

**UT Pembroke Creek Wetland
and Stream Restoration Site
Conceptual Repair Plan
Project # 283
Chowan County**



Submitted to:



NCDENR-EEP, 1652 Mail Service Center, Raleigh, NC 27699-1652

Submitted: October 2010



**Landmark Center II, Suite 220
4601 Six Forks Road
Raleigh, NC 27609
Phone: (919) 783-9214
Fax: (919) 783-9266**

**Project Manager: Adam Spiller
Email: adam.spiller@kci.com
Project No: 12090965B_20**

1.0 Executive Summary

1.1 Site Description

The North Carolina Ecosystem Enhancement Program (EEP) restored, enhanced, and preserved wetlands and restored a headwater wetland valley, which is analogous to a stream in this setting at the UT Pembroke Creek Site in Chowan County, North Carolina. The 59-acre site is located within the USGS 8-digit HUC 03010205 of the Pasquotank River Basin. Prior to restoration, the site was planted in row crops and had been ditched since the 1920's. The restoration project in fall of 2007 restored and enhanced the wetland by filling the ditches and focusing the hydrology into headwater wetland valleys. The project also preserved a large forested wetland and decommissioned an animal waste lagoon adjacent to the project. The project goals and objectives are listed below.

Goal: Modify the channelized water features, based on reference condition, with the intent to restore the sites primary wetland functions such as nutrient cycling, flood storage, and providing wildlife habitat.

Objectives:

- Improve water quality in the basin by filtering nutrients through on-site wetlands.
- Buffer flood flows downstream by increasing infiltration and storage areas.
- Design a waterway through the wetland complex with appropriate cross-section, slope, and pattern as to provide nutrient filtering, flood storage, and wildlife habitat while meeting the appropriate success criteria for the wetland.
- Improve terrestrial and aquatic habitat diversity.
- Establish a contiguous buffer along the project that can serve as a migration corridor for local fauna.
- Use natural materials and native vegetation into the proposed restoration design to the greatest extent possible.
- Establish a native forested riparian plant community within the non-wetland buffer area.
- Establish a headwater wetland community.
- Provide an aesthetically pleasing landscape.

1.2 Adaptive Management Needs

The two roads that divided the site into three separate pieces were site constraints in the original design of the project. The restoration installed road crossings on each road where water can flow over the roads to facilitate the movement of water through the site. One road (Road A) runs east-west and separates the two large restoration parts of the project, and the other road (Road B) runs north-south and separates most of the preservation part of the site from the restoration part (see Plan Sheet 2). Even with the installation of the crossings, these two roads are still impeding the flow of water through the wetland. Road B is specifically holding water in a large depression in the center of the site. During the winter months, this area of standing water occupies almost three acres. This artificially long hydroperiod is atypical for headwater wetlands. There is also a structure at the bottom of the site that provides a stable flow path for water leaving the site. The elevation of this structure impedes the natural flow of water through the site. It holds water in the preservation wetland, preventing a natural drawdown throughout the site. In the future some of these issues may be resolved by the increased evapotranspiration that comes with more mature vegetation on the site. In the meantime the water needs to move down the valley and draw down as it would in a natural wetland.

These hydrologic concerns are linked to problems with the planted vegetation survivability. In the depressions with long durations of standing water many of the planted trees have died. Some of the plants may have survived if more flood tolerant species were planted and the planting stock had been more mature. In other parts of the site *Juncus effusus* has become so thick and tall that it is outcompeting the planted vegetation.

1.3 Additional Project Information

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in project monitoring reports. Narrative background and supporting information can be found in the mitigation and restoration plan documents available on EEPs website. All raw data supporting the tables and figures in the appendices are available from EEP upon request.

2.0 Repair Approach

2.1 Description

In early June 2010, KCI conducted a site survey at the UT Pembroke Site. This survey was used to verify the elevations of the roads, the road crossings, the grade transition structure, and the elevation of the surrounding wetland areas. The information from this survey was used to develop this conceptual plan for repairs at the UT Pembroke Site to correct the failures described in Section 1.2.

2.1.1 Piped Road Crossings

To ensure that Road A does not impede the natural surface flow between the two halves of the restored wetland, three drainage pipes will be installed under the access road that runs west to east. The pipes will be 8" schedule 40 PVC. These pipes will increase the volume of water that can flow from the northern to the southern half of the site without flowing over the top of the road. The current elevation of the two crossings on Road A is 17.6'. The new pipes will be installed approximately two tenths higher than the road crossings. This will maintain primary flow through the headwater wetland valley, but larger flows will access the pipes and not be impeded by the presence of the road, improving drawdown time.

2.1.2 Additional Road Crossing

To reduce the quantity of standing water in the depression area adjacent to Road B an additional road crossing will be installed (see Plan Sheet 2). This action will distribute some of this water across the road and into the preservation wetland, where it will flow south to the grade transition structure. This will not eliminate the standing water, because parts of the depression will still be lower than the crossing, but it will reduce the area of standing water, especially in the winter months and improve the drawdown time for the site. The current elevation of the road adjacent to the depression is 15.5'. The elevation of the proposed road crossing will be around 14.3'. This elevation is only 0.2' below the wetland valley's primary road crossing farther south on Road B, but between the depression and the current primary road crossing there are high parts of the wetland that hold water in depressions and prevent access to the crossing. Instead of a large amount of grading within the wetland valley to adjust these elevations,

the additional road crossing is an alternative that will minimize direct construction impacts to the restored wetland.

2.1.3 Alteration to Grade Transition Structure

Currently the grade transition structure contributes to the ponding and long hydroperiod at the site. The top of the structure is set at 15.0', which is higher than the southern parts of the preservation wetland and the primary road crossing on Road B (14.5'). To reduce the amount of standing water in the preservation wetland the top of the existing grade transition structure will be lowered. This will involve removing the two logs from the top of the structure and grading down the stone by approximately one foot. The second log structure is piping and will be reconstructed at 13.9' in elevation. Filter fabric will be installed to prevent piping. These measures will still maintain a small ponded area at the southern part of the preservation wetland; however this structure will no longer influence the flow and hydroperiod on the western side of Road B. This elevation has been selected based on the current elevations of the water table in the restored and preservation wetlands, which provide a reference for restoring a seasonal drawdown of the water table across the project site. Since some parts of the preservation wetland are lower in elevation than 13.9', there will still be pockets of standing water, but the adjusted structure will restore a natural drawdown process in the preservation wetland and the other wetlands south of Road A.

2.1.4 Additional Planting

The site will also be planted with additional trees (see Plan Sheets 3 and 4). The planting will include a variety of containerized and tubling materials. The areas of standing water will be replanted with approximately 3,500 trees that are tolerant of these conditions, such as bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*). Other parts of the wetland restoration will be planted with approximately 4,850 tublings to increase the woody species diversity and fill in any areas that experienced increased mortality. Fifty-five 1" caliper trees will be planted along portions of the conservation easement that are bordered by row crops, and some will be put in the large ponded area.

2.2 Repair Goals and Objectives

Goals:

- Modify the wetland hydrology at the UT Pembroke Creek Site to decrease the amount and duration of standing water in the restored and preserved wetlands while maintaining the site's wetland hydrology.
- Increase the site's vegetative density, with particular attention to the areas with standing water.

Objectives:

- Add piped road crossings between the northern and southern parts of the site to facilitate surface flow.
- Build an additional road crossing between the southern part of the site and the preservation wetland, providing a flow path for the excess standing water in the restored wetland.
- Adjust the grade transition structure at the outlet of the preservation wetland to decrease the amount of standing water in the preservation wetland.
- Plant native trees and shrubs in parts of the site that have experienced excessive mortality of the previously planted vegetation.

2.3 Constraints Analysis

An overhead utility line runs adjacent to Road A. A fiber optic cable also runs underneath this road.

2.4 Mitigation Projection

The repairs will alter the path of the headwater wetland valley (see Figures 1 and 2). By installing the new road crossing, the headwater wetland valley will cross Road B and flow south along the eastern side of the road to the site's downstream outlet. This change will convert some area from wetland preservation to headwater wetland valley (stream) restoration. This modified flowpath coincides with the natural valley through the site. The flat valley is also the reason that Road B was built in this location. Since the road is not in the conservation easement, the 100' corridor for the new location of the wetland valley will extend to the western side of Road B. This change will decrease the preservation credit, but increase the restoration credit at the site. In addition to altering the location of the centerline at the new road crossing, this asset projection also corrects a conflict in the centerline location that was carried over from the as-built documentation. This conflict is illustrated in Figure 1, where the centerline is not in the center of the wetland valley. The centerline has been repositioned and stationed in Figure 2. See Tables 1 and 2 for the revised credit calculation.

2.5 Estimate of Cost

It is anticipated that the cost for this project, including all work associated with replanting the site and modifying and adding structures, will total approximately \$107,710.

TABLES AND FIGURES

Table 1. Project Restoration Components
Project Number and Name: 283 - UT Pembroke

Project Component	Restoration Level	Original Acreage / Linear Feet	Post Repair Acreage / Linear Feet	Original Stationing	Post Repair Stationing	Comment
Headwater Wetland Valley	Restoration	4,488 lf	4,344 lf	00+00 to 34+73 and 40+00 to 58+72	00+00 to 34+81 and 40+00 to 57+18	This feature is 100 feet wide for its entire length, encompassing 9.94 acres.
Riparian Wetlands	Restoration	13.81 ac	14.41 ac	N/A	N/A	
Non-Riparian Wetlands	Restoration	4.46 ac	4.46 ac	N/A	N/A	
Non-Riparian Wetlands	Enhancement	5.26 ac	5.26 ac	N/A	N/A	
Riparian Wooded Wetlands	Preservation	8.95 ac	8.35 ac	N/A	N/A	
Non-Riparian Wooded Wetlands	Preservation	16.97 ac	16.97 ac	N/A	N/A	

Table 2. Post-Repair Component Summations
Project Number and Name: 283 - UT Pembroke

Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-Riparian (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	4,450	14.41		4.46			
Enhancement				5.26			
Enhancement I							
Enhancement II							
Creation							
Preservation		8.35		16.97			
HQ Preservation							

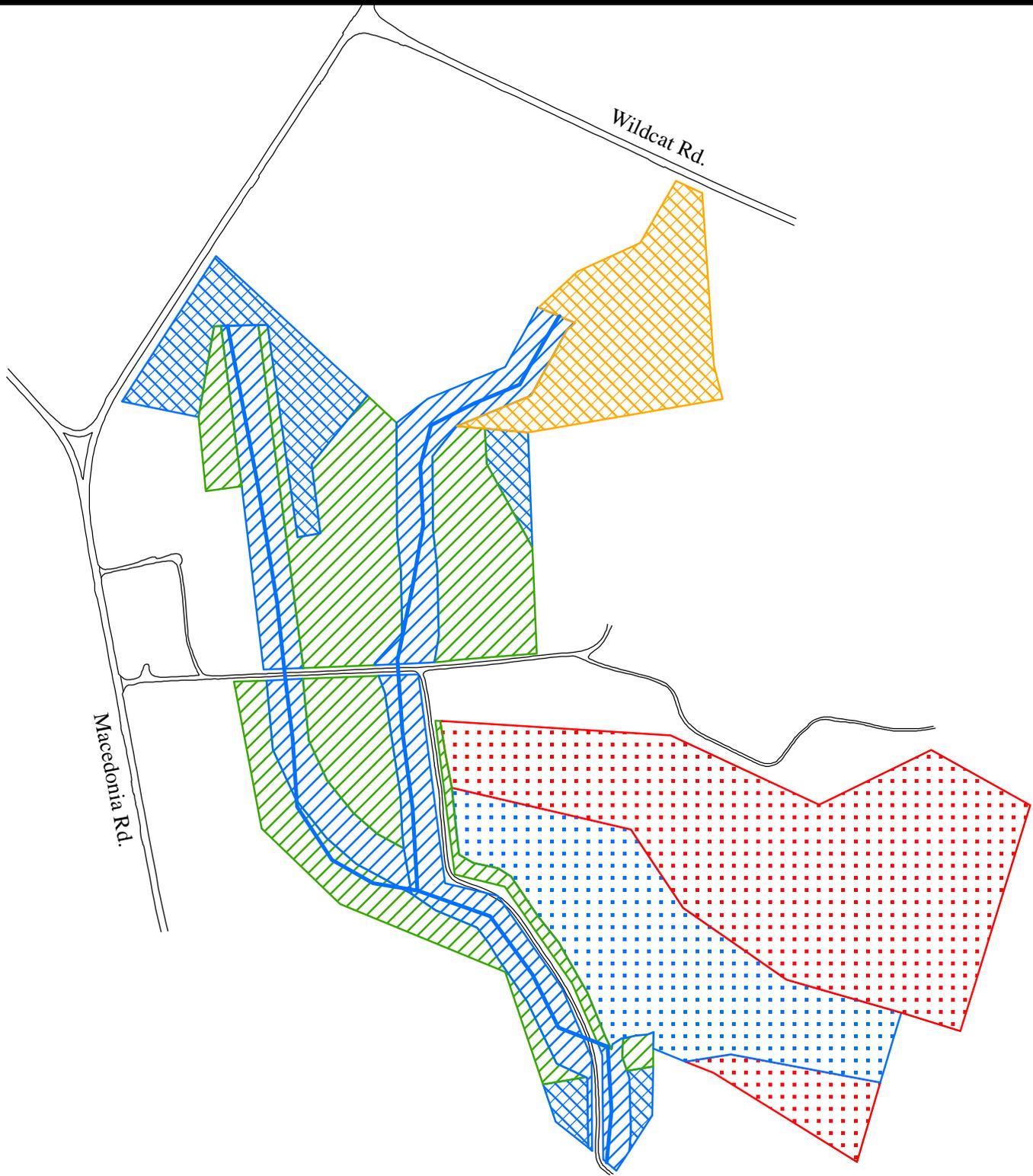


Figure 1. Pre-Repair Site Asset Map
UT Pembroke Creek, Chowan County, EEP Project # 283

- | | |
|--|---|
|  Wetland Valley Centerline (4,488 lf) |  Non-Riparian Wooded Wetland Preservation (16.97 ac) |
|  Headwater Wetland Valley (9.94 ac) |  Riparian Wetland Restoration (13.81 ac) |
|  Non-Riparian Wetland Enhancement (5.26 ac) |  Riparian Wooded Wetland Preservation (8.95 ac) |
|  Non-Riparian Wetland Restoration (4.46 ac) | |



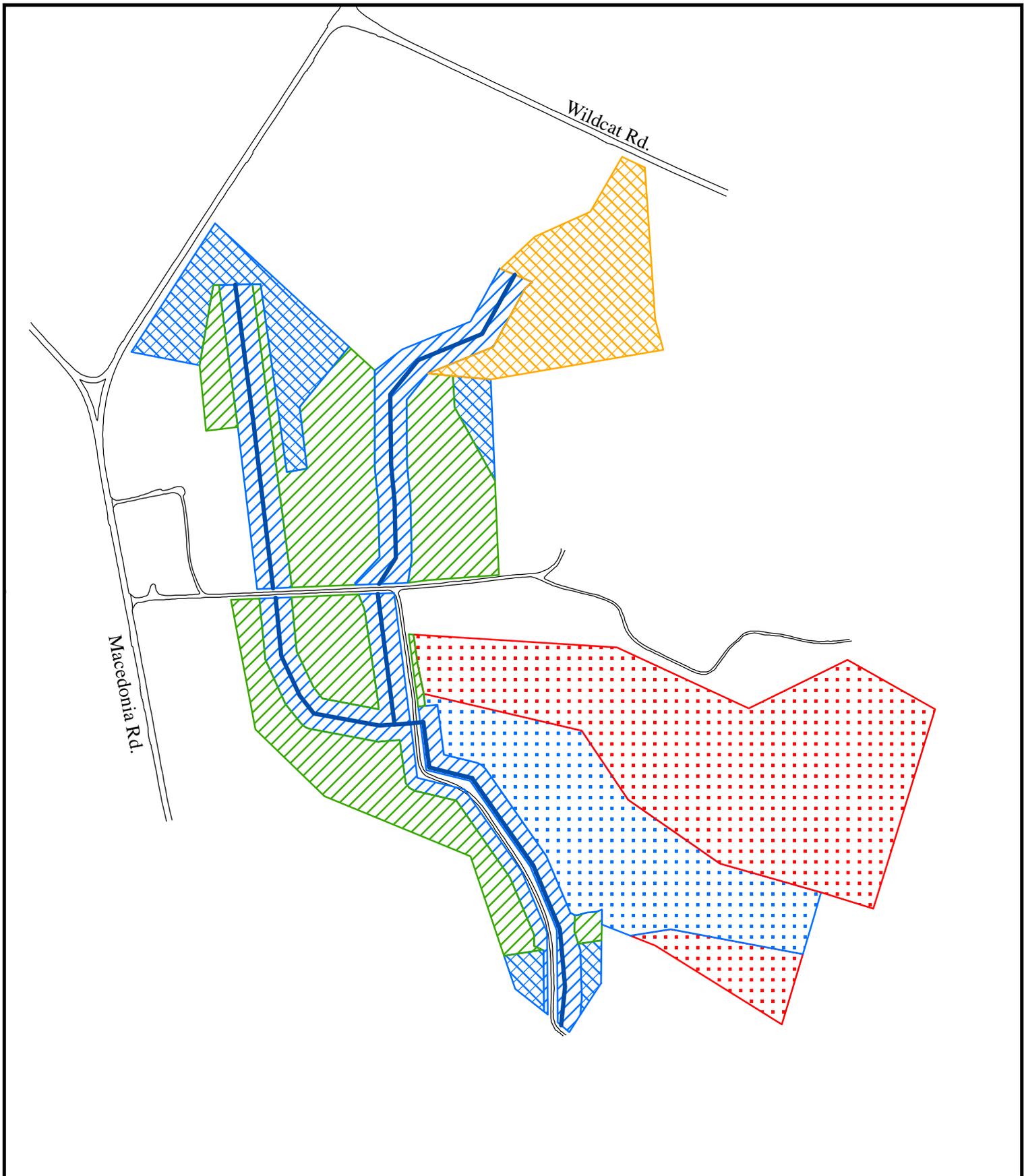


Figure 2. Post-Repair Site Asset Map
UT Pembroke Creek, Chowan County, EEP Project # 283

- | | |
|--|---|
| Wetland Valley Centerline (4,355 lf) | Non-Riparian Wooded Wetland Preservation (16.97 ac) |
| Headwater Wetland Valley (9.94 ac) | Riparian Wetland Restoration (14.41 ac) |
| Non-Riparian Wetland Enhancement (5.26 ac) | Riparian Wooded Wetland Preservation (8.35 ac) |
| Non-Riparian Wetland Restoration (4.46 ac) | |



PLAN SHEETS

KCI JOB# : 12090965B

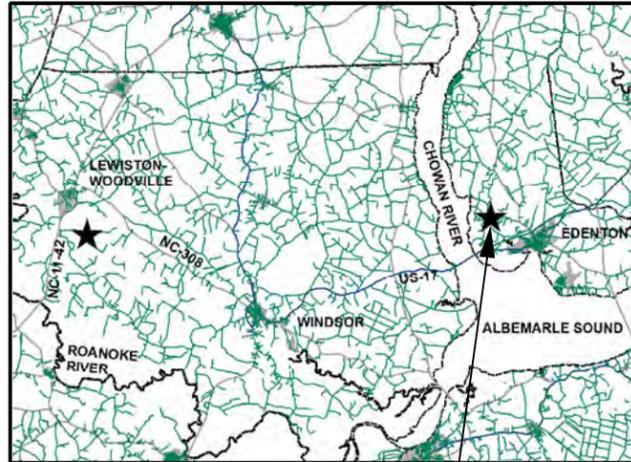
STATE	CONTRACT NUMBER	SHEET NO.	TOTAL SHEETS
N.C.	D09077S	1	4

A CONCEPTUAL PLAN		10/0	
SYN.	DESCRIPTION	DATE	APPROVED
REVISIONS			

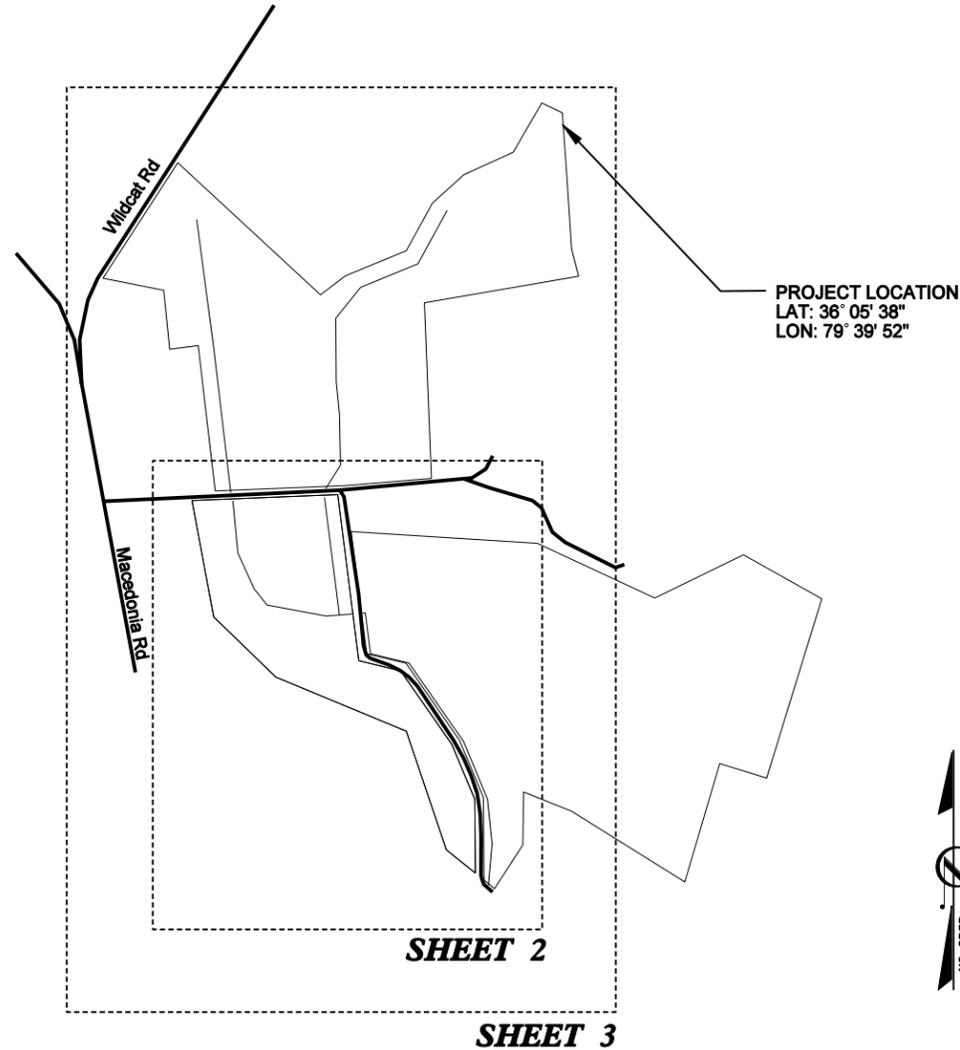
STATE OF NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM

UT PEMBROKE CREEK REPAIR

CHOWAN COUNTY, NORTH CAROLINA



UT PEMBROKE CREEK SITE
VICINITY MAP
NOT TO SCALE



CONCEPT PLAN

INDEX OF SHEETS

- 1 TITLE SHEET
- 2 REPAIR PLANS
- 3 - 4 PLANTING PLAN

DIRECTIONS TO SITE

To UT Pembroke from Raleigh, take US-64 East. Continue on US-64 East for approximately 100 miles. US-17 North will merge with US-64 East; stay on US-17 North for approximately 30 miles. Take Edenton exit, number 224. Take a left onto W. Queen St. Continue 1,500 feet and take a left onto Emperor Landing Rd. Follow Emperor Landing Rd. for approximately 1,200 feet and take a right onto Tip Toe Rd. Follow Tip Toe Rd. to a T intersection and take a left onto Macedonia Rd. The site is on the right.



SUITE 220 LANDMARK CENTER II
4601 SIX FORKS RD., RALEIGH, NC

Prepared In the Office of:

Prepared for:

TRACY MORRIS
EEP PROJECT MANAGER

LIN XU
EEP REVIEW COORDINATOR

Prepared by:

GARY M. MRYNCZA, PE
PROJECT ENGINEER

ADAM SPILLER
PROJECT DESIGNER

PROJECT ENGINEER

Prepared for:



SIGNATURE:

P.E.

SCO #: 050608802

PROJECT ENGINEER

SYL	DESCRIPTION	DATE	APPROVED



KCI
ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
460 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

**UT PEMBROKE
REPAIRS AND REPLANTING
EEP PROJECT #283
CHOWAN COUNTY, NORTH CAROLINA**

DATE: JULY 2010
SCALE: 1" = 200'

**PLANTING
PLAN**

SHEET 3 OF 4

