DANIEL'S FARM PHASE II
WETLAND RESTORATION
MITIGATION PLAN
JUNE 2006

FULL DELIVERY PROJECT

CONSULTANT: KCI

EXECUTIVE SUMMARY

The Daniels Farm #2 Wetland Restoration Site is located southeast of Louisburg, North Carolina in Franklin County and is situated on an unnamed tributary to the Tar River within the United States Geologic Survey (USGS) 8-digit Hydrologic Unit Code (HUC) 03020101. The project watershed occupies 313.8 acres and drains directly to the Tar River. The area within the project watershed is in a rural section of Franklin County and consists primarily of forest and agriculture. The site is located within the Piedmont physiographic province and is part of the Northern Outer Piedmont Level IV Ecoregion.

The 34.0-acre project site is contained in a small, shallow drainage leading to the Tar River. Much of the land has been selectively logged and ditches and berms altered the site hydrology. A first-order, unnamed tributary to the Tar River (UTTR) bisects the site, flowing north shortly before turning east-southeast and flowing into the Tar River just below the project site boundary. The stream originates from a series of seeps and three ponds directly south of the project site and then gathers groundwater and additional drainage, which allows it to maintain a year-round perennial flow. In addition to the UTTR, a network of drainage ditches were constructed to drain the site for forestry and agriculture.

The hydrology for the site wetlands is driven primarily by surface water inputs: precipitation, overland flow from upstream slopes, overbank events from the UTTR, and periodic flooding from the Tar River. Hydrologic analyses of the site determined that pre-construction there were 13.75 acres of drained hydric soils, 4.51 acres of modified wetlands, and 10.27 acres of existing high quality wetland within the 5-year floodplain of the Tar River. The Daniels Farm #2 wetland restoration project will restore, enhance, and preserve a riverine Piedmont Bottomland Hardwood wetland community along the Tar River in central Franklin County.

This project proposes to improve water quality and protect aquatic habitat in a predominantly agricultural area by restoring and enhancing 18.3 acres of riverine wetland and preserving 10.3 acres of riverine wetland. Construction of the Daniels Farm #2 wetland restoration site was completed in March 2006. The wetland restoration areas at the project site include two agricultural fields as well as a forested section along the UTTR. These sections have the necessary hydric soils, but did not contain adequate vegetation and hydrology for jurisdictional wetland status. Hydrologic restoration consisted of filling in ditches and creating microtopography to direct water onto the restoration areas and lengthen the path and slow the flow of water through the wetlands. The restored sites have been replanted with hardwood species typical of a Piedmont Bottomland Hardwood Community.

Forested land in the southwestern corner of the project site has jurisdictional wetland status, but will benefit from enhancement. This section is believed to have contained a small stream before berms and ditches changed the flow patterns through the wetland. KCI has directed flow from the constructed ditch back into the old stream channel. The enhancement area has also been planted with hardwood species to increase species diversity among the existing vegetation.

In addition to the restoration and enhancement portions of the project, 10.3 acres of riverine wetland have been preserved. This wetland is located in the southeastern section of the project site and contains a functioning Piedmont Bottomland Hardwood Community. Small inclusions of upland and nonriverine wetland have also been included in the project in order to fully restore the surrounding ecosystem.

Mitigation Summary Table

	Restoration	**Enhancement**	**Preservation**	**TOTAL**
Riverine Wetland Acreage	13.75	4.51	10.27	28.53
Nonriverine Wetland Acreage	0.68	0.72	0.11	1.51
TOTAL	**14.43 acres**	**5.23 acres**	**10.38 acres**	**30.04 acres**

A monitoring program will be implemented to observe the progress toward achieving mitigation goals and objectives within the restored wetland areas. Monitoring data will be collected annually for a period of five years or until vegetative and hydrologic success criteria are achieved. Wetland hydrology will be monitored by automatic recording wells located within the project area and reference wetland. Automatic recording wells will be established within restoration areas at a density of one automatic well per four acres. Wetland hydrology will be considered established if well data from the site indicates that the water table is within 12 inches of the soil surface for 5% (12 days) of the growing season (235 days) during normal weather conditions. Permanent monitoring plots (10 x 10 meters) will be established in the wetland restoration areas at a density that will ensure 2% coverage of the total restoration acreage. Data will be collected at each plot for: total number of stems, species, percent survival, height, and evidence of insects, disease or browsing. Survival of planted species must be 320 stems/acre at the end of five years of monitoring. Non-target species must not constitute more than 20 percent of the woody vegetation based on permanent monitoring plots.

The success of the enhancement area vegetation will be based on changes in vegetation. Using a baseline created from the existing vegetation sampling point in the enhancement area, each subsequent monitoring year will compare the change in basal area of undesirable species. The enhancement area will be considered successful if the undesirable species (*Acer rubrum* and *Liquidambar styraciflua*) decrease in basal area proportional to desirable species.

TABLE OF CONTENTS

Figures

Tables

Appendices

1.0 INTRODUCTION

The Daniels Farm #2 Wetland Restoration Project restored and enhanced 19.7 acres of wetland and preserved 10.4 acres of wetland in the Tar-Pamlico River Basin. The project was initiated in spring of 2005 and construction was completed in the spring of 2006. The goals of the project are to restore ecosystem processes, structure, and composition to mitigate for wetland functions and values that have been lost as a result of anthropogenic disturbances in this region of the Tar-Pamlico River Basin. Functions that will be restored include:

- Aquatic/Terrestrial Wildlife Habitat
- Water Quality
- Groundwater Recharge
- Nutrient Cycling

2.0 SUMMARY

The Daniels Farm #2 Wetland Restoration Site is located within the Tar-Pamlico River Watershed (USGS Hydrologic Unit 03020101) and North Carolina Division of Water Quality (NCDWQ) sub-basin 03-03-01 (Figure 1). The local watershed drains approximately 314 acres in a rural section of Franklin County, North Carolina. The project watershed is located within the Piedmont physiographic province and is part of the Northern Outer Piedmont Level IV Ecoregion. The site is only about 12 miles west of the edge of the Rolling Coastal Plain Level IV Ecoregion, which is part of the Southeastern Plains physiographic region.

According to the county soil survey, the dominant soils within the project site are the Roanoke-Wahee Complex with minor inclusions of Altavista Sandy Loam. Roanoke-Wahee soils are low gradient, very deep, somewhat poorly to poorly drained soils found on floodplains and stream terraces. Altavista Sandy Loam is low gradient, very deep, moderately well drained soils found on low stream terraces. Additional soils within the project watershed include Appling Loamy Sand, Wedowee Sandy Loam, Vance Sandy Loam, State Loam, Wake-Saw-Wedowee Complex, and Cecil Sandy Loam (USDA, NRCS 1998).

Based on the historical aerial photos reviewed for this site, the Daniels Farm #2 Site was primarily forested until sometime between 1973 and 1982, when portions of the site were cleared for agricultural production. There is no visible evidence of mass disturbance such as filling or mining on the property in any of the review photographs.

Site hydrology was evaluated during field investigations. Wetland hydrology at the site is driven primarily by surface water inputs: precipitation, overland flow from upstream slopes, overbank events from an unnamed tributary to the Tar River (UTTR), and periodic flooding from the Tar River. Existing site hydrology was modeled by developing an annual water budget that calculates water inputs and outputs in order to compare the change in storage on a monthly time step. Two water budgets were developed – Budget #1 for the agricultural land in the northeastern portion of the project site and Budget #2 for the agricultural and forested area in the western portion. Both wetland budgets drain to the UTTR and then on to the Tar River. During the late summer, both Budgets #1 and #2 show that the preconstruction conditions were unsaturated within the upper 12 inches of soil. Ditches and berms prevented the site from experiencing the maximum amount of hydrologic inputs it could receive.

KCI also conducted a hydrologic analysis to determine which wetlands are within the 5-year Tar River floodplain. Based on this analysis, preconstruction conditions included 13.8 acres of drained hydric soils, 4.5 acres of modified wetlands, and 10.3 acres of existing high quality wetland within the 5-year floodplain of the Tar River. The drained hydric soils had been used for agriculture and did not qualify as jurisdictional wetlands. The 4.5-acre portion of modified wetland existed at the southwestern portion of the project site. This area had maintained its primary wetland vegetative communities, but ditches that drained the forested portion had altered its hydrology. The area had adequate hydrology for jurisdictional status, but the hydrologic conditions were improved by removing the ditches. Existing wetlands – primarily in the southeast portion of the project site along the UTTR - total 10.3 acres and contain Piedmont Bottomland Hardwood Wetlands in good condition.

There are also 0.7-acre of drained hydric soils, 0.7-acre of modified wetland, and 0.1-acre of intact wetland that are not within the 5-year floodplain and are classified as nonriverine wetland.

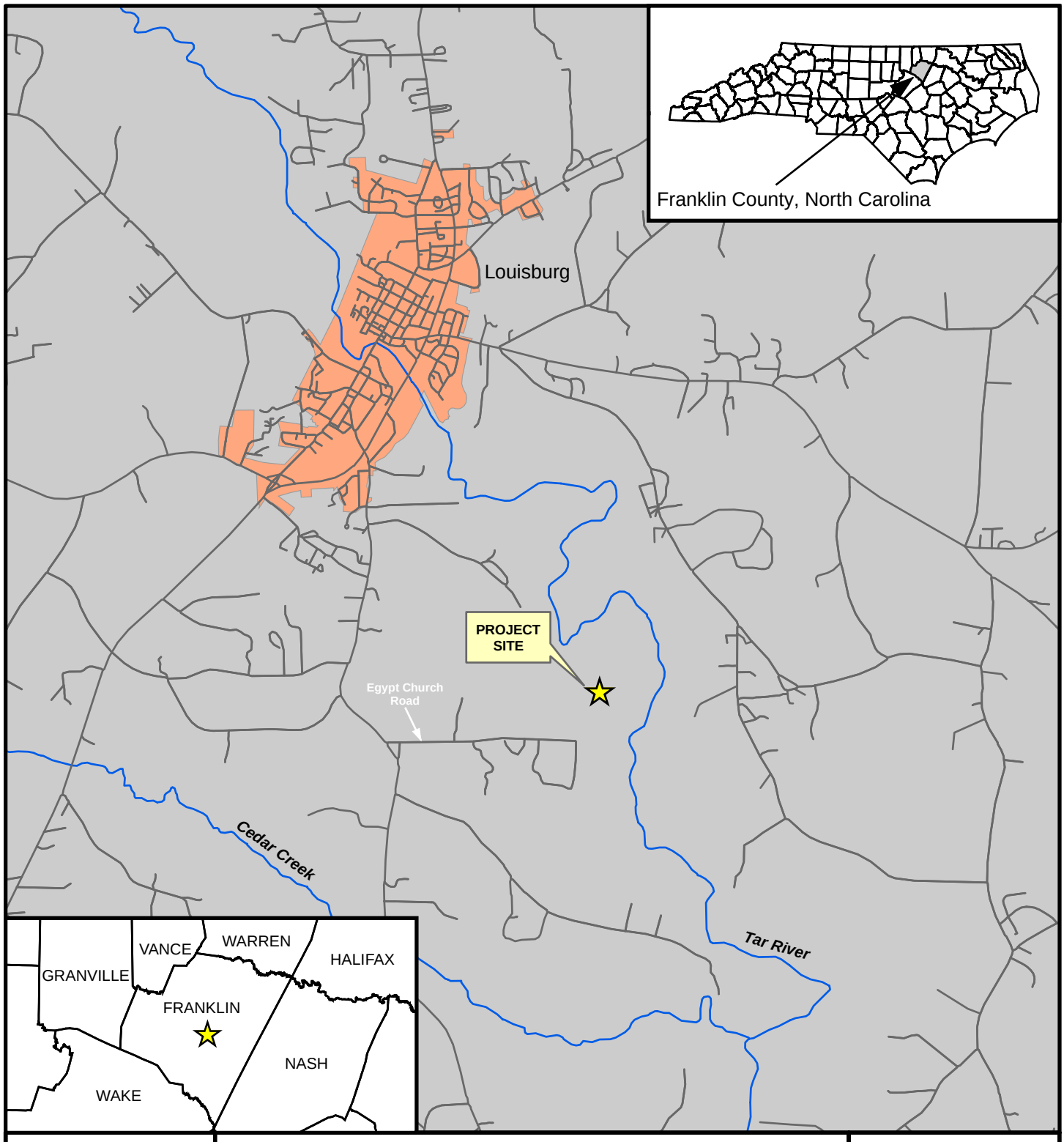

Figure 1. Site Location

- Project Site
- Roads
- Major Rivers
- Municipalities
- Counties

N
W E
S

1:63,360
1 inch equals 1 miles

1 0.5 0 1 Miles

KCI TECHNOLOGIES

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

Restoration of the site focused on the removal of hydrologic alterations and reforestation of the site with species common to Piedmont Bottomland Hardwood Forest. The restoration activities resulted in substantial enhancement of the existing water quality and habitat functions on-site. The elimination of channelized flow from agricultural ditches that drain to the UTTR reduced nutrient, pesticide and sediment runoff from the site. Plugging and filling ditches resulted in increased short-term surface and subsurface water storage and a subsequent increase in the duration and elevation of the seasonally high water table.

Specific actions conducted to achieve the goals and objectives of the project included:

- Filling drainage ditches throughout the site
- Removing ditch spoil from wooded areas to restore natural drainage patterns
- Placing water diversion features, where appropriate, to redistribute the surface hydrology
- Recreating microtopography across the site to enhance surface water retention and storage
- Ripping the ground surface to reduce compaction from livestock
- Re-vegetating the site with Piedmont Bottomland Hardwood Forest species

Designed/Monitoring by: KCI Technologies, Inc. / KCI Associates of North Carolina, PA

Construction by: KCI Environmental Technologies and Construction Inc.

3.0 SUCCESS CRITERIA

3.1 Hydrology

Groundwater elevations will be monitored to demonstrate the attainment of jurisdictional hydrology. Wetland hydrology will be considered established if well data from the site indicates that the water table is within 12 inches of the soil surface for 5% of the growing season (NRCS published or locally calculated) during normal weather conditions. A "normal" year is based on NRCS climatological data for Franklin County, and using the 30th to 70th percentile thresholds as the range of normal, as documented in the USACOE Technical Report "Accessing and Using Meterological Data to Evaluate Wetland Hydrology, April 2000." According to the USDA, NRCS Franklin County Soil Survey, the growing season is considered to extend from March 20 to November 11, yielding 235 days. Therefore, success will be achieved if the water table is within 12 inches of the soil surface for 12 days during the growing season.

3.2 Vegetation

The success criteria for the planted species in the restoration areas will be based on survival and growth. Survival of planted species must be 320 stems/acre at the end of five years of monitoring. Non-target species must not constitute more than 20 percent of the woody vegetation based on permanent monitoring plots.

The success of the enhancement area vegetation will be measured using a baseline created from the existing enhancement vegetation sampling point. Each subsequent monitoring year will compare the change in basal area of undesirable species using the US Army Corps of Engineers criteria (1987). The enhancement area will be considered successful if the undesirable species (*Acer rubrum* and *Liquidambar styraciflua*) decrease in basal area proportionate to desirable species.

3.3 Soils

Soils in the restoration portion of the site have been determined to be hydric soils on the state and federal hydric soils lists. NRCS verified the limits of hydric soils and confirmed their status as Prior Converted wetland. As the soils are already considered hydric, no success criteria or monitoring is required.

4.0 MONITORING SCHEDULE

The site will be monitored for a period of five years beginning in 2006 through 2010 or until success criteria are achieved. Reports will be submitted to EEP each year. Monitoring will include collection of vegetative and hydrologic data, photo documentation and an annual site walk (see "As-Built Plans" for locations).

4.1 Hydrology

Groundwater elevations will be monitored to demonstrate the attainment of jurisdictional hydrology. Verification of wetland hydrology will be determined by automatic recording well data collected within the project area. Automatic recording wells will be established within restoration areas at a density of one automatic well per four acres. Data will be collected from automatic wells over the 5-year monitoring period following implementation.

4.2 Vegetation

Permanent monitoring plots (10 x 10 meters) will be established in the wetland restoration areas at a density that will ensure 2% coverage of the total restoration acreage. Plots will be systematically located to ensure even placement. Data will be collected at each plot for: total number of stems, species, percent survival, height, estimated percent cover of all species, and evidence of insects, disease or browsing. A separate plot will be established in the enhancement area to sample for changes in basal area on a yearly basis.

5.0 MITIGATION

Mitigation for wetland impacts will be achieved through the restoration of Prior Converted wetlands, the enhancement of existing wetlands, and the preservation of existing wetlands on the site. The site is 34.0 acres of land, 14.4 of which had been classified as Prior Converted wetland due to artificial drainage on the site (PC Wetland per NRCS), 5.2 of which have been classified as jurisdictional wetland in need of enhancement, and 10.4 acres of which had been classified as jurisdictional wetland. The restoration of the site removed artificial drainages and re-vegetated 19.7 acres of Piedmont Bottomland Hardwood Forest that historically occupied this landscape position. The project also preserved 10.4 acres of existing Piedmont Bottomland Hardwood Forest. The restoration of these wetlands will result in 15.9 wetland mitigation units to offset un-avoidable wetland impacts in the Tar-Pam River Basin.

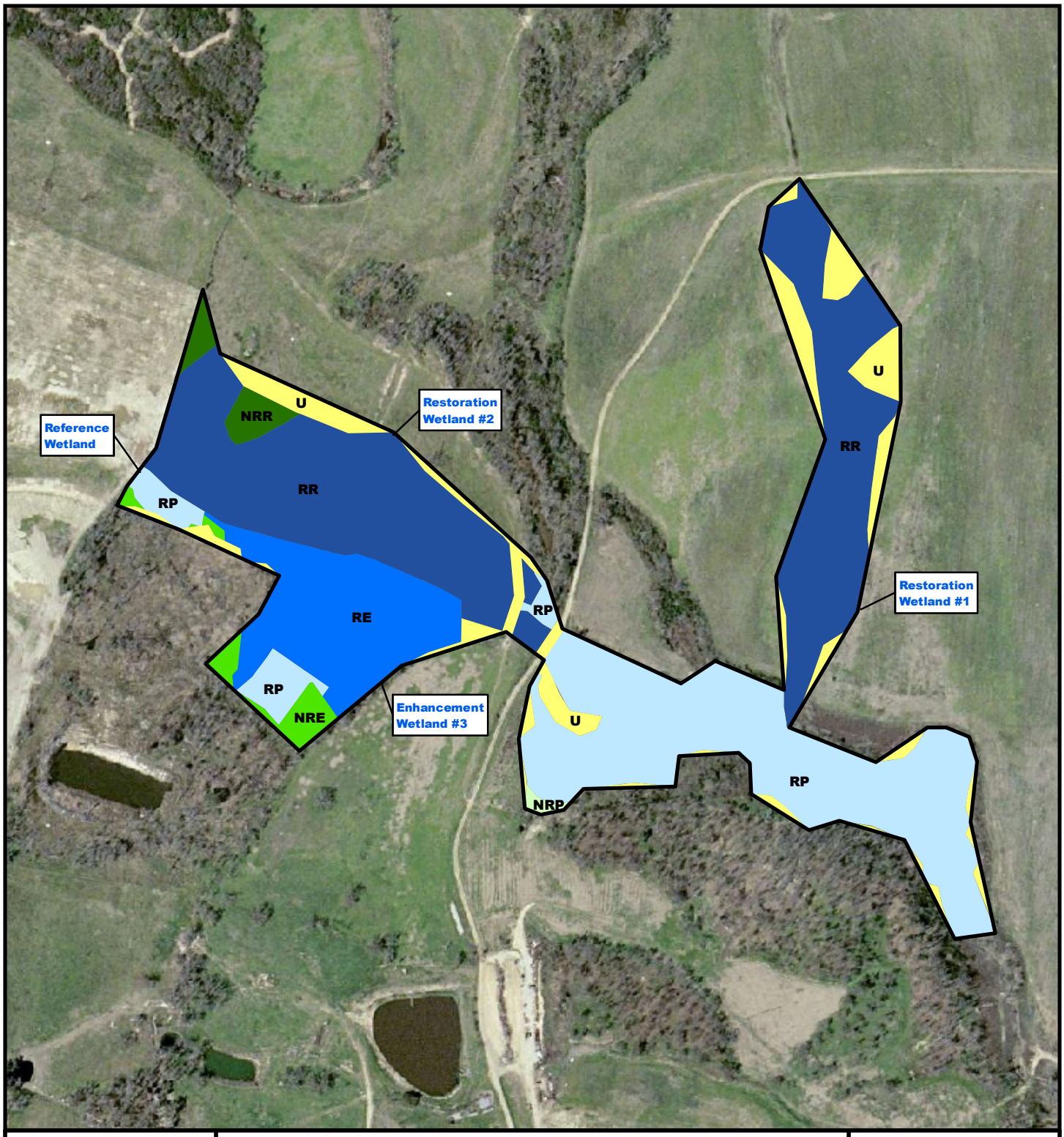

Figure 2. Mitigation Type and Extent

- Riverine Restoration (RR) - 13.8 acres
- Riverine Enhancement (RE) - 4.5 acres
- Riverine Preservation (RP) - 10.3 acres
- Upland Inclusions (U) - 4.0 acres
- Project Site Boundary
- Nonriverine Restoration (NRR) - 0.7 acres
- Nonriverine Enhancement (NRE) - 0.7 acres
- Nonriverine Preservation (NRP) - 0.1 acres

1:4,800
1 inch equals 400 feet
400 200 0 400 Feet

Image Source: AirPhotoUSA April 1, 2004

KCI TECHNOLOGIES

KCI ASSOCIATES OF NC
ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

6.0 MAINTENANCE AND CONTINGENCY PLANS

Activities will be conducted throughout the year and may include invasive species control, debris or trash removal, etc. If the monitoring of the site identifies a failure to attain specific success criteria, a remedial action plan will be developed that investigates the cause of the failure and proposes actions to rectify the problem.

Contingency and maintenance plans were developed to help ensure the proper maintenance of the restored wetlands in order to promote the long-term success of the restoration project. Corrective actions, as detailed in Table 1, will be taken to rectify identified site problems as well as to address monitoring findings that indicate a failure to meet established success criteria.

Table 1 - Contingency Plans.

Identified Problem	*Corrective Action*	*Timeframe*
1. Ditch plugs or other hydrologic feature not functioning as designed.	Evaluate the cause for failure and design a remedial action to ensure hydrologic integrity on the site.	Immediate
2. Woody vegetation not meeting success criteria	Determine reason for failure, determine quantity of plantings required to replant, develop list of species to be utilized, and install in accordance with original design specifications.	Seasonal (during dormancy)
3. Barren areas void of herbaceous vegetation.	Determine reason for failure, prepare area applying topsoil and amendments as necessary, and reseed with appropriate mix.	Immediate
4. Invasive species edging out desirable species.	Hand removal of or herbicide application to invasive plants.	Immediate

Guidance related to the approved seed mixture to be used in the event any reseeding activities are necessary is provided in Table 2.

Table 2 - Re-seeding Specifications.

Summer Mix (April 15 – October 15)

Species		Application Rate (in Mix) % of Mix	lbs./acre
Redtop	*Agrostis alba*	5	1.5
Purple Lovegrass	*Eragrostis spectabilis*	5	1.5
Gama grass	*Tripsacum dactyloides*	35	10.5
Switchgrass	*Panicum virgatum*	30	9.0
Brown Top Millet	*Pennisetum glaucoma*	25	7.5
	TOTALS	100	30.0

Winter Mix (October 15 – April 15)

Same as above except substitute Rye Grain (*Secale cereale*) for Brown Top Millet.