

PLUM CREEK WETLAND RESTORATION SITE

**Brunswick County, NC
Lumber River Basin
Cataloging Unit: 03040207
Project Number D06040-A**



Prepared for:



**North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
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Wetland Restoration Plan

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EXECUTIVE SUMMARY

The Louis Berger Group, Inc. (Berger) is designing and constructing a minimum of 80 acres of nonriverine wetland restoration and 6 acres of Level 1 enhancement (2.5 to 1 ratio) on the 89-acre Plum Creek Wetland Restoration site located in Brunswick County in the Lumber River Basin, USGS Hydrologic Unit 03040207. The project is being implemented through the North Carolina Department of Environment and Natural Resources (NC DENR) Ecosystem Enhancement Program (EEP) Full-Delivery Process (FDP). This Wetland Restoration Plan has been developed using EEP's guidance document *Content, Format and Data Requirements for EEP Restoration Plans* (Version 1, 9/21/05.)

The 89 acre Plum Creek Wetland Restoration site is connected by a network of drainage ditches to Boggy Branch, a tributary to the Lockwood Folly River within the Lumber River Basin. The original wetland was ditched, drained, bedded, and replanted in loblolly pine. Approximately 6 acres of the site continue to meet the criteria to be considered jurisdictional wetlands.

The site is surrounded by deep drainage ditches, and two ditches cross the width of the tract. To implement the wetland restoration project, Berger proposes to plug the two central ditches, and leave the perimeter ditches intact. The entire site will be drum chopped to remove existing loblolly pine growth and graded to remove planting bed patterns. Soil to construct the ditch plugs will be excavated from the site and the borrow pits will become small, shallow ponds.

The goals of the proposed Plum Creek Wetland Restoration project include the reestablishment of wetland hydrologic, water quality, and habitat functions. The restoration project will increase surface water residence time which will improve groundwater recharge. Also, a longer residence time will lead to improved biochemical treatment resulting in improved water quality. Restoration of a native wetland vegetative community will enhance floral and faunal habitat diversity benefiting both terrestrial and aquatic wildlife. Wildlife habitat will also be improved by the creation of small ponds within the wetland matrix. These features will provide fish-free environments for amphibian reproduction, openings for wildlife foraging, and improve overall habitat diversity within the site.

1. PROJECT SITE IDENTIFICATION AND LOCATION

The Louis Berger Group, Inc. (Berger) is restoring the Plum Creek Wetland Mitigation site in Brunswick County, North Carolina to provide the North Carolina Ecosystem Enhancement Program (EEP) with 80 nonriverine wetland mitigation units needed to compensate for projects occurring within the Lumber River Basin (Table 1). This Restoration Plan describes existing project site conditions, presents data collected at reference sites evaluated to guide the restoration design, and details the restoration design process. This report continues the regulatory review process through EEP.

1.1. Directions to Project Site

From Raleigh: Follow I-40 towards Wilmington. Near Burgaw take exit to 140. Follow 140 for six miles across the Cape Fear River and exit onto Hwy 17 South towards Shallotte. Travel approximately 10 miles, notice the option to take 17 Business, but remain on Hwy 17 South two more miles. Turn right onto Galloway Road and follow for two miles, turn right onto Red Run Road about a block after Randolphville Road intersects with Galloway Road. Follow dirt road past two residences, the road will bend to the left. Go straight west for about one and a half miles through recently timbered acreage, you will have an option to turn right but remain straight until you reach a T intersection. As you face the T intersection, the southwest corner of the 89 acre site is on your right. There is a stream gage visible from the road in the first drainage ditch at the south eastern corner of the property.

1.2. USGS Hydrologic Unit Code and NCDWQ River Basin Designations

The 89 acre Plum Creek Wetland Restoration site is located in Brunswick County in the Lumber River Basin, USGS Hydrologic Unit 03040207 (Figure 1). The basin extends about 150 miles from the Sandhills region to the Atlantic Ocean, with a land area of 3,336 square miles. The Lumber River Basin contains approximately 2,233 stream miles, most of which ultimately flow into the Pee Dee River in South Carolina (NCDWQ, 2003). The Lockwood Folly and Shallotte Rivers within the basin flow to the Atlantic Ocean. The Lumber River basin encompasses three distinct ecological regions in North Carolina: the Sandhills, the Carolina Bay region, and the Southeastern Coastal Plain. The mainstem Lumber River is designated as a National Wild and Scenic River, the only blackwater river in North Carolina to receive this designation. Much of the mainstem Lumber River is also designated as a state Natural and Scenic River, one of only four in North Carolina.

The Plum Creek Wetland Restoration site is located in the Lumber River Subbasin 03-07-59, which covers 267 square miles, and is the only subbasin in the Lumber River basin where all waters drain to the Atlantic Ocean (NCDWQ, 2003) (Figure 1). Boiling Spring Lakes and several popular beaches are located within this subbasin. As a result of population growth, the towns of Shallotte and Calabash, located six and 12 miles from the site, have experienced recent development and an increase in impervious surfaces. The Plum Creek Wetland Restoration has the potential to improve local water quality through the restored functions of filtration and treatment.

1.3. Project Vicinity

Located in Brunswick County, North Carolina, the project site is north of Galloway Road and Hwy 17 South, six miles east of Shallotte (Figure 1).

2. Watershed Characterization

2.1. Drainage Area

The Plum Creek Wetland Restoration site has a total drainage area of approximately 110 acres at the project terminus (Figure 1 and Table 2). The watershed is mostly characterized by loblolly pine plantations and wetlands. There is a small percent of agricultural land and an increasing number of commercial and residential developments.

2.2. Surface Water Classification / Water Quality

According to the Basinwide Water Quality Management Plan for the Lumber River Basin, streams in Subbasin 03-07-59 are impacted from urban stormwater runoff and continue to be threatened by pressure from development. The number of golf courses in Brunswick County has rapidly grown over the last several years, and turf fertilizers are contributing excess nitrogen and phosphorus into surface waters.

- **Water Supply Watershed**
The Plum Creek Wetland site is not located in a water supply watershed; however, the site drains into the Lockwoods Folly River, which is classified as SA for shellfish harvesting. Portions of the Lockwoods Folly River are also designated as High Quality Waters (HQW), although they are downstream of the project site.
- **303d-Listed Stream or Watershed**
Subbasin 03-07-59 has the most 303(d)-listed impaired water bodies in the Lumber River Basin. Use support ratings in Subbasin 03-07-59 were assigned for aquatic life, recreation, fish consumption, and shellfish harvesting categories. The following water bodies are listed as impaired in the final 2006 North Carolina 303(d) list: Big Gut Slough, Calabash River, Goose Creek, Hangman Branch, portions of the Intracoastal Waterway, Jinny's Branch, Kilbart Slough, Lockwoods Creek, portions of the Lockwoods Folly River, Mill Creek, Montgomery Slough, Mullet Creek, Sams Branch, Saucepan Creek, Shallotte Creek, Shallotte River, Spring Creek, The Mill Pond, and The Swash (NCDWQ, 2006). Also 25.6 Atlantic coastline miles are Impaired in the fish consumption category for mercury based on monitoring data recovered from fish tissue.
- **NCWRP Targeted Watershed**
The Plum Creek Wetland site is not located within a Targeted Local Watershed.
- **Natural Heritage Area**
Significant Natural Heritage Areas are identified either because of the presence of rare or endangered species, or because an area provides an excellent, intact example of an ecological community that occurs naturally in North Carolina. The wetlands of Brunswick County are diverse and include many high quality nonriverine communities.

The Natural Heritage Program has identified over 150 individual natural areas in the Lumber River basin. The Plum Creek Wetland site is located approximately 0.5 miles southeast of the Green Swamp Preserve, which encompasses approximately 16,000 acres. Approximately three miles from the site are five other Significant Natural Heritage areas: Middle Swamp, Fall Swamp/Middle River, Cumbee Pond and Sandhills, Limesink Complex, and Lockwoods Folly Tidal Wetlands. Additionally, located approximately 5 miles to the east of the Plum Creek Wetland site are three Significant Aquatic Endangered Species Habitats in the Cape Fear Basin: Lewis Swamp, Bell Swamp, and Harris Swamp (NCNHP, 2007).

2.3. Physiography, Geology, and Soils

The Plum Creek Wetland Restoration site is located within the Middle Atlantic Coastal Plain region, more specifically the Carolina Flatwoods ecoregion. This nearly level ecoregion has less relief, wider upland surfaces, and larger areas of poorly drained soils than adjacent ecoregions. Usually characterized as fine-loamy and/or coarse-loamy, soils within the Carolina Flatwoods are unconsolidated materials which resulted from fluvial or marine deposition. Historically rich with pine flatwoods, pine savannas, freshwater marshes, and pocosins, much of the area is now in loblolly pine plantations. Drainage within the plantations has been modified, thus many wetlands have been lost to the forest industry. However, the endemic biota and biological diversity of the area remains greater than neighboring ecoregions.

2.4. Historical Land Use and Development Trends

According to the NCDWQ Basinwide Water Quality Plan from 2003, 74% of subbasin 03-07-59 is forested or is wetland (100% of the site is forested loblolly plantation, as noted on Table 3). Eighteen percent of the subbasin is agricultural land with urban land comprising less than 5%. Estimated population for the year 2000 in Brunswick County was 21,177. This is expected to nearly double to 39,742 for the period 2000-2020 (NCDWQ, 2003). The subbasin is likely to increase its urban land cover resulting in increased impervious surface area, wastewater discharges, and water resource demands.

2.5. Endangered / Threatened Species

The US Fish and Wildlife Service (USFWS) lists 15 species occurring in Brunswick County as protected by the Endangered Species Act of 1973, as amended (Table 4). The region near the project site has a landscape of pocosin wetlands, longleaf pine uplands and the transition zones in the margins between these communities that provides habitat for several rare and protected floral and faunal species. Due to its disturbed and impacted state, the Plum Creek wetland restoration site itself currently offers little habitat for these species. The site is situated in a ditched and drained former high pocosin wetland that has been in silvicultural rotation until only recently. Surface water onsite is directed through a drainage ditch system, although approximately six acres of the pocosin wetland have retained saturated conditions within the site boundaries.

Berger submitted a request for Categorical Exclusion for the Plum Creek wetland restoration project site to the USFWS in February 2007. Biological Conclusions of “May affect, but not likely to adversely affect” were given for both rough-leaf loosestrife (*Lysimachia asperulifolia*) and Cooley’s meadowrue (*Thalictrum cooleyi*). Potential habitat was identified within the site boundaries; however preliminary site plans do not include grading at the likely locations of these species. The USFWS was apprised of these opinions and concurred on February 13, 2007.

On June 14, 2007 Berger scientists re-visited the site and conducted pedestrian surveys on transects throughout the identified habitat area. This time frame is within the species fruiting or flowering period and represents the optimal season for field identification. No individuals or populations of the target species were observed during this survey.

The North Carolina Natural Heritage Program (NCNHP) has reported that within a 0.5 square mile area of the proposed project there were no recorded occurrences of rare species, significant natural communities, or natural heritage areas. NCNHP also noted the proximity of the proposed project site to Green Swamp Preserve; which is positioned 0.3 miles to the northwest of the site. Green Swamp Preserve is a nationally significant natural area owned by both the Nature Conservancy and private landowners.

The North Carolina Wildlife Resources Commission (NCWRC) also responded that there does not appear to be any threatened or endangered species that may be impacted from the project, and did not object to the project as proposed.

Berger scientists conducted field inspections of the site in 2006 and 2007 to assess the existing habitat types. The onsite habitat was compared with the known habitat descriptions for each species known to occur within Brunswick County. The assessment methodology involved onsite field inspections and best professional judgment of site conditions and descriptions of known biological life histories and ecological habitat preferences. The findings listed below are based on these inspections and available data. Of the 15 species listed by the USFWS as occurring in Brunswick County, habitat appropriate for the following two species potentially occurs on the site. USFWS representatives were consulted following the site inspections and that agency has concurred with the following findings of Berger scientists (Appendix 10).

Cooley's meadowrue (*Thalictrum cooleyi*)

Endangered

Habitat Description - This is a perennial rhizomatic herb with stems usually one meter in height that flowers in mid June to early July. Ideal conditions are under full sun in the ecotone between wet savannas or pocosins and adjacent upland community types. This species is dependant on regular disturbance such as fire or mowing to maintain its open habitat and may also grow along fire plow lines, in roadside ditches, woodland clearings, and power line rights-of-way. Typical populations of Cooley's meadowrue have robust reproductive plants among shrubs and in adjacent open savanna and repressed vegetative individuals in nearby dense shade. This species is most often found growing on the borders of woodland communities dominated by red maple (*Acer rubrum*), swamp tupelo (*Nyssa biflora*), tulip poplar (*Liriodendron tulipifera*), and Atlantic white cedar (*Chamaecyparis thyoides*) in the canopy and wax myrtle (*Myrica cerifera*), ti-ti (*Cyrilla racemiflora*), sweet pepper bush (*Clethra alnifolia*), sweetbay magnolia (*Magnolia virginiana*), huckleberry (*Gaylussacia dumosa*), inkberry (*Ilex glabra*), gallberry (*Ilex coriacea*), and other bay shrubs in the shrub zone (USFWS, 2007).

Biological conclusion

May affect, but not likely to adversely affect

Along the northern edge of the project boundary, approximately six acres of saturated pocosin remain after silvicultural clearing and ditching operations. No populations of Cooley's meadowrue have been identified within five miles of the project site (NCNHP, 2007). The vegetation of the wetland and surrounding landscape is indicative of appropriate habitat for Cooley's meadowrue. However, extensive surveys were conducted by Berger scientists in June of 2007, and no Cooley's meadowrue were found. Preliminary site plans do not include grading at the likely locations of this species. Therefore, it is concluded the proposed project is not likely to affect this species.

Rough-leaf Loosestrife (*Lysimachia asperulifolia*)

Endangered

Habitat Description - This species is a perennial herb in the Primrose Family (Primulaceae) that grows to approximately 30 to 60 centimeters in height. Flowering occurs from mid-May through June, with fruits (capsules) present from July through October. Ideal habitat for rough-leaf loosestrife is generally in the ecotone between longleaf pine and oak savannas and wetter, shrubby areas, where moist, sandy, or peaty soils occur and where low vegetation allows abundant sunlight in the herb layer. This species generally depends on periodic fires to naturally maintain the low vegetation, however where fires are not suppressed, the shrubs present in the ecotone will attain their full height. Complete fire suppression may result in extirpation from a site, though rough-leaf loosestrife may persist for years or decades under a fairly dense shrub layer. Rough-leaf loosestrife may also be found in disturbed sites such as roadside depressions, power line rights-of-way, and firebreaks (USFWS, 1994).

Biological conclusion

May affect, but not likely to adversely affect

Appropriate habitat for rough-leaf loosestrife was identified by Berger scientists in February of 2007 along the northern edge of the project boundary at the edge of the remaining pocosin wetland. No rough-leaf loosestrife were identified within the project site at that time, however, NHP GIS data indicated six occurrences of this species in the Green Swamp Preserve within five miles of the project site. One of these populations was located approximately 1.6 miles to the west of the project site (NCNHP, 2007). The vegetation of the wetland and surrounding landscape is indicative of appropriate habitat for rough-leaf loosestrife. However, extensive surveys for this species were conducted in June of 2007 and none were found. Preliminary site plans do not include grading at the likely locations of this species. Therefore, it is concluded the proposed project is not likely to affect this species.

2.6. Cultural Resources

Berger conducted a cultural resources records review for the Plum Creek Wetland Restoration site on September 11, 2006. The site inventory and National Register files at the North Carolina State Historic Preservation Office (NC SHPO) and the Office of State Archaeology (OSA) in Raleigh were reviewed for the presence of previously recorded historical properties and archaeological sites within the boundaries of the parcel that contains the proposed wetland restoration site and within a 1-mile (1.6 kilometer) radius of the parcel. No archaeological sites are located within a 1-mile (1.6 kilometer) radius of the parcel. No architectural properties listed on the National Register of Historic Places, determined eligible, or under consideration, are located within a 1-mile (1.6-kilometer) radius of the parcel.

Archaeological fieldwork was conducted from September 21 through September 22, 2006. Fieldwork included a pedestrian reconnaissance of the site. This was accomplished by walking the perimeter of the proposed wetland restoration site, which is located in a series of timber management clear cuts. The site was photographed and its topographic and vegetative characteristics noted. Two shovel tests were excavated near the northeastern and southwestern corners of the site (also known as the Area of Potential Effect). A third shovel test was attempted near the center of the tract but could not be completed due to the high water table and disturbed character of the mounded soils. The shovel tests revealed leached and water saturated soils to a depth from 28-30 inches (70-75 centimeters) below ground surface (bgs). The water table was encountered at the bottom of each shovel test at approximately 20-30 inches (50-75 centimeters) bgs. No isolated artifacts, archaeological sites, or cultural deposits were identified within the site.

A letter summarizing the findings of the cultural resources records review and the archaeological reconnaissance were submitted to the NC SHPO on January 9, 2007. A letter response, dated January 31, 2007, from the NC SHPO stated that the “investigations undertaken have adequately addressed any concerns” that the office may have had. Therefore, no further investigation was performed. Letters of coordination, including the NC SHPO concurrence, are provided in Appendix 10.

These findings were summarized in the Categorical Exclusion (CE) document submitted February 18, 2007. The North Carolina State Clearing House approved the CE for the Plum Creek Wetland Restoration site in March 2007, and a copy of this approval is provided in Appendix 10. Therefore, the proposed project is not likely to affect cultural resources.

2.7. Potential Constraints

2.7.1. Property Ownership and Boundary

The Plum Creek Wetland Restoration site is enrolled in a perpetual conservation easement held by Plum Creek Timberland (Grantee) and Berger (Grantor). Documentation of this enrollment and the property boundary survey are provided in Appendix 11. This arrangement does not place any constraints of restoration of the site to a wetland mitigation bank.

2.7.2. Site Access

The Project site is accessed through a series of dirt roads through recently cleared loblolly pine plantations. Therefore, site access does not pose any constraints to restoration of the site.

2.7.3. Utilities

Based on a deed and title search there are no known utility right of ways that traverse the project site.

2.7.4. FEMA / Hydrologic Trespass

There are no FEMA studied streams on the project site, nor is there any stream work to be completed on the project site; therefore there should be no FEMA coordination needed for this project. Additionally, the ditch network surrounding the site will remain intact and thereby prevent increased height of the water table beyond the bounds of the site. Furthermore, both the onsite and offsite areas landuse will not change significantly such that it will result in an increase or decrease in runoff.

3. Project Site Streams

There is no stream component to this project. Two silvicultural drainage ditches traverse the project site, and those will be plugged.

4. Reference Streams

There is no stream component to this project.

5. Project Site Wetlands – Existing Conditions

Wetland scientists from Berger conducted a wetland delineation on the site in February of 2007. Conditions were typical of a pocosin wetland system hydrologically altered (drained) to support silvicultural operations. Photos of the project site conditions are provided in Appendix 1.

5.1. Jurisdictional Wetlands

Wetlands within the project area were delineated in accordance with the procedures outlined in the *Corps of Engineers Wetland Delineation Manual, Technical Report Y-87-1* with guidance outlined in a clarification interpretation memorandum from the Directorate of Civil Works (Environmental Laboratory, 1987). Wetlands, as defined in the 1987 manual, are: “Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal conditions do support, a prevalence of vegetation typically adapted to life in saturated soil conditions.” To be considered jurisdictional a wetland must have hydric soils, evidence of wetland hydrology, and support a prevalence of hydrophytic vegetation.

The wetland delineation was performed to determine the jurisdictional boundaries of all wetlands identified within the project site. The boundaries of wetland areas were marked in the field by sequentially numbered flags and recorded with a submeter accurate Global Positioning System (GPS) unit. Wilmington District Corps wetland delineation data sheets were completed to document the wetland boundary. Soil profiles were examined at each of the observation plots. Profiles were typically to a depth of 18 inches. Soil matrix color, redoximorphic features, USDA texture and pore linings were recorded for each distinct soil horizon within the soil profile. Field data sheets are included in Appendix 2 of this report. The wetland delineation was performed by individuals trained in the three-parameter methodology adopted by the U.S. Army Corps of Engineers (USACE) as set forth in the above mentioned manual and by a certified professional soil scientist.

Berger identified and delineated a six acre wetland area located at the north east of the property (WA). On April 8, 2008, a representative of the USACE, Wilmington District met with Berger scientists at the site and verified that the delineated wetland boundary was accurate as surveyed (Appendix 10 – email dated June 16, 2008). This wetland abuts the Relatively Permanent Water (RPW) that runs north to south located on the east side of the site. Also, the two ditches that run west to east through the site and drain to the RPW located on the east side were determined to be “jurisdictional tributaries” based on the presence of an Ordinary High Water Mark (OHWM), but not stream channels.

Wetland WA: Approximately six acres of functional jurisdictional palustrine broad-leaved deciduous scrub-shrub wetland (PSS1) were identified in the northern portion of the site. The entire Plum Creek Wetland Restoration site had been timbered approximately five years prior to the delineation effort and the vegetation of Wetland WA is typical of a wetland situated in an area which has been cleared or otherwise disturbed. Dominant plant species were hydrophytic species such as inkberry (*Ilex glabra*), loblolly pine (*Pinus taeda*), ti-ti (*Cyrilla racemiflora*), sweetbay (*Magnolia virginiana*), laurel leaf greenbrier (*Smilax laurifolia*), and bushy bluestem (*Andropogon glomeratus*). Swamp bay (*Persea palustris*), red maple (*Acer rubrum*), poison ivy (*Toxicodendron radicans*), and woolgrass (*Scirpus cyperinus*) were also present. The northern site boundary crosses Wetland WA such that approximately six acres of the wetland were contained within the site. Berger scientists estimate that an equal amount of the wetland lies outside the boundary to the north of the site.

Wetland WA spans three mapped soil units. The majority of the soil underlying this wetland is mapped as Torhunta Mucky Fine Sandy Loam (3.7 acres). Other soil units present are Leon Fine Sand (2 acres), and Pantego Mucky Loam (0.4 acres). These soils are listed by the USDA as hydric soils (USDA, 2006). Field data indicate that soils of wetland WA are hydric due to the presence of saturated conditions and a low chroma matrix (10YR 2/1) within the upper 12 inches of the soil profile. Some surface ponding was observed in low lying planting bed rows.

Jurisdictional Tributaries:

Two ditches drain the site, running west to east and roughly dividing the site into thirds. These ditches are approximately eight feet wide at the top of the excavated channel and five feet deep. Water was not often observed in these channels during field efforts; however an OHWM was identified at approximately six inches above bed elevation. The USACE determined these ditches were “jurisdictional tributaries”, but not stream channels.

5.2. Hydrological Characterization

5.2.1. Groundwater Modeling

Hydrologic analysis was conducted to aid in the design of the Plum Creek wetland site. Analysis consisted of performing groundwater level monitoring and performing a water budget simulation of the site.

5.2.1.1. Input Analysis for the Wetland Water Budget

A daily water budget for the proposed nonriverine wetland restoration area was developed following an application of the conservation of mass law:

$$\underbrace{\Delta S}_{\text{Change in Storage}} = \underbrace{(P + Q_R + R_{on})}_{\text{Inflow}} - \underbrace{(ET + Q_D + R_{off})}_{\text{Outflow}} \pm \underbrace{S_W}_{\text{Soil Water Effect}}$$

Where:

- | | | | |
|--------------------|-----------------------|-------------------|----------------------|
| ΔS = | Change in storage | P = | Precipitation |
| Q _R = | Groundwater recharge | R _{on} = | Surface water inflow |
| R _{off} = | Surface water outflow | ET = | Evapotranspiration |
| Q _D = | Groundwater discharge | S _W = | Soil water storage |

This approach is consistent with guidance suggested by Pierce (1992) and Garbisch (1994). Even though groundwater recharge and discharge may occur to and from the Plum Creek site, it was assumed that the groundwater inflow and outflow did not result in a change in water storage within the wetland. Based on this result, groundwater recharge and discharge was not considered in the daily water budget model. This assumption was adopted because no offsite groundwater data was available. As a result the conservation of mass equation for the water budget was simplified to:

$$\underbrace{\Delta S}_{\text{Change in Storage}} = \underbrace{(P + R_{on})}_{\text{Inflow}} - \underbrace{(ET + R_{off})}_{\text{Outflow}} \pm \underbrace{S_w}_{\text{Soil Water Effect}}$$

The fact that groundwater inflow and outflow were not included in the model will have little or no effect on the model results because as mentioned in section 5.3.3 of this report, the soil has very low hydraulic conductivity (10.04 in/month). Since groundwater flow is a function of hydraulic conductivity, groundwater inflow and outflow will therefore be low or negligible. A summary of input variables for the water budget and their sources are shown in Data Table 1.

Data Table 1: Input Variables for the Existing and Proposed Freshwater Water Budget Models	
Parameter	Source
Precipitation	NOAA rainfall gage data at Wilmington, NC International Airport (COOP ID # 319457). Daily data, 1976-2006 (30 years of data). Same values used for existing and proposed conditions.
Evapotranspiration (ET)	Reference or potential evapotranspiration (ET _o) data for the period 1976 to 2006 (30 years) was obtained from the NOAA climatological data gage at Wilmington, NC International Airport (COOP ID # 319457). And then converted to actual crop evapotranspiration (ET _c) using the relationship ET _c = K _c ET _o ; where K _c is the crop coefficient (FAO, 1997). Data available daily. February 2007 to August 2007 obtained via an average of the previous 10 years of data for those respective months. Seasonably variable crop coefficients from 0.50 to 1.05 were used for the existing and proposed condition respectively based on model calibration.
Soil Water Storage	Soil is composed of mostly mucky fine sandy loam and some fine sand and some mucky loam (USDA, 2007). Actual values for soil water holding capacity determined from model calibration.
Surface Water Inputs/Outputs	Inputs determined using TR-55 (equation 2.1) (USDA, 1986) for proposed conditions only.
Groundwater Inputs/Outputs	It was assumed that groundwater inflows equal the outflows.

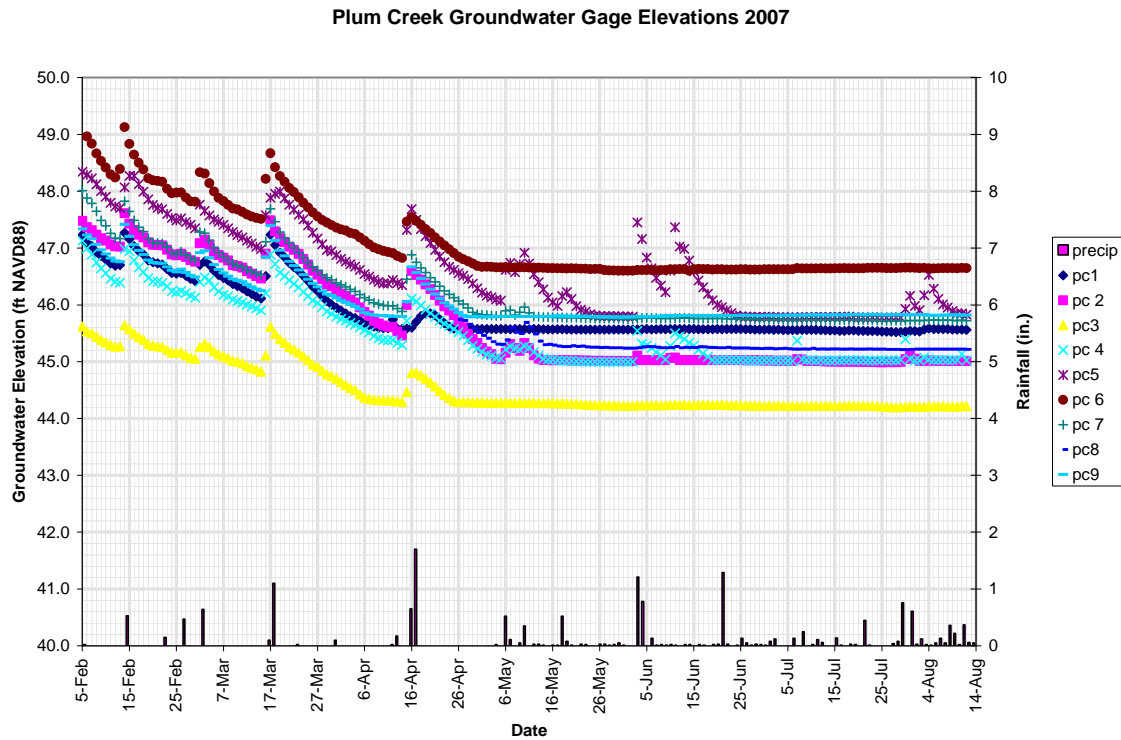
Surface inflows to the site were determined from the offsite drainage area. The offsite drainage area flowing to the site was found to be 22 acres via USGS quadrangle maps. The surface inflows to the site R_{on} from this offsite drainage area were determined using equation 2-1 from TR-55 USDA, 1986). Curve numbers were calculated and used to determine the potential maximum retention after runoff and the initial abstraction needed to satisfy equation 2-1. Once the depth of available run-on was determined from equation 2-1, it was assumed that the entire volume of water from offsite was distributed uniformly over the acreage of the study location, thereby providing the depth of run-on for the water budget.

Using the precipitation, evapotranspiration, soil water holding capacity, and the surface water run-on to the site, the daily change in water storage was determined for a given set of site parameters. Based on these changes in water storage, water level fluctuations/elevations at the site were determined. The elevations were calibrated to the measured groundwater elevations as discussed in Section 3.2.1.3.

5.2.1.2. Groundwater Monitoring

Nine groundwater monitoring gages were installed at the site. Their locations are shown in Figure 4. The groundwater elevations were measured using EcoTone waterlevel loggers recorded every eight hours (average of three readings for daily values) with an accuracy of +/- 3 mm. Groundwater data was monitored from February 5, 2007 to August 12, 2007. A plot of the groundwater elevations at the nine gages during the monitoring period is shown in Plot 1.

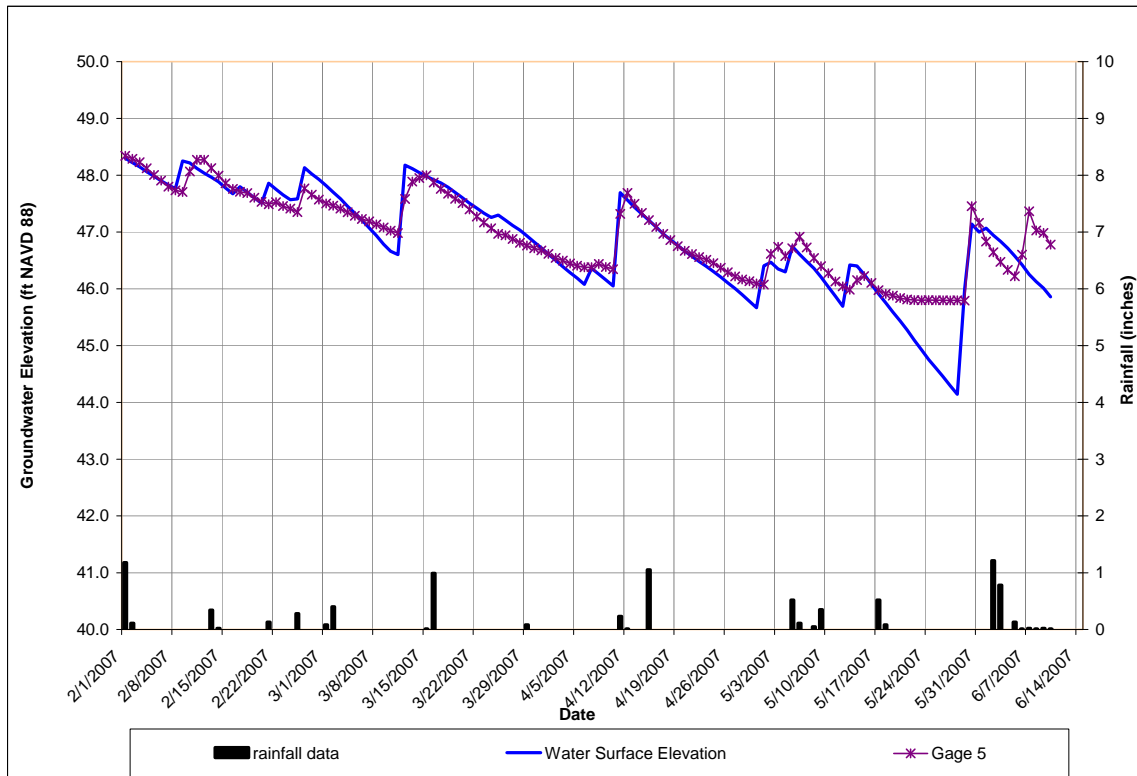
Plot 1: Plum Creek Groundwater Gage Elevations 2007



5.2.1.3. Calibrating Existing Conditions Groundwater Data

The existing condition groundwater data was calibrated using the water budget formula discussed in Section 3.2.1.2. Surface water run-on from the offsite drainage area was neglected because of existing ditches that intercept surface water flows before reaching the Plum Creek site. The parameters that were varied during the calibration were the crop coefficient and the water holding capacity. These parameters were varied until the root mean square errors between measured groundwater elevations and those predicted by the model were minimized. It was found that a variable crop coefficient of 1.05 to 0.50 (variable from February to August) and a water holding capacity of 0.055 were the parameter values that optimized the modeled elevations to the measured elevations. The water holding capacity falls within the range of empirical values of 0.00-0.15 for the type of soil at the site (USDA, 2007). A typical plot of modeled and measured data is shown in Plot 2. Plot 2 shows that gage 5, located in existing wetland, was the most responsive gage to precipitation events at the site.

Plot 2: Modeled and measured groundwater elevations at the location of monitoring gage 5



As shown in Plot 2 there is a time delay in response between the modeled and measured groundwater elevations. This may be caused by processes not considered in the model that occur over “fast” timescales such as net groundwater flow into the ditches and away from the site. It may be possible that during these storm events significant amounts of net surface outflow were occurring through the artificial ditch network at the site. It may also be possible that the soil water holding capacity was variable over the period of study, although it was assumed to have a constant value. These hypotheses may explain the relatively poor fit of the data in the summer months (June to August) as compared to good fit of the data in the late winter and spring months (February to May).

5.2.2. Surface Water Modeling at Restoration Site

The Plum Creek Wetland Restoration Project lacks any significant surface water component. Surface water run-on from the offsite drainage area is negligible because of existing ditches that intercept surface water flows before reaching the Plum Creek site. Therefore, no surface water modeling was completed.

5.2.3. Hydrologic Budget for Restoration Site

5.2.3.1. Proposed Groundwater Condition for an Average Year of Rainfall

Unlike the existing condition where the Plum Creek site is isolated with no offsite runoff, the proposed water budget includes offsite runoff to the site. The ditches that currently intercept flow under existing conditions will be plugged during the proposed conditions thereby allowing the offsite overland flow to add to the water budget of the site. The surface water contribution to the

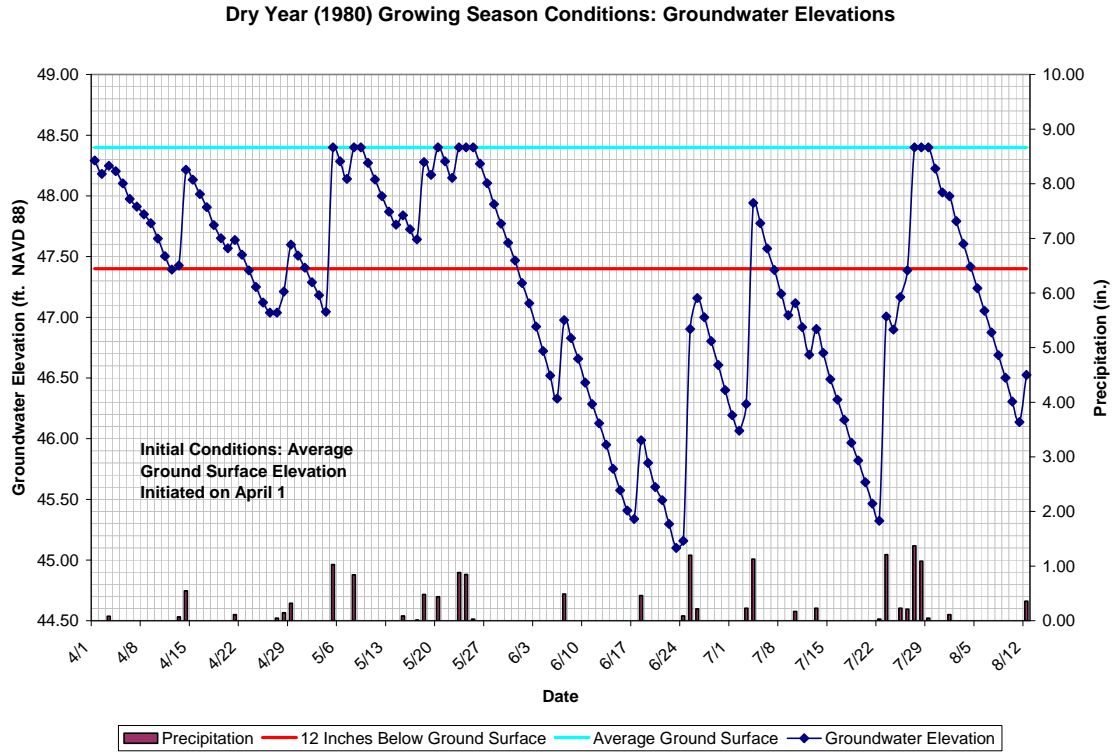
restored site was computed using the TR-55 method as described in Section 3.2.1.1. The initial condition water elevation for the proposed model could affect the overall number of events of inundation and saturation for the site. Therefore, three different initial conditions were modeled: initial water elevation set to the average ground surface elevation at the site and the simulation starting on April 1st (Scenario 1), initial water elevation set to the average measured elevation on February 5th and the simulation starting on February 5th (Scenario 2), and initial water elevation set to the lowest measured elevation from any of the nine groundwater gages and the simulation starting on February 5th (Scenario 3). These three scenarios simulate wet, average, and dry soil conditions respectively. All three scenarios produced identical results, therefore only Scenario 1 will be chosen to display the model results in the proceeding sections.

5.2.3.2. Proposed Condition Water Budget Results

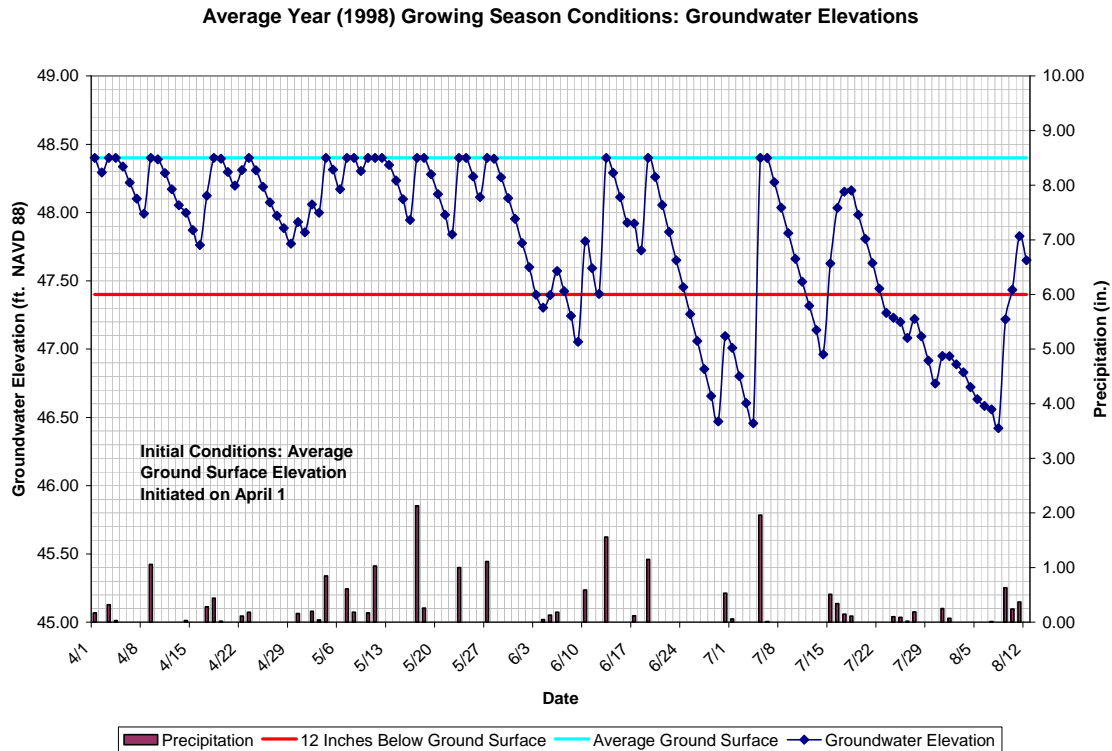
The results for the proposed condition groundwater elevations are displayed in Plots 3, 4, and 5 for a dry (1978), average (1998), and wet (1999) year respectively. Data is only shown for the period where the growing season (4/1 to 10/31) and the groundwater measurement period (2/5 to 8/12) overlap (i.e. 4/1 to 8/12). The horizontal lines show the average ground surface elevation (taken as an average of the surface elevations at each of the groundwater gages) and the depth 12 inches below the level of the average ground surface. The modeled results were used to determine the number of days of inundation and saturation within 12 inches of the ground surface that will result at the site for the dry, average, and wet precipitation years during the growing season. Data Table 2 summarizes these results along with the percent of the growing season that the wetland site will be inundated or saturated within 12 inches. The number of days of saturation and inundation are compared to the wetland criteria. The wetland criteria used for this project was hydrologic zone IV, seasonally inundated or saturated. The criterion is summarized as: Inundation and or soil saturation for greater than 12.5% -25% of the growing season in the upper 12 inches of the soil (Environmental Laboratory, 1987).

Therefore, it can be seen from Data Table 2 that the dry, average, and wet precipitation years all satisfy this criteria even under existing ground elevations.

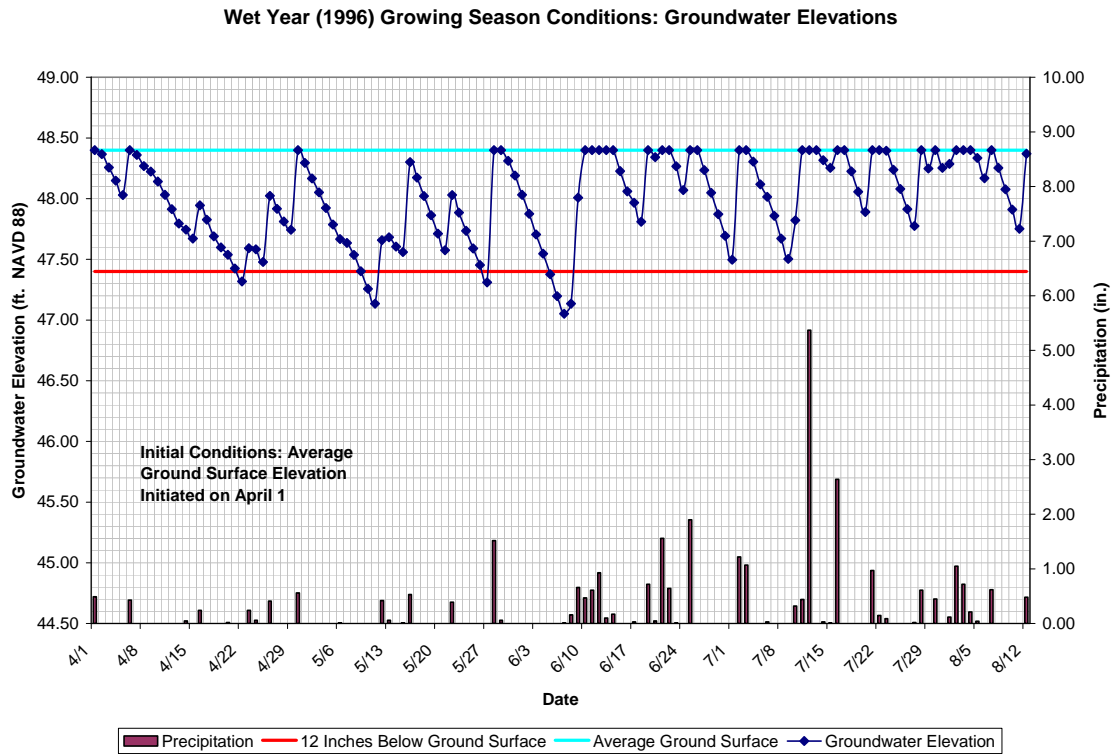
Plot 3: Proposed condition groundwater elevation for a dry year of precipitation (1980) during the growing season



Plot 4: Proposed condition groundwater elevation for an average year of precipitation (1998) during the growing season



Plot 5: Proposed condition groundwater elevation for a wet year of precipitation (1996) during the growing season



Data Table 2: Percentages of the modeled groundwater elevations that show inundation and or soil saturation within the upper 12 inches of the soil during the growing season for dry, average, and wet precipitation years

Event	% of Growing Season with Inundation or Saturation within upper 12" of soil	Greater than 12.5%-25% to meet wetland criteria?
Dry Year	34%	Yes
Average Year	53%	Yes
Wet Year	68%	Yes

Note: % includes only the days of inundation or saturation from 4/1 to 8/12

It can be seen from Data Table 2 and Plots 3, 4, and 5 that the choice of initial condition does not affect the behavior of the proposed groundwater at the site.

5.2.3.3. Conclusion

To restore wetland hydrology to the site, the existing ditches will be filled. It can be seen from Data Table 2 that the restored wetland will meet saturation and or inundation wetland criteria at existing ground elevations for dry, average, and wet precipitation years. Excavation of surface soils will not be required.

5.3. Soil Characterization

The soils data for Brunswick County, North Carolina (Figure 5) indicates that the project area contains four soil series/map units: Torhunta Mucky Fine Sandy Loam (77.8 acres), Pantego Mucky Loam (3.5 acres), and Leon Fine Sand (1.0 acres) (USDA, 2006). All areas that have soil characteristics falling within certain defined limits are classified together as a soil series. A soil series is a part of a soil's taxonomy that includes order, great group, subgroup, family, and series. Soil phases are used for subdividing series into specific units that are significant for practical use and management (i.e. surface texture, slope, degree of erosion, stoniness). A mapping unit is a grouping of soils by their natural landscape and soil patterns. Most soil mapping units shown on detailed soil maps are phases of soil series.

5.3.1. Taxonomic Classification

Of the four soil series identified on the USDA-SCS maps, all are classified as hydric by USDA-Natural Resources Conservation Service. By definition, a hydric soil is one that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, July 13, 1994). Therefore, hydric soils are typically found within wetlands. The soil mapping units shown within the project area are listed and described below. Soil descriptions are based on the text of the *Soil Survey of Brunswick County, North Carolina* (Barnhill *et al.*, 1986). Soil characteristics are presented in Table 5.

Torhunta mucky fine sandy loam (To): This soil mapping unit is nearly level, very poorly drained and situated in broad interstream areas or stream terraces. Typically the upper 11 inches is a black mucky fine sandy loam. Below that is a subsurface layer grayish brown fine sandy loam also 11 inches thick. The subsoil is a grayish brown fine sandy loam 28 inches thick. Below the subsoil extending to a depth of 80 inches is a light gray loamy sand. The soil ranges from acid to strongly acid throughout. Surface runoff is very slow and the soil has moderately rapid permeability. Available water capacity is moderate and the seepage rate is high. The seasonal high water table is 0.5 foot to 1.5 feet below the surface and water may pond during the wet season for brief periods. This soil is commonly associated with forest vegetation adapted to wet conditions.

Pantego mucky loam (Pn): This soil mapping unit consists of nearly level, very deep, very poorly drained soils located on broad interstream areas. Pantego soils formed in thick loamy marine sediments on the Southern Coastal Plain and Atlantic Coast Flatwoods. The surface layer is typically black mucky loam 11 inches thick. The subsurface layer is dark gray loam 4 inches thick. The subsoil is dark gray sandy clay loam 49 inches thick. The underlying material extends to a depth of 80 inches and consists of gray sandy clay loam.

Permeability and the available water capacity are moderate. Surface runoff is very slow and the seasonal high water table is at the surface. This soil is commonly associated with forest vegetation adapted to wet conditions.

Leon Fine Sand (Lo): This soil mapping unit consists of nearly level, very poorly drained soils located in broad, smooth interstream areas and in depressions in undulating areas. Typically the surface is dark gray fine sand six inches thick and the subsurface layer is light gray fine sand eight inches thick. The subsoil is black and dark reddish brown fine sand nine inches thick.

Below the subsoil, extending to a depth of 80 inches is light gray fine sand in the upper part, black and brown fine sand in the middle part, and black fine sand in the lower part.

The soil is extremely acid to strongly acid throughout. Surface runoff is very slow and the soil has rapid permeability. Available water capacity is low. The seasonal high water table is at or near the surface. This soil is commonly associated with forest vegetation adapted to wet conditions and a hardpan that limits root growth.

Rains Fine Sandy Loam (Ra): This nearly level, poorly drained soil is on broad, smooth interstream areas and in depressions on slightly convex divides throughout the county.

5.3.2. Profile Description

Six hand augered soil borings were advanced using a 4-inch diameter bucket auger to a depth of 4 feet on July 24, 2007. All six soil borings were located near existing groundwater wells 1, 3, 6, 7, 8, and 9. Figure 3 depicts the approximate location of the wells (and thereby the soil borings).

The soil characteristics of texture, color, and structure were used to determine the presence or absence of groundwater and estimate the soil water properties in the unsaturated zone. Soil texture was estimated in the field using the U.S. Department of Agriculture (USDA) classification system. Other characteristics such as redoximorphic features, consistence, and structure were also noted. Color was described using Munsell color charts (USDA, 2000). Groundwater level, when encountered, was also recorded. Soil color can be an indicator of the relative degree of soil saturation; in certain mineral soils, the presence of iron oxidation and reduction can be detected visually. A well-developed soil structure can improve water flow by providing macropores and consequent gravitational flow. To decide whether the soil, then, is saturated due to regional groundwater, a perched zone of saturation, or other reasons, is part of the soil science approach to the soil profile interpretation.

A total of six soil borings were located within the Torhunta mucky fine sandy loam soil mapping unit (To). Soil textures in the representative profile were consistent with the description in the soil survey and the above section. The color, texture, and structure of the surface layers within the observed soil profiles (hand augered borings) were, in general, consistent with this mapping as Torhunta soils. The surface layer consisted of dark brown to very dark brown sandy loam approximately one to 12 inches thick. The texture of the substratum layers ranged from loamy sand to sandy loam, and was darker in color than the representative profile.

5.3.3. Hydraulic Conductivity

In order to determine the groundwater flow component to and from a wetland, an estimate of the hydraulic conductivity (K) of the soil, or its ability to transmit water is required. The hydraulic conductivity of the Plum Creek site was determined by the Falling-Head Test using the increasing tailwater pressure method (Method C). Three tests were conducted with an average hydraulic conductivity value of 9.84×10^{-6} cm/sec or 10.04 in/month. According to USDA soil permeability classification (Barnhill *et al.*, 1986); this hydraulic conductivity value corresponds to slow movement of groundwater. This slow movement of water means the Plum Creek site soil has a high water holding capacity. The stored water is available for use by plants.

5.3.4. Organic Matter Content

The organic matter content was tested from three of the six boring sites (near wells 1, 3, and 7). The organic matter content was found to be 5%, 5.6%, and 7.2% within the three samples. Additionally, these values were found to correspond to estimated nitrogen releases of 118 lbs/ac, 124 lbs/ac, and 150 lbs/ac which would be considered high, high, and very high values, respectively.

5.3.5. Bulk Density

This section is optional and was not deemed relevant for this project.

5.4. Plant Community Characterization

The Plum Creek Wetland Restoration site occupies a historic Pond Pine Woodland community that has been modified to support silvicultural rotations of cultivated loblolly pine (*Pinus taeda*). Species present included loblolly pine, red maple (*Acer rubrum*), gallberry (*Ilex coriacea*), inkberry (*Ilex glabra*), ti-ti (*Cyrilla racemiflora*), swamp redbay (*Persea palustris*), fetterbush (*Lyonia lucida*) and winged sumac (*Rhus copallinum*). The tree canopy was dominated by loblolly pine and averaged 13 feet in height. Infrequent bald cypress (*Taxodium distichum*) stems were observed across the site. This species composition was dominant throughout the site.

6. Reference Wetlands

Reference Wetland Site Search

Berger conducted a preliminary reference wetland site search by locating areas within the Carolina Flatwoods subregion of the Middle Atlantic Coastal Plain ecoregion which exhibit similar drainage areas, soil types, watershed characteristics, and landscape position as the project site. The targeted reference watershed included unmanaged forested wetlands in a flat drainage divide setting with little drainage area, preferably over Torhunta soils. One large site was identified within the Green Swamp Nature Preserve. The targeted reference landscape was forested wetland coastal flats dominated by longleaf pine (*Pinus palustris*) and pocosin communities that had not been altered for silviculture.

Selected Reference Wetland

The selected reference site is located approximately four miles northwest of the restoration site and within the Green Swamp Nature Preserve (Figure 6). This site is situated to the east side of US Highway 211 approximately 4.5 miles north of the intersection with US Highway 17. Berger scientists selected this site because it met the stated criteria, falling within a unit of Torhunta soil and an undisturbed forested community. The site did not exhibit evidence of past hydrologic or other landform alteration.

6.1. Hydrological Characterization

The Green Swamp Nature Preserve spans four of the 14-digit HUCs in the lower Lumber River Basin. The reference wetland community is found in the western portion of this watershed. This portion of the watershed is predominantly comprised of forested landuses with no impervious area apart from the roadways. This wetland was chosen over others because it contains the same

soil type as the project, is situated in a mature forest area, and the site was not in close enough proximity to a roadway to be affected hydrologically. A map of the reference well is located in Figure 9.

6.1.1. Gage Data Summary

Data obtained from the groundwater monitoring gage installed at the reference site reflects drought conditions and readings have ranged from near zero inches to as deep as three feet below the ground surface.

6.2. Soil Characterization

The soil within the reference wetland is mapped as Torhunta mucky fine sandy loam soil. Soil textures are consistent with the description in the soil survey and the above section (3.3.1). The color, texture, and structure of the surface layers within the observed soil profiles (hand augered borings dug prior to the installation of the reference well) were, in general, consistent with this mapping as Torhunta soils. The surface layer consisted of dark brown to very dark brown sandy loam approximately one to 12 inches thick. The texture of the substratum layers ranged from loamy sand to sandy loam, and was darker in color than the representative profile. The depth to free water with the reference wetland was consistently within the first 12 inches. A map of the reference site soils are provided in Figure 8.

6.3. Plant Community Characterization

6.3.1. Community Descriptions – (All Strata)

The identified reference site was located within a Pond Pine Woodland community adjacent to Mesic Pine Flatwood communities with open canopies of longleaf pine (Figure 10). The upper canopy of the reference wetland was approximately 40% closed and dominated by pond pine (*Pinus serotina*) with red maple (*Acer rubrum*) and loblolly bay (*Gordonia lasianthus*) also present though in lesser quantities. The shrub stratum was dominated by gallberry. Ti-ti, inkberry, sweet bay (*Magnolia virginiana*), coastal sweet pepperbush (*Clethra alnifolia*), and honeycup (*Zenobia pulverulenta*) were present and numerous in the shrub layer as well. Herbaceous coverage was patchily distributed and dominated by ferns including sensitive fern (*Onoclea sensibilis*), netted chain fern (*Woodwardia areolata*), and cinnamon fern (*Osmunda cinnamomea*). Laurel leaf greenbrier (*Smilax laurifolia*) and Carolina yellow jessamine (*Gelsemium sempervirens*) were also present, though not in great density.

6.3.2. Basal Area

The estimated basal area value of the reference wetland was determined with a Biltmore stick in four sample plots (Table 6). The four plots in the reference area were spaced approximately 70 feet apart on two transects running north to south centered on the reference well location.

7. Project Site Restoration Plan

7.1. Restoration Project Goals and Objectives

Wetlands provide many benefits and are a natural solution for improving water quality. One important function wetlands provide within the greater watershed is connecting area hydrologic flows by moderating groundwater, surface water, and floodwater flows.

Goals: The goals of the proposed Plum Creek Wetland Restoration project include the reestablishment of the following wetland functions: floodwater storage, groundwater recharge, organic matter decomposition, and suitable wildlife and aquatic habitats.

Restoring this 80 acre wetland will immediately benefit the wildlife of the region by expanding wetland habitats utilized by a variety of species including larger keystone species that require large corridors such as black bear (*Ursus americanus*). Managed by the Nature Conservancy, the Green Swamp Nature Preserve is located just 0.5 miles to the north of the site. The Plum Creek Wetland Restoration Site will connect and expand ranges within the area. Habitat benefits will be achieved for both terrestrial and aquatic species by increasing microhabitat diversity and vegetation diversity. Similarly, the restored habitat may improve conditions for some threatened and endangered species within Brunswick County such as the wood stork, rough-leaved loosestrife, and Cooley's meadowrue.

Objectives: The original wetland was ditched, drained, and bedded to support loblolly pine production. The site is bordered by drainage ditches, and two ditches cross the width of the tract. Berger proposes to restore 80 of the 89 acres within the project site; to achieve the wetland restoration goals, Berger proposes to complete the following activities:

- Both of the interior ditches and will be plugged as will portions of the southern perimeter ditch. (The eastern and western ditch around the perimeter will remain intact to prevent hydrologic trespass on adjoining properties.)
- Minor regrading of the site will be performed to obtain fill material for the ditch plugs and to facilitate the creation of vernal pools.
- Diffuse surface flow will enter the site from adjoining parcels and much of the water budget will be influenced by precipitation.

7.1.1. Designed Wetland Type

The Plum Creek Wetland Restoration project will ultimately result in the restoration of a Pond Pine Woodland community. The restoration approach that will be utilized to restore this wetland includes the following four steps: 1) plugging ditches that cross the interior of the site; 2) preparing the land by drum chopping to remove loblolly pines; 3) regrading nonwetland portions of the site with a bedding harrow to remove linear planting beds; and 4) re-planting to restore native tree and shrub wetland vegetation.

7.1.2. Target Wetland Communities

Historically, this area would have supported a Pond Pine Woodland community. These communities historically occurred on outer parts of domed peatlands on poorly drained interstream flats or shallow swales (Schafale and Weakley, 1990). The vegetation currently present on site, the topography of the site and the Torhunta soil type further supports the proposed community type of Pond Pine Woodland. Within the Pond Pine Woodland will be several vernal pools. Proposed species are listed with planting plan, shown in Section 12.

7.2. Sediment Transport Analysis

There is no sediment transport portion of this project (no stream channel).

7.3. Hydrologic and Hydraulic Analysis

7.3.1. No Rise, LOMR, or CLOMR

When a proposed project will change the existing floodway and 100-year flood elevations, an application must be submitted to FEMA containing the modeling results from the proposed project and the proposed map revisions. If approved, FEMA will issue a conditional letter of map revision (CLOMR) for a new hydraulic model based on new cross sections, to be developed. The new maps and modeling results generated from the as-built information are then submitted to FEMA. Once these are approved by FEMA, a “letter of map revision” (LOMR) is issued. If the stream elevation, in a FEMA studied stream, will not be increased, instead of CLOMR and LOMR, the project will require a No-rise certification.

There are no FEMA studied streams on the project site, nor is there any stream work to be completed on the project site; therefore, there should be no FEMA coordination needed for this project.

7.3.2. Hydrologic Trespass

Evaluation of the potential for offsite hydrologic impact (hydrologic trespass) was carried out by analyzing the ditch network surrounding the site which will remain intact. Results of the water budget model indicate that surface water discharge from the site will be minimal even for an extreme wet year avoiding hydrologic trespass conflicts.

7.4. Stormwater Best Management Practices

There are no structures or impervious areas located within the project site. The entire project site is currently a pine plantation. Under the proposed conditions, all stormwater not captured by the relic, plugged ditches, will migrate across the project site in the form of overland flow, or as channelized flow into the ditch network encircling the site. The addition of wetland vegetation to the already flat landscape will extend travel time and provide treatment to stormwater before it enters the surrounding ditches. The existing ditches onsite will be plugged, but the borrow pits created during the ditch plugging process will remain as permanent pools and will provide additional storage for stormwater as well as groundwater.

7.4.1. Narrative of Site-Specific Stormwater Concerns

Since project site topography is nearly flat and the majority of the project site is, and shall remain, vegetated through the construction process, general stormwater and erosion control concerns are minor. Immediately following grading, the site will be seeded with the specified seed mix shown in the planting plans. Silt fence will be installed around the perimeter of all wetland areas within the Limit of Disturbance (LOD), as shown on the plan sheets (Section 12.0), so that sheet flow and sediment will not enter the wetland systems. Descriptions of specific devices used to control stormwater and prevent erosion are specified in the next sub-section.

7.4.2. Device Description and Application

Construction Entrance - A 16 foot X 100 foot tracking pad consisting of rip-rap will be installed from the road on the south of the property bridging the shallowest portion of the southern ditch. The tracking pad is designed to stabilize the construction entrance to the project site from heavy equipment traffic and control the movement of sediment and other materials onto the project site.

Ditch Plugs - These structures will be created using on-site material. These structures will fill the existing ditches to redirect the concentration of surface flows into the surrounding wetland area. The borrow areas will create several permanent shallow pools.

Silt Fence - The limit of disturbance shall be bordered by silt fence. No construction activity will occur outside of the limits of any silt fence installed onsite. Additionally, no grading will occur specifically within the existing wetland (to be enhanced). The existing wetland area will be bordered by silt fence and planting will occur in this area.

Seeding - Any cleared, grubbed, or any other disturbed surfaces will be seeded with specified seed mix as construction is completed. The seed mix was selected to use both cool and warm season native grasses in order to establish vegetative cover quickly without adverse effects of succession.

7.5. Hydrologic Modifications

7.5.1. Narrative of Modifications

Since the site has been previously drained by ditching for its use as a pine plantation, the ditches will be plugged in order to return the pre-disturbance hydrology to the site. Additionally, some small pools may be incorporated into the site to provide diversity of habitat and serve as semi-permanent water storage. The size and frequency of these pools will be determined by the need for material onsite to fill drainage ditches once construction begins.

7.5.2. Scaled Schematic of Modifications

Since the final quantities are to be determined onsite with the contractor and design engineer's representative, only a preliminary approximation of modifications have been established at this time. The proposed design plans are provided in Section 12.

7.6. Soil Restoration

7.6.1. Narrative, Soil Preparation, and Amendment

The onsite soil tests showed a high to very high nitrogen component within the soil. Several other nutrients were found in lesser quantities. The construction contractor will be instructed to save the topsoil for reuse in the areas where earthwork will occur. Soil will be scarified in any areas that might be subject to compaction due to construction activities.

The antecedent vegetation conditions, the nutrient findings, and the fact that planting will occur in selected areas around the healthy vegetation as opposed to every inch of the site, will lead to very minimal soil preparation or amendment.

7.7. Natural Plant Community Restoration

The vegetative community currently occupying the project site is a loblolly pine vegetative community that has been significantly disturbed by silvicultural activities. The entire site is currently planted in loblolly pine. Six acres currently meet the three parameters to be considered a jurisdictional wetland. The remaining area exhibits two vegetative strata. Cultivated loblolly pine approximately 13 feet in height and a shrub layer dominated by inkberry. A detailed description of the plant community within the wetland area is provided in sub-section 5.1.

The existing conditions onsite are such that there are currently several thousand woody stems per acre, only a few tens of which are loblolly pine. The pines are to be mechanically removed and their biomass is to remain onsite. The remaining vegetation is almost entirely composed of desirable native species and as much of it as possible will be kept. The planting of pond pine and several other tree and shrub species will be used to augment the remaining shrub community.

7.7.1. Narrative & Plant Community Restoration

Tree and shrub species will be established primarily through the planting of bareroot seedlings of hardwood trees and plugs of evergreen species native to the area, at a density of 404 trees per acre. The establishment of species will follow the Wetlands Engineering Handbook (Hayes *et al.*, 2000). The successional trajectory of the wetland community planting will be similar to, and contiguous with, the existing surrounding forest communities, attaining a minimum density of 320 woody stems per acre at monitoring year 3, and 260 woody stems per acre at maturity (monitoring year 5).

Over the course of the first year, planted vegetation will receive a visual examination to evaluate the degree of overtopping of the seedlings by herbaceous plants. Problem areas identified during the first growing season will be communicated with EEP. Quantitative vegetation sampling of the vegetation will be performed in accordance with EEP CVS Protocol for Levels I-II (Lee *et al.*, 2008). Monitoring of stem height, stem width, position in plot and species diversity will take place each year for a minimum of five years.

7.7.2. Onsite Invasive Species Management

The Plum Creek Wetland Restoration project was surveyed for invasive species during multiple site visits in 2007, and none were identified. Should Berger scientists observe populations of invasive species during the course of restoration efforts, species specific control measures and techniques will be enacted that may include both mechanical and chemical treatments. Herbicides utilized will be EPA certified for use in aquatic systems.

If necessary to manage invasive species, Berger staff experienced in invasive species control will oversee all efforts to eradicate target species while minimizing non-target impacts. Also, only properly licensed pesticide applicators will be employed to ensure proper handling, storage, and application methods are followed for all herbicides.

8. Performance Criteria

8.1. Streams

The project site does not receive stormwater runoff from impervious surfaces or other concentrated sources that require specific stormwater management devices.

8.2. Stormwater Management Devices

The project site does not receive stormwater runoff from impervious surfaces or other concentrated sources that require specific stormwater management devices.

8.3. Wetlands

The hydrology and vegetation of the Plum Creek Wetland Restoration site will be monitored to assess stability of the restored wetland. A detailed discussion of the monitoring effort and performance criteria are described in the following sections. Berger will follow EEP's guidelines for monitoring protocol and reporting, as detailed in the document *Content, Format and Data Requirements for EEP Monitoring Reports* (Version 1.2 – 11/16/06), or the most recent version available post-construction (EEP, 2006).

8.3.1. Hydrology

Groundwater level monitoring gages will be established throughout the site. Generally these wells will be placed on intervals such that the data collected will provide an accurate indication of groundwater levels over the entire site. The target mean groundwater level will be within the upper 12 inches of the soil profile for, at minimum, 8% to 12.5% of the growing season.

8.3.2. Vegetation Plots

The location and quantity of vegetation sampling plots will be established with guidance from EEP. Generally, permanent sampling plots will be installed in a randomized pattern throughout the site following construction and planting. Vegetation data will be collected in accordance with the methods described in the EEP CVS protocol (Lee *et al.*, 2008).

Survival criteria of planted woody stems will be 320 stems per acre in Year 3, 288 stems per acre in Year 4, and 260 stems per acre at the completion of the project monitoring period at Year 5.

8.3.3. Photo Points

Berger will document project site conditions by installing photo stations as well as taking photos of any identified problem areas.

Fixed Station Photos: Berger will establish photo stations immediately following construction of and planting.

Numbered Issue Photos: Berger will take representative photographs of problem areas identified during annual monitoring. The location where the photo was taken will be revisited each year

until the monitoring period is over or the stream has become stable (either naturally or through repairs).

8.3.4. Problem Areas

Berger will document identified problem areas in the annual monitoring report by means of photographs and plan sheets that illustrate the problem areas. The monitoring report will address which types of actions, if any, are needed and the schedule for their completion.

8.4. Vegetation

Vegetation success criteria were discussed as a subcategory of the wetland success criteria in section 8.3.2.

8.5. Schedule / Reporting

Construction is scheduled to be completed by late summer 2008 followed by planting in fall of 2008, after which the initial monitoring report, Year 0, will be published. The monitoring period will extend 5 years beyond completion of construction and a report will be produced after each subsequent year of monitoring (Year-1 {2009} through Year-5 {2013}). Berger will develop the monitoring reports following EEP's guidelines, as detailed in the document *Content, Format and Data Requirements for EEP Monitoring Reports* (Version 1.2 - 11/16/06) or the most recent version available post-construction (EEP, 2006).

Each annual monitoring report will have three main sections: the project background section, the methodology section, and the project condition / monitoring results section.

The Project Background Section: The project background section will contain information about the project's location, setting, history, background, and objectives. Additionally, it will include a monitoring plan view.

The Methodology Section: The methodology section will detail the methodology (recommended by EEP) used. Additionally, this section will address any modifications made to the methodology and or any new methods introduced.

Project Condition and Monitoring Results: This section will be divided into two subsections: vegetative assessment, and wetland assessment.

- Vegetation Assessment: This subsection will include a Vegetation Problem Area Table and a Wetland Problem Areas Plan View.

Problem areas will be defined as either lacking vegetation or containing exotic vegetation. All problems areas identified within the project boundary up to the final inspection date must be listed along with appropriate location information and a brief statement regarding probable cause. At least one representative photo will be provided for each category and arranged sequentially in the appropriate appendix. This subsection will include soil data, vegetative problem areas, and stem count data.

A vegetative problem area plan view exhibit and photos from the vegetation plots will also be referenced in this subsection and found in the appropriate appendix of the report.

The purpose of this figure is to provide an overview of all the vegetative problem areas with regard to the scale and layout of the entire project. This figure will provide a plan view, with patterns representing vegetation conditions of concern and a color code for degree of concern.

- Wetland Assessment: This subsection will include a Wetland Criteria Attainment Table and a Wetland Problem Areas Plan View.

The Wetland Criteria Attainment Table is designed to provide a performance summary for wetland projects. This large wetland project with many wells and plots will provide tract means in lieu of individual performance. For example, if Tract X has seven wells within its boundaries and six have met the hydrological threshold, there will be 86% attainment.

This subsection will include a Wetland Problem Areas Plan View. This figure will be provided as a plan view in the appropriate appendix. Wells will be identified and grouped by color code designed to convey the degree of attainment for hydrologic criteria.

The plan view will include, but not be limited to the following items:

1. Vegetation plots,
2. Labeled photo stations,
3. Topographic layer, and
4. Soils layer.

9. REFERENCES

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- USFWS, 2007. U.S. Fish And Wildlife Service Division of Endangered Species. Cooley's meadowrue (*Thalictrum cooleyi*). Available URL:
<http://www.fws.gov/southeast/es/county%20lists.htm> (Accessed May 7, 2007)

10. TABLES

Table 1: Project Restoration Structure and Objectives Project Number D06040-A (Plum Creek Wetland Restoration)						
Restoration Segment / Reach ID	Station Range	Restoration Type	Priority Approach	Existing Linear Footage or Acreage	Designed Linear Footage or Acreage	Comment
Non-riverine Wetland Area	Not applicable	Restoration	Not Applicable	89 acres	80 acres	8 acres already in wetlands, drainage ditches and uplands

Table 2: Drainage Areas Project Number D06040-A (Plum Creek Wetland Restoration)	
Reach	Drainage Area
Entire site	110 acres (0.17 square miles)
Total	110 acres (0.17 square miles)

Table 3: Land Use of Watershed Project Number D06040-A (Plum Creek Wetland Restoration)		
Land Use	Acreage	Percentage
Loblolly Pine Plantation	89	100%

Table 4: Federally-listed Threatened and Endangered Species in Brunswick County, NC Project Number D06040-A (Plum Creek Wetland Restoration)						
Species	Common Name	Federal Status/NC Status*	Species Record In Brunswick County	Species Record in Bolivia Quadrangle	Suitable Habitat Present Onsite	Effect
<i>Alligator mississippiensis</i>	American alligator	T(SA)/T	Current	Current	No	No Effect
<i>Haliaeetus leucocephalus</i>	Bald eagle	T/T	Current	Current	No	No Effect
<i>Puma concolor couguar</i>	Eastern puma	E/E	Historical	None	No	No Effect
<i>Chelonia mydas</i> (incl. <i>agassizi</i>)	Green sea turtle	T/T	Current	None	No	No effect
<i>Lepidochelys kempii</i>	Atlantic ridley sea turtle	E/E	Current	None	No	No effect
<i>Dermochelys coriacea</i>	Leatherback sea turtle	E/E	Current	None	No	No effect
<i>Caretta caretta</i>	Loggerhead sea turtle	T/T	Current	None	No	No effect
<i>Charadrius melodus</i>	Piping plover	T/T	Current	None	No	No effect
<i>Picoides borealis</i>	Red-cockaded woodpecker	E/E	Current	Current	No	No effect
<i>Acipenser brevirostrum</i>	Shortnose sturgeon	E/E	Current	None	No	No effect
<i>Trichechus manatus</i>	West Indian manatee	E/E	Current	None	No	No effect
<i>Mycteria americana</i>	Wood stork	E/E	Current	None	No	No effect
<i>Thalictrum cooleyi</i>	Cooley's meadowrue	E/E	Current	None	Yes	May affect, not likely to effect
<i>Lysimachia asperulaefolia</i>	Rough leafed loosestrife	E/E	Current	None	Yes	May affect, not likely to effect
<i>Amaranthus pumilus</i>	Sea beach amaranth	T/T	Current	None	No	No effect

* T= Threatened, E = Endangered, T(SA) = Threatened (Similarity of Appearance)

Map Unit Symbol	Soil Name	Percent Slope	Drainage Characteristics	Hydrologic Group	Depth to SHWT (ft)	Hydric Soil	Restrictive Layer
To	Torhunta mucky fine sandy loam	0.5 to 1.5	Very poorly drained	C	0 to 0.5	Yes	None
Pn	Pantego mucky loam	0 to 2	Very poorly drained	D	0 to 1.5	Yes	None
Lo	Leon fine sand	0 to 2	Very poorly drained	D	0 to 1.0	Yes	None
Ra	Rains fine sandy loam	0 to 2	Poorly drained	D	0 to 1.0	Yes	None

Note: SHWT= Seasonal High Water Table.
If a soil is assigned to a dual hydrologic group (A/D), the first letter is for drained areas and the second is for undrained areas.

Source: "Soil Survey of Brunswick County, North Carolina" USDA-SCS-2004.

Plot Number	Basal Area per acre (square feet)
1	60
2	70
3	60
4	50
Mean stand basal area	60

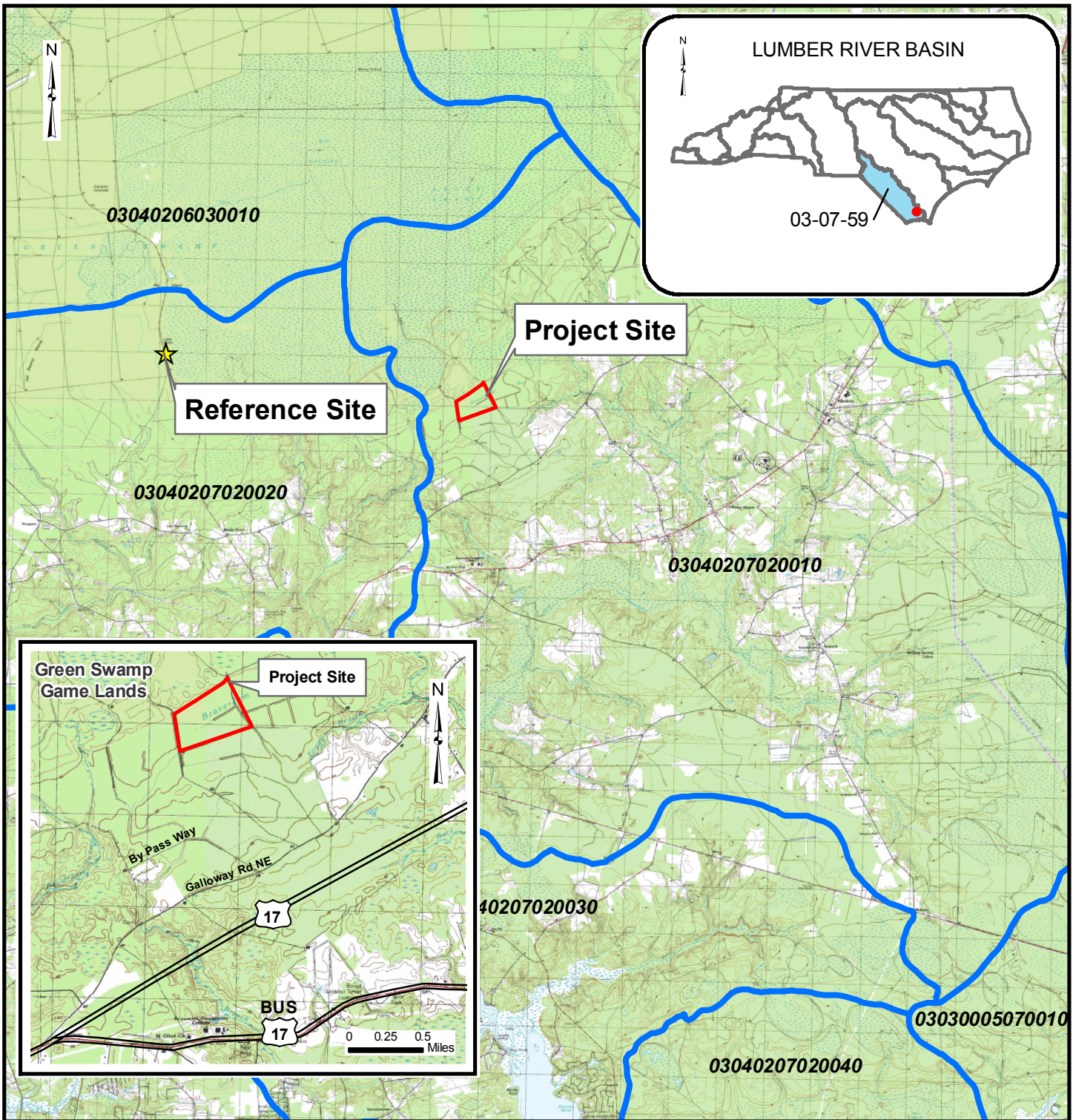
Table 7A: Vegetative Communities								
Project Number D06040-A (Plum Creek Stream Restoration)								
Plant Community	Species	Common Name	Root	Caliper & Height	Spacing (O.C.)	Quantity Per Acre	Acreage	Total
Planting Zone 1 Pond Pine Woodland Community	Pinus serotina	Pond Pine	B.R./ tubling	min. 1/4 in. root collar 1.0 to 2.0 ft. high	16	177	82	14,500
	Gordonia lasianthus	Loblolly Bay	B.R./ tubling	min. 1/4 in. root collar 1.0 to 2.0 ft. high	19	122	82	10,006
	Magnolia virginiana	Sweetbay Magnolia	B.R./ tubling	min. 1/4 in. root collar 1.0 to 2.0 ft. high	24	74	82	6,100
	Chamaecyparis thyoides	Atlantic White Cedar	B.R./ tubling	min. 1/4 in. root collar 1.0 to 2.0 ft. high	38	30	82	2,500
Total						404	82	33,106

Table 7B: Vegetative Communities								
Project Number D06040-A (Plum Creek Stream Restoration)								
Plant Community	Species	Common Name	Root	Caliper & Height	Spacing (O.C.)	Quantity Per Acre	Acreage	Total
Planting Zone 2 Nonriverine Wet Hardwood Forest Community	Gordonia lasianthus	Loblolly Bay	B.R./tubling	min. 1/4 in. root collar 1.0 to 2.0 ft. high	19	122	2	244
	Quercus laurifolia	Laurel Oak	B.R./tubling	min. 1/4 in. root collar 1.0 to 2.0 ft. high	11	350	2	700
	Quercus michauxii	Swamp Chestnut Oak	B.R./tubling	min. 1/4 in. root collar 1.0 to 2.0 ft. high	11	350	2	700
	Liriodendron tulipifera	Yellow Poplar	B.R./tubling	min. 1/4 in. root collar 1.0 to 2.0 ft. high	11	350	2	700
Total						1172	2	2,344

Table 7C: Vegetative Communities								
Project Number D06040-A (Plum Creek Stream Restoration)								
Plant Community	Species	Common Name	Root	Caliper & Height	Spacing (O.C.)	Quantity Per Acre (lbs)	Acreage	Total
Planting Zone 3 Vernal Pool Community	Agrostis alba	Red Top	NA	NA	NA	2	4	8
	Lolium multiflorum	Annual Rye	NA	NA	NA	11	4	44
	Panicum virgatum	Switchgrass (panicum)	NA	NA	NA	2	4	8
Total						15	4	60

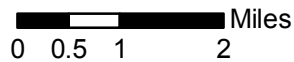
11. FIGURES

Figure 1: Project Site Vicinity Map



Legend

- Site Boundary
- HUC 14 Boundary



SOURCE:
Base Mapping - USGS Topographic Map.



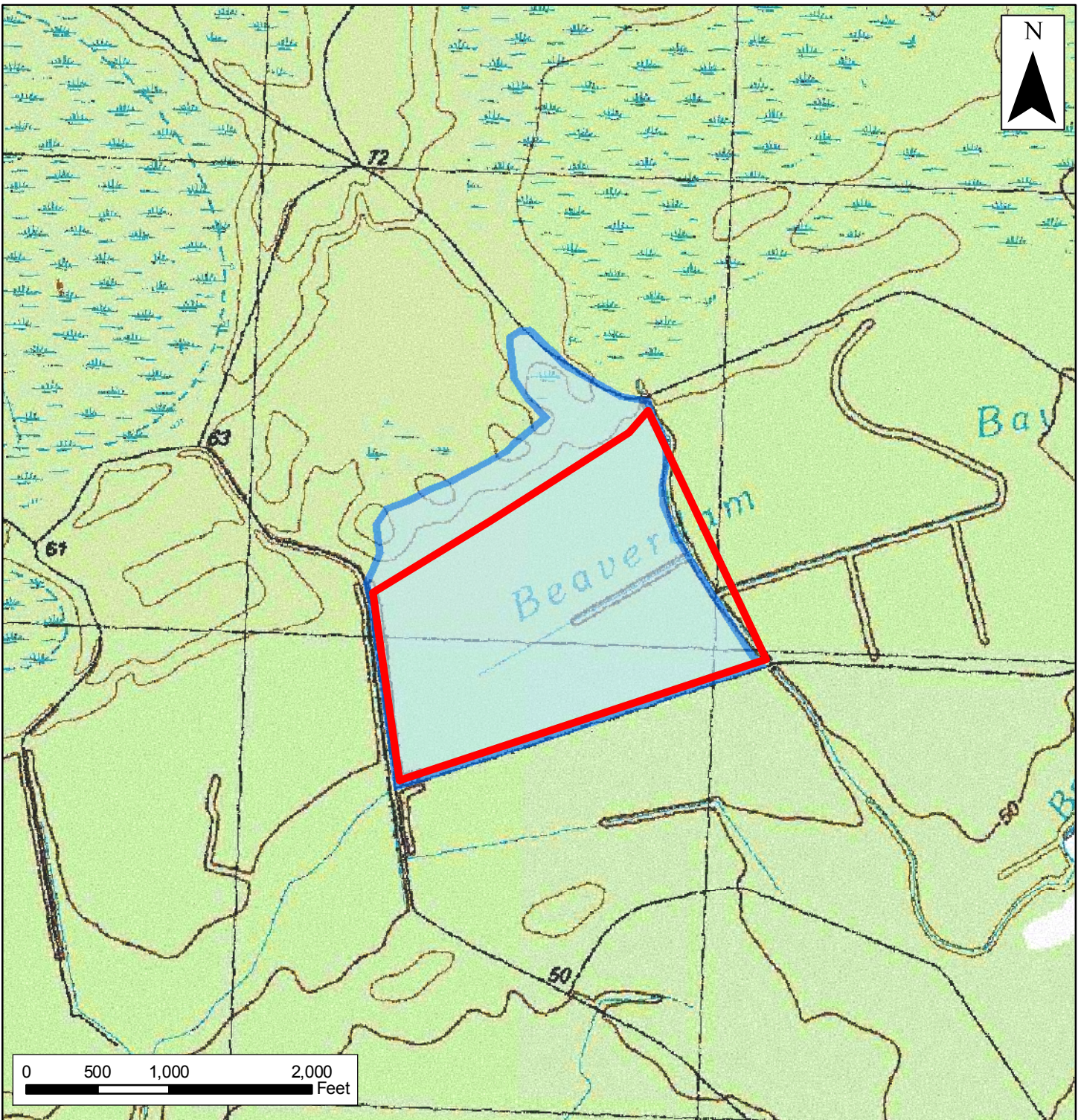
	<p>N.C. Ecosystem Enhancement Program</p>
<p>Plum Creek Site EEP Project # D06040</p>	
<p>Project Site Vicinity Map</p>	
	<p>THE LOUIS BERGER GROUP 1001 Wade Avenue, Suite 400 Raleigh, NC 27605</p>
<p>FIGURE 1 Jan. 2008</p>	

Figure 2: Project Site Watershed Map



Legend

- Site Boundary
- Drainage Area

SOURCE:
Base Mapping - 7.5 Minute USGS Topographic Map.



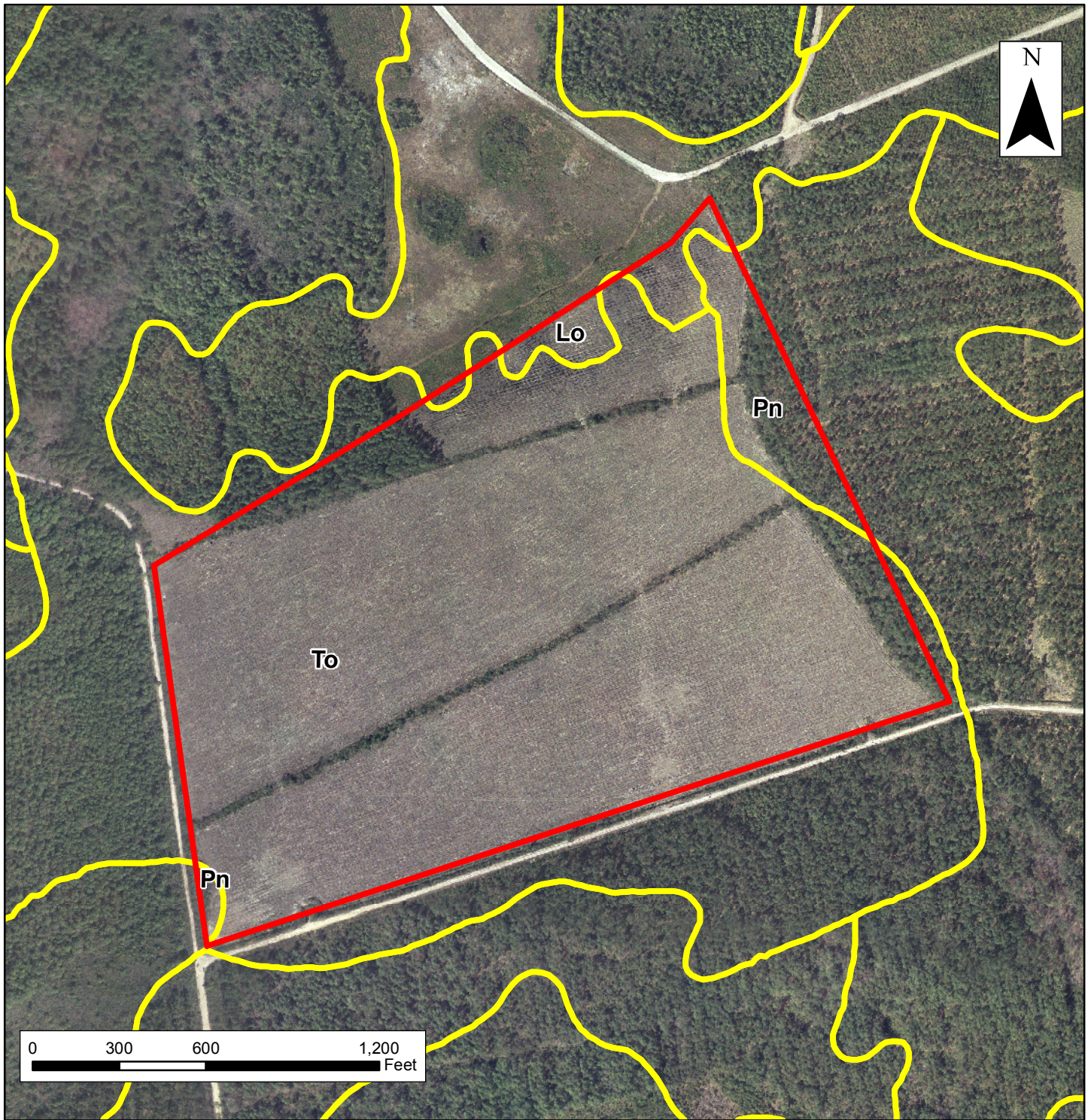


	<p>N.C. Ecosystem Enhancement Program</p>
<p>Plum Creek Site <i>EEP Project # D06040</i></p>	
<p>Project Site Watershed Map</p>	
	<p>THE LOUIS BERGER GROUP 1001 Wade Avenue, Suite 400 Raleigh, NC 27605</p>
<p>FIGURE 2</p>	
<p>Jan. 2008</p>	

Figure 3: Project Site NRCS Soil Survey Map



Legend

-  Project Site Boundary
-  Hydric A Soil
- Lo Leon Fine Sand, 0 To 2 Percent Slopes
- Pn Pantego Mucky Loam
- To Torhunta Mucky Fine Sandy Loam

Sources:
 Base Mapping - Brunswick County, NC 2004.
 Soils Data - USDA, NRCS SSURGO Database, Brunswick County, NC.



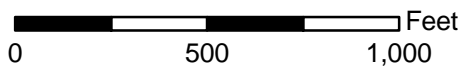
	N.C. Ecosystem Enhancement Program	
	Plum Creek Site <i>EEP Project # D06040</i>	
Project Site NRCS Soil Survey Map		
	THE LOUIS BERGER GROUP 1001 Wade Avenue, Suite 400 Raleigh, NC 27605	FIGURE 3 Jan. 2008

Figure 4: Project Site Existing Hydrological Features Map with Gage Stations



Legend

- Jurisdictional Tributaries**
- Non-RPW
 - RPW
 - Project Site
 - Existing Ditch Network

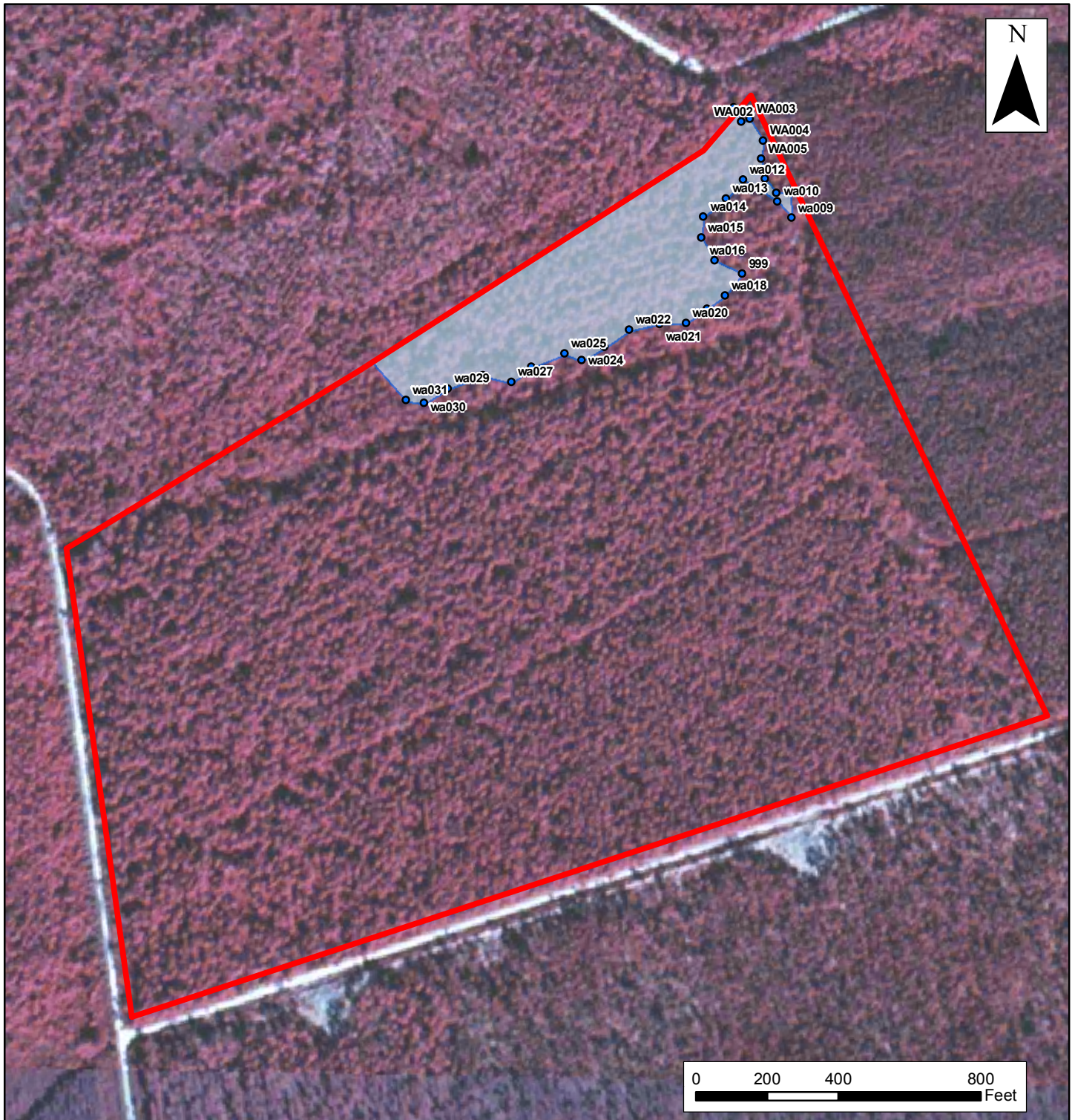


SOURCE:
Base Mapping - USGS Topographic Map: Bolivia



	N.C. Ecosystem Enhancement Program	
	Plum Creek Site <i>EEP Project # D06040</i>	
Project Site Hydrological Features with Gauge Stations		
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	Figure 4 May 2008	

Figure 5: Project Site Wetland Delineation



Legend

- Project Site
- Existing Wetland

Sources:
 Base Mapping - Brunswick County, NC 2004.
 Wetland Line - GPS collected by Berger, 2007.





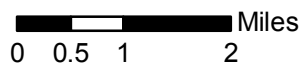
	<p>N.C. Ecosystem Enhancement Program</p>
<p>Plum Creek Site <i>EEP Project # D06040</i></p>	
<p>Project Site Wetland Delineation</p>	
	<p>THE LOUIS BERGER GROUP 1001 Wade Avenue, Suite 400 Raleigh, NC 27605</p>
<p>FIGURE 5 Jan. 2008</p>	

Figure 6: Reference Site Vicinity Map



Legend

-  Site Boundary
-  HUC 14 Boundary



SOURCE:
Base Mapping - USGS Topographic Map.



N.C. Ecosystem
Enhancement Program

Plum Creek Site
EEP Project # D06040

Reference Site Vicinity Map



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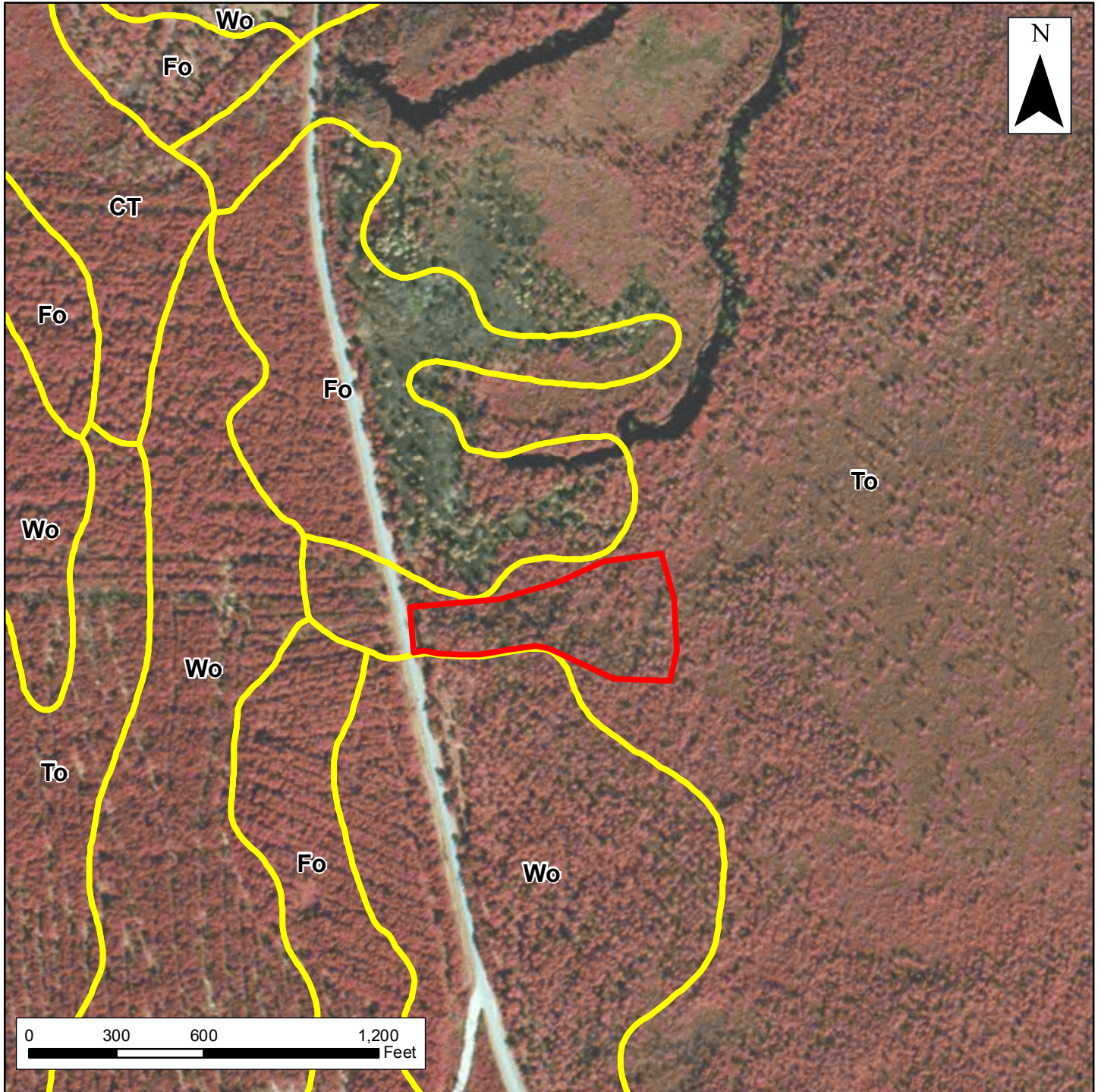
FIGURE 6

Jan. 2008

Figure 7: Reference Site Watershed Map

Not applicable to this project. Figure not produced.

Figure 8: Reference Site NRCS Soil Survey Map



Legend

- Project Site Boundary
- Fo - Foreston loamy fine sand
- To - Torhunta mucky fine sandy loam
- Wo - Woodington fine sandy loam

Sources:
 Base Mapping - Brunswick County, NC 1998.
 Soils Data - USDA, NRCS SSURGO Database, Brunswick County, NC.



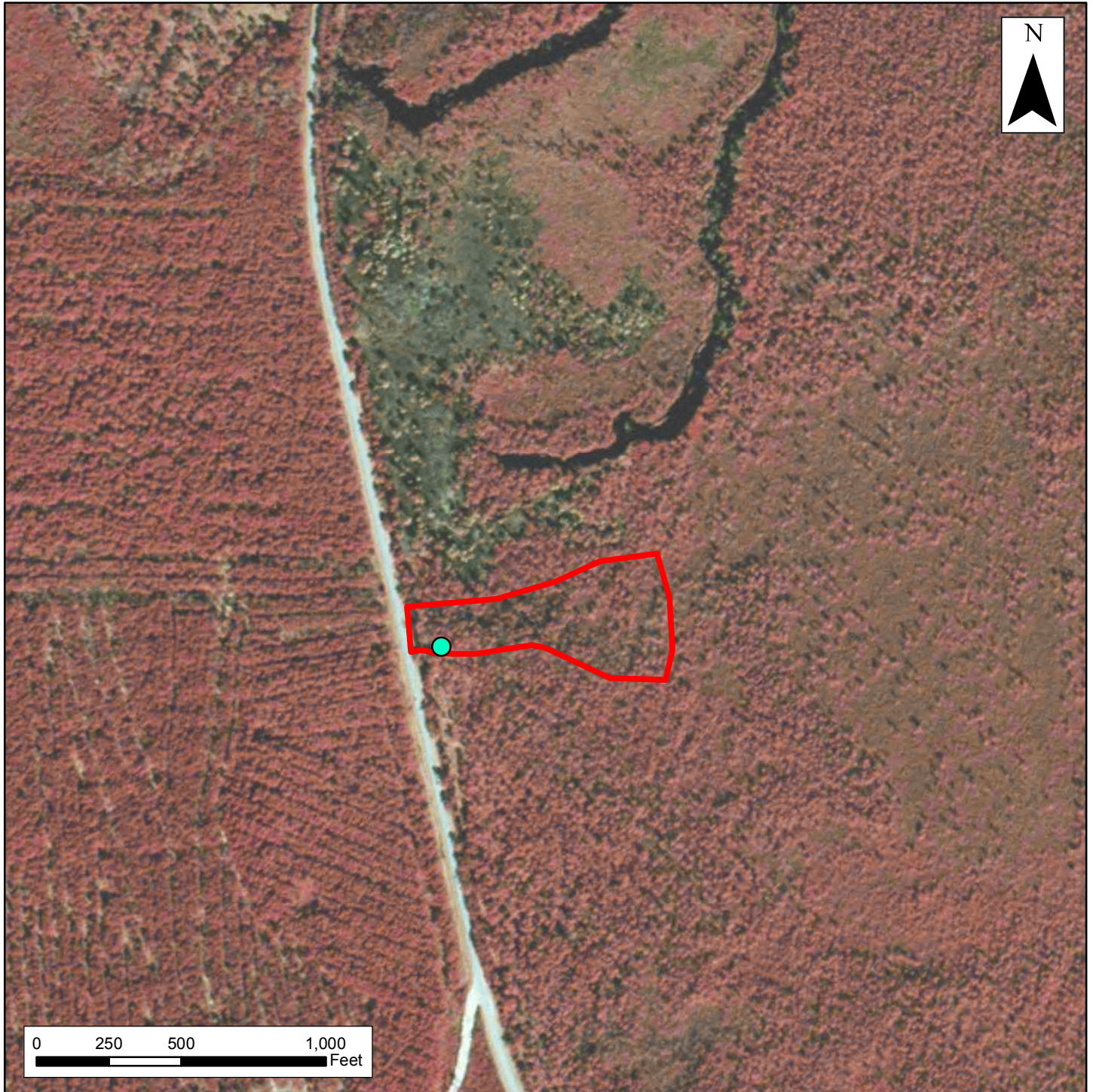
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<p>Plum Creek Site <i>EEP Project # D06040</i></p>	
<p>Reference Site NRCS Soil Survey Map</p>	
	<p>THE LOUIS BERGER GROUP 1001 Wade Avenue, Suite 400 Raleigh, NC 27605</p>
<p>FIGURE 8</p>	
<p>Jan. 2008</p>	

Figure 9: Reference Site Wetland Determination Map with Gage Locations



Legend

- Reference Site
- Monitoring Well

Source:
Base Mapping - Brunswick County, NC 1998.



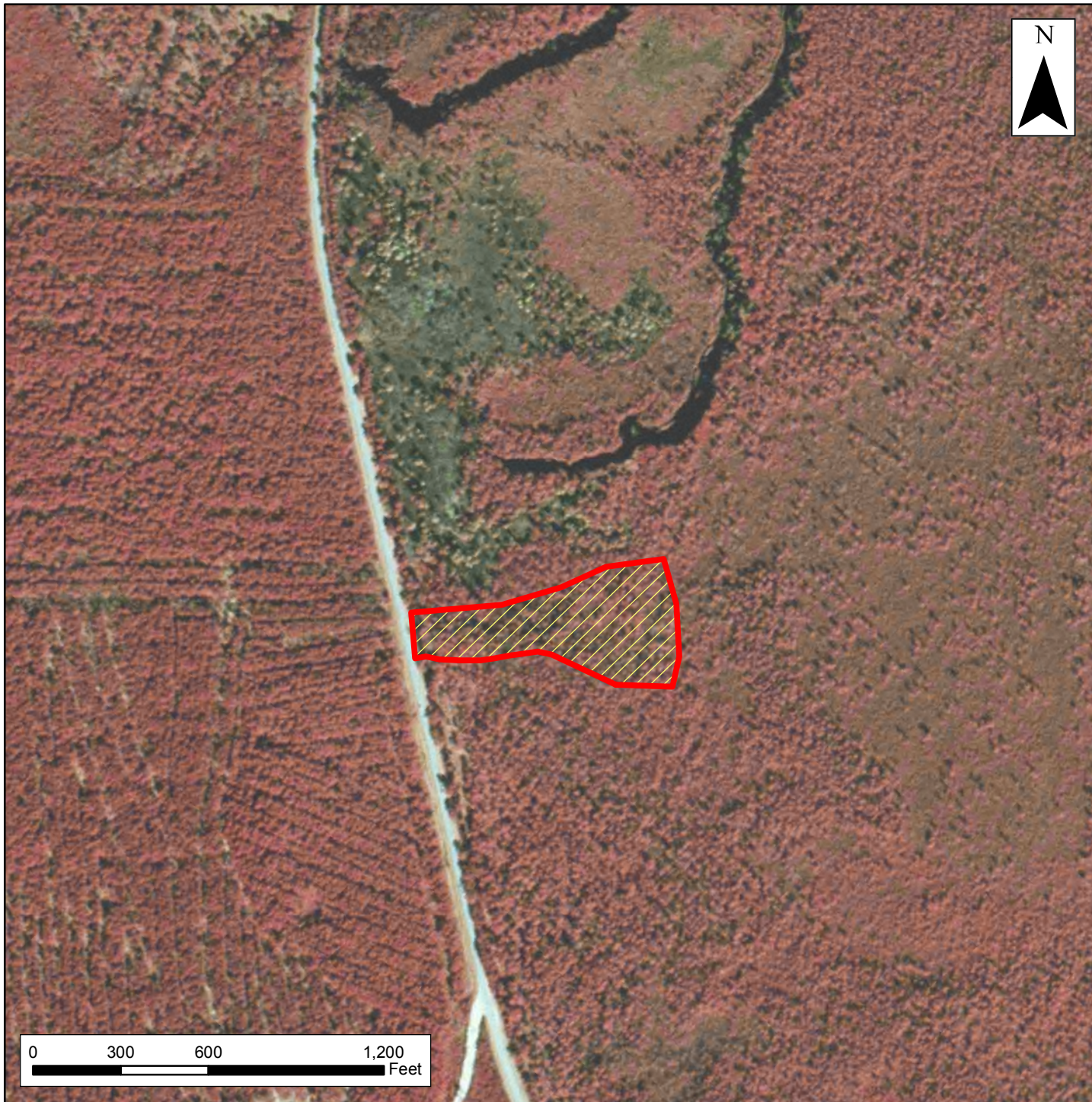
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<p>Plum Creek Site <i>EEP Project # D06040</i></p>	
<p>Reference Site Wetland Determination with Gauge Locations</p>	
	<p>THE LOUIS BERGER GROUP 1001 Wade Avenue, Suite 400 Raleigh, NC 27605</p>
<p>FIGURE 9</p>	
<p>Jan. 2008</p>	



Figure 10: Reference Site Vegetative Communities Map



Legend

 Reference Community (Pond Pine Woodland)

Sources:
 Base Mapping - Brunswick County, NC 1998.
 Soils Data - USDA, NRCS SSURGO Database, Brunswick County, NC.

	<p>N.C. Ecosystem Enhancement Program</p>	
<p>Plum Creek Site <i>EEP Project # D06040</i></p>		
<p>Reference Site Vegetative Communities Map</p>		
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12. DESIGN SHEETS

Sheet 7. Planting Details

Sheet 8. Typical Sections

Sheet 9. Typical Sections (2)

Sheet 10. Sediment and Erosion Control Sheet

APPENDICES

Sheet 5. Planting Plan

Sheet 6. Planting Notes

Sheet 7. Planting Details

Sheet 8. Typical Sections

Sheet 9. Typical Sections (2)

Sheet 10. Sediment and Erosion Control Sheet

APPENDICES

Sheet 7. Planting Details

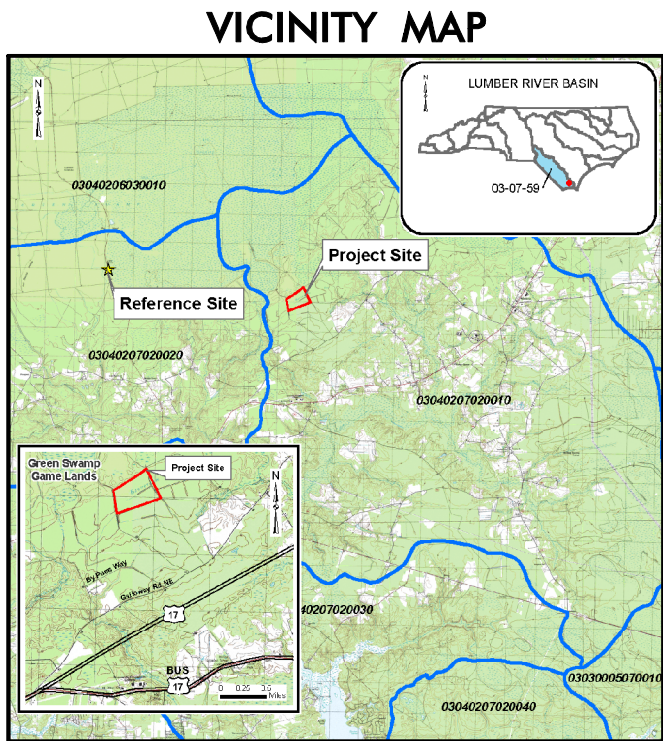
Sheet 8. Typical Sections

Sheet 9. Typical Sections (2)

Sheet 10. Sediment and Erosion Control Sheet

APPENDICES

PLUM CREEK WETLAND RESTORATION PROJECT BRUNSWICK COUNTY ECOSYSTEM ENHANCEMENT PROGRAM MAY 2008



INDEX OF DRAWINGS	
SHEET No.	DESCRIPTION
1	TITLE SHEET
2	GENERAL NOTES
3	EXISTING CONDITIONS
4	PROPOSED CONDITIONS
5	PLANTING PLAN
6	PLANTING NOTES
7	PLANTING DETAILS
8-9	TYPICAL SECTIONS
10	SOIL EROSION AND SEDIMENT CONTROL PLAN
11	SOIL EROSION AND SEDIMENT CONTROL NOTES

NO.	REVISIONS	DRMCHK	DATE









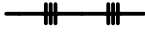
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**PLUM CREEK
WETLAND RESTORATION PROJECT
BRUNSWICK COUNTY
ECOSYSTEM ENHANCEMENT PROGRAM**




TITLE SHEET

DATE: MAY 2008
 PROJECT NO.: D06040-A
 FILENAME:
 SHEET NO.: 1 of 11
 DRAWN BY: MBL

LEGEND

	DITCH PLUG FILL
	POOL
	AVAILABLE CUT
	MONITORING GAUGES
	PROPERTY BOUNDARY
	WETLAND LINE
	SILT FENCE

PLANTING LEGEND

	ZONE 1
	ZONE 2
	ZONE 3

GENERAL NOTES

1. POOL NOT TO EXCEED 1.5' OF DEPTH.
2. POOL LIMITS ARE APPROXIMATE.
3. ACTUAL SIZE AND SHAPE OF POOLS TO BE DETERMINED ON SITE BY ENGINEERS REPRESENTATIVE.

CONSTRUCTION NOTES

TO BE PROVIDED WITH FINAL CONSTRUCTION PLAN SET.

SEQUENCE OF CONSTRUCTION EVENTS

TO BE PROVIDED WITH FINAL CONSTRUCTION PLAN SET.

STOCKPILE AND STAGING AREA NOTES

TO BE PROVIDED WITH FINAL CONSTRUCTION PLAN SET.

NO.	REVISIONS	DRMCHK	DATE

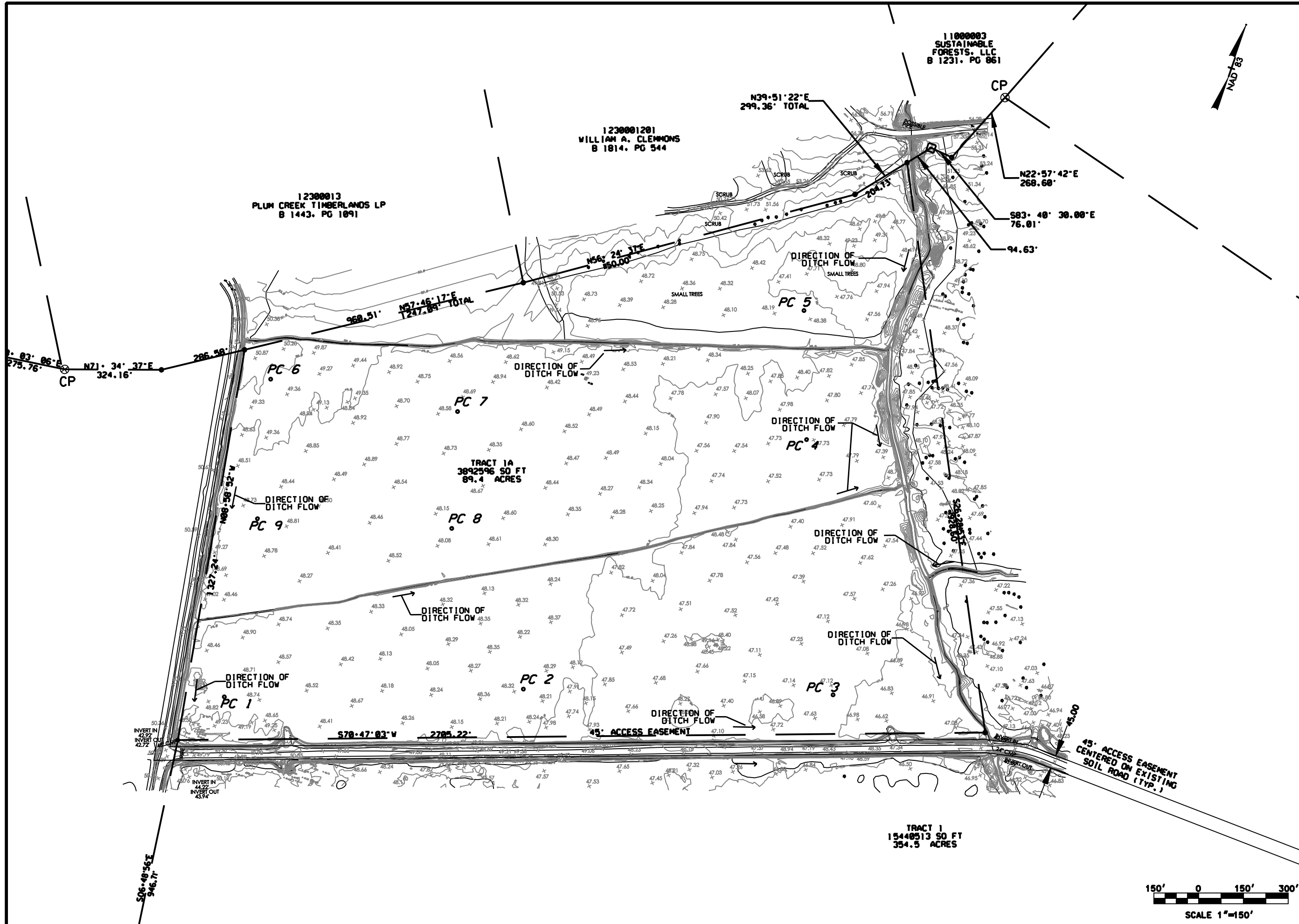


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Raleigh, North Carolina 27605



PLUM CREEK
WETLAND RESTORATION PROJECT
BRUNSWICK COUNTY
ECOSYSTEM ENHANCEMENT PROGRAM
GENERAL NOTES

DATE	MAY 2008
PROJECT NO.	D06040-A
FILENAME	
SHEET NO.	2 of 11
DRAWN BY	MBL



NO.	REVISIONS	DATE



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 Raleigh, North Carolina 27605

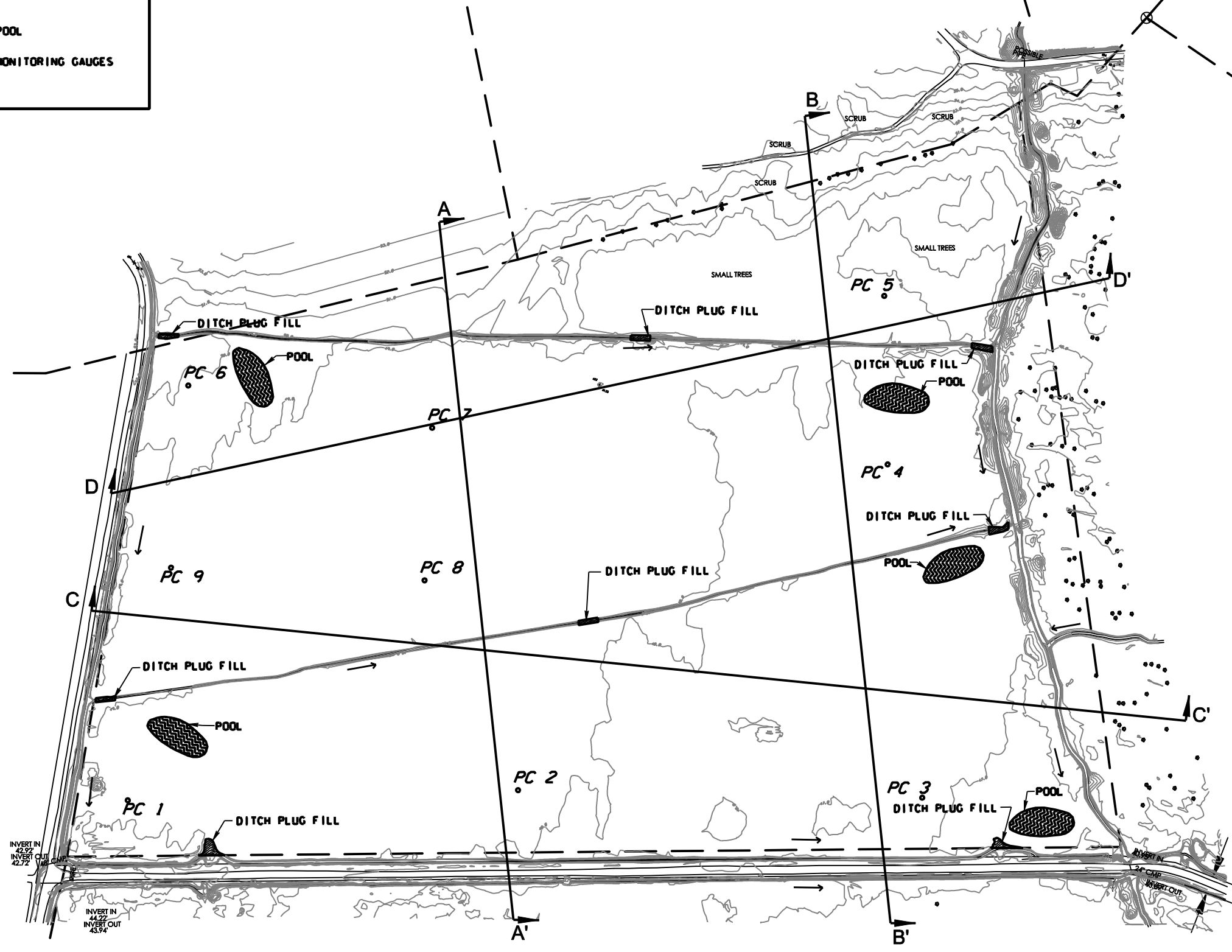
**PLUM CREEK
 WETLAND RESTORATION PROJECT
 BRUNSWICK COUNTY
 ECOSYSTEM ENHANCEMENT PROGRAM**

EXISTING CONDITIONS

DATE	MAY 2008
PROJECT NO.	D06040-A
FILENAME	
SHEET NO.	3 of 11
DRAWN BY	MBL

LEGEND

-  DITCH PLUG FILL
-  POOL
-  PC 9 MONITORING GAUGES



NO.	REVISIONS	DRMCHIK	DATE

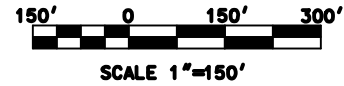


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**PLUM CREEK
 WETLAND RESTORATION PROJECT
 BRUNSWICK COUNTY
 ECOSYSTEM ENHANCEMENT PROGRAM
 PROPOSED CONDITIONS**

DATE	MAY 2008
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LEGEND

 ZONE 1
 ZONE 2
 ZONE 3

NOTES:

1. ZONE 1 INCLUDES ENTIRE SITE WITH THE EXCEPTION OF ZONE 2 AND ZONE 3
2. ZONE 2 IS A BAND OF 50' WIDTH FROM THE CENTER LINE OF THE NORTH - SOUTH DITCHES
3. ZONE 3 ARE VERNAL POOLS



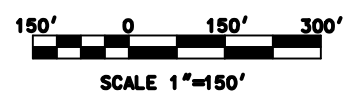
NO.	REVISIONS	DRNCHK	DATE



THE LOUIS BERGER GROUP, Inc.
 1001 Wade Avenue
 Raleigh, North Carolina 27605

**PLUM CREEK
 WETLAND RESTORATION PROJECT
 BRUNSWICK COUNTY
 ECOSYSTEM ENHANCEMENT PROGRAM
 PLANTING PLAN**

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Plant Community	Species	Common Name	Spacing (O.C.)	Quantity / Acre	Acreage	Total Quantity
Planting Zone 1 Pond Pine Woodland Community	Pinus serotina	Pond Pine	16	177	82	14,500
	Gordonia lasianthus	Loblolly Bay	19	122	82	10,006
	Magnolia virginiana	Sweetbay Magnolia	24	74	82	6,100
	Chamaecyparis thyoides	Atlantic White Cedar	38	30	82	2,500
Total				404	82	33,106

Plant Community	Species	Common Name	Spacing (O.C.)	Quantity / Acre	Acreage	Total Quantity
Planting Zone 2 Nonriverine Wet Hardwood Forest Community	Gordonia lasianthus	Loblolly Bay	19	122	2	244
	Quercus laurifolia	Laurel Oak	11	350	2	700
	Quercus michauxii	Swamp Chestnut Oak	11	350	2	700
	Liriodendron tulipifera	Yellow Poplar	11	350	2	700
Total				1,172	2	2,344

Plant Community	Species	Common Name	Spacing (O.C.)	lbs / Acre	Acreage	Total Quan. (Lbs)
Planting Zone 3 Vernal Pool Community	Agrostis alba	Red Top	NA	2	4	8
	Lolium multiflorum	Annual Rye	NA	11	4	44
	Panicum virgatum	Switchgrass (panicum)	NA	2	4	8
Total				15	4	60

PLANTING NOTES:

1. THE CONTRACTOR SHALL SUBMIT COPIES OF THE PLANT MATERIAL ORDERS TO THE LOUIS BERGER GROUP, INC., AT LEAST SIX MONTHS PRIOR TO THE PROPOSED PLANTING DATE.

2. ALL PROPOSED CHANGES TO THE PLANTING PLAN SHALL BE MADE IN WRITING TO THE LOUIS BERGER GROUP, INC. AT LEAST THREE MONTHS PRIOR TO PLANTING. ALL PROPOSED CHANGES MUST BE APPROVED IN WRITING.

3. ALL PLANT STOCK WILL BE INSPECTED ON-SITE BY THE LOUIS BERGER GROUP, INC. SITE ENGINEER OR REPRESENTATIVE PRIOR TO INSTALLATION. PLANTING STOCK NOT MEETING SPECIFICATIONS WILL NOT BE PLANTED AND SHALL BE REPLACED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE.

4. ALL BARE ROOT PLANT MATERIAL SHALL BE INOCULATED WITH MYCORRHIZAE FUNGI EITHER AT THE NURSERY OR ON-SITE AT THE TIME OF PLANTING. THE METHOD OF INOCULATION SHALL BE APPROVED IN ADVANCE BY THE LOUIS BERGER GROUP, INC.

5. AFTER LIFTING THE PLANT STOCK AT THE NURSERY AND PRIOR TO PACKAGING, THE ENTIRE ROOT SYSTEM OF ALL BARE ROOT PLANT MATERIAL SHALL BE TREATED WITH A KAOLIN CLAY EMULSION.

6. THE INSTALLATION OF BARE ROOT TREE SAPLINGS SHALL BE WITH AN OST BAR, KBC BAR, OR HOEDAD. HOWEVER, THE USE OF HOEDADS BY AN INEXPERIENCED PLANTING CREW MAY BE PROHIBITED. SEE CONSTRUCTION DETAILS FOR ACCEPTABLE METHODS FOR INSTALLATION BARE ROOT SAPLINGS.

7. ALL PLANT MATERIAL SHALL BE ESTABLISHED IN A NATURALIZED PATTERN. NATURALIZED PLANTING SHALL RESULT IN A RELATIVELY EVEN DISTRIBUTION OF EACH SPECIES ACROSS THE PLANTING AREA AT THE SPECIFIED DENSITY. UNEVEN DISTRIBUTIONS OF SPECIES OR MONOCULTURES SHALL NOT BE ACCEPTED AS SOLELY DETERMINED BY THE ENGINEER. PLANTINGS IN ALL PLANTS SHALL BE PLACED IN THE HIGHEST MICROTOPOGRAPHIC POSITIONS.

8. THE ESTABLISHMENT PERIOD FOR BARE ROOT TREES AND SHRUBS IS FROM DECEMBER 15 TO MARCH 15.

9. PLANTING WILL BE SUPERVISED BY A CERTIFIED PROFESSIONAL WETLAND SCIENTIST PROVIDED BY THE LOUIS BERGER GROUP, INC.

10. HERBACEOUS COMPETITION MAY BE CONTROLLED PRIOR TO PLANTING AND THROUGHOUT THE MAINTENANCE AND MONITORING PERIOD BY ACCEPTABLE MECHANICAL AND/OR CHEMICAL METHODS.

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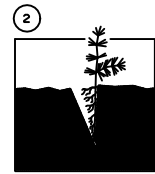
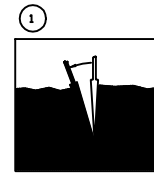
PLUM CREEK
WETLAND RESTORATION PROJECT
BRUNSWICK COUNTY
ECOSYSTEM ENHANCEMENT PROGRAM
PLANTING NOTES

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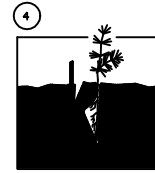
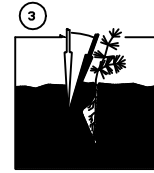
REFORESTATION

PLANTING PROCEDURE WITH KBC/OST BAR (DIBBLE BAR)

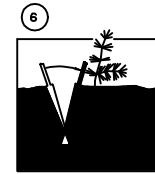
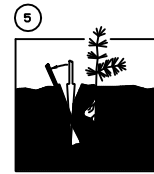
PLANTING PROCEDURE WITH HOEDAD



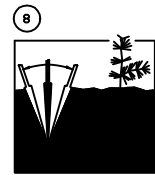
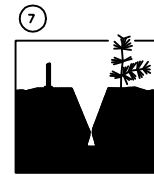
1. INSERT THE PLANTING BAR STRAIGHT DOWN INTO THE SOIL TO THE FULL DEPTH OF THE BLADE AND PULL BACK ON THE HANDLE TO OPEN THE PLANTING HOLE. (DO NOT ROCK THE PLANTING BAR BACK AND FORTH AS THIS CAUSES SOIL IN THE PLANTING HOLE TO BE COMPACTED, INHIBITING GROWTH.)



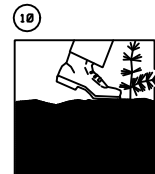
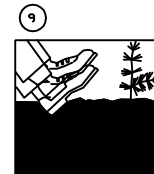
2. REMOVE THE PLANTING BAR AND PUSH THE TREE ROOTS DEEP INTO THE PLANTING HOLE. PULL THE TREE BACK UP TO THE CORRECT PLANTING DEPTH. GENTLY SHAKE THE TREE TO ALLOW THE ROOT TO STRAIGHTEN OUT. DO NOT TWIST OR SPIN THE TREE OR LEAVE THE ROOTS J-ROOTED.



3. INSERT THE PLANTING BAR SEVERAL INCHES IN FRONT OF THE TREE AND PUSH THE BLADE HALFWAY INTO THE SOIL. TWIST AND PUSH THE HANDLE FORWARD TO CLOSE THE TOP OF THE SLIT TO HOLD THE TREE IN PLACE.



4. PUSH THE PLANTING BAR DOWN TO THE FULL DEPTH OF THE BLADE.



5. PULL BACK ON THE HANDLE TO CLOSE THE BOTTOM OF THE PLANTING HOLE.

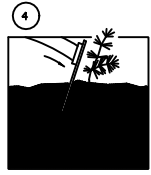
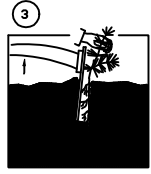
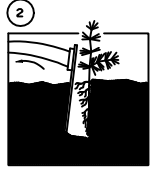
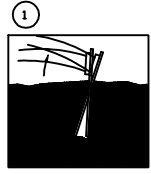
6. PUSH FORWARD ON THE HANDLE TO FIRM SOIL ON TOP OF ROOTS AND TO CLIMINATE AIR POCKETS AROUND THE ROOT.

7. INSERT PLANTING BAR 2 INCHES FROM LAST HOLE.

8. PUSH FORWARD, THEN PULL BACKWARD TO FILL PREVIOUS HOLE.

9. REMOVE THE PLANTING BAR AND FIRM UP THE OPENING WITH THE HEEL.

10. FIRM THE SOIL AROUND THE TREE WITH THE FOOT. BE CAREFUL TO AVOID DAMAGING THE TREE.



1. STRIKE BLADE ALMOST VERTICALLY, FULL DEPTH OF BLADE, INTO THE SOIL. PULL UP ON THE HANDLE TO BREAK THE SOIL LOOSE AT THE BOTTOM OF THE HOLE. CAUTION - AVOID RAISING THE HANDLE MORE THAN A FEW INCHES. OTHERWISE THE HOLE WILL FILL WITH SOIL AND THE TREE WILL BE SHALLOW ROOTED.

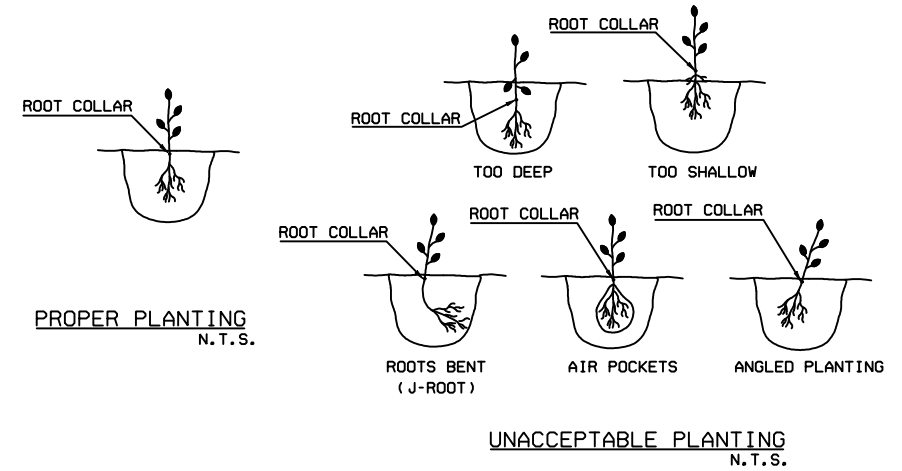
2. SLIDE HAND DOWN HANDLE ALMOST TO THE BLADE. PULL BACK AND DOWN ON THE HANDLE TO FORM A POCKET ON THE FAR SIDE OF THE BLADE. WITH THE OTHER HAND, IMMEDIATELY PLACE THE TREE ROOTS INTO THE POCKET TO THE FULL DEPTH OF THE HOLE.

3. HOLD TREE IN PLACE WHILE SLIDING THE HOEDAD BLADE OUT OF THE HOLE. LOOSE SOIL SHOULD FALL INTO THE HOLE, HOLDING TREE IN PLACE.

4. PULL BLADE COMPLETELY OUT OF THE HOLE AND PUSH SOIL AGAINST PLANTED TREE WITH THE TIP OF THE BLADE.

5. USE FOOT TO FIRM THE SOIL AGAINST THE TREE. DO NOT STEP ON OR BRUISE TREE WITH YOUR FOOT.

REFORESTATION - PLANTING CRITERIA



NO.	REVISTONS	DATE

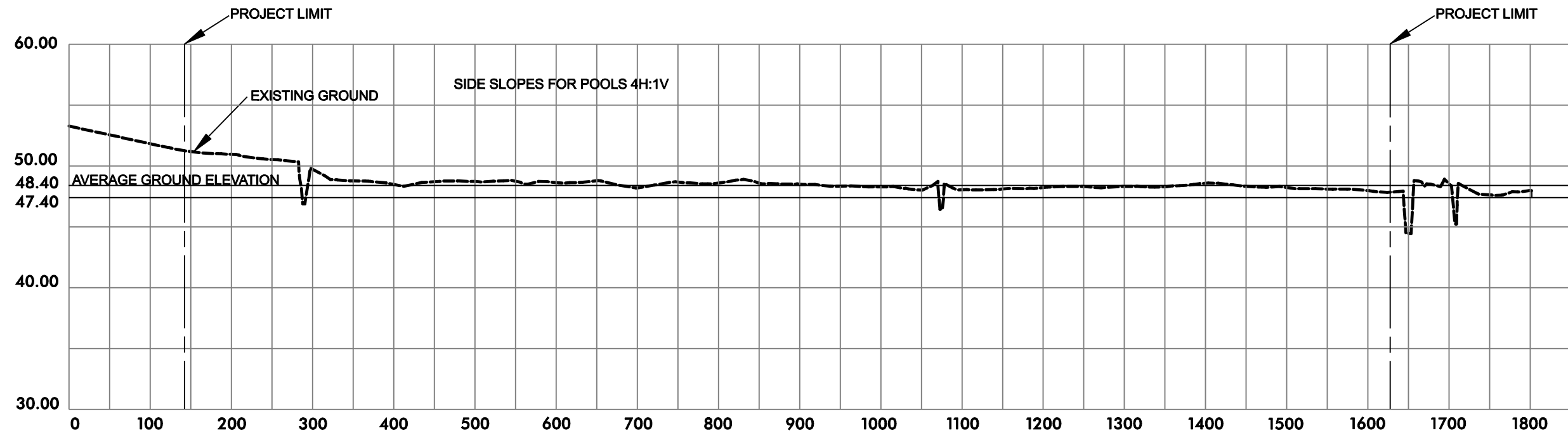


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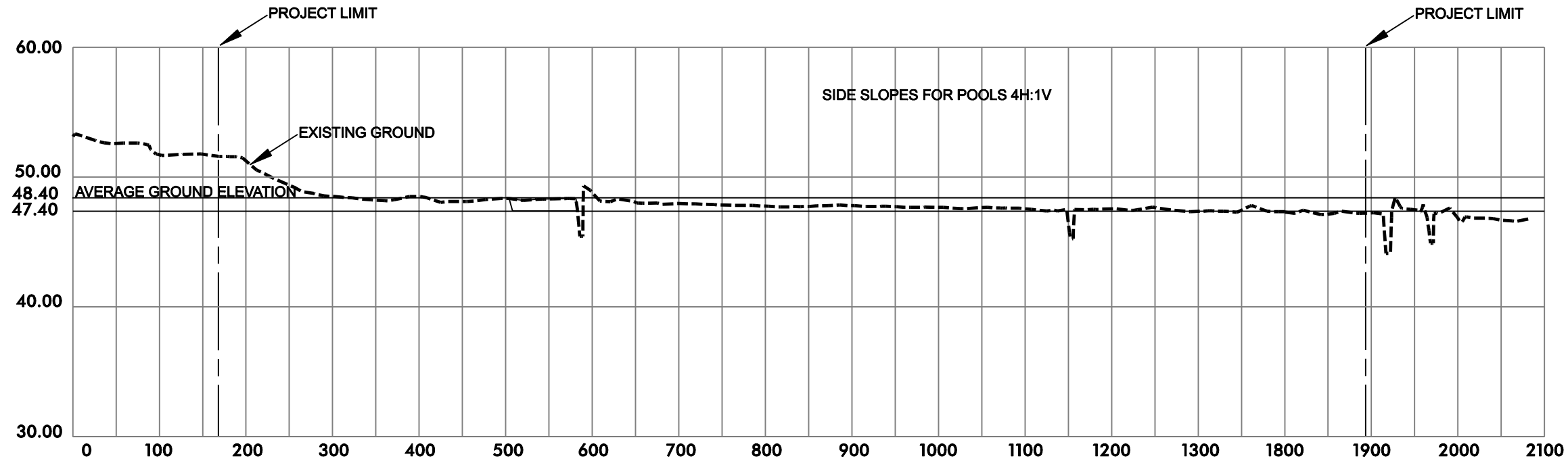
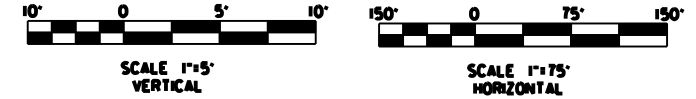


PLUM CREEK
WETLAND RESTORATION PROJECT
BRUNSWICK COUNTY
ECOSYSTEM ENHANCEMENT PROGRAM
PLANTING DETAILS

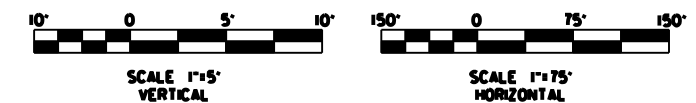
DATE	MAY 2008
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Cross Section A-A'



Cross Section B-B'



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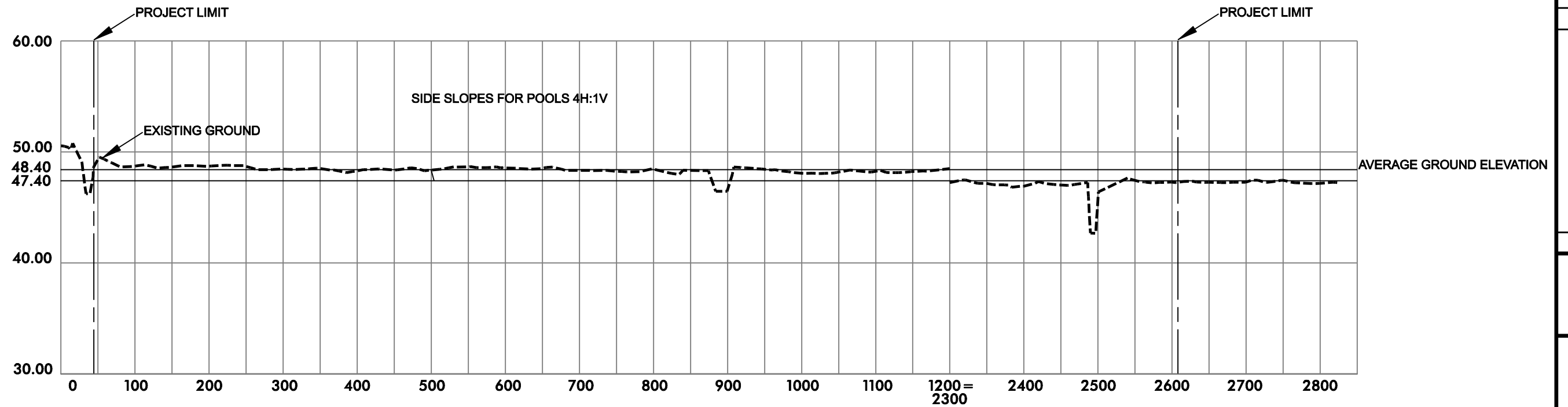


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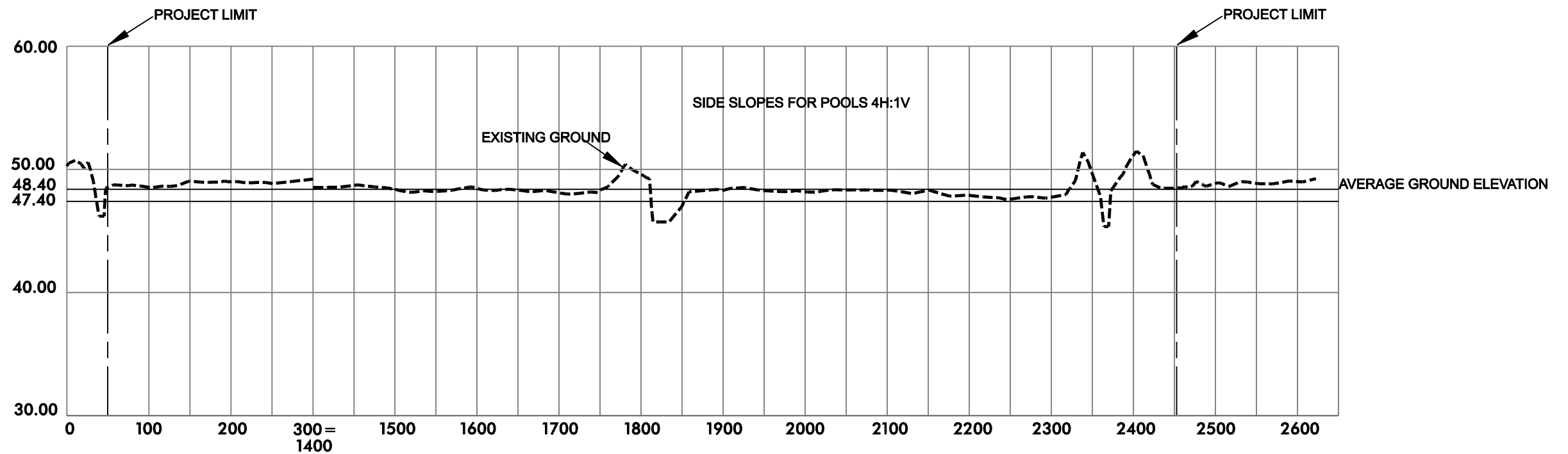
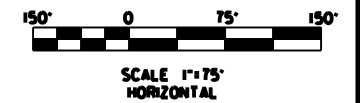
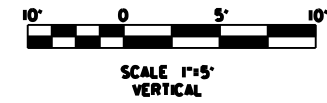


PLUM CREEK
 WETLAND RESTORATION PROJECT
 BRUNSWICK COUNTY
 ECOSYSTEM ENHANCEMENT PROGRAM
 TYPICAL SECTIONS

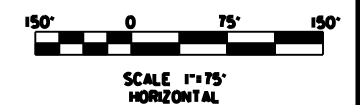
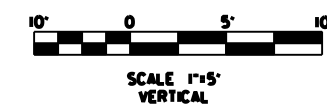
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Cross Section C-C'



Cross Section D-D'



NO.	REVISIONS	DRN/CHK	DATE



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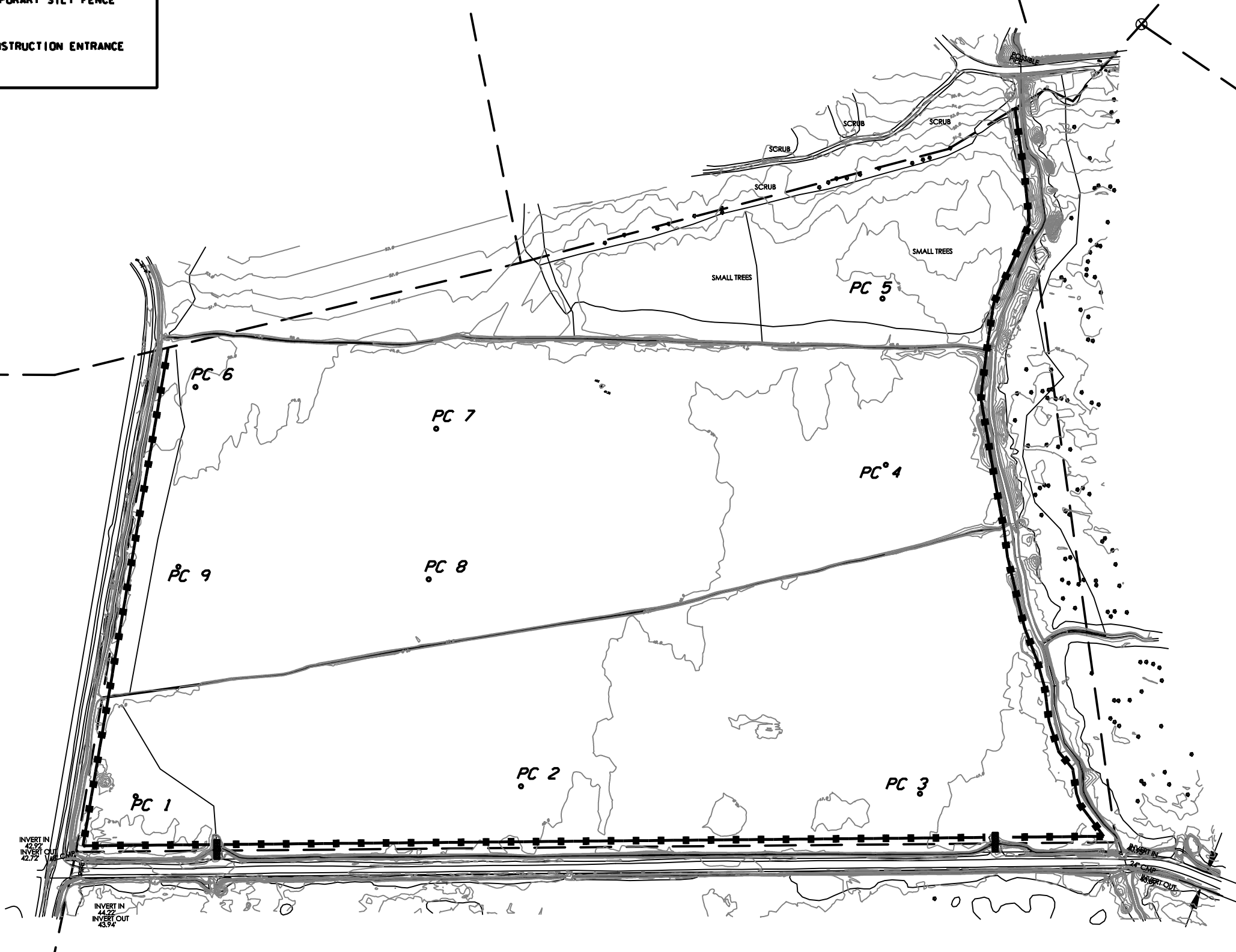


PLUM CREEK
WETLAND RESTORATION PROJECT
BRUNSWICK COUNTY
ECOSYSTEM ENHANCEMENT PROGRAM
TYPICAL SECTIONS

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LEGEND

-  TEMPORARY SILT FENCE
-  CONSTRUCTION ENTRANCE



NO.	REVISIONS	DRNCHK	DATE

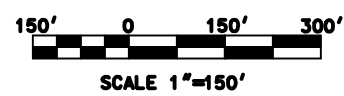


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**PLUM CREEK
 WETLAND RESTORATION PROJECT
 BRUNSWICK COUNTY
 ECOSYSTEM ENHANCEMENT PROGRAM
 SOIL EROSION AND SEDIMENT CONTROL**

DATE	MAY 2008
PROJECT NO.	D06040-A
FILENAME	
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APPENDICES

APPENDIX 1
PROJECT SITE PHOTOGRAPHS



Photo 1: Shooting north, typical plant community on western end of 88-acre site.



Photo 2: Facing east from western end of site, dense shrub layer of Ti-ti (*Cyrilla racemiflora*) and Gallberry (*Ilex coriacea*)



Photo 3: Typical plant communities on western end of site.



Photo 4: Near middle of 88-acre site facing east.

APPENDIX 2
PROJECT SITE USACE ROUTINE WETLAND
DETERMINATION DATA FORMS

FIELD DATA FORM

Job Number: JR5155	Nearest Wetland Flag: WA - 013
Field Investigators: R. Bode	Date: 2/6/2007
Project/Site: Plum Creek Wetland Restoration Site	County: Brunswick
Applicant/Owner: The Louis Berger Group, Inc.	State: NC

Wetland: WA **Upland: WA**

Wetland Vegetation

Indicator Status	Dominant Plant Species	Stratum	Indicator Status
1	<i>Pinus taeda</i>	Tree	FAC
2	<i>Magnolia virginiana</i>	Tree	FACW+
3	<i>Cyrilla racemiflora</i>	Shrub	FACW
4	<i>Ilex glabra</i>	Shrub	FACW
5	<i>Zenobia pulverulenta</i>	Shrub	OBL
6	<i>Smilax laurifolia</i>	Vine	FACW+
7	<i>Andropogon glomeratus</i>	Herb	FACW+
8			

Upland Vegetation

Indicator Status	Dominant Plant Species	Stratum	Indicator Status
1	<i>Pinus taeda</i>	Tree	FAC
2	<i>Cyrilla racemiflora</i>	Shrub	FACW
3	<i>Ilex glabra</i>	Shrub	FACW
4	<i>Gelsemium sempervirens</i>	Vine	FAC
5	<i>Smilax laurifolia</i>	Vine	FACW+
6			
7			
8			

>50% FAC or Wetter, or Prevalence Index <3?
 Yes (Hydrophytic Vegetation Criterion Met)
 No (Hydrophytic Vegetation Criterion Not Met)

>50% FAC or Wetter, or Prevalence Index <3?
 Yes (Hydrophytic Vegetation Criterion Met)
 No (Hydrophytic Vegetation Criterion Not Met)

Wetland Soils

Soil Series/Phase: Leon fine sandy loam

Is the Soil Listed as Hydric? no

Depth (Inches)	Matrix	Mottling	%	Texture
0-11	10YR2/1	none		sandy clay loam
11-16	10YR2/1	none		silty clay loam

Hydric Soil Criterion Met?
 Yes (Hydric Soil Criterion Met)
 No (Hydric Soil Criterion Not Met)

Rationale: _____

Upland Soils

Soil Series/Phase: Leon fine sandy loam

Is the Soil Listed as Hydric? no

Depth (Inches)	Matrix	Mottling	%	Texture
0-16	10YR2/1			sandy clay loam

Hydric Soil Criterion Met?
 Yes (Hydric Soil Criterion Met)
 No (Hydric Soil Criterion Not Met)

Rationale: _____

Wetland Hydrology

Ground Surface Inundated? no Depth (Inches): _____

Soil Saturated? yes Depth to Saturation (Inches): 2

Depth to Free-standing Water in Probe Hole (Inches): 11

Field Evidence of Hydrology: drainage patterns

Upland Hydrology

Ground Surface Inundated? no Depth (Inches): _____

Soil Saturated? yes Depth to Saturation (Inches): 15

Depth to Free-standing Water in Probe Hole (Inches): n/a

Field Evidence of Hydrology: _____

Evidence of Prolonged Saturation and/or Inundation?

Yes (Wetland Hydrology Criterion Met)
 No (Wetland Hydrology Criterion Not Met)

Evidence of Prolonged Saturation and/or Inundation?

Yes (Wetland Hydrology Criterion Met)
 No (Wetland Hydrology Criterion Not Met)

Atypical Situation in Upland and/or Wetland? no

Comments: _____

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD):

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION: North and West of Randolphville Rd. and Galloway Road. The Louis Berger Group, Inc. (Berger) proposes to restore approximately 88 acres of degraded wetland to meet jurisdictional criteria. This tract is located off Red Run Trail to the north of Galloway Road near Shallotte in Brunswick County, North Carolina (Figure 1). This project will be undertaken as a full delivery project contracted with the North Carolina Ecosystem Enhancement Program (NCEEP). The outcome of the wetland restoration will be a PSS Pond Pine Woodland community. Berger delineated approximately 6 acres of jurisdictional wetland abutting an off-site RPW and 2 Non-RPW jurisdictional tributaries within the area of the proposed activities (Figure 2).

State: NC County/parish/borough: Brunswick City: near Shallotte
Center coordinates of site (lat/long in degree decimal format): Lat. 34.072065° N, Long. 78.228314° W.
Universal Transverse Mercator:

Name of nearest waterbody: Boggy Branch

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Lockwood Folly River

Name of watershed or Hydrologic Unit Code (HUC): 03040207

Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.

Check if other sites (e.g., offsite mitigation sites, disposal sites, etc...) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

Office (Desk) Determination. Date:

Field Determination. Date(s): 4/8/2008

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "navigable waters of the U.S." within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [Required]

Waters subject to the ebb and flow of the tide.

Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.

Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "waters of the U.S." within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [Required]

1. Waters of the U.S.

a. Indicate presence of waters of U.S. in review area (check all that apply):¹

- TNWs, including territorial seas
- Wetlands adjacent to TNWs
- Relatively permanent waters² (RPWs) that flow directly or indirectly into TNWs
- Non-RPWs that flow directly or indirectly into TNWs
- Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
- Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
- Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
- Impoundments of jurisdictional waters
- Isolated (interstate or intrastate) waters, including isolated wetlands

b. Identify (estimate) size of waters of the U.S. in the review area:

Non-wetland waters: 3,500 linear feet: 8 width (ft) and/or acres.

Wetlands: 6 acres.

c. Limits (boundaries) of jurisdiction based on: Established by OHWM.

Elevation of established OHWM (if known): .

2. Non-regulated waters/wetlands (check if applicable):³

¹ Boxes checked below shall be supported by completing the appropriate sections in Section III below.

² For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).

³ Supporting documentation is presented in Section III.F.

Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional.
Explain: .

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW

Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW

Summarize rationale supporting conclusion that wetland is “adjacent”: .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are “relatively permanent waters” (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody⁴ is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:

Watershed size: 25 acres

Drainage area: 25 acres

Average annual rainfall: 55.8 inches

Average annual snowfall: 0.7 inches

(ii) Physical Characteristics:

(a) Relationship with TNW:

Tributary flows directly into TNW.

Tributary flows through 4 tributaries before entering TNW.

Project waters are Pick List river miles from TNW.

Project waters are Pick List river miles from RPW.

Project waters are Pick List aerial (straight) miles from TNW.

Project waters are Pick List aerial (straight) miles from RPW.

Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW⁵: .

Tributary stream order, if known: .

⁴ Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.

⁵ Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: Natural
 Artificial (man-made). Explain: Tributaries are ditches draining a pocosin wetland.
 Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):

Average width: 6 feet
Average depth: 3 feet
Average side slopes: **2:1**.

Primary tributary substrate composition (check all that apply):

Silts Sands Concrete
 Cobbles Gravel Muck
 Bedrock Vegetation. Type/% cover:
 Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: Stable vegetated banks.

Presence of run/riffle/pool complexes. Explain: None evident.

Tributary geometry: **Relatively straight**

Tributary gradient (approximate average slope): 2 %

(c) Flow:

Tributary provides for: **Ephemeral flow**

Estimate average number of flow events in review area/year: **1**

Describe flow regime: Source of tributary flow is primarily groundwater intercepted from the drained wetland.

Observable surface flow is very infrequent.

Other information on duration and volume: None known.

Surface flow is: **Discrete.** Characteristics: .

Subsurface flow: **Unknown.** Explain findings: .

Dye (or other) test performed: .

Tributary has (check all that apply):

Bed and banks
 OHWM⁶ (check all indicators that apply):
 clear, natural line impressed on the bank the presence of litter and debris
 changes in the character of soil destruction of terrestrial vegetation
 shelving the presence of wrack line
 vegetation matted down, bent, or absent sediment sorting
 leaf litter disturbed or washed away scour
 sediment deposition multiple observed or predicted flow events
 water staining abrupt change in plant community
 other (list):
 Discontinuous OHWM.⁷ Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

High Tide Line indicated by: Mean High Water Mark indicated by:
 oil or scum line along shore objects survey to available datum;
 fine shell or debris deposits (foreshore) physical markings;
 physical markings/characteristics vegetation lines/changes in vegetation types.
 tidal gauges
 other (list):

(iii) **Chemical Characteristics:**

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: Water was clear.

Identify specific pollutants, if known: None are known. The watershed for these ditches is undeveloped.

⁶A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.

⁷Ibid.

(iv) **Biological Characteristics. Channel supports (check all that apply):**

- Riparian corridor. Characteristics (type, average width): Vegetation is typical of the pocosin that once existed on the site.
Average width is 10 feet.
- Wetland fringe. Characteristics: .
- Habitat for:
- Federally Listed species. Explain findings: .
 - Fish/spawn areas. Explain findings: .
 - Other environmentally-sensitive species. Explain findings: .
 - Aquatic/wildlife diversity. Explain findings: .

2. **Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW**

(i) **Physical Characteristics:**

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is: **Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

Directly abutting

Not directly abutting

Discrete wetland hydrologic connection. Explain: .

Ecological connection. Explain: .

Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List**.

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) **Chemical Characteristics:**

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) **Biological Characteristics. Wetland supports (check all that apply):**

Riparian buffer. Characteristics (type, average width): .

Vegetation type/percent cover. Explain: .

Habitat for:

Federally Listed species. Explain findings: .

Fish/spawn areas. Explain findings: .

Other environmentally-sensitive species. Explain findings: .

Aquatic/wildlife diversity. Explain findings: .

3. **Characteristics of all wetlands adjacent to the tributary (if any)**

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately () acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N) Size (in acres) Directly abuts? (Y/N) Size (in acres)

Summarize overall biological, chemical and physical functions being performed:

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D:Based on the information presented in the sections above, the tributaries on the site have potential to significantly affect the chemical, physical, and biological integrity of the TNW.
2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D:
3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D:

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
 TNWs: linear feet width (ft), Or, acres.
 Wetlands adjacent to TNWs: acres.
2. **RPWs that flow directly or indirectly into TNWs.**
 Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial:
 Tributaries of TNW where tributaries have continuous flow “seasonally” (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally:

Provide estimates for jurisdictional waters in the review area (check all that apply):

- Tributary waters: linear feet width (ft).
 Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs⁸ that flow directly or indirectly into TNWs.**

- Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):

- Tributary waters: **3,500** linear feet **8**width (ft).
 Other non-wetland waters: acres.
Identify type(s) of waters: .

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**

- Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
 Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **200 ft. north of delineated wetland the wetland complex is abutting a channelized unnamed tributary, the RPW, which ultimately flows to the TNW Lockwood Folly River. Overland flow was observed draining into the RPW. Elevations on the USGS quad corroborated the direction of drainage within the delineated wetland.**
 Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: **6** acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**

- Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**

- Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.⁹**

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.

- Demonstrate that impoundment was created from "waters of the U.S.," or
 Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
 Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):¹⁰

- which are or could be used by interstate or foreign travelers for recreational or other purposes.
 from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.

⁸See Footnote # 3.

⁹To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

¹⁰Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA Memorandum Regarding CWA Act Jurisdiction Following Rapanos.

- which are or could be used for industrial purposes by industries in interstate commerce.
- Interstate isolated waters. Explain: .
- Other factors. Explain: .

Identify water body and summarize rationale supporting determination:

Provide estimates for jurisdictional waters in the review area (check all that apply):

- Tributary waters: linear feet width (ft).
- Other non-wetland waters: acres.
Identify type(s) of waters: .
- Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

- If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
- Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
 - Prior to the Jan 2001 Supreme Court decision in "SWANCC," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
- Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
- Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):

- Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
- Lakes/ponds: acres.
- Other non-wetland waters: acres. List type of aquatic resource: .
- Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):

- Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
- Lakes/ponds: acres.
- Other non-wetland waters: acres. List type of aquatic resource: .
- Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

- Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
- Data sheets prepared/submitted by or on behalf of the applicant/consultant.
 - Office concurs with data sheets/delineation report.
 - Office does not concur with data sheets/delineation report.
- Data sheets prepared by the Corps: .
- Corps navigable waters' study: .
- U.S. Geological Survey Hydrologic Atlas: .
 - USGS NHD data.
 - USGS 8 and 12 digit HUC maps.
- U.S. Geological Survey map(s). Cite scale & quad name: Beaverdam Bay USGS Bolivia, NC 1:24,000.
- USDA Natural Resources Conservation Service Soil Survey. Citation: Barnhill et. al., 1986. Soil Survey of Brunswick County, North Carolina, United States Department of Agriculture, Soil Conservation Service. Washington, DC..
- National wetlands inventory map(s). Cite name: Beaverdam Bay USGS Bolivia, NC 1:24,000.
- State/Local wetland inventory map(s): .
- FEMA/FIRM maps: .
- 100-year Floodplain Elevation is: (National Geodetic Vertical Datum of 1929)
- Photographs: Aerial (Name & Date): .
or Other (Name & Date): .
- Previous determination(s). File no. and date of response letter: .
- Applicable/supporting case law: .
- Applicable/supporting scientific literature: .
- Other information (please specify): Survey by Berger 2/6/2007.

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

APPENDIX 3
PROJECT SITE NCDWQ STREAM
CLASSIFICATION FORMS

NA (No Streams)

There are no streams associated with this project, wetland restoration only.

APPENDIX 4
REFERENCE SITE PHOTOGRAPHS



Photo 1: Facing northeast from well location, typical view of reference vegetation



Photo 2: Facing northwest, typical view of canopy layer



Photo 3: Facing east from groundwater gage, view of shrub layer vegetation



Photo 4: Diverse and dense shrub and herbaceous layers

APPENDIX 5
REFERENCE SITE USACE ROUTINE WETLAND
DETERMINATION DATA FORMS

FIELD DATA FORM

Job Number: JR5155	Nearest Wetland Flag: near reference gw gage
Field Investigators: R. Bode	Date: 5/23/2007
Project/Site: Plum Creek Wetland Reference Site	County: Brunswick
Applicant/Owner: The Louis Berger Group, Inc.	State: NC

Wetland: WA **Upland: WA**

Wetland Vegetation

	Dominant Plant Species	Stratum	Indicator Status
1	<i>Pinus serotina</i>	Tree	FACW+
2	<i>Nyssa biflora</i>	Tree	OBL
3	<i>Taxodium distichum</i>	Tree	OBL
4	<i>Acer rubra</i>	Tree	FAC
5	<i>Cyrilla racemiflora</i>	Shrub	FACW
6	<i>Ilex glabro</i>	Shrub	FACW
7	<i>Osmunda cinnamomea</i>	Herb	FACW+
8	<i>Arundinaria gigantea</i>	Herb	FACW

>50% FAC or Wetter, or Prevalence Index <3?
 Yes (Hydrophytic Vegetation Criterion Met)
 No (Hydrophytic Vegetation Criterion Not Met)

Upland Vegetation

	Dominant Plant Species	Stratum	Indicator Status
1	<i>Magnolia virginiana</i>	Tree	FACW+
2	<i>Pinus palustris</i>	Tree	FACU+
3	<i>Acer rubrum</i>	Tree	FAC
4	<i>Ilex glabra</i>	Shrub	FACW
5	<i>Myrica cerifera</i>	Shrub	FAC+
6	<i>Arundinaria gigantea</i>	Herb	FACW
7			
8			

>50% FAC or Wetter, or Prevalence Index <3?
 Yes (Hydrophytic Vegetation Criterion Met)
 No (Hydrophytic Vegetation Criterion Not Met)

Wetland Soils

Soil Series/Phase: Torhunta

Is the Soil Listed as Hydric? yes

Depth (Inches)	Matrix	Mottling %	Texture
0-20	10YR2/1	none	silty sandy loam

Hydric Soil Criterion Met?
 Yes (Hydric Soil Criterion Met)
 No (Hydric Soil Criterion Not Met)

Rationale: _____

Upland Soils

Soil Series/Phase: Torhunta

Is the Soil Listed as Hydric? yes

Depth (Inches)	Matrix	Mottling %	Texture
0-18	10YR2/3		silty sandy loam

Hydric Soil Criterion Met?
 Yes (Hydric Soil Criterion Met)
 No (Hydric Soil Criterion Not Met)

Rationale: _____

Wetland Hydrology

Ground Surface Inundated? yes Depth (Inches): _____

Soil Saturated? yes Depth to Saturation (Inches): _____

Depth to Free-standing Water in Probe Hole (Inches): _____

Field Evidence of Hydrology: drainage patterns

Evidence of Prolonged Saturation and/or Inundation?

Yes (Wetland Hydrology Criterion Met)
 No (Wetland Hydrology Criterion Not Met)

Upland Hydrology

Ground Surface Inundated? no Depth (Inches): _____

Soil Saturated? no Depth to Saturation (Inches): _____

Depth to Free-standing Water in Probe Hole (Inches): n/a

Field Evidence of Hydrology: _____

Evidence of Prolonged Saturation and/or Inundation?

Yes (Wetland Hydrology Criterion Met)
 No (Wetland Hydrology Criterion Not Met)

Atypical Situation in Upland and/or Wetland? no

Comments: _____

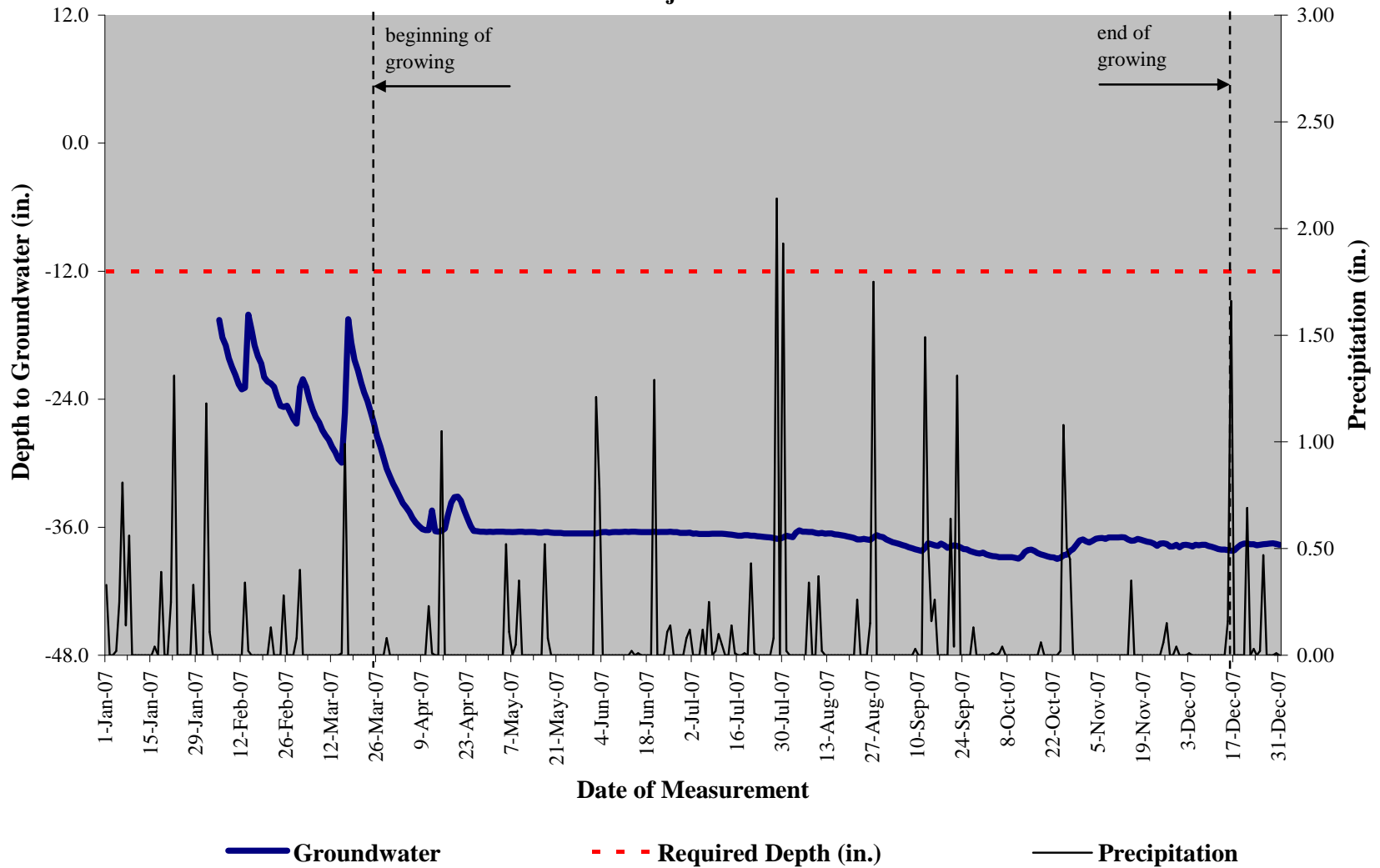
APPENDIX 6
REFERENCE SITE NCDWQ STREAM
CLASSIFICATION FORMS

NA (No Streams)

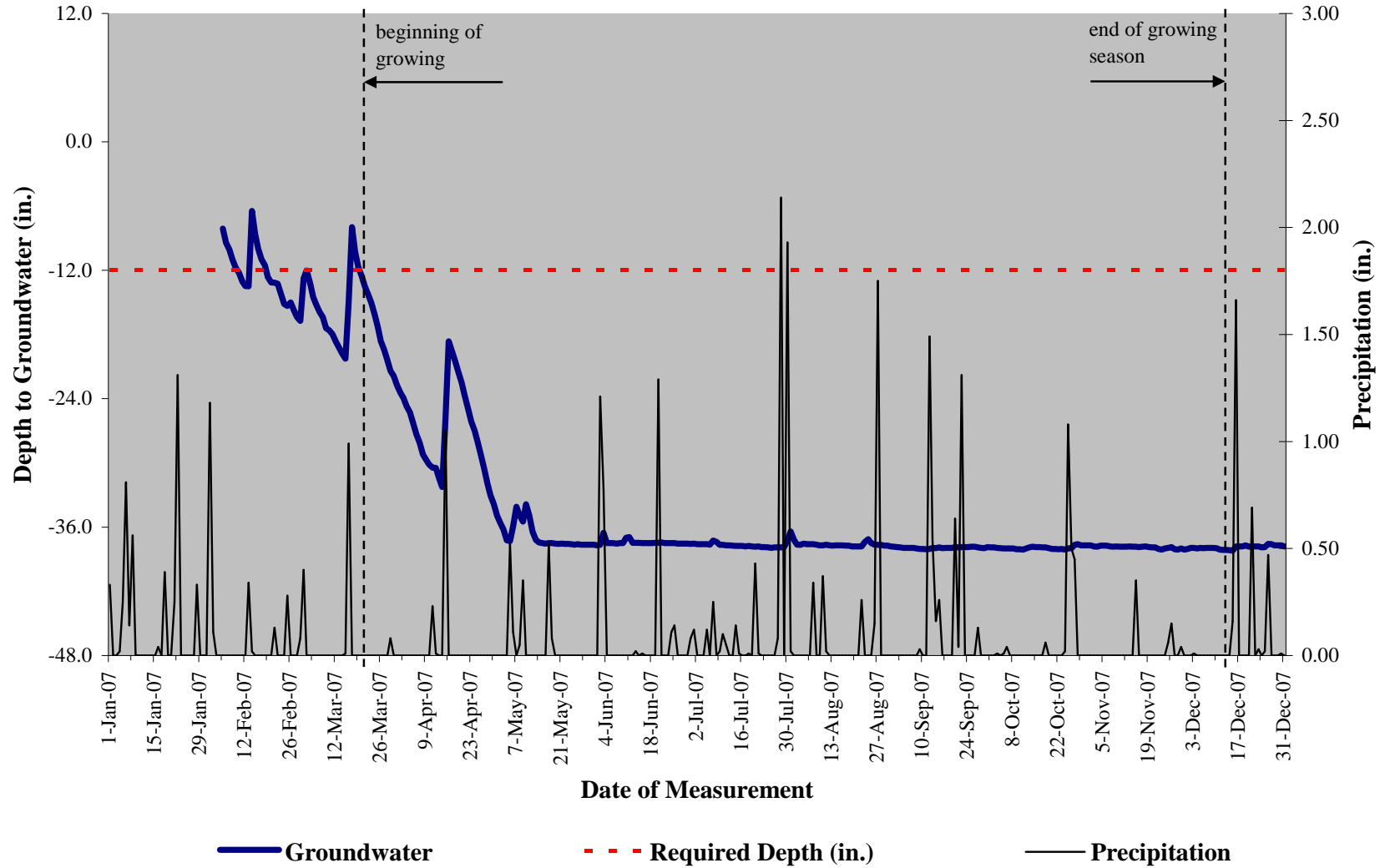
There are no streams associated with this project, wetland restoration only.

APPENDIX 7
HYDROLOGIC GAUGE DATA SUMMARY,
GROUNDWATER, AND RAINFALL
INFORMATION

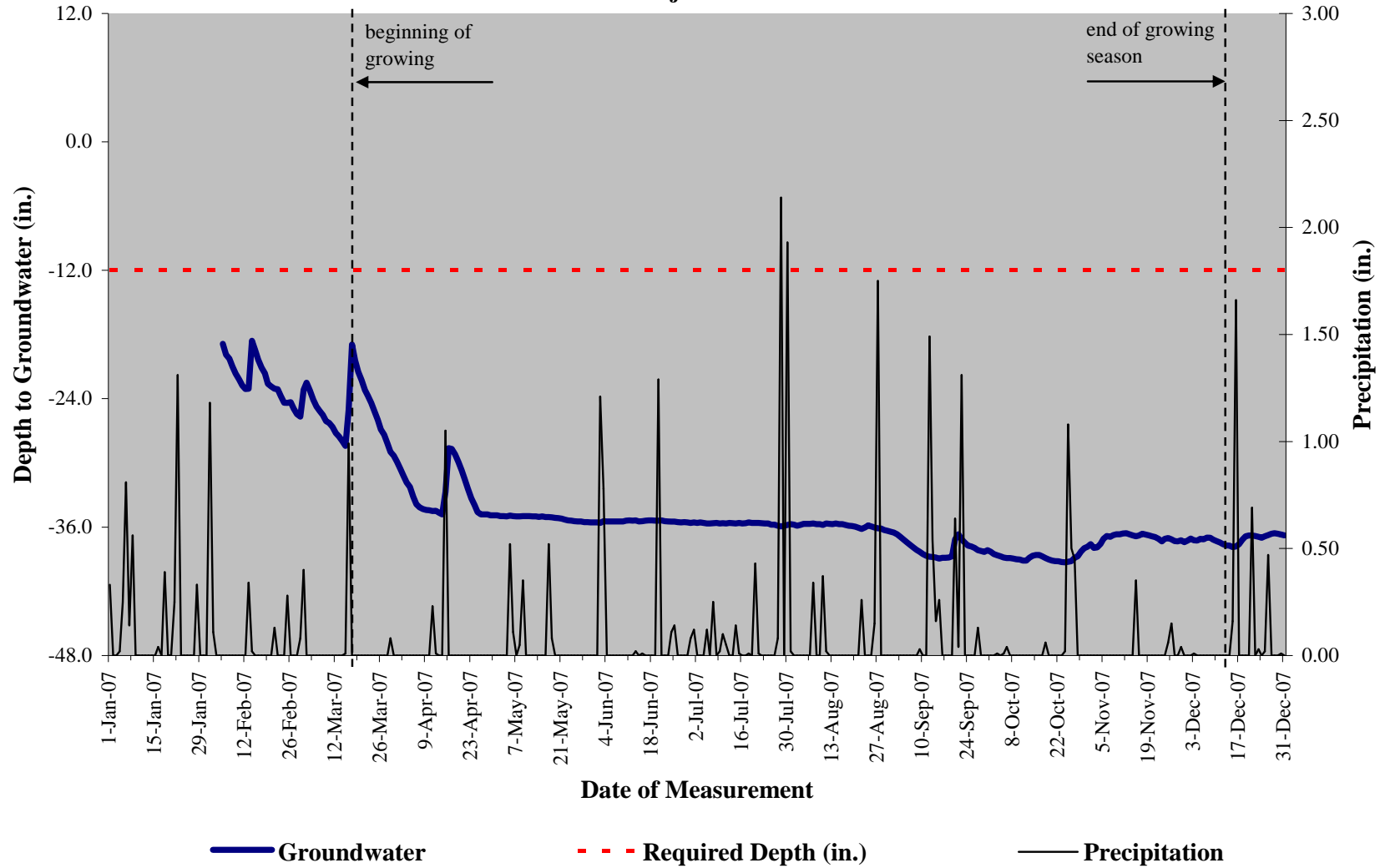
**Plum Creek Wetland Mitigation
Gauge G-1 (Serial No. EBD3EDF)
Project Site**



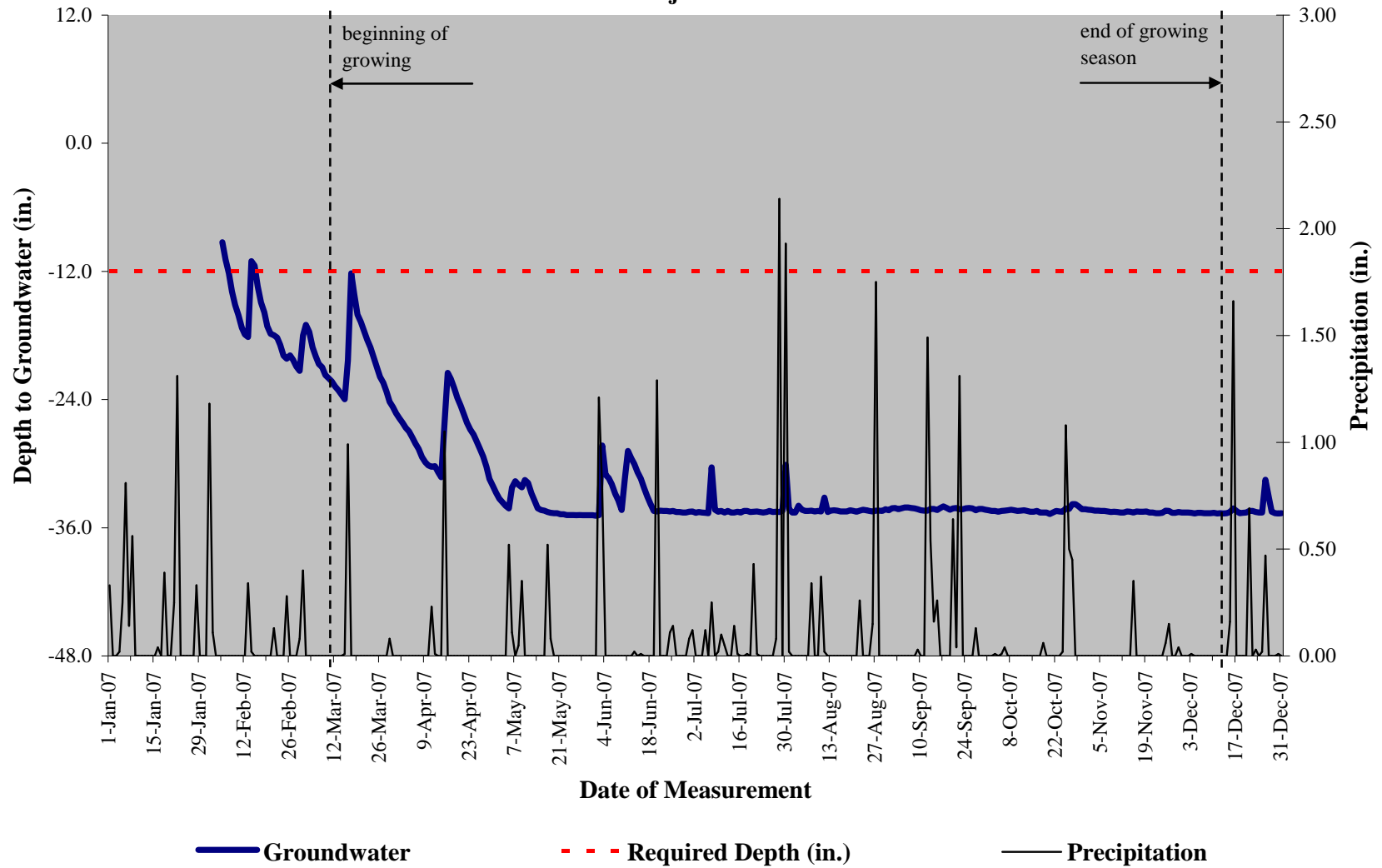
**Plum Creek Wetland Mitigation
Gauge G-2 (Serial No. EBD218E)
Reference Wetland**



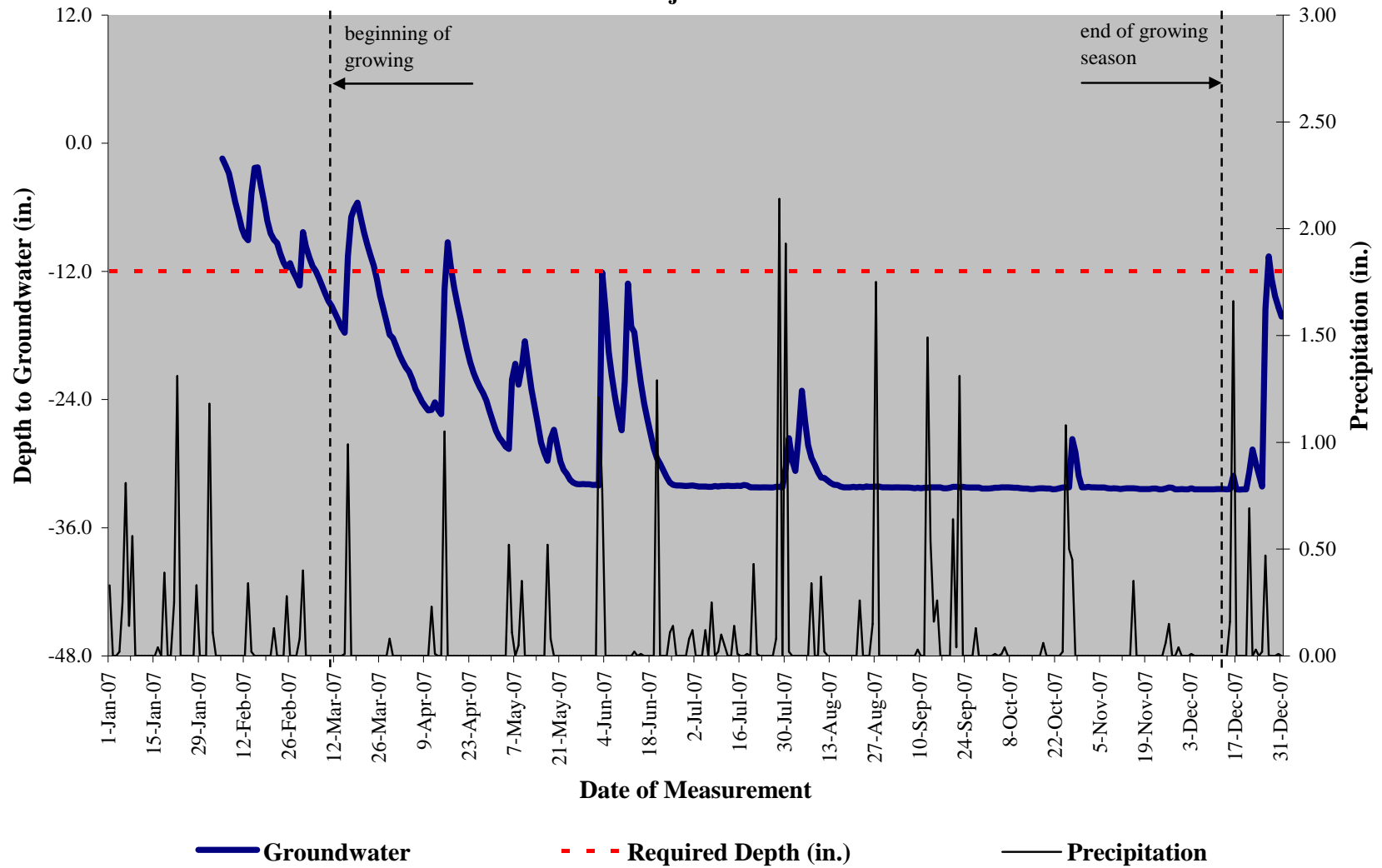
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Gauge G-3 (Serial No. EBCFCF6)
Project Site**



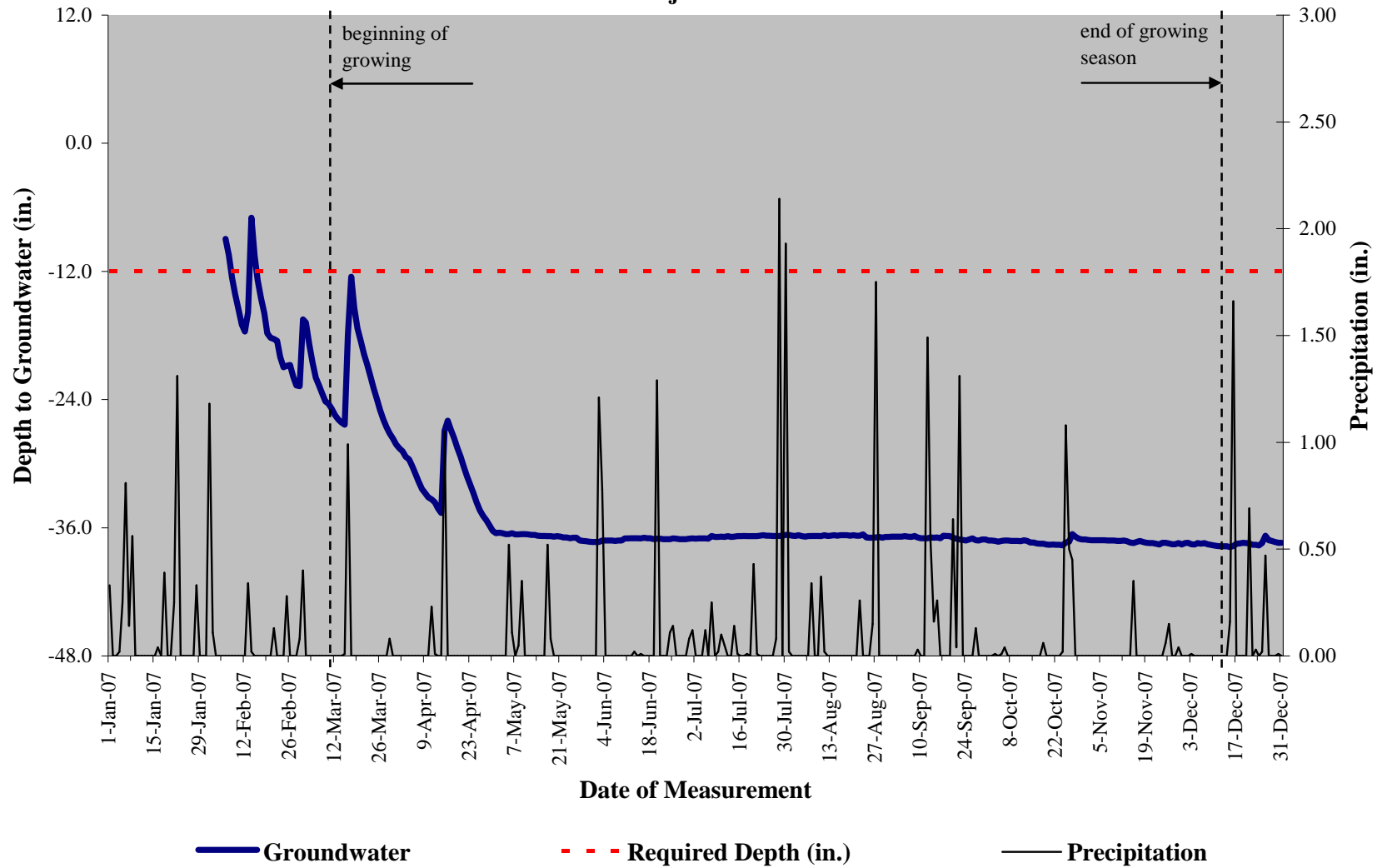
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Project Site**



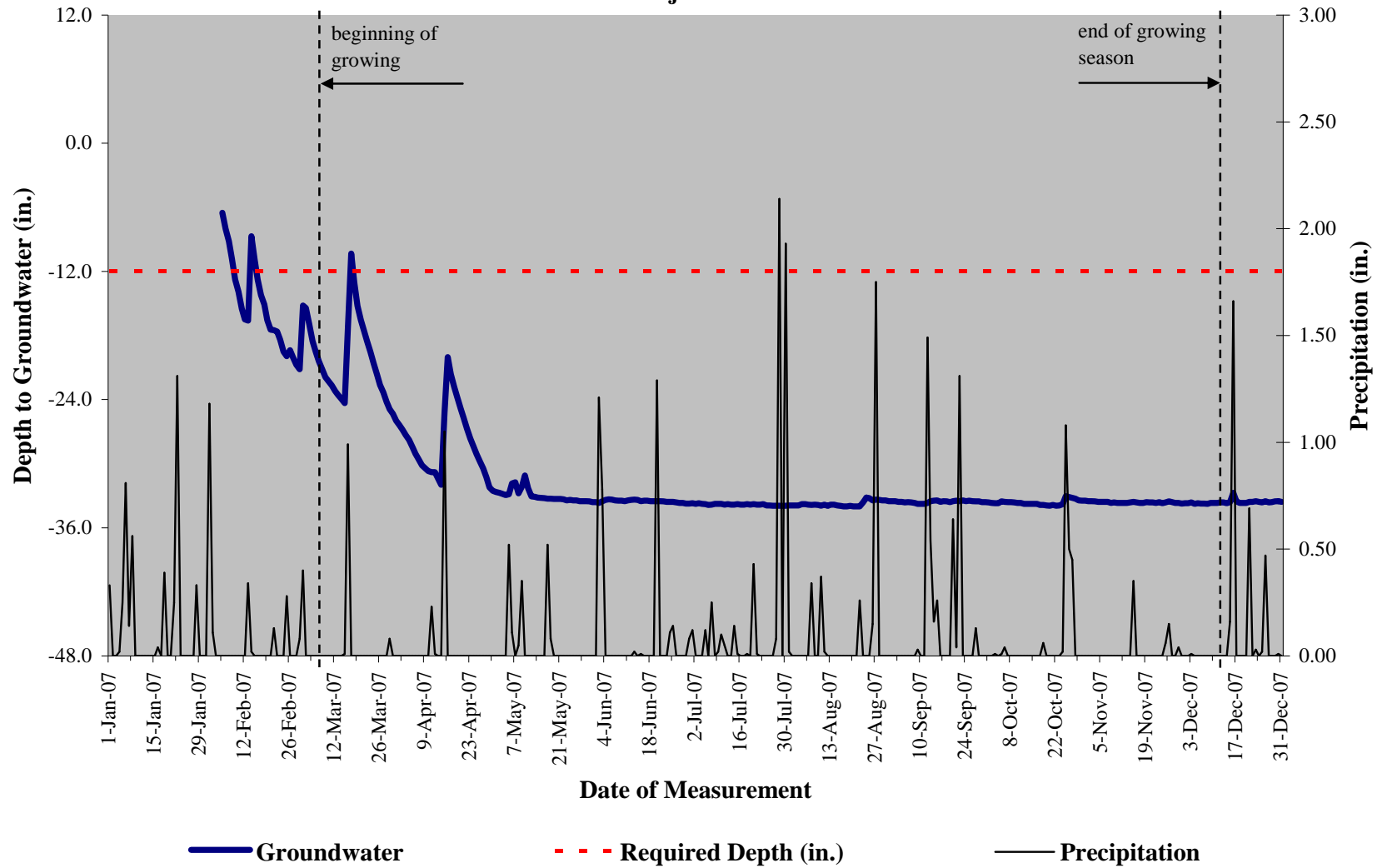
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Project Site**



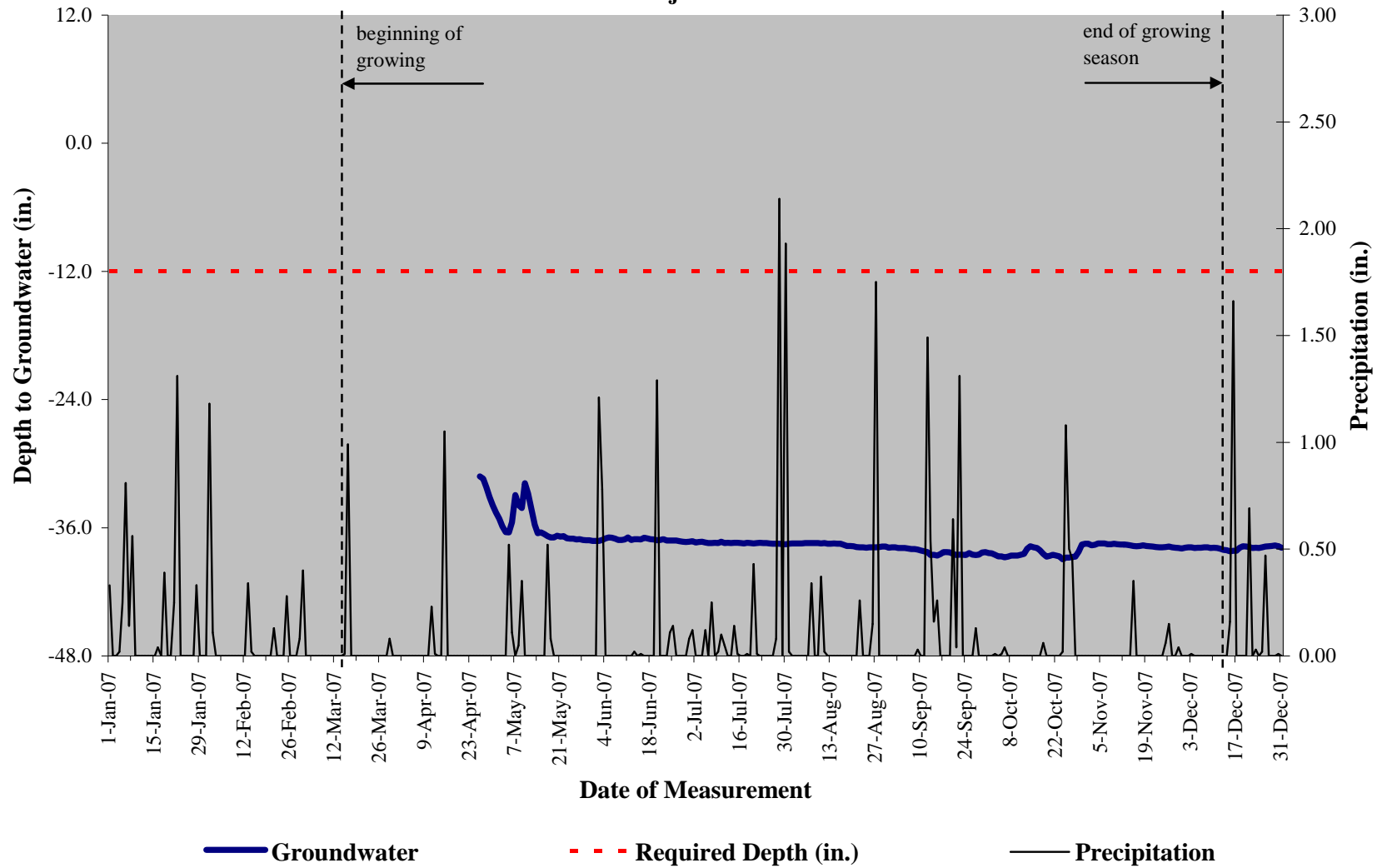
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Gauge G-6 (Serial No. EBD5020)
Project Site**



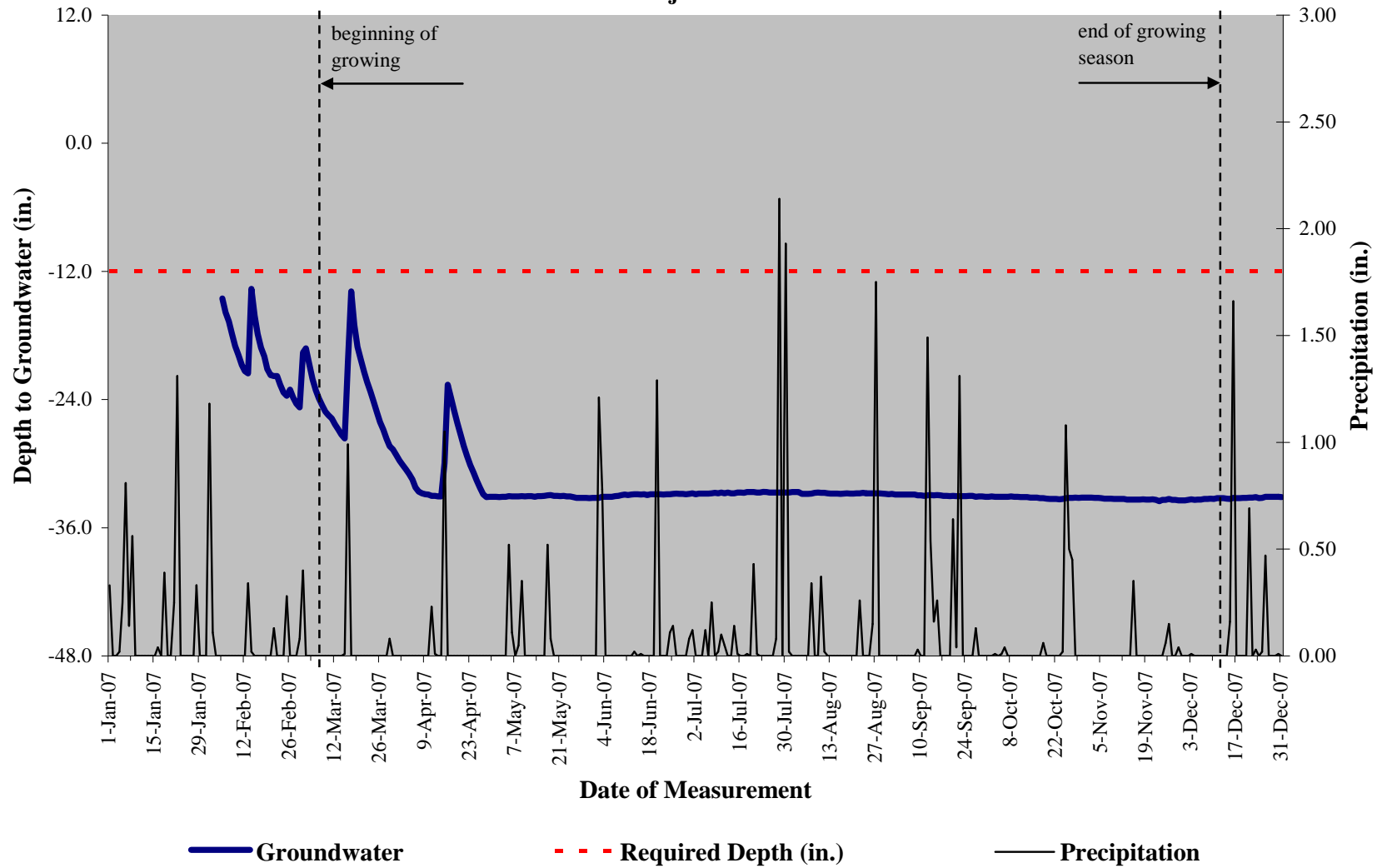
**Plum Creek Wetland Mitigation
Gauge G-7 (Serial No. EBD3BBC)
Project Site**



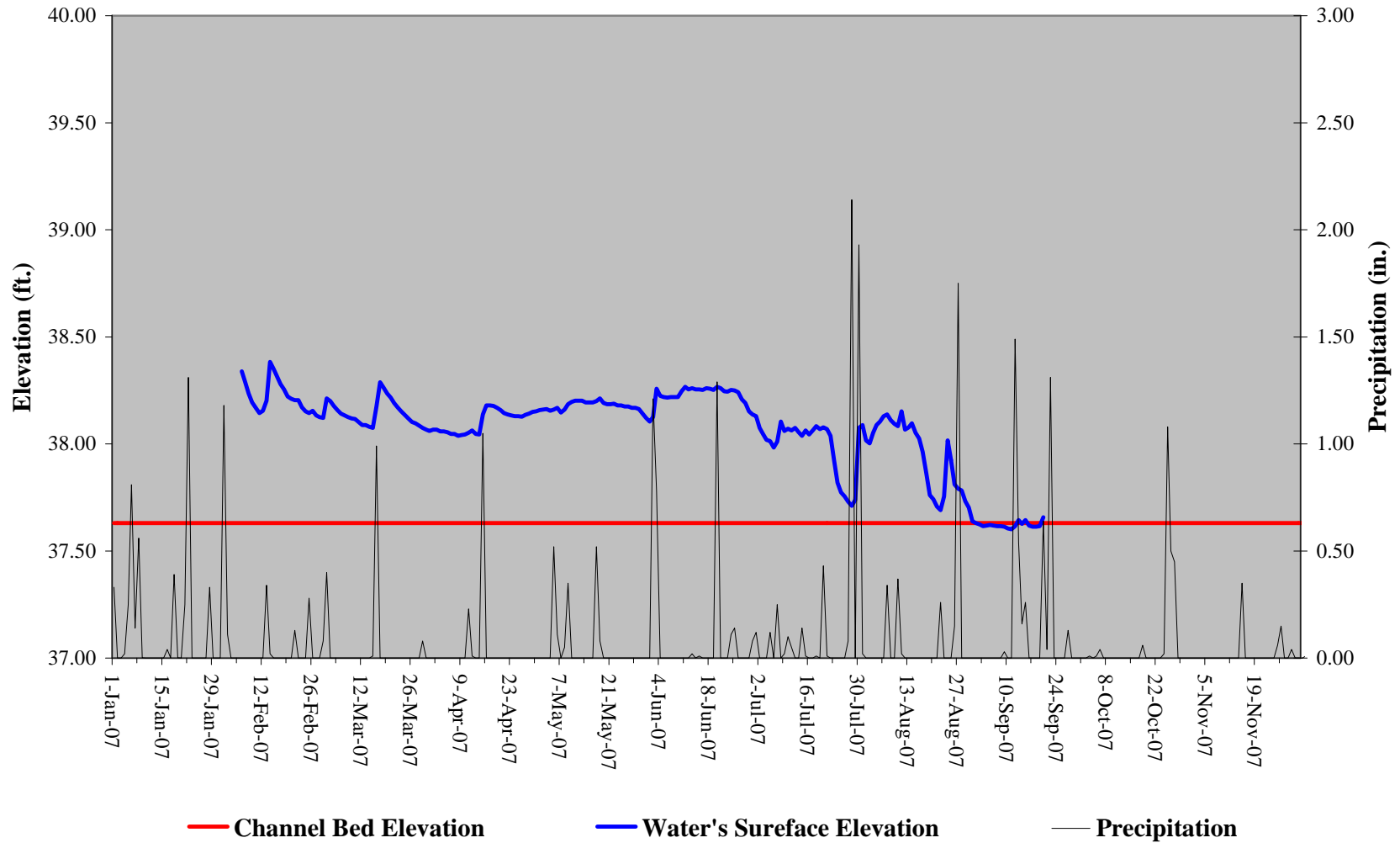
**Plum Creek Wetland Mitigation
Gauge G-8 (Serial No. EBDC54A)
Project Site**



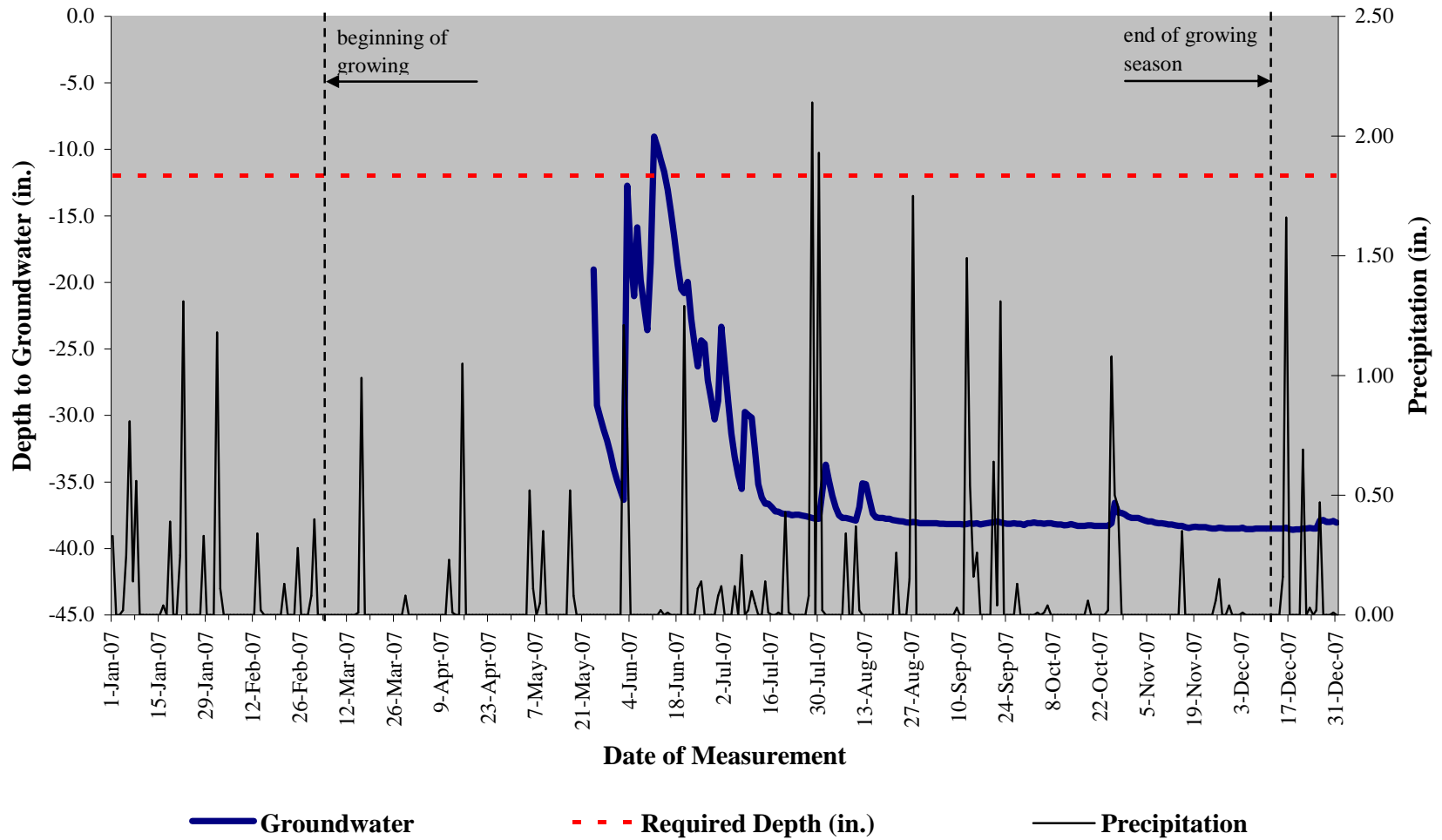
**Plum Creek Wetland Mitigation
Gauge G-9 (Serial No. EBD64BE)
Project Site**



**Plum Creek Mitigation Site
Stream Gauge SG-1 (Serial No.EBD2A12)**



**Plum Creek Wetland Mitigation
Gauge G-11 (Serial No. 9DE6C99)
Reference Site**



APPENDIX 8
HEC-RAS ANALYSIS

NA (No Streams)

There are no streams associated with this project, wetland restoration only.

APPENDIX 9
EEP FLOODPLAIN REQUIREMENTS 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. Edward Curtis), NC Floodplain Mapping Unit (attn. John Gerber) and NC Ecosystem Enhancement Program.

Project Location

Name of project:	Plum Creek Wetland Restoration
Name if stream or feature:	Un-named wetland
County:	Brunswick
Name of river basin:	Lumber River
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Brunswick County
DFIRM panel number for entire site:	37019C
Consultant name:	The Louis Berger Group, Inc.
Phone number:	919-866-4400
Address:	1001 Wade Avenue, Suite 400 Raleigh, NC 27605

Design Information

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

The Louis Berger Group, Inc. (Berger) proposes to design and construct a minimum of 80 acres of nonriverine wetland restoration and 6 acres of Level 1 enhancement (2.5 to 1 ratio) on the 89-acre Plum Creek Wetland Restoration site located in Brunswick County in the Lumber River Basin, USGS Hydrologic Unit 03040207. The wetland restoration will be accomplished by the installation of soil plugs in two lateral ditches that currently drain the site and installation of native forest tree species. No stream channels were identified on site and no streams will be affected by this work.

Wetland	Acres	Priority
Area 1	80	Restoration
Area 2	6	Enhancement

Floodplain Information

Is project located in a Special Flood Hazard Area (SFHA)? <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If project is located in a SFHA, check how it was determined: <input type="checkbox"/> Redelineation <input type="checkbox"/> Detailed Study <input type="checkbox"/> Limited Detail Study <input type="checkbox"/> Approximate Study <input type="checkbox"/> Don't know
List flood zone designation: X
Check if applies: <input checked="" type="checkbox"/> AE Zone <input checked="" type="checkbox"/> Floodway <input checked="" type="checkbox"/> Non-Encroachment <input checked="" type="checkbox"/> None <input type="checkbox"/> A Zone

<input checked="" type="checkbox"/> Local Setbacks Required <input checked="" type="checkbox"/> No Local Setbacks Required
<p>If local setbacks are required, list how many feet:</p>
<p>Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks?</p> <p><input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
<p>Land Acquisition (Check)</p> <p><input type="checkbox"/> State owned (fee simple)</p> <p><input checked="" type="checkbox"/> Conservation easment (Design Bid Build)</p> <p><input type="checkbox"/> Conservation Easement (Full Delivery Project)</p> <p>Note: if the project property is state-owned, then all requirements should be addressed to the Department of Administration, State Construction Office (attn: Herbert Neily, (919) 807-4101)</p>
<p>Is community/county participating in the NFIP program?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Note: if community is not participating, then all requirements should be addressed to NFIP (attn: Edward Curtis, (919) 715-8000 x369)</p>
<p>Name of Local Floodplain Administrator: Mr. Delaney Aycock Phone Number: (910) – 253-2041</p>

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:

Name: _____ Signature: _____

Title: _____ Date: _____

APPENDIX 10
AGENCY CORRESPONDENCE



North Carolina Department of Cultural Resources
State Historic Preservation Office

Peter B. Sandbeck, Administrator

Office of Archives and History
Division of Historical Resources
David Brook, Director

Michael F. Easley, Governor
Lisbeth C. Evans, Secretary
Jeffrey J. Crow, Deputy Secretary

January 31, 2007

Eric Voigt
The Louis Berger Group
1513 Walnut Street, Suite 250
Cary, NC 27511

Re: Plum Creek Stream and Wetland Restoration, Brunswick County, ER 07-0115

Dear Mr. Voigt:

Thank you for your letter of January 9, 2007, concerning the above project.

We have conducted a review of the proposed undertaking and are aware of no historic resources that would be affected by the project. Therefore, we have no comment on the undertaking as proposed.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919/733-4763, ext. 246. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Peter B. Sandbeck
Peter Sandbeck *12/21/07*

ADMINISTRATION
RESTORATION
SURVEY & PLANNING

Location
507 N. Blount Street, Raleigh NC
515 N. Blount Street, Raleigh NC
515 N. Blount Street, Raleigh, NC

Mailing Address
4617 Mail Service Center, Raleigh NC 27699-4617
4617 Mail Service Center, Raleigh NC 27699-4617
4617 Mail Service Center, Raleigh NC 27699-4617

Telephone/Fax
(919)733-4763/733-8653
(919)733-6547/715-4801
(919)733-6545/715-4801

Two shovel tests were excavated near the northeastern and southwestern corners of the APE (Figure 3). A third shovel test was attempted near the center of the tract but could not be completed due to the high water table and disturbed character of the mounded soils. The shovel tests revealed leached and water saturated soils to a depth from 28-30 inches (70-75 centimeters) below ground surface (bgs). A typical shovel test profile consisted of three strata: Stratum A, a black (10YR 2/1) sandy loam extending from 0-12 inches (0-30 centimeters) bgs; Stratum B, a gray (10YR 5/1) sandy loam extending from 12-20 inches (30-50 centimeters) bgs; and Stratum C, a black (10YR 2/1) sandy loam extending from 20-30 (50-75 centimeters) bgs. The water table was encountered at the bottom of each shovel test.

Conclusions

No isolated artifacts, archaeological sites, or cultural deposits were identified within the APE. Due to the poorly drained and disturbed character of soils, no further cultural resources investigation is recommended. If you have any questions or comments regarding this assessment, please feel free to contact me or Mr. Lee Tippett at (919) 467-3885 x23.

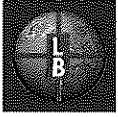
Sincerely yours,

THE LOUIS BERGER GROUP, INC.

A handwritten signature in cursive script that reads "Eric Voigt" followed by "for" and a signature that appears to be "Lee Tippett".

Eric Voigt
Assistant Director/Senior Archaeologist, Cultural Resources

cc: File XE3836
Mr. Michael O'Rourke
G:\A-JM-PROJECTS\Projects\XE3836PlumCreek\PlumCreek-Letterrep-Jan07.doc



THE Louis Berger Group, INC.

1513 Walnut Street, Suite 250, Cary, North Carolina 27511
Tel 919 467 3885 Fax 919 467 9458 www.louisberger.com

North Carolina Division of Coastal Management
Wilmington District
127 Cardinal Drive Ext.
Wilmington, NC 28405-3845
Attn: Jim Gregson, District Manager
Subject: Plum Creek Restoration Project

November 20, 2006

Dear Mr. Gregson:

On behalf of the North Carolina Ecosystems Enhancement Program (EEP), The Louis Berger Group, Inc. (Berger) is proposing to create a wetland mitigation site in Brunswick County, NC. The site is located near Green Swamp Game Land and US Hwy 17, north of Galloway Rd. (*Figure 1*). Proposed actions include strategic plugging of silvicultural drainage ditches, the restoration of 88 acres of forested wetland and native vegetation planting. Restoration goals for this site include the restoration of valuable wildlife habitats. Since this activity is considered a ground disturbing activity within a CAMA county; the EEP is requesting the DCM's comments regarding this proposed project. Sites requiring a CAMA Permit typically meet the following criteria:

- in or on navigable waters within the 20 CAMA counties;
- on a marsh or wetland;
- within 75 feet of the mean high water line along an estuarine shoreline;
- near the ocean beach;
- near an inlet;
- within 30 feet of the normal high water level of areas designated as inland fishing waters by the N.C. Marine Fisheries Commission;
- near a public water supply.

Based on these criteria; Berger believes that this site would not require a CAMA permit and that the proposed activities are consistent with the NC Coastal Management Program. Your comments and coordination concerning this project are valuable and appreciated.

Sincerely,

Michael O'Rourke
Louis Berger Group, Inc.
Sr. Environmental Scientist

cc: Ed Samanns (Berger)



North Carolina Department of Environment and Natural Resources

Michael F. Easley, Governor

William G. Ross Jr., Secretary

November 28, 2006

Mr. Michael O'Rourke
Louis Berger Group, Inc.
1513 Walnut Street, Suite 250
Cary, NC 27511

Subject: EEP Wetland Mitigation Project; Beaverdam Bay area south of Green Swamp Game Lands,
Brunswick County

Dear Mr. O'Rourke:

The Natural Heritage Program has no record of rare species, significant natural communities, or significant natural heritage areas at the site. Roughly 0.3 mile to the northwest is the Green Swamp Preserve, a nationally significant natural area owned by The Nature Conservancy. About 0.1 mile to the north of the tract is the southern boundary of the Green Swamp natural area, but this portion is not in protected ownership. We have no records of rare species within at least 0.5 mile of the project area.

NC OneMap now provides digital Natural Heritage data online for free. This service provides site specific information on GIS layers with Natural Heritage Program rare species occurrences and Significant Natural Heritage Areas. The NC OneMap website provides Element Occurrence (EO) ID numbers (instead of species name), and the data user is then encouraged to contact the Natural Heritage Program for detailed information. This service allows the user to quickly and efficiently get site specific NHP data without visiting the NHP workroom or waiting for the Information Request to be answered by NHP staff. For more information about data formats and access, visit <www.nconemap.com/data.html>, or email NC OneMap at <david.giordano@ncmail.net>.

Please do not hesitate to contact me at 919-715-8697 if you have questions or need further information.

Sincerely,

Harry E. LeGrand, Jr., Zoologist
Natural Heritage Program




◻ North Carolina Wildlife Resources Commission ◻

Richard B. Hamilton, Executive Director

MEMORANDUM

To: Michael O'Rourke
The Louis Berger Group, Inc.
1513 Walnut St., Ste. 250
Cary, NC 27511
morourke@louisberger.com

From: Steven H. Everhart, PhD 
Southeastern Permit Coordinator
Habitat Conservation Program
127 Cardinal Drive
Wilmington, NC 28405
steve.everhart@ncwildlife.org

Date: December 5, 2006

RE: Plum Creek Wetland Restoration Site, Brunswick County

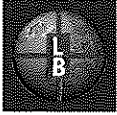
Biologists with the North Carolina Wildlife Resources Commission (NCWRC) have reviewed the subject project for impacts to wildlife and fishery resources. Our comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et. seq.), and Sections 401 and 404 of the Clean Water Act (as amended).

The project is located northwest of US 17, south of the NCWRC Green Swamp Gamelands. A letter and vicinity map was submitted for review of threatened or endangered species impacts associated with the project.

The applicant proposes to restore 80+ acres of wet pine flatwood community. The mitigation site will be protected through a perpetual conservation easement and satisfy needs for the NC Ecosystem Enhancement Program (EEP).

There do not appear to be any threatened or endangered species that may be impacted by the project. Significant habitat types identified by the Natural Heritage Program in the vicinity include pine savanna, wet pine flatwoods, and small depression ponds.

The Wildlife Resources Commission does not object to this project as proposed. Thank you for the opportunity to review and comment. If you have any questions or require additional information regarding these comments, please call me at (910) 796-7217.



THE Louis Berger Group, INC.

1513 Walnut Street, Suite 250, Cary, North Carolina 27511
Tel 919 467 3885 Fax 919 467 9458 www.louisberger.com

Dale Suiter
US Fish and Wildlife Service
Raleigh Field Office
P.O. Box 33726
Raleigh, NC 27636

November 20, 2006

Subject: EEP Wetland Restoration Project in Brunswick County.

Dear Mr. Suiter,

The Plum Creek site has been identified for the purpose of providing in-kind mitigation for unavoidable wetland impacts. The 88-acre site is a silvicultural property that has been subject to extensive ditching and forest clearing in the past. The drainage ways on-site have been altered and degraded. Underlain by hydric soils, the site offers the potential to improve water quality and restore non-riverine wetland ultimately restoring over 80 acres to a wet pine flatwood community.

We have already obtained an updated species list for Brunswick County from your web site (<http://nc-es.fws.gov/es/countyfr.html>). The threatened or endangered species for this county are:

American alligator	<i>Alligator mississippiensis</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Eastern puma	<i>Puma concolor cougar</i>
Green sea turtle	<i>Chelonia mydas</i> (incl. <i>agassizi</i>)
Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>
Leatherback sea turtle	<i>Dermochelys coriacea</i>
Loggerhead sea turtle	<i>Caretta caretta</i>
Piping plover	<i>Charadrius melodus</i>
Red cockaded woodpecker	<i>Picoides borealis</i>
Shortnose sturgeon	<i>Acipenser brevirostrum</i>
West indian manatee	<i>Trichechus manatus</i>
Wood stork	<i>Mycteria Americana</i>
Cooley's meadowrue	<i>Thalictrum cooleyi</i>
Rough leafed loosestrife	<i>Lysimachia asperulaefolia</i>
Sea Beach amaranth	<i>Amaranthus pumilus</i>

We are requesting that you please provide any known information for each freshwater species in the county. The USFWS will be contacted if suitable habitat for any listed species is found or if we determine that the project may affect one or more federally listed species or designated critical habitat.

Please provide comments on any possible issues that might emerge with respect to endangered species, migratory birds or other trust resources from the construction of a wetland and/or stream restoration project on the subject property. A USGS map showing the approximate property lines and areas of potential ground disturbance is enclosed.

If we have not heard from you in 30 days we will assume that our species list is correct, that you do not have any comments regarding associated laws, and that you do not have any information relevant to this project at the current time.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,



Michael O'Rourke
Louis Berger Group

cc: Ed Samanns

BY E-MAIL

RECEIVED BY RAY BODE 2/13/2007

Thanks for sending this over for my review. Other than the minor comments that we discussed over the phone, I don't have any objections to the wording that you have proposed for the CE. I believe that we can concur with your determination of May Affect, Not Likely to Adversely Affect for rough-leaf loosestrife and Cooley's meadowrue.

Let me know if you have any questions.

Dale Suiter
Endangered Species Biologist
U.S. Fish and Wildlife Service
P.O. Box 33726
Raleigh, NC 27636-3726

phone - 919-856-4520 ext. 18
fax - 919-856-4556
email - Dale_Suiter@fws.gov

"Bode, Raymond"
<rbode@louisberger.com>

To

<dale_suiter@fws.gov>

02/13/2007 02:14

cc

PM

Subject

CE text for your review

Dale

As we discussed, this is an excerpt from a CE for a wetland restoration site in Brunswick County. Appropriate habitat for rough-leaf loosestrife and Cooley's meadowrue was found on the site, but not during flowering season. Survey for these species has not been conducted at this point. We plan to submit the CE for this site as soon as possible and want to make sure that the text for these species is worded correctly before submittal.

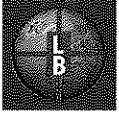
Attached is the text we discussed on the phone. I inserted some background project information as well. Any comments will be welcome, feel free to give me a call or email.

Thanks very much for your help with this.

Ray Bode

Louis Berger Group, Inc.
1513 Walnut Street, Suite 250
Cary, NC 27511
919.467.3885 ext 15
Fax (919) 467-9458

(See attached file: text for usfws review.doc)



THE Louis Berger Group, INC.

1513 Walnut Street, Suite 250, Cary, North Carolina 27511
Tel 919 467 3885 Fax 919 467 9458 www.louisberger.com

Bill Bailey
Brunswick County NRCS
Soil Survey Office
128 E. Water St., Ste. 202
Plymouth, NC 27962

Subject: Plum Creek Wetland Restoration Project, Lumber River Basin 03040207

Dear Mr. Bailey,

On behalf of the North Carolina Ecosystems Enhancement Program (EEP), The Louis Berger Group, Inc. (Berger) is proposing to use an approximately 88 acre tract including a portion of Don Small's property (herein referred to as site) as a stream mitigation area. The site is located near Green Swamp Game Land and US Hwy 17, north of Galloway Rd. (**Figure 1**). Proposed actions include strategic plugging of silvicultural drainage ditches, the restoration of 88 acres of forested wetland and native vegetation planting. Restoration goals for this site include the restoration of valuable wildlife habitats.

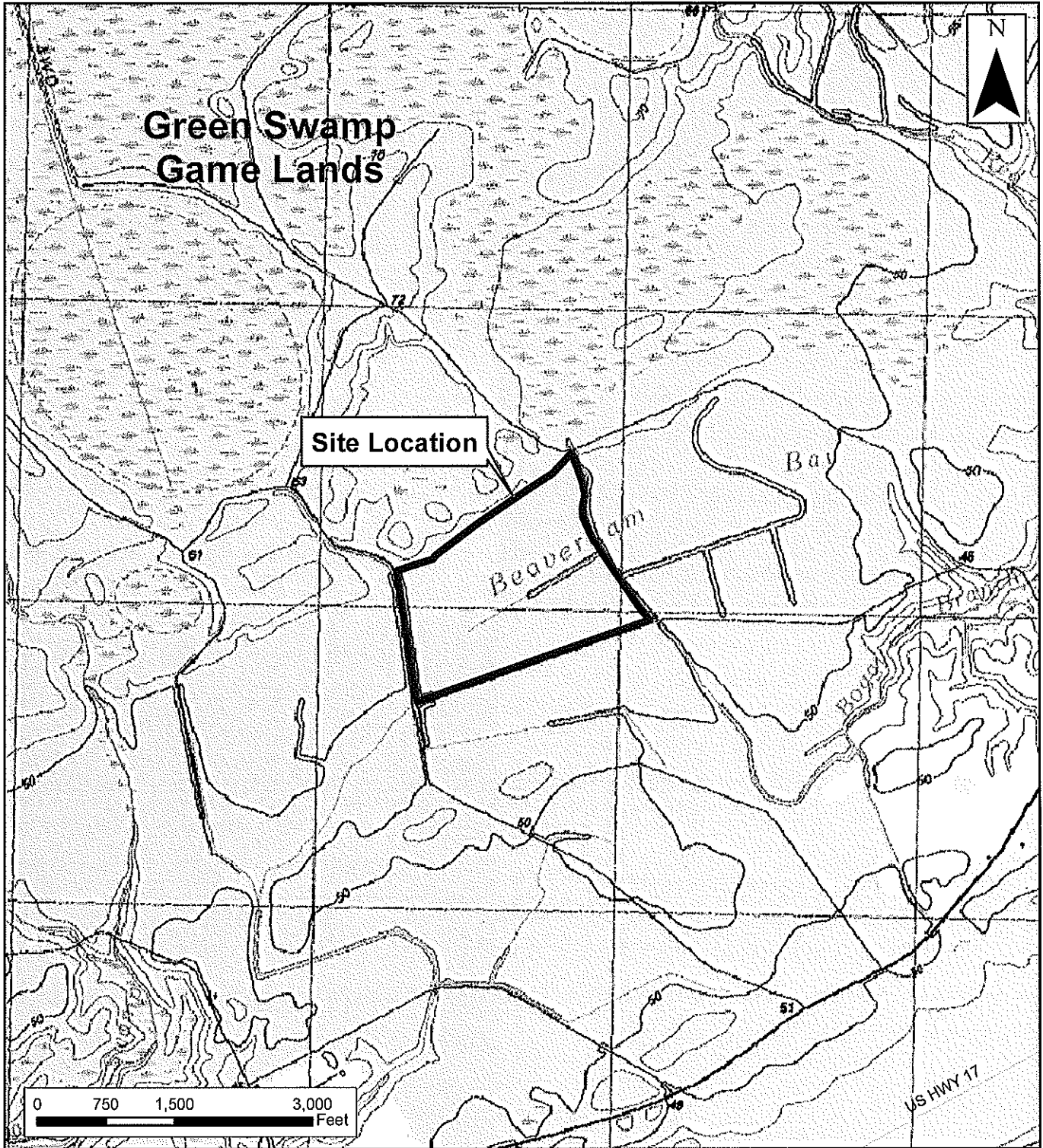
In order to comply with the Farmland Protection Policy Act (FPPA), the EEP requests your coordination concerning the existence of three prime farmland soil units onsite: Pantego Mucky Loam, Rains Fine Sandy Loam, and Torhunta Mucky Fine Sandy Loam, and Leon Fine Sand which is a farmland soil of unique importance. **Figure 2** shows soils onsite and indicates the approximate amounts of each of the four soils series/map units.

The proposed action to the site would remove the drainage, thereby converting these soils to non-prime. Additionally, the proposed actions mandate a perpetual conservation easement, taking the land out of agricultural use permanently. Please review the attached AD-1006 form in addition to **Figure 1 and 2**. If you have any questions or comments regarding this project please contact me by phone at (919) 467-3885 ext.27, or e-mail (morourke@louisberger.com)

Sincerely,
THE LOUIS BERGER GROUP, INC.

Michael O'Rourke
Sr. Environmental Scientist

cc: Ed Samanns



Legend

 Site Boundary

SOURCE:
Base Mapping - USGS Topographic Map.

**PLUM CREEK
WETLAND RESTORATION SITE**

USGS Topographic Map


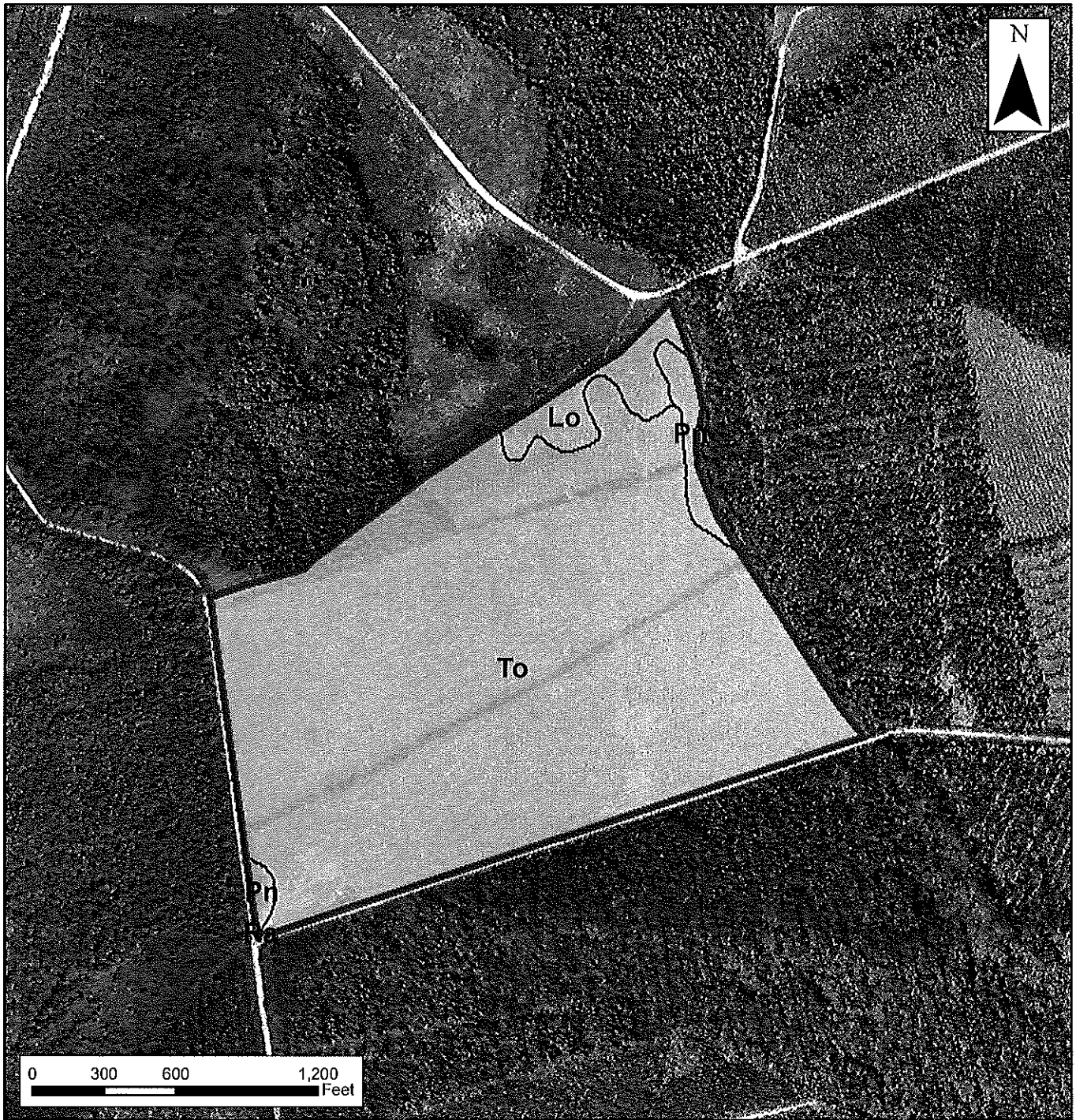


 THE LOUIS BERGER GROUP
1513 Walnut Street, Suite 250
Cary, NC 27511


FIGURE 4
March 2006



Legend

-  Site Boundary
-  Hydric A Soil
- Lo Leon Fine Sand, 0 To 2 Percent Slopes
- Pn Pantego Mucky Loam
- Ra Rains Fine Sandy Loam
- To Torhunta Mucky Fine Sandy Loam

Sources:
 Base Mapping - Brunswick County, NC 2004.
 Soils Data - USDA, NRCS SSURGO Database, Brunswick County, NC.

PLUM CREEK WETLAND RESTORATION SITE	
NRCS Soils Map	
 THE LOUIS BERGER GROUP 1513 Walnut Street, Suite 250 Cary, NC 27511	FIGURE 6 March 2006

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I (To be completed by Federal Agency)		Date Of Land Evaluation Request	
Name Of Project	Plum Creek Wetland Restoration		
Proposed Land Use	Federal Agency Involved	Federal Highway Administration	
	County And State	Brunswick County, NC	

PART II (To be completed by NRCS)		Date Request Received By NRCS	
Does the site contain prime, unique, statewide or local important farmland? (If no, the FPPA does not apply -- do not complete additional parts of this form).		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Acres Irrigated	Average Farm Size		
0	152		
Major Crop(s)	Farmable Land In Govt. Jurisdiction	Amount Of Farmland As Defined In FPPA	
CORN	Acres: 303,638 % 55.1	Acres: 245,728 % 44.6	
Name Of Land Evaluation System Used	Name Of Local Site Assessment System	Date Land Evaluation Returned By NRCS	
Brunswick LE	NONE		

PART III (To be completed by Federal Agency)	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	80			
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	88	0.0	0.0	0.0

PART IV (To be completed by NRCS) Land Evaluation Information	Site A	Site B	Site C	Site D
A. Total Acres Prime And Unique Farmland	43			
B. Total Acres Statewide And Local Important Farmland	0			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	4.01			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	29.2			

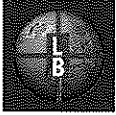
PART V (To be completed by NRCS) Land Evaluation Criterion	Site A	Site B	Site C	Site D
Relative Value Of Farmland To Be Converted (Scale of 0 to 100 Points)	47.7	0	0	0

PART VI (To be completed by Federal Agency)	Maximum Points	Site A	Site B	Site C	Site D
Site Assessment Criteria (These criteria are explained in 7 CFR 658.5(b))					
1. Area In Nonurban Use	15				
2. Perimeter In Nonurban Use	10				
3. Percent Of Site Being Farmed	20				
4. Protection Provided By State And Local Government	0				
5. Distance From Urban Builtup Area	15				
6. Distance To Urban Support Services	15				
7. Size Of Present Farm Unit Compared To Average	2				
8. Creation Of Nonfarmable Farmland	0				
9. Availability Of Farm Support Services	5				
10. On-Farm Investments	1				
11. Effects Of Conversion On Farm Support Services	0				
12. Compatibility With Existing Agricultural Use	0				
TOTAL SITE ASSESSMENT POINTS	83/160	0	0	0	

PART VII (To be completed by Federal Agency)	Maximum Points	Site A	Site B	Site C	Site D
Relative Value Of Farmland (From Part V)	100	0	0	0	
Total Site Assessment (From Part VI above or a local site assessment)	160	0	0	0	
TOTAL POINTS (Total of above 2 lines)	260	0	0	0	

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
----------------	-------------------	--

Reason For Selection:



THE Louis Berger Group, INC.

1513 Walnut Street, Suite 250, Cary, North Carolina 27511
Tel 919 467 3885 Fax 919 467 9458 www.louisberger.com

Ron Sechler
NOAA-Fisheries
Beaufort Field Office
101 Pivers Island Road
Beaufort, NC 28516

Subject: EEP Wetland Mitigation Project in Brunswick County.

Dear Mr. Sechler,

The purpose of this letter is to request review and comment on any possible issues that might emerge with respect to endangered species and essential fish habitat issues associated with a potential wetland and stream restoration project on the attached site (USGS site maps with approximate property lines and areas of potential ground disturbance are enclosed).

The Plum Creek site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts. The 88-acre site is a silvicultural property that has been subject to extensive ditching and forest clearing in the past. The drainage ways on-site have been altered and degraded. Underlain by hydric soils, the site offers the potential to improve water quality and restore non-riverine wetland ultimately restoring over 80 acres to a wet pine flatwood community.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Michael O'Rourke
Louis Berger Group

cc: Ed Samanns



THE LOUIS BERGER GROUP, INC.

1001 Wade Ave. Raleigh, North Carolina 27605
Tel (919) 866-4400 Fax (919) 755-3502 www.louisberger.com

April 8, 2008

MEMO

Re: Jurisdictional Determination – Wetland Boundary Verification

On April 8, 2008, Liz Hair (US Army Corps of Engineers, Wilmington) met with Ray Bode (Louis Berger Group, Raleigh) to tour the Plum Creek wetland restoration site near Shallotte in Brunswick County, North Carolina.

Berger had identified and delineated a six acre wetland area located at the north east of the property. Ms. Hair viewed the delineated wetland and verified that the boundary was accurate as surveyed. This wetland abuts the RPW that runs north to south located on the east side of the site.

Ms. Hair and Mr. Bode viewed the two ditches that run west to east through the site and drain to the RPW located on the east side. Ms. Hair determined these two features were "jurisdictional tributaries" based on the presence of an Ordinary High Water Mark (OHWM), but not stream channels.

Ms. Hair indicated that plugging these ditches as called for in the current restoration plans will not require a USACE permit.

At the conclusion of the meeting, Mr. Bode agreed to revise and submit Rapanos forms to show the jurisdictional status of the tributaries per the decisions made at the site during this meeting.

From: Hair, Sarah E SAW [mailto:Sarah.E.Hair@saw02.usace.army.mil]
Sent: Monday, June 16, 2008 3:41 PM
To: Bode, Raymond
Subject: RE: Plum Creek wetland restoration site - Brunswick County

Ray,

The SAW Action ID# for the Plum Creek project is [2008-01905](#).

Take Care,

Liz Hair

USACE-RG Wilmington Field Office
Regulatory Specialist
(910) 251-4469 office
(910) 251-4025 fax
sarah.e.hair@usace.army.mil

From: Bode, Raymond [mailto:rbode@louisberger.com]
Sent: Monday, June 16, 2008 3:13 PM
To: Hair, Sarah E SAW
Subject: RE: Plum Creek wetland restoration site - Brunswick County

Ok thanks. I'll get the PCN in with the request for the NWP27 as soon as possible. I don't have the Action ID for the site, though. Would you mind forwarding that when you get a chance?

Thanks

Ray Bode, PWS

From: Hair, Sarah E SAW [mailto:Sarah.E.Hair@saw02.usace.army.mil]
Sent: Monday, June 16, 2008 10:53 AM
To: Bode, Raymond
Subject: RE: Plum Creek wetland restoration site - Brunswick County

Ray,

Sorry for the delay. I've been out of the office on and off for the past two months (trying to stay on top of things).

--As far as JD status goes for the Plum Creek site according to my field notes and the email below, I am waiting for you to submit the NWP 27.

--I was going to do the JD and the NWP together since this is not a stand-alone JD.

--If you want the JD first, I can issue a tearsheet no problem; but I do need a sealed survey (11x17 (3) and one full size) with the JD areas clearly identified and Corps signature block. I looked through our email correspondence and the file to ensure that I hadn't missed it somehow. No luck...

As soon as I have the survey I can sign it and issue the tearsheet.

Thanks for your patience!

From: Hair, Sarah E SAW [mailto:Sarah.E.Hair@saw02.usace.army.mil]
Sent: Tuesday, April 29, 2008 9:54 AM
To: Bode, Raymond
Subject: RE: Plum Creek Wetland Restoration Site

Ray,

Thank you for the additional informational for the Plum Creek site. A USACE permit will not be required for the ditch plug(s) since the project as proposed is wetland restoration and will fall under NWP 27.

Thanks again and please feel free to contact me with any additional questions.

Liz Hair

USACE-RG Wilmington Field Office

Regulatory Specialist

(910) 251-4469 office

(910) 251-4025 fax

sarah.e.hair@usace.army.mil

APPENDIX 11
CONSERVATION EASEMENT ENROLLMENT
DOCUMENTATION AND PROPERTY BOUNDARY
SURVEY

STATE OF NORTH CAROLINA

**CONSERVATION EASEMENT
PROVIDED PURSUANT TO
FULL DELIVERY
MITIGATION CONTRACT**

BRUNSWICK COUNTY

SPO File Number

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 17th day of October, 2007, by The Louis Berger Group, Inc., ("**Grantor**"), whose mailing address is 1001 Wade Avenue, Raleigh, NC 27605, 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 (The Louis Berger Group, Inc. 1001 Wade Avenue, Raleigh, NC 27605), 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 **D06040-A**.

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 Lockwood Folly Township, Brunswick County, North Carolina (the "**Property**"), and being more particularly described as that certain parcel of land containing approximately 89.4 acres and being conveyed to the Grantor by deed as recorded in **Deed Book (Map Cabinet) 44 at Page 31** of the Brunswick 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 **Boggy Branch**.

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 of the nature and character and to the extent hereinafter set forth, over a described area of the Property, referred to hereafter as the "**Easement Area**", for the benefit of the people of North Carolina, and being all of the tract of land as identified as **Tract 1A** as shown on a plat of survey entitled "**Exempt Subdivision Plat, Property of Plum Creek Timberlands, LP**" dated **October 3, 2007**,

certified by **Richard L. Morrison, P.L.S.**, and recorded in **Map Cabinet 44, Page 31, Brunswick County Registry. Tract 1A** being more particularly described as follows:

[Exempt Subdivision Plat, Property of Plum Creek Timberlands, LP - attached]

The purposes of this Conservation Easement are to maintain, restore, enhance, 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

This Conservation Easement shall be perpetual. It is an easement in gross, runs with the land, and is enforceable by Grantee against Grantor, their personal representatives, heirs, successors, and assigns, lessees, agents, and licensees.

II. GRANTOR RESERVED USES AND RESTRICTED ACTIVITIES

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

B. 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.

C. Vegetative Cutting. Except as related to the removal of non-native plants, diseased or damaged trees, and vegetation that obstructs, destabilizes or renders unsafe the 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.

D. Industrial, Residential and Commercial Uses. All are prohibited in the Easement Area.

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

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

G. Roads and Trails. There shall be no construction of roads, trails, walkways, or paving in the Easement Area. Existing roads or trails located in the Easement Area may be maintained by Grantor in order to minimize runoff, sedimentation and for access to the interior of the Property for management, maintenance, stewardship purposes, or undeveloped recreational and educational uses of the Easement Area. Existing roads, trails or paths may be maintained with loose gravel or permanent vegetation to stabilize or cover the surfaces.

H. 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 may be allowed.

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

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

K. 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. No altering or tampering with water control structures or devices, or disruption or alteration of the restored, enhanced, or created drainage patterns. All removal of wetlands, polluting or discharging into waters, springs, seeps, or wetlands, or use of pesticide or biocides 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.

L. Subdivision and Conveyance. Grantor voluntarily agrees that no subdivision, partitioning, or dividing of the underlying fee that is subject to this Easement is allowed. Unless agreed to by the Grantee in writing, any future conveyance of the underlying fee for the Easement Area and the rights as 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 ingress, egress, and regress over and across the Property to the Easement Area for the purposes set forth herein.

M. Development Rights. All development rights are removed from the Easement Area and shall not be transferred.

N. 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 consistent with the purposes of this Conservation Easement. The Grantor shall not vary from the above restrictions without first obtaining 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. Ingress, Egress, Regress and Inspection. The Grantee, its employees and agents, successors and assigns, receive the perpetual right of general ingress, egress, and regress to the Easement Area over the Property at reasonable times to undertake any activities to restore, manage, maintain, enhance, and monitor the wetland and riparian resources of 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.

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 subterranean water flow.

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 of the Easement Area that may have been damaged by such activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, their successors or assigns that comes to the attention of the Grantee the Grantee shall, except as provided below, notify the Grantor, their successors or assigns in writing of such breach. The Grantor shall have ninety (90) days after receipt of such notice to correct the conditions constituting such breach. If the breach remains uncured after ninety (90) days, the Grantee may enforce this Conservation Easement by appropriate legal proceedings

including damages, 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 of the term of this Conservation Easement is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement. The Grantor and Grantee acknowledge that under such circumstances damage to the Grantee would be irreparable and remedies at law will be 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, their successors or assigns are 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, their successors or assigns, 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, damage to property or harm to the Property resulting from such causes.

D. Costs of Enforcement. Beyond regular and typical monitoring, any costs incurred by Grantee in enforcing the terms of this Conservation Easement against Grantor, their successors or assigns, 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.

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

C. 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 to make any subsequent lease, deed, or other legal instrument by which any interest in the Property is conveyed subject to the Conservation Easement herein created.

D. 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.

E. This Conservation Easement may be amended, but only in a writing signed by all parties hereto, and provided 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.

F. 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

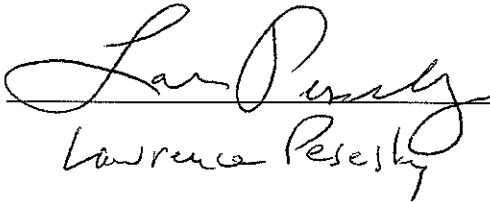
Grantor reserves all remaining rights accruing from ownership of the Property, including the right to engage in or permit or invite others to engage in only those uses of the Easement Area that are expressly reserved herein, not prohibited or restricted herein, and are not inconsistent with the purposes 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 are

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.

 (SEAL)
Lawrence Pesesky

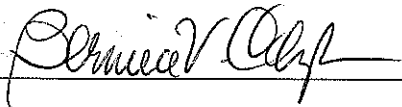
NEW JERSEY

COUNTY OF Essex

I, Bernice Calpo-Melee, a Notary Public in and for the County and State aforesaid, do hereby certify that Lawrence Pesesky, 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

17th day of October, 2007.



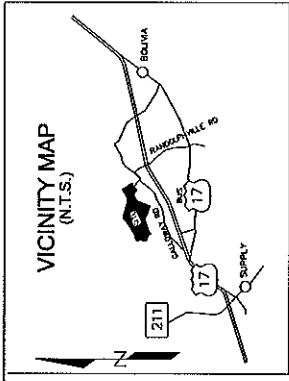
Notary Public

BERNICE V. CALPO-MELEE
NOTARY PUBLIC OF NEW JERSEY

My Commission Expires 06/20/2010 Print Name

My commission expires:

June 20, 2010



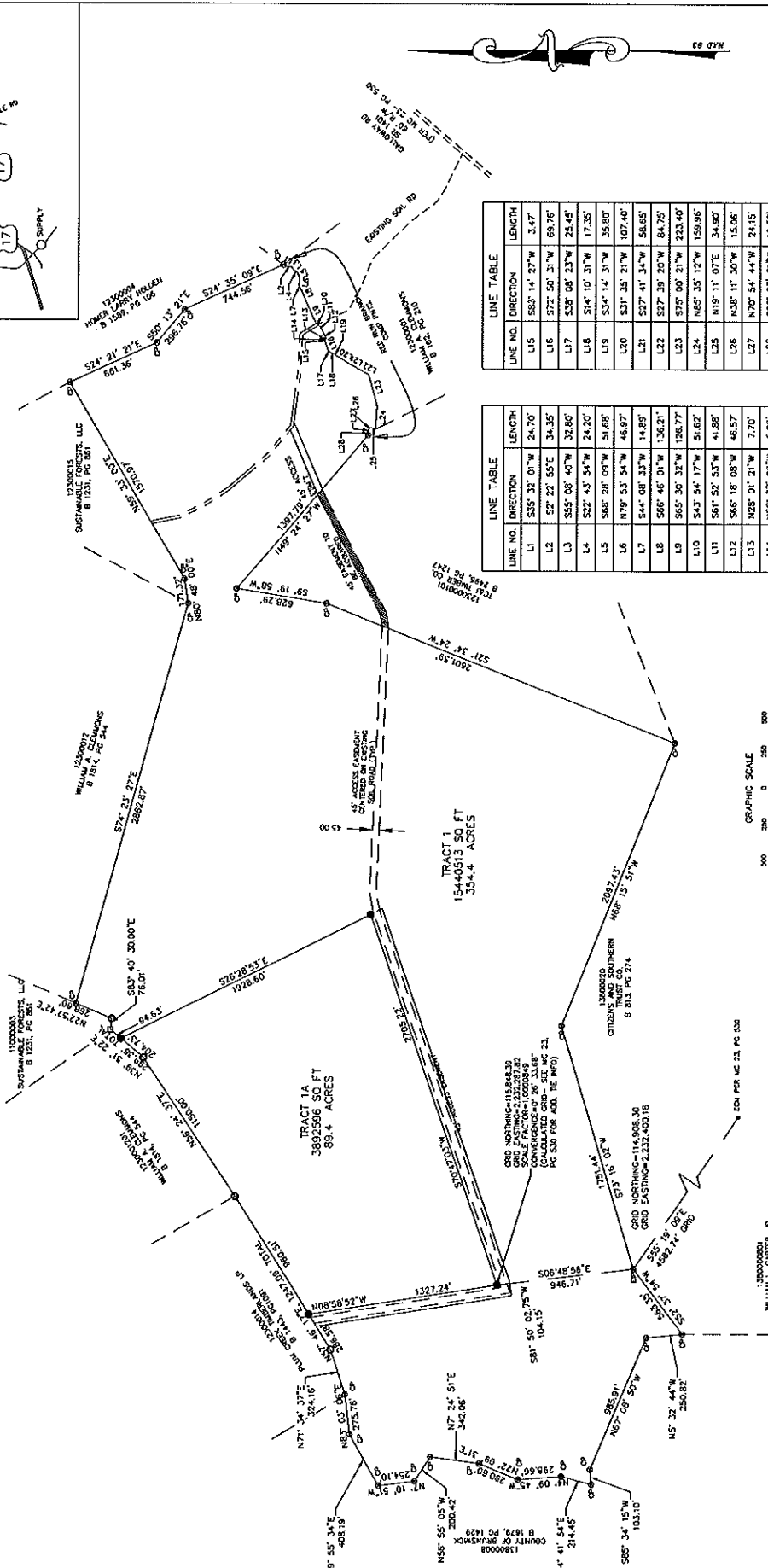
ZONING NOTES:
 CURRENT ZONING: RU (RURAL)
 MINIMUM YARD REQUIREMENTS:
 FRONT YARDS- 30'
 REAR YARDS- 50'
 SIDE YARDS- 20'

LEGEND
 EXISTING CONCRETE MONUMENT
 IRON ROD FOUND
 #5 REBAR SET
 COMPUTED POINT
 LINES NOT SURVEYED
 RIGHT OF WAY

R/W

TRACT 1 AREA (TOTAL PRIOR TO SUBDIVISION)
 19,333.110 SQ. FT./ 443.8 ACRES
 TRACT 1 AREA LESS TRACT 1A
 15,445.513 SQ. FT./ 354.4 ACRES
 TRACT 1A AREA
 3,887,596 SQ. FT./ 89.4 ACRES

RICHARD L. MORRISON, PLS L-3249
 THIS DAY OF _____ A.D., 2007.



LINE NO.	DIRECTION	LENGTH
L15	S83°14'27"W	3.47'
L16	S72°50'31"W	60.76'
L17	S38°08'23"W	25.45'
L18	S14°10'31"W	17.35'
L19	S34°14'31"W	35.80'
L20	S31°35'21"W	107.40'
L21	S27°41'34"W	58.65'
L22	S27°39'20"W	84.75'
L23	S75°00'21"W	223.40'
L24	N85°35'12"W	159.96'
L25	N19°11'07"E	34.80'
L26	N38°11'30"W	15.06'
L27	N70°54'44"W	24.15'
L28	S60°03'01"W	19.56'

LINE NO.	DIRECTION	LENGTH
L1	S35°32'01"W	24.70'
L2	S2°22'55"E	34.35'
L3	S85°08'40"W	32.88'
L4	S22°43'54"W	24.20'
L5	S65°28'09"W	51.68'
L6	N79°53'54"W	46.97'
L7	S44°08'33"W	14.89'
L8	S66°46'01"W	136.21'
L9	S65°30'32"W	126.77'
L10	S43°54'17"W	51.62'
L11	S61°52'53"W	41.88'
L12	S65°18'08"W	46.57'
L13	N28°01'21"W	7.70'
L14	N52°37'06"W	5.26'

MINOR SUBDIVISION PLAT
 PROPERTY OF
PLUM CREEK TIMBERLANDS LP
 LOOKWOOD FOLLY TOWNSHIP, BRUNSWICK COUNTY
 NORTH CAROLINA

SEPI
 ENGINEERING GROUP

9303 MONROE ROAD, SUITES G2-H2
 CHARLOTTE, NORTH CAROLINA 28270
 TEL: 704-845-9977

DRAWING DATE: 06/22/2007
 CHECK BY: RLM
 PROJECT NUMBER: SR.07.005.00
 SHEET: 1 OF 1
 SCALE: 1"=500'

DATE	REVISIONS

GRAPHIC SCALE
 0 100 200 300 400 500
 SCALE: 1"=500 FEET

1. RICHARD L. MORRISON, PROFESSIONAL LAND SURVEYOR, CERTIFY THAT:
 A. THAT THE SURVEY CREATES A SUBDIVISION OF LAND WITHIN THE AREA OF A COUNTY OR MUNICIPALITY THAT HAS AN ORDINANCE THAT REGULATES PARCELS OF LAND.
 NOTES:
 1. APPARENT SOURCE OF TITLE: BOOK 1510, PG 904, TPN 123000013.
 2. BOUNDARY BASED ON SOURCE OF TITLE AND MC 21, PG 430. LINES NOT SURVEYED ON TRACT 1, SHOWN WITH COMPUTED POINTS AT CORNERS. 45' CASSEMENT BASED ON SOIL ROAD BEARINGS SHOWN ON MC 21, PG 530.
 3. UNLESS SIGNED AND SEALED, THIS PLAT IS PRELIMINARY, NOT FOR RECORDATION, SALES OR CONVEYANCE.
 4. GRID TIE BASED ON MC 21, PG 530, NC GRID NORTH, NAD83 HORIZONTAL GRID DISTANCES.
 5. ACCORDING TO FIRM PANEL 3701920031215 DATED 12/09/03, A PORTION OF TRACT 1 LIES WITHIN A FLOOD HAZARD AREA AND TRACT 1A DOES NOT.

on (he or) the owners of the property shown and described hereon (has been) (was) (is) by deed recorded in Book _____ of _____ County, North Carolina, and the same is hereby subdivided with my (our) (his) (her) (its) (their) consent, establish the minimum building lines, and dedicate all drainage ways and other open space to public or private use as noted. Further, I (we) certify that the subdivision shown is within the subdivision jurisdiction of Brunswick County.

Date _____
 Owner(s) _____

Prepared by:



The Louis Berger Group, Inc.
1001 Wade Ave, Suite 400
Raleigh, North Carolina 27605
Tel (919) 866-4400
Fax (919) 755-3502

Project Manager:

Michael O'Rourke
Tel (919) 866-4421
Fax (919) 755-3502
morourke@louisberger.com