MITIGATION PLAN

Twin Bays Restoration Site
Duplin County, North Carolina
EEP Contract 004739
EEP Project Number 95363

Cape Fear Basin
Cataloging Unit 03030007

Prepared for:

NC Department of Environment and Natural Resources
Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

FINAL – APRIL 2013

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Prepared by:

KCI Associates of North Carolina, PC
4601 Six Forks Rd, Suite 220
Raleigh, NC 27609
(919) 783-9214

FINAL – April 2013

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).*
- *NCDENR Ecosystem Enhancement Program In-Lieu Fee Instrument signed and dated July 28, 2010*

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

The Twin Bays Wetland Restoration Site (TBWRS) is a full-delivery mitigation project being developed for the North Carolina Ecosystem Enhancement Program (EEP). The TBWRS is former non-riparian wetland system in the Cape Fear Basin (03030007 8-digit HUC) in southern Duplin County, North Carolina that has been substantially modified to maximize agricultural production. The site offers the chance to restore impacted agricultural lands to non-riparian wetland habitat.

The Cape Fear River Basin Restoration Priorities state the goals for the TBWRS's 14-digit HUC are to expand restoration opportunities and repair riparian buffers (NCDENR EEP, 2009). The project goals for TBWRS are in line with the basin priorities and include the following:

- Slow and treat the runoff of upslope agricultural drainage
- Restore a Hardwood Flats Community
- Develop valuable wetland habitat niches within a drained agricultural landscape

The project goals will be addressed through the following objectives:

- Fill field ditches to restore surface flow retention and elevate local groundwater levels.
- Redevelop longer wetland flow patterns to increase surface flow retention time.
- Modify an existing pond to its natural seep condition to feed the downslope wetland.
- Restore a native forested hardwood wetland community using natives trees and seed mixes.

The site is located within a flat interstream divide that spans two unnamed tributaries to Rock Fish Creek and is currently used for agriculture. The majority of the site will be restored to non-riparian wetland with one smaller portion preserved as upland habitat. The ditches and ponds across the site will be filled and redeveloped to retain and distribute surface flow across the site. Once site grading is complete, the non-riparian communities will be planted as Hardwood Flats (NCWAM, v. 4.1 2010). The site will be monitored for seven years or until the success criteria are met.

R= Restoration RE= Restoration Equivalent of Creation or Enhancement

Twin Bays Restoration Site, Duplin County									
Mitigation Credits									
	Stream		**Riparian Wetland**		**Non-riparian Wetland**		**Buffer**	**Nitrogen Nutrient Offset**	**Phosphorous Nutrient Offset**
Type	R	RE	R	RE	R	RE			
Acres	-	-	-	-	11.1	-			
Credits	-	-	-	-	11.1	-	-	-	-
TOTAL CREDITS					11.1				

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1.0 RESTORATION PROJECT GOALS AND OBJECTIVES

EEP develops River Basin Restoration Priorities to guide its restoration activities within each of the state's 54 cataloging units. RBRPs delineate specific watersheds that exhibit both the need and opportunity for wetland, stream and riparian buffer restoration. These watersheds are called Targeted Local Watersheds (TLWs) and receive priority for EEP planning and restoration project funds.

The 2009 Cape Fear River Basin RBRP identified HUC 03030007090040 (Rock Fish Creek) as a Targeted Local Watershed (http://www.nceep.net/services/lwps/cape_fear/RBRP%20Cape%20Fear%202008.pdf). The watershed is characterized by 43% forested and 42% agricultural area with impacts to streams including channelization and nonpoint source pollution.

Rock Fish Creek was listed on the North Carolina 303(d) list in 2006, 2008, and 2010 for impaired biological integrity with the source of impairment undetermined; however, it is no longer listed in 2012. The Twin Bays Wetland Restoration Site (TBWRS) Project was identified as a wetland opportunity to improve habitat within the TLW.

The project goals address stressors identified in the TLW and include the following:

- Slow and treat the runoff of upslope agricultural drainage
- Restore a Hardwood Flats Community
- Develop valuable wetland habitat niches within a drained agricultural landscape

The project goals will be addressed through the following project objectives:

- Fill field ditches to restore surface flow retention and elevate local groundwater levels.
- Redevelop longer wetland flow patterns to increase surface flow retention time.
- Modify an existing pond to its natural seep condition to feed the downslope wetland.
- Restore a forested hardwood wetland community using native trees and seed mixes.

2.0 SITE SELECTION

2.1 Directions

The TBWRS is located on a single parcel located off of Cornwallis Road approximately two miles northwest of Wallace, North Carolina. To reach the site from Raleigh: proceed east on I-40 for approximately 69 miles. Then travel on US-117 south toward Wallace. Turn right onto NC-41 South/East Main Street. Travel for two miles (East Main Street turns into West Main Street and then Wallace Highway). Next, take a slight right onto Cornwallis Road. The site will be approximately 0.5 mile ahead on the right.

2.2 Site Selection

The site is part of the 03030007 USGS Cataloging Unit (Cape Fear). The Cape Fear River Basin as a whole is experiencing a large amount of habitat alteration due to population growth from Wilmington and its surrounding metropolitan area. As a result, the focus in this watershed is on mitigating impacts from stormwater and protecting and/or restoring existing habitat (NCDENR EEP, 2009).

The project site is bounded by Cornwallis Road to the west, a ditch along the property line to the south, and agricultural land to the east and north. The site has a long history of hydrologic modification in order to allow for farming to take place on the property. The existing site conditions are shown in Section 2.6 and seen in site photographs (Section 2.8). Within the 03030007 unit, the Rock Fish Creek drainage (03030007090040) remains relatively unaffected by urban development. The nearest named downstream water body is a reach of Rock Fish Creek (DWQ 18-74-29b), which is classified as Class C with the supplemental listing of Swamp Waters (Sw). Rock Fish Creek and its tributaries are not listed as impaired under the 2012 303(d) listing. However, less than 0.1% of the 14-digit HUC is protected and approximately 42% of its land use is in agriculture (NCDENR EEP, 2009). The project watershed for the TBWRS is comprised of 25.4 total acres. Current land use in the project watershed consists of agriculture (23.6 ac/93%), forest (0.6 ac/2%), and low-intensity development (1.2 ac/5%). The approximate total impervious cover of the project watershed is 2.0%.

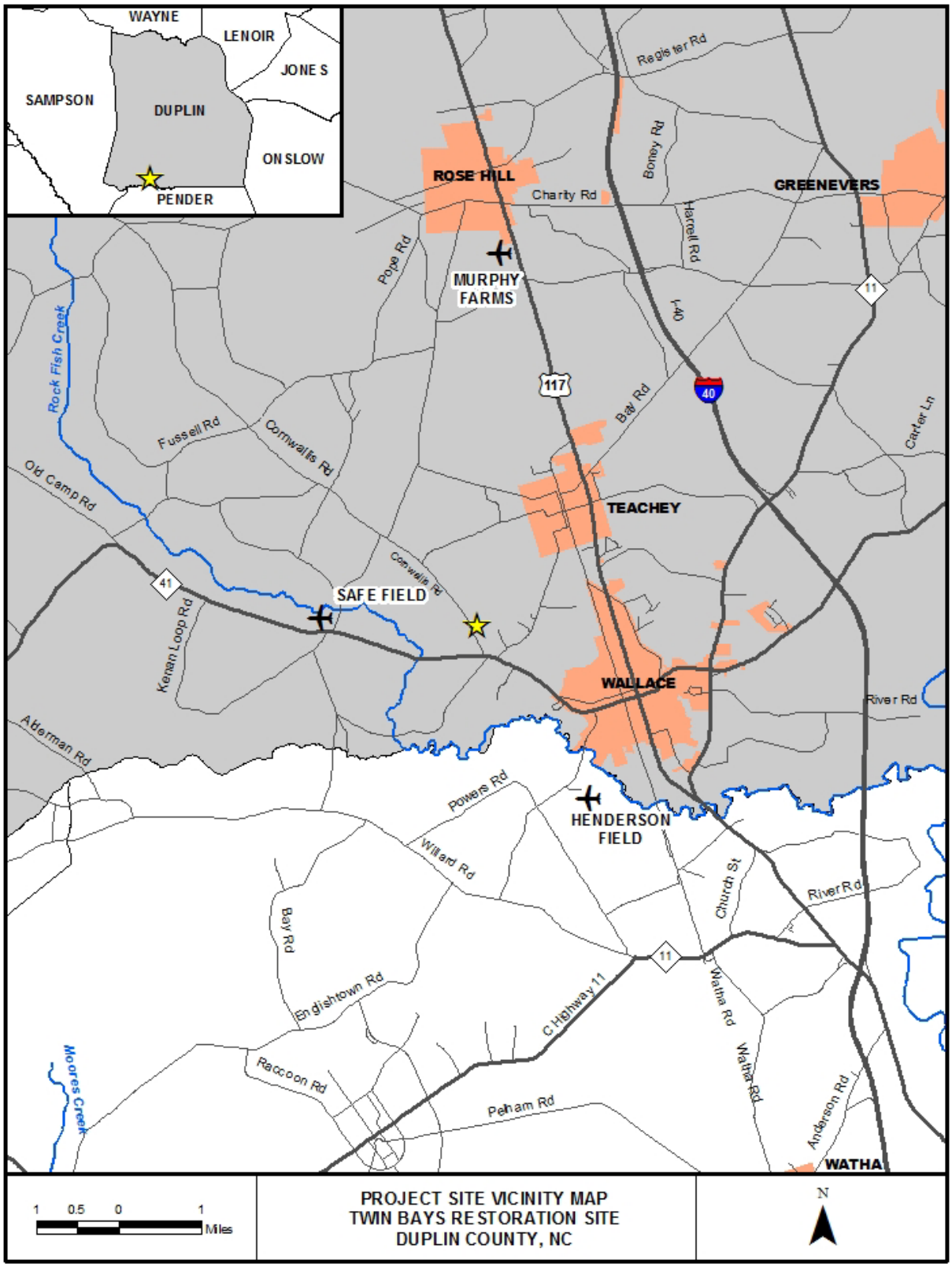
Historic aerials from Duplin County were examined for any information about how the site hydrology and vegetation have changed over the last century. They were obtained from the USGS EarthExplorer, USDA NAIP, and NC OneMap for 1950, 1959, 1974, 1982, 1993, 1998, 2005, and 2010. The reviewed aerials are found in Section 2.7. The first aerial photo from 1950 shows that a small portion of the site may have been forested at this time, but this changed by 1959, when the majority of the site is cleared and a ditch is visible running west to east through the center of the site. The site remained relatively unchanged through 1974, although a dark signature of either vegetation or wetted land appears in the middle of the site. In 1993, additional ditches have been installed that drain the site from the north to the south. The land cover remains in agriculture currently. The surrounding area is rural with low development pressure at this time. These land use trends indicated that restoring this property back to a forested wetland will provide an important habitat enhancement in the watershed.

The site lies within the Carolina Flatwoods (Level IV 63h) ecoregion of the Coastal Plain physiographic province. This low-gradient region generally has fine-loamy and coarse-loamy soils with high water tables. The geology at the site is classified as part of the Peedee Formation, which has sand, clayey sand, and clay with patches of limestone in the upper portions.

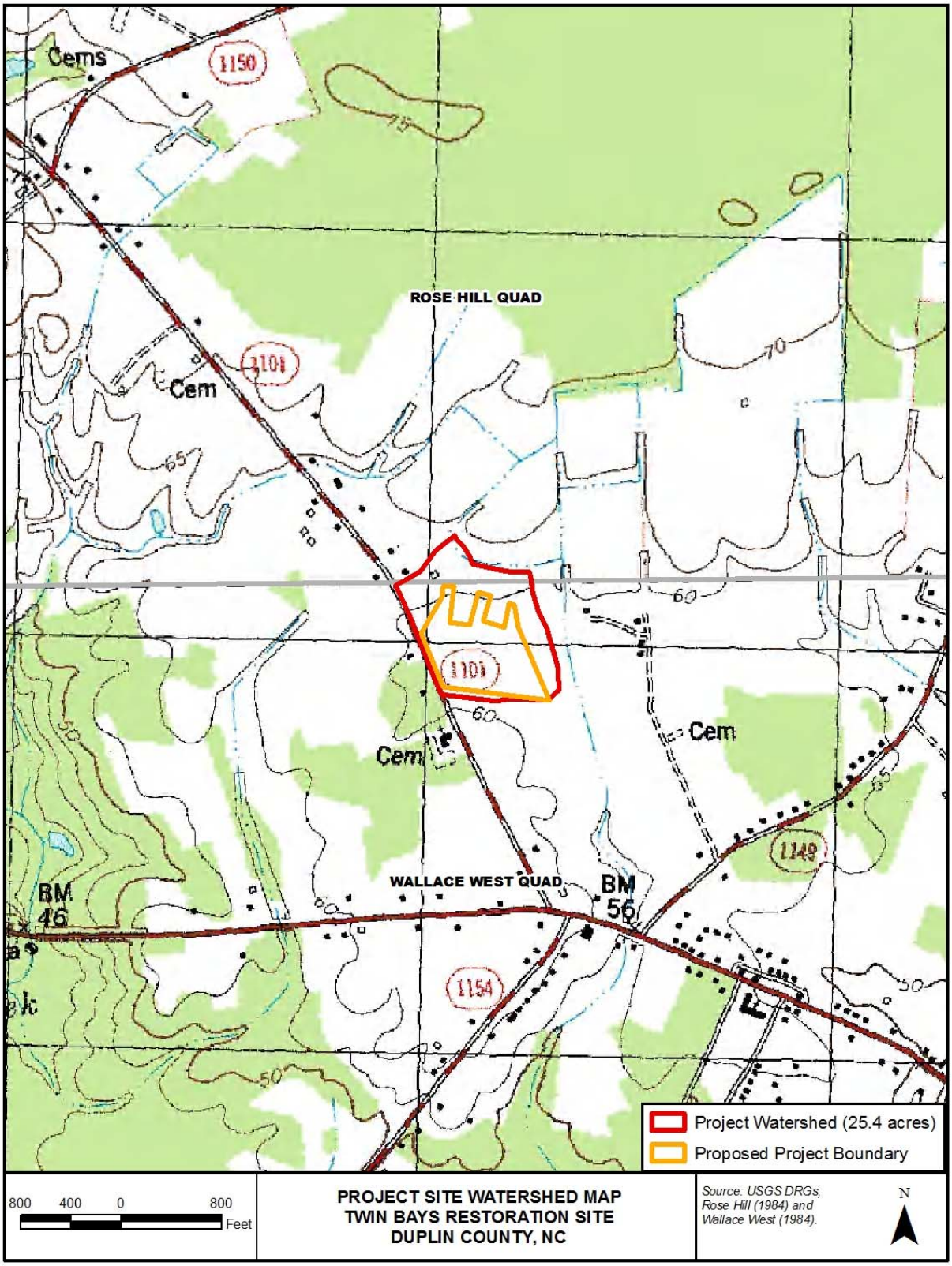
The soils at the site were also examined for their wetland potential. The Soil Survey of Duplin County has the TBWRS mapped as the Rains fine sandy loam soils series. A detailed investigation confirmed that the Rains series occupies the majority of the site, particularly around the perimeter, but also determined that the central portion of the site contains Torhunta soils. The Rains series is described as a poorly drained soil located on flats or broad interstream divides on marine terraces. Similarly, the Torhunta series is a very poorly drained soil found on flats on marine terraces or depressions on stream terraces. There is also a small inclusion of a Murville/Leon complex in the southwestern corner and an area of Udorthents along the ponded seeps in the north-central wooded section of the site. The northeastern corner of the TBWRS has a small area of Goldsboro. With the exception of the Goldsboro soil, all of the mapped soils at the TBWRS site are hydric soils that have been drained through on-site ditching. The soil data sheets and a map of the soil borings are included in Appendix C.

Based on these watershed and site-specific attributes, the TBWRS was selected as an ideal candidate for wetland mitigation. The restored site will expand forested wetland habitat in an area that has been actively used for agriculture since at least 1950.

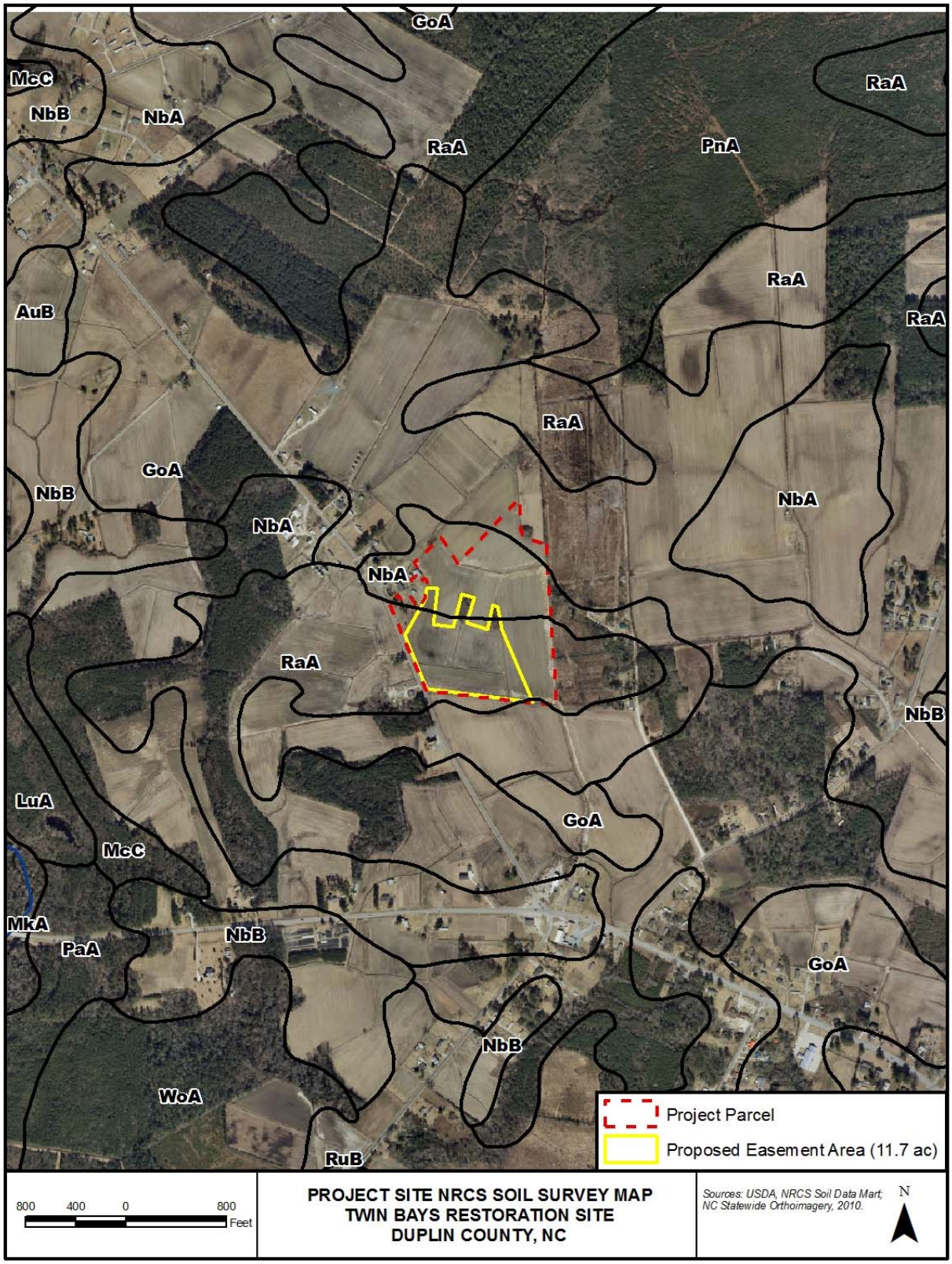
2.3 Vicinity Map



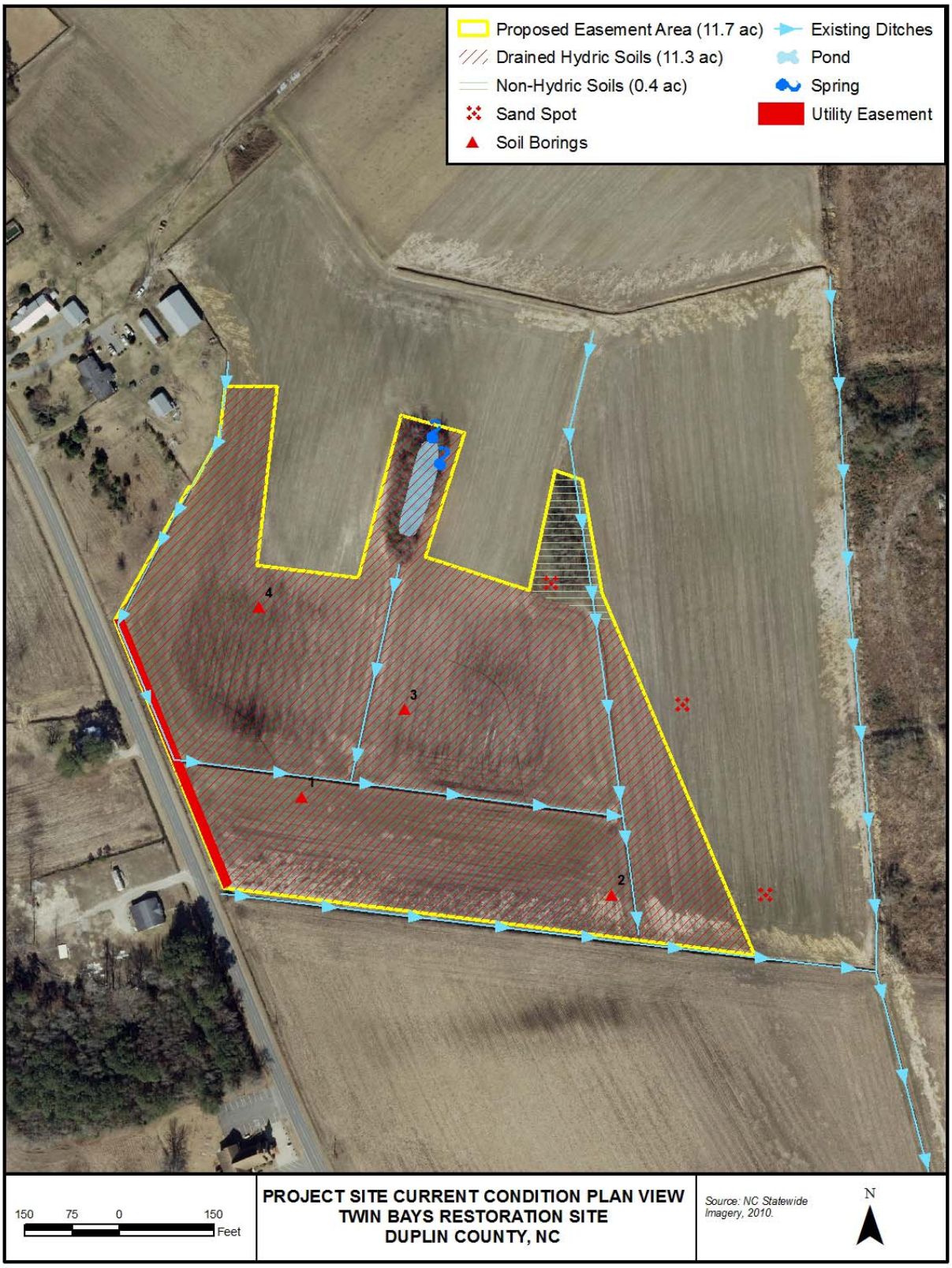
2.4 Watershed Map



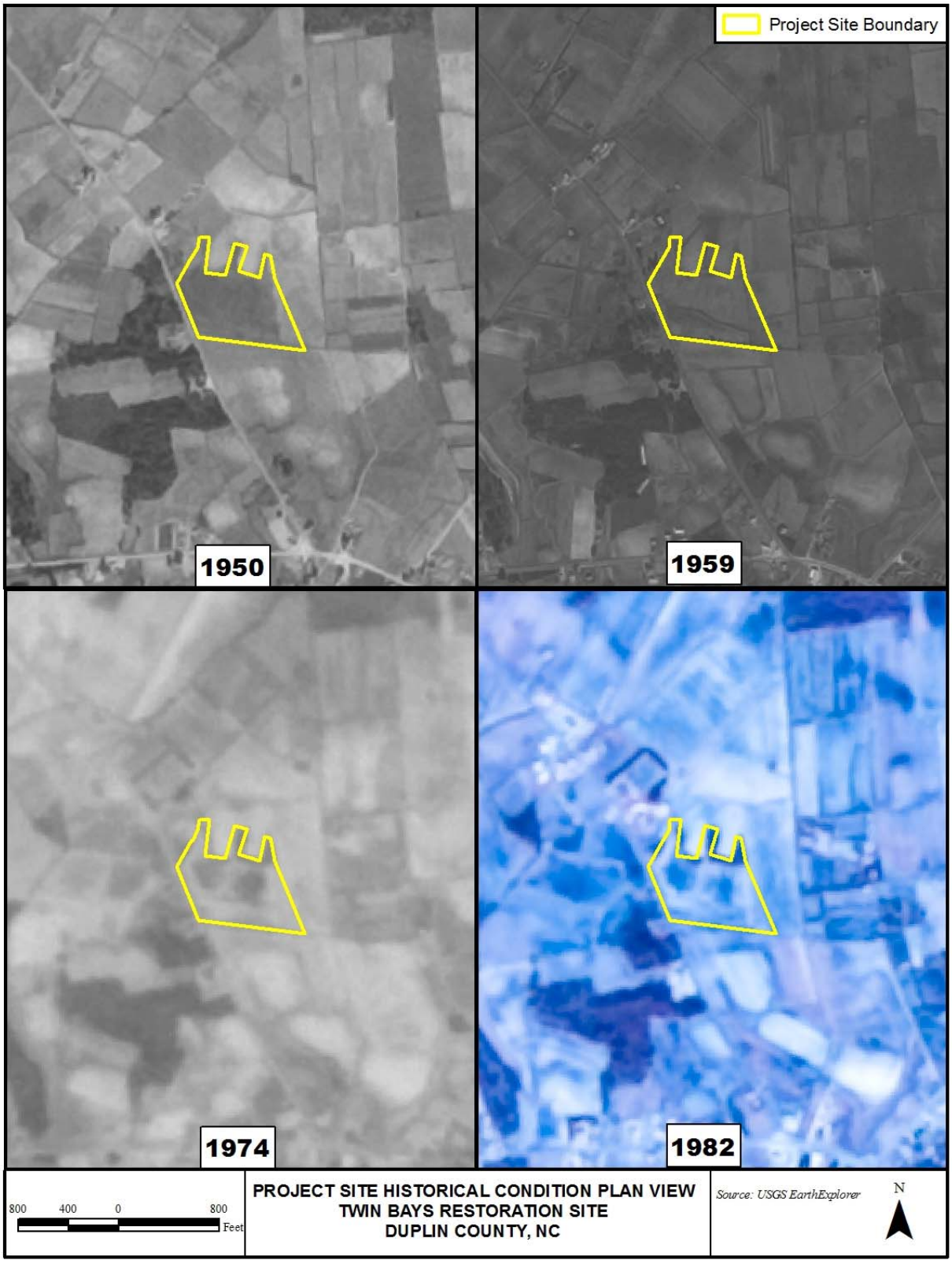
2.5 Soil Survey

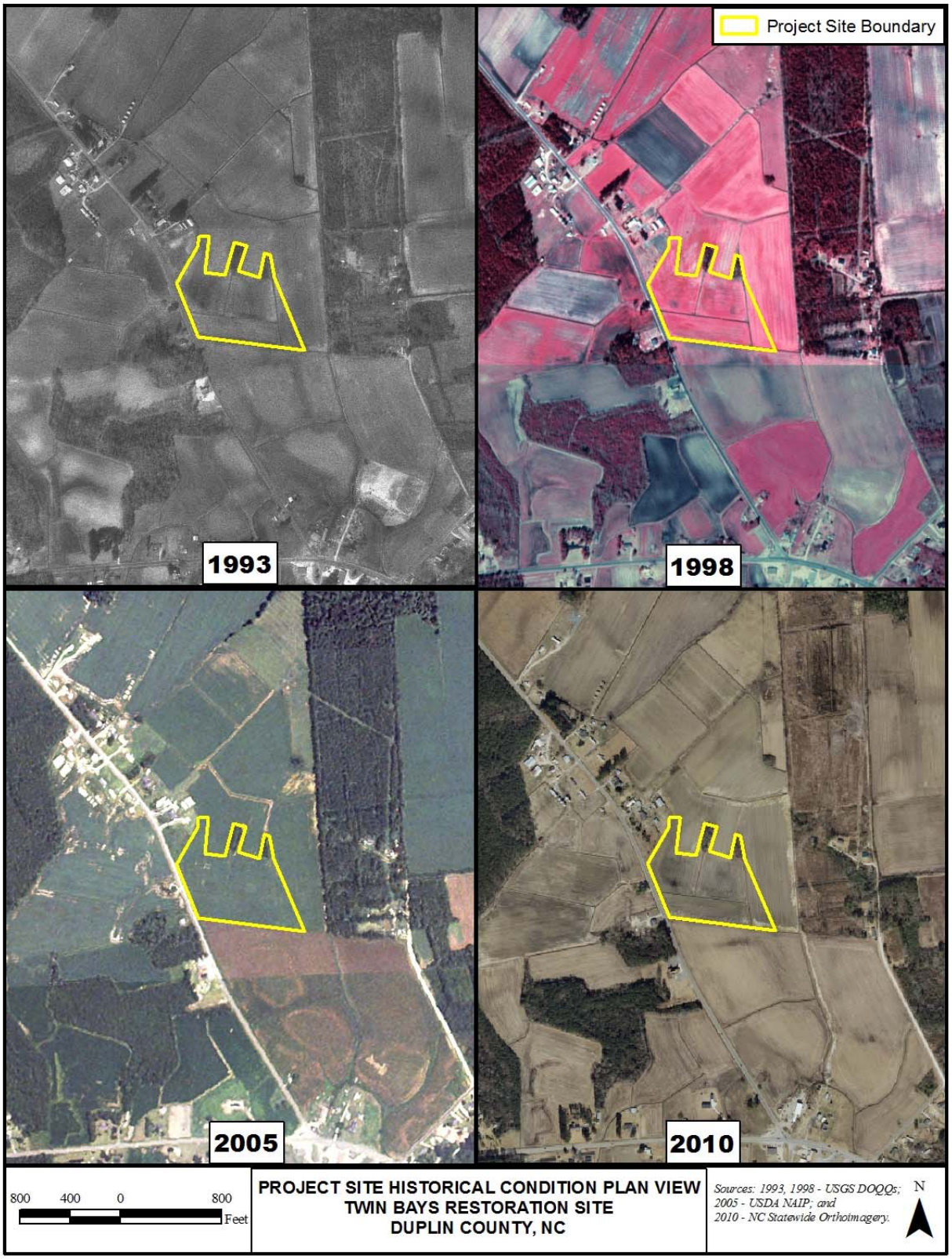


2.6 Current Condition Plan View



2.7 Historical Condition Plan View




Project Site Boundary
1993
1998
2005
2010
800 400 0 800
Feet
PROJECT SITE HISTORICAL CONDITION PLAN VIEW
TWIN BAYS RESTORATION SITE
DUPLIN COUNTY, NC
Sources: 1993, 1998 - USGS DOQQs;
2005 - USDA NAIP; and
2010 - NC Statewide Orthoimagery.
N

2.8 Site Photographs

Looking south across the site along an existing ditch. 9/8/2011

Looking toward the west. 9/8/2011

Looking north across the site from Cornwallis Road. 9/27/2011

Looking toward the northeast over the site. 9/27/2011

A view west toward the existing forested areas. 9/8/2011

Existing pond that is impounding seeps. 9/8/2011

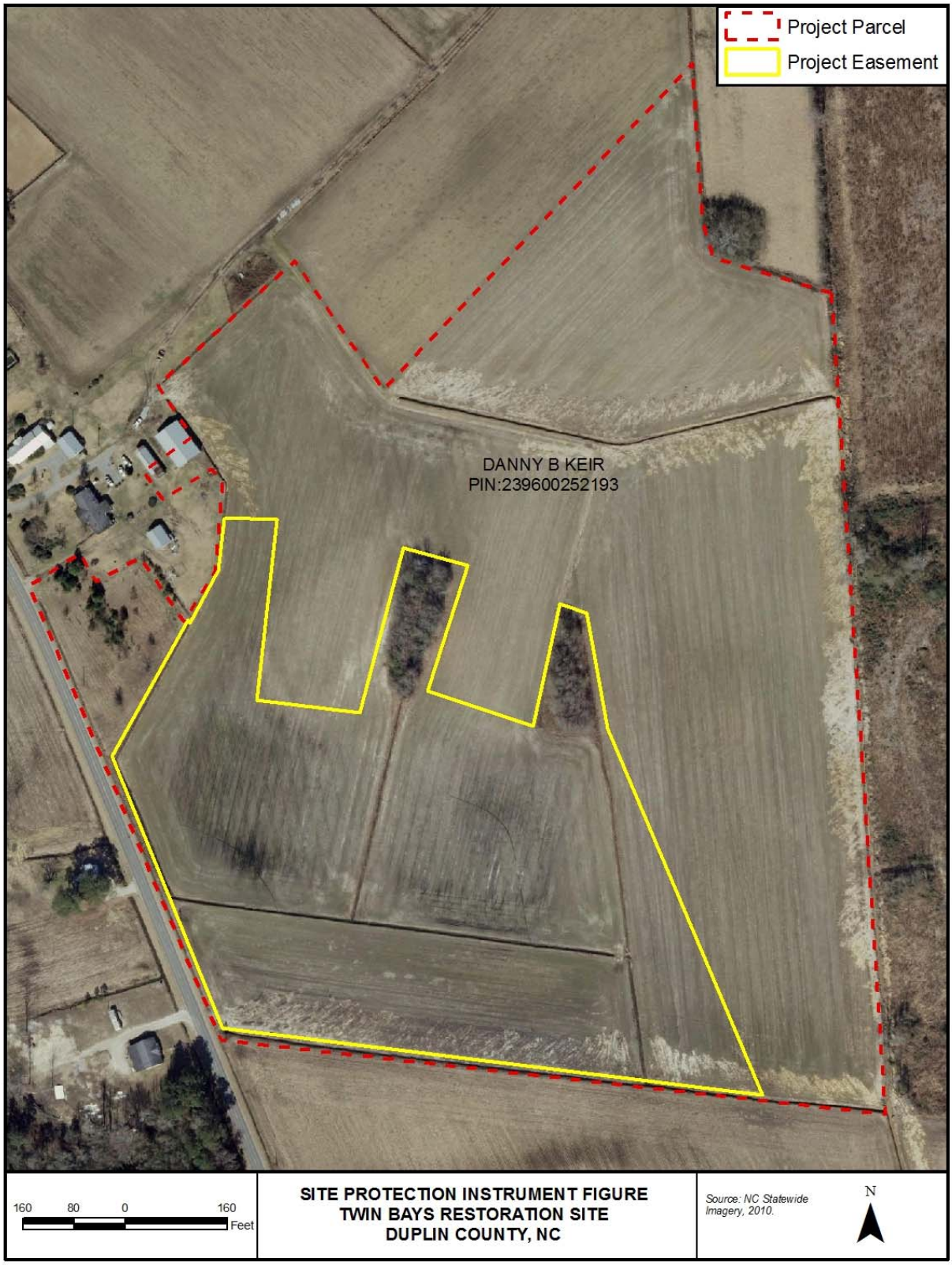
3.0 SITE PROTECTION INSTRUMENT

3.1 Site Protection Instrument Summary Information

The land required for the construction, management, and stewardship of this mitigation project includes portions of the following parcels. The conservation easement documents were finalized in October 2012. A copy of the land protection instrument is included in Appendix A.

	Landowners	PIN	County	Site Protection Instrument	Deed Book and Page Number	Acreage protected
Parcel A	Danny B. Keir	2396-0025-2193	Duplin	Conservation Easement	DB 1666 PG 116	11.72 acres

3.2 Site Protection Instrument Figure



4.0 BASELINE INFORMATION

Project Information			
Project Name	Twin Bays Wetland Restoration Site		
County	Duplin County		
Project Area (acres)	11.72 acres		
Project Coordinates (lat. and long.)	34.748418 N , -78.027129 W		
Project Watershed Summary Information			
Physiographic Province	Coastal Plain		
River Basin	Cape Fear		
USGS Hydrologic Unit 8-digit	03030007	**USGS Hydrologic Unit 14-digit**	03030007090040
DWQ Sub-basin	18-74-29b		
Project Drainage Area (acres)	25.4 acres		
Project Drainage Area Percentage of Impervious Area	2%		
CGIA Land Use Classification	93% Cultivated, 2% Mixed Shrubland, and 5% Low-Intensity Development		
Wetland Summary Information			
Parameters	**Wetland Area 1**		
Size of Wetland (acres)	11.1 acres		
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Non-riparian		
Mapped Soil Series	Rains (Torhunta, Murville/Leon and Udorthents by detailed soil investigation)		
Drainage class	Poorly drained		
Soil Hydric Status	Drained Hydric		
Source of Hydrology	Hillside seepage / precipitation		
Hydrologic Impairment	Ditching and Crops		
Native vegetation community	Crops		
Percent composition of exotic invasive vegetation	0%		
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States – Section 404	Yes	Applying for NWP 27	Jurisdictional Determination
Waters of the United States – Section 401	Yes	Applying for NWP 27	Jurisdictional Determination
Endangered Species Act*	No	N/A	N/A
Historic Preservation Act*	No	N/A	N/A
Coastal Zone Management Act * (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	No	N/A	FEMA Floodplain Checklist
Essential Fisheries Habitat*	No	N/A	N/A

* Items addressed in the Categorical Exclusion in Appendix B.

4.1 Watershed Summary Information

The site is within the 03030007 USGS Cataloging Unit (Cape Fear). The Cape Fear River Basin as a whole is experiencing a large amount of habitat alteration due to population growth from Wilmington and its surrounding metropolitan area. According to 1996 land cover data from the North Carolina Center for Geographic Information and Analysis (CGIA), only 3% of the Cape Fear River Basin is developed, but the area is expected to continue to grow. The predominant land uses are 48% forest and 14% agriculture.

The project watershed for the TBWRS is comprised of 25.4 total acres. Current land use in the project watershed consists of agriculture (23.6 ac/93%), forest (0.6 ac/2%), and low-intensity development (1.2 ac/5%). The approximate total impervious cover of the project watershed is 2.0%. The nearest named downstream water body is a reach of Rock Fish Creek. The project area is located in the United States Geological Survey (USGS) Rose Hill and Wallace West Quadrangles (1984).

4.2 Reach Summary Information

Not applicable for this project.

4.3 Wetland Summary Information

Currently, there are no existing wetlands present. The wetland data forms are included in Appendix B.

Based on field topographic survey data and LIDAR elevation data, the contours at the site range from 60 – 64 feet. The topography of the site begins with the higher elevations at the northern edge of the site, which is the top of the small project watershed. The highest elevations curve around the two existing forested portions in the north-central and northwestern portions of the site. The drained hydric soils at the site experience approximately a 2’ change in elevation as the slope grades down slightly toward the southern end of the site.

A jurisdictional determination delineation was completed in which the ditch network installed at the site was identified as jurisdictional tributaries (see Appendix B for jurisdictional determination plat). The ditch network consists of channels that generally drain the site from the north to the south. Three primary ditches carry water from the northern edge of the site toward the center of the project and all discharge into a main ditch that runs west to east across the extent of the site. A small portion of runoff is collected from Cornwallis Road. The central ditch then discharges into another ditch running north to south. This southeastern ditch flows into an off-site ditch running west to east along the southern property line. In addition to the modifications made to the site with ditching, the TBWRS also contains a small pond in the north-central wooded portion of the site. A past landowner created a pond berm to capture flow from two seeps to the north. This pond is hindering the dispersal of seepage flow across the site to the south. Existing vegetation around the pond and in isolated sections along the ditches includes laurel oak (*Quercus laurifolia*), red bay (*Persea borbonia*), sweet bay (*Magnolia virginiana*), and giant cane (*Arundinaria gigantea*).

4.4 Regulatory Considerations

A jurisdictional determination was submitted to the US Army Corps of Engineers on October 9, 2012 and approved on October 30, 2012. Following the completion of the mitigation plan, a pre-construction notification (PCN) will be completed to apply for a Nationwide 27 Permit (NWP) to comply with Sections

401 and 404 of the Clean Water Act with the Wilmington District of the US Army Corps of Engineers and the NCDENR Division of Water Quality.

TBWRS is not located within the FEMA 100-year floodplain and therefore a flood study is not anticipated for this project.

5.0 DETERMINATION OF CREDITS

Twin Bays Restoration Site, Duplin County									
Mitigation Credits									
	Stream		**Riparian Wetland**		**Non-riparian Wetland**		**Buffer**	**Nitrogen Nutrient Offset**	**Phosphorous Nutrient Offset**
Type	R	RE	R	RE	R	RE			
Acres	-	-	-	-	11.1	-	-	-	-
Credits	-	-	-	-	11.1	-	-	-	-
TOTAL CREDITS					11.1				
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**
Wetland Area 1	Central and Southern portion of project easement		11.1 acres		-		Restoration	11.1 acres	1:1

Component Summation						
Restoration Level	**Stream (linear feet)**	**Riparian Wetland (acres)**		**Non-riparian Wetland (acres)**	**Buffer (square feet)**	**Upland (acres)**
		Riverine	Non-Riverine			
Restoration	-	-	-	11.1 acres	-	-
Enhancement		-	-		-	-
Enhancement I	-					
Enhancement II	-					
Creation		-	-	-		-
Preservation	-	-	-	-		0.4 acre
High Quality Preservation	-	-	-	-		-
TOTAL				11.1 acres*		0.4 acre

R= Restoration RE= Restoration Equivalent of Creation or Enhancement

*Additional 0.2 acre is under the utility easement and not included in the determination of credits.

6.0 CREDIT RELEASE SCHEDULE

All credit releases will be based on the total credit generated as reported by the as-built survey of the mitigation site. Under no circumstances shall any mitigation project be debited until the necessary DA authorization has been received for its construction or the District Engineer (DE) has otherwise provided written approval for the project in the case where no DA authorization is required for construction of the mitigation project. The DE, in consultation with the Interagency Review Team (IRT), will determine if performance standards have been satisfied sufficiently to meet the requirements of the release schedules below. In cases where some performance standards have not been met, credits may still be released depending on the specifics of the case. Monitoring may be required to restart or be extended, depending on the extent to which the site fails to meet the specified performance standard. The release of project credits will be subject to the criteria described as follows:

Forested Wetlands Credits			
Monitoring Year	**Credit Release Activity**	**Interim Release**	**Total Released**
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50%
3	Third year monitoring report demonstrates performance standards are being met	10%	60%
4	Fourth year monitoring report demonstrates performance standards are being met	10%	70%
5	Fifth year monitoring report demonstrates performance standards are being met; Provided that all performance standards are met, the IRT may allow the NCEEP to discontinue hydrologic monitoring after the fifth year, but vegetation monitoring must continue for an additional two years after the fifth year for a total of seven years.	10%	80%
6	Sixth year monitoring report demonstrates performance standards are being met	10%	90%
7	Seventh year monitoring report demonstrates performance standards are being met, and project has received close-out approval	10%	100%

Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan can be released by the NCEEP without prior written approval of the DE upon satisfactory completion of the following activities:

- Approval of the final Mitigation Plan
- Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property
- Completion of project construction (the initial physical and biological improvements to the mitigation site) pursuant to the mitigation plan; Per the NCEEP Instrument, construction means that a mitigation site has been constructed in its entirety, to include planting, and an as-built report has been produced. As-built reports must be sealed by an engineer prior to project closeout, if appropriate but not prior to the initial allocation of released credits.

- Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.

Subsequent Credit Releases

All subsequent credit releases must be approved by the DE, in consultation with the IRT, based on a determination that required performance standards have been achieved. For stream projects a reserve of 15% of a site's total stream credits shall be released after two bank-full events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than two bank-full events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT. As projects approach milestones associated with credit release, the NCEEP will submit a request for credit release to the DE along with documentation substantiating achievement of criteria required for release to occur. This documentation will be included with the annual monitoring report.

7.0 MITIGATION WORK PLAN

7.1 Target Wetland Types and Plant Communities

Wetland plantings shall consist of native species commonly found in the Hardwood Flats Community (NCWAM, v. 4.1 2010). Trees and shrubs will be planted at a density of 968 stems per acre (9 feet x 5 feet spacing) to achieve a mature survivability of two hundred sixty (210) stems per acre after seven years. Woody vegetation planting will be conducted during dormancy. Species to be planted may consist of the following consistent with a hardwood flat (NCWAM, v. 4.1 2010):

Common Name	**Scientific Name**	**Wetland Indicator**
Red maple	*Acer rubrum*	FACW
Red chokeberry	*Aronia arbutifolia*	FACW
Tulip poplar	*Liriodendron tulipifera*	FACW
Sweetbay	*Magnolia virginiana*	FACW
Swamp red bay	*Persea palustris*	FACW
Swamp chestnut oak	*Quercus michauxii*	FACW
Water oak	*Quercus nigra*	FAC
Cherrybark oak	*Quercus pagoda*	FAC
American elm	*Ulmus americana*	FACW
Highbush blueberry	*Vaccinium corymbosum*	FACW

A herbaceous seed mix composed of appropriate native species will also be developed and used to further stabilize and restore the wetland.

All of the above options will be marked and surveyed as per EEP's requirements contained within http://portal.ncdenr.org/web/eep/fd-forms-templates. In addition, the easement boundaries will be marked with salt-treated wooden posts placed approximately 100 feet apart. Each line post will be marked with a conservation easement placard. Corner posts will be marked with signs stating "Conservation Easement Corner."

7.2 Design Parameters

The mitigation approach for the TBWRS will aim to restore the hydrology and vegetation components to this non-riparian wetland system. The available historic data, detailed soils mapping, and topographic and geographic positions suggest that a hardwood flat used to exist at the TBWRS (NCWAM, v. 4.1 2010). The site will be restored to a condition that resembles the former wetland community. A local comparable reference wetland system was identified approximately 0.5 mile north of the restoration site and was used to aid in design of a wetland community most suited to the area. Please see the mitigation overview in Section 7.4 and the wetland plans included in Appendix D. The following elements of functional uplift are expected from this project:

1. Increase in groundwater recharge
2. Increase in sediment trapping and filtration
3. Increase in carbon storage
4. Increase in biochemical cycling of nutrients and other pollutants
5. Increase in habitat utilization by wildlife (migrants and residents)
6. Increase in landscape patch structure

Non-Riparian Wetland Restoration – 11.1 acres
All of the existing drained hydric soils will be restored to a non-riparian wetland system. The primary restoration action will be to fill the existing ditches across the site in order to restore hydrology. Clay ditch plugs will be installed along the lengths of the ditches. Existing spoil will be used as available to fill the remainder of the ditches. The primary receiving ditch, which runs west to east, will remain open. Detailed topographic survey will be used to design slight grading modifications to redirect and lengthen overland flow paths in order to retain and treat surface hydrology longer. Surface roughness variations will also be enhanced in areas where the years of agricultural production have overly compacted the soil.

The small wooded section with ponded seeps in the north-central portion of the site will also be restored. The deep portions of pond will be filled in to recreate ephemeral ponding conditions and the berms will be selectively breached, allowing the seeps that feed the ephemeral pond to flow into the downslope wetlands, while still maintaining existing mature trees that have grown up in this area. Following the completion of site grading, the non-riparian wetland will be planted as a Hardwood Flats Community as described in Section 7.1. Proposed project conditions are shown in Section 7.4.

Upland Inclusions – 0.4 acre of Upland Inclusions
There are 0.4 acres of uplands located in the forested northeastern corner of the project boundary. This area will remain undisturbed and will be included in the TBWRS conservation easement. Once the grading is completed, the unvegetated portion of this upland area will be planted as a Hardwood Flats Community as described in Section 7.1.

Reference Wetland
A suitable reference wetland was found approximately 0.5 mile north of the TBWRS. The reference wetland is comprised of deciduous hardwoods over a shrub layer with broad-leaved evergreens and is consistent with the Hardwood Flats Community that will be the primary wetland type at the project site. A groundwater monitoring well has been installed to document the reference wetland hydrology during the course of monitoring.

7.3 Data Analysis

The numerous modifications to the hydrology of the TBWRS have effectively drained the historic wetlands on-site. The development of a network of field ditches has significantly altered the retention of surface hydrology in these areas. The pre and post-restoration effects of ditching on wetland hydrology was evaluated using a hydrologic budget for the site (see Appendix C).

Existing Conditions
Existing site hydrology was modeled by developing an annual water budget that calculates hydrologic inputs and outputs in order to calculate the change in storage on a monthly time step. In order to set up the water budget, historic climatic data were obtained from the North Carolina State Climatic Office. The weather station in Maysville, North Carolina was used, which is the closest station with the longest period of record and is approximately 46 miles to the northeast of TBWRS. Monthly precipitation totals from the entire period of record (1945-2011) were reviewed and three years were selected to represent a range of precipitation conditions: dry year (1990), average year (1973), and wet year (1991).

Potential inputs to the water budget include precipitation, groundwater, and surface inputs. For precipitation, the data from the three selected years were used in the budget. Groundwater inputs likely exist, particularly in the upper portions of the site, but they were considered to be negligible to be conservative for the purposes of this study. Surface water input was calculated using the USDA Soil Conservation Service (SCS) runoff curve number equation (USDA, SCS 1986).

Outputs from the site include potential evapotranspiration (PET), groundwater, and surface water diversion. PET was calculated by the Thornthwaite method using mean monthly temperatures determined from the chosen years of record: 1990, 1973, and 1991. Surface water was assumed entirely lost since there is no surface storage in the existing conditions model.

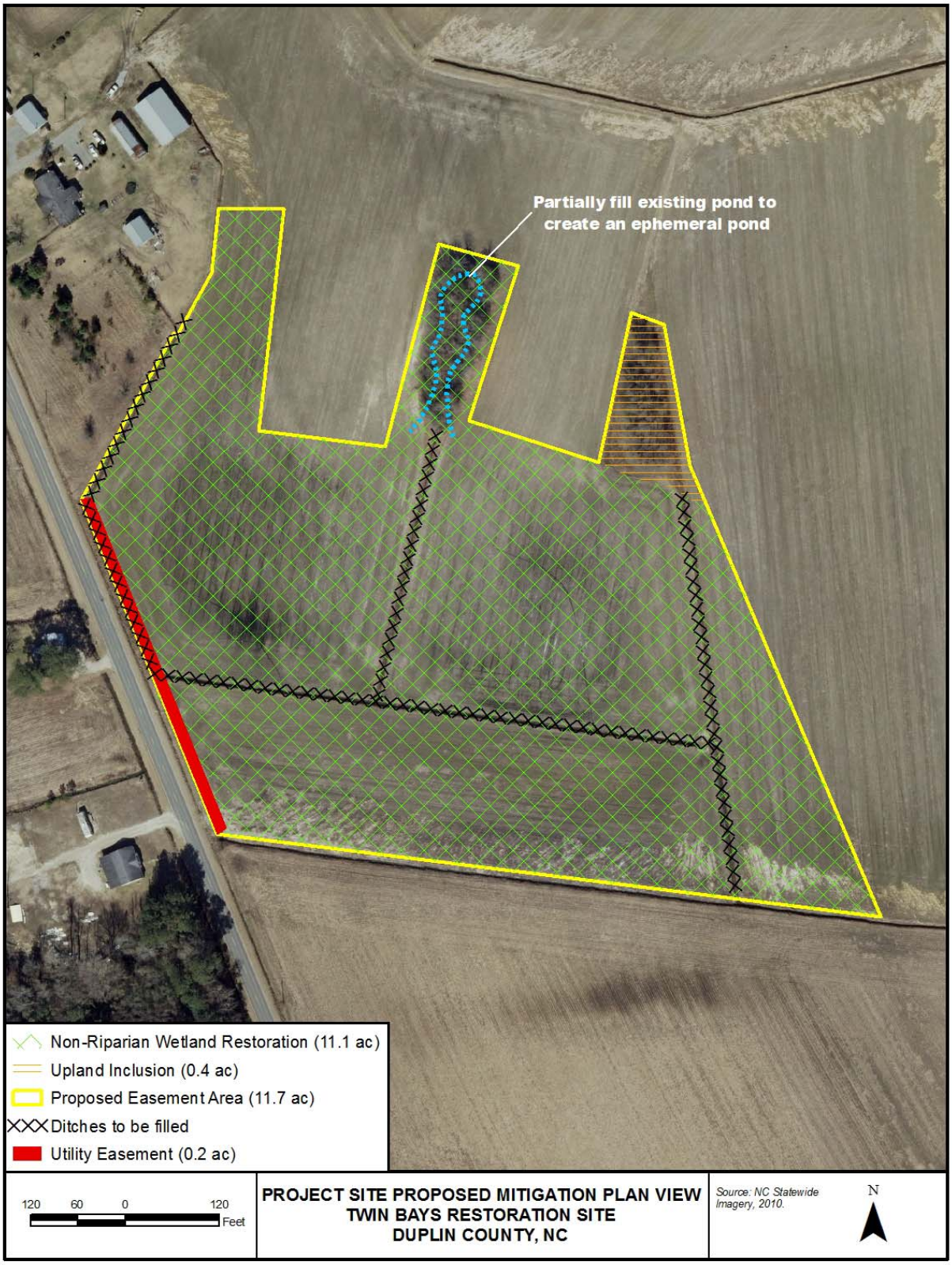
Once the inputs and outputs were determined, a net monthly total was calculated in inches and used to estimate a yearly water budget. The model assumes unsaturated conditions at the beginning of the year. Because the TBWRS consisted of two separate soils (Rains and Torhunta), two models were used for the water budget. A maximum wetland water volume of 5.4 inches was calculated based on the specific yield of 0.15 for 36 inches of Rains soil and a maximum wetland water volume of 4.68 inches was calculated based on the specific yield of 0.13 for 36 inches of Torhunta soil. The resulting hydrographs for the average and wet years show a seasonal pattern. The model shows that the majority of hydrologic inputs to the site come during the rainy spring months for the average year and during both the spring months and late summer/early fall for the wet year. The site begins to lose saturation in the upper twelve inches in the late spring and early summer months for both years. However, after late spring, the wet year shows an increase in hydrologic inputs that continues through the summer months and then decreases in fall. The average year does not see an increase in hydrologic inputs until the late fall. The dry year shows very little hydrology overall. It is clear from the existing model output that the deep ditches within the site are exerting a larger influence on the site's storage capacity than the water budget is accurately able to predict. The site is currently not achieving the wetland hydrology that the model predicts.

Proposed Conditions

A modified water budget was developed to analyze the effect of mitigation actions described in Section 7.2 on the site hydrology. Two models were used for the proposed conditions water budget to account for both soil types observed in TBWRS. To estimate the impact from surface roughening, an additional 2.4 inches of hydrologic capacity was added to the calculations to represent surface roughness. All surface flow is assumed to be retained in the proposed condition, because it will no longer be immediately routed off the site. Based on these changes, the budget shows the site potentially attaining jurisdictional wetland hydrology in portions of the spring and summer for the average and wet years when compared to the existing conditions. The dry year remains relatively unchanged from the pre-construction condition, indicating that the site's wetland hydrology may be susceptible to drought conditions.

The southernmost ditch, adjacent to the restoration area, will be left open and not filled. It is anticipated that leaving this ditch open will have minimal impacts to the overall hydrologic performance of the site. The hydrologic influence of this ditch was modeled using Lateral Effect, a software program that determines the lateral effect of a drainage ditch or borrow pit on adjacent wetland hydrology (NCSU BAE, 2011). This software determined that the potential horizontal drainage influence averages 76'.

7.4 Proposed Mitigation Plan View



8.0 MAINTENANCE PLAN

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

Component/Feature	Maintenance Through Project Close-Out
Wetland	Routine wetland maintenance and repair activities may include securing of loose coir matting and supplemental installations of live 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 field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as needed basis.

Additionally, a utility right of way exists adjacent to the restored wetland, but because there is no creditable acreage within this right of way, it is not expected that the utility maintenance will affect the restored wetland.

9.0 PERFORMANCE STANDARDS

The TBWRS will be monitored to determine if the development of the wetland indicators on site meet the standards for mitigation credit production as presented in Section 5.0. The credits will be validated upon confirmation that the success criteria described below are met. The site will be monitored for performance standards for seven years after completion of construction.

Hydrologic Performance
Verification of hydrologic performance standards within the wetland mitigation area will be determined through evaluation of automatic recording well data supplemented by documentation of wetland hydrology indicators as defined in the 1987 US ACOE Wetland Delineation Manual (Manual). Twelve automatic recording gauges will be established within the restoration area of the site.

To meet success criteria, the upper 12 inches of the soil profile will display continuously saturated or inundated conditions for at least 8% of the growing season with a 50% probability of reoccurrence during normal weather conditions. A "normal" year is based on NRCS climatological data for Duplin County using the 30th to 70th percentile thresholds as the range of normal as documented in the USACE Technical Report "Accessing and Using Meteorological Data to Evaluate Wetland Hydrology, April 2000." The soil survey for Duplin County does not contain growing season data; therefore, due to its close proximity, the Sampson County soil survey was used. The estimated growing season begins March 18 and ends November 11 (239 days). KCI will monitor soil temperature to verify that the local growing season is consistent with the NRCS published data and reserves the right to present this information as a modifier to the number of days saturation is required to achieve jurisdictional status.

Due to the inherent variability in the sites soils and associated drainage characteristics, it is unlikely that the project will exhibit uniform hydrologic conditions across the site, making a single hydrologic performance criterion unrepresentative of the sites performance. As such, the gauge data can be evaluated and presented as a spatial average with each gauge representing the area half the distance to adjacent gauges. The spatial average will be the calculated value for comparison with the performance standard for credit validation. Gauges representing areas not achieving a minimum of 6.5% saturation will be considered non-attaining even if the spatial average exceeds the credit validation performance standard.

Vegetation Success
The vegetation success criteria will comply with guidance included in "Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation" (NCDENR EEP, 2011), which states that the plots must achieve a stem density of 320 stems/acre after three years, 260 stems/acre after five years, and 210 stems/acre after seven years to be considered successful. In addition to density requirements, plant height will be monitored within the monitoring plots to ensure that trees average 10 feet in height after seven years.

10.0 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.

Required	Parameter	Quantity	Frequency	Notes
Yes	Groundwater Hydrology	7-8 gauges distributed throughout the restored wetland and an additional 4 gauges to determine the effect of the open ditch	Annual	Groundwater monitoring gauges with data recording devices will be installed on site; the data will be downloaded on a monthly basis during the growing season
Yes	Vegetation	Will be distributed to ensure sufficient coverage of planted vegetation	During monitoring years 1, 2, 3, 5, and 7.	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
Yes	Project boundary		Semi-annual	Locations of vegetation damage, boundary encroachments, etc. will be mapped

The first scheduled monitoring will be conducted during the first full growing season following project completion. Monitoring shall subsequently be conducted annually for a total period of seven years or until the project meets its success criteria.

Groundwater elevations will be monitored to evaluate the attainment of jurisdictional wetland hydrology. Verification of wetland hydrology will be determined by automatic recording well data collected within the project area and reference wetland. Seven to eight automatic recording gauges will be established within the mitigation areas. Daily data will be collected from the automatic gauges for a minimum of a 5-year monitoring period following wetland construction. A nearby reference wetland will also be monitored using the same procedures for comparative analysis (see Appendix B for reference wetland data sheet and location map). Additionally, to monitor the effect of the unfilled ditch described in Section 7.3, two sets of coupled gauges will be established perpendicular to the unfilled ditch. Each set will include a well that is 20’ from the open ditch and one that is 80’ from the ditch. The first set will be established one third of the distance from Cornwallis Road to the eastern project boundary and the second set will be established at two thirds of that distance. A figure in Appendix C shows the potential gauge locations at the site.

Beginning at the end of the first growing season, KCI will monitor the planted vegetation in monitoring years 1, 2, 3, 5, and 7 or until the success criterion is met. The survivability of the vegetation plantings will be evaluated using a sufficient number of 100 m^2 vegetative sampling plots randomly placed throughout the restored wetland. Permanent monuments will be established at the corners of each monitoring plot and documented by either conventional survey or GPS. These plots will be monitored according to the current CVS/EEP monitoring protocol. The vegetation monitoring will follow the Level 2 method of the current CVS-EEP protocol (http://cvs.bio.unc.edu/methods.htm).

Photograph reference points (PRPs) will be established to assist in characterizing the site and to allow qualitative evaluation of the site conditions. The location of each photo point will be marked in the monitoring plan and the bearing/orientation of the photograph will be documented.

Annual monitoring reports will be prepared and submitted after all monitoring tasks for each year are completed. The report will document the monitored components and include all collected data, analyses, and photographs. Each report will provide the new monitoring data and compare the most recent results against previous findings. The monitoring report format will be similar to that set out in the most recent EEP monitoring protocol.

11.0 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. This party shall be responsible for periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. Endowment funds required to uphold easement and deed restrictions shall be negotiated prior to site transfer to the responsible party.

The NCDENR Division of Natural Resource Planning and Conservation's 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 transaction 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.

12.0 ADAPTIVE MANAGEMENT PLAN

Upon completion of site construction KCI will implement the post-construction monitoring protocols previously defined in this document. Project maintenance will be performed as described previously in this document. If, during the course of annual monitoring it is determined the site's ability to achieve site performance standards are jeopardized, KCI will notify the EEP and 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 KCI will:

1. Notify the EEP and 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.

13.0 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 U.S. 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.

14.0 OTHER INFORMATION

14.1 Definitions

8-digit Catalog Unit (CU) – The USGS developed a hydrologic coding system to delineate the country into uniquely identified watersheds that can be commonly referenced and mapped. North Carolina has 54 of these watersheds uniquely defined by an 8-digit number. EEP typically addresses watershed – based planning and restoration in the context of the 17 river basins (each has a unique 6-digit number), 54 catalog units and 1,601 14-digit hydrologic units.

14–digit Hydrologic Unit (HU) – In order to address watershed management issues at a smaller scale, the U.S. Natural Resources Conservation Service (NRCS) developed methodology to delineate and uniquely identify watersheds at a scale smaller than the 8-digit catalog unit. A hydrologic unit is a drainage area delineated to nest in a multilevel, hierarchical drainage system. Its boundaries are defined by hydrographic and topographic criteria that delineate an area of land upstream from a specific point on a river, stream or similar surface waters. North Carolina has 1,601 14-digit hydrologic units.

DWQ – North Carolina Division of Water Quality

EEP – The North Carolina Ecosystem Enhancement combines existing wetlands restoration initiatives (formerly the Wetlands Restoration Program or NCWRP) of the N.C. Department of Environment and Natural Resources with ongoing efforts by the N.C. Department of Transportation (NCDOT) to offset unavoidable environmental impacts from transportation-infrastructure improvements.

Native vegetation community – a distinct and reoccurring assemblage of populations of plants, animals, bacteria and fungi naturally associated with each other and their population; as described in Schafale, M.P. and Weakley, A. S. (1990), Classification of the Natural Communities of North Carolina, Third Approximation.

Project Area - includes all protected lands associated with the mitigation project.

RBRP - The River Basin Restoration Priorities are documents that delineate specific watersheds (Targeted Local Watersheds) within a River Basin that exhibit both the need and opportunity for wetland, stream and riparian buffer restoration.

TLW - Targeted Local Watershed, are 14-digit hydrologic units which receive priority for EEP planning and restoration project funds.

USGS – United States Geological Survey

14.2 References

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14.3 Appendix A. Site Protection Instrument

B1737 P0104 11-29-2012 15:02:25.000
Davis H. Brinson PROP
Duplin County, NC Register of Deeds page 1 of 10

Davis H. Brinson Register of Deeds
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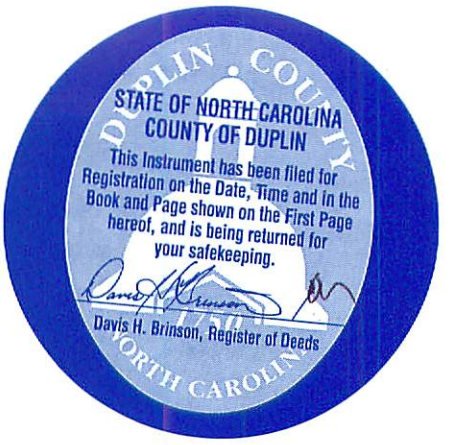
NC REVENUE STAMP: $282.00 (#167948)



$ 282.00 stamps
$ 26.00
10

STATE OF NORTH CAROLINA

CONSERVATION EASEMENT PROVIDED PURSUANT TO FULL DELIVERY MITIGATION CONTRACT

Parcel #10-529-1
DUPLIN COUNTY
SPO File Number 31-0
EEP Site ID Number 95363 (Twin Bays)
Prepared by: Office of the Attorney General
Property Control Section
Return to: NC Department of Administration
State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

THIS CONSERVATION EASEMENT DEED, made this 27th day of NOVEMBER, 2012, by Danny B. Keir and wife, Annice Morrison Keir (collectively, "**Grantor**"), whose mailing address is 5114 Clear Run Drive, Wilmington NC 28403, to the State of North Carolina, ("**Grantee**"), whose mailing address is State of North Carolina, Department of Administration, State Property Office, 1321 Mail Service Center, Raleigh, NC 27699-1321. The designations of Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine, or neuter as required by context.

WITNESSETH:

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

WHEREAS, this Conservation Easement from Grantor to Grantee has been negotiated, arranged and provided for as a condition of a full delivery contract between **KCI Technologies, Inc.** and the North Carolina Department of Environment and Natural Resources, to provide stream, wetland and/or buffer mitigation pursuant to the North Carolina Department of Environment and Natural Resources Purchase and Services Contract Number 004739.

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

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

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

WHEREAS, the Ecosystem Enhancement Program in the Department of Environment and Natural Resources, which has been delegated the authority authorized by the Governor and Council of State to the Department of Administration, has approved acceptance of this instrument; and

WHEREAS, Grantor owns in fee simple certain real property situated, lying, and being in **Rockfish Township, Duplin County**, North Carolina (the "**Property**"), and being more particularly described as that certain parcel of land containing approximately **31.958 net** acres, described as "Tract C" on plat recorded in Map Book 23, Page 315, Duplin County Registry, and being conveyed to the Grantor by deed as recorded in **Deed Book 1645 at Page 99** of the **Duplin County** Registry, North Carolina; and

WHEREAS, Grantor is willing to grant a Conservation Easement over the herein described areas of the Property, thereby restricting and limiting the use of the included areas of the Property to the terms and conditions and purposes hereinafter set forth, and Grantee is willing to accept such Conservation Easement. This Conservation Easement shall be for the protection and benefit of **Rockfish Creek**.

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

The Easement Area consists of the following:

Conservation Easement containing a total of **11.72 acres** as shown on the plat of survey entitled "Final Plat, Conservation Easement for North Carolina Ecosystem Enhancement Program, Project Name: **Twin Bays Wetland Restoration Site**, EEP Project #: 95363, SPO#: **31-O**," dated **August 20, 2012** by **James M. Gellenthin**, PLS Number **L-3860** and recorded in the **Duplin County**, North Carolina Register of Deeds at **Map Book 26 Page 384.**

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

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

I. DURATION OF EASEMENT

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

II. GRANTOR RESERVED USES AND RESTRICTED ACTIVITES

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

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

B. **Motorized Vehicle Use.** Motorized vehicle use in the Easement Area is prohibited.

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

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

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

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

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

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

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

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

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

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

M. **Subdivision and Conveyance.** Grantor voluntarily agrees that no subdivision, partitioning, or dividing of the underlying Property owned by the Grantor in fee simple ("fee") that is subject to this Easement is allowed. Unless agreed to by the Grantee in writing, any future conveyance of the underlying fee and the rights conveyed herein shall be as a single block of property. Any future transfer of the fee simple shall be subject to this Conservation Easement. Any transfer of the fee is subject to the Grantee's right of unlimited and repeated ingress and egress over and across the Property to the Easement Area for the purposes set forth herein.

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

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

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

III. GRANTEE RESERVED USES

A. Right of Access, Construction, and Inspection. The Grantee, its employees and agents, successors and assigns, are hereby granted and receive a perpetual non-exclusive easement for access to the Easement Area over the Property at reasonable times to undertake any activities to restore, construct, manage, maintain, enhance, and monitor the stream, wetland and any other riparian resources in the Easement Area, in accordance with restoration activities or a long-term management plan. Unless otherwise specifically set forth in this Conservation Easement, the rights granted herein do not include or establish for the public any access rights. The recommended access to the site from Cornwallis Road is shown on the plat of survey entitled "Final Plat, Conservation Easement for North Carolina Ecosystem Enhancement Program, Project Name: **Twin Bays Wetland Restoration Site**, EEP Project #: 95363, SPO#: **31-O**," dated **August 20, 2012** by **James M. Gellenthin**, PLS Number **L-3860** and recorded in the **Duplin County**, North Carolina Register of Deeds at **Map Book 26 Page 384.**

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

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

D. Fences. The Grantee, its employees and agents, successors or assigns, shall be permitted to place fencing on the Property to restrict livestock access. Although the Grantee is not responsible for fence maintenance, the Grantee reserves the right to repair the fence, at its sole discretion.

IV. ENFORCEMENT AND REMEDIES

A. Enforcement. To accomplish the purposes of this Conservation Easement, Grantee is allowed to prevent any activity within the Easement Area that is inconsistent with the purposes of this Easement and to require the restoration of such areas or features in the Easement Area that may have been damaged by such unauthorized activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, the Grantee shall, except as provided below, notify

the Grantor-in writing of such breach and the Grantor shall have ninety (90) days after receipt of such notice to correct the damage caused by such breach. If the breach and damage remains uncured after ninety (90) days, the Grantee may enforce this Conservation Easement by bringing appropriate legal proceedings including an action to recover damages, as well as injunctive and other relief. The Grantee shall also have the power and authority, consistent with its statutory authority: (a) to prevent any impairment of the Easement Area by acts which may be unlawful or in violation of this Conservation Easement; (b) to otherwise preserve or protect its interest in the Property; or (c) to seek damages from any appropriate person or entity. Notwithstanding the foregoing, the Grantee reserves the immediate right, without notice, to obtain a temporary restraining order, injunctive or other appropriate relief, if the breach is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement, and the Grantor and Grantee acknowledge that the damage would be irreparable and remedies at law inadequate. The rights and remedies of the Grantee provided hereunder shall be in addition to, and not in lieu of, all other rights and remedies available to Grantee in connection with this Conservation Easement.

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

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

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

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

V. MISCELLANEOUS

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

B. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Property. Grantee shall not be responsible for any costs or liability of any kind related to the

ownership, operation, insurance, upkeep, or maintenance of the Property, except as expressly provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

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

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

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

F. This Conservation Easement and Right of Access may be amended, but only in writing signed by all parties hereto, or their successors or assigns, if such amendment does not affect the qualification of this Conservation Easement or the status of the Grantee under any applicable laws, and is consistent with the purposes of the Conservation Easement. The owner of the Property shall notify the U.S. Army Corps of Engineers in writing sixty (60) days prior to the initiation of any transfer of all or any part of the Property. Such notification shall be addressed to: Justin McCorkle, General Counsel, US Army Corps of Engineers, 69 Darlington Avenue, Wilmington, NC 28403

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

VI. QUIET ENJOYMENT

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

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

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

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

Danny B. Keir (SEAL)
Danny B. Keir

Annice Morrison Keir (SEAL)
Annice Morrison Keir

NORTH CAROLINA
COUNTY OF NEW HANOVER

I, ROBERT G COLLINS, a Notary Public in and for the County and State aforesaid, do hereby certify that **Danny B. Keir and Annice Morrison Keir**, 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 27th day of NOVEMBER, 2012.

Notary Public

NEW HANOVER COUNTY, N.C. NOTARY PUBLIC ROBERT G. COLLINS

My commission expires:
SEPTEMBER 19, 2015

Exhibit A
Conservation Easement Description

A parcel of land to be used for conservation easement purposes located on lands now or formerly owned by Danny B. Keir (DB 1666 Pg 116), located in Rockfish Township, Duplin County, North Carolina and being more particularly described as follows:

Commencing at a found railroad spike in the center of Cornwallis Road (60 foot public right-of-way) at the Southwest corner of said Danny B. Keir lands; said point having State Plane Coordinates (NAD '83) of Northing:364604.71 and Easting:2291890.15; Thence South 82°54'05" East on the South line of said lands owned by Danny B. Keir, a distance of 34.37 feet to the intersection with the Easterly right-of –way line of Cornwallis Road (NCSR 1101); Thence North 22°07'18" West, on the said Easterly right-of-way line of Cornwallis Road, a distance of 5.67 feet to the **Point of Beginning;**

Thence N 22°07'18" W, continuing on the Easterly line of Cornwallis Road, a distance of 459.93 feet to a point;

Thence N 29°06'58" E a distance of 243.43 feet to a point on a Southwesterly line of lands now or formerly owned by Larry Allen Keir, Jr. (DB 1645 PG 107);

Thence S 34°16'08" E, on the said Southwesterly line of Larry Allen Keir, Jr. lands, a distance of 5.37 feet to a point;

Thence N 28°38'16" E on the Southeasterly line of said Larry Allen Keir, Jr. lands a distance of 93.28 feet to a point;

Thence N 06°26'39" E, on the Easterly line of said Larry Allen Keir, Jr. lands, a distance of 81.86 feet to a point;

Thence S 89°35'35" E a distance of 82.68 feet to a point;

Thence S 06°22'31" W a distance of 284.75 feet to a point;

Thence S 82°45'43" E a distance of 162.72 feet to a point;

Thence N 14°37'28" E a distance of 266.95 feet to a point;

Thence S 75°01'38" E a distance of 105.07 feet to a point;

Thence S 17°42'38" W a distance of 207.27 feet to a point;

Thence S 71°55'53" E a distance of 174.39 feet to a point;

Thence N 12°11'01" E a distance of 195.71 feet to a point;

Thence S 70°36'57" E a distance of 44.79 feet to a point;

Thence S 10°24'40" E a distance of 183.19 feet to a point;

Thence S 22°51'13" E a distance of 624.43 feet to a point;

Thence N 82°50'51" W a distance of 852.09 feet to the **Point of Beginning.**

Containing 510721 square feet or 11.72 acres.

Exhibit A (Continued)

Point Table (Table of Coordinates)			
Point	Northing	Easting	Description
1	364605.59	2291922.18	Easement Corner
2	365031.66	2291748.98	Easement Corner
3	365244.33	2291867.43	Easement Corner
4	365239.90	2291870.45	Easement Corner
5	365321.77	2291915.16	Easement Corner
6	365403.11	2291924.35	Easement Corner
7	365402.52	2292007.03	Easement Corner
8	365119.54	2291975.41	Easement Corner
9	365099.04	2292136.83	Easement Corner
10	365357.33	2292204.23	Easement Corner
11	365330.19	2292305.74	Easement Corner
12	365132.74	2292242.68	Easement Corner
13	365078.65	2292408.47	Easement Corner
14	365269.95	2292449.77	Easement Corner
15	365255.09	2292492.02	Easement Corner
16	365074.91	2292525.13	Easement Corner
17	364499.50	2292767.64	Easement Corner

<u>NOTES:</u>

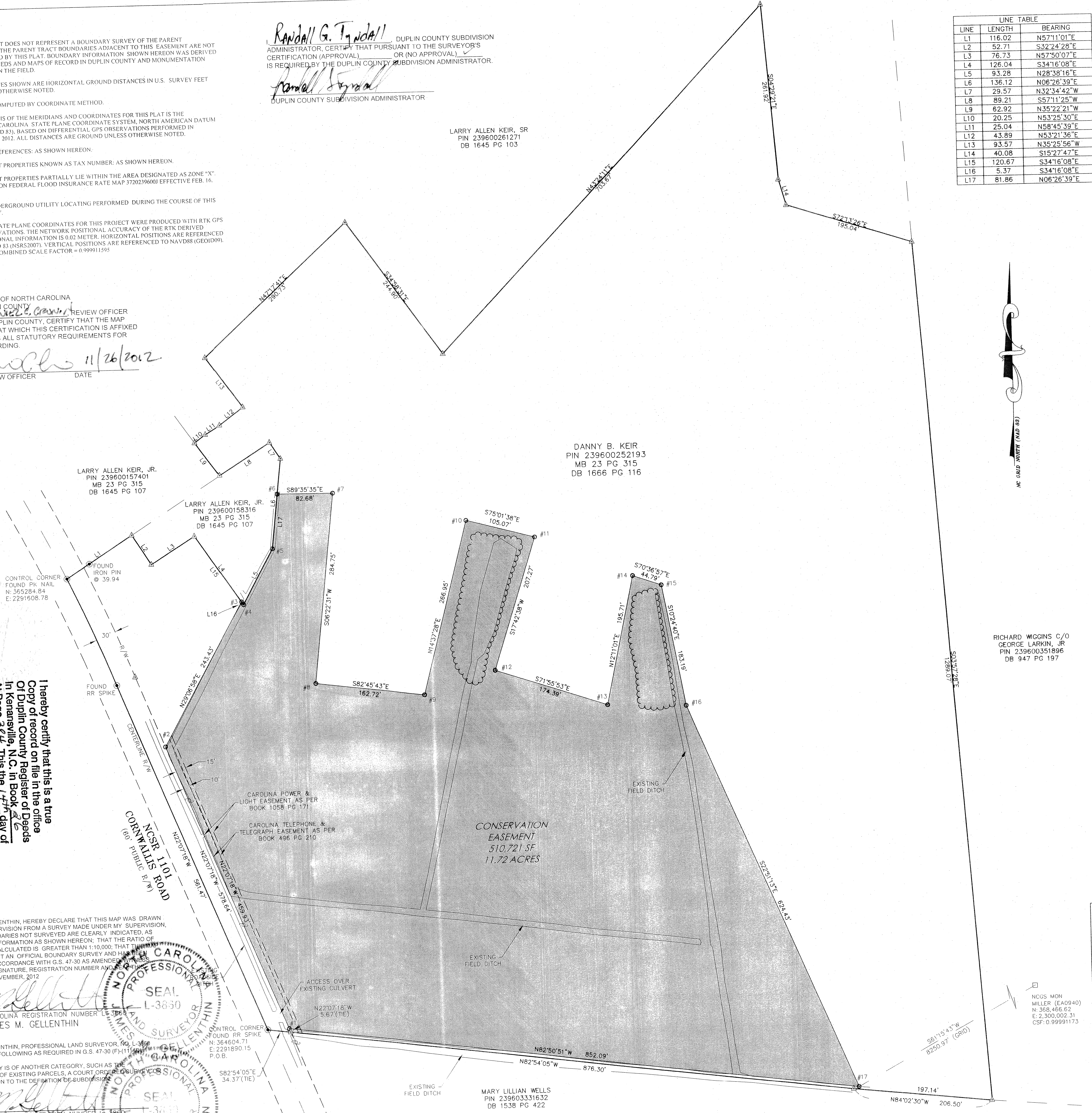
1. THIS PLAT DOES NOT REPRESENT A BOUNDARY SURVEY OF THE PARENT TRACTS. THE PARENT TRACT BOUNDARIES ADJACENT TO THIS EASEMENT ARE NOT CHANGED BY THIS PLAT. BOUNDARY INFORMATION SHOWN HEREON WAS DERIVED FROM DEEDS AND MAPS OF RECORD IN DUPLIN COUNTY AND MONUMENTATION FOUND IN THE FIELD.
2. DISTANCES SHOWN ARE HORIZONTAL GROUND DISTANCES IN U.S. SURVEY FEET UNLESS OTHERWISE NOTED.
3. AREA COMPUTED BY COORDINATE METHOD.
4. THE BASIS OF THE MERIDIANS AND COORDINATES FOR THIS PLAT IS THE NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83), BASED ON DIFFERENTIAL GPS OBSERVATIONS PERFORMED IN AUGUST 2012. ALL DISTANCES ARE GROUND UNLESS OTHERWISE NOTED.
5. DEED REFERENCES: AS SHOWN HEREON.
6. SUBJECT PROPERTIES KNOWN AS TAX NUMBER: AS SHOWN HEREON.
7. SUBJECT PROPERTIES PARTIALLY LIE WITHIN THE AREA DESIGNATED AS ZONE "X". BASED ON FEDERAL FLOOD INSURANCE RATE MAP 3720239600J EFFECTIVE FEB. 16, 2006.
8. NO UNDERGROUND UTILITY LOCATING PERFORMED DURING THE COURSE OF THIS SURVEY.
9. THE STATE PLANE COORDINATES FOR THIS PROJECT WERE PRODUCED WITH RTK GPS OBSERVATIONS. THE NETWORK POSITIONAL ACCURACY OF THE RTK DERIVED POSITIONAL INFORMATION IS 0.02 METER. HORIZONTAL POSITIONS ARE REFERENCED TO NAD 83 (NSRS2007). VERTICAL POSITIONS ARE REFERENCED TO NAVD88 (GEOID09). COMBINED SCALE FACTOR = 0.999911595

I, Randall G. Tyndall, DUPLIN COUNTY SUBDIVISION ADMINISTRATOR, CERTIFY THAT PURSUANT TO THE SURVEYOR'S CERTIFICATION (APPROVAL)_____ OR (NO APPROVAL) ✓ IS REQUIRED BY THE DUPLIN COUNTY SUBDIVISION ADMINISTRATOR.

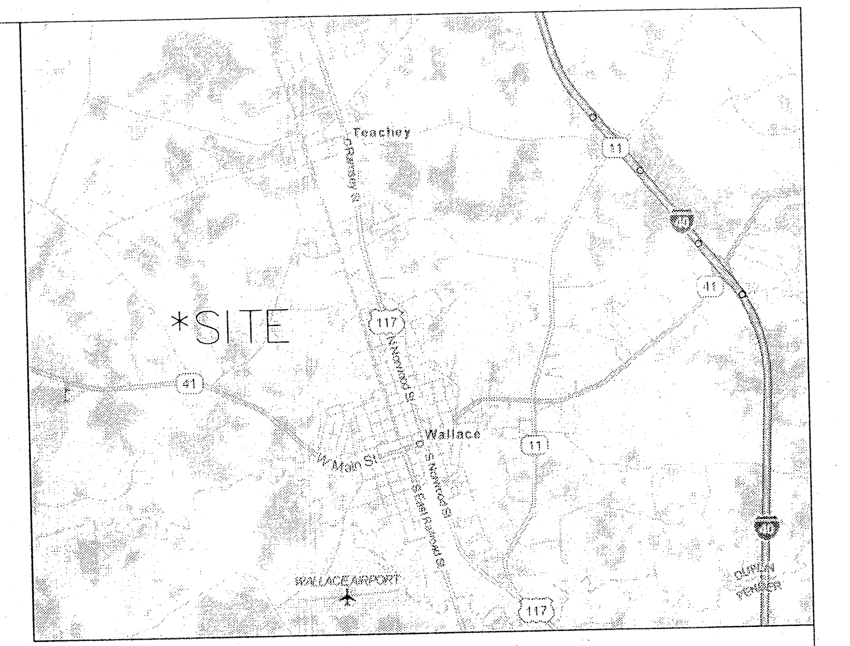
Randall Tyndall
DUPLIN COUNTY SUBDIVISION ADMINISTRATOR

STATE OF NORTH CAROLINA
DUPLIN COUNTY
I, Daniel E. Crawford, REVIEW OFFICER OF DUPLIN COUNTY, CERTIFY THAT THE MAP OR PLAT WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

[signature] 11/26/2012
REVIEW OFFICER DATE



LINE	LENGTH	BEARING
L1	116.02	N57°11'01"E
L2	52.71	S32°24'28"E
L3	76.73	N57°50'07"E
L4	126.04	S34°16'08"E
L5	93.28	N28°38'16"E
L6	136.12	N06°26'39"E
L7	29.57	N32°34'42"W
L8	89.21	S57°11'25"W
L9	62.92	N35°22'21"W
L10	20.25	N53°25'30"E
L11	25.04	N58°45'39"E
L12	43.89	N53°21'36"E
L13	93.57	N35°25'56"W
L14	40.08	S15°27'47"E
L15	120.67	S34°16'08"E
L16	5.37	S34°16'08"E
L17	81.86	N06°26'39"E



VICINITY MAP
(NOT TO SCALE)

POINT	NORTHING	EASTING	DESCRIPTION
1	364605.59	2291922.18	ESMT CORNER
2	365031.66	2291748.98	ESMT CORNER
3	365244.33	2291867.43	ESMT CORNER
4	365239.90	2291870.45	ESMT CORNER
5	365321.77	2291915.16	ESMT CORNER
6	365403.11	2291924.35	ESMT CORNER
7	365402.52	2292007.03	ESMT CORNER
8	365119.54	2291975.41	ESMT CORNER
9	365099.04	2292136.83	ESMT CORNER
10	365357.33	2292204.23	ESMT CORNER
11	365330.19	2292305.74	ESMT CORNER
12	365132.74	2292242.68	ESMT CORNER
13	365078.65	2292408.47	ESMT CORNER
14	365269.95	2292449.77	ESMT CORNER
15	365255.09	2292492.02	ESMT CORNER
16	365074.91	2292525.13	ESMT CORNER
17	364499.50	2292767.64	ESMT CORNER

STATE OF NORTH CAROLINA
DUPLIN COUNTY
THIS MAP WAS FILED FOR REGISTRATION AT 11:32:38 O'CLOCK A.M. ON THIS THE 26 DAY OF November 2012.
REGISTERED IN MAP BOOK 26 PAGE 384

Davis H. Brinson
REGISTER OF DEEDS
By Janne W. Carr Deputy

B0026 P0384 11-26-2012 11:32:38.000
Davis H. Brinson PLAT
Duplin County, NC Register of Deeds page 1 of 1

LEGEND

- • EXISTING PK NAIL
- ⊙ EXISTING IRON
- ○ 5/8" REBAR SET W/ 3.25" ALUMINUM CAP WITH STATE SEAL
- ▲ CALCULATED POINT
- ⊡ EXISTING MONUMENT
- NEW CONSERVATION EASEMENT FOR "THE STATE OF NC, ECOSYSTEM ENHANCEMENT PROGRAM."
- P.O.B. POINT OF BEGINNING
- —OHW—OHW—OHW— OVERHEAD WIRES

GRAPHIC SCALE
100 0 50 100 200
1 INCH = 100 FEET

I hereby certify that this is a true Copy of record on file in the office Of Duplin County Register of Deeds In Kenansville, N.C. in Book 26 At Page 384. This the 14th day of December, 2012
DAVIS H. BRINSON
REGISTER OF DEEDS
BY: Audrey K Bryant
Deputy

I, JAMES M. GELLENTHIN, HEREBY DECLARE THAT THIS MAP WAS DRAWN UNDER MY SUPERVISION FROM A SURVEY MADE UNDER MY SUPERVISION, THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED, AS DRAWN FROM INFORMATION AS SHOWN HEREON; THAT THE RATIO OF PRECISION AS CALCULATED IS GREATER THAN 1:10,000; THAT THIS MAP DOES REPRESENT AN OFFICIAL BOUNDARY SURVEY AND HAS BEEN PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 16TH DAY OF NOVEMBER, 2012

[signature]
NORTH CAROLINA REGISTRATION NUMBER L-3860
JAMES M. GELLENTHIN

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-3860 JAMES M. GELLENTHIN

I, JAMES M. GELLENTHIN, PROFESSIONAL LAND SURVEYOR, NO. L-3860 CERTIFY TO THE FOLLOWING AS REQUIRED IN G.S. 47-30 (F)-(11)-(D):

THAT THE SURVEY IS OF ANOTHER CATEGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT ORDERED SURVEY OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION.

[signature]
NORTH CAROLINA REGISTRATION NUMBER L-3860
JAMES M. GELLENTHIN

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-3860 JAMES M. GELLENTHIN

FINAL PLAT
CONSERVATION EASEMENT
FOR
NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM
PROJECT NAME: TWIN BAYS WETLAND RESTORATION SITE
EEP PROJECT #: 95363
SPO FILE NO. 31-O: PROPERTY OF DANNY B. KEIR
CAPE FEAR RIVER BASIN CATALOGING UNIT 03030007
ROCKFISH TOWNSHIP, DUPLIN COUNTY, NC

DATE:	SCALE:	SHEET:
AUGUST 20, 2012	1" = 100'	1 OF 1

KCI ASSOCIATES OF N.C.
ENGINEERS, SURVEYORS AND PLANNERS
4601 SIX FORKS ROAD, SUITE 220
RALEIGH, NC 27609
PHONE (919) 783-9214 * FAX (919) 783-9266
KCI ASSOCIATES OF NORTH CAROLINA C-0764

20122265

14.4 Appendix B. Baseline Information Data

USACE Wetland Determination Forms

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Twin Bays City/County: Wallace / Duplin Sampling Date: 9-26-12

Applicant/Owner: KCI Associates of NC State: NC Sampling Point: DP#1

Investigator(s): S. Stokes Section, Township, Range:

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR or MLRA): LRR T Lat: 34°44'53.59"N Long: 78°1'39.48"W Datum:

Soil Map Unit Name: Rains NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✓

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks:

Site is drained farmland planted in soybeans.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No ____	Depth (inches): ____	
Water Table Present?	Yes ____	No ✓	Depth (inches): >18"	
Saturation Present? (includes capillary fringe)	Yes ____	No ____	Depth (inches): ____	**Wetland Hydrology Present?** Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP#1

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 1m)			
1. Soybeans			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks: (If observed, list morphological adaptations below).

Soybean crop N/A to hydrophytic vegetation.

SOIL Sampling Point: DP#1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10yr 3/1	100					fsl	
4-6	10yr 3/1	98	10yr 4/3	2	C	M	sl	
6-10	10yr 4/2	98	7.5yr 4/4	2	C	M/PL	scl	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ✓ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Twin Bays City/County: Wallace/Duplin Sampling Date: 9-26-12

Applicant/Owner: Kex Associates of NC State: NC Sampling Point: DP#2

Investigator(s): S. Stokes Section, Township, Range:

Landform (hillslope, terrace, etc.): upland Bay Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR or MLRA): LRR T Lat: 34°44'54.87"N Long: 78°1'33.74"W Datum:

Soil Map Unit Name: Pantego NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✓

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks:

Site is drained farmland planted in soybeans.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No ____	Depth (inches): ____
Water Table Present?	Yes ____	No ✓	Depth (inches): > 18"
Saturation Present? (includes capillary fringe)	Yes ____	No ____	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP# 2

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Herb Stratum (Plot size: 1m)			
1. Soybean	100		N.I
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	_____	x 1 =	_____
FACW species	_____	x 2 =	_____
FAC species	_____	x 3 =	_____
FACU species	_____	x 4 =	_____
UPL species	_____	x 5 =	_____
Column Totals:	_____ (A)		_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks: (If observed, list morphological adaptations below).

Soybean crop N/A to hydrophytic vegetation.

SOIL

Sampling Point: DP# 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10yr 3/1	100					ls	
7-12	10yr 3/1	99	10yr 4/3	1	C	M	ls	
12-19	10yr 4/2	98	10yr 4/4	2	C	M	lfs	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ✓ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No _____

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Twin Bays City/County: Wallace / Duplin Sampling Date: 9-26-12

Applicant/Owner: Kar Associates of NC State: NC Sampling Point: DP#3

Investigator(s): S. Stokes Section, Township, Range:

Landform (hillslope, terrace, etc.): Upland Bay Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR or MLRA): LRR T Lat: 34° 44'54.87"N Long: 78° 1'33.74"W Datum:

Soil Map Unit Name: Torhunta NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✓

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks:

Site is drained farmland planted in soybeans

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): ____

Water Table Present? Yes ____ No ✓ Depth (inches): 7/8"

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP# 3

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Herb Stratum (Plot size: 1 m)			
1. Soybeans	100		NI
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	_____	x 1 =	_____
FACW species	_____	x 2 =	_____
FAC species	_____	x 3 =	_____
FACU species	_____	x 4 =	_____
UPL species	_____	x 5 =	_____
Column Totals:	_____ (A)		_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks: (If observed, list morphological adaptations below).

Soybean Crop N/A to Hydrophytic Vegetation.

SOIL

Sampling Point: DP#3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10yr 3/1	100					LFS	
8-12	10yr 5/2	100					S	
12-16	10yr 6/1	98	10yr 5/4	2	C	M	S	
16-27	10yr 6/2	95	7.5yr 6/2	5	C	M	SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ✓ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Twin Bays City/County: Wallace / Duplin Sampling Date: 9-26-12

Applicant/Owner: KCI Associates of NC State: NC Sampling Point: DP#4

Investigator(s): S. Stokes Section, Township, Range:

Landform (hillslope, terrace, etc.): upland bay Local relief (concave, convex, none): concave Slope (%): 0-2

Subregion (LRR or MLRA): LRR T Lat: 34°44'56.45"N Long: 78°1'40.78"W Datum:

Soil Map Unit Name: Toahnita NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✓

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks:

Site is drained farmland planted in Soybeans

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No ____	Depth (inches): ____
Water Table Present?	Yes ____	No ✓	Depth (inches): >18"
Saturation Present? (includes capillary fringe)	Yes ____	No ____	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP# 4

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Herb Stratum (Plot size: 1m)			
1. Soybeans	100		NI
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
50% of total cover: _____	20% of total cover: _____		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	_____	x 1 =	_____
FACW species	_____	x 2 =	_____
FAC species	_____	x 3 =	_____
FACU species	_____	x 4 =	_____
UPL species	_____	x 5 =	_____
Column Totals:	_____ (A)		_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks: (If observed, list morphological adaptations below).

Soybeans crops N/A to hydrophytic vegetation.

SOIL

Sampling Point: DP#4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10yr 3/1	100					fs	fine sand
10-22	10yr 6/1	100					s	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ✓ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Reference Wetland

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Twin Bays Reference Wetland City/County: Wallace / Duplin Sampling Date: 11-5-2012

Applicant/Owner: KCI / EEP State: NC Sampling Point: DP#1

Investigator(s): S. Stokes, K. O'Briant Section, Township, Range:

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR or MLRA): LRR T Lat: N34°45'24.0" Long: W078°01'40.6" Datum:

Soil Map Unit Name: Pantego NWI classification: PFO1Bd

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks:
NWI maps classify the area as PSS4Ad. The reference wetland is in a transition zone between upland areas and PSS4Ad. It is comprised of 50% areal coverage of trees over a shrub layer with 60% Broad leaved evergreens.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ✓ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No ____	Depth (inches): ____	
Water Table Present?	Yes ____	No ✓	Depth (inches): 42"	
Saturation Present? (includes capillary fringe)	Yes ____	No ____	Depth (inches): ____	**Wetland Hydrology Present?** Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP#1

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Red Maple - Acer rubrum	40	✓	FAC
2. Water Oak - Quercus nigra	30	✓	FAC
3. Sweetgum - Liquidambar Styraciflua	30	✓	FAC
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		
Sapling/Shrub Stratum (Plot size: 30')			
1. Sweetbay - Magnolia virginiana	30	✓	FACW
2. Water Oak - Quercus nigra	20	✓	FAC
3. Swamp Redbay - Persea palustris	20	✓	FACW
4. Titi - Cyrilla racemiflora	20	✓	FACW
5. Fetterbush - Lyonia lucida	10	✓	FACW
6. Highbush blueberry - Vaccinium corymbosum	5		FACW
7.			
8.			
	105 = Total Cover		
50% of total cover: 52.5	20% of total cover: 21		
Herb Stratum (Plot size: 1m)			
1. Giant cane - Arundinaria gigantea	20	✓	FACW
2. Virginia chain fern - Woodwardia virginica	5	✓	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	25 = Total Cover		
50% of total cover: 12.5	20% of total cover: 5		
Woody Vine Stratum (Plot size: 30')			
1. Smilax laurifolia	20	✓	FACW
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover: 10	20% of total cover: 4		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 11 (A)

Total Number of Dominant Species Across All Strata: 11 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks: (If observed, list morphological adaptations below).

SOIL Sampling Point: DP#1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10yr 2/1						loam	
7-9	10yr 3/1	98	7.5yr 3/4	2			l	
9-11	10yr 3/1	68	10yr 4/1	30	C	m	fsl	
			7.5yr 3/4	2	C	m		
11-14	10yr 5/1	80	10yr 4/1	20	C	m	scl	
14-26	10yr 6/1	90	7.5yr 5/8	10	C	m/PL	scl	
			5yr 3/4	2	C	PL		Also has 10yr 4/1 5%

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ✓ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ___ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

26 - 42" 10yr 5/1 7.5yr 5/8 md 40% scl
5yr 3/4 5%
10yr 4/1 5%

42 - 56" 10yr 5/2 10yr 4/1 20% scl

56 - 59" 10yr 5/2 scl

KCI

SUBJECT _____

JOB NUMBER _____ SHEET _____ OF _____

DESIGN _____ DATE _____

CHECK _____ DATE _____

Leading through Excellence • www.kci.com • (800) 572-7496

Twin Bays Reference Wetland Location

From the Twin Bays site, T-R onto Cornwallis Rd and go 0.9 miles to Log Cabin Rd, T-R on Log Cabin Rd and go 0.4 miles to immediately past blue (bluish-grey house) and T-R onto Farm path, go to the gate then continue to T intersection, T-R and go to T intersection, T-L and go 0.1 miles or 550' where a no hunting sign is erected. T- 90° to Right (SW) and go ≈50' along fire lane, turn right and go 30' to MW. Reference Well is marked with 6' T post of Orange flagging.

From I-40 Yoke exit 384, at top of ramp T R and go 1/10 miles on NC Hwy 11 S to Log Cabin Rd, T-R on Log Cabin Rd and go 4.1 miles to Farm path between Blue house and yellow house, T-L onto Farm path and proceed to gate and beyond


Reference Wetland Gauge
Project Easement
300 150 0 300
Feet
PROJECT SITE REFERENCE WETLAND
TWIN BAYS RESTORATION SITE
DUPLIN COUNTY, NC
Source: NC Statewide Imagery, 2010.
N

FHWA Categorical Exclusion Form

October 15, 2012

Mr. Tim Morris
KCI Associates of NC, PA
Landmark Center II, Suite 220
4601 Six Forks Road
Raleigh NC 27609

Subject: Categorical Exclusion
Twin Bays Wetland Restoration Project
Cape Fear River Basin – CU# 03030007
Duplin County, North Carolina
Contract No. 004739, RFP No. 16-004102

Dear Mr. Morris:

Attached please find the approved Categorical Exclusion form for the subject full delivery project. Please include a copy of the approval form in your Mitigation Plan. You may submit your invoice for completion of the Task 1 deliverable for review and approval.

If you have any questions, or wish to discuss this matter further, please contact me at any time. I can be reached at (910) 796-7475, or email me at kristin.miguez@ncdenr.gov.

Sincerely,

Kristin E. Miguez, Project Manager

cc: Donnie Brew, FHWA
file

Categorical Exclusion Form for Ecosystem Enhancement Program Projects
Version 1.4

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

Part 1: General Project Information	
Project Name:	Twin Bays Non-riparian Wetland Mitigation Project
County Name:	Duplin County, NC
EEP Number:	95363
Project Sponsor:	KCI Technologies, Inc.
Project Contact Name:	Tim Morris
Project Contact Address:	4601 Six Forks Rd, Suite 220, Raleigh, NC 27609
Project Contact E-mail:	tim.morris@kci.com
EEP Project Manager:	Kristin Miguez

Project Description

For Official Use Only

Reviewed By:

10-12-12
Date

K Leigner
EEP Project Manager

Conditional Approved By:

Date

For Division Administrator
FHWA

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

Final Approval By:

10-12-12
Date

For Division Administrator
FHWA

Part 2: All Projects Regulation/Question	Response
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☒ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☒ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☒ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☒ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☒ No ☐ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☒ No ☐ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☐ No ☒ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☒ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☒ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☒ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☒ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☒ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Does the project require the acquisition of real estate?	☒ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☒ No ☐ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☒ Yes ☐ No ☐ N/A

Part 3: Ground-Disturbing Activities Regulation/Question	Response
American Indian Religious Freedom Act (AIRFA)	
1. Is the project located in a county claimed as "territory" by the Eastern Band of Cherokee Indians?	☐ Yes ☒ No
2. Is the site of religious importance to American Indians?	☐ Yes ☐ No ☒ N/A
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	☐ Yes ☒ No ☐ N/A
4. Have the effects of the project on this site been considered?	☐ Yes ☐ No ☒ N/A
Antiquities Act (AA)	
1. Is the project located on Federal lands?	☐ Yes ☒ No
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Archaeological Resources Protection Act (ARPA)	
1. Is the project located on federal or Indian lands (reservation)?	☐ Yes ☒ No
2. Will there be a loss or destruction of archaeological resources?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Endangered Species Act (ESA)	
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	☒ Yes ☐ No
2. Is Designated Critical Habitat or suitable habitat present for listed species?	☐ Yes ☒ No ☐ N/A
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	☐ Yes ☒ No ☐ N/A
4. Is the project "likely to adversely affect" the specie and/or "likely to adversely modify" Designated Critical Habitat?	☐ Yes ☐ No ☒ N/A
5. Does the USFWS/NOAA-Fisheries concur in the effects determination? (By virtue of no-response)	☒ Yes ☐ No ☐ N/A
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?	☐ Yes ☐ No ☒ N/A

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

Jurisdictional Determination

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2012-01285** County: **Duplin** U.S.G.S. Quad: **Wallace West**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner: **Danny B. Keir**
Address: **5114 Clear Run Drive**
Wilmington, NC 28403

Agent: **KCI Associates of NC**
attn: Steven F. Stokes
Address: **Landmark Center II, Suite 220**
4601 Six Forks Road
Raleigh, NC 27609

Property description:
Size (acres) **~13**
Nearest Waterway **UT to Rock Fish Creek**
USGS HUC **03030007**
Nearest Town **Wallace**
River Basin **Northeast Cape Fear**
Coordinates **34.748806** N **-78.027356** W
Location description: **The property is located on the east side of Cornwallis Road, approximately 0. 45 mi. north of its intersection with NC 41, near Wallace, Duplin County, North Carolina. The Project Area is located in the southwestern half of PIN #: 239600252193.**

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.

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

_ We 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.

X The waters of the U.S.s on your project area have been delineated and the delineation has been verified by the Corps. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to CWA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

_ The waters of the U.S. including wetlands have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on ___. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

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

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

Placement of dredged or fill material within waters of the US 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 **Mr. David E. Bailey** at **(910) 251-4469 / David.E.Bailey2@usace.army.mil.**

C. Basis For Determination

The site exhibits features with Ordinary High Water. The waters on-site include an 4 unnamed tributaries (UTs) to Rock Fish Creek and a small pond - all Relatively Permanent Waters (RPWs) which flow via another UT to Rock Fish Creek (RPW) and Rock Fish Creek (RPW) to the Northeast Cape Fear River, a Traditionally Navigable Water.

D. Remarks

The Waters of the US were delineated by Steve Stokes (KCI), with changes made in the field by Dave E. Bailey (USACE), and are approximated as the shaded areas on the attached figure entitled "Jurisdictional Tributary Delineation Map of Twin Bays Wetland Restoration", dated 8/20/2012.

E. Attention USDA Program Participants

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

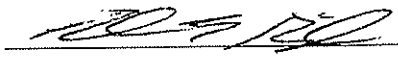
F. Appeals Information (This information applies only to approved jurisdictional determinations as indicated in B. above)

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:

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

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the 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 **December 29, 2012**.

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: 

Date **October 30, 2012** Expiration Date **October 30, 2017**

Copy furnished:
Chad Coburn , NCDENR-DWQ, 127 Cardinal Drive Extension, Wilmington, NC 28405

LARRY ALLEN KEIR, SR
PIN 239600261271
DB 1645 PG 103

DANNY B. KEIR ETAL
PIN 239600157401
MB 23 PG 315
DB 1645 PG 107

DANNY B. KEIR ETAL
PIN 239600158316
MB 23 PG 315
DB 1645 PG 107

JURISDICTIONAL TRIBUTARY CONTINUES PAST PROJECT LIMITS

DANNY B. KEIR
PIN 239600252193
MB 23 PG 315
DB 1666 PG 116

PROPOSED CONSERVATION EASEMENT LINE

RICHARD WIGGINS C/O
GEORGE LARKIN, JR
PIN 239600351896
DB 947 PG 197

STUDY AREA
517,704 SF
11.88 ACRES

NCSR 1101
CORNWALLIS ROAD
(60' PUBLIC R/W)

2.4'
4.3'
4.9'
3.7'
4.3'
4.5'
4.4'
4.1'
3.6'
5.3'
CROSSING
6.2'
5.4'
5.3'
5.2'
3.4'
4.5'
2.2'
4.3'
1.2'
2.6'
4.3'
FLOW

JURISDICTIONAL TRIBUTARY CONTINUES PAST PROJECT LIMITS

*** JD IS FOR THE EXISTING KEIR *** PROPERTY (TWIN BAYS) LABELED AS STUDY AREA AND DOES NOT EXTEND ONTO ADJACENT PROPERTIES

MARY LILLIAN WELLS
PIN 239603331632
DB 1538 PG 422

VICINITY MAP
NOT TO SCALE

N
W
E
S

LINEAR FEET OF JURISDICTIONAL TRIBUTARY – 3,340'

JURISDICTIONAL TRIBUTARY – 16,900 S.F. (0.39 ACRES)

GRAPHIC SCALE
0 75 150 300
1 INCH = 150 FEET

JURISDICTIONAL TRIBUTARY DELINEATION MAP
FOR
TWIN BAYS WETLAND RESTORATION
ROCKFISH TWP, DUPLIN COUNTY
NORTH CAROLINA

DATE:	SCALE:	SHEET:
AUGUST 20, 2012	1" = 150'	1 OF 1

KCI ASSOCIATES OF NORTH CAROLINA C-0764

KCI ASSOCIATES OF N.C.
ENGINEERS, SURVEYORS AND PLANNERS

4601 SIX FORKS ROAD, SUITE 220
RALEIGH, NC 27609
PHONE (919) 783-9214 * FAX (919) 783-9266

20122265

FEMA Floodplain Checklist

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. State NFIP Engineer), NC Floodplain Mapping Unit (attn. State NFIP Coordinator) and NC Ecosystem Enhancement Program.

Project Location

Name of project:	Twin Bays Wetland Restoration Project
Name if stream or feature:	N/A
County:	Duplin
Name of river basin:	Cape Fear
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Wallace, Duplin County
DFIRM panel number for entire site:	2396J
Consultant name:	KCI Technologies, Inc.
Phone number:	919-783-9214
Address:	4601 Six Forks Rd. Raleigh, NC 27609

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
Wetland 1	*11.1 acres*	*N/A*

Floodplain Information

Is project located in a Special Flood Hazard Area (SFHA)?

☐ Yes ☉ No

If project is located in a SFHA, check how it was determined:

☐ Redelineation

☐ Detailed Study

☐ Limited Detail Study

☐ Approximate Study

☐ Don't know

List flood zone designation:

Check if applies:

☐ AE Zone

- ☐ Floodway
- ☐ Non-Encroachment
- ☉ None

☐ A Zone

- ☐ Local Setbacks Required
- ☐ No Local Setbacks Required

If local setbacks are required, list how many feet:

Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks?

☐ Yes ☒ No

Land Acquisition (Check)

☐ State owned (fee simple)

☐ Conservation easment (Design Bid Build)

☑ Conservation Easement (Full Delivery Project)

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)

Is community/county participating in the NFIP program?

☒ Yes ☐ No

Note: if community is not participating, then all requirements should be addressed to NFIP (attn: State NFIP Engineer, (919) 715-8000)

Name of Local Floodplain Administrator:
Phone Number:

Floodplain Requirements

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

☑ No Action

☐ No Rise

☐ Letter of Map Revision

☐ Conditional Letter of Map Revision

☐ Other Requirements

List other requirements:

Comments:

Project is not located in a jurisdictional floodplain.

Name: _____ Signature: _____

Title: _____ Date: _____

14.5 Appendix C. Mitigation Work Plan Data and Analyses

Groundwater Modeling/Hydrologic Budget

Twin Bays Restoration Site - Existing Conditions - Rains Soils

Dry Year	*Water Inputs*			*Water Outputs*			Change in Storage	Excess Water	Wetland Volume
1990	P	Si *	Gi	PET	So	Go			
January	2.07	0.00	0.00	0.80	0.00	2.80	-1.53	0.00	0.00
February	1.86	0.01	0.00	1.25	0.01	2.80	-2.19	0.00	0.00
March	5.96	1.03	0.00	1.60	1.03	2.80	1.56	0.00	1.56
April	2.50	0.02	0.00	2.39	0.02	2.80	-2.69	0.00	0.00
May	5.95	0.34	0.00	3.84	0.34	2.80	-0.69	0.00	0.00
June	0.86	0.00	0.00	5.99	0.00	2.80	-7.93	0.00	0.00
July	2.21	0.00	0.00	6.82	0.00	2.80	-7.41	0.00	0.00
August	5.72	0.15	0.00	5.99	0.15	2.80	-3.07	0.00	0.00
September	0.33	0.00	0.00	4.22	0.00	2.80	-6.69	0.00	0.00
October	3.64	0.60	0.00	2.71	0.60	2.80	-1.87	0.00	0.00
November	3.91	1.53	0.00	1.15	1.53	2.80	-0.04	0.00	0.00
December	1.60	0.01	0.00	0.90	0.01	2.80	-2.10	0.00	0.00
Annual Totals	**36.61**	**3.70**	**0.00**	**37.66**	**3.70**	**33.60**			

Avg. Year	*Water Inputs*			*Water Outputs*			Change in Storage	Excess Water	Wetland Volume
1973	P	Si *	Gi	PET	So	Go			
January	4.51	0.08	0.00	0.45	0.08	2.80	1.26	0.00	1.26
February	4.34	0.14	0.00	0.32	0.14	2.80	1.22	0.00	2.48
March	4.97	0.29	0.00	1.84	0.29	2.80	0.33	0.00	2.82
April	5.53	1.07	0.00	2.19	1.07	2.80	0.54	0.00	3.36
May	3.06	0.24	0.00	3.65	0.24	2.80	-3.39	0.00	0.00
June	8.70	1.89	0.00	5.48	1.89	2.80	0.42	0.00	0.42
July	3.96	0.04	0.00	5.65	0.04	2.80	-4.49	0.00	0.00
August	7.71	0.73	0.00	5.53	0.73	2.80	-0.62	0.00	0.00
September	3.70	1.17	0.00	4.43	1.17	2.80	-3.53	0.00	0.00
October	1.05	0.03	0.00	2.41	0.03	2.80	-4.16	0.00	0.00
November	0.47	0.00	0.00	1.26	0.00	2.80	-3.59	0.00	0.00
December	7.84	1.17	0.00	0.58	1.17	2.80	4.46	0.00	4.46
Annual Totals	**55.84**	**6.85**	**0.00**	**33.79**	**6.85**	**33.60**			

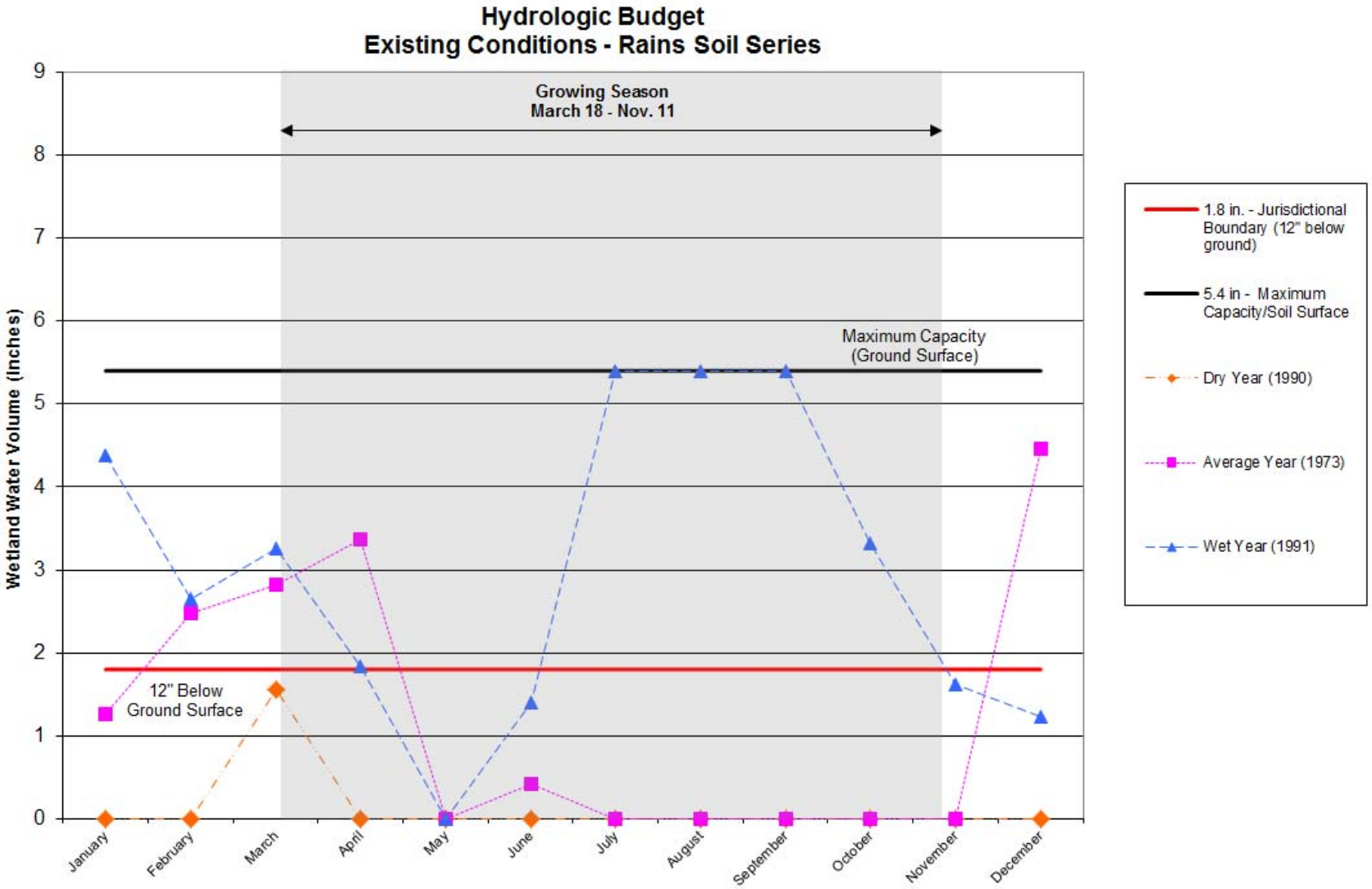
Wet Year	*Water Inputs*			*Water Outputs*			Change in Storage	Excess Water	Wetland Volume
1991	P	Si *	Gi	PET	So	Go			
January	7.8	0.69	0.00	0.62	0.69	2.80	4.38	0.00	4.38
February	1.97	0.07	0.00	0.90	0.07	2.80	-1.73	0.00	2.65
March	5.06	0.36	0.00	1.65	0.36	2.80	0.61	0.00	3.26
April	4.45	0.86	0.00	3.07	0.86	2.80	-1.42	0.00	1.83
May	3.13	0.06	0.00	5.31	0.06	2.80	-4.98	0.00	0.00
June	9.39	2.23	0.00	5.19	2.23	2.80	1.40	0.00	1.40
July	14.35	3.30	0.00	6.29	3.30	2.80	5.26	1.26	5.40
August	9.75	0.88	0.00	5.33	0.88	2.80	1.62	1.62	5.40
September	6.65	1.09	0.00	3.83	1.09	2.80	0.02	0.02	5.40
October	2.8	0.06	0.00	2.08	0.06	2.80	-2.08	0.00	3.32
November	2.04	0.07	0.00	0.95	0.07	2.80	-1.71	0.00	1.62
December	3.04	0.09	0.00	0.63	0.09	2.80	-0.39	0.00	1.23
Annual Totals	**70.43**	**9.76**	**0.00**	**35.84**	**9.76**	**33.60**			

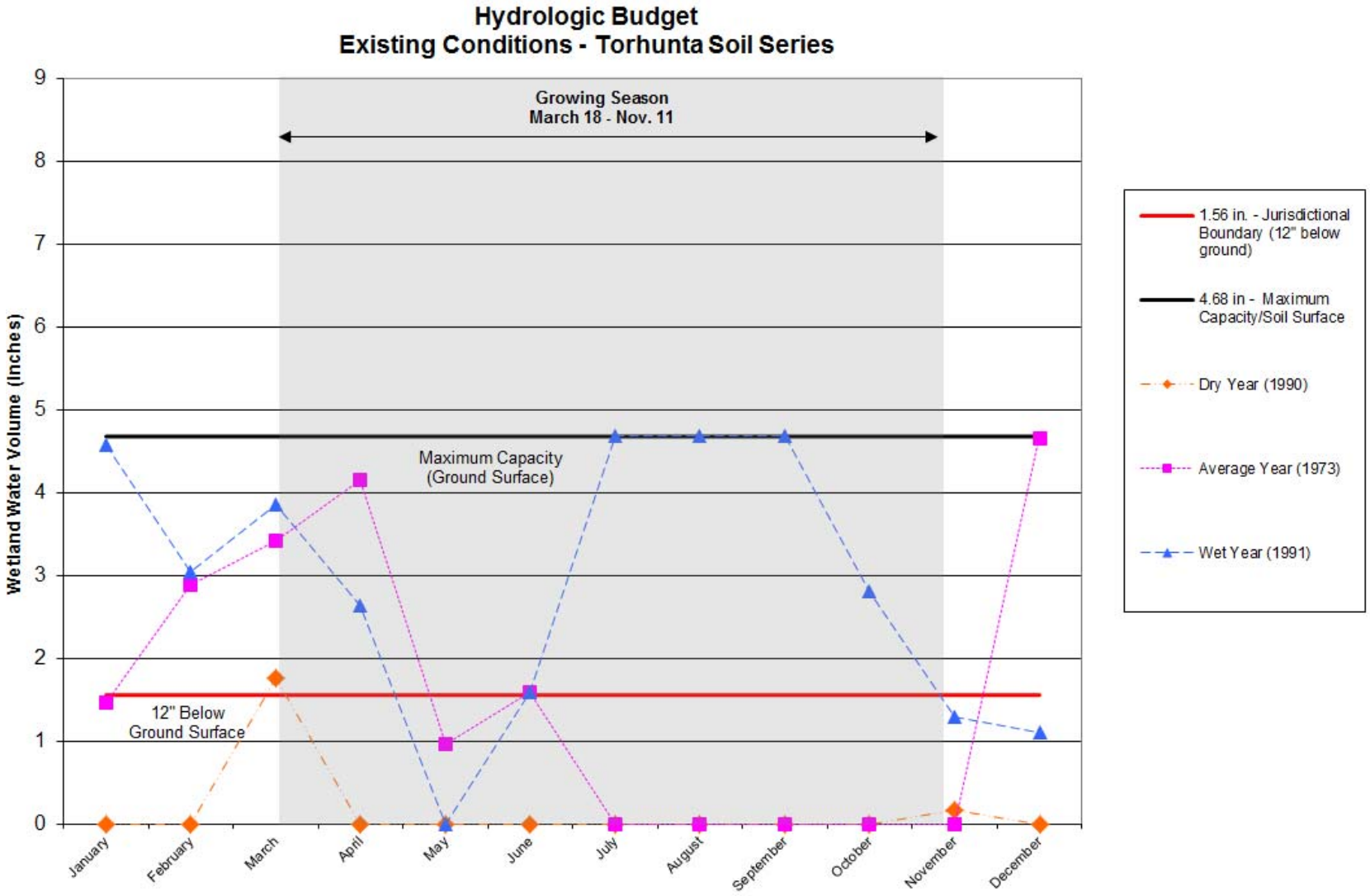
Twin Bays Restoration Site - Existing Conditions - Torhunta Soils

Dry Year	*Water Inputs*			*Water Outputs*			Change in Storage	Excess Water	Wetland Volume
1990	P	Si *	Gi	PET	So	Go			
January	2.07	0.00	0.00	0.80	0.00	2.60	-1.33	0.00	0.00
February	1.86	0.01	0.00	1.25	0.01	2.60	-1.99	0.00	0.00
March	5.96	1.03	0.00	1.60	1.03	2.60	1.76	0.00	1.76
April	2.50	0.02	0.00	2.39	0.02	2.60	-2.49	0.00	0.00
May	5.95	0.34	0.00	3.84	0.34	2.60	-0.49	0.00	0.00
June	0.86	0.00	0.00	5.99	0.00	2.60	-7.73	0.00	0.00
July	2.21	0.00	0.00	6.82	0.00	2.60	-7.21	0.00	0.00
August	5.72	0.15	0.00	5.99	0.15	2.60	-2.87	0.00	0.00
September	0.33	0.00	0.00	4.22	0.00	2.60	-6.49	0.00	0.00
October	3.64	0.60	0.00	2.71	0.60	2.60	-1.67	0.00	0.00
November	3.91	1.53	0.00	1.15	1.53	2.60	0.16	0.00	0.16
December	1.60	0.01	0.00	0.90	0.01	2.60	-1.90	0.00	0.00
Annual Totals	**36.61**	**3.70**	**0.00**	**37.66**	**3.70**	**31.20**			

Avg. Year	*Water Inputs*			*Water Outputs*			Change in Storage	Excess Water	Wetland Volume
1973	P	Si *	Gi	PET	So	Go			
January	4.51	0.08	0.00	0.45	0.08	2.60	1.46	0.00	1.46
February	4.34	0.14	0.00	0.32	0.14	2.60	1.42	0.00	2.88
March	4.97	0.29	0.00	1.84	0.29	2.60	0.53	0.00	3.42
April	5.53	1.07	0.00	2.19	1.07	2.60	0.74	0.00	4.16
May	3.06	0.24	0.00	3.65	0.24	2.60	-3.19	0.00	0.97
June	8.70	1.89	0.00	5.48	1.89	2.60	0.62	0.00	1.59
July	3.96	0.04	0.00	5.65	0.04	2.60	-4.29	0.00	0.00
August	7.71	0.73	0.00	5.53	0.73	2.60	-0.42	0.00	0.00
September	3.70	1.17	0.00	4.43	1.17	2.60	-3.33	0.00	0.00
October	1.05	0.03	0.00	2.41	0.03	2.60	-3.96	0.00	0.00
November	0.47	0.00	0.00	1.26	0.00	2.60	-3.39	0.00	0.00
December	7.84	1.17	0.00	0.58	1.17	2.60	4.66	0.00	4.66
Annual Totals	**55.84**	**6.85**	**0.00**	**33.79**	**6.85**	**31.20**			

Wet Year	*Water Inputs*			*Water Outputs*			Change in Storage	Excess Water	Wetland Volume
1991	P	Si *	Gi	PET	So	Go			
January	7.8	0.69	0.00	0.62	0.69	2.60	4.58	0.00	4.58
February	1.97	0.07	0.00	0.90	0.07	2.60	-1.53	0.00	3.05
March	5.06	0.36	0.00	1.65	0.36	2.60	0.81	0.00	3.86
April	4.45	0.86	0.00	3.07	0.86	2.60	-1.22	0.00	2.63
May	3.13	0.06	0.00	5.31	0.06	2.60	-4.78	0.00	0.00
June	9.39	2.23	0.00	5.19	2.23	2.60	1.60	0.00	1.60
July	14.35	3.30	0.00	6.29	3.30	2.60	5.46	2.38	4.68
August	9.75	0.88	0.00	5.33	0.88	2.60	1.82	1.82	4.68
September	6.65	1.09	0.00	3.83	1.09	2.60	0.22	0.22	4.68
October	2.8	0.06	0.00	2.08	0.06	2.60	-1.88	0.00	2.80
November	2.04	0.07	0.00	0.95	0.07	2.60	-1.51	0.00	1.30
December	3.04	0.09	0.00	0.63	0.09	2.60	-0.19	0.00	1.11
Annual Totals	**70.43**	**9.76**	**0.00**	**35.84**	**9.76**	**31.20**			


Hydrologic Budget
Existing Conditions - Rains Soil Series
Growing Season
March 18 - Nov. 11
Maximum Capacity
(Ground Surface)
12" Below
Ground Surface
Wetland Water Volume (Inches)
0
1
2
3
4
5
6
7
8
9
January
February
March
April
May
June
July
August
September
October
November
December
1.8 in. - Jurisdictional Boundary (12" below ground)
5.4 in - Maximum Capacity/Soil Surface
Dry Year (1990)
Average Year (1973)
Wet Year (1991)


Hydrologic Budget
Existing Conditions - Torhunta Soil Series
Growing Season
March 18 - Nov. 11
Maximum Capacity
(Ground Surface)
12" Below
Ground Surface
Wetland Water Volume (Inches)
0
1
2
3
4
5
6
7
8
9
January
February
March
April
May
June
July
August
September
October
November
December
1.56 in. - Jurisdictional Boundary (12" below ground)
4.68 in - Maximum Capacity/Soil Surface
Dry Year (1990)
Average Year (1973)
Wet Year (1991)

Twin Bays Restoration Site - Proposed Conditions - Rains Soils

Dry Year	*Water Inputs*			*Water Outputs*			Change in	Excess	
1990	P	Si *	Gi	PET	So	Go	Storage	Water	Wetland Volume
January	2.07	0.00	0.00	0.80	0.00	2.80	-1.53	0.00	0.00
February	1.86	0.01	0.00	1.25	0.00	2.80	-2.18	0.00	0.00
March	5.96	1.03	0.00	1.60	0.00	2.80	2.60	0.00	2.60
April	2.50	0.02	0.00	2.39	0.00	2.80	-2.67	0.00	0.00
May	5.95	0.34	0.00	3.84	0.00	2.80	-0.35	0.00	0.00
June	0.86	0.00	0.00	5.99	0.00	2.80	-7.93	0.00	0.00
July	2.21	0.00	0.00	6.82	0.00	2.80	-7.41	0.00	0.00
August	5.72	0.15	0.00	5.99	0.00	2.80	-2.92	0.00	0.00
September	0.33	0.00	0.00	4.22	0.00	2.80	-6.69	0.00	0.00
October	3.64	0.60	0.00	2.71	0.00	2.80	-1.26	0.00	0.00
November	3.91	1.53	0.00	1.15	0.00	2.80	1.50	0.00	1.50
December	1.60	0.01	0.00	0.90	0.00	2.80	-2.09	0.00	0.00
Annual Totals	36.61	3.70	0.00	37.66	0.00	33.60			

Avg. Year	*Water Inputs*			*Water Outputs*			Change in	Excess	
1973	P	Si *	Gi	PET	So	Go	Storage	Water	Wetland Volume
January	4.51	0.08	0.00	0.45	0.00	2.80	1.34	0.00	1.34
February	4.34	0.14	0.00	0.32	0.00	2.80	1.36	0.00	2.70
March	4.97	0.29	0.00	1.84	0.00	2.80	0.62	0.00	3.32
April	5.53	1.07	0.00	2.19	0.00	2.80	1.62	0.00	4.93
May	3.06	0.24	0.00	3.65	0.00	2.80	-3.16	0.00	1.78
June	8.70	1.89	0.00	5.48	0.00	2.80	2.31	0.00	4.09
July	3.96	0.04	0.00	5.65	0.00	2.80	-4.45	0.00	0.00
August	7.71	0.73	0.00	5.53	0.00	2.80	0.11	0.00	0.11
September	3.70	1.17	0.00	4.43	0.00	2.80	-2.36	0.00	0.00
October	1.05	0.03	0.00	2.41	0.00	2.80	-4.13	0.00	0.00
November	0.47	0.00	0.00	1.26	0.00	2.80	-3.59	0.00	0.00
December	7.84	1.17	0.00	0.58	0.00	2.80	5.62	0.00	5.62
Annual Totals	55.84	6.85	0.00	33.79	0.00	33.60			

Wet Year	*Water Inputs*			*Water Outputs*			Change in	Excess	
1991	P	Si *	Gi	PET	So	Go	Storage	Water	Wetland Volume
January	7.8	0.69	0.00	0.62	0.00	2.80	5.07	0.00	5.07
February	1.97	0.07	0.00	0.90	0.00	2.80	-1.66	0.00	3.41
March	5.06	0.36	0.00	1.65	0.00	2.80	0.97	0.00	4.37
April	4.45	0.86	0.00	3.07	0.00	2.80	-0.57	0.00	3.81
May	3.13	0.06	0.00	5.31	0.00	2.80	-4.93	0.00	0.00
June	9.39	2.23	0.00	5.19	0.00	2.80	3.63	0.00	3.63
July	14.35	3.30	0.00	6.29	0.00	2.80	8.56	4.39	7.80
August	9.75	0.88	0.00	5.33	0.00	2.80	2.51	2.51	7.80
September	6.65	1.09	0.00	3.83	0.00	2.80	1.12	1.12	7.80
October	2.8	0.06	0.00	2.08	0.00	2.80	-2.01	0.00	5.79
November	2.04	0.07	0.00	0.95	0.00	2.80	-1.64	0.00	4.15
December	3.04	0.09	0.00	0.63	0.00	2.80	-0.30	0.00	3.85
Annual Totals	70.43	9.76	0.00	35.84	0.00	33.60			

Note: An increase in capacity of 0.2 feet (2.4 inches) of surface water is assumed based on the creation of microtopography during wetland restoration.

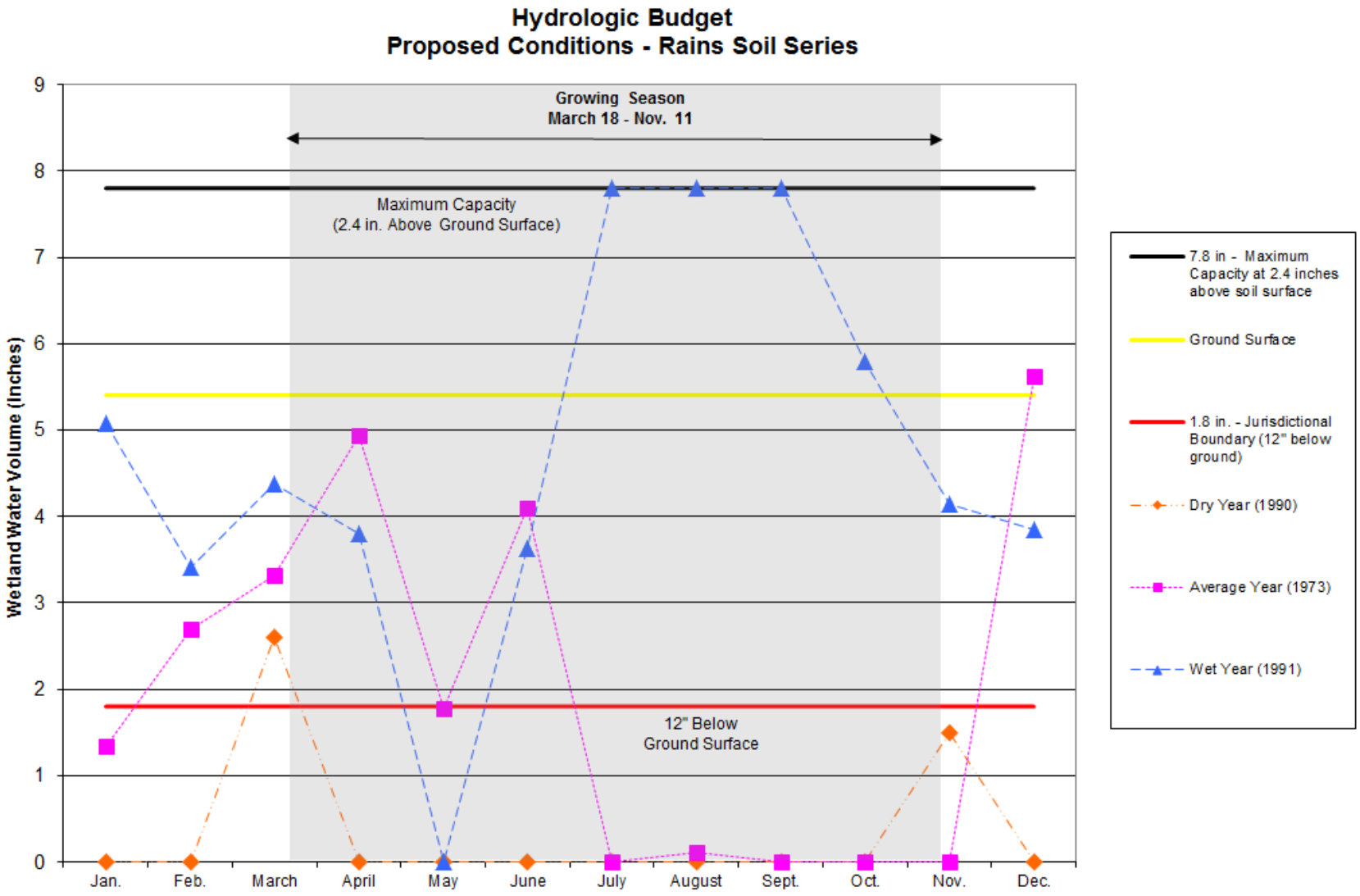
Twin Bays Restoration Site - Proposed Conditions - Torhunta Soils

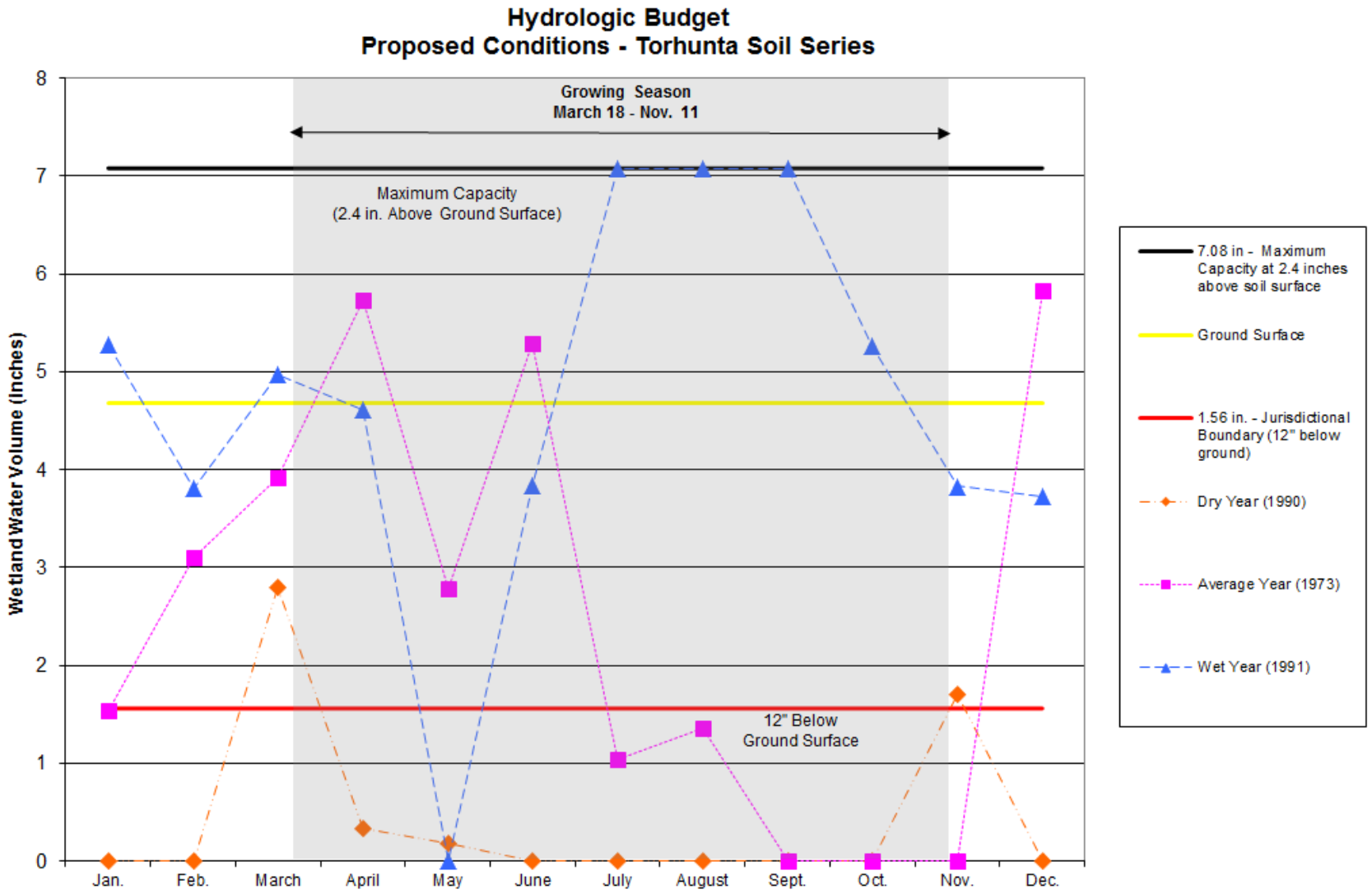
Dry Year	*Water Inputs*			*Water Outputs*			Change in	Excess	
1990	P	Si *	Gi	PET	So	Go	Storage	Water	Wetland Volume
January	2.07	0.00	0.00	0.80	0.00	2.60	-1.33	0.00	0.00
February	1.86	0.01	0.00	1.25	0.00	2.60	-1.98	0.00	0.00
March	5.96	1.03	0.00	1.60	0.00	2.60	2.80	0.00	2.80
April	2.50	0.02	0.00	2.39	0.00	2.60	-2.47	0.00	0.33
May	5.95	0.34	0.00	3.84	0.00	2.60	-0.15	0.00	0.17
June	0.86	0.00	0.00	5.99	0.00	2.60	-7.73	0.00	0.00
July	2.21	0.00	0.00	6.82	0.00	2.60	-7.21	0.00	0.00
August	5.72	0.15	0.00	5.99	0.00	2.60	-2.72	0.00	0.00
September	0.33	0.00	0.00	4.22	0.00	2.60	-6.49	0.00	0.00
October	3.64	0.60	0.00	2.71	0.00	2.60	-1.06	0.00	0.00
November	3.91	1.53	0.00	1.15	0.00	2.60	1.70	0.00	1.70
December	1.60	0.01	0.00	0.90	0.00	2.60	-1.89	0.00	0.00
Annual Totals	**36.61**	**3.70**	**0.00**	**37.66**	**0.00**	**31.20**			

Avg. Year	*Water Inputs*			*Water Outputs*			Change in	Excess	
1973	P	Si *	Gi	PET	So	Go	Storage	Water	Wetland Volume
January	4.51	0.08	0.00	0.45	0.00	2.60	1.54	0.00	1.54
February	4.34	0.14	0.00	0.32	0.00	2.60	1.56	0.00	3.10
March	4.97	0.29	0.00	1.84	0.00	2.60	0.82	0.00	3.92
April	5.53	1.07	0.00	2.19	0.00	2.60	1.82	0.00	5.73
May	3.06	0.24	0.00	3.65	0.00	2.60	-2.96	0.00	2.78
June	8.70	1.89	0.00	5.48	0.00	2.60	2.51	0.00	5.29
July	3.96	0.04	0.00	5.65	0.00	2.60	-4.25	0.00	1.04
August	7.71	0.73	0.00	5.53	0.00	2.60	0.31	0.00	1.36
September	3.70	1.17	0.00	4.43	0.00	2.60	-2.16	0.00	0.00
October	1.05	0.03	0.00	2.41	0.00	2.60	-3.93	0.00	0.00
November	0.47	0.00	0.00	1.26	0.00	2.60	-3.39	0.00	0.00
December	7.84	1.17	0.00	0.58	0.00	2.60	5.82	0.00	5.82
Annual Totals	**55.84**	**6.85**	**0.00**	**33.79**	**0.00**	**31.20**			

Wet Year	*Water Inputs*			*Water Outputs*			Change in	Excess	
1991	P	Si *	Gi	PET	So	Go	Storage	Water	Wetland Volume
January	7.8	0.69	0.00	0.62	0.00	2.60	5.27	0.00	5.27
February	1.97	0.07	0.00	0.90	0.00	2.60	-1.46	0.00	3.81
March	5.06	0.36	0.00	1.65	0.00	2.60	1.17	0.00	4.97
April	4.45	0.86	0.00	3.07	0.00	2.60	-0.37	0.00	4.61
May	3.13	0.06	0.00	5.31	0.00	2.60	-4.73	0.00	0.00
June	9.39	2.23	0.00	5.19	0.00	2.60	3.83	0.00	3.83
July	14.35	3.30	0.00	6.29	0.00	2.60	8.76	5.51	7.08
August	9.75	0.88	0.00	5.33	0.00	2.60	2.71	2.71	7.08
September	6.65	1.09	0.00	3.83	0.00	2.60	1.32	1.32	7.08
October	2.8	0.06	0.00	2.08	0.00	2.60	-1.81	0.00	5.27
November	2.04	0.07	0.00	0.95	0.00	2.60	-1.44	0.00	3.83
December	3.04	0.09	0.00	0.63	0.00	2.60	-0.10	0.00	3.73
Annual Totals	**70.43**	**9.76**	**0.00**	**35.84**	**0.00**	**31.20**			

Note: An increase in capacity of 0.2 feet (2.4 inches) of surface water is assumed based on the creation of microtopography during wetland restoration.


Hydrologic Budget
Proposed Conditions - Rains Soil Series
Growing Season
March 18 - Nov. 11
Maximum Capacity
(2.4 in. Above Ground Surface)
12" Below
Ground Surface
Wetland Water Volume (Inches)
0
1
2
3
4
5
6
7
8
9
Jan.
Feb.
March
April
May
June
July
August
Sept.
Oct.
Nov.
Dec.
7.8 in - Maximum Capacity at 2.4 inches above soil surface
Ground Surface
1.8 in. - Jurisdictional Boundary (12" below ground)
Dry Year (1990)
Average Year (1973)
Wet Year (1991)


Hydrologic Budget
Proposed Conditions - Torhunta Soil Series
Growing Season
March 18 - Nov. 11
Maximum Capacity
(2.4 in. Above Ground Surface)
12" Below
Ground Surface
Wetland Water Volume (Inches)
0
1
2
3
4
5
6
7
8
Jan.
Feb.
March
April
May
June
July
August
Sept.
Oct.
Nov.
Dec.
7.08 in - Maximum Capacity at 2.4 inches above soil surface
Ground Surface
1.56 in. - Jurisdictional Boundary (12" below ground)
Dry Year (1990)
Average Year (1973)
Wet Year (1991)

Soil Delineation and Characterization

A detailed soils investigation at the TBWRS was conducted by a licensed soil scientist (# 187) to determine the extent and distribution of the hydric soils and to classify the predominate soils to the soil series level. The investigation consisted of delineating the hydric soil boundaries with pink flagging and wooden survey stakes in accordance with the US Army Corps of Engineers, Wetland Delineation Manual (1987) and the USDA Field Indicators of Hydric Soils in the United States: A Guide for Identifying and Delineating Hydric Soils, Version 7.0 (2010). Areas that were identified as possible hydric soil mapping units were surveyed at a higher intensity until the edge of the mapping unit was identified. The boundary of the hydric and non-hydric soil mapping units were then followed by continual sampling and observations as the boundary line was identified and delineated. In those areas where the boundary was found to be a broad gradient rather than a distinct break, microtopography, landscape position, soil textural changes, redoximorphic features, and depleted matrices were additionally considered to identify the extent of the hydric soils.

In developing a detailed soils map, several soil borings were advanced on the site in the general hydric soil areas identified by landscape position, vegetation and slope. Once the hydric soil borings were identified, the soil scientist marked the points and established a visual line to the next auger boring where again hydric soil conditions were confirmed by additional borings. The soil scientist moved along the edges of the mapping unit and marked each point along the line. To confirm the hydric soil mapping unit and taxonomic classification, soil borings were advanced to a depth of 50 inches. The soil profile descriptions identified the individual horizons in the topsoil and upper subsoil as well as the depth, color, texture, structure, boundary, and evidence of restrictive horizons and redoximorphic features. Delineated hydric soils boundaries were in contrast to those mapped in the Soil Survey of Duplin County, North Carolina. The delineated hydric soil boundaries are shown in the following figure, Detailed Soils Map.

Taxonomic Classification

The predominant soils identified on the site were of the Rains (Fine-loamy, siliceous, semiactive, thermic Typic Paleaquults) soil series and the Torhunta (Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts) soil series. Inclusions of other soil series include Murville/Leon complex (Sandy, siliceous, thermic Umbric Endoaquods), Udorthents, Goldsboro (Fine-loamy, siliceous, subactive, thermic Aquic Paleudults). The Rains and Torhunta series are listed as hydric soils in Duplin County, North Carolina. They are defined as hydric due to saturation for a significant period during the growing season. These two soils are listed as hydric on the federal, state and local lists. The Rains and Torhunta series are also listed by the Natural Resources Conservation Service (NRCS) as hydric soils.

Profile Description

The Rains series is described as very deep, poorly drained, moderately permeable soils typically found on flats and in depressions throughout the Coastal Plain. They are formed in loamy sediments with slopes ranging from 0 to 2 percent. The Torhunta series is described as very poorly drained soils that formed in upland bays and on stream terraces in the Coastal Plain. Slopes range from 0 to 2 percent.

Typical Pedon Description of the Rains mapping unit:

RAINS SERIES

TAXONOMIC CLASS: Fine-loamy, siliceous, semiactive, thermic Typic Paleaquults

TYPICAL PEDON: Rains loamy sand--forested. (Colors are for moist soil, unless otherwise indicated.)

A--0 to 7 inches; very dark gray (10YR 3/1) sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; many fine and medium roots; very strongly acid; clear smooth boundary. (4 to 10 inches thick)

Eg--7 to 12 inches; light brownish gray (10YR 6/2) sandy loam; weak fine granular structure; very friable; many fine and few medium roots; many fine pores; few fingers of A horizon in upper part; very strongly acid; clear wavy boundary. (0 to 11 inches thick)

Btg1--12 to 20 inches; gray (10YR 6/1) sandy loam; weak coarse subangular blocky structure; friable; few fine and medium roots; many fine pores; many clay bridging between sand grains; few medium prominent yellowish brown (10YR 5/6) masses of oxidized iron in lower half; very strongly acid; gradual wavy boundary.

Btg2--20 to 40 inches; gray (10YR 6/1) sandy clay loam; weak medium subangular blocky structure; friable; few fine and medium roots; many fine pores; few faint clay films on faces of peds; few coarse pockets of gray sandy loam; common medium prominent yellowish brown (10YR 5/6) masses of oxidized iron; few fine prominent red (2.5YR 4/6) masses of oxidized iron; very strongly acid; gradual wavy boundary.

Btg3--40 to 52 inches; gray (10YR 6/1) sandy clay loam; weak medium subangular blocky structure; firm; few fine pores; few faint clay films on faces of peds; few fine and medium prominent red (2.5YR 4/6) and yellowish brown (10YR 5/6) masses of oxidized iron; very strongly acid; gradual wavy boundary.

Btg4--52 to 62 inches; gray (10YR 6/1) sandy clay loam; weak medium subangular blocky structure; friable; few faint clay films on faces of peds; few medium prominent brownish yellow (10YR 6/6) masses of oxidized iron; very strongly acid; gradual wavy boundary. (Combined thickness of the Btg horizon is more than 40 inches.)

BCg--62 to 79 inches; gray (10YR 6/1) sandy clay loam; weak coarse subangular blocky structure; friable; few fine distinct brownish yellow (10YR 6/6) masses of oxidized iron; very strongly acid; gradual wavy boundary. (0 to 20 inches thick)

2Cg--79 to 85 inches; light gray (10YR 7/1) sand; single grain; loose; very strongly acid.

TYPE LOCATION: Florence County, South Carolina; about 2.0 miles southeast of Timmonsville; 1.1 miles south of intersection of State Highway 45 and U.S. Highway 76; 150 feet west of State Highway 45.

RANGE IN CHARACTERISTICS: Solum thickness ranges from about 60 to more than 80 inches. Depth to bedrock is more than 5 feet. Content of rock fragments range from 0 to 5 percent by volume. The soil is extremely acidic to strongly acidic throughout, unless the surface has been limed.

The A horizon or Ap horizon (where present) has a hue of 10YR or 2.5Y, value of 2 to 5, chroma of 1 to 2, or is neutral with value of 2 to 5. The texture is sand, loamy coarse sand, loamy sand, loamy fine sand, coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, or loam.

The Eg horizon has a hue of 10YR to 5Y, value of 4 to 7, chroma of 0 to 2, or is neutral with value of 4 to 7. The texture is sand, loamy coarse sand, loamy sand, loamy fine sand, coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, or loam. Redoximorphic features (where present) have iron depletions in shades of brown, yellow, olive, or gray and masses of oxidized iron or iron-manganese masses in shades of red, yellow, or brown.

The Btg horizon has a hue of 10YR to 5Y, value of 4 to 7, chroma of 1 to 2, or is neutral with value of 4 to 7. The texture is typically, sandy clay loam or clay loam and includes sandy loam, fine sandy loam, or loam in the upper part and sandy clay in the lower part. Redoximorphic features have iron depletions in shades of brown, yellow, olive, or gray and masses of oxidized iron or iron-manganese masses in shades of red, yellow, or brown.

The BCg horizon or BCtg horizon (where present) has a hue of 10YR to 5Y, value of 4 to 7, chroma of 1 to 2, or is neutral with value of 4 to 7. The texture is sandy loam, fine sandy loam, sandy clay loam, or sandy clay. Redoximorphic features have iron depletions in shades of brown, yellow, olive, or gray and masses of oxidized iron or iron-manganese masses in shades of red, yellow, or brown.

The Cg horizon (where present) has a hue of 10YR to 5Y, value of 4 to 7, chroma of 1 or 2, or is neutral with value of 4 to 7. The texture is coarse sandy loam, sandy loam, fine sandy loam, loam, sandy clay loam, or clay loam, and may be stratified with finer or coarser-textured materials. Redoximorphic features have iron depletions in shades of brown, yellow, olive, or gray and masses of oxidized iron or iron-manganese masses in shades of red, yellow, or brown.

The 2Cg horizon has a hue of 10YR to 5Y, value of 4 to 7, chroma of 1 or 2, or is neutral with value of 4 to 7. The texture is coarse sand, sand, fine sand, loamy coarse sand, or loamy sand and may be stratified with finer-textured material.

Typical Pedon Description of the Torhunta mapping unit:

TORHUNTA SERIES

TAXONOMIC CLASS: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts

TYPICAL PEDON: Torhunta fine sandy loam--cultivated. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 9 inches; black (10YR 2/1) fine sandy loam; weak medium granular structure; friable; many fine roots; strongly acid; abrupt wavy boundary. (0 to 12 inches thick.)

A--9 to 15 inches; very dark gray (10YR 3/1) loamy sand; weak medium granular structure; very friable; many fine roots; thin coats of organic matter on grains; very strongly acid; gradual wavy boundary. (4 to 15 inches thick.)

Bg--15 to 40 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine subangular blocky structure; friable; slightly sticky and slightly plastic; many fine roots in upper part; thin silt coatings on sand grains; few loamy sand and sand pockets; extremely acid; gradual wavy boundary. (10 to 25 inches thick.)

Cg1--40 to 48 inches; dark grayish brown (10YR 4/2) loamy sand; common medium faint gray (10YR 5/1) and brown (10YR 5/3) mottles; single grained; very friable; few sand pockets; extremely acid; diffuse wavy boundary. (0 to 10 inches thick.)

Cg2--48 to 80 inches; grayish brown (10YR 5/2) sand; single grained; loose; uncoated sand grains; very strongly acid.

TYPE LOCATION: Wayne County, North Carolina; 1.5 miles south of New Hope; 0.4 mile northeast of intersection of Roads 1712 and 1713, 50 feet south of Road 1713 and 50 feet northeast of power line poles.

RANGE IN CHARACTERISTICS: Torhunta soil has loamy textured horizons that range from 20 to 50 inches thick. The soil reaction ranges from extremely acid through strongly acid, unless the surface has been limed.

The Ap or A horizon has hue of 10YR, 2.5Y, or it is neutral, value of 2 or 4, and chroma of 0 to 2. It is sandy loam, fine sandy loam, loam, loamy sand or their mucky analogues.

The Bg horizon has hue of 10YR, 2.5Y, or it is neutral, value of 4 to 6, and chroma of 0 to 2. Mottles are in shades of brown or yellow. It is sandy loam or fine sandy loam.

The BCg horizon, where present, has hue of 10YR, 2.5Y, or it is neutral, value of 4 to 7, and chroma of 0 to 2. Mottles are in shades of yellow or brown. It is sandy loam, fine sandy loam, loamy sand, or sand.

The Cg horizon has colors of the BCg horizon and in addition, has hue of 5GY or 5G, value of 4 to 6, and chroma of 1. It is loamy sand, loamy fine sand, sand, or sandy loam.

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** September 21, 2011
Project: Twin Bays Wetland Restoration Site **Project #:** 20110659P-CF_07
County: Duplin **State:** NC
Location: Cornwallis Road Wallace, NC **Site/Lot:** Boring # 1
Soil Series: Rains
Soil Classification: Fine-loamy, siliceous, semiactive, thermic Typic Paleaquults
AWT: 60" **SHWT:** 0-12" **Slope:** 0-1% **Aspect:**
Elevation: **Drainage:** Poorly Drained **Permeability:** Moderate
Vegetation: Soybeans
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-4	10YR 3/1		fsl	1fgr	mfr	cs	
A	4-6	10YR 3/1	10YR 4/3f1f	sl	1fsbk	mfr	cs	Plow pan
Btg1	6-10	10YR 4/2	10YR 4/4f1d	scl	1fsbk	mfr	gw	
Btg2	10-15	10YR 4/1	10YR 4/6f2d	scl	2msbk	mfr	gw	
Bgt3	15-30	10YR 4/1	10YR 4/6c2d	cl	2msbk	mfr	gw	
Btg4	30-40	10YR 4/1	10YR 4/6c2d	scl-sc	1msbk	mfr	gw	sand lenses
Btg5	40-48	10YR 5/1	10YR 5/2c2f	scl	1msbk	mfr	gw	10YR 5/1 sand lenses
			10YR 5/6f1d					
BCg	48-60	10YR 5/1	10YR 5/4c1d	scl	1csbk-massive	mfr		sand lenses

COMMENTS:
The Rains series is a poorly drained soil of the upper Coastal Plain that occur on Flats, depressions and Carolina bays.
This Rains soil almost meets the percent clay content criteria for the Coxsville series a clayey soil.
The Coxville series is a poorly drained soil of the Coastal Plain that occur on flats, carolina bays and depressions.
This Rains series is a drained hydric soil by ditching.
This Rains soil has slow runoff and a seasonally high water table at or near the surface during wet seasons, typically between 0-12 inches.

DESCRIBED BY: SFS DATE: 9/21/2011

KCI ASSOCIATES OF NORTH CAROLINA, PA

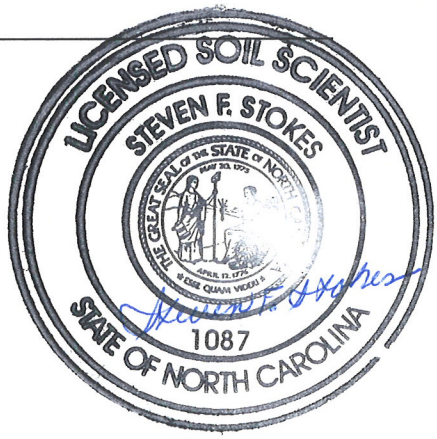
SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** September 21, 2011
Project: Twin Bays Wetland Restoration Site **Project #:** 20110659P-CF_07
County: Duplin **State:** NC
Location: Cornwallis Road Wallace, NC **Site/Lot:** Boring # 2
Soil Series: Pantego
Soil Classification: Fine-loamy, siliceous, semiactive, thermic Umbric Paleaquults
AWT: >62" **SHWT:** 0-12" **Slope:** 0-1% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained **Permeability:** Moderate slow
Vegetation: Soybeans
Borings terminated at 62 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-7	10YR 3/1		ls	1fgr	mfr	cs	
A	7-12	10YR 3/1	10YR 4/3f1f	ls	1mpl	mfr	cs	
Btg1	12-19	10YR 4/2	10YR 4/4f1d	sl	1msbk	mfr	gw	
Btg2	19-23	10YR 5/2	10YR 4/4f1d	sl	1msbk	mfr	gw	
Btg3	23-30	10YR 5/2	7.5YR 5/8c2d	scl	2msbk	mfr	gw	
			10YR 5/1					
Btg4	30-42	10YR 5/2	10YR 5/1c2d	scl-sc	2msbk	mfr	gw	
			7.5YR 5/8c2d					
Btg5	42-48	10YR 5/2	10YR 5/1c2d	scl	1csbk	mfr	gw	
			10YR 5/4f1d					
BCg1	48-54	10YR 5/2		scl	1csbk	mfr	gw	sand lenses 10YR 7/2
Cg	54-62	10YR 6/1	10YR 5/6c2d	sc	massive	mfi		

COMMENTS:
This Pantego soil is an inclusion in the Rains series.
The Pantego series is a very deep, very poorly drained soil formed in thick loamy deposits in nearly level and slightly depressional areas of the Southern Coastal Plain and Atlantic Coast Flatwoods.
This Pantego series is a drained hydric soil by ditching.
This Pantego soil is ponded to very slow runoff and the seasonally high water table is at or near the surface during wet seasons, typically between 0-12 inches.

DESCRIBED BY: SFS DATE: 9/21/2011



KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** September 26, 2011
Project: Twin Bays Wetland Restoration Site **Project #:** 20110659P-CF_07
County: Duplin **State:** NC
Location: Cornwallis Road Wallace, NC **Site/Lot:** Boring # 3
Soil Series: Torhunta
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: 50" **SHWT:** 0-12" **Slope:** 0-1% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained **Permeability:** Moderately rapid
Vegetation: Soybeans
Borings terminated at 50 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-8	10YR 3/1		lfs	1fgr	mfr	aw	
Bg1	8-12	10YR 5/2		s	sg	ml	gw	
Bg2	12-16	10YR 6/1	10YR 5/4f1d	s	sg	ml	gw	
Bg3	16-27	10YR 6/2	7.5YR 6/2c2d	sl	1fsbk	mfr	gw	
Bg4	27-38	10YR 6/2	10YR 5/2c2d	sl	1fsbk	mfr	gw	slightly cemented
			10YR 5/6m3d					
Bg5	38-44	10YR 5/1	10YR 5/4c2d	ls	1csbk	mfr	gw	
Cg	44-50	10YR 5/1	10YR 5/2c2d	s	massive	ml-mfi		sand lenses with clay balls
			5/10Yc2p					

COMMENTS:
The Torhunta series consist of very poorly drained soils in upland bays and on stream terraces in Coastal Plain.
The Torhunta series is a drained hydric soil by ditching.
The Torhunta soil has slow runoff and the seasonally high water table is at or near the surface during wet seasons, typically between 0-12 inches.

DESCRIBED BY: SFS DATE: 9/26/2011

KCI ASSOCIATES OF NORTH CAROLINA, PA

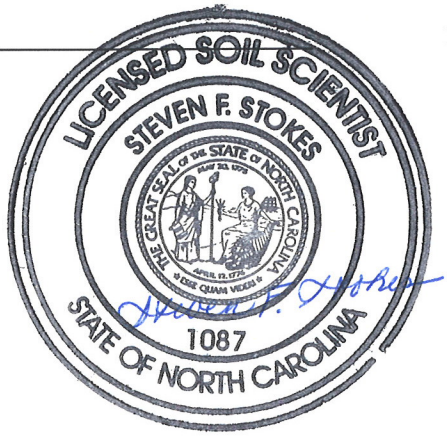
SOIL PROFILE DESCRIPTION

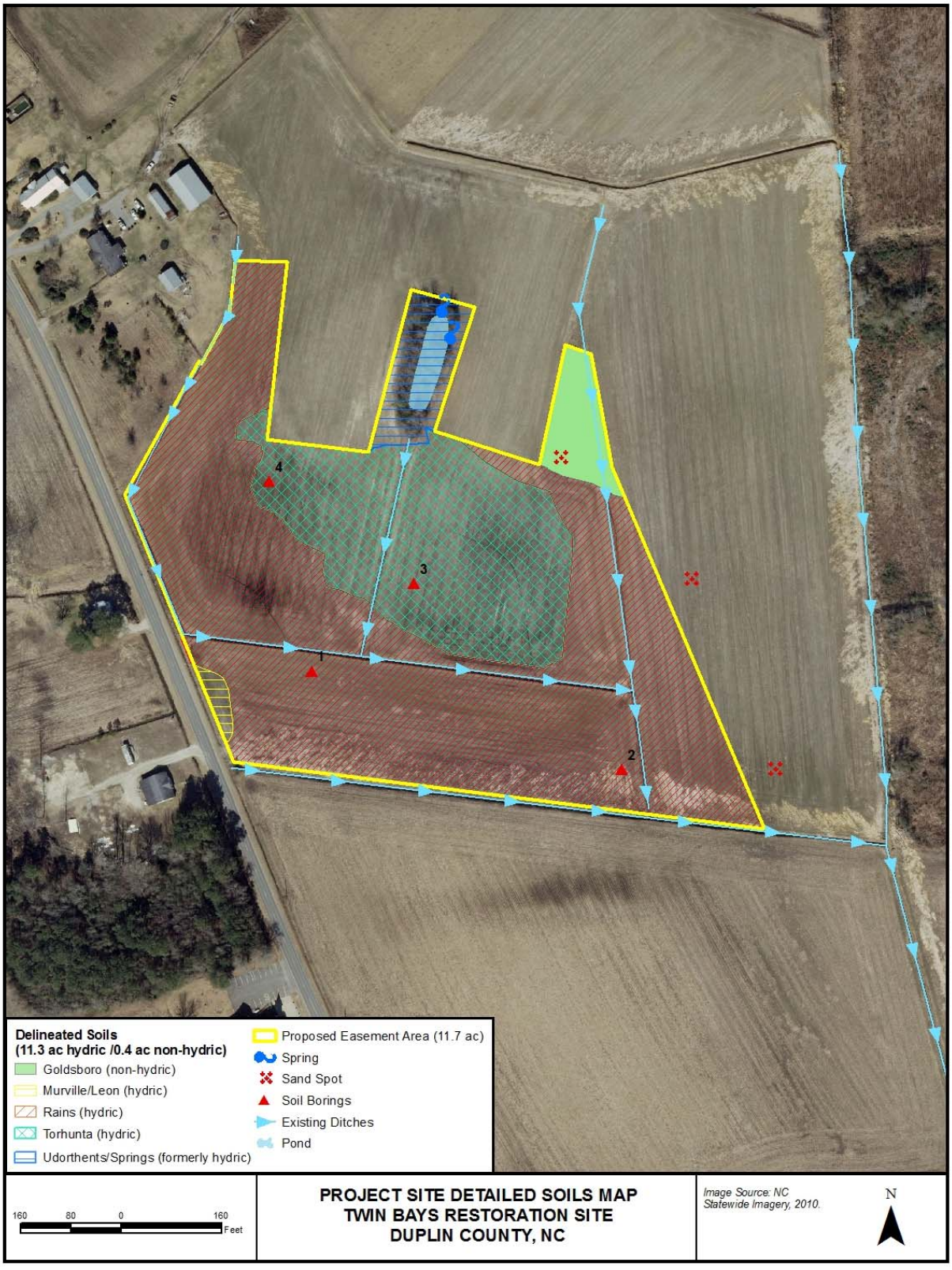
Client: KCI Associates of North Carolina, P.A. **Date:** September 26, 2011
Project: Twin Bays Wetland Restoration Site **Project #:** 20110659P-CF_07
County: Duplin **State:** NC
Location: Cornwallis Road Wallace, NC **Site/Lot:** Boring # 4
Soil Series: Torhunta Variant
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: 22" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained **Permeability:** Moderately rapid
Vegetation: Soybeans
Borings terminated at 45 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-10	10YR 3/1		fs	1mgr	mfr	gs	
Bg1	10-22	10YR 6/1		s	sg	ml	gw	slightly cemented
Bg2	22-24	10YR 4/1		ls	sg	ml	gw	slightly cemented
Cg1	24-32	10YR 6/1		ls	massive	ml	gw	strongly cemented
Cg2	32-40	10YR 6/1	5/10Yc21d	s-ls	massive	ml	gw	
Cg3	40-45	10YR 4/1	5/10Yc2p	scl	massive	mfi		sand lenses with clay balls

COMMENTS:
Torhunta does not have scl texture in the C horizon. Additionally, Torhunta does not typically have a fragipan. This is an inclusion in Torhunta mapping unit.
The Torhunta series consist of very poorly drained soils in upland bays and on stream terraces in Coastal Plain.
The Torhunta series is a drained hydric soil by ditching.
The Torhunta soil has slow runoff and the seasonally high water table is at or near the surface during wet seasons, typically between 0-12 inches.

DESCRIBED BY: SFS DATE: 9/26/2011




Delineated Soils
(11.3 ac hydric /0.4 ac non-hydric)
Goldsboro (non-hydric)
Murville/Leon (hydric)
Rains (hydric)
Torhunta (hydric)
Udorthents/Springs (formerly hydric)
Proposed Easement Area (11.7 ac)
Spring
Sand Spot
Soil Borings
Existing Ditches
Pond
1
2
3
4
160 80 0 160
Feet
PROJECT SITE DETAILED SOILS MAP
TWIN BAYS RESTORATION SITE
DUPLIN COUNTY, NC
Image Source: NC
Statewide Imagery, 2010.
N

Potential Wetland Gauge Locations


Non-Riparian Wetland Restoration (11.1 ac)
Upland Inclusion (0.4 ac)
Proposed Easement Area (11.7 ac)
Ditches to be filled
Wetland Gauge
120 60 0 120
Feet
POTENTIAL WETLAND GAUGE LOCATIONS
TWIN BAYS RESTORATION SITE
DUPLIN COUNTY, NC
Source: NC Statewide Imagery, 2010.
N

14.6 Appendix D. Project Plan Sheets

KCI JOB# : 20122265

CONTRACT #: 004739

STATE OF NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM

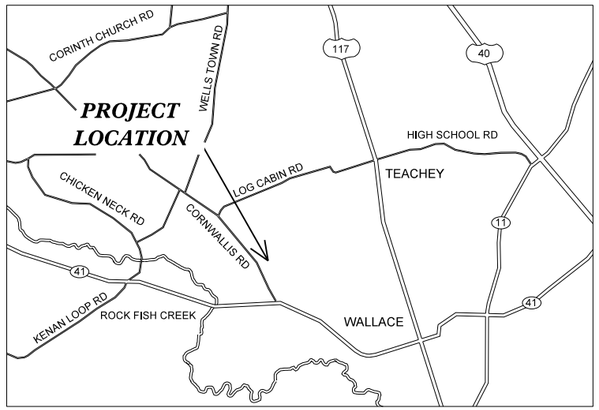
STATE	EEP PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
N.C.	95363	1	10

SYM.	DESCRIPTION	DATE	APPROVED
A	SUBMITTED WITH MITIGATION PLAN	NOV 2012	
B	SUBMITTED FOR EROSION CONTROL PERMIT	MAR 2012	
	REVISIONS		

TWIN BAYS RESTORATION SITE

DUPLIN COUNTY, NORTH CAROLINA
CAPE FEAR RIVER BASIN

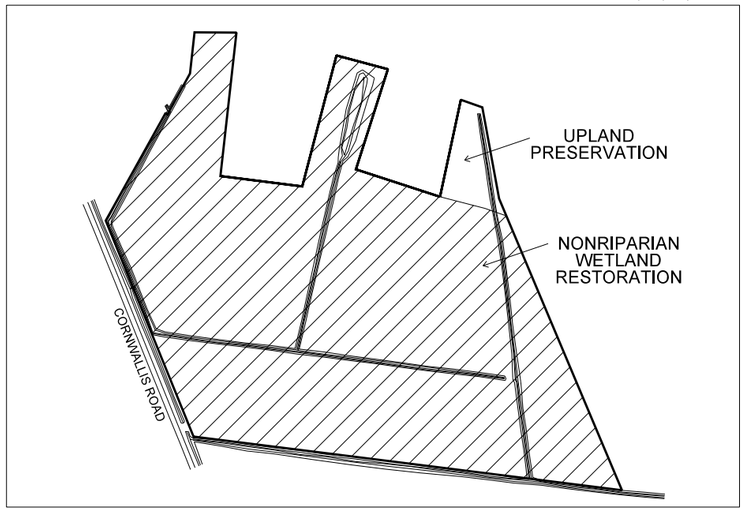
ROCK FISH CREEK WATERSHED
03030007090040



VICINITY MAP
NOT TO SCALE

DIRECTIONS FROM RALEIGH:
PROCEED EAST ON I-40 FOR APPROXIMATELY 70 MILES. TAKE EXIT 369, US-117 S. TAKE A LEFT ONTO US-117 S, TRAVEL APPROXIMATELY 15 MILES AND THEN TAKE A RIGHT ONTO E MAIN ST IN WALLACE, NC. TRAVEL 2 MILES AND TURN RIGHT ONTO CORNWALLIS RD. THE SITE WILL BE ON THE RIGHT APPROXIMATELY 0.4 MILES AHEAD.

SHEET 4, 5, 6, 9



INDEX OF SHEETS

NC GRID
NAD '83

GRAPHIC SCALES

–50 –25 0 50 100
GRADING, PLANTING PLANS, AND BOUNDARY MARKING
–80 –40 0 80 120
EROSION CONTROL OVERVIEW

PROJECT DATA

NONRIPARIAN WETLAND RESTORATION = 11.1 ACRES

PROJECT TOTAL AREA OF DISTURBANCE = 12.0 ACRES

Prepared in the Office of:

KCI Associates of North Carolina, P.A.
SUITE 220 LANDMARK CENTER II, 4601 SIX FORKS RD., RALEIGH, NC 27609
ENGINEERS • PLANNERS • ECOLOGISTS

GARY M. MRYNCZA, P.E.
PROJECT ENGINEER

JOE PFEIFFER
WETLAND DESIGN

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

P.E.
SIGNATURE:

Prepared for:

Ecosystem Enhancement PROGRAM

JEFF JUREK
CONTRACT ADMINISTRATOR

GENERAL NOTES

BEARING AND DISTANCES:
ALL BEARINGS ARE NAD 1983 GRID BEARINGS.
ALL DISTANCES AND COORDINATES SHOWN ARE HORIZONTAL (GROUND) VALUES.
ALL INFORMATION IS BASED ON THE FOLLOWING KCI CONTROL POINTS.

	NORTHING	EASTING	ELEVATION
KCI#1	364644.92	2291890.51	59.67
KCI#2	365002.05	2291745.40	60.47
KCI#4	365181.14	2292298.01	64.06

GRADING:
-PROPOSED GRADE LINES IN THE PLANS ARE A GENERAL GUIDE FOR GRADING. EXACT TIE OUTS FROM THE DITCH TO THE RESTORED WETLAND SHALL BE GRADED UNDER THE DIRECTION OF THE ENGINEER.

UTILITY/SUBSURFACE PLANS:
-NO SUBSURFACE PLANS ARE AVAILABLE ON THIS PROJECT. EXISTING UNDERGROUND UTILITIES HAVE NOT BEEN VERIFIED. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING A UTILITY LOCATOR AND ESTABLISHING THE EXACT LOCATION OF ANY AND ALL EXISTING UTILITIES IN THE PROJECT REACH.

PROJECT LEGEND

WETLAND MITIGATION

Proposed Filled Ditches

Proposed Ditch Plug

Proposed Stabilized Drainage Outfall

SEDIMENTATION & EROSION

Stabilized Construction Entrance

Silt Fence — SF —

Limits of Disturbance — LOD —

Temporary Rock Silt Screen

Temporary Bridge Mat Crossing

TOPOGRAPHY

Minor Contour Line

Major Contour Line — 720 —

Proposed Contour

MISCELLANEOUS

Existing Overhead Wire and Poles — OHW —

Existing Woods Line

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 32733 GARY MICHAEL MRYNCZA

SYM.	DESCRIPTION	DATE	APPROVED
A	SUBMITTED WITH MITIGATION PLAN	NOV 2012	

REVISIONS

Ecosystem Enhancement PROGRAM

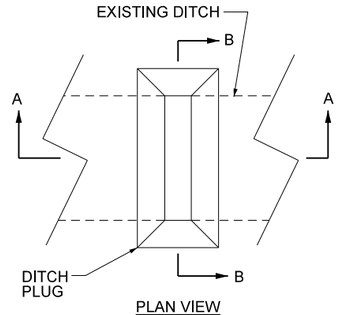
KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD, SUITE 220
RALEIGH, NORTH CAROLINA 27609

TWIN BAYS RESTORATION SITE
WALLACE, DUPLIN COUNTY, NORTH CAROLINA

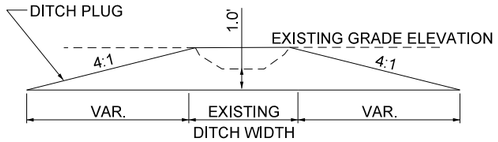
DATE: MARCH 2013
SCALE: N.T.S.

GENERAL NOTES & PROJECT LEGEND

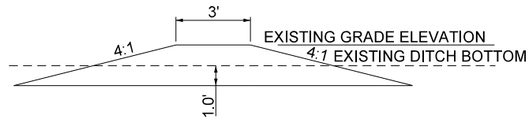
SHEET 2 OF 10



PLAN VIEW



SECTION B-B

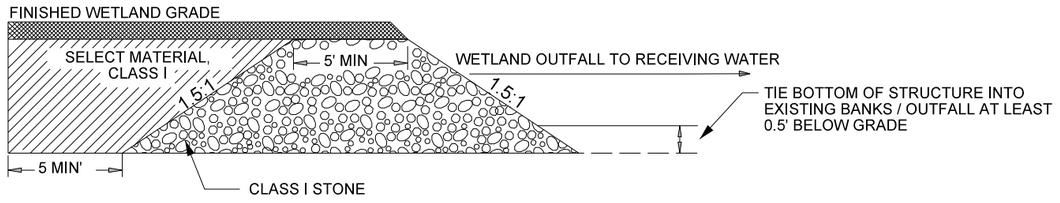


SECTION A-A

DITCH PLUG DETAIL

SCALE: NTS

NOTE:
SEE PLAN SHEETS FOR LOCATIONS OF DITCH PLUGS.
USE SELECT MATERIAL, CLASS I OR SUITABLE
SALVAGED MATERIAL, IF AVAILABLE FOR DITCH PLUGS.



PROFILE VIEW

STABILIZED DRAINAGE OUTFALL

SCALE: NTS

NOTE:
IF AVAILABLE SUITABLE SALVAGED MATERIAL
MAY BE SUBSTITUTED FOR SELECT MATERIAL, CLASS I.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

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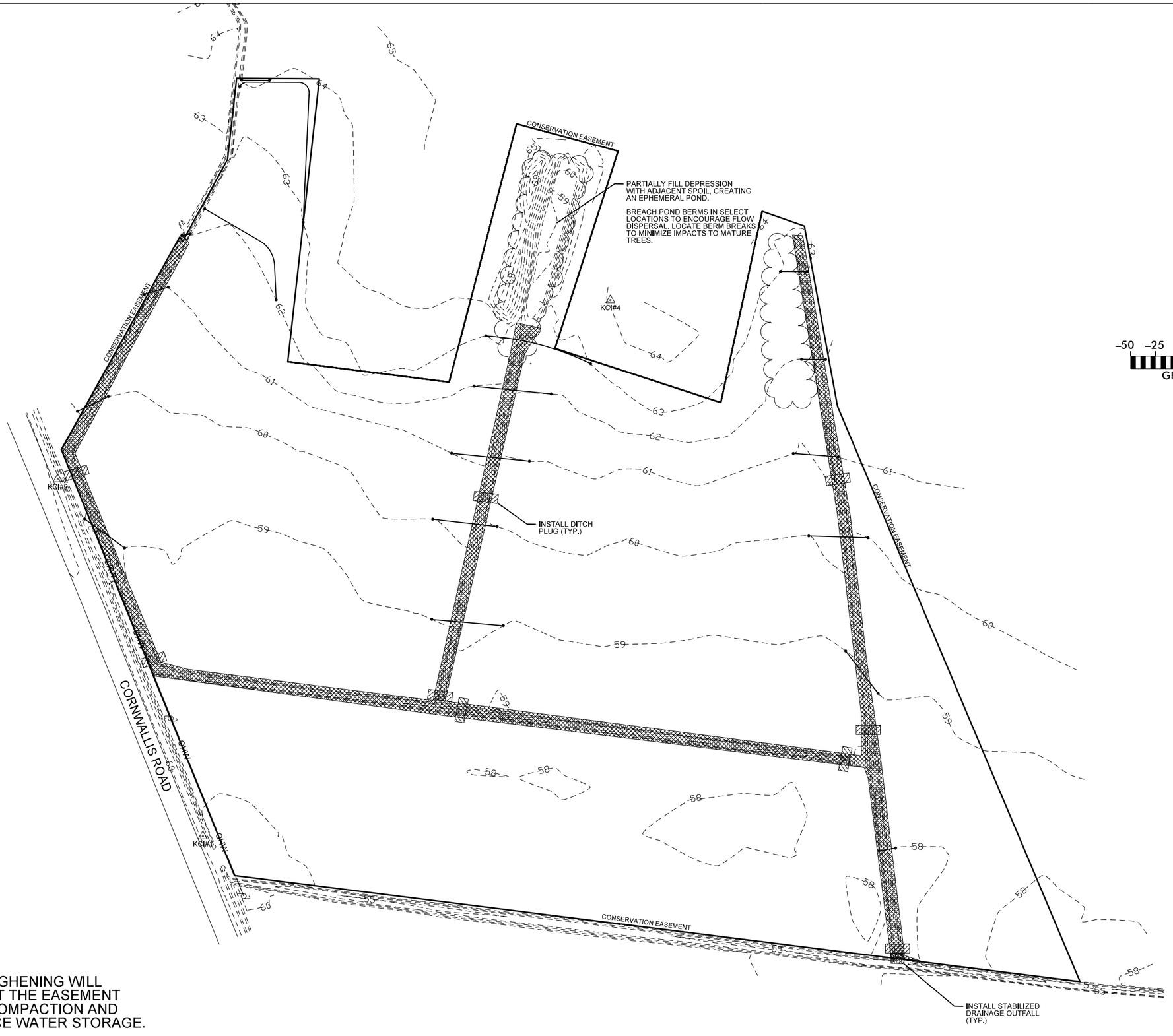
DETAILS



NOTE: SURFACE ROUGHENING WILL OCCUR THROUGHOUT THE EASEMENT TO ALLEVIATE SOIL COMPACTION AND TO ENHANCE SURFACE WATER STORAGE.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NO SCALE 181

–50 –25 0 50 100
GRAPHIC SCALE

REVISIONS

A	SUBMITTED WITH MITIGATION PLAN	SWL	DESCRIPTION	DATE	APPROVED
				NOV 2012	

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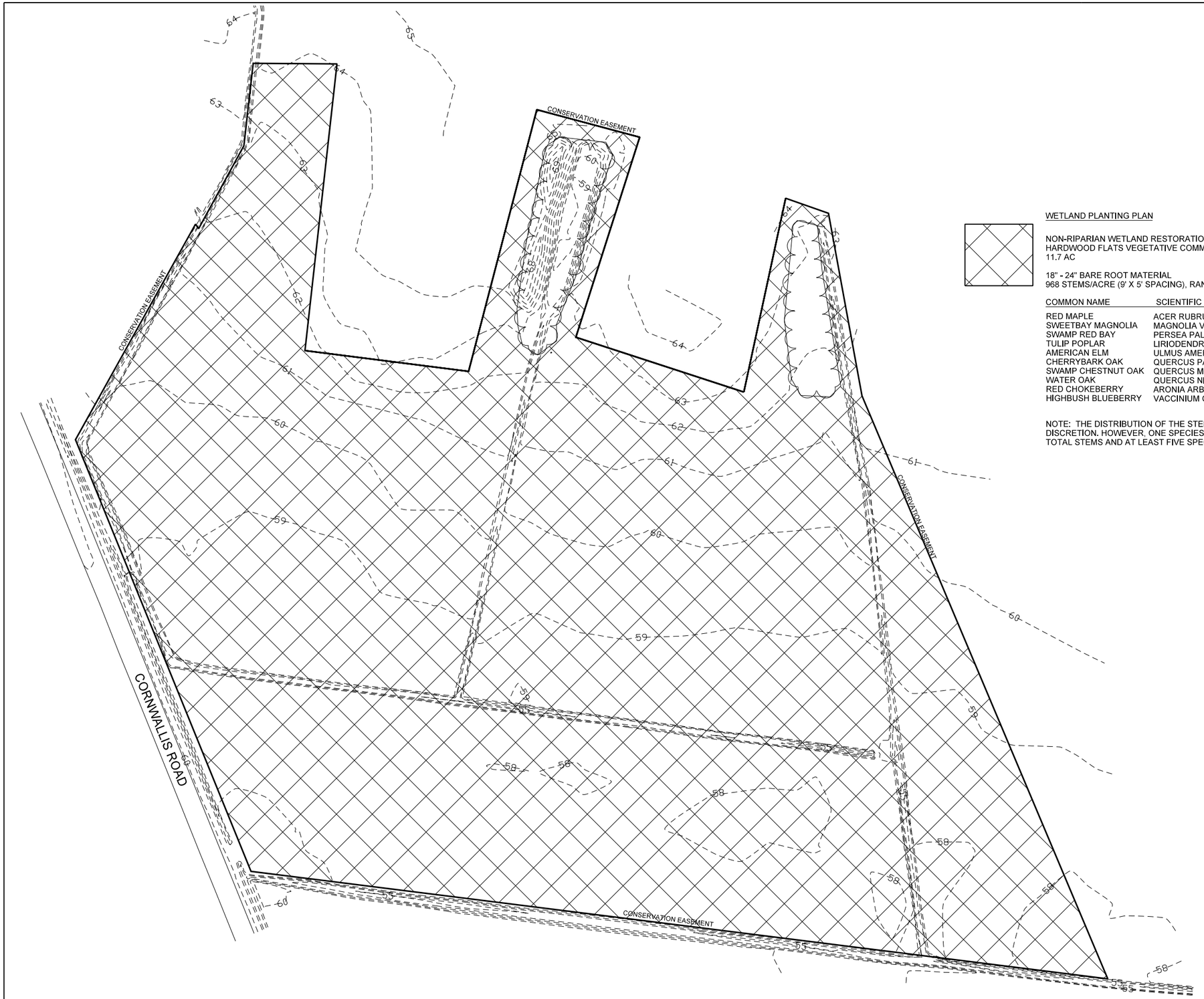
TWIN BAYS
RESTORATION SITE
WALLACE, DUPLIN COUNTY, NORTH CAROLINA

DATE: MARCH 2013
SCALE: GRAPHIC

GRADING PLAN

SHEET 4 OF 10



WETLAND PLANTING PLAN

NON-RIPARIAN WETLAND RESTORATION
HARDWOOD FLATS VEGETATIVE COMMUNITY
11.7 AC

18" - 24" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

COMMON NAME	SCIENTIFIC NAME	WETLAND INDICATOR	% OF TOTAL	# OF PLANTS
RED MAPLE	ACER RUBRUM	FACW	5	600
SWEETBAY MAGNOLIA	MAGNOLIA VIRGINIANA	FACW	4	500
SWAMP RED BAY	PERSEA PALUSTRIS	FACW	4	500
TULIP POPLAR	LIRIODENDRON TULIPIFERA	FACW	13	1,500
AMERICAN ELM	ULMUS AMERICANA	FACW	13	1,500
CHERRYBARK OAK	QUERCUS PAGODA	FAC	18	2,000
SWAMP CHESTNUT OAK	QUERCUS MICHAUXII	FACW	26	3,000
WATER OAK	QUERCUS NIGRA	FAC	13	1,500
RED CHOKEBERRY	ARONIA ARBUTIFOLIA	FACW	2	250
HIGHBUSH BLUEBERRY	VACCINIUM CORYMBOSUM	FACW	2	250
			100	11,600

NOTE: THE DISTRIBUTION OF THE STEMS MAY BE CHANGED AT THE ENGINEER'S DISCRETION. HOWEVER, ONE SPECIES MAY OCCUPY NO MORE THAN 25% OF THE TOTAL STEMS AND AT LEAST FIVE SPECIES MUST BE USED.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NC GRID NAD 83

–50 –25 0 50 100
GRAPHIC SCALE

REVISIONS

A	SUBMITTED WITH MITIGATION PLAN	NOV 2012	APPROVED
			DATE
			DESCRIPTION
			SYM.

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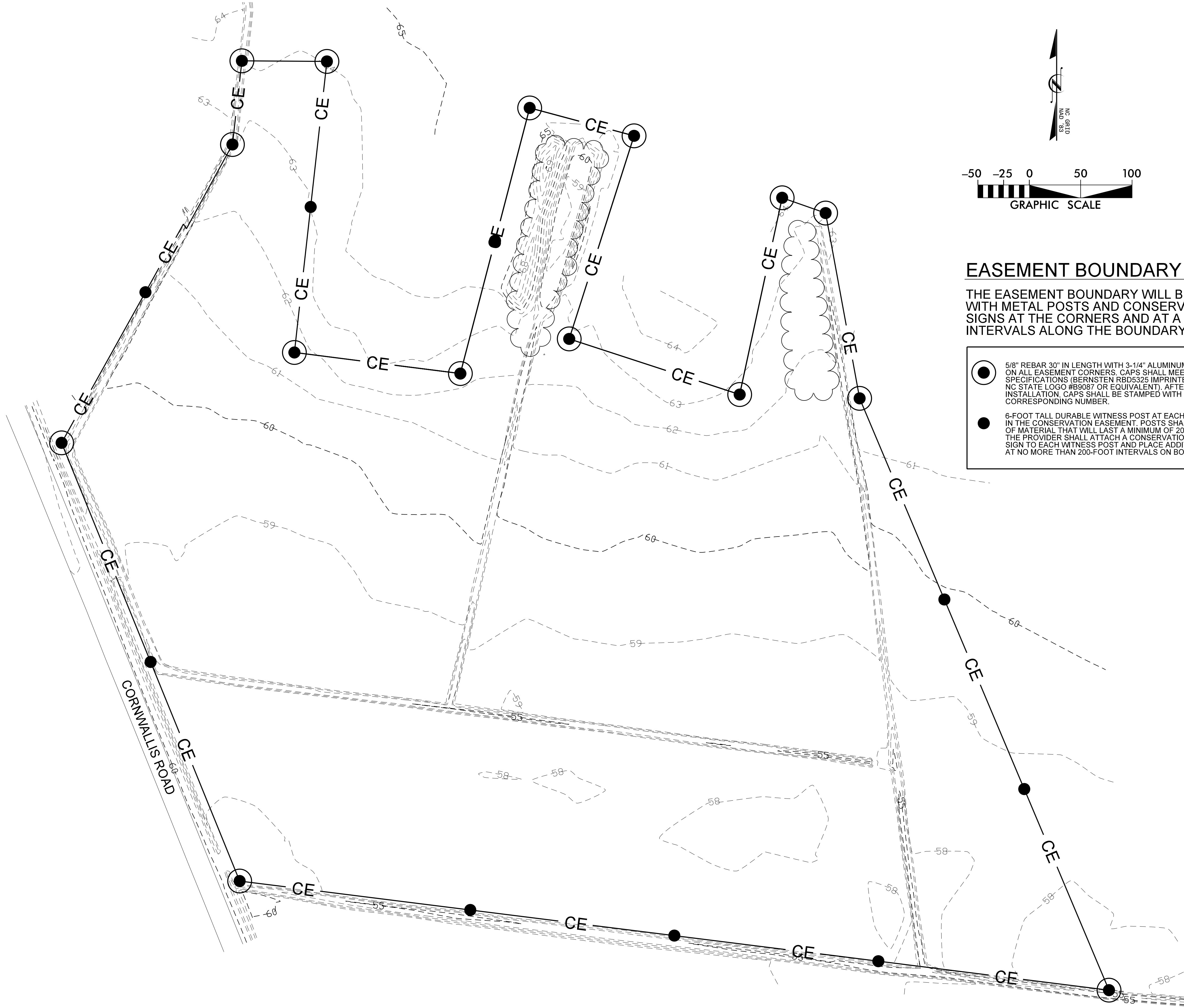
PLANTING PLAN

SHEET 5 OF 10



EASEMENT BOUNDARY MARKING

THE EASEMENT BOUNDARY WILL BE MARKED WITH METAL POSTS AND CONSERVATION EASEMENT SIGNS AT THE CORNERS AND AT A MINIMUM OF 200' INTERVALS ALONG THE BOUNDARY.

- (Rebar symbol) 5/8" REBAR 30" IN LENGTH WITH 3-1/4" ALUMINUM CAPS ON ALL EASEMENT CORNERS. CAPS SHALL MEET EEP SPECIFICATIONS (BERNSTEN RBD5325 IMPRINTED WITH NC STATE LOGO #B9087 OR EQUIVALENT). AFTER INSTALLATION, CAPS SHALL BE STAMPED WITH THE CORRESPONDING NUMBER.
- (Post symbol) 6-FOOT TALL DURABLE WITNESS POST AT EACH CORNER IN THE CONSERVATION EASEMENT. POSTS SHALL BE MADE OF MATERIAL THAT WILL LAST A MINIMUM OF 20 YEARS. THE PROVIDER SHALL ATTACH A CONSERVATION EASEMENT SIGN TO EACH WITNESS POST AND PLACE ADDITIONAL SIGNS AT NO MORE THAN 200-FOOT INTERVALS ON BOUNDARY LINES.

NORTH CAROLINA PROFESSIONAL ENGINEER
SEAL 32733
GARY MICHAEL MRYNCZA

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SCALE: GRAPHIC

BOUNDARY MARKING PLAN

SHEET 6 OF 10

NOTES:

1. IT IS THE INTENT OF THESE PLANS THAT AS SOON AS AN AREA OF GRADING IS COMPLETE IT SHALL BE STABILIZED IN ACCORDANCE WITH THE EROSION CONTROL PRACTICES DESCRIBED IN THESE PLANS.DUE TO THE ANTICIPATED DURATION AND SEQUENCE OF THE CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS REQUIRED TO MINIMIZE, AS MUCH AS POSSIBLE, THE AMOUNT 0F THE AREA THAT IS DISTURBED AT ONE TIME.

2. THE CONTRACTOR SHALL EXERCISE EVERY REASONABLE PRECAUTION THROUGHOUT THE CONSTRUCTION OF THE PROJECT TO PREVENT EROSION AND SEDIMENTATION. EROSION CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE PROJECT PLANS, NORTH CAROLINA SEDIMENT AND EROSION CONTROL GUIDELINES AND AS DIRECTED BY THE DESIGNER.

3. ALL EXCAVATED MATERIAL SHALL BE STOCKPILED WITHIN THE LIMITS OF DISTURBANCE FOR LATER USE AS EMBANKMENT MATERIAL. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING APPROPRIATE STABILIZATION MEASURES AROUND THE STOCKPILE AREA(S) AND ANY TEMPORARY OR PERMANENT SPOIL AND TOPSOIL PILES TO PREVENT EROSION AND SEDIMENTATION.

4. IN THE EVENT OF A STORM, THE CONTRACTOR WILL BE RESPONSIBLE FOR REMOVAL OR PROTECTION OF ANY EQUIPMENT, TOOLS, MATERIALS OR OTHER ITEMS NEEDED TO COMPLETE THE WORK THAT COULD BE AFFECTED BY STORMWATER.

5. AFTER THE WETLAND GRADING CALLED FOR IN THE PLANS IS COMPLETED, THE CONTRACTOR SHALL IMMEDIATELY INSTALL APPROPRIATE STABILIZATION MATERIALS AS CALLED FOR IN THE PLANS TO STABILIZE THE SOIL AND PROVIDE IMMEDIATE SEDIMENT/EROSION CONTROL.

6. EACH SEDIMENT CONTROL DEVICE WILL BE REMOVED AFTER ALL WORK IN THE CORRESPONDING CONSTRUCTION PHASE HAS BEEN COMPLETED AND THE AREAS HAVE BEEN STABILIZED.

7. THE CONSTRUCTION ENTRANCE AND STAGING AREA IDENTIFIED ON THE PLANS PROVIDE THE ONLY ACCESS POINTS INTO THE LIMITS OF DISTURBANCE. NO ADDITIONAL ACCESS POINTS SHALL BE USED WITHOUT APPROVAL OF THE DESIGNER.

8. SILT FENCE SHALL BE INSTALLED ON THE LOW SIDE OF ANY TEMPORARY OR PERMANENT SPOIL AND TOPSOIL PILES. THESE SPOIL PILES SHALL ALSO BE SEEDED AND MULCHED FOR VEGETATIVE STABILIZATION ON THE SAME DAY THEY ARE CREATED. ALL SPOIL MATERIAL SHALL STAY ON THE SITE AND SHALL NOT BE REMOVED FROM THE SUBJECT PROPERTY.

9. ALL EROSION AND SEDIMENT CONTROL PRACTICES WILL BE CHECKED FOR STABILITY AND FUNCTIONAL OPERATION FOLLOWING EVERY RUNOFF PRODUCING RAIN EVENT AND/OR AT LEAST ONCE PER WEEK. ANY NEEDED MAINTENANCE OR REPAIRS SHALL BE MADE IMMEDIATELY TO MAINTAIN ALL MEASURES AS DESIGNED. ACCUMULATED SEDIMENT SHALL BE REMOVED FROM CONTROL MEASURES WHEN THEY REACH APPROXIMATELY 50% OF THEIR FUNCTIONAL CAPACITY. THESE MEASURES SHALL BE REPAIRED IF DISTURBED DURING MAINTENANCE. ALL SEEDED AREAS SHALL BE FERTILIZED, RESEEDED AND MULCHED, AS NECESSARY, TO PROMOTE THE ESTABLISHMENT OF VEGETATION COVER.

10. THE CONSTRUCTION MANAGER AND EROSION CONTROL CONTACT FOR THIS SITE IS TIM MORRIS. OFFICE PHONE - 919-783-9214 CELL PHONE - 919-793-6886

SEQUENCE OF CONSTRUCTION:

THE CONTRACTOR IS RESPONSIBLE FOR FOLLOWING THE SEQUENCE OF CONSTRUCTION IN ACCORDANCE WITH THE PLANS AND THE FOLLOWING PROVISIONS, AS DIRECTED BY THE DESIGNER. CONSTRUCTION SHALL PROCEED IN THE SPECIFIED MANNER UNLESS OTHERWISE DIRECTED OR APPROVED BY THE DESIGNER. THE FOLLOWING PROVISIONS, ALONG WITH THE INSTRUCTIONS CONTAINED IN THE PLANS, CONSTITUTE THE SEQUENCE OF CONSTRUCTION.

PHASE 1: INITIAL SITE PREPARATION
- A. IDENTIFY PROJECT BOUNDARY, LIMITS OF DISTURBANCE, SENSITIVE AREAS, STAGING AREAS, STABILIZED ENTRANCES, AND ACCESS POINTS WITH THE DESIGNER.
- B. CONSTRUCT ENTRANCE AND STAGING AREAS AND THEIR ASSOCIATED SEDIMENT AND EROSION CONTROL DEVICES IN A MANNER TO SUPPORT EXECUTION OF THE WETLAND RESTORATION IN PHASES AS INDICATED IN THE PLANS AND AS DIRECTED BY THE DESIGNER.

PHASE 2: WETLAND RESTORATION GRADING
- A. FILLING EXISTING DITCHES/DEPRESSIONS
  - i. CLEAR VEGETATION AS NEEDED TO INSTALL SEDIMENT AND EROSION CONTROL MEASURES. INSTALL SEDIMENT AND EROSION CONTROL MEASURES AS DEPICTED ON THE PLANS.
  - ii. INSTALL PROPOSED OUTLET STABILIZATION STRUCTURES.
  - iii. FILL DITCHES/DEPRESSIONS AS INDICATED IN THE PLANS USING ADJACENT SPOIL MATERIAL, MAKING SURE TO DEWATER THE EXISTING DITCHES AS INDICATED ON THE PLANS.
  - iv. INSTALL ROCK SILT SCREENS AT OUTLET STABILIZATION STRUCTURES.
  - v. SEED AND MULCH COMPLETED WORK AREAS. THIS SHALL BE DONE WITHIN 72 HOURS OF REACHING FINAL GRADE WHEN FILLING DITCHES/PONDS/DEPRESSIONS AND MAY OCCUR PRIOR TO PHASE 2.A.iii.
- B. SURFACE ROUGHENING
  - i. BEGINNING ON THE NORTH SIDE OF THE WETLAND RESTORATION AREA AND PROGRESSING TOWARDS THE SOUTHERN SIDE OF THE SITE, ROUGHEN THE SOIL TO AN APPROXIMATE DEPTH OF 8" TO ALLEVIATE COMPACTION AND MIMIC NATURAL WETLAND MICROTOPOGRAPHY. THIS WILL INCREASE THE STORAGE OF SURFACE WATER IN THE WETLAND AND PROMOTE VEGETATION ESTABLISHMENT.
  - ii. SEED AND MULCH COMPLETED WORK AREAS. THIS SHALL BE DONE WITHIN 72 HOURS OF SURFACE ROUGHENING.

PHASE 3: TREE PLANTING
- A. PLANTS SHOULD BE PLANTED DURING THE DORMANT SEASON (NOVEMBER 17 - MARCH 17).
- B. PREPARE AND PLANT TREES IN ACCORDANCE WITH PLAN SHEETS 7-10 AND AS DIRECTED BY THE DESIGNER.

PHASE 4: COMPLETION OF PROJECT SITE
- A. PHASE 4 CAN BE INITIATED AFTER THE WETLAND GRADING WORK IS COMPLETED, AFTER THE SITE IS STABLIZED WITH REQUIRED VEGETATIVE COVER, AND PRIOR TO PHASE 3.
- B. REMOVE ALL REMAINING WASTE MATERIALS, AND THE EROSION CONTROL MEASURES AND RESTORE THE REMAINING STAGING AND STOCKPILING AREAS AND CONSTRUCTION ENTRANCES TO THEIR PRIOR CONDITION. SEED AND MULCH ALL DISTURBED AREAS UTILIZING THE SEED/MULCH MIXES SPECIFIED IN THE PLANS.

GROUND STABILIZATION

SITE AREA DESCRIPTION	STABILIZATION TIME FRAME
PERIMETER DIKES, SWALES, DITCHES AND SLOPES	7 DAYS
HIGH QUALITY WATER (HQW) ZONES	7 DAYS
SLOPES STEEPER THAN 3:1	7 DAYS
SLOPES 3:1 OR FLATTER	7 DAYS
ALL OTHER AREAS WITH SLOPES FLATTER THAN 4:1	7 DAYS

INSPECTIONS

WEEKLY INSPECTIONS REQUIRED.

RAIN GAUGE MUST BE PRESENT AT SITE. INSPECTIONS REQUIRED AFTER 0.5" RAIN EVENTS.

INSPECTIONS ARE ONLY REQUIRED DURING "NORMAL BUSINESS HOURS".

INSPECTION REPORTS MUST BE AVAILABLE ON-SITE DURING BUSINESS HOURS UNLESS A SITE SPECIFIC EXEMPTION IS APPROVED.

RECORD MUST BE KEPT FOR 3 YEARS AND AVAILABLE UPON REQUEST.

ELECTRONICALLY-AVAILABLE RECORDS MAY BE SUBSTITUTED UNDER CERTAIN CONDITIONS.

SEDIMENTATION & EROSION CONTROL PLAN LEGEND

- DITCHES TO BE FILLED
- STABILIZED CONSTRUCTION ENTRANCE
- SILT FENCE — SF —
- LIMITS OF DISTURBANCE — LOD —
- BRIDGE MAT STREAM CROSSING
- ROCK SILT SCREEN (STD. DRAWING 1636.01)

TEMPORARY SEED MIX

THE CONTRACTOR SHALL UTILIZE THE FOLLOWING SEED/FERTILIZER MIX IN SEEDING ALL DISTURBED AREAS WITHIN THE PROJECT LIMITS:

SUMMER MIX (MAY 15 - AUGUST 15)
- GERMAN MILLET. . . . . SETARIA ITALICA . . . . . 20 LBS / ACRE
- BROWNTOP MILLET. . . . UROCHLOA RAMOSA. . . . 20 LBS / ACRE

WINTER MIX (AUGUST 15 - MAY 15)
- RYE GRAIN. . . . . SECALE CEREALE. . . . . 120 LBS / ACRE

FERTILIZER. . . . . 750 LBS / ACRE
LIMESTONE. . . . . 2000 LBS / ACRE

FERTILIZER SHALL BE 10-10-10 ANALYSIS. UPON SOIL ANALYSIS A DIFFERENT RATIO OF FERTILIZER MAY BE USED.

SEEDBED PREPARATION
THE SEEDBED SHALL BE COMPRISED OF LOOSE SOIL AND NOT COMPACTED. THIS MAY REQUIRE MECHANICAL LOOSENING OF THE SOIL. SOIL AMENDMENTS SHOULD FOLLOW THE FERTILIZER AND LIMING DESCRIPTION IN THE ABOVE SECTIONS. FOLLOWING SEEDING, MULCHING SHALL FOLLOW THE BELOW APPLICATION METHODS AND AMOUNTS. AREAS CONTAINING SEVERE SOIL COMPACTION WILL BE SCARIFIED TO A DEPTH OF 8 INCHES.

MULCHING

SEEDED AREAS ARE TO BE PROTECTED BY SPREADING STRAW MULCH UNIFORMLY TO FORM A CONTINUOUS BLANKET (75% COVERAGE = 2 TONS/ACRE).

PERMANENT SEED MIX

SUMMER MIX (MAY 15 -- AUGUST 15)

SPECIES	APPLICATION RATE (IN MIX) % OF MIX	LBS / ACRE
REDTOPPANICGRASS - PANICUM RIGIDULUM	28	5.6
BEAKED PANICGRASS - PANICUM ANCEPS	20	4.0
RIVER OATS - CHASMANTHIUM LATIFOLIUM	20	4.0
VIRGINIA WILDRYE - ELYMUS VIRGINICUS	20	4.0
SWITCHGRASS - PANICUM VIRGANTUM	10	2.0
LEATHERY RUSH - JUNCUS CORIACEUS	2	0.4
	100	20

NOTE:
ADD 10 LBS/ACRE OF MILLET TO ABOVE MIXTURE FOR A TOTAL OF 30 LBS/ACRE

WINTER MIX (AUGUST 15 – MAY 15)

SPECIES	APPLICATION RATE (IN MIX) % OF MIX	LBS / ACRE
REDTOPPANICGRASS - PANICUM RIGIDULUM	28	5.6
BEAKED PANICGRASS - PANICUM ANCEPS	20	4.0
RIVER OATS - CHASMANTHIUM LATIFOLIUM	20	4.0
VIRGINIA WILDRYE - ELYMUS VIRGINICUS	20	4.0
SWITCHGRASS - PANICUM VIRGANTUM	10	2.0
LEATHERY RUSH - JUNCUS CORIACEUS	2	0.4
	100	20

NOTE:
ADD 10 LBS/ACRE OF RYE TO ABOVE MIXTURE FOR A TOTAL OF 30 LBS/ACRE

FERTILIZER AND LIMESTONE SHALL BE APPLIED AT THE RATE OF 750 LBS / ACRE AND 2000 LBS / ACRE, RESPECTIVELY. FERTILIZER SHALL BE 10-10-10 ANALYSIS. UPON SOIL ANALYSIS A DIFFERENT RATIO OF FERTILIZER MAY BE USED.

NOTE: FERTILIZER IS ONLY TO BE APPLIED ONCE. IF TEMPORARY SEED AND FERTILIZER IS APPLIED PRIOR TO PERMANENT SEED, THEN FERTILIZER SHALL NOT BE APPLIED WITH THE PERMANENT SEED.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

B	SUBMITTED FOR EROSION CONTROL PERMIT	MAR 2013	
	DESCRIPTION	DATE	APPROVED
SVM	REVISIONS		

Ecosystem Enhancement Program

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD, SUITE 220
RALEIGH, NORTH CAROLINA 27609

TWIN BAYS RESTORATION SITE
WALLACE, DUPLIN COUNTY, NORTH CAROLINA

DATE: MARCH 2013
SCALE: N.T.S.

EROSION CONTROL PLAN

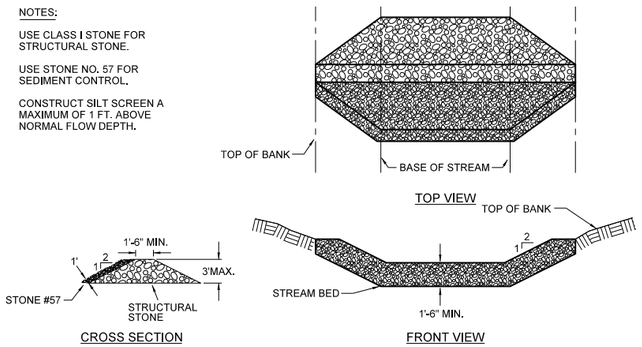
SHEET 7 OF 10

NOTES:

USE CLASS I STONE FOR STRUCTURAL STONE.

USE STONE NO. 57 FOR SEDIMENT CONTROL.

CONSTRUCT SILT SCREEN A MAXIMUM OF 1 FT. ABOVE NORMAL FLOW DEPTH.

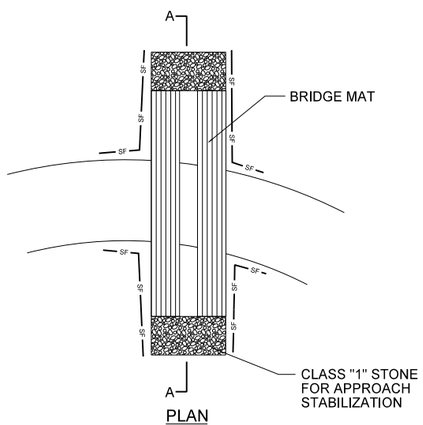


TEMPORARY ROCK SILT SCREEN

NOT TO SCALE

STREAM CROSSING MAINTENANCE:

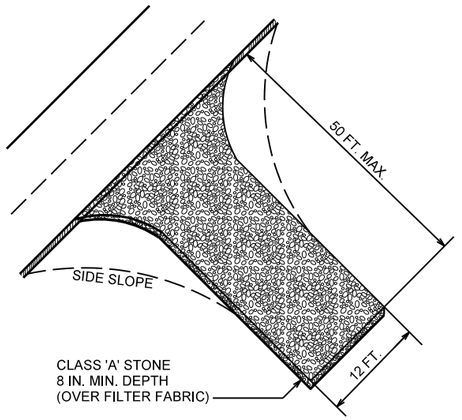
1. INSPECT TEMPORARY CROSSING AFTER EACH RAINFALL EVENT FOR ACCUMULATION OF DEBRIS, BLOCKAGE, EROSION OF ABUTMENTS AND OVERFLOW AREAS, CHANNEL SCOUR, RIPRAP DISPLACEMENT, OR PIPING ALONG CULVERTS.
2. REMOVE DEBRIS, REPAIR AND REINFORCE DAMAGED AREAS IMMEDIATELY TO PREVENT FURTHER DAMAGE TO THE INSTALLATION.



1. BRIDGE LOCATIONS DEPICTED ON SITE PLANS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE DEPENDING ON THE AREA THAT IS BEING WORKED UPON.
2. WIDTH OF EACH MAT IS DEPENDENT ON THE SIZE OF THE EQUIPMENT MEANT TO CROSS IT.
3. DISTANCE BETWEEN MATS IS DEPENDENT ON THE DISTANCE BETWEEN TRACKS ON THE EQUIPMENT MEANT TO CROSS IT.
4. APPROACH STABILIZATION, COMPOSED OF CLASS 1 STONE, WILL BE REQUIRED FOR EACH SECTION OF THE BRIDGE.

BRIDGE MAT CROSSING

PLACE AS SPECIFIED IN THE PLANS AND APPROVED BY THE DESIGNER

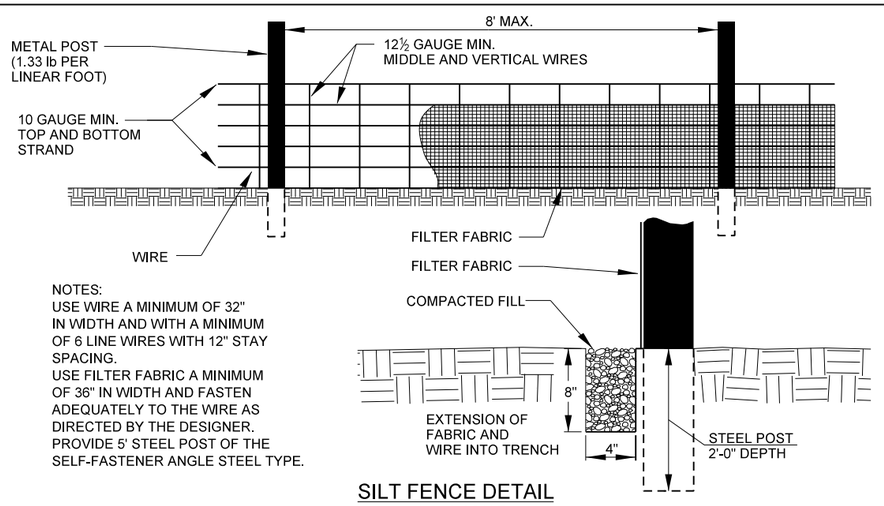


NOTES:

1. TURNING RADIUS SUFFICIENT TO ACCOMODATE LARGE TRUCKS SHALL BE PROVIDED.
2. ENTRANCE(S) SHOULD BE LOCATED TO PROVIDE FOR UTILIZATION BY ALL CONSTRUCTION VEHICLES.
3. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOPDRESSING WITH STONE WILL BE NECESSARY.
4. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED UP IMMEDIATELY.
5. GRAVEL CONSTRUCTION ENTRANCE SHALL BE LOCATED AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE MUST BE PROVIDED.
6. INSTALL A CULVERT IF NECESSARY TO ACCOMODATE ROADWAY DRAINAGE.
7. SIDE SLOPES FOR ENTRANCE MUST BE AT LEAST 2:1 SLOPE.

STABILIZED CONSTRUCTION ENTRANCE

SCALE: NTS



NOTES:
USE WIRE A MINIMUM OF 32" IN WIDTH AND WITH A MINIMUM OF 6 LINE WIRES WITH 12" STAY SPACING.
USE FILTER FABRIC A MINIMUM OF 36" IN WIDTH AND FASTEN ADEQUATELY TO THE WIRE AS DIRECTED BY THE DESIGNER.
PROVIDE 5' STEEL POST OF THE SELF-FASTENER ANGLE STEEL TYPE.

SILT FENCE DETAIL

NOT TO SCALE

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

	DESCRIPTION	DATE	APPROVED
B	SUBMITTED FOR EROSION CONTROL PERMIT	MAR 2013	
SYM.			

Ecosystem Enhancement Program

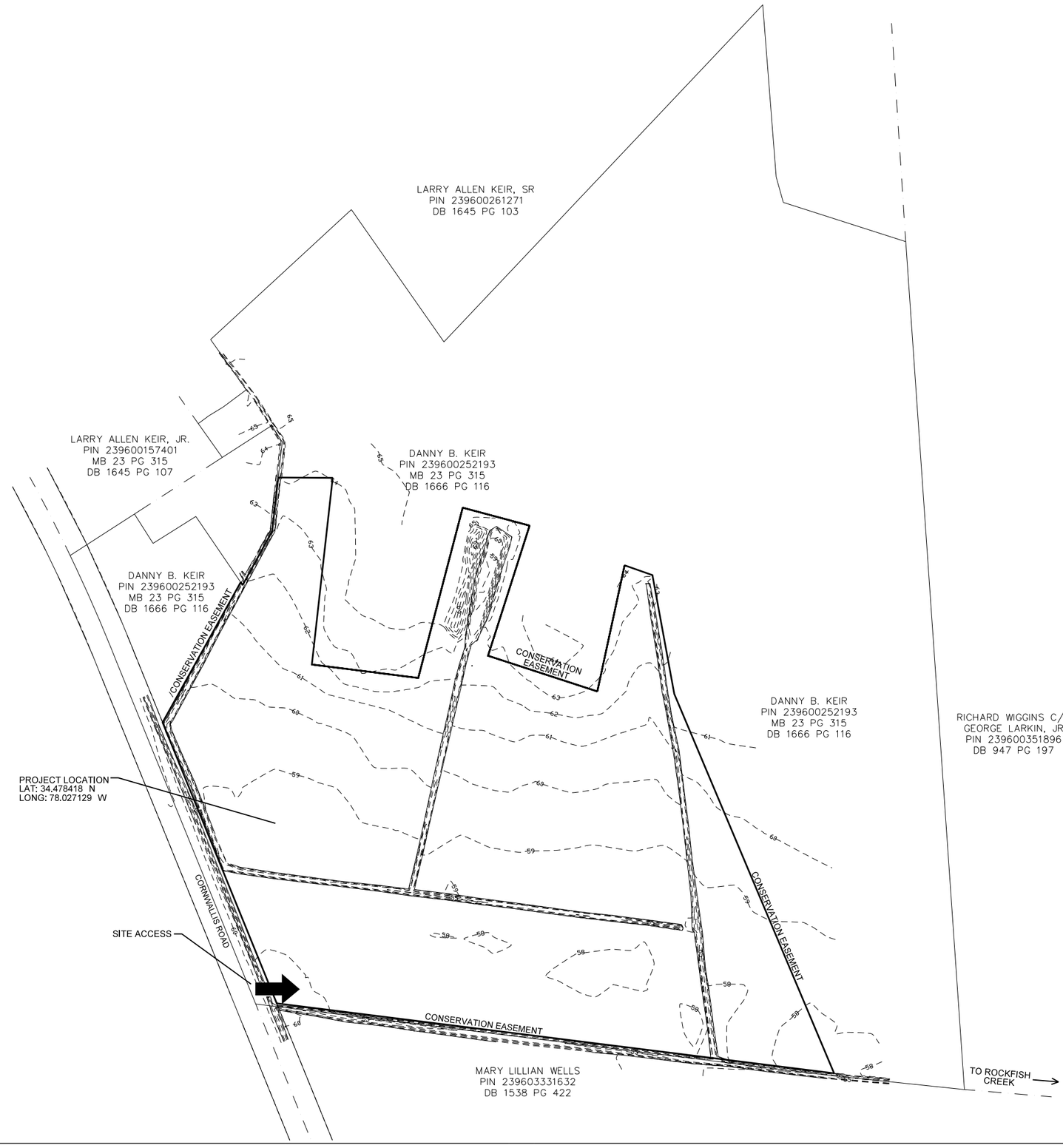
KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD, SUITE 220
RALEIGH, NORTH CAROLINA 27609

TWIN BAYS
RESTORATION SITE
WALLACE, DUPLIN COUNTY, NORTH CAROLINA

DATE: MARCH 2013
SCALE: N.T.S.

EROSION CONTROL PLAN

SHEET 8 OF 10



NC GRID NAD 83

–80 –40 0 80 160

GRAPHIC SCALE

NOTE:

ALL DITCHES WITHIN SITE ARE DEFINED "JURISDICTIONAL TRIBUTARIES" BY THE US ARMY CORPS OF ENGINEERS.

TOTAL DISTURBED AREA = 11.7 AC

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

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SVML	DESCRIPTION	DATE	

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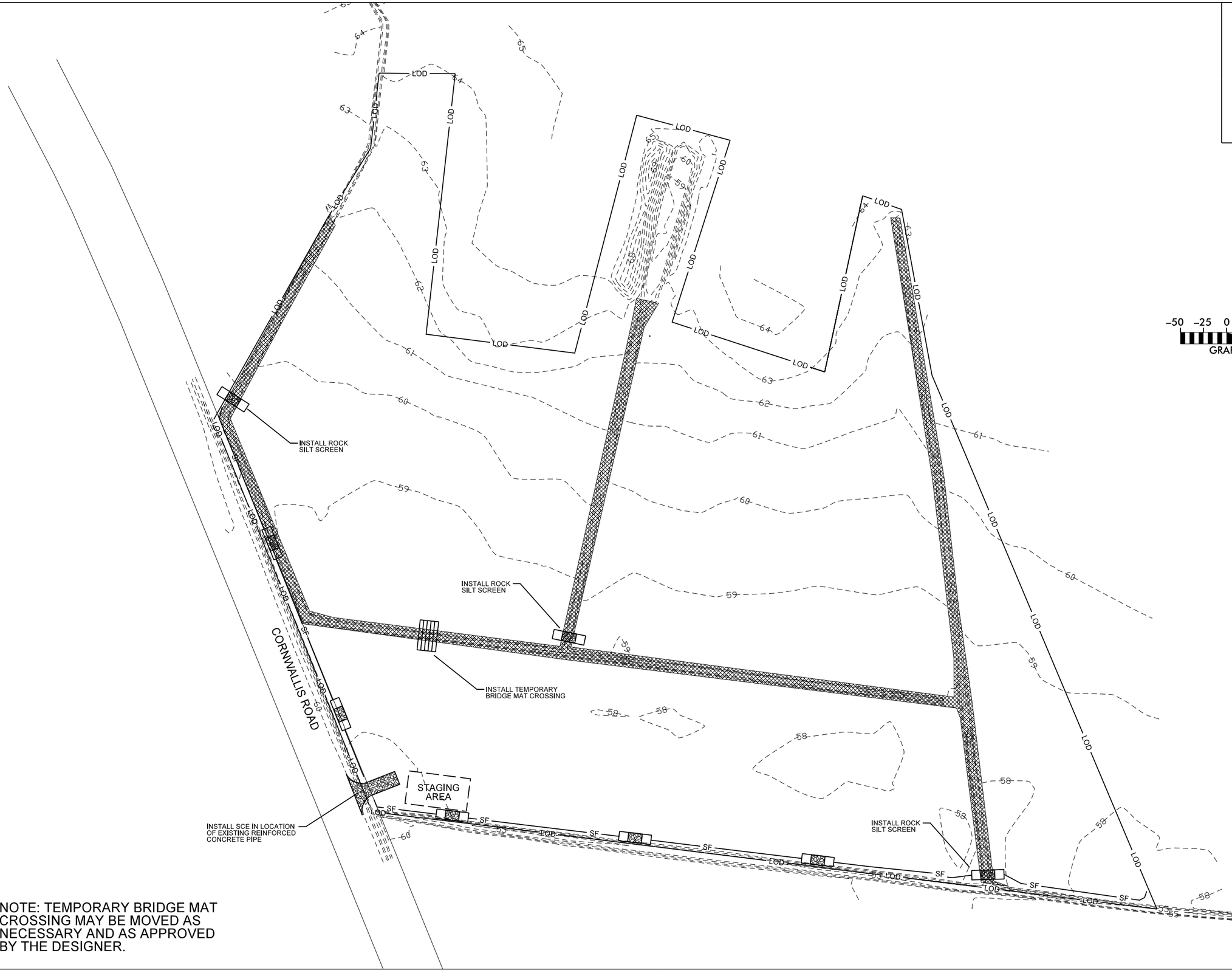
DATE: MARCH 2013
SCALE: GRAPHIC

EROSION CONTROL PLAN

SHEET 9 OF 10



NOTE: TEMPORARY BRIDGE MAT CROSSING MAY BE MOVED AS NECESSARY AND AS APPROVED BY THE DESIGNER.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

NC GRID NAD 83

−50 −25 0 50 100
GRAPHIC SCALE

B	SUBMITTED FOR EROSION CONTROL PERMIT	MAR 2013	
	DESCRIPTION	DATE	APPROVED
SVM	REVISIONS		

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EROSION CONTROL PLAN

SHEET 10 OF 10