

REVISED MITIGATION PLAN

Watts Property Stream and Wetland Restoration Site

Perquimans County, North Carolina

EEP Project No. 413

Pasquotank River Basin

Cataloging Unit 03010205



Prepared for:



NC Department of Environment and Natural Resources

Ecosystem Enhancement Program

1652 Mail Service Center

Raleigh, NC 27699-1652

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Prepared by:



1151 SE Cary Parkway, Suite 101

Cary, NC 27518

919.557.0929

November 2012

This Mitigation Plan has been revised as per discussions and comments received by the US Army Corps of Engineers pertaining to mitigation success criteria and monitoring. An on-site meeting was held on July 23, 2012 to discuss the mitigation plan and its potential for success. Ongoing conversations were conducted between August and November 2012 to determine the protocols for post-construction monitoring. Updates are inserted in Section 8.0, Section 9.0 and Appendix I.

This document is consistent with NCEEP Mitigation Template Version 2.0 dated October 1, 2010.

EXECUTIVE SUMMARY

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).
- NC Department of Environment and Natural Resources (NCDENR) Ecosystem Enhancement Program (EEP) In-Lieu Fee Instrument signed and dated July 28, 2010

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

Ecological Engineering, LLP (Ecological Engineering) has entered into an open services design contract with EEP to provide designs and construction management for stream and wetland restoration within the Pasquotank River Basin (US Geological Survey 8-digit Hydrologic Unit Code 03010205). Professional services associated with this contract will be performed at the Watts Property, also referred to as the Site, Watts Site or Project Site. This property is situated along Durants Neck peninsula in Perquimans County, approximately 11 miles east-southeast of Hertford and nine miles south-southwest of Elizabeth City (Figure 1). The purpose of this project is to restore the headwater stream and wetland complex that likely existed prior to the Site's conversion to agriculture.

Goals and Objectives

The proposed project will be implemented within the confines of one State of North Carolina-owned property parcel covering 48.09 acres. The overall goal of this project is to provide an ecological uplift to the Project Site and its surrounding area. This uplift will be provided via modifications to the existing channel and subsequent drainage network that currently exist at the Project Site. Designs will be based on USACE (2007) guidance, reference information and professional judgment. A copy of the USACE (2007) guidance is presented in Appendix B. This goal is in accordance with the defined restoration goals (NCDENR, 2009) for the Pasquotank River Basin which includes the NC Coastal Habitat Protection Plan (Street et. al., 2005). The goals are:

- Improve effectiveness of existing rules and programs protecting coastal fish habitats.
- Identify, designate, and protect strategic habitat areas.
- Enhance habitat and protect it from physical impacts.
- Enhance and protect water quality.

The objectives are to design a headwater stream and wetland system with the appropriate cross section and slope that ultimately provides the proper physical characteristics to supply intended functions and meet success criteria. In addition to cross section and slope, hydraulic stability and native vegetation establishment will also contribute to the overall functionality of the system.

The ecological uplift will include the restoration of ecological function, the improvement of overall water quality and enhancement of native wildlife habitat. Three main components, stream, wetland and riparian buffer restoration, will serve as the dominant inputs for achieving this goal.

Watershed and Watershed Planning Information

The Project Site is part of the US Geological Survey (USGS) 14-digit Hydrologic Unit Code (HUC) 03010205060020 and the NC Division of Water Quality (NCDWQ) subbasin 03-01-52. An unnamed tributary (UT) to the Little River is the primary water feature at the Site. This channelized, first order conveyance bisects the property from south to north. Ecological Engineering utilized planning and existing watershed information from the NC Department of Environment and Natural Resources (NCDENR) Basinwide Planning Program, 303(d) Listing, the Pasquotank River Local Watershed Plan and NCDENR EEP Pasquotank River Basin Restoration Priorities, dated September 2009. The Project Site is not within a Targeted Local Watershed (TLW), as defined by EEP. Nor, is there any information regarding the specific subbasin in the Local Watershed Plan (LWP). Goals for the watershed, based on the existing available resources, are presented in the preceding paragraph.

Existing Amount of Streams and Wetlands

Based on survey data, approximately 1,505 linear feet of jurisdictional stream channel and 0.06 acres of jurisdictional wetlands currently exist at the Project Site. These lengths and acreages were confirmed by the US Army Corps of Engineers (USACE) in September 2010.

Proposed Design Approach

Ecological Engineering will provide designs for the restoration of approximately 1,505 linear feet of Headwater Forest, approximately 20.4 acres of Hardwood Flat and approximately 26.8 acres upland buffer. In addition, approximately 0.06 acres of Hardwood Flat will be enhanced via supplemental planting. Wetland restoration work will occur in combination with stream restoration work along the existing unnamed tributary. The current drainage network used to drain the property for agricultural operations will be removed from the interior portion of the Site. The remaining onsite areas not defined as either stream or wetland restoration will be planted with native riparian and/or non-riparian vegetation depending on their landscape position.

Stream restoration will follow guidance provided in the document entitled Information Regarding Stream Restoration in the Outer Coastal Plain of North Carolina, updated in 2007 by the USACE and NC Division of Water Quality (NCDWQ). This guidance provides improved methodology associated with the restoration of zero and first order streams in the outer Coastal Plain physiographic province. The channelized UT currently functions as a conduit to quickly and effectively remove both surface and groundwater from the Site and accompanying watershed. By converting its current characteristics to those associated more with a headwater stream system, the UT will ultimately provide opportunities for water quality improvement.

Wetland restoration will be implemented via the removal of the existing drainage network. The current network includes a combination of both lateral and linear drainages that manipulate groundwater to allow for the planting and continuous maintenance of agricultural row crops. Any excess runoff will be filtered through a vegetated buffer prior to entering the unnamed tributary.

The combination of both stream and wetland restoration at this site will immediately improve water quality outputs. Ecological functions will be restored, as well as the enhancement of native wildlife habitat.

Jurisdictional Wetland Impacts

No impacts will occur to jurisdictional wetlands as a result of project implementation. One jurisdictional wetland along the northeastern perimeter of the property will be enhanced as part of the project. The enhancement work will include planting of native hardwood species.

Regulatory Coordination

Coordination with the USACE took place in early 2012 for Section 404 purposes. The USACE provided several comments with regard to the Mitigation Plan and associated design drawings. These comments included questions about the version of stream restoration guidance, proposed monitoring time period, elevation of the design channel, vegetation landscape position, proposed monitoring assessment methodology and a concern related to a specific vegetative species. Appendix A includes the USACE comments and EEP response.

Coordination took place again in late summer 2012. Additional comments were received and the Mitigation Plan was revised. These discussions are presented in Appendix I.

TABLE OF CONTENTS

	<u>Page</u>
1.0 RESTORATION PROJECT GOALS AND OBJECTIVES.....	1
1.1 Overarching Goals and Objectives of Mitigation Plans	1
1.2 Watershed Goals and Objectives.....	1
1.3 Project Site Goals and Objectives	4
2.0 SITE SELECTION.....	7
2.1 Directions	7
2.2 Site Selection.....	7
2.3 Project Site Vicinity Map.....	9
2.4 Site Photographs.....	10
3.0 SITE PROTECTION INSTRUMENT	13
3.1 Site Protection Instrument Summary Information.....	13
3.2 Site Protection Instrument Plat	13
4.0 BASELINE INFORMATION	15
4.1 Watershed Summary Information.....	16
4.1.1 Drainage Area, Project Area and Easement Acreage	16
4.1.2 Surface Water Classifications and Water Quality.....	16
4.1.3 Physiography, Geology and Soils	18
4.1.4 Existing Hydrological Features.....	21
4.1.5 Vegetative Community Type Descriptions and Disturbance History.....	22
4.1.6 Historical Land Use and Development Trends.....	22
4.1.7 Potential Constraints	24
4.1.7.1 Environmental Screening.....	24
4.1.7.2 Site Access.....	24
4.1.7.3 Utilities and Easements	24
4.1.7.4 FEMA/ Hydrologic Trespass	24
4.2 Regulatory Considerations.....	25
4.2.1 Jurisdictional Streams and Wetlands.....	25
4.2.2 Endangered Species Act.....	25
4.2.3 Historic Preservation Act	27
4.2.4 Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	28
4.2.5 Essential Fish Habitat.....	28
5.0 DETERMINATION OF CREDITS.....	30
6.0 MITIGATION WORK PLAN.....	31
6.1 Stream Project and Design Justification	31
6.2 Designed Channel Classification and Wetland Types	31
6.3 Target Wetland and Buffer Communities.....	32
6.4 Preliminary Groundwater Characterization.....	32
6.5 Water Budget.....	32

6.6	Soil Characterization	33
6.7	Sediment Transport Analysis	33
6.8	HEC-RAS Analysis	33
6.9	Site Construction.....	34
6.9.1	Site Grading, Structure Installation and Other Project Related Information	35
6.9.2	Native Plant Community Restoration	35
6.9.2.1	Soil Preparation and Amendments.....	35
6.9.2.2	Proposed Plant Communities	36
6.9.2.3	Planting Plan	37
6.9.2.4	Invasive Species Management.....	39
7.0	MAINTENANCE PLAN	41
8.0	PERFORMANCE STANDARDS	42
8.1	Streams	42
8.2	Wetlands.....	43
8.3	Vegetation.....	43
9.0	MONITORING REQUIREMENTS	44
9.1	Baseline Monitoring Document.....	44
9.2	Schedule and Reporting.....	45
10.0	LONG-TERM MANAGEMENT PLAN.....	46
11.0	ADAPTIVE MANAGEMENT PLAN	46
12.0	FINANCIAL ASSURANCES	46
13.0	REFERENCES	47

Appendices

- Appendix A. Regulatory Correspondence
- Appendix B. Guidance Pertaining to Stream Restoration in the Outer Coastal Plain of North Carolina
- Appendix C. Site Protection Instruments
- Appendix D. Baseline Information Data
- Appendix E. Mitigation Work Plan Data and Analyses
- Appendix F. Reference Site Analyses
- Appendix G. Project Plan Sheets
- Appendix H. Land Acquisition
- Appendix I. Regulatory Coordination Discerning Proposed Success Criteria and Monitoring Period

SECTION 1.0 RESTORATION PROJECT GOALS AND OBJECTIVES

1.1 Overarching Goals and Applications of Mitigation Plans

According to *USACE and NCDWQ (2007)*, restoration of stream pattern, dimension and profile is not often appropriate in features appearing as zero to first order, headwater streams in the outer Coastal Plain. Projects constructed in these areas may still qualify for stream restoration even though they may not include construction of an actual channel. Credits will be calculated based on the length of the valley rather than an exact length of the channel. Since a 50-foot buffer is typically required for stream mitigation projects, areas outside of this 100-foot corridor but within the valley feature may be used as riparian wetland mitigation. The width of the valley is defined using the edge of the valley slope. Mitigation outside of and/or above this valley is considered non-riparian wetland mitigation assuming restoration of wetland hydrology, hydric soils and hydrophytic vegetation are present (USACE and NCDWQ, 2007).

The timely and cost effective delivery of sustainable ecological uplift will meet compensatory mitigation requirements. Without excavation and fill, the Project Site would likely never revert back to pre-disturbance conditions due to the existing drainage network. This network would eventually lose efficiency; however, it would continue to function to remove excess surface and groundwater from the Site. In addition, natural uplift via succession without any supplements would take significantly longer to form climax community types. Based on these conditions, earthwork and the reestablishment of native vegetation will be necessary for Site uplift.

Intervention via earthwork and planting will be conducted to the minimal extent practicable to ensure that project goals and objectives are met. The approach is formulated to provide a jump start or accelerated schedule for transformation of the Site. Factors of influence are based mainly on physical parameters, including soil types and characteristics, topography, project constraints and various other attributes discussed earlier in this document. These have been studied and compared with existing reference information to aid in design development. Based on existing Site conditions, earthwork and the planting of vegetation are necessary to ensure that effective transformation takes place. These aspects ultimately justify the proposed level of intervention.

1.2 Watershed Goals and Objectives

The Watts Site is located in the 03010205 Catalogue Unit (CU), in the Pasquotank River Basin. According to the Pasquotank River Basin Restoration Priorities (EEP, 2009), the Pasquotank CU offers an array of assets, including but not limited to large forested tracts and conservation areas. An important priority is to promote projects that reestablish riparian buffers and corridors of substantial width to improve connectivity of these protected areas. Agricultural impacts are also prevalent throughout the CU, including nonpoint source runoff and hydrologic modification. Projects that address agricultural runoff are important. The watershed will also benefit from stream restoration projects that reestablish more natural pattern, hydrology and habitat, especially in heavily ditched headwater areas. Additionally, this CU has an abundance of diverse marsh habitats along an extensive shoreline. Wetland and marsh restoration projects, as well as shoreline stabilization are high priorities for areas prone to erosion from natural exposure or from heavy boat traffic. Finally, in developed areas like Elizabeth City, Manteo and the Outer Banks, projects that address stormwater runoff and treatment are of primary importance (EEP, 2009). This document is available via: http://www.nceep.net/services/restplans/FINAL_RBRP_Pasquotank_2009.pdf.

Restoration goals for CU 03010205 identified in the 2009 Pasquotank RBRP include supporting implementation of the NC Coastal Habitat Protection Plan (Street et. al., 2005) and its associated implementation plans. The three commissions, including the North Carolina Marine Fisheries, Environmental Management, and Coastal Resources Commissions unanimously adopted the North Carolina Coastal Habitat Protection Plan (CHPP) in December 2004. This plan recognizes the importance of North Carolina's coastal fisheries resources and the commercial and recreational fisheries they support. The continued existence and enhancement of these resources depend on the health of the aquatic habitats they occupy. The commissions all agree that they will work in unison to accomplish the following goals:

- **GOAL 1 – Improve effectiveness of existing rules and programs protecting coastal fish habitats.**
 - Enhance enforcement of, and compliance with, Coastal Resources Commission (CRC), Environmental Management Commission (EMC), and Marine Fisheries Commission (MFC) rules and permit conditions.
 - Coordinate and enhance water quality, physical habitat, and fisheries resource monitoring (including data management) from headwaters to the nearshore ocean.
 - Enhance and expand educational outreach on the value of fish habitat, threats from human activities, effects of non-native species, and reasons for management measures.
 - Coordinate rulemaking and enforcement among regulatory commissions and agencies.

- **GOAL 2 – Identify, designate, and protect strategic habitat areas.**
 - Evaluate potential Strategic Habitat Areas by:
 - Coordinating, completing, and maintaining baseline habitat mapping (including seagrass, shell bottom, and other bottom types) using the most appropriate technology,
 - Selective monitoring of the status of those habitats, and
 - Assessing effects of land use and human activities on those habitats.
 - Identify and designate Strategic Habitat Areas using ecologically based criteria.
 - Analyze existing rules and enact measures needed to protect Strategic Habitat Areas.
 - Improve programs for conservation (including voluntary actions) and acquisition of areas supporting Strategic Habitat Areas.

- **GOAL 3 – Enhance habitat and protect it from physical impacts.**
 - Greatly expand habitat restoration, including:
 - Creation of subtidal oyster reef no-take sanctuaries, and
 - Re-establishment of riparian wetlands and stream hydrology.
 - Prepare and implement a comprehensive beach and inlet management plan that addresses ecologically based guidelines, socio-economic concerns, and fish habitat.
 - Protect Submerged Aquatic Vegetation (SAV), shell bottom, and hard bottom areas from fishing gear effects through improved enforcement, establishment of protective buffers around habitats, and further restriction of mechanical shellfish harvesting.
 - Protect fish habitat by revising estuarine and public trust shoreline stabilization rules using best available information, considering estuarine erosion rates, and the development and promotion of incentives for use of alternatives to vertical shoreline stabilization measures.
 - Protect and enhance habitat for anadromous fishes by:
 - Incorporating the water quality and quantity needs of fish in surface water use planning and rule making, and
 - Eliminating obstructions to fish movements, such as dams, locks, and road fills.

- GOAL 4 – Enhance and protect water quality.

Point sources

- Reduce point source pollution from wastewater by:
 - Increasing inspections of wastewater treatment facilities, collection infrastructure, and land disposal sites, and
 - Providing incentives for upgrading all types of wastewater treatment systems.
- Adopt or modify rules or statutes to prohibit ocean wastewater discharges.
- Prohibit new or expanded stormwater outfalls to coastal beaches and to coastal shellfishing waters (EMC surface water classifications SA and SB) except during times of emergency (as defined by the Division of Water Quality's Stormwater Flooding Relief Discharge Policy) when public safety and health are threatened, and continue to phase-out existing outfalls by implementing alternative stormwater management strategies.

Non-point sources

- Enhance coordination with, and financial/technical support for, local government actions to better manage stormwater and wastewater.
- Improve land-based strategies throughout the river basins to reduce non-point pollution and minimize cumulative losses to wetlands and streams through voluntary actions, assistance, and incentives, including:
 - Improved methods to reduce sediment pollution from construction sites, agriculture, and forestry,
 - Increased on-site infiltration of stormwater,
 - Documentation and monitoring of small but cumulative impacts to wetlands and streams from approved, un-mitigated activities,
 - Incentives for low-impact development,
 - Increased inspections of onsite wastewater treatment facilities,
 - Increased water re-use and recycling.
- Improve land-based strategies throughout the river basins to reduce non-point pollution and minimize cumulative losses to wetlands and streams through rule making, including:
 - Increased use of effective vegetated buffers,
 - Reduction of impervious surfaces where feasible and reduction of the level of impervious surface allowable in the absence of engineered stormwater controls,
 - Expansion of CAMA Areas of Environmental Concern (AECs) upstream and landward,
 - Consideration of erosion rates as an additional factor in the siting of structures along estuarine and public trust shorelines.
- Develop and implement a comprehensive coastal marina and dock management plan and policy for the protection of shellfish harvest waters and fish habitat.
- Reduce non-point source pollution from large-scale animal operations by the following actions:
 - Support early implementation of environmentally superior alternatives to the current lagoon and spray field systems as identified under the Smithfield Agreement and continue the moratorium on new/expanded swine operations until alternative waste treatment technology is implemented,
 - Seek additional funding to phase-out large-scale animal operations in sensitive areas and relocate operations from sensitive areas,
 - Use improved siting criteria to protect fish habitat.

According to the Pasquotank RBRP (2009), EEP is committed to advancing these goals by supporting efforts to:

- Develop additional Strategic Habitat Areas (SHAs) and coordinate data and methodology improvements with other state and federal agencies.
- Map, monitor and restore SAV.
- Improve and restore shellfish beds.
- Implement agricultural BMPs to reduce nonpoint source inputs to the estuary.
- Remove barriers to anadromous fish movement and improve nursery and spawning habitats.
- Protect, augment and connect Natural Heritage Areas and other conservation lands.

EEP will actively develop projects that can coincidentally meet CHPP objectives while meeting its primary mitigation requirements within designated planning areas. The program will continue to promote innovative coastal mitigation methods such as the split function crediting strategy proposed expert panels in the White Oak Local Watershed Plan project titled *Coordinating Compensatory Mitigation Requirements to Meet the Goals of the Coastal Habitat Protection Plan* (2009).

1.3 Project Site Goals and Objectives

The Watts Site was identified as a stream, wetland and buffer restoration opportunity to improve water quality, habitat and hydrology within the CU. The Project Site is part of the US Geological Survey (USGS) 14-digit Hydrologic Unit Code (HUC) 03010205060020 and the NC Division of Water Quality (NCDWQ) subbasin 03-01-52. An unnamed tributary (UT) to the Little River is the primary water feature at the Site. This channelized, first order conveyance bisects the property from south to north. Ecological Engineering utilized planning and existing watershed information from the NC Department of Environment and Natural Resources (NCDENR) Basinwide Planning Program, 303(d) Listing and the Pasquotank River Local Watershed Plan. The Project Site is not within a Targeted Local Watershed (TLW), as defined by EEP. Nor, is there any information regarding the specific subbasin in the Local Watershed Plan (LWP).

The main stressors and impacts to watersheds are pervasive and to a large extent, transcend physiography. As a result, overlapping of goals formulated to address these stressors and impacts often occurs. To compensate for this aspect when working on individual project sites, a combination of goals and objectives are presented. Project goals often broadly stated and standardized; therefore, project specific objectives have been provided to assist with this project's approach to restoration. By properly understanding issues, stressors and specific project concerns, an appropriate project design can be achieved that is instrumental in the development of tailored, measurable and achievable goals.

Existing watershed and project stressors at the Project Site appear to be generated predominately by agricultural related activities. These activities cause channel degradation, systemic sedimentation, buffer deforestation, riparian compaction, compaction of wetland vegetation and soils, eutrophication and promotion of invasive, non-native vegetation biomass and seed sources. The effects with regard to ecological services and/or functions lost and requiring replacement and/or enhancement are transport of watershed sediments in equilibrium, treatment of lateral overland flow, treatment of groundwater, provision of instream habitat, provision of wetland habitat, provision of riparian buffer habitat, processing of organic matter inputs and temporary sediment storage.

This uplift will include the restoration of ecological function, the improvement of overall water quality and enhancement of native wildlife habitat. Three main components, stream, wetland and riparian buffer restoration, will serve as the dominant inputs for achieving this goal.

Furthermore, project objectives are to design a headwater stream and wetland system with the appropriate cross section and slope that ultimately provides the proper physical characteristics to supply intended functions and meet success criteria. In addition to cross section and slope, hydraulic stability and native vegetation establishment will also contribute to the overall functionality of the system.

Stream restoration will follow guidance provided in the document entitled Information Regarding Stream Restoration in the Outer Coastal Plain of North Carolina, updated in 2007 by the USACE and NCDWQ. This guidance provides improved methodology associated with the restoration of zero and first order streams in the outer Coastal Plain physiographic province. The UT is currently channelized. Its purpose is to act as a conduit to quickly and effectively remove both surface and ground water from the Site and its accompanying watershed. By converting its current characteristics to those associated more with a headwater stream system, the UT will ultimately provide opportunities for water quality improvement.

Wetland restoration will be implemented via the removal of the existing drainage network. The current network includes a combination of both lateral and linear drainages that manipulate groundwater to allow for the planting and continuous maintenance of agricultural row crops. Surface water at the Site will be allowed to properly percolate. Any excess runoff will be filtered through vegetation prior to entering the UT. The combination of both stream and wetland restoration at this site will immediately improve water quality outputs. Ecological functions will be restored, as well as the enhancement of native wildlife habitat.

The Watts Site was identified as a stream, wetland and buffer restoration opportunity to improve water quality, habitat and hydrology within the CU. The Project Site is part of the US Geological Survey (USGS) 14-digit Hydrologic Unit Code (HUC) 03010205060020 and NCDWQ subbasin 03-01-52. An unnamed tributary (UT) to the Little River is the primary water feature at the Site. This channelized, first order conveyance bisects the property from south to north. Ecological Engineering utilized planning and existing watershed information from the NC Department of Environment and Natural Resources (NCDENR) Basinwide Planning Program, 303(d) Listing and the Pasquotank River Local Watershed Plan. The Project Site is not within a Targeted Local Watershed (TLW), as defined by EEP. Nor, is there any information regarding the specific subbasin in the Local Watershed Plan (LWP).

The overall goal of this project is to provide an ecological uplift to the Project Site and its surrounding area. This uplift will be provided via modifications to the existing channel and subsequent drainage network that currently exist at the Project Site. Designs will be based on *USACE and NCDWQ (2005)* guidance, reference information and professional judgment. This goal is in accordance with the abovementioned goals for the CU and includes the following Site-specific goals:

- restore ditched wetlands to improve the habitat, fishery and flood control functions;
- reduce sediment loading and other pollutants from surface runoff by increasing the soil retention, filtration and nutrient uptake functions of wetland and riparian areas;
- restore and protect wildlife corridors and other key links to high-value habitat areas; and
- restore and protect natural breeding, nesting and feeding habitat to promote species richness and diversity.

The objectives are to design a headwater stream and wetland system with the appropriate cross section and slope that ultimately provides the proper physical characteristics to supply intended functions and meet success criteria. In addition to cross section and slope, hydraulic stability and native vegetation establishment will also contribute to the overall functionality of the system.

The existing pre-restoration baseline depicts a channelized stream surrounded by a network of linear and lateral ditches. The Site is drained in its entirety, aside from a very small wetland area (0.06 acres) along the northeastern perimeter. Both the existing channel and wetland are considered jurisdictional. Impacts to these two resources will be considered minimal, if any. The existing base elevations of the channel will remain the same; however, its dimension will be significantly altered and thus requiring submittal and approval of a Nationwide Permit 27 (Section 404) and its corresponding water quality certification (Section 401), as well as a likely consistency determination from the NC Division of Coastal Management. The pattern of the tributary will be minimally altered. It is expected that the resulting headwater, first order channel will have little or no actual meanders. No impacts are proposed to the jurisdictional wetland area. Once earthwork is complete, the entire site will be planted with native vegetation. The other permit that will be required is a land disturbance permit. Erosion and sediment control measures will be implemented to their fullest extent to ensure that any impacts to water resources downstream are minimized to their fullest extent during and immediately after construction.

SECTION 2.0 SITE SELECTION

2.1 Directions to Site

The Watts Property is situated along Durants Neck peninsula in Perquimans County, approximately 11 miles east-southeast of Hertford and nine miles south-southwest of Elizabeth City (Figure 1). It can be accessed by using the following directions from US Highway 17:

From the west (Raleigh, Williamston and Hertford):

- Turn south (right) onto SR 1300 (New Hope Road), after crossing the Perquimans River.
- Proceed approximately 11.3 miles and turn northeast (left) onto SR 1326 (Little River Shore Drive).
- Proceed approximately 1.2 miles and turn northwest (left) onto Shore Drive.
- Follow Shore Drive approximately 0.2 miles and turn northwest (left) onto Norma Drive.
- The Watts Property is approximately 0.1 mile to the south (left side) of the roadway.

From the east (Elizabeth City):

- Turn south (left) onto SR 1197 (Northside Road) towards Woodville.
- Follow Northside Road approximately 1.3 miles and turn to the south (left) onto SR 1329.
- Proceed approximately 6.2 miles to New Hope Road. Turn to the southeast (left).
- Proceed approximately 3.0 miles and turn northeast (left) onto SR 1326 (Little River Shore Drive).
- Proceed approximately 1.2 miles and turn northwest (left) onto Shore Drive.
- Follow Shore Drive approximately 0.2 miles and turn northwest (left) onto Norma Drive.
- The Watts Property is approximately 0.1 mile to the south (left side) of the roadway.

Based on available mapping from the US Geological Survey, the project is located at the following coordinates: 36.1652791 °N and 76.2676037 °W.

2.2 Site Selection

The Watts Property was purchased fee simple by the State of North Carolina in 2004 for the purposes of mitigation. It is situated in Perquimans County, along Durants Neck Peninsula separating the Perquimans River, Little River and Albemarle Sound. The majority of the waters associated with the Site drain into an unnamed tributary to the Little River. The Project Site and its surrounding area are all part of the Pasquotank River Basin. Figures 2 through 4 depict the Site's watershed, underlying soils and current conditions. In addition, historical aeriels and Site photographs are also provided at the end of this Section.

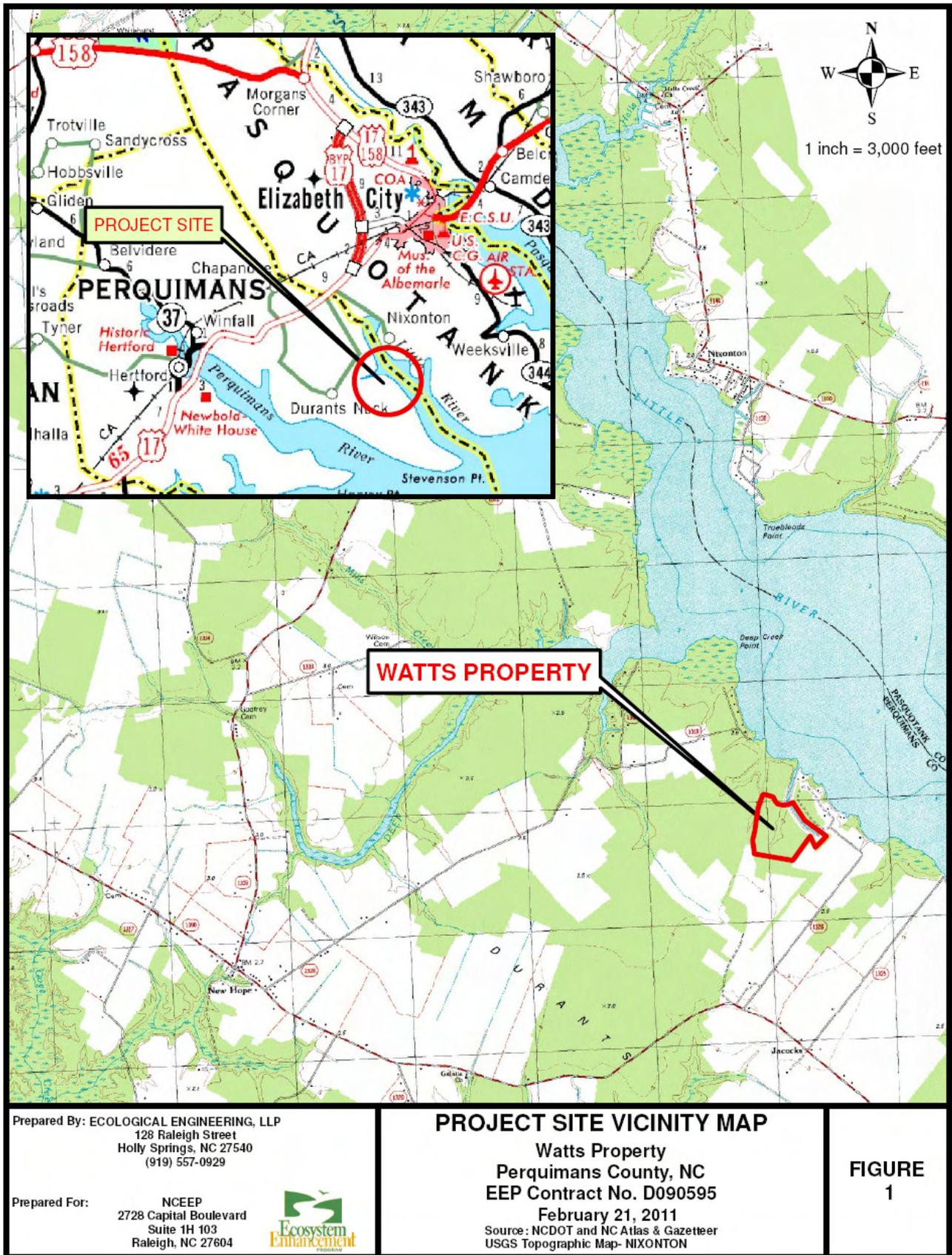
The following information pertains to project components and structure with regard to the headwater stream restoration of the UT, non-riparian wetland restoration and the restoration of upland buffer. This information is summarized in Table 1. Based on existing survey data, implementation of the project will provide approximately 1,003 linear feet of Headwater Forest stream restoration, 20.4 acres of Hardwood Flat wetland restoration and 0.06 acres of Hardwood Flat wetland enhancement. In addition, the remaining 26.8 acres at the Project Site will serve as buffer. Additional information pertaining to the Project's components and structure is provided in Section 5.0 entitled *Determination of Credits*.

As previously mentioned, headwater stream restoration will follow guidance provided in the document entitled Information Regarding Stream Restoration in the Outer Coastal Plain of North Carolina, updated in 2007 by the USACE and NCDWQ. This guidance provides improved methodology associated with the restoration of zero and first order streams in the outer Coastal Plain physiographic province. The existing UT is a prime candidate for this type of restoration due to its location, state of channelization, current hydrological characteristics and absence of physical constraints. By converting its physical components to those associated more with a headwater stream system, the UT will ultimately provide opportunities for water quality improvement.

Wetland restoration will be implemented via the removal of the existing drainage network. The current network includes a combination of both lateral and linear drainages that manipulate groundwater to allow for the planting and continuous maintenance of agricultural row crops. This network will be removed from the interior portion of the Site. As a result, surface water at the site will be allowed to properly percolate. Any excess runoff will be filtered through vegetation prior to entering the UT.

Buffers, extending more than 200 feet outward will be established along the UT and remaining areas not utilized for wetland restoration. Although no additional credits are anticipated, these buffers will function to provide additional water quality enhancement, stormwater and floodwater management, streambank and shoreline stabilization, water temperature modification, wildlife habitat and absorption of airborne pollutants. Ultimately the Site restoration efforts will result in the reduction of nutrient and sediment export from the Site into the Little River.

2.3 Project Site Vicinity Map



2.4 Site Photographs – Taken March 2010



Facing south across the Watts Site



Facing West across the Watts Site



Facing south (upstream) at the UT from Norma Drive



Facing southwest (upstream) from culvert located in the approximate middle of the Site



Facing west from southern property perimeter



Facing west across the Watts Site from the eastern property corner

Site Photographs Con't. – Taken March 2010



Facing north (downstream) at culvert under Norma Drive



Facing east at the location where the southern perimeter ditches unite with the UT as it enters the Site



Facing north along western perimeter ditch



Facing northeast along interior drainage ditch



Facing north at the northwest perimeter ditch, which is not affiliated with the UT that bisects the Site



Facing northeast along eastern perimeter of Site

Site Photographs Con't. – Taken March 2010



Facing southeast at the southwest property corner



Facing southeast (upstream) along the northeastern perimeter ditch



Facing northwest at Norma Drive



Facing southeast along the northeastern site perimeter



Drain pipe entering perimeter ditch along northeast property boundary



Facing northeast (upstream) at 24-inch pipe situated along middle reach of UT

SECTION 3.0 SITE PROTECTION INSTRUMENT

3.1 Site Protection Instrument Summary Information

The land required for the construction, management and stewardship of this mitigation project includes the following parcel information provided below. The State of North Carolina currently owns the property and boundaries are posted. A copy of the deed is included in Appendix C. A copy of the plat is provided on the following page. The State of North Carolina purchased the land fee simple from Richard L. and Kyle K. Watts in September 2004.

Watts Property Tax Information

Parcel Owner:	State of North Carolina	Deed_Acre:	48.09
Parcel ID:	8808-69-9972	Deed_Bk1:	156
Pin:	2	Deed_Pg1:	654
Account:	413705	Deed_Bk2:	271
Name:	4-0056-007	Deed_Pg2:	589

3.2 Site Protection Instrument Plat

The following Plat was provided by EEP. It depicts the 2004 Watts Site Boundary Survey.

SECTION 4.0 BASELINE INFORMATION

The following table summarizes the baseline information at the Project Site.

TABLE 1. BASELINE INFORMATION			
Watts Property Stream and Wetland Restoration Site			
EEP Project Number 413			
Project Information			
Project Name		Watts Stream, Wetland and Buffer Site	
County		Perquimans County	
Project Area		48.09 acres	
Project Coordinates (Latitude and Longitude)		36.1652791 °N and 76.2676037 °W	
Watershed Summary Information			
Physiographic Province		Coastal Plain	
River Basin		Pasquotank River Basin	
USGS Hydrologic Unit 8-digit	03010205	USGS Hydrologic Unit 14-digit	03010205060020
DWQ Sub-basin		03-01-52	
Project Drainage Area		136 acres	
Project Drainage Area Percentage Impervious Area		0 acres	
CGIA Land Use Classification		Agriculture	
Reach Summary Information			
Parameters		Reach 1 (upper)	Reach 2 (lower)
Length of Reach		750	755
Valley Classification		X	X
Drainage Area		110	136
NCDWQ Stream Identification Score		25.0	33.25
NCDWQ Water Quality Classification		SC (receiving water)	SC (receiving water)
Morphological Description – Stream Type		G5 or similar	G5 or similar
Evolutionary Trend		C to G to F	C to G to F
Underlying Mapped Soils		Roanoke silt loam	Roanoke silt loam
Drainage Class		Poorly drained	Poorly drained
Soil Hydric Status		Hydric A	Hydric A
Slope		<2%	<2%
FEMA Classification		Zone AE	Zone AE
Native Vegetation Community		N/A – Row Crops	N/A – Row Crops
Percent Composition of Exotic Invasive Vegetation		<5%	<5%
Wetland Summary Information			
Parameters		Wetland 1	
Size of Wetland		0.058 acres	
Wetland Type		Hardwood Flat (NCWAM)	
Mapped Soil Series		Roanoke silt loam	
Drainage Class		Poorly drained	
Soil Hydric Status		Hydric A	
Source of Hydrology		Surface and groundwater	
Hydrologic Impairment		Clay confining layer	
Native Vegetation Community		N/A – Row Crops	
Percent Composition of Exotic Invasive Vegetation		0%	
Regulatory Considerations			
Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the US – Section 404	Yes	No	
Waters of the US – Section 401	Yes	No	
Endangered Species Act	Yes	Yes	Categorical Exclusion
Historic Preservation Act	Yes	Yes	Categorical Exclusion
CZMA/ CAMA Regulation	Yes	No	
Essential Fisheries Habitat	Yes	Yes	Categorical Exclusion

Existing conditions surveys were completed during the early spring of 2010. These surveys included natural resources assessments, protected species assessments, jurisdictional wetland delineations and topographic assessments. Field surveys were undertaken to determine natural resource conditions and to document Waters of the United States. No detailed morphological surveys were completed along the existing channel, which currently functions as a drainage ditch removing both surface and groundwater from the Project Site.

4.1 Watershed Summary Information

4.1.1 Drainage Area, Project Area and Easement Acreage

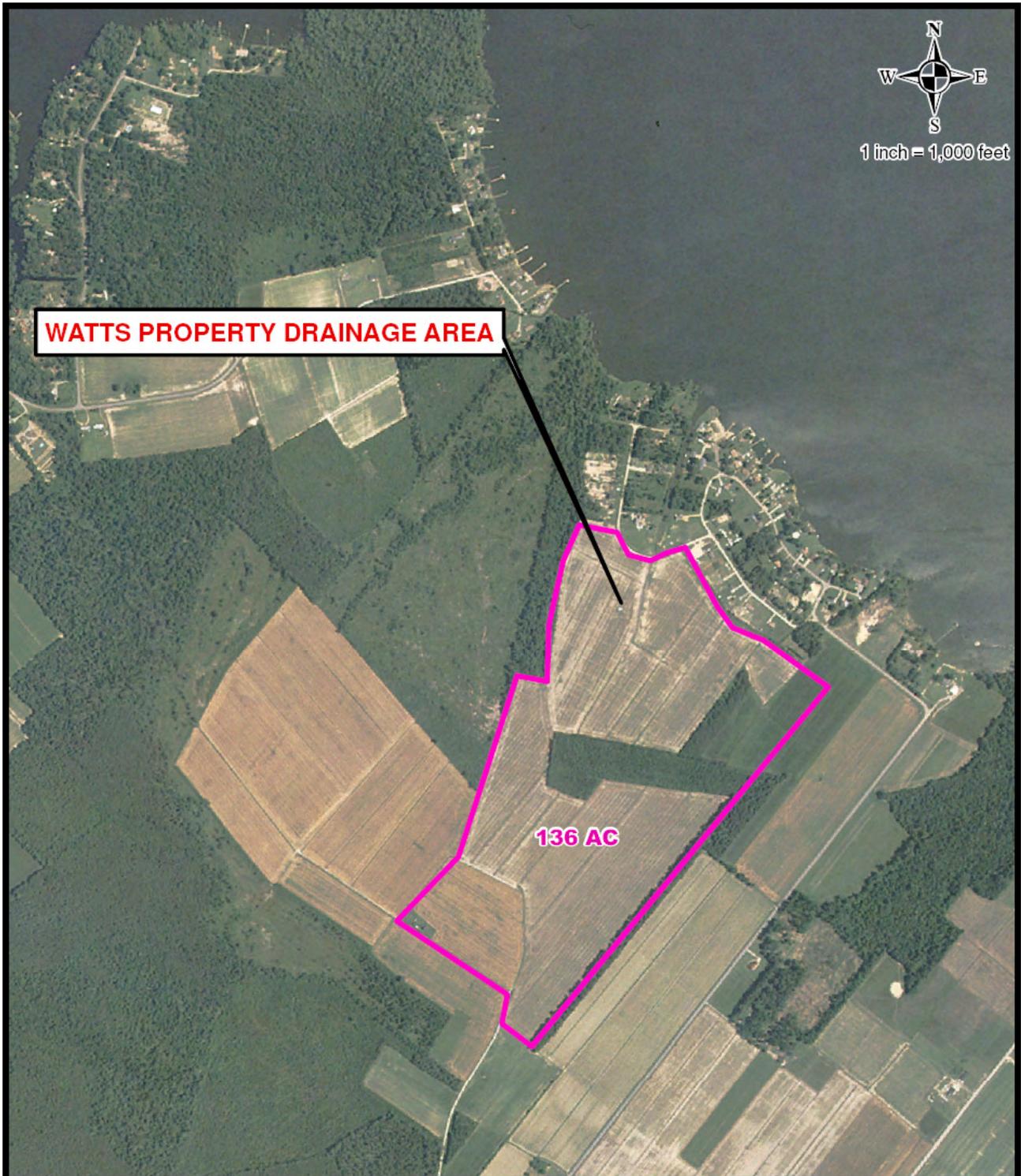
The watershed associated with the UT is rural, consisting predominantly agricultural lands with a small mix of forest lands. Figure 2 provides an aerial view of the watershed. The drainage area, calculated from the culvert under Norma Drive at the downstream end of the Site covers approximately 0.21 square miles (136 acres). Drainage at the Watts Property is via an onsite drainage network connected with one first order stream channel that bisects the Site. No impervious services were noted within the watershed encompassing the Site and it surrounding areas.

Landuse within the Project Area is agricultural. Row crops were planted through 2004 by the previous property owner. Since this time, it has remained fallow. The existing drainage network however, is still functioning as originally intended; effectively draining the Site. The drainage area including and surrounding the Site is comprised of a network of exterior and interior drainage ditches emptying into a first order stream channel. These ditches help to remove both surface and groundwater from the Site. One drainage outlet is responsible for removing the majority of water from the Project Site. This outlet is along the northern edge of the property and consists of a channel that flows under Norma Drive and discharges immediately into the Little River. One other outlet is connected to the perimeter network of ditches at the northwestern corner of the property.

4.1.2 Surface Water Classifications and Water Quality

The Project Site is situated within NCDWQ subbasin 03-01-52 of the Pasquotank River Basin. This basin is part of the Albemarle-Pamlico Estuarine System, the second largest estuarine system in the United States (NCDWQ, 2007). The subbasin consists of the northwestern edge of the Albemarle Sound and includes the Little and Perquimans Rivers. The subbasin covers a total area of approximately 541 square miles, separated within by 399 square miles of land and 142 square miles of water (NCDWQ, 2007).

According to *NCDWQ* (2009b), the UT's surface water classification is the same as its receiving water, the Little River. The Little River is classified as Class SC waters, which denotes saltwaters protected for secondary recreation, fishing, aquatic life propagation and survival, and wildlife (NCDWQ, 2009b). The UT within the Watts Property receives its flow from both surface and groundwater with little to no saltwater intrusion except in the case of backwater flow from storm surges. As a result, the classification under normal circumstances would be Class C, which denotes freshwaters protected for aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture.



Prepared By: ECOLOGICAL ENGINEERING, LLP
 128 Raleigh Street
 Holly Springs, NC 27540
 (919) 557-0929

Prepared For: NCEP
 2728 Capital Boulevard
 Suite 1H 103
 Raleigh, NC 27604



PROJECT SITE WATERSHED MAP

Watts Property
 Perquimans County, NC
 EEP Contract No. D090595

November 9, 2010
 Source: www.gisdatadepot.com

**FIGURE
 2**

No High Quality Waters (HQWs), Outstanding Resource Waters (ORWs), or Special Management Strategy Areas exist within five miles of the study area.

NCDWQ (2007) denotes four minor National Pollutant Discharge Elimination System (NPDES) discharges in this subbasin with a total permitted flow of 0.7 MGD. Three of these facilities are water treatment plants. In addition, there are three non-discharge permits and six stormwater discharge permits identified in the subbasin (NCDWQ, 2007). None of the dischargers are situated along or adjacent to the Little River.

Section 303(d) of the Clean Water Act (CWA) requires states to develop a list of waters not meeting water quality standards or which have impaired uses. Listed waters must be prioritized, and a management strategy or total maximum daily load (TMDL) must subsequently be developed for all listed waters. The Little River, downstream of the UT, is currently listed on North Carolina's 303(d) List. It was originally listed in 2000 under the standard violation for low dissolved oxygen (NCDWQ, 2009a). According to NCDWQ (2009a), potential sources(s) include, but are not limited to, agriculture and onsite wastewater systems (septic tanks).

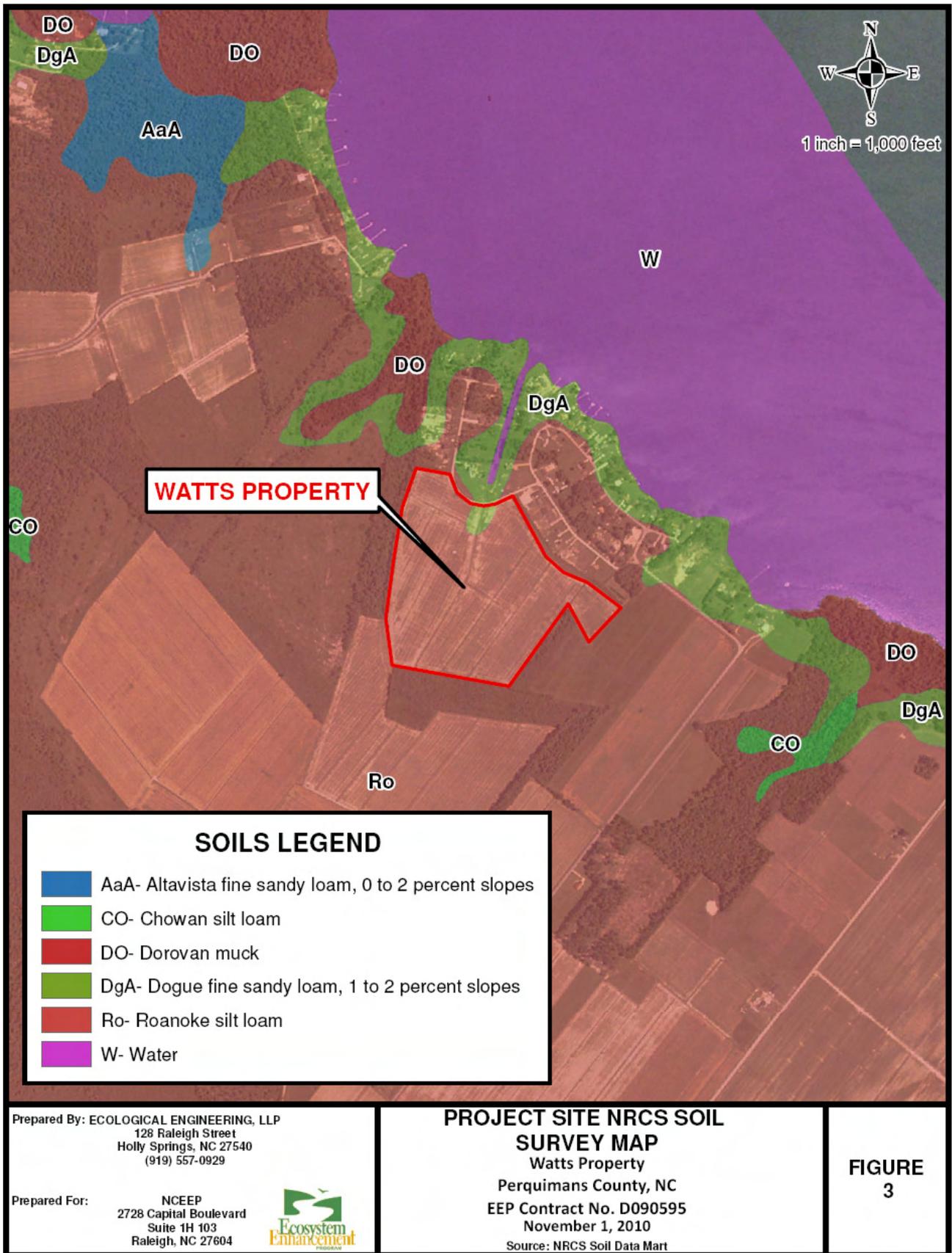
4.1.3 Physiography, Geology and Soils

The Coastal Plain physiographic province is the largest geologic belt in the state. It consists of a wedge of mostly marine sedimentary rocks that gradually thickens to the east. The most common sediment types are sand and clay, with limestone ever-present in the southern portion. According to *Lapham and Lyman* (1905), the Project Site is geologically underlain by the Columbia Formation. This formation is built up from mineral materials transported by streams from the Piedmont physiographic province and deposited as sediments of various grades of fineness, at a time in geological history when the coast of North Carolina was submerged under the edge of the Atlantic Ocean. The distribution of these sediments was controlled by varying current and wave action, modified to some extent by stream erosion after the emergence of the land. The texture of some of the soil types has also been modified in a measure by the incorporation of considerable amounts of organic mater, resulting from the decay of quantities of vegetation (Lapham and Lyman, 1905).

The soils underlying the Watts Property are dominated by the Roanoke Series, with the exception of the northern portion where the tributary exits under Norma Drive, which is underlain by the Dogue Series. The locations of these soils are provided on Figure 3. Both the Roanoke and Dogue Series exhibit similar characteristics such as their pH (acidic), depths to restrictive features (more than 80 inches), slopes (zero to two percent), available water capacity (high, between 9.2 and 9.3 inches) and their parent material (loamy and clayey fluviomarine deposits). Roanoke soils however, differ from Dogue soils in landform position, drainage class, depth to water table and profile. Soil borings were conducted across the Site to verify mapped locations. The results are presented in Appendix D and are discussed later in the document. The locations of the borings are presented on Figure 4 along with the hydrologic features described in the following section.

According to the *Natural Resources Conservation Service* (2009), Roanoke silt loam occurs along depressions and flats on marine terraces. Its drainage class is poorly drained and the depth to water table varies between zero and 12 inches (NRCS, 2009). The typical profile of Roanoke silt loam is provided in the chart below. This soil is identified as a hydric soil, or soil that is formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper portion.

Dogue fine sandy loam occurs along the ridges on marine and stream terraces. This soil is moderately well drained and exhibits an average depth to the water table between 18 and 36 inches (NRCS, 2009).



Current Condition Plan View

WELL INFORMATION:

W-1 WELL 182732 N=890,475 E=2,806,944 ELEV = 3.9	W-2 WELL 181064 N=890,230 E=2,806,669 ELEV = 6.8	W-3 WELL 185631 N=889,598 E=2,806,527 ELEV = 7.9
W-4 WELL 174340 N=889,733 E=2,806,829 ELEV = 4.9	W-5 WELL 182821 N=889,478 E=2,807,027 ELEV = 7.8	W-6 WELL 174148 N=889,832 E=2,807,462 ELEV = 6.9



1 inch = 300 feet



LEGEND

- CMP: Corrugated Metal Pipe
- CPP: Corrugated Plastic Pipe
- IP: Iron Pipe
- SB1: Soil Boring Location
- W-1: Monitoring Well
- : Drainage Flow Direction

Prepared By: ECOLOGICAL ENGINEERING, LLP
128 Raleigh Street
Holly Springs, NC 27540
(919) 557-0929

Prepared For: NCEEP
2728 Capital Boulevard
Suite 1H 103
Raleigh, NC 27604



PROJECT SITE HYDROLOGICAL FEATURES AND GAUGE LOCATIONS MAP

Watts Property
Perquimans County, NC
EEP Contract No. D090595
November 9, 2010
Source: www.gisdatadepot.com

FIGURE 4

Profile information for both Roanoke silt loam and Dogue fine sandy loam is shown below.

Brief Soil Comparison Chart

PARAMETER	ROANOKE SILT LOAM	DOGUE FINE SANDY LOAM
Taxonomic Name	Fine, mixed, semiactive, thermic Typic Endoaquults	Fine, mixed, semiactive, thermic Aquic Hapludults
Map Unit Elevation	0 to 20 feet	0 to 20 feet
Landform Setting:	Depressions and flats on marine terraces	Ridges on marine and stream terraces
Slope	0 to 2 percent	0 to 2 percent
Depth to Restrictive Feature	More than 80 inches	More than 80 inches
Drainage Class	Poorly drained	Moderately well drained
Depth to Water Table	0 to 12 inches	18 to 36 inches
Profile	0 to 8 inches – Silt loam 8 to 13 inches – Clay loam 13 to 58 inches – Clay 58 to 80 inches – Fine sandy loam	0 to 8 inches – Fine sandy loam 8 to 66 inches – Clay loam 66 to 80 inches – Sandy loam
Hydric Classification*	A	-

Source: NRCS, 2009

Note: * Hydric A classification denotes map unit that are all hydric soils or have hydric soils as a major component.

The growing season is calculated as the period between the average date of the last killing frost in the spring and the average date of the first killing frost in the fall. The closest climate station to the Project Site is in Elizabeth City. According to *Gregory (2000)*, the growing season consists of 246 days and begins on March 18 and ends on November 19.

4.1.4 Existing Hydrological Features

As previously noted, the current landuse is agriculture and the existing drainage network confirms its intended use. This network was installed to remove both surface and groundwater from the property in a quick and efficient manner. The on-site network includes an internal assemblage of nine intersecting ditches of varying dimensions that total more than 4,500 linear feet in length and a perimeter network totaling more than 4,200 linear feet. The majority of the internal ditches drain into the UT that bisects the Project Site while externally, the perimeter ditches on the west, south and eastern side empty into the UT. The ditch along the northeast side also drains into the UT, although it is downstream of the Site and the ditch situated along the northwest corner drains into another UT west of the Site. These ditches range from approximately eight inches to three feet in depth and two to eight feet in top width. The UT, on the other hand, ranges between three and four feet in depth and six and ten feet in width. Its total length is approximately 1,505 linear feet.

Existing pipes are located near the junctions of several of the ditches, as well as along the UT. These pipes were identified as either corrugated metal pipe (CMP), iron pipe (IP) or corrugated plastic pipe (CPP) and range in diameter between 12 and 24 inches. The primary function of the pipes is to provide access for equipment to cross the drainage network.

The UT exits the Project Site through a pipe under Norma Drive. This pipe appears to be a 24-inch CMP and is completely submerged at both ends. Over the past several years, headwall erosion has been slowly compromising this pipe and Norma Drive. Excessive sedimentation exists within the pipe and portions of the pipe are corroding. This pipe will be upgraded to two 36-inch corrugated aluminum pipes (CAP) during project implementation to ensure the hydrologic trespass does not occur upon its ultimate failure.

4.1.5 Vegetation Community Type Descriptions and Disturbance History

Terrestrial plant communities at the Watts Property have been significantly altered from their natural states and currently fall under the Agricultural – Row Crops classification. Although the Site is currently in a state of fallow, this area consists almost entirely of herbaceous vegetation, including seasonal grasses and weeds. An historical aerial photograph, dated 1975, is depicted in the following sub-section. This photograph shows the Site as forested, further confirming the overall restoration goal of the project.

Common species observed were clover (*Trifolium* sp.), dogfennel (*Eupatorium capillifolium*), ragweed (*Ambrosia* sp.), Japanese honeysuckle (*Lonicera japonica*), thistle (*Carduus* sp.), Joe-pye-weed (*Eupatorium fistulosum*), dandelion (*Taraxacum officinale*), broomsedge (*Andropogon* sp.), fescue (*Festuca* sp.), blackberry (*Rubus* sp.), onion (*Allium* sp.), foxtail grass (*Setaria* sp.), aster (*Aster* sp.), vetch (*Vicia* sp.) and henbit (*Lamium* sp.). Within the drainage network, soft rush (*Juncus effusus*), smartweed (*Polygonum* sp.), duckweed (*Lemna* sp.), and seedbox (*Ludwigia* sp.) were observed. In addition, several pioneer woody species have begun to establish themselves. These species included loblolly pine (*Pinus taeda*), black cherry (*Prunus serotina*), baccharis (*Baccharis halimifolia*) and several oaks (*Quercus* spp.).

4.1.6 Historical Land Use and Development Trends

Based on a review of landuses and development throughout the Project and surrounding areas, little has changed for the past several decades. More residential development has occurred downstream of the Site along the Little River. The area west, east and south has remained unchanged. It is anticipated that over the next couple of decades, growth will occur primarily in the form of residential housing. As a result, the overall amount of impervious surface is expected to increase within this and the adjacent watersheds.

A review of aerial photographs was conducted as part of the preparation of the Environmental Resource Technical Report (ERTR). It appears that major land disturbance activities including the conversion from forest to agriculture occurred between 1975 and 1983. In addition, to the 1975 photograph, other recent aerial photographs are provided in Appendix D.

According to *Community Planning Collaborative, Inc.* (2006), Perquimans County envisions the majority of residential development will continue to be in residential subdivisions, within Hertford and Winfall, and to a limited degree along State maintained roads. The State projects that Perquimans County's population will grow from 11,890 persons in 2005 to 12,647 persons by 2015, and 13,011 persons by 2020. If these projections hold true, the County will grow by about 1,121 people in the period 2005 – 2020. If residential construction trends continue (at or near the rate of 168 residential structures per year) until 2020, an additional 2,520 residential units could potentially be built or placed in Perquimans County. This total would adequately accommodate the population growth projected. However, this level of residential construction would involve some conversion of lands from other uses (most notably cleared agricultural lands and woodlands); additional strip type development along State roads, and the development of additional subdivisions. At a rate of one acre per home site, over 2,500 acres could potentially be converted to residential uses, although the actual figure would most likely be much less as development is directed intosubdivisions which allow for greater densities (CPC, 2006).

Historical Condition Plan View



4.1.7 Potential Constraints

4.1.7.1 *Environmental Screening*

Ecological Engineering completed the checklist entitled “Environmental Screening and Document Guidelines for Ecosystem Enhancement Program Projects (draft date 8.18.05)” in accordance with EEP protocols. This information is intended to assist EEP in satisfying the Federal Highway Administration’s (FHWA) obligation to ensure compliance with various federal environmental laws and regulations. This obligation is necessary in order to preserve FHWA’s ability to reimburse the NC Department of Transportation (NCDOT) for costs incurred for offsetting NCDOT impacts through EEP projects. The signed Categorical Exclusion Form is provided in Appendix D.

In addition, Ecological Engineering obtained data from Environmental Data Resources, Inc. (EDR) with regards to environmental risk at or near the Site. The Site is not listed on any of the databases searched by EDR (EDR, 2009). A copy of the report’s overall findings and map are presented in the ERTR, dated October 2010.

4.1.7.2 *Site Access*

Access to the Watts Property is available via Norma Drive, a private road that intersects the northern perimeter of the Site. No fences, barriers or other obstacles are present to deter access. Directions are provided in Section 2.1.

4.1.7.3 *Utilities and Easements*

Based on field observations and associated mapping, two utility poles were noted within the Project Site along Norma Drive. These poles are likely maintained by the local utility coop and are immediately outside of the right-of-way associated with Norma Drive. No restoration or enhancement work is proposed within or immediately adjacent to this area. Otherwise, no other utilities or easements were identified within the project area.

4.1.7.4 *FEMA/ Hydrologic Trespass*

According to *FEMA* (2004), the majority of the UT is situated in a mapped backwater area from the Little River labeled as Zone AE, where base flood elevations have been determined. There is no established floodway or non-encroachment area along this tributary. Furthermore, A HEC RAS analysis (results provided later in the document) denotes no rise in water surface elevations based on proposed conditions. Therefore, there will be no impact on Federal Emergency Management Agency (FEMA) mapping. FEMA approval will not be necessary for project implementation. In addition, no floodplain development permit will be required and no further coordination is anticipated.

A copy of EEP’s Floodplain Requirements Checklist and current FEMA Map are provided in Appendix D. This checklist was submitted to the State Construction Office, National Flood Insurance Program (NFIP), NC Floodplain Mapping Unit and EEP.

No hydrologic trespass will occur at the Project Site. Its position, including the topography and the existence of a perimeter ditch along the eastern, southern and western boundaries will prohibit any opportunities for hydrologic trespass. Portions of the site will be designed to function as a wetland, holding water for extended periods of time. Drainage will follow natural valley contours which flow towards the UT that bisects the property. The perimeter drainage ditches will capture any excess surface and/or groundwater and provide

relief to either the UT bisecting the Site or the existing drainage network situated along the property's northwest corner.

4.2 Regulatory Considerations

4.2.1 Jurisdictional Streams and Wetlands

As per verification by the USACE in 2010, the UT is considered a jurisdictional stream channel. The NCDWQ Stream Classification Forms for the UT are provided in Appendix D. This form offers a quick, qualitative assessment based on a numerical system. Scores exceeding 30 represent a perennial or primary stream, while those between 19 and 30 represent an intermittent or secondary channel. Any scores less than 19 discern the channel as either ephemeral or stormwater-based. The UT scored 25.0 along the upper portion and 33.25 along the lower portion. This information is generally utilized to address stream mitigation credits; however, being that the mitigation type proposed for this project includes a first order channel, rather than perennial or intermittent, it is considered jurisdictional throughout its length. Therefore, mitigation credits will be offered for its entire length throughout the property.

Jurisdictional wetland determinations were performed using the three-parameter approach as prescribed in the 1987 *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987). Supplementary technical literature describing the parameters of hydrophytic vegetation, hydric soils, and hydrological indicators were also utilized. One jurisdictional wetland was observed within the project area (Figure 4). The wetland is considered low value and is the likely result of a soil confining layer, which significantly slows the percolation of surface water. Its overall functions are severely limited due to its small size (0.058 acres), location and surrounding land use. Coordination with the USACE began in March 2010. A request for jurisdictional determination (JD) was submitted in August 2010 and concurrence was received in September 2010. The approved JD and associated forms are provided in Appendix D.

4.2.2 Endangered Species Act

Certain populations of fauna and flora have been, or are, in decline due to either natural forces or their inability to coexist with humans. Federal law (under the provisions of Section 7 of the Endangered Species Act [ESA] of 1973, as amended) requires that any federal action likely to adversely affect a species listed as federally protected be subject to review by the US Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS). Prohibited actions which may affect any species protected under the ESA are outlined in Section 9 of the Act. Other species may receive additional protection under separate laws such as the Lacey Act Amendments of 1981, the Migratory Bird Treaty of 1999, the Marine Mammal Protection Act of 1972, or the Eagle Protection Act of 1940.

Species which are listed, or are proposed for listing, as endangered or threatened are recorded in Section 4 of the ESA. As defined by the Act, an Endangered species is any plant or animal which is in danger of extinction throughout all or a significant portion of its range within the foreseeable future. A Threatened species is any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Resource investigations were conducted by a qualified scientist during January, February and March 2010. Field surveys were undertaken to determine natural resource conditions and to document natural communities, wildlife and the presence of protected species and/or their habitats. Published information regarding the study area and region and protected species was derived from a number of resources, which are summarized in the ETRR, dated October, 2010.

According to the *USFWS* (2010), there are no federal Endangered “E” or Threatened “T” species listed as potentially occurring in Perquimans County. In addition, there are no known critical habitats listed within two miles of the project area (USFWS, 2010).

Scoping letters requesting review were sent via US Mail to the USFWS and NC Wildlife Resources Commission (NCWRC) on January 25, 2010. As of October 31, 2010, no correspondence had been received from either entity. Therefore, it is determined that neither the USFWS nor NCWRC have any comments regarding protected species or their habitats with regard to the proposed project. Copies of the letters are provided in the ERTR, dated 2010.

Species identified as Endangered, Threatened, or Special Concern (SC) by the NC Natural Heritage Program’s (NCNHP’s) list of rare plant and animal species are afforded state protection under the State Endangered Species Act and the North Carolina Plant Protection and Conservation Act of 1979.

According to the *USFWS* (2010), there are three Federal Species of Concern (FSC) and one species listed under the Bald and Golden Eagle Protection Act (BGPA) that potentially may occur in Perquimans County. The NCNHP identifies a total of five species as either state-endangered, threatened or of special concern (NCNHP, 2009). These species are afforded state protection under the State Endangered Species Act and the North Carolina Plant Protection and Conservation Act of 1979. The chart presented at the end of this section depicts the species of importance for Perquimans County, their scientific names, classifications and the presence of available habitat within the project area.

On-line map reviews at the NCNHP website were conducted on July 15, 2009 and reconfirmed on August 31, 2010. There are no recorded sightings or occurrences of any species denoted by the USFWS or NCNHP documented within a two mile radius of the Watts Property.

Protected Species Potentially Occurring in Perquimans County

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS	STATE STATUS	HABITAT PRESENT	RECORD STATUS
Vertebrates:					
American eel	<i>Anquilla rostrata</i>	FSC	-	No	Current
Bald eagle	<i>Haliaeetus leucocephalus</i>	BGPA	T	No	Current
Rafinesque’s big-eared bat	<i>Corynorhinus rafinesqui</i>	FSC	SC	No	Current
Shortnose sturgeon	<i>Acipenser brevirostrum</i>	-	E	No	Current
Timber rattlesnake	<i>Crotalus horridus</i>	-	SC	No	Obscure
Vascular Plants:					
Carolina grasswort	<i>Lilaeopsis carolinensis</i>	-	T	No	Current
Raven’s boxseed	<i>Ludwigia ravenii</i>	FSC	-	No	Historic

FSC – Federal Species of Concern: A species under consideration for listing, for which there is insufficient information to support listing at this time. These species may or may not be listed in the future, and many of these species were formerly recognized as "C2" candidate species.

BGPA: In the July 9, 2007 Federal Register (72:37346-37372), the bald eagle was declared recovered, and removed (de-listed) from the Federal List of Threatened and Endangered wildlife. This de-listing took effect August 8, 2007. After de-listing, the Bald and Golden Eagle Protection Act (Eagle Act) (16 U.S.C. 668-668d) becomes the primary law protecting bald eagles. The Eagle Act prohibits take of bald and golden eagles and provides a statutory definition of “take” that includes “disturb.” The USFWS has developed National Bald Eagle Management Guidelines to provide guidance to land managers, landowners and others as to how to avoid disturbing bald eagles.

E – Endangered (State of NC): "Any native or once-native species of wild animal whose continued existence as a viable component of the state's fauna is determined by the N.C. Wildlife Resources Commission to be in jeopardy or any species of wild animal determined to be an 'endangered species' pursuant to the Endangered Species Act." (Article 25 of Chapter 113 of the General Statutes; 1987).

T- Threatened (State of NC): "Any native or once-native species of wild animal which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, or one that is designated as a threatened species pursuant to the Endangered Species Act." (Article 25 of Chapter 113 of the General Statutes; 1987)

SC – Special Concern (State of NC): "Any species of wild animal native or once-native to North Carolina which is determined by the Wildlife Resources Commission to require monitoring but which may be taken under regulations adopted under the provisions of this Article." (Article 25 of Chapter 113 of the General Statutes; 1987).

Sources: USFWS, 2010 & NCNHP, 2009

4.2.3 Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 provides that properties and districts listed in or eligible for listing in the National Register of Historic Places be considered in the planning of federal undertakings such as highway construction and community development projects. "Federal undertakings" also include activities sponsored by state or local governments or private entities if they are licensed, permitted, approved, or funded (wholly or in part) by the federal government. "Federal undertakings" do not include loans made by banks insured by the FDIC or federal farm subsidies.

There is no absolute protection from federal actions that may affect a historic property. If a federal undertaking is in conflict with the preservation of a historic property, the State Historic Preservation Office will negotiate with the responsible federal agency, sometimes with the involvement of the federal Advisory Council on Historic Preservation, in an effort to eliminate or minimize the effect on the property. This mitigation procedure applies to properties that are determined eligible for the National Register in the day-to-day environmental review process as well as those actually listed in the National Register.

North Carolina law (G.S. 121-12(a)) provides for consideration of National Register properties in undertakings funded or licensed by the state. Where a state undertaking is in conflict with the preservation of a National Register property, the NC Historical Commission is given the opportunity to review the case, "giving due consideration to the competing public interests involved," and make recommendations to the state agency responsible for the undertaking. The commission's recommendations to the state agency are only advisory. Properties potentially eligible for but not actually listed in the National Register are not protected under G.S. 121-12 (a).

No structures, buildings, ruins or other man-made items exist within the area denoted as the Project Site. Structures, including those associated with private residences and their associated farm buildings exist outside of the project area; however, none of these will be impacted by the restoration of the stream channel and enhancement of the surrounding wetland and buffer areas.

No items relating to archaeological resources were observed during the Site visit.

Scoping letters requesting review were sent via US Mail to the NC Department of Cultural Resources, State Historic Preservation Office (SHPO) and the Tribal Historic Preservation Office (THPO) associated with the Eastern Band of Cherokee Indians on January 25, 2010. Ecological Engineering received a letter dated February 9, 2010 from SHPO confirming there are no historic resources that would be affected by the project, and thus no comment on the undertaking as proposed. No letters or comments have been received from the Eastern Band of Cherokee Indians. Copies of these scoping letters and the SHPO response are provided in the ERTR, dated 2010.

4.2.4 Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)

Perquimans County is one of 20 counties along the coastal region of North Carolina that is subject to the rules and policies of the Coastal Resources Commission, which administers the Coastal Area Management Act (CAMA). Immediately downstream of the Site is an identified Area of Concern (AEC). Generally AECs are defined as those areas exhibiting areas with navigable waters within the 20 CAMA counties, existing marsh or wetland areas, areas within 75 feet of the mean high water line along an estuarine shoreline; near the ocean beach, near an inlet, within 30 feet of the normal high water level of areas designated as inland fishing waters by the N.C. Marine Fisheries Commission or near a public water supply. The NC Division of Coastal Management oversees CAMA for permitting purposes.

In addition, Federal consistency authority exists under the Federal Coastal Zone Management Act (CZMA). This Act was enacted on October 27, 1972, to encourage coastal States, such as North Carolina, to develop comprehensive programs to manage and balance competing uses of and impacts to coastal resources. It applies to any activity that is within the State's coastal zone that may reasonably affect any coastal resource or coastal use within the State's coastal zone (even if the activity occurs outside of the coastal zone), if the activity is a Federal activity, requires a Federal license or permit, receives Federal money or is a plan for exploration, development or production from any area leased under the Outer Continental Shelf Lands Act.

4.2.5 Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) set forth a new mandate for the National Marine Fisheries Service (NMFS), regional fishery management councils and other federal agencies to identify and protect important marine and anadromous fish habitats. The Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Act support one of the Nation's overall marine resource management goals - maintaining sustainable fisheries.

According to NOAA (2011), no EFH, Habitat Areas of Particular Concern (HAPC) or EFH areas protected from fishing were identified within the Project boundaries. The remaining portion of the UT downstream of the Site and the Little River exhibit EFH for all life stages of the red drum (*Sciaenops ocellatus*).

SECTION 5.0 DETERMINATION OF CREDITS

Mitigation credits presented in Table 2 are projections based upon Site design. Upon completion of Site construction, the project components and credits data will be revised to be consistent with the as-built condition.

TABLE 2. PROJECT COMPONENTS AND STRUCTURE									
Watts Property Stream and Wetland Restoration Site									
EEP Project Number 413									
Mitigation Credits									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	1,505 lf	-	-	-	20.4 ac	0.04 ac	-	-	-
Project Components									
Project Component -or- Reach ID	Stationing/ Location		Existing Footage/ Acreage		Approach (PI, PII, etc.)		Restoration -or- Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
UT Little River	10+00 to 25+05		1,505 lf		CPHSR*		Restoration	1,003 lf	1:1
Non-riparian Wetland	n/a		0 ac		n/a		Restoration	20.4 ac	1:1
Non-riparian Wetland	n/a		0.06 ac		n/a		Enhancement	0.06 ac	1.5:1
Component Summation									
Restoration Level	Stream (linear feet)		Riparian Wetland (acres)		Non-riparian Wetland (acres)		Buffer (square feet)		Upland (acres)
			Riverine	Non-riverine					
Restoration	1,003		-	-	20.4		-		26.8
Enhancement	-		-	-	0.06		-		-
Enhancement I	-		-	-	-		-		-
Enhancement II	-		-	-	-		-		-
Creation	-		-	-	-		-		-
Preservation	-		-	-	-		-		-
High Quality Preservation	-		-	-	-		-		-
BMP Elements									
Element	Location		Purpose/ Function		Notes				
n/a	-		-		-				

Notes:

CPHSR = Coastal Plain Headwater Stream Restoration (USACE et. al., 2005)

BMP Elements: BR= Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer

SECTION 6.0 MITIGATION WORK PLAN

6.1 Stream Project and Design Justification

This section is characterized as a functional balance sheet further establishing the design approach or level of intervention is proportional and appropriate to the existing conditions at the Site and within the watershed in order for uplift to be maximized to the fullest extent. Current impairment factors for the Project Site are considered the following:

- Hydrological: existing channelized conveyance (UT) and surrounding drainage network.
- Impairment Severity: maximum with complete landuse change from previous community type.
- Proportion: entire 48-acre property parcel.
- Rate of Deterioration: moderate, requiring periodic maintenance.

Although relatively small (136 acres), the contributing watershed also presents several impairment factors. These factors include:

- Hydrological: existing channelized conveyance (UT) and surrounding drainage network.
- Impairment Severity: moderate with partial landuse changes from previous community type.
- Proportion: throughout.
- Rate of Deterioration: minimal to moderate, requiring periodic maintenance.

The main differences between the Project Site and its surrounding watershed area are that a portion of the area remains wooded, with mature vegetation. This vegetation has helped to stabilize the channel upstream of the Site. The area has still been altered through a drainage network though. The remainder of the watershed consists of agricultural fields.

The abovementioned factors when contrasted and compared with existing features of value including: standing ecological value of instream habitat complexity; standing ecological value of mature vegetation and the biological state of the channel and existing wetland areas result in an overwhelming justification for maximum intervention. The standing ecological values of instream habitat and mature vegetation are essentially non-existent. In addition, the biological state of the channel and existing wetland areas are severely compromised due to lack of stability, flow regimes, canopy cover and periodic maintenance. As a result, the uplift potential for this project is very high.

6.2 Designed Channel Classification and Wetland Types

Stream mitigation credits will be generated via modification of the existing, channelized UT to a headwater, first order stream channel. These modifications will effect the overall dimension, pattern and profile of the channel. The classification of a design channel is not applicable in this case. Rather, the entire linear feature will be restored to function similar to a Headwater Forest Community, as defined by *NCWAM* (2010) and discussed in detail later in this section.

The existing interior drainage network will be removed in its entirety and restored to depict a Hardwood Flat Community. This community type will transition into a Mesic Mixed Hardwood Community throughout the remainder of the Project Site. The Hardwood Flat Community will occur in the wetter portions of the Site, primarily those obtaining jurisdictional wetland status while the Mesic Mixed Hardwood Community will occur along the drier portions.

6.3 Target Wetland and Buffer Communities

As mentioned above, target wetland and buffer communities will be categorized under the Coastal Plain Headwater Forest, Hardwood Flat and Mesic Mixed Hardwood Communities. According to the *Schafale and Weakley (1990)*, vegetative communities commonly transition between each other and differences are generally based on landscape position, hydrology, soil types and dynamics. These communities are all indicative of the Coastal Plain physiographic province.

6.4 Preliminary Groundwater Characterization

Based on available groundwater information, nearly six years of groundwater data exist at the Project Site. Initial collection efforts began in December 2003 and ended in December 2004. Following this effort, no data was available for Year 2005 although the groundwater gauges remained in place. These gauges were replaced at the beginning of 2010. Once the original gauges were removed from the Site, the manufacturer was able to extract the additional data from 2006 to 2010. The replacement gauges have been periodically monitored since their installation and will remain on site until implementation activities begin.

According to EEP (2005), the previous consultant's evaluation of site groundwater included the siting and installation of a series of groundwater monitoring gauges with electronic data loggers. These gauges were manufactured by Infinities USA, Inc. and provided by EEP. A total of six were installed along with a 6.5-inch diameter, 0.01-inch, self emptying tipping bucket rain gauge data logger (EEP, 2005). The locations of the original gauges have been preserved and are depicted on Figure 4. The data associated with these gauges is provided in Appendix E.

Ecological Engineering replaced the previously installed gauges with Ecotone brand gauges provided from Remote Data Systems, Inc. As previously mentioned, the original gauges were returned to the manufacturer and downloaded. The current Ecotone gauges are situated immediately adjacent to the previous gauge locations to maintain the groundwater data stream. Ultimately, this data will be used to compare the pre- and post-implementation conditions. The data collected during this time period represents a snap-shot of groundwater levels compared with precipitation data. Appendix E also depicts existing groundwater and precipitation data at the Project Site. Based on current data, the existing drainage network is effectively removing groundwater from the Site.

6.5 Water Budget

Ecological Engineering developed a water budget for the Watts Site to determine the viability of reestablishing wetland hydrology on this site. The water budget is based on methods presented in *Pierce (1993) "Planning Hydrology for Constructed Wetlands."* Development of a water budget requires knowledge of the hydrologic inputs and outputs, site dimensions, physical properties of the soils present and existing features on and adjacent to the project site which may affect groundwater hydrology. The water budget calculations indicate that adequate water is present to meet the proposed hydrologic criteria for the restored wetlands.

Site constraints limiting the extent of wetland development include a perimeter ditch and Norma Drive at the lower project boundary. The perimeter ditch must remain in place to avoid hydrologic trespass on adjacent properties, some of which are currently being used for agriculture. Norma Drive creates the northern (downstream) project boundary. As previously mentioned, a 24-inch CMP conveys the UT under the roadway and roadside ditches provide drainage for the road bed. These features must also remain in place to prevent erosion from compromising the current road. As a result, both of these constraints limit the extent of wetland development within the Project Site.

The water budget results verify the presence of adequate water to meet the proposed wetland hydrology criteria for the majority of the Project Site. Calculations indicate excess water when comparing inflow to outflow and by assuming that base channel flow and stormwater flow were zero, these calculations present a conservative estimate of available water.

6.6 Soil Characterization

As previously mentioned, the soils underlying the Watts Property are dominated by the Roanoke Series, with the exception of the northern portion where the UT exits under Norma Drive, which is underlain by the Dogue Series. The soils associated with both the Roanoke and Dogue Series exhibit similar characteristics such as their pH (acidic), depths to restrictive features (more than 80 inches), slopes (zero to two percent), available water capacity (high, between 9.2 and 9.3 inches) and their parent material (loamy and clayey fluviomarine deposits). Roanoke soils however, differ from Dogue soils in landform position, drainage class, depth to water table and profile. Taxonomic classifications are:

Taxonomic Classifications	
Roanoke Silt Loam	fine, mixed, semiactive, thermic typic endoaquults
Dogue Fine Sandy Loam	fine, mixed, semiactive, thermic aquic hapludults

Ecological Engineering characterized the underlying soils at the Site and compared them with typical profile information for Roanoke silt loam. Ten soil borings were examined. These borings were randomly located across the property as a comparison to the mapped underlying series (Figure 4). Based on the results, the soils appear to be similar with the mapped Roanoke series. This information is provided in Appendix E. Upon review of the data, it appears that all ten of the borings would fall under the hydric classification as evidenced by the matrix and mottle colors within the upper 12 inches of the column.

6.7 Sediment Transport Analysis

A sediment transport analysis is generally conducted to determine channel stability, morphology and existing and proposed bedload. Although an active channel is currently present at the Watts Site, the need for sediment transport was not necessary in the formulation of the design of a headwater, first order stream system. This design will transport sediment during high events; however, no base channel will be designed. Therefore, any sediment transport analysis would be considered unreliable based on current designs.

6.8 HEC-RAS Analysis

Section 4.1.7.4 denotes that the UT is situated within FEMA Zone AE, where base flood elevations have been determined. This classification is based on backwater influence from Little River, its downstream receiving water. Ecological Engineering developed a HEC-RAS surface water model for the Watts Site to determine the impacts, if any, the proposed stream and wetland restoration would have on water surface elevations through the project area. In addition, the analysis was used to ensure that no hydraulic trespass occurred on adjacent properties. HEC-RAS version 4.0, developed by the USACE, Hydraulic Engineering Center, was the program utilized to most accurately model the flow of surface waters.

As part of development, Ecological Engineering created an existing model of the Site. Cross sections of the UT and its floodplain were taken from 150 feet downstream of Norma Drive through the upstream limits of the Site. The existing 24-inch CMP under Norma Drive was included in the model. Roughness coefficients, or Manning's "n" values, were determined for the floodplain and channel sections based on field observations. The overbank area was determined to exhibit traits resulting in a Manning's "n" of 0.04 and the channel was determined to be a 0.045. The overbank roughness coefficient was based on former agricultural land in its current fallow state. The existing vegetation is mostly herbaceous in nature and does not create much restriction to flow. The channel depicts slightly more roughness than its overbank area since it contains a minimal amount of woody species.

Once the existing model was developed and calibrated, a proposed model was prepared. The proposed cross sections show the widening of the stream bed and the flatter sloped banks. Also, Manning's "n" values were adjusted to mimic the future condition. Overbank Manning's "n" was estimated at 0.15 to reflect the most dense vegetative growth occurring within five years of construction. The channel Manning's "n" was estimated at 0.08 to reflect the additional woody and more aquatic species that will occur within the stream channel. The proposed model also includes the replacement of the 24-inch CMP with two 36-inch corrugated aluminum pipes (CAP) with a headwall.

Ecological Engineering compared the existing and proposed scenarios to ensure no hydraulic trespass would occur outside the Project Site. Due to the increase conveyance under Norma Drive and the increase flow capacity of the proposed channel, water surface elevations decreased for all storm events within the project area and no hydrologic trespass occurs upstream of the project.

The HEC-RAS model output is provided Appendix E.

6.9 Site Construction

6.9.1 Site Grading, Structure Installation and Other Project Related Construction

Based on the components itemized in Table 2 of this document, a combination of Coastal Plain Headwater Forest restoration, Hardwood Flat restoration and enhancement and buffer restoration are proposed as part of this overall project. The Watts Site is unique in the fact that the entire 48-acre property will be ecologically uplifted through community based restoration techniques. Each of these aspects are described in detail. In addition, the attached Design Sheets provide a visual observation of the existing conditions, proposed conceptual design and proposed planting plan.

Construction access will occur from the northern boundary of the property along Norma Drive. This road will afford equipment and material access to the Project Site. Norma Drive is a private road maintained by the current parcel owners along the roadway. It is expected that the contractor will maintain the road during construction implementation to ensure that its condition remains consistent with the integrity prior to implementation. Ecological Engineering recommends the selected contractor thoroughly note and document existing road conditions prior to mobilization.

Construction activities will likely begin with the replacement of the existing pipe under Norma Drive. It is currently in very poor condition. Ecological Engineering will prepare designs for the new pipe(s). These designs will be incorporated with the construction documents. Once the pipe has been replaced, excavation will begin along the existing side slopes of the UT throughout its length across the property. These side slopes will be reduced from their existing 60 to 90-degree orientation to a slope averaging approximately 10:1, with a substantial increase of the base channel width. The excavated material will be used to fill the interior drainage network. The existing pipes situated along the interior drainage network will be removed in their entirety. Several pipes exist along the northeastern perimeter that extend outside of the property boundary. These pipes will be capped to ensure that water removal does not take place. Once excavation along the UT has been completed, grading will continue outside of this area to reduce the existing field crowns (see topographic contours on Design Sheet 1), as applicable. This material will be excavated no more than six inches and directed into the interior drainage network. Any excess will be placed along the eastern portion of the property, depicted on Design Sheet 3.

Throughout the duration of construction implementation, the Site will be stabilized with erosion and sedimentation control devices, consistent with the requirements of the NC Sedimentation and Pollution Control Act of 1973, as regulated by the NCDENR Division of Land Resources, Land Quality Section. Temporary seeding will occur along all areas of disturbance.

Once construction activities have been completed and approved, the Site will be seeded with a permanent seed mix and trees will be planted. Several vegetated zones exist based on the current conceptual design. These zones will be planted with their appropriate mix of vegetation. In addition, larger trees will be intermixed with bare-rooted seedlings, especially along the project perimeter. These trees will function as boundary trees and offer an aesthetically pleasing view from areas outside of the property.

6.9.2 Native Plant Community Restoration

6.9.2.1 *Soil Preparation and Amendments*

Project implementation will involve excavation along the current UT and field crowns between the drainage ditches and fill along the project boundaries and interior drainage network. During the excavation process, topsoil will be stockpiled aside from subsoil, where feasible, and utilized as a dressing once the desired amount of subsoil has been removed. Ripping will not be required since compaction did not likely occur during past farming operations. Fertilizer and seeding will be distributed per the NC Division of Land Quality's (NCDLQ) recommended rates, unless the contractor performs a soil test to determine the prescribed amounts. This soil test may be submitted prior to implementation. Table 3 details soil preparation methodologies and amendment summaries per vegetated zone.

Herbicide treatments will also be part of the amendment process. Japanese honeysuckle (*Lonicera japonica*) exists at the Site. It will be treated along with soil amendment processes. More information pertaining to this treatment is provided later in the document.

TABLE 3. SOIL PREPARATION AND AMENDMENT SUMMARY PER ZONE								
Watts Property Stream and Wetland Restoration Site								
EEP Project Number 413								
Zone 1 – Headwater Forest Areas							Acres	0.9
Mechanical Treatment	Approx. Date	Ground Cover Fabric	Mulch Type	Mulch Density / Thickness	Nutrient Amendments	Nutrient Total lbs ¹		
n/a	1/12 – 5/12	Coir	Wheat straw	75% cover	n/a	n/a		
						Subtotal	n/a	
Zone 2 – Mesic Mixed Hardwood Forest Areas							Acres	26.8
Mechanical Treatment	Approx. Date	Ground Cover Fabric	Mulch Type	Mulch Density / Thickness	Nutrient Amendments	Nutrient Total lbs		
Herbicide ³	1/12 – 5/12	n/a	n/a	n/a	n/a	n/a		
n/a	1/12 – 5/12	n/a	Wheat straw	75% cover	Pellet Fertilizer	TBD		
n/a	1/12 – 5/12	n/a	n/a	n/a	Ground Limestone	TBD		
						Subtotal	TBD	
Zone 3 – Hardwood Flat Areas							Acres	20.4
Mechanical Treatment	Approx. Date	Ground Cover Fabric	Mulch Type	Mulch Density / Thickness	Nutrient Amendments	Nutrient Total lbs		
n/a	1/12 – 5/12	n/a	Wheat straw	75% cover	Pellet Fertilizer	TBD		
n/a	1/12 – 5/12	n/a	n/a	n/a	Ground Limestone	TBD		
						Subtotal	TBD	
						Total	TBD	
							48.1	

Notes: ¹ Nutrient Total lbs will be determined by contractor upon the results of a soil test.

² TBD = to be determined.

³ Herbicide applications will only be performed in areas exhibiting non-native species.

6.9.2.2 Proposed Plant Communities

Natural plant community restoration will follow descriptions of community types by *NCWAM* (2010), *Schafale and Weakley* (1990), reference wetland vegetation types and professional judgment. The designed natural communities are based primarily on landscape position and hydrology. Vegetative restoration will aid to benefit biological function and habitat. Three distinct vegetative communities are proposed. They are described in detail below.

The first community follows the existing UT to Little River channel area. It will consist primarily of riparian wetland vegetation. This community is labeled as “Zone 1” and will depict the characteristics of a Headwater Forest, as described by *NCWAM* (2010). Headwater Forest Communities, previously documented as Coastal Plain Small Stream Swamp Communities by *Schafale and Weakley* (1990), are found in geomorphic floodplains or first-order or smaller streams and in topographic crenulations without a stream. Groundwater seepage and diffuse surface flow are often important sources of water, and this wetland type frequently has surface flow, especially through ephemeral channels. Overbank flooding is not a substantial source of water and Headwater Forests are relatively dry when compared to other riparian types. This wetland type is characterized by a relatively flat ground surface that provides little water storage. Headwater Forests generally occur on mineral soils that may be intermittently inundated by surface water or seasonally saturated to semi-permanently saturated (*NCWAM*, 2010).

The second community, identified as “Zone 2,” consists of the non-riparian vegetation situated immediately outside of the proposed wetland areas at the Project Site. This community is most consistent with the Mesic Mixed Hardwood Forest, as identified by *Schafale and Weakley* (1990). Although fire is a necessity for most Coastal Plain vegetative communities, the Mesic Mixed Hardwood Forest is generally found along upland areas protected from fire. It is underlain by various moist soils and is generally situated immediately upslope of Coastal Plain Small Stream Swamp and Non-Riverine Wet Hardwood Communities (Schafale and Weakley, 1990). There are some aspects of this community description that do not fit the characteristics of the Project Site; however, *Schafale and Weakley* (1990), identified three recognized variants for the areas located in the northeastern corner of North Carolina. These included the bluff/ slope variant, upland flat variant and swamp island variant. Based on current site conditions, the Project Site falls under the upland flat variant, which transitions into the Non-riverine Wet Hardwood Community and often contains combinations of wetter and drier species, as well as typical mesic species. Variation may be controlled by small microtopographic differences (Schafale and Weakley, 1990).

Zone 3, represented as the Hardwood Flat Community, is the third community proposed for the Project Site. This community will occupy all wetland and transition areas, aside from the area along the existing tributary. According to *NCWAM* (2010), Hardwood Flats are found primarily in the Coastal Plain Ecoregion on poorly drained, interstream flats. These areas are usually seasonally saturated or intermittently to seasonally inundated by a high water table or poor drainage, but have a shorter hydroperiod than Non-Riverine Swamp Forests. The primary source of water is a high water table resulting from precipitation and overland runoff. In their reference state, Hardwood Flats generally occur on mineral soils. These systems are commonly dominated by hardwood tree species including various oaks including, but not limited to swamp chestnut oak (*Quercus michauxii*), laurel oak (*Quercus laurifolia*) and cherrybark oak (*Quercus pagoda*), as well as tulip poplar (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), American elm (*Ulmus americana*), red maple (*Acer rubrum*) and black gum (*Nyssa biflora*) (NCWAM, 2010).

6.9.2.3 Planting Plan

The planting plan for the Project Site will provide post-construction erosion control and habitat enhancement. It will also attempt to blend existing vegetative communities into the recently restored areas. Plantings in the wetland and buffer areas will include native species appropriate for the Coastal Plain physiographic province and the Project Site. A variety of trees and shrubs will be planted to provide cover and habitat for wildlife, as well as soil stabilization.

The Project Site is divided into three vegetated zones. As previously mentioned, these zones were identified based primarily on landscape position and hydrology. Zone 1, also referred to as the Streamside Area, is situated along the headwater stream location. This zone will be planted with species similar to the Headwater Forest, as identified by *NCWAM* (2010). Zone 2 includes the non-wetland areas and buffer areas outside of the headwater stream. This zone will be planted with species similar to the Mesic Mixed Hardwood Forest, as identified by *Schafale and Weakley* (1990). The remaining areas, depicted as non-riparian wetlands, are considered Zone 3. Zone 3 will consist of species similar to the Hardwood Flat Community as described by *NCWAM* (2010). The proposed planting plan is depicted on Design Sheets 3 and 4. A listing of the preferred species associated with each zone is presented below.

Zone 1 Headwater Forest Community		
Common Name	Scientific Name	Stratum
Bald cypress	<i>Taxodium distichum</i>	Canopy
Swamp tupelo	<i>Nyssa biflora</i>	Canopy
Laurel oak	<i>Quercus laurifolia</i>	Canopy
Overcup oak	<i>Quercus lyrata</i>	Canopy
Swamp chestnut oak	<i>Quercus michauxii</i>	Canopy
River birch	<i>Betula nigra</i>	Canopy
Ironwood	<i>Carpinus caroliniana</i>	Understory
American holly	<i>Ilex opaca</i>	Understory
Sweetbay	<i>Magnolia virginiana</i>	Understory
Red bay	<i>Persea palustris</i>	Understory
Titi	<i>Cyrilla racemiflora</i>	Understory

Zone 2 Mesic Mixed Hardwood Forest Community		
Common Name	Scientific Name	Stratum
American beech	<i>Fagus grandifolia</i>	Canopy
Swamp chestnut oak	<i>Quercus michauxii</i>	Canopy
White oak	<i>Quercus alba</i>	Canopy
Northern red oak	<i>Quercus rubra</i>	Canopy
Flowering dogwood	<i>Cornus florida</i>	Understory
Hop-hornbeam	<i>Ostrya virginiana</i>	Understory
American holly	<i>Ilex opaca</i>	Understory
Deerberry	<i>Vaccinium stamineum</i>	Understory

Zone 3 Hardwood Flat Community		
Common Name	Scientific Name	Stratum
Swamp chestnut oak	<i>Quercus michauxii</i>	Canopy
Laurel oak	<i>Quercus laurifolia</i>	Canopy
Cherrybark oak	<i>Quercus pagoda</i>	Canopy
Swamp tupelo	<i>Nyssa biflora</i>	Canopy
American elm	<i>Ulmus Americana</i>	Canopy
Ironwood	<i>Carpinus caroliniana</i>	Understory
American holly	<i>Ilex opaca</i>	Understory
Red bay	<i>Persea palustris</i>	Understory
Sweet pepperbush	<i>Clethra alnifolia</i>	Understory
Wax myrtle	<i>Morella cerifera</i>	Understory

Prior to the planting of trees and shrubs, all disturbed areas associated with the Project Site will be seeded first with a temporary seed mix. This mix will include either grain rye (*Secale cereale*), brown-top millet (*Panicum ramosum*), or German millet (*Setaria italica*). The seed material will be selected according to the time period selected for implementation. Currently, implementation is proposed for the spring of 2012, in which grain rye would be the preferred seed mix. Table 4 summarizes this data, including time periods and application rates.

TABLE 4. SEEDING SUMMARY FOR TEMPORARY VEGETATION Watts Property Stream and Wetland Restoration Site EEP Project Number 413					
Temporary Seeding Throughout Disturbed Areas				Acres	TBD*
Year round	<i>Secale cereale</i>	Herb	Grain rye	130 lbs/ac	Single species to be applied
May - September	<i>Panicum ramosum</i>	Herb	Brown top millet	40 lbs/ac	
May - September	<i>Setaria italica</i>	Herb	German millet	25 lbs/ac	

TBD* To be determined once final grading plans and areas of disturbance are finalized.

The permanent seed mix will be distributed per vegetated zone. The permanent seed mix will be applied at a rate of approximately 12 to 15 lbs per acre, although the individual species will be different in each zone. Virginia wild rye (*Elymus virginicus*), autumn bentgrass (*Agrostis perennans*) and showy tick trefoil (*Desmodium canadense*) will be utilized in all three zones. While switchgrass (*Panicum virgatum*), beggar ticks (*Bidens aristosa*), coreopsis (*Coreopsis lanceolata*), deer tongue (*Panicum clandestinum*), bushy bluestem (*Andropogon glomeratus*), little bluestem (*Schizachyrium scoparium*), partridge pea (*Chamaecrista fasciculata*), Indian grass (*Sorghastrum nutans*) and river oats (*Uniola latifolia*) will be planted along the Streamside Area and Riparian Area and fox sedge (*Carex vulpinoidea*), blue flag (*Iris versicolor*), black-eyed

susan (*Rudbeckia hirta*), blue vervain (*Verbena hastata*), soft rush (*Juncus effusus*) and Pennsylvania smartweed (*Polygonum pennsylvanicum*) are planted within the Wetland Area. A complete description of each zone, its proposed species and planting percentages and mix rates is provided in Table 5.

TABLE 5. SEEDING SUMMARY FOR PERMANENT VEGETATION PER PLANTING ZONE					
Watts Property Stream and Wetland Restoration Site					
EEP Project Number 413					
Zone 1 and Zone 3 –Permanent Seeding for Wet/Sunny Conditions				Acres	21.3
Approved Date	Species Name	Stratum	Common Name	Total lbs	Mix to be applied at rate of approx. 20 lbs/ acre
n/a	<i>Trifolium pratense</i>	Herb	Red clover	128(30%)	
n/a	<i>Panicum clandestinum</i>	Herb	Deer tongue	85 (20%)	
n/a	<i>Carex vulpinoidea</i>	Herb	Fox Sedge	64 (15%)	
n/a	<i>Elymus virginicus</i>	Herb	Virginia wild rye	64 (15%)	
n/a	<i>Juncus effusus</i>	Herb	Soft Rush	43 (10%)	
n/a	<i>Agrostis perennans</i>	Herb	Upland bentgrass	43 (10%)	
Subtotal				427 (100%)	
Zone 2 –Permanent Seeding for Dry/Sunny Conditions				Acres	26.8
Approved Date	Species Name	Stratum	Common Name	Total lbs	Mix to be applied at rate of approx. 20 lbs/ acre
n/a	<i>Festuca rubra</i>	Herb	Red fescue	107 (20%)	
n/a	<i>Trifolium pratense</i>	Herb	Red clover	161(30%)	
n/a	<i>Panicum clandestinum</i>	Herb	Deer tongue	107 (20%)	
n/a	<i>Schizachyrium scoparium</i>	Herb	Little bluestem	161(30%)	
Subtotal				536 (100%)	
Total lbs (Permanent Seeding)				963	48.1

Note: Seed drilling is the preferred method of installation.

The planting of canopy and understory species will dominate Zones 1, 2 and 3. Due to the location and the flooding regime of the Project Site, the majority of these species must be conducive to periodic flooding. These species will be planted as bare roots and containerized individuals, with larger individuals placed randomly throughout the area and especially along the existing non-forested boundaries. Specific species listings, proposed quantities and other detailed information are provided on Design Sheets 3 and 4.

Vegetation will be planted in a random fashion in an effort to mimic natural plant communities. Colonization of local herbaceous vegetation will inevitably occur, which will provide additional soil stability. Tree species will be planted as bare root stock on random eight-foot centers at a frequency of approximately 680 stems per acre. Understory species will be dispersed among the tree species also on random eight-foot centers. Containerized plantings will occupy approximately 20 percent of each zone. These plantings will be installed at a frequency of approximately 320 stems per acre. Planting stock will be culled to remove inferior specimens, allowing only healthy, viable stock to be planted at the Project Site. Plantings will be dormant and will be performed to the extent practicable between November 3rd and March 30th.

6.9.2.4 Invasive Species Management

The following list of exotic plant species poses a severe threat to native plant communities in North Carolina (Table 6). These species have invasive characteristics and spread readily into native plant communities, displacing native vegetation.

TABLE 6. INVASIVE SPECIES LIST
Watts Property Stream and Wetland Restoration Site
SCO Project Number 09-0780401, EEP Project Number 413

High Concern			
Vines – Common Name	Scientific Name	Shrubs/Herbs	Scientific Name
Kudzu	<i>Pueraria montana</i>	Japanese knotweed	<i>Polygonum cuspidatum</i>
Porcelain Berry	<i>Ampelopsis brevipedunculata</i>	Asian bittersweet	<i>Celastrus orbiculatus</i>
Japanese honeysuckle	<i>Lonicera japonica</i>	Multiflora rose	<i>Rosa multiflora</i>
Japanese Hops	<i>Humulus japonicus</i>	Russian olive	<i>Elaeagnus angustifolia</i>
Wisterias	<i>Wisteria spp.</i>	Chinese privet	<i>Ligustrum sinense</i>
Winter Creeper	<i>Euonymus fortunei</i>	Chinese Silvergrass	<i>Miscanthus sinensis</i>
Trees – Common Name	Scientific Name	Shrubs/Herbs	Scientific Name
Tree of Heaven	<i>Ailanthus altissima</i>	Phragmites	<i>Phragmites australis</i>
Mimosa	<i>Albizia julibrissin</i>	Bamboos	<i>Phyllostachys spp.</i>
Princess tree	<i>Paulownia tomentosa</i>	Sericea Lespedeza	<i>Sericea lespedeza</i>
China Berry	<i>Melia azedarach</i>	Garlic Mustard (Watch List)	<i>Alliaria petiolata</i>
Callery Pear	<i>Pyrus calleryana</i>	Cogon Grass (Watch List)	<i>Imperata cylindrica</i>
White Mulberry	<i>Morus alba</i>	Giant Reed (Watch List)	<i>Arundo donax</i>
Tallow Tree (Watch List)	<i>Triadica sebifera</i>	Tropical Soda Apple (Watch List)	<i>Solanum viarum</i>
		Japanese Spirea (Watch List)	<i>Spiraea japonica</i>
Low/Moderate Concern			
Shrubs/Herbs	Scientific Name	Shrubs/Herbs	Scientific Name
Japanese Privet	<i>Ligustrum japonicum</i>	Bush Honeysuckles	<i>Lonicera spp.</i>
Glossy Privet	<i>Ligustrum lucidum</i>	Periwinkles	<i>Vinca minor</i>
Fescue	<i>Festuca spp.</i>	Morning Glories	<i>Morning Glories</i>
English ivy	<i>Hedera helix</i>	Bicolor Lespedeza (Watch List)	<i>Lespedeza bicolor</i>
Microstegium	<i>Microstegium vimineum</i>	Chinese Yams (Watch List)	<i>Dioscorea oppositifolia</i>
Burning Bush	<i>Euonymus alatus</i>	Air Potato (Watch List)	<i>Dioscorea bulbifera</i>
Johnson Grass	<i>Sorghum halepense</i>	Japanese Climbing Fern (Watch List)	<i>Lygodium japonicum</i>

Japanese honeysuckle (*Lonicera japonica*) was the only invasive species observed during the site visits at the Project Site. It is situated along the northeastern portion in several isolated areas. It is likely that past farming operations utilized weed control and the use of herbicide. Although only one invasive species is currently present, it is anticipated that soil movement from implementation will promote seed growth that is currently dormant from within the soil column. It is essential that invasive species are documented and controlled during the monitoring period to ensure that native species are afforded the opportunity to colonize the Project Site.

The construction contractor will provide removal, as necessary, to any of the species listed above during construction implementation. Removal will be conducted according to recommended control measures made through the NC Cooperative Extension Service.

It is anticipated that invasive species management will occur throughout the monitoring period. As seedbeds and their associated soils are disturbed, it is likely that other invasive species may appear within the Project Site. Periodical assessments will be conducted to determine if these species are posing a threat to native population levels. The threats will be determined on an annual basis as well as, their remedial activities, as necessary.

SECTION 7.0 MAINTENANCE PLAN

EEP shall monitor the site on a regular basis and shall conduct a physical inspection of the Site 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 items depicted in Table 7.

TABLE 7. MAINTENANCE PLAN	
Watts Property Stream and Wetland Restoration Site	
EEP Project Number 413	
Component/ Feature	Maintenance Through Project Close-Out
Stream	Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting and supplemental installations of live stakes and other target vegetation along the channel. Areas where stormwater and floodplain flows intercept the channel may also require maintenance to prevent bank failures and head-cutting.
Wetland	Routine wetland maintenance and repair activities may include securing of loose coir matting and supplemental installations of liver stakes and other target vegetation within the wetland. Areas where stormwater and floodplain flows intercept the wetland may also require maintenance to prevent scour.
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 filed 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.
Utility Right-of-Way	Utility rights-of-way within the Site may be maintained only as allowed by Conservation Easement or existing easement, deed restrictions, rights of way or corridor agreements.

SECTION 8.0 PERFORMANCE STANDARDS

Performance criteria set forth for this project will be provided according to current EEP monitoring criteria and format. It will cover stream, wetland, and vegetation assessments. The basic monitoring period is five years with two additional years if the site is not meeting success criteria.

8.1 Streams

Although stream restoration credit is being provided, common perennial-based stream monitoring activities will not be conducted as part of the annual monitoring assessments. The existing headwater channel will function to transport surface water; however, it will not maintain the characteristics and morphology of a perennial channel. Therefore, profile, pattern and substrate monitoring will not be required. Rather, monitoring activities will be concentrated primarily to observing whether or not the first order system is stable and functioning similar to the reference sites. The majority of the monitoring will be based on visual assessments.

During Monitoring Years 1-4, the preponderance of documented field indicators must demonstrate the accumulation of flow within the topographic low point of the valley or crenulation. These indicators may include:

- presence of litter and debris (wracking) indicating a surface flow;
- leaf litter disturbed or washed away;
- matted, bent or absence of vegetation (herbaceous or otherwise) indicative of surface flow;
- sediment deposition and/or scour indicating sediment transport by flowing water; or,
- water staining due to continual presence of water.

After Monitoring Year 4, the presence of documented field indicators must also indicate the development of a primary path of flow, stream channel or ordinary high water mark. These indicators may include any of the following:

- formation of channel bed and banks;
- sediment sorting indicated by grain-size distribution within the primary path of flow;
- sediment shelving or a natural line impressed on the banks;
- change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes);
- development of channel pattern (meander bends and/or channel braiding at natural topographic breaks, woody debris piles, or plant root systems);
- exposure of woody plant roots within the primary path of flow; or,
- changes in soil characteristics (when compared to the soils abutting the primary path of flow).

Two pressure transducers will be installed to measure and document stream flow. Cross sections will be established along sections of the valley to document any aggradation or degradation and photographs will be taken from permanently established locations. These visual assessments, cross section surveys and photographs will be completed annually. It is anticipated that the actual flow path will migrate across the section from year to year, depending on flow regimes. The proposed success criteria will be based on the overall performance of the headwater channel. In addition to aggradation and/or degradation, the channel should not experience any head-cutting, down-cutting and excessive erosion.

8.2 Wetlands

Both Coastal Plain headwater wetland systems and non-riverine wet hardwood communities exhibit variable water tables throughout the year. Six monitoring gauges are currently being monitored across the Project Site to note existing groundwater elevations throughout the area. These gauges have been located strategically across the site. They will be removed during construction implementation and be returned once all ground disturbing activities are complete.

Based on the current USACE guidelines for hydrologic success, the area must be either inundated or saturated within 12 inches of the soil surface by surface or groundwater for at least 12.5% of the growing season, under normal conditions. The growing season for the area is 246 days. If inundation or saturation is documented within 12 inches of the soil surface for 31 consecutive days, the Site would meet the hydrologic success requirement. Any areas inundated or saturated between 8% and 12.5% (20 and 31 days) of the growing season will be classified as wetlands when hydrophytic vegetation and hydric soils are present.

8.3 Vegetation

The Watts Site will be planted with vegetative species appropriate for the three targeted community types. The vegetation will be assessed using several variables. The post-construction document will outline these variables, including plot layout locations, transect locations and/or any other methods pertinent to determining vegetation success. Stem counts will be conducted within strategically placed vegetation plots. The plots locations will be determined once implementation has been completed; however, at least one vegetation plot will be situated on the slope adjacent to the stream channel. Photos will also be provided as part of this task. Once this is complete, all information will be summarized with the stream/wetland assessment information and inserted into the monitoring report.

The vegetation will be monitored on an annual basis. Stem densities that meet 320 stems per acre in the third year and 260 stems per acre in the fifth year of monitoring will meet the vegetation success requirement. In addition, there is a minimum height requirement of eight (8.0) feet for planted trees at Monitoring Year 5. Vegetation plots will be established for the collection of this data on an annual basis.

SECTION 9.0 MONITORING REQUIREMENTS

Annual monitoring data will be reported using the EEP monitoring template. The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, population of EEP databases for analysis, research purposes and assist in decision making regarding project close-out.

TABLE 8. MONITORING REQUIREMENTS				
Watts Property Stream and Wetland Restoration Site				
EEP Project Number 413				
Required	Parameter	Quantity	Frequency	Notes
No	Pattern	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Annual	Data assessments of stream pattern are not applicable for Coastal Plain Headwater Stream restoration projects.
Yes	Dimension	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Annual	Permanent cross sections will be established along sections of the valley to document any aggradation or degradation
No	Profile	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Annual	Data assessments of stream profile are not applicable for Coastal Plain Headwater Stream restoration projects.
No	Substrate	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Annual	Data assessments of stream substrate are not applicable for Coastal Plain Headwater Stream restoration projects.
Yes	Surface Water Hydrology	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Annual	A crest gage will be installed on Site; the device will be inspected on quarterly basis to document the occurrence of bankfull events on the Project.
Yes	Groundwater Hydrology	Quantity and Location of gauges will be determined in consultation with EEP	Annual	Groundwater monitoring gauges with data recording devices will be installed on Site; the data will be downloaded on a quarterly basis throughout the year.
Yes	Vegetation	Quantity and Location of plots will be determined in consultation with EEP	Annual	Vegetation will be monitored using the Carolina Vegetation Survey (CVS) protocols.
Yes	Exotic and Nuisance Vegetation	-	Annual	Locations of exotic and nuisance vegetation will be mapped, as applicable.
Yes	Project Boundary	-	Semi-Annual	Locations of fence damage, vegetation damage, boundary encroachments, etc. will be mapped, as applicable.
Yes	Visual Assessments	As per the information provided in Section 8.1. Quantity and Location of Photo Points will be determined in consultation with EEP	Annual	Photo Points will be located throughout the Project Site and depicted on a map. These photographs will provide a visual comparison of succession across the property.

9.1 Baseline Monitoring Document

A Baseline Monitoring Document will be prepared to mark the transition from the design/implementation phase to the monitoring phase. This document along with the As-built record drawings provides a means to compare the as-built condition to the design specifications and along with the baseline monitoring data provides a means to assess change/trends during the monitoring period. Many of the tables and components that originate here in this document will be carried through the monitoring reports and further populated as the monitoring data is generated (EEP, 2010). According to EEP (2010), the document generally serves several functions:

- restates the project goals and objectives for stream, vegetation and hydrology components;
- details the project structure in terms of the restoration components/assets;
- provides a synopsis of the project and site background;
- finalizes the success criteria for stream, vegetation and hydrology components;
- finalizes the monitoring plan for stream, vegetation and hydrology components;
- compares the As-built baseline condition to the design specifications for stream, wetland and vegetation components and encompasses the following:
 - sealed As-built plan sheets
 - morphological (where necessary) and vegetation data suitable to serve as a monitoring baseline (year-0); and,
- describes maintenance and repair contingencies.

Although the first three bulleted items may be refined somewhat between the Mitigation Plan and the Baseline Monitoring Document, in most cases they are simply carried through as they exist in the mitigation plan. The fourth, fifth and seventh bullets will originate in the Mitigation Plan, but may undergo refinement between that point and the final Baseline Monitoring Document. Bullet 6 is truly unique to the Baseline Monitoring Document (EEP, 2010).

9.2 Schedule and Reporting

Schedule and reporting activities for the first year of monitoring will begin once construction implementation activities have concluded. Initial work, including the establishment of fixed photograph locations, vegetation plots and channel cross sections, will be completed with regard to future monitoring efforts. Monitoring gauges will be reinstalled in the same pre-construction locations.

Monitoring reports will be submitted to the regulatory agencies by EEP on an annual basis. The first-year of monitoring will include two submittals; the As-Built drawings and the First Year Annual Monitoring Report. All drawings and monitoring will follow EEP protocols established during the project period. It is understood that EEP will coordinate any necessary monitoring report submittals with the regulatory agencies. If the monitoring reports indicate any deficiencies in achieving the success criteria on schedule, EEP will coordinate with the resource agencies, as applicable, to determine the extent of remedial actions necessary. In some cases EEP may be required to submit remedial action plan, as necessary, as part of the annual monitoring report. Vegetative monitoring will be conducted during the late summer months of each monitoring year. Monitoring reports will be provided no later than December 15. The projected schedule provided below is contingent on completion of Site construction and planting by March 2013.

Proposed Monitoring Schedule

March 2013	Complete construction/planting activities.
May 2013	Submit As-Built Drawings and Mitigation Plan report in draft format.
October 2013	Conduct first year monitoring activities.
December 2013	Submit first year Monitoring Report in draft format.
September 2014	Conduct second year monitoring activities
December 2014	Submit second year Monitoring Report in draft format.
September 2015	Conduct third year monitoring activities
December 2015	Submit third year Monitoring Report in draft format.
September 2016	Conduct fourth year monitoring activities
December 2016	Submit fourth year Monitoring Report in draft format.
September 2017	Conduct fifth year monitoring activities
December 2017	Submit fifth year Monitoring Report in draft format.
To be determined	Additional year(s) of monitoring as dictated by success criteria

SECTION 10.0 LONG-TERM MANAGEMENT PLAN

Upon approval for close-out by the Interagency Review Team (IRT), the Site will be transferred to the NCDENR Division of Natural Resource Planning and Conservation's Stewardship Program (Stewardship Program). This party shall be responsible for periodic inspection of the Site to ensure that restrictions required in the conservation easement or the deed restriction document(s) are upheld. Endowment funds required to uphold easement and deed restrictions shall be negotiated prior to Site transfer to the responsible party.

The NCDENR Stewardship Program currently houses EEP stewardship endowments within the non-reverting, interest-bearing Conservation Lands Stewardship Endowment Account. The use of funds from the Endowment Account is governed by North Carolina General Statute GS 113A-232(d)(3). Interest gained by the endowment fund may be used only for the purpose of stewardship, monitoring, stewardship administration and land transfer costs, if applicable. The NCDENR Stewardship Program intends to manage the account as a non-wasting endowment. Only interest generated from the endowment funds will be used to steward the compensatory mitigation sites. Interest funds not used for those purposes will be re-invested in the Endowment Account to offset losses due to inflation.

SECTION 11.0 ADAPTIVE MANAGEMENT PLAN

Upon completion of Site construction, EEP will implement the post-construction monitoring protocols previously defined in this document. Project maintenance will be performed as described. If, during the course of annual monitoring it is determined the Site's ability to achieve Site performance standards are jeopardized, EEP will notify the USACE of the need to develop a Plan of Corrective Action. The Plan of Corrective Action may be prepared using in-house technical staff or may require engineering and consulting services. Once the Corrective Action Plan is prepared and finalized, EEP will:

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

SECTION 12.0 FINANCIAL ASSURANCES

Pursuant to Section IV H and Appendix III of the Ecosystem Enhancement Program's In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environment and Natural Resources has provided the US Army Corps of Engineers Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by EEP. This commitment provides financial assurance for all mitigation projects implemented by the program.

SECTION 13.0 REFERENCES

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APPENDIX A.

Regulatory Correspondence (Early 2012)



REPLY TO
ATTENTION OF:

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

February 16, 2012

Regulatory Division

Re: Request for Additional Information for the Watts Property Mitigation Site (SAW-2005-11813)

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

Dear Mr. Ellison:

Please reference the letter of January 19, 2012, from Mr. Wyatt Brown with the North Carolina Ecosystem Enhancement Program (NCEEP), which transmitted the Watts Property Stream and Wetland Mitigation Plan and associated Preconstruction Notification Application. I have reviewed the Mitigation Plan and have several questions related to the proposal, which I've listed below.

1. The mitigation plan refers to the 2005 guidance on stream restoration in the coastal plain, and didn't use the 2007 update. Is there a reason for this?
2. The plan indicates monitoring for both the streams and wetlands will be for 5 years. I understand that this project predates the 2008 change to 7 years for forested wetlands, but given the length of time that the site has been in development, I encourage EEP to consider a 7 year monitoring cycle for both wetlands and streams on this site (see comment 5 below).
3. The mitigation plan shows that the site will be graded down to the bed elevation of the central ditch rather than filling the ditch to bring the site up. Because of this, the site will be sloped toward the ditch, and much more earthwork will be required, with excavation of up to 3 feet in some areas based on the grading plan. As we all know, we have historically had many problems with excavation, particularly with vegetation growth. Also, the sloped site will tend to drain the wetlands that would normally be expected develop next to the restored stream. Why was the site not brought up to the existing grade, which would have eliminated these concerns? Inclusion of a vegetation vigor performance standard may be appropriate given the extent of grading. I would suggest the following standard, which is based on a 7 year monitoring cycle, but this can be adjusted if necessary:

“Planted vegetation must average 10 feet in height in each plot at year 7 in sites located in the coastal and piedmont counties and 8 feet in height in each plot at year 7 in the mountain counties (as defined in the 2003 SMGs). If this performance standard is met by year 5 and stem density is trending toward success (i.e., no less than 260 five year-old stems/acre) monitoring of vegetation on

the site may be terminated provided written approval is provided by the USACE in consultation with the NCIRT.”

4. The plan shows that upland vegetation will be planted along the restored stream, but having an upland boundary next to a 10 to 15-foot wide coastal stream is not a reference condition. Ideally, these areas should return to wetland and should be planted in riparian wetland vegetation even if they are not monitored or receive wetland credit.
5. The stream monitoring as proposed in the plan is not sufficient to demonstrate a stream has developed in the bed of the channel, particularly since this channel will count toward restoration credit. We are in the process of revising the guidance for streams on the coastal plain again, and have dealt with this same issue on other mitigation sites. Attached are some proposed performance standards that could be added to the mitigation plan to help address our concerns (see attached). Please note that these standards were originally developed for a 7 year monitoring cycle, and I believe it would be better to implement these over 7 years, but they could be adapted for a 5 year period, if necessary.
6. The mitigation plan includes *Juncus effusus* in the wetland seed mix, which may have allelopathic effects on planted species and should be removed from the seed mix if possible.
7. The PCN lists impacts to wetlands (0.058 acres) for planting trees, which is not a regulated activity. These impacts should be removed from the PCN.

Please keep in mind that Section 332.8(j)(2) of the Mitigation Rule states “if a DA permit is required for an in-lieu fee project, the permit should not be issued until all relevant provisions of the mitigation plan have been substantively determined, to ensure that the DA permit accurately reflects all relevant provisions of the approved mitigation plan”. Accordingly, the concerns which have been identified in this correspondence must be addressed prior to our verification that impacts associated with your mitigation project are authorized by NWP 27.

Thank you for working with us to address these issues. Please contact me if you have any questions about this letter, or if there is any additional information you need. I can be contacted at telephone (919) 846-2564.

Sincerely,

Todd Tugwell
Special Projects Manager

Enclosures

Electronic Copies Furnished:

Wyatt Brown, NCEEP

Amy Adams, NCDWQ Washington Regional Office

CESAW-RG-W/Wheeler

NCIRT Distribution List

Performance Standards for Coastal Streams on the Watts Property Site

Stream channels associated with the project that do not involve construction of pattern, dimension, and/or profile were generally designed in accordance with the USACE guidance for stream restoration in the Coastal Plain. Development of the streams in these systems will be achieved through the reestablishment of braided stream morphology through passive measures, including ditch filling, and natural progression of the stream through historic sloughs, braids and channels. These stream systems shall be subject to the performance standards listed below:

1. Under normal climatic conditions, continuous surface water flow within the valley or crenulation must be documented to occur every year for at least 30 consecutive days within each monitoring year during the prescribed monitoring period (7 years). Additional monitoring and/or analysis may be necessary in the event of abnormal climatic conditions. Documentation of flow shall be accomplished using flow meters and photographic evidence of observed flow taken from fixed photo stations located along the path of the flow.
2. Evidence of channel formation within the valley or crenulation must be documented through the identification of field indicators on an annual basis in accordance with the following schedule:
 - a. During monitoring years 1 through 4, the preponderance of documented field indicators must demonstrate the accumulation of flow within the topographic low-point of the valley or crenulation. Documented indicators may include any of the following indicators or any of the indicators listed in part b:
 - i. Presence of litter and debris (wracking) indicating a surface water flow;
 - ii. Leaf litter disturbed or washed away;
 - iii. Matted, bent or absence of vegetation (herbaceous or otherwise) indicative of surface flow;
 - iv. Sediment deposition and/or scour indicating sediment transport by flowing water;
 - v. Water staining due to continual presence of water;
 - b. During monitoring years 5 through 7, the preponderance of documented field indicators must demonstrate the accumulation of flow within the topographic low-point of the valley or crenulation (documented by the field indicators listed in Part A) and the development of a primary path of flow, stream channel, or ordinary high water mark. Documented indicators may include any of the following:
 - i. Formation of channel bed and banks;
 - ii. Sediment sorting indicated by grain-size distribution within the primary path of flow;
 - iii. Sediment shelving or a natural line impressed on the banks;
 - iv. Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)
 - v. Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems;
 - vi. Exposure of woody plant roots within the primary path of flow;
 - vii. Changes in soil characteristics (when compared to the soils abutting the primary path of flow).



March 6, 2012

Todd Tugwell
U.S. Army Corps of Engineers
11405 Falls of Neuse Road
Wake Forest, NC 27587

Re: UT to Little River (Watts), Perquimans County
Mitigation Plan

Dear Mr. Tugwell,

Our project review team has completed a written response to the USACE comments.

Feel free to contact me with any questions at 919.715.5590 or Heather.C.Smith@ncdenr.gov.

Sincerely,

Heather Smith
Project Manager

cc: Jeff Jurek, EEP
Jeff Schaffer, EEP
Wyatt Brown, EEP
Tracy Stapleton, EEP
Jenny Fleming, Ecological Engineering

1. The mitigation plan refers to the 2005 guidance on stream restoration in the coastal plain, and didn't use the 2007 update. Is there a reason for this?

The mitigation plan will be changed to refer to the 2007 update.

2. The plan indicates monitoring for both the streams and wetlands will be for 5 years. I understand that this project predates the 2008 change to 7 years for forested wetlands, but given the length of time that the site has been in development, I encourage EEP to consider a 7 year monitoring cycle for both wetlands and streams on this site (see comment 5 below).

EEP recognizes that the USACE prefers monitoring of 7 years but doesn't want to commit to 7 years at this time. EEP will evaluate the project site at year 4 and determine if it is ready for closeout with the regulatory agencies.

3. The mitigation plan shows that the site will be graded down to the bed elevation of the central ditch rather than filling the ditch to bring the site up. Because of this, the site will be sloped toward the ditch, and much more earthwork will be required, with excavation of up to 3 feet in some areas based on the grading plan. As we all know, we have historically had many problems with excavation, particularly with vegetation growth. Also, the sloped site will tend to drain the wetlands that would normally be expected develop next to the restored stream. Why was the site not brought up to the existing grade, which would have eliminated these concerns? Inclusion of a vegetation vigor performance standard may be appropriate given the extent of grading. I would suggest the following standard, which is based on a 7 year monitoring cycle, but this can be adjusted if necessary:

“Planted vegetation must average 10 feet in height in each plot at year 7 in sites located in the coastal and piedmont counties and 8 feet in height in each plot at year 7 in the mountain counties (as defined in the 2003 SMGs). If this performance standard is met by year 5 and stem density is trending toward success (i.e., no less than 260 five year-old stems/acre) monitoring of vegetation on the site may be terminated provided written approval is provided by the USACE in consultation with the NCIRT.”

EEP has attempted to obtain an easement/purchase the upstream portion of the watershed twice. The landowner has declined. Raising the elevation of the stream channel would cause hydrologic trespass. The channel elevation is restricted by the upstream elevation of the adjacent landowners ditch and the downstream culvert.

4. The plan shows that upland vegetation will be planted along the restored stream, but having an upland boundary next to a 10 to 15-foot wide coastal stream is not a reference condition. Ideally, these areas should return to wetland and should be planted in riparian wetland vegetation even if they are not monitored or receive wetland credit.

Ecological Engineering volunteered to include a cross-section that shows the wetter species extending from the stream channel up the slope a little, and then transition to the Mesic Mixed Hardwood community. They have taken landscape position, hydroperiod, reference data and plant community descriptions into account in their planning. And indeed, this is not Reference Condition. After the upstream landowner decided not to work

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with us, we changed our plans to Priority 2 because there is still a fair amount of uplift and treatment to be had at this site. Otherwise it will remain a chute for stormwater.

The mix of plants listed for the Mesic Mixed Hardwood community includes both wetland and facultative upland species because this is a transition zone from stream/wetland up the slope and then transitioning into the Non-Riparian flat. A mix of facultative wetland and facultative upland species will ensure that the nuances in the transition zone are addressed without breaking it into several tiny planting zones. Also, some species in this transition zone mix are taken from the adjacent reference headwater stream.

5. The stream monitoring as proposed in the plan is not sufficient to demonstrate a stream has developed in the bed of the channel, particularly since this channel will count toward restoration credit. We are in the process of revising the guidance for streams on the coastal plain again, and have dealt with this same issue on other mitigation sites. Attached are some proposed performance standards that could be added to the mitigation plan to help address our concerns (see attached). Please note that these standards were originally developed for a 7 year monitoring cycle, and I believe it would be better to implement these over 7 years, but they could be adapted for a 5 year period, if necessary.

This project follows the success criteria set forth in the 2007 guidelines for headwater systems. A bed and bank are not expected to form in the valley. Flow of the headwater stream will be documented using a crest gauge and visual observation as mentioned in the 2007 Coastal Plain guidance and vegetation establishment will be monitored.

6. The mitigation plan includes *Juncus effusus* in the wetland seed mix, which may have allelopathic effects on planted species and should be removed from the seed mix if possible.

From our internet search, it appears that *Juncus effusus* has been found to have some limited autotoxic allelopathy, that is, the decaying parts of the plant discourage some reproduction of seedlings of the same plant. However, it is a native wetland species found in most, if not all, of our coastal wetland sites. It establishes well (helping stabilize soil, provide cover and refuge, protecting the soil surface from compaction, diffusing flow, etc.), and is native and appropriate for the site. For these reasons, we do not feel *Juncus effusus* should be removed from the seed mix.

<http://www.amjbot.org/content/87/6/853.full>

7. The PCN lists impacts to wetlands (0.058 acres) for planting trees, which is not a regulated activity. These impacts should be removed from the PCN.

We will remove 0.058 acres of impact from PCN.

EEP has been in contact with the DCM representative John CeCe. He is reviewing the potential AEC and will be corresponding with EEP on this issue. EEP will provide email correspondences to the USACE regarding the AEC.



Final Mitigation Plan Updates According to USACE Comments and EEP Responses.

Comment #1. The 2007 update was utilized, but references pointed to the original 2005 document. These references have been updated throughout the document to reflect the 2007 USACE document.

Comment #2. The performance standards and monitoring requirements are provided in Section 8.0 and 9.0 of the document, respectively. They still reflect a five-year monitoring period. EEP will evaluate the project site at Year 4 and determine if it is ready for closeout with the regulatory agencies.

Comment #3. A section depicting landowner coordination has been inserted as Appendix H.

Comment #4. Design Sheet #3 has been revised to illustrate the proposed channel cross section that identifies species zones based on landscape position, hydroperiod, reference data and plant community descriptions.

Comment #5. The performance standards and monitoring requirements are provided in Section 8.0 and 9.0 of the document, respectively. They follow the criteria set forth in the 2007 guidelines. Flow of the headwater stream will be documented using a crest gage and visual observation as already mentioned.

Comment #6. The planting summary remains as is in the document.

Comment #7. EEP removed the 0.058-acre wetland impact in the PCN.

APPENDIX B.

Guidance Pertaining to Stream Restoration in the Outer Coastal Plain of North Carolina

PLEASE NOTE: The following document is in draft and subject to change. While the information contained herein may be used for planning purposes, final plans should be coordinated with the Ecosystem Enhancement Program, The Corps of Engineers and/or The NC Division of Water Quality as appropriate.

**INFORMATION REGARDING STREAM RESTORATION
With Emphasis on the Coastal Plain**

Prepared By:

**US Army Corps of Engineers,
Wilmington District, Regulatory Division
And
North Carolina Department of Environment and Natural Resources,
Division of Water Quality**

**Version 2
April 4, 2007**

This document is intended to provide general information to compensatory mitigation providers for use when planning or evaluating potential stream mitigation projects; particularly in the coastal plain (defined as the Middle Atlantic Coastal Plain Ecoregion as shown on Griffith, et. al. 2002) of North Carolina. The term "stream" as used in this document, means that the flow of water is contained in a natural channel or bed with identifiable banks and, in its unaltered state on the coastal plain, usually has adjacent wetlands. This document is meant to complement the April 2003, Stream Mitigation Guidelines, prepared by the Corps of Engineers Wilmington District, Environmental Protection Agency, the North Carolina Division of Water Quality and the North Carolina Wildlife Resources Commission (US Army Corps of Engineers, 2003).

INTRODUCTION

The decision whether to pursue any potential mitigation site should hinge on what can reasonably be accomplished considering current site conditions, and site constraints. Mechanically returning a site to a historic condition may not be possible or in some cases even preferable. The primary consideration must be what functions need to be returned or improved upon. Designers must then examine to what degree they can control those factors contributing to the loss or degradation of those identified functions. Together, these considerations should indicate whether a project is viable and ultimately determine the goals of the project.

Site Selection Considerations

The primary consideration in site selection for stream restoration efforts should be whether the site historically supported a stream. Placing a stream or wetland in a landscape position in which it does not naturally occur is considered "Creation" and brings with it many potential factors of failure. In some instances, manmade channels constructed in areas where no historic stream existed, have intercepted surface and/or ground water sufficient to develop intermittent or perennial flow and exhibit functions commonly associated with natural streams. While true stream restoration or enhancement activities may not be appropriate in these systems, there may be opportunities to meet watershed goals through application of best management practices (BMP). BMP projects will be considered on an individual basis. Therefore, we will not make effort to expand on the discussion in this document.

It is sometimes difficult to determine if a site historically supported a stream. This is particularly true in areas of the outer coastal plain that have been historically channelized or ditched. Direct evidence such as construction or maintenance records or photographs is the most acceptable method of documenting historical conditions. USDA Soil Surveys and USGS topographical maps are also often reliable indicators. However, it should be noted that, especially on the lower coastal plain, manmade ditches and canals are also sometimes identified as perennial and intermittent streams on these maps. Comparison to less altered systems in similar landscape positions may also be helpful.

There are many acceptable indicators which may be used in the absence of specific evidence. Streams exist primarily as a function of slope and watershed area. Local topographic signatures exhibiting both latitudinal and longitudinal slope can indicate historic presence of waterways. Tools such as visual observation, onsite surveys or LIDAR imaging can aid in determining presence and degree of slope. Designers should also document the presence of sufficient watershed area. Recent studies indicate that a drainage basin of 50 to 100 acres in size is generally sufficient to support the development of stream features in the coastal plain depending on the hydrogeomorphology of the site. Consideration should be given to both historic watershed and present watershed. It is possible that a system historically had sufficient hydrologic input to exhibit flowing water but due to recent land-use/drainage practices, this input has been removed.

Soils data can also be helpful in determining whether a stream or watercourse existed on the site. Project designers should look at local, site specific soil information as well as NRCS County Soil Surveys. The presence of soils classified as entisols or inceptisols would indicate historical flow. Linear features exhibiting higher organic content than surrounding soils or vertical layers of higher organic content may indicate historic presence of water. Likewise, variation in soil texture may indicate past sorting of sediment by a channel.

Project Design Considerations

Designers must consider what overall functional lift can be accomplished given current conditions and what type of project can be accomplished given current land use practices. If a stream historically relied on a watershed which has been significantly altered to the point that a new hydrologic regime is now present, restoration of the historic feature may no longer be appropriate. Likewise, if the stream has been channelized historically and now possesses a mature wooded buffer and does not have significant stability/erosion problems; restoring pattern and profile at the expense of the existing buffer may not result in any real gain in aquatic function. This is particularly true where existing wetlands are associated with these channels. Substantial channel work may not only lead to direct damage for equipment and materials access but may also result in drainage of portions of the wetland area.

When evaluating a site, designers must identify what natural functions have been removed or diminished. Restoration efforts should be focused on returning those functions to a stable state closer to that of the original system. Selecting a reference system to use as a target may be useful. The stated goals of the project should reflect the proposed functional lift. Success criteria should then be established which will adequately demonstrate that goals have been accomplished and function has been returned. In the absence of true data collection and analysis it is acceptable to infer level of function based on physical condition. It is critical however, to choose the appropriate physical indicators.

In the Mountain and Piedmont regions, streams that have experienced some clearing, channelization and/or damage to the riparian buffer are most often targeted as potential stream restoration sites. The decreased sinuosity and eroding banks typically observed in these systems are good indicators that the system is experiencing increased direct sediment input and unnatural sediment transport leading to degradation of water quality and habitat. In these situations, stream restoration efforts most often focus on restoring pattern, stabilizing banks and introducing structure. It is widely accepted that restoring the pre-impact pattern dimension and profile to these system and replacing structure will result in a more stable system with improved water quality and better habitat. In these systems, measuring physical properties of pattern, dimension and profile is typically appropriate for estimating function.

Another important consideration in project design is the degree of control over the immediate site and over the watershed as a whole. The success and longevity of any stream project is largely dependent on both present and future land uses within the watershed. The quality and quantity of water entering a site can have a significant bearing on the overall success of the site. Designers should make every attempt to control these inputs. For example, if there are local storm water inputs, designers should incorporate treatment of these storm water inputs into their design where possible.

Designers should not only consider present and planned development within the watershed but must also consider the possibility of hydrologic trespass and/or hydrologic bypass, particularly in the coastal plain. Project designers will often face legal ramifications if the project causes the impoundment of water on adjacent sites. If sites

are located within established drainage districts, project designers must also be aware of the possibility that water passing through the site may be diverted to other waterways if the project affects overall drainage within the district. Designers may wish to contact the local Natural Resources Conservation Service office and/or the Board of Drainage Commissioners to explore this issue further.

COASTAL PLAIN STREAM MITIGATION

In the Coastal Plain, the concept that simply restoring channel pattern, dimension and profile will result in a net gain in function, does not necessarily hold true. It has been our experience that existing channels, even when heavily manipulated, are often stable and direct sediment input is typically not a major concern. In these coastal plain systems one of the more likely physical links to decrease in function is the lack of or disconnection from riparian wetlands and/or floodplain buffers. Riparian wetlands often play an integral role in coastal plain stream function and designers should consider incorporating wetlands into stream designs whenever possible. Where designers can adequately document, through achievement of appropriate success criteria, reconnection with an effective floodplain, it is possible to achieve restoration credit with little or no channel engineering. On a case-by-case basis, we will also consider allowing restoration credit without the restoration of pattern, dimension and profile; provided designers can document that lost key functions are being restored.

In deciding whether a coastal plain site is appropriate for mitigation, designers should consider comparing the site to a nearby reference area with similar landscape conditions. This will give some indication of what type of system the site may support and potentially aid in the development of project goals. For the purposes of this document, we have separated coastal stream systems into three broad categories:

1. **Riparian Headwater Systems** – These systems are, for purpose of this guidance, those systems that either do not appear or appear as first order streams¹ on the appropriate county soil survey as published by the Natural Resources Conservation Service or its predecessor, the Soil Conservation Service and/or USGS Topographic Map. These systems typically have small watersheds draining into defined valleys with little longitudinal slope. Relatively unaltered riparian headwater systems will usually possess a braided, diffuse surface flow pattern across a narrow floodplain of riparian, wooded wetlands.
2. **Low energy streams** – These systems may appear as first or higher order streams on Soil Surveys or USGS maps. In a relatively unaltered state, these systems may have either intermittent or perennial flow and exhibit true bed and bank and

¹ A first order stream is that portion of a waterway from its identified point of origin downstream to the first intersection with another waterway.

indicators of an ordinary high water mark. In headwater settings, these systems are typically formed when a relatively large watershed drains into a well-defined topographic feature with little to moderate slope. They are usually associated with specific soil series (Table 1). Lower on the Coastal Plain, these systems may be affected by lunar or wind tides causing bidirectional flow.

3. **High energy streams** - These systems are typically found in areas with a relatively high slope. They tend to behave similar to piedmont type streams.

Riparian Headwater Systems

Many lower coastal plain riparian headwater systems have been converted to intense agricultural or silvicultural use, making it difficult to determine whether a true intermittent or perennial stream was historically present. Depending on the degree and success of the drainage system, some ditches may have intercepted sufficient surface and/or ground water so as to possess intermittent or perennial flow and exhibit functions commonly associated with natural streams. These ditches are often considered jurisdictional waters of the United States and, in some cases, are classified as “streams” for permitting purposes.

Mitigation project designers exploring projects in this setting must first document that a riparian system historically existed on the landscape. Areas exhibiting non-hydric soils or non-alluvial hydric soils are typically not suitable sites for riparian headwater establishment. Likewise, sites with little or no topographical relief would not likely exhibit flowing water features.

Designers should then consider local topography and watershed condition to determine whether the system historically supported an intermittent or perennial stream. Typically, sites with watersheds less than 100 acres would not support a stream with defined bed and bank. These sites may contain a valley with some longitudinal slope but it is likely that historic flow was not concentrated in a channel feature. If a channel feature is present it is likely man-made and typically does not appear on the county Soil Survey. In this situation, restoration of a riparian headwater type system may be more appropriate than channel construction. According to data being assembled by NCDWQ (Periann Russell, DWQ, personal communication) watersheds less than 25 acres in size, will not likely support a riparian headwater system.

Restoration of these riparian headwater systems could still be accomplished to provide both stream and wetland mitigation credit without physically constructing a distinctive stream channel. This type of mitigation would typically be appropriate for offsetting impacts to those systems that either do not appear or appear as first order streams on USGS maps or Soil surveys but would not necessarily be acceptable for mitigating impacts to higher order systems. The limit of stream and riparian wetland mitigation credit will be decided on a case-by-case basis and will typically depend on the width and

extent of a clearly visible valley in the landscape. A 50-foot buffer is typically required for stream mitigation projects in the coastal plain. Therefore, stream credit may only be awarded where the discernible valley is a minimum of 100 feet wide. Areas outside this 100 foot corridor but within the valley feature may be used as riparian wetland mitigation. Mitigation outside of and/or above the riparian boundary could be considered non-riparian wetland mitigation assuming restoration of wetland hydrology, hydric soils and appropriate wetland plants. The limits of the riparian area may be defined using appropriate and identifiable topographical or soils boundaries. In-field confirmation of the presence and limits of the valley may be needed in order to determine the extent of riparian wetland and stream mitigation. Local topographic information, site-specific soil mapping and information on flood frequency and duration are often helpful tools in identifying these valleys in the outer coastal plain.

Success criteria for these systems should include vegetation establishment similar to the restoration of a bottomland riparian (wetland) community. Additional considerations for success criteria should include documenting an adequate flooding regime and presence of at least periodic flow. Identification and examination of a local reference area may be helpful in establishing the appropriate target hydrograph. Flooding regime may be documented by continuous or semi-continuous monitoring wells, periodic staff gauge measurement, and/or visual observation. Potential methods of flow documentation are strategically placed flow meters, recording movement of wrack materials and/or periodic dye testing. Monitoring changes in faunal species and distribution patterns to document a shift from a terrestrial to an emergent aquatic community may also be appropriate.

Low Energy Stream

These are typically existing streams with intermittent or perennial flow. In the coastal plain, these systems have often been channelized historically and many are being actively maintained for drainage purposes. The channelization work alone does not typically result in the destabilization of these systems therefore, simply returning pattern and profile will not usually result in a lift in aquatic function. Designers should strongly consider whether substantial amounts of engineering and construction are actually necessary.

The loss or reduction in function is more typically due to a lack of access to a flood plain or significant alteration within the riparian zone. Designers should concentrate more on connecting these systems to an adequate and functioning floodplain and less on restoring historic morphology. In-Stream structures that serve to effectively raise the bottom elevation of a stream channel so as to increase the frequency and duration of over-bank flooding and/or to restore adjacent wetlands may be appropriate but should be scrutinized on a case-by-case basis. Designers must ensure that such structures do not cause other adverse impacts such as restricting the passage of important aquatic organisms for feeding and reproduction. If used, in-stream structures should be designed so that long term maintenance is not required and so that, over time, the stream channel will accumulate sediment to the level of the grade control that was installed.

Restoration of riparian wetlands and treatment of existing stormwater input is strongly encouraged as a part of any stream restoration project in this setting.

Often these streams may have been historically channelized but due to abandoned maintenance they have developed a semi-mature vegetated riparian areas. Since stability is often not an issue, these systems can begin to function as well as unchannelized systems. In these cases, substantial work within these systems resulting in damage to the existing resources will seldom result in any substantial lift in aquatic function. This is particularly true when existing wetlands will be impacted. Therefore, designers are encouraged to avoid such projects. These systems may however have benefit if approached as enhancement or preservation activities. The North Carolina Division of Water Quality is currently working on guidance regarding the disturbance of riparian zones for stream restoration projects (Appendix 1).

Generally, credit for this type of project would be calculated based on actual channel length. As with riparian headwater systems, the riparian area may be defined by identifying and documenting appropriate soils or topographic boundaries. Documentation of restoration could be tied to lifting key functions rather than returning or installing pattern dimension and profile. Success criteria could be based on documenting the return of the system to the floodplain as measured by increased occurrence of overbank flooding and/or return of wetland conditions within the floodplain where appropriate.

High Energy streams

Traditional stream mitigation methods using natural channel design to predict and restore pattern, dimension and profile are typically appropriate in systems indicated as second and higher order streams. Generally, credit for this type project would be calculated based on the actual length of the channel restored or enhanced. The restoration of wetlands adjacent to the restored channel should be given strong consideration.

This document is intended as a general guide. The preparers realize there may be exceptions to the above information. Natural channel design may, for instance, be appropriate when a zero or first order stream is located in a soil series that traditionally supports streams (Table 1) and sufficient watershed area is available. The converse is also true in that there may be larger watersheds where stream mitigation as described for zero to first order streams may be more appropriate. It is also likely that large mitigation sites may have both zero/first order streams and higher order streams as well as wetland complexes thereby requiring multiple mitigation design techniques. Designers are strongly encouraged, in all cases, to use reference sites with similar watershed size and topographic conditions to determine the type of restoration that is appropriate for the site. Planning documents must adequately support the mitigation work proposed.

The guidance found in this document is subject to change if and when additional information becomes available. The most current version of this document as well as information on its applicability will be posted on the websites of both the Corps of

Engineers (<http://www.saw.usace.army.mil/wetlands/notices.html>) and Division of Water Quality (http://h2o.enr.state.nc.us/newetlands/rd_pub_not.html).

Citations

Griffith, G.E., et al. 2002. Ecoregions of North and South Carolina. Reston, VA. United States Geological Survey.

US Army Corps of Engineers, et al. 2003. Stream Mitigation Guidelines. Wilmington, NC

DWQ. 2006. Stream Origin Assessment: South Creek, NC (PCS Phosphate Company). Available at <http://h2o.enr.state.nc.us/newetlands/documents/pcsdofinal.pdf>

Brinson?

Evans?

Doyle?

DRAFT

Table 1²
Soils series in the coastal plain of NC which typically can contain streams

Soil Series Name	Beaufort	Bertie	New Hanover	Craven
------------------	----------	--------	-------------	--------

Altavista	X			X
Augusta	X			
Autryville				X
Bibb		X		
Chewacla		X		
Craven		X		X
Currituck	X			
Doravan	X	X	X	X
Exum				X
Goldsboro				X
Johnston			X	
Lafitte				X
Masontown				X
Muckalee	X			
Norfolk		X		X
Onslow				X
Seabrook				X
State				X
Suffolk				X
Tidal Marsh			X	
Wahee	X	X		
Wasda	X			
Wehadkee		X		
Winton	X	X		

² These features normally occur on soils that typically contain streams. This table lists examples of some of these soil series for several coastal plain counties and is intended to serve as a general guide for this determination.

Appendix 1: Disturbance of Riparian Zones for Stream Restoration

The demand for stream restoration for mitigation of federal and state permitting requirements is increasing in response to continued development in North Carolina. The growing number of restoration projects has facilitated the need for additional guidelines in making restoration decisions. The following guidance is associated with existing riparian zones and buffers adjacent to potential restoration sites. It is expected that this policy will eventually be incorporated into the updated version of the joint state-federal stream mitigation guidelines in North Carolina (US Army Corps of Engineers, et al 2003).

General Guidance: Where an established and functioning riparian zone* consisting of native trees and shrubs exists at a potential restoration site, the riparian zone and the protection it provides to stream function and aquatic life will take precedence in restoration considerations. Given the existence of an established riparian zone (most common in rural settings), stream restoration that disturbs the riparian zone should be avoided.

Exceptions include but not limited by:

- Conditions (e.g. urban settings) where stream incision processes (degradation) are dominant and threaten most of the existing buffer, and where sufficient space exists for stream restoration.
- Rural settings where stream incision processes are dominant and portions of established riparian zones can be maintained on one or both sides of newly constructed channel.

All exceptions must be fully justified and documented upon submission for 401 certification and 404 permitting. Exceptions will be reviewed and approved by DENR Division of Water Quality and the US Corps of Engineers through the 404 permit process.

*Established and functioning riparian zone consists of at least two species of abundant (greater than 100 stems per acre) native overstory trees with a minimum of 5" DBH and understory woody shrubs and herbaceous vegetation that functions to filter sediment and nutrients, to provide shade and to supply small and large woody debris and leaf litter to the stream. The width requirement of the functioning riparian zone is based on the quality and quantity of native vegetation specific to a stream, that is, if a width of 1 or 2 large trees is providing an ecological benefit to the stream, then that width is the 'established and functioning' riparian zone. It may be necessary to evaluate select riparian zones on a site by site basis as needed.

APPENDIX C.

Site Protection Instruments

FILED in PERQUIMANS Cou. NC
on Sep 15 2004 at 04:51:24 PM
by: DEBORAH S. REED
REGISTER OF DEEDS
BOOK 271 PAGE 589

FILED

DEC 01 2004

SECRETARY OF STATE

04-778
PERQUIMANS COUNTY
LAND TRANSFER TAX
AMOUNT \$ 1539.00
PAID \$ 1539.00

10:4361 Issued Sep 15 2004
\$ 308.00
State of PERQUIMANS
North Carolina County
Real Estate Excise Tax

NORTH CAROLINA

DEED

PERQUIMANS COUNTY

THIS DEED, made this the 10 day of September, 2004, by **RICHARD L. WATTS and wife, KYLE K. WATTS**, of 918 South Doral Lane, Venice, FL 34243, **GRANTORS**, to **STATE OF NORTH CAROLINA, c/o State Property Office**, of 1321 Mail Service Center, Raleigh, NC 27699-1321, **GRANTEE**;

WITNESSETH:

That the Grantors, in consideration of \$10.00 and other valuable consideration to them paid by the Grantee, the receipt of which is hereby acknowledged, have bargained and sold, and do hereby bargain, sell and convey to the Grantee, its successors and assigns, the following described land in New Hope Township, Perquimans County, North Carolina:

BEGINNING at a point at the western edge of the right of way of Norma Drive, said point being at the southeastern corner of Lot 20 of Section B of Little River Estate, thence southerly and easterly along the western and southern edge of Norma Drive along a curved line having a length of 566.58 feet and a radius of 280 feet, to a point, thence continuing along the southern edge of Norma Drive North 74° 30' East 125.43 feet to a point, said point being southwesterly 254.42 feet from the intersection of the southern edge of Norma Drive with the southern edge of Tuscarora Trail, thence South 26° 10' 56" East 586.27 feet to a point, thence South 49° 33' 20" East 740.56 feet to a point, thence South 52° 1' 50" West 450 feet, thence North 8° 56' West 379.9 feet to the center of a ditch, thence along the center of said ditch South 43° 46' West 918 feet to another ditch at the southern edge of Old Newby Lane, thence North 72° West 989 feet along the last mentioned ditch to a point, thence North 10° West 172 feet along the eastern edge of Old Brickhouse Road to a point, thence North 14° East 1003 feet along the eastern edge of Old Brickhouse Road to a point, thence North 20° East 271.5 feet, thence North 30° East 220 feet, thence North 24° East 50 feet to the southwest corner of Lot 20 of Section B of Little River Estate, thence South 72° 40' 40" East 273.28 feet along the southern boundary of said Lot 20 to the western edge of the right of way of Norma Drive, the place of beginning, a tract containing 48.09 acres and being shown on the plat of S. Elmo Williams, Reg. Surveyor, entitled "T & W Enterprises" dated September 1979 and March 3, 1994 and recorded in Real Estate Book 156, page 655 of the Perquimans County Registry. This property is a portion of the land described in the Deed recorded in Real Estate Book 90, page 511 of the Perquimans County Registry. For further description and chain of title, see the Deed recorded in Real Estate Book 156, page 654 of said registry. Also see the plat recorded in Plat Cabinet 2, Slide 124, Map 7 of said registry.

The Grantors also convey hereby to the Grantee, its successors and assigns, an easement of way over and upon Norma Drive and Tuscarora Trail as shown on the plat

referred to above and Tuscora Trail and Cherokee Drive as shown on the plat recorded in Plat Book 4, page 205 of the Perquimans County Registry.

To have and to hold the aforesaid tract or parcel of land and all improvements, privileges and appurtenances thereunto belonging, to it the said Grantee, its successors and assigns in fee simple.

The Grantors covenant to and with the Grantee, that they are seized of said property in fee, and have the right to convey the same in fee simple, that the same is free of encumbrances and that the Grantors do hereby warrant and will forever defend the title to the same against the lawful claims of all persons whomsoever.

IN WITNESS WHEREOF, the Grantors have hereunto set their hands the day and year first above written.

Richard L. Watts
RICHARD L. WATTS

Kyle K. Watts
KYLE K. WATTS

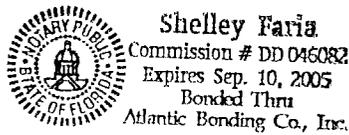
FLORIDA
CITY/COUNTY OF Charlotte

I, Shelley Faria, a Notary Public, do hereby certify that **Richard L. Watts and wife, Kyle K. Watts**, personally appeared before me this day and acknowledged the due execution of the foregoing deed.

WITNESS my hand and official seal, this 10th day of September, 2004.

My commission expires: _____

Shelley Faria
Notary Public



NORTH CAROLINA, PERQUIMANS COUNTY

The foregoing Certificate of Shelley Faria, Notary Public for the State of Florida, is certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page shown on the first page hereof.

DEBORAH S. REED, REGISTER OF DEEDS FOR PERQUIMANS COUNTY

By Donna H. Phelps Deputy Register of Deeds

APPENDIX D

Baseline Information Data

Contents:

Historical Aerial Photographs
FHWA Signed Categorical Exclusion Form
FEMA Compliance – EEP Floodplain Requirements Checklist
NCDWQ Stream Classification Forms
USACE Jurisdictional Determination and Associated Data Forms

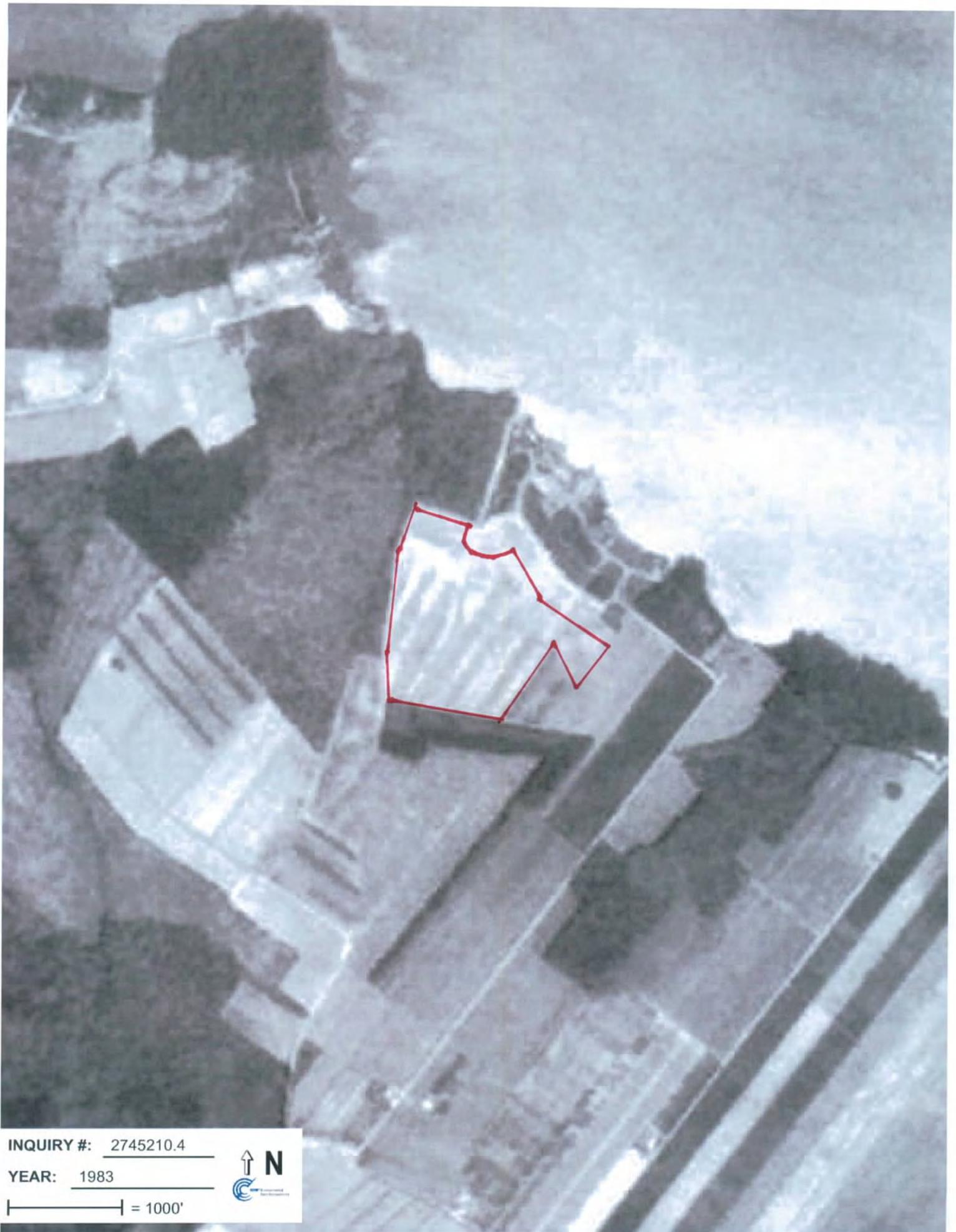


INQUIRY #: 2745210.4

YEAR: 1975

| = 500'





INQUIRY #: 2745210.4

YEAR: 1983

| = 1000'





INQUIRY #: 2745210.4

YEAR: 1993

| = 750'





INQUIRY #: 2745210.4

YEAR: 1998

| = 750'





INQUIRY #: 2745210.4

YEAR: 2006

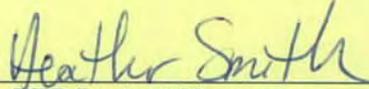
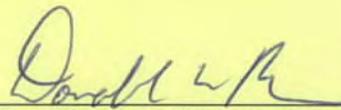
|—————| = 604'



Appendix A

Categorical Exclusion Form for Ecosystem Enhancement
Program Projects
Version 1.4

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

Part 1: General Project Information	
Project Name:	WATTS PROPERTY STREAM AND WETLAND RESTORATION
County Name:	PERQUIMANS
EEP Number:	413
Project Sponsor:	DENR ECOSYSTEM ENHANCEMENT PROGRAM
Project Contact Name:	G. LANE SAULS JR. - ECOLOGICAL ENGINEERING, LLP
Project Contact Address:	128 RALEIGH STREET, HOLLY SPRINGS, NC 27540
Project Contact E-mail:	lsauls@ecologicaleng.com
EEP Project Manager:	HEATHER SMITH
Project Description	
For Official Use Only	
Reviewed By:	
<div style="border-bottom: 1px solid black; padding-bottom: 5px; display: inline-block;">7-9-10</div> Date	<div style="border-bottom: 1px solid black; padding-bottom: 5px; display: inline-block;"></div> EEP Project Manager
Conditional Approved By:	
<div style="border-bottom: 1px solid black; padding-bottom: 5px; display: inline-block;"> </div> Date	<div style="border-bottom: 1px solid black; padding-bottom: 5px; display: inline-block;"> </div> For Division Administrator FHWA
<input type="checkbox"/> Check this box if there are outstanding issues	
Final Approval By:	
<div style="border-bottom: 1px solid black; padding-bottom: 5px; display: inline-block;">7-9-10</div> Date	<div style="border-bottom: 1px solid black; padding-bottom: 5px; display: inline-block;"></div> 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?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
3. Has a CAMA permit been secured?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)		
1. Is this a "full-delivery" project?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
6. Is there an approved hazardous mitigation plan?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> 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?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
2. Does the project affect such properties and does the SHPO/THPO concur?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
3. If the effects are adverse, have they been resolved?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)		
1. Is this a "full-delivery" project?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
2. Does the project require the acquisition of real estate?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
3. Was the property acquisition completed prior to the intent to use federal funds?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> 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?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
2. Is the site of religious importance to American Indians?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
4. Have the effects of the project on this site been considered?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Antiquities Act (AA)		
1. Is the project located on Federal lands?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
3. Will a permit from the appropriate Federal agency be required?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
4. Has a permit been obtained?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Archaeological Resources Protection Act (ARPA)		
1. Is the project located on federal or Indian lands (reservation)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
2. Will there be a loss or destruction of archaeological resources?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
3. Will a permit from the appropriate Federal agency be required?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
4. Has a permit been obtained?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Endangered Species Act (ESA)		
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
2. Is Designated Critical Habitat or suitable habitat present for listed species?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
4. Is the project "likely to adversely affect" the species and/or "likely to adversely modify" Designated Critical Habitat?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
5. Does the USFWS/NOAA-Fisheries concur in the effects determination?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> 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?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Has NRCS determined that the project contains prime, unique, statewide or locally important farmland?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2. Have the USFWS and the NCWRC been consulted?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Has the NPS approved of the conversion?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Is suitable habitat present for EFH-protected species?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
4. Will the project adversely affect EFH?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
5. Has consultation with NOAA-Fisheries occurred?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Have the USFWS recommendations been incorporated?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Wilderness Act	
1. Is the project in a Wilderness area?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A



EEP Floodplain Requirements Checklist

This form was developed by the National Flood Insurance program, NC Floodplain Mapping program and Ecosystem Enhancement Program to be filled for all EEP projects. The form is intended to summarize the floodplain requirements during the design phase of the projects. The form should be submitted to the Local Floodplain Administrator with three copies submitted to NFIP (attn. Edward Curtis), NC Floodplain Mapping Unit (attn. John Gerber) and NC Ecosystem Enhancement Program.

Project Location

Name of project:	Watts Property Stream and Wetland Restoration
Name if stream or feature:	UT to Little River
County:	Perquimans, NC
Name of river basin:	Pasquotank River Basin
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Perquimans County Unincorporated Areas, NC
DFIRM panel number for entire site:	8808J
Consultant name:	Ecological Engineering, LLP
Phone number:	(919)557-0929
Address:	128 Raleigh Street Holly Springs, NC 27540

Design Information

Provide a general description of project (one paragraph). Include project limits on a reference orthophotograph at a scale of 1" = 500".

Summarize stream reaches or wetland areas according to their restoration priority.

Example

Reach	Length	Priority
<i>Example: Reach A</i>	<i>1000</i>	<i>One (Restoration)</i>
UT to Little River	1500 ft.	Coastal Plain First Order Restoration

Floodplain Information

Is project located in a Special Flood Hazard Area (SFHA)? <input checked="" type="checkbox"/> Yes - see comments next page <input type="checkbox"/> No
If project is located in a SFHA, check how it was determined: <input type="checkbox"/> Redelineation <input type="checkbox"/> Detailed Study <input checked="" type="checkbox"/> Limited Detail Study <input type="checkbox"/> Approximate Study <input type="checkbox"/> Don't know
List flood zone designation:
Check if applies: <input checked="" type="checkbox"/> AE Zone <ul style="list-style-type: none"> <input type="checkbox"/> Floodway <input type="checkbox"/> Non-Encroachment <input checked="" type="checkbox"/> None <input type="checkbox"/> A Zone <ul style="list-style-type: none"> <input type="checkbox"/> Local Setbacks Required <input type="checkbox"/> No Local Setbacks Required
If local setbacks are required, list how many feet: N/A

<p>Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks?</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
<p>Land Acquisition (Check)</p> <p><input checked="" type="checkbox"/> State owned (fee simple)</p> <p><input type="checkbox"/> Conservation easment (Design Bid Build)</p> <p><input type="checkbox"/> Conservation Easement (Full Delivery Project)</p> <p>Note: if the project property is state-owned, then all requirements should be addressed to the Department of Administration, State Construction Office (attn: Herbert Neily, (919) 807-4101)</p>
<p>Is community/county participating in the NFIP program?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Note: if community is not participating, then all requirements should be addressed to NFIP (attn: Edward Curtis, (919) 715-8000 x369)</p>
<p>Name of Local Floodplain Administrator: Mr. Virgil Parrish</p> <p>Phone Number: (252) 426-8283</p>

Floodplain Requirements

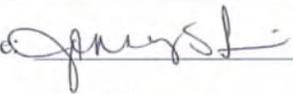
This section to be filled by designer/applicant following verification with the LFPA

- No Action - *see comments*
- No Rise
- Letter of Map Revision
- Conditional Letter of Map Revision (CLOMR)
- Other Requirements

List other requirements:

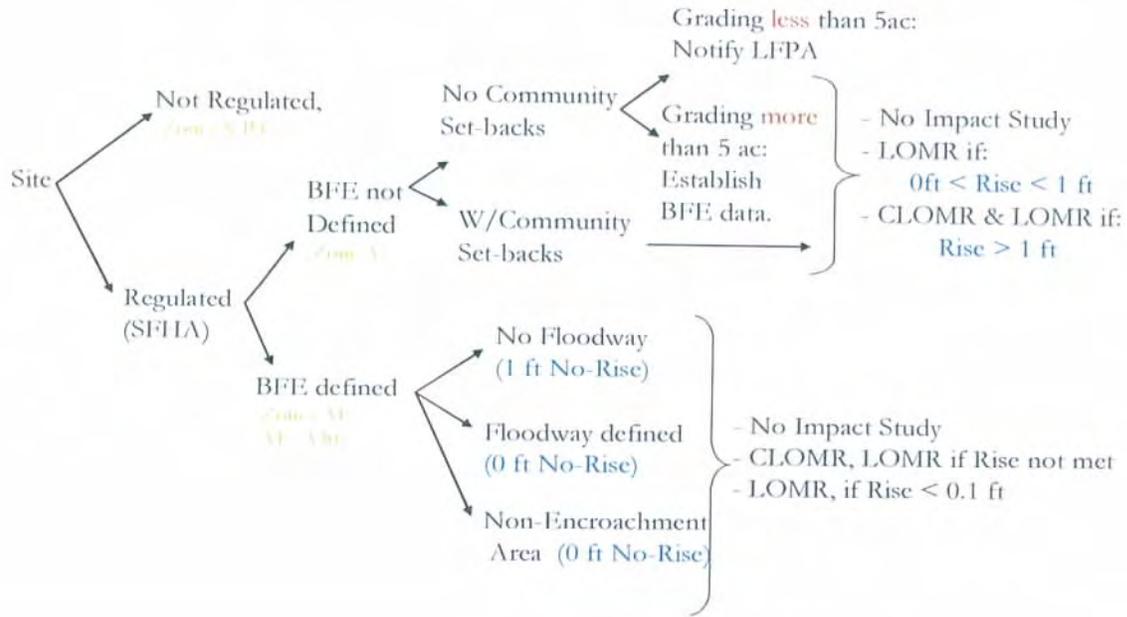
Comments:

The project is located on an unstudied, unmapped tributary incurring backwater from a Limited Detail Study stream with established BFE. FEMA approval is not necessary. As per Mr. Bobby Darden with the Perquimans County Managers Office on 5/14/10, no floodplain development permit is required because there is no structure being put into the stream. No further coordination between NCEEP (through Ecological Engineering, LLP) and Perquimans County will be required.

Name: Jenny S. Fleming, PE Signature: 

Title: Principal Date: 11/10/10

Criteria for Flooding Requirements



Summary of Scenarios					
Zone (map)	SFHA	BFE	Floodway Or Non-Encroachment	Comm. Set-back	Floodplain Criteria
X,B,C	No	No	No	No	a. Notify Floodplain Administration b. FP Dev. Permit maybe required
A	Yes	No	No	No	a. If grading < 5 ac, notify LFPA.
A	Yes	No	No	Yes	a. If No-Rise = 0 ft, LOMR not required b. If Rise > 0 ft, LOMR is Required c. If Rise ≥ 1 ft, CLOMR is required
AE, A1-A30	Yes	Yes	No	n/a	a. No-Rise Study b. CLOMR if ≥ 1ft c. LOMR
AEFW A1-A30	Yes	Yes	Yes	n/a	a. No-Rise Study b. CLOMR if ≥ 0 ft c. LOMR



GRID NORTH

MAP SCALE 1" = 1000' (1 : 12,000)



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 8808J

FIRM FLOOD INSURANCE RATE MAP NORTH CAROLINA

PANEL 8808

(SEE LOCATOR DIAGRAM OR MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY NUMBER	PANEL	SUFFIX
37764	8808	1
37295	8808	2

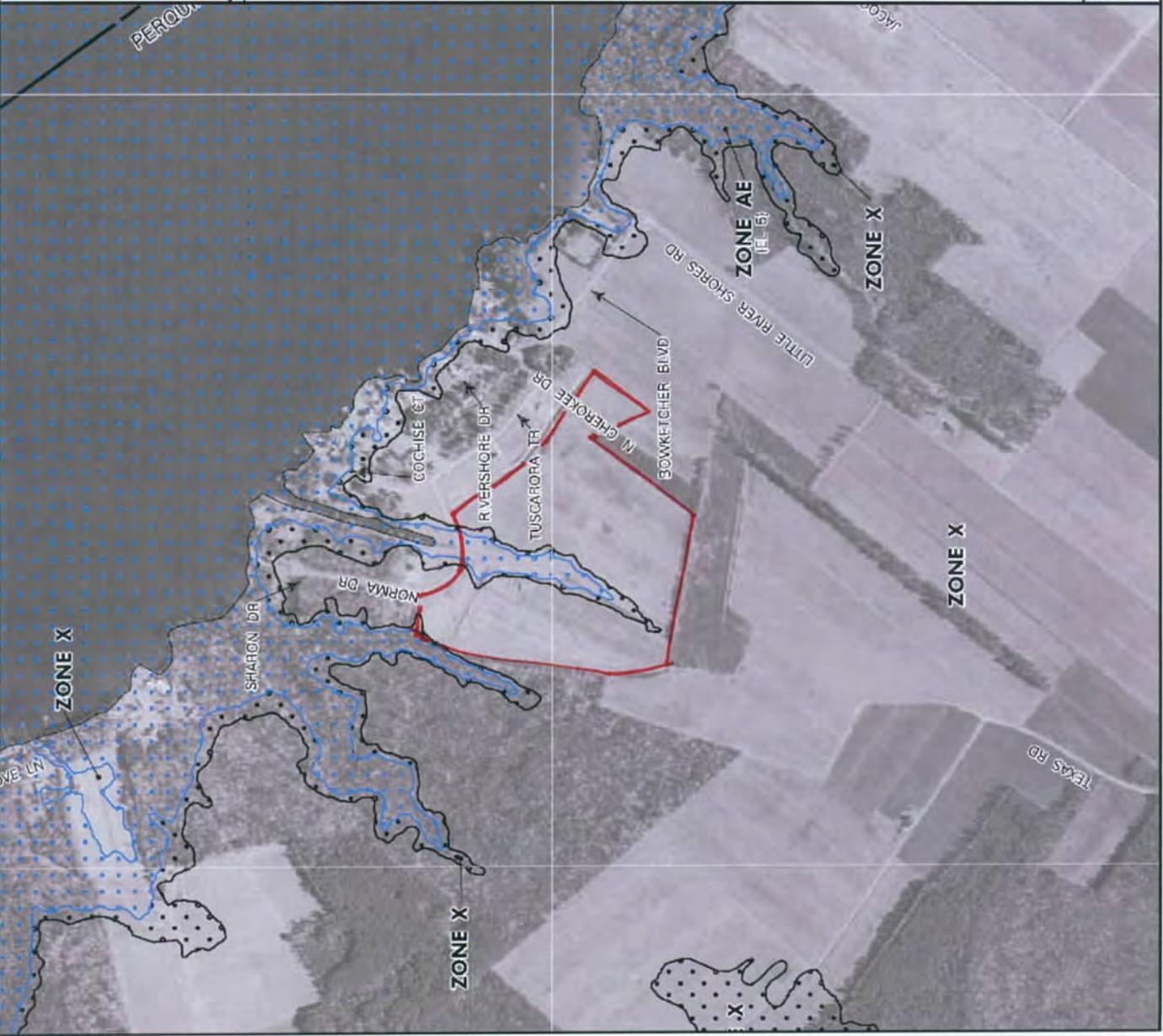
Notes to User: The Map Number shown below should be used along with the Community Number shown above to identify the community for insurance purposes to the project.

EFFECTIVE DATE
OCTOBER 5, 2004

MAP NUMBER
3720880800J



State of North Carolina
Federal Emergency Management Agency



This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 3/16/10	Project: EEP - WATTS	Latitude:
Evaluator: L. SAMLS	Site: UPPER REACH	Longitude:
Total Points: <i>Stream is at least intermittent If ≥ 9 or perennial if ≥ 10</i> 25.0	County: PERQUIMANS	Other e.g. Quad Name:

A. Geomorphology (Subtotal = 10.5)

	Absent	Weak	Moderate	Strong
1 ^a . Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-Channel structure: riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9 ^a . Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on <u>existing</u> USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

^a Man-made ditches are not rated; see discussions in manual.

B Hydrology (Subtotal = 9.0)

	Absent	Weak	Moderate	Strong
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs. since rain, <u>or</u> Water in channel – dry or growing season	0	1	2	3
16. Leaf litter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 5.5)

	Absent	Weak	Moderate	Strong
20 ^b . Fibrous roots in channel	3	2	1	0
21 ^b . Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macroinvertebrates (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron Oxidizing bacteria/fungus	0	0.5	1	1.5
29 ^b . Wetland plants in streambed	FAC=0.5; FACW=0.75; OBL=1.5; SAV=2.0; Other=0			

^b Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (Use back side of this form for additional notes.)

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 3/16/10	Project: EEP-WATTS	Latitude:
Evaluator: L SAULS	Site: LOWER REACH	Longitude:
Total Points: <i>Stream is at least intermittent if ≥ 9 or perennial if ≥ 10</i> 33.25	County: PERQUIMANS	Other e.g. Quad Name:

A. Geomorphology (Subtotal = 16.0)

	Absent	Weak	Moderate	Strong
1 ^a . Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-Channel structure: riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9 ^a . Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

^a Man-made ditches are not rated; see discussions in manual.

B Hydrology (Subtotal = 9.5)

	Absent	Weak	Moderate	Strong
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs. since rain, <u>or</u> Water in channel – dry or growing season	0	1	2	3
16. Leaf litter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 7.75)

	Absent	Weak	Moderate	Strong
20 ^b . Fibrous roots in channel	3	2	1	0
21 ^b . Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macroinvertebrates (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron Oxidizing bacteria/fungus	0	0.5	1	1.5
29 ^b . Wetland plants in streambed	FAC=0.5; FACW=0.75; OBL=1.5; SAV=2.0; Other=0			

^b Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (Use back side of this form for additional notes.)

Sketch:

**U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT**

Action Id. SAW-2005--11813

County: Perquimans

U.S.G.S. Quad: Nixonton, NC

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner/Agent: Ms. Heather Smith, EEP Project Manager
Address: North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, North Carolina 27699-1652
Telephone No.: (919) 715-5590

Property description:

Size (acres)	<u>48 acres</u>	Nearest Town	<u>New Hope</u>
Nearest Waterway	<u>Little River</u>	River Basin	<u>Pasquotank</u>
USGS HUC	<u>03010205</u>	Coordinates	<u>N 36.1654101 W 76.2662275</u>

Location description The project area is located off Norma Drive near it's intersection with Little River Shore Road (NCSR 1326), northeast of the community of New Hope, in the vicinity of Durant's Neck, adjacent to the Little River, in Perquimans County (Property known as the Watts Site).

Indicate Which of the Following Apply:

A. Preliminary Determination

- Based on preliminary information, there may be wetlands on the above described property. We strongly suggest you have this property inspected to determine the extent of Department of the Army (DA) jurisdiction. To be considered final, a jurisdictional determination must be verified by the Corps. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331).

B. Approved Determination

- There are Navigable Waters of the United States within the above described property subject to the permit requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.
- There are waters of the U.S. including wetlands on the above described property subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.
 - We strongly suggest you have the wetlands on your property delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.
 - The waters of the U.S. including wetland on your property 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 wetlands have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on _____. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.
- There are no waters of the U.S., to include wetlands, present on the above described property which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

X The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management in Elizabeth City, NC, at (252) 264-3901 to determine their requirements.

Action Id. SAW-2005-11813

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **Bill Biddlecome** at **(910) 251-4558**.

C. Basis For Determination

This waterbody exhibits an Ordinary High Water Mark as indicated by changes in soil character and absence of terrestrial vegetation and is hydrologically connected to the Little River which is a tributary to the Albemarle Sound.

D. Remarks

Site visits by Tracey Wheeler and Dave Lekson (Corps of Engineers) on three separate occasions, 12/18/2003, 9/1/2005, and 9/27/2005

E. Appeals Information (This information applies only to approved jurisdictional determinations as indicated in B. above)

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

District Engineer, Wilmington Regulatory Division
Attn: Bill Biddlecome, Project Manager,
Washington Regulatory Field Office
P.O. Box 1000
Washington, North Carolina 27889

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the District Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by **November 13, 2010**.

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

Corps Regulatory Official: William J. Biddlecome

Date 09/13/2010

Expiration Date 09/13/2015

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

Copy furnished:
Mr. Lane Sauls Jr.
Ecological Engineering, LLP
128 Raleigh Street
Holly Springs, North Carolina 27540
(919) 557-0929

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: EEP/Ecological Engineering LLP	File Number: SAW-2005-11813	Date: 09/13/2010
Attached is:		See Section below
<input type="checkbox"/> INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
<input type="checkbox"/> PROFFERED PERMIT (Standard Permit or Letter of permission)		B
<input type="checkbox"/> PERMIT DENIAL		C
<input checked="" type="checkbox"/> APPROVED JURISDICTIONAL DETERMINATION		D
<input type="checkbox"/> 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/inet/functions/cw/cecwo/reg> or Corps regulations at 33 CFR Part 331.

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

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

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

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

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

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

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

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

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

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

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

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:

Mr. Bill Biddlecome
Washington Regulatory Field Office
P.O. Box 1000
Washington, North Carolina 27889
(910) 251-4558

If you only have questions regarding the appeal process you may also contact:

Mr. Mike Bell, Administrative Appeal Review Officer
CESAD-ET-CO-R
U.S. Army Corps of Engineers, South Atlantic Division
60 Forsyth Street, Room 9M15
Atlanta, Georgia 30303-8801

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.

Date:

Telephone number:

Signature of appellant or agent.

For appeals on Initial Proffered Permits and approved Jurisdictional Determinations send this form to:

District Engineer, Wilmington Regulatory Division, Attn: Bill Biddlecome, Project Manager, Washington Regulatory Field Office, P.O. Box 1000, Washington, North Carolina 27889

For Permit denials and Proffered Permits send this form to:

Division Engineer, Commander, U.S. Army Engineer Division, South Atlantic, Attn: Mr. Mike Bell, Administrative Appeal Officer, CESAD-ET-CO-R, 60 Forsyth Street, Room 9M15, Atlanta, Georgia 30303-8801

**DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)**

Project/Site: <u>Watts Site</u> Applicant/Owner: <u>NCDENR Ecosystem Enhancement Program</u> Investigator(s): <u>L. Sauls</u>	Date: <u>3/16/2010</u> County: <u>Perquimans</u> State: <u>NC</u>
Do Normal Circumstances exist on the site? <input checked="" type="radio"/> Yes No Is the site significantly disturbed (Atypical Situation)? Yes <input checked="" type="radio"/> No Is this area a potential Problem Area? Yes <input checked="" type="radio"/> No (If needed, explain on reverse)	Community ID: <u>Wetland</u> Transect ID: _____ Plot ID: _____

VEGETATION

<u>Dominant Plant Species</u>	<u>Stratum</u>	<u>Indicator</u>		<u>Dominant Plant Species</u>	<u>Stratum</u>	<u>Indicator</u>
1. <u>Juncus effusus</u>	<u>herb</u>	<u>FACW</u>		9. _____	_____	_____
2. <u>Polygonum sp.</u>	<u>herb</u>	<u>FACW</u>		10. _____	_____	_____
3. _____	_____	_____		11. _____	_____	_____
4. _____	_____	_____		12. _____	_____	_____
5. _____	_____	_____		13. _____	_____	_____
6. _____	_____	_____		14. _____	_____	_____
7. _____	_____	_____		15. _____	_____	_____
8. _____	_____	_____		16. _____	_____	_____

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 100%

Remarks:

HYDROLOGY

<input type="checkbox"/> Recorded Data (Describe in Remarks) <input type="checkbox"/> Stream, Lake, or tide Gauge <input type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input checked="" type="checkbox"/> No Recorded Data Available	Wetland Hydrology Indicators: Primary Indicators: <input checked="" type="checkbox"/> Inundated <input checked="" type="checkbox"/> Saturated in Upper 12 Inches <input checked="" type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input checked="" type="checkbox"/> Drainage Patterns in Wetlands Secondary Indicators (2 or more required): <input checked="" type="checkbox"/> Oxidized Root Channels in Upper 12 Inches <input checked="" type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (Explain in Remarks)
Field Observations: Depth of Surface Water: <u>4</u> (in.) Depth to Free Water in Pit: <u>0</u> (in.) Depth to Saturated Soil: <u>0</u> (in.)	
Remarks:	

SOILS

Map Unit Name (Series and Phase) <u>Roanoke silt loam</u>		Drainage Class: <u>Poorly drained</u>			
Taxonomy (Subgroup) <u>Typic endoaquults</u>		Confirm Mapped Type? Yes <input type="radio"/> No <input checked="" type="radio"/>			
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
<u>0-10"</u>	<u>A</u>	<u>10 YR 5/2</u>	<u>7.5 YR 5/4</u>	<u>Moderate/Distinct</u>	<u>Silt loam</u>
<u>10-16"</u>	<u>Btg</u>	<u>10 YR 6/2</u>	<u>10 YR 5/6</u>	<u>Moderate/Distinct</u>	<u>Clay</u>
<u> </u>	<u> </u>	<u> </u>	<u>10 YR 5/1</u>	<u>Few/Distinct</u>	<u>Clay</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol		<input type="checkbox"/> Concretions			
<input type="checkbox"/> Histic Epipedon		<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Sulfidic Odor		<input type="checkbox"/> Organic Streaking in Sandy Soils			
<input checked="" type="checkbox"/> Aquic Moisture Regime		<input checked="" type="checkbox"/> Listed on Local Hydric Soils List			
<input checked="" type="checkbox"/> Reducing Conditions		<input checked="" type="checkbox"/> Listed on National Hydric Soils List			
<input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors		<input type="checkbox"/> Other (Explain in Remarks)			
Remarks:					

WETLAND DETERMINATION

<p>Hydrophytic Vegetation Present? <input checked="" type="radio"/> Yes <input type="radio"/> No</p> <p>Wetland Hydrology Present? <input checked="" type="radio"/> Yes <input type="radio"/> No</p> <p>Hydric Soils Present? <input checked="" type="radio"/> Yes <input type="radio"/> No</p>	<p>Is this Sampling Point Within a Wetland? <input checked="" type="radio"/> Yes <input type="radio"/> No</p>
Remarks:	

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: <u>Watts Site</u> Applicant/Owner: <u>NCDENR Ecosystem Enhancement Program</u> Investigator(s): <u>L. Sauls</u> Do Normal Circumstances exist on the site? <input checked="" type="radio"/> Yes <input type="radio"/> No Is the site significantly disturbed (Atypical Situation)? Yes <input checked="" type="radio"/> No Is this area a potential Problem Area? Yes <input checked="" type="radio"/> No (If needed, explain on reverse)	Date: <u>3/16/2010</u> County: <u>Perquimans</u> State: <u>NC</u> Community ID: <u>Upland</u> Transect ID: _____ Plot ID: _____
--	--

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. <u>Rubus sp.</u>	<u>shrub</u>	<u>FAC</u>	9. <u>Aster sp.</u>	<u>herb</u>	<u>FACU</u>
2. <u>Baccharis halimifolia</u>	<u>shrub</u>	<u>FAC</u>	10. <u>Vicia sp.</u>	<u>herb</u>	<u>NI</u>
3. <u>Rhus sp.</u>	<u>shrub</u>	<u>FACU</u>	11. <u>Lamium sp.</u>	<u>herb</u>	<u>UPL</u>
4. <u>Eupatorium capillifolium</u>	<u>herb</u>	<u>FACU</u>	12. _____	_____	_____
5. <u>Andropogon sp.</u>	<u>herb</u>	<u>FAC-</u>	13. _____	_____	_____
6. <u>Festuca sp.</u>	<u>herb</u>	<u>FACU</u>	14. _____	_____	_____
7. <u>Stellaria sp.</u>	<u>herb</u>	<u>FACU</u>	15. _____	_____	_____
8. <u>Trifolium sp.</u>	<u>herb</u>	<u>FACU</u>	16. _____	_____	_____
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-).			<u>18%</u>		
Remarks:					

HYDROLOGY

<input type="checkbox"/> Recorded Data (Describe in Remarks) <input type="checkbox"/> Stream, Lake, or tide Gauge <input type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input checked="" type="checkbox"/> No Recorded Data Available	Wetland Hydrology Indicators: Primary Indicators: <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 Inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12 Inches <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (Explain in Remarks)
Field Observations: Depth of Surface Water: <u>0</u> (in.) Depth to Free Water in Pit: <u>>12"</u> (in.) Depth to Saturated Soil: <u>>12"</u> (in.)	
Remarks:	

SOILS

Map Unit Name (Series and Phase) Roanoke silt loam Drainage Class: Poorly drained
 Field Observations

Taxonomy (Subgroup) Typic endoaquults Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
<u>0-10"</u>	<u>A</u>	<u>10 YR 5/2</u>	<u>7.5 YR 5/4</u>	<u>Few/Distinct</u>	<u>Silt loam</u>
<u>10-16"</u>	<u>Btg</u>	<u>10 YR 6/2</u>	<u>7.5 YR 5/4</u>	<u>Few/Distinct</u>	<u>Clay</u>
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Hydric Soil Indicators:

- | | |
|---|---|
| <input type="checkbox"/> Histosol | <input type="checkbox"/> Concretions |
| <input type="checkbox"/> Histic Epipedon | <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils |
| <input type="checkbox"/> Sulfidic Odor | <input type="checkbox"/> Organic Streaking in Sandy Soils |
| <input checked="" type="checkbox"/> Aquic Moisture Regime | <input checked="" type="checkbox"/> Listed on Local Hydric Soils List |
| <input type="checkbox"/> Reducing Conditions | <input checked="" type="checkbox"/> Listed on National Hydric Soils List |
| <input type="checkbox"/> Gleyed or Low-Chroma Colors | <input type="checkbox"/> Other (Explain in Remarks) |

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes <input type="radio"/> No <input checked="" type="radio"/>	Is this Sampling Point Within a Wetland? Yes <input type="radio"/> No <input checked="" type="radio"/>
Wetland Hydrology Present? Yes <input type="radio"/> No <input checked="" type="radio"/>	
Hydric Soils Present? <input checked="" type="radio"/> Yes <input type="radio"/> No	

Remarks:

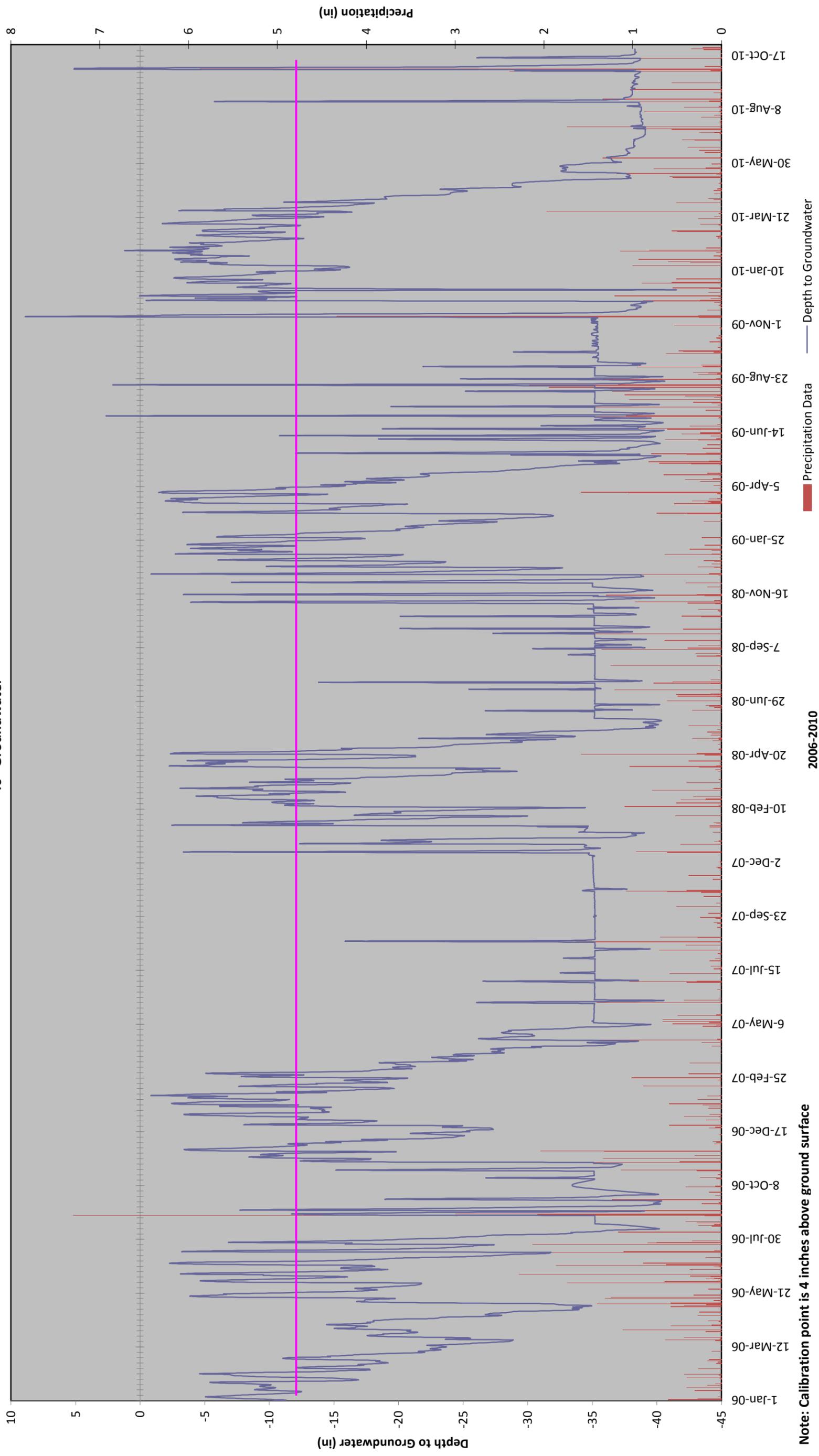
APPENDIX E

Mitigation Work Plan Data and Analyses

Contents:

Groundwater Data
Groundwater Modeling/ Hydrologic Budget
Soil Characterization
HEC-RAS Model and Graphic

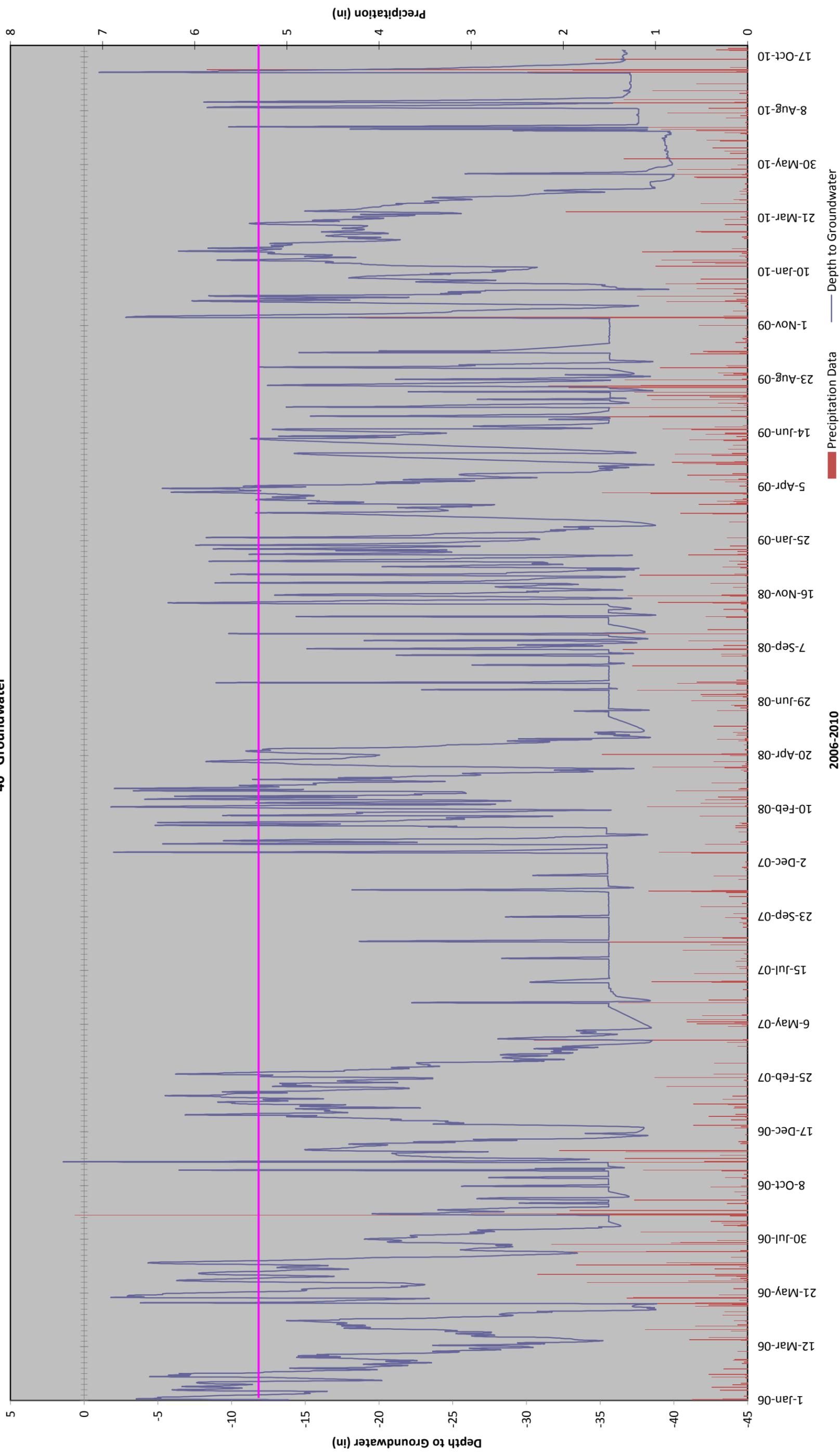
**Monitoring Well #1
40" Groundwater**



Note: Calibration point is 4 inches above ground surface

2006-2010

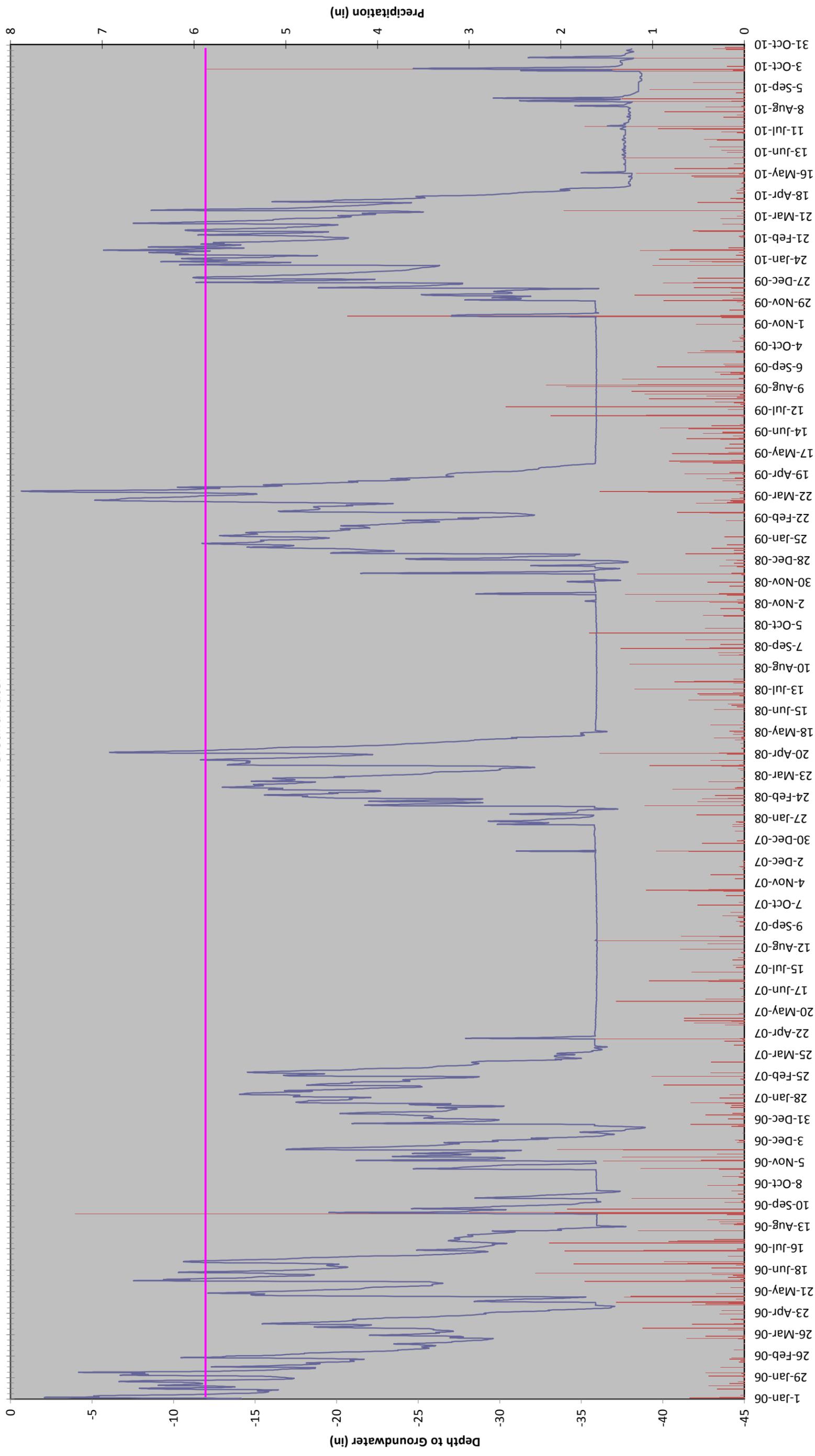
**Monitoring Well #2
40" Groundwater**



2006-2010

Precipitation Data — Depth to Groundwater

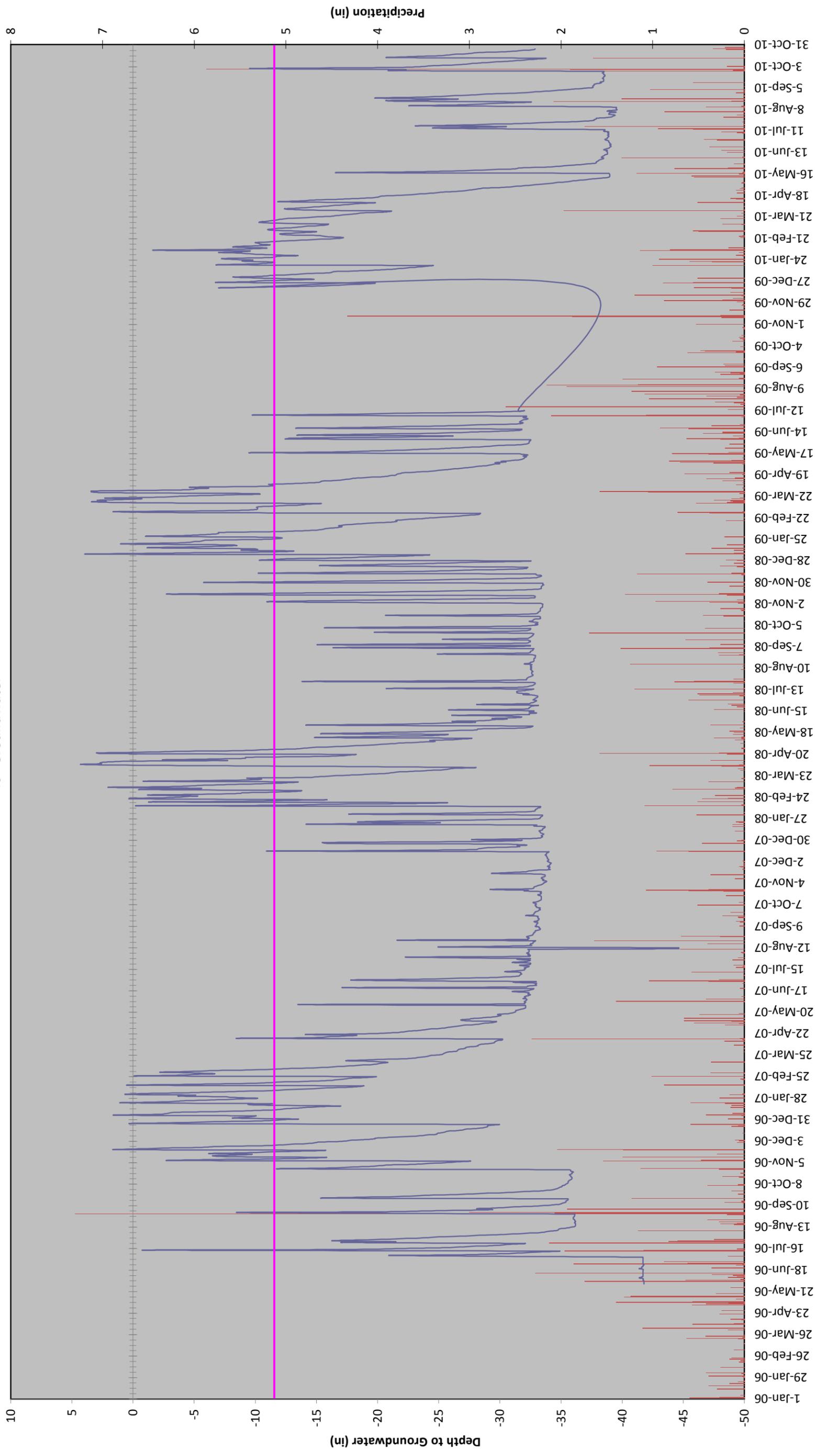
**Monitoring Well #3
40" Groundwater**



Note: Calibration point is 2 inches above ground surface

2006-2010

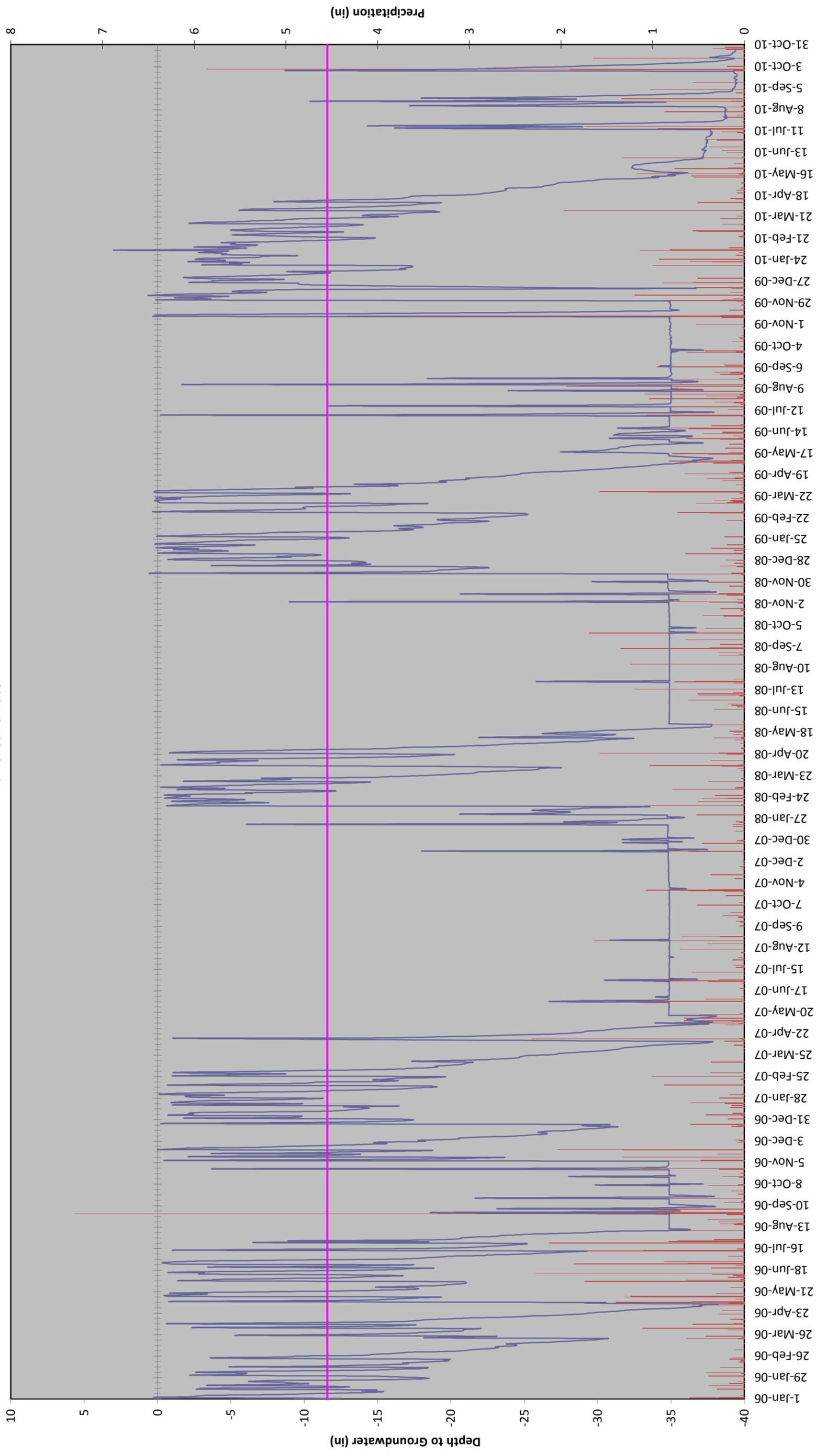
**Monitoring Well #5
40" Groundwater**



■ Precipitation Data — Depth to Groundwater

2006-2010

**Monitoring Well #6
40" Groundwater**

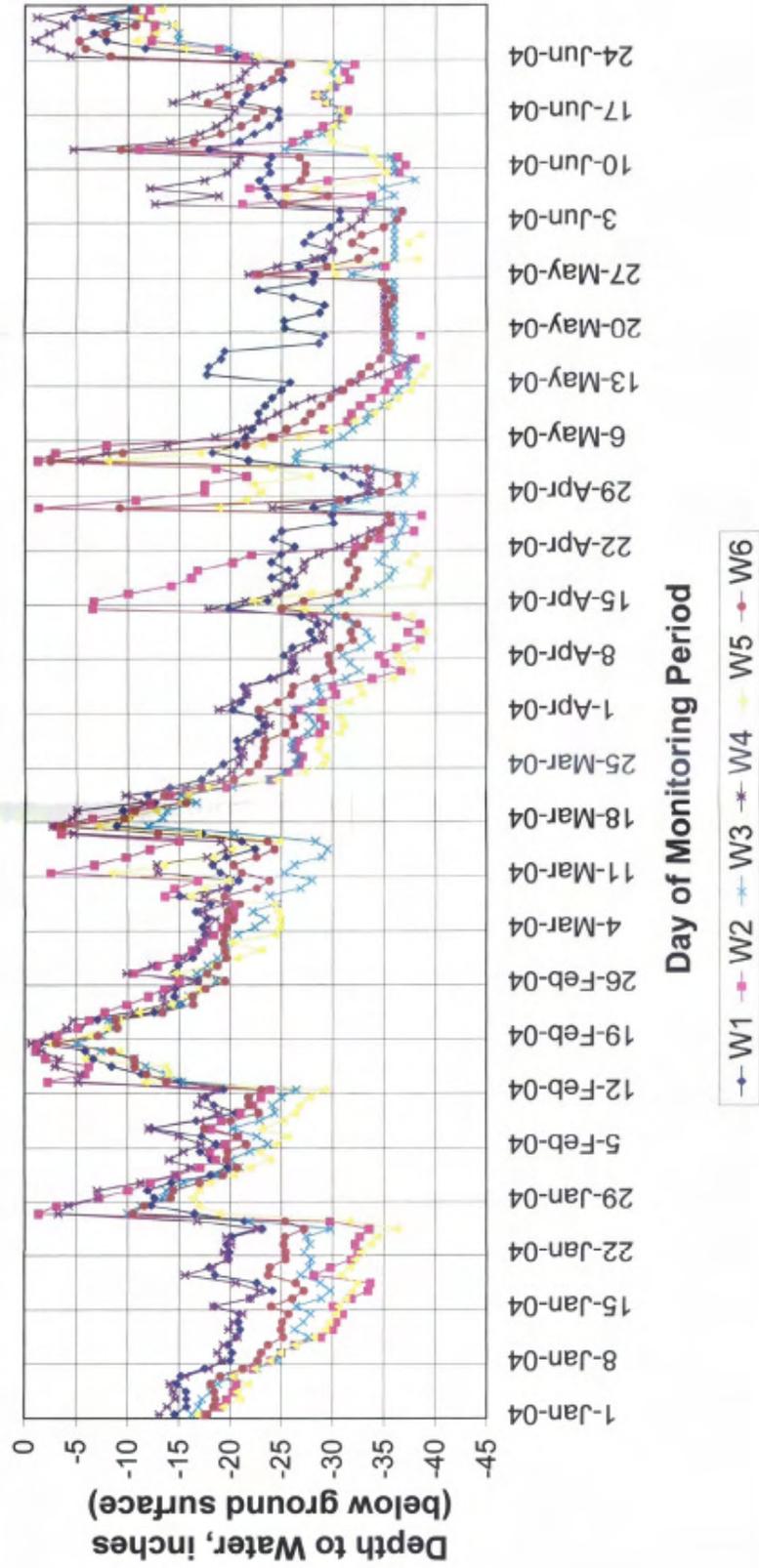


— Precipitation Data

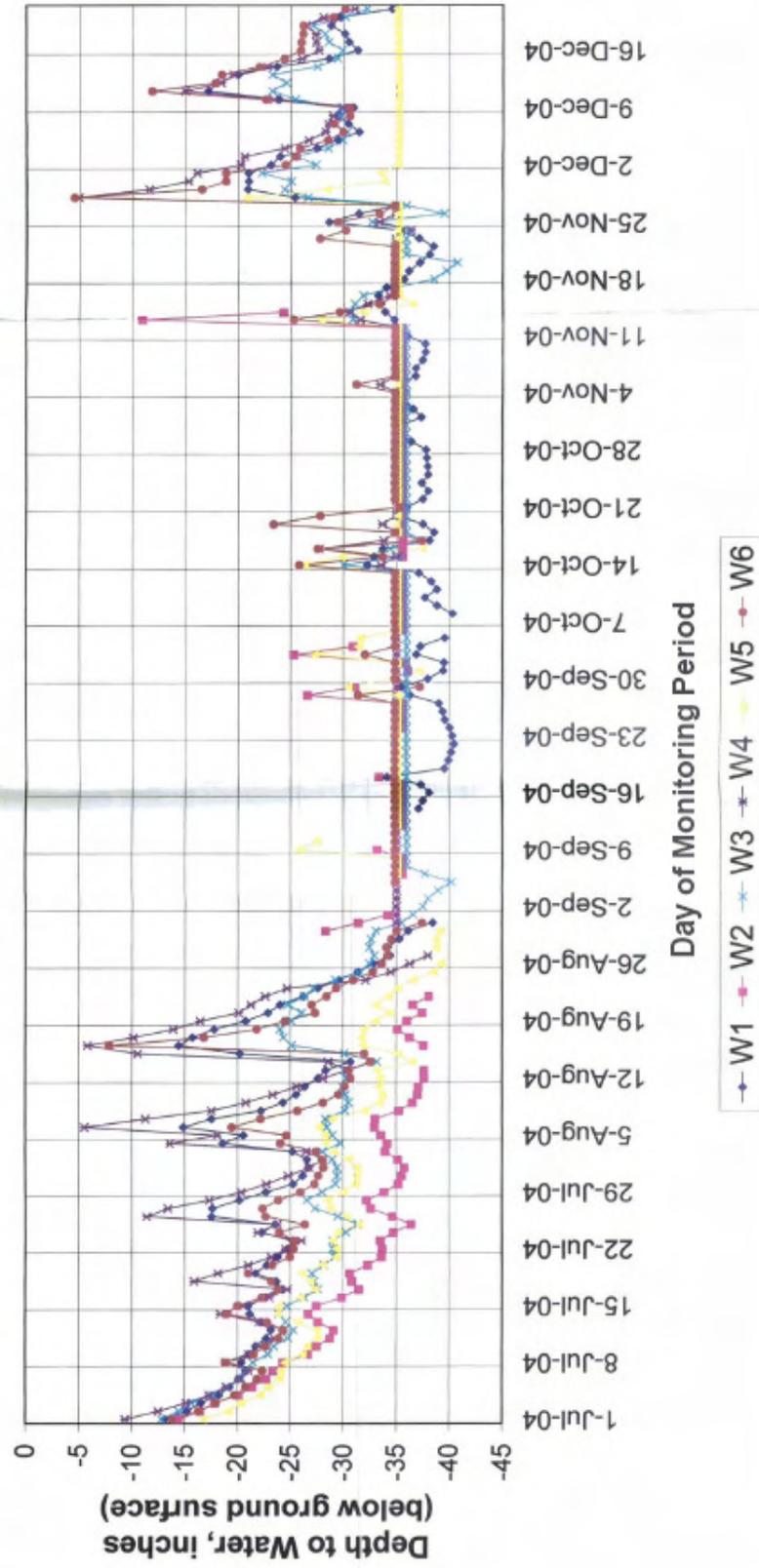
— Depth to Groundwater

2006-2010

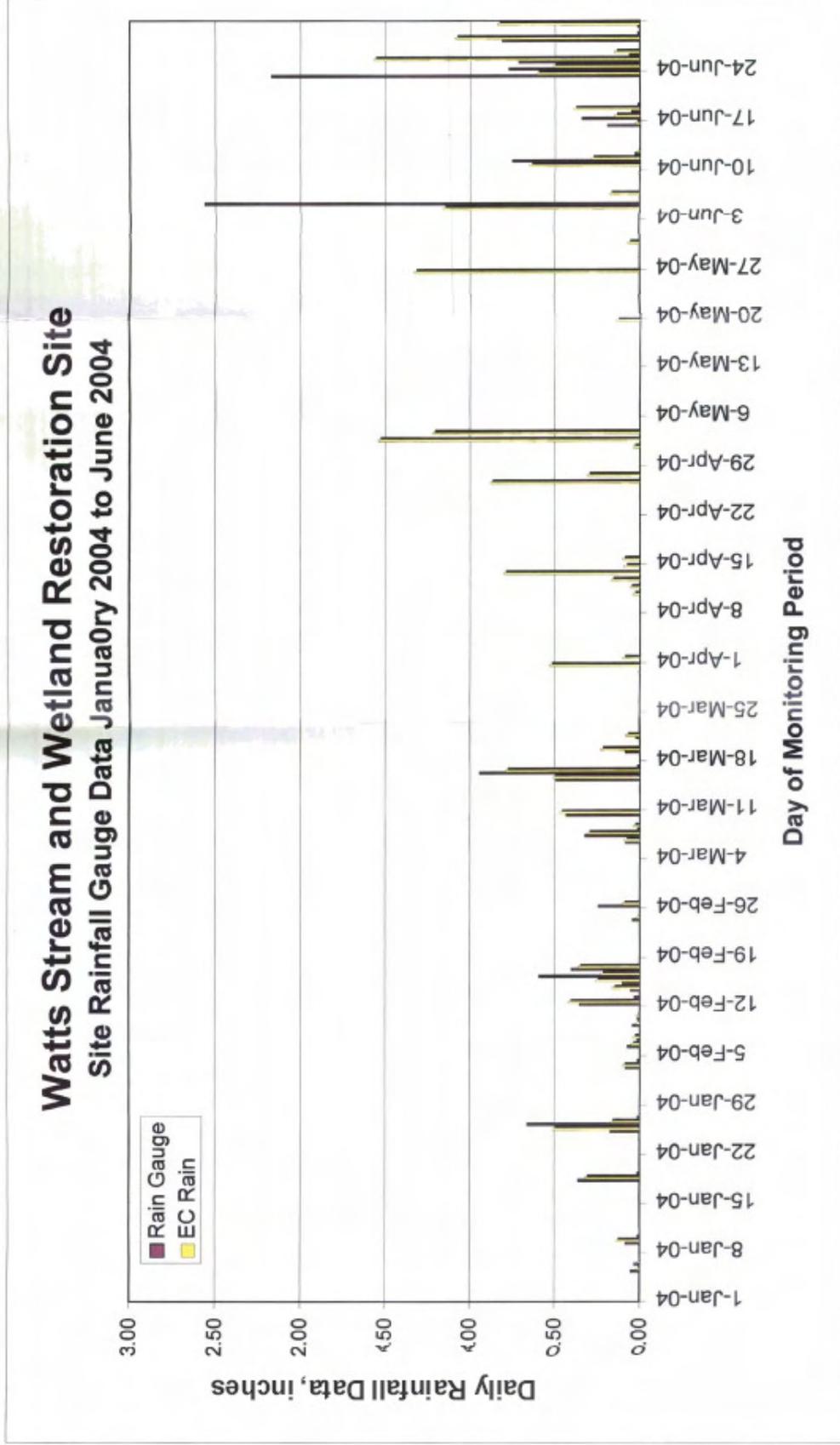
Watts Stream and Wetland Restoration Site Monitoring Gauge Data Comparison January 2004 to June 2004



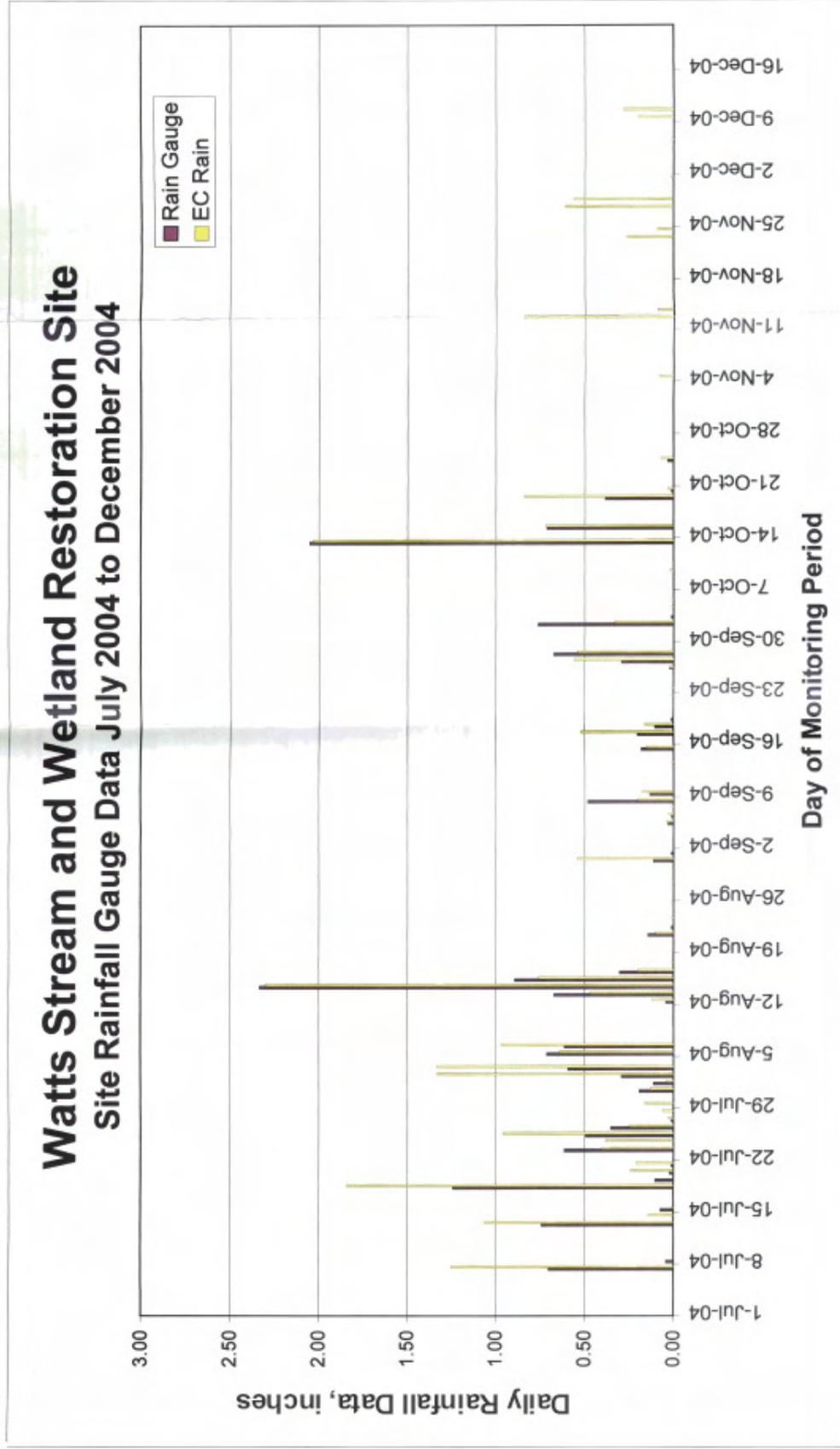
Watts Stream and Wetland Restoration Site Monitoring Gauge Data Comparison July 2004 to December 2004



Watts Site Rainfall Summary – Period January 2004 to June 2004 (Source: EEP, 2005)



* Note: EC = NC Climate Retrieval Observations Network of the Southeast (CRONOS), Elizabeth City, FAA Airport Gauge in Elizabeth City, NC



*Note: EC = NC Climate Retrieval Observations Network of the Southeast (CRONOS), Elizabeth City, FAA Airport Gauge in Elizabeth City, NC

Groundwater Modeling/ Hydrologic Budget

Methodology and Input Data

Development of the water budget follows equations presented in the Engineering Field Handbook (USDA, 1997). The following equations were used to determine the inflow, outflow and water available for storage on-site.

$$\Delta S/\Delta t = Q_i - Q_o$$

Where: $\Delta S/\Delta t$ = change in water volume per unit time
 Q_i = flow rate of water entering wetland
 Q_o = flow rate of water exiting wetland

$$Q_i = P + R_i + B_i + G_i + P_i + T_i$$

Where: P = direct precipitation
 R_i = stormwater runoff from contributing drainage area
 B_i = base flow from streams entering wetland
 G_i = groundwater entering wetland
 P_i = water pumped or artificially added to the wetland
 T_i = tidal flow into wetland

$$Q_o = R + T + R_o + B_o + G_o + P_o + T_o$$

Where: E = evaporation from surface
T = transpiration
 R_o = stormwater outflow
 B_o = base flow leaving wetland
 G_o = groundwater leaving wetland
 P_o = water pumped or artificially removed from wetland
 T_o = tidal flow out of wetland

$$S = S_s + S_p$$

Where: S = total volume of stored water
 S_s = volumes of stored surface water
 S_p = volume of stored subsurface water

Site Data

The physical properties of Roanoke silt loam are presented below along with a chart of mean monthly temperatures.

Soil Physical Properties

Soil Type	Depth (in)	Texture	Hydraulic Conductivity (mm/hr)	Porosity (%)
Roanoke	0-8	Silty Loam	25	43
	8-19	Silty Clay Loam	8	49
	19-33	Silty Clay	3	51

Data obtained from Pierce, Soil and Water Conservation Engineering, fourth edition and Schwab, Soil and Water Conservation Engineering

Mean Monthly Temperatures

Month	Mean Temperature (°F)	Mean Temperature (°C)
January	42.4	5.8
February	44.8	7.1
March	51.8	11.0
April	60.1	15.6
May	67.8	19.9
June	75.7	24.3
July	79.9	26.6
August	78.3	25.7
September	73.2	22.9
October	62.6	17.0
November	54.1	12.3
December	45.9	7.7

Data obtained from State Climate Center website, Elizabeth City Station, October 2010

Water Storage

The following chart depicts the calculated water storage available at the Project Site.

Water Storage			
Soil Type	Depth (in)	Average Water Capacity (in/in)	Storage Capacity (ft ³) (depth)*(capacity)*(area)
Roanoke	0-8	0.17	236,595.5
	8-36	0.175	851,743.6
Total			1,088,339

Data obtained from Soil Survey of Perquimans County

Using a storage depth of three feet, and a surface area of 2,087,604 square feet, a total subsurface storage capacity of 1,088,339 ft³ was calculated. It is anticipated that minimal or no surface water (ponding) will occupy the wetland areas, with exception of the channel flowing through the Site. Due to the Site constraints, a conservative estimate of no surface water was made for calculation purposes.

Inflow

Precipitation

The average annual precipitation over the last 30 years was 48.2 inches, per the State Climate Office as recorded in Elizabeth City. Over the square footage of the property, a volume of 8,385,209 ft³ of rainfall was calculated.

Stormwater Runoff

To simplify calculations and to be more conservative, stormwater inputs are assumed to be zero.

Base Flow

Base flow is assumed to be zero.

Groundwater Flow

Due to a perimeter ditch that circumvents the project site and extensive draining of adjacent properties, zero groundwater inflow is assumed for conservative calculation purposes.

Artificially Added Water

There is no water artificially added to the Project Site.

Tidal Flow

The water level in the wetlands is not influenced by tidal flows.

Outflow

Evapotranspiration (E + T)

The loss of water due to evaporation and transpiration (ET) was calculated using the Thornthwaite Method. Temperature data was obtained from the State Climate Office Website, Elizabeth City Station.

$$ET = 1.6 * (10 * T_a / I)^a$$

Where:

ET = Evapotranspiration

T_a = mean monthly air temperature ($^{\circ}$ C)

I = heat index over 12 months

$$a = 0.49 + 0.0179 * I - 0.0000771 * I^2 + 0.000000675 * I^3$$

I = sum of 12 i values

$$i = (T_a / 5)^{1.514}$$

Where:

i = monthly heat index

T_a = mean monthly air temperature ($^{\circ}$ C)

Water loss due to evapotranspiration is 30.93 inches per year (5,338,011 ft^3 /year) due to a heat index of 77.61. The value of "a" calculates to 1.730.

Stormwater Runoff

To simplify calculations and to be more conservative, stormwater outputs are assumed to be zero.

Base Flow

Base flow is assumed to be zero.

Groundwater Flow

Groundwater flow exiting the project site was calculated from an equation presented in Applied Hydrology, Third Edition.

$$V_x = (K / n_e) * (dh/dl)$$

Where:

V_x = ground water velocity

K = hydraulic conductivity of the soil

n_e = soil porosity

dh/dl = change in vertical distance over change in horizontal distance

The Watts property is underlain predominately by Roanoke silty loam. This soil type exhibits a K of 25 mm/hr and n_e of 43% up to a depth of eight inches. From eight to 36 inches the K is 8 mm/hr and n_e is 49%. For a conservative calculation, K of 25 and n_e of 43% was used for the entire three foot depth studied. A volume of 11,530 ft^3 /year was calculated to leave the site via groundwater flow.

Artificially Added Water

There is no water artificially removed from the Project Site.

Tidal Flow

The water level in the wetlands is not influenced by tidal flows.

Summary

Storage

$$S_s = 0 \text{ ft}^3$$

$$S_p = 1,088,339 \text{ ft}^3$$

$$S = 1,088,339 \text{ ft}^3$$

Inflow

$$P = 8,385,209 \text{ ft}^3$$

$$R_i = 0 \text{ ft}^3$$

$$B_i = 0 \text{ ft}^3$$

$$G_i = 0 \text{ ft}^3$$

$$P_i = 0 \text{ ft}^3$$

$$T_i = 0 \text{ ft}^3$$

$$Q_i = 8,385,209 \text{ ft}^3$$

Outflow

$$E + T = 5,338,011 \text{ ft}^3$$

$$R_o = 0 \text{ ft}^3$$

$$B_o = 0 \text{ ft}^3$$

$$G_o = 11,530 \text{ ft}^3$$

$$P_o = 0 \text{ ft}^3$$

$$T_o = 0 \text{ ft}^3$$

$$Q_o = 5,349,541 \text{ ft}^3$$

Change in Volume

$$Q_i = 8,385,209 \text{ ft}^3$$

$$Q_o = 5,349,541 \text{ ft}^3$$

$$\Delta S/\Delta t = 3,035,668 \text{ ft}^3$$

The water budget results verify the presence of adequate water to meet the proposed wetland hydrology criteria for the majority of the Project Site. Calculations indicate excess water when comparing inflow to outflow and by assuming that base channel flow and stormwater flow were zero, these calculations present a conservative estimate of available water.

HEC-RAS River: UT Little River Reach: Watts

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Watts	1365	2yr	Existing	22.00	3.20	5.32		5.36	0.001719	1.63	14.44	16.35	0.24
Watts	1365	2yr	Proposed	22.00	3.20	4.49		4.50	0.001747	0.80	29.52	35.79	0.14
Watts	1365	5yr	Existing	45.00	3.20	5.92		5.97	0.001834	1.98	28.65	31.00	0.25
Watts	1365	5yr	Proposed	45.00	3.20	4.98		5.00	0.001870	1.07	49.43	45.58	0.15
Watts	1365	10yr	Existing	65.00	3.20	6.21		6.27	0.001984	2.25	39.74	50.15	0.27
Watts	1365	10yr	Proposed	65.00	3.20	5.31		5.33	0.001925	1.23	65.38	52.11	0.16
Watts	1365	25yr	Existing	95.00	3.20	6.51		6.58	0.002031	2.48	59.06	75.72	0.28
Watts	1365	25yr	Proposed	95.00	3.20	5.73		5.75	0.001912	1.40	89.16	60.55	0.16
Watts	1365	50yr	Existing	120.00	3.20	6.69		6.77	0.002093	2.65	74.11	90.78	0.29
Watts	1365	50yr	Proposed	120.00	3.20	6.02		6.05	0.001929	1.53	107.68	66.64	0.17
Watts	1365	100yr	Existing	150.00	3.20	6.86		6.94	0.002204	2.83	90.24	104.55	0.30
Watts	1365	100yr	Proposed	150.00	3.20	6.31		6.35	0.002008	1.68	128.56	76.28	0.17
Watts	1165	2yr	Existing	22.00	2.83	4.93		4.98	0.002196	1.74	12.64	9.48	0.27
Watts	1165	2yr	Proposed	22.00	2.80	4.17		4.18	0.001454	0.68	32.52	37.43	0.12
Watts	1165	5yr	Existing	45.00	2.83	5.50		5.57	0.002212	2.19	27.28	45.66	0.28
Watts	1165	5yr	Proposed	45.00	2.80	4.65		4.66	0.001508	0.91	52.74	47.01	0.13
Watts	1165	10yr	Existing	65.00	2.83	5.82		5.88	0.001883	2.25	45.39	68.32	0.27
Watts	1165	10yr	Proposed	65.00	2.80	4.96		4.98	0.001573	1.06	68.33	53.23	0.14
Watts	1165	25yr	Existing	95.00	2.83	6.15		6.21	0.001721	2.35	72.76	107.72	0.26
Watts	1165	25yr	Proposed	95.00	2.80	5.39		5.41	0.001524	1.21	95.20	72.78	0.15
Watts	1165	50yr	Existing	120.00	2.83	6.33		6.39	0.001685	2.44	95.52	140.54	0.26
Watts	1165	50yr	Proposed	120.00	2.80	5.68		5.71	0.001504	1.31	118.63	86.87	0.15
Watts	1165	100yr	Existing	150.00	2.83	6.49		6.55	0.001689	2.54	120.25	169.13	0.26
Watts	1165	100yr	Proposed	150.00	2.80	5.97		6.00	0.001532	1.42	145.20	100.48	0.15
Watts	965	2yr	Existing	22.00	2.60	4.45		4.50	0.002532	1.89	12.21	12.05	0.29
Watts	965	2yr	Proposed	22.00	2.60	3.78		3.79	0.002812	1.04	25.57	33.51	0.18
Watts	965	5yr	Existing	45.00	2.60	4.87		4.98	0.004103	2.76	18.04	15.81	0.38
Watts	965	5yr	Proposed	45.00	2.60	4.19		4.22	0.003519	1.44	41.30	41.86	0.21
Watts	965	10yr	Existing	65.00	2.60	5.08		5.25	0.005746	3.49	21.86	25.82	0.46
Watts	965	10yr	Proposed	65.00	2.60	4.47		4.51	0.003843	1.69	53.71	47.42	0.22
Watts	965	25yr	Existing	95.00	2.60	5.29		5.55	0.007537	4.31	30.16	50.60	0.53
Watts	965	25yr	Proposed	95.00	2.60	4.94		4.98	0.003322	1.83	77.90	56.71	0.22
Watts	965	50yr	Existing	120.00	2.60	5.45		5.72	0.008092	4.68	39.10	67.80	0.56
Watts	965	50yr	Proposed	120.00	2.60	5.22		5.27	0.003475	2.03	95.99	73.92	0.22
Watts	965	100yr	Existing	150.00	2.60	5.61		5.88	0.008010	4.89	51.61	86.31	0.56
Watts	965	100yr	Proposed	150.00	2.60	5.48		5.54	0.003650	2.22	118.12	93.25	0.23
Watts	765	2yr	Existing	22.00	2.10	4.05		4.07	0.001808	1.22	18.39	29.74	0.24
Watts	765	2yr	Proposed	22.00	2.10	2.96		2.98	0.006395	1.09	20.22	32.15	0.24
Watts	765	5yr	Existing	45.00	2.10	4.57		4.59	0.001000	1.26	48.27	83.97	0.19
Watts	765	5yr	Proposed	45.00	2.10	3.38		3.41	0.004704	1.30	35.73	40.67	0.23
Watts	765	10yr	Existing	65.00	2.10	4.80		4.82	0.000968	1.37	69.48	106.91	0.19
Watts	765	10yr	Proposed	65.00	2.10	3.78		3.80	0.003241	1.34	53.19	48.51	0.20
Watts	765	25yr	Existing	95.00	2.10	5.01		5.04	0.001038	1.55	95.05	129.26	0.20
Watts	765	25yr	Proposed	95.00	2.10	4.51		4.53	0.001556	1.22	101.46	91.31	0.15
Watts	765	50yr	Existing	120.00	2.10	5.16		5.19	0.001060	1.65	115.71	144.93	0.21
Watts	765	50yr	Proposed	120.00	2.10	4.80		4.82	0.001508	1.31	130.81	112.87	0.15
Watts	765	100yr	Existing	150.00	2.10	5.32		5.35	0.001069	1.74	139.83	161.32	0.21
Watts	765	100yr	Proposed	150.00	2.10	5.05		5.07	0.001579	1.43	160.99	132.70	0.15
Watts	565	2yr	Existing	22.00	1.20	3.65		3.69	0.002052	1.53	14.55	18.95	0.25
Watts	565	2yr	Proposed	22.00	1.20	2.33		2.34	0.001889	0.76	29.70	37.59	0.14
Watts	565	5yr	Existing	45.00	1.20	4.40		4.42	0.000763	1.32	54.24	88.03	0.17
Watts	565	5yr	Proposed	45.00	1.20	2.93		2.94	0.001395	0.92	55.68	49.52	0.13
Watts	565	10yr	Existing	65.00	1.20	4.62		4.64	0.000793	1.44	76.06	109.07	0.18
Watts	565	10yr	Proposed	65.00	1.20	3.46		3.47	0.000980	0.94	84.92	60.18	0.12
Watts	565	25yr	Existing	95.00	1.20	4.81		4.84	0.000965	1.69	98.48	127.11	0.20
Watts	565	25yr	Proposed	95.00	1.20	4.34		4.35	0.000568	0.91	148.92	96.24	0.09
Watts	565	50yr	Existing	120.00	1.20	4.95		4.98	0.001040	1.82	117.21	140.41	0.21
Watts	565	50yr	Proposed	120.00	1.20	4.62		4.63	0.000637	1.02	178.37	116.71	0.10
Watts	565	100yr	Existing	150.00	1.20	5.10		5.13	0.001092	1.94	139.19	154.47	0.21
Watts	565	100yr	Proposed	150.00	1.20	4.84		4.86	0.000753	1.16	206.27	133.23	0.11
Watts	465	2yr	Existing	22.00	0.70	3.46		3.48	0.000592	1.02	26.51	42.01	0.14
Watts	465	2yr	Proposed	22.00	0.70	2.05		2.06	0.001054	0.57	38.68	42.10	0.10
Watts	465	5yr	Existing	45.00	0.70	4.33		4.34	0.000225	0.85	87.15	98.34	0.10
Watts	465	5yr	Proposed	45.00	0.70	2.72		2.72	0.000833	0.63	71.00	55.35	0.10
Watts	465	10yr	Existing	65.00	0.70	4.54		4.55	0.000285	1.01	108.99	112.23	0.11
Watts	465	10yr	Proposed	65.00	0.70	3.33		3.34	0.000469	0.62	108.72	67.41	0.08
Watts	465	25yr	Existing	95.00	0.70	4.70		4.71	0.000426	1.28	127.32	122.69	0.13
Watts	465	25yr	Proposed	95.00	0.70	4.27		4.28	0.000250	0.59	181.72	94.02	0.06
Watts	465	50yr	Existing	120.00	0.70	4.82		4.83	0.000523	1.46	142.39	130.66	0.15
Watts	465	50yr	Proposed	120.00	0.70	4.54		4.55	0.000290	0.67	209.22	112.00	0.07
Watts	465	100yr	Existing	150.00	0.70	4.95		4.97	0.000622	1.63	159.85	139.33	0.16
Watts	465	100yr	Proposed	150.00	0.70	4.75		4.76	0.000357	0.78	233.80	125.93	0.08
Watts	365	2yr	Existing	22.00	0.67	3.42		3.43	0.000437	0.86	30.43	47.39	0.12
Watts	365	2yr	Proposed	22.00	0.67	1.93		1.94	0.001402	0.63	34.88	40.25	0.12
Watts	365	5yr	Existing	45.00	0.67	4.32		4.32	0.000155	0.70	103.86	118.21	0.08
Watts	365	5yr	Proposed	45.00	0.67	2.63		2.64	0.000953	0.66	67.76	54.18	0.10
Watts	365	10yr	Existing	65.00	0.67	4.52		4.53	0.000198	0.84	129.60	135.65	0.09
Watts	365	10yr	Proposed	65.00	0.67	3.28		3.29	0.000484	0.62	107.59	67.24	0.08

HEC-RAS River: UT Little River Reach: Watts (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Watts	365	25yr	Existing	95.00	0.67	4.66		4.67	0.000304	1.08	150.12	148.09	0.12
Watts	365	25yr	Proposed	95.00	0.67	4.25		4.25	0.000248	0.59	186.91	112.34	0.06
Watts	365	50yr	Existing	120.00	0.67	4.77		4.79	0.000379	1.24	167.07	157.62	0.13
Watts	365	50yr	Proposed	120.00	0.67	4.51		4.52	0.000285	0.67	219.45	134.97	0.07
Watts	365	100yr	Existing	150.00	0.67	4.90		4.91	0.000457	1.40	186.80	168.04	0.14
Watts	365	100yr	Proposed	150.00	0.67	4.71		4.72	0.000351	0.77	248.17	152.18	0.07
Watts	315	2yr	Existing	22.00	0.68	3.38		3.39	0.000304	0.78	38.93	63.82	0.10
Watts	315	2yr	Proposed	22.00	0.68	1.73		1.74	0.002884	0.82	26.88	36.06	0.17
Watts	315	5yr	Existing	45.00	0.68	4.31		4.31	0.000085	0.55	145.72	156.14	0.06
Watts	315	5yr	Proposed	45.00	0.68	2.52		2.53	0.001249	0.73	61.35	51.76	0.12
Watts	315	10yr	Existing	65.00	0.68	4.51		4.51	0.000107	0.65	178.28	168.65	0.07
Watts	315	10yr	Proposed	65.00	0.68	3.23		3.24	0.000542	0.64	103.49	66.06	0.08
Watts	315	25yr	Existing	95.00	0.68	4.65		4.65	0.000166	0.83	202.19	177.27	0.08
Watts	315	25yr	Proposed	95.00	0.68	4.22		4.23	0.000246	0.58	206.12	150.95	0.06
Watts	315	50yr	Existing	120.00	0.68	4.75		4.76	0.000209	0.95	221.37	183.90	0.10
Watts	315	50yr	Proposed	120.00	0.68	4.48		4.49	0.000274	0.65	247.49	167.18	0.07
Watts	315	100yr	Existing	150.00	0.68	4.87		4.88	0.000256	1.08	243.15	191.15	0.11
Watts	315	100yr	Proposed	150.00	0.68	4.68		4.69	0.000332	0.74	281.12	179.28	0.07
Watts	265	2yr	Existing	22.00	0.35	3.38	1.50	3.38	0.000126	0.55	58.97	82.92	0.07
Watts	265	2yr	Proposed	22.00	0.35	1.64	0.72	1.65	0.001268	0.61	36.17	40.89	0.11
Watts	265	5yr	Existing	45.00	0.35	4.30	1.97	4.31	0.000052	0.46	167.07	142.95	0.05
Watts	265	5yr	Proposed	45.00	0.35	2.48	0.92	2.48	0.000636	0.58	77.17	58.07	0.09
Watts	265	10yr	Existing	65.00	0.35	4.50	2.40	4.51	0.000073	0.57	196.74	154.71	0.06
Watts	265	10yr	Proposed	65.00	0.35	3.21	1.06	3.22	0.000314	0.54	128.77	82.38	0.07
Watts	265	25yr	Existing	95.00	0.35	4.64	2.78	4.64	0.000119	0.75	218.30	162.72	0.07
Watts	265	25yr	Proposed	95.00	0.35	4.21	1.23	4.22	0.000165	0.51	236.92	137.65	0.05
Watts	265	50yr	Existing	120.00	0.35	4.74	2.95	4.75	0.000157	0.88	235.58	168.87	0.09
Watts	265	50yr	Proposed	120.00	0.35	4.47	1.35	4.48	0.000194	0.58	274.50	152.91	0.06
Watts	265	100yr	Existing	150.00	0.35	4.86	3.11	4.86	0.000200	1.01	255.20	175.59	0.10
Watts	265	100yr	Proposed	150.00	0.35	4.66	1.48	4.67	0.000243	0.68	304.86	164.21	0.06
Watts	215	2yr	Existing	22.00	0.00	3.20	1.43	3.33	0.001652	2.83	7.79	55.26	0.28
Watts	215	2yr	Proposed	22.00	0.00	1.49	0.57	1.53	0.004612	1.64	13.39	44.75	0.24
Watts	215	5yr	Existing	45.00	0.00	4.30	2.24	4.30	0.000061	0.56	137.06	102.38	0.05
Watts	215	5yr	Proposed	45.00	0.00	2.32	0.92	2.40	0.004361	2.15	20.91	61.55	0.25
Watts	215	10yr	Existing	65.00	0.00	4.50	2.84	4.50	0.000091	0.71	158.13	111.18	0.06
Watts	215	10yr	Proposed	65.00	0.00	3.07	1.18	3.16	0.003591	2.35	27.64	76.69	0.24
Watts	215	25yr	Existing	95.00	0.00	4.63	3.64	4.64	0.000156	0.95	173.10	117.03	0.09
Watts	215	25yr	Proposed	95.00	0.00	4.21	1.51	4.21	0.000121	0.47	241.16	103.41	0.04
Watts	215	50yr	Existing	120.00	0.00	4.73	4.10	4.74	0.000212	1.13	185.06	121.51	0.10
Watts	215	50yr	Proposed	120.00	0.00	4.46	1.77	4.47	0.000149	0.54	269.02	113.21	0.05
Watts	215	100yr	Existing	150.00	0.00	4.84	4.10	4.85	0.000280	1.32	198.58	126.37	0.12
Watts	215	100yr	Proposed	150.00	0.00	4.65	2.05	4.66	0.000194	0.64	291.11	120.42	0.06
Watts	182			Culvert									
Watts	150	2yr	Existing	22.00	0.00	1.44	1.44	2.11	0.021813	6.59	3.34	7.50	1.01
Watts	150	2yr	Proposed	22.00	0.00	1.18	1.00	1.39	0.014326	3.70	5.94	7.09	0.71
Watts	150	5yr	Existing	45.00	0.00	2.26	2.26	3.34	0.018352	8.33	5.40	8.82	1.00
Watts	150	5yr	Proposed	45.00	0.00	2.02	1.43	2.22	0.007009	3.61	12.47	8.43	0.52
Watts	150	10yr	Existing	65.00	0.00	2.86	2.86	4.24	0.016984	9.43	6.89	9.78	1.00
Watts	150	10yr	Proposed	65.00	0.00	2.60	1.74	2.81	0.005240	3.70	17.57	9.36	0.47
Watts	150	25yr	Existing	95.00	0.00	3.50	3.50	3.67	0.003019	3.37	33.50	38.00	0.36
Watts	150	25yr	Proposed	95.00	0.00	3.26	2.13	3.52	0.004215	4.03	23.55	24.69	0.44
Watts	150	50yr	Existing	120.00	0.00	3.72	3.50	3.90	0.003156	3.64	43.37	50.49	0.38
Watts	150	50yr	Proposed	120.00	0.00	3.72	2.42	3.90	0.003156	3.64	43.37	50.50	0.38
Watts	150	100yr	Existing	150.00	0.00	4.07	3.50	4.22	0.002576	3.55	67.64	118.02	0.35
Watts	150	100yr	Proposed	150.00	0.00	4.07	2.70	4.22	0.002576	3.55	67.64	118.02	0.35
Watts	100	2yr	Existing	22.00	-2.00	0.78		0.91	0.006019	2.85	7.72	5.56	0.43
Watts	100	2yr	Proposed	22.00	-2.00	0.78		0.91	0.006019	2.85	7.72	5.56	0.43
Watts	100	5yr	Existing	45.00	-2.00	1.74		1.90	0.005146	3.21	14.01	7.49	0.41
Watts	100	5yr	Proposed	45.00	-2.00	1.74		1.90	0.005146	3.21	14.01	7.49	0.41
Watts	100	10yr	Existing	65.00	-2.00	2.36		2.55	0.004731	3.41	19.05	8.73	0.41
Watts	100	10yr	Proposed	65.00	-2.00	2.36		2.55	0.004731	3.41	19.05	8.73	0.41
Watts	100	25yr	Existing	95.00	-2.00	3.06		3.28	0.004493	3.70	25.77	13.63	0.41
Watts	100	25yr	Proposed	95.00	-2.00	3.07		3.28	0.004490	3.70	25.77	13.65	0.41
Watts	100	50yr	Existing	120.00	-2.00	3.52		3.73	0.003684	3.74	37.82	39.19	0.38
Watts	100	50yr	Proposed	120.00	-2.00	3.52		3.73	0.003684	3.74	37.83	39.20	0.38
Watts	100	100yr	Existing	150.00	-2.00	3.92		4.08	0.002859	3.58	57.72	61.35	0.34
Watts	100	100yr	Proposed	150.00	-2.00	3.92		4.08	0.002859	3.58	57.72	61.35	0.34
Watts	50	2yr	Existing	22.00	-3.00	0.50		0.61	0.005459	2.69	8.17	4.67	0.36
Watts	50	2yr	Proposed	22.00	-3.00	0.50		0.61	0.005459	2.69	8.17	4.67	0.36
Watts	50	5yr	Existing	45.00	-3.00	1.43	0.08	1.61	0.006530	3.44	13.07	5.90	0.41
Watts	50	5yr	Proposed	45.00	-3.00	1.43	0.08	1.61	0.006530	3.44	13.07	5.90	0.41
Watts	50	10yr	Existing	65.00	-3.00	2.03	0.58	2.26	0.007018	3.81	17.05	7.41	0.44
Watts	50	10yr	Proposed	65.00	-3.00	2.03	0.58	2.26	0.007018	3.81	17.05	7.41	0.44
Watts	50	25yr	Existing	95.00	-3.00	2.73	1.17	2.99	0.007079	4.16	22.85	9.27	0.47
Watts	50	25yr	Proposed	95.00	-3.00	2.73	1.16	2.99	0.007074	4.16	22.86	9.27	0.47
Watts	50	50yr	Existing	120.00	-3.00	3.18	1.60	3.47	0.006722	4.38	28.16	19.95	0.47
Watts	50	50yr	Proposed	120.00	-3.00	3.18	1.60	3.47	0.006720	4.38	28.16	19.96	0.47

HEC-RAS River: UT Little River Reach: Watts (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Watts	50	100yr	Existing	150.00	-3.00	3.61	2.06	3.88	0.005388	4.33	42.17	44.36	0.43
Watts	50	100yr	Proposed	150.00	-3.00	3.61	2.06	3.88	0.005388	4.33	42.17	44.36	0.43
Watts	0	2yr	Existing	22.00	-3.00	0.00	-0.69	0.21	0.012449	3.67	6.00	4.00	0.53
Watts	0	2yr	Proposed	22.00	-3.00	0.00	-0.69	0.21	0.012449	3.67	6.00	4.00	0.53
Watts	0	5yr	Existing	45.00	-3.00	0.08	0.08	0.87	0.045190	7.11	6.33	4.11	1.01
Watts	0	5yr	Proposed	45.00	-3.00	0.08	0.08	0.87	0.045190	7.11	6.33	4.11	1.01
Watts	0	10yr	Existing	65.00	-3.00	0.58	0.58	1.48	0.042202	7.60	8.55	4.78	1.00
Watts	0	10yr	Proposed	65.00	-3.00	0.58	0.58	1.48	0.042202	7.60	8.55	4.78	1.00
Watts	0	25yr	Existing	95.00	-3.00	1.17	1.17	2.21	0.040341	8.21	11.57	5.55	1.00
Watts	0	25yr	Proposed	95.00	-3.00	1.16	1.16	2.21	0.040453	8.22	11.55	5.55	1.00
Watts	0	50yr	Existing	120.00	-3.00	1.60	1.60	2.72	0.038316	8.51	14.11	6.26	1.00
Watts	0	50yr	Proposed	120.00	-3.00	1.60	1.60	2.72	0.038351	8.51	14.10	6.26	1.00
Watts	0	100yr	Existing	150.00	-3.00	2.06	2.06	3.23	0.036228	8.69	17.27	7.49	1.01
Watts	0	100yr	Proposed	150.00	-3.00	2.06	2.06	3.23	0.036223	8.69	17.27	7.49	1.01

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chi	Shear Chan (lb/sq ft)
Watts	0	2yr	22.00	-3.00	0.00	-0.69	0.21	0.012449	3.67	6.00	4.00	0.53	0.65
Watts	0	5yr	45.00	-3.00	0.08	0.08	0.87	0.045190	7.11	6.33	4.11	1.01	2.41
Watts	0	10yr	65.00	-3.00	0.58	0.58	1.48	0.042202	7.60	8.55	4.78	1.00	2.62
Watts	0	25yr	95.00	-3.00	1.16	1.16	2.21	0.040453	8.22	11.55	5.55	1.00	2.92
Watts	0	50yr	120.00	-3.00	1.60	1.60	2.72	0.038351	8.51	14.10	6.26	1.00	3.03
Watts	0	100yr	150.00	-3.00	2.06	2.06	3.23	0.036223	8.69	17.27	7.49	1.01	3.08
Watts	50	2yr	22.00	-3.00	0.50		0.61	0.005459	2.69	8.17	4.67	0.36	0.33
Watts	50	5yr	45.00	-3.00	1.43	0.08	1.61	0.006530	3.44	13.07	5.90	0.41	0.50
Watts	50	10yr	65.00	-3.00	2.03	0.58	2.26	0.007018	3.81	17.05	7.41	0.44	0.59
Watts	50	25yr	95.00	-3.00	2.73	1.16	2.99	0.007074	4.16	22.86	9.27	0.47	0.68
Watts	50	50yr	120.00	-3.00	3.18	1.60	3.47	0.006720	4.38	28.16	19.96	0.47	0.72
Watts	50	100yr	150.00	-3.00	3.61	2.06	3.88	0.005388	4.33	42.17	44.36	0.43	0.67
Watts	100	2yr	22.00	-2.00	0.78		0.91	0.006019	2.85	7.72	5.56	0.43	0.37
Watts	100	5yr	45.00	-2.00	1.74		1.90	0.005146	3.21	14.01	7.49	0.41	0.43
Watts	100	10yr	65.00	-2.00	2.36		2.55	0.004731	3.41	19.05	8.73	0.41	0.46
Watts	100	25yr	95.00	-2.00	3.07		3.28	0.004490	3.70	25.77	13.65	0.41	0.51
Watts	100	50yr	120.00	-2.00	3.52		3.73	0.003684	3.74	37.83	39.20	0.38	0.49
Watts	100	100yr	150.00	-2.00	3.92		4.08	0.002859	3.58	57.72	61.35	0.34	0.43
Watts	150	2yr	22.00	0.00	1.18	1.00	1.39	0.014326	3.70	5.94	7.09	0.71	0.68
Watts	150	5yr	45.00	0.00	2.02	1.43	2.22	0.007009	3.61	12.47	8.43	0.52	0.55
Watts	150	10yr	65.00	0.00	2.60	1.74	2.81	0.005240	3.70	17.57	9.36	0.47	0.53
Watts	150	25yr	95.00	0.00	3.26	2.13	3.52	0.004215	4.03	23.55	24.69	0.44	0.57
Watts	150	50yr	120.00	0.00	3.72	2.42	3.90	0.003156	3.64	43.37	50.50	0.38	0.45
Watts	150	100yr	150.00	0.00	4.07	2.70	4.22	0.002576	3.55	67.64	118.02	0.35	0.41
Watts	182												
Watts	182		Culvert										
Watts	215	2yr	22.00	0.00	1.49	0.57	1.53	0.004612	1.64	13.39	44.75	0.24	0.43
Watts	215	5yr	45.00	0.00	2.32	0.92	2.40	0.004361	2.15	20.91	61.55	0.25	0.63
Watts	215	10yr	65.00	0.00	3.07	1.18	3.16	0.003591	2.35	27.64	76.69	0.24	0.69
Watts	215	25yr	95.00	0.00	4.21	1.51	4.21	0.000121	0.47	241.16	103.41	0.04	0.03
Watts	215	50yr	120.00	0.00	4.46	1.77	4.47	0.000149	0.54	269.02	113.21	0.05	0.03
Watts	215	100yr	150.00	0.00	4.65	2.05	4.66	0.000194	0.64	291.11	120.42	0.06	0.05
Watts	265	2yr	22.00	0.35	1.64	0.72	1.65	0.001268	0.61	36.17	40.89	0.11	0.07
Watts	265	5yr	45.00	0.35	2.48	0.92	2.48	0.000636	0.58	77.17	58.07	0.09	0.06
Watts	265	10yr	65.00	0.35	3.21	1.06	3.22	0.000314	0.54	126.77	82.38	0.07	0.04
Watts	265	25yr	95.00	0.35	4.21	1.23	4.22	0.000165	0.51	236.92	137.65	0.05	0.03
Watts	265	50yr	120.00	0.35	4.47	1.35	4.48	0.000194	0.58	274.50	152.91	0.06	0.04
Watts	265	100yr	150.00	0.35	4.66	1.48	4.67	0.000243	0.68	304.66	164.21	0.06	0.05
Watts	315	2yr	22.00	0.68	1.73		1.74	0.002884	0.82	26.88	36.06	0.17	0.13
Watts	315	5yr	45.00	0.68	2.52		2.53	0.001249	0.73	61.35	51.76	0.12	0.09
Watts	315	10yr	65.00	0.68	3.23		3.24	0.000542	0.64	103.49	66.06	0.08	0.06
Watts	315	25yr	95.00	0.68	4.22		4.23	0.000246	0.58	206.12	150.95	0.06	0.04
Watts	315	50yr	120.00	0.68	4.48		4.49	0.000274	0.65	247.49	167.18	0.07	0.05
Watts	315	100yr	150.00	0.68	4.68		4.69	0.000332	0.74	281.12	179.28	0.07	0.07
Watts	365	2yr	22.00	0.67	1.93		1.94	0.001402	0.63	34.88	40.25	0.12	0.08
Watts	365	5yr	45.00	0.67	2.63		2.64	0.000953	0.66	67.76	54.18	0.10	0.07
Watts	365	10yr	65.00	0.67	3.28		3.29	0.000484	0.62	107.59	67.24	0.08	0.06
Watts	365	25yr	95.00	0.67	4.25		4.25	0.000248	0.59	186.91	112.34	0.06	0.04
Watts	365	50yr	120.00	0.67	4.51		4.52	0.000285	0.67	219.45	134.97	0.07	0.06
Watts	365	100yr	150.00	0.67	4.71		4.72	0.000351	0.77	248.17	152.18	0.07	0.07
Watts	465	2yr	22.00	0.70	2.05		2.06	0.001054	0.57	38.68	42.10	0.10	0.06
Watts	465	5yr	45.00	0.70	2.72		2.72	0.000833	0.63	71.00	55.35	0.10	0.07
Watts	465	10yr	65.00	0.70	3.33		3.34	0.000469	0.62	108.72	67.41	0.08	0.06
Watts	465	25yr	95.00	0.70	4.27		4.28	0.000250	0.59	181.72	94.02	0.06	0.04
Watts	465	50yr	120.00	0.70	4.54		4.55	0.000290	0.67	209.22	112.00	0.07	0.06
Watts	465	100yr	150.00	0.70	4.75		4.76	0.000357	0.78	233.80	125.93	0.08	0.07
Watts	565	2yr	22.00	1.20	2.33		2.34	0.001889	0.76	29.70	37.59	0.14	0.11
Watts	565	5yr	45.00	1.20	2.93		2.94	0.001395	0.92	55.68	49.52	0.13	0.13
Watts	565	10yr	65.00	1.20	3.46		3.47	0.000980	0.94	84.92	60.18	0.12	0.13
Watts	565	25yr	95.00	1.20	4.34		4.35	0.000568	0.91	148.92	96.24	0.09	0.10
Watts	565	50yr	120.00	1.20	4.62		4.63	0.000637	1.02	178.37	116.71	0.10	0.13
Watts	565	100yr	150.00	1.20	4.84		4.86	0.000753	1.16	206.27	133.23	0.11	0.16
Watts	765	2yr	22.00	2.10	2.96		2.98	0.006395	1.09	20.22	32.15	0.24	0.25
Watts	765	5yr	45.00	2.10	3.38		3.41	0.004704	1.30	35.73	40.67	0.23	0.30
Watts	765	10yr	65.00	2.10	3.78		3.80	0.003241	1.34	53.19	48.51	0.20	0.29
Watts	765	25yr	95.00	2.10	4.51		4.53	0.001596	1.22	101.46	91.31	0.15	0.21
Watts	765	50yr	120.00	2.10	4.80		4.82	0.001508	1.31	130.81	112.87	0.15	0.23
Watts	765	100yr	150.00	2.10	5.05		5.07	0.001579	1.43	160.99	132.70	0.15	0.27
Watts	965	2yr	22.00	2.60	3.78		3.79	0.002812	1.04	25.57	33.51	0.18	0.19
Watts	965	5yr	45.00	2.60	4.19		4.22	0.003519	1.44	41.30	41.86	0.21	0.33
Watts	965	10yr	65.00	2.60	4.47		4.51	0.003843	1.69	53.71	47.42	0.22	0.43
Watts	965	25yr	95.00	2.60	4.94		4.98	0.003322	1.83	77.90	56.71	0.22	0.46
Watts	965	50yr	120.00	2.60	5.22		5.27	0.003475	2.03	95.99	73.92	0.22	0.55

HEC-RAS Plan: Proposed River: UT Little River Reach: Watts (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Shear Chan (lb/sq ft)
Watts	985	100yr	150.00	2.60	5.48		5.54	0.003650	2.22	118.12	93.25	0.23	0.64
Watts	1165	2yr	22.00	2.80	4.17		4.18	0.001454	0.68	32.52	37.43	0.12	0.09
Watts	1165	5yr	45.00	2.80	4.65		4.66	0.001508	0.91	52.74	47.01	0.13	0.13
Watts	1165	10yr	65.00	2.80	4.96		4.98	0.001573	1.06	68.33	53.23	0.14	0.17
Watts	1165	25yr	95.00	2.80	5.39		5.41	0.001524	1.21	95.20	72.78	0.15	0.21
Watts	1165	50yr	120.00	2.80	5.68		5.71	0.001504	1.31	118.63	86.87	0.15	0.23
Watts	1165	100yr	150.00	2.80	5.97		6.00	0.001532	1.42	145.20	100.48	0.15	0.26
Watts	1365	2yr	22.00	3.20	4.49		4.50	0.001747	0.80	29.52	35.79	0.14	0.11
Watts	1365	5yr	45.00	3.20	4.98		5.00	0.001870	1.07	49.43	45.58	0.15	0.18
Watts	1365	10yr	65.00	3.20	5.31		5.33	0.001925	1.23	65.38	52.11	0.16	0.22
Watts	1365	25yr	95.00	3.20	5.73		5.75	0.001912	1.40	89.16	60.55	0.16	0.27
Watts	1365	50yr	120.00	3.20	6.02		6.05	0.001929	1.53	107.68	66.64	0.17	0.31
Watts	1365	100yr	150.00	3.20	6.31		6.35	0.002008	1.68	128.56	76.28	0.17	0.36

APPENDIX F.

Reference Site Analyses

REFERENCE SITE ANALYSES

Ecological Engineering utilized several sources of existing reference information approved by EEP and the regulatory agencies as part of the reference assessment for the proposed design. Information was obtained from EEP, which recently implemented a similar Coastal Plain headwater stream restoration project approximately 24 miles west of the Watts Site. In addition, previous work was completed for the Watts Site under a pretense for natural channel design-based stream restoration. This work included a limited assessment of potential wetland reference areas for riverine and non-riverine wetland restoration. Both reference assessments were conducted by consultants under contract with EEP. Ecological Engineering also qualitatively viewed the property immediately west of the Watts Site. Permission to conduct surveys was not granted. Therefore, only visual surveys were recorded from the property boundary separating the Project Site from this area. Photographs of the reference wetland sites are depicted later in this appendix.

Since data from multiple reference sites was available, a holistic approach was used to formulate the conceptual design. More emphasis however, was associated with the data from Reference Wetland Sites 1 through 4 rather than Sites 5 and 6. This reasoning was based on raw data availability and confidence.

Target Reference Conditions

The Watts Site is currently fallow. It is drained via a network of linear and lateral drainages. Other than the soil characterization, there is little evidence of the historical wetlands that would have existed on the site. As a result, Ecological Engineering utilized physical parameters as well as other reference materials to ascertain the target wetland types. The physical parameters included watershed size, soil mapping units and general topography. Reference materials included information on vegetation community types.

According to *EEP* (2006), the following conditions summarized the search for a suitable Coastal Plain headwater stream and wetland reference (Headwater Forest) site:

- location within the Outer Coastal Plain physiographic region;
- minimal hydrologic alteration;
- jurisdictional wetland status;
- watershed size between 30 and 300 acres (with the three sites spanning the range);
- climax community – Headwater Forest (Small Stream Swamp) or Hardwood Flat (Non-Riverine Wet Hardwood Forest);
- similar watershed soil types;
- similar site soil types;
- minimal impervious surfaces within watershed;
- similar topography; and,
- minimal presence of invasive species.

Reference Site Search Methodology

According to *EEP* (2006), all of the parameters listed in the above section were used to find three appropriate reference sites. A GIS-based search was initially conducted for the identification of reference wetland sites in the Outer Coastal Plain. The GIS process was first based on an automated procedure which included the overlay of CAMA wetland data, Chowan Soil Data, NC Gap Analysis Project (NCGAP) data, and public land. No eligible sites were found on public land. After potential sites were identified, sites near the project area were manually reviewed using other available GIS data such as aerial photography and topography. Once sites

were identified, some were visited that could be easily viewed from public roads. Neither Chowan County nor Edenton have GIS based parcel data; therefore, candidate reference site information was acquired at the Chowan County Tax office and Register of Deeds office (EEP, 2006).

In 2003, Hurricane Isabelle impacted the northeastern portion of North Carolina and caused localized damage. This storm knocked down many trees. Even more trees were taken down as the landowners undertook clearcut operations in an effort to salvage available timber and reduce fire hazards. Several potential reference sites identified during the reference site search suffered tree loss from Hurricane Isabelle and were subsequently clearcut (EEP, 2006). Three reference sites were located during this search. The first, adjacent to EEP's UT to Pembroke Creek headwater stream restoration project site, and two within 20 miles of the Watts Site. All three reference sites are situated within Chowan County and may require permission from the landowner prior to entry. The fourth site is adjacent to the Watts Site in Perquimans County. Sites 5 and 6 were ascertained from previous work done at the Watts Site in 2005. These two sites are located approximately three miles northwest of the Project Site in Perquimans County.

The following table shows a general assessment of each reference wetland as they relate to the parameters laid out above.

Watts Property Stream and Wetland Restoration Site EEP Project Number 413						
Compatibility Parameters	Reference Wetland 1	Reference Wetland 2	Reference Wetland 3	Reference Wetland 4 (Visual Only)	Reference Wetland 5	Reference Wetland 6
Outer Coastal Plain	Yes	Yes	Yes	Yes	Yes	Yes
Amount of Hydrologic Alteration	Minimal	Minimal	Minimal	Minimal	Unknown	Unknown
Jurisdiction Wetland Status	Yes	Yes	Yes	Yes	Likely	Likely
Watershed Size	30 - 300 acres	30 - 300 acres	30 - 300 acres			
Climax Community Type	Mostly	Mostly	Young	Mostly	Young	Mostly
Similar Watershed Soil Types	Some	Yes	Yes	Yes	Some	Some
Impervious Surfaces w/in Watershed	None	Minimal	Minimal	None	Unknown	Unknown
Topography	Similar	Similar	Similar	Similar	Similar	Similar
Invasive Species Present	None	None	None	None	Yes	Yes

Source for Reference Wetland 1, 2 and 3 data is EEP (2006) and Wetland 5 and 6 is EEP (2005).

Reference Site Parameters

Wetland determination forms were completed for the first three reference wetland sites. Copies of these forms are provided later in the appendix. Each reference wetland exhibits two forms, one from within the wetland boundary and one from outside the boundary.

Reference Wetland 1

Reference Wetland 1 is situated approximately 3.5 miles northwest of Edenton and adjacent to the UT to Pembroke Creek Restoration Site (Appendix F - Figure 5). According to EEP (2006), several parameters were collected during the reference reach surveys to better understand the physical setting of the reference area and to integrate the collected parameters into the restoration design. Reference wetland cross sections were

surveyed and are provided at the end of the appendix. The drainage area for Reference Wetland 1 is approximately 45 acres and significant ponded and flowing water was evident during the survey. Average land slope down the wetland valley was 0.5% and water surface slope was 0.2%. The flat portion of Cross Section 1 was 143 feet

long and 58% of the distance was wet or had standing water. The flat portion of Cross Section 2 was 133 feet long and 76% of the distance was wet or standing water. Reference Wetland 1 is located in a former Carolina Bay and a significant portion of its upstream watershed was a former sandpit. Accordingly, a large portion of the watershed has the soil designation Udorthents, indicating an area where natural soil has been altered (EEP, 2006).

Soil Characterization

According to EEP (2006), soil borings were conducted within Reference Wetland 1. The wetland soils were determined as Cape Fear loam bordered by Roanoke silt loam. Cape Fear loam is described as very poorly drained, nearly level soils on stream terraces. These soils formed in alluvial sediment. A seasonal high water table is at or near the surface. In a typical profile, the surface layer is black and very dark gray loam about 14 inches thick. The subsoil, about 26 inches thick is dominantly gray, firm clay mottled with yellowish brown. Below the subsoil and extending to a depth of about 60 inches is light-gray coarse sand mottled with gray. Natural fertility, the content of organic matter, and available water capacity are all medium. Permeability is slow, and shrink-swell potential is high. In areas that have not received lime, reaction is very strongly acid. Its taxonomic classification is fine, mixed, semiactive, thermic typic umbraquults. Soil maps and aerial photographs are presented in Appendix F - Figures 6 and 7, respectively.

The following chart depicts the typical soil description for Reference Wetland 1.

Soil Name: Cape Fear Loam		
Soil Horizon	Depth	Description
A	0 to 6 inches	Black (10YR 2/1) loam, weak medium granular structure, friable, many fine medium roots.
Eg	6 to 15 inches	Gray (10YR 6/1) sandy loam, weak medium granular structure, friable, few fine medium roots.
Btg1	15 to 24 inches	Light gray (10YR 7/1) sandy loam, weak medium subangular blocky structure, friable, slightly sticky, slightly plastic, common fine pores, few medium faint brownish yellow (10YR 6/6) soft iron masses, common medium prominent red (2.5YR 4/6) soft iron masses.
Btg2	24 to 34 inches	Light gray (10YR 5/1) sandy clay loam, moderate medium subangular blocky structure, friable, slightly sticky, slightly plastic, common fine pores, many medium distinct brownish yellow (10YR 6/6) soft iron masses.
BCg	34 to 48 inches	Grayish brown (10YR 5/2) loamy sand, weak medium subangular blocky structure, very friable, nonsticky, nonplastic, many medium prominent yellowish brown (10YR 5/8) soft iron masses.
Cg	48 to 56+ inches	Cg 48 to 56+ inches Gray (10YR 6/1) sand, single grained, loose.

Source: EEP, 2006

Vegetation

According to EEP (2006), Reference Wetland 1 was in fairly good condition for vegetation analysis. However, many trees had been knocked over from Hurricane Isabelle and the transition area had a fairly high number

of loblolly pine (*Pinus taeda*). The following charts depict the community types and plant species list found at Reference Wetland 1.

Transect 1 - Wetland Area

Community Type – Hardwood Flat (Non-Riverine Wet Hardwood Forest (Oak-Gum Slough Subtype))

	Canopy (%)	Subcanopy (%)
<i>Acer rubrum</i>	5	
<i>Liquidambar styraciflua</i>	5	
<i>Liriodendron tulipifera</i>	5	
<i>Magnolia virginiana</i>		Occasional
<i>Nyssa biflora</i>	50	
<i>Pinus taeda</i>	5	
<i>Quercus laurifolia</i>	25	
<i>Quercus michauxii</i>	5	
<i>Ilex opaca</i>		Occasional

Transect 1 - Wetland Edge

Community Type – Hardwood Flat (Non-Riverine Wet Hardwood Forest (Transitional Disturbed))

	Canopy (%)	Subcanopy (%)
<i>Acer rubrum</i>	5	
<i>Carya glabra</i>	10	
<i>Cornus florida</i>		Occasional
<i>Liquidambar styraciflua</i>	10	
<i>Liriodendron tulipifera</i>	25	
<i>Magnolia grandiflora</i>		Occasional
<i>Pinus taeda</i>	40	
<i>Quercus alba</i>	10	
<i>Quercus nigra</i>		Occasional
<i>Vaccinium atrococcum</i>		Occasional
<i>Prunus serotina</i>		Occasional
<i>Ilex opaca</i>		Occasional

Transect 2 - Wetland Area

Community Type – Hardwood Flat (Non-Riverine Wet Hardwood Forest (Oak-Gum Slough Subtype))

	Canopy (%)	Subcanopy (%)
<i>Acer rubrum</i>	25	
<i>Nyssa aquatica</i>	20	
<i>Nyssa biflora</i>	40	
<i>Pinus taeda</i>	5	
<i>Quercus laurifolia</i>	10	
<i>Pinus taeda</i>	5	
<i>Ilex opaca</i>		Occasional
<i>Fraxinus caroliniana</i>		Occasional

Transect 2 - Wetland Edge

Community Type – Hardwood Flat (Non-Riverine Wet Hardwood Forest (Transitional Disturbed))

	Canopy (%)	Subcanopy (%)
<i>Acer rubrum</i>	15	
<i>Liriodendron tulipifera</i>	15	
<i>Magnolia virginiana</i>		Occasional
<i>Nyssa biflora</i>	10	
<i>Pinus taeda</i>	40	
<i>Quercus michauxii</i>	10	
<i>Quercus nigra</i>	5	
<i>Quercus phellos</i>	5	
<i>Ilex opaca</i>		Occasional
<i>Fraxinus caroliniana</i>		Occasional

Source: EEP, 2006

Reference Wetland 2

Reference Wetland 2 is situated approximately eight miles east of Edenton (Appendix F - Figure 8). According to EEP (2006), the drainage area for Reference Wetland 2 was approximately 279 acres. Average land and water surface slopes along the wetland valley was 0.5%. The flat portion of Cross Section 1 was 133 feet long and 53% of the distance was wet or had standing water. The flat portion of Cross Section 2 was 87 feet long and 28% of the distance was wet or standing water (EEP, 2006). These cross sections are depicted in at the end of the appendix.

Soil Characterization

According to EEP (2006), the site soil series for Reference Wetland 2 is Chowan silt loam (Appendix F - Figure 9). Reference Wetland 2 is very wet, but it does not have a defined stream channel. Therefore, this is reflected in the proposed restoration efforts as no defined stream channel is proposed (EEP, 2006). Soil borings were conducted within Reference Wetland 2. The taxonomic classification for Chowan silt loam is

mixed, active, nonacid, thermic Thapto-Histic Fluvaquents. The following is the typical soil description for Reference Wetland 2.

Soil Name: Chowan Silt Loam		
Soil Horizon	Depth	Description
A	0 to 6 inches	Dark grayish brown (10YR 4/2) silt loam, weak granular structure, very friable, common medium distinct yellowish brown (10YR 5/6) soft iron masses.
Cg	6 to 36 inches	Gray (10YR 5/1) silty clay, friable, slightly sticky, slightly plastic, common medium distinct yellowish brown (10YR 5/6) soft iron masses.
20a	15 to 24 inches	Black (10YR 2/1) sapric material, massive, very friable.

Source: EEP, 2006

Vegetation

According to EEP (2006), the canopy of Reference Wetland 2 was impacted by Hurricane Isabelle. However, all of the plant species are still represented, just present at lower densities. An aerial photograph is presented in Appendix F - Figure 10. Overall, Reference Wetland 2 appeared to be very representative of the Coastal Plain Small Stream Swamp and the Mesic Mixed Hardwood Forest community type (EEP, 2006).

Wetland Area		Wetland Buffer Area	
Community Type – Headwater Forest (Coastal Plain Small Stream Swamp)		Community Type - - Mesic Mixed Hardwood Forest (Coastal Plain Subtype)	
	Canopy (%)		Canopy (%)
<i>Liriodendron tulipifera</i>	21	<i>Fagus grandifolia</i>	20
<i>Liquidambar styraciflua</i>	12	<i>Nyssa biflora</i>	40
<i>Acer rubrum</i>	15	<i>Liriodendron tulipifera</i>	30
<i>Carpinus caroliniana</i>	21	<i>Liquidambar styraciflua</i>	10
<i>Quercus laurifolia</i>	3		
<i>Nyssa aquatica</i>	9		
<i>Nyssa biflora</i>	12		
<i>Fraxinus pennsylvanica</i>	3		
<i>Fraxinus caroliniana</i>	3		
<i>Diospyros virginiana</i>	3		

Source: EEP, 2006

Reference Wetland 3

Reference Wetland 3 is also located approximately eight miles east of Edenton. It is approximately one mile north of Reference Wetland 2 (Appendix F - Figure 8). According to EEP (2006), the drainage area for Reference Wetland 3 was 30 acres and had the appearance of being slightly drier than Reference Wetland 2 with no standing water. Small channels were evident at the lower end of the reference. Average land surface slope along the wetland valley was 1.6%. Assuming flow in the observed channels, a range for valley width of 14 to 47 feet for this reference (EEP, 2006).

Soil Characterization

According to EEP (2006), Soil borings were conducted within Reference Wetland 3. The wetland soils were found to be Roanoke silt loam (Appendix F - Figure 11). The following is the typical soil description for Reference Wetland 3 (EEP, 2006).

Soil Name: Roanoke Silt Loam		
Soil Horizon	Depth	Description
Ap	0 to 3 inches	Grayish brown (10YR 3/2) loam, weak fine granular structure, friable, slightly sticky, slightly plastic, common fine roots.
A	3 to 12 inches	Gray (10YR 6/1) loam, weak fine granular structure, friable, slightly sticky, slightly plastic, few fine roots, common medium prominent yellowish brown (10YR 5/6) soft iron masses.
Btg1	12 to 30 inches	Gray (10YR 6/1) silty clay loam, moderate medium subangular blocky structure, firm, moderately sticky, moderately plastic, few medium roots, common coarse distinct yellowish brown (10YR 5/6) soft iron masses.
Btg2	30 to 42 inches	Dark gray (10YR 3/1) sandy clay, weak medium subangular blocky structure, firm, moderately sticky, moderately plastic, few medium roots.
Cg	42 to 48+ inches	Gray (10YR 6/1) loamy sand, massive, loose.

Source: EEP, 2006

Vegetation

According to EEP (2006), Reference Wetland 3 is a younger forest than the other two reference wetland sites. This appears to have helped save the trees as they were more protected during Hurricane Isabelle. Even though it was younger, it still has an enclosed canopy and no real invasive species problems. An aerial photograph is provided in Appendix F - Figure 12.

Wetland Area		Wetland Buffer Area	
Community Type – Hardwood Flat (Non-Riverine Wet Hardwood Forest)		Community Type - - Mesic Mixed Hardwood Forest (Coastal Plain Subtype)	
	Canopy (%)		Canopy (%)
<i>Liriodendron tulipifera</i>	60	<i>Carya glabra</i>	5
<i>Carya glabra</i>	5	<i>Fagus grandifolia</i>	30
<i>Acer rubrum</i>	25	<i>Liriodendron tulipifera</i>	20
<i>Carpinus caroliniana</i>	80 (subcanopy)	<i>Liquidambar styraciflua</i>	20
<i>Liquidambar styraciflua</i>	5	<i>Ulmus americana</i>	20
<i>Ulmus americana</i>	5	<i>Quercus pagoda</i>	5

Source: EEP, 2006

Reference Wetland 4

Reference Wetland 4 is situated immediately adjacent to the Project Site (Appendix F - Figure 13). Specifically, it is located adjacent to the western boundary and supports a stable Headwater Forest community. Property access was denied by the landowner; however, a visual reconnaissance was completed by walking along the property boundary. This visual reconnaissance along with a detailed map review provided the following information regarding this reference site.

Reference Wetland 4 exhibits an overall drainage area of approximately 60 acres. One small channel was observed with standing water throughout its length. Its immediate watershed is mostly forested surrounded by network of agricultural lands. The vegetation within this area is mature and likely greater than 50 years in age. Its understory is relatively sparse allowing for visual investigations to take place.

Soil Characterization

The following soil information is based exclusively on a literature and map review. As previously mentioned, access to this area was not granted. According to NRCS (2010), Reference Site 4 is underlain primarily by Roanoke silt loam (Appendix F - Figure 14). Dogue fine sandy loam and Dorovan muck also exist, but are situated near the site’s downstream confluence with the Little River. The taxonomic classifications for Roanoke and Dogue soils are presented in Section 6.6. The taxonomic classification for Dorovan muck is dysic, thermic typic haplosaprists (NRCS, 2010).

Soil Name:		Roanoke Silt Loam (Typical Profile)
Soil Horizon	Depth	Description
Ap	0 to 7 inches	dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; strongly acid; abrupt smooth boundary. (5 to 9 inches thick)
Btg1	7 to 12 inches	gray (10YR 5/1) silty clay loam; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine and medium roots; few faint clay films on faces of peds; few medium prominent yellowish brown (10YR 5/8) irregularly shaped masses of iron accumulation; few fine flakes of mica; very strongly acid; clear smooth boundary.
Btg2	12 to 20 inches	gray (10YR 5/1) clay; moderate medium and coarse angular blocky structure; firm, moderately sticky, moderately plastic; few medium and large roots; few faint clay films on faces of peds; few medium prominent brownish yellow (10YR 6/8) irregularly shaped masses of iron accumulation; few fine flakes of mica; very strongly acid; gradual smooth boundary.
Btg3	20 to 40 inches	gray (N 6/0) clay; moderate coarse prismatic structure parting to weak medium subangular blocky; firm, moderately sticky, moderately plastic; few medium and large roots; common medium prominent yellowish brown (10YR 5/4) irregularly shaped masses of iron accumulation; common faint clay films on faces of peds; 2 percent quartz gravel; few fine flakes of mica; very strongly acid; gradual smooth boundary. (Combined thickness of the Btg horizon is 25 to 50 inches.)
BCg	40 to 50 inches	light brownish gray (2.5Y 6/2) silty clay loam with a few pockets of sand; weak fine subangular and angular blocky structure; firm, slightly sticky, slightly plastic; many medium distinct pale yellow (2.5Y 7/4) and many medium prominent yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; 2 percent quartz gravel; common fine flakes of mica; very strongly acid; gradual smooth boundary. (0 to 20 inches thick)
2Cg	50 to 72 inches	gray (5Y 6/1) strata ranging from sand to clay; massive; many gray and green iron depletions and yellow irregularly shaped masses of iron accumulation; some strata contain up to 40 percent quartz gravel; few fine flakes of mica; very strongly acid.

Vegetation

Based on visual investigations of the reference area, a mature forest is present. Storm damage is obvious by the gaps in the canopy, as well as evidence of downed trees. However, this damage does not seem to have adversely effected the current type. An aerial photograph of the area is presented in Appendix F - Figure 15. Vegetative species observed are presented below. Actual percentages and/ or dominance assessments were not conducted since access to the property was restricted.

Wetland Area

Community Type – Headwater Forest
(Coastal Plain Small Stream Swamp)

	Stratum
<i>Liriodendron tulipifera</i>	Canopy
<i>Quercus michauxii</i>	Canopy
<i>Acer rubrum</i>	Canopy
<i>Morella cerifera</i>	Understory
<i>Liquidambar styraciflua</i>	Understory
<i>Magnolia virginiana</i>	Understory
<i>Carpinus caroliniana</i>	Understory

Wetland Buffer Area

Community Type - - Mesic Mixed
Hardwood Forest (Coastal Plain Subtype)

	Stratum
<i>Quercus alba</i>	Canopy
<i>Fagus grandifolia</i>	Canopy
<i>Liriodendron tulipifera</i>	Canopy
<i>Liquidambar styraciflua</i>	Canopy
<i>Ulmus americana</i>	Canopy
<i>Pinus taeda</i>	Canopy
<i>Quercus rubra</i>	Canopy
<i>Prunus serotina</i>	Understory
<i>Ostrya virginiana</i>	Understory
<i>Arundinaria sp.</i>	Understory
<i>Smilax sp.</i>	Understory
<i>Polystichum acrostichoides</i>	Understory

Reference Wetland 5

According to EEP (2005), this wetland area is located approximately three miles northwest of the Watts Site (Appendix F - Figure 16). Specifically, it is east of Red Bank Road (SR 1331) approximately one mile north of its intersection with Woodville Road (SR 1329). This wetland site was identified as riverine. Based on the information available, its underlying soils are mapped as Chowan silt loam (Appendix F - Figure 17). This soil is very poorly drained and present along the floodplains of small streams that flow into the Perquimans River (EEP, 2005).

The canopy is dominated red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*) and American elm (*Ulmus Americana*). According to the document, it was evident that approximately 60 to 80% of the canopy was damaged by the hurricanes that struck the area in 2004. The shrub stratum included Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), greenbrier (*Smilax* spp.), rattan vine (*Berchemia scandens*) and various saplings from the species noted in the tree stratum (EEP, 2005). The document also notes the manipulation of this site has occurred in the past, and the consultant recognized that the reference vegetation lacks diversity (EEP, 2005). An aerial photograph of the reference area is provided in Appendix F - Figure 18 and site photographs are also available in this appendix.

During March 2005, the consultant reportedly installed two gauges within this reference area to collect groundwater data. These gauges were identified as WRR-1 and WRR-2. No data was available for these gauges and it is unsure whether or not these gauges are still in place.

Ecological Engineering presented this information since it was available and associated with prior work at the Project Site. Overall, the existing data was lacking in quantitative information and not utilized as a main background source for the conceptual design.

Reference Wetland 6

In addition to Reference Wetland 5, the consultant also located and assessed a nearby non-riverine wetland reference site. This site, referred to as Reference Wetland 6 is also located east of SR 1331 and approximately three-fourths of a mile west-northwest of its intersection with SR 1329 (Appendix F - Figure 16). According to EEP (2005), the area appears to flood much less frequently than the riverine reference wetland (Reference Wetland 5) and although no areas of standing water were observed, soils were saturated to near the ground

surface. These soils were mapped as Tomotley fine sandy loam, a poorly drained soil with moderate permeability (EEP, 2005).

The canopy was dominated by loblolly pine (*Pinus taeda*) with limited specimens of tulip poplar (*Liriodendron tulipifera*), red maple (*Acer rubrum*) and an unidentified oak (EEP, 2005). The shrub stratum consists of wax myrtle (*Morella cerifera*), sweetgum (*Liquidambar styraciflua*), American holly (*Ilex opaca*), greenbrier (*Smilax* spp.) and saplings of species noted in the canopy. An aerial photograph of this area is depicted on Appendix F - Figure 18 and site photographs are also provided in the appendix.

Ecological Engineering also presented this information since it was available and associated with prior work at the Project Site. Overall, the existing data was lacking in quantitative information and not utilized as a main background source for the conceptual design.

During March 2005, the consultant also reportedly installed two gauges within this reference area to collect groundwater data. These gauges were identified as WRN-1 and WRN-2. No data was available for these gauges and it is unsure whether or not these gauges are still in place.

Reference Wetland 1 Photographs (Source: EEP, 2006)



Photo 1 – Reference Wetland 1. MW 16 in foreground.



Photo 2 – Reference Wetland 1



Photo 3 – Reference Wetland 1



Photo 4 – Reference Wetland 1

Reference Wetland 2 Photographs (Source: EEP, 2006)



Photo 1 – Reference Wetland 2



Photo 2 – Reference Wetland 2



Photo 3 – Reference Wetland 2



Photo 4 – Reference Wetland 2

Reference Wetland 3 Photographs (Source: EEP, 2006)



Photo 1 – Reference Wetland 3. Hanging blue/white tape indicates cross-section 2.



Photo 2 – Reference Wetland 3.



Photo 3 – Reference Wetland 3.

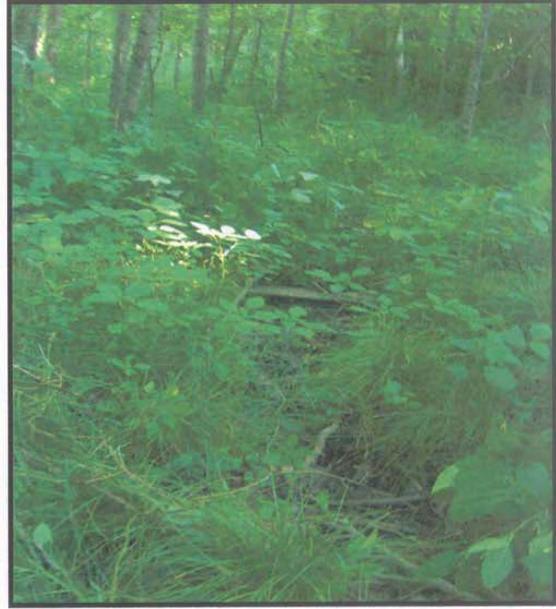


Photo 4 – Reference Wetland 3.



Photo 5 – Reference Wetland 3.



Photo 6 – Reference Wetland 3.



Photo 7 – Reference Wetland 3.



Photo 8 – Reference Wetland 3.

Reference Wetland 4 Photographs



Reference Wetland 4 – Coastal Plain first order stream channel (May 2009)



Reference Wetland 4 – Coastal Plain first order stream channel (May 2009)



Reference Wetland 4 – Coastal Plain first order stream channel (May 2009)



Reference Wetland 4 – Coastal Plain first order stream channel (March 2010)



Reference Wetland 4 – Coastal Plain first order stream channel (March 2010)



Reference Wetland 4 – Coastal Plain first order stream channel (March 2010)



Reference Wetland 4 – Mesic Mixed Hardwood Forest (March 2010)



Reference Wetland 4 – Mesic Mixed Hardwood Forest (March 2010)

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: <u>UT Pembroke Reference Wetland 1</u> Applicant / Owner: <u>EEP</u> Investigator: <u>Brian Smith</u>	Date: <u>4/21/06</u> County: <u>Chowan</u> State: <u>NC</u>
Do normal circumstances exist on the site? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Is the site significantly disturbed (Atypical situation)? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Is the area a potential problem area? Yes <input type="checkbox"/> No <input type="checkbox"/> (explain on reverse if needed)	Community ID: _____ Transect ID: _____ Plot ID: <u>Ref 1 W</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. <u>Nyssa biflora</u>	<u>Tree</u>	<u>FAC</u>	9. _____	_____	_____
2. <u>Quercus laurifolia</u>	<u>Tree</u>	<u>FACU</u>	10. _____	_____	_____
3. <u>Acer rubrum</u>	<u>Tree</u>	<u>FAC</u>	11. _____	_____	_____
4. <u>Liquidambar styraciflua</u>	<u>Tree</u>	<u>FAC+</u>	12. _____	_____	_____
5. <u>Quercus michauxii</u>	<u>Tree</u>	<u>FACW-</u>	13. _____	_____	_____
6. <u>Liriodendron tulipifera</u>	<u>Tree</u>	<u>FAC</u>	14. _____	_____	_____
7. <u>Smilax spp</u>	<u>Vine</u>	<u>FAC</u>	15. _____	_____	_____
8. _____	_____	_____	16. _____	_____	_____

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-. 100%

Remarks:

HYDROLOGY

<p>___ Recorded Data (Describe in Remarks): ___ Stream, Lake, or Tide Gauge ___ Aerial Photographs ___ Other</p> <p><input checked="" type="checkbox"/> No Recorded Data Available</p> <p>Field Observations:</p> <p>Depth of Surface Water: _____ (in.)</p> <p>Depth to Free Water in Pit: <u>6</u> (in.)</p> <p>Depth to Saturated Soil: <u>2</u> (in.)</p>	<p>Wetland Hydrology Indicators</p> <p>Primary Indicators:</p> <p>___ Inundated <input checked="" type="checkbox"/> Saturated in Upper 12" <input checked="" type="checkbox"/> Water Marks ___ Drift Lines ___ Sediment Deposits <input checked="" type="checkbox"/> Drainage Patterns in Wetlands</p> <p>Secondary Indicators:</p> <p>___ Oxidized Roots Channels in Upper 12" <input checked="" type="checkbox"/> Water-Stained Leaves ___ Local Soil Survey Data <input checked="" type="checkbox"/> FAC-Neutral Test ___ Other (Explain in Remarks)</p>
Remarks: <u>Very dry spring</u>	

SOILS

Ref 2 W

Map Unit Name (Series and Phase): Cape Fear 1sam Drainage Class: Very Poorly Drained
 Taxonomy (Subgroup): Typic Umbraqualts Confirm Mapped Type? Yes No

Profile Description:					
Depth (Inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	A	10YR 3/2	10YR 7/2 Sand	less Fair/Prom	L
6-15	E	10YR 5/1	10YR 3/2	Comm/Faint	SL
15-24	B1	10YR 7/1	2.5YR 4/6	comm/Prom	LS
24-32+	B2	10YR 5/1	10YR 5/6	Many/Dist.	SCL

Hydric Soil Indicators:

<input type="checkbox"/> Histosol	<input type="checkbox"/> Concretions
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils
<input checked="" type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Organic Streaking in Sandy Soils
<input type="checkbox"/> Aquic Moisture Regime	<input type="checkbox"/> Listed On Local Hydric Soils List
<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> Listed on National Hydric Soils List
<input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Other (Explain in Remarks)

Remarks: Sulfur dioxide odor

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes No Is the Sampling Point Within a Wetland? Yes No
 Wetland Hydrology Present? Yes No
 Hydric Soils Present? Yes No

Remarks:

Reference Site 1
Upland

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: <u>UT Pembroke Reference Wetland 1</u>	Date: <u>4/21/06</u>
Applicant / Owner: <u>EEP</u>	County: <u>Chowan</u>
Investigator: <u>Brian Smith</u>	State: <u>NC</u>
Do normal circumstances exist on the site? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Community ID: _____
Is the site significantly disturbed (Atypical situation)? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Transect ID: _____
Is the area a potential problem area? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> (explain on reverse if needed)	Plot ID: <u>Ref 2U</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. <u>Pinus taeda</u>	<u>Tree</u>	<u>FAC</u>	9. _____	_____	_____
2. <u>Liriodendron tulipifera</u>	<u>Tree</u>	<u>FAC</u>	10. _____	_____	_____
3. <u>Liquidambar styraciflua</u>	<u>Tree</u>	<u>FAC+</u>	11. _____	_____	_____
4. <u>Quercus alba</u>	<u>Tree</u>	<u>FACU</u>	12. _____	_____	_____
5. <u>Cornus florida</u>	<u>Tree</u>	<u>FACU</u>	13. _____	_____	_____
6. <u>Magnolia grandiflora</u>	<u>Tree</u>	<u>FAC+</u>	14. _____	_____	_____
7. <u>Fraxinus serotina</u>	<u>Tree</u>	<u>FACU</u>	15. _____	_____	_____
8. _____	_____	_____	16. _____	_____	_____

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-. 57%

Remarks:

HYDROLOGY

<p>___ Recorded Data (Describe in Remarks):</p> <p>___ Stream, Lake, or Tide Gauge</p> <p>___ Aerial Photographs</p> <p>___ Other</p> <p><input checked="" type="checkbox"/> No Recorded Data Available</p> <p>Field Observations:</p> <p>Depth of Surface Water: _____ (in.)</p> <p>Depth to Free Water in Pit: <u>> 30</u> (in.)</p> <p>Depth to Saturated Soil: <u>> 30</u> (in.)</p>	<p>Wetland Hydrology Indicators</p> <p>Primary Indicators:</p> <p>___ Inundated</p> <p>___ Saturated in Upper 12"</p> <p>___ Water Marks</p> <p>___ Drift Lines</p> <p>___ Sediment Deposits</p> <p>___ Drainage Patterns in Wetlands</p> <p>Secondary Indicators:</p> <p>___ Oxidized Roots Channels in Upper 12"</p> <p>___ Water-Stained Leaves</p> <p>___ Local Soil Survey Data</p> <p><input checked="" type="checkbox"/> FAC-Neutral Test</p> <p>___ Other (Explain in Remarks)</p>
<p>Remarks: <u>Very dry spring</u></p>	

SOILS

Map Unit Name (Series and Phase): Dogue fine sandy loam Drainage Class: Moderately Well Drained

Taxonomy (Subgroup): Aquic Hapludults Confirm Mapped Type? Yes ___ No

Profile Description:					
Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	A	10YR 3/1			L
3-15	B1	10YR 6/4	10YR 3/1	Few/Dist.	LS
15-22+	B2	10YR 3/2	2.5YR 6/4 10YR 6/4	Many/Prom	LS

Hydric Soil Indicators:

<input type="checkbox"/> Histosol	<input type="checkbox"/> Concretions
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Organic Streaking in Sandy Soils
<input type="checkbox"/> Aquic Moisture Regime	<input type="checkbox"/> Listed On Local Hydric Soils List
<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> Listed on National Hydric Soils List
<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No ___	Is the Sampling Point	
Wetland Hydrology Present?	Yes ___ No <input checked="" type="checkbox"/>	Within a Wetland?	Yes ___ No <input checked="" type="checkbox"/>
Hydric Soils Present?	Yes ___ No <input checked="" type="checkbox"/>		

Remarks:

**DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)**

Project / Site: <u>UT Pembroke Reference Wetland 2</u> Applicant / Owner: <u>EEP</u> Investigator: <u>Brian Smith</u>	Date: <u>4/21/06</u> County: <u>Chowan</u> State: <u>NC</u>
Do normal circumstances exist on the site? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Is the site significantly disturbed (Atypical situation)? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Is the area a potential problem area? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> (explain on reverse if needed)	Community ID: _____ Transect ID: _____ Plot ID: <u>Ref 2W</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. <u>Nyssa biflora</u>	<u>Tree</u>	<u>FAC</u>	9. _____	_____	_____
2. <u>Carpinus caroliniana</u>	<u>Tree</u>	<u>FAC</u>	10. _____	_____	_____
3. <u>Juncus spp</u>	<u>Herb</u>	<u>FACW</u>	11. _____	_____	_____
4. <u>Carex spp</u>	<u>Herb</u>	<u>FACW</u>	12. _____	_____	_____
5. <u>Typha spp</u>	<u>Herb</u>	<u>OBL</u>	13. _____	_____	_____
6. _____	_____	_____	14. _____	_____	_____
7. _____	_____	_____	15. _____	_____	_____
8. _____	_____	_____	16. _____	_____	_____

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). 100%

Remarks: many fallen trees from hurricane Isabelle in 2003

HYDROLOGY

___ Recorded Data (Describe in Remarks): ___ Stream, Lake, or Tide Gauge ___ Aerial Photographs ___ Other <input checked="" type="checkbox"/> No Recorded Data Available Field Observations: Depth of Surface Water: _____ (in.) Depth to Free Water in Pit: _____ (in.) Depth to Saturated Soil: <u>10</u> (in.)	Wetland Hydrology Indicators Primary Indicators: ___ Inundated <input checked="" type="checkbox"/> Saturated in Upper 12" ___ Water Marks ___ Drift Lines ___ Sediment Deposits <input checked="" type="checkbox"/> Drainage Patterns in Wetlands Secondary Indicators: <input checked="" type="checkbox"/> Oxidized Roots Channels in Upper 12" ___ Water-Stained Leaves <input checked="" type="checkbox"/> Local Soil Survey Data <input checked="" type="checkbox"/> FAC-Neutral Test ___ Other (Explain in Remarks)
Remarks: _____	

Soils

Ref 24

Map Unit Name (Series and Phase): Chowan silt loam Drainage Class: Poorly Drained

Taxonomy (Subgroup): Thapto-histic Fluvaquents Confirm Mapped Type? Yes No

Profile Description:					
Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A1	10YR 3/1	-	-	L
4-8	A2	10YR 3/1	2.5YR 6/4	Common/Prom	SCL
8-12	E	10YR 7/1	10YR 5/4	Many/Dist.	S
12-20+	B	10YR 3/1	2.5YR 6/4	Com/Prom	C

Hydric Soil Indicators:

<input type="checkbox"/> Histosol	<input type="checkbox"/> Concretions
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Organic Streaking in Sandy Soils
<input type="checkbox"/> Aquic Moisture Regime	<input type="checkbox"/> Listed On Local Hydric Soils List
<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> Listed on National Hydric Soils List
<input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampling Point Within a Wetland?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Wetland Hydrology Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		
Hydric Soils Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		

Remarks:

**DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)**

Project / Site: <u>WT Pembroke Reference Wetland 2</u>	Date: <u>4/21/06</u>
Applicant / Owner: <u>EEP</u>	County: <u>Chatham</u>
Investigator: <u>Brian Smith</u>	State: <u>NC</u>
Do normal circumstances exist on the site? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Community ID: _____ Transect ID: _____ Plot ID: <u>Ref 2A</u>
Is the site significantly disturbed (Atypical situation)? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Is the area a potential problem area? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> (explain on reverse if needed)	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. <u>Pinus taeda</u>	<u>Tree</u>	<u>FAC</u>	9. _____	_____	_____
2. <u>Fagus grandifolia</u>	<u>Shrub</u>	<u>FACU</u>	10. _____	_____	_____
3. <u>Liriodendron tulipifera</u>	<u>Tree</u>	<u>FAC</u>	11. _____	_____	_____
4. <u>Liquidambar styraciflua</u>	<u>Tree</u>	<u>FAC+</u>	12. _____	_____	_____
5. _____	_____	_____	13. _____	_____	_____
6. _____	_____	_____	14. _____	_____	_____
7. _____	_____	_____	15. _____	_____	_____
8. _____	_____	_____	16. _____	_____	_____

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). 75%

Remarks:

HYDROLOGY

<p>___ Recorded Data (Describe in Remarks): ___ Stream, Lake, or Tide Gauge ___ Aerial Photographs ___ Other</p> <p><input checked="" type="checkbox"/> No Recorded Data Available</p> <p>Field Observations:</p> <p>Depth of Surface Water: _____ (in.)</p> <p>Depth to Free Water in Pit: _____ (in.)</p> <p>Depth to Saturated Soil: <u>7/8</u> (in.)</p>	<p>Wetland Hydrology Indicators</p> <p>Primary Indicators:</p> <p>___ Inundated</p> <p><input checked="" type="checkbox"/> Saturated in Upper 12"</p> <p>___ Water Marks</p> <p>___ Drift Lines</p> <p>___ Sediment Deposits</p> <p>___ Drainage Patterns in Wetlands</p> <p>Secondary Indicators:</p> <p>___ Oxidized Roots Channels in Upper 12"</p> <p>___ Water-Stained Leaves</p> <p>___ Local Soil Survey Data</p> <p><input checked="" type="checkbox"/> FAC-Neutral Test</p> <p>___ Other (Explain in Remarks)</p>
Remarks:	

Soils

AST 201

Map Unit Name (Series and Phase): Dogue fine sandy loam Drainage Class: Moderately Well Drained

Taxonomy (Subgroup): Aquic Hapludults Confirm Mapped Type? Yes ___ No

Profile Description:					
Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	A	10YR 3/1			L
3-15	B1	10YR 6/4	10YR 3/1	Few/Dist.	LS
15-22+	B2	10YR 3/2	2.5YR 6/4 10YR 6/4	Many/Perm	LS

Hydric Soil Indicators:

<input type="checkbox"/> Histosol	<input type="checkbox"/> Concretions
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Organic Streaking in Sandy Soils
<input type="checkbox"/> Aquic Moisture Regime	<input type="checkbox"/> Listed on Local Hydric Soils List
<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> Listed on National Hydric Soils List
<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No ___	Is the Sampling Point	
Wetland Hydrology Present?	Yes ___ No <input checked="" type="checkbox"/>	Within a Wetland?	Yes ___ No <input checked="" type="checkbox"/>
Hydric Soils Present?	Yes ___ No <input checked="" type="checkbox"/>		

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: <u>UT Pembroke Reference Wetland 3</u>	Date: <u>5/30/06</u>
Applicant / Owner: <u>EEP</u>	County: <u>Chatham</u>
Investigator: <u>Brian Smith</u>	State: <u>NC</u>
Do normal circumstances exist on the site? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Community ID: _____ Transect ID: _____ Plot ID: <u>REF 3W</u>
Is the site significantly disturbed (Atypical situation)? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Is the area a potential problem area? (explain on reverse if needed) Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. <u>Acer rubrum</u>	<u>Tree</u>	<u>FAC</u>	9.		
2. <u>Liriodendron tulipifera</u>	<u>Tree</u>	<u>FAC</u>	10.		
3. <u>Carpinus caroliniana</u>	<u>Shrub</u>	<u>FAC</u>	11.		
4. <u>Salix nigra</u>	<u>Shrub</u>	<u>OBL</u>	12.		
5. <u>Sambucus canadensis</u>	<u>Shrub</u>	<u>FAC</u>	13.		
6. <u>Juncus effusus</u>	<u>Herb</u>	<u>FACW</u>	14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC: 100%

Remarks:

HYDROLOGY

<p>Recorded Data (Describe in Remarks): <input type="checkbox"/> Stream, Lake, or Tide Gauge <input type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other</p> <p><input checked="" type="checkbox"/> No Recorded Data Available</p> <p>Field Observations:</p> <p>Depth of Surface Water: _____ (in.)</p> <p>Depth to Free Water in Pipe: _____ (in.)</p> <p>Depth to Saturated Soil: _____ (in.)</p>	<p>Wetland Hydrology Indicators</p> <p>Primary Indicators:</p> <p><input type="checkbox"/> Inundated</p> <p><input type="checkbox"/> Saturated in Upper 12"</p> <p><input type="checkbox"/> Water Marks</p> <p><input type="checkbox"/> Drift Lines</p> <p><input type="checkbox"/> Sediment Deposits</p> <p><input checked="" type="checkbox"/> Drainage Patterns in Wetlands</p> <p>Secondary Indicators:</p> <p><input type="checkbox"/> Oxidized Root Channels in Upper 12"</p> <p><input checked="" type="checkbox"/> Water-Stained Leaves</p> <p><input checked="" type="checkbox"/> Local Soil Survey Data</p> <p><input checked="" type="checkbox"/> FAC Neutral Test</p> <p><input type="checkbox"/> Other (Explain in Remarks)</p>
Remarks:	

SOILS

Map Unit Name (Series and Phase): Roanoke Drainage Class: Poorly Drained
 Taxonomy (Subgroup): thermic Typic Endoaquolls Confirm Mapped Type? Yes No

Profile Descriptions					
Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	Ap	10YR 3/2			L, Gr
3-12	A	10YR 6/1	10YR 5/6	Common Distinct	L, WSBK
12-30	Btg1	10YR 6/1	10YR 5/6	Common Prom.	S, Cl, SBK
30+	Btg2	10YR 3/1			S, Cl, SBK

- Hydric Soil Indicators:
- | | |
|---|---|
| <input type="checkbox"/> Histosol | <input type="checkbox"/> Concretions |
| <input type="checkbox"/> Histic Epipedon | <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils |
| <input type="checkbox"/> Sulfidic Odor | <input type="checkbox"/> Organic Streaking in Sandy Soils |
| <input type="checkbox"/> Aquic Moisture Regime | <input type="checkbox"/> Listed on Local Hydric Soils List |
| <input type="checkbox"/> Reducing Conditions | <input type="checkbox"/> Listed on National Hydric Soils List |
| <input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors | <input type="checkbox"/> Other (Explain in Remarks) |

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes No Is the Sampling Point Within a Wetland? Yes No
 Wetland Hydrology Present? Yes No
 Hydric Soils Present? Yes No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
 (1987 COE Wetlands Determination Manual)

Reference Site 3
 Upland

Project / Site: <u>UT Pembroke Reference Wetland 3</u>	Date: <u>5/30/06</u>
Applicant / Owner: <u>EEP</u>	County: <u>Felton</u>
Investigator: <u>Brian Smith</u>	State: <u>NC</u>
Do normal circumstances exist on the site? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Community ID: _____ Transect ID: _____ Plot ID: <u>Ref 3 U</u>
Is the site significantly disturbed (Atypical situation)? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Is the area a potential problem area? (explain on reverse if needed) Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. <u>Equis grandifolia</u>	<u>tree</u>	<u>FACU</u>	9. _____	_____	_____
2. <u>Liriodendron tulipifera</u>	<u>tree</u>	<u>FAC</u>	10. _____	_____	_____
3. <u>Liquidambar styraciflua</u>	<u>tree</u>	<u>FAC+</u>	11. _____	_____	_____
4. <u>Ulmus americana</u>	<u>tree</u>	<u>FAC</u>	12. _____	_____	_____
5. <u>Carpinus caroliniana</u>	<u>Shrub</u>	<u>FAC</u>	13. _____	_____	_____
6. _____	_____	_____	14. _____	_____	_____
7. _____	_____	_____	15. _____	_____	_____
8. _____	_____	_____	16. _____	_____	_____

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-: 80%

Remarks: _____

HYDROLOGY

Recorded Data (Describe in Remarks): Stream, Lake, or Tide Gauge _____ Aerial Photographs _____ Other _____ <input checked="" type="checkbox"/> No Recorded Data Available	Wetland Hydrology Indicators Primary Indicators: <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12" <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands Secondary Indicators: <input type="checkbox"/> Oxidized Roots Channels in Upper 12" <input type="checkbox"/> Water Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input checked="" type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (Explain in Remarks)
Field Observations: Depth of Surface Water: _____ (in.) Depth to Free Water in Pit: _____ (in.) Depth to Saturated Soil: _____ (in.)	

Remarks: _____

SOILS

Map Unit Name (Series and Phase): Roanoke Drainage Class: Poorly Drained
 Taxonomy (Subgroup): thermic Typic Endosqualls Confirm Mapped Type? Yes No

Depth (meters)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, concretions, Structure, etc.
0-7	A	10YR 3/2			SL GR
7-18	Bt1	10YR 5/3			SL WSBK
18+	Bt2	10YR 5/3			SCL SBK

- Hydric Soil Indicators:
- | | |
|--|---|
| <input type="checkbox"/> Histosol | <input type="checkbox"/> Concretions |
| <input type="checkbox"/> Histic Epipedon | <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils |
| <input type="checkbox"/> Sulfidic Odor | <input type="checkbox"/> Organic Streaking in Sandy Soils |
| <input type="checkbox"/> Aquic Moisture Regime | <input type="checkbox"/> Listed on Local Hydric Soils List |
| <input type="checkbox"/> Reducing Conditions | <input type="checkbox"/> Listed on National Hydric Soils List |
| <input type="checkbox"/> Gleyed or Low-Chroma Colors | <input type="checkbox"/> Other (Explain in Remarks) |

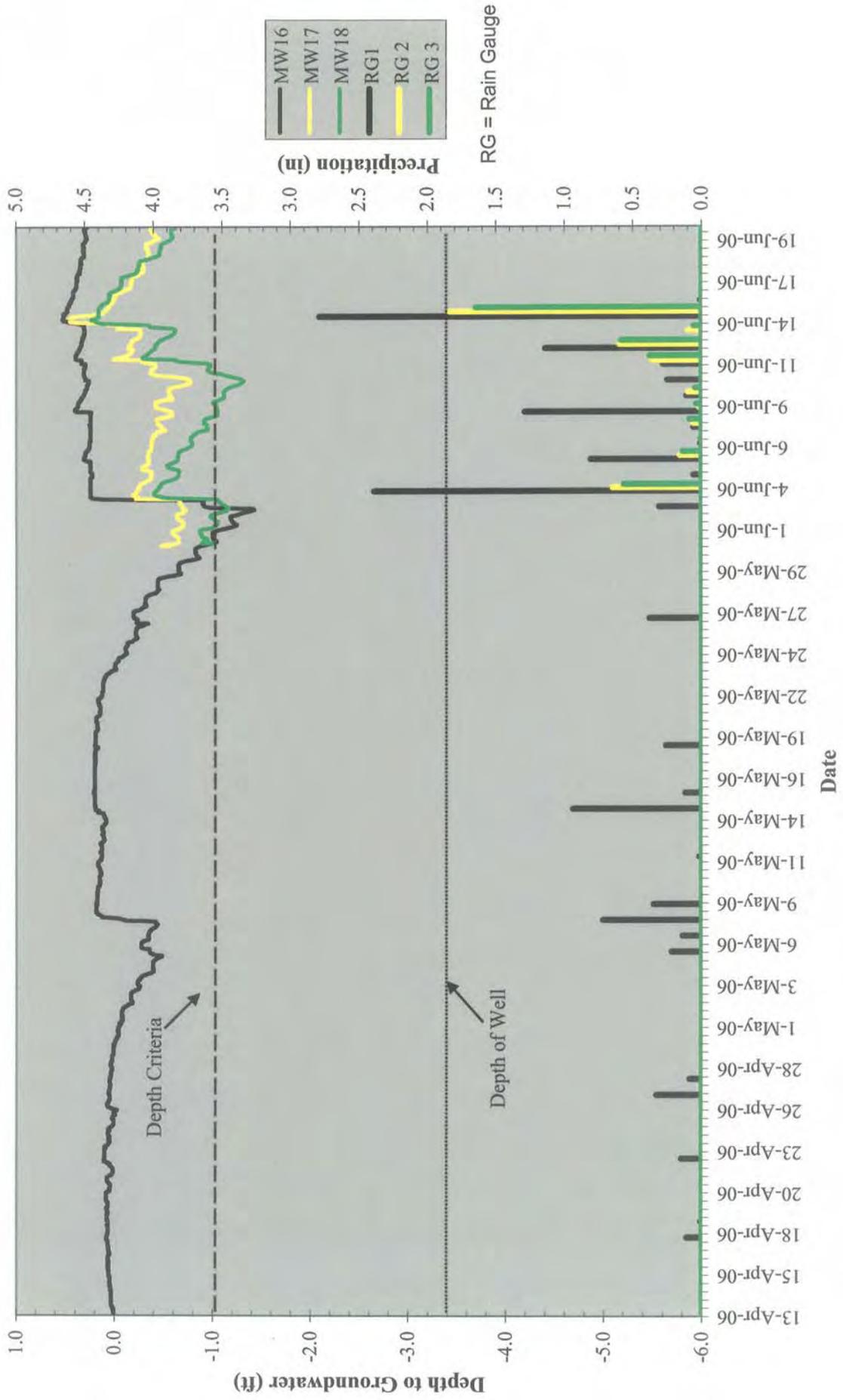
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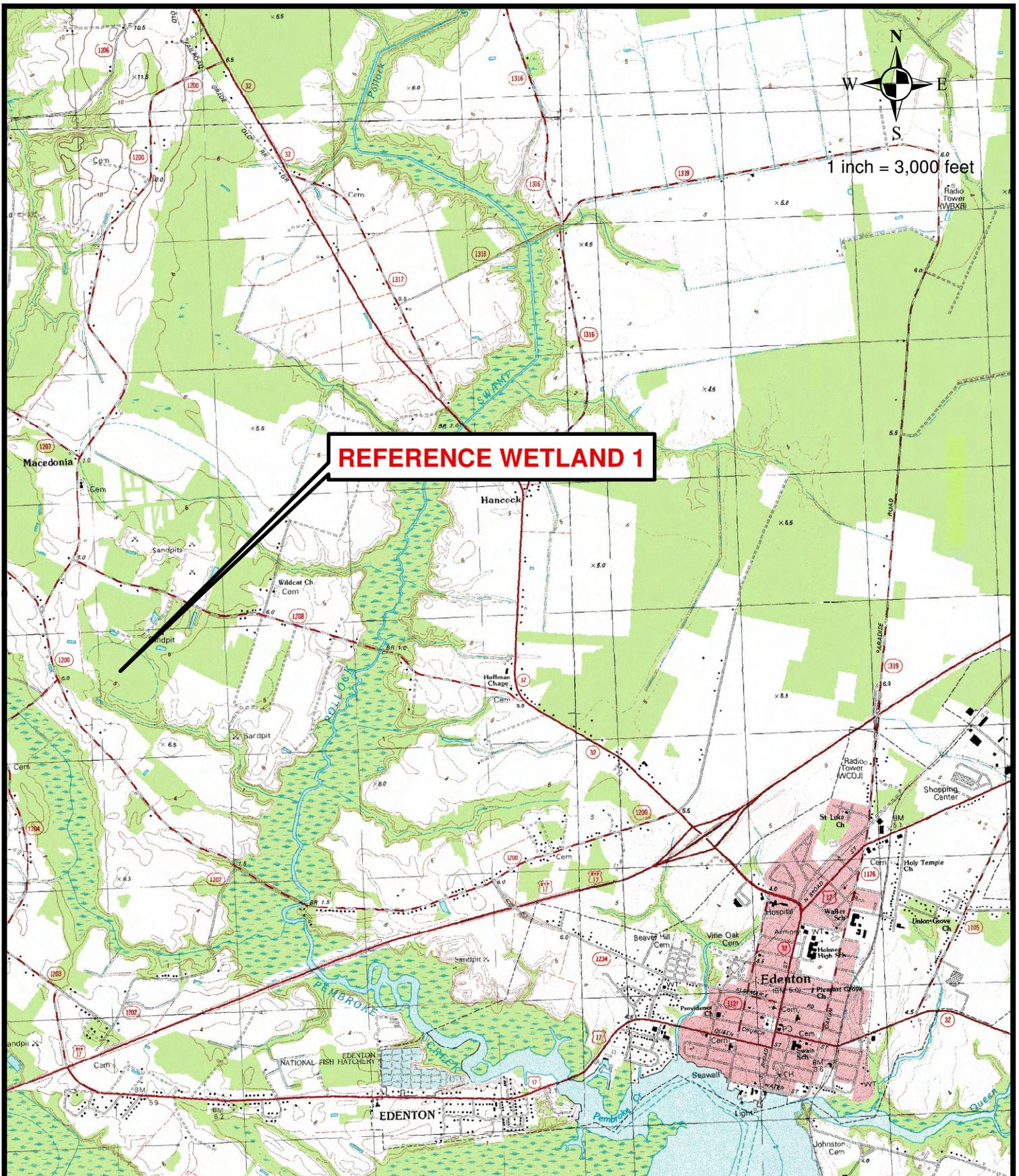
WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes No Is the Sampling Point Within a Wetland? Yes No
 Wetland Hydrology Present? Yes No
 Hydric Soils Present? Yes No

Remarks:

Reference Sites Groundwater Elevations and Rainfall Data





REFERENCE WETLAND 1

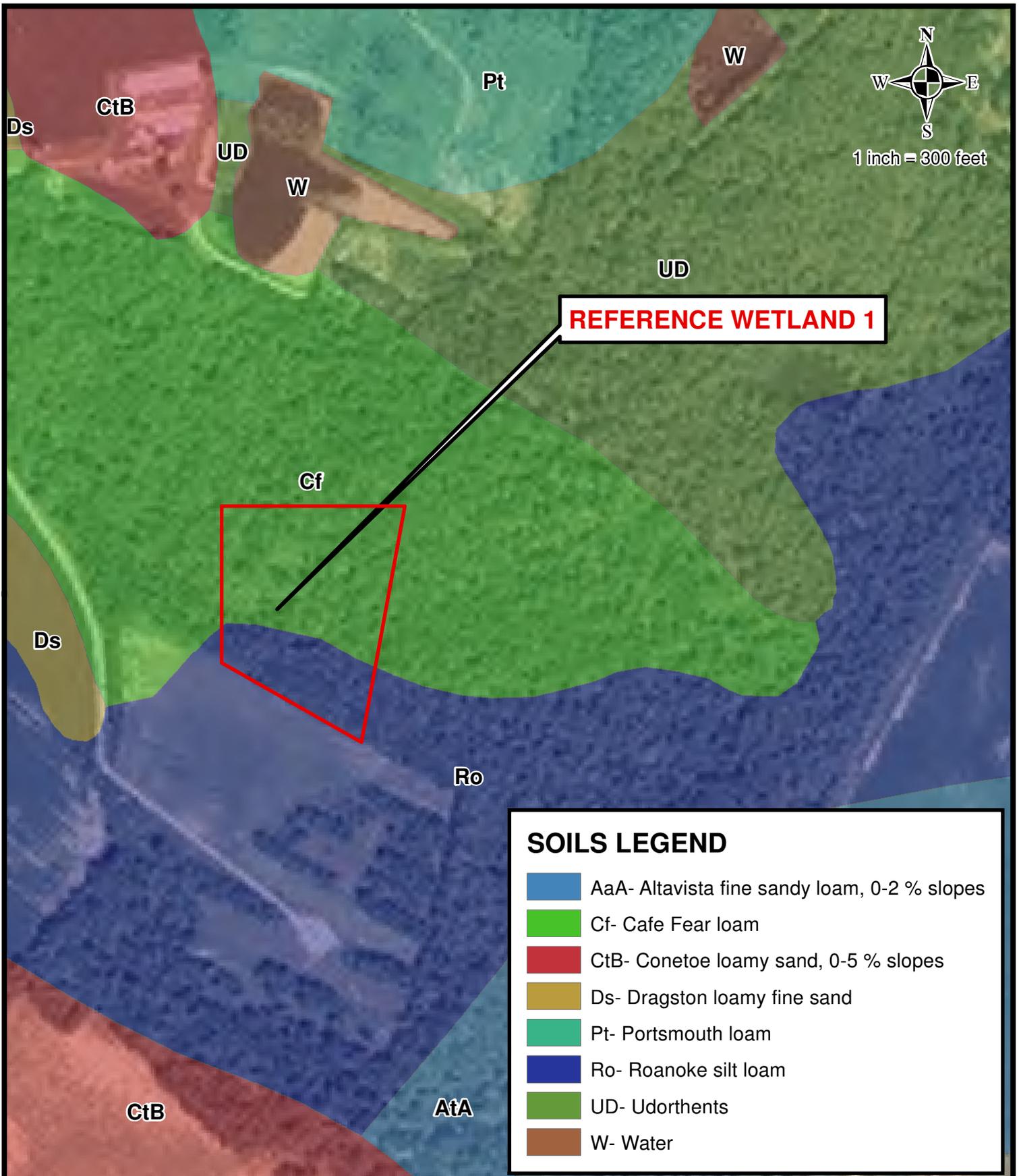
Prepared By: ECOLOGICAL ENGINEERING, LLP
 128 Raleigh Street
 Holly Springs, NC 27540
 (919) 557-0929

Prepared For: NCEP
 2728 Capital Boulevard
 Suite 1H 103
 Raleigh, NC 27604



REFERENCE WETLAND 1
VICINITY MAP
 Watts Property
 Perquimans County, NC
 EEP Contract No. D090595
 February 21, 2011
 Source: NCDOT and NC Atlas & Gazetteer
 USGS Topographic Map- EDENHOUSE

FIGURE
5



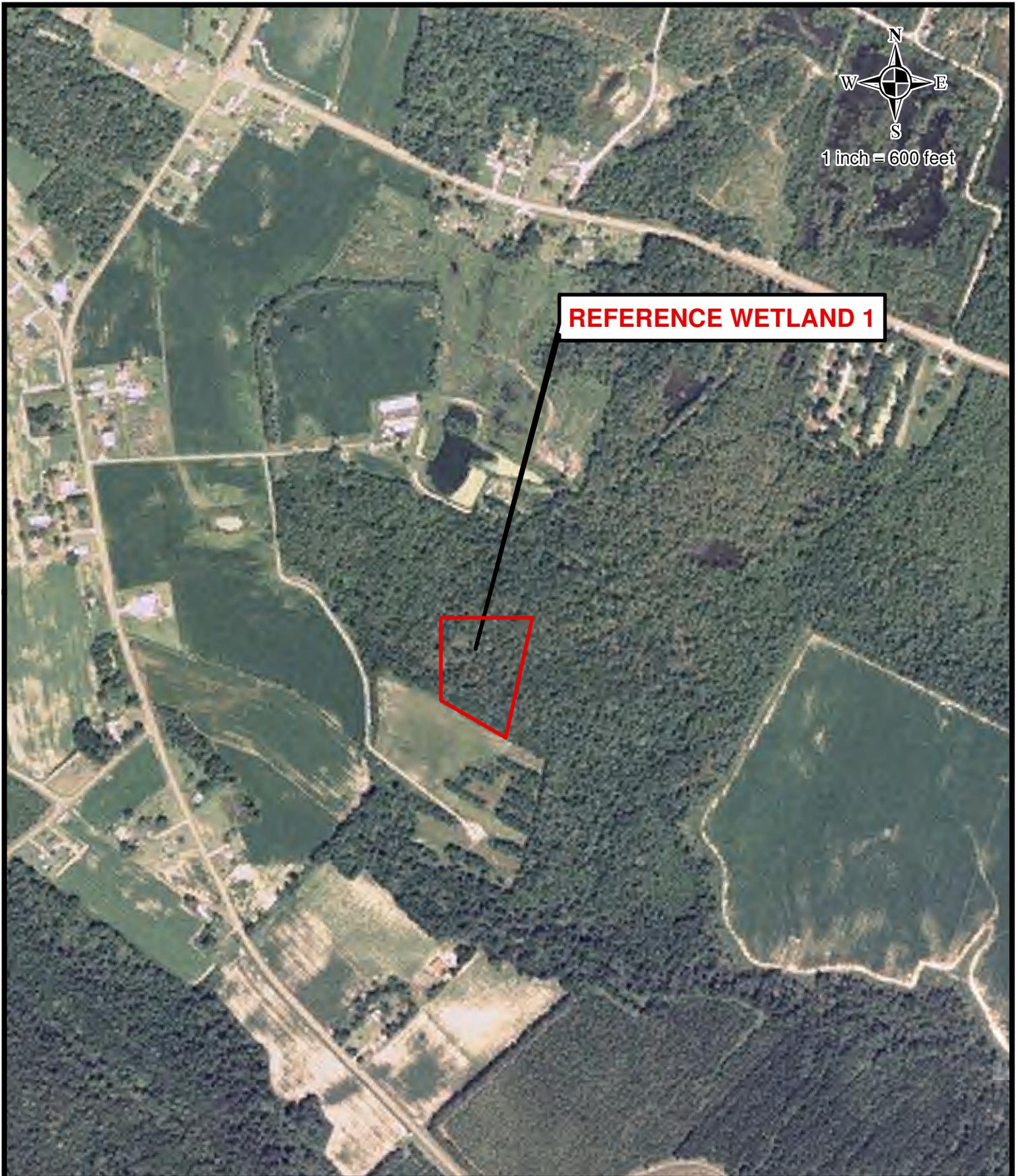
Prepared By: ECOLOGICAL ENGINEERING, LLP
 128 Raleigh Street
 Holly Springs, NC 27540
 (919) 557-0929

Prepared For: NCEP
 2728 Capital Boulevard
 Suite 1H 103
 Raleigh, NC 27604



REFERENCE WETLAND 1
NRCS SOILS MAP
 Watts Property
 Perquimans County, NC
 EEP Contract No. D090595
 November 9, 2010
 Source: NCDOT and NC Atlas & Gazetteer

FIGURE
6



Prepared By: ECOLOGICAL ENGINEERING, LLP
128 Raleigh Street
Holly Springs, NC 27540
(919) 557-0929

Prepared For: NCEP
2728 Capital Boulevard
Suite 1H 103
Raleigh, NC 27604



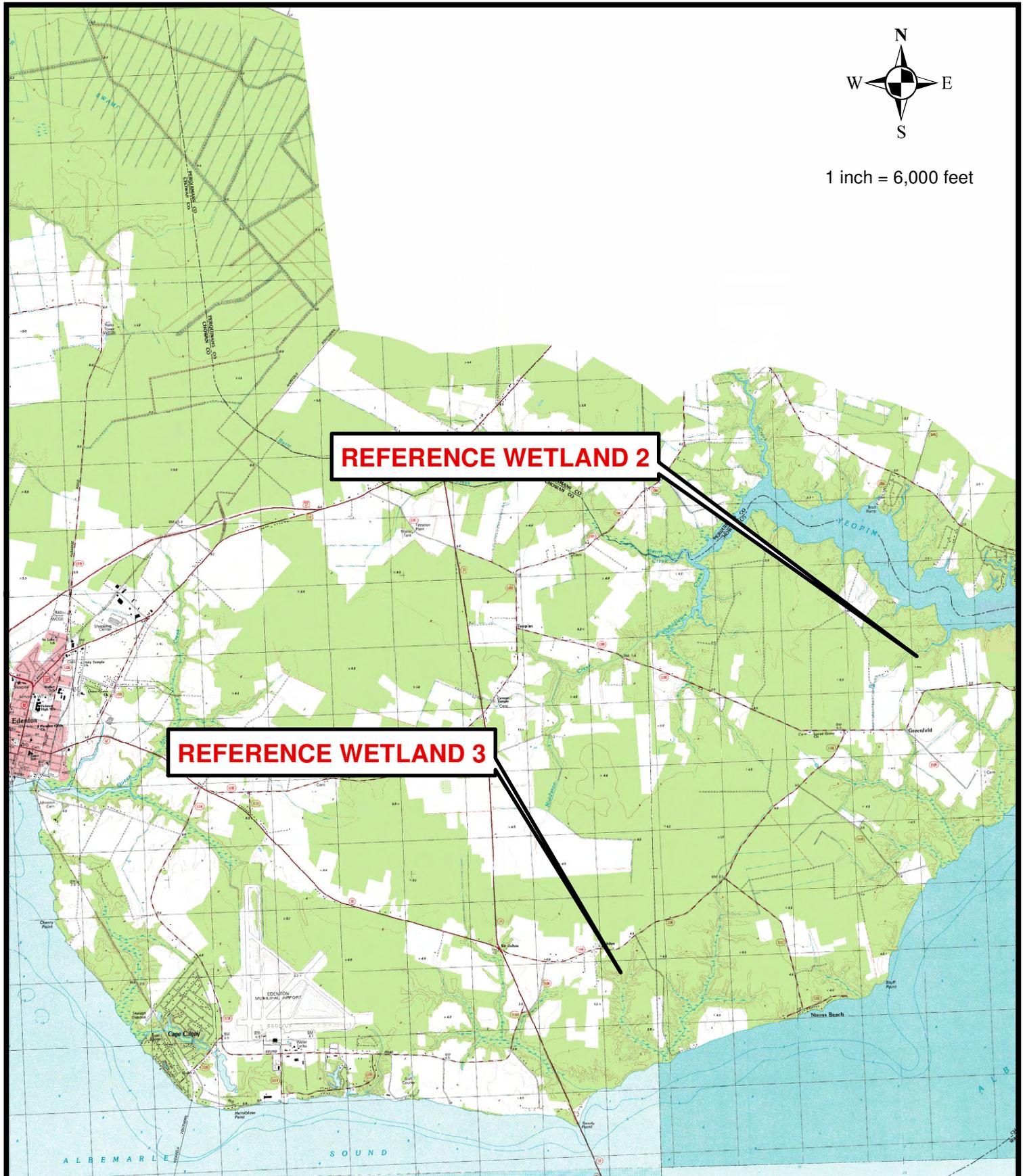
REFERENCE WETLAND 1
AERIAL PHOTOGRAPH
Watts Property
Perquimans County, NC
EEP Contract No. D090595
November 9, 2010

Source: NCDOT and www.gisdatadepot.com

FIGURE
7



1 inch = 6,000 feet



REFERENCE WETLAND 2

REFERENCE WETLAND 3

Prepared By: ECOLOGICAL ENGINEERING, LLP
128 Raleigh Street
Holly Springs, NC 27540
(919) 557-0929

Prepared For: NCEP
2728 Capital Boulevard
Suite 1H 103
Raleigh, NC 27604



REFERENCE WETLANDS 2 AND 3

VICINITY MAP

Watts Property

Perquimans County, NC

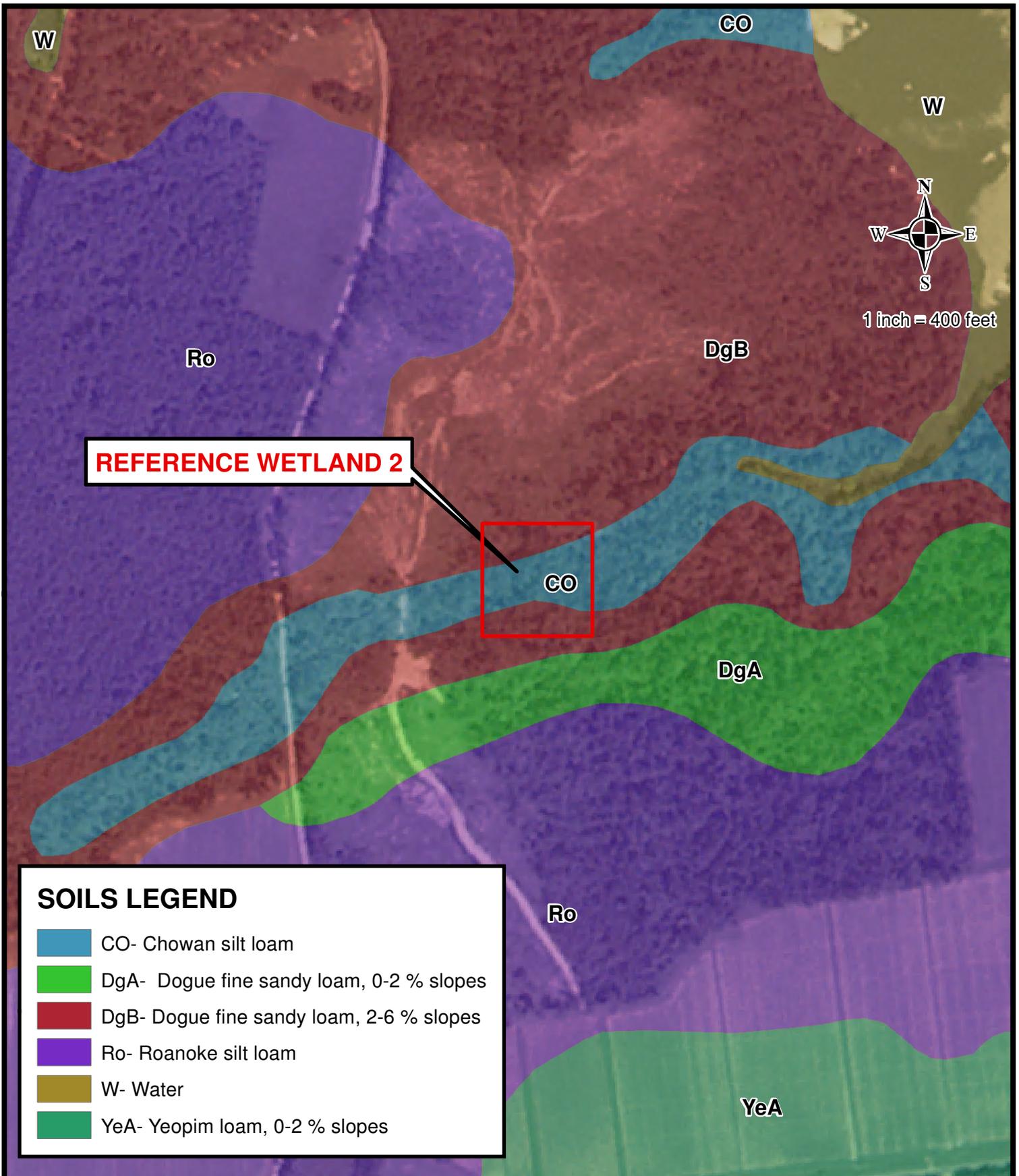
EEP Contract No. D090595

February 21, 2011

Source: NCDOT and NC Atlas & Gazetteer
USGS Topographic Map- YEOPIM RIVER

FIGURE

8



SOILS LEGEND

- CO- Chowan silt loam
- DgA- Dogue fine sandy loam, 0-2 % slopes
- DgB- Dogue fine sandy loam, 2-6 % slopes
- Ro- Roanoke silt loam
- W- Water
- YeA- Yeopim loam, 0-2 % slopes

Prepared By: ECOLOGICAL ENGINEERING, LLP
 128 Raleigh Street
 Holly Springs, NC 27540
 (919) 557-0929

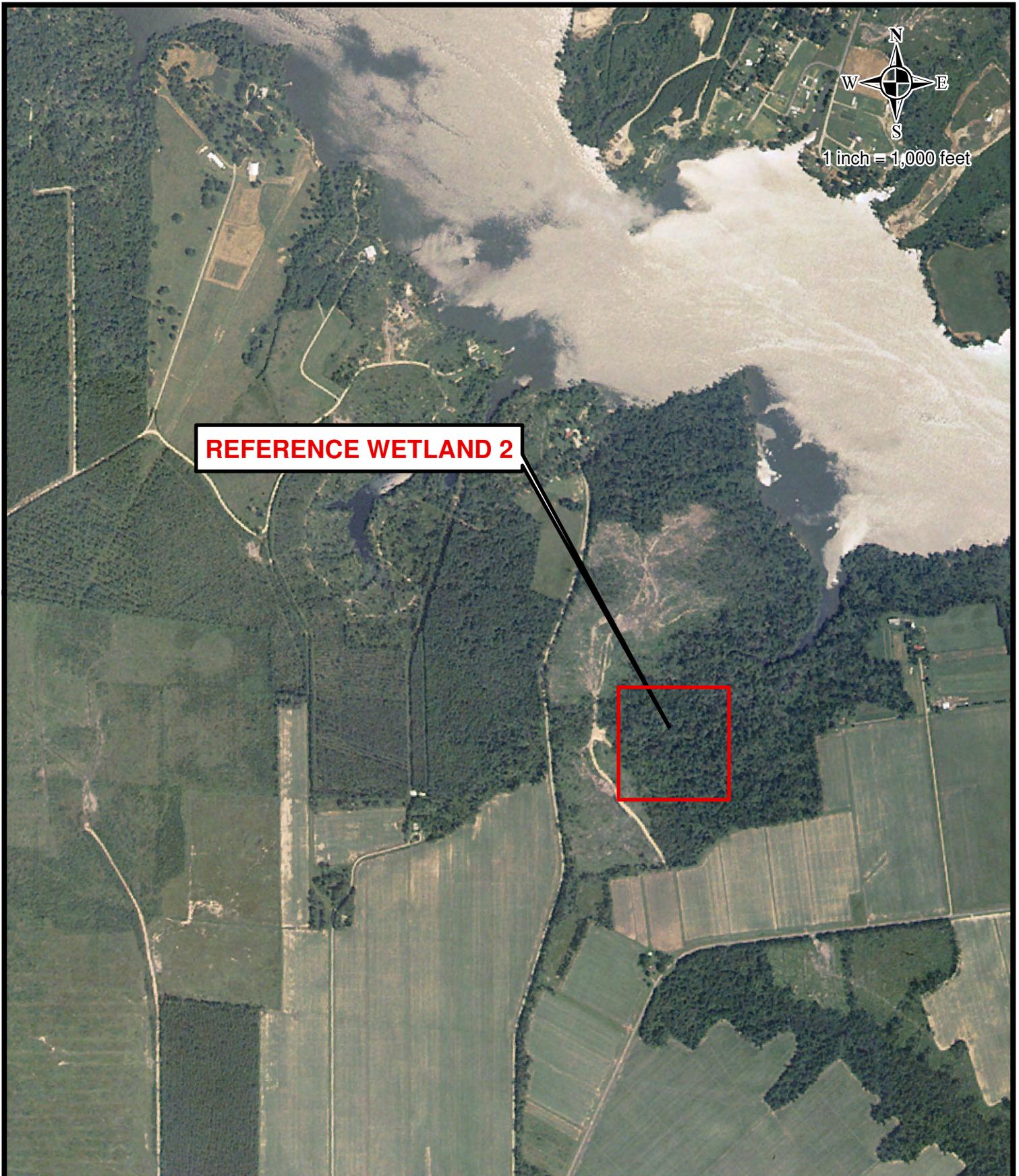
Prepared For: NCEP
 2728 Capital Boulevard
 Suite 1H 103
 Raleigh, NC 27604



REFERENCE WETLAND 2
NRCS SOILS MAP
 Watts Property
 Perquimans County, NC
 EEP Contract No. D090595
 November 9, 2010

Source: NRCS Soil Data Mart and www.gisdatadepot.com

FIGURE
9



REFERENCE WETLAND 2

N
W E
S
1 inch = 1,000 feet

Prepared By: ECOLOGICAL ENGINEERING, LLP
128 Raleigh Street
Holly Springs, NC 27540
(919) 557-0929

Prepared For: NCEP
2728 Capital Boulevard
Suite 1H 103
Raleigh, NC 27604



**REFERENCE WETLAND 2
AERIAL PHOTOGRAPH**
Watts Property

Perquimans County, NC
EEP Contract No. D090595
November 9, 2010
Source: NCDOT and www.gisdatadepot.com

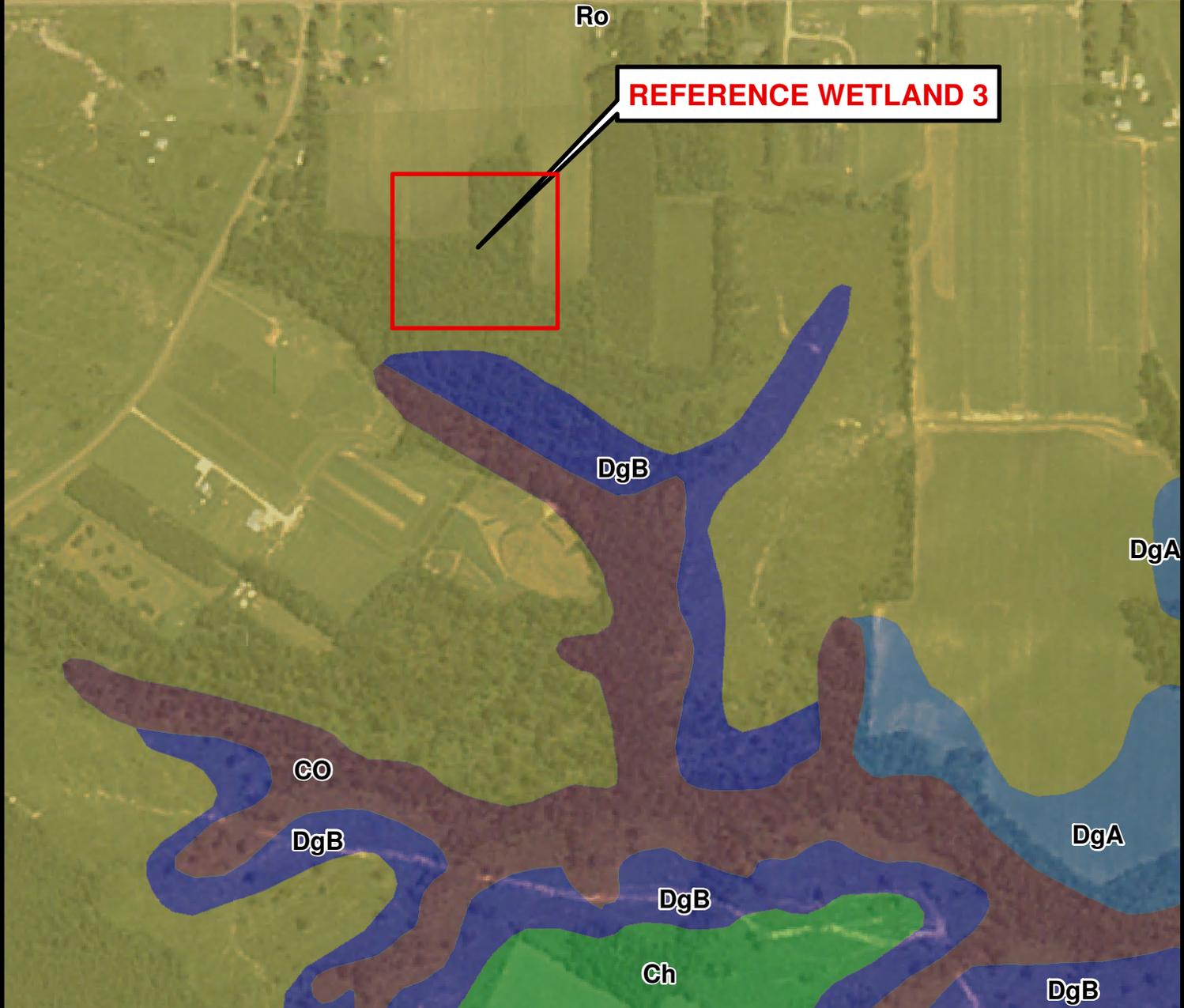
**FIGURE
10**



1 inch = 500 feet

SOILS LEGEND

- CO- Chowan silt loam
- Ch- Chapanoke silt loam
- DgA- Dogue fine sandy loam, 0-2 % slopes
- DgB- Dogue fine sandy loam, 2-6 % slopes
- Ro- Roanoke silt loam



Prepared By: ECOLOGICAL ENGINEERING, LLP
128 Raleigh Street
Holly Springs, NC 27540
(919) 557-0929

Prepared For: NCEP
2728 Capital Boulevard
Suite 1H 103
Raleigh, NC 27604

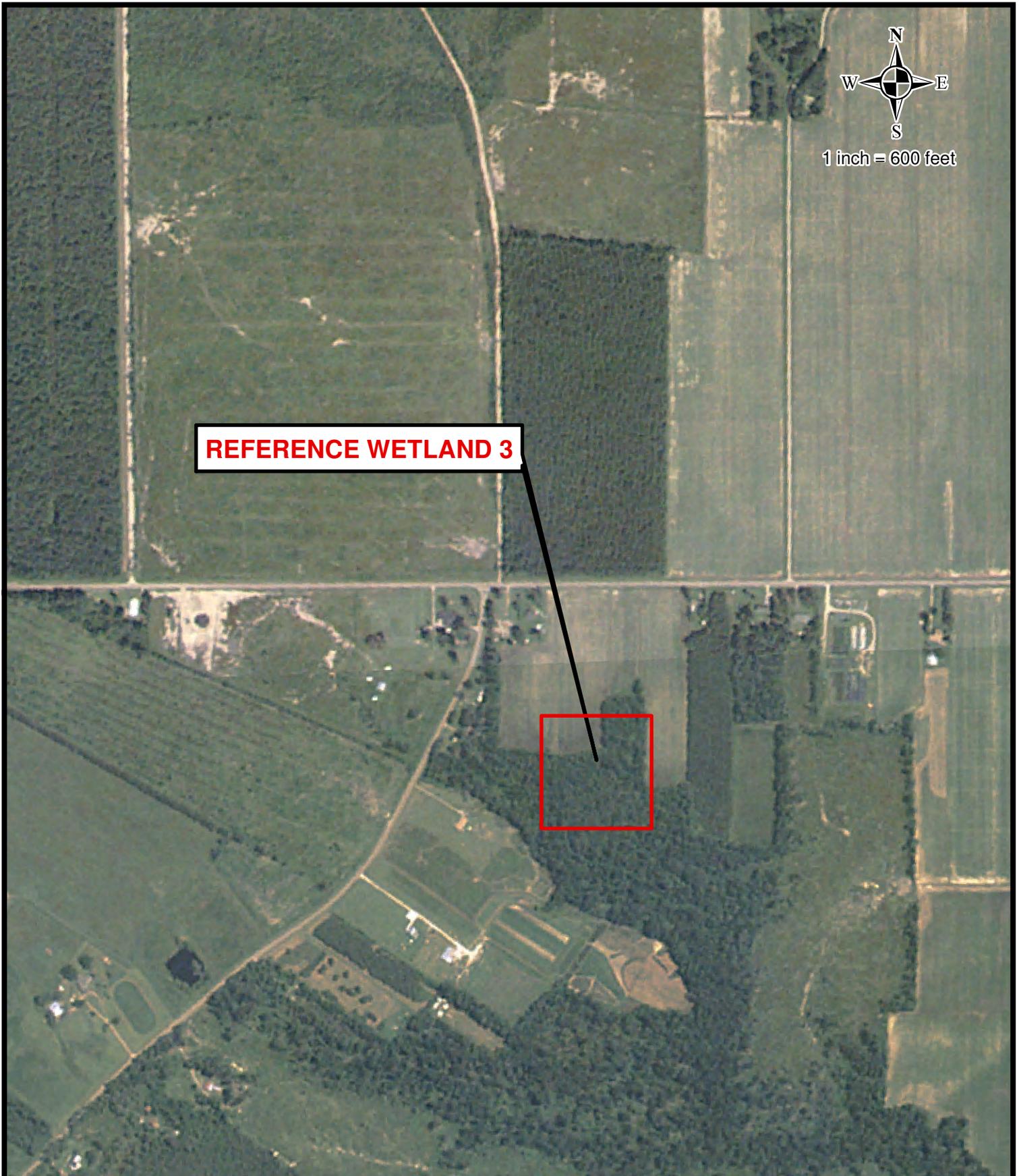


REFERENCE WETLAND 3 NRCS SOILS MAP Watts Property

Perquimans County, NC
EEP Contract No. D090595
November 9, 2010

Source: NRCS Soil Data Mart and www.gisdatadepot.com

**FIGURE
11**



1 inch = 600 feet

REFERENCE WETLAND 3



Prepared By: ECOLOGICAL ENGINEERING, LLP
128 Raleigh Street
Holly Springs, NC 27540
(919) 557-0929

Prepared For: NCEP
2728 Capital Boulevard
Suite 1H 103
Raleigh, NC 27604

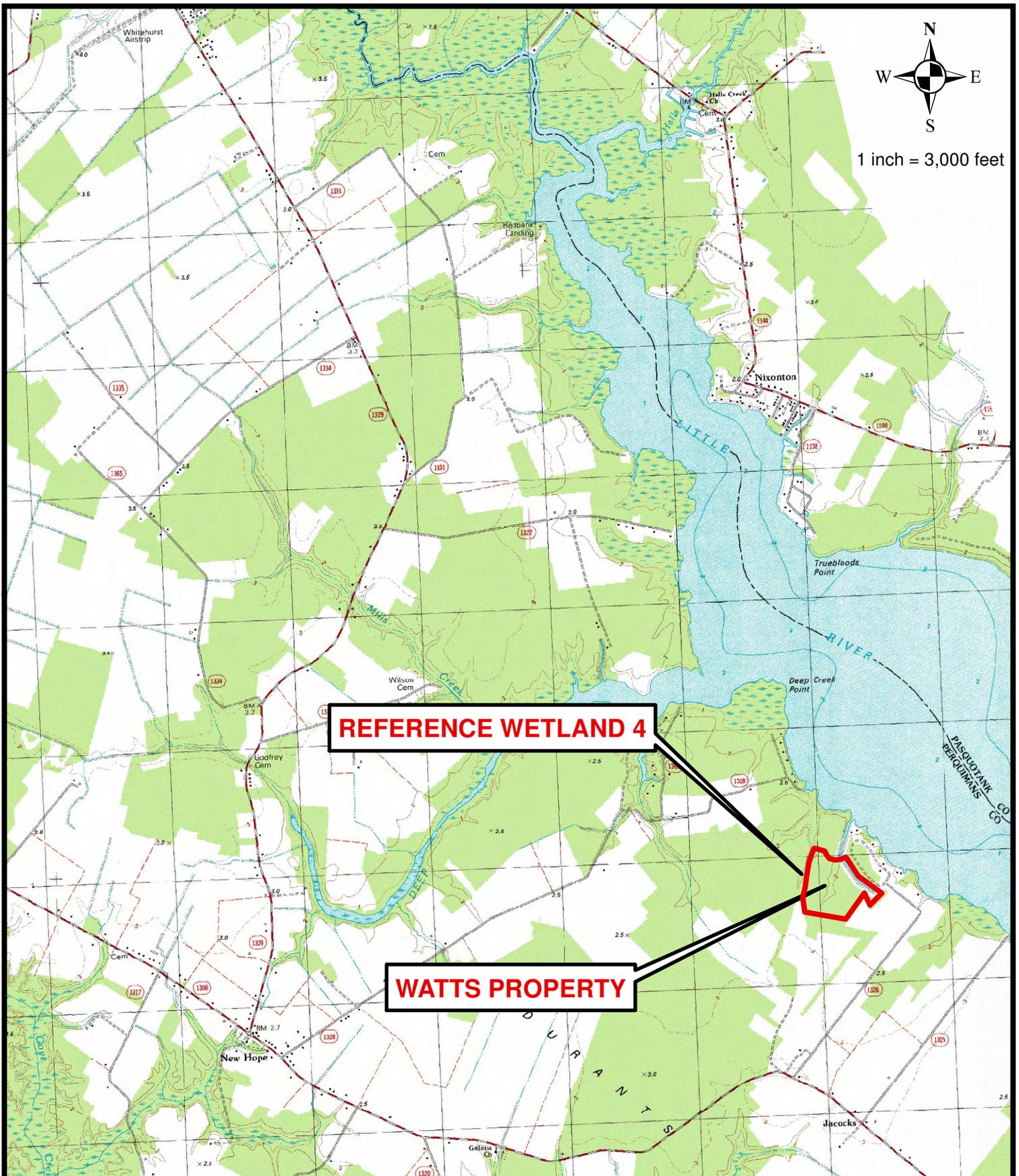


**REFERENCE WETLAND 3
AERIAL PHOTOGRAPH**

Watts Property
Perquimans County, NC
EEP Contract No. D090595
November 9, 2010

Source: NCDOT and www.gisdatadepot.com

**FIGURE
12**



N
W E
S
1 inch = 3,000 feet

REFERENCE WETLAND 4

WATTS PROPERTY

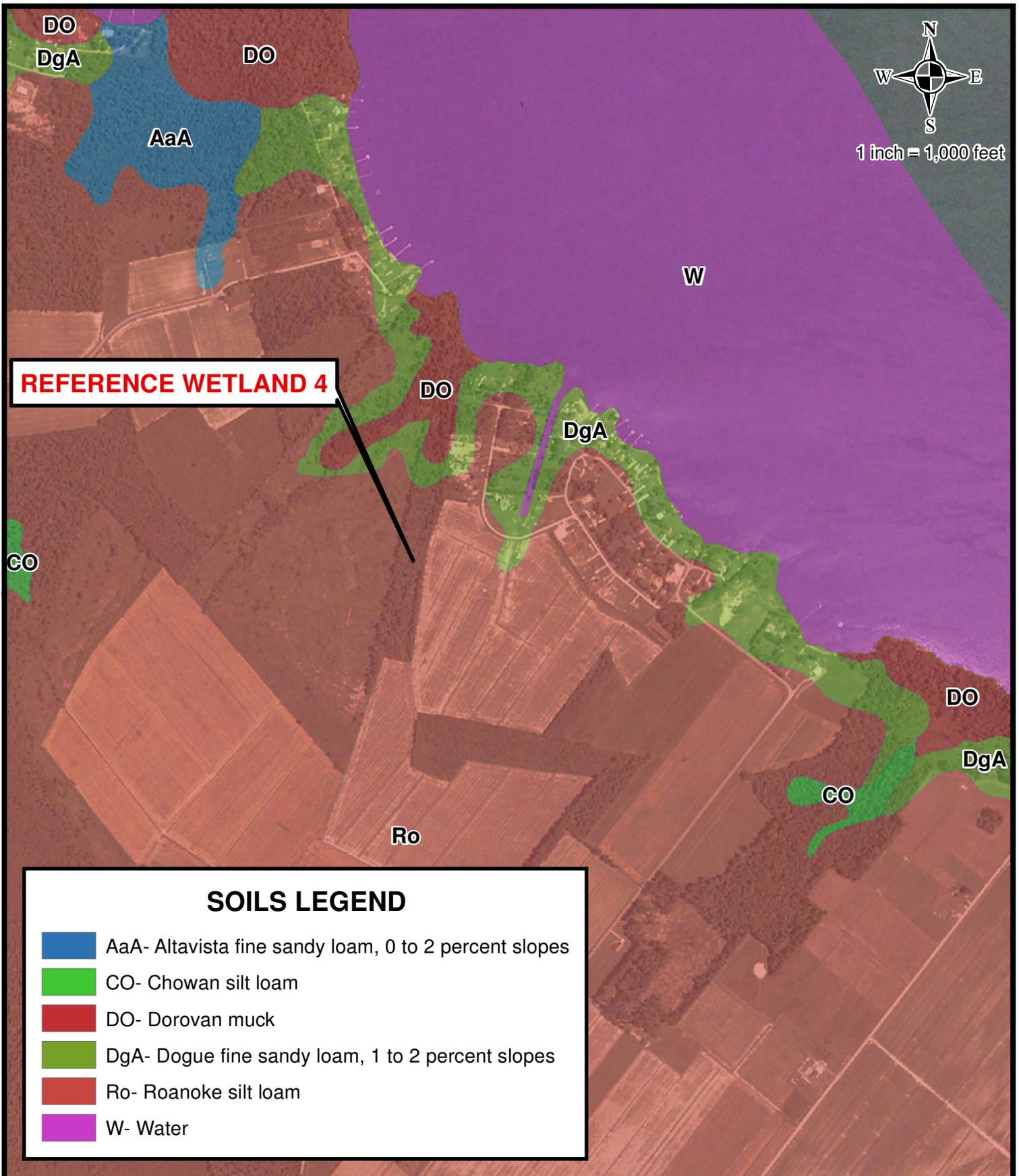
Prepared By: ECOLOGICAL ENGINEERING, LLP
 128 Raleigh Street
 Holly Springs, NC 27540
 (919) 557-0929

Prepared For: NCEP
 2728 Capital Boulevard
 Suite 1H 103
 Raleigh, NC 27604



**REFERENCE WETLAND 4
 VICINITY MAP
 Watts Property
 Perquimans County, NC
 EEP Contract No. D090595
 February 21, 2011
 Source: NCDOT and NC Atlas & Gazetteer
 USGS Topographic map- NIXONTON**

**FIGURE
 13**



REFERENCE WETLAND 4

SOILS LEGEND

- AaA- Altavista fine sandy loam, 0 to 2 percent slopes
- CO- Chowan silt loam
- DO- Dorovan muck
- DgA- Dogue fine sandy loam, 1 to 2 percent slopes
- Ro- Roanoke silt loam
- W- Water

<p>Prepared By: ECOLOGICAL ENGINEERING, LLP 128 Raleigh Street Holly Springs, NC 27540 (919) 557-0929</p>	<p>REFERENCE WETLAND 4 NRCS SOILS MAP Watts Property Perquimans County, NC EEP Contract No. D090595 November 1, 2010 Source: NRCS Soil Data Mart</p>	<p>FIGURE 14</p>
<p>Prepared For: NCEP 2728 Capital Boulevard Suite 1H 103 Raleigh, NC 27604</p>		



1 inch = 600 feet

REFERENCE WETLAND 4



Prepared By: ECOLOGICAL ENGINEERING, LLP
128 Raleigh Street
Holly Springs, NC 27540
(919) 557-0929

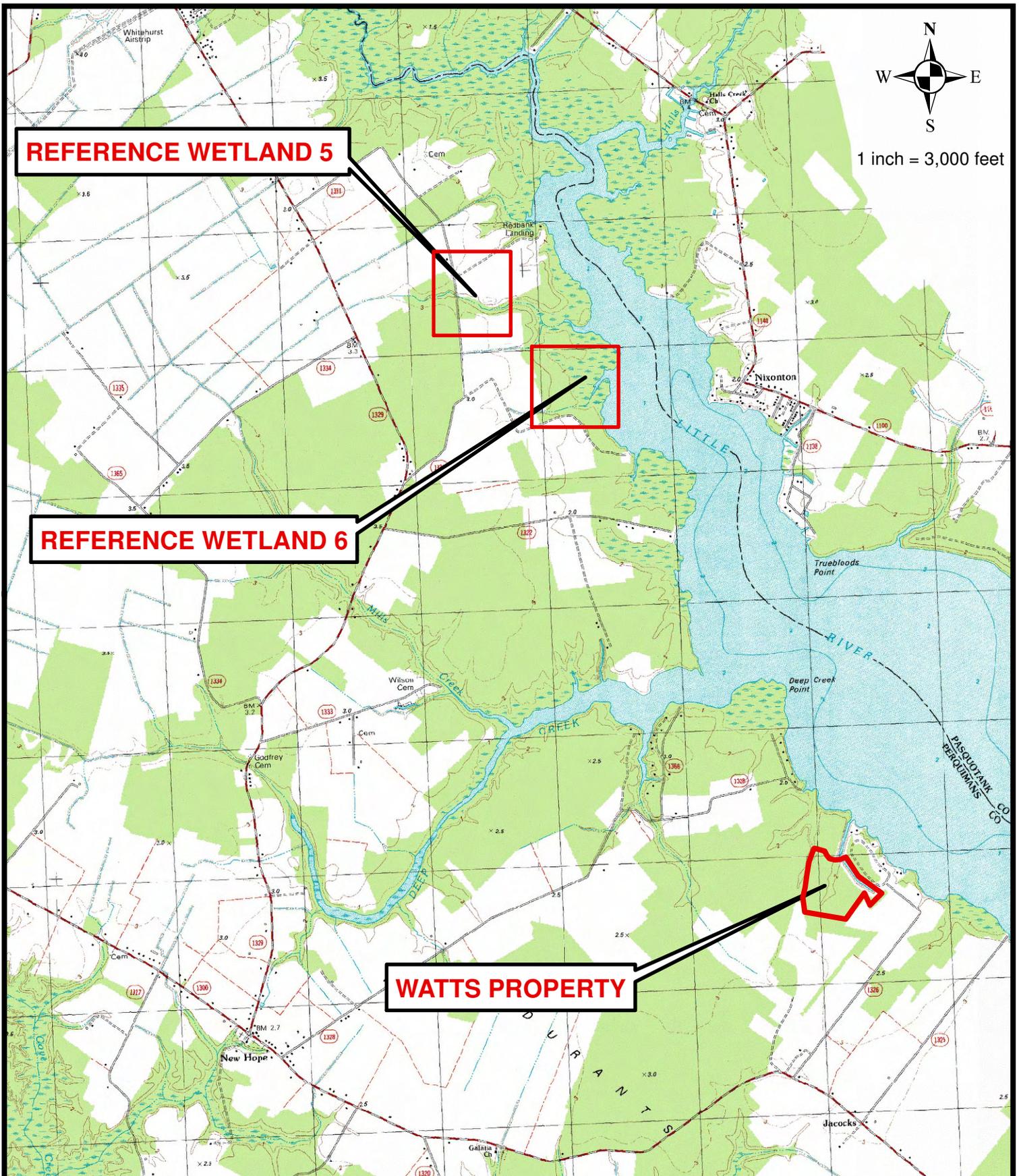
Prepared For: NCEP
2728 Capital Boulevard
Suite 1H 103
Raleigh, NC 27604



REFERENCE WETLAND 4
AERIAL PHOTOGRAPH
Watts Property

Perquimans County, NC
EEP Contract No. D090595
September 3, 2010
Source: www.gisdatadepot.com

FIGURE
15



REFERENCE WETLAND 5

REFERENCE WETLAND 6

WATTS PROPERTY

N
W E
S
1 inch = 3,000 feet

Prepared By: ECOLOGICAL ENGINEERING, LLP
128 Raleigh Street
Holly Springs, NC 27540
(919) 557-0929

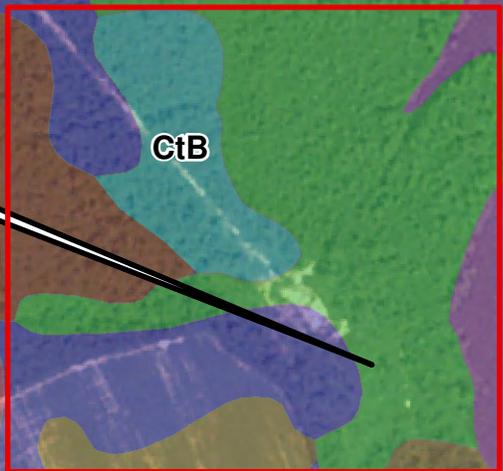
Prepared For: NCEP
2728 Capital Boulevard
Suite 1H 103
Raleigh, NC 27604



**REFERENCE WETLANDS 5 AND 6
VICINITY MAP
Watts Property
Perquimans County, NC
EEP Contract No. D090595
February 21, 2011**
Source: NCDOT and NC Atlas & Gazetteer
USGS Topographic Map- NIXONTON

**FIGURE
16**

REFERENCE WETLAND 5



REFERENCE WETLAND 5

SOILS LEGEND

-  AaA- Altavista fine sandy loam, 0 to 2 percent slopes
-  At- Augusta fine sandy loam
-  CtB- Conetoe loamy sand, 0-5 % percent slopes
-  DO- Dorovan muck
-  Ro- Roanoke silt loam
-  Se- Seabrook fine sand
-  StB- State loamy fine sand, 2-6 % slopes
-  To- Tomotley fine sandy loam
-  W- Water

Prepared By: ECOLOGICAL ENGINEERING, LLP
 128 Raleigh Street
 Holly Springs, NC 27540
 (919) 557-0929

Prepared For: NCEP
 2728 Capital Boulevard
 Suite 1H 103
 Raleigh, NC 27604



REFERENCE WETLANDS 5 AND 6

NRCS SOILS MAP

Watts Property

Perquimans County, NC

EEP Contract No. D090595

November 1, 2010

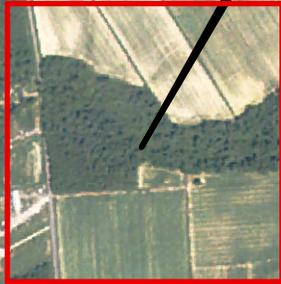
Source: NRCS Soil Data Mart

FIGURE
 17



1 inch = 1,000 feet

REFERENCE WETLAND 5



REFERENCE WETLAND 6

Prepared By: ECOLOGICAL ENGINEERING, LLP
128 Raleigh Street
Holly Springs, NC 27540
(919) 557-0929

Prepared For: NCEP
2728 Capital Boulevard
Suite 1H 103
Raleigh, NC 27604

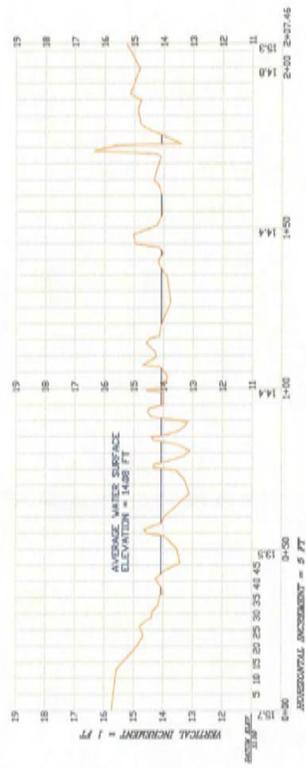


**REFERENCE WETLANDS 5 AND 6
AERIAL PHOTOGRAPH**

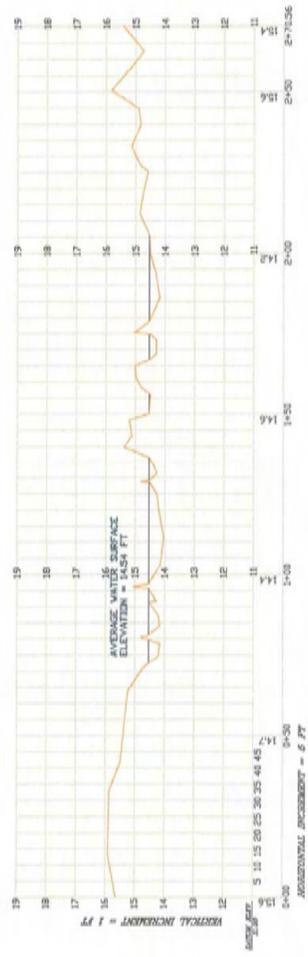
Watts Property
Perquimans County, NC
EEP Contract No. D090595
September 3, 2010
Source: www.gisdatadepot.com

**FIGURE
18**

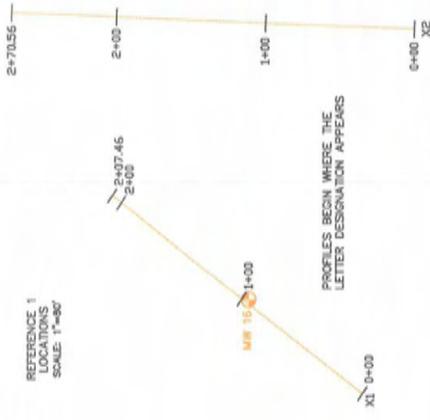
Reference Wetland 1 Cross Sections (Source: EEP, 2006)



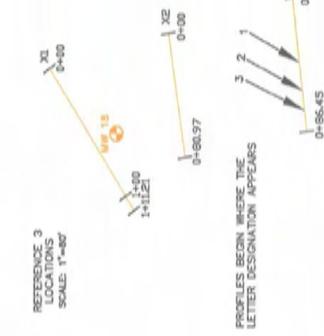
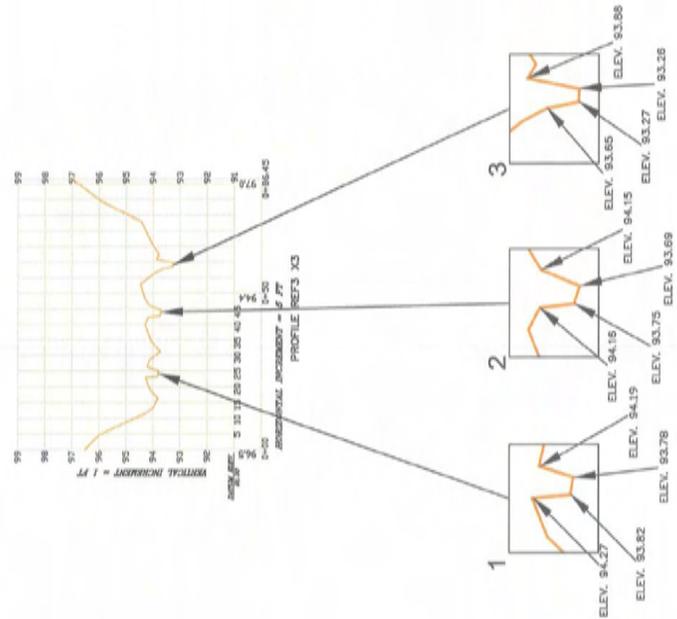
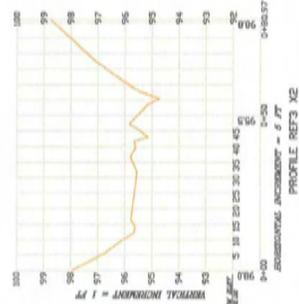
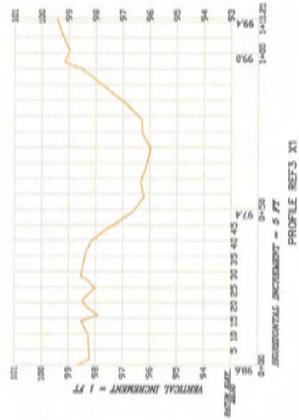
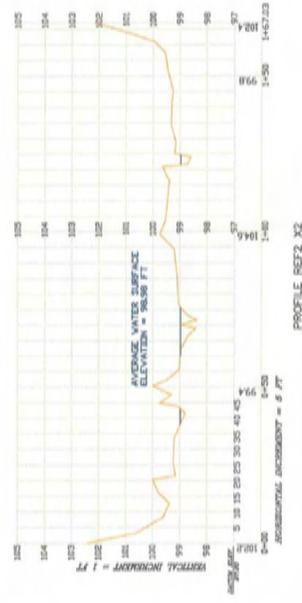
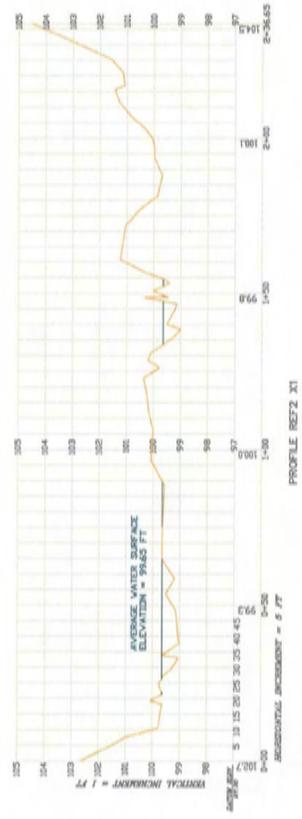
PROFILE REF 1 XI



PROFILE REF 2 XII



Reference Wetland 2 and 3 Cross Sections (Source: EEP, 2006)

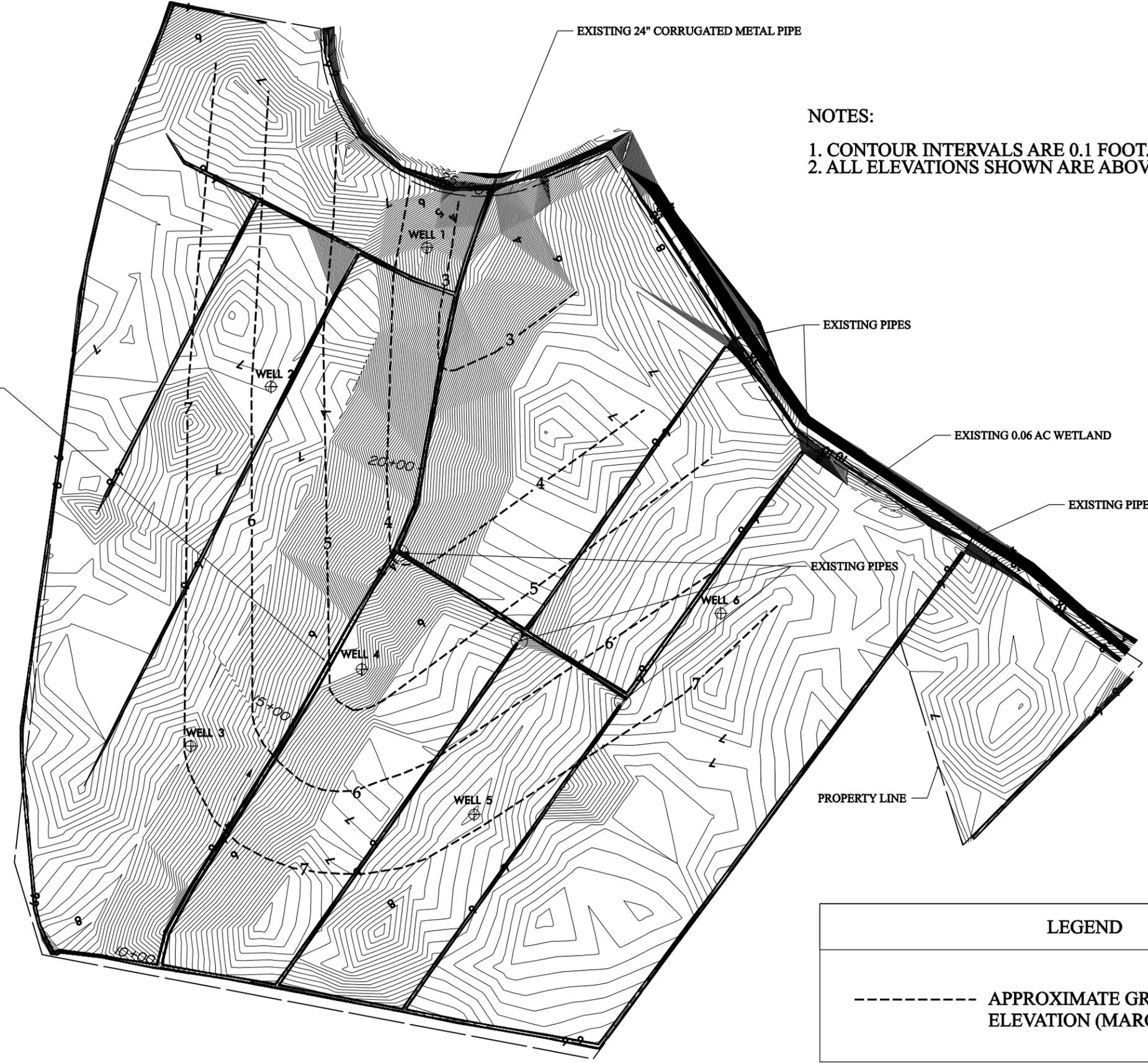


APPENDIX G.

Project Plan Sheets



EXISTING UT TO
LITTLE RIVER CORRIDOR



EXISTING 24" CORRUGATED METAL PIPE

NOTES:

1. CONTOUR INTERVALS ARE 0.1 FOOT.
2. ALL ELEVATIONS SHOWN ARE ABOVE MEAN SEA LEVEL.

EXISTING PIPES

EXISTING 0.06 AC WETLAND

EXISTING PIPE

EXISTING PIPES

PROPERTY LINE

LEGEND	
-----	APPROXIMATE GROUND WATER ELEVATION (MARCH 2010)

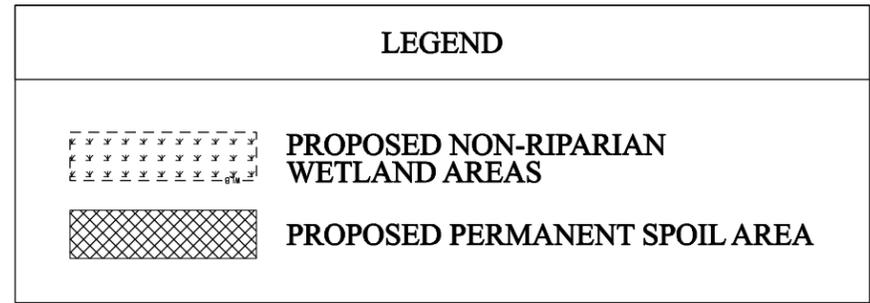
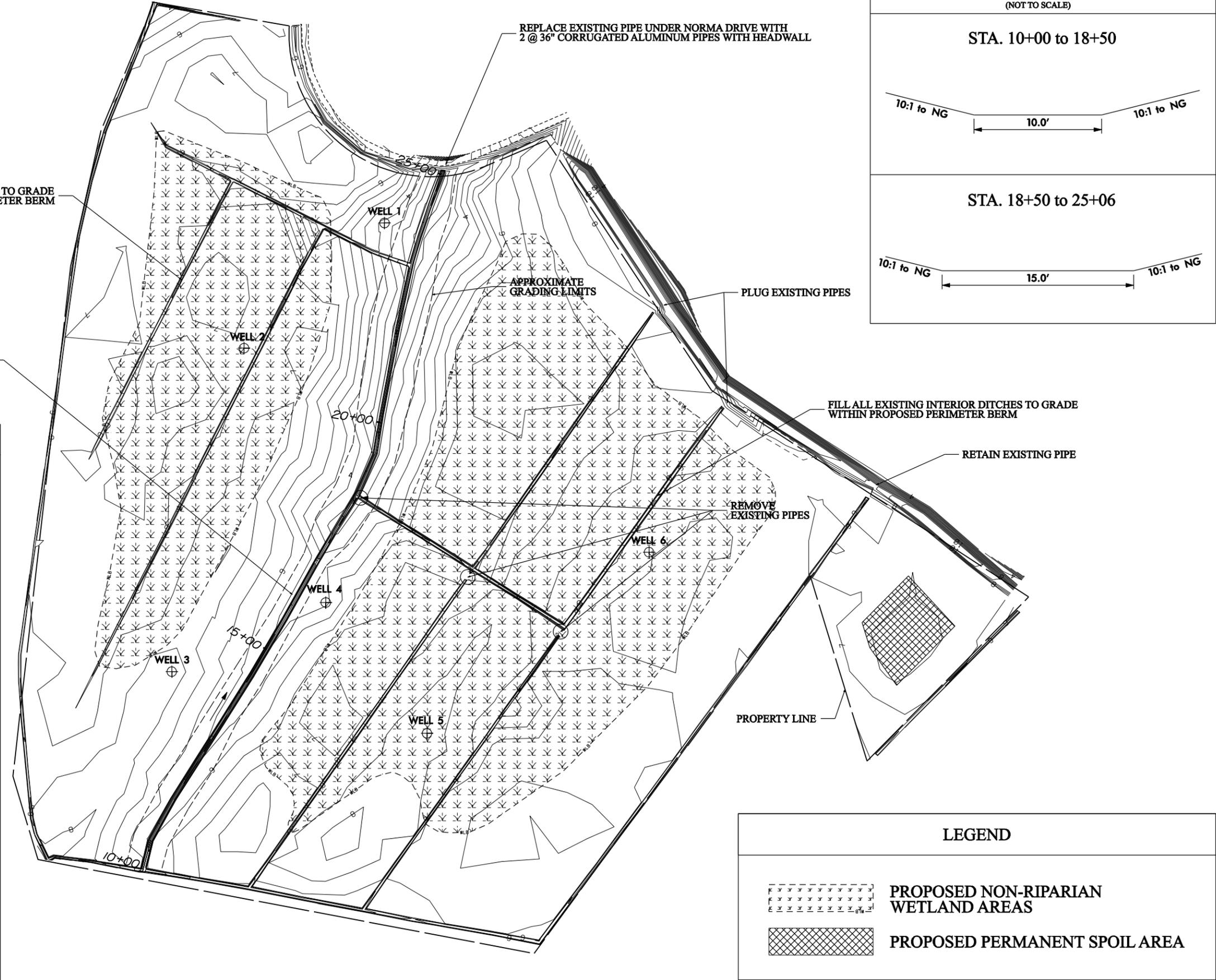
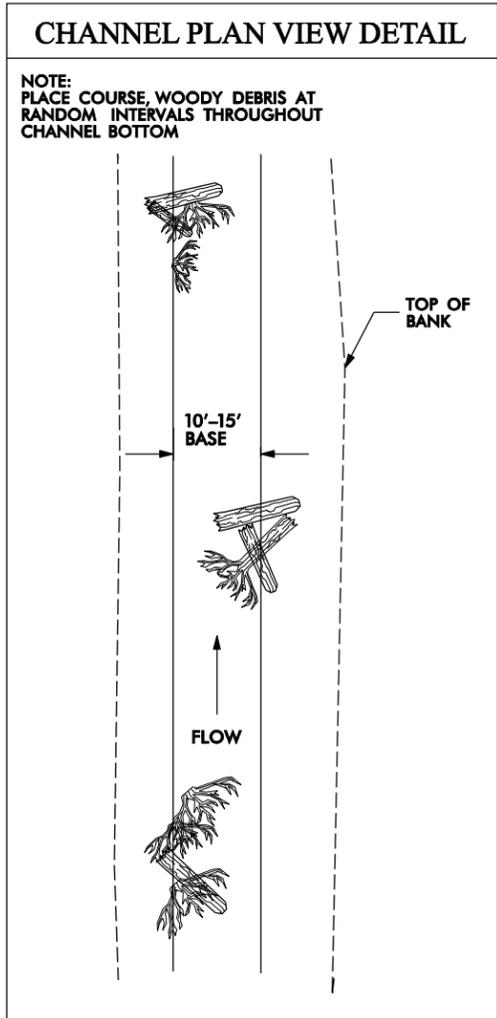
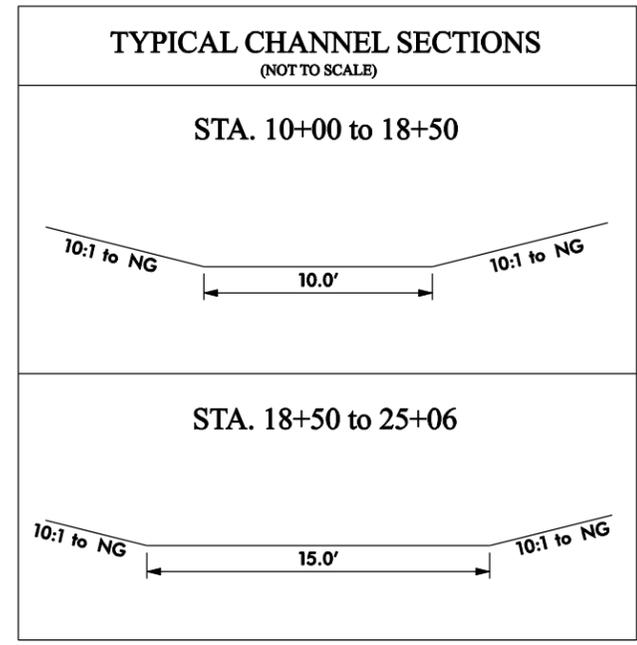


REVISIONS
REDUCED CONTOUR INTERVALS AS REQ.
2/21/11

EXISTING CONDITIONS FOR THE WATTS PROPERTY STREAM AND WETLAND RESTORATION PROJECT PREPARED FOR NC DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES ECOSYSTEM ENHANCEMENT PROGRAM

DESIGN SHEET 1 SHEET	MARCH 9, 2011 DATE
	50512-002 PROJECT NO.





REVISIONS	
UPDATED PLAN VIEW DETAIL	
REVISED SPOIL AREA	2/21/11

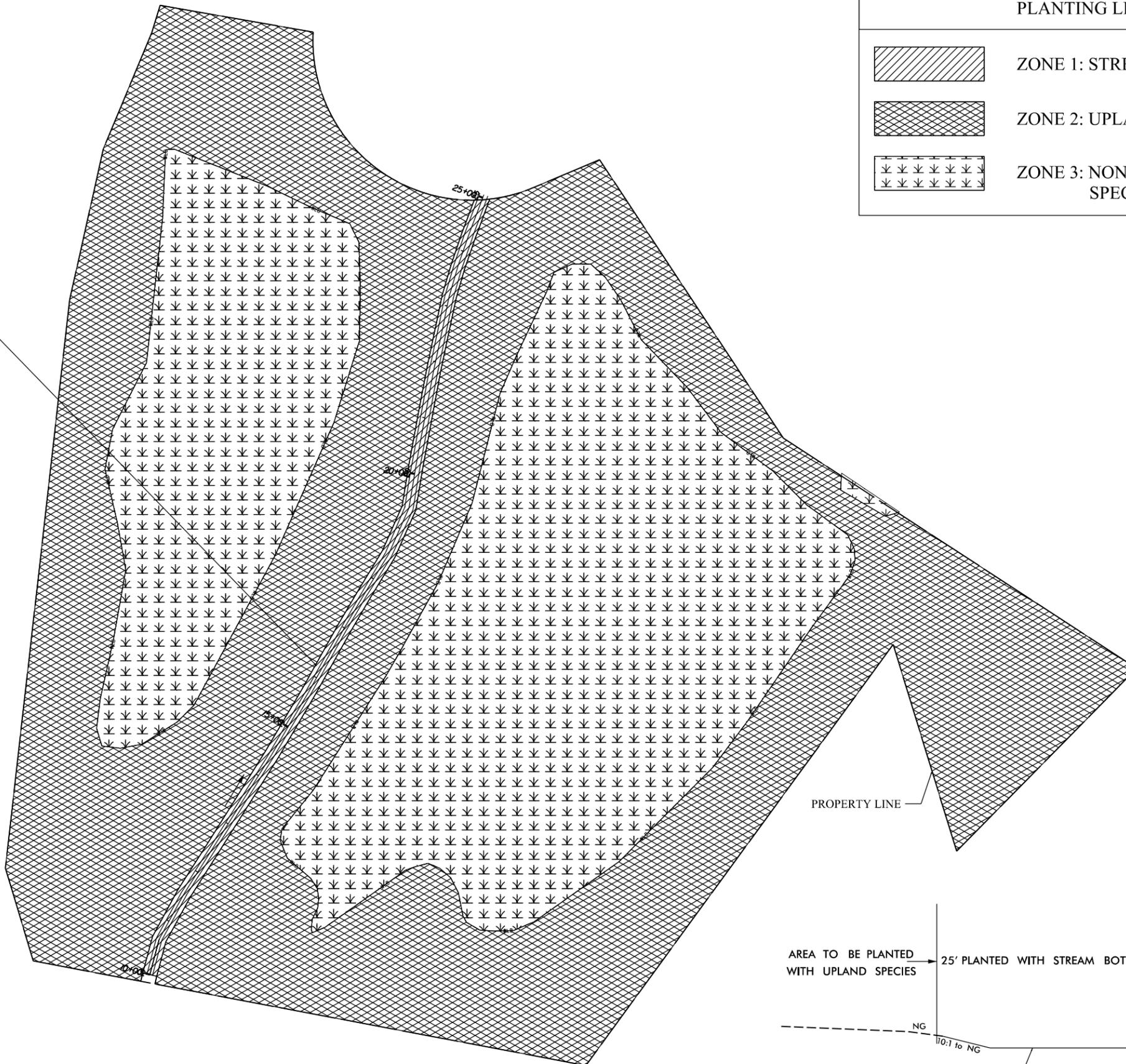
CONCEPTUAL PLAN
FOR THE
WATTS PROPERTY
STREAM AND WETLAND
RESTORATION PROJECT
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

DESIGN SHEET 2 SHEET	MARCH 9, 2011 DATE
	50512-002 PROJECT NO.



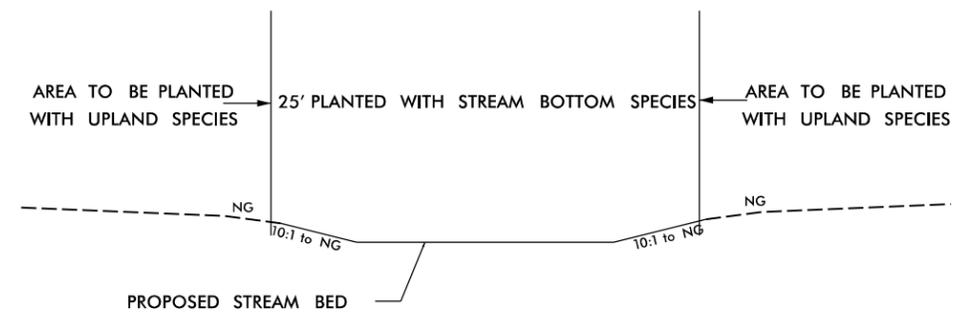


PROPOSED UT TO
LITTLE RIVER CORRIDOR



PLANTING LEGEND	
	ZONE 1: STREAM BOTTOM SPECIES
	ZONE 2: UPLAND SPECIES
	ZONE 3: NON-RIPARIAN WETLAND SPECIES

PROPERTY LINE



PROJECT ENGINEER



REVISIONS

PLANTING PLAN
FOR THE
WATTS PROPERTY
STREAM AND WETLAND
RESTORATION PROJECT
PREPARED FOR
NC DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM

DESIGN SHEET 3 SHEET	MAY 10, 2012 DATE	50512-002 PROJECT NO.
-------------------------	----------------------	--------------------------

Ecological Engineering
1151 SE Cary Parkway
Suite 101
Cary, NC 27518

PLANTING SPECIES

BARE ROOT AND CONTAINERIZED PLANTING SPECIES PER ZONE

Zone 1: Coastal Plain Headwater Forest Community					Acres	0.9		
Species	Common Name	Density	Unit Type	Stratum	Individual Spacing	No. of S tems		
<i>Taxodium distichum</i>	Bald cypress	680 stems per acre (approx. 80% of total planting)	Bare Root	Canopy	Approx. 8 feet on center	50		
<i>Nyssa biflora</i>	Swamp tupelo		Bare Root	Canopy		50		
<i>Quercus laurifolia</i>	Laurel oak		Bare Root	Canopy		50		
<i>Quercus lyrata</i>	Overcup oak		Bare Root	Canopy		50		
<i>Quercus michauxii</i>	Swamp chestnut oak		Bare Root	Canopy		50		
<i>Betula nigra</i>	River birch		Bare Root	Canopy		50		
<i>Carpinus caroliniana</i>	Ironwood		Bare Root	Understory		45		
<i>Ilex opaca</i>	American holly		Bare Root	Understory		45		
<i>Magnolia virginiana</i>	Sweetbay		Bare Root	Understory		45		
<i>Persea palustris</i>	Red bay		Bare Root	Understory		45		
<i>Cyrilla racemiflora</i>	Titi		Bare Root	Understory		45		
<i>Taxodium distichum</i>	Bald cypress		320 stems per acre (approx. 20% of total planting)	Container		Canopy	Approx. 12 feet on center	10
<i>Nyssa biflora</i>	Swamp tupelo			Container		Canopy		10
<i>Quercus laurifolia</i>	Laurel oak			Container		Canopy		10
<i>Quercus lyrata</i>	Overcup oak			Container		Canopy		10
<i>Quercus michauxii</i>	Swamp chestnut oak	Container		Canopy	10			
<i>Betula nigra</i>	River birch	Container		Canopy	10			
Total						585		

Zone 2: Mesic Mixed Hardwood Forest Community					Acres	26.8		
Species	Common Name	Density	Unit Type	Stratum	Individual Spacing	No. of S tems		
<i>Quercus michauxii</i>	Swamp chestnut oak	680 stems per acre (approx. 80% of total planting)	Bare Root	Canopy	Approx. 8 feet on center	2,080		
<i>Quercus alba</i>	White oak		Bare Root	Canopy		2,080		
<i>Quercus rubra</i>	Northern red oak		Bare Root	Canopy		2,080		
<i>Cornus florida</i>	Flowering dogwood		Bare Root	Understory		2,080		
<i>Ostrya virginiana</i>	Hop-hornbeam		Bare Root	Understory		2,080		
<i>Ilex opaca</i>	American holly		Bare Root	Understory		2,080		
<i>Vaccinium stamineum</i>	Deerberry		Bare Root	Understory		2,080		
<i>Quercus michauxii</i>	Swamp chestnut oak		320 stems per acre (approx. 20% of total planting)	Container		Canopy	Approx. 12 feet on center	566
<i>Quercus alba</i>	White oak			Container		Canopy		566
<i>Quercus rubra</i>	Northern red oak			Container		Canopy		566
Total						16,258		

Zone 3: Hardwood Flat Forest Community					Acres	20.4		
Species	Common Name	Density	Unit Type	Stratum	Individual Spacing	No. of S tems		
<i>Quercus michauxii</i>	Swamp chestnut oak	680 stems per acre (approx. 80% of total planting)	Bare Root	Canopy	Approx. 8 feet on center	1,500		
<i>Quercus laurifolia</i>	Laurel oak		Bare Root	Canopy		1,500		
<i>Quercus pagoda</i>	Cherrybark oak		Bare Root	Canopy		1,500		
<i>Nyssa biflora</i>	Swamp tupelo		Bare Root	Canopy		1,500		
<i>Ulmus Americana</i>	American elm		Bare Root	Canopy		1,500		
<i>Carpinus caroliniana</i>	Ironwood		Bare Root	Understory		1,200		
<i>Ilex opaca</i>	American holly		Bare Root	Understory		1,200		
<i>Persea palustris</i>	Red bay		Bare Root	Understory		1,200		
<i>Quercus michauxii</i>	Swamp chestnut oak		320 stems per acre (approx. 20% of total planting)	Container		Canopy	Approx. 12 feet on center	325
<i>Quercus laurifolia</i>	Laurel oak			Container		Canopy		325
<i>Quercus pagoda</i>	Cherrybark oak	Container		Canopy	325			
<i>Ulmus Americana</i>	American elm	Container		Canopy	325			
Total						12,400		

SEEDING SUMMARY FOR PERMANENT VEGETATION PER PLANTING ZONE

Seeding Summary for Permanent Vegetation per Planting Zone					
Zone 1 and Zone 3- Permanent Seeding for Wet/Sunny Conditions				Acres	21.3
Approved Date	Species Name	Stratum	Common Name	Total lbs	Mix to be applied at rate of approx. 20 lbs/ acre
n/a	<i>Trifolium pratense</i>	Herb	Red clover	128(30%)	
n/a	<i>Panicum clandestinum</i>	Herb	Deer tongue	85 (20%)	
n/a	<i>Carex vulpinoidea</i>	Herb	Fox Sedge	64 (15%)	
n/a	<i>Elymus virginicus</i>	Herb	Virginia wild rye	64 (15%)	
n/a	<i>Juncus effusus</i>	Herb	Soft Rush	43 (10%)	
n/a	<i>Agrostis perennans</i>	Herb	Upland bentgrass	43 (10%)	
Subtotal				427 (100%)	
Zone 2 – Permanent Seeding for Dry/Sunny Conditions				Acres	26.8
Approved Date	Species Name	Stratum	Common Name	Total lbs	Mix to be applied at rate of approx. 20 lbs/ acre
n/a	<i>Festuca rubra</i>	Herb	Red fescue	107 (20%)	
n/a	<i>Trifolium pratense</i>	Herb	Red clover	161(30%)	
n/a	<i>Panicum clandestinum</i>	Herb	Deer tongue	107 (20%)	
n/a	<i>Schizachyrium scoparium</i>	Herb	Little bluestem	161(30%)	
Subtotal				536 (100%)	



REVISIONS	
REVISED SPECIES 2/21/11	
REVISED SPECIES 4/1/11	

PLANTING SPECIES FOR THE WATTS PROPERTY STREAM AND WETLAND RESTORATION PROJECT PREPARED FOR NC DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES ECOSYSTEM ENHANCEMENT PROGRAM

DESIGN SHEET 4 SHEET	MAY 10, 2012 DATE	50512-002 PROJECT NO.
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DESIGN SHEET 4 SHEET	
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APPENDIX H.

Land Acquisition



North Carolina Department of Administration

Beverly Eaves Perdue, Governor
Moses Carey, Jr., Secretary

State Property Office

April 20, 2011

Mr. William Taylor, Jr.
5523- 4th Street NW
Washington, DC 20011

Re: Proposed Acquisition of a Conservation Easement on Approximately 85 +/- Acres
Project: Property of the Estate of William Taylor
c/o William Taylor, Jr.
SPO File: 72-M Perquimans County

Dear Mr. Taylor:

Thank you for speaking with Heather Smith of NC Ecosystem Enhancement Program and me this week. We discussed the State's interest in acquiring a conservation easement on the 85 +/- acres which you and other family members own in Perquimans County, NC. During that conversation, you requested that we forward a written summary.

The State is prepared to offer \$2000 per acre for open areas and \$560 per acre for wooded areas, subject to survey, for a permanent conservation easement that extends in perpetuity. Per the Perquimans County Tax Office, there are approximately 53 +/- acres of open land and approximately 24 acres of wooded land, subject to survey.

When a conservation easement is placed on a property, the landowner still owns the remaining fee interest and is responsible for all taxes on said property. Each county has different policies regarding taxation value of land that has a conservation easement on it.

Enclosed is a copy of the template used for a conservation easement with the State for your consideration. The document covers activities allowed and restricted within the conservation area. For example, hunting is allowed within the conservation easement area, however hunting structures are not.

It is my understanding that the property is currently leased for farming. We will work with you and your lessee to allow for harvesting the current year's crop. After the conservation easement is placed on the property, farming will not be allowed.

Mailing Address:
1321 Mail Service Center
Raleigh, N.C. 27699-1321

Telephone (919) 807-4650
Fax (919) 733-1431
State Courier #52-71-78

Location:
116 West Jones Street
Raleigh, North Carolina
27603-8003

If you and your family are agreeable to a conservation easement, then we will move forward with an option agreement which all persons having an interest in the property and their spouses would sign. During the option period, a title examination and survey will be prepared at the State's expense and any necessary releases will be obtained. Information from the title report will be provided to you. The preliminary survey will be submitted for your review and comment. The final acreage shown on the survey will be used to calculate the acquisition cost of the property. Then, the conservation easement deed will be prepared. The NC Ecosystem Enhancement Program will pay for costs associated with the property acquisition except for outstanding taxes, commissions, and NC excise tax stamp. The completion of this transaction is subject to approval by the Council of State and availability of funds.

If you and your family prefer to sell in fee simple, there is another process to go through. A request for permission to appraise will be forwarded for your signature. An appraisal will be prepared and copy of said report provided to you. Then an option agreement will be prepared and executed. Title and survey will be prepared as stated above. The NC Ecosystem Enhancement Program will pay for costs associated with the property acquisition except for outstanding taxes, commissions, and NC excise tax stamp. The completion of this transaction is subject to approval by the Council of State and availability of funds.

Thank you for your interest in the NC Ecosystem Enhancement Program. Please contact Heather Smith, EEP project manager at (919-715-5590) or Marion Patrick with the State property Office (919-807-4665) if there are any questions.

Respectfully yours,

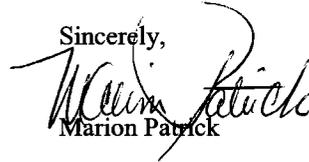
A handwritten signature in black ink, appearing to read 'Blane Rice', written over a horizontal line.

Blane Rice
EEP Manager

cc: Heather Smith, EEP Project Manager
Marion Patrick, State Property Office

If you would like to discuss any aspect of this matter prior to granting permission to appraise and survey, please feel free to contact EEP project manager heather smith at 919-715-5590 me at 919-807-4665. I am assigned to EEP as one of their agents in the State Property Office.

Thank you for your consideration of the proposed conservation area.

Sincerely,

Marion Patrick

Real Property Agent

Enclosures

PROPERTY OWNER: Mr. William Taylor, et al.

PROPERTY ADDRESS: 85 +/- acres off Little River Shore Drive
PIN# 4-0056-0005

COUNTY: Perquimans

FILE # : 72-M

_____ I hereby give my permission to have my property appraised
and surveyed, if necessary, with no obligation on my part.

_____ I need more information concerning this matter.

COMMENTS:

DATE: _____

SIGNED: _____
William Taylor, Jr. (primary contact for landowners)

PHONE NO.: 202-486-5523

E-MAIL: Elaine63taylor@yahoo.com

THE NORTH CAROLINA DEPARTMENT OF ADMINISTRATION
APPRAISAL CONTRACT

THIS AGREEMENT, consisting of twenty-five (25) numbered provisions, entered into this the _____ day of _____ 2011 by and between the North Carolina Department of Administration, hereinafter referred to as the "DEPARTMENT" and Josh Tunnell of Josh Tunnell's Appraisal Service, 601 E. Elizabeth Street, Elizabeth City, NC 27909 (252-335-5219) hereinafter referred to as the "APPRAISER".

WITNESSETH

It is mutually agreed between the parties hereto as follows:

- (1) The APPRAISER shall furnish to the Department a professional appraisal of the fair market value of certain parcels of land, or designated parts thereof as follows:
- (2) For and in consideration of services in furnishing said appraisals, the APPRAISER shall be paid as follows: (see below)

Project: UT Little River, EEP 413 SPO File # 72-M
County of Perquimans

Description: 84.20 +/- acre parcel off Little River Shore Drive, New Hope Township; DB 189 PG 143, Plat Cabinet 2 Slide 197 Map 1

PARCEL	OWNER	TYPE OF APPRAISAL	APPRAISAL FEE
L-0056-0005	Taylor Estate (William B. Taylor, Jr. Lawrence L. Taylor Helena T. McDuffie)	Summary	\$1,950.00 (not to exceed without prior written approval)

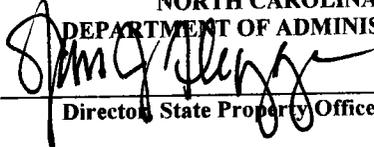
- (3) The following items have been furnished the APPRAISER, the receipt of which is hereby acknowledged.
- (4) The APPRAISER agrees to fully complete all of the appraisals herein set out and to furnish the Department an original and two (2) copies of each appraisal on or before 30 days from date of contract, it being fully understood and agreed that in the event the APPRAISER shall fail so to do, the Department shall consider the services of the said APPRAISER terminated and shall not be liable for the payment for appraisals submitted after said date. In the event of extenuating circumstances and upon written application by the APPRAISER, a written extension of time may, at the option of the Department, be granted.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals on the day and year first above written.

APPRAISER

Tax I.D. or Social Security No.

Date:

NORTH CAROLINA
DEPARTMENT OF ADMINISTRATION
By 
Director, State Property Office 

Date:

(5) In the event it becomes necessary to enter into condemnation proceedings on any of the above parcels, the APPRAISER shall, upon request of the Director of the State Property Office or TRIAL ATTORNEY, make himself available for reinspection of the property; appraisal or pre-trial conferences; or to testify as a witness for the DEPARTMENT at Commissioner's Hearing or in Superior Court. The APPRAISER shall be paid for such services commensurate with the APPRAISER'S qualifications at a per diem rate agreed upon by and between the APPRAISER and the DEPARTMENT at the time the services are required.

(6) The aforementioned appraisals shall conform with all requirements set out in the current publication of the "Uniform Standards of Professional Appraisal Practice" and any additions, revisions or supplements thereto.

(7) Should the DEPARTMENT for any reasons decide to cancel or terminate the APPRAISER'S services, it will furnish written notice thereof to the APPRAISER, who shall, as instructed immediately terminate work or bring to a reasonable state of completion such items of work as may be directed by the DEPARTMENT, and will turn over all data and other records or information collected, whether partial or completed. Upon termination, the fee to be paid the APPRAISER will be equitable to cover all services actually rendered, based on a ratio of the amount of work done to the total amount of work which was to have been done.

(8) No additional fee shall be allowed the APPRAISER for assistance by, or services of, supporting APPRAISERS, agents, or employees except by express prior permission in writing by the DEPARTMENT.

(9) In the event the DEPARTMENT deems a correction of the above-described appraisals necessary because of APPRAISER'S error or oversight, or failure to meet the requirements of paragraph 6 above, the APPRAISER shall submit to the DEPARTMENT within ten (10) days from receipt of such request and at no additional cost to the DEPARTMENT, such corrected appraisal. If revisions become necessary because of revised plans or additional requirements on the part of the DEPARTMENT, it is agreed that a new contract covering such revisions shall be entered into in writing before such work is performed.

(10) The APPRAISER agrees to indemnify and save harmless the State, its officers, agents and employees from any and all damages or claims for damages accruing or resulting to any and all persons, firms or corporations furnishing or supplying work, services, materials or supplies in connection with the performance of this contract, and from any and all damages or claims for damages accruing or resulting to any person, firm or corporation who may be injured or damaged by the APPRAISER, the APPRAISER'S employees, servants or agents, in performance of this contract. The APPRAISER shall provide necessary workman's compensation insurance at APPRAISER'S own cost and expense.

(11) During the performance of this contract, the APPRAISER (hereinafter referred to as the "CONTRACTOR") agrees as follows:

- (1) **Compliance with Regulations:** The contractor shall comply with the Regulations relative to nondiscrimination in federally-assisted programs as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.
- (2) **Nondiscrimination:** The CONTRACTOR, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, national origin, sex or religion in the selection and retention of subcontractors, including procurements of materials and leases of equipment.
- (3) **Solicitations for Subcontracts, Including Procurement of Materials and Equipment:** In all solicitations either by competitive bidding or negotiation made by the CONTRACTOR for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the CONTRACTOR of the CONTRACTOR'S obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, national origin, sex or religion.
- (4) **Information and Reports:** The CONTRACTOR shall provide all information and reports required by the Regulations or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the State or the Federal Government to be pertinent to ascertain compliance with such Regulations, orders and instructions. Where any information required of a CONTRACTOR is in the exclusive possession of another who fails or refuses to furnish this information the CONTRACTOR shall so certify to the State or the Federal Government as appropriate, and shall set forth what efforts it has made to obtain the information.
- (5) **Sanctions for Noncompliance:** In the event of the CONTRACTOR'S noncompliance with the nondiscrimination provisions of this contract, the State shall impose such contract sanctions as it or the Federal Government may determine to be appropriate, including, but not limited to:
 - (a) withholding of payments to the CONTRACTOR under the contract until the CONTRACTOR complies, and/or
 - (b) cancellation, termination or suspension of the contract, in whole or in part.
- (6) **Incorporation of Provisions:** The CONTRACTOR shall include the provisions of paragraphs (1) through (6) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The CONTRACTOR shall take such action with respect to any subcontract or procurement as the State or the Federal Government may direct as a means of enforcing such provisions including

sanctions for non-compliance; provided, however, that, in the event a CONTRACTOR becomes involved in, or is threatened with litigation with a subcontractor or supplier as a result of such direction, the CONTRACTOR may request the State to enter into such litigation to protect the interests of the State, and, in addition, the CONTRACTOR may request the United States to enter into such litigation to protect the interests of the United States.

- (12) All of the work to be performed under the provisions of this contract shall be accomplished by the named APPRAISER unless prior written permission shall have been secured from the DEPARTMENT to utilize services of others in the preparation of the appraisals set forth in this contract.
- (13) None of the work provided for in this Agreement may be subcontracted by the named APPRAISER without the prior written permission of the DEPARTMENT.
- (14) This Agreement is not assignable by the APPRAISER either in whole or in part.
- (15) The DEPARTMENT and the Federal Government shall have the right to approve or reject any firm or individual that the APPRAISER may propose as a subcontractor or employee whose services will be employed in the preparation of the appraisals herein set out.
- (16) The APPRAISER shall not engage the services of any person, or persons now in the employment of the State or of any County or City in the State during the time covered by this Agreement, without written consent of the employer of such person.
- (17) The parties hereto agree that the APPRAISER, and any agents and employees of the APPRAISER in the performance of this Agreement, shall act in an independent capacity and not as officers, employees, representatives or agents of the State of North Carolina.
- (18) The APPRAISER agrees that a properly executed "Certificate of Appraiser" shall be attached to the original and one copy of each appraisal made under the terms of this contract.
- (19) Time is of the essence on each and all of the provisions of this Agreement, and the provisions of this Agreement shall extend to and be binding upon and inure to the benefit of the successor or the successors of the DEPARTMENT.
- (20) It is agreed that the APPRAISER, its servants, agents and employees, shall keep the appraisals and all information pertaining thereto in strict confidence and shall not reveal the appraisals or information to any persons, firms, agencies or corporations unless expressly authorized in writing by the DEPARTMENT to reveal such appraisals or information relating thereto; subject to 11 (4) above.
- (21) It is mutually understood and agreed that no alteration or variation of the terms of this contract shall be valid unless made in writing and signed by the parties hereto, and that no oral understandings or agreements not incorporated herein, and no alterations or variations of the terms hereof, unless made in writing between the parties hereto, shall be binding on any of the parties hereto.
- (22) In the event a dispute arises between the parties of this Agreement concerning a question or fact in connection with the requirements of this Agreement or compensation therefor, the decision of the Secretary of the Department of Administration in the matter shall be final and conclusive for both parties.
- (23) The APPRAISER shall comply with all laws, ordinances, and regulations, Federal, State, and local, applicable to the work covered by this Agreement.
- (24) The APPRAISER warrants that he/she has not employed or retained any company or person, other than a bona fide employee working solely for the APPRAISER, to solicit or secure this Agreement, and that he/she has not paid or agreed to pay any company or persons, other than a bona fide employee working solely for the APPRAISER any fee, commission, percentage, brokerage fee, gifts, or any other consideration contingent upon or resulting from the award or making of this Agreement. For breach or violation of this warranty, the DEPARTMENT shall have the right to annul this Agreement without liability.
- (25) In accordance with G.S. 14-234 and G.S. 143-63, no public official (including the Secretary of the Department of Administration, any assistant of the Secretary, any member of the Advisory Budget Commission or any employee of any State Department, agency or institution) may directly or indirectly benefit or otherwise participate in the expenditure of public funds, under this contract. Nor shall any public official be awarded by rebate, gifts or otherwise any money or anything of value. Nor shall there be any possible obligation or contract for future reward or compensation.

The APPRAISER warrants that no public official has any interest (whether personal or that of a corporation, partnership, or association) in this Contract or its proceeds.

STATE OF NORTH CAROLINA

COUNTY OF PERQUIMANS

Prepared by State Property Office

Return after recording to:

State Property Office

1321 Mail Service Center

Raleigh, NC 27699-1321

FEE SIMPLE OPTION AGREEMENT

Ecosystem Enhancement Program

SPO File Number 72-M EEP # 413

THIS OPTION AGREEMENT, hereinafter referred to as Option, made and entered into this _____ day of _____, 2011 by and between William B. Taylor, Jr. and wife, Elsie Elaine Taylor, Lawrence L. Taylor (divorced), Helena T. McDuffie (divorced), and Wilbert Turner and wife, Sylvia Turner hereinafter referred to as the **Seller**, and the **State of North Carolina**, and its successors and assigns, hereinafter referred to as the **State**.

WITNESSETH

In consideration of \$10.00 and other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, and of the agreements contained in this Option, **Seller** hereby grants to the **State**, and its successors and assigns, the exclusive right and option to purchase, those certain parcels of land, including all buildings and improvements, hereinafter referred to as **Property**, located in New Hope Township, Perquimans County, North Carolina, containing 77 +/- acres more or less, and being that parcel of land more particularly described as follows Deed Book 189 Page 143 and Plat Cabinet 2, Slide 197, Map 1 of the Perquimans County Registry and further identified as PIN# 4-0056-0005. See attached "**Exhibit A**" map for reference.

The following terms, provisions, and conditions are further agreed to:

1. **OPTION PERIOD.** This option shall remain in effect from the date that this Option has been executed by the **Grantor** until the 31st day of **December 2012**. This Option shall be exercised upon posting, by certified mail, a written notice to the **Grantor** at the following address: **5523-4th Street NW Washington DC 20011, attention William Taylor**. Exercise shall be deemed timely if such written notice is mailed on or before the date first set forth in this paragraph.

2. **PURCHASE PRICE.** The total purchase price for the **Easement Area** shall be:

The sum of \$ **3,500.00, (Thirty Five Hundred Dollars)** per acre subject to final survey (\$3,500.00 per acre) for **agricultural** land and

The sum of \$**1,166.00, (One Thousand One Hundred and Sixty-Six Dollars)** per acre subject to final survey (\$1,166.00 per acre) for **wood** land.

(If donation, Seller elects to decline full fair market value compensation by placing initials here _____.)

3. **CLOSING.** A closing of the sale of this **Property** under this Option shall be held within **90 days** of the exercise of this Option; provided, however, in the event of objections to title or condition of land at closing, and diligent efforts on **Seller's** part to cure said objections, a closing shall be held within a reasonable time following the removal of said objections.
4. **EVIDENCE OF TITLE.** Upon receipt of this signed Option, the **State** will have title to the **Property** examined, and if applicable, obtain a preliminary title insurance commitment on the **Property**. The title examination and/or commitment must evidence the **Seller's** ability to deliver title at closing as set forth below. All costs necessary to procure the title examination and, if applicable, the title commitment and final title insurance policy to be issued at closing, shall be the responsibility of the **State**.
5. **TITLE.** At closing, the **Seller** shall convey good, insurable and marketable title to the **Property** together with all rights necessary to protect the **Property** in perpetuity, including legal access, all mineral rights and all development rights, to the **State** free and clear of all liens, encumbrances, restrictions, rights, or exceptions unless excepted of record as are acceptable to the **State**.
6. **TITLE DEFECTS.** If for any reason the **Seller** cannot deliver title at closing as required by Paragraph 5 of this Option, the **State** may elect to a) accept the **Property** with title as is; b) refuse to accept the **Property**; or c) allow the **Seller** additional time to pursue reasonable efforts to correct the problem, including bringing any necessary quiet title actions or other lawsuits.
7. **SUBJECT TO SURVEY.** It is understood and intended that the **Property** under this option is subject to final survey as agreed and approved by the **Ecosystem Enhancement Program** with these costs paid by the **State**.
8. **DOCUMENTS FOR CLOSING.** The **Seller** shall execute and deliver at closing a **General Warranty Deed with restrictions as shown in "Exhibit B"**, any owner's affidavits or documents required by a title insurance company to remove the standard title policy exceptions, and any other documents necessary to close in accordance with the terms of this Option. These documents will be prepared at the expense of the **State**.
9. **PROPERTY TAXES.** Any delinquent real estate taxes and all levied assessments are the **Seller's** responsibility and should be satisfied of record by the **Seller** at or before closing. Any deferred taxes on the **Property**, which become due as a result of this conveyance, shall

be the responsibility of the **Seller**. Real estate taxes for the year in which the transaction is closed shall be the responsibility of the **Seller** and not prorated, as the **State** is not receiving fee simple title.

10. **MISCELLANEOUS CLOSING EXPENSES.** The **Seller** will pay any documentary stamp tax, real estate transfer fee or any similar charge due upon conveyance of title to the **State**. The **State** will pay recording fees.
11. **POSSESSION.** Unless otherwise agreed in writing, the **Seller** will deliver possession of the **Property** to the **State** at closing subject to no leases, mortgages, liens or other reserved rights, and in the condition set forth below in Paragraph 12.
12. **CONDITION OF PROPERTY/ RISK OF LOSS.** The **Seller** shall not transfer or encumber any interests in the **Property** prior to closing. The **Seller** shall keep the **Property** in its current condition until closing and shall prevent and refrain from any use of the **Property**, for any purpose or in any manner that would diminish its value or adversely affect the **State's** intended use of the **Property**.

In the event of any adverse change in the condition of the **Property**, whether said change is caused by **Seller** or by forces beyond **Seller's** control, the **State** may elect to a) refuse to accept the **Property**; b) accept the **Property**, or a portion thereof, in which case there may be an equitable adjustment of the purchase price based on a change in circumstances; or c) require restoration of the **Property** to its condition at the time this Option was granted.

13. **RIGHT OF ENTRY AND INSPECTION.** The **State** and its agents shall have the right to enter upon the **Property** at reasonable times for surveying, engineering, conducting environmental inspections and assessments to detect hazardous or toxic substances, and other reasonable purposes related to this transaction. Based upon the results of the environmental inspections and assessments, or upon other conditions revealed to be unsuitable to the **State**, the **State** may elect to refuse to accept the **Property**.
14. **REMEDIES.** In addition to any other remedy specifically set forth in this Option, the **State** has the right to enforce the provisions of this Option through an action for specific performance, injunctive relief, damages, contribution or any other available proceedings in law or equity. The election of any one remedy available under this Option shall not constitute a waiver of any other available remedies.
15. **BINDING EFFECT.** This Option becomes effective when signed by the **Seller** and shall then apply to and bind the **Seller** and **Seller's** heirs, executors, administrators, successors, and assigns.
16. **COMPLETE AGREEMENT.** This Option agreement is subject to approval by the Governor of North Carolina and the elected representatives comprising the Council of State and availability of funds. If for any reason the Council of State does not vote to approve this exchange, this entire agreement shall become null and void. The **Ecosystem Enhancement Program** promotes the preservation, restoration and enhancement of streams and/or wetlands. Any representations, contracts or agreements created by or for the **Ecosystem**

Enhancement Program are exclusive of this option unless specifically incorporated herein by exhibit.

17. **NO WAIVER.** No provision of the Option shall be deemed amended or waived unless such amendment or waiver is set forth in a writing signed by the **State**. No act or failure to act by the **State** shall be deemed a waiver of its rights hereunder, and no waiver in any one circumstance or of any one provision shall be deemed a waiver in other circumstances or of other provisions.

18. **ASSIGNMENT.** The **State** has the right to assign this Option. In the event of such assignment, the assignee will have all the rights, powers, privileges and duties held by the **State** pursuant to this Option.

IN TESTIMONY THEREOF, the parties have hereunto set their hands and seals, or if corporate have caused this instrument to be executed in their corporate names by their duly authorized representatives as of the dates indicated below.

Seller

By: _____
William B. Taylor, Jr.

By: _____
Elsie Elaine Taylor

By: _____
Lawrence L. Taylor

By: _____
Helena T. McDuffie

By: _____
Wilbert Turner

By: _____
Sylvia Turner

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that _____, 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 _____ day of _____, 2011.

Notary Public

My commission expires:

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that _____, 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 _____ day of _____, 2011.

Notary Public

My commission expires:

STATE OF _____
COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that _____, 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 _____ day of _____, 2011.

Notary Public

My commission expires:

STATE OF _____
COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that _____, 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 _____ day of _____, 2011.

Notary Public

My commission expires:

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that _____, 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 _____ day of _____, 2011.

Notary Public

My commission expires:

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that _____, 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 _____ day of _____, 2011.

Notary Public

My commission expires:

“EXHIBIT A”

(Insert map here)

“EXHIBIT B”

RESERVED USES AND RESTRICTED ACTIVITIES

A. Motorized Vehicles. Usage of motorized vehicles in the Restricted Area is prohibited, except as they are used exclusively for management, maintenance, or stewardship purposes, and on existing trails, paths or roads for the purposes recited above.

B. Vegetative Cutting. Except as related to the removal of non-native plants, diseased or damaged trees, and vegetation that obstructs destabilizes or renders unsafe the Restricted Area to persons or natural habitat, all cutting, removal, mowing, harming, or destruction of any trees and vegetation in the Restricted Area is prohibited.

C. Industrial, Agricultural, Residential and Commercial Uses. All are prohibited in the Restricted Area.

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

E. Roads and Trails. There shall be no new construction of roads, trails, walkways, or paving in the Restricted Area. Existing roads or trails located in the Restricted Area may be maintained with loose gravel, soil, or permanent vegetation in order to minimize runoff, prevent sedimentation and for access to the interior of the Property for management, maintenance, stewardship purposes, or undeveloped recreational and educational uses of the Restricted Area.

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

G. Dumping or Storing. Dumping or storage of soil, trash, ashes, garbage, waste, abandoned vehicles, appliances or machinery, or other material in the Restricted Area is prohibited.

H. Grading, Mineral Use, Excavation, Dredging. Unless related to approved restoration activities, there shall be no grading, filling, excavation, dredging, mining, or drilling within the Restricted Area.

I. Water Quality and Drainage Patterns. Unless related to approved restoration activities, 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 Restricted Area. There shall be no altering or tampering with water control structures or devices, or disruption or alteration of the restored, enhanced, or created drainage patterns. Any use of pesticide or biocides is prohibited.

J. Subdivision and Conveyance. No further subdivision, partitioning, or dividing of the Restricted Area is allowed.

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

L. Restoration Activities Are Permitted. Includes but not limited to 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 subterranean water flow according to a restoration plan as provided, contracted, or managed by the N.C. Ecosystem Enhancement Program, successors or assigns.

M. Enforcement. The right of enforcement of these Restrictions is hereby granted to and vested entirely with the N.C. Ecosystem Enhancement Program, its successors and assigns.

N. Notice. The owner of the Property shall notify the U.S. Army Corps of Engineers in writing sixty (60) days prior to the initiation of any amendment or change to these Covenants and Restrictions or any transfer of all or any part of the Property. Such notification shall be addressed to: Justin McCorkle, General Counsel, US Army Corps of Engineers, 69 Darlington Avenue, Wilmington, NC 28403.



North Carolina Department of Administration

Beverly Eaves Perdue, Governor
Moses Carey, Jr., Secretary

State Property Office

May 10, 2012

Mr. William Taylor, Jr.
5523- 4th Street NW
Washington, DC 20011

Re: Proposed Acquisition in Fee of Approximately 77 +/- Acres
Project: Property of the Estate of William Taylor
c/o William Taylor, Jr.
SPO File: 72-M Perquimans County

Dear Mr. Taylor:

Thank you for speaking with Heather Smith of NC Ecosystem Enhancement Program and me this week. We discussed the State's interest in acquiring in fee the 77 +/- acres which you and other family members own in Perquimans County, NC. During that conversation, you requested that we forward a written summary.

The State is prepared to offer \$3,500 per acre for open areas and \$1,166 per acre for wooded areas, subject to survey, for the acquisition of the property in fee. Per the Perquimans County Tax Office, there are approximately 53 +/- acres of open land and approximately 24 acres of wooded land, subject to survey.

If you and your family are agreeable, one copy of the attached option agreement will need to be signed by all parties having an interest in the property, notarized, and returned to my attention. During the option period, a title examination and survey will be prepared at the State's expense and any necessary releases will be obtained. Information from the title report will be provided to you. The preliminary survey will be submitted for your review and comment. The final acreage shown on the survey will be used to calculate the acquisition cost of the property. Then, the General Warranty deed will be prepared. The NC Ecosystem Enhancement Program will pay for costs associated with the property acquisition except for outstanding taxes, commissions, and NC excise tax stamp. The completion of this transaction is subject to approval by the Council of State and availability of funds.

It is my understanding that the property is currently leased for farming. We will work with you and your lessee to allow for harvesting the current year's crop. Thereafter farming will not be allowed on the property.

Mailing Address:
1321 Mail Service Center
Raleigh, N.C. 27699-1321

Telephone (919) 807-4650
Fax (919) 733-1431
State Courier #52-71-78

Location:
116 West Jones Street
Raleigh, North Carolina
27603-8003

Thank you for your interest in the NC Ecosystem Enhancement Program. Please contact Heather Smith, EEP project manager at (919-715-5590) or Marion Patrick with the State Property Office (919-807-4665) if there are any questions.

Respectfully yours,

Blane Rice
EEP Manager

cc: Heather Smith, EEP Project Manager
Marion Patrick, State Property Office

Message

FW: Sale offer - Message (HTML)

You replied on 10/18/2011 9:26 AM.

Sent: Tue 10/18/2011 9:23 AM

From: Patrick, Marion
To: Smith, Heather
Cc: Rice, Blane; Horton, Stephanie
Subject: FW: Sale offer

I was out yesterday. As I went through my e-mails I found this from the Taylors. They are declining to participate.

Please note my new e-mail address: Marion.Patrick@doa.nc.gov
Marion Patrick
Real Property Agent
State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321
Direct Line 919-807-4665 Fax 919-733-1431

E-mail correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Elaine Taylor [<mailto:elaine63taylor@yahoo.com>]
Sent: Monday, October 17, 2011 11:01 AM
To: Patrick, Marion
Subject: Sale offer

Ms Patrick, The family has made the decision to reject the offer of sale at this time. We thank you for your assistance and patience. Bill Taylor

start | UT to Little River (Wa... | PW: Sale offer - Mess... | https://portal.ncgov... | Search Desktop | 10:20 AM

APPENDIX I.

**Regulatory Coordination Discerning Proposed Success Criteria and Monitoring Period
(Late Summer 2012)**

Lane Sauls

From: Smith, Heather
Sent: Tuesday, November 27, 2012 2:29 PM
To: Lane Sauls
Subject: FW: Watts discussion (UNCLASSIFIED)

Sincerely,

Heather Smith
Eastern Project Manager
Ecosystem Enhancement Program
919-707-8496
heather.c.smith@ncdenr.gov

Please note NEW PHYSICAL ADDRESS and NEW PHONE NUMBER

217 West Jones St., 3rd Floor, Suite 3000A, Raleigh, N.C. 27603
919-707-8496

Mailing address:
1652 Mail Service Center, Raleigh, N.C. 27699-1652.

Parking and visitor access information is available on the EEP website.

Email correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties.

-----Original Message-----

From: Jurek, Jeff
Sent: Friday, November 02, 2012 10:50 AM
To: Smith, Heather
Subject: RE: Watts discussion (UNCLASSIFIED)

That is what I have also, go with it

-----Original Message-----

From: Smith, Heather
Sent: Friday, November 02, 2012 9:30 AM
To: Jurek, Jeff
Subject: RE: Watts discussion (UNCLASSIFIED)

Jurek,

Here is the summary from all the emails I have received.

- 1.5:1 ratio

- 5 years monitoring with 2 additional if not meeting success criteria
- Vegetation plot on the slope
- 8' height requirement for trees at year 5
- 2 pressure transducers to measure slope but not use as a success criteria
- 8% Hydroperiod (I never received a response back on this, I sent the email on 10/1/12)
- Use his recommended success criteria for headwater channel(s) formation.

Once you give me the ok I will get this added to the mitigation plan and we will proceed.

Sincerely,

Heather Smith
 Eastern Project Manager
 Ecosystem Enhancement Program
 919-715-5590
 heather.c.smith@ncdenr.gov

Please note that the Ecosystem Enhancement Program's Raleigh office has moved and is physically located in the N.C. Dept. of Administration building at 116 West Jones St., # G111, Raleigh, N.C. 27603. The mailing address remains 1652 Mail Service Center, Raleigh, N.C. 27699-1652. Parking and visitor access information is available on the EEP website.

-----Original Message-----

From: Jurek, Jeff
 Sent: Friday, September 21, 2012 11:37 AM
 To: Tugwell, Todd SAW
 Cc: Smith, Heather; Kulz, Eric; Wilson, Travis W.; Wheeler, Tracey L SAW
 Subject: RE: Watts discussion (UNCLASSIFIED)

Todd, Below I have updated what we will agree to. Keep in mind that there is a lot of history (push/pull) on this site and we have tried to make the site meet most people's expectations (sometimes decisions made in 1999 don't equate logically to feelings today).

- We agreed on the 1.5:1 ration for stream enhancement -We agreed to five years of monitoring (seven was not the back-breaker, but seven was not in place historically). Two more years if project is unacceptable in five.
- We agreed on vegetation plot on the slope -We also agree to stem growth of 8 feet at year 5 monitoring period -We said we would put two pressure transducers out to measure surface flow but would not use for success criteria. This was the "back-breaker" on project viability that was discussed.
- We agreed that a 5% hydroperiod was not good enough, we will provide a proper one.
- We will use the success criteria you mentioned as below:

Evidence of channel formation within the valley or crenulation must be documented through the identification of field indicators on an annual basis in accordance with the following schedule: a. During monitoring years 1 through 4, the preponderance of documented field indicators must demonstrate the accumulation of flow within the topographic low-point of the valley or crenulation. Documented indicators may include any of the following indicators or any of the indicators listed in part b: i. Presence of litter and debris (wracking) indicating a surface water flow; ii. Leaf litter disturbed or washed away; iii. Matted, bent or absence of vegetation (herbaceous or otherwise) indicative of surface flow; iv. Sediment deposition and/or scour indicating sediment transport by flowing water; v. Water staining due to continual presence of water;

b. During monitoring years 5 through 7, the preponderance of documented field indicators must demonstrate the accumulation of flow within the topographic low-point of the valley or crenulation (documented by the field indicators

listed in Part A) and the development of a primary path of flow, stream channel, or ordinary high water mark. Documented indicators may include any of the following: i. Formation of channel bed and banks; ii. Sediment sorting indicated by grain-size distribution within the primary path of flow; iii. Sediment shelving or a natural line impressed on the banks; iv. Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes) v. Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems; vi. Exposure of woody plant roots within the primary path of flow; vii. Changes in soil characteristics (when compared to the soils abutting the primary path of flow).

Let me know if you all can live with this, if not we can discuss further.

-----Original Message-----

From: Tugwell, Todd SAW [mailto:Todd.Tugwell@usace.army.mil]

Sent: Tuesday, September 18, 2012 11:43 AM

To: Jurek, Jeff

Cc: Smith, Heather; Kulz, Eric; Wilson, Travis W.; Wheeler, Tracey L SAW; Recktenwald, Marc

Subject: RE: Watts discussion (UNCLASSIFIED)

Classification: UNCLASSIFIED

Caveats: NONE

Jeff, I can't remember who else was at the meeting on site, but I wanted to include them for comment as well - please forward to the providers or others than may have an interest. I have taken a look at the responses. Please note that we did not agree at the meeting on all these points. I have a couple comments listed below:

When we met on the 28th, I believe you indicated that if 7 years of monitoring were required, the project would not be viable. While I still think that 7 years would be best given the circumstances, I can agree to 5 years, but if we determine that the data is not conclusive after 5 years, we will require additional monitoring.

You stated that you will place gauges (pressure transducers) across the valley, but that these will not be linked to performance standards. I think the intent of the gauges is to document stream flow, which we have stated is a major concern for us in this project. So we will have to consider the data from the gauges in determining success, even if we don't establish a particular threshold for success. I think what you are stating is that you do not agree to the 30-day consecutive flow standard, correct? If this is the case, then what is the minimum consecutive days of flow that you propose?

You have suggested modifications to the performance standards that were proposed in my letter of February 16th (see attached), but you have eliminated Standard 1 (which documented flow - see comment above) and Standard 2, Part b, which I think is critical to demonstrate the formation of a channel. Standard 2, Part a really only gets to the movement of water across a site, which is what we expect in the first few years. I think this standard would be met in most wetlands regardless of channel formation, so I think it's important to include the Part b as well, which gets to development of a channel. I suggest that we shift the timeframes so that Standard 2, Part a runs from monitoring years 1 through 3, and Part b runs from years 4 through 5. Obviously, this is compressed from the original, but if you only want a 5 year monitoring cycle, we (the IRT) need to have some assurances that the site is developing appropriately, to include the formation of a stream channel. That is, after all, the type of credit that will be generated.

Lastly, my letter also requested that a performance standard for tree vigor be included. Given the extent of excavation and earthwork on this project, I strongly feel that this standard needs to be included in the final mitigation plan. To account for the shorter monitoring period, it can be adjusted to 7 feet at year 5 instead of 10 feet at year 7.

Thanks,

Todd Tugwell
Special Projects Manager
Regulatory Division
Wilmington District
U.S. Army Corps of Engineers
11405 Falls of Neuse Road
Wake Forest, NC 27587
(919) 846-2564

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-----Original Message-----

From: Jurek, Jeff [mailto:jeff.jurek@ncdenr.gov]
Sent: Wednesday, September 05, 2012 3:49 PM
To: Tugwell, Todd SAW
Cc: Smith, Heather
Subject: Watts discussion

Todd, we appreciate you meeting with us the other day to discuss Watts. Below is the summary of what we discussed and what EEP would submit per your comments:

In response to our discussion on 8/28/12

EEP agrees with the 1.5:1 ratio for enhancement for the project length.

EEP agrees to monitor for five years; if at the end of the five year monitoring period, the IRT can make the determination, based on inconclusive monitoring data, to have EEP monitor two more years.

EEP agrees to place a vegetation plot on the slope of the headwater stream

EEP will place pressure transducers across a portion of the headwater valley and will monitor/report the results but they will not be used as success criteria

EEP will submit a more realistic targeted wetland hydroperiod (to be determined)

EEP will use the success criteria suggested by the USACE as listed below:

Evidence of channel formation within the valley or crenulation must be documented through the identification of field indicators on an annual basis in accordance with the following schedule:

a. During monitoring years 1 through 4, the preponderance of documented field indicators must demonstrate the accumulation of flow within the topographic low-point of the valley or crenulation. Documented indicators may include any of the following indicators or any of the indicators listed in part b:

- i. Presence of litter and debris (wracking) indicating a surface water flow;
- ii. Leaf litter disturbed or washed away;
- iii. Matted, bent or absence of vegetation (herbaceous or otherwise) indicative of surface flow;
- iv. Sediment deposition and/or scour indicating sediment transport by flowing water;
- v. Water staining due to continual presence of water;

Jeff Jurek
Project Management Manager
NC Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652
(919) 715-1157 phone
(919) 715-2219 fax
jeff.jurek@ncdenr.gov <mailto:jeff.jurek@ncmail.net>

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Classification: UNCLASSIFIED
Caveats: NONE