FINAL MITIGATION PLAN

Stony Fork Restoration Site
Johnston County, North Carolina
DMS Project Number 97085
DMS Contract 6830
USACE AID SAW-2016-00875
DWR Project Number 2016-0372

FULL-DELIVERY PROJECT

Neuse River Basin
Cataloging Unit 03020201

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 Stony Fork Restoration Site (SFRS) is a full-delivery stream and riparian buffer mitigation project being developed for the North Carolina Division of Mitigation Services (DMS) in the Neuse River Basin (03020201 8-digit cataloging unit) in Johnston County, North Carolina. The site's natural hydrologic regime has been substantially modified through the relocation and straightening of the existing stream channels and clearing of riparian buffer. This site offers the chance to restore impacted agricultural lands to a stable stream ecosystem with a functional riparian buffer and floodplain access.

The SFRS is situated in southwestern Johnston County. SFRS is located approximately 5.5 miles north of Benson, NC in Johnston County. Specifically, the site is 0.2 mile west on Elevation Road from its intersection with Federal Road (SR-1331). The center of the site is at approximately 35°26'55.0"N and 78°31'18.5"W in the Benson USGS Quadrangle. The site location is shown in Figure 1.

The SFRS will restore a stable stream ecosystem along Stony Fork and four of its tributaries (T1, T1A, T2, and T3) with a combination of stream restoration and enhancement with primarily a Priority 1 approach to reconnect the streams with an active floodplain. Riparian buffer restoration, enhancement, and preservation under the Neuse Buffer Rule (*NCAC Rule 15A NCAC 02B .029)* will also take place at the site. Invasive Chinese privet (*Ligustrum sinense*) and kudzu (*Pueraria lobata*) will be both physically cleared and chemically treated from the project site as part of the stream and buffer mitigation. Once site grading is complete, the riparian buffer will be planted with native tree species. The site will be monitored for seven years or until the success criteria are met.

Table 1. Credit Summary

Stony Fork Restoration Site, Johnston County DMS Contract 6830; DMS Project Number 97085										
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	6,405 lf	405 lf					450,285 sf	499,462 sf		
Credits	6,405	181					425,434	54,904		
TOTAL CREDITS	**6,586**						**480,338**			

R=Restoration RE=Restoration Equivalent

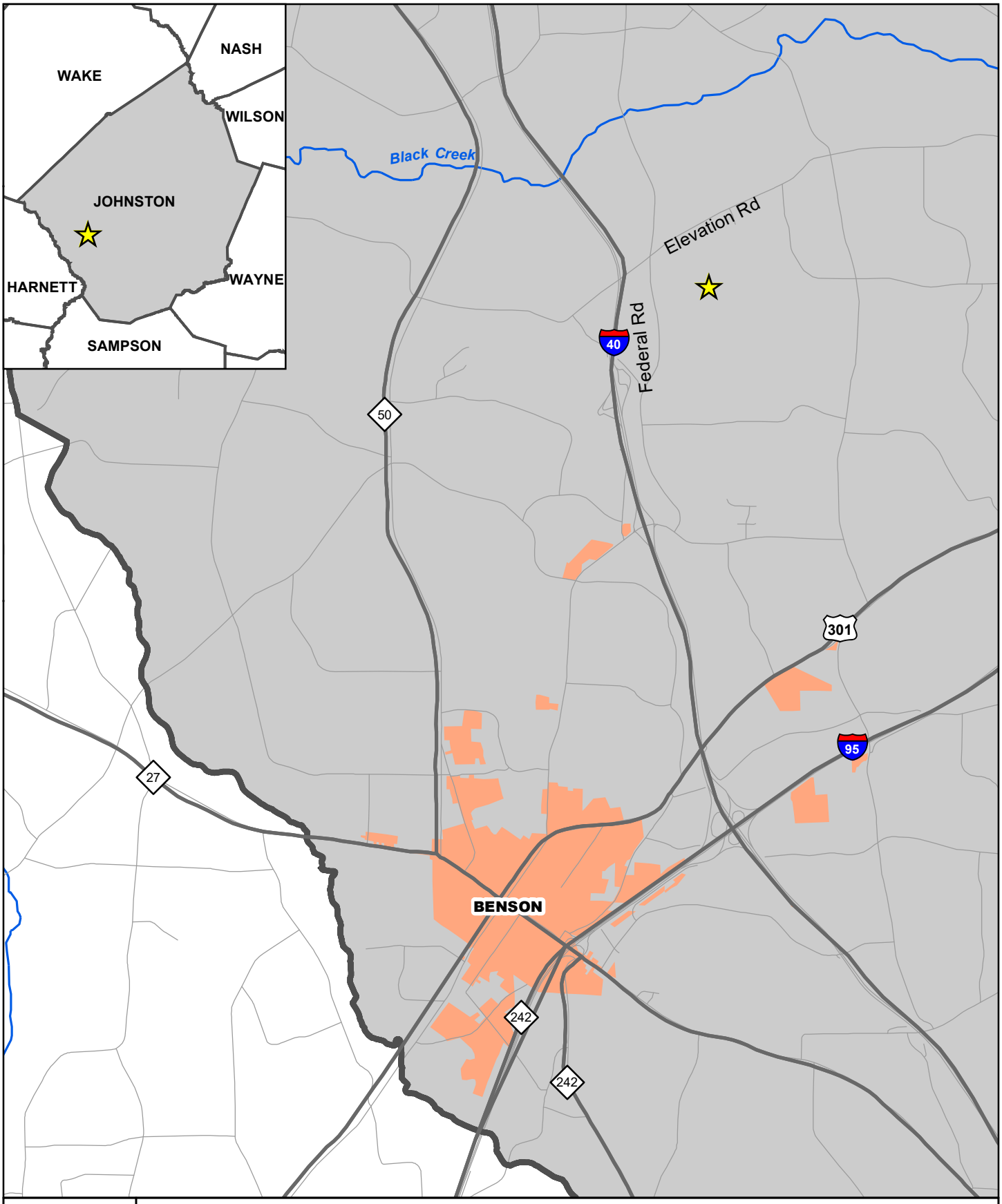

FIGURE 1. VICINITY MAP, STONY FORK RESTORATION SITE, JOHNSTON COUNTY, NC

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2.0 WATERSHED APPROACH AND SITE SELECTION

The SFRS is located within the Upper Neuse River Basin (03020201), where population growth and rapid development have produced a significant need for restoration projects. DMS updated the priorities for the Neuse 01 cataloging unit (CU) in 2015 due to extensive mitigation needs and changes in watershed conditions since the 2010 report. The project 14-digit CU is included as a targeted local watershed (TLW), which faces challenges such as a high percentage of agricultural land/animal operations, disturbed riparian buffer, and increasing impervious surface from development. The amount of problems identified were scored higher than the amount of assets available in the most recent 14-digit CU ranking (NCDENR, EEP 2015).

The Neuse River Basin Restoration Priorities are maintaining and enhancing water quality, restoring hydrology, and improving fish and wildlife habitat (NCEEP, 2010). The project will support the following basin priorities:

- Managing stormwater runoff
- Improving/restoring riparian buffers
- Reducing sediment loading
- Improving stream stability

The project watershed for the SFRS is comprised of 0.79 square mile (497 acres). The project aims to uphold the goals consistent with several CU-wide watershed improvement objectives by restoring stream hydraulics, improving/restoring riparian buffers, improving stream stability and reducing sediment loading (NCDENR, EEP 2010). Stony Fork (27-52-6-2) has been rated by Division of Water Resources (DWR) as Class C, Nutrient Sensitive Waters, and is not on the 2016 303(d) list. However, Hannah Creek (27-52-6a), 4.2 miles downstream of the site, is listed as impaired for dissolved oxygen. There are no other DMS mitigation projects currently located in the 03020201150010 watershed cataloging unit. The project watershed is shown in a map in Figure 2, and another map illustrating the project's watershed location in relation to the 03020201150010 watershed identified in the TLW is shown in Figure 3.

There are no conservation or protected areas located adjacent to the project site, but it will connect with the forested buffer immediately adjacent to the project and improve and restore the existing forested buffer on the site itself. The site is approximately 4.5 miles upstream of the Hannah Creek Swamp Natural Heritage Area.

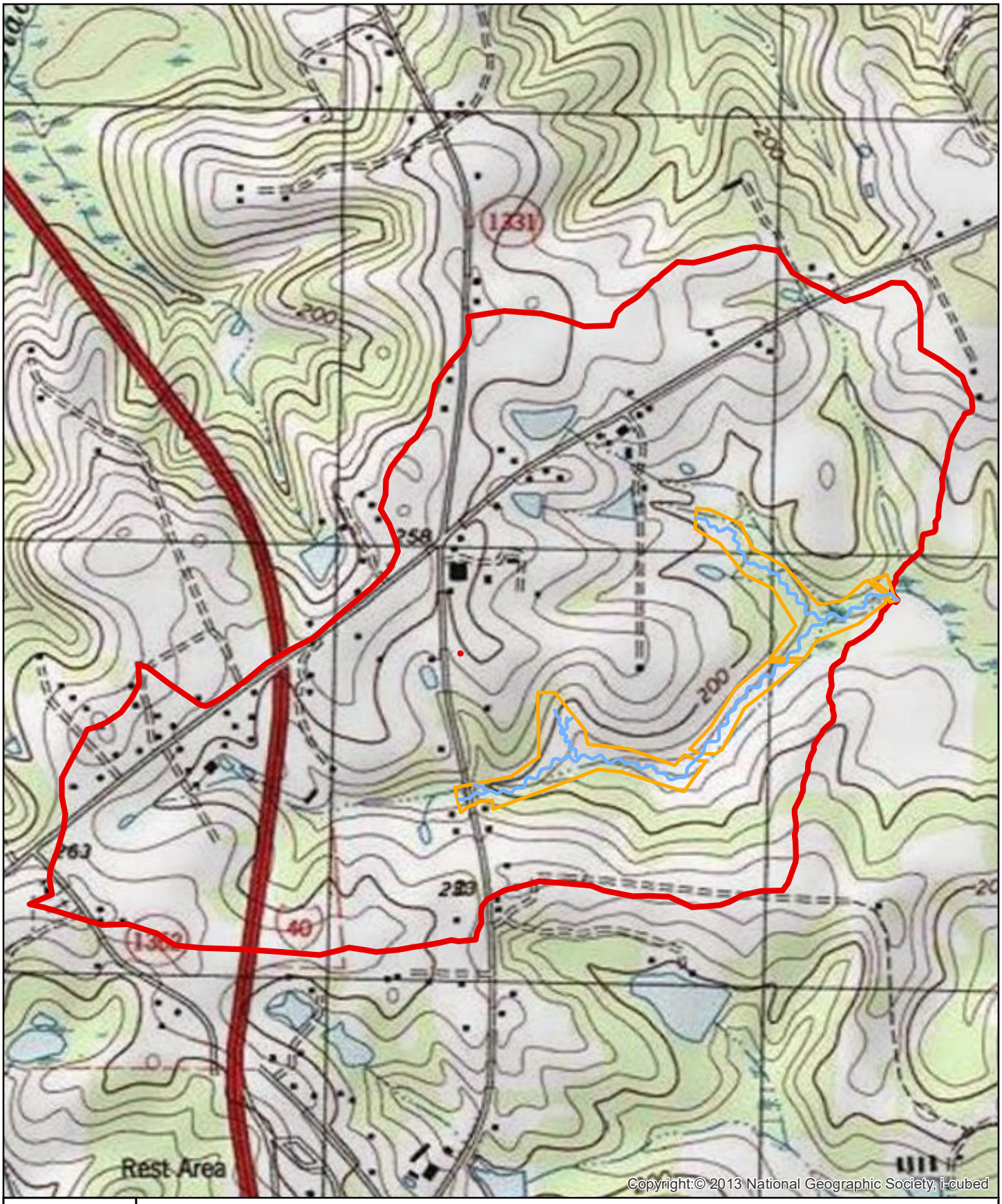

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FIGURE 2. PROJECT WATERSHED, STONY FORK RESTORATION SITE, JOHNSTON COUNTY, NC

Proposed Streams
Proposed Easement
Project Watershed (497 ac)

N

0 1,000 2,000 Feet

Source: USGS DRG, Benson Quad (1973).

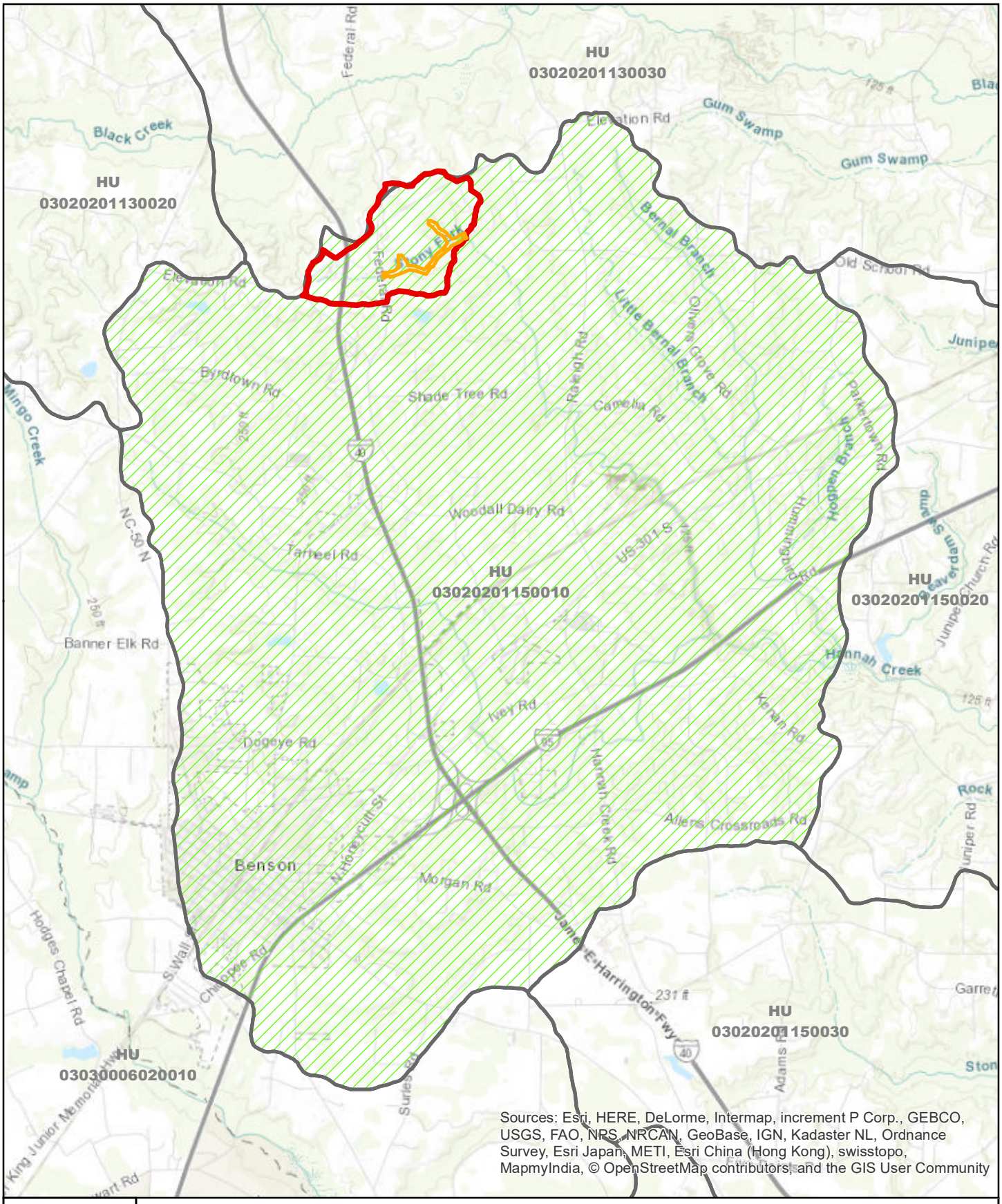

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FIGURE 3. PROJECT SITE/LWP WATERSHED, STONY FORK RESTORATION SITE, JOHNSTON COUNTY, NC

- Proposed Easement Project
- Watershed (497 ac) 14-digit
- HUC Boundaries HUC
- 03020201150010 (TLW)

N

0 1 2 Miles

3.0 BASELINE AND EXISTING CONDITIONS

3.1 Watershed Processes and Resource Conditions

3.1.1 Landscape Characteristics

The site lies within the Rolling Coastal Plain (Level IV 65m) ecoregion of the Southeastern Plains. The Rolling Coastal Plain is mostly irregular plains with broad interstream areas and a mosaic of cropland, pasture, woodland, and forest. While the natural vegetation was historically longleaf pine, oak-hickory and mixed pine forests are more abundant now. The geology of this area is typified by Cretaceous or Tertiary-age sands, silts and clays (Griffith et al 2002).

Many of the stream reaches have been ditched to a clay bottom and are overlaid with a sediment transport regime of sand and small gravel. While gravel is the predominant bed material, sand is entering the system from bank erosion both upstream and on-site. The floodplain for Stony Fork is unconfined in most areas, although it is currently disconnected from the existing stream.

According to the Soil Survey of Johnston County, all of the project streams and floodplain areas are underlain by Bibb sandy loam (Bb). The official Map Unit Name is Bibb sandy loam, 0 to 2 percent slopes, frequently flooded. These soils are poorly drained floodplain soils that are usually linear, associated with streams, and frequently found along the toe of slopes. The soil survey for the project area is shown in Figure 4.

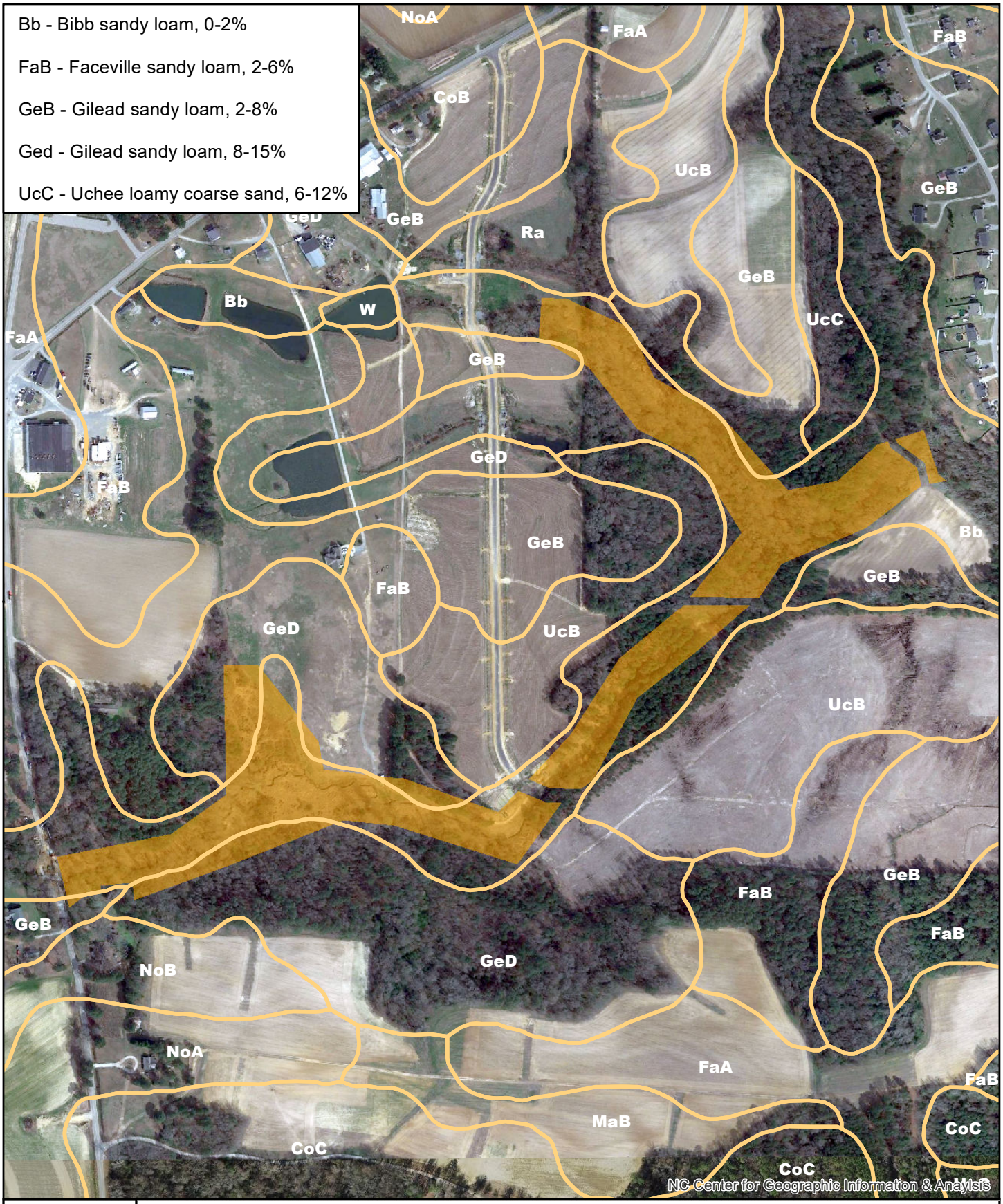

FIGURE 4. NRCS SOIL SURVEY, STONY FORK RESTORATION SITE, JOHNSTON COUNTY, NC

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NRCS Soil Survey
Proposed Easement

N

0 500 1,000 Feet

Source: NRCS Web Soil Survey; Google Earth, 3/2018.

3.1.2 Land Use/Land Cover and Chronology of Impacts

The project watershed for the SFRS is comprised of 0.78 square mile (497 acres). Current land use in the project watershed (Figure 5) was derived from the 2013 orthoimagery and consists of agriculture/open space (53% / 262 ac), forest (31% / 150 ac), rural development (9% / 42 ac), residential (5% / 24 ac), and roads/impervious (3% / 13 ac), and water. The current adjacent land use has a negative impact on water quality of the project streams. This is evidenced by direct run off from agricultural open space along parts of the stream where there is no riparian buffer. The top of T2 will receive stormwater from a residential development currently being constructed. Impervious surfaces within the project watershed include Federal Road, which is immediately adjacent to the project, and I-40, which is just 1,400 linear feet upstream of the project. KCI's measurement of the total impervious area for the watershed is approximately 5%, which is based on the land use delineated from the 2013 orthoimagery and based on published average impervious values for land use categories (Center for Watershed Protection 2003). Development pressure in the watershed is high as evidenced by the new development mentioned above that is being constructed to the northeast and southeast of the project streams. The existing ponds above T2 will remain and be incorporated into the stormwater system of the new development. A new aluminum arched culvert will be installed across Stony Fork to access the southeastern part of the development and will be incorporated into our project design in the existing easement exception.

The SFRS has undergone significant modifications that have altered the site hydrology and vegetation. Historic aerials were examined for any information about how the site has changed over recent history. Historic aerials were obtained from the NRCS, USGS EarthExplorer, and Google Earth for 1938, 1949, 1960, 1972, 1980, 1998, 2005, and 2013. Selected historic aerials are presented in Figures 6A and 6B.

The site was systematically impacted over the twentieth century with channelization and clearing. In the earliest aerial photo from 1938, the upstream part of the project appears forested, but the channel is straight, indicating that it had been ditched prior to this photo. Also, the nearby Federal Road is on a different alignment, which suggests that when it was realigned to its current position, there may have been further manipulation of Stony Fork. The ponds upstream of T2 had not been built yet in this photo. Additionally, the portion of Stony Fork that currently flows through an existing dense stand of kudzu is flowing south of that area. In the 1949 aerial, there has been more clearing along the periphery of the project area and the straightened streams are easily identifiable throughout the site. Stony Fork at the downstream end of the project has been ditched between two fields.

In 1960, there was more clearing just downstream of Federal Road. This cleared field borders the ditched portion of Stony Fork to the north. Also, the ponds upstream of T2 have been built by this point. In the 1972 aerial, some fields south of the project have reforested, and other areas north of the project that have been cleared. The 1980 aerial looks similar to the previous aerial, with some minor changes to the clearing limits. By 1998, there has been extensive clearing throughout the middle of the project along the southeastern side of Stony Fork. Also, the previously cleared fields on the north side of Stony Fork at the downstream end of the project have revegetated. The 2006 aerial looks similar to conditions today. The area of Stony Fork around T1 has been cleared and is revegetating, likely with the kudzu present today, and the previously large cleared area that appeared in the 1998 photo has been planted with loblolly pine. The most recent aerial (2013) shows the rows of pine trees in the plantation and area of kudzu around T1.

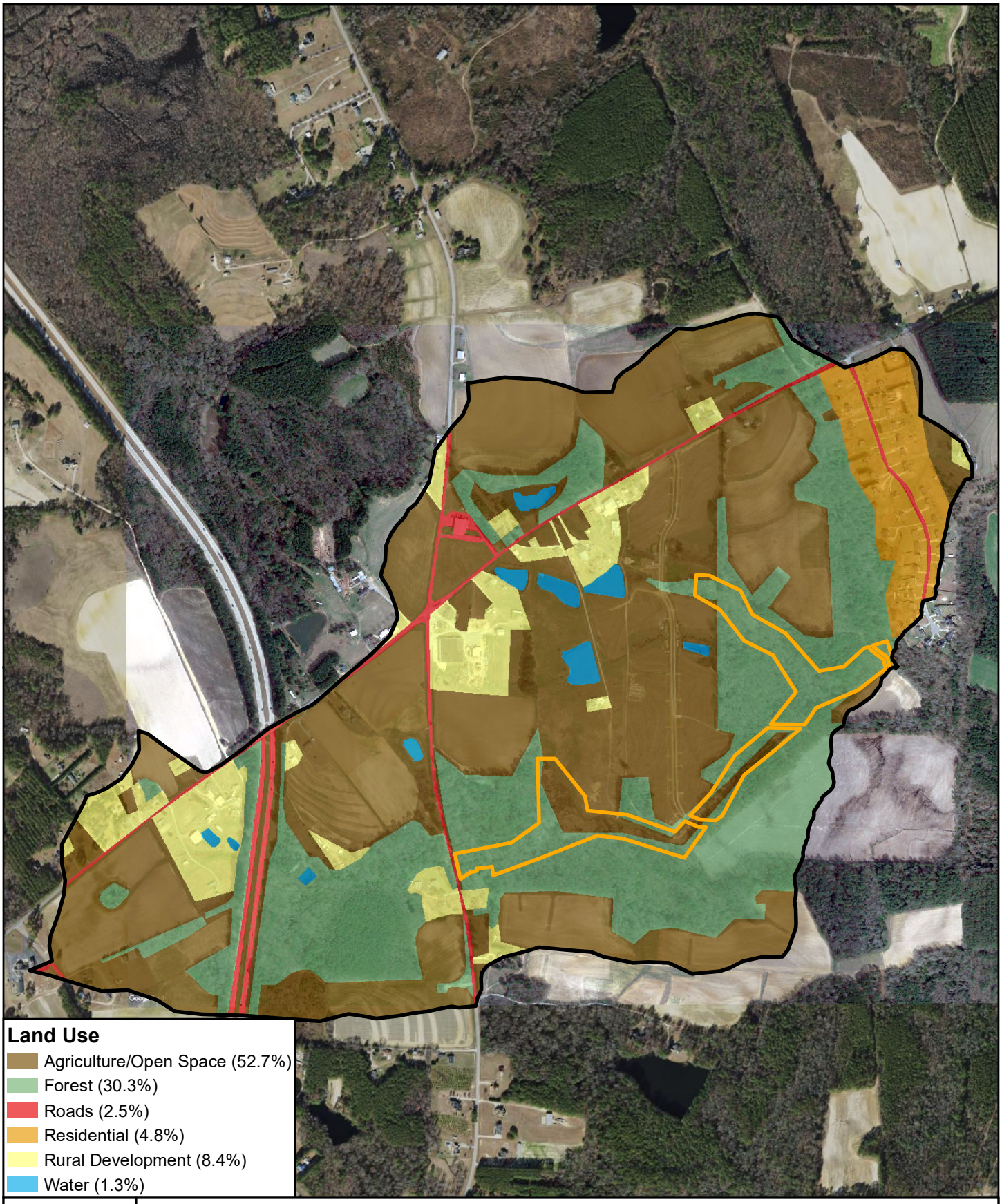

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FIGURE 5. PROJECT LANDUSE, STONY FORK RESTORATION SITE, JOHNSTON COUNTY, NC

Project Watershed (497 ac)
Project Easement (24.4 ac)

N

0 1,000 2,000 Feet

Source: Google Earth, 3/2018 and NCOneMap Orthoimagery 2017

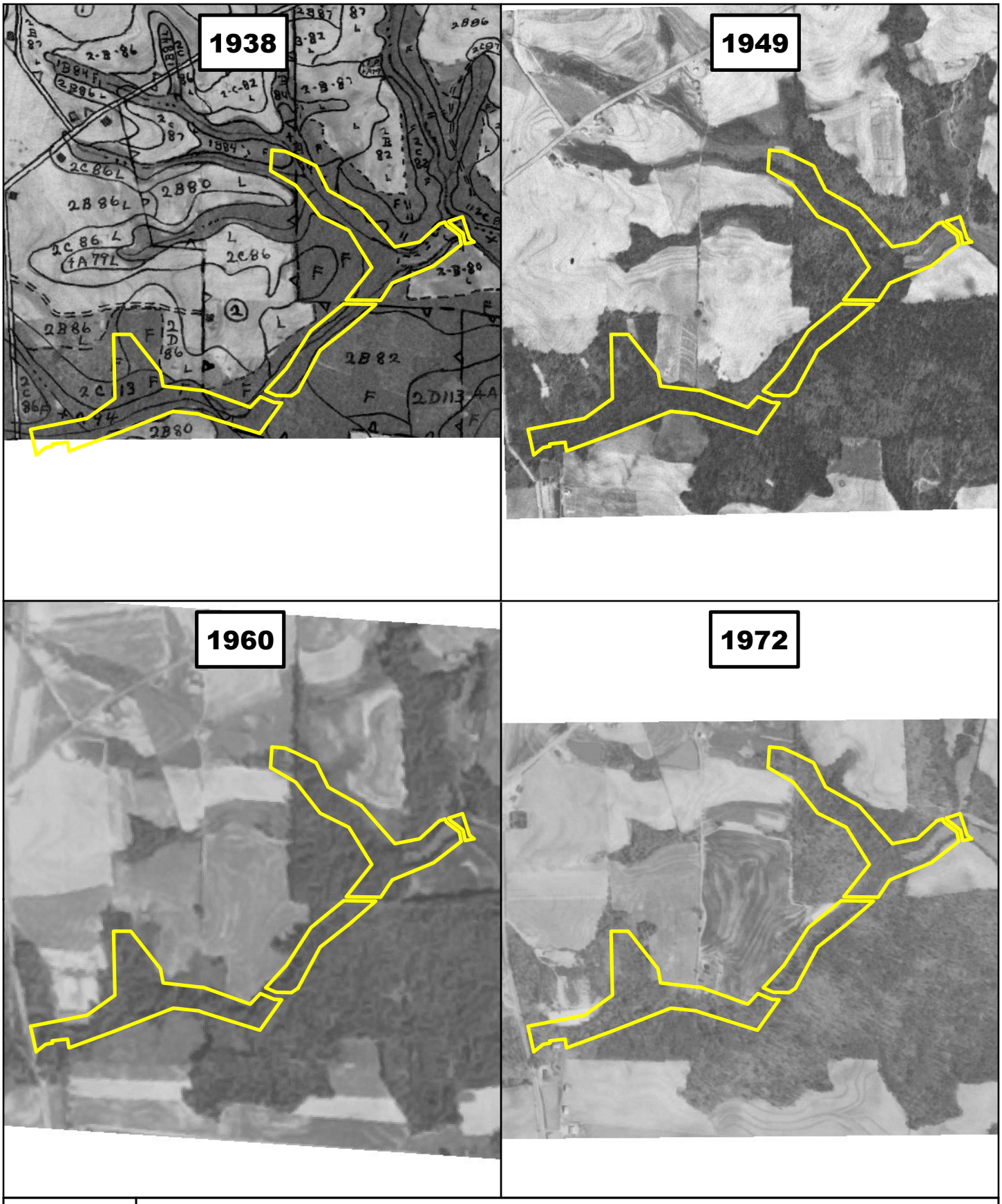

FIGURE 6A. HISTORIC AERIAL PHOTOGRAPHS

Proposed Easement (24.4 ac)

Image Sources: Johnston County NRCS; USGS Earth Explorer.

N

0 1,000 2,000 Feet

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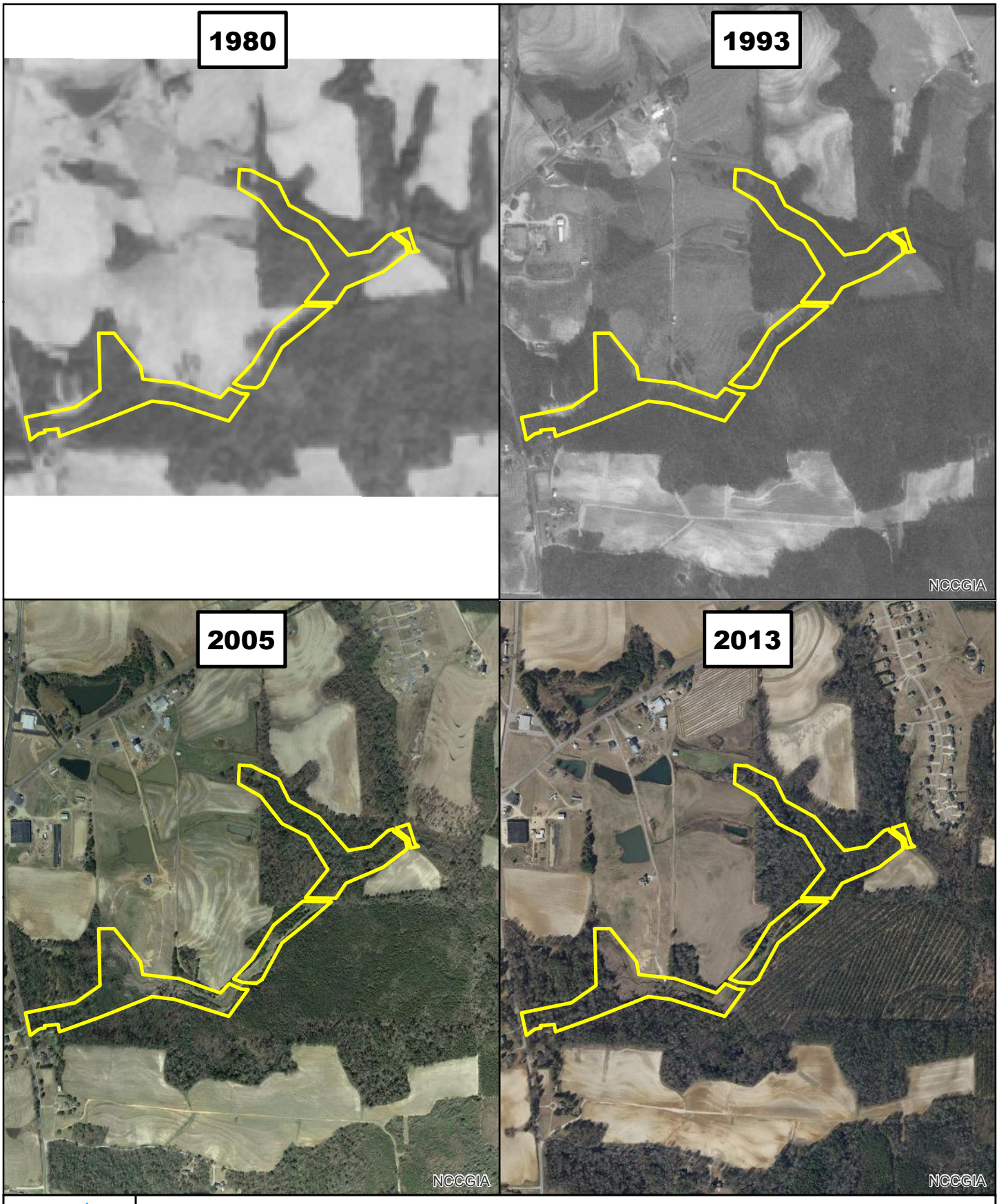

FIGURE 6B. HISTORIC AERIAL PHOTOGRAPHS

Proposed Easement (24.4 ac)

Image Sources: USGS Earth Explorer; Johnston County Orthoimagery; NC OneMap.

N

0 1,000 2,000 Feet

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3.1.3 Watershed Disturbance and Response

The project has experienced significant landscape and vegetative modifications to allow for agriculture and timber management along the project streams of Stony Fork (SF), Tributary 1 (T1), Tributary 1A (T1A), Tributary 2 (T2), and Tributary 3 (T3). The measured bank height ratios along the project streams are all greater than 1.5 and the reaches have been altered through channelization as seen in Table 2. Additional existing conditions data are included in Section 12.2.

Table 2. Existing Stream Bank Height and Entrenchment Ratios

Stream	Existing Bank Height Ratio	Existing Entrenchment Ratio
SF	1.6-2.9	1.2-1.5
T1	4.5	1.3
T2	1.5-4.1	1.3-5.4

The primary hydrologic feature at the site is SF, which has been impacted by channelization and riparian vegetation removal or alteration. This stream enters the projects from a 48”-diameter concrete pipe from under Federal Road. SF flows in a general west to east direction until flowing off of the project site. The first 450 linear feet (lf) are incised with steep vertical banks, a narrow channel, and intermittent headcuts. The channel likely was relocated, because there is no existing floodplain connection. The canopy is mostly composed of a dense midstory of invasive Chinese privet (*Ligustrum sinense*).

After about 450 lf, SF begins to flow northeast; the condition changes, and the channel becomes less incised and wider. A distinct floodplain is not actively connected to the existing channel, but is present in this landscape position. However, the channel is still narrower than a natural system and the banks are vertical. Chinese Privet and kudzu dominate the riparian buffer. Downstream of this point, SF channel has been mechanically ditched in the past.

After the confluence with T2, SF continues to flow northeast until it comes along a field edge. Similar to most other parts of SF on this project, the stream is not in the correct position in the valley and is disconnected from the former floodplain. In some instances, the channel has one dramatically higher bank, while the other bank is significantly lower. This is evidence of the channel having been moved to its current location to the side of the valley. The stream continues to flow in this condition off of the project site to the southeast.

T1 flows north to south before flowing into SF. The stream originates from one distinct seep/spring in the hillslope to the north of SF and receives additional hydrology from degraded seeps (including T1A) at the base of the slope to the east of T1 that are currently impacted by vegetation removal and land clearing. This tributary has been moved out of the natural position in the low point of the valley to the base of the slope to drain the seepage from the hill slope. The riparian buffer is currently a monoculture of kudzu.

T2 begins at a headcut and is bordered by a narrow buffer of brush and trees before it meets the wood line. Upstream land clearing, agriculture, and farm ponds have altered the hydrologic regime of the stream and caused the tributary to become unstable. After the wood line, there are several small headcuts, and after a larger headcut 345 feet into the wood line, the stream becomes more incised as it flows southeast to its confluence with SF. This lower portion of T2 is disconnected from its historic floodplain.

T3 is a seep-driven stream that flows north to south until it meets SF approximately 160 linear feet downstream of the beginning of the project. The first 125 linear feet of T3 are channelized, but with mature trees scattered along the stream, stabilizing portions of the banks. After this point, the flow enters a breached pond bed with accumulated sediment for an estimated 50 feet of flow length. Although the pond has been breached, the majority of the former dam is still in place. T3 exits the former pond to join SF at a location against the valley grade.

The riparian areas at the SFRS has been colonized by a dense layer of invasive Chinese privet, especially along SF. In addition, kudzu dominates the middle portion of SF and T1. There is existing native forested buffer near the bottom of SF and at the outer margins of the easement, which consists of tulip poplar (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), white oak (*Quercus alba*), American sycamore (*Platanus occidentalis*), and green ash (*Fraxinus pennsylvanica*). Additional details regarding the extent of the invasive species in the riparian areas at SFRS are included in the *Buffer Mitigation Plan* in Section 12.3.

A jurisdictional determination was submitted to the US Army Corps of Engineers on July 12, 2016 and was approved July 13, 2016. The approved jurisdictional determination is included in Section 12.7. NC Division of Water Resources also provided a stream determination on July 8, 2016, which is provided in Section 12.3 in the appendices. An updated site assessment of the stream buffer along T2-2 was completed by DWR on March 29, 2018 and is included in the appendices as well.

Table 3. Project Attribute Table

Project Name	Stony Fork Restoration Site			
County	Johnston County			
Project Area (acres)	24.4 ac			
Project Coordinates (lat. and long.)	35°26'55.0"N, 78°31'18.5"W			
Planted Acreage (Acres of Woody Stems Planted)	12.1			
Project Watershed Summary Information				
Physiographic Province	Coastal Plain			
River Basin	Neuse			
USGS Hydrologic Unit 8-digit	03020201	**USGS Hydrologic Unit 14-digit**	03020201150010	
DWR Sub-basin	03-04-04			
Project Drainage Area (acres)	497 acres			
Project Drainage Area Percentage of Impervious Area	5%			
CGIA Land Use Classification	Managed Herbaceous Cover 53% (262 ac), Mixed Hardwoods/Conifers 31% (150 ac), Low Density Developed 9% (42 ac), Medium Density Residential 5% (24 ac), Transportation/Impervious 3% (13 ac)			
Existing Reach Summary Information				
Parameters	**Stony Fork**	**T1 and T1A**	**T2**	**T3**
Length of reach (linear feet)	3,141	412	1,433	154
Valley Confinement	Unconfined	Confined	Confined, then unconfined	Unconfined
Drainage area (acres)	497 acres	12 acres	150 acres	29 acres
Perennial, Intermittent, Ephemeral	Intermittent	Intermittent	Intermittent/ Perennial	Intermittent
NCDWQ Water Quality Classification	C; NSW	C; NSW	C; NSW	C; NSW
Rosgen Classification (Existing/Proposed)	G4c	G4	G4	G4
Evolutionary trend (Simon)	Channelized, Stage III	Channelized, Stage III	Channelized, Stage III	Modified with pond, Stage III
FEMA classification	None	None	None	None
Existing Wetland Summary Information				
Parameters				
Size of Wetland (acres)	0.33 (WA and WE)	0.06 (WB)	0.14 (WC and WF)	
Wetland Type	Headwater Forest	Bottomland Hardwood Forest	Non-Tidal Freshwater Marsh	
Mapped Soil Series	Gilead sandy loam	Bibb sandy loam	Bibb sandy loam	
Drainage class	Moderately Well Drained	Poorly Drained	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	

**Items addressed in the Categorical Exclusion in Appendix.

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.
Waters of the United States – Section 401	Yes	Applying for NWP 27	
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	Yes	N/A
Essential Fisheries Habitat**	No	N/A	N/A

**Items addressed in the Categorical Exclusion in Appendix.

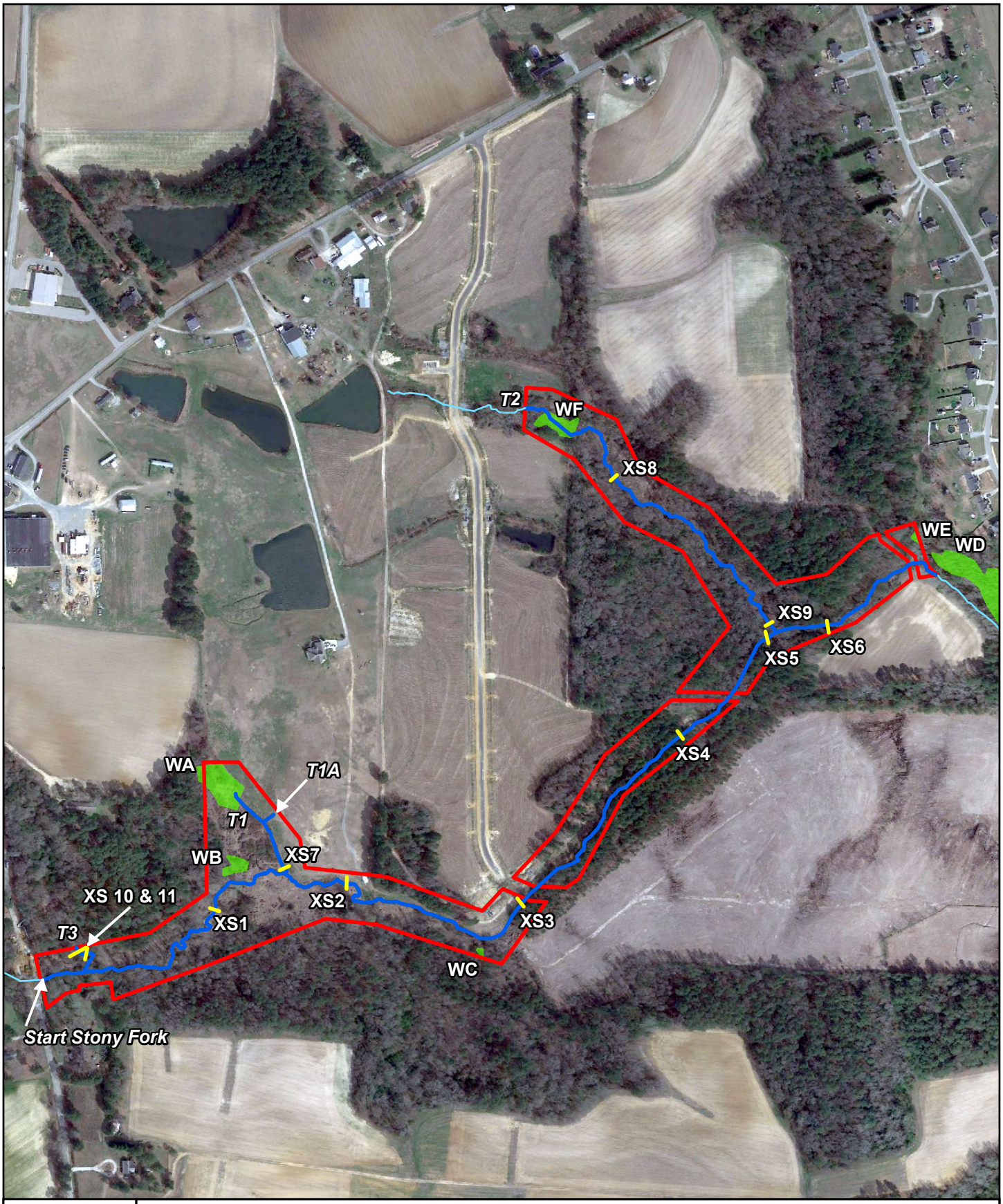

FIGURE 7. CURRENT CONDITIONS PLAN VIEW, STONY FORK RESTORATION SITE, JOHNSTON COUNTY, NC

Project Easement (24.4 ac)
Existing Project Streams
Other Streams
Cross-Sections
Jurisdictional Wetlands

N

0 500 1,000 Feet

Image Source: Google Earth, 3/2018.

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3.1.4 Site Photographs

Photo 1: Head of project at exit from culvert at Federal Rd.

Photo 2: Typical view of Stony Fork near top.

Photo 3: View of eroding banks on Stony Fork on Reach 1.

Photo 4: View of 2-acre kudzu monoculture near confluence of T1 and Stony Fork.

Photo 5: View of flowing seep near head of T1.

Photo 6: View of clay channel bottom on Stony Fork along channelized stream.

Photo 7: View of 18" headcut on Stony Fork.

Photo 8. View of accelerated erosion and undercut banks on Stony Fork.

Photo 9: View of T2 bed erosion and incision.

Photo 10: Typical view of upper portion of T2 above headcut

Photo 11: View of Stony Fork downstream of mid-project culvert.

Photo 12: View of upstream portion of T2.

	
Photo 13: Top of T3.	**Photo 14.** T3 as it becomes incised.
	
Photo 15: Another view of T3 with incised banks.	**Photo 16**: T3 as it goes through the pond bottom near the end of the stream near SF.

4.0 FUNCTIONAL UPLIFT POTENTIAL

Based on the current stream and watershed conditions at the SFRS, there is a high potential for functional improvements at this site. Channelization, incision, riparian vegetation removal, and invasive species monocultures have resulted in a local system with lack of floodplain connectivity, high shear stress, minimal bedform variation, and high amounts of sediment inputs from bank erosion and a degraded riparian buffer.

The primary uplift for the SFRS will be achieved at the hydraulic and geomorphological functional levels. Reestablishing floodplain connectivity with a Priority 1 Restoration will allow stream flows to access the floodprone area more frequently, providing uplift of hydraulic functions within this system that will distribute flood flows through a wide area instead of within a confined channel. Geomorphological functional uplift will be achieved through channels sized to the bankfull flow, a planform and profile design emphasizing bedform variation, and the reestablishment of a native riparian corridor with invasive species removed. As a result, bank migration and lateral stability will be restored to a sustainable level and the banks and bed will accommodate design flows in a stable manner. Sediment inputs will decrease due to reduced bank erosion and sediment transport can return to a stable level that will accommodate watershed inputs. Riparian plantings will further support geomorphological functionality by increasing bank stability.

Consideration of future impacts to the area that could limit functional uplift opportunities is important when assessing project potential. The upstream watershed is agricultural, but the vicinity is experiencing development pressure. A new residential development is being constructed to the northeast and southeast of the project. The project streams are sized such that the floodprone areas will accommodate changes in hydrology as needed. The table below summarizes the project goals and objectives that will lead to functional improvements and the monitoring tools that will be used to track these changes to the site.

5.0 MITIGATION PROJECT GOALS AND OBJECTIVES

Table 4. Project Goals, Objectives, and Functional Outcomes

Goals	Objective	Functional Level	Function-Based Parameter Effects	Monitoring Measurement Tool
Restore an incised stream to a stable stream system with an active floodplain	Relocate streams to a meandering landscape position	Hydraulics	Floodplain Connectivity	Flood Frequency
				Bank Height Ratio and Entrenchment Ratio
	Install a cross-section sized to the bankfull discharge	Geomorphology	Bank Migration/Lateral Stability	Cross-Sectional Survey
				Visual Inspection of Bank Stability
	Create bedform diversity with pools, riffles, and habitat structures	Geomorphology	Bed Form Diversity	Percent Riffle and Pool
				Visual Inspection of Feature Maintenance
Restore a forested riparian buffer to provide bank stability and shading	Treat invasive plant populations and plant the site with native trees and shrubs.	Geomorphology	Vegetation	Density
				Species Composition/Diversity

6.0 DESIGN APPROACH AND MITIGATION WORK PLAN

The project streams were designed using a modified reference reach approach using a local regional curve developed from stable reference cross-sections (see Section 12.2 for reference data). In addition to the data from the on-site references, common reference values from Harmon et al. 2011 were also used to aid the development of the design criteria. The proposed channel design values have been adjusted as necessary to fit the existing site conditions based on these sources. Stable pattern data were taken from the UT Fisher River reference in Surry County as needed.

6.1 Stony Fork (SF)

Stony Fork will be broken into three separate reaches: Stony Fork Reach 1 (SF1) from the western edge of the project until the confluence with T1, Reach 2 (SF2) from SF1 until the confluence with T2, and Reach 3 (SF3) from SF2 until the end of the project. The first reach, SF1, begins at the culvert under Federal Road and is 1,155 linear feet. Since the elevation of this reach is controlled by this culvert, this reach will be a transition part of the project where the design will follow more of a Priority 2 approach. The design will raise the channel elevation to match the channel grade with the invert of the culvert. In the lower third of this reach, the channel will be meandered to the south of its current location and into the former floodplain location. Invasive privet, which is extensive throughout Reach 1, will be removed from the buffer.

From the T1 confluence, SF2 will continue with Priority 1 restoration down the valley in the historic floodplain location. This is the longest reach on Stony Fork at 2,707 linear feet. The first half of this reach has a narrower valley width and as a result, the proposed stream will follow along the general path of the existing channel, while increasing the sinuosity and raising the bed elevation. The second half of this reach will be relocated to the north of the existing channel where the valley is broader. Every effort will be made to work around trees in this area that can provide shade to the restored stream.

After the confluence with T2, SF3 will continue to be restored by moving the stream back to the relic floodplain in the center of the valley. The proposed stream (624 linear feet) will remain to the north of the existing channel before tying back into the existing thalweg at the end of the project. The stream will be remeandered around significant trees that will provide shade to the restored channel. The project crediting will end at Station 56+04 approximately 26 lf below the last crossing due to limitations of the buffer width, but the stream will be improved until the end of the project easement and property line for another 70 lf.

6.2 Tributary 1 (T1)

T1 will be restored using a Priority 1 approach for approximately 510 linear feet. The design will move the channel west to its historic floodplain away from the toe of the hill slope. The stream will originate from the primary spring/seep that emerges from the base of the hill and provides the hydrology for the stream. T1 will then join Stony Fork to the west of the current location of the confluence. In addition, 159 linear feet of T1A, which is fed by seep flow, will be redeveloped through restoration.

6.3 Tributary 2 (T2)

T2 has been divided into three reaches: T2-1 (334 linear feet of EII), T2-2 (337 linear feet of restoration), and T2-3 (885 linear feet of restoration). Enhancement II for T2-1 will involve installing a step pool to

stabilize a headcut, planting the riparian buffer with native vegetation, and removing and controlling invasive vegetation within the easement. T2-2 begins where several headcuts cause the stream to rapidly incise. The restoration will maintain the landscape position of the stream, but add appropriate sinuosity and restore the streambed morphology by raising the elevation of the streambed to regain floodplain connection. T2-3 will continue this approach, but with a larger cross-section to accommodate additional drainage area.

6.4 Tributary 3 (T3)

T3 has been divided into two reaches: T3-1 (71 linear feet of Enhancement I) and T3-2 (58 linear feet of restoration). The top reach will be enhanced along its existing planform up until the pond bed. After this point, T3-2 will be restored by constructing a stable channel and eliminating spoil piles in this area.

6.5 Riparian Buffer Mitigation

Riparian buffer mitigation will take place across the site in the form of restoration (450,285 sf / 425,434 credits), enhancement (74,802 sf / 37,401 credits), and preservation (424,660 sf / 17,503 credits) and adhering to the Neuse Buffer Rule (NCAC Rule 15A NCAC 02B .029). The preservation area has been limited to 25% of the total area for crediting purposes as mandated by the rule, but uncredited preservation areas will still be protected as part of the conservation easement. See Section 12.3 for the Buffer Mitigation Plan, including calculations and maps.

6.6 Crossings

There are three easement exceptions for crossings on Stony Fork. The first culvert will be installed as part of the current development being constructed to the southeast of the site. The second crossing will be a rock ford crossing; this landowner will use this crossing infrequently and there are no livestock in this area. The third crossing is an existing culvert pipe that will stay in place.

6.7 Design Discharge Determination

KCI developed the design discharge values for the proposed streams by using four stable reference cross-sections located in the vicinity of the project: two on-site (Ref XS1 and 4) and two downstream (Ref XS 2 and 3) from the project on Stony Fork (see Section 12.2 for locations and cross-sectional data). In comparison to other impaired portions of the site, these four reference cross-sections have stable bankfull features that allowed for the cross-sectional area and discharge to be linked to the drainage area. Based on these values, we developed a local regional curve using these cross-sections. The rural Piedmont regional curves were used to as a comparison for the on-site relationships (Harman et al 1999) (although the site is in the Coastal Plain, the Piedmont curve was deemed more suitable based on the watershed's characteristics). The local curve showed a linear power relationship lower than the Piedmont curve as shown in Figure 8 and Table 5 below (Reference Cross-Sections 2 and 3 have similar drainage areas, and appear as one data point on the curve).

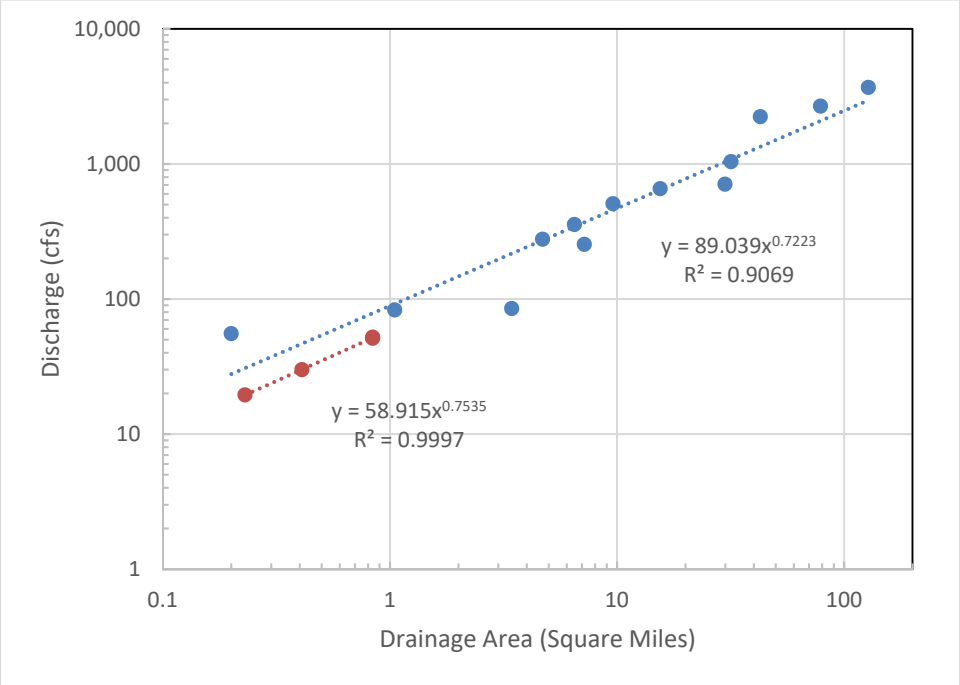


Figure 8. Local Regional Curve for Stony Fork

Table 5. Local Regional Curve Data

Cross-Section Location	Drainage Area (Sq. Miles)	Reference XS Area (sf)	XS Area Estimate (sf) from Piedmont Regional Curve	Q (cfs) from Ref XS	Q (cfs) from Piedmont Regional Curve
Onsite T1 (Ref XS 4)	0.23	5.0	7.9	19.5	30.9
Stony Fork Upstream (Ref XS 1)	0.41	9.3	11.7	30.0	46.9
Onsite Stony Fork (Ref XS 2)	0.84	17.0	19.0	51.2	78.5
Stony Fork Downstream (Ref XS 3)	0.84	24.8	19.0	52.2	78.5

To further evaluate the field measurements taken within the project, we compared the flow results for the four cross-sections to two different hydrologic methods. First, we compared our results to the 2-year recurrence interval flow calculations using the USGS Rural Peak-Flow Regression Equations for North Carolina in the USGS National Streamflow Statistics Program (USGS 2016). Bankfull values in the North Carolina Piedmont average a 1.4-year recurrence interval (Harman et al. 1999), and as such should be lower than the 2-year recurrence interval USGS values. Our field results are lower than the USGS values as expected. The effective discharge equation for a 1.2 recurrence interval for the Southeastern Plains Ecoregion (Simon et al. 2004) was also used as a comparison tool; in general, the $Q_{1.2}$ values are close in range to the reference cross-section flow values. This comparison shows that our field calculations are within the range of other established discharge estimates. In addition to the field-acquired reference data, we also used common reference values from Harman et al. 2011 as mentioned previously.

Table 6. Local XS Flow Compared to USGS Regression for North Carolina

Cross-Section Location	Drainage Area (Sq. Miles)	Field Q (cfs)[1]	USGS Regression 2-year Q (cfs)[2]	USGS Regression Low Prediction (cfs)	USGS Regression High Prediction (cfs)	Effective Discharge[3] (cfs)
Onsite T1 (Ref XS 4)	0.23	19.5	32.5	14.8	71.4	18.0
Stony Fork Upstream (Ref XS 1)	0.41	30	45.7	20.9	99.0	26.8
Onsite Stony Fork (Ref XS 2)	0.84	51.2	69.9	32.1	152	43.8
Stony Fork Downstream (Ref XS 3)	0.84	52.2	69.9	32.1	152	43.8

1. Calculated using field bankfull dimensions and Manning's formula.
2. Calculated using USGS NSS, North Carolina Region 4 Equations assuming impervious percentage of 5%.
3. Simon et al. 2004 equation for Southeastern Plains (Ecoregion 65) for 1.2 Recurrence Interval.

6.8 Sediment

The on-site streams have sediment with a mixture of small gravel and sand. The project streams have a silt/clay bed underneath the active sediment where excessive shear stresses from the confined channels have removed existing bed material and created an unstable condition.

In order to analyze the existing sediment conditions within the project streams, two pavement samples and nine pebble counts were performed for trend analysis. These data are provided in Section 12.2. Based on the existing conditions data, the project sediment sizes range from sand up to small gravels. Bank erosion is currently contributing excess sand to the system. Following project completion, the amount of sand being contributed from on-site erosion is expected to decrease. However, a sand component is still anticipated for the sediment regime given that upstream agriculture and development will continue in the upper watershed and move through Stony Fork.

Based on the collected sediment and cross-section data, shear stress values were calculated using both average channel boundary shear stress and a modified critical shear stress (USDA, Forest Service 2008). The modified shear stress was calculated using the D84 values from field samples and compared to the average channel boundary shear stress based on the existing and proposed channel dimensions and slopes. The results are shown in the table below.

Table 7. Sediment Summary for Project Reaches

XS	Reach	Avg Shear Stress (lb/sf)	D50 (mm)	D84 (mm)	Sample Type	Modif. Critical Shear Stress (lb/sf)	Predicted Grain Size Movement (mm)
Existing	XS1 SF1	0.45	2.2	7.5	PC	0.042	
Existing	XS2 SF2	0.42	0.57	8	PC	0.015	
Existing	XS3 SF2	0.49	0.062	4.7	PC	0.007	
Existing	XS4 SF2	0.40	0.093	0.14	PC	0.001	
Existing	XS5 SF2	0.47	4.1	12	PC	0.080	
Existing	XS6 SF3	0.39	8.3	12	PC	0.137	
Existing	XS7 T1	0.54	0.062	0.062	PC	0.001	
Existing	XS8 T2-2	0.60	0.062	0.062	PC	0.001	
Existing	XS9 T2-3	1.00	0.21	2	PC	0.005	
Proposed	SF1	0.39	2.2	7.5	PC	0.042	29
Proposed	SF2	0.40	0.57	8	PC	0.015	30
Proposed	SF3	0.45	8.3	12	PC	0.137	34
Proposed	T1	0.45	0.062	0.062	PC	0.001	34
Proposed	T2-1	0.27	0.062	0.062	PC	0.001	20
Proposed	T2-2	0.41	0.062	0.062	PC	0.001	31
Proposed	T2-3	0.43	0.21	2	PC	0.005	32

Based on the calculated average channel boundary shear stress for the proposed channels, the stream will have adequate stream power to transport the existing D84 material as shown by the critical shear stress values. Due to the small size of existing site sediment, the average channel boundary shear stress is higher than that needed to move the existing D84 (critical shear stress). While we do anticipate that native small gravels and sand will move into the restored reaches, the results indicate the need for riffle reinforcement to protect the newly constructed riffles from excessive scour. Proposed riffle grade control structures have been designed with a mix of Class A, B, and 1 stone with 10% ABC stone; Class A (the smallest among Classes A, B, and 1) has a modified critical shear stress that is large enough to withstand all of the predicted average channel boundary stresses. The last column in the table above provides a predicted grain size that will move at the calculated modified critical shear stress for the proposed channel. The largest grain size predicted to be mobilized is 34 mm (1.3 inches). Given the mix of the constructed riffle, 106 mm equates to the midrange of the Class A Stone (approximately 4 in.). It can be expected that approximately 85% of the constructed riffle stone will be greater than this diameter. Additionally, our experience has revealed minimal movement of constructed riffle material when it is well mixed and placed in the stream bed in similar design conditions.

6.9 Morphological Essential Parameters Tables

Table 8. Morphological Essential Parameters for SF1

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	90-210	N/A	90-210
Contributing Drainage Area (acres)	175	Variable	175
Channel/Reach Classification	G4c	C4	C4
Design Discharge Width (ft)	7.2	N/A	9.7
Design Discharge Depth (ft)	0.9	N/A	0.7
Design Discharge Area (ft^2)	6.4	N/A	7.0
Design Discharge Velocity (ft/s)	3.5	N/A	3.2
Design Discharge (cfs)	22	N/A	23
Water Surface Slope	0.009	N/A	0.009
Sinuosity	1.3	1.2-1.4	1.2
Width/Depth Ratio	8.1	10-15	13.5
Bank Height Ratio	2.9	1.0-1.1	1.0
Entrenchment Ratio	1.2	2.5+	10.3
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.15/1.2/2.2/7.5/11/-0.4/7.1	Gravel	Gravel

Table 9. Morphological Essential Parameters for SF2

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	45-130	N/A	45-130
Contributing Drainage Area (acres)	264	Variable	264
Channel/Reach Classification	G4c-G5c	C4	C4
Design Discharge Width (ft)	5-10	N/A	11.3
Design Discharge Depth (ft)	1.0-1.4	N/A	0.8
Design Discharge Area (ft^2)	6.9-8.9	N/A	9.4
Design Discharge Velocity (ft/s)	3.3-3.8	N/A	3.2
Design Discharge (cfs)	24-30	N/A	30
Water Surface Slope	0.008	N/A	0.008
Sinuosity	1.1	1.2-1.4	1.2
Width/Depth Ratio	3.7-11.2	10-15	13.5
Bank Height Ratio	1.6-2.1	1.0-1.1	1.0
Entrenchment Ratio	1.4-1.5	2.5+	8.8
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.33/0.61/1.2/6.2/9.8/0.3/5.5	Gravel	Gravel

Table 10. Morphological Essential Parameters for SF3

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	180-230	N/A	180-230
Contributing Drainage Area (acres)	497	Variable	497
Channel/Reach Classification	G4c	C4	C4
Design Discharge Width (ft)	10.5	N/A	12.6
Design Discharge Depth (ft)	1.2	N/A	0.9
Design Discharge Area (ft^2)	12.5	N/A	11.8
Design Discharge Velocity (ft/s)	3.4	N/A	3.6
Design Discharge (cfs)	42	N/A	43
Water Surface Slope	0.006	N/A	0.008
Sinuosity	1.1	1.2-1.4	1.2
Width/Depth Ratio	8.9	10-15	13.5
Bank Height Ratio	2.0	1.0-1.1	1.0
Entrenchment Ratio	1,4	2.5+	7.9
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	1.1/6.0/8.3/12/15/-0.7/3.3	Gravel	Gravel

Table 11. Morphological Essential Parameters for T1

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	40-70	N/A	40-70
Contributing Drainage Area (acres)	12	Variable	12
Channel/Reach Classification	G5	C4	C4
Design Discharge Width (ft)	3.4	N/A	5.0
Design Discharge Depth (ft)	0.3	N/A	0.4
Design Discharge Area (ft^2)	0.9	N/A	1.9
Design Discharge Velocity (ft/s)	3.2	N/A	3
Design Discharge (cfs)	3	N/A	6
Water Surface Slope	0.035	N/A	0.020
Sinuosity	1.0	1.2-1.4	1.2
Width/Depth Ratio	12.7	10-15	13.5
Bank Height Ratio	4.5	1.0-1.1	1.0
Entrenchment Ratio	1.3	2.5+	10.0
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	Silt-Clay	Gravel	Gravel

Table 12. Morphological Essential Parameters for T2-1

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	30-100	N/A	30-100
Contributing Drainage Area (acres)	93	Variable	93
Channel/Reach Classification	G5c	C4	C4
Design Discharge Width (ft)	4.4	N/A	5.0
Design Discharge Depth (ft)	0.8	N/A	0.4
Design Discharge Area (ft^2)	3.6	N/A	1.9
Design Discharge Velocity (ft/s)	3.9	N/A	2.9
Design Discharge (cfs)	14	N/A	5
Water Surface Slope	0.014	N/A	0.012
Sinuosity	1.1	1.2-1.4	1.2
Width/Depth Ratio	5.4	10-15	13.5
Bank Height Ratio	4.1	1.0-1.1	1.0
Entrenchment Ratio	1.3	2.5+	10.0
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	Silt-Clay	Gravel	Gravel

Table 13. Morphological Essential Parameters for T2-2

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	90-140	N/A	90-140
Contributing Drainage Area (acres)	135	Variable	135
Channel/Reach Classification	G5c	C4	C4
Design Discharge Width (ft)	4.4	N/A	7.6
Design Discharge Depth (ft)	0.8	N/A	0.6
Design Discharge Area (ft^2)	3.6	N/A	4.3
Design Discharge Velocity (ft/s)	3.9	N/A	3.1
Design Discharge (cfs)	14	N/A	14
Water Surface Slope	0.009-0.020	N/A	0.012
Sinuosity	1.1	1.2-1.4	1.2
Width/Depth Ratio	5.4	10-15	13.4
Bank Height Ratio	4.1	1.0-1.1	1.0
Entrenchment Ratio	1.3	2.5+	6.6
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	Silt-Clay	Gravel	Gravel

Table 14. Morphological Essential Parameters for T2-3

Parameter	Existing Condition	Reference Condition	Proposed
Valley Width (ft)	90-150	N/A	90-150
Contributing Drainage Area (acres)	149	Variable	149
Channel/Reach Classification	G5c	C4	C4
Design Discharge Width (ft)	5.7	N/A	9.0
Design Discharge Depth (ft)	1.7	N/A	0.6
Design Discharge Area (ft^2)	9.4	N/A	5.8
Design Discharge Velocity (ft/s)	2.1	N/A	3.4
Design Discharge (cfs)	20	N/A	20
Water Surface Slope	0.009-0.020	N/A	0.011
Sinuosity	1.1	1.2-1.4	1.2
Width/Depth Ratio	3.4	10-15	13.9
Bank Height Ratio	1.5	1.0-1.1	1.0
Entrenchment Ratio	1.8	2.5+	5.6
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	0.031/0.13/0.21/2.0/6.1/0.1/8	Gravel	Gravel

Table 15. Morphological Essential Parameters for T3

Parameter	Existing Condition*	Reference Condition	Proposed
Valley Width (ft)	50-90	N/A	50-90
Contributing Drainage Area (acres)	29	Variable	29
Channel/Reach Classification	G4	C4	C4
Design Discharge Width (ft)	4.2-4.8	N/A	5.0
Design Discharge Depth (ft)	0.4-0.6	N/A	0.4
Design Discharge Area (ft^2)	1.9-2.6	N/A	1.9
Design Discharge Velocity (ft/s)	1.8-2.3	N/A	1.2
Design Discharge (cfs)	3-6	N/A	2
Water Surface Slope	0.007	N/A	0.016
Sinuosity	N/A	1.2-1.4	1.2
Width/Depth Ratio	6.9-12.6	10-15	13.5
Bank Height Ratio	3.2-3.4	1.0-1.1	1.0
Entrenchment Ratio	1.2	2.5+	10
d16 / d35 / d50 / d84 / d95 / dip / disp (mm)	N/A	Gravel	Gravel

*Existing condition values for upper portion only – the remainder is impacted by pond bed.

6.10 Planting

All unforested portions of the project easement will be planted to establish a forested riparian buffer. At a minimum, 12.1 acres will be reforested, but additional plantings may take place beyond this area to ensure an adequate density across the site. The planting plan is shown in the attached project plan sheets (Section 12.1). 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 this list:

Common Name	Scientific Name
River Birch	*Betula nigra*
American Persimmon	*Diospyros virginiana*
Green Ash	*Fraxinus pennsylvanica*
Tulip Poplar	*Liriodendron tulipifera*
American Sycamore	*Platanus occidentalis*
White Oak	*Quercus alba*
Southern Red Oak	*Quercus falcata*
Swamp Chestnut Oak	*Quercus michauxii*
Pin Oak	*Quercus palustris*
Willow Oak	*Quercus phellos*

On the restored stream banks, live stakes will be used to provide natural stabilization. Species identified for live staking include:

Common Name	Scientific Name
Silky Dogwood	*Cornus amomum*
Black Willow	*Salix nigra*
Silky Willow	*Salix sericea*

In addition, partially forested sections of the easement that have been treated for privet will be supplementally planted with either one gallon container trees at a 20 by 20 foot spacing or bare root trees contained in tree shelters with 10-foot center spacing. These species may consist of river birch, sycamore, or any of the five oak species listed above. A custom herbaceous seed mix composed of native species will also be developed and used to further stabilize the easement area as needed.

6.11 Project Assets

The tables below outline the anticipated project assets that will be produced from the Stony Fork project, and Figure 9 shows the proposed mitigation assets for the site. The total stream mitigation credits (SMCs) are slightly different than those outlined in the initial proposal. SMCs were removed at the bottom of the site due to land title issues associated with the Critcher Farms subdivision and narrow buffer widths at the property edge. The upper portion of T2 was eliminated from the project, since it was not a jurisdictional stream, but an additional tributary, Tributary 3, was added to the project once it was determined it was jurisdictional. The buffer mitigation credits (BMCs) were reduced from the contracted amount due to the limitation on preservation credits once the final restoration, enhancement, and preservation BMCs were tabulated.

Table 16. Project Asset Table

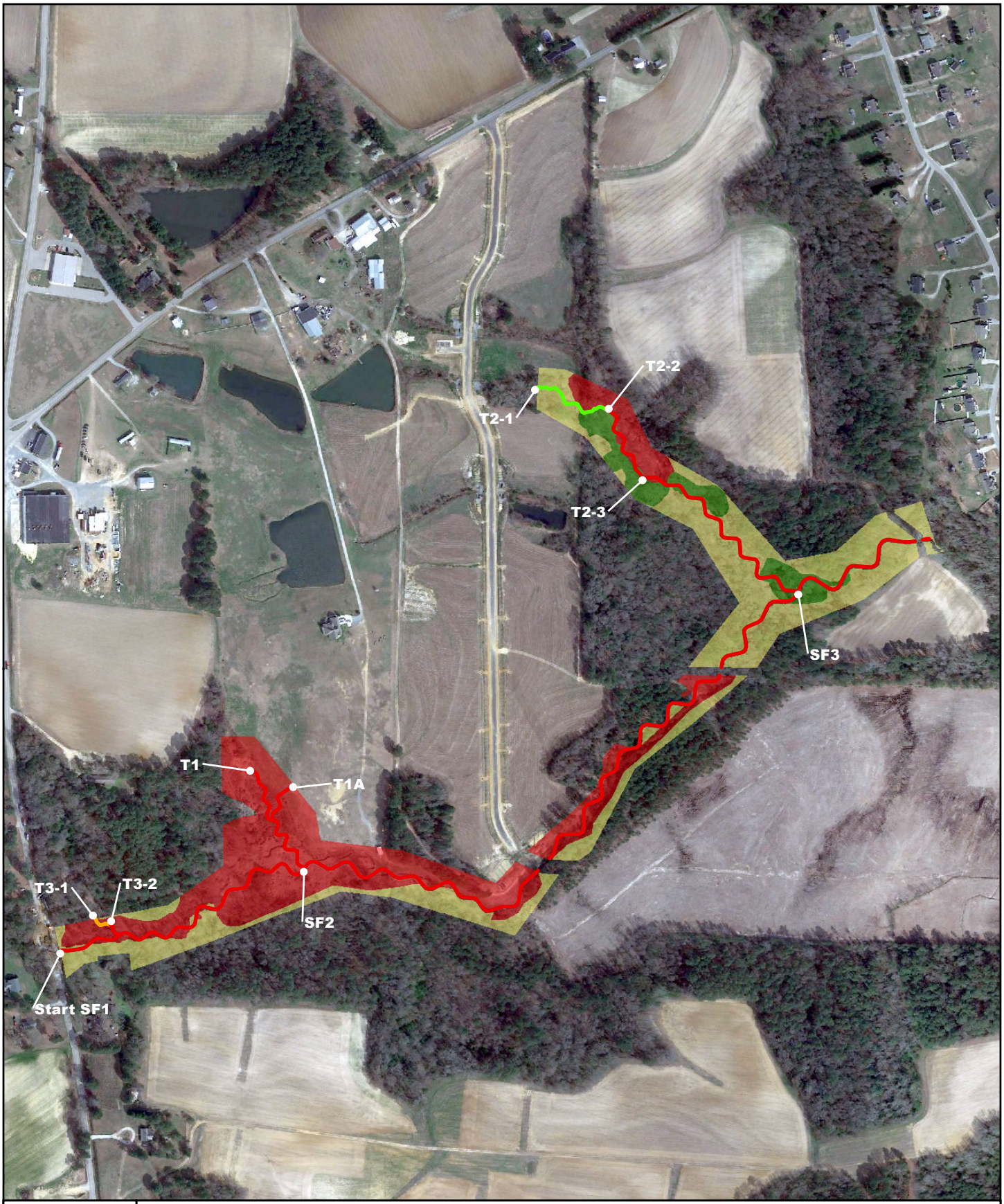
Project Component -or- Reach ID	Existing Footage/ Acreage	Stationing	Restoration Footage or Acreage	Creditable Footage or Acreage	Restoration Level	Approach Priority Level	Mitigation Ratio (X:1) or Percentage	Mitigation Credits	Notes/Comments
SF1	1,235	9+93-21+48	1155	1155	R	PI/PII	1:1	1155	
SF2	2,453	21+48-49+50	2802	2707	R	PI	1:1	2707	Crossings at STA 32+52-33+17 (65') and 44+49-44+80 (31')
SF3	618	49+50-56+04	654	624	R	PI	1:1	624	Crossing at STA 55+48-55+78 (30')
T1	365	100+00-105+10	510	510	R	PI/PII	1:1	510	
T1A	47	150+00-151+59	159	159	R	PI/PII	1:1	159	
T2-1	327	200+00-203+34	334	334	EII	N/A	2.5:1	134	
T2-2	326	203+34-206+71	337	337	R	PI/PII	1:1	337	
T2-3	780	206+71-215+26	855	855	R	PI/PII	1:1	855	
T3-1	72	300+00-300+71	71	71	EI	PI/PII	1.5:1	47	
T3-2	82	300+71-301+29	58	58	R	PI/PII	1:1	58	
Buffer Restoration TOB to 100'	413,194	N/A	413,194	413,194	R	N/A	100%	413,194	
Buffer Restoration 101-200'	37,091	N/A	37,091	37,091	R	N/A	33%	12,240	
Buffer Enhancement TOB to 100'	74,802	N/A	74,802	74,802	E	N/A	50%	37,401	
Buffer Preservation TOB to 100'	424,660	N/A	424,660	175,029	P	N/A	10%	17,503	Preservation limited to no more than 25% of total buffer mitigation area (175,029 sf)

Table 17. 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	6,405				450,285
Enhancement					74,802
Enhancement I	71				
Enhancement II	334				
Creation					
Preservation					424,660 (175,029 allowable for credit)
High Quality Preservation					

Table 18. Overall Assets Summary

Stony Fork Restoration Site (Project ID - 97085)	
Overall Assets Summary	
Asset Category	Overall Credits
Stream	6,586
RP Wetland	
NR Wetland	
Buffer	480,338



KCI ASSOCIATES OF NC

FIGURE 9. PROJECT ASSET MAP, STONY FORK RESTORATION SITE, JOHNSTON COUNTY, NC

Stream Mitigation	Buffer Mitigation
6,586 SMCs	**480,338 total credits**
R (6,405 lf / 6,405 SMCs)	Buffer Restoration (450,285 sf / 425,434 credits)
EI (71 lf / 47 SMCs)	Buffer Enhancement (74,802 sf / 37,401 credits)
EII (334 lf / 134 SMCs)	Buffer Preservation (424,660 sf / 17,503 credits limited to 25% of total)

N

0 250 500 Feet

Image Source: Google Earth, 3/2018.

7.0 PERFORMANCE STANDARDS

Monitoring of the site 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. Buffer mitigation must meet the standards outlined in Neuse River Basin Buffer Rule 15A NCAC 02B .0295.

Vegetation Performance

The site 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 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 included in Section 6.10. If monitoring indicates that any of these standards are not being met, corrective actions will take place.

Stream Hydrologic Performance

During the monitoring period, a minimum of four bankfull events must be recorded within the monitoring period. These bankfull events must occur in separate monitoring years. Bankfull events will be verified using a minimum of one automatic stream monitoring gauge on Stony Fork to record daily stream depth readings. Any Q_{gs} flows at the project during the monitoring period will also be documented. All project streams must also show a minimum of 30 continuous flow day within a calendar year (assuming normal precipitation) for three out of four of the first four monitoring years.

Stream Geomorphology Performance

The site's geomorphology will be monitored per the NCIRT's 2016 guidance. The bank height ratio (BHR) must not exceed 1.2 and the entrenchment ratio (ER) should be at least 2.2 for C channels. BHR and ER at any measured riffle cross-section should not change by more than 10% from the baseline condition during any given monitoring interval (e.g., no more than 10% between years 1 and 2, 2 and 3, 3 and 5, or 5 and 7). Adjustment and lateral movement following construction and as the channel settles over the monitoring period are to be expected. Geomorphological measurements of cross-sections will be used to determine if any adjustments that occur are out of the range typically expected for this type of stream.

Riparian Buffer Performance

The vegetation within the areas proposed for riparian buffer credit must contain 260 stems per acre at the end of five years of monitoring. There should be a minimum of four native hardwood tree species (inclusive of volunteers), with no species greater than 50% of the stems. See the *Buffer Mitigation Plan* in Section 12.3 for further details.

8.0 MONITORING PLAN

Monitoring of the Stony Fork Site shall consist of the collection and analysis of stream hydrology, 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 10 shows the proposed locations of monitoring features described below.

Vegetation Monitoring
Vegetation monitoring will take place no earlier than the end of August and no later than mid-December. The success of the riparian buffer plantings will be evaluated using twelve 0.02-acre square or rectangular plots within the enhancement and restoration buffer mitigation areas. Seven plots will be permanently installed, while the remainder will be randomly placed at the time of each monitoring visit.

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, exotic and invasive stems will also be included in the stem counts. Additionally, a photograph will be taken of each plot. Beginning at the end of the first growing season, KCI will monitor the planted vegetation in monitoring years 1, 2, 3, 4, 5, and 7. Riparian buffer mitigation requires monitoring in Years 1-5, while the stream mitigation requires monitoring in Years 1, 2, 3, 5, and 7.

Stream Hydrologic Monitoring
Bankfull events on-site will be verified using an automatic stream monitoring gauge on SF3 as seen on Figure 10 to record daily stream depth readings. The Q_{gs} flow after the confluence with T2 is 45 cfs (based on 67% of a 2-year USGS regression flow of 67.4 cfs). The measured flows will be compared to the Q_{gs} value as well as the bankfull discharge. In addition, flow will recorded on T1, T2-2, and T3.

Stream Geomorphology Monitoring
For stream monitoring, the purpose of monitoring is to evaluate the stability of the restored stream. Following the procedures established in the USDA Forest Service Manual, Stream Channel Reference Sites (Harrelson et al. 1994) and the methodologies utilized in the Rosgen stream assessment and classification system (1994 and 1996), data collected will consist of detailed dimension measurements, longitudinal profiles, and bed materials sampling.

Dimension
Sixteen permanent cross-sections will be established at the Stony Fork Site, one set of a riffle and pool each on SF1, SF3, T1, T2-2, T2-3, and T3-2 and two sets on SF2, the longest of the project reaches. The extents of each cross-section will be recorded by either conventional survey or GPS. The cross-sectional surveys shall provide a detailed measurement of the stream and banks and will include points on the adjacent floodplain or valley, at the top of bank, bankfull, at all breaks in slope, the edge of water, and thalweg. Width/depth, bank height and entrenchment ratios, as well as bankfull cross-sectional area, width, max depth and mean depth will be calculated for each riffle cross-section based on the survey data. Width/depth ratios, bankfull cross-sectional area, width, max depth and mean depth will be calculated for each pool cross-section. Cross-section measurements will take place in Years 1, 2, 3, 5, and 7.

Profile
A detailed longitudinal profile will be conducted along the lengths of SF1, SF2, SF3, T1, T2-2, T2-3, and T3-2 during the as-built survey. Measurements will include slopes (average, pool, and riffle) as well as calculations of pool-to-pool spacing. No additional profile measurements will be taken during the monitoring period unless deemed necessary due to concerns about bed elevation adjustments.

Visual Assessment
An annual site walk will be conducted at the end of each monitoring period to document any problem areas. Specific problem areas that could include 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.

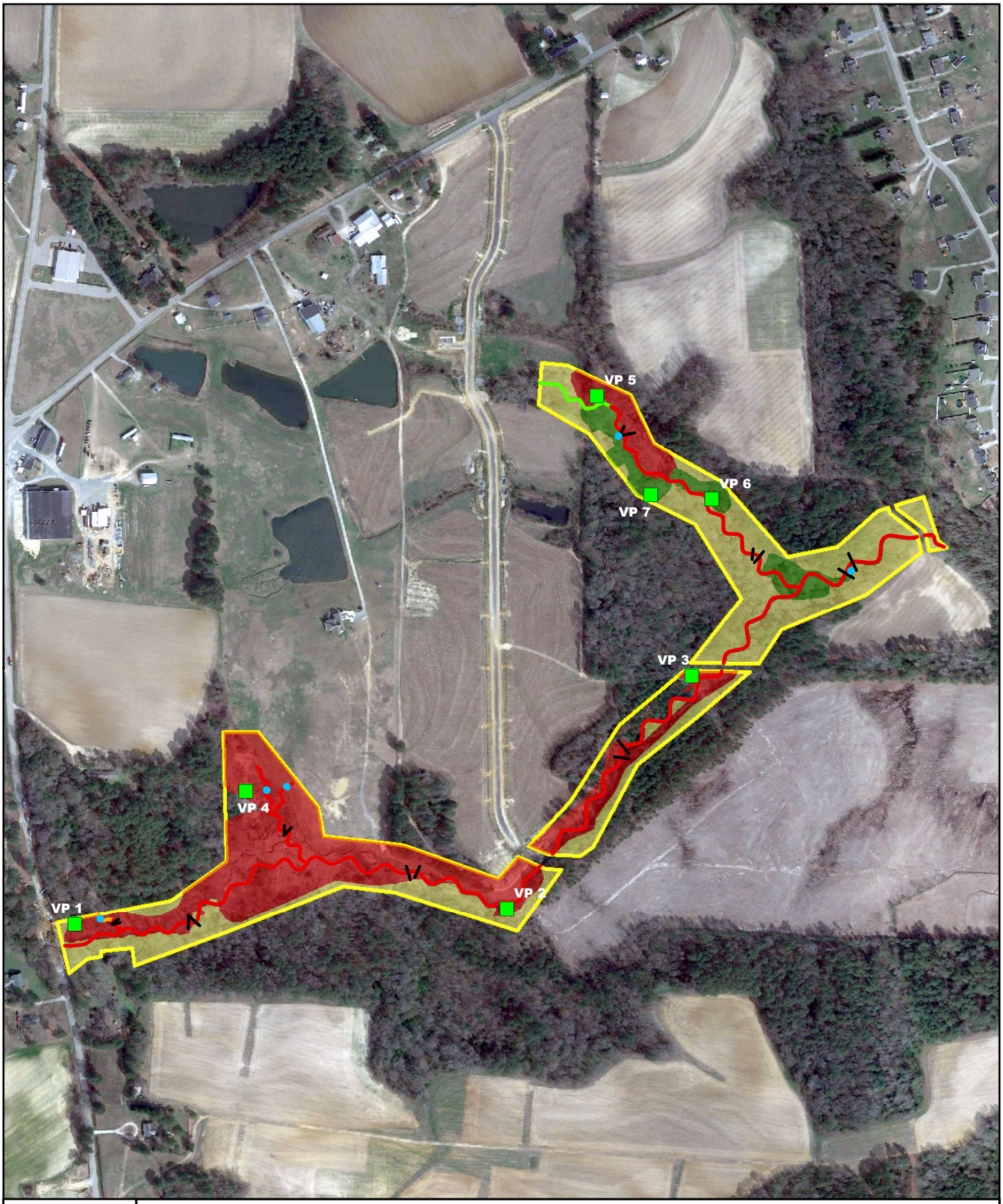
Photograph reference points (PRPs) will be established to assist in characterizing the site and to allow qualitative evaluation of the site conditions. The location of each photo point will be marked in the monitoring plan and the bearing/orientation of the photograph will be documented to allow for 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 year of monitoring will occur no earlier than the end of the first growing season and no sooner than 5 months following planting. The site will be monitored for performance standards for seven years as needed after completion of construction. Full monitoring reports will be completed in Years 1, 2, 3, 5, and 7. Limited monitoring reports will be submitted in Years 4 (vegetation, CCPV, photos, stream gauge data, and site narrative) and 6 (CCPV, photos, stream gauge data, and site narrative).

Table 20. Monitoring Requirements

Stony Fork Restoration Site				
Required	**Parameter**	**Quantity**	**Frequency**	**Notes**
Yes	Pattern and Profile	SF1, SF2, SF3, T1, T2-2, T2-3, and T3-2	Once, during as-built survey	Additional measurements in later years may be taken as necessary.
Yes	Stream Dimension	16 cross-sections (8 riffles, 8 pools)	Monitoring Years 1, 2, 3, 5, and 7	
Yes	Stream Hydrology	5 pressure transducer gauges or cameras	Annual	1 each on SF3, T1, T1A, T2-2, and T3-2
Yes	Vegetation	7 permanent and 5 random vegetation monitoring plots	Monitoring Years 1, 2, 3, 4, 5, and 7	Minimum size of 0.02 acre
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



KCI ASSOCIATES OF NC

FIGURE 10. PROPOSED MONITORING PLAN, STONY FORK RESTORATION SITE, JOHNSTON COUNTY, NC

Proposed Permanent Veg Plots (7)
Proposed Stream Gauges (5)
Proposed Cross-Sections (16)
Stream Restoration
Stream Enhancement I
Stream Enhancement II
Buffer Restoration
Buffer Enhancement
Buffer Preservation

0 250 500 Feet

N

Source: Google Earth, 3/2018

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, the sponsor shall notify the members of the IRT as well as NCDWR's 401 and Buffer Permitting Branch staff and work with both groups to develop contingency plans and remedial actions.

10.0 LONG-TERM MANAGEMENT PLAN

SFRS 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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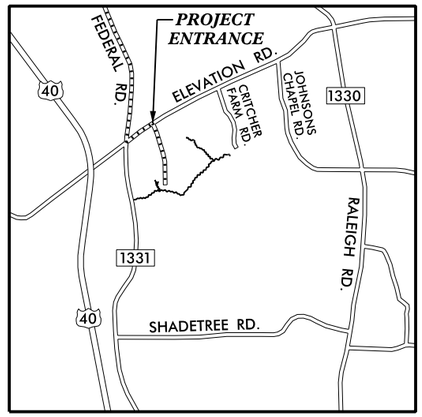
12.0 APPENDICES

12.1 Plan Sheets

KCI JOB# : 161600959

CONTRACT #: 6830



VICINITY MAP
NOT TO SCALE

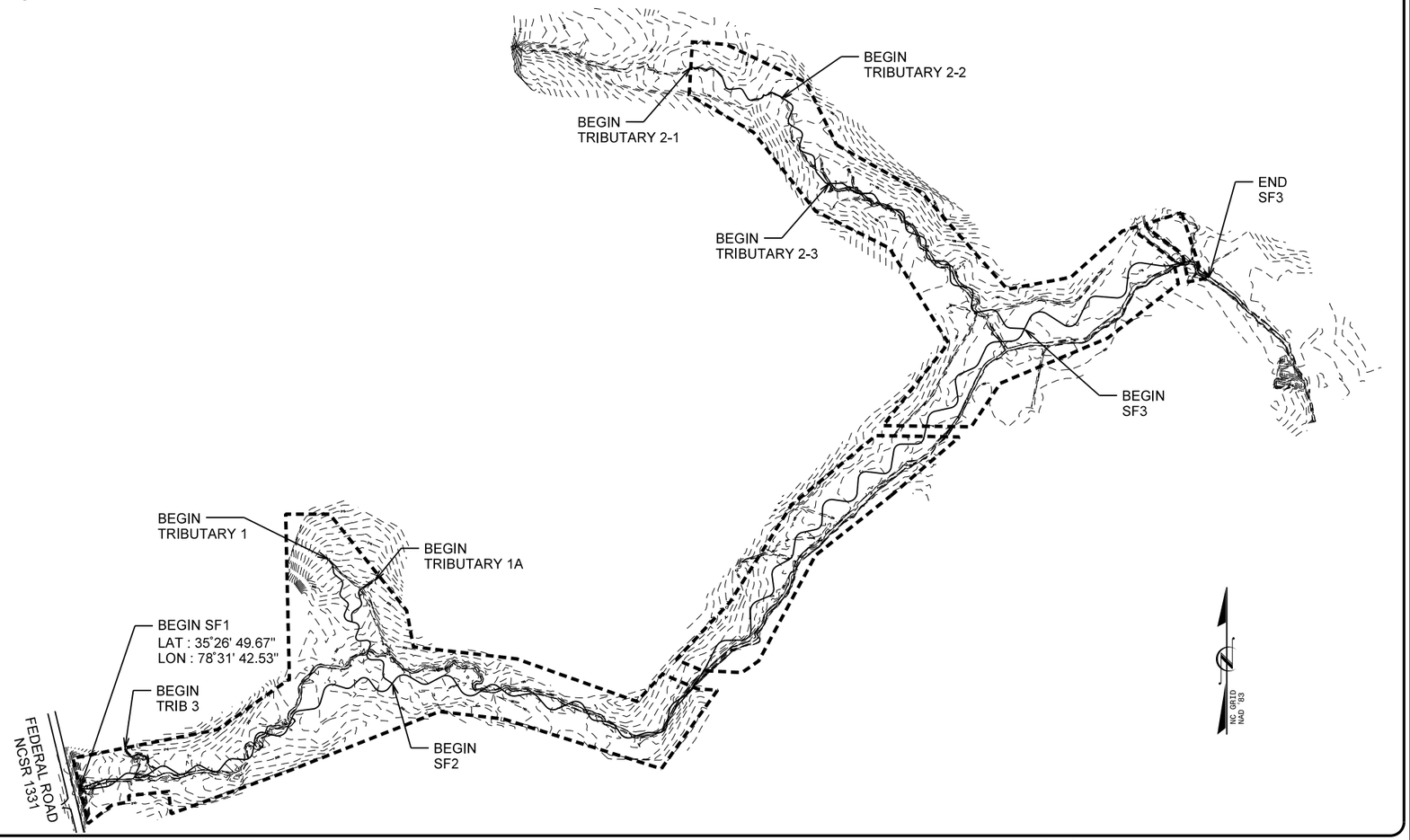
NCDEQ DIVISION OF MITIGATION SERVICES

STATE	DMS PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
N.C.	97085	1	21

	REVISIONS	
A	REVISED PER IRT COMMENTS	JULY 2018

STONY FORK STREAM RESTORATION SITE

JOHNSTON COUNTY, NORTH CAROLINA



⚠ **PROJECT COMPONENTS – 6,588 STREAM CREDITS AND 480,338 BUFFER CREDITS**

Reach ID	Proposed Stationing	Existing Footage or Square Feet	Approach	Mitigation Ratio	Restoration Footage or Area	Mitigation Credits
SF1	10+00 to 21+55	1,235	Restoration	1 to 1	1,155	1,155
	21+55 to 32+62	1,143			1,105	1,105
SF2*	33+19 to 44+53	1,027	Restoration	1 to 1	1,134	1,134
	44+84 to 49+54	283			470	470
SF3*	49+54 to 55+52	592	Restoration	1 to 1	598	598
	55+82 to 56+08	26			26	26
Tributary 1	100+00 to 105+10	365	Restoration	1 to 1	510	510
Tributary 1A	150+00 to 151+59	47	Restoration	1 to 1	159	159
Tributary 2-1	200+00 to 203+34	326	Enhancement II	2.5 to 1	334	134
Tributary 2-2	203+34 to 206+71	318	Restoration	1 to 1	337	337
Tributary 2-3	206+71 to 215+26	820	Restoration	1 to 1	855	855
Tributary 3	300+00 to 300+71	72	Enhancement I	1.5 to 1	71	47
Tributary 3	300+71 to 301+29	82	Restoration	1 to 1	58	58
				TOTAL STREAM CREDITS		**6,588**
Buffer Restoration TOB to 100'	N/A	413,194	Buffer Restoration TOB to 100'	1.00	413,194	413,194
Buffer Restoration 101-200'	N/A	37,091	Buffer Restoration 101-200'	0.33	37,091	12,240
Buffer Enhancement TOB to 100'	N/A	74,802	Buffer Enhancement TOB to 100'	0.50	74,802	37,401
Buffer Preservation TOB to 100'	N/A	175,029	Buffer Preservation TOB to 100'	0.10	175,029	17,503
				TOTAL BUFFER CREDITS		**480,338**

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

DIRECTIONS TO SITE

From Raleigh, follow I–40 East. Take exit 319 and turn left onto US–210 E. After a mile, take a right onto Raleigh Road and follow for 2.2 miles. Take a right onto Federal Road and follow for 2.3 miles. Sharp left onto Elevation Road and follow for about 0.2 mile. Take a right into the driveway for 4045 Elevation Road and follow down to the project stream.

INDEX OF SHEETS

LIMITS OF DISTURBANCE = 24.95 ACRES

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
LIN XU
DMS REVIEW COORDINATOR

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:

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

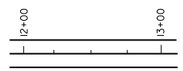
UTILITY/SUBSURFACE PLANS:
NO SUBSURFACE PLANS ARE AVAILABLE ON THIS PROJECT.
EXISTING UNDERGROUND UTILITIES HAVE NOT BEEN VERIFIED.
THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING A UTILITY LOCATOR AND ESTABLISHING THE EXACT LOCATION OF ANY AND ALL EXISTING UTILITIES IN THE PROJECT REACH.

CONTROL POINTS

DESC.	NORTHING	EASTING	ELEV.
KCI#1	617963.8850	2140422.9350	224.81
KCI#2	618560.7860	2140254.4140	234.77
KCI#3	619091.5730	2140208.0230	245.10
KCI#4	619813.6020	2140179.9710	257.71
KCI#5	620201.2280	2140534.7970	244.50
KCI#6	620516.7890	2140955.1860	238.28
KCI#7	620786.7920	2141419.5800	226.11
KCI#8	621037.2060	2141915.6500	233.96
KCI#9	621335.2930	2142433.5220	231.03
KCI#12	621279.8580	2143554.3330	223.40
KCI#13	620817.3810	2143803.4980	207.94
KCI#14	620329.6450	2143968.8740	200.58
KCI#15	619802.2110	2143992.3170	195.55
KCI#16	619526.0640	2144313.0070	180.76
KCI#17	619258.1820	2144289.1880	174.74
KCI#18	619155.1760	2143993.3840	174.65
KCI#19	619197.6280	2143671.8300	179.68
KCI#20	619247.1850	2143372.1020	179.70
KCI#21	619293.4980	2143114.3640	178.48
KCI#22	619076.3090	2142913.8240	179.51
KCI#23	618883.2380	2142769.5000	181.99
KCI#24	618687.8540	2142547.0370	184.71
KCI#25	618458.1640	2142354.8290	189.60

* CONTACT DESIGN REPRESENTATIVE FOR FULL LIST OF CONTROL POINTS

PROJECT LEGEND:

Proposed Thalweg w/Approximate Bankfull Limits ..... 

Proposed Riffle Enhancement ..... 

Proposed Riffle Grade Control ..... 

Proposed Step Pool ..... 

Proposed Live Lift ..... 

Existing Channel to be Filled ..... 

Proposed Channel Block ..... 

Existing Tree Line ..... 

Minor Contour Line .....

Major Contour Line .....

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

NO.	DESCRIPTION	DATE

NCDEQ - DIVISION OF MITIGATION SERVICES

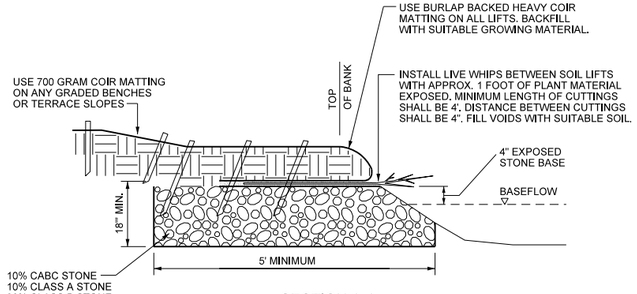
KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

STONY FORK
STREAM RESTORATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: N.T.S.

GENERAL NOTES & PROJECT LEGEND

SHEET 2 OF 21



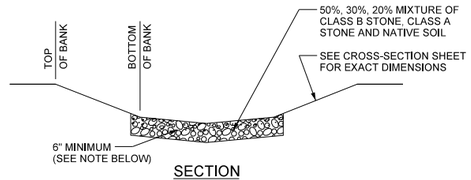
SECTION A-A

NOTE:

USE 1.5'x1"x2" WOODEN STAKES ON 1' CENTERS. STAKES SHALL HAVE A 'ROOFING' NAIL AT TOP TO KEEP FABRIC FROM SLIPPING OFF.

LIVE LIFT

SCALE: NTS



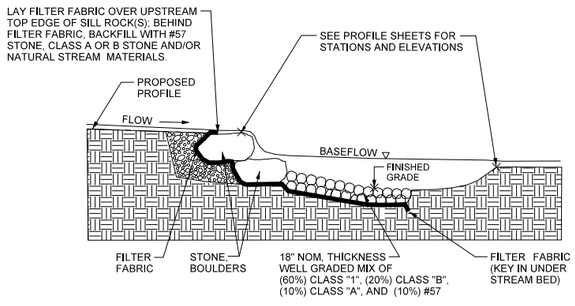
SECTION

NOTE:

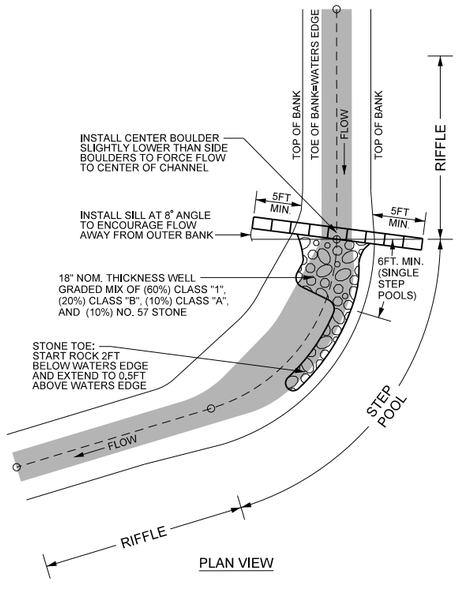
START BY INSTALLING CLASS B STONE AND CLASS A STONE MIXTURE. FINISH BY WASHING IN NATURAL STREAM MATERIAL TO OBTAIN FINAL GRADE.

RIFFLE ENHANCEMENT

SCALE: NTS



PROFILE VIEW



PLAN VIEW

NOTES:

FOR DOUBLE STEP POOLS, CONTINUE ROCK MIXTURE FROM FIRST SILL ALL THE WAY TO THE SECOND SILL. DO NOT STOP AT THE 6FT MINIMUM AS SHOWN IN THE SINGLE STEP POOL PLAN VIEW.

BOULDERS SHOULD BE NATIVE STONES OR SHOT ROCK, ANGULAR AND OBLONG, WITH AN AXIS APPROXIMATELY 3' L x 2' W x 1.5' D.

BOULDER SILLS TO EXTEND 5' MINIMUM INTO STREAM BANKS FOR STEP POOL STRUCTURES.

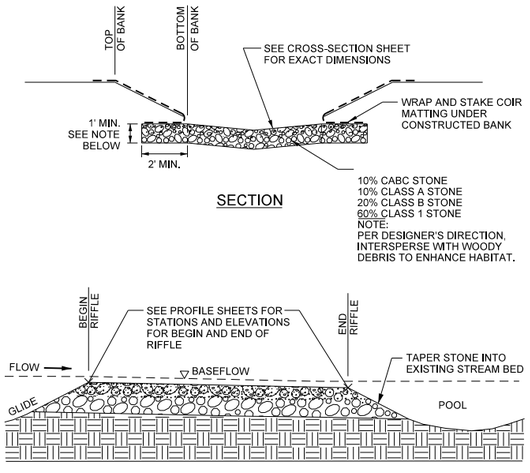
STONE INSTALLATION: START BY INSTALLING STONE MIXTURE. THEN ADD SURGE STONE TO FILL IN VOIDS. FINISH BY WASHING IN NATURAL STREAM MATERIAL TO OBTAIN FINAL GRADE.

IF APPROVED BY DESIGNER, BOULDER SILLS CAN BE REPLACED WITH LIVE HARDWOOD LOGS FOUND ON SITE. LOGS MUST BE A MINIMUM OF 10" DIAMETER AND STACKED IN A TRIANGLE FORMATION. NAIL (WITH PLASTIC WASHER) FILTER FABRIC TO THE TOP LOG AND CONTINUE DOWN AND UNDER STRUCTURE AS SHOWN ON STEP POOL DETAIL.

LOG SILL

STEP POOL

SCALE: NTS



SECTION

PROFILE

NOTE:

STONE INSTALLATION: START BY INSTALLING STONE MIXTURE. THEN ADD SURGE STONE TO FILL IN VOIDS. FINISH BY WASHING IN NATURAL STREAM MATERIAL TO OBTAIN FINAL GRADE.

RIFFLE GRADE CONTROL

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

STONY FORK
STREAM RESTORATION SITE

JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: N.T.S.

DETAILS

SHEET 3 OF 21

NOTES:

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

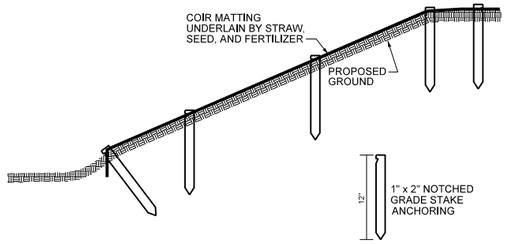
-ALL DISTURBED AREAS INSIDE FLOOD-PLAIN EXTENTS SHALL BE SEEDED DAILY.

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

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

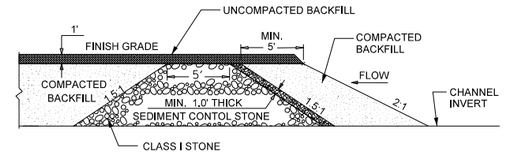
-MATTING SHALL EXTEND FROM TOE OF SLOPE TO THE TOP OF BANK.

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



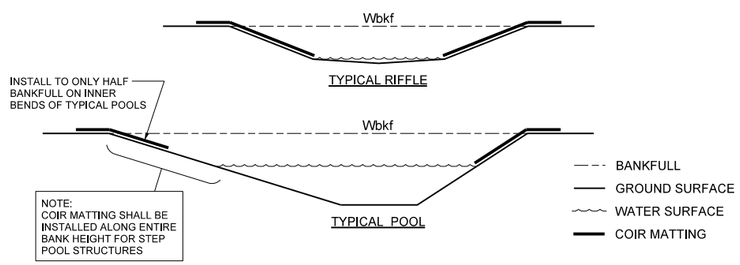
COIR MATTING

SCALE: NTS



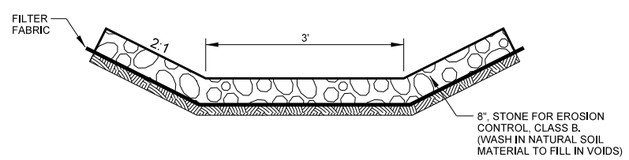
CHANNEL BLOCK

SCALE: NTS



EXAMPLE COIR MATTING PLACEMENT

SCALE: NTS



STABILIZED ROCK OUTLET

SCALE: NTS

SYM.	DESCRIPTION	DATE

REVISIONS

NCDEQ - DIVISION OF MITIGATION SERVICES

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4505 FALLS OF NEUSE ROAD, SUITE 400
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STREAM RESTORATION SITE

JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
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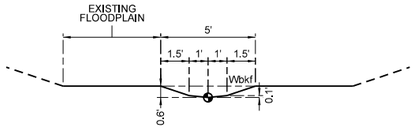
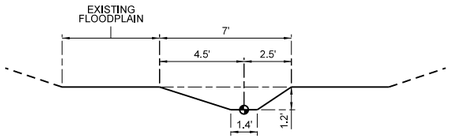
DETAILS

SHEET 4 OF 21

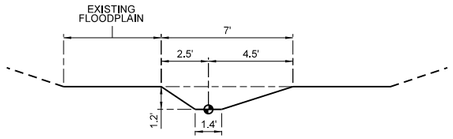
REACH : T1 - STATION 100+00 TO 105+10
⚠ REACH : T1A - STATION 150+00 TO 151+59
REACH : T2-1 - STATION 200+00 TO 203+34
REACH : T3 - STATION 300+00 TO 301+29
"C4" STREAM TYPE



TYPICAL RIFFLE
= THALWEG LOCATION

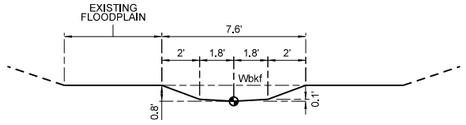


TYPICAL POOL - RIGHT MEANDER

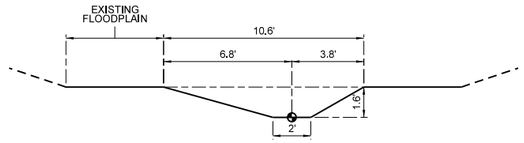


TYPICAL POOL - LEFT MEANDER

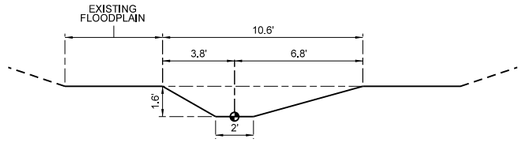
REACH : T2-2 - STATION 203+34 TO 206+71
"C4" STREAM TYPE



TYPICAL RIFFLE
= THALWEG LOCATION

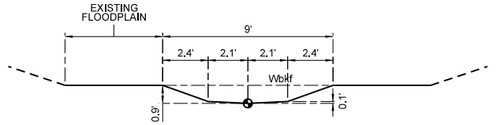


TYPICAL POOL - RIGHT MEANDER

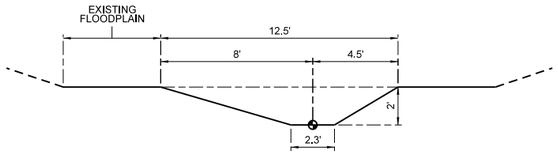


TYPICAL POOL - LEFT MEANDER

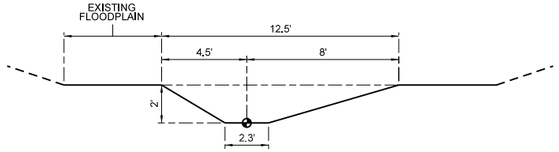
REACH : T2-3 - STATION 206+71 TO 215+26
"C4" STREAM TYPE



TYPICAL RIFFLE
= THALWEG LOCATION

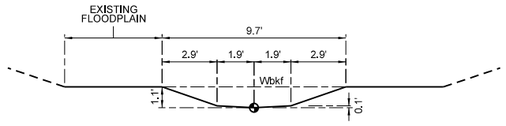


TYPICAL POOL - RIGHT MEANDER

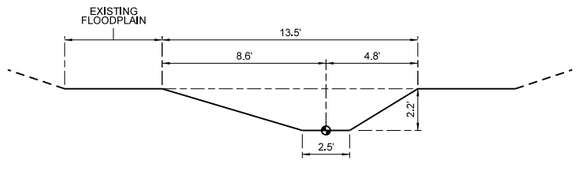


TYPICAL POOL - LEFT MEANDER

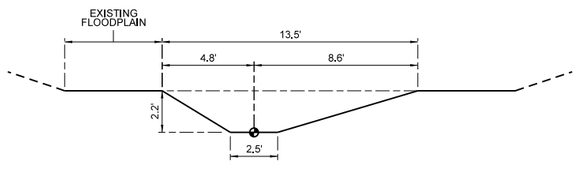
REACH : SF1
STATION 10+00 TO 21+55
"C4" STREAM TYPE



TYPICAL RIFFLE
= THALWEG LOCATION

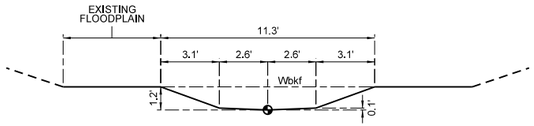


TYPICAL POOL - RIGHT MEANDER

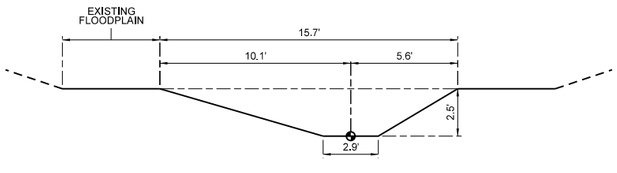


TYPICAL POOL - LEFT MEANDER

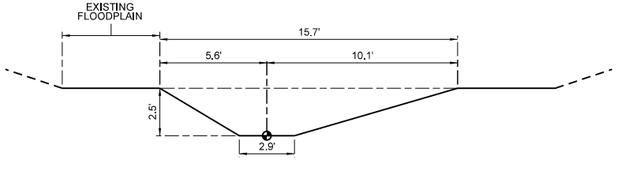
REACH : SF2
STATION 21+55 TO 49+54
"C4" STREAM TYPE



TYPICAL RIFFLE
= THALWEG LOCATION

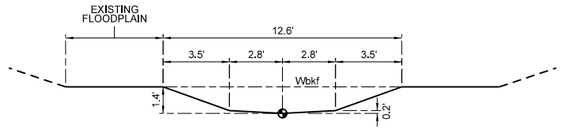


TYPICAL POOL - RIGHT MEANDER

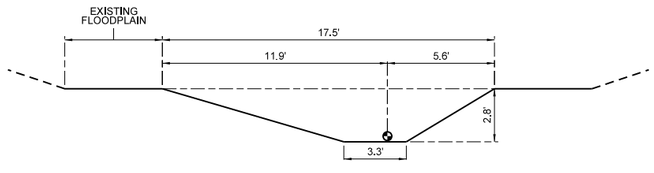


TYPICAL POOL - LEFT MEANDER

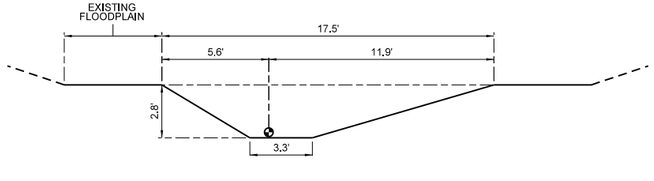
REACH : SF3
STATION 49+54 TO 56+78
"C4" STREAM TYPE



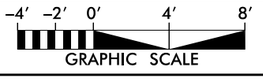
TYPICAL RIFFLE
= THALWEG LOCATION



TYPICAL POOL - RIGHT MEANDER



TYPICAL POOL - LEFT MEANDER



	DATE	DESCRIPTION
A	JULY 2018	REVISED PER IRT COMMENTS
	SYM.	REVISIONS

NCDEQ - DIVISION OF MITIGATION SERVICES

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

STONY FORK
STREAM RESTORATION SITE

JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: SEE SHEET

TYPICAL CROSS SECTIONS

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

GRAPHIC SCALE
–40′ –20′ 0′ 40′ 80′

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

FEDERAL ROAD - NCSR 1331

EXISITNG EARTHEN ACCESS DRIVE

BEGIN SF1

EXTEND RIFFLE GRADE CONTROL STONE MIXTURE INTO POOL AREA TO CREATE PLUNGE POOL

BEGIN TRIB 3

GRADE SOIL PILE TO FILL EXISTING PONDED AREA

EXISTING TREES TO REMAIN, TYPICAL ALL "●"

BEGIN TRIBUTARY 1

EXISTING WETLAND

CONSERVATION EASEMENT

BEGIN TRIB 1A

FLOODPLAIN GRADING EXTENTS

EXISTING BARN

PROPOSED 'CHANNEL BLOCK'. SEE DETAIL SHEET.

PROPOSED 'RIFFLE ENHANCEMENT'. SEE DETAIL SHEET.

PROPOSED 'LIVE LIFT'. SEE DETAIL SHEET.

PROPOSED 'RIFFLE GRADE CONTROL'. SEE DETAIL SHEET.

PROPOSED 'STEP POOL'. SEE DETAIL SHEET.

BEGIN SF2 (END TRIBUTARY 1)

MATCHLINE - SEE SHEET 7

	DATE	DESCRIPTION
A	JULY 2018	REVISED PER IRT COMMENTS

REVISIONS

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RALEIGH, NORTH CAROLINA 27609

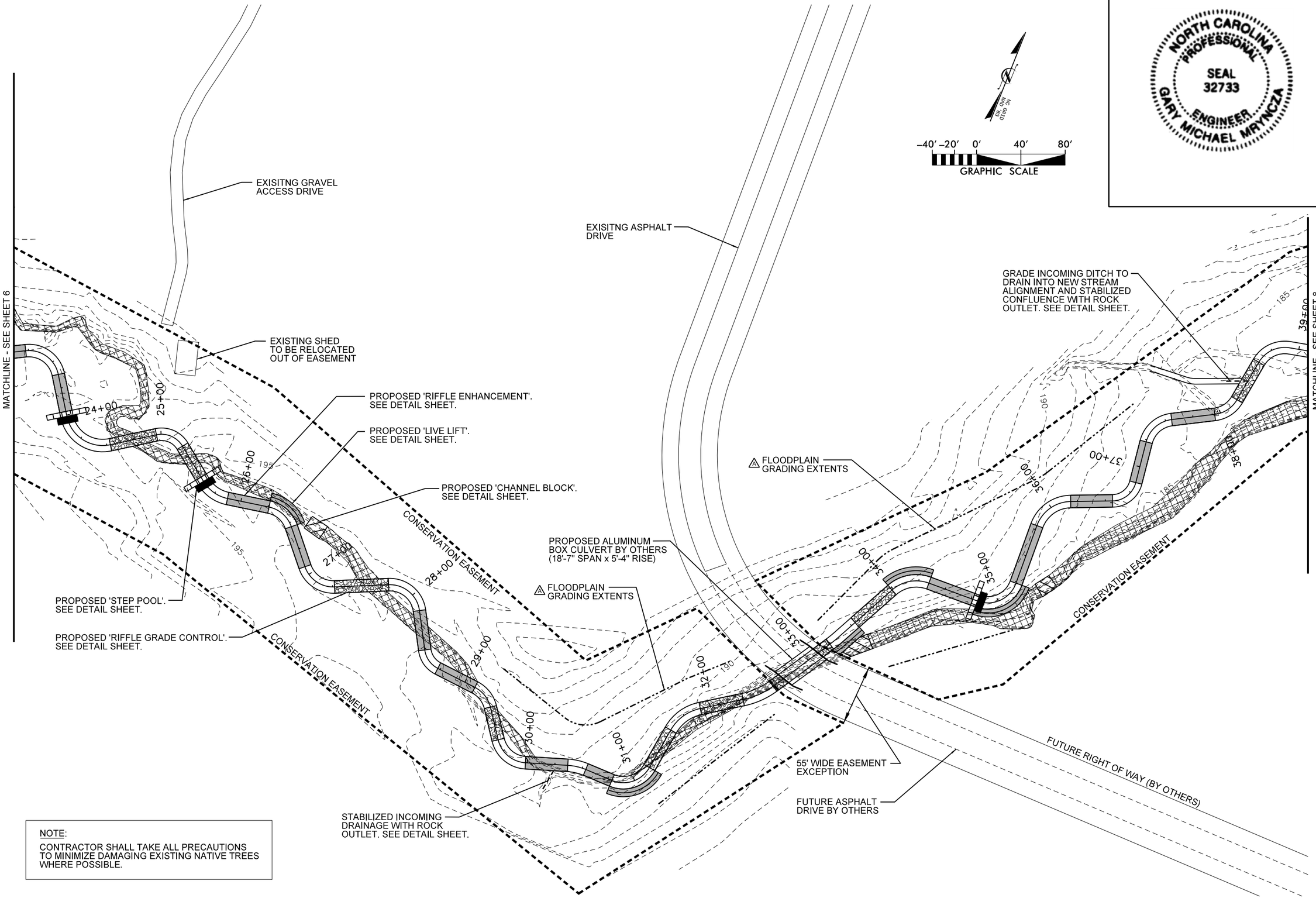
STONY FORK STREAM RESTORATION SITE

JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

SITE PLAN

REACH: SF1, SF2 & T1, T1A, T3



NOTE:

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

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

	DATE	DESCRIPTION	BY
A	JULY 2018	REVISED PER IRT COMMENTS	

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RALEIGH, NORTH CAROLINA 27609

STONY FORK
STREAM RESTORATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

SITE PLAN

REACH:
SF2

SHEET 7 OF 21

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NC GRID NORTH

–40′ –20′ 0′ 40′ 80′
GRAPHIC SCALE

MATCHLINE - SEE SHEET 10 FOR TRIBUTARY 2

MATCHLINE - SEE SHEET 9

MATCHLINE - SEE SHEET 7

CONSERVATION EASEMENT

FLOODPLAIN GRADING EXTENTS

STABILIZED INCOMING DRAINAGE WITH ROCK OUTLET. SEE DETAIL SHEET.

PROPOSED 'CHANNEL BLOCK'. SEE DETAIL SHEET.

30' WIDE EASEMENT EXCEPTION

BEGIN SF3

PROPOSED 'RIFFLE GRADE CONTROL'. SEE DETAIL SHEET.

PROPOSED 'STEP POOL'. SEE DETAIL SHEET.

PROPOSED 'LIVE LIFT'. SEE DETAIL SHEET.

PROPOSED 'RIFFLE ENHANCEMENT'. SEE DETAIL SHEET.

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

REVISIONS		
STA.	DESCRIPTION	DATE
A	REVISED PER IRT COMMENTS	JULY 2018

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RALEIGH, NORTH CAROLINA 27609

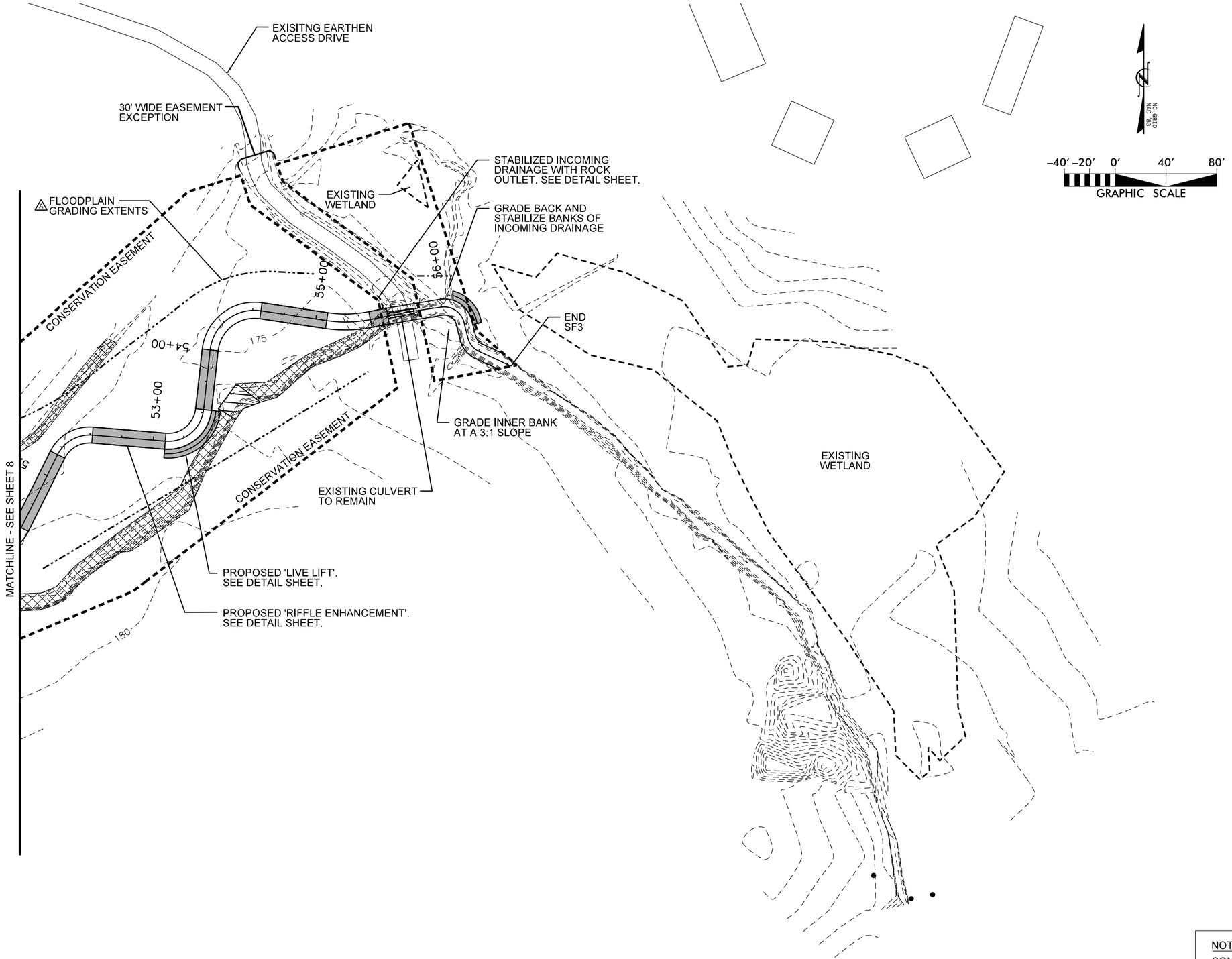
STONY FORK STREAM RESTORATION SITE

JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

SITE PLAN

REACH:
SF2 & SF3



NOTE:

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

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

A	REVISED PER IRT COMMENTS	JULY 2018

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STONY FORK
STREAM RESTORATION SITE

JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

SITE PLAN

REACH:
SF3

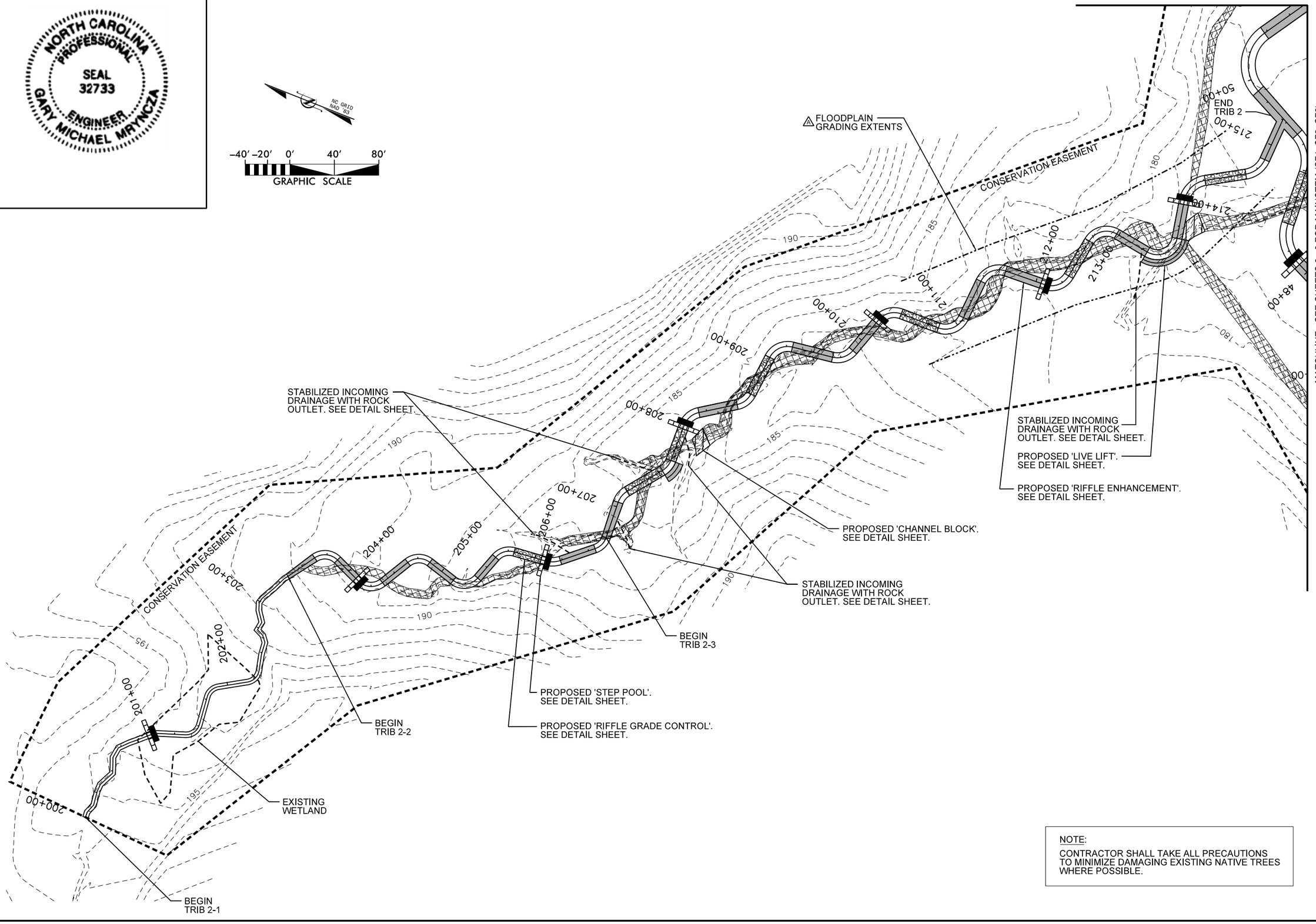
SHEET 9 OF 21

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NC GRID NAD 83

–40′ –20′ 0′ 40′ 80′

GRAPHIC SCALE



MATCHLINE - SEE SHEETS 6 - 9 FOR MAINSTEM (SF1, SF2, SF3)

NOTE:

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

REVISIONS			
SYM.	DESCRIPTION	DATE	
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STONY FORK
STREAM RESTORATION SITE

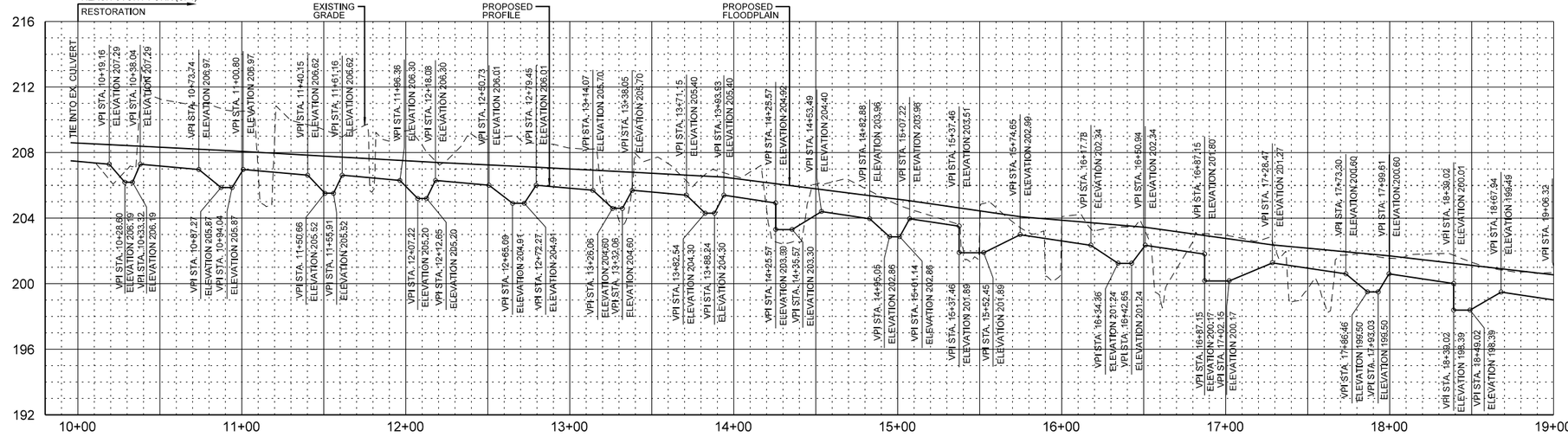
JOHNSTON COUNTY, NORTH CAROLINA

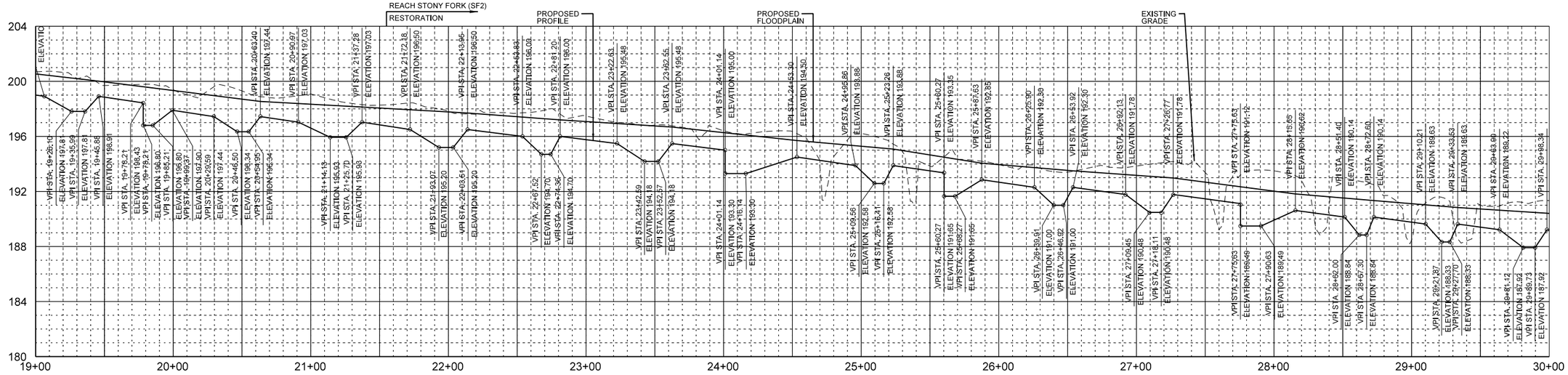
DATE: AUGUST 2018

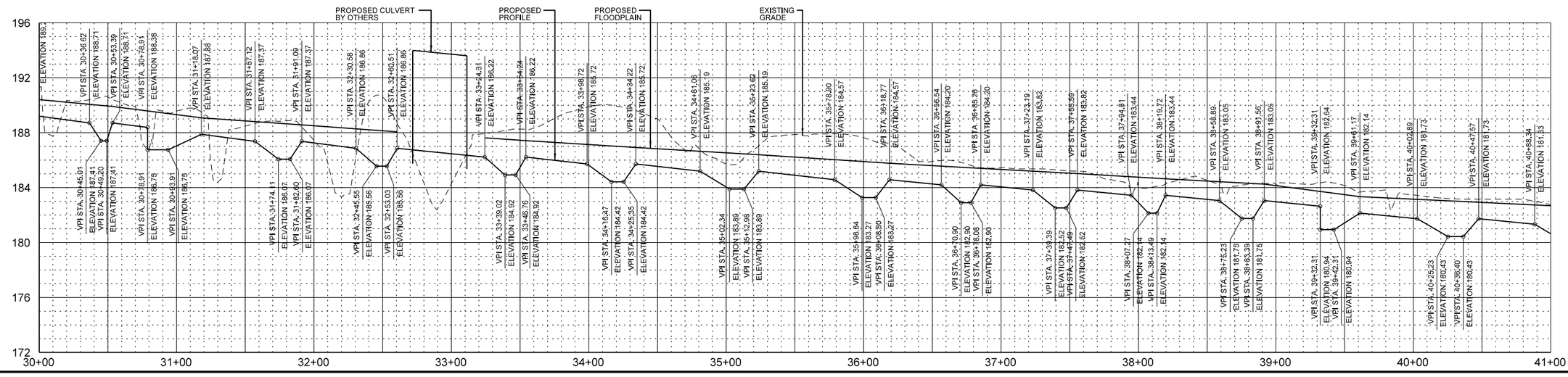
SCALE: GRAPHIC

SITE PLAN

REACH:
TRIB 2-1, 2-2, 2-3







NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

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STM.	DESCRIPTION	DATE
	REVISIONS	

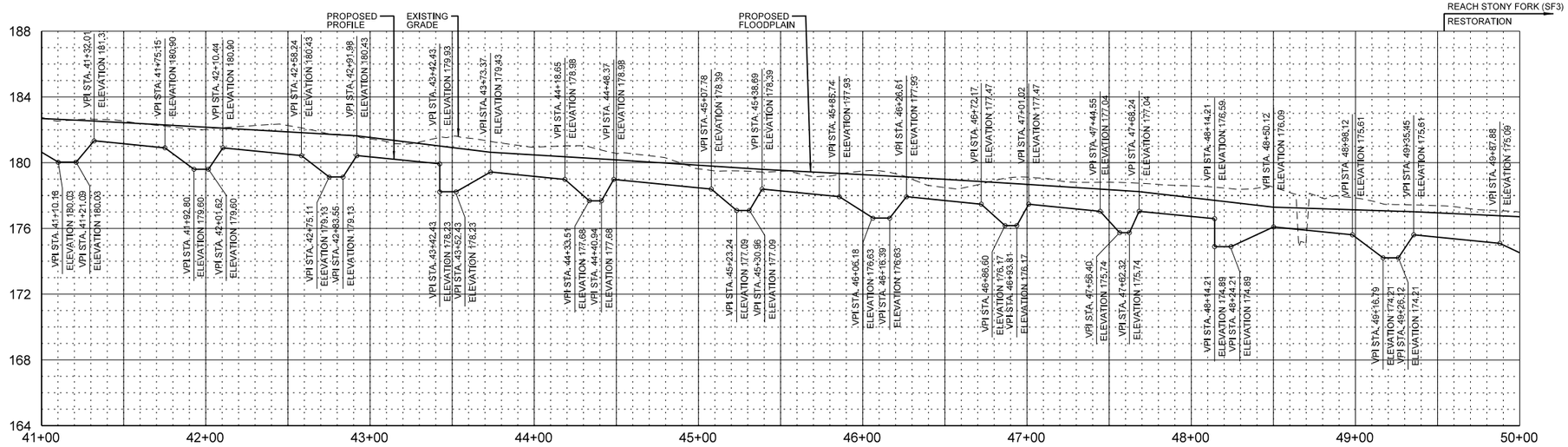
STONY FORK
STREAM RESTORATION SITE

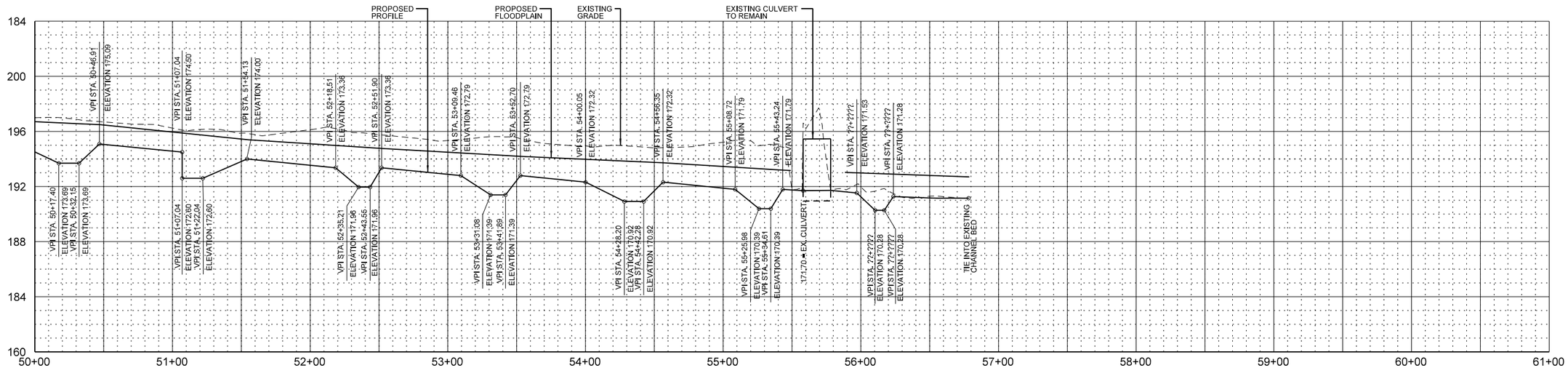
JOHNSTON COUNTY, NORTH CAROLINA

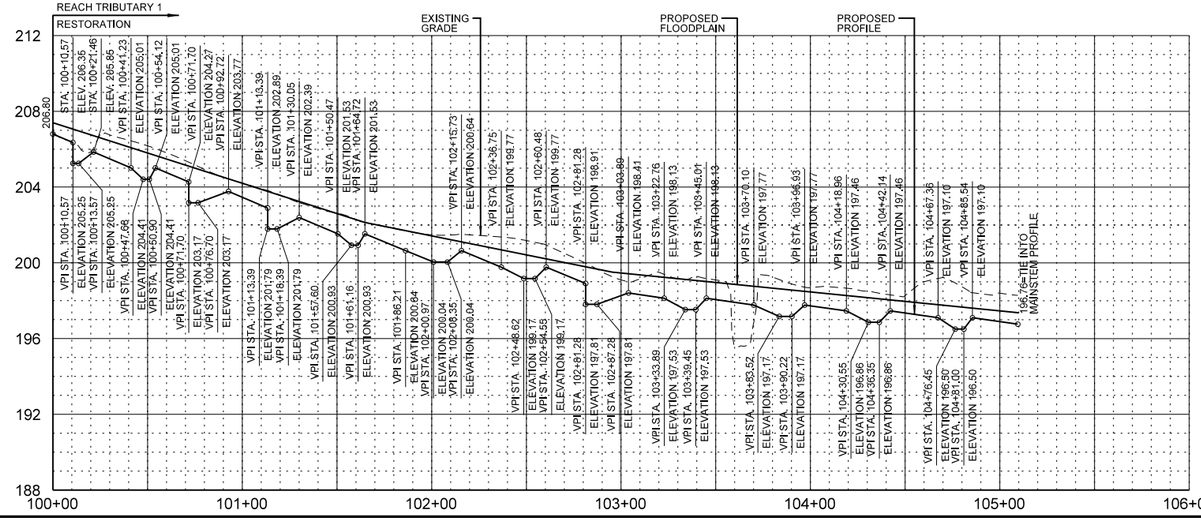
DATE: AUGUST 2018
SCALE: 1"=40'

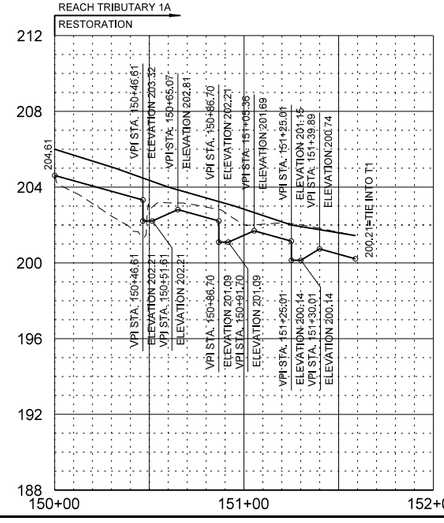
PROFILES

SHEET 11 OF 21









NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

A	REVISED PER IRT COMMENTS	JULY 2018	
SYM.	DESCRIPTION	DATE	

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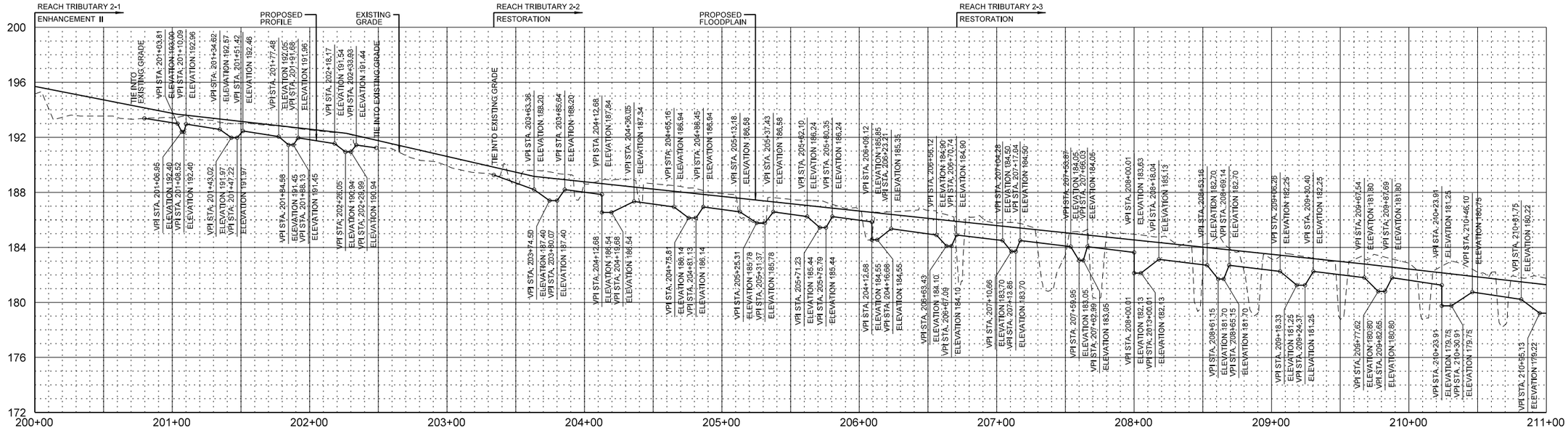
STONY FORK
STREAM RESTORATION SITE

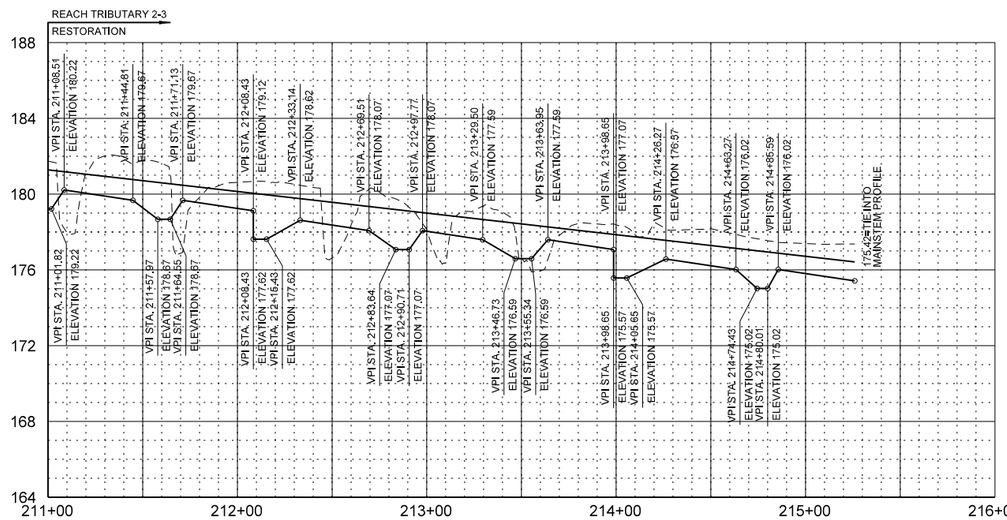
JOHNSTON COUNTY, NORTH CAROLINA

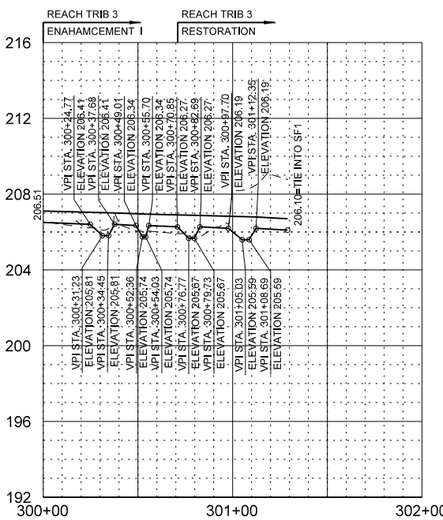
DATE: AUGUST 2018
SCALE: 1"=40'

PROFILES

SHEET 12 OF 21







NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

STAL	DESCRIPTION	DATE
	REVISIONS	

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RALEIGH, NORTH CAROLINA 27609

STONY FORK STREAM RESTORATION SITE

JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: 1"=40'

PROFILES

SHEET 13 OF 21

RIPARIAN FOREST PLANTING:

PLANTING ZONE 1 = 13.4 ACRES

12" - 18" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

COMMON NAME	SCIENTIFIC NAME	STATUS	% OF TOTAL	# OF PLANTS
AMERICAN SYCAMORE	PLATANUS OCCIDENTALIS	FACW	20	2,600
SWAMP CHESTNUT OAK	QUERCUS MICHAUXII	FACW	20	2,600
GREEN ASH	FRAXINUS PENNSYLVANICA	FACW	20	2,600
RIVER BIRCH	BETULA NIGRA	FACW	20	2,600
WILLOW OAK	QUERCUS PHELLOS	FAC	10	1,300
TULIP POPLAR	LIRIODENDRON TULIPIFERA	FACU	10	1,300
				13,000

PLANTING ZONE 2 = 9.5 ACRES

12" - 18" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

COMMON NAME	SCIENTIFIC NAME	STATUS	% OF TOTAL	# OF PLANTS
TULIP POPLAR	LIRIODENDRON TULIPIFERA	FACU	20	1,900
SOUTHERN RED OAK	QUERCUS FALCATA	FACU	25	2,300
WILLOW OAK	QUERCUS PHELLOS	FAC	15	1,400
WHITE OAK	QUERCUS ALBA	FACU	20	1,900
AMERICAN PERSIMMON	DIOSPYROS VIRGINIANA	FAC	10	900
PIN OAK	QUERCUS PALUSTRIS	FACW	10	900
				9,300

⚠ PLANTING ZONE 3 = 6.2 ACRES (APPROX)
SUPPLEMENTAL PLANTING ZONE AS NEEDED FOR AREAS CLEARED OF CHINESE PRIVET

ONE-GALLON CONTAINER TREES AT 20' X 20' SPACING, OR
BARE ROOT TREES IN TREE SHELTERS AT 10' ON CENTER SPACING

COMMON NAME	SCIENTIFIC NAME	STATUS	% OF TOTAL	# OF PLANTS
RIVER BIRCH	BETULA NIGRA	FACW	15	105
AMERICAN SYCAMORE	PLATANUS OCCIDENTALIS	FACW	15	105
WHITE OAK	QUERCUS ALBA	FACU	15	105
SOUTHERN RED OAK	QUERCUS FALCATA	FACU	15	105
SWAMP CHESTNUT OAK	QUERCUS MICHAUXII	FACW	15	105
PIN OAK	QUERCUS PALUSTRIS	FACW	10	70
WILLOW OAK	QUERCUS PHELLOS	FAC	15	105
				700

PLANTING NOTE:

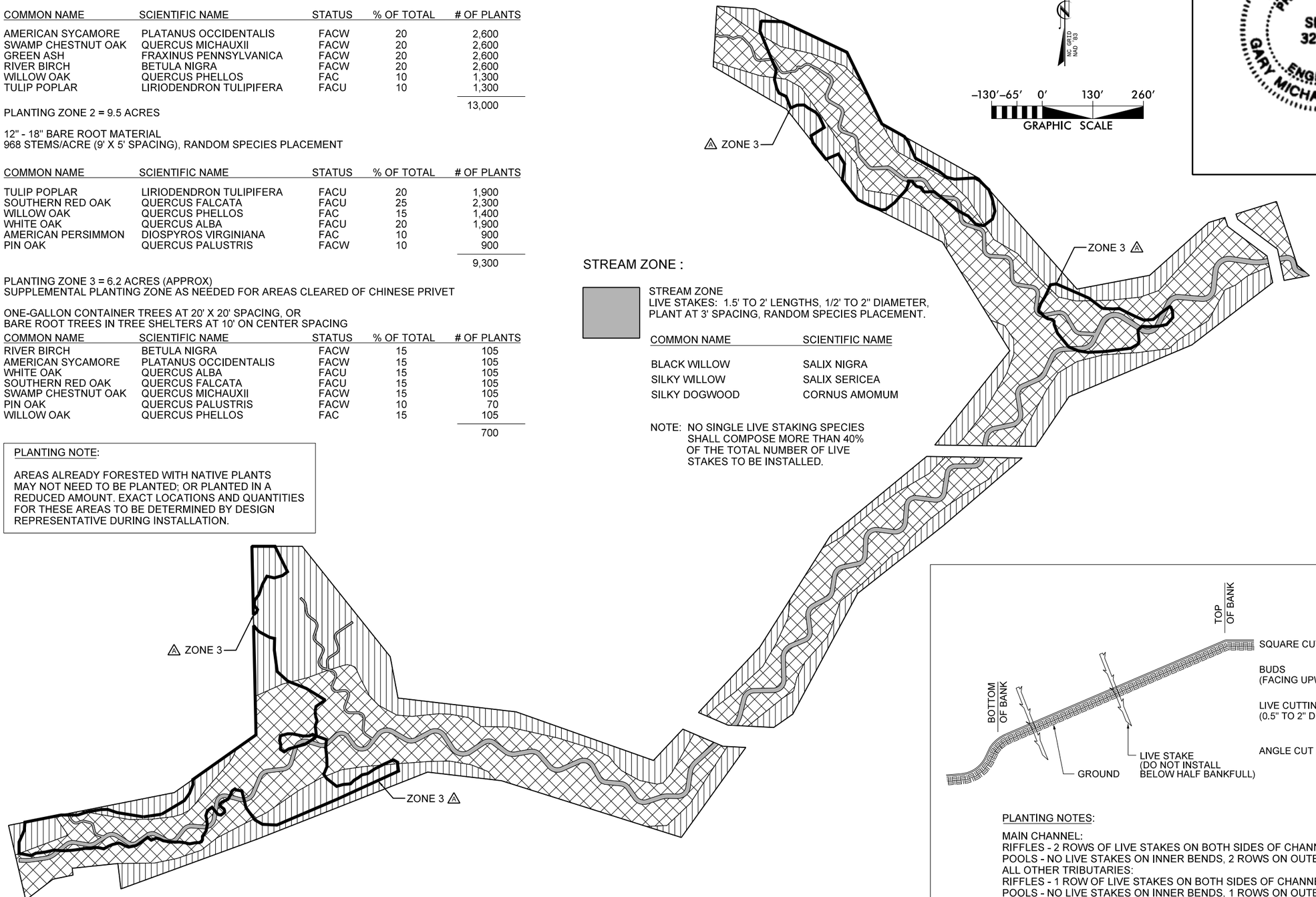
AREAS ALREADY FORESTED WITH NATIVE PLANTS MAY NOT NEED TO BE PLANTED; OR PLANTED IN A REDUCED AMOUNT. EXACT LOCATIONS AND QUANTITIES FOR THESE AREAS TO BE DETERMINED BY DESIGN REPRESENTATIVE DURING INSTALLATION.

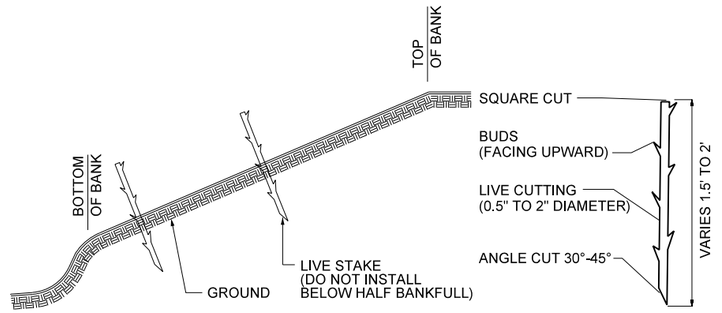
STREAM ZONE :

STREAM ZONE
LIVE STAKES: 1.5' TO 2' LENGTHS, 1/2' TO 2" DIAMETER, PLANT AT 3' SPACING, RANDOM SPECIES PLACEMENT.

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

NOTE: NO SINGLE LIVE STAKING SPECIES SHALL COMPOSE MORE THAN 40% OF THE TOTAL NUMBER OF LIVE STAKES TO BE INSTALLED.





PLANTING NOTES:

MAIN CHANNEL:
RIFFLES - 2 ROWS OF LIVE STAKES ON BOTH SIDES OF CHANNEL.
POOLS - NO LIVE STAKES ON INNER BENDS, 2 ROWS ON OUTER BENDS.
ALL OTHER TRIBUTARIES:
RIFFLES - 1 ROW OF LIVE STAKES ON BOTH SIDES OF CHANNEL.
POOLS - NO LIVE STAKES ON INNER BENDS, 1 ROWS ON OUTER BENDS.

LIVE STAKES

SCALE: NTS

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS		
A	REVISED PER IRT COMMENTS	JULY 2018

NCDEQ - DIVISION OF MITIGATION SERVICES

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

STONY FORK
STREAM RESTORATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

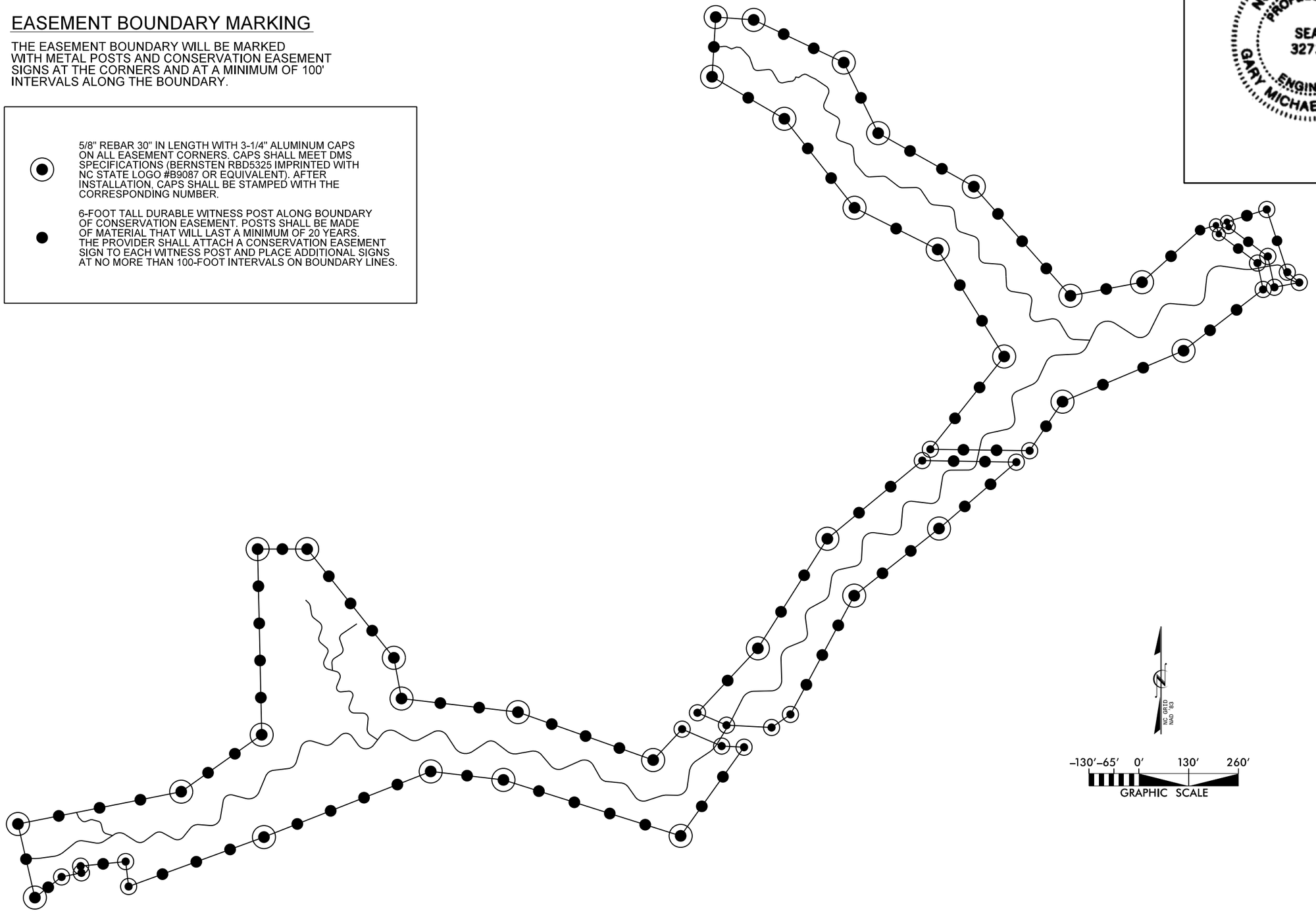
DATE: AUGUST 2018
SCALE: GRAPHIC

PLANTING PLAN

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.

- 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.



NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NO.	DESCRIPTION	DATE
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BOUNDARY MARKING PLAN

SHEET 15 OF 21

SEDIMENTATION AND EROSION CONTROL NOTES:

1. IT IS THE INTENT OF THESE PLANS THAT AS SOON AS AN AREA OF GRADING IS COMPLETE IT SHALL BE STABILIZED IN ACCORDANCE WITH THE EROSION CONTROL PRACTICES DESCRIBED IN THESE PLANS.DUE TO THE ANTICIPATED DURATION AND SEQUENCE OF THE CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS REQUIRED TO MINIMIZE, AS MUCH AS POSSIBLE, THE AMOUNT OF THE AREA THAT IS DISTURBED AT ONE TIME.

2. THE CONTRACTOR SHALL EXERCISE EVERY REASONABLE PRECAUTION THROUGHOUT THE CONSTRUCTION OF THE PROJECT TO PREVENT EROSION AND SEDIMENTATION. EROSION CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE PROJECT PLANS, NORTH CAROLINA SEDIMENT AND EROSION CONTROL GUIDELINES AND AS DIRECTED BY THE DESIGNER.

3. ALL EXCAVATED MATERIAL SHALL BE STOCKPILED WITHIN THE LIMITS OF DISTURBANCE FOR LATER USE AS FILL MATERIAL. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING SILT FENCE AROUND THE STOCKPILE AREA(S) AND ANY TEMPORARY OR PERMANENT SPOIL AND TOPSOIL PILES TO PREVENT EROSION AND SEDIMENTATION.

4. IN THE EVENT OF A STORM, THE CONTRACTOR WILL BE RESPONSIBLE FOR REMOVAL OR PROTECTION OF ANY EQUIPMENT, TOOLS, MATERIALS OR OTHER ITEMS NEEDED TO COMPLETE THE WORK THAT COULD BE AFFECTED BY STORMWATER.

5. EACH SEDIMENT CONTROL DEVICE WILL BE REMOVED AFTER ALL WORK IN THE CORRESPONDING CONSTRUCTION PHASE HAS BEEN COMPLETED AND ADEQUATE PERMANENT GROUND COVER HAS BEEN RE-ESTABLISHED ON THE DISTURBED AREAS, AS DETERMINED BY THE DESIGNER.

6. THE CONSTRUCTION ENTRANCES AND STAGING AREAS IDENTIFIED ON THE PLANS PROVIDE THE ONLY ACCESS POINTS INTO THE LIMITS OF DISTURBANCE. NO ADDITIONAL ACCESS POINTS SHALL BE USED WITHOUT APPROVAL OF THE DESIGNER.

7. SILT FENCE SHALL BE INSTALLED ON THE LOW SIDE OF ANY TEMPORARY OR PERMANENT SPOIL AND TOPSOIL PILES. THESE SPOIL PILES SHALL ALSO BE SEEDED AND MULCHED FOR VEGETATIVE STABILIZATION WITHIN 7 DAYS THAT THEY ARE CREATED. ALL SPOIL MATERIAL SHALL STAY ON THE SITE AND SHALL NOT BE REMOVED FROM THE SUBJECT PROPERTY.

8. ALL EROSION AND SEDIMENT CONTROL PRACTICES WILL BE CHECKED FOR STABILITY AND FUNCTIONAL OPERATION FOLLOWING EVERY RUNOFF PRODUCING RAIN EVENT AND/OR AT LEAST ONCE PER WEEK. ANY NEEDED MAINTENANCE OR REPAIRS SHALL BE MADE IMMEDIATELY TO MAINTAIN ALL MEASURES AS DESIGNED. ACCUMULATED SEDIMENT SHALL BE REMOVED FROM CONTROL MEASURES WHEN THEY REACH APPROXIMATELY 50% OF THEIR FUNCTIONAL CAPACITY. THESE MEASURES SHALL BE REPAIRED IF DISTURBED DURING MAINTENANCE. ALL SEEDED AREAS SHALL BE FERTILIZED, RESEEDED AND MULCHED, AS NECESSARY, TO PROMOTE THE ESTABLISHMENT OF VEGETATION COVER.

9. THE CONSTRUCTION MANAGER AND EROSION CONTROL CONTACT FOR THIS SITE IS TIM MORRIS. OFFICE PHONE - 919-783-9214 CELL PHONE - 919-793-6886

10. ALL EXCESS WASTE MATERIAL SHALL BE DISPOSED OF AT A PERMITTED FACILITY OR SITE. (15A NCAC 04B .0110)

SEDIMENTATION & EROSION CONTROL PLAN LEGEND

LIMITS OF DISTURBANCE ..... —— LOD ——

SILT FENCE ..... —— SF ——

STRAW WADDLE ..... —— W ——

TEMPORARY BRIDGE MAT STREAM CROSSING .....

STREAM TO BE FILLED .....

STAGING AREA .....

STOCK PILE .....

SEEDING AND PLANTING NOTES:

TEMPORARY SEED MIX

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

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

WINTER MIX (AUGUST 15 - MAY 15)
RYE GRAIN. . . . . .SECALE CEREALE. . . . . .120 LBS / ACRE

THE CONTRACTOR SHALL UTILIZE THE PERMANENT SEED MIXES INDICATED BELOW. THE UPLAND SEED MIX SHOULD BE USED IN DRYER PARTS OF THE SITE, WHILE THE RIPARIAN SEED MIX SHOULD BE USED LONG THE FLOODPLAIN AND BANKFULL BENCHES AND AS DIRECTED BY THE DESIGNER.

PERMANENT UPLAND SEED MIX

SUMMER MIX (MAY 15 – AUGUST 15)

SPECIES	APPLICATION RATE (IN MIX) % OF MIX	LBS / ACRE
ORCHARDGRASS -- DACTYLIS GLOMERATA	5	1.5
BLUESTEM -- ANDROPOGON GLOMERATUS	5	1.5
VIRGINIA WILDRYE -- ELYMUS VIRGINICUS	10	3.0
RIVER OATS – CHASMANTHIUM LATIFOLIUM	5	1.5
DEERTONGUE -- PANICUM CLANDESTINUM	25	7.5
SWITCHGRASS – PANICUM VIRGATUM	25	7.5
PEARL MILLET -- PENNISETUM GLAUCOMA	25	7.5
TOTALS	100	30

WINTER MIX (AUGUST 15 -- MAY 15)

SPECIES	APPLICATION RATE (IN MIX) % OF MIX	LBS / ACRE
ORCHARDGRASS -- DACTYLIS GLOMERATA	5	1.5
BLUESTEM -- ANDROPOGON GLOMERATUS	5	1.5
VIRGINIA WILDRYE -- ELYMUS VIRGINICUS	10	3.0
RIVER OATS -- CHASMANTHIUM LATIFOLIUM	5	1.5
DEERTONGUE -- DICHANTHELIUM CLANDESTINUM	25	7.5
SWITCHGRASS – PANICUM VIRGATUM	25	7.5
RYE GRAIN -- SECALE CEREALE	25	7.5
TOTALS	100	30

PERMANENT RIPARIAN SEED MIX

SUMMER MIX (MAY 15 – AUGUST 15)

SPECIES	APPLICATION RATE (IN MIX) % OF MIX	LBS / ACRE
VIRGINIA WILDRYE – ELYMUS VIRGINICUS	15	4.6
BIG BLUESTEM -- ANDROPOGON GERARDII	8	2.3
SWITCHGRASS – PANICUM VIRGATUM	11	3.3
AUTUMN BENTGRASS -- AGROSTIS PERENNANS	11	3.3
BLACK-EYED SUSAN -- RUDBECKIA HIRTA	8	2.3
LANCELEAF COREOPSIS -- COREOPSIS LANCEOLATA	8	2.3
SOFT RUSH -- JUNCUS EFFUSUS	4	1.1
LITTLE BLUESTEM -- SCHIZACHYRIUM SCOPARIUM	4	1.1
INDIAN GRASS – SORGHASTRUM NUTANS	4	1.1
EASTERN GAMMA -- TRIPSACUM DACTYLOIDES	4	1.1
PEARL MILLET – PENNISETUM GLAUCOMA	25	7.5
TOTALS	100	30

WINTER MIX (AUGUST 15 – MAY 15)

SPECIES	APPLICATION RATE (IN MIX) % OF MIX	LBS / ACRE
VIRGINIA WILDRYE – ELYMUS VIRGINICUS	15	4.6
BIG BLUESTEM -- ANDROPOGON GERARDII	8	2.3
SWITCHGRASS -- PANICUM VIRGATUM	11	3.3
AUTUMN BENTGRASS -- AGROSTIS PERENNANS	11	3.3
BLACK-EYED SUSAN -- RUDBECKIA HIRTA	8	2.3
LANCELEAF COREOPSIS -- COREOPSIS LANCEOLATA	8	2.3
SOFT RUSH -- JUNCUS EFFUSUS	4	1.1
LITTLE BLUESTEM -- SCHIZACHYRIUM SCOPARIUM	4	1.1
INDIAN GRASS – SORGHASTRUM NUTANS	4	1.1
EASTERN GAMMA -- TRIPSACUM DACTYLOIDES	4	1.1
RYE GRAIN -- SECALE CEREALE	25	7.5
TOTALS	100	30

FERTILIZER. . . . . 750 LBS / ACRE
LIMESTONE. . . . . 2000 LBS / ACRE

FERTILIZER SHALL BE 10-10-10 ANALYSIS. UPON SOIL ANALYSIS A DIFFERENT RATIO OF FERTILIZER MAY BE USED.

SEEDBED PREPARATION

THE SEEDBED SHALL BE COMPRISED OF LOOSE SOIL AND NOT COMPACTED. THIS MAY REQUIRE MECHANICAL LOOSENING OF THE SOIL. SOIL AMENDMENTS SHOULD FOLLOW THE FERTILIZER AND LIMING DESCRIPTION IN THE ABOVE SECTIONS. FOLLOWING SEEDING, MULCHING SHALL FOLLOW THE BELOW APPLICATION METHODS AND AMOUNTS. AREAS CONTAINING SEVERE SOIL COMPACTION WILL BE SCARIFIED TO A DEPTH OF 8 INCHES.

MULCHING

SEEDED AREAS ARE TO BE PROTECTED BY SPREADING STRAW MULCH UNIFORMLY TO FORM A CONTINUOUS BLANKET (75% COVERAGE = 2 TONS/ACRE).

NOTE: FERTILIZER IS ONLY TO BE APPLIED ONCE. IF TEMPORARY SEED AND FERTILIZER IS APPLIED PRIOR TO PERMANENT SEED, THEN FERTILIZER SHALL NOT BE APPLIED WITH THE PERMANENT SEED.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

MAJOR ELEMENTS OF DWQ CONSTRUCTION GENERAL PERMIT

1) GROUND STABILIZATION

SITE AREA DESCRIPTION	STABILIZATION TIME FRAME	STABILIZATION TIME FRAME EXCEPTIONS
PERIMETER DIKES, SWALES, DITCHES AND SLOPES	7 DAYS	NONE
HIGH QUALITY WATER (HQW) ZONES	7 DAYS	NONE
SLOPES STEEPER THAN 3:1	7 DAYS	IF SLOPES ARE 10' OR LESS IN LENGTH AND ARE NOT STEEPER THAN 2:1, 14 DAYS ARE ALLOWED.
SLOPES 3:1 OR FLATTER	14 DAYS	7-DAYS FOR SLOPES GREATER THAN 50 FEET IN LENGTH
ALL OTHER AREAS WITH SLOPES FLATTER THAN 4:1	14 DAYS	NONE (EXCEPT FOR PERIMETERS AND HQW ZONES)

2) BUILDING WASTES HANDLING
- NO PAINT OR LIQUID WASTES IN STREAM OR STORM DRAINS.
- DEDICATED AREAS FOR DEMOLITION, CONSTRUCTION AND OTHER WASTES MUST BE LOCATED 50' FROM STORM DRAINS AND STREAMS UNLESS NO REASONABLE ALTERNATIVES AVAILABLE.
- EARTHEN-MATERIAL STOCKPILES MUST BE LOCATED 50' FROM STORM DRAINS AND STREAMS UNLESS NO REASONABLE ALTERNATIVES AVAILABLE.
- CONCRETE MATERIALS MUST BE CONTROLLED TO AVOID CONTACT WITH SURFACE WATERS, WETLANDS, OR BUFFERS.

3) DISCHARGES TO FEDERALLY-LISTED WATERS
- REQUIREMENTS ARE THE SAME AS IN PREVIOUS PERMIT.
- THE PERMIT ALLOWS REDUCTION FROM THE 20 ACRE MINIMUM IF THE DIRECTOR OF DWQ DETERMINES THAT OTHER BMPS PROVIDE EQUIVALENT PROTECTION.

4) INSPECTIONS
- SAME WEEKLY INSPECTION REQUIREMENTS.
- SAME RAIN GAUGE & INSPECTIONS AFTER 0.5" RAIN EVENT.
- INSPECTIONS ARE ONLY REQUIRED DURING "NORMAL BUSINESS HOURS".
- INSPECTION REPORTS MUST BE AVAILABLE ON-SITE DURING BUSINESS HOURS UNLESS A SITE-SPECIFIC EXEMPTION IS APPROVED.
- RECORDS MUST BE KEPT FOR 3 YEARS AND AVAILABLE UPON REQUEST.
- ELECTRONICALLY-AVAILABLE RECORDS MAY BE SUBSTITUTED UNDER CERTAIN CONDITIONS.

5) IMPLEMENTATION OF NEW PERMIT CONDITIONS
- PROJECTS PERMITTED UNDER THE PREVIOUS PERMIT CAN CONTINUE TO FOLLOW THE PREVIOUSLY-PERMITTED CONDITIONS.
- COMPLETE APPLICATIONS RECEIVED PRIOR TO AUGUST 3, 2011 CAN FOLLOW CONDITIONS OF APPROVED APPLICATION.
- APPLICATIONS RECEIVED AFTER AUGUST 2, 2011 MUST COMPLY WITH NEW PERMIT CONDITIONS.

6) CONDITIONS IN EROSION & SEDIMENTATION CONTROL PLANS*
- DESIGNATION ON THE PLANS WHERE THE 7 AND 14-DAY GROUND STABILIZATION REQUIREMENTS OF THE NPDES PERMIT APPLY.
- DESIGNATION ON THE PLANS WHERE BASINS THAT COMPLY WITH THE SURFACE-WITHDRAWAL REQUIREMENTS OF THE NPDES PERMIT ARE LOCATED.

7) BUILDING WASTES HANDLING
- NO PAINT OR LIQUID WASTES IN STREAM OR STORM DRAINS
- DEDICATED AREAS FOR DEMOLITION, CONSTRUCTION AND OTHER WASTES LOCATED 50' FROM STORM DRAINS AND STREAMS UNLESS NO REASONABLE ALTERNATIVES ARE AVAILABLE.
- EARTHEN-MATERIAL STOCKPILES LOCATED 50' FROM STORM DRAINS UNLESS NO REASONABLE ALTERNATIVES AVAILABLE.
- CONCRETE MATERIALS MUST BE CONTROLLED TO AVOID CONTACT WITH SURFACE WATERS, WETLANDS, OR BUFFERS.

8) SEDIMENT BASINS
- OUTLET STRUCTURES MUST WITHDRAW FROM BASIN SURFACE UNLESS DRAINAGE AREA IS LESS THAN 1 ACRE.
- USE ONLY DWQ-APPROVED FLOCCULANTS.

B	EDITED AS PER LAND QUALITY COMMENTS	MAY 2017
	DESCRIPTION	DATE
	REVISIONS	

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STONY FORK
STREAM RESTORATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: N.T.S.

EROSION CONTROL PLAN

SHEET 16 OF 21

SEQUENCE OF CONSTRUCTION:

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

GENERAL SITE NOTES:

I. THE CONTRACTOR SHALL ONLY CONDUCT STREAM WORK, INCLUDING ALL IN-STREAM STRUCTURES, GRADING, STABILIZATION MEASURES, AND SEEDING, MULCHING, AND MATTING WORK, ON A SECTION OF STREAM THAT SHALL BE ENTIRELY COMPLETED WITHIN A SINGLE DAY. EACH SECTION OF COMPLETED STREAM MUST BE STABILIZED AND MATTED BEFORE FLOW CAN BE RETURNED INTO THE CHANNEL.

II. WHEN WORKING IN STREAMS WITH NO ACTIVE FLOW THE CONTRACTOR IS REQUIRED TO HAVE APPROPRIATELY SIZED PUMPS AND MATERIALS TO INSTALL AND MAINTAIN A TEMPORARY STREAM DIVERSION IN ANTICIPATION OF PENDING STORM EVENTS. WORKING IN A DRY CHANNEL DOES NOT PRECLUDE THE CONTRACTOR FROM HAVING TO COMPLY WITH NOTE I ABOVE.

III. UPON APPROVAL FROM THE DESIGNER, PHASES 2 THROUGH 12 MAY BE CONSTRUCTED IN A DIFFERENT SEQUENCE THAN INDICATED BELOW OR CONCURRENTLY.

IV. ALL CONSTRUCTION WORK SHALL BE DONE DURING PERIODS OF DRY WEATHER (15A NCAC 04B .0106.a.5)

PHASE 1: INITIAL SITE PREPARATION

A. IDENTIFY PROJECT BOUNDARY, LIMITS OF DISTURBANCE, SENSITIVE AREAS, STAGING AREAS, STABILIZED ENTRANCES, TEMPORARY CROSSINGS AND ACCESS POINTS WITH THE DESIGNER.
B. CONSTRUCT ENTRANCE AND STAGING AREAS AND THEIR ASSOCIATED SEDIMENT AND EROSION CONTROL DEVICES IN A MANNER TO SUPPORT EXECUTION OF THE RESTORATION IN PHASES AS INDICATED IN THE PLANS AND AS DIRECTED BY THE DESIGNER.

PHASE 2: STREAM REACH STONY FORK - STA. 10+00 TO 17+60

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED ALONG EXISTING AND NEW CHANNEL AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA. (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. COMPLETE CHANNEL GRADING AS DIRECTED IN THE PLANS. INSTALL ANY BANK STABILIZATION TREATMENTS AND IN-STREAM STRUCTURES.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.
   v. BEFORE CONTINUING TO THE OFFLINE PHASE OF THE CHANNEL, ENSURE THAT THE NEW CHANNEL IS TIED INTO EXISTING CHANNEL TO USING A RIPRAP TO ALLOW POSITIVE DRAINAGE AND PROTECT THE BED FROM HEADCUTTING. ALL DISTURBED BANKS SHALL BE STABILZED WITH COIR MATTING AND SEEDING.

PHASE 3: STREAM REACH STONY FORK - STA. 18+50 TO STA. 24+75 (OFFLINE SECTION)

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. INSTALL SEDIMENT AND EROSION CONTROL MEASURES ALONG EXISTING CHANNEL AS DEPICTED ON THE PLANS.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. WORKING FROM DOWNSTREAM TO UPSTREAM, COMPLETE CHANNEL GRADING AND INSTALL ANY BANK STABILIZATION TREATMENTS OR STRUCTURES AS DIRECTED IN THE PLANS. THIS WILL ALLOW POSITIVE DRAINAGE OF THE NEW STREAM INTO THE EXISTING STREAM DURING CONSTRUCTION OF THE OFFLINE SECTION.
   iv. STOCKPILE SPOIL ALONG OLD STREAM FOR EASY FILL ONCE OFFLINE SECTION HAS BEEN COMPLETED.
   v. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 4: STREAM REACH STONY FORK - STA. 17+60 TO 18+50 (CONNECT FINISHED UPSTREAM TO OFFLINE SECTION)

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA.
   iii. CONNECT THE FINISHED UPSTREAM SECTION TO THE NEW OFFLINE SECTION BY FINISHING STREAM GRADING FROM STATION 17+60 TO 18+50 AND INSTALL ANY BANK STABILIZATION TREATMENTS OR STRUCTURES AS DIRECTED IN THE PLANS. THIS PHASE WILL INTRODUCE THE FLOW INTO THE NEW STREAM, BYPASSING THE OLD STREAM.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.
   v. ONCE THE NEW OFFLINE SECTION HAS BEEN CONNECTED TO THE FINISHED UPSTREAM SECTION, AND ALL EROSION AND CONTROL STRUCTRES ARE IN PLACE, THE OLD (NOW OFFLINE) SECTION OF STREAM UPSTREAM OF TRIBUTARY 1 CAN BE FILLED. SEED AND MULCH ALL COMPLETED WORK AREAS. (THE OFFLINE SECTION BELOW TRIBUTARY 1 WILL NEED TO STAY UNFILLED UNTIL TRIBUTARY 1 OF COMPLETE TO ALLOW POSITIVE DRAINAGE)

PHASE 5: STREAM REACH STONY FORK - STA. 24+75 TO 35+00

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED ALONG EXISTING AND NEW CHANNEL AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA. (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. COMPLETE CHANNEL GRADING AS DIRECTED IN THE PLANS. INSTALL ANY BANK STABILIZATION TREATMENTS AND IN-STREAM STRUCTURES.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.
   v. BEFORE CONTINUING TO THE OFFLINE PHASE OF THE CHANNEL, ENSURE THAT THE NEW CHANNEL IS TIED INTO EXISTING CHANNEL TO USING A RIPRAP TO ALLOW POSITIVE DRAINAGE AND PROTECT THE BED FROM HEADCUTTING. ALL DISTURBED BANKS SHALL BE STABILZED WITH COIR MATTING AND SEEDING.

PHASE 6: STREAM REACH STONY FORK - STA. 35+75 TO STA. 55+50 (OFFLINE SECTION)

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. INSTALL SEDIMENT AND EROSION CONTROL MEASURES ALONG EXISTING CHANNEL AS DEPICTED ON THE PLANS.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. WORKING FROM DOWNSTREAM TO UPSTREAM, COMPLETE CHANNEL GRADING AND INSTALL ANY BANK STABILIZATION TREATMENTS OR STRUCTURES AS DIRECTED IN THE PLANS. THIS WILL ALLOW POSITIVE DRAINAGE OF THE NEW STREAM INTO THE EXISTING STREAM DURING CONSTRUCTION OF THE OFFLINE SECTION.
   iv. STOCKPILE SPOIL ALONG OLD STREAM FOR EASY FILL ONCE OFFLINE SECTION HAS BEEN COMPLETED.
   v. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 7: STREAM REACH STONY FORK - STA. 35+00 TO 35+75 (CONNECT FINISHED UPSTREAM TO OFFLINE SECTION)

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA.
   iii. CONNECT THE FINISHED UPSTREAM SECTION TO THE NEW OFFLINE SECTION BY FINISHING STREAM GRADING FROM STATION 35+00 TO 35+75 AND INSTALL ANY BANK STABILIZATION TREATMENTS OR STRUCTURES AS DIRECTED IN THE PLANS. THIS PHASE WILL INTRODUCE THE FLOW INTO THE NEW STREAM, BYPASSING THE OLD STREAM.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.
   v. ONCE THE NEW OFFLINE SECTION HAS BEEN CONNECTED TO THE FINISHED UPSTREAM SECTION, AND ALL EROSION AND CONTROL STRUCTRES ARE IN PLACE, THE OLD (NOW OFFLINE) SECTION OF STREAM CAN BE FILLED. SEED AND MULCH ALL COMPLETED WORK AREAS.

PHASE 8: STREAM REACH STONY FORK - STA. 55+50 TO 55+78

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED ALONG EXISTING AND NEW CHANNEL AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA. (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. COMPLETE CHANNEL GRADING AS DIRECTED IN THE PLANS. INSTALL ANY BANK STABILIZATION TREATMENTS AND IN-STREAM STRUCTURES.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 9: STREAM REACH TRIBUTARY 1 - STA. 100+50 TO STA. 103+60 & STA. 104+00 TO STA. 105+10 (OFFLINE SECTIONS)

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. INSTALL SEDIMENT AND EROSION CONTROL MEASURES ALONG EXISTING CHANNEL AS DEPICTED ON THE PLANS.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. WORKING FROM DOWNSTREAM TO UPSTREAM, COMPLETE CHANNEL GRADING AND INSTALL ANY BANK STABILIZATION TREATMENTS OR STRUCTURES AS DIRECTED IN THE PLANS. THIS WILL ALLOW POSITIVE DRAINAGE OF THE NEW STREAM INTO THE EXISTING STREAM DURING CONSTRUCTION OF THE OFFLINE SECTION.
   iv. STOCKPILE SPOIL ALONG OLD STREAM FOR EASY FILL ONCE OFFLINE SECTION HAS BEEN COMPLETED.
   v. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 10: STREAM REACH TRIBUTARY 1 - STA. 100+00 TO STA. 100+50 & STA. 103+60 TO STA. 104+00 & TRIBUTARY 1A - STA. 150+00 TO STA. 151+59 (CONNECT FINISHED UPSTREAM TO OFFLINE SECTIONS)

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA.
   iii. CONNECT THE FINISHED UPSTREAM SECTION TO THE NEW OFFLINE SECTION BY FINISHING STREAM GRADING FROM STATIONS SHOWN ABOVE, INSTALL ANY BANK STABILIZATION TREATMENTS OR STRUCTURES AS DIRECTED IN THE PLANS. THIS PHASE WILL INTRODUCE THE FLOW INTO THE NEW STREAM, BYPASSING THE OLD STREAM.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.
   v. ONCE THE NEW OFFLINE SECTION HAS BEEN CONNECTED TO THE FINISHED UPSTREAM SECTION, AND ALL EROSION AND CONTROL STRUCTRES ARE IN PLACE, THE OLD (NOW OFFLINE) SECTION OF STREAM CAN BE FILLED. SEED AND MULCH ALL COMPLETED WORK AREAS.

PHASE 11: STREAM REACHS TRIBUTARY 2 - STA. 200+00 TO 215+26

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED ALONG EXISTING AND NEW CHANNEL AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA. (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. COMPLETE CHANNEL GRADING AS DIRECTED IN THE PLANS. INSTALL ANY BANK STABILIZATION TREATMENTS AND IN-STREAM STRUCTURES.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 12: STREAM REACHS TRIBUTARY 3 - STA. 300+00 TO 301+29

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED ALONG EXISTING AND NEW CHANNEL AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA. (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. COMPLETE CHANNEL GRADING AS DIRECTED IN THE PLANS. INSTALL ANY BANK STABILIZATION TREATMENTS AND IN-STREAM STRUCTURES.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 13: RIPARIAN BUFFER PLANTING

A. PHASE 13 CAN BE INITIATED AFTER THE STREAM WORK IS COMPLETED IN EACH SECTION OF THE PROJECT.
B. PLANTS SHALL BE PLANTED DURING THE DORMANT SEASON (NOVEMBER 17 - MARCH 17).
C. PREPARE AND PLANT BANK AND RIPARIAN VEGETATION IN ACCORDANCE WITH THE CONSTRUCTION PLANS AND AS DIRECTED BY THE DESIGNER.

PHASE 14: COMPLETION OF PROJECT SITE

A. REMOVE ALL REMAINING WASTE MATERIALS AND RESTORE THE REMAINING STAGING AND STOCKPILING AREAS AND CONSTRUCTION ENTRANCES TO THEIR PRIOR CONDITION. REMOVE TEMPORARY CROSSINGS AND INSTALL BANK STABILIZATION TREATMENTS, AND PLANT, SEED AND MULCH DISTURBED AREAS. SEED AND MULCH ALL DISTURBED AREAS UTILIZING THE SEED/MULCH MIXES SPECIFIED IN THE PLANS.

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

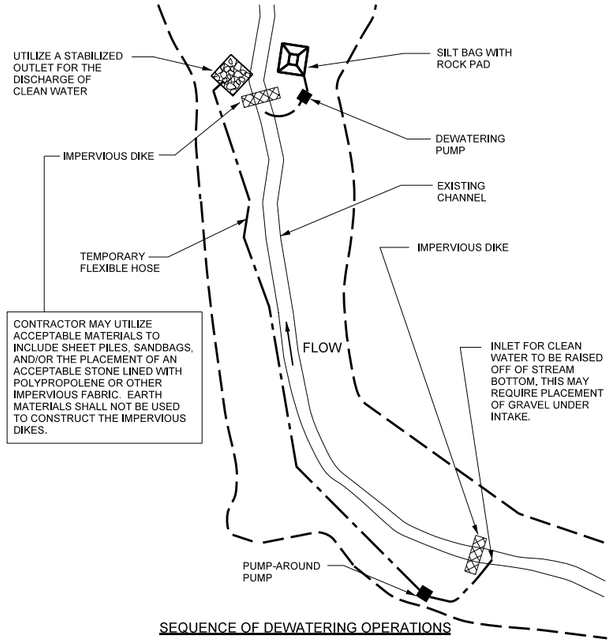
STONY FORK
STREAM RESTORATION SITE

JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: N.T.S.

EROSION CONTROL PLAN

SHEET 17 OF 21



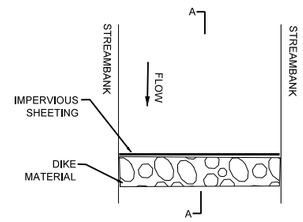
SEQUENCE OF DEWATERING OPERATIONS

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

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

EXAMPLE OF PUMP-AROUND OPERATION

SCALE: NTS



NOTES:

DIKE MATERIAL MAY BE ROCK OR SANDBAGS.

DIKE MATERIAL MAY NOT BE EARTH OR DIRT.

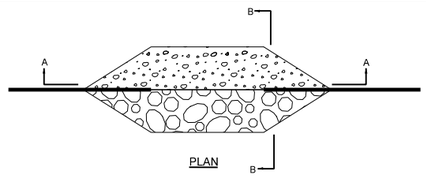
DIKE MATERIAL MUST CONFORM TO THE SHAPE OF THE STREAM CHANNEL AND MUST BE HIGH ENOUGH IN THE CHANNEL TO NOT ALLOW REGULAR FLOW TO OVERTOP THE DIKE.

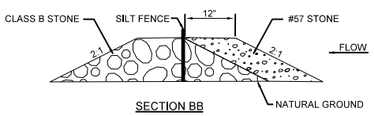
IMPERVIOUS SHEETING SHOULD BE PLASTIC OR RUBBER SHEETING THICK ENOUGH TO NOT BE EASILY PUNCTURED GIVEN THE CONDITIONS OF THE CHANNEL.

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

IMPERVIOUS DIKE DETAIL

SCALE: NTS

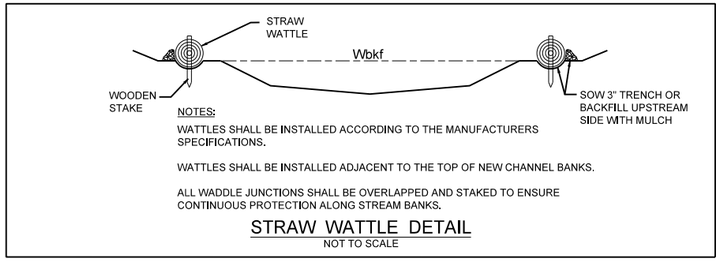




SILT FENCE ROCK OUTLET MAINTENANCE:
1. REMOVE SEDIMENT WHEN IT ACCUMULATES TO ONE-HALF THE DESIGN VOLUME.
2. CHECK STRUCTURE AND ABUTMENTS FOR EROSION, PIPING, OR ROCK DISPLACEMENT. REPAIR IMMEDIATELY.
3. REMOVE ROCK OUTLET WHEN CONTRIBUTING DRAINAGE AREA HAS BEEN PERMANENTLY STABILIZED, INSPECTED AND APPROVED. REMOVE ALL WATER AND SEDIMENT PRIOR TO REMOVING SCREEN. DISPOSE OF WASTE MATERIAL IN DESIGNATED DISPOSAL AREA.

TEMPORARY SILT FENCE ROCK OUTLET DETAIL

SCALE: NTS



NOTES:

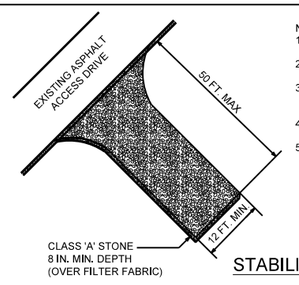
WATTLES SHALL BE INSTALLED ACCORDING TO THE MANUFACTURERS SPECIFICATIONS.

WATTLES SHALL BE INSTALLED ADJACENT TO THE TOP OF NEW CHANNEL BANKS.

ALL WADDLE JUNCTIONS SHALL BE OVERLAPPED AND STAKED TO ENSURE CONTINUOUS PROTECTION ALONG STREAM BANKS.

STRAW WATTLE DETAIL

NOT TO SCALE

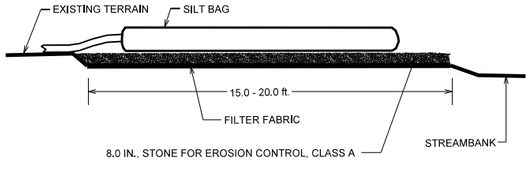


NOTES:
1. TURNING RADIUS SUFFICIENT TO ACCOMODATE LARGE TRUCKS SHALL BE PROVIDED.
2. ENTRANCE(S) SHOULD BE LOCATED TO PROVIDE FOR UTILIZATION BY ALL CONSTRUCTION VEHICLES.
3. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOPDRESSING WITH STONE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

STABILIZED CONSTRUCTION ENTRANCE DETAIL

SCALE: NTS

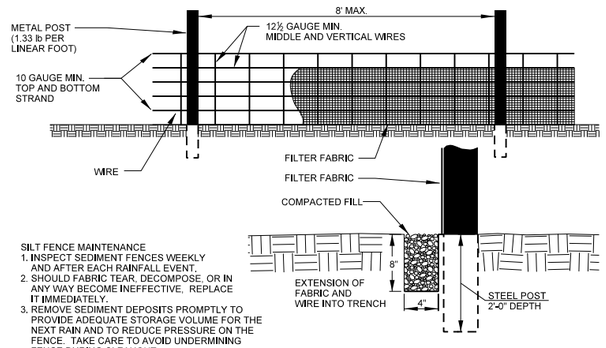
STILLING BASIN MAINTENANCE:
1. SEDIMENT BAGS SHALL BE REPLACED AND DISPOSED OF WHEN IT IS THREE-QUARTERS FULL OF SEDIMENT OR WHEN IT IS IMPRACTICAL FOR THE BAG TO FILTER THE SEDIMENT OUT AT A REASONABLE FLOW RATE.
2. ACCUMULATED SEDIMENT SHOULD BE DISPOSED OF IN A DESIGNATED DISPOSAL AREA.
3. SPENT BAGS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



NOTE: PROVIDE STABILIZED OUTLET DOWN BANK TO STREAM

SPECIAL STILLING BASIN (SILT BAG) WITH ROCK PAD

SCALE: NTS

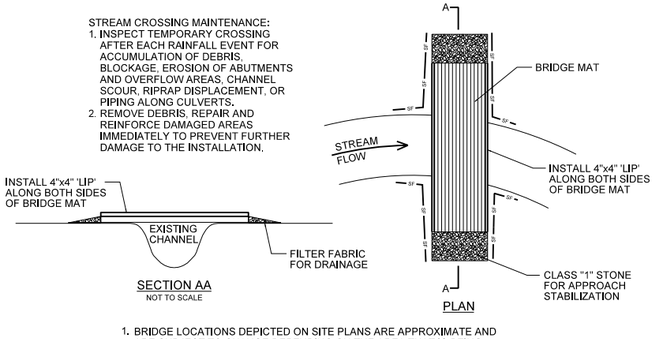


SILT FENCE MAINTENANCE
1. INSPECT SEDIMENT FENCES WEEKLY AND AFTER EACH RAINFALL EVENT.
2. SHOULD FABRIC TEAR, DECOMPOSE, OR IN ANY WAY BECOME INEFFECTIVE, REPLACE IT IMMEDIATELY.
3. REMOVE SEDIMENT DEPOSITS PROMPTLY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE.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

SILT FENCE DETAIL

SCALE: NTS

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



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

TEMPORARY BRIDGE MAT CROSSING

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

	DESCRIPTION	DATE
B	EDITED AS PER LAND QUALITY COMMENTS	MAY 2017
	REVISIONS	

NCDEQ - DIVISION OF MITIGATION SERVICES

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

STONY FORK
STREAM RESTORATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: N.T.S.

EROSION CONTROL PLAN

SHEET 18 OF 21

ELEVATION RD.
NCSR 1308
(60' PUBLIC R/W)

FEDERAL ROAD
NCSR 1331
(60' PUBLIC R/W)

164100-28-7593
N/F SHERRILL FARM, LLC
DEED BOOK 4702, PAGE 505

EXISITNG GRAVEL
ACCESS DRIVE

EXISITNG ASPHALT
DRIVE

164100-19-1598
N/F JERRY W. PARRISH
DEED BOOK 1147, PAGE 287

164100-08-6845
N/F GARY THOMAS BENSON
DEED BOOK 3701, PAGE 909

BEGIN
TRIBUTARY 2

EXISITNG EARTHEN
ACCESS DRIVE

164100-28-7593
N/F GARY T BENSON
DEED BOOK 1430, PAGE 674

CONSERVATION EASEMENT

STABILIZED
CONSTRUCTION
ENTRANCE

TEMPORARY
STAGING AREA
(TYPICAL)

END
STONY FORK
RESTORATION

164100-39-8527
N/F REBECCA C CLIFTON
DEED BOOK 3381, PAGE 37

EXISITNG
STREAM PATH

PROPOSED
STREAM PATH

BEGIN
TRIBUTARY 1

BEGIN
TRIBUTARY 1A

TEMPORARY
STAGING AREA

STABILIZED
CONSTRUCTION
ENTRANCE

EXISITNG
EARTHEN
ACCESS DRIVE

STABILIZED
CONSTRUCTION
ENTRANCE

BEGIN
TRIBUTARY 3

BEGIN
STONY
FORK

CONSERVATION EASEMENT

FUTURE ASPHALT
DRIVE, BY OTHERS

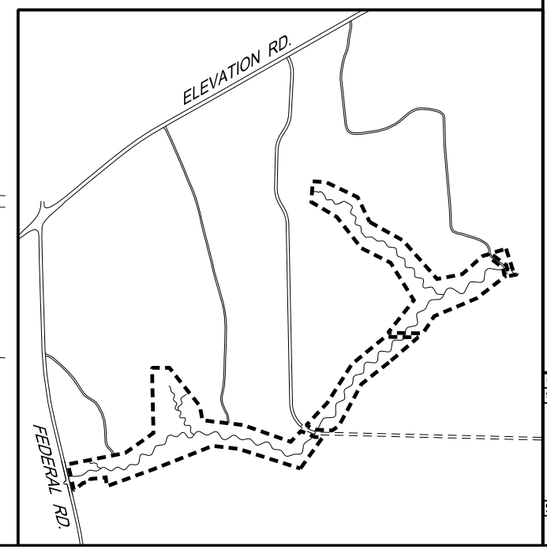
164100-17-2357
N/F MAXINE K. MEDLIN
TESTMENTARY TRUST
DEED BOOK 3734, PAGE 0001

164100-07-3890
N/F MAXINE K.
MEDLIN, HEIRS
DEED BOOK 1025, PAGE 147

164100-07-4699
N/F SEXTON GERALD BLACKMON
LIFE ESTATE
DEED BOOK 3358, PAGE 941

NC GRID
NAD '83

-130' -65' 0' 130' 260'
GRAPHIC SCALE



NORTH CAROLINA
PROFESSIONAL
SEAL
32733
ENGINEER
GARY MICHAEL MRYNCZA

NO.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ - DIVISION OF
MITIGATION SERVICES

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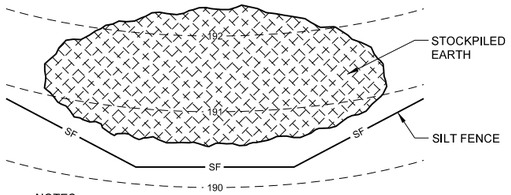
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

STONY FORK
STREAM RESTORATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018
SCALE: GRAPHIC

EROSION
CONTROL
PLAN
-OVERVIEW-

SHEET 19 OF 21



NOTES:

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

ALL STOCKPILES SHALL BE WITHIN LIMITS OF DISTURBANCE.

SILT FENCE SHALL BE INSTALLED DOWN GRADIENT OF ALL STOCK-PILES.

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

TEMPORARY STOCKPILE DETAIL

SCALE: NTS

LIMITS OF DISTURBANCE = 24.95 ACRES

FEDERAL ROAD NCSR 1331 (60' PUBLIC R/W)

EXISITNG EARTHEN ACCESS DRIVE

STABILIZED CONSTRUCTION ENTRANCE

TEMPORARY BRIDGE MAT STREAM CROSSING. EXACT LOCATION AND QUANTITY OF CROSSINGS WILL BE DETERMINED BY DESIGN REPRESENTATIVE IN THE FIELD.

EXISTING WETLAND

EXISTING GRAVEL ACCESS DRIVE

TEMPORARY STAGING AREA

STABILIZED CONSTRUCTION ENTRANCE

EXISITNG ASPHALT DRIVE

FUTURE ASPHALT DRIVE, BY OTHERS

TEMPORARY STOCK PILE, TYP. (SEE DEATIL THIS SHEET)

LOD

SF

W

MATCHLINE - SEE SHEET 21

NO GRID MAG 03

–80′ –40′ 0′ 80′ 160′

GRAPHIC SCALE

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS		
SYM.	DESCRIPTION	DATE

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RALEIGH, NORTH CAROLINA 27609

STONY FORK
STREAM RESTORATION SITE

JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018

SCALE: GRAPHIC

EROSION CONTROL PLAN

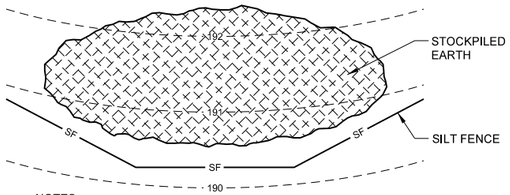
SHEET 20 OF 21

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NC GRID NAD 83

–80′ –40′ 0′ 80′ 160′

GRAPHIC SCALE



NOTES:

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

ALL STOCKPILES SHALL BE WITHIN LIMITS OF DISTURBANCE.

SILT FENCE SHALL BE INSTALLED DOWN GRADIENT OF ALL STOCK-PILES.

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

TEMPORARY STOCKPILE DETAIL

SCALE: NTS

LIMITS OF DISTURBANCE = 24.95 ACRES

EXISTING WETLAND

EXISITNG ASPHALT DRIVE

EXISITNG EARTHEN ACCESS DRIVE

STABILIZED CONSTRUCTION ENTRANCE

TEMPORARY STAGING AREA (TYP.)

EXISTING WETLAND

TEMPORARY STOCK PILE, TYP. (SEE DEATIL THIS SHEET)

TEMPORARY BRIDGE MAT STREAM CROSSING. EXACT LOCATION AND QUANTITY OF CROSSINGS WILL BE DETERMINED BY DESIGN REPRESENTATIVE IN THE FIELD.

MATCHLINE - SEE SHEET 20

NO.	BY	DESCRIPTION	DATE
	SYM.	REVISIONS	

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RALEIGH, NORTH CAROLINA 27609

STONY FORK STREAM RESTORATION SITE

JOHNSTON COUNTY, NORTH CAROLINA

DATE: AUGUST 2018

SCALE: GRAPHIC

EROSION CONTROL PLAN

SHEET 21 OF 21

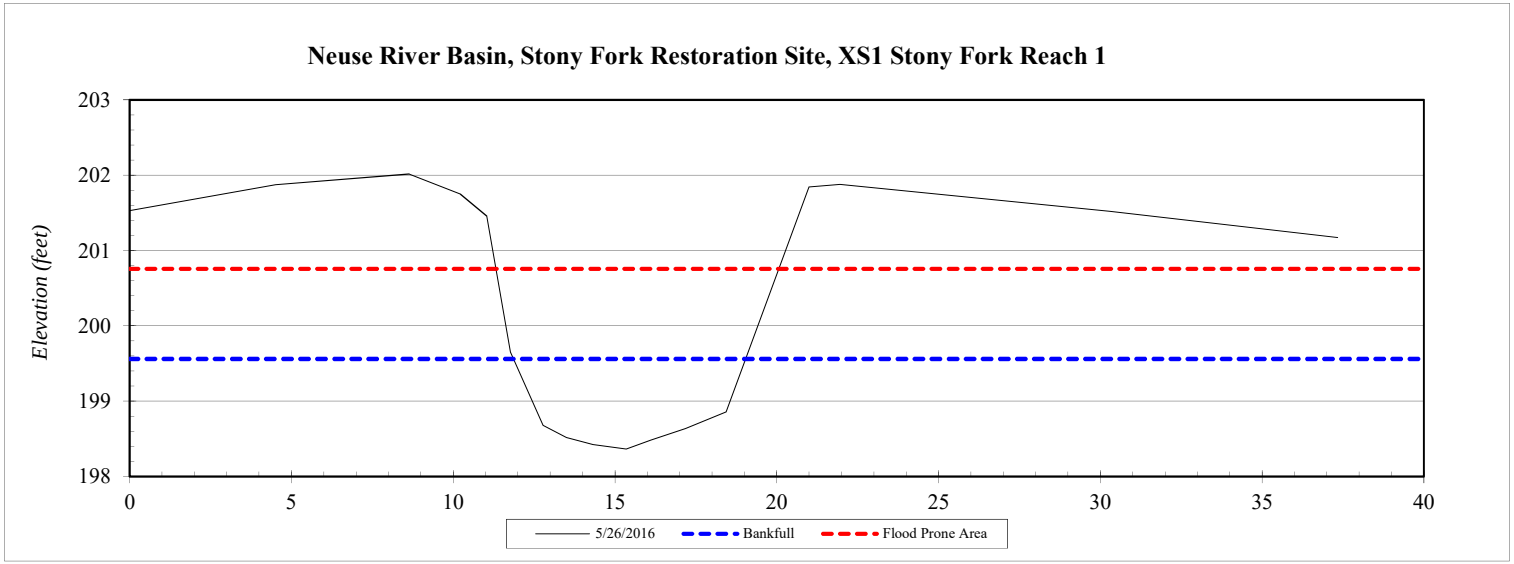
12.2 Data Analysis/Supplemental Information and Maps

Existing Conditions Cross-Sections
Pebble Count Tables
Stream Morphological Tables

River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS1 Stony Fork Reach 1
Drainage Area:	175 acres
Date:	5/26/2016
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.0	201.53
4.5	201.87
8.6	202.02
10.2	201.75
11.0	201.46
11.8	199.65
12.8	198.68
13.5	198.52
14.3	198.43
15.4	198.36
16.1	198.48
17.2	198.64
18.4	198.86
21.0	201.84
22.0	201.88
30.3	201.52
37.3	201.17

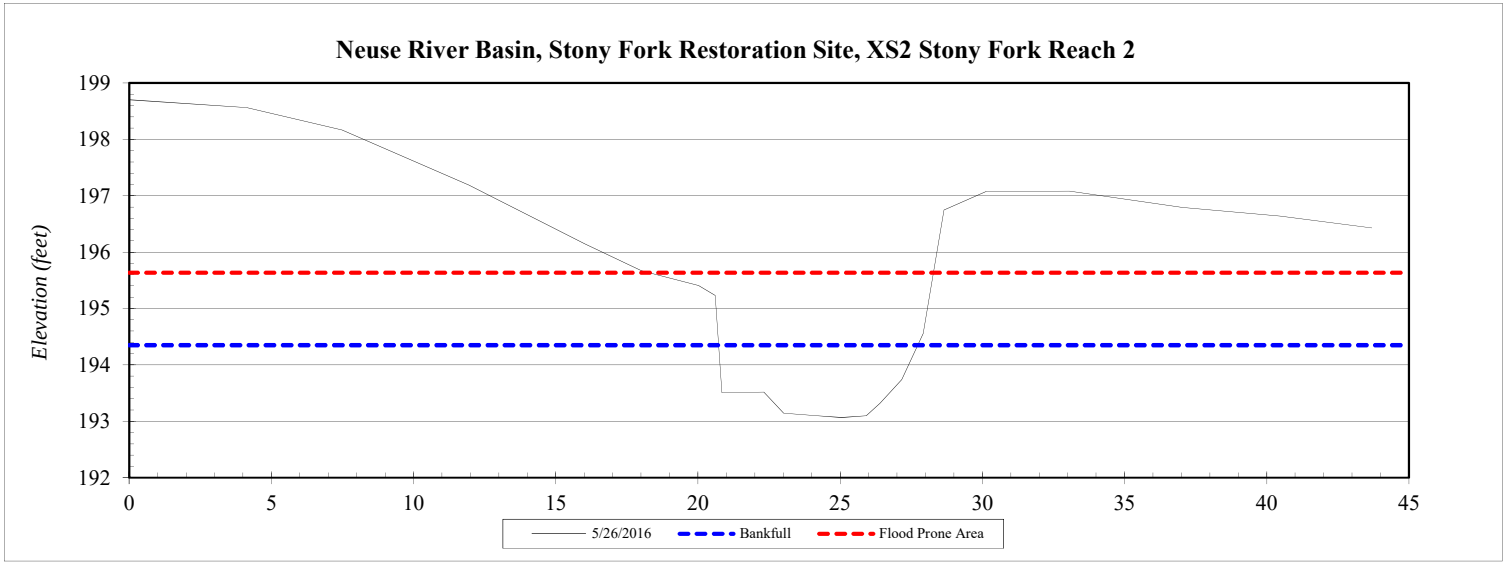
SUMMARY DATA	
Bankfull Elevation:	199.6
Bankfull Cross-Sectional Area:	6.4
Bankfull Width:	7.2
Flood Prone Area Elevation:	200.8
Flood Prone Width:	8.7
Max Depth at Bankfull:	1.2
Mean Depth at Bankfull:	0.9
W / D Ratio:	8.1
Entrenchment Ratio:	1.2
Bank Height Ratio:	2.9



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS2 Stony Fork Reach 2
Drainage Area:	190 acres
Date:	5/26/2016
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.0	198.70
4.1	198.56
7.5	198.16
11.9	197.19
16.0	196.15
18.0	195.67
20.0	195.41
20.6	195.23
20.8	193.51
22.3	193.52
23.0	193.14
24.2	193.10
25.1	193.07
25.9	193.10
26.4	193.32
27.2	193.74
27.9	194.56
28.7	196.75
30.1	197.07
33.1	197.08
37.0	196.79
40.5	196.64
43.7	196.43

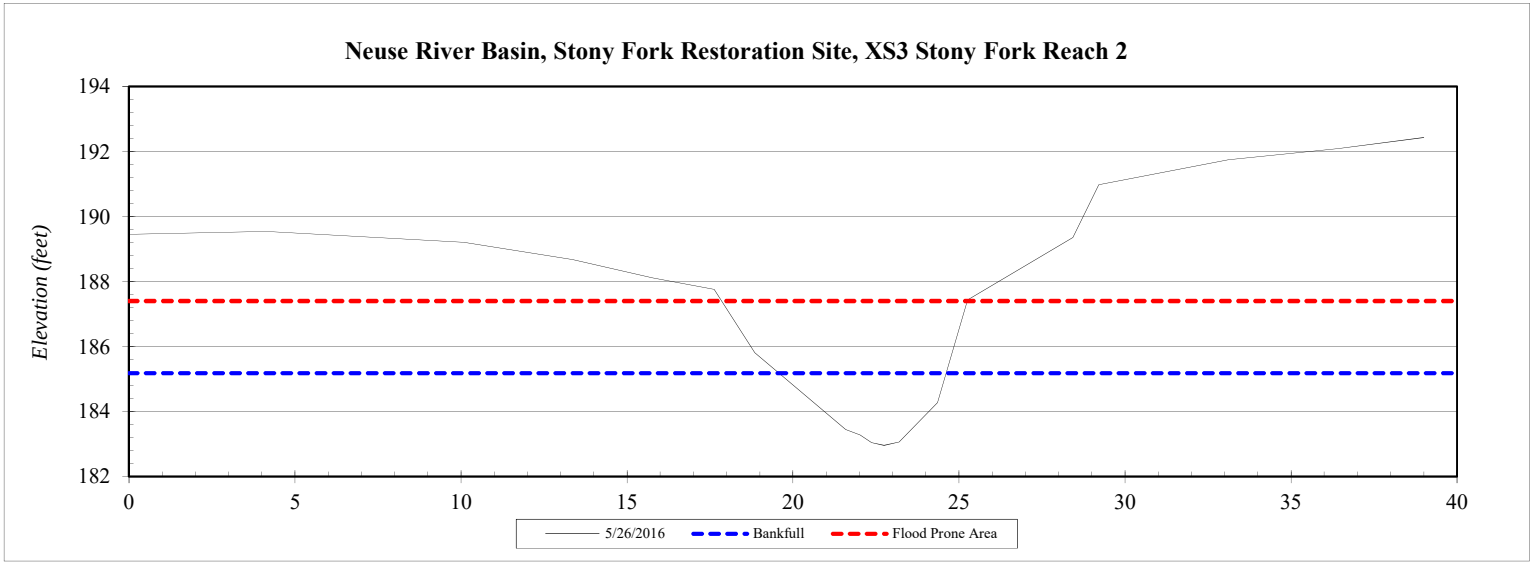
SUMMARY DATA	
Bankfull Elevation:	194.4
Bankfull Cross-Sectional Area:	7.0
Bankfull Width:	7.0
Flood Prone Area Elevation:	195.6
Flood Prone Width:	10.0
Max Depth at Bankfull:	1.3
Mean Depth at Bankfull:	1.0
W / D Ratio:	7.0
Entrenchment Ratio:	1.4
Bank Height Ratio:	1.7



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS3 Stony Fork Reach 2
Drainage Area:	217 acres
Date:	5/26/2016
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.0	189.45
4.1	189.55
10.1	189.21
13.4	188.67
15.8	188.11
17.6	187.76
18.9	185.81
21.6	183.44
22.0	183.27
22.4	183.05
22.7	182.96
23.2	183.06
24.4	184.28
25.3	187.44
28.4	189.36
29.2	190.98
33.1	191.74
36.4	192.09
39.0	192.43

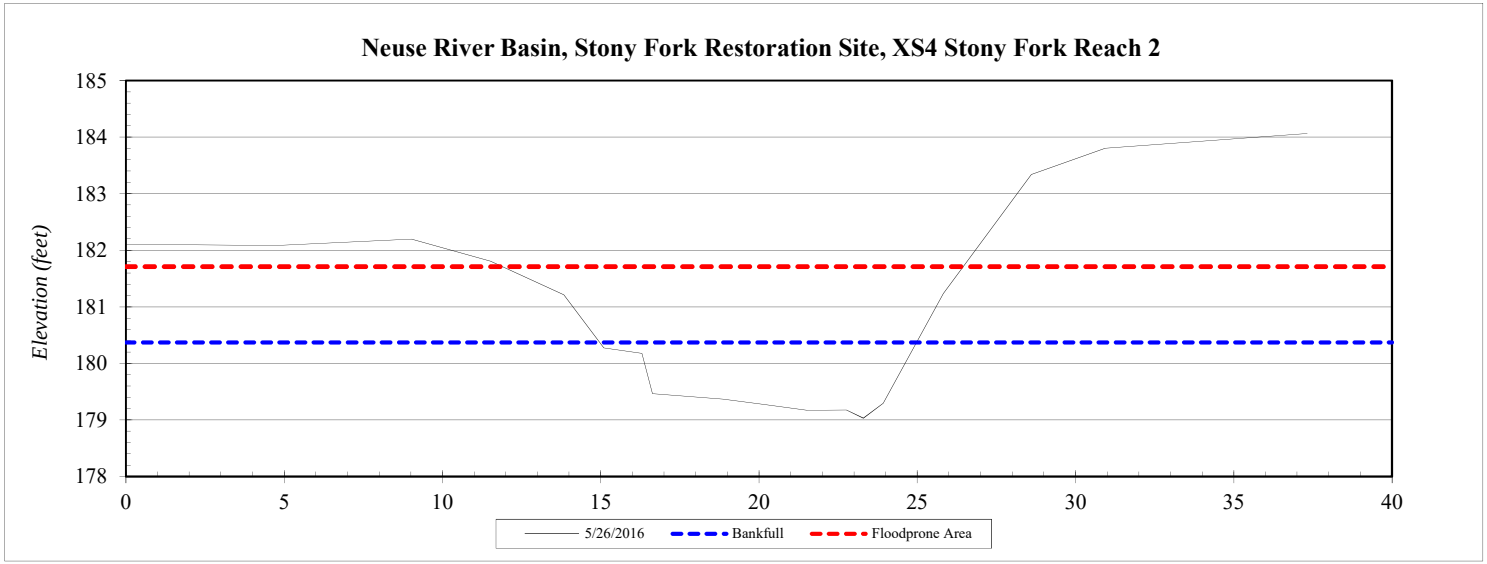
SUMMARY DATA	
Bankfull Elevation:	185.2
Bankfull Cross-Sectional Area:	6.9
Bankfull Width:	5.0
Flood Prone Area Elevation:	187.4
Flood Prone Width:	7.4
Max Depth at Bankfull:	2.2
Mean Depth at Bankfull:	1.4
W / D Ratio:	3.6
Entrenchment Ratio:	1.5
Bank Height Ratio:	2.1



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS4 Stony Fork Reach 2
Drainage Area:	254 acres
Date:	5/26/2016
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.0	182.10
4.7	182.08
9.0	182.19
11.5	181.81
13.8	181.21
15.1	180.27
16.3	180.18
16.6	179.46
18.9	179.37
20.2	179.27
21.5	179.17
22.8	179.18
23.3	179.03
23.9	179.30
25.8	181.24
28.6	183.34
30.9	183.80
37.3	184.06

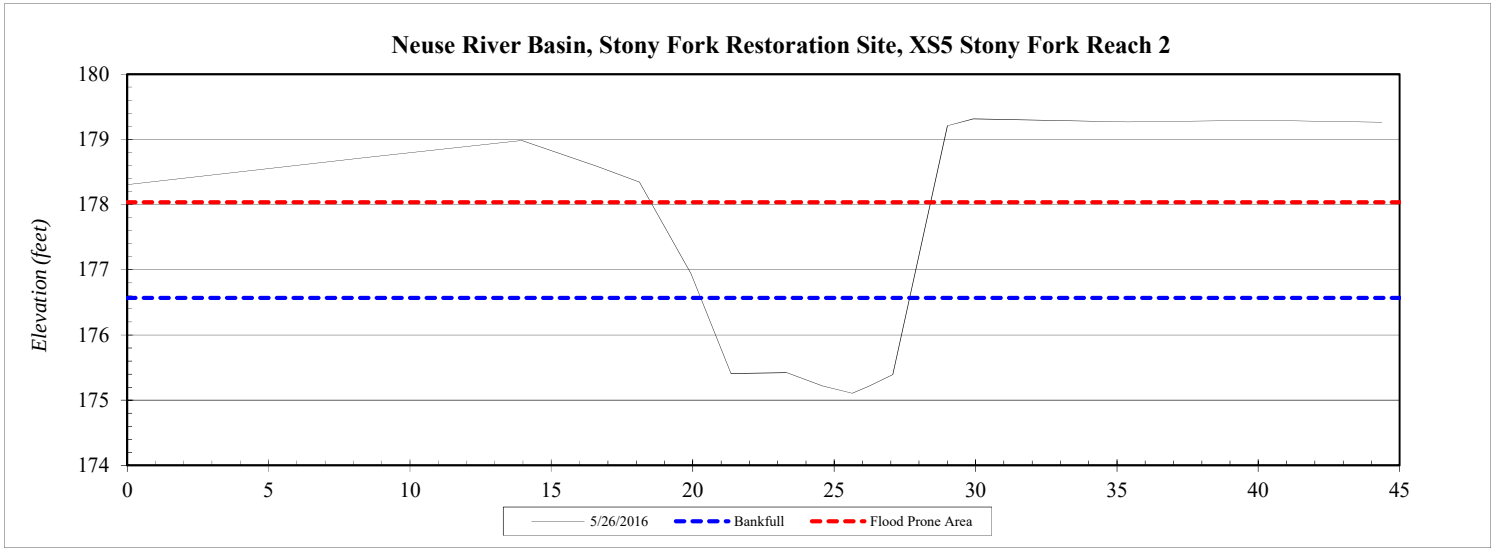
SUMMARY DATA	
Bankfull Elevation:	180.4
Bankfull Cross-Sectional Area:	8.9
Bankfull Width:	10.0
Flood Prone Area Elevation:	181.7
Flood Prone Width:	14.5
Max Depth at Bankfull:	1.3
Mean Depth at Bankfull:	0.9
W / D Ratio:	11.2
Entrenchment Ratio:	1.5
Bank Height Ratio:	1.6



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS5 Stony Fork Reach 2
Drainage Area:	264 acres
Date:	5/26/2016
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.0	178.30
8.5	178.72
14.0	178.98
16.6	178.59
18.1	178.34
19.9	176.94
21.4	175.41
23.3	175.42
24.6	175.22
25.6	175.11
26.3	175.22
27.1	175.39
29.0	179.21
29.9	179.32
35.4	179.27
40.1	179.29
44.4	179.26

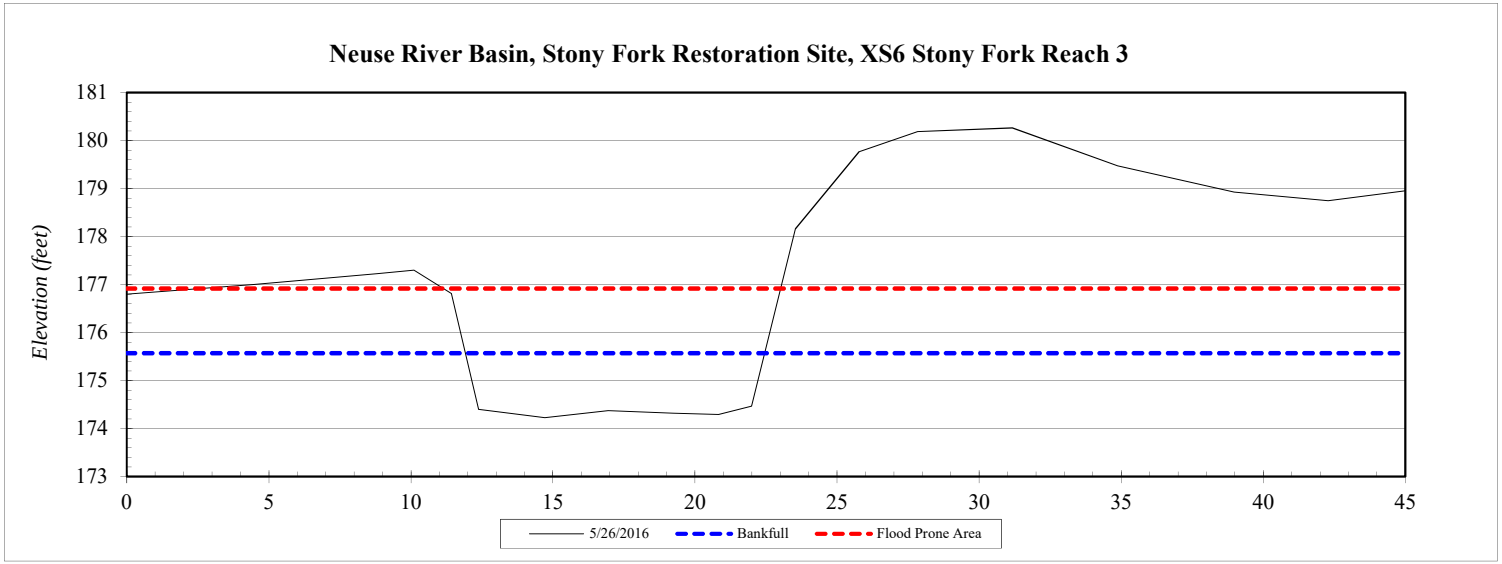
SUMMARY DATA	
Bankfull Elevation:	176.6
Bankfull Cross-Sectional Area:	8.2
Bankfull Width:	7.4
Flood Prone Area Elevation:	178.0
Flood Prone Width:	9.9
Max Depth at Bankfull:	1.5
Mean Depth at Bankfull:	1.1
W / D Ratio:	6.7
Entrenchment Ratio:	1.3
Bank Height Ratio:	2.2



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS6 Stony Fork Reach 3
Drainage Area:	414 acres
Date:	5/26/2016
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.0	176.80
4.4	177.00
8.8	177.22
10.1	177.30
11.4	176.81
12.4	174.40
14.7	174.22
16.9	174.37
19.2	174.32
20.8	174.29
22.0	174.47
23.5	178.16
25.8	179.77
27.8	180.19
31.2	180.26
34.9	179.48
39.0	178.93
42.3	178.75
45.0	178.96

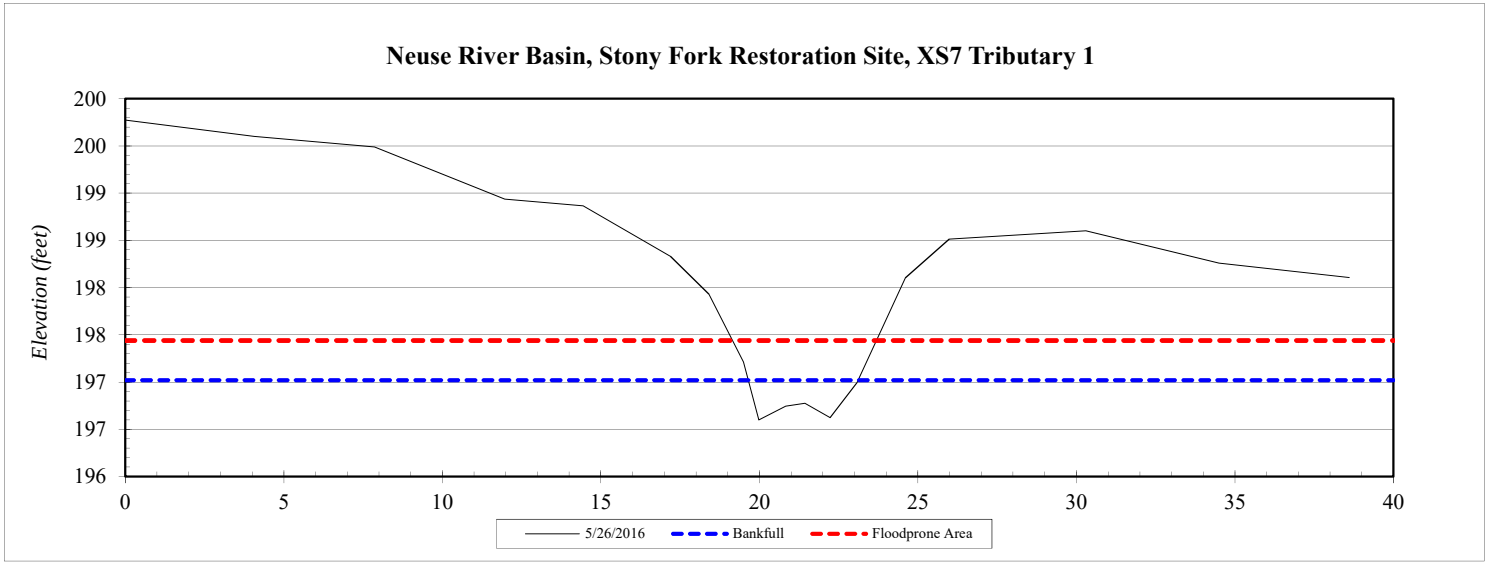
SUMMARY DATA	
Bankfull Elevation:	175.6
Bankfull Cross-Sectional Area:	12.5
Bankfull Width:	10.5
Flood Prone Area Elevation:	176.9
Flood Prone Width:	14.4
Max Depth at Bankfull:	1.3
Mean Depth at Bankfull:	1.2
W / D Ratio:	8.8
Entrenchment Ratio:	1.4
Bank Height Ratio:	2.0



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS7 Tributary 1
Drainage Area:	12 acres
Date:	5/26/2016
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.0	199.77
4.1	199.60
7.9	199.49
12.0	198.93
14.4	198.87
17.2	198.33
18.4	197.93
19.5	197.21
20.0	196.60
20.8	196.75
21.4	196.77
22.2	196.62
23.1	196.99
24.6	198.10
26.0	198.51
30.3	198.60
34.5	198.26
38.6	198.11

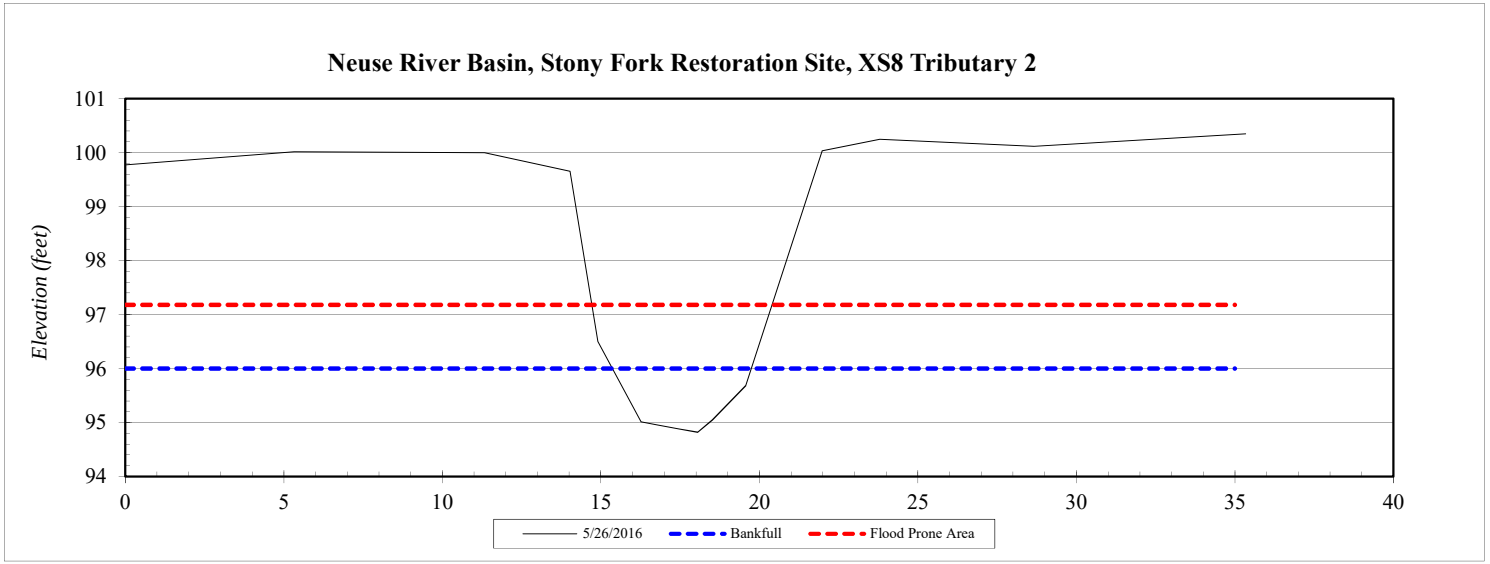
SUMMARY DATA	
Bankfull Elevation:	197.0
Bankfull Cross-Sectional Area:	0.9
Bankfull Width:	3.4
Flood Prone Area Elevation:	197.4
Flood Prone Width:	4.5
Max Depth at Bankfull:	0.4
Mean Depth at Bankfull:	0.3
W / D Ratio:	12.8
Entrenchment Ratio:	1.3
Bank Height Ratio:	4.5



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS8 Tributary 2
Drainage Area:	93 acres
Date:	5/26/2016
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.0	99.77
5.3	100.02
11.3	100.00
14.0	99.65
14.9	96.50
16.3	95.01
16.7	94.96
17.5	94.88
18.1	94.82
18.5	95.05
19.6	95.68
22.0	100.03
23.8	100.25
28.7	100.11
35.3	100.35

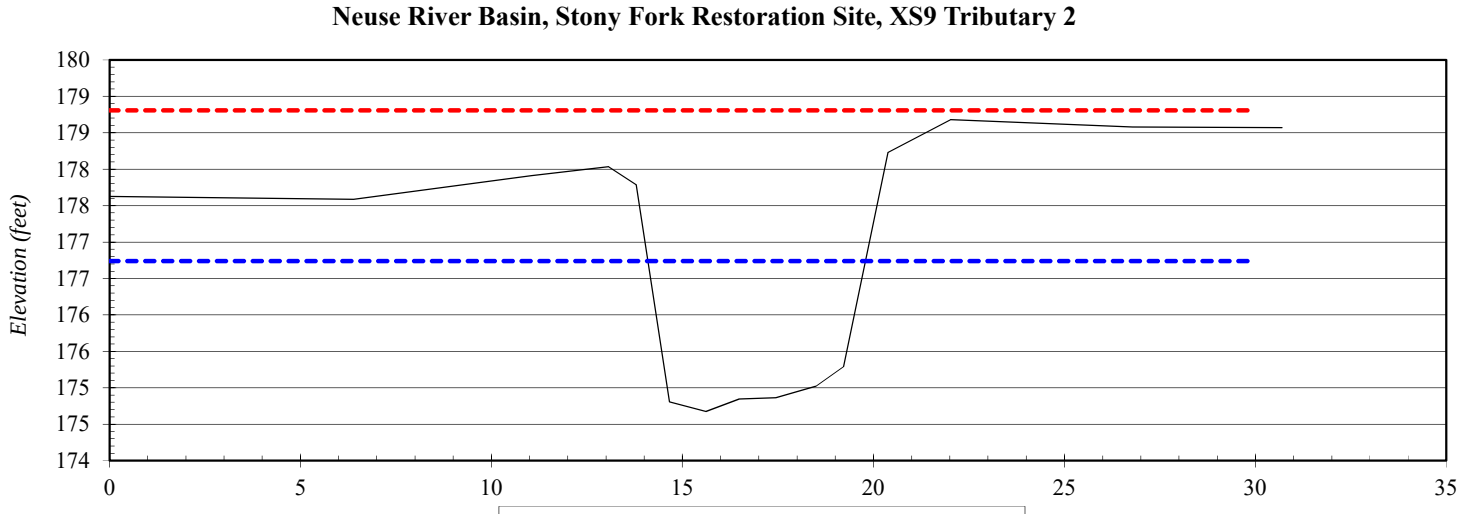
SUMMARY DATA	
Bankfull Elevation:	96.0
Bankfull Cross-Sectional Area:	3.6
Bankfull Width:	4.4
Flood Prone Area Elevation:	97.2
Flood Prone Width:	5.7
Max Depth at Bankfull:	1.2
Mean Depth at Bankfull:	0.8
W / D Ratio:	5.4
Entrenchment Ratio:	1.3
Bank Height Ratio:	4.1



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS9 Tributary 2
Drainage Area:	149.5 acres
Date:	5/26/2016
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.0	177.63
6.4	177.59
11.0	177.91
13.1	178.03
13.8	177.79
14.7	174.81
15.6	174.67
16.5	174.85
17.5	174.86
18.5	175.02
19.2	175.29
20.4	178.23
22.0	178.68
26.8	178.58
30.7	178.57

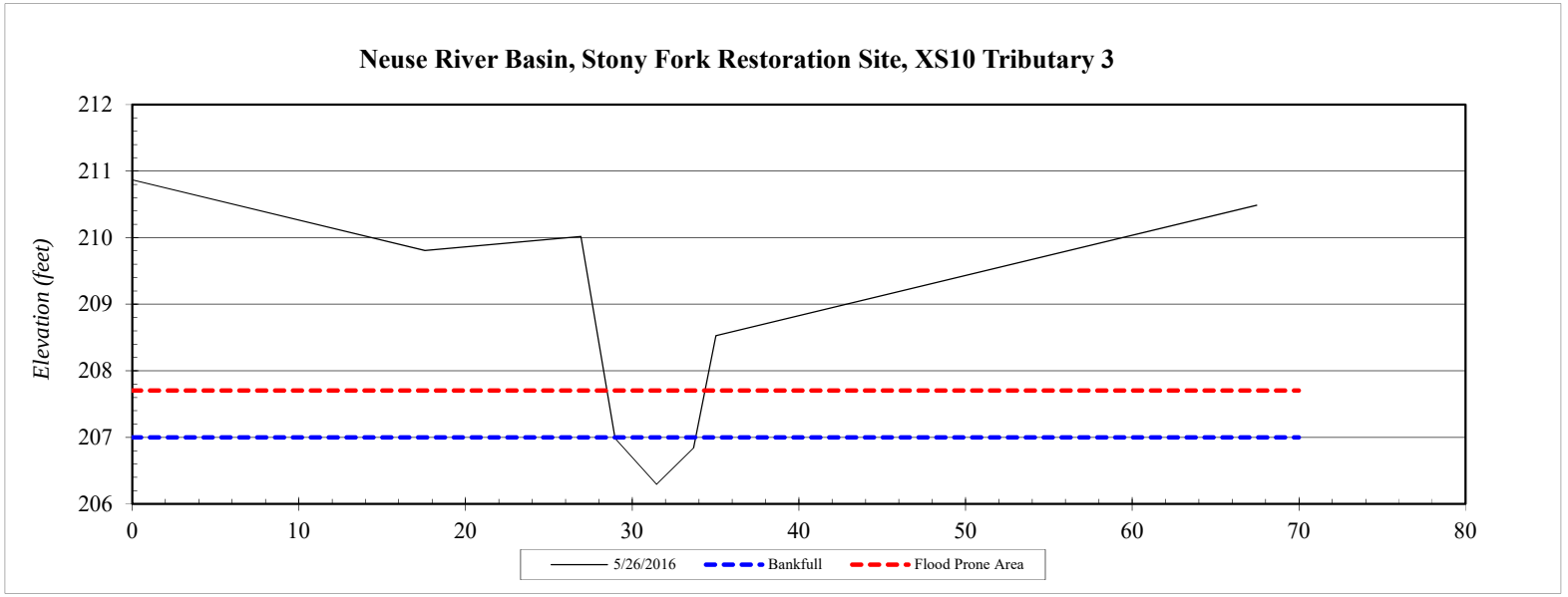
SUMMARY DATA	
Bankfull Elevation:	176.7
Bankfull Cross-Sectional Area:	9.4
Bankfull Width:	5.7
Flood Prone Area Elevation:	178.8
Flood Prone Width:	>30
Max Depth at Bankfull:	2.1
Mean Depth at Bankfull:	1.6
W / D Ratio:	3.5
Entrenchment Ratio:	5.3
Bank Height Ratio:	1.5



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS10 Tributary 3
Drainage Area:	29 acres
Date:	May-16
Field Crew:	Survey staff

Station	Elevation
0.0	210.87
17.6	209.81
26.9	210.02
29.0	206.99
31.5	206.30
33.7	206.84
35.0	208.53
67.5	210.49

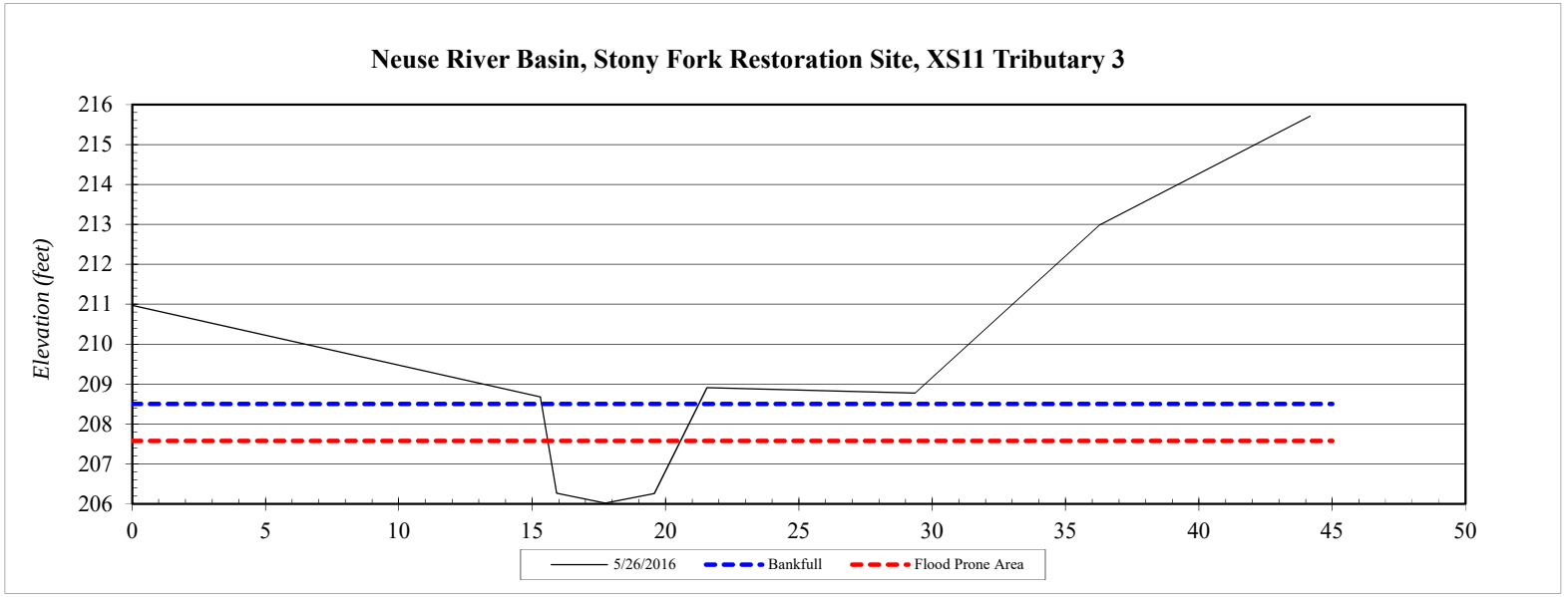
SUMMARY DATA	
Bankfull Elevation:	207.0
Bankfull Cross-Sectional Area:	1.9
Bankfull Width:	4.8
Flood Prone Area Elevation:	207.7
Flood Prone Width:	5.9
Max Depth at Bankfull:	0.7
Mean Depth at Bankfull:	0.4
W / D Ratio:	12.6
Entrenchment Ratio:	1.3
Bank Height Ratio:	3.2



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS11 Tributary 3
Drainage Area:	29 acres
Date:	May-16
Field Crew:	Survey staff

Station	Elevation
0.0	210.97
15.3	208.68
15.9	206.27
17.7	206.02
19.6	206.26
21.6	208.91
29.4	208.78
36.3	212.99
44.2	215.71

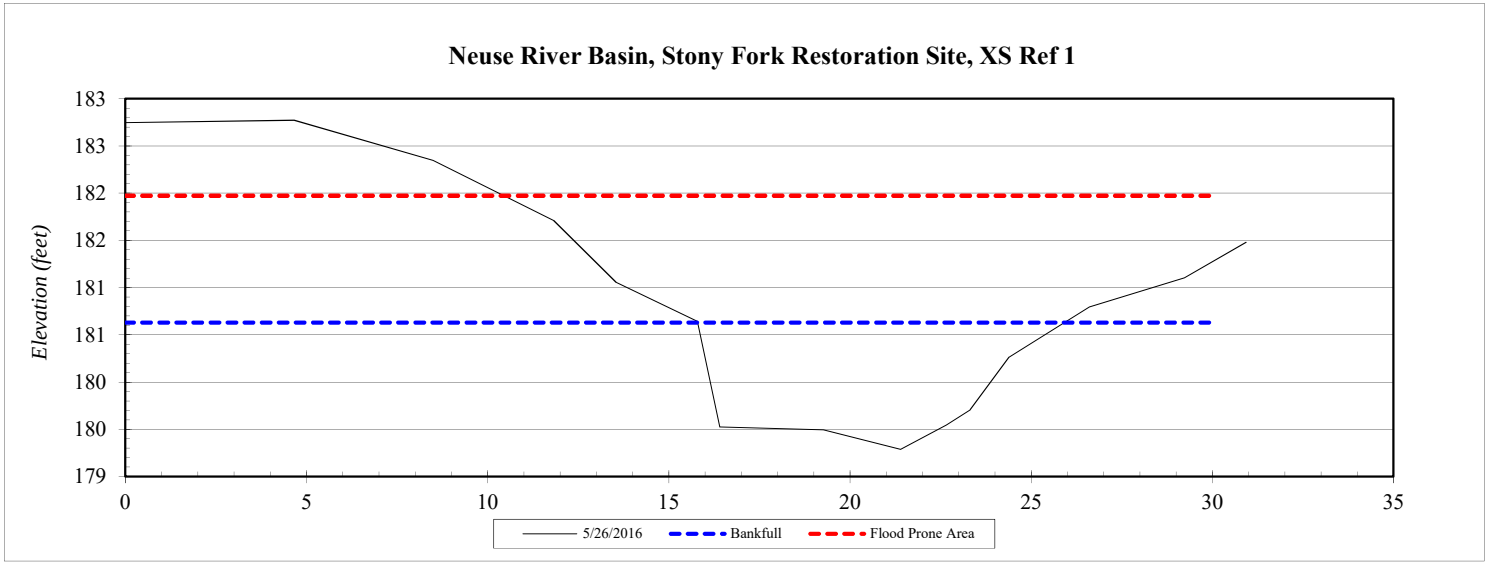
SUMMARY DATA	
Bankfull Elevation:	206.8
Bankfull Cross-Sectional Area:	2.6
Bankfull Width:	4.2
Flood Prone Area Elevation:	207.6
Flood Prone Width:	5.0
Max Depth at Bankfull:	0.8
Mean Depth at Bankfull:	0.6
W / D Ratio:	6.9
Entrenchment Ratio:	1.2
Bank Height Ratio:	3.4



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS Ref 1
Drainage Area:	263.9 acres
Date:	5/26/2016
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.0	182.75
4.7	182.77
8.5	182.35
11.8	181.71
13.5	181.06
15.8	180.64
16.4	179.53
19.3	179.49
21.4	179.29
22.7	179.54
23.3	179.70
24.4	180.26
26.6	180.80
29.2	181.10
30.9	181.48

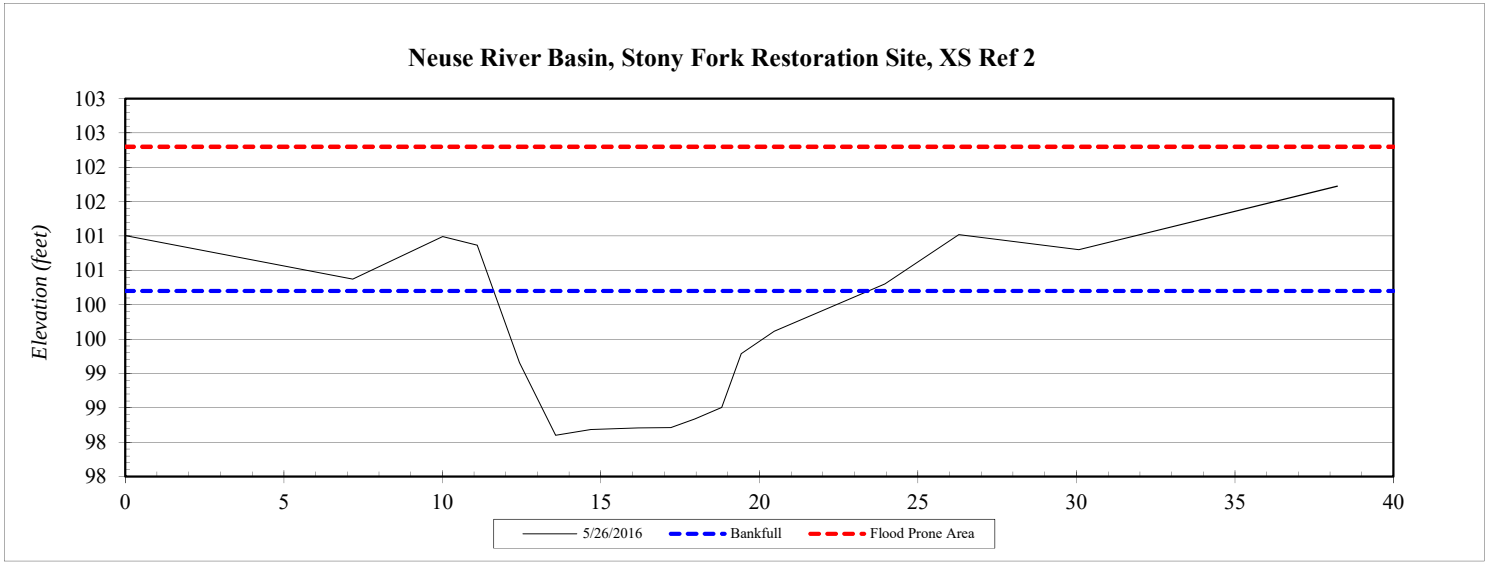
SUMMARY DATA	
Bankfull Elevation:	180.6
Bankfull Cross-Sectional Area:	9.3
Bankfull Width:	10.1
Flood Prone Area Elevation:	182.0
Flood Prone Width:	>20
Max Depth at Bankfull:	1.3
Mean Depth at Bankfull:	0.9
W / D Ratio:	11.0
Entrenchment Ratio:	2.0
Bank Height Ratio:	1.1



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS Ref 2
Drainage Area:	536.8 acres
Date:	5/26/2016
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.0	101.01
7.2	100.37
10.0	100.99
11.1	100.87
12.4	99.16
13.6	98.10
14.7	98.18
16.2	98.21
17.2	98.21
18.0	98.34
18.8	98.50
19.4	99.29
20.5	99.61
24.0	100.30
26.3	101.02
30.1	100.80
38.2	101.73

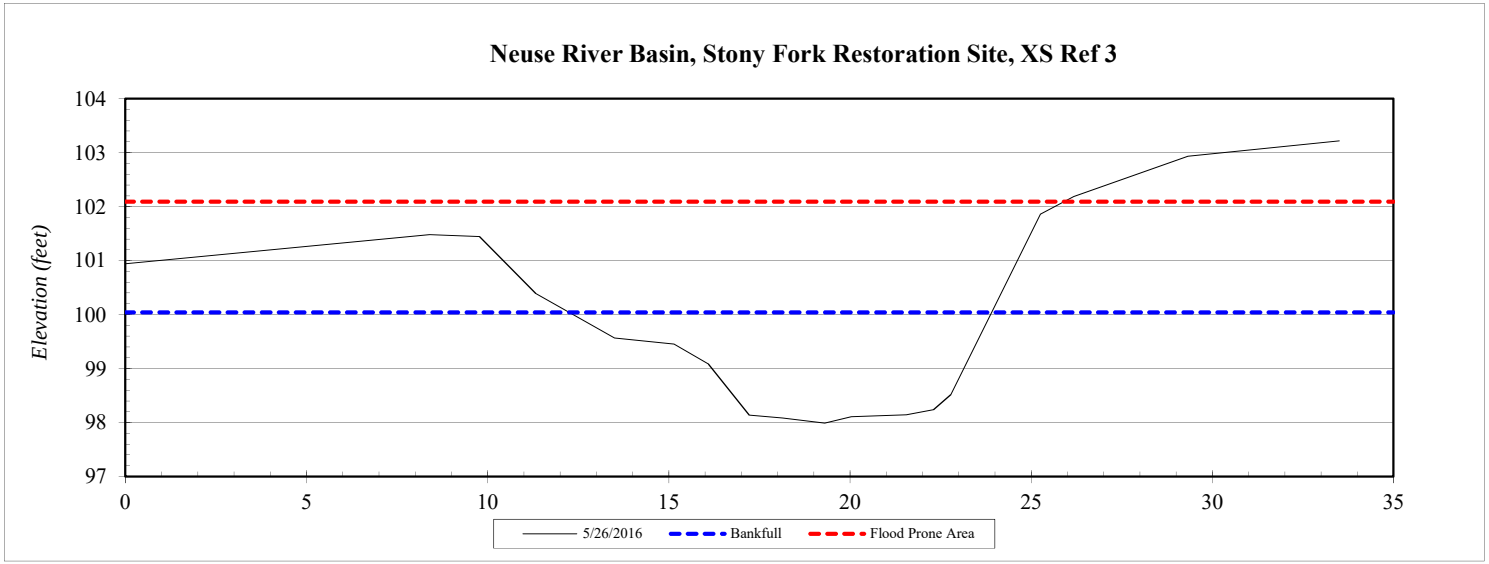
SUMMARY DATA	
Bankfull Elevation:	100.2
Bankfull Cross-Sectional Area:	15.0
Bankfull Width:	11.8
Flood Prone Area Elevation:	102.3
Flood Prone Width:	>38
Max Depth at Bankfull:	2.1
Mean Depth at Bankfull:	1.3
W / D Ratio:	9.3
Entrenchment Ratio:	3.2
Bank Height Ratio:	1.1



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS Ref 3
Drainage Area:	536.8 acres
Date:	5/26/2016
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.0	100.94
8.4	101.48
9.8	101.44
11.3	100.39
13.5	99.56
15.1	99.45
16.1	99.09
17.2	98.14
18.1	98.09
19.3	97.99
20.0	98.11
21.6	98.14
22.3	98.24
22.8	98.52
25.3	101.86
26.2	102.19
29.3	102.93
33.5	103.22

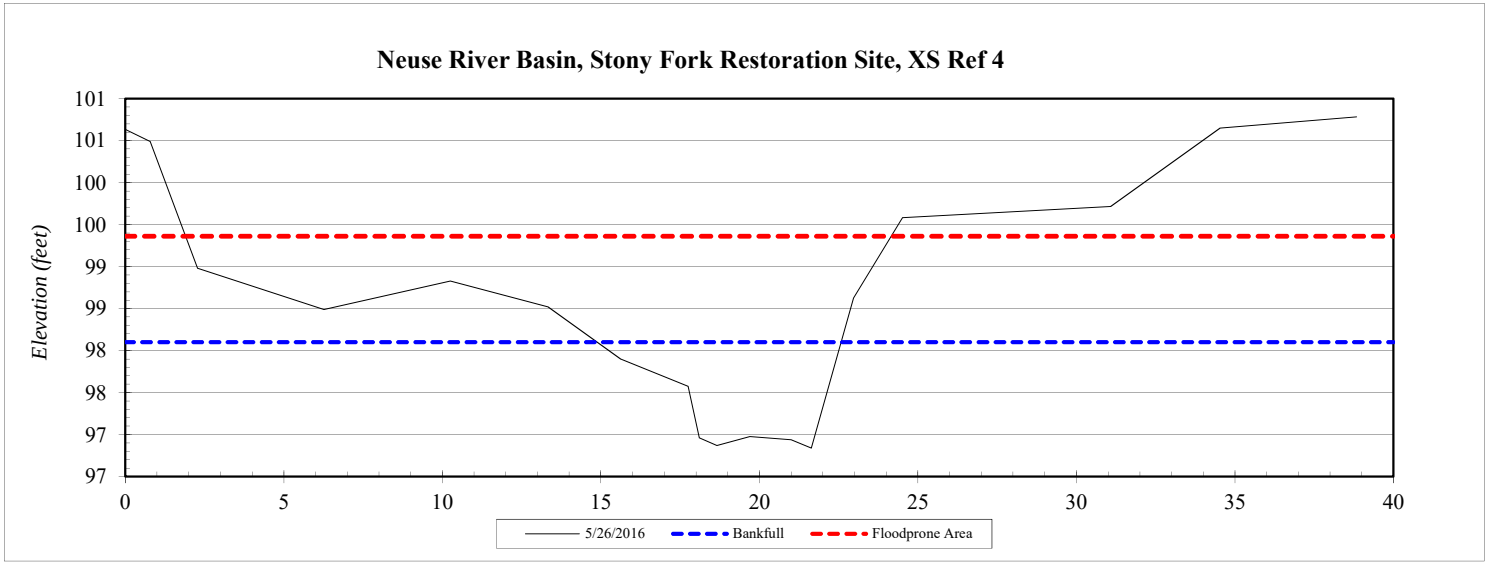
SUMMARY DATA	
Bankfull Elevation:	100.0
Bankfull Cross-Sectional Area:	15.0
Bankfull Width:	11.7
Flood Prone Area Elevation:	102.1
Flood Prone Width:	>25
Max Depth at Bankfull:	2.1
Mean Depth at Bankfull:	1.3
W / D Ratio:	9.1
Entrenchment Ratio:	2.1
Bank Height Ratio:	1.5



River Basin:	Neuse
Project Name	Stony Fork Restoration Site
XS ID	XS Ref 4
Drainage Area:	149.5 acres
Date:	5/26/2016
Field Crew:	T. Seelinger, A. French

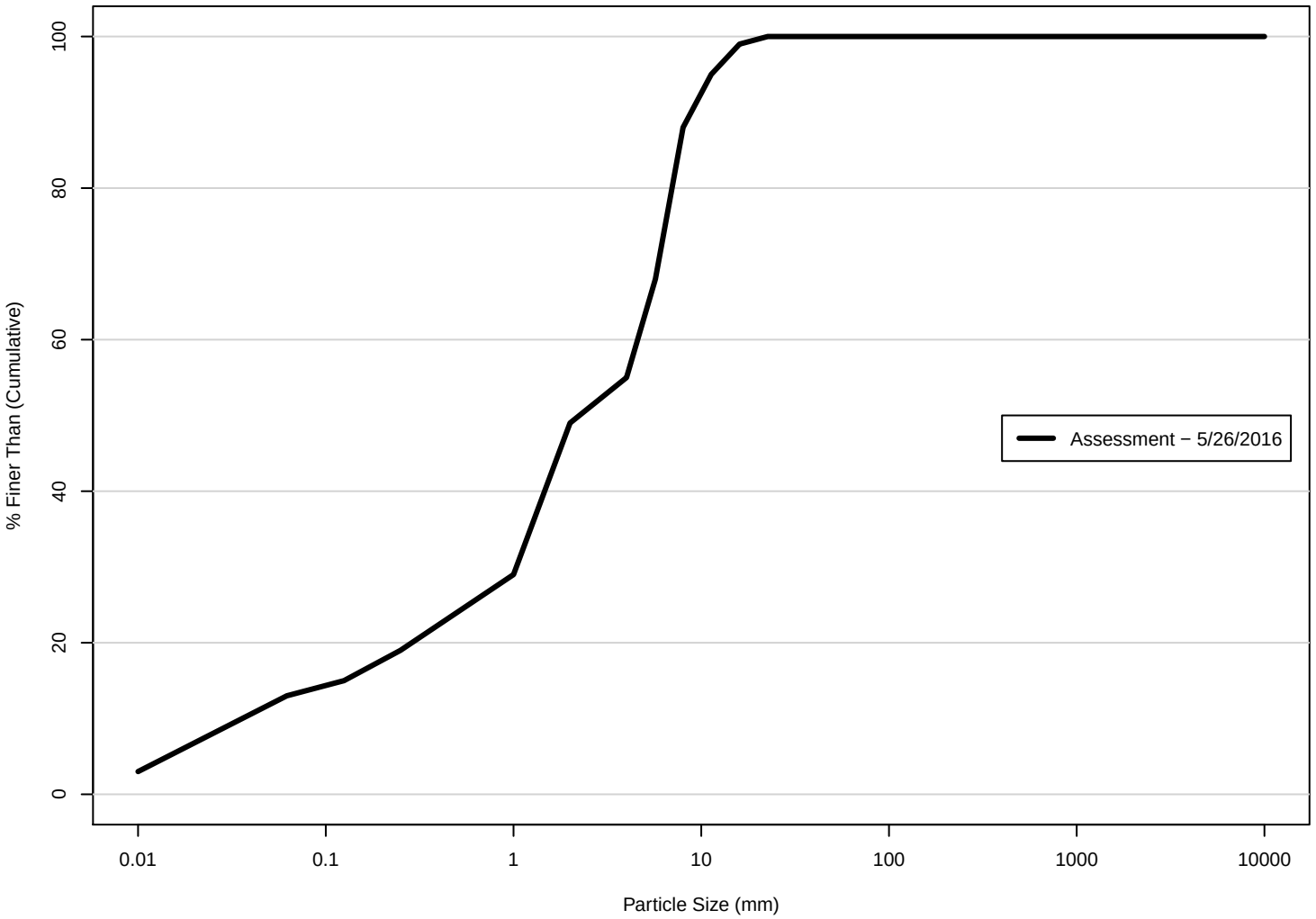
Station	Elevation
0.0	100.63
0.8	100.49
2.3	98.98
6.3	98.49
10.3	98.83
13.3	98.52
15.6	97.90
17.8	97.57
18.1	96.96
18.7	96.87
19.7	96.98
21.0	96.94
21.6	96.84
23.0	98.62
24.5	99.58
31.1	99.72
34.5	100.65
38.8	100.78

SUMMARY DATA	
Bankfull Elevation:	98.1
Bankfull Cross-Sectional Area:	5.9
Bankfull Width:	7.7
Flood Prone Area Elevation:	99.4
Flood Prone Width:	22.3
Max Depth at Bankfull:	1.3
Mean Depth at Bankfull:	0.8
W / D Ratio:	10.0
Entrenchment Ratio:	2.9
Bank Height Ratio:	1.2



Particle Size Distribution
Stony Fork Stream Restoration Site
XS1

Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	3
Very Fine	.062 − .125	S	10
Fine	.125 − .25	A	2
Medium	.25 − .50	N	4
Coarse	.50 − 1	D	5
Very Coarse	1 − 2	S	5
Very Fine	2 − 4		20
Fine	4 − 5.7	G	6
Fine	5.7 − 8	R	13
Medium	8 − 11.3	A	20
Medium	11.3 − 16	V	7
Coarse	16 − 22.6	E	4
Coarse	22.6 − 32	L	1
Very Coarse	32 − 45	S	
Very Coarse	45 − 64		
Small	64 − 90	C	
Small	90 − 128	O	
Large	128 − 180	B	
Large	180 − 256	L	
Small	256 − 362	B	
Small	362 − 512	L	
Medium	512 − 1024	D	
Lrg− Very Lrg	1024 − 2048	R	
Bedrock	>2048	BDRK	
		Total	100



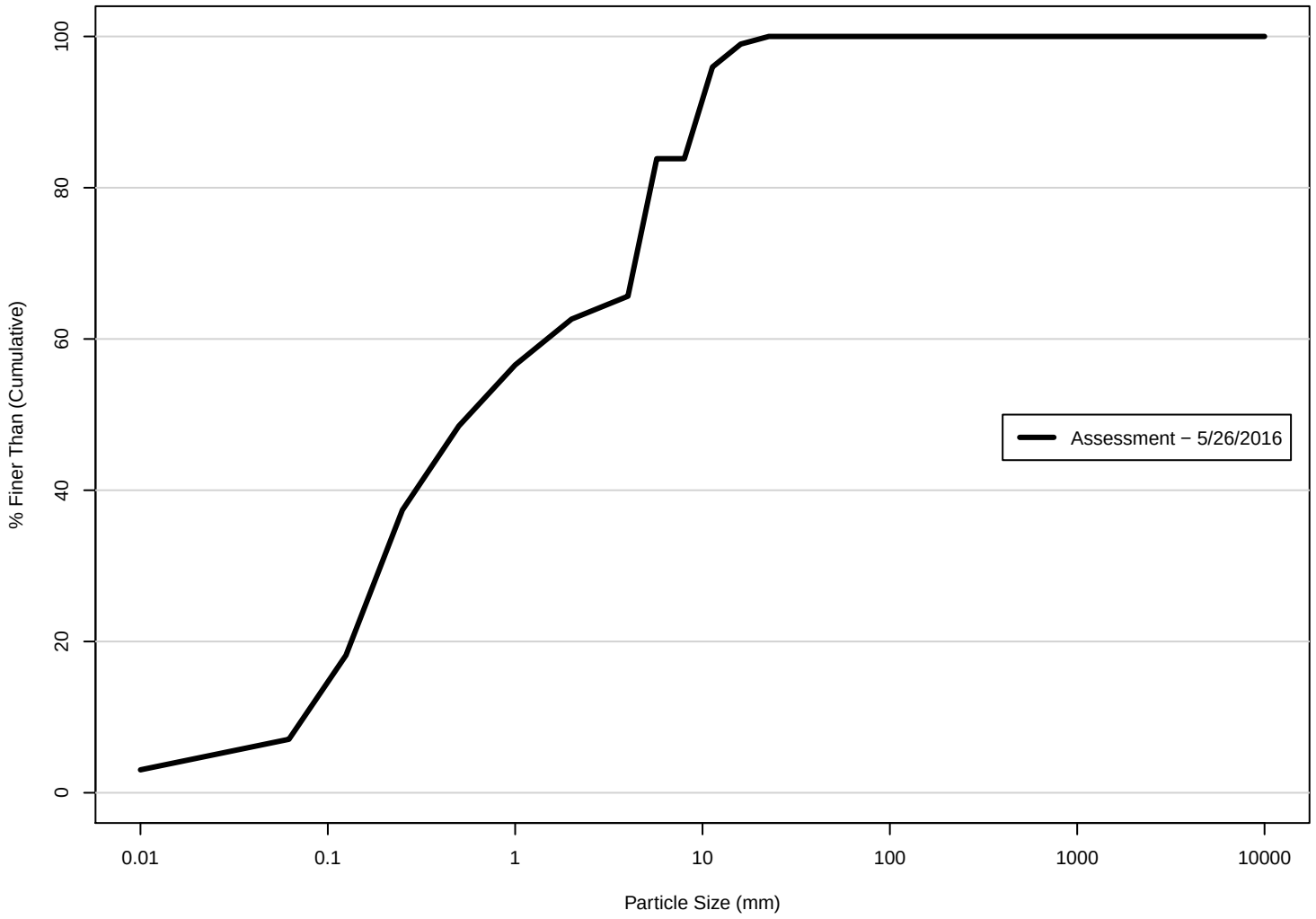
	Size (mm)
D16	0.15
D35	1.2
D50	2.2
D65	5.3
D84	7.5
D95	11

	Size Distribution
Mean (mm)	1.1
Dispersion	7.1
Skewness	−0.4

	Type
Silt/Clay	3%
Sand	26%
Gravel	71%
Cobble	0%
Boulder	0%
Bedrock	0%
Hardpan	0%
Wood/Det.	0%
Artificial	0%

Particle Size Distribution
Stony Fork Stream Restoration Site
XS2

Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	3
Very Fine	.062 − .125	S	4
Fine	.125 − .25	A	11
Medium	.25 − .50	N	19
Coarse	.50 − 1	D	11
Very Coarse	1 − 2	S	8
Very Fine	2 − 4		6
Fine	4 − 5.7	G	3
Fine	5.7 − 8	R	18
Medium	8 − 11.3	A	
Medium	11.3 − 16	V	12
Coarse	16 − 22.6	E	3
Coarse	22.6 − 32	L	1
Very Coarse	32 − 45	S	
Very Coarse	45 − 64		
Small	64 − 90	C	
Small	90 − 128	O	
Large	128 − 180	B	
Large	180 − 256	L	
Small	256 − 362	B	
Small	362 − 512	L	
Medium	512 − 1024	D	
Lrg− Very Lrg	1024 − 2048	R	
Bedrock	>2048	BDRK	
		Total	99



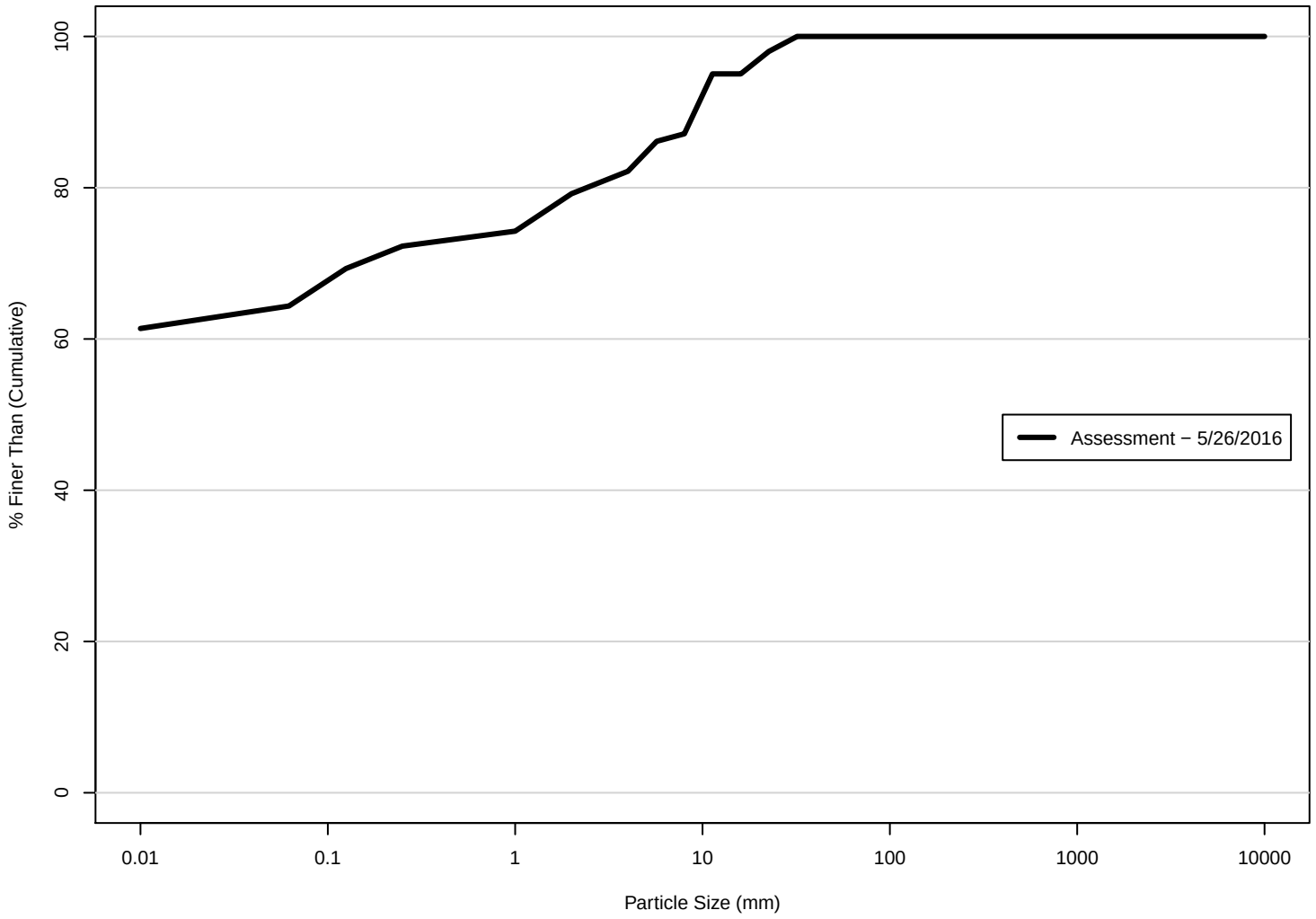
	Size (mm)
D16	0.11
D35	0.23
D50	0.57
D65	3.4
D84	8.0
D95	11

	Size Distribution
Mean (mm)	0.9
Dispersion	8.6
Skewness	0.2

	Type
Silt/Clay	3%
Sand	54%
Gravel	43%
Cobble	0%
Boulder	0%
Bedrock	0%
Hardpan	0%
Wood/Det.	0%
Artificial	0%

Particle Size Distribution
Stony Fork Stream Restoration Site
XS3

Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	62
Very Fine	.062 − .125	S	3
Fine	.125 − .25	A	5
Medium	.25 − .50	N	3
Coarse	.50 − 1	D	1
Very Coarse	1 − 2	S	1
Very Fine	2 − 4		5
Fine	4 − 5.7	G	3
Fine	5.7 − 8	R	4
Medium	8 − 11.3	A	1
Medium	11.3 − 16	V	8
Coarse	16 − 22.6	E	
Coarse	22.6 − 32	L	3
Very Coarse	32 − 45	S	2
Very Coarse	45 − 64		
Small	64 − 90	C	
Small	90 − 128	O	
Large	128 − 180	B	
Large	180 − 256	L	
Small	256 − 362	B	
Small	362 − 512	L	
Medium	512 − 1024	D	
Lrg− Very Lrg	1024 − 2048	R	
Bedrock	>2048	BDRK	
		Total	101



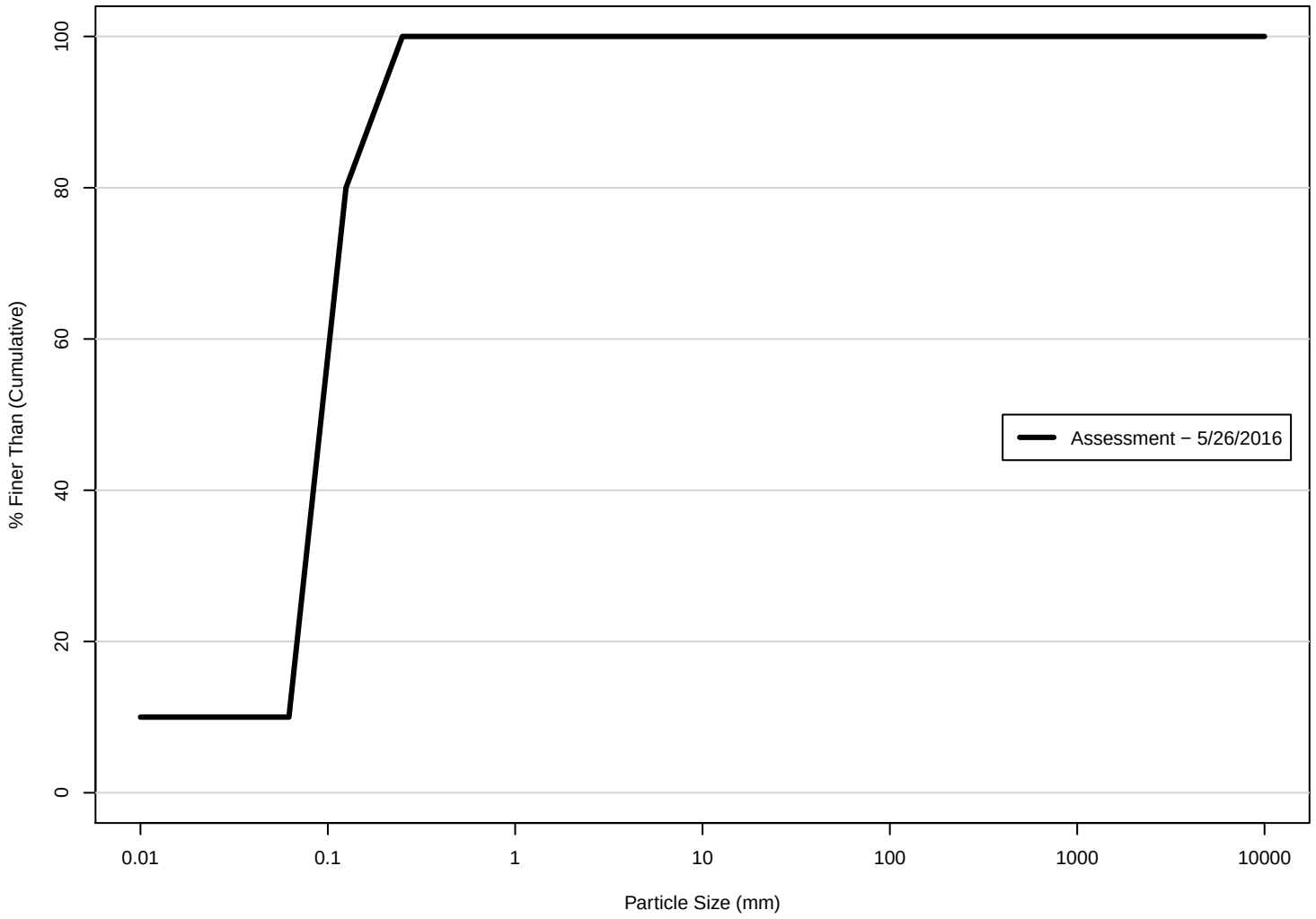
	Size (mm)
D16	0.062
D35	0.062
D50	0.062
D65	0.068
D84	4.7
D95	11

	Size Distribution
Mean (mm)	0.5
Dispersion	8.7
Skewness	1

	Type
Silt/Clay	61%
Sand	13%
Gravel	26%
Cobble	0%
Boulder	0%
Bedrock	0%
Hardpan	0%
Wood/Det.	0%
Artificial	0%

Particle Size Distribution
Stony Fork Stream Restoration Site
XS4

Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	10
Very Fine	.062 − .125	S	
Fine	.125 − .25	A	70
Medium	.25 − .50	N	20
Coarse	.50 − 1	D	
Very Coarse	1 − 2	S	
Very Fine	2 − 4		
Fine	4 − 5.7	G	
Fine	5.7 − 8	R	
Medium	8 − 11.3	A	
Medium	11.3 − 16	V	
Coarse	16 − 22.6	E	
Coarse	22.6 − 32	L	
Very Coarse	32 − 45	S	
Very Coarse	45 − 64		
Small	64 − 90	C	
Small	90 − 128	O	
Large	128 − 180	B	
Large	180 − 256	L	
Small	256 − 362	B	
Small	362 − 512	L	
Medium	512 − 1024	D	
Lrg− Very Lrg	1024 − 2048	R	
Bedrock	>2048	BDRK	
		Total	100



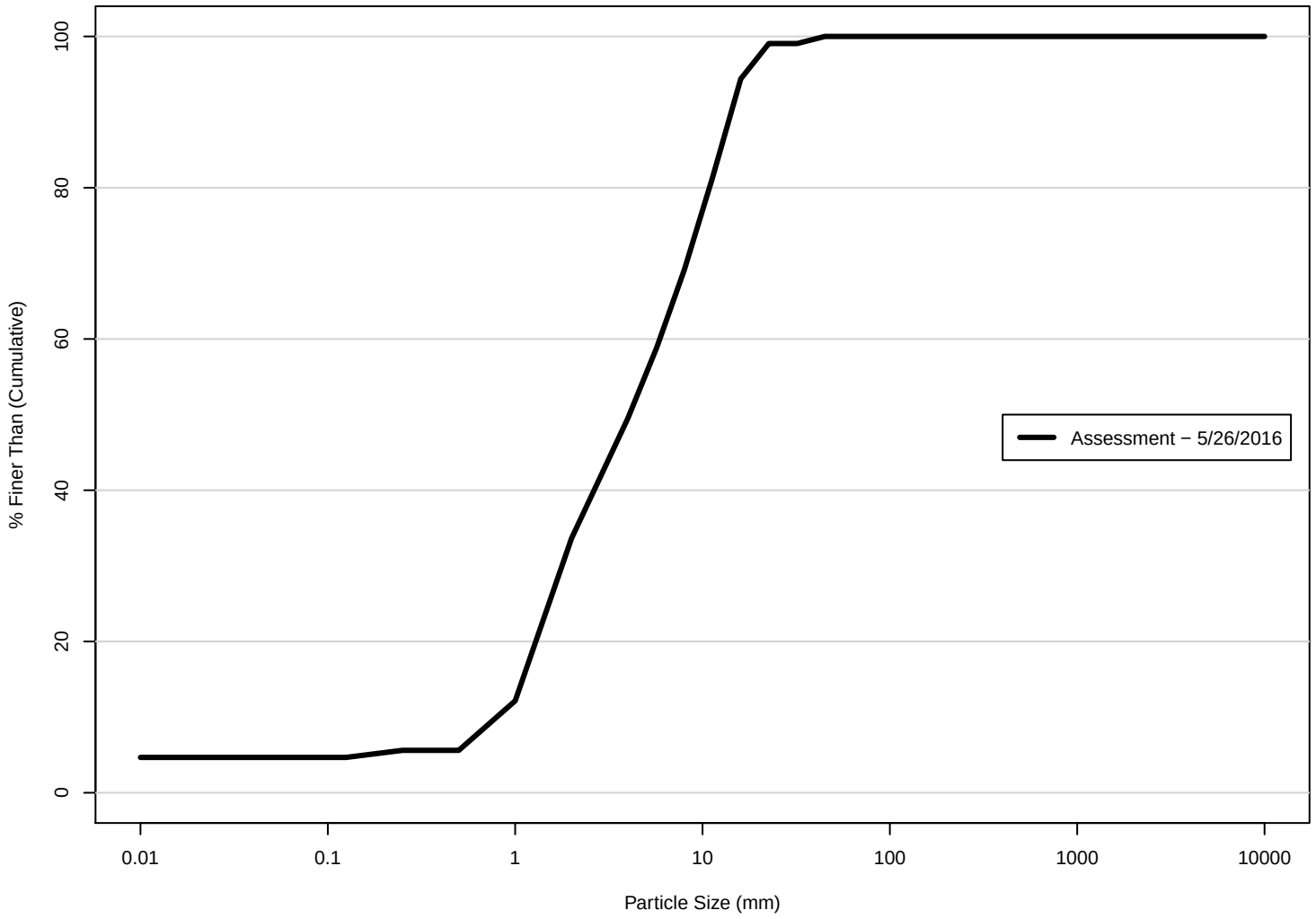
	Size (mm)
D16	0.066
D35	0.080
D50	0.093
D65	0.11
D84	0.14
D95	0.21

	Size Distribution
Mean (mm)	0.1
Dispersion	1.5
Skewness	0.1

	Type
Silt/Clay	10%
Sand	90%
Gravel	0%
Cobble	0%
Boulder	0%
Bedrock	0%
Hardpan	0%
Wood/Det.	0%
Artificial	0%

Particle Size Distribution
Stony Fork Stream Restoration Site
XS5

Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	5
Very Fine	.062 − .125	S	
Fine	.125 − .25	A	
Medium	.25 − .50	N	1
Coarse	.50 − 1	D	
Very Coarse	1 − 2	S	7
Very Fine	2 − 4		23
Fine	4 − 5.7	G	17
Fine	5.7 − 8	R	10
Medium	8 − 11.3	A	11
Medium	11.3 − 16	V	13
Coarse	16 − 22.6	E	14
Coarse	22.6 − 32	L	5
Very Coarse	32 − 45	S	
Very Coarse	45 − 64		1
Small	64 − 90	C	
Small	90 − 128	O	
Large	128 − 180	B	
Large	180 − 256	L	
Small	256 − 362	B	
Small	362 − 512	L	
Medium	512 − 1024	D	
Lrg− Very Lrg	1024 − 2048	R	
Bedrock	>2048	BDRK	
		Total	107

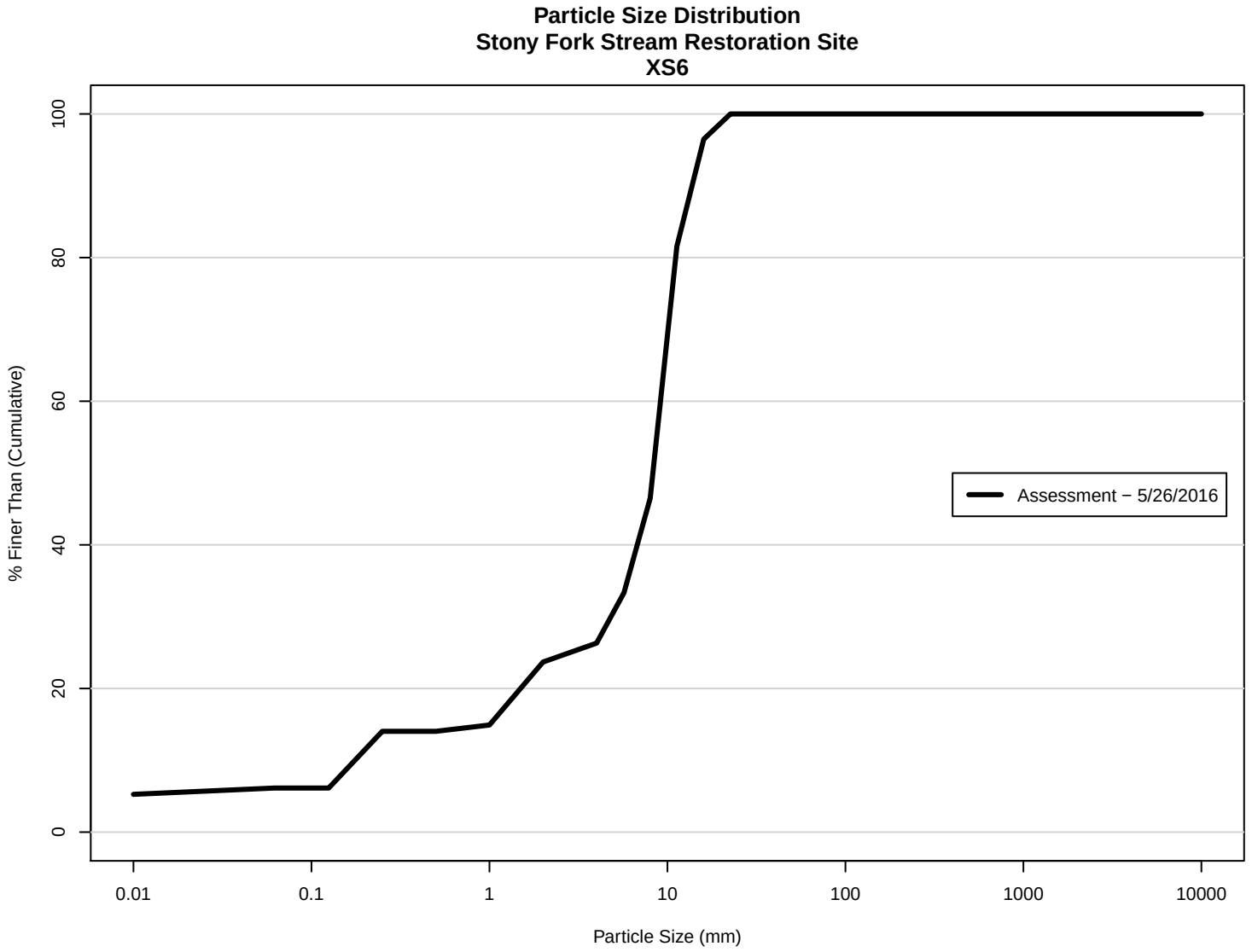


	Size (mm)
D16	1.1
D35	2.1
D50	4.1
D65	7.0
D84	12
D95	17

	Size Distribution
Mean (mm)	3.7
Dispersion	3.3
Skewness	−0.1

	Type
Silt/Clay	5%
Sand	7%
Gravel	88%
Cobble	0%
Boulder	0%
Bedrock	0%
Hardpan	0%
Wood/Det.	0%
Artificial	0%

Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	6
Very Fine	.062 − .125	S	1
Fine	.125 − .25	A	
Medium	.25 − .50	N	9
Coarse	.50 − 1	D	
Very Coarse	1 − 2	S	1
Very Fine	2 − 4		10
Fine	4 − 5.7	G	3
Fine	5.7 − 8	R	8
Medium	8 − 11.3	A	15
Medium	11.3 − 16	V	40
Coarse	16 − 22.6	E	17
Coarse	22.6 − 32	L	4
Very Coarse	32 − 45	S	
Very Coarse	45 − 64		
Small	64 − 90	C	
Small	90 − 128	O	
Large	128 − 180	B	
Large	180 − 256	L	
Small	256 − 362	B	
Small	362 − 512	L	
Medium	512 − 1024	D	
Lrg− Very Lrg	1024 − 2048	R	
Bedrock	>2048	BDRK	
		Total	114



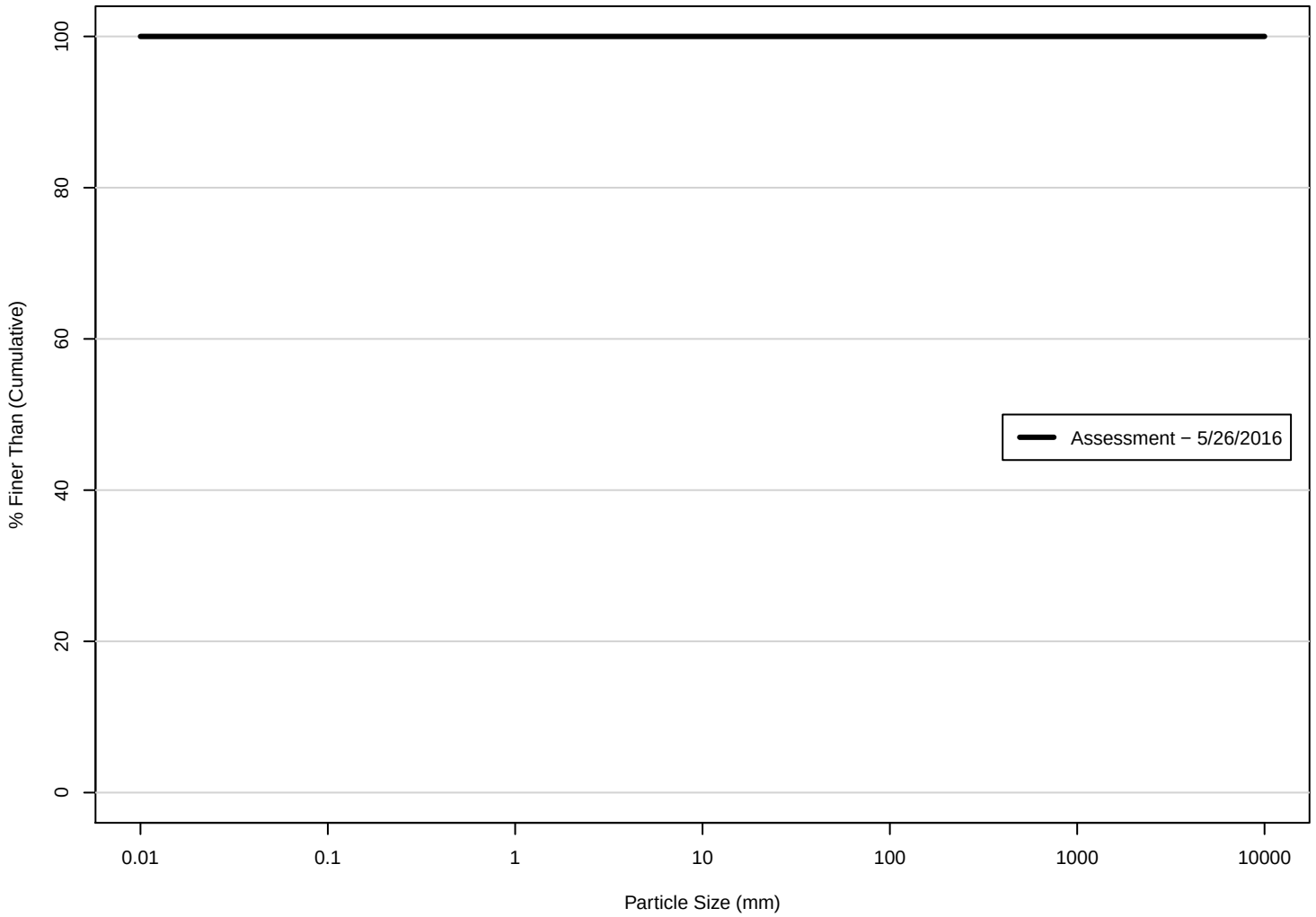
	Size (mm)
D16	1.1
D35	6.0
D50	8.3
D65	9.6
D84	12
D95	15

	Size Distribution
Mean (mm)	3.6
Dispersion	3.3
Skewness	−0.7

	Type
Silt/Clay	5%
Sand	10%
Gravel	85%
Cobble	0%
Boulder	0%
Bedrock	0%
Hardpan	0%
Wood/Det.	0%
Artificial	0%

Particle Size Distribution
Stony Fork Stream Restoration Site
XS7

Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 − .125	S	
Fine	.125 − .25	A	
Medium	.25 − .50	N	
Coarse	.50 − 1	D	
Very Coarse	1 − 2	S	
Very Fine	2 − 4		
Fine	4 − 5.7	G	
Fine	5.7 − 8	R	
Medium	8 − 11.3	A	
Medium	11.3 − 16	V	
Coarse	16 − 22.6	E	
Coarse	22.6 − 32	L	
Very Coarse	32 − 45	S	
Very Coarse	45 − 64		
Small	64 − 90	C	
Small	90 − 128	O	
Large	128 − 180	B	
Large	180 − 256	L	
Small	256 − 362	B	
Small	362 − 512	L	
Medium	512 − 1024	D	
Lrg− Very Lrg	1024 − 2048	R	
Bedrock	>2048	BDRK	
		Total	100



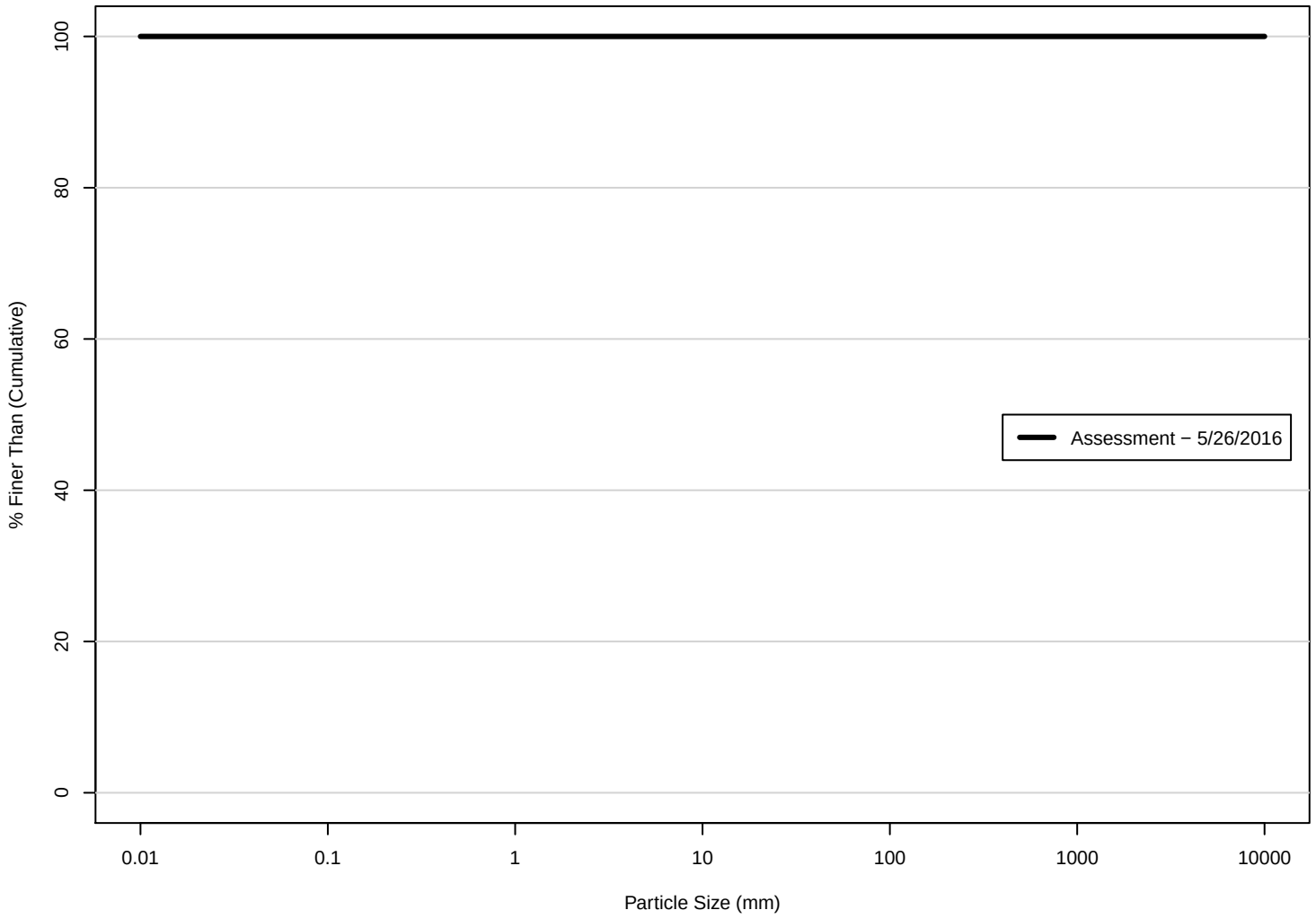
	Size (mm)
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

	Size Distribution
Mean (mm)	0.1
Dispersion	1
Skewness	NaN

	Type
Silt/Clay	100%
Sand	0%
Gravel	0%
Cobble	0%
Boulder	0%
Bedrock	0%
Hardpan	0%
Wood/Det.	0%
Artificial	0%

Particle Size Distribution
Stony Fork Stream Restoration Site
XS8

Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 − .125	S	
Fine	.125 − .25	A	
Medium	.25 − .50	N	
Coarse	.50 − 1	D	
Very Coarse	1 − 2	S	
Very Fine	2 − 4		
Fine	4 − 5.7	G	
Fine	5.7 − 8	R	
Medium	8 − 11.3	A	
Medium	11.3 − 16	V	
Coarse	16 − 22.6	E	
Coarse	22.6 − 32	L	
Very Coarse	32 − 45	S	
Very Coarse	45 − 64		
Small	64 − 90	C	
Small	90 − 128	O	
Large	128 − 180	B	
Large	180 − 256	L	
Small	256 − 362	B	
Small	362 − 512	L	
Medium	512 − 1024	D	
Lrg− Very Lrg	1024 − 2048	R	
Bedrock	>2048	BDRK	
		Total	100



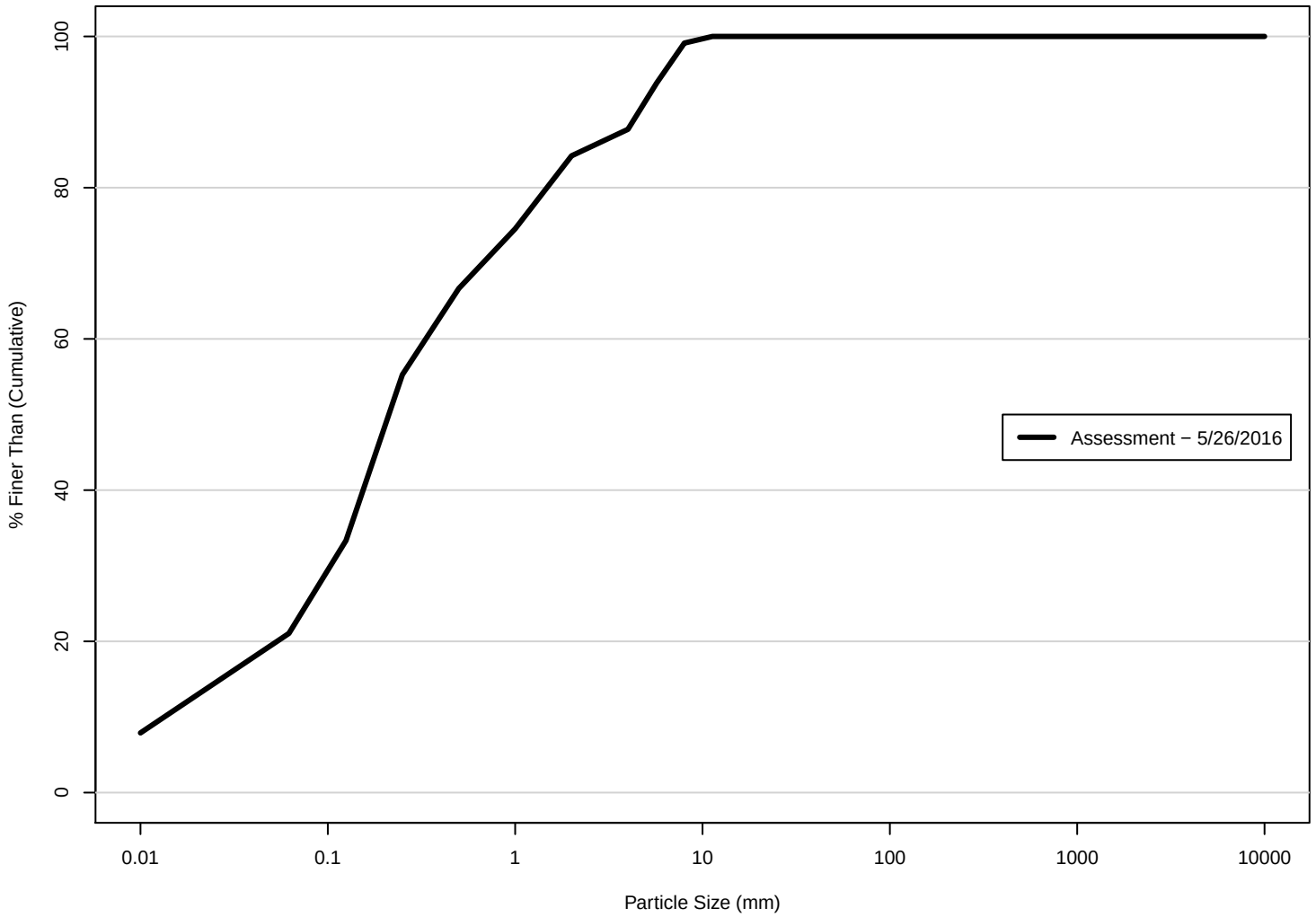
	Size (mm)
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

	Size Distribution
Mean (mm)	0.1
Dispersion	1
Skewness	NaN

	Type
Silt/Clay	100%
Sand	0%
Gravel	0%
Cobble	0%
Boulder	0%
Bedrock	0%
Hardpan	0%
Wood/Det.	0%
Artificial	0%

Particle Size Distribution
Stony Fork Stream Restoration Site
XS9

Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	9
Very Fine	.062 − .125	S	15
Fine	.125 − .25	A	14
Medium	.25 − .50	N	25
Coarse	.50 − 1	D	13
Very Coarse	1 − 2	S	9
Very Fine	2 − 4		11
Fine	4 − 5.7	G	4
Fine	5.7 − 8	R	7
Medium	8 − 11.3	A	6
Medium	11.3 − 16	V	1
Coarse	16 − 22.6	E	
Coarse	22.6 − 32	L	
Very Coarse	32 − 45	S	
Very Coarse	45 − 64		
Small	64 − 90	C	
Small	90 − 128	O	
Large	128 − 180	B	
Large	180 − 256	L	
Small	256 − 362	B	
Small	362 − 512	L	
Medium	512 − 1024	D	
Lrg− Very Lrg	1024 − 2048	R	
Bedrock	>2048	BDRK	
		Total	114



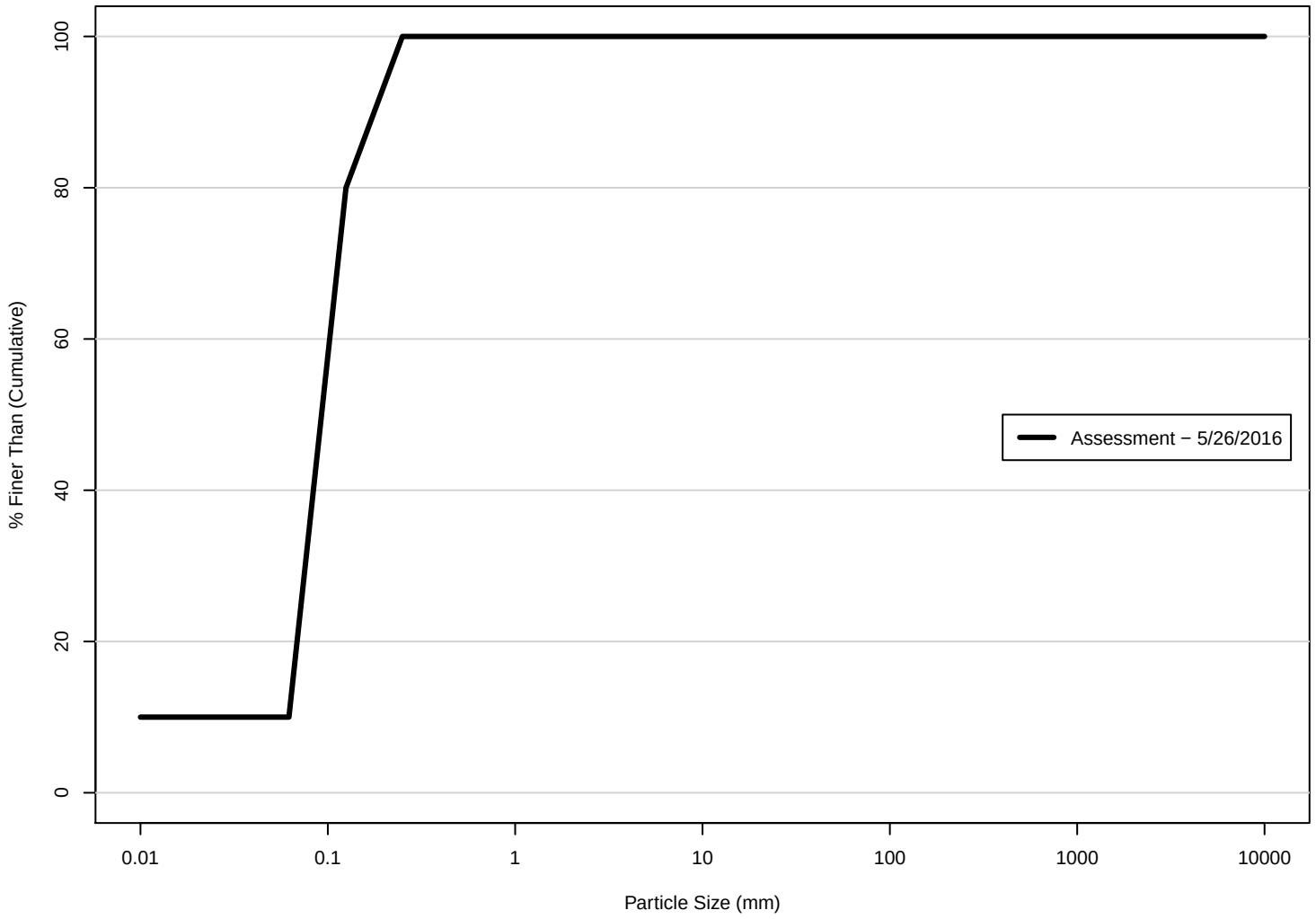
	Size (mm)
D16	0.031
D35	0.13
D50	0.21
D65	0.45
D84	2.0
D95	6.1

	Size Distribution
Mean (mm)	0.2
Dispersion	8
Skewness	0.1

	Type
Silt/Clay	8%
Sand	67%
Gravel	25%
Cobble	0%
Boulder	0%
Bedrock	0%
Hardpan	0%
Wood/Det.	0%
Artificial	0%

Particle Size Distribution
Stony Fork Stream Restoration Site
XS Ref 1

Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	10
Very Fine	.062 − .125	S	
Fine	.125 − .25	A	70
Medium	.25 − .50	N	20
Coarse	.50 − 1	D	
Very Coarse	1 − 2	S	
Very Fine	2 − 4		
Fine	4 − 5.7	G	
Fine	5.7 − 8	R	
Medium	8 − 11.3	A	
Medium	11.3 − 16	V	
Coarse	16 − 22.6	E	
Coarse	22.6 − 32	L	
Very Coarse	32 − 45	S	
Very Coarse	45 − 64		
Small	64 − 90	C	
Small	90 − 128	O	
Large	128 − 180	B	
Large	180 − 256	L	
Small	256 − 362	B	
Small	362 − 512	L	
Medium	512 − 1024	D	
Lrg− Very Lrg	1024 − 2048	R	
Bedrock	>2048	BDRK	
		Total	100



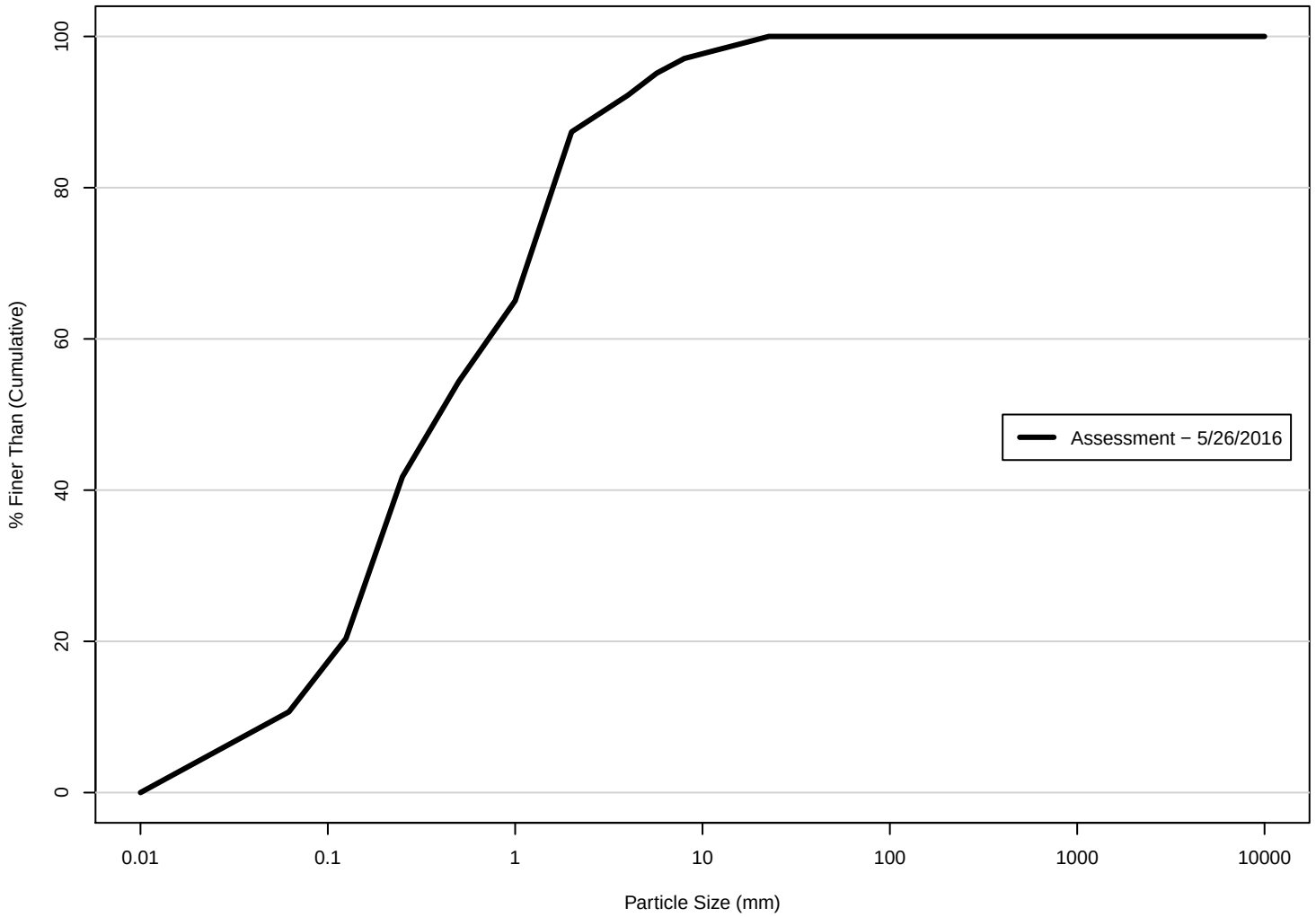
	Size (mm)
D16	0.066
D35	0.080
D50	0.093
D65	0.11
D84	0.14
D95	0.21

	Size Distribution
Mean (mm)	0.1
Dispersion	1.5
Skewness	0.1

	Type
Silt/Clay	10%
Sand	90%
Gravel	0%
Cobble	0%
Boulder	0%
Bedrock	0%
Hardpan	0%
Wood/Det.	0%
Artificial	0%

Particle Size Distribution
Stony Fork Stream Restoration Site
XS Ref 2

Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 − .125	S	11
Fine	.125 − .25	A	10
Medium	.25 − .50	N	22
Coarse	.50 − 1	D	13
Very Coarse	1 − 2	S	11
Very Fine	2 − 4		23
Fine	4 − 5.7	G	5
Fine	5.7 − 8	R	3
Medium	8 − 11.3	A	2
Medium	11.3 − 16	V	1
Coarse	16 − 22.6	E	1
Coarse	22.6 − 32	L	1
Very Coarse	32 − 45	S	
Very Coarse	45 − 64		
Small	64 − 90	C	
Small	90 − 128	O	
Large	128 − 180	B	
Large	180 − 256	L	
Small	256 − 362	B	
Small	362 − 512	L	
Medium	512 − 1024	D	
Lrg− Very Lrg	1024 − 2048	R	
Bedrock	>2048	BDRK	
		Total	103



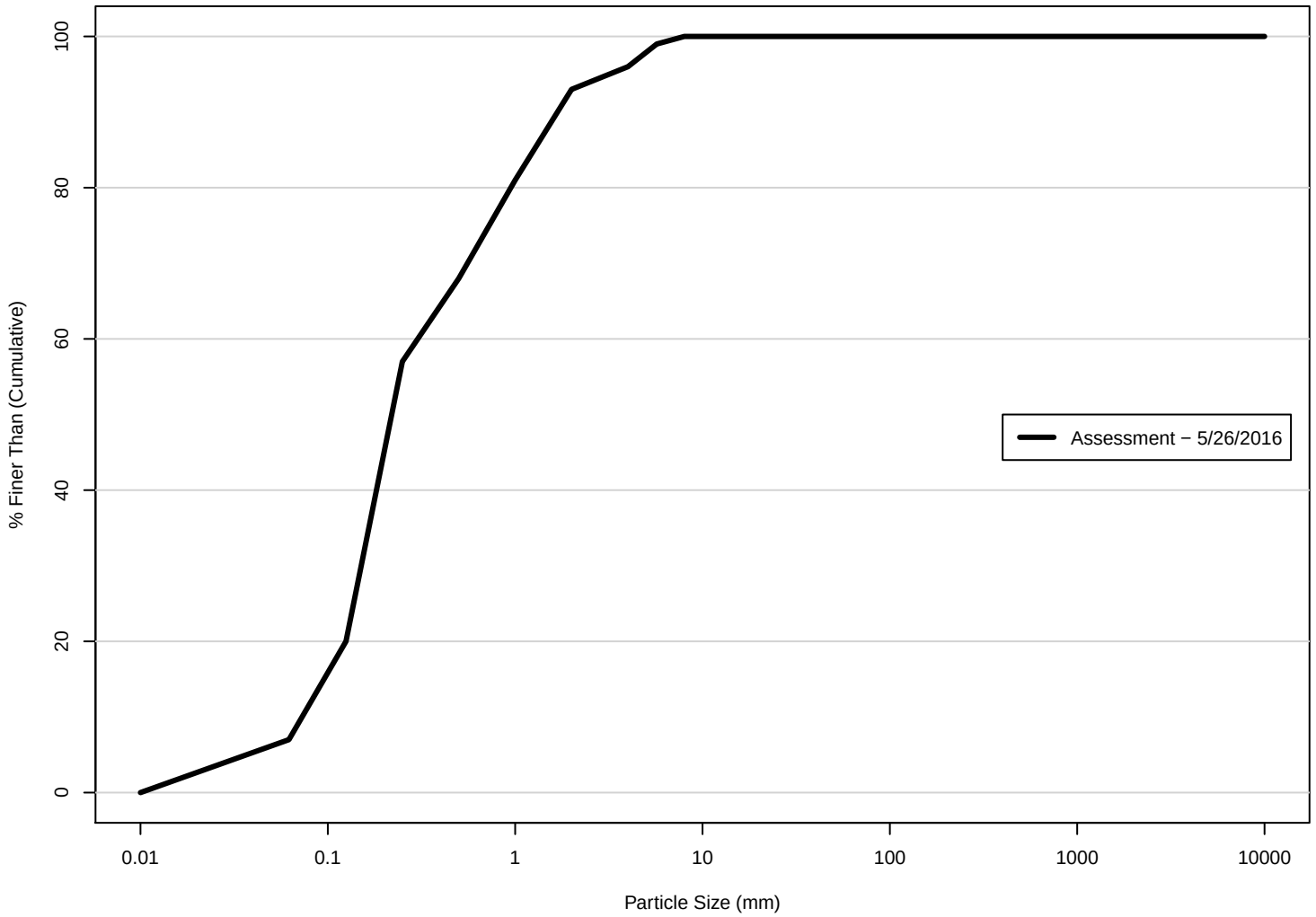
	Size (mm)
D16	0.091
D35	0.20
D50	0.39
D65	1.0
D84	1.8
D95	5.6

	Size Distribution
Mean (mm)	0.4
Dispersion	4.4
Skewness	0

	Type
Silt/Clay	0%
Sand	65%
Gravel	35%
Cobble	0%
Boulder	0%
Bedrock	0%
Hardpan	0%
Wood/Det.	0%
Artificial	0%

Particle Size Distribution
Stony Fork Stream Restoration Site
XS Ref 3

Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 − .125	S	7
Fine	.125 − .25	A	13
Medium	.25 − .50	N	37
Coarse	.50 − 1	D	11
Very Coarse	1 − 2	S	13
Very Fine	2 − 4		12
Fine	4 − 5.7	G	3
Fine	5.7 − 8	R	3
Medium	8 − 11.3	A	1
Medium	11.3 − 16	V	
Coarse	16 − 22.6	E	
Coarse	22.6 − 32	L	
Very Coarse	32 − 45	S	
Very Coarse	45 − 64		
Small	64 − 90	C	
Small	90 − 128	O	
Large	128 − 180	B	
Large	180 − 256	L	
Small	256 − 362	B	
Small	362 − 512	L	
Medium	512 − 1024	D	
Lrg− Very Lrg	1024 − 2048	R	
Bedrock	>2048	BDRK	
		Total	100



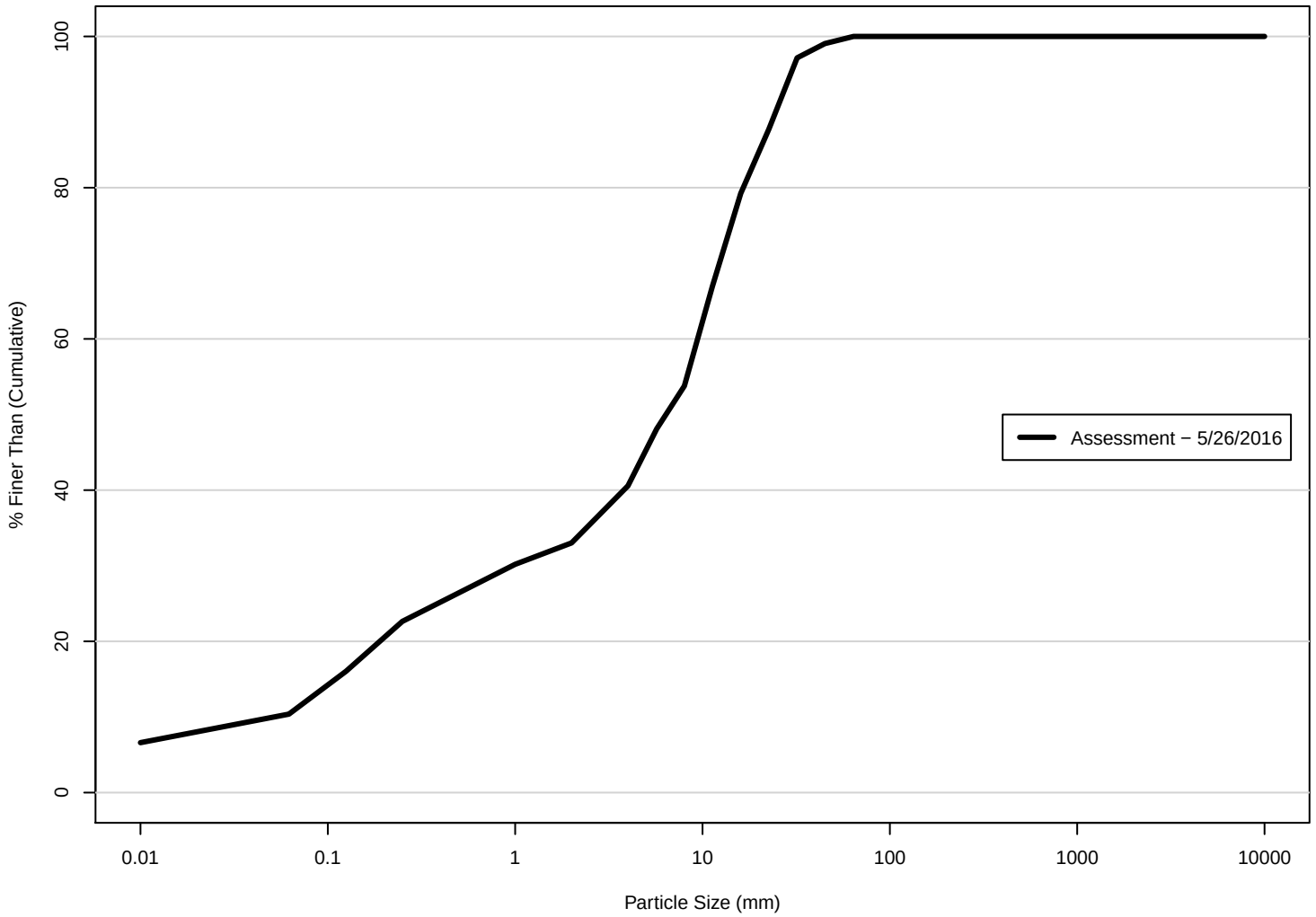
	Size (mm)
D16	0.10
D35	0.17
D50	0.22
D65	0.41
D84	1.2
D95	3.2

	Size Distribution
Mean (mm)	0.3
Dispersion	3.4
Skewness	0.4

	Type
Silt/Clay	0%
Sand	81%
Gravel	19%
Cobble	0%
Boulder	0%
Bedrock	0%
Hardpan	0%
Wood/Det.	0%
Artificial	0%

Particle Size Distribution
Stony Fork Stream Restoration Site
XS Ref 4

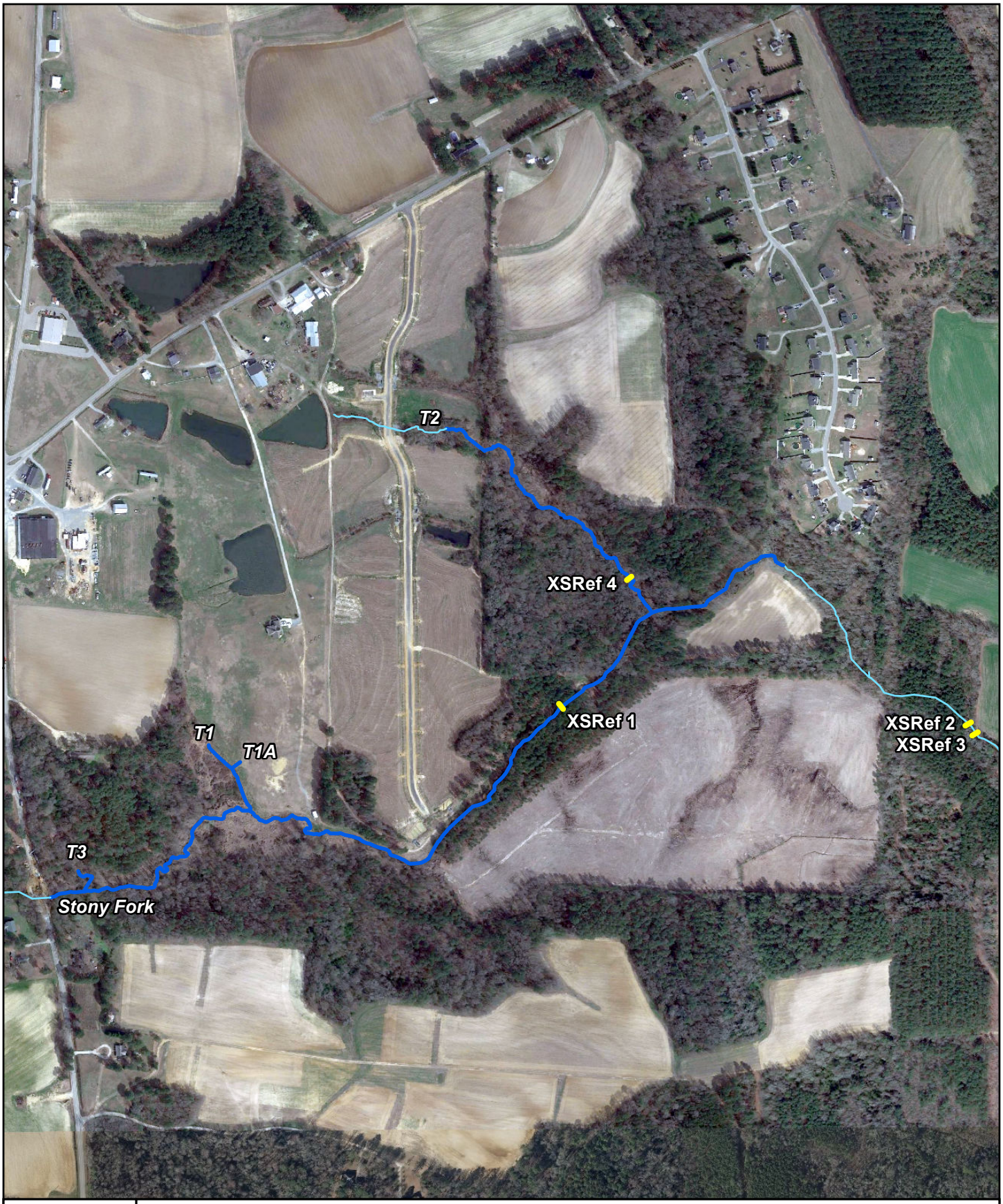
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	7
Very Fine	.062 − .125	S	4
Fine	.125 − .25	A	6
Medium	.25 − .50	N	7
Coarse	.50 − 1	D	4
Very Coarse	1 − 2	S	4
Very Fine	2 − 4		3
Fine	4 − 5.7	G	8
Fine	5.7 − 8	R	8
Medium	8 − 11.3	A	6
Medium	11.3 − 16	V	14
Coarse	16 − 22.6	E	13
Coarse	22.6 − 32	L	9
Very Coarse	32 − 45	S	10
Very Coarse	45 − 64		2
Small	64 − 90	C	1
Small	90 − 128	O	
Large	128 − 180	B	
Large	180 − 256	L	
Small	256 − 362	B	
Small	362 − 512	L	
Medium	512 − 1024	D	
Lrg− Very Lrg	1024 − 2048	R	
Bedrock	>2048	BDRK	
		Total	106



	Size (mm)
D16	0.12
D35	2.4
D50	6.4
D65	11
D84	19
D95	30

	Size Distribution
Mean (mm)	1.6
Dispersion	12.5
Skewness	−0.6

	Type
Silt/Clay	7%
Sand	24%
Gravel	68%
Cobble	1%
Boulder	0%
Bedrock	0%
Hardpan	0%
Wood/Det.	0%
Artificial	0%



KCI ASSOCIATES OF NC

REFERENCE CROSS-SECTION LOCATIONS

Project Easement
Reference Cross-Sections
Existing Project Streams
Other Streams

N

0 500 1,000 Feet

Image Source: Google Earth, 3/2018.

Morphological Criteria

		Existing Channel						Reference	Stable Design Ratios	Restored Reaches							
		SF1 (xs1)	SF2 (xs2-5)	SF3 (xs6)	T1 (xs7)	T2 (xs8-9)	T3 (xs10-11)	Long Branch		SF1	SF2	SF3	T1	T2-1	T2-2	T2-2	T3
Stream Type (Rosgen)		G4c	G4c - G5c	G4c	G5	G5c	G4	C4	C4	C4	C4	C4	C4	C4	C4	C4	C4
Drainage Area (mi^2)		0.27	0.41	0.84	0.02	0.23	0.05	1.49	~	0.27	0.41	0.84	0.02	0.04	0.15	0.23	0.02
Bankfull Width (W_{bkf}) (ft)		7.2	5.0 -- 10.0	10.5	3.4	4.5 -- 5.7	4.2-4.8	14.8 -- 18.8	~	9.7	11.3	12.6	5.0	5.0	7.6	9.0	5.0
Bankfull Mean Depth (D_{bkf}) (ft)		0.9	1.0 -- 1.4	1.2	0.3	0.8 -- 1.7	0.4-0.6	1.3 -- 1.8	~	0.7	0.8	0.9	0.4	0.4	0.6	0.6	0.4
Bankfull Cross-Sectional Area (A_{bkf}) (ft^2)		6.4	6.9 -- 8.9	12.5	0.9	3.6 -- 9.4	1.9-2.6	25	~	7.0	9.4	11.8	1.9	1.9	4.3	5.8	1.9
Width / Depth Ratio (W_{bkf} / D_{bkf})		8.1	3.7 -- 11.2	8.9	12.7	3.4 -- 5.4	6.9-12.6	9.0 -- 14.0	10 -- 15	13.5	13.5	13.5	13.5	13.5	13.4	13.9	13.5
Maximum Depth (d_{mbkf}) (ft)		1.2	1.3 -- 2.2	1.3	0.4	1.2 -- 2.1	0.6-0.7	1.9 -- 2.4	~	1.1	1.2	1.4	0.6	0.6	0.8	1.0	0.6
Width of Flood Prone Area (W_{fpa}) (ft)		8.7	7.4 -- 14.5	14.4	4.5	5.7 -- 30.7	5.0-5.9	>50	~	100	100	100	50	50	50	50	50
Entrenchment Ratio (ER)		1.2	1.4 -- 1.5	1.4	1.3	1.3 -- 5.4	1.2	>2.5	>2.5	10.3	8.8	7.9	10	10	6.6	5.6	10
Sinuosity (stream length/valley length) (K)		1.3	1.1	1.1	1.0	1.1	1.0	1.3	1.2 -- 1.4	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Dimension	Pool Mean Depth (ft)	*	*	*	*	*	***	1.6 -- 1.8	~	1.3	1.5	1.7	0.7	0.7	1.0	1.2	0.7
	Riffle Mean Depth (ft) (Dbkf)	0.9	1.0 -- 1.4	1.2	0.3	0.8 -- 1.7	***	1.3 -- 1.8	~	0.7	0.8	0.9	0.4	0.4	0.6	0.6	0.4
	Pool Width (ft)	*	*	*	*	*	***	16.2 -- 18.8	~	13.5	15.7	17.5	7.0	7.0	10.6	12.5	7.0
	Riffle Width (ft)	7.2	5.0 -- 10.0	10.5	3.4	4.5 -- 5.7	***	14.8 -- 18.8	~	9.7	11.3	12.6	5.0	5.0	7.6	9.0	5.0
	Pool XS Area (sf)	*	*	*	*	*	***	25.5 -- 33.4	~	17.6	23.3	29.2	5.0	5.0	10.1	14.8	5.0
	Riffle XS Area (sf)	6.4	6.9 -- 8.9	12.5	0.9	3.6 -- 9.4	***	25.0	~	7.0	9.4	11.8	1.9	1.9	4.3	5.8	1.9
	Pool Width / Riffle Width	*	*	*	*	*	***	1.2 -- 1.3	1.2 -- 1.7	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
	Pool Max Depth / D_{bkf}	*	*	*	*	*	***	2.2	1.5 -- 3.5	3.1	3.1	3.1	3.0	3.0	2.7	3.3	3.0
	Bank Height Ratio	2.9	1.6 -- 2.1	2.0	4.5	1.5 -- 4.1	3.2-3.4	1.0 -- 1.2	1.0 -- 1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Mean Bankfull Velocity (V) (fps)	3.5	3.3 -- 3.8	3.4	3.2	2.1 -- 3.9	1.8-2.3	3.7 -- 4.2	3.5 -- 5	3.2	3.2	3.6	3.0	2.9	3.1	3.4	1.2
	Bankfull Discharge (Q) (cfs)	22.2	23.7 -- 30.2	42.1	3	13.9 -- 19.7	3-6	93 -- 105	~	22.7	30.4	42.8	5.6**	5.3	13.5	19.9	2.2
Pattern	Radius of Curvature (Rc) (ft)	*	*	*	*	*	***	16 -- 87	~	20 -- 29	22 -- 33	28 -- 35	11 -- 17	12 -- 15	16 -- 23	18 -- 23	11 -- 14
	Belt Width (Wblt) (ft)	*	*	*	*	*	***	60	~	30 -- 55	37 -- 65	46 -- 77	23 -- 37	25 -- 40	28 -- 45	32 -- 54	16 -- 26
	Meander Length (Lm) (ft)	*	*	*	*	*	***	66 -- 191	~	93 -- 132	105 -- 148	148 -- 176	58 -- 72	70	85 -- 90	92 -- 100	43-- 47
	Radius of Curvature / Bankfull Width	*	*	*	*	*	***	0.9 -- 5.9	2 -- 3	2.1 -- 3.0	2.0 -- 2.9	2.2 -- 2.8	2.2 -- 3.4	2.4 -- 3.0	2.1 -- 3.0	2 .0-- 2.6	2.2 -- 2.8
	Meander Width Ratio (Wblt / Wbkf)	*	*	*	*	*	***	4.1	3.5 -- 8	3.1 -- 5.7	3.3 -- 5.8	3.7 -- 6.1	4.6 -- 7.4	5.0 -- 8.0	3.7 -- 5.9	3.6 -- 6.0	3.2 -- 5.2
	Meander Length / Bankfull Width	*	*	*	*	*	***	3.5 -- 12.9	7 -- 14	9.6 -- 13.6	9.3 -- 13.1	11.7 -- 14.0	11.6 -- 14.4	14	11.2 -- 11.8	10.2 -- 11.1	8.6 -- 9.4
Profile	Valley slope	0.011	0.009	0.007	0.028	0.013	0.012	0.006	0.005 -- 0.015	0.011	0.009	0.007	0.024	0.016	0.014	0.013	0.0019
	Average water surface slope	0.009	0.008	0.006	0.035	0.014	0.007	0.005	~	0.009	0.008	0.008	0.020	0.012	0.012	0.011	0.0016
	Riffle slope	0.009	0.003 -- 0.008	0.006	0.035	0.009 -- 0.020	***	0.013 -- 0.035	~	0.009 -- 0.015	0.009 -- 0.015	0.01	0.014 - 0.04	0.016	0.014	0.012 -- 0.015	0.0025
	Pool slope	*	*	*	*	*	***	0 -- 0.0003	~	0	0	0	0	0 -- 0.006	0	0	0
	Pool to pool spacing	*	*	*	*	*	***	50 -- 105	~	55 -- 70	59 -- 84	84 -- 101	31 -- 44	32-- 40	44 -- 50	46 -- 63	21 -- 27
	Pool length	*	*	*	*	*	***	14 -- 33	~	21 -- 46	24 -- 52	35 -- 62	11 -- 29	6 -- 16	14 -- 24	12 -- 34	7 -- 15
	Riffle Slope / Avg. Water Surface Slope	1.00	0.31 -- 1.00	1.00	1.00	1.00 -- 1.43	***	2.6 -- 7.0	1.2 -- 1.5	1.0 -- 1.6	1.1 -- 1.9	1.2	0.7 - 2.0	1.3	1.2	1.1 -- 1.4	1.6
	Pool Slope / Avg. Water Surface Slope	*	*	*	*	*	***	0 -- 0.06	0 -- 0.2	0	0	0	0	0	0	0	0
	Pool to Pool Spacing / Bankfull Width	*	*	*	*	*	***	2.7 -- 7.1	3.5 -- 7	5.6 -- 7.3	5.2 -- 7.4	6.7 -- 8.0	6.2 -- 8.8	6.4 -- 8.0	5.7 -- 6.6	5.1 -- 7.0	4.2 -- 5.4

* : no data shown for pools, radius of curvature or meanders in existing stream do to channelization / lack of bed diversity

** : channel sized larger for constructability

***: channel affected by former pond

12.3 Buffer Mitigation Plan

BUFFER MITIGATION PLAN

Stony Fork Restoration Site
Johnston County, North Carolina
DWR Project Number: 2016-0372
DMS Project Number 97085
DMS Contract 6830

Neuse River Basin
Cataloging Unit 03020201

Prepared by:

KCI Associates of North Carolina, PC

4505 Falls of Neuse Rd, Suite 400

Raleigh, NC 27609

(919) 783-9214

Table of Contents

ATTACHMENTS:

A. BUFFER MITIGATION SUMMARY

The Stony Fork Restoration Site (SFRS) is a stream and riparian buffer mitigation site located in Johnston County, NC. The site will produce riparian buffer credits for the Neuse Basin under Rule 15A NCAC 02B .0295, effective November 1, 2015. This plan provides an overview of the existing buffer conditions, proposed mitigation actions, and monitoring performance standards along the three project subject streams, Stony Fork (SF), which has three reaches, and Tributaries 1 (T1) and 2 (T2). There are two additional project streams (T1A and T3) that are not subject to the buffer rule. Below are the anticipated buffer credits that will be produced from this project, and project maps are included in the attachments. Additional information on the stream mitigation components is included in the mitigation plan prepared for NCDMS.

Table 1. Buffer Credit Summary

Project Component	Existing Square Footage	Creditable Footage or Acreage	Restoration Level	Mitigation Ratio (X:1)	Mitigation Credits	Notes/Comments
Buffer Restoration TOB to 100'	413,194	413,194	R	1:1	413,194	
Buffer Restoration 101-200'	37,091	37,091	R	3.03:1	12,240	
Buffer Enhancement TOB to 100'	74,802	74,802	E	2:1	37,401	
Buffer Preservation TOB to 100'	424,660	175,029	P	10:1	17,503	Preservation limited to no more than 25% of total buffer mitigation area.
TOTAL	**949,747**	**700,116**			**480,338**	

B. EXISTING CONDITIONS

The land uses at the project site are a combination of farmland, pine plantation, and reforested hardwoods. In recent years, residential development has increased to the north of the project site, and an additional development is proposed to the southeast (see Attachment II). In the revegetated portions of the site, invasive species have become prevalent throughout the riparian areas of SFRS. Dominant species include Chinese privet (*Ligustrum sinense*), kudzu (*Pueraria montana*), and Japanese honeysuckle (*Lonicera japonica*). Treatment of these populations began in November and December 2017 with mechanical removal and will continue with additional physical and chemical treatments as the project proceeds (see Section D below). A map has been prepared showing the original extent of aerial coverage of these primary invasive species. It is included as Attachment III. Hardwoods, where present, consist of tulip poplar (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), white oak (*Quercus alba*), American sycamore (*Platanus occidentalis*), and green ash (*Fraxinus pennsylvanica*). Below is further detail about these invasive plant populations.

B.1 Chinese Privet

Chinese privet is found throughout the forested components of the project varying in lateral extent and density throughout the project area. The areas of highest density were found along Stony Fork from the upstream limit of the project to the confluence of T1 (Attachment 1, Area A). The entire riparian area within the easement and extending outside the easement is dominated by privet in this area. A second high density area was located within the riparian area along T2 from the upstream extent of the project tributary to the confluence of Stony Fork (Attachment 1, Area B). Again, most of the mid-story canopy is dominated by privet with a few mature desirable

tree species mixed in to comprise a patchy overstory. In these two areas, the privet dominates the mid-story canopy and had crowded out more desirable understory species. The size of the privet ranges in diameter from seedling size to 8" DBH. Privet is also located sporadically within the riparian zone throughout the rest of the project. In many of these areas it does not dominate the understory, but instead is interspersed with more desirable native trees and shrubs as noted above.

B.2 Kudzu

Kudzu dominates the area of the project surrounding T1 as well as a large section of Stony Fork in the general vicinity of T1. This approximately 3-acre area is essentially a monoculture of kudzu during the growing season, with vines extending up and into the tree canopy that located along the edge of the easement boundary. The approximate location of the kudzu infestation is shown in Attachment 2. Other small patches of kudzu exist within the easement, especially along the farm road approximately 1,500 feet below the confluence of T1 and Stony Fork.

B.3 Japanese Honeysuckle

Japanese honeysuckle is located sporadically throughout the easement area, but has a stronger presence along Tributary 2, especially in areas directly adjacent (10-15') from the T2 stream channel.

C. BUFFER PHOTOGRAPHS

Photo 1. Top of Stony Fork showing privet coverage and other invasives prior to removal.

Photo 2. Kudzu along Stony Fork Reach 2.

Photo 3. Kudzu near the confluence of Stony Fork and T1.

Photo 4. Privet covering T2 channel (approximately halfway down) prior to removal.

Photo 5: Near top of T2 showing mechanical removal of privet that occurred in December 2017.

Photo 6: Lower part of T2 showing another view of privet removal.

D. IMPLEMENTATION PLAN

The following approach will be used to restore, enhance, and preserve the buffer areas across the site as outlined in the project maps in the attachments. The dominance of the three target species above will require a diligent and persistent treatment approach to control and prevent the future encroachment of these species into the riparian areas. The treatment program will consist of three phases of treatment. These include the pre-construction, construction, and post-construction phases of treatment.

D.1 Pre-construction Phase

The preconstruction phase started with the physical removal of privet biomass through mechanical grinding in fall and winter 2017. Physical removal was required because of the degree of infestation. Chemically treating these areas was not be feasible initially due to the size and density of the existing privet plants. Physical removal was completed using a FECON mulching head mounted to a track loader (skid steer). Privet trees were ground into mulch and left in place to decompose. Pictures showing the condition of T2 after grinding are shown above in Section C. This first step in the invasive control program allowed for more direct access to the riparian area for future chemical treatment. It also served to remove the larger privet trees that were acting as a seed source for the colonization and spread of the privet stand.

In the spring of 2018, topical chemical treatment of privet using a tank mix of active ingredients triclopyr and glyphosate was completed throughout the riparian areas of the easement using backpack sprayers. Stumps were also treated using a 40% active ingredient glyphosate solution. At the same time as privet was being treated, other invasives such as Japanese honeysuckle, multiflora rose and autumn olive were also treated topically with glyphosate.

The kudzu area was also treated in the Fall 2017 using the active ingredient Clopyralid. The initial treatment was effective at reducing the aerial standing crop of kudzu by an estimated 50% based on a re-evaluation in Spring 2018 (post emergence). A second treatment was conducted in the Spring 2018 on the main kudzu area as well as several smaller patches in other areas of the easement.

The pre-construction phase activities allowed KCI to establish a baseline condition to lay the groundwork for the construction phase and-post construction phase programs.

D.2 Construction Phase

Mechanical removal (including grubbing) will occur throughout the stream construction phase since equipment will be mobilized for an extended duration during construction. This period will also include the mechanical removal of kudzu after chemical treatments have had adequate time to translocate to the root system. Debris from mechanical removal of privet and kudzu will be burned on site. Larger debris remaining from the pre-construction phase will also be burned during the construction phase. KCI equipment operators are experienced in identifying privet, kudzu and multiflora rose and understand the need for mechanical removal of these invasives as they implement the designed stream improvements. The staff is also experienced in minimizing damage to desirable canopy trees and will avoid critical root zones when possible to minimize damage to trees that will remain.

A NC licensed aquatic pesticide applicator from KCI (Kevin O'Briant) will be on-site at all times during construction. In addition to serving as the on-site construction manager, Mr. O'Briant will

apply, supervise, and oversee the application of herbicides to the target species mentioned above during the construction process. With the construction duration expected to last 4-5 months during the growing season, KCI envisions this time period to be critical in the process of eradicating the dense stands of privet and kudzu (as well as other invasives) that occur on the site. Weekly treatment of the entire easement area, as well as infested areas outside the easement where property owners have agreed to allow treatment, are expected to occur during the construction phase of the project.

D.3 Post-Construction Phase / Adaptive Management

KCI has an active maintenance contract with Riverworks, Inc. for the long-term care of invasive species on site. This work will be supervised by George Morris, a botanist and experienced invasive species specialist, with Riverworks. It is anticipated that multiple treatments each year (likely spring and fall), will be required to control the growth and re-propagation of the invasive populations within the Stony Fork project. The program is envisioned to cover the full five years of monitoring required for the stream restoration project; however, the treatment program will adapt yearly to accommodate the ongoing effectiveness of the treatment work. Chemical treatment is expected to be the standard process for post construction services, but physical removal may be required to ensure the survivability of desirable planted trees and native volunteers.

E. PLANTING PLAN

All unforested portions of the project easement will be planted to establish a forested riparian buffer. At a minimum, 12.1 acres will be reforested, but additional plantings may take place beyond this area to ensure an adequate density across the site. The planting plan is shown in greater detail in the project construction sheets. Trees and shrubs will be planted at a density of 968 stems per acre (9 feet x 5 feet spacing). 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 this list:

Common Name	**Scientific Name**
River Birch	*Betula nigra*
American Persimmon	*Diospyros virginiana*
Green Ash	*Fraxinus pennsylvanica*
Tulip Poplar	*Liriodendron tulipifera*
American Sycamore	*Platanus occidentalis*
White Oak	*Quercus alba*
Southern Red Oak	*Quercus falcata*
Swamp Chestnut Oak	*Quercus michauxii*
Pin Oak	*Quercus palustris*
Willow Oak	*Quercus phellos*

In addition, partial overstory forested enhancement sections of the easement that have been treated for privet will be supplementally planted with either one gallon container trees at a 20 by 20 foot spacing or bare root trees contained in tree shelters 10-foot center spacing. These species may consist of river birch, sycamore, or any of the five oak species listed above.

F. MONITORING PLAN

Vegetation monitoring will take place between the end of August and mid-December. The success of the riparian plantings will be evaluated using twelve 0.02-acre square or rectangular plots within the enhancement and restoration buffer mitigation areas. Six plots will be permanently installed, while the remainder will be randomly placed at the time of each monitoring visit. The plots will be distributed as follows:

Table 2. Vegetative Monitoring Plots for Buffer Mitigation

Veg Plot	Reach	Buffer Mitigation	Distance from TOB	Bank	Type
1	SF1	Restoration	51-200'	Left	Permanent
2	SF2	Restoration	TOB-50'	Right	Permanent
3	SF2	Restoration	TOB-50'	Left	Permanent
4	T1	Restoration	51-200'	Right	Permanent
5	T2	Restoration	TOB-50'	Left	Permanent
6	T2	Enhancement	TOB-50'	Left	Permanent
7	SF1	Restoration	TOB-50'	Right	Random
8	SF2	Restoration	TOB-50'	left	Random
9	SF2	Restoration	TOB-50'	Right	Random
10	SF3	Enhancement	TOB-50'	Right	Random
11	T1	Restoration	TOB-50'	Left	Random
12	T2	Enhancement	51-200'	Right	Random

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. Height will be used as a determination of plant vigor. In all plots, exotic and invasive stems will also be included in the stem counts. Additionally, a photograph will be taken of each plot. Beginning at the end of the first growing season and no sooner than 5 months following planting, KCI will monitor the planted vegetation for riparian area success in monitoring years 1, 2, 3, 4, and 5 *or until DWR approval is obtained*.

G. PROJECT PERFORMANCE STANDARDS

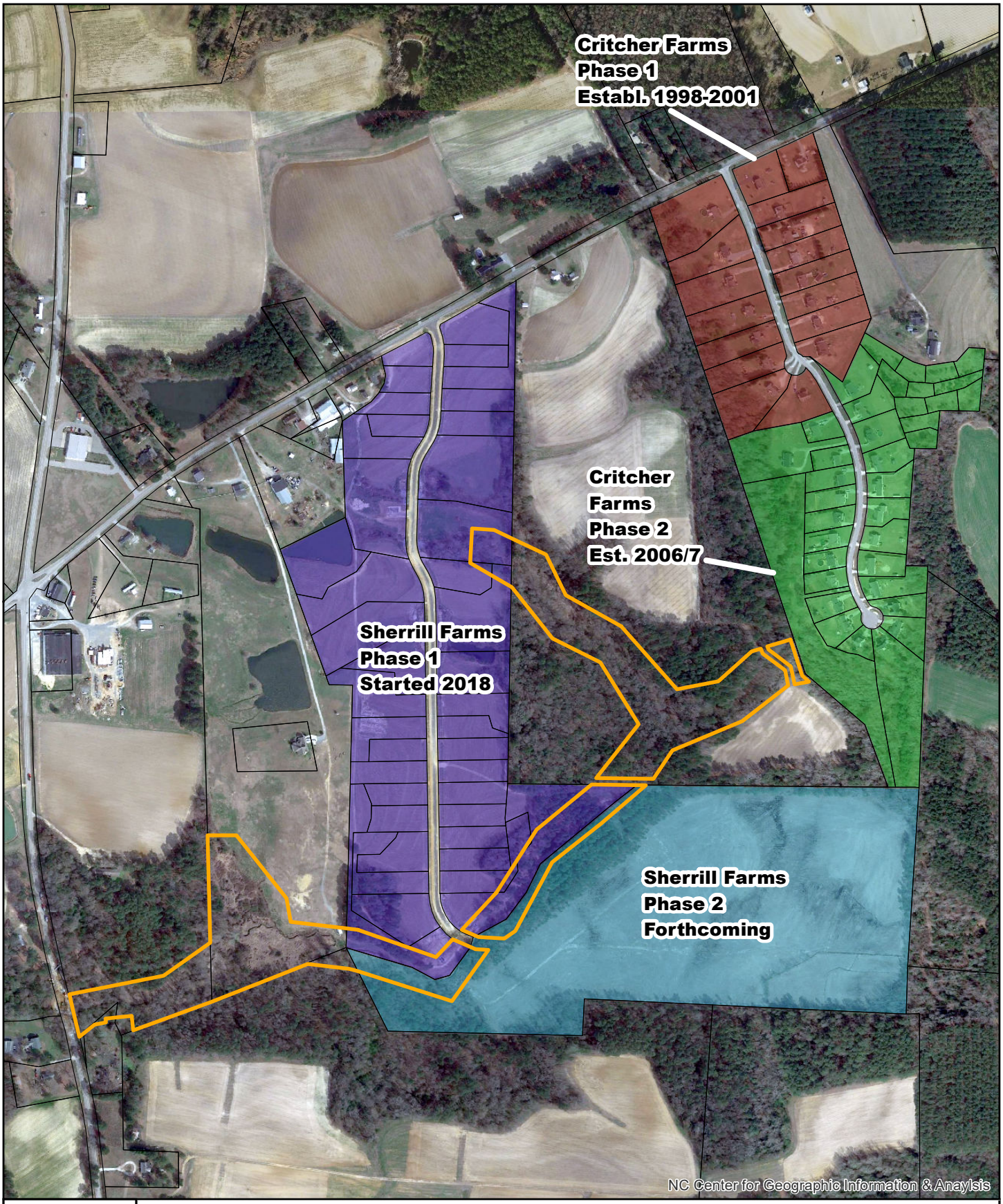
The vegetation within the areas proposed for riparian buffer credit must contain 260 stems per acre at the end of five years of monitoring. There should be a minimum of four native hardwood tree species (inclusive of volunteers), with no species greater than 50% of the stems. Trees in each plot must average 7 feet in height at Year 5. For any volunteer tree stem to count toward vegetative success, it must be a species from the approved planting list included in the Mitigation Plan.

Table 3. Buffer Project Areas and Assets

Location	Jurisdictional Streams	Restoration Type	Reach ID/Component	Buffer Width (ft)	Creditable Area (sf)*	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits (BMU)
Rural	Subject	Restoration		Min. 20' from TOB to 29'		1	75%	1.33	-
			SF	Min. 30' from TOB to 100'	291,656		100%	1.00	291,656
			SF	101-200'	20,075		33%	3.03	6,625
		Enhancement		Min. 20' from TOB to 29'		2	75%	2.67	-
			SF	Min. 30' from TOB to 100'	16,364		100%	2.00	8,182
				101-200'			33%	6.06	-
Rural	Subject	Restoration		Min. 20' from TOB to 29'		1	75%	1.33	-
			T1	Min. 30' from TOB to 100'	74,430		100%	1.00	74,430
			T1	101-200'	17,015		33%	3.03	5,615
		Enhancement		Min. 20' from TOB to 29'		2	75%	2.67	-
				Min. 30' from TOB to 100'			100%	2.00	-
				101-200'			33%	6.06	-
Rural	Nonsubject	Restoration		Min. 20' from TOB to 29'		1	75%	1.33	-
			T2	Min. 30' from TOB to 100'	47,108		100%	1.00	47,108
				101-200'			33%	3.03	-
		Enhancement		Min. 20' from TOB to 29'		2	75%	2.67	-
			T2	Min. 30' from TOB to 100'	58,439		100%	2.00	29,219
				101-200'			33%	6.06	-
				SUBTOTALS	**525,087**				**462,835**

			ELIGIBLE PRESERVATION AREA		**175,029**				
Location	**Jurisdictional Streams**	**Restoration Type**	**Reach ID/Component**	**Buffer Width (ft)**	**Creditable Area (sf)***	**Initial Credit Ratio (x:1)**	**% Full Credit**	**Final Credit Ratio (x:1)**	**Riparian Buffer Credits (BMU)**
Rural	Subject	Preservation	SF	Min. 20' from TOB to 29'	1,378	10	75%	13.33	103
			SF	Min. 30' from TOB to 100'	297,223		100%	10.00	29,722
			SF	101-200'	9,358		33%	30.30	309
	Nonsubject			Min. 20' from TOB to 29'		5	75%	6.67	-
				Min. 30' from TOB to 100'			100%	5.00	-
				101-200'			33%	15.15	-
Rural	Subject	Preservation		Min. 20' from TOB to 29'		10	75%	13.33	-
			T2	Min. 30' from TOB to 100'	115,847		100%	10.00	11,585
			T2	101-200'	854		33%	30.30	28
	Nonsubject			Min. 20' from TOB to 29'		5	75%	6.67	-
				Min. 30' from TOB to 100'			100%	5.00	-
				101-200'			33%	15.15	-
				SUBTOTALS	**424,660**				**41,747**
SUBTOTAL AREA MIN. 30' FROM TOB TO 100' PRESERVATION ELIGIBLE FOR 10:1 CREDIT					413,069				
LIMIT OF PRESERVATION BASED ON ELIGIBLE PRESERVATION AREA					**175,029**	10	100%	10	**17,503**

TOTAL BUFFER MITIGATION SQUARE FOOTAGE	949,747				504,582
TOTAL BUFFER MITIGATION SQUARE FOOTAGE WITH ELIGIBLE PRESERVATION	**700,116**				**480,338**



ATTACHMENT II. ADJACENT DEVELOPMENT, STONY FORK RESTORATION SITE, JOHNSTON COUNTY, NC

KCI ASSOCIATES OF NC

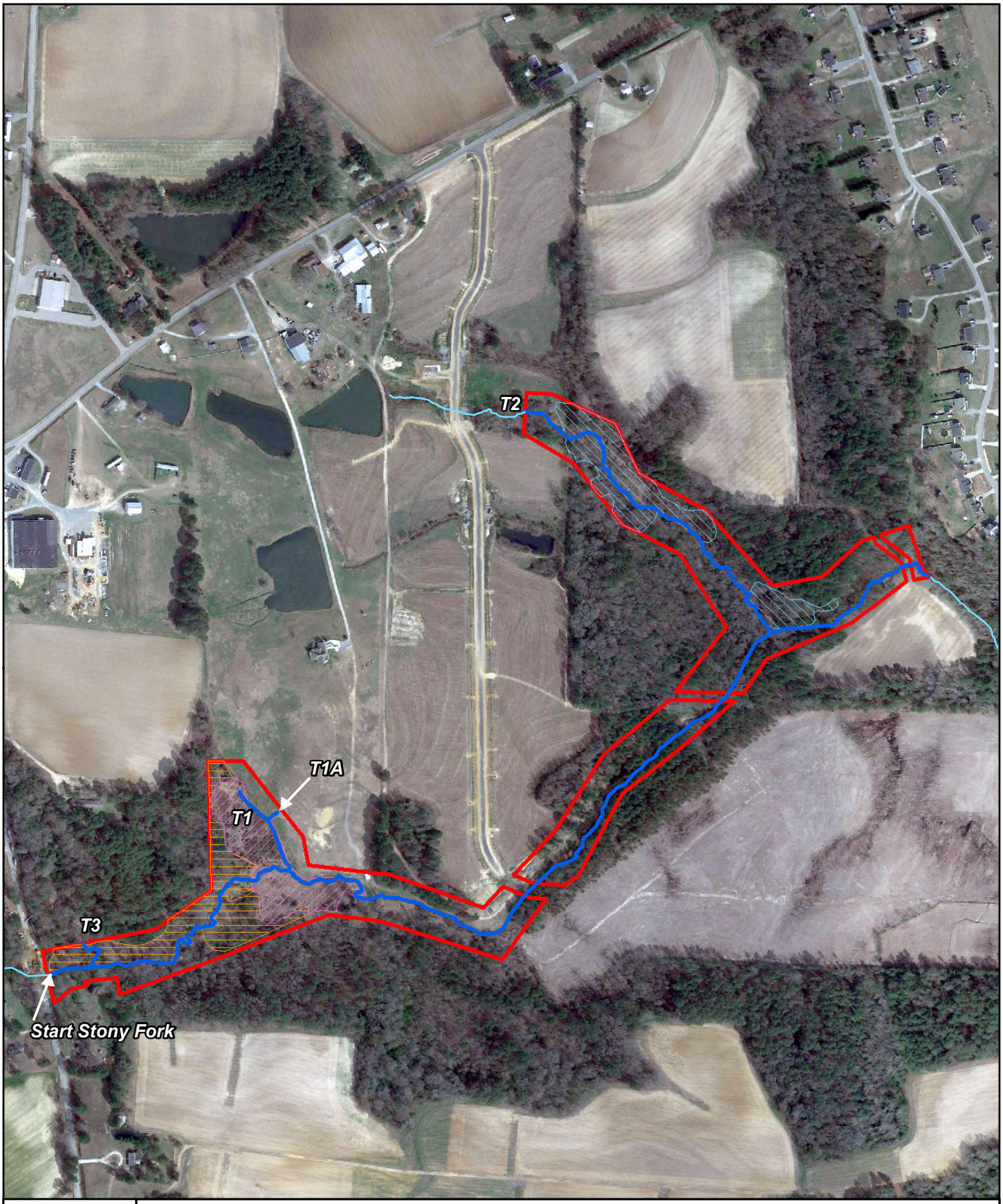
Project Easement (24.4 ac)

Johnston County Parcels

N

0 600 1,200 Feet

Source: Google Earth, 3/2018.



KCI ASSOCIATES OF NC

ATTACHMENT III. EXTENT OF INVASIVE SPECIES, STONY FORK RESTORATION SITE, JOHNSTON COUNTY, NC

Project Easement (24.4 ac)
Existing Project Streams
Other Streams
Kudzu Area
Privet - Area A
Privet - Area B

N

0 500 1,000 Feet

Source: Google 2018.

Water Resources
ENVIRONMENTAL QUALITY

PAT MCCRORY
Governor
DONALD R. VAN DER VAART
Secretary
S. JAY ZIMMERMAN
Director

April 28, 2016

DWR Project #: 2016-0372

Tim Morris
KCI Associates of NC
Landmark Center II
4601 Six Forks Road - Suite 220
Raleigh NC 27609
(via electronic mail)

Re: Site Viability for Buffer Mitigation & Nutrient Offset – Stony Fork
Located at 1955 Federal Rd., Benson, NC
Johnston County

Dear Mr. Morris,

On April 7, 2016, Katie Merritt, with the Division of Water Resources (DWR), assisted you and others from KCI Technologies, Inc. at the proposed Stony Fork Mitigation Site (Site) in Benson, NC. The Site is located in the Neuse River Basin within the 8-digit Hydrologic Unit Code 03020201. The Site is being proposed as part of a full-delivery stream restoration project for the Division of Mitigation Services (RFP #16-006477). The Interagency Review Team (IRT) was also present onsite. At your request, Ms. Merritt performed a site assessment of features onsite to determine suitability for buffer and nutrient offset mitigation. Features are more accurately shown in the attached maps signed by Ms. Merritt on April 19, 2016. If approved, mitigating this site could provide stream mitigation credits, riparian buffer credits and/or nutrient offset credits.

Ms. Merritt's evaluation of the features from Top of Bank (TOB) out to 200' for buffer and nutrient offset mitigation pursuant to Rule 15A NCAC 02B .0295 (effective November 1, 2015) and Rule 15A NCAC 02B .0240 is provided in the table below:

Feature	Classification	*Subject to Buffer Rule	Landuses	Buffer Credit Viable	**Nutrient Offset Viable at 2,273 lbs/acre	Mitigation Type
T1	Modified natural stream	No	West side of TOB = dense monoculture of kudzu; East side of TOB = managed lawn	Yes	No	Restoration per 15A NCAC 02B .0295 (o)(3)
Stony Fork (R1 – T1 confluence)	Stream	Yes	Canopy comprised mostly of dense mid-story sized privet 6" DBH, dense kudzu & a sparse fringe of large native hardwoods	Yes	No	Restoration per 15A NCAC 02B .0295 (o)(3) only if invasive vegetation is all removed and managed and impacted buffer is replanted with native hardwoods.
Stony Fork (below T1	Stream	Yes	West side of TOB= farm path and loblolly	Yes (farm	No	Farm Path only = Restoration East side of TOB = Preservation per

confluence – T2 confluence)			pine forest; East side of TOB = Native Hardwood forest	path & East side)		15A NCAC 02B .0295 (o)(5)
Stony Fork (below T2 confluence throughout	Stream (not including riparian wetlands)	Yes	Native hardwood forest	Yes	No	Preservation per 15A NCAC 02B .0295 (o)(5)
T2.1	Undetermined conveyance	on maps	Hay crop & native hardwood forest mix	n/a	Yes	Need stream determination by DWR to be buffer credit viable; Riparian Restoration down to crossing & Restoration *outside* of the native hardwood forest down to wood line;
T2.2 to Stony Fork	Stream	Yes	Native hardwood forest w/ dense mid-story privet along channel banks	Yes	No	Preservation per 15A NCAC 02B .0295 (o)(5)

*Subjectivity calls were determined using the 1:24,000 scale quadrangle topographic map prepared by USGS and the most recent printed version of the soil survey map prepared by the NRCS

**For nutrient offset viability to be determined, the landowner must provide proof in writing that the land is being used for agriculture or has been used for agriculture previously (prior to rule baseline). Dates, supported by photos or other written records, must be included to confirm that the uses of the open fields onsite are for hay crop cultivation/row crop.

Maps showing the project site and the features are provided and signed by Ms. Merritt on April 19, 2016. This letter should be provided in all future mitigation plans for this Site. In addition, all vegetative plantings, performance criteria and other mitigation requirements for riparian restoration and preservation must follow the requirements in 15A NCAC 02B .0295 to be eligible for buffer and nutrient offset credits. In addition, Neuse Buffer mitigation credits generated at this site are not able to be transferred into nutrient offset credits.

For any areas depicted as not being viable for nutrient offset credit, one could propose a different measure other than riparian restoration, along with supporting calculations and sufficient detail to support estimates of load reduction, for review by the DWR to determine viability for nutrient offset according to 15A NCAC 02B .0240.

Please contact Katie Merritt at (919)-807-6371 if you have any questions regarding this correspondence.

Sincerely,

Karen Higgins

Karen Higgins, Supervisor
401 and Buffer Permitting Branch

KAH/*km*
Attachments: Site Aerial Map, USGS Topographic Map, NRCS Soil Survey

cc:File Copy (Katie Merritt)
DMS – Jeff Schaffer (via electronic mail)

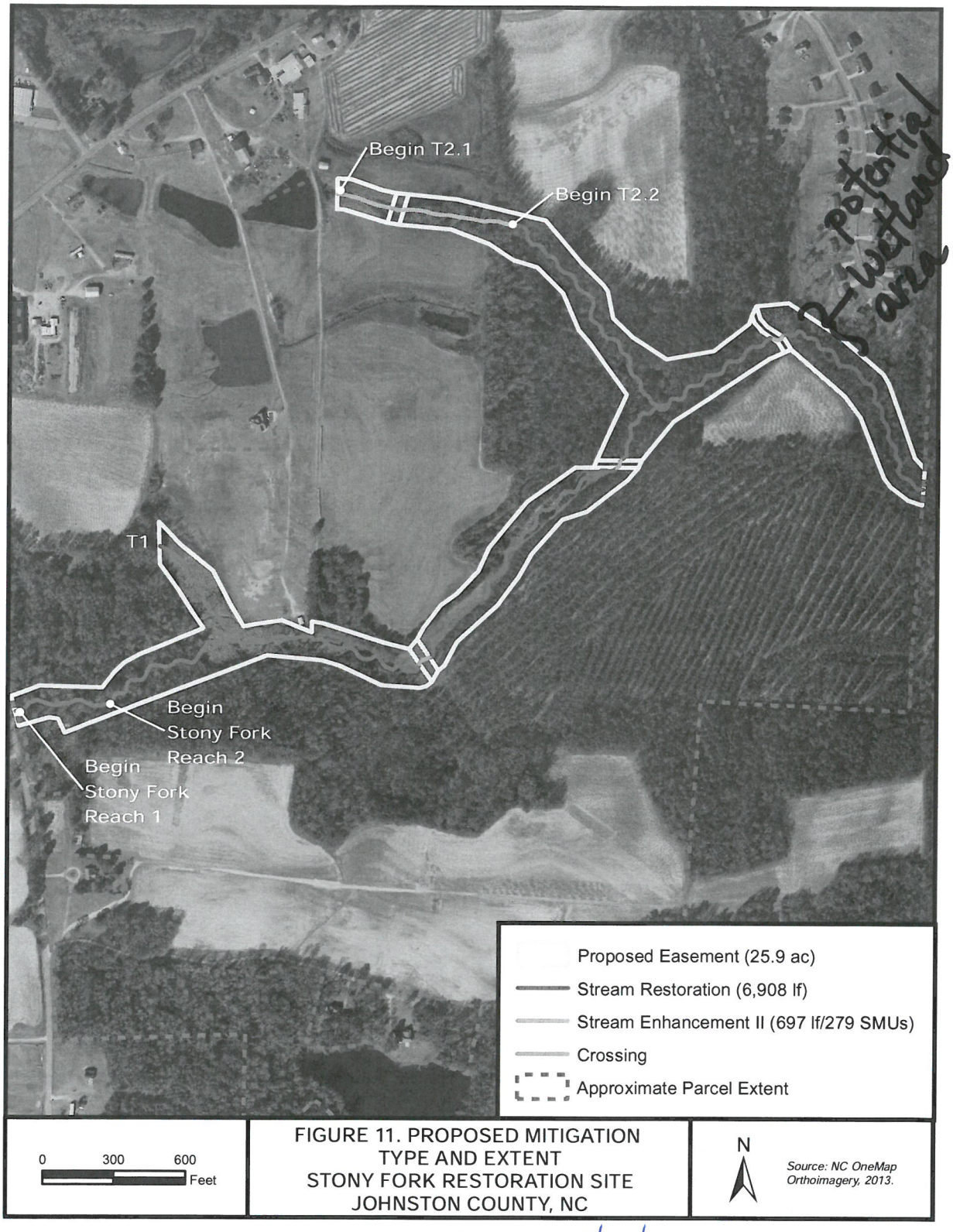


FIGURE 11. PROPOSED MITIGATION TYPE AND EXTENT
STONY FORK RESTORATION SITE
JOHNSTON COUNTY, NC

Kym 4/19/16
#2016-0372

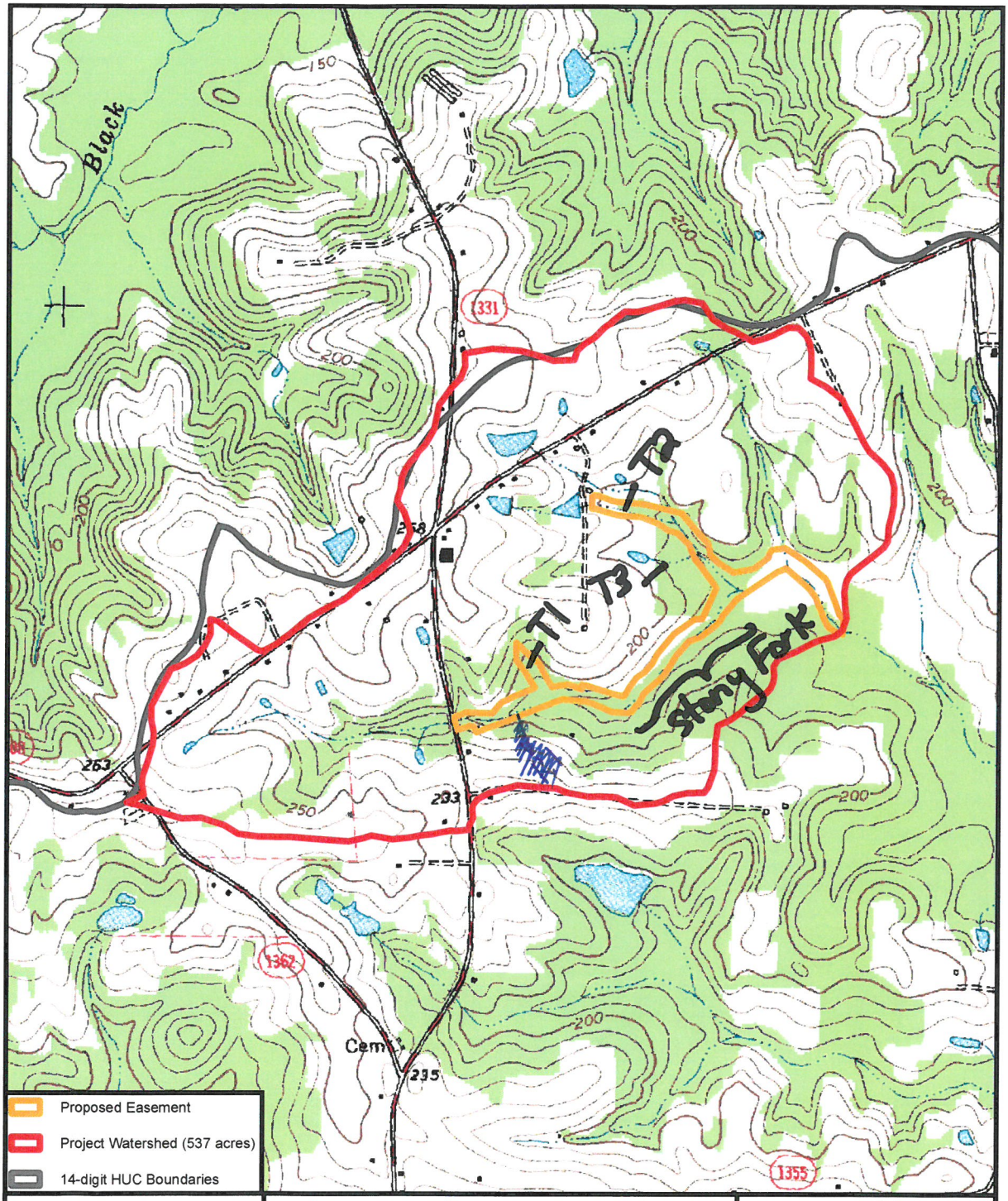
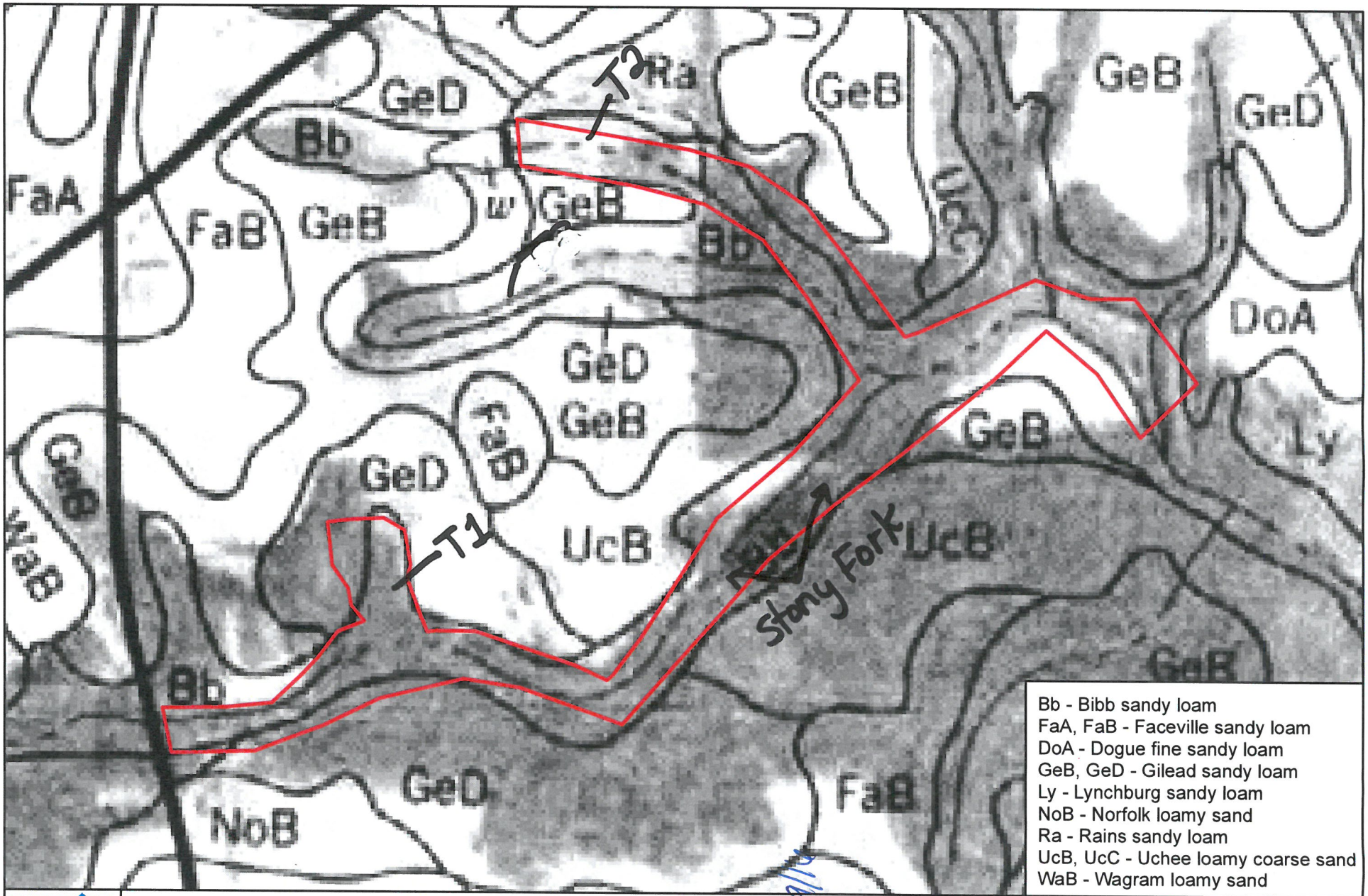


FIGURE 2. USGS TOPOGRAPHIC MAP
STONY FORK RESTORATION SITE
JOHNSTON COUNTY, NC

Kym 4/19/16
2016-0372



Bb - Bibb sandy loam
FaA, FaB - Faceville sandy loam
DoA - Dogue fine sandy loam
GeB, GeD - Gilead sandy loam
Ly - Lynchburg sandy loam
NoB - Norfolk loamy sand
Ra - Rains sandy loam
UcB, UcC - Uchee loamy coarse sand
WaB - Wagram loamy sand

KCI ASSOCIATES OF NC

Project Easement

500 250 0 500
Feet

Image Source: Johnston County NRCS Soil Survey Sheet 9

N
W E
S

#2016-0372

NRCS Soil Survey
Stony Fork Restoration Site
Johnston County, NC

April 2016

Water Resources
ENVIRONMENTAL QUALITY

PAT MCCRORY
Governor

DONALD R. VAN DER VAART
Secretary

S. JAY ZIMMERMAN
Director

July 8, 2016

Joe Sullivan
4601 Six Forks Road
Suite 220
Raleigh, NC 27609

Subject: Buffer Determination Letter
NBRRO #16-144
Johnston County

Determination Type:	
Buffer	Intermittent/Perennial
☒ Neuse (15A NCAC 2B .0233) ☐ Tar-Pamlico (15A NCAC 2B .0259) ☐ Jordan (15A NCAC 2B .0267) (governmental and/or interjurisdictional projects)	☐ Intermittent/Perennial Determination (where local buffer ordinances apply)

Project Name: Stony Fork Restoration Site

Address/Location: Southeast of the Federal Road and Elevation Road intersection in Benson NC

Stream(s): Un-named tributaries to Stony Fork and Stony Fork

Determination Date: 6/23/2016 **Staff: Erin Deck**

Stream	E/I/P*	Not Subject	Subject	Start@	Stop@	Soil Survey	USGS Topo
Stony Fork	I		X	Throughout Project Boundary		X	X
T2	I/P		X	35.4528 -78.5224	Confluence with Stony Fork	X	X
T5	I		X	Off property	Confluence with Stony Fork	X	X
T6	I		X	pond	35.4517 -78.5216	X	X
T7		X		Linear Wetland		X	X
NT		X		Not present on ground		X	X

**E/I/P = Ephemeral/Intermittent/Perennial*

Explanation: The stream(s) listed above has been located on the most recent published NRCS Soil Survey of Johnston County, North Carolina and/or the most recent copy of the USGS Topographic map at a 1:24,000 scale. Each stream that is checked "Not Subject" has been determined to not be at least intermittent or is not present. Streams that are checked "Subject" have been located on the property and possess characteristics that qualify it to be at least an intermittent stream. There may be other streams located on the property that do not show up on the maps referenced above but may be considered jurisdictional according to the US Army Corps of Engineers.

This on-site determination shall expire five (5) years from the date of this letter. Landowners or affected parties that dispute a determination made by the DWR may request a determination by the Director. An appeal request must be made within sixty (60) days of date of this letter. A request for a determination by the Director shall be referred to the Director in writing. ***If sending via US Postal Service:*** **c/o** ***Karen Higgins; DWR – 401 & Buffer Permitting Unit; 1617 Mail Service Center; Raleigh, NC 27699-1617. If sending via delivery service (UPS, FedEx, etc.): Karen Higgins; DWR – 401 & Buffer Permitting Unit; 512 N. Salisbury Street; Raleigh, NC 27604.***

This determination is final and binding unless, as detailed above, unless an appeal is requested within sixty (60) days.

This project may require a Section 404/401 Permit for the proposed activity. Any inquiries should be directed to the US Army Corp of Engineers (Raleigh Regulatory Field Office) at (919)-554-4884.

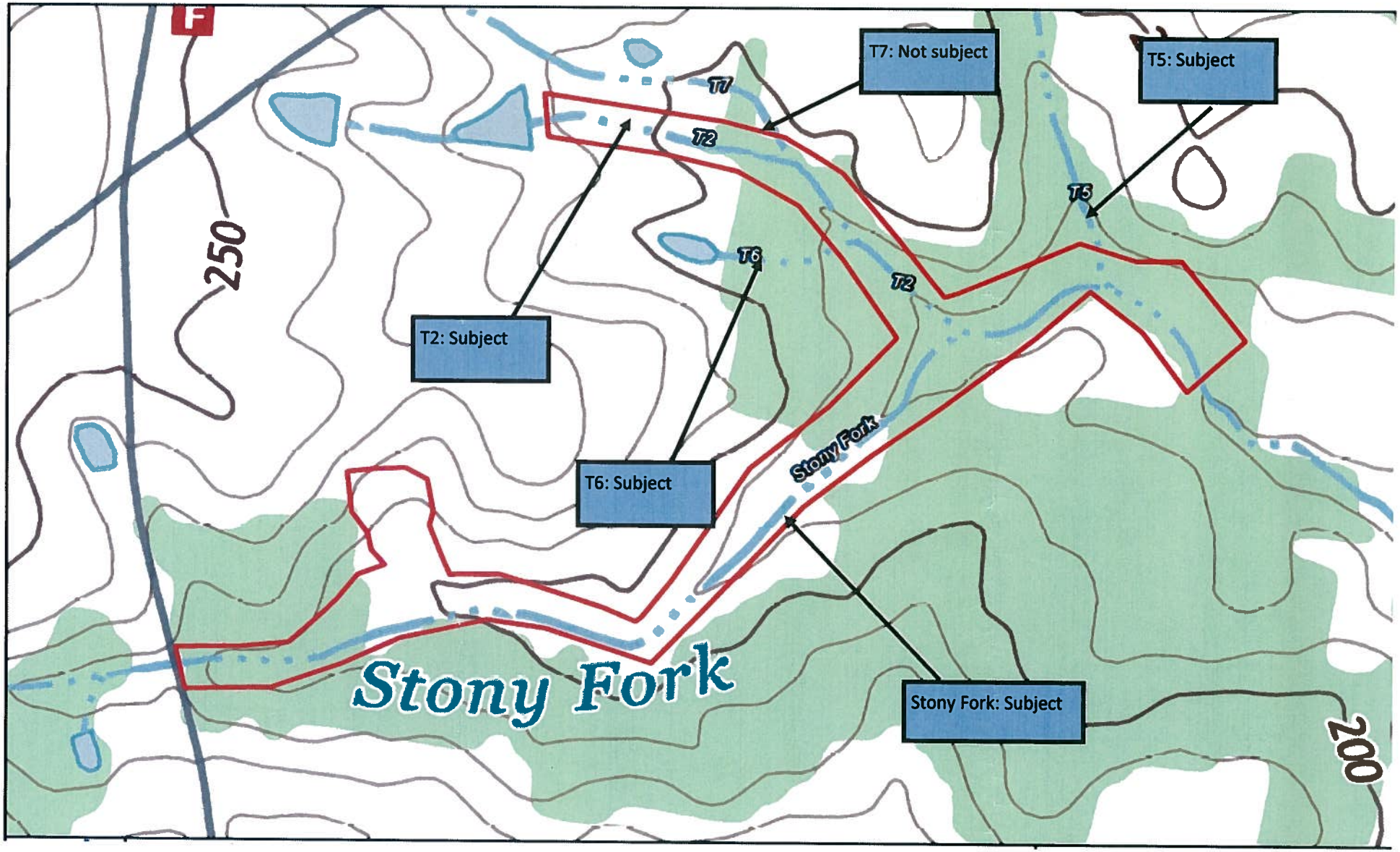
If you have questions regarding this determination, please feel free to contact Erin Deck at (919) 791-4200.

Sincerely,

Danny Smith
Supervisor, Water Quality Regional Operations Center

cc: RRO DWR File Copy

16-144: Stony Fork Restoration Project



Legend:

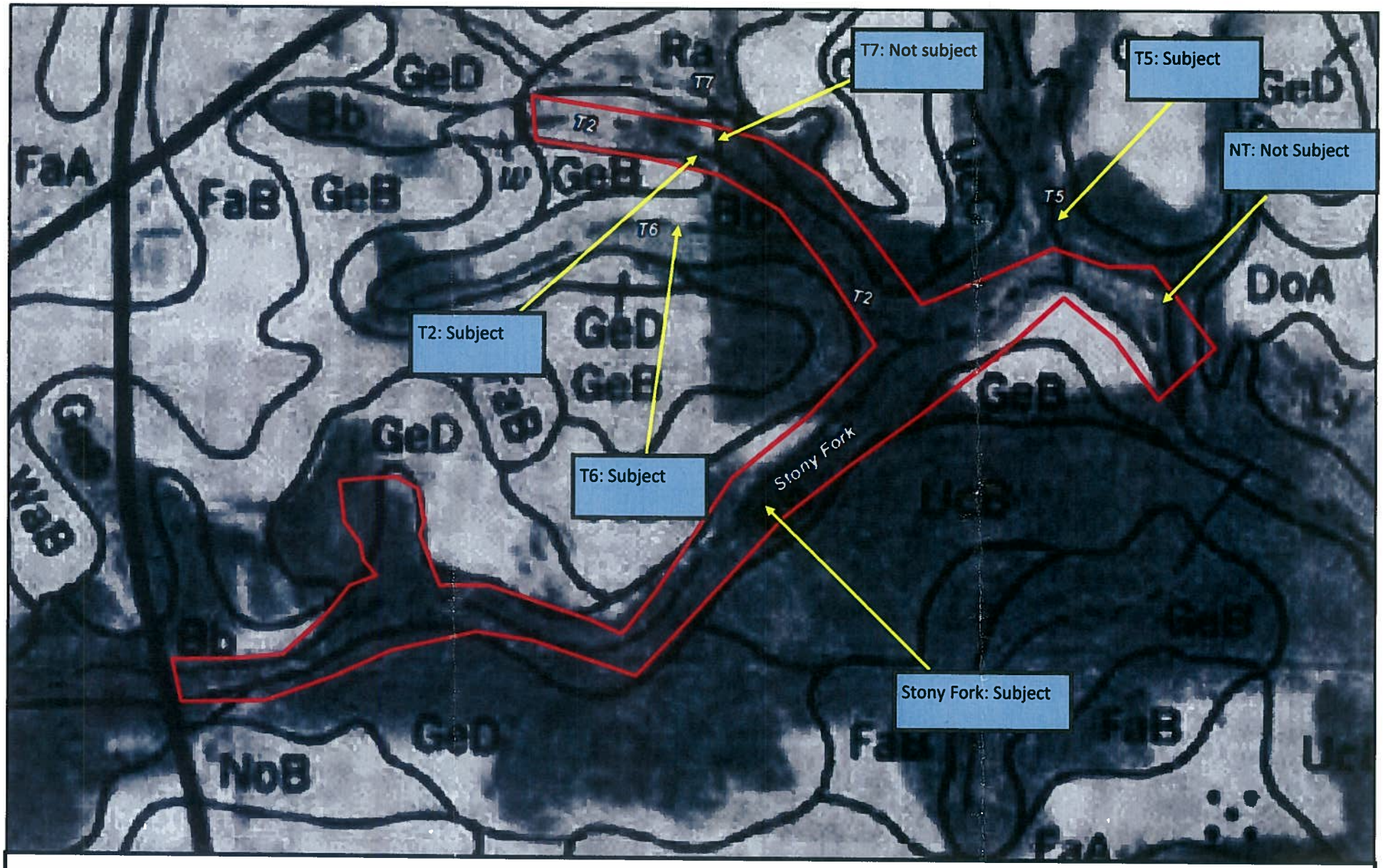
-Approximate Site boundary:

Map provided by NCDEQ Division of Water Resources

:: Locations are approximate and are provided for reference only ::

N

16-144: Stony Fork Restoration Project



Legend:

-Approximate Site boundary:

Map provided by NCDEQ Division of Water Resources

:: Locations are approximate and are provided for reference only ::

N

Water Resources
ENVIRONMENTAL QUALITY

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
LINDA CULPEPPER
Interim Director

April 16, 2018

DWR Project #: 2016-0372

Tim Morris
KCI Associates of NC
4505 Falls of Neuse Rd, Suite 400
Raleigh, NC 27609
(via electronic mail: tim.morris@kci.com)

Re: *Re-evaluation* Site Viability for Buffer Mitigation & Nutrient Offset
Stony Fork Site (T2.2 only)
Located at 1955 Federal Rd., Benson, NC
Johnston County

Dear Mr. Morris,

On April 7, 2016, Katie Merritt, with the Division of Water Resources (DWR), assisted you and others from KCI Technologies, Inc. at the proposed Stony Fork Mitigation Site (Site) in Benson, NC. The Site is located in the Neuse River Basin within the 8-digit Hydrologic Unit Code 03020201. The Site is being proposed as part of a full-delivery stream restoration project for the Division of Mitigation Services (RFP #16-006477). The Interagency Review Team (IRT) was also present onsite. On April 28, 2016, DWR issued a Site Viability Letter for the subject site.

At your request, on March 29, 2018, Ms. Merritt performed an additional site assessment of the feature labeled as T2.2 in the table below to determine if riparian conditions had changed since the site visit on April 7, 2016. As referenced in the letter dated April 28, 2016, the riparian land-use was described as being "*Native hardwood forest with dense mid-story privet along channel banks"* and the mitigation type for this feature was determined to be *Preservation per 15A NCAC 02B .0295 (o)(5)*. During the site visit on March 29, 2018, Ms. Merritt observed the substantial removal of mid-story and understory privet to the extent that the riparian buffer was completely void of understory and mid-story woody species. Ms. Merritt determined that onsite conditions observed on March 29, 2018 indicated a need to re-evaluate the mitigation type along this entire reach. Ms. Merritt placed four (4) flags along the riparian areas of T2.2 indicating the mitigation type determined. Placement of the four flags can be seen in the attached aerial labeled "Buffer Mitigation-Field Points" provided by KCI. Additionally, the mitigation types described in the table below are better represented in the attached aerial labeed "Buffer Mitigation – Sheet 3". If approved, mitigating this site could provide stream mitigation credits, riparian buffer credits and/or nutrient offset credits.

This letter only replaces the site viability assessment of the mitigation type for the stream labeled as T2.2 in the letter dated April 28, 2016. All other parts of the letter dated April 28, 2016 remain unchanged.

Ms. Merritt's evaluation of the features and their associated mitigation determination for the riparian areas are provided in the table below. The evaluation was made from Top of Bank (TOB) out to

200' from each existing feature for buffer mitigation pursuant to 15A NCAC 02B .0295 (effective November 1, 2015) and for nutrient offset credits pursuant to 15A NCAC 02B .0240.

Feature ID	Classification in the field	[1]Subject to Buffer Rule	Riparian Land uses of Feature onsite (0-200')	Buffer Credit Viable	[2]Nutrient Offset Viable at 2,273 lbs/acre	Mitigation Type Determination w/in riparian areas *(see Sheet 3 for location of mitigation)*
T2.2 to Stony Fork	Stream	Yes	Combination of Full, Partial & Open Canopy of Native hardwood forest with invasive privet removed	Yes[3]	No	Open Canopy Areas w/ no understory - **Restoration Site** per 15A NCAC 02B .0295 (n) Partial Canopy Areas w/ partial understory - **Enhancement Site** per 15A NCAC 02B .0295 (n) Full Canopy Area w/ full understory - **Preservation Site** per 15A NCAC 02B .0295 (o)(5) Buffer mitigation areas where privet was removed need to be managed aggressively during the entire five (5) years of monitoring to keep privet manageable. DWR recommends planting larger stock woody stems in these areas.

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

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

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

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

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

This viability assessment will expire on April 16, 2020 or upon the submittal of an As-Built Report to the DWR, whichever comes first. Please contact Katie Merritt at (919)-807-6371 if you have any questions regarding this correspondence.

Sincerely,

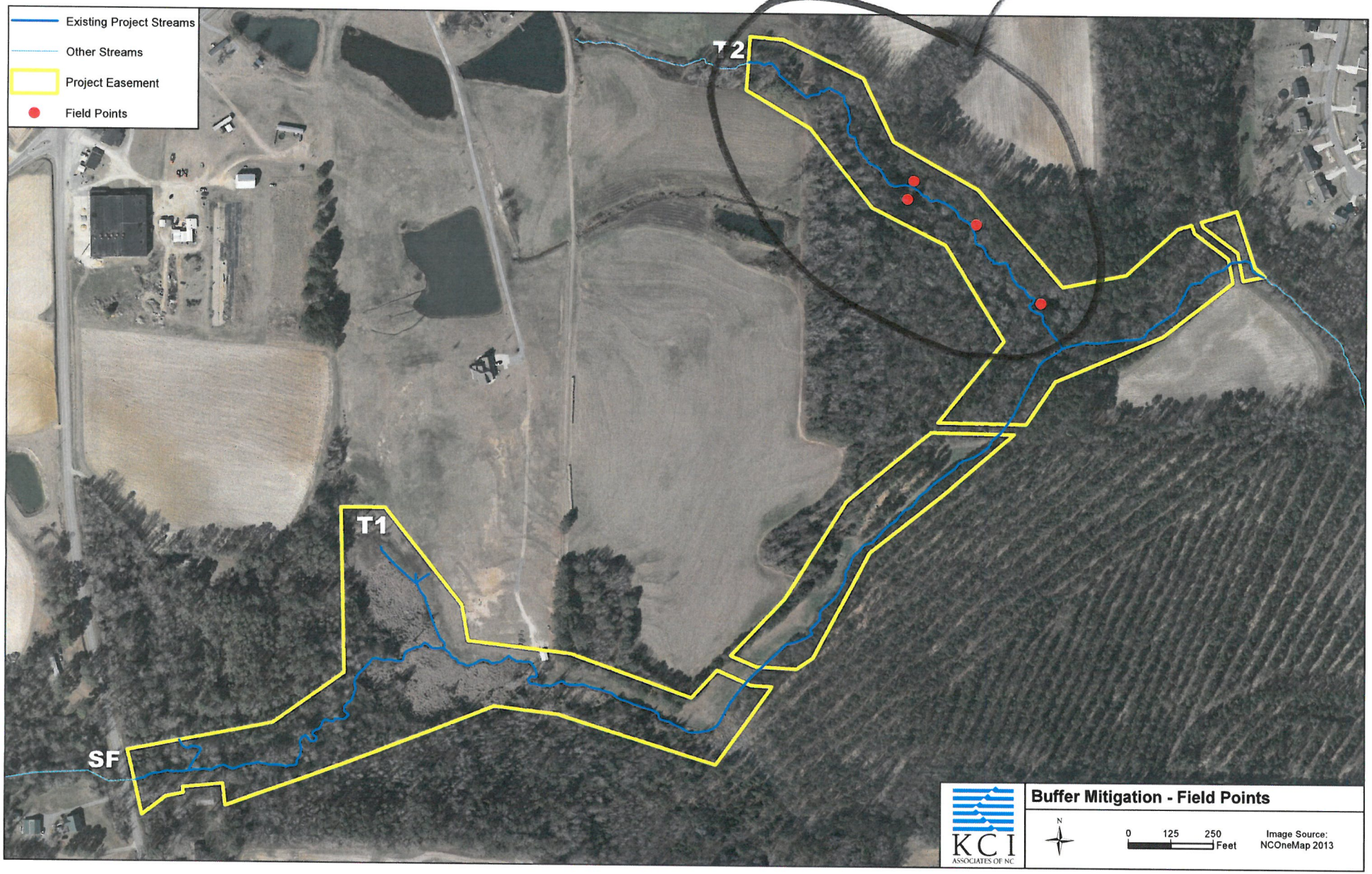
Karen Higgins

Karen Higgins, Supervisor
401 and Buffer Permitting Branch

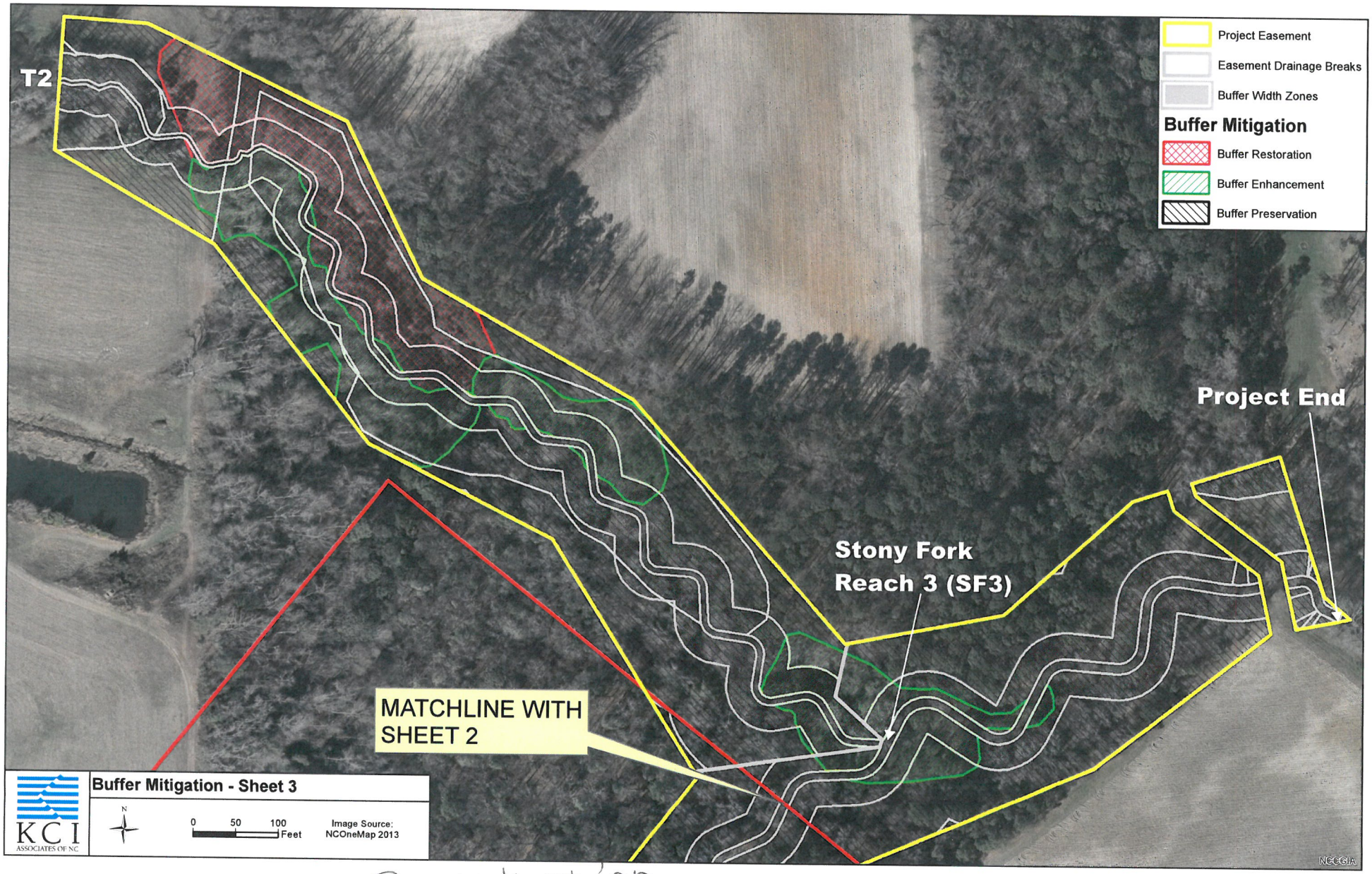
KAH/*km*
Attachments: Buffer Mitigation-Field Points, Buffer Mitigation – Sheet 3

cc: File Copy (Katie Merritt)
DMS – Jeff Schaffer (via electronic mail)

Re-evaluated section



4/12/18



Re-evaluation of T2.2

Kym 4/12/18

Project Easement

Buffer Zones

- TOB to less than 20' (No Credit)
- TOB to 20-29'
- TOB to 30'
- 30-100'
- 101-200'

T2

Sheet 3

T1

Sheet 1

Sheet 2

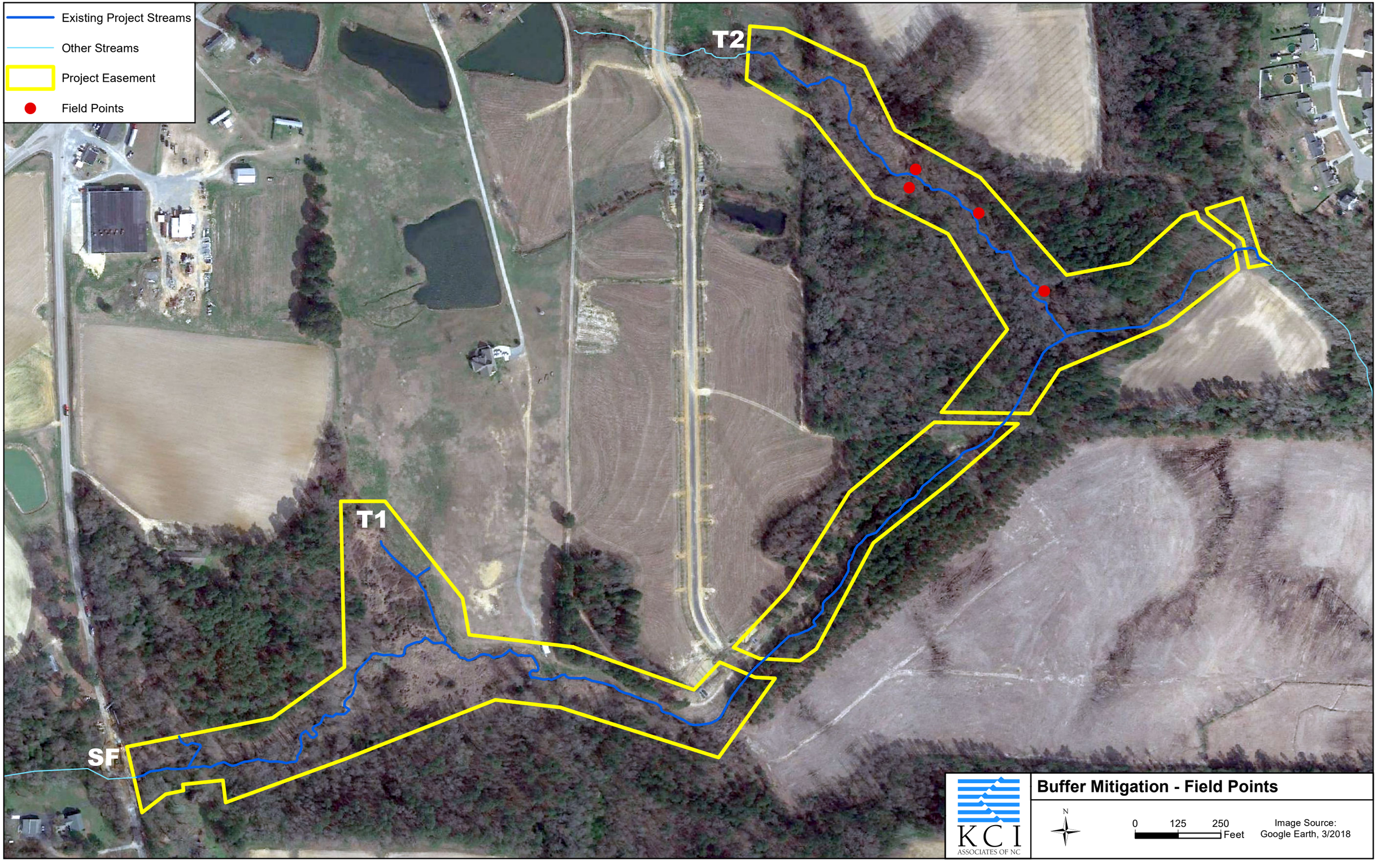
KCI ASSOCIATES OF NC

Buffer Mitigation - Overview

N

0 125 250 Feet

Image Source:
Google Earth, 3/2018



Buffer Mitigation - Field Points

KCI ASSOCIATES OF NC

N

0 125 250 Feet

Image Source: Google Earth, 3/2018

Project Easement

Easement Drainage Breaks

Buffer Width Zones

Buffer Mitigation

Buffer Restoration

Buffer Enhancement

Buffer Preservation

Proposed Top of Bank, 30' and 101' lines

T1

Out of T1 watershed and beyond 200' of Stony Fork

MATCHLINE WITH SHEET 2

Start Stony Fork Reach 1 (SF1)

Stony Fork Reach 2 (SF2)

KCI ASSOCIATES OF NC

Buffer Mitigation - Sheet 1

N

0 50 100 Feet

Image Source: Google Earth, 3/2018

Proposed Top of Bank and 30' lines

MATCHLINE WITH SHEET 1

MATCHLINE WITH SHEET 3

Stony Fork Reach 2 (SF2)

Project Easement

Buffer Width Zones

Buffer Mitigation

Buffer Restoration

Buffer Enhancement

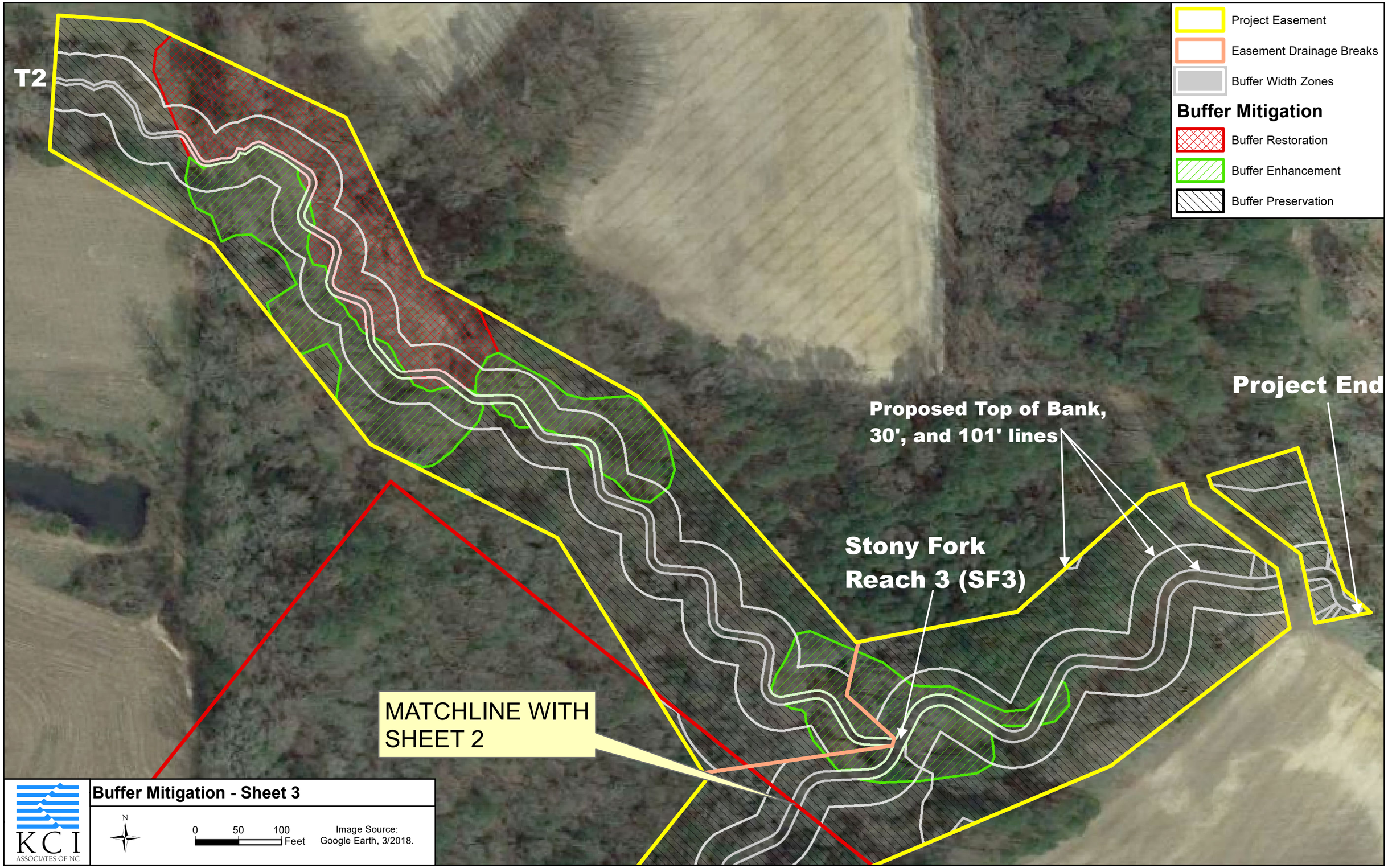
Buffer Preservation

KCI ASSOCIATES OF NC

Buffer Mitigation - Sheet 2

0 50 100 Feet

Image Source: Google Earth, 3/2018



Buffer Mitigation - Sheet 3

KCI ASSOCIATES OF NC

N

0 50 100 Feet

Image Source:
Google Earth, 3/2018.

12.4 Site Protection Instrument

OWNER CERTIFICATION (CE #1&6) SPO FILE NO. 51-CD

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 JOHNSTON AND THAT I HEREBY ADOPT THIS SUBDIVISION PLAN WITH MY FREE CONSENT, ESTABLISH MINIMUM SETBACK LINES, AND DEDICATE ALL STREETS, ALLEYS, PARKS AND OTHER SITES AND EASEMENTS TO PUBLIC OR PRIVATE USE AS NOTED.

GARY T. BENSON — DATE 10/12/17

LINDA W. BENSON — DATE 10/12/17

OWNER CERTIFICATION (CE #2) SPO FILE NO. 51-CH

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 JOHNSTON AND THAT I HEREBY ADOPT THIS SUBDIVISION PLAN WITH MY FREE CONSENT, ESTABLISH MINIMUM SETBACK LINES, AND DEDICATE ALL STREETS, ALLEYS, PARKS AND OTHER SITES AND EASEMENTS TO PUBLIC OR PRIVATE USE AS NOTED.

FATISHA BETH BLACKMON — DATE 10/11/17

OWNER CERTIFICATION (CE #3) SPO FILE NO. 51-CG

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 JOHNSTON AND THAT I HEREBY ADOPT THIS SUBDIVISION PLAN WITH MY FREE CONSENT, ESTABLISH MINIMUM SETBACK LINES, AND DEDICATE ALL STREETS, ALLEYS, PARKS AND OTHER SITES AND EASEMENTS TO PUBLIC OR PRIVATE USE AS NOTED.

JERRY W. PARRISH — DATE 10/12/17

LISA B. PARRISH — DATE 10/12/17

OWNER CERTIFICATION (CE #4) SPO FILE NO. 51-CF

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 JOHNSTON AND THAT I HEREBY ADOPT THIS SUBDIVISION PLAN WITH MY FREE CONSENT, ESTABLISH MINIMUM SETBACK LINES, AND DEDICATE ALL STREETS, ALLEYS, PARKS AND OTHER SITES AND EASEMENTS TO PUBLIC OR PRIVATE USE AS NOTED.

DANIEL MEDLIN JR. — DATE 10.12.17

CATHRYN Z. MEDLIN — DATE 10/12/17

WILLIAM R. MEDLIN — DATE 10.11.17

BONNIE J. MEDLIN — DATE 10-11-17

DEVAN BARBOUR, III — DATE 10/7/17

DEVAN BARBOUR, IV — DATE 10/11/17

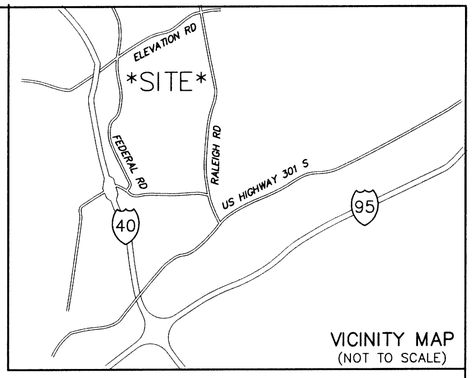
OWNER CERTIFICATION (CE #5) SPO FILE NO. 51-CE

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 JOHNSTON AND THAT I HEREBY ADOPT THIS SUBDIVISION PLAN WITH MY FREE CONSENT, ESTABLISH MINIMUM SETBACK LINES, AND DEDICATE ALL STREETS, ALLEYS, PARKS AND OTHER SITES AND EASEMENTS TO PUBLIC OR PRIVATE USE AS NOTED.

SHERRILL FARM LLC — DATE 10-12-17

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 JOHNSTON 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 OCTOBER 2016. ALL DISTANCES ARE GROUND UNLESS OTHERWISE NOTED.
5. DEED REFERENCES: AS SHOWN HEREON.
6. SUBJECT PROPERTIES KNOWN AS TAX NUMBER: AS SHOWN HEREON.
7. SUBJECT PROPERTIES PARTIALLY LIE WITHIN THE AREA DESIGNATED AS ZONE "X", BASED ON FEDERAL FLOOD INSURANCE RATE MAP 3720164100J EFFECTIVE DECEMBER 2, 2005.
8. NO UNDERGROUND UTILITY LOCATING PERFORMED DURING THE COURSE OF THIS SURVEY.
9. THE STATE OF NORTH CAROLINA, ITS EMPLOYEES AND AGENTS, SUCCESSORS AND ASSIGNS, RECEIVE A PERPETUAL RIGHT OF ACCESS TO THE EASEMENT AREA OVER THE PROPERTY AT REASONABLE TIMES TO UNDERTAKE ANY ACTIVITIES TO RESTORE, CONSTRUCT, MANAGE, MAINTAIN, ENHANCE, AND MONITOR THE STREAM, WETLAND AND ANY OTHER RIPARIAN RESOURCES IN THE EASEMENT AREA, IN ACCORDANCE WITH RESTORATION ACTIVITIES OR A LONG-TERM MANAGEMENT PLAN AS DESCRIBED IN SECTION III-A OF THE CONSERVATION EASEMENT AGREEMENT.



VICINITY MAP
(NOT TO SCALE)

TIE LINE TABLE		
LINE	LENGTH	BEARING
L1	467.40	N68°30'11"E
L2	58.52	S43°08'24"W
L3	30.01	N72°45'58"E

EASEMENT LINE TABLE		
LINE	LENGTH	BEARING
E1	375.77	S69°56'15"W
E2	65.59	N06°51'27"W
E3	35.52	S84°07'59"W
E4	64.76	N00°32'02"W
E5	165.63	S52°17'28"W
E6	88.06	S52°17'28"W
E7	197.03	N12°57'14"W
E8	434.06	N78°48'17"E
E9	257.12	N54°43'26"E
E10	267.02	S01°15'58"E
E11	82.49	S84°07'59"W
E12	17.62	S06°51'27"E
E13	52.77	S78°23'16"W
E14	751.47	N01°15'58"W
E15	129.25	N90°00'00"E
E16	362.76	S38°34'31"E
E17	108.15	S10°36'06"E
E18	264.70	S83°20'39"E
E19	86.54	S01°05'46"W
E20	666.35	S68°30'11"W
E21	198.94	N68°30'11"E
E22	114.57	S21°18'17"E
E23	38.86	N72°28'27"W
E24	190.96	N83°20'39"W
E25	218.84	S00°41'45"W
E26	218.16	N59°50'04"W
E27	155.96	N03°31'19"E
E28	99.28	S85°46'28"E
E29	91.49	S64°39'20"E
E30	245.32	S89°02'47"E
E31	265.78	S49°20'40"W
E32	282.13	S51°38'12"W
E33	351.68	S28°14'09"W
E34	59.84	S55°11'21"W
E35	117.75	N87°04'13"W
E36	82.35	N66°49'37"W
E37	230.44	N43°08'24"E
E38	338.41	N32°22'18"E
E39	320.77	N50°31'26"E
E40	112.15	S66°49'37"E
E41	58.55	S87°04'13"E
E42	284.31	S35°33'51"W
E43	445.87	N72°28'27"W
E44	41.06	S83°20'39"E
E45	374.12	S70°29'22"E
E46	110.43	N43°08'24"E
E47	168.44	S64°39'20"E
E48	204.84	S25°58'57"E
E49	285.89	S60°47'36"E
E50	380.21	S41°29'53"E
E51	190.03	N79°14'36"E
E52	203.38	N48°08'53"E
E53	43.25	N72°45'58"E
E54	24.38	S18°18'00"E
E55	125.76	S53°08'51"E
E56	70.38	S12°05'25"E
E57	261.95	S52°23'53"W
E58	342.50	S67°09'08"W
E59	154.05	S33°50'40"W
E60	258.94	N89°10'23"W
E61	309.35	N38°29'57"E
E62	328.72	N31°50'39"W
E63	242.58	N63°22'20"W
E64	295.56	N38°15'39"W
E65	108.84	N72°45'58"E
E66	172.06	S18°07'18"E
E67	41.18	S49°09'47"E
E68	65.98	S79°09'08"W
E69	82.27	N12°05'25"W
E70	127.58	N53°08'51"W
E71	14.40	N18°18'00"W

PT #	NORTHING	EASTING
1	618047.77	2141051.73
2	617918.86	2140698.76
3	617983.98	2140690.93
4	617980.35	2140655.60
5	618045.11	2140654.99
6	617943.80	2140523.95
7	617889.94	2140454.29
8	618081.96	2140410.12
9	618166.23	2140835.92
10	618314.72	2141045.83
11	617971.92	2140573.54
12	617954.42	2140575.64
13	617799.06	2141035.12
14	617799.06	2141164.37
15	618515.46	2141390.56
16	618409.15	2141410.46
17	618378.47	2141673.38
18	618291.95	2141671.72
19	618219.05	2141486.62
20	618185.21	2141713.34
21	618196.91	2141676.29
22	620140.32	2142411.62
23	619921.50	2142408.96
24	620031.13	2142220.35
25	620186.80	2142229.93
26	620179.48	2142328.94
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31	618367.78	2142424.75
32	618333.62	2142375.63
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44	620068.22	2142563.85
45	619884.08	2142653.59
46	619744.57	2142903.14
47	619459.80	2143155.07
48	619495.27	2143341.76
49	619630.96	2143493.25
50	619643.78	2143534.56
51	619620.64	2143542.21
52	619545.21	2143642.84
53	619476.39	2143657.58
54	619316.56	2143450.05
55	619183.57	2143134.42
56	619055.62	2143048.63
57	619059.36	2142789.71
58	619301.46	2142982.28
59	619580.70	2142808.84
60	619689.43	2142591.99
61	619652.67	2143563.22
62	619684.92	2143667.17
63	619521.39	2143720.69
64	619494.46	2143751.85
65	619482.04	2143687.05
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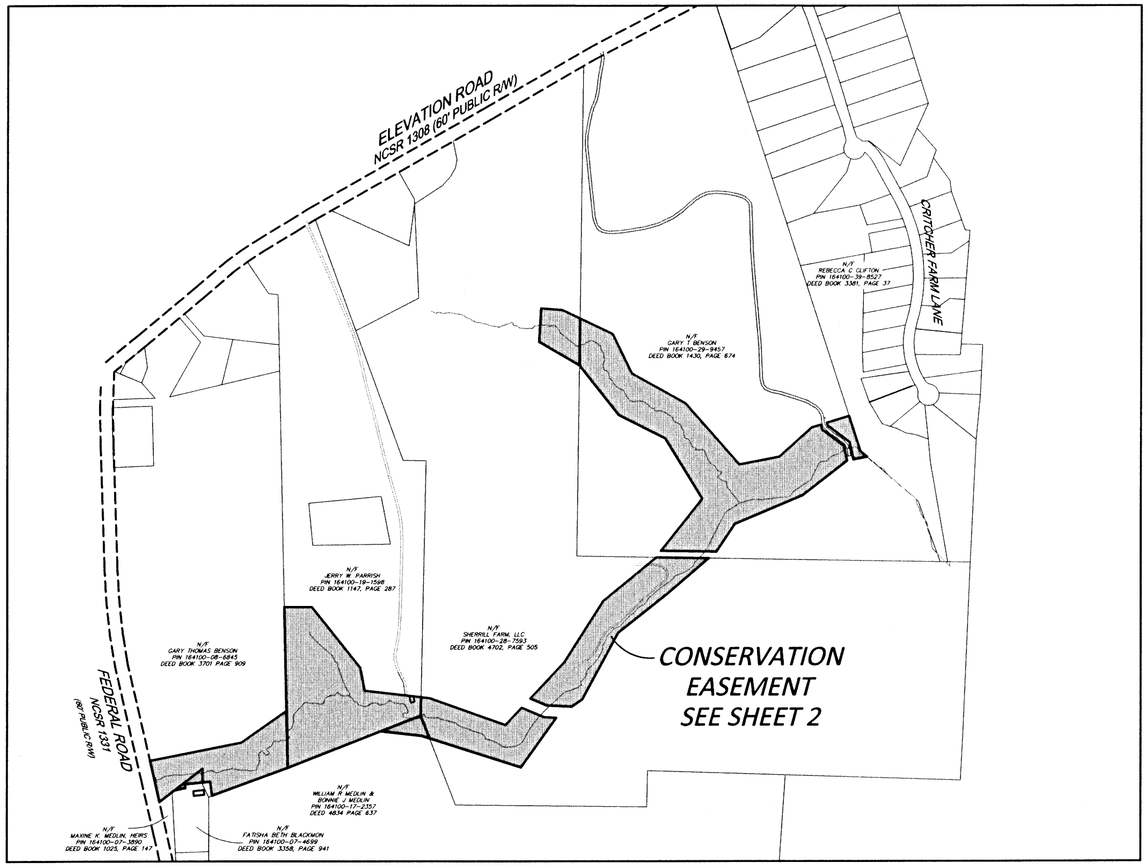
67	619638.99	2143567.74



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 (OF THE EASEMENT AREA) AND HAS BEEN PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 25TH DAY OF SEPTEMBER, 2017

NORTH CAROLINA REGISTRATION NUMBER L-3860
JAMES M. GELLENTHIN

NORTH CAROLINA PROFESSIONAL SEAL L-3860 LAND SURVEYOR 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

STATE OF NORTH CAROLINA
JOHNSTON COUNTY

I, Stephanie Ritchie, REVIEW OFFICER OF JOHNSTON COUNTY, CERTIFY THAT THE MAP OR PLAT WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER — DATE 10/13/17

STATE OF NORTH CAROLINA
JOHNSTON COUNTY

FILED FOR REGISTRATION AT 11:33:22 AM
October 13, 2017 IN THE
REGISTER OF DEEDS OFFICE
RECORDED IN BOOK 85 PAGE 412
Craig Olive Register of Deeds
BY Betty G. Woodall Asst. Assistant

THIS PLAT IS EXEMPT FROM THE DEFINITION OF A SUBDIVISION WITHIN THE ZONING JURISDICTION OF THE JOHNSTON COUNTY PLANNING DEPARTMENT.

DATE 12/12/17 — JOHNSTON COUNTY-PLANNER

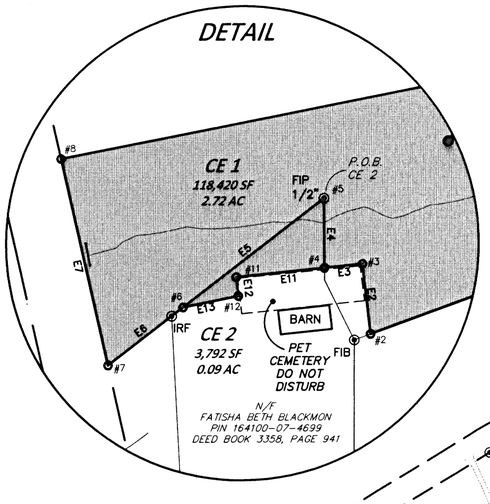
FINAL PLAT
CONSERVATION EASEMENT
FOR
STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
PROJECT NAME: STONY FORK RESTORATION PROJECT
DMS PROJECT #: 97085
SPO FILE NO. 51-CD, 51-CE, 51-CF, 51-CG, 51-CH
ELEVATION TOWNSHIP, JOHNSTON COUNTY
NORTH CAROLINA

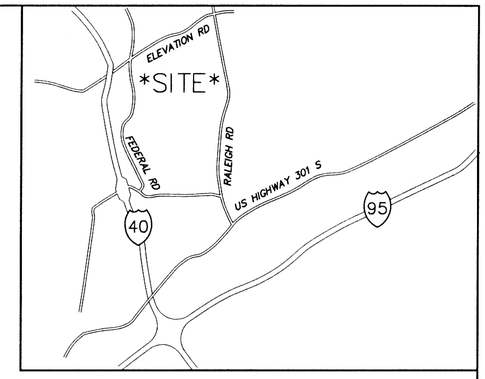
DATE:	SCALE:	SHEET:
AUGUST 16, 2017	N/A	1 OF 2

REVISED: 9/7/17

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





LEGEND

•	EXISTING PK NAIL
◉	EXISTING IRON
O	5/8"*30" REBAR SET W/3.25" ALUMINUM CAP WITH STATE SEAL
○	CALCULATED POINT
⊡	EXISTING MONUMENT
	NEW CONSERVATION EASEMENT FOR "DIVISION OF MITIGATION SERVICES"
P.O.B.	POINT OF BEGINNING
P.O.C.	POINT OF COMMENCEMENT

NCGS MON LANG BEND (AH4769)
N: 627,067.59
E: 2,134,119.26
CSF: 0.99987437

S55°16'49"E
10105.98'

FIP

P.O.C.
CE 5
CE 6

ELEVATION ROAD
NCSR 1308 (60' PUBLIC R/W)

S00°41'45"W 1171.36'

N/F
REBECCA C CLIFTON
PIN 164100-39-8527
DEED BOOK 3381, PAGE 37

CRITCHER FARM LANE

N/F
GARY T BENSON
PIN 164100-29-9457
DEED BOOK 1430, PAGE 674

P.O.B.
CE 5A
CE 6A

CE 5A
36,783 SF
0.84 AC

CE 6B
12,749 SF
0.29 AC

P.O.B.
CE 6B

CE 6A
371,932 SF
8.54 AC

P.O.B.
CE 5B

CE 5B
148,176 SF
3.40 AC

S89°02'47"E
370.53' (TIE)

S89°02'47"E
1078.87'(TIE)

FIB

FIP

S00°41'45"W
885.45'

S01°15'58"E
1453.56'(TIE)

S01°05'46"W
1100.38'(TIE)

N/F
JERRY W. PARRISH
PIN 164100-19-1598
DEED BOOK 1147, PAGE 287

N/F
SHERRILL FARM, LLC
PIN 164100-28-7593
DEED BOOK 4702, PAGE 505

N/F
GARY THOMAS BENSON
PIN 164100-08-6845
DEED BOOK 3701 PAGE 909

CE 3
251,785 SF
5.78 AC

CE 1
118,420 SF
2.72 AC

P.O.B.
CE 4

CE 4
10,696 SF
0.25 AC

CE 5C
108,065 SF
2.48 AC

P.O.B.
CE 1
CE 3
P.O.C.
CE 4

N/F
WILLIAM R MEDLIN &
BONNIE J MEDLIN
PIN 164100-17-2357
DEED 4834 PAGE 637

FEDERAL ROAD
NCSR 1331
(60' PUBLIC R/W)

PET
CEMETERY
DO NOT
DISTURB

SEE
DETAIL

CE 2
3,792 SF
0.09 AC

N/F
MAXINE K. MEDLIN, HEIRS
PIN 164100-07-3890
DEED BOOK 1025, PAGE 147

N/F
FATISHA BETH BLACKMON
PIN 164100-07-4699
DEED BOOK 3358, PAGE 941

FIP

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

State of North Carolina, Johnston Co.
Filed For Registration at 11:33:22 A M.
October 13 2017 in the
Register of Deeds Office
Recorded in Book 85 Page 413
Craig Olive
Register Of Deeds
Patty P. Woodall Asst.
Assistant

FINAL PLAT
CONSERVATION EASEMENT
FOR
STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
PROJECT NAME: STONY FORK RESTORATION PROJECT
DMS PROJECT #: 97085
SPO FILE NO. 51-CD, 51-CE, 51-CF, 51-CG, 51-CH
ELEVATION TOWNSHIP, JOHNSTON COUNTY
NORTH CAROLINA

DATE:	SCALE:	SHEET:
AUGUST 16, 2017	1" = 250'	2 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

12.5 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% (60%*)
3	Third year monitoring report demonstrates performance standards are being met	10%	60% (70%*)
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*

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 stream project with a 7-year monitoring period, a reserve of 10% of a site's total stream credits shall be released after four bank-full

events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than four bankfull events occur during the monitoring period, release of these reserve credits 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.

12.6 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.

12.7 DWR Stream Identification Forms

NC DWQ Stream Identification Form Version 4.11

Date: 10-21-2015	**Project/Site:** Swift - Steam Fork	**Latitude:** 35.4472
Evaluator: TS/AF	**County:** Johnston	**Longitude:** -78.5281
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 29	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 17.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	1	(2)	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	(1)	2	3
9. Grade control	0	0.5	(1)	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 = 5.5)				
12. Presence of Baseflow	0	(1)	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 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:

NC DWQ Stream Identification Form Version 4.11

Date: 10-21-2015	**Project/Site:** Form 1 - Trib 1	**Latitude:** 35.4469
Evaluator: TS/AF	**County:** Johnston	**Longitude:** -78.5260
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 19.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 9.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	(1)	2	3
9. Grade control	(0)	0.5	1	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = (0)		Yes = 3	

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

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

C. Biology (Subtotal = 3.5)				
18. Fibrous roots in streambed	3	2	1	(0)
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = (1.5) Other = 0			

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

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 10-21-2015	**Project/Site:** form 2 - Trib 1	**Latitude:** 35.4484
Evaluator: TS / AF	**County:** Johnston	**Longitude:** -78.5255
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 24.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 12.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	(1)	2	3
9. Grade control	(0)	0.5	1	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 = 7)				
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 = 5)				
18. Fibrous roots in streambed	3	2	1	(0)
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	0.5	1	(1.5)
26. Wetland plants in streambed	FACW = 0.75; OBL = (1.5) Other = 0			

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

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 10-21-2015	**Project/Site:** form 3 - trib 2	**Latitude:** 35.4522
Evaluator: TS/AF	**County:** Johnston	**Longitude:** -78.5210
Total Points: 39.5 *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 = 23)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	2	(3)
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	1	2	(3)
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	No = (0)		Yes = 3	

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

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

C. Biology (Subtotal = 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:

NC DWQ Stream Identification Form Version 4.11

Date: 10-21-2015	**Project/Site:** form 5 - trib 2	**Latitude:** 35.4531
Evaluator: TS/AF	**County:** Johnston	**Longitude:** -78.5239
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 22.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 10)	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 = 6.5)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	1	2	(3)
14. Leaf litter	1.5	1	(0.5)	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	(0)	0.5	1	1.5
17. Soil-based evidence of high water table?	No = (0)		Yes = 3	

C. Biology (Subtotal = 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:

T3

NC DWQ Stream Identification Form Version 4.11

Date: 4/14/16	**Project/Site:** Stony Fork	**Latitude:** 35.4474
Evaluator: J. Sullivan	**County:** Johnston	**Longitude:** -78.5280
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 24.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 11)

	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 = 7.5)

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

C. Biology (Subtotal = 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:

T 8

a.k.a T1A

NC DWQ Stream Identification Form Version 4.11

Date: 5/12/16	**Project/Site:** Stony Fork	**Latitude:** 35.4487
Evaluator: J. Sullivan	**County:** Johnston	**Longitude:** -78.5257
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 19	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 6.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	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 = 7.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 5)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

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

Notes: Small seep that is constantly flowing.

Sketch:

12.8 Approved Jurisdictional Determination

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2016-00875** County: **Johnston** U.S.G.S. Quad: **NC-BENSON**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner: Joe Sullivan
KCI Technologies, Inc.
Address: Landmark Center II, Suite 220
4601 Six Forks Road
Raleigh, North Carolina 27609-5210

Telephone Number: 919 278-2533

Size (acres)	32.3	Nearest Town	**Benson**
Nearest Waterway	**Black Creek**	River Basin	**Upper Neuse**
USGS HUC	**03020201**	Coordinates	Latitude: **35.45297**
			Longitude: **-78.523527**

Location description: Proposed stream channel / wetland bank easement located on 3836 Elevation Road, adjacent to tributaries of Black Creek, north of Benson, in Johnston County, North Carolina.

Indicate Which of the Following Apply:

A. Preliminary Determination

X Based on preliminary information, there may be waters of the U.S. including wetlands on the above described project area . We strongly suggest you have this property inspected to determine the extent of Department of the Army (DA) jurisdiction. To be considered final, a jurisdictional determination must be verified by the Corps. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also, you may provide new information for further consideration by the Corps to reevaluate the JD. **Please see remarks section in regard to the Jurisdictional determination.**

B. Approved Determination

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

_ We 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 signed by the Corps Regulatory Official identified below on _____. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

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

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

Placement of dredged or fill material within waters of the US 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 Thomas at 919-554-4884 x25 or John.T.Thomas.JR@usace.army.mil**.

C. Basis For Determination: ***Sites includes tributaries of Black Creek which flows to the Neuse River and on to the Atlantic Ocean.***

D. Remarks: For the purpose of a mitigation bank planning, the Corps concurs with the preliminary jurisdictional determinations depicted on provided maps included in agents review request received on July 12, 2016.

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 **9/13/2016**.

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: July 13, 2016

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete our Customer Satisfaction Survey, located online at http://regulatory.usacesurvey.com/.

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL		
Applicant: **Joe Sullivan** **KCI Technologies, Inc.**	File Number: **SAW-2016-00875**	Date: July 13, 2016
Attached is:		See Section below
☐ INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
☐ PROFFERED PERMIT (Standard Permit or Letter of permission)		B
☐ PERMIT DENIAL		C
☐ APPROVED JURISDICTIONAL DETERMINATION		D
☒ PRELIMINARY JURISDICTIONAL DETERMINATION		E

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

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

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

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

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

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

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

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

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

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact:
District Engineer, Wilmington Regulatory Division, Attn: John Thomas	Mr. Jason Steele, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

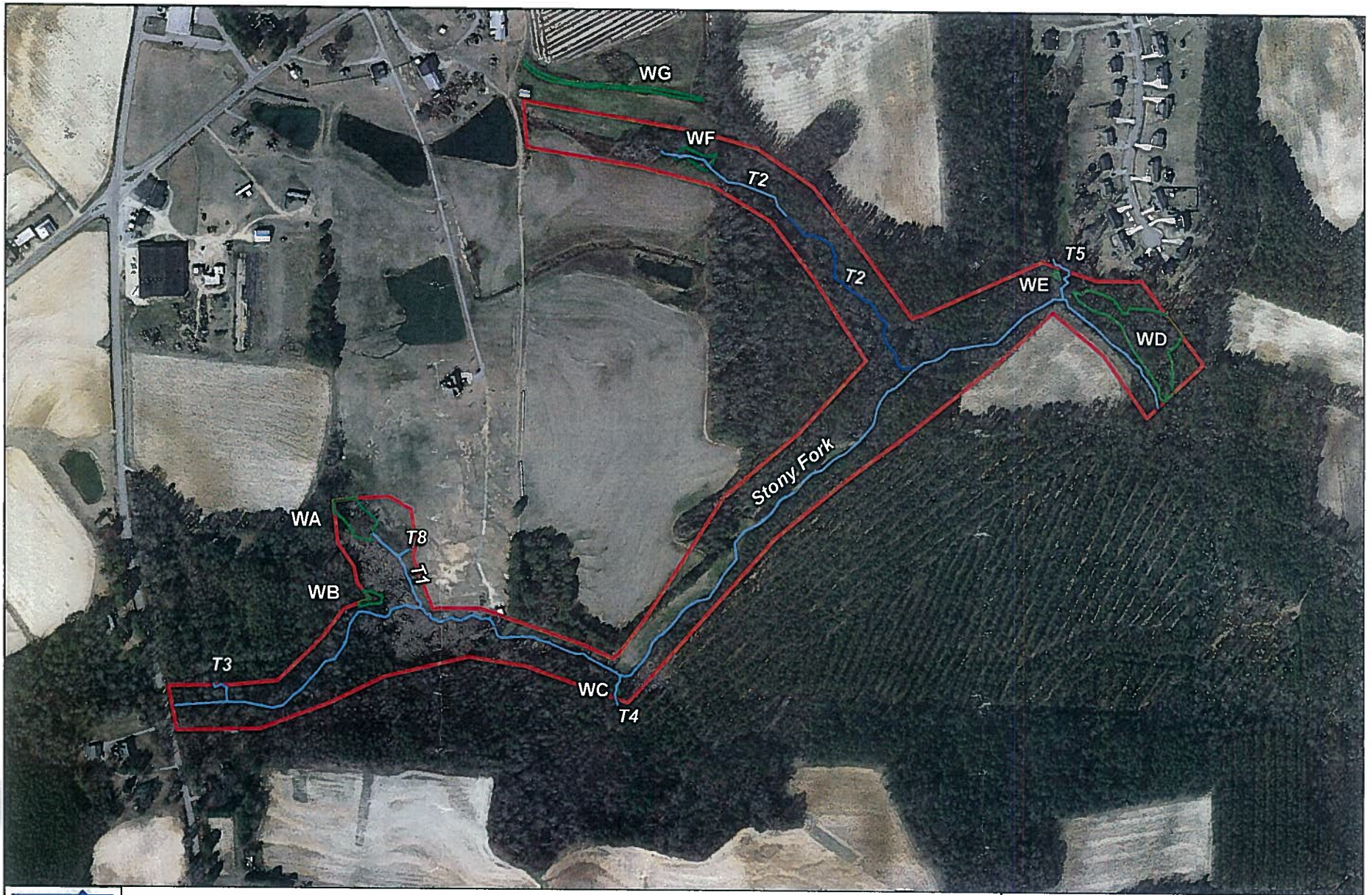
_____ Signature of appellant or agent.	Date:	Telephone number:

For appeals on Initial Proffered Permits send this form to:

District Engineer, Wilmington Regulatory Division, John Thomas,

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

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



KCI ASSOCIATES OF NC

Project Easement
Wetlands
Intermittent Streams
Perennial Streams

500 250 0 500
Feet

Image Source: NC Statewide Aerial Impagey - 2013

N
W E
S

Figure 3: Jurisdictional Features
Stony Fork Restoration Site
Johnston County, NC

July 2016

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:	Stony Fork Stream Restoration Site
County Name:	Johnston County, NC
DMS Number:	97085
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
DMS Project Manager:	Lindsay Crocker

Project Description

Stony Fork is a stream and stream buffer restoration project for the North Carolina Department of Environmental Services, Division of Mitigation Services that aims to restore and enhance over 7000 linear feet of channelized and entrenched stream channels in the Neuse River Basin. This project will occur on eight parcels of privately owned land near the Town of Benson in Johnston County North Carolina.

For Official Use Only

Reviewed By: Lindsay Crocker

7-6-2016

Date

DMS Project Manager

Conditional Approved By:

Date

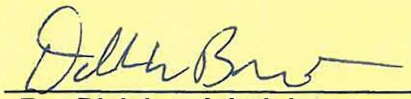
For Division Administrator FHWA

☐ **Check this box if there are outstanding issues**

Final Approval By:

7-5-16

Date



For Division Administrator FHWA

Part 2: All Projects Regulation/Question	Response
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☒ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☒ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☒ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☒ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☒ No ☐ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☒ No ☐ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☐ No ☒ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☒ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☒ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☒ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☒ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☒ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Does the project require the acquisition of real estate?	☒ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☒ No ☐ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☒ Yes ☐ No ☐ N/A

Part 3: Ground-Disturbing Activities Regulation/Question	Response
American Indian Religious Freedom Act (AIRFA)	
1. Is the project located in a county claimed as "territory" by the Eastern Band of Cherokee Indians?	☐ Yes ☒ No
2. Is the site of religious importance to American Indians?	☐ Yes ☐ No ☒ N/A
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	☐ Yes ☐ No ☒ N/A
4. Have the effects of the project on this site been considered?	☐ Yes ☐ No ☒ N/A
Antiquities Act (AA)	
1. Is the project located on Federal lands?	☐ Yes ☒ No
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Archaeological Resources Protection Act (ARPA)	
1. Is the project located on federal or Indian lands (reservation)?	☐ Yes ☒ No
2. Will there be a loss or destruction of archaeological resources?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Endangered Species Act (ESA)	
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	☒ Yes ☐ No
2. Is Designated Critical Habitat or suitable habitat present for listed species?	☐ Yes ☒ No ☐ N/A
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	☐ Yes ☐ No ☒ N/A
4. Is the project "likely to adversely affect" the specie and/or "likely to adversely modify" Designated Critical Habitat?	☐ Yes ☐ No ☒ N/A
5. Does the USFWS/NOAA-Fisheries concur in the effects determination? (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

Agency Responses

North Carolina Department of Natural and Cultural Resources

State Historic Preservation Office

Ramona M. Bartos, Administrator

Governor Pat McCrory
Secretary Susan Kluttz

Office of Archives and History
Deputy Secretary Kevin Cherry

May 12, 2016

Timothy Morris
KCI Technologies
Landmark Center II, Suite 220
4601 Six Forks Road
Raleigh, NC 27609

Re: Stony Fork Stream Restoration, KCI 161600959, Johnston County, ER 16-0710

Dear Mr. Morris:

Thank you for your letter of April 21, 2016, concerning the above project.

We have conducted a review of the project and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the project as proposed.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh ES Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

May 19, 2016

Timothy Morris
KCI Associates of NC
Landmark Center II, Suite 220
4601 Six Forks Road
Raleigh, NC 27609

Re: Stony Fork Stream Restoration Site – Johnston County, NC

Dear Mr. Morris:

This letter is to inform you that a list of all federally-protected endangered and threatened species with known occurrences in North Carolina is now available on the U.S. Fish and Wildlife Service's (Service) web page at http://www.fws.gov/raleigh. Therefore, if you have projects that occur within the Raleigh Field Office's area of responsibility (see attached county list), you no longer need to contact the Raleigh Field Office for a list of federally-protected species.

Our web page contains a complete and frequently updated list of all endangered and threatened species protected by the provisions of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)(Act), and a list of federal species of concern[1] that are known to occur in each county in North Carolina.

Section 7 of the Act requires that all federal agencies (or their designated non-federal representative), in consultation with the Service, insure that any action federally authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species. A biological assessment or evaluation may be prepared to fulfill that requirement and in determining whether additional consultation with the Service is necessary. In addition to the federally-protected species list, information on the species' life histories and habitats and information on completing a biological assessment or evaluation and can be found on our web page at http://www.fws.gov/raleigh. Please check the web site often for updated information or changes.

---

[1] The term "federal species of concern" refers to those species which the Service believes might be in need of concentrated conservation actions. Federal species of concern receive no legal protection and their designation does not necessarily imply that the species will eventually be proposed for listing as a federally endangered or threatened species. However, we recommend that all practicable measures be taken to avoid or minimize adverse impacts to federal species of concern.

If your project contains suitable habitat for any of the federally-listed species known to be present within the county where your project occurs, the proposed action has the potential to adversely affect those species. As such, we recommend that surveys be conducted to determine the species' presence or absence within the project area. The use of North Carolina Natural Heritage program data should not be substituted for actual field surveys.

If you determine that the proposed action may affect (i.e., likely to adversely affect or not likely to adversely affect) a federally-protected species, you should notify this office with your determination, the results of your surveys, survey methodologies, and an analysis of the effects of the action on listed species, including consideration of direct, indirect, and cumulative effects, before conducting any activities that might affect the species. If you determine that the proposed action will have no effect (i.e., no beneficial or adverse, direct or indirect effect) on federally listed species, then you are not required to contact our office for concurrence (unless an Environmental Impact Statement is prepared). However, you should maintain a complete record of the assessment, including steps leading to your determination of effect, the qualified personnel conducting the assessment, habitat conditions, site photographs, and any other related articles.

With regard to the above-referenced project, we offer the following remarks. Our comments are submitted pursuant to, and in accordance with, provisions of the Endangered Species Act.

Based on the information provided and other information available, it appears that the proposed action is not likely to adversely affect any federally-listed endangered or threatened species, their formally designated critical habitat, or species currently proposed for listing under the Act at these sites. We believe that the requirements of section 7(a)(2) of the Act have been satisfied for your project. Please remember that obligations under section 7 consultation must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner that was not considered in this review; or, (3) a new species is listed or critical habitat determined that may be affected by the identified action.

However, the Service is concerned about the potential impacts the proposed action might have on aquatic species. Aquatic resources are highly susceptible to sedimentation. Therefore, we recommend that all practicable measures be taken to avoid adverse impacts to aquatic species, including implementing directional boring methods and stringent sediment and erosion control measures. An erosion and sedimentation control plan should be submitted to and approved by the North Carolina Division of Land Resources, Land Quality Section prior to construction. Erosion and sedimentation controls should be installed and maintained between the construction site and any nearby down-gradient surface waters. In addition, we recommend maintaining natural, vegetated buffers on all streams and creeks adjacent to the project site.

The North Carolina Wildlife Resources Commission has developed a Guidance Memorandum (a copy can be found on our website at (http://www.fws.gov/raleigh) to address and mitigate secondary and cumulative impacts to aquatic and terrestrial wildlife resources and water quality. We recommend that you consider this document in the development of your projects and in completing an initiation package for consultation (if necessary).

We hope you find our web page useful and informative and that following the process described above will reduce the time required, and eliminate the need, for general correspondence for species' lists. If you have any questions or comments, please contact Emily Wells of this office at (919) 856-4520 ext. 25.

Sincerely,

for Pete Benjamin
Field Supervisor

List of Counties in the Service's Raleigh Field Office Area of Responsibility

Alamance
Beaufort
Bertie
Bladen
Brunswick
Camden
Carteret
Caswell
Chatham
Chowan
Columbus
Craven
Cumberland
Currituck
Dare
Duplin
Durham
Edgecombe
Franklin
Gates
Granville
Greene
Guilford
Halifax
Harnett
Hertford
Hoke
Hyde
Johnston
Jones
Lee
Lenoir
Martin
Montgomery
Moore
Nash
New Hanover
Northampton
Onslow
Orange
Pamlico
Pasquotank
Pender
Perquimans
Person
Pitt
Randolph
Richmond
Robeson
Rockingham
Sampson
Scotland
Tyrrell
Vance
Wake
Warren
Washington
Wayne
Wilson

Natural Resources
Conservation Service

North Carolina
State Office

4407 Bland Road
Suite 117
Raleigh, NC 27609
Voice 919-873-2171
Fax 844-325-6833

May 31, 2016

Timothy J. Morris
Senior Environmental Scientist
KCI Technologies, Inc.
Landmark Center II, Suite 220
4601 Six Forks Road
Raleigh, NC 27609

Dear Mr Morris:

Thank you for your letter dated April 22, 2016, Subject: Request for Comments – Stony Fork Stream Restoration Project, KCI Job Number – 161600959, Johnston Co., NC. The following guidance is provided for your information.

Projects are subject to the Farmland Protection Policy Act (FPPA) requirements if they may irreversibly convert farmland (directly or indirectly) to non-agricultural use and are completed by a federal agency or with assistance from a federal agency. Farmland means prime or unique farmlands as defined in section 1540(c)(1) of the FPPA or farmland that is determined by the appropriate state or unit of local government agency or agencies with concurrence of the Secretary of Agriculture to be farmland of statewide local importance.

For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forestland, pastureland, cropland, or other land, but not water or urban built-up land.

Farmland does not include land already in or committed to urban development or water storage. Farmland *already in* urban development or water storage includes all such land with a density of 30 structures per 40-acre area. Farmland already in urban development also includes lands identified as *urbanized area* (UA) on the Census Bureau Map, or as urban area mapped with a *tint overprint* on the United States Geological Survey (USGS) topographical maps, or as *urban-built-up* on the United States Department of Agriculture (USDA) Important Farmland Maps.

The area in question meets one or more of the above criteria for Farmland. Farmland area will be affected or converted. Enclosed is the Farmland Conversion Impact Rating form AD1006 with PARTS II, IV and V completed by NRCS. The corresponding agency will need to complete the evaluation, according to the Code of Federal Regulation 7CFR 658, Farmland Protection Policy Act.

If you have any questions, please contact Milton Cortes, Assistant State Soil Scientist at 919-873-2171 or by email: milton.cortes@nc.usda.gov.

Again, thank you for inquiry. If we can be of further assistance, please do not hesitate to contact us.

Sincerely,

MILTON CORTES

Digitally signed by MILTON CORTES
DN: c=US, o=U.S. Government, ou=Department of Agriculture, cn=MILTON CORTES, 0.9.2342.19200300.100.1.1=12001000080173
Date: 2016.05.31 15:49:42 -04'00'

Milton Cortes
Assistant State Soil Scientist

cc:
Kent Clary, State Soil Scientist, NRCS, Raleigh, NC

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 4/22/16
Name Of Project Stony Fork Stream Restoration Project	Federal Agency Involved NC DOT/FHWA
Proposed Land Use Stream Mitigation	County And State Johnston County NC
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).* Yes ☑ No ☐	Acres Irrigated none	Average Farm Size 156	
Major Crop(s) CORN	Farmable Land In Govt. Jurisdiction Acres: 390,735 acres % 76	Amount Of Farmland As Defined in FPPA Acres: 379,107 acres % 74	
Name Of Land Evaluation System Used Johnston Co. LESA	Name Of Local Site Assessment System none	Date Land Evaluation Returned By NRCS May 31, 2016 by email	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	32.3			
B. Total Acres To Be Converted Indirectly	0.0			
C. Total Acres In Site	32.3	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	1.4			
B. Total Acres Statewide And Local Important Farmland	2.6			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0.0			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	77.0			
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	4	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use	15	15			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	0			
4. Protection Provided By State And Local Government	20	20			
5. Distance From Urban Builtup Area	15	15			
6. Distance To Urban Support Services	15	10			
7. Size Of Present Farm Unit Compared To Average	10	0			
8. Creation Of Nonfarmable Farmland	10	0			
9. Availability Of Farm Support Services	5	5			
10. On-Farm Investments	20	0			
11. Effects Of Conversion On Farm Support Services	10	0			
12. Compatibility With Existing Agricultural Use	10	0			
TOTAL SITE ASSESSMENT POINTS	160	75	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	4	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	75	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	79	0	0	0

Site Selected: Stony Fork Stream Restoration	Date Of Selection 6/13/16	Was A Local Site Assessment Used? Yes ☐ No ☒

Reason For Selection:

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

May 4, 2016

Mr. Timothy Morris
KCI Technologies
Landmark Center II, Suite 220
4601 Six Forks Road
Raleigh, NC 27609

Subject: Request for Environmental Information for the Stony Fork Stream Restoration Project, KCI Project Number 161600959, Johnston County, North Carolina.

Dear Mr. Morris,

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) have reviewed the proposed project description. Comments are provided in accordance with certain provisions of the Clean Water Act of 1977 (as amended), Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667e) and North Carolina General Statutes (G.S. 113-131 et seq.).

KCI Technologies of North Carolina proposes to complete a wetland restoration project for the North Carolina Division of Mitigation Services. The subject site, referred to as the Stony Fork Stream Restoration Site, is located approximately 2,000 feet south and east of the intersection of Elevation and Federal Roads. The proposed restoration work will restore hydrology and vegetation by realigning the existing stream and stabilizing the site with native vegetation. Stony Creek flows into Hannah Creek in the Neuse River basin.

Stream restoration projects often improve water quality and aquatic habitat. Establishing native, forested buffers in riparian areas will help protect water quality, improve aquatic and terrestrial habitats and provide a travel corridor for wildlife species. The NCWRC recommends the use of biodegradable and wildlife-friendly sediment and erosion control devices. Silt fencing, fiber rolls and/or other products should have loose-weave netting that is made of natural fiber materials with movable joints between the vertical and horizontal twines. Silt fencing and similar products that have been reinforced with plastic or metal mesh should be avoided as they impede the movement of terrestrial wildlife species. Excessive silt and sediment loads can have detrimental effects on aquatic resources including destruction of spawning habitat, suffocation of eggs and clogging of gills. Any invasive plant species that are found onsite should be removed.

Mailing Address: Habitat Conservation • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

Thank you for the opportunity to review and comment on this project. If I can be of further assistance, please contact me at (910) 409-7350 or gabriela.garrison@ncwildlife.org.

Sincerely,

Gabriela Garrison

Gabriela Garrison
Eastern Piedmont Habitat Conservation Coordinator
Habitat Conservation Program

NORTH CAROLINA DEPARTMENT OF NATURAL AND CULTURAL RESOURCES

Pat McCrory
Governor

Bryan Gossage
Executive Director
Clean Water Management Trust Fund

Susan Kluttz
Secretary

NCNHDE-1517

April 20, 2016

Thomas Seelinger
KCI Technologies, Inc.
4601 Six Forks Road
Raleigh, NC 27609
tommy.seelinger@kci.com

RE: Stony Fork Stream Restoration Site

Dear Thomas Seelinger:

The North Carolina Natural Heritage Program (NCNHP) appreciates the opportunity to provide information about natural heritage resources from our database that have been compiled for the project referenced above.

A query of the NCNHP database, based on the project area mapped with your request, indicates that there are no records for rare species, important natural communities, natural areas, or conservation/managed areas within the proposed project boundary. Please note that although there may be no documentation of natural heritage elements within the project boundary, it does not imply or confirm their absence; the area may not have been surveyed. The results of this query should not be substituted for site-specific surveys where suitable habitat exists. In the event that rare species are found within the project area, please contact the NCNHP so that we may update our records.

The attached 'Potential Occurrences' table summarizes rare species and natural communities that have been documented within a one-mile radius of the property boundary. The proximity of these records suggests that these natural heritage elements may potentially be present in the project area if suitable habitat exists and is included for reference.

Tables of natural areas and conservation/managed area within a one-mile radius of the project area, if any, are also included in this report. The location of the natural areas and conservation/managed areas can be viewed online on the Natural Heritage Data Explorer found at: https://ncnhde.natureserve.org/.

Please note that natural heritage element data are maintained for the purposes of conservation planning, project review, and scientific research, and are not intended for use as the primary criteria for regulatory decisions. Information provided by the NCNHP database may not be published without prior written notification to the NCNHP, and the NCNHP must be credited as an information source in these publications. Maps of NCNHP data may not be redistributed without permission.

The NC Natural Heritage Program may follow this letter with additional correspondence if a Dedicated Nature Preserve (DNP), Registered Heritage Area (RHA), or Federally-listed species are documented near the project area.

If you have questions regarding the information provided in this letter or need additional assistance, please contact John Finnegan at john.finnegan@ncdcr.gov or 919.707.8630.

Sincerely,
NC Natural Heritage Program

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Within a One-mile Radius of the Project Area
Stony Fork Stream Restoration Site
April 20, 2016
NCNHDE-1517

Element Occurrences Documented Within a One-mile Radius of the Project Area

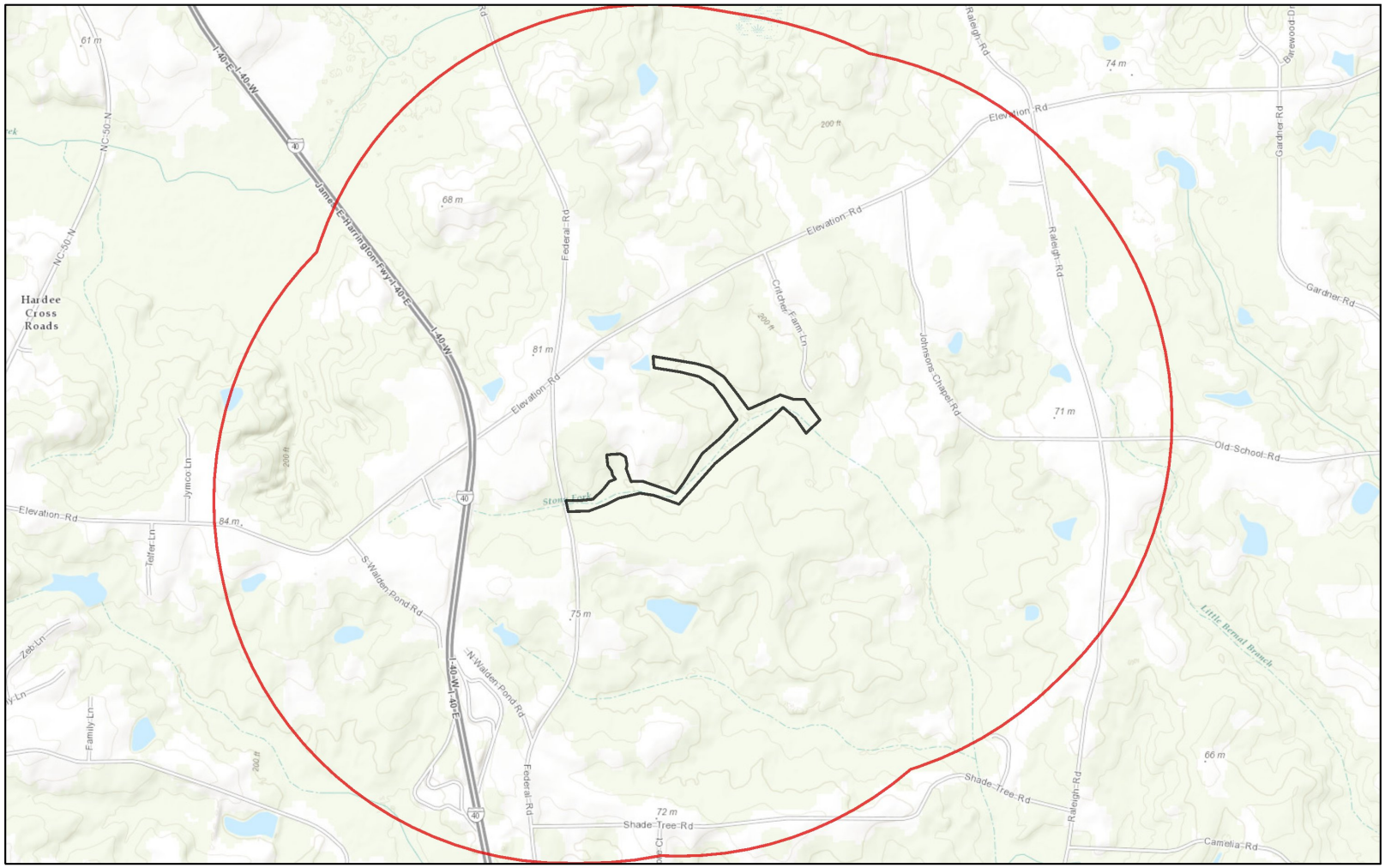
Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Status	Accuracy	Federal Status	State Status	Global Rank	State Rank
Dragonfly or Damselfly	33753	Somatochlora georgiana	Coppery Emerald	2004-PRE	Historical	5-Very Low	---	Significantly Rare	G3G4	S2?

No Natural Areas are Documented Within a One-mile Radius of the Project Area

No Managed Areas are Documented Within a One-mile Radius of the Project Area

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/content/help. Data query generated on April 20, 2016; source: NCNHP, Q4 October 2015. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

NCNHDE-1517: Stony Fork Stream Restoration Site



April 20, 2016

Project Boundary

Buffered Project Boundary

1:24,743

0 0.2 0.4 0.8 mi

0 0.325 0.65 1.3 km

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey,

Affidavit of Public Notice

AFFIDAVIT OF PUBLICATION

STATE OF NORTH CAROLINA
COUNTY OF JOHNSTON

Ad Number
0002404684

Advertiser Name: KCI ASSOCIATES OF NC
Address: 4601 SIX FORKS ROAD, STE 220
LANDMARK CENTER II
RALEIGH, NC 27609

Stony Fork Stream Restoration Project

KCI Technologies, Inc. proposes to purchase conservation easement rights on approximately 33 acres of existing farm and woodland in Johnston County, NC. The site is located on several properties south of the intersection of Elevation Road and Federal Road north of the Town of Benson and west of Four Oaks. The purpose of acquiring the easement rights is to provide mitigation for impacts to streams that have, or will, result from existing or future development in this area.

Anyone desiring that an informational public meeting be held for this proposed action may make a request by registered letter to KCI Technologies, Inc. at 4601 Six Forks Road, Suite 220, Raleigh NC 27609. Requests must be postmarked by **May 23, 2016**. If additional information is required, please contact Tim Morris at 919-278-2511.

The project is being completed for the North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS). DMS reserves the right to determine if a public meeting will be held.

SH: April 24, 2016

Before the undersigned, a Notary Public of Wake County North Carolina, duly commissioned and authorized to administer oaths, affirmations, etc., personally appeared R. C. Brooks, who being duly sworn or affirmed, according to law, doth depose and say that he or she is Accounts Receivable Specialist of The News & Observer Publishing Company a corporation organized and doing business under the Laws of the State of North Carolina, and publishing a newspaper known as The Herald, in the City of Raleigh, Wake County and State aforesaid, the said newspaper in which such notice, paper, document, or legal advertisement was published was, at the time of each and every such publication, a newspaper meeting all of the requirements and qualifications of Section 1-597 of the General Statutes of North Carolina and was a qualified newspaper within the meaning of Section 1-597 of the General Statutes of North Carolina, and that as such he or she makes this affidavit; and is familiar with the books, files and business of said corporation and by reference to the files of said publication the attached advertisement for KCI ASSOCIATES OF NC was inserted in the aforesaid newspaper on dates as follows:

04/24/2016

WENDY D. HAKEM
Notary Public
Wake County
NORTH CAROLINA

R. C. Brooks, Accounts Receivable Specialist
Wake County, North Carolina

Sworn to and subscribed before me
This 25th day of April, 2016

My Commission Expires: FEB 17 2020

Notary Signature

12.10 Agency Correspondence

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: July 27, 2018

To: Andrea Hughes, USACE
Lindsay Crocker, NC DMS

From: Tim Morris, Project Manager
KCI Associates of North Carolina, P.A.

Subject: Stony Fork Restoration Site
Mitigation Plan Review – Response to IRT Comments
Neuse River Basin - 03020201
Johnston County, North Carolina
Contract No. #6830
DMS Project #97085

Below are our responses to comments received on the mitigation plan for the Stony Fork Restoration Site, which includes changes that were agreed upon at the site visit between KCI and Ms. Hughes on June 25, 2018 (the email correspondence following that site visit is included in the mitigation plan appendices). All of the following changes have been completed in the revised mitigation plan. Please contact me if you have any questions or would like clarification concerning these responses.

<u>Mac Haupt, NCDWR, May 18, 2018:</u>

1. DWR recalls during the site visit that the area planned for reaches T1 and reaches T1 A and B had a lot of wetlands or wet areas. DWR is concerned that sections of these reaches will become more wetland-like than streams, particularly for T1A and B. T1A and B may be spring heads, however; given the amount of flow coming out of the springs, channel formation may not form until further down in the watershed (DMS comment #5).

   Response: Based on the site visit with USACE and KCI on June 25, 2018 as a follow-up to these comments, KCI has decided to remove T1B from the mitigation plan as it was not flowing during the site visit and is not currently on the JD map. T1A was an active seep flowing at the time of the 6/25/18 site visit. Ms. Hughes expressed concern that because of the limited flow, this tributary could become more wetland-like than stream-like in the post-restoration condition. While this is a possible outcome, we believe that the on-site topography and soil indicators suggest it will be a stream. Obviously, this decision is risk-based on our part, and the IRT's position on this issue is noted. We will closely monitor the site to evaluate if credit reductions are warranted.

2. DMS had several comments regarding sediment size of stream and size of rock being placed in the stream, particularly in the constructed riffles, both as "enhanced" and "riffle grade control". DWR is also very concerning with the size and amount of stone proposed to go in the stream with the particle size which is essentially sand. DWR believes there is a risk to the stream channel from a sediment transport standpoint. DWR requests the designer revisit the amount and size of rock being proposed for the riffle structures.
    a. DWR looked up the various rock sizes and please confirm that these size classes are correct, or close to the standard:
        i. Class A- midrange size 4 inches,
        ii. Class B- midrange size 8 inches,
        iii. Class 1- midrange size 10 inches
    b. If these are the midrange sizes of the stone going into the structures, DWR has issue with the use of these sizes of stone going into this stream.
    c. Would not Class 57 stone be the more relevant stone size for this stream?

    Response: The stone sizing is as we intended. These materials have been selected based on our past construction and monitoring experience. During the period right after construction, Class 57 Stone will mobilize even during small storms. Using these classes of stone provides a factor of safety in the design that we feel is necessary to ensure the maintenance and development of the channel profile and habitat features (riffles and pools) in the system. We do anticipate that the system will seed the bed features with a native mixture of sand and small gravels, while the larger materials become part of the subpavement over time.

3. It appears from recent Google aerials that the new subdivision road may have an outlet structure from one of the sediment basins located in the easement. DWR would like assurances that the new subdivision on both sides of the stream will honor the easement for the project.

    Response: The sediment ponds for the adjacent development do currently infringe slightly on the easement, but they are temporary features that will be removed as that phase of the project is completed. The developer's obligation is to fill in the sediment ponds and bring them back to a natural grade. The timing of construction of the stream restoration project and the abandonment of the sediment control features is dependent on several variables but the timing right now indicates that the ponds will be removed near the time we anticipate initiating project construction. We are in contact with the developer regarding this and other issues that need to be coordinated for the stream restoration project. Ultimately, the developer (Clifton Enterprises) signed the easement and is obligated to abide by the easement terms just like any other landowner.

4. DWR would like to know the minimum amount of benching that will be constructed, especially on the stream channel with the larger drainage area. The cross section typicals shown on design Sheet 5 do not specific a minimum width. DWR prefers 2X bankfull width for a minimum for benching of the floodplain.

    Response: We have added the floodplain grading extents on the project sheets, which reflect the grading limits consistent with the two times bankfull width requested in the DWR comment. The majority of the restored reaches on this project are Priority 1. There are sections of Priority 1/2 transitional areas and Priority 2 that were needed due to site constraints.

5. DWR is concerned with the amount of kudzu on site and reminds the designer of the need for multiple treatments throughout the construction and monitoring of the site.

   Response: The kudzu as well as the privet documented in the post-contract site memo were treated in Fall 2017 and again in Spring 2018. The treatment program will remain aggressive until the invasive species are under control. Privet was also mechanically removed throughout the site in Fall 2017. We have provided additional details on invasive species management in a newly added "Buffer Mitigation Plan" in Section 12.3 of the appendices.

Andrea Hughes, USACE, June 14, 2018:

1. According to maps submitted for the public notice and field notes from the site visit on April 7, 2016, T1 is a stream-wetland complex and the IRT recommended that no work should occur above the cattail area. The map included with the JD depicts T1 and a very short feature labeled T8 but does not indicate any other jurisdictional features in this area. The DWR site viability letter indicates T1 is a modified stream not subject to buffer rules and does not mention T8, T1a or T1b. Since the current proposal includes restoration for T1a, and T1b, we will need to field review these features before we can approve the draft mitigation plan.

   Response: Based on our field visit on 6/25/18, T1A was verified as a stream and T1B was removed from the project. No work will be done above the cattail wetland as indicated in the original post-contract site review memo. T1 starts just below the cattail swamp.

2. The draft mitigation plan does not provide existing morphological parameters for T3 and this feature was not proposed for restoration at the technical stage so we would like to review this feature during the site visit.

   Response: Based on the 6/25/18 field visit, we are providing additional morphological data for the upper part of T3 (see Table 15 in the report and the existing cross-sections 10 and 11 in the updated Morphological Table in Section 12.2 in the appendices). We also provided an additional narrative description in Section 3.3.1.

3. The boundaries of the project have been revised due to land title issues associated with the Critcher Farms subdivision and the project now ends a short distance below a 30 foot wide easement. According to page 9 of the design plans, the small section of stream channel below the 30 foot easement does not have the minimum 50-foot buffers (it appears that a large portion of one side abuts the conservation easement boundary). The project should be revised to end before the 30-foot easement (approximately 55+50).

   Response: Based on email correspondence following the 6/25/18 site meeting (included in Section 12.10 in the appendices), we have agreed to end the project stream credits at Station 56+04. This is the point at which the stream still has the minimum 15-foot riparian buffers on either side. We will still continue the restoration work of the remainder of Stony Fork Reach 3 until the property boundary for no credit. The credits have been adjusted throughout the revised mitigation plan.

5. Stream gauges should be placed in the upper third of the channel for T3, T1, T1a, and T1b.

   Response: For T1 and T3, we moved up the proposed locations into the upper third of the streams. We added a location on T1A. The T2 gauge was already proposed for installation in the upper third of the channel. We will have stream gauges (and/or cameras) in these locations to document flow. T1B has been eliminated from the project. These changes are shown in Figure 10.

5. Section 7.0: The draft mitigation plan does not include performance standards for stream geomorphology. Per the 2016 guidance, stream performance standards should include:

   BHR must not exceed 1.2 and ER should be at least 2.2 for C and E channels. BHR and ER at any measured riffle cross-section should not change by more than 10% from the baseline condition during any given monitoring interval (e.g., no more than 10% between years 1 and 2, 2 and 3, 3 and 5, or 5 and 7).

   Response: These parameters were added.

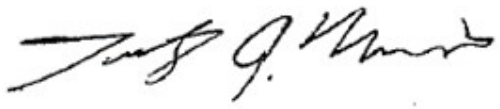
6. Regarding vegetation performance, for any tree stem to count towards success it must be a species from the approved planting list included in the Mitigation Plan.

   Response: The vegetative performance section was changed to address the comment above.

In addition to addressing the IRT's comments, KCI has also incorporated changes in the revised mitigation plan based on DWR's review of the proposed buffer mitigation credits. A new "Buffer Mitigation Plan" has been added to Section 12.3, which provides greater detail on the invasive plant populations and proposed treatment. The response to comments to DWR, outlining all of the changes made, is included in Section 12.10 Agency Correspondence. None of the changes made based on the buffer comments affect the stream credits. Below is a summary of the changes in the mitigation plan:

- **Section 5.0**: The objective under the second goal was amended to start with "Treat invasive plant populations and….".
- **Section 6.10**: An additional planting zone (Zone 3) has been added to the construction plans for supplemental plantings in areas cleared of privet understory.
- **Section 7.0**: The vegetative performance standard was changed from *four native trees or shrub* species to just *four native tree species*.
- **Section 8.0:** Vegetative monitoring will occur no earlier than the end of August and no later than mid-December. Also, a permanent vegetation plot was added to the buffer enhancement area along T2-2, making the division of plots 7 permanent and 5 random. Under *Reporting*, the first year of monitoring will occur no earlier than the end of the first growing season and no sooner than 5 months following planting.
- **General**: Aerial backgrounds for the mitigation plan were changed to a 2018 aerial showing the proposed development to the north of the site.

Sincerely,



Tim Morris
Project Manager

From: Tim Morris
Sent: Wednesday, July 18, 2018 10:03 AM
To: Tugwell, Todd J CIV USARMY CESAW (US); Crocker, Lindsay; Hughes, Andrea W CIV USARMY CESAW (US); Haupt, Mac
Cc: Adam Spiller; Kristin Knight-Meng; Gary Mryncza
Subject: RE: [External] RE: Stony Fork Response to Comments and Field Meeting Summary

Thanks, we will finalize our response to comments and resubmit our mitigation plan for final approval in the coming days.

-----Original Message-----
From: Tugwell, Todd J CIV USARMY CESAW (US) [mailto:Todd.J.Tugwell@usace.army.mil]
Sent: Wednesday, July 18, 2018 9:59 AM
To: Tim Morris <Tim.Morris@kci.com>; Crocker, Lindsay <Lindsay.Crocker@ncdenr.gov>; Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>; Haupt, Mac <mac.haupt@ncdenr.gov>
Cc: Adam Spiller <Adam.Spiller@kci.com>; Kristin Knight-Meng <Kristin.Knight-Meng@kci.com>; Gary Mryncza <Gary.Mryncza@kci.com>
Subject: RE: [External] RE: Stony Fork Response to Comments and Field Meeting Summary

Tim, given that you are in a situation where you must complete the repair below the crossing and include the stream in the easement, I think we can agree to credits on the reach that has a full buffer.

Todd

-----Original Message-----
From: Tim Morris [mailto:Tim.Morris@kci.com]
Sent: Wednesday, July 18, 2018 9:43 AM
To: Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>; Crocker, Lindsay <Lindsay.Crocker@ncdenr.gov>; Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>; Haupt, Mac <mac.haupt@ncdenr.gov>
Cc: Adam Spiller <Adam.Spiller@kci.com>; Kristin Knight-Meng <Kristin.Knight-Meng@kci.com>; Gary Mryncza <Gary.Mryncza@kci.com>
Subject: [Non-DoD Source] RE: [External] RE: Stony Fork Response to Comments and Field Meeting Summary

The easement has been paid for and recorded already. I would not feel right about leaving the end of the project within the easement unfinished for the landowner knowing his expectations.

Unless you have some objection, we will complete the project as designed, and not get credit for the bottom. There are certainly plenty of instances where the ends of projects have been looked at differently, but you have made your decision and we will have to live with it. It is just a shame that knowing we have substantial extra credits in wider buffers (that we can't ask for credit for), that this circumstance can't be looked at in a different light.

One last question and I'll give up on this. Given the landowner expectations, can we at least recover the 26 credits below the culvert that have full buffer?

-----Original Message-----
From: Tugwell, Todd J CIV USARMY CESAW (US) [mailto:Todd.J.Tugwell@usace.army.mil]

Sent: Wednesday, July 18, 2018 8:59 AM
To: Tim Morris <Tim.Morris@kci.com>; Crocker, Lindsay <Lindsay.Crocker@ncdenr.gov>; Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>; Haupt, Mac <mac.haupt@ncdenr.gov>
Cc: Adam Spiller <Adam.Spiller@kci.com>; Kristin Knight-Meng <Kristin.Knight-Meng@kci.com>
Subject: RE: [External] RE: Stony Fork Response to Comments and Field Meeting Summary

The stream takes a 90 degree turn and runs along the property line for the last 75 feet, where the left top of bank is essentially the property boundary. In all other cases where the there is a reach of stream that has a one-sided easement, we have not allowed credit, and that is basically what is happening in this case. At most, it looks like about 15 feet of stream below the crossing exception would have a protected buffer of any meaningful width on both sides.

Also, if the 90 degree turn in the channel downstream of the crossing has erosion problems in the future, there is no easement there for the stream to migrate into or to allow repair. We also don't want to see fragmentation of projects, and what is proposed here is to disconnect the last 100 or so feet of stream, which will also have no buffer on one side for 75'. For these reasons, it seems to make sense to end the project at the easement crossing.

I know this is an unusual case, but I do not see how this particular configuration meets our basic requirements.

Todd

-----Original Message-----
From: Tim Morris [mailto:Tim.Morris@kci.com]
Sent: Tuesday, July 17, 2018 9:07 AM
To: Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>; Crocker, Lindsay <Lindsay.Crocker@ncdenr.gov>; Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>; Haupt, Mac <mac.haupt@ncdenr.gov>
Cc: Adam Spiller <Adam.Spiller@kci.com>; Kristin Knight-Meng <Kristin.Knight-Meng@kci.com>
Subject: [Non-DoD Source] RE: [External] RE: Stony Fork Response to Comments and Field Meeting Summary

It is at the property boundary??

-----Original Message-----
From: Tugwell, Todd J CIV USARMY CESAW (US) [mailto:Todd.J.Tugwell@usace.army.mil]
Sent: Monday, July 16, 2018 4:24 PM
To: Tim Morris <Tim.Morris@kci.com>; Crocker, Lindsay <Lindsay.Crocker@ncdenr.gov>; Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>; Haupt, Mac <mac.haupt@ncdenr.gov>
Cc: Adam Spiller <Adam.Spiller@kci.com>; Kristin Knight-Meng <Kristin.Knight-Meng@kci.com>
Subject: RE: [External] RE: Stony Fork Response to Comments and Field Meeting Summary

Tim, my concern remains the width of the buffer downstream of 56+10 or so. I understand this is at the bottom of the site, but it is not at the property boundary, and it appears to be only a couple feet wide if that. The provision for the 5% was meant for areas where stream intersect a property boundary at an angle, not to allow the inclusion of reaches with no effective buffer at all. In this case, I would recommend just stopping the project at the crossing.

Todd

-----Original Message-----
From: Tim Morris [mailto:Tim.Morris@kci.com]
Sent: Friday, July 13, 2018 9:50 AM

To: Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>; Crocker, Lindsay <Lindsay.Crocker@ncdenr.gov>; Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>; Haupt, Mac <mac.haupt@ncdenr.gov>
Cc: Adam Spiller <Adam.Spiller@kci.com>; Kristin Knight-Meng <Kristin.Knight-Meng@kci.com>
Subject: [Non-DoD Source] RE: [External] RE: Stony Fork Response to Comments and Field Meeting Summary

Todd - The culvert is in good condition and is sized properly. It will not be removed. We did what we could to align the stream better with the angle of the culvert, but the position of the easement exception (an existing farm road) and the constraints imposed by the property line didn't allow much flexibility in what we could do to the end of the project. The table on the enclosed plan was meant to provide you all the information you need to make a credit decision on this reach.

As you probably are aware, the project was originally designed to extend another 700+ feet downstream, but property title issues associated with the downstream property forced us to stop the project short. Not your problem, but I wanted to make sure you knew the history.

-----Original Message-----
From: Tugwell, Todd J CIV USARMY CESAW (US) [mailto:Todd.J.Tugwell@usace.army.mil]
Sent: Friday, July 13, 2018 8:42 AM
To: Crocker, Lindsay <Lindsay.Crocker@ncdenr.gov>; Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>; Tim Morris <Tim.Morris@kci.com>; Haupt, Mac <mac.haupt@ncdenr.gov>
Cc: Adam Spiller <Adam.Spiller@kci.com>; Kristin Knight-Meng <Kristin.Knight-Meng@kci.com>
Subject: RE: [External] RE: Stony Fork Response to Comments and Field Meeting Summary

Tim/Lindsay,
I looked at the plan view and do have a couple questions - is the culvert at the crossing proposed to be replaced? I assume that is part of the reason for the erosion given the 90 degree turn in the channel immediately downstream. Secondly, from STA 56+10 down to the end of the project, it looks like the buffer is considerably narrower than 15' - maybe closer to just 1 or 2 feet from the top of bank to easement/property line? This seems essentially like a one-sided buffer in this area.

Todd

-----Original Message-----
From: Crocker, Lindsay [mailto:Lindsay.Crocker@ncdenr.gov]
Sent: Monday, July 02, 2018 10:44 AM
To: Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>; Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>; Tim Morris <Tim.Morris@kci.com>; Haupt, Mac <mac.haupt@ncdenr.gov>
Cc: adam.spiller@kci.com; Kristin Knight-Meng <Kristin.Knight-Meng@kci.com>
Subject: [Non-DoD Source] RE: [External] RE: Stony Fork Response to Comments and Field Meeting Summary

Todd,

Yes, this is the case. The small area in question is at the end of the project, below a culverted crossing. The buffer width is (approx.) >50' on stream right (although it tapers at the end), and the buffer width ranges from 140' to 15' (at the end) on stream left. The reason the easement was not extended is that it is owned by a HOA and all 24 homeowners would have to sign the easement, which is extremely difficult to accomplish. It is likely that this ownership situation will protect this area perpetually because of the nature of the real estate situation.

Thanks,
Lindsay

Lindsay Crocker
NC DEQ Division of Mitigation Services
217 West Jones St., Raleigh, NC 27603
Office 919.707.8944
Cell 919.594.3910
lindsay.crocker@ncdenr.gov

-----Original Message-----
From: Tugwell, Todd J CIV USARMY CESAW (US) [mailto:Todd.J.Tugwell@usace.army.mil]
Sent: Thursday, June 28, 2018 3:19 PM
To: Crocker, Lindsay <Lindsay.Crocker@ncdenr.gov>; andrea.w.hughes@usace.army.mil; Tim Morris <Tim.Morris@kci.com>; Haupt, Mac <mac.haupt@ncdenr.gov>
Cc: adam.spiller@kci.com; Kristin Knight-Meng <Kristin.Knight-Meng@kci.com>
Subject: RE: [External] RE: Stony Fork Response to Comments and Field Meeting Summary

Lindsay,
I have not seen the plan view for the area in question. As the guidance points out, the 5% is intended to apply to areas near project termini where buffers are narrow due to the project intersecting with a road or property line. Is this the case here?

Also, what is the width of the buffer for the reach in question? If there is a section that has no buffer at all, obviously that is not what is intended - we have never agreed to credits for a one-sided buffer.

Todd

-----Original Message-----
From: Crocker, Lindsay [mailto:Lindsay.Crocker@ncdenr.gov]
Sent: Thursday, June 28, 2018 10:25 AM
To: Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>; Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>; Tim Morris <Tim.Morris@kci.com>; Haupt, Mac <mac.haupt@ncdenr.gov>
Cc: adam.spiller@kci.com; Kristin Knight-Meng <Kristin.Knight-Meng@kci.com>
Subject: [Non-DoD Source] Re: [External] RE: Stony Fork Response to Comments and Field Meeting Summary

All,

Based on interpretation of State contract law, DMS will not allow KCI to use IRT 2016 wider buffer guidance for any of the contracts in this particular RFP. This RFP and project was contracted well before the 2016 guidance existed. DMS

will not seek the additional credits this way, nor will KCI be able to realize those credits. These credits would have provided a significant increase for KCI to meet their contracted amount (they are currently below).

The 75' in question is well below the threshold of 5% of the project total (1%). DMS has realized credits for streams with less than 50' in the past (pre-2016), as long as it was not more than 5% of the project total. I think this is what you are saying, Todd? Please confirm if the inclusion of those 75' for credits would be ok with this clarification as it is in line with previous projects.

Thanks and apologies for all the acronyms in this email. I'm slightly embarrassed that I communicate this way.

Lindsay

_____

From: Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>
Sent: Thursday, June 28, 2018 9:28:34 AM
To: andrea.w.hughes@usace.army.mil; Tim Morris
Cc: Crocker, Lindsay; adam.spiller@kci.com; Kristin Knight-Meng
Subject: [External] RE: Stony Fork Response to Comments and Field Meeting Summary

CAUTION: External email. Do not click links or open attachments unless verified. Send all suspicious email as an attachment to Report Spam.<mailto:report.spam@nc.gov>

Tim,

Under normal circumstances buffers of less than 15 feet cannot generate credits, and this is built into the buffer calculation tool; however, per our 2016 guidance (Sec XI(A)5), exceptions to the 15 foot standard can be made in certain circumstances. The limit on this is 5% cumulatively over the entire project. I'm not sure from the description below if the area in question exceeds this amount. Note that if you request additional stream credits on the project by using the buffer tool, the 5% allowance does not apply. In your case, it sounds like you are able to get additional credits per your contract, correct? And I assume that also means that DMS would not be asking for those credits either? If that is the case, then the 5% limit would apply.

Does this help?

Todd

-----Original Message-----
From: Hughes, Andrea W CIV USARMY CESAW (US)
Sent: Wednesday, June 27, 2018 4:17 PM
To: Tim Morris <Tim.Morris@kci.com>
Cc: Crocker, Lindsay <Lindsay.Crocker@ncdenr.gov>; adam.spiller@kci.com; Kristin Knight-Meng <Kristin.Knight-Meng@kci.com>; Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>
Subject: RE: Stony Fork Response to Comments and Field Meeting Summary

Hi Tim,

Thank you for providing field notes from our meeting. I am not aware of SAW allowing credit for a stream reach that has a buffer of less than 15 feet on one side. I realize the project has lost credits due to easement issues beyond your control but we have to be careful setting a precedence, particularly when it is contrary to current guidance. I am copying Todd on this e-mail so he can weigh in on your proposal.

Andrea W. Hughes
Mitigation Project Manager
Regulatory Division, Wilmington District
11405 Falls of Neuse Road
Wake Forest, North Carolina 27587
Phone: (919) 846-2564

-----Original Message-----
From: Tim Morris [mailto:Tim.Morris@kci.com]
Sent: Wednesday, June 27, 2018 3:03 PM
To: Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>
Cc: Crocker, Lindsay <Lindsay.Crocker@ncdenr.gov>; Adam Spiller <Adam.Spiller@kci.com>; Kristin Knight-Meng <Kristin.Knight-Meng@kci.com>
Subject: [Non-DoD Source] Stony Fork Response to Comments and Field Meeting Summary

Andrea - thank you for meeting with us on short notice on Monday (6-25) to view the stream features that were questioned during the IRT in-house review. Specifically we looked at T1A and T1B as well as T-3. This email summarizes our discussions in the field.

T1-A - This was an active seep area that was flowing at the time of the site visit. ACOE expressed concern that because of the limited flow, this tributary could become more wetland-like than stream-like in its post restoration condition. KCI will address this concern in the response to comments.

T1-B - This tributary was another seep area that was not flowing at the time of the site visit. Since it was not flowing and did not appear on the JD map, KCI agreed to remove this feature from the plan. T1B was likely picked up during the assessment phase as a seep and survived the design process erroneously. Removal of this feature will reduce the overall credit yield by 26 credits.

T-3 - This feature was flowing at the time of the site visit. ACOE expressed concern that the area in and around the old pond bed, although manipulated, was stable. KCI indicated that the floodplain bench of the main channel would require all the spoil from the pond to be removed. That accompanied with the fact that the T-3 drainage pattern was un-natural (directed upstream to Stony Fork) and the channel was improperly sized resulted in the restoration call for T-3 through the pond. After looking at the channel upstream of the pond, ACOE agreed with the E1 call, but asked that additional justification be provided in the Mitigation Plan, including cross sections and sizing justification. KCI will provide this data to substantiate the R and E1 calls for T3. Below is a close up of the planform for T-3 (page 6 of the design plans). The dotted line below shows the extent of the floodplain grading.

Stream buffer issues at the bottom of the project - KCI also discussed (but did not visit) the end of the project where there is a short (75') section of stream with less than the minimum buffer on the left bank. The written IRT comment asks why we couldn't stop the project at the culvert instead of having a short section of narrow easement below the culvert.

I looked back at the design and confirmed that there is no design reason why we could not stop at the culvert. There are some badly eroded sections below the culvert that are within the easement that we feel should be addressed, especially the tight right-hand meander that we plan to stabilize with a soil lift. That is the reason we pursued credits in this section. KCI purchased excess buffer width on most of this project with the intent of providing two main benefits to the project. In addition to providing more buffering capacity, the wider buffers would also allow a broader treatment envelop for the extensive privet stands that dominated the understory, especially in the area of the stream valleys. We anticipated that the excess credit that we could generate using the expanded buffer guidance would offset the additional acreage encumbered in the easement, however we did not anticipate that Contract issues would not allow us to recover credits from the purchase of the wider buffers. We have run several versions of the buffer guidance during the assessment and design phase of this project. These methods show excess credit yields of 145 to 463 credits due to the expanded buffer. The most recent method provided by the IRT (using the DMS' GIS tool) yields the least number of credits (145). Since we can't recover these credits contractually we would request that we be able to utilize these credits to cover the narrow buffer area at the bottom of the project. In the past the IRT has been lenient on the terminal ends of easements where they come to a property line at an angle (as an example). I guess what we are asking for is leniency for this downstream section with the knowledge that the excess buffer in other areas of the project could more than offset any deficiencies at the end of the project. Any feedback on this issue would be appreciated prior to providing our formal response to comment letter to the rest of the IRT.

Thanks in advance for your feedback.

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: July 18th, 2018

To: Katie Merritt, DWR

From: Tim Morris, Project Manager
KCI Associates of North Carolina, P.A.

Subject: Stony Fork Restoration Site
Mitigation Plan Review for Buffer Mitigation – Response to DWR Comments
Neuse River Basin - 03020201
Johnston County, North Carolina
Contract No. #6830
DMS Project #97085
DWR Project Number: 2016-0372

We have addressed each of your comments below. We are attaching a "Buffer Mitigation Plan" that will be included in Section 12.3 in the revised mitigation plan that should address many of your comments. Please contact me if you have any questions or would like clarification concerning these responses.

General comments:

1. Credit Assets for buffer are inconsistent throughout the document. Inconsistencies noted on the following: pg. 23, 32, section 12.3 (table)

   The inconsistency on page 23 was our error – it showed an earlier version of our calculations. This has been corrected to match the numbers on page 32 and the table in Section 12.3. All of these numbers are in agreement now.

2. Provide site photos in the Appendix showing existing conditions of riparian areas proposed for restoration, & enhancement along T2.2.

   We have provided additional photos in the "Buffer Mitigation Plan" showing the conditions along T2 before and after physical removal that targeted the larger invasive stems – see attached.

3. Usually there is an appendix summarizing the buffer mitigation along reaches, which includes specifics to the monitoring plan, performance standards, credit assets, restoration/enhancement plan, etc that are different than the stream mitigation plan. Please provide an appendix titled "Buffer Mitigation Plan".

We have prepared the "Buffer Mitigation Plan" to be included in Section 12.3 in the appendices; this section previously was titled "Buffer Mitigation" and included only the spreadsheet and maps, but it has been expanded upon to include the information requested in the DWR review. A draft is being included with these responses for your review.

4. Lack of detail is provided for riparian restoration & enhancement areas:
   - SF reaches: Riparian Restoration along South Fork is not described in much detail, other than in section 6.1 where it vaguely references the removal of privet in the buffer (note that "buffer" is defined as Zone 1 and Zone 2 and only includes the first 50' from Top of Banks). For added clarity, please use the term "riparian areas".

     We have added additional descriptions of these areas in the "Buffer Mitigation Plan". Rather than organize descriptions of the existing site conditions by reach, we have grouped them by invasive species type since those drive much of the buffer impacts at the site.

   - According to the viability letter much is needed in the form of invasive species removal & management along SF up to its confluence with T1 to receive Restoration credit. Please explain what KCI will be doing in areas proposed for Restoration along SF & T1.

     Please see Section D. Implementation Plan in the "Buffer Mitigation Plan". Mitigation work will consist of mechanical and chemical treatment of invasive species plus plantings of native hardwoods.

   - T2.2 was re-evaluated this year based on the substantial privet removal in the buffer. The Site viability letter indicates that Enhancement & Restoration areas *"need to be managed aggressively during the entire five (5) years."* No mention of this is provided in the mitigation plan. Additionally, planting larger stock of woody stems was also recommended due to the conditions of the buffer during that site visit in April. Therefore, please provide more detail so I can confirm it complies with the site viability letter for being eligible for buffer mitigation. I recommend this level of detail be provided in the appendix requested in Item #3 above & noted on the Planting Plan sheets

     For T2.2, please see Section D. Implementation Plan in the "Buffer Mitigation Plan". Mitigation work will consist of mechanical and chemical treatment of invasive species plus plantings of native hardwoods.

     We have also added in Section E in the "Buffer Mitigation Plan" that we will plant addition partial forested sections of the easement that have been treated for privet with either one gallon container trees at a 20 by 20 foot spacing or bare root trees contained in tree shelters at 10-foot center spacing. This area, approximately 6.2 acres, will also be denoted on the Planting Plan sheets.

   - Many references describing changes to adjacent land uses since the IRT/DWR visit are provided, but no visual representation is included in the plan. Please include an aerial showing the current site conditions in and around the proposed easement boundary. Please reference the new aerial as a Figure and incorporate that figure in text where KCI references future roads, construction, development, crossings, etc.

We have put together a map showing the new development (Sherrill Farms Phase I to the north of the center of the project, currently in progress, and Phase 2 to the southeast of the project, still in the planning stages; it is Attachment II for the "Buffer Mitigation Plan". We have also inserted a recent aerial image from March 2018 that shows the most recent development to the north of the site. We will use this aerial as a background in the mitigation plan figures as well.

5. Section 12.3: Map Sheets
   - Map Sheet #2-Shows the west side of the farm path between T1/SF confluence and T2/SF confluence proposed for Preservation credit. However, the viability letter indicates the pine plantation is not suitable for any credit. Please revise credits accordingly to comply with the viability letter.

     We have changed this area to no credit (see revised map sheets attached).

   - Sheets do not accurately depict current land uses in close proximity to the project easement. Please use the aerial requested in #5 above as the base layer for this section.

     We are now using the 2018 aerial discussed above for these maps.

6. Section 6.10: lacks essential details. Many areas on this site require special attention with regards to the stems planted, stock and density. Please add detail to the planting plan using specific areas where special attention is warranted (see viability letter). (example: Enhancement areas are described in the viability letter as having no understory; therefore, DWR recommends KCI be selective when choosing what plants to use to establish a healthy understory in areas receiving Enhancement credit.

   Section 6.10 will be updated to reflect the information presented in Section E. Planting Plan in the "Buffer Mitigation Plan". Partially forested sections of the easement that have been treated for privet will be supplementally planted with either one gallon container trees at a 20 by 20 foot spacing or bare root trees contained in tree shelters 10-foot center spacing. These species may consist of river birch, sycamore, or any of the five oak species listed in the primary planting zone.

7. Section 5.0:
   a. Please add a goal that targets a high level of intervention and management of invasive species within the riparian areas. This should be a goal for this site considering that a 1:1 and 2:1 ratio has been agreed to by the DWR for the removal and management of the invasives present for buffer mitigation.

   *We prefer to have broad goals and believe the current second goal encompasses invasive species management. We did add to the objectives for the second goal: "**Treat invasive plant populations** and plant the site with native trees" to emphasize the importance of the task of removing these plants. The measurement tool of species composition/diversity takes into account the number and type of species present, and will track any invasive species present during monitoring events.*

8. Table 16: a ratio of 3:1 is shown in the column for areas >100' from top of bank, and therefore the amount of credits are higher than if using 33% as required in the buffer mitigation rule.

Adjust credits based on using 33% instead of 3:1. Example: 37,091 * .33=12,240 whereas 37,091/3 = 12,364. Note: the mitigation banks are required to use the 33%.

We have corrected the value used to 33.0% for the two pertinent calculations. We show 3.03:1 as the ratio in Table 16 to maintain the formatting of that table for DMS, but we used 33.0% for all of the calculations.

9. Section 7.0:
    a. Riparian Buffer Performance should be included in the added appendix with that new appendix referenced here in this section

        Please see Section G in the "Buffer Mitigation Plan", which will be referenced in the revised mitigation plan.

    b. In this part, there are two different performance standards being stated, however KCI needs to choose which one they want to be held accountable for. Here are the two performance standards to choose from:
        1. …a minimum of 4 native hardwood tree species with no species greater than 50% of planted stems; or
        2. four native hardwood tree and native shrub species, with no species greater than 50% of planted stems

        We have changed it to indicate we would like to use four native trees.

    c. If you want to include volunteer species, that's fine. Clarify that only "desirable volunteers may be included to meet performance standards and upon DWR approval".

        Per your request as well as based on comments from USACE during their review, we have changed this to read: "For any volunteer tree stem to count toward vegetative success, it must be a species from the approved planting list included in the Mitigation Plan."

10. Section 8.0:

We have included an overview of proposed monitoring in the "Buffer Mitigation Plan", Section F, and will update the revised mitigation plan to be consistent with this section.

    i. DWR requests that monitoring be done no earlier than the end of August and no later than mid-December. Mitigation banks are held to this standard.

        We have changed this.

    ii. Add a statement clarifying that vegetation monitoring will begin no earlier than at least 5 months post-planting efforts. Currently, it says after the first full growing season.

        We have amended this to say "Beginning at the end of the first growing season and no sooner than 5 months following planting….".

    iii. Add a statement that the monitoring will be for a period of five monitoring years *or until DWR approval.(emphasis added)*

We have added this in the "Buffer Mitigation Plan".

Clarify that the parameters being monitored are mainly for planted stems.

iv. Why are exotic and invasive "stems" going to be included in the stem counts?

This allows us to quantify the number of invasive species present versus the desirable species.

v. Section 5.1 - 0295 (2)(E) indicates that the monitoring plan shall also include the "*health* and average stem densities" (emphasis added). Add clarity to this section to meet the rule expectation that vigor is an important parameter to note in the annual reports.

We added a sentence stating that "Height will be used as a determination of plant vigor" in the "Buffer Mitigation Plan". Height is already included as one of the plot measurements. Per Section 8 in the DMS mitigation plan for Vegetative Performance, trees in each plot must average 7 feet in height at Year 5, and we added that to the "Buffer Mitigation Plan" as well in Section G.

vi. Figure 10 shows the approximate location of monitoring plots. --DWR recommends ensuring that each reach has a plot located on both sides of the stream where restoration or enhancement is being generated for buffer mitigation.
-Please do not place plots within or partially within a buffer preservation area.

None of the current plots are mapped within preservation areas, although they may appear close to the boundaries at the scale of Figure 10.

-Please add another permanent plot within the buffer enhancement area along T2 along the right bank.

We have included another permanent plot along T2's right bank as requested – please see the revised Figure 10 in the attachments and plot table below.

-Where non-permanent random plots are installed each monitoring year, DWR would like to know what parameters KCI will use to determine where the plots will be placed to accurately represent the planted and partially planted areas. For example: areas within just 0-50' and/or 51-200', Enhancement areas, Restoration areas, etc. This level of detail is necessary to determine if the buffer mitigation areas are being monitored in the appropriate locations.

For the permanent plots, we had 5 plots in the restoration areas and 1 plot in the enhancement area. We have further described and modified the distribution of the plots as follows. The random plots will be selected during each annual monitoring event using these criteria.

Veg Plot	Reach	Buffer Mitigation	Distance from TOB	Bank	Type
1	SF1	Restoration	51-200'	Left	Permanent
2	SF2	Restoration	TOB-50'	Right	Permanent
3	SF2	Restoration	TOB-50'	Left	Permanent
4	T1	Restoration	51-200'	Right	Permanent
5	T2	Restoration	TOB-50'	Left	Permanent
6	T2	Enhancement	TOB-50'	Left	Permanent
7	T2	Enhancement	51-200'	Right	Permanent
8	SF1	Restoration	TOB-50'	Right	Random
9	SF2	Restoration	TOB-50'	left	Random
10	SF2	Restoration	TOB-50'	Right	Random
11	SF3	Enhancement	TOB-50'	Right	Random
12	T1	Restoration	TOB-50'	Left	Random

11. Section 9.0: Add DWR to this paragraph for purposes of notification and contingency planning

    We have amended this sentence in the revised mitigation plan to read that "….the sponsor shall notify the members of the IRT as well as NCDWR's 401 and Buffer Permitting Branch staff and work with both groups to develop contingency plans and remedial actions".

12. Section 12.1: Plan Sheets
    a. Sheet 6: Tributary 1B & 1A are new tribs proposed off T1. Buffer Credit will need to be deducted from the footpint where these streams will be located. Figures provided in this plan do not currently show that deduction. Buffer credit is only viable adjacent T1.

       We have removed the bankfull extent of T1A from the buffer credits. Based on USACE comments during the IRT review, we are removing T1B from the project altogether. In addition, we have deducted the footprint of T3 from the buffer credit calculations; this is an additional tributary that was added for stream credit that flows into Stony Fork Reach 1 (SF1).

    b. Sheet 14: bare roots are the only size of stems shown to be planted other than live stakes. Is KCI not intending on planting larger stock within the buffer Enhancement areas along T2.2? (see viability letter note)

       As noted above, we have changed this sheet to show that the enhancement sections of the easement will be supplementally planted with either one gallon container trees at a 20 by 20 foot spacing or bare root trees contained in tree shelters 10-foot center spacing. These species may consist of river birch, sycamore, or any of the five oak species listed in the primary planting zone.

13. Section 12.3:
    a. I like this table!
    b. please give the table a title for referencing.

We have named this Table 1. Buffer Project Areas and Assets for the "Buffer Mitigation Plan".

c. This table shows different summations of credit potential than other parts of this plan. Please address all inconsistencies in credit assets for buffer mitigation prior to final submittal

These have all been corrected. See revised values in the "Buffer Mitigation Plan."

d. There is a subtotal of 45,445 ft2 of buffer preservation credits after applying the ratios and % reductions; which is below the EPA of 175,721ft2. However, the EPA of 175,721 is then applied to a ratio of 10:1 on the next row implying that the project will only yield 17,572 ft2. Please explain why the 10:1 was applied on the EPA and which row of subtotals KCI is using towards their credit assets.

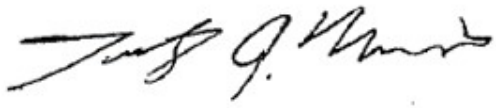
We calculated the preservation credits as follows – please correct us if we are using an incorrect method (note numbers are slightly different now due to edits in this most recent version).

- *Eligible area (square footage) for preservation is*
  (R+E)/0.75-(R+E)
  (525,087/0.75) – (525,087) = 175,029 square feet
- *On-site area of preservation mitigation is 424,660 square feet*
- *Of this, we used 175,029 square feet of preservation that are eligible for full preservation credit (minimum 30' to 100' buffer area) at 10%, therefore the final preservation credit we are claiming is 17,503 credits.*

14. Note that this site cannot be used to generate nutrient offset credits according to the viability letter.

The viability letters are included in the appendix for reference. Assets generated on this site are retained by the State of North Carolina per a legally recorded easement. KCI will report the riparian buffer assets per the contract and RFP specifications as required by DMS.

Sincerely,



Tim Morris
Project Manager

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: April 24, 2018

To: Lindsay Crocker, Project Manager
DMS Review Team Members: Periann Russell and Greg Melia

From: Tim Morris, Project Manager
KCI Associates of North Carolina, P.A.

Subject: Stony Fork Restoration Site
Draft Mitigation Plan Review
Neuse River Basin - 03020201
Johnston County, North Carolina
Contract No. #6830
DMS Project #97085

Dear Ms. Crocker,

Please see below our responses to your comments received January 12, 2018 on the draft of the Stony Fork Mitigation Plan. We have addressed your comments in the final report and have outlined our changes below. In addition, there are further changes we needed to make that are described after the DMS comments. We are including 3 hard copies of the final report along with a CD with a PDF of the plan and this letter.

1. This Mitigation Plan is 82 SMU and 76,088 BMU under contract amounts. Ensure that these amounts are correct as the future payments will be reduced accordingly (see notes below on new IRT policies).
   We have revised the final mitigation units to 6,682 SMUs and 482,608 BMUs. The stream credits are reduced from the proposal stage due to land title issues associated with the Critcher Farms subdivision at the bottom of the site and removal of a portion of T2 that was not jurisdictional. We also removed the additional stream credits calculated from extra buffer widths after Jeff Jurek indicated they would not be approved for this site. The BMUs were reduced due to the limitation on preservation credits that we didn't originally take into account.

2. Page 3, last sentence of first paragraph- this sentence is not clear. Please revise to make more sense.
   We were trying to relay that problem areas throughout this CU outweigh assets in the most recent document. We have reworded it to say: "The CU's problem areas scored higher than the assets (98 compared to 36), indicating there is more disturbed land than intact resources (NCDENR, EEP 2015)."

3. Page 8. Will the ponds above T2 be removed as part of the residential development? If so, do you know what stormwater BMPs will be installed with the development?
   No, the ponds will remain and be used as part of the residential development stormwater system. During the residential construction, additional sediment traps will be used to capture sediment.

   A note has been added about the ponds at the bottom of Section 3.1.2.

4. Page 13, last paragraph, please add that DWR also provided a stream determination and the date.
   We added this note about the stream determination from July 8, 2016.

5. Page 14, Table 3. The T1 and T2 drainage areas are very small, especially for a coastal plain stream (even though it is western coastal plan). Both streams may currently be intermittent due to their depth, so are you sure you can maintain at least intermittent flow following restoration? The DWR stream scores are very low and if the 'strong" bed and bank indicators are the result of mechanical straightening and cleaning, that strong indicator is misleading.
   The project streams were initially evaluated during a drier period, when all but a portion of the project streams were classified as intermittent. We believe these streams will have sufficient hydrology for intermittent status.

6. Section 6- general comment: something is going on with your numbering in this section, it moves from 6.1-6.7 and then goes backwards. Check and update in text and table of contents.
   This has been corrected.

7. Section 6.7, provide a discussion or clarification of why you chose the on-site and nearby reference locations- are these cross sections reference quality for the stream design? The selection of these four cross sections needs to be better justified.
   Yes, these reference cross-sections exhibited stable bankfull indicators in the field that were used to determine bankfull area and discharge values. The design cross-sections were developed using these values, but the exact shapes of the sections were dictated by other typical Piedmont and Coastal Plain reference values like those found in Harman et al 2011. A more detailed explanation has been added to this section.

8. Section 6.7 Figure 8- provide a legend to label the red and blue regression lines. It appears that these are only 3 cross sections on the red (reference sites). Is the fourth included?
   Yes, References Cross-Sections 2 and 3 have similar drainage areas, so they appear as one data point. We added a sentence explaining this in the first paragraph of this section.

9. Table 8, SF1 sinuosity is showing 1.3 in pre-condition, but I recall that area is very straightened. Double check this is correct.
   This value is correct. While the majority of the reach is channelized, there is a section in the middle that has unstable bends with high sinuosity that affects the overall average for the reach.

10. Page 25, Section 6.5 Sediment. Please state clearly the intent for the sediment regime for the constructed channel. Since this project lies in the coastal plain, sand and/or sand bed channels are expected. Currently, these channels are receiving fine sediment, likely predominately sand, because of bank erosion, where the banks are dominantly sand (is this correct?). If the channel

substrate is composed of silt and clay (as stated in the first paragraph), and excess shear is preventing deposition of the courser fraction of sediment (sand and small gravel), will your design and design discharge provide for sediment input, transport and deposition?
Yes, we believe the channel will develop a stable sediment regime once the on-site bank erosion is stabilized. The size of sediment input is not expected to change, but the quantity is expected to be less following restoration. The stable cross-section will also be able to accommodate more sediment deposition on the floodplain. Some seeding is expected in the project riffles, but to ensure that riffle degradation does not occur in the period immediately following restoration, we will be adding the larger material to protect the riffle beds.

11. Page 25. Reference to pebble counts and tables in section 12 – Were pebble counts used for determination of sediment > 2mm? How did you measure a sediment size of 0.091, 0.2, 0.39?
Yes, pebble counts were the main source of sediment sampling. Sand is measured using a sand gauge card, which allows the user to calibrate their determination of sand size with provided size samples on the card (very coarse 1- 2 mm, coarse 0.5-1 mm, medium 0.25-0.5 mm, fine 0.125-0.25 mm, and very fine sand 0.0625-0.125 mm, and silt less than 0.0625).

12. Page 26, table 7. All the predicted grain size movement values (in the proposed sections) are much greater the D84 values. Is this intentional and if so, please explain how this condition will not result in total bed scour during effective discharges (based on the proposed D50 and D84 values).
Given the small sediment sizes in this system, there is a discrepancy between the D84 and the predicted grain size movement in the restored channel. This is a frequent occurrence with projects of similar sediment regimes. To accommodate for this condition, the riffles will be stabilized with material large enough to withstand channel stresses. This means that sediment transport will occur as the natural sediment washes in to seed these riffles and is then transported through the system. As this occurs, both the riffle bed features and the transport of fine sediment through the system will be maintained as the project matures.

13. Page 26. The explanation of need for 'riffle reinforcement' suggests that all sediment sizes less than the grade control material will be moved at all effective discharges as well as .5 to 1 year frequency discharges. Does this mean the constructed channel bed will be composed of silt and clay, retaining little to sand or gravel? This section is not clear and the discussion is not consistent with the data you have provided.
We do expect a large portion of the sand and gravel material inputs from upstream to be mobilized during stream events. However, over time this material should accumulate within the gaps of the larger riffle grade control material.

14. P. 26, text indicates that all riffles are rock. Will you incorporate wood here?
We have added in wood into our detail for the riffles. The use of wood will be balanced against the expected flow duration in each location, since embedded wood is prone to rotting if it experiences frequent wet/dry cycles.

15. P. 31, DMS recommends limiting black willow, or more heavily relying on other lives stakes as it tends to become dominant in a system and could clog channel.
We are proposing a mixture of species including two willows and one dogwood. In addition, we strategically place live stakes such that they will not overwhelm the channel (eg minimal to no live stakes on inner meander bends).

16. P. 35, 8.0, text states monitoring UT West Branch…do you mean this to say Stony Fork?
Yes, this has been corrected.

17. P. 36 top paragraph- must have year 4 monitoring for vegetation to receive riparian buffer credit (required Monitoring in years 1-5). Also need to update last sentence on page 37 and Table 20 (Vegetation Monitoring frequency) to reflect this update. Might want to add a separate section for Riparian Buffer monitoring to clarify?
We have added that Year 4 monitoring will take place for riparian buffer mitigation.

18. Page 37, Table 20 – Believe it is intended to be 0.02 acres for vegetation; also add visual assessment parameter to include the occurrence of bank erosion, beaver, etc.
This has been corrected to state 0.02 acre plot. Also, we added in Year 4 for vegetation monitoring as well as the visual assessment.

19. Please provide a brief narrative in the document that describes what changes occurred from the Technical Proposal IRT site visit and the Mitigation Plan stages. Specifically, describe the additional jurisdictional stream features added (T3). There appears to be a loss of stream in the upper section of tributary T2 from the mitigation plan (in addition to the eastern section of the project area). Can you provide a brief description of why those areas were dropped to insert in the mitigation plan? Please also provide description of if buffers were widened from the Technical proposal stage and justify use of this methodology, if applicable. Of relevance, KCI was encouraged to increase the buffer in some areas if possible during the IRT post-contract review; consider including in justification.
We have added the following to Section 6.11, Project Assets. "The total stream mitigation credits (SMCs) are slightly different than those outlined in the initial proposal. SMCs were removed at the bottom of the site due to land title issues associated with the Critcher Farms subdivision. The upper portion of T2 was eliminated from the project, since it was not a jurisdictional stream, but an additional tributary, Tributary 3, was added to the project once it was determined it was jurisdictional. The buffer mitigation credits (BMCs) were reduced from the contracted amount due to the limitation on preservation credits once the final restoration, enhancement, and preservation BMCs were tabulated."

Plan Sheets:

- Sheet 7 of 15: what is the future right of way depicted here?
This refers to the subdivision road that will be constructed through here to support a proposed development. The first phase will be on the northern side of Stony Fork, which will be built soon. The second phase will be on the southern side of Stony Fork and will be constructed at a later date to be determined.

- Plan Sheet Legend. Please clarify why 'riffle enhancement' is being used in a newly constructed stream.
We have found that riffle enhancements are necessary in many newly constructed streams with fine-grained material to prevent bed degradation shortly after construction. Many new riffles are not seeded quickly enough with incoming sediment to protect them from the stresses experienced from large flow events. Over time, natural sediment (sand and fine gravels) will fill in the void space in the enhancement rock.
- Please justify the need for step-pool features adjacent to enhance riffle features.
The step pools are used to both provide a stable grade transition in steeper sections and to

create pool habitat.

- Please justify the need for size and frequency of rock/boulder structures.
  These structures are needed to provide additional stability within the channel, generally in sections where the site conditions dictate a steeper slope or where further bed or bank protection is needed. We will incorporate as much wood as we can, although as mentioned above, we will be selective where we place it, since wood can be prone to rotting if it experiences frequent wet/dry cycles (such as in an intermittent channel).

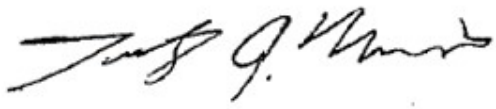
Additional Changes by KCI

Since the draft mitigation plan submittal, several items in the mitigation plan were changed based on developments in the project.

- *We removed the extra credit calculations based on stream buffer widths beyond 50' following feedback from Jeff Jurek and revised the total credit to 6,682 SMCs.*
- *NCDOT unexpectedly installed a new culvert under Federal Road at the beginning of the project. As a result, we recently resurveyed this area and adjusted the profile slightly in the first reach (SF1) to 0.9% slope from 1.0% slope. The new culvert also starts further back than the prior one, so the stationing was adjusted to 9+93 instead of 10+00 for the beginning of the project.*
- *We also adjusted the riparian buffer mitigation amounts. KCI performed additional GPS mapping on-site following privet removal to determine the boundaries of buffer restoration versus enhancement on T2-2. I met Katie Merritt from NCDWR for a field visit at the site to confirm these boundaries on 3/29/2018, and they issued a letter on 4/16/2018 confirming the revised buffer calls.*

Please contact me if you have any questions or would like clarification concerning these responses.

Sincerely,



Tim Morris
Project Manager