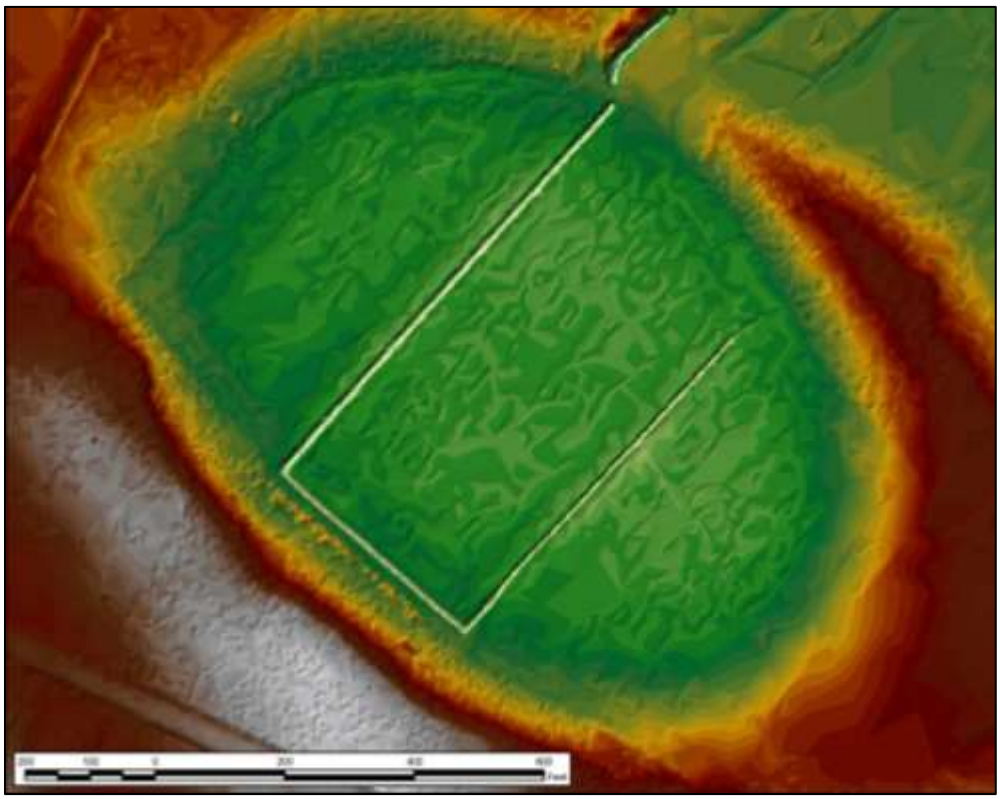
MITIGATION PLAN

ARABIA BAY WETLAND MITIGATION SITE

Hoke County, North Carolina

DMS Project ID No. 100061
Full Delivery Contract No. 7529
USACE Action ID No. SAW-2018-01151
DWR Project No. 2018-0784
RFP No. 16-007332

Cape Fear River Basin
Cataloging Unit 03030004



Prepared for:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NORTH CAROLINA 27699-1652

June 2019

July 1, 2019

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Subject: Arabia Bay, Project ID #100061, DMS Contract #0007529
Response to IRT Comments on the Draft Mitigation Plan Review Received 04-12-2019

Restoration Systems received comments on the Arabia Bay Mitigation Plan from the North Carolina Inter-Agency Review Team on April 12th, 2019. Below are the comments received in black, and Restoration Systems' response in blue.

Todd Bowers, EPA:

1. Section 7.4/Table 9/Page 15: Natural Plant Community Restoration
   - Schafale 2012 lists two distinct Cypress Savannas (typic and acidic). Recommend providing some discussion and justification on which type is being implemented for the target plant community at Arabia Bay.

See updated section 7.4. The Natural Plant Community Restoration target has been expanded and clarified to reflect a Cypress Savanna (Typic Subtype) in the deepest portions of the bay, with a gradient upslope to Nonriverine Wet Hardwood Forest (Oak Flat Subtype) around the bay rim.

2. Table 9 planted total should be 10,200 based on the number of each species provided. I also noted that with 10,200 planted stems over 16 acres would result in only 638 stems per acre, well below the desired planting density of 680.

See updated Table 9. Planting plans have been updated to reflect the appropriate density of canopy tree species (680 stems/acre x 16 acres = ~10,900 stems). Shrubs and herbaceous species will not be counted towards this density.

3. Section 8.1/Table 12/Page 18: Success Criteria
   - Shallow freshwater marsh is expected to encompass approximately 20% of the bay area, some discussion on this habitat type should be included in Section 7 as a subcomponent of the cypress savannah target habitat.

Noted, Section 7 has been revised to include habitat type discussion. These areas are expected to contain appropriate tree species and are referred to as ephemeral pool "habitat areas" in the narrative.

4. I am bit confused by the inclusion of many of the shrub species (namely Leucothoe racemosa, Lindera melissafolia, and Lyonia lucida) being a) counted towards stem density and b) potentially counted toward tree height averages. Most of the shrubs in Table 9 may not grow above 2 meters tall and contain multiple stems. Recommend some additional clarity as to which species will be counted towards stem density and tree height averages.

See response #2 above and updated planting plan.

5. Section 8.3/Table 13/Page 19:
    - See notes above as they pertain to success criteria for vegetation. "Plant" density, which implies all species, is dependent on stem counts, however "plant" height may only be referring to tree species. Average plant height of 10 feet will be difficult to achieve if the shrubs are included in the height estimations. Recommend some clarity to differentiate between planted shrubs and trees and how they contribute to the parameter estimations for success.

See response #2 above and updated planting plan.

Kathy Matthews, USFWS:

1. The Service reviewed the public notice for this project in June 2018, before a mitigation plan was developed. Although pondberry is not on the county list for Hoke County, it likely was historically in the county, and is found in Carolina bays and similar habitats. Pondberry was listed as endangered on July 31, 1986.

Noted. After consulting with Lesley Starke (Plant Ecologist, NC PCP) and Dale Suiter (Endangered Species Biologists, US FWS), we will not be including *Lindera melissifolia* in our primary planting list. We are however exploring the potential to work with NC PCP & USFWS to propagate ~100 stems of pondberry to plant at the site at a later date, after the restored hydrology has stabilized and the canopy trees are well established.

2. The Service is very pleased that Restoration Systems (RS) is proposing to plant pondberry on the site. We do not recommend any specific requirements for monitoring or replanting of the species other than what is already proposed. We do not recommend any specific requirements for survival of the species on the site.

Noted.

3. We recommend that RS ensure that the planted stems are correctly identified as the listed species, the plants are propagated and transported in North Carolina (unless appropriate permits are in-hand for interstate transport/commerce), and that we are provided with name and location of the propagation facility. Also, the Service would appreciate the opportunity to survey the site in the coming years to determine the success of the planted population. This is in addition to the annual monitoring efforts, since we would be interested in determining population numbers over time throughout the site, and not just in the vegetation plots. These plants are rhizomatous, frequently propagating by vegetative sprouts and forming clonal colonies, and we hope that planted individuals will spread throughout appropriate habitat on the site.

Noted.

4. It is through efforts such as this that a species may be recovered and eventually down-listed or removed from the endangered species list. We recommend that NCDMS consider recommending the planting of pondberry in appropriate habitat (described below) to all mitigation providers, and we will strive to also do that when given the opportunity. As you may know, plants that are not on federally-owned lands are not subject to take provisions, (unless such take is in violation of a State law), so hopefully, other mitigation providers will not be discouraged from planting the species.

Noted.

5. Habitat (USFWS website; Beckley and Gramling 2013): Pondberry is associated with coastal wetland habitats such as mixed pine or hardwood sinks, ponds and other depressions, including pocosins and successional swamp forest. The plants generally grow in shaded areas but may also be found in full sun.

Noted.

6. As for the vegetation success criteria, I believe that the loblolly recruitment may more than make up for any deficit in numbers of planted trees. We welcome planting of additional tree species, however we would not like to see a reduction in the number of planted pondberry stems.

Noted.

7. The mitigation provider will need to contact the North Carolina Plant Conservation Program (NC PCP) for a permit before planting any state-listed (which includes all federally-listed) species. Please let me know if the Service can be of assistance in any way.

Noted and Restoration Systems appreciates the USFWS' offer to facilitate communications with NC PCP.

Mac Haupt, NCDWR:

1. DWR liked the discussions of the soils in the comment/response letter from DMS (Lindsay Crocker) to RS. DWR is still concerned with the possibility of ponding (other comments will cover later). In addition, DWR would like to know the location and soil series of the Reference Wetland that this section (question/statement #2) referenced.

Thank you. We would like to specify the Reference Carolina Bay does not specifically represent a Reference Wetland but rather a Reference Soil Site to evaluate the morphology of the target soil series (McColl loam) under forested conditions. The coordinates of the Reference Wetland are 34.961270°, -79.173666° and is near the intersection of Arabia Road and Upchurch Road, Raeford, NC. The soil series of the Reference Wetland is Mc - McColl loam.

2. DMS comment letter #10 - states that much of the ditch plug material will come from "habitat areas" within the site. DWR cautions that the depressions should not be over 6 inches in depth and obviously the IRT does not expect to find wetland gauges in these areas. In addition, there should be some representation of the location and extent of the depressions in the design sheets (DWR realizes the location will be determined once construction initiates, however, there should be some plan showing extent).

We acknowledge the habitat areas will not exceed 6 inches in depth and will not include gauges. The location and extent of the habitat areas has been developed and is shown on the design sheets. The size and extent of the habitat areas was determined by back calculating the volume of fill needed to fill in the existing ditches. The volume of fill required to fill the ditches is 2,300 cubic-yards, which equates to 1.4 acre-feet. When factoring in the 6-inch max depth of the habitat areas the area required is doubled to 2.8 acres. The habitat areas vary in shape and are distributed throughout the Project. Habitat areas were not placed in the middle of the Project as it is expected this will be the wettest area of the Project and would not benefit from the constructed habitat areas. Habitat areas will comprise 2.8-acres and be constructed by excavating multiple depressions ranging in size from 0.10-0.35 acres with a depth of no greater than 6-inches.

The design sheets have been updated to show the extent of the habitat areas.

3. DMS comment letter #11 - as DWR reads it no surface water will leave the site unless it reaches the outlet elevation of the Terracell structure. DWR is concerned about excessive ponding for the site. More comments will be mentioned later regarding surveyed elevations versus QL2 Lidar.

While no surface water will leave the Project until it reaches the outlet elevation of the Terracell structure, lateral groundwater movement will not be restricted. The adjacent soil series to the Project include CaB – Candor sand and NoA – Norfolk loamy sand, which have drainage classes of somewhat excessively drained and well drained respectively. Both of these adjacent soil series will allow excessive hydrological inputs to exit the Project via lateral subsurface groundwater movement when surface water stops exiting the constructed outlet. This will provide relief of excess hydrological inputs while retaining the water necessary to meet wetland hydrology performance standards. Aside from the Terracell structure outlet the hydrology of the Project will perform as it did historically under natural conditions.

4. DMS comment letter #12 - DWR appreciates the inclusion of a water budget.

Thank you.

5. Section 7.3 - DWR appreciates the moving of the current dirt road outside the easement, however, DWR is concerned that the road will be built and the outlet placed based on QL2 Lidar. DWR would prefer that these elevations would be verified by traditional survey methods.

Noted, we understand the need to verify the elevation of the relocated dirt road. A total station will be on site during construction and used to verify the elevation of the relocated dirt road is above the outlet and rim of the restored wetland.

6. Table 11 - the growing season for Hoke County, as per the Soil Survey, is from April 5th to October 28th. As been stated in the past, another growing season may be proposed based on soil temperature, however, no growing season may start before March 1st. In addition, any change in growing season must be noted in each wetland hydrologic summary table.

Noted.

7. Table 12 - DWR accepts the proposed 10% saturation minimum for this site, however, DWR will not accept the proposed 8% saturation standard for monitoring years 1 and 2. That will be an IRT decision once the data for these monitoring years have been reviewed.

Table 12 has been revised to remove the last sentence from the Wetland Hydrology section.

8. Design sheets-PS4 - DWR realizes the ditches will be filled to grade, however, does RS have any concerns that the ditches, other than the plugged areas may still facilitate drainage of the wetland? In other words, unless work is undertaken to compact the material (clay?) filling the ditches, areas may still drain. Will RS/Axiom require the entire ditch be filled with compacted clay or non-impervious material?

In order to restore wetland hydrology the restrictive soil layer throughout the Project needs to be reestablished. Prior to the Project being placed in agricultural production an impervious layer did not exist within the lower sections of the existing ditches. Therefore, the ditches will be backfilled with available material to the deepest extent of the restrictive layer as observed in the ditch cross-section/profile. Once the ditches have been filled to the lower extent of the restrictive layer, clay material will be utilized to connect the broken restrictive layer. The clay material will be keyed in to the undisturbed restrictive layer along the ditch margins and compacted in 1-ft lifts.

9. Design sheets 5 and 6 - DWR would prefer that the figures be supported with surveyed in elevations, especially the constructed road, inlet, outlet of the Terracell and on sheet 6 spot elevations within the site showing elevation differences near the rim and in the center of the site.

Noted, as described in the response to NCDWR Comment #5 a total station will be used during construction to ensure the constructed road, inlet/outlet of the Terracell structure, and elevations of the rim and center of the Project are constructed as designed.

10. DWR found (in a different section than the other figures) a Figure 3 with Arabia Bay elevations based on the QL2 Lidar. This figure should have been with the others, however, it does show a considerable amount of elevation variation which would remove the need to create "habitat areas".

The elevation variation was noted as we prepared the mitigation plan, and while it is extensive there are opportunities for improvement including the extent, size, and distribution of the habitat areas. Based on the QL2 Lidar data the southeastern third of the Project (southeast of the eastern most ditch) consist mainly of a contiguous low flat area, while the centrally located third of the Project (between the two ditches) appears to have an appropriate balance of depressional areas, and the northwestern third of the Project has depressional areas at a higher elevation relative to the rest of the Project. The constructed habitat areas will be sized and distributed throughout the project to avoid large areas of surface ponding. Also, these constructed habitat areas will provide material to backfill the existing ditches.

11. Figure 10 displays the monitoring components proposed for the site. DWR would like at least four gauges placed near the outer rim or outside the innermost elevation line as seen in Figure 7. For example, DWR would like a gauge in the outer area where the road was removed, also, the other 3 gauges should be spaced within these outer areas. The other 11 gauges should be placed to address differences in elevation throughout the site.

Figure 10 has been revised to incorporate the preferred gauge placements and the contour lines from Figure 7 have been added for reference.

12. Each wetland gauge should be tied to a specific ground elevation. These elevations should be representative of the site and tied to a surveyed in elevation.

The Project elevations range from 219-ft to 221-ft with a majority of the Project within the 220-ft contour. Based on the approximate length (1,000-ft) of the Project, the slope is ~0.2%. Given the lack of elevation and slope for the Project we do not see the benefit in surveying gauge ground elevations. If during monitoring gauges are not meeting the hydrology performance standard we will utilize a laser level to determine gauge ground elevation relative to the outlet (a known elevation). We understand and acknowledge that gauges will not be placed in habitat areas, and gauges will be calibrated to the soil surface during installation.

Kim Browning, USACE:

1. It is anticipated that water levels for this project will vary seasonally and across years from inundated to dry, especially given the fact that the main input is rainfall; however, the hydrology standard should be at least 10% (preferably 12%) across the site, with considerations to be taken in the first few years after construction.

Table 12 has been revised to remove the last sentence referring to 8% wetland hydrology performance standard in the first two monitoring years from the Wetland Hydrology section.

2. From a wildlife standpoint, I would be interested to know the amphibian species composition at the closure of this project, both in the summer and the winter, assuming it's successful in restoring wetland habitat. These isolated wetlands are often the only landscape feature available for amphibian reproduction in large areas.
    a. Has any consideration been made regarding the condition of the existing soil, specifically the effects of agricultural nutrients and pesticides, on proposed vegetation and habitat? (Perhaps a good justification for Table 7B-Habitat)

The inclusion of the ephemeral pool "habitat areas" is aimed at providing varied hydroperiods which among other benefits will support development of habitat for wildlife particularly reptiles and amphibians. The existing soil conditions have been considered in the mitigation plan. For the 2019 growing season no agricultural practices crops will be conducted within the Project area including no planting of crops, no use of fertilizer, and no application of herbicides or pesticides. We will plant a selected herbaceous seed mix following construction to facilitate the restoration of the vegetative community which will also support the restoration of the wildlife community.

Based on a quick literature search it does not appear agricultural practices inhibit the regeneration of the amphibian community. However, other factors including: predation, presence of non-native plant and animal species, absence of microtopographic features, and lack of habitat during early succession of restored sites do negatively affect the development of these communities.

3. I would recommend conducting hydrology monitoring often, in the first few years, using a combination of piezometers, wells and water level gauges in order to get accurate data. I think a few of the wells should be moved closer to the outer edge of the site. Also, considering that this proposed system is rainfall driven, perhaps gathering data on air temperature, humidity, wind speed, etc. would be beneficial in justifying the hydrology each monitoring year.
    a. Is there a reference wetland with a gauge?

There is not a reference wetland with a gauge. A considerable time was spent trying to locate a non-disturbed McColl loam soil series reference site, and we simply could not locate one. The Reference Carolina Bay mentioned in the comment/response letter from DMS (Lindsay Crocker) to RS was evaluated for soil morphological conditions under forested vegetation.

We will closely monitor the gauges following construction to assess the restoration of wetland hydrology. If during normal rainfall conditions the gauges indicate the Project is not meeting wetland hydrology additional instrumentation (eg piezometers coupled with gauges, additional gauges, and/or IRIS tubes) will be installed to determine the potential cause and extent of the issue. Also, additional weather instrumentation beyond the rain gauge will be considered if the Project is not meeting the hydrology performance standard.

Four of the gauges have been moved to the edges of the Project, outside of the inner most contour line on Figure 6.

4. Section 3.3: since the approved JD indicates that there are currently no jurisdictional wetlands, a 404 permit may not be required, unless the outlet of the project involves jurisdictional waters.

Noted.

5. Table 6: In the reference forest ecosystem, were wetland grass species present? Since 20% of the bay area is expected to be freshwater marsh, this may be an opportunity to incorporate desirable herbaceous species.

Graminoids are an expected component based on the reference ecosystem, and native species will be included in the planted herbaceous seed mix.

6. Table 11: Under Wetland Restoration, adding annual inspections of the clay plugs (if possible) may be beneficial in ensuring you meet this parameter.
    a. Also, it would be helpful to add a section in the monitoring section to including inspecting site boundaries and terracell drop structures (I did find some of this in the Maintenance Plan).

During monitoring we will visually inspect the easement boundary of the Project to check for encroachment and ensure the Project is protected. This visual inspection will consist of assessing all components of the project including the outlet and clay plugs. The clay plugs will be monitored visually to ensure there is no significant surface slumping which would indicate the clay plug has potentially been compromised. We recognize the integrity of the restored soil restrictive layer is essential to restoring wetland hydrology and the overall success of the Project. Visual inspection of the Terracell outlet and clay plugs has been added to Table 11.

7. It is likely that you will not be able to plant vegetation until the wetland establishes, so vegetative monitoring may need to be extended a year.

We expect construction to occur in Summer 2019. As discussed during the IRT site visit constructing the site at this time is preferred as it will allow the opportunity for the site to retain hydrological inputs and wetland hydrology to become established prior to planting. Planting will occur during Fall/Winter 2019, which will keep the Project on schedule for monitoring. If the Project appears to be lacking wetland hydrology based on gauge data and visual assessment then planting will be delayed and an additional monitoring year will be included.

MITIGATION PLAN

ARABIA BAY WETLAND MITIGATION SITE

Hoke County, North Carolina

DMS Project ID No. 100061
Full Delivery Contract No. 7529
USACE Action ID No. SAW-2018-01151
DWR Project No. 2018-0784RFP No. 16-007332

Cape Fear River Basin
Cataloging Unit 03030004

Prepared for:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
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June 2019

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

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

These documents govern NCDMS operations and procedures for the delivery of compensatory mitigation."
This document was assembled using the June 2017 *DMS Stream and Wetland Mitigation Plan Template and Guidance* and the October 24, 2016 NC Interagency Review Team *Wilmington District Stream and Wetland Compensatory Mitigation Update*.

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APPENDICES

1.0 PROJECT INTRODUCTION

The Arabia Bay Wetland Mitigation Site (hereafter referred to as the "Site") encompasses 16.1 acres of agricultural fields used for row crop production. The Site is located approximately 4.5 miles southeast of Raeford, NC and northeast of the intersection of Arabia Road (SR 1003) and LA Sandy Road in southeast Hoke County (Figures 1 and 2, Appendix A).

1.1 Directions to Site

Directions to the Site from Raleigh, North Carolina.

- Take I-40 East out of Raleigh; travel ~30 miles
- Take exit 328A to merge onto I-95 S; travel ~40 miles
- Take exit 41 for NC-59 towards Hope Mills and Parkton
- Turn right onto NC-59 N; after 0.7 miles, turn left onto Shipman Rd
- After 1 mile, turn right onto US-301 South; travel 2.4 miles
- Turn right onto NC-71 South; travel 2.7 miles
- Turn right onto 3rd Street and continue straight onto Barlow Road and Chason Road; travel 5.5 miles
- Turn left on Arabia Rd; travel 3 miles
- The Site is located on the right, down a gravel driveway.
    - Site Latitude, Longitude 34.9570, -79.1379 (WGS84)

1.2 USGS Hydrologic Unit Code and NCDWR River Basin Designation

The Site is located within the Cape Fear River Basin in 14-digit United States Geological Survey (USGS) Cataloging Unit and **Targeted Local Watershed 03030004150011** of the South Atlantic/Gulf Region (North Carolina Division of Water Resources [NCDWR] subbasin number 03-06-15) [Figures 1 and 2, Appendix A]). Site hydrology is comprised of precipitation and lateral groundwater flow. A ditch network has been excavated to drain the Site, which ultimately drains to Rockfish Creek located less than a mile to the north. Rockfish Creek (Stream Index Number 18-31-(15)) has been assigned a Best Usage Classification of **C** (NCDWR 2013). Rockfish Creek is not listed on the final 2016 NC 303(d) lists (NCDWR 2018).

1.3 Physiography and Land Use

The Site is located in the Atlantic Southern Loam Plains portion of the Southeastern Plains ecoregion of North Carolina. Regional physiography is characterized by dissected irregular plains, some smooth plains; broad interstream divides and mostly gentle side slopes dissected by numerous small, low to moderate gradient sandy bottomed streams (Griffith et al. 2002). Onsite elevations are nearly level averaging 220 feet National Geodetic Vertical Datum (NGVD) (USGS Raeford, North Carolina 7.5-minute topographic quadrangle) (Figures 1 and 3, Appendix A).

The Site is situated in a Carolina bay that has been cleared, drained, and farmed (Figure 3, Appendix A). The NC Geological Survey 1956 aerial photograph for Hoke County shows the site in agricultural production indicating the area was cleared prior to that date. The bay is an isolated depression surrounded by sand rims along the northwest and southeast margins. Surrounding the bay are rural residential properties, timber tracts, and additional row crops. Land use at the Site is characterized entirely by agricultural row crops. Herbaceous vegetation and a few shrubby species

grow within the ditches, which are regularly maintained by bush hogging and herbicide application.

The 1956 NC Geological Survey aerial photograph and 1974 aerial photograph included in the Hoke and Cumberland Counties Soil Survey show a historic ditch that is no longer present (USDA 1984). The ditch was placed in the middle of the field and ran from the southeast to the northwest where it connected the primary present-day ditches. The historical ditch appeared to be a secondary ditch that was not necessary for agricultural production and was therefore filled in during the 1980's. A field investigation was performed using hand tools to locate the historic ditch location and determine if the subsurface clay layer was intact. Based on the field investigation it appears the clay layer within the footprint of the historic ditch is intact. It is impossible for RS to determine the depth of the historic ditch which may have never broken through the Site's restrictive layer. The ditch could simply have been used to remove surface water. During Site construction, additional field investigations may be conducted to assure the historic ditch does not undermine the restoration goals.

1.4 Project Components and Structure

The Site encompasses 16.0 acres of drained hydric soil (Figure 4, Appendix A), which is proposed for non-riparian wetland restoration. Completed project activities, reporting history, completion dates, project contacts, and background information are summarized in Tables 1-4.

Table 1. Project Components and Mitigation Credits
Arabia Bay Restoration Site

Reach ID	Wetland Type	Existing Acreage	Restoration Acreage	Restoration Level	Restoration or Restoration Equivalent	Mitigation Ratio	Mitigation Credits
Wetland Restoration	Non-riparian	--	16.0	Restoration	16.0	1:1	16.0

Length & Area Summations by Mitigation Category	
Restoration Level	**Non-riparian Wetland (acreage)**
Restoration	16.0

Overall Assets Summary	
Asset Category	**Overall Credits**
Non-riparian Wetland	**16.0**

Table 2. Project Activity and Reporting History
Arabia Bay Restoration Site

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Technical Proposal (RFP No. 16-007332)	February 8, 2018	February 8, 2018
Institution Date (NCDMS Contract No. 7529)	--	April 4, 2018
Mitigation Plan	October 2018	February 2019
Construction Plans	--	February 2019

Table 3. Project Contacts Table
Arabia Bay Restoration Site

Full Delivery Provider	Restoration Systems 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604 Raymond Holz 919-755-9490
Designer / Monitoring	Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693
Engineer	Sungate Design Group, P.A. 905 Jones Franklin Road Raleigh, NC 27606 Josh Dalton 919-856-2243
Surveyor	k2 Design Group 5688 U.S. Hwy. 70 E. Goldsboro, NC 27534 919-394-2547 John Rudolph, PLS (L-4194)
Planting Contractor	Carolina Silvics 114 E King Street PO Box 1017 Edenton, NC 27932 Mary-Margaret McKinney 252-482-8491
Construction Contractor	Land Mechanic Design, Inc. 126 Circle G Lane Willow Spring, NC 27592 Charles Hill 919-639-6132

Table 4. Project Attribute Table
Arabia Bay Restoration Site

Project Information			
Project Name	Arabia Bay Restoration Site		
Project County	Hoke County, North Carolina		
Project Area (acres)	16.1		
Project Coordinates (latitude & latitude)	34.9570ºN, 79.1379ºW		
Planted Area (acres)	16.1		
Project Watershed Summary Information			
Physiographic Province	Piedmont		
Project River Basin	Cape Fear		
USGS HUC for Project (14-digit)	03030004150011		
NCDWR Sub-basin for Project	03-06-15		
Project Drainage Area (acres)	NA		
Percentage of Project Drainage Area that is Impervious	<5%		
CGIA Land Use Classification	Cultivated		
Wetland Summary Information			
Parameters	**Wetlands**		
Wetland acreage	16.0 acres drained		
Wetland Type	Non-riparian		
Mapped Soil Series	McColl		
Drainage Class	Poorly drained		
Hydric Soil Status	Hydric		
Source of Hydrology	Precipitation, groundwater		
Hydrologic Impairment	Ditched and drained		
Native Vegetation Community	Bay Forest/Small Depression Pocosin		
% Composition of Exotic Invasive Vegetation	0%		
Restoration Method	Hydrologic, vegetative		
Enhancement Method	NA		
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States-Section 401	Yes	Yes	Approved JD (App D)
Waters of the United States-Section 404	Yes	Yes	Approved JD (App D)
Endangered Species Act	Yes	Yes	CE Document (App E)
Historic Preservation Act	Yes	Yes	CE Document (App E)
Coastal Zone Management Act	No	--	CE Document (App E)
FEMA Floodplain Compliance	No	--	CE Document (App E)
Essential Fisheries Habitat	No	--	CE Document (App E)

2.0 WATERSHED APPROACH AND SITE SELECTION

The Cape Fear River basin is one of four rivers in North Carolina completely contained within the state's boundaries. Comprised of five major drainages—Haw River, Deep River, Northeast Cape Fear River, Black River, and the Cape Fear River—the basin drains portions of 26 counties and 115 municipalities with a total of 6386 stream miles. The most populated portions of the basin are located in the Triad, the Triangle, Fayetteville, and Wilmington (NCDWQ 2005).

Primary considerations for Site selection included the potential for improvement of water quality within a region of North Carolina under heavy development and livestock/agricultural pressure. More specifically, considerations included: desired aquatic resource functions; hydrologic conditions; soil characteristics; aquatic habitat diversity; habitat connectivity; compatibility with adjacent land uses; reasonably foreseeable effects the mitigation project will have on ecologically important aquatic and terrestrial resources; and potential development trends and land use changes. Site specific characteristics are summarized below, in addition to development trends and land use changes within the watershed.

Currently, the proposed Site is characterized by row crops. A summary of existing Site characteristics in favor of proposed wetland activities include the following.

- Wetlands have been cleared of forest vegetation
- Site receives nonpoint source inputs including agricultural chemicals
- Wetland soils have been compacted by agricultural equipment
- Wetland hydrology has been removed by ditching

In addition to the opportunity for ecological improvements at the Site, the use of the particular mitigation activities and methods proposed in the Design Approach & Mitigation Work Plan (Section 7.0) are expected to produce naturalized wetland resources that will be ecologically self-sustaining, requiring minimal long-term management (Long-term Management Plan [Section 10.0]).

The project is not located in a Regional or Local Watershed Planning Area; however, *Cape Fear River Basin Restoration Priorities* (CFRBRP) report (NCEEP 2009) goals are addressed by project objectives as follows:

1. CFRBRP Goal – Reduce and control sediment inputs
   Site specific objective – Cessation of row crop production and conversion of a ditched Carolina Bay to a depressional wetland will remove agricultural sediment inputs leaving the Site and control sediment within the Site.

2. CFRBRP Goal – Reduce and manage nutrient inputs
   Site specific objective – Cessation of row crop production may result in a direct reduction of 160 pounds of nitrogen and 280 pounds of phosphorus per year (nutrient model [Section 3.2]) from the elimination of agricultural nutrient inputs/fertilizer application at the Site.

Site specific mitigation goals and objectives have been developed through the use of North Carolina Wetland Assessment Method (NC WAM) and are discussed further in Section 5.0 (Functional Uplift and Project Goals/Objectives).

3.0 BASELINE AND EXISTING CONDITIONS

3.1 Soils and Land Form

Soils that occur within the Site, according to the *Web Soil Survey* (USDA 2017) are described in Table 5.

Table 5. Web Soil Survey Soils Mapped within the Site

Map Unit Symbol	Map Unit Name (Classification)	Hydric Status	Description
CaB	Candor sand (*Grossarenic Kandiudults*)	Non-hydric	This series consists of somewhat excessively-drained soils found along 1-8 percent slopes on broad flats and rounded side slopes of uplands.
Mc	McColl loam (*Typic Fragiaquults*)	Hydric	This series consists of poorly drained soils found in shallow, oval depressions of uplands.
NoA	Norfolk loamy sand (*Typic Kandiudults*)	Non-hydric	This series consists of well-drained soils found along 0-2 percent slopes on broad smooth flats of uplands.

3.2 Nutrient Model

A preliminary land use nutrient model was developed to estimate nitrogen and phosphorus inputs from row crops at the Site. Model inputs include Site area, percent land use, and row-crop type. Using published values of Nitrogen and Phosphorus the model predicts the nutrient input of fertilizer associated with land uses (NC State 2016). A copy of the model input and output is presented in Appendix B.

Based on the land use nutrient model, cessation of active row crops at the Site will result in a direct reduction of 160 pounds of nitrogen and 280 pounds of phosphorus per year.

3.3 Project Site Wetlands

Following guidelines set forth in the *Corps of Engineers Wetlands Delineation Manual* and subsequent regional supplements, there are currently no jurisdictional areas present within the Site (Environmental Laboratory 1987). This was verified by United States Army Corps of Engineers (USACE) representative Gary Beecher during a field meeting on October 30, 2018; the signed, Approved Jurisdictional Determination, is provided in Appendix D.

3.3.1 Hydrological Characterization

Construction activities are expected to restore 16.0 acres of drained non-riparian hydric soils. Areas of the Site targeted for non-riparian wetlands will receive hydrological inputs from direct precipitation, upland/stormwater runoff, and to a lesser extent, groundwater migration into

wetlands resulting in surface ponding due to the presence of an impervious soil layer. Hydrological impairment in drained soils has resulted from lateral draw-down of the water table from an existing network of agricultural ditches.

A water balance calculation was performed to determine if wetland hydrology will be restored by removing the ditch outlet and restoring the broken restrictive soil layer in the existing ditches. The water balance calculation was performed using nearby state operated weather station for hydrological inputs and outputs as no direct hydrological measurements from the site are available. The calculation determined a surplus of ~32 acre-feet for the site on an annual basis which will support wetland hydrology success criteria during years of normal precipitation.

3.3.2 Soil Characterization

The system is characterized as a clay-based Carolina bay of the McColl series; however, the term clay-based is too specific when describing the mechanism whereby these bays develop a perched water table. Inherent soil factors that contribute to ponding of water in the Carolina bays characterized by sandy clay loam soil of the McColl series includes the presence of a fragipan, an iron hardpan, a mixture of organic substances that binds soil particles into a relatively water-tight layer, and possibly a spodic horizon (NatureServe 2018).

The entire Site was analyzed to verify the depth of the restrictive layer (Figure 5, Appendix A). This analysis included soil borings, soil horizon identification along ditch margins, and mapping of historic ditches from aerial photographs. The restrictive layer appears to be intact across the site and occurs within a depth range of 2 – 32-inches below the soil surface. The locations of soil borings and ditch margin analysis are depicted on Figure 4 (Appendix A). Detailed soil boring logs are included in Appendix B.

Hydrological impairment at the Site results from drainage ditch excavation. The drainage ditch invert has been excavated below impervious layer and into coarse sand, thereby draining the entire Site. During large rain events surface water may flow from the ditch; however, the majority of the groundwater table alterations appear to result from subsurface, groundwater drawdown in coarse sand below the ditch bottom.

Drained hydric soils were verified by a licensed soil scientist (NC LSS # 1233) in January 2018 and the entire 16.0-acre Site (Figure 4, Appendix A) is comprised of drained hydric soil of the McColl series.

3.3.3 Plant Community Characterization

Areas proposed for wetland restoration are currently used for agricultural row crops. Ditches contain opportunistic herbaceous species with very little vegetative diversity. The entire Site including ditches is subject to regular maintenance including bush hogging and herbicide application.

4.0 REFERENCE FOREST ECOSYSTEM

A Reference Forest Ecosystem (RFE) is a forested area on which to model restoration efforts at the Site in relation to soils and vegetation. RFEs should be ecologically stable climax communities and should be a representative model of the Site as it likely existed prior to human disturbances. Data describing plant community composition and structure should be collected at the RFEs and subsequently applied as reference data in an attempt to emulate a natural climax community.

An RFE for this project was difficult to locate as the majority of Carolina bays in the area have been ditched and drained in support of agricultural and silvicultural practices. Therefore, data from the NatureServe Explorer, in addition to Schafale and Weakley (1990) and Schafale (2012) community descriptions were used for development of the planting plan. These wetland systems are ovoid, shallow, nearly flat-bottomed depressions with dense, diverse herbaceous layers and a fairly open canopy. A natural transition between community types is expected moving from the bottom of the bay up to the higher rim. Based on this gradient, two target communities were selected from Schafale (2012) to capture the diversity expected in this landscape position: **Cypress Savanna (Typic Subtype)** (Atlantic Coastal Plain Clay-based Carolina Bay Wetland, Unique ID # CES203.245, NatureServe 2018) and **NonRiverine Wet Hardwood Forest (Oak Flat Subtype)**(Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest Unique ID # CES203.304, NatureServe 2018). Table 6 summarizes the dominant tree and shrub species found in these systems.

Table 6. Reference Forest Ecosystems (Trees and Shrubs)

Atlantic Coastal Plain Clay-based Carolina Bay Wetland/Cypress Savana	
Pond cypress (*Taxodium ascendens*)	Swamp tupelo (*Nyssa biflora*)
Southern spicebush (*Lindera melissifolia*)	Loblolly pine (*Pinus taeda*)
Southern Atlantic Coastal Plain Nonriverine Swamp & Wet Hardwood Forest	
Sweetgum (*Liquidambar styraciflua*)	Poplar (*Liriodendron tulipifera*)
Water tupelo (*Nyssa aquatica*)	Swamp tupelo *(Nyssa biflora*)
Swamp chestnut oak (*Quercus michauxii*)	Cherrybark oak (*Quercus pagoda*)
Laurel oak (*Quercus laurifolia*)	Loblolly pine (*Pinus taeda*)
Bald cypress (*Taxodium distichum*)	Pond cypress (*Taxodium ascendens*)
Coastal sweet pepperbrush *(Clethra alnifolia*)	Atlantic white cedar (*Chamaecyparis thyoides*)
Fetterbush (*Leucothoe axillaris*)	Georgia False Indigo (*Amorpha georgiana var. georgiana*)
Southern spicebush (*Lindera melissifolia*)	

5.0 FUNCTIONAL UPLIFT AND PROJECT GOALS/OBJECTIVES

The project is not located in a Regional or Local Watershed Planning Area; however, *Cape Fear River Basin Restoration Priorities* (CFRBRP) report (NCEEP 2009) goals are addressed by project objectives as follows.

1. CFRBRP Goal – Reduce and control sediment inputs
   Site specific objective – Cessation of row crop production and conversion of a ditched Carolina Bay to a depressional wetland will remove agricultural sediment inputs leaving the Site and control sediment within the Site.

2. CFRBRP Goal – Reduce and manage nutrient inputs
   Site specific objective – Cessation of row crop production may result in a direct reduction of 160 pounds of nitrogen and 280 pounds of phosphorus per year (nutrient model [Section 3.2]) from the elimination of agricultural nutrient inputs/fertilizer application at the Site.

Site specific mitigation goals have been developed through the use of North Carolina Wetland Assessment Method (NC WAM) analyses (NC WFAT 2010). This methodology rates functional metrics for wetlands as high, medium, or low based on field data collected on forms and transferred into a rating calculator. Using Boolean logic, the rating calculator assigns a high, medium, or low value for each metric and overall function. Site functional assessment data forms are available upon request and model output is included in Appendix B.

Table 7A summarizes NC WAM metrics targeted for functional uplift and the corresponding mitigation activities proposed to provide functional uplift. Metrics targeted to meet the Site's goals and objectives are depicted in bold.

Table 7A. Arabia Bay NC WAM Summary

NC WAM Sub-function Rating Summary	Arabia Bay
Wetland Type	Pocosin
(1) HYDROLOGY	**LOW**
(2) Surface Storage & Retention	LOW
(2) Sub-surface Storage and Retention	LOW
(1) WATER QUALITY	**LOW**
(2) Pollution Change	LOW
(1) HABITAT	**LOW**
(2) Physical Structure	LOW
(2) Landscape Patch Structure	LOW
(2) Vegetative Composition	LOW
OVERALL	**LOW**

Due to a lack of wetland hydrology in reestablishment areas, it is inappropriate to conduct an NC WAM evaluation. However, the NC WAM description of a pocosin, as well as data collected at the Site were utilized to determine wetland functions to target for uplift. Based on NC WAM data, all three primary wetland functional metrics (Hydrology, Water Quality, and Habitat), as well as all six sub-metrics are currently under-performing as exhibited by a LOW metric rating. LOW

performing metrics are to be targeted for functional uplift through mitigation activities, goals and objectives, as well as, monitoring and success criteria.

Table 7B below presents wetland metrics targeted for functional uplift, in addition to Site specific project goals and objectives.

Table 7B. Wetland Targeted Functions, Goals, and Objectives

Targeted Functions	Goals	Objectives
(1) HYDROLOGY		
(2) Surface Storage & Retention	• Minimize downstream flooding to the maximum extent possible.	• Fill agriculture ditches to restore jurisdictional hydrology • Plant native woody vegetation • Cease row crop production within the easement • Plow soils (6-8 inches) to reduce surface compaction and increase surface roughness • Protect the Site with a perpetual conservation easement
(2) Sub-surface Storage & Retention		
(1) WATER QUALITY		
(2) Pollution Change	• Remove direct nutrient, sediment, and pollutant inputs from the Site.	• Remove agricultural land uses and agricultural inputs from the Site • Fill the ditch network to restore ground and surface hydrology within the Site • Plant woody vegetation • Restore jurisdictional wetlands
(1) HABITAT		
(2) Physical Structure	• Improve wildlife habitat within and adjacent to the Site.	• Plant woody vegetation to provide organic matter and shade • Fill ditches to provide groundwater hydrology and plant woody native vegetation • Protect the Site with a perpetual conservation easement • Restore jurisdictional wetlands
(2) Landscape Patch Structure		
(2) Vegetation Composition		

6.0 SITE DESIGN AND IMPLEMENTATION CONSTRAINTS

The presence of conditions or characteristics that have the potential to hinder restoration activities on the Site was evaluated. The evaluation focused primarily on the presence of hazardous materials, utilities and restrictive easements, rare/threatened/endangered species or critical habitats, and the potential for hydrologic trespass. Existing information regarding Site constraints was acquired and reviewed. In addition, any Site conditions that have the potential to restrict the restoration design and implementation were documented during the field investigation.

No known Site constraints, that may hinder proposed mitigation activities, were identified during field surveys. Potential constraints reviewed include the following.

6.1 Threatened & Endangered Species

Six federally protected species are listed as occurring in Hoke County (USFWS 2018); the following table summarizes potential habitat and preliminary biological conclusions for each.

Table 8. Threatened and Endangered Species

Species Federal Status	Habitat	Potential Habitat at Site	Biological Conclusion
American alligator (*Alligator mississippiensis*) Threatened due to Similarity of Appearance	Found in rivers, streams, canals, lakes, swamps, and coastal marshes.	No	Not Required
Red-cockaded woodpecker (*Picoides borealis*) Endangered	Open stands of pine containing trees 60 years or older for nesting and roosting. Cavity excavation occurs in living pine trees.	No	No Effect
Saint Francis' Satyr (*Neonympha mitchellii*) Endangered	Occurs only in the sandhills of North Carolina in Hoke and Cumberland Counties.	No	No Effect
American chaffseed (*Schwalbea americana*) Endangered	Occurs in sandy (sandy peat, sandy loam), acidic, seasonally moist to dry soils. Generally found in habitats described as open, moist pine flatwoods, fire-maintained savannas, ecotonal areas between peaty wetlands and xeric sandy soils, and other open grass-sedge systems.	No	No Effect
Michaux's sumac (*Rhus michauxii*) Endangered	Occurs in sandy or rocky open woods in association with basic soils	No	No Effect

6.2 Cultural Resources

The term "cultural resources" refers to prehistoric or historic archaeological sites, structures, or artifact deposits over 50 years old. "Significant" cultural resources are those that are eligible or potentially eligible for inclusion in the National Register of Historic Places. Evaluations of site significance are made with reference to the eligibility criteria of the National Register (36 CFR 60) and in consultation with the North Carolina State Historic Preservation Office (SHPO).

Field visits were conducted at the Site in early 2018 to ascertain the presence of structures or other features that may be eligible for inclusion on the National Register of Historic Places. No structures were identified within proposed easement boundaries; however, coordination with SHPO will occur prior to construction activities to determine if any significant cultural resources are present.

6.3 North Carolina Natural Heritage Elements

A query of the North Carolina Natural Heritage Program (NCNHP) database indicates there are no records for rare species, important natural communities, natural areas, or conservation/managed areas within the proposed project boundary. Within a one-mile radius of the project boundary

NCNHP lists seven element occurrences including three amphibians, a butterfly, two vascular plants, and a natural community. NCNHP correspondence is included in Appendix C.

The nearest North Carolina Division of Mitigation Services (NCDMS) project is Hillcrest Bay, located approximately three miles northwest of the Site.

6.4 Utilities

No utilities are located on the Site.

6.5 Air Transport Facilities

No known air transport facilities are located within 5 miles of the Site.

7.0 DESIGN APPROACH AND MITIGATION WORK PLAN

7.1 Wetland Restoration

Portions of the Site underlain by hydric soils have been impacted by drainage ditch excavation, vegetative clearing, agriculture plowing, herbicide application, and other land disturbances associated with land use management. Precipitation driven wetlands are dependent on retaining all direct precipitation and benefit from secondary inputs including overland flow and subsurface groundwater from within the surrounding watershed. The site naturally retains hydrology due to its convex shape, so by filling existing ditches and elevating the sole drainage outlet the site will retain all hydrological inputs. Also, the restrictive soil layer in the existing ditches will be restored in order to eliminate potential lateral drainage within the existing ditches which have penetrated the restrictive soil layer. Finally, the upper 6 – 8 inches of the soil surface will be plowed to reduce compaction of the soil surface and increase soil surface roughness. Plowing will occur when the soil moisture is less than 30 percent of field capacity at the maximum depth of tillage. Wetland restoration will focus on the restoration of vegetative communities, filling drainage ditches, and reestablishing a perched water table (Figure 6, Appendix A).

Ephemeral pool “habitat areas” will be constructed to provide microtopography, prolong surface water availability for wildlife benefit, and provide a source of material to fill existing ditches. The size and extent of these areas was determined by calculating the volume of fill needed to fill in the existing ditches. The volume of fill required to fill the ditches is 2,300 cubic-yards, which equates to 1.4 acre-feet. When factoring in a 6-inch max depth of the ephemeral pool “habitat areas”, as found in reference Carolina Bays, the area required computes to 2.8 acres. These shallow depressions will vary in shape and are distributed throughout the Project, but were not placed in the middle of the Project as it is expected this will be the wettest area and would not benefit from additional depth. In review, these ephemeral pool “habitat areas” will comprise 2.8-acres and be constructed by excavating multiple depressions ranging in size from 0.10-0.35 acres with a depth of no greater than 6-inches.

7.2 Ditch Plugging

In order to retain hydrological inputs the existing ditches will be plugged and backfilled with impervious material. Impervious material will consist of clay borrow located from the Site within the limits of disturbance. The clay borrow will be collected from areas adjacent to the existing

ditches where it was previously side cast during ditch excavation. Clay borrow will also be collected from constructed ephemeral pool "habitat areas" (small depressions, <6 inches deep) throughout the project area, and excess clay borrow from relocating the driveway.

The ditch plugs will be placed in three locations including the ditch outlet and in the two 90-degree bends of the ditch alignment. Existing ditch sections between the plugs will be backfilled with impervious material as well.

As discussed in Section 1.3 a historic ditch located in the center of the bay was determined, through a field investigation, to still have the restrictive layer intact. No additional plugging or backfilling of the historic ditch is anticipated.

7.3 Driveway Relocation & Terracell Structure

In support of wetland restoration activates the existing driveway will be relocated outside of the easement/historic bay. To prevent flooding of the driveway during large rainfall events a Terracell structure will be constructed in the current ditch outfall location. The Terracell will be situated approximately 2.5 feet above the elevation of the bay floor, where it will be keyed in below the surface of the road. The Terracell will only be accessed by flow during a significant and prolonged storm. The existing culvert will be removed and subsequently plugged with impervious material. A road will be built to a base elevation of 221.5 feet (elevation not tied to grid). The Terracell structure will extend approximately 50 feet down gradient (northwest) from the road crossing with a final elevation grade matching the existing ditch at 215.01 feet (Figure 7, Appendix A).

7.4 Natural Plant Community Restoration

RFE data from the NatureServe Explorer in addition to Schafale and Weakley (1990) and Schafale (2012) community descriptions were used to develop the primary plant community restoration plan. Two target communities were selected to capture the diversity expected in this landscape position: *Cypress Savanna (Typic Subtype)* (Atlantic Coastal Plain Clay-based Carolina Bay Wetland, Unique ID # CES203.245, NatureServe 2018) and *NonRiverine Wet Hardwood Forest (Oak Flat Subtype)*(Southern Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest Unique ID # CES203.304, NatureServe 2018). It should be noted that both target communities experience a range of hydroperiods which results in dry and wet subtypes of each community. This range of hydroperiods creates variations in the vegetative communities as it relates to the duration of the hydroperiods. Due to the variation in hydroperiods noted in these target communities, there is a potential that during years of excessive rainfall up to 20% of the project will experience prolonged periods of inundation and saturation. These wetter areas will correlate to locations where the restrictive soil layer is shallow to the surface and will be represented by ephemeral pool "habitat areas". Vegetation for these areas will consist of herbaceous vegetation including floating-leaved aquatic vegetation and/or tall graminoids as well as appropriate tree species.

Bare-root seedlings will be planted throughout the Site at a density of 680 stems per acre on 8-foot centers. Table 9 depicts the total number of stems and species distribution to be planted (Figure 8, Appendix A). Planting will be performed between December 1 and March 15.

Table 9. Tree Planting Plan

Area (acres)	16.0	
Species	**# Planned**	**% of total**
Pond cypress (*Taxodium ascendens*)	3500	32
Swamp tupelo *(Nyssa biflora*)	2000	18
Swamp white oak (*Quercus bicolor*)	1000	9
Laurel oak (*Quercus laurifolia*)	1000	9
Swamp chestnut oak (*Quercus michauxii*)	1000	9
Cherrybark oak (*Quercus pagoda*)	600	6
Black gum (*Nyssa sylvatica*)	600	6
Green ash (*Fraxinus pennsylvanica*)	600	6
Sweetbay (*Magnolia virginiana)*	600	6
TOTAL	**10,900**	**100**

While site success criteria are driven by establishment of appropriate tree species, restoration of understory vegetation will provide significant additional ecological benefit. An herbaceous seed mix including native grasses and forbs will be planted throughout the site. Following tree establishment native shrubs may be planted where site conditions are favorable for their survival. Potential shrub species include *Cephalanthus occidentalis, Clethra alnofolia, Cyrilla racemiflora, Ilex Amelanchier, Leucothoe racemosa, Lyonia lucida*, and *Lindera melissifolia (Endangered).* Any efforts related to listed species will be coordinated through USFWS and NCPCP.

7.4.1 Nuisance Species Management

No nuisance species controls are proposed at this time. Inspections for feral hogs and other potential nuisance species will occur throughout the course of the monitoring period. Appropriate actions may be taken to ameliorate any negative impacts regarding vegetation development and/or water management on an as-needed basis. The presences of nuisance species will be monitored over the course of the monitoring period. Appropriate actions will be taken to amend any negative impacts regarding vegetation development and/or water management on an as-needed basis.

8.0 MONITORING AND SUCCESS CRITERIA

Monitoring will be conducted by Axiom Environmental, Inc based on the schedule in Table 10. A summary of monitoring is outlined in Table 11 (Figure 9, Appendix A). Annual monitoring reports will be submitted to the NCDMS by Restoration Systems no later than December 1st of each monitoring year data is collected.

Table 10. Monitoring Schedule

Resource	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Wetlands							
Vegetation							
Visual Assessment							
Report Submittal							

Table 11. Monitoring Summary

Wetland Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Wetland Restoration	Groundwater gauges	As-built, Years 1, 2, 3, 4, 5, 6, and 7 throughout the year with the growing season defined as March 1-November 12	14 gauges spread throughout restored wetlands	Soil temperature* at the beginning of each monitoring period to verify the start of the growing season, groundwater and rain data for each monitoring period
	Visual Assessment	As-built, Years 1, 2, 3, 5, and 7	Terracell outlet structure and ditch plugs	Visually inspect features to ensure they are performing as designed and retaining hydrological inputs
Vegetation Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Vegetation establishment and vigor	Permanent vegetation plots 0.0247 acre (100 square meters) in size; *CVS-EEP Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008)	As-built, Years 1, 2, 3, 5, and 7	14 plots spread across the Site	Species, height, planted vs. volunteer, stems/acre
	Annual random vegetation plots, 0.0247 acre (100 square meters) in size	As needed	As needed	Species and height

*Soil Temperature will be measured with a continuous recording soil probe. Temperatures will be measured from February to the end of April in each monitoring year.

8.1 Success Criteria

Monitoring and success criteria for stream restoration should relate to project goals and objectives identified from NC WAM data collection. From a mitigation perspective, several of the goals and objectives are assumed to be functionally elevated by restoration activities without direct measurement. Other goals and objectives will be considered successful upon achieving success criteria. The following summarizes Site success criteria.

Table 12. Success Criteria

Wetland Hydrology
• Saturation or inundation within the upper 12 inches of the soil surface for, at a minimum, 10 percent of the growing season, during average climatic condition based on the *Wilmington District Stream and Wetland Compensatory Mitigation Update* (USACE 2016), Table 1, for a *Typic Paleaquult* (Rains).
Vegetation
• Within planted portions of the site, a minimum of 320 stems per acre must be present at year 3; a minimum of 260 stems per acre must be present at year 5; and a minimum of 210 stems per acre must be present at year 7. • Trees must average 7 feet in height at year 5, and 10 feet in height at year 7 in each plot. • Planted and volunteer stems are counted, provided they are included in the approved planting list for the site; natural recruits not on the planting list may be considered by the IRT on a case-by-case basis. Volunteer Loblolly pine which is not included on the planting list is a desirable species for the restoration of the vegetative community and will count towards vegetative success. • Any single species can only account for 50% of the required stems within any vegetation plot. o Ephemeral pool "habitat areas" are a normal component of Carolina bays. Areas of freshwater marsh are expected to be comprised of herbaceous emergent vegetation and not forested woody vegetation. Ephemeral pool "habitat areas" are expected to encompass approximately 20% of the bay area and should not be held to the above vegetative success criteria.

8.2 Contingency

In the event that success criteria are not fulfilled, a mechanism for contingency will be implemented.

8.2.1 Wetland Contingency

Hydrological contingency will require consultation with hydrologists and regulatory agencies if wetland hydrology enhancement is not achieved. Recommendations for contingency to establish wetland hydrology will be implemented and monitored until Hydrology Success Criteria are achieved.

8.2.2 Vegetation Contingency

If vegetation success criteria are not achieved, supplemental planting may be performed with tree species approved by regulatory agencies. Supplemental planting will be performed as needed until achievement of vegetation success criteria.

8.3 Compatibility with Project Goals

The following table outlines the compatibility of Site performance criteria described above to Site goals and objectives that will be utilized to evaluate if Site goals and objectives are achieved.

Table 13. Compatibility of Performance Criteria to Project Goals and Objectives

Goals	Objectives	Success Criteria
(1) HYDROLOGY		
• Minimize downstream flooding to the maximum extent possible.	• Fill agriculture ditches to restore jurisdictional hydrology • Plant native woody vegetation • Cease row crop production within the easement • Plow soils to reduce surface compaction and increase surface roughness (6-8 inches) • Protect the Site with a perpetual conservation easement	• Row crop production ceased within the easement • Monitoring wells will be successful if the water table is within 12 inches of the soil surface for 10% of the growing season • Vegetation plots will be successful if the plant density is 210 stems per acre with an average plant height of 10 feet at 7 years following planting • Conservation Easement recorded
(1) WATER QUALITY		
• Remove direct nutrient, sediment, and pollutant inputs from the Site.	• Remove agricultural land uses and agricultural inputs from the Site • Fill the ditch network to restore ground and surface hydrology within the Site • Plant woody vegetation • Restore jurisdictional wetlands	• Row crop production ceased within the easement • Monitoring wells will be successful if the water table is within 12 inches of the soil surface for 10% of the growing season • Vegetation plots will be successful if the plant density is 210 stems per acre with an average plant height of 10 feet at 7 years following planting
(1) HABITAT		
• Improve wildlife habitat within and adjacent to the Site.	• Plant woody vegetation to provide organic matter and shade • Fill ditches to provide groundwater hydrology and plant native woody vegetation • Protect the Site with a perpetual conservation easement • Restore jurisdictional wetlands	• Monitoring wells will be successful if the water table is within 12 inches of the soil surface for 10% of the growing season • Vegetation plots will be successful if the plant density is 210 stems per acre with an average plant height of 10 feet at 7 years following planting • Conservation Easement recorded

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 and work with the IRT to develop contingency plans and remedial actions.

10.0 LONG-TERM MANAGEMENT PLAN

The Site will be transferred to the NCDEQ Stewardship Program. This party shall serve as conservation easement holder and long-term steward for the property and will conduct periodic inspection of the Site to ensure that restrictions required in the conservation easement are upheld. 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 Statute 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.

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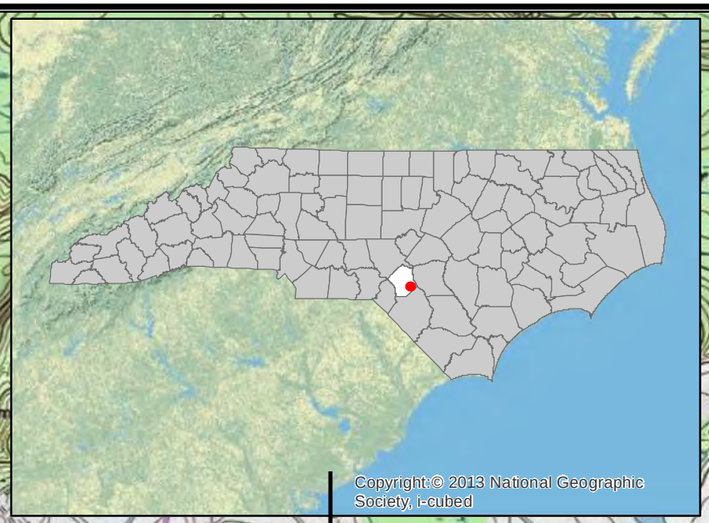
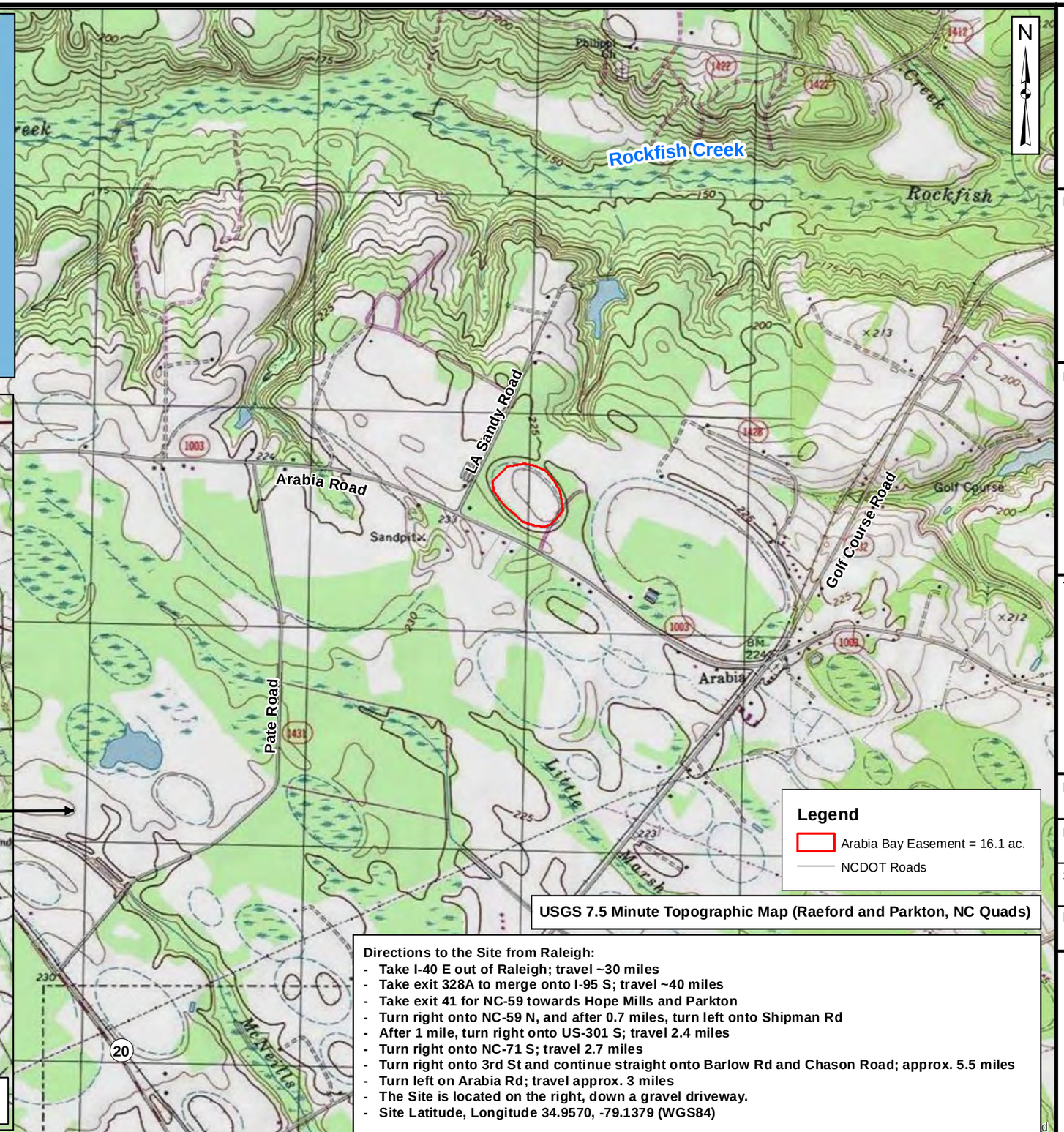
APPENDIX A
FIGURES



NOTE: No air transport facilities are located within 5 miles of the project area.



Legend

- Arabia Bay Easement = 16.1 ac.
- NCDOT Roads

USGS 7.5 Minute Topographic Map (Raeford and Parkton, NC Quads)

Directions to the Site from Raleigh:

- Take I-40 E out of Raleigh; travel ~30 miles
- Take exit 328A to merge onto I-95 S; travel ~40 miles
- Take exit 41 for NC-59 towards Hope Mills and Parkton
- Turn right onto NC-59 N, and after 0.7 miles, turn left onto Shipman Rd
- After 1 mile, turn right onto US-301 S; travel 2.4 miles
- Turn right onto NC-71 S; travel 2.7 miles
- Turn right onto 3rd St and continue straight onto Barlow Rd and Chason Road; approx. 5.5 miles
- Turn left on Arabia Rd; travel approx. 3 miles
- The Site is located on the right, down a gravel driveway.
- Site Latitude, Longitude 34.9570, -79.1379 (WGS84)

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

ARABIA BAY WETLAND MITIGATION SITE

Hoke County, NC

Title:

SITE LOCATION

Drawn by: KRJ

Date: JAN 2019

Scale: 1:20,000

Project No.: 18-016

FIGURE

1

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

ARABIA BAY WETLAND MITIGATION SITE

Hoke County, NC

Title:

HYDROLOGIC UNIT MAP

Drawn by: KRJ

Date: JAN 2019

Scale: 1:375,000

Project No.: 18-016

FIGURE

2

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

ARABIA BAY WETLAND MITIGATION SITE

Hoke County, NC

Title:

TOPOGRAPHY

Drawn by: KRJ

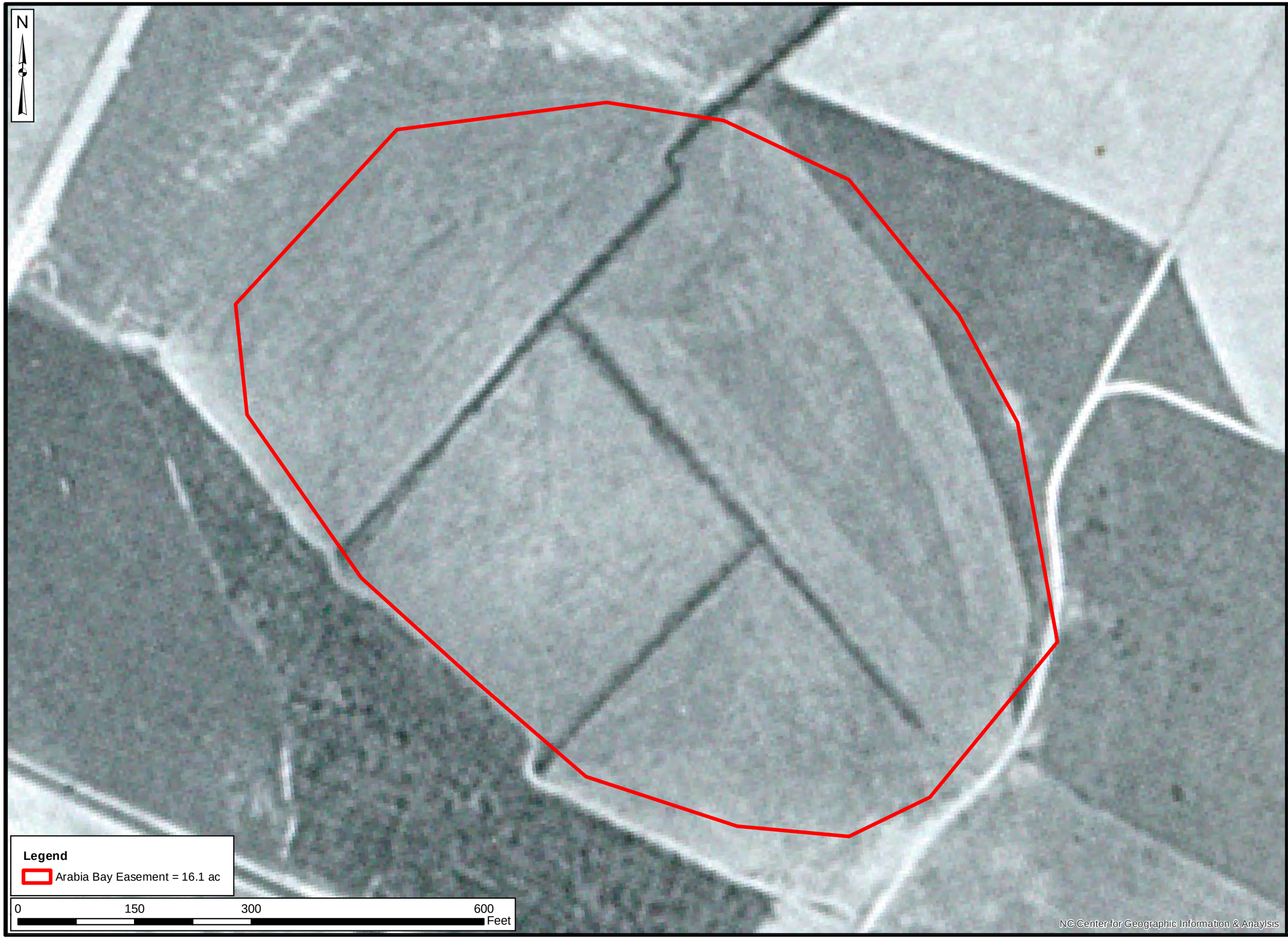
Date: JAN 2019

Scale: 1:10,000

Project No.: 18-016

FIGURE

3



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

ARABIA BAY WETLAND MITIGATION SITE

Hoke County, NC

Title:

HISTORICAL AERIAL PHOTOGRAPH (1956)

Drawn by: KRJ

Date: JAN 2019

Scale: 1:1400

Project No.: 18-016

FIGURE

4

Soil Map Unit	Soil Series
CaB	Candor sand, 1 to 8 % slopes
Mc	McColl loam, nearly level
NoA	Norfolk loamy sand, 0 to 2 % slopes

N

Soil Profile #2

Soil Profile #1

NoA

Mc

CaB

Legend

- Arabia Bay Easement = 16.1 ac
- Drained Hydric Soils = 16.1 ac
- Existing Ditches
- Historic Ditch Location
- Soil Profiles
- NRCS Soil Boundaries

0 150 300 600 Feet

NC Center for Geographic Information & Analysis

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

ARABIA BAY WETLAND MITIGATION SITE

Hoke County, NC

Title:

EXISTING CONDITIONS AND SOILS

Drawn by: KRJ

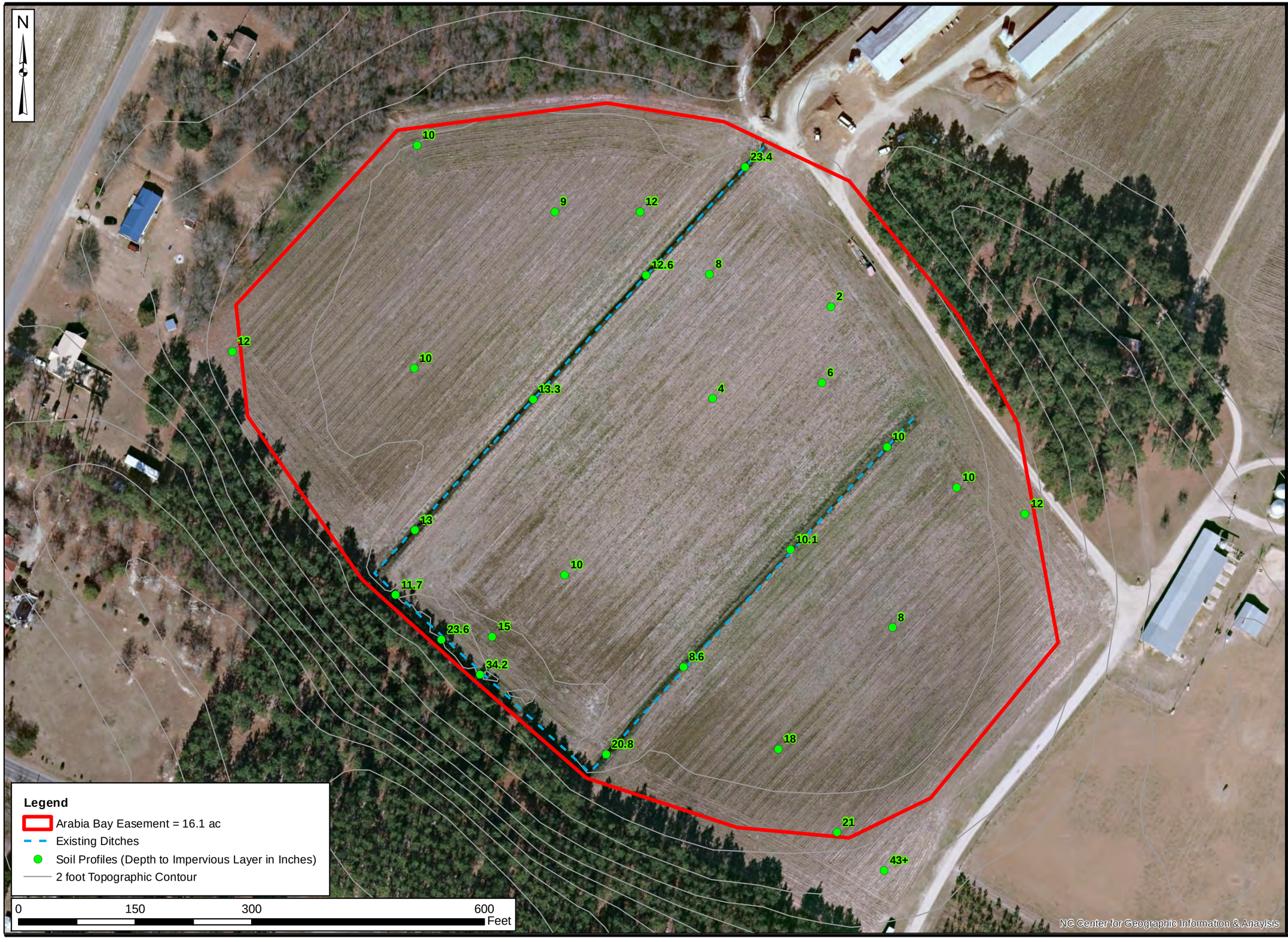
Date: JAN 2019

Scale: 1:1400

Project No.: 18-016

FIGURE

5



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

ARABIA BAY WETLAND MITIGATION SITE

Hoke County, NC

Title:

IMPERVIOUS LAYER DEPTH ANALYSIS

Drawn by: KRJ

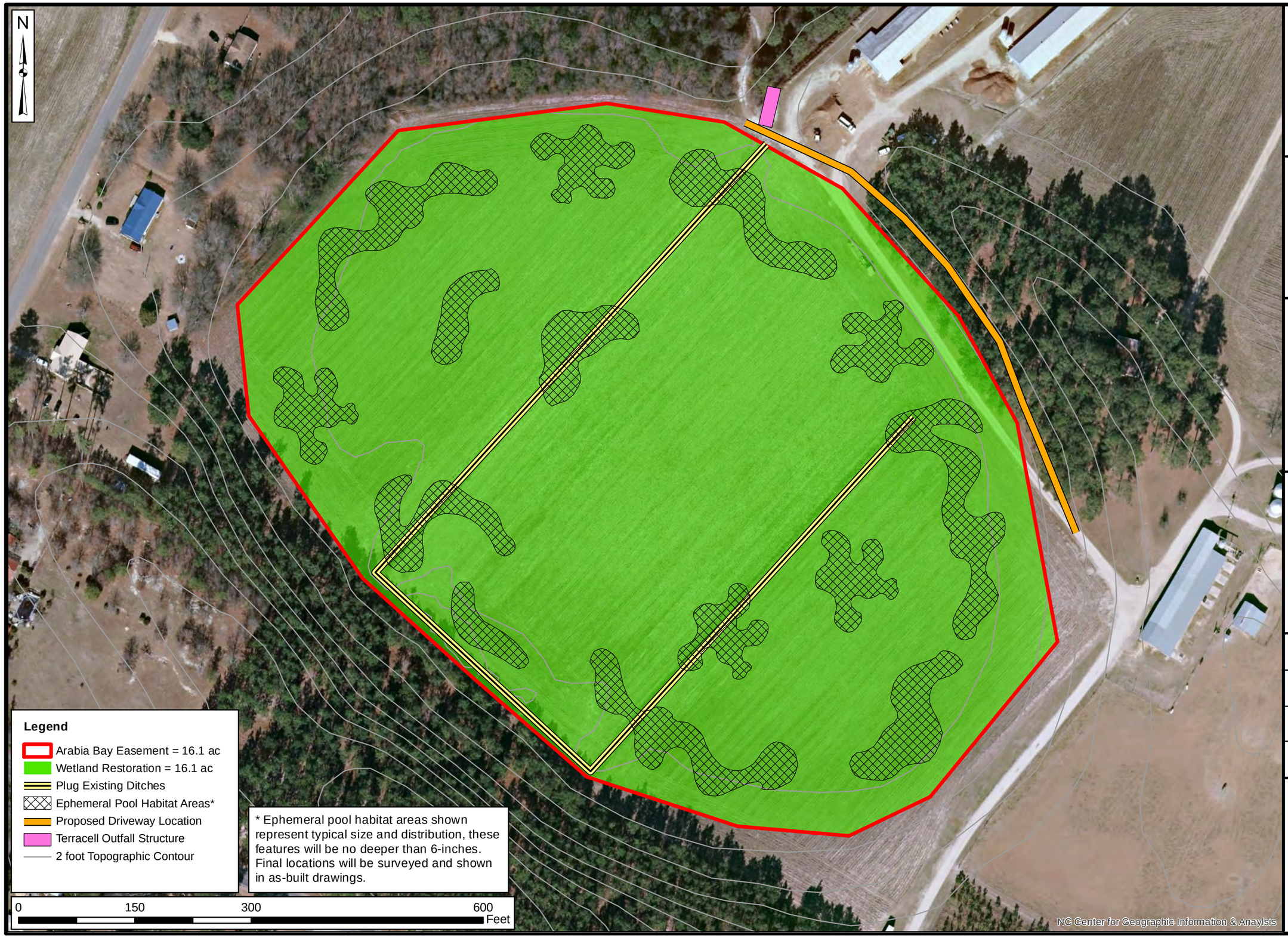
Date: JAN 2019

Scale: 1:1400

Project No.: 18-016

FIGURE

6



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

ARABIA BAY WETLAND MITIGATION SITE

Hoke County, NC

Title:

PROPOSED CONDITIONS

Drawn by: KRJ

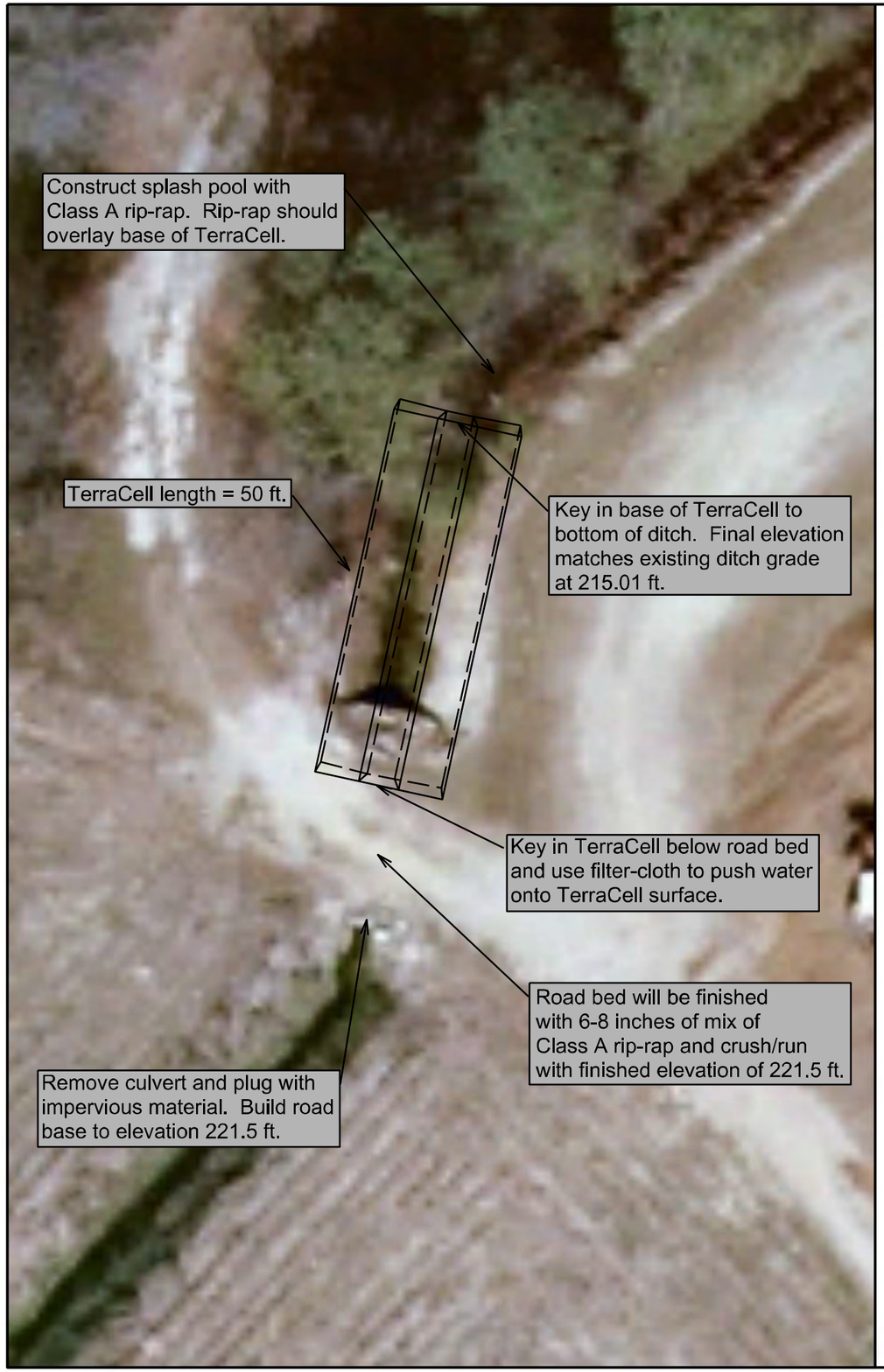
Date: MAY 2019

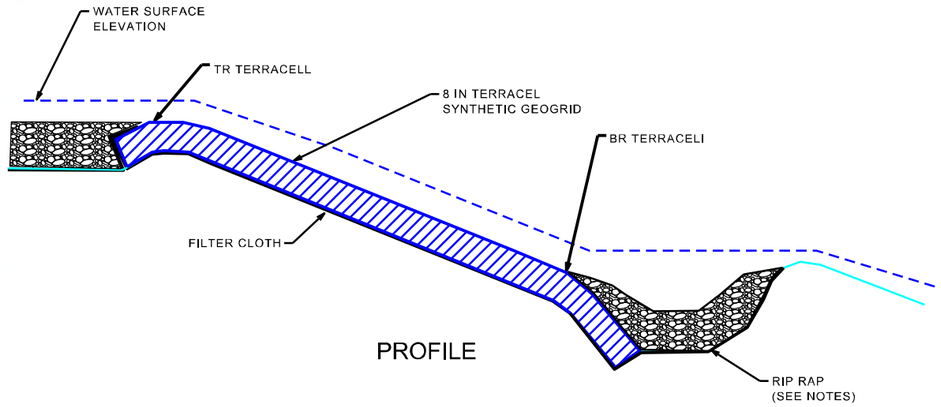
Scale: 1:1400

Project No.: 18-016

FIGURE

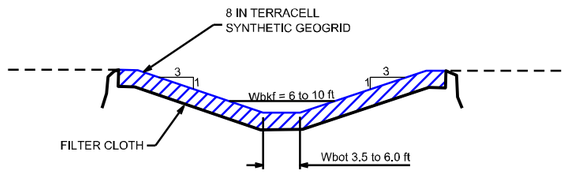
7





PROFILE

TERRACELL STRUCTURE NOTES:
1. CONTRACTOR WILL INSTALL 18-INCH TERRACELL SYNTHETIC GEOGRID AS PER THE MANUFACTURER'S SPECIFICATIONS.
2. AT BOTTOM RIFFLE DOWNSTREAM FROM TERRACELL STRUCTURE THE POOL WILL BE ARMORED WITH EROSION CONTROL FABRIC AND CLASS 1 RIP RAP OR OTHER SUITABLE MATERIAL.



CROSS-SECTION

TERRACELL STRUCTURE NOTES:
1. CONTRACTOR WILL INSTALL 18-INCH TERRACELL SYNTHETIC GEOGRID AS PER THE MANUFACTURER'S SPECIFICATIONS.
2. ONCE THE SYNTHETIC GEOGRID HAS BEEN INSTALLED, GEOCELLS WILL BE BACKFILLED WITH GRAVEL AND TOPSOIL AND PLANTED WITH EROSION CONTROL GRASSES AND WILLOW STAKES (*SALIX NIGRA*).

Axiom Environmental, Inc.

RESTORATION SYSTEMS | LLC

NOTES/REVISIONS

Project:

Arabia Bay Mitigation Site

Hoke County North Carolina

Title:

OUTFALL STRUCTURE

Scale:	FIGURE NO.
NA	8
Date: Aug 2018	
Project No.: 18-016	

Due to the relatively mild topographic relief across the site and the intended construction of borrow pits/ vernal pools, final planting zones will be selected post-construction to ensure that species are planted in appropriate landscape positions. All planting will be on 8' x 8' spacing.

The wetter areas will be planted with the specified cypress and swamp tupelo as well as a minor portion of sweetbay and swamp chestnut oak.

The dryer areas will receive the balance of the species listed in the table.

Area (acres)		**16**
Species	**# Planned**	**% of total**
Pond cypress (*Taxodium ascendens*)	3500	32
Swamp tupelo (*Nyssa biflora*)	2000	18
Swamp white oak (*Quercus bicolor*)	1000	9
Laurel oak (*Quercus laurifolia*)	1000	9
Swamp chestnut oak (*Quercus michauxii*)	1000	9
Cherrybark oak (*Quercus pagoda*)	600	6
Black gum (*Nyssa sylvatica*)	600	6
Green ash (*Fraxinus pennsylvanica*)	600	6
Sweetbay (*Magnolia virginiana)*	600	6
TOTAL	**10,900**	**100**

Legend

- Expected_Vernal_Pools
- Arabia Bay Conservation Easement_Draft to State
- Remainder_of_Planting_Area

Feet

0 55 110 220 330 440

RESTORATION SYSTEMS | LLC

Project:

ARABIA BAY WETLAND MITIGATION SITE

Hoke County, NC

Title:

PLANTING PLAN

Drawn by: MAH

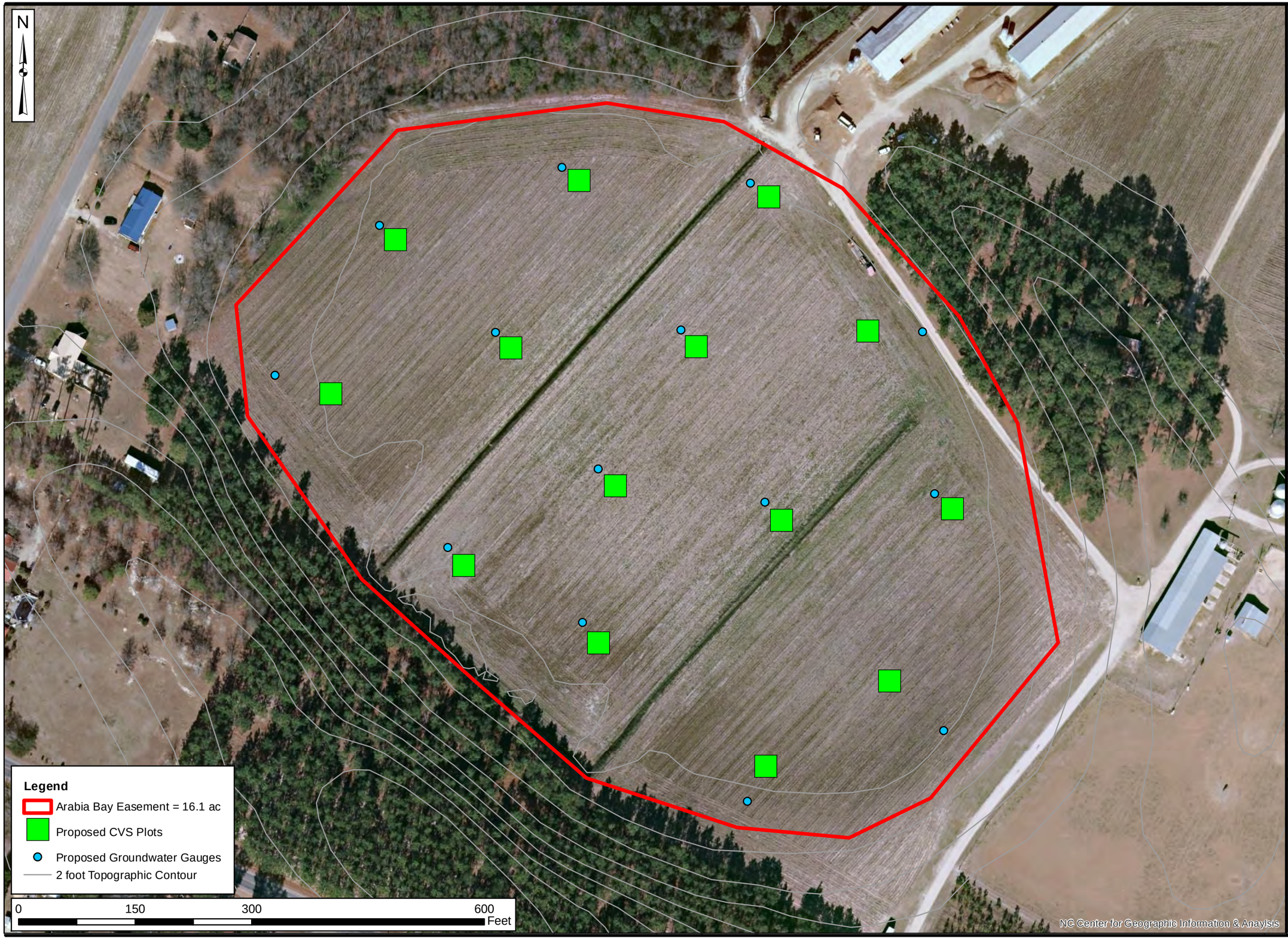
Date: 6/4/2019

Scale: 1 in = 125 ft

Project No: SITE: L-03-001

FIGURE

9



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

ARABIA BAY WETLAND MITIGATION SITE

Hoke County, NC

Title:

MONITORING PLAN

Drawn by: KRJ

Date: MAY 2019

Scale: 1:1400

Project No.: 18-016

FIGURE

10

Appendix B
Existing Wetland Data

NC WAM Forms
Soil Boring Log
Nutrient Model Output

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Arabia Bay	Date	1/31/18
Wetland Type	Pocosin	Assessor Name/Organization	Jernigan/Axiom

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

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**LOW**
Water Quality	Pathogen Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Particulate Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Physical Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Pollution Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**YES**
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Condition	**LOW**

Overall Wetland Rating **LOW**

Soil Profile # 1

AXIOM ENVIRONMENTAL, INC

218 Snow Avenue
Raleigh, North Carolina 27603
919-215-1693

SOIL BORING LOG

Project/Site: Arabia Bay Wetland Mitigation Site

County, State: Hoke, NC

Sampling Point/
Coordinates: Hydric Soil/ 34.957125, -79.137307

Investigator: Lewis

Notes: Location of soil profile is depicted on Figure 4.

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-9	10YR 4/1	98	10YR 5/6	2	clay
9-14	10YR 6/2	60	10YR 5/6	40	clay
14+	10YR 6/2	40	10YR 5/6	60	clay

North Carolina Licensed Soil Scientist

Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

Soil Profile # 2

AXIOM ENVIRONMENTAL, INC

218 Snow Avenue
Raleigh, North Carolina 27603
919-215-1693

SOIL BORING LOG

Project/Site: Arabia Bay Wetland Mitigation Site

County, State: Hoke, NC

Sampling Point/
Coordinates: Hydric Soil/ 34.957807, -79.138144

Investigator: Lewis

Notes: Location of soil profile is depicted on Figure 4.

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-3	10YR 4/2	100			sandy clay loam
3-8	10YR 4/2	95	10YR 5/6	5	sandy clay loam
8-14	10YR 4/2	90	10YR 5/6	10	sandy clay loam
14+	10YR 4/2	75	10YR 5/6	15	sandy clay loam
			7.5YR 6/2	10	

North Carolina Licensed Soil Scientist

Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

Land Use Nutrient Model

Stream Length	
Site Buffer Width	
Site Area (ft sq)	697396

Land Use	%
Pasture	
Woods	
Row Crop	100
Urban	
must total 100	100

	Rainfall
Annual	

Land Use Characteristics		Number of Animals	N inputs lbs/au/yr	P inputs lbs/au/yr	Total N (lbs)	Total P (lbs)	
Pasture	Beef		113	40	0	0	
	Dairy		164	26	0	0	
	Pig		153	58	0	0	
	Horse		102	40	0	0	
	fert/ac		60	45	0	0	
					0	0	Total Pasture N and P

		% Row Crop Area	N inputs lbs/ac/yr	P inputs lbs/ac/yr	Total N	Total P	
Row Crop	Corn	50	20	20	160	160	
16.0	Cotton		20	20	0	0	
	Soybeans	50	0	15	0	120	
	Hay Fescue		50	45	0	0	
	Hay Bermuda		70	45	0	0	
	must total 100	100			160	280	Total Row Crop N and P

Woods Minimal Nutrients

		% Area	Runnoff	Concentration N (mg/l)	Concentration P (mg/l)	Total N (lbs)	Total P (lbs)	
Urban	Residential		0	2.2	0.4	0	0	
	Commercial/Industrial		0	2.3	0.3	0	0	
	Roadway		0	3.0	0.5	0	0	
						0.0	0.0	Total Urban N and P

Notes: Residential Assumes 25 % Impervious Surfac
Commercial/Industrial Assumes 75% Impervous Surface
Roadway Assumes 100% Impervious Surface
Annual Load (lbs) = 0.226*Annual Runoff (inches)*Concentration (mg/l)*Acres

Total Nutrients Removed within Easement

Total N Removed (lbs/yr)	**160**
Total P Removed (lbs/yr)	**280**

Appendix C
NHP Report

North Carolina Department of Natural and Cultural Resources
Natural Heritage Program

Governor Roy Cooper | Secretary Susi H. Hamilton

NCNHDE-5261

February 2, 2018

Phillip Perkinson
Axiom Environmental Inc.
218 Snow Avenue
Raleigh, NC 27612
RE: Arabia Bay; 17-001.06

Dear Phillip Perkinson:

The North Carolina Natural Heritage Program (NCNHP) appreciates the opportunity to provide information about natural heritage resources for the project referenced above.

A query of the NCNHP database, 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 field 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.

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), Clean Water Management Trust Fund (CWMTF) easement, 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 Rodney A. Butler at rodney.butler@ncdcr.gov or 919.707.8603.

Sincerely,
NC Natural Heritage Program

MAILING ADDRESS:
1651 Mail Service Center
Raleigh, NC 27699-1651

Telephone: (919) 707-8107
www.ncnhp.org

LOCATION:
121 West Jones Street
Raleigh, NC 27603

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Within a One-mile Radius of the Project Area
Arabia Bay
Project No. 17-001.06
February 2, 2018
NCNHDE-5261

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

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Amphibian	21003	Ambystoma mabeei	Mabee's Salamander	2005-03-05	E	3-Medium	---	Significantly Rare	G4	S2?
Amphibian	21000	Ambystoma tigrinum	Eastern Tiger Salamander	2005-03-05	B?	2-High	---	Threatened	G5	S2
Amphibian	20998	Pseudacris ornata	Ornate Chorus Frog	2005-03-05	E	3-Medium	---	Significantly Rare	G4	S2
Butterfly	34472	Neonympha areolatus	Georgia Satyr	1980-Pre	H	5-Very Low	---	Significantly Rare	G3G4	S2
Natural Community	11205	Cypress Savanna (Typic Subtype)	---	2003-09-09	B	3-Medium	---	---	G2G3	S2
Vascular Plant	21661	Rhexia aristosa	Awned Meadow-beauty	2003-09-09	B	2-High	---	Special Concern Vulnerable	G3G4	S3
Vascular Plant	21754	Scleria reticularis	Netted Nutrush	2003-09-09	B	2-High	---	Threatened	G4	S2

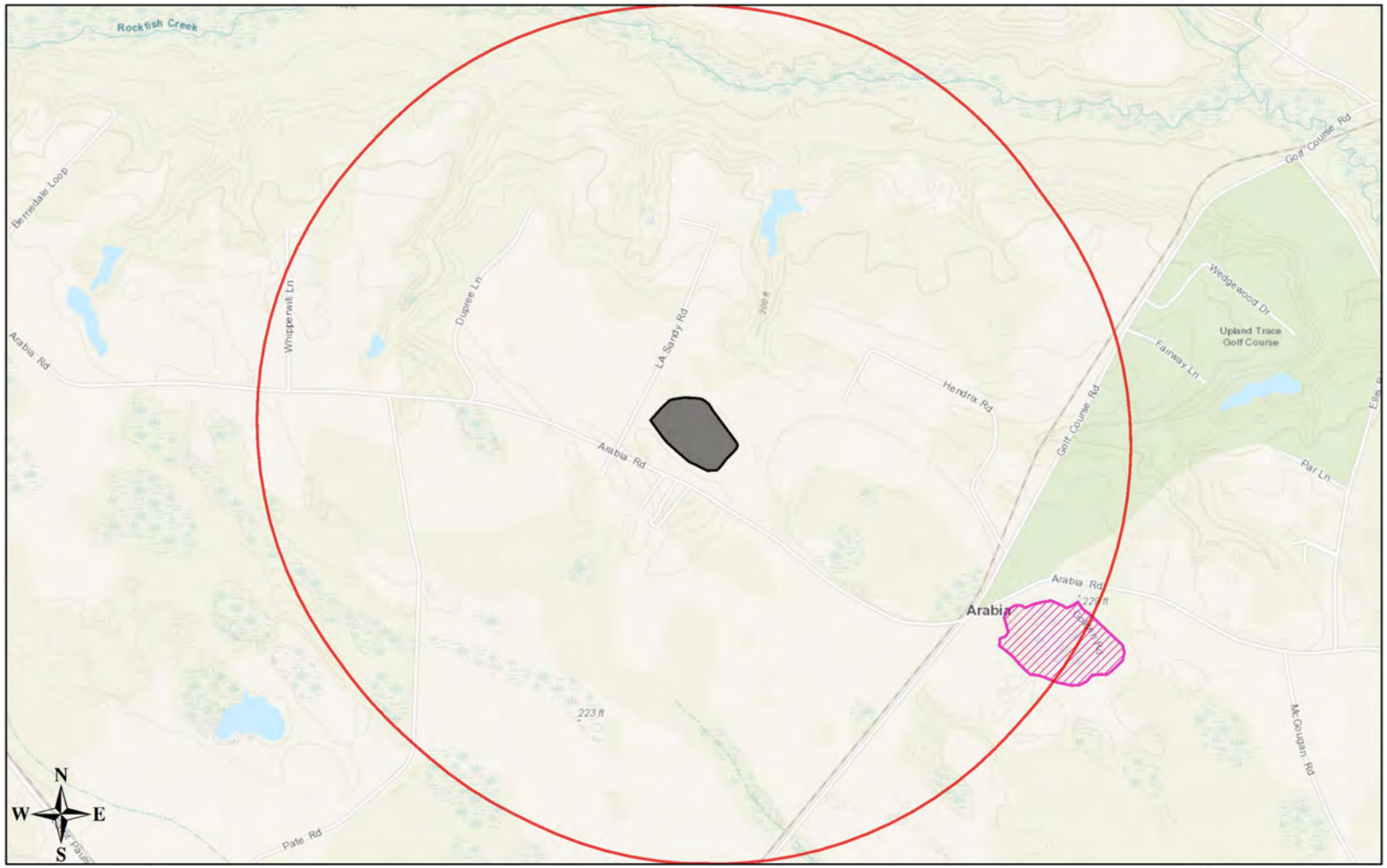
Natural Areas Documented Within a One-mile Radius of the Project Area

Site Name	Representational Rating	Collective Rating
Arabia Bay	R3 (High)	C4 (Moderate)

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 February 2, 2018; source: NCNHP, Q4 October 2017. 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-5261: Arabia Bay



February 2, 2018

- Project Boundary
- Buffered Project Boundary
- NHP Natural Area (NHNA)

1:22,150

0 0.175 0.35 0.7 mi

0 0.3 0.6 1.2 km

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Appendix D
Jurisdictional Determination

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2018-02135** County: **Hoke County** U.S.G.S. Quad: **Raeford**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner/Applicant: **Fred Harris**

Address: **3941 Arabia Road**
Raeford, NC 28376

Telephone Number: **(910) 818-6449**

Size (acres)	**16 acres**	Nearest Town	**Raeford, NC**
Nearest Waterway	**Little Marsh Swamp**	River Basin	**Cape Fear**
USGS HUC	**03030004**	Coordinates	Latitude: **34.9570**
			Longitude: **-79.1379**

Location description: **This 16 acre site is located in a Carolina Bay. It's located off Hwy 20 to Pate Road then to Arabia Road in Raeford, Hoke County, NC. The bay will be restored into a wetland mitigation site.**

Indicate Which of the Following Apply:

A. Preliminary Determination

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

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

B. Approved Determination

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

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

_ We recommend you have the waters of the U.S. on your property delineated. As the Corps may not be able to accomplish this wetland delineation in a timely manner, you may wish to obtain a consultant to conduct a delineation that can be verified by the Corps.

_ 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.

X There are no waters of the U.S., to include wetlands, present on the above described 16 acre project site which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

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

Placement of dredged or fill material within waters of the US, including wetlands, without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). Placement of dredged or fill material, construction or placement of structures, or work within navigable waters of the United States without a Department of the Army permit may constitute a violation of Sections 9 and/or 10 of the Rivers and Harbors Act (33 USC § 401 and/or 403). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **Gary Beecher at (910) 251-4629 or Gary.H.Beecher@usace.army.mil**.

C. Basis For Determination: **This site did not exhibit the required wetland criteria as described in the 1987 Corps Wetland Delineation Manual and the Atlantic and Gulf Coastal Plain Regional Supplement.**

D. Remarks: **There are no wetlands or waters of the US located within this 16 acre project site. To restore hydrology on this site the existing ditches will be plugged and a wetland mixture will be planted.**

E. Attention USDA Program Participants

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

F. Appeals Information for Approved Jurisdiction Determinations (as indicated in Section B. above)

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

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

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by January 11, 2019.
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: **November 13, 2018** Expiration Date: **November 13, 2023**

SAW-2018-02135

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

Copy Furnished via e-mail to:

Grant Lewis
Axiom Environmental, Inc.

3941 Arabia Road
Raeford, NC, 28376
(919) 215-1693
glewis@axiomenvironmental.org

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant:	File Number:	Date:
Fred Harris	**SAW-2018-02135**	**November 13, 2018**

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 division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

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

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

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

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

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

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

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

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

For appeals on Initial Proffered Permits send this form to:

District Engineer, Wilmington Regulatory Division, Attn: Gary Beecher, 69 Darlington Avenue, Wilmington, North Carolina 28403

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

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

SAW-2018-02135

Soil Map Unit	Soil Series
CaB	Candor sand, 1 to 8 % slopes
Mc	McColl loam, nearly level
NoA	Norfolk loamy sand, 0 to 2 % slopes

Soil Profile #2

Soil Profile #1

GA 01

NoA

Mc

CaB

Legend

- Arabia Bay Easement = 16.0 ac
- Drained Hydric Soils = 16.0 ac
- Existing Ditches
- Soil Profiles
- Upland Form Location
- NRCS Soil Boundaries
- 2 foot Topographic Contour

0 150 300 600 Feet

NC Center for Geographic Information & Analysis

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

ARABIA BAY WETLAND MITIGATION SITE

Hoke County, NC

Title:

EXISTING CONDITIONS AND SOILS

Drawn by: KRJ

Date: FEB 2018

Scale: 1:1400

Project No.: 17-001.06

FIGURE

4

Appendix E
Categorical Exclusion Document

Arabia Bay Wetland Mitigation Site

Hoke County, North Carolina

DMS Project No. 100061

Categorical Exclusion/ERTR

Prepared for:

North Carolina Department of Environmental Quality

Division of Mitigation Services

1652 Mail Service Center

Raleigh, NC 27699-1652

June 2018

TASK 1 b.) Categorical Exclusion Summary:

Part 1: General Project Information

(Attached) Part 2: All Projects

Regulation/Questions

Coastal Zone Management Act

Not applicable – project is not located within a CAMA county.

CERCLA

No issue within project boundaries – please see the attached Executive Summary from a Limited Phase 1 Site Assessment performed by Environmental Data Resources, Inc. (EDR) on June 12th, 2018.

National Historic Preservation Act (Section 106)

No Issue – please see attached letter from Ramona M. Bartos- State of the Historic Preservation Office.

Uniform Act

Please see the attached letter, sent to the landowner June 12th, 2018.

Part 3: Ground-Disturbing Activates Regulation/Questions

American Indian Religious Freedom Act (AIRFA)

Not applicable – project is not located in a county claimed as "territory" by the Eastern Band of Cherokee Indians.

Antiquities Act (AA)

Not applicable – project is not located on Federal land.

Archaeological Resources Protection Act (ARPA)

Not applicable – project is not located on federal or Indian lands.

Endangered Species Act (ESA)

Project activities were determined to pose "No Effect" to Endangered or Threatened Species. The proposed project will occur in existing agricultural fields which are intensively managed for row crops. There is no Critical Habitat on-site, nor is there any suitable habitat for any of the T&E species identified. Additionally, no T&E species were observed during field surveys. Record searches from the Natural Heritage Program indicate that federally protected species are not documented within a mile of the Site boundaries.

Executive Order 13007 (Indian Sacred Sites)

Not applicable – project is not located in a county claimed as "territory" by the Eastern Band of Cherokee Indians.

Farmland Protection Policy Act (FPPA)

Please find the attached Form AD-1006 and letter from Milton Cortes of the NRCS.

Fish and Wildlife Coordination Act (FWCA)

Please find the attached response from the Fish and Wildlife Service

Land & Water Conservation Fund Act (Section 6(f))

Not applicable

Magnuson-Stevens Fishery Conservation and management Act (Essential Fish Habitat)

Not applicable – project is not located within an estuarine system

Migratory Bird Treaty Act (MBTA)

USFWS has no recommendation with the project relative to the MBTA

Wilderness Act

Not applicable – the project is not located within a Wilderness area.

Appendix A

Categorical Exclusion Form for Ecosystem Enhancement Program Projects
Version 1.4

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Arabia Bay Wetland Mitigation Site
County Name:	Hoke
DMS Number:	ID #: 100061 Contract #: 7529
Project Sponsor:	Restoration Systems, LLC
Project Contact Name:	JD Hamby
Project Contact Address:	1101 Haynes Street, Suite 211, Raleigh, NC 27604
Project Contact E-mail:	jhamby@restorationsystems.com
DMS Project Manager:	Lindsay Crocker lindsay.crocker@ncdenr.gov

Project Description

The Site is located within 14-digit Cataloging Unit and Targeted Local Watershed 03030004150011, approximately 4.5 miles southeast of Raeford, NC. The Site is situated in a Carolina bay that has been cleared, drained, and farmed. Ditches will be plugged in order to rehydrate the drained soils and woody vegetation planted.

For Official Use Only

Reviewed By: Lindsay Crocker

7/13/2018
Date

LHCrocker.
DMS Project Manager

Conditional Approved By:

Date

For Division Administrator FHWA

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

Final Approval By:

7-18-18
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 species and/or "likely to adversely modify" Designated Critical Habitat?	☐ Yes ☐ No ☑ N/A
5. Does the USFWS/NOAA-Fisheries concur in the effects determination?	☐ Yes ☐ No ☑ N/A
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?	☐ Yes ☐ No ☑ N/A

Executive Order 13007 (Indian Sacred Sites)	
1. Is the project located on Federal lands that are within a county claimed as "territory" by the EBCI?	☐ Yes ☑ No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	☐ Yes ☐ No ☑ N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	☐ Yes ☐ No ☑ N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	☑ Yes ☐ No
2. Has NRCS determined that the project contains prime, unique, statewide or locally important farmland?	☑ Yes ☐ No ☐ N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	☑ Yes ☐ No ☐ N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	☐ Yes ☑ No
2. Have the USFWS and the NCWRC been consulted?	☐ Yes ☐ No ☑ N/A
Land and Water Conservation Fund Act (Section 6(f))	
1. Will the project require the conversion of such property to a use other than public, outdoor recreation?	☐ Yes ☑ No
2. Has the NPS approved of the conversion?	☐ Yes ☐ No ☑ N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	☐ Yes ☑ No
2. Is suitable habitat present for EFH-protected species?	☐ Yes ☐ No ☑ N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	☐ Yes ☐ No ☑ N/A
4. Will the project adversely affect EFH?	☐ Yes ☐ No ☑ N/A
5. Has consultation with NOAA-Fisheries occurred?	☐ Yes ☐ No ☑ N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	☐ Yes ☑ No
2. Have the USFWS recommendations been incorporated?	☐ Yes ☐ No ☑ N/A
Wilderness Act	
1. Is the project in a Wilderness area?	☐ Yes ☑ No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	☐ Yes ☐ No ☑ N/A

Appendix F
Performance Bond

PERFORMANCE BOND

Travelers Casualty and Surety Company of America
One Tower Square, Hartford, CT 06183

Bond No. 106979588

KNOW ALL MEN BY THESE PRESENTS, that we, **Restoration Systems, LLC** as Principal, and **Travelers Casualty and Surety Company of America**, licensed to do business in the State of, **North Carolina** as Surety, are held and firmly bound unto **North Carolina Department of Environmental Quality – Division of Mitigation Services** (Obligee), in the penal sum of **Four Hundred Thirteen Thousand Six Hundred Dollars** (**$413,600.00**), lawful money of the United States of America, for the payment of which sum, well and truly to be made, the Principal and Surety do bind themselves, their heirs, executors, administrators, and successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the above bounden Principal has entered into certain written Contract with the above named Obligee, effective the **9th** day of **April**, **2018** for **Arabia Bay Non-Riverine Wetland Mitigation Site in the Cape Fear River Basin, Cataloging Unit 03030004 (Contract 7529) per RFP 16-007332** and more fully described in said Contract, a copy of which is attached, which Contract is made a part hereof and incorporated herein by reference, except that nothing said therein shall alter, enlarge, expand or otherwise modify the term of the bond as set out below.

NOW, THEREFORE, if Principal, its executors, administrators, successors and assigns shall promptly and faithfully perform the Contract, according to the terms, stipulations or conditions thereof, then this obligation shall become null and void, otherwise to remain in full force and effect. This bond is executed by the Surety and accepted by the Obligee subject to the following express condition:

Notwithstanding the provisions of the Contract, this bond will commence on the date of approval of the **Arabian Bay Non-Riverine Wetland Mitigation Site** Mitigation Plan and will remain in effect until the Principal has received written notification from the North Carolina Department of Environmental Quality – Division of Mitigation Services that the requirements of Task 6 (Submittal of Baseline Monitoring Report) have been met, but may be extended by the Surety at its sole option by Continuation Certificate. However, neither nonrenewal by the Surety, nor the failure or inability of the Principal to file a replacement bond in the event of nonrenewal, shall itself constitute a loss to the Obligee recoverable under this bond or any renewal or continuation thereof. The liability of the Surety under this bond and all Continuation Certificates issued in connection therewith shall not be cumulative and shall in no event exceed the amount as set forth in this bond or in any additions, riders, or endorsements properly issued by the Surety as supplements thereto.

Sealed with our seals and dated this **19th** day of **February** , **2019**.

Witness

RESTORATION SYSTEMS, LLC
Principal

Witness

Travelers Casualty and Surety Company of America
Julia C. McElligott, Attorney-in-Fact

McGriff Insurance Services
4309 Emperor Blvd Suite 300
Durham, NC 27709

Agreed and acknowledged this ___ day of _____, 2018

By: _____
Obligee

S-5025 (08-99)

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

TRAVELERS

POWER OF ATTORNEY

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

Attorney-In Fact No. 230519 **Certificate No.** 007077194

KNOW ALL MEN BY THESE PRESENTS: That Farmington Casualty Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company are corporations duly organized under the laws of the State of Connecticut, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa, and that Fidelity and Guaranty Insurance Underwriters, Inc., is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

Angela B. Britt, Richard V. Haar Jr., Phoebe C. Honeycutt, Kenneth J. Peeples, Heather Burroughs, Neil B. Biller, Bobbi D. Pendleton, Christopher A. Lydick, Julia C. McElligott, Adam Pfanmiller, and Jason Lee Sayers

of the City of Durham, State of North Carolina, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 21st day of December, 2016.

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

State of Connecticut
City of Hartford ss.

By: _____
Robert L. Raney, Senior Vice President

On this the 21st day of December, 2016, before me personally appeared Robert L. Raney, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.
My Commission expires the 30th day of June, 2021.

MARIE C. TETREAULT NOTARY PUBLIC CONNECTICUT

Marie C. Tetreault
Marie C. Tetreault, Notary Public

58440-5-16 Printed in U.S.A.

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

Appendix G
Site Protection Instrument

FILED Apr 25, 2019 11:42:51 am
BOOK 01262
PAGE 0077 THRU 0087
INSTRUMENT # 02193
RECORDING $26.00
EXCISE TAX $386.00

FILED
HOKE COUNTY, NC
CAMILLE D. HURST
REGISTER
OF DEEDS
NL

This certifies that pin: 794530001033
is free of any delinquent ad valorem Tax liens charged to the Hoke County Tax Collector, but does not certify that the deed description matches the PIN.

Collection Clerk Signature

Date: 4/25/2019
NCGS 161-31

STATE OF NORTH CAROLINA

Rs: $386.00

Parcel ID: 794530001033

HOKE COUNTY

DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS PROVIDED PURSUANT TO FULL DELIVERY MITIGATION CONTRACT

SPO File Number: 47-AA
DMS Project Number: 100061

Prepared by: Office of the Attorney General
Property Control Section
Return to: NC Department of Administration
State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

THIS DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS, made this 25th day of April, 2019, by Fred B. Harris and wife, Agnes T. Harris ("**Grantor**"), whose mailing address is 3941 Arabia Road, Raeford, NC 28376-9615, to the State of North Carolina, ("**Grantee**"), whose mailing address is State of North Carolina, Department of Administration, State Property Office, 1321 Mail Service Center, Raleigh, NC 27699-1321. The designations of Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine, or neuter as required by context.

WITNESSETH:

WHEREAS, pursuant to the provisions of N.C. Gen. Stat. § 143-214.8 et seq., the State of North Carolina has established the Division of Mitigation Services (formerly known as the Ecosystem Enhancement Program and Wetlands Restoration Program) within the Department of Environment and Natural Resources for the purposes of acquiring, maintaining, restoring, enhancing, creating and preserving wetland and riparian resources that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; and

WHEREAS, this Conservation Easement from Grantor to Grantee has been negotiated, arranged and provided for as a condition of a full delivery contract between Restoration Systems, LLC, a North Carolina limited liability company, 1101 Haynes St., Suite 211, Raleigh, NC 27604-1499 and the North Carolina Department of Environmental Quality, to provide wetland mitigation pursuant to the North Carolina Department of Environmental Quality Purchase and Services Contract Number 7529.

WHEREAS, The State of North Carolina is qualified to be the Grantee of a Conservation Easement pursuant to N.C. Gen. Stat. § 121-35; and

WHEREAS, the Department of Environment and Natural Resources and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Understanding, (MOU) duly executed by all parties on November 4, 1998. This MOU recognized that the Wetlands Restoration Program was to provide effective compensatory mitigation for authorized impacts to wetlands, streams and other aquatic resources by restoring, enhancing and preserving the wetland and riparian areas of the State; and

WHEREAS, the Department of Environment and Natural Resources, the North Carolina Department of Transportation and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Agreement, (MOA) duly executed by all parties in Greensboro, NC on July 22, 2003, which recognizes that the Division of Mitigation Services (formerly Ecosystem Enhancement Program) is to provide for compensatory mitigation by effective protection of the land, water and natural resources of the State by restoring, enhancing and preserving ecosystem functions; and

WHEREAS, the Department of Environment and Natural Resources, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the North Carolina Wildlife Resources Commission, the North Carolina Division of Water Quality, the North Carolina Division of Coastal Management, and the National Marine Fisheries Service entered into an agreement to continue the In-Lieu Fee operations of the North Carolina Department of Natural Resources' Division of Mitigation Services (formerly Ecosystem Enhancement Program) with an effective date of 28 July, 2010, which supersedes and replaces the previously effective MOA and MOU referenced above; and

WHEREAS, the acceptance of this instrument for and on behalf of the State of North Carolina was granted to the Department of Administration by resolution as approved by the Governor and Council of State adopted at a meeting held in the City of Raleigh, North Carolina, on the 8th day of February 2000; and

WHEREAS, the Division of Mitigation Services in the Department of Environmental Quality, which has been delegated the authority authorized by the Governor and Council of State to the Department of Administration, has approved acceptance of this instrument; and

WHEREAS, Grantor owns in fee simple certain real property situated, lying, and being in Stonewall Township, Hoke County, North Carolina (the "**Property**"), and being more

particularly described as that certain parcel of land containing approximately 85.80 acres and being conveyed to the Grantor by deed as recorded in **Deed Book 276 at Page 518** of the Hoke County Registry, North Carolina; and

WHEREAS, Grantor is willing to grant a Conservation Easement and Right of Access over the herein described areas of the Property, thereby restricting and limiting the use of the areas of the Property subject to the Conservation Easement to the terms and conditions and purposes hereinafter set forth, and Grantee is willing to accept said Easement and Access Rights. The Conservation Easement shall be for the protection and benefit of the waters of Rockfish Creek.

NOW, THEREFORE, in consideration of the mutual covenants, terms, conditions, and restrictions hereinafter set forth, Grantor unconditionally and irrevocably hereby grants and conveys unto Grantee, its successors and assigns, forever and in perpetuity, a Conservation Easement along with a general Right of Access.

The Conservation Easement Area consists of the following:

BEING ALL OF the Conservation Easement area containing a total of 16.08 acres, more or less, as shown on the plat of survey entitled "Final Plat, Conservation Easement for North Carolina Division of Mitigation Services, Project ID No. 10061, SPO File No. 47-AA, of the Arabia Bay Mitigation Site Over and Across a Portion of the Lands Currently Owned by Fred B. Harris and wife, Agnes T. Harris Per D.B. 276, PG 518," dated April 18, 2019, by John A. Rudolph. PLS Number L-4194, K2 Design Group, and recorded in the Hoke County, North Carolina Register of Deeds at Plat Book 4125, Page 1.

See attached "**Exhibit A**", Legal Description of area of the Property hereinafter referred to as the "Conservation Easement Area"

The purposes of this Conservation Easement are to maintain, restore, enhance, construct, create and preserve wetland and/or riparian resources in the Conservation Easement Area that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; to maintain permanently the Conservation Easement Area in its natural condition, consistent with these purposes; and to prevent any use of the Easement Area that will significantly impair or interfere with these purposes. To achieve these purposes, the following conditions and restrictions are set forth:

I. DURATION OF EASEMENT

Pursuant to law, including the above referenced statutes, this Conservation Easement and Right of Access shall be perpetual and it shall run with, and be a continuing restriction upon the use of, the Property, and it shall be enforceable by the Grantee against the Grantor and against Grantor's heirs, successors and assigns, personal representatives, agents, lessees, and licensees.

II. GRANTOR RESERVED USES AND RESTRICTED ACTIVITIES

The Conservation Easement Area shall be restricted from any development or usage that would impair or interfere with the purposes of this Conservation Easement. Unless expressly reserved as a compatible use herein, any activity in, or use of, the Conservation Easement Area by the Grantor is prohibited as inconsistent with the purposes of this Conservation Easement. Any rights not expressly reserved hereunder by the Grantor have been acquired by the Grantee. Any rights not expressly reserved hereunder by the Grantor, including the rights to all mitigation credits, including, but not limited to, stream, wetland, and riparian buffer mitigation units, derived from each site within the area of the Conservation Easement, are conveyed to and belong to the Grantee. Without limiting the generality of the foregoing, the following specific uses are prohibited, restricted, or reserved as indicated:

A. Recreational Uses. Grantor expressly reserves the right to undeveloped recreational uses, including hiking, bird watching, hunting and fishing, and access to the Conservation Easement Area for the purposes thereof.

B. Motorized Vehicle Use. Motorized vehicle use in the Conservation Easement Area is prohibited except within a Crossing Area(s) or Road or Trail as shown on the recorded survey plat.

C. Educational Uses. The Grantor reserves the right to engage in and permit others to engage in educational uses in the Conservation Easement Area not inconsistent with this Conservation Easement, and the right of access to the Conservation Easement Area for such purposes including organized educational activities such as site visits and observations. Educational uses of the property shall not alter vegetation, hydrology or topography of the site.

D. **Damage to Vegetation.** Except within Crossing Area(s) as shown on the recorded survey plat and as related to the removal of non-native plants, diseased or damaged trees, or vegetation that destabilizes or renders unsafe the Conservation Easement Area to persons or natural habitat, all cutting, removal, mowing, harming, or destruction of any trees and vegetation in the Conservation Easement Area is prohibited.

E. Industrial, Residential and Commercial Uses. All industrial, residential and commercial uses are prohibited in the Conservation Easement Area.

F. Agricultural Use. All agricultural uses are prohibited within the Conservation Easement Area including any use for cropland, waste lagoons, or pastureland.

G. New Construction. There shall be no building, facility, mobile home, antenna, utility pole, tower, or other structure constructed or placed in the Conservation Easement Area.

H. **Roads and Trails.** There shall be no construction or maintenance of new roads, trails, walkways, or paving in the Conservation Easement.

All existing roads, trails and crossings within the Conservation Easement Area shall be shown on the recorded survey plat.

I. Signs. No signs shall be permitted in the Conservation Easement Area except interpretive signs describing restoration activities and the conservation values of the Conservation Easement Area, signs identifying the owner of the Property and the holder of the Conservation Easement, signs giving directions, or signs prescribing rules and regulations for the use of the Conservation Easement Area.

J. Dumping or Storing. Dumping or storage of soil, trash, ashes, garbage, waste, abandoned vehicles, appliances, machinery, or any other material in the Conservation Easement Area is prohibited.

K. Grading, Mineral Use, Excavation, Dredging. There shall be no grading, filling, excavation, dredging, mining, drilling, hydraulic fracturing; removal of topsoil, sand, gravel, rock, peat, minerals, or other materials.

L. Water Quality and Drainage Patterns. There shall be no diking, draining, dredging, channeling, filling, leveling, pumping, impounding or diverting, causing, allowing or permitting the diversion of surface or underground water in the Conservation Easement Area. No altering or tampering with water control structures or devices, or disruption or alteration of the restored, enhanced, or created drainage patterns is allowed. All removal of wetlands, polluting or discharging into waters, springs, seeps, or wetlands, or use of pesticide or biocides in the Conservation Easement Area is prohibited. In the event of an emergency interruption or shortage of all other water sources, water from within the Conservation Easement Area may temporarily be withdrawn for good cause shown as needed for the survival of livestock on the Property.

M. Subdivision and Conveyance. Grantor voluntarily agrees that no further subdivision, partitioning, or dividing of the Conservation Easement Area portion of the Property owned by the Grantor in fee simple ("fee") that is subject to this Conservation Easement is allowed. Any future transfer of the Property shall be subject to this Conservation Easement and Right of Access and to the Grantee's right of unlimited and repeated ingress and egress over and across the Property to the Conservation Easement Area for the purposes set forth herein.

N. Development Rights. All development rights are permanently removed from the Conservation Easement Area and are non-transferrable.

O. Disturbance of Natural Features. Any change, disturbance, alteration or impairment of the natural features of the Conservation Easement Area or any intentional introduction of non-native plants, trees and/or animal species by Grantor is prohibited.

The Grantor may request permission to vary from the above restrictions for good cause shown, provided that any such request is not inconsistent with the purposes of this Conservation Easement, and the Grantor obtains advance written approval from the Division of Mitigation Services, 1652 Mail Services Center, Raleigh, NC 27699-1652.

III. GRANTEE RESERVED USES

A. Right of Access, Construction, and Inspection. The Grantee, its employees and agents, successors and assigns, receive a perpetual Right of Access to the Conservation Easement Area over the Property at reasonable times to undertake any activities on the property to restore, construct, manage, maintain, enhance, protect, and monitor the stream, wetland and any other riparian resources in the Conservation Easement Area, in accordance with restoration activities or a long-term management plan. Unless otherwise specifically set forth in this Conservation Easement, the rights granted herein do not include or establish for the public any access rights.

B. Restoration Activities. These activities include planting of trees, shrubs and herbaceous vegetation, installation of monitoring wells, utilization of heavy equipment to grade, fill, and prepare the soil, modification of the hydrology of the site, and installation of natural and manmade materials as needed to direct in-stream, above ground, and subterraneous water flow.

C. Signs. The Grantee, its employees and agents, successors or assigns, shall be permitted to place signs and witness posts on the Property to include any or all of the following: describe the project, prohibited activities within the Conservation Easement, or identify the project boundaries and the holder of the Conservation Easement.

D. Fences. Conservation Easements are purchased to protect the investments by the State (Grantee) in natural resources. Livestock within conservations easements damages the investment and can result in reductions in natural resource value and mitigation credits which would cause financial harm to the State. Therefore, Landowners (Grantor) with livestock are required to restrict livestock access to the Conservation Easement area. Repeated failure to do so may result in the State (Grantee) repairing or installing livestock exclusion devices (fences) within the conservation area for the purpose of restricting livestock access. In such cases, the landowner (Grantor) must provide access to the State (Grantee) to make repairs.

E. Crossing Area(s). The Grantee is not responsible for maintenance of crossing area(s), however, the Grantee, its employees and agents, successors or assigns, reserve the right to repair crossing area(s), at its sole discretion and to recover the cost of such repairs from the Grantor if such repairs are needed as a result of activities of the Grantor, his successors or assigns.

IV. ENFORCEMENT AND REMEDIES

A. Enforcement. To accomplish the purposes of this Conservation Easement, Grantee is allowed to prevent any activity within the Conservation Easement Area that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features in the Conservation Easement Area that may have been damaged by such unauthorized activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, the Grantee shall, except as provided below, notify the Grantor in writing of such breach and the Grantor shall have ninety (90) days after receipt of such notice to correct the damage caused by such breach. If the breach and damage remains uncured after ninety (90) days, the Grantee may enforce this Conservation Easement by bringing appropriate legal proceedings including an action to recover damages, as well as injunctive and other relief. The Grantee shall also have the

power and authority, consistent with its statutory authority: (a) to prevent any impairment of the Conservation Easement Area by acts which may be unlawful or in violation of this Conservation Easement; (b) to otherwise preserve or protect its interest in the Property; or (c) to seek damages from any appropriate person or entity. Notwithstanding the foregoing, the Grantee reserves the immediate right, without notice, to obtain a temporary restraining order, injunctive or other appropriate relief, if the breach is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement, and the Grantor and Grantee acknowledge that the damage would be irreparable and remedies at law inadequate. The rights and remedies of the Grantee provided hereunder shall be in addition to, and not in lieu of, all other rights and remedies available to Grantee in connection with this Conservation Easement.

B. Inspection. The Grantee, its employees and agents, successors and assigns, have the right, with reasonable notice, to enter the Conservation Easement Area over the Property at reasonable times for the purpose of inspection to determine whether the Grantor is complying with the terms, conditions and restrictions of this Conservation Easement.

C. Acts Beyond Grantor's Control. Nothing contained in this Conservation Easement shall be construed to entitle Grantee to bring any action against Grantor for any injury or change in the Conservation Easement Area caused by third parties, resulting from causes beyond the Grantor's control, including, without limitation, fire, flood, storm, and earth movement, or from any prudent action taken in good faith by the Grantor under emergency conditions to prevent, abate, or mitigate significant injury to life or damage to the Property resulting from such causes.

D. Costs of Enforcement. Beyond regular and typical monitoring expenses, any costs incurred by Grantee in enforcing the terms of this Conservation Easement against Grantor, including, without limitation, any costs of restoration necessitated by Grantor's acts or omissions in violation of the terms of this Conservation Easement, shall be borne by Grantor.

E. No Waiver. Enforcement of this Easement shall be at the discretion of the Grantee and any forbearance, delay or omission by Grantee to exercise its rights hereunder in the event of any breach of any term set forth herein shall not be construed to be a waiver by Grantee.

V. MISCELLANEOUS

A. This instrument sets forth the entire agreement of the parties with respect to the Conservation Easement and supersedes all prior discussions, negotiations, understandings or agreements relating to the Conservation Easement. If any provision is found to be invalid, the remainder of the provisions of the Conservation Easement, and the application of such provision to persons or circumstances other than those as to which it is found to be invalid, shall not be affected thereby.

B. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Property. Grantee shall not be responsible for any costs or liability of any kind related to the ownership, operation, insurance, upkeep, or maintenance of the Property, except as expressly provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the

obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

C. Any notices shall be sent by registered or certified mail, return receipt requested to the parties at their addresses shown herein or to other addresses as either party establishes in writing upon notification to the other.

D. Grantor shall notify Grantee in writing of the name and address and any party to whom the Property or any part thereof is to be transferred at or prior to the time said transfer is made. Grantor further agrees that any subsequent lease, deed, or other legal instrument by which any interest in the Property is conveyed is subject to the Conservation Easement herein created.

E. The Grantor and Grantee agree that the terms of this Conservation Easement shall survive any merger of the fee and easement interests in the Property or any portion thereof.

F. This Conservation Easement and Right of Access may be amended, but only in writing signed by all parties hereto, or their successors or assigns, if such amendment does not affect the qualification of this Conservation Easement or the status of the Grantee under any applicable laws, and is consistent with the purposes of the Conservation Easement. The owner of the Property shall notify the State Property Office and the U.S. Army Corps of Engineers in writing sixty (60) days prior to the initiation of any transfer of all or any part of the Property or of any request to void or modify this Conservation Easement. Such notifications and modification requests shall be addressed to:

Division of Mitigation Services Program Manager
NC State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

and

General Counsel
US Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403

G. The parties recognize and agree that the benefits of this Conservation Easement are in gross and assignable provided, however, that the Grantee hereby covenants and agrees, that in the event it transfers or assigns this Conservation Easement, the organization receiving the interest will be a qualified holder under N.C. Gen. Stat. § 121-34 et seq. and § 170(h) of the Internal Revenue Code, and the Grantee further covenants and agrees that the terms of the transfer or assignment will be such that the transferee or assignee will be required to continue in perpetuity the conservation purposes described in this document.

VI. QUIET ENJOYMENT

Grantor reserves all remaining rights accruing from ownership of the Property, including the right to engage in or permit or invite others to engage in only those uses of the Conservation Easement Area that are expressly reserved herein, not prohibited or restricted herein, and are not inconsistent with the purposes of this Conservation Easement. Without limiting the generality of the foregoing, the Grantor expressly reserves to the Grantor, and the Grantor's invitees and licensees, the right of access to the Conservation Easement Area, and the right of quiet enjoyment of the Conservation Easement Area,

TO HAVE AND TO HOLD, the said rights and easements perpetually unto the State of North Carolina for the aforesaid purposes,

AND Grantor covenants that Grantor is seized of said premises in fee and has the right to convey the permanent Conservation Easement herein granted; that the same is free from encumbrances and that Grantor will warrant and defend title to the same against the claims of all persons whomsoever.

IN TESTIMONY WHEREOF, the Grantor has hereunto set his hand and seal, the day and year first above written.

Fred B Harris (SEAL)
Fred B. Harris

Agnes T Harris (SEAL)
Agnes T. Harris

NORTH CAROLINA
COUNTY OF Hoke

I, Rachel Harrison, a Notary Public in and for the County and State aforesaid, do hereby certify that Fred B. Harris and wife, Agnes T, Harris, Grantor, personally appeared before me this day and acknowledged the execution of the foregoing instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and Notary Seal this the 25th day of April, 2018.

Notary Public

My commission expires:

8/11/19

Exhibit A
CONSERVATION EASEMENT
OF THE ARABIA BAY MITIGATION SITE

All of the Conservation Easement Area of the Arabia Bay Wetland Mitigation Site lying and being situated in Stonewall Township, Hoke County, North Carolina and particularly described as follows (all distances are ground distances unless otherwise noted):

Beginning at an iron stake (Point of Beginning) labeled as Point No. 1 and being a Western corner of the Conservation Easement Area and being located South 14°53'47" West 169.59 feet from an iron stake with a blue cap inscribed: "K2 DESIGN CONTROL POINT" (Point No. 27) with N.C. Grid Coordinates N=439,282.1121', E=1,958,342.8839' (NAD '83, 2011).

Thence from the Point of Beginning (Point No. 1), North 34°56'37" West 256.36' to an iron stake; thence North 05°59'37" West 143.41' to an iron stake; thence North 42°49'02" East 306.21' to an iron stake; thence North 82°34'28" East 272.03' to an iron stake; thence South 81°03'10" East 152.75' to an iron stake; thence South 60°40'41" East 175.16' to an iron stake; thence South 42°16'38" East 222.48' to an iron stake; thence South 28°44'52" East 157.47' to an iron stake; thence South 10°23'04" East 287.19' to an iron stake; thence South 39°26'11" West 258.55' to an iron stake; thence South 64°03'47" West 116.22' to an iron stake; thence North 84°50'34" West 144.86' to an iron stake; thence North 71°47'27" West 204.62' to an iron stake; thence North 49°07'49" West 188.30' to an iron stake; thence North 47°58'31" West 197.94' to an iron stake, which is the Point of Beginning (Point No. 1), having an area of 16.08 acres, more or less.

The foregoing Conservation Easement Areas is also as shown on the plat of survey titled "Conservation Easement Survey for The State of North Carolina, Division of Mitigation Services, DMS Project ID No. 100061, SPO File Number 47-AA of Arabia Bay Mitigation Site over and across a Portion of the Lands Currently Owned by Fred B. Harris and wife, Agnes T. Harris" dated April 18, 2019, by John A. Rudolph. PLS Number L-4194, K2 Design Group, and recorded in the Hoke County, North Carolina Register of Deeds at Plat Book 4125, Page 1.

TOGETHER WITH that certain new twenty (20) foot-wide non-exclusive access easement, for ingress, egress, and regress labeled as Access Easement as shown on the foregoing described plat of survey recorded in Plat Book Plat Book 4125, Page 1, Hoke County Registry.

Appendix H
Credit Release Schedule

The standard release schedule for ILF credits generated through wetland mitigation projects has been modified to meet the new standards for the monitoring timeframes provided in this guidance document.

The schedules below list the updated credit release schedules for wetland mitigation projects developed by ILF sites in North Carolina:

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

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

Appendix I
Maintenance Plan

Maintenance Plan

The Site shall be monitored on a regular basis and a physical inspection of the site shall be conducted a minimum of once per year throughout the post-construction monitoring period until performance standards are met. These Site inspections may identify Site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two years following site construction and may include the following:

Component/Feature	**Maintenance through project close-out**
Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted plant community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations.
Site Boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree- blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as needed basis.
Terracell Drop Structure	Routine maintenance and repair activities may include removal of debris and supplemental installation of live stakes and other target vegetation along the channel. Undermining of the structure may require repair or replacement.

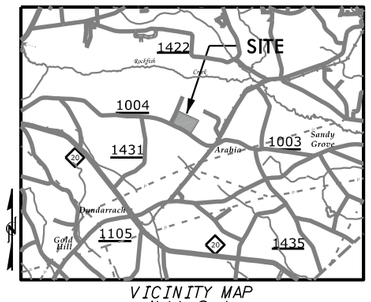
Appendix J
Construction Plans

Erosion Control Plan
Structure Details

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	ARABIA BAY SITE	1	

CONSTRUCTION PLANS
ARABIA BAY SITE

DWR PROJECT #2018-0784

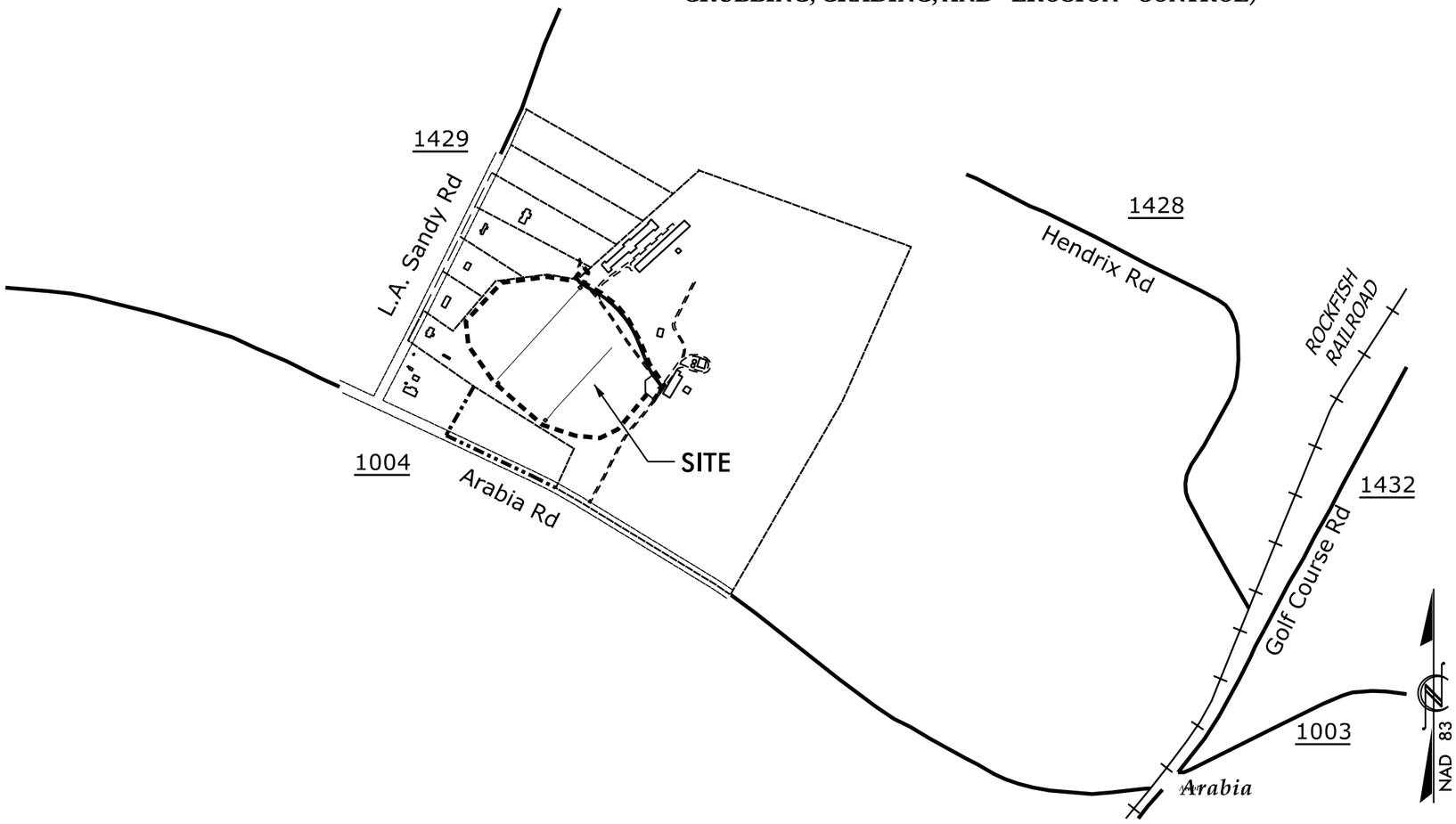


VICINITY MAP
Not to Scale

LOCATION: HOKE COUNTY, NORTH CAROLINA

TYPE OF WORK: WETLAND RESTORATION AND MITIGATION (CLEARING, GRUBBING, GRADING, AND EROSION CONTROL)

INDEX OF SHEETS:



LIMITS OF CONSTRUCTION:
17.4 ACRES

CONTRACT: ARABIA BAY SITE

THESE EROSION AND SEDIMENT CONTROL PLANS COMPLY WITH THE REGULATIONS SET FORTH BY THE NCG-010000 GENERAL CONSTRUCTION PERMIT EFFECTIVE AUGUST 1, 2016 ISSUED BY THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY – DIVISION OF WATER RESOURCES.

Designed By:

Axiom Environmental, Inc.
Axiom Environmental
218 Snow Ave
Raleigh, NC 27603

GRANT LEWIS
PROJECT DESIGNER

RESTORATION SYSTEMS | LLC
Restoration Systems
1101 Haynes St.
Suite 211
Raleigh, NC 27604

WORTH CREECH
SITE CONSTRUCTION MANAGER

Prepared in the Office of:
SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

JOSHUA G. DALTON, P.E.
PROJECT ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

DocuSigned by:
Josh Dalton
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NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

5/30/2019
DATE:

5/30/2019
Arabia_Hyd_PSH_01.dgn
jharvey

SHEET NAME	SHEET NUMBER
DETAILS	2
PROJECT NAME: ARABIA BAY WETLAND RESTORATION AND MITIGATION SITE	
COUNTY: HOKE	DATE: 2019

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

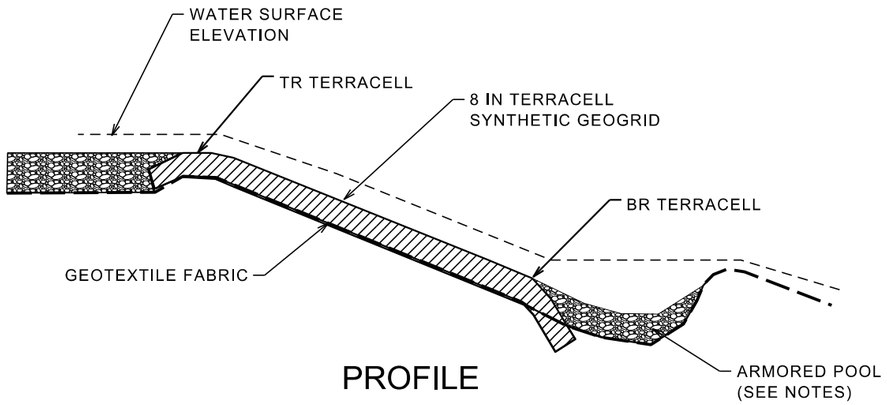
DocuSigned by:
Josh Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA C. DALTON

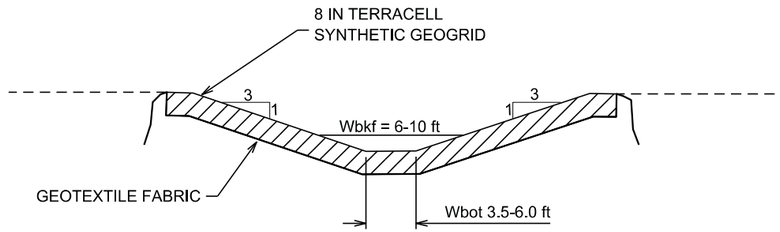
5/30/2019
DATE:

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

DROP STRUCTURE - TERRACELL



PROFILE

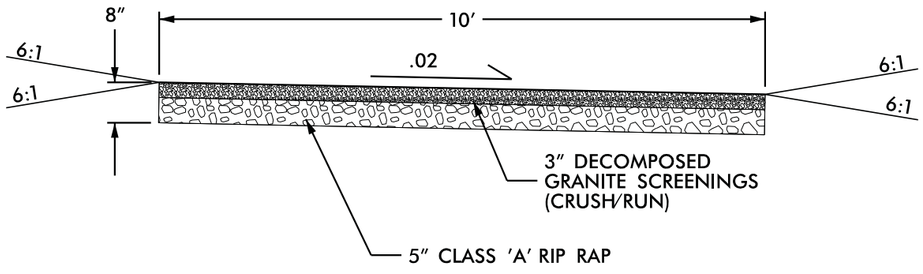


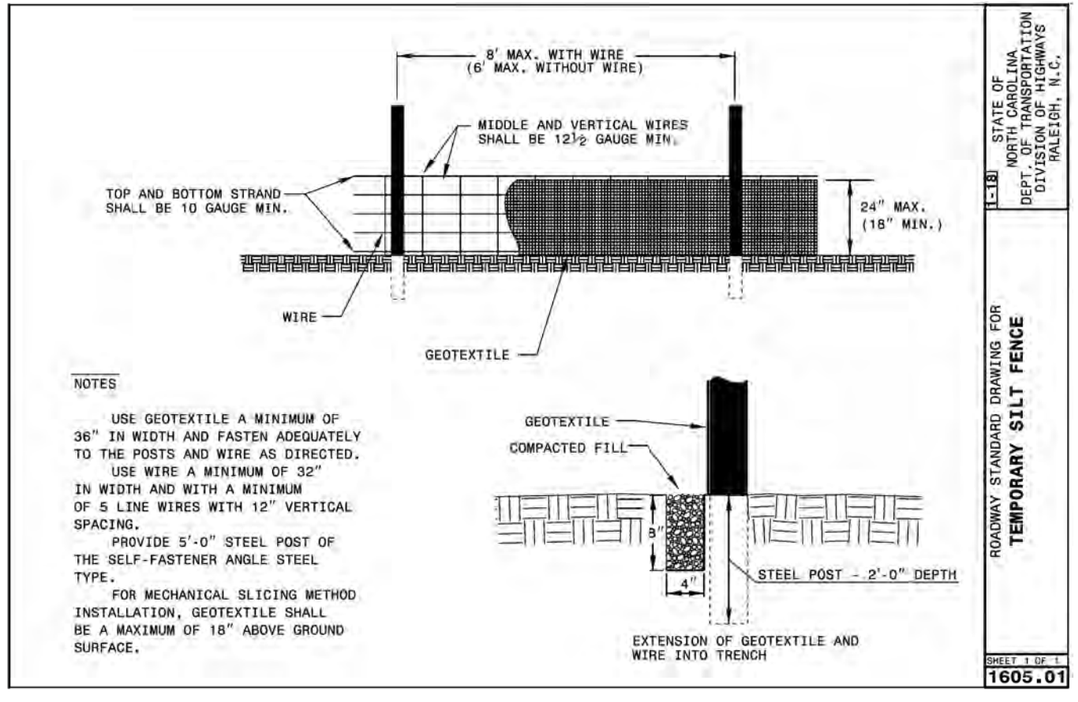
CROSS-SECTION

TERRACELL STRUCTURE NOTES:
1. CONTRACTOR WILL INSTALL 8-INCH TERRACELL SYNTHETIC GEOGRID AS PER THE MANUFACTURER'S SPECIFICATIONS.
2. THE POOL AT THE BOTTOM OF THE DROP STRUCTURE WILL BE ARMORED WITH GEOTEXTILE FABRIC AND SUITABLE NATURAL BED MATERIAL.
3. NATURAL BED MATERIAL IS DEFINED AS MATERIAL OBTAINED FROM STOCKPILES AT THE SITE RANGING IN SIZE FROM 5" - 17" AVERAGE DIAMETER WITH THE MAJORITY OF MATERIAL HAVING 10" AVERAGE DIAMETER, OR EQUIVALENT MATERIAL.

TERRACELL STRUCTURE NOTES:
1. CONTRACTOR WILL INSTALL 8-INCH TERRACELL SYNTHETIC GEOGRID AS PER THE MANUFACTURER'S SPECIFICATIONS.
2. ONCE THE SYNTHETIC GEOGRID HAS BEEN INSTALLED, GEOCELLS WILL BE BACKFILLED WITH GRAVEL AND TOPSOIL AND PLANTED WITH EROSION CONTROL GRASSES AND WILLOW STAKES (*SALIX NIGRA*).

DRIVEWAY TYPICAL





5/30/2019
Arabia_Bay_Std_PSH_02.dgn
jharvey

SHEET NAME	SHEET NUMBER
DETAILS	2A

PROJECT NAME: ARABIA BAY WETLAND RESTORATION AND MITIGATION SITE

COUNTY: HOKE DATE: 2019

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

DocuSigned by:
Josh Dalton
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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 26971 JOSHUA G. DALTON

5/30/2019

DATE:

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NOTES

USE NO. 5 OR NO. 57 STONE FOR SEDIMENT CONTROL STONE.

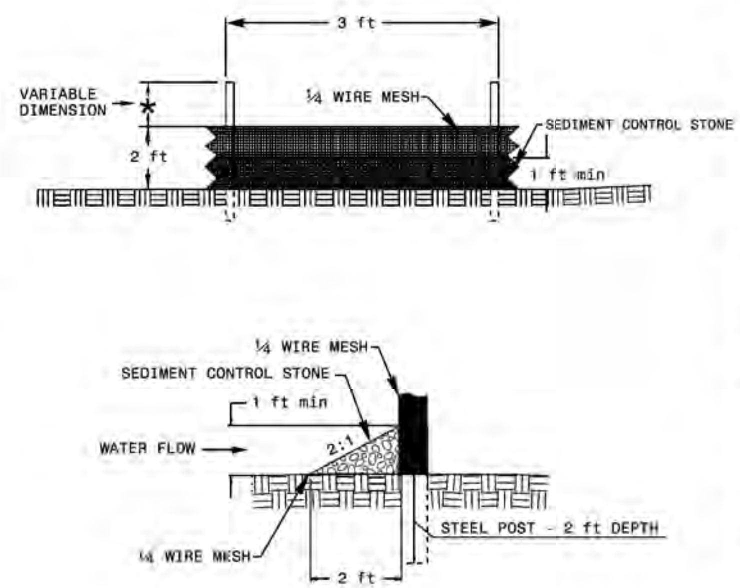
USE HARDWARE CLOTH 24 GAUGE WIRE MESH WITH ¼ INCH MESH OPENINGS.

INSTALL 5 FT. SELF FASTENER ANGLE STEEL POST 2 FT. DEEP MINIMUM.

ATTACH HARDWARE CLOTH TO POSTS WITH WIRE STAPLE OR OTHER ACCEPTABLE METHODS.

SPACE POSTS A MAXIMUM OF 3 FT.

FOR INSTALLATION BETWEEN SECTIONS OF SILT FENCE, EXTEND SEDIMENT CONTROL STONE A MINIMUM OF 12" ON EACH SIDE OF SPECIAL SEDIMENT CONTROL FENCE SECTION.



STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

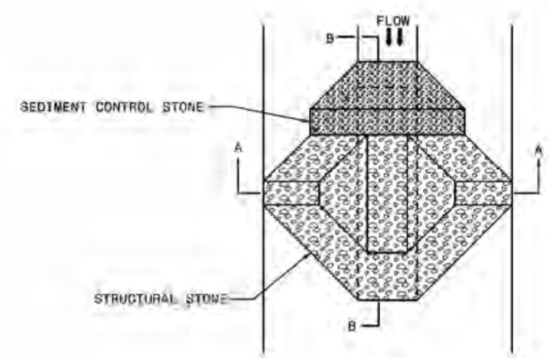
1-18

ROADWAY STANDARD DRAWING FOR

SPECIAL SEDIMENT CONTROL FENCE

SHEET 1 OF 1

1606.01

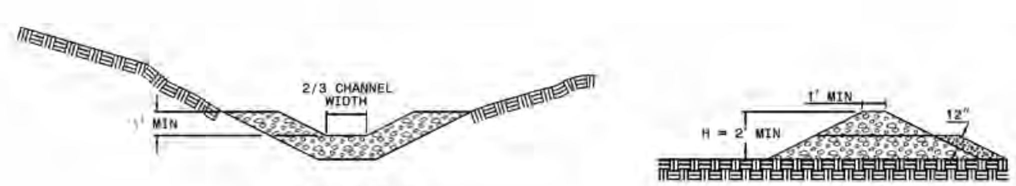


PLAN

NOTES

USE CLASS B EROSION CONTROL STONE FOR STRUCTURAL STONE.

USE NO. 5 OR NO. 57 STONE FOR SEDIMENT CONTROL STONE.



SECTION A-A

SECTION B-B

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

1-18

ROADWAY STANDARD DRAWING FOR

TEMPORARY ROCK SILT CHECK TYPE A

SHEET 1 OF 1

1633.01

5/30/2019
Arabia_Hyd_PSH_02a.dgn
jbarrey

SHEET NAME	SHEET NUMBER
DETAILS	2B
PROJECT NAME: ARABIA BAY WETLAND RESTORATION AND MITIGATION SITE	
COUNTY: HOKE	DATE: 2019

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

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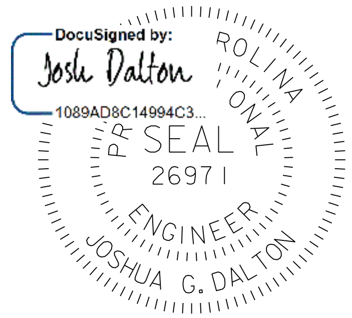
Josh Dalton
1089AD8C14994C3...



5/30/2019
DATE:

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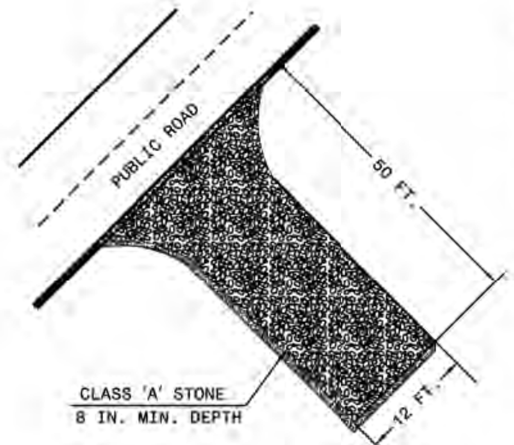


NOTES

1. PROVIDE TURNING RADIUS SUFFICIENT TO ACCOMMODATE LARGE TRUCKS.
2. LOCATE ENTRANCES 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. LOCATE GRAVEL CONSTRUCTION ENTRANCE AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. PROVIDE FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE.
6. NUMBER AND LOCATION OF CONSTRUCTION ENTRANCES TO BE DETERMINED BY THE ENGINEER.
7. USE CLASS 'A' STONE OR OTHER COARSE AGGREGATE APPROVED BY THE ENGINEER.
8. INSTALL CONSTRUCTION ENTRANCES IN A WAY TO PREVENT VEHICLES FROM BYPASSING CONSTRUCTION ENTRANCE LEAVING PROJECT SITE.

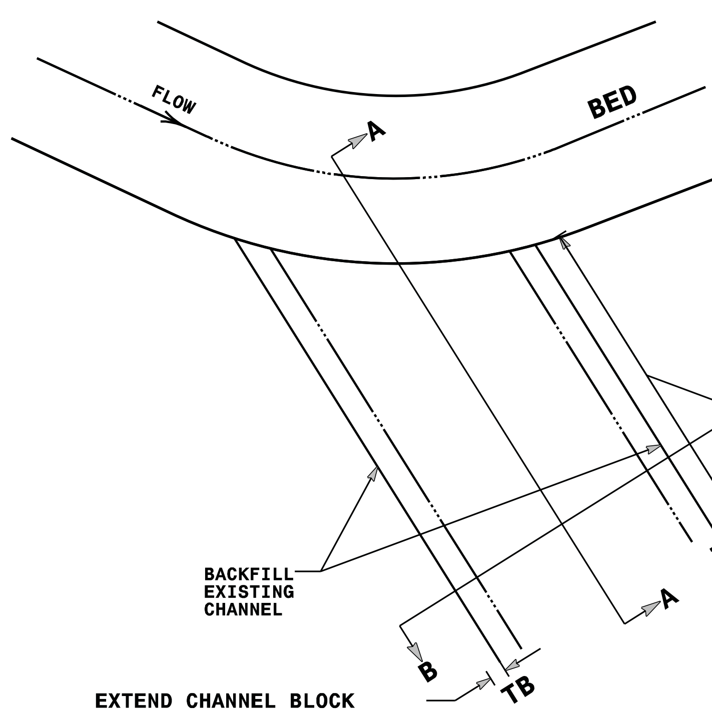
NOTE: PLACE GEOTEXTILE FOR DRAINAGE BENEATH STONE

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

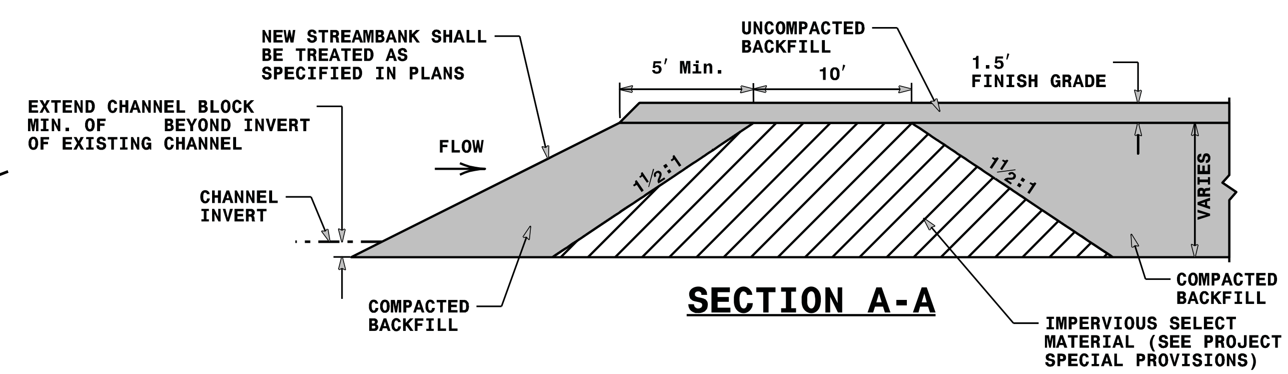
1-18

ROADWAY STANDARD DRAWING FOR
GRAVEL CONSTRUCTION ENTRANCE

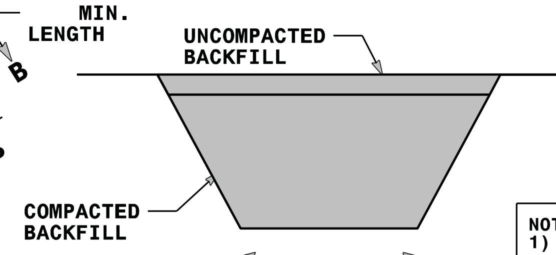
SHEET 1 OF 1
1607.01



PLAN VIEW



SECTION A-A



SECTION B-B

STREAM PLUG

NOT TO SCALE

NOTES:
1) CHANNEL BLOCK SHALL BE INSTALLED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
2) BLOCK SHOULD BE INSTALLED AT THE INTERFACE BETWEEN EXISTING CHANNEL AND PROPOSED CHANNEL.
3) BOTTOM OF BLOCK SHOULD BE A MINIMUM OF BELOW THE INVERT OF THE EXISTING CHANNEL.
4) BLOCK SHOULD EXTEND A MINIMUM OF BEYOND THE LIMITS OF THE EXISTING STREAM CHANNEL.
5) INSTALL EROSION CONTROL MATTING AND SEED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS IMMEDIATELY AFTER GRADING.
6) COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.

5/30/2019
Arabia_Hyd_PSH_02b.dgn
jharvey

SHEET NAME	SHEET NUMBER
NOTES	3

PROJECT NAME: ARABIA BAY WETLAND RESTORATION AND MITIGATION SITE

COUNTY: HOKE DATE: 2019

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

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1089AD8C14994C3...

CAROLINA PROFESSIONAL SEAL 026971 ENGINEER JOSHUA G. DALTON

5/30/2019
DATE:

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EROSION CONTROL CONSTRUCTION SEQUENCE

1) Obtain grading permit.
2) Install temporary construction entrance, silt fencing, access roads, and other measures shown on the approved erosion and sedimentation control plan.
3) Install rain gage on site. Contractor shall provide a log book at the project site and shall read and record rain amounts at the same time each day.
4) Contact local Soil Erosion Authority or State for on-site inspection by Environmental Inspector and obtain certificate of compliance.
5) Begin clearing - maintain devices as necessary.
6) Begin channel fill in - stockpile waste material in designated spoil areas and surround with silt fencing.
7) Temporary or permanent ground cover stabilization shall occur within 7 calendar days from the last land-disturbing activity, with the following exceptions in which temporary or permanent ground cover shall be provided within 14 calendar days from the last land-disturbing activity:
   - Slopes between 2:1 and 3:1, with a slope length of 10 feet or less
   - Slopes 3:1 or flatter, with a slope length of 50 feet or less
   - Slopes 4:1 or flatter
8) Roughen the soil using disc plow method, not deep ripping.
9) All graded areas must be seeded, mulched, and matted at the end of each day. For this reason, daily disturbance is limited to the length of ditch that can be completed within daily work hours.
10) Once a existing channel fill in section is stabilized, water may be reintroduced to the channel.
11) When construction is complete and all areas are stabilized completely, call for inspection by Environmental Inspector.
12) If site is approved, remove silt fencing, other measures, etc. and seed out any resulting bare areas.
13) When vegetation has been established, call for final site inspection by Environmental Inspector.

SITE DESCRIPTION	STABILIZATION TIME	TIMEFRAME 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' IN LENGTH.
ALL OTHER AREAS WITH SLOPES FLATTER THAN 4:1	14 DAYS	NONE, EXCEPT FOR PERIMETERS AND HQW ZONES.

SEEDING SCHEDULE

TEMPORARY HERBACEOUS SEED

Common Name	Scientific Name	Application Rate	Application Dates
Grain Rye [A]	*Secale cereale*	130 lbs. per acre (3 lbs. per 1,000 ft^2)	Year-round
Orchard Grass [B]	*Dactylis glomerata*	15 lbs per acre (0.35 lbs. per 1,000 ft^2)	September - March
Brown Top Millet [B]	*Panicum ramosum*	40 lbs. per acre (1.0 lbs. per 1,000 ft^2)	May – September
German Millet [B]	*Setaria italica*	25 lbs. per acre (0.5 lbs. per 1,000 ft^2)	May – September

[A] Primarily utilized on disturbed or stockpiled areas.
[B] Primarily utilized near stream channels and streambanks.

SEEDING SCHEDULE

PERMANENT HERBACEOUS SEED

Permanent herbaceous seeds containing a custom mix of the following forbs and grasses will be used from within the bankfull channel to the limits of the riparian buffer. The application timeframe for the mix is March through June and the minimum rate is 30 lbs/acre. This mix will also be used to plant the staging and stockpile areas and any other areas as directed by the designer.

Common Name	Scientific Name	Mix Percentage
Big Bluestem	*Andropogon gerardii*	15%
Deer tongue	*Dichanthelium clandstinum*	10%
Gama grass	*Tripsicum dactyloides*	10%
Indian grass	*Sorghastrum nutans*	10%
Lance leaf tickseed	*Coreopsis lanceolata*	5%
Little Bluestem	*Schizachyrium scoparium*	10%
Partridge pea	*Chamaecrista fasciculata*	5%
Purple-top	*Tridens flavus*	10%
Switch grass	*Panicum virgatum*	10%
Virginia wild rye	*Elymus virginicus*	15%
	Total	100%

5/30/2019
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jharvey

SHEET NAME	SHEET NUMBER
MITIGATION PLAN	4
PROJECT NAME: ARABIA BAY WETLAND RESTORATION AND MITIGATION SITE	
COUNTY: HOKE	DATE: 2019

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
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TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

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Josh Dalton
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NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

5/30/2019
DATE:

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50' 25' 0 50' 100'
SCALE: 1" = 100'

NAD 83

SEE PSH 5

NEW GRAVEL DRIVEWAY
SEE TYPICAL (PSH 02)

DITCH PLUG
SEE DETAIL (PSH 02B)

STAGING AREA

GRAVEL CONSTRUCTION ENTRANCE – SEE DETAIL (PSH 02B)

FILL IN EXISTING DRAINAGE DITCH TO EXISTING FIELD ELEVATION EST 2300 CY

FILL IN EXISTING DRAINAGE DITCH TO EXISTING FIELD ELEVATION

DITCH PLUG
SEE DETAIL (PSH 02B)

DITCH PLUG
SEE DETAIL (PSH 02B)

FILL IN EXISTING DRAINAGE DITCH

Lot No. 3
"Elliot Place Subdivision
Slide 249, Map 2

Fred B. Harris and wife,
Agnes T. Harris
as Tennants By The Entireties
86.81 Acres
D.B. 276, Pg. 518

S 80°29'28" E 161.84'
N 82°30'06" E 140.03'
N 82°45'39" E 169.97'
N 40°23'46" E 121.12'
N 40°29'26" E 266.81'
N 27°01'10" E 200.64'
(698.28')

TOPOGRAHY BASED ON NC SPATIAL DATA QL2 LIDAR

TYPICAL EPHEMERAL POOL/BORROW AREA – MAX DEPTH 6 INCHES

1605.01	Temporary Silt Fence
1606.01	Special Sediment Control Fence
1633.01	Temporary Rock Silt Check Type-A
	Limits of Disturbance
	Gravel Construction Entrance
	Borrow Areas

5/30/2019
A:\Projects\Arabia Bay\dgn\Arabia_Bay_PSH_04.dgn
jbarnett

SHEET NAME	SHEET NUMBER
MITIGATION PLAN	5
PROJECT NAME: ARABIA BAY WETLAND RESTORATION AND MITIGATION SITE	
COUNTY: HOKE	DATE: 2019

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

30′ 15′ 0 30′ 60′
SCALE: 1″ = 60′

NAD 83

TOPOGRAHY BASED ON
NC SPATIAL DATA QL2 LIDAR

DocuSigned by:
Josh Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

5/30/2019
DATE:

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PI Sta 10+18.43
Δ = 34° 09' 12.8" (LT)
D = 95° 29' 34.7"
L = 35.77'
T = 18.43'
R = 60.00'

PI Sta 13+33.61
Δ = 37° 38' 24.2" (RT)
D = 9° 32' 57.5"
L = 394.17'
T = 204.49'
R = 600.00'

PI Sta 17+25.14
Δ = 16° 35' 14.5" (LT)
D = 28° 38' 52.4"
L = 57.90'
T = 29.15'
R = 200.00'

CONSTRUCT SPLASH POOL WITH CLASS 'B' RIP RAP.
OVERLAY BASE OF TERRACELL WITH RIP RAP SEE DROP STRUCTURE DETAIL (PSH 02)

KEY IN BASE OF TERRACELL TO BOTTOM OF DITCH. FINAL ELEV MATCHES EXTG DITCH GRADE AT 215.0 FT.

KEY IN TERRACELL BELOW ROAD SEE DROP STRUCTURE DETAIL (PSH 02)

CONSTRUCT ROAD BED TO FINISHED ELEV OF 221.5 FT. SEE TYPICAL (PSH 02)

REMOVE 29 FT EXISTING PIPE. FILL WITH SELECT MATERIAL AND COMPACT IN 1 FT LIFTS.

DITCH PLUG SEE DETAIL (PSH 02B)

FILL IN EXTG CHANNEL TO EXTG FIELD ELEVATION EST 2300 CY

LIMITS OF DISTURBANCE

NEW GRAVEL DRIVEWAY SEE TYPICAL (PSH 02)

GRAVEL CONSTRUCTION ENTRANCE - SEE DETAIL (PSH 02B)

STAGING AREA (SEE PSH 04)

PC Sta 10+00.00

PT Sta 10+35.77

PC Sta 11+29.12

PT Sta 15+23.29

PC Sta 16+95.99

PT Sta 17+53.89

S 59° 41' 40.9" E

S 22° 02' 16.7" E

1605.01	Temporary Silt Fence
1606.01	Special Sediment Control Fence
1633.01	Temporary Rock Silt Check Type-A
	Limits of Disturbance
	Borrow Areas

TYPICAL EPHEMERAL POOL/BORROW AREA – MAX DEPTH 6 INCHES

5/30/2019
X:\3360_Arabia Bay\Cad\Plan\Grd_PSH_05.dgn
jharvey

Appendix K
Water Balance Calculations

Arabia Water Budget Calculation

Water Budget Equation

The hydrologic cycle of a wetland can be expressed in a water budget that accounts for water inflows and outflows to the system, as follows:

$$\Delta S = [P + S_i + G_i] - [ET + S_o + G_o]$$

where:

ΔS = change in volume of water storage in a defined area over time

P = precipitation

S_i = surface-water inflow

G_i = ground-water inflow

ET = evapotranspiration

S_o = surface water outflow

G_o = groundwater outflow

Water Budget Calculation Assumptions

This drained Carolina Bay will be restored as a single wetland polygon. The following assumptions apply to the water budget calculation:

1. Precipitation that falls within the 16-acre footprint will be the primary hydrologic input.
2. Surface-water and ground-water inflow will be secondary hydrologic inputs and are not expected to be critical factors in restoring wetland hydrology. This is assumed because of the smaller size of the local watershed (24-acres excluding the 16-acre footprint of the restoration area) and the Site is bounded on the upslope side by the Candor soil series which consist of excessively drained sandy textured soils.
3. Currently surface water outflow for the site is being conveyed off the Site via a ditch network system, and will be eliminated by removing the culvert outlet during restoration of the Carolina Bay.
4. The existing ditches have broken through the Site's restrictive soil layer. The restrictive soil layer supports wetland hydrology by creating a perched water table. During construction the ditches will be filled with clay material which will restore the fragmented restrictive soil layer and prevent potential for vertical groundwater outflow.

Based on these assumptions it is assumed that no significant groundwater or surface water inflow/outflow will occur at the Site to the degree that it will affect the restoration of wetland

hydrology. Applying these assumptions to the water budget equation, modifies the water balance equation for the Site to:

$$\Delta S = [P] - [ET]$$

Precipitation

The USDA NRCS provides Wetlands Climate Tables through the Agricultural Applied Climate System (AgACIS) which includes climate data and summary reports. There are seven AgACIS weather stations listed for Hoke County, however when queried all of these weather stations displayed a message that there was insufficient data to provide probability analysis of precipitation data. Therefore, the nearest weather station (Red Springs 1 SE, NC) which is located ~10-miles to the south in Robeson County was used as it provided the data needed. The precipitation data is the average of precipitation data collected from 1971 – 2000.

Evapotranspiration

As discussed above in the water budget calculation assumptions surface water and groundwater outflows will be eliminated during construction of the Site, leaving evapotranspiration as the only water loss for the system after construction is complete. The State Office of North Carolina at NCSU developed the NC Climate Retrieval and Observations Network Of the Southeast Database (NC CRONOS) provides Daily Reference Crop Evapotranspiration (ETo) and Daily Crop Evapotranspiration (ETc) for the previous 48-months at their weather stations around the state. A crop coefficient is multiplied by the ETo in order to calculate ETc. The closest weather station to the Site is the Fayetteville Airport (Station ID: KFAY) in Cumberland County, NC. The KFAY weather station is ~14-miles east northeast of the Site.

The data was accessed from the NC CRONOS KFAY weather station in January 2019, and provided ETo and ETc data. Field corn at mid-season growth stage was selected for ETc as this crop has the highest water loss through evapotranspiration of the crops previously grown at the Site. The ETo and ETc data provided was from Jan 2015 – Dec 2018, and was averaged for each month in order to perform the water budget calculation.

Summary of Water Budget Analysis Results

Month	Total Precipitation (in)	Wetland Area (ac)	Direct Precipitation on Wetland (ac-ft)	Total Water Available (ac-ft)	Avg Eto Rate (in)	Avg Etc Rate (in)	ET Water Loss (ac-ft)	Water Budget Net Balance +/- (ac-ft)	Water Budget Remaining Total +/- (ac-ft)
Jan	4.03	16	5.37	5.37	2.16	2.59	1.16	4.21	
Feb	3.42	16	4.56	4.56	2.87	3.44	1.31	3.25	7.47
Mar	4.24	16	5.65	5.65	4.54	5.45	2.57	3.09	10.55
Apr	3.07	16	4.09	4.09	5.77	6.93	2.36	1.73	12.28
May	3.30	16	4.40	4.40	6.72	8.06	2.96	1.44	13.73
Jun	4.19	16	5.59	5.59	7.33	8.79	4.09	1.49	15.22
Jul	5.83	16	7.77	7.77	7.48	8.97	5.81	1.96	17.18
Aug	4.70	16	6.27	6.27	6.37	7.64	3.99	2.28	19.46
Sep	4.58	16	6.11	6.11	4.96	5.95	3.03	3.08	22.53
Oct	3.15	16	4.20	4.20	3.68	4.42	1.55	2.65	25.19
Nov	3.04	16	4.05	4.05	2.38	2.86	0.97	3.09	28.27
Dec	3.20	16	4.27	4.27	1.85	2.22	0.79	3.48	31.75
Totals:	**46.75**		**62.33**	**62.33**	**56.11**	**67.33**	**30.58**	**31.75**	

Results and Conclusions

The monthly and annual water budget results for the proposed wetlands are presented in the "Water Budget Net Balance +/-" column of the table above. A monthly running total of the water budget is presented in "Water Budget Remaining Total +/-" column of the table above. No water deficits were observed in the calculation during any month of the year. A water surplus is available on a monthly and annual basis. This analysis reflects monthly water budget conditions based on monthly direct precipitation and subtracting monthly evapotranspiration to arrive at monthly water budget summaries.

Based on this calculation ~2-feet surplus of water will cover the entire 16-acre on an annual basis. Considering the approximate depth to the restrictive soil layer the proposed wetland project will be able to meet the wetland hydrology requirement during years of normal precipitation.

References

Kreiser, G.S. 2003. A Wetland Restoration Project: Water Budget and Nutrient Analysis of a Drained Carolina Bay (Master's Thesis). Retrieved from NCSU Library Repository. (Acessed on December 14, 2018 https://repository.lib.ncsu.edu/handle/1840.16/243)

Mitsch, W.J., and J.G. Gosselink. 2000. Wetlands. 3rd edition. John Wiley & Sons, New York, NY, USA.

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

REPLY TO
ATTENTION OF:

April 30, 2019

Regulatory Division

Re: NCIRT Review and USACE Approval of the Arabia Bay Mitigation Plan; SAW-2018-01151; NCDMS Project # 100061

Mr. Tim Baumgartner
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Dear Mr. Baumgartner:

The purpose of this letter is to provide the North Carolina Division of Mitigation Services (NCDMS) with all comments generated by the North Carolina Interagency Review Team (NCIRT) during the 30-day comment period for the Arabia Bay Mitigation Plan, which closed on March 29, 2019. These comments are attached for your review.

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

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

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

Sincerely,

Kim Browning
Mitigation Project Manager
for Henry Wicker

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List
Jeff Schaffer – NCDMS
Lindsay Crocker – NCDMS
Raymond Holz – Restoration Systems

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

REPLY TO
ATTENTION OF:

CESAW-RG/Browning April 12, 2019

MEMORANDUM FOR RECORD

SUBJECT: Arabia Bay Mitigation Site - NCIRT Comments during 30-day Mitigation Plan Review

PURPOSE: The comments listed below were posted to the NCDMS Mitigation Plan Review Portal during the 30-day comment period in accordance with Section 332.8(g) of the 2008 Mitigation Rule.

NCDMS Project Name: Arabia Bay Mitigation Site, Hoke County, NC

USACE AID#: SAW-2018-01151

NCDMS #: 100061

30-Day Comment Deadline: March 29, 2019

Todd Bowers, EPA:

- Section 7.4/Table 9/Page 15: Natural Plant Community Restoration
    - Schafale 2012 lists two distinct Cypress Savannas (typic and acidic). Recommend providing some discussion and justification on which type is being implemented for the target plant community at Arabia Bay.
- Table 9 planted total should be 10,200 based on the number of each species provided. I also noted that with 10,200 planted stems over 16 acres would result in only 638 stems per acre, well below the desired planting density of 680.
- Section 8.1/Table 12/Page 18: Success Criteria
    - If shallow freshwater marsh is expected to encompass approximately 20% of the bay area, some discussion on this habitat type should be included in Section 7 as a subcomponent of the cypress savannah target habitat.
- I am bit confused by the inclusion of many of the shrub species (namely Leucothoe racemosa, Lindera melissafolia, and Lyonia lucida) being a) counted towards stem density and b) potentially counted toward tree height averages. Most of the shrubs in Table 9 may not grow above 2 meters tall and contain multiple stems. Recommend some additional clarity as to which species will be counted towards stem density and tree height averages.
- Section 8.3/Table 13/Page 19:
    - See notes above as they pertain to success criteria for vegetation. "Plant" density, which implies all species, is dependent on stem counts, however "plant" height may only be referring to tree species. Average plant height of 10 feet will be difficult to achieve if the shrubs are included in the height estimations. Recommend some clarity to differentiate between planted shrubs and trees and how they contribute to the parameter estimations for success.

Kathy Matthews, USFWS:

- The Service reviewed the public notice for this project in June 2018, before a mitigation plan was developed. Although pondberry is not on the county list for Hoke County, it likely was historically in the county, and is found in Carolina bays and similar habitats. Pondberry was listed as endangered on July 31, 1986.

- The Service is very pleased that Restoration Systems (RS) is proposing to plant pondberry on the site. We do not recommend any specific requirements for monitoring or replanting of the species other than what is already proposed. We do not recommend any specific requirements for survival of the species on the site.

- We recommend that RS ensure that the planted stems are correctly identified as the listed species, the plants are propagated and transported in North Carolina (unless appropriate permits are in-hand for interstate transport/commerce), and that we are provided with name and location of the propagation facility. Also, the Service would appreciate the opportunity to survey the site in the coming years to determine the success of the planted population. This is in addition to the annual monitoring efforts, since we would be interested in determining population numbers over time throughout the site, and not just in the vegetation plots. These plants are rhizomatous, frequently propagating by vegetative sprouts and forming clonal colonies, and we hope that planted individuals will spread throughout appropriate habitat on the site.

- It is through efforts such as this that a species may be recovered and eventually down-listed or removed from the endangered species list. We recommend that NCDMS consider recommending the planting of pondberry in appropriate habitat (described below) to all mitigation providers, and we will strive to also do that when given the opportunity. As you may know, plants that are not on federally-owned lands are not subject to take provisions, (unless such take is in violation of a State law), so hopefully, other mitigation providers will not be discouraged from planting the species.

- Habitat (USFWS website; Beckley and Gramling 2013) : Pondberry is associated with coastal wetland habitats such as mixed pine or hardwood sinks, ponds and other depressions, including pocosins and successional swamp forest. The plants generally grow in shaded areas but may also be found in full sun.

- As for the vegetation success criteria, I believe that the loblolly recruitment may more than make up for any deficit in numbers of planted trees. We welcome planting of additional tree species, however we would not like to see a reduction in the number of planted pondberry stems.

- The mitigation provider will need to contact the North Carolina Plant Conservation Program (NC PCP) for a permit before planting any state-listed (which includes all federally-listed) species. Please let me know if the Service can be of assistance in any way.

Mac Haupt, NCDWR:

1. DWR liked the discussions of the soils in the comment/response letter from DMS (Lindsay Crocker) to RS. DWR is still concerned with the possibility of ponding (other comments will cover later). In addition, DWR would like to know the location and soil series of the Reference Wetland that this section (question/statement #2) referenced.
2. DMS comment letter #10- states that much of the ditch plug material will come from "habitat areas" within the site. DWR cautions that the depressions should not be over 6 inches in depth and obviously the IRT does not expect to find wetland gauges in these areas. In addition, there should be some representation of the location and extent of the depressions in the design sheets (DWR realizes the location will be determined once construction initiates, however, there should be some plan showing extent).

3. DMS comment letter #11- as DWR reads it no surface water will leave the site unless it reaches the outlet elevation of the Terracell structure. DWR is concerned about excessive ponding for the site. More comments will be mentioned later regarding surveyed elevations versus QL2 Lidar.
4. DMS comment letter #12- DWR appreciates the inclusion of a water budget.
5. Section 7.3- DWR appreciates the moving of the current dirt road outside the easement, however, DWR is concerned that the road will be built and the outlet placed based on QL2 Lidar. DWR would prefer that these elevations would be verified by traditional survey methods.
6. Table 11- the growing season for Hoke County, as per the Soil Survey, is from April 5th to October 28th. As been stated in the past, another growing season may be proposed based on soil temperature, however, no growing season may start before March 1st. In addition, any change in growing season must be noted in each wetland hydrologic summary table.
7. Table 12- DWR accepts the proposed 10% saturation minimum for this site, however, DWR will not accept the proposed 8% saturation standard for monitoring years 1 and 2. That will be an IRT decision once the data for these monitoring years have been reviewed.
8. Design sheets-PS4- DWR realizes the ditches will be filled to grade, however, does RS have any concerns that the ditches, other than the plugged areas may still facilitate drainage of the wetland? In other words, unless work is undertaken to compact the material (clay?) filling the ditches, areas may still drain. Will RS/Axiom require the entire ditch be filled with compacted clay or non-impervious material?
9. Design sheets 5 and 6- DWR would prefer that the figures be supported with surveyed in elevations, especially the constructed road, inlet, outlet of the Terracell and on sheet 6 spot elevations within the site showing elevation differences near the rim and in the center of the site.
10. DWR found (in a different section than the other figures) a Figure 3 with Arabia Bay elevations based on the QL2 Lidar. This figure should have been with the others, however, it does show a considerable amount of elevation variation which would remove the need to create "habitat areas".
11. Figure 10 displays the monitoring components proposed for the site. DWR would like at least four gauges placed near the outer rim or outside the innermost elevation line as seen in Figure 7. For example, DWR would like a gauge in the outer area where the road was removed, also, the other 3 gauges should be spaced within these outer areas. The other 11 gauges should be placed to address differences in elevation throughout the site.
12. Each wetland gauge should be tied to a specific ground elevation. These elevations should be representative of the site and tied to a surveyed in elevation.

Kim Browning, USACE:

1. It is anticipated that water levels for this project will vary seasonally and across years from inundated to dry, especially given the fact that the main input is rainfall; however, the hydrology standard should be at least 10% (preferably 12%) across the site, with considerations to be taken in the first few years after construction.
2. From a wildlife standpoint, I would be interested to know the amphibian species composition at the closure of this project, both in the summer and the winter, assuming it's successful in restoring wetland habitat. These isolated wetlands are often the only landscape feature available for amphibian reproduction in large areas.
    a. Has any consideration been made regarding the condition of the existing soil, specifically the effects of agricultural nutrients and pesticides, on proposed vegetation and habitat? (Perhaps a good justification for Table 7B-Habitat)
3. I would recommend conducting hydrology monitoring often, in the first few years, using a combination of piezometers, wells and water level gauges in order to get accurate data. I think a few of the wells should be moved closer to the outer edge of the site. Also, considering that this proposed system is rainfall driven, perhaps gathering data on air temperature, humidity, wind speed, etc. would be beneficial in justifying the hydrology each monitoring year.
    a. Is there a reference wetland with a gauge?
4. Section 3.3: since the approved JD indicates that there are currently no jurisdictional wetlands, a 404 permit may not be required, unless the outlet of the project involves jurisdictional waters.

5. Table 6: In the reference forest ecosystem, were wetland grass species present? Since 20% of the bay area is expected to be freshwater marsh, this may be an opportunity to incorporate desirable herbaceous species.
6. Table 11: Under Wetland Restoration, adding annual inspections of the clay plugs (if possible) may be beneficial in ensuring you meet this parameter.
    a. Also, it would be helpful to add a section in the monitoring section to including inspecting site boundaries and terracell drop structures (I did find some of this in the Maintenance Plan).
7. It is likely that you will not be able to plant vegetation until the wetland establishes, so vegetative monitoring may need to be extended a year.

Kim Browning
Mitigation Project Manager
Regulatory Division