature trees. Further downstream, UT2 becomes channelized and flows for approximately 120 lf before reaching the confluence with Long Bay Creek. The fourth project stream, Unnamed Tributary 3 (UT3), starts just upstream of a farm road crossing in RHSII. The first 168 lf are ponded behind the road crossing without an adequate structure to carry flow downstream. The current pipe at the road crossing is an 8-inch reinforced concrete pipe perched approximately 0.2 feet above the existing bed at the upstream side. After the crossing, the channel is ditched and has been rerouted away from its natural valley to the northeast for 571 lf before it reaches Long Bay Creek. The fifth project stream, Unnamed Tributary 4 (UT4), is a ditched channel that enters the site from the northeast and flows into wetland W2. Its flow is disrupted by the ditched channel of Long Bay Creek cutting diagonal across this area. A sixth project stream, Unnamed Tributary 5 (UT5), enters the RHSII site from the southeast and flows approximately 597 linear feet, but does not flow directly into Long Bay Creek due to being blocked by road fill south of Long Bay Creek along the southern easement boundary of RHSII and ponded until excessive flow is forced against the natural grade into the ditched Long Bay Creek channel. UT5 is included in the project boundary of RHSII, but will not be utilized for mitigation credit.

The confluence of Long Bay Creek and UT1 occurs on the RHS project and forms a stream that is currently routed through ditches around the southern boundary of the RHS site. Additional drainage ditches serve to move both surface and groundwater quickly off the site, which has removed wetland hydrology. After leaving the RHS project boundary, Long Bay Creek continues to flow in a westerly direction to its confluence with the Lumber River approximately 3,000 feet to the west of the project site.

Wetlands historically formed at RHS and RHSII sites due to surface inputs, with additional inputs coming from overbank stream events, but anthropogenic modifications have drained the majority of the on-site wetlands. Four groundwater gauges were installed in drained wetlands and provide data from 1/24/2017-10/3/2018. During the 2017 growing season, none of the gauges had continuous saturation for more than 6 days (data are provided in Section 12.2). Portions of wetlands have persisted where ditch spacing is not sufficient enough to drain the site. Wetlands of marginal quality exist in the wooded areas in the middle of the RHSII site. These wetlands (W1, W2, and WA) are located within or near Long Bay Creek's historic landscape position and total 4.74 acres. Wetland WD is 0.63 acres and has formed where UT3 has been ponded above the road crossing. Wetland WC is 5.47 acres and is located along the historic landscape position of UT3. Wetland WE is 2.27 acres and is associated with UT5. At the eastern end of RHSII, Wetland WB has approximately 16.65 acres of mature hardwood wetlands. Portions of WB ranging from 30-50' offset from Long Bay Creek has been drained, but beyond this the wetlands are receiving adequate drainage from upslope crenulations to support wetland hydrology. The RHS site includes one wetland (W3) measuring 0.16 acre. W3 is found within the ditch near the northern edge of the property.

The RHSII project includes mature woods within the center and the eastern portions of the site. This forested area is partially ditched, but also contains the relic channel for Long Bay Creek. There are a variety of tree species, including black gum (*Nyssa sylvatica*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), swamp bay (*Persea palustris*), American holly (*Ilex opaca*), and tulip poplar (*Liriodendron tulipifera*). The remaining RHSII land on the project to the northwest and the entire RHS project are currently being used for row crops.

A jurisdictional determination for the RHS site was submitted to the US Army Corps of Engineers on October 9, 2015 and was approved on January 22, 2016 (SAW-2015-02410). A second jurisdictional determination was later submitted for the RHSII site on May 4, 2018 and was approved on August 29, 2018 (SAW-2016-02026). The approved jurisdictional determinations are included in Section 12.7. A table is included that lists the different names used for the project streams throughout the history of the two sites. UT4 was not originally included in the JDs, but was recommended for mitigation during the NCIRT site visit for the banking prospectus review on 10/26/2016 (UT4 was known as UTLBC1 at that time; see KCI notes in Section 12.10).

Table 3. Project Attribute Table

Project Name	Rough Horn Swamp Restoration Site		
County	Columbus County		
Project Area (acres)	34.5 ac		
Project Coordinates (lat. and long.)	34.4481°, -78.9390°		
Planted Acreage (Acres of Woody Stems Planted)	34.5 ac		
Project Watershed Summary Information			
Physiographic Province	Coastal Plain		
River Basin	Lumber		
USGS Hydrologic Unit 8-digit	03040203	**USGS Hydrologic Unit 14-digit**	03040203190010
DWR Sub-basin	03-07-53		
Project Drainage Area (acres)	1,800 acres		
Project Drainage Area Percentage of Impervious Area	1%		
CGIA Land Use Classification	Agricultural Land, Forestland		
Existing Reach Summary Information			
Parameters	**Long Bay Creek**		
Length of reach (linear feet)	3,702		
Valley Confinement	Valley Type X		
Drainage area (acres)	1,800 acres		
Perennial, Intermittent, Ephemeral	Perennial		
NCDWQ Water Quality Classification	C (Aquatic Life, Secondary Recreation); Sw (Swamp Waters)		
Rosgen Classification (Existing/Proposed)	N/A (Ditched Channel)		
Evolutionary trend (Simon)	Channelized, Stage III		
FEMA classification	Zone X		
Existing Wetland Summary Information			
Parameters			
Size of Wetland (acres)	0.16 ac (W3)		
Wetland Type	Headwater Forest		
Mapped Soil Series	Torhunta Fine Sandy Loam		
Drainage class	Very poorly drained		
Soil Hydric Status	Hydric A/D		
Source of Hydrology	Groundwater		
Restoration or Enhancement Method	N/A		

**Items addressed in the Categorical Exclusion in Appendix 12.9.

Table 3, continued

Project Name	Rough Horn Swamp II Restoration Site					
County	Columbus County					
Project Area (acres)	62.3 ac					
Project Coordinates (lat. and long.)	34.445253°, -81.937000°					
Planted Acreage (Acres of Woody Stems Planted)	7.3 ac					
Project Watershed Summary Information						
Physiographic Province	Coastal Plain					
River Basin	Lumber					
USGS Hydrologic Unit 8-digit	03040203	**USGS Hydrologic Unit 14-digit**	03040203190010			
DWR Sub-basin	03-07-53					
Project Drainage Area (acres)	1,684 ac (1,638 ac Long Bag Creek + 46 ac UT1)					
Project Drainage Area Percentage of Impervious Area	1%					
CGIA Land Use Classification	Agricultural Land, Forestland					
Existing Reach Summary Information						
Parameters	**Long Bay Creek**	**UT1**	**UT2**	**UT3**	**UT4**	**UT5**
Length of reach (lf)	2,077 (RHSII)	811 (RHSII)	636	739	447	597
Valley Confinement	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined
Drainage area (acres)	1,638 acres	46 acres	602 acres	142 acres	84 acres	120 acres
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Perennial	Perennial	Perennial
NCDWQ Water Quality Classification	C; SW	C; SW	C; SW	C; SW	C; SW	C; SW
Rosgen Classification (Existing/Proposed)	N/A (Ditched Channel)	N/A (Ditched Channel)	N/A (Ditched Channel)	N/A (Ditched Channel)	N/A (Ditched Channel)	N/A (Ditched Channel)
Evolutionary trend (Simon)	Channelized	Channelized	Channelized	Channelized	Channelized	Channelized
FEMA classification	None	None	None	None	None	None
Existing Wetland Summary Information						
Parameters						
Size of Wetland (acres)	4.85 (W1, W2, WA)	3.05 (WC, WD)	18.92 (WB, WE)			
Wetland Type	Bottomland Hardwood Forest	Non-Tidal Freshwater Marsh/Headwater Forest	Riverine Swamp Forest			
Mapped Soil Series	Johnston	Johnston	Johnston			
Drainage class	Very Poorly Drained	Very Poorly Drained	Very Poorly Drained			
Soil Hydric Status	Non-Hydric	Hydric	Hydric			
Source of Hydrology	Surface Water	Stream Floodplain	Stream Floodplain			
Restoration or Enhancement Method	N/A	N/A	N/A			

Table 3, continued

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States – Section 404	Yes	Applying for NWP 27	JD has been obtained for RHS and RHSII.
Waters of the United States – Section 401	Yes	Applying for NWP 27	JD has been obtained for RHS and RHSII.
Endangered Species Act**	Yes	Yes	USFWS
Historic Preservation Act**	No	Yes	NCSHPO
Coastal Zone Management Act ** (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	No	N/A	N/A
Essential Fisheries Habitat**	No	N/A	N/A

**Items addressed in the Categorical Exclusion in Appendix 12.9.

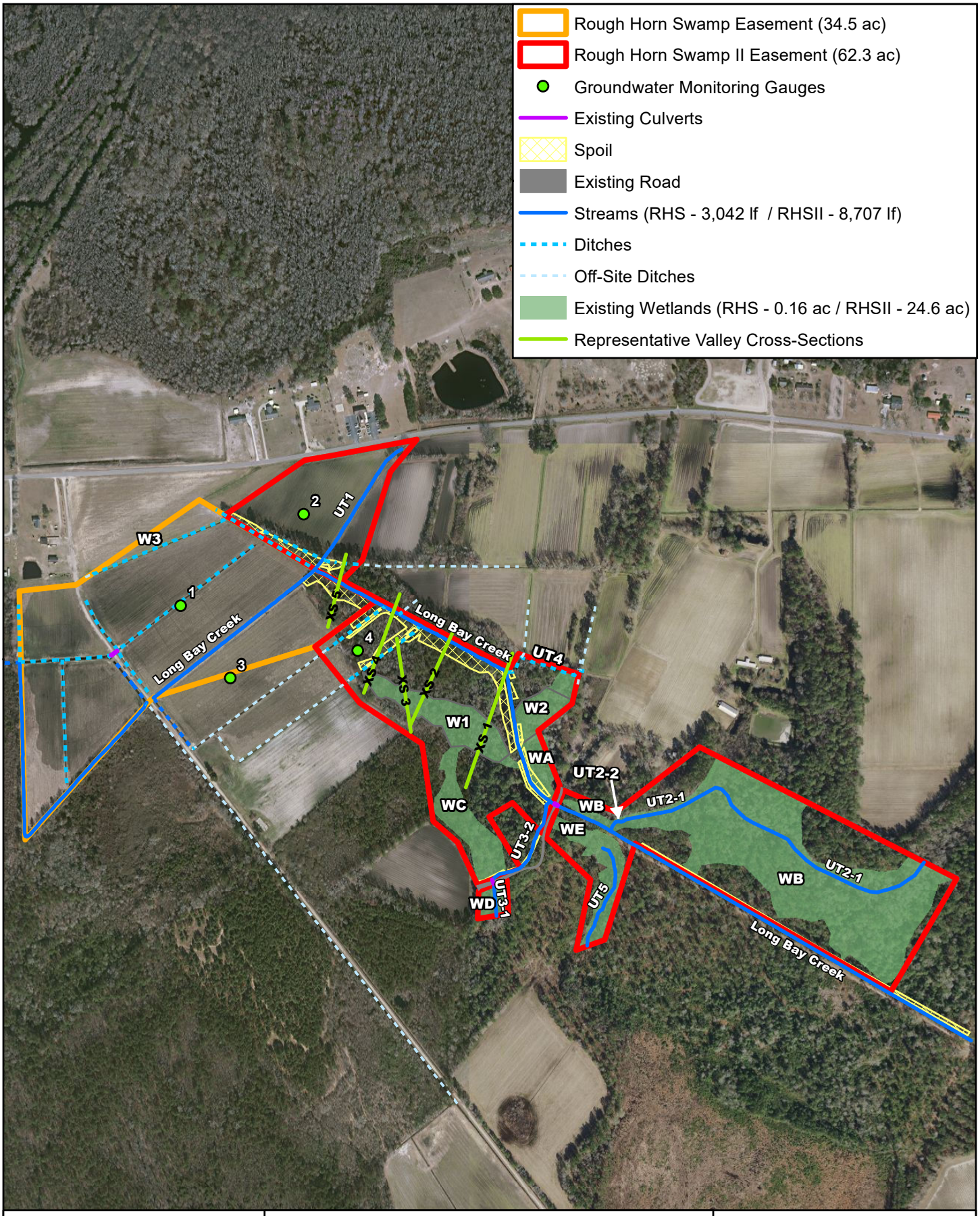


FIGURE 7. CURRENT CONDITION PLAN VIEW ROUGH HORN SWAMP RESTORATION SITE & ROUGH HORN SWAMP II RESTORATION SITE COLUMBUS COUNTY, NC

3.1.4 Site Photographs – Rough Horn Swamp

Photo 1: Drainage ditch bisecting the two eastern fields above CCC Road. 6/17/08

Photo 2: View looking south across the western portion of site. 6/17/08

Photo 3: Looking from CCC Road culvert northeast along ditched stream channel. 10/29/10

Photo 4: View looking north across RHS. 10/29/10

Photo 5: View looking east across RHS. 6/17/08

Photo 6: Drainage ditch along northern boundary RHS. 6/17/08

3.1.5 Site Photographs – Rough Horn Swamp II

Photo 1: Looking southwest along the farm field and tree line. 6/17/08

Photo 2: Looking at Long Bay Creek that will be relocated through its historic location. 4/3/15

Photo 3: Remnant coastal plain stream (W1) within wooded area. 4/3/15

Photo 4: Looking at ditch (UT1) to be filled in the Non-Riparian wetland Re-establishment area. 4/3/15

Photo 5: Looking at Long Bay where relocation will begin. 1/26/18

Photo 6: Looking at ponded area (WD) upstream of existing road. 1/26/18

4.0 FUNCTIONAL UPLIFT POTENTIAL

Given the existing stream and watershed conditions at RHS and RHSII, there is a high potential for functional improvements at these sites. Vegetation removal and ditching and channelization of streams are the predominant impairments within the project sites, and have contributed to the overall degradation of the local ecosystem.

Mitigation actions will focus on filling the ditched channels and creating a shallow braided headwater stream/wetland complex. The restored system will increase flooding frequency within the project site. The restoration of the wetlands will fill in the field ditches and return a natural hydrologic condition to the site. Functional uplift will be achieved through the reestablishment of healthy riparian and non-riparian vegetation within the wetland areas and riparian corridors. Physicochemical functions will improve with the reduction in nitrogen and phosphorus inputs to the project watershed from converted land use (agriculture to forested wetland/stream buffer) and filtering capabilities of the riparian buffer. These nutrient reductions will not be monitored directly, but rather have been estimated as a reduced contribution to project streams of 1,190 pounds of total nitrogen, and 77 pounds of total phosphorus per year (based on NCDMS 2016 guidance; see Section 12.2 for calculations).

Consideration of future impacts to the area that could limit functional uplift opportunities is important when assessing project potential. These projects exist in a rural setting with low impervious surface (1% or less), and significant changes to the surrounding area are not expected. Table 4 summarizes the project goals and objectives that will lead to functional improvements and the monitoring tools that will be used to track these changes to the sites.

5.0 MITIGATION PROJECT GOALS AND OBJECTIVES

Table 4. Project Goals, Objectives, and Functional Outcomes

Goals	Objective	Functional Level	Function-Based Parameter Effects	Monitoring Measurement Tool
Restore an integrated wetland/stream system	Plant the site with native trees and shrubs that support the development of wetland communities	Wetland Species Composition	Vegetation	Density
				Species Composition/ Diversity
	Fill field ditches to slow the flow of surface and subsurface drainage	Wetland Hydrology	Groundwater Saturation/ Surface Ponding	Percent Saturation Within 12 inches Over Growing Season
	Relocate channelized streams their historic landscape position	Hydraulics	Floodplain Connectivity	Flood Frequency
Reduce nutrient impacts to the Lumber River and its tributaries from existing and adjacent agricultural practices	Convert existing agricultural land to wetland and stream buffer	Physicochemical	Nutrient Reduction	Nutrient Reduction Estimates

6.0 DESIGN APPROACH AND MITIGATION WORK PLAN

Mitigation actions will focus on filling the onsite ditches and relocating the site's streams to the former valley locations as shallow headwater streams in order to create an integrated stream/wetland complex with a forested wetland ecosystem. The proposed project design is shown in Figure 8 and in the Construction Plan Sheets in Section 12.1.

6.1 Riparian Wetland Mitigation

RHS – Riparian Wetland Restoration (Re-establishment) – 20.267 acres

Re-establishment occurs where the functions are returned to the site in a location where an aquatic resource previously existed.

The drained hydric soils adjacent to the relic forested stream/wetland valley will be restored to riparian wetland as part of the restoration of Long Bay Creek. The mitigation area will be further restored by filling approximately 4,500 linear feet of additional ditches, relocating sidecast spoil, and completing minor surface contouring to offset existing drainage modifications (primarily field crowning). The stream will be the main hydrologic source to the riparian components of the wetland system, but will be augmented by a shallow groundwater table, overland flow, and seepage from the adjacent uplands. Following the completion of site grading, the riparian wetland will be planted with native hardwood trees and shrubs.

RHSII – Riparian Wetland Restoration (Re-establishment) – 17.079 acres

The drained hydric soils (15.803 acres) adjacent to the all of the relic stream/wetland valleys will be restored to riparian wetland as part of the restoration of the project streams. The majority of this area is forested (aside from the agricultural land along UT1 to the north), and as such restoration actions will focus on restoring a natural hydrologic condition through increased flooding frequency and surface retention. The restoration area will be improved by filling approximately 4,750 linear feet of channelized stream or field ditches, relocating sidecast spoil, and completing minor surface contouring to offset existing anthropogenic drainage enhancements (primarily field crowning in the existing field area along UT1). The streams will be the main hydrologic source to the riparian components of the wetland system but will be augmented by a shallow groundwater table, overland flow, and seepage from the adjacent uplands.

RHSII – Riparian Wetland Enhancement – 5.956 acres

The existing riparian wetlands identified in the field will be improved through wetland enhancement. Mitigation actions will focus on increasing the hydroperiod, primarily through more frequent overbank events and a connection to an elevated water table through stream restoration. Existing wetlands WC and WB will benefit from reconnected Priority 1 stream flow when UT3, UT4, and Long Bay Creek are returned to natural stream valleys. Existing spoil piles will be either removed from the mitigation area or used to backfill former ditched channels. Wetland WE (2.300 acres) will be additionally enhanced by reconnecting UT5 to Long Bay Creek.

RHSII – Riparian Wetland Preservation – 15.319 acres

The existing wetlands in the eastern portion of the site along the top of Long Bay Creek and at the top of UT3 will be protected with wetland preservation. These areas are suitable candidates for preservation due to the existing mature mixed hardwood forest with a lack of invasive species and a functional wetland hydrologic regime.

6.2 Non-Riparian Wetland Mitigation

RHS – Non-Riparian Wetland Restoration (Re-establishment) – 11.873 acres
RHSII – Non-Riparian Wetland Restoration (Re-establishment) – 1.619 acres

In addition to the riparian mitigation at the site, there will also be 11.873 acres of non-riparian restoration (re-establishment) at RHS and 2.895 acres of non-riparian restoration (re-establishment) at RHSII. The drained Torhunta non-riparian hydric soils are found adjacent to the riparian soils on the outer edges of the western half of the two sites. Ditches have been installed in the fields to remove ponding and saturation from surface water inputs, which are the primary hydrologic source for the non-riparian wetlands. The mitigation area will be restored by filling ditches, removing remnant spoil piles, and grading the site with minor variations to restore natural wetland topography. Following the completion of site grading, the non-riparian wetland will be planted with native trees and shrubs. Non-riparian wetlands are included for RHSII for no credit.

6.3 Reference Wetland

A reference wetland ecosystem has been located to the north of the project site. This riparian wetland is comprised of primarily red maple and oaks. The hydroperiod is expected to be similar to the proposed riparian wetland at RHS. A groundwater gauge will be installed to monitor the hydroperiod for comparison to the project site. No reference wetland is currently proposed for the non-riparian wetland, because this type of reference system was not found in the vicinity of the project site. See Section 12.2 for the reference wetland data form and map for the reference wetland.

6.4 Water Budgets and Wetland Hydroperiods

In order to model the effect of filling the onsite ditches and grading the wetland restoration areas of RHS and RHSII, DRAINMOD was used to simulate the before and after conditions. DRAINMOD is a computer simulation water balance model that follows the groundwater elevation in the surface profile using soil inputs, climatic data, and drainage conditions (NCSU 2015). It was originally developed for agricultural drainage design, but has been adapted for evaluating wetland hydrology due to its modeling of poorly drained soils over a time step.

Two different DRAINMOD models were developed for the site based on recorded groundwater gauge data available from 2017-2018 for model calibration. Four gauges were installed at the site and two were selected for use in DRAINMOD. Gauge 1 represents a proposed riparian wetland location and Gauge 3 represents a proposed non-riparian wetland (Gauge 3) (gauge locations are shown on Figure 7; gauge data for 1/25/17-10/3/18 are included in Section 12.2). Both Gauges 1 and 3 recorded 5 days of continuous saturation, or approximately 2% of the growing season over the 2017 period. During the 2018 monitoring, these two gauges showed increased periods of saturation due to the flooding of the Lumber River during Hurricane Florence in September. Gauge 1 recorded fewer continuous days of saturation (10) compared to Gauge 3 (19), but we believe Gauge 1 was damaged in February 2018 from farm equipment and the readings are thus not as reliable for that gauge after that point. Two additional gauges not simulated in DRAINMOD, Gauges 2 and 4, recorded 6 days each of continuous saturation in 2017 (2.3% of the growing season) and 19 and 21 days (7.2% and 7.9% of the growing season), respectively, in 2018.

Climatic data (daily rainfall and maximum and minimum daily temperatures) were obtained from the Whiteville 7 NW Station (319357), approximately 9 miles east-southeast from the site and the closest station with at least 50 years of daily rainfall data. For the model simulation, 64 years of available data

were used (1955-2018). The daily rainfall was distributed to an hourly increment within the computer program. The temperatures were used in the Thornthwaite potential evapotranspiration calculations. The soils data were obtained from the NRCS parameters based on the Columbus County Soil Survey and surveyed drainage ditch measurements.

Once the initial baseline models were created in DRAINMOD, the parameters were calibrated to match the measured gauge data from 2017 and 2018 as much as feasible. Variations between the recorded groundwater data and modeled levels exist due to the difference in rainfall quantity and intensity between the site and the weather station. The gauge data also showed more seasonal variation than could be accounted for in the model, likely from interconnections of the ditch network that cause varying ditch water surface levels related to agricultural controls and the Lumber River downstream. In particular, the model had similar peaks to the measured peaks in the late fall through mid-spring, but lower peaks during the summer. As a result, the model may underestimate summer saturation events. The wetland criteria were set to evaluate the groundwater saturation over a growing period of March 1 through November 20 (265 days) (growing season based on advice of USACE representative recommendation – see 10/24/16 notes in Section 12.10). Success for the riparian wetland was evaluated at 12% continuous saturation (32 days) and at 10% continuous saturation (27 days) for the non-riparian wetland. Wetland hydrology was considered achieved if the model reached the continuous saturation goal for 50% or more of the simulated years of 1955-2017 (63 years).

The Gauge 1 model was developed for the riparian wetland portions. For the existing conditions model, the average ditch spacing for Gauge 1 is approximately 195 feet and the average drain depth is 3.5 feet. The proposed conditions model has the same drain spacing, but with a minimal depth (5 cm) to assume a small influence from the regraded wetland and dispersed surface flow. Based on these conditions, the existing conditions model simulates that the gauge never achieves the riparian hydroperiod of 30 days over the period of record, with a maximum estimate of continuous saturation for 25 days in 1975. For the proposed conditions, the model shows the site achieving wetland hydrology for 63 out of the 63 years simulated (100%), predicting that wetland hydrology should be successfully restored based on the conditions of the model.

The Gauge 3 model was created for the proposed non-riparian wetland of RHS. The ditch spacing for this gauge is approximately 221 feet with an average drain depth of 3.9 feet deep. For the proposed condition, the ditch spacing was again held at the same width, but with minimal depth (5 cm). The existing conditions model for this gauge also simulated no wetland hydrology, with a maximum saturation period of 9 days in 1999. The proposed conditions model predicts every year achieving the non-riparian hydroperiod of 10% or greater.

Based on the model results, the site should show an increase in anticipated groundwater hydroperiod following restoration that will lead to jurisdictional wetland conditions in both the riparian and non-riparian units. The model results are included in Section 12.2.

6.5 Stream Mitigation

The projects streams will be restored following the USACE Headwater Stream Guidance from April 2007 and the North Carolina Interagency Review Team's Stream and Wetland Compensatory Mitigation Update from October 2016. The restored streams will not be single-thread channels, but rather integrated

stream/wetland valleys with multiple flowpaths that will meander through the valley shaped by minor variations in topography and woody debris. KCI developed the design values for the proposed streams by examining upstream forested streams. All of the project streams will be removed from channelized ditches and returned to an integrated floodplain landscape position, which will allow the streams to adjoin the riparian wetlands. For each restored reach stream, an undersized channel will be constructed in order to initiate stream formation, but each stream has been designed to frequently exceed this channel and to have the ability to flow freely throughout the stream valley. This initial channel is necessary to convey positive drainage throughout the site and avoid hydrologic trespass on the adjacent parcels. In low portions of the valley that already have positive drainage it will not be necessary to grade this channel. In these areas the initial channel will only serve to minimally connect these low points and promote flow through the system. Valley lengths have been used for all of the stream credit calculations except for UT2-1 stream preservation, which is noted below.

RHSII – Long Bay Creek – Stream Restoration 1,866 lf (valley length)
The lower 1,866 linear feet of Long Bay Creek will be restored as a low-energy coastal plain stream (the upper portion of Long Bay Creek will be maintained in its existing condition for approximately 2,250 lf to avoid hydrologic trespass). The restored stream will not be a single-thread channel system, but instead a stream/wetland valley with multiple flowpaths that will meander through variations in streambed topography created by existing roots and woody debris. From Station 10+00 to approximately 18+25, the stream will be restored along the current channel location, but brought back up to the elevation of the existing floodplain. Starting at Station 18+25, Long Bay Creek will be removed from the ditched channel that currently turns to the north and instead redirected to its prior position in the forested valley bottom to the northwest. Existing spoil remaining from previous ditch excavations will be used to fill the former channel; KCI anticipates using a balanced cut/fill across the two sites (see Section 12.1 for further detail). A small undersized channel will be constructed to direct the flow during the immediate post-construction period, but the stream has been designed with the intent that it will frequently expand beyond this channel across the floodplain and into the adjacent riparian wetlands. Adjustment is expected across the stream valley as multiple flow paths form. A new culverted crossing (approximately 8’ by 4’ concrete box, embedded 1’ deep) will be installed to replace the existing 48” CMP, which will be the one stream crossing on this reach.

RHSII – UT1 – Stream Restoration 917 lf (valley length)
This tributary will be restored in the northern section of an existing farm field as a headwater stream. The former ditched channel will be filled and the flow will be returned to broad stream valley and riparian wetlands. Two log drop structures have been designed within the middle portion of UT1 at Stations 102+00 and 104+00 to stabilize grade transitions. The restoration of UT1 will continue downstream onto the Rough Horn Swamp project before reaching the confluence with the restored Long Bay Creek.

RHSII – UT2-1 – Stream Preservation 516 lf
The first reach of UT2 is a single-thread channel with occasional braided sections, low banks, and mature trees. The stable geomorphology and hydraulics present give the stream a high level of functionality. The actual linear footage of this reach is approximately 2,019 lf, but the amount used for mitigation credit has been limited to 494 lf immediately upstream of the restoration reach to keep the preservation length to 10% or less of the total project linear footage.

RHSII – UT2-2 – Stream Restoration 120 lf (valley length)
The lower portion of UT2 becomes channelized as it nears the confluence with Long Bay Creek. This reach will be restored to tie together the stable upstream reach of UT2 and the newly restored reach of Long Bay Creek. A series of three log drops have been included in this reach to stabilize a headcut as the tributary reaches Long Bay Creek.

RHSII – UT3-1 – Stream Enhancement 164 lf (valley length)
The top reach of UT3 has been impacted by the stream crossing at the downstream end that prevents adequate flow passage through an 8-inch reinforced concrete pipe. As a result, the stream valley is ponded at the road, reducing the functionality of this stream; currently this reach provides open water habitat rather than a stream/wetland complex. A new crossing will be installed with three 18-inch polyethylene pipes that will allow for free stream flow with a low-gradient crossing.

RHSII – UT3-2 – Stream Restoration 914 lf (valley length)
After the stream crossing, the existing channel of UT3-2 is forced into a ditch that flows against the existing topography toward the northeast to Long Bay Creek. The restoration of this reach will redirect the stream toward the northwest to follow the natural gradient toward the restored stream and floodplain of Long Bay Creek. Similar to Long Bay Creek, the restored UT3-2 channel will be an integrated stream/wetland valley with multiple flowpaths to encourage frequent inundation of the floodplain.

RHSII – UT4 – Stream Restoration 629 lf (valley length)
The restoration of UT4 will take stream flow from an existing ditch upstream of the RHSII property line and return it to a stream valley flowing along the natural gradient toward the southwest and the confluence with Long Bay Creek. The newly restored UT4 will be integrated into the existing wetland (W2) and provide additional surface hydrology to this system. Existing spoil piles that currently serve as barriers to overland flow will be removed.

RHS – Additional Stream Restoration – 2,132 lf (valley length)
Although no stream credit will be gained from work within the Rough Horn Swamp boundaries, the restoration of Long Bay Creek (1,899 lf) and UT1 (233 lf) will continue into this project since both streams are necessary components of restoring the hydrology for the riparian wetlands at RHS. The design approaches outlined above will be continued for these two streams.

Once Long Bay Creek enters the RHS boundary, the stream will continue to be restored until the downstream end of the project. The portion of stream restored within RHS will be completed in a former agricultural field, and as a result, woody debris will be installed to add bed heterogeneity throughout this section. Two log drop structures will be installed upstream of the new culverted structure under CCC Road in order to focus the flow into the culvert entrance. Three additional log drop structures will be installed at the end of Long Bay Creek as it leaves RHS in order to transition the Priority 1 stream valley back to the existing ditched channel below the project easement boundary.

6.6 Crossings
The RHS site has one crossing at CCC Road. The road is in a NCDOT right-of-way, and the entire right-of-way has been excluded from the project easement. KCI has coordinated with NCDOT for this crossing, which will be a 20’ 4” wide by 4’ 6” high aluminum culvert to replace the existing 60” corrugated metal

pipe (CMP). The new crossing has been designed to accommodate the restored stream flow while protecting the integrity of the road crossing.

The RHSII site has two crossings as mentioned above in the design descriptions for Long Bay Creek and UT3. A new culverted crossing (approximately 8' by 4' concrete box, embedded 1' deep) will be installed to replace the existing 48" CMP for the Long Bay Creek crossing. At UT3, a new crossing will be installed with three 18" polyethylene pipes at a low-gradient crossing.

6.7 Stream Design Parameters

As mentioned previously, the projects streams were designed using the USACE Headwater Stream Guidance from April 2007 and the North Carolina Interagency Review Team's Stream and Wetland Compensatory Mitigation Update from October 2016 along with site-specific data in order to develop an approach that would restore headwater stream functionality to the two sites.

Table 5 shows the drainage areas for the project streams, all of which exceed 25 acres, which is the approximate minimum drainage size for coastal plain streams as stated in the April 2007 guidance. Long Bay Creek and UT2 carry the primary drainage for the project watershed from the drained Carolina Bay and other sources upstream of RHSII. Flow estimates are provided in Table 5 based on the North Carolina Coastal Plain Regional Curve (Harman et al 1999) and USGS 2-year flow estimates using the USGS National Streamflow Statistics Database (NSS). An undersized channel has been designed for the project reaches that will help initiate stream formation within each stream valley. Most importantly, this initial channel will maintain positive drainage from adjacent parcels, preventing hydrologic trespass. In areas where the elevation is already low enough to provide for this, the new channel will not be graded. This will provide routing for incoming base flow, but for larger magnitude events, stream flow will flow freely throughout the stream valley. Based on the anticipated magnitude of flows from these reaches, the proposed stream valleys will have adequate capacity to accommodate the range of flows as shown in the table.

Table 5. Project Drainage Areas and Flow Estimates

Stream	Drainage Area (Acres)	Drainage Area (Sq. Miles)	Bankfull XS Area (sf) from NC Coastal Plain Regional Curve	Bankfull Q (cfs) from NC Coastal Plain Regional Curve	Q (cfs) from 2-Year USGS Regression
Long Bay Creek (bottom of RHSII)	1,638	2.56	27	33	111
Long Bay Creek (bottom of RHS)	1,800	2.81	29	35	118
UT1 (bottom of RHSII)	46	0.07	2.5	2	15
UT1 (confluence with Long Bay Creek within RHS)	48	0.08	2.6	3	16
UT2	602	0.94	13.9	16	70
UT3	142	0.22	5.4	6	30
UT4	84	0.13	3.8	4	22

Table 6 summarizes the design parameters used for the project streams. Five surveyed cross-sections are provided in Section 12.2 that show how the proposed stream valley will fit in the existing forested floodplain in the relocated section of Long Bay Creek from approximately Station 18+25 to 30+49. The available stream valley width varies from 63-145 feet wide at a design depth of 0.8 feet deep in this section. The design slopes of the stream valleys range from 0.1-0.3% with the exception of UT2, which has a steeper transitional reach as it meet Long Bay Creek.

Table 6. Stream Design Parameters

Stream	Drainage Area (Acres)	Soil Type	Proposed Stream Valley Length	Proposed Stream Valley Slope (%)
Long Bay Creek (RHSII)	1,638	Johnston	2,049	0.14%
Long Bay Creek (RHS)	1,800	Johnston	1,959	0.27%
UT1 (RHSII)	46	Johnston	917	0.27%
UT1 (RHS)	48	Johnston	233	0.14%
UT2	602	Johnston	636	1.25%*
UT3	142	Johnston	1,078	0.18%
UT4	84	Johnston	629	0.18%

* The restoration reach of UT2 will be carried over an existing headcut before reaching the confluence with Long Bay Creek, and as such has a higher design slope than typically found at the site.

6.8 Planting Plan

The planting plan proposed for the site considers the species that have been observed in the adjacent wetland areas. In the riparian wetland and stream portions, bald cypress, swamp tupelo, cherrybark oak, and overcup oak will be planted due to the anticipated periods of prolonged saturation and inundation. The non-riparian zone will be at an elevation slightly above the stream area transitioning to the adjacent uplands. The two planting areas will have many of the same species, differing slightly based on the tolerance to the wetness regime. As with many natural communities, the areas with longer periods of saturation may have less diversity of tree species since fewer species naturally thrive in those conditions. Trees and shrubs will be planted at a density of 968 stems per acre (9 feet x 5 feet spacing) to achieve a mature survivability of 210 stems per acre after seven years. Woody vegetation planting will be conducted during dormancy. Species to be planted may consist of the following and any substitutions from the planting plan will be taken from these lists:

Riparian Wetland Planted Areas – 31.4 acres

Common Name	Scientific Name	Wetland Status Atlantic & Gulf Coast Plain
River Birch	*Betula nigra*	FACW
Buttonbush	*Cephalanthus occidentalis*	OBL
Atlantic White Cedar	*Chamaecyparis thyoides*	OBL
Water Tupelo	*Nyssa aquatic*	OBL
Swamp Tupelo	*Nyssa biflora*	OBL

Swamp Bay	*Persea palustris*	FACW
Overcup Oak	*Quercus lyrata*	OBL
Swamp Chestnut Oak	*Quercus michauxii*	FACW
Bald Cypress	*Taxodium distichum*	OBL

Non-Riparian Wetland Planted Areas – 15.1 acres

Common Name	Scientific Name	Wetland Status Atlantic & Gulf Coast Plain
River Birch	*Betula nigra*	FACW
Water Tupelo	*Nyssa aquatic*	OBL
American Sycamore	*Platanus occidentalis*	FACW
Laurel Oak	*Quercus laurifolia*	FACW
Overcup Oak	*Quercus lyrata*	OBL
Swamp Chestnut Oak	*Quercus michauxii*	FACW
Water Oak	*Quercus nigra*	FAC
Bald Cypress	*Taxodium distichum*	OBL

A custom herbaceous seed mix composed of appropriate native species will be used to further stabilize and restore the wetland.

6.9 Project Assets

The tables below outline the anticipated project assets that will be produced from RHS and RHSII, and Figure 8 shows the proposed mitigation assets for the sites.

Table 7. Project Asset Table - RHS

Project Component -or- Reach ID	Existing Footage/ Acreage	Stationing	Restoration Footage or Acreage	Creditable Footage or Acreage	Restoration Level	Approach Priority Level	Mitigation Ratio (X:1)	Mitigation Credits	Notes/Comments
Riparian Wetland	None (Drained Wetland)	N/A	20.267	20.267	Restoration (Re-establishment)	N/A	1 : 1	20.267	
Non-Riparian Wetland	0.16 ac existing wetland	N/A	11.873	11.873	Restoration (Re-establishment)	N/A	1 : 1	11.873	
Long Bay Creek	3,470	30+49 to 50+08	1,959	1,899	Restoration	Low Energy Stream	N/A	0	60’ right-of-way over CCC Rd; completed for no stream credit
UT1	4	109+17 to 111+50	233	233	Restoration	Headwater Stream	N/A	0	Completed for no stream credit

Table 8. Project Asset Table - RHSII

Project Component -or- Reach ID	Existing Footage/ Acreage	Stationing	Restoration Footage or Acreage	Creditable Footage or Acreage	Restoration Level	Approach Priority Level	Mitigation Ratio (X:1)	Mitigation Credits	Notes/Comments
Riparian Wetland Restoration	None (Drained Wetland)	N/A	17.079	17.079	Restoration (Re-establishment)	N/A	1 : 1	17.079	
Riparian Wetland Enhancement	7.900	N/A	5.956	5.956	Enhancement	N/A	2.5 : 1	2.382	
Riparian Wetland Preservation	16.700	N/A	15.319	15.319	Preservation	N/A	10 : 1	1.532	
Non-Riparian Wetland Restoration	None (Drained Wetland)	N/A	1.619	1.619	Restoration (Re-establishment)	N/A	N/A	0	No non-riparian credits in RHSII
Long Bay Creek	2,077	10+00 to 30+49	2,049	1,866	Restoration	Low Energy Stream	1 : 1	1,866	One 30' crossing exception STA 14+66 to 14+96
UT1	815	100+00 to 109+17	917	917	Restoration	Headwater Stream	1 : 1	917	
UT2-1	516	200+00 to 205+16	516	516	Preservation	Headwater Stream	10 : 1	52	
UT2-2	120	205+16 to 206+36	120	120	Restoration	Headwater Stream	1 : 1	120	
UT3-1	168	300+00 to 301+64	164	164	Enhancement II	Headwater Stream	2.5 : 1	66	One 31' crossing exception STA 301+64 to 301+95
UT3-2	571	301+95 to 311+09	914	914	Restoration	Headwater Stream	1 : 1	914	
UT4	447	400+00 to 406+29	629	629	Restoration	Headwater Stream	1 : 1	629	

Table 9. RHS - Length and Summations by Mitigation Category

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)
		Riverine	Non-Riverine		
Restoration	(2,132 not credited)	20.267		11.873	
Enhancement					
Enhancement I					
Enhancement II					
Creation					
Preservation					
High Quality Preservation					

Table 10. RHSII - Length and Summations by Mitigation Category

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)
		Riverine	Non-Riverine		
Restoration	4,446	17.079		(1.619 not credited)	
Enhancement		5.956			
Enhancement I					
Enhancement II	164				
Creation					
Preservation	516		15.319		
High Quality Preservation					

Table 11. RHS - Overall Assets Summary

Rough Horn Swamp Restoration Site (Project ID - 97005)	
Overall Assets Summary	
Asset Category	Overall Credits
Stream	(2,132 not credited)
RP Wetland	20.267
NR Wetland	11.873
Buffer	

Table 12. RHSII - Overall Assets Summary

Rough Horn Swamp II Restoration Site (Project ID - 100053)	
Overall Assets Summary	
Asset Category	Overall Credits
Stream	4,564
RP Wetland	20.993
NR Wetland	(1.619 not credited)
Buffer	

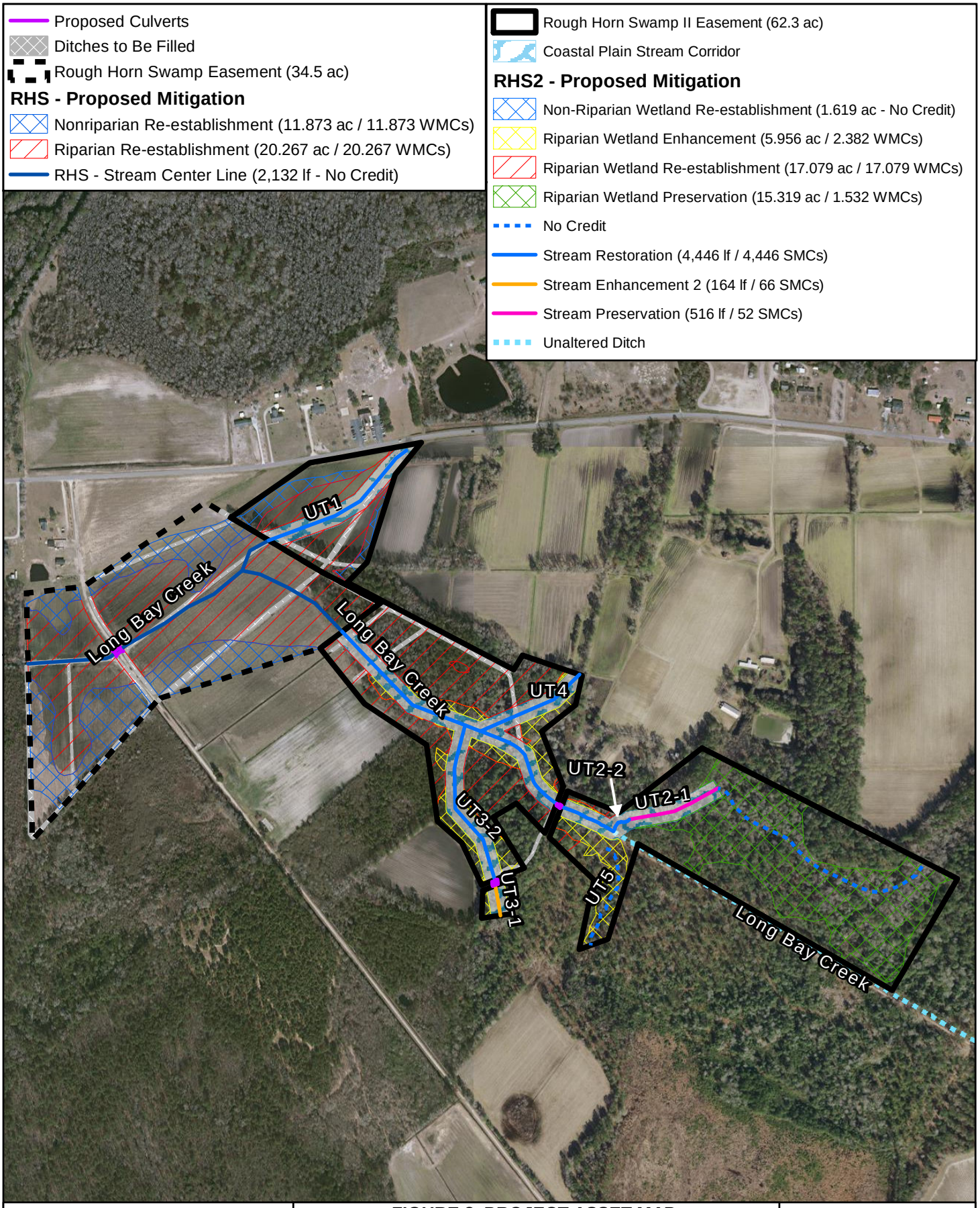


FIGURE 8. PROJECT ASSET MAP
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC

7.0 PERFORMANCE STANDARDS

Monitoring of the sites shall occur for a minimum of seven years following construction. The following performance standards for stream mitigation are based on the Wilmington District Stream and Wetland Compensatory Mitigation Update (NCIRT 2016) and will be used to judge site success.

Vegetation Performance

The sites must achieve a woody stem density of 260 stems/acre after five years and 210 stems/acre after seven years to be considered successful. Trees in each plot must average 7 feet in height at Year 5 and 10 feet at Year 7. A single species may not account for more than 50% of the required number of stems within any plot. Volunteers must be present for a minimum of two growing seasons before being included in performance standards in Year 5 and Year 7. For any volunteer tree stem to count toward vegetative success, it must be a species from the approved planting list. If monitoring indicates that any of these standards are not being met, corrective actions will take place.

Stream Hydrologic Performance

The project streams must meet the requirements for headwater stream hydrologic monitoring per the NCIRT 2016 guidelines. Each stream must have continuous surface water flow within a flowpath for a minimum of 30 continuous days within a calendar year (assuming normal precipitation) and for every year of monitoring. The stream must show signs of supporting flowpaths in all monitoring years. These indicators may include evidence of: scour, sediment deposition and sorting, multiple flow events, wrack lines and flow over vegetation, leaf litter, matted vegetation, or water staining.

Stream Geomorphology Performance

The site's geomorphology will be monitored per the NCIRT's 2016 guidance for headwater streams. Adjustment and lateral movement following construction are anticipated for these headwater stream systems. There will be an overall assessment for each reach to distinguish between localized adjustment within the stream valley and systemic concerns for the entire stream.

In monitoring years one through four the streams will be monitored for specific signs of concentrated flow. This could include linear scour, areas of flow that are deeper than adjacent flow, preferential paths through the wetland that are developing, and signs of continuous flow as documented by a field camera. As the site progresses to years five through seven, there should be signs of developing bed and banks throughout the site. These may not always be continuous, but evidence of an ordinary high water mark should be developing.

As discussed within this mitigation plan, there will be portions of the site that will have a low flow channel graded through the valley bottom to maintain positive surface drainage from the adjacent parcels and the various incoming drains and ditches. For these sections of stream the signs of concentrated flow should also be evident. This could also include evidence of scour or erosion or indications of concentrated flow outside of the initial channel. Even though these channels may have bed and banks artificially graded at the offset of monitoring, evidence of an ordinary high water mark developing within these channels will also be expected in years five through seven. Other indicators of successful stream development could include changing geomorphology within these channels, such as areas of scour and deposition, fish in the areas of concentrated flow or macroinvertebrates that are typically found in streams.

Wetland Hydrologic Performance
Wetland hydrology monitoring will be conducted to determine if the restored wetland areas meet the proposed performance criteria for wetland hydrology. The growing season for the project monitoring period will be March 1st through November 20th (265 days) based on correspondence with the USACE representative (Section 12.10). The site must present continuous saturated or inundated hydrologic conditions for at least 12% of the growing season (32 consecutive days) during normal weather conditions based on a conservative estimate. A "normal" year will be based on NRCS climatological data for Columbus County, and using the 30th to 70th percentile thresholds as the range of normal, as documented in the USACE Technical Report "Accessing and Using Meteorological Data to Evaluate Wetland Hydrology, April 2000."

8.0 MONITORING PLAN

Monitoring of the RHS and RHSII sites shall consist of the collection and analysis of stream and wetland hydrology, channel stability, and vegetation survivability data to support the evaluation of the project in meeting established performance standards described above. The Proposed Monitoring Plan in Figure 9 shows the anticipated locations of monitoring features described below.

Vegetation Monitoring
Vegetation monitoring will take place between July 1st and leaf drop. Vegetation must be planted and plots established at least 180 days prior to the start of the first year of monitoring. The success of the project vegetation will be evaluated using 0.02-acre square or rectangular plots. RHS will have 20 plots in the riparian wetland and stream zone and 12 plots in the non-riparian wetlands. Half of all of the plots will be permanently installed, while the remainder will be placed randomly at the time of each monitoring visit.

The majority of the RHSII easement is forested. RHSII will have 8 permanent plots in the riparian wetland and stream zone and 1 permanent plot in the non-riparian wetland in areas that are currently unforested or expected to be impacted by project construction. The current estimate for the amount of planted acreage required is 7.3 acres, but this quantity is subject to change depending on the exact amount of clearing necessary to complete the RHSII design. If additional vegetation plot coverage is needed following construction, randomly placed plots will be added for RHSII.

In the permanent plots, the plant's height, species, location, and origin (planted versus volunteer) will be noted. In the random plots, species and height will be recorded. In all plots, invasive stems will also be recorded to determine the percentage of invasive stems present. Additionally, a photograph will be taken of each plot. Beginning at the end of the first growing season, the site's vegetation will be monitored in years 1, 2, 3, 5, and 7.

Wetland Hydrologic Monitoring
Hydrologic performance will be determined through evaluation of automatic recording gauge data supplemented by documentation of wetland hydrology indicators as defined in the 1987 USACE Wetland Delineation Manual. Daily data at will be collected from automatic wells over the 7-year monitoring period following implementation. RHS will contain 13 automatic wells (8 in riparian wetlands and 5 in non-riparian wetlands). The RHSII will contain 7 automatic wells in the riparian wetlands and 1 in the non-riparian wetland.

Stream Hydrologic Monitoring
A minimum of one automatic recording gauge will be installed on Long Bay Creek on RHSII to document the presence of surface water. In addition, physical flow indicators (as described under Stream Hydrologic Performance) will be documented to demonstrate there are surface flows throughout the remainder of the project streams. One or more cameras (set to record a photo or video a minimum of once per day) may also be used to supplement the visual indicators. These monitoring tools will be used together to determine the presence of surface water throughout the headwater flowpaths.

Stream Geomorphology Monitoring
The project streams do not have a traditional stream morphology design, and as such, the typical stream geomorphology parameters will not be measured. The development of geomorphology across the headwater stream valleys will be evaluated through visual assessment.

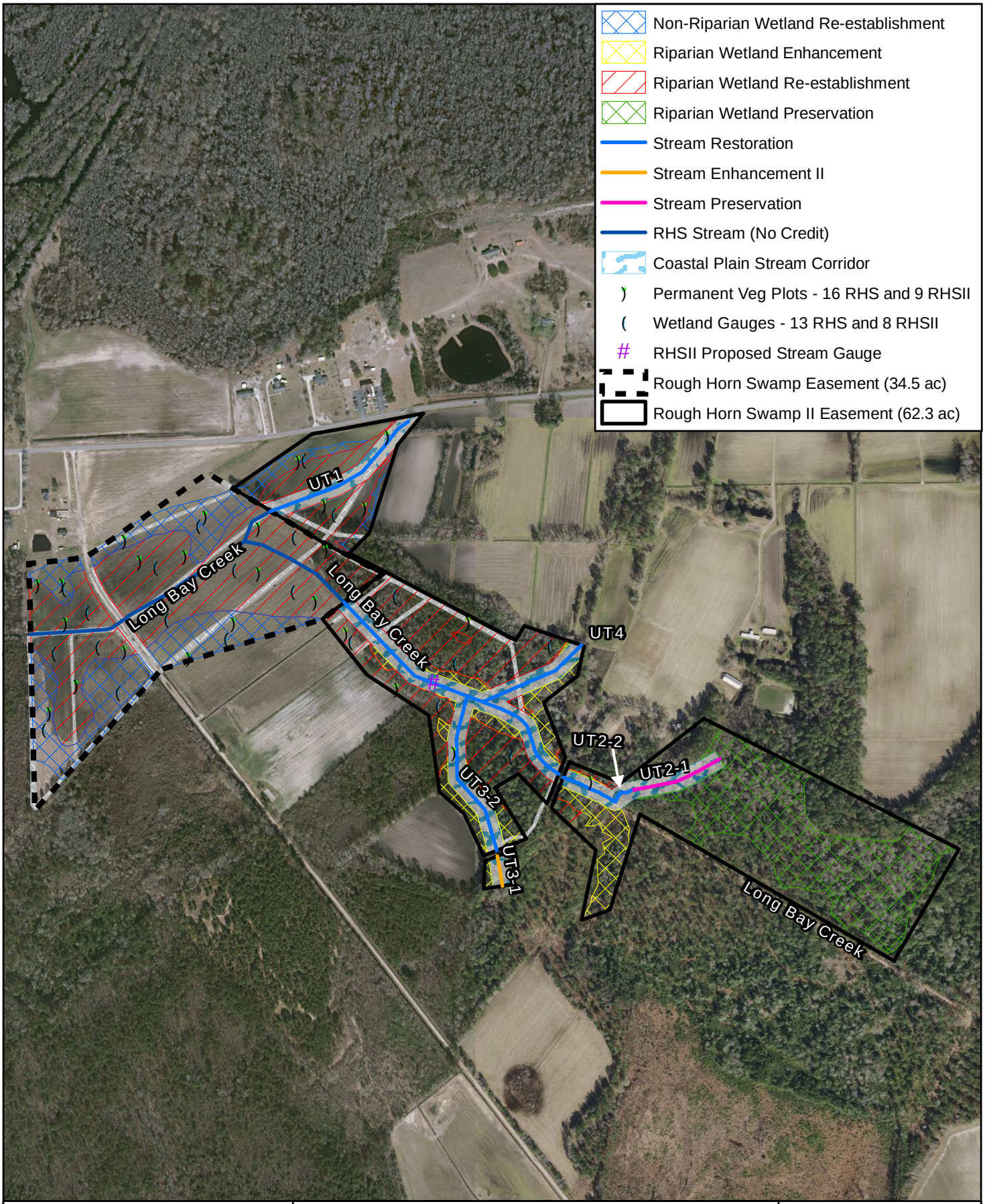
Visual Assessment
An annual site walk will be conducted within each monitoring period to evaluate and document the evolution of stream morphology. In addition, the site walk will also note any problem such as low stem density or poor plant vigor, areas dominated by undesirable volunteer species, prolonged inundation, native and exotic invasive species, beaver activity, herbivory, encroachments, indicators of livestock access, or other areas of concern. The findings of the visual assessment as well as any recommended corrective actions for problem areas will be summarized in the monitoring reports by way of a Current Conditions Plan View (CCPV) figure.

Photograph reference points (PRPs) will be established to assist in characterizing the site and to allow qualitative evaluation of the site conditions. The location of each photo point will be marked in the monitoring plan and the bearing/orientation of the photograph will be documented to allow for repeated use.

Reporting
Annual monitoring data will be reported using the most current DMS monitoring template from June 2017. The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, population of DMS databases for analysis, research purposes, and assist in decision making regarding project close-out. The report will document the monitored components and include all collected data, analyses, and photographs. The first scheduled monitoring will be conducted during the first full growing season following project completion. Full monitoring reports will be completed in Years 1, 2, 3, 5, and 7. Limited monitoring reports will be submitted in Years 4 and 6.

Table 13. Monitoring Requirements

Rough Horn Swamp and Rough Horn Swamp II Restoration Sites				
Required	**Parameter**	**Quantity**	**Frequency**	**Notes**
Yes	Stream Hydrology	1 pressure transducer gauge	Annual	1 gauge to be installed on Long Bay Creek within RHSII; visual monitoring will also be performed.
Yes	Groundwater Hydrology	21 gauges (13 at RHS; 8 at RHSII)	Annual	Groundwater monitoring gauges with data recording devices will be installed on-site; the data will be downloaded on a monthly basis during the growing season
Yes	Vegetation	20 riparian/stream plots and 12 non-riparian plots at RHS; 8 permanent riparian plots and 1 non-riparian at RHSII	Monitoring Years 1, 2, 3, 5, and 7	Minimum size of 0.02 acre square or rectangular; half of the RHS plots will be installed permanently while the other half will be randomly placed during each monitoring visit.
Yes	Visual Assessment		Annual	
Yes	Exotic and nuisance vegetation		Annual	Locations of exotic and nuisance vegetation will be mapped
Yes	Project boundary		Semi-annual	Locations of vegetation damage, boundary encroachments, etc. will be mapped



0 350 700 Feet

FIGURE 9. PROPOSED MONITORING PLAN
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC

Source: NC Statewide Orthoimagery, 2016 and 2017

9.0 ADAPTIVE MANAGEMENT PLAN

In the event the mitigation site or a specific component of the mitigation site fails to achieve the necessary performance standards as specified in the mitigation plan, KCI shall notify the members of the IRT and work with the IRT to develop contingency plans and remedial actions.

10.0 LONG-TERM MANAGEMENT PLAN

RHS and RHSII will be transferred to the NCDEQ Stewardship Program, which 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. Funding will be supplied by the responsible party on a yearly basis until such time an endowment is established. 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 Stewardship Program will periodically install signage as needed to identify boundary markings as needed. Any livestock or associated fencing or permanent crossings will be the responsibility the owner of the underlying fee to maintain.

11.0 REFERENCES

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12.0 APPENDICES

12.1 Plan Sheets

CONTRACT #: 6596 & 7514

KCI JOB# : 20152925 & 161802917

NCDEQ DIVISION OF MITIGATION SERVICES

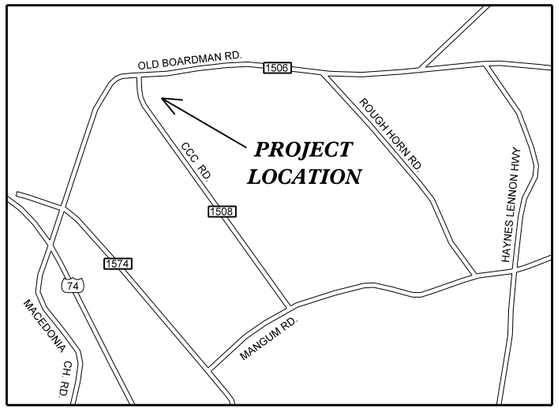
STATE	CONTRACT NUMBER	SHEET NO.	TOTAL SHEETS
N.C.	6596 & 7514	1	16

⚠	REVISED PER IRT COMMENTS	APRIL 2019
	REVISIONS	

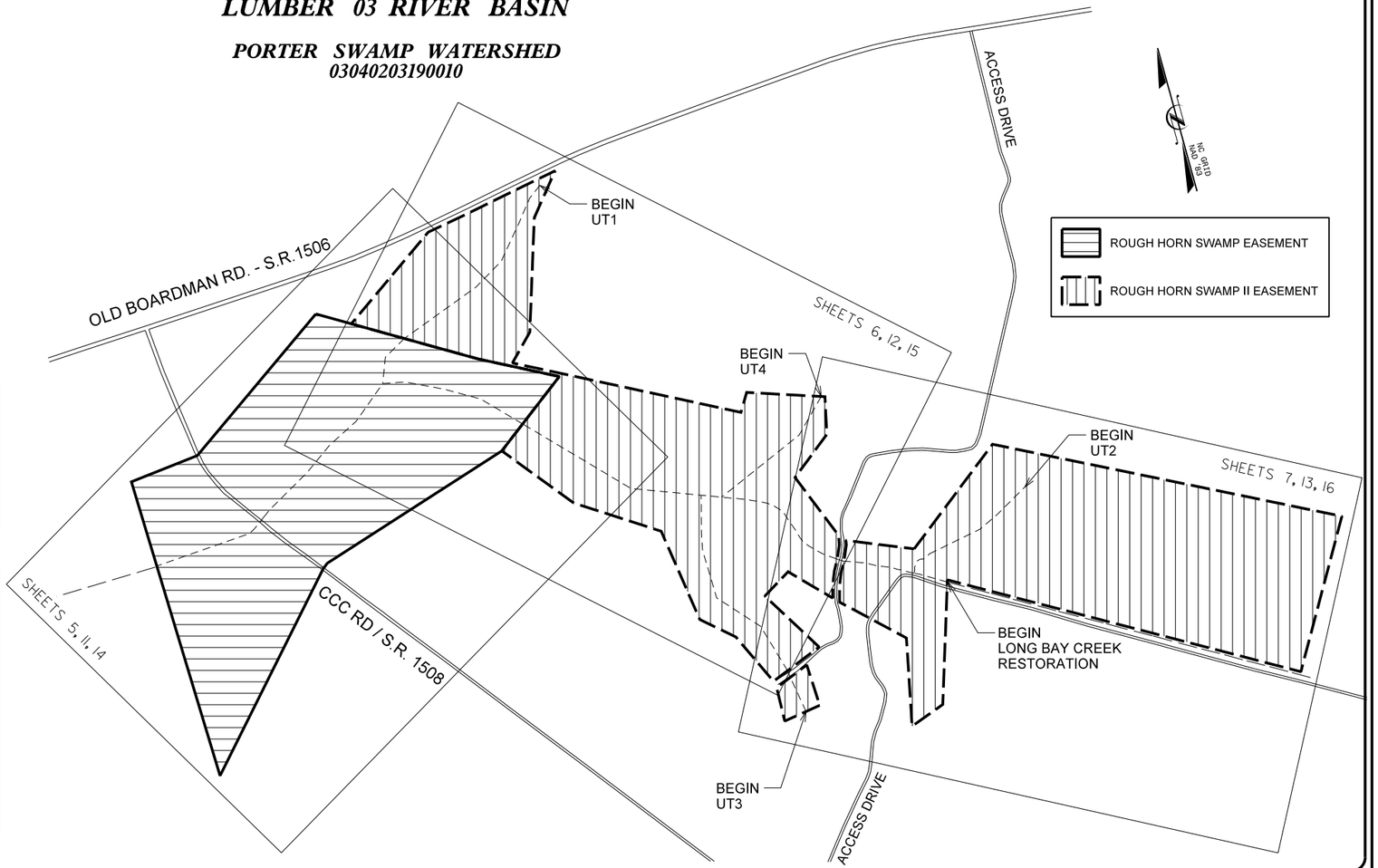
ROUGH HORN SWAMP & ROUGH HORN SWAMP II RESTORATION SITES

COLUMBUS COUNTY, NORTH CAROLINA
LUMBER 03 RIVER BASIN

PORTER SWAMP WATERSHED
03040203190010



VICINITY MAP
NOT TO SCALE



⚠

RHS - Project Asset Table

Project Component -or- Reach ID	Existing Footage/ Acreage	Stationing	Restoration Footage or Acreage	Creditable Footage or Acreage	Restoration Level	Approach Priority Level	Mitigation Ratio (X:1)	Mitigation Credits
Riparian Wetland	None (Drained Wetland)	N/A	20.267	20.267	Restoration (Re-establishment)	N/A	1 : 1	20.267
Non-Riparian Wetland	0.160 ac existing wetland	N/A	11.873	11.873	Restoration (Re-establishment)	N/A	1 : 1	11.873
Stream - LBC	3,470	30+49 to 50+08	1,959	1,899	Restoration	I	1 : 1	-
Stream - UT1	4	109+17 to 111+50	233	233	Restoration	I	1 : 1	-

RHSII - Project Asset Table

Riparian Wetland Restoration	None (Drained Wetland)	N/A	17.079	17.079	Restoration (Re-establishment)	N/A	1 : 1	17.079
Riparian Wetland Enhancement	7.900	N/A	5.956	5.956	Enhancement	N/A	2.5 : 1	2.382
Riparian Wetland Preservation	16.700	N/A	15.319	15.319	Preservation	N/A	10 : 1	1.532
Non-Riparian Wetland Restoration	None (Drained Wetland)	N/A	1.619	1.619	Restoration (Re-establishment)	N/A	1 : 1	-
Stream - LBC	2077	10+00 to 30+49	2,049	1,866	Restoration	I	1 : 1	1,866
Stream - UT1	811	100+00 to 109+17	917	917	Restoration	I	1 : 1	917
Stream - UT2-1	516	200+00 to 205+16	516	516	Preservation	I	10 : 1	52
Stream - UT2-2	120	205+16 to 206+36	120	120	Restoration	I	1 : 1	120
Stream - UT3-1	168	300+00 to 301+64	164	164	Enhancement II	I	2.5 : 1	66
Stream - UT3-2	571	301+95 to 311+09	914	914	Restoration	I	1 : 1	914
Stream - UT4	447	400+00 to 406+29	629	629	Restoration	I	1 : 1	629

* Crossings have been removed from creditable linear footage for all project streams.

DIRECTIONS TO SITE

FROM RALEIGH, TAKE I–40 EAST. AT BENSON, EXIT ONTO I–95 SOUTH. FOLLOW I–95 SOUTH TO LUMBERTON. TAKE EXIT 13A TO MERGE ONTO US–74 EAST. FOLLOW US–74 EAST FOR ABOUT 12 MILES, THEN TAKE A LEFT ONTO OLD BOARDMAN ROAD (S.R. 1506). AFTER APPROXIMATELY 1.5 MILES, TAKE A RIGHT ONTO S.R. 1508. THE SITE IS 400 FEET DOWN THE STREET.

INDEX OF SHEETS

Prepared in the Office of:

KCI ASSOCIATES OF NC

ENGINEERS•PLANNERS•ECOLOGISTS
4505 FALLS OF NEUSE ROAD
SUITE 400
RALEIGH, NC 27609

Prepared for:

LINDSAY CROCKER
DMS PROJECT MANAGER

Prepared by:

GARY M. MRYNCZA, PE
PROJECT ENGINEER

ALEX FRENCH
PROJECT DESIGNER

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

P.E.

SIGNATURE:

GENERAL NOTES:

BEARING AND DISTANCES:
ALL BEARINGS ARE NAD 1983 GRID BEARINGS.
ALL DISTANCES AND COORDINATES SHOWN ARE HORIZONTAL (GROUND) VALUES.

GRADING:
-PROPOSED GRADING NOTES IN THE PLANS ARE A GENERAL GUIDE FOR GRADING. EXACT TIE OUTS FROM THE DITCH TO THE RESTORED WETLAND SHALL BE GRADED UNDER THE DIRECTION OF THE ENGINEER.

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

CONTROL POINTS:

	NORTHING	EASTING	ELEVATION
KCI#1	255164.8288	2020768.8988	88.0874
KCI#2	255088.7100	2020181.9370	86.2800
KCI#3	255051.6568	2019649.8797	85.2638
KCI#4	254945.6643	2019068.3949	85.0196
KCI#5	254851.7880	2018498.6016	93.4930
KCI#6	254859.1490	2017867.1802	93.0103
KCI#7	254277.9022	2017857.8860	83.9231
KCI#8	253814.3610	2018105.9737	82.3403
KCI#9	253373.7183	2018472.7388	83.2617
KCI#10	252906.1865	2018813.4292	86.2284
KCI#11	253160.4947	2019307.4765	86.4407
KCI#12	253476.0715	2019681.1411	84.0832
KCI#13	253902.7348	2019877.2428	85.2121
KCI#14	253803.7436	2020167.4303	85.0118
KCI#15	254036.1245	2020306.4308	85.1697
KCI#16	254458.9481	2020345.4887	85.6331
KCI#17	254777.0273	2020615.6705	86.8116
KCI#20	252526.1552	2019122.6578	86.7974
KCI#21	253595.3824	2019734.5388	82.8941
KCI#22	253488.6556	2019963.8199	83.2555
KCI#23	253364.7901	2020232.9005	84.1880
KCI#50	253952.4178	2019608.3835	83.1195
KCI#51	254077.8778	2019602.2696	83.0505
KCI#52	253855.8829	2019496.1346	83.7082
KCI#53	254002.8940	2019237.2140	82.5800
KCI#54	254239.7698	2019293.4929	82.8265
KCI#55	254320.8500	2019131.1964	81.2323
KCI#56	254518.1660	2019297.2988	82.6386
KCI#57	254323.5000	2019660.9783	84.2180
KCI#58	253792.0988	2020196.7582	84.6658
KCI#60	253391.8963	2020258.6851	81.9831
KCI#61	253435.6362	2020080.4943	83.4059
KCI#62	253162.5774	2020333.3210	82.2832
KCI#63	253043.5532	2020459.9125	86.8679
KCI#64	252977.2653	2020634.8041	82.7222

PROJECT LEGEND:

Existing Ditch to be Filled .....

Existing Spoil Piles to be Removed .....

Proposed Ditch Plug .....

Proposed Log Drop .....

Proposed Live Lift .....

Proposed Thalweg Spot Elevations ..... + 83.5

Proposed Stream Valley Stationing ..... 10+00 11+00

Existing Woods Line .....

Minor Contour Line .....

Major Contour Line 77.0

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

DATE	DESCRIPTION	SYM.

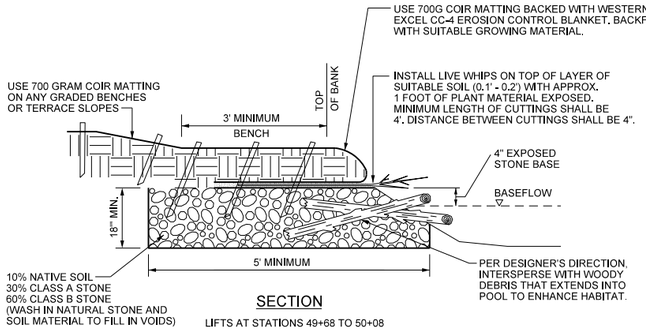
NCDEQ – DIVISION OF MITIGATION SERVICES

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

ROUGH HORN SWAMP
& ROUGH HORN SWAMP II
RESTORATION SITES
COLUMBUS COUNTY, NORTH CAROLINA

DATE: APRIL 2019
SCALE: N.T.S.

GENERAL NOTES & PROJECT LEGEND



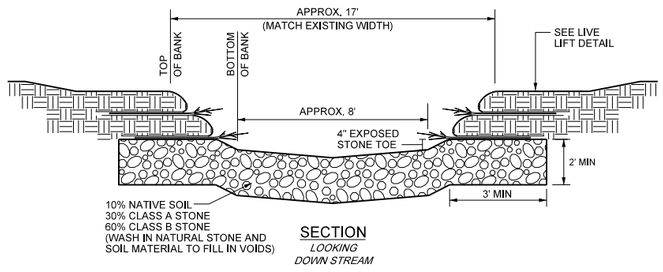
SECTION

LIFTS AT STATIONS 49+68 TO 50+08

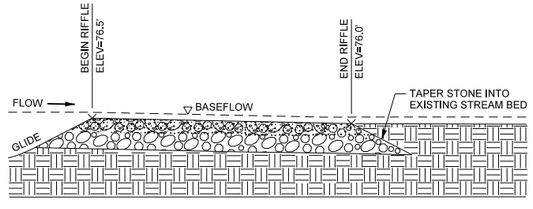
NOTE:
USE 1.5'x1"x2" WOODEN STAKES ON 2' CENTERS. STAKES SHALL HAVE A 'ROOFING' NAIL AT TOP TO KEEP FABRIC FROM SLIPPING OFF.

LIVE LIFT

SCALE: NTS



SECTION
LOOKING DOWN STREAM

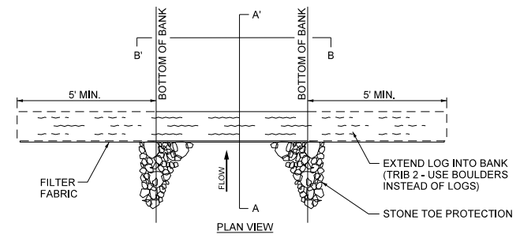


PROFILE

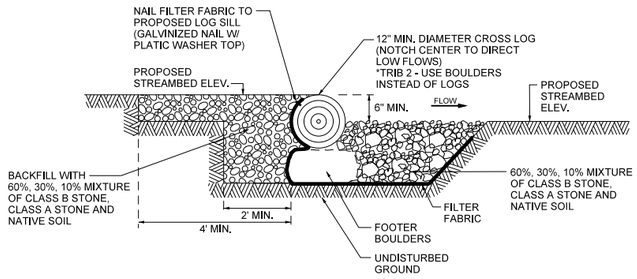
NOTE:
STONE INSTALLATION: START BY INSTALLING STONE MIXTURE. FINISH BY WASHING IN NATURAL STREAM MATERIAL TO FILL IN VOIDS.

CONSTRUCTED RIFFLE (STATION 49+68 TO 50+08)

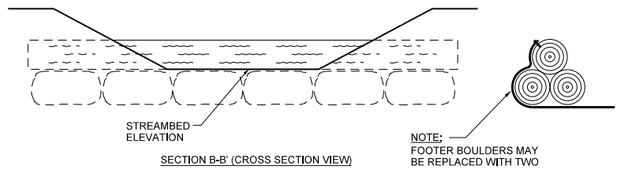
SCALE: NTS



PLAN VIEW



SECTION A-A' (PROFILE VIEW)



SECTION B-B' (CROSS SECTION VIEW)

NOTE:
FOOTER BOULDERS MAY BE REPLACED WITH TWO 12" DIAMETER (MIN.) LOGS IF AVAILABLE. ENSURE LOGS ARE STRAIGHT WITH NO GAPS WHEN PLACED TOGETHER.

LOG DROP DETAIL

SCALE: NTS

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

SYM.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ – DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
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4505 FALLS OF NEUSE ROAD, SUITE 400
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ROUGH HORN SWAMP
& ROUGH HORN SWAMP II
RESTORATION SITES
COLUMBUS COUNTY, NORTH CAROLINA

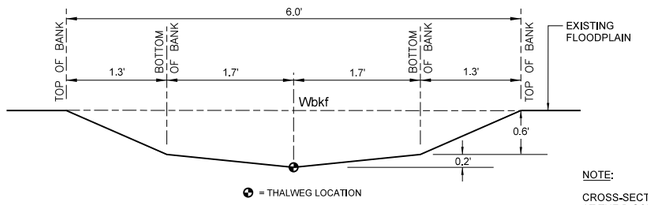
DATE: APRIL 2019
SCALE: N.T.S.

DETAILS

SHEET 3 OF 16

TYPICAL CROSS-SECTION

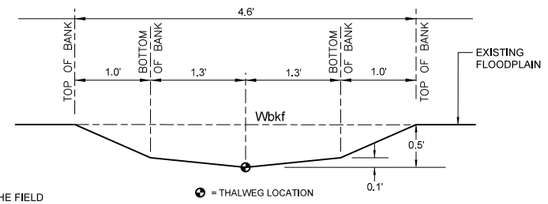
MAINSTEM
STATION 10+00 TO 50+08



TYPICAL CROSS-SECTION

UT1: STATION 100+00 TO 111+50
UT2: STATION 205+16 TO 206+36
UT3: STATION 300+00 TO 311+09
UT4: STATION 400+00 TO 406+29

AND ALL INCOMING DRAINAGES



NOTE:

CROSS-SECTION MAY BE ADJUSTED IN THE FIELD AT THE DISCRETION OF THE DESIGN REPRESENTATIVE.

WOODY DEBRIS TO BE EMBEDDED IN NEW STREAM THALWEGS TO ACT AS NATURAL HABITAT AND AID IN BED VARIABILITY.

NOTES:

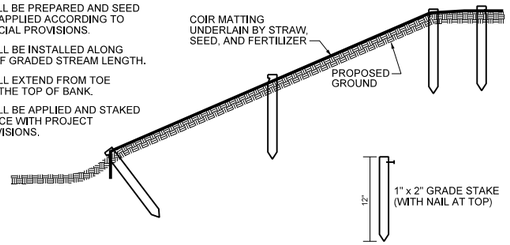
-MATTING SHALL BE INSTALLED PRIOR TO THE INTRODUCTION OF WATER TO A STREAM SECTION.

-GROUND SHALL BE PREPARED AND SEED & FERTILIZER APPLIED ACCORDING TO PROJECT SPECIAL PROVISIONS.

-MATTING SHALL BE INSTALLED ALONG BOTH SIDES OF GRADED STREAM LENGTH.

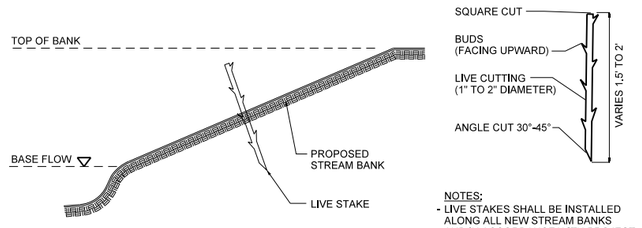
-MATTING SHALL EXTEND FROM TOE OF SLOPE TO THE TOP OF BANK.

-MATTING SHALL BE APPLIED AND STAKED IN ACCORDANCE WITH PROJECT SPECIAL PROVISIONS.



COIR MATTING DETAIL

SCALE: NTS

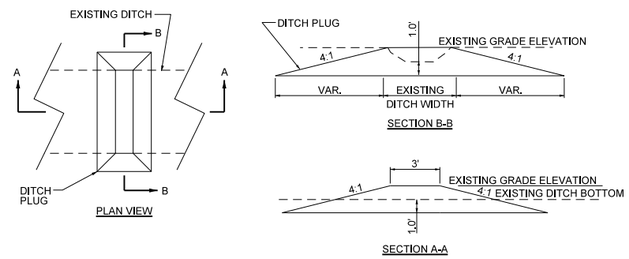


NOTES:
- LIVE STAKES SHALL BE INSTALLED ALONG ALL NEW STREAM BANKS AND IN ACCORDANCE WITH PROJECT SPECIAL PROVISIONS AND AS DIRECTED BY THE DESIGNER.

LIVE STAKES SHALL BE PLANTED AT 3' CENTER SPACING (EACH BANK).
- RANDOM SPECIES PLACEMENT.

LIVE STAKES

SCALE: NTS



NOTE:
SEE PLAN SHEETS FOR LOCATIONS OF DITCH PLUGS.
USE SELECT MATERIAL, CLASS I OR SUITABLE SALVAGED MATERIAL, IF AVAILABLE FOR DITCH PLUGS.

DITCH PLUG DETAIL

SCALE: NTS

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

SYM.	DESCRIPTION	DATE

NCDEQ – DIVISION OF MITIGATION SERVICES

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

ROUGH HORN SWAMP
& ROUGH HORN SWAMP II
RESTORATION SITES
COLUMBUS COUNTY, NORTH CAROLINA

DATE: APRIL 2019
SCALE: N.T.S.

DETAILS

SHEET 4 OF 16

S.R. 1506

CONSERVATION EASEMENT (RH)

END NEW CHANNEL FOR LONG BAY CREEK (TIE INTO EXISTING THALWEG)

BEGIN PROPOSED CONSTRUCTED RIFFLE / LIVE LIFTS (SEE DETAIL SHEET 3) BEGIN=76.50' / END=76.00'

PROPOSED LOG DROP
77.10=LOG SILL
76.60=AFTER LOG DROP

PROPOSED LOG DROP
77.80=LOG SILL
77.30=AFTER LOG DROP

PROPOSED LOG DROP
78.50=LOG SILL
78.00=AFTER LOG DROP

INSTALL DITCH PLUG

INSTALL DITCH PLUG

PROPOSED 20'-4"Wx4'-6"H ALUMINUM CULVERT (SUBJECT TO ONGOING REVIEW BY NCDOT)

INV=78.5'

INV=78.6'

EXISTING 60" CMP CULVERT TO BE REMOVED

PROPOSED LOG DROP
79.54=LOG SILL
79.16=AFTER LOG DROP

PROPOSED LOG DROP
79.06=LOG SILL
78.68=AFTER LOG DROP

FILL EXISTING DITCH (TYPICAL ALL)

CONFLUENCE OF UT1 AND LONG BAY CREEK

SEE SHEET 6 FOR UT1 THALWEG ELEVATIONS

WOODY DEBRIS TO BE EMBEDDED IN NEW STREAM THALWEGS TO ACT AS NATURAL HABITAT AND AID IN BED VARIABILITY.

INSTALL DITCH PLUG AND GRADE TO REDIRECT DRAINAGE PATH TOWARD CENTER OF WETLAND

FILL EXISTING DITCH (TYPICAL ALL)

INSTALL DITCH PLUG AND GRADE TO REDIRECT DRAINAGE PATH TOWARD CENTER OF WETLAND

EXISTING 48" CMP CULVERT TO BE REMOVED

CONSERVATION EASEMENT (RH)

USE EXISTING SPOIL PILES TO FILL DITCHES (TYPICAL ALL HATCHED AREAS)

FILL EXISTING DITCH (TYPICAL ALL)

CONSERVATION EASEMENT (RH)

CONSERVATION EASEMENT (RH)

CCC RD / S.R. 1508

MATCHLINE - SEE SHEET 6

MATCHLINE - SEE SHEET 6

NC GRID AND NAD 83

–80′ –40′ 0′ 80′ 160′

GRAPHIC SCALE

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

DATE	DESCRIPTION	SYM.
	REVISIONS	

NCDEQ – DIVISION OF MITIGATION SERVICES

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RALEIGH, NORTH CAROLINA 27609

ROUGH HORN SWAMP & ROUGH HORN SWAMP II RESTORATION SITES

COLUMBUS COUNTY, NORTH CAROLINA

DATE: APRIL 2019
SCALE: GRAPHIC

SITE PLAN

OLD BOARDMAN RD. - S.R. 1506

BEGIN UT1 RESTORATION

PROPOSED LOG DROP
83.1=LOG SILL
82.6=AFTER LOG DROP

INSTALL DITCH PLUG

PROPOSED LOG DROP
82.2=LOG SILL
81.7=AFTER LOG DROP

WOODY DEBRIS TO BE EMBEDDED IN NEW STREAM THALWEGS TO ACT AS NATURAL HABITAT AND AID IN BED VARIABILITY.

INSTALL DITCH PLUG AND GRADE TO REDIRECT DRAINAGE PATH TOWARD CENTER OF WETLAND

CONFLUENCE OF UT1 AND LONG BAY CREEK

LONG BAY CREEK

FILL EXISTING DITCH (TYPICAL ALL)

CONSERVATION EASEMENT (RH2)

CONSERVATION EASEMENT (RH)

MATCHLINE - SEE SHEET 5

BEGIN UT4 RESTORATION

INSTALL DITCH PLUG AND GRADE TO REDIRECT DRAINAGE PATH TOWARD CENTER OF WETLAND

USE EXISTING SPOIL PILES TO FILL DITCHES (TYPICAL ALL HATCHED AREAS)

INSTALL DITCH PLUG AND GRADE TO REDIRECT DRAINAGE PATH TOWARD CENTER OF WETLAND

WOODY DEBRIS TO BE EMBEDDED IN NEW STREAM THALWEGS TO ACT AS NATURAL HABITAT AND AID IN BED VARIABILITY.

CONFLUENCE OF UT4 AND LONG BAY CREEK

CONFLUENCE OF UT3 AND LONG BAY CREEK

INSTALL DITCH PLUG

LONG BAY CREEK

FILL EXISTING DITCH (TYPICAL ALL)

MATCHLINE - SEE SHEET 7

NE GRID
MAG 6°

–80′ –40′ 0′ 80′ 160′
GRAPHIC SCALE

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NO.	BY	DESCRIPTION	DATE
	SYM.	REVISIONS	

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RALEIGH, NORTH CAROLINA 27609

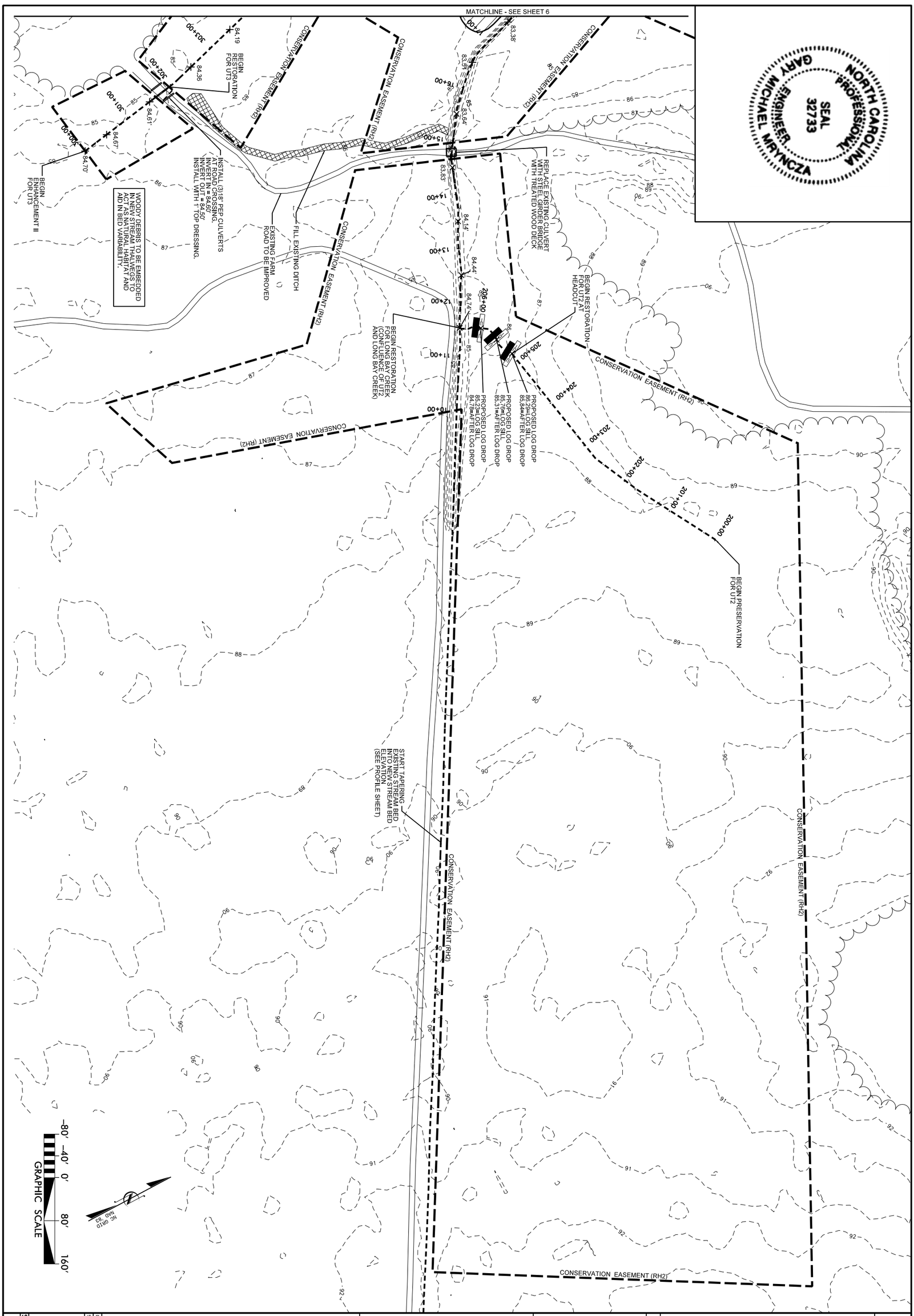
ROUGH HORN SWAMP & ROUGH HORN SWAMP II RESTORATION SITES

COLUMBUS COUNTY, NORTH CAROLINA

DATE: APRIL 2019
SCALE: GRAPHIC

SITE PLAN

SHEET 6 OF 16



NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 32733 GARY MICHAEL MRYNCZA

SHEET 7 OF 16	SITE PLAN	DATE: APRIL 2019 SCALE: GRAPHIC

ROUGH HORN SWAMP & ROUGH HORN SWAMP II RESTORATION SITES

COLUMBUS COUNTY, NORTH CAROLINA

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SYM.	DESCRIPTION	DATE
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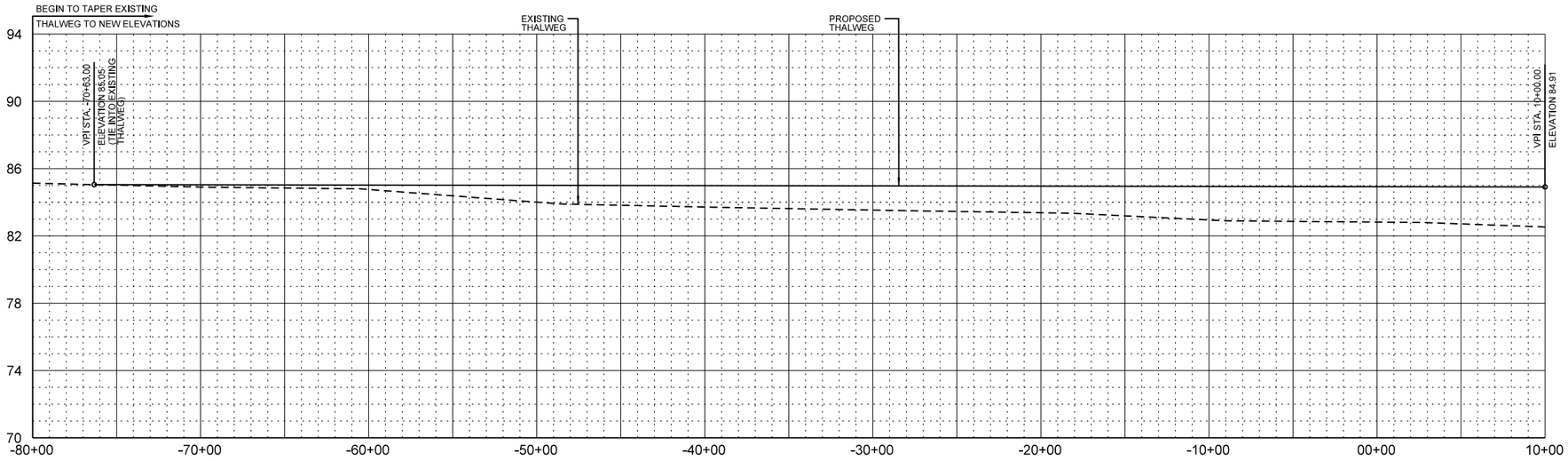

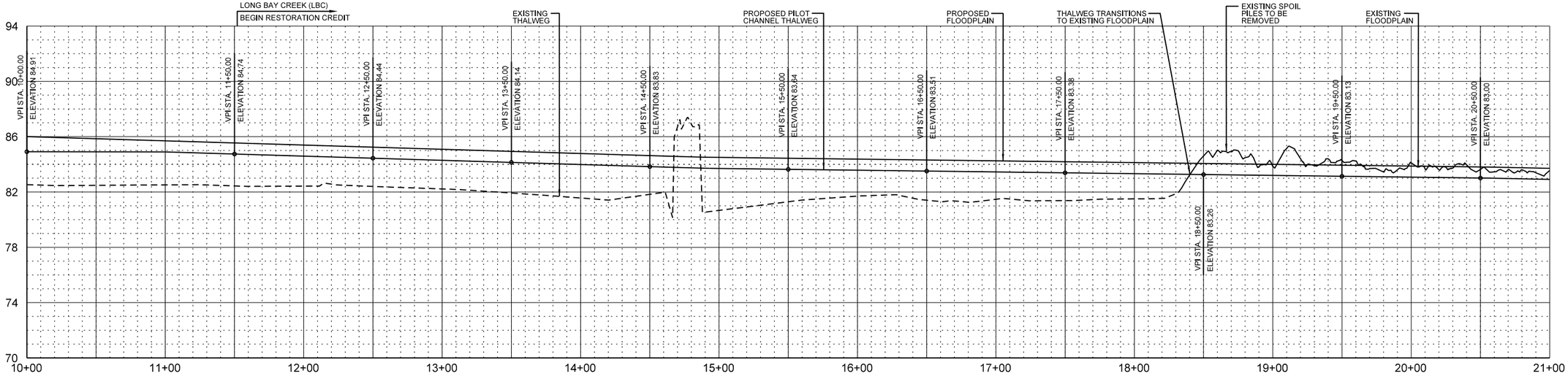

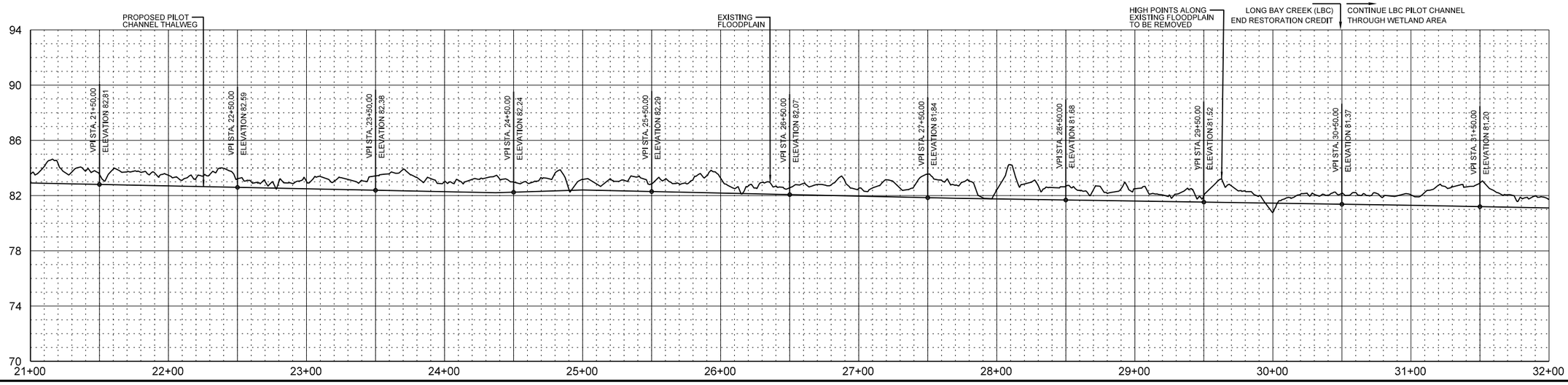

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

SYM.	DESCRIPTION	DATE
	REVISIONS	

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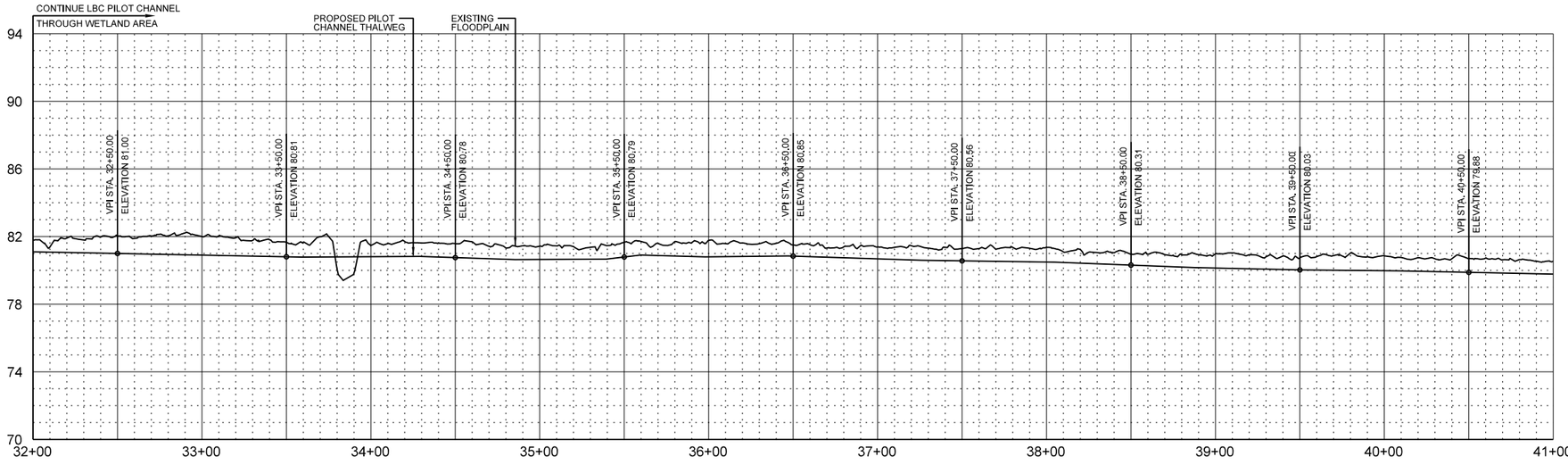
ROUGH HORN SWAMP & ROUGH HORN SWAMP II RESTORATION SITES

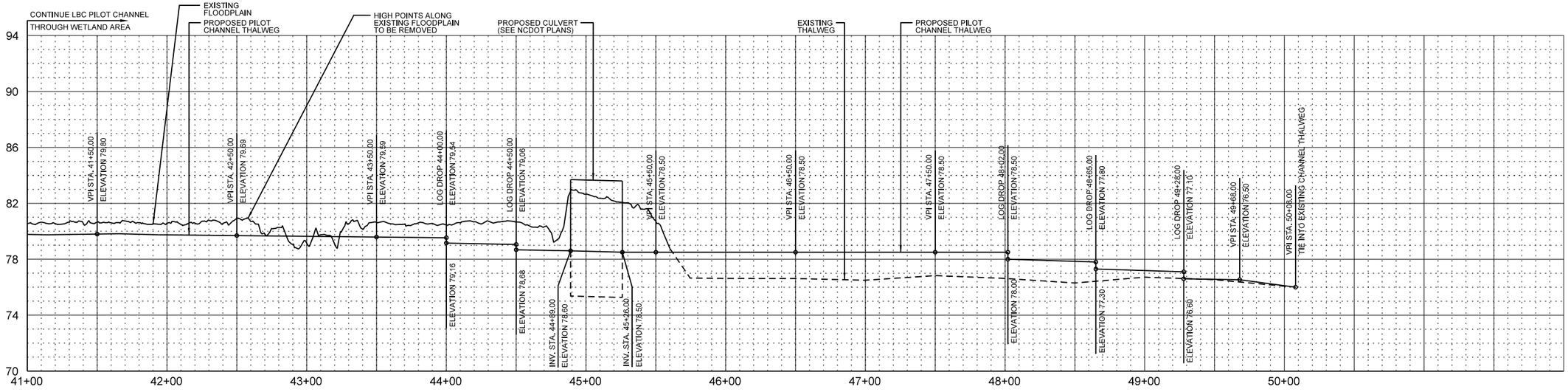
COLUMBUS COUNTY, NORTH CAROLINA

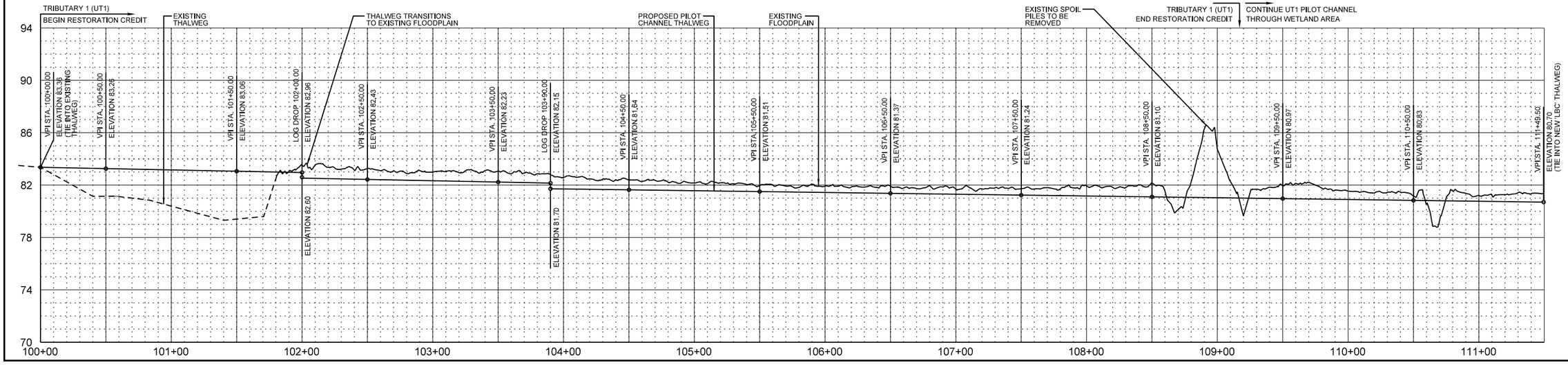
DATE: APRIL 2019
SCALE: 1"=40'

PROFILES

SHEET 8 OF 16







SYM.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ – DIVISION OF MITIGATION SERVICES

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RALEIGH, NORTH CAROLINA 27609

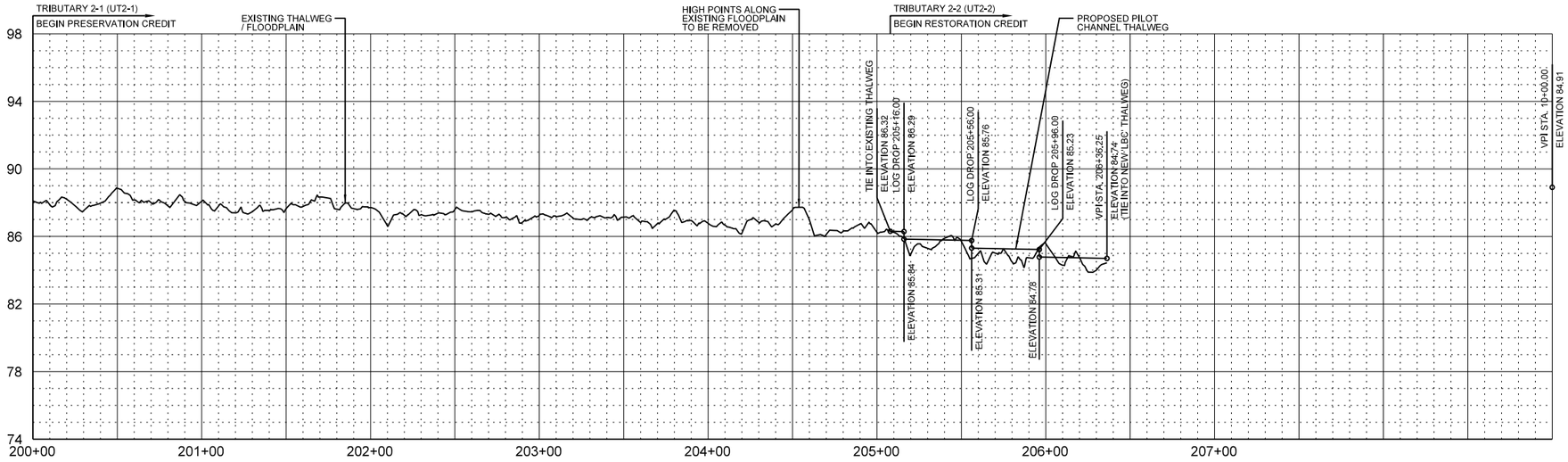
ROUGH HORN SWAMP & ROUGH HORN SWAMP II RESTORATION SITES

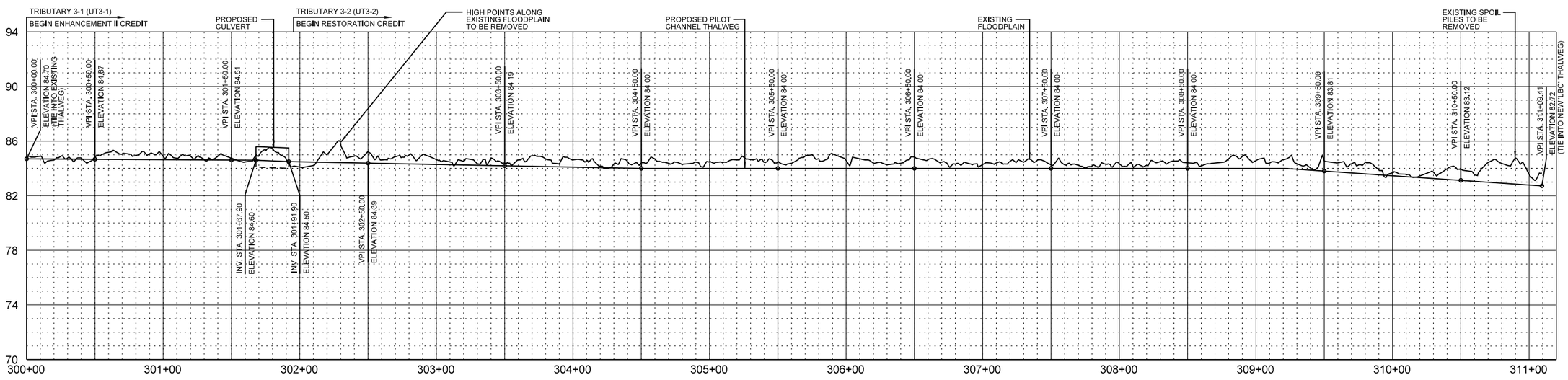
COLUMBUS COUNTY, NORTH CAROLINA

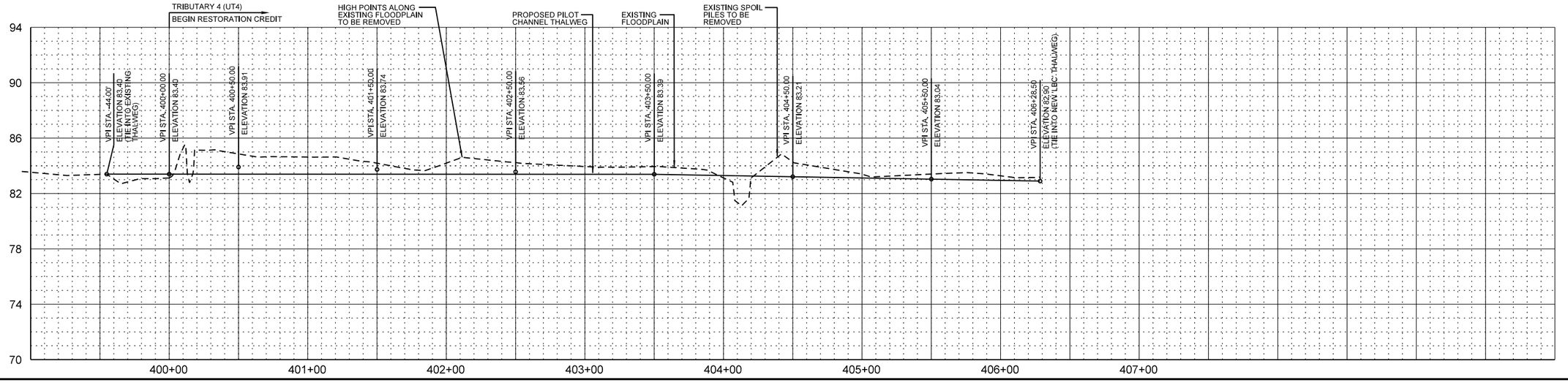
DATE: APRIL 2019
SCALE: 1"=40'

PROFILES

SHEET 9 OF 16







NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

SYM.	DESCRIPTION	DATE
	REVISIONS	

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

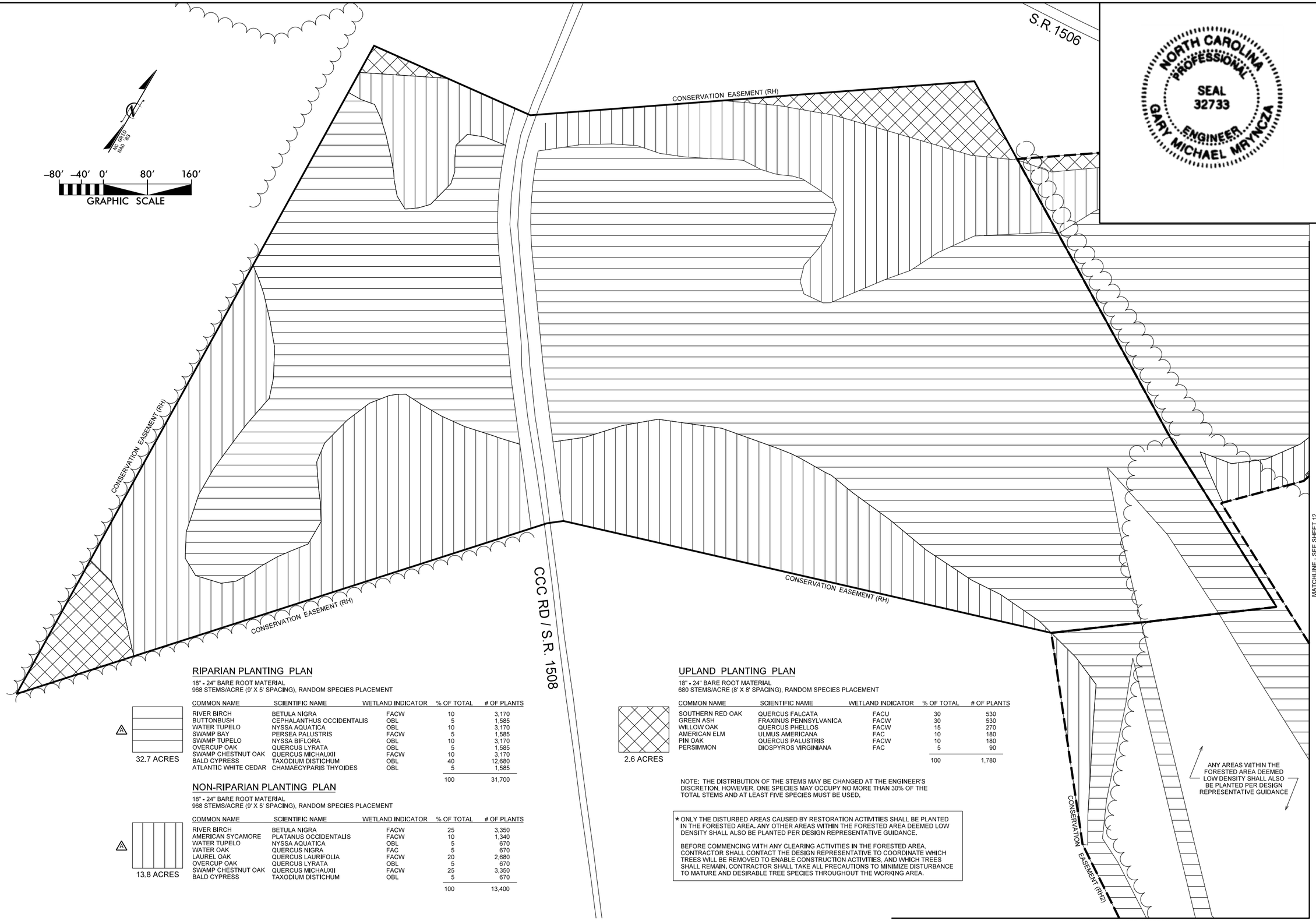
ROUGH HORN SWAMP & ROUGH HORN SWAMP II RESTORATION SITES

COLUMBUS COUNTY, NORTH CAROLINA

DATE: APRIL 2019
SCALE: 1"=40'

PROFILES

SHEET 10 OF 16



NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

RIPARIAN PLANTING PLAN

18" - 24" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

A — 32.7 ACRES

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR	% OF TOTAL	# OF PLANTS
RIVER BIRCH	BETULA NIGRA	FACW	10	3,170
BUTTONBUSH	CEPHALANTHUS OCCIDENTALIS	OBL	5	1,585
WATER TUPELO	NYSSA AQUATICA	OBL	10	3,170
SWAMP BAY	PERSEA PALUSTRIS	FACW	5	1,585
SWAMP TUPELO	NYSSA BIFLORA	OBL	10	3,170
OVERCUP OAK	QUERCUS LYRATA	OBL	5	1,585
SWAMP CHESTNUT OAK	QUERCUS MICHAUXII	FACW	10	3,170
BALD CYPRESS	TAXODIUM DISTICHUM	OBL	40	12,680
ATLANTIC WHITE CEDAR	CHAMAECYPARIS THYOIDES	OBL	5	1,585
			100	31,700

NON-RIPARIAN PLANTING PLAN

18" - 24" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

A — 13.8 ACRES

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR	% OF TOTAL	# OF PLANTS
RIVER BIRCH	BETULA NIGRA	FACW	25	3,350
AMERICAN SYCAMORE	PLATANUS OCCIDENTALIS	FACW	10	1,340
WATER TUPELO	NYSSA AQUATICA	OBL	5	670
WATER OAK	QUERCUS NIGRA	FAC	5	670
LAUREL OAK	QUERCUS LAURIFOLIA	FACW	20	2,680
OVERCUP OAK	QUERCUS LYRATA	OBL	5	670
SWAMP CHESTNUT OAK	QUERCUS MICHAUXII	FACW	25	3,350
BALD CYPRESS	TAXODIUM DISTICHUM	OBL	5	670
			100	13,400

UPLAND PLANTING PLAN

18" - 24" BARE ROOT MATERIAL
680 STEMS/ACRE (8' X 8' SPACING), RANDOM SPECIES PLACEMENT

2.6 ACRES

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR	% OF TOTAL	# OF PLANTS
SOUTHERN RED OAK	QUERCUS FALCATA	FACU	30	530
GREEN ASH	FRAXINUS PENNSYLVANICA	FACW	30	530
WILLOW OAK	QUERCUS PHELLOS	FACW	15	270
AMERICAN ELM	ULMUS AMERICANA	FAC	10	180
PIN OAK	QUERCUS PALUSTRIS	FACW	10	180
PERSIMMON	DIOSPYROS VIRGINIANA	FAC	5	90
			100	1,780

NOTE: THE DISTRIBUTION OF THE STEMS MAY BE CHANGED AT THE ENGINEER'S DISCRETION. HOWEVER, ONE SPECIES MAY OCCUPY NO MORE THAN 30% OF THE TOTAL STEMS AND AT LEAST FIVE SPECIES MUST BE USED.

* ONLY THE DISTURBED AREAS CAUSED BY RESTORATION ACTIVITIES SHALL BE PLANTED IN THE FORESTED AREA. ANY OTHER AREAS WITHIN THE FORESTED AREA DEEMED LOW DENSITY SHALL ALSO BE PLANTED PER DESIGN REPRESENTATIVE GUIDANCE.

BEFORE COMMENCING WITH ANY CLEARING ACTIVITIES IN THE FORESTED AREA, CONTRACTOR SHALL CONTACT THE DESIGN REPRESENTATIVE TO COORDINATE WHICH TREES WILL BE REMOVED TO ENABLE CONSTRUCTION ACTIVITIES, AND WHICH TREES SHALL REMAIN. CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO MINIMIZE DISTURBANCE TO MATURE AND DESIRABLE TREE SPECIES THROUGHOUT THE WORKING AREA.

ANY AREAS WITHIN THE FORESTED AREA DEEMED LOW DENSITY SHALL ALSO BE PLANTED PER DESIGN REPRESENTATIVE GUIDANCE

DATE	DESCRIPTION	BY
APRIL 2019	REVISED PER IRT COMMENTS	

REVISIONS

NCDEQ – DIVISION OF MITIGATION SERVICES

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

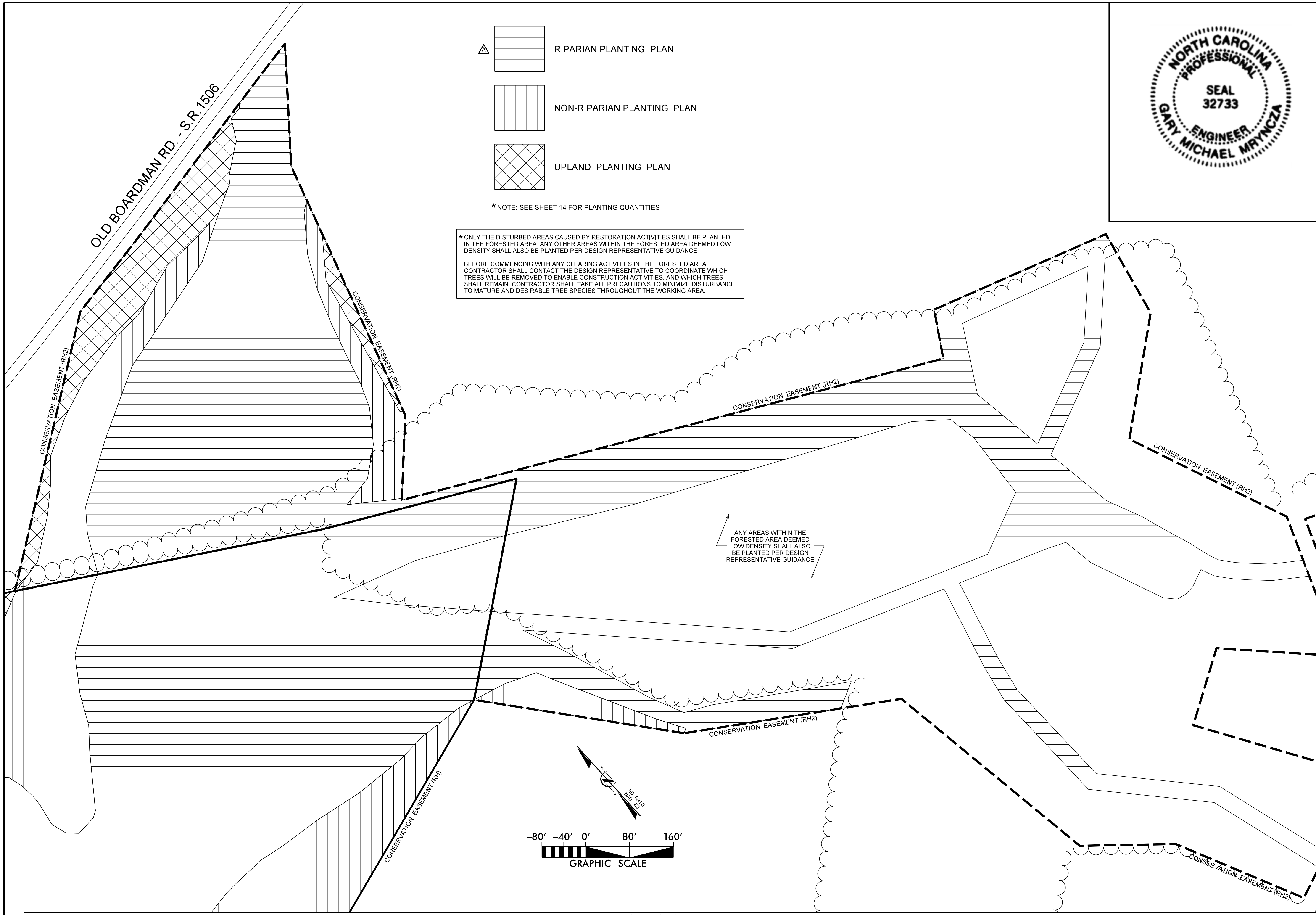
ROUGH HORN SWAMP & ROUGH HORN SWAMP II RESTORATION SITES

COLUMBUS COUNTY, NORTH CAROLINA

DATE: APRIL 2019
SCALE: GRAPHIC

PLANTING PLAN

SHEET 11 OF 16



A RIPARIAN PLANTING PLAN

NON-RIPARIAN PLANTING PLAN

UPLAND PLANTING PLAN

*NOTE: SEE SHEET 14 FOR PLANTING QUANTITIES

* ONLY THE DISTURBED AREAS CAUSED BY RESTORATION ACTIVITIES SHALL BE PLANTED IN THE FORESTED AREA. ANY OTHER AREAS WITHIN THE FORESTED AREA DEEMED LOW DENSITY SHALL ALSO BE PLANTED PER DESIGN REPRESENTATIVE GUIDANCE.

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NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

SYM.	DESCRIPTION	DATE
A	REVISED PER IRT COMMENTS	APRIL 2019

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RALEIGH, NORTH CAROLINA 27609

ROUGH HORN SWAMP
& ROUGH HORN SWAMP II
RESTORATION SITES
COLUMBUS COUNTY, NORTH CAROLINA

DATE: APRIL 2019
SCALE: GRAPHIC

PLANTING PLAN

SHEET 12 OF 16

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NC GRID NAD 83

–80′ –40′ 0′ 80′ 160′

GRAPHIC SCALE

MATCHLINE - SEE SHEET 12

CONSERVATION EASEMENT (RH2)

ANY AREAS WITHIN THE FORESTED AREA DEEMED LOW DENSITY SHALL ALSO BE PLANTED PER DESIGN REPRESENTATIVE GUIDANCE

RIPARIAN PLANTING PLAN

*NOTE: SEE SHEET 14 FOR PLANTING QUANTITIES

* ONLY THE DISTURBED AREAS CAUSED BY RESTORATION ACTIVITIES SHALL BE PLANTED IN THE FORESTED AREA. ANY OTHER AREAS WITHIN THE FORESTED AREA DEEMED LOW DENSITY SHALL ALSO BE PLANTED PER DESIGN REPRESENTATIVE GUIDANCE.

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SYM.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ – DIVISION OF MITIGATION SERVICES

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RALEIGH, NORTH CAROLINA 27609

ROUGH HORN SWAMP & ROUGH HORN SWAMP II RESTORATION SITES

COLUMBUS COUNTY, NORTH CAROLINA

DATE: APRIL 2019
SCALE: GRAPHIC

PLANTING PLAN

S.R. 1506

CCC RD / S.R. 1508

CE

MATCHLINE - SEE SHEET 15

MATCHLINE - SEE SHEET 15

EASEMENT BOUNDARY MARKING

THE EASEMENT BOUNDARY WILL BE MARKED WITH METAL POSTS AND CONSERVATION EASEMENT SIGNS AT THE CORNERS AND AT A MINIMUM OF 100' INTERVALS ALONG THE BOUNDARY.

WHEN APPROPRIATE, PROVIDER SHALL MARK EXISTING TREES WITH CONSERVATION EASEMENT SIGNS AND / OR BLAZE PROPERTY LINES AT APPROXIMATELY EYE LEVEL.

- 6-FOOT TALL DURABLE WITNESS POSTS AND 5/8" REBAR 30" IN LENGTH WITH 3-1/4" ALUMINUM CAPS ON ALL EASEMENT CORNERS. CAPS SHALL MEET DMS SPECIFICATIONS (BERNSTEN RBD5325 IMPRINTED WITH NC STATE LOGO #B9087 OR EQUIVALENT). AFTER INSTALLATION, CAPS SHALL BE STAMPED WITH THE CORRESPONDING NUMBER.
- 6-FOOT TALL DURABLE WITNESS POST ALONG BOUNDARY OF CONSERVATION EASEMENT. POSTS SHALL BE MADE OF MATERIAL THAT WILL LAST A MINIMUM OF 20 YEARS. THE PROVIDER SHALL ATTACH A CONSERVATION EASEMENT SIGN TO EACH WITNESS POST AND PLACE ADDITIONAL SIGNS AT NO MORE THAN 100-FOOT INTERVALS ON BOUNDARY LINES.
- CE — CONSERVATION EASEMENT

NC GRID NAD 83

–80′ –40′ 0′ 80′ 160′

GRAPHIC SCALE

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NO.	DESCRIPTION	DATE
	REVISIONS	

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

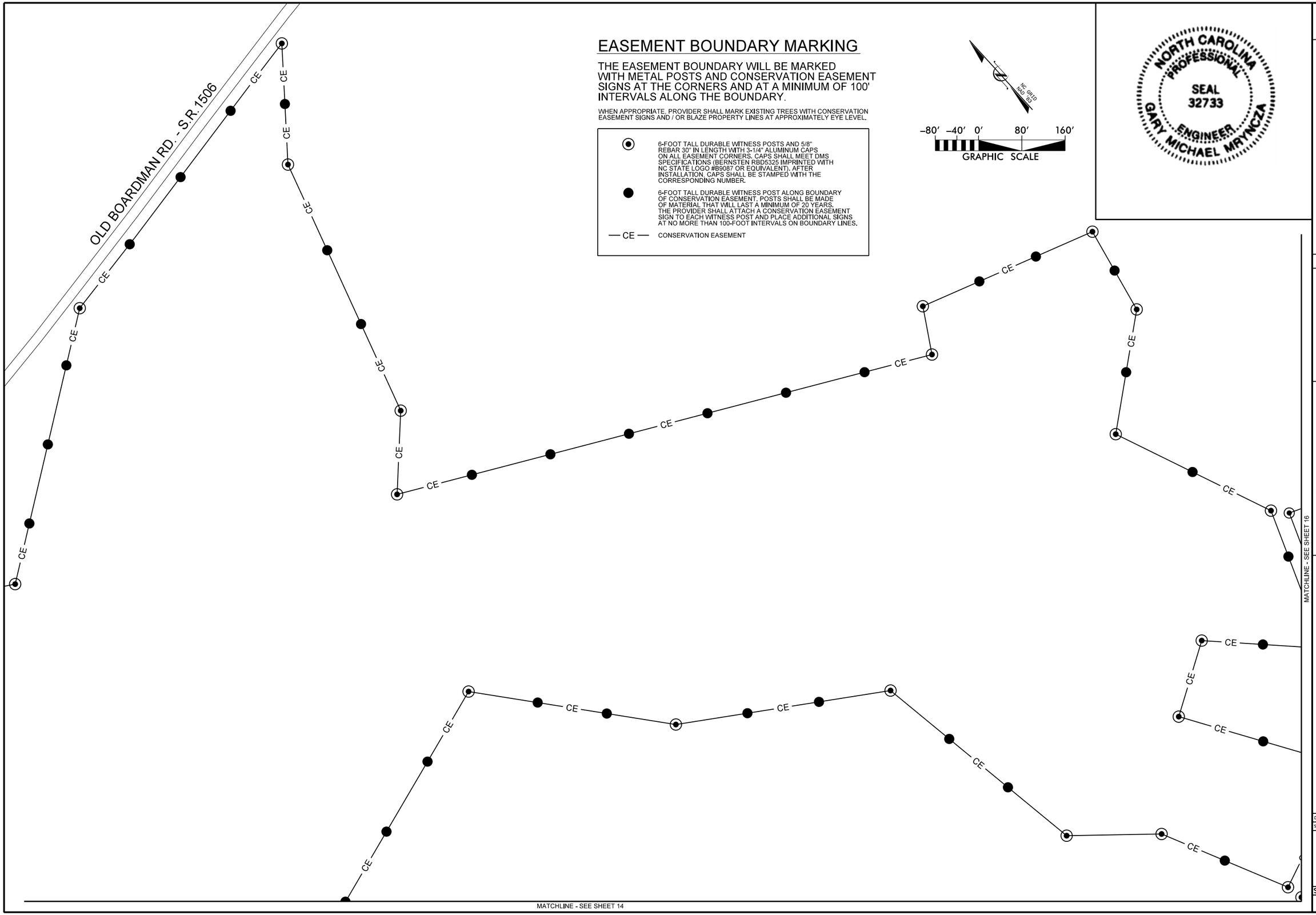
ROUGH HORN SWAMP
& ROUGH HORN SWAMP II
RESTORATION SITES

COLUMBUS COUNTY, NORTH CAROLINA

DATE: APRIL 2019
SCALE: GRAPHIC

BOUNDARY MARKING PLAN

SHEET 14 OF 16



EASEMENT BOUNDARY MARKING

THE EASEMENT BOUNDARY WILL BE MARKED WITH METAL POSTS AND CONSERVATION EASEMENT SIGNS AT THE CORNERS AND AT A MINIMUM OF 100' INTERVALS ALONG THE BOUNDARY.

WHEN APPROPRIATE, PROVIDER SHALL MARK EXISTING TREES WITH CONSERVATION EASEMENT SIGNS AND / OR BLAZE PROPERTY LINES AT APPROXIMATELY EYE LEVEL.

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- — CE — CONSERVATION EASEMENT

NC GRID NAD 1983

–80′ –40′ 0′ 80′ 160′

GRAPHIC SCALE

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS			
STAL	DESCRIPTION	DATE	

NCDEQ – DIVISION OF MITIGATION SERVICES

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

ROUGH HORN SWAMP & ROUGH HORN SWAMP II RESTORATION SITES

COLUMBUS COUNTY, NORTH CAROLINA

DATE: APRIL 2019

SCALE: GRAPHIC

BOUNDARY MARKING PLAN

SHEET 15 OF 16

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

MATCHLINE - SEE SHEET 15

CE

EASEMENT BOUNDARY MARKING

THE EASEMENT BOUNDARY WILL BE MARKED WITH METAL POSTS AND CONSERVATION EASEMENT SIGNS AT THE CORNERS AND AT A MINIMUM OF 100' INTERVALS ALONG THE BOUNDARY.

WHEN APPROPRIATE, PROVIDER SHALL MARK EXISTING TREES WITH CONSERVATION EASEMENT SIGNS AND / OR BLAZE PROPERTY LINES AT APPROXIMATELY EYE LEVEL.

- 6-FOOT TALL DURABLE WITNESS POSTS AND 5/8" REBAR 30" IN LENGTH WITH 3-1/4" ALUMINUM CAPS ON ALL EASEMENT CORNERS. CAPS SHALL MEET DMS SPECIFICATIONS (BERNSTEN RBD5325 IMPRINTED WITH NC STATE LOGO #B9087 OR EQUIVALENT). AFTER INSTALLATION, CAPS SHALL BE STAMPED WITH THE CORRESPONDING NUMBER.
- 6-FOOT TALL DURABLE WITNESS POST ALONG BOUNDARY OF CONSERVATION EASEMENT. POSTS SHALL BE MADE OF MATERIAL THAT WILL LAST A MINIMUM OF 20 YEARS. THE PROVIDER SHALL ATTACH A CONSERVATION EASEMENT SIGN TO EACH WITNESS POST AND PLACE ADDITIONAL SIGNS AT NO MORE THAN 100-FOOT INTERVALS ON BOUNDARY LINES.
- — CE — CONSERVATION EASEMENT

NC GRID AND NAD 83

–80′ –40′ 0′ 80′ 160′

GRAPHIC SCALE

REVISIONS

SYM	DESCRIPTION	DATE

NCDEQ – DIVISION OF MITIGATION SERVICES

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

ROUGH HORN SWAMP & ROUGH HORN SWAMP II RESTORATION SITES

COLUMBUS COUNTY, NORTH CAROLINA

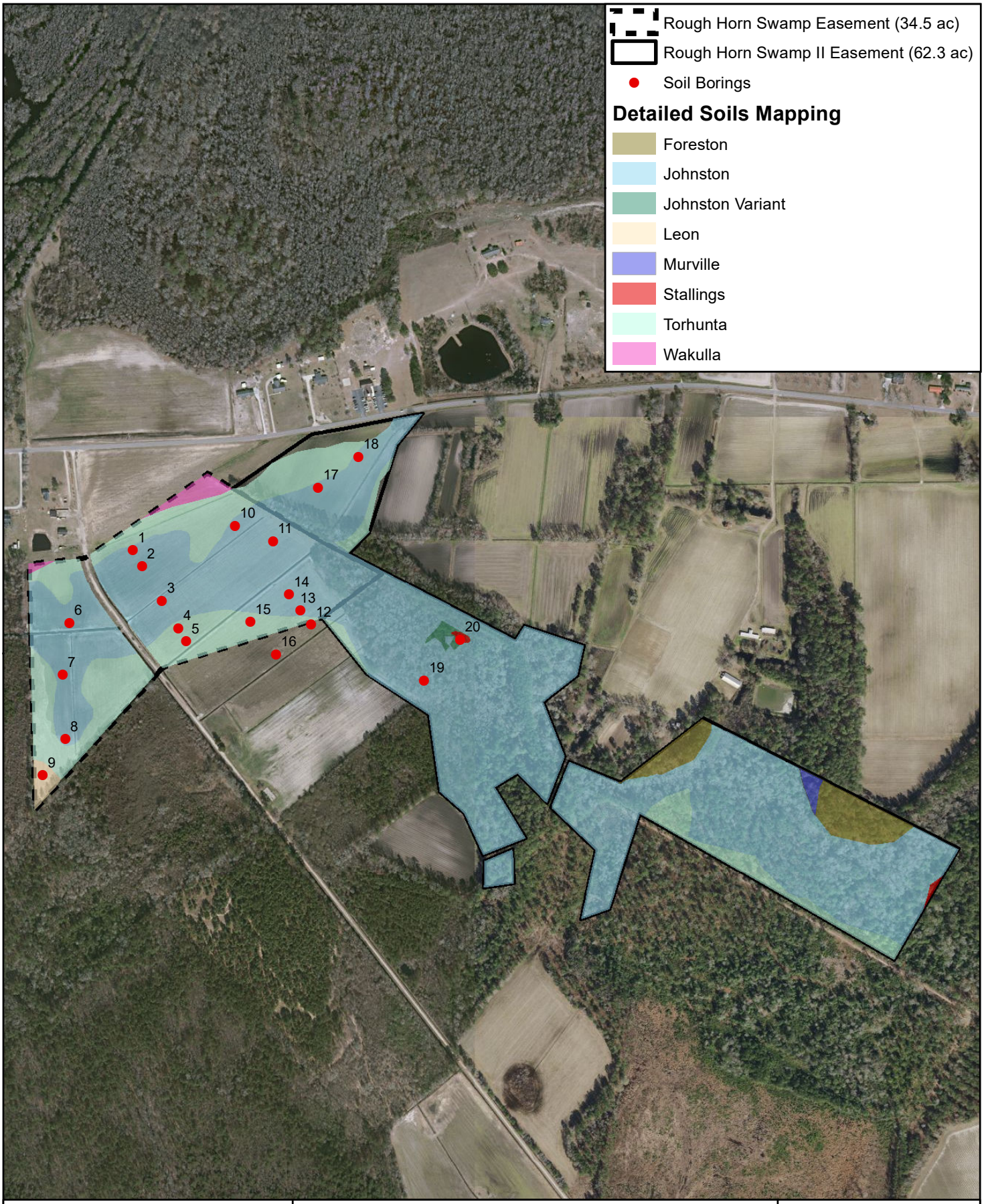
DATE: APRIL 2019
SCALE: GRAPHIC

BOUNDARY MARKING PLAN

SHEET 16 OF 16

12.2 Data Analysis/Supplemental Information and Maps

Soil Delineation and Borings
Lidar Mapping
Groundwater Data
DRAINMOD Water Budget
Reference Wetland
Valley Cross-Sections
Nutrient Reduction Estimate



0 350 700 Feet

DETAILED SOIL MAPPING AND SOIL BORINGS
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC

N

Source: NC Statewide Orthoimagery, 2016 and 2017

KCI
ASSOCIATES OF
NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** February 9, 2011
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20101137P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road, Evergreen, NC 28438 **Site/Lot:** SB # 1
Soil Series: Johnston Variant
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Cumulic Humaquepts
AWT: 19" **SHWT:** 0-12" **Slope:** 0-1% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained **Permeability:** Moderately rapid
Vegetation: Soybeans
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-13	10YR 2/1		Mucky fsl	1fgr	mfr	as	
A1	13-16	10YR 2/1		fsl	1fgr	mfr	as	
A2	16-25	10YR 3/1		Mucky ls	1fsbk	mfr	as	
A3	25-46	10YR 3/1		sl	massive	mfr	as	
Cg	46-60	10YR 4/2	10YR 5/1c2d	ls	massive	wso		scl lenses

COMMENTS:

DESCRIBED BY: SFS

DATE: 2/9/2011

KCI
ASSOCIATES OF
NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** February 9, 2011
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20101137P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road, Evergreen, NC 28438 **Site/Lot:** SB # 2
Soil Series: Johnston
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Cumulic Humaquepts
AWT: N/A **SHWT:** 0-12" **Slope:** 0-1% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained **Permeability:** Moderately rapid
Vegetation: Soybeans
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-8	10YR 2/1		Mucky loam	massive	mfr	as	
A	8-30	10YR 3/1		lcos	massive	mfr	as	
Cg1	30-38	10YR 4/2		lcos	sg	wso	as	
Cg2	38-60	10YR 5/1		ls-s	massive	mfr		

COMMENTS:
Surface ponding from melted snow yesterday fills bore hole while augering.

DESCRIBED BY: SFS DATE: 2/9/2011

LICENSED SOIL SCIENTIST
STEVEN F. STOKES
THE GREAT SEAL OF THE STATE OF NORTH CAROLINA
1087
STATE OF NORTH CAROLINA

KCI
ASSOCIATES OF
NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** February 9, 2011
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20101137P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road, Evergreen, NC 28438 **Site/Lot:** SB # 3
Soil Series: Johnston
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Cumulic Humaquepts
AWT: 18" **SHWT:** 0-12" **Slope:** 0-1% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained **Permeability:** Moderately rapid
Vegetation: Soybeans
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-8	10YR 3/1		Mucky loam	massive	mfr	as	
A	8-28	10YR 3/1		ls-sl	1fgr	mfr	as	
Cg1	28-34	10YR 4/1		ls	massive	mfr	as	
Cg2	34-40	10YR 5/2		s-ls	sg	wso	as	stratified sand
Cg3	40-60	10YR 5/2		s-ls	massive	wso		scl lenses

COMMENTS:

LICENSED SOIL SCIENTIST
STEVEN F. STOKES
THE GREAT SEAL OF THE STATE OF NORTH CAROLINA
1087
STATE OF NORTH CAROLINA

DESCRIBED BY: SFS DATE: 2/9/2011

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** February 9, 2011
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20101137P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road, Evergreen, NC 28438 **Site/Lot:** SB # 4
Soil Series: Torhunta
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: N/A **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained, slow runoff **Permeability:** Moderately rapid
Vegetation: Soybeans
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-8	10YR 2/1		Mucky loam	massive	mfr	as	
A	8-24	10YR 3/1		sl	1fgr	mfr	gw	
Bg	24-40	10YR 4/2		sl	1fsbk	mfr	gw	
Cg1	40-46	10YR 4/2		s	massive	mfr	as	
Cg2	46-60	10YR 5/2		s	sg			coarse sand

COMMENTS:
Surface ponding from melted snow yesterday fills bore hole while augering.

DESCRIBED BY: SFS

LICENSED SOIL SCIENTIST
STEVEN F. STOKES
THE GREAT SEAL OF THE STATE OF NORTH CAROLINA
1087
STATE OF NORTH CAROLINA

DATE: 2/9/2011

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** February 9, 2011
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20101137P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road, Evergreen, NC 28438 **Site/Lot:** SB # 5
Soil Series: Torhunta
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: 20" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained, slow runoff **Permeability:** Moderately rapid
Vegetation: Soybeans
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-6	10YR 2/1		Mucky loam	1fgr	mfr	as	
A1	6-10	10YR 3/1		ls	1fgr	mfr	gw	
A2	10-18	10YR 3/2		ls	1fgr	mfr	gw	
Bg	18-30	10YR 3/2	10YR 4/2f1f	sl	1fsbk	mfr	gw	
			10YR 4/3f1f					
Cg1	30-54	10YR 4/2		ls	sg	mfr	dw	
Cg2	54-62	10YR 5/1		sl	massive			

COMMENTS:
Water level in UT to Lumber River 30" from top of bank.

DESCRIBED BY: SFS DATE: 2/9/2011

LICENSED SOIL SCIENTIST
STEVEN F. STOKES
1087
STATE OF NORTH CAROLINA

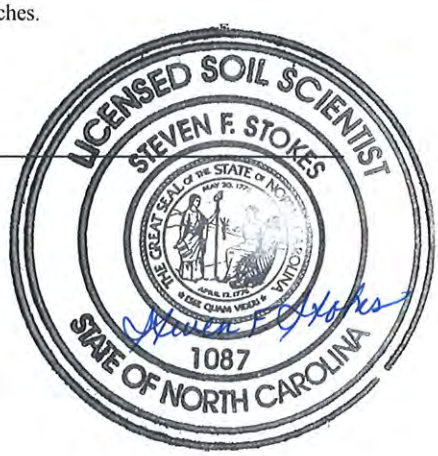
KCI
ASSOCIATES OF
NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** February 9, 2011
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20101137P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road, Evergreen, NC 28438 **Site/Lot:** SB # 6
Soil Series: Johnston
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Cumulic Humaquepts
AWT: 18" **SHWT:** 0-12" **Slope:** 0-1% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained **Permeability:** Moderately rapid
Vegetation: Soybeans
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-12	10YR 2/1		Mucky loam	massive	mfr	as	
A	12-30	10YR 3/1		ls	1fgr-massive	mfr	as	
Cg1	30-42	10YR 4/1		sl	massive	mfr	as	
Cg2	42-54	10YR 3/2	10YR 3/3c2d	s	massive	mfr	gw	10YR 3/3 color of naturally buried wood
			10YR 4/3f1f			mfr		
Cg3	54-60	10YR 6/2		s	massive			

COMMENTS:
Water level in ditch 22" from top of bank.
Gravel layer (0.5"-1" gravel) between 50 to 56 inches.



DESCRIBED BY: SFS DATE: 2/9/2011

KCI
ASSOCIATES OF
NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** February 9, 2011
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20101137P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road, Evergreen, NC 28438 **Site/Lot:** SB # 7
Soil Series: Johnston
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Cumulic Humaquepts
AWT: 18" **SHWT:** 0-12" **Slope:** 0-1% **Aspect:**
Elevation: **Drainage:** Very poorly Drained **Permeability:** Moderately rapid
Vegetation: Soybeans
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-8	10YR 2/1		Mucky loam	1fgr-massive	mfr	as	High Organic Content
A1	8-20	10YR 2/1		Mucky loam	massive	mfr	as	High Organic Content
A2	20-39	10YR 3/1		sl	massive	mfr	as	
Cg1	39-48	10YR 4/2		s	sg	wso	as	
Cg2	48-60	10YR 5/2		s	massive	wso		

COMMENTS:

DESCRIBED BY: SFS DATE: 2/9/2011

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** February 9, 2011
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20101137P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road, Evergreen, NC 28438 **Site/Lot:** SB # 8
Soil Series: Johnston
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Cumulic Humaquepts
AWT: 18" **SHWT:** 0-12" **Slope:** 0-1% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained **Permeability:** Moderately rapid
Vegetation: Soybeans
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-8	10YR 2/1		Mucky loam	massive	mfr	as	High Organic Content
A1	8-30	10YR 2/1		Mucky loam	massive	mfr	as	High Organic Content
A2	30-42	10YR 3/1		sl	massive	mfr	as	
Cg1	42-46	10YR 4/2		ls	sg	mfr	as	
Cg2	46-60	10YR 5/1		s	massive			

COMMENTS:

LICENSED SOIL SCIENTIST
STEVEN F. STOKES
THE GREAT SEAL OF THE STATE OF NORTH CAROLINA
1087
STATE OF NORTH CAROLINA

DESCRIBED BY: SFS DATE: 2/9/2011

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** February 9, 2011
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20101137P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road, Evergreen, NC 28438 **Site/Lot:** SB # 9
Soil Series: Leon
Soil Classification: Sandy, siliceous, thermic Aeric Haplaquods
AWT: 48" **SHWT:** 0-12 **Slope:** 0-5% **Aspect:**
Elevation: **Drainage:** Poorly Drained **Permeability:** Moderate to moderately slowly
Vegetation: Soybeans
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-6	10YR 2/1		fs	1fgr	as		
A	6-10	10YR 3/2		fs	1fgr	cw		
E	10-22	10YR 4/2		fs	1fsbk	cw		
Bh1	22-31	10YR 3/1		ls	1csbk	cs		
B'h1	31-44	10YR 3/1		ls	1fsbk	cw		
B'h2	44-60	10YR 3/1		s	massive			cemented

COMMENTS:
Water level in UT to Lumber River 48" from top of bank.

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STATE OF NORTH CAROLINA

DESCRIBED BY: SFS DATE: 2/9/2011

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** February 9, 2011
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20101137P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road, Evergreen, NC 28438 **Site/Lot:** SB # 10
Soil Series: Torhunta Variant
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: 20" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately rapid
Vegetation: Soybeans
Borings terminated at 54 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-8	10YR 2/1		fsl	1fgr	mfr	as	
Bg	8-30	10YR 4/2		ls	1fsbk	mfr	cs	
Cg1	30-54	10YR 4/1		s	sg	wso		

COMMENTS:
Didn't achieve 60" due to bore hole cave-in but reached the C horizon.

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1087
STATE OF NORTH CAROLINA

DESCRIBED BY: SFS DATE: 2/9/2011

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** February 9, 2011
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20101137P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road, Evergreen, NC 28438 **Site/Lot:** SB # 11
Soil Series: Johnston Variant
Soil Classification: Coarse-loamy, siliceous, active, acid thermic Cumulic Humaquepts
AWT: 20" **SHWT:** 0-12" **Slope:** 0-1% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained **Permeability:** Moderately rapid
Vegetation: Soybeans
Borings terminated at 40 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-8	10YR 2/1		Mucky loam	massive	mfr	as	breaking to 1fgr
Cg1	8-24	10YR 5/2		ls	massive	mfr	gw	breaking to 1fgr
Cg2	24-36	10YR 3/2		s	sg	wso	ac	
Cg3	36-40	10YR 3/2		s	massive	wso		cemented

COMMENTS:
Didn't achieve 60" due to bore hole cave-in but reached the C horizon.

LICENSED SOIL SCIENTIST
STEVEN F. STOKES
THE GREAT SEAL OF THE STATE OF NORTH CAROLINA
1087
STATE OF NORTH CAROLINA

DESCRIBED BY: SFS DATE: 2/9/2011

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** April 8, 2015
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring#12
Soil Series: Torhunta
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: 20" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately Rapid
Vegetation: Corn
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-9	10YR 2/1		fsl	1fgr	mfr	aw	
A1	9-20	10YR 2/1		fsl	1fgr	mfr	gw	
Bg	20-36	10YR 4/2		sl	1fsbk	mfr	gw	
BC	36-51	10YR 4/2		ls	1msbk	mfr	dw	diffuse boundary, sandy loam (sl) lenses
Cg	51-60	10YR 5/2		s	massive			

COMMENTS:
Torhunta is a drained hydric soil
The Torhunta series is a very poorly drained soil found on nearly level stream terraces and upland bay areas of Coastal Plain.
This Torhunta soil has very slow runoff and moderately rapid permeability.

DESCRIBED BY: SFS DATE: 4/8/2015

LICENSED SOIL SCIENTIST
STEVEN F. STOKES
1087
STATE OF NORTH CAROLINA

KCI ASSOCIATES OF NORTH CAROLINA, PA

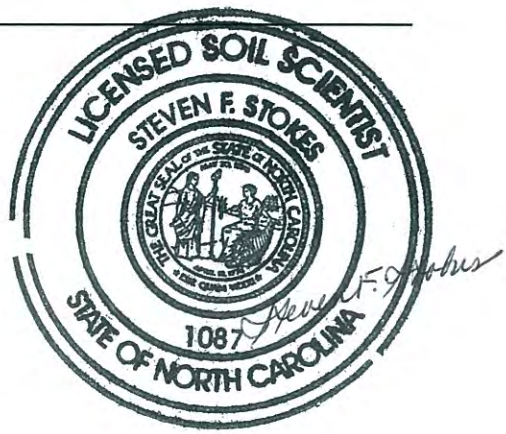
SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** April 8, 2015
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring#13
Soil Series: Johnston
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Cumulic Humaquepts
AWT: 24" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately rapid
Vegetation: Corn
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-6	10YR 2/1		ls	massive	mfr	as	massive breaking to 1fgr
A1	6-11	10YR 3/1		fsl	massive	mfr	as	massive breaking to 1msbk
A2	11-42	10YR 3/2		sl	massive	mfr	as	massive breaking to 1f&msbk
Cg1	42-50	10YR 5/2		cos sl	sg	mfr	as	
Cg2	50-60	10YR 5/2		cos s	massive			

COMMENTS:
Johnston is a drained hydric soil
The Johnston series is a very poorly drained soil found on nearly level floodplains and swamps of the Coastal Plain.
This Johnston soil has very slow runoff and moderately rapid permeability.

DESCRIBED BY: SFS DATE: 4/8/2015



KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** April 8, 2015
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring # 14
Soil Series: Johnson
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Cumulic Humaquepts
AWT: 36" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately Rapid
Vegetation: Corn
Borings terminated at 56 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-14	10YR 2/1		fsl	massive	mfr	as	massive breaking to 1fgr
A1	14-18	10YR 3/1		fsl	massive	mfr	as	massive breaking to 1fsbk
A2	18-36	10YR 3/2		sl	massive	mfr	as	massive breaking to 1fsbk
Cg1	36-45	10YR 3/2		ls	sg	mfr	as	
Cg2	45-56	10YR 5/2		ls	massive			Auger refusal at 56"

COMMENTS:
Johnston is a drained hydric soil
The Johnston series is a very poorly drained soil found on nearly level floodplains and swamps of the Coastal Plain.
This Johnston soil has very slow runoff and moderately rapid permeability.
Boring is 75' from ditch. Water table in ditch is 52" below top of bank.

DESCRIBED BY: SFS DATE: 4/8/2015

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** April 8, 2015
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring # 15
Soil Series: Torhunta
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: 42" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately Rapid
Vegetation: Corn
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-12	10YR 2/1		ls	1fgr	mfr	aw	
Bg1	12-15	10YR 4/1	7.5YR 3/3c2d	sl	1fsbk	mfr	aw	Mn masses
Bg2	15-22	10YR 4/2	7.5YR 3/3c2d	sl	1msbk	mfr	gw	
Bg3	22-30	10YR 4/2		sl	1msbk	mfr	gw	Fe & Mn accumulations at 20"
BC	30-35	10YR 5/4		ls	1fsbk	mfr	gw	
BCg	35-51	10YR 5/2	10YR 5/6c2d	sl	1msbk	mfr	gw	
Cg1	51-55	10YR 5/2		ls	massive	mfr	gw	
Cg2	55-60	10YR 4/2		ls	massive	mfr		

COMMENTS:
Torhunta is a drained hydric soil
The Torhunta series is a very poorly drained soil found on nearly level stream terraces and upland bay areas of Coastal Plain.
This Torhunta soil has very slow runoff and moderately rapid permeability.

DESCRIBED BY: SFS DATE: 4/8/2015

LICENSED SOIL SCIENTIST
STEVEN F. STOSSE
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STATE OF NORTH CAROLINA

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** April 8, 2015
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring # 16
Soil Series: Torhunta
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: 24" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately Rapid
Vegetation: Corn
Borings terminated at 52 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-12	10YR 2/1		ls	1fgr	mfr	as	Compacted surface
A1	12-16	10YR 2/1		fsl	1fsbk	mfr	cs	
A2	16-19	10YR 3/1		sl	1fsbk	mfr	cs	
Bg	19-44	10YR 4/2		sl-scl	1msbk	mfr	gw	
Cg	44-52	10YR 4/1		ls	massive	mfr		

COMMENTS:
Torhunta is a drained hydric soil
The Torhunta series is a very poorly drained soil found on nearly level stream terraces and upland bay areas of Coastal Plain.
This Torhunta soil has very slow runoff and moderately rapid permeability.
Boring is 36' from ditch. Water table in ditch is 29" below top of bank.

DESCRIBED BY: SFS DATE: 4/8/2015

LICENSED SOIL SCIENTIST STEVEN F. STOKES 1087 STATE OF NORTH CAROLINA

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** April 8, 2015
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring # 17
Soil Series: Torhunta Variant
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: 20" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately Rapid
Vegetation: Soybeans
Borings terminated at 56 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-12	10YR 2/1		ls	1fgr	mfr	cs	
Bg1	12-36	10YR 4/1		sl	1fsbk	mfr	gw	
Bg2	36-44	10YR 4/1		ls	1fsbk	mfr	gw	
Cg	44-56	10YR 4/1		scl	massive	mfr		

COMMENTS:
Torhunta is a drained hydric soil
The Torhunta series is a very poorly drained soil found on nearly level stream terraces and upland bay areas of Coastal Plain.
This Torhunta soil has very slow runoff and moderately rapid permeability.

DESCRIBED BY: SFS DATE: 4/8/2015

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** April 8, 2015
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring # 18
Soil Series: Torhunta
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: 22" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately Rapid
Vegetation: Soybeans
Borings terminated at 54 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-8	10YR 2/1		fsl	1fgr	mfr	as	
A1	8-11	10YR 3/1		fsl	1fsbk	mfr	cs	
Bg1	11-26	10YR 4/2		sl	1msbk	mfr	gw	
Bg2	26-36	10YR 3/2		ls	1fsbk	mfr	gw	
BC	36-54	10YR 4/2		ls	1fsbk	mfr		
Cg	54							Soil, probably sand, slid from auger.

COMMENTS:
Torhunta is a drained hydric soil
The Torhunta series is a very poorly drained soil found on nearly level stream terraces and upland bay areas of Coastal Plain.
This Torhunta soil has very slow runoff and moderately rapid permeability.

DESCRIBED BY: SFS DATE: 4/8/2015

LICENSED SOIL SCIENTIST
STEVEN F. STOKES
1087
STATE OF NORTH CAROLINA

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** September 19, 2016
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring # 19
Soil Series: Johnson
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Cumulic Humaquepts
AWT: 19" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately Rapid
Vegetation: Forest-Red Maple, Black Gum, Red Bay, Cinnamon Fern, Chain Fern
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Oa	0-2	10YR 2/1		muck	massive	mfr	as	massive breaking to 1fgr
A	2-30	10YR 2/1		muck	massive	mfr	as	massive breaking to 1fsbk
Cg1	30-52	10YR 3/1		s	sg	mfr	as	massive breaking to 1fsbk
Cg2	52-60	10YR2/1		fsl-ls	massive	mfr	as	

COMMENTS:
Johnston is in a jurisdictional wetland unit at this location.
The Johnston series is a very poorly drained soil found on nearly level floodplains and swamps of the Coastal Plain.
This Johnston soil has very slow runoff and moderately rapid permeability.

DESCRIBED BY: SFS, JS DATE: 9/19/2016

KCI ASSOCIATES OF NORTH CAROLINA, PA

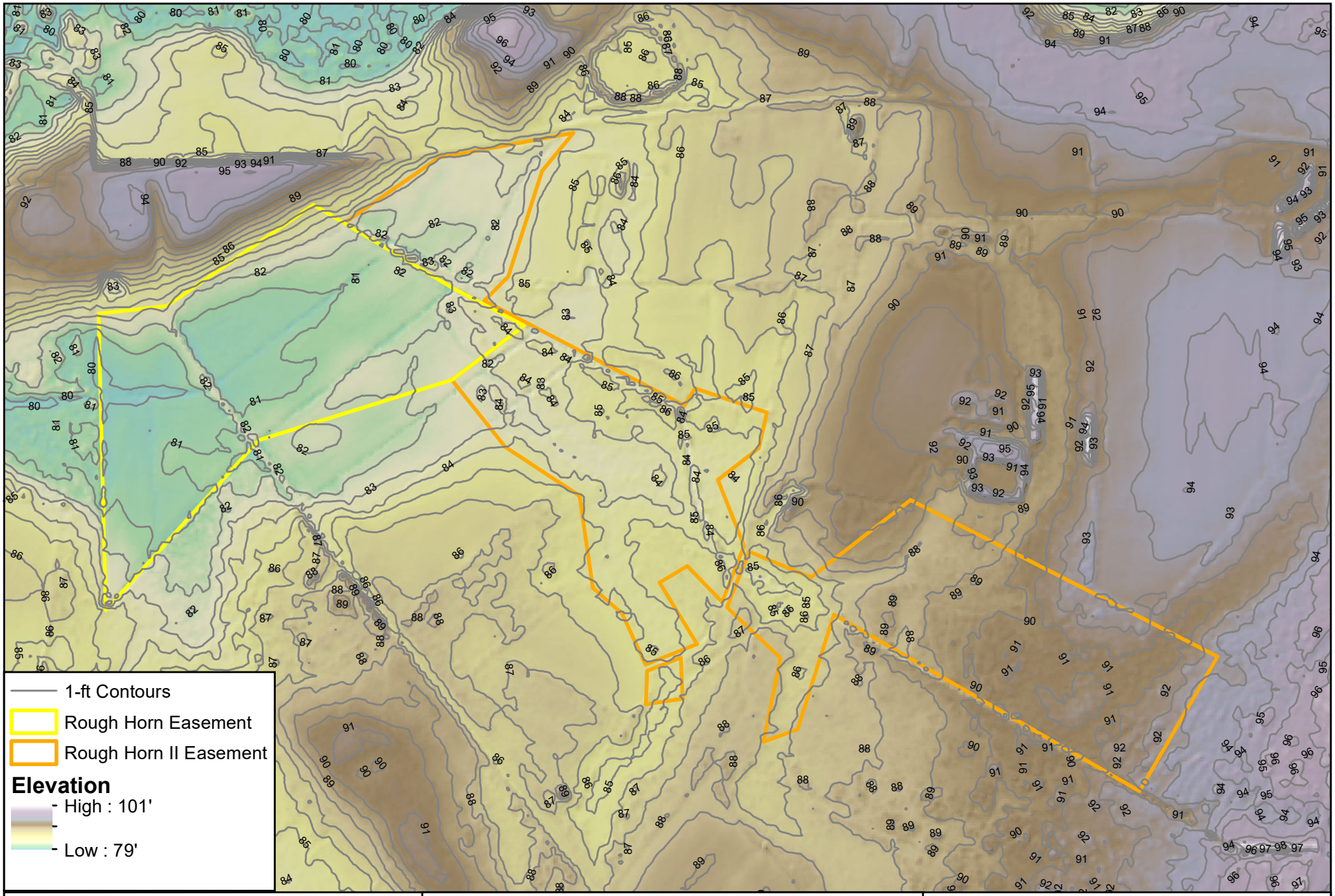
SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** September 19, 2016
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring # 20
Soil Series: Stallings
Soil Classification: Coarse-loamy, siliceous, semiactive, thermic Aeric Paleaquults
AWT: 54" **SHWT:** 12"-18" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Somewhat poorly drained **Permeability:** Moderately Rapid
Vegetation: Forest-Loblolly Pine, Saplings of Red Maple, Sweetgum and Smilax
Borings terminated at 61 **Inches**

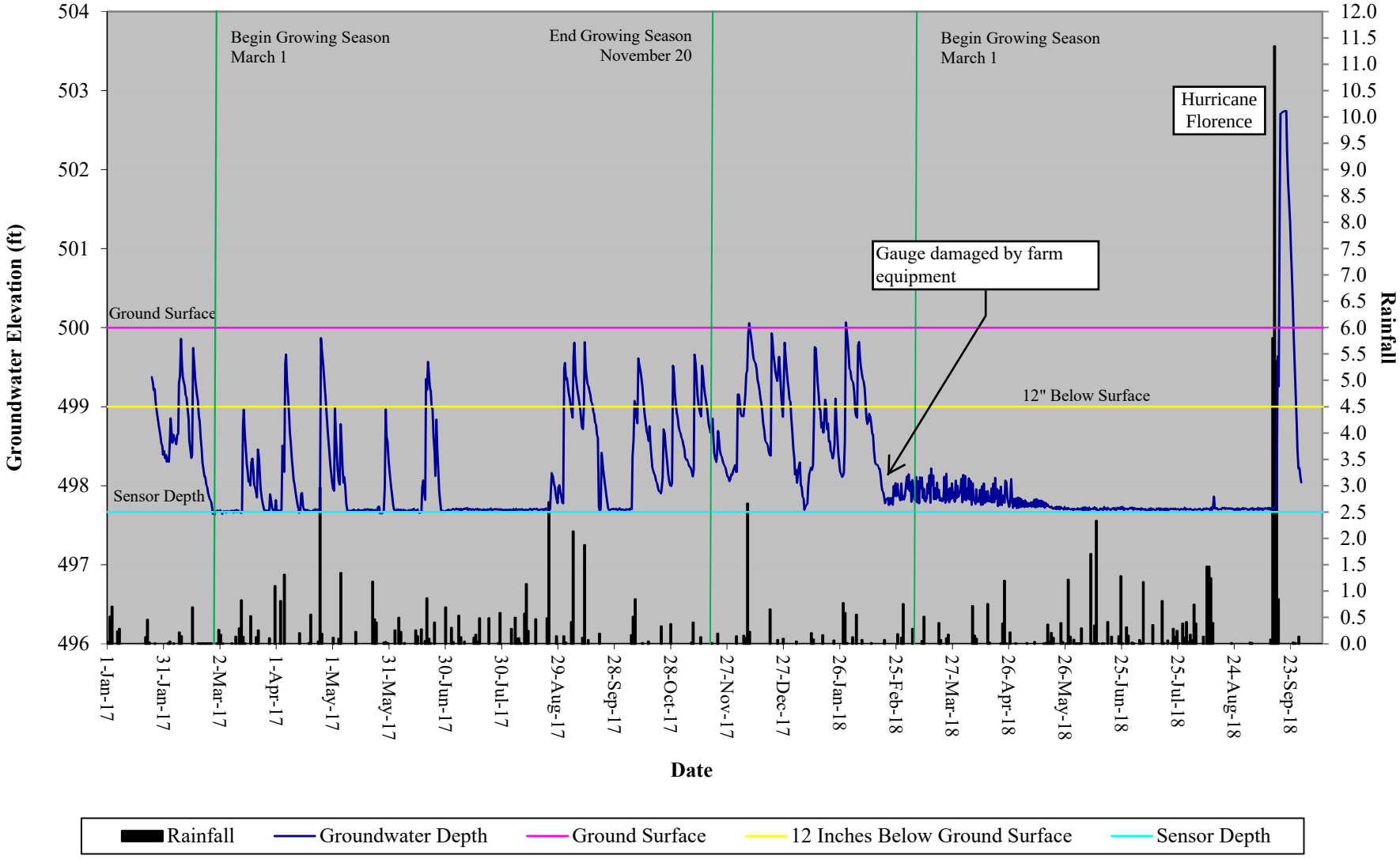
HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
A	0-8	10YR 2/1		fsl	1fgr	mfr	cs	
Bt1	8-11	10YR 4/3	10YR 5/4c2d	sl	1fsbk	mfr	cw	
Bt2	11-29	10YR 4/3	10YR 4/2c2d	sl	1fsbk	mfr	gw	
Bt3	29-37	10YR 5/3		sl	2msbk	mfr	gw	
Bt4	37-48	10YR 4/2		fsl	1fsbk	mfr	gw	
BCg	48-61	10YR 5/2		ls	1mgr	mfr	cw	
BCg2	59-61	10YR 5/1	10YR 4/2c2f	ls	1mgr	mfr		

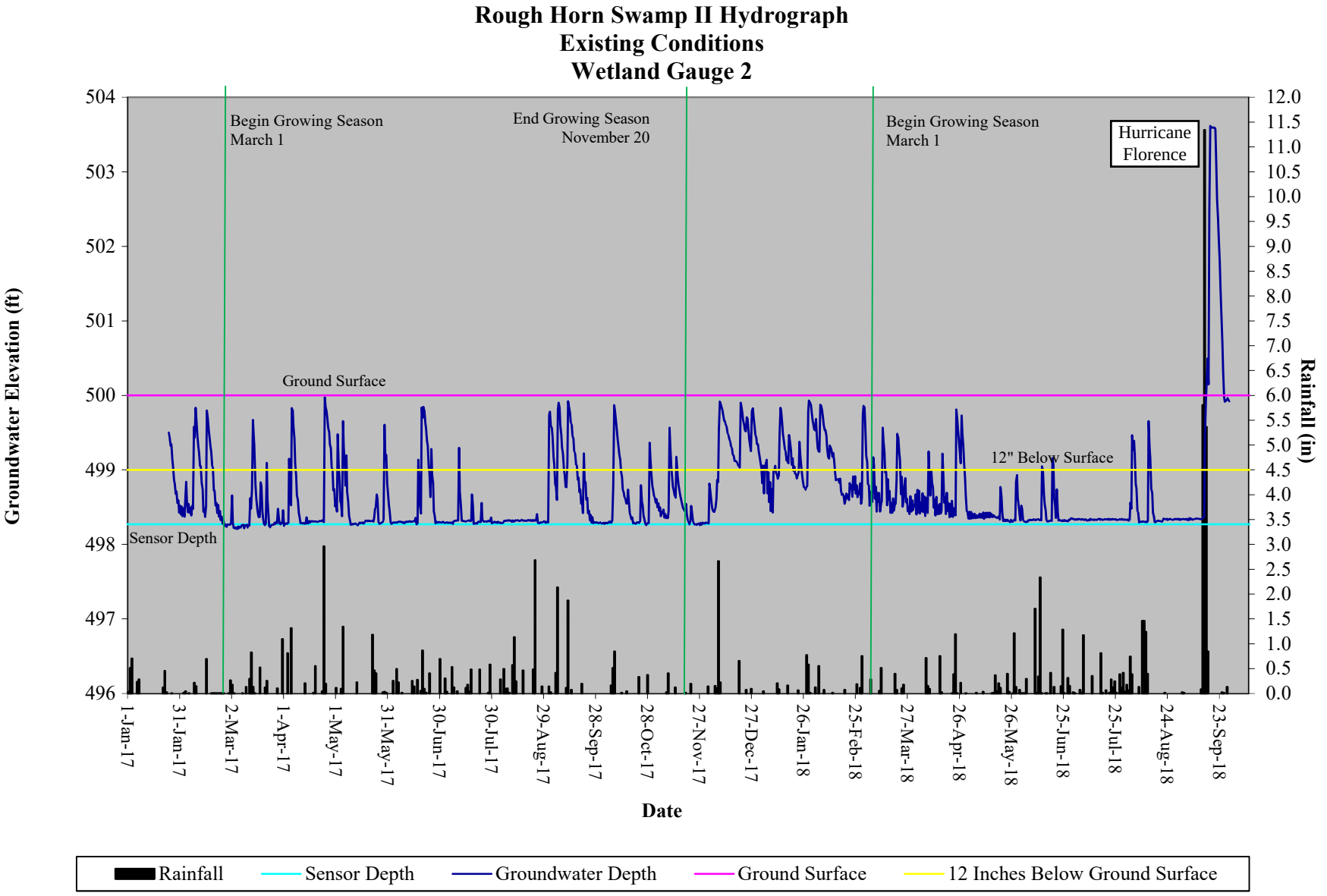
COMMENTS:
Stallings series is a non-hydric soil.
The Stallings series is a somewhat poorly drained soil found on nearly level interstream divides of the Coastal Plain.
This Stallings soil has very slow runoff and moderately rapid permeability.

DESCRIBED BY: SFS, JS DATE: 9/19/2016

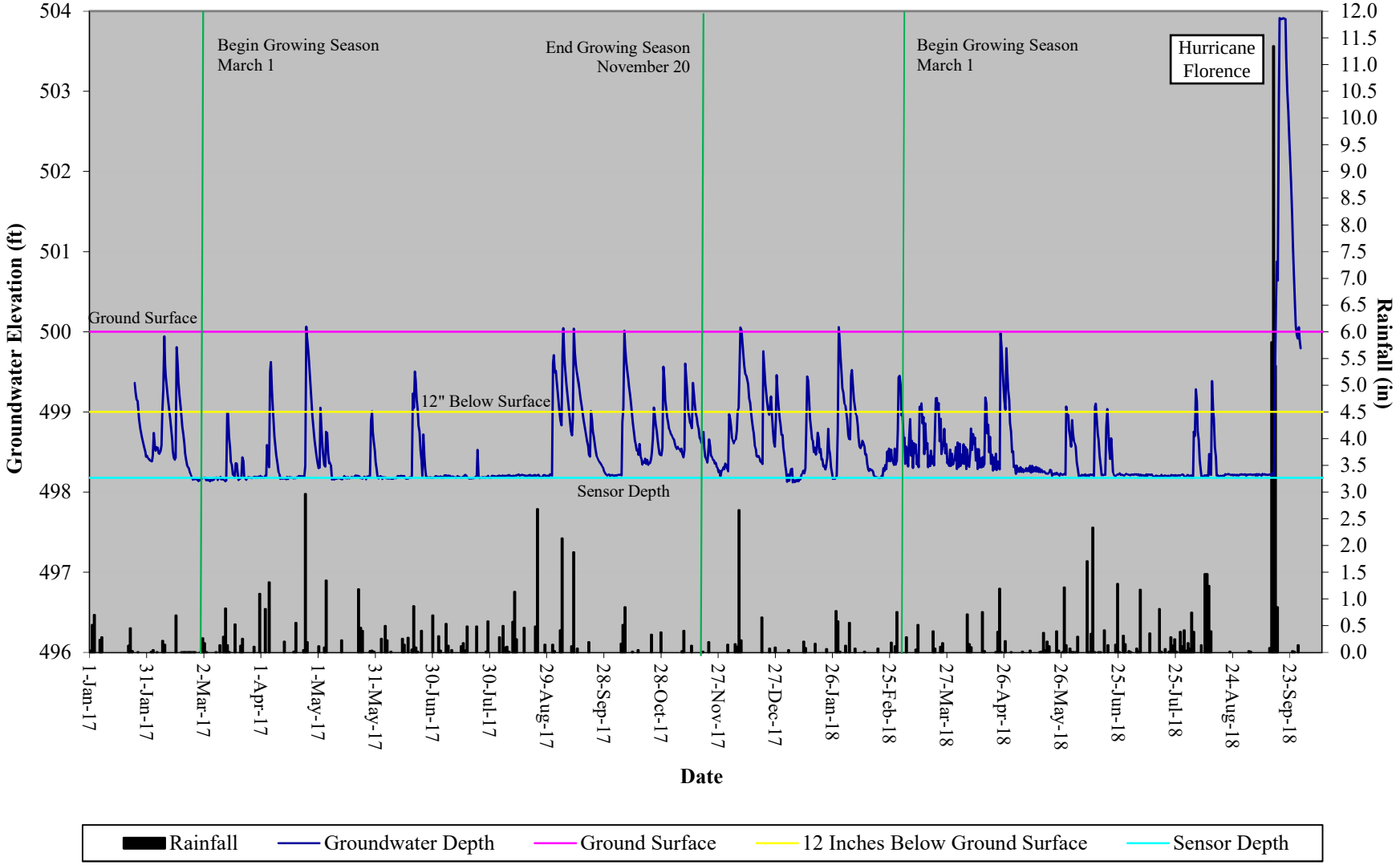

1-ft Contours
Rough Horn Easement
Rough Horn II Easement
Elevation
High : 101'
Low : 79'
0
300
600
Feet
LIDAR MAPPING
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC
N
Source: NC QL2 LIDAR 2014

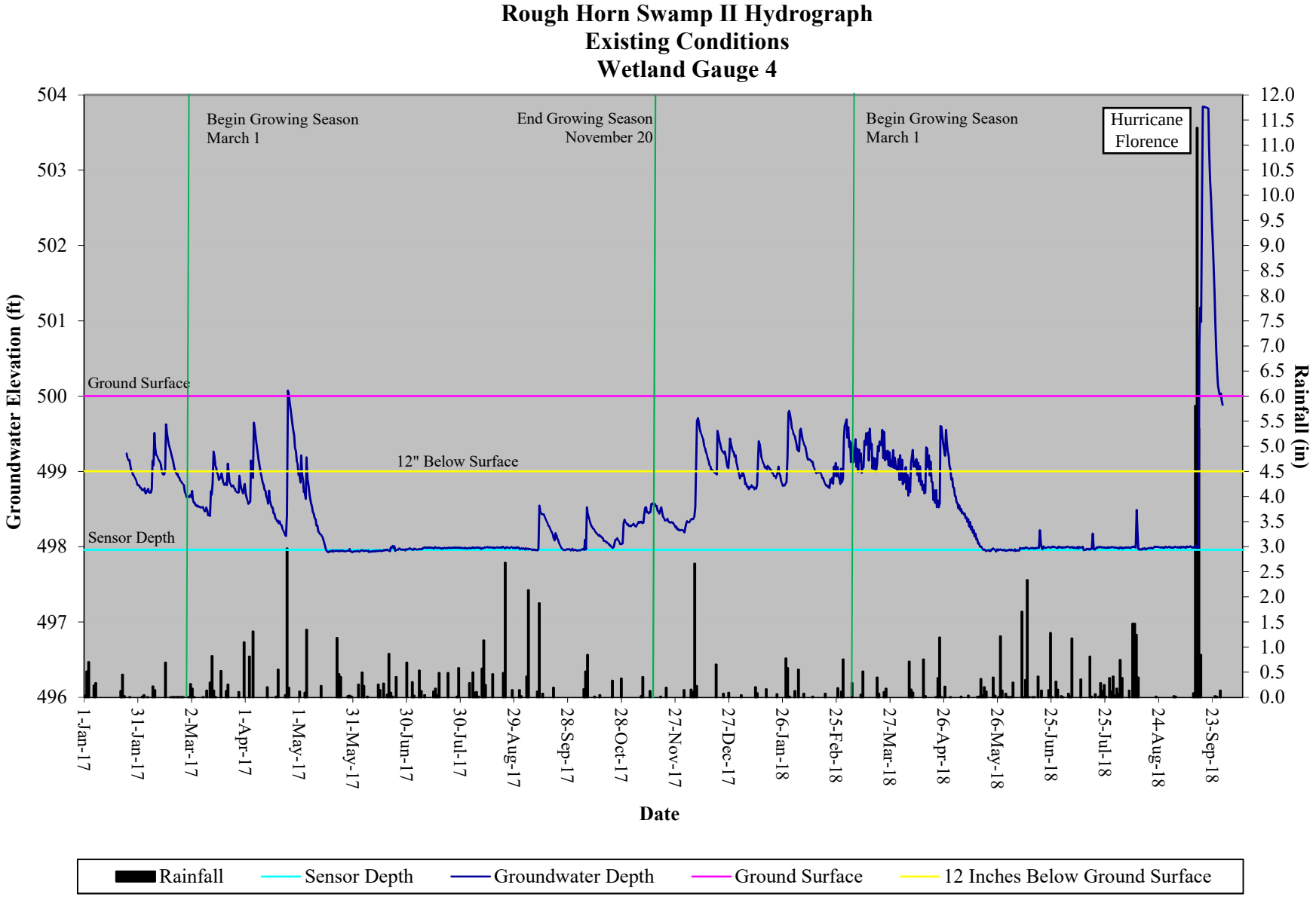
Rough Horn Swamp Hydrograph
Existing Conditions
Wetland Gauge 1




Rough Horn Swamp II Hydrograph
Existing Conditions
Wetland Gauge 2
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
March 1
End Growing Season
November 20
Begin Growing Season
March 1
Hurricane
Florence
Ground Surface
12" Below Surface
Sensor Depth
504
503
502
501
500
499
498
497
496
12.0
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1-Jan-17
31-Jan-17
2-Mar-17
1-Apr-17
1-May-17
31-May-17
30-Jun-17
30-Jul-17
29-Aug-17
28-Sep-17
28-Oct-17
27-Nov-17
27-Dec-17
26-Jan-18
25-Feb-18
27-Mar-18
26-Apr-18
26-May-18
25-Jun-18
25-Jul-18
24-Aug-18
23-Sep-18
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface

Rough Horn Swamp Hydrograph
Existing Conditions
Wetland Gauge 3




Rough Horn Swamp II Hydrograph
Existing Conditions
Wetland Gauge 4
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
March 1
End Growing Season
November 20
Begin Growing Season
March 1
Hurricane
Florence
Ground Surface
12" Below Surface
Sensor Depth
504
503
502
501
500
499
498
497
496
12.0
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1-Jan-17
31-Jan-17
2-Mar-17
1-Apr-17
1-May-17
31-May-17
30-Jun-17
30-Jul-17
29-Aug-17
28-Sep-17
28-Oct-17
27-Nov-17
27-Dec-17
26-Jan-18
25-Feb-18
27-Mar-18
26-Apr-18
26-May-18
25-Jun-18
25-Jul-18
24-Aug-18
23-Sep-18
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface

Project:	Rough Horn Swamp					
DMS Project ID:	97005					
Wetland Component:	Riparian & Non-Riparian Wetlands					
Growing Season:	3/12 - 11/15					
Units	Feet					
Gauge Type	Groundwater			Groundwater		
	Serial #			Serial #		
	Gauge ID : 1 (Riparian)			Gauge ID: 3 (Non-Riparian)		
	Offset: 0			Offset: 0		
Date	Depth	Q	S	Depth	Q	S
1/24/2017	0.63			0.64		
1/25/2017	0.79			0.85		
1/26/2017	0.95			1.02		
1/27/2017	1.13			1.20		
1/28/2017	1.30			1.34		
1/29/2017	1.45			1.44		
1/30/2017	1.61			1.56		
1/31/2017	1.65			1.58		
2/1/2017	1.70			1.61		
2/2/2017	1.70			1.62		
2/3/2017	1.15			1.26		
2/4/2017	1.46			1.49		
2/5/2017	1.41			1.45		
2/6/2017	1.47			1.52		
2/7/2017	1.34			1.42		
2/8/2017	0.62			0.71		
2/9/2017	0.48			0.42		
2/10/2017	0.69			0.73		
2/11/2017	0.85			0.97		
2/12/2017	1.03			1.17		
2/13/2017	1.43			1.48		
2/14/2017	1.65			1.60		
2/15/2017	0.26			0.19		
2/16/2017	0.64			0.63		
2/17/2017	0.85			0.92		
2/18/2017	1.10			1.18		
2/19/2017	1.40			1.39		
2/20/2017	1.71			1.60		
2/21/2017	1.88			1.69		
2/22/2017	1.99			1.75		
2/23/2017	2.09			1.82		
2/24/2017	2.18			1.83		
2/25/2017	2.26			1.83		
2/26/2017	2.35			1.85		
2/27/2017	2.33			1.84		
2/28/2017	2.31			1.83		
3/1/2017	2.32			1.82		
3/2/2017	2.33			1.82		
3/3/2017	2.33			1.84		
3/4/2017	2.32			1.85		
3/5/2017	2.32			1.85		
3/6/2017	2.32			1.85		
3/7/2017	2.32			1.83		
3/8/2017	2.32			1.82		
3/9/2017	2.31			1.82		
3/10/2017	2.31			1.81		
3/11/2017	2.32			1.83		
3/12/2017	2.34			1.85		
3/13/2017	2.33			1.86		
3/14/2017	1.04			1.02		
3/15/2017	1.53			1.44		
3/16/2017	1.81			1.66		
3/17/2017	1.94			1.78		
3/18/2017	1.71			1.64		
3/19/2017	1.82			1.74		
3/20/2017	2.03			1.83		
3/21/2017	2.15			1.82		

3/22/2017	1.65	1.62
3/23/2017	2.04	1.83
3/24/2017	2.22	1.82
3/25/2017	2.32	1.82
3/26/2017	2.32	1.82
3/27/2017	2.31	1.82
3/28/2017	2.11	1.81
3/29/2017	2.29	1.81
3/30/2017	2.31	1.81
3/31/2017	2.18	1.80
4/1/2017	2.31	1.81
4/2/2017	2.31	1.81
4/3/2017	2.31	1.79
4/4/2017	1.64	1.53
4/5/2017	0.46	0.50
4/6/2017	0.69	0.73
4/7/2017	1.10	1.17
4/8/2017	1.47	1.46
4/9/2017	1.77	1.65
4/10/2017	1.99	1.78
4/11/2017	2.15	1.82
4/12/2017	2.28	1.82
4/13/2017	2.33	1.83
4/14/2017	2.09	1.81
4/15/2017	2.30	1.82
4/16/2017	2.31	1.82
4/17/2017	2.31	1.82
4/18/2017	2.32	1.82
4/19/2017	2.32	1.82
4/20/2017	2.31	1.80
4/21/2017	2.30	1.80
4/22/2017	2.31	1.80
4/23/2017	2.31	1.81
4/24/2017	0.13	-0.06
4/25/2017	0.41	0.24
4/26/2017	0.76	0.57
4/27/2017	1.11	0.97
4/28/2017	1.43	1.26
4/29/2017	1.72	1.47
4/30/2017	1.96	1.64
5/1/2017	2.06	1.69
5/2/2017	1.36	1.21
5/3/2017	1.80	1.54
5/4/2017	1.98	1.68
5/5/2017	1.44	1.26
5/6/2017	1.96	1.64
5/7/2017	2.01	1.67
5/8/2017	2.31	1.82
5/9/2017	2.31	1.84
5/10/2017	2.32	1.83
5/11/2017	2.31	1.83
5/12/2017	2.32	1.83
5/13/2017	2.32	1.84
5/14/2017	2.30	1.80
5/15/2017	2.31	1.82
5/16/2017	2.31	1.81
5/17/2017	2.31	1.82
5/18/2017	2.31	1.81
5/19/2017	2.30	1.81
5/20/2017	2.30	1.79
5/21/2017	2.31	1.80

5/22/2017	2.32	1.81
5/23/2017	2.31	1.82
5/24/2017	2.32	1.82
5/25/2017	2.27	1.82
5/26/2017	2.35	1.81
5/27/2017	2.34	1.80
5/28/2017	2.03	1.11
5/29/2017	1.37	1.25
5/30/2017	1.67	1.49
5/31/2017	1.93	1.71
6/1/2017	2.14	1.83
6/2/2017	2.31	1.80
6/3/2017	2.32	1.84
6/4/2017	2.30	1.82
6/5/2017	2.31	1.83
6/6/2017	2.31	1.83
6/7/2017	2.31	1.83
6/8/2017	2.31	1.83
6/9/2017	2.33	1.83
6/10/2017	2.31	1.83
6/11/2017	2.30	1.80
6/12/2017	2.31	1.81
6/13/2017	2.31	1.80
6/14/2017	2.31	1.80
6/15/2017	2.33	1.83
6/16/2017	2.34	1.83
6/17/2017	2.03	1.82
6/18/2017	2.09	1.82
6/19/2017	0.65	0.77
6/20/2017	0.43	0.50
6/21/2017	0.75	0.85
6/22/2017	0.99	1.17
6/23/2017	1.40	1.48
6/24/2017	1.88	1.80
6/25/2017	1.58	1.56
6/26/2017	2.07	1.82
6/27/2017	2.32	1.82
6/28/2017	2.32	1.81
6/29/2017	2.33	1.82
6/30/2017	2.32	1.82
7/1/2017	2.30	1.80
7/2/2017	2.31	1.82
7/3/2017	2.30	1.82
7/4/2017	2.31	1.82
7/5/2017	2.29	1.82
7/6/2017	2.30	1.79
7/7/2017	2.32	1.81
7/8/2017	2.31	1.80
7/9/2017	2.29	1.81
7/10/2017	2.29	1.80
7/11/2017	2.28	1.81
7/12/2017	2.29	1.82
7/13/2017	2.30	1.81
7/14/2017	2.30	1.82
7/15/2017	2.31	1.81
7/16/2017	2.30	1.79
7/17/2017	2.31	1.80
7/18/2017	2.30	1.82
7/19/2017	2.31	1.83

7/20/2017	2.31	1.83
7/21/2017	2.31	1.83
7/22/2017	2.30	1.81
7/23/2017	2.30	1.48
7/24/2017	2.31	1.83
7/25/2017	2.30	1.82
7/26/2017	2.30	1.82
7/27/2017	2.30	1.82
7/28/2017	2.30	1.82
7/29/2017	2.30	1.82
7/30/2017	2.30	1.82
7/31/2017	2.31	1.80
8/1/2017	2.31	1.80
8/2/2017	2.31	1.81
8/3/2017	2.30	1.80
8/4/2017	2.31	1.80
8/5/2017	2.31	1.79
8/6/2017	2.29	1.80
8/7/2017	2.30	1.80
8/8/2017	2.30	1.79
8/9/2017	2.30	1.80
8/10/2017	2.31	1.81
8/11/2017	2.31	1.80
8/12/2017	2.31	1.79
8/13/2017	2.30	1.79
8/14/2017	2.30	1.80
8/15/2017	2.30	1.79
8/16/2017	2.30	1.79
8/17/2017	2.29	1.79
8/18/2017	2.31	1.80
8/19/2017	2.30	1.79
8/20/2017	2.30	1.79
8/21/2017	2.30	1.79
8/22/2017	2.28	1.79
8/23/2017	2.33	1.80
8/24/2017	2.30	1.79
8/25/2017	1.84	1.81
8/26/2017	1.97	1.81
8/27/2017	2.10	1.79
8/28/2017	2.22	1.80
8/29/2017	1.99	1.79
8/30/2017	2.13	1.78
8/31/2017	2.23	1.80
9/1/2017	0.45	0.29
9/2/2017	0.64	0.49
9/3/2017	0.83	0.75
9/4/2017	1.00	0.99
9/5/2017	1.14	1.17
9/6/2017	0.19	-0.04
9/7/2017	0.70	0.50
9/8/2017	0.86	0.75
9/9/2017	1.05	1.00
9/10/2017	1.26	1.24
9/11/2017	0.98	1.09
9/12/2017	0.52	0.26
9/13/2017	0.71	0.49
9/14/2017	0.80	0.64
9/15/2017	0.93	0.83
9/16/2017	1.06	1.00

9/17/2017	1.20	1.16
9/18/2017	1.35	1.30
9/19/2017	2.27	1.43
9/20/2017	2.30	1.56
9/21/2017	1.73	1.11
9/22/2017	1.94	1.31
9/23/2017	2.16	1.48
9/24/2017	2.29	1.58
9/25/2017	2.30	1.63
9/26/2017	2.29	1.66
9/27/2017	2.30	1.70
9/28/2017	2.29	1.77
9/29/2017	2.31	1.79
9/30/2017	2.28	1.78
10/1/2017	2.30	1.79
10/2/2017	2.30	1.79
10/3/2017	2.30	1.79
10/4/2017	2.30	1.79
10/5/2017	2.29	1.78
10/6/2017	2.29	1.78
10/7/2017	1.63	1.13
10/8/2017	0.93	-0.01
10/9/2017	1.11	0.37
10/10/2017	1.21	0.59
10/11/2017	0.54	0.78
10/12/2017	0.70	1.01
10/13/2017	1.00	1.25
10/14/2017	1.20	1.40
10/15/2017	1.35	1.48
10/16/2017	1.25	1.40
10/17/2017	1.65	1.59
10/18/2017	1.81	1.62
10/19/2017	1.87	1.58
10/20/2017	1.97	1.60
10/21/2017	2.07	1.64
10/22/2017	2.10	1.59
10/23/2017	1.89	1.33
10/24/2017	1.34	1.03
10/25/2017	1.61	1.24
10/26/2017	1.86	1.44
10/27/2017	1.99	1.54
10/28/2017	1.98	1.45
10/29/2017	0.59	0.60
10/30/2017	0.97	0.96
10/31/2017	1.15	1.12
11/1/2017	1.31	1.24
11/2/2017	1.39	1.29
11/3/2017	1.49	1.34
11/4/2017	1.65	1.43
11/5/2017	1.67	1.43
11/6/2017	1.74	1.46
11/7/2017	1.77	1.46
11/8/2017	1.88	1.57
11/9/2017	0.34	0.40
11/10/2017	0.65	0.77
11/11/2017	0.95	1.05
11/12/2017	1.09	1.16
11/13/2017	0.48	0.64
11/14/2017	0.73	0.90

11/15/2017	0.92	1.07
11/16/2017	1.09	1.20
11/17/2017	1.28	1.35
11/18/2017	1.25	1.29
11/19/2017	1.44	1.45
11/20/2017	1.66	1.59
11/21/2017	1.60	1.53
11/22/2017	1.44	1.43
11/23/2017	1.61	1.56
11/24/2017	1.70	1.60
11/25/2017	1.75	1.64
11/26/2017	1.83	1.70
11/27/2017	1.90	1.73
11/28/2017	1.92	1.74
11/29/2017	1.86	1.69
11/30/2017	1.78	1.64
12/1/2017	1.82	1.70
12/2/2017	0.85	1.03
12/3/2017	0.93	1.17
12/4/2017	1.12	1.37
12/5/2017	1.12	1.36
12/6/2017	0.83	1.23
12/7/2017	0.55	0.95
12/8/2017	-0.06	-0.05
12/9/2017	0.11	0.15
12/10/2017	0.31	0.43
12/11/2017	0.43	0.55
12/12/2017	0.52	0.66
12/13/2017	0.72	0.89
12/14/2017	0.88	1.11
12/15/2017	1.05	1.27
12/16/2017	1.29	1.46
12/17/2017	1.45	1.56
12/18/2017	1.50	1.58
12/19/2017	1.61	1.64
12/20/2017	0.07	0.24
12/21/2017	0.35	0.65
12/22/2017	0.55	0.88
12/23/2017	0.67	1.04
12/24/2017	0.37	0.81
12/25/2017	0.83	1.24
12/26/2017	1.13	1.43
12/27/2017	0.19	0.54
12/28/2017	0.54	0.95
12/29/2017	0.76	1.15
12/30/2017	0.94	1.29
12/31/2017	1.31	1.54
1/1/2018	1.65	1.74
1/2/2018	1.80	1.78
1/3/2018	1.87	1.79
1/4/2018	1.71	1.71
1/5/2018	2.01	1.85
1/6/2018	2.17	1.85
1/7/2018	2.27	1.85
1/8/2018	2.23	1.84
1/9/2018	1.86	1.78
1/10/2018	1.77	1.73
1/11/2018	1.74	1.71
1/12/2018	0.25	0.56

1/13/2018	0.50	0.89
1/14/2018	0.83	1.20
1/15/2018	1.04	1.36
1/16/2018	1.21	1.45
1/17/2018	1.20	1.46
1/18/2018	0.99	1.33
1/19/2018	1.21	1.46
1/20/2018	1.44	1.59
1/21/2018	1.59	1.67
1/22/2018	1.61	1.67
1/23/2018	0.90	1.21
1/24/2018	1.36	1.53
1/25/2018	1.73	1.77
1/26/2018	1.86	1.83
1/27/2018	1.87	1.82
1/28/2018	1.43	1.23
1/29/2018	0.04	0.08
1/30/2018	0.35	0.53
1/31/2018	0.55	0.76
2/1/2018	0.68	0.92
2/2/2018	0.83	1.10
2/3/2018	1.12	1.34
2/4/2018	0.22	0.55
2/5/2018	0.35	0.67
2/6/2018	0.58	0.94
2/7/2018	0.68	1.05
2/8/2018	0.97	1.32
2/9/2018	1.22	1.45
2/10/2018	1.09	1.36
2/11/2018	1.21	1.43
2/12/2018	1.35	1.53
2/13/2018	1.69	1.72
2/14/2018	1.73	1.71
2/15/2018	1.78	1.72
2/16/2018	1.87	1.79
2/17/2018	2.06	1.81
2/18/2018	2.16	1.82
2/19/2018	2.17	1.82
2/20/2018	2.15	1.80
2/21/2018	2.16	1.70
2/22/2018	2.16	1.66
2/23/2018	2.00	1.49
2/24/2018	1.97	1.46
2/25/2018	1.98	1.47
2/26/2018	2.14	1.63
2/27/2018	1.97	1.46
2/28/2018	2.13	1.62
3/1/2018	2.14	0.57
3/2/2018	1.88	0.67
3/3/2018	1.86	1.01
3/4/2018	1.95	1.32
3/5/2018	1.93	1.43
3/6/2018	2.17	1.68
3/7/2018	1.89	1.09
3/8/2018	1.95	1.36
3/9/2018	1.89	1.39
3/10/2018	1.90	1.41
3/11/2018	2.04	1.55
3/12/2018	2.20	0.94

3/13/2018	1.98	0.90
3/14/2018	1.87	1.07
3/15/2018	1.78	1.15
3/16/2018	1.87	1.39
3/17/2018	2.03	1.55
3/18/2018	1.96	1.48
3/19/2018	2.05	1.56
3/20/2018	2.15	1.31
3/21/2018	2.19	0.83
3/22/2018	1.89	0.89
3/23/2018	1.85	1.09
3/24/2018	2.05	1.44
3/25/2018	2.03	1.21
3/26/2018	1.97	1.40
3/27/2018	2.09	1.60
3/28/2018	1.94	1.47
3/29/2018	2.00	1.52
3/30/2018	2.09	1.61
3/31/2018	1.91	1.44
4/1/2018	1.87	1.38
4/2/2018	1.88	1.40
4/3/2018	2.03	1.53
4/4/2018	1.91	1.40
4/5/2018	1.94	1.44
4/6/2018	1.97	1.47
4/7/2018	2.19	1.69
4/8/2018	2.05	1.21
4/9/2018	2.20	1.28
4/10/2018	2.05	1.32
4/11/2018	2.01	1.46
4/12/2018	1.97	1.47
4/13/2018	2.08	1.58
4/14/2018	2.07	1.57
4/15/2018	2.15	1.65
4/16/2018	2.03	0.89
4/17/2018	1.98	1.16
4/18/2018	1.90	1.31
4/19/2018	2.04	1.54
4/20/2018	2.07	1.57
4/21/2018	2.01	1.52
4/22/2018	2.12	1.62
4/23/2018	2.22	1.72
4/24/2018	1.96	0.19
4/25/2018	2.22	0.65
4/26/2018	2.21	0.97
4/27/2018	2.13	0.47
4/28/2018	2.17	0.86
4/29/2018	2.16	1.24
4/30/2018	2.15	1.49
5/1/2018	2.16	1.67
5/2/2018	2.17	1.67
5/3/2018	2.20	1.71
5/4/2018	2.19	1.69
5/5/2018	2.22	1.71
5/6/2018	2.23	1.73
5/7/2018	2.21	1.70
5/8/2018	2.21	1.70
5/9/2018	2.18	1.67
5/10/2018	2.17	1.67

5/11/2018	2.19	1.69
5/12/2018	2.19	1.68
5/13/2018	2.19	1.70
5/14/2018	2.21	1.71
5/15/2018	2.22	1.72
5/16/2018	2.24	1.74
5/17/2018	2.27	1.76
5/18/2018	2.26	1.77
5/19/2018	2.29	1.76
5/20/2018	2.27	1.73
5/21/2018	2.27	1.77
5/22/2018	2.27	1.77
5/23/2018	2.27	1.76
5/24/2018	2.29	1.78
5/25/2018	2.27	1.77
5/26/2018	2.29	1.79
5/27/2018	2.28	1.77
5/28/2018	2.30	0.93
5/29/2018	2.29	1.04
5/30/2018	2.29	1.31
5/31/2018	2.30	1.10
6/1/2018	2.29	1.36
6/2/2018	2.30	1.44
6/3/2018	2.29	1.71
6/4/2018	2.28	1.80
6/5/2018	2.27	1.79
6/6/2018	2.28	1.79
6/7/2018	2.28	1.78
6/8/2018	2.29	1.80
6/9/2018	2.29	1.80
6/10/2018	2.27	1.78
6/11/2018	2.29	1.78
6/12/2018	2.31	0.94
6/13/2018	2.29	1.10
6/14/2018	2.29	1.35
6/15/2018	2.27	1.66
6/16/2018	2.29	1.79
6/17/2018	2.28	1.78
6/18/2018	2.30	1.18
6/19/2018	2.29	1.22
6/20/2018	2.28	1.59
6/21/2018	2.29	1.49
6/22/2018	2.28	1.79
6/23/2018	2.28	1.80
6/24/2018	2.27	1.78
6/25/2018	2.27	1.76
6/26/2018	2.29	1.79
6/27/2018	2.29	1.79
6/28/2018	2.29	1.78
6/29/2018	2.28	1.78
6/30/2018	2.28	1.78
7/1/2018	2.28	1.78
7/2/2018	2.29	1.78
7/3/2018	2.29	1.78
7/4/2018	2.30	1.78
7/5/2018	2.28	1.78
7/6/2018	2.29	1.78
7/7/2018	2.30	1.79
7/8/2018	2.31	1.79

7/9/2018	2.29	1.78
7/10/2018	2.29	1.78
7/11/2018	2.30	1.79
7/12/2018	2.31	1.78
7/13/2018	2.29	1.81
7/14/2018	2.29	1.79
7/15/2018	2.29	1.80
7/16/2018	2.29	1.80
7/17/2018	2.29	1.78
7/18/2018	2.29	1.80
7/19/2018	2.29	1.80
7/20/2018	2.30	1.80
7/21/2018	2.29	1.81
7/22/2018	2.29	1.79
7/23/2018	2.29	1.79
7/24/2018	2.30	1.80
7/25/2018	2.31	1.79
7/26/2018	2.29	1.79
7/27/2018	2.30	1.79
7/28/2018	2.28	1.78
7/29/2018	2.30	1.81
7/30/2018	2.30	1.80
7/31/2018	2.29	1.79
8/1/2018	2.31	1.80
8/2/2018	2.31	1.82
8/3/2018	2.30	1.25
8/4/2018	2.30	0.72
8/5/2018	2.29	1.24
8/6/2018	2.31	1.60
8/7/2018	2.29	1.81
8/8/2018	2.30	1.81
8/9/2018	2.29	1.79
8/10/2018	2.29	1.80
8/11/2018	2.28	1.53
8/12/2018	2.29	1.78
8/13/2018	2.29	0.96
8/14/2018	2.28	1.44
8/15/2018	2.30	1.79
8/16/2018	2.30	1.80
8/17/2018	2.28	1.79
8/18/2018	2.28	1.79
8/19/2018	2.28	1.79
8/20/2018	2.29	1.78
8/21/2018	2.29	1.78
8/22/2018	2.29	1.78
8/23/2018	2.29	1.78
8/24/2018	2.30	1.78
8/25/2018	2.29	1.79
8/26/2018	2.29	1.79
8/27/2018	2.29	1.78
8/28/2018	2.28	1.78
8/29/2018	2.29	1.78
8/30/2018	2.30	1.78
8/31/2018	2.30	1.79
9/1/2018	2.29	1.78
9/2/2018	2.28	1.78
9/3/2018	2.29	1.78
9/4/2018	2.29	1.78
9/5/2018	2.28	1.77

9/6/2018	2.29	1.77
9/7/2018	2.29	1.79
9/8/2018	2.29	1.77
9/9/2018	2.28	1.78
9/10/2018	2.28	1.78
9/11/2018	2.28	1.78
9/12/2018	2.29	1.78
9/13/2018	2.29	1.76
9/14/2018	2.31	1.79
9/15/2018	1.65	-0.35
9/16/2018	0.74	-0.64
9/17/2018	-2.70	-3.91
9/18/2018	-2.73	-3.90
9/19/2018	-2.74	-3.91
9/20/2018	-2.74	-3.90
9/21/2018	-1.84	-3.00
9/22/2018	-1.33	-2.48
9/23/2018	-0.68	-1.83
9/24/2018	0.08	-1.07
9/25/2018	0.84	-0.33
9/26/2018	1.54	0.04
9/27/2018	1.78	-0.06
9/28/2018	1.96	0.21
9/29/2018	2.08	0.38
9/30/2018	2.25	0.57
10/1/2018	2.28	0.74
10/2/2018	2.26	0.96

Project:	Rough Horn Swamp II					
DMS Project ID:	100053					
Wetland Component:	Existing Conditions Riparian Wetland					
Growing Season:	3/12 - 11/15					
Units	Feet					
Gauge Type	Groundwater			Groundwater		
	Serial #			Serial #		
	Gauge ID : 2			Gauge ID: 4		
	Offset: 0			Offset: 0		
Date	Depth	Q	S	Depth	Q	S
1/24/2017	0.50			0.76		
1/25/2017	0.68			0.85		
1/26/2017	0.86			0.92		
1/27/2017	1.14			1.00		
1/28/2017	1.32			1.05		
1/29/2017	1.44			1.10		
1/30/2017	1.57			1.18		
1/31/2017	1.60			1.19		
2/1/2017	1.62			1.22		
2/2/2017	1.63			1.24		
2/3/2017	1.16			1.23		
2/4/2017	1.57			1.29		
2/5/2017	1.58			1.23		
2/6/2017	1.61			1.28		
2/7/2017	1.52			1.23		
2/8/2017	0.56			0.92		
2/9/2017	0.37			0.69		
2/10/2017	0.69			0.80		
2/11/2017	0.95			0.85		
2/12/2017	1.18			0.90		
2/13/2017	1.56			1.03		
2/14/2017	1.63			1.04		
2/15/2017	0.20			0.38		
2/16/2017	0.47			0.56		
2/17/2017	0.68			0.68		
2/18/2017	0.94			0.78		
2/19/2017	1.28			0.88		
2/20/2017	1.48			0.99		
2/21/2017	1.58			1.04		
2/22/2017	1.63			1.08		
2/23/2017	1.67			1.12		
2/24/2017	1.72			1.16		
2/25/2017	1.74			1.18		
2/26/2017	1.74			1.31		
2/27/2017	1.73			1.34		
2/28/2017	1.73			1.34		
3/1/2017	1.72			1.34		
3/2/2017	1.70			1.36		
3/3/2017	1.77			1.42		
3/4/2017	1.77			1.45		
3/5/2017	1.76			1.46		
3/6/2017	1.76			1.48		
3/7/2017	1.75			1.48		
3/8/2017	1.74			1.51		
3/9/2017	1.74			1.53		
3/10/2017	1.74			1.51		
3/11/2017	1.74			1.58		
3/12/2017	1.38			1.27		
3/13/2017	1.26			1.16		
3/14/2017	0.53			0.79		
3/15/2017	1.18			0.95		
3/16/2017	1.50			1.04		
3/17/2017	1.63			1.08		
3/18/2017	1.17			1.03		
3/19/2017	1.56			1.15		
3/20/2017	1.73			1.16		
3/21/2017	1.73			1.18		

3/22/2017	1.40	1.04
3/23/2017	1.76	1.17
3/24/2017	1.75	1.20
3/25/2017	1.74	1.22
3/26/2017	1.71	1.26
3/27/2017	1.70	1.28
3/28/2017	1.52	1.06
3/29/2017	1.72	1.23
3/30/2017	1.71	1.29
3/31/2017	1.54	1.17
4/1/2017	1.72	1.35
4/2/2017	1.71	1.43
4/3/2017	1.71	1.40
4/4/2017	1.34	1.02
4/5/2017	0.17	0.35
4/6/2017	0.43	0.54
4/7/2017	0.92	0.72
4/8/2017	1.34	0.89
4/9/2017	1.58	1.04
4/10/2017	1.72	1.16
4/11/2017	1.72	1.24
4/12/2017	1.71	1.34
4/13/2017	1.72	1.43
4/14/2017	1.71	1.38
4/15/2017	1.69	1.48
4/16/2017	1.69	1.55
4/17/2017	1.69	1.62
4/18/2017	1.69	1.66
4/19/2017	1.69	1.69
4/20/2017	1.69	1.71
4/21/2017	1.69	1.76
4/22/2017	1.69	1.82
4/23/2017	1.69	1.86
4/24/2017	0.03	-0.07
4/25/2017	0.21	0.08
4/26/2017	0.44	0.27
4/27/2017	0.66	0.46
4/28/2017	0.96	0.68
4/29/2017	1.28	0.87
4/30/2017	1.49	1.05
5/1/2017	1.56	1.15
5/2/2017	0.92	1.05
5/3/2017	1.43	1.28
5/4/2017	1.62	1.37
5/5/2017	0.70	1.10
5/6/2017	1.21	1.31
5/7/2017	1.29	1.42
5/8/2017	1.62	1.54
5/9/2017	1.74	1.62
5/10/2017	1.72	1.72
5/11/2017	1.73	1.80
5/12/2017	1.72	1.83
5/13/2017	1.74	1.86
5/14/2017	1.71	1.92
5/15/2017	1.71	2.01
5/16/2017	1.71	2.07
5/17/2017	1.71	2.07
5/18/2017	1.68	2.06
5/19/2017	1.68	2.05
5/20/2017	1.68	2.05
5/21/2017	1.69	2.05

5/22/2017	1.70	2.05
5/23/2017	1.52	2.05
5/24/2017	1.33	2.05
5/25/2017	1.70	2.05
5/26/2017	1.72	2.06
5/27/2017	1.71	2.06
5/28/2017	1.67	2.05
5/29/2017	0.81	2.06
5/30/2017	1.19	2.07
5/31/2017	1.47	2.06
6/1/2017	1.70	2.06
6/2/2017	1.72	2.05
6/3/2017	1.71	2.07
6/4/2017	1.71	2.05
6/5/2017	1.71	2.05
6/6/2017	1.70	2.05
6/7/2017	1.70	2.05
6/8/2017	1.70	2.05
6/9/2017	1.72	2.07
6/10/2017	1.70	2.06
6/11/2017	1.70	2.06
6/12/2017	1.69	2.06
6/13/2017	1.69	2.06
6/14/2017	1.69	2.05
6/15/2017	1.69	2.06
6/16/2017	1.73	2.05
6/17/2017	0.86	2.05
6/18/2017	1.48	2.05
6/19/2017	0.16	2.05
6/20/2017	0.16	2.06
6/21/2017	0.37	2.01
6/22/2017	0.61	2.02
6/23/2017	0.96	2.06
6/24/2017	1.36	2.04
6/25/2017	1.07	2.03
6/26/2017	1.55	2.04
6/27/2017	1.72	2.04
6/28/2017	1.70	2.04
6/29/2017	1.70	2.03
6/30/2017	1.71	2.04
7/1/2017	1.70	2.02
7/2/2017	1.71	2.03
7/3/2017	1.71	2.04
7/4/2017	1.71	2.03
7/5/2017	1.71	2.04
7/6/2017	1.71	2.03
7/7/2017	1.72	2.04
7/8/2017	1.68	2.03
7/9/2017	1.68	2.02
7/10/2017	1.68	2.01
7/11/2017	1.29	2.01
7/12/2017	1.68	2.01
7/13/2017	1.69	2.02
7/14/2017	1.69	2.02
7/15/2017	1.69	2.01
7/16/2017	1.68	2.02
7/17/2017	1.69	2.02
7/18/2017	1.33	2.02
7/19/2017	1.73	2.02

7/20/2017	1.72	2.02
7/21/2017	1.72	2.02
7/22/2017	1.70	2.02
7/23/2017	1.70	2.02
7/24/2017	1.67	2.02
7/25/2017	1.70	2.01
7/26/2017	1.69	2.02
7/27/2017	1.69	2.02
7/28/2017	1.69	2.01
7/29/2017	1.64	2.02
7/30/2017	1.71	2.02
7/31/2017	1.69	2.02
8/1/2017	1.70	2.01
8/2/2017	1.70	2.02
8/3/2017	1.71	2.02
8/4/2017	1.71	2.02
8/5/2017	1.71	2.01
8/6/2017	1.68	2.02
8/7/2017	1.68	2.01
8/8/2017	1.68	2.01
8/9/2017	1.68	2.02
8/10/2017	1.70	2.03
8/11/2017	1.70	2.02
8/12/2017	1.68	2.01
8/13/2017	1.68	2.01
8/14/2017	1.69	2.01
8/15/2017	1.68	2.01
8/16/2017	1.67	2.01
8/17/2017	1.68	2.01
8/18/2017	1.68	2.02
8/19/2017	1.68	2.01
8/20/2017	1.68	2.01
8/21/2017	1.67	2.01
8/22/2017	1.67	2.00
8/23/2017	1.68	2.02
8/24/2017	1.68	2.01
8/25/2017	1.71	2.01
8/26/2017	1.72	2.02
8/27/2017	1.70	2.00
8/28/2017	1.70	2.02
8/29/2017	1.70	2.02
8/30/2017	1.69	2.01
8/31/2017	1.71	2.01
9/1/2017	0.22	2.03
9/2/2017	0.43	2.03
9/3/2017	0.82	2.03
9/4/2017	1.19	2.02
9/5/2017	1.40	2.02
9/6/2017	0.10	2.03
9/7/2017	0.40	2.04
9/8/2017	0.70	2.03
9/9/2017	1.00	2.04
9/10/2017	1.23	2.04
9/11/2017	0.92	2.03
9/12/2017	0.16	1.54
9/13/2017	0.36	1.57
9/14/2017	0.53	1.58
9/15/2017	0.74	1.63
9/16/2017	0.93	1.69

9/17/2017	1.13	1.73
9/18/2017	1.30	1.79
9/19/2017	1.46	1.84
9/20/2017	1.58	1.92
9/21/2017	1.14	1.85
9/22/2017	1.40	1.91
9/23/2017	1.58	1.98
9/24/2017	1.68	2.02
9/25/2017	1.71	2.04
9/26/2017	1.72	2.04
9/27/2017	1.70	2.03
9/28/2017	1.70	2.03
9/29/2017	1.72	2.05
9/30/2017	1.70	2.03
10/1/2017	1.72	2.04
10/2/2017	1.71	2.05
10/3/2017	1.71	2.05
10/4/2017	1.72	2.05
10/5/2017	1.70	2.04
10/6/2017	1.69	2.03
10/7/2017	1.68	1.91
10/8/2017	0.13	1.48
10/9/2017	0.34	1.61
10/10/2017	0.59	1.69
10/11/2017	0.79	1.74
10/12/2017	1.02	1.77
10/13/2017	1.26	1.81
10/14/2017	1.36	1.84
10/15/2017	1.45	1.84
10/16/2017	1.27	1.87
10/17/2017	1.57	1.89
10/18/2017	1.66	1.92
10/19/2017	1.72	1.94
10/20/2017	1.72	1.96
10/21/2017	1.71	1.98
10/22/2017	1.70	2.01
10/23/2017	1.69	2.01
10/24/2017	1.42	1.91
10/25/2017	1.62	1.89
10/26/2017	1.72	1.93
10/27/2017	1.72	1.96
10/28/2017	1.72	1.95
10/29/2017	0.84	1.64
10/30/2017	1.22	1.68
10/31/2017	1.35	1.70
11/1/2017	1.44	1.72
11/2/2017	1.50	1.72
11/3/2017	1.55	1.70
11/4/2017	1.62	1.73
11/5/2017	1.58	1.71
11/6/2017	1.64	1.67
11/7/2017	1.65	1.67
11/8/2017	1.65	1.69
11/9/2017	0.44	1.58
11/10/2017	0.95	1.48
11/11/2017	1.23	1.54
11/12/2017	1.34	1.54
11/13/2017	0.82	1.43
11/14/2017	1.17	1.43

11/15/2017	1.33	1.43
11/16/2017	1.42	1.46
11/17/2017	1.52	1.53
11/18/2017	1.53	1.52
11/19/2017	1.60	1.54
11/20/2017	1.70	1.62
11/21/2017	1.69	1.65
11/22/2017	1.59	1.63
11/23/2017	1.72	1.68
11/24/2017	1.73	1.67
11/25/2017	1.73	1.68
11/26/2017	1.72	1.72
11/27/2017	1.71	1.73
11/28/2017	1.71	1.76
11/29/2017	1.71	1.78
11/30/2017	1.71	1.78
12/1/2017	1.72	1.79
12/2/2017	1.18	1.74
12/3/2017	1.39	1.66
12/4/2017	1.55	1.68
12/5/2017	1.56	1.64
12/6/2017	1.39	1.64
12/7/2017	1.17	1.60
12/8/2017	0.08	0.99
12/9/2017	0.15	0.29
12/10/2017	0.26	0.43
12/11/2017	0.35	0.51
12/12/2017	0.42	0.58
12/13/2017	0.54	0.70
12/14/2017	0.62	0.78
12/15/2017	0.71	0.86
12/16/2017	0.81	0.93
12/17/2017	0.88	0.98
12/18/2017	0.90	1.01
12/19/2017	0.95	1.03
12/20/2017	0.10	0.46
12/21/2017	0.24	0.59
12/22/2017	0.39	0.69
12/23/2017	0.48	0.74
12/24/2017	0.31	0.73
12/25/2017	0.59	0.88
12/26/2017	0.75	0.96
12/27/2017	0.18	0.57
12/28/2017	0.41	0.69
12/29/2017	0.56	0.74
12/30/2017	0.66	0.79
12/31/2017	0.83	0.92
1/1/2018	0.98	1.03
1/2/2018	0.94	1.06
1/3/2018	0.95	1.01
1/4/2018	0.86	1.09
1/5/2018	1.03	1.16
1/6/2018	1.17	1.20
1/7/2018	1.26	1.21
1/8/2018	1.00	1.18
1/9/2018	0.95	1.21
1/10/2018	1.06	1.22
1/11/2018	1.08	1.18
1/12/2018	0.17	0.60

1/13/2018	0.38	0.73
1/14/2018	0.62	0.85
1/15/2018	0.75	0.90
1/16/2018	0.83	0.94
1/17/2018	0.53	0.93
1/18/2018	0.74	0.95
1/19/2018	0.85	0.98
1/20/2018	0.96	1.03
1/21/2018	1.06	1.06
1/22/2018	1.08	1.06
1/23/2018	0.62	0.94
1/24/2018	0.94	1.05
1/25/2018	1.15	1.16
1/26/2018	1.24	1.18
1/27/2018	1.23	1.16
1/28/2018	0.22	0.82
1/29/2018	0.09	0.20
1/30/2018	0.22	0.34
1/31/2018	0.39	0.46
2/1/2018	0.47	0.53
2/2/2018	0.58	0.63
2/3/2018	0.75	0.73
2/4/2018	0.13	0.45
2/5/2018	0.20	0.51
2/6/2018	0.40	0.62
2/7/2018	0.46	0.67
2/8/2018	0.71	0.79
2/9/2018	0.85	0.84
2/10/2018	0.70	0.85
2/11/2018	0.82	0.87
2/12/2018	0.88	0.95
2/13/2018	1.14	1.03
2/14/2018	1.13	1.00
2/15/2018	1.17	1.01
2/16/2018	1.28	1.05
2/17/2018	1.32	1.09
2/18/2018	1.45	1.16
2/19/2018	1.32	1.18
2/20/2018	1.39	1.20
2/21/2018	1.18	1.11
2/22/2018	1.21	1.09
2/23/2018	1.09	0.94
2/24/2018	1.09	0.89
2/25/2018	1.21	0.94
2/26/2018	1.33	1.11
2/27/2018	1.18	0.96
2/28/2018	1.38	1.09
3/1/2018	0.14	0.40
3/2/2018	0.41	0.31
3/3/2018	0.90	0.42
3/4/2018	1.21	0.60
3/5/2018	1.29	0.63
3/6/2018	1.43	0.88
3/7/2018	0.94	0.58
3/8/2018	1.23	0.70
3/9/2018	1.30	0.71
3/10/2018	1.31	0.76
3/11/2018	1.46	0.94
3/12/2018	0.44	0.60

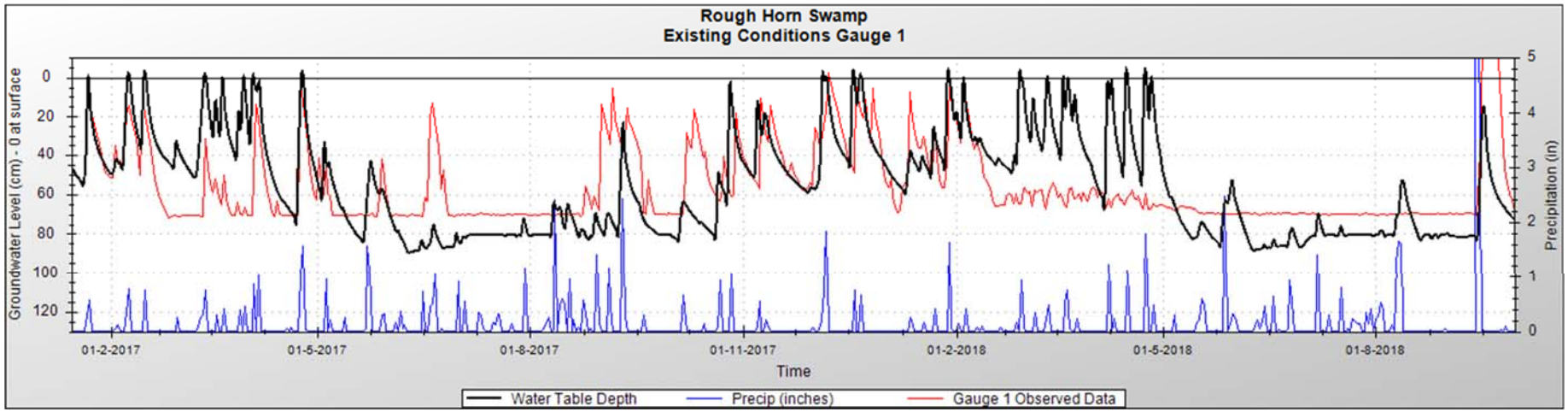
3/13/2018	0.76	0.49
3/14/2018	1.03	0.48
3/15/2018	1.13	0.43
3/16/2018	1.29	0.64
3/17/2018	1.45	0.82
3/18/2018	1.38	0.83
3/19/2018	1.46	0.91
3/20/2018	1.13	0.74
3/21/2018	0.57	0.62
3/22/2018	0.87	0.45
3/23/2018	1.09	0.48
3/24/2018	1.42	0.74
3/25/2018	1.11	0.72
3/26/2018	1.39	0.75
3/27/2018	1.50	0.86
3/28/2018	1.35	0.72
3/29/2018	1.41	0.82
3/30/2018	1.49	0.95
3/31/2018	1.33	0.84
4/1/2018	1.27	0.79
4/2/2018	1.28	0.85
4/3/2018	1.44	1.03
4/4/2018	1.31	0.94
4/5/2018	1.36	1.04
4/6/2018	1.37	1.09
4/7/2018	1.58	0.89
4/8/2018	1.08	0.72
4/9/2018	1.01	0.87
4/10/2018	1.24	0.84
4/11/2018	1.40	0.89
4/12/2018	1.36	0.93
4/13/2018	1.48	1.12
4/14/2018	1.46	1.18
4/15/2018	1.55	1.28
4/16/2018	1.10	0.69
4/17/2018	1.37	0.79
4/18/2018	1.31	0.87
4/19/2018	1.44	1.15
4/20/2018	1.46	1.25
4/21/2018	1.42	1.25
4/22/2018	1.51	1.39
4/23/2018	1.61	1.43
4/24/2018	0.32	0.41
4/25/2018	0.62	0.62
4/26/2018	0.91	0.79
4/27/2018	0.51	0.60
4/28/2018	0.91	0.79
4/29/2018	1.35	0.97
4/30/2018	1.56	1.09
5/1/2018	1.56	1.22
5/2/2018	1.56	1.33
5/3/2018	1.59	1.42
5/4/2018	1.59	1.45
5/5/2018	1.61	1.50
5/6/2018	1.61	1.54
5/7/2018	1.59	1.56
5/8/2018	1.60	1.61
5/9/2018	1.57	1.63
5/10/2018	1.58	1.67

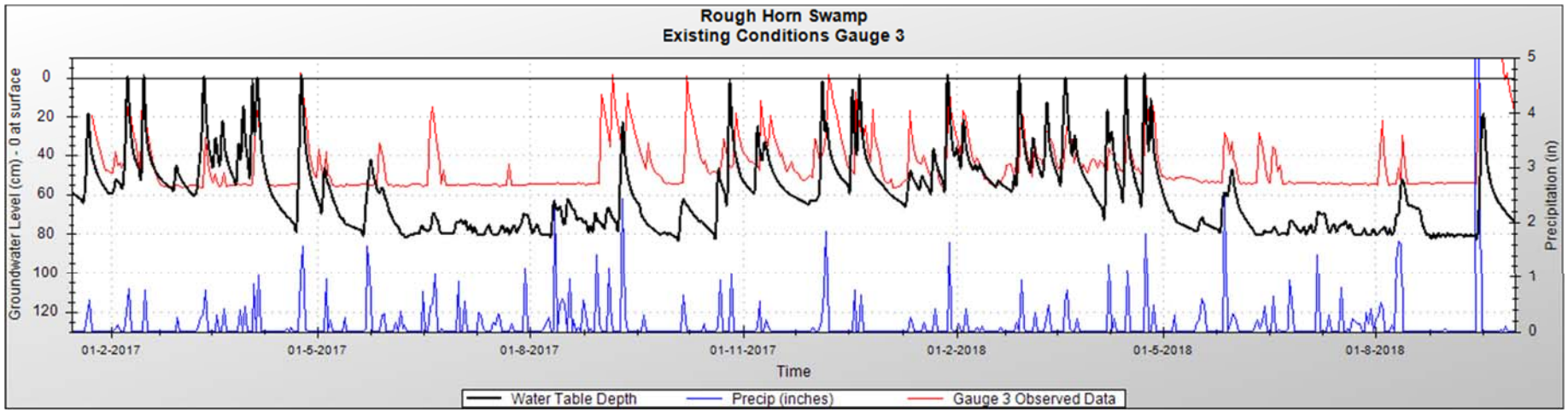
5/11/2018	1.57	1.73
5/12/2018	1.57	1.78
5/13/2018	1.58	1.83
5/14/2018	1.59	1.90
5/15/2018	1.61	1.96
5/16/2018	1.63	2.00
5/17/2018	1.65	2.04
5/18/2018	1.62	2.04
5/19/2018	1.23	2.06
5/20/2018	1.55	2.05
5/21/2018	1.67	2.04
5/22/2018	1.67	2.03
5/23/2018	1.67	2.02
5/24/2018	1.69	2.05
5/25/2018	1.67	2.04
5/26/2018	1.70	2.04
5/27/2018	1.67	2.04
5/28/2018	1.16	2.05
5/29/2018	1.37	2.04
5/30/2018	1.61	2.06
5/31/2018	1.48	2.05
6/1/2018	1.68	2.04
6/2/2018	1.70	2.04
6/3/2018	1.69	2.05
6/4/2018	1.68	2.04
6/5/2018	1.67	2.05
6/6/2018	1.67	2.05
6/7/2018	1.66	2.02
6/8/2018	1.67	2.02
6/9/2018	1.67	2.03
6/10/2018	1.66	2.01
6/11/2018	1.67	2.01
6/12/2018	0.95	2.03
6/13/2018	1.33	2.02
6/14/2018	1.54	2.01
6/15/2018	1.69	2.02
6/16/2018	1.68	2.02
6/17/2018	1.68	2.01
6/18/2018	0.84	1.78
6/19/2018	1.37	2.02
6/20/2018	1.64	2.00
6/21/2018	1.57	2.01
6/22/2018	1.67	2.01
6/23/2018	1.68	2.01
6/24/2018	1.68	2.01
6/25/2018	1.67	2.00
6/26/2018	1.68	2.00
6/27/2018	1.69	2.01
6/28/2018	1.67	2.02
6/29/2018	1.65	2.00
6/30/2018	1.66	2.01
7/1/2018	1.67	2.01
7/2/2018	1.67	2.01
7/3/2018	1.66	2.00
7/4/2018	1.66	2.01
7/5/2018	1.66	2.01
7/6/2018	1.67	2.00
7/7/2018	1.66	2.01
7/8/2018	1.68	2.02

7/9/2018	1.67	2.00
7/10/2018	1.66	2.00
7/11/2018	1.67	2.01
7/12/2018	1.67	2.00
7/13/2018	1.67	2.04
7/14/2018	1.66	2.03
7/15/2018	1.66	2.03
7/16/2018	1.66	2.04
7/17/2018	1.67	2.03
7/18/2018	1.66	2.03
7/19/2018	1.66	2.04
7/20/2018	1.67	2.02
7/21/2018	1.67	2.01
7/22/2018	1.67	2.00
7/23/2018	1.66	2.01
7/24/2018	1.67	2.02
7/25/2018	1.67	2.02
7/26/2018	1.67	2.01
7/27/2018	1.67	2.01
7/28/2018	1.66	2.01
7/29/2018	1.67	2.01
7/30/2018	1.67	2.02
7/31/2018	1.67	2.02
8/1/2018	1.68	2.03
8/2/2018	1.44	2.01
8/3/2018	0.53	2.02
8/4/2018	0.61	2.02
8/5/2018	1.19	2.01
8/6/2018	1.55	2.01
8/7/2018	1.70	2.01
8/8/2018	1.70	2.01
8/9/2018	1.70	2.01
8/10/2018	1.69	2.01
8/11/2018	1.69	1.51
8/12/2018	1.69	2.03
8/13/2018	0.70	2.03
8/14/2018	1.26	2.04
8/15/2018	1.58	2.03
8/16/2018	1.70	2.04
8/17/2018	1.69	2.02
8/18/2018	1.68	2.02
8/19/2018	1.69	2.02
8/20/2018	1.70	2.02
8/21/2018	1.65	2.00
8/22/2018	1.66	2.00
8/23/2018	1.66	2.00
8/24/2018	1.66	2.01
8/25/2018	1.66	2.01
8/26/2018	1.67	2.01
8/27/2018	1.66	2.00
8/28/2018	1.66	2.01
8/29/2018	1.66	2.00
8/30/2018	1.66	2.01
8/31/2018	1.66	2.01
9/1/2018	1.66	2.01
9/2/2018	1.66	2.01
9/3/2018	1.66	2.00
9/4/2018	1.66	2.00
9/5/2018	1.65	2.00

9/6/2018	1.65	2.00
9/7/2018	1.67	2.01
9/8/2018	1.66	2.00
9/9/2018	1.65	2.00
9/10/2018	1.65	1.99
9/11/2018	1.66	2.01
9/12/2018	1.66	2.00
9/13/2018	1.64	1.99
9/14/2018	0.56	2.02
9/15/2018	-0.16	-0.68
9/16/2018	-0.15	-0.99
9/17/2018	-3.62	-3.84
9/18/2018	-3.60	-3.84
9/19/2018	-3.59	-3.83
9/20/2018	-3.58	-3.82
9/21/2018	-2.63	-2.88
9/22/2018	-2.10	-2.36
9/23/2018	-1.45	-1.72
9/24/2018	-0.70	-0.96
9/25/2018	0.03	-0.29
9/26/2018	0.07	-0.06
9/27/2018	0.04	-0.03
9/28/2018	0.08	0.12
9/29/2018	0.11	0.24
9/30/2018	0.16	0.36
10/1/2018	0.18	0.48
10/2/2018	0.20	0.59

DRAINMOD Calibration





RoughHorn_EX_G1_updated2018_v2.WET

```
-----------------------------------------------------
*              DRAINMOD version 6.1                 *
* Copyright 1980-2013 North Carolina State University *
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```

Rough Horn - Existing Gauge 1
Columbus, NC Station 319357

****

```
  ----------RUN STATISTICS ----------          time: 11/ 5/2018  @ 16:13
 input file:   C:\Program Files (x86)\DrainMod\inputs\RoughHorn
 parameters:    subirrigation run          and yields not calculated
               drain spacing =    5944. cm   drain depth =  107.0 cm
-----------------------------------------------------------------------
```

DRAINMOD --- WET PERIOD EVALUATION
****** Version 6.1 ******

Number of periods with water table closer than 30.00 cm
for at least 32 days. Counting starts on day
60 and ends on day 324 of each year

YEAR	Number of Periods of 32 days or more with WTD < 30.00 cm	Longest Consecutive Period in Days
1955	0.	9.
1956	0.	10.
1957	0.	11.
1958	0.	9.
1959	0.	11.
1960	0.	11.
1961	0.	9.
1962	0.	11.
1963	0.	9.
1964	0.	7.
1965	0.	15.
1966	0.	8.
1967	0.	6.
1968	0.	13.
1969	0.	11.

1970	0.	18.
1971	0.	8.
1972	0.	13.
1973	0.	17.
1974	0.	17.
1975	0.	25.
1976	0.	12.
1977	0.	10.
1978	0.	9.
1979	0.	12.
1980	1.	33.
1981	0.	6.
1982	0.	6.
1983	0.	19.
1984	0.	20.
1985	0.	6.
1986	0.	12.
1987	0.	7.
1988	0.	6.
1989	0.	12.
1990	0.	7.
1991	0.	11.
1992	0.	12.
1993	0.	13.
1994	0.	6.
1995	0.	21.
1996	0.	8.
1997	0.	10.
1998	0.	8.
1999	0.	11.
2000	0.	20.
2001	0.	12.
2002	0.	10.
2003	0.	11.
2004	0.	5.
2005	0.	8.
2006	0.	14.
2007	0.	5.
2008	0.	8.
2009	0.	8.
2010	0.	6.
2011	0.	12.
2012	0.	6.
2013	0.	7.
2014	0.	7.
2015	0.	18.
2016	0.	8.
2017	0.	13.

Number of Years with at least one period =   1. out of   63 years.

RoughHorn_PROP_G1_updated2018_v2.WET

```
-----------------------------------------------------
*              DRAINMOD version 6.1                 *
* Copyright 1980-2013 North Carolina State University *
-----------------------------------------------------
```

Rough Horn - Proposed Gauge 1 Rip.
Columbus, NC Station 319357
****

```
 ----------RUN STATISTICS ----------          time: 11/ 5/2018  @ 16:16
 input file:   C:\Program Files (x86)\DrainMod\inputs\RoughHorn
 parameters:    free drainage              and yields not calculated
               drain spacing =    5944. cm   drain depth =    5.0 cm
```

DRAINMOD --- WET PERIOD EVALUATION
****** Version 6.1 ******

Number of periods with water table closer than 30.00 cm
for at least 32 days. Counting starts on day
60 and ends on day 324 of each year

YEAR	Number of Periods of 32 days or more with WTD < 30.00 cm	Longest Consecutive Period in Days
1955	1.	52.
1956	2.	55.
1957	1.	42.
1958	2.	63.
1959	2.	63.
1960	1.	44.
1961	1.	53.
1962	1.	51.
1963	1.	45.
1964	1.	53.
1965	1.	63.
1966	1.	39.
1967	1.	36.
1968	1.	35.
1969	1.	63.

1970	1.	45.
1971	2.	44.
1972	1.	47.
1973	1.	46.
1974	1.	56.
1975	1.	65.
1976	1.	36.
1977	1.	42.
1978	2.	36.
1979	1.	51.
1980	1.	41.
1981	1.	41.
1982	1.	35.
1983	1.	61.
1984	1.	68.
1985	2.	48.
1986	1.	35.
1987	1.	39.
1988	1.	39.
1989	1.	57.
1990	1.	44.
1991	1.	38.
1992	1.	39.
1993	1.	62.
1994	2.	42.
1995	2.	39.
1996	1.	49.
1997	1.	37.
1998	1.	61.
1999	1.	40.
2000	1.	64.
2001	1.	38.
2002	1.	39.
2003	1.	49.
2004	1.	40.
2005	1.	49.
2006	1.	37.
2007	1.	34.
2008	1.	48.
2009	1.	58.
2010	1.	37.
2011	1.	63.
2012	1.	45.
2013	1.	65.
2014	1.	57.
2015	1.	39.
2016	1.	47.
2017	1.	44.

Number of Years with at least one period =   63. out of   63 years.

RoughHorn_EX_G3_updated2018_v2.WET

```
-----------------------------------------------------
*              DRAINMOD version 6.1                 *
* Copyright 1980-2013 North Carolina State University *
-----------------------------------------------------
```

Rough Horn EX Gauge 3 Non-rip
Columbus, NC Station 319357

****

```
  ----------RUN STATISTICS ----------          time: 11/ 5/2018  @ 16:18
 input file:   C:\Program Files (x86)\DrainMod\inputs\RoughHorn
 parameters:    subirrigation run          and yields not calculated
               drain spacing =    3597. cm   drain depth =  116.0 cm
-----------------------------------------------------------------------
```

DRAINMOD --- WET PERIOD EVALUATION
****** Version 6.1 ******

Number of periods with water table closer than 30.00 cm
for at least 27 days. Counting starts on day
60 and ends on day 324 of each year

YEAR	Number of Periods of 27 days or more with WTD < 30.00 cm	Longest Consecutive Period in Days
1955	0.	4.
1956	0.	5.
1957	0.	5.
1958	0.	5.
1959	0.	4.
1960	0.	3.
1961	0.	7.
1962	0.	3.
1963	0.	4.
1964	0.	5.
1965	0.	5.
1966	0.	3.
1967	0.	2.
1968	0.	5.
1969	0.	4.

1970	0.	5.
1971	0.	5.
1972	0.	4.
1973	0.	4.
1974	0.	3.
1975	0.	4.
1976	0.	3.
1977	0.	5.
1978	0.	4.
1979	0.	8.
1980	0.	4.
1981	0.	3.
1982	0.	3.
1983	0.	4.
1984	0.	6.
1985	0.	4.
1986	0.	4.
1987	0.	4.
1988	0.	3.
1989	0.	8.
1990	0.	4.
1991	0.	5.
1992	0.	4.
1993	0.	3.
1994	0.	3.
1995	0.	4.
1996	0.	5.
1997	0.	3.
1998	0.	5.
1999	0.	9.
2000	0.	3.
2001	0.	3.
2002	0.	3.
2003	0.	5.
2004	0.	4.
2005	0.	4.
2006	0.	3.
2007	0.	3.
2008	0.	3.
2009	0.	5.
2010	0.	5.
2011	0.	3.
2012	0.	4.
2013	0.	4.
2014	0.	3.
2015	0.	6.
2016	0.	3.
2017	0.	4.

Number of Years with at least one period =   0. out of   63 years.

RoughHorn_PROP_G3_updated2018_v3.WET

```
-----------------------------------------------------
*              DRAINMOD version 6.1                 *
* Copyright 1980-2013 North Carolina State University *
-----------------------------------------------------
```

Rough Horn PROP Gge 3 Non-rip
Columbus, NC Station 319357

****

```
 ----------RUN STATISTICS ----------          time: 11/ 5/2018  @ 16:21
 input file:   C:\Program Files (x86)\DrainMod\inputs\RoughHorn
 parameters:    free drainage              and yields not calculated
               drain spacing =    3597. cm   drain depth =    5.0 cm
```

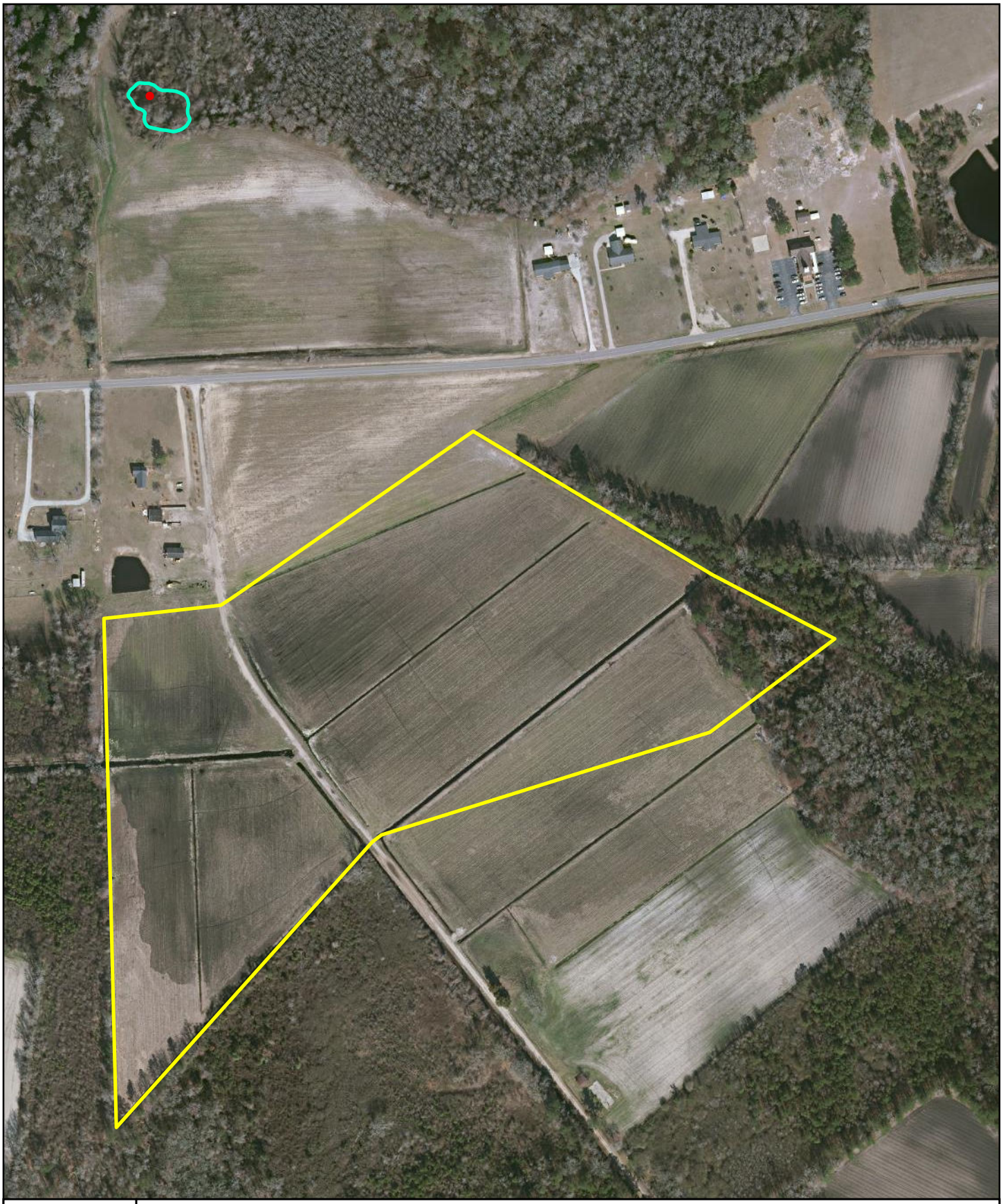
DRAINMOD --- WET PERIOD EVALUATION
****** Version 6.1 ******

Number of periods with water table closer than 30.00 cm
for at least   27 days. Counting starts on day
60 and ends on day 324 of each year

YEAR	Number of Periods of 27 days or more with WTD < 30.00 cm	Longest Consecutive Period in Days
1955	1.	51.
1956	2.	40.
1957	1.	41.
1958	2.	62.
1959	2.	44.
1960	1.	43.
1961	1.	53.
1962	1.	51.
1963	1.	34.
1964	1.	52.
1965	1.	44.
1966	1.	37.
1967	1.	35.
1968	1.	34.
1969	1.	63.

1970	2.	45.
1971	2.	44.
1972	1.	47.
1973	1.	45.
1974	1.	55.
1975	1.	64.
1976	1.	35.
1977	2.	41.
1978	2.	36.
1979	1.	51.
1980	1.	38.
1981	1.	40.
1982	2.	34.
1983	1.	61.
1984	1.	68.
1985	2.	48.
1986	1.	34.
1987	1.	38.
1988	1.	38.
1989	1.	56.
1990	2.	44.
1991	1.	37.
1992	1.	38.
1993	2.	62.
1994	2.	42.
1995	2.	38.
1996	1.	49.
1997	1.	35.
1998	1.	61.
1999	1.	39.
2000	1.	63.
2001	1.	37.
2002	1.	38.
2003	1.	48.
2004	1.	38.
2005	2.	48.
2006	1.	36.
2007	1.	33.
2008	1.	47.
2009	1.	57.
2010	1.	37.
2011	1.	63.
2012	1.	44.
2013	1.	57.
2014	1.	36.
2015	1.	36.
2016	1.	46.
2017	1.	43.

Number of Years with at least one period =   63. out of   63 years.



Reference Wetland Map, Rough Horn Swamp, Columbus County, NC

KCI ASSOCIATES OF NC

- Reference Wetland Data Form Location
- Reference Wetland
- Project Easement

N

0 175 350 Feet

Image Source: NC OneMap Orthoimagery 2017.

Reference

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: RHS - across street City/County: Columbus Sampling Date: 3/17/17

Applicant/Owner: KCI State: NC Sampling Point: Ref

Investigator(s): J. Sullivan Section, Township, Range:

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Slope (%): —

Subregion (LRR or MLRA): P-133A Lat: 34.4522 Long: -78.9411 Datum: NAD83

Soil Map Unit Name: Johnston sandy loam NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	Is the Sampled Area within a Wetland? Yes X No
Hydric Soil Present?	Yes X	No	
Wetland Hydrology Present?	Yes X	No	

Remarks: North of RHS restoration site - Across Old Boardman Rd. Area is adjacent to Cypress Swamp.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [ ] Surface Water (A1)
- [X] High Water Table (A2)
- [X] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [X] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [X] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [X] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes	No X	Depth (inches):
Water Table Present?	Yes X	No	Depth (inches): 6
Saturation Present? (includes capillary fringe)	Yes X	No	Depth (inches): 6

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Surface water in lower area of wetland - 2" deep.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Ref

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	40	Y	FAC
2. Quercus laurifolia	60	Y	FACW
3.			
4.			
5.			
6.			
7.			
8.			
	100	= Total Cover	

50% of total cover: 50 20% of total cover: 20

Sapling/Shrub Stratum (Plot size: 15)			
1. Acer rubrum	10	X	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	10	= Total Cover	

50% of total cover: 5 20% of total cover: 2

Herb Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size: 30)			
1. Vitis rotundifolia	5	X	FAC
2.			
3.			
4.			
5.			
	5	= Total Cover	

50% of total cover: 25 20% of total cover: 1

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:

__ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: Ref.

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR2/1	100					SL	Masked Sand Grains. Heavy Organics
15-85	10YR3/1	100					LS	Masked grains
85-45	10YR3/1	100					S	Masked grains.

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☒ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

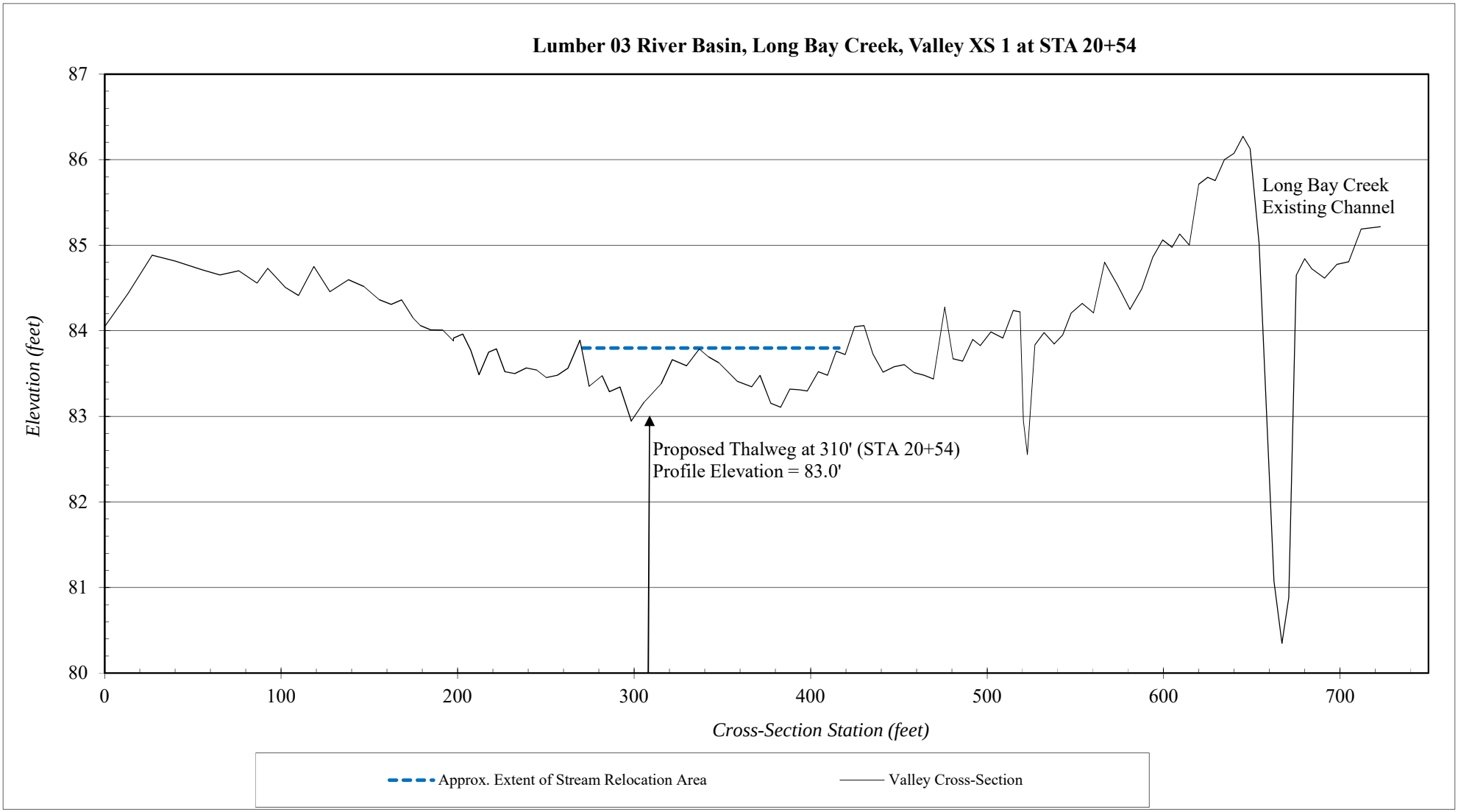
Type: _____

Depth (inches): _____

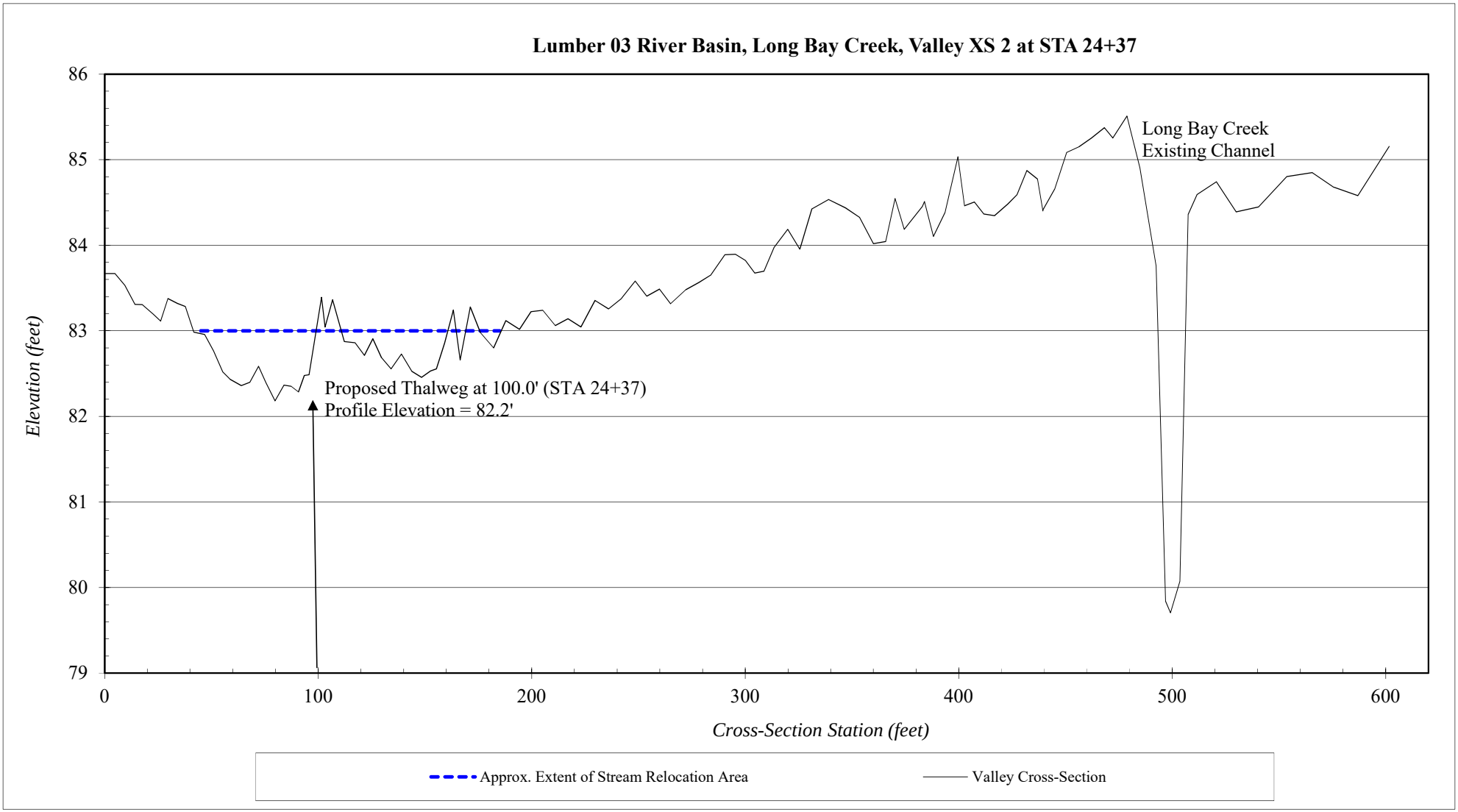
Hydric Soil Present? Yes X No _____

Remarks:

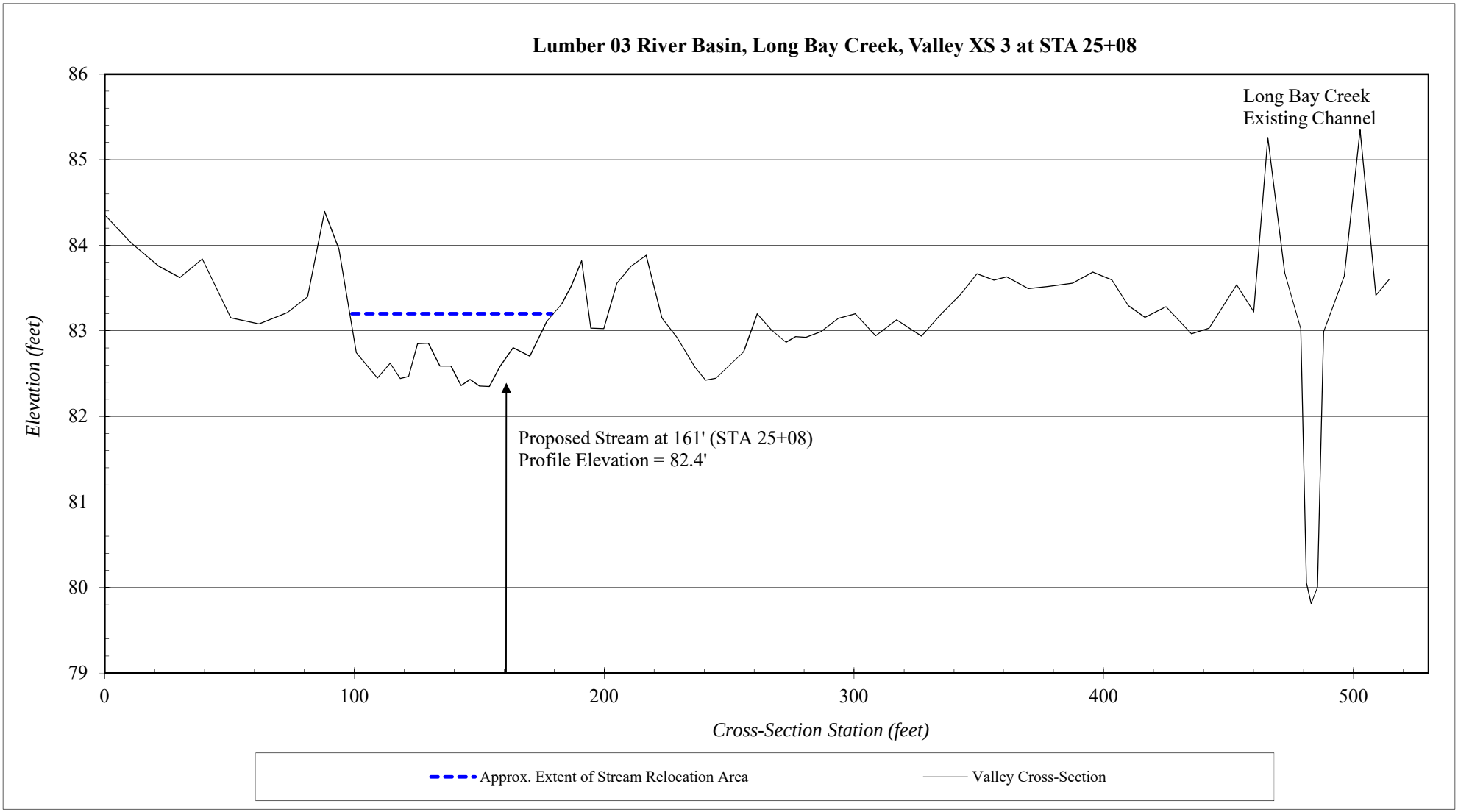
River Basin:	Lumber 03
Watershed:	Long Bay Creek
XS ID	Valley XS 1 at STA 20+54
Drainage Area (sq mi):	2.81 square miles
Date:	March 2016
Field Crew:	KCI



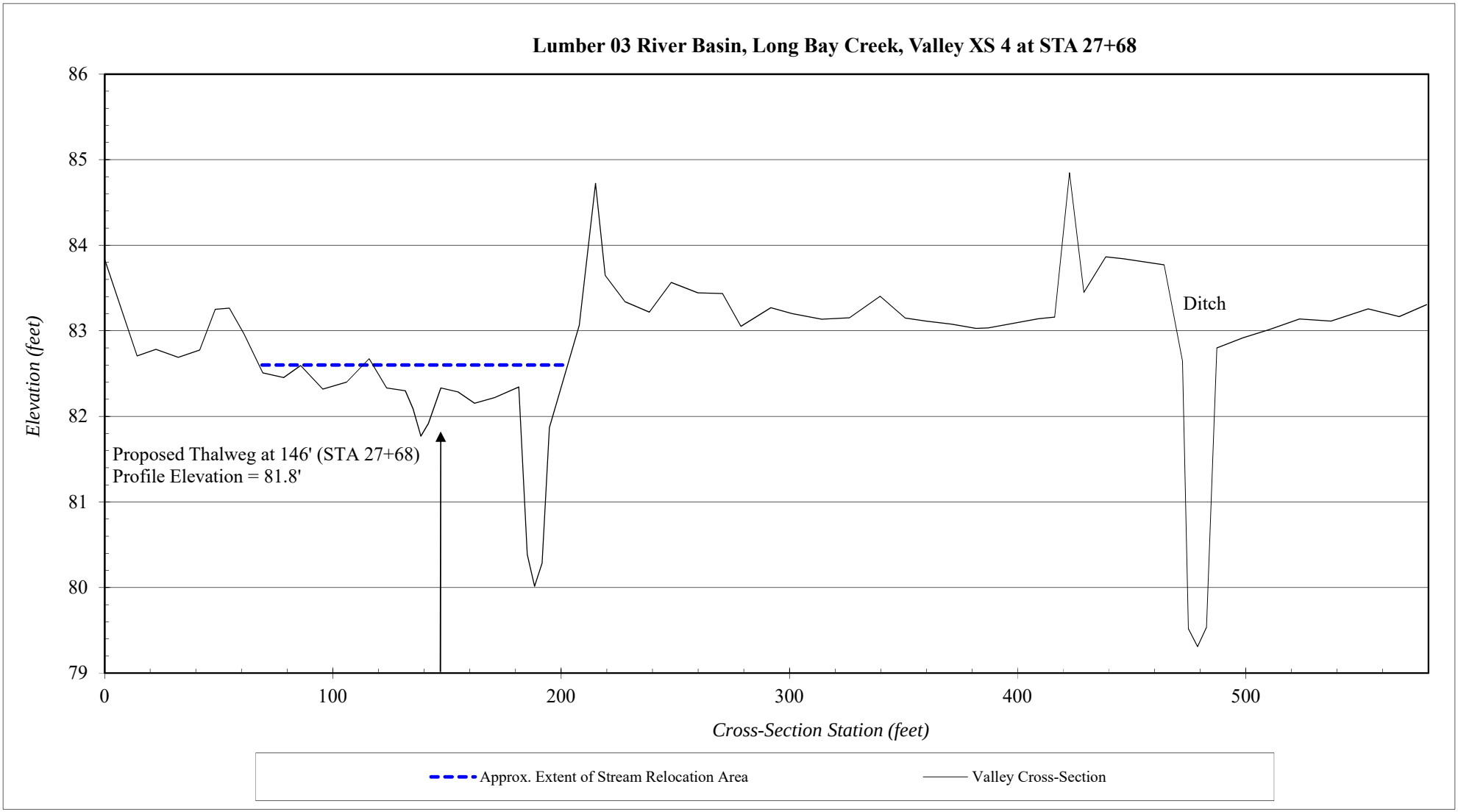
River Basin:	Lumber 03
Watershed:	Long Bay Creek
XS ID	Valley XS 2 at STA 24+37
Drainage Area (sq mi):	2.81 square miles
Date:	March 2016
Field Crew:	KCI



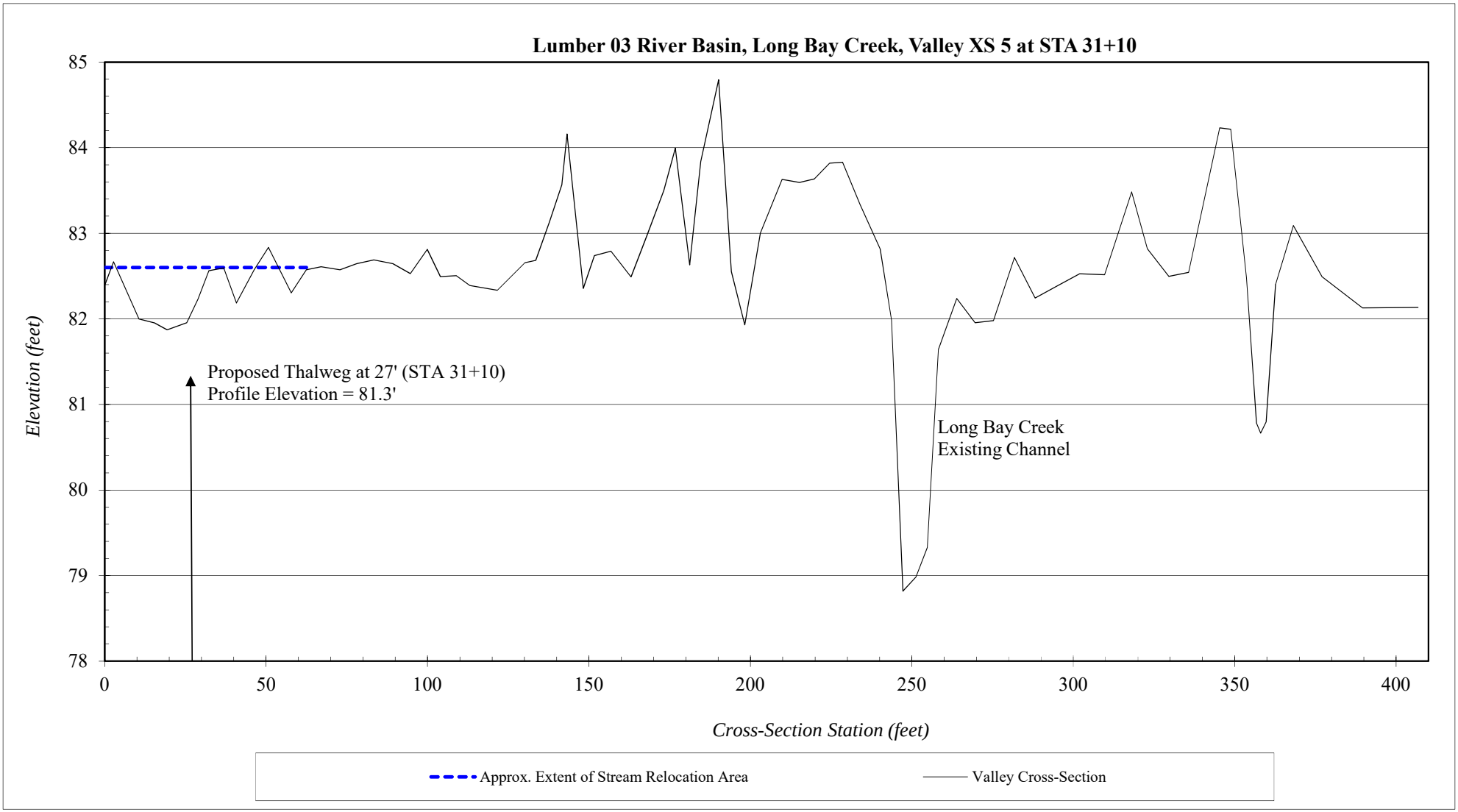
River Basin:	Lumber 03
Watershed:	Long Bay Creek
XS ID	Valley XS 3 at STA 25+08
Drainage Area (sq mi):	2.81 square miles
Date:	March 2016
Field Crew:	KCI



River Basin:	Lumber 03
Watershed:	Long Bay Creek
XS ID	Valley XS 4 at STA 27+68
Drainage Area (sq mi):	2.81 square miles
Date:	March 2016
Field Crew:	KCI



River Basin:	Lumber 03
Watershed:	Long Bay Creek
XS ID	Valley XS 5 at STA 31+10
Drainage Area (sq mi):	2.81 square miles
Date:	March 2016
Field Crew:	KCI



Estimated Reduction in Total Nitrogen and Total Phosphorus From Rough Horn Swamp and Rough Horn Swamp II

Nutrient Reduction from Buffer Adjacent to Agricultural Fields

TN reduction (lbs/yr) = 75.77 (lbs/ac/yr) x Area (ac)

TP reduction (lbs/yr) = 4.88 (lbs/ac/yr) x Area (ac)

	Reduction (lbs/ac/year)	Acres	Total Reduction (lbs/year)
TN	75.77	15.7	1,189.6
TP	4.88	15.7	76.6

Buffer Area = Northeastern and southeastern edges of Long Bay Creek and UT1

Calculated using NC Division of Water Quality – Methodology and Calculation (1998) as described in NCDEQ, Division of Mitigation Services (2016), Quantifying Benefits to Water Quality from Livestock Exclusion and Riparian Buffer Establishment for Stream Restoration. Last accessed at: http://deq.nc.gov/about/divisions/mitigation-services/dms-vendors/rfp-forms-templates

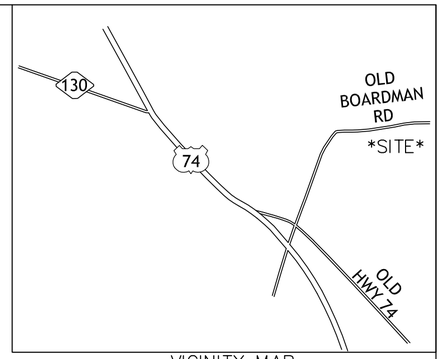
12.3 Site Protection Instrument

SURVEYOR NOTES:

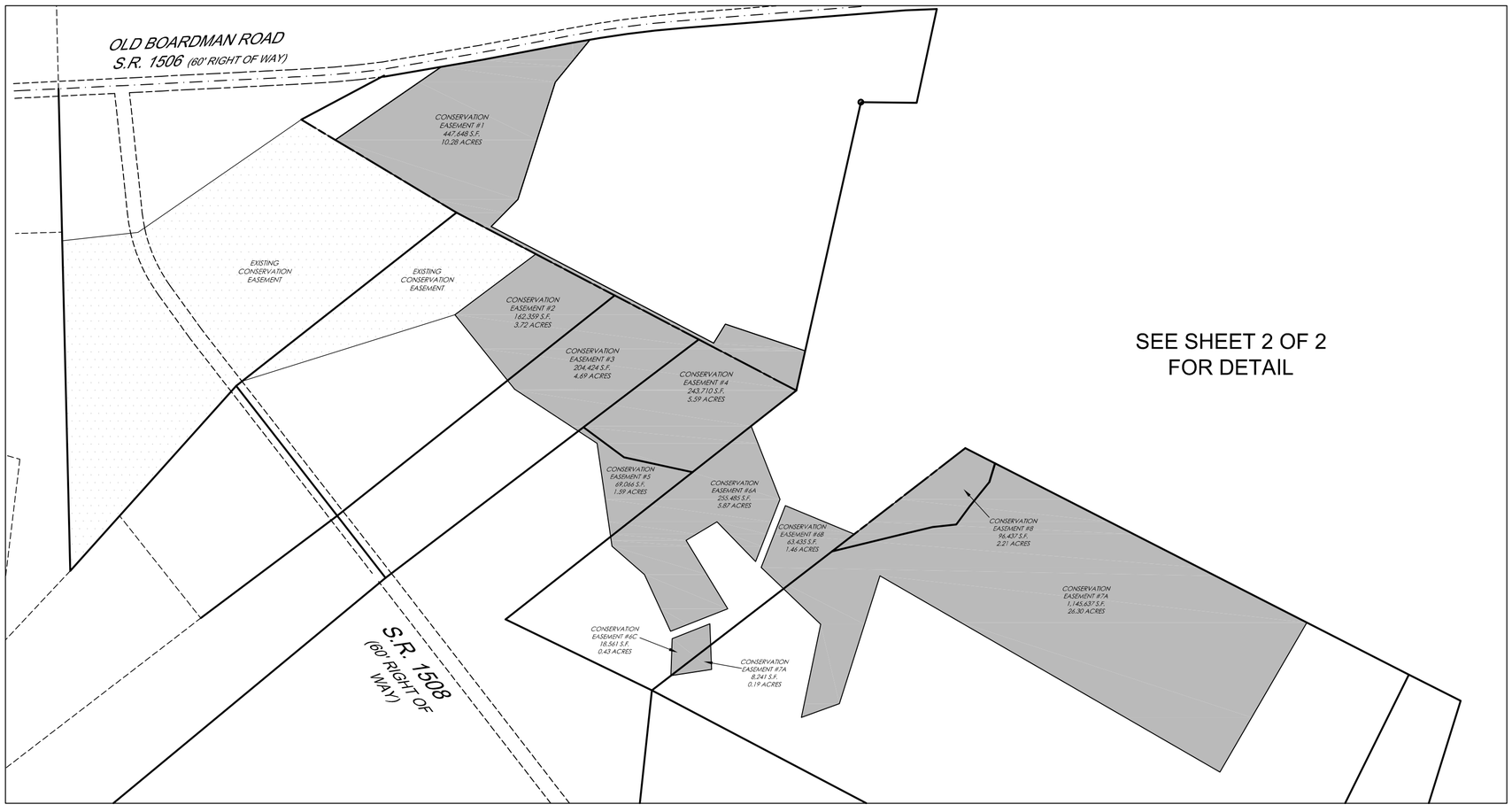
1. THIS PLAT DOES NOT REPRESENT A BOUNDARY SURVEY OF THE PARENT TRACTS. THE PARENT TRACT BOUNDARIES ADJACENT TO THIS EASEMENT ARE NOT CHANGED BY THIS PLAT. BOUNDARY INFORMATION SHOWN HEREON WAS DERIVED FROM DEEDS AND MAPS OF RECORD IN COLUMBUS COUNTY AND MONUMENTATION FOUND IN THE FIELD.
2. DISTANCES SHOWN ARE HORIZONTAL GROUND DISTANCES IN U.S. SURVEY FEET UNLESS OTHERWISE NOTED.
3. AREA COMPUTED BY COORDINATE METHOD.
4. THE BASIS OF THE MERIDIANS AND COORDINATES FOR THIS PLAT IS THE NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83), BASED ON DIFFERENTIAL GPS OBSERVATIONS PERFORMED IN JUNE 2015.
5. DEED REFERENCES: AS SHOWN HEREON.
6. SUBJECT PROPERTIES KNOWN AS TAX NUMBER: AS SHOWN HEREON.
7. SUBJECT EASEMENT LIES WITHIN THE AREA DESIGNATED AS ZONE "X", BASED ON FEDERAL FLOOD INSURANCE RATE MAP 3720021500K AND 3720021400K, EFFECTIVE JUNE 2, 2006.
8. NO UNDERGROUND UTILITY LOCATING PERFORMED DURING THE COURSE OF THIS SURVEY.
9. THE STATE PLANE COORDINATES FOR THIS PROJECT WERE PRODUCED WITH RTK GPS OBSERVATIONS. THE NETWORK POSITIONAL ACCURACY OF THE RTK DERIVED POSITIONAL INFORMATION IS 0.02 METER. HORIZONTAL POSITIONS ARE REFERENCED TO NAD 83 (2011). COMBINED SCALE FACTOR = 0.99997060

STATE OF NORTH CAROLINA
COLUMBUS COUNTY
I, _____, REVIEW OFFICER OF COLUMBUS COUNTY, CERTIFY THAT THE MAP OR PLAT WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

_____
REVIEW OFFICER DATE



VICINITY MAP
(NOT TO SCALE)



SEE SHEET 2 OF 2
FOR DETAIL

POINT #	NORTHING	EASTING
4	254316.47	2019173.06
8	254147.69	2019495.52
11	254611.72	2018680.22
12	254908.68	2019111.39
13	254936.71	2019275.47
14	255006.44	2019644.79
15	255019.39	2019716.81
16	254846.15	2019574.66
17	254369.58	2019422.99
18	254259.61	2019314.02
20	253785.83	2020219.20
21	253863.25	2020266.76
22	253754.31	2020591.32
23	253593.02	2020555.22
24	253979.80	2019816.28
25	253633.91	2019380.74
26	253901.16	2019166.69
27	253800.72	2020158.40
28	253428.02	2019668.71
29	253598.37	2019409.20
30	253260.98	2020133.10
31	253321.66	2019854.60
32	253444.11	2019689.85
33	252998.85	2019799.85
34	253377.98	2019744.96
35	253448.53	2020371.53
36	253150.97	2020488.77
37	252897.70	2020389.24
38	253059.46	2020232.60
39	252984.04	2020106.69
40	252706.41	2020276.10
41	252614.96	2020044.03
42	252844.94	2019937.37
43	252960.63	2019805.38
44	253125.10	2020510.84
45	253009.36	2020790.65
46	252939.30	2020700.19
47	252787.31	2020503.05
48	252873.89	2020412.11
49	252434.34	2020045.22
50	252584.55	2020049.91
51	252645.23	2020203.14
52	252558.80	2020206.65
53	252459.80	2020210.67
54	253008.88	2020984.92
55	253038.07	2021109.48
56	253048.92	2021205.37
57	253122.41	2021260.24
58	253221.44	2021340.24
59	253297.28	2021362.95
60	252649.89	2022630.79
61	252042.51	2022277.50
62	252840.06	2020894.71
63	252320.63	2020730.49
64	252264.56	2020575.93
65	252643.20	2020654.43

LINE TABLE		
LINE	LENGTH	BEARING
L1	166.45	N80°18'18"E
L2	375.85	N79°18'32"E
L3	73.18	N79°48'18"E
L4	224.10	S39°22'10"W
L5	154.81	S44°44'22"W
L6	90.86	N31°34'02"E
L7	342.35	S71°26'43"E
L8	165.28	S12°36'54"W
L9	556.18	S51°32'41"W
L10	342.40	N38°41'33"W
L11	410.98	N53°08'26"E
L12	310.43	N56°43'08"W
L13	45.53	N38°41'33"W
L14	556.18	N51°32'41"E
L15	285.03	N77°42'25"W
L16	205.27	N53°22'44"W
L17	205.27	S53°22'44"E
L18	285.03	S77°42'25"E
L19	383.08	N08°14'17"W
L20	91.20	N56°43'08"W
L21	26.56	N52°43'31"E
L22	319.82	S21°30'20"E
L23	272.13	S21°27'17"W
L24	225.17	N44°04'34"W
L25	146.78	S59°04'39"W
L26	325.24	S31°23'30"E
L27	249.44	S68°29'33"W
L28	253.51	N24°52'50"W
L29	175.51	N48°45'53"W
L30	38.62	N08°14'17"W
L31	302.80	S67°31'45"E
L32	114.42	S52°14'36"W
L33	248.92	S52°22'07"W
L34	125.56	N46°24'30"W
L35	269.91	N21°27'17"E
L36	98.06	N52°22'07"E
L37	150.28	N01°47'18"E
L38	164.80	N68°23'49"E
L39	86.50	S02°19'31"E
L40	203.83	S52°22'07"W
L41	203.83	N52°22'07"E
L42	99.08	S02°19'31"E
L43	167.39	S81°15'07"W
L44	248.92	N52°22'07"E
L45	293.11	N76°16'06"E
L46	127.94	N76°48'36"E
L47	96.50	N83°32'36"E
L48	91.71	N36°44'36"E
L49	127.31	N38°56'06"E
L50	79.16	N16°40'21"E
L51	164.42	S70°03'37"W
L52	386.69	N11°42'42"E
L53	209.00	N46°24'30"W
L54	135.58	S62°50'11"E

I, JAMES M. GELLENTHIN, HEREBY DECLARE THAT THIS MAP WAS DRAWN UNDER MY SUPERVISION FROM A SURVEY MADE UNDER MY SUPERVISION, THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED, AS DRAWN FROM INFORMATION AS SHOWN HEREON; THAT THE RATIO OF PRECISION AS CALCULATED IS GREATER THAN 1:10,000; THAT THIS MAP DOES REPRESENT AN OFFICIAL BOUNDARY SURVEY AND HAS BEEN PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 8TH DAY OF OCTOBER, 2018

_____
NORTH CAROLINA REGISTRATION NUMBER L-3860
JAMES M. GELLENTHIN

I, JAMES M. GELLENTHIN, PROFESSIONAL LAND SURVEYOR, NO. L-3860 CERTIFY TO THE FOLLOWING AS REQUIRED IN G.S. 47-30 (F)(11):

THAT THE SURVEY IS OF ANOTHER CATEGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT ORDERED SURVEY, OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION.

_____
NORTH CAROLINA REGISTRATION NUMBER L-3860
JAMES M. GELLENTHIN

OWNER CERTIFICATION (CE#1,6 & 8) SPO FILE NO. 24-BG

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF CLUMBUS AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

_____
GEORGE ALLEN SANDERSON *DATE*

OWNER CERTIFICATION (CE#2, 3 & 4) SPO FILE NO. 24-BH

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF CLUMBUS AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

_____
KCI ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION INC. *DATE*

OWNER CERTIFICATION (CE#5) SPO FILE NO. 24-BI

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF CLUMBUS AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

_____
TEDDY BRITT *DATE*

_____
ALEXANDER CAIN *DATE*

OWNER CERTIFICATION (CE#7) SPO FILE NO. 24-BJ

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF CLUMBUS AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

_____
CAROL SIMMONS *DATE*

DRAFT

FINAL PLAT
CONSERVATION EASEMENT
FOR
STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
PROJECT NAME: ROUGH HORN SWAMP II
DMS PROJECT #: 100053
SPO FILE NOS. 24BG, 24-BH, 24-BI, 24-BJ
TATUM TOWNSHIP, COLUMBUS COUNTY
NORTH CAROLINA

DATE:	SCALE:	SHEET:
OCTOBER 4, 2018	N/A	1 OF 2

KCI
ASSOCIATES OF NORTH CAROLINA C-0764

KCI ASSOCIATES OF N.C.
ENGINEERS, SURVEYORS AND PLANNERS

4505 FALLS OF NEUSE ROAD, FLOOR 4
RALEIGH, NC 27607
PHONE (919) 783-9214 * FAX (919) 783-9266

OLD BOARDMAN ROAD
S.R. 1506 (60' RIGHT OF WAY)

S.R. 1508
(60' RIGHT OF

N/F
HORACE G FIELD, JR.
JANET GAIL FIELDS
PROPERTY #: 21056
PIN 0215.00-84-3286.000
DB 354 PG 85

N/F
GEORGE ALLEN SANDERSON
PROPERTY #: 22394
PIN 0215.00-94-9519.000
DB 373 PG 560

N/F
KCI ENVIRONMENTAL TECHNOLOGIES
AND CONSTRUCTION INC.
PROPERTY #: 77799
PIN: 0215.00-93-0724.000
DB 1124 PG 934-936
TRACT 2

N/F
KCI ENVIRONMENTAL
TECHNOLOGIES
AND CONSTRUCTION INC.
PROPERTY #: 097935
PIN: 0215.00-93-3481.000
DB 1124 PG 934-936
TRACT 1

N/F
KCI ENVIRONMENTAL TECHNOLOGIES
AND CONSTRUCTION INC.
PROPERTY #: 098144
PIN: 0225.00-03-1512.000
DB 1131 PG 750
PB 100 PG 12

N/F
GEORGE ALLEN SANDERSON
PROPERTY #: 22398
PIN: 0225.00-15-6334.000
DB 205 PG 398

N/F
GEORGE ALLEN SANDERSON
PROPERTY #: 022397
PIN: 0225.00-13-1136.000
WILL 2002 E 490
PB 26 PG 34

N/F
TEDDY BRITT &
ALEXANDER CAIN
PROPERTY #: 20694
PIN: 0215.00-93-7106.000
DB 500 PG 293

N/F
CAROL SIMMONS
PROPERTY #: 020725
PIN: 0225.00-12-4258.000
DB 403 PG 39
PB 28 PG 42

N/F
CAROL SIMMONS
PROPERTY #: 022560
PIN: 0225.00-20-7748.000
DB 1052 PG 64
PB 45 PG 75

CONSERVATION EASEMENT #1
447,648 S.F.
10.28 ACRES

CONSERVATION EASEMENT #2
162,359 S.F.
3.72 ACRES

CONSERVATION EASEMENT #3
204,424 S.F.
4.69 ACRES

CONSERVATION EASEMENT #4
243,710 S.F.
5.59 ACRES

CONSERVATION EASEMENT #5
69,066 S.F.
1.59 ACRES

CONSERVATION EASEMENT #6A
255,485 S.F.
5.87 ACRES

CONSERVATION EASEMENT #6B
63,435 S.F.
1.46 ACRES

CONSERVATION EASEMENT #6C
18,561 S.F.
0.43 ACRES

CONSERVATION EASEMENT #7A
1,145,637 S.F.
26.30 ACRES

CONSERVATION EASEMENT #7A
8,241 S.F.
0.19 ACRES

CONSERVATION EASEMENT #8
96,437 S.F.
2.21 ACRES

EXISTING CONSERVATION EASEMENT

EXISTING CONSERVATION EASEMENT

DIRT PATH

NC GRID NORTH (NAD 83)

POINT #	NORTHING	EASTING
4	254316.47	2019173.06
8	254147.69	2019495.52
11	254611.72	2018680.22
12	254908.68	2019111.39
13	254936.71	2019275.47
14	255006.44	2019644.79
15	255019.39	2019716.81
16	254846.15	2019574.66
17	254369.58	2019422.99
18	254259.61	2019314.02
20	253785.83	2020219.20
21	253863.25	2020266.76
22	253754.31	2020591.32
23	253593.02	2020555.22
24	253979.80	2019816.28
25	253633.91	2019380.74
26	253901.16	2019166.69
27	253800.72	2020158.40
28	253428.02	2019668.71
29	253598.37	2019409.20
30	253260.98	2020133.10
31	253321.66	2019854.60
32	253444.11	2019689.85
33	252998.85	2019799.85
34	253377.98	2019744.96
35	253448.53	2020371.53
36	253150.97	2020488.77
37	252897.70	2020389.24
38	253059.46	2020232.60
39	252984.04	2020106.69
40	252706.41	2020276.10
41	252614.96	2020044.03
42	252844.94	2019937.37
43	252960.63	2019805.38
44	253125.10	2020510.84
45	253009.36	2020790.65
46	252939.30	2020700.19
47	252787.31	2020503.05
48	252873.89	2020412.11
49	252434.34	2020045.22
50	252584.55	2020049.91
51	252645.23	2020203.14
52	252558.80	2020206.65
53	252459.80	2020210.67
54	253008.88	2020984.92
55	253038.07	2021109.48
56	253048.92	2021205.37
57	253122.41	2021260.24
58	253221.44	2021340.24
59	253297.28	2021362.95
60	252649.89	2022630.79
61	252042.51	2022277.50
62	252840.06	2020894.71
63	252320.63	2020730.49
64	252264.56	2020575.93
65	252643.20	2020654.43

LINE TABLE		
LINE	LENGTH	BEARING
L1	166.45	N80°18'18"E
L2	375.85	N79°18'32"E
L3	73.18	N79°48'18"E
L4	224.10	S39°22'10"W
L5	154.81	S44°44'22"W
L6	90.86	N31°34'02"E
L7	342.35	S71°26'43"E
L8	165.28	S12°36'54"W
L9	556.18	S51°32'41"W
L10	342.40	N38°41'33"W
L11	410.98	N53°08'26"E
L12	310.43	N56°43'08"W
L13	45.53	N38°41'33"W
L14	556.18	N51°32'41"E
L15	285.03	N77°42'25"W
L16	205.27	N53°22'44"W
L17	205.27	S53°22'44"E
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L19	383.08	N08°14'17"W
L20	91.20	N56°43'08"W
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L22	319.82	S21°30'20"E
L23	272.13	S21°27'17"W
L24	225.17	N44°04'34"W
L25	146.78	S59°04'39"W
L26	325.24	S31°23'30"E
L27	249.44	S68°29'33"W
L28	253.51	N24°52'50"W
L29	175.51	N48°45'53"W
L30	38.62	N08°14'17"W
L31	302.80	S67°31'45"E
L32	114.42	S52°14'36"W
L33	248.92	S52°22'07"W
L34	125.56	N46°24'30"W
L35	269.91	N21°27'17"E
L36	98.06	N52°22'07"E
L37	150.28	N01°47'18"E
L38	164.80	N68°23'49"E
L39	86.50	S02°19'31"E
L40	203.83	S52°22'07"W
L41	203.83	N52°22'07"E
L42	99.08	S02°19'31"E
L43	167.39	S81°15'07"W
L44	248.92	N52°22'07"E
L45	293.11	N76°16'06"E
L46	127.94	N76°48'36"E
L47	96.50	N83°32'36"E
L48	91.71	N36°44'36"E
L49	127.31	N38°56'06"E
L50	79.16	N16°40'21"E
L51	164.42	S70°03'37"W
L52	386.69	N11°42'42"E
L53	209.00	N46°24'30"W
L54	135.58	S62°50'11"E

LEGEND

- EXISTING PK NAIL
- EXISTING IRON
- 5/8" REBAR SET W/ 3.25" ALUMINUM CAP WITH STATE SEAL
- CALCULATED POINT
- EXISTING MONUMENT
- NEW CONSERVATION EASEMENT
- P.O.B. POINT OF BEGINNING
- P.O.C. POINT OF COMMENCEMENT

GRAPHIC SCALE
250 0 125 250 500
1 INCH = 250 FEET

DRAFT

FINAL PLAT
CONSERVATION EASEMENT
FOR
STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
PROJECT NAME: ROUGH HORN SWAMP II
DMS PROJECT #: 100053
SPO FILE NOS. 24BG, 24-BH, 24-BI, 24-BJ
TATUM TOWNSHIP, COLUMBUS COUNTY
NORTH CAROLINA

DATE:	SCALE:	SHEET:
OCTOBER 4, 2018	1" = 250'	2 OF 2

KCI ASSOCIATES OF N.C.
ENGINEERS, SURVEYORS AND PLANNERS
4505 FALLS OF NEUSE ROAD, FLOOR 4
RALEIGH, NC 27607
PHONE (919) 783-9214 * FAX (919) 783-9266
KCI ASSOCIATES OF NORTH CAROLINA C-0764

20157877

12.4 Credit Release Schedule

All credit releases will be based on the total credit generated as reported in the final design plans unless otherwise documented and provided to the Interagency Review Team following construction. 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:

Stream Credit Release Schedule – 7-year Timeframe			
Monitoring Year	**Credit Release Activity**	**Interim Release**	**Total Released**
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50%
3	Third year monitoring report demonstrates performance standards are being met	10%	60%
4	Fourth year monitoring report demonstrates performance standards are being met	5%	65% (75%*)
5	Fifth year monitoring report demonstrates performance standards are being met	10%	75% (85%*)
6	Sixth year monitoring report demonstrates performance standards are being met	5%	80% (90%*)
7	Seventh year monitoring report demonstrates performance standards are being met, and project has received close-out approval from IRT	10%	90% (100%*)

**See Subsequent Credit Releases description below*

Wetland Credit Release Schedule – 7-year Timeframe			
Monitoring Year	**Credit Release Activity**	**Interim Release**	**Total Released**
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50%
3	Third year monitoring report demonstrates performance standards are being met	15%	65%
4	Fourth year monitoring report demonstrates performance standards are being met	5%	70%
5	Fifth year monitoring report demonstrates performance standards are being met	15%	85%
6	Sixth year monitoring report demonstrates performance standards are being met	5%	90%
7	Seventh year monitoring report demonstrates performance standards are being met, and project has received close-out approval from IRT	10%	100%

Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan can be released by the NCDMS 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 NCDMS Instrument, construction means that a mitigation sit\e 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

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 a stream project with a 7-year monitoring period, a reserve of 10% of a site's total stream credits shall be released after four years of documented headwater stream flow, provided the channel is stable and all other performance standards are met. In the event that less than four years of documented headwater stream flow 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 NCDMS 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.

12.5 Financial Assurance

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 Environmental Quality (formerly NCDENR) has provided the U.S. 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.

12.6 DWR Stream Identification Forms and Wetland JD Forms

Cross-Reference of Stream Names Used for JD Submissions, Prospectus, and Mitigation Plan			
JD Submittal #1 for Rough Horn Swamp SAW-2015-02410 Approved 1/22/2016	**JD Submittal #2 for Rough Horn Swamp II SAW 2016-02026 Approved 8/29/2018**	**KCI Bank Prospectus to NCIRT 9/2016**	**KCI FDP Mitigation Plan for NCDMS 10/2018**
S1	S1	Long Bay Creek	Long Bay Creek
S2	S2	Unnamed Tributary to Long Bay Creek 2 (UTLBC2)	Unnamed Tributary 1
	SA		Unnamed Tributary 2
	SB		Unnamed Tributary 5
	SC		Unnamed Tributary 3
		Unnamed Tributary to Long Bay Creek 1 (UTLBC1)	Unnamed Tributary 4

Table 1.

Stream Name	Stream Status	Length (Feet)	Width (Feet)	Latitude	Longitude
S1	Perennial	4,682	6	34.4477	-78.9341
S2	Perennial	844	3	34.4493	-78.9359
S3	Perennial	281	3	34.4471	-78.9397
S4	Perennial	321	3	34.4465	-78.9390

Table 2.

Wetland ID	NCWAM	Hydrologic Class	Cowardin Class	Size (Acres)	USACE Forms		Latitude	Longitude
					WET	UP		
W1	Bottomland Hardwood Forest	Riparian	PFO	2.77	X	X	34.4467	-78.9345
W2	Bottomland Hardwood Forest	Riparian	PFO	1.19	W1	W1	34.4467	-78.9324
W3	Headwater Forest	Riparian	PSS	0.16	W1	W1	34.4490	-78.9394

X = Data Forms Completed

N/A = Upland area has been heavily disturbed by agricultural activities

PFO = Palustrine Forested; PSS = Palustrine Scrub-Shrub

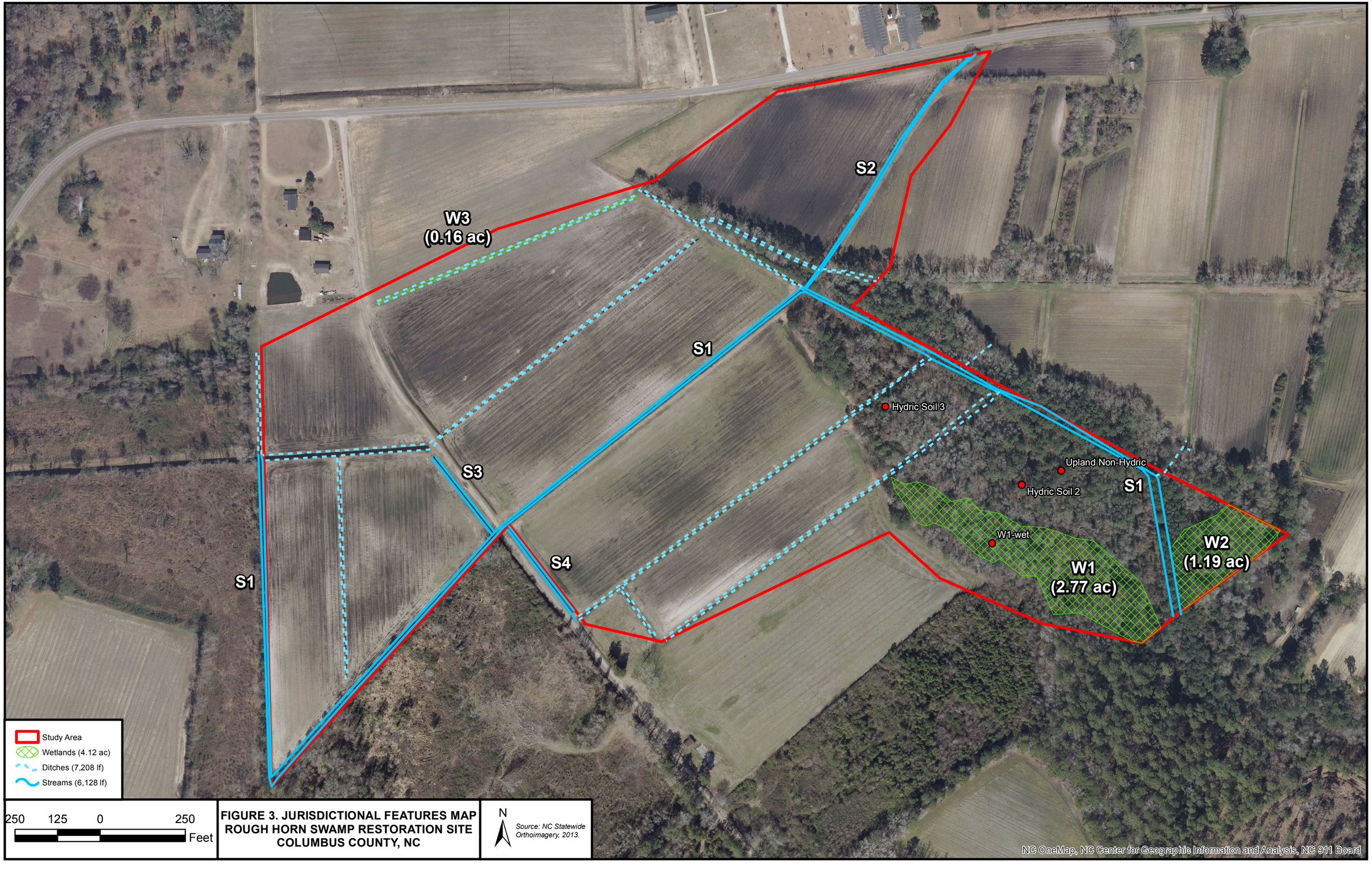


FIGURE 3. JURISDICTIONAL FEATURES MAP
ROUGH HORN SWAMP RESTORATION SITE
COLUMBUS COUNTY, NC

W1 - wet

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Rough Horn Restoration Site City/County: Columbus Sampling Date: 9/1/15

Applicant/Owner: KCI State: NC Sampling Point: W1 - wet

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range:

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Slope (%): 0-1

Subregion (LRR or MLRA): P-133A Lat: 34.44666 Long: -78.93446 Datum: NAD83

Soil Map Unit Name: Johnston NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☒ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☒ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): —
Water Table Present?	Yes ____	No X	Depth (inches): >36
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): —

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: W1-wd

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Nyssa sylvatica	20	Y	FAC
2. Persea palustris	30	Y	FACW
3. Acer rubrum	20	Y	FAC
4. Liquidambar styraciflua	10		FAC
5.			
6.			
7.			
8.			
	80	= Total Cover	
50% of total cover: 40	20% of total cover: 16		

Sapling/Shrub Stratum (Plot size: 15)			
1. Acer rubrum	16	Y	FAC
2. Ilex opaca	10	Y	FAC
3. Liquidambar styraciflua	20	Y	FAC
4.			
5.			
6.			
7.			
8.			
	40	= Total Cover	
50% of total cover: 20	20% of total cover: 8		

Herb Stratum (Plot size: 5)			
1. Woodwardia aerolata	80	X	OBL
2. Osmunda cinnamomea	10		FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	40	= Total Cover	
50% of total cover: 45	20% of total cover: 18		

Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 % (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: W1 - wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR2/1	100			MS	M	SL	>0.5 in mucky surface
6-18	10YR2/1	100					SL	
18-22	10YR 3/1	100					SL	
22-26	10YR 4/2	100					SL	
26-30	10YR 3/1	100					SL	
30-36	10YR 3/2	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☒ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☒ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Hydric Soil 2

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Rough Horn Swamp Restoration Site City/County: Columbus Sampling Date: 9/1/15

Applicant/Owner: KCT State: NC Sampling Point: Hydric Soil 2

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): _____ Slope (%): 1-2

Subregion (LRR or MLRA): P-133A Lat: 34.447113 Long: -78.934343 Datum: NAD83

Soil Map Unit Name: Johnston NWI classification: —

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes _____ No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): —
Water Table Present?	Yes _____	No X	Depth (inches): >20
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): —

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Hydric Soil 2

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Rough Horn Swamp Restoration Site City/County: Columbus Sampling Date: 9/1/15

Applicant/Owner: KCT State: NC Sampling Point: Hydric Soil 2

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): _____ Slope (%): 1-2

Subregion (LRR or MLRA): P-133A Lat: 34.447113 Long: -78.934343 Datum: NAD83

Soil Map Unit Name: Johnston NWI classification: —

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes _____ No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): —
Water Table Present?	Yes _____	No X	Depth (inches): >20
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): —

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Hydric Soil 2

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Persea Palustris	30	X	FACW
2. Liquidambar Styraciflua	30	X	FAC
3. Acer rubrum	30	X	FAC
4. Pinus taeda	10		FAC
5.			
6.			
7.			
8.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		

Sapling/Shrub Stratum (Plot size: 15)			
1. Persea Palustris	20	X	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		

Herb Stratum (Plot size: 5)			
1. Woodwardia areolata	20	X	OBL
2. Smilax bona nox	20	X	FAC
3. Vitis rotundifolia	20	X	FAC
4. Lyonia lucida	5		FACW
5. Osmunda Cinnamonea	5		FACW
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	70 = Total Cover		
50% of total cover: 35	20% of total cover: 14		

Woody Vine Stratum (Plot size: 30)			
1. Vitis rotundifolia	20	X	FAC
2.			
3.			
4.			
5.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 9 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 % (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: Hydric Soil 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 10	10YR 2/1	100			MS	M	SL	
10 - 13	10YR 3/1	100			MS	M	SL	
13 - 20+	10YR 4/1	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☒ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Hydric Soil 3

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Rough Horn Swamp Restoration Site City/County: Columbus Sampling Date: 9/1/15

Applicant/Owner: KCI State: NC Sampling Point: Hydric Soil 3

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): _____ Slope (%): 1-2

Subregion (LRR or MLRA): P-133A Lat: 34.447795 Long: -78.935629 Datum: NAD 83

Soil Map Unit Name: Johnston NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes _____ No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): –
Water Table Present?	Yes _____	No X	Depth (inches): >24
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): –

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Hydric Soil 3

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Persea Palustris	45	X	FACW
2. Liquidambar styraciflua	45	X	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		

Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Lyonia lucida	15	X	FACW
2. Clethra alnifolia	10	X	FACW
3. Persea Palustris	10	X	FAC
4.			
5.			
6.			
7.			
8.			
	30 = Total Cover		
50% of total cover: 15	20% of total cover: 6		

Herb Stratum (Plot size: 5 ft)			
1. Osmunda cinnamomea	10		FACW
2. Leucothoe axillaris	50	X	FACW
3. Smilax bona-nox	10		FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	70 = Total Cover		
50% of total cover: 35	20% of total cover: 14		

Woody Vine Stratum (Plot size: 3 ft.)			
1. Smilax bona-nox	10	X	FAC
2. Smilax rotundifolia	10	X	FAC
3.			
4.			
5.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 8 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 % (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: Hydric soil 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 2/1	100					SL	few uncoated
12-17	10YR 3/1	100					SL	few uncoated
17-18	10YR 3/1	100					SL	many uncoated
18-24+	10YR 4/1							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☒ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Upland
Non-Hydric Soil

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Pough Horn Swamp Restoration Site City/County: Columbus Sampling Date: 9/1/15

Applicant/Owner: KCI State: NC Sampling Point: Upland

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): 0-3%

Subregion (LRR or MLRA): P-133A Lat: 34.447279 Long: -78.933914 Datum: NAD83

Soil Map Unit Name: Stallings NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? Nr (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____ No X	
Wetland Hydrology Present?	Yes _____ No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): –
Water Table Present?	Yes _____	No X	Depth (inches): >18
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): –

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland Non-hydric Soil

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus taeda	50	X	FAC
2. Liquidambar styraciflua	20	X	FAC
3. Quercus nigra	20	X	FAC
4.			
5.			
6.			
7.			
8.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		
Sapling/Shrub Stratum (Plot size: 30 ft.)			
1. Vaccinium corymbosum	10	X	FACW
2. Morella cerifera	20	X	FAC
3. Persea palustris	10	X	FACW
4.			
5.			
6.			
7.			
8.			
	40 = Total Cover		
50% of total cover: 20	20% of total cover: 8		
Herb Stratum (Plot size: 1 m)			
1. Leucothoe axillaris	40	X	FACW
2. Vitis rotundifolia	10	X	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50 = Total Cover		
50% of total cover: 25	20% of total cover: 10		
Woody Vine Stratum (Plot size: 30 ft.)			
1. Vitis rotundifolia	20	X	FAC
2.			
3.			
4.			
5.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 9 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 % (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (If observed, list morphological adaptations below).

upland

SOIL Sampling Point: Non-hydric Soil

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 7/1	100					SL	weathered grains
1-9	10YR 4/2	100					SL	
9-18+	2.5Y 4/2	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Rough Horn Swamp Restoration Site	Date of Evaluation	3/14/2018
Applicant/Owner Name	KCI	Wetland Site Name	W1
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J. Sullivan / KCI
Level III Ecoregion	Southeastern Plains	Nearest Named Water Body	Lumber River
River Basin	Lumber	USGS 8-Digit Catalogue Unit	03040203
County	Columbus	NCDWR Region	Wilmington
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	34.4467 / -79.9345

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

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

Is the assessment area intensively managed? ☐ Yes ☒ No

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5. Discharge into Wetland – opportunity metric

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Answer for assessment area dominant landform.

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

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

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

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

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

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

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

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

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

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

☐A 0
☒B 1 to 4
☐C 5 to 8

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

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

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

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

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

17a. Is vegetation present?

☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☒A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

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

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

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

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

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

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

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

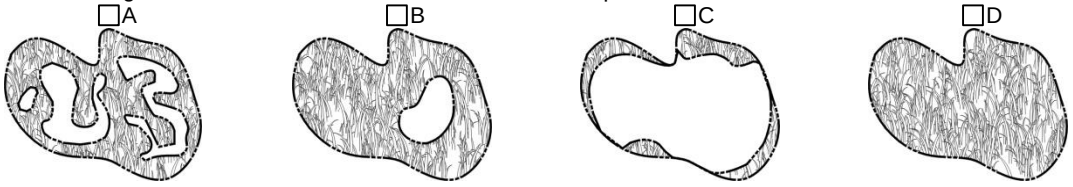
Include both natural debris and man-placed natural debris.

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

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

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

☐A ☐B ☐C ☐D



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

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☐A Overbank and overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	W1	Date of Assessment	3/14/2018
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J. Sullivan / KCI

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

Sub-function Rating Summary

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

Function Rating Summary

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

Overall Wetland Rating **MEDIUM**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Rough Horn Swamp Restoration Site	Date of Evaluation	3/14/2018
Applicant/Owner Name	KCI	Wetland Site Name	W2, WA
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J. Sullivan / KCI
Level III Ecoregion	Southeastern Plains	Nearest Named Water Body	Lumber River
River Basin	Lumber	USGS 8-Digit Catalogue Unit	03040203
County	Columbus	NCDWR Region	Wilmington
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	34.4457 / -79.9324

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

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

Is the assessment area intensively managed? ☐ Yes ☒ No

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5. Discharge into Wetland – opportunity metric

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Answer for assessment area dominant landform.

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

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

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

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

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

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

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

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

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

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

☐A 0
☒B 1 to 4
☐C 5 to 8

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

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

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

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

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

17a. Is vegetation present?

☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☒A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

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

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

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

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

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

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

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

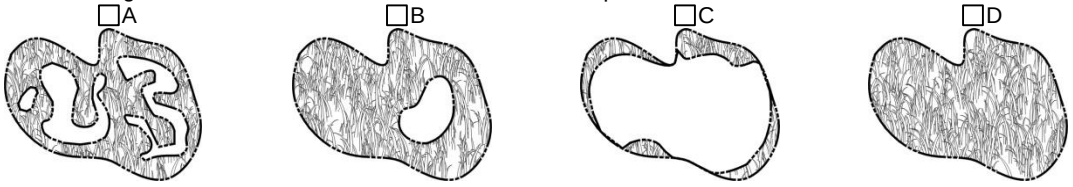
Include both natural debris and man-placed natural debris.

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

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

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

☐A ☐B ☐C ☐D



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

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☐A Overbank and overland flow are not severely altered in the assessment area.
☒B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	W2, WA	Date of Assessment	3/14/2018
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	J. Sullivan / KCI

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

Sub-function Rating Summary

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

Function Rating Summary

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

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Rough Horn Swamp Restoration Site	Date of Evaluation	3/14/2018
Applicant/Owner Name	KCI	Wetland Site Name	W3
Wetland Type	Headwater Forest	Assessor Name/Organization	J. Sullivan / KCI
Level III Ecoregion	Southeastern Plains	Nearest Named Water Body	Lumber River
River Basin	Lumber	USGS 8-Digit Catalogue Unit	03040203
County	Columbus	NCDWR Region	Wilmington
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	34.4490 / -79.9394

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

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

Is the assessment area intensively managed? ☒ Yes ☐ No

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5. Discharge into Wetland – opportunity metric

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Answer for assessment area dominant landform.

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

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

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

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

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

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

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

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

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

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

☐A 0
☐B 1 to 4
☒C 5 to 8

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

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

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

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

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

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

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

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

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

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

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

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

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

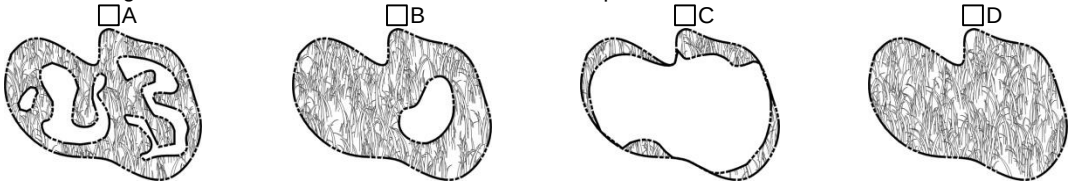
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

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

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

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

☐A ☐B ☐C ☐D



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

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

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	W3	Date of Assessment	3/14/2018
Wetland Type	Headwater Forest	Assessor Name/Organization	J. Sullivan / KCI

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

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-surface Storage and Retention	Condition	**LOW**
Water Quality	Pathogen Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Soluble Change	Condition	**HIGH**
		Condition/Opportunity	**HI**

			GH
		Opportunity Presence (Y/N)	**YES**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence (Y/N)	**YES**
Habitat	Condition	**LOW**

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Rough Horn Swamp Restoration Site	Date of Evaluation	3/14/2018
Applicant/Owner Name	KCI	Wetland Site Name	WB
Wetland Type	Riverine Swamp Forest	Assessor Name/Organization	J. Sullivan / KCI
Level III Ecoregion	Southeastern Plains	Nearest Named Water Body	Lumber River
River Basin	Lumber	USGS 8-Digit Catalogue Unit	03040203
County	Columbus	NCDWR Region	Wilmington
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	34.4453 / -79.9291

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

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

Is the assessment area intensively managed? ☐ Yes ☒ No

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5. Discharge into Wetland – opportunity metric

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Answer for assessment area dominant landform.

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

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

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

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

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

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

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

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

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

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

☒A 0
☐B 1 to 4
☐C 5 to 8

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

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

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

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

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

17a. Is vegetation present?

☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☒A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

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

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

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

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

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

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

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

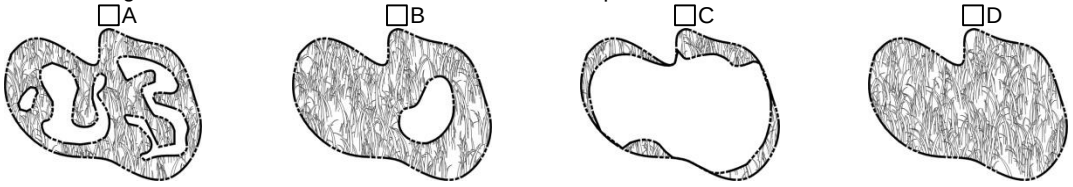
Include both natural debris and man-placed natural debris.

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

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

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

☐A ☐B ☐C ☐D



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

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☒A Overbank and overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	WB	Date of Assessment	3/14/2018
Wetland Type	Riverine Swamp Forest	Assessor Name/Organization	J. Sullivan / KCI

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

Sub-function Rating Summary

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

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence (Y/N)	**YES**
Habitat	Condition	**HIGH**

Overall Wetland Rating **HIGH**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Rough Horn Swamp Restoration Site	Date of Evaluation	3/14/2018
Applicant/Owner Name	KCI	Wetland Site Name	WC
Wetland Type	Headwater Forest	Assessor Name/Organization	J. Sullivan / KCI
Level III Ecoregion	Southeastern Plains	Nearest Named Water Body	Lumber River
River Basin	Lumber	USGS 8-Digit Catalogue Unit	03040203
County	Columbus	NCDWR Region	Wilmington
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	34.4449 / -79.9331

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

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

Is the assessment area intensively managed? ☐ Yes ☒ No

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5. Discharge into Wetland – opportunity metric

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Answer for assessment area dominant landform.

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

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

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

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

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

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

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

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

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

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

☐A 0
☒B 1 to 4
☐C 5 to 8

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

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

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

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

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

17a. Is vegetation present?

☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☒A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

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

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

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

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

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

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

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

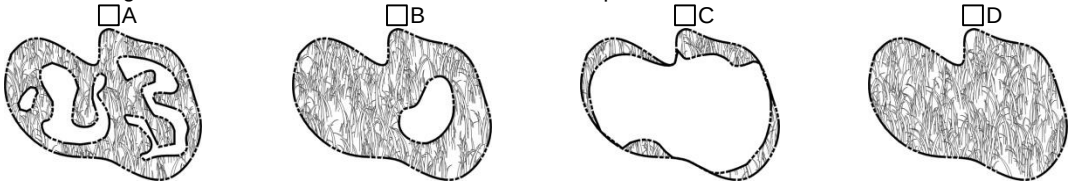
Include both natural debris and man-placed natural debris.

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

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

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

☐A ☐B ☐C ☐D



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

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☐A Overbank and overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☒D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	WC	Date of Assessment	3/14/2018
Wetland Type	Headwater Forest	Assessor Name/Organization	J. Sullivan / KCI

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

Sub-function Rating Summary

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

Function Rating Summary

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

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Rough Horn Swamp Restoration Site	Date of Evaluation	3/14/2018
Applicant/Owner Name	KCI	Wetland Site Name	WD
Wetland Type	Non-Tidal Freshwater Marsh	Assessor Name/Organization	J. Sullivan / KCI
Level III Ecoregion	Southeastern Plains	Nearest Named Water Body	Lumber River
River Basin	Lumber	USGS 8-Digit Catalogue Unit	03040203
County	Columbus	NCDWR Region	Wilmington
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	34.4439 / -79.9332

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

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

Is the assessment area intensively managed? ☐ Yes ☒ No

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5. Discharge into Wetland – opportunity metric

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Answer for assessment area dominant landform.

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

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

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

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

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

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

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

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

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

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

☐A 0
☒B 1 to 4
☐C 5 to 8

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

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

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

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

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

17a. Is vegetation present?

☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐A ≥ 25% coverage of vegetation
☒B < 25% coverage of vegetation

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

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

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

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

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

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

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

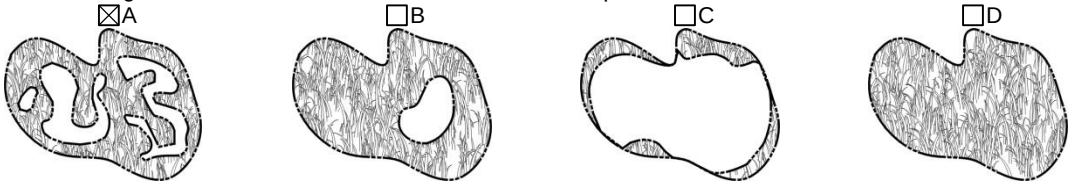
Include both natural debris and man-placed natural debris.

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

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

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

☒A ☐B ☐C ☐D



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

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.

☐A Overbank and overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☒D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	WD	Date of Assessment	3/14/2018
Wetland Type	Non-Tidal Freshwater Marsh	Assessor Name/Organization	J. Sullivan / KCI

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

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	NA
	Sub-surface Storage and Retention	Condition	NA
Water Quality	Pathogen Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Particulate Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Soluble Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Physical Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**MEDIUM**
	Landscape Patch Structure	Condition	**HIGH**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

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

Overall Wetland Rating **LOW**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Rough Horn Swamp Restoration Site	Date of Evaluation	3/14/2018
Applicant/Owner Name	KCI	Wetland Site Name	WE
Wetland Type	Riverine Swamp Forest	Assessor Name/Organization	J. Sullivan / KCI
Level III Ecoregion	Southeastern Plains	Nearest Named Water Body	Lumber River
River Basin	Lumber	USGS 8-Digit Catalogue Unit	03040203
County	Columbus	NCDWR Region	Wilmington
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	34.4441 / -79.9311

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

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

Is the assessment area intensively managed? ☐ Yes ☒ No

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5. Discharge into Wetland – opportunity metric

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Answer for assessment area dominant landform.

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

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

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

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

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

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

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

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

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

13. Connectivity to Other Natural Areas – landscape condition metric

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

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

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

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

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

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

☐A 0
☒B 1 to 4
☐C 5 to 8

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

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

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

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

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

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

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

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

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

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

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

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

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

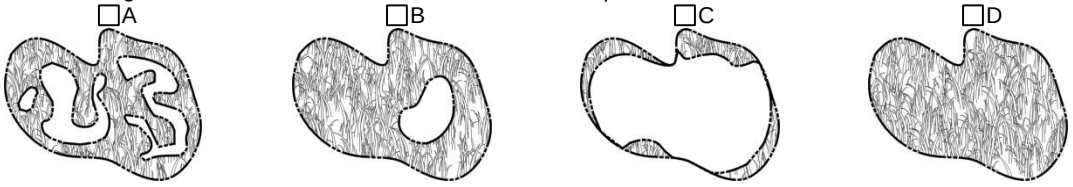
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

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

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

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

☐A ☐B ☐C ☐D



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

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

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	WE	Date of Assessment	3/14/2018
Wetland Type	Riverine Swamp Forest	Assessor Name/Organization	J. Sullivan / KCI

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

Sub-function Rating Summary

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

Function Rating Summary

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

Overall Wetland Rating **LOW**

Table 1.

Stream Name	Stream Status	Bankfull Height (Feet)	Bankfull Width (Feet)	Length (Feet)	DWQ Score	Lat	Long
S1	Perennial	4	6	1,508	-	34.4477	-78.9341
S2	Perennial	4	3	844	-	34.4493	-78.9359
SA	Perennial	1	4	2,019	30	34.4451	-78.9307
SB	Perennial	N/A	N/A	597	-	34.4437	-78.9313
SC	Perennial	N/A	N/A	145	-	34.4439	-78.9332

Table 2.

Wetland ID	NCWAM	Class		Isolated	Size	USACE Forms		Lat	Long
		Hydrologic	Cowardin	Yes/No	(Acres)	WET	UP		
W1	Bottomland Hardwood Forest	Riparian	PFO	No	2.87	X	X	34.4467	-78.9345
W2	Bottomland Hardwood Forest	Riparian	PFO	No	1.07	W1	W1	34.4467	-78.9324
WA	Bottomland Hardwood Forest	Riparian	PFO	No	0.91	X	WB	34.4457	-78.9324
WB	Riverine Swamp Forest / Bottomland Hardwood Forest	Riparian	PFO	No	16.65	X	X	34.4453	-78.9291
WC	Headwater Forest	Riparian	PFO	No	2.42	X	W1	34.4449	-78.9331
WD	Non-Tidal Freshwater Marsh	Riparian	PEM	No	0.63	X	WB	34.4439	-78.9332
WE	Riverine Swamp Forest	Riparian	PSS	No	2.27	WB	WB	34.4441	-78.9311

PFO = Palustrine Forested, Palustrine Scrub Shrub, Palustrine Emergent
X = Data form completed

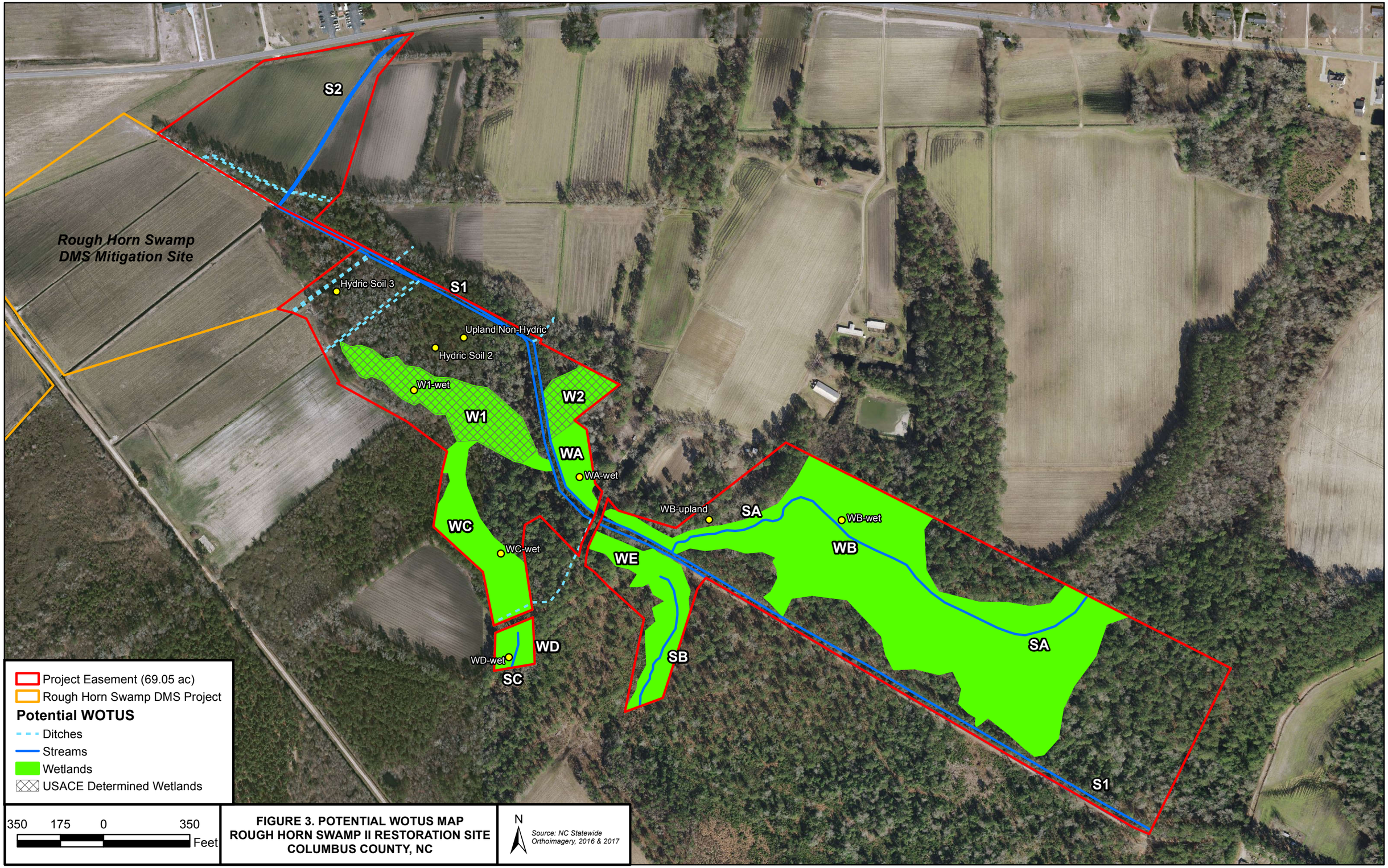


FIGURE 3. POTENTIAL WOTUS MAP
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC

Stream Pres
SA

NC DWQ Stream Identification Form Version 4.11

Date: 3/14/18	**Project/Site:** Rough Horn Swamp 2	**Latitude:** 34.4451
Evaluator: J. Sullivan	**County:** Columbus	**Longitude:** -78.9307
Total Points: 30 *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
1[a]. Continuity of channel bed and bank	0	(1)	2	3
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	(1)	2	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	(0.5)	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

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

B. Hydrology (Subtotal = 8)

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

C. Biology (Subtotal = 6)

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

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

Notes:

Sketch:

WA wet

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Rough Horn Swamp 2 City/County: Columbus Sampling Date: 3/14/19

Applicant/Owner: KCI State: NC Sampling Point: WA wet

Investigator(s): J. Sullivan Section, Township, Range:

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Slope (%): 1

Subregion (LRR or MLRA): P-133A Lat: 34.4457 Long: -78.9324 Datum: NAD83

Soil Map Unit Name: Johnston NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☒ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): —
Water Table Present?	Yes ____	No X	Depth (inches): —
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): —

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WA wet

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	10	X	FAC
2. Persea palustris	5	X	FACW
3.			
4.			
5.			
6.			
7.			
8.			
	15 = Total Cover		
50% of total cover: 7.5	20% of total cover: 3		

Sapling/Shrub Stratum (Plot size: 15)			
1. Ilex opaca	5	X	FAC
2. Persea palustris	10	X	FACW
3.			
4.			
5.			
6.			
7.			
8.			
	15 = Total Cover		
50% of total cover: 7.5	20% of total cover: 3		

Herb Stratum (Plot size: 5)			
1. Osmunda cinnamomea	5	X	FACW
2. Woodwardia aerolata	5	X	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	10 = Total Cover		
50% of total cover: 5	20% of total cover: 2		

Woody Vine Stratum (Plot size: 30)			
1. Vitis rotundifolia	10	X	FAC
2. Gelsemium sempervirens	5	X	FAC
3.			
4.			
5.			
	15 = Total Cover		
50% of total cover: 7.5	20% of total cover: 3		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 8 (A)

Total Number of Dominant Species Across All Strata: 8 (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:

X 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: WAwet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 6	10YR 2/1	100					L	
6 - 12	10YR 2/1	100					SL	
12 - 48+	10YR 3/1	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☒ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

WB wet

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Rough Horn Swamp 2 City/County: Columbus Sampling Date: 3/14/18

Applicant/Owner: KCI State: NC Sampling Point: WB wet

Investigator(s): J. Sullivan Section, Township, Range:

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Slope (%): 1%

Subregion (LRR or MLRA): P-133A Lat: 34.4453 Long: -78.9291 Datum: NAD 83

Soil Map Unit Name: Johnston NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [X] Surface Water (A1)
- [X] High Water Table (A2)
- [X] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [X] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [X] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [X] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [X] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 3
Water Table Present?	Yes X	No ____	Depth (inches): 6
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WBwet

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Persea palustris	30	X	FACW
2. Nyssa sylvatica	20	X	FAC
3. Ilex opaca	10		FAC
4. Acer rubrum	10		FAC
5.			
6.			
7.			
8.			
	70	= Total Cover	
50% of total cover: 35	20% of total cover: 14		

Sapling/Shrub Stratum (Plot size: 15)			
1. Ilex opaca	10	X	FAC
2. Persea palustris	30	X	FACW
3.			
4.			
5.			
6.			
7.			
8.			
	40	= Total Cover	
50% of total cover: 20	20% of total cover: 8		

Herb Stratum (Plot size: 5)			
1. Osmunda cinnamomea	5	X	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	5	= Total Cover	
50% of total cover: 25	20% of total cover: 1		

Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (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:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: WB wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 2/1	100					L	A bit muckey.
8-15	10YR 2/1	100					SL	
15-30	10YR 3/1	100					SL	
30+	10YR 4/1	90	7.5YR 5/6	10			scL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☒ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☒ No ☐

Remarks:

WB up

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Rough Horn Swamp 2 City/County: Columbus Sampling Date: 3/14/19

Applicant/Owner: KCI State: NC Sampling Point: WBup

Investigator(s): J. Sullivan Section, Township, Range: —

Landform (hillslope, terrace, etc.): — Local relief (concave, convex, none): — Slope (%): 52

Subregion (LRR or MLRA): P-133A Lat: 34.4452 Long: -78.9306 Datum: NAD83

Soil Map Unit Name: Foreston NWI classification: —

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): —
Water Table Present?	Yes ____	No X	Depth (inches): —
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): —

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WSC4

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus taeda	30	Y	FAC
2. Persea palustris	10	Y	FACW
3. Quercus nigra	10	Y	FAC
4.			
5.			
6.			
7.			
8.			
	50 = Total Cover		
50% of total cover: 25	20% of total cover: 10		
Sapling/Shrub Stratum (Plot size: 15)			
1. Ilex glabra	10	Y	FACW
2. Persea palustris	10	Y	FACW
3. Arundinaria gigantea	10	Y	FACW
4.			
5.			
6.			
7.			
8.			
	30 = Total Cover		
50% of total cover: 15	20% of total cover: 6		
Herb Stratum (Plot size: 5)			
1. Ilex glabra	5	X	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	5 = Total Cover		
50% of total cover: 2.5	20% of total cover: 1		
Woody Vine Stratum (Plot size: 30)			
1. Vitis rotundifolia	5	X	FAC
2.			
3.			
4.			
5.			
	5 = Total Cover		
50% of total cover: 2.5	20% of total cover: 1		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 8 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: WPt4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 2/1	100					SL	Uncoated sand grains
3-12	10YR 4/1	100					S	
12-14	10YR 3/3	100					LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

WC wet

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Rough Horn Swamp 2 City/County: Columbus Sampling Date: 3/14/18

Applicant/Owner: KCI State: NC Sampling Point: WC wet

Investigator(s): J. Sullivan Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): _____ Slope (%): 2

Subregion (LRR or MLRA): P-133A Lat: 34.4449 Long: -78.9331 Datum: NAD83

Soil Map Unit Name: Johnston NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☒ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): —
Water Table Present?	Yes _____	No X	Depth (inches): —
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): —

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WCwet

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus taeda	50	X	FAC
2. Acer rubrum	20	X	FAC
3. Persea palustris	20	X	FACW
4. Quercus nigra	5		FAC
5.			
6.			
7.			
8.			
	95 = Total Cover		
50% of total cover: 47.5	20% of total cover: 19		

Sapling/Shrub Stratum (Plot size: 15)			
1. Persea palustris	10	X	FACW
2. Acer rubrum	5	X	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	15 = Total Cover		
50% of total cover: 7.5	20% of total cover: 3		

Herb Stratum (Plot size: 5)			
1. Persea palustris	10	X	FACW
2. Quercus nigra	5	X	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	15 = Total Cover		
50% of total cover: 7.5	20% of total cover: 3		

Woody Vine Stratum (Plot size: 30)			
1. Vitis rotundifolia	5	X	FAC
2. Gelsemium sempervirens	5	X	FAC
3.			
4.			
5.			
	10 = Total Cover		
50% of total cover: 5	20% of total cover: 2		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 9 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: UC wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 4	10YR2/1	100					L	
4 - 6	10YR4/1	100					LS	
6 - 10	10YR 4/2	70	10YR4/4	30	C	M	SL	
10 - 18+	10YR5/1	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

WDwet

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Rough Horn Swamp 2 City/County: Columbus Sampling Date: 3/14/19

Applicant/Owner: KCI State: NC Sampling Point: WDwet

Investigator(s): J. Sullivan Section, Township, Range:

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Slope (%): 1%

Subregion (LRR or MLRA): P-133A Lat: 34.4439 Long: -78.9332 Datum: NAD83

Soil Map Unit Name: Johnston NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Area ponded by road.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- [X] Surface Water (A1)
- [X] High Water Table (A2)
- [X] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [X] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [X] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [X] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 3
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WD wet

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 5)			
1. Juncus effusus	5	X	FACW
2. Scirpus sp.	5	X	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	10 = Total Cover		

50% of total cover: 5 20% of total cover: 2

Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: W Dwet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-3	10YR 2/1	100					L	
3-6	10YR 4/1	100					SL	
6-12	10YR 4/2	80	10YR 4/4	20	C	M	SL	
12-14+	10YR 5/1	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

12.7 Approved Jurisdictional Determinations

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2015-02410** County: **Columbus** U.S.G.S. Quad: **Evergreen**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owners: **Horace and Janet Fields**
2076 Old Boardman Road
Evergreen, North Carolina 28438

George Sanderson
3001 Old Boardman Road
Evergreen, North Carolina 28438

William Stephens
P.O. Box 100
Orrum, North Carolina 28369

Teddy Britt
19096 Highway 242 South
Evergreen, North Carolina 28438

Agent: **Steven F. Stokes**
KCI Associates of North Carolina, P.A.
4601 Six Forks Road, Landmark Center II
Suite 220
Raleigh, North Carolina 27609

Size (acres)	**66.2-acres**	Nearest Town	**Evergreen**
Nearest Waterway	**UNT to Lumber River**	River Basin	**Lumber**
USGS HUC	**03040203**	Coordinates	Latitude: **34.4482 N**
			Longitude: **-78.9379 W**

Location description: **The property is located at 2076 Old Boardman Road (Property Nos. 21,056; 22,394; 77,799; 21,273; 21,705; and 20,694) in Evergreen, Columbus County, North Carolina. The project site consists of 66.2-acres of active agricultural land and undeveloped, forested land. A large ditch runs through the central part of the project site. This ditch was a former stream that had been relocated within the property for agricultural purposes. There are also several smaller farm ditches throughout the property. The project area is bordered by Old Boardman Road to the north, forested tracts to the west and south, and agricultural lands to the east.**

Indicate Which of the Following Apply:

A. Preliminary Determination

X There appear to be waters, including wetlands, on the above described property, as depicted on the attached exhibit, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344). This preliminary jurisdictional determination may be used in the permit evaluation process, including determining compensatory mitigation. 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.

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

_ We strongly suggest you have the waters of the U.S. including wetlands on your project area delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.

_ 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 identified below. 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 property which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management in Wilmington, NC, at (910) 796-7215 to determine their requirements.

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **John N. Policarpo at 910-251-4487 or John.N.Policarpo@usace.army.mil**.

C. **Basis for Determination: Portions of this site may exhibit wetland criteria as described in the 1987 Corps Wetland Delineation Manual and the Atlantic and Gulf Coastal Plain Regional Supplement. Two separate non-tidal wetlands on-site are considered abutting a Relatively Permanent Water (RPW), an unnamed tributary (UNT) to the Lumber River, while a third wetland is located in a linear ditch connected to an RPW. The UNT to the Lumber River is an RPW relocated from a natural stream that previously flowed through the project site, but was relocated for agricultural purposes. This RPW is a perennial stream with bed and bank and an ordinary high water mark. There are seven jurisdictional ditches located throughout the project site that are considered RPWs; these ditches exhibit bed and bank and an ordinary high water mark. This determination is based on a site visit conducted by John N. Policarpo of the Corps on October 29, 2015. The enclosed figure titled "Figure 3. Jurisdictional Features Map, Rough Horn Swamp Restoration Site, Columbus County, NC", undated, accurately depicts the approximate extent of on-site waters of the U.S., including wetlands, that may be jurisdictional under Section 404 of the Clean Water Act.**

D. Remarks:

E. Attention USDA Program Participants

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

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

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

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

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by **March 22, 2016**.

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

Corps Regulatory Official: 

Date: **January 22, 2016** Expiration Date: **January 22, 2021**

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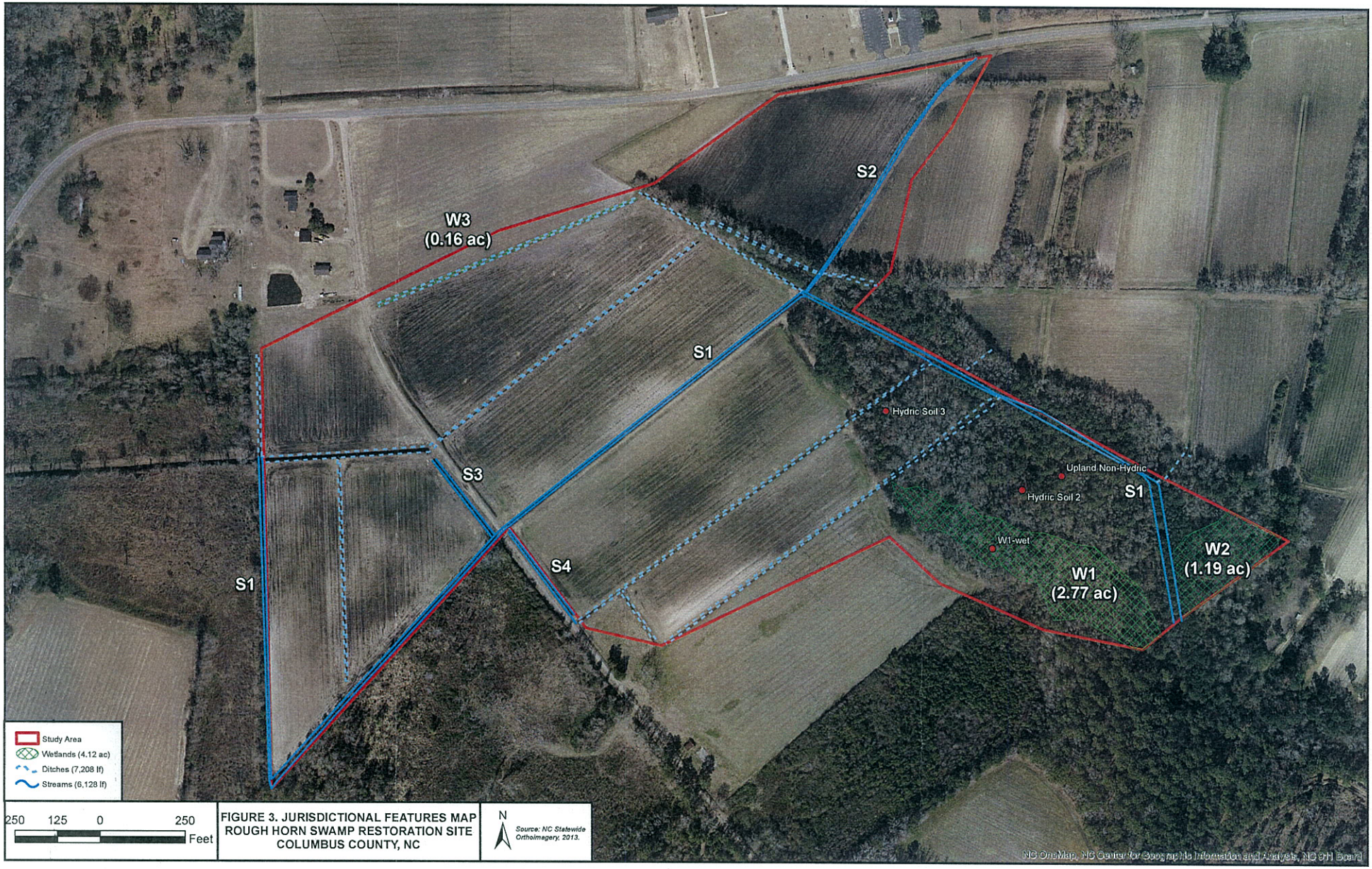


FIGURE 3. JURISDICTIONAL FEATURES MAP
ROUGH HORN SWAMP RESTORATION SITE
COLUMBUS COUNTY, NC

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2016-02026** County: **Columbus**
(Cross reference SAW-2015-02410)

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Owner: **George Allen Sanderson**
3001 Old Boardman Road
Evergreen, NC 28438

Owner: **Teddy Britt**
19096 Highway 242
Evergreen, NC 28438

Owner: **Carol Simmons**
6427 South Orchard Road
Linthicum Heights, MD 21090

Agent: **Joe Sullivan**
KCI Associates of NC
4505 Falls of the Neuse Road, Suite 400
Raleigh, NC 27609
(919) 278-2533/286-1080

Property description:

Size (acres)	**~69**	Nearest Town	**Evergreen**
Nearest Waterway	**UT to Lumber River**	River Basin	**Lumber**
USGS HUC	**03040203**	Coordinates	**34.445253** N **-78.932111** W

Location description: **The property is located at the southeast intersection of SR 1506 (Old Boardman Road) and SR 1508 (CCC Road), adjacent to an UT of Lumber River and downslope of Long Bay and Big Bay, near Boardman, Columbus County, North Carolina.**

Indicate Which of the Following Apply:

A. Preliminary Determination

X **There are waters, including wetlands, on the above described project area, (depicted on the enclosed Figure 3 that was received by email on June 28, 2018) 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.**

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 and Section 404 of the Clean Water Act. 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 waters of the U.S. on the above described property subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344) as identified by *** and depicted on the attached ***. 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 strongly suggest you have the wetlands on your property delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.

_ The waters of the U.S. on your property have been delineated and the delineation has been verified by the Corps office. 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 dated ** and signed by the Corps Regulatory Official 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 ** verified date.

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

X 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 Wilmington, NC at (910) 796-7215 to determine their requirements.

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). If you have any questions regarding this determination and/or the Corps regulatory program, please contact me at **(910) 251-4811 or mickey.t.sugg@usace.army.mil.**

C. Basis For Determination: N/A

D. Remarks

E. Appeals Information (This information applies only to approved jurisdictional determinations as indicated in B. above) N/A

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

U.S. 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 District 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 *****.

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

Corps Regulatory Official: Mickey Sugg

Date **August 29, 2018** Expiration Date **N/A**

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete the attached customer Satisfaction Survey or visit http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0 to complete the survey online.

Copy furnished by e-mail:
Joe Sullivan, KCI
Kim Browning, USACE

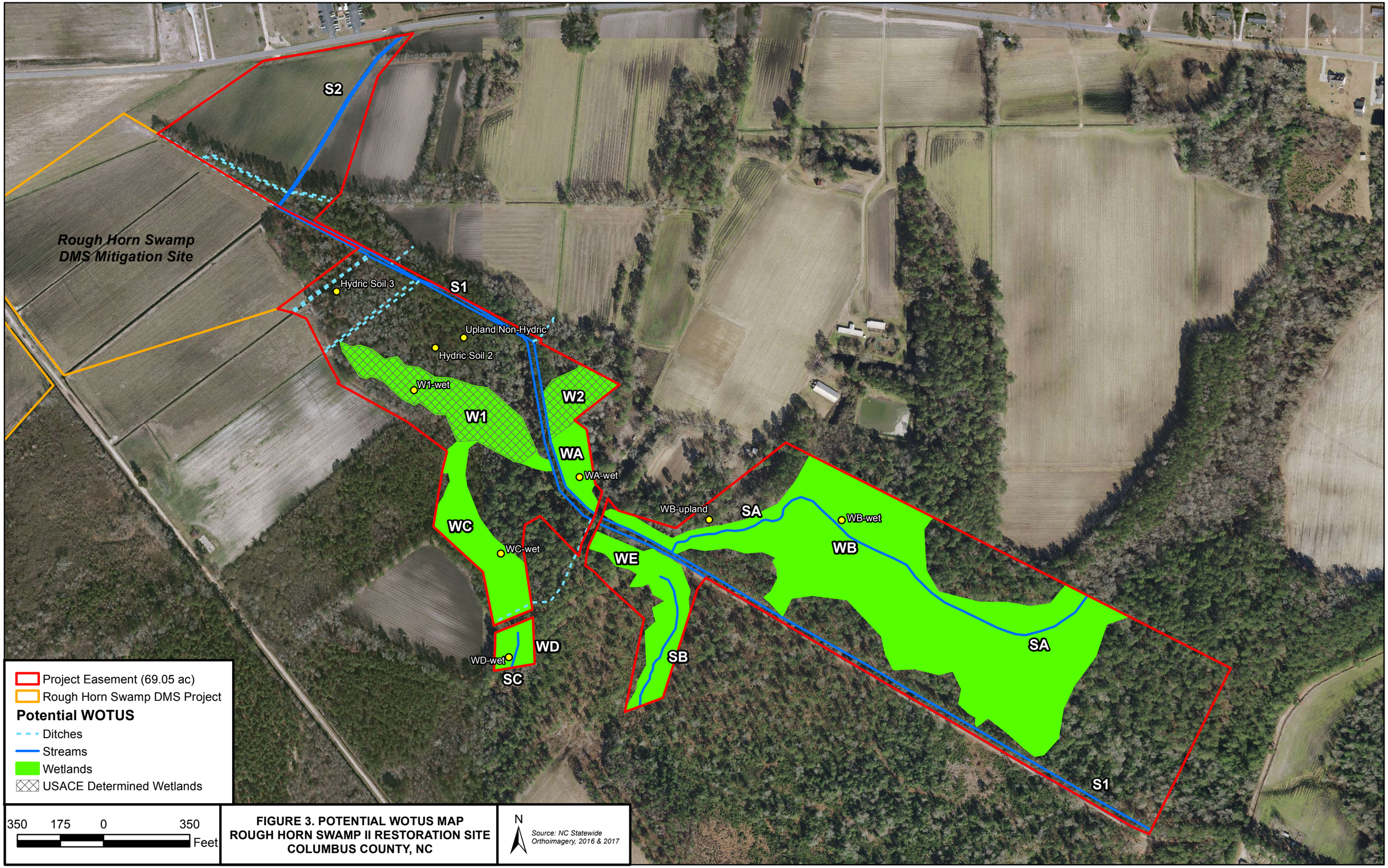


FIGURE 3. POTENTIAL WOTUS MAP
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC

12.8 Invasive Species

The site will be monitored for the presence of invasive species during both the visual assessments and vegetation plot monitoring events and will follow the guidance in the Wilmington District Stream and Wetland Compensatory Mitigation Update (NCIRT 2016) regarding invasive species. A list of non-native invasive species for North Carolina is found in the NC SAM User Manual Appendix I.

Per the NCIRT 2016 guidance, invasive species management should occur when the functional integrity of the vegetative community is impacted. One or more invasive species may present a threat to the site, but the desirable species may have the ability to survive or outcompete despite the competition. Once an invasive species is identified as impairing the site, physical and/or chemical removal and treatment should occur. Any control measures will be noted in the annual monitoring reports.

North Carolina Interagency Review Team. 2016. Wilmington District Stream and Wetland Compensatory Mitigation Update. Last accessed at: http://saw-reg.usace.army.mil/PN/2016/Wilmington-District-Mitigation-Update.pdf

N.C. Stream Functional Assessment Team. 2016. N.C. Stream Assessment Method (NC SAM) User Manual. (https://ribits.usace.army.mil/ribits_apex/f?p=107:150:16800695257725::NO::P150_DOCUMENT_ID:36298)

12.9 Approved FHWA Categorical Exclusion Form

Categorical Exclusion Form for Division Of Mitigation Services Projects
Version 1.4

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Rough Horn Wetland Restoration Site
County Name:	Columbus County, NC
EEP Number:	97005
Project Sponsor:	KCI Technologies, Inc.
Project Contact Name:	Tim Morris
Project Contact Address:	4601 Six Forks Rd, Suite 220, Raleigh, NC 27609
Project Contact E-mail:	tim.morris@kci.com
EEP Project Manager:	Kristin Miguez

Project Description

For Official Use Only

Reviewed By:

10-7-15
Date

Kelligy
DMS Project Manager

Conditional Approved By:

Date

For Division Administrator FHWA

☐ **Check this box if there are outstanding issues**

Final Approval By:

10-2-15 DWB
Date 5-24-18 Rough Horn II

For Division Administrator FHWA

Part 2: All Projects Regulation/Question	Response
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☒ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☒ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☒ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☒ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☒ No ☐ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☒ No ☐ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☐ No ☒ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☒ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☒ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☒ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☒ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☒ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Does the project require the acquisition of real estate?	☒ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☒ No ☐ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☒ Yes ☐ No ☐ N/A

Part 3: Ground-Disturbing Activities Regulation/Question	Response
American Indian Religious Freedom Act (AIRFA)	
1. Is the project located in a county claimed as "territory" by the Eastern Band of Cherokee Indians?	☐ Yes ☒ No
2. Is the site of religious importance to American Indians?	☐ Yes ☐ No ☒ N/A
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	☐ Yes ☐ No ☒ N/A
4. Have the effects of the project on this site been considered?	☐ Yes ☐ No ☒ N/A
Antiquities Act (AA)	
1. Is the project located on Federal lands?	☐ Yes ☒ No
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Archaeological Resources Protection Act (ARPA)	
1. Is the project located on federal or Indian lands (reservation)?	☐ Yes ☒ No
2. Will there be a loss or destruction of archaeological resources?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Endangered Species Act (ESA)	
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	☒ Yes ☐ No
2. Is Designated Critical Habitat or suitable habitat present for listed species?	☐ Yes ☒ No ☐ N/A
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	☐ Yes ☐ No ☒ N/A
4. Is the project "likely to adversely affect" the specie and/or "likely to adversely modify" Designated Critical Habitat?	☐ Yes ☐ No ☒ N/A
5. Does the USFWS/NOAA-Fisheries concur in the effects determination? (By virtue of no-response)	☐ Yes ☐ No ☒ N/A
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?	☐ Yes ☐ No ☒ N/A

Executive Order 13007 (Indian Sacred Sites)	
1. Is the project located on Federal lands that are within a county claimed as "territory" by the EBCI?	☐ Yes ☒ No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	☐ Yes ☐ No ☒ N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	☐ Yes ☐ No ☒ N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	☒ Yes ☐ No
2. Has NRCS determined that the project contains prime, unique, statewide or local important farmland?	☒ Yes ☐ No ☐ N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	☒ Yes ☐ No ☐ N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	☒ Yes ☐ No
2. Have the USFWS and the NCWRC been consulted?	☒ Yes ☐ No ☐ N/A
Land and Water Conservation Fund Act (Section 6(f))	
1. Will the project require the conversion of such property to a use other than public, outdoor recreation?	☐ Yes ☒ No
2. Has the NPS approved of the conversion?	☐ Yes ☐ No ☒ N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	☐ Yes ☒ No
2. Is suitable habitat present for EFH-protected species?	☐ Yes ☐ No ☒ N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	☐ Yes ☐ No ☒ N/A
4. Will the project adversely affect EFH?	☐ Yes ☐ No ☒ N/A
5. Has consultation with NOAA-Fisheries occurred?	☒ Yes ☐ No ☐ N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	☐ Yes ☒ No
2. Have the USFWS recommendations been incorporated?	☐ Yes ☐ No ☒ N/A
Wilderness Act	
1. Is the project in a Wilderness area?	☐ Yes ☒ No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	☐ Yes ☐ No ☒ N/A

12.10 Agency Correspondence

Memoranda

ENGINEERS ♦ SURVEYORS ♦ SCIENTISTS ♦ CONSTRUCTION MANAGERS

LANDMARK CENTER II, SUITE 220 ♦ 4601 SIX FORKS ROAD ♦ RALEIGH, NC 27609 ♦ 919-783-9214 ♦ (FAX) 919-783-9266

TO:	Kristin Miguez, DMS PM Todd Tugwell, ACOE
FROM:	Tim Morris, KCI
DATE:	September 24, 2015
SUBJECT:	Rough Horn Swamp Wetland Restoration Project IRT Site Review Meeting KCI Project Number: 20158593 DMS Project Number 97005

Attendees:

Ginny Baker, NC DWR
Todd Tugwell, ACOE
Mickey Sugg, ACOE
Jeff Schaffer, DMS
Kristin Miguez, DMS
Anjie Ackerman, DMS
Tim Morris, KCI
Steve Stokes, KCI
Adam Spiller, KCI
Joe Pfeiffer, KCI
Joe Sullivan, KCI

An IRT field review was conducted for the above referenced project on September 24th, 2015 starting at approximately 2pm. Weather was overcast with showers in the area. Rainfall totals were 1.58" in the previous 30 days and 0.01" in the previous 12 days. Streams and ditches across the site were dry. Joe Pfeiffer from KCI presented the DMS project to the attendees. He also explained how it was KCI's intention to develop the remaining ancillary credit pieces outside the DMS site as a speculative bank. The following issues and concerns were documented at the meeting and will be addressed in the future development of the site.

1. The IRT expressed concern related to how the DMS site and the bank site would work together. They indicated that there needed to be clear boundaries/distinctions between the two projects including the financial assurances. There were also several questions asked to ensure that the projects were not dependent on each other to be successful. Mr.

Pfeiffer explained that KCI has land options in place to ensure that water level manipulation above the project would not result in hydraulic trespass issues. With control over the upgradient properties KCI can ensure that even if the bank project did not move forward, the DMS project would be complete unto itself.

Response: KCI will ensure that there is no overlap between the two projects that could cause potential maintenance/monitoring/adaptive management concerns. It is likely that KCI will show the boundaries of both projects in each mitigation plan to add context for proper review.

2. The IRT expressed concern regarding financial assurances for the bank and the DMS project.

   Response: KCI will ensure that separate financial assurances will be created for each project.

3. KCI had recently received an addendum adding another 6 riparian wetland credits to the project. The IRT asked questions regarding the location of the additional assets.

   Response: KCI has several options for the placement of the additional 6 RMU's. Some of the RMU's will be utilized within the existing footprint of the DMS project since KCI had offered more credits than were requested. The remaining credits can either be directed towards the Sanderson property to the north or towards the Stephens property to the southeast. KCI will determine which direction the expansion would take place during the assessment stage of the project. The IRT did not express a preference which direction the expansion would take place.

4. KCI is hoping to remove the existing roadway that crosses the site as part of the project and is working with NC DOT for abandonment or partial abandonment of the roadway. NC DOT does not appear to have ownership rights to the roadway based on the Title history that has been reviewed to date.

5. IRT walked the site and reviewed some of the wetland work completed to date. A JD application has not been submitted as of the date of the meeting but the intent is to submit a JD in the next couple of weeks.

   Response: The ACOE seemed to be in general agreement with delineation that had been completed but will review more thoroughly after the formal application has been submitted.

KCI File Notes from Rough Horn Swamp Mitigation Bank Prospectus
Site Meeting, October 26, 2016

Action ID: SAW-2016-02026
Attendees: Chad Coburn and Mac Haupt (NCDWR); Kimberly Browning, Mickey Sugg, and Todd Tugwell (USACE); Tim Morris, Joe Pfeiffer, and Steve Stokes (KCI).

Initial Discussion:

- KCI will do what we can to align the construction phase of the DMS and the Bank project
- Corps wanted to make sure that we know that these project have to have independent utility. They are concerned if something happens to one project, it could impact the other project. Todd was concerned about financial assurances. Needs to be addressed in the MBI.
- Atlantic Coast Conservancy will steward this site. Joe will continue to coordinate with ACC regarding the details of this, which will be addressed in the MBI.
- Remove Section 10 reference from Prospectus.
- Remove rehabilitation wetlands and change to enhancement. Todd doesn't believe that we are lifting multiple functions because the areas are already forested.
- Corps strongly encouraged KCI to install pre-construction wells out there. Agree this should be done.
- Encouraged KCI to run NC SAM and NC WAM to get a preconstruction reference.
- Service area – Stick to 8 digit HUC, no secondary SA allowed. Corps can approve transfers on a case-by-case. If the DMS proposal for modified SA's gets approved, our bank will be retroactively approved for the same SA (although KCI would need to modify instrument).
- Corps recommended water budgets for smaller drainages – something to put in the MP.
- Add section to each MP (MP and Bank) that discusses the integration of the two projects.
- Recommended we find a reference site for the wetland. Helps to elucidate differences, especially during droughts.
- Pay close attention to Corps technical guidance on well installation. Corps is cracking down on sloppy well installs.
- Corps does not recommend a low flow channel, just get the flow back to the old valley and let it flow where it wants to flow.
- There was a discussion/disagreement between Todd and Mickey regarding growing season dates. Todd says March 1 to November 20th. Mickey said February 1st to November 20th. Sounds like we use March 1, but February is on the table if we can make a case for it through soil temp, bud break, etc.
- Mickey said target community type should be headwater forest instead of bottomland hardwood forest.
- Hydroperiod targets should be 10% for Torhunta (non-riparian) and 12% for Johnston (riparian).

Field Review

- Corps reiterated not creating a pilot channel to avoid construction impacts within the woods. Grading will obviously be required at tie-in points and to fill the old channel.
- Corps OK with approach for UTLBC1. Will need to modify drainage upstream of that to direct water out of the ditches upstream and into our stream valley
- Corps OK with approach on UTLBC2. We will need to bring it up to grade using a P2 transition approach. Will likely need to define a valley (or pilot channel) initially for this channel.
- From flooding events you could see where water was getting out of main channel and moving towards the valley that we are going to put water in. We need to mark these locations for

design purposes. We will need to create a broad floodplain connection from the old channel to our new valley.

- Corps asked us to try to avoid large trees when we filled in the old channel.
- Corps recommended solid channel plugs (rock/clay) in the old channel.

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

November 14, 2016

Regulatory Division

Action ID. SAW-2016-02026

KCI Technologies, Inc.
Attn: Mr. Joe Pfeiffer
4601 Six Forks Road, Suite 220
Raleigh, North Carolina 27609

Dear Mr. Pfeiffer:

This letter confirms the initial evaluation of your prospectus detailing the establishment of a wetland and stream mitigation bank, known as the Rough Horn Swamp Mitigation Bank (Bank), within a 31.7-acre tract located at the intersection of SR 1506 (Old Boardman Road) and SR 1508 (CCC Road), adjacent to a tributary of the Lumber River, near the community of Boardman, Columbus County, North Carolina. Also, please reference our October 26, 2016 onsite meeting, with attendees Mr. Chad Coburn and Mr. Mac Haupt of North Carolina Division of Water Resources, Mr. Todd Tugwell and Ms. Kimberly Browning of the Corps Office, and Tim Morris and Steve Stokes of KCI.

Pursuant to 33 CFR Part 332.8(d)(5) Compensatory Mitigation For Losses of Aquatic Resources, our office is providing our initial evaluation as to the potential of your proposed Bank for providing appropriate compensatory mitigation for activities authorized by Department of the Army (DA) permits. Based on our review of the prospectus and other supporting documentation, coordination with the Interagency Review Team (IRT), and the onsite inspection, it is our position that the Bank site has potential for appropriately providing compensatory mitigation for DA authorizations. Consequently, our office, along with the IRT, confirms proceeding with the development of a draft mitigation banking instrument (MBI). Please be aware that a mitigation plan must be approved prior to the release of any credits, and it is recommended that the plan be submitted prior to the MBI.

With respect to the development of the proposed bank and the mitigation plan, several of the following items were discussed during the October 26th onsite meeting: the banks functional design and construction with the adjacent NC Division of Mitigation Service Rough Horn Swamp tract; application of NC WAM for credit determination on existing wetland areas and proposed type (riparian vs non-riparian); use of the October 24, 2016 Wilmington District Stream and Wetland Compensatory Mitigation Update guidance; scheduled credit release percentages; establishment of an appropriate Geographical Service Area; use of a reference area; and

identifying appropriate success criteria, specifically hydrology percentage for the growing season and identifying the growing season. Other components were also covered during the meeting and all discussed topics should be incorporated in your bank planning and development of the mitigation plan.

If you have any questions regarding the banking process or moving forward with the establishment of your proposal, please do not hesitate to contact me at the Wilmington Regulatory Field Office, telephone (910) 251-4811.

Sincerely,

Mickey Sugg, Project Manager
Wilmington Regulatory Field Office

Copies Furnished:

Mr. Tim Morris
KCI Technologies, Inc.
4601 Six Forks Road, Suite 220
Raleigh, North Carolina 27609

Mr. George Allen Sanderson
3001 Old Boardman Road
Evergreen, North Carolina 28438

Ms. Gabriele Garrison
North Carolina Wildlife Resources Commission
Sandhills Depot
P.O. Box 149
Hoffman, North Carolina 28347

Mr. Todd Bowers
U.S. Environmental Protection Agency
Wetland Section- Region 4
61 Forsyth Street, S.W.
Atlanta, Georgia 30303-8960

Mr. Chad Coburn
Division of Water Resources
North Carolina Department of Environmental Quality
127 Cardinal Drive Extension
Wilmington, North Carolina 28405

Mr. Chad Turlington
North Carolina Division of Water Resources
225 Green Street (Systel Building)
Suite 714
Fayetteville, North Carolina 28301-5094

Mr. Mac Haupt
North Carolina Division of Water Resources
NCDEQ- 1650 Mail Service Center
Raleigh, North Carolina 27699-1650

Ms. Kathy Matthews
U.S. Fish and Wildlife Services
Post Office Box 33726
Raleigh, North Carolina 27636-3726

Dr. Ken Riley
National Marine Fisheries, NOAA
Habitat Conservation Division
Pivers Island
Beaufort, North Carolina 28516

Mr. Travis Wilson
North Carolina Wildlife Resource
Commission
1718 Highway 56 West
Creedmor, North Carolina 27522

ROY COOPER
Governor

MICHAEL REGAN
Secretary

Mitigation Services
ENVIRONMENTAL QUALITY

December 7, 2018

Sent via email to: tim.morris@kci.com

Tim Morris
KCI Associates of NC, PC
4505 Falls of Neuse Road, Suite 400
Raleigh, NC 27609

Subject: DMS Comments on the Draft Mitigation Plan Review
Rough Horn Swamp, Project ID #97005 (Contract #6596) and
Rough Horn II, Project ID # 100053 (Contract # 7514)
DMS review team: Periann Russel, Lin Xu, Lindsay Crocker

Tim,

After receiving the draft Mitigation Plan on November 13, 2018, DMS conducted its initial review. Please review these comments, make changes as appropriate, or respond to the comments.

General Comments:

- Provide the hydrologic tables for the pre-construction wetland gauges (1-4)
- Provide the JPEGs of the pre-condition photos
- Provide the project tables (excel files for all tables)
- Suggest adding a DEM, contour map, or elevation color intensity map to illustrate 'historic locations of streams' as a figure

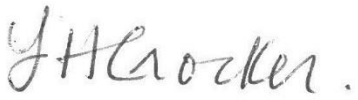
Specific Comments:

- Add DWR Number to front page (2015-0903 for both)
- Table 1, 2, 7-12: wetland acreage should be shown out three significant digits (.000) and stream footage should be shown to the whole foot. This should be for all projects and to match impact permits. Be advised that you may report the numbers here in your mitigation plan as they are out to those significant digits (just add zeros), or you can do the conversion in GIS, which may result in some slight changes in your tables (example RHII riparian reestablishment may become 15.803 instead of 15.800…this change is up to you at this point, DMS is comfortable with either).
- Table 1 and 2 footnotes, please remove any mention of DMS contract amounts as this is not relevant to the IRT or Mitigation Plan or provide justification for including it.
- Page 15, Watershed Disturbance and response: clarify if you are describing the project area or the entire watershed impacts in the first paragraph. Because the rest of this section mostly describes specific current condition, suggest breaking this out or adding 'Site conditions' to section title.
- Page 20: the text that describes areas of wetland WC and the sum of wetlands W1, W2, and WA don't match exactly the areas shown on page 177 (Table 2, potential wetland table). Update whichever is incorrect or explain.

- The historic aerials show some of the land clearing before 1979 and some between 79 and 93. Can you verify (landowner accounts and/or FSA records) that land clearing occurred before December 23, 1985 and/or documentation of federally approved conversion?
- P 21-22, please provide a date on the document that the photos were taken. If multiple dates, please indicate by attributing the picture by date.
- I see a discussion about berm removal but can't find a description how KCI will handle the old ditches/channel (fill methods/material) although it is the plan sheets. Please indicate where this is described in the Mitigation Plan or provide a brief description of that on page 27, section 6.5 or just mention that ditch filling or plugging details are in plan sheets.
- Did KCI install a gauge in the reference wetland in 2018? If so, please include.
- Page 30, you describe design slopes as 0.1-0.3%. Do you mean 1-3% when evaluated as a percent or (0.01-0.03) or can you help me understand? Same goes for the Proposed stream valley slope column of table 6.
- Construction Plan Sheet – In details, there were live lift and log drop shown in the detail sheet. However, those structures were not shown in the following site plan sheets. Please show the locations of those structures or remove them from the details.
- Nitrogen and Phosphorus removal-- Please provide a footnote indicating the DWR 1998 methodology that was used on that page.
- The PJD for SAW-2016-02026 from 8/29/18 erroneously checked that Columbus is in a CAMA county, which is it not. This comment is being made for the record.

Because the nature of these comments is minor, DMS does not require a formal response (e-mail responding to any questions is fine). Provide 3 hard copies of the Final Draft Mitigation Plan, electronic deliverables, and financial assurance to process the Task 3 invoice. DMS will then post this Mitigation Plan for regulatory review.

Thanks for your work,



Lindsay Crocker, DMS

KCI ASSOCIATES OF NC

ISO 9001:2015 CERTIFIED

ENGINEERS • PLANNERS • SCIENTISTS • CONSTRUCTION MANAGERS

4505 Falls of Neuse Rd., Suite 400 • Raleigh, NC 27609 • Phone 919-783-9214 • Fax 919-783-9266

Date: 12/17/2018

To: Lindsay Crocker, Project Manager

From: Tim Morris, Project Manager
KCI Associates of North Carolina, P.A.

Subject: Rough Horn Swamp Restoration Site and Rough Horn Swamp II Restoration Site
Draft Mitigation Plan Review
Lumber River Basin - 03040203
Columbus County, North Carolina
Contract No. #s 6596 and 7514
DMS Project #s 97005 and 100053
USACE Action IDs SAW-2015-02410 and SAW-2016-02026
NCDEQ DWR # 2015-0903

Dear Ms. Crocker,

Please see below our responses to your comments from December 7, 2018 on the draft of the Rough Horn Swamp/Rough Horn Swamp II Mitigation Plan. We have addressed your comments in the revised draft report and have outlined our changes below. We are enclosing 3 hard copies of the final report along with a flash drive with the requested digital files and PDF of the report.

General Comments:

- Provide the hydrologic tables for the pre-construction wetland gauges (1-4)
  The groundwater tables in Section 12.2 have been included in the enclosed digital deliverable.

- Provide the JPEGs of the pre-condition photos
  The JPEGS are included in the enclosed digital deliverable.

- Provide the project tables (excel files for all tables)
  Tables 1-12 from the mitigation plan have been included in the enclosed digital deliverable.

- Suggest adding a DEM, contour map, or elevation color intensity map to illustrate 'historic locations of streams' as a figure
  This additional figure has been included in Section 12.2 and is referred to in the first paragraph of Section 3.1.3 in the report.

Specific Comments:

- Add DWR Number to front page (2015-0903 for both)
  This has been added.

- Table 1, 2, 7-12: wetland acreage should be shown out three significant digits (.000) and stream footage should be shown to the whole foot. This should be for all projects and to match impact permits. Be advised that you may report the numbers here in your mitigation plan as they are out to those significant digits (just add zeros), or you can do the conversion in GIS, which may result in some slight changes in your tables (example RHII riparian reestablishment may become 15.803 instead of 15.800…this change is up to you at this point, DMS is comfortable with either).
  We have kept the same wetland calculations, but just added zeros to have the requested number of significant digits. The stream credits were changed to 4,564 total credits for Rough Horn II once the reaches were tabulated using no decimal places.

- Table 1 and 2 footnotes, please remove any mention of DMS contract amounts as this is not relevant to the IRT or Mitigation Plan or provide justification for including it.
  This text has been removed.

- Page 15, Watershed Disturbance and response: clarify if you are describing the project area or the entire watershed impacts in the first paragraph. Because the rest of this section mostly describes specific current condition, suggest breaking this out or adding 'Site conditions' to section title.
  We edited the first paragraph to make a clearer distinction between the watershed and the sites. We also updated the heading to Section 3.1.3 Watershed Disturbance and Existing Site Conditions.

- Page 20: the text that describes areas of wetland WC and the sum of wetlands W1, W2, and WA don't match exactly the areas shown on page 177 (Table 2, potential wetland table). Update whichever is incorrect or explain.
  The acreages listed in Table 3 have been updated from earlier numbers to those shown in the JD table in Section 12.6.

- The historic aerials show some of the land clearing before 1979 and some between 79 and 93. Can you verify (landowner accounts and/or FSA records) that land clearing occurred before December 23, 1985 and/or documentation of federally approved conversion?
  According to the landowner, the clearing seen between the 1979 and 1993 photos occurred primarily in 1980 and 1981.

- P 21-22, please provide a date on the document that the photos were taken. If multiple dates, please indicate by attributing the picture by date.
  Dates have been added to each picture.

- I see a discussion about berm removal but can't find a description how KCI will handle the old ditches/channel (fill methods/material) although it is the plan sheets. Please indicate where this is described in the Mitigation Plan or provide a brief description of that on page 27, section 6.5 or just mention that ditch filling or plugging details are in plan sheets.
  KCI anticipates using a balanced cut/fill at the site by using any material from spoil piles to fill existing ditched channels that will be abandoned. We have added a description of this in Section 6.5 in the Long Bay Creek paragraph: "Existing spoil remaining from previous ditch excavations will be used to fill the former channel; KCI anticipates using a balanced cut/fill across the two sites (see

Section 12.1 for further detail).”

- Did KCI install a gauge in the reference wetland in 2018? If so, please include.
  No, a wetland gauge has not yet been installed in the reference wetland.

- Page 30, you describe design slopes as 0.1-0.3%. Do you mean 1-3% when evaluated as a percent or (0.01-0.03) or can you help me understand? Same goes for the Proposed stream valley slope column of table 6.
  We mean 0.1-0.3%, or 0.001-0.003 when described as ft/ft. The slopes are quite flat for this stream.

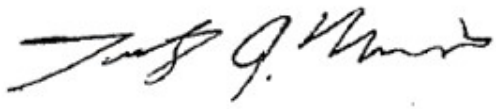
- Construction Plan Sheet – In details, there were live lift and log drop shown in the detail sheet. However, those structures were not shown in the following site plan sheets. Please show the locations of those structures or remove them from the details.
  We have updated the sheets to better denote these structures in the planview. There are log drops along UT1, UT2, and the bottom of Long Bay Creek. There is a live lift at the bottom of Long Bay Creek.

- Nitrogen and Phosphorus removal-- Please provide a footnote indicating the DWR 1998 methodology that was used on that page.
  This has been added.

- The PJD for SAW-2016-02026 from 8/29/18 erroneously checked that Columbus is in a CAMA county, which is it not. This comment is being made for the record.
  Noted.

Please contact me if you have any questions or would like clarification concerning these responses.

Sincerely,



Tim Morris
Project Manager

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

REPLY TO
ATTENTION OF:

March 1, 2019

Regulatory Division

Re: NCIRT Review and USACE Approval of the Rough Horn Swamp II Mitigation Plan; SAW-2016-02026; NCDMS Project # 100053

Mr. Tim Baumgartner
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Dear Mr. Baumgartner:

The purpose of this letter is to provide the North Carolina Division of Mitigation Services (NCDMS) with all comments generated by the North Carolina Interagency Review Team (NCIRT) during the 30-day comment period for the Rough Horn Swamp II Mitigation Plan, which closed on February 2, 2019. Due to the lapse in federal funding, the dispute resolution period was extended an additional 15 days. These comments are attached for your review.

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

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

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

Sincerely,

Kim Browning
Mitigation Project Manager
for Henry Wicker

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List
Jeff Schaffer – NCDMS
Lindsay Crocker—NCDMS
Tim Morris—KCI Associates

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

REPLY TO
ATTENTION OF:

March 1, 2019

Regulatory Division

Re: NCIRT Review and USACE Approval of the Rough Horn Swamp Mitigation Plan; SAW-2015-00952; NCDMS Project # 97005

Mr. Tim Baumgartner
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Dear Mr. Baumgartner:

The purpose of this letter is to provide the North Carolina Division of Mitigation Services (NCDMS) with all comments generated by the North Carolina Interagency Review Team (NCIRT) during the 30-day comment period for the Rough Horn Swamp Mitigation Plan, which closed on February 2, 2019. Due to the lapse in federal funding, the dispute resolution period was extended an additional 15 days. These comments are attached for your review.

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

Sincerely,

Kim Browning
Mitigation Project Manager
for Henry Wicker

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List
Jeff Schaffer – NCDMS
Lindsay Crocker—NCDMS
Tim Morris—KCI Associates

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

REPLY TO
ATTENTION OF:

CESAW-RG/Browning February 13, 2019

MEMORANDUM FOR RECORD

SUBJECT: Rough Horn Swamp and Rough Horn Swamp II Mitigation Sites - NCIRT Comments during 30-day Mitigation Plan Review

PURPOSE: The comments listed below were posted to the NCDMS Mitigation Plan Review Portal during the 30-day comment period in accordance with Section 332.8(g) of the 2008 Mitigation Rule.

NCDMS Project Name: Rough Horn Swamp and Rough Horn Swamp II Mitigation Sites, Columbus County, NC

USACE AID#: SAW-2015-00952, SAW-2016-02026

NCDMS #: 97005, 100053

30-Day Comment Deadline: February 2, 2019

Mac Haupt, NCDWR:

1. DWR questions the amount of wetland restoration classified as non-riparian.
2. Section 6.5-Stream Mitigation- the paragraph starts by stating the restored streams will not be a single-thread channel then later in the paragraph states an undersized channel will be constructed.
    a. It appears from the design plans that KCI intends to dig a pilot channel for all streams and getting restoration through valley length. There were discussions at one of the site visits where the COE voiced reservations about building a pilot channel through the reaches in wooded areas. DWR prefers the no pilot channel approach. If DMS and the designer maintain that they would like to maintain the pilot channel approach, then DWR would require at least 3-4 cross sections across, with at least one cross section in the wooded area.
3. Section 7.0- Wetland Hydrologic Performance- DWR recalls some discussion at the site meeting regarding the wetland hydroperiods (12% for Riparian, and 10% for Non-riparian). The site visit was held at the same time the wetland saturation threshold ranges came out in the October 2016 Mitigaiton Update. DWR believes the standard for both the Johnston and Torhunta Soil Series should be at least 12%. In addition, the planting plan shows Bald Cypress and Water Tupleo being proposed for the areas underlain by the Torhunta series, this further substantiates a wetter hydroperiod standard.
4. Table 9 and 10- Length and Summations by Mitigation Category- this table is listing the Riparian wetlands as non-riverine. DWR believes that most of the Riparian wetlands are riverine.
5. Design Typicals-
    a. The Log Drop Detail shows boulder footers, DWR recommends in this physiographic region the use of footer logs.
    b. For the constructed riffle at the end of the project the typical seems to be showing some fairly large stone. DWR recommends minimizing the stone size for this area.

c. The typical for the cross section on sheet 4 states that, "woody debris is to be embedded in the new stream thalweg…" does this mean for the entire reach or what percentage will get woody debris? DWR approves of this approach and would like to have an idea of how much this practice will be employed.

6. DWR prefers that for the Design sheets that the plan view and longitudinal profile be on the same sheet for comparison purposes.

Kim Browning, USACE:

1. Cover Page: The correct USACE ID for the Rough Horn Swamp site is SAW-2015-00952.
2. Section 6.3: A wetland gauge should be placed in the reference wetland for hydrologic comparison to observe whether results onsite are rainfall driven.
3. Section 6.5, page 28: "An undersized channel will be constructed in order to initiate stream formation." The discussion regarding this during the IRT field visit on 10/26/16 was that no new channel would be constructed and the only construction that would occur would be at connection points. Please justify the need for this, especially in wooded areas.
4. Section 7.0: Performance standards for stream hydrology and geomorphology should list specific parameters to demonstrate a concentration of flow in years one through four, and in years five through seven should demonstrate the development of stream bed and banks (ordinary high water mark).
5. Please provide a plan view sheet, similar to the monitoring map, which includes gauges, veg plots, cross sections, etc.
6. Please include NCWAM forms.
7. Section 8: Vegetation monitoring—please specify that though invasive stems will be recorded to determine the percentage of invasive stems present, that the invasives will not count toward vegetative plot success.

Kim Browning
Mitigation Specialist
Regulatory Division

KCI ASSOCIATES OF NC

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ENGINEERS • PLANNERS • SCIENTISTS • CONSTRUCTION MANAGERS

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Date: 4/2/2019

To: Kimberly Browning, Mitigation Specialist, USACE

From: Tim Morris, Project Manager
KCI Associates of North Carolina, P.A.

Subject: Rough Horn Swamp Restoration Site and Rough Horn Swamp II Restoration Site
Final Mitigation Plan Review
Lumber River Basin - 03040203
Columbus County, North Carolina
Contract No. #s 6596 and 7514
DMS Project #s 97005 and 100053
USACE Action IDs SAW-2015-02410 and SAW-2016-02026
NCDEQ DWR # 2015-0903

Dear Ms. Browning,

Please see below our responses to the IRT comments from February 13, 2019 on the draft of the Rough Horn Swamp/Rough Horn Swamp II Mitigation Plan. We have addressed your comments in the revised final report and have outlined our changes below.

Mac Haupt, NCDWR

1. DWR questions the amount of wetland restoration classified as non-riparian.
   The boundary between the proposed riparian and non-riparian wetland re-establishment has been adjusted based on conversations between KCI and NCDWR. This has moved this boundary slightly farther upslope in the northern portion of RHS and RHSII. These updates have been made throughout the narrative, figures, and tables in the mitigation plan.

2. Section 6.5-Stream Mitigation- the paragraph starts by stating the restored streams will not be a single thread channel then later in the paragraph states an undersized channel will be constructed.
   a. It appears from the design plans that KCI intends to dig a pilot channel for all streams and getting restoration through valley length. There were discussions at one of the site visits where the COE voiced reservations about building a pilot channel through the reaches in wooded areas. DWR prefers the no pilot channel approach. If DMS and the designer maintain that they would like to maintain the pilot channel approach, then DWR would require at least 3-4 cross sections across, with at least one cross section in the wooded area.

   What appears as a channel in the plans in the wooded areas is not intended to be built as a channel, but is intended to provide guide elevations during construction to maintain positive drainage through this part of the site. The topographic depiction of this area in the woods does not capture the complexity of the low and high spots throughout this area. There are many areas in the woods where the current elevations are below the guide elevations in the plans. In those

areas there will be no grading at all, and instead the grading guide that appears to be a channel in the plans is meant to indicate that a graded connection will be made between these already low elevation areas, to create the headwater stream/wetland that is proposed.

3. Section 7.0- Wetland Hydrologic Performance- DWR recalls some discussion at the site meeting regarding the wetland hydroperiods (12% for Riparian, and 10% for Non-riparian). The site visit was held at the same time the wetland saturation threshold ranges came out in the October 2016 Mitigaiton Update. DWR believes the standard for both the Johnston and Torhunta Soil Series should be at least 12%. In addition, the planting plan shows Bald Cypress and Water Tupleo being proposed for the areas underlainby the Torhunta series, this further substantiates a wetter hydroperiod standard.
   The hydroperiod for the non-riparian and the riparian wetlands has been changed to 12%.

4. Table 9 and 10- Length and Summations by Mitigation Category- this table is listing the Riparian wetlands as non-riverine. DWR believes that most of the Riparian wetlands are riverine.
   This has been changed in the mitigation plan.

5. Design Typicals
   a. The Log Drop Detail shows boulder footers, DWR recommends in this physiographic region the use of footer logs.
      The detail indicates that footer logs are an option for this structure. During construction the material that is most readily available for the footers will be used.
   b. For the constructed riffle at the end of the project the typical seems to be showing some fairly large stone. DWR recommends minimizing the stone size for this area.
      For this structure, the stone sizes will be mixed and native soil and channel material will fill-in the voids between the stone. This design is intended to reduce risk and provide stability to this part of the project immediately after construction and into the future. This stone mix will ensure that these goals are met.
   c. The typical for the cross section on sheet 4 states that, "woody debris is to be embedded in the new stream thalweg…" does this mean for the entire reach or what percentage will get woody debris? DWR approves of this approach and would like to have an idea of how much this practice will be employed.
      The intent of this is to place woody debris along the stream path and in the wetland area to promote habitat complexity. The amount of wood to be installed on site will be determined by how much woody debris will be generated by grading at the site. The intent is to use the wood that we generate onsite, not bring any wood in from offsite, and not need to burn any excess wood onsite. For this reason it is difficult to give a sense of the quantity of wood to be installed at the site. We do intend for the wood to be dispersed throughout the site, with wood elements in all portions of the site, not concentrated in one place.

6. DWR prefers that for the Design sheets that the plan view and longitudinal profile be on the same sheet for comparison purposes.
   For formatting purposes and to give the construction contractor a good overall view of the site as a whole from a planform perspective, the decision was made to put more of the planform view of the site on each sheet and put the profile on a separate sheet. Recent stream design plans have used this same approach and have been built successfully without issues during construction or from the contractor about ease of plan interpretation.

Kim Browning, USACE

1. Cover Page: The correct USACE ID for the Rough Horn Swamp site is SAW-2015-00952.
   This correction has been made.

2. Section 6.3: A wetland gauge should be placed in the reference wetland for hydrologic comparison to observe whether results onsite are rainfall driven.
   A gauge is planned to be installed in the reference wetland as discussed in Section 6.3 Reference Wetland.

3. Section 6.5, page 28: "An undersized channel will be constructed in order to initiate stream formation." The discussion regarding this during the IRT field visit on 10/26/16 was that no new channel would be constructed and the only construction that would occur would be at connection points. Please justify the need for this, especially in wooded areas.
   Please see the response to NCDWR comment 2 in regards to the wooded areas. For the rest of the site this "channel" will be less of a formal channel and more of a grading guide as well. In some places the grading may more resemble a channel, and in others the grading will just define the wetland valley to promote positive drainage through the system.

4. Section 7.0: Performance standards for stream hydrology and geomorphology should list specific parameters to demonstrate a concentration of flow in years one through four, and in years five through seven should demonstrate the development of stream bed and banks (ordinary high water mark).
   This section has been updated within the mitigation plan to better communicate these performance standards.

5. Please provide a plan view sheet, similar to the monitoring map, which includes gauges, veg plots, cross sections, etc.
   A monitoring plan view as a part of the record drawings with the exact locations of these features will be provided in the Baseline Monitoring Report. At this point in the design process, the exact location of these monitoring features is uncertain. The monitoring map provides the best summary of the location and quantity of the monitoring features.

6. Please include NCWAM forms.
   The NCWAM forms have been included in in the Appendices with the Approved JD.

7. Section 8: Vegetation monitoring—please specify that though invasive stems will be recorded to determine the percentage of invasive stems present, that the invasives will not count toward vegetative plot success.
   This has been clarified within the mitigation plan.

Please contact me if you have any questions or would like clarification concerning these responses.

Sincerely,

Tim Morris
Project Manager