Barlow Canal Nutrient Offset Mitigation Bank

Bank Parcel Development Package

October 2014

Greene Environmental Services, LLC

Tar-Pamlico River Basin Umbrella Mitigation Bank

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Submitted to:

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GES **Greene Environmental Services**

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1.0 Project Location and Description

The proposed Barlow Canal Nutrient Offset Mitigation Bank (Bank) is located in Edgecombe County, approximately 3.5 miles northeast of the town of Tarboro, NC and may be accessed by exiting US 64 at Exit 486 in Princeville, immediately east of Tarboro and travelling north on US 258/ NC 122 for 3 miles (Figure 1). From the US 258 and NC 122 divergence, the right fork (NC 122) continues for approximately 1.3 miles to Cherry Hill Church Road and travel south approximately 0.8 miles to an unpaved farm road on the right; follow the farm road approximately 0.8 miles to the project location. The latitude/longitude coordinates of the site are approximately 35.92225°N and -77.47392°W.

Greene Environmental Services, LLC (GES) of Snow Hill, North Carolina proposes this nutrient offset Bank to improve the water quality in the Tar-Pamlico River Basin by providing offsite mitigation for development impacts within the8-digit Hydrologic Unit Code (HUC) 03020103 of the Tar-Pamlico River Basin. Improvements to water quality include but are not limited to: uptake and sequestration of eutrophic nutrients (chiefly nitrogen-containing plant nutrients and phosphate) in surface runoff and subsurface flow from adjacent agricultural lands and stabilization of soils within the Bank and interception of eroding soils from adjacent lands that would otherwise enter and adversely impact the waterways; moderating microclimate and thermal pollution of waterways; improving habitat for aquatic species in adjacent waterways and terrestrial species within the Bank and improving the water storage capacity of the site (Castelle, et al. 1994; Spruill 2004).

The proposed bank parcel is located within the Lower Tar Watershed (HUC: 03020103). Stormwater runoff from this site drains into the Barlow Canal (Not Indexed in the NCDENR, Tar-Pamlico Basinwide Water Quality Plan), which discharges directly to the Tar River approximately 2 miles downstream from the project site (Figure 1).

The proposed Bank totals 20 acres, which, with the exception of 0.02 acres of existing trees and stands (described in Section 2.2 of this document), will be designated for nutrient offset buffer

restoration. This bank parcel shall be established under the terms and conditions of the Greene Environmental Services Tar-Pamlico River Basin Riparian Buffer and Nutrient Offset Umbrella Mitigation Banking Instrument (UMBI) made and entered into by Mr. Bobby Ham of Greene Environmental Services, LLC, acting as the Bank Sponsor and the North Carolina Department of Environment and Natural Resources – Division of Water Resources on May 1, 2013.

A site visit was conducted by NC-DENR - Division of Water Resources staff, Katie Merritt and Sara Knies, on March 10, 2014. At that time, the configuration and extent of the proposed mitigation bank were not finalized; so, any potentially affected waterways were assessed to determine if they were subject to Tar-Pamlico Buffer Rules. This Bank was originally planned to be named Cherry Hill Church Road, as indicated on the letter from Ms. Knies (Appendix A); we renamed the project, Barlow Canal Nutrient Offset Mitigation Bank to better identify the principal hydrologic feature being mitigated. An onsite stream determination was conducted by Ms. Knies for subjectivity to the Tar-Pamlico Buffer Rule. Barlow Canal (Feature B on a map in Ms. Knies' Stream Determination Letter included in Appendix A) was determined to be a perennial stream and subject to the Tar-Pamlico Buffer Rule. Feature C on Ms. Knies maps was not assessed as a perennial stream but is hydrologically connected to Barlow Canal and receive untreated stormwater runoff from the adjacent crop lands, which is then discharged into Barlow Canal, thus is suitable for nutrient offset mitigation. Features A and D on Ms. Knies' map will not be components of the proposed Bank but may be included future bank expansions. Two field drainage ditches (not indicated on Ms. Knies' map), Ditch A and Ditch B are hydrologically connected to Barlow Canal and are being included in this proposed Bank project. Based on the site visit, Ms. Merritt determined that all features shown in Figure 2 would be suitable for nutrient offset mitigation. There are no drainage district easements on the lands proposed for inclusion in the Bank (Appendix A).

The proposed 20-acre, Barlow Canal Nutrient Offset Mitigation Bank, will be partitioned into four tracts as described in Table 1 below and in Figures 2 and 3a and 3b. With the exception of sparsely vegetated strips along the two ditch banks comprising of mostly native and non-native herbaceous and woody vegetation, the entire bank parcel is in agricultural cropland. Soybeans were cropped during the 2014 growing season. Pending approval of this BPDP, the project area will be planted

with native tree seedlings between January and February 2015. Subsequently, annual monitoring reports will be submitted to NC-DENR, Division of Water Resources for the following five years.

Table 1. Tract characteristics at the Barlow Canal Mitigation Bank.

Parameter	Tract 1	Tract 2	Tract 3	Tract 4
Acreage	4.46	5.44	6.27	3.83
Percent of Total Bank Area	22.30	27.20	31.35	19.15
Soils (described in Table 2 below)	Ro	Ro	Ro, Pu	Ro, DgA, Pu, AaA
Hydrologic Features Being Mitigated	Un-named Tributary (UT)	Un-named Tributary (UT) and Barlow Canal	Field Drainage Ditch A and Barlow Canal	Field Drainage Ditch B and Barlow Canal

2.0 Project Area - Existing Conditions

Existing site conditions were assessed based on published documents and maps and from site visits during the spring and summer of 2014. Summaries are provided in the following subsections.

2.1 Geologic and Soil Characteristics

Based upon review of the United States Geological Survey (USGS) Speed, North Carolina Quadrangles, the proposed Bank Parcel is located adjacent to the Barlow Canal and an un-named tributary (UT) to Barlow Canal with elevations ranging from ± 49-feet to ± 51-feet. Topographic relief and surface drainage is generally south and west (Figures 4 and 5).

The property is located within the Upper Coastal Plain Physiographic Province, within the Southeastern Plains Ecoregion (more specifically the Southeastern Floodplains and Low Terraces subtype). The Southern floodplain forest subtype predominantly includes primarily bottomland hardwood forest and cypress-gum swamp vegetative communities

The Soil Survey of Edgecombe County, North Carolina (Soil Conservation Service, 1979) indicates four soils series of two soil associations for the soils mapped at the project site. (Table 2 and Figure 6). The dominant soil series, Roanoke loam, is in the Roanoke - Conetoe - Portsmouth Association; as is the subdominant series Portsmouth fine sandy loam. The Soil Survey describes this association as:

"Nearly level and gently sloping, somewhat excessively drained to moderately well drained soils that have a loamy subsoil or sandy underlying material; on stream terraces."

In addition, other subdominant soil series mapped at the project site are Altavista fine sandy loam and Dogue fine sandy loam. The Soil Survey describes this association as:

"Nearly level and gently sloping, very poorly drained to poorly drained soils, and well drained soils that have a clayey to sandy subsoil; on stream terraces."

Table 2. Mapped soils, and their pertinent parameters, at the Barlow Canal Mitigation Bank project site (NRCS 1979).

Pertinent Parameters	**Soil Series**			
	Roanoke	**Dogue**	**Portsmouth**	**Altavista**
Soil Mapping Symbol	Ro	DgA	Pu	AaA
Soil texture	Loam	Fine sandy loam	Fine sandy loam	Fine sandy loam
Landscape Position	Broad flats and depressions of stream terraces	Stream terraces, 0-3 percent slopes	Broad flats of stream terraces	Stream terraces, 0-2 percent slopes
Drainage	Poorly drained	Moderately well-drained	Very poorly drained	Moderately well-drained
Water Table	Seasonally high	Seasonally high	Seasonally high	Seasonally high
Flooding Potential	Frequent and brief	None	None	None
Agricultural Potential	High if drained, otherwise low	High	High if drained, otherwise low	High
Silvicultural Potential	High for broadleaf and needle-leaf species; 2w (high potential, wetness limitation)	High for broadleaf species; 2w (high potential, wetness limitation)	High for broadleaf and needle-leaf species; 2w (high potential, wetness limitation)	High for broadleaf and pine species; 2w (high potential, wetness limitation)
Prevalence at Barlow Canal Project Site	Ro only	Ro only	Ro dominant, Pu very minor	Ro, DgA, Pu, AaA approx. equally represented

2.2 Vegetative Communities

With the exception of a narrow ditch bank strip of herbaceous and woody vegetation, the entire Barlow Canal Mitigation Bank project site is presently in actively cultivated farm fields; soybeans were cropped during the 2014 growing season (Appendix B).

On the opposite side of the northern section of the UT from Tract 1, there is a pine plantation consisting of approximately 20-30 year old loblolly pines (*Pinus taeda*) and a mix of hardwoods, especially sweetgum (*Liquidambar styraciflua*) (Figure 2). Along the segments of UT adjacent to Tracts 1 and 2, is a herbaceous plant, woody shrub and woody vine field border approximately 10 feet wide consisting of poison ivy (*Toxicodendron radicans*), catbriar (*Smilax* spp.), blackberry (*Rubus* spp.), muscadine and other native grapes (*Vitis* spp.) and Japanese honeysuckle (*Lonicera japonica*). Interspersed along the UT are several saplings and trees including southern hackberry (*Celtis laevigata*), swamp chestnut oak (*Quercus michauxii*), willow oak (*Quercus phellos*), water oak (*Quercus nigra*), red maple (*Acer rubrum*), dogwood (*Cornus florida*), sweetbay (*Magnolia virginiana*) and black cherry (*Prunus serotina*). The basal area of individual trees greater than five inches in diameter and the area of stands containing trees greater than five inches in diameter that are on top of the ditch bank or landward from the top of the ditch bank was measured and these areas will be subtracted from the available mitigation credits. In Tracts 1 and 2, a total area of 1072 square feet (0.0246 acres) will not be available as mitigation credits.

Along Barlow Canal, adjacent to portions of Tracts 2, 3 and 4, there are no mature trees on side of the canal proposed for inclusion in the mitigation bank. Along Ditch A, there are no mature trees. Along Ditch B there are several loblolly pines (*Pinus taeda*) that are greater than five inches in diameter; the basal area of these trees totals 11 square feet (0.0002 acres) and this area will be subtracted from the available mitigation credits. Shrubby, woody vegetation along the canal and drainage ditches is comprised of immature or recently mowed loblolly pine (*Pinus taeda*), black cherry (*Prunus serotina*), sweetgum (*Liquidambar styraciflua*), eastern cottonwood (*Populus deltoides*) and black willow (*Salix nigra*); herbaceous vegetation includes, pigweed (*Amaranthus palmeri*), Japanese honeysuckle (*Lonicera japonica*), blackberry (*Rubus* sp.), poison ivy

(*Toxicodendron radicans*), goldenrod (*Solidago* sp.), dog fennel (*Eupatorium capillifolium*), pokeweed (*Phytolacca americana*), various grasses (*Poa* spp.) and sedges (Cyperaceae), and kudzu (*Pueraria* sp.). In total, and area of 1083 square feet (0.02 acres) will not be available for mitigation credits due to the presence of trees greater than five inches in diameter (DBH). Photographs representative of the stream bank and ditch bank vegetation are provided in Appendix B.

Based on existing remnants of mature trees and understory species as well as position in the landscape and soils, prior to conversion to agriculture and drainage, the Bank site was likely occupied by the Nonriverine Wet Hardwood Forest and/or a Mesic Mixed Hardwood Forest (Coastal Plain Subtype). These community types, described by Schafale and Weakly 1990), are highly variable and now rare due to conversion to agriculture.

2.3 Threatened and Endangered Species

The US Fish and Wildlife Service (USFWS) and NC Natural Heritage Program (NHP) databases were searched for federally listed threatened and endangered plant and animal species for Edgecombe County, NC. Two federally listed species, the red-cockaded woodpecker (*Picoides borealis*) and the Tar River spineymussel (*Elliptio steinstansana*), are currently listed in Edgecombe County (Table 3).

The NC Natural Heritage Program Map Viewer is currently unavailable (last attempt October 6, 2014); however, information contained in the EDR Radius Map Report (Report) shows one occurrence of the red-cockaded woodpecker approximately 0.75 miles north of the Barlow Canal Mitigation Bank Site (Environmental Data Resources, Inc, 2014). Habitat for the red-cockaded woodpecker does not exist on the Mitigation Bank Site, therefore no impact is anticipated. The Report also documents that there are no Significant Natural Areas within the Bank Site.

Table 3. Listed threatened and endangered species in Edgecombe County, NC.

Species	Federal Status	Habitat
Red-cockaded woodpecker (*Picoides borealis*)	Endangered	The red-cockaded woodpecker prefers mature stands of longleaf pine (*Pinus palustris*) trees, generally over 80 years old. Habitat requirements average 125 to 200 acres in area. Although some cavities have been found in pine forests as small as 60 acres.
Tar River spineymussel (*Elliptio steinstansana*)	Endangered	The Tar River Spineymussel requires relatively silt-free, uncompacted gravel and/or coarse sand in fast-flowing, well oxygenated stream reaches. The species has only been documented in the main stem of the Tar River, Shocco Creek, Fishing Creek, Little Fishing Creek, and Swift Creek in the Tar-Pamlico Basin.

2.4 Environmental Issues

Preliminary data obtained from the EDR Radius Map Report regarding the potential for on-site or nearby sources of contamination. EDR maintains an updated database of current and historical sources of contamination. All storage tanks, whether above-ground or underground are identified, as well as superfund sites, landfills, hazardous waste sites, and other potential hazards. No sites were noted on their database within a one-mile radius of the Bank site (Environmental Data Resources, Inc., Inquiry Number: 4090157.2s - Cherry Hill Church Road, Tarboro, NC September 29, 2014; and excerpt of this report is provided in Appendix A).

2.5 FEMA Floodplain/Floodway Mapping

As shown in Figure 7, the Barlow Canal Mitigation Bank Site does not contain areas designated by Federal Emergency Management Association (FEMA) as floodway or 100-year flood boundary. Therefore, no floodplain or floodway impacts are anticipated.

3.0 Proposed Nutrient Offset Restoration Plan

During the 2014 growing season, the proposed Bank project area was planted in soybeans. During the fall of 2014, the soybeans will be harvested then the crop stubble and the land surface will be disked and leveled as per normal agricultural operations by the landowners. The land will either remain fallow or planted in a cover crop of annual rye or similar small grain. Along stream banks and ditch banks, herbaceous vegetation and small woody shrubs and vines will be mowed. Along a segment of Ditch B in Tract 4, there is an existing (several years prior) berm created by excavated spoil material; site preparation will include the removal of all or portions of this berm such that overland runoff is not impeded.

The areas to be planted in Tracts 1, 2 and 3 will extend from the top of the stream bank of the UT and Barlow Canal or ditch bank of Ditch A, outward to distance of 198 feet, thus some allowance will be included as to not exceed the 200-foot maximum distance. Tract 4 will extend outward from Ditch B to a distance of 114 feet (Figure 8). In Tracts 1 and 2, only the eastern side of the UT will be planted; the western side is not owned by a participating landowner and is not part of the Bank. Similarly, in portions of Tracts 2, 3 and 4 bordering Barlow Canal, only the northern side of the Canal will be planted; the southern side is not part of the participating landowner's property. In Tracts 3 and 4, only the eastern side of Ditches A and B, respectively, will be planted.

Bareroot seedlings of character trees (Table 4) will be planted between December, 2014 and February, 2015 within the proposed Mitigation Bank project area. "Character Trees" are defined as tree species identified from a survey of local vegetation on less degraded sections of the specified stream and from reference literature that details native species.

Bareroot seedlings will be purchased from ArborGen Inc., of Ridgeway, SC and from the North Carolina Forest Service's Claridge Nursery in Goldsboro, NC. The ArborGen seedling nursery is located near Blenheim, SC in northeastern South Carolina, which is approximately 150 statute miles from the Barlow Canal site. Seedlings will be planted at an approximate spacing of 10-ft by 10-ft; planting at this rate will yield 436 seedlings per acre.

Table 4. Seedling species and quantities required for planting the proposed 20-acre Barlow Canal Mitigation Bank.

Seedling Species	Common Name	Proposed Number of Seedlings in 20-Acre Bank	Estimated Number of Seedlings per Acre
Juglans nigra	Black Walnut	320	16
Liriodendron tulipifera	Yellow poplar	1,500	75
Platanus occidentalis	Sycamore	1,400	70
Quercus lyrata	Overcup oak	2,000	100
Quercus pagoda	Cherrybark oak	1,500	75
Quercus shumardii	Shumard's oak	2,000	100
Totals		**8,720**	**436**

The seedlings reserved for planting are all well adapted for the soils and site conditions at the Barlow Canal Mitigation Bank project area. These six seedling species include: black walnut (*Juglans nigra*), yellow poplar (*Liriodendron tulipifera*), sycamore (*Platanus occidentalis*), overcup oak (*Quercus lyrata*), cherrybark oak (*Quercus pagoda*), and Shumard's oak (*Quercus shumardii*) (Table 4). None of these species have been found in the nearby forested areas but likely may have been present prior to habitat alteration due to timber harvest and conversion of the land to agricultural production. With the exception the "weedy" vegetation along the top of the ditch banks, soil and site conditions are somewhat uniform across the project area. Thus a random mix of the six species will be planted. Sycamore will be planted most frequently along the top of the ditch banks, due to its typically high success rate and rapid growth; thus assumed better able to compete with the weedy vegetation. Alternative trees for planting include: mockernut hickory (*Carya tomemtosa*), persimmon (*Diospyros virginiana*), and laurel oak (*Quercus laurifolia*).

The invasive species, kudzu (*Pueraria* sp.), is present along portions of the ditch banks, especially at the confluence of Ditch B with Barlow Canal (Appendix B). A vegetation control program will be implemented to suppress kudzu and other invasive and competing species. Mean of vegetation control will include the application of herbicide as well as mechanical removal using hand-held

rotary trimmers outfitted with cutting blades.

According to the UMBI, vegetative success criteria is based upon the density and growth of planted character tree species. Therefore, the planting plan will be based on having a minimum of 320 living planted stems per acre at the end of the 5-year monitoring period.

4.0 Monitoring and Maintenance Plan

The Barlow Canal Mitigation Bank Parcel will be monitored annually for five years (or until NC-DENR- DWR's success criteria have been met). Monitoring activities will not begin until Fall 2015 and at least five months after the initial planting. Supplemental planting and necessary site modifications will be implanted as necessary. Monitoring activities will follow the terms and conditions of the Greene Environmental Services Tar-Pamlico River Basin Riparian Buffer and Nutrient Offset UMBI.

Vegetative success will be monitored within the restored Tar-Pamlico nutrient offset buffer and a monitoring report will be provided to DWR no later than December 31st of each monitoring year. The report will include vegetative plot data, monitored in accordance with the CVS-EEP Protocol for Recording Vegetation (CVS-EEP, v. 4.2). Plots measuring 100 m^2 (ten by ten meter squares) will be permanently established (Figure 9). The Barlow Canal Mitigation Bank Parcel will contain eighteen vegetative monitoring plots placed randomly throughout the site. The plant species, survival rates, and character species density of the planted stems will be recorded within each plot, as well as general notes on problems encountered or unique situational developments. A map will be generated indicating the relative position of each planted seedling and its survival status, for each plot. Photographs of each plot from the same plot corner will be included in the monitoring reports to provide DWR with a snapshot of the site success each year. At the end of the five year monitoring period, target acreage density for the Tar-Pamlico nutrient offset riparian area is a minimum of 320 planted character trees per acre. Monitoring will take place between late August and November.

If vegetative success criteria are not achieved based on acreage density calculations from combined monitoring plots over the entire restoration area, or if an inspection of the restoration/mitigation site indicates that portions of the site do not have sufficient stem densities or are otherwise deficient, supplemental planting shall be performed with tree species approved by NC-DWR. Supplemental planting shall be performed as needed until vegetative success criteria are met. The quantity of monitoring plots shall be determined in accordance with CVS Protocol, Levels I and II (The Carolina Vegetation Survey - Sampling Methodology and Data Management, Online).

5.0 Financial Assurance and Conservation Easement Language

Greene Environmental Services, LLC will provide a performance bond to ensure completion of all mitigation work. The amount of the performance bond shall be efficient to cover all costs associated with establishing the site for its proposed mitigation. The amount of the performance bond shall be efficient to cover all costs associated with establishing the site for its proposed mitigation, but shall not be less than $150,000. Upon approval of the subject BPDP, Greene Environmental Services, LLC will provide financial assurance in the form of a monitoring bond to ensure that adequate funds are available for completion of the maintenance and monitoring outlined in the BPDP under Section 4.

6.0 Nutrient Offset Mitigation Potential

The Barlow Canal Mitigation Bank Parcel will generate approximately 19.98 acres (20 acres minus the 0.02 acres of existing stream bank vegetation) of riparian restoration along Barlow Canal, a UT and two ditches, which will be protected under a permanent conservation easement. Restoration efforts will generate 19.98 acres of nutrient offset credits, which yields 45,414.94 pounds of nitrogen (N) credits at 2,273.02 lb-N/acre and 2,925.07 pounds of phosphorus (P) credits at 146.40 lb-P/acre. Greene Environmental Services, LLC will maintain one credit ledger for nutrient offset credits which are generated from 0-200 feet back landward from the features depicted in Figure 2.

7.0 References

Castelle, A.J., A.W. Johnson and C. Conolly. 1994. Wetland and stream buffer size requirements – a review. *Journal of Environmental Quality* 23(5): 878-882.

Natural Resources Conservation Service (NRCS). 1979. Edgecombe County Soil Survey. (Soil Conservation Service, 1979). Online at: http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/north_carolina/edgecombeNC1979/edgecombe.pdf

Environmental Data Resources, Inc. (ERDI) 2014. Environmental Data Resources, Inc., Inquiry Number: 4090157.2s - Cherry Hill Church Road, Tarboro, NC September 29, 2014.

The Carolina Vegetation Survey - Sampling Methodology and Data Management. Online at: http://cvs.bio.unc.edu/methods.htm

Schafale, M.P. and A.S. Weakly. 1990. Classification of the Natural Communities of North Carolina, Third Approximation. North Carolina Natural Heritage Program, Raleigh, NC. 321pp.

Spruill, T.B. 2004. Effectiveness of riparian buffers in controlling ground-water discharge of nitrate to streams on selected hydrologic settings in the North Carolina Coastal Plain. *Water Science and Technology* 49(3): 63-70.

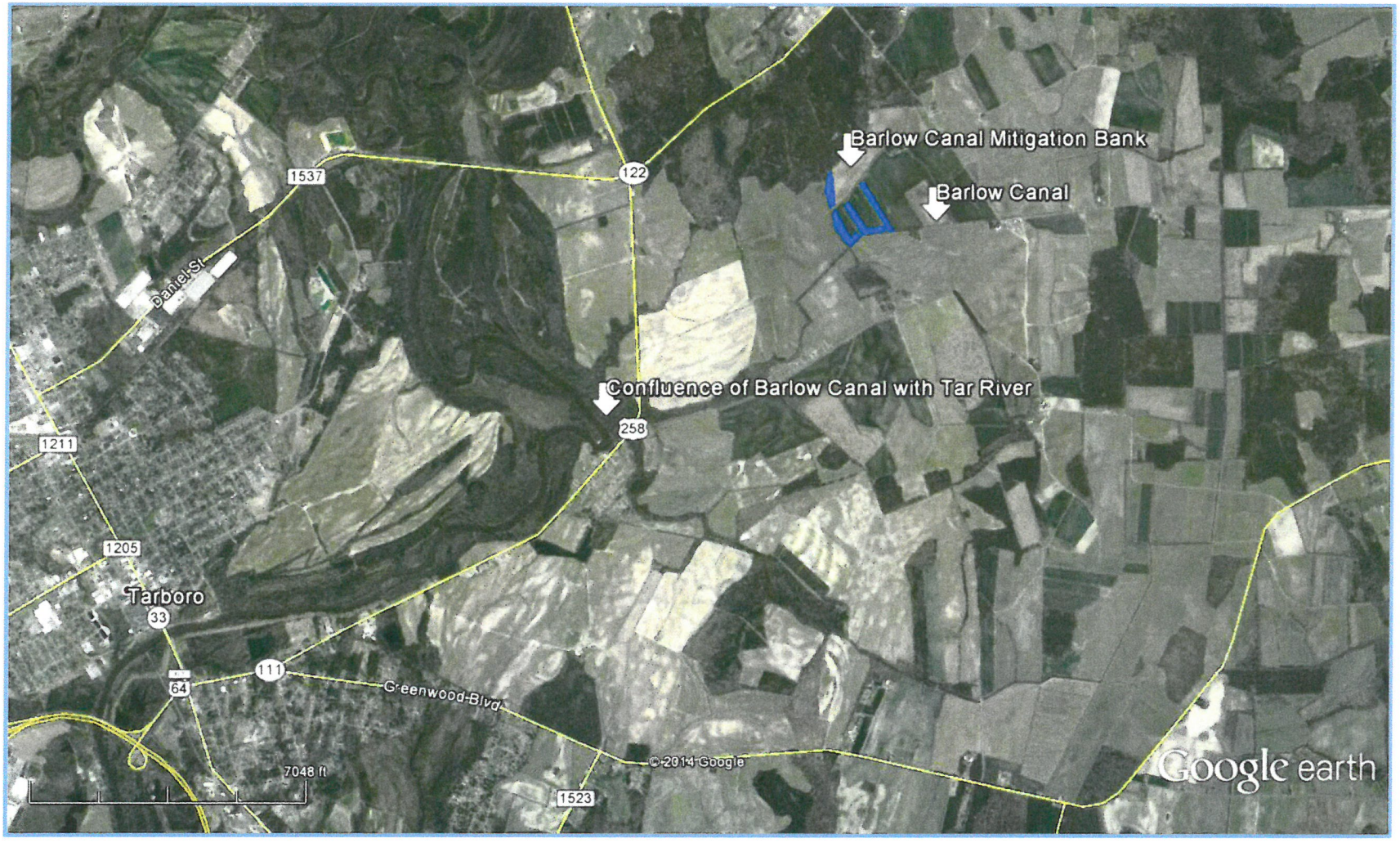
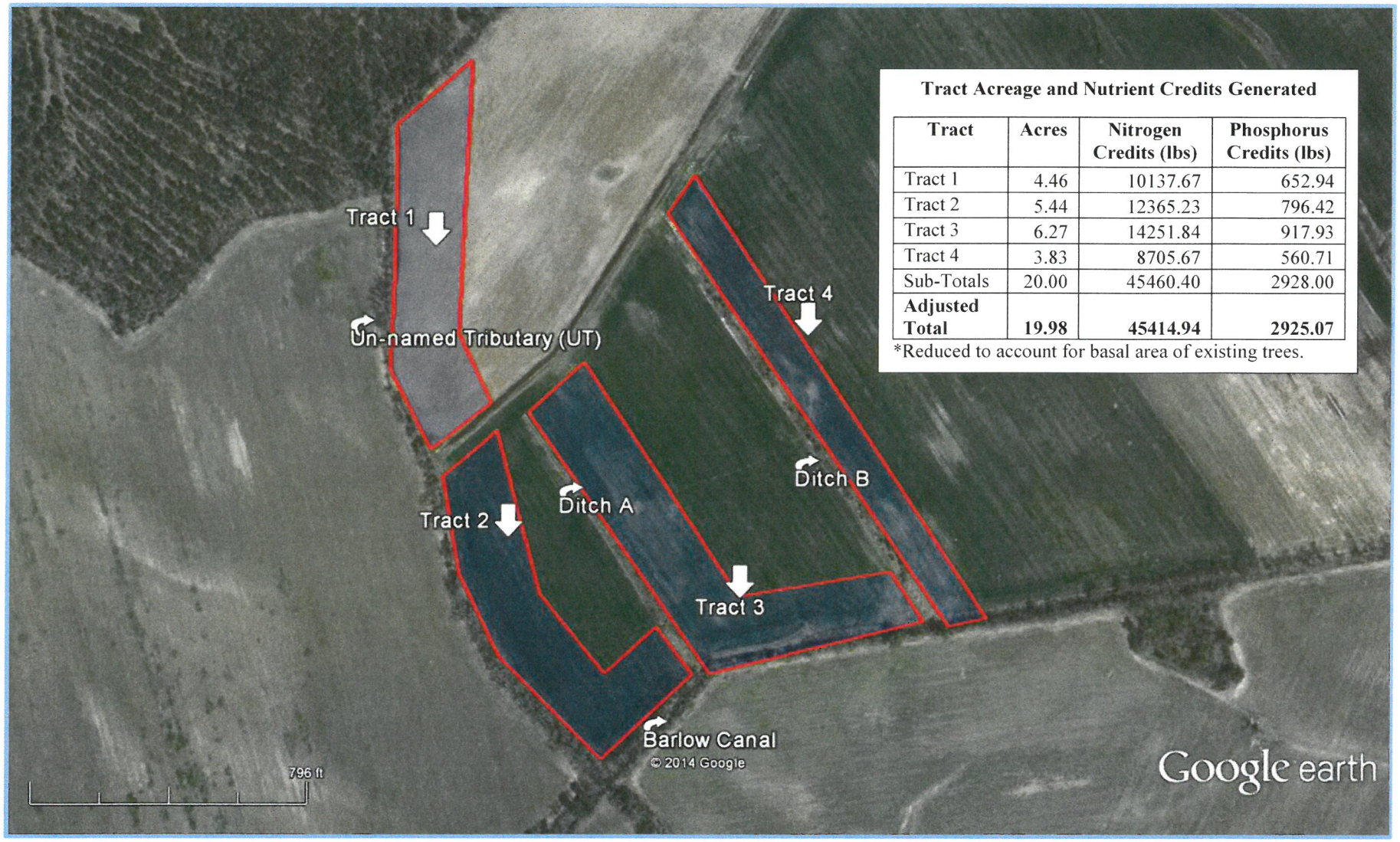


Figure 1. Vicinity map of the Barlow Canal Mitigation Bank area. The project site is located approximately 3.5 miles northeast of Tarboro, NC. Barlow Canal discharges to the Tar River approximately 1.7 miles downstream from the project site.



Tract Acreage and Nutrient Credits Generated

Tract	Acres	Nitrogen Credits (lbs)	Phosphorus Credits (lbs)
Tract 1	4.46	10137.67	652.94
Tract 2	5.44	12365.23	796.42
Tract 3	6.27	14251.84	917.93
Tract 4	3.83	8705.67	560.71
Sub-Totals	20.00	45460.40	2928.00
Adjusted Total	**19.98**	**45414.94**	**2925.07**

*Reduced to account for basal area of existing trees.

Figure 2. Aerial imagery of the Barlow Canal Mitigation Bank project site. The Bank is divided into four tracts, identified by blue polygons (polygon dimensions are approximations).

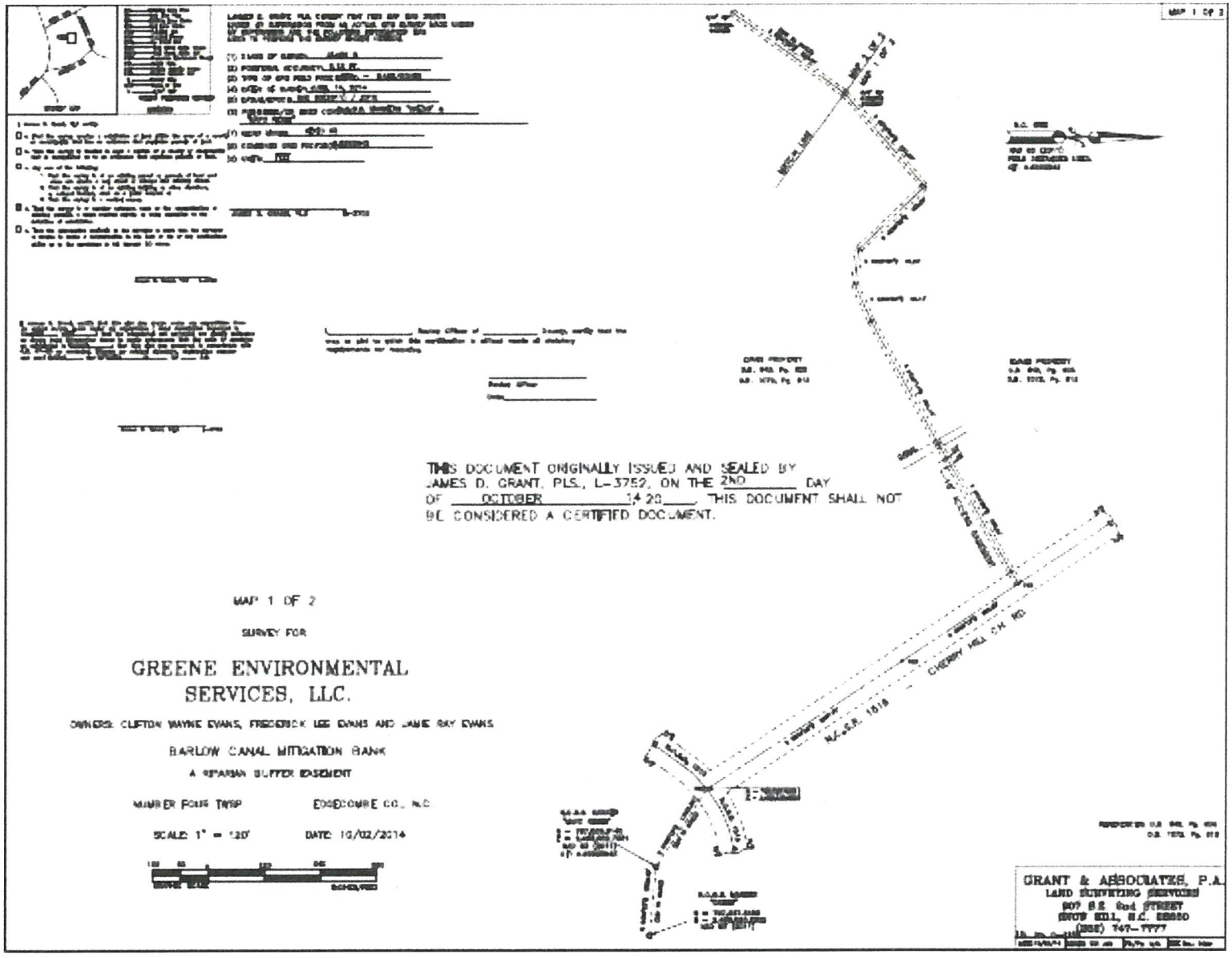


Figure 3a. Copy of survey plat (Plat 1 of 2) depicting farm access road from Cherry Hill Church Road to project site.

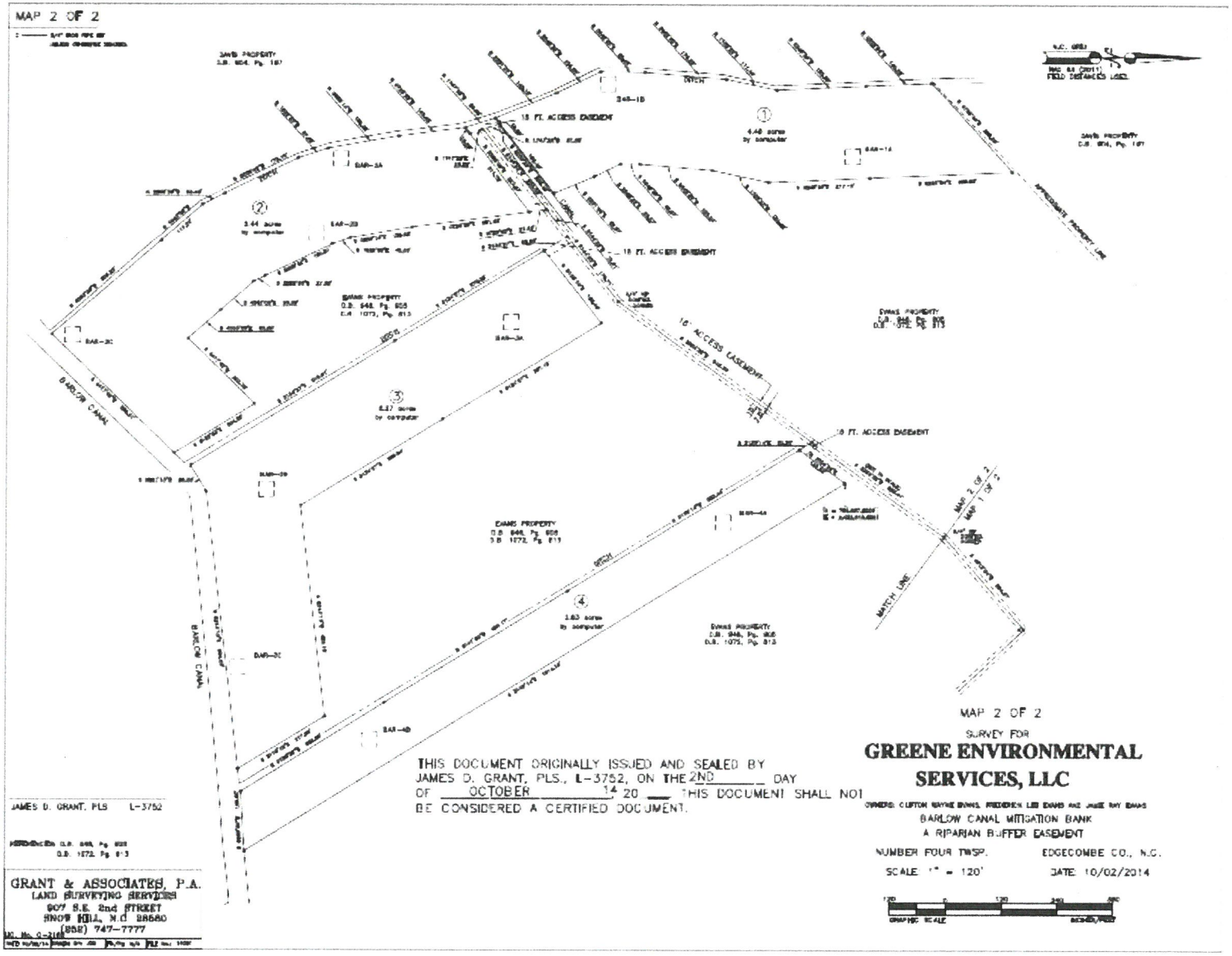
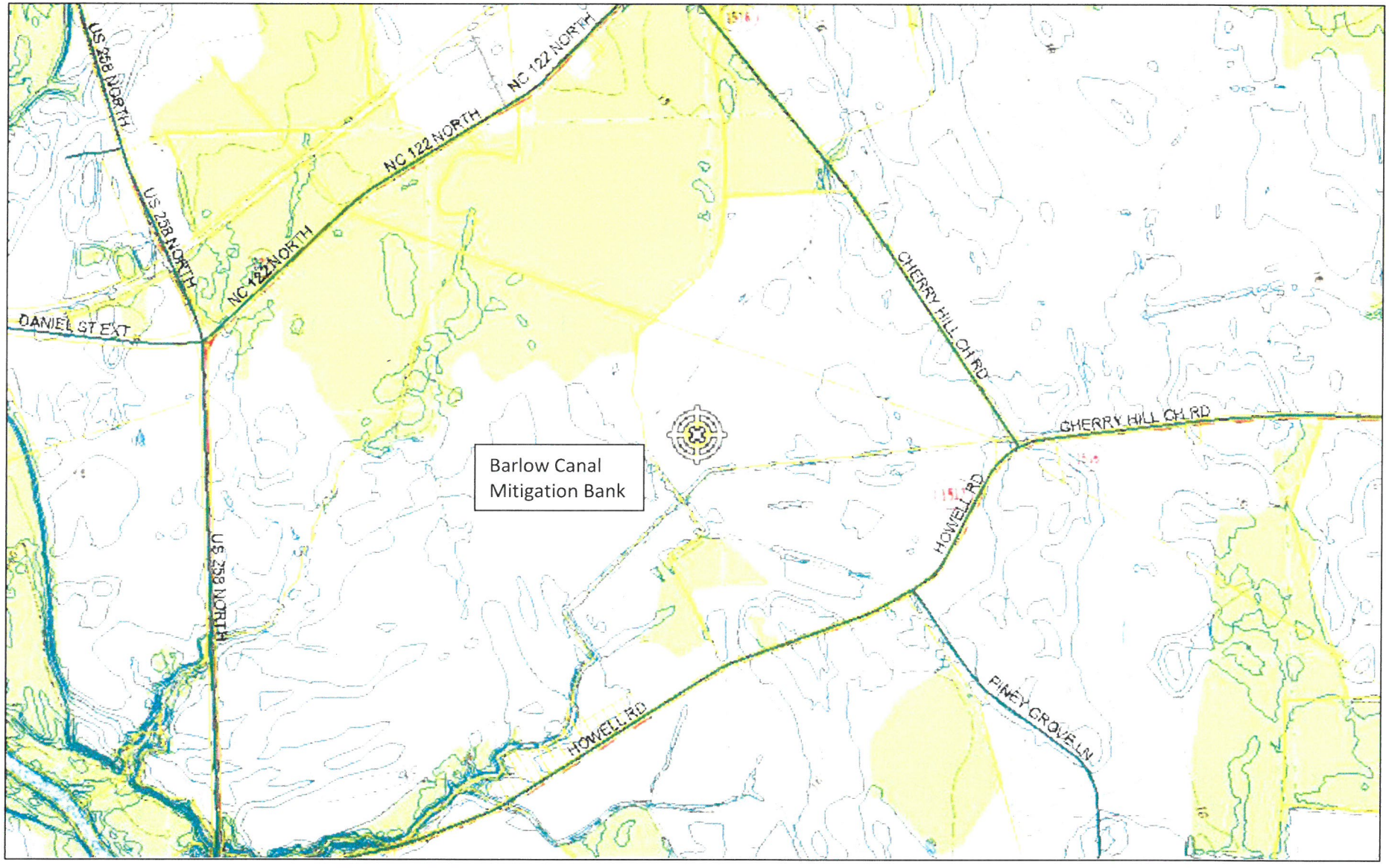


Figure 3b. Copy of survey plat (Plat 2 of 2) depicting Barlow Canal Mitigation Bank.



1:19,200

0 0.15 0.3 0.6 mi

0 0.25 0.5 1 km

Figure 4. USGS Topographic Map depicting the location (compass symbol) of the Barlow Canal Mitigation Bank project area within the regional area.

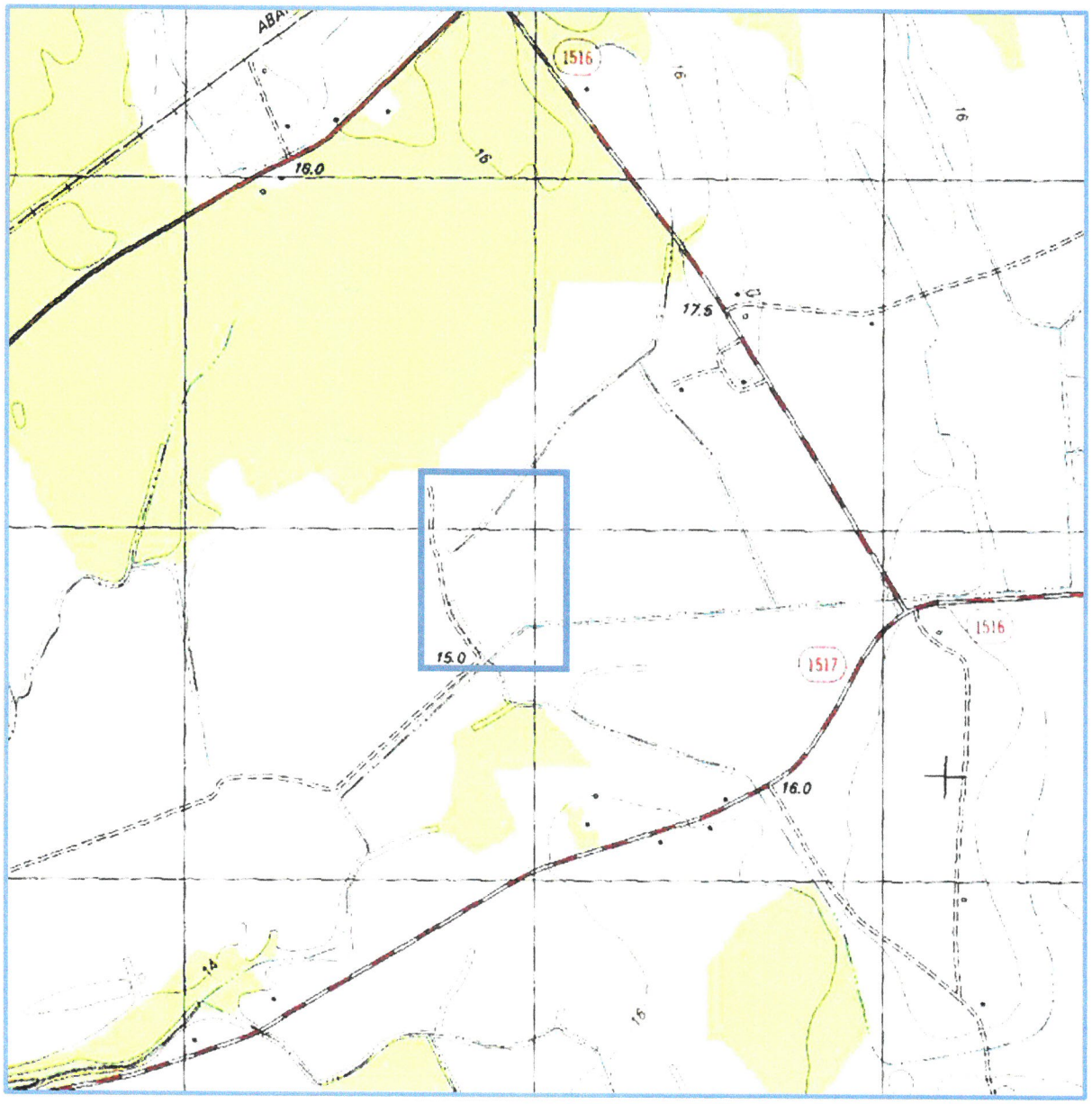
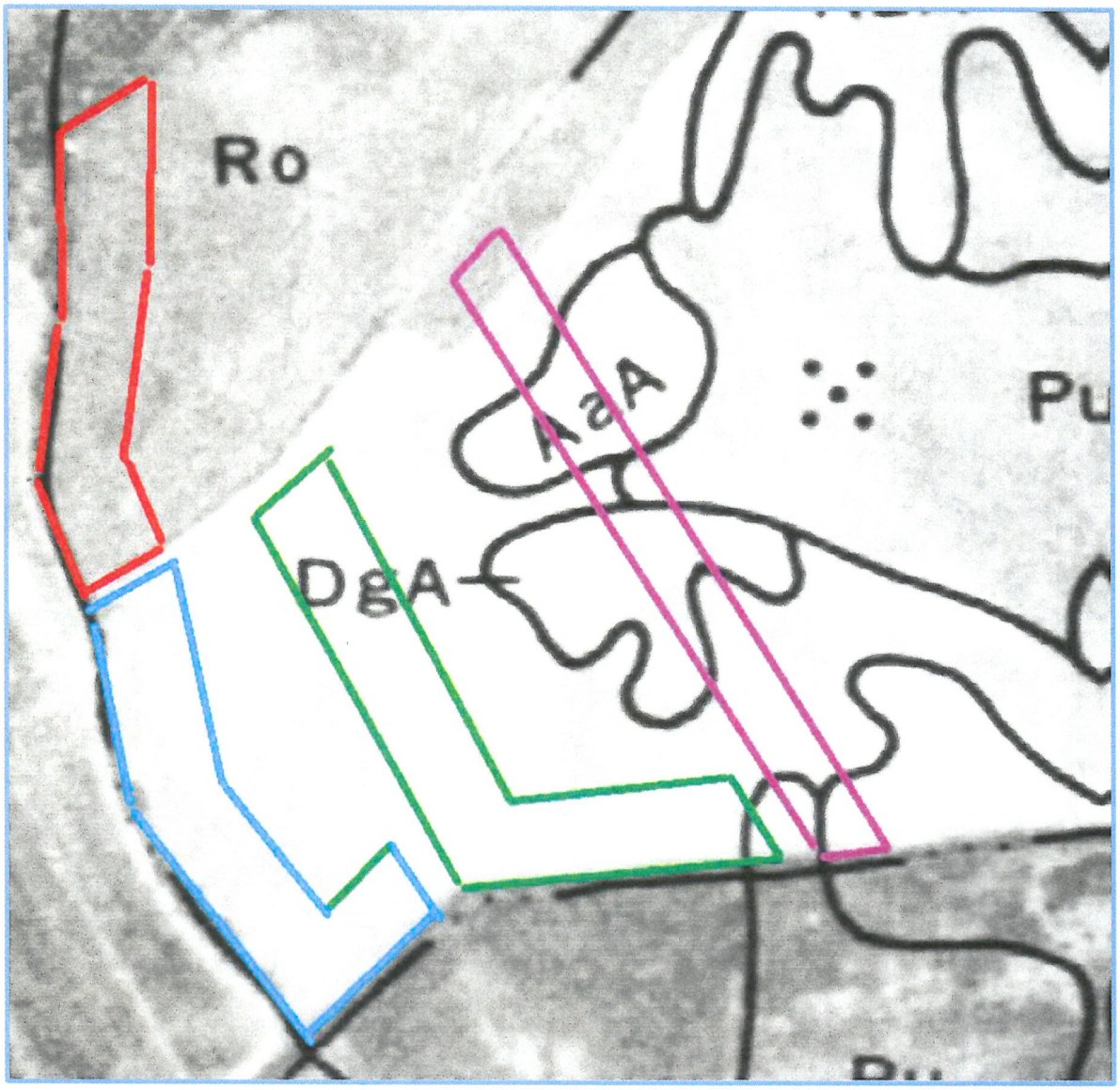


Figure 5. Local USGS Topographic Map from Speed, NC, 1:24,000 Quadrangle. The Barlow Canal Mitigation Bank is within the area delineated by the blue rectangle at the center of the map.



Legend

Tract	Polygon Color	Soils Series Present in Tract
Tract 1	Red	Roanoke loam
Tract 2	Blue	Roanoke loam
Tract 3	Green	Roanoke loam, Portsmouth fine sandy loam
Tract 4	Purple	Roanoke loam, Portsmouth fine sandy loam, Dogue fine sandy loam, Altavista fine sandy loam

Figure 6. Soil map of the at the Barlow Canal Mitigation Bank project site. Barlow Canal Mitigation Bank, Bank Parcel Development Package, Greene Environmental Services, LLC, October 2014. Map Source: NRCS, Edgecombe County Soil Survey online at: http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/north_carolina/edgecombeNC1979/edgecombe.pdf

On Following Page

Figure 7. Floodplain / Floodway Map for the Barlow Canal Mitigation Bank vicinity. Federal Emergency Management Agency (FEMA). (ERDI 2014).

This digital Flood Insurance Rate Map (FIRM) was produced through a unique cooperative partnership between the State of North Carolina and the Federal Emergency Management Agency (FEMA). The State of North Carolina has implemented a long term approach to floodplain management to decrease the costs associated with flooding. This is demonstrated by the State's commitment to map flood hazard areas at the local level. As a part of this effort the State of North Carolina has joined in a Cooperating Technical State agreement with FEMA to produce and maintain this digital FIRM.

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR ZONE DESCRIPTIONS AND INDEX MAP
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTP://FRIS.NC.GOV/FRIS

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, 499*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% Annual Chance Flood with Average Depth Less Than One Foot or With Drainage Areas of Less Than One Square Mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*

OTHER AREAS
- Areas Determined to be Outside the 0.2% Annual Chance Floodplain *Zone X*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Accredited or Provisionally Accredited Levee, Dike, or Floodwall
- Non-accredited Levee, Dike, or Floodwall
- BM5510 D — North Carolina Geodetic Survey bench mark
- BM5510 D / BM5510 Z — National Geodetic Survey bench mark / Contractor Est. NCFMP Survey bench mark
- 17 / 12.5 — Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

OTHER FEATURES
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. An accompanying Flood Insurance Study report, Letter of Map Revision (LOMR) or Letter of Map Amendment (LOMA) revising portions of this panel, and digital versions of this FIRM may be available. Visit the North Carolina Floodplain Mapping Program website at http://www.ncfloodmaps.com or contact the FEMA Map Service Center.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRM was provided in digital format by the North Carolina Floodplain Mapping Program (NCFMP). The source of this information can be determined from the metadata available in the digital FLOOD database and in the Technical Support Data Notebook (TSDN).

ACCREDITED LEVEE NOTES TO USERS: If an accredited levee note appears on this panel, check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at: http://www.fema.gov/business/nfip/index.shtm

PROVISIONALLY ACCREDITED LEVEE NOTES TO USERS: If a Provisionally Accredited Levee (PAL) note appears on this panel, check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations. If the community or owner does not provide the necessary data and documentation, or if the data and documentation provided indicates the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at: http://www.fema.gov/business/nfip/index.shtm

LIMIT OF MODERATE WAVE ACTION NOTES TO USERS: For some coastal flooding zones the AE Zone category has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA (or between the shoreline and the LiMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

Limit of Moderate Wave Action (LiMWA)

COASTAL BARRIER RESOURCES SYSTEM (CBRS) NOTE

This map may include approximate boundaries of the CBRS for informational purposes only. Flood insurance is not available within CBRS areas for structures that are newly built or substantially improved on or after the date(s) indicated on the map. For more information see http://www.fws.gov/habitatconservation/coastal_barrier.html, the FIS Report, or call the U.S. Fish and Wildlife Service Customer Service Center at 1-800-344-WILD.

CBRS Area — Otherwise Protected Area

SCALE

Map Projection
North Carolina State Plane Projection Feet (Zone 3200)
Datum: NAD 1983 (Horizontal), NAVD 1988 (Vertical)
1 inch = 500 feet — 1:6,000

0 250 500 1,000 Feet
0 75 150 300 Meters

PANEL LOCATOR

FEMA
National Flood Insurance Program

NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 4759

PANEL LOCATION

COMMUNITY	CID	PANEL	SUFFIX
EDGECOMBE COUNTY	370087	4759	J

MAP NUMBER
3720475900J

MAP REVISED
11/03/04

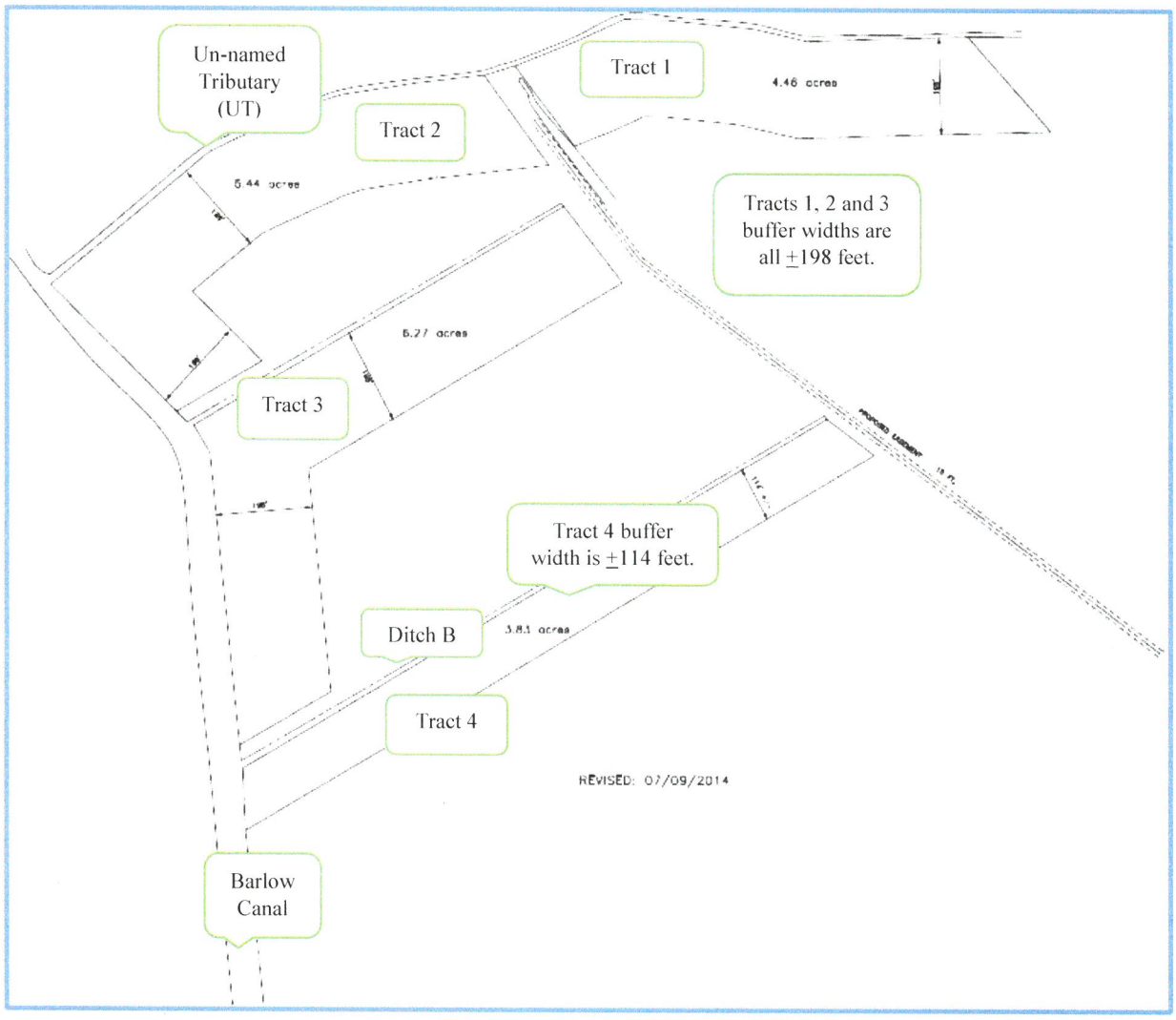


Figure 8. Depiction of tracts excerpted from Barlow Canal Mitigation Bank topographic survey and indicating the widths of the Bank buffers. Buffers widths for Tracts 1-3 are ±198 feet outward from the top of the stream or ditch banks; the width of Tract 4 is ±114 feet.

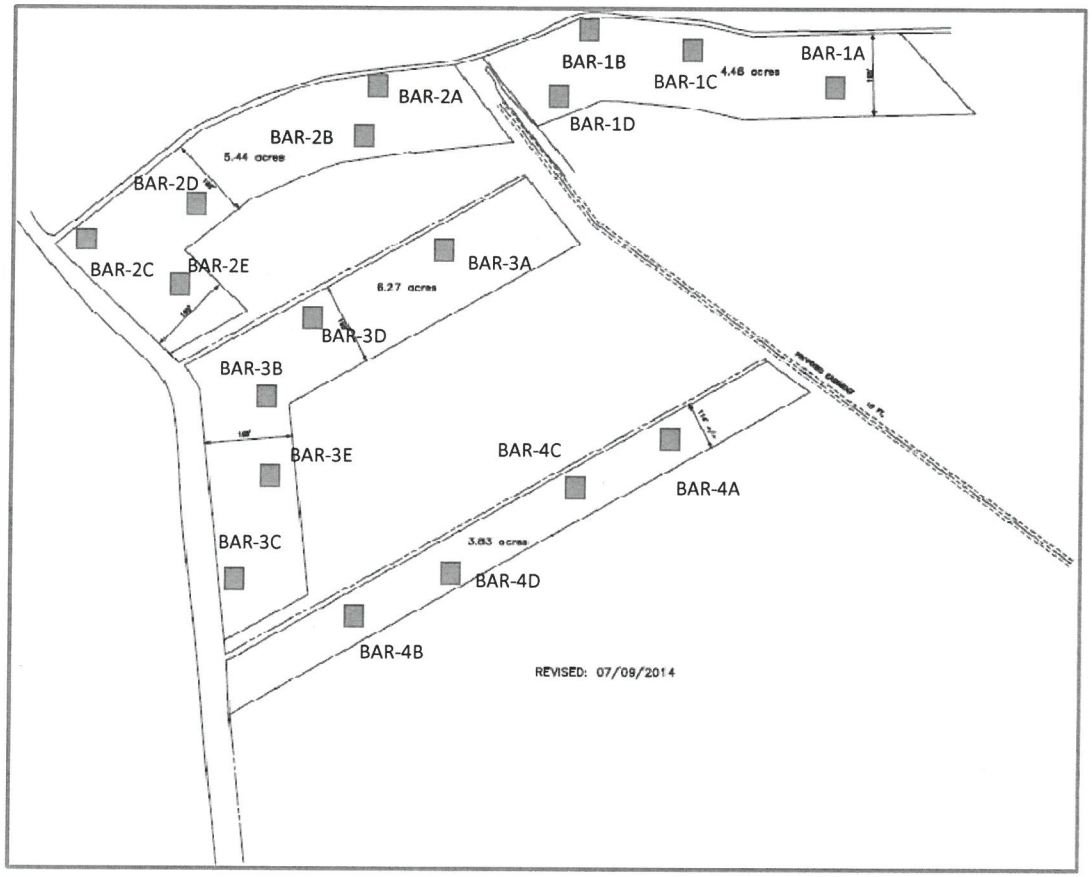


Figure 9. Tract map with 10m x 10m monitoring plots locations. Monitoring plots are as follows, Tract 1: BAR-1A , -1B, -1C and -1D; Tract 2: BAR-2A, -2B, -2C, -2D and -2E; Tract 3: BAR-3A, -3B, -3C, -3D and -3E; Tract 4: BAR-4A, -4B, -4C and -4D.

Appendix A: Supporting Documents

1. Stream Determination letter
2. Drainage District letter
3. EDR excerpt

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Water Resources
Water Quality Programs

Pat McCrory
Governor

Thomas A. Reeder
Director

John E. Skvarla, III
Secretary

March 13, 2014

Jamie Evans
1600 Canterbury Road
Tarboro, NC 27886

Subject: Surface Water Determination Letter
TPRRO#14-062
Edgecombe County

Determination Type.	
Buffer Call	Isolated or EIP Call
☐ Neuse (15A NCAC 2B .0233) ☒ Tar-Pamlico (15A NCAC 2B .0259) ☐ Jordan (15A NCAC 2B 0267)	☐ Ephemeral/Intermittent/Perennial Determination ☐ Isolated Wetland Determination

Project Name: Cherry Hill Church Road Proposed Mitigation Bank

Location/Directions: Subject property is agricultural land used for row crop agriculture; site is proposed for a nutrient offset/buffer mitigation bank. Property is located off of Cherry Hill Church Road in Speed, NC (Pin #'s 4759-35-5680 & 4759-34-0217)

Subject Stream: UT to Tar River

Determination Date: March 10, 2014 **Staff: Sara Knies**

Feature	E/I/P*	Not Subject	Subject	Start@	Stop@	Soil Survey	USGS Topo
A	P		X	Throughout	Throughout	X	X
B	P		X	Throughout	Throughout	X	X
C	Not Assessed **	Not Assessed* *	Not Assessed **	Not Assessed**	Not Assessed**	X	X
D	Not Assessed ***	Not Assessed* **	Not Assessed ***	Not Assessed***	Not Assessed***	X	X

**E/I/P = Ephemeral/Intermittent/Perennial*
***Feature C was not assessed during this site visit. Please contact DWR if a stream determination for this feature is required.*
****Feature D was not assessed during this site visit due to failed pipes in the existing stream crossings; pipes will need to be functioning properly in order for this feature to be accurately assessed*

One NorthCarolina *Naturally*

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

This on-site determination shall expire five (5) years from the date of this letter. Landowners or affected parties that dispute a determination made by the DWR or Delegated Local Authority may request a determination by the Director. An appeal request must be made within sixty (60) days of date of this letter or from the date the affected party (including downstream and/or adjacent owners) is notified of this letter. A request for a determination by the Director shall be referred to the Director in writing c/o Karen Higgins, DWR WeBSCaPe Unit, 1650 Mail Service Center, Raleigh, NC 27699.

This determination is final and binding unless, as detailed above, you ask for a hearing or appeal within sixty (60) days.

The owner/future owners should notify the Division of Water Resources (including any other Local, State, and Federal Agencies) of this decision concerning any future correspondences regarding the subject property (stated above). This project may require a Section 404/401 Permit for the proposed activity. Any inquiries should be directed to the Division of Water Resources (Central Office) at (919)-807-6300, and the US Army Corp of Engineers (Raleigh Regulatory Field Office) at (919)-554-4884.

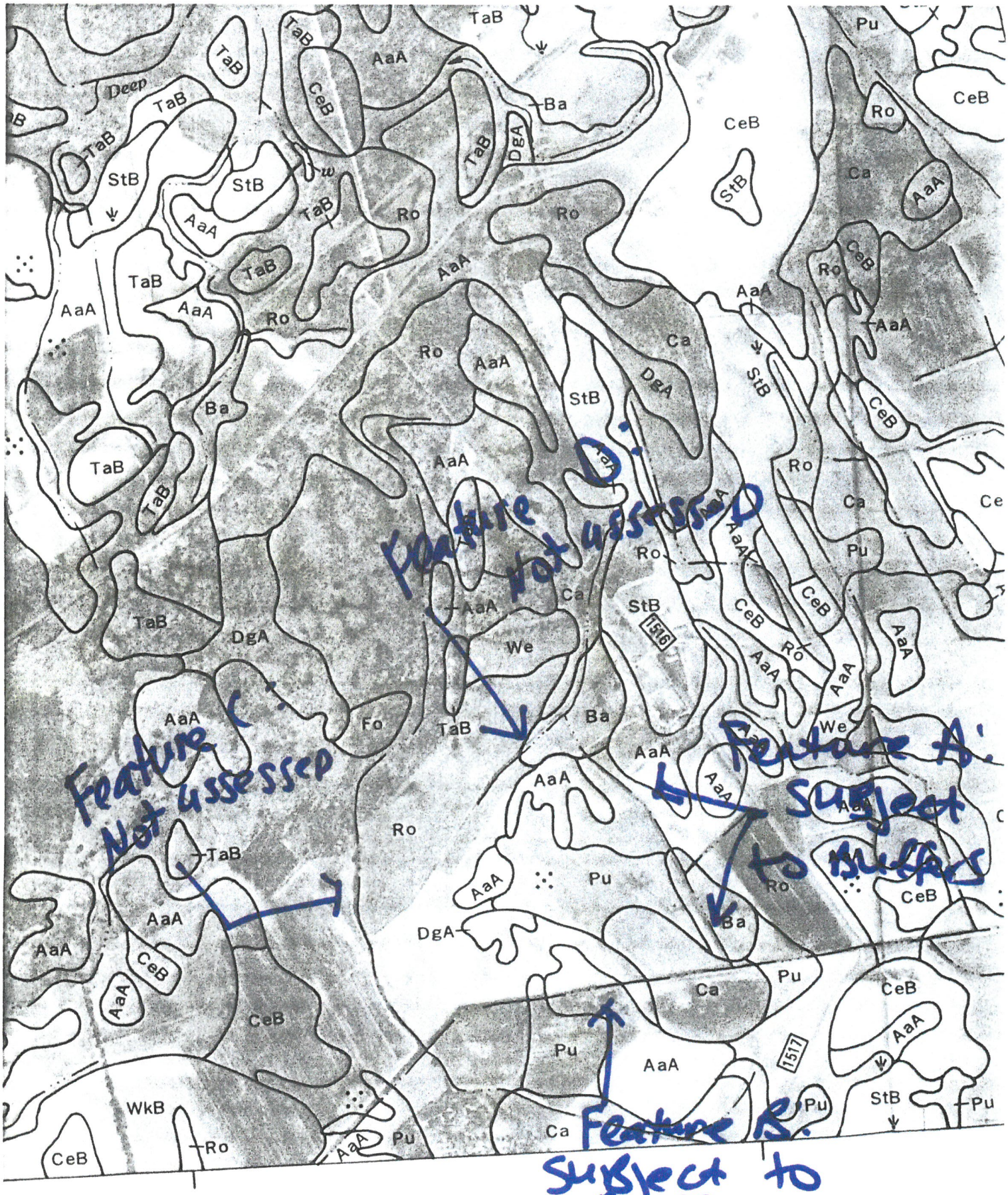
If you have questions regarding this determination, please feel free to contact Sara Knies at (919) 791-4200.

Respectfully,

Danny Smith

Danny Smith, Supervisor
Water Quality Section
Raleigh Regional Office

cc: RRO/SWP File Copy


Feature D: Not assessed
Feature C: Not assessed
Feature A: Subject to Buffers
Feature B: Subject to Buffers
1516
1517

3.10.14 SVK

3.10.14 SYK

200 m

Edgecombe Soil and Water Conservation District

201 St. Andrew Street P O Box 10
Tarboro, North Carolina 27886-0010
Telephone: (252) 823-8187 Ext. 3

Jeff Becker
Green Environmental Services

Mr. Becker,

The Edgecombe SWCD has reviewed the proposed mitigation site, you identified on the Evans Property. Upon review we have determined that we currently, do not have any existing Easements or Contracts that will be affected by the proposed project.

We appreciate your participation with the Edgecombe SWCD. If you have any questions or concerns, please feel free to call us Monday through Friday, 8:00 am to 5:00 pm.
We can be reached at 252-823-8187 ext.3.

J. Scott Kiser

J. Scott Kiser

Soil Conservationist
Edgecombe SWCD

Cherry Hill Church Road
Cherry Hill Church Road
Tarboro, NC 27886

Inquiry Number: 4090157.2s
September 29, 2014

The EDR Radius Map™ Report with GeoCheck®

EDR® Environmental Data Resources Inc

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

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

CHERRY HILL CHURCH ROAD
TARBORO, NC 27886

COORDINATES

Latitude (North):	35.9225000 - 35° 55' 21.00"
Longitude (West):	77.4739000 - 77° 28' 26.04"
Universal Tranverse Mercator:	Zone 18
UTM X (Meters):	276788.2
UTM Y (Meters):	3977980.5
Elevation:	48 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	35077-H4 SPEED, NC
Most Recent Revision:	1988

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	20120511
Source:	USDA

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

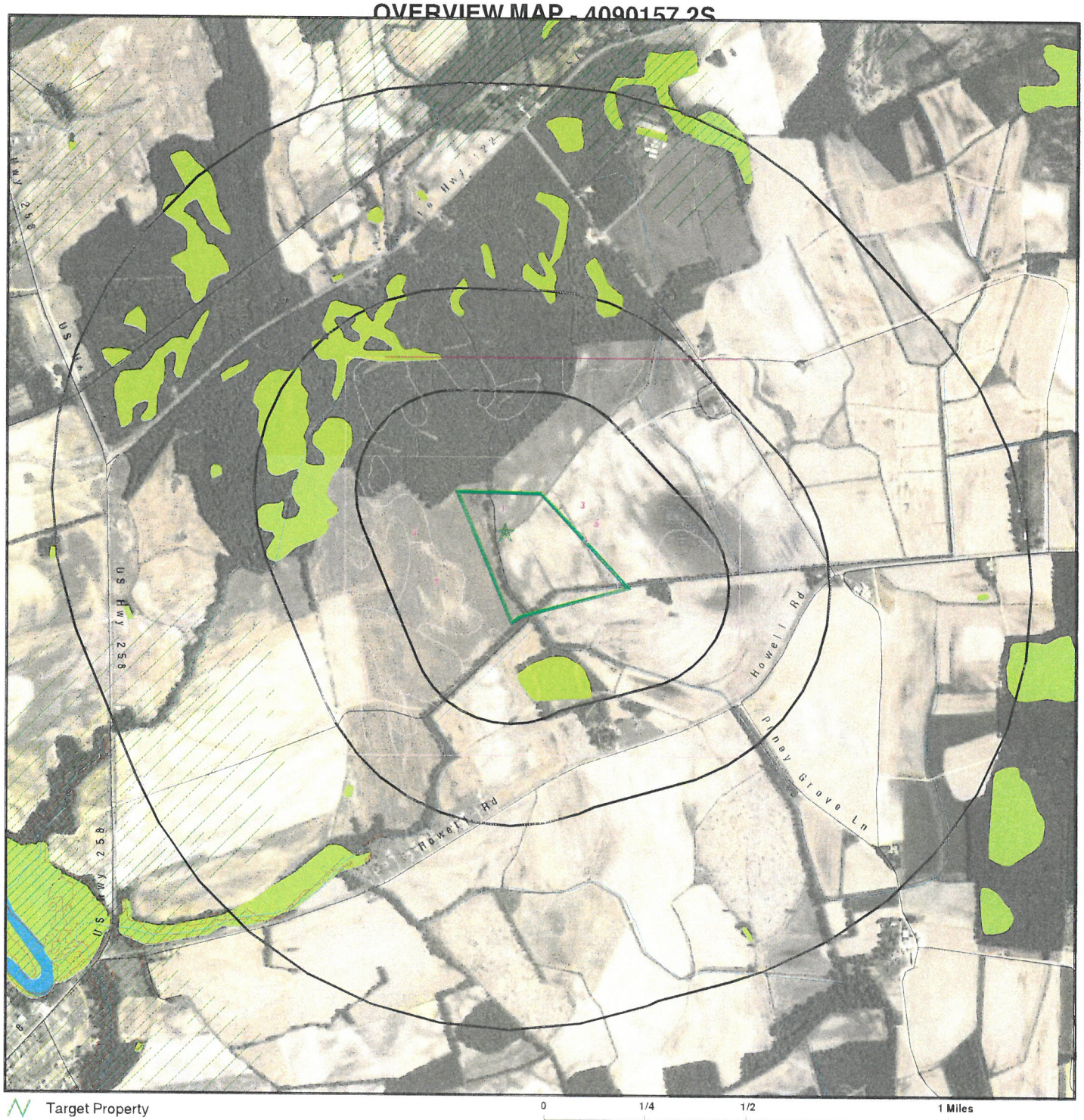
No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL.....National Priority List

OVERVIEW MAP - 4090157.2S



Target Property

0 1/4 1/2 1 Miles

Sites at elevations higher than or equal to the target property

Sites at elevations lower than the target property

Manufactured Gas Plants

National Priority List Sites

Dept. Defense Sites

Indian Reservations BIA

Oil & Gas pipelines from USGS

100-year flood zone

500-year flood zone

National Wetland Inventory

State Wetlands

Hazardous Substance Disposal Sites

SITE NAME: Cherry Hill Church Road ADDRESS: Cherry Hill Church Road Tarboro NC 27886 LAT/LONG: 35.9225 / 77.4739	CLIENT: Greene Environmental Services, LLC CONTACT: Ron Ferrell INQUIRY #: 4090157.2s DATE: September 29, 2014 2:46 pm

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DETAIL MAP -4090157.25

N Target Property

Sites at elevations higher than or equal to the target property

Sn. Sat elevations lower than the target property

&. Manufactured Gas Plants

Ii Sensitive Receptr,rs

EJ National Priority List SilN

[TT] Dept. Defense Sites

D Indian Reservations BIA

N Oil & Gas pipelines from USGS

100-year flood zone

600-yaar flood zone

D National Wetland Invenmry

D 81 ala Wetlands

LJ Hazardous Substance Disposal Sites

This report includes Interacttve Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

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MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	TP		NR	NR	NR	NR	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
CERCLIS	0.500		0	0	0	NR	NR	0
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
Federal CERCLIS NFRAP site List								
CERC-NFRAP	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-CESQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
LUCIS	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
State- and tribal - equivalent NPL								
NC HSDS	1.000		0	0	0	0	NR	0
State- and tribal - equivalent CERCLIS								
SHWS	1.000		0	0	0	0	NR	0
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500		0	0	0	NR	NR	0
OLI	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
LUST TRUST	0.500		0	0	0	NR	NR	0
LAST	0.500		0	0	0	NR	NR	0
INDIAN LUST	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
UST	0.250		0	0	NR	NR	NR	0
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
FEMA UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
VCP	0.500		0	0	0	NR	NR	0
INDIAN VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
SWRCY	0.500		0	0	0	NR	NR	0
HIST LF	0.500		0	0	0	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US CDL	TP		NR	NR	NR	NR	NR	0
US HIST CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
IMD	0.500		0	0	0	NR	NR	0
SPILLS 80	TP		NR	NR	NR	NR	NR	0
SPILLS 90	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
DOT OPS	TP		NR	NR	NR	NR	NR	0
DOD	1.000		0	0	0	0	NR	0
FUDS	1.000		0	0	0	0	NR	0
CONSENT	1.000		0	0	0	0	NR	0
ROD	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
UIC	TP		NR	NR	NR	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
LEAD SMELTERS PRP	TP		NR	NR	NR	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
Financial Assurance	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	TP		NR	NR	NR	NR	NR	0
PCB TRANSFORMER	0.500		0	0	0	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
COAL ASH	TP		NR	NR	NR	NR	NR	0
	0.500		0	0	0	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR US Hist Auto Stat	0.250		0	0	NR	NR	NR	0
EDR US Hist Cleaners	0.250		0	0	NR	NR	NR	0
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
RGA LUST	TP		NR	NR	NR	NR	NR	0
RGA LF	TP		NR	NR	NR	NR	NR	0
RGA HWS	TP		NR	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted

NOTES:

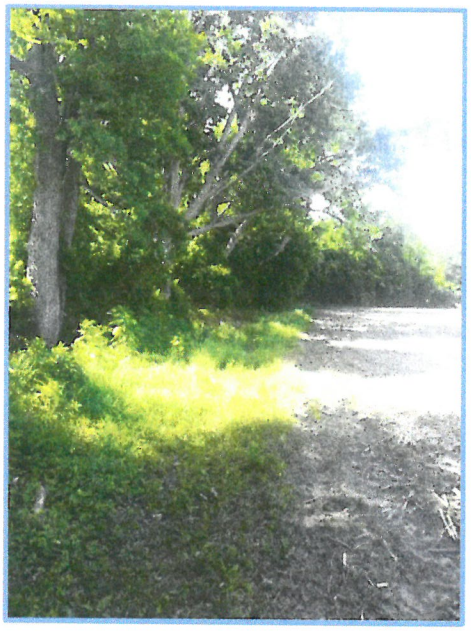
TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one

Appendix B: Photographs

Barlow Canal Mitigation Bank Photographs



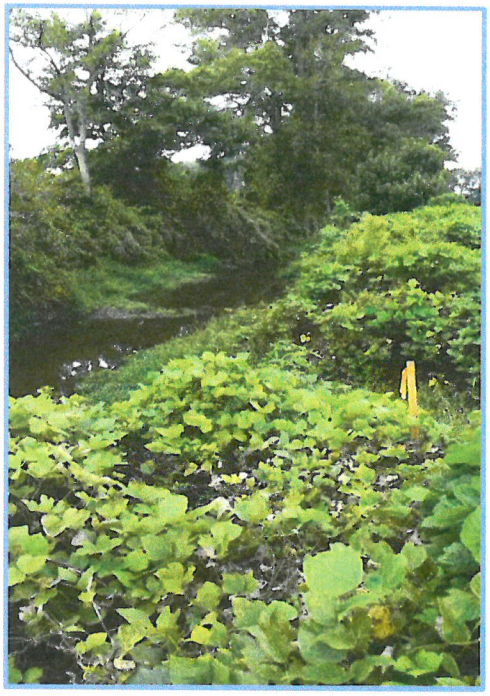
Tract 1: View northward along UT

Tract 2: View southward along UT

Tract 2: Confluence of UT with Barlow Canal

Tract 3: Ditch A, Tract 3 is to the left of ditch.

Tract 4: Ditch B, Tract 4 is to the left of the ditch.



Tract 4: Ditch B confluence with Barlow Cana